AIRCRAFT MAINTENANCE MANUAL

Diamond AIRCRAFT

DA20-C1

DOC # DA201-C1

DIAMOND AIRCRAFT INDUSTRIES INC.
1560 CRUMLIN SIDEROAD, LONDON, ONTARIO
CANADA N5V 1S2

This manual contains the maintenance information required by JAR-VLA. Contents and revision status can be found in the TABLE OF CONTENTS and the RECORD OF REVISIONS.

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RECORD OF REVISIONS

Use this list to record and control all of the revisions that you put in this Aircraft Maintenance Manual (AMM). Put the affected pages of the revision into the AMM as soon as you get them. Remove and destroy the pages that are superseded. Complete the table below when you have put the revised pages into the AMM.

A vertical bar in the left margin shows changes on text pages and illustrations.

DAI: Diamond Aircraft Industries, Inc., Canada

Revision Number	Date Issued	Date Inserted	Inserted By	Revision Number	Date Issued	Date Inserted	Inserted By
Initial Issue	19 Dec 97	19 Dec 97	DAI	15	30 Apr 09	30 Apr 09	DAI
1	24 Mar 99	24 Mar 99	DAI	16	30 Oct 09	30 Oct 09	DAI
2	15 Dec 99	15 Dec 99	DAI	17	01 Nov 10	01 Nov 10	DAI
3	21 Jul 00	21 Jul 00	DAI	18	09 May 11	09 May 11	DAI
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HIGHLIGHTS

1. General

The table below highlights the changes that have been incorporated in Revision 22.

CH-SE-SU	Page	Highlights
Front Matter		Cover Page, Record of Revisions (ROR), Highlights, Master TOC and List of Effective Pages (LOEP) were revised.
03-00-00		Added UMA Inc information
05-50-00	6	Added overspeed inspection for flapbellcrank
11-TOC	1	Revised Table of Contents
11-20-00	1 thru 4	Revised the chapter and the figures.
11-30-00	1 thru 16	Revised the chapter and the figures. Added New IP figure
23-TOC	1	Revised Table of Contents
23-00-00	1	Added Garmin GTN 650 information
23-10-00	1, 9-16, 205, 206, 213, 214	Added Garmin GTN 650 and GTR 225 information
24-31-00	206-208	Added UMA indicator information
27-50-00	2 and 7	Added new flap controller details
28-40-00	3-4, 101, 202 thru 208	Added New Fuel probe figure and provide UMA engine instrument information.
31-10-00	1, 2, 8-12	Added new instrument panel layout
34-TOC	3	Revised Table of Contents
34-20-00	3, 4	Added new instrument panel layout
34-50-00	1, 22-24, 216, 217, 225	Added GTN 650 information
74-TOC	1	Revised table of contents
74-00-00	208-212	Moved Starting Vibrator battery information to Chap 80-00-00
77-00-00	206-210	Added UMA engine instrument information
79-00-00	207, 209-210	Added UMA instrument information
80-TOC	1, 2	Revised Table of Contents
80-00-00	201, 202	Moved Starting Vibrator battery details to this chapter

CH-SE-SU	Page	Highlights
92-TOC	1 thru 4	Revised Table of Contents
92-00-00	1 thru 4	Added new schematic information
92-10-00	1 thru 31	Added new schematics
92-30-00	5 thru 35	Added new schematics

LIST OF SERVICE BULLETINS

Service Bulletin Number	Revision Number	Category	Title of Service Bulletin	Issue Date
DAC1-11-01	1	Recommended	Chinese Placards and Markings	21 Mar 11
DAC1-23-01	0	Recommended	GMA 340 Isolation Diodes	08 Dec 04
DAC1-23-50	0	Optional	Installation of 27 Ohm Resistor	09 Sep 09
DAC1-24-01	1	Recommended	Generator Lower Attaching Bolt Replacement	03 Mar 10
DAC1-24-03	2	Optional	G-35 Battery, Optional Installation	27 Apr 10
DAC1-24-04	3	Recommended	Generator Attachment Bracket	18 Jul 08
DAC1-24-05	1	Optional	B & C Battery Retrofit	19 Apr 01
DAC1-24-06	0	Optional	Installation of YTX24HL-BS Battery on Firewall	14 Jan 04
DAC1-24-07	0	Optional	Battery EPU Relay	08 Nov 12
DAC1-25-01	3	Recommended	ME406 ELT installation	18 Mar 11
DAC1-25-02	0	Recommended	ME406 ELT installation on Reverse Panel	23 Nov 10
DAC1-25-03	0	Optional	Installation of Safety Hammer, Type II	29 Aug 11
DAC1-27-01	0	Optional	Control Stick Elevator Trim Installation	26 Apr 01
DAC1-27-02	1	Optional/ Recommended	Flap Actuator Bushing Retainers	01 Feb 08
DAC1-27-03	0	Mandatory	Inspection of Flap Bellcrank	03 Mar 14
DAC1-28-01	0	Optional	Type II Fuel System/Pump Retrofit	08 Oct 98
DAC1-28-02	3	Mandatory	Two speed Electri Fuel Pump System	27 Oct 99
DAC1-32-01	0	Optional/ Recommended	NLG Elastomer Pack Disk Retention	28 Feb 07
DAC1-32-02	0	Optional	Optional Installation of Extended Main Landing Gear Struts	05 Jun 09
DAC1-32-03	0	Recommended	NLG Wheel and Fork Installation	15 Jul 11
DAC1-33-01	0	Optional	Reconition Lights	21 Feb 00
DAC1-33-02	0	Optional	Installation of Replacement EL Flood Light	23 Apr 10

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DAC1-33-04	1	Optional	Installation of Backlighting on the Instrument Panel	23 Nov 10
DAC1-34-02	1	Optional	Installation of Backup Artificial Horizon	21 Aug 12
DAC1-52-01	0	Optional	Canopy, Seal Replacement	07 Jan 99
DAC1-34-05	0	Optional	Garmin G500 Software Upgrade 006-B1076-40	27 May 13
DAC1-34-06	0	Reccomended	Garmin G500 Software Update 006-B1076-51	7 Mar 14
DAC1-52-03	1	Recommended	Canopy Lock Cover Plate Installation	17 Aug 99
DAC1-53-01	2	Recommended	Spar Bridge Gusset Reinforcement	23 Mar 09
DAC1-55-01A	3	Alert	Horizontal Stabilizer Attachment	30 Mar 01
DAC1-61-00A	1	Alert	Spinner Rear Bulkhead Replacement	02 Apr 01
DAC1-61-01	3	Recommended	Sensenich W69EK7-63 Propeller Installation	28 Aug 02
DAC1-71-01	1	Optional	Cowling Thermal Protection Shielding	16 May 02
DAC1-71-02	0	Optional	Engine Mount to Firewall Washers	19 Jan 04
DAC1-71-03	0	Optional	Winterization Kit	19 May 04
DAC1-71-04	0	Optional	Enlarged Cowl Inlet for Hot Weather Ops	29 Jun 04
DAC1-73-03	0	Optional/ Recommended	Engine Fuel Line Replacement	08 Dec 05
DAC1-73-04	5	Optional/ Recommended	Engine Fuel System Conversion	26 Nov 10
DAC1-73-05	1		Operating Limitations with Altitude Compensating Fuel Systems	14 Dec 07
DAC1-74-01	0	Recommended	Ignition Harness Routing	12 Nov 99
DAC1-74-02	0	Recommended	Starting Vibrator Battery Installation	18 Feb 00
DAC1-74-03	2	Optional	Installation of Optional Push-to-Start Ignition Switch	09 Mar 11
DAC1-76-01	1	Recommended	Mixture Cable Kinking	29 Jan 99
DAC1-76-02	0	Recommended	Mixture Cable Routing	03 Dec 03

Service Bulletin Number	Revision Number	Category	Title of Service Bulletin	Issue Date
DAC1-76-03	2	Optional	Installation of Mixture Cable for Altitude Compensating Fuel Pump	06 Mar 06
DAC1-76-04	1	Recommended	Throttle Cable Firewall Feed-Thru	28 Jan 10
DAC1-79-01	0	Optional	Power Plant Cooling	09 Nov 99
DAC1-79-02	0	Recommended	Oil Filter Bracket Installation	10 Apr 01
DAC1-92-01	0		Certification, German Import Requirements	18 Feb 02
DAC1-92-02	0		Certification, United Kingdom Import Requirements	28 Feb 07
DAC1-92-03	0		Certification, Mexico Import Requirements	28 Feb 07
DAC1-92-05	0		Certification, French Import Requirements	06 Jun 07
DAC1-92-07	1	Mandatory for EASA Member Countries Optional to other countries	Operation Limit Changes for EASA Member Countries	09 Aug 12
DAC1-92-08	0	Mandatory for EASA Member Countries Optional to other countries	Installation of Illuminated Placards	09 Aug 12

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LIST OF TEMPORARY REVISIONS

Temporary Revision Number	Date Issued	Date Inserted	Inserted By

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LIST OF EFFECTIVE PAGES

1. General

The List of Effective Pages (LOEP) uses the following abbreviations:

- TOC = Table of Contents
- ROR = Record of Revisions
- SB = Service Bulletin
- TR = Temporary Revisions.

All Chapters have a Title page and the Table of Contents.

Each revision to the Aircraft Maintenance Manual (AMM) will have a new List of Effective Pages.

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27-TITLE	2	30 Oct 09
27-TOC	1	14 Jan 13
27-TOC	2	14 Jan 13
27-TOC	3	14 Jan 13

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27-20-00	3	09 May 11
27-20-00	4	09 May 11
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27-20-00	6	09 May 11

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27-31-00	201	30 Oct 09
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27-31-00	203	30 Oct 09

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28-TOC	2	14 Jan 13
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28-00-00	2	14 Jan 13

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28-40-00	207	30 May 14
28-40-00	208	30 May 14
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31-10-00	1	30 May 14
31-10-00	2	30 May 14
31-10-00	3	30 Oct 09
31-10-00	4	30 Oct 09

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31-50-00	101	30 Oct 09

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31-62-00	3	12 Jun 12

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32-40-00	5	09 May 11

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32-40-00	214	09 May 11
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33-20-00	102	30 Oct 09

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34-TOC	4	14 Jan 13
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34-10-00	1	30 Oct 09

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37-10-00	201	30 Oct 09

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56-10-00	3	30 Oct 09

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57-10-00	3	30 Oct 09
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57-10-00	201	01 Nov 10
57-10-00	202	30 Oct 09
57-10-00	203	30 Oct 09
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57-50-00	203	09 May 11
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71-00-00	101	14 Jan 13
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71-00-00	222	14 Jan 13
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71-10-00	206	30 Oct 09
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74-TOC	2	30 May 14
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80-TITLE	2	30 Oct 09
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CHAPTER 01-00
INTRODUCTION

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INTRODUCTION

1. General

This Aircraft Maintenance Manual (AMM) gives instructions for maintenance personnel to service and maintain the Diamond Aircraft Industries (DAI) DA20-C1 aircraft. The AMM provides sufficient information to inspect, fault isolate and to complete the removal/installation and test/adjustment of equipment as well as the repair of certain systems. To provide as complete a coverage as possible, optional equipment has been included in the manual.

This AMM does not contain maintenance data for components removed from the aircraft. (Maintenance Shop data).

The AMM contains wiring diagrams for the electrical system.

Use the following manuals with the AMM and the related Service Bulletins:

- The DA20-C1 Aircraft Illustrated Parts Catalogue (AIPC)
- The DA20-C1 Airplane Flight Manual (AFM)
- The ELT Manufacturer’s Operators’ Manual
- The Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
- The Continental Motors Operator and Installation Manual (Form X30620)
- The Slick Maintenance Manual
- W69EK7 Series Wood Propeller with 7/16" Bolt Attachment for Diamond DA20-C1 Aircraft: Installation, Operation and Maintenance (number W69EK7-CF)
- W69EK Series Wood Propeller with 3/8" Bolt Attachment for Diamond DA20-C1 Aircraft: Installation, Operation and Maintenance (number W69EK-CF).
- ASPEN EFD1000 Installation Manual, Document Number #A-01-126-00, latest Revision
- Garmin G500 Installation Instructions, Document Number 190-01122-06, latest revision.

If it is necessary to contact DAI about your aircraft, it is important to include the aircraft serial number in all correspondence. The serial number can be found on the data placard.

Use only parts that have been approved and certified by DAI and obtained from DAI approved sources for maintenance on the aircraft. Salvaged or reworked parts obtained from non-DAI approved sources are unsuitable and unsafe for use on the aircraft.

In the event that the aircraft should be maintained and/or operated with parts and/or components that are not approved by DAI and/or its supplier and vendor, all warranties will be rendered null and void upon installation of such parts and/or components.

2. Revision Service

The primary delivery method for DAI manuals is in an electronic format. Aircraft owners, repair facilities and others having licenced access to DAI maintenance publications will electronic and/or written notification when revisions are made.

Upon request, DAI maintenance publications will be made available in a hard copy media. Print revisions will be provided coinciding with revision of the electronic version of any manual. These revisions will include instructions for inserting the revised material and each revised chapter will include revision highlight pages with a brief summary of the changes and revision bars will be present in the margin adjacent to any changed text or illustration.

Each page of the manual shows the date of first issue. If the page has changed, it shows the date of the revision.

The Record of Revisions (ROR) and Check List are part of each revision. The Check List shows which pages have changed.

3. Warning, Cautions and Notes

Obey all the usual safety precautions and maintenance instructions when doing maintenance.

This AMM also contains warnings, cautions and notes before applicable instructions:

WARNING: A WARNING TELLS THE PERSON DOING THE MAINTENANCE THAT INJURY OR DEATH IS POSSIBLE IF THEY DO NOT FOLLOW THE INSTRUCTIONS.

CAUTION: A CAUTION TELLS THE PERSON DOING THE MAINTENANCE THAT DAMAGE TO EQUIPMENT IS POSSIBLE IF THEY DO NOT FOLLOW THE INSTRUCTIONS.

NOTE: A Note tells the person doing the maintenance how to make the task easier.

4. Manual Configuration

This manual is written in accordance with the regulations of the Air Transport Association of America (ATA) Specification, *i*Spec2200. Each system is given a chapter number from the ATA *i*Spec2200. Where applicable, a chapter contains sections for each sub-system.

The European Association of Aerospace Industries specification, AECMA Simplified English has been used to write this AMM. This is a mandatory requirement of the ATA *i*Spec2200.

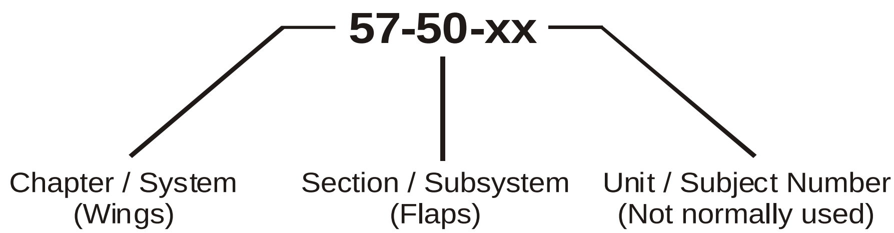
There are only 3 sources of words available to use in Simplified English (SE).

- Approved words from the SE Guide. These words have defined meanings and selected parts of speech.
- Technical names as defined in the SE Guide. Used only as adjectives or nouns.
- Manufacturing processes as defined in the SE Guide. Always used as verbs.

This manual does not use the ATA *i*Spec2200 - Aircraft Maintenance Task Oriented Support System (ATMOSS) or the ATA *i*Spec2200 - Production Management Data Base (PMDB).

A. The ATA *i*Spec2200 Numbering System

The ATA *i*Spec2200 numbering system uses 3 pairs of numbers, for example:



The first pair of numbers shows the system. System 57 is the wings. Chapter 57 contains the data for the wings.

The second pair of numbers shows the sub-system. Sub-system 50 is the Trailing Edge Flaps. Chapter 57, section 50 contains the data for the trailing edge flaps installation.

The third pair of numbers shows a unit. A unit could be the flap itself. Only complex systems use unit numbers.

For simple systems, the main chapter has all of the data and there are no section/sub-system break-downs.

B. Groups of Chapters

The chapters are put together in the following groups:

Group A	Introduction	Chapters 01-02
Group B	Aircraft General	Chapters 03-12
Group C	Airframe Systems	Chapters 20-37
Group D	Structure	Chapters 51-57
Group E	Propeller	Chapter 61
Group F	Power Plant	Chapters 71-80

A separation sheet divides each chapter. The separation sheet shows the number of the chapter and the title.

The main contents of each group of chapters are given below:

(1) Group A - Introduction

Chapter 1 describes about the AMM and Chapter 2 describes how to use the AMM.

(2) Group B - Aircraft General

Chapter 3 describes the general description of the airplane and its systems.

Chapter 4 describes the data about the Airworthiness Limitations and certification of the airplane.

Chapter 5 contains the Scheduled Maintenance Checklist. Some tasks require a maintenance procedure. The scheduled maintenance checklist identifies the chapter in the manual that gives the maintenance procedure for the task. It also tells you where to find general information.

Chapters 6 to 10 describe about the dimensions of the airplane and general procedures such as towing, parking and weighing.

Chapter 11 describes about the placards and markings which are important for the safe operation of the airplane.

Chapter 12 contains servicing tasks such as refueling and lubrication. It also contains data about cleaning the airplane.

(3) Group C - Airframe Systems

Chapter 20 contains the standard practices for airframe maintenance.

Chapters 21 to 37 describe about the airframe systems. They include the avionics systems (such as communications (23)) and the mechanical systems (such as flight controls (27)).

Chapter 31 shows the location of the instruments. The chapter which is applicable to the system gives the details. For example, Chapter 27 gives the details for the flap position indicator.

(4) Group D - Structure

Chapter 51 contains data about the design of the airframe. It also gives instructions for assessing damage to the airframe and how to do minor repairs.

Chapters 52 to 57 describe about each part of the structure.

(5) Group E - Propeller

Chapter 61 contains the maintenance procedures for the propeller. Refer to the propeller manufacturer’s manual for other data.

(6) Group F - Engine

This group of chapters describes the engine and its systems. It contains the maintenance procedures for maintenance of the engine on the airplane. Refer to the engine manufacturer’s manual for other data.

C. Chapter Configuration

The first page of each chapter shows the number of the chapter and the title. The second page shows the contents. Where applicable, each chapter and section contains the topics that follow:

- Description and Operation
- Troubleshooting
- Maintenance Practices. Where applicable the Maintenance Practices give data on the following procedures:
  - Servicing
  - Removal and Installation
  - Adjustment/Tests
  - Checking/Testing
  - Cleaning/Painting
  - Repairs.

5. Page Numbering System

This manual uses the ATA *i*Spec2200 page block-numbering system. The page number is at the bottom of the page at the outer edge. It is adjacent to the chapter/section number.

Each topic in a Chapter has numbers from the following page blocks:

- Description and Operation:Pages 1 to 99
- Troubleshooting:Pages 101 to 199
- Maintenance Practices:Pages 201 to 299

6. Figures

Figures are given numbers in sequence. The first figure in:

- Description and Operation section is figure 1
- Troubleshooting section is 101
- Maintenance Practices is 201.

7. Record of Revisions

This AMM has a Record of Revisions (ROR). Use the ROR to show when changes were included in the AMM.

8. Record of Temporary Revisions

This AMM has a record of Temporary Revisions (TR). Use the TR to show when temporary changes were included in the AMM.

9. List of Applicable Publications

The aircraft manufacturer keeps a List of Applicable Publications (LOAP). The LOAP shows you the Service Bulletins number and the revision that it was issued with.

10. List of Effective Pages

This AMM has a List of Effective Pages (LOEP). The LOEP shows you the number and effective date of each page contained in the AMM.

11. Service Bulletins

Service Bulletins will be issued as required to provide information or instructions for modification and/or inspection of the aircraft in service.

12. Safety

This manual describes processes that may require the use of chemicals, solvents, paints or other commercially available materials.

Material Safety Data Sheets (MSDS) containing information about Trade name, Safety hazards, Health Hazards, Reactivity, Spill or Leak Procedures, Special Protection Information, Special Precautions and Transportation and Labelling are available from the manufacturer. Make sure that you read prior to using the consumable materials. Anyone using chemicals, solvents, paints or other materials in the performance maintenance on the aircraft is responsible for knowing and complying with requirements of all governing agencies with jurisdiction at that location.

13. Acronyms

An acronym is defined the first time it is used within a task with the abbreviation following in parenthesis (e.g. Air Transport Association (ATA)). Subsequent use uses the abbreviation.

14. Request for Manual Change

If operators have suggestions for improvements to the content of the manual or errors or omissions are found, please submit the proposed changes on the Manual Change Request form shown in Figure 1.

Diamond AIRCRAFT

Technical Publications - Manual Change Request

To: Diamond Aircraft Corporation Technical Publications 1560 Crumlin Sideroad, London, Ontario, Canada N5V 1S2 techpubs@diamondair.com	Diamond Reference #: Date:

All Fields marked with an asterisk * are required

Contact Information

*Name: and Name of Company	*Telephone:		*Department:
Mobile/Cell Phone:	Fax Number:	*E−Mail:	
I would like to receive notification of actions on this request.			*Media Type:

NOTE: Responses will only be sent by electronic mail.

Publication Information

*Publication Name:	Revision:	*What is the location of the data in the Publication: Chapter/Section/Subject/Task/IPC Figure/Page Number, etc.
*Publication Document/Part Number:		

*Description of Change Requested: (Attach sheets if more space is required)

Reason for change:

Reference Data Provided:

Description:

Figure 1 - Manual Change Request Form

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CHAPTER 02-00
ORGANIZATION AND HANDLING
OF THE MANUAL

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ORGANIZATION AND HANDLING OF THE MANUAL

1. General

For data about a system, look in the list of chapters and find the chapter number. The first page of each chapter after the title page shows the contents.

2. Applicability

Data applicable to a series aircraft is marked with an applicability note.

For example:

Valid for S/N: C0067 through C0090

This shows that you can use this data for aircraft with serial number: C0067 through C0090 inclusive.

3. Revisions

The manufacturer makes changes to the AMM to show design changes (or to show maintenance procedure changes), and/or other changes. Each group of changes is called a "Revision".

A manual revision contains the following items:

- The changed pages
- The reason for the revision
- Instructions for putting the revision into the AMM
- A new List of Effective Pages (LOEP).

A vertical bar in the left margin of the page shows the change to the text and illustration.

4. Temporary Revisions

Temporary revisions correct errors, or they give temporary instructions. The manufacturer sends them to the aircraft owners quickly. The manufacturer uses yellow paper for Temporary Revisions. The manufacturer usually puts the contents of a Temporary Revision in the next approved Revision.

5. Service Bulletins

Service Bulletins (SB) regulate modifications carried out on registered, in field operated aircraft. SBs get issued when necessary and they give the operator more information on inspections, maintenance, repairs or modifications.

Service Bulletins have two categories:

- Alert Service Bulletins

  Alert Service Bulletins effect the airworthiness of the airplane. The Alert Service Bulletin gets supplied to the operator as fast as possible. Alert Service Bulletins are identified as such and are printed on blue paper. If necessary, the instructions of an Alert Service Instruction get sent by FAX. Diamond Aircraft highly recommends that you obey the instructions of each Alert Service Bulletin in as short a time as possible. But not later than the compliance date specified in the Alert Service Bulletin.

- Service Bulletins

  Service Bulletins get sent to the operator to give data on inspection and maintenance procedures.

  NOTE: Write the numbers of all Service Bulletins issued for this aircraft in the List of SB in the front matter of this AMM.

6. Service Instructions

Service Informations give the operator technical instruction about the product that are not included in the standard documentation. This could be for example recommendations for maintenance or information about SB‘s of other manufacturers (Teledyne, Hartzell etc.).

7. Document Notifications

Manual Revisions, Temporary Revisions, Service Bulletins and Service Information are notified via e-mail. The new documents are available for download on the internet web site of Diamond Aircraft Industries, Canada: www.diamondair.com.

8. Abbreviations

Where possible, the abbreviations used correspond with the related regulations.

ACL:	Anti-Collision Light
ADF:	Automatic Direction Finder
A.M.E:	Aircraft Maintenance Engineer
A&P:	Airframe and Powerplant Mechanic
ASI:	Airspeed Indicator
CFRP:	Carbon Fiber Reinforced Plastic
DME:	Distance Measuring Equipment
ELT:	Emergency Location Transmitter
FRP:	Fiber Reinforced Plastic
GFRP:	Glass Fiber Reinforced Plastic
GPS:	Global Positioning System
G/S:	Glide Slope
HSI:	Horizontal Situation Indicator
LOC:	Localizer
OAT:	Outside Air Temperature
SB:	Service Bulletin
S/N:	Serial Number
TBO:	Time Between Overhaul
TCM:	Teledyne Continental Motors
TCMOH:	Time Since Major Overhaul
TTSN:	Total Time Since New
UHMW:	Ultra High Molecular Weight
VFR:	Visual Flight Rules
VHF:	Very High Frequency
VLA:	Very Light Aircraft
VOR:	VHF Omni-directional Ranging
VSI:	Vertical Speed Indicator

9. Conversions of Factors and Abbreviations

Use table 1 for conversion factors and the related abbreviations

Table 1 - Conversion Table

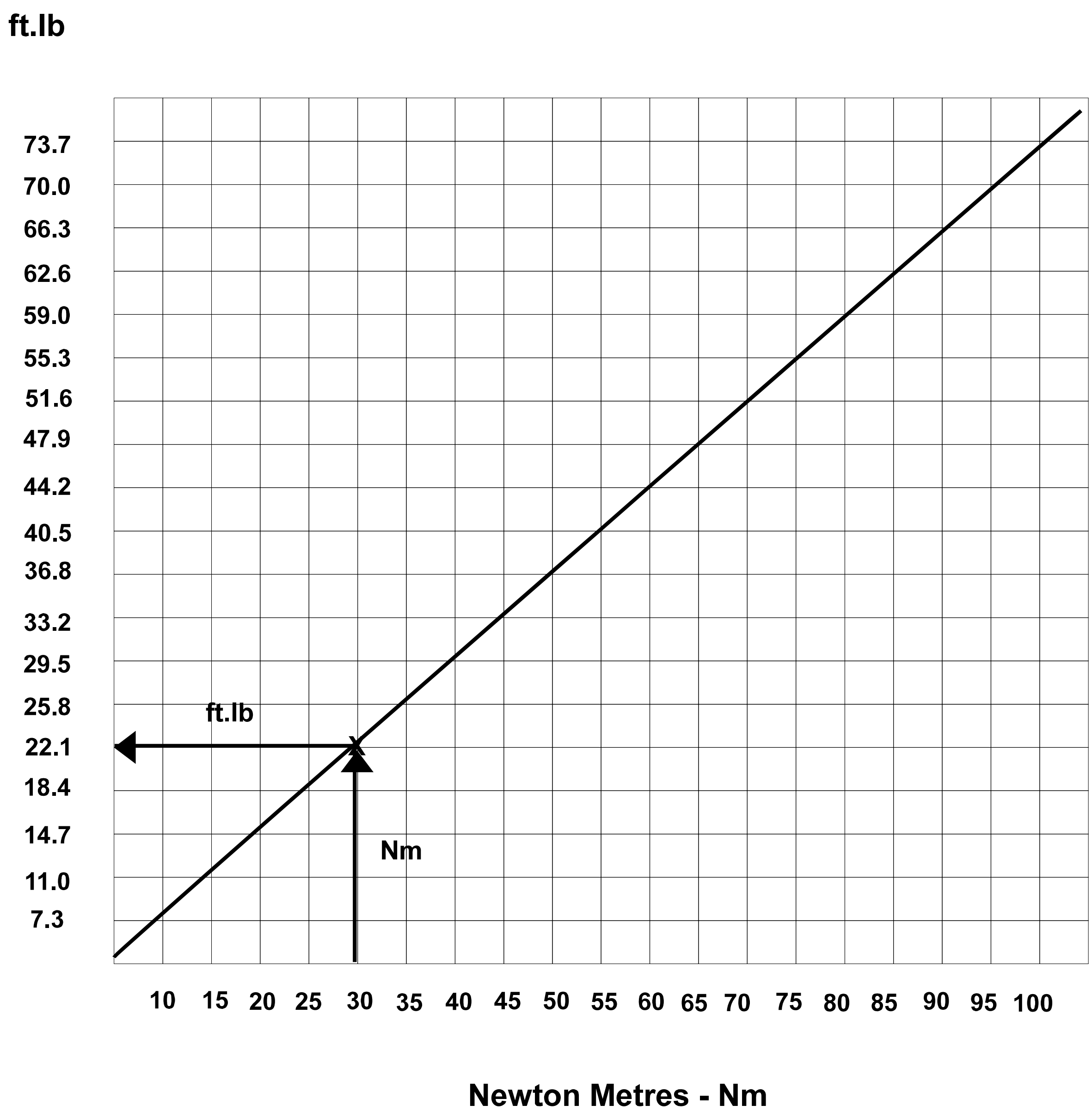
Dimension Units/Abbreviations	Conversion Factor SI to US/Imperial	Conversion Factor US/Imperial to SI
Length		
Meter [m]	[m] x 0.3048 = [ft]	
Millimeter [mm]	[mm] / 25.4 = [in]	
Kilometer [km]	[km] / 1.852 = [nm]	
Inch [in]		[in] x 25.4 = [mm]
Foot [ft]		[ft] x 0.3048 = [m]
Nautical mile [NM]	[km] / 1.609 =[sm]	[nm] x 1.852 = [km]
Statute mile [SM]		[sm] x 1.609 = [km]
Velocity		
Kilometers per hour [km/h]	[km/h] / 1.852 = [kts]	
Miles per hour [mph]	[km/h] / 1.609 = [mph]	[mph] x 1.609 = [km/h]
Meters per second [m/s]	[m/s] x (60/0.3048) = [fpm]	
Knots [kts]		[kts] x 1.852 = [km/h]
Feet per minute [fpm]		[fpm] / 196.85 = [m/s]
Rotational Speed		
Revolutions per minute [RPM]		[RPM] = [min^{-1}]
Pressure		
Bar [bar]	[bar] x 14.5038 = [psi]	
Hectopascal [hPa]	[hPa] / 33.865 = [InHg]	
	[mbar] / 33.864 = [inHg]	
Pounds per square inch [psi]		[psi] / 14.5038 = [bar]
Inches of mercury column [inHg]		[inHg] x 33.864 = [hPa]
		[inHg] x 33.864 = [mbar]

Dimension Units/Abbreviations	Conversion Factor SI to US/Imperial	Conversion Factor US/Imperial to SI
Force or Weight Newton [N] Decanewton [daN] Pound [lb]	 [N] / (g x 0.45359) = [lbs] where g = 9.80665 m/s^2 [daN] / 0.4448 = [lb]	 [lb] x 4.448 = [N] [lb] x 0.4448 = [daN]
Mass Kilogram [kg] Pound [lb]	 [kg] / 0.45359 = [lbs]	 [lb] x 0.45359 = [kg]
Volume Liter [l] US gallon [US gal] US quart [US Qt] Imperial gallon [Imp gal] Cubic inch [in^3]	 [l] / 3.7853 = [US gal] [l] / 0.9464 = [US qts] [l] / 4.5459 = [Imp gal] [l] / 61.024 = [in^3]	 [US gal] x 3.7854 = [l] [US qt] x 0.9464 = [l] [Imp gal] x 4.5459 = [l] [in^3] x 61.024 = [l]
Torque Newton meter [Nm] Foot pound [ft.lb] Inch pound [in.lb]	 [Nm] / 1.3558 = [lbf-ft] [Nm] x 8.851 = [lbf-in]	 [lbf-ft] x 1.3558 = [Nm] [lbf-in] / 8.851 = [Nm]
Temperature Degree celsius [°C] Degree fahrenheit [°F]	 [°C] x 1.8 + 32 = [°F]	 ([°F] - 32) / 1.8 = [°C]

10. Torque Conversion Graph

Use graph 1 for conversion of torque values Nm - lbf-ft. and use graph 2 for conversion of Nm - lbf-in

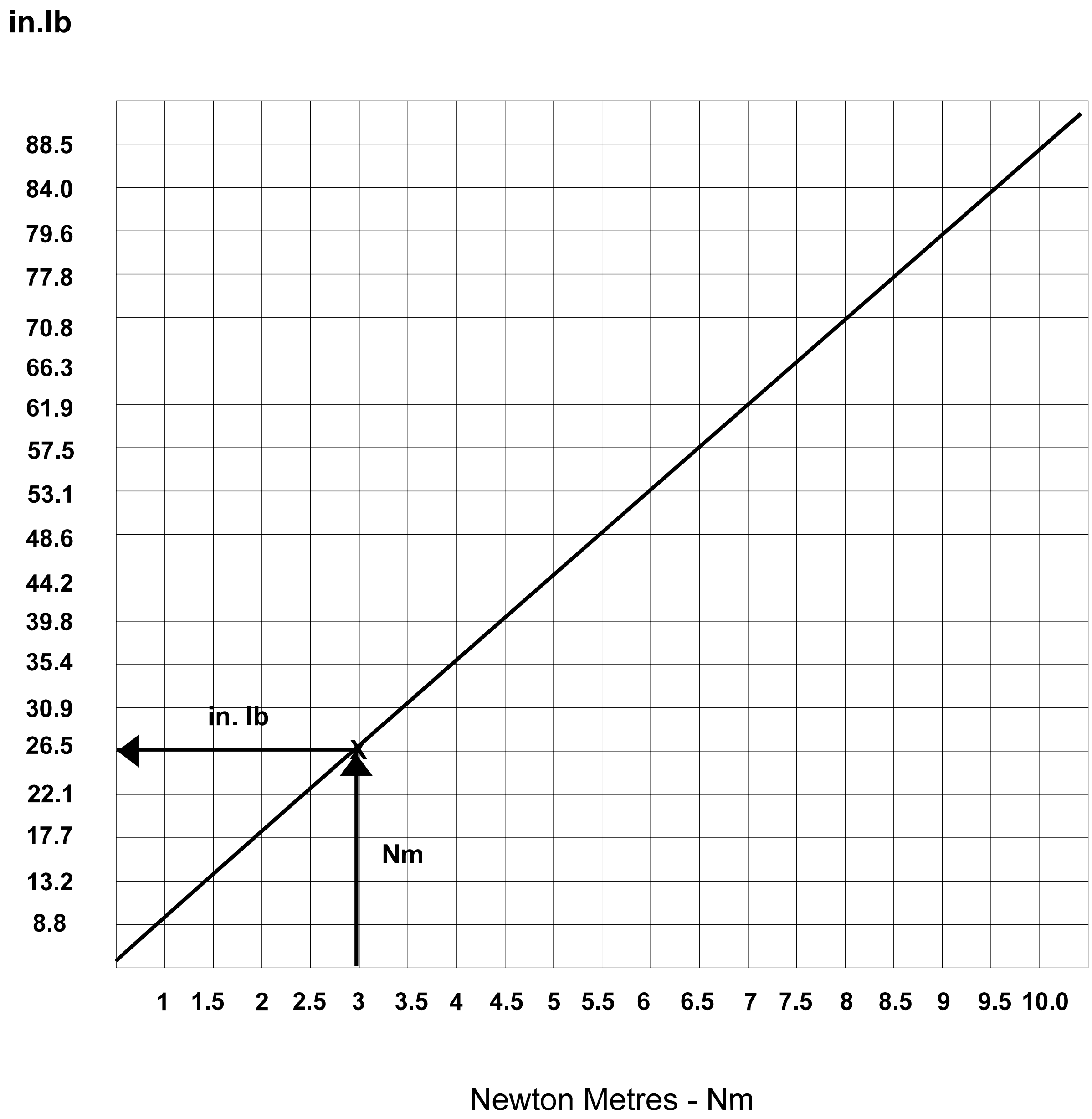
Graph 1 - Nm - lbf-ft



To calculate the value in ft lbs follow your Nm value vertically until you reach the hatched axis line follow the line across horizontally and read of the value in ft.lb.

e.g: 30 Nm = 22.1 ft.lb

Graph 2 - Nm - lbf-in.



To calculate the value in. lbs follow your Nm value vertically until you reach the hatched axis line follow the line across horizontally and read of the value in. lbs.

e.g: 3 Nm = 26.5 in. lb

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CHAPTER 03-00
GENERAL DESCRIPTION
OF THE AIRCRAFT

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GENERAL DESCRIPTION OF THE AIRCRAFT

1. General

Diamond Aircraft Industries Inc., 1560 Crumlin Road, London, N5V 1S2, Ontario, Canada, make the DA20-C1 aircraft.

2. Description

The DA20-C1 aircraft is a single-engine, two seat, low-wing monoplane. It has a cantilever wing and a “T-tail” Fiber-reinforced plastic-composite makes the aircraft structure. Fiber-reinforced composite gives a very strong but light structure.

The semi-monocoque fuselage is a glass-fiber reinforced-plastic (GFRP) shell with bulkheads and stiffeners. The one-piece canopy has a large quantity of wrap-around glazing. This gives a good all-round view from the cockpit. The vertical stabilizer has two GFRP half-shells that are part of the fuselage shell.

The cantilever wing is a semi-monocoque sandwich. It has an I-shaped spar with caps made from carbon-fiber rovings. The left wing and the right wing attach to the fuselage. Each wing has a stump spar. Three special bolts attach each wing to the fuselage. Standard ailerons and electrically operated flaps attach to the trailing edge of the wing.

Polyurethane paint protects the outside skin from ultraviolet rays and humidity.

The fixed tricycle landing gear has optional fairings attached to each leg. The main legs attach to the spar bridge and the nose leg attaches to the forward fuselage. Each main wheel has a disc brake on the inside. Hydraulic pressure operates each disc brake.

The flight control system uses conventional ailerons, elevator and rudder. The DA20-C1 aircraft has two control sticks and two rudder pedal assemblies to operate the primary flight-controls. Push-pull rods operate the ailerons and elevator. Cables operate the rudder. Electric motors operate the elevator trim and wing flaps.

A Teledyne Continental (IO-240-B), four cylinder, direct drive, horizontally opposed engine powers the DA20-C1 aircraft.

The aircraft may be fitted with one of several different types of two bladed propeller. A Sensenich W69EK7-63 wood propeller with 7/16" diameter attachment bolts. A Sensenich W69EK7-63G wood propeller with a composite covering and 7/16" diameter attachment bolts. A Sensenich W69EK-63 wood propeller with 3/8" diameter attachment bolts.

The aircraft has an aluminum fuel tank in the fuselage. The fuel tank is between the backrest of the seat and the B-bulkhead below the floor of the baggage compartment.

The aircraft has two sources of electrical power. A 12-volt battery supplies power when the engine is not running. An alternator provides power when the engine is running. Switches and circuit breakers control all electrical devices. An ignition key controls the magnetos. It also controls the engine starter motor.

The DA20-C1 aircraft has a full range of flight instruments. These include pitot/static instruments to show airspeed and altitude. Vacuum or electric driven instruments show attitude. The aircraft has all the usual engine instruments. It also has air data, Automated Heading and Reference System (AHRS), glass display and radio and navigation aids installed.

3. Equipment Data

The table below gives the names and address of the manufacturers who supply systems and/or equipment for the DA20-C1 aircraft. This will help you get more data on a system and/or equipment.

Equipment/System	Address
Engine: Teledyne Continental (IO 240-B):	Teledyne Continental Motors P.O. Box 90 Mobile, AL 36601, USA Tel: (334) 438-3411
Propeller: Sensenich (W69EK63) (W69EK7-63) (W69EK7-63G)	Sensenich Wood Propeller Company 2008 Wood Court Plant City, FL, USA Tel: (813) 752-3711 Fax: (813) 752-2818
Main Wheels and Brakes: Cleveland 30-9D:	Parker Hannifin Corporation Aircraft Wheel and Brake Division P.O. Box 158 Avon, OH 44011, USA Tel: (216) 934-5221
Navigation and Communication Equipment:	Bendix/King 400 North Rogers Road Olathe, KS 66062-1212, USA Tel: (913) 782-0400
Air Data Instruments:	United Instruments Inc. 3625 Comotara Ave. Wichita, KS 67226, USA Tel: (316) 265-4271. Garmin International, Inc. 1200 E. 151st Street Olathe, KS 66062 USA Tel: (913) 397-8200
Emergency Beacon:	Emergency Beacon Corp. 15 River Street New Rochelle, NY 10801-4351, USA Tel: (914) 235-9400
Yuasa Battery:	Yuasa-Exide, INC. P.O. BOX 14145 Reading, PA 19612-4145, USA

Equipment/System	Address
Teledyne Battery:	Teledyne Battery Products 840 West Brockton Redlands, CA 92374, USA Tel: (714) 793-3131 or 1-800-456-0070 Fax: (714) 793-5818
Tachometer:	Mitchell Aircraft Products, INC 910 Sherwood Drive, Suite 20 Lake Bluff, IL 60044, USA Tel: (847) 615-2887 Fax: (708) 615-2349 Superior Labs Inc., 5783 Central Avenue Hot Springs, AR 71913, USA Tel: (501) 525-6688
Instruments:	Mid-Continent Instrument Co., INC., 7706 E, Osie Wichita, KS 67207, USA Tel: (316) 683-5619 Fax: (316) 683-1861
Attitude and Direction:	SIGMA TEK Instruments and Avionics 1001 Industrial Road Augusta, KS 67010-9566, USA Tel: (316) 775 6375 Fax: (316) 775 1416
Emergency Locator Transmitter (ELT):	Emergency Beacon Corp PO Box 178 New Rochelle, NY 10801, USA Tel: (914) 235 9400 Fax: (914) 576-7075 Artex Aircraft Supplies 14405 Kell Road NE Aurora, OR 97002, USA Tel: (800) 547-8901
Altitude Encoder:	Trans-Cal Industries, Inc 16141 Cohasset Str Van Nuys, CA 91406, USA Tel: (818) 787 1221 or (800) 423 2913 Fax: (818) 787 8916

Equipment/System	Address
Intercom:	PS Engineering, Inc 9800 Martel Road Lenoir City, TN 37772, USA Tel: (423) 988 9800 Fax: (423) 988 6619
Vacuum Pump: Filter: Regulator:	Aero Accessories Inc, 1240 Springwood Ave Gibsonville NC 27249 Tel: 800-822-3200 Tel: 366-449-5054 Fax: 366-449-5461
Auto Pilot:	S-Tec Corporation One S-TEC Way Municipal Airport Mineral Wells, TX 76067-9236, USA Tel: (940) 325-9406 or 1-800-USA-S-TEC Fax: (940) 325-3904 www.s-tec.com
Electronic Instrumentation:	Vision Micro Systems Inc. 4255 Mitchell Way Bellingham, WA 98226, USA Tel: (360) 714-8203 Fax: (360) 714-8253
Instrument Panel: Aspen EFD1000	Aspen Avionics Inc., 5001 Indian School Road NE Albuquerque, NM 87110, USA
Instrument Panel: Garmin G500	Garmin AT Inc., 2345 Turner Road, SE Salem, OR 97302, USA Tel: (503) 581-8101
Engine Instrumentation	Uma Inc. P.O. Box 1500, 260 N. Main Street Dayton, VA, 22821 Tel: (540) 879-2040 Fax: (540) 879-2738

CHAPTER 04-00
AIRWORTHINESS LIMITATIONS

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AIRWORTHINESS LIMITATIONS

The Airworthiness Limitations section is approved by the Minister and specifies maintenance required under any applicable airworthiness or operating rule, unless an alternative program has been approved by the Minister.

Bill Taylor

A/Chief Engineering

Aircraft Certification Branch

Transport Canada

7 Aug 2012

Date

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1. General

A. Airworthiness Limitations

The Airworthiness Limitations chapter is approved by the Aircraft Certification Branch, Transport Canada Civil Aviation (TCCA) on behalf of the Minister and specifies maintenance required under Canadian Aviation Regulations (CAR) unless an alternate program has been approved by TCCA.

This chapter shows the mandatory limitations established by the airframe manufacturer and is approved by the Aircraft Certification Branch, Transport Canada on behalf of the Minister.

Personnel must obey the limitations given in this chapter.

B. Airframe

A comprehensive airframe inspection is mandatory after 6,000 hours of flight.

C. Paint

It is mandatory to paint certain parts of the DA20-C1 aircraft white. This will help to keep the temperature of the composite structure below the structural temperature limit for the flight [55 °C (131 °F)]. Paint colors, markings, and placards are subject to the following zone restrictions. (Refer to Figure 1):

(1) Zone I: You must paint this area white. You can only paint areas of registration marks, placards and minor trim different colors.

(2) Zone II: You can paint this area any color with average solar absorptivity of 0.5 or less (Yellow, light green etc.). Or you can paint areas of registration marks, placards and minor trim different colors on a white background.

(3) Zone III: You can paint this area any color. If you paint this area any color other than white, you must install a structural temperature indicator (Thermindex Chemicals RTP-55/RED). The indicator must be installed in the area of color, close to the aircraft center line. Where possible, install the indicator near the fuel drain.

(4) Zone IV: You must paint this area with fire resistant paint.

D. Engine Life Limited Components

Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 and associated continuing airworthiness documents for the engine life limited components.

E. Aircraft Life Limited Components

Replace the following components at the time shown:

Component	Time Between Replacement
20-2720-12-00 Rudder Control Cable Short, Fwd Assembly	3000 hours or 10 years whichever comes first.
20-2720-11-00 Rudder Control Cable Long, Fwd Assembly	
22-2720-21-00 Cable Aft Rudder	

2. Component Life Tracking

To make sure that component replacement is performed at the correct time, the aircraft is delivered with the part number and the serial number of the cable identified. If you replace the cables you must record the data that follows in the Aircraft Maintenance Log for the replacement cables.

- Flight hours and date at removal of the old cables
- Serial numbers or an equivalent series of identifying characters for the new cables
- Flight hours and date at installation.

The aircraft is delivered with the following cables installed (serial numbers will be identified in the Aircraft Maintenance Log):

- 20-2720-12-00 Rudder Control Cable Short, Fwd Assembly Qty 2
- 20-2720-11-00 Rudder Control Cable Long, Fwd Assembly Qty 2
- 22-2720-21-00 Cable Aft Rudder Qty 2

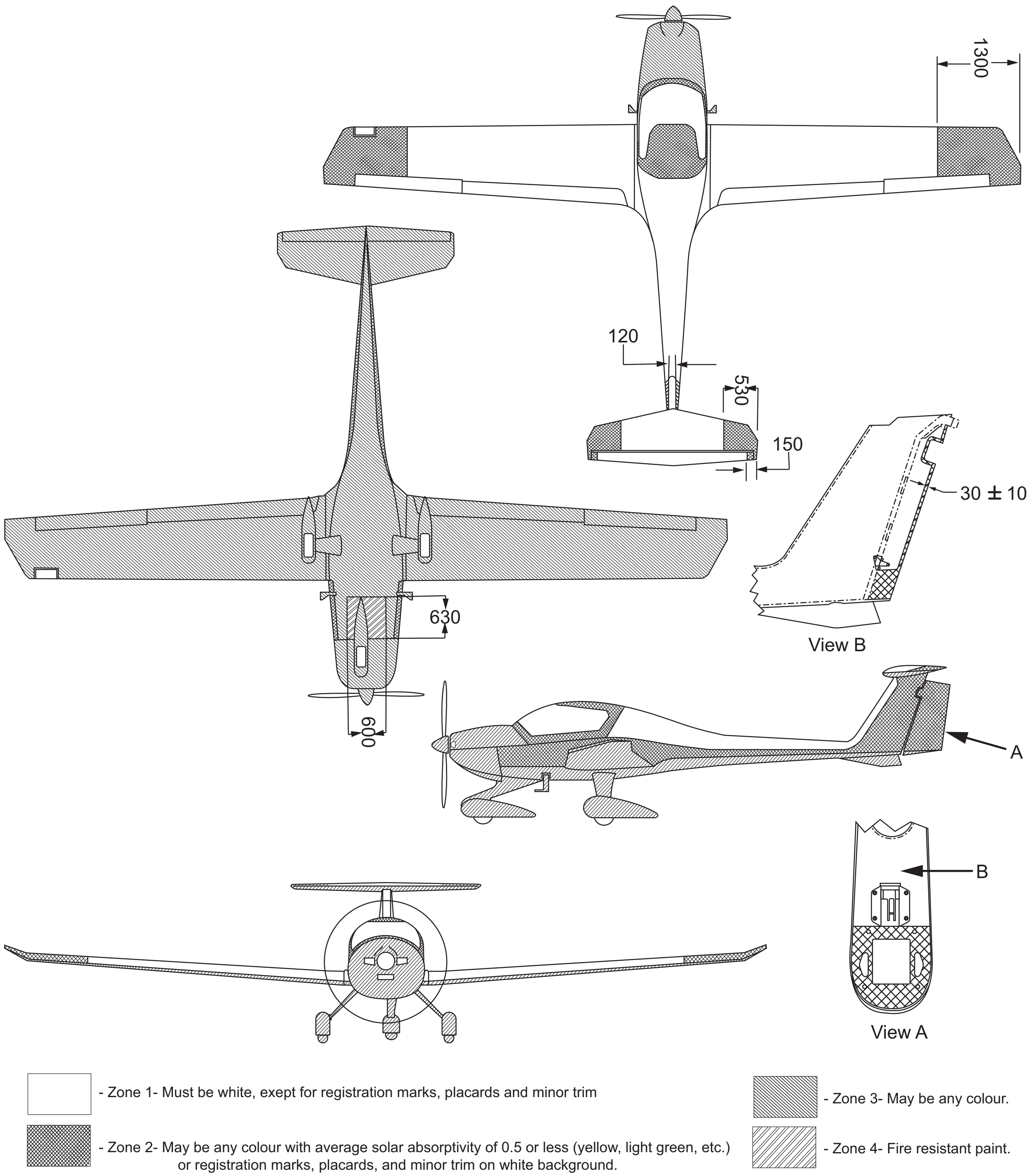

Figure 1 - Paint Zones

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CHAPTER 05-00
TIME LIMITS AND MAINTENANCE CHECKS

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TIME LIMITS AND MAINTENANCE CHECKS

1. General

This chapter will help you to do the maintenance of the DA20-C1 aircraft correctly. All of the usual tasks are easy to do and no special tools are necessary. Refer to AMM Chapter 04-00 and Chapter 05-00 to help you when you do maintenance and inspections.

Do the scheduled maintenance checks given in this chapter at the recommended times. These checks are the minimum required to keep the aircraft in a good technical condition.

These checks do not over-ride the requirements of the airworthiness authority of the country where the aircraft is registered. You must make sure that all Airworthiness Directives, Service Bulletins and any other requirements of the airworthiness authority are completed as required.

The aircraft manufacturer can change the time between checks. If this happens, the aircraft manufacturer will publish the change as a revision to the Aircraft Maintenance Manual.

You can decrease the time between scheduled maintenance checks if the aircraft's operation makes it necessary. You must not extend the time between scheduled maintenance checks without the airworthiness authority's approval.

2. Chapter Configuration

A. Chapter 05-10

This chapter contains the time limits for maintenance checks. It also contains the time between overhaul for components. Use the data in this chapter to find when to do the maintenance.

B. Chapter 05-20

This chapter contains the maintenance checks schedule for 50, 100, 200, 1000 and 6000 hour checks. It also contains data for the annual check if necessary for national regulations and contains data for a special 25 hour check on new aircraft.

C. Chapter 05-30

This chapter contains data for Flight Line checks.

D. Chapter 05-50

This chapter contains the unscheduled maintenance checks. Do these checks after hard landings and propeller damage.

3. Words with Special Meanings

In this maintenance manual, the words that follow have special meanings:

Adjust: To put to a specified position or condition. For example, adjust the clearance to 1 mm.

Check: A technical name for a group of maintenance tasks.
For example, the 100 hour check

Examine: To look carefully at an item. It includes steps such as the following:

- Make sure that the item:
  - is complete
  - is correctly attached
  - has no loose parts
  - shows no signs of leaks
  - is not cracked or damaged
  - is not worn.
- Make sure that:
  - the surface protection is not damaged
  - all locking devices are installed correctly.
- Make sure that items such as pipes and cables:
  - look serviceable
  - do not rub against other items.

For log books and other technical records:

- to find outstanding faults
- to make sure they are up-to-date and correctly maintained.

Inspection: The procedure which compares an object with its standard or specification.

Measure: To find out the dimensions, capacity or quantity of something.

Monitor: To look at something during a time. For example, monitor the engine speed indicator.

Record: (1) Technical name for something that shows what was done.
For example, write the result of the test in the engine record.

(2) The act of making a record. For example, record the result of the test in the aircraft log book.

Replace: To remove an unserviceable item and install a serviceable item in the same location. A new part or new parts, as applicable, must be installed.

Set: To put equipment into a given adjustment, condition or mode.
For example, set the altimeter scale to 1013 mb or 29.92 in.Hg.

Task: An assigned work or a procedure. For example, each step of the task has an identification letter.

Test: That which you do when you operate or examine an item to make sure that it agrees with the applicable specifications. For example, disconnect the systems which are not necessary for the test. Or do an engine test.

TIME LIMITS

1. General

All scheduled maintenance checks have time limits. You must do the scheduled maintenance within the time limits.

Some components installed in the aircraft have a fixed time between overhaul (TBO), (for example the engine). Refer to Paragraph 4.

The Slick Magneto has a 500 hour inspection requirement (Refer to the Teledyne Continental Motors IO-240-B Maintenance Manual).

2. Regulatory Authorities

The time limits given in this chapter meet the requirements of the Canadian Department of Transport. Other Regulatory Authorities can have different requirements. You must make sure that you meet the requirements of the Regulatory Authority of the country where the aircraft is registered.

3. Scheduled Maintenance Time Limits

Refer to Chapter 05-20.

The following hourly and calendar time limits apply to the scheduled maintenance checks which are necessary to maintain the aircraft in an airworthy condition. Do the scheduled maintenance at the intervals shown below:

Scheduled Maintenance Check (Hourly)	Do At These Times
25 Hour Check	At 25 hours since new do items without the asterisk (*) beside the item in 100 hour column of inspection checklist.
50 Hour Check	At 50 hours since new and every 50 hour intervals.
100 Hour Check	At 100 hours since new and every 100 hour intervals.
200 Hour Check	At 200 hours since new and every 200 hour intervals.
1000 Hour Check	At 1000 hours since new and every 1000 hour intervals.
6000 Hour Check	At 6000 hours since new and every 6000 hour intervals.

Scheduled Maintenance Check (Calendar)	Do At These Times
Annual Inspection (for aircraft maintenance not done to FAR 91).	At 12 months since new and every 12 month interval do a 200 Hour Check.
Annual Inspection (for aircraft maintenance done to FAR 91).	At 12 months since new and every 12 month interval do a 100 Hour Check.

NOTE: The 6000 hour airframe check is mandatory for Airworthiness.

4. Component Time Limits

Overhaul the following components at the times indicated:

Component	Time Between Overhaul
Engine, Continental Motors IO-240-B.	2000 hours. (Refer to Continental Motors Service Information Letter No SIL-98-9A).
Electrical Fuel Pump, Dukes	10 years
Fuel Cap, Newton	Annual. (Refer to AMM Chapter 28-10).

Replace the following components at the times indicated:

Component	Time Between Replacement
Battery for starting vibrator	2000 hours or 2 years whichever occurs first.

Replace the following systems at the times indicated:

System	Time Between Replacement
Brake Fluid	3 years

NOTE: Continental Motors recommends that engines used in aerial dressing, dusting or spraying have a maximum 1200 hours TBO or less at the operators discretion.

5. Component Time Tracking

To make sure that components overhaul is done at the correct time you must record the data that follows in the Aircraft Maintenance Log for each component requiring overhaul:

- Serial Number
- Flight hours and date at installation
- Flight hours and date at removal.

SCHEDULED MAINTENANCE CHECKS

1. General

Do the scheduled maintenance checks given in this chapter at the intervals stated in Chapter 05-10, Paragraph 3. Only persons authorized by national regulatory authorities of the country where the aircraft is registered may do these checks. The inspection level for each item is a general visual inspection unless differently specified.

2. Maintenance Checklist

Do the scheduled maintenance checks with reference to the Maintenance Practices in this chapter. Before starting a check, complete the requirements of Paragraph 2 (Preparation) and Paragraph 3 (Engine Ground Test) of the Maintenance Practices.

Do all the applicable tasks on the checklist.

All of the applicable items must be signed by authorized maintenance personnel. Record the completion of the check in the aircraft log book. Complete a copy of the Maintenance Report (Refer to Paragraph 4).

The Maintenance Checklist is divided into zones. The zones are defined as follows:

A. Engine Compartment

All items forward of the firewall. It includes the cowlings and the propeller.

B. Front Fuselage

All items on the outside of the front fuselage from the firewall to the trailing edge of the wing. It includes the nose landing gear, external parts of the main landing gear and the canopy.

C. Cockpit

All items inside the fuselage shell from the aft face of the firewall to the aft face of the spar bridge and seatback. It also includes the internal parts of the main landing gear and the brake system.

D. Center Fuselage, Internal

All items inside the fuselage shell below the baggage compartment floor from the aft face of the spar bridge and seatback to the B-bulkhead. It includes the fuel tank and the control systems on the aft control bulkhead, the baggage compartment, the battery box and the GPS antenna.

E. Rear Fuselage

All items on the outside of the fuselage from the trailing edge of the wing to the front of the vertical stabilizer.

F. Tail

All items of the fuselage, vertical stabilizer and horizontal stabilizer aft of the rear fuselage.

G. Wings

All items on the inside and outside of the left and right wings. It includes the ailerons, flaps and pitot head.

H. General

Those items which include more than one zone at the same time. It includes items such as control checks which need one person in the cockpit and another person at the control surface.

3. <u>6000 Hour Inspection</u>

All 6000 hour inspection items listed in the tables must be performed within 6000 hours of flight time and every 6000 hours thereafter.

A. Types of Inspection

In the 6000 hour inspection checklist, three types of inspections are specified:

- Visual Inspection
- Tap Test
- Functional or Fit Check.

(1) Visual Inspection

In composite structures, surface damage, e.g. dents or scratches may be detected by visual inspection. You can see where fiber breakage or matrix cracking has happened. Damage to the core may also be visible. It is easier to see damage on unpainted areas of composite. On painted composite surfaces, damage is often first visible as waviness that shows up when you illuminate the surface with a bright light at a low angle.

To simplify laminating, a paste made of epoxy resin filled with silica powder is sometimes used to smooth abrupt transitions, such as sharp inside corners or at the edges of foam core. Since the cured paste is white, it can be difficult to tell the difference between this paste and a delamination in a glass fiber composite. The areas of paste are whiter and have more sharply defined edges.

In composite structures, small hairline cracks may occur in the surface finish, especially at places where filler putty has been used. If the part has no foam core and the opposite face is accessible and unpainted, you may be able to determine if there is damage to the composite. If not, you must remove the paint and filler from the affected area by careful hand sanding to expose the underlying composite.

The composite structure is protected by paint from exposure to damaging ultraviolet light from the sun. It is important that the paint be in good condition. UV light can also damage the paint. You can inspect for UV damage of the paint as follows:

(a) Clean the painted surface with solvent-based cleaner (BASF Prekleeno 900). Wipe the cleaner off before it dries.

(b) Rub the paint surface with a dark cloth. An excess of white, chalky residue on the cloth indicates oxidation of the paint due to UV damage. If only a small amount of residue is found, the paint can be polished smooth. If a large amount of residue is found, the component should be repainted.

If visual inspection of a metal component indicates possible damage, non-destructive inspection may be used to check for cracks. Alternately, the part may be replaced.

(2) Tap Test for Composites

Each type of structure makes a distinct sound when tapped with a large coin or washer. The thicker and more solid the structure, the higher pitch the sound. Areas of delamination, cracks in overlapping bonds and sandwich panels with underlying damage to the core sound dull or dead when tapped. The best technique is to tap repeatedly while moving slowly around the area of interest, listening for changes in the sound. In this way, it is possible to find the extent of an area of damage.

Tap testing is also useful to find the edges of an area of core, to find underlying bulkheads or ribs and to find steps in the thickness of solid laminates.

Tap testing is done if visual inspection indicates possible damage. For example, if a surface dent is found in a sandwich part, tap testing should be used to determine if there is a disbond between the skin and the core.

(3) Functional or Fit Check

Wear on mating parts can be evaluated by measuring the play between the parts when they are engaged, such as the fit of the A-Bolt and B-Bolt bushings in the spar bridge.

B. Defect Limits for Composites

Diamond Aircraft has established defect limits for inspection of composite airframe components. Refer to Chapter 51-10 for this information.

Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

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SCHEDULED MAINTENANCE CHECKS - MAINTENANCE PRACTICES

1. General

Enter the applicable data in the blocks below:

Aircraft S/N: ____________	Registration: ____________
Date: ____________	Engine Hours, TTSN/TSMOH: ____________
Check: ____________	Aircraft Operating Hours: ____________
(50, 100, 200, 1000, 6000 hrs, Annual Inspection)	

At 25 hours time since new of an aircraft, inspect the items in the 100 hour column that DO NOT have an asterisk (*). Items that do have an asterisks beside may be initialed "N/A @ 25 hr." in the “Initials” column.

2. Preparation

Do the following items before you start the applicable check:

Inspection Items	Interval (Flight Hours)					
	50	100	200	1000	6000	Initials
1. Before you do the inspection: - Read the applicable Airworthiness Directives.	X	X	X	X	X	
2. For aircraft that are not US registered: - Read the applicable Service Bulletins.	X	X	X	X	X	
3. Examine the Log Books. - Do a check of the Technical Records. Make sure that the mass and static moment for the ailerons, flaps, elevator and rudder are within the specified limits. (Refer to Chapter 06-00)	X	X	X	X	X	
4. Clean the aircraft fully (Refer to Chapter 12-30).		X*	X	X	X	

* Not applicable at 25 hour inspection.

3. Engine Ground Test

Do an engine ground test as follows:

NOTE: Complete a copy of the Engine Ground Test Report as part of the engine ground test. (Refer to paragraph 7).

Inspection Items	Interval (Flight Hours)				
	50	100	200	1000	Initials
WARNING: DO NOT LET PERSONS GO INTO THE DANGER AREA OF THE PROPELLER. PROPELLERS CAN CAUSE INJURY OR DEATH. WARNING: SET THE PARKING BRAKE TO ON. IF YOU DO NOT DO THIS, THE AIRCRAFT CAN MOVE AND THIS CAN CAUSE INJURY OR DEATH.					
1. Do an operational test of the parking brake.		X	X	X	
2. Set the parking brake to ON.	X	X	X	X	
3. Put the chocks against the aircraft main wheels.	X	X	X	X	
4. Do an engine operational test. - For the engine run procedures, refer to DA20-C1 Airplane Flight Manual. - For the operational test, refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 - Record the data in the checklist in Chapter 05-20, paragraph 7, Engine Ground Test Record.	X	X	X	X	
5. Perform Cabin Heat and Defrost check: With engine running, select Heat ON, and Defrost, check to ensure that warm air is coming out from the defrost vents on top of the instrument panel cover. With Heat still ON, select Floor, and ensure that warm air is coming from the floor vents.			X	X	
6. Do an operational test of the fuel shut-off valve for correct operation. (Refer to Chapter 28-20).			X	X	
7. When the propeller stops rotating, set the ignition switch to the OFF position. Set the master switch to the OFF position. If step 5 carried out, reset the fuel shut-off valve to open.	X	X	X	X	

4. Maintenance of Checklist Zones

Do the applicable checks in each of the zones that follow:

A. Engine Compartment

Do the following scheduled inspections for Continental Motors IO-240-B engine at the predetermined intervals shown in the table below to verify system and subsystem integrity.

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft, if damages are determined that cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
WARNING: MAKE SURE THAT THE EXHAUST SYSTEM IS COOL BEFORE YOU DO MAINTENANCE ON THE ENGINE. THE EXHAUST SYSTEM CAN BE HOT AND THIS CAN CAUSE INJURY TO PERSONS.					
1. Remove the top and bottom cowlings. Examine the cowlings. Make sure that the fasteners are serviceable. Look for cracks and areas that have got too hot.	X	X	X	X	
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE. WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FUEL BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE THE EQUIPMENT.					
2. Examine the engine for oil/fuel leaks.	X	X	X	X	
3. Remove the oil drain plug. Drain the engine oil into an approved container (with the engine warm). - Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.	X	X	X	X	
4. Install the drain plug. - Tighten the drain plug. Torque to 190-210 lbf-in (21.5-23.8 Nm). - Lock the drain plug with the safety wire.	X	X	X	X	
5. Replace the oil filter. (Refer to Chapter 79-00).	X	X	X	X	
6. Examine the lubricating system. - Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.	X	X	X	X	

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
7. Cut open the used oil filter. If the filter is clogged with foreign debris, determine the source of foreign debris. Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.	X	X	X	X	
CAUTION: YOU MUST USE ENGINE OILS THAT AGREE WITH THE APPLICABLE REVISION OF THE CONTINENTAL MOTORS (CM) SPECIFICATIONS SHOWN IN CONTINENTAL MOTORS SIL99-2B. FOR MORE INFORMATION, SEE CONTINENTAL MOTORS SERVICE INFORMATION LETTER SIL99-2B REVISION B OR THE APPLICABLE REVISION					
8. Fill the engine with new oil. - Refer to Continental Motors Service Information Letter SIL99-2B for oil specifications, viscosity, and quantity.	X	X	X	X	
9. Remove the spark plugs. - Examine the spark plugs. Look specially for damaged electrodes - Clean the spark plugs (refer to spark plug manufacturer's instructions) - Do a spark plug gap test (Refer to the manufacturer's specified spark plug gap).		X*	X	X	
10. Do a compression test with the engine warm and the throttle open. Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. - Do the compression test on the four cylinders - Record the compression test results: - 1 _______ 2 _______ 3 _______ 4 _______		X*	X	X	
11. Install the spark plugs. Use a thread lubricant approved by the spark plug manufacturer: - Install the spark plugs with a new gasket - Torque to 300-360 lbf-in (33-40 Nm) - Refer to Teledyne Continental Motors Service Instructions for approved spark plugs.		X*	X	X	

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
NOTE: Refer to Continental IO-240 Series Engine and Overhaul Manual, Publication M-6 for 50 and 100 hours inspection for items 12, 13 and 15.					
12. Do the 50 hour engine inspection.	X	X	X	X	
13. Do the 100 hour engine inspection.		X	X	X	
14. Do the 200 hour fuel filter assembly inspection.			X	X	
15. Do the 100 hour cylinder assembly inspection.		X	X	X	
16. Clean fuel injector nozzles every 300 hours.		300			
17. Do the 500 hour Continental magneto inspection.		500		X	
18. Do the 500 hour inspection.		500		X	
19. Inspect the Tanis preheat system, if installed, as follows: - Make sure that the system is secure - Refer to Tanis Aircraft Products - Tanis Preheat System Owners' Manual.		X	X	X	
WARNING: MAKE SURE THAT THE EXHAUST SYSTEM IS COOL BEFORE YOU DO MAINTENANCE ON THE EXHAUST SYSTEM. THE EXHAUST SYSTEM CAN BE HOT. THIS CAN CAUSE INJURY TO PERSONS					
20. Examine the exhaust system. Look especially for cracks and heat damage: - Remove the flexible hoses from the heat exchanger - Remove the heat exchanger shroud - Clean the exhaust pipe thoroughly of all dirt and corrosion - Inspect the exhaust pipe carefully, using a hand held magnifying glass and light/mirror, for signs of cracks and pinholes - Evaluate further any suspected areas by appropriate means. - Repair or replace, before futher flight, any part containing cracks or holes. - Install the heat exchanger shroud - Install the flexible hoses to the heat exchanger. Refer to Chapter 78-00.		X*	X	X	

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
21. Examine the cabin heat system: - Remove the worm drive clamp from the flexible hose at the cabin-heat selector-valve - Disconnect the flexible hose to the cabin-heat selector-valve - Examine the flexible hose for damage - Examine the cabin-heat selector-valve - Connect the flexible hose to the cabin-heat selector-valve - Install the worm drive clamp.		X*	X	X	
22. Examine the engine baffles. Look especially for cracks and incorrect attachment.	X	X	X	X	
23. Examine the cowling seal on the firewall extension.	X	X*	X	X	
24. Examine the mechanical attachments and electrical connections on the alternator.	X	X	X	X	
25. Do a test for correct adjustment of the generator belt. Refer to Chapter 24-30.	X	X	X	X	
26. Examine the air hoses. Look especially for signs of leakage and damage. Make sure that the air hoses are correctly attached.		X	X	X	
27. Examine the cable ties and all electrical connectors. Pull lightly to make sure they are not loose.		X	X	X	
28. Examine the battery area (aircraft with front mounted battery only). Look especially for cleanliness.		X	X	X	
29. Test starting vibrator battery. (Refer to Chapter 74-00).		X	X	X	
30. Examine the drain pipes. Look especially for signs of chafing and damage. Make sure that the drain pipes are clear.		X	X	X	
31. Examine the fuel hoses. Look specially for signs of leakage and damage. Make sure that the fuel hoses are correctly attached.		X	X	X	

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
32. Examine the oil cooler. Look especially for leakage and damage. Make sure that the cooling fins are not blocked.		X	X	X	
33. Replace the air filter. (Refer to Chapter 71-60).		X*	X	X	
34. Examine the air filter. (Refer to Chapter 71-60).	X	X	X	X	
35. Examine the air box. (Refer to Chapter 71-60).	X	X	X	X	
36. Examine the engine starter relay. Look especially for correct attachment.		X	X	X	
37. Examine the throttle and mixture controls. - Make sure that the connection to the control lever is tight - Make sure that the end fitting can turn in the control lever - Examine the outer cables. Look specially for wear and for kinks - On aircraft with a standard fuel pump only, lubricate the mixture control inner cable with a small amount of oil. Refer to Chapter 12-20.		X	X	X	
38. Clean the engine compartment. (Refer to Chapter 12-30).		X*	X	X	
39. Make sure that there is no blockage of the engine oil separator. Long operation of the engine at low temperature with high air humidity, can cause blockage of the breather pipe.		X*	X	X	
40. Examine the engine mount. Look specially for: - Cracks or corrosion - Incorrect attachment and poor condition of the mounting bolts - Deterioration or cracking of the shock mounts - Inspect for proper assembly and security of the shock mounts - Incorrect torque value. (Refer to Chapter 20-00, Section 4).		X	X	X	
41. Bleed the fuel system. (Refer to Chapter 73-00).		X	X	X	

<table>
<tr><th rowspan="2">Inspection Items, Engine</th><th colspan="5">Interval (Flight Hours)</th></tr>
<tr><th>50</th><th>100</th><th>200</th><th>1000</th><th>Initials</th></tr>
<tr><td colspan="6">NOTE: For the fuel injection system inspection, the IDLE RPM setting for the IO-240-B engine installed in the DA20-C1 is 1000 ± 25 RPM. Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.</td></tr>
<tr><td>42. Do the fuel system check/adjustment.
- Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.</td><td></td><td>X</td><td>X</td><td>X</td><td></td></tr>
<tr><td colspan="6">WARNING: DO NOT LET PERSONS GO INTO THE DANGER AREA OF THE PROPELLER. PROPELLERS CAN CAUSE INJURY OR DEATH.

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU TURN THE PROPELLER. DISCONNECT THE SPARK PLUG LEADS.
MAKE SURE THAT:
- THE IGNITION SWITCH IS IN THE "OFF" POSITION
- THE "P" LEADS ARE GROUNDED
- THE THROTTLE IS SET TO "CLOSED"
- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".</td></tr>
<tr><td>43. Visually examine the wear port indicator of the Tempest Vacuum Pump.
- If the examination reveals that the backside of the vane has entered the indicator hole, then do the inspection at 800 hours of pump service life
- If the examination reveals that the top of the vane has entered the indicator hole, then do the next inspection at 1000 hours of pump service life.
- When the observations reveal the end of the vane to be in the middle of the indicator hole, perform the future observations at every one hundred (100) hours of service until the vane reaches the bottom 1/8 of the indicator hole.
- Refer to Tempest Service Letter Number SL-004 - Rear Wear Indicator Instructions.</td><td></td><td></td><td>600 hrs</td><td>X</td><td></td></tr>
</table>

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
CAUTION: FAILURE TO COMPLY WITH THE FOLLOWING MAY RESULT IN THE LOSS OF THE PROPELLER: - THE HUB OF A WOODEN PROPELLER WILL SHRINK OR EXPAND TO MATCH THE AMBIENT CONDITIONS. EXCESSIVE HUB SHRINKAGE, ESPECIALLY POSSIBLE DURING VERY COLD AND/OR DRY AMBIENT CONDITIONS CAN RESULT IN LOSS OF PROPELLER BOLT TORQUE (PRE-LOAD). THIS CAN ALLOW SLIGHT MOVEMENT RELATIVE TO THE DRIVE FLANGE, WHICH MAY RESULT IN DAMAGE TO THE PROPELLER AND/OR THE PROPELLER BOLTS, POSSIBLY EVEN LOSS OF THE PROPELLER. - TO PREVENT THIS, PROPER INSTALLATION AND PERIODIC RE-TORQUING IN ACCORDANCE WITH ALL APPLICABLE MAINTENANCE INSTRUCTIONS IS NECESSARY. - UNDER ALL CIRCUMSTANCES THE INSPECTION INTERVALS MUST NEVER EXCEED 50 HOURS. EXTREME CHANGES IN AMBIENT CONDITIONS (TEMPERATURE/HUMIDITY) MAY REQUIRE SHORTER INSPECTION INTERVALS.					
44. Remove and clean the spinner. Examine the spinner and backing plate for cracks. For Sensenich propeller W69EK-63 (3/8" bolt attachment) only. - Refer to the Chapter 61.		X	X	X	
45. Examine the propeller extension. Inspect for damage. Make sure that it is seated correctly.			X	X	
CAUTION: IMPROPER TORQUE VALUES WILL BE OBTAINED BY MEASURING THE BREAKING TORQUE IN A LOOSENING DIRECTION. THE TORQUE SHOULD BE CHECKED IN A TIGHTENING DIRECTION AND ADJUSTED AS NEEDED.					

Inspection Items, Engine	Interval (Flight Hours)				
	50	100	200	1000	Initials
46. Check the propeller attachment bolt torques. - Refer to the Chapter 61 - For Sensenich propeller W69EK7-63 or W69EK7-63G (7/16" bolt attachment), refer to the Sensenich W69EK7-CF Manual - For Sensenich propeller W69EK-63 (3/8" bolt attachment), refer to the Sensenich W69EK-CF Manual - For Hoffmann propeller HO-14HM-175-157, refer to the Hoffmann Owner's Manual number E0110.74	X	X	X	X	
47. Check blade tracking. Tracking must not exceed 1/8". - Refer to the Sensenich Document (W69EK-CF or W69EK7-CF) - Refer to The Hoffmann propeller Owner's Manual (Number E 0110.74).		X	X	X	
48. Install new cotter pins (W69EK7-63 or W69EK7-63G propeller with castellated nuts only). - Lock-wire the attachment bolts in pairs (Hoffmann and W69EK-63 propeller)	X	X	X	X	
49. Install the spinner. - Refer to Chapter 61.		X	X	X	
50. Sensenich propeller only: - Apply a non-silicon automotive type paste wax to the propeller blades.	X	X*	X	X	
NOTE: Do not apply wax to the propeller hub area.					

*- Not applicable at 25 hour inspection

1- Required at annual inspection for aircraft maintenance done to FAR 91.

B. Front Fuselage

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Front Fuselage	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Visually examine the complete surface of the front fuselage. Look especially for damage (dents, cracks, holes, scratches, and delamination). Examine the paint coat.		X	X	X	
2. Examine the canopy. Check the latching components for corrosion wear and damage. - Inspect the aft mount and rear hinge, the forward attaching points, the rubber stopper and the balance spring. - Look for delamination of the structure and leaks or breaks in the plexiglass seal. Make sure that the canopy locking mechanism will release. (Refer to Chapter 52-10).		X	X	X	
3. Do the canopy latch force test. (Refer to Chapter 52-10).		X	X	X	
4. Remove the wheel fairings. Look for cracks on the fairing mounts. (Refer to Chapter 32-40).		X	X	X	
5. Inspect the jacking pad to check: - whether the pad is either lose or has fallen off - if so, then bond jacking pad with TEROSTAT M9380 as per chapter 51-00 of the AMM - Cure for 24 hours before the flight or cure for 72 hours before using the jacking pads.		X	X	X	
6. Lift the aircraft on jacks. (Refer to Chapter 07-10).		X*	X	X	
7. Examine the tires. Look especially for cuts and wear. Measure the tire pressure. (Refer to Chapter 12-10).		X	X	X	
8. Examine the rims of the main and the nose-wheel. Look especially for cracks.		X	X	X	
9. Examine the wheel bearings. Look especially for play, corrosion and irregular operation.		X*	X	X	
10. Remove the main wheels. Clean and lubricate the bearings. (Refer to Chapter 12-20).			X	X	

Inspection Items, Front Fuselage	Interval (Flight Hours)				
	50	100	200	1000	Initials
11. Examine the brake lining. Look especially for wear. Minimum thickness 0.12 in (3.0 mm)		X	X	X	
12. Examine the brake disks. Look especially for wear. Minimum thickness 0.15 in (3.8 mm)		X*	X	X	
13. Install the main wheels. (Refer to Chapter 32-40).			X	X	
14. Examine the main landing gear. - Inspect for cracks and deformation - Inspect the strut for distortion, corrosion and paint condition. - Inspect mounting hardware for security and damage.		X	X	X	
15. Check for abnormal tire wear and correct tire pressure. (Refer to Chapter 12-10 and Chapter 32-10).		X	X	X	
16. Examine the nose-wheel assembly. Look especially for correct attachment, cracks and deformation.		X	X	X	
17. Examine the nose-gear journal-bearings in the bottom of the fuselage. Look especially for play.		X*	X	X	
18. Examine the bearing in the shock absorber retainer and strut bushings. Look especially for play.		X*	X	X	
19. Examine the nose landing gear shock absorber assembly as follows: - Inspect for damage, corrosion or cracks - Inspect rubber dampers for deterioration, cracks or damage - Inspect for proper attachment and loose components. - If any component of the assembly is found loose, the assembly must be removed and check for proper length and to determine the cause. Refer to Chapter 32-20-00 for further information.		X*	X	X	
20. Remove the NLG fork. (Refer to Chapter 32-20-00).		X	X	X	
21. Inspect the fork for cracks, corrosion and deformation. - Carefully inspect the NLG fork for cracks - Look especially for cracks in radius areas.		X	X	X	

Inspection Items, Front Fuselage	Interval (Flight Hours)				
	50	100	200	1000	Initials
22. Visually examine the NLG fork pivot. - Look especially for cracks in the radius where the fork makes contact, corrosion and wear. Any corrosion needs to be assessed, treated and/or the component replaced - Inspect the pivot stud threads of the lower end of the strut for cracks/damage.		X	X	X	
23. Lubricate the NLG fork pivot as per Chapter 12-00 and install the NLG fork as per Chapter 32-00.		X	X	X	
24. Visually examine the NLG strut condition. Look especially for distortion, corrosion and condition of the paint. Ensure that there is no excessive play in the NLG strut pivot. Allowable radial play is 0.002” (0.05mm). If play is excessive remove strut and inspect condition of flanged bushings.				X	
25. Do a test for play and caster friction. (Refer to Chapter 32-20). The friction should be 6.75-11.25 lbs (3-5 N) at the axle.			X	X	
26. Lubricate the spherical bearing at the top of the shock absorber assembly. (Refer to Chapter 12-20).				X	
27. Lower the aircraft off jacks. (Refer to Chapter 07-10).		X	X	X	
28. Install the wheel fairings.		X	X	X	
29. Examine the exterior placards. Make sure that they are not damaged and that none are missing. - Replace any that are damaged or missing. (Refer to Chapter 11-20).			X	X	

*- Not applicable at 25 hour inspection

C. Cockpit

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Cockpit	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Remove the seat shells. (Refer to Chapter 25-10).		X	X	X	
2. Examine the safety belts for general condition and security of the metal fitting in the surrounding composite. Make sure that the lock mechanism operates correctly. - Insert the connector into the buckle and pull on the connector. Make sure that the ratchet holds the connector. The connector must fall freely from buckle when held in a vertical position and when you open the cover to the release position.		X	X	X	
3. Examine the cable ties and electrical connectors. Pull lightly to make sure they are not loose.		X	X	X	
4. Examine the control sticks. Make sure that the control stick attachments are not loose and do not catch.		X	X	X	
5. Examine the control stick stops.		X	X	X	
6. Examine the pitot-static system water traps.		X	X	X	
7. Examine the stall warning hose. Look especially for contamination by water. (Refer to Chapter 34-20).		X	X	X	
8. Examine the flap-actuator indicator and position switches. Look especially for correct attachment and operation.		X	X	X	
9. Examine the flap-actuator stops and support. Look especially for correct attachment. Examine for security of the bracket on the laminate and cracks in the surrounding laminate.		X	X	X	
10. Examine the locking-device for the wing main-bolt. Look especially for: - Correct operation - Condition.		X	X	X	
11. Examine the mounting for the landing gear. Look especially for correct attachment and lock devices.		X	X	X	

Inspection Items, Cockpit	Interval (Flight Hours)				
	50	100	200	1000	Initials
12. Examine the rudder pedals. Look especially for correct attachment and function. (Refer to Chapter 27-20).		X	X	X	
13. Examine the complete rudder control system (cables, pulleys, brackets, hardware, and surrounding structure). Look especially for correct attachment, function, wear, damage and corrosion. (Refer to Chapter 27-20).		X	X	X	
14. Examine the brake pipes/hoses and components. Look especially for leakage.		X	X	X	
15. Examine the brake reservoirs on the co-pilots side. Make sure the fluid level is correct. The fluid level must be 1/2 to 1 in (12 to 25 mm) below the top face of the reservoir filler hole.		X	X	X	
16. Examine the instruments. Make sure that: - The markings are clear - The function is correct - Switches are correctly attached.		X	X	X	
17. Examine the interior placards. Make sure that they are not damaged and that none are missing. Replace any placards that are damaged or missing. (Refer to Chapter 11-30).		X*	X	X	
18. Remove the instrument panel cover.		X	X	X	
19. Visually inspect the fuel shut-off cover box. Ensure that the seal around the box is intact and not deteriorated.				X	
20. Visually examine the cockpit area for any signs of fuel leaks. Follow along the fuel hose conduit and fuel hoses from the drain trap block, along the floor of the cockpit to the fuel shut-off valve. Make sure that there are no signs of fuel leaks.		X	X	X	
21. Examine the instrument panel. Make sure that: - Wiring is correctly attached - Instruments are correctly attached - Hoses are correctly attached - Circuit breakers are correctly attached.		X	X	X	

Inspection Items, Cockpit	Interval (Flight Hours)				
	50	100	200	1000	Initials
22. Examine the vacuum inlet filter. (Aircraft with pneumatic instrument system only) Make sure that: - The filter is correctly attached - The filter is clean - Replace the filter at 500 hour intervals.		X	X	X	
23. Examine the vacuum system regulator. (Aircraft with pneumatic instrument system only) Make sure that: - The regulator is correctly attached - Replace the filter.		X	X	X	
24. Lubricate the ignition switch: - See FAA AD 93-05-06 reference ACS/Gerdes service bulletin SB92-01-ACS, ignition switch lubrication/inspection.				X	
25. Install the instrument panel cover.		X	X	X	
26. Examine the compass. Make sure that: - The compass is correctly attached - The fluid level is correct.			X	X	

* - Not applicable at 25 hour inspection

D. Center Fuselage, Internal

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Center Fuselage, Internal	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Examine the fire extinguisher. Make sure that the fire extinguisher will release and the fire extinguisher contents are full. Do a check of the extinguisher expiry date. (Refer to Chapter 26-00). Refer to Amerex Owners Service Manual No. 05602 - Installation, Operating and Servicing Instructions for more information on 6 year teardown maintenance and 12 year hydrostatic test.		X	X	X	
2. Examine the baggage net. Make sure that the spring clips operate correctly.		X	X	X	
3. Examine the ELT. (Refer to Chapter 25-60).		X	X	X	
4. Do a battery check. (Refer to Chapter 24-31). Look especially for: - Charge and capacity - Correct acid level - Correct mounting.		X	X	X	
5. Examine the battery bay area (aircraft with aft mounted battery only). Look especially for cleanliness.		X	X	X	
6. Remove the center fuselage panels on the bottom of the aircraft for access.		X	X	X	
7. Remove the baggage compartment floor for access. (Refer to Chapter 25-10).		X*	X	X	
8. Remove the B-Bulkhead cover plate (disconnect antenna), or on aircraft with the aft mounted battery remove the battery and battery tray for access. (Refer to Chapter 24-31). Visually examine the interior of the tail section. Look especially for signs of damage and FOD.				X	
9. Examine the push rod guides for the elevator push-rod. Look especially for correct attachment and freedom of movement.			X	X	

Inspection Items, Center Fuselage, Internal	Interval (Flight Hours)				
	50	100	200	1000	Initials
10. Examine the flap control mechanism on the aft control bulkhead. Look especially for damage, corrosion, correct attachment and lock devices.		X	X	X	
11. Examine the aileron control system on the aft control bulkhead. Look especially for wear, damage, corrosion, correct attachment and lock devices.		X	X	X	
12. Do a cable tension test of the rudder control cable. (Refer to Chapter 27-20).		X*	X	X	
13. Examine the rudder control lever and cables on the B-bulkhead. Look especially for damage, corrosion, correct attachment and lock devices.		X	X	X	
14. Examine the rudder control cables in the center fuselage. Look especially for wear, damage, corrosion and correct lock devices.		X	X	X	
WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.					
15. Remove and clean the gascolator filter bowl. Install the gascolator filter bowl. (Refer to Chapter 28-20).		X	X	X	
16. Examine the fuel tank strap. Look especially for rub marks.		X*	X	X	
17. Examine the fuel tank and fuel pipes for leakage.		X	X	X	
18. Examine the fuel system electrical cables and ground strap. Look especially for rub marks.		X	X	X	
19. Examine the filler neck of the fuel tank and the filler cap. Look especially for fuel leaks and damage.		X*	X	X	
20. Examine the fuel vent pipe. Look especially for rub marks and damage. Make sure the vent pipe is clear.		X	X	X	
21. Examine the cable ties and electrical connectors. Pull lightly to make sure they are not loose.		X	X	X	
22. With the wings removed perform a visual inspection and a tap test of the spar bridge. - Examine the condition of the laminates and the bond to the fuselage.				X	

Inspection Items, Center Fuselage, Internal	Interval (Flight Hours)				
	50	100	200	1000	Initials
Look especially around: - The LH and RH A-bolt bushing - The B-bolt bushing - The MLG brackets - The LH and RH top aft outer corners (behind the back-rest) - The seat fastener through the side of the spar bridge (if applicable). Do a visual inspection of the inside spar bridge. Refer to Chapter 51-00, Page 5, Item 6.A.					
23. Install the B-Bulkhead cover plate (connect antenna), or on aircraft with the aft mounted battery install battery and battery tray. (Refer to Chapter 24-31).				X	
24. Install the bottom center fuselage panels.		X	X	X	

* - Not applicable at 25 hour inspection.

E. Rear Fuselage

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Rear Fuselage	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Examine the complete surface of the rear fuselage. On aircraft with a rear window, examine around the inside and outside of the window including surrounding structure and seal. Look especially for damage (dents, cracks, holes, scratches, and delamination).		X	X	X	
2. Visually examine the condition of the paint. Look for chips, scratches, UV damage.		X	X	X	
3. Examine the push rod guides for the elevator push-rod. Look especially for correct attachment. And freedom of movement.		X*	X	X	
4. Examine the rudder-control cables and turnbuckles. Look especially for wear, damage, corrosion and correct lock devices.		X	X	X	

* - Not applicable at 25 hour inspection.

F. Tail

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Tail	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Examine the complete surface of the aft part of the fuselage, vertical stabilizer, and horizontal stabilizer. Look especially for damage (dents, cracks, holes, scratches and delamination). Look especially around the access panels.		X	X	X	
2. Visually examine the drain holes in the horizontal stabilizer. Make sure that they are open.			X	X	
3. Visually examine the condition of the paint. Look for chips, scratches, UV damage.		X	X	X	
4. Examine the lower fin. Look especially for damage to the bottom of the fin and correct attachment.		X	X	X	
5. Remove the rudder. - Visually examine the hinge pin for cracks, corrosion and fit in the composite. - On aircraft that have a sleeve installed over the hinge pin, replace the sleeve if it is damaged or worn. - Lubricate the hinge bushes. Refer to Chapter 55-40.			X	X	
6. Visually examine the drain holes in the rudder. Make sure that they are open.			X	X	
7. View through the access holes in the vertical stabilizer spar and visually inspect internal composite components for disbonding with skin, and for delamination and cracks.			X	X	
8. Examine the rudder mounting and control cable connections.		X	X	X	
9. Examine the rudder support bracket.		X	X	X	
10. Visually examine the rudder pivot bearing for corrosion and wear.			X	X	

Inspection Items, Tail	Interval (Flight Hours)				
	50	100	200	1000	Initials
11. Examine the bottom edge of the rudder. Look especially for cracks and deformation.		X	X	X	
12. Examine the rudder-stop reinforcement bars. Look especially for cracks and corrosion.		X	X	X	
13. Examine the trim actuator. Look especially for correct attachment and wear.			X	X	
14. Examine the fork assembly on the trim actuator. Look especially for cracks and corrosion.			X	X	
15. Remove the horizontal stabilizer. Examine the horizontal stabilizer for damage. (Refer to Chapter 55-10).				X	
16. Examine the elevator for damage. Look especially for correct attachment and lock devices. (Refer to Chapter 27-30).		X	X	X	
17. Visually examine the drain holes in the elevator. Make sure that they are open.			X	X	
18. Examine the elevator hinges and control horn. Check the laminate around the hinges and the control horn fasteners for cracks, corrosion or delamination. Look especially for too much play. Play allowed: - Axial: ± 0.06 in (± 1.49 mm) - Radial: ± 0.01 in (± 0.25 mm).		X	X	X	
19. Remove the elevator horizontal push-rod and examine it for damage. Look especially for rub marks and excessive wear. The maximum wear permitted is 0.015 in (0.381 mm). Measure the amount of wear as follows: - Take a measurement of the push-rod diameter at the edge of the paint - Take a measurement of the push-rod diameter at the middle of the wear mark - Compare the two measurements. If the maximum wear permitted is exceeded, replace the push-rod. Install the pushrod. (Refer to Chapter 27-30).				X	

Inspection Items, Tail	Interval (Flight Hours)				
	50	100	200	1000	Initials
20. Inspect the elevator vertical push rod for corrosion in the following areas: - under the trim spring mounts by removing the roll pin - upper and lower trim spring mounts - under the chaffing protection sleeve of the center bushing				X	
21. Examine the forward mounting brackets for the horizontal stabilizer.				X	
22. Install the horizontal stabilizer. (Refer to Chapter 55-10).				X	
23. Install the rudder. (Refer to Chapter 55-40).			X	X	

G. Wings

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, Wings	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Examine the complete surface of the wings. Look especially for damage (dents, cracks, holes, and delamination). Examine the paint coat.		X	X	X	
2. Remove the wings (Refer to Chapter 57-10). - Examine the A bolts and bushings for security in surrounding composite, tightness of fit of pin/bolt, cracks, corrosion, wear and distortion - Replace the A bolts if there is more than 0.004 in (0.1 mm) of radial play - Grease the A bolts - Examine the B-bolts and bushings for security in surrounding composite, tightness of fit of pin/bolt, cracks, corrosion, wear and distortion - Replace the B bolts if there is more than 0.004 in (0.1 mm) of radial play				X	

Inspection Items, Wings	Interval (Flight Hours)				
	50	100	200	1000	Initials
- Grease the B-bolts. Refer to Chapter 12-20.					
3. Visually examine the ailerons. Look especially for damage (dents, cracks, holes and delamination).		X	X	X	
4. Examine the aileron hinges and control horns. Check the laminate around the hinges and the control horn fasteners for cracks, corrosion or delamination. Look especially for too much play. Play allowed: - axial: ± 0.04 in (± 1.00 mm) - radial: ± 0.01 in (± 0.25 mm).		X	X	X	
5. Visually examine the drain holes in the ailerons. Make sure that they are open.			X	X	
6. Visually examine the mass balance attachment through the access hole on the lower surface. Inspect for cracks in the laminate and bonding paste around the fasteners.		X	X	X	
7. Examine the flaps. Look especially for damage (dents, cracks, holes and delamination).		X	X	X	
8. Remove the flap push-rods and examine them for damage. Look especially for rub marks and excessive wear. The maximum wear permitted is 0.005 in (0.127 mm). Measure the amount of wear as follows: - Take a measurement of the push-rod diameter at the edge of the paint - Take a measurement of the push-rod diameter at the middle of the wear mark - Compare the two measurements. If the maximum wear permitted is exceeded, replace the push-rod. Install the pushrods.				X	

Inspection Items, Wings	Interval (Flight Hours)				
	50	100	200	1000	Initials
9. Examine the flap hinges and control horn. Check the laminate around the hinges and the control horn fasteners for cracks or delamination. Look especially for too much play. Play allowed: - Axial: ± 0.04 in (± 1.00 mm) - Radial: ± 0.01 in (± 0.25 mm).		X	X	X	
10. Remove the flap and aileron bellcrank access panels in the wing (Refer to Chapter 52-40). - Examine the aileron and flap control system. Look especially for correct attachment and lock devices. (Refer to Chapter 27-10 and Chapter 27-50). - Install the access panels.		X	X	X	
11. Examine the pitot head. Look especially for correct attachment.		X	X	X	
12. Examine the vent and drain holes in the wings, fuselage and control surfaces. Make sure that they are clear.		X	X	X	
13. Do a test for axial play in the B-bolts. (Refer to Chapter 57-10).		X	X	X	
14. Remove the aileron push-rods and examine them for damage. Look especially for rub marks and excessive wear. The maximum wear permitted is 0.010 in (0.254 mm). Measure the amount of wear as follows: - Take a measurement of the push-rod diameter at the edge of the paint - Take a measurement of the push-rod diameter at the middle of the wear mark - Compare the two measurements. If the maximum wear permitted is exceeded, replace the push-rod. Install the aileron push-rods. Refer to Chapter 27-10.				X	
15. Install the wings. (Refer to Chapter 57-10).				X	

H. General

All items performed, the findings, as well as their correction must be recorded in accordance with an approved procedures manual. Contact Diamond Aircraft if damages are determined which cannot be repaired in accordance with an approved procedures manual.

Inspection Items, General	Interval (Flight Hours)				
	50	100	200	1000	Initials
1. Examine the pitot-static system. Look especially for leaks. - Do a low-range static leak test. (Refer to Chapter 34-10) - Do a pitot test. (Refer to Chapter 34-10) - Make sure that the pitot-static system is clean.				X	
2. Perform a functional check of the pitot static heat system (if installed). - Inspection Interval; 1000 hrs. or 12 months, whichever comes first Refer to Chapter 34-10.				X	
3. Lubricate the aircraft. Refer to Chapter 12-20.			X	X	
4. Measure the play in the aileron and elevator controls with the control surfaces locked. (Refer to Chapter 27-30). Look especially for too much play. Do the test at the top of the control stick. Maximum play allowed: - 0.375 in (10 mm) Refer to Chapter 27-10.		X	X	X	
5. Do a system test for the correct range of movement of the aileron control system. Refer to Chapter 27-10.		X	X	X	
6. Do a system test for the correct range of movement of the rudder control system. Refer to Chapter 27-20.		X	X	X	
7. Do a system test for the correct range of movement of the elevator control system. Refer to Chapter 27-30.		X	X	X	
8. Do an actuator-motor test of the trim-system. Look especially for correct operation and indication.		X	X	X	

Inspection Items, General	Interval (Flight Hours)				
	50	100	200	1000	Initials
9. Do a system test of the flap system. (Refer to Chapter 27-50). Look especially at the pre-load. With the flaps set to CRUISE in the up position. - Correct pre-load: 6.7 - 11.2 lbs (30 - 50 N).			X	X	
10. Do an operational test of the external lights.		X	X	X	
11. Examine the aircraft. Look especially for loose items and tools. Close all access panels. Install the following items: - Engine cowlings - The instrument panel cover - The seat shells - The control-stick boots.	X	X	X	X	
WARNING: DO NOT LET PERSONS INTO THE DANGER AREA OF THE PROPELLER. PROPELLERS CAN CAUSE INJURY OR DEATH. WARNING: SET THE PARKING BRAKE TO ON. IF YOU DO NOT DO THIS THE AIRCRAFT CAN MOVE. THIS CAN CAUSE INJURY OR DEATH.					
12. Set the parking brake to ON.	X	X	X	X	
13. Put the chocks against the main aircraft wheels.	X	X	X	X	
14. Do the post maintenance operational test. - For the engine run procedures refer to the DA20-C1 Airplane Flight Manual - For the operational test refer to Continental Motors Maintenance Manual, Chapter 23 - Record the data (Refer to Paragraph 7).	X	X	X	X	
15. Examine the engine for leakage.	X	X	X	X	
16. Make sure the engine oil filter is tight. Refer to Chapter 79-00.	X	X	X	X	
17. Do a test flight. Record the engine ground test and the flight test reports in the Aircraft Maintenance Log.				X	

5. 6000 Hour Inspection

NOTE: All 1000 hour inspection items must be performed in addition to the 6000 hour inspection items below.

5.1 Engine Ground Test

Perform all inspection items described in 1000 hour interval.

5.2 Maintenance of Checklist Zones

Perform all inspection items described in 1000 hour interval along with the following:

A. Engine Compartment

Inspection Items, Engine Compartment	Interval (Flight Hours)	
	6000	Initials
1. Visually examine the forward firewall. Examine the condition of the paste fillet and fire paint over the edge of the fire shield on the front face of the firewall. Check for cracks, damage and disbond from the fire shield.	X	

B. Front Fuselage

Inspection Items, Front Fuselage	Interval (Flight Hours)	
	6000	Initials
1. Do a visual inspection and a tap test of the fuselage skin. Inspect for disbonding between internal composite components and skin.	X	
2. After removing the main wheels, visually examine the condition of the axles. Look especially for cracks and corrosion.	X	
3. Visually examine the MLG struts and shims in the outboard brackets. Check for the correct fit of the components.	X	
4. Remove, disassemble and clean the brake cylinders (4x) and calipers (2x).	X	
5. Replace the o-rings and assemble the brake cylinders (4x) and calipers (2x).	X	
6. Remove the NLG strut. (Refer to Chapter 32-20-00).	X	
7. Visually examine the NLG strut upper journal assembly lock bolt. Look especially for cracks and corrosion.	X	

Inspection Items, Front Fuselage	Interval (Flight Hours)	
	6000	Initials
8. Do a visual inspection of the NLG bushings in the T-panel on the bottom of the fuselage. - Check for the security of the bushing in the T-panel - Perform a tap test to check for the condition of the surrounding laminate - Check the bond of the T-panel to the floor panel and to the fuselage skin.	X	
9. Install the nose landing gear strut. (Refer to Chapter 32-20-00).	X	

C. Cockpit

Inspection Items, Cockpit	Interval (Flight Hours)	
	6000	Initials
1. Visually examine the seats and seat attachments. Look especially for cracks, delamination and damage around the fastener holes.	X	
2. Visually examine the cockpit floor. Look especially for cracks or delamination around the aft rudder pedal bracket, boarding step, and the throttle quadrant opening.	X	
3. Visually examine the MLG and A-bolt attachment brackets. Look especially for: - Cracks in, or corrosion of the bracket - Disbond from the laminate - Delamination in the surrounding laminate	X	
4. Visually examine the firewall. Inspect the condition of the laminate when viewed from the cockpit side for cracks, discoloration and delamination. Particularly around the engine mount fastener holes and the battery box. Examine the structure for security of the attaching bolts on the firewall and cracks in the surrounding laminate.	X	

D. Center Fuselage, Internal

Inspection Items, Center Fuselage, Internal	Interval (Flight Hours)	
	6000	Initials
1. Visually examine the B-bulkhead. Look for cracks and delamination, especially around the fuel tank attachments.	X	
2. Visually examine the rudder yoke assembly, its attachment, and surrounding structure under the B-bulkhead.	X	

E. Rear Fuselage

Inspection Items, Rear Fuselage	Interval (Flight Hours)	
	6000	Initials
1. Perform a visual inspection and tap test of the fuselage skin. - Inspect for disbonding between internal composite components and skin.	.X	

F. Tail

Inspection Items, Tail	Interval (Flight Hours)	
	6000	Initials
1. Perform a visual inspection and a tap test of the vertical stabilizer. - Inspect for disbonding between internal composite components (spar) and the skin. - Inspect vertical stabilizer (fuselage) skin around the lower tail fin.	X	
2. Perform a visual inspection and a tap test of the horizontal stabilizer. - Inspect for disbonding between internal composite components (including leading/trailing edges) and the skin. - Inspect for disbonding and cracks above or below the overlap seam.	X	

Inspection Items, Tail	Interval (Flight Hours)	
	6000	Initials
3. Visually examine the forward mounting bracket of the horizontal stabilizer. Look especially for: - Cracks in the bond to the plate - Delamination in the rib around the fasteners	X	
4. Perform a visual inspection and a tap test of the rudder. - Examine the skin for delamination, cracks, dents and scratches. - Examine the paint for chips, scratches and UV damage - Examine for damage to the foam core - Examine for a disbond between the skin and the foam core	X	
5. Visually examine the bushings at the aft horizontal stabilizer attachment. Examine for corrosion, cracks, delamination or cracks in composite around bushing.	X	
6. Perform a visual inspection and tap test of the elevator. - Examine the skin for delamination, cracks, dents and scratches - Examine the paint for chips, scratches and UV damage - Examine for damage to the foam core - Examine for disbonds between the skin and the foam core	X	
7. Perform a visual inspection of the elevator hinges, attaching hardware including the bronze bushings, and surrounding structure. Look especially for damage and wear.	X	

G. Wings

Inspection Items, Wings	Interval (Flight Hours)	
	6000	Initials
1. Perform a visual inspection and tap test of the upper and lower wing skins. Examine for damage to the core or a disbond between the skin and core.	X	
2. Perform a visual inspection and tap test of the leading edge. Examine for disbonds and cracks above or below the overlap seam.	X	
3. Perform a visual inspection and tap test to examine the main spar bonding with the wing skins.	X	

<table>
<tr><th rowspan="2">Inspection Items, Wings</th><th colspan="2">Interval (Flight Hours)</th></tr>
<tr><th>6000</th><th>Initials</th></tr>
<tr><td>4. Perform a visual inspection and tap test of the wing roots (in front and behind the spar) to examine the bonding with the skins.</td><td>X</td><td></td></tr>
<tr><td>5. At the lower wing, remove the tie-down ring to check for damage to the hole. Check for delamination, cracks and elongation of the hole.</td><td>X</td><td></td></tr>
<tr><td>6. Visually examine the internal ribs through the lower wing inspection panels.
- Check for the condition of the laminate on the ribs
- Check for cracks and delamination around the bellcrank brackets and a disbond between the bracket and rib
- Check the condition of the bellcrank brackets. Look especially for cracks, elongation of the bellcrank mounting holes, corrosion and chipped paint.</td><td>X</td><td></td></tr>
<tr><td>7. Perform a visual inspection and tap test of the trailing edge spar.
- Examine for the condition of the laminate and bond of the trailing edge to the skin
- Examine for the bonding of the flap and aileron hinges to the trailing edge and skin
- Examine the bonding of the flap up-stop rib to the trailing edge and skin.</td><td>X</td><td></td></tr>
<tr><td>8. Visually examine the main spar flange joint and web, outboard from the root rib. Look through the root rib openings. Look for signs of damage (delamination).</td><td>X</td><td></td></tr>
<tr><td>9. Visually examine the main spar web sandwich structure, outboard from the root rib. Look through the root rib openings. Look for condition of laminate, delamination, condition of core.</td><td>X</td><td></td></tr>
<tr><td>10. Visually examine the wing roots (in front and behind the spar) to inspect the joints with the main spar and spar stump. Examine the condition of the laminate. Look especially for damage (cracks and delamination).</td><td>X</td><td></td></tr>
<tr><td>11. Visually examine the main bolt bushing in the spar web. Look especially for corrosion or wear of bushing, bond of bushing in spar stump. Ensure a tight fit of the main pin within the bushing.</td><td>X</td><td></td></tr>
</table>

Inspection Items, Wings	Interval (Flight Hours)	
	6000	Initials
12. Perform a visual inspection and tap test of the ailerons. - Examine the paint for chips, scratches and UV damage - Inspect the skin for delamination - Inspect for damage to the core or disbond between the skin and the core - Inspect the ribs for bonding with the skins	X	
13. Perform a visual inspection and tap test of the flaps. - Examine the paint for chips, scratches and UV damage - Inspect the skin for delamination - Inspect for damage to the core or disbond between the skin and the core - Inspect the ribs for bonding with the skins	X	
14. Visually examine the main pin bushing in the spar stump. Replace the main pin bushing if it is damaged.	X	
15. Visually examine the main pin bushing in the spar bridge. Replace the main pin bushing if it is damaged.	X	

6. Maintenance Report

Complete a copy of the Maintenance Report after all of the applicable maintenance tasks in the Maintenance Checklist have been initialled.

DA20-C1	
Aircraft Serial Number:	Registration Number:
Check: ___________________ (50 hr., 100 hr., 200 hr., 1000 hr., 6000 hr., Annual)	
REMARKS:	
The aircraft is airworthy with respect to its maintenance condition. Place: ____________________________________ Date: _____________________________________ Authorized: ________________________________	

7. Maintenance Check Flight Report

NOTE: The maintenance check flight must be done in accordance with the applicable national regulations.

Diamond AIRCRAFT	MAINTENANCE CHECK FLIGHT (See Maintenance Checklist for Applicability)		DA20-C1 Page 1 of 2		
Registration:	Pilot:	Airdrome:			
Date:	Take-Off:	Landing:			
Functional Check, Flight Behavior			Findings		
			N/A	NO	YES
Fuel quantity indicator					
ACL, Navigation lights					
Warning and Caution lights					
Altimeter, QNH adjustment					
Radio, radio check					
Navigational instruments					
Electrical fuel pump					
Engine starting behavior, cold					
Oil pressure indicator					
Ammeter, generator					
Voltmeter					
RPM indicator					
Cylinder head temperature indicator					
Oil temperature indicator					
Parking brake					
Wing flaps					
Ignition circuits					

	MAINTENANCE CHECK FLIGHT	DA20-C1		
Diamond AIRCRAFT	(See Maintenance Checklist for Applicability)	Page 2 of 2		
		Findings		
Functional Check, Flight Behavior		**N/A**	**NO**	**YES**
Taxiing behavior, take-off behavior				
Airspeed indicator				
Vertical speed indicator				
Compass				
Behavior during climb				
Cylinder head temperature				
Cabin heat/cabin air				
Behavior during high speed flight				
Trim/trim range				
Behavior during low speed flight				
Stall warning				
Landing behavior				
Fuel shut-off valve				
Engine starting behavior, warm				
Engine shut down behavior				
Remarks:				
(Pilot)				

8. Engine Ground Test Record

WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU TURN THE PROPELLER. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT:

- THE IGNITION SWITCH IS IN THE "OFF" POSITION

- THE "P" LEADS ARE GROUNDED

- THE THROTTLE IS SET TO "CLOSED"

- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".

WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.

WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FUEL BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.

WARNING: WHEN YOU COMPLETE AN INSPECTION, MAKE SURE THAT YOU REMOVE ALL LOOSE ITEMS/TOOLS FROM THAT AREA. LOOSE ITEMS/TOOLS CAN PREVENT FULL MOVEMENT OF THE AIRCRAFT CONTROLS. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

CAUTION: YOU MUST ATTACH BLANKS/CAPS TO HOLES/PIPES WHEN YOU REMOVE COMPONENTS. IF YOU DO NOT DO THIS, UNWANTED DEBRIS CAN ENTER THE HOLES/PIPES. THIS CAN CAUSE BLOCKAGE TO THE AIRCRAFT SYSTEMS.

System Check	Result
NOTE: The Idle RPM and the ground static Max RPM specifications are different from the Continental Motors IO-240-B engine Maintenance Manual specifications. This is because of the engine to propeller installation in the DA20-C1 aircraft. Refer to Chapter 71-00 for data. NOTE: Set the engine mixture control to Full Rich to do the engine checks unless you are told differently. CAUTION: BEFORE YOU RUN THE ENGINE AT MORE THAN 1800 RPM, MAKE SURE THAT THE OIL TEMPERATURE HAS RISEN TO 24 °C/75 °F AND THE CHT HAS RISEN TO 93 °C/200 °F. THIS WILL PREVENT POSSIBLE DAMAGE/TOO MUCH WEAR TO THE ENGINE. Start the engine. Set the engine RPM to 1700 for sufficient time to do these checks:	
- Record Fuel Pressure:	________________
- Record RPM drop for each magneto: (Limit: Not more than 50 RPM drop difference with a maximum RPM drop of 150 RPM for each magneto).	________________
Set engine RPM to Full Power for sufficient time to do these checks:	
- Record Fuel Pressure:	________________
- Record Oil Pressure:	________________
- Record Oil Temperature:	________________
- Record Cylinder Head Temperature:	________________
- Record Alternator/Generator Output:	________________
- Record Full Power RPM:	________________

System Check	Result
CAUTION: THE MAGNETO OFF CHECK MUST BE DONE AT IDLE RPM. THIS WILL PREVENT DAMAGE TO THE ENGINE. CAUTION: DO NOT SHUT THE ENGINE DOWN UNTIL THE CHT GOES BELOW 149 °C/300 °F. NOTE: For the fuel injection system inspection, the IDLE RPM setting for the IO-240-B engine installed in the DA20-C1 aircraft is 1000 ± 25 RPM. Set engine RPM to IDLE.	
- Record IDLE RPM:	________________
- Record Fuel Pressure:	________________
- Record Oil Pressure:	________________
- Record Oil Temperature:	________________
Set the Ignition switch to OFF for a short time. Then set the Ignition switch to BOTH. If the engine continues to run when the ignition switch is set to OFF, refer to Continental Motors Maintenance Manual Chapter 12. Set the engine mixture control to LEAN/CUT OFF. - Do a mixture RPM rise check. (Limit: 25 - 50 RPM). - Do a positive Fuel Cutoff (manifold valve) check. When the propeller stops rotating: - Set the ignition switch to OFF. - Set the master switch to OFF.	

FLIGHTLINE CHECKS

1. General

The following checks include the pre-flight and post-flight checks. Do these checks each day the aircraft is used.

2. Flightline Checks

The Pre-Flight Check must be done before the first flight of the day. It shows the pilot the general condition of the aircraft and the engine. It is important for flight safety. Look in the aircraft log-book for problems before doing the pre-flight check.

WARNING: DO ALL THE STEPS OF THE PRE-FLIGHT CHECK CAREFULLY. ACCIDENTS CAN OCCUR IF THE PRE-FLIGHT CHECK IS NOT DONE CORRECTLY.

The schedule for the pilots pre-flight check is in the Airplane Flight Manual (AFM) for the DA20-C1 aircraft.

3. Post Flight Check

Do the post-flight check after the last flight of the day. The post-flight check includes all the steps of the pre-flight check.

You must also:

- Refuel the airplane (Refer to Chapter 12-10)
- Record in the log book each problem found in flight and during the post-flight check
- Park the airplane (Refer to Chapters 10-00 and 10-10)
- If necessary, moor the airplane (Refer to Chapter 10-20).

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UNSCHEDULED MAINTENANCE CHECKS

1. General

Unscheduled maintenance checks are necessary after any incident that could cause damage to the aircraft.

2. Hard Landing Check

Figure 1 shows the hard landing check areas. You must do a hard landing check when the pilot makes a report of a hard landing. Or when ground handling applies unusual loads.

A. Equipment

Item	Quantity	Part Number
Slide Sheets	4	Commercial

B. Procedure

	Maintenance Work	Key Items/References
CAUTION: IF YOU THINK THE AIRCRAFT HAS DAMAGE TO AN AREA THAT TRANSMITS A LOAD, YOU MUST ASK THE AIRCRAFT MANUFACTURER FOR ADVICE.		
1.	Examine the landing gear fittings. Look especially for cracks.	Use a mirror and a flashlight.
2.	Examine the fuselage structure where the landing gear attaches. Look especially for: - Delamination of the GFRP structure - Damage to the mounting brackets.	Refer to Chapter 32-10.
3.	Examine the landing gear struts. Look especially for: - Bending - Cracks.	Refer to Chapter 32-10.
4.	Measure the maximum deflection of the main landing gear struts as follows: - Lift the aircraft on jacks. - Lay a straight rod on the upper surface of the strut.	 Refer to Chapter 07-10-00. Make sure that the ends of the rod are resting on the upper bend radius and lower bend radius of the strut.

	Maintenance Work	Key Items/References
	- Measure the maximum gap between the rod and the strut.	If the gap is less or equal to 0.12 in (3mm) examine the strut for corrosion and cracks particularly in the area of the maximum gap. If the gap is more than 0.12 in (3mm) replace the strut as per Chapter 32-10-00.
5.	Do a test of the wheel tracking.	Refer to Chapter 32-10.
6.	Examine the tires. Look especially for cuts in the side walls.	Refer to Chapter 32-40.
7.	Examine the brake discs. Look especially for damage. Turn the wheel and make sure the disc is not bent.	
8.	Examine the nose-gear assembly. Look especially for deformation of the upper cross bar of the engine mount.	
9.	Examine the top-hat contour in the bottom of the fuselage for delamination. Look especially in the area of the bearings for the nose-gear assembly.	
10.	Remove the load from the nose-gear and examine it. Look especially for more than the usual play.	
11.	Remove and disassemble the NLG shock absorber assembly; examine components.	Refer to Chapter 32-20-00 Examine the shock absorber rod for deformation.
12.	Examine the control surfaces. Look especially for: - Correct attachment of the hinges - Correct attachment of the mass balance to the structure.	
13.	Examine the leading edge of the wing for damage.	
14.	Examine the leading edge of the horizontal and vertical stabilizers for damage.	
15.	Examine the area of the spar attachment. Look especially for cracks.	
16.	Examine the engine mounts.	

	Maintenance Work	Key Items/References
17.	Examine the engine mount points on the firewall.	
18.	Examine the propeller. Look especially to see if the propeller touched the ground.	
19.	Examine instrument panel shock mounts for damage.	Hard landings can cause instrument glass to crack due to failed shock mount.

3. Propeller Strike

A propeller strike can be a moving propeller (engine running) which has hit a solid object. Or it can be a moving object that hits a propeller that is not moving.

If the engine is stopped when the propeller hits a solid object:

- Remove the engine (Refer to Chapter 71-00)
- Completely disassemble and inspect all rotating engine components and must be completed prior to any further flight (Refer to the Continental Motors IO240 Series Engine Maintenance and Overhaul Manual, Publication M-6)
- Do an inspection of all engine driven accessories in accordance with the manufacturer’s maintenance instructions.
- Do an inspection of the mounting frame (Refer to Chapter 71-20)
- Do an inspection of the propeller. (Refer to the Sensenich propeller Owner's Manual, W69EK7-CF, latest revision).

If a propeller which is not moving, is hit by a moving object:

- Do an inspection of the propeller. (Refer to the Sensenich propeller Owner's Manual, W69EK7-CF, latest revision).
- If the propeller must be removed to do a repair other than minor dressing of the blades, you must do the inspection procedure specified for a moving propeller strike
- Inspect the airplane for damage.

4. Hydraulic Lock

Hydraulic lock is defined as a condition in which a volume of liquid, equal to or greater than the clearance volume of the combustion chamber, is drawn into the cylinder during starting. This liquid, being incompressible, restricts piston travel during the compression stroke. Damage only occurs after the preceding cylinder or cylinders in the firing order have fired, thereby providing the required force to drive the piston of the fluid filled cylinder through the compression stroke. Most hydraulic lock events in horizontally opposed aircraft engines are due to fuel accumulation in the induction system and/or cylinder assembly and usually occur in one of the forward cylinders.

CAUTION: OVER PRIMING CAN CAUSE A FLOODED INTAKE RESULTING IN A "HYDRAULIC LOCK" EVENT AND SUBSEQUENT ENGINE MALFUNCTION OR FAILURE. IF YOU OVER PRIME, OR FLOOD YOUR ENGINE, MAKE CERTAIN THAT ALL FUEL HAS DRAINED FROM THE INTAKE MANIFOLD AND/OR CYLINDER PRIOR TO ATTEMPTING ENGINE STARTING.

CAUTION: MODIFICATION OF OR DEVIATION FROM THE ORIGINAL INTAKE MANIFOLD DESIGN MAY RESULT IN INSUFFICIENT DRAINAGE OF THE INTAKE MANIFOLD, RESULTING IN AN INCREASED POTENTIAL FOR HYDRAULIC LOCK. ALL INTAKE MANIFOLD DRAINS MUST BE PROPERLY PLACED, AND OPERATIONAL.

Over priming prior to or during engine starting will allow fuel to accumulate in the induction system or cylinder faster than the system drains can evacuate it. Other causes of hydraulic lock can be attributed to:

A. Restricted or clogged induction system drains or cylinder intake port drain(s).

B. Extended operation of the electric boost pump:

(1) During failed engine start.

(2) Following loss of power during ground operation.

(3) Following momentary engine shutdown.

(4) During single engine operation for training purposes on twin engine aircraft.

C. Over priming and attempting engine start with the aircraft parked on an incline that negates the effective operation of the drain system.

D. A failure to drain oil from cylinders that have been preserved.

Damage from a hydraulic lock can be extensive. Engine components such as connecting rods, cylinder assemblies, pistons, piston pins, crankcase and crankshaft can be damaged due to the extreme stress. Subsequent failure of these components can occur if the instructions set forth in the Continental Motors IO240 Series Engine Maintenance and Overhaul Manual, Publication M-6 are not followed.

5. Engine Fire

WARNING: BEFORE YOU DO WORK ON THE AIRCRAFT, MAKE SURE THAT THE FIRE HAS BEEN EXTINGUISHED. LET THE ENGINE COOL AND DISCONNECT THE BATTERY.

WARNING: FIRE CAN SERIOUSLY WEAKEN GFRP. IF YOU FIND ANY DAMAGE TO GFRP, DO NOT OPERATE THE AIRCRAFT. ASK THE MANUFACTURER FOR ADVICE.

<table>
<tr><th></th><th>Maintenance Work</th><th>Key Items/References</th></tr>
<tr><td>1.</td><td>Disconnect the battery.</td><td>Refer to Chapter 24-31.</td></tr>
<tr><td>2.</td><td>Remove the engine cowlings.</td><td>Refer to Chapter 71-10.</td></tr>
<tr><td>3.</td><td>Examine the engine cowlings. Look especially for signs of fire damage.</td><td></td></tr>
<tr><td>4.</td><td>Examine the electrical cables. Look especially for signs of fire damage.</td><td>Replace damaged cables.</td></tr>
<tr><td>5.</td><td>Examine the fuel pipes. Look especially for signs of fire damage to the fire-protection sleeves.</td><td>Replace damaged fuel pipes.</td></tr>
<tr><td>6.</td><td>Examine the engine oil pipes. Look especially for signs of fire damage to the fire-protection sleeves.</td><td>Replace damaged oil pipes.</td></tr>
<tr><td>7.</td><td>Examine the engine. Look especially for:
- Damage to the engine air filter
- Damage to gaskets and seals
- Damage to the engine mounts
- Damage to pipes/hoses.</td><td>Replace damaged items.</td></tr>
<tr><td>8.</td><td>Examine the fuselage. Look especially for:
- Blisters on the paint or burn marks
- Disbonding of the fuselage skin from the firewall.</td><td>If you find any damage, ask the aircraft manufacturer for advice.</td></tr>
<tr><td colspan="3">WARNING: DO NOT GET FIRE EXTINGUISHER PARTICLES ON YOU. THE CHEMICALS USED TO EXTINGUISH A FIRE CAN BE CAUSTIC/ POISONOUS. WHEN YOU CLEAN THE ENGINE, REFER TO THE FIRE EXTINGUISHER MANUFACTURER’S SAFETY INSTRUCTIONS. USE SAFETY MASKS AND GLOVES AS RECOMMENDED.</td></tr>
<tr><td>9.</td><td>Clean the engine. Make sure that you clean all the fire extinguisher particles from the engine.</td><td>Refer to the manufacturer of the fire extinguisher.</td></tr>
<tr><td>10.</td><td>Connect the battery.</td><td>Refer to Chapter 24-31.</td></tr>
<tr><td>11.</td><td>Troubleshoot the engine. Find the cause of the engine fire.
- Repair the defect.</td><td>Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.</td></tr>
<tr><td>12.</td><td>Do a test of the engine.</td><td>Refer to the DA20-C1 Airplane Flight Manual.</td></tr>
</table>

6. Overspeed Flap Extension

If the flaps are extended above V_{FE} or left extended above V_{FE} an inspection of the flap system including the main bell crank must be completed.

	Maintenance Work	Key Items/References
1	Inspect flaps, flap attachment brackets/hinges/ horns and flap control rods for any signs of damage.	
2.	Remove the flap bellcrank (inside fuselage)	Refer to 27-50
3.	Inspect the flap bellcrank for any visual signs of damage.	Look in particular around the weld joints of the bellcrank arms
4.	Inspect the flap bellcrank using LPI or MPI	A certified individual should be used.
5.	Any signs of damage or cracks the bellcrank shall be replaced	

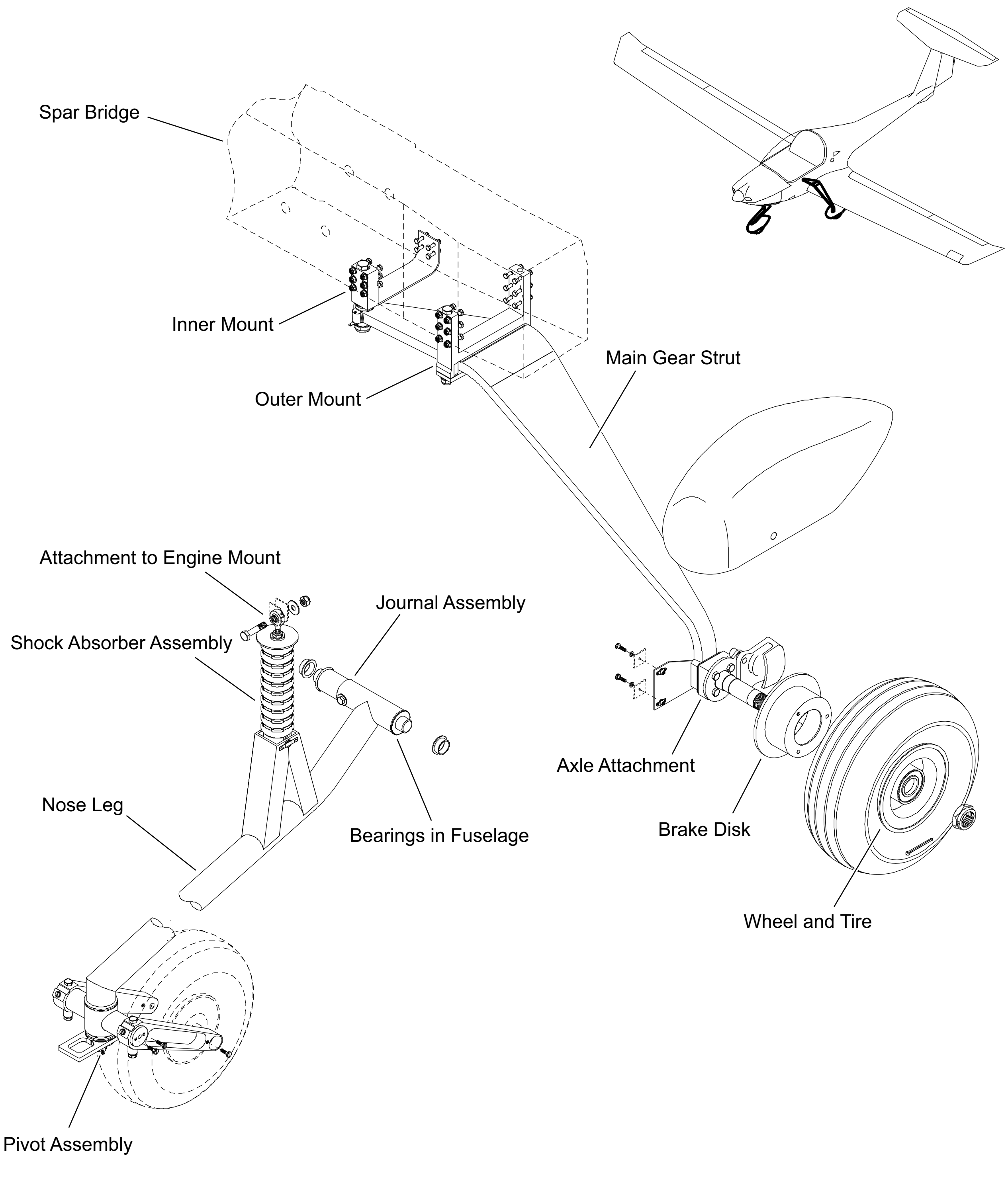

Figure 1 - Hard Landing Check Areas

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CHAPTER 06-00
DIMENSIONS AND AREAS

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DIMENSIONS AND AREAS

1. General

The DA 20-C1 aircraft uses the Imperial measurement for dimensions and areas. System International (SI) dimensions are also given in brackets. For example: Wing span 35.4 ft. (10.78 m).

A. Unit Conversions

Dimension Units/Abbreviations	Conversion Factor SI to US/Imperial	Conversion Factor US/Imperial to SI
Length		
Meter [m]	[m] x 0.3048 = [ft]	
Millimeter [mm]	[mm] / 25.4 = [in]	
Kilometer [km]	[km] / 1.852 = [nm]	
Inch [in]		[in] x 25.4 = [mm]
Foot [ft]		[ft] x 0.3048 = [m]
Nautical mile [NM]	[km] / 1.609 =[sm]	[nm] x 1.852 = [km]
Statute mile [SM]		[sm] x 1.609 = [km]
Force or Weight		
Newton [N]	[N] / (g x 0.45359) = [lbs] where g = 9.80665 m/s²	
Decanewton [daN]	[daN] / 0.4448 = [lb]	
Pound [lb]		[lb] x 4.448 = [N] [lb] x 0.4448 = [daN]
Mass		
Kilogram [kg]	[kg] / 0.45359 = [lbs]	
Pound [lb]		[lb] x 0.45359 = [kg]
Moment		
Kilogram centimeter [kg.cm]	[kg.cm] / 1.152 = [in.lbs]	
Inch pound [in.lb]		

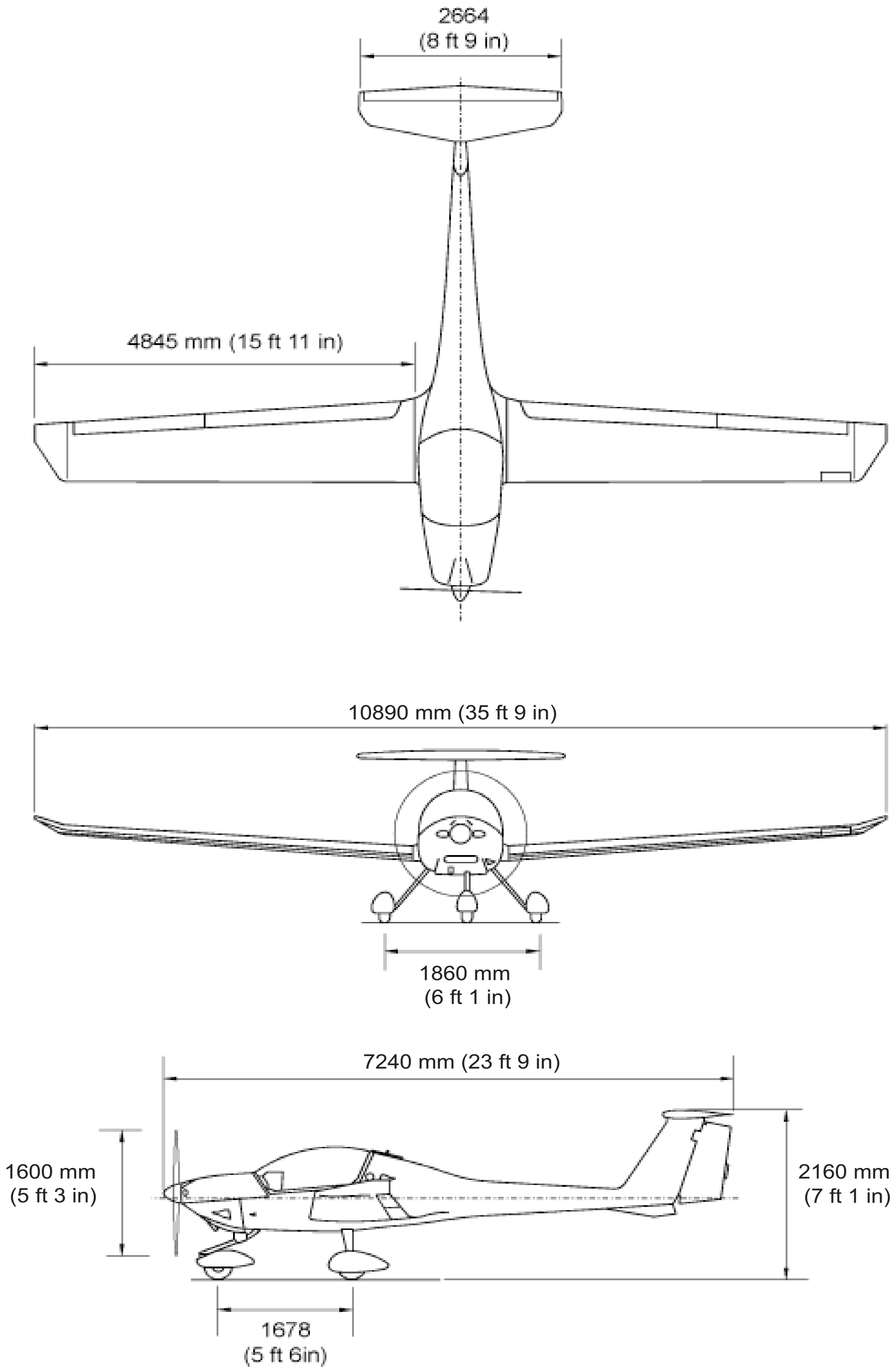

Figure 1 - Overall Dimensions

2. Dimensions

DA20-C1 Dimensions	
Overall Dimensions	
Wing Span	35 ft 9 in (10.89 m)
Length	23 ft 9 in (7.24 m)
Height (Nominal)	7 ft 1 in (2.16 m)
Wing	
Airfoil	Wortmann FX63-137/20-HOAC
Wing Area	125 ft^2 (11.6 m^2)
Dihedral (Nominal)	4°
Angle of Incidence	3°
Aspect Ratio	10
Horizontal Tail Surfaces	
Span	8 ft 9 in (2.67 m)
Angle of Incidence	-4°
Landing Gear	
Wheel Track	6 ft 1 in (1.86 m) nominal
Wheel Base	5 ft 6 in (1.67 m)
Nose Wheel	5.00 - 4 (6 PLY)
Main Wheel	380*150/6.00-15 5.00 - 5 (6 PLY)

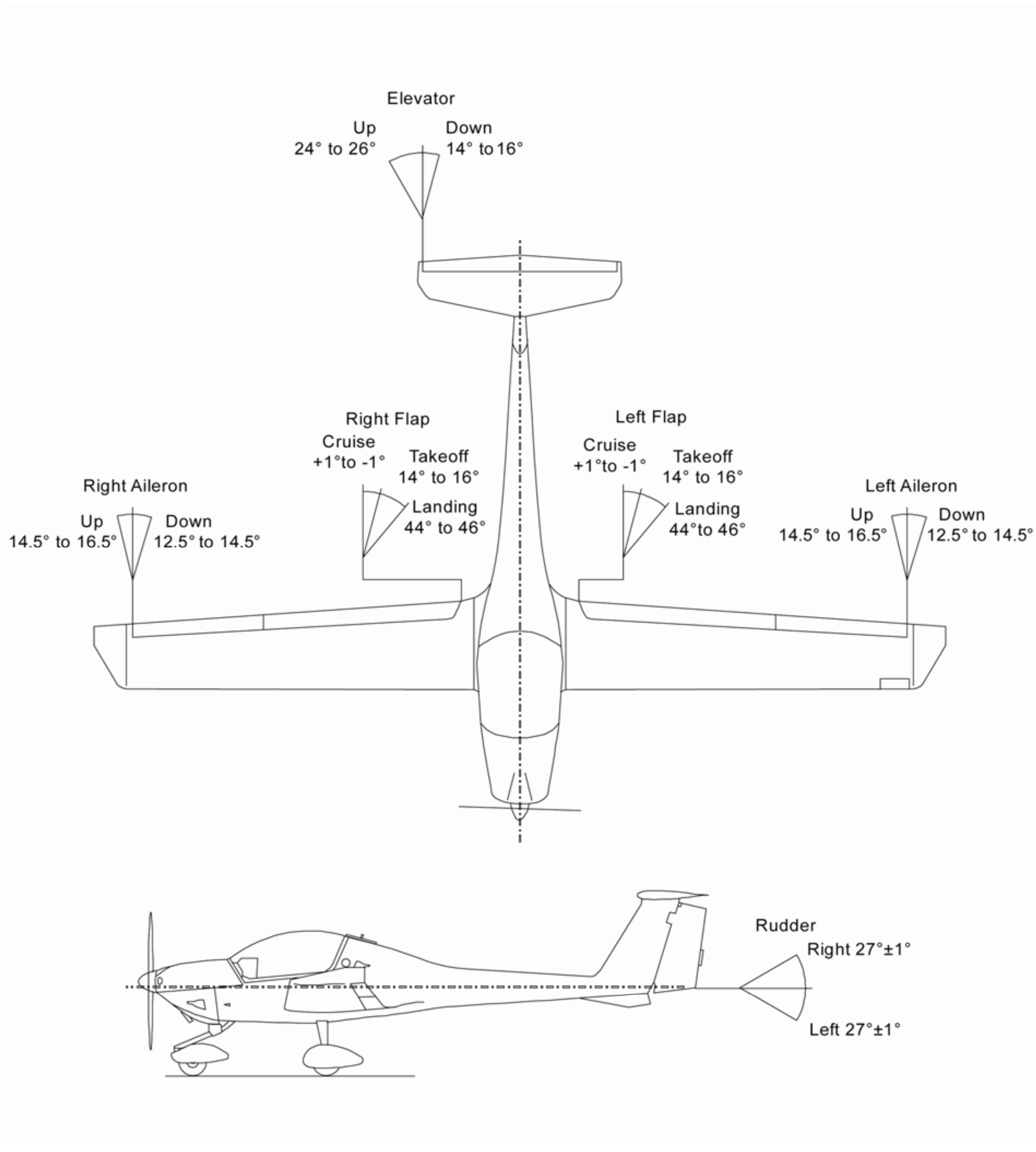

Figure 2 - Control Surface Deflections

Diamond Aircraft DA20-C1 | S/N: ____________________ | Date: ___________________ INSP.: _________________

ITEM	DEFLECTION		WEIGHT					STATIC MOMENTS			
			BEFORE BALANCING			AFTER BALANCING		TRAILING EDGE	ARM	MOMENT	
	LIMITS	ACTUAL	LIMITS	ACTUAL	BALANCE WEIGHT [3]	LIMITS	ACTUAL	WEIGHT		LIMITS	ACTUAL
	(degrees)	(degrees)	(kg)	(kg)	(kg)	(kg)	(kg)	(kg)	(cm)	(kg-cm)	(kg-cm)
LEFT AILERON	UP 14.5° to 16.5°		(1.6 to 2.1) [1]		(0.65)	2.1 to 2.7 [1]				2.55 to	
(with Trim Tab)	DOWN 12.5° to 14.5°									6.71 [1]	
RIGHT AILERON	UP 14.5° to 16.5°		(1.6 to 2.1) [1]		(0.65)	2.1 to 2.7 [1]				2.55 to	
	DOWN 12.5° to 14.5°									6.71 [1]	
LEFT FLAP	CRUISE -1° to +1°		(3 to 4) [1]							28.55 to 37.2 [1]	
	T/O 14° to 16°										
	LAND 44° to 46°										
RIGHT FLAP	CRUISE -1° to +1°		(3 to 4) [1]								
	T/O 14° to 16°										
	LAND 44° to 46°										
ELEVATOR	UP 24° to 26°		(2.25 to 2.75) [1]		(0.79)					0 to	
	DOWN 14° to 16°									3.5 [2]	
RUDDER	LEFT 26° to 28°		(2.0 to 2.8) [1]		(1.9)	3.3 to 4.7 [4]				13.25 to	
(with Trim Tab)	RIGHT 26° to 28°									18.35 [4]	

() Nominal weight may vary
1 Include hinges and control surface horn
2 Include hinges, control horn, mass balance. Do not include the vertical pushrod.
3. Include mass balance only
4. Include lower mounting bracket
5. Composite part only

Figure 3: Adjustment Report

Diamond Aircraft DA20-C1	S/N: ____________________	Date: ___________________	INSP.: _________________

ITEM		LIMITS	ACTUAL
FLAP PRELOAD (kg)	LEFT RIGHT	3.0 to 5.0 (kg)	
DIHEDRAL (mm)	LEFT RIGHT	2.90 TO 330*	
LEADING EDGE SWEEP BACK (mm)	LEFT RIGHT	20 TO 55*	
SYMMETRY CHECK	LEFT RIGHT	max. diff. 50 mm	
RUDDER CABLE TENSION		13.25 to 17.33 kg	
CANOPY UNLATCHING FORCE		4.5 - 9.0 kg (10 - 20 lbs) No outside handles	
		6.8 - 11.3 kg (15 - 25 lbs) With outside handles	

ITEM	LIMITS	ACTUAL
HORIZONTAL STABILIZER INCIDENCE	-4° ± 0.5° degrees	
MAIN LANDING	0° to 4°	
GEAR CAMBER	(0º to 2º desirable)	
MAIN LANDING GEAR TOE IN	0º ± 0.5º per side Total Toe (Included angle) 0º ± 0.5º	
MAIN LANDING GEAR TRACK	1860mm NOMINAL	
NOSE GEAR FRICTION	3.06 to 5.10 kg	

Figure 4 - Adjustment Report

3. Adjustment Values

The measurements of the DA20-C1 aircraft are recorded on an Adjustment Report at the factory when the aircraft is built. See Figures 2 and 3. This Report becomes part of the aircraft records.

When you measure the dimensions, use the Adjustment Report as a reference for deviations.

NOTE: The Static Moments given in this Chapter are trailing edge heavy.

4. Control Surface Gaps

The gaps between control surfaces and wings and stabilizers must be at least 3 mm (0.12 in) wide.

5. Weight And Static Moments Of Control Surfaces

WARNING: IF YOU REPAINT (OR DO REPAIRS) TO THE CONTROL SURFACES, MAKE SURE THAT THE WEIGHTS AND STATIC MOMENTS OF THE CONTROL SURFACES ARE NOT MORE THAN THE VALUES IN THE ADJUSTMENT REPORT. THIS WILL PREVENT CONTROL SURFACE FLUTTER.

To measure the static moments you must remove the control surface from the aircraft. Then support the control surface at the hinge line. The horns remain attached to the control surface. Refer to AMM Chapter 51-60 for the procedures.

The static moment is (M = m * r) where the value of (m) is measured with a spring scale opposite to the balancing weight. And (r) is the lever arm, the distance between the hinge line and the point where (m) was measured.

If the values are more than the limit in the Adjustment Report, you must ask the manufacturer for advice before you adjust the balancing weight.

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CHAPTER 07-00
LIFTING AND SHORING

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LIFTING AND SHORING

1. General

The DA20-C1 aircraft is a light airplane. It has no hoisting points. Use belts to lift the airplane.

You can use your hands to lift the wings and the horizontal stabilizer.

The DA20-C1 aircraft has 2 jacking points and a tail support. For maintenance lift the fuselage with the 2 hydraulic jacks. Use the special former to hold the rear fuselage.

Chapter 07-10 describes how to lift the airplane with jacks.

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JACKING

1. General

The DA20-C1 aircraft has two jacking points. They are located under the fuselage at the root ribs. To support the rear fuselage a trestle with a former is positioned in front of the tail skid.

WARNING: IF THE WIND SPEED IS MORE THAN 10 KM/HR (6 KNOTS), DO NOT LIFT THE AIRCRAFT ON JACKS IN THE OPEN.

2. Lifting the Aircraft on the Jacks

A. Equipment

Item	Quantity	Part Number
Aircraft Jacks	2	Commercial
Hold down strap or weighted belt	1	Commercial
Tail trestle	1	Commercial

B. Procedure

	Detail Steps/Work Items	Key Items/References
1.	If the aircraft is in the open, then align the aircraft into wind. The tail hold-down point must be over a hold-down or mooring attachment in the ground.	Maximum wind speed 10 KM/hr. (6 knots).
2.	Apply the parking brake. Put chocks under the main wheels.	
3.	Put the tail trestle into position under the fuselage.	In front of the tail skid.
4.	Put the hold-down strap in position on the rear fuselage.	
5.	Put the two jacks in position under the jacking points. Extend the jacks to engage with the jacking plates.	

	Detail Steps/Work Items	Key Items/References
6.	Remove the chocks and release the parking brake.	
7.	Extend the jacks until the wheels are clear of the ground.	Operate the jacks together to keep the aircraft level.
8.	Tie the tail down with the hold down strap.	If you do not have a mooring point in the ground, you can attach a heavy weight to the strap.

C. Lowering the Aircraft

	Detail Steps/Work Items	Key Items/References
WARNING: MAKE SURE THAT THE AREA UNDER THE AIRCRAFT IS CLEAR BEFORE YOU LOWER THE AIRPLANE OFF JACKS.		
1.	Release the hold-down strap.	
2.	Remove the trestle from under the rear fuselage.	
3.	Retract the jacks until the wheels are on the ground.	Retract the jacks at the same time.
4.	Apply the parking brake. Put chocks under the wheels.	
5.	Retract the jacks fully. Then move the jacks clear of the airplane.	

D. Rear Fuselage Trestle Point

The trestle for the rear fuselage must have the same profile as the fuselage. Put the trestle under the rear fuselage in front of the tail skid.

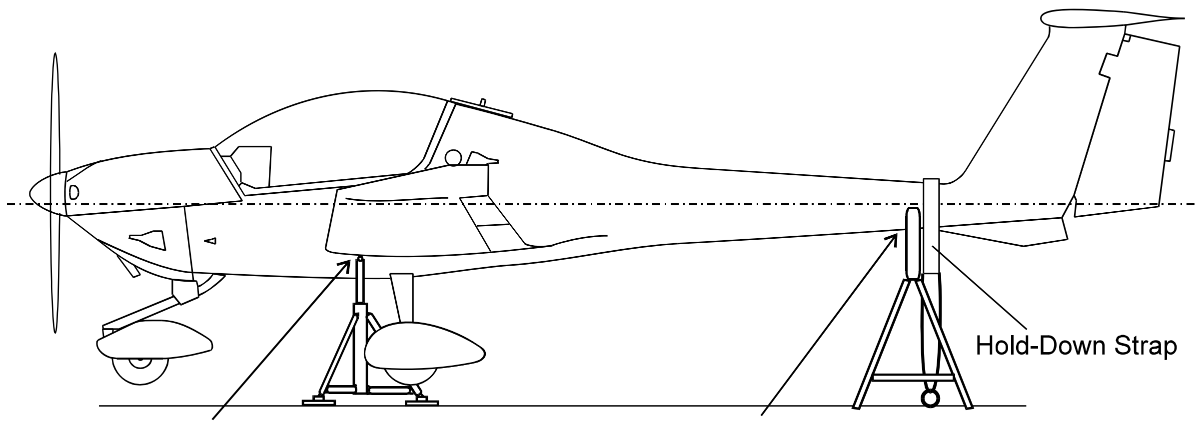

Figure 1 - Lifting the Aircraft on Jacks

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CHAPTER 08-00
LEVELING AND WEIGHING

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LEVELING AND WEIGHING

1. General

This chapter describes how to weigh and level the aircraft.

Use the procedures in Chapter 08-10 to weigh the aircraft and to calculate the aircraft moment. Use the procedures in Chapter 08-20 to level the aircraft.

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WEIGHING

1. General

Only operate the aircraft within the permitted range of weight and center of gravity limits. This will give good flight performance and good handling qualities. It is also necessary for safety.

If you make any changes to the aircraft that will alter the weight (or the center of gravity), then you must calculate the new weight of the aircraft and its center of gravity.

Only an approved person can weigh the aircraft. The national airworthiness authority of the country where the aircraft is registered gives approval for persons to weigh the aircraft. It also gives the time limits.

Use the weighing report when you do the weight and balance calculations. (Refer to Figure 4).

2. Weighing

You can use mechanical scales or electrical scales to weigh the aircraft. You must obey the manufacturers' instructions on the scales.

A. Equipment

Item	Quantity	Part Number
Spirit level	1	Commercial
Plumb line	1	Commercial
Wedge - slope 1000:55.84	1	Commercial

Before you weigh the aircraft do the following items:

- Make sure the aircraft has all its equipment as per aircraft equipment list and all equipment are in the location shown in the equipment list.
- Defuel the aircraft to the unusable fuel level 2 liters (0.6 US gal), 1.44 kg (3.18 lbs)
  Refer to Chapter 12-10
- Add engine oil and operating fluids up to the maximum level. Refer to Chapter 12-10
- Clean the aircraft and dry it
- Remove all objects which are not part of the equipment list (for example tools, luggage, etc).

B. Weighing

WARNING: EXCEEDING WEIGHT LIMITATIONS MAY LEAD TO OVERLOADING OF THE AIRPLANE AND CAUSE LOSS OF CONTROL OF THE AIRPLANE AND/OR STRUCTURAL DAMAGE.

WARNING: EXCEEDING THE CENTER OF GRAVITY LIMITATIONS REDUCES THE MANEUVERABILITY AND STABILITY OF THE AIRPLANE.

	Detail Steps/Work Items	Key Items/References
NOTE: Weigh the aircraft in a closed room. This will avoid any wind causing weighing errors.		
1.	Move the airplane onto the scales.	The scales under the main wheels must be the same.
NOTE: Make sure that the aircraft is at pre-weighing conditions. Refer to DA20-C1 Airplane Flight Manual (AFM), Chapter 06. NOTE: Make sure that each wheel is in the center of the weighing scale. If the wheel is on the side of the scale the data can be wrong.		
2.	Align the aircraft laterally: - Open the canopy. - Put the spirit level on the back rest of the seat. - Adjust the level of the aircraft by placing wooden blocks under the right-hand or the left-hand main wheel. If required, deflate a tire a small amount.	Refer to Figure 1. If necessary, use 2 packing blocks of equal thickness to clear the safety belt attachments.
3.	Align the aircraft longitudinally. - Put the 1000:55.84 wedge on the fuselage. - Place the spirit level on the wedge.	Refer to Figure 2. To lower the nose, decrease the nose wheel tire pressure a small amount. To raise the nose, place a wood block under the nose wheel
4.	Remove the alignment equipment and close the canopy.	

	Detail Steps/Work Items	Key Items/References
5.	With the aircraft correctly positioned, do the following: - Drop a plumb line from the leading edge of each wing at the root rib to the floor. - Join these two points to determine the reference datum (RD) - From this line use a suspended plumb line aligned with each landing axle gear to measure the following distances: - X_1 (nose landing gear) - X_{2LH} (left main landing gear) - X_{2RH} (right main landing gear)	Refer to Figure 3.
CAUTION: ITEMS FORWARD OF THE REFERENCE DATUM ARE CONSIDERED TO HAVE A NEGATIVE LEVER ARM. ITEMS AFT OF THE REFERENCE DATUM ARE CONSIDERED TO HAVE A POSITIVE LEVER ARM.		
6.	Read the weight off the scales.	
7.	Apply the formulae in Figure 4 to calculate the empty weight and empty weight CG	Refer to Figure 4.
8.	Calculate the Empty Weight (G) using the formula: - $G = G_1 + G_{2LH} + G_{2RH}$ kg (lbs)	
9.	Calculate the Empty-Weight Moment (M) using the formula: - Empty-Weight Moment: M = Empty Weight (G) x Empty-weight CG (X_{CG})	
10.	Record the data in the weighing report of the AFM.	

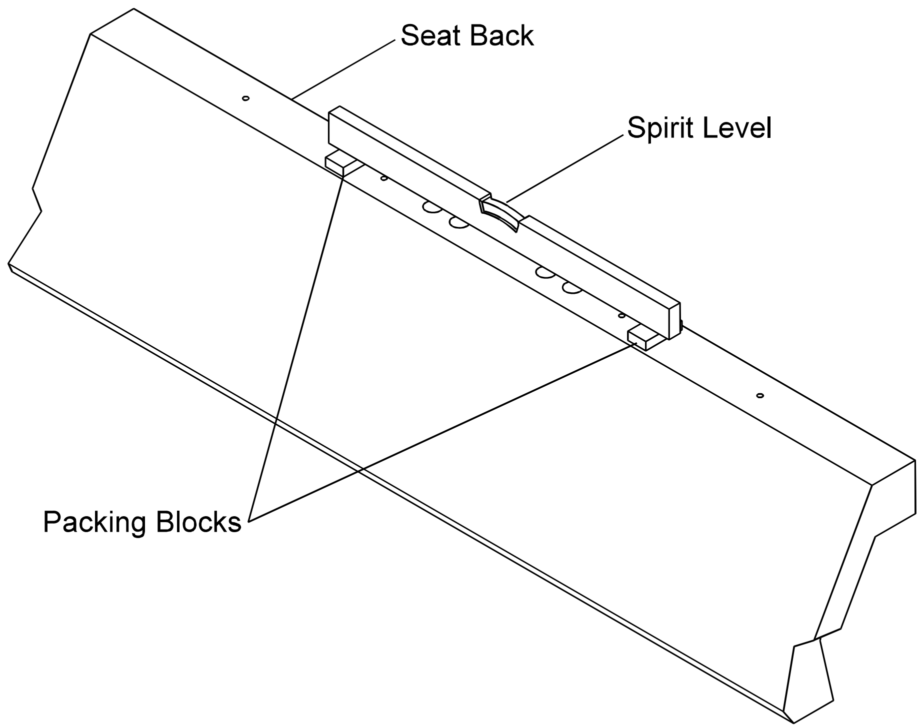


Figure 1: Level The Aircraft Laterally For Weighing

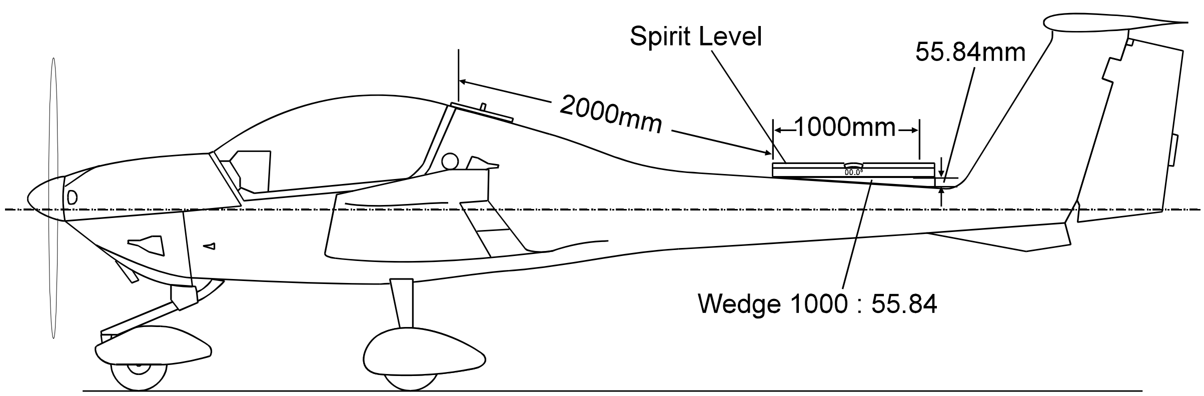
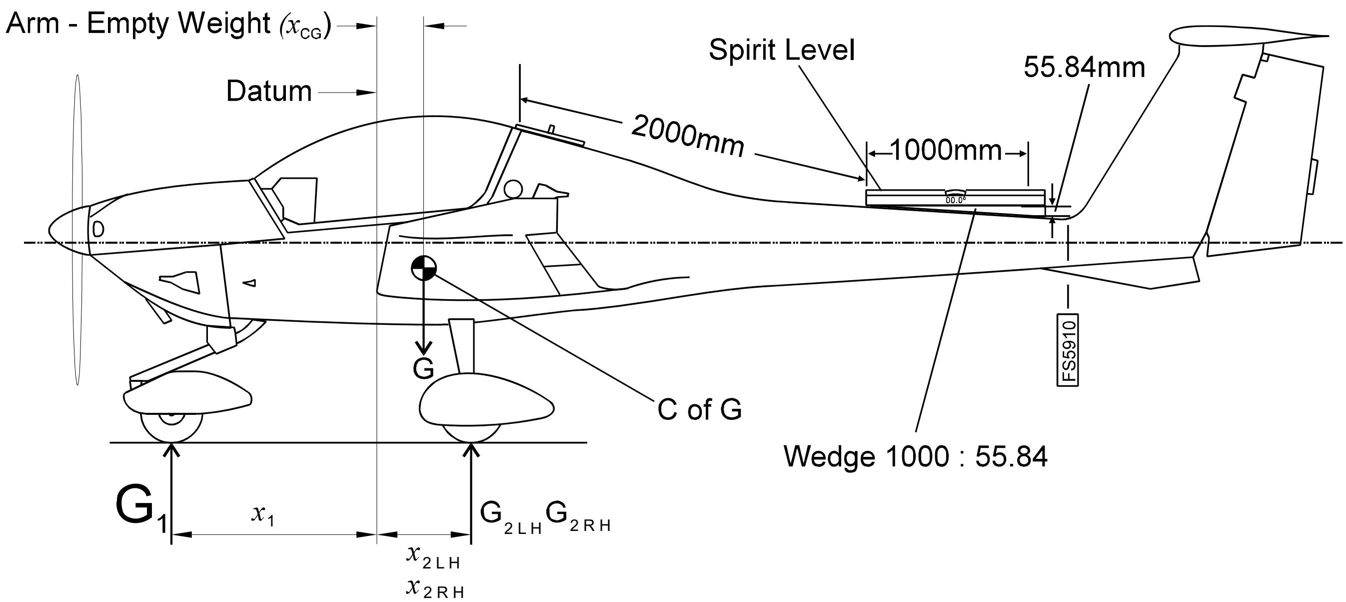


Figure 2: Level The Aircraft Longitudinally For Weighing



Legend:

X_1 = Arm - Datum to center line nose wheel

X_2 = Arm - Datum to C/L main wheels (LH and RH)

G_1 = Net weight - Nose wheel

G_2 = Net weight - Main wheels (LH and RH)

G = Empty weight

X_{CG} = Arm - Empty - weight (Calculated)

Figure 3 - Weighing Dimensions

Model: DA20-C1 Serial Number:___________ Registration_____________

Data with reference to the Type Certificate Data Sheet and the Airplane Flight Manual.

Reference Datum: Leading edge of wing at root rib.

Horizontal reference line: Wedge 1000:55.84, 2000mm (78.7 in) aft of the step in the fuselage at the canopy edge.

Equipment list - dated: __________ Cause for Weighing: _________________________________

Weight and Balance Calculations

Weight Condition: Include brake fluid, engine oil and Unusable fuel (Type 2 system, 2 liters unusable, 1.44 kg (3.18 lbs)

Finding Arm: (Measured)

Support	Gross (kg) (lbs)	Tare (kg) (lbs)	Net (kg) (lbs)
Front G_1			
Rear G_{2LH}			
Rear G_{2RH}			
EMPTY WEIGHT (G)			

Lever Arm (cm) (in)
X_1 =
X_{2LH} =
X_{2RH} =

Finding Empty - Weight Center of Gravity (X_{CG}):

Empty Weight CG Formula:

$$X_{CG} = \frac{(G_1 \times X_1)+(G_{2LH} \times X_{2LH})+(G_{2RH} \times X_{2RH})}{G_1 + G_{2LH} + G_{2RH}} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

Finding Empty - Weight Moment

Empty-weight Moment (M) = Empty Weight (G) x Empty-weight CG
(Positive results indicate that CG is located aft of RD) ____________________

Finding Maximum Permitted Useful Load:

Maximum Weight kg (lbs)	750 kg/1653 lbs for operations in EASA member countries (800 kg/1764 lbs for all others equipped with a Sensenich propeller)
Empty Weight kg (lbs)	
Maximum useful Load kg (lbs)	

Record the Empty Weight (G) and the Empty-weight Moment (M) in the AFM.

Place/Date:	Authorizing Stamp:	Authorizing Signature:

Figure 4 - Weighing Report

LEVELING

1. General

The following procedures describe how to make the aircraft level. Refer to Chapter 07-10 for lifting the aircraft with jacks.

You can make the aircraft level with jacks. Or you can make the aircraft level by changing the tire pressures. Or you can put blocks under the wheels.

If you have to do an asymmetry test, use the jacks to make the aircraft level. If you weigh the aircraft, change the aircraft tire pressures to make the aircraft level. Or you can put blocks under the wheels to make the aircraft level.

2. Make the Aircraft Level with Jacks

A. Equipment

Item	Quantity	Part Number
Aircraft jacks	2	Commercial
Trestle	1	Commercial
Spirit level	1	Commercial
Wedge - slope 1000:55.84	1	Commercial

B. Procedure

	Detail Steps/Work Items	Key Items/References
1.	Lift the aircraft on jacks.	Refer to Chapter 07-10.
2.	Open the canopy.	
3.	Align the aircraft laterally. - Put the spirit level on the back rest of the seat. - Adjust the level of the aircraft by raising the jack on the low side.	If necessary, use two packing blocks of equal thickness to clear the safety belt attachments.

	Detail Steps/Work Items	Key Items/References
4.	Align the aircraft longitudinally. - Put the 1000:55.84 wedge on the fuselage. - Place the spirit level on the wedge. - Lift or lower the rear fuselage with the tail trestle to make the fuselage level.	
5.	Remove the alignment equipment and close the canopy.	

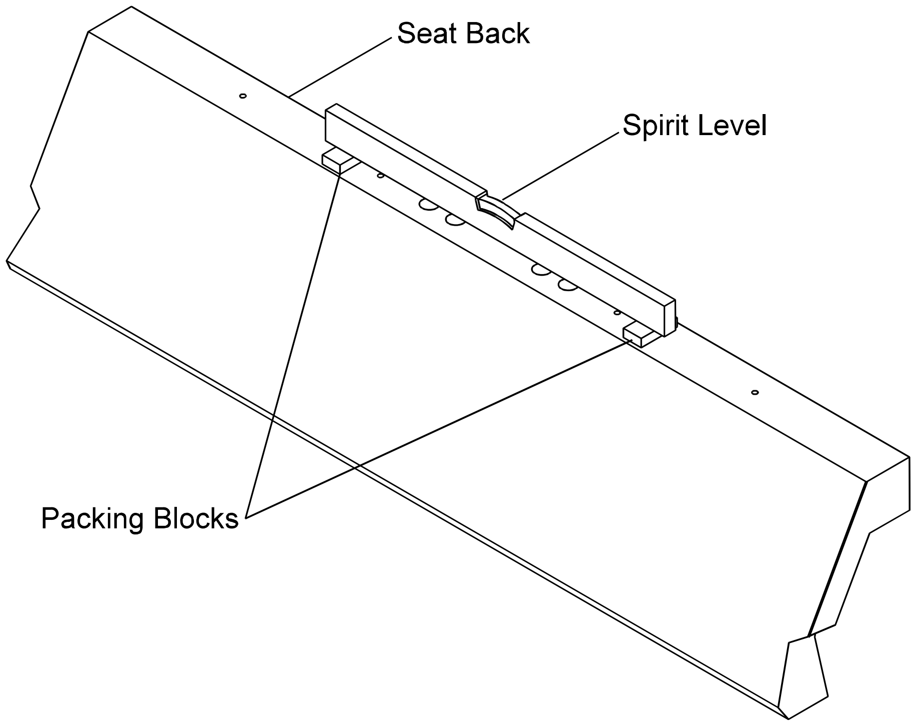


Figure 1: Level The Aircraft Laterally

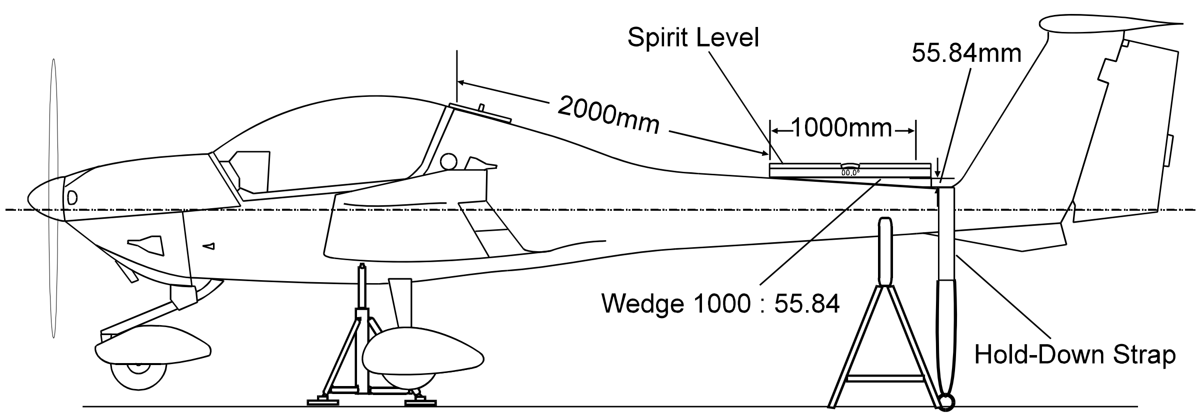


Figure 2 - Level the Aircraft Longitudinally

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CHAPTER 09-00
TOWING AND TAXIING

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TOWING AND TAXIING

1. General

You can move the aircraft on the ground with the tow bar, or by taxiing the aircraft.

WARNING: YOU MUST NOT TAXI THE AIRCRAFT UNLESS YOU HAVE BEEN TRAINED TO TAXI.

If you know the towing procedure you can move the aircraft safely and if you know the taxiing procedure then you can taxi the aircraft safely.

Chapter 09-10 describes how to move the aircraft with a tow bar. Chapter 09-20 describes how to taxi the aircraft.

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TOWING

1. General

You can move the aircraft on the ground by hand, or you can use a towing vehicle. Obey the towing procedures.

2. Tools and Equipment

Use the DA20-C1 aircraft tow bar to move the aircraft. The tow bar is part of the aircraft standard equipment. One person can move the aircraft on a flat surface.

Use the sliding strap to close the arms of the tow bar and use your hands to open the arms of the tow bar.

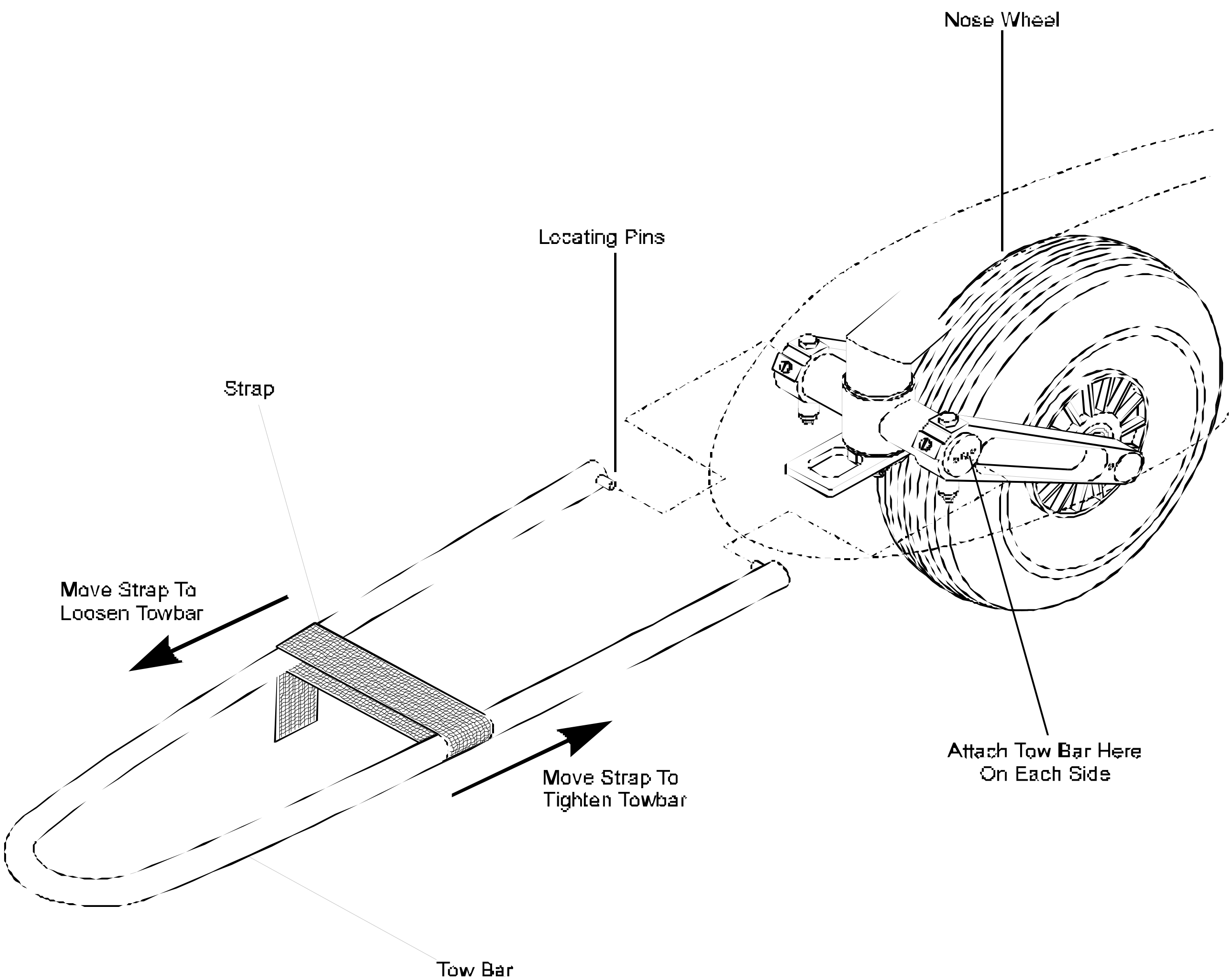

Figure 1 - Tow Bar

3. Towing Procedure

WARNING: MAKE SURE THAT THE PINS OF THE TOW BAR ARE CORRECTLY ENGAGED IN THE NOSE WHEEL STRUT. IF THE PINS ARE NOT CORRECTLY ENGAGED, THE TOW BAR CAN DETACH. THE AIRCRAFT CAN CAUSE INJURY TO PERSONS.

CAUTION: THE NOSE WHEEL STEERING ANGLE IS 64° TO THE LEFT AND 64° TO THE RIGHT. IF YOU TURN THE WHEEL MORE THAN 64° TO THE LEFT OR THE RIGHT, YOU WILL CAUSE DAMAGE TO THE NOSE GEAR.

CAUTION: IF YOU TOW THE AIRCRAFT WITH A TOWING VEHICLE, ONE PERSON MUST BE IN THE COCKPIT TO OPERATE THE BRAKES IN AN EMERGENCY.

CAUTION: YOU MUST NOT TOW THE AIRCRAFT REARWARDS USING THE TOW BAR. THE NOSE WHEEL STEERING ANGLE IS 64° TO THE LEFT AND 64° TO THE RIGHT. IF YOU TURN THE WHEEL MORE THAN 64° TO THE LEFT OR THE RIGHT, YOU WILL CAUSE DAMAGE TO THE NOSE GEAR. MOVE THE AIRCRAFT REARWARDS USING YOUR HANDS. (REFER TO PARAGRAPH 3.D, PUSHING OR PULLING THE AIRCRAFT).

A. Equipment

Item	Quantity	Part Number
Tow bar assembly	1	Commercial

B. Towing by Hand

CAUTION: MAKE SURE THAT THE AIRCRAFT IS ON LEVEL GROUND. IF YOU TRY TO MOVE THE AIRCRAFT ON GROUND THAT IS NOT LEVEL, YOU CAN LOSE CONTROL OF THE AIRCRAFT.

	Detail Steps/Work Items	Key Items/References
CAUTION: MAKE SURE THAT THE TOWING AREA IS CLEAR OF OBJECTS AND THE WINGS DO NOT HIT ANYTHING. CAUTION: MAKE SURE THAT YOU HAVE WHEEL CHOCKS AT HAND. IF THE AIRCRAFT BRAKES SHOULD BE DEFECTIVE, YOU MUST BE ABLE TO STOP THE AIRCRAFT.		
1.	Attach the tow bar to the nose wheel strut. Lock the pins of the tow bar with the sliding strap of the tow bar.	Refer to Figure 1.
2.	Release the aircraft parking brake.	
3.	Remove the wheel chocks.	

	Detail Steps/Work Items	Key Items/References
	CAUTION: DO NOT PUSH OR PULL THE CONTROL SURFACES WHEN TOWING. YOU CAN CAUSE DAMAGE TO THE CONTROL SURFACES.	
4.	Move the aircraft to its new position.	
5.	Put wheel chocks in front and behind the main wheels.	
6.	Remove the tow bar.	Refer to Figure 1.
7.	Set the parking brake to ON.	

C. Towing with a Towing Vehicle

CAUTION: IF YOU TOW THE AIRCRAFT WITH A TOWING VEHICLE, ONE PERSON MUST BE IN THE COCKPIT TO OPERATE THE BRAKES IN AN EMERGENCY.

	Detail Steps/Work Items	Key Items/References
	CAUTION: MAKE SURE THAT THE TOWING AREA IS CLEAR OF OBJECTS AND THE WINGS DO NOT HIT ANYTHING. CAUTION: MAKE SURE THAT YOU HAVE WHEEL CHOCKS AT HAND. IF THE AIRCRAFT BRAKES SHOULD BE DEFECTIVE, YOU MUST BE ABLE TO STOP THE AIRCRAFT.	
1.	Attach the tow bar to the nose wheel strut. Lock the pins of the tow bar with the sliding strap of the tow bar.	Refer to Figure 1.
2. 3.	Attach the tow bar to the towing hook of the towing vehicle. Remove the wheel chocks.	
4.	Release the aircraft parking brake.	
	CAUTION: THE NOSE WHEEL STEERING ANGLE IS 64° TO THE LEFT AND 64° TO THE RIGHT. IF YOU TURN THE WHEEL MORE THAN 64° TO THE LEFT OR THE RIGHT, YOU WILL CAUSE DAMAGE TO THE NOSE GEAR.	
5.	Move the aircraft to its new position.	

	Detail Steps/Work Items	Key Items/References
6.	Set the parking brake to ON.	
5.	Put wheel chocks in front and behind the main wheels.	
6.	Remove the tow bar from the towing vehicle and the aircraft.	Refer to Figure 1.

D. Pushing or Pulling the Aircraft

CAUTION: NEVER USE FORCE ON THE PROPELLER OR ON THE CONTROL SURFACES. YOU CAN DAMAGE THE PROPELLER AND THE CONTROL SURFACES.

CAUTION: NEVER APPLY WEIGHTS TO THE TAILPLANE TO LIFT THE NOSE WHEEL. YOU CAN DAMAGE THE TAILPLANE.

CAUTION: NEVER TOW THE AIRCRAFT IF THE WHEELS ARE BLOCKED BY SNOW OR MUD. YOU CAN DAMAGE THE LANDING GEAR.

You can also move the aircraft without using a tow bar. You can push the DA20-C1 aircraft at the wing tip and at the wing-fuselage connection.

If you have a limited area to maneuver the aircraft, you can use two people to turn the aircraft around the main wheels. One person must push down on the front of the vertical stabilizer, while the other person holds on to the wing tip.

TAXIING

1. General

WARNING: DO NOT TAXI THE AIRCRAFT UNLESS YOU HAVE BEEN TRAINED TO TAXI AND YOU HAVE BEEN AUTHORIZED.

CAUTION: THIS SECTION GIVES GENERAL DATA ON TAXIING ONLY. YOU MUST USE THE DA20-C1 AIRPLANE FLIGHT MANUAL WHEN YOU TAXI THE AIRCRAFT.

When you taxi the DA20-C1 aircraft, use the toe operated brakes to steer the aircraft. To make the aircraft turn, operate the left or the right toe brake.

2. Taxiing Procedure

	Detail Steps/Work Items	Key Items/References
WARNING: MAKE SURE THAT THERE ARE NO PERSONS OR OBJECTS NEAR THE AIRCRAFT. THE AIRCRAFT CAN INJURE PERSONS AND OBJECTS CAN DAMAGE THE AIRCRAFT.		
1.	Make sure the area around the aircraft is clear of persons and objects.	For example: ground equipment and tools.
2.	Set the parking brake to ON.	
3.	If necessary remove: - the wheel chocks - the tow bar - the mooring ropes.	
4.	Start the engine	Refer to DA20-C1 Airplane Flight Manual.
5.	Release the aircraft parking brake.	

	Detail Steps/Work Items	Key Items/References
	<u>WARNING:</u> MAKE SURE THAT THE BRAKES OPERATE CORRECTLY WHEN YOU TAXI THE AIRCRAFT. IF THE BRAKES SHOULD FAIL, YOU MUST BE ABLE TO STOP THE AIRCRAFT BEFORE YOU HIT PERSONS OR EQUIPMENT. <u>CAUTION:</u> OBEY THE SAFETY RANGE FOR TAXIING. <u>CAUTION:</u> TAKE CARE IF YOU TAXI ON UNEVEN GROUND. THE PROPELLER MUST NOT TOUCH THE GROUND. LOOSE STONES AND GRAVEL CAN DAMAGE THE PROPELLER.	
6.	Taxi the aircraft to its new position.	
7.	Shut down the engine.	Refer to DA20-C1 Airplane Flight Manual.
8.	Park the aircraft. If necessary, moor the aircraft.	Refer to Chapter 10-00.

CHAPTER 10-00

PARKING, MOORING, STORAGE AND RETURN TO SERVICE

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PARKING, MOORING, STORAGE AND RETURN TO SERVICE

1. General

Always park or moor the DA20-C1 aircraft when it is not in use. Use the procedures in Chapter 10-10 for parking the aircraft. Use the procedure in Chapter 10-20 to moor the aircraft. If the aircraft is parked over night, we recommend that you moor the aircraft. If high winds are forecast, you must always moor the aircraft.

Refer to Continental Motors IO-240 Series Engine Maintenance and Overhaul Manual, Publication M-6, latest revision for detailed information about engine storage.

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PARKING/STORAGE

1. General

Use these procedures to protect the aircraft when it is parked. Use the short-term parking procedure when the aircraft will be parked for less than 5 days. Use the long term parking procedure when the aircraft will be parked for 5 to 30 days.

Use the storage procedure if the aircraft will be parked/stored for a period of more than 30 days.

All pilots and persons who do maintenance must know the procedures in this Section.

2. Parking

A. Equipment

Item	Quantity	Part Number
Chocks	4	Commercial

B. Short Term Parking (Less than 5 days)

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT TAXI THE AIRCRAFT UNLESS YOU HAVE BEEN TRAINED TO TAXI AND YOU HAVE BEEN AUTHORIZED.	
1.	Taxi or tow the aircraft to the parking position.	
2.	Align the aircraft into wind.	
	CAUTION: MAKE SURE THAT THE NOSE WHEEL IS ALIGNED STRAIGHT AHEAD WHEN THE AIRCRAFT STOPS. THIS WILL PREVENT SIDE LOADS WHICH CAN DAMAGE THE LANDING GEAR.	
3.	If the wind is gusty (or the weather is stormy) moor the aircraft.	Refer to Chapter 10-20.
4.	If there is packed snow or ice on the parking area, spread about 0.2 in (5 mm) of sand under the wheels.	
	CAUTION: DO NOT APPLY THE PARKING BRAKE WHEN THE BRAKES ARE OVER-HEATED. THE BRAKES CAN SEIZE ON.	
5.	Set the parking brake ON.	Pull the knob fully aft and push the brake pedals.
6.	Put the chocks in front of and behind the main wheels.	

	Detail Steps/Work Items	Key Items/References
7.	Set the parking brake OFF.	Push the knob fully forward.
8.	Set the controls to neutral. Install the control lock.	
9.	Set the flaps to CRUISE.	Fully up.
10.	Close and lock the canopy.	

C. Long Term Parking (From 15 to 30 days)

If the aircraft is parked for a long time, the wheel bearings can corrode. Also, the tires can deform. Do this procedure to prevent these problems.

	Detail Steps/Work Items	Key Items/References
1.	Do the procedure for short-term parking.	Refer to Paragraph B.
2.	If the aircraft can be moved, remove the chocks. Move the aircraft to turn the wheels 3 or 4 revolutions. Put the chocks back. If the aircraft is on jacks, turn each wheel 3 or 4 revolutions by hand.	You can push or tow the aircraft. Make sure that a different part of the tire touches the ground when you stop.
NOTE: Do item 2 daily in cold weather. Do it weekly in warm weather.		

3. Storage

If the aircraft will be parked/stored for more than 30 days, you must do the storage procedure on the aircraft.

A. Material

Item	Quantity	Part Number
Tire protector spray	A/R	Commercial

B. Preparation

	Detail Steps/Work Items	Key Items/References
1.	If the aircraft will be parked between 30 and 90 days, do the procedure for Temporary Storage for the engine.	Refer to Continental Motors IO-240 Series Engine Maintenance and Overhaul Manual Publication M-6, latest revision.
2.	If the aircraft will be parked for more than 90 days, do the procedure for Indefinite Storage for the engine.	Refer to Continental Motors IO-240 Series Engine Maintenance and Overhaul Manual Publication M-6, latest revision.
3.	If possible, ventilate the aircraft in a dry atmosphere.	
4.	Do the procedure for long-term parking.	Refer to Paragraph 2.
5.	Remove the aircraft battery.	Refer to Chapter 24-31.
6.	Fill the fuel tank completely.	
7.	Wipe the tires with a dry cloth. Apply tire protector spray.	
8.	Lubricate the aircraft.	Refer to Chapter 12-10.
9.	Remove all loose equipment from the aircraft.	

C. Weekly Routine Check

Do the following procedure each week and the inspection requirements for the engine while the aircraft is stored. (Refer to Continental Motors IO-240 Series Engine Maintenance and Overhaul Manual, Publication M-6 for inspection requirements of the engine).

	Detail Steps/Work Items	Key Items/References
1.	Do a test for water contamination of the fuel tank.	Refer to Chapter 12-10.
2.	If the aircraft can be moved, move it to turn the wheels 3 or 4 revolutions. If the aircraft is on jacks, turn each wheels 3 or 4 revolutions by hand.	You can push or tow the aircraft. Make sure that a different part of the tire touches the ground. Mark the position and date on the tire with chalk.
NOTE: Do step 2 daily in cold weather. Do it weekly in warm weather.		
3.	Do a test for the correct air pressure in each tire. If necessary, inflate the tires.	

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MOORING

1. General

If the aircraft must be left outside for a long time, you must moor it. Strong winds or gusts can cause damage to an aircraft that is not moored.

2. Mooring

Figure 1 shows the location of the mooring points on the aircraft. There are 3 mooring points: One below each wing. One on the skid plate at the tail.

A. Equipment

Item	Quantity	Part Number
Chocks	4	Commercial
Rope (Nylon preferred, or hemp)	3	Commercial

B. Mooring Procedure

	Detail Steps/Work Items	Key Items/References
1.	Park the aircraft.	Refer to Chapter 10-10.
2.	Make sure that the flaps are set to CRUISE.	Fully up.
	CAUTION: MOOR THE AIRCRAFT AT THE MOORING POINTS ONLY. CAUTION: WHEN USING HEMP ROPES, DO NOT MAKE THEM TIGHT. IF THE ROPES GET WET THEY WILL TIGHTEN AND DAMAGE THE AIRCRAFT. THIS IS MOST IMPORTANT WHEN YOU USE SECURE GROUND ANCHOR-POINTS.	
3.	Attach a rope to each mooring point and to the ground anchor point.	Do not make the ropes tight.
4.	Remove all items that may damage the aircraft.	

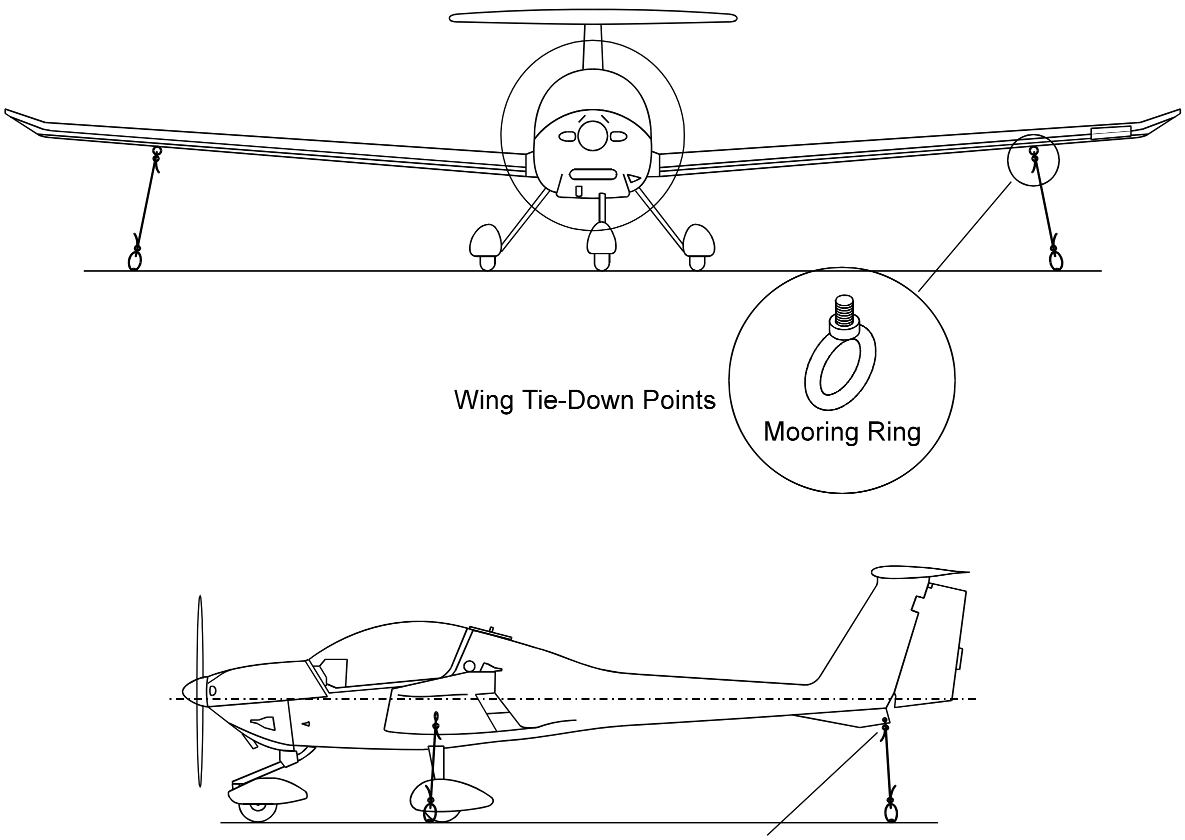

Figure 1 - Location of the Mooring Points on the Aircraft

RETURN TO SERVICE

1. General

Do this procedure when the aircraft has been parked (or stored) for more than 5 days.

2. Return to Service Procedure

	Detail Steps/Work Items	Key Items/References
1.	If the engine was preserved/stored in accordance with Temporary or Indifinite Storage procedure, then do the procedure for Returning Engine to Service.	Refer to Continental IO-240 Series Engine Maintenance and Overhaul Manual Publication M-6.
2.	If necessary, install loose equipment which was removed for storage.	
3.	If the battery has been removed: - Install the battery.	 Refer to Chapter 24-31.

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CHAPTER 11-00
PLACARDS AND MARKINGS

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PLACARDS AND MARKINGS

1. General

Placards are used for identification and indication. They show the function, operation and operating limitations of systems and equipment.

This chapter shows you the location of the exterior placards and markings and the location of the interior placards.

Self-adhesive plastic foil is used for all placards except for the metal manufacturers placard located on the skid-plate.

Replace damaged placards.

2. Replace the Plastic Foil Placards

A. Material

Item	Quantity	Part Number
Solvent	A/R	Commercial

B. Replace a Placard

	Detail Steps/Work Items	Key Items/References
1.	Remove the old placard. - Heat the placard with a hot air blower - Lift one corner of the placard - Pull the placard off.	
WARNING: DO NOT GET SOLVENT ON YOUR SKIN. DO NOT BREATH SOLVENT VAPOR. SOLVENT CAN CAUSE DISEASE OR ILLNESS.		
2.	Clean the surface where the new placard will go.	Use a commercial solvent. There must be no dirt or oil on the surface.
3.	Remove the protective backing from the new placard.	
4.	Put the new placard in the correct position.	

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EXTERIOR PLACARDS AND MARKINGS

1. General

The DA20-C1 aircraft has the following exterior placards.

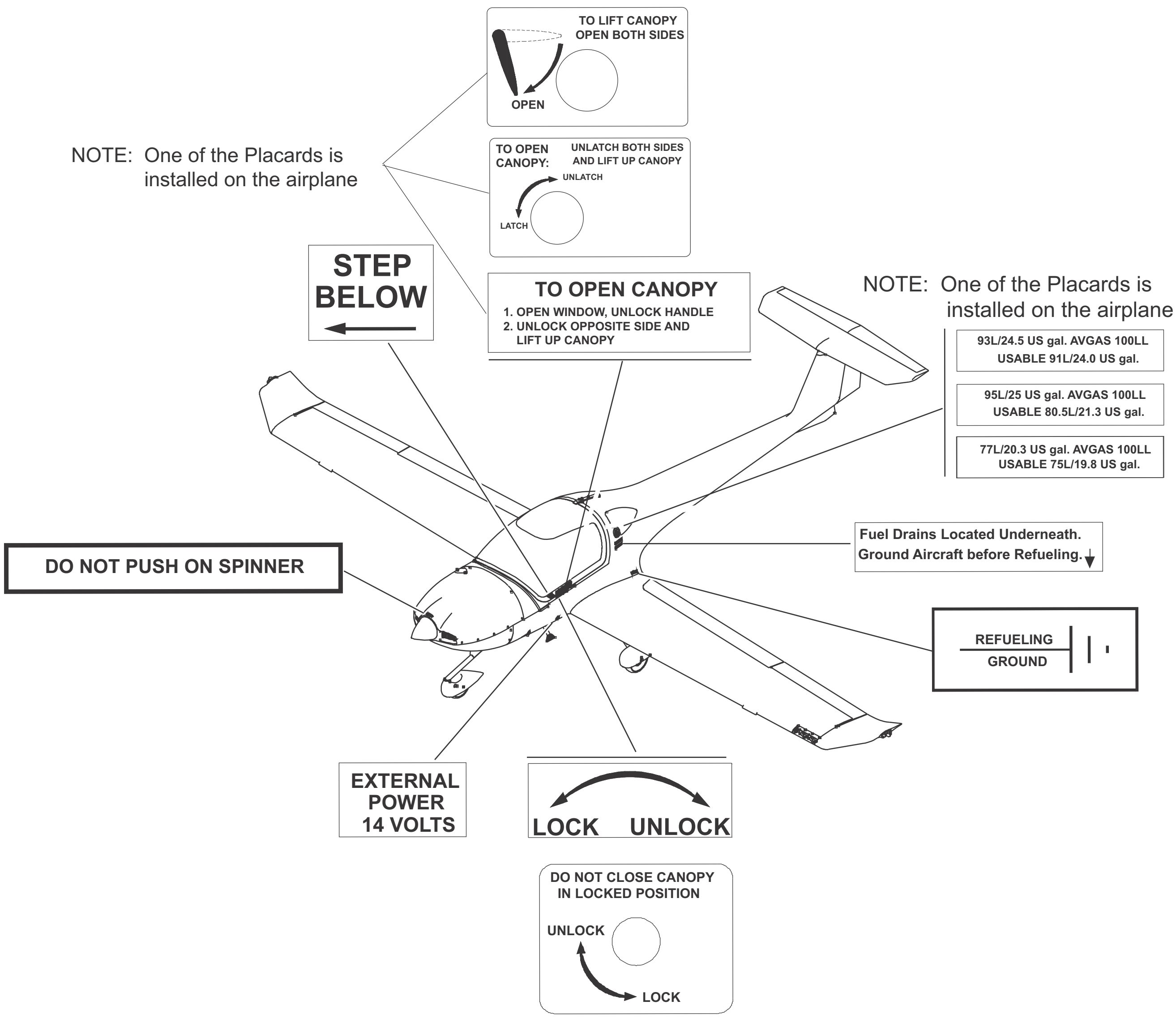


Figure 1 - Exterior Placards - Upper Surfaces (Sheet 1 of 2)

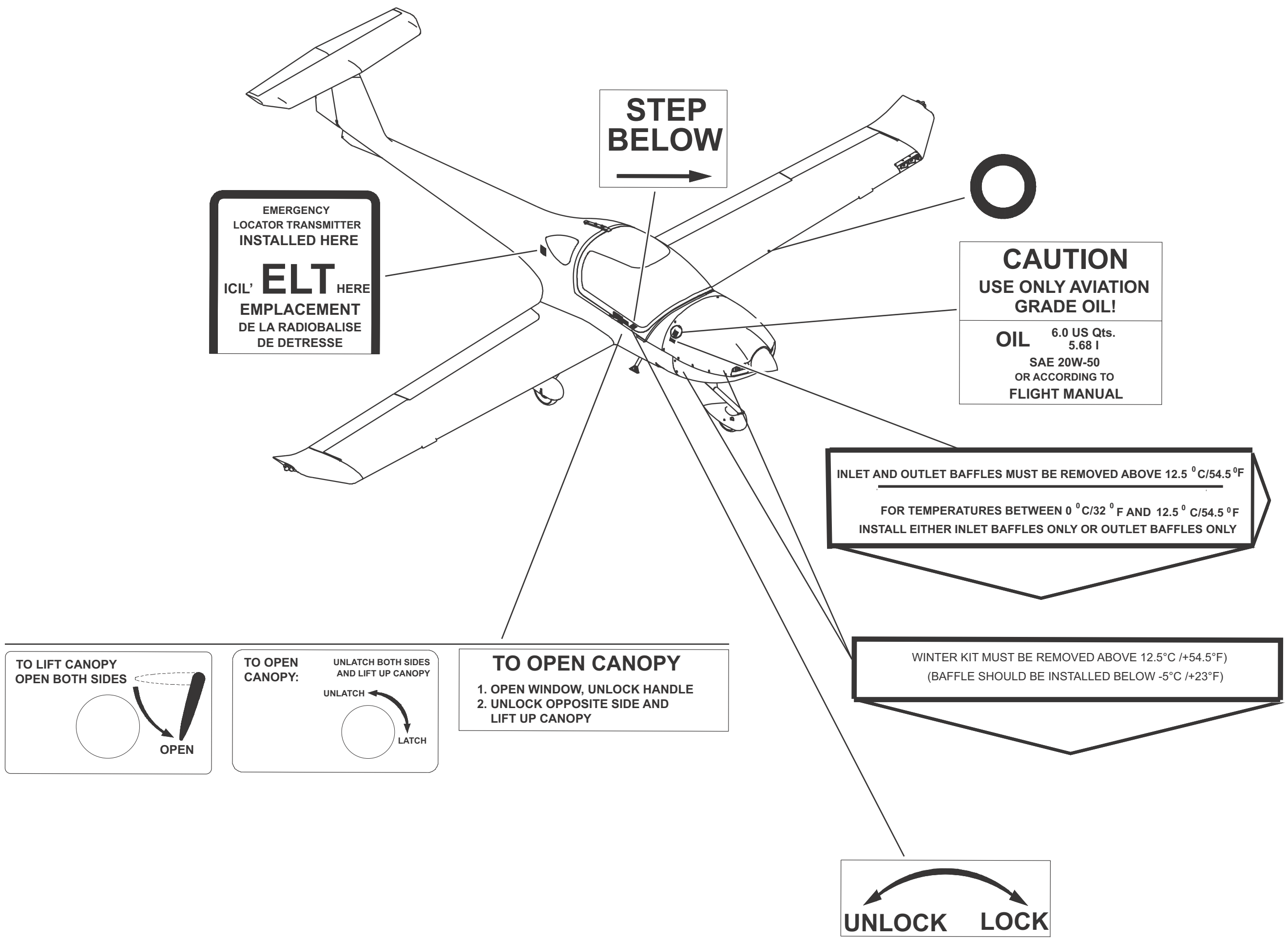
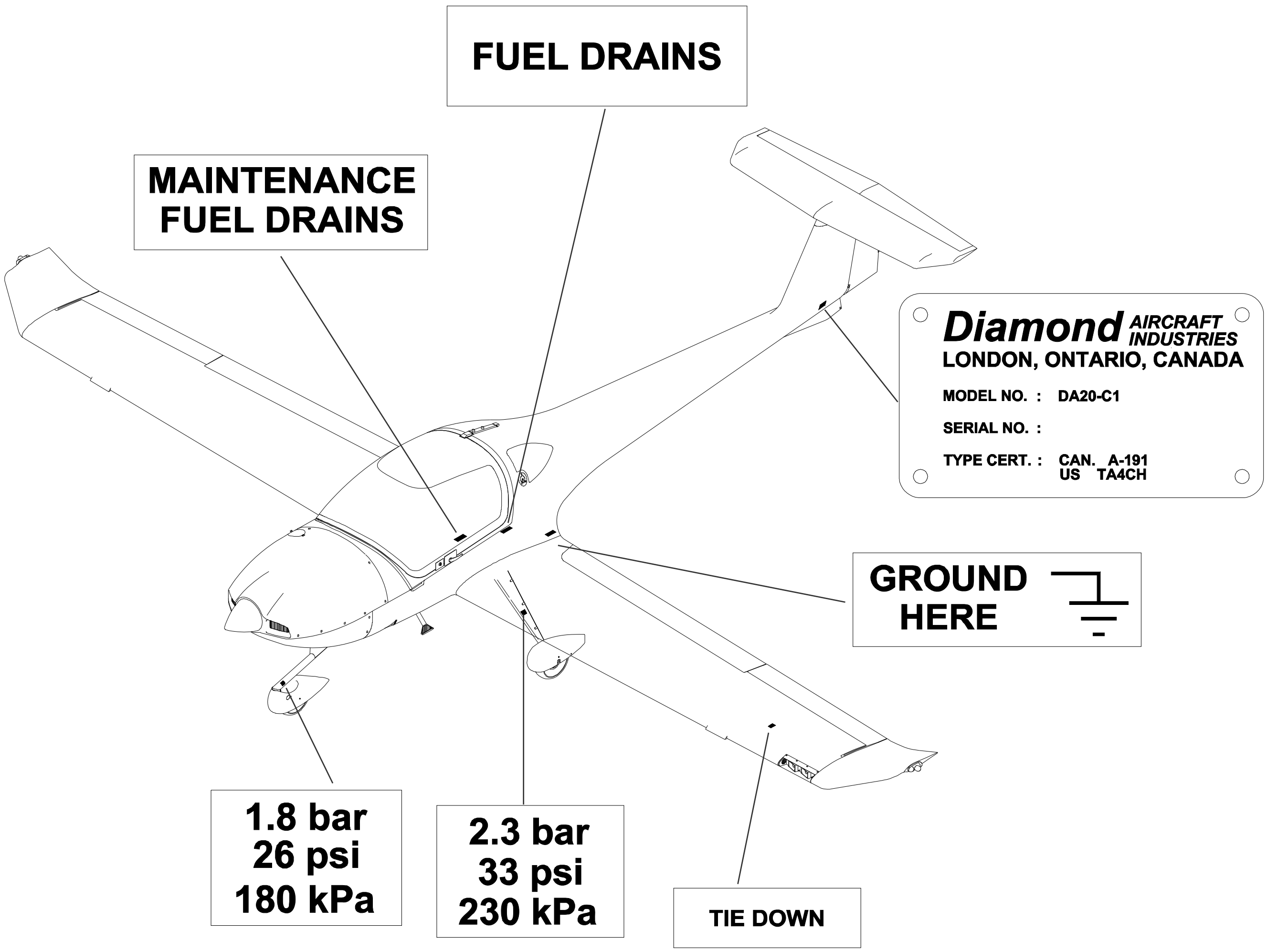
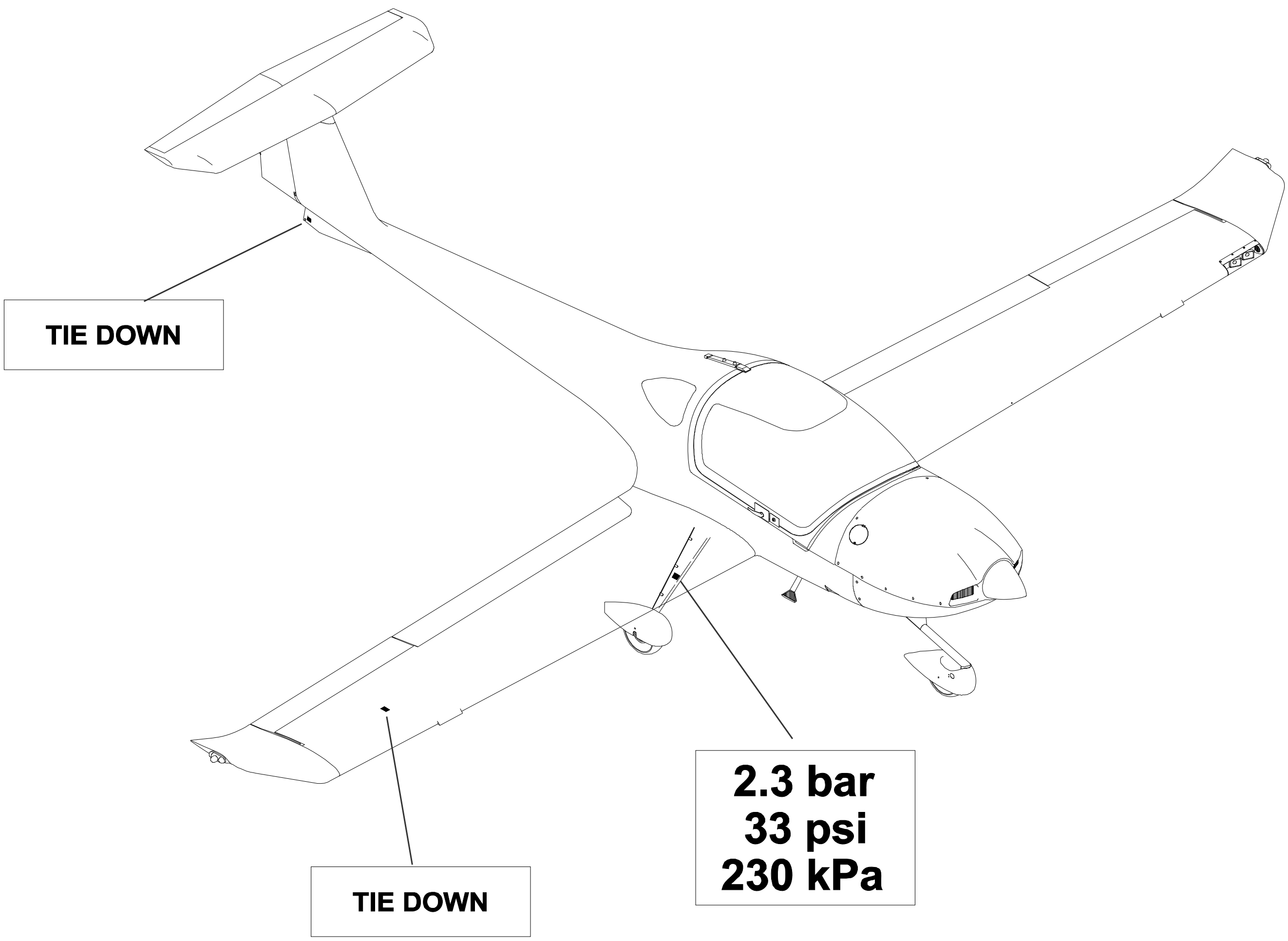


Figure 1 - Exterior Placards - Upper Surfaces (Sheet 2 of 2)



NOTE: The Placards and Markings shown are on the lower surfaces of the airplane.

Figure 2 - Exterior Placards - Lower Surfaces (Sheet 1 of 2)



NOTE: The Placards and Markings shown are on the lower surfaces of the airplane.

Figure 2 - Exterior Placards - Lower Surfaces (Sheet 2 of 2)

INTERIOR PLACARDS AND MARKINGS

1. General

Figures 1 through 8 show the interior placards and markings.

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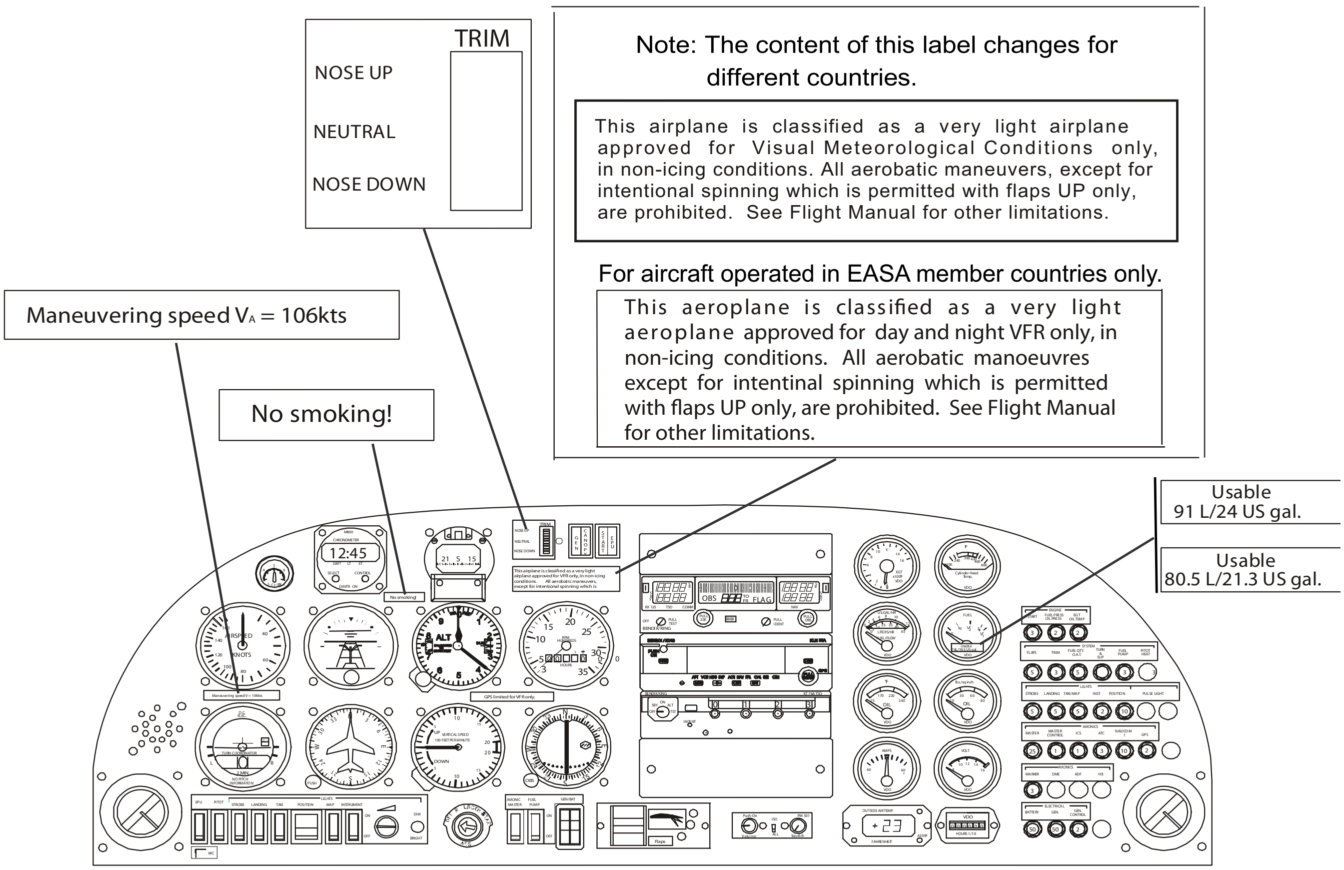


Figure 1 - Placards on the Instrument Panel (Up to S/N 0149) (Sheet 1 of 2)

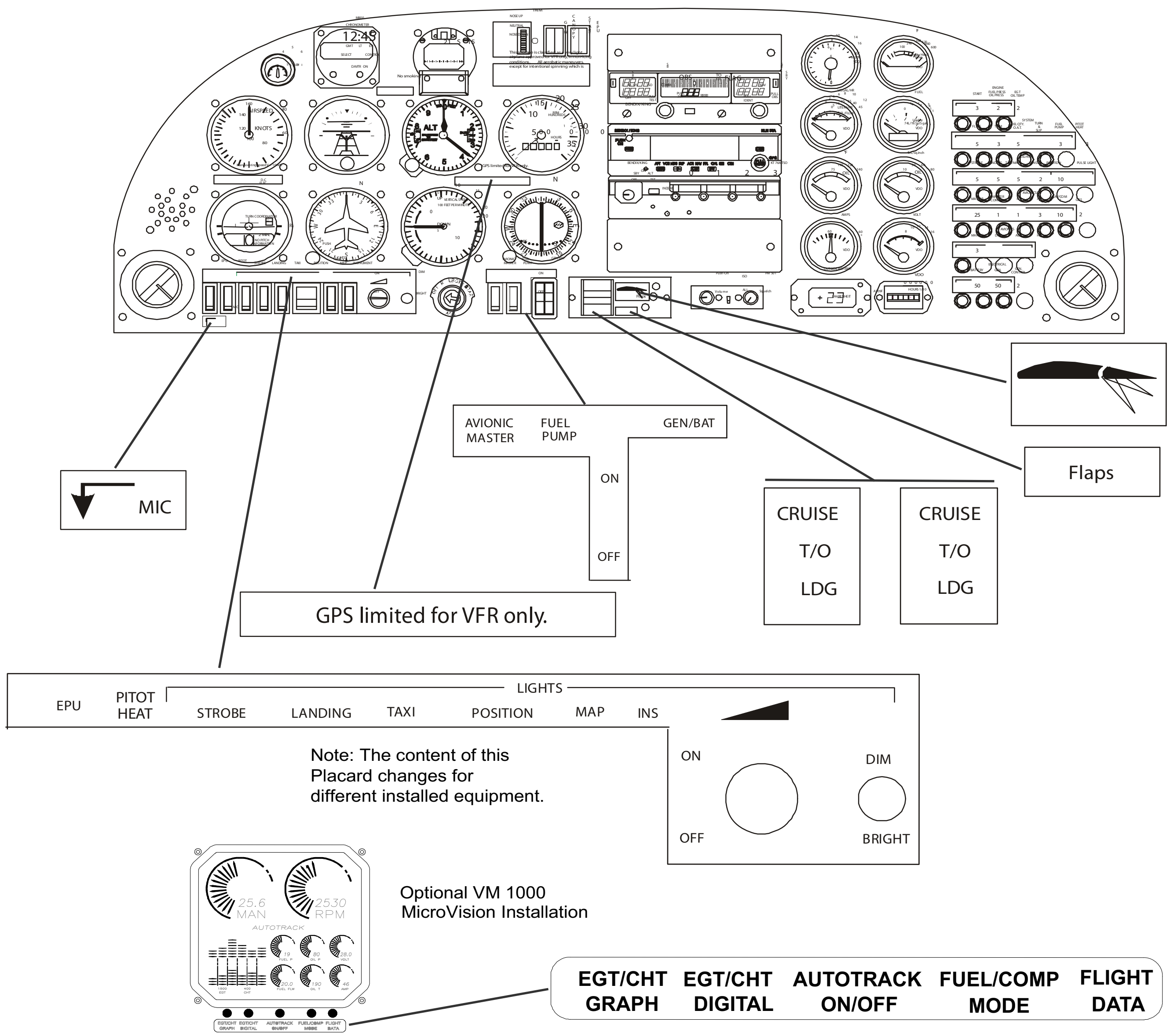


Figure 1 - Placards on the Instrument Panel (Up to S/N 0149) (Sheet 2 of 2)

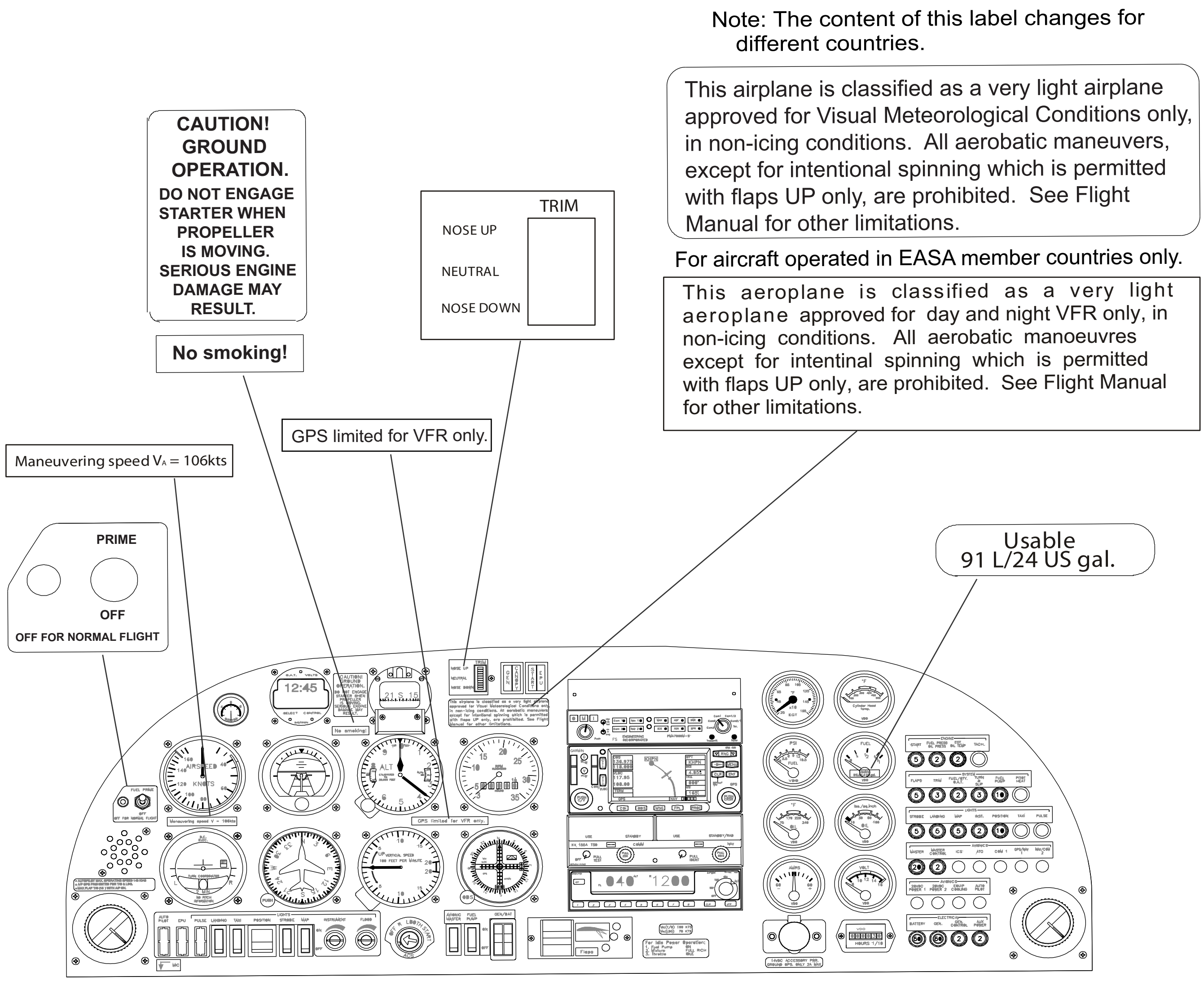
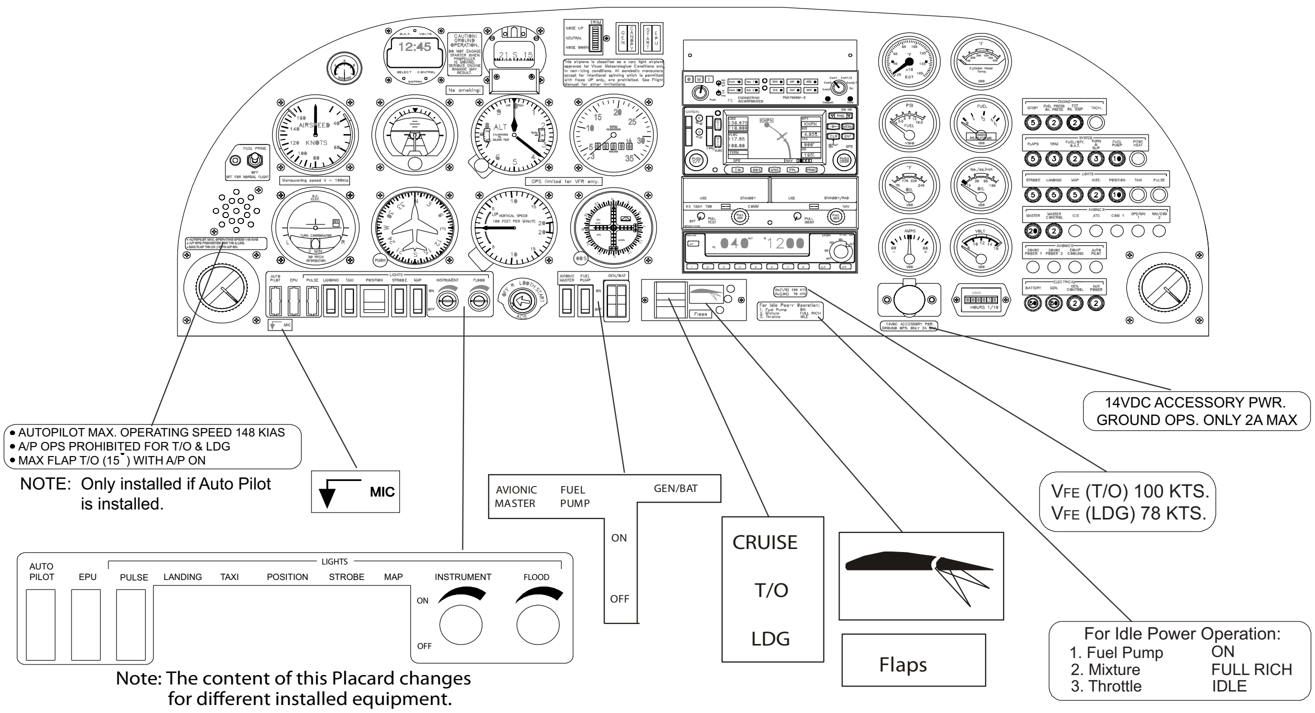


Figure 2 - Placards on the Instrument Panel (S/N 0150 and subs) (Sheet 1 of 2)



Optional VM 1000 MicroVision Installation

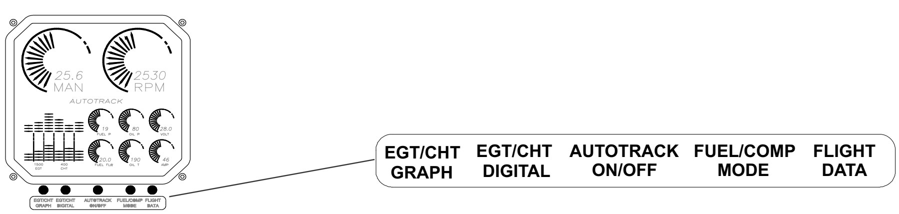


Figure 2 - Placards on the Instrument Panel (S/N 0150 and subs) (Sheet 2 of 2)

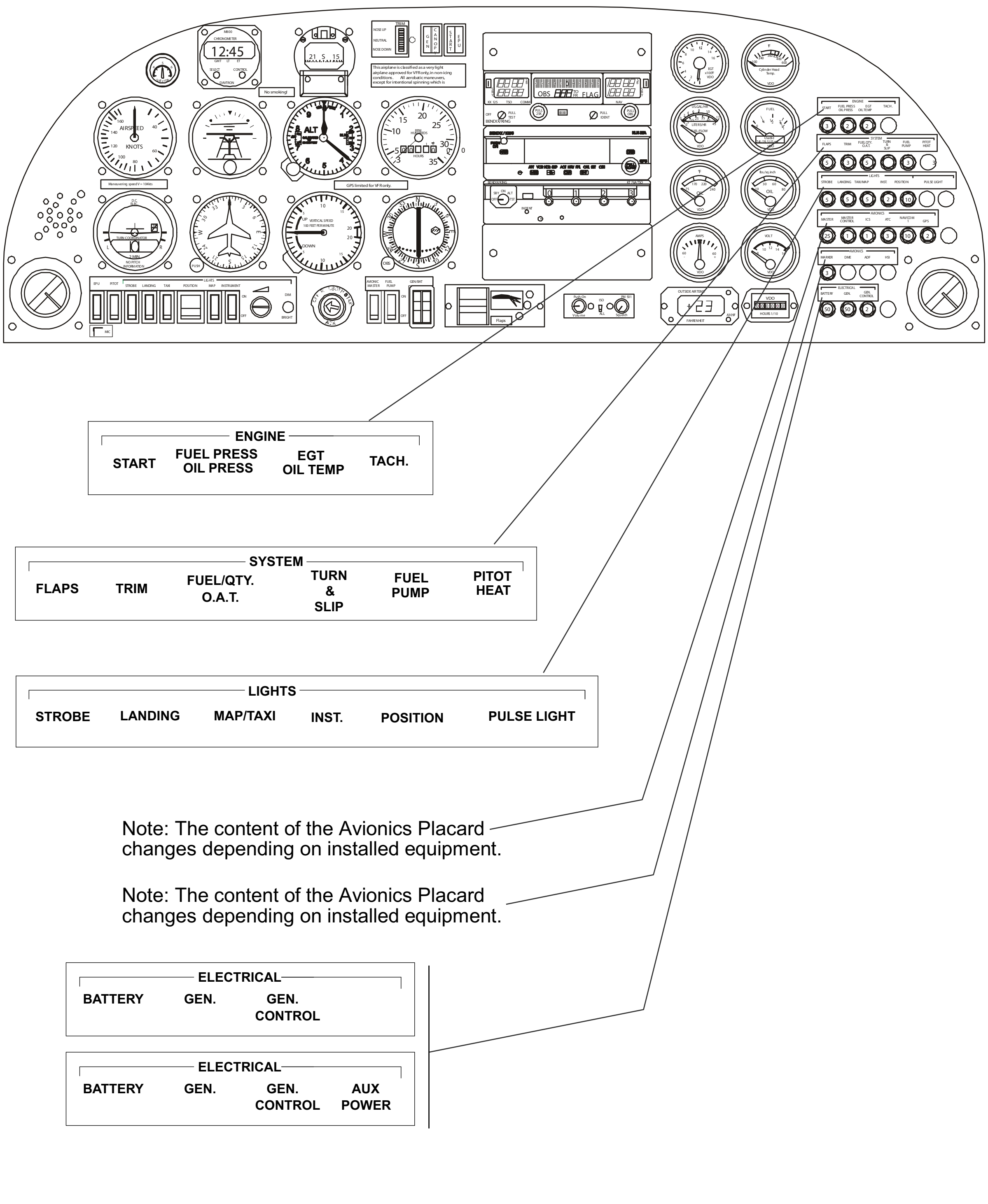


Figure 3 - Placards on the Instrument Panel - Circuit Breakers

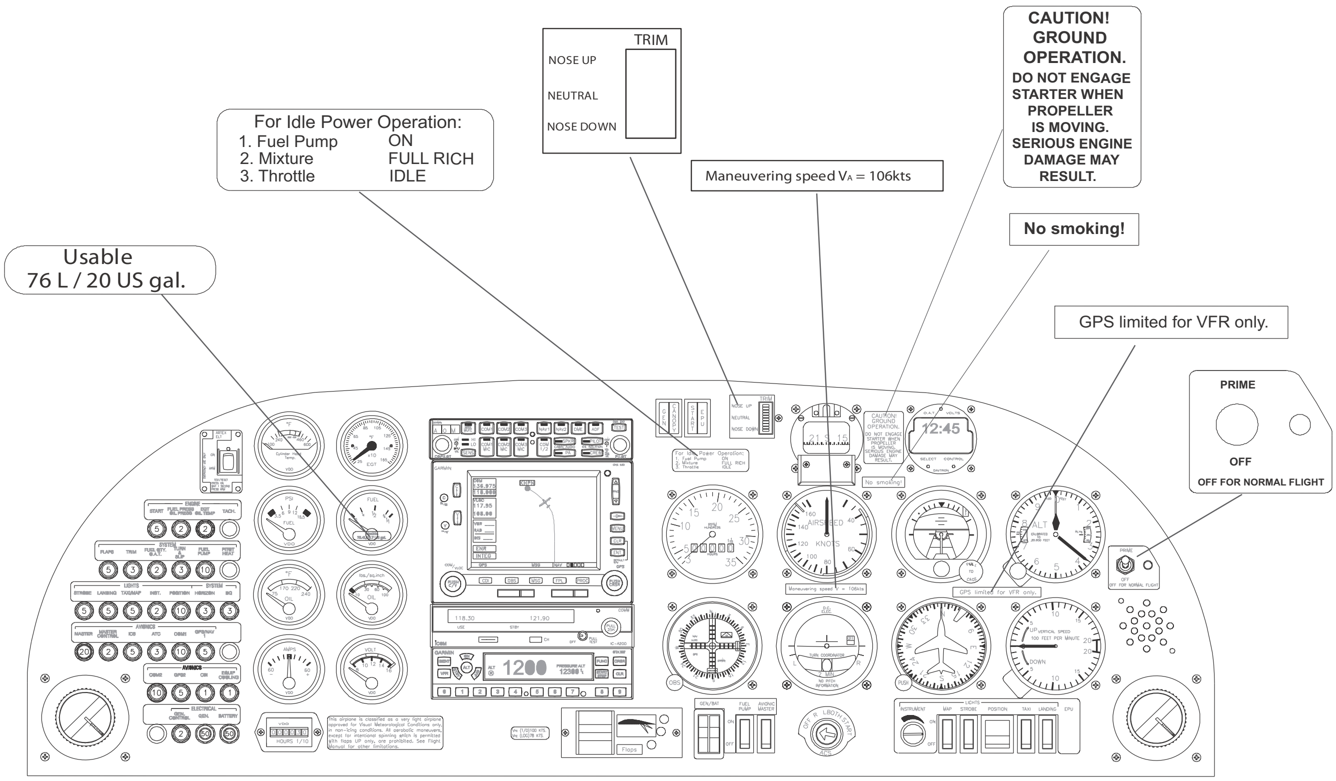


Figure 4 - Placards on the Reversed Instrument Panel (Sheet 1 of 2)

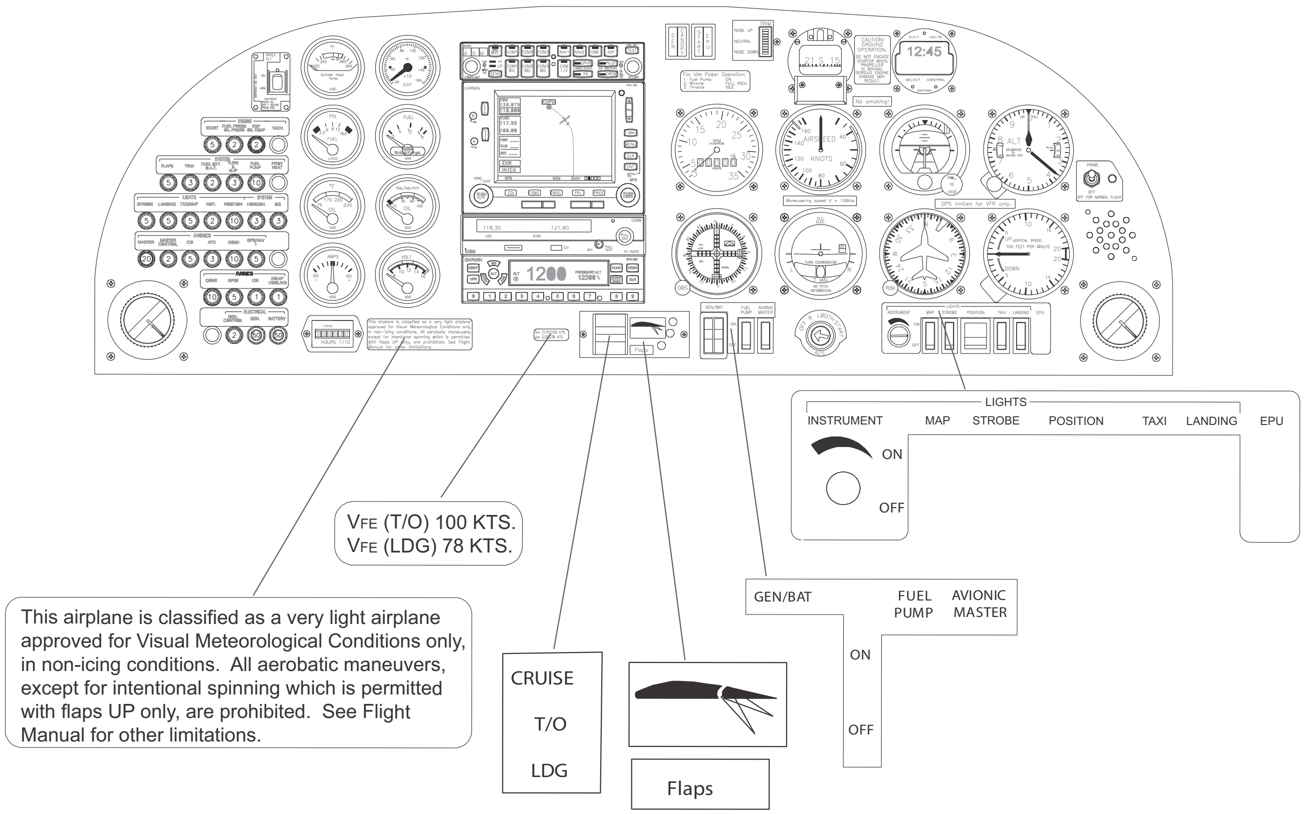


Figure 4 - Placards on the Reversed Instrument Panel (Sheet 2 of 2)

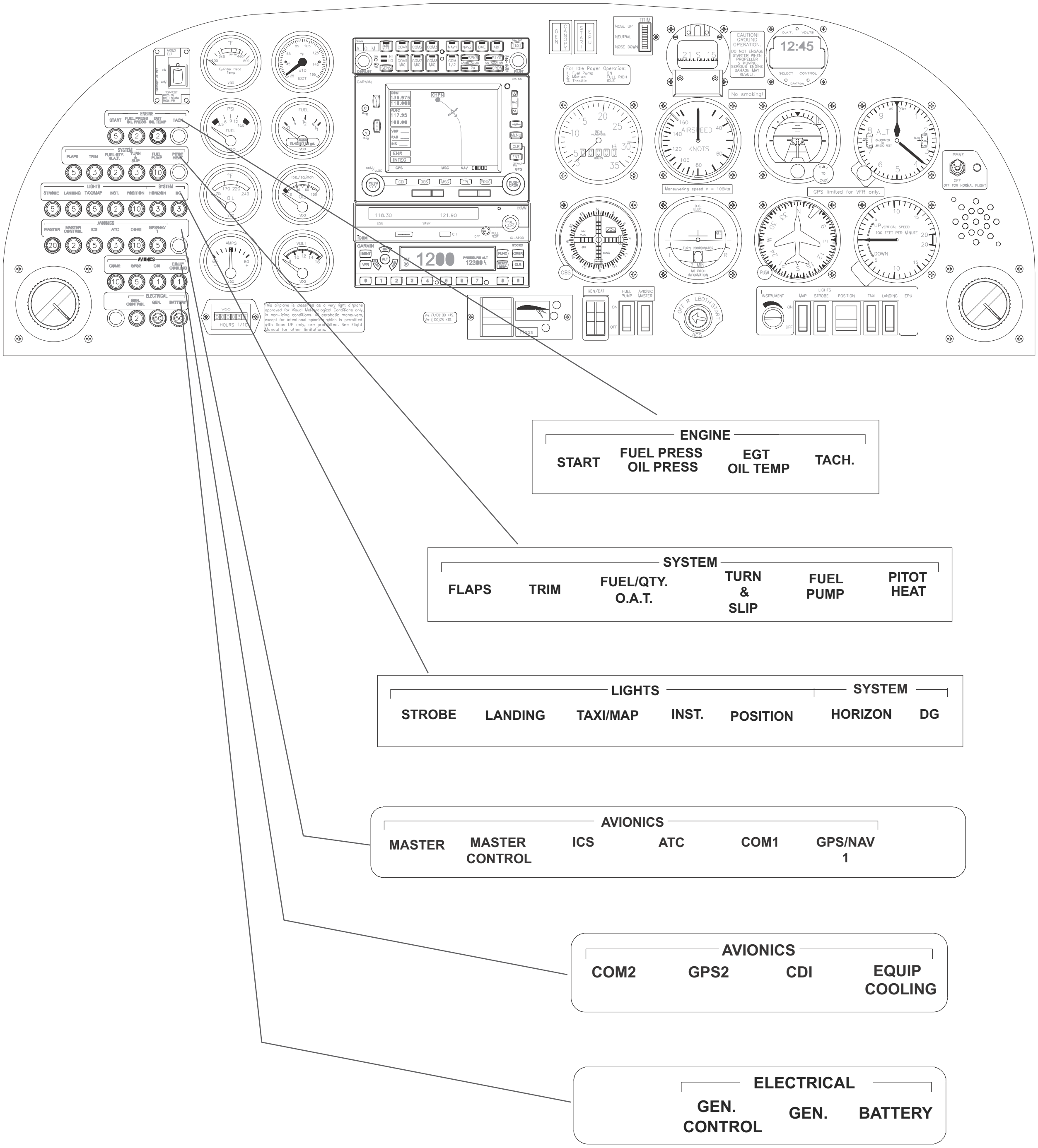


Figure 5 - Placards on the Reversed Instrument Panel - Circuit Breakers

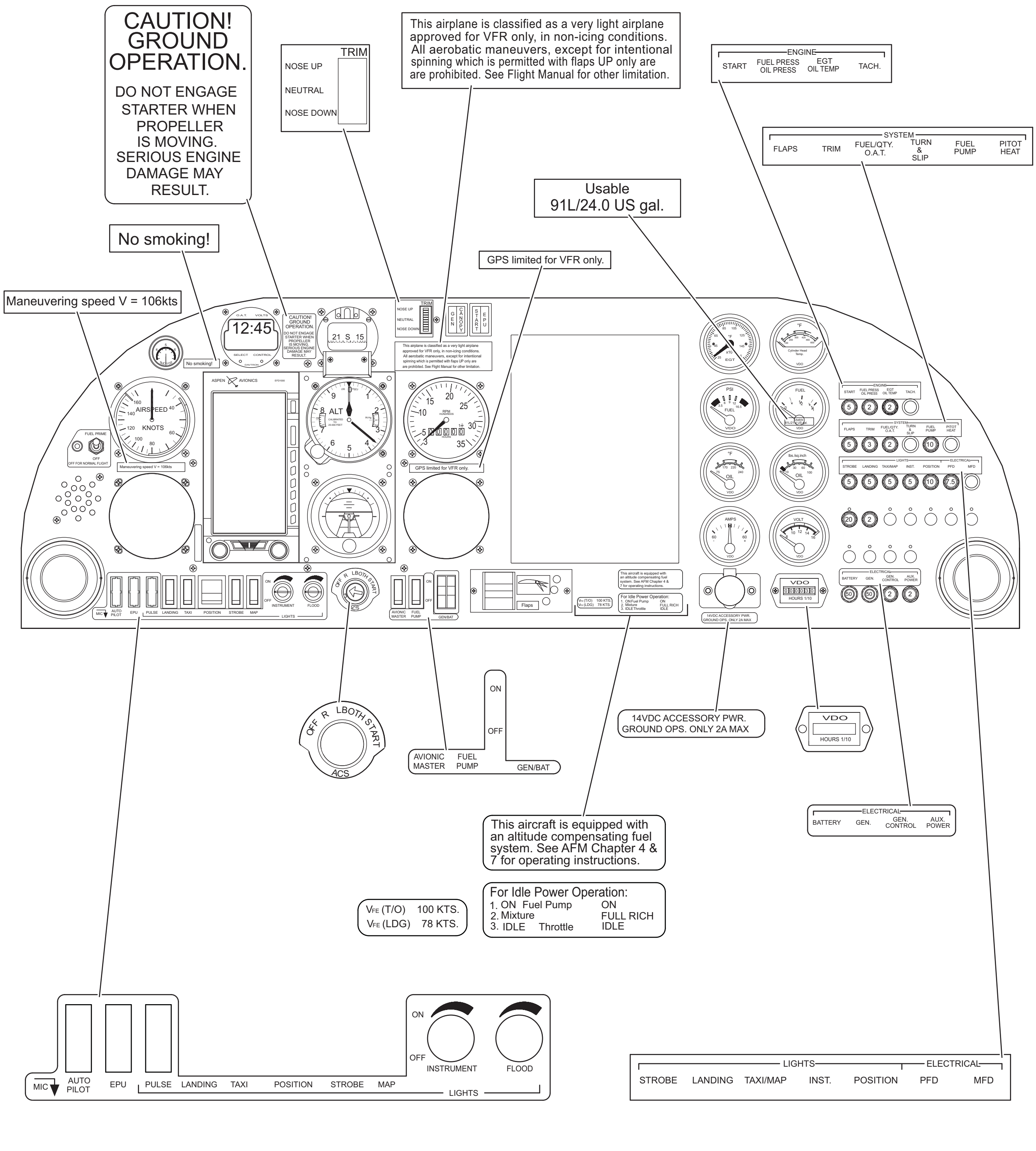


Figure 6 - Placards on the Instrument Panel with Aspen EFD1000 Display

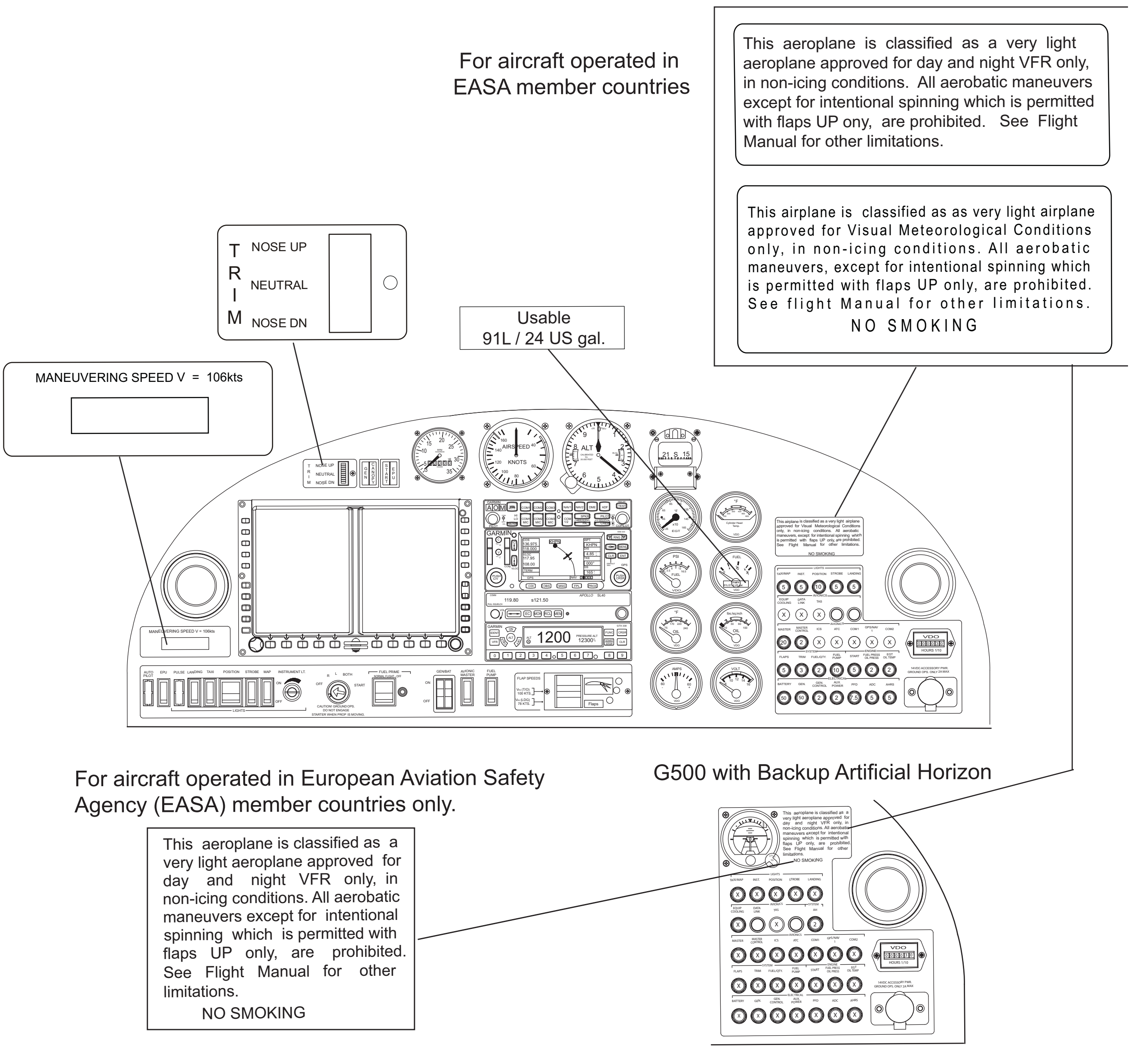


Figure 7 - Placards on the Instrument Panel with Garmin G500 Display (Sheet 1 of 2)

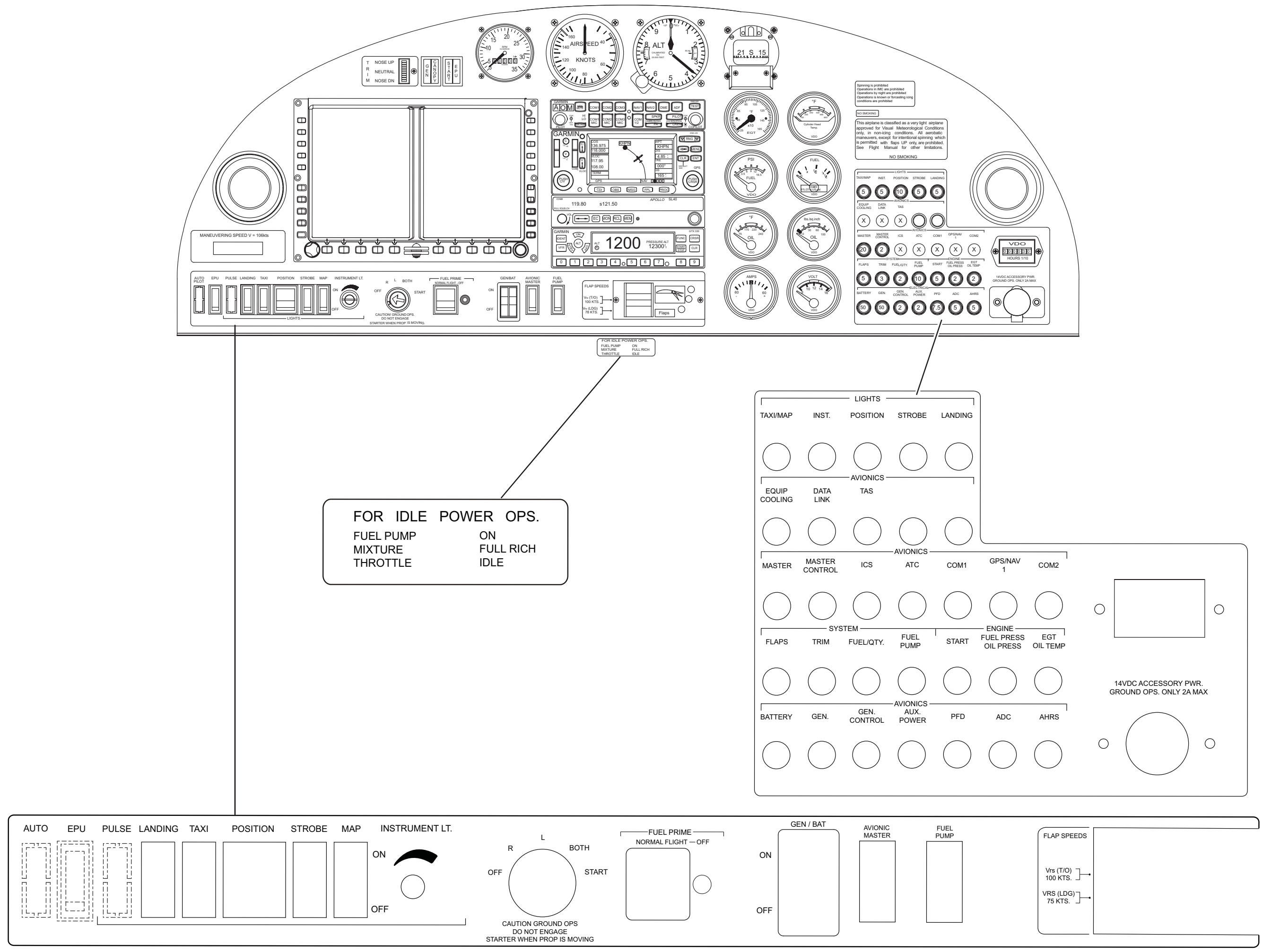


Figure 7 - Placards on the Instrument Panel with Garmin G500 Display (Sheet 2 of 2)

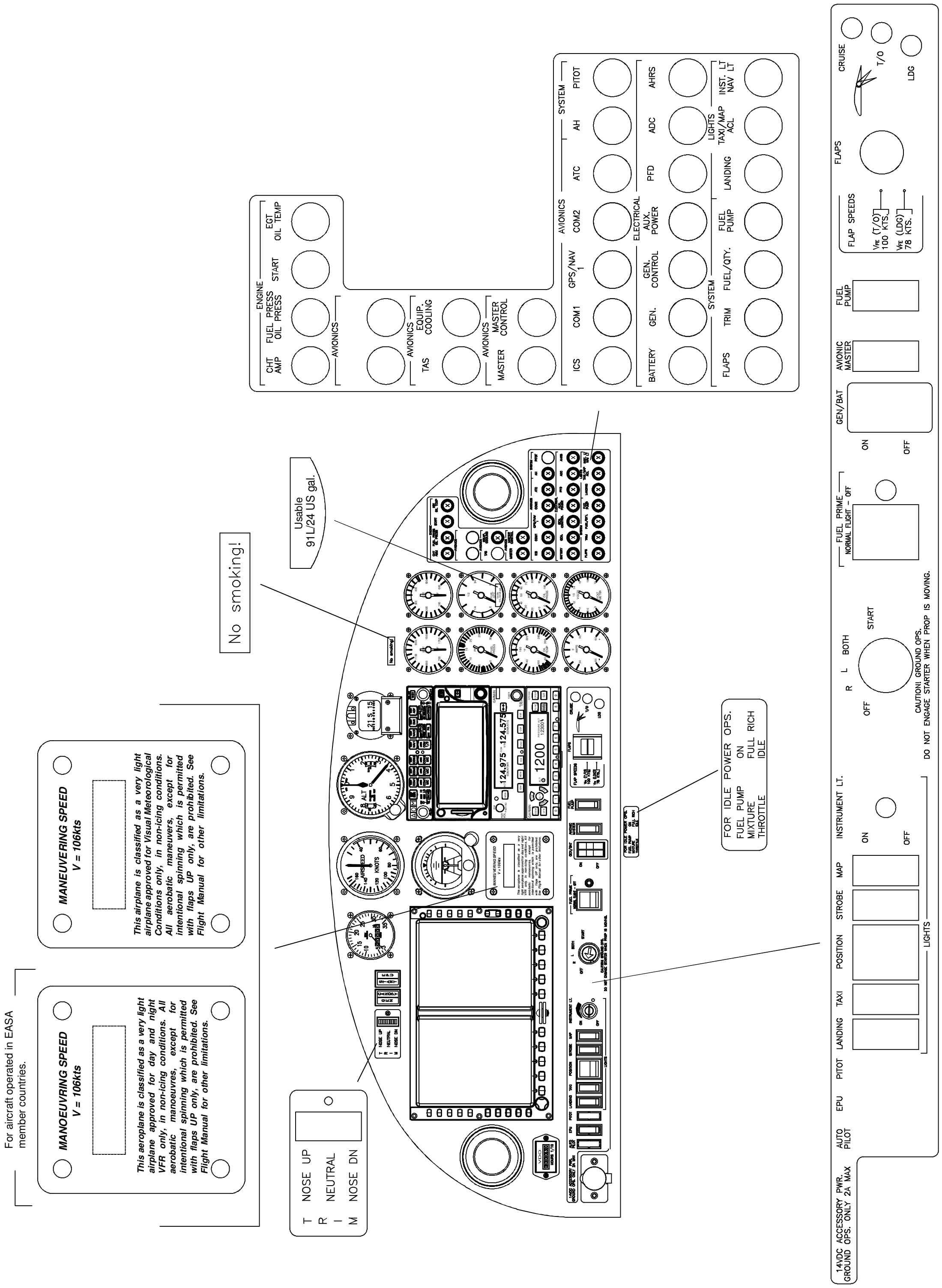


Figure 8 - **Placards on the Instrument Panel with Garmin G500 Display, UMA engine instruments and Garmin GTN650/GTR225 installed.**

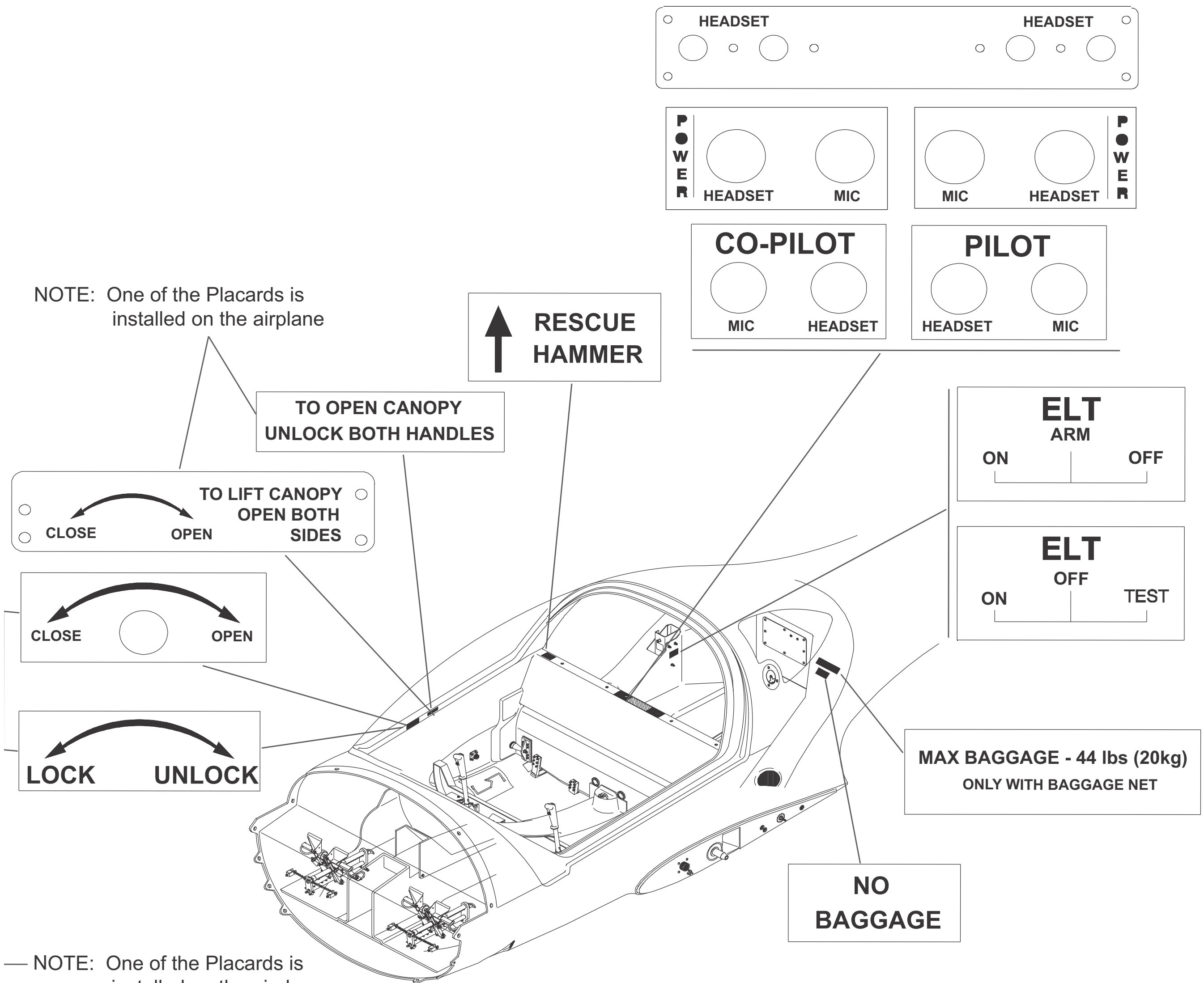


Figure 9- General Interior Placards and Markings (Sheet 1 of 3)

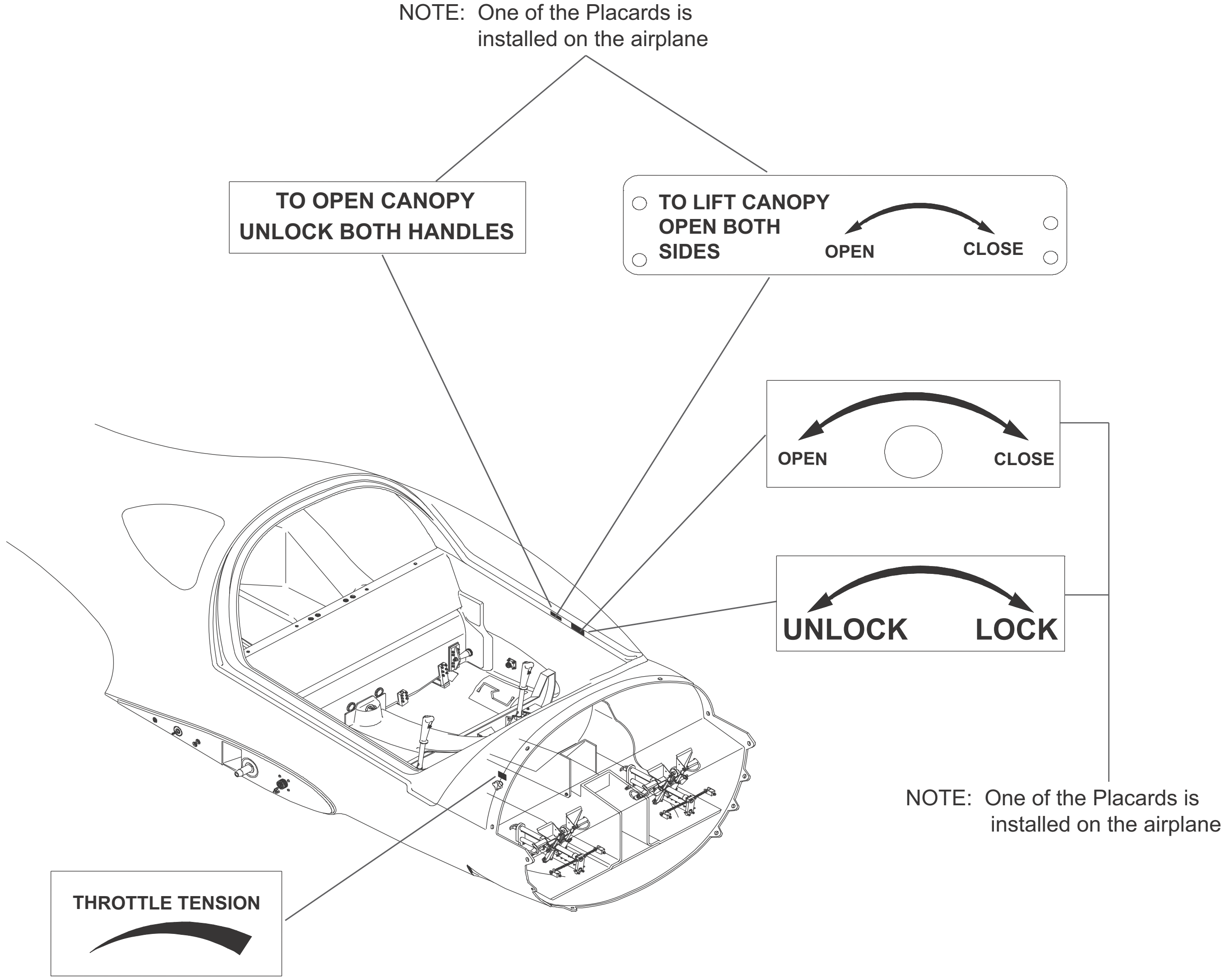


Figure 9- General Interior Placards and Markings (Sheet 2 of 3)

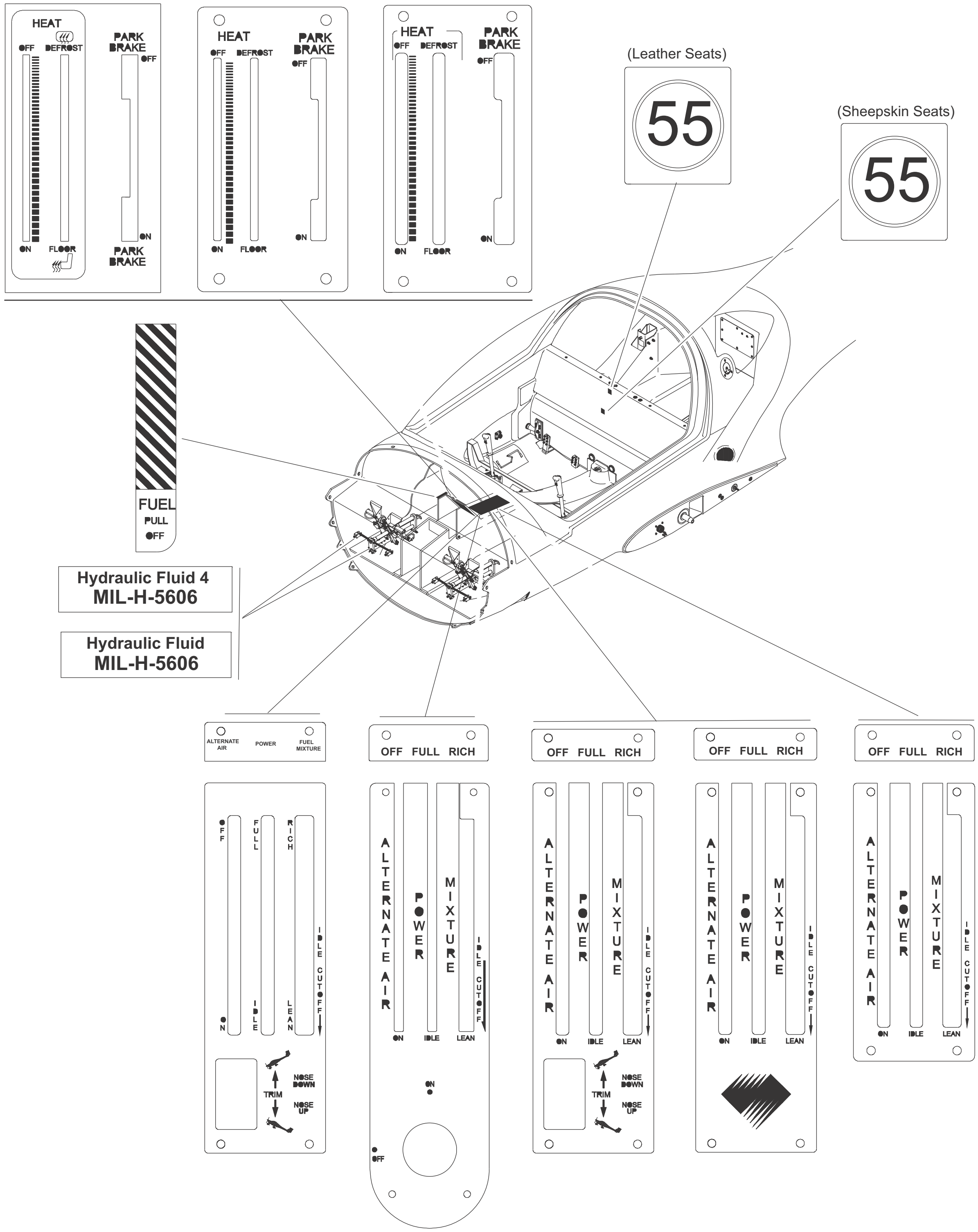


Figure 9- General Interior Placards and Markings (Sheet 3 of 3)

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CHAPTER 12-00
SERVICING

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SERVICING

1. General

This Chapter gives the following servicing tasks that apply to the whole aircraft:

- Section 12-10. Replenishing procedures for fluid systems
- Section 12-20. Lubrication data
- Section 12-30. Cleaning and snow and ice removal.

The procedures for the preventive and corrective maintenance of systems are given in the related Chapter of this manual. Refer to Chapter 05 for time limits and schedule maintenance.

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REPLENISHING

1. General

Use the procedures in this Section to replenish the fluid systems on the airplane. Figure 1 shows the location of the servicing points.

2. Fuel System

A tank in the fuselage holds the fuel for the DA20-C1 aircraft. The tank can hold 24.5 US gal (93 liters) of fuel. A fuel tank with a capacity of 20 US gal (76 liters) may be installed in place of the standard tank as an option. The tank is located below the baggage compartment floor.

The tank filler-neck is located on the left side of the fuselage about 18 in (45 cm) aft of the canopy. It is about 18 in (45 cm) above the left wing root. The fuel tank drain is located below the tank. The drain pipe comes through the fuselage bottom skin.

A. Refueling

WARNING: DO NOT ALLOW FIRE OR HEAT NEAR FUEL. FUEL BURNS VIOLENTLY AND CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE AIRCRAFT.

WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

WARNING: GROUND THE AIRCRAFT AND THE FUEL SUPPLY VEHICLE BEFORE REFUELING. IF YOU DO NOT GROUND THE AIRPLANE, STATIC ELECTRICITY CAN CAUSE FIRE DURING REFUELING.

WARNING: MAKE SURE THAT A FIRE EXTINGUISHER IS AVAILABLE.

WARNING: TURN OFF ALL GROUND EQUIPMENT IN THE REFUELING AREA.

WARNING: DO NOT OPERATE ELECTRICAL SWITCHES IN THE AIRCRAFT.

CAUTION: USE ONLY FUEL TYPES GIVEN IN CHAPTER 2 OF THE AIRPLANE FLIGHT MANUAL.

	Detail Steps/Work Items	Key Items/References
1.	Turn the engine off.	
2.	Ground the aircraft.	At the refueling ground connection.
3.	Ground the refueling vehicle.	
4.	Remove the fuel filler cap.	
5.	Refuel the aircraft.	

	Detail Steps/Work Items	Key Items/References
6.	Replace the fuel filler cap.	Make sure that the fuel filler cap is locked.
7.	Remove the ground cable from the aircraft.	At the refueling ground connection.
8.	Remove the ground cable from the refueling vehicle.	

B. Defueling

WARNING: DO NOT ALLOW FIRE OR HEAT NEAR FUEL. FUEL BURNS VIOLENTLY AND CAN CAUSE INJURY TO PERSONS AND DAMAGE TO THE AIRCRAFT.

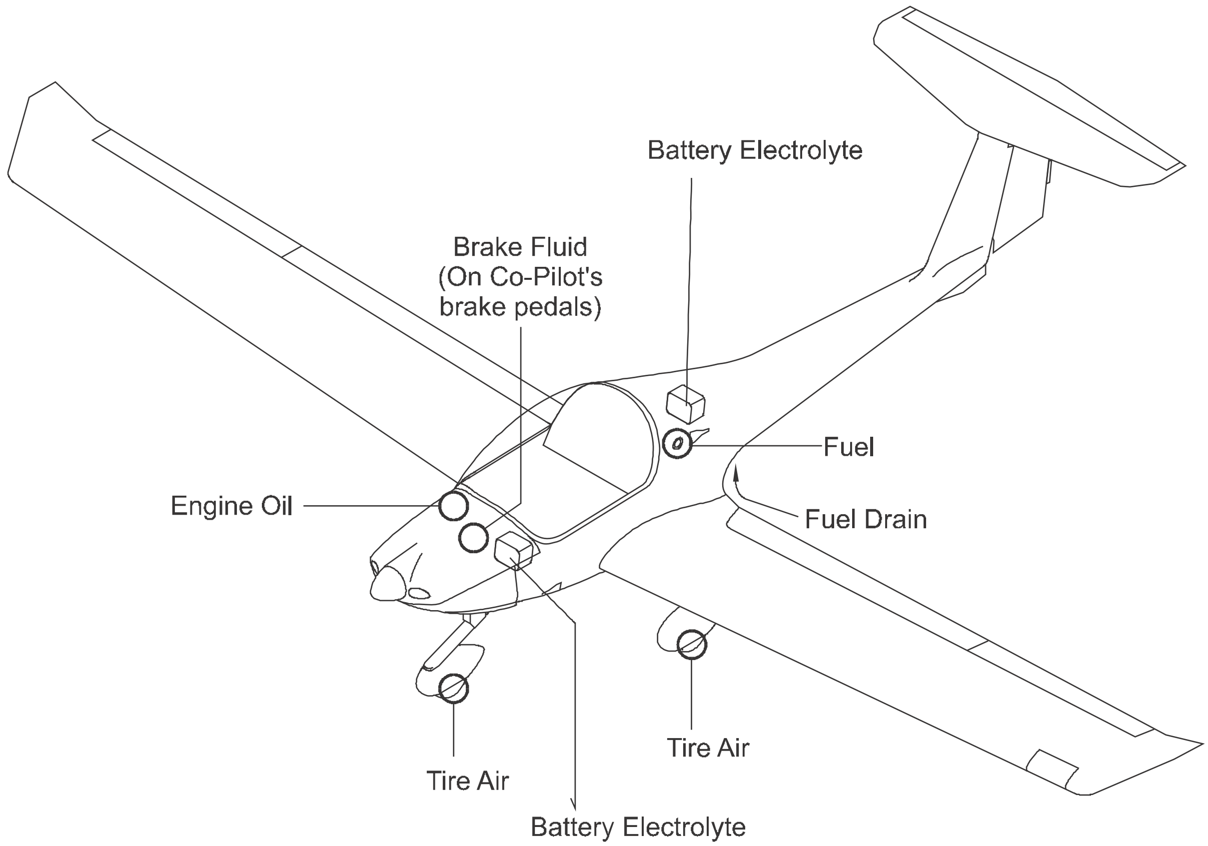
WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

WARNING: MAKE SURE THAT A FIRE EXTINGUISHER IS AVAILABLE.

WARNING: TURN OFF ALL GROUND EQUIPMENT IN THE DEFUELING AREA.

WARNING: DO NOT OPERATE ELECTRICAL SWITCHES IN THE AIRCRAFT.

	Detail Steps/Work Items	Key Items/References
1.	Ground the aircraft.	At the refueling ground connection.
2.	Place a container below the drain valve.	Make sure you have enough containers to hold the fuel.
3.	Open the drain valve.	Push the drain pipe up.
4.	When the fuel stops draining, close the drain valve.	Let the drain pipe move down.
5.	Remove the ground cable from the aircraft.	At the refueling ground connection.



As an option the battery may be located at the firewall.

Figure 1 - Replenishing Points

3. Engine Oil System

CAUTION: ENGINE OPERATION WITH NO OIL (OR VERY LOW OIL LEVEL) WILL CAUSE ENGINE MALFUNCTION OR FAILURE.

The engine installed in the DA20-C1 aircraft has a wet-sump oil system. The oil sump can hold 6 US quarts (5.68 liters). See Table 1 for approved oils and Figure 2 for selection of viscosity according to the various climatic conditions.

The oil filler point is located aft of the rear right cylinder. A panel in the top cowling gives access to the filler (Figure 1). The oil filler cap has a dip-stick attached.

Some oil consumption is normal. Measure the oil contents before each flight (or engine ground run-up). If necessary, fill the sump to the correct level.

A. Replenish the Engine Oil System

	Detail Steps/Work Items	Key Items/References
1.	Open the access panel in the top cowling.	
2.	Release the oil filler cap.	
3.	Measure the oil contents. - Clean the oil dip stick - Install the filler cap - Remove the filler cap again - Read the oil contents from the dip stick.	
CAUTION: USE ONLY THE CORRECT ENGINE OIL. REFER TO THE TELEDYNE CONTINENTAL SERVICE INFORMATION LETTER SIL99-2B REVISION B OR THE APPLICABLE REVISION FOR THE CORRECT ENGINE OIL SPECIFICATIONS. IF YOU DO NOT USE THE CORRECT ENGINE OIL, THE ENGINE CAN BE DAMAGED.		
4.	If necessary, fill the oil system to the correct level.	
5.	Install the filler cap.	
6.	Close the access panel in the cowling.	

Table 1 - Engine Oil

All seasonal weight:	
All temperatures	SAE 5W-50
Below 40 ºF (4.5 ºC) Ambient air, sea level	SAE 30 or Multi Viscosity
Above 40 ºF (4.5 ºC) Ambient air, sea level	SAE 50 or Multi Viscosity

The viscosity should be selected according to the various climatic conditions as shown in Figure 1.

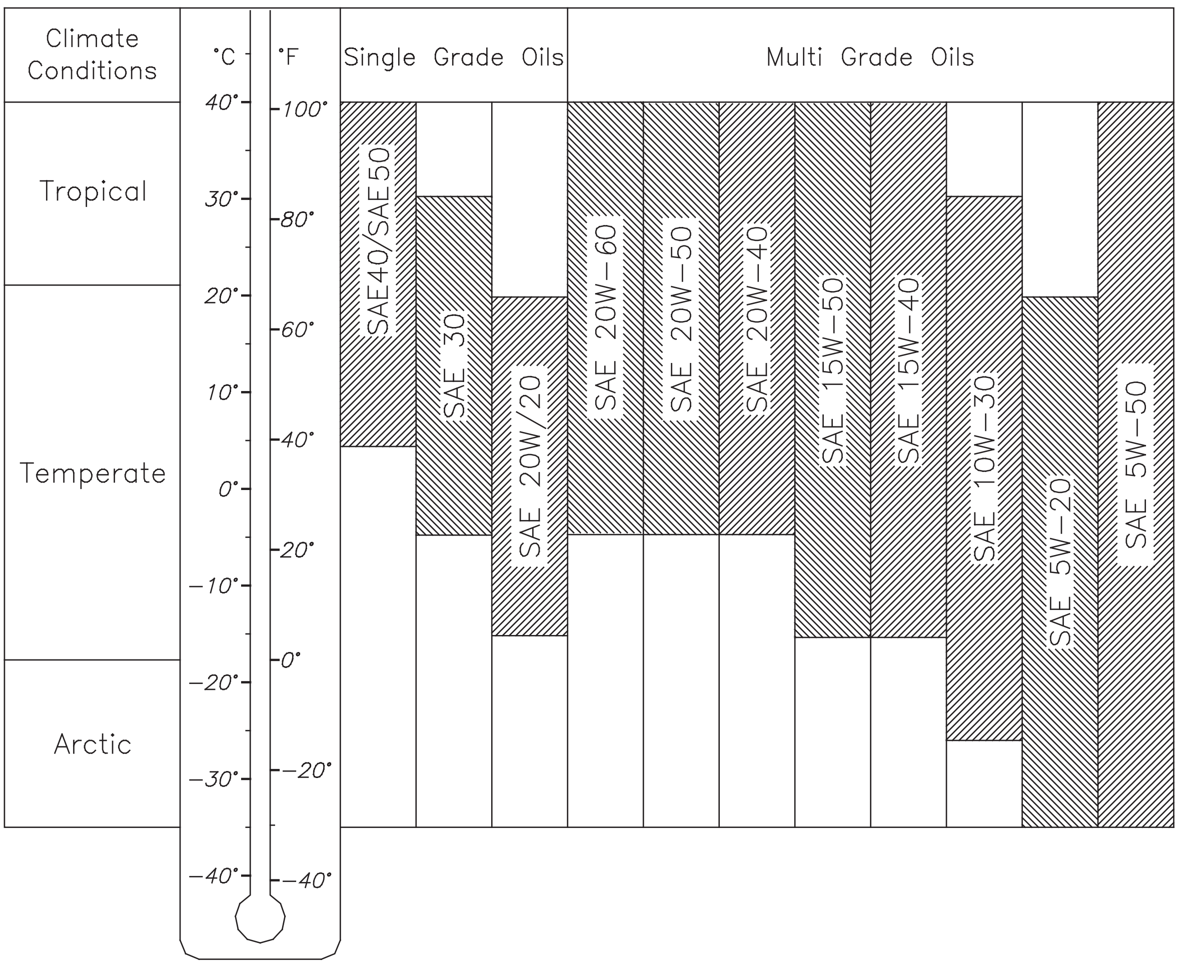


Figure 2 - Selection of Viscosity

4. Brake System

The brake fluid reservoirs are located on the brake master cylinders on the co-pilots side. You get access in the cockpit below the instrument panel.

WARNING: DO NOT GET BRAKE FLUID ON YOUR SKIN OR IN YOUR MOUTH. BRAKE FLUID CAN CAUSE DISEASE.

CAUTION: REMOVE SPILLED BRAKE FLUID IMMEDIATELY. BRAKE FLUID CAN CAUSE DAMAGE TO PAINT AND OTHER MATERIALS.

A. Fill the Brake System Reservoirs

	Detail Steps/Work Items	Key Items/References
1.	Clean the top of the brake fluid reservoir and filler cap.	
2.	Remove the filler cap.	
3.	Fill the reservoir to the correct level.	Use only Aeroshell Fluid 41 (MIL-H-5606H) hydraulic fluid. 0.5 to 1 in (12 to 25 mm) below the top of the filler hole.
4.	Install the filler cap.	

5. Tires

The DA20-C1 has the following tires:

- Main tire: 5.00 x 5 - pressure 33 psi (2.3 bar)
- Nose tire: 5.00 x 4 - pressure 26 psi (1.8 bar).

A. Examine the Tires and Measure the Pressure

	Detail Steps/Work Items	Key Items/References
1.	Examine the tires. Look specially for: - Cuts and friction damage - Correct alignment of the red slip marks.	Move the aircraft as necessary so that each part of each tire can be seen. Reference Chapter 32-10. If the slip marks do not align, remove the wheel for shop maintenance.
2.	Measure the tire pressure. If necessary, inflate the tires to the correct pressure.	Main tire: 33 psi (2.3 bar). Nose tire: 26 psi (1.8 bar).

SCHEDULED SERVICING

1. General

This chapter gives the lubrication data. It describes where components are located and gives a list of approved lubricants. It also gives the components which MUST NOT be lubricated.

Most systems and components have maintenance-free bearings. These can be sealed ball/roller bearings or Teflon bushings. These bearings MUST NOT be lubricated.

Table 1 shows the items which MUST NOT be lubricated.

Table 1 - Items that MUST NOT be Lubricated	
Rudder pedal sled	DO NOT LUBRICATE
Flap rod-end bearings	DO NOT LUBRICATE
Aileron rod-end bearings	DO NOT LUBRICATE
Elevator rod-end bearings	DO NOT LUBRICATE
Nose wheel bearings (1)	DO NOT LUBRICATE
Throttle control cable (2)	DO NOT LUBRICATE
Elastomeric spring (3)	DO NOT LUBRICATE

Notes:

(1) The nose wheel bearings are sealed and maintenance-free.

(2) The throttle control cable is sealed and maintenance free.

(3) The elastomeric spring is maintenance free.

2. Lubrication Schedule

Table 2 shows the lubrication schedule. Clean each lubrication point before lubrication. See Figure 1 (Sheets 1 and 2) for the location of the lubrication points listed on the left side of the table. Refer to Table 3 for the type of lubricant that is required for each item.

The right column shows the lubrication interval.

Table 2 - Lubrication Schedule

	Location	Type of Lubricant (See Table 3)						Interval
No.	**See Figure 1 and 2**	**1**	**2**	**3**	**4**	**5**	**6**	**(Hours) see Notes (1), (2)**
(NS)	Parking brake, cabin heat, defrost, and alternate air control cables		•					200
1.	Brake pedal pivot (see Note 4)		•					100
2.	Rudder cable S-tubes			•				200
3.	Flap actuator universal pivot block	•						1000
4.	Stick support pivot pins	•						1000
5.	Flap actuator extension rod			•				200
6.	Upper rudder pivot bearing	•						200
7.	Main wheel bearings (see Notes 3 and 7)	•						200
8.	Brake caliper locating pins						•	1000
9.	Nose landing gear fork pivot (see Note 4)	•						100
10.	Nose landing gear transverse tube interior (see Note 4)					•		1000
11.	Upper nose landing gear journal bearing (left and right) (see Note 4)	•						1000
12.	Elastomeric spring top mounting spherical bush	•						1000
13.	Brake pedal pivot shaft interior					•		1000
14.	Mixture control cable		•					200
15.	Horizontal stabilizer front mounting spherical bush	•						1000
16.	Battery terminals				•			1000

Table 2 - Lubrication Schedule								
	Location	**Type of Lubricant (See Table 3)**						**Interval**
No.	**See Figure 1 and 2**	**1**	**2**	**3**	**4**	**5**	**6**	**(Hours) see Notes (1), (2)**
17.	Cable eyes on rudder	•						200
NS	Rudder hinge bushing			•				200
18.	Flap, Aileron, Elevator hinge bearings (Oil Lite) (see Note 5)		•					200
18A	Flap horn bearing	•						200
19.	B-bolt spherical bearing	•						1000
20.	B-bolt below spherical bearing (not threaded) (see Note 6)	•						1000
21.	B-bolt shank and mid-bar end fitting					•		1000
22.	A-bolt spherical bearing	•						1000
23.	A-bolt	•						1000
24.	Wing bolts (wing attachment)	•						1000
25.	Main bolts locking device		•					200
26.	Nose landing gear strut axle stud end					•		100

Notes:

(NS) Item is not shown in the Figures

(1) Lubricate at the time shown or at every disassembly/assembly.

(2) Lubricate more frequently in severe climates or operating conditions.

(3) Lubricate the main wheel bearing felt seals with wheel bearing grease.

(4) Lubricate at the time shown and at annual service.

(5) The flap, aileron and elevator hinge bearings may also be lubricated with engine oil.

(6) Do not grease on the threads. It will reduce the friction of the lock-nut

(7) Do not mix aviation wheel bearing grease with each other. If using other approved grease, complete removal of contained grease and bearing cleaning is required. Replacement of previously lubricated felt grease seals is also required.

Table 3 - Lubricant Specifications		
Specification	Product	Manufacturer
TYPE 1		
MIL-G-81322	AeroShell Grease 22	Shell Canada Products Limited P O Box 100 Station M Calgary, Alberta, T2P 2H5 Canada Shell Oil Co P O Box 2463, One Shell Plaza Houston, TX 77001, USA
Preferred for MLG wheel bearings. Not compatible with MIL-G-81322 (For main wheel bearings and felt seals lubrication only)	Mobil Aviation Grease SHC 100	Exxon Mobil Corporation 3225 Gallows Road Fairfax, VA 22037-0001, USA
TYPE 2		
MIL-L-7870	Royco 363	Royal Lubricants Co Inc. River Road East Hanover, NJ 07936, USA
	Brayco 363	Bray Oil Company 3344 Medford St Los Angeles, CA 90032, USA
Warm climates only	LPS 2	LPS (Canada) 378 Hersey Crescent Bolton, ON, L7E 4A1, Canada 1-800-241-8334 LPS (Corporate Office) 4647 Hugh Howell Rd Tucker, GA 30084, USA 1-800-543-1563
TYPE 3		
Greaseless Lubricant	LPS 1	LPS (Canada) 378 Hersey Crescent Bolton, ON L7E 4A1, Canada 1-800-241-8334 LPS (Corporate Office) 4647 Hugh Howell Rd Tucker, GA 30084, USA 1-800-543-1563

Table 3 - Lubricant Specifications		
TYPE 4		
VV-P-236 (petrolatum)	Royco 1	Royal Lubricants Co Inc. River Road East Hanover, NJ 07936, USA
	DC 4	Dow Corning S Saginaw Rd Midland, MI 48641, USA
TYPE 5		
MIL-C-16173 (grade 2)	LPS 3	LPS (Canada) 378 Hersey Crescent Bolton, ON L7E 4A1, Canada 1-800-241-8334 LPS (Corporate Office) 4647 Hugh Howell Rd Tucker, GA 30084, USA 1-800-543-1563
MIL-C-16173 (grade 4)	CRC SP-400	CRC Industries Inc. 885 Louis Drive Warminster, PA 18974 USA 1-800-272-4620
TYPE 6		
MIL-A-907	Loctite Antisieze 767	Loctite Canada Inc 270 Britannia Rd East Missisauga, ON L4Z 1S6, Canada (416) 890-6511 Loctite Corp (Industrial Group) 705 North Mountain Rd Newington, CT 06111, USA (203) 278-1280

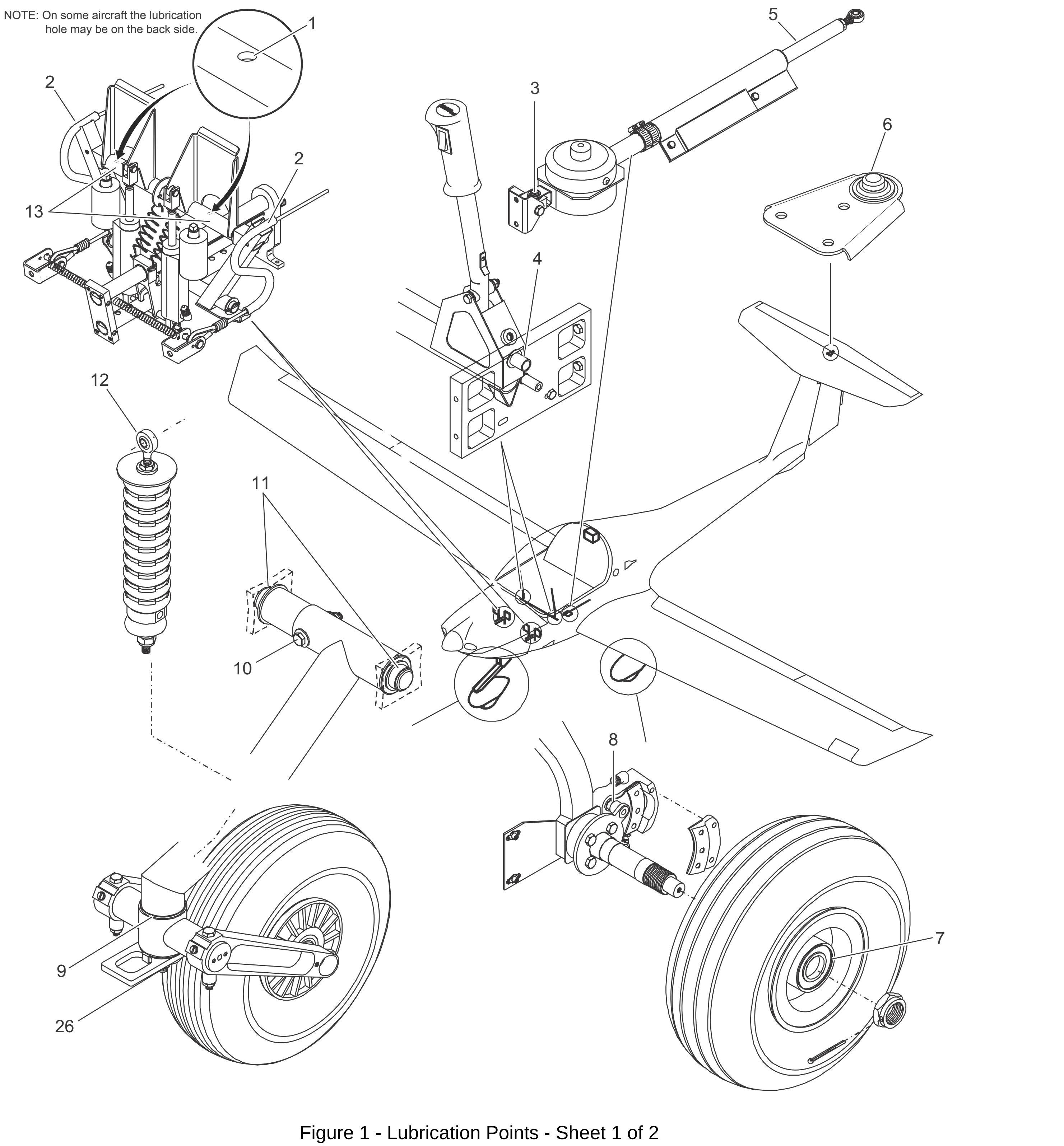


Figure 1 - Lubrication Points - Sheet 1 of 2

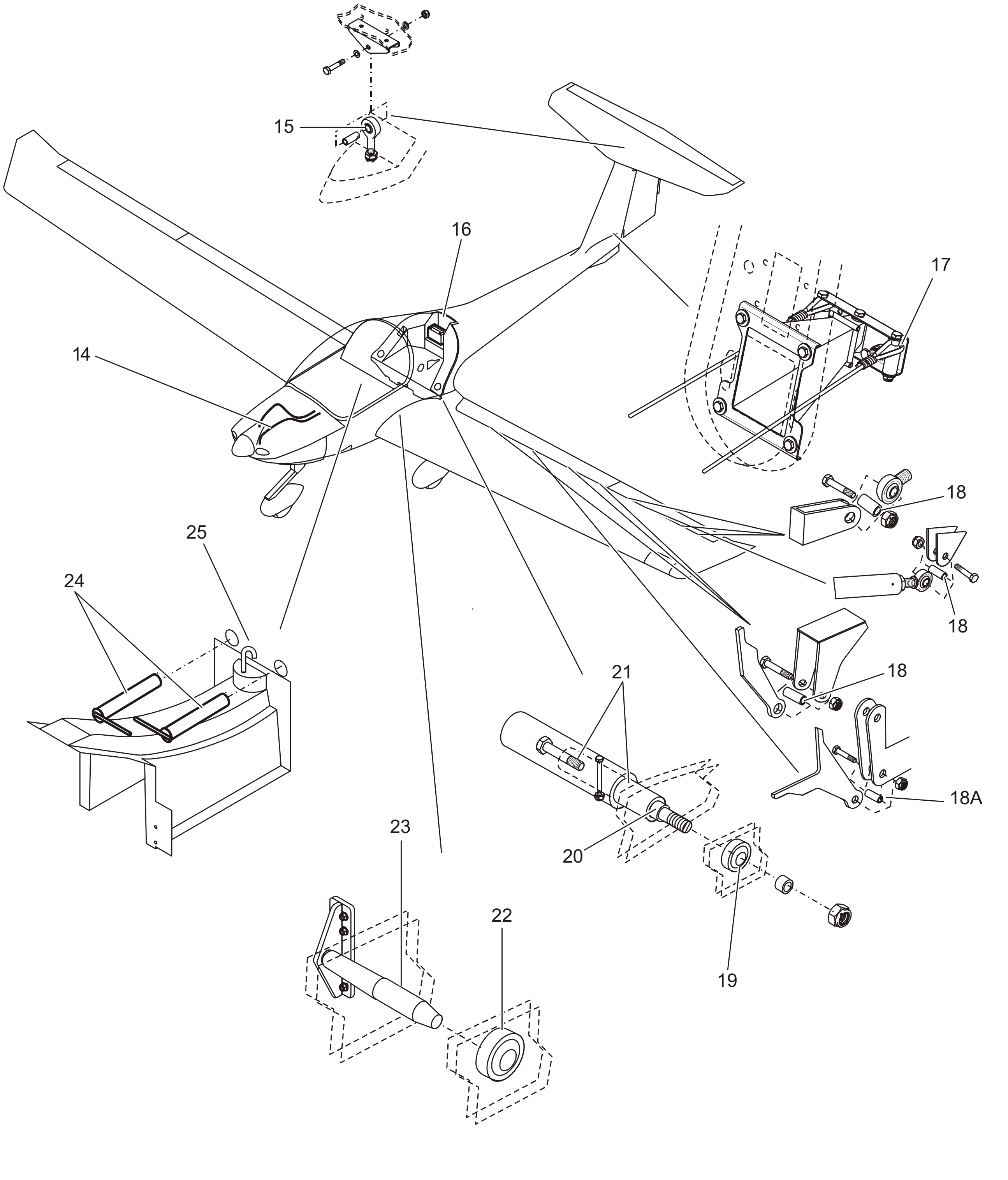


Figure 1 - Lubrication Points - Sheet 2 of 2

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UNSCHEDULED SERVICING

1. General

This chapter describes how to clean the aircraft and how to remove snow and ice from the aircraft.

2. Exterior Cleaning

The outer surfaces of the DA20-C1 aircraft must be kept clean to keep the good performance characteristics of the aircraft. The leading edges of the wings are specially important.

Protect all control surface bearings and other lubricated components before cleaning the aircraft.

Use large quantities of water to clean the aircraft. If necessary, add a mild-cleaning agent to the water. Remove excess dirt or dead insects immediately after flight. Dried-on dirt is difficult to remove.

CAUTION: DO NOT USE CLEANING OR POLISHING AGENTS WHICH CONTAIN SILICONE. IF THE AIRCRAFT NEEDS REPAIR, SILICONE CAN PREVENT REPAIR MATERIALS FROM BONDING CORRECTLY.

Approximately once a year, apply a silicone-free automotive polish to the outer surface.

3. Canopy Cleaning

CAUTION: DO NOT RUB THE CANOPY WHILE IT IS DRY. DO NOT USE DIRTY CLOTHS OR SPONGES. THE PLEXIGLASS CANOPY SCRATCHES VERY EASILY WITH EVEN THE SMALLEST PARTICLES OF DUST.

Clean the canopy with large quantities of water. Use clean sponges and a good chamois leather which is not used for any other purpose.

Polish dull or scratched areas using a special Plexiglas cleaner. Remove scratches with special polishing emery cloth (e.g. Micromesh)

4. Interior Cleaning

Clean the interior with a flameproof vacuum cleaner.

5. Engine Cleaning

Use a cold cleaning agent to clean the engine.

CAUTION: DO NOT LET THE CLEANING AGENT GET INTO ELECTRICAL COMPONENTS AND ENGINE INTAKES.

CAUTION: DO NOT LET THE CLEANING AGENT CONTAMINATE THE VACUUM PUMP AND COMPONENTS. YOU MAY DAMAGE THE VACUUM PUMP.

CAUTION: DO NOT START THE ENGINE UNTIL ALL OF THE CLEANING AGENT HAS EVAPORATED.

Protect all electrical components and engine intakes with polythene bags or other means. Obey the cleaning agent manufacturers instructions. Protect the vacuum pump and it's main components from contamination. Make sure that the vacuum pump fittings are not loose. Refer to the manufacturers Maintenance Instruction Manual for more data.

6. Ice and Snow Removal

CAUTION: DO NOT USE SHARP OBJECTS TO REMOVE SNOW OR ICE. YOU CAN DAMAGE THE AIRCRAFT STRUCTURE.

Remove snow and ice as soon as possible to prevent melted water from freezing later and causing damage.

Use soft brushes to remove snow from the surfaces. If possible put the aircraft in a heated hangar to remove ice.

CAUTION: NEITHER OF THESE PRODUCTS PROVIDES "HOLDOVER TIME". HOLDOVER TIME IS THE ESTIMATED AMOUNT OF TIME A FLUID WILL PREVENT ICE AND SNOW FROM REFORMING ON SURFACES UNDER FREEZING PRECIPITATION CONDITIONS.

Commercially available Ethylene Glycol or Propylene Glycol aircraft de-ice solutions prepared and applied according to the product manufacturer instructions may be used to aid in the removal of ice. Collect and dispose of fluid in accordance with applicable laws and regulations.

CHAPTER 20-00
STANDARD PRACTICES
AIRFRAME

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STANDARD PRACTICES - AIRFRAME

1. General

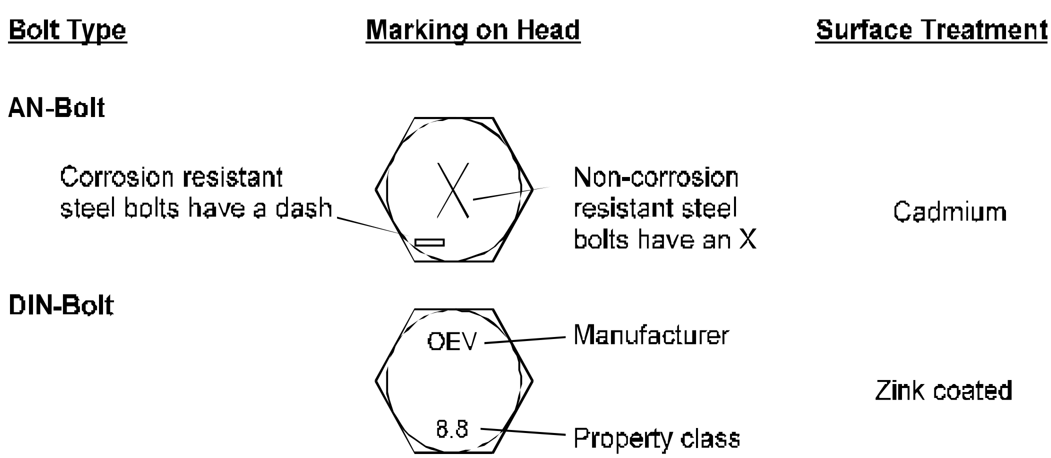
There are no maintenance practices that apply to the DA20-C1 airframe and its systems in general. This chapter only has data about standard threaded fasteners.

Always tighten the nut or bolt to the torque shown in the tables below. Always use the correct locking device with the nut or bolt.

CAUTION: DISCARD SELF-LOCKING NUTS AFTER REMOVAL. THE FRICTION TORQUE REDUCES WITH USE.

2. Bolt and Nut Types Used in the Aircraft

The DA20-C1 uses 2 types of standard bolt: AN3 through AN20 and DIN 985 specifications. You can identify the bolt type by the marking on the head and the surface treatment.



The DA20-C1 aircraft uses the following types of standard nut:

- AN364
- AN365
- MS21042
- MS21044.

3. Standard Torque Values

These tables show the maximum permissible torque values for bolts and nuts to AN and DIN specifications.

A. AN Fine Thread Series

Bolt Size	Torque (lbf-ft)	Torque (Nm)
10 - 32	1.2	1.7
1/4 - 28	4.6	6.5
5/16 - 24	10.0	13.3
3/8 - 24	15.3	20.5
7/16 - 20	27.8	37.3
1/2 - 20	40.0	54.0
9/16 - 18	66.7	90.0
5/8 - 18	91.7	123.0

B. AN Coarse Thread Series

Bolt Size	Torque (lbf-ft)	Torque (Nm)
10 - 24	1.2	1.7
1/4 - 20	4.2	5.6
5/16 - 18	7.5	10.1
3/8 - 16	15.4	20.8
7/16 - 14	21.3	28.6
1/2 - 13	40.0	54.2
9/16 - 12	58.3	78.7
5/8 - 11	75.0	101.2

C. DIN Specifications

Metric Thread	Torque (lbf-ft)	Torque (Nm)
M4	1.3	1.8
M5	2.7	3.6
M6	4.7	6.4
M8	11.8	16.0
M10	23.6	32.0
M12	44.4	60.0

Use the above torque values for all bolts/nuts/screws which meet the specifications unless they are in the list of special torque values below.

4. Special Torque Values

Part	Torque (lbf-ft)	Torque (Nm)
Propeller to extension bolts 7/16 in (Sensenich)	See Sensenich W69EK7 Manual Doc # W69EK7-CF Rev F or later	
Propeller to extension bolts 3/8 in (Sensenich)	14.6 - 18.75	19.8 - 25.5
Propeller extension to engine flange bolts 1/2 in	56.75 - 59.7	77 - 81
Spark plugs	25 - 30	34 - 40.8
Bolts attaching the engine mount to the firewall	25 - 25.8	34 - 35
Bolts attaching the engine to the isolators	15 - 15.8	20.4 - 21.5
Main landing gear bolt, inner	0.16 ±0.02 in	Height of spring washers 4 ± 0.5 mm
Main landing gear bolts, outer	14.75	20.0
Brake back-plate bolts	6.25 - 6.7	8.5 - 9

Part	Torque (lbf-ft)	Torque (Nm)
Brake flexible hoses	3.3 - 5	4.5 - 6.8
B-Bolt nut in root rib	14.8	20.0
Safety belt attachment in center console	Loose fit, NO torque	
M10 bolt attaching generator to bottom mounting bracket	26.3	35.0
M8 bolts attaching generator to top mounting bracket and to engine	16.5	22.0
Engine	See Continental IO-240-B maintenance manual	
Exhaust clamp bolts	20 - 25 lbf-in or 0.12" minimum distance between ears	2.3 - 2.8 or 3 mm minimum distance between ears
Exhaust pipe to cylinder head nuts	16.7 - 17.5	22.6 - 23.7
Elevator Mass Balance Hardware NOTE: The bolts should be installed with Loctite 242.	4.2 - 5.8	5.6 - 7.9
Horizontal Stabilizer forward mount: upper and lower bracket attachment bolts (AN3) * Includes friction of self locking nut.	* 3.75 - 4.16	* 5.1 - 5.6

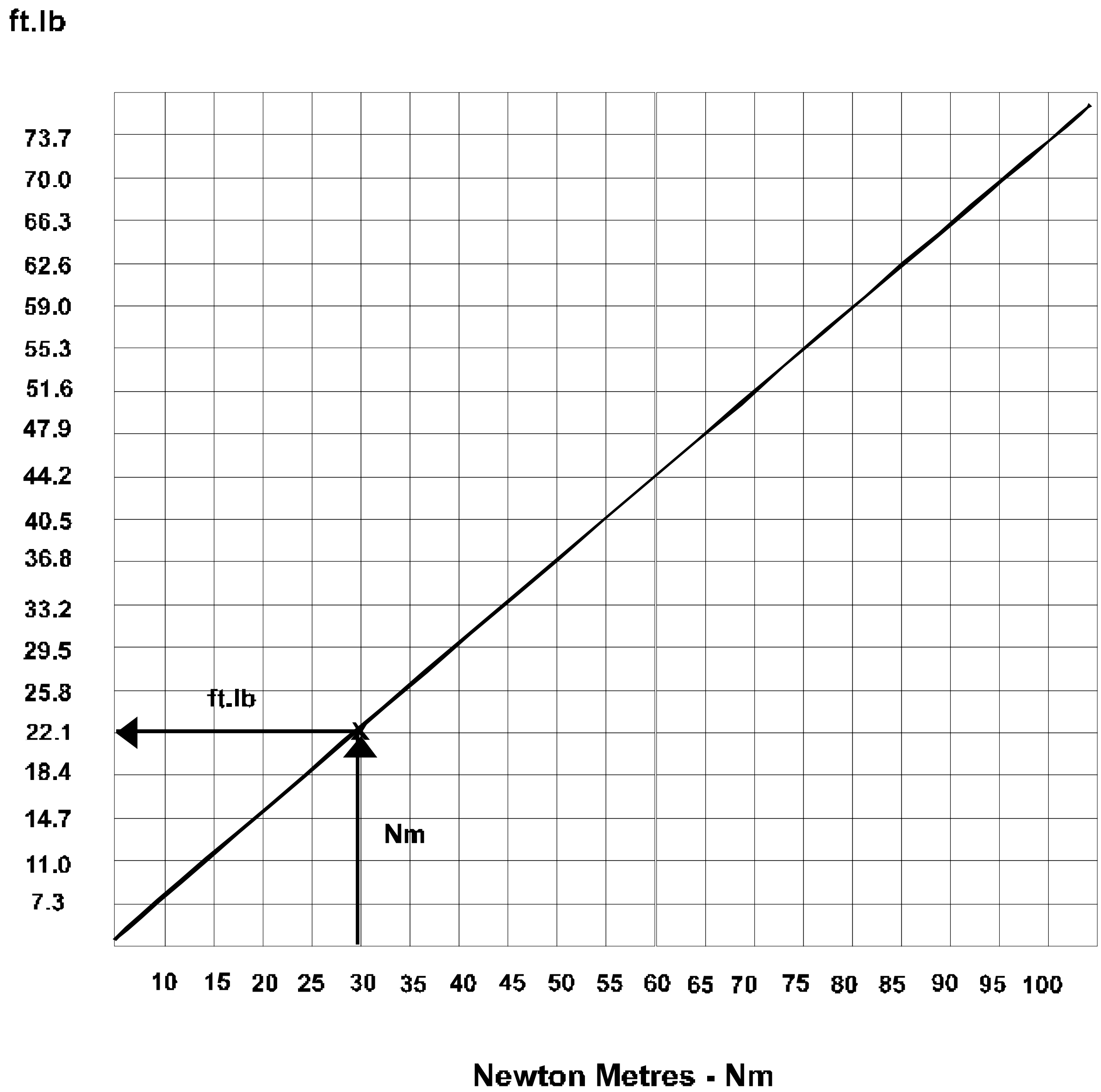
5. Torque Measurement

For self-locking nuts, add the torque value of the locking device (friction or brake torque) to the value in the table. Read the friction value from the torque wrench before the nut seats.

Where a bolt is tightened from the bolt-head, add the value of the shaft friction (the friction of the bolt in the attached part) to the value in the table. Read the fiction value from the torque wrench before the bolt seats.

6. Torque Conversion Graphs

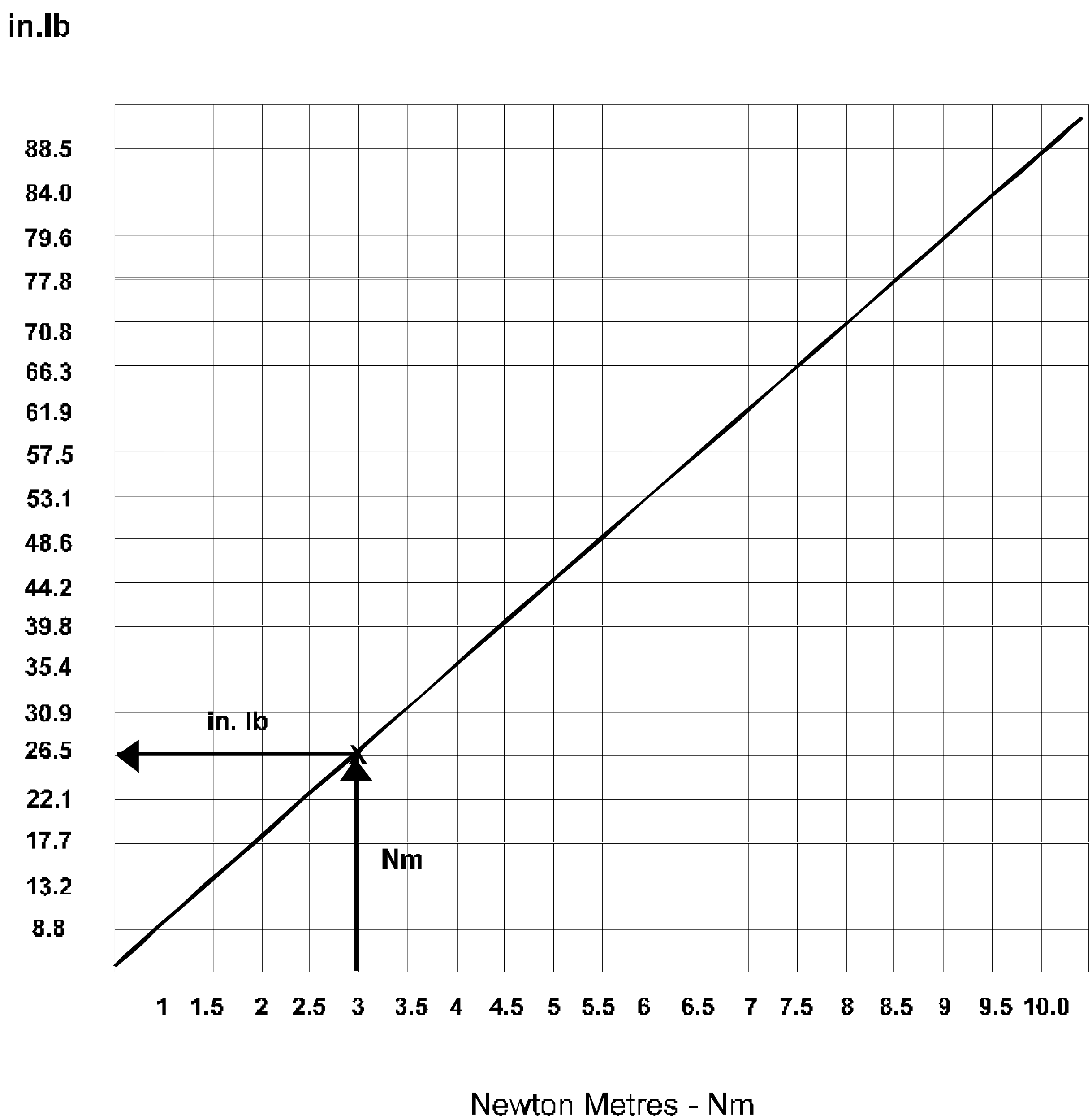
Use graph 1 for conversion of torque values (Nm - lbf-ft) and use graph 2 for conversion of (Nm - lbf-in).



To calculate the value in ft lbs follow your Nm value vertically until you reach the hatched axis line follow the line across horizontally and read of the value in ft.lb.

e.g: 30 Nm = 22.1 ft.lb

Graph 1 - Nm - ft.lb



To calculate the value in. lbs follow your Nm value vertically until you reach the hatched axis line follow the line across horizontally and read of the value in. lbs.

e.g: 3 Nm = 26.5 in. lb

Graph 2 - Nm - in.lb

CHAPTER 21-00
AIR CONDITIONING

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HEATING AND VENTILATION

1. General

The DA20-C1 aircraft has separate systems to supply hot air and cold air. The hot air system can supply air from ambient temperature to warm. The system supplies the footwells or the windscreen. The cold air system can supply ambient air to adjustable vents at each side of the instrument panel. Cold air also cools the avionic equipment in the instrument panel.

2. Description and Operation

Figure 1 shows the heating and ventilation system schematic diagram.

A. Cabin Heat System

The cabin heat system has the following components:

- An air intake at the front of the bottom cowling
- A heat-exchanger. A shroud around the exhaust muffler makes the heat exchanger. The shroud has an air inlet connection at the front on the right. It also has a warm air outlet connection at the back on the left
- A heat control valve. The heat control valve attaches to the front face of the firewall at the bottom. The cabin heat valve has two outlets. One outlet lets hot air flow into the engine compartment. The other outlet lets the hot air flow through the firewall into the distribution box
- A flap in the heat control valve controls the flow of warm air to the outlets. It closes one outlet as it opens the other outlet
- A distribution box. The distribution box attaches to the sides of the center console at the front. The distribution box has four outlets. Two outlets let hot air flow to the canopy windscreen and the other two outlets let hot air flow to the floor at each side of the center console
- A flap in the distribution box controls the flow of warm air to the outlets. It closes two of the outlets as it opens the other two outlets
- A CABIN HEAT control lever at the front of the center console. A bowden cable connects the lever to the flap of the heat control valve
- A DEFROST/FLOOR control lever at the front of the center console. A bowden cable connects the lever to the distribution control valve

Ambient air goes into the engine compartment through the intake at the front of the bottom cowling. A large flexible hose connects the intake to the front of the heat exchanger. The hot exhaust muffler makes the air hot. The air flows out of the heat-exchanger through a large flexible hose to the heat control valve.

The CABIN HEAT control lever moves the flap in the heat control valve. In the OFF position (fully forward) no hot air can flow into the cockpit. Move the lever aft (towards the ON position) to let gradually more hot air flow into the cabin.

The DEFROST/FLOOR control lever moves the flap in the distribution box. In the DEFROST position (fully forward) the hot air flows to the windscreen. Move the lever aft (towards the FLOOR position) to let the hot air flow to the floor.

B. Cold Air System

Ambient air enters the cockpit through a NACA duct on each side of the forward fuselage. Flexible hoses connect the ducts to ventilation nozzles on each side of the instrument panel. Each nozzle can adjust to point the airflow as necessary. Turning the nozzle flap controls the amount of air flowing into the cockpit.

C. Equipment Cooling

Ram air from the right NACA duct cools the equipment. Warm air escapes through holes in the instrument panel cover. Only the right hand fresh air vent receives ram air from the right NACA duct. Avionics equipment is cooled by a cooling fan mounted behind the instrument panel.

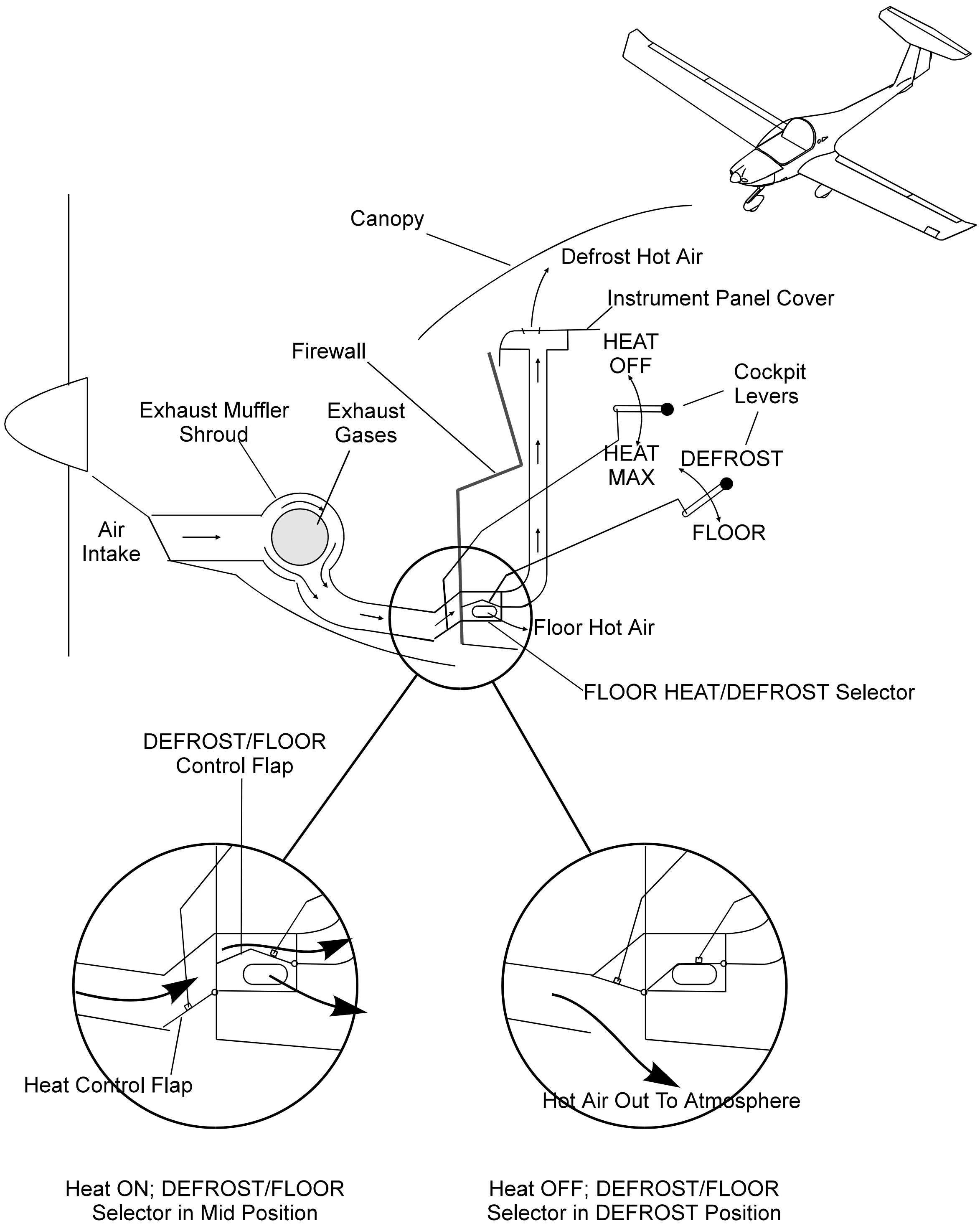

Figure 1 - Heating and Ventilation Schematic Diagram

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HEATING AND VENTILATION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the air conditioning system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Burning smell in the cockpit.	Exhaust heat-exchanger cracked.	Replace or repair the heat exchanger.
Heating system supplies warm air when set to OFF.	Control cable out of adjustment.	Adjust the heat valve control cable.
Heating system cannot be selected to the windscreen/ floor.	Control cable out of adjustment.	Adjust the distribution box control cable.
Avionics equipment shuts off without electrical issues.	Avionics cooling fan inoperative. Hoses have become loose.	Replace fan. Check hoses attached to the fan and radio racks.

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HEATING AND VENTILATION - MAINTENANCE PRACTICES

1. General

This chapter describes about the Maintenance Practices for the distribution and heating systems. It also describes how to remove/install and adjust components.

2. Remove/Install the Heat Control Valve

A. Remove the Heat Control Valve

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
WARNING: IF THE ENGINE HAS BEEN RUNNING, TAKE CARE WHEN YOU TOUCH THE HEAT CONTROL VALVE. THE HEAT CONTROL VALVE GETS HOT.		
2.	Release the worm drive clamp which holds the flexible hose to the heat control valve. Then disconnect the hose from the valve.	
3.	Set the HEAT control lever to ON. Loosen the screw which holds the bowden cable to the lever in the heat control valve. - Move the bowden cable clear.	
4.	Remove the four bolts and the washers that attach the heat control valve to the firewall.	
5.	Remove the heat control valve from the firewall.	

B. Install the Heat Control Valve

	Detail Steps/Work Items	Key Items/References
1.	Put the heat control valve in position on the firewall.	Use Product PR 812, (MIL-S-38249 Type 1) Fire Wall Sealant.
2.	Install the washers and bolts that attach the valve to the firewall.	
3.	Set the cockpit control lever to OFF. Then move it forward about 3 mm (0.1 in).	
4.	Put the bowden cable in position on the heat control valve. Adjust the nuts on the outer sheath adjuster to a mid position.	Make sure that the inner cable is through the end fitting on the flap lever of the heat control valve.

	Detail Steps/Work Items	Key Items/References
5.	Set the flap in the heat control valve to fully close the hole in the firewall.	
6.	Tighten the screw in the end fitting on the flap lever to hold the inner cable.	
7.	Do a test for correct operation of the heat control valve.	
8.	Connect the flexible hose to the heat control valve. Tighten the worm drive clamp.	
9.	Install the engine cowlings.	Refer to Chapter 71-10.

3. <u>Test/Adjust the Heat Control Valve</u>

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Set the CABIN HEAT control lever in the cockpit to OFF.	There must be 'bounce' of about 3 mm (0.1 in) between the back of the lever and the cockpit stop.
WARNING: IF THE ENGINE HAS BEEN RUNNING, TAKE CARE WHEN YOU TOUCH THE HEAT CONTROL VALVE. THE HEAT CONTROL VALVE GETS HOT.		
3.	Make sure that: - The flap fully closes the opening to the distribution box.	Look or feel inside the heat control valve.
4.	If necessary, adjust the outer sheath of the cable that goes through the distribution box to give the correct 'bounce'.	
5.	Set the CABIN HEAT control lever in the cockpit to ON (fully forward).	
6.	Make sure that: - The flap fully closes the outlet to the engine compartment.	
CAUTION: MAKE SURE THAT THE FLAP ON THE HEAT CONTROL VALVE FULLY CLOSES THE FIREWALL OUTLET WHEN YOU SET THE CABIN HEAT CONTROL LEVER TO OFF. THIS IS TO STOP FIRE OR EXHAUST FUMES FROM GOING INTO THE COCKPIT IN AN EMERGENCY.		
7.	Install the engine cowlings.	Refer to Chapter 71-10.

4. Remove/Install the Distribution Box

A. Remove the Distribution Box.

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: YOU MUST MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE CABIN HEAT SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "IDLE" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF". WARNING: IF THE ENGINE HAS BEEN RUNNING, TAKE CARE WHEN YOU TOUCH THE HEAT CONTROL VALVE AND THE DISTRIBUTION BOX. THE HEAT CONTROL VALVE AND THE DISTRIBUTION BOX GETS HOT.	
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the engine cowlings.	Refer to Chapter 71-10.
3.	Make the engine safe: - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Mixture control set to LEAN CUT-OFF. - Disconnect the spark plug leads.	Use a suitable container to catch the fuel.
4.	Remove the heat control valve.	Refer to the Remove The Heat Control Valve procedure.

	Detail Steps/Work Items	Key Items/References
5.	Remove the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR - ALTERNATE AIR - FUEL MIXTURE.	
6.	Remove the engine controls face plate from the center console cover: - Remove the four screws.	
7.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
8.	Remove the center console cover from the center console: - Remove the six screws from the two sides of the center console cover.	
9.	Disconnect the cable wire end of the HEAT DEFROST-FLOOR control from the lever at the control quadrant. - Loosen the swivel attachment.	
10.	Disconnect the outer sheath of the HEAT DEFROST-FLOOR control bowden cable from the tab at the control quadrant. - Remove the two nuts.	
11.	Disconnect the cable wire end of the HEAT ON-OFF control from the lever at the control quadrant. - Loosen the swivel attachment.	
12.	Disconnect the outer sheath of HEAT ON-OFF control bowden cable from the tab at the control quadrant. - Remove the two nuts.	

	Detail Steps/Work Items	Key Items/References
13.	Remove the distribution box installation screws from the center console at the left and right footwells.	
14.	Remove the support block from the distribution box: - Remove the nut from the heat valve bowden cable at the support block - Turn the bowden cable outer sheath and remove from the support block - Remove the two screws that attach the support block to the distribution box.	
15.	Carefully pull the distribution box forward into the engine compartment. - Remove the two hot air distribution hoses.	Sufficient to get access to the hot air distribution hoses at the rear of the distribution box.
16.	Remove the distribution box.	

B. Install the Distribution Box

	Detail Steps/Work Items	Key Items/References
1.	Install the HEAT DEFROST-FLOOR bowden control cable to the distribution box before you install it in the center console.	
2.	Install the two hot air distribution pipes to the rear of the distribution box before you install it in the center console. - Tighten the worm-drive clamps.	
3.	Carefully put the HEAT DEFROST-FLOOR bowden control cable in position in the center console. Then put the distribution box in position in the center console.	From the engine compartment.
4.	Put the HEAT ON-OFF bowden control cable in position: - From the control quadrant into the hole at the top of the distribution box.	

	Detail Steps/Work Items	Key Items/References
5.	Turn the HEAT ON-OFF bowden control cable and install to the support block: - Install the bowden cable lock nut.	
6.	Install the support block to the top of the distribution box.	
7.	Install the distribution box to the sides of the center console: - Install the two screws in the left and right footwells.	
8.	Install the outer sheath of the HEAT DEFROST-FLOOR control bowden cable to the tab at the control quadrant: - Install the two nuts.	
9.	Install the cable wire end of the HEAT DEFROST-FLOOR control to the lever at the control quadrant. - Tighten the screw in the swivel attachment.	
10.	Install the outer sheath of HEAT ON-OFF control bowden cable to the tab at the control quadrant. - Install the two nuts.	
11.	Install the cable wire end of the HEAT ON-OFF control to the lever at the control quadrant. - Tighten the screw in the swivel attachment.	
12.	Do a test for correct operation of the DEFROST-FLOOR control valve. If necessary, adjust the bowden cable.	Refer to the Test/Adjust Distribution Box Valve procedure.
13.	Install The Heat Control Valve.	Refer to the Install The Heat Control Valve procedure.
14.	Install the center console cover to the center console.	
15.	Install the TRIM switch to the face plate.	Push the TRIM switch into position in the face plate. Connect the connector below the face plate.

	Detail Steps/Work Items	Key Items/References
16.	Install the face plate to the center console cover.	
17.	Install the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR - ALTERNATE AIR - FUEL MIXTURE.	
18.	Do a controls freedom of movement check.	
19.	Install the ignition harness "B" nuts to the spark plugs. Tighten the "B" nuts.	Torque to 110-120 lbf-in (12.4 Nm)
20.	Connect the airplane battery.	Refer to Chapter 24-31.
21.	Do operational checks of the elevator trim control system.	
22.	Do an engine test.	Refer to the DA20-C1 Airplane Flight Manual.

5. Test/Adjust the Distribution Box Valve

	Detail Steps/Work Items	Key Items/References
1.	Set the CABIN HEAT control lever in the cockpit to DEFROST.	There must be 'bounce' of about 3 mm (0.1 in) between the back of the lever and the cockpit stop.
	WARNING: IF THE ENGINE HAS BEEN RUNNING, TAKE CARE WHEN YOU TOUCH THE HEAT CONTROL VALVE. THE HEAT CONTROL VALVE GETS HOT.	
2.	Remove the heat control valve.	Refer to the Remove The Heat Control Valve procedure.
	NOTE: Only do steps 3 through 7 if you must adjust the distribution valve range of movement.	
3.	Disconnect the airplane battery.	Refer to Chapter 24-31.

	Detail Steps/Work Items	Key Items/References
4.	Install the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR - ALTERNATE AIR - FUEL MIXTURE.	
5.	Remove the engine controls face plate from the center console cover. - Remove the four screws.	
6.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
7.	Remove the center console cover from the center console:	
8.	Remove the six screws from the two sides of the center console cover.	
9.	Make sure that: - The flap fully closes the two openings to the FLOOR distribution holes.	Look or feel inside the distribution box valve.
10.	Set the CABIN HEAT control lever in the cockpit to FLOOR.	There must be 'bounce' of about 3 mm (0.1 in) between the top of the lever and the cockpit stop.
11.	Make sure that: - The flap fully closes the two openings to the DEFROST distribution holes.	Look or feel inside the distribution box valve.
12.	If necessary, adjust the outer sheath of the cable that goes through the tab in the control quadrant to give the correct 'bounce'.	
13.	Install the heat control valve.	Refer to the Install The Heat Control Valve procedure.
NOTE: Only do steps 14 through 21 if you had to do steps 3 through 7.		
14.	Do a check for loose items in the cockpit.	Look specially in the area of the control quadrant.

	Detail Steps/Work Items	Key Items/References
15.	Install the center console cover to the center console:	
16.	Install the TRIM switch to the face plate.	Push the Trim switch into position in the face plate. Connect the connector below the face plate.
17.	Install the engine controls face plate to the center console cover.	
18.	Install the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR - ALTERNATE AIR - FUEL MIXTURE.	
19.	Do a control freedom of movement check.	
20.	Connect the airplane battery.	Refer to Chapter 24-31.
21.	Do operational checks of the elevator trim control system.	

6. Remove/Install the Heat Exchanger Shroud

A. Remove the Heat Exchanger Shroud

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
WARNING: IF THE ENGINE HAS BEEN RUNNING, TAKE CARE WHEN YOU TOUCH THE HEAT CONTROL VALVE. THE HEAT CONTROL VALVE GETS HOT.		
2.	Release the worm drive clamps which attach the inlet and outlet hoses to the heat exchanger.	Refer to Figure 201.
3.	Disconnect the inlet and outlet hoses from the heat exchanger.	
4.	Release the screws which hold the shroud to the muffler.	
5.	Remove the shroud from the muffler.	

B. Install the Heat Exchanger Shroud

	Detail Steps/Work Items	Key Items/References
1.	Put the shroud in position on the muffler with the joint at the top.	Refer to Figure 201. The inlet connection points forward on the right. The outlet connection points down and aft on the left.
2.	Install the screws which hold the flanges of the shroud together.	
3.	Connect the inlet and outlet hoses from the heat exchanger.	
4.	Tighten the worm drive clamps which hold the hoses.	
5.	Install the engine cowlings.	Refer to Chapter 71-10.

7. Inspect the Heat Exchanger

WARNING: NO CRACKS ARE PERMITTED IN THE EXHAUST MUFFLER. CRACKS ALLOW CARBON MONOXIDE TO ENTER THE HEATING SYSTEM. CARBON MONOXIDE IS POISONOUS.

	Detail Steps/Work Items	Key Items/References
1.	Remove the heat-exchanger shroud.	Refer to the Heat Exchanger Shroud Removal procedure.
2.	Examine the inside of the shroud. Look especially for soot marks and cracks.	If you find soot marks, the exhaust muffler is cracked. You must remove it for repair or replace it.
3.	Examine the outer face of the exhaust muffler. Look specially for soot marks and cracks.	Use a magnifying glass and a strong light. If you find soot marks or cracks, you must remove the muffler for repair or replace it.
4.	Install the heat exchanger shroud.	Refer to the Heat Exchanger Shroud Install procedure.

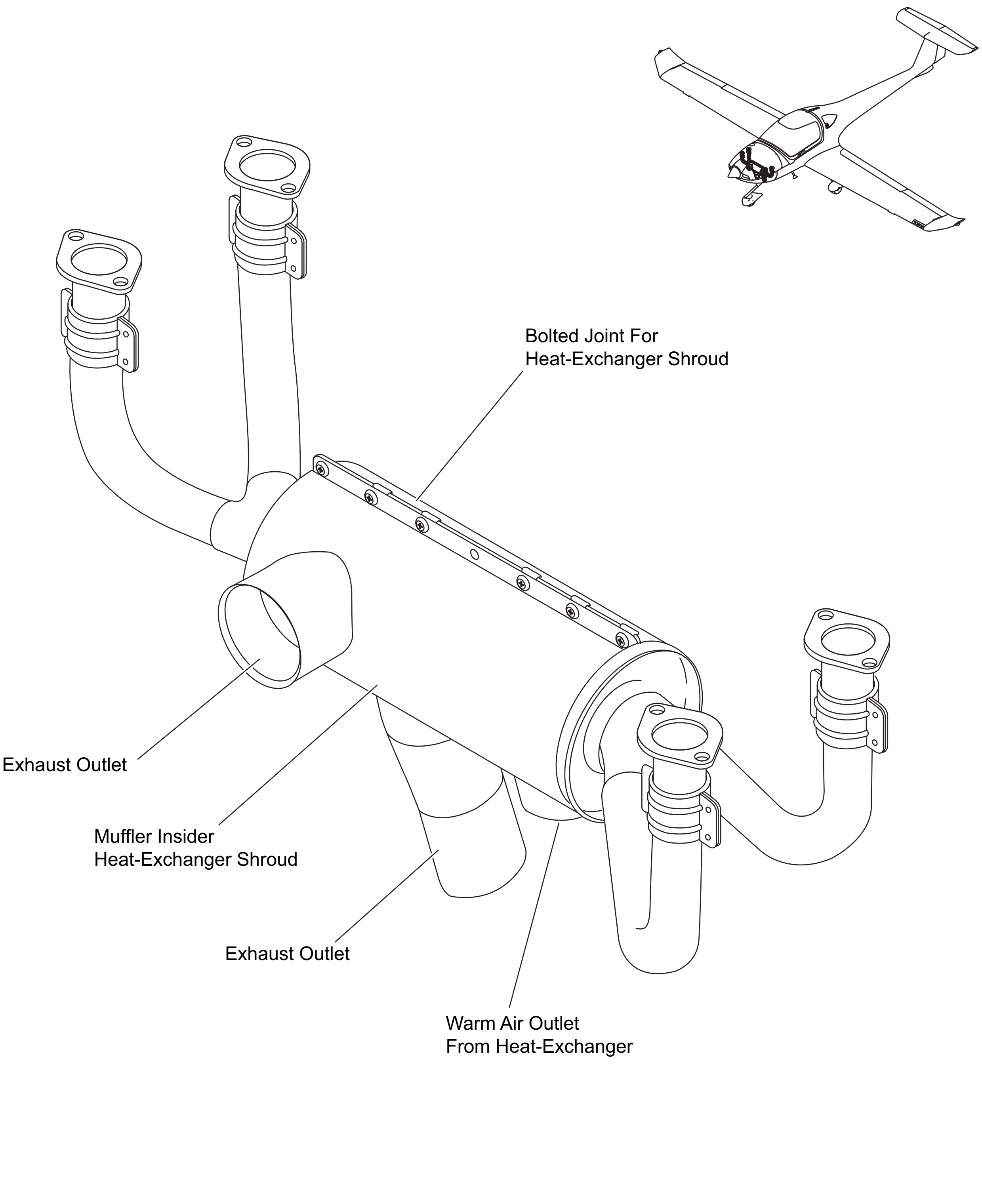


Figure 201 - Heat Exchanger Installation on the Exhaust Muffler

8. Remove/Install the Avionics Cooling Fan

A. Remove the Avionics Cooling Fan

Refer to Figure 202.

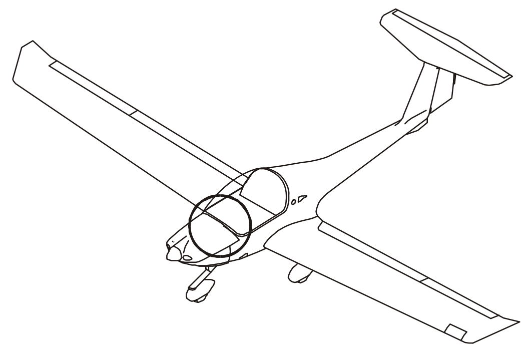
	Detail Steps/Work Items	Key Items/References
1.	Remove aircraft power.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Behind the instrument panel, remove the two duct hoses at the avionics cooling fan.	Make note of the hose arrangement at the avionics cooling fan. Position the hoses to make sure that no debris can get into the hoses.
4.	Cut the tie wrap holding the two-pin electrical connectors to the instrument panel base.	
5.	Disconnect the two-pin electrical connectors that provide power to the avionics cooling fan.	
6.	Reach under the pilot’s instrument panel and remove the four (4) machine screws that hold the avionics cooling fan in place.	Clip nuts are attached to the avionics cooling fan base.
7.	Remove the avionics cooling fan.	

B. Install the Avionics Cooling Fan

Refer to Figure 202.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Put the avionics cooling fan in position behind the pilot’s instrument panel.	
3.	Reach under the pilot’s instrument panel and install the four (4) machine screws to hold the avionics cooling fan in place.	
4.	Connect the two-pin electrical connector to the aircraft wiring connector.	

	Detail Steps/Work Items	Key Items/References
5.	Do an Operational Check of the avionics cooling fan at this time, as follows: - Apply aircraft power. - Reach behind the instrument panel and make sure that the avionics cooling fan is blowing out cooling air. - Remove aircraft power.	Make sure that the EQUIP COOLING circuit breaker is closed.
6.	Tie wrap the two pin electrical connectors to the instrument panel base.	
7.	Connect the two duct hoses to the avionics cooling fan.	Make sure that they are installed to the same locations as in the removal.
8.	Remove all tools, equipment, and unwanted materials from the work area.	
9.	Install the instrument panel cover.	Refer to Chapter 25-10.



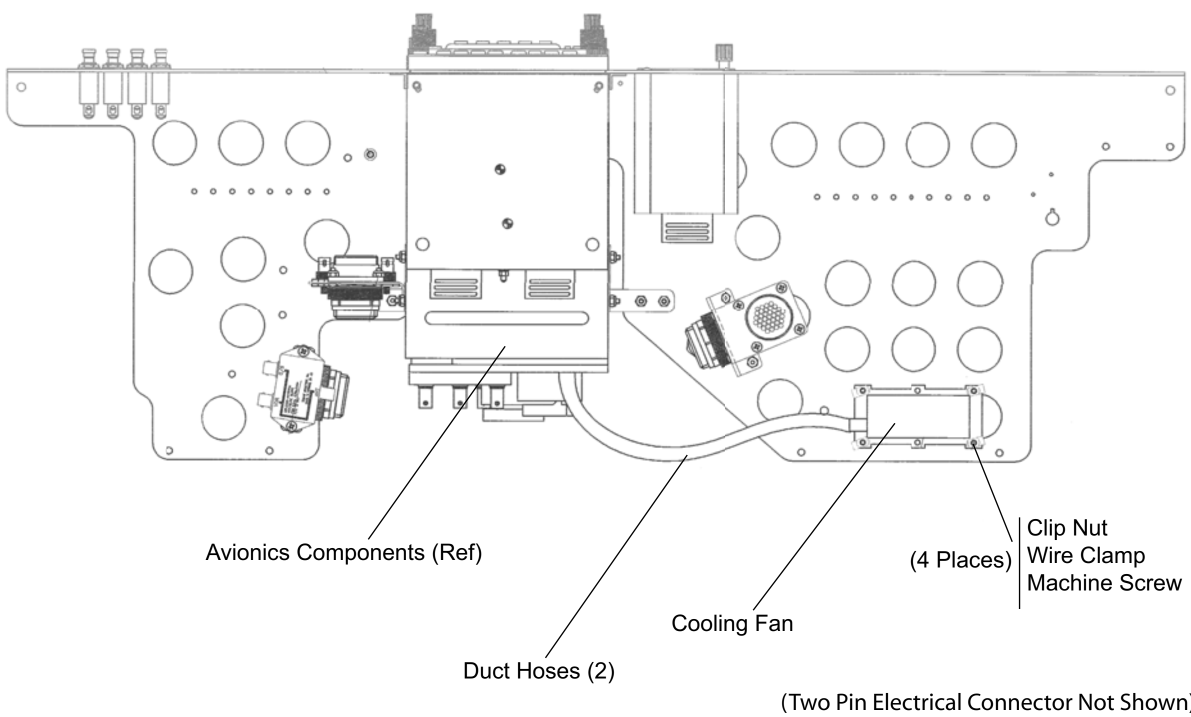


Figure 202 - Avionics Cooling Fan - Removal/Installation

CHAPTER 23-00

COMMUNICATIONS

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COMMUNICATIONS

1. General

This chapter describes about the following communications and communications related systems:

- Chapter 23-10. Speech communication
- Chapter 23-50. Audio integrating
- Chapter 23-60. Static discharging (including bonding).

This chapter gives you only the on-aircraft data about the systems and components. Refer to the manufacturer's handbooks for shop data.

Many different instruments and avionics can be installed as options. This chapter describes about standard installations.

2. Description

A. Speech Communication

The basic speech communication system has the following components:

- Bendix\King KX 125 NAV COMM
- Bendix\King KLX 135/135A GPS COMM. (Option for dual systems)
- GNC420W/GNS430W/GNS530W/GTN 650 GPS COMM. (Option for dual systems)
- COMM antenna(s).

A Bendix\King KX 155 NAV COMM can replace the KX 125 as an option for dual systems.

B. Audio Integrating

The basic audio integrating system has the following components:

- PM 501/PM 1000 Voice activated intercom
- Press-to-transmit buttons on each control stick
- Mic and phone jack-sockets for each pilot
- A cabin speaker (optional).

C. Static Discharging

The composite structure of the DA20-C1 aircraft makes a special bonding system necessary. Copper foil tape with conductive adhesive and bonding wire connect metal components. They also connect the ground planes for antennas.

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SPEECH COMMUNICATION

1. General

The DA20-C1 aircraft has single or dual VHF communications only. The basic single system has a Bendix\King KX 125 NAV COMM. A Bendix\King KX 155 can replace the KX 125 as a customer option. The basic dual system has:

- a Bendix\King KLX 135\135A GPS COMM
- GNS430W/GNS530W GPS COMM utilizing a SL40 as the COMM 2.
- GTN 650 GPS COMM utilizing a GTR 225 COMM 2

In single installations the integral speaker amplifier operates the optional cabin speaker. In dual installations, an audio panel with speaker amplifier operates the cabin speaker.

Figure 1 shows the antenna locations. The #1 VHF COMM antenna is a dipole. It is installed in the leading edge of the vertical stabilizer. The #2 VHF COMM antenna is a 1/4 wave whip. It is installed below the bottom skin of the fuselage. The antenna ground plane is copper adhesive tape. The ground plane connects to the aircraft static bonding system.

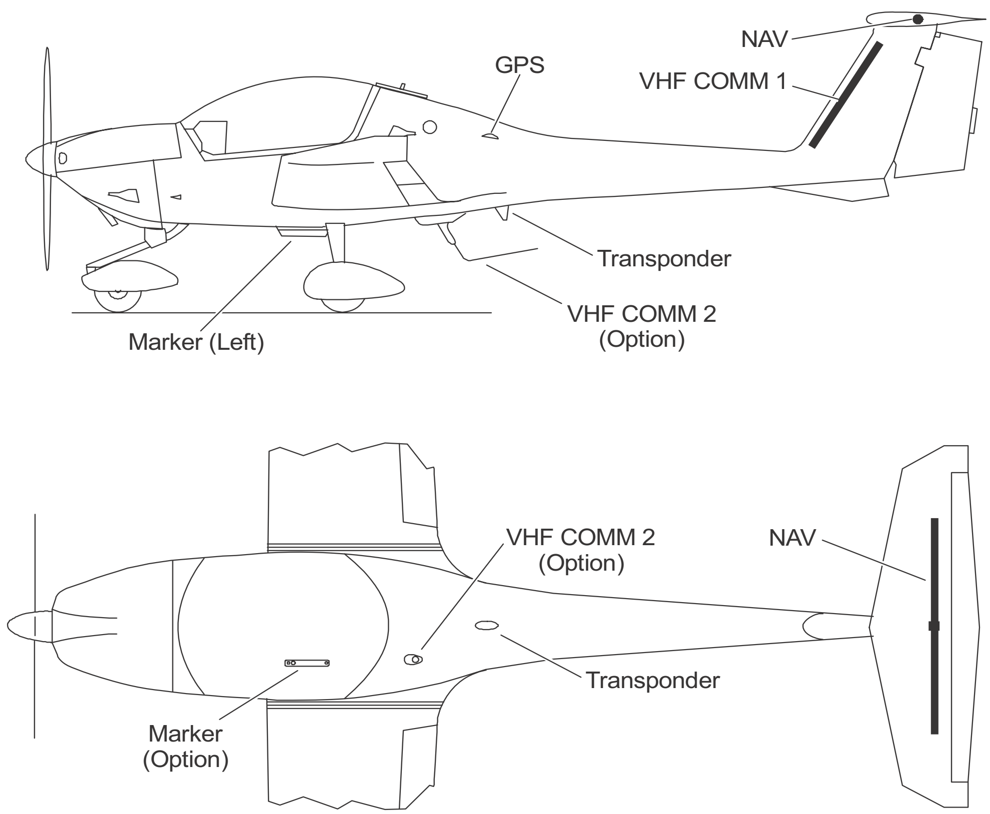

Figure 1 - Antenna Locations

2. Description

A. Bendix\King KX 125 NAV COMM

Figure 2 shows the KX 125 NAV COMM. The KX 125 is a communications transceiver and navigation receiver. See Chapter 34-50 for data about the navigation functions. The equipment can receive COMM signals from 118.00 MHz to 136.975 MHz in 25 kHz increments. This gives 760 channel operation.

The left hand display panel shows COMM frequency data. The top line shows the active COMM frequency. The bottom line shows the SBY frequency. When the equipment transmits, a TX annunciator comes on next to the active COMM frequency.

The KX 125 has the following controls:

- An OFF/PULL TEST switch
- COMM frequency selector knobs
- A COMM frequency transfer button.

The press-to-transmit buttons on the pilot's control sticks (or hand mic) control the transmitter. The transmitter can be keyed for a continuous period of 30 seconds. After 30 seconds the transmitter stops transmitting and the COMM frequency display flashes. This gives protection against a sticking mic key (press-to-transmit button). Releasing the mic key returns to the usual operation.

The OFF/PULL TEST rotary switch controls power to the equipment. The full counter-clockwise position is OFF. Movement clockwise gives volume control. The KX 125 has automatic squelch. Pull the switch to cancel the squelch for test purposes.

To change the frequency, turn the large frequency selector knob for 1 MHz increments. Turn the small frequency selector knob for 50 kHz increments. Pull the small knob out to set 25 kHz increments. When you turn the selector knobs, the SBY frequency changes. Push the COMM frequency transfer button to toggle the active and SBY frequencies.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COMM OFF/PULL TEST knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. You can enter frequencies directly to the active display. Push and hold the COMM frequency transfer button for more than 2 seconds. The SBY display will show the blank symbols (---). The frequency selector knobs will control the frequency in the active display.

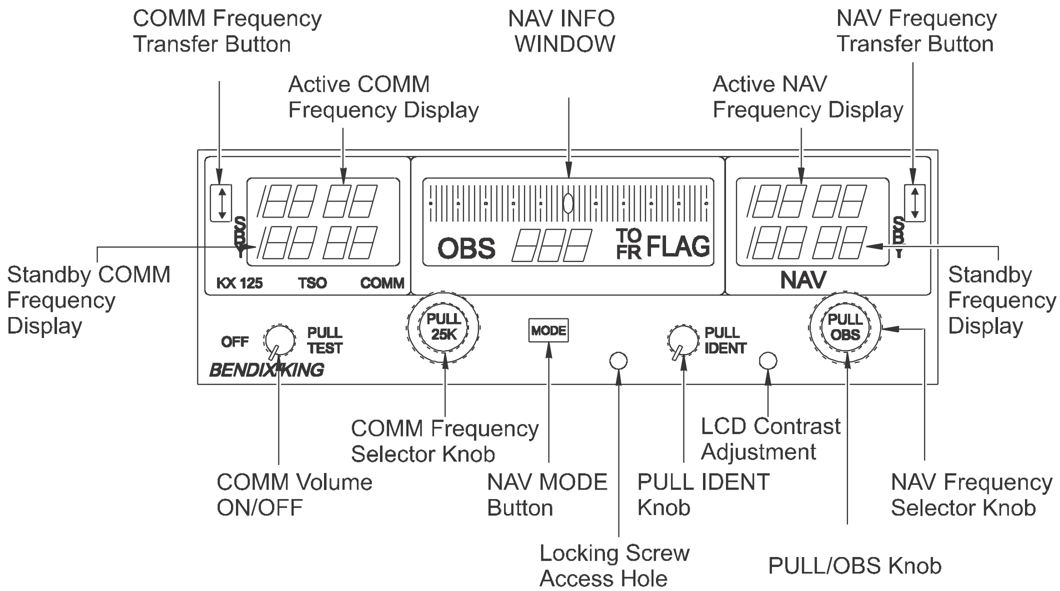

Figure 2 - Bendix\King KX 125 NAV COMM

B. Bendix\King KLX 135\135A GPS COMM

Figure 3 shows the KLX 135\135A GPS COMM. The KLX 135\135A is a VHF communications transceiver and a GPS receiver (See Chapter 34-50 for the GPS functions). The equipment can receive COMM signals from 118.00 MHz to 136.975 MHz in 25 kHz increments. This gives 760 channel operation.

The KLX 135\135A has the following controls:

- An OFF/VOL/PULL TEST switch
- COMM frequency selector knobs
- A COMM frequency transfer button.

The OFF/VOL/PULL TEST rotary switch controls power to the equipment. The full counter-clockwise position is OFF. Movement clockwise gives volume control. The KLX 135\135A has automatic squelch. Pull the switch to cancel the squelch for test purposes.

The press-to-transmit buttons on the pilot's control sticks (or hand mic) control the transmitter. The transmitter can be keyed for a continuous period of 35 seconds. After 35 seconds the transmitter stops transmitting and the COMM frequency display flashes the message 'Stuck Mic'. This gives protection against a sticking mic key (press-to-transmit button). Releasing the mic key returns to the usual operation.

When the equipment transmits, a TX annunciator comes on next to the COMM USE frequency.

To change the frequency, turn the left-outer frequency selector knob for 1 MHz increments. Turn the left-inner frequency selector knob for 50 kHz increments. Pull the left-inner knob out to set 25 kHz increments.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COMM OFF/VOL/PULL TEST knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. The DIM/ BRIGHT switch (located on the instrument panel) controls the brightness of the display.

See the operators handbook provided with the equipment for further data.

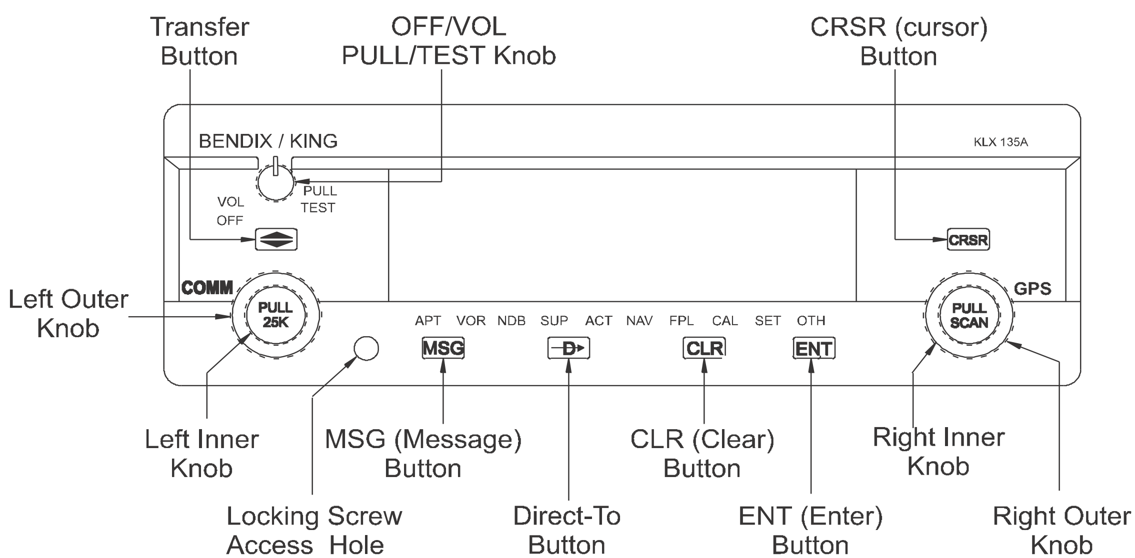

Figure 3 - Bendix\King KLX 135/135A GPS COMM

C. Bendix/King KX 155 NAV COM

Figure 4 shows the KX 155 NAV COM. The KX 155 is a VHF communications transceiver and a NAV receiver. (See AMM Chapter 34-50 for the NAV functions). The equipment can receive COMM signals from 118.00 MHz to 136.975 MHz in 25 kHz increments. This gives 760 channel operation.

The left hand display panel shows COMM frequency data. The left side shows the COMM USE frequency. The right side shows the STBY frequency. When the equipment transmits, a T annunciator comes on between the COMM USE frequency and the STBY frequency.

When the power is off, a non-volatile memory holds the frequency that was last used. A photo-cell in the display controls the display brightness.

The KX 155 has the following controls:

- An OFF/PULL TEST switch
- COMM frequency selector knobs
- A COMM frequency transfer button.

The press-to-transmit buttons on the pilot's control sticks (or hand mic) control the transmitter.

The OFF/PULL TEST rotary switch controls power to the equipment. The full counter-clockwise position is OFF. Movement clockwise gives volume control. The KX 155 has automatic squelch. Pull the switch to cancel the squelch for test purposes.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COMM OFF/PULL TEST knob clockwise from the OFF position

To change the frequency, turn the large frequency selector knob for 1 MHz increments. Turn the small frequency selector knob for 50 kHz increments. Pull the small knob out to set 25 kHz increments. When you turn the selector knobs, the STBY frequency changes. Push the COMM frequency transfer button to toggle the USE and STBY frequencies.

If the equipment finds an in-valid frequency in the non-volatile memory, both USE and STBY frequencies show 120.00 when power is applied.

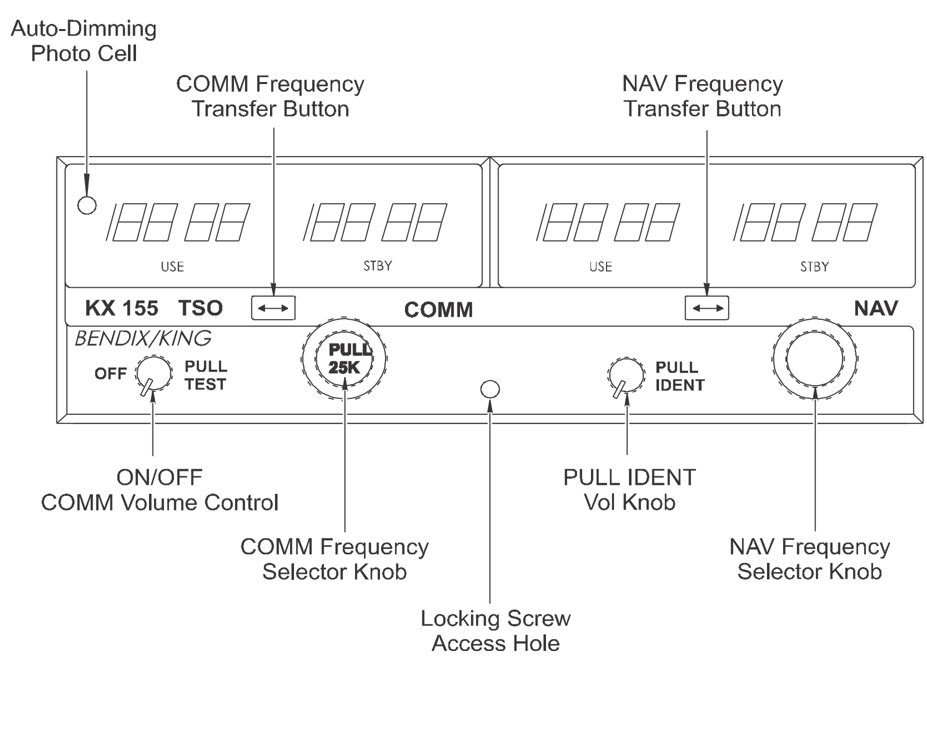

Figure 4 - Bendix\King KX 155 NAV COMM

D. Garmin GPS COMM

(1) GNS430W

The GNS430W is a VHF communications transceiver and a GPS receiver. (Refer to Chapter 34-50 for the GPS functions). It also includes the a TSO'd airborne VOR/Localizer and Glideslope receivers. It has two removable data cards, one with a Jeppesen database (inserted in the left-most card slot) and the other the Terrain database (inserted in the right-most card slot).

The equipment can receive COMM signals from 118.00 MHz to 136.975 MHz in 25 kHz increments. This gives 760 channel operations. The GNS430W is 6.25 in wide and 2.66 in high. The display is a 240 x by 128 pixel color LCD. See Figure 5.

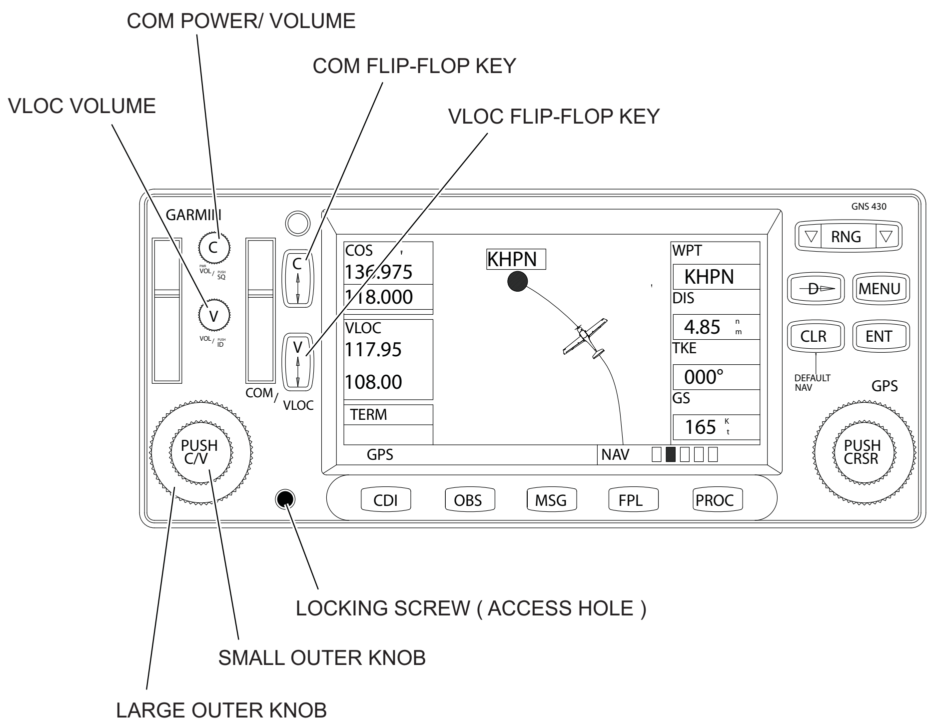

Figure 5 - Garmin GNS430W COMM

The GNS430W has the following controls:

(a) Left-Hand Keys and Knobs

COM Power/Volume Knob - controls unit power and communications radio volume. To override the squelch function, press the COM power/volume knob.

VLOC Volume Knob - controls audio volume for the selected VOR/Localizer frequency.

Large (Outer) Left Knob - to tune the MHz value of the standby frequency for the communications transceiver (COM) or the VLOC receiver.

Small (Inner) Left Knob - to tune kHz value of the standby frequency for the communications transceiver (COM) or the VLOC receiver.

COMM Flip-Flop Key - to swap the active and standby COM frequencies.

VLOC Flip-Flop Key - to swap the active and standby VLOC frequencies.

(b) Right Hand Keys and Knobs

Refer to Chapter 34-50 for the GPS functions.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM Power/Volume knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. The DIM/BRIGHT switch (located on the instrument panel) controls the brightness of the display.

Refer to the operators handbook provided with the equipment for additional information.

(2) GNS530W

The GNS530W is a VHF communications transceiver and a GPS receiver. (Refer to Chapter 34-50 for the GPS functions). It also includes the a TSO'd airborne VOR/Localizer and Glideslope receivers. It has two removable data cards, one with a Jeppesen database (inserted in the left-most card slot) and the other the Terrain database (inserted in the right-most card slot).

The equipment can receive COMM signals from 118.00 MHz to 136.975 MHz in 25 kHz increments. This gives 760 channel operations. The GNS530W is 6.25 in wide and 4.60 in. high. The display is a 320 x by 2348 pixel color LCD. See Figure 6.

The GNS530W has the following controls:

(a) Left-Hand Keys and Knobs

COM Power/Volume Knob - controls unit power and communications radio volume. To override the squelch function, press the COM power/volume knob.

VLOC Volume Knob - controls audio volume for the selected VOR/Localizer frequency.

Large (Outer) Left Knob - to tune the MHz value of the standby frequency for the communications transceiver (COM) or the VLOC receiver.

Small (Inner) Left Knob - to tune kHz value of the standby frequency for the communications transceiver (COM) or the VLOC receiver.

COMM Flip-Flop Key - to swap the active and standby COM frequencies.

VLOC Flip-Flop Key - to swap the active and standby VLOC frequencies.

(b) Right Hand Keys and Knobs

Refer to Chapter 34-50 for the GPS functions.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM Power/Volume knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. The DIM/BRIGHT switch (located on the instrument panel) controls the brightness of the display.

Refer to the operators handbook provided with the equipment for additional information.

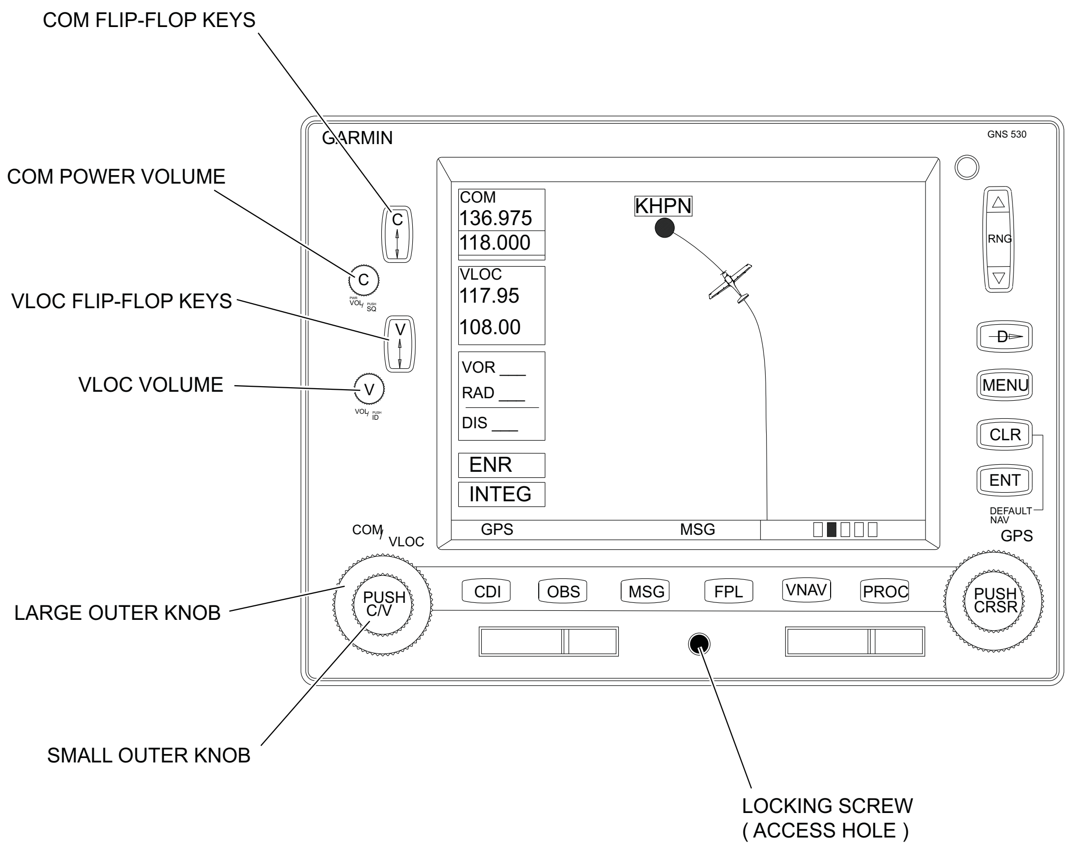

Figure 6 - GNS530W GPS COMM

(3) GTN 650

The GTN 650 is a VHF communications transceiver and a GPS receiver. (Refer to Chapter 34-50 for GPS functions). It also includes a TSO-d airborne VOR/Localizer and Glideslope receivers. It uses a Secure Digital (SD) card to load and store various types of data. For basic flight operations, the SD card is required for Terrain, Obstacle, and Safe Taxi database storage as well as Jeppesen aviation database updates.

The equipment can receive Comm signals from 118.00 MHz to 136.976 MHz in 25 KHz increments. This gives 760 channel operations. The display is a 600 by 266 pixel, 4.9 inch diagonal color LCD with touchscreen controls. See Figure 5.

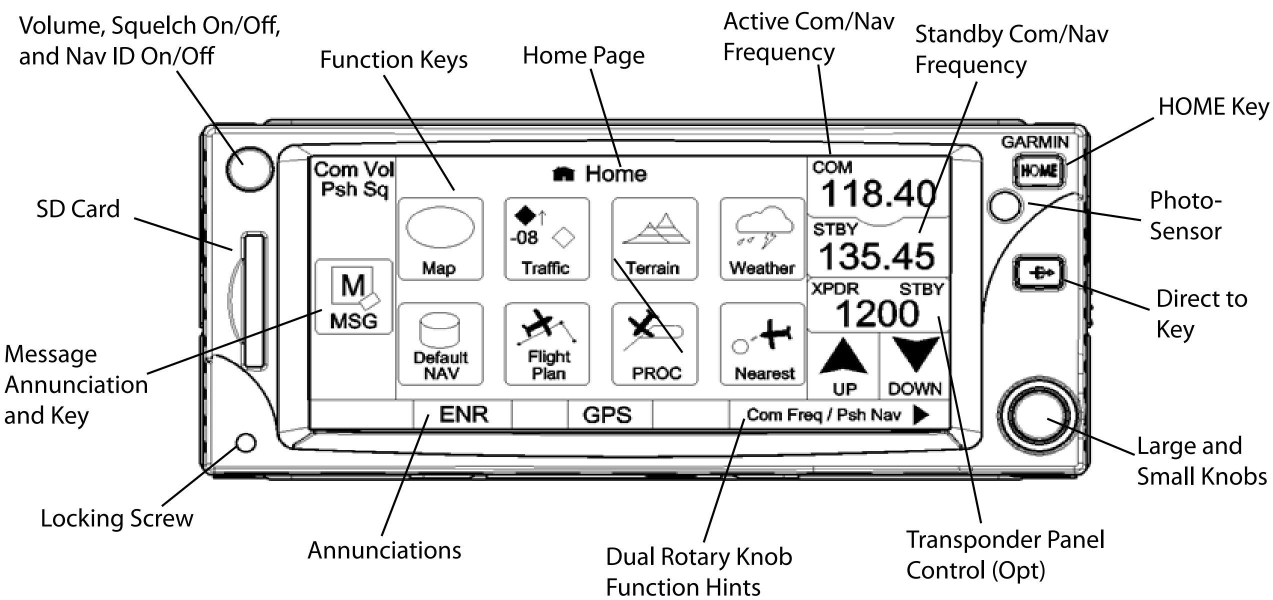

Figure 7- GTN 650 GPS COMM

The GTN 650 has the following controls:

(a)Left-Hand Knob

Volume / Squelch Knob - controls audio volume for the selected Com radio or Nav receiver and other volume levels for external audio input devices that are controlled via the GTN interface, if installed. Pressing the Volume knob momentarily will disable the automatic squelch control for the Com radio, when active.

(b)Right-Hand Keys and Knobs

HOME Key - displays the Home page, the main screen for accessing the GTN features. Pressing and holding the HOME key will open the Default Navigation page from any other page.

Direct-To Key - provides access to the direct-to function, which allows you to enter a waypoint and establishes a direct course to the selected destination.

Large and Small Concentric Knobs - used for data entry, such as in the Waypoint or Direct-To functions, and to set the frequencies for the communications transceiver or the VOR/Localizer in units so equipped.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM power/Volume knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. The INST. LT knob controls the brightness of the display.

Refer to the operators handbook provided with the equipment for additional information.

E. SL40 VHF COMM Transceiver

The SL40 is a 760 channel VHF COMM transceiver. It is one member of the slimline series, which includes the SL40 COMM, the SL50 GPS, and the SL60 GPS/COMM. See Figure 7.

The features of the SL40 COMM include:

- 760 channels
- Frequency range of 118.000 to 136.975MHz
- Active and standby frequency display
- 16 character high-intensity alphanumeric LED display
- Automatic display intensity
- Back-lit buttons
- Transmit status indicator
- Frequency memory and recall functions
  - from remote source
  - eight last used
  - eight user stored
- Weather channels
- Frequency monitor function
- Built-in intercom function
- Stuck mic time-out
- Two microphone inputs
- Internal non-volatile memory - no battery required
- Full range input supply voltage
- 12 watt audio amplifier

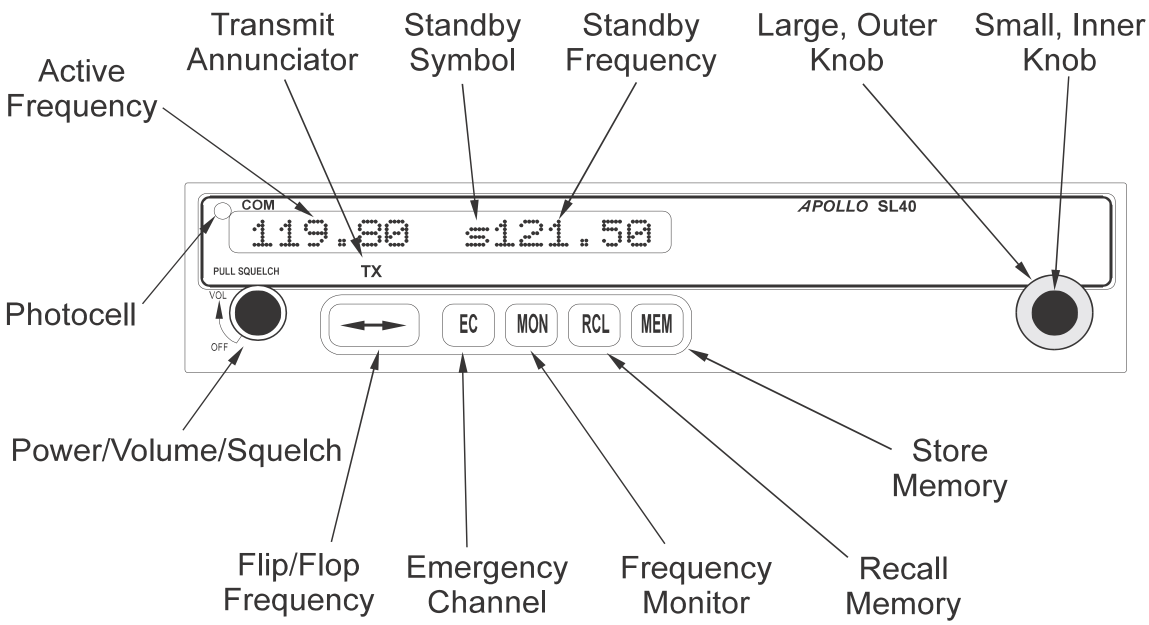

Figure 8- SL40 Front Panel

F. ICOM IC-A200 VHF Air Band Transceiver

The ICOM IC-A200 is a VHF air band transceiver installed in the instrument panel. See figure 8.

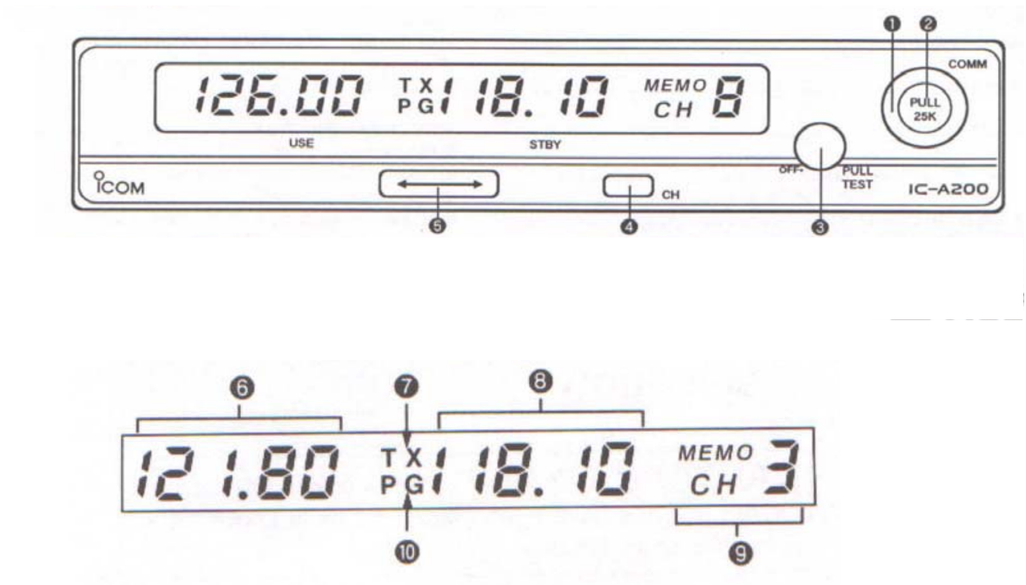

Figure 9- ICOM IC-A200 VHF Air Band Transceiver Front Panel

Legend:

1. Large Turning Knob
2. Small Turning Knob
3. Volume Control
4. Channel Switch (CH)
5. Frequency Exchange Switch
6. Use Window
7. Transmit Indicator
8. Standby Window
9. Memory Channel Indicator
10. Programming Indicator

ICOM IC-A200 VHF air band transceiver has the following controls:

Large Turning Knob:	Changes the STBY or USE window frequency in 1 MHz steps. Selects a memory channel. Programs a selected memory channel as a blank channel.
Small Turning Knob:	Changes the STBY or USE window frequency in 25 or 50 KHz steps. This knob does not change the 1 MHz digit. Selects a memory channel.
Volume Control:	Turns power ON and adjust the audio level. When pulled OUT, opens the squelch manually for testing.
Channel Switch (CH):	Recalls a memory channel in the STBY window. When pushed and held, allows memory channel programming.
Frequency Exchange Switch:	Exchanges the USE window frequency for the STBY window frequency and vice versa. When pushed and held, hides the STBY window frequency and allows the selection of the USE window frequency directly.
USE Window:	Indicates the operating frequency that is used for transmitting and receiving.
Transmit Indicator:	Appears while transmitting.
STBY Window:	Indicates the standing-by frequency that is used as the next operating frequency. When a memory channel is recalled, indicates the memory channel frequency content.
Memory Channel Indicator:	Indicates a selected memory channel number.
Programming Indicator:	Indicates that a memory channel can be programmed.

G. Garmin GTR 225 COMM

The GTR 225 Comm Radio provides a VHF Communications transceiver in a small footprint. The unit has the ability to monitor the standby Com frequencies and store the most-used frequencies into memory. The GTR 225 (10 watt) operates in the aviation voice band, from 118.000 to 136.975 MHz, in 25 KHz steps.

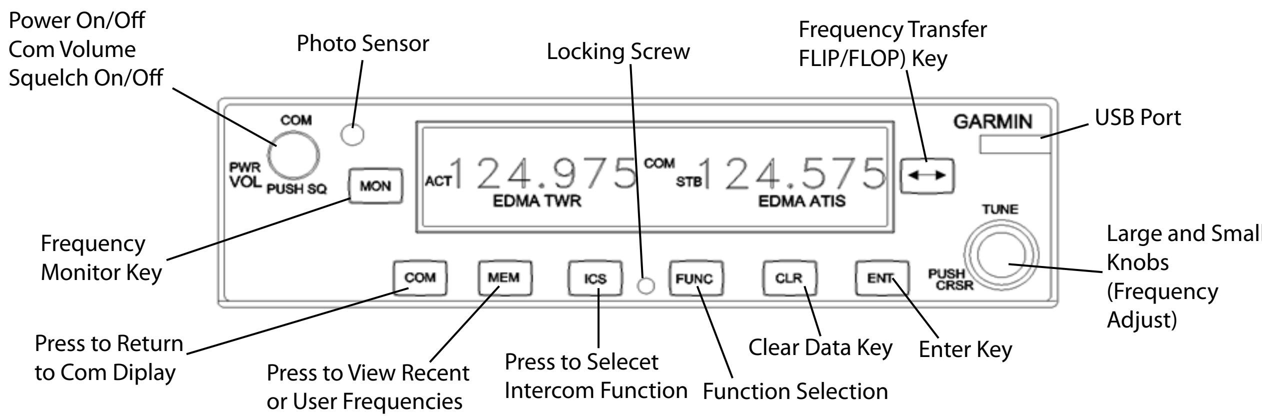

Figure 10- GTR 225 COMM

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SPEECH COMMUNICATION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the speech communication system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
NOTE: For the faults shown below: use the hand mic, set the intercom to OFF, listen to the speaker or pilot's headphones.		
LCD display hard to read (KX 125, GNS430W, AND GNS530W)	Contrast adjustment too low.	Adjust the contrast. (See Figures 2, 4, and 5)
Radio check reports readability good, strength poor due to low modulation.	Mic output low. Faulty radio.	Replace the defective mic. Replace the radio.
Radio check reports readability poor, strength good.	Faulty radio. Faulty mic.	Replace the radio. Replace the defective mic.
Radio check reports readability poor, strength poor.	Co-ax connector faulty.	Examine the co-ax and connections for condition and security.
Received audio is poor.	Faulty radio. Faulty antenna	Replace the radio. Replace the antenna.
Short range in transmit mode, but reception is OK.	Faulty radio.	Replace the radio.
Faults not covered with hand mic and speaker:		
No voice modulation when transmitting from one pilot's side. The other pilot's side is OK.	Audio integrating fault.	Refer to Chapter 23-50.
Cannot transmit. Transmit annunciator not shown in COMM display.	Faulty mic PTT switch. PTT wiring circuit open. Faulty audio panel mic select switch. Faulty radio.	Replace defective mic. Do a test for continuity. Refer to Chapter 92 for wiring diagrams. Replace the audio panel. Refer to Chapter 23-50. Replace the radio.

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SPEECH COMMUNICATION - MAINTENANCE PRACTICES

1. General

This part gives you the data to remove/install and adjust/test the components of speech communication systems on the aircraft. See the component manufactures manuals for more data and for shop data.

2. Remove/Install the Bendix/King KX-125 NAV COMM

A. Remove the Bendix/King KX-125 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 2 in Chapter 23-10.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix/King KX-125 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 2 in Chapter 23-10.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	

	Detail Steps/Work Items	Key Items/References
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the NAV COMM circuit-breaker.	
6.	Do a function test.	See below.

C. Bendix\King KX 125 NAV COMM Adjustment/Test

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-00655-0001 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	See this Chapter and Chapter 34-50.
2.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF COMM band.
3.	Test the VOR system at 4000 ft. Select a VOR frequency within 40 miles range. Listen to the station identifier. Test the operation of the tone identifier filter. Fly in-bound and out-bound on a selected VOR radial. Look for the correct LEFT-RIGHT and TO-FROM indications. Monitor the VOR accuracy.	
4.	Do a test of LOC operation and accuracy on a suitable runway.	
5.	If necessary, set the viewing contrast of the LCD display.	Through the small hole in the front panel.

3. Remove/Install the Bendix\King KLX 135/135A GPS COMM

A. Remove the Bendix\King KLX 135/135A GPS COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related GPS COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 3 in Chapter 23-10.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix\King KLX 135/135A GPS COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the rear of the unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 3 in Chapter 23-10.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the GPS COMM circuit-breaker.	
6.	Do a function test.	See below.

C. Adjustment/Test KLX 135/135A GPS COMM

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-10500-0003 for performance specifications.

Refer to the Bendix\King Pilot's Guide (#006-08751-0000 for the KLX 135, #006-08789-0000 for the KLX 135A) which gives start-up and operating procedures.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATA BASE. OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	See this Chapter and Chapter 34-50.
2.	Make sure that the data base is date valid.	Refer to Figure 3 in Chapter 23-10.
3.	Move the aircraft clear of buildings and ground equipment.	
4.	Bring the unit to the NAV READY status.	If the unit does not reach NAV READY status in 5 minutes, refer to the Bendix\King Pilot's Guide section 3.6: Initialization and Time to First Fix.
5.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF band.

D. Database Loading

You load the data base with an IBM compatible lap-top computer with a 3.5 in disk drive and an open COM1 or COM 2 port. Use interface kit Bendix\King part number 050-03213-0000.

	Detail Steps/Work Items	Key Items/References
1.	Connect the PC to the data loading port below the left instrument panel.	
2.	Set the KLX 135/135A to the SET 0 page.	
3.	Insert the diskette in the PC.	
4.	Cycle the power of the PC. Follow the menu instructions.	

4. Remove/Install the Garmin GNC 420W/GNS 430W/GTN 650

A. Remove the Garmin GNC 420W/GNS 430W/GTN 650

	Detail Steps/Work Items	Key Items/References
1.	Open the related GPS COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 4 in Chapter 23-10.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Garmin GNC 420W/GNS 430W/GTN 650/

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 4 in Chapter 23-10.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the GPS COMM circuit-breaker.	
6.	Do a functional test.	Refer to Paragraph C.

C. Garmin GNC 420W/GNS 430W/GTN 650- Adjustment/Test

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a GPS COMM test set to make sure that the system operates correctly. Refer to the appropriate installation manual for performance specifications.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATABASE. OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to Chapter 23-50.
2.	Make sure that the database date is valid.	Once the database has been acknowledged, the instrument panel self-test page will appear. Refer to the units Pilot's Guide and Reference for Instrument Panel Self-Test.

D. Database Loading

The GNS430W has two data card slots on the face of the unit. The NAV Data card is inserted in the left-most slot and the second slot is provided for the terrain card. Refer to 400W Series Pilot's Guide and Reference for NAV Data card use.

The GTN 650 utilizes various databases. With the exception of the navigation, Basemap, Safetaxi and obstacle databases which reside internal to the GTN, all datbases are stored in a single SD memory card that is inserted into the vertical slot on the left side of the panel. Refer to the GTN 650 Pilot’s guide for data card use.

5. Remove/Install the Garmin GNS530W

A. Remove the Garmin GN530W

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 5 in Chapter 23-10.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Garmin GN530W

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 5 in Chapter 23-10.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the NAV COMM circuit-breaker.	
6.	Do a functional test.	Refer to Paragraph C.

C. Garmin GNS530W - Adjustment/Test

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a GPS COMM test set to make sure that the system operates correctly. Refer to the GNS530W installation manual for performance specifications.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATABASE. OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to Chapter 23-50.
2.	Make sure that the database date is valid.	Once the database has been acknowledged, the instrument panel self-test page will appear. Refer to 500W Series Pilot's Guide and Reference for Instrument Panel Self-Test.

D. Database Loading

The GNS530W has two data card slots on the face of the unit. The NAV Data card is inserted in the left-most slot and the second slot is provided for the terrain card. Refer to 500W Series Pilot's Guide and Reference for NAV Data card use.

6. Remove/Install the Bendix/King KX155 NAV COMM

A. Remove the Bendix/King KA155 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 6 in Chapter 23-10.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix/King KA155 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 6 in Chapter 23-10.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the NAV COMM circuit-breaker.	
6.	Do a functional test.	Refer to Paragraph C.

C. Bendix/King KA155 NAV COMM - Adjustment/Test

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a GPS COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation Manual #006-00179-0006 for performance specifications.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATABASE. OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to Chapter 23-50.
2.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF COMM band.
3.	Test the VOR system at 4000 ft. Select a VOR frequency within 40 miles range. Listen to the station identifier. Test the operation of the tone identifier filter. Fly in-bound and out-bound on a selected VOR radial. Look for the correct LEFT-RIGHT and TO-FROM indications. Monitor the VOR accuracy.	
4.	Do a test of LOC/GS operation and accuracy on a suitable runway.	
5.	Do a test of the DME remote channeling.	If installed.

7. Remove/Install the IC-A200 VHF Air Band Transceiver

A. Remove the IC-A200 VHF Air Band Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Open the related circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw in the front panel. Engage the screw.	Refer to Figure 201.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the IC-A200 VHF Air Band Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Visually make sure that the metal catch on top of the transceiver is engaged.	
3.	Insert the transceiver slowly into the mounting rack.	Refer to Figure 201.
4.	Insert a 3/32 inch allen wrench into the hole in the front panel.	
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
5.	Turn the locking screw clockwise until the screw stops.	
6.	Close the circuit-breaker.	
7.	Do an operational test.	Refer to paragraph 7.C.

C. Operational Test of IC-A200 VHF Air Band Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Do the operational test of the transceiver in the “Receiving” mode as follows: - Select an operating frequency - Pull the volume control OUT to open the squelch manually - Rotate the volume control to adjust the audio level - Push the volume control IN to close the squelch.	The squelch automatically opens only when a signal is received.
2.	Do the operational test of the transceiver in the “Transmitting” mode as follows:	
NOTE: To prevent interference, listen on the frequency before transmitting. If the frequency is busy, wait until the frequency is clear.		
	- Select the yoke-mounted communication/intercom switch to the “Communication” position - Select an operating frequency - Push the PTT switch - Speak into the microphone at normal voice level. - Release the PTT switch to receive.	“TX” appears. Do not set the microphone too closely to your mouth or speak too loudly. This may distort the signal.

8. Remove/Install the SL40/GTR 225VHF COMM Transceiver

A. Remove the SL40 VHF COMM Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Open the related circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw in the front panel. Engage the screw.	Refer to Figure 202.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the SL40/GTR 225VHF COMM Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	
2.	Insert the transceiver slowly into the mounting rack.	Refer to Figure 202.
3.	Insert a 3/32 inch allen wrench into the hole in the front panel.	
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the circuit-breaker.	
6.	Do an operational test.	Refer to paragraph 8.C.

C. Operational Test of the SL40/GTR 225VHF COMM Transceiver

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to Chapter 23-50.
2.	Tune the unit to a local frequency.	Make sure that the receiver output produces a clear and understandable audio output.
3.	Verify the transmitter by contacting another station and getting a report of reliable communications.	

9. Antennas

Use a thin coat of 'Penatrox' (Manufacturer: Burndy) or 'Noalox' (Manufacturer: Ideal) corrosion inhibitor between the aluminum antenna backing plate and the copper foil ground plane. Apply a bead of Dow Corning 732 RTV around the antenna to give a waterproof seal.

10. Connectors

Remove contacts from connectors in the radio rack with Hand Ejector Tool Molex part number HT-1884. Crimp solderless contact terminals with Molex part number 6115.

Remove contacts from KI 208/209 connectors with Burndy part number RXK20-25 Extraction Tool Tip and part number RXT20-4P3 Extraction Tool Handle. Crimp Burndy Socket part number SC20M-6TK6 with Burndy Hytool M8ND.

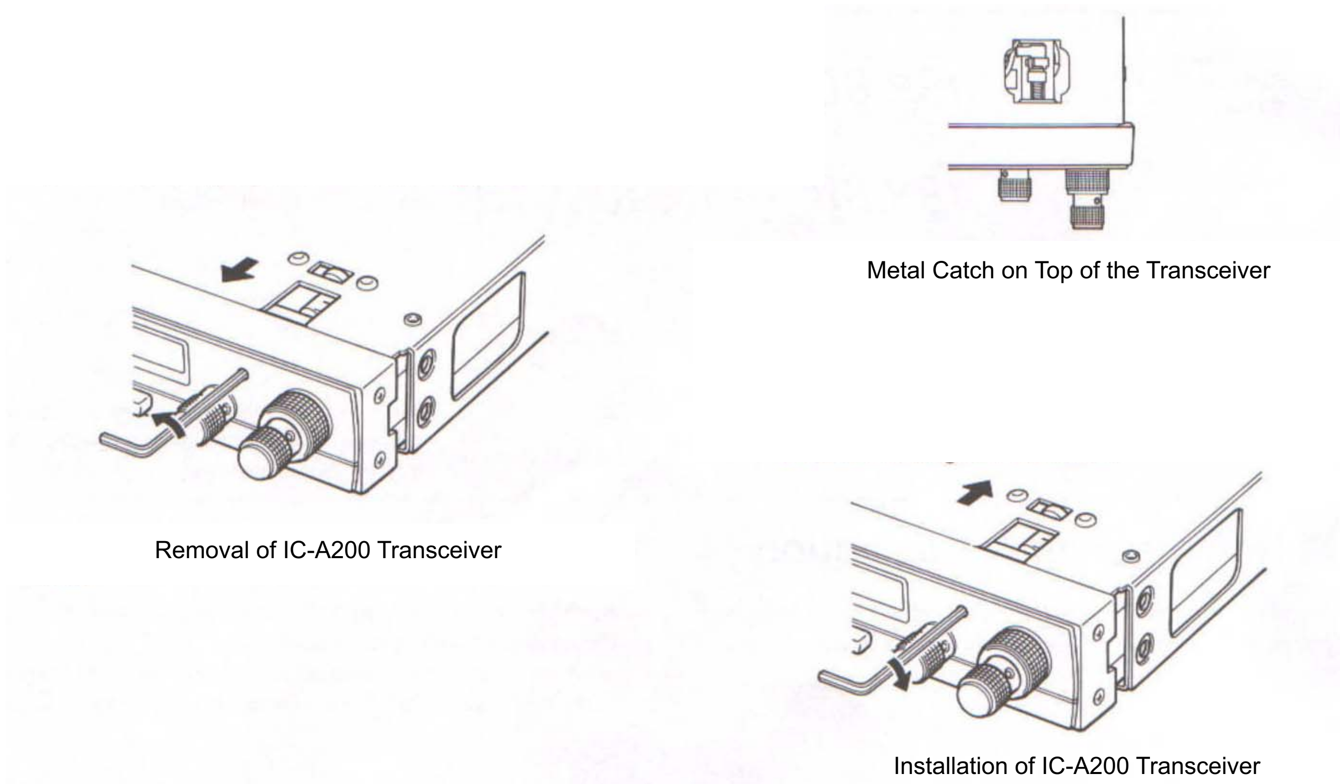
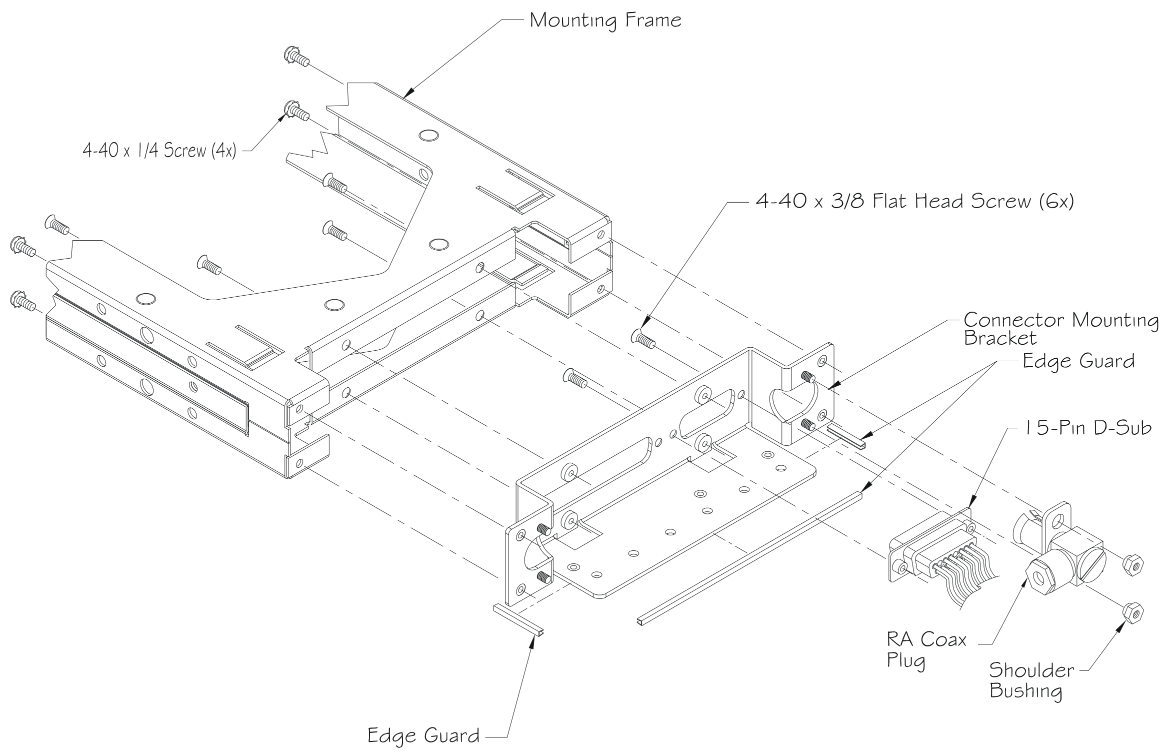
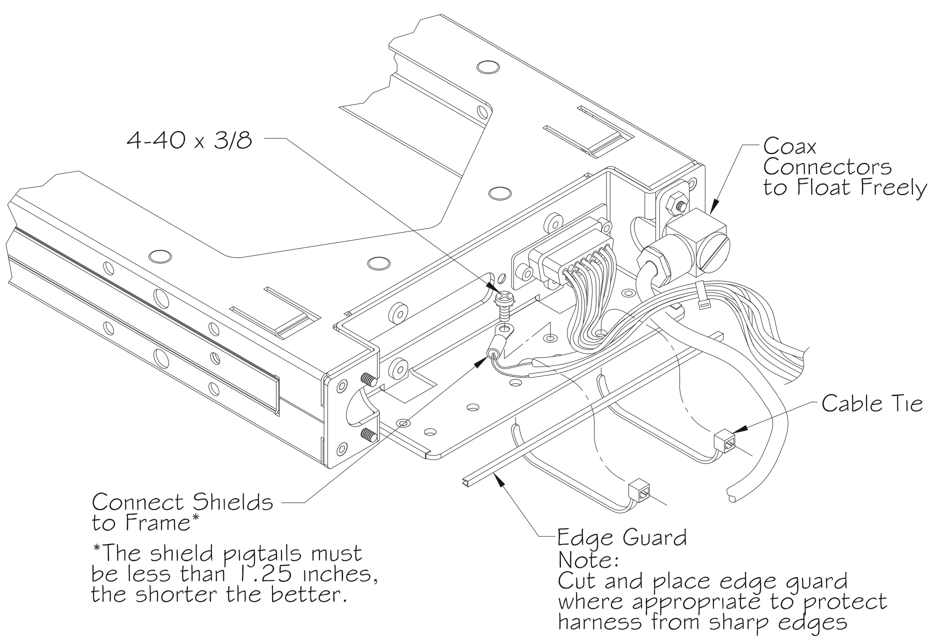


Figure 201 - IC-A200 VHF Air Band Transceiver Removal/Installation



Mounting Frame Assembly



Cable Routing

Figure 202 - SL40 VHF COMM Transceiver Removal/Installation

AUDIO INTEGRATING

1. General

The DA20-C1 aircraft has a voice-activated (VOX) intercom. This gives hands-free intercom when the pilots' use head-sets. Press-to-transmit switches are installed in the handle of each control stick. The microphone and the phone jack-sockets are located between the pilot's seats at shoulder height. There is also a microphone jack-socket on the left side of the instrument panel. The optional cabin speaker can be installed below the pilot's seat.

In single installations the integral speaker amplifier in the COMM equipment operates the (optional) cabin speaker. In dual installations, an audio panel with speaker amplifier is installed which operates the cabin speaker.

2. Description

A. PM 501 Intercom

Figure 1 shows the PM 501 intercom. The PM 501 is a 4 channel VOX intercom with individual amplifiers for each output. The headset jack-plugs connect to the PM 501. When the unit is set to OFF (or when the power fails), an internal relay connects the pilots headset to the aircraft radio. This gives fail-safe operation. The PM 501 has the following controls:

Control	Function
PUSH-ON/VOLUME knob	Push the knob to turn the intercom ON. Turn the knob to control the volume in all of the headsets.
SQUELCH knob	Adjusts the level at which the mic operates the intercom. When the knob is set fully counter-clockwise, the ambient noise operates the intercom. This gives a 'Hot mic' effect. Set the squelch to operate the intercom at a level which is correct for you. The VOX system has a 1 second delay. This prevents 'choppy speech'.
ISO/ALL switch:	
- ISO	The pilot is connected only to the aircraft radio. He is isolated from the intercom. The co-pilot cannot make or hear transmissions on the aircraft radio
- ALL	The pilot and co-pilot can hear the aircraft radio. Both pilots can communicate on the intercom.

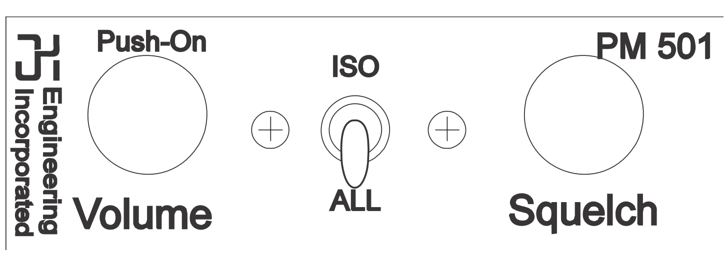


Figure 1 - PM 501 Intercom

B. PM 1000 Intercom

Figure 2 shows the PM 1000 intercom. The PM 1000 is a 4 channel VOX intercom with individual amplifiers for each output. The headset jack-plugs connect to the PM 1000. When the unit is set to OFF (or when the power fails), an internal relay connects the pilots headset to the aircraft radio. This gives fail-safe operation. The PM1000 is a 2-place, panel mounted intercom with individual volume and squelch controls for the pilot and copilot. This unit is designed to provide voice activated intercom in a dual audio control panel aircraft.

The PM 1000 has the following controls:

Control	Function
PUSH-ON/VOLUME knob	Push the knob to turn the intercom ON. Turn the knob to control the volume in all of the headsets.
SQUELCH knob	Adjusts the level at which the mic operates the intercom. When the knob is set fully counter-clockwise, the ambient noise operates the intercom. This gives a 'Hot mic' effect. Set the squelch to operate the intercom at a level which is correct for you. The VOX system has a 1 second delay. This prevents 'choppy speech'.
ISO/ALL switch:	
- ISO	The pilot is connected only to the aircraft radio. He is isolated from the intercom. The co-pilot cannot make or hear transmissions on the aircraft radio
- ALL	The pilot and co-pilot can hear the aircraft radio. Both pilots can communicate on the intercom.

The LED shows green when power is on, and is not a transmit indicator. The PM1000 does not have a direct interconnection with the aircraft audio, and therefore will not affect operation if power is removed. Because the crew’s intercom volume control does not affect the aircraft radio volume, it is possible to select various balances of volume level between the ICS and the aircraft radio while in the ALL mode. Reducing the intercom volume, the pilots can place the aircraft radio in the foreground while the ICS is in the background.

Figure 2 - PM 1000 Intercom

C. Bendix\King KMA 24 Audio\Marker Receiver

Figure 2 shows the KMA 24 Audio\Marker Receiver. The Bendix\King KMA 24 Audio\Marker Receiver has the following main components:

- A speaker isolation amplifier
- A headphone isolation amplifier
- A marker beacon receiver.

The KMA 24 has the following controls:

- A mic selector switch. This switch has OFF, TEL, COM1, COM2, INT and EXT settings. This switch connects the mic audio and PTT to the related radio. It also turns on the speaker amplifier
- A top row of push-buttons which set the avionic equipment to be heard on the speaker. The end right AUTO button automatically connects the COMM set by the mic selector switch to the speaker
- A bottom row of push-buttons which set the avionic equipment to be heard on the headphones. The end right AUTO button automatically connects the COMM set by the mic selector switch to the headphones
- A TEST switch. (Described in 34-30-00)
- A SENS switch. (Described in 34-30-00).

A 3-part display on the left of the panel has lights for the inner, middle and outer marker functions (See Chapter 34-30).

When the PTT button is pressed, the KMA 24 cuts the output to the speaker.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The ICS (for headphone amplifier) and Marker (for speaker amplifier) circuit-breakers must be closed. Turn the Mic selector switch clockwise from the OFF position to the radio which you will use. Push the top selector button for the equipment you wish to hear on the speaker. And push the bottom selector button for the equipment which you wish to hear on the headphones.

The speaker amplifier operates when the mic selector switch is not set to OFF. The headphone amplifier operates at all times.

D. Garmin GMA 340 Audio Panel

Figure 3 shows the GMA 340 Audio Panel. The Garmin GMA 340 is a panel mounted TSO'd audio panel that provides control of the aircraft audio system. The GMA 340 provides flexibility in switching up to three microphone and audio receiver communication inputs. Audio selection of NAV 1, NAV 2, ADF, DME and marker audio is available on the GMA 340 and GMA 340H. In addition, selection of ADF1 and ADF 2 is provided on the GMA 340 dual ADF. The GMA 340 includes a voice activated (VOX) intercom system and a three-lamp marker beacon receiver and display.

The VOX intercom uses rotary knobs for volume and squelch adjustment while selection of all other functions is accomplished with the use of push-buttons.

Marker HI and LO and button annunciation is accomplished with LED devices. Front panel backlighting of button function, squelch and volume control knobs is provided by LED's controlled by the aircraft lighting bus.

On the GMA 340 and GMA 340H the split com function allows the pilot and copilot to talk on COM 1 and COM 2 simultaneously.

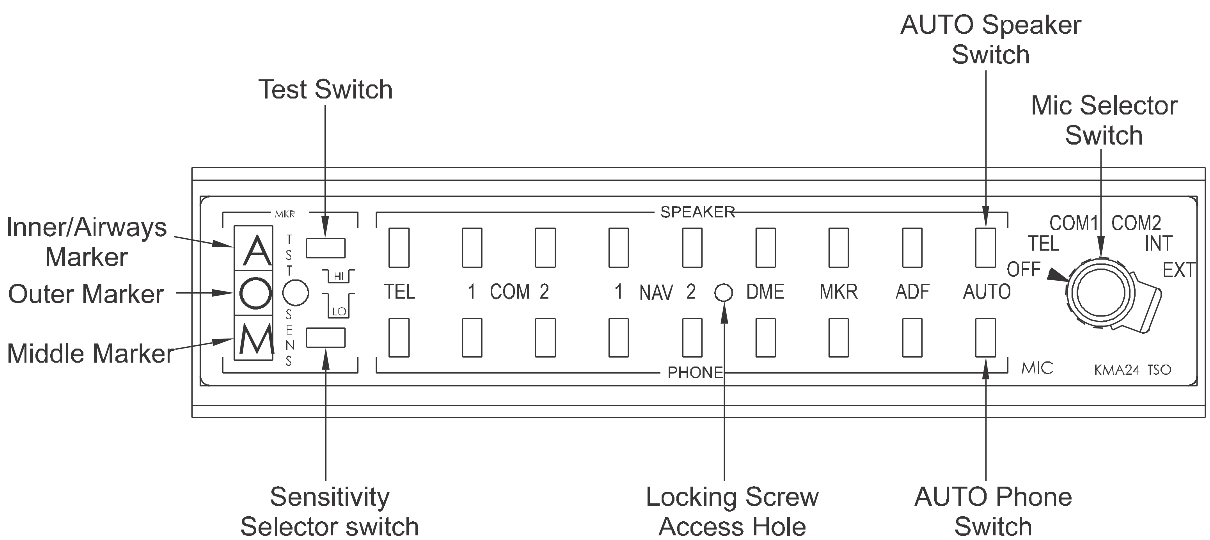
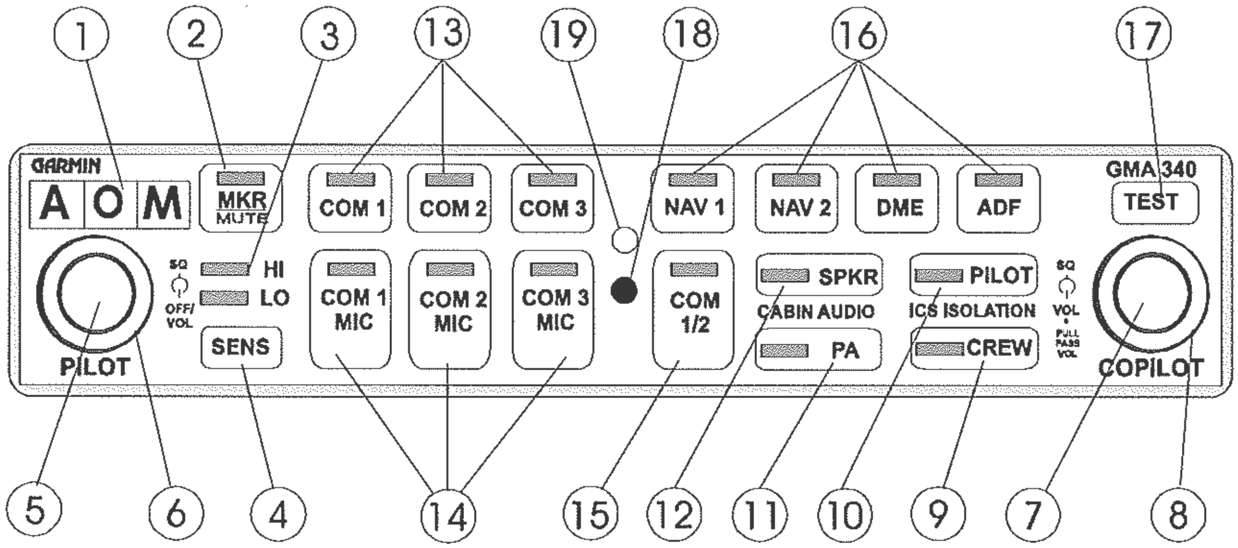


Figure 2 - KMA 24 Audio/Marker Receiver



Legend:			
1.	Marker Beacon Lights	11.	PA Function Button
2.	Marker Beacon Receiver Audio Select/Mute Button	12.	Speaker Function Button (DME in dual ADF)
3.	Marker Beacon Receiver Sensitivity Indicator LEDs	13.	Transceiver Audio Selector Buttons
4.	Marker Beacon Receiver Sensitivity Selection Button	14.	Transmitter (Audio/MIC) Selection Button
5.	Unit On/Off, Pilot Intercom System (ICS) Volume	15.	Split COM Button
6.	Pilot ICS Voice Activated (VOX) Intercom Squelch Level	16.	Aircraft Radio Audio Selection Button
7.	Copilot ICS Volume Control	17.	Annunciator Test Button
8.	Copilot VOX Intercom Squelch Level	18.	Locking Screw Access
9.	Crew Isolation Intercom Mode Button	19.	Photocell - Automatic Annunciator Dimming
10.	Pilot Address (PA) Function Button		

Figure 3 - GMA 340 Audio Panel

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AUDIO INTEGRATING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the audio integrating system. If you find the trouble in column 1, do the repair given in column 3.

A. PM 501/PM 1000

TROUBLE	POSSIBLE CAUSE	REPAIR
No voice modulation when transmitting from co-pilot's side on headset. Pilot’s side is OK.	Faulty headset. Open mic audio line. Faulty PM 501/PM 1000.	Replace headset. Do a test of the mic audio wiring. Refer to Chapter 92 for wiring diagrams. Replace the intercom.
No voice modulation when transmitting from pilot's side on headset. Co-pilot’s side is OK.	Faulty headset. Open mic audio line. Faulty PM 501/PM 1000.	Replace headset. Do a test of the mic audio wiring. Refer to Chapter 92 for wiring diagrams. Set the intercom to OFF. If the pilot can transmit with the intercom OFF, replace the intercom.
Cannot transmit. Transmit symbol not shown in COMM display.	Faulty mic PTT switch. PTT wiring circuit open. Faulty audio panel mic select switch. Faulty COMM unit.	Replace the defective mic. Do a test of the mic audio wiring. Refer to Chapter 92 for wiring diagrams. Replace the audio panel. Replace the COMM unit.
No intercom (PM 501) audio on pilot's headsets. Receives radio transmissions correctly.	Mode switch is in ISO position. Faulty intercom.	Set the mode switch to ALL. Replace the intercom.
No audio on co-pilot's headset.	Faulty headset. Open mic audio line. Faulty PM 501/PM 1000.	Replace headset. Do a test of the mic audio wiring. Refer to Chapter 92 for wiring diagrams. Replace the intercom.

B. GMA 340

Refer to Garmin GMA 340 Audio Panel, Maintenance Manual, Doc No.190-00149-02, latest revision, for detailed troubleshooting procedure.

TROUBLE	POSSIBLE CAUSE	REPAIR
When the power is turned ON, the unit fails.	Verify the voltage.	If the proper voltage is not measured in J1, then replace the main board in the unit. If the proper voltage is measured in J1 but not J3, then replace the power input board in the unit. If the proper voltage is measured at both J1 and J3, then replace the main board in the unit.
When you turn on the light, the unit fails.	Verify the voltage.	If the proper voltage is not measured in J1, then replace the main board in the unit. If the proper voltage is measured in J1 but not J2, then replace the power input board in the unit. If the proper voltage is measured at both J1 and J2, then replace the main board in the unit.
Lamp fails.	Verify the resistance check of lamps and flex cables.	If the resistance checks pass, replace the main board of the unit. If the resistance checks fail, remove and replace the flex cables and lamp assembly.
During the annunciator/lamp test, the unit fails.	Remove the front panel assembly and verify continuity from flex cable to the appropriate pin. If the continuity passes, then reinstall the front panel assembly and verify NLT 3.0V at appropriate pin when TEST is pressed and held.	If the continuity fails, remove and replace the flex cables. It it passes, then remove and replace the flex cables. Send the front panel to the factory for repair. If it fails, replace the main board.

AUDIO INTEGRATING - MAINTENANCE PRACTICES

1. General

This part gives you the data to remove/install and adjust/test the components of audio integrating system on the aircraft. See the component manufactures manuals for more data and for shop data.

2. Remove/Install the PM 501 Intercom

A. Remove the PM 501 Intercom

	Detail Steps/Work Items	Key Items/References
1.	Open the ICS circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the connector from the unit.	
4.	Remove the mounting screws and knobs from the unit.	Hold the unit.
5.	Remove the unit from the instrument panel.	

B. Install the PM 501 Intercom

	Detail Steps/Work Items	Key Items/References
1.	Put the unit in position in the instrument panel.	
2.	Install the attaching screws.	
3.	Connect the connector to the unit.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Close the ICS circuit-breaker.	
6.	Do a function test.	Refer to paragraph 2.C.

C. Adjustment/Test - PM 501 Intercom

(1) Equipment

Item	Quantity	Part Number
Headsets	2	Commercial

(2) Procedure

	Detail Steps/Work Items	Key Items/References
1.	Connect the headsets.	
2.	Select the mode switch to ALL.	
3.	Push the VOLUME control to turn on the unit.	
4.	Do a test for communication between the pilot and co-pilot.	
5.	Test the function of the VOLUME control.	Through the small hole in the front panel.
6.	Set the ISO/ALL switch to ISO.	Make sure that there is no intercom between the pilot and co-pilot.
7.	Pull the ICS circuit-breaker. Make sure that radio reception and transmission is possible from the pilot's headset.	

3. Remove/Install the PM 1000 Intercom

A. Remove the PM 1000 Intercom

	Detail Steps/Work Items	Key Items/References
1.	Open the ICS circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the connector from the unit.	
4.	Remove the knobs over the volume and the squelch control shafts.	
5.	Remove the mounting screws and knobs from the face plate of the unit.	Hold the unit.
6.	Remove the unit from the instrument panel.	

B. Install the PM 1000 Intercom

	Detail Steps/Work Items	Key Items/References
1.	Put the unit from behind the instrument panel, aligning the holes for the knobs, LED, and switch.	
2.	Install the attaching screws.	
3.	Connect the connector to the unit.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Install the knobs over the volume and the squelch control shafts.	
6.	Close the ICS circuit-breaker.	
7.	Do a function test.	Refer to paragraph 3.C.

C. Adjustment/Test - PM 1000 Intercom

(1) Equipment

Item	Quantity	Part Number
Headsets	2	Commercial

(2) Procedure

	Detail Steps/Work Items	Key Items/References
1.	Connect the headsets.	
2.	Select the mode switch to ALL.	
3.	Push the VOLUME control to turn on the unit.	
4.	Do a test for communication between the pilot and co-pilot.	
5.	Test the function of the VOLUME control.	Through the small hole in the front panel.
6.	Set the ISO/ALL switch to ISO.	Make sure that there is no intercom between the pilot and co-pilot.
7.	Pull the ICS circuit-breaker. Make sure that radio reception and transmission is possible from the pilot's headset.	

4. Remove/Install the Bendix\King KMA 24 Audio/Marker Receiver

A. Remove the Bendix\King KMA 24 Audio/Marker Receiver

	Detail Steps/Work Items	Key Items/References
1.	Open the marker and ICS circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 2 in Chapter 23-00.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix\King KMA 24 Audio/Marker Receiver

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the rear of the unit.	
2.	Slide the unit into the rack. Engage the locking screw.	Refer to Figure 2 in Chapter 23-00.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the marker and ICS circuit-breakers.	
6.	Do a function test.	See below.

C. Adjustment/Test KMA 24 Audio/Marker Receiver

If possible, do an operational flight check of the marker receiver functions after the KMA 24 has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-00180-0001 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of the marker receiver control function.	Refer to Chapter 34-30 for description.
2.	Press the Test button: - Make sure that the 3 marker beacon lights come on.	Refer to Figure 3 in Chapter 23-00.
3.	Do a test of each audio source button: - Set one selector button to ON. - Set the selector button to OFF.	Make sure that the speaker or phone operates correctly for each button.
	- Do this for each button that controls an audio source.	
4.	Make sure that the COMM 1 and 2 speaker and phone buttons are set to OFF.	
5.	Set the AUTO SPEAKER and PHONE buttons to ON.	
6.	Set the mic selector switch to COM 1.	Make sure that you can hear received audio from COMM 1 on the speaker and headphones.
7.	Set the mic selector switch to COM 2.	Make sure that you can hear received audio from COMM 2 on the speaker and headphones.
8.	Do a radio check on COMM 1 and COMM 2.	To make sure that the mic audio and PTT lines operate correctly.

5. Remove/Install the GMA 340 Audio Panel

A. Remove the GMA 340 Audio Panell

	Detail Steps/Work Items	Key Items/References
1.	Open the related circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the GMA 340 Audio Panel

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related circuit-breaker.	
6.	Do a functional test.	

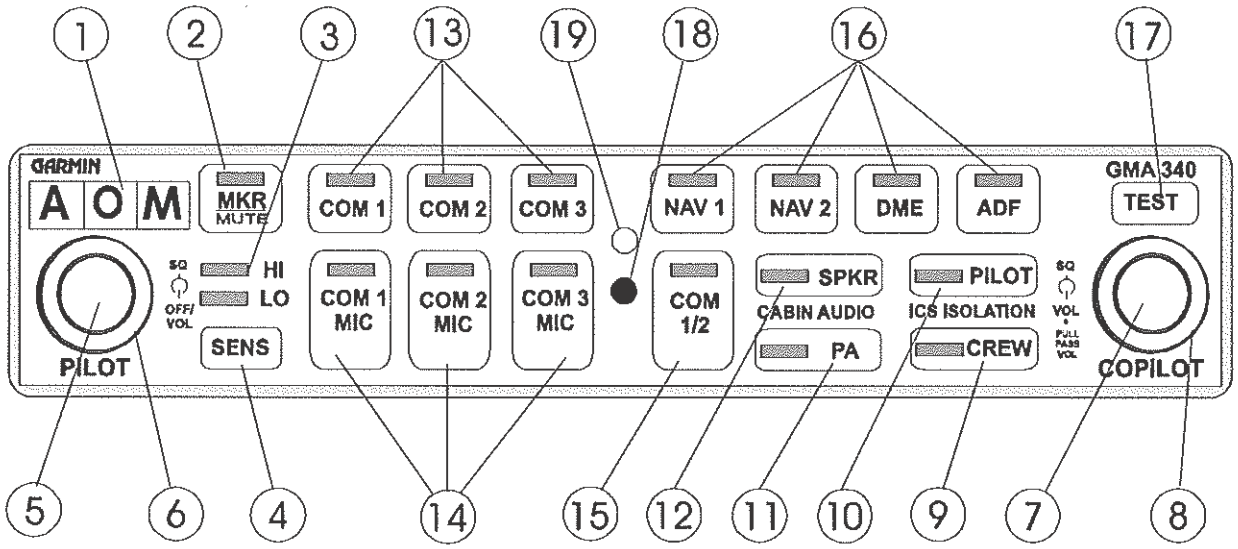
C. Adjustment/Test of the GMA 340 Audio Panel

	Detail Steps/Work Items	Key Items/References
1.	Do the lamp test as follows:	
	- Apply power to the unit by rotating the pilot intercom knob clockwise	Refer to item 5 in Figure 201.
	- Press the TEST button to confirm the operation of the LEDs	Refer to item 17 in Figure 201.
	- Cover the photocell with a finger and observe that the LED annunciators dim automatically	Refer to item 19 in Figure 201.
	- Check the front panel backlighting and dimming function.	Make sure that each annunciation is illuminated.
2.	Do a failsafe operation check as follows:	
	- Turn the power OFF to the unit by rotating the pilot intercom knob counter clockwise	
	- Check the failsafe operation by exercising the COM 1 microphone, microphone key and audio over the headphones.	
	- Apply power to the unit by rotating the pilot intercom knob clockwise.	
	CAUTION: THE HEADSET JACKS OF GMA 340 ARE POWERED. TRANSMITTING WITH AN INLINE PTT WILL DAMAGE THE AUDIO PANEL AND IS PROHIBITED.	
3.	Do the operational check of the transceiver as follows:	
	- Do a ramp test radio check by exercising the installed receivers, microphone, microphone key and audio over the headphones and speaker.	Make sure that the communications are loud and clear and PTT operation is correct.
4.	Do the Intercom System (ICS) check as follows:	
	- Set the intercom to the ALL mode	
	- Plug in the headsets at each ICS position	
	- Adjust squelch and volume for each position	Refer to items 8 and 7 in Figure 201. Make sure that the ICS is working properly.

	Detail Steps/Work Items	Key Items/References
	- Check pilot and copilot ICS positions for isolation and proper operation of volume and squelch controls. - Press the PA button.	Refer to items 5, 6, 7 and 8 in Figure 201. Refer to item 11 in Figure 201. Make sure that the microphone audio is heard over the speaker.
5.	Do the aircraft receivers check as follows: - Check for pilot/copilot audio isolation when pressing the COM 1/2 button. - Press the SPKR button.	 Refer to item 15 in Figure 201. Refer to item 12 in Figure 201. Make sure that any selected audio is heard over the speaker.

6. Connectors

Remove contacts from connectors in the radio rack with Daniels insertion/extraction tool number M24308/18-1. Crimp solderless contact terminals with Daniels part number AFM8 with positioner K42.



Legend:

1.	Marker Beacon Lights	11.	PA Function Button
2.	Marker Beacon Receiver Audio Select/Mute Button	12.	Speaker Function Button (DME in dual ADF)
3.	Marker Beacon Receiver Sensitivity Indicator LEDs	13.	Transceiver Audio Selector Buttons
4.	Marker Beacon Receiver Sensitivity Selection Button	14.	Transmitter (Audio/MIC) Selection Button
5.	Unit On/Off, Pilot Intercom System (ICS) Volume	15.	Split COM Button
6.	Pilot ICS Voice Activated (VOX) Intercom Squelch Level	16.	Aircraft Radio Audio Selection Button
7.	Copilot ICS Volume Control	17.	Annunciator Test Button
8.	Copilot VOX Intercom Squelch Level	18.	Locking Screw Access
9.	Crew Isolation Intercom Mode Button	19.	Photocell - Automatic Annunciator Dimming
10.	Pilot Address (PA) Function Button		

Figure 201 - GMA 340 Audio Panel

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STATIC DISCHARGING

1. General

A special bonding system is necessary for the composite structure of the DA20-C1 aircraft. The composite structure does not conduct electricity. Copper foil tape bonds to the inside of the structure to make a conducting path. A special conductive adhesive bonds the tape to the structure. Bonding wires connect the foil to all metal components and antenna ground planes.

2. Description

Figure 1 shows the bonding installation in the aircraft.

The copper tape in the fuselage makes a loop. One end of the loop connects to the firewall at a feed-thru connection. The engine bonding wire connects to the feed-thru connection on the front face of the firewall. The other end of the loop connects to the right side of the firewall in the same way.

The copper tape goes along each side of the fuselage. The side tapes are connected by a piece of copper tape on the forward face of the B-bulkhead. Pop-rivets attach faston tabs to each end of the tape on the B-bulkhead. Jumper wires connect the faston tabs to the 2 copper tapes which go aft of the B-bulkhead.

Bonding jumper wires connect to all main metal components. Pop rivets through the structure and the copper tape hold faston connectors. The jumper wires attach to the connectors.

Copper tape also makes the ground planes for antennas. The strips of copper tape over-lap each other. The conductive adhesive for the tape bonds the strip together. It also bonds the ground plane to the bonding loop.

You can test the bonding system like other bonding systems. The maximum resistance values between connection points must not be more than standard bonding connection tolerances.

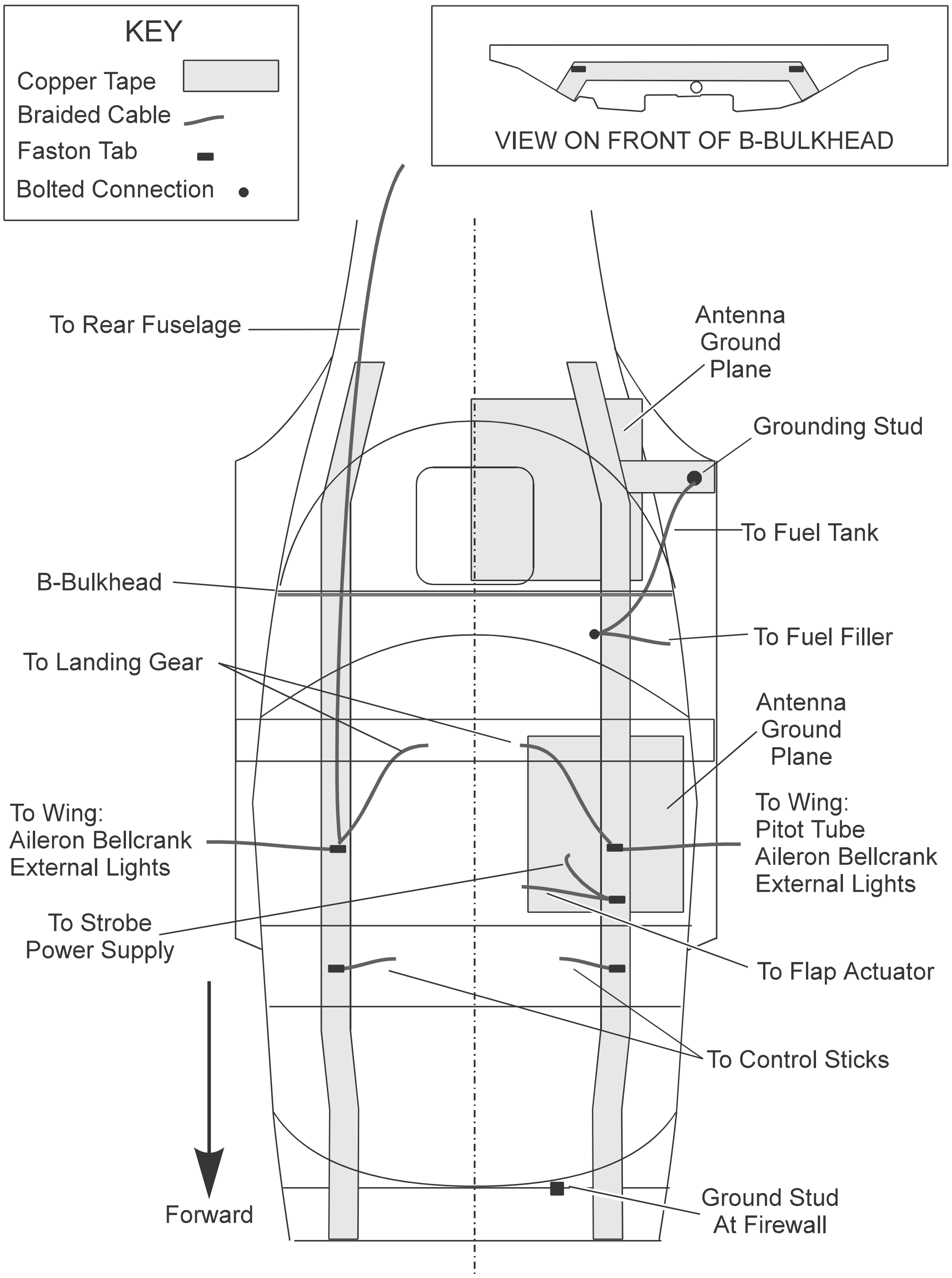

Figure 1 - Bonding

STATIC DISCHARGING - MAINTENANCE PRACTICES

1. General

This chapter describes how to:

- repair copper tape (or how to install new copper tape) and bonding tabs
- test the bonding system.

Aluminum touching copper causes corrosion. Protect areas where aluminum touches copper tape. Use a material which prevents a reaction between aluminum and copper. The material must conduct electricity. Use one of the following or an equivalent product:

- Noalox (Ideal)
- Penatrox (Burndy).

The edges of copper tape which touch GFRP can lift. Apply a moderate amount of 189 contact adhesive (Ontario Rubber, Mississauga, Ontario, Canada) with a brush. Cover the top of the tape and the GFRP for 1 in (25 mm) each side of the join.

Apply protective coating to the base of a tab which overlaps the copper tape. Use NYCOAT 7-11 (Nycoat laboratories, North Hollywood, CA) or an equivalent product.

2. Repair/Install the New Copper Tape

A. Material

Item	Quantity	Part Number
Copper tape (3M)	A/R	1181
Industrial alcohol	A/R	Commercial
189 Contact adhesive or equivalent	A/R	Commercial

B. Repair/Installation Procedure

	Detail Steps/Work Items	Key Items/References
1.	Clean the area where adhesive will touch.	Remove all dirt, oil and resin.
2.	Immediately before applying tape (or making contact with electrical connections) clean the surface with alcohol.	Use alcohol or an equivalent cleaning solution.
NOTE: If necessary, remove the resin from the edges of the copper tape. This will make sure that over-lapping tape will make a good contact.		
3.	Apply copper tape to overlap existing tape.	The overlap must be at least 0.5 in (12 mm) along the length of the new tape.
4.	Apply more tape as above until you have covered the area.	
5.	Apply 189 contact adhesive to the top of the tape and the GFRP where they join.	Use a brush to apply the adhesive for 1 in (25 mm) each side of the join.
6.	Do a bonding resistance check.	

3. Replace/Install the New Bonding Tabs

A. Material

Item	Quantity	Part Number
NYCOAT 7-11	A/R	Commercial
Industrial alcohol	A/R	Commercial

B. Procedure

	Detail Steps/Work Items	Key Items/References
1.	Remove the loose tab.	
2.	Clean the area where the new tab will touch.	Remove all dirt, oil, and resin.
3.	Apply protective coating to the base of a tab which overlaps the copper tape.	Use NYCOAT 7-11 or an equivalent product.
4.	Do a bonding resistance check.	

CHAPTER 24-00
ELECTRICAL POWER

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ELECTRICAL POWER

1. General

NOTE: Throughout this chapter the nomenclatures "generator" and "alternator" are used for the same component. For DA20-C1 aircraft purposes, the terms "generator" and "alternator" are interchangeable in this document.

This chapter describes about the electrical system on the aircraft. The chapter has only simplified schematic diagrams and location diagrams. Refer to Chapter 92 for wiring diagrams. Refer to the related Chapter for data about systems. For example, refer to Chapter 80 for data about the starter system.

The DA20-C1 aircraft has a 14 volt direct current (DC) electrical system. The system has two sources of electrical power. It has a 14 volt generator and has a 12 volt battery. In the usual operation, the generator supplies the power for the system.

The generator attaches to the front of the engine. A flexible belt turns the generator. The generator has a built-in rectifier and voltage regulator.

The battery position is aft of the baggage compartment in the battery compartment, or battery can be located on the front left hand side of the firewall.

Figure 1 shows a simplified schematic diagram of the Electrical Power System. An over-voltage sensor protects the electrical system from too high a generator voltage. The over-voltage sensor controls a relay which isolates the generator from the system.

The electrical system has a 12 volt, 20 ampere hour battery. The battery supplies DC to the electrical system when the generator is not operating. It also supplies power for engine starting. The battery can also supply power when the load is more than the generator can supply.

The battery supplies heavy current for starting through the battery relay and the starter relay. The circuit has no protection. Circuit-breakers or fuses protect all other circuits. The GEN/BAT switch controls all electrical power sources in the system. A main bus and an avionics bus distribute power to the consumer systems.

The battery relay attaches to the rear of the battery compartment, or the battery relay can be located on the front left hand side of the firewall.

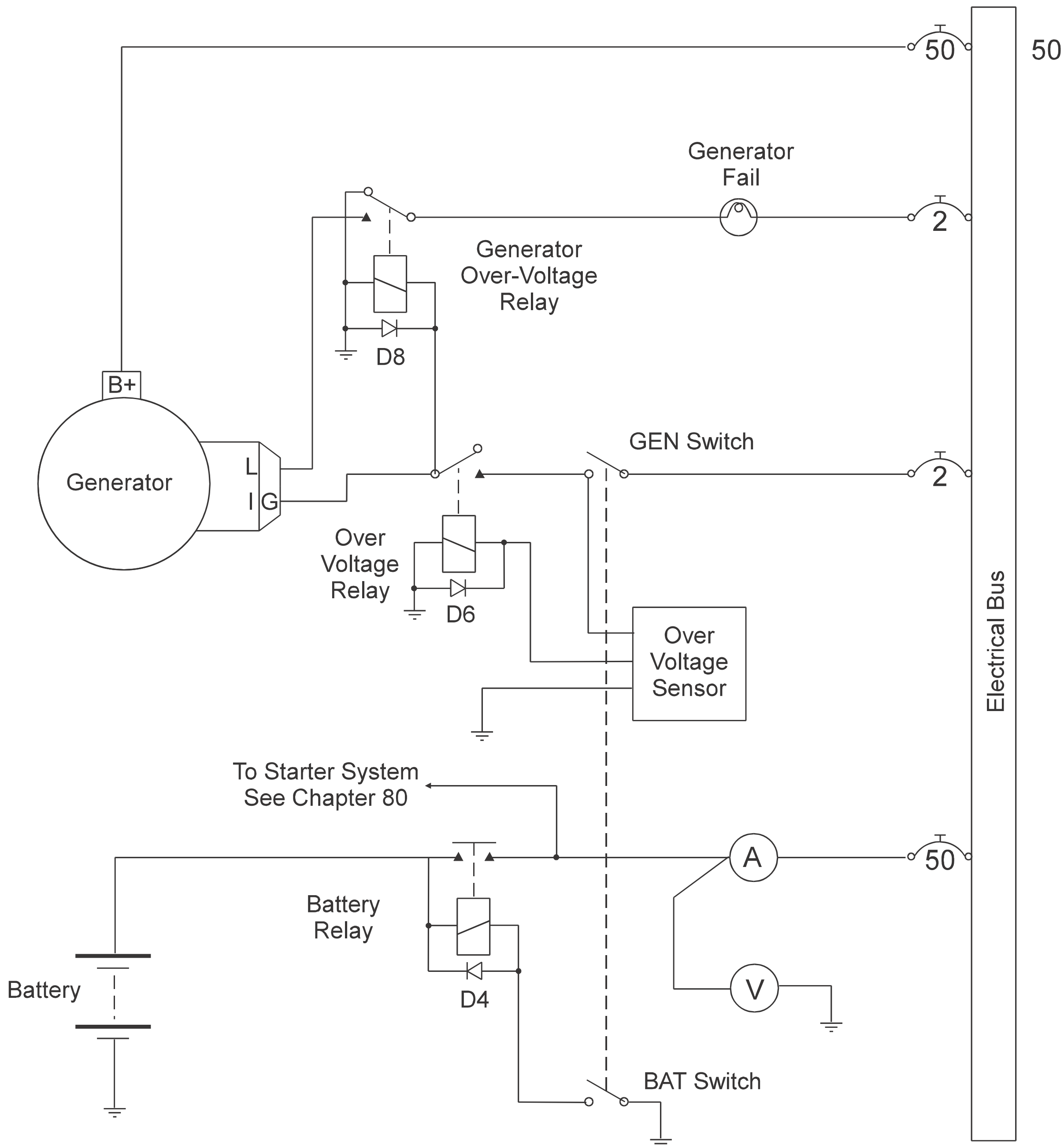


Figure 1 - Simplified Schematic Diagram

2. Component Identification

All electrical components are identified in accordance with the ATA *i*Spec2200 specification. For example:

OV2430-02

- OV: Over voltage sensor
- 24: Chapter 24 Electrical Power
- 30: Section 30 DC Generation

3. Component Location

Figure 2 shows the location of the main components in the electrical power system.

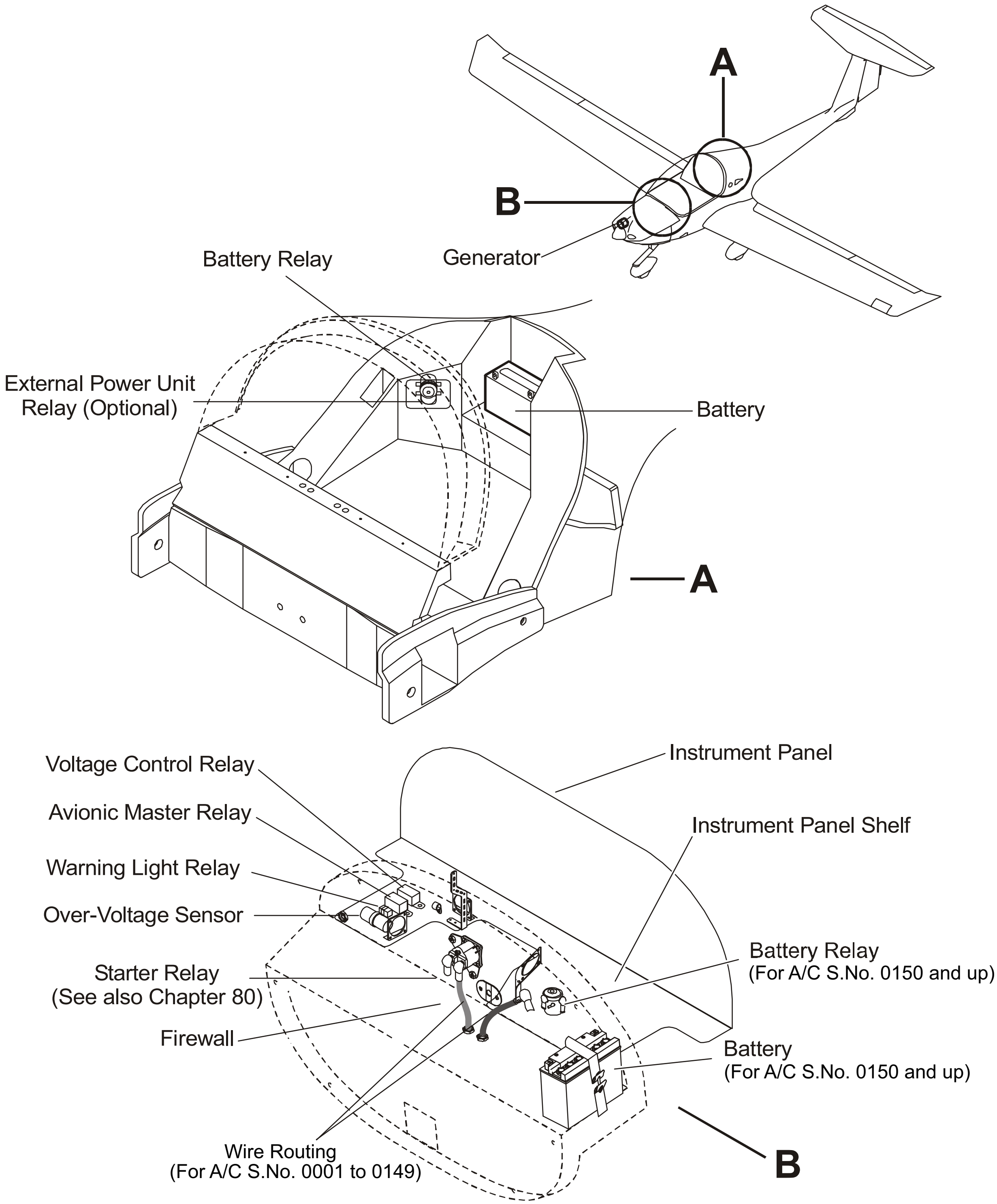


Figure 2 - Component Location Diagram

DC GENERATION

1. General

The DC generation system has the following components:

Component	Identification
Generator	GO2430-03
Over-voltage Control Relay	OV2430-01
Over-voltage Sensor	OV2430-02
Generator Warning Light	GO2430-01
Generator Circuit-breaker	GO2430-02
Generator Control Circuit-breaker	GC2430-01
Voltmeter	VM2430-01
Ammeter	AM2430-01
Warning Light Relay	GO2430-04
GEN/BAT Switch	GC2430-02

Chapter 24-00 Figure 2 shows the location of some of the components.

2. Description and Operation

A. Generator

A 40 amp generator attaches to the front right of the engine. A flexible belt turns the generator. A pulley on the engine crankshaft operates the flexible belt. The generator is the usual source of power for the electrical system.

The nominal output-voltage of the generator is 14 volts DC ±2.5%. A rectifier and voltage regulator are built-in to the generator. You cannot adjust the output voltage.

The generator has the following connections:

- The main bus supplies power to terminal IG of the generator for excitation
- Terminal B supplies the generator output
- Terminal L gives failure warning.

Brushes and slip-rings transmit the field current to the rotor. The rotor has a fan for blast-cooling the generator.

The generator can supply 40 amps continuously at engine speeds of 1742 to 2800 RPM. The graph at Figure 1 shows the generator performance.

The generator will come on line when:

- The engine is operating
- The battery, generator and generator control circuit-breakers are closed
- The GEN/BAT switch is set to ON.

B. Generator Control

The following components make the generator control system:

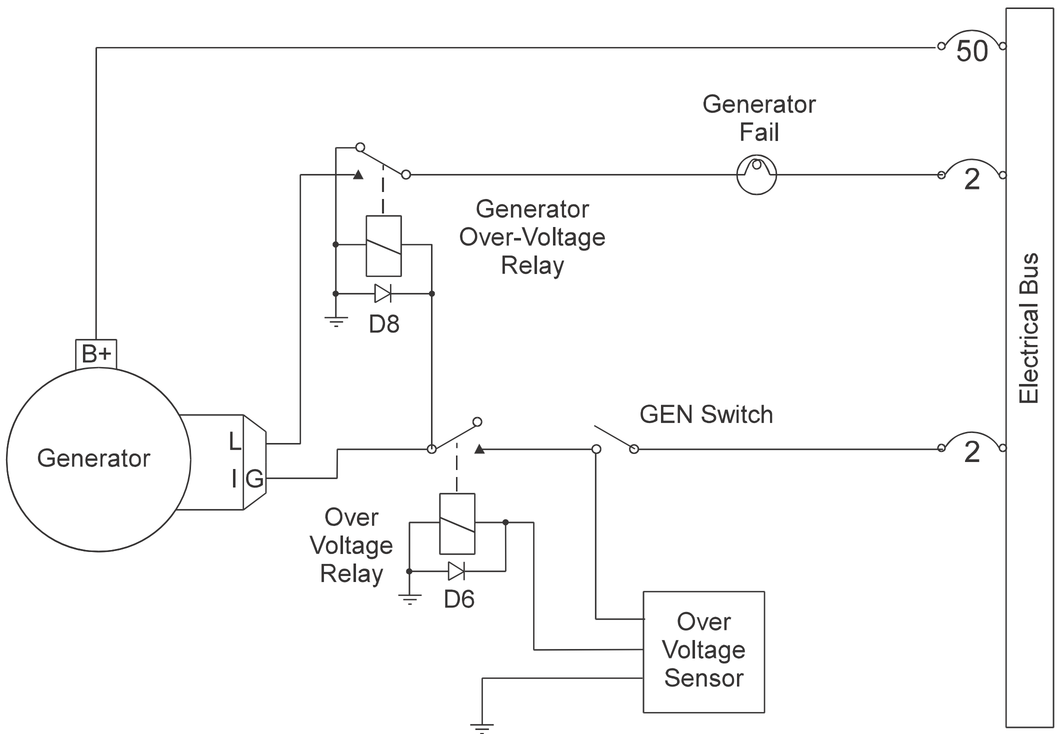
- GEN/BAT switch GC2430-02
- Over-voltage sensor OV2430-02
- Over-voltage relay OV2430-01.

Refer to Chapter 92 for the wiring diagram 22-2400-98-00 Sheet 1-1.

When the GEN/BAT switch GC2430-02 is set to ON, pin 2 of the over-voltage sensor OV2430-02 receives battery voltage from the main bus #1. Pin 1 of the over-voltage sensor supplies positive bus voltage to the coil of the over-voltage relay OV2430-01. The relay energizes. The closed contacts of the over-voltage relay supply #1 main bus voltage to terminal IG on the generator. The generator comes on-line.

If the over-voltage sensor senses more than 16.1 volts at its input (pin 2), the output voltage on pin 1 goes to zero. The over-voltage relay de-energizes. This removes the excitation voltage for the generator and the generator goes off-line.

If you cycle the GEN/BAT switch OFF and ON after the over-voltage has cleared, the generator will come back on line.



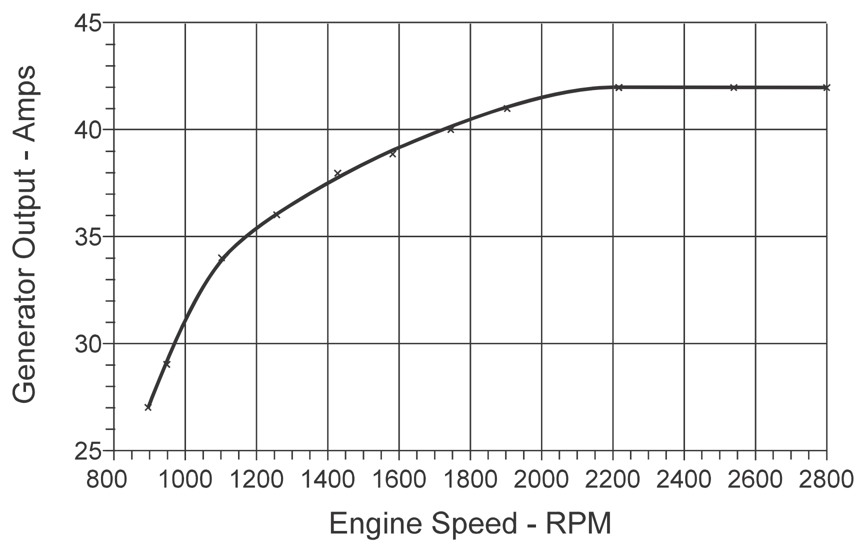


Figure 1 - Simplified Schematic Diagram and Generator Performance Graph

C. Generator Identification

The following components make the generator indication system:

- GEN warning light GO2430-01. To test the warning light, push the lens in
- Warning light relay GO2430-04
- Voltmeter VM2430-01
- Ammeter AM2430-01.

If the cockpit is in the usual flight configuration (all circuit-breakers closed), the warning light will come ON in the following cases:

- The GEN/BAT switch is set to ON. The engine is not running
- The voltage on the main bus is more than 16.1 volts
- The generator has failed. The engine is not running
- The lens cap on the GEN warning light is pushed (test function).

Refer to Chapter 92 for the wiring diagram 22-2400-98-00 Sheet 1-1.

When a generator failure occurs, terminal L on the generator gives a ground (through the closed contacts of the warning light relay GO2430-04) to the GEN warning light GO2430-01. The GEN warning light comes ON.

If the over-voltage sensor senses more than 16.1 volts at its input (pin 2), the output voltage on pin 1 goes to zero. The over-voltage relay de-energizes. This de-energizes the warning light relay GO2430-04. The normally closed contacts of the warning light relay give a ground to the GEN warning light GO2430-01. The GEN warning light comes ON.

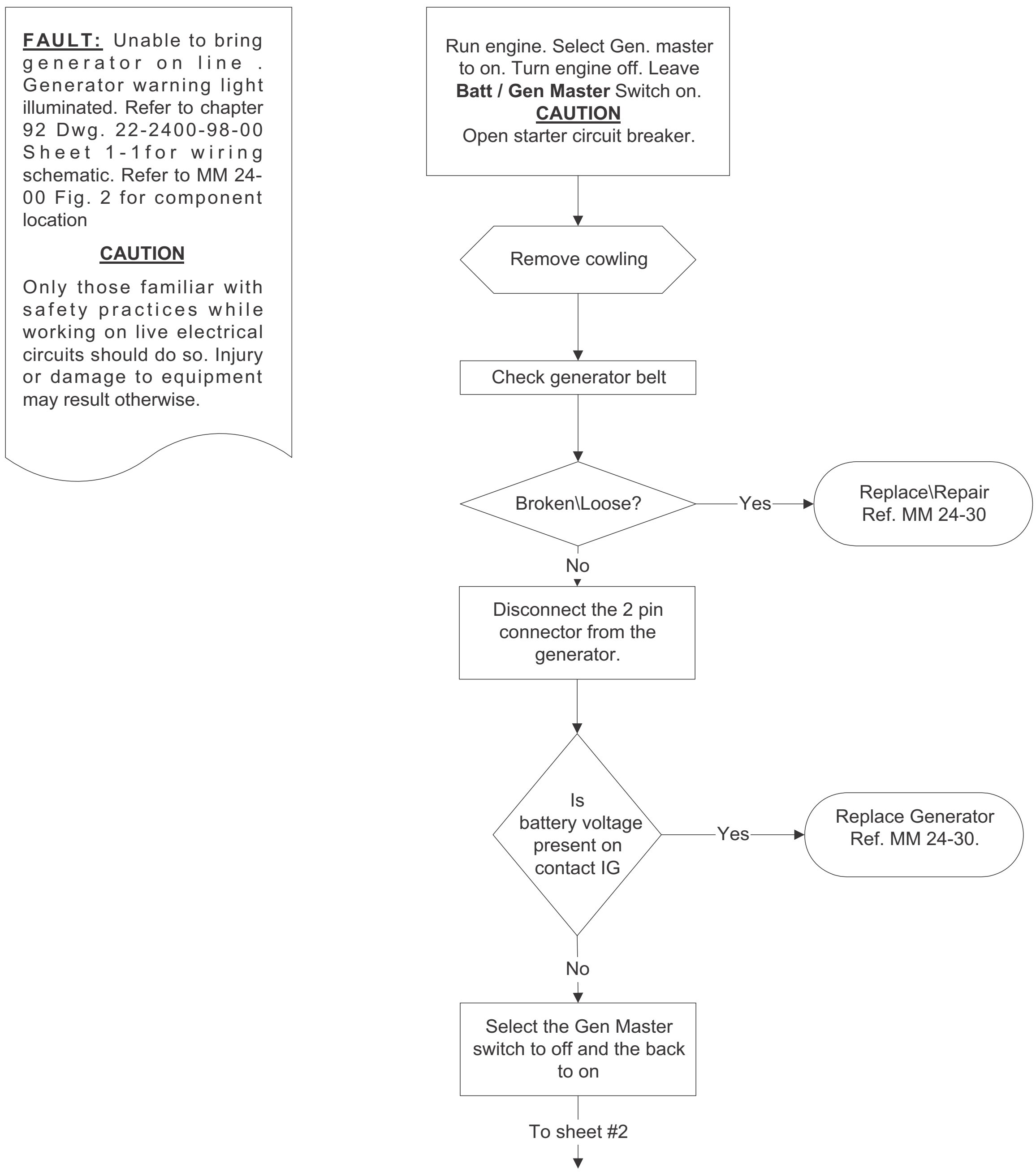
The voltmeter VM2430-01 shows the voltage on the main bus. It usually shows 14 volts when the generator is on-line. It shows the battery voltage when the generator is off-line. The voltmeter may show less than 14 volts during high electrical loads and low engine RPM. This shows that the battery is helping the generator.

The ammeter AM2430-01 shows the current flowing between the battery and the main bus. When the ammeter needle shows +, the battery is receiving a charge. When the ammeter needle shows -, the battery is supplying current.

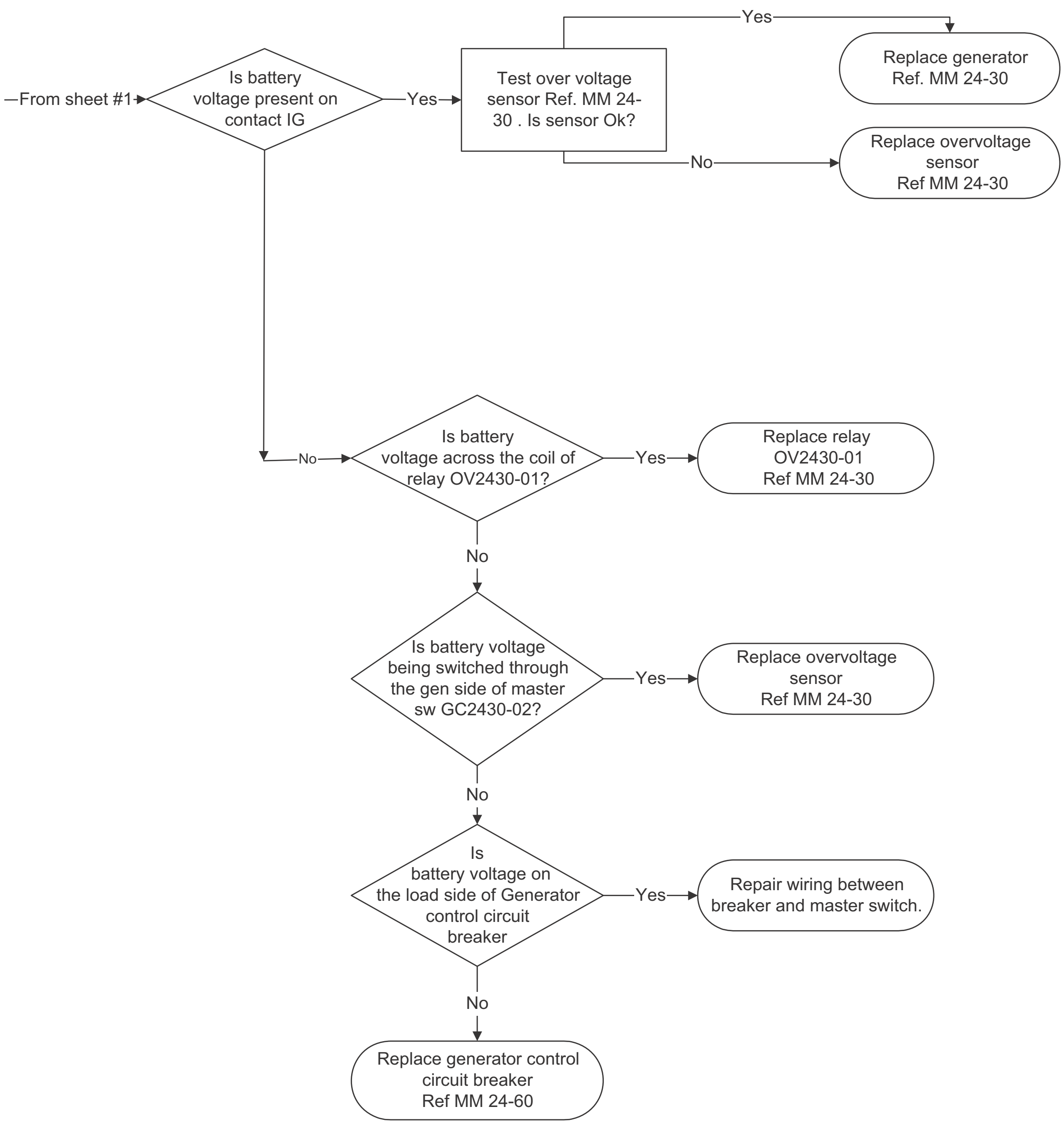
DC GENERATION - TROUBLESHOOTING

1. General

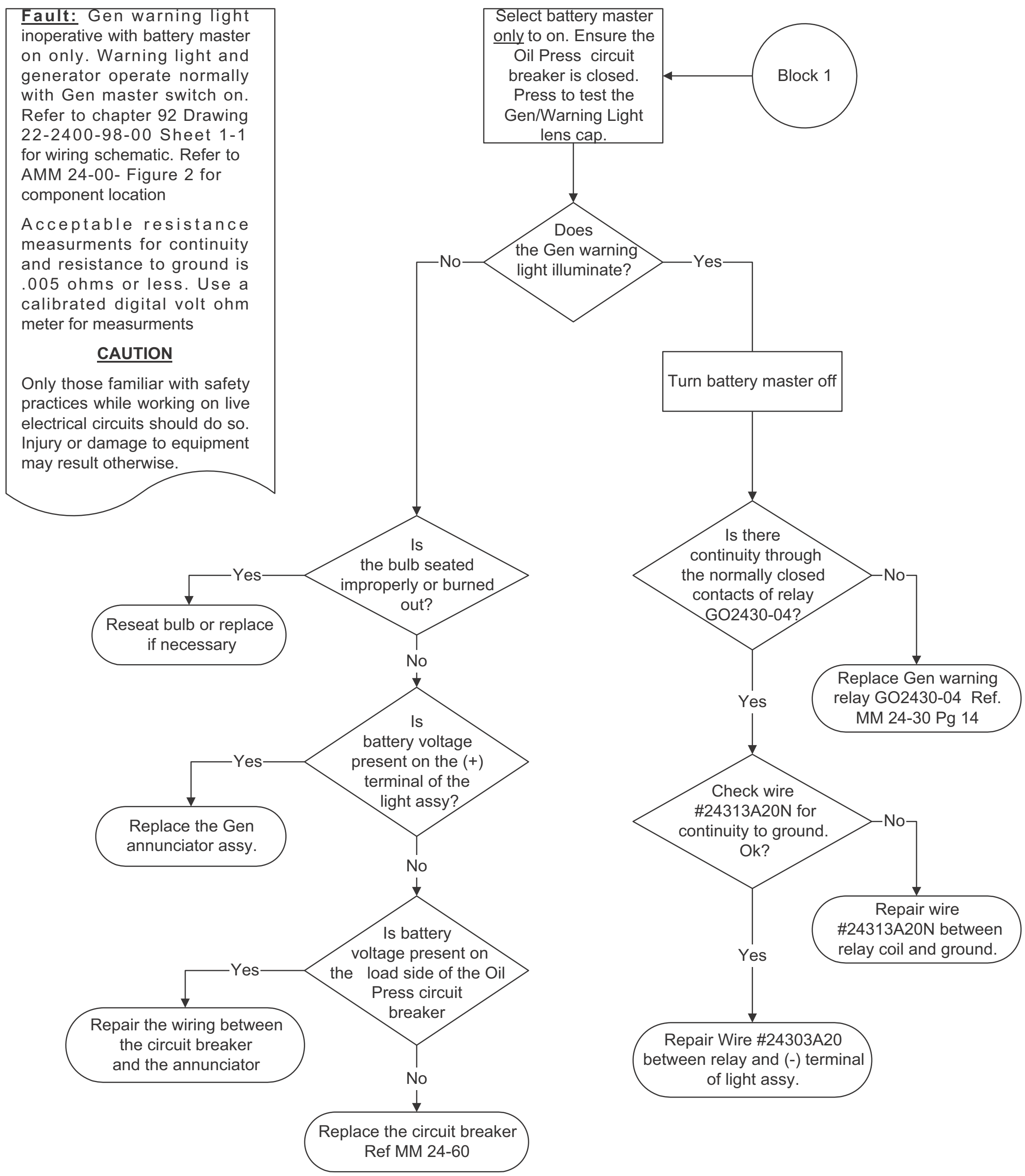
Use the following flow charts to trouble-shoot the DC electrical generation system:



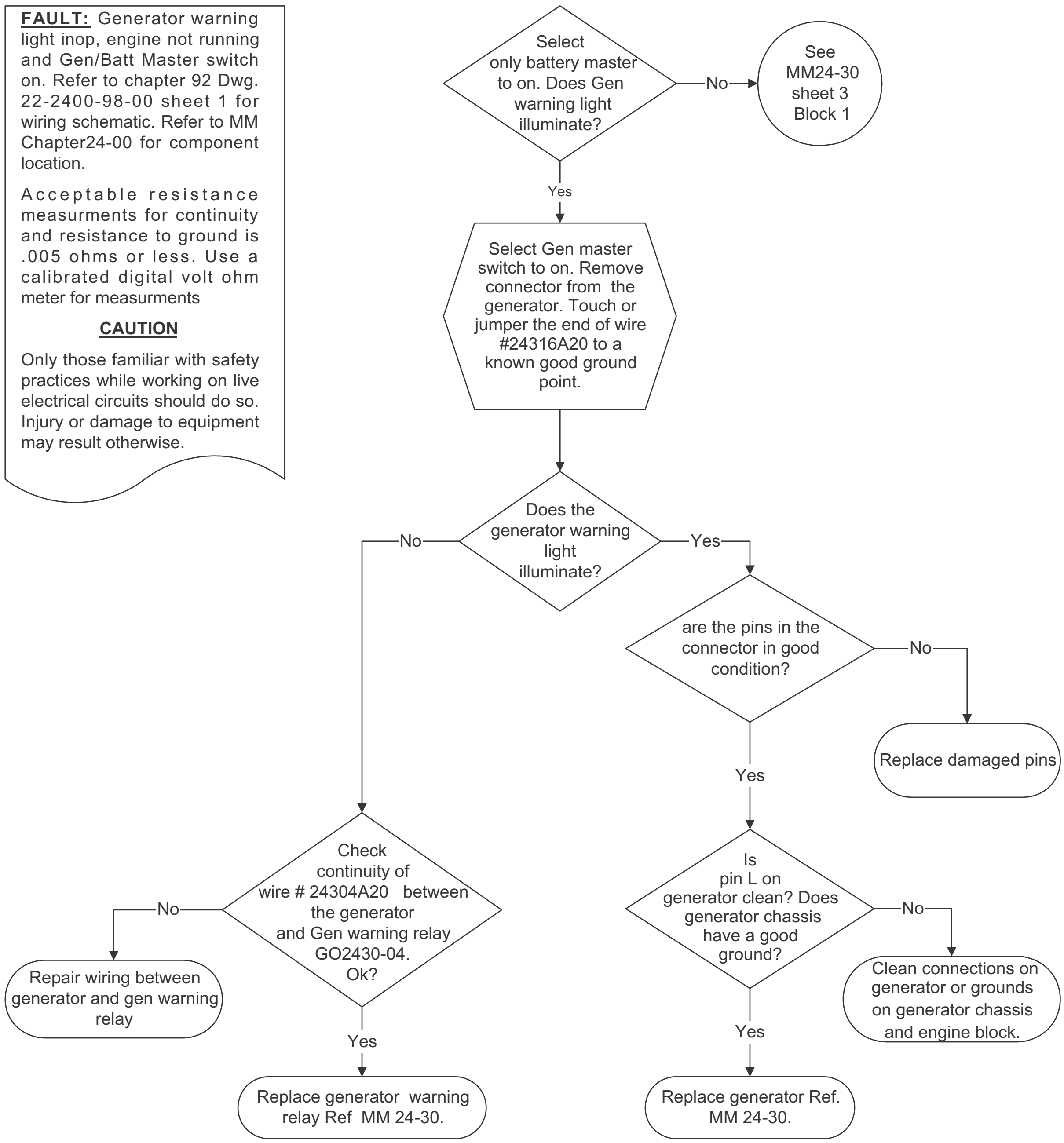
Flow Chart - Sheet 1 of 5



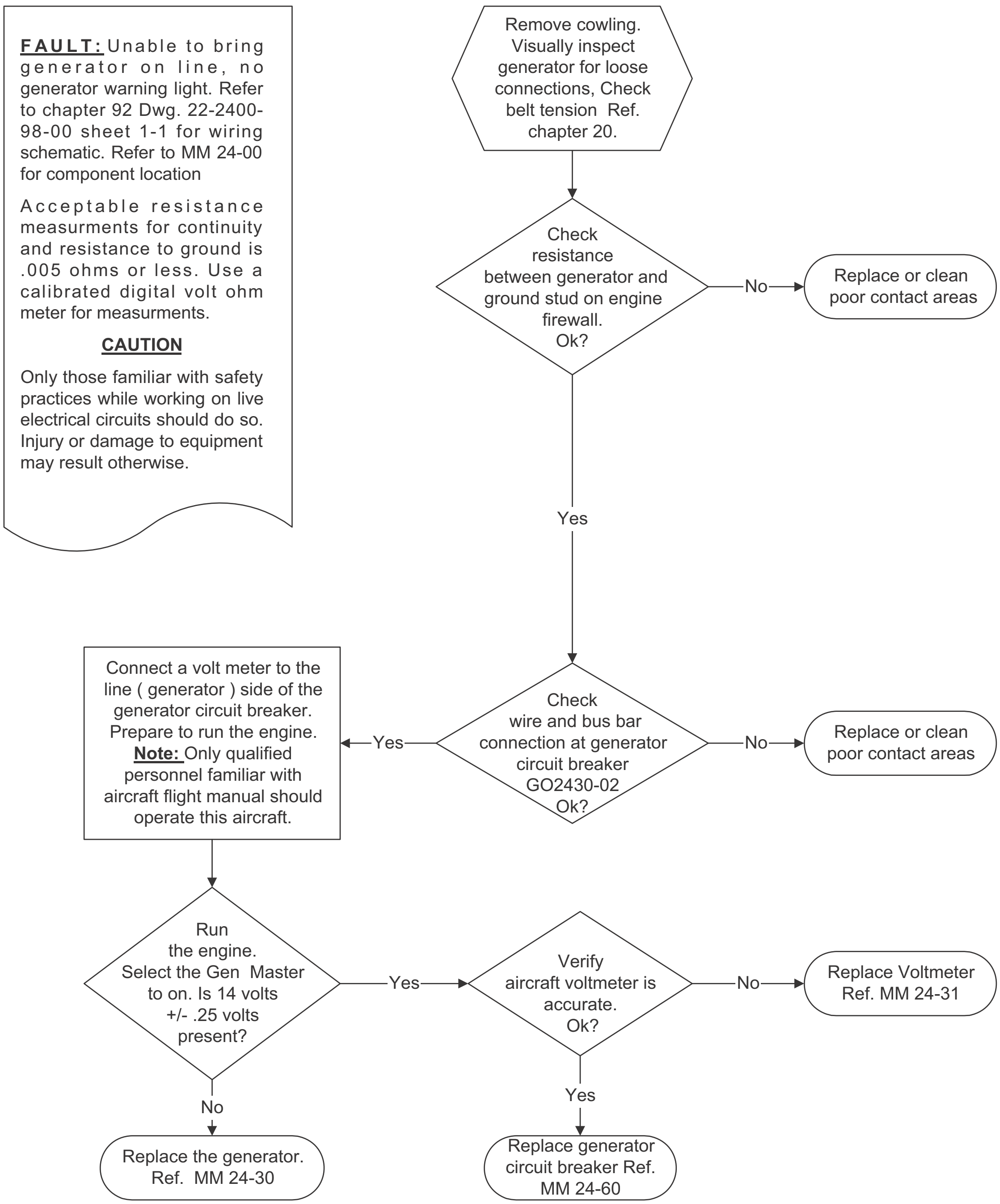
Flow Chart - Sheet 2 of 5



Flow Chart - Sheet 3 of 5



Flow Chart - Sheet 4 of 5



Flow Chart - Sheet 5 of 5

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DC GENERATION - MAINTENANCE PRACTICES

1. General

This chapter describes the data to remove/install and adjust/test the components of the DC electrical generation system on the aircraft. Refer to the component manufacturer's manuals for more data and shop data.

2. Electrical Safety

The DA20-C1 aircraft has a low-voltage DC electrical system. When correctly maintained it is safe to work on. But the battery can supply heavy current through low-resistance circuits (for example, if you ground the positive output with a wrench by accident).

Always follow the usual safety practices for working on electrical equipment. Allow only qualified persons to maintain the electrical system.

CAUTION: DISCONNECT THE BATTERY BEFORE DOING MAINTENANCE ON THE ELECTRICAL SYSTEM. MAKE SURE TO DISCONNECT THE NEGATIVE LEAD FIRST.

CAUTION: AFTER DOING ELECTRICAL MAINTENANCE DO A CONFIDENCE TEST OF THE SYSTEM WITH A 14 VOLT POWER SUPPLY THAT HAS OVER-CURRENT PROTECTION. DO THIS BEFORE CONNECTING THE BATTERY.

CAUTION: USE ONLY DA20-C1 AIRCRAFT SPARE PARTS APPROVED BY THE MANUFACTURER.

3. Remove/Install the Over Voltage Sensor

A. Remove the Over Voltage Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery. Make sure that you disconnect the negative lead first.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect P2430-01 from J2430-01.	Plug/socket
4.	Release the clamp which holds the over-voltage sensor to the shelf.	
5.	Remove the over-voltage sensor.	

B. Install the Over Voltage Sensor

	Detail Steps/Work Items	Key Items/References
1.	Put the over-voltage sensor in position in the clamp.	
2.	Tighten the clamp which holds the over-voltage sensor to the shelf.	
3.	Connect P2430-01 from J2430-01.	Plug/socket
4.	Do a test for correct function of the sensor.	
5.	Install the instrument panel cover.	Refer to Chapter 25-10.
6.	Connect the battery. Make sure you connect the positive lead first.	Refer to Chapter 24-31.

4. Adjust/Test the Over Voltage Sensor

A. Equipment

Item	Quantity	Part Number
DC Voltmeter	1	Commercial
Variable-output DC power supply (Current limited)	1	Commercial

B. Test the Over Voltage Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery. Make sure you disconnect the negative lead first.	Refer to Chapter 24-31.
2.	Disconnect the 2 pin connector from the generator.	
3.	Connect a variable-output DC power supply to the positive and negative terminals of the battery cables.	Make sure that you monitor the polarity of the battery.
4.	Switch on the power supply.	Set the output to 12 volts.
CAUTION: FOLLOW THE USUAL SAFETY PRECAUTIONS FOR WORKING ON LIVE ELECTRICAL SYSTEMS.		
5.	Set the GEN/BAT switch to ON.	The GEN warning light must be off.

	Detail Steps/Work Items	Key Items/References
6.	Slowly increase the voltage of the power supply to 16.1 volts.	The GEN warning light must come on at 16.1 ± 0.2 volts.
7.	Decrease the voltage of the power supply to 12 volts.	The GEN warning light must stay on.
8.	Set the GEN side of the GEN/BAT switch to OFF.	The GEN warning light must stay on.
9.	Set the GEN side of the GEN/BAT switch to ON.	The GEN warning light must stay off.
10.	Set the GEN/BAT switch to OFF.	
11.	Remove the power supply.	
12.	Connect the 2 pin connector to the generator.	
13.	Connect the battery.	Positive lead first.
14.	Set the GEN/BAT switch to ON.	The GEN warning light must come on.
15.	Set the GEN/BAT switch to OFF.	

5. Remove/Install the Generator/Alternator Mounting Bracket

A. Remove the Generator/Alternator Mounting Bracket

Refer to Figure 201.

	Detail Steps/Work Items	Key Items/References
1.	Remove the Generator/Alternator.	Refer to Chapter 24-30.
2.	Remove and discard the tie wraps and the tie wrap connector that hold the generator electrical ground-wire to the mounting bracket.	
3.	Remove the bolt, the nut, the two washers and the adjuster link from the top of the mounting bracket.	This bolt was loosened to remove the generator.
4.	Remove the bolt, the plain washer and lock washer from the top forward side of the mounting bracket going into the spacer.	Discard the lock washer. Leave in place, the spacer and washer installed between the bracket and the engine.
5.	Remove the nut and plain washer from the upper pivot point of the mounting bracket.	

	Detail Steps/Work Items	Key Items/References
6.	Remove the spacer installed between the bracket and the engine.	
7.	Remove the nut and plain washer from the lower pivot point of the mounting bracket.	
8.	Remove the spacer installed between the bracket and the engine.	
9.	Remove the generator/alternator mounting bracket from the aircraft.	

B. Install the Generator/Alternator Mounting Bracket

Refer to Figure 201.

	Detail Steps/Work Items	Key Items/References
1.	Put the generator/alternator mounting bracket in place on the aircraft engine.	Make sure that everything aligns correctly with the through-bolts and the spacers.
2.	At the lower pivot point of the mounting bracket, install the spacer between the bracket and the engine.	Lubricate the through-bolt with clean 50-weight oil.
3.	Install the nut and plain washer at the lower pivot point.	Do not torque the nut at this time. The mounting bracket will have to be adjusted.
4.	At the upper pivot point of the mounting bracket, install the spacer between the bracket and the engine.	Lubricate the through-bolt with clean 50-weight oil.
5.	Install the nut and plain washer at the upper pivot point.	Do not torque the nut at this time. The mounting bracket will have to be adjusted.
6.	At the top forward side of the mounting bracket, do a visual check of the spacer and washer between the bracket and the engine.	The washer used may be the thin washer (AN960-416L) or the plain washer (AN960-416). The clearance required will assist in the decision of which washer to use. Torque the bolt on the engine side to 100 - 125 lbf-in (11.3 - 14.0 Nm).
7.	Install the bolt, the plain washer and the lock washer at the top forward side of the mounting bracket, going into the spacer.	Apply Loctite 222 to the threads of the bolt. Use a new lock washer.
8.	Put the generator loosely in place on the mounting bracket for a trial fit.	Make sure that generator pulley and the prop extension pulley can be aligned.

	Detail Steps/Work Items	Key Items/References
9.	Remove the generator after the trial fit.	
10.	Tighten the bolt at the forward side of the mounting bracket going into the spacer.	Torque the bolt on the generator side to 90 - 110 lbf-in (10.2 - 10.4 Nm).
11.	Tighten the nut at the lower pivot point of the mounting bracket.	Torque the through-bolt nut on the bracket side to 36.6 - 38.3 lbf-ft. (49.7 - 52.0 Nm).
12.	Tighten the nut at the upper pivot point of the mounting bracket.	Torque the through-bolt nut on the bracket side to 36.6 - 38.3 lbf-ft. (49.7 - 52.0 Nm).
13.	Put witness marks on the hardware that follows: - The nut at the upper pivot point - The nut at the lower pivot point - The bolt at the top forward side of the mounting bracket going into the spacer.	
14.	Install the tie wrap connector and tie wraps to hold the generator electrical ground-wire to the mounting bracket.	
15.	Install the adjuster link to the top of the mounting bracket. At the pivot point install the bolt, the nut and the two washers.	Leave the bolt hand tightened for the installation of the Generator/Alternator.
16.	Install the Generator/Alternator.	Refer to AMM Chapter 24-30.

NOTE: When the Generator/Alternator is installed it may be necessary to loosen the attaching hardware and adjust the mounting bracket forward or aft to get the correct alignment between the generator pulley and the prop extension pulley.

NOTE: If the mounting bracket must be adjusted, make sure to torque and witness mark the components in step 5.B.(13) when completed.

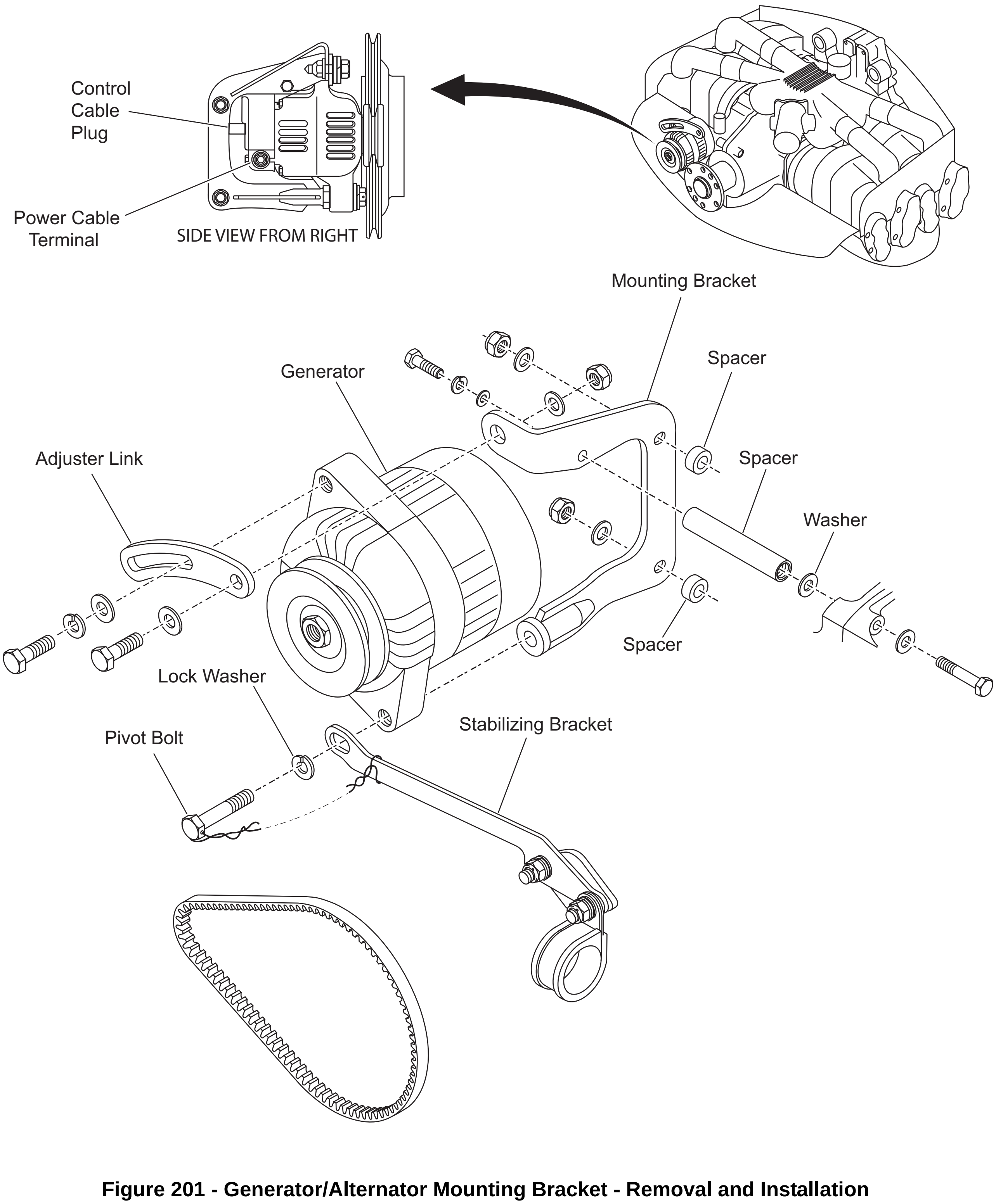

Figure 201 - Generator/Alternator Mounting Bracket - Removal and Installation

6. Remove/Install the Generator/Alternator

A. Remove the Generator/Alternator

Refer to Figure 202 - Sheet 1.

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery. Make sure that you disconnect the negative lead first.	Refer to Chapter 24-31.
2.	Disconnect the electrical connections to the generator at the generator.	
3.	Loosen the top mounting bolt that holds the adjuster link to the mounting bracket.	
4.	Remove the adjusting bolt from the adjusting bracket adjusting bolt, the plain washer and lock washer from the generator and the adjuster link bracket.	Discard the lock-washer.
5.	Cut and discard the lock-wire on the bottom mounting-bracket bolt at the generator pivot point. Remove the bolt and the lock washer from the generator and the bottom mounting bracket.	Hold the generator so that it does not fall when the bolt is removed. Discard the lock washer.
6.	Remove the generator from the aircraft.	

B. Install the Generator/Alternator

Refer to Figure 202 - Sheets 1 and 2.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the mounting bracket is held in place and is correctly installed on the engine.	
2.	Put the generator in its correct position to align with the bottom of the mounting bracket, aft of the stabilizer bracket.	The generator is installed between the bottom of the mounting bracket and the stabilizer bracket.
3.	At the generator pivot point on the stabilizer bracket, install the attaching bolt and lock washer. Do not torque the bolt.	Make sure that the head is marked '10.9'. Apply Loctite 222 to the shank and threads of the bolt. Use a new lock washer.
4.	At the adjuster link for the generator, install the adjusting bolt, the plain washer and lock washer. Do not torque the bolt.	Apply Loctite 222 to the shank and threads of the bolt. Use a new lock washer.

	Detail Steps/Work Items	Key Items/References
CAUTION: DO NOT MAKE THE BELT TOO TIGHT. TOO MUCH TENSION CAN CAUSE GENERATOR BEARING FAILUREDO NOT ADJUST THE GENERATOR BELT TO MAKE IT TOO TIGHT. IF IT IS ADJUSTED TOO TIGHTLY THE TENSION CAN CAUSE DAMAGE TO THE GENERATOR BEARINGS.		
5.	Adjust the flexible belt tension. - Then tighten the adjusting bolt and the top adjusting bolt and the top mounting bolt at the adjuster link.	Belt movement = 0.2 in (5 mm) with 6.5 lbs (3 kg) load applied. Torque the two bolts to 195 lbf-in (22 Nm).
6.	At the generator pivot point on the stabilizer bracket, tighten the bolt. Lock the bolt head with wire to the bracing strut.	Torque the two bolts to 26 lbf-ft (35 Nm).
7.	With all of the attaching hardware correctly in place, measure the alignment between the generator pulley and the prop extension pulley.	The misalignment between the generator pulley and the prop extension pulley is not to exceed ± 0.031 in (0.8 mm).
8.	If necessary, adjust the generator/alternator mounting bracket to align the generator pulley with the prop extension pulley.	Refer to Chapter 24-30. Install the Generator/Alternator Mounting Bracket.
NOTE: To align the generator pulley with the prop extension pulley it may be necessary to loosen attaching hardware and adjust the mounting bracket forward or aft. If the mounting bracket must be adjusted, do as follows: - Make sure to torque again and witness mark the components in step 5.B.(13) when completed - Make sure to adjust the flexible belt tension again as necessary - Make sure to torque again the components in Item 6.B.(5) and (6) when completed.		
9.	Lock-wire the bottom mounting-bracket bolt at the generator pivot point to the stabilizing bracket.	Use 0.032" Lock-wire. Apply LPS3 to the hole in the bolt head after installing the lock-wire.
10.	Put witness marks on the hardware that follows: - The adjusting bolt at the adjuster link - The top mounting bolt at the adjuster link - The bottom mounting-bracket bolt at the generator pivot point.	

	Detail Steps/Work Items	Key Items/References
11.	Connect the electrical connections to the generator at the generator.	
12.	Connect the battery. Make sure that you connect the positive lead first.	Refer to Chapter 24-31.
13.	Do a functional test of the generator.	Refer to Chapter 24-30 - Adjust/Test the Generator/Alternator.

7. Adjust/Test the Generator/Alternator

A. Equipment

Item	Quantity	Part Number
DC Voltmeter	1	Commercial

B. Test the Generator/Alternator

NOTE: Only persons who are authorized and trained can do an engine ground run-up.

	Detail Steps/Work Items	Key Items/References
CAUTION: FOLLOW THE USUAL SAFETY PRECAUTIONS FOR WORKING ON LIVE ELECTRICAL SYSTEMS.		
1.	Connect the DC voltmeter to the measure the main bus voltage.	
2.	Set the GEN/BAT switch to ON.	The GEN warning light must come on.
3.	Start the engine.	Refer to Chapter 71-00.
4.	Set the engine speed to 1720 RPM.	The ammeter must show a positive reading.
5.	When the battery has charged, measure the generator voltage.	The voltage must be 14 volts ± 2%.
6.	Set all electrical loads to ON.	
7.	Operate intermittent loads throughout this part of the test. Operate the trim, flaps, transmitters.	The voltage must remain within 2.5% of the no-load generator voltage. The ammeter must not show a discharge.
8.	Shut-down the engine.	Refer to Chapter 71-00.
9.	Set the GEN/BAT switch to OFF.	The GEN warning light must come on.
10.	Disconnect the voltmeter.	

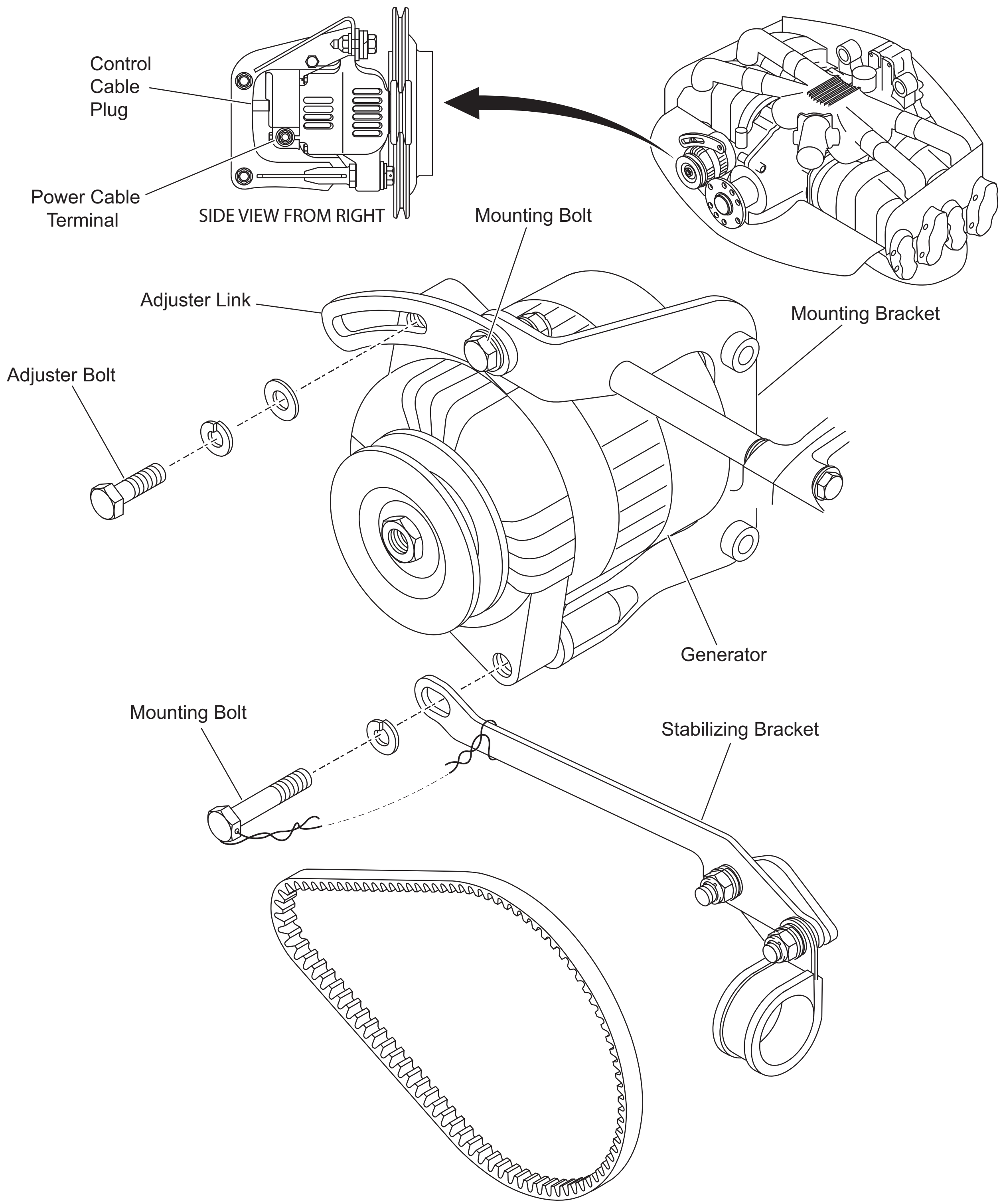

Figure 202 - Generator/Alternator Removal and Installation (Sheet 1 of 2)

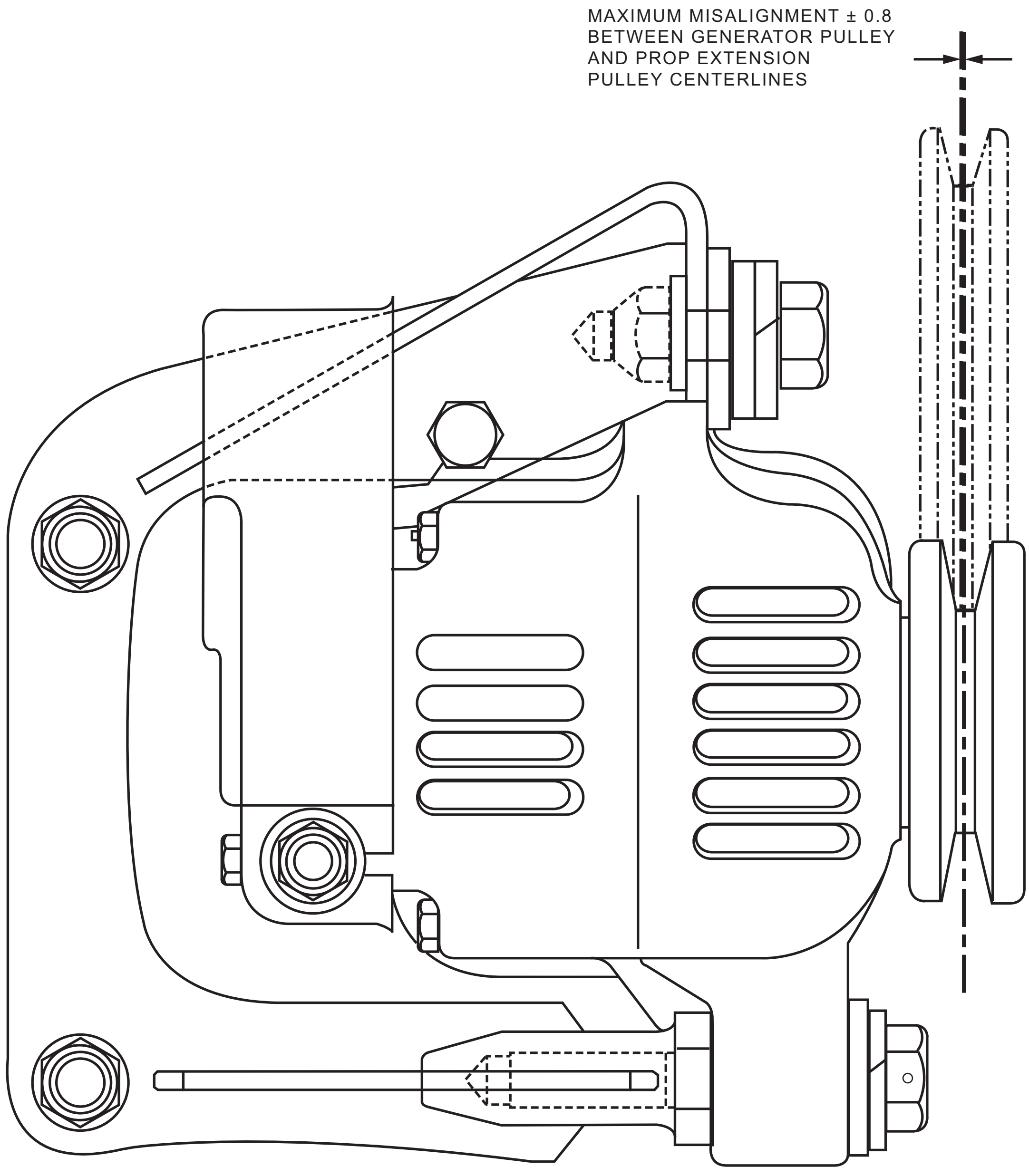

Figure 202 - Generator/Alternator Removal and Installation (Sheet 2 of 2)

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BATTERY SYSTEM

1. General

This chapter describes about the battery system. Refer to Chapters 24-00 and 24-30 for the description and operation of the battery in the electrical generation system.

The battery is located in a battery box aft of the baggage compartment or optionally mounted at the left side of the firewall. When the generator voltage is greater than the battery voltage, the generator charges the battery. If a non-sealed battery is installed, a vent hose connects the battery to the outside air through the bottom of the fuselage.

The ammeter and voltmeter monitor the battery. The ammeter shows the current flowing to or from the battery. The voltmeter shows the voltage on the main bus. When the generator is operating, it shows the generator voltage. When the generator is off-line, it shows the battery voltage.

The battery supplies current to the main bus through the battery relay. The battery relay is in a relay box in the B-bulkhead. A 50 amp circuit-breaker protects the battery system.

Regular maintenance is necessary for the battery. Do not wait until a starting problem occurs.

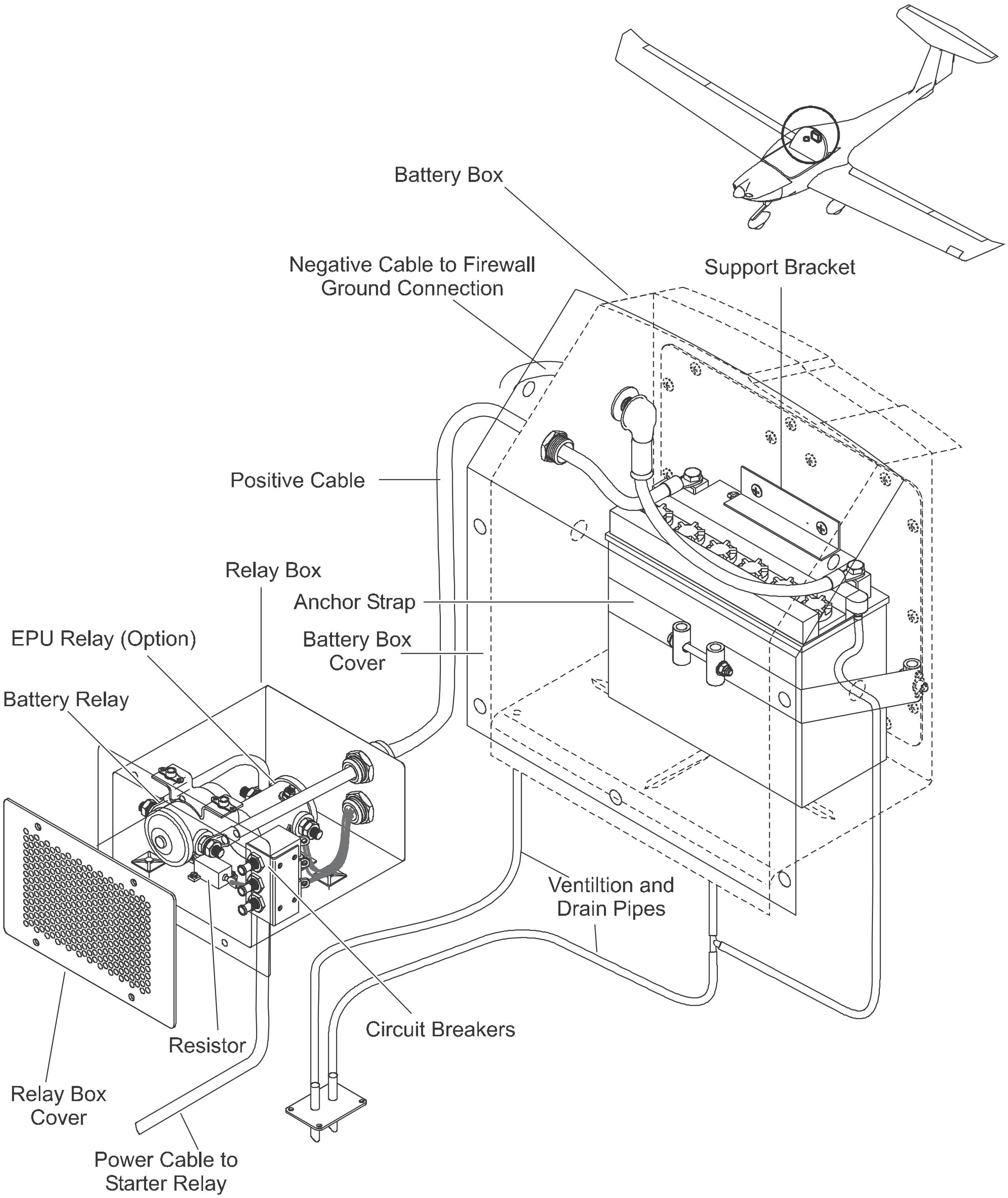

Figure 1 - Battery Installation

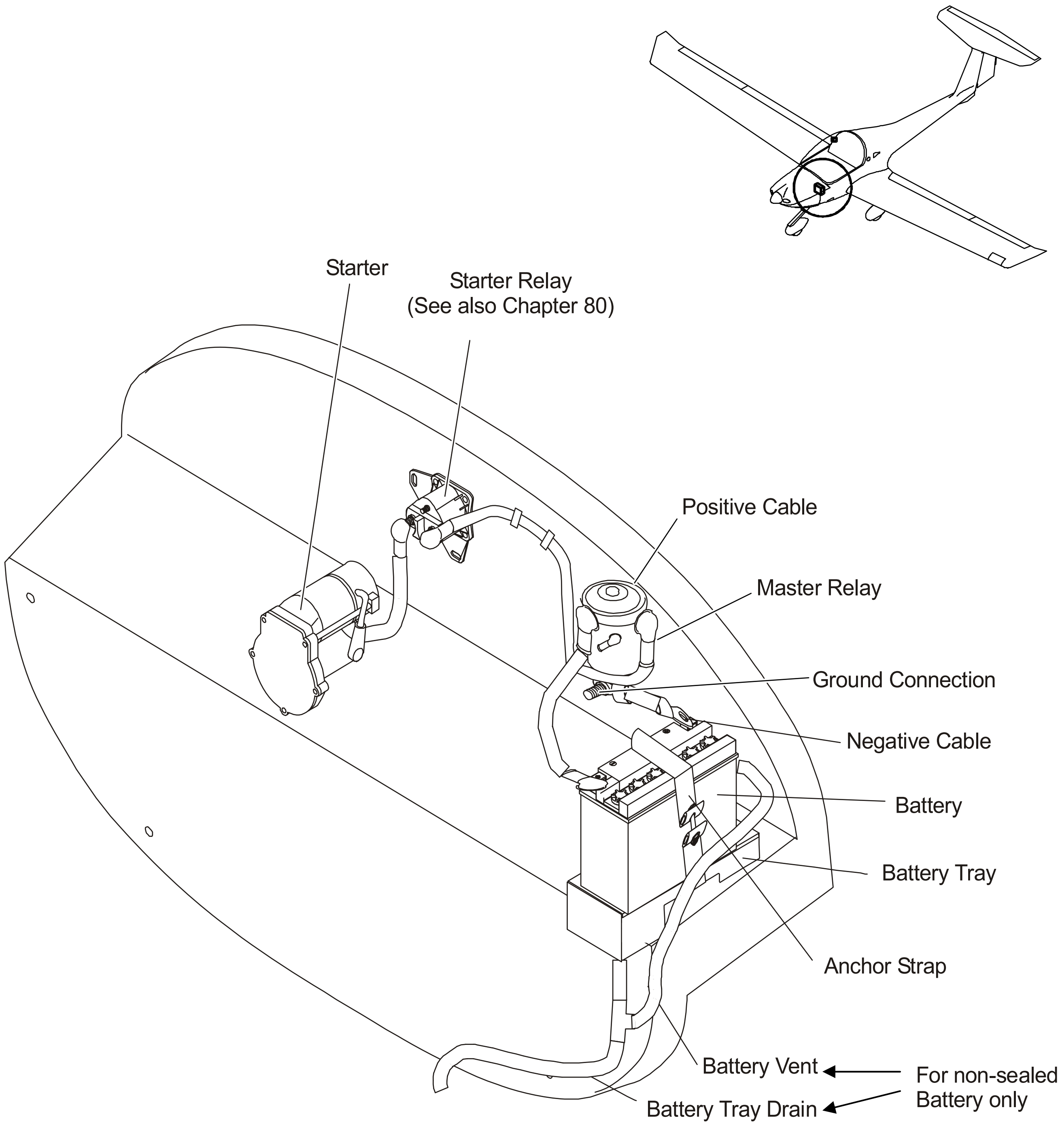

Figure 2 - Firewall Mounted Battery Installation

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BATTERY SYSTEM - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the battery system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Battery voltage low.	Battery electrolyte level low.	Fill to the correct level.
	Battery capacity low.	Do a capacity test. If necessary, replace the battery.
	Generator output low.	Troubleshoot the generator. Refer to Chapter 24-30.
Battery uses too much water.	Generator output high.	Replace the generator. Refer to Chapter 24-30.
Battery will not connect to the main bus.	Battery circuit-breaker open.	Close the circuit-breaker.
	Battery circuit-breaker defective.	Replace the circuit-breaker. Refer to Chapter 24-60.
	Battery relay defective.	Replace the battery relay.
	BAT GEN switch defective.	Replace the BAT GEN switch.
	Wiring between the BAT GEN switch and the battery relay, or the BAT GEN switch and ground defective.	Do a continuity test of the wiring. Repair or replace defective wiring.
Ammeter shows zero at all times.	Defective ammeter.	Replace the ammeter.
Voltmeter shows zero at all times.	Defective voltmeter.	Replace the voltmeter.
	Defective wiring between the ammeter and voltmeter, or voltmeter and ground.	Do a continuity test of the wiring. Repair or replace defective wiring.

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BATTERY SYSTEM - MAINTENANCE PRACTICES

1. General

WARNING: DO NOT GET BATTERY ELECTROLYTE ON YOU. THE ELECTROLYTE CONTAINS SULFURIC ACID. THE ACID CAN BURN YOU.

CAUTION: INSTALL ONLY A BATTERY WHICH IS APPROVED BY THE AIRCRAFT MANUFACTURER.

Keep the battery clean. Remove electrolyte from the outside of the battery. Remove dirt from the area of the terminals. Protect the terminals and cable lugs with Dow Corning compound 4 (DC4).

Keep the vent hose free from kinks. Make sure that the inside is clear.

If you do not use the aircraft regularly, you must remove the battery for charging.

2. Safety Precautions

Wear protective clothing when you work on the battery (rubber gloves, rubber apron and goggles).

If you get acid on you, apply a solution of sodium bicarbonate and water to the area. Then flush with large quantities of water. Get medical attention as soon as possible.

If you get acid in or near your eyes, flush with large quantities of water and an eye-wash solution. Get medical attention immediately.

Obey the maintenance instructions of the battery manufacturer.

Always disconnect the battery when you do work on the electrical system. Disconnect the negative cable first. Connect the negative cable last.

3. Battery

Measure the battery charge, capacity and electrolyte level at regular intervals. (Refer to Chapter 05-20).

NOTE: A fully charged battery is approximately 12.8 V. Capacity check should read 60% or higher.

A. Remove the Battery from the Aircraft

	Detail Steps/Work Items	Key Items/References
1.	Remove the access panel for the battery.	At the rear of the baggage compartment. or Remove upper cowling on aircraft with firewall mounted battery.
2.	Disconnect the negative cable from the battery.	
3.	Disconnect the positive cable from the battery.	
4.	Disconnect the ventilation hose from the battery.	For non-sealed batteries only.
5.	Remove the battery from the aircraft.	

B. Install the Battery

	Detail Steps/Work Items	Key Items/References
1.	Clean the battery box. Wipe the battery box dry.	
2.	Put the battery in position in the battery box. Install the battery retaining strap.	
3.	Connect the ventilation hose to the battery.	For non-sealed batteries only. Make sure that the hose is clear.
CAUTION: MAKE SURE THAT YOU CONNECT THE CABLES TO THE CORRECT TERMINALS. INCORRECT CONNECTION CAN DAMAGE THE ELECTRICAL AND AVIONIC SYSTEMS.		
4.	Connect the positive cable to the battery.	Apply Dow Corning compound 4 (DC4) to the battery terminal and cable lug.
5.	Connect the negative cable to the battery.	Apply Dow Corning compound 4 (DC4) to the battery terminal and cable lug.
6.	Install the battery access panel.	

C. Fill the Battery with Distilled Water

Remove the battery from the aircraft before you fill it with distilled water.

WARNING: WEAR PROTECTIVE GOGGLES, RUBBER GLOVES AND RUBBER APRON WHEN WORKING ON THE BATTERY. THE BATTERY CONTAINS DILUTE SULFURIC ACID THAT CAN INJURE PERSONS AND DAMAGE EQUIPMENT.

	Detail Steps/Work Items	Key Items/References
1.	Clean the outer surface of the battery with warm water. Wipe the battery dry.	
2.	Remove the caps from the cells.	
3.	Add water to the level marked on the battery.	Use only clean distilled water.
4.	Replace the caps.	

D. Disconnect the Battery for Maintenance

	Detail Steps/Work Items	Key Items/References
1.	Remove the access panel for the battery.	At the rear of the baggage compartment.
2.	Disconnect the negative cable from the battery.	
3.	Disconnect the positive cable from the battery.	

E. Connect the Battery for Maintenance

	Detail Steps/Work Items	Key Items/References
CAUTION: MAKE SURE THAT YOU CONNECT THE CABLES TO THE CORRECT TERMINALS. INCORRECT CONNECTION CAN DAMAGE THE ELECTRICAL AND AVIONIC SYSTEMS.		
1.	Connect the positive cable to the battery.	Apply Dow Corning compound 4 (DC4) to the battery terminal and cable lug.
2.	Connect the negative cable to the battery.	Apply Dow Corning compound 4 (DC4) to the battery terminal and cable lug.
3.	Install the battery access panel.	

4. Remove/Install the Battery Relay

A. Remove the Battery Relay

	Detail Steps/Work Items	Key Items/References
1.	Remove the cover from the battery.	
2.	Disconnect the battery.	Disconnect the negative cable first.
3.	Remove the cover from the relay box.	
4.	Disconnect the wires from the battery relay.	
5.	Release the bolts which attach the battery relay to the relay box.	
6.	Remove the relay.	

B. Install the Battery Relay

	Detail Steps/Work Items	Key Items/References
1.	Put the relay in position in the relay box.	
2.	Install the attaching bolts.	
3.	Connect the control and power wires to the relay.	Refer to AMM Chapter 92 for wiring diagrams.
4.	Install the cover to the relay box.	
5.	Connect the battery.	Connect the positive cable first.
6.	Install the cover to the battery.	
7.	Do a test for correct operation of the battery relay.	

C. Battery Relay Functional Test

Do this test in an area where the engine can be run.

	Detail Steps/Work Items	Key Items/References
1.	Make sure the GEN/BAT switch is set to OFF.	There must be no indication on the voltmeter.
2.	Set the GEN/BAT switch to ON.	The voltmeter must indicate battery voltage.
WARNING: MAKE SURE THAT THE AREA OF THE PROPELLER IS CLEAR BEFORE YOU OPERATE THE STARTER MOTOR. PROPELLERS CAN CAUSE INJURY OR DEATH		
3.	Operate the starter motor.	You do not need to start the engine.

5. Remove/Install the Battery Relay on the Firewall

A. Remove the Battery Relay

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery.	Disconnect the negative cable first.
2	Disconnect the wires from the battery relay.	
3.	Remove the two nuts and the two washers that secure the battery relay to the firewall.	Refer to Figure 201.
4.	Remove the two bolts and the two washers.	
5.	Remove the relay.	

B. Install the Battery Relay

	Detail Steps/Work Items	Key Items/References
1.	Put the relay in position in the firewall.	
2.	Install the two attaching bolts and the two washers.	Refer to Figure 201.
3.	Install the two washers and the two nuts.	Tighten the nuts.

	Detail Steps/Work Items	Key Items/References
4.	Connect the wires to the battery relay.	
5.	Connect the battery.	Connect the positive cable first.
6.	Do a test for correct operation of the battery relay.	

6. Remove/Install the Ammeter

A. Remove the Ammeter

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery.	Disconnect the negative cable first.
2.	Remove the instrument panel cover for access.	Refer to Chapter 25-10.
3.	Disconnect the wires from the ammeter.	
4a.	For VDO indicator: Release the ring that attaches the ammeter.	
4b.	For UMO Indicator: Remove the attaching screws	
5.	Remove the ammeter.	

B. Install the Ammeter

	Detail Steps/Work Items	Key Items/References
1.	Put the ammeter in position in the instrument panel.	
2a.	For VDO indicators: Install the ring that attaches the ammeter.	
2b.	For UMA indicator: Install the ammeter with the attaching screws	
3.	Connect the wires to the ammeter.	Refer to Chapter 92 for wiring diagrams.
4.	Connect the battery.	Connect the positive cable first.
5.	Do a test for correct operation of the ammeter.	Refer to Paragraph C.
6.	Install the instrument panel cover.	Refer to Chapter 25-10.

C. Ammeter Functional Test

Do this test in an area where the engine can be run. Only persons approved by the airworthiness authority can do engine runs.

	Detail Steps/Work Items	Key Items/References
1.	Make sure the GEN/BAT switch is set to OFF.	There must be no indication on the voltmeter.
2.	Set the GEN/BAT switch to ON.	The voltmeter must indicate battery voltage.
	WARNING: MAKE SURE THAT THE AREA OF THE PROPELLER IS CLEAR BEFORE YOU OPERATE THE STARTER MOTOR. PROPELLERS CAN CAUSE INJURY OR DEATH	
3.	Start the engine.	Refer to DA20-C1 Airplane Flight Manual.
4.	Increase the engine RPM to bring the generator on-line.	The ammeter must show a charge (+).
5.	Stop the engine.	Refer to DA20-C1 Airplane Flight Manual.

7. Remove/Install the Voltmeter

A. Equipment

Item	Quantity	Part Number
Calibrated DC Voltmeter	1	Commercial

B. Remove the Voltmeter

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery.	Disconnect the negative cable first.
2.	Remove the instrument panel cover for access.	Refer to Chapter 25-10.
3.	Disconnect the wires from the voltmeter.	
4a.	Fro VDO indicator: Release the ring that attaches the voltmeter.	
4b.	For UMA indicator: Remove the attaching screws.	
5.	Remove the voltmeter.	

C. Install the Voltmeter

	Detail Steps/Work Items	Key Items/References
1.	Put the voltmeter in position in the instrument panel.	
2a.	For VDO indicator: Install the ring that attaches the voltmeter.	
2b.	For UMA indicator: Install the voltmeter with the attaching screws.	
3.	Connect the wires to the voltmeter.	Refer to Chapter 92 for wiring diagrams.
4.	Connect the battery.	Connect the positive cable first.
5.	Do a test for correct operation of the voltmeter.	Refer to Paragraph D.
6.	Install the instrument panel cover.	Refer to Chapter 25-10.

D. Voltmeter Functional Test

	Detail Steps/Work Items	Key Items/References
1.	Make sure the GEN/BAT switch is set to OFF.	There must be no indication on the voltmeter.
2.	Set the GEN/BAT switch to ON.	The voltmeter must indicate battery voltage.
3.	Connect a test voltmeter to the terminals of the voltmeter.	The aircraft voltmeter must show the same voltage as the test voltmeter.
4.	Set the GEN/BAT switch to OFF.	

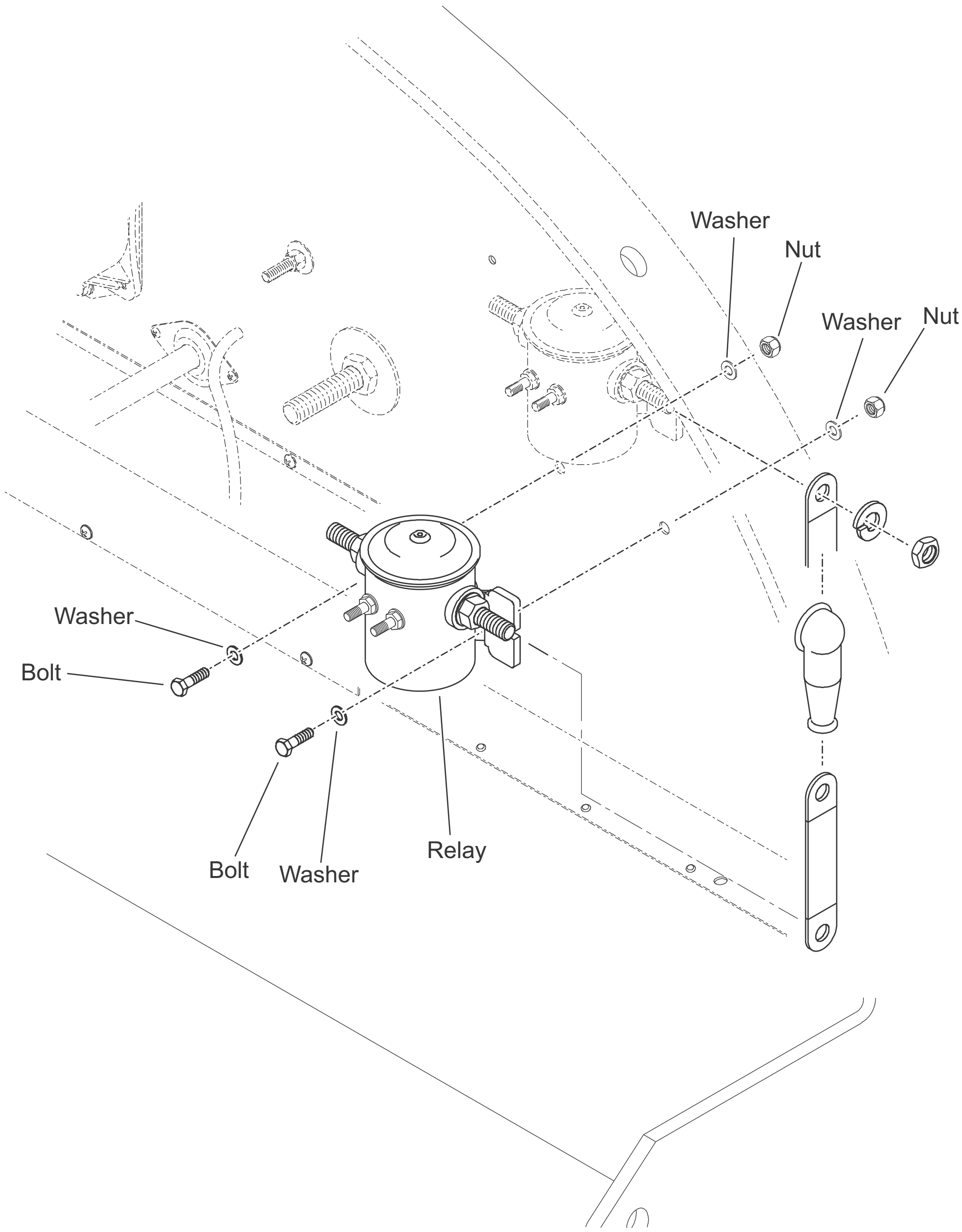

Figure 201 - Removal/Installation of Battery Relay on the Firewall

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EXTERNAL POWER UNIT (EPU) SYSTEM

1. General

The DA20-C1 aircraft has an external power receptacle located in one of two locations. Aircraft serial numbers C0001 through C0148 and C0150 have this receptacle located on the fuselage at the rear portion of the wing root. Aircraft serial numbers C0149 and C0151 onwards have this receptacle located on the fuselage in front of the left-hand wing root. Refer to Figure 1.

2. Description

The three main components of the external power source are the EPU receptacle, the switch that controls the relay, and the relay.

The EPU receptacle and related circuits provide for the connection of an external power source for various ground operations, e.g. maintenance, battery charging, starting.

The external power relay is mounted on the forward face of the cockpit front bulkhead. Heavy duty positive and negative cables are connected to the relay terminal. Another heavy duty cable is connected to the solenoid of the external power relay via the diode.

3. Operation

The external power system is reverse polarity proteced with the addition of a diode as shown in Figure 1. A switch in the cockpit to the left of the light switches allows the EPU relay to close once the external power source is connected and power is available. A light in the cockpit indicates that the power is available at the receptacle or that the EPU relay has remained closed when it was disconnected.

On aircraft C0001 through C0148 and C0150 with an EPU installed, a relay bypass circuit is provided to enable the battery relay to be closed if the battery has been discharged. When the battery does not have enough power to close the relay by itself, the relay bypass circuit enables the battery relay to close. Depending on the state of battery discharge, the battery relay may take several minutes to close. This circuit is not installed on aircraft C0149 and C0151 onwards. Refer to Figure 1, simplified schematic diagram of the EPU.

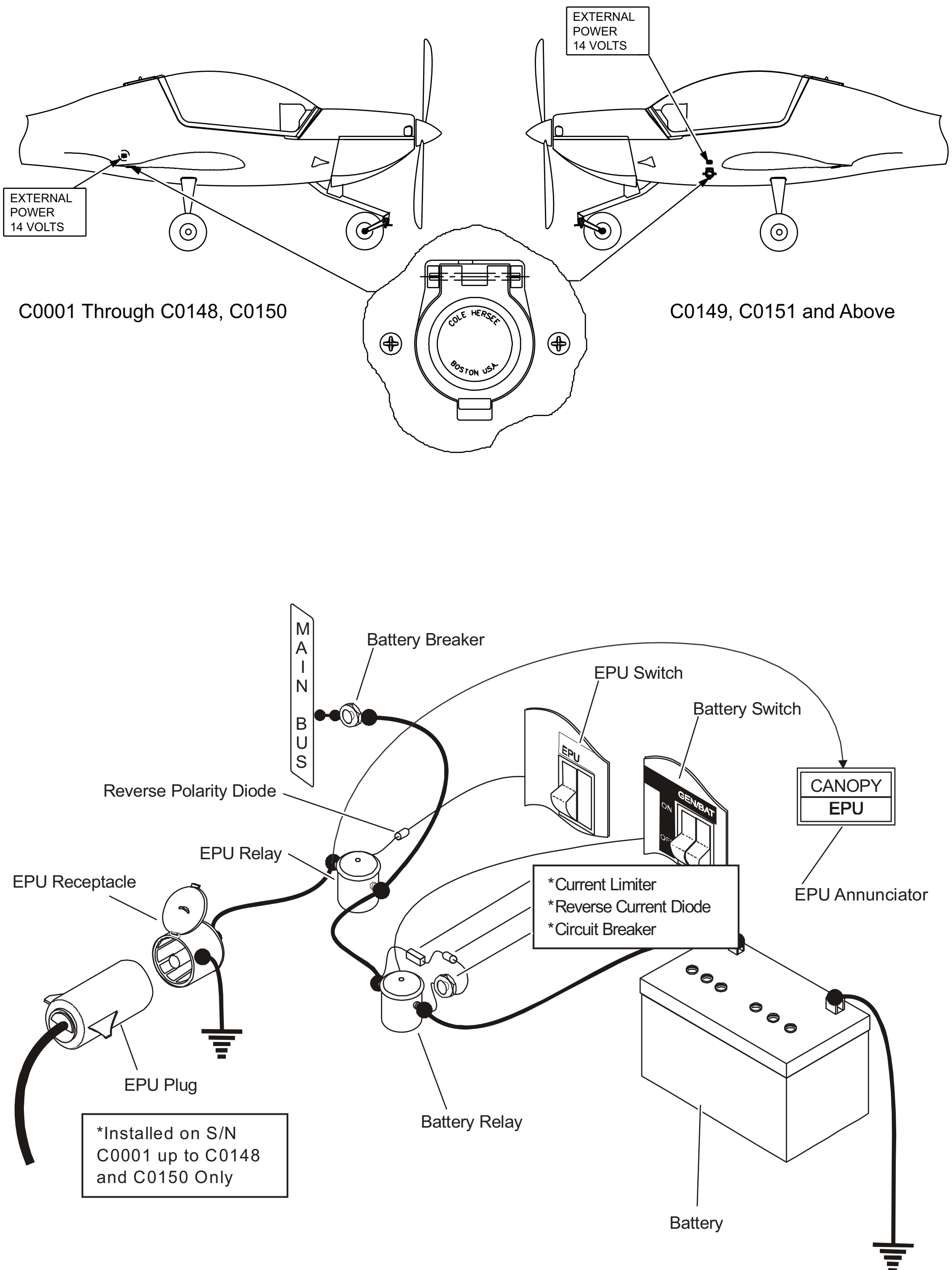

Figure 1 - EPU Receptacle Locations and Simplified Schematic Diagram

EPU SYSTEM - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the EPU system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
No external power supply in the system.	External power source is not connected.	Make sure the external power source is securely plugged into the receptacle.
	External power relay is defective.	Test the external power relay. Replace the external power relay if defective.
	EPU switch not ON or defective.	Check the EPU switch. If defective, replace the switch.

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EPU SYSTEM - MAINTENANCE PRACTICES

1. General

This chapter describes how to remove/install the components of the external power system. Refer to the manufacturer's manuals for more information on the external power relay.

2. Electrical Safety

The DA20-C1 aircraft has a low-voltage DC electrical system. When correctly maintained it is safe to work on. But the battery can supply heavy current through low-resistance circuits (for example, if you ground the positive output with a wrench by accident).

Always follow the usual safety practices for working on electrical equipment. Allow only qualified persons to maintain the electrical system.

CAUTION: DISCONNECT THE BATTERY BEFORE DOING MAINTENANCE ON THE ELECTRICAL SYSTEM. MAKE SURE TO DISCONNECT THE NEGATIVE LEAD FIRST.

CAUTION: AFTER DOING ELECTRICAL MAINTENANCE ALWAYS DO A CONFIDENCE TEST OF THE SYSTEM WITH A 14 VOLT POWER SUPPLY THAT HAS OVER-CURRENT PROTECTION. DO THIS BEFORE CONNECTING THE BATTERY

CAUTION: USE ONLY DA20-C1 AIRCRAFT SPARE PARTS APPROVED BY THE MANUFACTURER.

3. Remove/Install the EPU Relay to C0001 through C0148 and C0150

A. Remove the External Power Relay

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31. Make sure to disconnect the negative cable first.
2.	Remove the relay box cover.	
3.	Disconnect the bus bar between the battery relay and the EPU relay.	
4.	Remove the battery relay.	Refer to Chapter 24-31.
5.	Disconnect the control and power cables from the EPU relay.	
6.	Remove the bolts that attach the EPU relay to the relay box.	
7.	Remove the EPU relay.	

B. Install the EPU Relay

	Detail Steps/Work Items	Key Items/References
1.	Put the EPU relay in position in the relay box.	
2.	Install the attaching bolts.	
3.	Connect the bus bar between the battery relay and EPU.	
4.	Connect the control and power cables to the EPU relay.	
5.	Install the battery relay.	
6.	Install the relay box cover.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31. Make sure that you connect the positive cable first.
5.	Do a test for the correct operation of the EPU relay.	Refer to Paragraph C.

C. EPU Test

	Detail Steps/Work Items	Key Items/References
1.	Connect a 14 volt external power source.	The EPU lamp must illuminate.
2.	Set the EPU switch to ON.	The voltmeter should indicate external power voltage.
3.	Set the BAT switch to ON.	
4.	Set the EPU switch to OFF.	The EPU lamp must remain illuminated.
5.	Remove the external power source.	The EPU lamp must go off.

4. Remove/Install the EPU Relay to C0149 and C0151 onwards

A. Remove the External Power Relay

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31. Make sure to disconnect the negative cable first.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the bus bar, control and power cables from the EPU relay.	
6.	Remove the bolts that attach the EPU relay to the firewall.	
7.	Remove the EPU relay.	

B. Install the EPU Relay

	Detail Steps/Work Items	Key Items/References
1.	Put the EPU relay in position on the firewall.	
2.	Install the attaching bolts.	
3.	Connect the bus bar, control and power cables to the EPY relay.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31. Make sure that you connect the positive cable first.
5.	Install the instrument panel cover.	Refer to Chapter 25-10.
6.	Do a test for the correct operation of the EPU relay.	Refer to Paragraph C.

C. EPU Test

	Detail Steps/Work Items	Key Items/References
1.	Connect a 14 volt external power source.	The EPU lamp must illuminate.
2.	Set the EPU switch to ON.	The voltmeter should indicate external power voltage.
3.	Set the BAT switch to ON.	
4.	Remove the external power source.	The EPU lamp must remain illuminated.
5.	Set the EPU switch to OFF.	The EPU lamp must go off.

DC ELECTRICAL LOAD DISTRIBUTION

1. General

The DC electrical load distribution system has the following components:

Component	Identification
Avionics Master Relay	AM2460-03
AVIONIC MASTER switch	AM2460-04
Battery Relay	BB2430-02
Circuit-breaker	GO2430-02
GEN/BAT Switch (See also Chapter 24-30)	GC2430-02

Refer to Chapter 24-30 for the generator system.

2. Description

A. Main Bus

The main bus has three parts: 3 copper bars are joined by a hard-wired connection. The generator supplies the main bus through the GEN circuit-breaker. The battery supplies the main bus through the battery relay, ammeter and BATTERY circuit-breaker.

The battery supplies a positive voltage to the coil of the battery relay. The GEN/BAT switch connects to the other side of the battery relay and to ground.

The main bus supplies the aircraft electrical systems through circuit-breakers.

B. Avionic Bus

The normally-closed contacts of the avionics master relay connect the main bus to the avionic bus. A 20 amp circuit-breaker protects the system. A 1 amp circuit-breaker protects the control circuit for the relay. The control circuit of the avionics master relay connects to the AVIONIC MASTER switch.

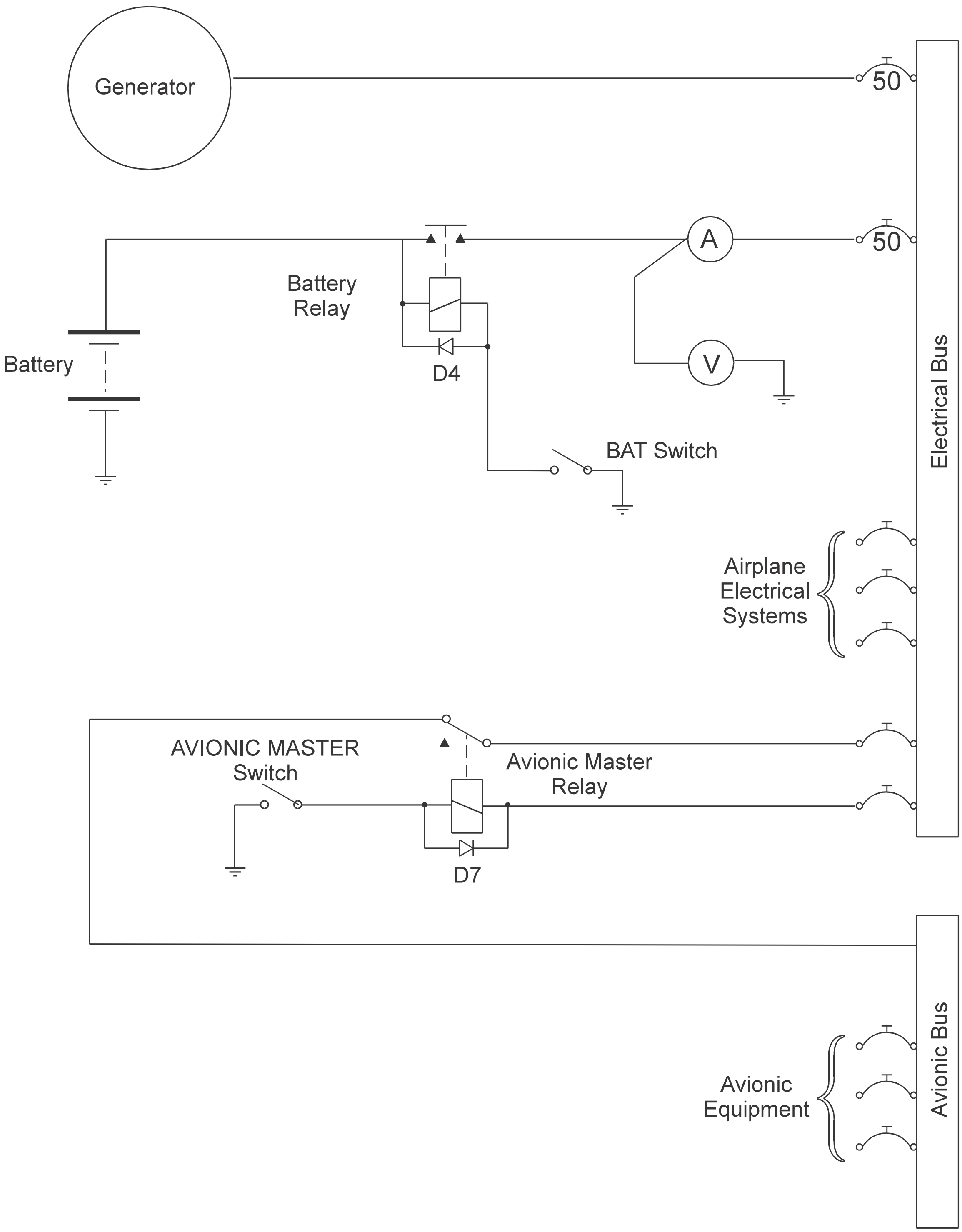

Figure 1 - DC Electrical Load Distribution Simplified Schematic Diagram

C. Circuit-breakers

Refer to Figure 2 and Figure 3.

NOTE: Figure 2 and Figure 3 illustrate typical instrument panel configurations. For aircraft with installed optional equipment refer to the specific aircraft's wiring diagram.

Circuit-breakers protect the wiring in each circuit from too much current. The circuit-breakers are located on the right side of the instrument panel. You can open and close all of the circuit-breakers manually. If too much current flows in a circuit, the related circuit-breaker opens automatically.

As an option some aircraft may be equipped with a "Reversed Panel" in which the circuit breakers are located on the left side of the panel.

3. Operation

When the GEN/BAT switch is ON, it gives a ground to the battery relay coil. The battery relay closes and connects the battery to the main bus through the circuit-breaker.

When the AVIONIC MASTER switch is OFF, the control circuit is closed. If there is power on the Main bus, the avionics master relay energizes. The avionics master relay contacts open. The avionic bus disconnects from the main bus.

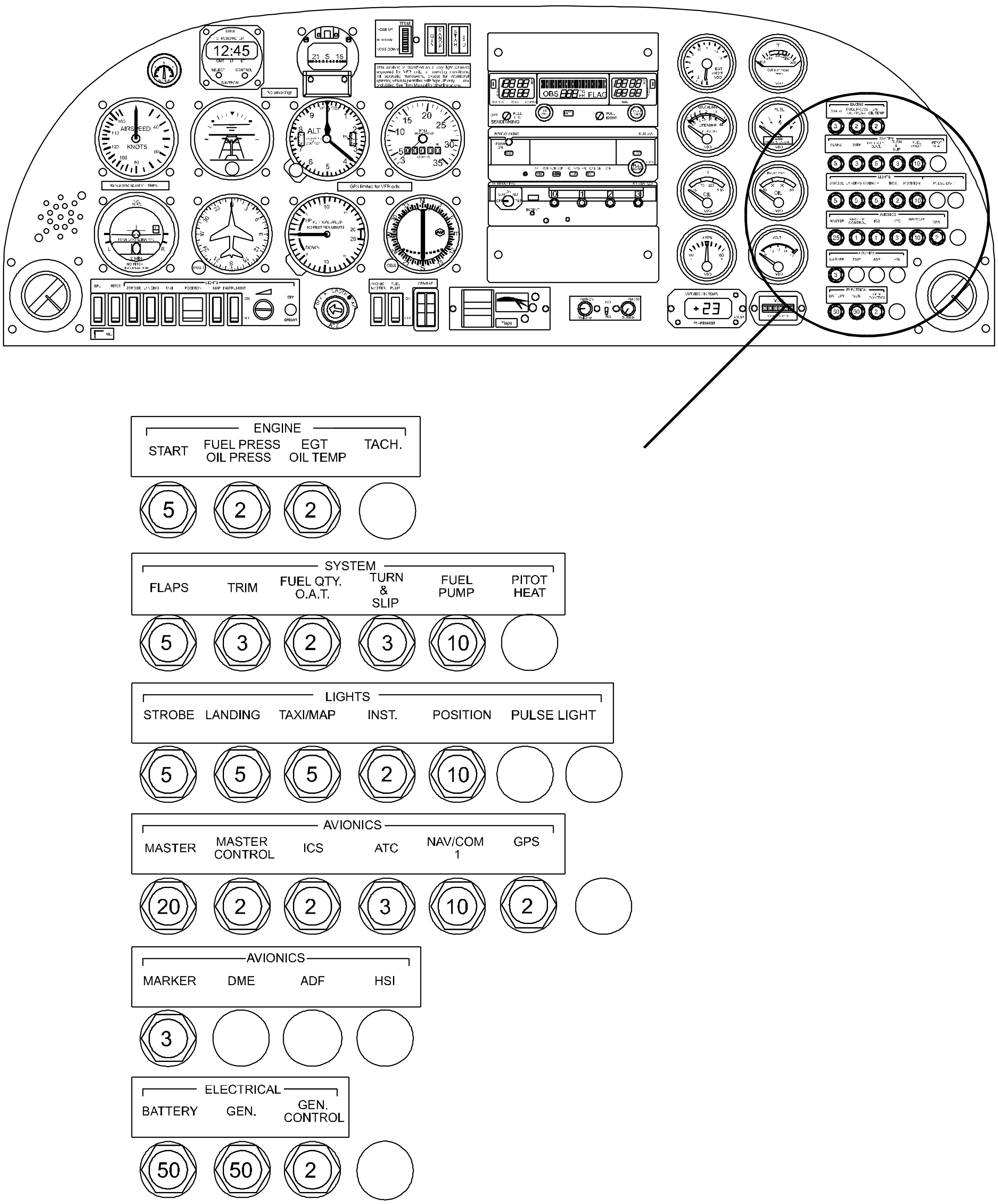

Figure 2 - Typical Circuit-breaker locations on the Instrument Panel

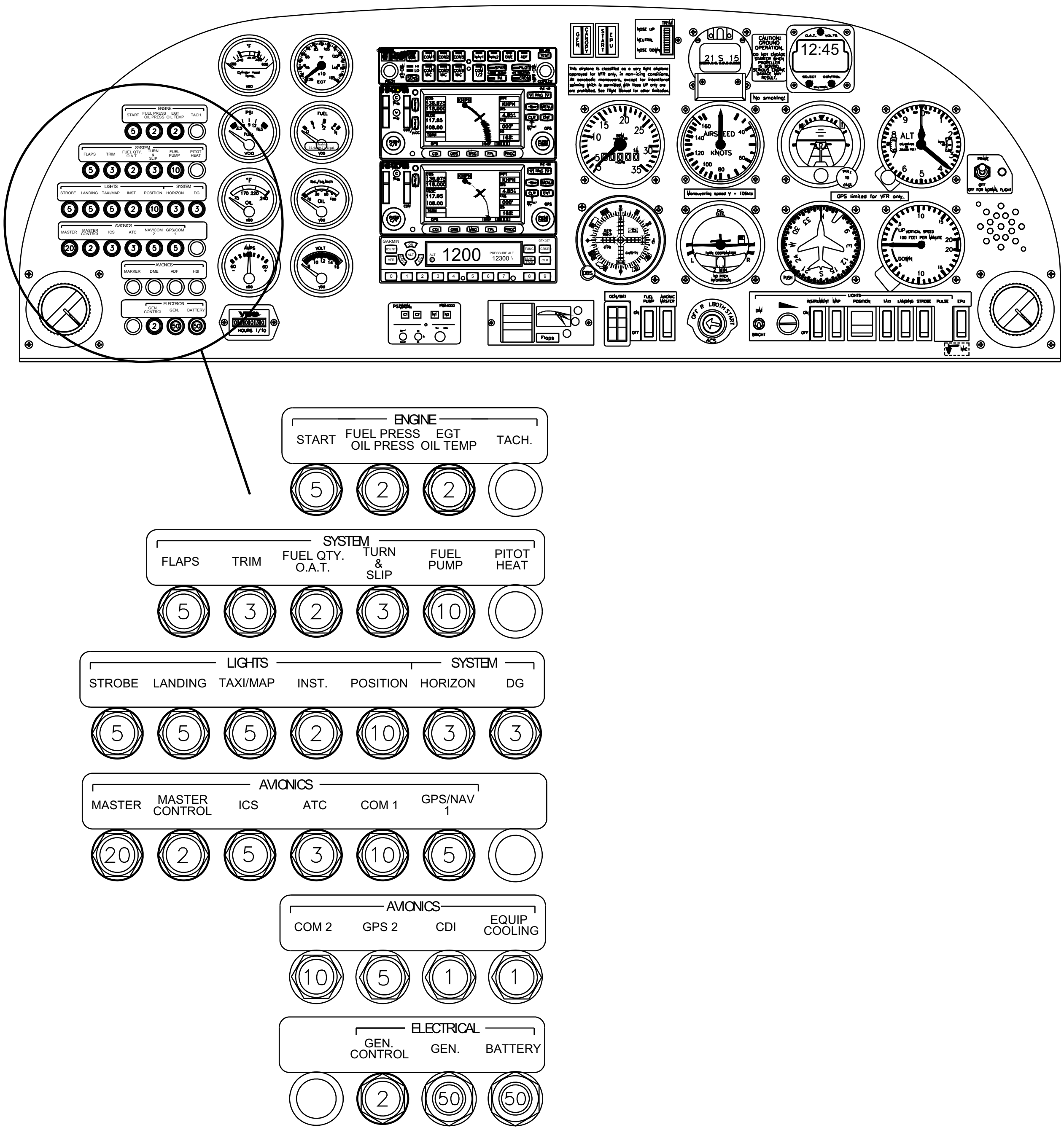

Figure 3 - Typical Reversed Instrument Panel Circuit-breaker Locations

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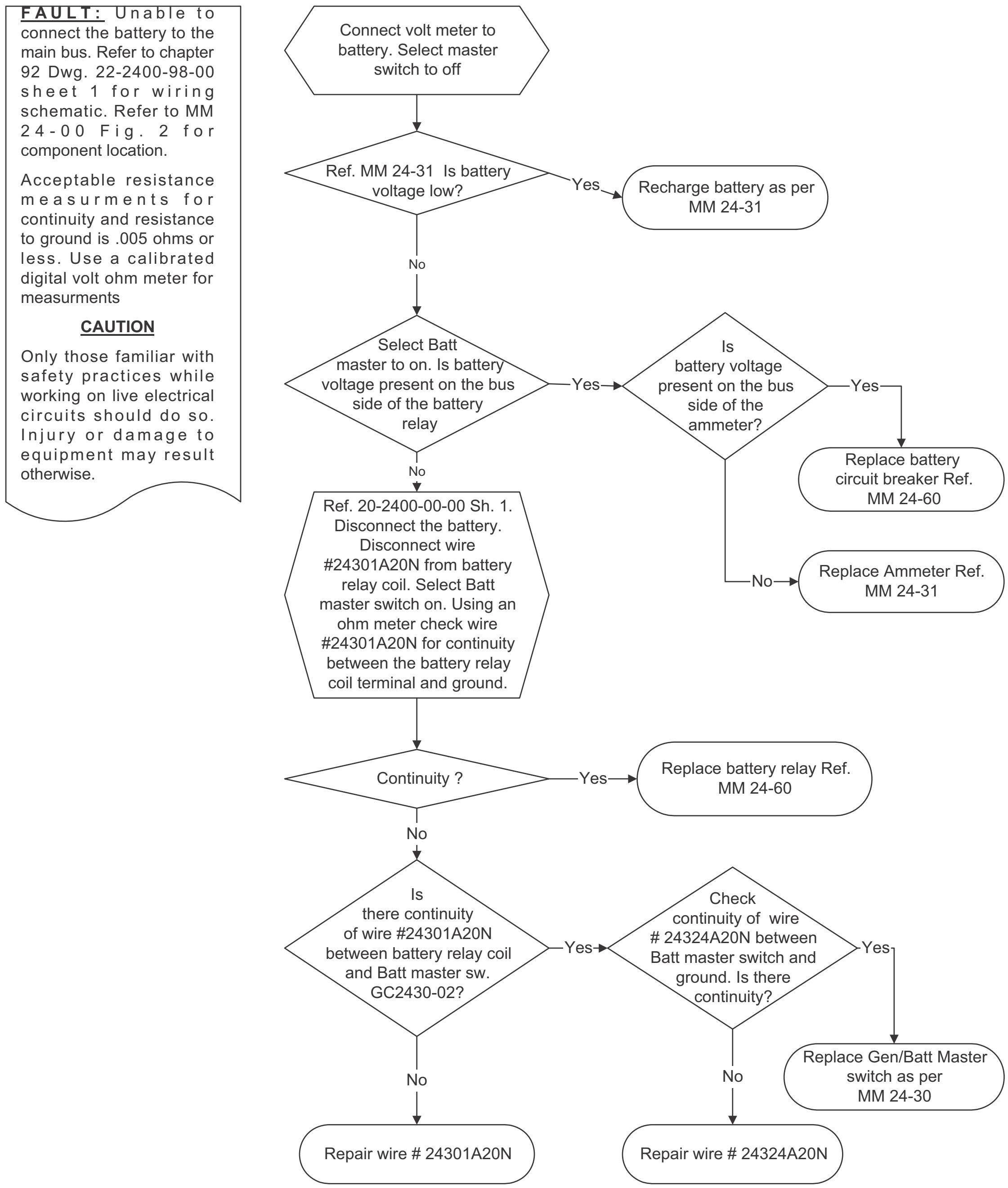
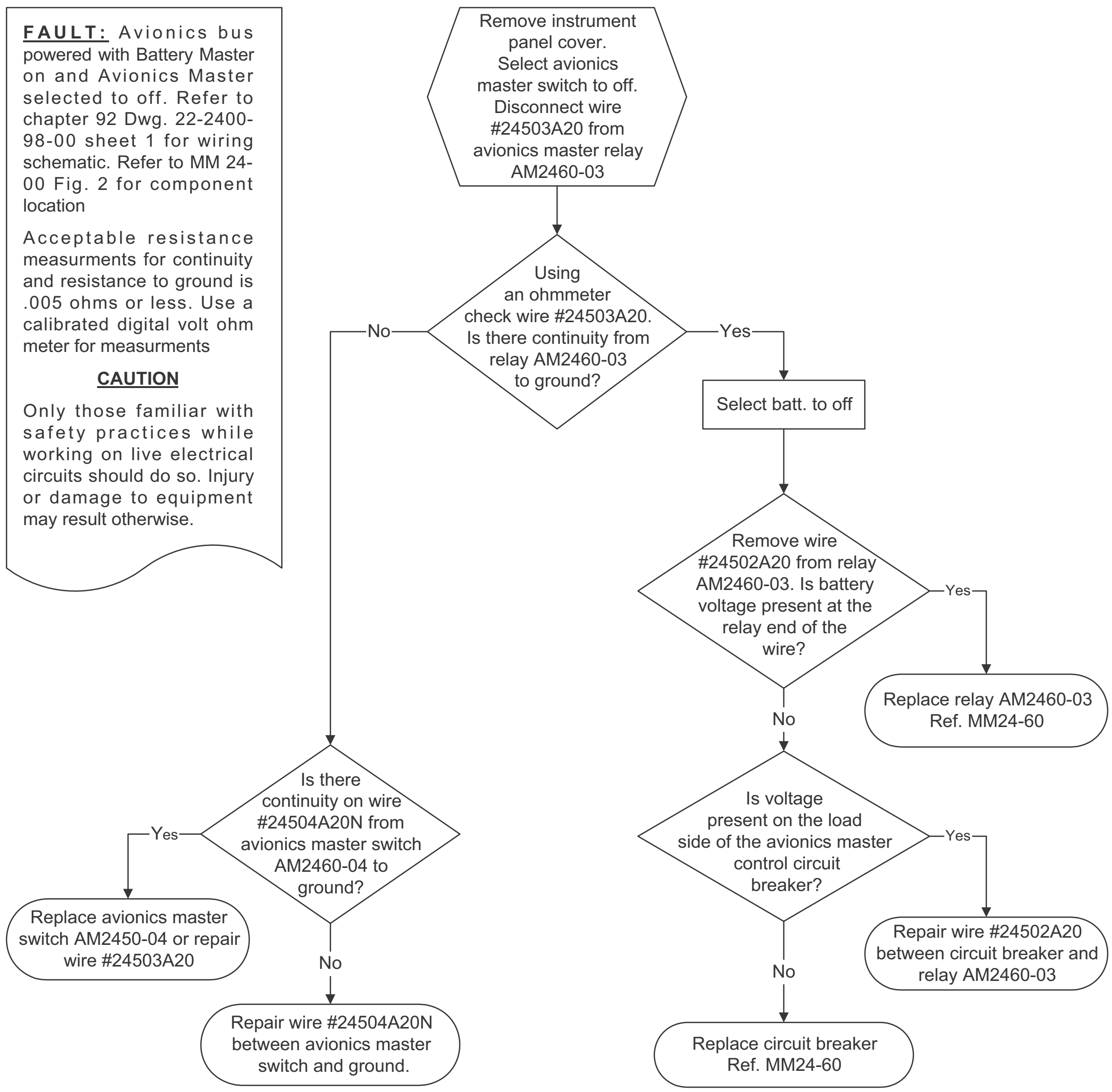
DC ELECTRICAL LOAD DISTRIBUTION - TROUBLESHOOTING

1. General

Use the following flow charts to trouble-shoot the DC electrical load distribution system:



Flow Chart - Sheet 1 of 2



Flow Chart - Sheet 2 of 2

DC ELECTRICAL LOAD DISTRIBUTION - MAINTENANCE PRACTICES

1. General

This chapter describes how to remove/install and adjust/test the components of the DC electrical distribution system on the aircraft. Refer to the component manufacturer's manuals for more data and shop data.

2. Electrical Safety

The DA20-C1 aircraft has a low-voltage DC electrical system. When correctly maintained it is safe to work on. But the battery can supply heavy current through low-resistance circuits (for example, if you ground the positive output with a wrench by accident).

Always follow the usual safety practices for working on electrical equipment. Allow only qualified persons to maintain the electrical system.

CAUTION: DISCONNECT THE BATTERY BEFORE DOING MAINTENANCE ON THE ELECTRICAL SYSTEM. MAKE SURE TO DISCONNECT THE NEGATIVE LEAD FIRST.

CAUTION: AFTER DOING ELECTRICAL MAINTENANCE ALWAYS DO A CONFIDENCE TEST OF THE SYSTEM WITH A 14 VOLT POWER SUPPLY THAT HAS OVER-CURRENT PROTECTION. DO THIS BEFORE CONNECTING THE BATTERY

CAUTION: USE ONLY DA20-C1 AIRCRAFT SPARE PARTS APPROVED BY THE MANUFACTURER.

3. Remove/Install the Avionic Master Relay

A. Remove the Avionic Master Relay

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Disconnect the negative cable first.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the control cable and power wires from the avionic master relay:	
4.	Release the bolt which attaches the avionic master relay to the instrument panel shelf.	
5.	Remove the relay.	

B. Install the Avionic Master Relay

	Detail Steps/Work Items	Key Items/References
1.	Put the avionic master relay in position on the instrument panel shelf.	
2.	Install the attaching bolt.	
3.	Connect the control and power wires to the avionic master relay.	Refer to Chapter 92 for wiring diagrams. Obey the numbering and terminal layout placard on the relay.
4.	Connect the aircraft battery.	Connect the positive cable first.
5.	Do a test of the avionic master relay.	
6.	Install the instrument panel cover.	Refer to Chapter 25-10.

C. Avionic Master Relay Functional Test

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to ON.	
2.	Set the radios ON.	
3.	Set the AVIONIC MASTER switch to ON.	The radios must operate.
4.	Set the AVIONIC MASTER switch to OFF.	
5.	Pull the AVIONIC MASTER CTRL Circuit-breaker.	The radios must operate.
6.	Set the GEN/BAT switch to OFF.	

4. Remove/Install a Circuit-breaker

A. Remove a Circuit-breaker

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Disconnect the negative cable first.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the wires from the circuit-breaker.	
4.	Remove the screw from the copper bus-bar.	
5.	Remove the circuit-breaker.	

B. Install a Circuit-breaker

	Detail Steps/Work Items	Key Items/References
1.	Put the circuit-breaker in position on the instrument panel shelf.	
2.	Install the attaching nut.	
3.	Install the screw in the copper bus-bar.	
4.	Connect the wires to the circuit-breaker.	Refer to Chapter 92 for wiring diagrams.
5.	Connect the aircraft battery.	Connect the positive cable first.
6.	Do a functional test of the circuit-breaker.	
7.	Install the instrument panel cover.	Refer to Chapter 25-10.

C. Circuit-breaker Functional Test

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to ON.	
2.	Operate the related system.	Apply the full electrical load to the system.
3.	Pull the circuit-breaker.	The system must stop operating. Make sure that there is no power to the system.
4.	Close the circuit-breaker.	
5.	Set the GEN/BAT switch to OFF.	

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CHAPTER 25-00
EQUIPMENT/FURNISHING

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EQUIPMENT/FURNISHING

1. General

   This chapter describes about the equipment and furnishing in the flight compartment. Chapter 25-10 includes the cabin trim panels, pilot's seats and safety belts. Chapter 25-60 gives the data for the Emergency Location Transmitter (ELT).

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FLIGHT COMPARTMENT

1. General

The flight compartment contains fixed seats for two pilots. Each pilot has a safety belt. The fuselage shell has fabric wall panels. GFRP or CFRP moldings make the instrument panel cover and the center console. Refer to Chapter 25-60 for data about the Emergency Locator Transmitter (ELT).

2. Description

A. Pilot’s Seats

Each pilot's seat has the following three parts:

- a molded GFRP backrest which is integral with the bulkhead
- a molded GFRP or CFRP seat pan which also makes the outer arm rest for the seat
- a full-length padded seat cushion.

B. Safety Belts

Each pilot's seat has a four-point safety belt with a central lock. The pilot can adjust each of the four straps to give the correct fit. Shoulder straps with inertia reels are optional. Replace frayed or damaged straps.

C. Fabric Wall Panels

Fabric wall panels bond to the inside of the fuselage shell. Each panel has a map pocket. Optionally some aircraft may have GFRP or CFRP wall panels with fabric coverings. The panels are attached with Velcro and screws.

D. Instrument Panel Cover

A GFRP or CFRP cover goes over the instrument panel. The outer face of the cover is painted. The cover has two air vents for avionic cooling. The air vents are used as hand-holds to help the pilot's to go in or out of the cockpit. Screws attach the cover to the instrument panel. The instrument panel cover has a de-frost manifold. The de-frost manifold connect to the cabin heating system. The manifold supplies warm air to the front of the canopy to prevent misting.

E. Center Console Access Panel

The center console has an access panel for the controls in the center console.

F. Baggage Compartment Floor Panel

The baggage compartment floor has three pieces. You can remove the center piece by itself. The outer pieces make stowage boxes. The pieces are made of GFRP or CFRP.

G. Baggage Net

A net attaches to the front of the floor panel. Quick-release hooks attach it to the roll bar.

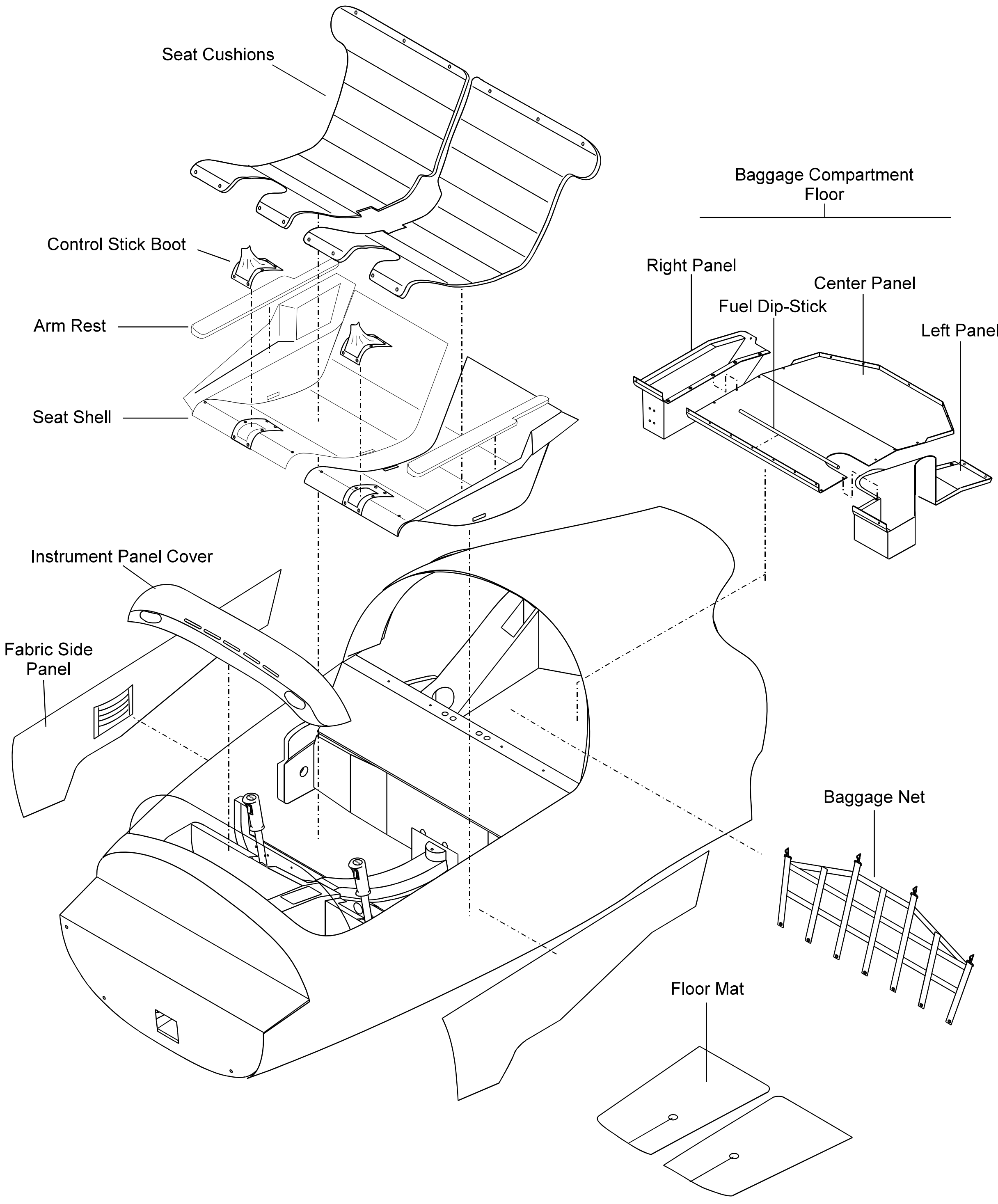

Figure 1 - Flight Compartment Furnishing Locations

EQUIPMENT/FURNISHING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove/install the seats and other furnishings. Refer to Chapter 25-60 for data about the ELT.

2. Remove/Install a Pilot's Seat

A. Remove a Pilot's Seat

	Detail Steps/Work Items	Key Items/References
1.	Release the press-studs which hold the seat cushion and remove the seat cushion.	
2.	Remove the boot for the control stick.	
3.	Remove the five screws from the seat shell.	
4.	Lift the seat a little: - Release the quick-release fastener for the outer strap - Move the inner strap through the hole in the seat shell.	Take care not to loose the rubber strips from the holes.
5.	Remove the seat shell.	

B. Install a Pilot's Seat

	Detail Steps/Work Items	Key Items/References
1.	Make sure that there are no unwanted items below the seat.	
2.	Make sure that the outer strap is in position in the seat shell.	
3.	Move the inner strap through the hole in the seat shell.	Make sure that the rubber strips are in position on the hole.
4.	Put the seat shell in position.	
5.	Install the attaching screws.	
6.	Install the boot for the control stick.	
7.	Install the seat cushion.	

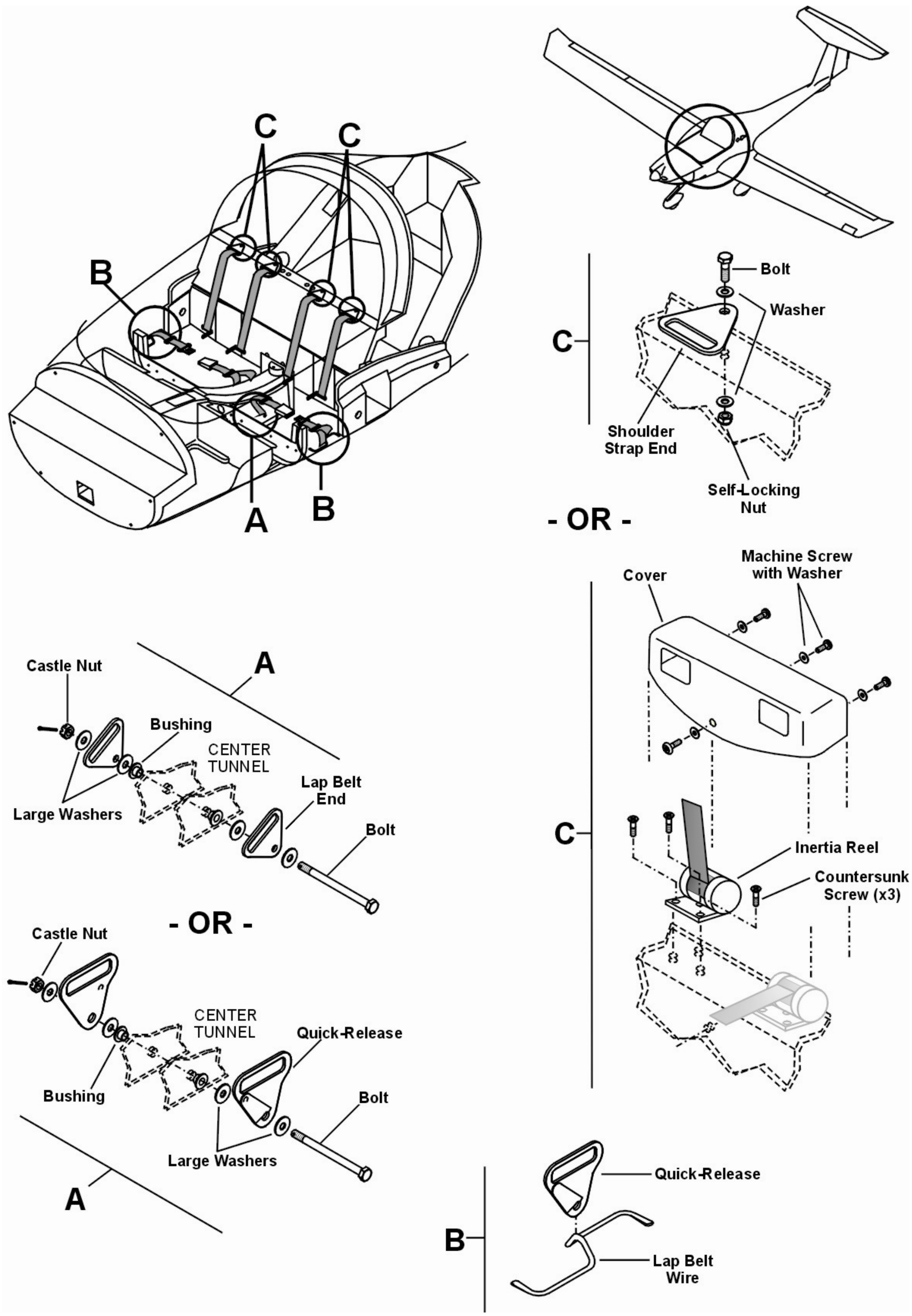

Figure 201 - Safety Belt Installation

3. Remove/Install a Safety Belt

A. Remove a Safety Belt

	Detail Steps/Work Items	Key Items/References
1.	Release the bolts that attach the shoulder straps, or remove the cover and the three screws that attach the inertia reels.	Refer to Figure 201.
2.	Remove the seat shell.	Refer to Paragraph 2 above.
3.	Remove the lap strap with the central lock by releasing the quick release.	
4.	Loosen the mounting bolt for the lap strap without a central lock. Pull the strap from the mounting, or release the quick release.	

B. Install a Safety Belt

	Detail Steps/Work Items	Key Items/References
1.	Connect the lap strap without the central lock onto the mounting using the quick release.	
2.	Install the mounting ball with the ends of the lap straps with the central lock, or install quick release.	
3.	Install the seat shell.	Refer to Paragraph 2 above.
4.	Put the shoulder straps in position and install the attaching bolts. Or attach the inertia reels with the three screws and install the plastic covers.	Refer to Chapter 92 for wiring diagrams.

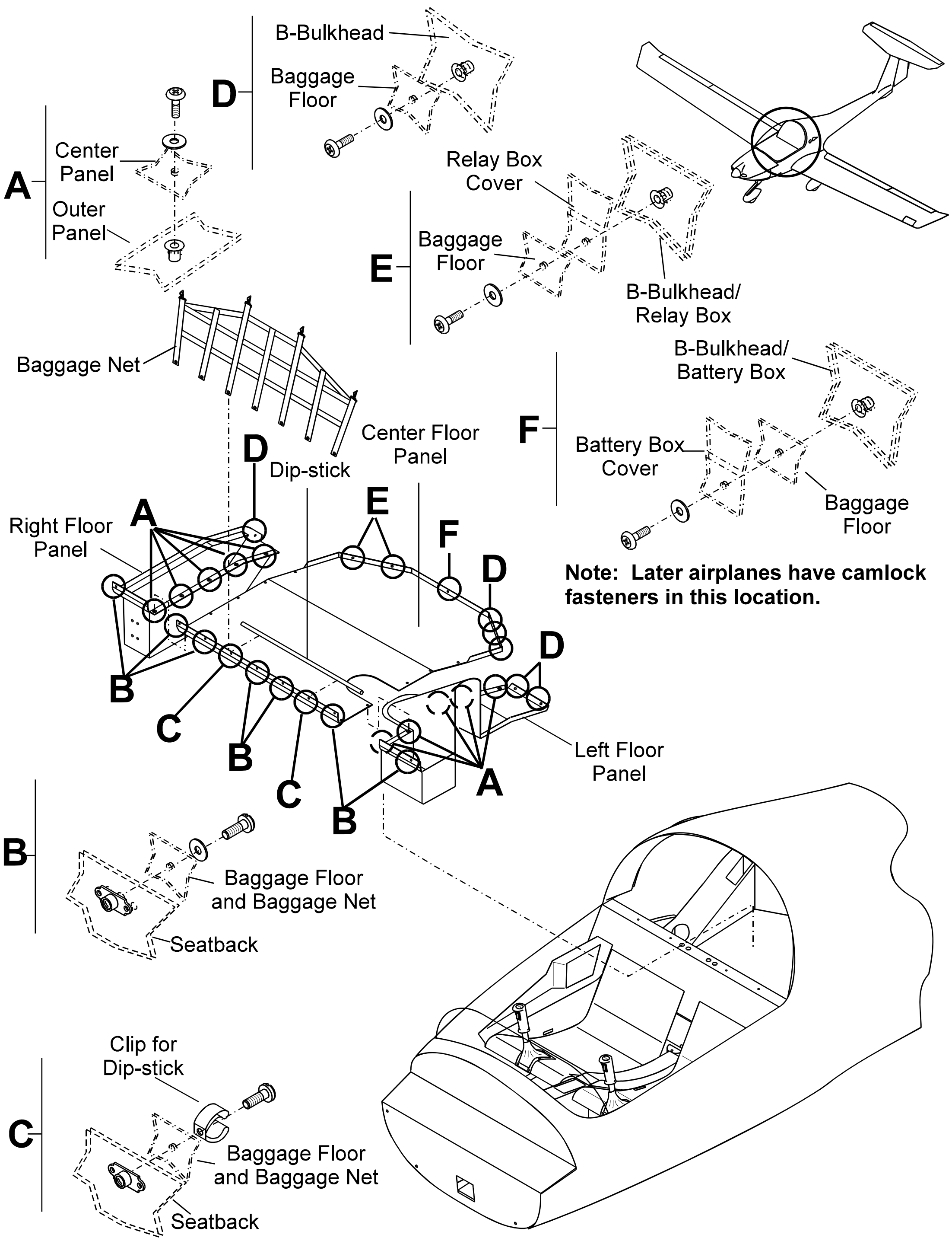

Figure 202 - Baggage Compartment Floor Panel Installation

4. Remove/Install the Instrument Panel Cover

A. Remove the Instrument Panel Cover

	Detail Steps/Work Items	Key Items/References
1.	Remove the screws around the edge of the instrument panel cover.	
2.	Lift the cover clear.	

B. Install the Instrument Panel Cover

	Detail Steps/Work Items	Key Items/References
1.	Make sure that there are no unwanted items forward of the instrument panel.	
2.	Put the instrument panel cover in position.	
3.	Install the screws around the edge of the cover.	Install the screws to the instrument panel first. Then install the screws to the fuselage.

5. Remove/Install the Baggage Compartment Floor Panel

A. Remove the Baggage Compartment Floor Panel.

Refer to Figure 202.

	Detail Steps/Work Items	Key Items/References
1.	Remove the battery box cover. (Aircraft with aft mounted battery only).	
2.	Remove inertia reel covers, if fitted.	
3.	Remove the screws around the aft edge of the center floor panel.	
4.	Remove the screws along the joints for the left and right panels.	
5.	Remove the fuel dip-stick from the clips.	
6.	Remove the screws along the front edge of the center panel.	Note the location of the baggage net and the gripper clips for the dip-stick.
7.	Lift the center panel clear.	
8.	If necessary, remove the screws from the outer edges of the outer panels.	Only remove the outer panels, if necessary.
9.	Lift the outer panel clear.	

A. Install the Baggage Compartment Floor Panel.

Refer to Figure 202.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that there are no unwanted items below the floor panel.	
2.	If necessary, put the outer floor panels in position.	Only if the panels were removed.
3.	Install the screws around the edge of the outer panels.	
4.	Put the center floor panel in position.	
5.	Loosely install the screws along the forward edge of the panel.	Each screw attaches the baggage net. Two screws also attach the clips for the dip-stick.
6.	Loosely install the screws along the joints of the left and right panels and the center panel.	
7.	Loosely install the screws along the aft edge of the center panel.	
8.	Install inertia reel covers, if fitted.	
9.	Install the battery box cover. (Aircraft with aft mounted batteries only).	
10.	Tighten all of the screws.	

6. <u>Cleaning</u>

A. Seats

The seat cushions are a fire resistant material. Clean the cushions with a vacuum cleaner. Use a mild soap solution to remove stains.

B. Safety Belts

Use a mild soap solution to remove dirt from the safety belts.

EMERGENCY

1. General

This chapter describes about the optional Emergency Location Transmitter (ELT). It describes only the installation in the aircraft. Refer to the manufacturer's Operator's Manual for more data.

2. Description

The ELT is located in a compartment in the B-bulkhead behind the right seat. The ELT transmits a signal automatically after a crash on the emergency frequencies of 121.5 and 243.0 MHz. You can operate the ELT manually for testing (or after an emergency landing).

Maintenance on the aircraft is only a visual examination of the installation (housing, mounting and antenna). Monitor the battery expiry date. The date is on the identification plate on the housing. Replace batteries when they expire or after 1 hour of cumulative use.

Do regular functional tests. (Refer to the DA20-C1 Airplane Flight Manual).

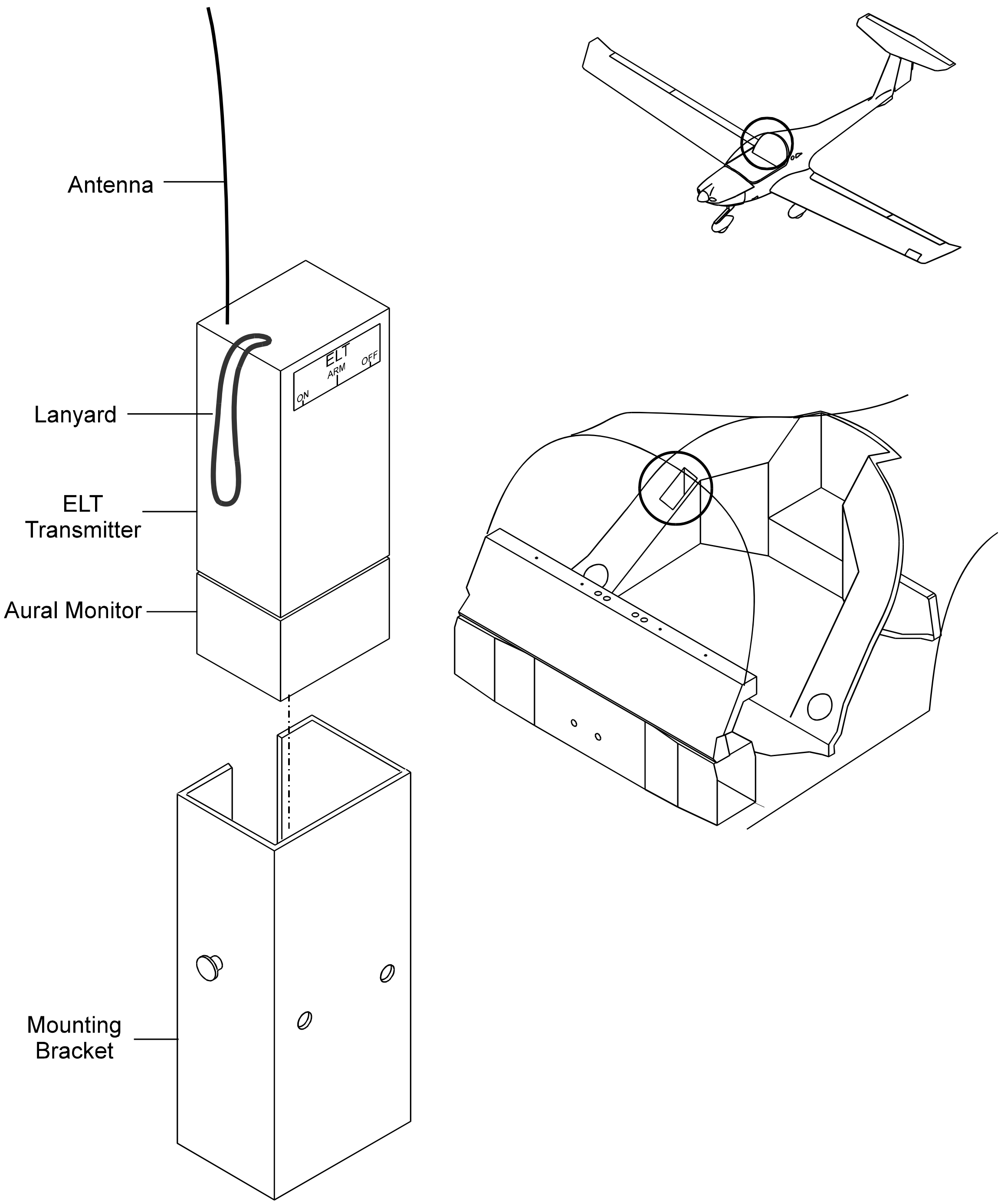

Figure 1 - ELT Installation

ELT - MAINTENANCE PRACTICES

1. General

This chapter describes only how to test the ELT in the aircraft. Refer to the ELT manufacturer's Operator's Manual for more data.

2. ELT Functional Test

NOTE: Do this test only during the first 5 minutes of each hour. If you are at a location with a control tower or other monitoring facility, tell them before you do the test.

	Detail Steps/Work Items	Key Items/References
1.	Set the master switch to ON.	
2.	Set the radio to receive on 121.5 MHz.	
3.	Set the ELT to ON.	The test must not last longer than 3 audio sweeps.
4.	Monitor the radio for the ELT sweep tone.	
5.	Set the ELT to OFF.	
6.	Set the master switch to OFF.	

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EMERGENCY LOCATOR TRANSMITTER (ELT)

1. General

This chapter describes about the optional ARTEX ELT model ME 406. Refer to the manufacturer's Operator's Manual for more data.

2. Description

A. ELT Equipment

(1) Location

The ME 406 ELT is located in a mounting bracket on the right side of the rear fuselage compartment adjacent to the baggage tray. For reverse panel configurations, the ME 406 ELT is located in a side bracket on the left side of the rear fuselage compartment adjacent to the baggage tray. A Velcro strap attached to the mounting bracket holds the ME 406 ELT in position. The ME 406 ELT has an antenna installed through a side bracket hole in accordance with the Artex ME 406 Manual.

(2) Signal Transmission

The ME 406 ELT transmits signals automatically after a crash on the emergency frequencies of 121.5 and 406.028 Megahertz (MHz). Every 50 seconds the transmitter transmits a signal on the 406.028 MHz frequency to a satellite. The signal to the satellite contains the serial number of the ELT transmitter or the aircraft ID, a country code and a unique identity code. The satellite will also give the emergency services a more accurate location for the aircraft.

(3) Functional Test

Do regular functional tests (Refer to the Maintenance Practices in this Section).

B. ELT Batteries

The ME 406 ELT has its own battery pack to supply electrical power. When the ELT is ON and transmitting, the batteries will keep the ELT transmitting the 121.5 MHz frequency until battery power is drained out and will transmit the 406.028 MHz frequency for up to 24 hours.

It is important to monitor the battery expiry dates for the battery pack. The expiry date for the battery pack is shown on the identity plate for the transmitter. The battery pack must be replaced:

- After use in an emergency
- After the transmitter has been accidentally switched ON for an unknown period of time
- After 1 hour of accumulated use (testing)
- On or before the battery pack expiry date.

3. Operation

A. ELT

The ELT has a switch with the following two positions:

- ON

- ARM

The ON position is for ground test. When the aircraft is in use, the switch must be in the ARM position.

(1) Emergency Operation

If the aircraft crashes, then the accelerometer senses the crash. The accelerometer sets the transmitter to ON. The transmitter transmits the international distress frequency and on 406.028 MHz. The battery in the ELT supplies power to the transmitter. The battery can operate the ELT for at least 50 hours.

(2) Test

If you switch the ELT to 'ON', then the following occurs:

- A LED flashes in the ELT unit.

NOTE: If more than 1 flash is observed, refer to the Artex Installation Manual: 570-1600.

- If you set the radio to 121.5 MHz, you can hear three audio sweeps tone from the ELT.

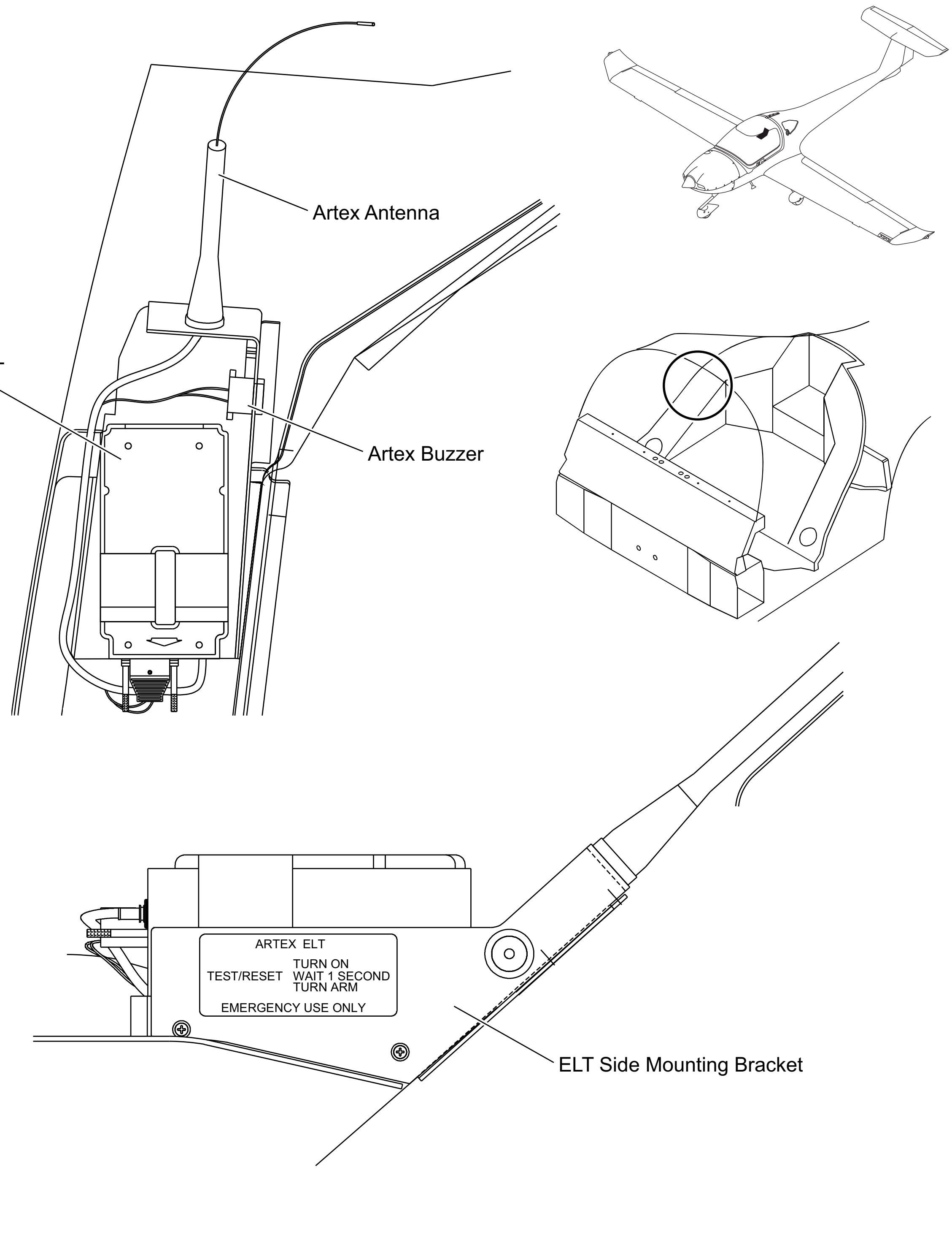

Figure 1 - ARTEX Model ME 406 ELT Installation

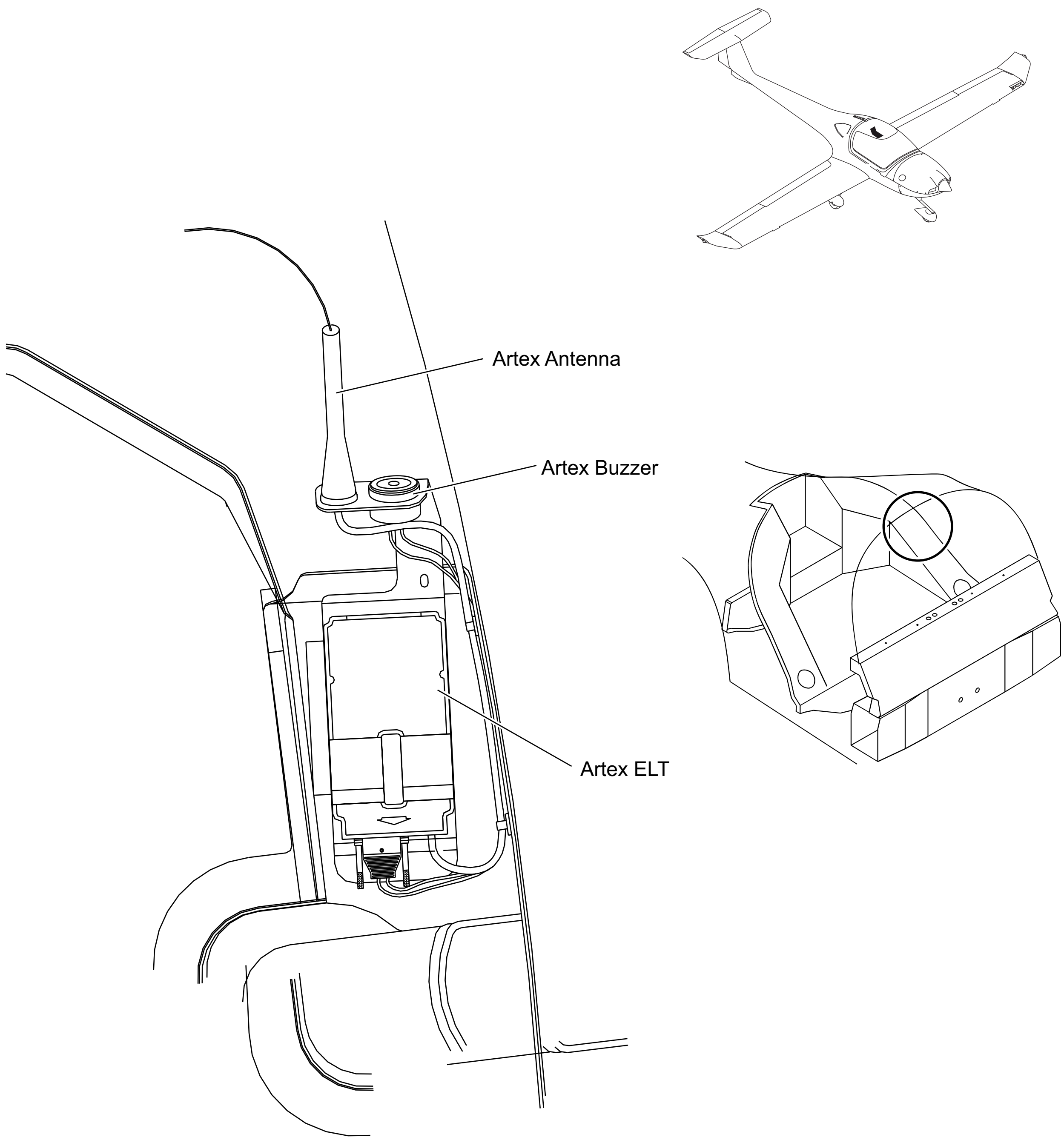

Figure 2 - ARTEX Model ME 406 ELT Installation (Reverse Panel Configuration)

ELT - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the ELT system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
ELT does not operate on test.	ELT batteries discharged.	Replace the ELT batteries.
	ELT defective.	If the ELT batteries are serviceable, then replace the ELT.

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ELT - MAINTENANCE PRACTICES

1. General

This chapter describes how to:

- remove and install the ELT
- test the ELT in the airplane
- replace the batteries in the ELT.

This chapter also describes the periodic maintenance necessary to maintain the ELT equipment in a serviceable condition.

2. Remove/Install the ELT

A. Remove the ELT

	Detail Steps/Work Items	Key Items/References
1.	Disconnect all the cables from ELT.	At the ELT.
2.	Release the velcro strap that holds the ELT in its mounting and remove the ELT from the aircraft.	Velcro strap.
NOTE: IF THE ELT IS MOVED TO A DIFFERENT AIRCRAFT THAN WHICH IT WAS ORIGINALLY REGISTERED WITH, THEN THE ELT MUST BE RE-REGISTERED AND THE PRODUCT LABEL RE-MARKED TO INDICATE THE NEW PROGRAMMING AND/OR NEW COUNTRY OF REGISTRY.		

B. Install the ELT

	Detail Steps/Work Items	Key Items/References
NOTE: IF THE ELT IS MOVED TO A DIFFERENT AIRCRAFT THAN WHICH IT WAS ORIGINALLY REGISTERED WITH, THEN THE ELT MUST BE RE-REGISTERED AND THE PRODUCT LABEL RE-MARKED TO INDICATE THE NEW PROGRAMMING AND/OR NEW COUNTRY OF REGISTRY.		
1.	Put the ELT into position to the mounting bracket.	
2.	Secure the ELT with the Velcro strap.	Velcro strap.
3.	Connect all the cables to the ELT that were disconnected during removal.	
4.	Do a test for the correct operation of the ELT.	Refer to Paragraph 3.

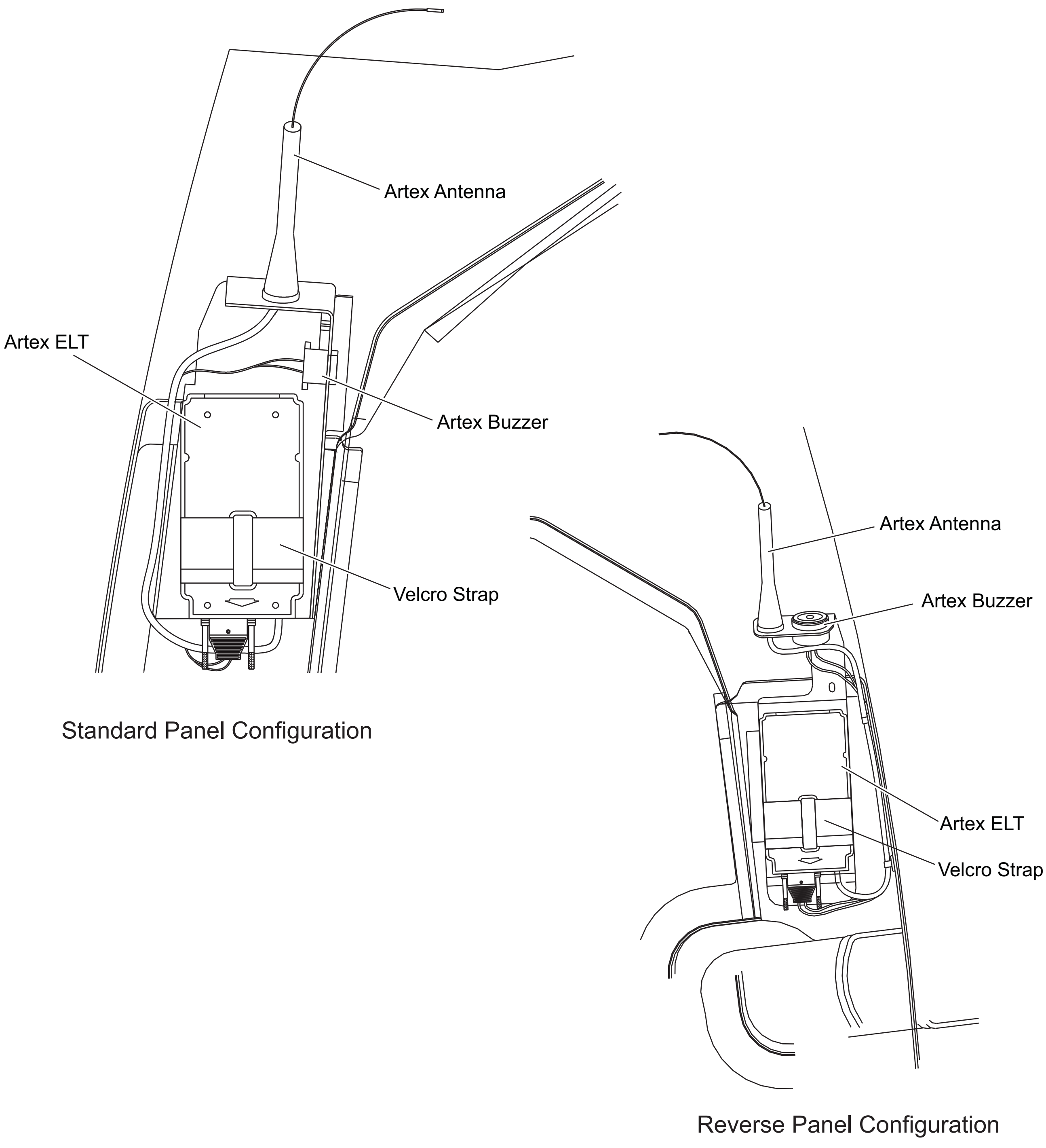

Figure 201 - Removal/Installation of ME 406 ELT

3. ELT Functional Test

CAUTION: DO NOT ALLOW THE TEST DURATION TO EXCEED 5 SECONDS. THE ELT WILL TRANSMIT A 406.025 MHZ SIGNAL AFTER THE ELT IS ACTIVE FOR APPROXIMATELY 47 SECONDS. THE SATELLITE SYSTEM CONSIDERS THIS TRANSMISSION TO BE A VALID DISTRESS SIGNAL.

NOTE: Do this test only during the first 5 minutes of each hour. If you are at a location with a control tower or other monitoring facility, tell them before you do the test.

NOTE: For maintenance done to FAR 91 (aircraft registered in the USA) an additional functional test of the ELT is required. Refer to FAA Action Notice 8150.3 for more data.

	Detail Steps/Work Items	Key Items/References
1.	Set the AVIONICS MASTER switch to ON.	
2.	Set the radio to receive on 121.5 MHz.	
3.	Set the ELT switch to ON for 1 second.	
4.	Make sure that the receiver voices three audio sweep tones.	
5.	Set the ELT switch to ARM.	Pay special attention to the LED activity upon entering the 'ARM' condition. If a problem is detected, the LED provides a coded signal following the initial 1 second pulse. Refer to the ME 406 ELT manufacturer's Operator's Manual for coded signals.
6.	Make sure that the ELT unit flashes once.	
7.	Set the AVIONICS MASTER switch to OFF.	

4. Replace the ELT Batteries

You must only use a battery pack that is supplied by the equipment manufacturer.

NOTE: The battery pack contains components that are sensitive to static electricity. You must take electro-static discharge precautions before doing work on the battery pack.

NOTE: The battery pack is connected to the ELT by a short electrical cable assembly. You must take care not to strain this cable when you separate the battery pack from the ELT.

	Detail Steps/Work Items	Key Items/References
1.	Remove the ELT from the aircraft ELT mounting.	Refer to Paragraph 2.
2.	Remove the battery pack as follows: - Remove the eight screws from the battery side cover - Carefully move the battery pack a short distance clear of the ELT - Disconnect the wiring harness - Move the battery pack clear of the ELT.	Hold the battery pack to the ELT with your hand to prevent the battery pack separating from the ELT.
3.	Do a visual inspection of the underside of the ELT (the battery pack side). Look especially for corrosion or other damage to the ELT casing.	
4.	Prepare the new battery pack for installation.	
5.	Lay the battery pack on the work surface with the batteries facing up.	
6.	Install the replacement seal.	In the slot along the perimeter housing.
7.	Position the ELT over the battery pack and plug the connector into the battery assembly.	Make sure that the cable is not twisted and that the connector is correctly attached.
8.	Mate the ELT to the battery.	Make sure that the seal is positioned correctly.
9.	Install the 8 screws that attach the battery pack to the ELT.	

	Detail Steps/Work Items	Key Items/References
10.	Install the ELT in the aircraft mounting and attach the Battery Pack Replacement Date label to the top surface of the ELT protective cover where it can be easily seen.	Refer to Paragraph 2.
11.	Record the details of the ELT battery pack replacement date in the airplane log-book.	
12.	Do a functional test of the ELT.	Refer to Paragraph 3.

5. ELT Periodic Inspection

The ELT installation must be inspected at least once every 12 months to maintain serviceability.

	Detail Steps/Work Items	Key Items/References
1.	Examine the ELT and the ELT mounting tray, look specially for: - Security of the fasteners - Security of all mechanical assemblies.	
2.	Examine the cable which connects the ELT. Look specially for: - Cuts or abrasions to the outer sheath of the cable.	
3.	Read the expiry date of the system battery and replace the battery if necessary.	Refer to Paragraph 4.

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CHAPTER 26-00
FIRE PROTECTION

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FIRE PROTECTION

1. General

This chapter describes the fire extinguisher installed in the aircraft. Refer to the manufacturer's manual for more data about the fire extinguisher.

2. Description

Figure 1 shows the installation of the fire extinguisher in the aircraft. The fire extinguisher is located behind the right seat in the baggage compartment. Bolts attach the mounting bracket for the fire extinguisher to the baggage compartment floor. The extinguisher uses a dry powder which is non-toxic. The powder does not leave a residue.

The only on-aircraft maintenance is:

- Monitor the pressure indicator. It must show in the green sector
- Make sure that the seal wire is not broken
- Make sure that the extinguisher is correctly held in the mounting.

If the seal wire is broken, remove the extinguisher for weighing. Weight data is given on the extinguisher body.

You must replace the extinguisher (or return it to the manufacturer for repair) when:

- the weight is incorrect
- the pressure is too low
- the extinguisher has been used.

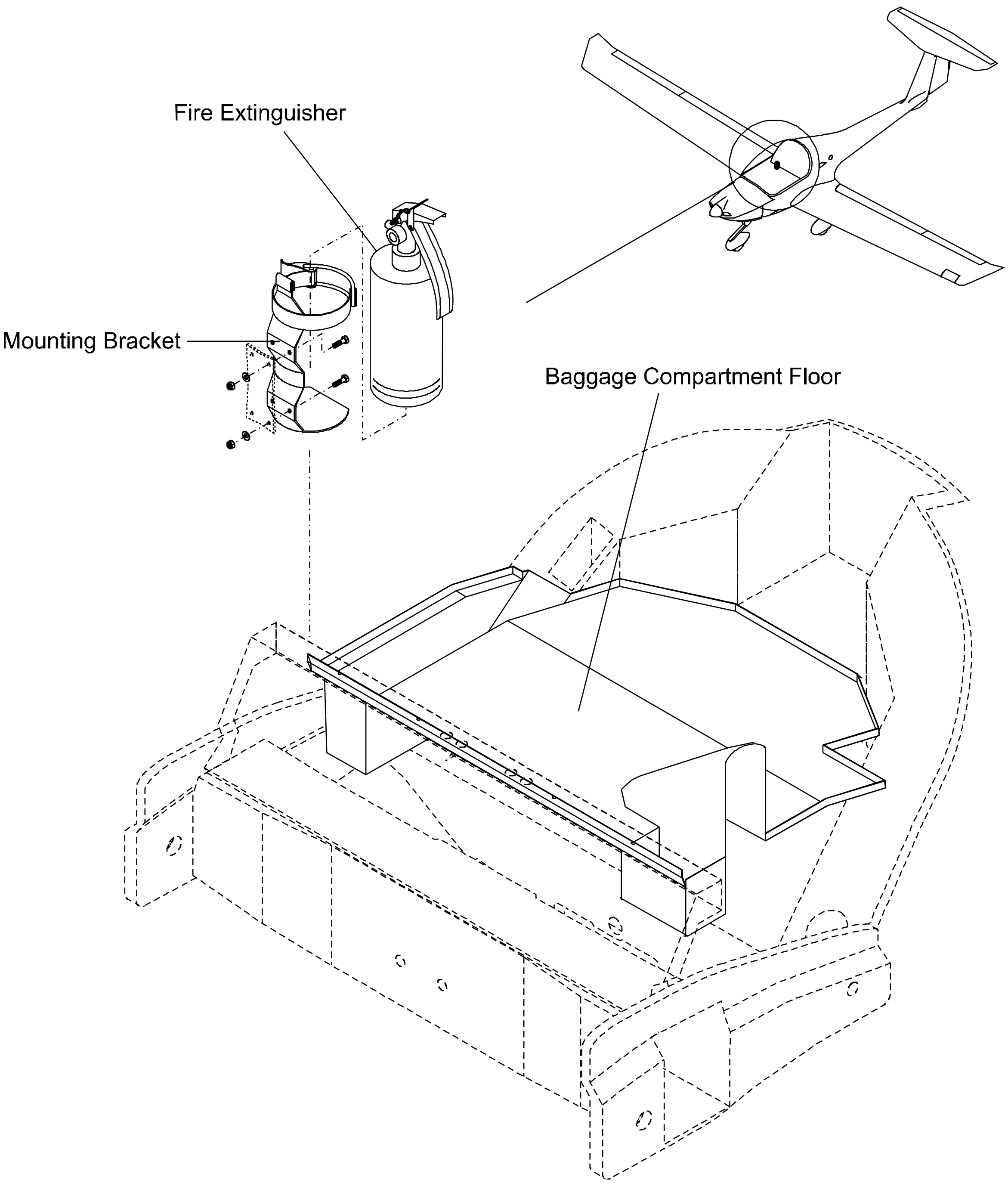

Figure 1 - Fire Extinguisher Installation

CHAPTER 27-00
FLIGHT CONTROLS

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FLIGHT CONTROLS

1. General

This chapter describes about the operation and the adjustment of the flight controls. It also describes about the assembly of the flight controls. Refer to the related section for the data on a specified system.

This chapter describes how standard parts are used to make the flight controls for each system.

2. Description

The DA20-C1 aircraft has the usual flight controls. An elevator attached to the horizontal stabilizer gives longitudinal control. Ailerons attached to the trailing edge of each wing give lateral control. The rudder attached to the Vertical Stabilizer gives yaw control. Flaps attached to the trailing edge of each wing give extra lift for landing and for take-off.

The DA20-C1 aircraft has a control stick for each pilot. The pilot can set the elevator trim with a control switch in the center console.

Each pilot has a rudder pedal assembly. The assembly attaches to the cockpit floor. The pilot can adjust the position of the rudder pedals with a T-grip selector on the rudder pedal assembly.

The pilot moves each primary control through a system of control rods and bellcranks. Cables operate the rudder. An electric actuator operates the flaps.

3. Control Rods

The control rods used in the DA20-C1 aircraft have standard end fittings. Also most rods use a standard diameter tube. Only the length of the rods is special.

Figure 1 shows an example of a standard control rod. The rod has adjustable end fittings. Each end fitting has an eye end with a threaded shaft. The eye end has a bearing. A lock nut on the threaded shaft locks the eye end in position. You can turn the eye end to adjust the length of the rod.

A steel tube connects the end fittings. Threaded inserts are welded into position in the end of each steel tube. A safety hole is drilled in each end of the steel tube. The safety hole shows you if the installation of the eye end to the insert in the steel tube is correct. If you can push the safety wire through the hole to the other side, the eye end installation is not correct. But, if you cannot push the safety wire through the hole, the eye end installation is correct.

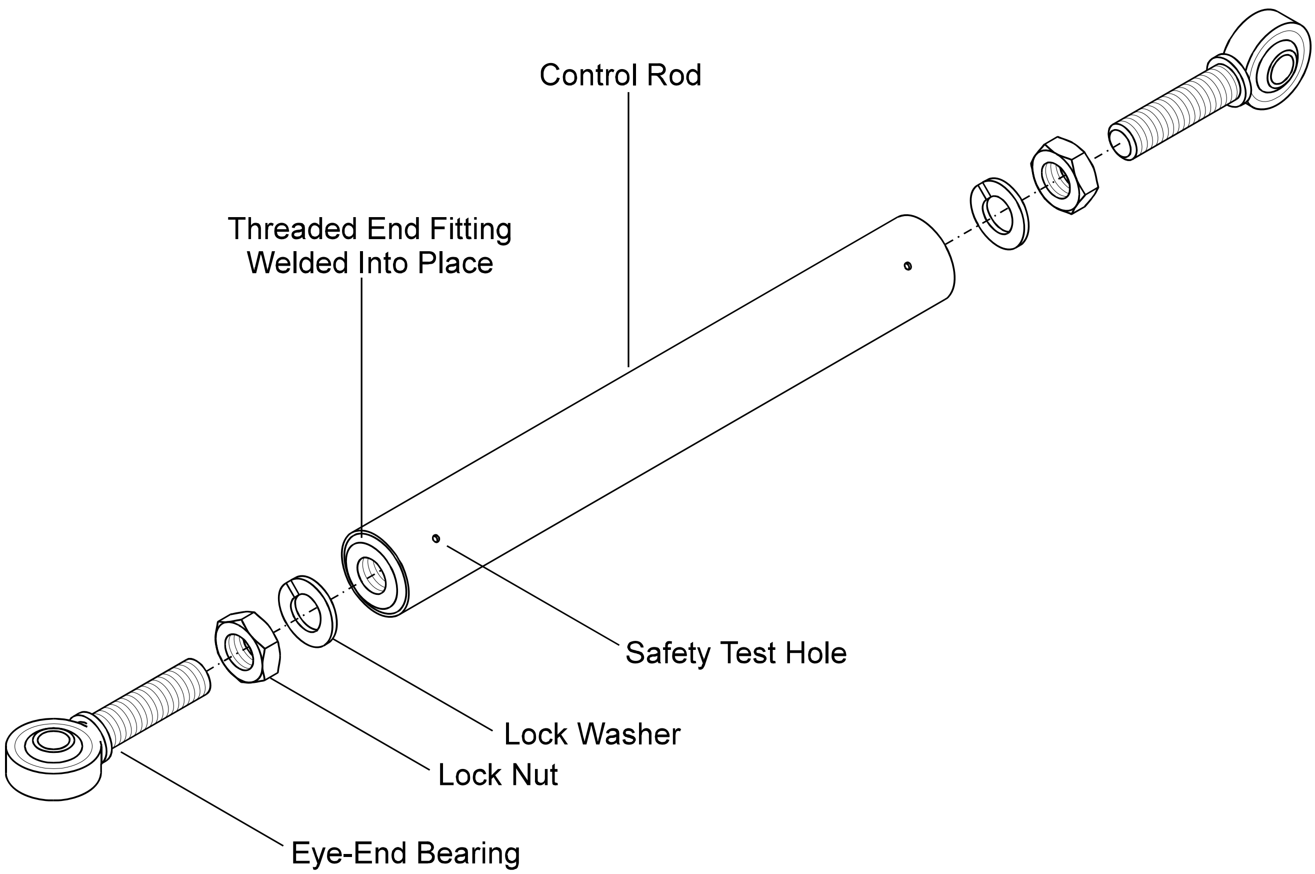

Figure 1 - Standard Control Rod

FLIGHT CONTROLS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the control stick.

WARNING: DO ALL THE STEPS OF THE CONTROL STICK INSTALL PROCEDURE CAREFULLY. CONTROL FAILURE CAN OCCUR IF THE CONTROL STICK INSTALLATION PROCEDURE IS NOT DONE CORRECTLY. THIS CAN CAUSE DEATH OR INJURY TO PERSONNEL.

WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.

WARNING: WHEN YOU COMPLETE WORK ON THE CONTROLS, MAKE SURE THAT YOU REMOVE ALL LOOSE ITEMS/TOOLS FROM THAT AREA. LOOSE ITEMS/TOOLS CAN PREVENT FULL MOVEMENT OF THE AIRCRAFT CONTROLS. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Remove/Install the Control Stick

A. Remove the Control Stick

	Detail Steps/Work Items	Key Items/References
1.	Remove the pilots’ seats.	Refer to Chapter 25-10.
2.	Make sure that the area around the controls/ control surfaces is clear of personnel/ equipment.	
3.	Cut the tie-wraps that hold the electrical cable (for the press to transmit buttons) to the control stick. - Disconnect the electrical cables (press to transmit button) from the control stick - Disconnect the ground cable from the control stick connection.	Refer to Chapter 27-10, Figure 1.
4.	Disconnect the aileron control rod from the control stick: - Remove the bolt that connects the aileron control rod to the control stick.	Refer to Chapter 27-10, Figure 1.

	Detail Steps/Work Items	Key Items/References
5.	Disconnect the control stick from the torque tube assembly: - Remove the bolt that connects the control stick to the torque tube assembly - Move the control stick clear of the torque tube assembly.	Refer to Chapter 27-10, Figure 1.

B. Install the Control Stick

	Detail Steps/Work Items	Key Items/References
1.	Examine the bearing of the aileron control rod. Make sure it is serviceable before you install the control stick.	Refer to Chapter 27-10, Figure 1.
2.	Put the control stick in position in the torque tube assembly. - Install the bolt that holds the control stick to the torque tube assembly.	Refer to Chapter 27-10, Figure 1. Torque to 4.2 lbf-ft (5.6 Nm).
3.	Put the aileron control rod in position in the control stick. - Install the bolt that holds the aileron control rod to the control stick.	Refer to Chapter 27-10, Figure 1. Make sure that the aileron control rod is at right angles to the control stick with the control sticks centered. Torque to 3.3 lbf-ft (4.5 Nm) (Shear nut).
4.	Connect the ground cable to the control stick.	Make sure that the cable does not limit the movement of the control stick.
5.	Connect the electrical cables (press to transmit button) to the control stick. - Crimp the two connections - Tie-wrap the cables to the control stick.	Make sure that the cable does not limit the movement of the control stick.
6.	Do a functional test of the press to transmit button.	Refer to Chapter 23-10.
7.	Do a loose item/tool inspection of the area. Make sure that you remove all loose items/ tools.	

	Detail Steps/Work Items	Key Items/References
8.	Do a test for correct operation of the controls and full range of movement. - If necessary, adjust the controls - If necessary for your airworthiness authority, do a second inspection of the controls.	Refer to Chapter 27-10 and Chapter 27-30.
9.	Install the pilots’ seats.	Refer to Chapter 25-10.

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FLIGHT CONTROLS - AILERONS AND TABS

1. General

The DA20-C1 aircraft has two control sticks that operate the ailerons. The aileron control system uses control rods and bellcranks.

A fixed trim tab attaches to the trailing edge of the left aileron.

Figure 1 shows the aileron controls in the fuselage, and Figure 2 shows the aileron controls in the wing.

2. Description

The DA20-C1 aircraft has a control stick for each pilot (Figure 1). Control rods connect to the bottom of the control sticks. The control rods connect to the bellcrank at the forward control bulkhead. The forward bellcrank at the control bulkhead connects to a control rod under the center console. The control rod connects to the rear control bellcrank.

The rear control bellcrank connects to the two long control rods in the wing. Each long control rod has 2 push rod guides. The first push rod guide attaches to the flap-control rib. The center rib holds the second push rod guide. The two long control rods connect to the two aileron bellcranks, one in each wing. Short control rods connect the aileron bellcranks to the aileron horns.

Each aileron bellcrank in the wing has a slot. A bolt with a sleeve goes through the slot. The ends of the slot hit the sleeve for the aileron gust stops. You cannot adjust the range of the gust stops. You can adjust the short control rods to move the range up or down.

The aileron mass balance attaches to a lever at the outboard end of the aileron.

The left aileron has a fixed trim tab. The fixed trim tab can only be adjusted on the ground.

3. Operation

If you move the control sticks to the left:

- The control rods connected to the stick move to the right
- The forward bellcrank moves the control rod below the center console to the rear
- The control rod below the center console moves the rear bellcrank so that the long control rods in the wing move to the left
- The aileron bellcrank in the left wing moves the short control rod attached to the left aileron horn to the rear
- The left aileron moves up
- The control rod in the right wing also moves to the left. It pulls the aileron bellcrank which moves the control rod attached to the right aileron horn forward
- The right aileron moves down.

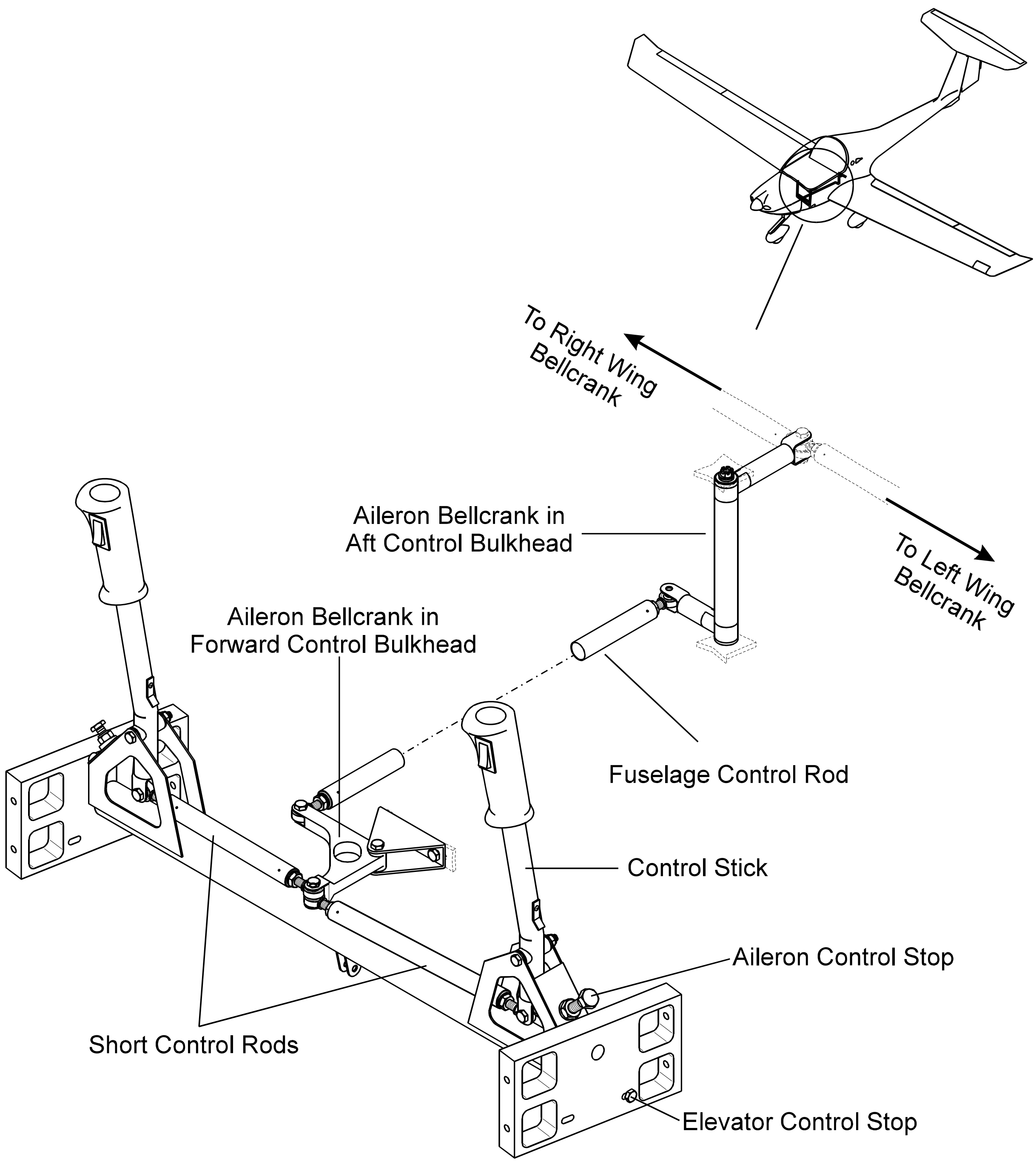

Figure 1 - Aileron Controls in the Fuselage

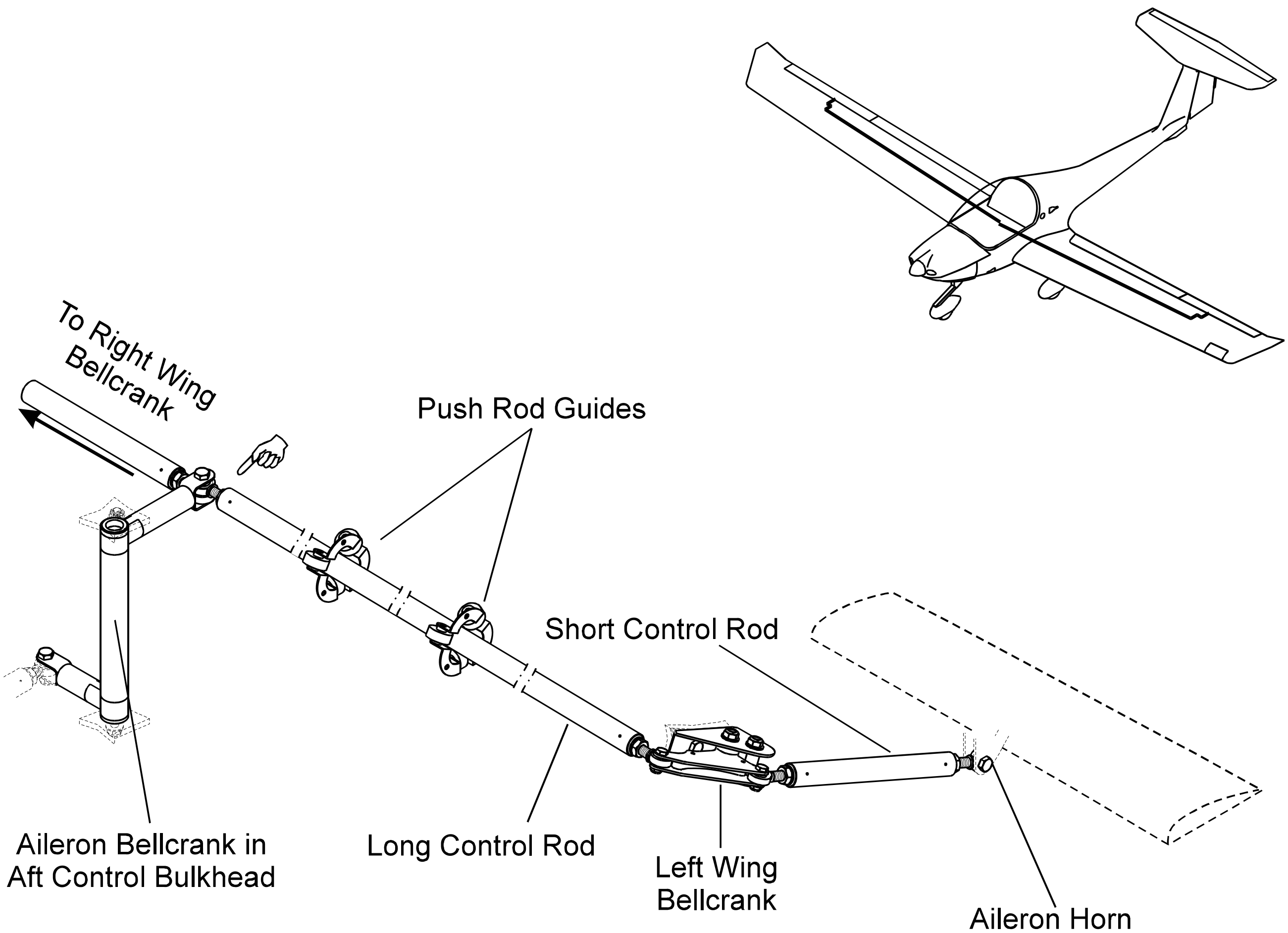

Figure 2 - Aileron Controls in the Wing

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AILERON CONTROL - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the aileron control system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Aircraft moves about its longitudinal axis.	Aileron control rods need adjusting.	Adjust the aileron control rods.
Aileron controls stiff/catch.	Bearings defective.	Replace the defective eye end.

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AILERON CONTROL - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to do test procedures on the aileron control system and how to adjust the aileron control system. Refer to paragraphs 4 and 5 for removal, installation and access data on the control rods and bellcranks. Refer to Chapter 57-60 to remove/install the ailerons.

WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.

WARNING: WHEN YOU COMPLETE WORK ON THE CONTROLS, MAKE SURE THAT YOU REMOVE ALL LOOSE ITEMS/TOOLS FROM THAT AREA. LOOSE ITEMS/TOOLS CAN PREVENT FULL MOVEMENT OF THE AIPLANE CONTROLS. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Aileron Control System Test For Correct Range Of Movement

A. Equipment

Item	Quantity	Part Number
Control Stick Lock	1	20-1000-01-00
Protractor	1	Commercial

B. Aileron Control Test Procedure

	Detail Steps/Work Items	Key Items/References
1.	Make a copy of the Control Adjustment Report. - Use it to record the measurements.	Refer to Chapter 06-00.
2.	Set the flaps to the CRUISE position.	Refer to Chapter 27-50.
3.	Make sure the control stick is centered. - Install the control stick lock.	
NOTE: Use a protractor to make all measurements at the aileron control surfaces. Make the measurement between the top surface of the aileron, and the top surface of the flap.		

	Detail Steps/Work Items	Key Items/References
4.	Measure the distance between the trailing edge of each aileron and the trailing edge of the flap. - Record these measurements.	The left aileron must align with the right aileron.
5.	Remove the control stick lock.	
	WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREAS AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONS/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.	
6.	Move the control stick fully to the left and hold it against the stop.	
7.	Measure the angle between the trailing edge of the left aileron and the trailing edge of the flap. - Record these measurements.	The left aileron must be between 15 and 17 degrees up.
8.	Measure the angle between the trailing edge of the right aileron and the trailing edge of the flap. - Record these measurements.	The right aileron must be between 12 and 14 degrees down.
9.	Move the control stick fully to the right and hold it against the stop.	
10.	Measure the angle between the trailing edge of the right aileron and the trailing edge of the flap. - Record these measurements.	The left aileron must be between 15 and 17 degrees up.
11.	Measure the angle between the trailing edge of the left aileron and the trailing edge of the flap. - Record these measurements.	The right aileron must be between 12 and 14 degrees down.

3. Aileron Control System Adjustments

If you cannot get the correct range of movement of the aileron control system, use this procedure to adjust the system. Gust travel refers to the amount of travel remaining at the control surface with the control stick held against the cockpit stop.

WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL ROD, MAKE SURE THAT THE CONTROL ROD IS STILL IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL ROD CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

A. Equipment

Item	Quantity	Part Number
Control Stick Lock	1	20-1000-01-00
Quick grips	2	Commercial

B. Aileron Adjustment Procedure

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td>1.</td><td>Remove the following items for access:
- Pilots’ seats
- Center fuselage access panels
- Aileron bellcrank access panels under each wing.</td><td>
Refer to Chapter 25-10.
Refer to Chapter 52-40.
Refer to Chapter 52-40.</td></tr>
<tr><td>2.</td><td>Make sure the control stick is centered.
- Install the control stick lock.</td><td></td></tr>
<tr><td colspan="3">WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREAS AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONS/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.</td></tr>
<tr><td>3.</td><td>Do a check of the two aileron control rods that connect the control sticks to the bellcrank at the forward control bulkhead.</td><td>The control sticks must be at 90 degrees to the aileron control rods (when you look from the front/rear of the aircraft).</td></tr>
<tr><td colspan="3">WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL ROD, YOU MUST MAKE SURE THAT THE CONTROL ROD IS STILL IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL ROD CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.</td></tr>
</table>

	Detail Steps/Work Items	Key Items/References
4.	If necessary, adjust the length of the aileron control rods. - Release the bolts that hold the aileron control rods to the control sticks - Adjust the length of the control rods - Install the bolts that hold the aileron control rods to the control sticks.	 Use a piece of safety lock wire to make sure that the aileron control rods that you have adjusted are still safe. Torque to 4.6 lbf-ft (6.5 Nm).
5.	Do a check of the aileron control rod from the bellcrank at the forward control bulkhead to the bellcrank at the aft control bulkhead.	The aileron control rod must be at 90 degrees to the bellcrank arm at the forward control bulkhead. And the aileron control rod must be at 90 degrees to the bellcrank lower arm at the aft control bulkhead.
6.	If necessary, adjust the length of the aileron control rod. - Release the bolt that holds the aileron control rod to the bellcrank at the forward control bulkhead. - Adjust the length of the control rod. - Install the bolt that holds the aileron control rod to the bellcrank	 Use a piece of safety lock wire to make sure that the aileron control rods that you have adjusted are still safe. Torque to 4.6 lbf-ft (6.5 Nm).
7.	Do a check of the aileron control rods from the bellcrank at the aft control bulkhead to the bell-cranks at the left/right wings.	The aileron control rod must be at 90 degrees to the bellcrank arm at the forward control bulkhead. And the aileron control rod must be at 90 degrees to the bellcrank lower arm at the aft control bulkhead.
8.	If necessary, adjust the length of the aileron control rods. - Release the bolt that holds the aileron control rod to the bellcrank at the forward control bulkhead. - Adjust the length of the control rod. - Install the bolt that holds the aileron control rod to the bellcrank	 Use a piece of safety lock wire to make sure that the aileron control rods that you have adjusted are still safe. Torque to 4.6 lbf-ft (6.5 Nm).

	Detail Steps/Work Items	Key Items/References
9.	Set the flaps to the CRUISE position.	
10.	Do a check of the aileron control rods from the bellcranks at the left/right wings to the left/right aileron horns.	Adjust the aileron control rods to give 0 degree. Measure between the aileron and the flap.
11.	Remove the control stick lock:	
	- Loosen the aileron stops in the cockpit	
	- Make sure the stops are clear of the control sticks when the controls hit the stops in the wing	
	- Move the control stick fully to the right and hold it against the stop	
	- Measure the gust travel of the left and right ailerons	The measurement must be between 15 and 17 degrees with the aileron up and 12 and 14 degrees with the aileron down.
	- Move the control stick fully to the left and hold it against the stop	
	- Measure the gust travel of the left and right ailerons.	The measurement must be between 15 and 17 degrees with the aileron up and 12 and 14 degrees with the aileron down.
12.	If necessary, adjust the length of the aileron control rod at the aileron:	
	- Release the bolts that hold the aileron control rod to the aileron horns	
	- Adjust the length of the control rod	Use a piece of safety lock wire to make sure that the aileron control rods that you have adjusted are still safe.
	- Install the bolt that holds the aileron control rod to the bellcrank	Torque to 4.6 lbf-ft (6.5 Nm).
13.	Clamp the ailerons to the flaps with quick grips.	
14.	Measure the play in the aileron controls with the control surfaces locked. Look especially for too much play. Do the test at the top of the control stick.	Maximum play allowed: 0.375 in (10 mm).
15.	Make sure the control stick is centered.	Refer to step 17.
	- Install the control stick rod.	

	Detail Steps/Work Items	Key Items/References
16.	Do a check of the aileron control rod from the bellcrank at the forward control bulkhead to the bellcrank at the aft control bulkhead.	The aileron control rod must be at 90 degrees to the bellcrank arm at the forward control bulkhead. And the aileron control rod must be at 90 degrees to the bellcrank lower arm at the aft control bulkhead.
17.	If necessary, adjust the length of the aileron control rod. - Release the bolt that holds the aileron control rod to the bellcrank at the forward control bulkhead. - Adjust the length of the control rod. - Install the bolt that holds the aileron control rod to the bellcrank	 Use a piece of safety lock wire to make sure that the aileron control rods that you have adjusted are still safe. Torque to 4.6 lbf-ft (6.5 Nm).
18.	Remove the quick grips from between the ailerons and the flaps. Then remove the control lock from the control stick.	
19.	Do a check of the aileron range of movement.	Refer to the Aileron Control System Test for Correct Range Of Movement.
20.	Adjust the aileron stops on the torque tube assembly with the controls against the gust stops in the wing: - Turn the stop bolts in to touch the control stick - Then turn the stop bolts in by 1¼ turns after they touch the control stick.	
NOTE: By each turn in of the stop bolt you will reduce the amount of aileron travel available.		
21.	Make sure there is gust travel available. - If necessary, adjust the stop bolts more.	
22.	Do a check of the aileron range of movement.	Refer to the Aileron Control System Test for Correct Range Of Movement.

	Detail Steps/Work Items	Key Items/References
23.	Do an inspection of all the controls that you have adjusted. - If necessary for your airworthiness authority, do a second inspection of the controls.	
24.	Install the following items: - Pilots' seats - Center fuselage access panels - Aileron bellcrank access panels under each wing.	 Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 52-40.

4. Aileron Control Rod Access

Aileron Rod	Removal/Install Access	References
Between the control stick and the bellcrank at the forward control bulkhead.	- Pilots' seats	Refer to Chapter 25-10.
Between the bellcrank at the forward control bulkhead and the bellcrank at the aft control bulkhead.	- Pilots' seats - Fuselage center access panels. - Baggage compartment floor. - Fuel tank	Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 52-40. Refer to Chapter 28-10.
Between the bellcrank at the aft control bulkhead and the bellcrank in the left/right wing.	- Wing left/right	Refer to Chapter 57-10.
Between the bellcrank in the left/right wing and the left/right aileron.	- Aileron bellcrank access panels under each wing.	Refer to Chapter 52-40.

5. Aileron Bellcrank Access

Aileron Rod	Removal/Install Access	References
Bellcrank at the forward control bulkhead.	- Pilots' seats	Refer to Chapter 25-10.
Bellcrank at the aft control bulkhead.	- Pilots' seats - Fuselage center access panels. - Baggage compartment floor. - Fuel tank	Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 52-40. Refer to Chapter 28-10.
Bellcrank in the left/right wing.	- Aileron bellcrank access panels under each wing.	Refer to Chapter 52-40.

FLIGHT CONTROLS - RUDDER AND TAB

1. General

The DA20-C1 aircraft has the usual rudder control system. Each pilot has a rudder pedal assembly. The pilot can adjust the pedal position. Control cables connect the pedal assembly to the rudder. A fixed trim tab gives a small amount of adjustment to the rudder trim. You can only adjust the fixed trim tab on the ground.

2. Description

The DA20-C1 aircraft has a set of rudder control pedals for each pilot. The pedal assembly can be adjusted. Figure 1 shows you the rudder control system. Figure 2 shows you the rudder pedal assembly. The system has the following parts:

- A rudder pedal assembly for each pilot at the front of the cockpit. The forward part of each pedal connects to a brake master cylinder (Chapter 32-40)
- An adjuster for each pilot attached to the aft face of the rudder pedal assembly
- A yoke (lever) assembly in the center of the fuselage behind the seats. The yoke attaches to the bottom of the B-bulkhead
- A rudder lower mounting-bracket at the rear of the fuselage. The rudder attaches to the mounting bracket
- Cable assemblies.

Six bolts attach each rudder pedal assembly to the cockpit floor.

Each rudder pedal assembly has two pedals. Each pedal has a lever and a foot pad. The pedal has an "S" shaped tube. The lower part of the "S" shaped tube aligns with the pivot of the pedal. The upper part of the "S" shaped tube aligns with the foot pad of the pedal.

Four control cables ('Cockpit cables') go from the firewall to enter the bottom of each "S" shaped tube. Each cable goes through a tube and comes out at the top. Each cable goes from the pedal assembly to the yoke in the center fuselage.

Each outboard control cable goes through teflon tubes in the aft face of the floor panel. Each outboard control cable goes inboard through 2 guide pulleys on the forward control bulkhead. The cables connect each outer pedal to the yoke in the center fuselage.

Each inboard control cable goes through teflon tubes in the forward control bulkhead. The cables connect each inner pedal to the yoke in the center fuselage.

Two cables ('Aft Fuselage cables') attach to the rear of the yoke in the center fuselage. The two cables have turnbuckles which can adjust the rudder control system.

The two aft fuselage cables go through Teflon tubes in the rear fuselage. The cables attach to the rudder mount on the rudder mounting bracket.

3. Operation

If you move the left rudder pedal forward:

- The top of the "S" shaped tube moves forward
- The "S" shaped tube pulls the left cockpit cable
- The left cockpit cable moves the left side of the yoke forwards
- The yoke pulls the left aft fuselage cable forwards
- The left aft fuselage cable moves the rudder to the left
- The rudder movement pulls the right aft fuselage cable aft
- The right aft fuselage cable moves aft with the right side of the yoke
- The right side of the yoke pulls the right cockpit cables aft. And the cables pull the "S" shaped tubes on the right rudder pedals aft.

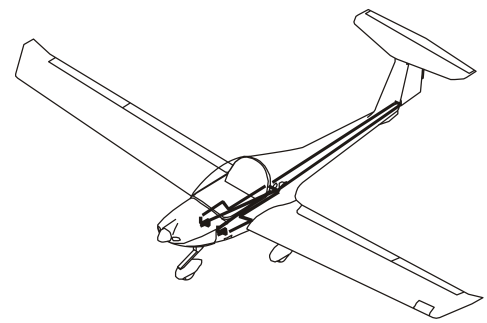
If you move the right rudder pedal forward:

- The right cockpit and aft fuselage cables move forward
- The rudder moves to the right
- The left cables moves aft
- The left cables pull the left rudder pedals aft.

You can adjust the position of the rudder pedals. When you pull on the adjuster handle, the latch disengages from the bottom sledge tube. If you pull further, the pedal assembly moves along the sledge tube towards you. Release the handle, then push with your feet on both pedals. The latch will lock.

If you push with both feet while you pull the handle, the pedal assembly moves along the sledge tubes away from you. Release the handle, then push with your feet on both pedals. The latch will lock.

When you adjust the position of the pedals, the control cables move through the "S" shaped tubes.



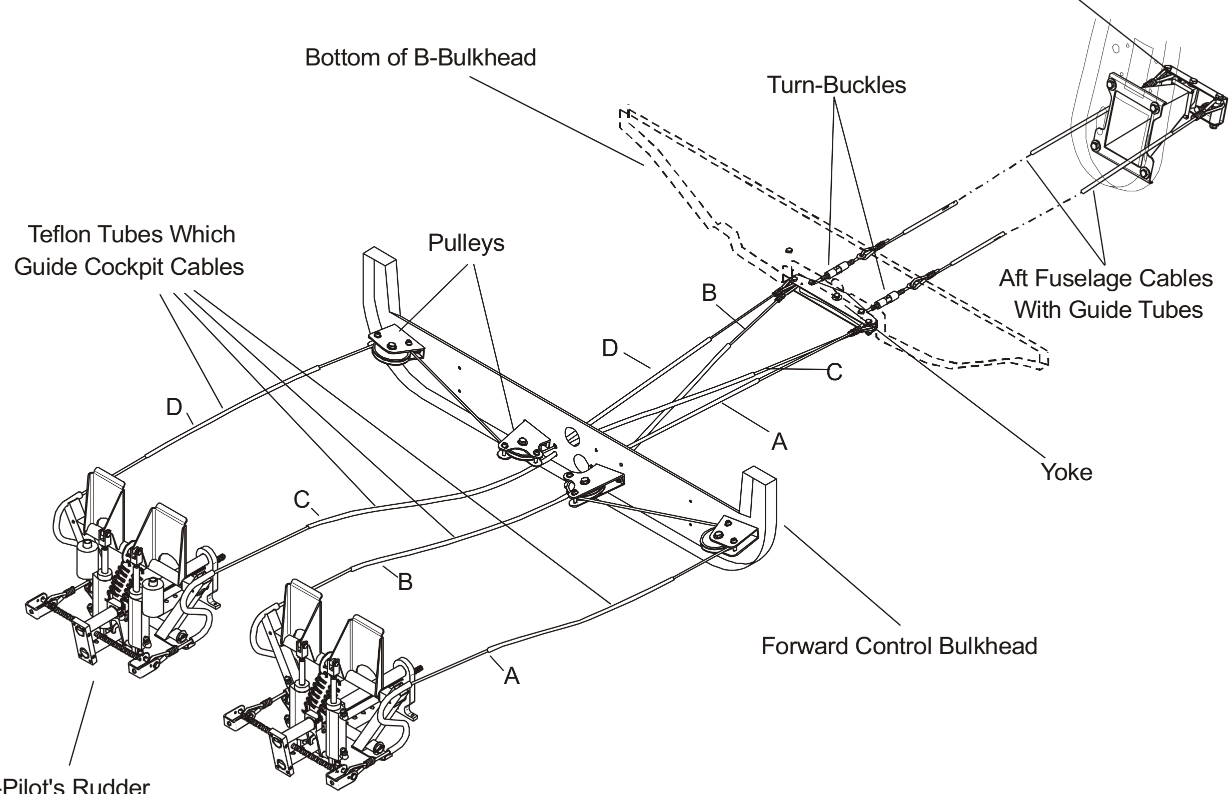


Figure 1 - Rudder Control System

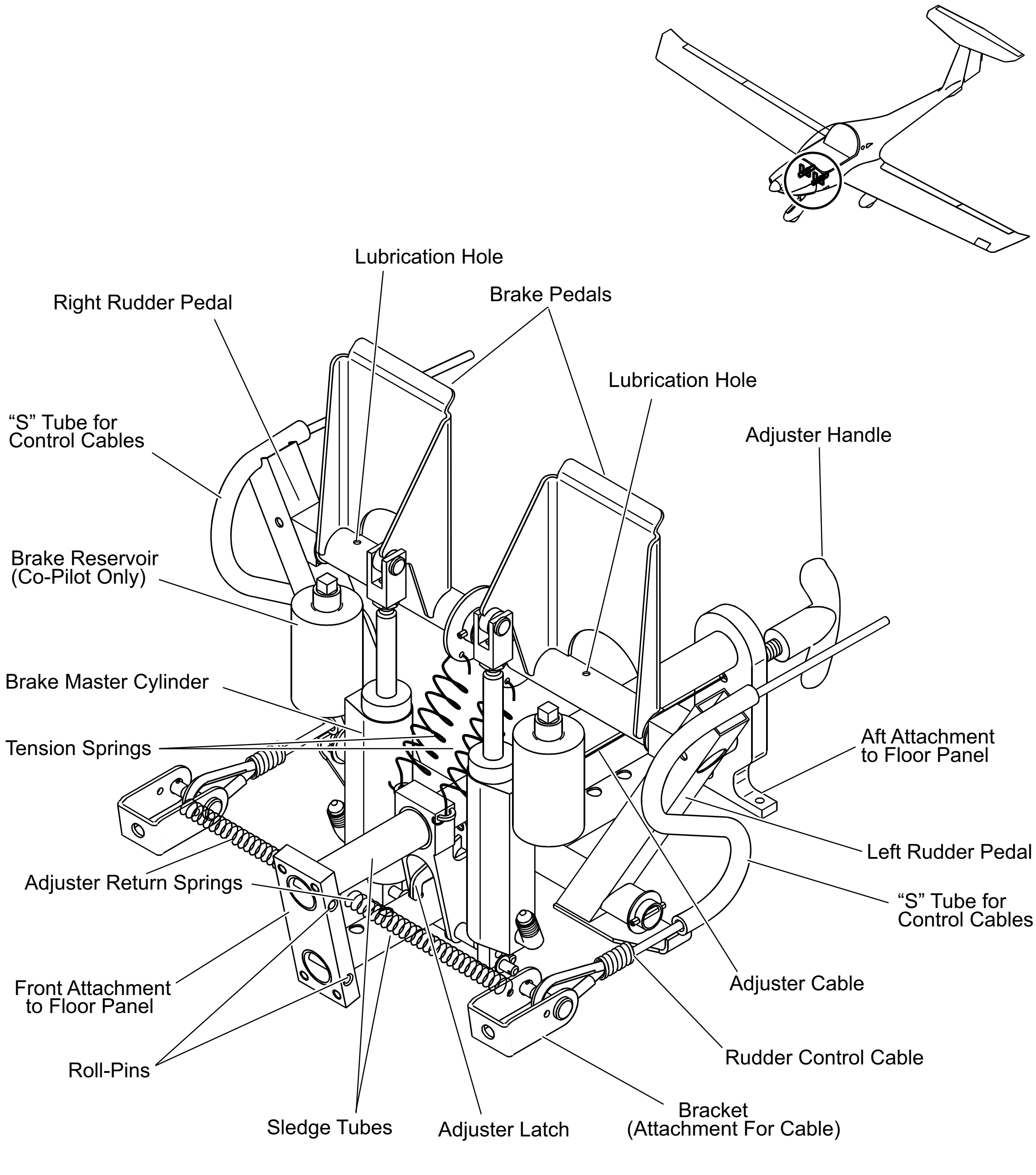


Figure 2 - Rudder Pedal Assembly

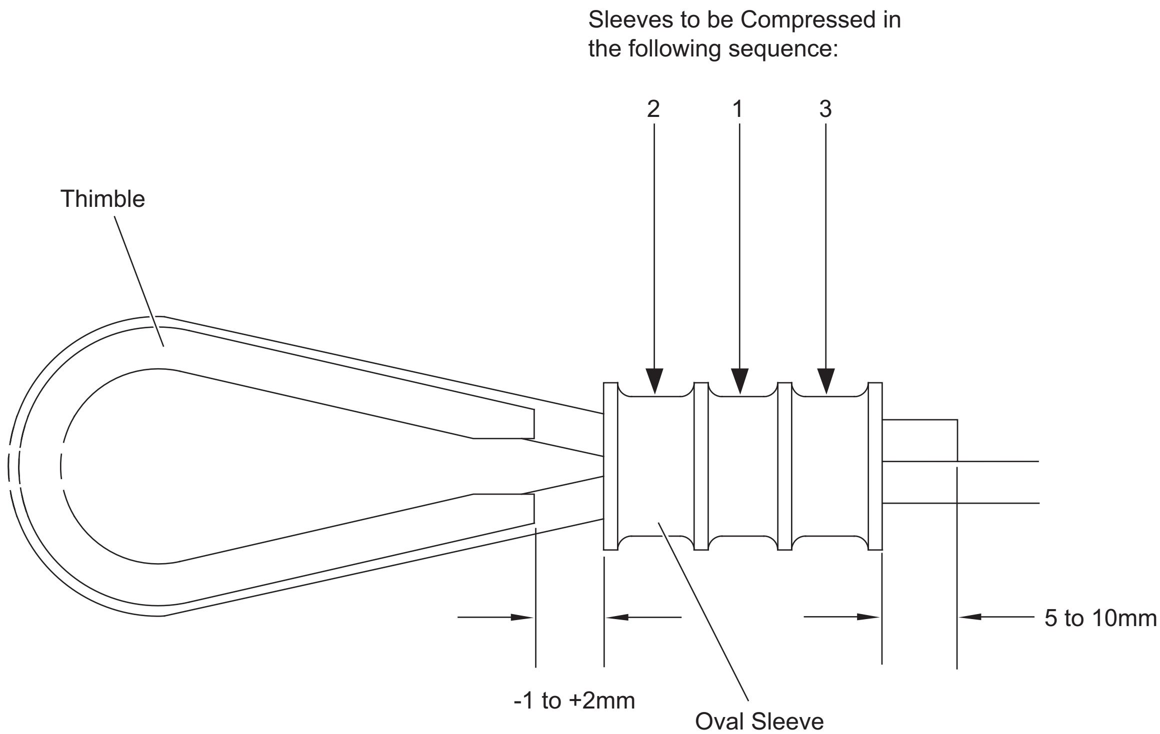


Figure 3 - Thimble Installation

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RUDDER CONTROL - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the rudder control system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Aircraft moves about its yaw axis.	Rudder cables out of adjustment. Fixed trim tab out of adjustment.	Adjust the rudder cables. Adjust the fixed trim tab.
Rudder controls stiff/catch.	Bearings defective.	Replace the defective bearings.

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RUDDER CONTROL - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to do test procedures on the rudder control system and how to adjust the rudder control system. Refer to Chapter 55-40 to remove/install the rudder.

WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.

WARNING: WHEN YOU COMPLETE WORK ON THE CONTROLS, MAKE SURE THAT YOU REMOVE ALL LOOSE ITEMS/TOOLS FROM THAT AREA. LOOSE ITEMS/TOOLS CAN PREVENT FULL MOVEMENT OF THE AIPLANE CONTROLS. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Rudder Control System Test for Correct Range Of Movement

A. Equipment

Item	Quantity	Part Number
Protractor	1	Commercial

B. Rudder Control Test Procedure

	Detail Steps/Work Items	Key Items/References
1.	Make a copy of the Control Adjustment Report. - Use it to record the measurements.	Refer to Chapter 06-00.
2.	Set both rudder pedals fully forward.	
3.	Set the rudder pedals central. - Make sure the rudder is in the neutral position.	The left pedal must align with the right pedal.
4.	Set the rudder pedals to fully left. - The rudder must hit the stops at the rudder mounting bracket.	The rudder position must be between 26 - 28 degrees to the left, when measured from the neutral position.

	Detail Steps/Work Items	Key Items/References
5.	Set the rudder pedals to fully right. - The rudder must hit the stops at the rudder mounting bracket.	The rudder position must be between 26 - 28 degrees to the right, when measured from the neutral position.
6.	Make sure that the left/right rudder pedals are free to move when they are set in all of the adjustable positions.	

3. Rudder Control System Adjustments

If you cannot get the correct range of movement of the rudder control system, use this procedure to adjust the system.

A. Equipment

Item	Quantity	Part Number
Cable Tension Gauge	1	Commercial
Protractor	1	Commercial

B. Rudder Adjustment Procedure

	Detail Steps/Work Items	Key Items/References
1.	Remove the following items for access: - Baggage compartment floor.	Refer to Chapter 25-10.
2.	Set both rudder pedals fully forward.	
3.	Set the rudder pedals central. - Make sure the rudder is in the neutral position.	The left pedal must align with the right pedal.
4.	If necessary, adjust the length of the cables between the yoke and the rudder mounting bracket. - Remove the lock clip from the turnbuckles - Adjust the turnbuckles to set the rudder to neutral	You can get access to the turnbuckles behind the fuel tank.

	Detail Steps/Work Items	Key Items/References
	- Do a test for correct cable tension	The cable tension must be between 29.21 - 38.20 lb (13.25 - 17.33 kg). It is recommended to set cable tension near the high limit.
	- Tighten the turnbuckles and install the lock clip.	Use a piece of safety lock wire to make sure the turnbuckles that you have adjusted are still safe.
5.	Set the rudder pedals to fully left. - The rudder must hit the stops at the rudder mounting bracket.	The rudder position must be between 26 - 28 degrees to the left, when measured from the neutral position.
6.	If necessary, adjust the rudder stop bolt on the left side of the rudder mounting plate: - Release the lock nut on the correct stop bolt. - Adjust the stop bolt to give the correct range of movement - Tighten the lock nut on the stop bolt.	The rudder position must be between 26 - 28 degrees to the left, when measured from the neutral position.
7.	Set the rudder pedals to fully right. - The rudder must hit the stops at the rudder lower mounting bracket.	The rudder position must be between 26 - 28 degrees to the right, when measured from the neutral position.
8.	If necessary, adjust the rudder stop bolt on the right side of the rudder mounting plate: - Release the lock nut on the correct stop bolt. - Adjust the stop bolt to give the correct range of movement - Tighten the lock nut on the stop bolt.	The rudder position must be between 26 - 28 degrees to the right, when measured from the neutral position.
9.	Do a check of the correct rudder range of movement.	Refer to Paragraph 2.

	Detail Steps/Work Items	Key Items/References
10.	Do an inspection of all the controls that you have adjusted. - If necessary for your airworthiness authority, do a second inspection of the controls.	
11.	Install the following items:	
	- Baggage compartment floor.	Refer to Chapter 25-10.

4. Remove/Install Rudder Control Cables

A. Equipment

Item	Quantity	Part Number
Cable Tension Gauge	1	Commercial
Swaging Tool	1	Commercial

B. Remove the Cockpit Rudder Control Cables (From the firewall to the yoke)

	Detail Steps/Work Items	Key Items/References
1.	Remove the following items for access: - Pilots’ seats - Baggage compartment floor. - Fuel tank	 Refer to Chapter 25-10. Refer to Chapter 25-10. Refer to Chapter 28-10.
2.	Remove the cable between the firewall and the yoke: - Remove the cotter pin and clevis pin that attaches the cable to the bracket at the firewall - Remove the bolt that attaches the cable to the yoke - Cut the eye end from the old cable at the firewall end - Remove the old cable.	

C. Install the Cockpit Rudder Control Cables (From the firewall to the yoke)

	Detail Steps/Work Items	Key Items/References
	WARNING: ONLY TRAINED AND AUTHORIZED PERSONS SHOULD INSTALL CABLE EYE-ENDS. IF THE EYE ENDS ARE NOT INSTALLED CORRECTLY, THE RUDDER CONTROLS CAN FAIL. THIS CAN CAUSE DEATH OR INJURY TO PERSONNEL.	
1.	Push the control cable through the teflon tubes from the rear.	Refer to Figure 1.
2.	Make sure the cable is in the correct position on the pulleys (for the outer cables only).	Refer to Figure 1.
3.	Push the cable through the "S" tube on the rudder pedal assembly.	Refer to Figure 1.
4.	Install the cable to the yoke:	
	- Install the bolt that attaches the cable to the yoke	
	- Tighten the bolt.	Torque to 4.6 lbf-ft (6.5 Nm).
5.	Install the new thimble and the oval sleeve on the cable at the firewall end. Do not swage the sleeve at this time.	
	- Attach the cable to the firewall bracket and adjust the cable length to have rudder pedals centered.	Make sure that the left pedal aligns with the right pedal.
	- Make sure that the rudder is in the neutral position during this operation.	Make sure that the rudder pedal levers are vertical when the rudder is in neutral.
6.	Clamp the cable end by the oval sleeve to prevent thimble from shifting on the cable. Use the vise grip pliers with protective sleeves on the jaws to prevent damage to the cable.	
7.	Disconnect the cable from the firewall bracket and swage the oval sleeve in accordance with AC43.13.	Refer to Figure 3.
	- Inspect the cable eye end for correct assembly.	
	- If necessary for your airworthiness authority, send a sample for the proof test.	

	Detail Steps/Work Items	Key Items/References
8.	Install the cable to the bracket at the firewall: - Install the clevis pin that attaches the cable to the firewall bracket - Install the cotter pin.	
9.	Do a check of the rudder range of movement.	Refer to the Rudder Control System Test for Correct Range of Movement.
10.	Do an inspection of all the controls that you have adjusted. - If necessary for your airworthiness authority, do a second inspection of the controls.	
11.	Install the following items: - Fuel tank - Baggage compartment floor. - Pilots' seats	 Refer to Chapter 28-10. Refer to Chapter 25-10. Refer to Chapter 25-10.

D. Remove the Aft Fuselage Rudder Control Cables (From the yoke to the rudder)

	Detail Steps/Work Items	Key Items/References
1.	Remove the following items for access: - Pilots' seats - Baggage compartment floor. - Fuel tank - Rudder	 Refer to Chapter 25-10. Refer to Chapter 25-10. Refer to Chapter 28-10. Refer to Chapter 55-40.
2.	Remove the cable between the rudder yoke and the rudder: - Remove the bolt that attaches the turnbuckle to the rudder yoke - Remove the bolt that attaches the cable to the rudder lower mounting bracket	

	Detail Steps/Work Items	Key Items/References
	- Cut the eye end from the old cable at the lower bracket end - Cut the eye end from the turnbuckle. - Remove the old cable.	

E. Install the Aft Fuselage Rudder Control Cables (From the yoke to the rudder)

	Detail Steps/Work Items	Key Items/References
	WARNING: ONLY TRAINED AND AUTHORIZED PERSONS SHOULD INSTALL CABLE EYE-ENDS. IF THE EYE ENDS ARE NOT INSTALLED CORRECTLY, THE RUDDER CONTROLS CAN FAIL. THIS CAN CAUSE DEATH OR INJURY TO PERSONNEL.	
1.	Push the control cable through the teflon tubes from the front.	Refer to Figure 1.
2.	Attach the turnbuckle end of the cable to the yoke. - Set the turnbuckle to the middle of adjustment.	
3.	Install the new thimble and the oval sleeve on the cable at the rudder lower mounting bracket. - Do not swage the sleeve at tis time. - Attach the cable to the rudder lower mounting bracket. - Adjust the cable tension to the middle of the value range specified.	Make sure that the left pedal aligns with the right pedal. Refer to paragraph 3 (Rudder Control System Adjustments).
4.	Clamp the cable end by the oval sleeve to prevent thimble from shifting on the cable. Use the vise grip pliers with protective sleeves on the jaws to prevent damage to the cable.	
5.	Disconnect the control cable from the rudder lower mount bracket and swage the oval sleeve in accordance with AC43.13. - Inspect the cable eye end for correct assembly.	Refer to Figure 3.

	Detail Steps/Work Items	Key Items/References
	- If necessary for your airworthiness authority, send a sample for the proof test.	
6.	Install the cable to the rudder lower mounting bracket: - Install the bolt that attaches the cable to the lower mounting bracket - Tighten the bolt. - Lubricate the cable eyes.	 Torque to 4.6 lbf-ft (6.5 Nm). Refer to Chapter 12-20-00.
7.	Install the turnbuckle to the rudder yoke: - Install the bolt that attaches the turnbuckle to the rudder yoke - Tighten the bolt.	 Torque to 4.6 lbf-ft (6.5 Nm).
8.	Install the rudder.	Refer to Chapter 55-40-00.
9.	Adjust both the rudder cables to give the correct tension.	Refer to the Rudder Adjustment Procedure in this Chapter.
10.	Do a check of the rudder range of movement.	Refer to the Rudder Control System Test for Correct Range Of Movement.
11.	Do an inspection of all the controls that you have adjusted. - If necessary for your airworthiness authority, do a second inspection of the controls.	
12.	Install the following items: - Fuel tank - Baggage compartment floor. - Pilots' seats	 Refer to Chapter 28-10. Refer to Chapter 25-10. Refer to Chapter 25-10.

FLIGHT CONTROLS - ELEVATOR

1. General

The DA20-C1 aircraft has the usual elevator flight controls. An elevator attached to the horizontal stabilizer gives longitudinal control. The two control sticks operate the elevator.

2. Description

Figure 1 shows the elevator controls in the fuselage.

Each pilot has a control stick that attaches to a torque tube assembly. The torque tube assembly has a lever which attaches to a short control rod. The short control rod attaches to a long control rod behind the aft control bulkhead. The aft control bulkhead has an UHMW bush for the short control rod.

The long control rod has two bearings. The half ring bulkhead and ring bulkhead #2 have push-rod guides. Each guide has three rollers.

The long control rod attaches to the bellcrank at the bottom of the vertical stabilizer. The bellcrank attaches to a vertical control rod in the vertical stabilizer. The vertical control rod connects to the elevator horn.

The vertical control rod in the vertical stabilizer has a spring assembly attached. The spring assembly connects to the trim motor. Refer to Chapter 27-31 for data about the trim system.

3. Operation

If you move the control stick forward:

- The torque tube assembly turns
- The lever below the torque tube assembly pushes the short control rod aft
- The short control rod pushes the long control rod aft
- The long control rod pushes the bellcrank rearward
- The bellcrank pushes the vertical control rod up
- The vertical control rod moves the elevator horn
- The elevator moves down.

If you move the control stick aft:

- The torque tube assembly turns
- The short and long control rods move forward
- The bellcrank pulls the vertical control rod down
- The elevator moves up.

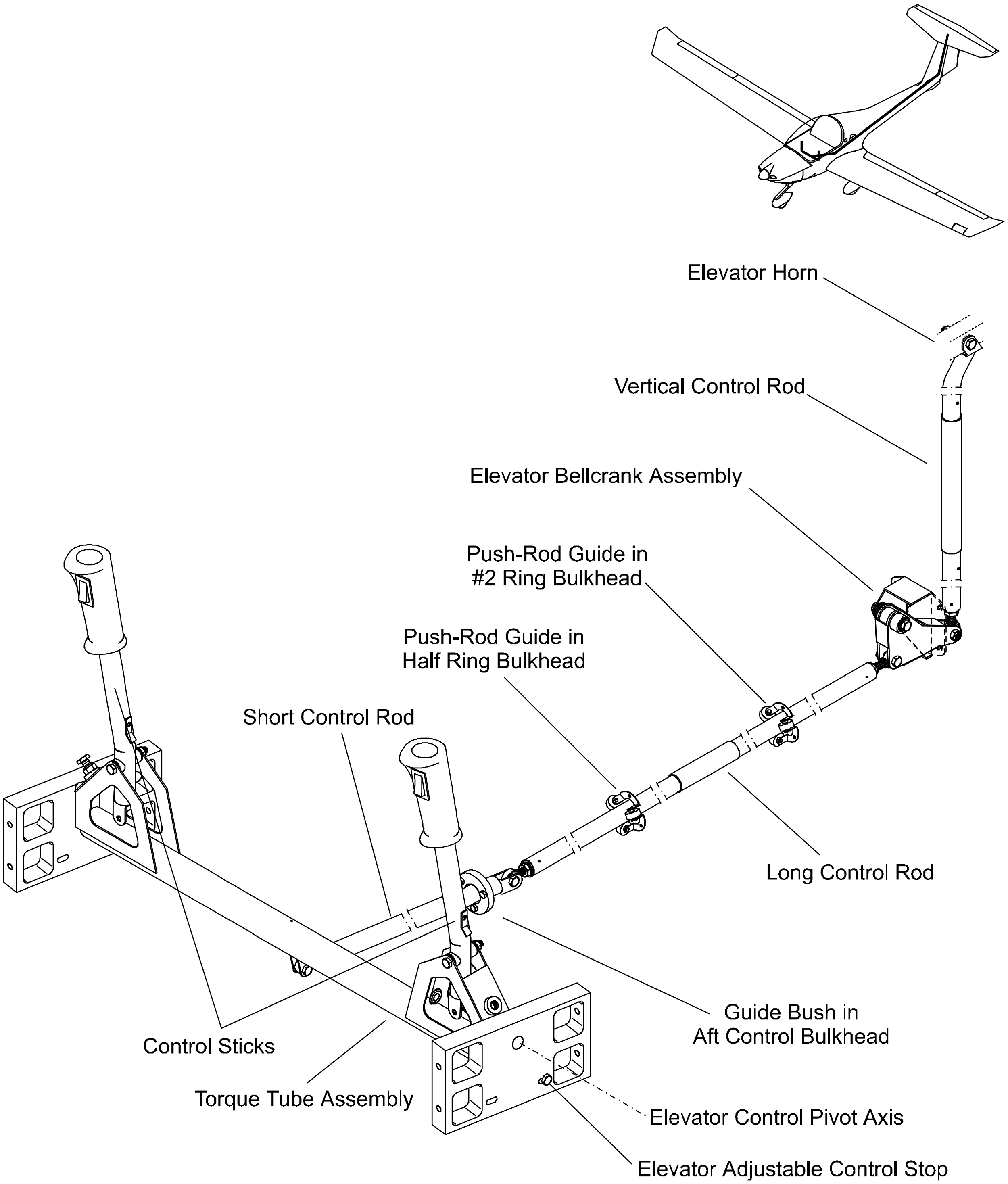

Figure 1 - Elevator Controls

ELEVATOR CONTROL - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the elevator control system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Control vibration in the air.	Too much backlash in the flight controls.	Examine the system to isolate the problem. Replace the defective part.
Elevator controls stiff/catch.	Bearings defective.	Replace the defective eye end.

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ELEVATOR CONTROL - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to do test procedures on the elevator control system and how to adjust the elevator control system. Refer to Chapter 55-20 to remove/install the elevator.

WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.

WARNING: WHEN YOU COMPLETE WORK ON THE CONTROLS, MAKE SURE THAT YOU REMOVE ALL LOOSE ITEMS/TOOLS FROM THAT AREA. LOOSE ITEMS/TOOLS CAN PREVENT FULL MOVEMENT OF THE AIPLANE CONTROLS. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Elevator Control System Test for Correct Range of Movement

A. Equipment

Item	Quantity	Part Number
Protractor	1	Commercial

B. Elevator Control Test Procedure

	Detail Steps/Work Items	Key Items/References
1.	Make a copy of the Control Adjustment Report. - Use it to record the measurements.	Refer to Chapter 06-00.
2.	Make sure the control stick is centered.	
	NOTE: Use a protractor to make all measurements at the elevator control surface. Make the measurement from the top surface of the horizontal stabilizer to the top surface of the elevator.	
3.	Measure the angle between the top surface of the horizontal stabilizer and the top surface of the elevator.	The elevator must align with the horizontal stabilizer.
	WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.	
5.	Move the control stick fully forward and hold it against the stop.	

	Detail Steps/Work Items	Key Items/References
6.	Measure the angle between the top surface of the horizontal stabilizer and the top surface of the elevator. - Record the measurement.	The elevator must be between 14 and 16 degrees down.
7.	Move the control stick fully aft and hold it against the stop.	
8.	Measure the angle between the top surface of the horizontal stabilizer and the top surface of the elevator. - Record the measurement.	The elevator must be between 24 and 26 degrees up.

3. Elevator Control System Adjustments

If you cannot get the correct range of movement of the elevator control system, use this procedure to adjust the system. Gust travel refers to the amount of travel remaining at the control surface with the control stick held against the cockpit stop.

WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL ROD, MAKE SURE THAT THE CONTROL ROD IS STILL IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL ROD CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONNEL.

A. Equipment

Item	Quantity	Part Number
Protractor	1	Commercial
Deleted		

B. Elevator Adjustment Procedure

	Detail Steps/Work Items	Key Items/References
1.	Remove the following items for access: - Pilots’ seats - Center fuselage access panels. - Rudder	 Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 55-40.
2.	Make sure the control stick is centered.	

	Detail Steps/Work Items	Key Items/References
	WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.	
3.	Do a check of the two elevator control rods that attach between the torque tube assembly and the bellcrank at the bottom of the vertical stabilizer.	Make sure that the bellcrank is at 90 degrees to the vertical stabilizer lower rib.
	WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL ROD, MAKE SURE THAT THE CONTROL ROD IS STILL IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL ROD CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.	
4.	If necessary, adjust the length of the elevator control rods.	
	- Release the bolts that hold the elevator control rods to the torque tube assembly and the bellcrank	
	- Adjust the length of the control rods	Use a piece of safety lock wire to make sure the elevator control rods that you have adjusted are still safe.
	- Install the bolts that hold the elevator control rods to the torque tube assembly and the bellcrank.	Torque to 4.6 lbf-ft (6.5 Nm).
5.	Do a check of the elevator control rod from the bellcrank at the bottom of the vertical stabilizer to the elevator.	The elevator must be in the neutral position.
6.	If necessary, adjust the length of the elevator control rods.	
	- Release the bolt that holds the elevator control rods to the bellcrank at the bottom of the vertical stabilizer	
	- Adjust the length of the control rods	Use a piece of safety lock wire to make sure the elevator control rods that you have adjusted are still safe.
	- Install the bolt that holds the elevator control rods to the bellcrank at the bottom of the vertical stabilizer.	Torque to 4.6 lbf-ft (6.5 Nm).

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FLIGHT CONTROLS - ELEVATOR TRIM

1. General

The DA20-C1 aircraft has an elevator with an electrically-operated trim system. This lets you trim the aircraft for different center of gravity positions. A switch on the center console controls the elevator trim. An indicator tells the pilot the trim position. An electric actuator moves a spring system. Alternatively, aircraft may be fitted with control stick mounted trim switches.

Control stick mounted trim switches are located on top of each control stick, aft of centre. The switches are positioned so that they can be easily operated by thumb. Forward movement of either switch gives nose down trimming and aft movement of the switch gives nose up trim. The trim switches control electrical relays that supply electrical power to the electric pitch trim motor. If the switches are operated in opposing directions at the same time the trim motor will not operate. Operation of the trim switches in the same direction and at the same time will cause the trim motor to operate in that direction.

2. Description

Figure 1 shows the elevator trim control system. The trim control system has the following parts:

- A 3-position rocker-switch is located in the center console or the switches are located on each of the control sticks depending on aircraft configuration. The switch (s) is spring-loaded to the middle (off) position

- A trim indicator located on the instrument panel. The indicator has a vertical row of light-emitting diodes

- A spring-mount assembly which attaches to the vertical control rod for the elevator. The spring-mount assembly has 2 springs. The vertical control rod goes through the bore of the springs. The top of the top spring (and the bottom of the bottom spring) have mounts. Roll pins attach the mounts to the vertical control rod. A spacer bush between the springs has a groove for the fork assembly on the trim actuator.

- An electrical trim actuator. Two brackets attach the trim actuator to the aft face of the spar in the vertical stabilizer. A snubber attaches to the output rod of the trim actuator. A fork assembly on the snubber engages with the spring-mount on the vertical control rod for the elevator.

The trim system used on the DA20-C1 aircraft is not adjustable.

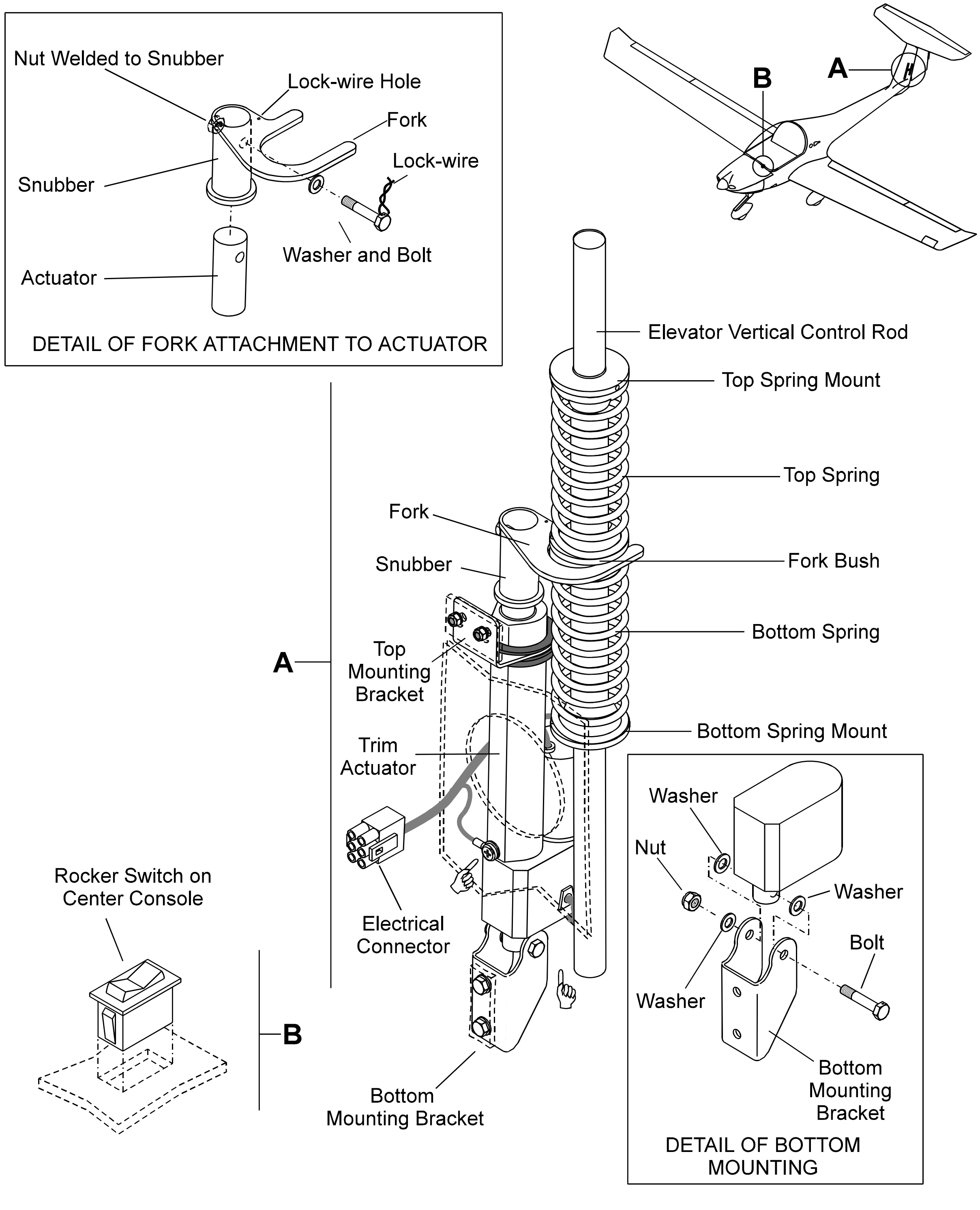

Figure 1 - Elevator Trim Controls

3. Operation

If you push the front part of the rocker switch with no load on the control column, the following happens:

- The actuator moves the fork assembly upwards
- The fork assembly moves the spring-mount upwards. This compresses the top spring. It also extends the bottom spring. This gives an upwards force on the rod
- The vertical control rod will move upwards until the 2 springs are equally compressed
- The elevator moves down
- The actuator will continue to move until:
    - You release the switch
    - The actuator extends fully.

If you push the rear part of the rocker switch with no load on the control column, the elevator will move up.

The pilot can set the elevator trim so that the spring load balances the aerodynamic load on the elevator.

The trim position indicator shows the position of the trim actuator.

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ELEVATOR CONTROL TRIM - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the elevator control trim system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Trim system does not operate.	Circuit breaker not set.	Set the trim circuit breaker. Do a test for correct trim system operation. If the circuit breaker opens: - Do a short circuit test - Do an electrical actuator friction test.
	Trim electric actuator defective.	Replace the trim electric actuator.
	Bearings defective.	Replace the defective bearings.
	Open circuit in the electrical control system.	Do a test for continuity in each wire of the control system. Repair/replace defective items.
	Trim switch defective.	Replace the trim switch.
Elevator trim moves too slowly. (Usual time for full travel 11 seconds)	Not enough actuator power.	Do a test for the correct electrical power at the actuator.
	Trim electric actuator defective.	Replace the trim electric actuator.
No (or incorrect) position indication.	Elevator trim position indicator out of adjustment.	Adjust elevator trim position indicator.
	Elevator trim position indicator defective.	Replace the elevator trim position indicator.
	Trim electric actuator defective.	Replace the trim electric actuator.
Loss of stick-centering.	Trim electric actuator disconnected.	Reconnect the trim electric actuator.
	Spring-mount assembly defective.	Replace the spring-mount assembly.

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ELEVATOR TRIM - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the elevator actuator. Refer to AMM Chapter 55-20 to remove/install the elevator.

2. Remove/Install the Elevator Trim Actuator

Refer to Figure 201.

A. Remove the Elevator Trim Actuator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the rudder.	Refer to Chapter 55-40.
WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.		
3.	Disconnect the bottom of the elevator vertical control rod at the elevator bellcrank. - Remove the nut bolt and two washers - Move the control rod clear of the fork assembly.	
4.	Get access through the hole in the vertical stabilizer and cut the Tie-wrap that holds the electrical harness of the elevator trim actuator. - Disconnect the electrical harness connector.	
5.	Remove the nut, bolt and three washers that attach the elevator trim actuator to the lower mounting bracket.	
6.	Cut the locking wire from the bolt that attaches the fork assembly to the elevator trim actuator. - Remove the bolt and washer	

	Detail Steps/Work Items	Key Items/References
	- Remove the fork assembly.	
7.	Carefully move the elevator trim actuator down until it clears the upper mounting bracket. - Remove the elevator trim actuator.	

B. Install the Elevator Trim Actuator

	Detail Steps/Work Items	Key Items/References
1.	Put the fork assembly in the correct position.	Refer to Figure 1.
2.	Carefully put the elevator trim actuator in the upper mounting bracket. - Make sure you align the actuator rod in the inner fork assembly. - Install the bolt and washer - Lock the bolt with wire.	Refer to Figure 1. Torque to 4.6 lbf-ft (6.5 Nm).
3.	Install the nut, the bolt and the three washers that attach the elevator trim actuator to the lower mounting bracket.	
4.	Connect the electrical harness to the elevator trim actuator. - Get access through the hole in the vertical stabilizer and connect the electrical harness connector - Install the tie-wrap that holds the electrical harness.	
WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.		
5.	Install the bottom of the elevator vertical control rod to the elevator bellcrank. - Make sure you correctly align the fork assembly with the spring mount assembly. - Install the nut bolt and two washers.	 Refer to Figure 1. Torque to 4.6 lbf-ft (6.5 Nm).

	Detail Steps/Work Items	Key Items/References
6.	Connect the aircraft battery.	Refer to Chapter 24-31.
7.	Do an operational check of the elevator trim control system.	
8.	Do a test for correct, full and free movement of the elevator control system.	Refer to Chapter 27-30.
9.	Install the rudder.	Refer to Chapter 55-40.

C. Adjust the Elevator Trim Position Indicator

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Remove the rudder.	Refer to Chapter 55-40.
	WARNING: WHEN YOU DO WORK ON THE AIRCRAFT CONTROLS, MAKE SURE THAT THE AREA AROUND THE CONTROLS/CONTROL SURFACES ARE CLEAR OF PERSONNEL/EQUIPMENT. IF YOU DO NOT DO THIS, INJURY TO PERSONNEL AND DAMAGE TO CONTROL SURFACES CAN OCCUR.	
3.	Using the elevator trim switch set the trim to full nose up.	
4.	Mark the position of the trim actuator shaft in the nose up position.	
5.	Using the elevator trim switch set the trim to full nose down.	
6.	Mark the position of the trim actuator shaft in the nose down position.	
7.	Measure the trim actuator travel between the marks for full nose up and full nose down and divide this measurement by two to get the midpoint of travel.	
8.	Using the elevator trim switch set the trim actuator to the midpoint of travel.	
9.	Use a small screwdriver to adjust the potentiometer on top of the trim position indicator.	The two middle light emitting diodes on the indicator must be lit.
10.	Using the elevator trim switch set the trim to full nose up.	The top light emitting diode must be lit at full nose up trim.

	Detail Steps/Work Items	Key Items/References
11.	Using the elevator trim switch set the trim to full nose down.	The bottom light emitting diode must be lit at full nose down trim.
12.	Do an operational check of the elevator trim control system.	
13.	Install the instrument panel cover.	Refer to Chapter 25-10.

FLIGHT CONTROLS - FLAPS

1. General

The DA20-C1 aircraft has slotted flaps for landing and take-off. An electric flap actuator moves the flaps. Refer to Chapter 57-50 for data about the flap structure.

A three-position toggle switch controls the flaps. The switch is in the center section of the instrument panel.

The flap position indicator has marks for CRUISE, T/O and LDG positions.

2. Description

Figure 1 shows the flap control system in the fuselage. Figure 2 shows the flap control system in the aft control bulkhead and wing.

A. Flap Actuator

An electric actuator operates the flaps. The electric actuator is under the left seat. A mounting bracket on the on the aft face of the T-panel holds the front of the actuator.

The electric actuator has an electric motor. The motor has a reduction gear which turns a spindle. The spindle operates a control rod. The control rod connects to a bellcrank attached to the aft control bulkhead.

A cam attached to the control rod operates five micro-switches. The micro-switches are part of the flaps electronic control circuit.

B. Control Rods and Bellcranks

The output lever of the bellcrank on the aft control bulkhead connects to two control rods. The two control rods connect to the flap bellcranks in the wings. Two short control rods attach to the flap horns.

A short rod connects to the input lever of the bellcrank on the aft control bulkhead. The rod goes through a hole in the aft control bulkhead. Large washers attach to the end of the rod. The washers make a stop for the up movement of the flaps. If there is an electrical fault, the stop protects the flaps from too much load.

C. Flap Electrical Control

Figure 3 shows the flap electrical controls. The main bus supplies power for the flaps. A 5 amp circuit breaker protects the circuit. Refer to AMM Chapter 92 for the wiring diagram.

The flap electrical control system uses solid-state electronics. It has an electronic control unit and a switchboard. The electronic control unit is located on the instrument panel. The switch board attaches to the flap actuator.

The electronic control unit has a 3-position selector switch, solid-state logic circuits and a flap position indicator. The selector switch can be set to:

- CRUISE (fully up). 0 ±1°
- T/O (take-off). 15 ±1°
- LDG (landing). 45 ±1°

The logic circuits monitor the outputs from the selector switch and the micro-switches on the switch board. They control 4 power transistors. Two of the power transistors can connect the power supply to the flap motor. The other two can connect the motor to ground.

The flap position indicator has three light-emitting diodes. The top diode lights when the flaps are in the CRUISE position. The middle diode lights when the flaps are in the T/O position. The bottom diode lights when the flaps are in the LDG position.

The switch board attaches to the body of the flap actuator with 2 worm-drive clamps. The switch board has 5 micro switches. Two screws attach each micro-switch to the switch board. You can adjust the position of the switch board with the worm-drive clamps. You can adjust each micro-switch with its attaching screws. The micro-switches have the following functions:

- Micro-switch 1 - CRUISE position
- Micro-switch 2 - CRUISE indication and T/O position moving down
- Micro-switch 3 - T/O indication
- Micro-switch 4 - LDG position
- Micro-switch 5 - LDG indication T/O position moving up.

With the Diamond flap control module installed (p/n 22-2753-00-00 the micro switches have the following functions:

- Micro-switch 1 - LDG indication and T/O limit (from LDG position)
- Micro-switch 2 - CRUISE indication and T/O limit (from CRUISE position)
- Micro-switch 3- LDG Limit
- Micro-switch 4 - T/O indication
- Micro-switch 5 - CRUISE limit

Cable harnesses with multi-pin connectors connect the components.

3. <u>Operation</u>

If you operate the flap selector switch the following happens:

- The switch energizes the related logic circuit

- The logic circuit switches on the related transistors to supply power/ground to the flap motor
- The flap motor turns the reduction gear and spindle. This moves the control rod towards the new set position
- The control rod turns the bellcrank around its axis
- The bellcrank moves the two control rods in the wings
- The two control rods move the bellcranks in the left and right wing
- The two short control rods move the flaps.

When the flaps come to the set position:

- The cam on the flap control rod operates the related position and indication micro-switches
- The logic circuit switches off the related transistors to de-energize the motor
- The flap position indicator shows the new flap position.

4. Fail Safe Operation

The flap control system has the following safety properties:

- If the CRUISE position micro-switch fails closed, the stop in the aft control bulkhead prevents damage to the flaps. The FLAP circuit-breaker opens.
- If the LDG position micro-switch fails closed, the actuator control rod contacts the end of the actuator body after about 5mm (0.2 in) of movement. This prevents damage to the flaps. The FLAP circuit-breaker opens.

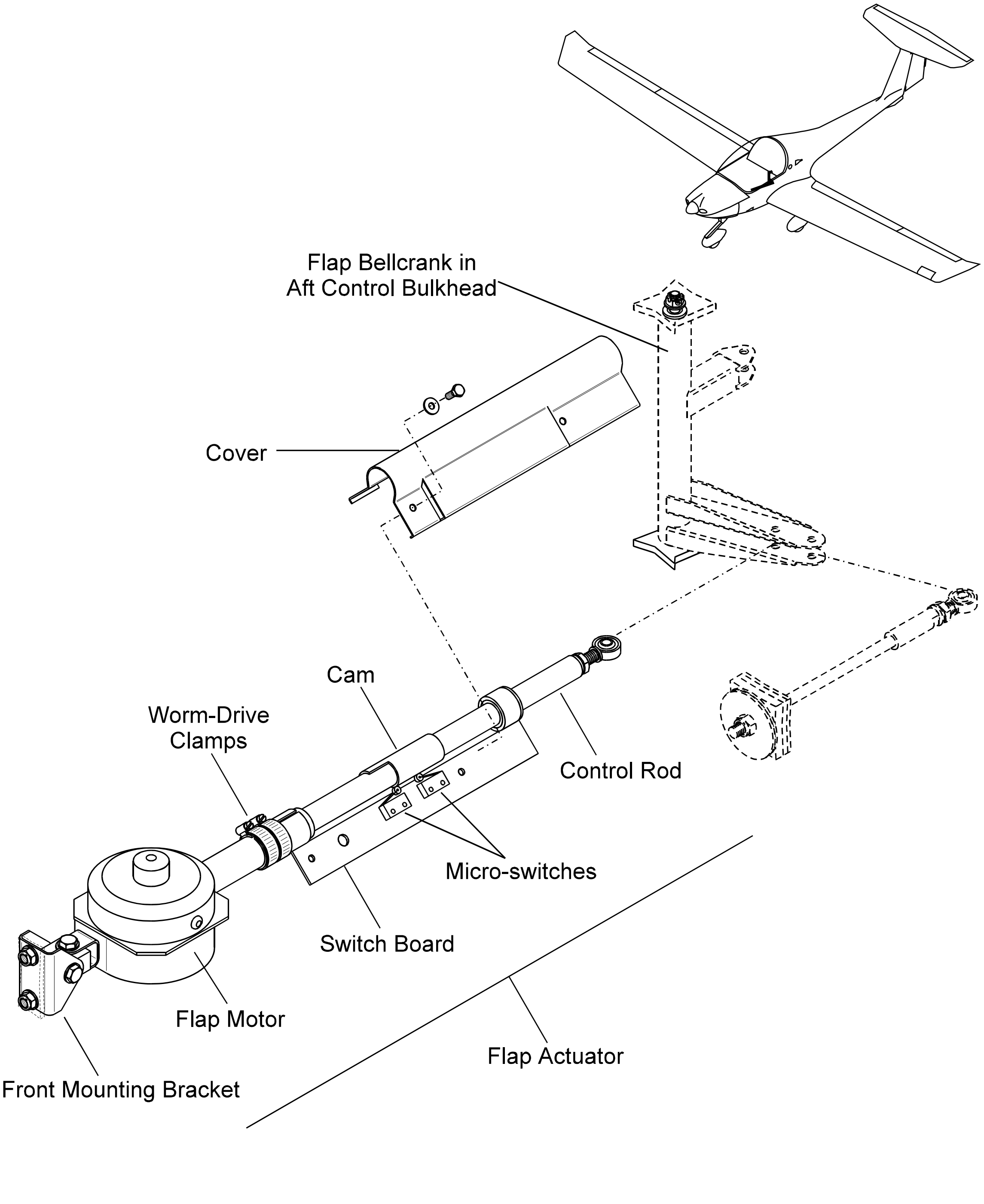

Figure 1 - Flap Control System in the Fuselage

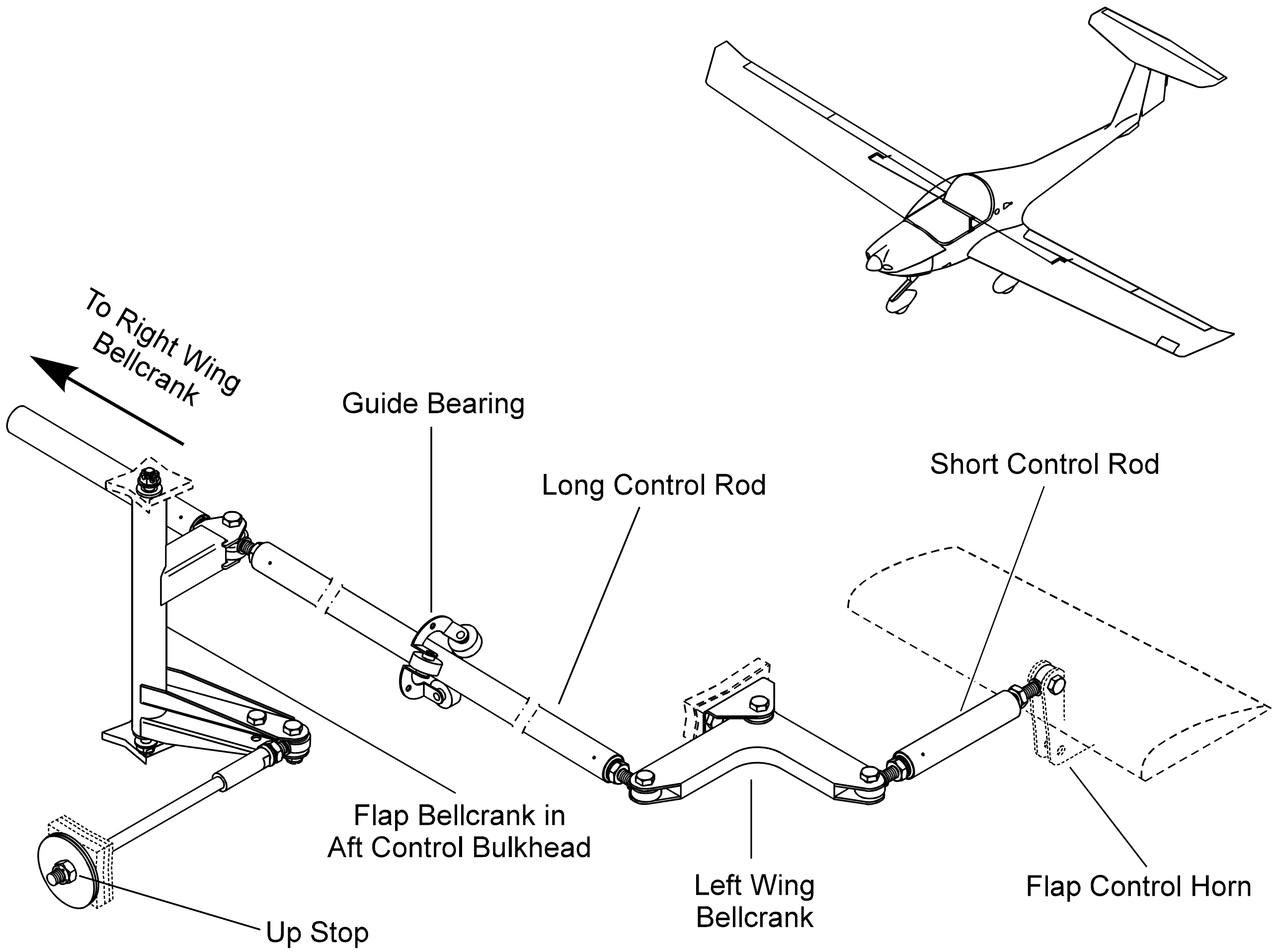

Figure 2 - Flap Controls in the Aft Control Bulkhead and Wing

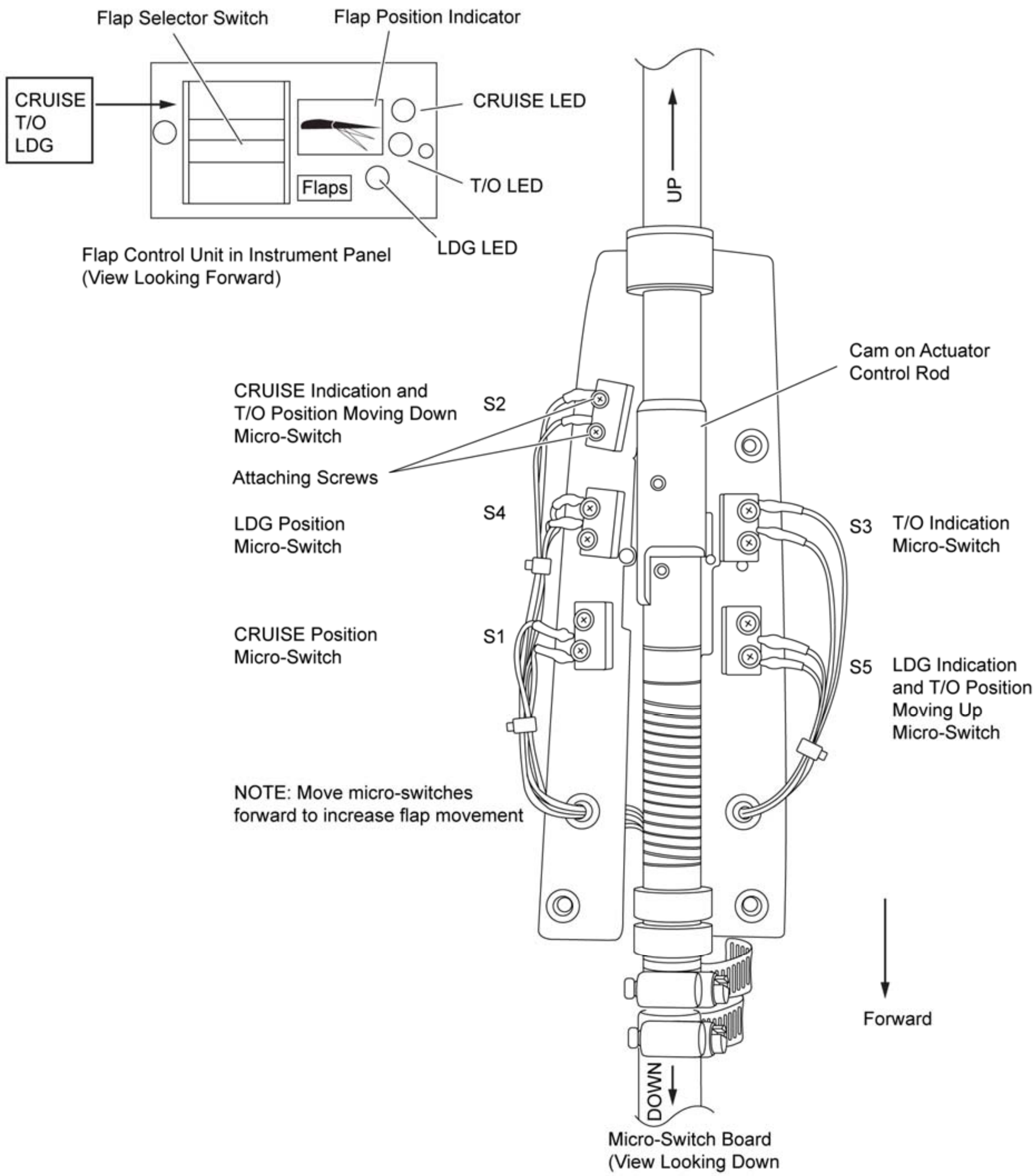

Figure 3 - Flap Electrical Control System

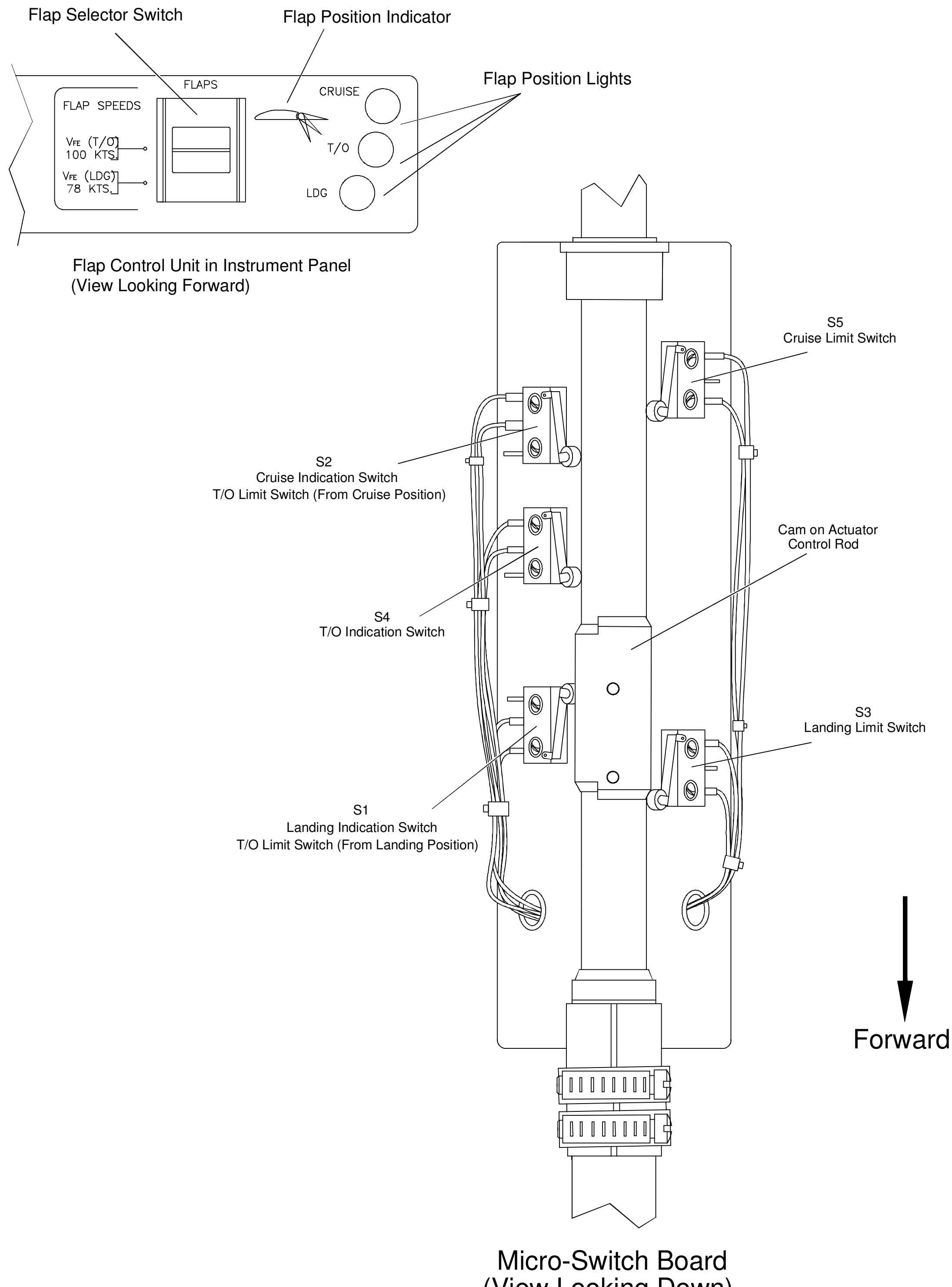

Figure 3 - Flap Electrical Control System (Diamond Flap Controller p/n 22-2753-00-00

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FLAPS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the flap system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Flaps do not operate.	Circuit breaker not set.	Set the flap circuit breaker.
	Aircraft electrical system voltage low.	Do a test of the aircraft electrical system voltage.
	Flap selector switch defective	Replace the flap electronic control unit.
Flap circuit-breaker will not stay closed.	Short to ground in the wires to the electrical control unit or the micro-switches.	Do an insulation test between each wire and ground. Repair or replace defective wires.
	Short to ground in the electrical control unit.	Replace the electrical control unit.
	Short to ground in a micro-switch.	Replace the micro-switch.
	Short to ground in a wire between a closed micro-switch and the control unit.	
Flap circuit-breaker opens when flap selector switch moved to any down position.	Short to ground in a motor supply wire.	Do an insulation test between each wire and ground. Repair or replace defective wires.
Flap circuit-breaker opens when flap selector switch moved to any up position.	Short to ground in a motor supply wire.	Do an insulation test between each wire and ground. Repair or replace defective wires.
Flap circuit-breaker opens when the flaps stop at the chosen position.	Short to ground in the wires to the electrical control unit from the related indication micro-switch.	Do an insulation test between each wire and ground. Repair or replace defective wires.
Flap circuit-breaker opens when the flaps have moved only a short distance from the CRUISE setting.	Short to ground in the wires to the electrical control unit from micro-switch 1.	Do an insulation test between each wire and ground. Repair or replace defective wires.
Flap circuit-breaker opens when the flaps have moved only a short distance from the LDG setting.	Short to ground in the wires to the electrical control unit from micro-switch 4.	Do an insulation test between each wire and ground. Repair or replace defective wires.

TROUBLE	POSSIBLE CAUSE	REPAIR
Flaps move slowly.	Aircraft electrical system voltage low. Flap motor defective. Defective flap actuator.	Do a test of the aircraft electrical system voltage. Do a test for 12V at the motor with flaps selected. If there is 12V at the motor. Replace the actuator. Examine the actuator. If you find damage, then replace the flap actuator.
Flaps do no not align with the wing trailing edge.	Flaps extended at too high airspeed.	Examine the flap system. Replace damaged parts. Adjust the system.
Flaps will not move to LDG position. Flaps move to T/O and CRUISE correctly.	Micro-switch 4 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 3 defective Open circuit in the micro-switch 4 wiring. With Diamond p/n 22-2753-00-00 installed: Open circuit in the micro-switch 3 wiring.	Replace the micro-switch. Do a continuity test of the wiring. Repair or replace the defective wire.
Flaps will not move to CRUISE position. Flaps move to T/O and LDG correctly.	Micro-switch 1 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 5 defective Open circuit in the micro-switch 1 wiring. With Diamond p/n 22-2753-00-00 installed: Open circuit in the micro-switch 5 wiring.	Replace the micro-switch. Do a continuity test of the wiring. Repair or replace the defective wire.
No LDG indication when the flaps are in the LDG position. Flaps will not move from LDG to T/O. Flaps move from LDG to CRUISE correctly.	Micro-switch 5 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 5 defective	Replace the micro-switch.

TROUBLE	POSSIBLE CAUSE	REPAIR
	Open circuit in the micro-switch 5 wiring. With Diamond p/n 22-2753-00-00 installed: Open circuit in the micro-switch 1 wiring.	Do a continuity test of the wiring. Repair or replace the defective wire.
No CRUISE indication when the flaps are in the CRUISE position. Flaps will not move from CRUISE to T/O. Flaps move from CRUISE to LDG correctly.	Micro-switch 2 defective.	Replace the micro-switch.
	Open circuit in the micro-switch 2 wiring.	Do a continuity test of the wiring. Repair or replace the defective wire.
No T/O indication when the flaps are in the T/O position. Flaps move to all positions correctly.	Micro-switch 3 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 4 defective	Replace the micro-switch.
	Open circuit in the micro-switch 3 wiring. With Diamond p/n 22-2753-00-00 installed: Open circuit in the micro-switch 4 wiring.	Do a continuity test of the wiring. Repair or replace the defective wire.
Flap circuit-breaker opens at the end of down movement.	Micro-switch 4 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 3 defective	Replace the micro-switch.
Flap circuit-breaker opens at the end of up movement.	Micro-switch 1 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 5 defective	Replace the micro-switch.
LDG LED stays on when the flaps are not in the LDG position. The other indications operate correctly.	Micro-switch 5 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 1 defective.	Replace the micro-switch.
	With Diamond p/n 22-2753-00-00 installed: Long side of cam making contact	Rotate switch tray

TROUBLE	POSSIBLE CAUSE	REPAIR
CRUISE LED stays on when the flaps are not in the CRUISE position. The other indications operate correctly.	Micro-switch 2 defective.	Replace the micro-switch.
	With Diamond p/n 22-2753-00-00 installed: Long side of cam making contact	Rotate switch tray
T/O LED stays on when the flaps are not in the T/O position. The other indications operate correctly.	Micro-switch 3 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 4 defective.	Replace the micro-switch.
Flaps move to LDG when T/O set from CRUISE.	Micro-switch 2 defective.	Replace the micro-switch.
Flaps move to CRUISE when T/O set from LDG.	Micro-switch 5 defective. With Diamond p/n 22-2753-00-00 installed: Micro-switch 1 defective.	Replace the micro-switch.

FLAPS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the components of the flap system and how to test and adjust the system. Refer to Chapter 57-50 for data about removing and installing the flaps.

2. Remove/Install the Flap Actuator

Refer to Figure 1.

A. Remove the Flap Actuator

	Detail Steps/Work Items	Key Items/References
1.	If possible, set the flaps to the LDG position.	
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Remove the pilot's seat.	Refer to Chapter 25-10.
4.	Disconnect the supply wires to the flap motor.	
5.	Disconnect the control harness plug from the switch-board.	
6.	Remove the access panels below the aft control bulkhead.	
7.	Remove the bolt that attaches the actuator control rod to the bellcrank.	At the aft control bulkhead. Hold the flaps.
8.	Lower the flaps by hand until the stop.	
9.	Remove the bolt which attaches the actuator body to the forward mounting bracket.	
10.	Remove the actuator from the aircraft.	

B. Install the Flap Actuator

	Detail Steps/Work Items	Key Items/References
1.	Put the flap actuator in position in the fuselage.	Make sure that the actuator is in the fully retracted position.
2.	Install the bolt which attaches the actuator to the forward mounting.	
3.	Install the bolt which attaches the actuator control rod to the bellcrank.	At the aft control bulkhead. Hold the flaps.
4.	Connect the control harness plug for the switch-board.	
5.	Connect the supply wires to the flap motor.	
6.	Connect the aircraft battery.	Refer to Chapter 24-31.
7.	Do the adjustment test procedure.	See below.
8.	Install the left pilot’s seat.	Refer to Chapter 25-10.
9.	Install the access panels below the aft control bulkhead.	

3. Adjust/Test the Flap System

A. Equipment

Item	Quantity	Part Number
Spring Scale	1	Commercial
Angle Level	1	Commercial

B. Procedure

NOTE: This procedure assumes that the flap controls are fully connected.

NOTE: Use the micro-switches to adjust the range of movement of both flaps. Use the short rods at the flap horns to adjust the angle of one flap against the other.

	Detail Steps/Work Items	Key Items/References
1.	Open the FLAP circuit-breaker.	On the right side of the instrument panel.
2.	Remove the left pilot’s seat.	Refer to Chapter 25-10.
3.	Remove the access panels below the aft control bulkhead.	
4.	Remove the cover from the flap actuator switch board.	
5.	Loosen the 2 worm-drive clamps which hold the switch board to the actuator body.	
6.	Set the BAT/GEN switch to ON.	
7.	Set the flap selector switch to LDG.	
8.	Close the FLAP circuit-breaker.	
9.	Set the flap selector switch to T/O.	Let the flap actuator extend about 1/2 in. (12 mm).
10.	Set the BAT/GEN switch to OFF.	
11.	Move the switch board to give approximately 0.2 in.(5 mm) of actuator control rod movement from the fully closed position.	
12.	Set the BAT/GEN switch to ON.	
13.	Set the flap selector switch to LDG.	The actuator must stop approximately 0.2 in. (5 mm) from the fully closed position.
14.	Do items 9 to 13 as necessary to get the correct movement.	Approximately 0.2 in. (5 mm) of actuator control rod movement from the fully closed position.
15.	Set the BAT/GEN switch to OFF.	
16.	Tighten the worm-drive clamps.	
17.	Set the BAT/GEN switch to ON.	
18.	Set the flap selector switch to CRUISE.	

	Detail Steps/Work Items	Key Items/References
19.	If the flap circuit-breaker opens: - Set the BAT/GEN switch to OFF - Increase the length of both short control rods by 1 turn at the flaps - If necessary, Increase the length of the emergency up-stop rod.	 Make sure that the rod-ends are in safety. Make sure that the rod-end is in safety.
20.	Close the FLAP circuit-breaker.	
21.	Set the BAT/GEN switch to ON.	
22.	Set the flap selector switch to T/O.	
23.	Do the items 18 to 22 again until the flaps stop correctly.	
24.	Test the flap pre-load: - Make sure that both flaps contact the bumpers together. - Pull down on the flaps to just clear the flap bumpers.	 If necessary, adjust the length of the short pushrod at the flap. Use a spring scale. The force must be 6.7 to 11.2 lb (3 to 5 kg).
25.	If the flap pre-load is too low, decrease the length of both short control rods by 1 turn at the flaps.	
26.	Do items 24 and 25 again until the flaps stop correctly.	
27.	Put the angle level in position on the flap.	Record the angle.
28.	Set the flap selector switch to LDG.	
29.	When the flaps stop, measure the angle on the angle level.	The angle must be 44 to 46 degrees.
30.	If necessary, adjust the angle with micro-switch 4: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. Move the switch forward to increase the angle.

	Detail Steps/Work Items	Key Items/References
31.	Set the BAT/GEN switch to ON.	
32.	Set the flap selector switch to T/O.	
33.	Do the steps 28 to 32 again until the flaps stop correctly.	
34.	When the flaps stop, measure the angle on the angle level.	The angle must be 14 to 16 degrees.
35.	If necessary, adjust the angle with micro-switch 5: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. Move the switch forward to increase the angle.
36.	Set the BAT/GEN switch to ON.	
37.	Set the flap selector switch to T/O.	
38.	Do the items 34 to 37 again until the flaps stop correctly.	
39.	Set the flap selector switch to CRUISE.	
40.	When the flaps stop, measure the angle on the angle level.	The angle must be +1 to -1 degree.
41.	If necessary, adjust the angle with micro-switch 1: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. Move the switch forward to increase the angle.
42.	Set the BAT/GEN switch to ON.	
43.	Set the flap selector switch to T/O.	
44.	Do the items 39 to 43 again until the flaps stop correctly.	

	Detail Steps/Work Items	Key Items/References
45.	When the flaps stop, measure the angle on the angle level.	The angle must be 14 to 16 degrees.
46.	If necessary, adjust the angle with micro-switch 2: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. Move the switch forward to increase the angle.
47.	Set the BAT/GEN switch to ON.	
48.	Set the flap selector switch to CRUISE.	
49.	Set the flap selector switch to T/O.	
50.	Do the items 45 to 49 again until the flaps stop correctly.	
51.	Make sure that the T/O LED on the flap position indicator is on.	
52.	If necessary, adjust the angle with micro-switch 3: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. Move the switch forward to increase the angle.
53.	Set the BAT/GEN switch to ON.	
54.	Set the flap selector switch to LDG.	
55.	When the flap stops at LDG: - Set the flap selector switch to T/O.	
56.	When the flaps stop at T/O: - Make sure that the T/O LED on the flap position indicator is on.	

	Detail Steps/Work Items	Key Items/References
57.	If necessary, adjust the angle with micro-switch 3: - Set the BAT/GEN switch to OFF - Loosen the two attaching screws - Move the switch a small distance - Tighten the two attaching screws.	Refer to Figure 201. If the position indication does not come on, move the switch forward.
58.	Do items 51 to 57 again until the flap position indicates correctly at T/O on the way up and down.	
59.	Set the flap selector switch to CRUISE.	
60.	Set the BAT/GEN switch to OFF.	
61.	Do a test of the flap pre-load.	
62.	If necessary, adjust the emergency up-stop.	There must be a light load on the washers.
63.	Remove the angle level.	
64.	Install the cover on the switch board of the flap actuator.	
65.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
66.	Do a check for loose items in the cockpit and the area of the aft control bulkhead.	
67.	Install the access panels below the fuselage.	
68.	Install the left pilot's seat.	Refer to Chapter 25-10.

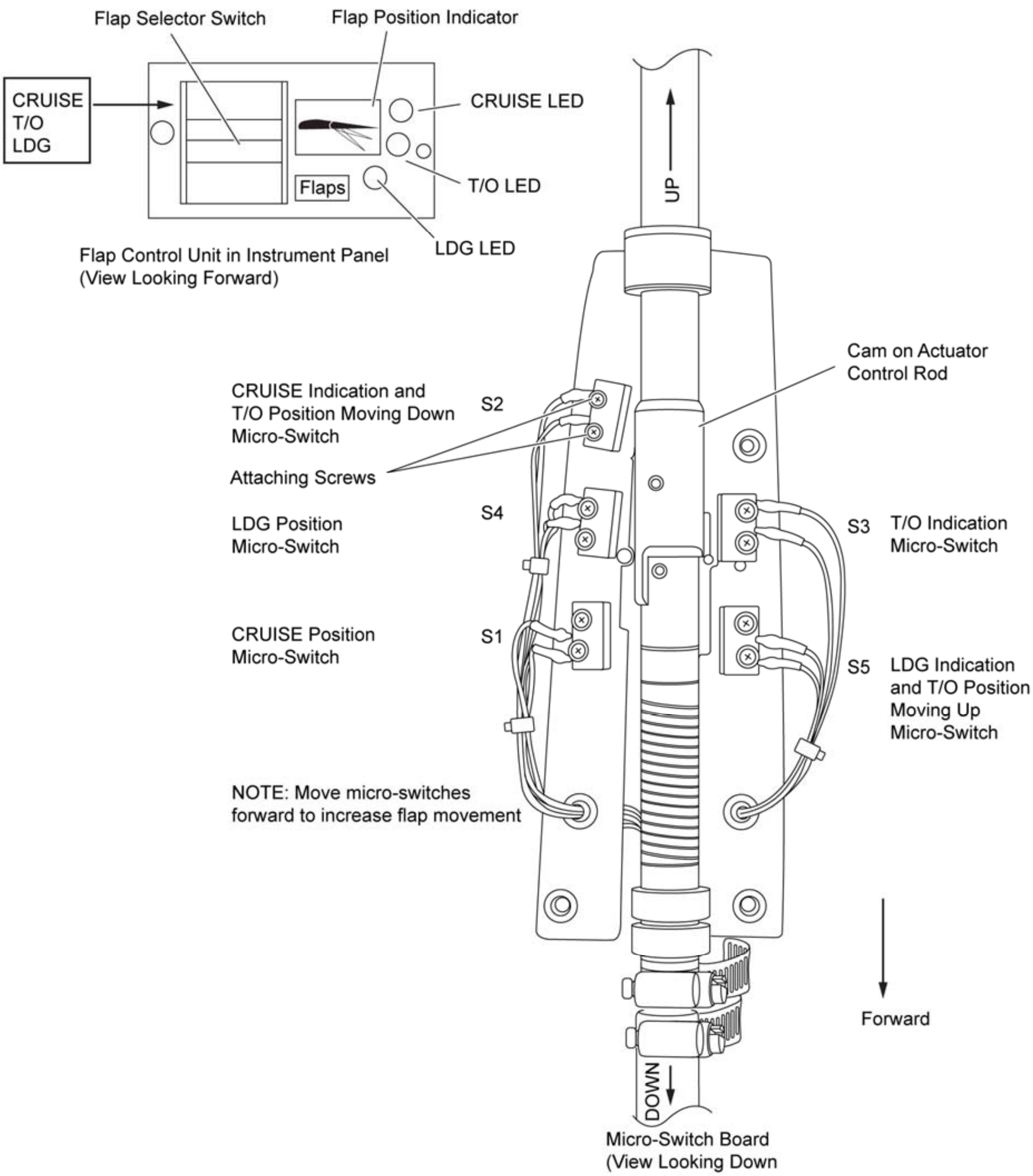

Figure 201 - Flap Electrical Control System

CHAPTER 28-00
FUEL

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FUEL

1. General

This chapter describes the general data about the airframe fuel system. Refer to the Continental Engine manuals for data about the engine fuel system.

2. Description

Figure 1 shows the fuel system schematic diagram. The DA20-C1 aircraft has the following fuel system components:

- A 24.5 US gallon (92.7 liters) fuel tank. The fuel tank is located in the fuselage behind the seats
- An optional 20 US gallon (75.7 Liters) fuel tank. This tank is located in place of the standard 24.5 US gallon (92.7 liters) fuel tank
- A fuel shut-off valve. The fuel shut-off valve is located on the aft side of the firewall. The control lever for the shut-off valve is on the forward part of the center console
- A optional console mounted fuel shut-off valve. This shut-off valve is located between the pilot and co-pilot seats. The console mounted fuel shut-off valve is installed in place of the firewall mounted shut-off valve
- A maintenance shut-off valve. The maintenance shut-off valve lets you remove the filter screen from the gascolator or the electrical pump without draining the fuel tank. The maintenance shut-off valve is located below the fuel tank
- A gascolator. The gascolator is located below the fuel tank. It has a 120 micron filter screen. The optional Andair gascolator has a 70 micron filter screen
- An electrical fuel pump. The electrical fuel pump is located below the fuel tank
- A check valve. The check valve is located in the return line beside the fuel tank
- A fuel quantity sensor. The fuel quantity sensor is located in the top of the fuel tank
- A fuel quantity gauge. The fuel quantity gauge is located on the right instrument panel
- A fuel pressure sensor. The fuel pressure sensor is located on the top right-hand side of the engine mount. Alternatively, some aircraft may have the fuel pressure sensor located behind the left-hand side of the aft engine baffle
- A fuel pressure gauge. The fuel pressure gauge is on the right side of the instrument panel
- A fuel tank drain valve. The drain valve is located below the fuel tank. A spring holds it closed
- Two maintenance drain taps. The low point of each supply and return pipe has a maintenance drain tap
- Flexible fuel hoses.

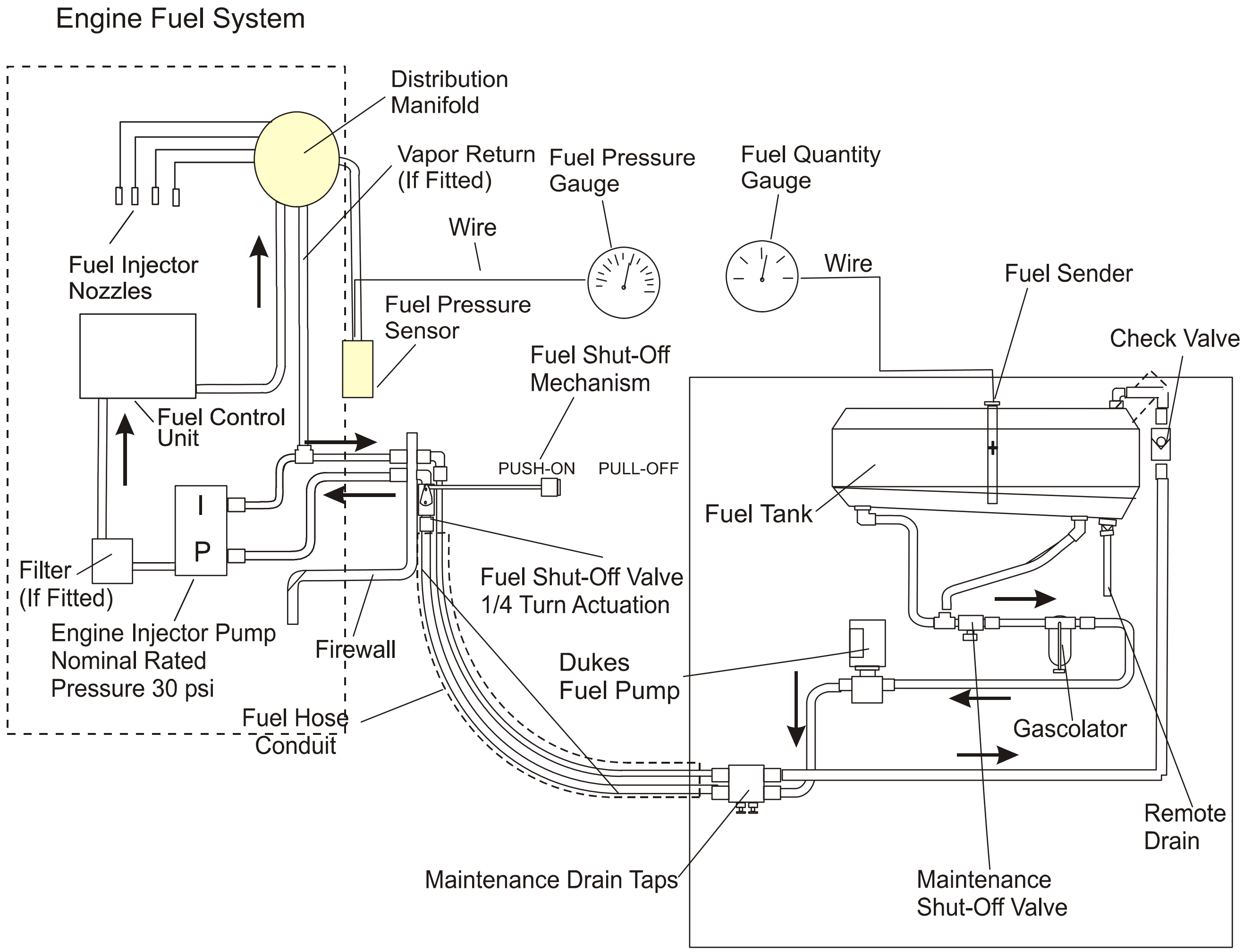

Figure 1 - Fuel System Schematic Diagram

3. Operation

With the fuel shut-off valve set to OPEN, fuel flows from the fuel tank to the engine through the following components:

- Maintenance shut-off valve
- Gascolator
- Electrical fuel pump
- Maintenance drain tap in the supply pipe
- Fuel shut-off valve.

Fuel returns from the engine to the fuel tank through the following components:

- Fuel return pipe
- Maintenance drain tap in the return pipe
- Check valve.

With the fuel shut-off valve set to CLOSED, fuel cannot flow to the engine.

CAUTION: LOCK THE MAINTENANCE SHUT-OFF VALVE OPEN WITH WIRE. IF YOU DO NOT LOCK THE VALVE OPEN IT MAY CLOSE IN FLIGHT. THIS WOULD CAUSE ENGINE FAILURE.

You can close the maintenance shut-off valve to do maintenance on the fuel system components below the fuel tank.

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FUEL STORAGE

1. General

This chapter describes more data about the fuel tank installation.

2. Description

Figure 1 shows the fuel tank. The standard capacity aluminum tank can hold 24.5 US gal (92.7 liter) total fuel of which 24 US gal (91 liter) is usable fuel. An optional tank with a capacity of 20.5 US gal (77.6 liter) total fuel of which 20 US gal (75.7 liter) is usable fuel may be installed in place of the standard capacity fuel tank.

Baffles inside the tank prevent too much fuel movement. An aluminum tube at the left of the tank connects to the fuel filler. A vent pipe connects to the aluminum tube. The vent pipe goes down through the fuselage skin to the outside of the airplane. The fuel tank electrically bonds to the fuel ground connection.

The tank is located between the spar bridge and the B bulkhead. Pads on the spar bridge and B bulkhead locate the tank. A steel band holds the tank in position. The baggage compartment floor panel covers the fuel tank.

The top of the tank has a mounting for the fuel quantity sensor. The bottom of the tank also has connections for:

- The fuel supply to the maintenance shut-off valve. The tank has two supply pipes. These connections have a hollow bolt with a finger filter. The bottom part of the hollow bolt makes a small stand-pipe. This makes a sump to prevent water (or other contaminants) from entering the fuel system.

- The fuel drain valve. The fuel drain valve connects to the lowest part of the tank. You can use the fuel-sampler cup to operate the drain valve. Push the extension tube upwards to operate the drain valve. Release it to close the valve. You can drain the tank fully using the drain valve.

- The fuel return pipe.

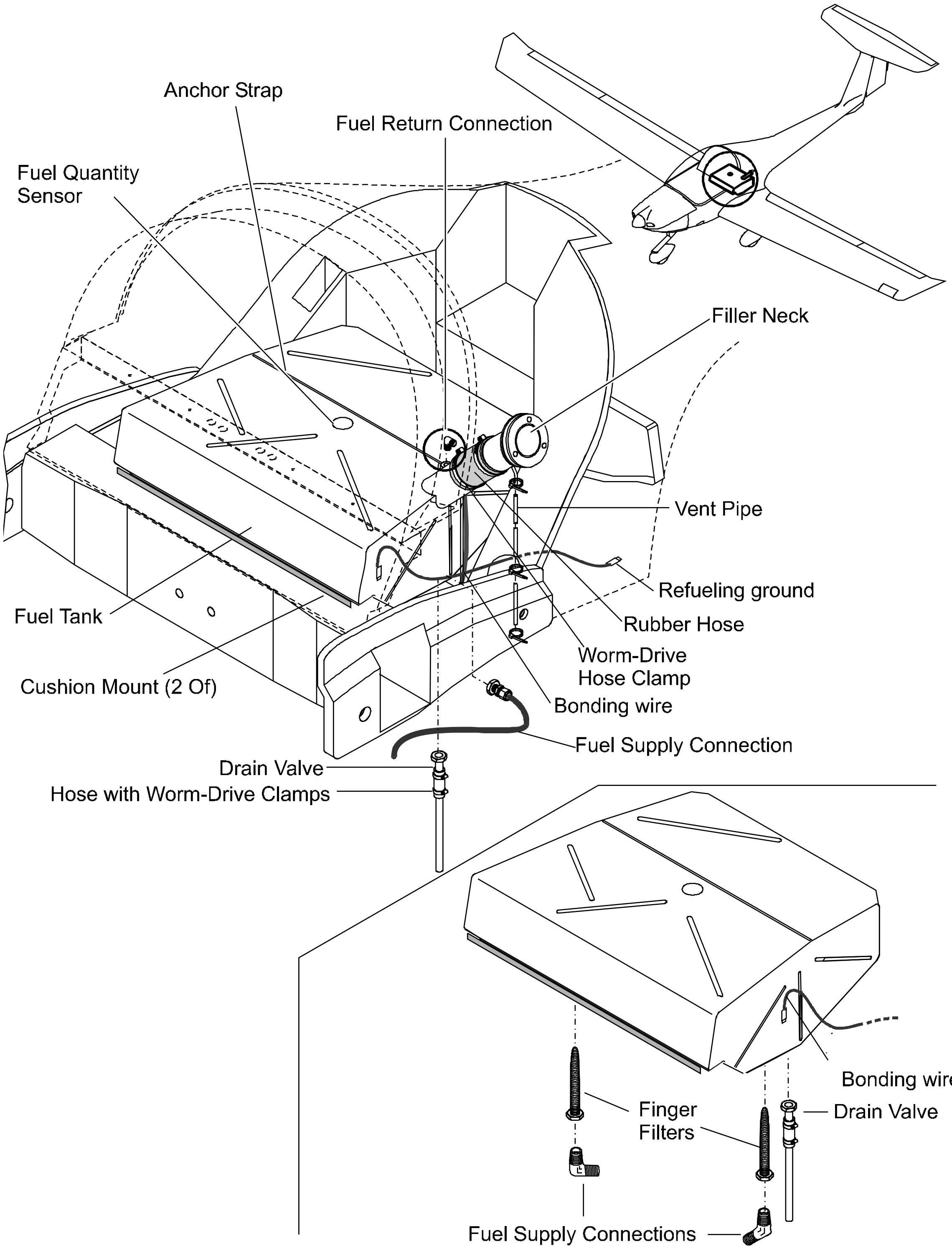

Figure 1 - Fuel Tank Installation

FUEL STORAGE - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the fuel storage system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Smell of fuel in the aircraft.	Fuel hose connection loose. Fuel tank cracked. Fuel filler hose loose.	Tighten the connection. Replace or repair the fuel tank. Tighten the connection.
Fuel tank filler-cap leaking.	Defective filler-cap seal.	Replace the seal.
Fuel tank connection leaking.	Defective drain valve seal. Damaged thread.	Replace the seal. Replace or repair the fuel tank.
Fuel contamination.	Bulk fuel supply contaminated.	Remove and flush the fuel tank. Flush all fuel pipes. Clean or replace all filters.
NOTE: Most fuel contamination comes from poor quality control of the fuel before putting it in the aircraft. Make sure that you use only clean fuel that meets the specification for AVGAS 100 LL.		

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FUEL STORAGE - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install components and how to flush the fuel system. Refer to Chapter 28-00 for the system description and Chapter 28-40 for the fuel gauge installation.

Obey the usual safety precautions when you do work on the fuel system.

WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

2. Remove/Install the Fuel Tank

A. Remove the Fuel Tank

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Attach the battery cover temporarily.	
3.	Disconnect any external electrical power from the aircraft.	
4.	Defuel the aircraft.	Refer to Chapter 12-10.
5.	Remove the baggage compartment floor.	Refer to Chapter 25-10.
6.	Disconnect the fuel return hose. - Remove the 90° fitting elbow.	
7.	Disconnect the fuel drain valve.	
8.	Disconnect the fuel supply hoses.	
9.	Release the rubber hose for the fuel filler: - Release the hose-clamps - Pull the hose from the connection sleeve.	
10.	Release the steel band which holds the tank.	
11.	Disconnect the wires from the fuel quantity sensor.	

	Detail Steps/Work Items	Key Items/References
12.	Remove the tank from the aircraft: - Lift the back of the tank upwards and forwards. - Turn the tank upside-down as you remove it over the seat back.	Refer to Figure 201.

B. Install the Fuel Tank

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the rubber pads are in position on the spar bridge and the B-bulkhead.	
2.	Put the fuel pump in position in the aircraft. - Hold the tank upside-down with the stepped edge facing aft - Move the tank above the seat back - Turn the tank so that the stepped edge goes down behind the seat back - Keep turning the tank until it is the correct way up.	Refer to Figure 201.
3.	Install the steel band which holds the tank: - Tighten the nuts at each end equally - Pull upwards on the middle of the strap with a spring balance.	Refer to Figure 201. The movement of the strap must be 0.15 - 0.23 in at 11 lb load (5 ± 1 mm at 5 kg load).
4.	Connect the wires to the fuel quantity sensor.	
5.	Install the rubber hose for the fuel filler: - Put the hose in position on the connection sleeve - Tighten the hose-clamps.	
6.	Connect the pipe to the fuel drain valve.	
7.	Install the 90° fitting elbow	
8.	Connect the fuel return hose.	

	Detail Steps/Work Items	Key Items/References
9.	Connect the fuel supply hoses.	
10.	Refuel the aircraft.	
11.	Examine the fuel tank installation.	Look especially for fuel leaks.
NOTE: If you find a leak from the tank (not from the connections), you must remove the tank for repair. Obey the regulations of your airworthiness authority when you repair fuel tanks.		
12.	Install the baggage compartment floor.	
13.	Remove the battery cover and connect the battery.	Refer to Chapter 24-31.
14.	Bleed the engine fuel system.	Refer to Chapter 73-00.

3. Remove/Install the Fuel Filler Neck

A. Remove the Fuel Filler Neck

Refer to Figure 202.

	Detail Steps/Work Items	Key Items/References
1.	On the aircraft exterior, remove the six screws from the fuel cap surround.	The screws are screwed into self clinching nuts on the flange of the filler neck.
2.	Remove the necessary floor covering from the baggage compartment.	
3.	Inside the baggage compartment, pry the fuel filler neck and spacer free from the fuselage.	Make sure that the fuel cap surround stays in place.
4.	Remove the spacer from the fuel filler neck assembly	
5.	Remove the bolt, two washers and locknut from the ground tab and remove the ground strap from the fuel filler neck.	
6.	Remove the drain tube from the fuel filler neck.	
7.	Loosen the hose-clamp at the fuel filler neck and pull the fuel filler neck from the hose.	
8.	Remove the fuel filler neck.	

B. Install the Fuel Filler Neck

Refer to Figure 202.

	Detail Steps/Work Items	Key Items/References
1.	Inside the baggage compartment, connect the hose to the fuel filler neck.	Do not tighten the hose-clamp immediately.
2.	Connect the drain tube.	
3.	Connect the ground strap to the ground tab with the bolt, two washers and locknut.	
4.	Align and install the fuel filler neck assembly and spacer with low adhesion fuel compatible sealant (inner fuselage mating surfaces, and between the fuel filler spacer and filler neck).	Use PR1428 B-1/2 low adhesion sealant. NOTE: Replace the spacer if it is damaged.
5.	On the aircraft exterior, install and tighten the six screws on the fuel cap surround using Loctite 545.	The screws are screwed into self clinching nuts on the flange of the filler neck.
6.	Tighten the hose-clamp at the fuel filler neck.	
7.	Install the baggage compartment floor covering.	

4. Flush the Fuel System Procedure

This procedure describes how to flush the fuel feed pipe from the fuel tank to the engine bay.

Obey the usual safety precautions when you do work on the fuel system.

WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Make sure the aircraft has sufficient fuel to do the test.	Approximately 1.2 US gallons (4.5 Liters) of fuel.
3.	Put a fire extinguisher in position next to the aircraft.	
4.	Disconnect the fuel feed hose from the fuel pump at the engine.	NOTE: Make sure to note the orientation of inline fuel filter.

	Detail Steps/Work Items	Key Items/References
5.	Put the end of the fuel feed hose into an approved container.	Make sure the fuel feed hose and the container are connected to approved ground connections.
6.	Set the GEN/BAT switch to ON. - Close the FUEL PUMP circuit breaker - Set the fuel pump switch to ON - Let the fuel pump operate for sufficient time to pump approximately 1.2 US gallons (4.5 liters) into the approved container.	This will make sure that sufficient fuel has been flushed through the system.
7.	Set the fuel pump switch to OFF.	
8.	Attach the fuel feed hose to the fuel pump inlet. Tighten the fuel hose connector.	NOTE: Make sure that the inline fuel filter is installed correctly. Refer to step 4. Torque to 270 lbf-in. (30.5 Nm).
9.	Set the fuel pump switch to ON. - Do a leak check of the fuel feed hose connection - Set the fuel pump switch to OFF - Set the GEN/BAT switch to OFF.	
10.	Bleed the engine fuel system.	Refer to Chapter 73-00.
11.	Install the engine cowlings.	Refer to Chapter 71-10.

5. Overhaul the Fuel Cap

This procedure describes how to flush the fuel feed pipe from the fuel tank to the engine bay.

Obey the usual safety precautions when you do work on the fuel system.

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WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

	Detail Steps/Work Items	Key Items/References
1.	Remove the fuel cap.	
2.	Disassemble and clean the cap.	Insert the key before removing the lock.
3.	Overhaul the fuel cap replacing all items included in the overhaul kit part number OHK3.	
4.	Re-assemble cap.	During the reassembly of the cap, lubricate with Vaseline or light silicone crease.
5.	Adjust the cap to provide a light but positive seal.	
6.	Install the fuel cap.	

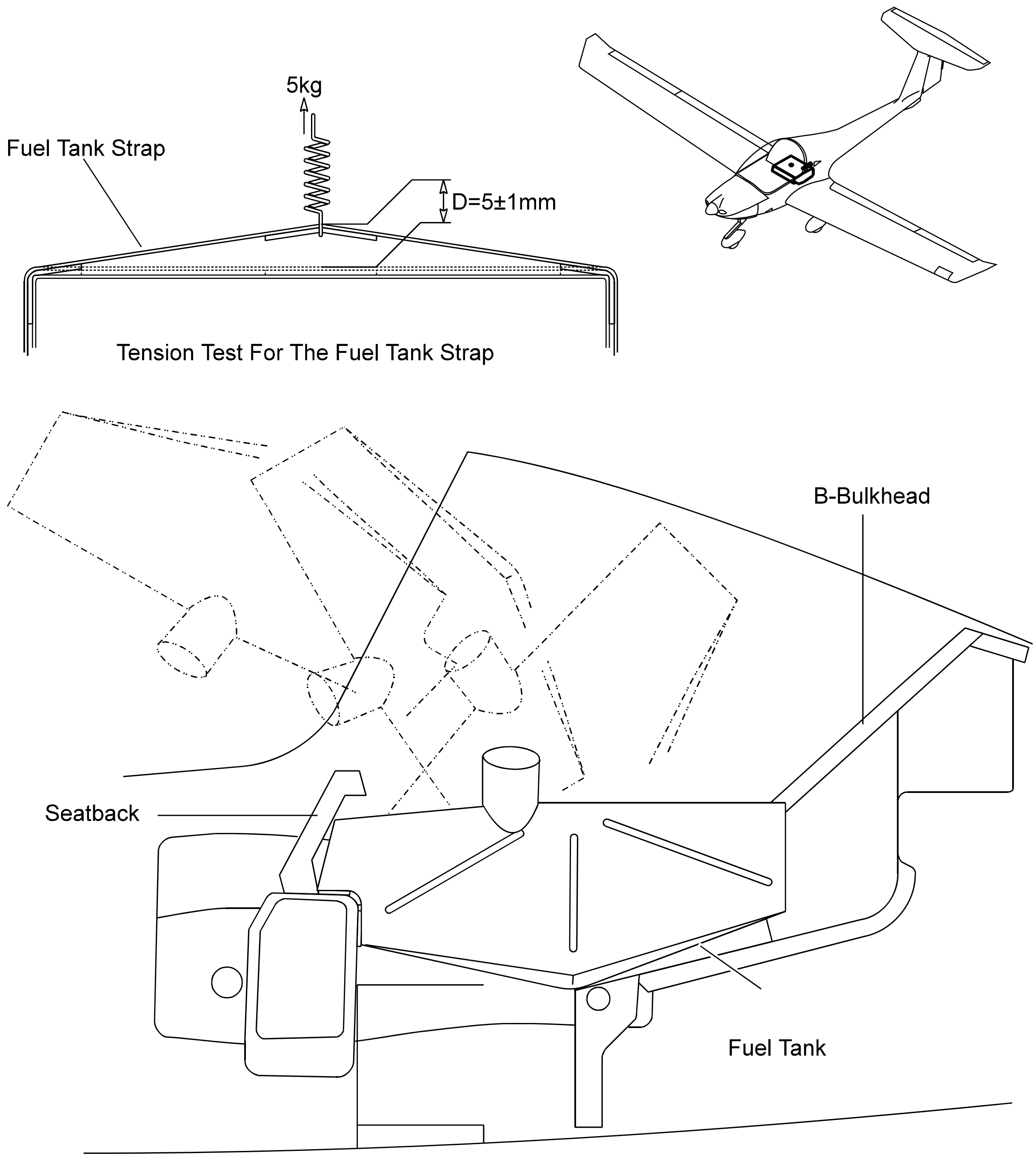


Figure 201 - Remove/Install the Fuel Tank

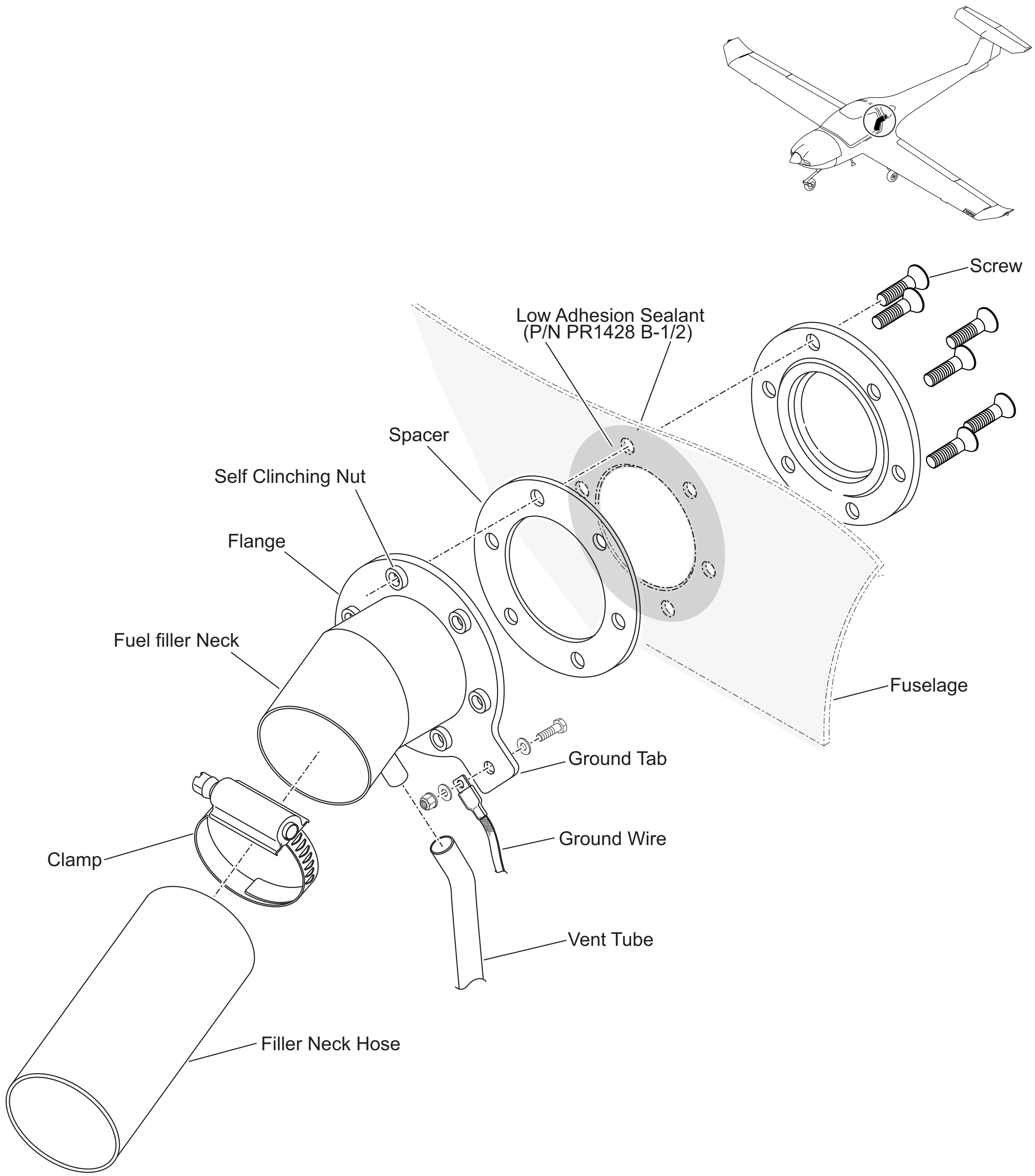


Figure 202 - Fuel Filler Neck Removal/Installation

FUEL DISTRIBUTION

1. General

This chapter describes more data about the fuel distribution system. Refer to the Continental engine manuals for data about the engine fuel system.

2. Description

Figure 1 shows the location of the fuel distribution system components in the aircraft.

The fuel distribution system has the following components:

A. Maintenance shut-off valve

The maintenance shut-off valve is located below the fuel tank. It attaches to the inlet port of the gascolator. The valve has 2 positions:

- Open: The valve connects the fuel tank to the gascolator inlet. You must lock the valve in this position with wire at all times when you operate the aircraft.

- Closed: The valve stops fuel flow to the gascolator inlet. Use this position only to do maintenance on the fuel system. For example, when you clean the fuel filter.

B. Gascolator

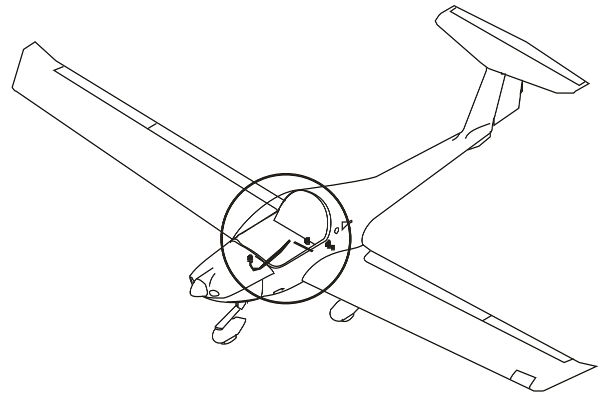
The gascolator is located below the fuel tank on the left. It attaches to the B-bulkhead. The gascolator is a sediment trap. It also has a filter screen. You can release the bowl of the gascolator to clean the filter.

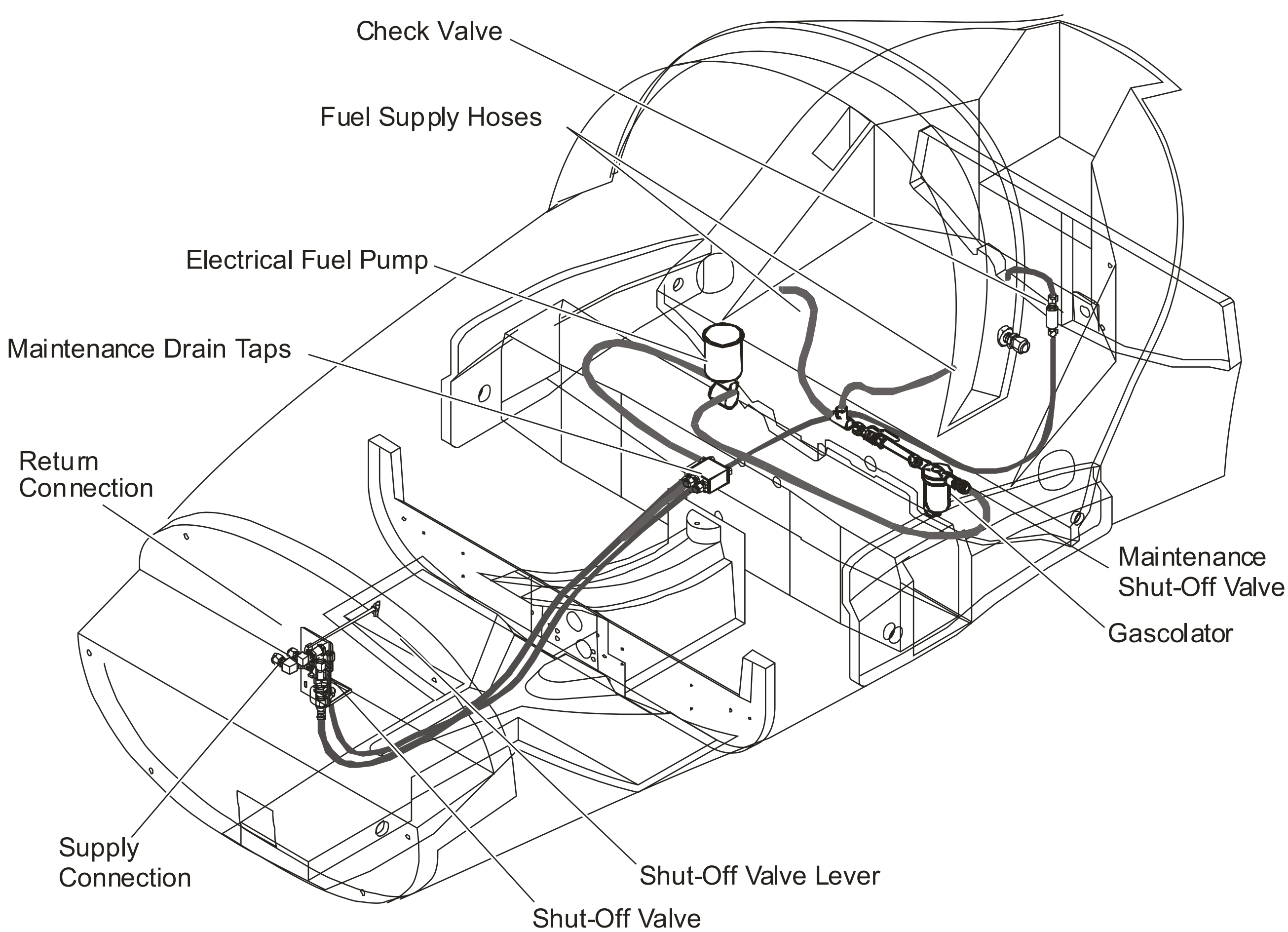
C. Electrical Fuel Pump

The electrical fuel pump is located below the fuel tank. It attaches to the forward face of the B-bulkhead at the bottom on the right. A FUEL PUMP switch is located on the left instrument panel with a FUEL PUMP PRIME switch located on the top left corner of the panel, top right on reversed panel. The FUEL PUMP circuit-breaker is located on the right instrument panel.

D. Maintenance Drain Taps

The maintenance drain taps are located on the fuselage inner skin below the spar bridge. They are at the lowest point in the fuel system. You can use the drain taps to drain water from the fuel pipes in the system. Use the drain valve in the fuel tank for the usual water drain check.





Type I System Removed

Figure 1 - Fuel Distribution System

E. Fuel Shut-Off Valve

Figure 2 shows the Fuel shut-off valve. The fuel shut-off valve is located on the aft face of the firewall. It has a red-striped handle. The fuel shut-off valve can also be located on the center console. The valve has 2 positions:

- OPEN: The valve connects the electrical fuel pump outlet to the engine fuel system. This is the usual position when you operate the aircraft

- CLOSED: The valve stops all fuel flow to the engine.

F. Check Valve

The check valve is located beside the fuel tank on the left. It is in the fuel return pipe. The check valve prevents fuel vapor from the return pipe being sucked into the engine during engine start. You cannot adjust the check valve.

G. Fuel Hoses

Flexible fuel hoses made of 'Teflon' connect the components. The hoses have a protective metal sheath. The hoses have standard flared end-fittings.

You must bleed the engine fuel system after any work which allows air into the aircraft fuel supply system. Refer to Chapter 73-00 for the bleeding procedure.

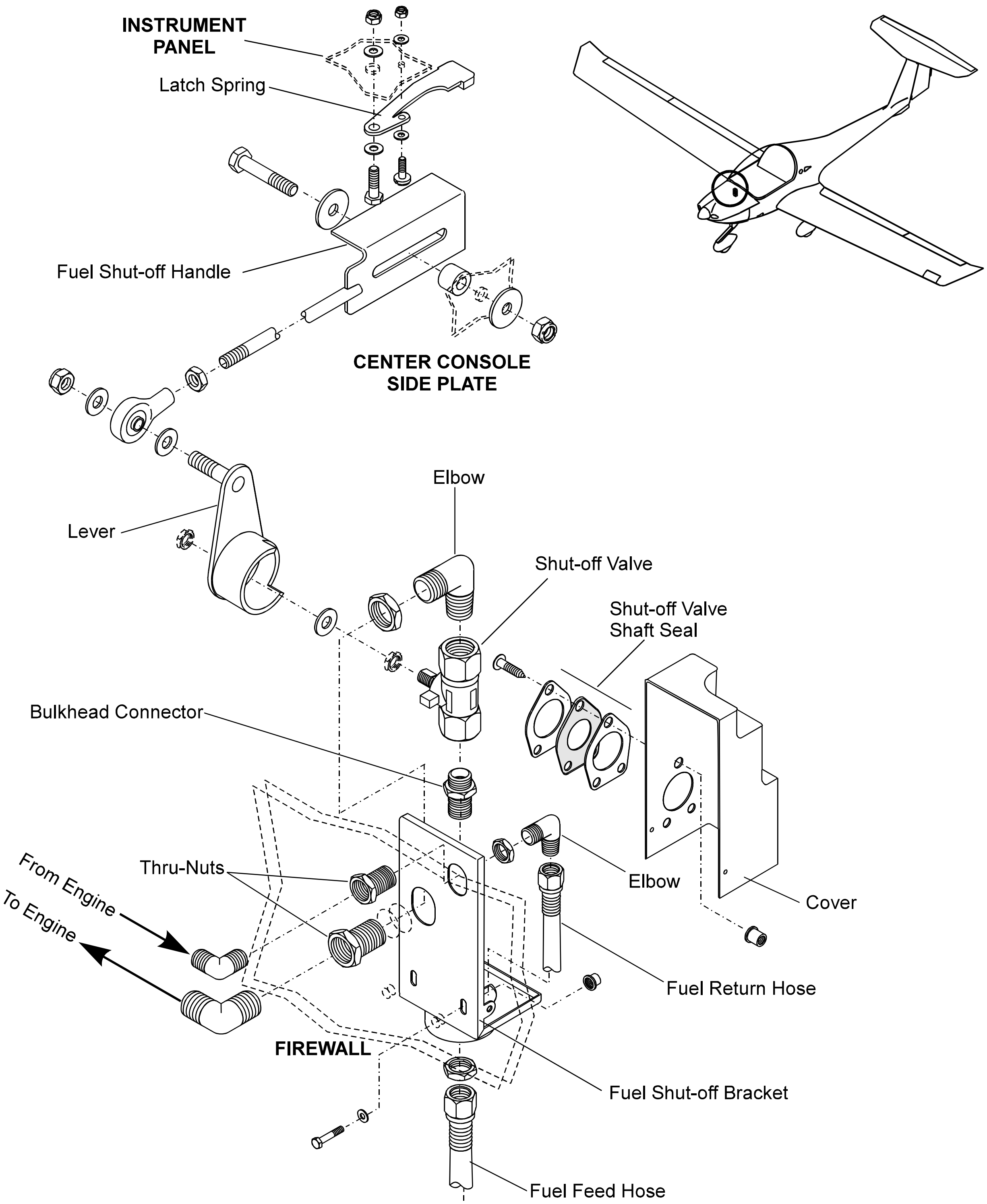


Figure 2 - Fuel Shut-Off Valve

FUEL DISTRIBUTION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the fuel distribution system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Smell of fuel in the aircraft.	Fuel hose connection loose.	Tighten the connection.
	Electrical fuel pump leaking.	Replace the fuel pump.
	Gascolator leaking.	Repair or replace the gascolator.
	Fuel shut-off valve leaking.	Replace the fuel shut-off valve.
Low fuel pressure.	Blocked filter (gascolator or pump).	Clean the filters.
	Defective engine-driven fuel pump.	Refer to the Teledyne Continental Motors Maintenance Manual.
Difficulty starting the engine.	Defective fuel pump.	Replace the fuel pump.

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FUEL DISTRIBUTION - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install components. Refer to Chapter 28-00 for the system description.

Obey the usual safety precautions when you do work on the fuel system.

WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.

2. Remove/Install the Electric Fuel Pump

A. Remove the Electric Fuel Pump

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the fuel-tank access-panels from the bottom of the fuselage.	
3.	Disconnect the electrical connector for the fuel pump.	
4.	Close the maintenance shut-off valve.	Cut the lock-wire.
5.	Open the maintenance Drain tap.	Use a container to catch the fuel.
6.	Release the inlet pipe to the fuel pump.	Put the caps on the open connections.
7.	Release the outlet pipe from the fuel pump.	Put the caps on the open connections.
8.	Remove the three bolts that attach the fuel pump to the B-bulkhead.	Hold the fuel pump. The fuel pump has three attaching bolts.
9.	Remove the fuel pump from the aircraft.	
10.	Make sure that the maintenance drain tap is closed.	
11.	Remove the fuel pump mounting bracket.	Release the four screws. (Only if the fuel pump mounting bracket needs to be removed).

B. Install the Electric Fuel Pump

	Detail Steps/Work Items	Key Items/References
1.	Install the fuel pump mounting bracket.	Install the four screws. (Only if the fuel pump mounting bracket was removed).
2.	Put the fuel pump in position in the aircraft.	
3.	Install the three bolts that attach the pump to the B-bulkhead.	Refer to Chapter 20 for torque value. The fuel pump has three attaching bolts.
4.	Connect the outlet pipe from the fuel pump.	
5.	Connect the inlet pipe to the fuel pump.	
6.	Connect the electrical connector for the fuel pump.	
7.	Open the maintenance shut-off valve.	
8.	Connect the battery.	Refer to Chapter 24-31.
9.	Do a functional test of the electrical fuel pump.	
10.	Examine the fuel pump installation.	Look especially for fuel leaks.
11.	Check the engine fuel-system set-up and adjust as necessary after the installation of a new electric fuel pump. A variation in boost pressure between pumps can affect the fuel system set-up.	Refer to the Teledyne Continental Maintenance Manual for the engine fuel-system set-up.
CAUTION: LOCK THE MAINTENANCE SHUT-OFF VALVE OPEN WITH WIRE. IF YOU DO NOT LOCK THE VALVE OPEN, IT MAY CLOSE IN FLIGHT. THIS WOULD CAUSE ENGINE FAILURE.		
12.	Lock the maintenance valve open with wire.	Lock the maintenance valve lever to the gascolator.
13.	Install the fuel-tank access-panels below the fuselage.	Refer to Chapter 24-31.
14.	Bleed the engine fuel system.	Refer to Chapter 73-00.

C. Clean the Filter Element in the Gascolator

	Detail Steps/Work Items	Key Items/References
1.	Remove the fuel-tank access-panels from the bottom of the fuselage.	
2.	Close the maintenance shut-off valve.	Cut the lock-wire.
3.	Remove the bowl from the gascolator.	Cut the lock-wire. Andair Type - Turn lock ring clockwise. ACS Type - Turn knurled nut counter clockwise. Swing wire bail clear of bowl.
4.	Remove the filter element.	Andair type - Turn filter assembly counter clockwise. ACS type - remove filter disk.
WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.		
5.	Wash the filter element.	Use clean fuel.
6.	Clean the inside of the Gascolator bowl.	
7.	Install the filter and the Gascolator bowl.	Andair Type - Align the arrow on the bowl with the mark on the housing, rotate retaining ring counter clockwise. ACS Type - Place bowl on housing, position wire bail directly under bowl, finger tighten knurled nut turning clockwise.
CAUTION: DO NOT OVERTIGHTEN THE KNURLED RETENTION NUT ON THE WIRE BAIL TYPE GASCOLATOR. SEPARATION OF THE GASCOLATOR BOWL MAY RESULT.		
8.	Open the maintenance shut-off valve.	
9.	Examine the Gascolator installation.	Look especially for fuel leaks.
CAUTION: LOCK THE MAINTENANCE SHUT-OFF VALVE OPEN WITH WIRE. IF YOU DO NOT LOCK THE VALVE OPEN, IT MAY CLOSE IN FLIGHT. THIS WOULD CAUSE ENGINE FAILURE.		
10.	Lock the maintenance valve open with lock-wire.	

	Detail Steps/Work Items	Key Items/References
11.	Lock the gascolator bowl retaining device.	Andair Type - Lockwire the ring to the Gascolator housing. ACS type - Lockwire the knurled nut to the retention bar.
12.	Install the fuel-tank access-panels below the fuselage.	
13.	Bleed the engine fuel system.	Refer to Chapter 73-00.

3. Remove/Install the Fuel Shut-Off Valve

A. Remove the Fuel Shut-Off Valve

Refer to Figure 201.

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the fuel-tank access-panels from the bottom of the fuselage.	
3.	Remove the top engine cowling.	Refer to Chapter 71-10.
4.	Close the maintenance shut-off valve.	Cut the lock-wire.
WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.		
5.	Drain the fuel lines: - Open the maintenance taps at the bottom of the fuselage.	Use a correct fuel container.
6.	Remove the instrument panel.	Refer to Chapter 31-10.
7.	Disconnect the shut-off control rod from the fuel valve lever.	
8.	Remove the cover from the fuel valve box.	Carefully break the adhesive fuel seal between the cover and the box.

	Detail Steps/Work Items	Key Items/References
9.	Loosen the nut on the pipe elbow at the cockpit side of the firewall. Disconnect the fuel feed hose from the pipe elbow on the engine side of the firewall.	Put a cap on the fuel hose.
10.	Remove the thru-nut from the firewall.	
11.	Remove the shut-off valve from the bulkhead nut. - Turn the shut-off valve.	
12.	Remove the fuel shut-off valve.	Put a cap on the fuel shut-off valve connections.

B. Install the Fuel Shut-Off Valve

	Detail Steps/Work Items	Key Items/References
1.	Remove the two caps from the fuel shut-off valve. Put the fuel shut-off valve in position in the aircraft.	
2.	Install the shut-off valve to the bulkhead nut. - Turn the shut-off valve.	Apply Loctite 545 to the threads of the connector (from the third thread aft). Torque to 1.5 - 3 turns past finger tight.
3.	Put the thru-nut through the firewall from the engine side.	
4.	Install the elbow pipe nut to the thru-nut.	Torque to 1.5 - 3 turns past finger tight.
5.	Remove the cap from the hose. Connect the fuel hose to the fuel valve at the engine side.	Apply Loctite 545 to the threads of the connector (from the third thread aft).
6.	Tighten the valve stem packing nut to give a spring force of 3.4 to 6.8 lbf (15 to 30 N).	Measure perpendicular to the lever with the lever aligned with the valve axis.
7.	Install the shut-off control rod to the fuel valve lever.	
8.	Open the maintenance shut-off valve.	
9.	Connect the battery.	Refer to Chapter 24-31.
10.	Operate the electrical fuel pump.	
11.	Examine the fuel shut-off valve installation.	Look especially for fuel leaks.

	Detail Steps/Work Items	Key Items/References
12.	Examine the cover of the box for the fuel shut-off valve. If necessary remove the old sealant.	Refer to the Teledyne Continental Maintenance Manual for the engine fuel-system set-up.
13.	Install the box cover.	Use sealant to specification PRC 1428.
	CAUTION: LOCK THE MAINTENANCE SHUT-OFF VALVE OPEN WITH WIRE. IF YOU DO NOT LOCK THE VALVE OPEN, IT MAY CLOSE IN FLIGHT. THIS WOULD CAUSE ENGINE FAILURE.	
14.	Lock the maintenance valve open with wire.	Lock the maintenance valve lever to the gascolator.
15.	Install the fuel-tank access-panels below the fuselage.	
16.	Install the instrument panel.	Refer to Chapter 31-10.
17.	Install the top engine cowling	Refer to Chapter 71-10.
18.	Do the fuel shut-off valve functional test.	Refer to Chapter 28-20.
19.	Bleed the engine fuel system.	Refer to Chapter 73-00.

4. Functional Test of the Fuel Shut-Off Valve

	Detail Steps/Work Items	Key Items/References
1.	Do an engine run up test: - Set the engine to IDLE RPM - Set the fuel shut-off valve to OFF - Make sure the engine stops.	For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual.
2.	Set The fuel shut-off valve to OPEN. - Restart the engine - Make sure that the engine operates correctly.	For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual. Refer to the Teledyne Continental Operators Manual for engine data.

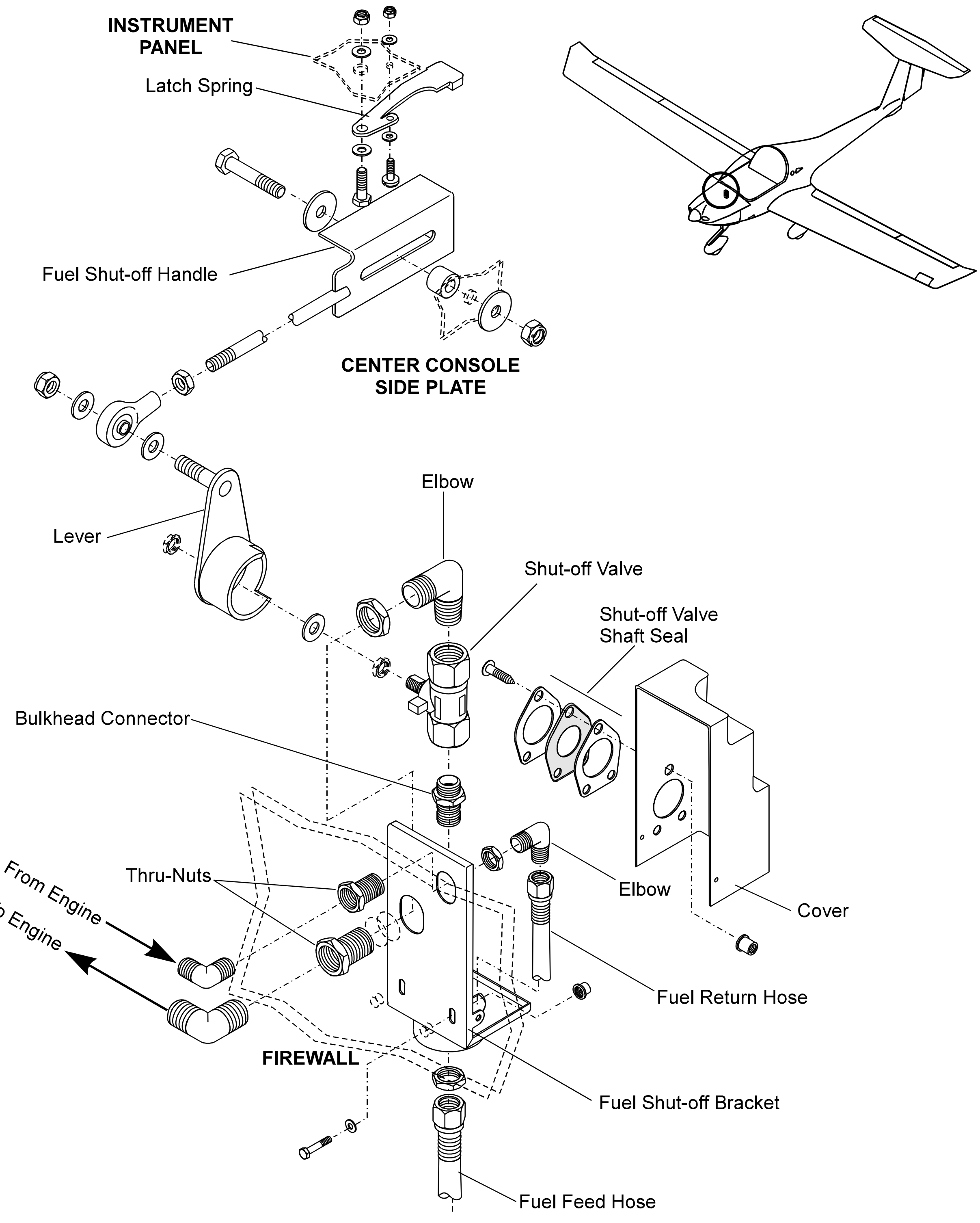

Figure 201 - Fuel Shut-Off Valve

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FUEL INDICATING

1. General

The DA20-C1 aircraft has a fuel quantity indicating system. The fuel quantity indicating system has a resistance-wire sensor. The gauge on the instrument panel measures the current flowing through the sensor. The gauge is marked 0, 1/4, 1/2, 3/4 and 1/1.

2. Description and Operation

Figure 1 shows the location and installation of the components in the aircraft.

The fuel quantity indication system has only two components. It has a fuel quantity sensor and a gauge.

The fuel quantity sensor is a located in the top of the fuel tank. It has a tube which goes close to the bottom of the fuel tank. The tube protects a float. The float can move up and down on two resistance wires. Contacts on the float make a short-circuit between the wires.

Five screws attach the sensor to the top of the fuel tank. A cork gasket makes a fuel-tight seal between the tank and the sensor. Two electrical wires connect to the sensor.

The fuel quantity gauge is on the right side of the instrument panel. The gauge gives a constant low-voltage supply to the fuel quantity sensor. The gauge measures the current flowing in the circuit to the sensor. You can adjust the gauge to give the correct zero indication.

The main bus supplies current for the system. When the float moves up or down, it changes the resistance of the circuit through the sensor. The current flowing in the system decreases as the resistance increases. The fuel quantity gauge uses the current to set the pointer.

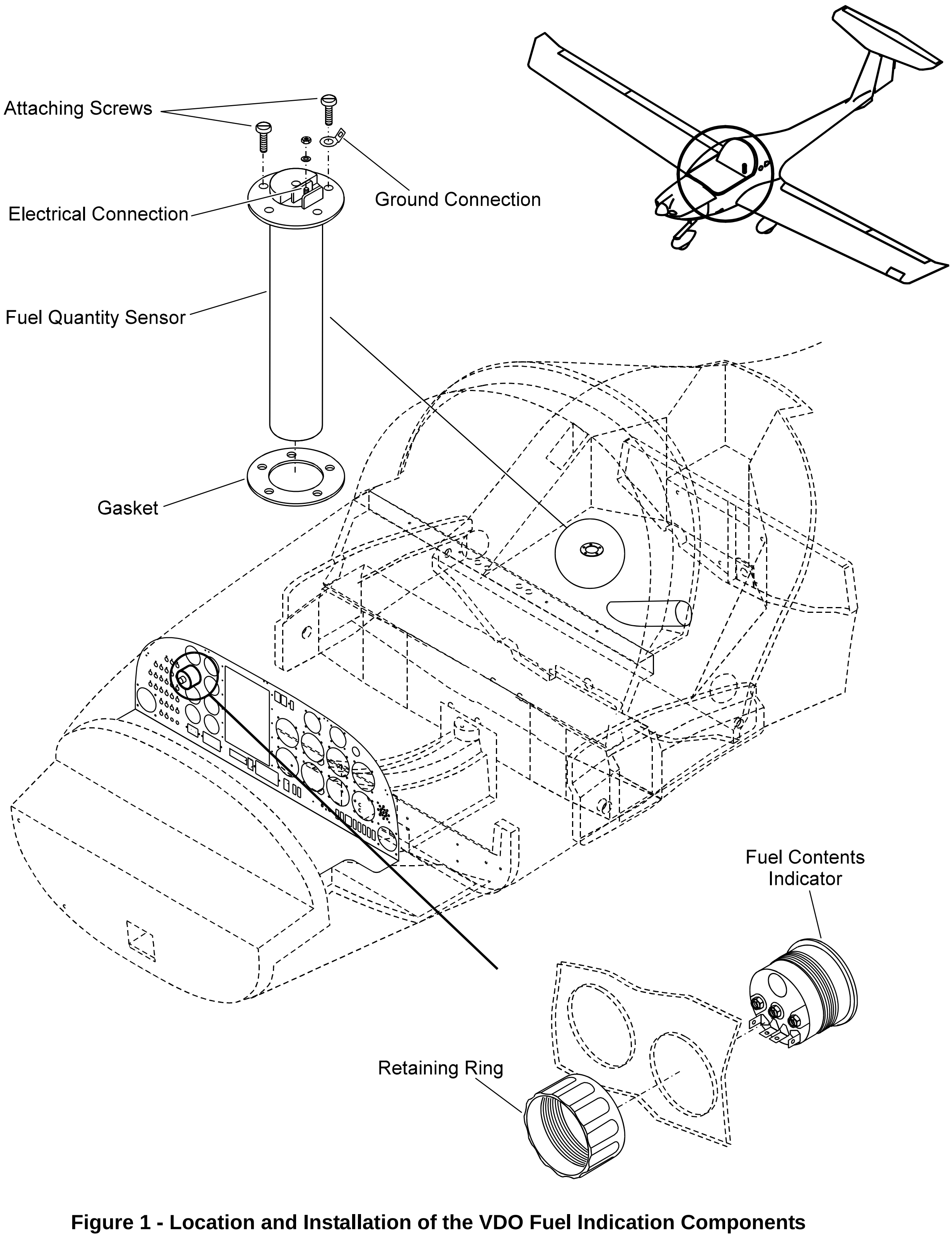

Figure 1 - Location and Installation of the VDO Fuel Indication Components

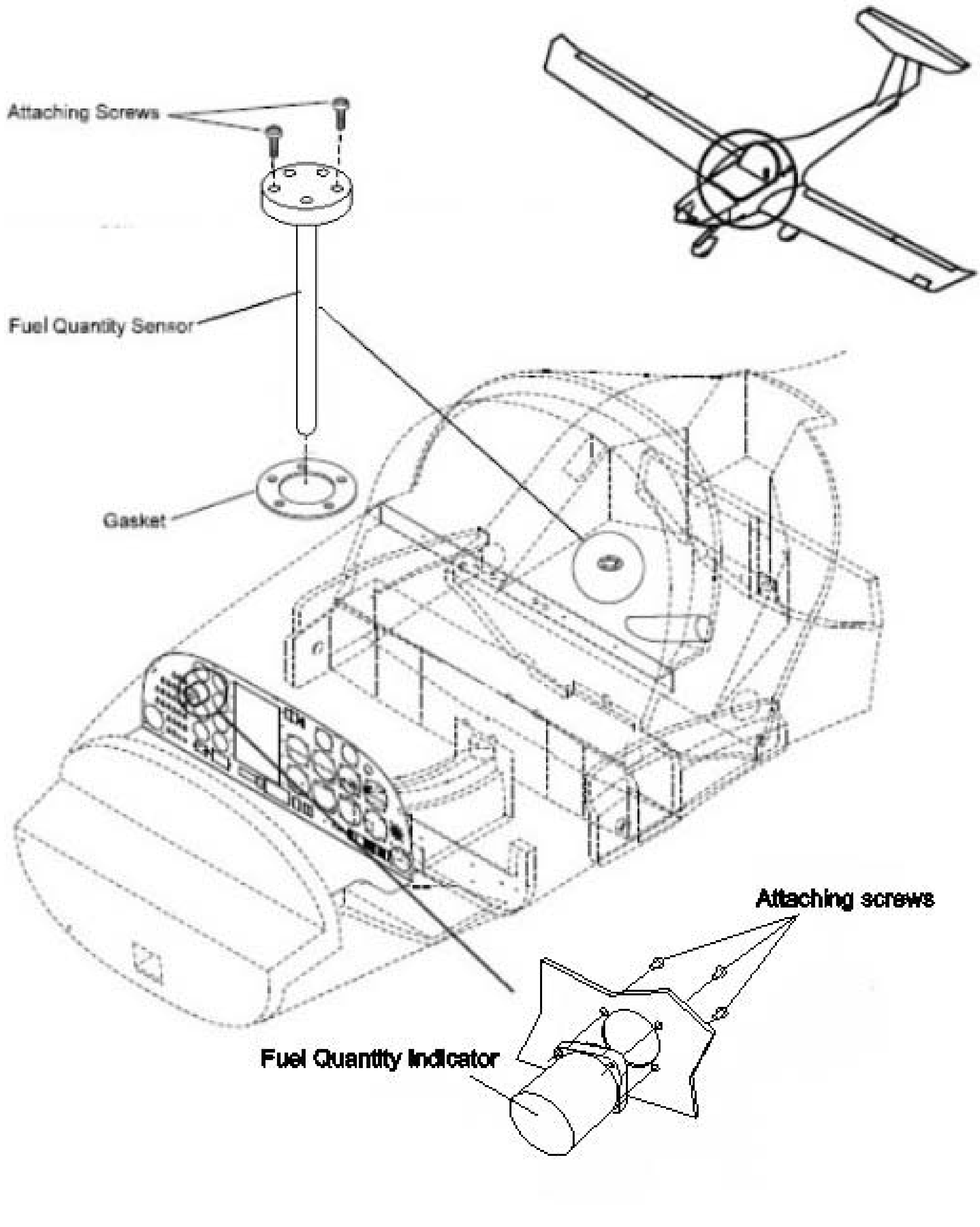

Figure 2- Location and Installation of the UMA Fuel Indication Components

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FUEL INDICATING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the fuel indicating system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Fuel quantity indication incorrect.	Fuel quantity senor and gauge need calibration and adjustment	Follow the procedures in 28-40-00 Maintenace procedures Item 3 and 4.
	Fuel quantity sensor defective.	Replace the quantity sensor.
	Fuel quantity gauge defective.	Replace the fuel quantity gauge.
	High resistance connection in the electrical wiring to the sensor.	Do a resistance test between the gauge and the sensor. Repair the defective connection.

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FUEL INDICATING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the components and how to calibrate the fuel quantity indication system. Refer to Chapter 28-00 for the system description.

2. Remove/Install the Fuel Quantity Sensor

A. Remove the Fuel Quantity Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Drain the fuel tank.	Refer to Chapter 12-10.
3.	Remove the baggage compartment floor.	Refer to Chapter 25-10.
4.	Release the electrical connections from the fuel quantity sensor.	Refer to Figure 201.
5.	Remove the five screws that attach the fuel quantity sensor to the tank.	
	WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.	
6.	Remove the sensor. Discard the cork gasket.	

B. Install the Fuel Quantity Sensor

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.	
1.	Remove the tape and transit pin from the new sensor.	
2.	Put 'Sealube' on the cork gasket.	Use a new gasket.
3.	Put the gasket in position on the sensor.	The holes for the screws are not equally spaced. There is only one correct position.
4.	Put the sensor in position in the fuel tank.	The holes for the screws are not equally spaced. There is only one correct position.
5.	Put 'Sealube' on the screws and install the screws.	Torque 20 - 30 lbf-in. (2.3 - 3.4 Nm)
6.	Connect the electrical connectors.	
7.	Connect the battery.	Refer to Chapter 24-31.
8.	Calibrate the fuel quantity indication system. The UMA Fuel Quantity gauge and the Diamond fuel quantity probe are calibrated at the factory and do not necessarily require any calibration to be carried out on installation. Calibration may only be required if there is an indication error	See below.
9.	When the tank is full, look for leaks around the fuel quantity sensor.	
10.	Install the baggage compartment floor.	Refer to Chapter 25-10.

3. Calibrate the VDO Fuel Quantity Indication System.

	Detail Steps/Work Items	Key Items/References
1.	Defuel the aircraft completely.	Refer to Chapter 12-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Remove the instrument panel cover.	Refer to Chapter 25-10.
4.	Measure the resistance of the sensor: - Disconnect the signal cable from the fuel quantity gauge - Do a resistance check between the signal cable and ground - Connect the signal cable.	Use an Ohmmeter. Must be between 62-65 ohms or 70-75 ohms.
5.	Install the instrument panel cover. (N/A for VM 1000)	Refer to Chapter 25-10.
6.	Connect the aircraft battery. (N/A for VM 1000)	Refer to Chapter 24-31.
7.	Level the aircraft.	Refer to Chapter 08-20.
8.	Add 0.5 US gallon (2 liter) of fuel to the tank.	
9.	Supply 14V to main bus of the instrument panel.	The gauge must indicate zero. (The right side of the pointer must be in line with the left edge of the zero mark.)
10.	If necessary, adjust the gauge.	See below.
11.	Remove the 14V supply from the instrument panel.	
12.	Fill the fuel tank	Refer to Chapter 12-10.
13.	Set the GEN/BAT switch to ON.	The fuel quantity gauge must indicate full.
14.	Set the GEN/BAT switch to OFF.	

4. Adjust the VDO Fuel Quantity Gauge

NOTE: Do this work with 0.5 gal of fuel in tank and with the aircraft levelled.

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Remove the ring that attaches the fuel quantity gauge.	Do not disconnect the electrical connection.
3.	Move the fuel quantity gauge aft into the cockpit until you can see the adjusting hole.	The hole is on the top of the fuel quantity gauge housing.
4.	Remove the sticker from the small hole on top of the fuel quantity gauge housing.	
5.	Supply 14V to main bus of the instrument panel.	
6.	Use a small screwdriver to adjust the potentiometer which is just inside the hole.	Make sure that the gauge indicates zero. (The right side of the pointer must be in line with the left side of the zero mark.
7.	Remove the 14V supply from the instrument panel.	
8.	Replace the sticker over the hole.	
9.	Install the fuel quantity gauge.	
10.	Install the instrument panel cover.	Refer to Chapter 25-10.

5. Calibrate the Diamond Fuel Probe

NOTE: This calibration is only required if there is an error in the fuel quantity indication.

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the fuel probe.	Refer to above.
3.	With the probe out of the tank, all the wires connected and power off, jump the yellow lead wire to ground and apply 14V power. Wait for 3 seconds and remove the jumper.	The pointer on the fuel quantity gauge will fluctuate between empty and full then settle to empty.
4.	With a full fuel tank and the probe installed (or by putting the probe in a tube full of fuel such that the fuel is up to the full level mark) with all wires connected, jump the yellow wire to ground and apply 14V power. Wait or 6 seconds and remove jumper	The pointer on the fuel quantity gauge will fluctuate between empty and full then settle to full.
5	Reinstall the probe	Refer to above.

6. Remove/Install the Fuel Quantity Gauge

A. Remove the Fuel Quantity Gauge

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover for access.	Refer to Chapter 25-10.
3.	Disconnect the wires from the fuel quantity gauge.	
4a.	For the VDO indicator: Release the ring which attaches the quantity gauge. On VM 1000 remove four mounting screws on the front of the panel.	
4b.	For the UMA indicator: Remove the four attaching screws.	
5.	Remove the fuel quantity gauge.	

B. Install the Fuel Quantity Gauge

	Detail Steps/Work Items	Key Items/References
1.	Put the fuel quantity gauge in position in the instrument panel.	
2a.	Install the ring which attaches the quantity gauge. On VM 1000 system install four mounting screws	
2b.	Install the four attaching screws to the front of the instrument panel	
3.	Connect the wires to the fuel quantity gauge.	Refer to Chapter 92 for wiring diagrams.
4.	Connect the aircraft battery.	Refer to Chapter 24-31. Connect the positive cable first.
9.	Calibrate the fuel quantity gauge.	See above.
10.	Install the instrument panel cover.	Refer to Chapter 25-10.

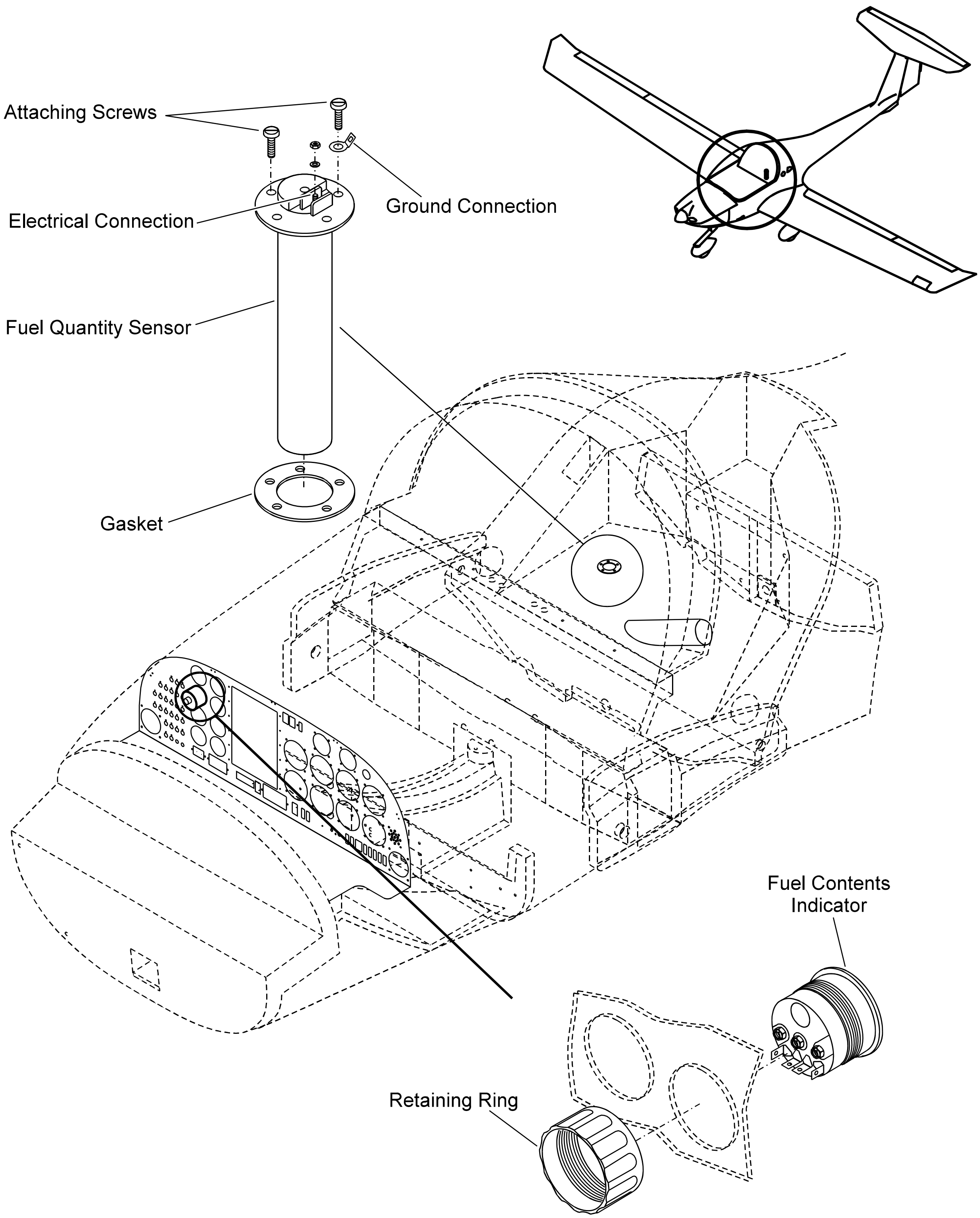

Figure 201 - Location and Installation of the VDO Fuel Indicating Components

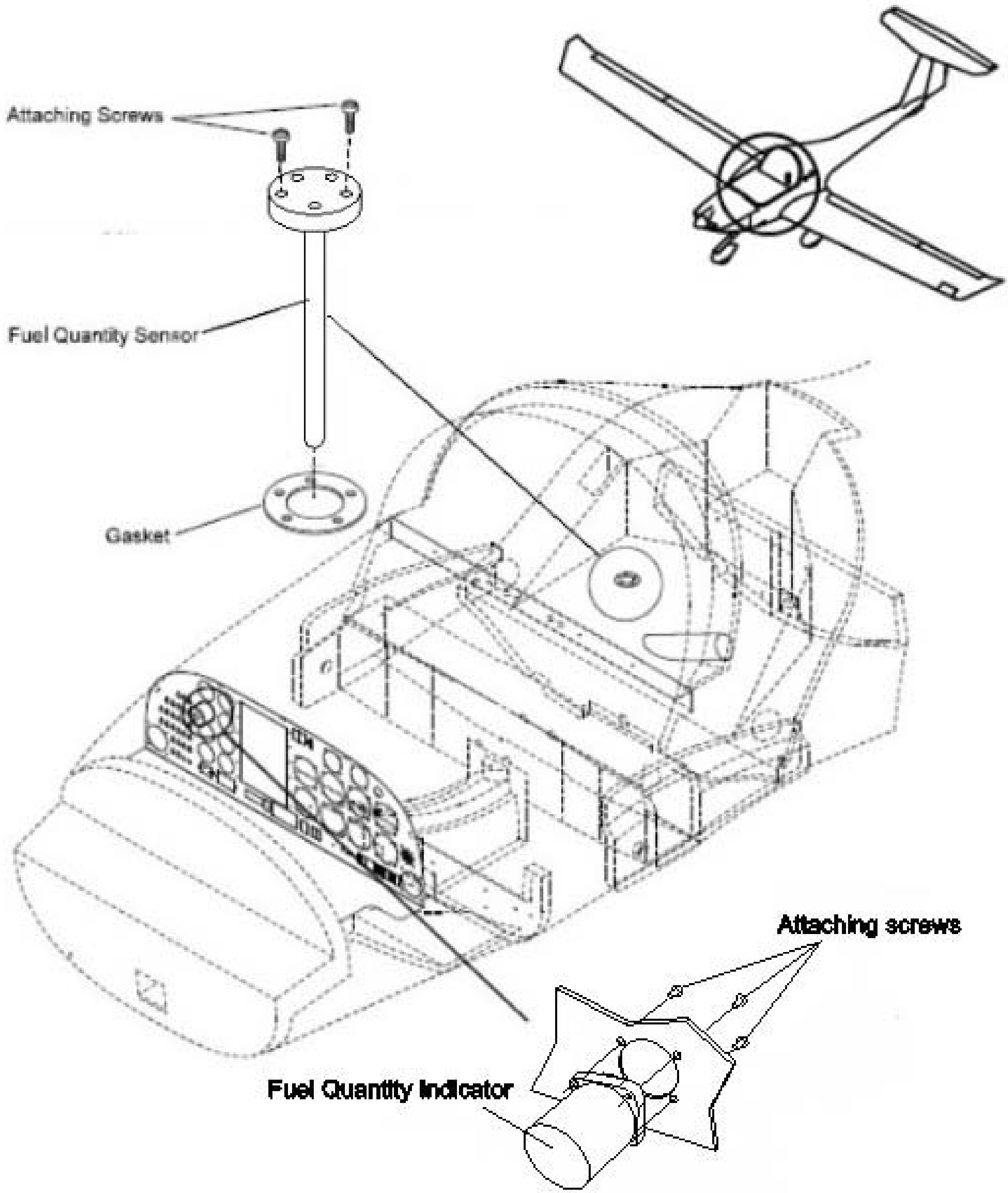

Figure 202 - Location and Installation of the UMA Fuel Indicating Components

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CHAPTER 31-00
INDICATING SYSTEMS

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INDICATING SYSTEMS

1. General

The DA20-C1 aircraft has the following indicating systems:

- An instrument panel: The instrument panel is made in one piece with a shelf. The shelf goes between the panel and the firewall.
- A control panel in the center console: This panel has the engine controls, fuel controls, parking brake and trim. It has a forward part and an aft part.
- Independent instruments: The aircraft has an electronic clock and an optional engine operated hours meter.
- Warning Lights (Red): The aircraft has warning lights for canopy unlocked, starter relay engaged and generator off-line.
- Caution light (Amber): The aircraft has a caution light for EPU Bus powered (Optional).

This chapter does not describe about the indicators that belong to the systems. Refer to the related system for data. For example, refer to Chapter 77-00 for data about the engine temperature indicators.

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INSTRUMENT AND CONTROL PANELS

1. General

The DA20-C1 aircraft has the following instrument and control panels:

- An instrument panel: The instrument panel is made in one piece with a shelf. The shelf goes between the panel and the firewall.

- A control panel in the center console: This panel has a forward cover and an aft cover. The forward cover has the cabin heat controls, parking brake and fuel controls. The aft cover has the engine controls and trim.

Refer to the related AMM Chapter for data about the controls. For example, refer to Chapter 76-00 for data on the engine controls.

2. Description

A. Instrument Panel

Figures 1A through 1F show the different instrument panels used for DA20-C1 aircraft.

As an option some aircraft may be equipped with a "Reversed Panel" in which the navigational instruments are located on the right side of the instrument panel. The power plant instruments and circuit breakers are relocated to the left side. Refer to Figure 2.

The aircraft has an aluminum alloy instrument panel. The panel has cut-outs for instruments and switches. A large cut-out in the middle of the panel has the avionic equipment. A bracket between the shelf and the avionic equipment rack makes the installation rigid.

The bottom of the panel bends up at 87 degrees to make a shelf. The shelf has mountings for electrical equipment such as relays and multi-pin connectors. Each side of the shelf has a row of ground terminals. Large cut-out areas in the shelf allow cooling air to move past the instruments and out through holes in the instrument panel cover.

The instrument panel with Garmin G500 system has the bottom of the panel bent up 97 degrees.

The engine instrumentation window displays a full-time dedicated display of the following engine parameters:

Exhaust Gas Temperature (EGT)	The EGT is expressed in °F. The pointer moves from left to right to show the temperature on the exhaust gas.
Cylinder Head Temperature (CHT):	The CHT is expressed in °F. The range bar is color coded, green in the normal temperature range and then red at the high end of the range. The pointer moves from left to right to show the temperature on the cylinder head.
Fuel Pressure:	The fuel pressure is expressed in psi. The pointer moves from left to right to show the fuel pressure.
Fuel Quantity:	The pointer in the fuel quantity indication moves from left (low) to right (full) to indicate the fuel quantity.
Oil Temperature:	The oil temperature is expressed in °F. The range bar is color coded, green in the normal temperature range and then red at the high end of the range. The pointer moves from left to right to show the temperature of the engine.
Oil Pressure:	The engine oil pressure is expressed in psi. The range bar is color coded, green in the normal pressure range and then red at the high end of the range. The pointer moves from left to right to show the oil pressure on the engine.
Amps:	Engine generator load is shown by an indicator located below the oil temperature indicator. The range bar is marked numerically from -60 amp on the left and +60 amp on the right with 0 amp in the center. The pointer moves left or right to show the load on the generator.
Volts:	Main bus voltage is displayed below the oil pressure indicator. The range bar is color coded. The yellow color in the central section of the bar indicates that the voltage is within limits. The red section at the left end of the range bar indicates too low a voltage. The green section at the right end of the range bar indicates too high a voltage.

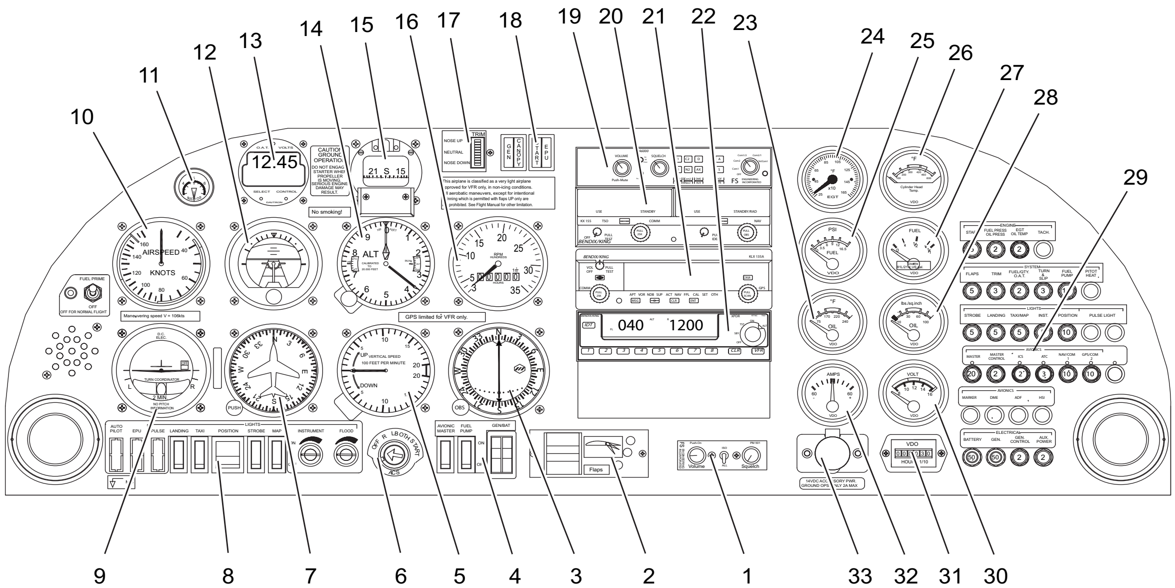

Figure 1A - Instrument Panel

Legend:

1. Intercom
2. Flap Switch
3. NAV Indicator
4. Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
5. Vertical Speed Indicator
6. Ignition Switch
7. Directional Gyro
8. Light Switch Panel
   - Optional Switch*
   - STROBE Light Switch
   - LANDING Light Switch
   - TAXI Light Switch
   - POSITION Light Switch
   - MAP Light Switch
   - INSTRUMENT Light Switch
   - FLOOD Light Switch
9. Turn Coordinator
10. Airspeed Indicator
11. Vacuum Gauge
12. Artificial Horizon Indicator
13. Clock
14. Altimeter
15. Magnetic Compass
16. RPM Indicator
17. Trim Indicator
18. Annunciator Lights
19. Auto Selector
20. NAV/COM GPS
21. Transceiver
22. Transponder
23. Oil Temperature Indicator
24. Exhaust Gas Temperature
25. Fuel Pressure Indicator
26. Cylinder Head Temperature
27. Fuel Contents Indicator
28. Oil Pressure Indicator
29. Circuit-Breaker Panel
30. Voltmeter
31. Engine Operated Hour Meter
32. Ammeter
33. Accessory Jack

<u>NOTE:</u> Items marked * are options

- Auto Pilot
- Pulse Lights
- EPU

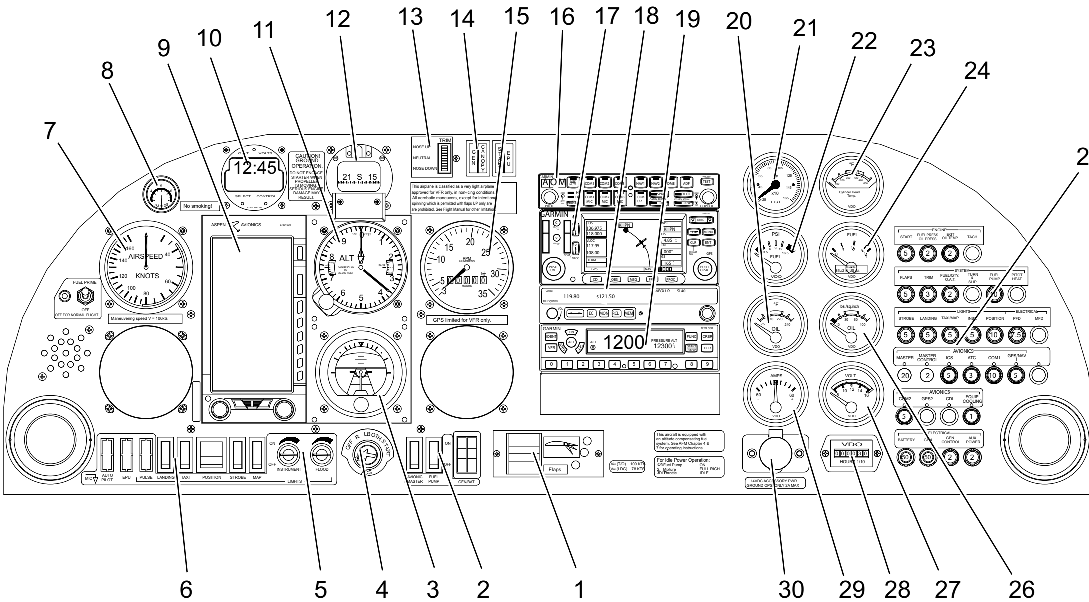

Figure 1B - Instrument Panel

Legend:

1. Flap Switch
2. Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
3. Artificial Horizon Indicator
4. Ignition Switch
5. Dimming Light Switch
   - INSTRUMENT Light
   - FLOOD Light Switch
6. Light Switch Panel
   - Optional Switch*
   - STROBE Light Switch
   - LANDING Light Switch
   - TAXI Light Switch
   - POSITION Light Switch
   - MAP Light Switch
7. Airspeed Indicator
8. Vacuum Gauge
9. Display Screen
10. Clock
11. Altimeter
12. Magnetic Compass
13. Trim Indicator
14. Annunciator Lights
15. RPM Indicator
16. Auto Selector
17. NAV/COM GPS
18. VHF COM
19. Transponder
20. Oil Temperature Indicator
21. Exhaust Gas Temperature
22. Fuel Pressure Indicator
23. Cylinder Head Temperature
24. Fuel Contents Indicator
25. Circuit-Breaker Panel
26. Oil Pressure Indicator
27. Voltmeter
28. Engine Operated Hour Meter
29. Ammeter
30. Accessory Jack

NOTE: Items marked * are options
- Auto Pilot
- Pulse Lights
- EPU

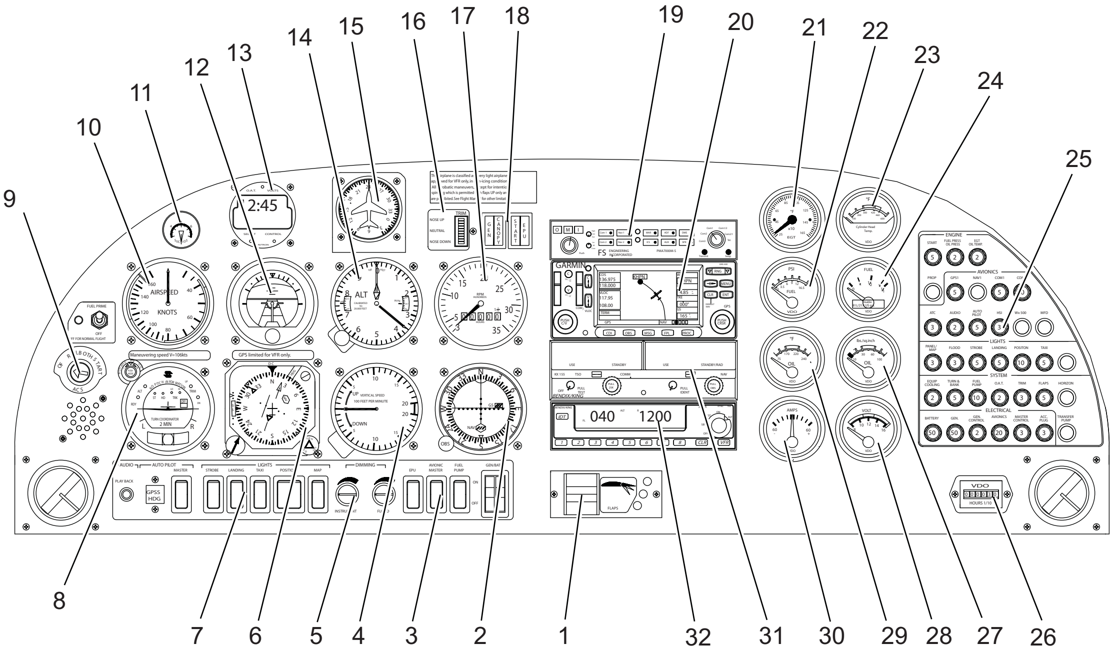

Figure 1C - Instrument Panel

Legend:

1. Flap Switch
2. NAV Indicator
3. Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
   - EPU
4. Vertical Speed Indicator
5. Dimming Light Switch
   - INSTRUMENT Light
   - FLOOD Light Switch
6. Horizontal Situation Indicator
7. Light Switch Panel
   - STROBE Light Switch
   - LANDING Light Switch
   - TAXI Light Switch
   - POSITION Light Switch
   - MAP Light Switch
   - AUTO PILOT/AUDIO Panel
8. Turn Coordinator
9. Ignition Switch
10. Airspeed Indicator
11. Vacuum Gauge
12. Artificial Horizon Indicator
13. Clock
14. Altimeter
15. Directional Gyro
16. Trim Indicator
17. RPM Indicator
18. Annunciator Lights
19. Audio Panel/Marker Receiver
20. NAV/COM GPS
21. Exhaust Gas Temperature
22. Fuel Pressure Indicator
23. Cylinder Head Temperature
24. Fuel Contents Indicator
25. Circuit-Breaker Panel
26. Engine Operated Hour Meter
27. Oil Pressure Indicator
28. Voltmeter
29. Oil Temperature Indicator
30. Ammeter
31. VHF NAV COM
32. Transponder

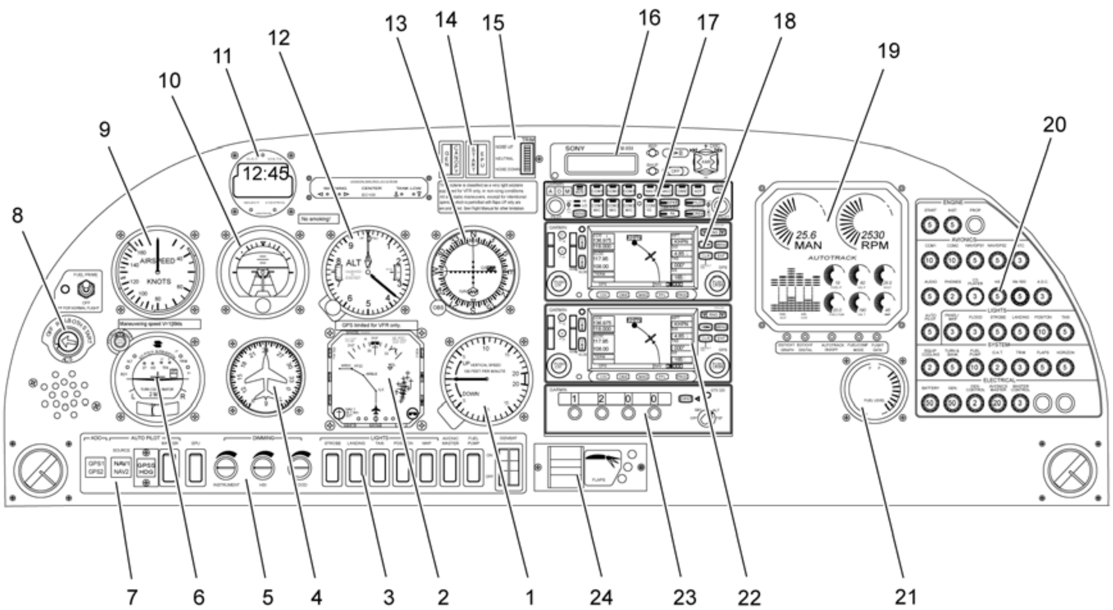

Figure 1D - Instrument Panel

Legend:

1. Vertical Speed Indicator
2. NAV Indicator
3. Lights Switch Panel
   - STROBE Light Switch
   - LANDING Light Switch
   - TAXI Light Switch
   - MAP Light Switch

   Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
   - EPU
4. Directional Gyro
5. Dimming Light Switch
   - INSTRUMENT Light
   - FLOOD Light Switch
   - Horizontal Situation Indicator
6. Turn Coordinator
7. AUTO PILOT/ADC Switch
8. Ignition Switch
9. Airspeed Indicator
10. Artificial Horizon Indicator
11. Clock
12. Altimeter
13. NAV Indicator
14. Annunciator Lights
15. Trim Indicator
16. LCD Remote Control
17. Audio Panel/Marker Receiver
18. NAV/COM GPS
19. Engine Management System
20. Circuit-Breaker Panel
21. Fuel Level Indicator
22. NAV/COM GPS
23. Transponder
24. Flap Switch

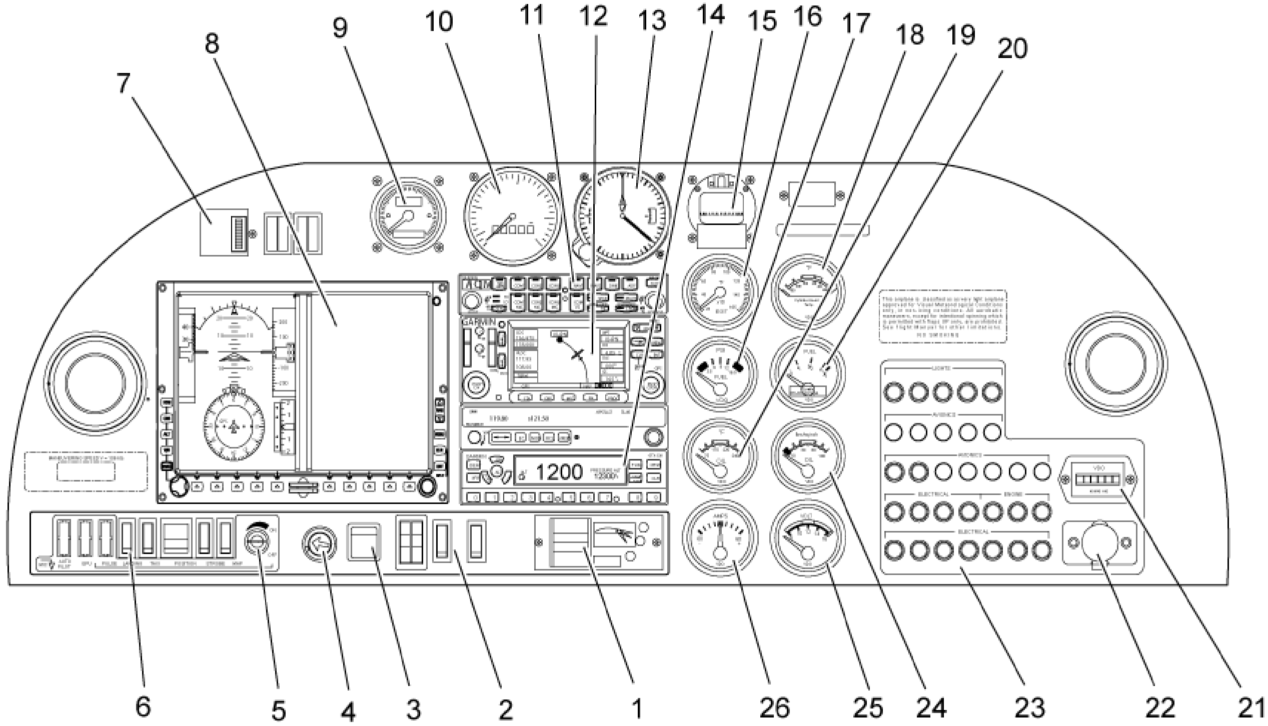

Figure 1E - G500 Instrument Panel

Legend:

1. Flap Switch
2. Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
3. Fuel Prime
4. Ignition Switch
5. Instrument Light Switch
6. Light Switch Panel
   - MAP
   - STROBE Light Switch
   - POSITION
   - TAXI Light Switch
   - LANDING Light Switch
   - Optional Switch*
   - EPU*
   - Auto Pilot*
7. Trim Indicator
8. G500 Integrated Display
9. Engine RPM
10. Air Speed Indicator
11. Auto Selector
12. NAV/COM GPS
13. Altimeter
14. VHF COM
15. Magnetic Compass
16. Exhaust Gas Temperature Temperature
17. Fuel Pressure Indicator
18. Cylinder Head Temperature
19. Oil Temperature Indicator
20. Fuel Quantity Indicator
21. Hourmeter
22. Aux Power Outlet
23. Circuit-Breaker Panel
24. Oil Pressure Indicator
25. Voltmeter
26. Ammeter

NOTE: Items marked * are options

- Auto Pilot
- EPU

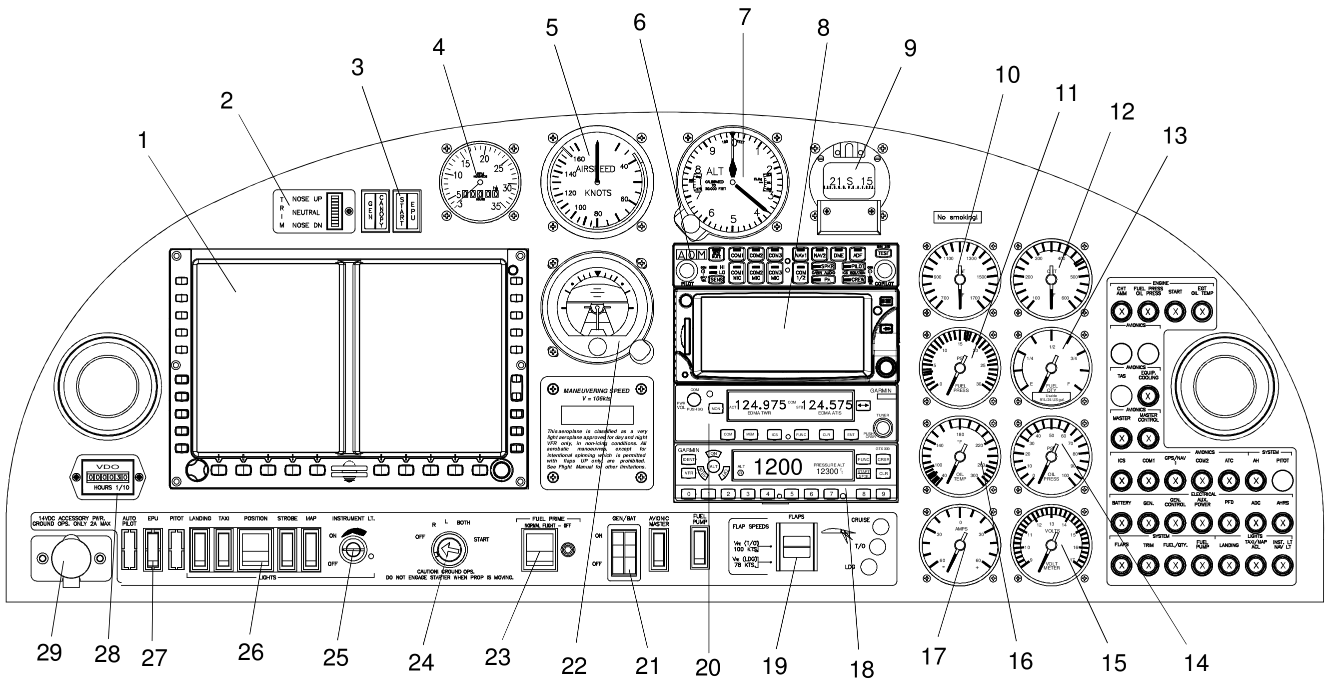

Figure 1F - G500 Instrument Panel with UMA Engine Instruments and Garmin GTN 650/GTR 225

Legend:

1.	GDU 620 Display	14.	Oil Pressure Indicator	26.	Light Switch Panel
2.	Trrim Indicatot	15.	Voltmeter		-MAP Switch
3.	Warning Lights	16.	Oil Temperature Indicator		-Strobe Switch
4.	Engine RPM	17.	Ammeter		Position Switch
5.	Airspeed Indicator	18.	Transponder		Taxi Switch
6.	Audio Panel	19.	Flap Controller		Landing Light Switch
7.	Altimeter	20.	Comm (#2)	27.	Optional Switches
8.	GPS/Nav/Comm	21.	Gen/Bat Master Switch		-Pitot Switch
9.	Magnetic Compass	22.	Artificial Horizion Indicator		-EPU Switch
10.	Exhaust Gas Temperature		(for EASA memebr countries		- Autopilot Switch
	Indicator (EGT)		and optional for non-EASA	28.	Hourmeter
11.	Fuel Pressure Indicator		member countries)	29	14Vdc Aux Power Outlet
12.	Cylinder Head Temperature	23.	Fuel Prime Switch		
	Indicator (CHT)	24.	Ignition Switch		
13.	Fuel Quantity Indicator	25.	Instrument Light Switch		

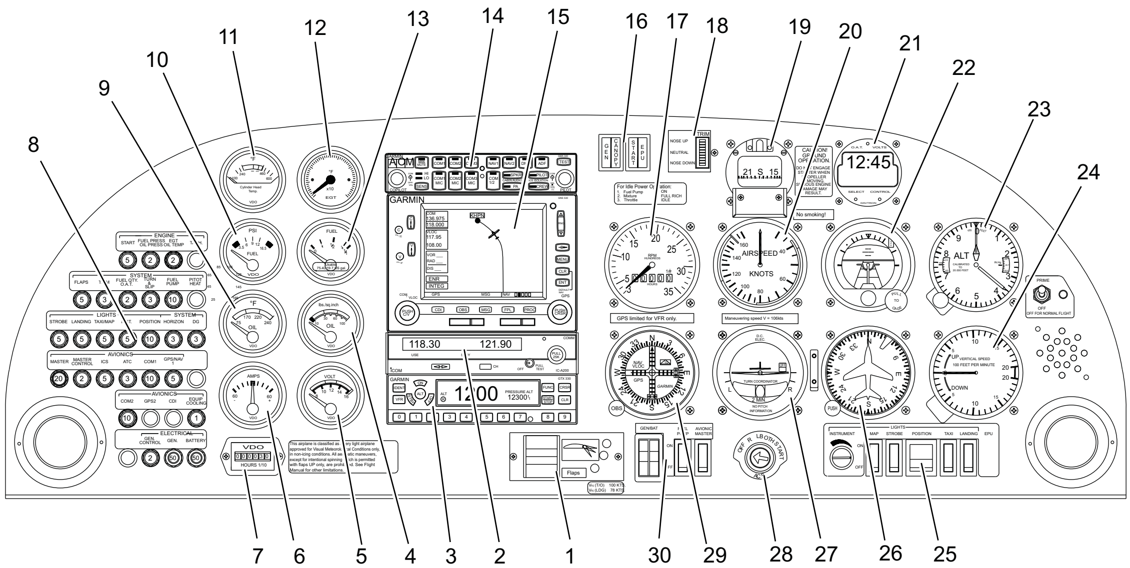

Figure 2 - Reversed Instrument Panel

Legend:

1. Flap Switch
2. COM
3. Transponder
4. Oil Pressure Indicator
5. Voltmeter
6. Ammeter
7. Hourmeter
8. Circuit-Breaker Panel
9. Oil Temperature Indicator
10. Fuel Pressure Indicator
11. Cylinder Head Temperature
12. Exhaust Gas Temperature
13. Fuel Quantity Indicator
14. Audio Panel/Marker Receiver
15. NAV/COM GPS
16. Annunciator Lights
17. Tachometer
18. Trim Indicator
19. Compass
20. Airspeed Indicator
21. Clock/OAT
22. Artificial Horizon Indicator
23. Altimeter
24. Vertical Speed Indicator
25. Lights Switch Panel
    - STROBE Light Switch
    - LANDING Light Switch
    - TAXI Light Switch
    - MAP Light Switch
    - INSTRUMENT Switch
26. Directional Gyro
27. Turn Coordinator
28. Ignition Switch
29. VOR Localizer Glide Slope
30. Master Switch Panel
    - AVIONICS MASTER
    - FUEL PUMP Switch
    - GEN/BAT Switch

B. Control Panel

The control panel in the center console has two aluminum-alloy side-plates. Tubular spacers keep the side plates in position. Two square spacers hold the outer sheaths of the control cables.

Long bolts with spacers go through the side plates. The bolts make pivots for the control levers. The pivot for the engine control levers has a tension knob on the right side.

The forward cover of the control panel attaches to the center console below the instrument panel. It has two control levers for the cabin heat system and one for the parking brake. The left lever sets the cabin heat ON or OFF. The middle lever sends the air to the windscreen (DEFR) or the FLOOR. The right lever sets the parking brake ON or OFF.

The control lever for the fuel shut-off valve is on the right of the forward cover. It is ON when it aligns with the longitudinal axis of the airplane. It is OFF when it points across the airplane.

The aft cover of the control panel attaches to the center console and to the forward cover. It has these engine controls towards the front:

- ALT AIR on the left side
- THROTTLE in the center
- MIXTURE on the right side.

The aft cover also has the trim switch at the rear.

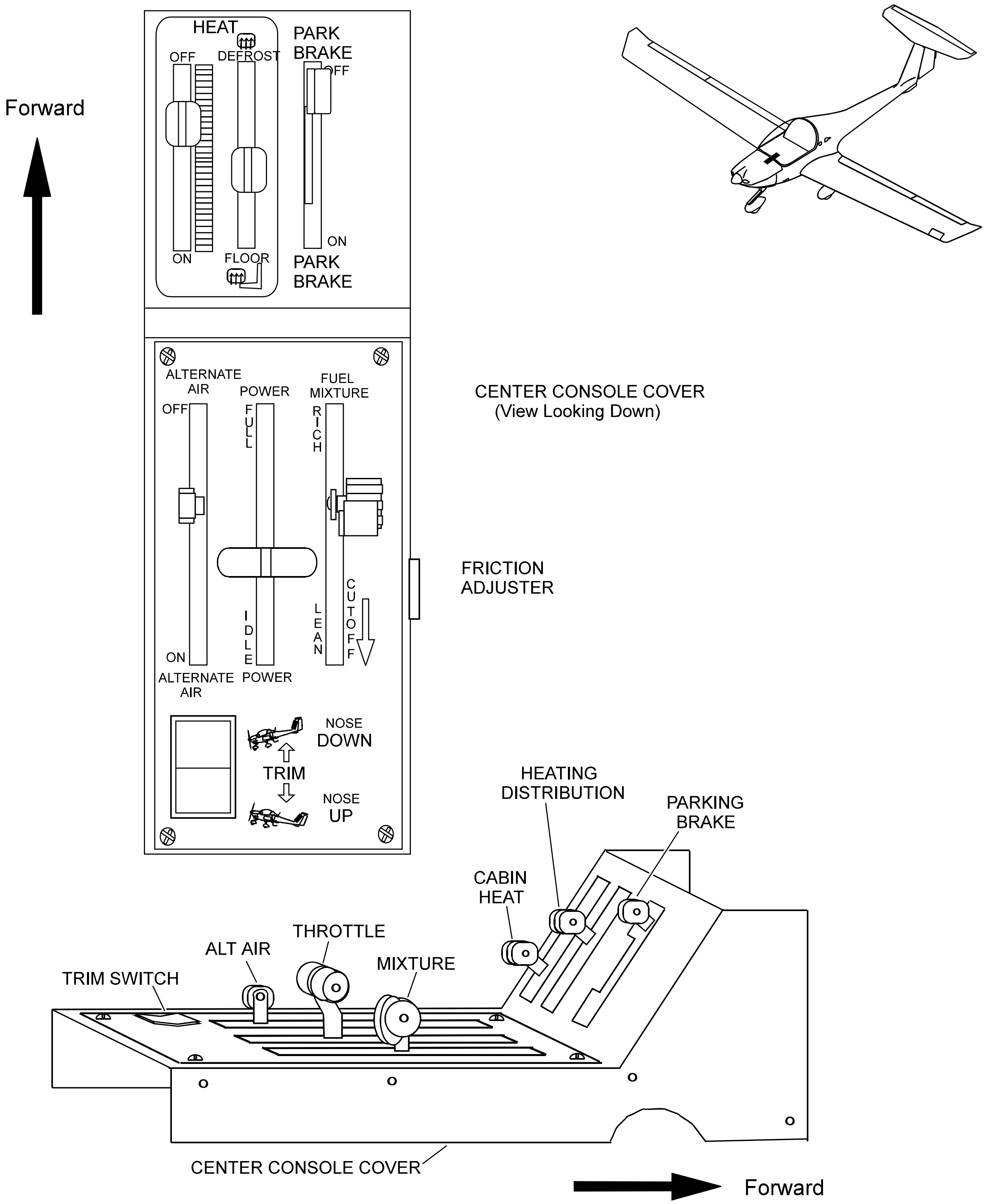

Figure 3 - Control Panel in the Center Console

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INSTRUMENT AND CONTROL PANELS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the instrument and control panels. If you find the trouble in column 1, do the repair given in column 3. Refer to the related AMM Chapter for other data on an instrument or switch.

TROUBLE	POSSIBLE CAUSE	REPAIR
Indication incorrect.	Sensor defective.	Replace the sensor.
	Indicator defective.	Replace the indicator.
	High resistance or open connection in the electrical wiring from the sensor.	Do resistance and continuity tests between the indicator and the sensor. Repair the defective connection or wire.

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INSTRUMENT AND CONTROL PANELS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the instrument and control panels. Refer to the related AMM Chapter for data about the indicators in other systems.

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU REMOVE THE INSTRUMENT PANEL. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT:

- THE IGNITION SWITCH IS IN THE "OFF" POSITION

- THE "P" LEADS ARE GROUNDED

- THE THROTTLE IS SET TO "CLOSED"

- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".

2. Remove/Install the Instrument Panel

A. Remove the Instrument Panel

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the engine cowlings.	Refer to Chapter 71-10.
3.	Disconnect the spark plug leads from the spark plugs.	
4.	Remove the instrument panel cover.	Refer to Chapter 25-10.
5.	Disconnect the pitot and static pipes and disconnect the stall warning pipe.	Pitot at the airspeed indicator. Static at the Tee connector. Stall Warning at the horn. Catch the ball valve.
6.	Disconnect the cable to the RPM indicator.	
7.	Remove the nut from the OAT temperature sensor.	In the right NACA duct.
8.	Put the temperature sensor on the instrument panel shelf.	
9.	Disconnect the coax cable from the duplexer.	On the instrument panel shelf if installed.
10.	Disconnect the coax cable(s) from the VHF COMM 2 or GPS/COMM.	For dual VHF installations only.

	Detail Steps/Work Items	Key Items/References
11.	Disconnect the coax cable from the GPS.	For basic GPS installation only.
12.	Disconnect the coax cable from the transponder.	
13.	Disconnect the 2 multi-pin electrical connectors.	On the instrument panel shelf.
14.	Cut the tie-wraps that hold the vacuum hose to the airframe (if installed).	
15.	Disconnect the vacuum hose at the vacuum regulator (if installed).	On the aft face of the firewall.
16.	Disconnect the 2 hoses from the air filter.	On the aft face of the firewall.
17.	Remove the wire clamps from the firewall.	
18.	Disconnect the main power cable from the starter relay to the instrument panel.	On the front face of the firewall.
19.	Disconnect the starter annunciator wire from the starter relay to the instrument panel.	On the front face of the firewall.
20.	Disconnect these cables in the engine compartment:	
	- Generator	Refer to Chapter 24-30.
	- Oil Pressure	Refer to Chapter 79-00.
	- Oil Temperature	Refer to Chapter 79-00.
	- Fuel Pressure	Refer to Chapter 73-00.
	- EGT	Refer to Chapter 77-00.
	- CHT	Refer to Chapter 77-00.
	- Ignition switch cables.	Refer to Chapter 74-00
21.	Remove the firewall shield from around the wires. Carefully pull the following cables through the firewall:	
	- Generator	
	- Oil Pressure	
	- Oil Temperature	
	- Fuel Pressure	

	Detail Steps/Work Items	Key Items/References
	- EGT - CHT - Ignition switch cables. - Instrument panel ground cable.	
22.	Release the Blind Encoder from the mounting tray.	
23.	Remove the seven nuts and the washers that hold the instrument panel to the fuselage.	
24.	Lift the instrument panel clear.	

B. Install the Instrument Panel

	Detail Steps/Work Items	Key Items/References
1.	Put the instrument panel in position in the fuselage.	Make sure that the pipe clips are in position on the aft attachments.
2.	Install the seven attaching nuts and the washers.	
3.	Carefully put the main power cable and starter annunciator wire through the firewall.	On the front face of the firewall.
4.	Connect the ground connections to the ground stud.	Clean the ground. And apply Nycote 7-11 or equivalent sealant.
5.	Connect the main power cable to the starter relay power input terminal.	Refer to Chapter 92 for wiring diagrams.
6.	Connect the starter annunciator wire to the starter relay main output terminal.	Refer to Chapter 92 for wiring diagrams.
7.	Carefully put these cables through the firewall: - Generator - Oil Pressure - Oil Temperature - Fuel Pressure - EGT - CHT	

	Detail Steps/Work Items	Key Items/References
	- Ignition switch cables. - Instrument panel ground cable.	
8.	Connect the following cables in the engine compartment: - Generator - Oil Pressure - Oil Temperature - Fuel Pressure - EGT - CHT - Ignition switch cables.	 Refer to Chapter 24-30. Refer to Chapter 79-00. Refer to Chapter 79-00. Refer to Chapter 73-00. Refer to Chapter 77-00. Refer to Chapter 77-00. Refer to Chapter 74-00
9.	Install the firewall shield around the wires.	
10.	Connect the vacuum hose at the vacuum regulator (if installed).	On the aft face of the firewall.
11.	Install the tie-wraps that hold the vacuum hose to the airframe (if installed).	
12.	Connect the 2 hoses to the air filter.	On the aft face of the firewall.
13.	Connect the 2 multi-pin electrical connectors.	On the instrument panel shelf.
14.	Connect the coax cable to the transponder.	
15.	Connect the coax cable to the GPS.	For basic GPS installation only.
16.	Connect the coax cable(s) to the VHF COMM 2 or GPS/COMM.	For dual VHF installations only.
17.	Connect the coax cable to the duplexer.	On the instrument panel shelf.
18.	Connect the cable to the RPM indicator.	
19.	Install the Blind Encoder to the mounting tray.	
20.	Install the OAT temperature sensor.	In the right NACA duct.
21.	Connect the pitot and static pipes and then connect the stall warning pipe.	Pitot at the airspeed indicator. Static at the Tee connector. Stall warning at the horn with the ball valve in place.

	Detail Steps/Work Items	Key Items/References
22.	Do a low range static leak test.	Refer to Chapter 34-10.
23.	Do a pitot test.	Refer to Chapter 34-10.
24.	Connect the battery.	Refer to Chapter 24-31.
25.	Do a function test of each system for which there is a circuit-breaker.	
26.	Connect the spark-plug leads to the spark-plugs.	
27.	Install the engine cowlings.	Refer to Chapter 71-10.
28.	Do an engine ground run. Look especially for correct operation of the engine instruments, electrical generation and the vacuum system (if installed).	
29.	Install the instrument panel cover.	Refer to Chapter 25-10.

3. Remove/Install the Control Panel

A. Remove the Control Panel in the Center Console

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the two screws which hold the fiberglass cover.	
3.	Remove the eight screws that hold the forward and aft covers.	
4.	Remove the knobs on all of the controls except for the Mixture.	
5.	Move the aft cover up and aft to clear the control levers.	Make sure that the wires for the trim switch do not catch.
6.	If necessary, disconnect the trim switch.	
7.	Lift the forward cover clear of the fuel shut-off valve shaft and then move it aft to clear the heating control levers.	

B. Install the Control Panel in the Center Console

	Detail Steps/Work Items	Key Items/References
1.	Move the forward cover into position over the heating control levers.	
2.	If necessary, connect the trim switch.	
3.	Move the aft cover forward and down into position around the control levers.	Make sure that the wires for the trim switch do not catch.
4.	Install the knobs on the controls.	
5.	Install the two screws in the fiberglass cover.	
6.	Install the eight screws that hold the forward and aft covers.	
7.	Connect the battery.	Refer to AMM Chapter 24-31.
8.	If you had disconnected the trim switch, do a function test of the elevator trim.	Refer to AMM Chapter 27-31.

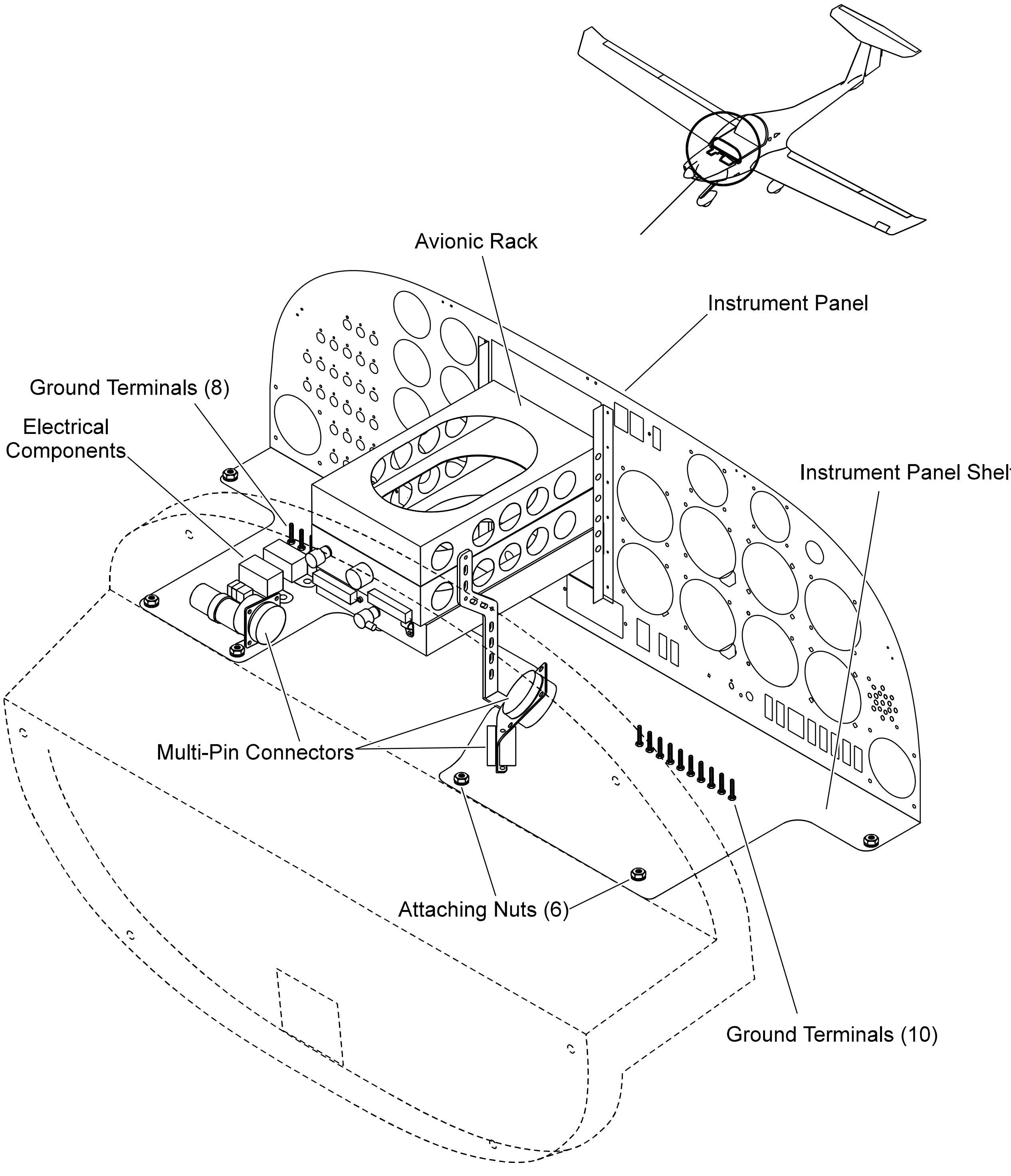

Figure 201 - Instrument Panel Installation

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INDEPENDENT INSTRUMENTS

1. General

The aircraft has an (optional) electronic clock and an (optional) engine operated hours meter. Both instruments are in the instrument panel.

2. Description and Operation

A. Electronic Clock

The DA20-C1 aircraft has an accurate electronic clock (chronometer). The clock is at the top left of the instrument panel. The clock has a digital display panel. It has GMT, local time and stopwatch functions. Two buttons control the clock.

The INST LIGHTS circuit-breaker supplies power for the clock. When the aircraft power is off, an internal battery supplies the power for the clock. The internal battery cannot operate the display or control functions. Refer to the manufacturer's data supplied with the aircraft for the full description and operation of the clock.

NOTE: The instrument panel with Garmin G500 system will not have an electronic clock.

B. Engine-Operated Hours Meter (Hobbs Meter)

The engine-operated hours meter is at the bottom right of the instrument panel. It is an electro-mechanical meter. The right window in the meter shows 1/10 of an hour. The other windows show hours, tens of hours and so on. The engine oil pressure sensor operates the meter.

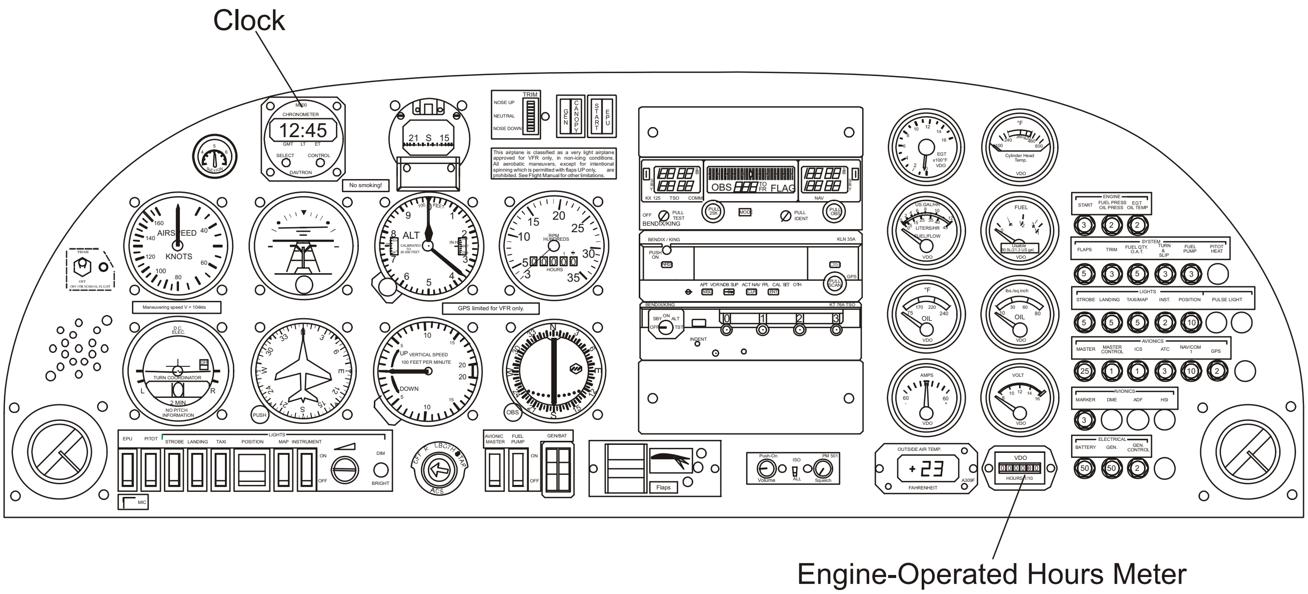

Figure 1 - Independent Instruments

INDEPENDENT INSTRUMENTS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the independent instruments. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Clock does not operate.	INST LIGHTS circuit-breaker open.	Close the circuit-breaker.
	Wiring defective.	Do resistance and short-circuit tests between the circuit-breaker and the clock. Repair the defective connection or wire. Refer to Chapter 92 for wiring diagrams.
Clock does not keep the correct time.	Clock battery discharged.	Remove the clock. Replace the battery. Refer to the clock manufacturers instructions.
	Clock defective.	Replace the clock.
Engine-operated hours meter does not operate.	Oil pressure sensor defective.	Replace the oil pressure sensor.
	Hourmeter defective.	Replace the hourmeter.
	High resistance or open connection in the electrical wiring from the oil pressure sensor.	Do resistance and short-circuit tests between the meter and the sensor. Repair the defective connection or wire. Refer to Chapter 92 for wiring diagrams.

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INDEPENDENT INSTRUMENTS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the independent instruments. Refer to AMM Chapter 92 for wiring diagrams.

2. Remove/Install the Clock

A. Remove the Clock

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Open the INST LIGHTS circuit breaker.	
3.	Remove the four screws and the nuts that attach the clock.	
4.	Lift the clock from the instrument panel.	

B. Install the Clock

	Detail Steps/Work Items	Key Items/References
1.	Put the clock in the instrument panel.	
2.	Install the four screws and the nuts that attach the clock.	
3.	Close the INST LIGHTS circuit breaker.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.

3. Remove/Install the Engine Operated Hourmeter

A. Remove the Engine Operated Hourmeter

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Release the two faston connectors from the engine-operated hourmeter.	
4.	Remove the two screws and the nuts that attach the hourmeter.	
5.	Remove the meter from the instrument panel.	

B. Install the Engine Operated Hourmeter

	Detail Steps/Work Items	Key Items/References
1.	Put the meter in the instrument panel.	
2.	Install the two attaching screws and the nuts.	
3.	Connect the two faston connectors to the engine-operated hourmeter.	Refer to Chapter 92 for wiring diagrams.
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Connect the battery.	Refer to Chapter 24-31.

WARNING SYSTEMS

1. General

The DA20-C1 aircraft has the following three standard warnings:

- CANOPY warning
- GEN warning and
- START warning.

An EPU warning is installed on aircraft with the optional external power socket.

2. Description and Operation

Figure 1 shows the location of the warnings. The warnings are in two annunciator units at the top of the instrument panel. The left unit has the GEN (Red) and the CANOPY (Red) warnings. The right unit has the START (Red) and optional EPU (Amber) warnings.

Each warning unit has a test switch. Press the front of the unit to operate the test switch. (The BAT/GEN switch must be ON). The FUEL PRESS/OIL PRESS circuit-breaker supplies power for the press-to-test function of the GEN, CANOPY and START warnings.

The main bus provides power to the GEN and CANOPY warnings through the FUEL PRESS/OIL PRESS circuit-breaker. The GEN and CANOPY warnings operate when the related system provides a ground for the warning lamp.

The starter side of the starter relay supplies power for the START warning. An in-line fuse protects the circuit. The external power bus supplies the EPU warning.

Refer to the related Chapters for data about the systems. Refer to Chapter 92 for wiring diagrams.

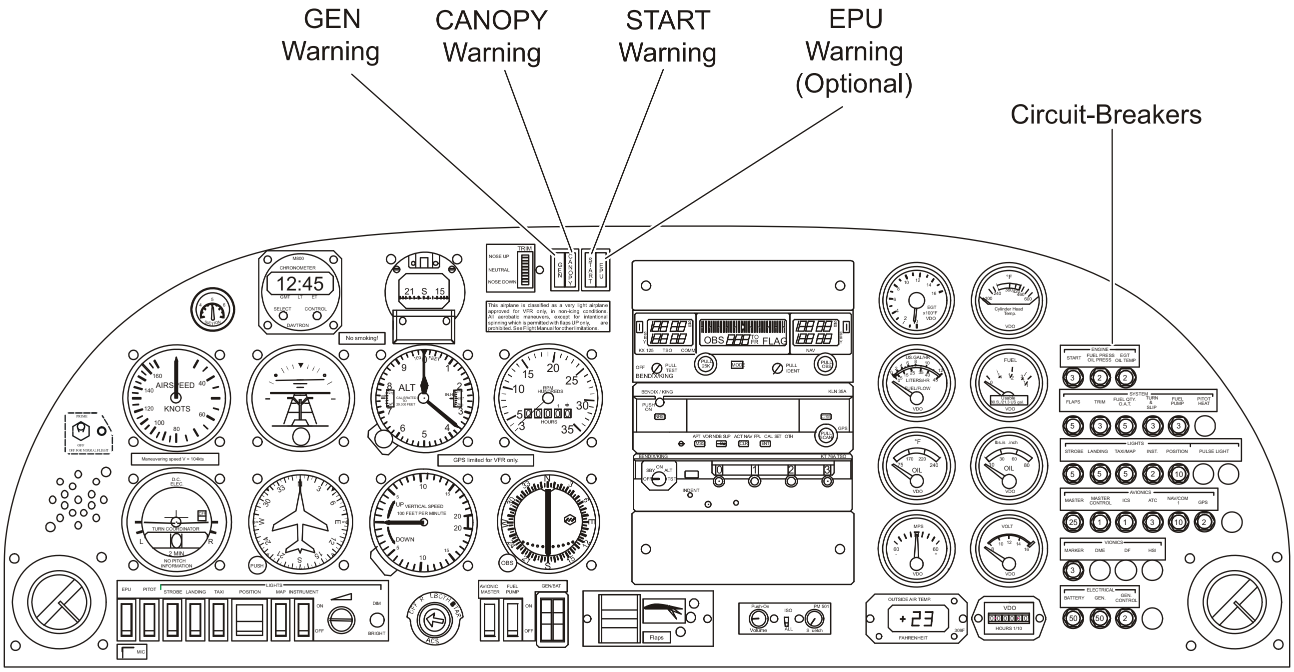

Figure 1 - Warning and Cautions Locations

WARNING SYSTEMS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the warning systems. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Warning indication incorrect.	Warning lamp bulb failed.	Replace the warning bulb.
	Sensor defective.	Replace the sensor.
	High resistance or open connection in the electrical wiring from the sensor.	Do resistance and continuity tests between the indicator and the sensor. Repair the defective connection or wire.

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WARNING SYSTEMS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the annunciator units. Refer to Chapter 92 for wiring diagrams.

2. Remove/Install a Warning Lamp Bulb

A. Replace a Warning Lamp Bulb

	Detail Steps/Work Items	Key Items/References
1.	Open the FUEL PRESS/OIL PRESS circuit-breaker.	
2.	Pull the lens from the front of the annunciator unit.	
3.	Carefully pull the PULL tab to remove the bulb.	
4.	Carefully push the PULL tab to install the bulb.	
5.	Push the lens onto the front of the annunciator unit.	
6.	Close the FUEL PRESS/OIL PRESS circuit-breaker.	
7.	Do a test of the warning lamps:	With the canopy open.
	- Set the BAT/GEN switch to ON	The GEN and CANOPY warnings must come on.
	- Push the front of each warning in turn	Each warning must come on.
	- Set the BAT/GEN switch to OFF.	

3. Remove/Install an Annunciator Unit

A. Remove an Annunciator Unit

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	De-solder the wires from the annunciator unit.	
4.	Release the spring clips that hold the annunciator unit.	
5.	Remove the annunciator unit through the instrument panel into the cockpit.	

B. Install an Annunciator Unit

	Detail Steps/Work Items	Key Items/References
1.	Put the annunciator unit in position in the instrument panel.	Make sure that the spring clips engage the panel.
2.	Solder the wires to the unit.	
3.	Connect the battery.	Refer to Chapter 24-31.
4.	Do a test of the warning lamps:	
	- Set the BAT/GEN switch to ON	The GEN and CANOPY warnings must come on.
	- Push the front of each warning in turn	Each warning must come on.
	- Set the BAT/GEN switch to OFF.	
5.	Install the instrument panel cover.	Refer to Chapter 25-10.

ASPEN EFD1000

NOTE: This pageblock is applicable to aircraft with Standard Mod 0219 installed and is completed in accordance with Aspen Avionics Supplemental Type Certificate (STC) Number SA10822SC.

1. General

The Aspen Avionics' EFD1000 is a panel-mounted Electronic Flight Instrument System (EFIS) that presents the pilot with displays of attitude, altitude, indicated airspeed, heading, rate of turn, slip/skid, and navigation course deviation information. The system also displays supplemental flight data such as winds, TAS, OAT, etc., moving maps, pilot-selectable indices ("bugs"), and various annunciations that increase situational awareness and enhance flight safety. Moving map situational awareness information is also displayed through the Garmin GNS 430W or GNS 530W.

The EFD1000 system includes the components that follow:

- EFD1000 Primary Flight Display (PFD)
- Remote Sensor Module (RSM)
- Configuration Module (CM)
- Analog Converter Unit (ACU). (When autopilot is installed)

When interfaced with the S-TEC 30 autopilot, the EFD1000 system provides heading and course datum information to the autopilot, which enables the autopilot to follow the Course and Heading values set by the pilot on the EFD1000, the same as is done with a mechanical HSI. When interfaced to GNS 430W or GNS530W, the EFD1000 can convert the digital GPS steering (GPSS) signals that are output from the GPS into analog GPSS signals that are compatible with the autopilot heading mode.

2. Description

The EFD1000 system is a flat-panel LCD primary flight instrument that presents the pilot with displays of attitude, airspeed, altitude, vertical speed, slaved compass, slip/skid, and rate of turn information. The PFD incorporates a solid-state Air Data and Attitude Heading Reference System (ADAHRS) to provide data for the flight instruments. The ADAHRS system uses data from its internal solid state rate gyros and accelerometers, pitot and static sensors, solid state magnetometer, and solid state temperature probes, all contained within the PFD and RSM, to derive the aircraft attitude and air data solutions. An ACU provides interfaces necessary for the S-TEC 30 autopilot equipment that accept or transmit data in analog signal formats.

Component Details

A. Primary Flight Display

Refer to Figure 1.

The PFD, installed on the pilot's instrument panel is a digital system that consists of a high resolution 6" diagonal color LCD display, user controls, photocell and Micro SD data card slot. The rear portion of the unit consists of a non-removable electronics module which contains a full air data computer, attitude heading reference system, power supplies, backup battery, and dual processor electronics. Also on the rear of the unit, a fan is provided to cool the backlight and electronics.

The PFD contains a microSD card port and reader at the bottom of the display bezel. Software updates and system upgrades will be loaded via this port.

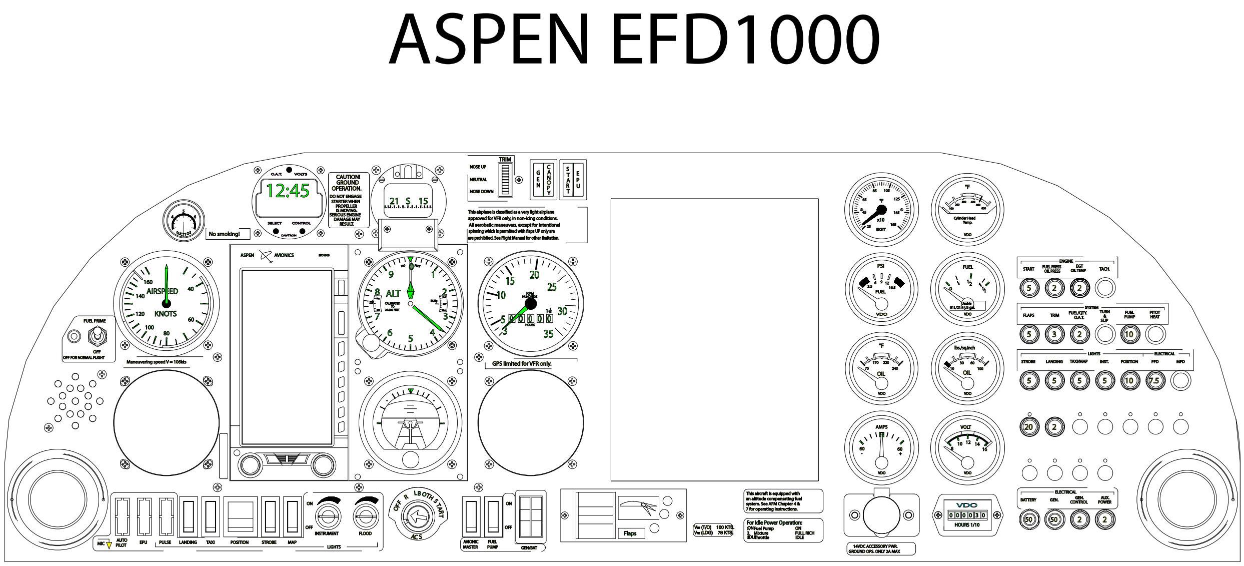

Figure 1 - Primary Flight Display Location

B. Remote Sensor Module (RSM)

The RSM is installed on the top, outer skin of the aircraft, behind the baggage compartment. The RSM connects directly to the PFD. It physically resembles a traditional GPS antenna and contains all of the sensors that must be remotely located from the PFD display unit. The RSM is powered by the PFD through a shielded wire harness and contains the following sub-systems:

- Outside Air Temperature (OAT) sensor
- Emergency backup GPS
- Magnetometer.

C. Configuration Module

The Configuration Module contains an EEPROM device which retains system configuration and calibration data. The Configuration Module connects to the PFD through a short fabricated harness and is fastened to the main wiring bundle of the PFD. The Configuration Module provides two primary functions:

- Retains aircraft specific configuration, calibration data and user settings, allowing the PFD to be swapped for service purposes without re-entering or re-calibrating the installation.
- Contains a license key that configures the PFD software.

D. Analog Converter Unit (ACU)

The Analog Converter Unit (ACU) is installed behind the instrument panel, below the PFD. It is installed only on aircraft that have an autopilot. The ACU provides compatibility with analog-based avionics when required. It converts and concentrates multiple analog interfaces to digital ARINC 429 buses supported by the PFD. Control parameters, such as desired heading, are also sent from the PFD to the ACU for conversion to analog format for autopilot support.

Power Control

The EFD1000 receives aircraft power from the battery bus via the PFD circuit breaker on the ELECTRICAL circuit breaker bus. The EFD1000 includes an internal battery that allows the system to continue to operate in the event of a failure of the aircraft electrical system.

Whenever indicated airspeed is invalid or below 30 KIAS the EFD1000 will power up and power down with the application or removal of external power. A message is presented during the normal power down sequence to enable the pilot to abort the shutdown and switch to internal battery.

When IAS is greater than 30 KIAS and the input voltage drops below 12.8V (14V Electrical System) the EFD will automatically switch to its internal battery (e.g. aircraft charging system failure).

The EFD1000 internal battery will provide at least 30 minutes of power when it is fully charged. The battery provides power to the PFD, RSM and emergency GPS. When operating from battery, a red “ON BAT” annunciation and battery charge status indication is presented in the lower portion of the Attitude Indicator.

A unit operating from battery may be powered off using the “Shut Down” command available in the Power Settings Menu. In the unlikely event that the normal power control is not working, the EFD may be forced to shut down by first pulling its associated circuit breaker and then pressing and holding the REV button for at least 5 seconds.

Battery charge status may be viewed from the “Power Settings” page of the Main Menu.

System Architecture

Refer to Figure 2.

The system architecture in Figure 2 shows the relationships of the PFD, RSM, Configuration Module and ACU

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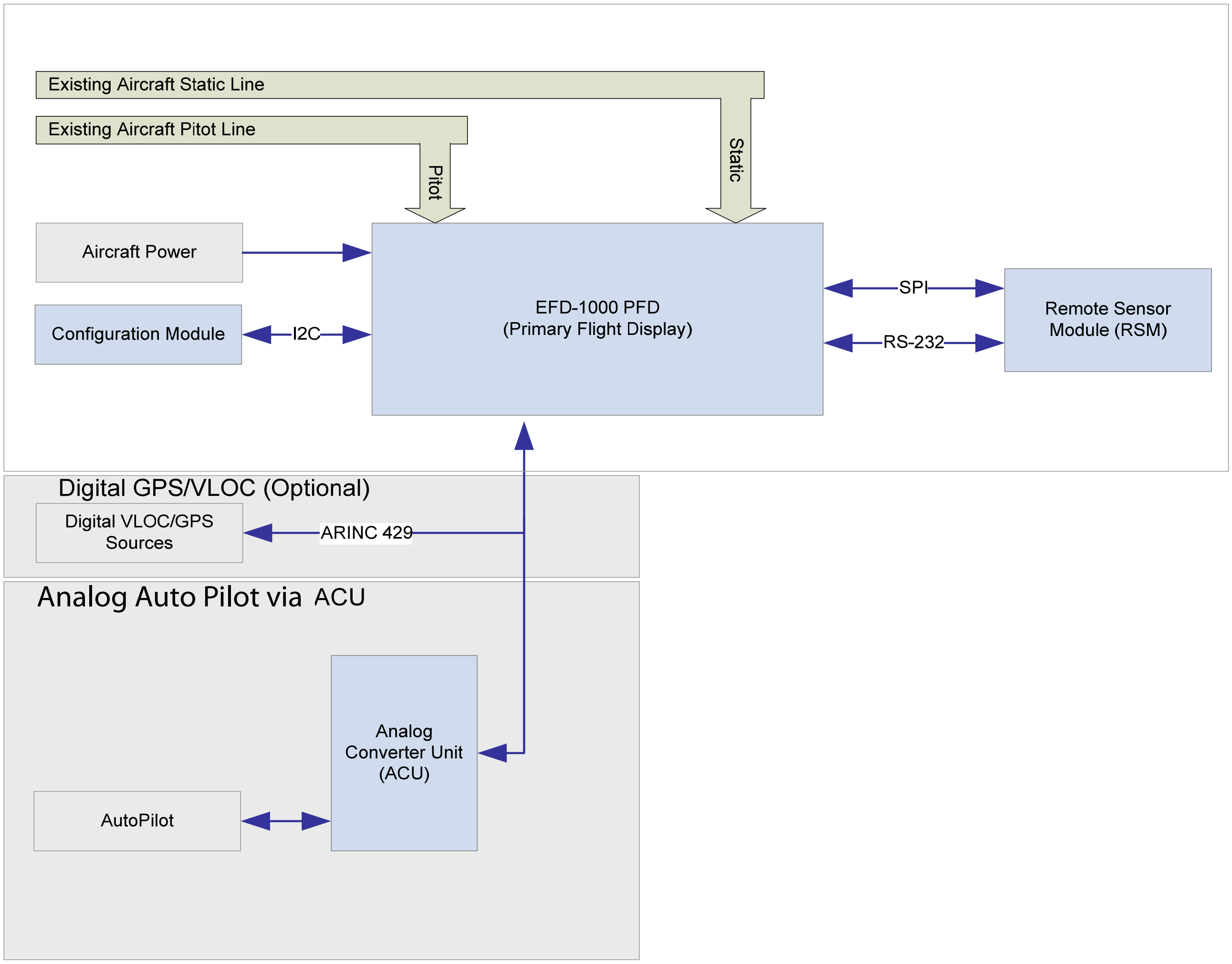

Figure 2 - EFD1000 SYSTEM ARCHITECTURE

3. Operation

Refer to Figure 3.

Pilot interaction with the EFD1000 is accomplished through two knobs with push/rotate function and 11 buttons located on the display bezel. Two control knobs (9 and 10) are used to control pilot settable bugs and references. Three lower push buttons (11, 12 and 13), located between the control knobs, are used to select navigation sources for the bearing pointers and the HSI. Three dedicated buttons (1, 2 and 3) on the upper side of the right bezel control map range, display reversion, and provide access to the main menu.

Five soft keys (4, 5, 6, 7 and 8) on the lower half of the right bezel control frequently used commands, such as the HSI mode or map declutter setting. These five keys are also used when navigating the main menu.

A. Control Knobs

Two control knobs (9 and 10) on the PFD bezel are used to adjust pilot editable data fields. The left knob adjusts data fields on the left side of the display, and the right knob adjusts data fields on the right side of the display. The knob logic includes active and inactive states to prevent inadvertent adjustment of editable fields. After 10 seconds of inactivity, the knob returns to an inactive “home” state. A single push activates an inactive knob. Pushing the knob again will advance the knob to the next editable field in a round-robin sequence. When inactive, the knob legend is rendered in Cyan. Once activated, the knob legend and associated data field and bug (where appropriate) are rendered in magenta.

The left control knob adjusts the CDI Course Set “CRS” and Indicated Airspeed Bug “IAS” editable fields. To adjust these values PUSH the knob in a round robin fashion until the desired field text turns magenta, then ROTATE the knob to set the value (clockwise to increase, counterclockwise to decrease). The home state for the left knob is “CRS”.

The right control knob controls Heading Bug “HDG”, Altitude Bug “ALT”, Barometric Pressure Setting “BARO”, and Minimums setting “MIN” editable fields in that order. To adjust these values PUSH the knob in a round robin fashion until the desired field text turns magenta, then ROTATE the knob to set the value (clockwise to increase, counterclockwise to decrease). The home state for the right knob is “HDG”.

B. Navigation Source Selection

The pilot can couple navigation data from external GPS or VOR/Localizer (VLOC) radio system to the HSI and bearing pointers. Navigation source selection is controlled by the three buttons (11, 12 and 13) located between the control knobs. The center button is used to control the source coupled to the Course Deviation Indicator on the HSI. The left button controls the source coupled to the single-needle bearing pointer. The right button controls the source coupled to the double-needle bearing pointer.

C. Range Control

The EFD1000 basemap range may be set to ranges of 2.5, 5, 10, 15, 20, 30, 40, 60, 80, 100, and 200 nautical miles. Map range is measured from the own ship position to the outside of the compass arc.

To increase the range push the ‘+’ side of the range key (2) located on the upper right side of the bezel. To decrease the range push the ‘–‘ side of the key. The currently selected map range is displayed in the lower left corner of the display.

D. Reversion Control

The reversion function is inoperative in single display installations. The REV button (1) may be used to force the unit to power off. When external power has been removed, pressing and holding the REV button for 5 seconds will give an immediate system shut down. When external power is available, pressing and holding the REV button for 5 seconds will result in a system restart.

E. Menu Control

The EFD1000 Main Menu (3) is used to adjust various system configuration settings and preferences. To select the Main Menu, press the MENU button on the right side of the display bezel. To exit the Menu, press the MENU button again. Once the Main Menu is activated, rotating the lower right control knob will select the various menu pages. The current menu page is indicated by the page name and legend “page # of #”, and by the location of the green segment within the segmented menu navigation bar displayed at the bottom of the display.

F. Attitude Indicator

The Attitude Indicator (16) consists of a conventional blue over brown attitude ‘ball’ rendered behind a fixed aircraft symbol to display pitch, roll and slip/skid information. The horizon line is represented by a fixed white line extending to each edge of the display area separating the blue sky and brown ground of the artificial horizon. A fixed roll pointer reads degrees of bank against a moveable roll scale.

The AHRS attitude solution continually self-monitors and will present a “CROSS CHECK ATTITUDE” annunciation whenever it determines that the AHRS solution may be degraded. Should this alert be presented, the pilot should immediately cross compare the attitude against backup sources of attitude information.

G. Airspeed Indicator

Airspeed is indicated by a moving airspeed tape against a fixed position airspeed pointer (23).
A digital, drum-type readout is provided adjacent to the fixed pointer. Tick marks are provided every 10 knots. The integral ADC computes the airspeeds. Color speed bands and speed markers are displayed on the indicated airspeed tape corresponding to those found on a traditional airspeed instrument.

H. Altimeter

Altitude is indicated by a moving altitude tape (27) against a fixed position altitude pointer (26). A digital, rolling drum readout indicating altitude values to the closest 20 feet is provided adjacent to the fixed pointer. Barometric pressure is adjusted with the right knob to provide a barometric-corrected altitude on the display. Altitude alerts are generated for level-off and deviation conditions.

I. Data Bar (TAS, GS, OAT, Winds, Barometric pressure Set)

The Data Bar visually separates the upper and lower halves of the EFD display. True Airspeed (34), GPS Ground Speed (36), Outside Air Temperature (37), Wind Direction and Wind Speed (38, 39), and Barometric Pressure Setting data (35) are all presented in the data bar.

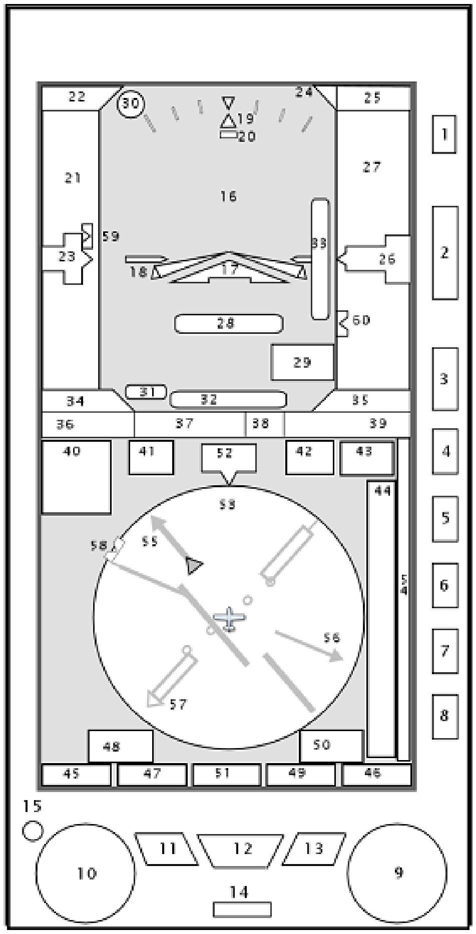

Figure 3 - ASPEN EFD1000

1) Reversion Control
2) Range Control
3) Menu Control
4) “TPS” Tapes ON/OFF Control
5) “MIN” Minimums ON/OFF Control
6) “360/ARC” HSI View Control
7) “MAP” Map declutter logic Control
8) “GPSS” GPS Steering ON/OFF Control
9) Right Control Knob
10) Left Control Knob
11) Single-Line Bearing Pointer Source Select
12) CDI Source Control
13) Dual-Line Bearing Pointer Source Select
14) Micro SD Card slot
15) Automatic Dimming Photocell
16) Attitude Indicator
17) Aircraft Symbol
18) Single Cue Flight Director (optional – compatible autopilot required)
19) Roll Pointer
20) Slip / Skid Indicator
21) Airspeed Indicator Tape
22) Selected Airspeed Field
23) Airspeed Drum/Pointer
24) Altitude Alert
25) Selected Altitude Field
26) Altitude Drum/Pointer
27) Altitude Tape
28) MINIMUMS annunciation
29) Selected Minimums Field
30) Decision Height “DH” Annunciation (compatible Radar Altimeter required)
31) LDI Navigation Source Indication
32) Lateral Deviation Indicator
33) Vertical Deviation Indicator
34) True Airspeed
35) Barometric Pressure Setting Field
36) Ground Speed
37) OAT
38) Wind Direction Arrow
39) Wind Direction and Speed
40) Selected Source Information Field
41) Selected Course (CRS) Field

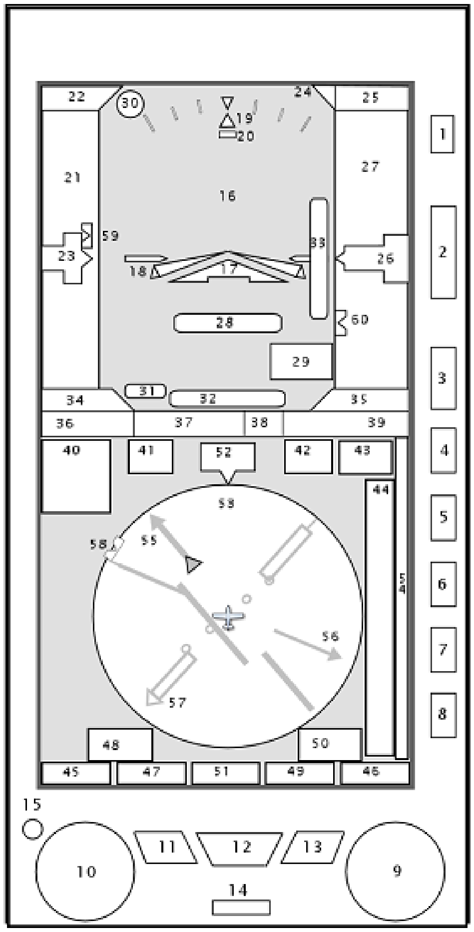

Figure 3- ASPEN EFD1000

42) Selected Heading Field

43) Vertical Speed Digital Value

44) Vertical Speed Tape

45) Left Control Knob state

46) Right Control Knob state

47) Single-Needle Bearing Pointer Source

48) Single-Needle Source Info Block

49) Dual-Needle Bearing Pointer Source

50) Dual-Needle Source Info Block

51) CDI Navigation Source

52) Magnetic Heading

53) Compass Scale

54) Hot Key legend

55) CRS Pointer

56) Single-Needle Bearing Pointer

57) Double-Needle Bearing Pointer

58) Heading Bug

59) Airspeed Bug

60) Altitude Bug

J. Horizontal Situation Indicator

The HSI portion of the EFD1000 combines a Direction Indicator overlaid with a rotating Course Deviation Indicator (CDI). The HSI can be presented in either a full 360 degree compass rose mode, or in a 100 deg ARC format. Within the ARC mode, the pilot may select (via the main menu) between two different formats of CDI presentation – ARC HSI mode and ARC CDI mode.

A Lateral Deviation Indicator (LDI) is presented on the HSI whenever the pilot has selected an ILS, LOC, LOC(BC), or a GPS Approach Mode to the HSI and valid lateral guidance is being provided. Back course deviation indications are automatically corrected for reverse sensing.

A Vertical Deviation Indicator (VDI) is presented on the attitude indicator whenever the LDI is shown and valid vertical guidance is provided, such as from an ILS or WAAS GPS.

A Navigation Source Information Block (40) is presented in the upper left corner of the HSI display area. The Source Information Block indicates the navigation source coupled to the HSI and its associated mode (e.g. VOR, ILS, LOC, etc). Information is provided related to the coupled source including, when available, waypoint or navaid identifier or frequency, bearing and distance, and the estimated time to the active waypoint.

Two bearing pointers (56 and 57) that show the radial of a VOR station or the bearing to a GPS waypoint are provided. Each bearing pointer has an associated source information block (48 and 50) that displays information about the source of bearing pointer data (when available). Bearing Pointers are only available in the 360 Compass mode. Any available navigation source may be connected to either bearing pointer. If connected to a source that does not provide angular bearing data, such as a localizer, the bearing pointer is not presented and the source is flagged as invalid.

K. Hot Key Operation

During normal operations, the five line select soft-keys on the lower right side of the display bezel are referred to as “Hot Keys.” Hot Keys provide single-action access to frequently used functions. An electronic legend adjacent to each Hot Key indicates its hot key function. When the legend is green, the function is active. When it is grey, the function is inactive. The legend always annunciates the current state.

(1) TPS Key (4) enables/disables the display of the airspeed and altitude tapes.

(2) MIN Key (5) enables / disables the MINIMUMS display. When enabled, the minimums field is available for editing and minimums alerts are provided. When disabled, no minimums alerting is provided and the field may not be selected for editing. Upon enabling the MINs field, the right knob cursor is activated for editing the MINs value.

(3) 360/ARC Key (6) toggles the compass between a 360 rose display and a 100 deg ARC display.

(4) MAP Key (7) is used to enable the basemap and control the amount of basemap symbology that is presented to the pilot.

(5) GPSS Key (8) is used to enable or disable GPS Steering (GPSS) outputs to the autopilot.

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ASPEN EFD1000 - TROUBLESHOOTING

NOTE: This pageblock is applicable to aircraft with Standard Mod 0219 installed and is completed in accordance with Aspen Avionics Supplemental Type Certificate (STC) Number SA10822SC.

1. General

A. The table that follows will assist in the troubleshooting of the Aspen EFD1000 system. It does not give information about the equipment or associated systems. For faults on an item of equipment or an associated system refer to that ATA Chapter in the AMM.

B. If the fault is shown in column 1, the possible cause is listed in column 2, the recommended repair is shown in column 3. .

TROUBLE	POSSIBLE CAUSE	REPAIR
Display does not power on (Note: there can be up to a 20 second delay from the application of power to a visible display)	a) PFD missing A/C power b) PFD may have been improperly shut down c) PFD missing A/C ground d) PFD is defective	a) Check PFD circuit breaker, PFD on/off switch on panel, wiring, and A/C battery voltage > 11.5 volts b) Switch unit off using “REV” button or “SHUT DOWN” command from Main Menu c) Check wiring to PFD d) Repair or replace PFD
Display does not power off (Note: PFD will switch to internal battery if airspeed is greater than 30kts.)	a) Airspeed is above 30kts b) PFD may have been switched to internal battery c) PFD may have been improperly shut down d) PFD is defective	a) Normal operation b) Switch unit off using “REV” button or “SHUT DOWN” command from Main Menu c) Hold “REV” button for 20 seconds or unplug PFD internal battery for 3 seconds d) Repair or replace PFD
Display flashes on/off, black/white or blue/white repetitively	a) Configuration Module unplugged or wired wrong b) RSM or CM wiring short c) Configuration module defective d) PFD defective	a) Check CM plug and wiring from PFD to CM b) Verify RSM pin 6 or CM pin 1 is not shorted to aircraft ground or another pin c) Repair or replace CM d) Repair or replace PFD
“CONFIG MODULE LINK FAIL” message	a) Configuration Module unplugged or wired wrong b) Configuration module defective c) PFD defective	a) Check CM plug and wiring from PFD to CM b) Repair or replace CM c) Repair or replace PFD

TROUBLE	POSSIBLE CAUSE	REPAIR
"INITIALIZING" message for more than 30 seconds (Note: At -20ºC and below the message may take up to 3 minutes to clear)	a) RSM to PFD communication lost b) RSM failed c) PFD failed	a) Check RSM to PFD wiring for shorts or opens b) Repair or replace RSM c) Repair or replace PFD
"RSM LINK FAIL" message	a) RSM to PFD communication lost b) RSM failed c) PFD failed	a) Check RSM to PFD wiring for shorts or opens b) Repair or replace RSM c) Repair or replace PFD
"WRONG CONFIG MODULE" message	a) PFD is at one software level and config module is at a different software level	a) Convert config module per appropriate service bulletin
ALTIMETER, AIRSPEED, VSI FAIL (RED-X)	a) Air data sensor has not had sufficient warm-up time b) Pitot/static lines reversed c) Air data sensor failed	a) Allow up to 20 minutes at temps below -20ºC for flags to clear b) Connect pitot line to "P" port and static line to "S" port on PFD c) Repair or replace PFD
ATTITUDE FAIL or DIRECTION FAIL (RED-X) (Note: Attitude flags could take up to 3 minutes to clear at temps below -20 ºC)	a) AHRS sensor has not completed initialization b) RSM failed/data missing c) Pitot and/or Static lines crossed, unplugged, or blocked. d) PFD is defective	a) Allow up to 3 minutes for AHRS to initialize b) Check RSM to PFD wiring. Repair or replace RSM. c) Correct pitot/static plumbing issue d) Repair or replace PFD
CROSS CHECK ATTITUDE message (yellow) (also see sluggish AHRS performance troubleshooting)	a) If it occurred on system start. b) Normal after abrupt maneuvers on ground or in air	a) RESET AHRS b) RESET AHRS
Red Slash through Navigation Sensor (i.e., ~~GPS1~~, ~~NAV2~~)	a) GPS or VLOC receiver is off. b) GPS does not have a valid "TO" waypoint and position c) GPS or VLOC receiver failed d) ACU not powered e) Wiring fault between sensor and ACU or PFD f) ACU to PFD wiring fault. g) ACU is defective. h) PFD is defective.	a) Turn on GPS or VLOC receiver b) Allow GPS to acquire a position and enter a flight plan or Direct To c) See GPS/VLOC manufacturers' instructions for troubleshooting d) Check ACU circuit breaker e) Check wiring between GPS/ VLOC and ACU or PFD f) Check ACU circuit breaker, check ACU to PFD A429 wiring and ACU to sensor wiring g) Repair or replace ACU h) Repair or replace PFD

TROUBLE	POSSIBLE CAUSE	REPAIR
GPS1 or GPS2 selection not available on Display (GNS430 and GNS530 only)	a) GPS receiver turned off b) GPS does not have a valid “TO” waypoint and position c) GNS CDI is selected to VLOC d) GPS to PFD A429 wiring issue e) GPS defective. f) PFD defective.	a) Turn on GPS and initialize b) Allow GPS to acquire a position and enter a flight plan or Direct To c) Verify the GNS CDI is selected to GPS d) Check A429 wiring for shorts, opens or crossed A and B lines e) Repair or replace GPS f) Repair or replace PFD
Autopilot or analog NAV/GPS inoperative	a) ACU chassis not grounded b) ACU not powered c) ACU to sensor wiring d) ACU to PFD wiring e) ACU fault f) PFD fault	a) Ground ACU chassis to airframe ground b) Check ACU circuit breaker and power/grounds c) Check ACU to sensor wiring d) Check ACU to PFD A429 wiring e) Repair or replace ACU f) Repair or replace PFD
Excessive Heading errors in one quadrant, or errors that are higher than actual in some quadrants and lower than actual in other quadrants	a) RSM is tilted more than allowed b) Poor RSM calibration c) RSM calibrated too close to buildings or ferrous objects d) Ferrous hardware used to mount RSM e) Airframe or external magnetic interference	a) Shim the RSM to within limits defined in Section 6 of the Aspen EFD 1000 Installation Manual b) Re-run RSM calibration at constant rate turns c) Re-run RSM calibration away from buildings and other ferrous objects d) Only stainless screws, nuts, washers may be used on RSM e) Check for magnetized areas on airframe close to RSM. Verify no ferrous hardware is near RSM. Degauss magnetized area(s)

TROUBLE	POSSIBLE CAUSE	REPAIR
Sluggish or Poor AHRS (ADI) performance Poor AHRS performance in steep bank turns Sluggish compass card (Note: may or may not be associated with “Cross Check Attitude” message)	a) RSM magnetic interference b) RSM has become magnetized c) “Pitch Attitude Trim” adjustment made without performing a subsequent RSM Calibration. d) Pitot and/or Static line connections at PFD blocked, kinked, or unplugged e) Normal after abrupt maneuvers.	a) Survey RSM location using handheld compass. Verify there are no cabin speakers within 3ft of RSM. Degauss any areas found to be magnetized or remove magnetism by other methods. b) With power removed from EFD1000 system degauss RSM and general area using degausser. c) Perform an RSM Calibration d) Check pitot/static connections and plumbing for blockage. Check IAS and ALT sensor e) Perform AHRS Reset
Autopilot has lateral offset in GPSS or APPR mode (HDG Bug may also be out of center)	a) Autopilot roll “null” centering is out of adjustment	a) Follow the autopilot manufacturers’ guidelines for adjusting roll “null” centering
OAT Display dashed	a) Wiring fault between PFD and RSM b) RSM is defective	a) Check wiring b) Repair or replace RSM
WIND vector, velocity, and direction display dashed (Note: wind readout will dash under 10kts of wind)	a) Groundspeed < 20kts b) No GPS ground track c) Airspeed failed	a) Normal operation b) GPS not computing GTK c) See AIRSPEED FAIL troubleshooting procedure
OBS mode inoperative on GPS	a) GPS A429 IN bus configured wrong b) ARINC 429 “A” and “B” lines reversed	a) Check GPS configuration b) Correct wiring error to GPS A429 IN bus

ASPEN EFD1000 SYSTEM - MAINTENANCE PRACTICES

NOTE: This pageblock is applicable to aircraft with Standard Mod 0219 installed and is completed in accordance with Aspen Avionics Supplemental Type Certificate (STC) Number SA10822SC.

1. General

The following maintenance procedures describe how to remove and install the following components of the Aspen EFD1000 system. They do not describe how to maintain the components:

- Primary Flight Display (PFD)
- Remote Sensor Module (RSM)
- Configuration Module (CM)
- Analog Converter Unit (ACU).

For more data about maintaining the equipment, refer to the Aspen Avionics EFD1000 Installation Manual, Aspen Document #A-01-126-00.

Refer to Chapter 92 for the ASPEN EFD1000 system wiring diagram.

2. Remove/Install the Primary Flight Display (PFD)

A. Remove the PFD

Refer to Figure 1.

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10
2.	Remove the clock.	Refer to Chapter 31-20.
3.	Open the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
4.	Through the opening where the clock was located, carefully insert a flat blade screw driver into the locking mechanism on the top center of the PFD.	
5.	Gently pry on the locking mechanism and pull back the top of the PFD.	Move the PFD slowly out of the holding bracket.
6.	Extract the PFD from the holding bracket in the instrument panel.	Secure the PFD while you remove attached parts.
7.	Remove the screw that holds the braided bonding strap to the PFD.	The bonding-strap attachment screw is below and right of the static port, looking forward.

	Detail Steps/Work Items	Key Items/References
8.	Remove the pitot and static quick connectors.	Pull back on the outer spring loaded locking sleeve while unplugging the connectors.
9.	Remove the D-sub connector.	Unscrew both jackscrews fully and pull the connector straight back
10.	Remove the PFD from the instrument panel.	
11.	install protective-caps on the pitot and static connectors	
12.	Install protective caps on the electrical connectors.	

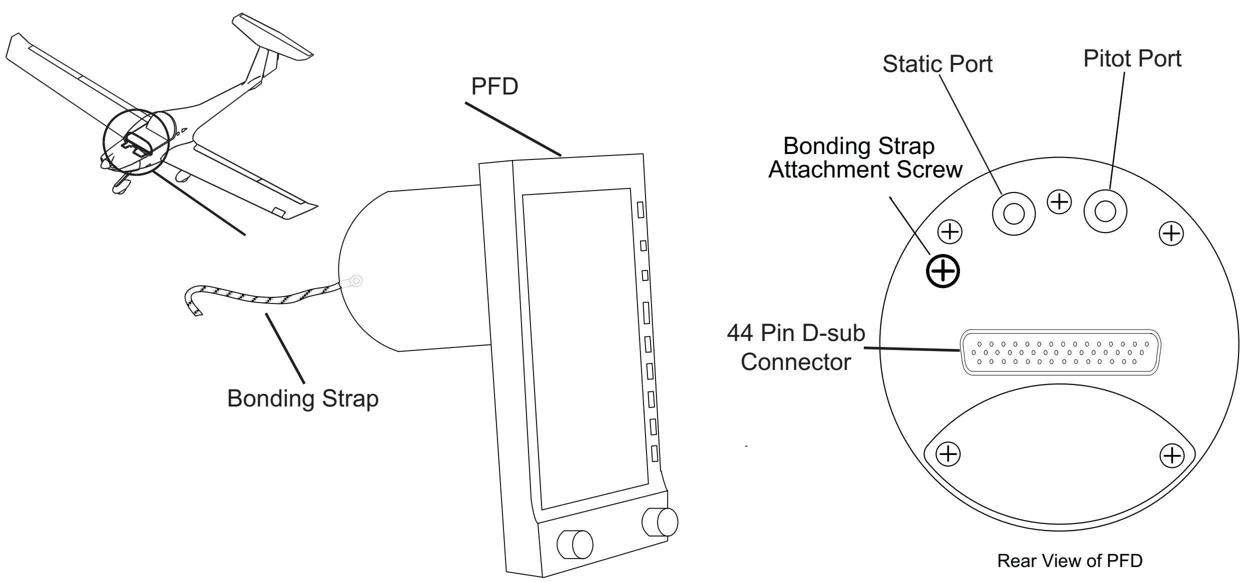

Figure 1: PFD - Removal/Installation

B. Install the PFD

Refer to Figure 1.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Remove the protective-caps from the pitot and static connectors.	
3.	Remove the protective caps from the electrical connectors.	
4.	Move the PFD into position in the instrument panel.	
5.	Connect the D-sub connector.	Align the connector and screw in both jackscrews until the connector is fully seated.
6.	Install the screw to connect the braided bonding strap to the PFD.	Gently pull on the connector to ensure proper connection.
7.	Install the pitot and static quick connectors.	Gently pull on the connectors to ensure proper connection.
8.	Move the bottom of the PFD into its bracket and pivot the top forward until it locks into place on the top of the bracket.	Make sure that the PFD is seated correctly and locked in place.
9.	Perform a pitot and static leak check and verify the airspeed and altitude indications on the PFD correspond to the values set on the pitot static test set.	Refer to Chapter 34-10.
10.	Install the clock.	Refer to Chapter 31-20.
11.	Install the instrument panel cover.	Refer to Chapter 25-10.
12.	Close the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
13.	Perform a return to service test of the PFD by verifying that no sensors are flagged invalid and there are no RED-X’s on the display.	

3. Remove/Install the Remote Sensor Module (RSM)

A. Remove the RSM

Refer to Figure 2.

	Detail Steps/Work Items	Key Items/References
1.	Open the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
2.	From inside the aircraft, cut the two cable ties that hold the RSM wiring harness in place and disconnect the RSM electrical connector.	It will be necessary to gain access to the underside of the RSM mounting location in order to unplug the RSM connector.
3.	Remove the shield ground wire from the ground stud.	
4.	Remove the sealant from around the base of the RSM and the mounting screws.	Use a plastic spatula or equivalent. Do not damage the aircraft skin.
5.	Remove the four non-ferrous mounting screws from the RSM. Remove the four nuts and four washers from the underside location.	It will be necessary to have someone hold the nuts from the underside of the RSM mounting location to remove the screws.
6.	Remove the RSM and wiring harness from the aircraft.	Take care to guide the 24 inch “pigtail” connector out through ½ inch hole in the aircraft skin.
7.	Install protective caps on the electrical connectors.	

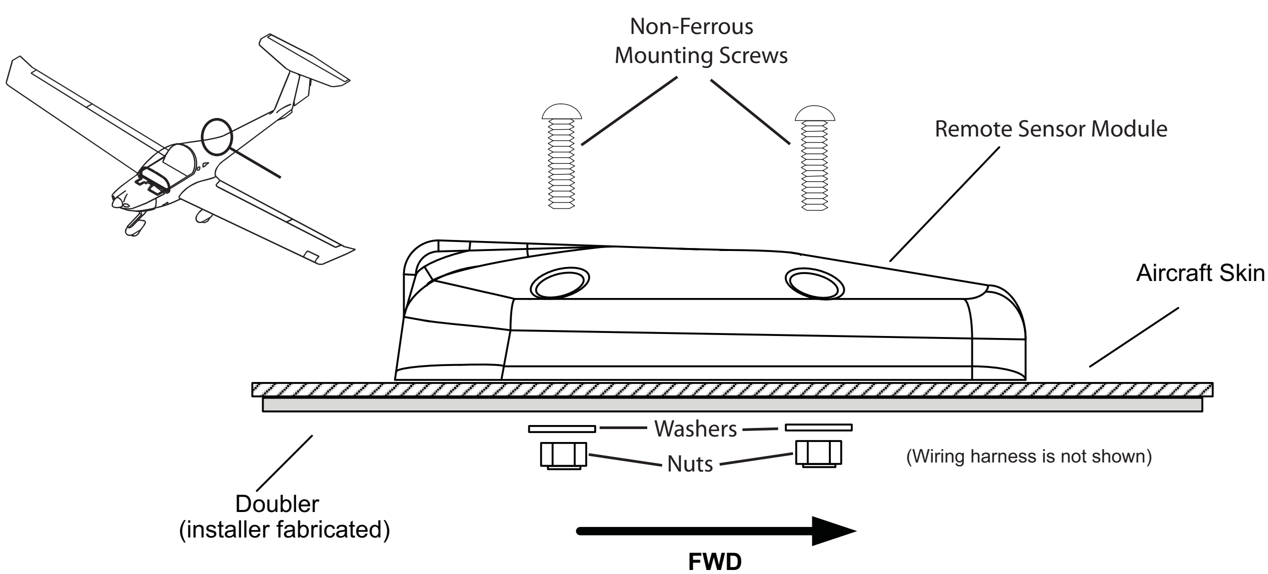

Figure 2: Remote Sensor Module - Removal/Installation

B. Install the RSM

Refer to Figure 2.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Remove the protective caps from the electrical connectors.	
3.	Make sure that the RSM O-ring is in good condition with no cracking or flattening.	Contact Aspen Avionics for a replacement O-ring if required.
4.	Feed the electrical connector and wiring harness down through the ½ inch hole in the aircraft skin and mount the RSM.	The OAT sensor on the RSM faces aft.
5.	Install the four non-ferrous mounting screws, the four nuts and four washers to hold the RSM in place. Torque hardware to 12-15 in-lbs	It will be necessary to have someone hold the nuts from the underside of the RSM mounting location to install the screws.
6.	Install the shield ground wire to the ground stud.	From underside of the RSM mounting location.
7.	Connect the RSM electrical connector and cable tie the wiring harness in place.	From underside of the RSM mounting location.
8.	Close the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
Perform a checkout of the RSM in accordance with the Aspen Avionics EFD1000 Installation Manual, Aspen Document #A-01-126-00, as follows:		
9.	a) Perform a calibration of the RSM b) Check the OAT operation c) Check the RSM GPS operation	a) As per Section 10.5 b) As per Section 10.6.4 c) As per Section 10.6.6.
10.	Re-seal around the base and on top of the four mounting screws of the RSM.	Use Marine 4000, P/N 06586 or equivalent.

4. Remove/Install the Configuration Module (CM)

A. Remove the CM

Refer to Figure 3.

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10
2.	Open the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
3.	Cut the two cable ties affixing the CM to the PFD wiring harness.	Access to the CM is via the removed instrument panel cover.
4.	Unplug the Molex connector by pressing down on the locking tab and gently pulling the connector from the module.	
5.	Remove the CM from the aircraft.	

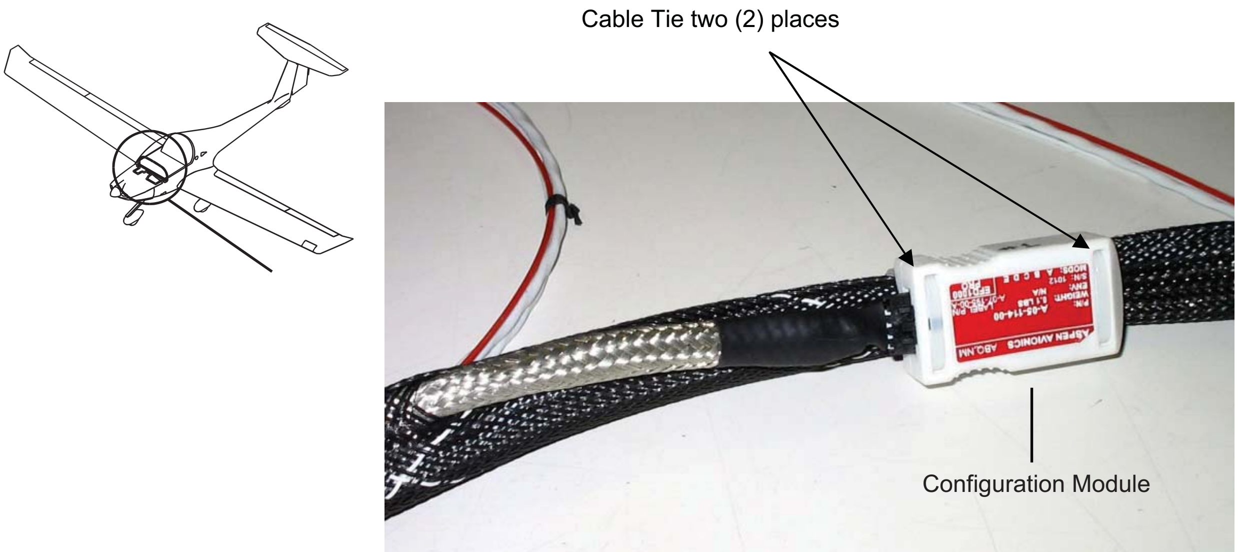

Figure 3: Configuration Module - Removal/Installation

B. Install the CM

Refer to Figure 3.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Plug the Molex connector into the module until it clicks.	Access to the CM is via the removed instrument panel cover.
3.	Cable tie the module to the PFD wiring harness.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Close the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
Perform a checkout of the CM in accordance with the Aspen Avionics EFD1000 Installation Manual, Aspen Document #A-01-126-00, as follows:		
6.	a) Perform the post-installation unit configuration b) Perform an RSM Calibration	a) As per Section 10.4.5 b) As per Section 10.5

5. Remove/Install the Analog Converter Unit (ACU)

NOTE: The ACU is installed only on those aircraft with S-TEC 30 Autopilot.

A. Remove the ACU

Refer to Figure 4.

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10
2.	Open the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
3.	At the ACU, remove the three D-sub connectors.	Access to the ACU is via the removed instrument panel cover and PFD. At each connector, unscrew both jackscrews fully and pull the connector straight back
4.	Remove the six mounting screws, nuts and washers securing the ACU to the aircraft.	
5.	Remove the ACU from the aircraft.	
6.	Install protective caps on the electrical connectors.	

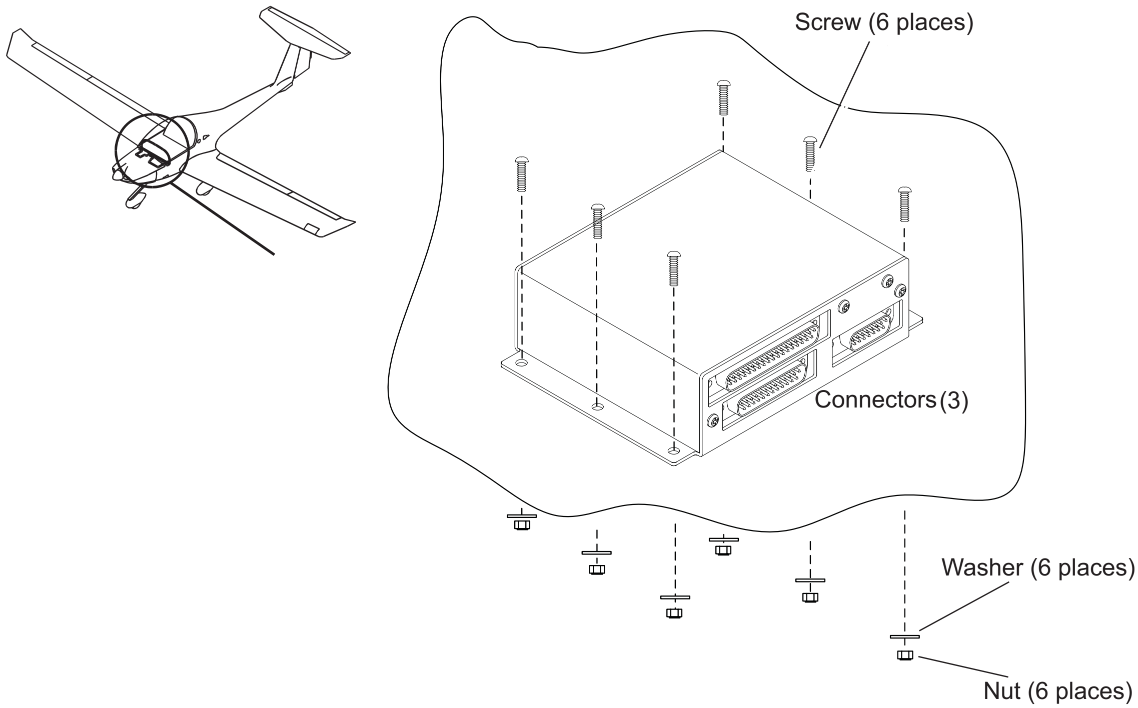

Figure 4: Analog Converter Unit - Removal/Installation

B. Install the ACU

Refer to Figure 4.

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Remove the protective caps from the electrical connectors.	
3.	Place the ACU in its correct position on the aircraft ACU mount.	Access to the ACU location is via the removed instrument panel cover and PFD.
4.	Install the six mounting screws, nuts and washers securing the ACU to the aircraft.	
5.	Connect the three D-sub connectors.	Align each connector and screw in both jackscrews until the connector is fully seated.
7.	Install the instrument panel cover.	Refer to Chapter 25-10.

	Detail Steps/Work Items	Key Items/References
8.	Close the PFD circuit breaker.	Located on the ELECTRICAL circuit breaker bus.
Do a checkout of the ACU in accordance with the Aspen Avionics EFD1000 Installation Manual, Aspen Document #A-01-126-00, as follows:		
9.	Do the post-installation tests of the ACU.	As per Sections 10.6.6, 10.6.7, 10.6.9 and 10.6.10.

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GARMIN G-500 INTEGRATED DISPLAY SYSTEM

NOTE: This pageblock is applicable to aircraft with Standard Mod 0232 installed. Additional maintenance instructions are contained in Garmin G500 PFD/MFD System Instructions for Continued Airworthiness Document Number 190-01102-00.

1. General

The DA20-C1 has a Garmin G500 integrated display system. The system presents primary flight instrumentation, navigation and provides a moving map to the pilot through large format displays. Refer to Figure 1.

For more detailed data about this integrated display system, refer to the G500 Cockpit Reference Guide for the DA20-C1 aircraft.

2. Description and Operation

The G500 system consists of:

- Garmin Display Unit (GDU) 620 (PFD/MFD)
- Garmin Data Computer (GDC) 74A [Air Data Computer (ADC)]
- Garmin Reference System (GRS) 77 [Attitude and Heading Reference System (AHRS)]
- Garmin Magnetometer Unit (GMU) 44
- Garmin Temperature Probe (GTP) 59.

The standby instruments will consist of an Airspeed Indicator and an Altimeter located at the top of the Instrument Panel (Refer to figure 2).

A. GDU 620 Display

The GDU 620 is a Primary Flight Display (PFD) and a Multi Function Display (MFD) that is interfaced to the other LRUs of the system installed on the aircraft. The GDU 620 provides the following operations:

- Display of attitude (pitch and roll), rate of turn, slip/skid, heading, airspeed, altitude, and vertical speed information
- Display and control of the Horizontal Situation Indicator (HSI) and selected heading
- Display of position and ground speed for use by the pilot/flight crew
- Display of the stored navigation and map database for use by the pilot/flight crew

- Interfacing with the following:
  - WAAS GPS sources (GNS 430W)
  - NAV sources (GNS 430W)
  - Synthetic Vision Technology (SVT)

The GDU 620 has dual VGA (640 x 480 pixels) 6.5” diagonal LCD displays. The left side of the GDU is the Primary Flight Display (PFD) and the right side is the Multi-Function Display (MFD). The PFD shows primary flight information. The MFD shows navigation and flight plan information, and terrain. An external configuration module is used, so no configuration is required if the GDU 620 is replaced.

(1) Primary Flight Display (PFD)

The left side of the GDU 620 is the PFD. The PFD is a 6.5" liquid crystal display. The PFD shows the basic primary flight display plus a number of additional options that can selected manually. Some other indications will be generated automatically for example, alert captions.

The PFD window displays the usual primary flight instruments in a standard 'T' configuration.

The basic flight instruments are:

Attitude Indicator (Artificial Horizon):	The attitude indicator is located on the top of the display. The attitude indicator shows the pitch, roll and yaw situation of the aircraft. If the attitude indicator fails the display marks the pitch attitude display area with a red 'X' and yellow text spelling out 'ATTITUDE FAIL'.
Airspeed Indicator (ASI):	The airspeed indicator is on the top of the display and indicates the airspeed on a rolling number gauge using a moving tape. The airspeed indicator also displays speed ranges for different aircraft configurations, airspeed trends and 'V' speeds. If the airspeed indicator fails the display marks the airspeed display area with a red 'X' and yellow text spelling out 'AIRSPEED FAIL'.
Altimeter:	The altimeter is located at the top right of the display. The altimeter displays the aircraft altitude in feet on a rolling number gauge using a moving tape. The altimeter also shows an altitude 'bug' at the selected altitude or the edge of the tape, whichever is closest to the current altitude. If the altitude indicator fails the display marks the tape display area with a red 'X' and yellow text spelling out 'ALTITUDE FAIL'.
TAS:	True airspeed is digitally displayed in a small window below the airspeed indicator.

Barometric Pressure Indicator:	The barometric pressure indicator is located immediately below the altitude indicator. The indicator shows the barometric pressure that has been set in either inches of mercury (Hg) or hectopascal number (hPa).
Alerts Window:	The alerts window is located on the lower right side of the PFD. This window opens when an alert is activated or when the WARNINGS softkey is operated.
Warnings and Cautions Window:	The warnings and cautions window is located above the alerts window. This window opens when a warning or caution is activated or if the WARNING softkey is operated.
NAV MAP:	The NAV MAP window is located in the lower left of the PFD. The window is activated by pressing the INSET softkey and when activated shows a pictorial view of the airplane on a moving map.

The PFD has a self-monitoring system. If the self-monitoring system detects a fault the PFD enters reversionary mode. In the reversionary mode the PDF is configured to display the flight instrument symbology and the basic engine parameter monitoring indications. The PFD reversionary mode can also be entered by pressing the DISPLAY BACKUP selector. The DISPLAY BACKUP selector is located on the bottom of the audio control panel.

(2) Multi-Function Display (MFD)

The right side of the GDU 620 is the MFD. The MFD is a 6.5" liquid crystal display. The MFD provides detailed moving-map graphics of the aircraft’s current position in relation to ground features, chart data, navaids, flight plan routings and more. Built-in terrain and the obstacles databases provide color-coding and other visual cues to graphically alert the pilot when proximity conflicts loom ahead.

The MFD displays engine and aircraft pages on the left side of the screen. The remainder of the screen is used to display navigational pages.

B. GRS 77 Attitude and Heading Reference System (AHRS)

The GRS 77 is an attitude and heading reference unit, or AHRS, that provides aircraft attitude and flight characteristics information to the GDU 620. The unit contains advanced tilt sensors, accelerometers, and rate sensors. In addition, the GRS 77 interfaces with both the GDC 74A air data computer and the GMU 44 magnetometer. The GRS 77 also utilizes GPS signals sent from the GPS/WAAS receiver. Actual attitude and heading information is sent using ARINC 429 digital interface to the GDU 620.

C. GDC 74A Air Data Computer (ADC)

The GDC 74A air data computer receives information from the pitot/static system and the GTP 59 outside air temperature (OAT) sensor. The GDC 74A is responsible for providing pressure altitude, airspeed, vertical speed, and OAT information to the G500 system. The GDC 74A provides data to the GDU 620 and GRS 77 using ARINC 429 digital interfaces. The GDC 74A also communicates maintenance and configuration information to the GDU 620 using an RS-232 interface.

D. GMU 44 Magnetometer

The GMU 44 magnetometer senses magnetic field information. Data is sent to the GRS 77 AHRS for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77 and communicates with the GRS 77 using an RS-485 digital interface.

E. Databases

The GDU 620 utilizes the following databases:

- Basemap Database
- Navigation Database
- Terrain and Airport Terrain Databases
- Obstacles Database
- IGRF (International Geomagnetic Reference Field) model

With the exception of the Navigation database and IGRF model, which reside internal to the GDU 620, all databases are stored on a single SD memory card that is inserted into the bottom slot of the GDU 620. The following describe each database and how the databases are updated.

(1) Basemap Database

The basemap provides ground based references such as roads and bodies of water. The database is stored in internal memory of the GDU 620 display. The basemap does not have a scheduled update cycle and as such does not have an expiration date. The basemap database is updated very infrequently.

(2) Navigation Database

The Jeppesen Navigation Database provides the G500 system with the required information for displaying flight plan information. The GDU 620 utilizes a database stored on an SD memory data card for easy updating and replacement. The Navigation database may be updated by simply inserting an updated Navigation database update card into the top SD card slot in the front panel in the GDU 620. The actual database is downloaded into the unit, so the card can be removed after the update. Each card will only update one system. Alternately, the Navigation database may be updated by copying the database to the Garmin-supplied Supplemental Data card. It will be downloaded into the GDU 620 on first use, and the file can be left on the Supplemental Data card until the next update cycle. The navigation database on the GDU 620 database card is generated from current Jeppesen Sanderson data and converted to a format that is used by the GDU 620.

(3) Terrain and Airport Terrain Databases

The Terrain database is used to provide basic Terrain awareness functionality. There are two variants of the Terrain database – one lower-resolution Terrain database for terrain alerting, and one higher-resolution Terrain database for SVT (this higher-resolution database can also be used for terrain alerting, so only one Terrain database is required for any given installation). The Airport Terrain database provides higher resolution terrain information near most airports.

The terrain databases are updated by removing the database card from the GDU 620, updating the databases on the card and reinserting the card in the lower card slot on the GDU 620 front panel. The Terrain databases can be downloaded via the internet and the card programmed using the supplied SD card reader.

(4) Obstacles Database

The obstacle database provides identification of known obstacles greater than 200 feet AGL. This database is also used with Terrain awareness functionality. The obstacle database is updated by removing the database card from the GDU 620, updating the database on the card and reinserting the card. The Obstacle database can be downloaded via the internet and the card programmed using the supplied SD card reader.

(5) IGRF Model

The IGRF model is contained in the GRS 77 and is only updated once every five years. The IGRF model is part of the Navigation Database. At system power-up, the IGRF models in the GRS 77 and in the Navigation Database are compared, and if the IGRF model in the GRS 77 is out of date, the user is prompted to update the IGRF model in the GRS 77. The prompt will appear after the G500 splash screen is acknowledged on the MFD.

Figure 1 - Garmin G500 Integrated Display System

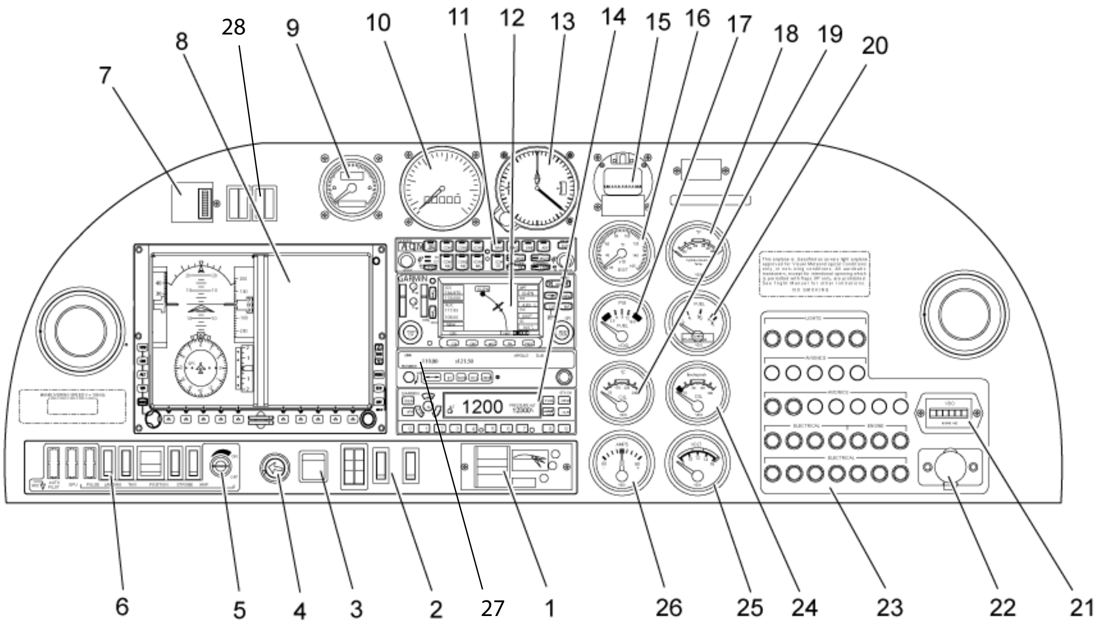

Figure 2 - Instrument Panel with G500 Display

Legend:

1.	Flap Switch		- LANDING Light Switch	16.	Exhaust Gas Temperature
2.	Master Switch Panel		- Optional Switch*	17.	Fuel Pressure Indicator
	- AVIONICS MASTER		- EPU*	18.	Cylinder Head Temperature
	- FUEL PUMP Switch		- Auto Pilot*	19.	Oil Temperature Indicator
	- GEN/BAT Switch	7.	Trim Indicator	20.	Fuel Quantity Indicator
3.	Fuel Prime	8.	GDU 620 Display	21.	Hourmeter
4.	Ignition Switch	9.	Engine RPM	22.	Aux Power Outlet
5.	Instrument Light Switch	10.	Air Speed Indicator	23.	Circuit-Breaker Panel
6.	Light Switch Panel	11.	GMA 340	24.	Oil Pressure Indicator
	- MAP	12.	GNS 430W	25.	Voltmeter
	- STROBE Light Switch	13.	Altimeter	26.	Ammeter
	- POSITION	14.	GTX 330	27.	SL 40 (COM 2)
	- TAXI Light Switch	15.	Magnetic Compass	28.	Warning Lights

NOTE: Items marked * are options

- Auto Pilot
- EPU
- Pulse Lights

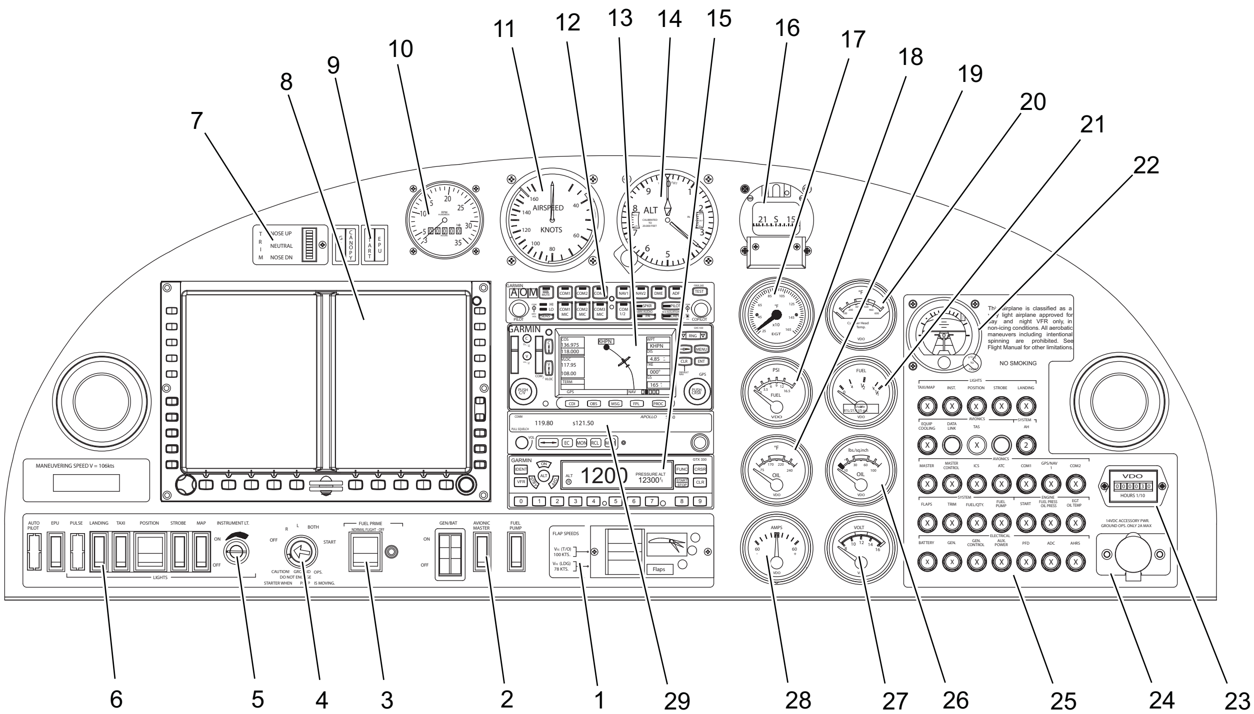

Figure 3 - Instrument Panel with G500 Display (Optional Artificial Horizon Indicator)

Legend:

1. Flap Switch
2. Master Switch Panel
   - AVIONICS MASTER
   - FUEL PUMP Switch
   - GEN/BAT Switch
3. Fuel Prime
4. Ignition Switch
5. Instrument Light Switch
6. Light Switch Panel
   - MAP
   - STROBE Light Switch
   - POSITION
   - TAXI Light Switch
   - LANDING Light Switch
   - Optional Switch*
   - EPU*
   - Auto Pilot*
7. Trim Indicator
8. GDU 620 Display
9. Warning Lights
10. Engine RPM
11. Air Speed Indicator
12. GMA 340
13. GNS 430W
14. Altimeter
15. GTX 330
16. Magnetic Compass
17. Exhaust Gas Temperature
18. Fuel Pressure Indicator
19. Cylinder Head Temperature
20. Oil Temperature Indicator
21. Fuel Quantity Indicator
22. Artificial Horizon Indicator
23. Hourmeter
24. Aux Power Outlet
25. Circuit-Breaker Panel
26. Oil Pressure Indicator
27. Voltmeter
28. Ammeter
29. SL 40 (COM 2)

NOTE: Items marked * are options

- Auto Pilot
- EPU
- Pulse Lights

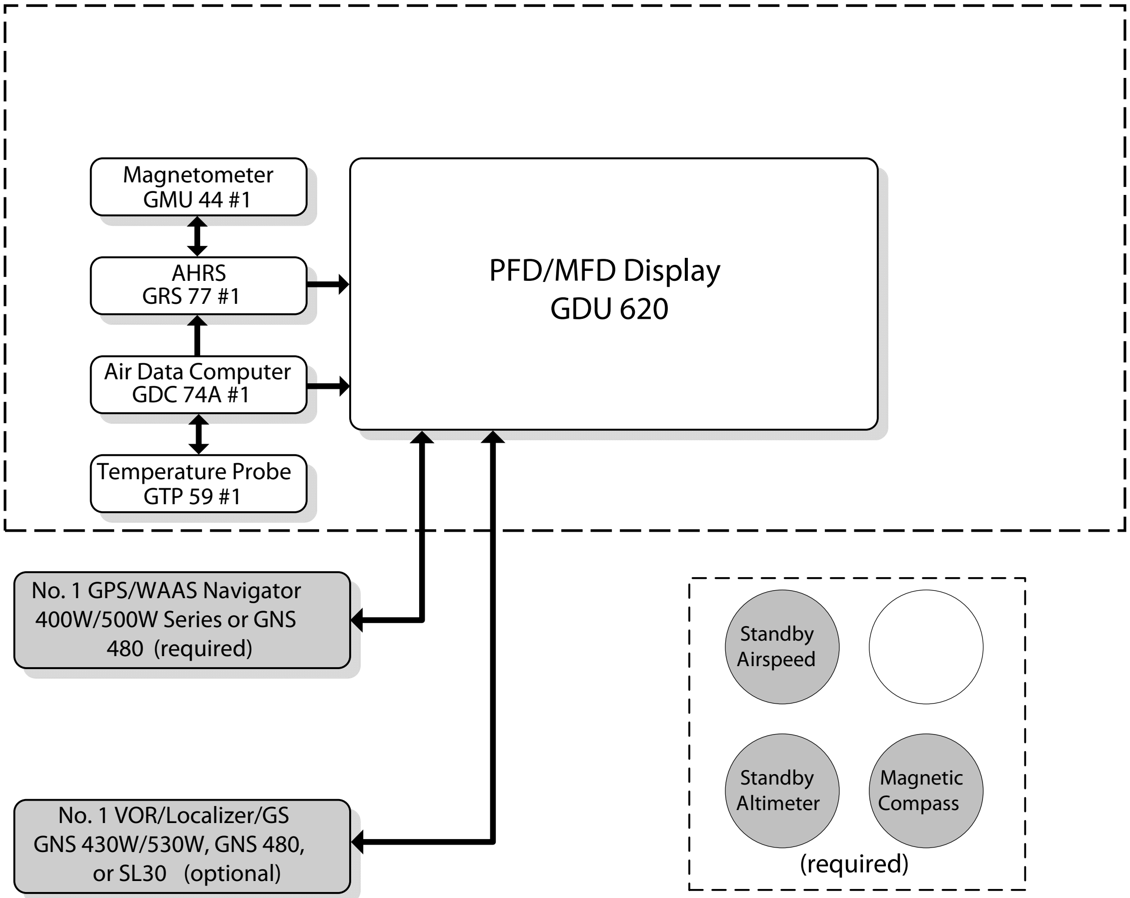

Figure 4 - G500 System Overview with Optional and Required Equipment

GARMIN G500 - TROUBLESHOOTING

NOTE: This pageblock is applicable to aircraft with Standard Mod 0232 installed.

1. General

This table explains how to troubleshoot the GDU 620 display. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Unit does not power up - blank screen.	Improper wiring; circuit breaker open.	Make sure that the power is properly wired to the GDU 620 and the circuit breaker is closed.
	Unit intensity turned down.	Make sure that the unit is not in manual intensity control mode with the intensity turned down.
All expected configuration pages are not displayed.	An installer unlock card is not inserted into the GDU 620.	Insert the installer unlock card P/N 010-00769-60 into the bottom slot of the GDU 620 and cycle power.
The GDC OAT probe type shows up as UNKNOWN.	The RS-232 connection to the GDC 74A is not working.	Make sure that the GDC 74A RS-232 connection to the GDU is properly wired, and that the GDC 74A circuit breaker is closed.
When loading software, the LRU software is not being displayed on the SOFTWARE UPLOAD page.	The software loader card is installed in the bottom slot of the GDU 620.	Insert the loader card in the top slot and cycle power to the GDU.
	The software loader card contains no information.	Repeat the process for making the software loader card.
Configuration errors are displayed on power-up, before the GDU enters normal mode.	The configuration module has not been updated.	Update the configuration module.
Vertical GPS deviation is not displayed on the GDU 620.	For the GNS 400W unit, the ARINC 429 vertical deviation labels are not being	Enable Labels on the GNS 400W unit ARINC 429 configuration page.
Unable to control the GPS course when in OBS mode.	The GPS navigator is not correctly configures as LNAV1/2 or SYS1/2.	Configure the ARINC 429 inputs/outputs for LNAV1 (SYS1) or LNAV2 (SYS2) based upon whether the navigator is GPS1 or GPS2.

TROUBLE	POSSIBLE CAUSE	REPAIR
Data is not being received from an ARINC 429 device. (valid data is being received on the 429 input port as shown on the GDU 620 PORT MONITORING page)	ARINC 429 bus hi and low are swapped. Wrong device is connected to port on GDU 620.	Verify wiring. Use correct ports.
Data is not being received from an ARINC 429 device. (no data is being received on the 429 input port as shown on the GDU 620 PORT MONITORING page)	On the transmitting LRU, the ARINC 429 transmitter speed is not set correctly. Wiring is not correct.	Set the ARINC 429 transmitter speed to correct speed. Check for continuity/shorts and correct as required.
Attitude and heading on GDU 620 red ‘X’ / GRS 77 resets during air data ground testing.	Attitude and heading errors/ resets are possible if the air data tests are conducted indoors without a good GPS signal. With marginal or no GPS signals present, sudden changes in airspeed caused by using a pressure tester may result in attitude and heading errors and possibly cause the GRS 77 to reset. This occurs because the artificial changes in airspeed cause disagreement with the other sensor measurements internal to the GRS 77. This sensor disagreement will not occur in the normal conditions of flight.	This is expected behavior and no troubleshooting is required if this occurs. To reduce the chances of inducing attitude and heading errors/resets while conducting the air data tests, ensure that the G500 is receiving good GPS signals.
Heading red ‘X’ during air data ground testing.	Invalidation of heading is possible if the air data tests are conducted indoors, due to typical magnetic anomalies, even with a good GPS signal.	This is expected behavior and no troubleshooting is required if this occurs.

2. Garmin G500 Alerts

The Garmin G500 will display a number of alerts on the GDU 620 MFD. The following table lists those alerts.

ALERT TEXT	CAUSE	SOLUTION
AHRS1 GPS - AHRS 1 using backup GPS source.	AHRS is using the backup GPS information.	
AHRS1 GPS - AHRS is not receiving any GPS information.	AHRS is not receiving any GPS information.	
AHRS1 GPS - AHRS 1 operating in exclusively in no-GPS mode.	AHRS is not receiving any GPS information.	Make sure that at least one GPS has acquired a valid position.
		If GDU 620 does not have a valid position, verify wiring between GDU and GPS receiver, and configuration of GDU 620 and GPS receiver.
		If GDU has a valid GPS position, verify wiring between GDU and GRS. Also verify time mark wiring.
AHRS1 GPS - AHRS 1 not receiving backup GPS information.	AHRS is not receiving GPS information from GPS2.	
AHRS1 SRVC	AHRS magnetic field model should be updated. Appears on ground only.	Update GRS 77 IGRF model.
AHRS1 TAS	AHRS is not receiving true air-speed from ADC.	GDC not powered up. Close ADC circuit breaker.
		GDC not receiving input from GTP 59 OAT probe. Verify wiring is correct.
		ARINC 429 connection from GDC 74A to GRS 77 is not working. Verify wiring is correct.
CAL LOST	Registry reports that it has lost calibration data.	Contact Garmin Technical Support.
CNFG MODULE	The configuration module is inoperative.	Verify wiring to configuration module.
		Replace configuration module.
DATA LOST	Pilot stored data was lost. Recheck data and settings.	

ALERT TEXT	CAUSE	SOLUTION
FAN FAIL	Fan has reported 0 RPM when it was powered with a PWM duty cycle higher than or equal to 10%.	
GDL 69 CONFIG	The GDL 69 configuration information stored in the GDL69 and the GDU 620 configuration module do not match.	With the GDU 620 in configuration mode, go to the GDL 69 page in the GDL page group. Verify that the SET and ACTIVE configuration settings are the same. If not, use the SET>ACTV soft key to copy the configuration settings from the GDU 620 into the GDL 69.
	The GDL 69 configuration was updated using another LRU (e.g. the GNS 400W).	Update the GDL 69 configuration using the GDU 620.
GDU CONFIG	This error appears whenever the GDU is replaced with a GDU that was configured for a different installation.	Cycle power to the GDU. This error automatically clears on the second power up with a different configuration module.
	Error in the configuration of the GDU 620.	
GDU COOLING	GDU has poor cooling, and power usage is being reduced.	Make sure that the fan on the GDU is functioning
		Make sure that the fan on the GDU is not obstructed.
GDU DB ERR	Error in specific database, where GDU DB denotes specific database.	
GDU VOLTAGE	GDU supply voltage is below 12 VDC.	Increase the voltage above 12VDC.
GEO LIMITS	Location is too far north/south for GRS 77 magnetic compass.	
GPS FAIL	No GPS data is available.	Make sure that the GPS is turned on.
		Verify RS-232 wiring from the GPS to GDU 620.
HDG FAULT	AHRS magnetometer fault has occurred.	GRS 77 not receiving information from GMU 44. Verify wiring to GMU 44.

ALERT TEXT	CAUSE	SOLUTION
HDG LOST	Heading from the GRS77/ GMU 44 is not valid.	Caused by a local magnetic anomaly. No action required.
<LRU> SERVICE	Specific LRU should be serviced, where <LRU> denotes specific LRU.	Return indicated LRU to Garmin for service.
MANIFEST	GDU has received product data for an LRU that should have a manifest entry, but is not in the manifest.	Make sure that the manifest is properly configured.
	The LRU software P/N and version number in the manifest does not match the values being reported by that LRU.	Update the LRU software to match the manifest.
		Update the manifest to match the LRU software
NAV FAIL	No navigation receiver data.	
SIMULATOR	The simulator mode is active.	Make sure that the P6202-36 is not grounded.
SVT DISABLED - Out of available terrain region.	Location is beyond region covered by terrain database.	
SVT DISABLED - Terrain DB resolution too low.	A 30 arc-second terrain database is being used.	Update the Supplemental Data card with the 9 arc-second terrain database.
SW MISMATCH	GDU software version strings do not match.	
TRAFFIC FAIL	The traffic information system has failed.	The GDU 620 is not receiving traffic information from the traffic sensor. Verify wiring between GDU 620 and traffic sensor.
		The GDU 620 is receiving information from the traffic sensor, but the information is indicating that the traffic sensor has failed. Troubleshoot traffic system.
TRK LOST	GPS1 TRK lost. HSI defaulted to GPS2 TRK.	
TRK TRAFFIC	Heading Lost. Traffic is now based on track.	See HDG errors.

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GARMIN G500 - MAINTENANCE PRACTICES

NOTE: This pageblock is applicable to aircraft with Standard Mod 0232 installed. Additional maintenance instructions are contained in Garmin G500™ Avionics System Maintenance Manual Document Number 190-00601-05.

1. General

The following maintenance procedures describe how to remove and install the following components of the Garmin G500 integrated display system. They do not describe how to maintain the components:

- GDU 620 Display
- GDC 74A Air Data Computer (ADC)
- GRS 77 Attitude, Heading and Reference Unit (AHRS)
- GMU 44 Magnetometer
- GTP 59 Temperature Probe.

For more data about maintaining the equipment, refer to the G500™ Avionics System Maintenance Manual. Refer to Chapter 92 for the Garmin G500 wiring diagram.

NOTE: Whenever removing or replacing units, remove power from the LRU by removing aircraft power or opening the LRU circuit breaker.

2. Remove/Install the GDU 620 Display

A. Remove the GDU 620 Display

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the PFD circuit-breaker.	7.5 amps on electrical bus.
3.	Remove the display unit: - Remove the six mounting screws that attach the display to the instrument panel. - Pull the GDU 620 display unit far enough out from the instrument panel to gain access to the three rear connectors. - Disconnect the three rear connectors. - Remove the GDU 620 display.	

B. Install the GDU 620 Display

	Detail Steps/Work Items	Key Items/References
1.	Open the PFD circuit-breaker.	7.5 amps on electrical bus.
2.	Install the GDU 620 display unit: - Visually inspect the connectors to make sure that there are no bent or damaged pins. - Connect the three rear connectors to the display unit. - Place the GDU 620 display into place. - Install the six mounting screws that attach the display unit to the instrument panel.	 Make sure that each slide lock is secured on both sides.
3.	Close the PFD circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Energize the GDU 620 in configuration mode.	Refer to Garmin G500 STC AML Installation Manual, Document No. 190-01102-06, latest revision.
6.	Verify that the configurations settings match those recorded in the check out log.	
7.	Energize the GDU 620 in normal mode.	
8.	Verify that there are no red-“X” and that no alerts are present.	If red-”X” or alerts are present, troubleshoot the system.

NOTE: The installation configuration settings are stored in the configuration module and will be retained when the GDU 620 display is replaced with a new unit. User settings, such as map orientation preferences, are stored internally and will be lost when the GDU 620 is replaced with a new unit.

NOTE: If the original GDU 620 display is reinstalled, then no software loading is required. This does not include units that were returned for repair as their software and configuration files are deleted during the repair process. No configuration is required. Verify that the configuration is correct using the previously completed checkout log.

NOTE: If the GDU 620 display is replaced with a new, repaired, or exchange unit then software must be loaded. No configuration is required.

3. Remove/Install the GDC 74A Air Data Computer (ADC)

A. Remove the GDC 74A Air Data Computer (ADC)

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft main battery.	Refer to AMM Chapter 24-31.
2.	Open the ADC circuit-breaker.	5 amp electrical bus.
3.	Remove the instrument panel cover.	
4.	Disconnect the pitot/static plumbing from the rear of the unit.	
4.	Disconnect the single connector.	
5.	Remove the GDC 74A: - Loosen each thumbscrew on the hold-down clamp and remove the clamp. - Carefully remove the unit from the mount.	

B. Install the GDC 74A Air Data Computer (ADC)

	Detail Steps/Work Items	Key Items/References
1.	Place the GDC 74A unit in the mounting tray.	
2.	Install the GDC 74A: - Position the locking clamp and install using the thumbscrews - Connect the pitot/static plumbing - Install the Pitot/Static tubes to the unit. - Visually inspect the connectors to make sure that there are no bent or damaged pins. - Connect the connector to GDC 74A.	Repair any damaged pin. Make sure that each side lock is secured on both sides.
3.	Close the ADC circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Energize the G500 system with GDU 620 in normal mode.	

	Detail Steps/Work Items	Key Items/References
6.	Verify that the GDU 620 display valid air data within approximately one minute.	
7.	Verify that no unexpected alerts are present.	If alerts are present, troubleshoot the system.
8.	Do pitot/static leak test and observe the airspeed, altitude, and vertical speed for proper operation.	Refer to AMM Chapter 34-10.

4. Remove/Install the GRS77 Attitude, Heading and Reference Unit (AHRS)

A. Remove the GRS77 Attitude, Heading and Reference Unit (AHRS)

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the AHRS circuit-breaker.	5 amp electrical bus.
3.	Open the access panel in the aft baggage compartment.	
4.	Remove the GRS77:	
	- Disconnect the GRS77 connector	
	- Remove the four thumbscrews that attach the GRS77 to the mounting plate.	
	- Gently lift the GRS77 from the mounting plate.	If the supports for the mounting plate are removed, the GRS77 must be recalibrated.

B. Install the GRS77 Attitude, Heading and Reference Unit (AHRS)

	Detail Steps/Work Items	Key Items/References
1.	Install the GRS77 unit:	
	- Place the GRS77 on the mounting plate.	Make sure that the orientation is correct.
	- Install the four thumbscrews that attach the GRS77 to the mounting plate.	Torque to 22 - 25 lbf-in (0.15 - 0.18 Nm)
	- Visually inspect the connectors to make sure that there are no bent or damaged pins.	Repair any damaged pin.
	- Connect the connector to GRS77.	Make sure that each side lock is secured on both sides.

	Detail Steps/Work Items	Key Items/References
2.	Close the access panel in the aft baggage compartment.	
3.	Close the AHRS circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Energize the G500 system with GDU 620 in normal mode.	
6.	Verify that the GDU 620 display valid heading and attitude within approximately one minute.	Note that heading can remain invalid if the magnetometer is near large metal structure such as a hanger wall or if the magnetometer is close to a large ground power cart.
7.	Verify that no unexpected alerts are present.	If alerts are present, troubleshoot the system.

NOTE: If the original GRS 77 is reinstalled, then no software loading is required. This does not include units that were returned for repair as their software and configuration files are deleted during the repair testing process.

NOTE: If the GRS 77 Configuration Module is replaced, the GRS 77 must be re-calibrated.

5. Remove/Install the GMU 44 Magnetometer

A. Remove the GMU 44 Magnetometer

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the AHRS circuit-breaker.	5 amp electrical bus.
3.	Open the access panel in the aft baggage compartment.	
4.	Remove the GMU 44 magnetometer: - Gain access to the GMU 44 magnetometer - Remove the three screws that attach the magnetometer to the mounting plate - Carefully lift the GMU 44 from the plate - Disconnect the wiring harness.	
4.	Remove the GMU 44 magnetometer.	

B. Install the GMU 44 Magnetometer

	Detail Steps/Work Items	Key Items/References
1.	Install the GMU 44 magnetometer: - Visually inspect the connectors to make sure that there are no bent or damaged pins. - Connect the wiring harness to the GMU 44 magnetometer. - Lower the GMU 44 into the mounting plate - Install the 3 screws that attach the GMU 44 magnetometer to the mounting plate.	 Repair any damaged pin. At the in-line connector.
2.	Close the access panel in the aft baggage compartment.	
3.	Close the AHRS circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Energize the G500 system with GDU 620 in normal mode.	
6.	Verify that the GDU 620 displays valid heading within approximately one minute.	Note that heading can remain invalid if the magnetometer is near large metal structure such as a hanger wall or if the magnetometer is close to a large ground power cart.
7.	Verify that no unexpected alerts are present.	If alerts are present, troubleshoot the system.

6. <u>Remove/Install the Temperature Probe (GTP 59)</u>

C. Remove the Temperature Probe (GTP 59)

	Detail Steps/Work Items	Key Items/References
1.	Remove the nut and the washer that attach the GTP 59 temperature probe to the access panel.	
2.	Remove the GTP 59 carefully from NACA.	

D. Install the Temperature Probe (GTP 59)

	Detail Steps/Work Items	Key Items/References
1.	Place the GTP 59 temperature probe into position in the access panel.	
2.	Install the washer and the nut that attach the GTP 59 temperature probe.	
3.	Tighten the nut.	

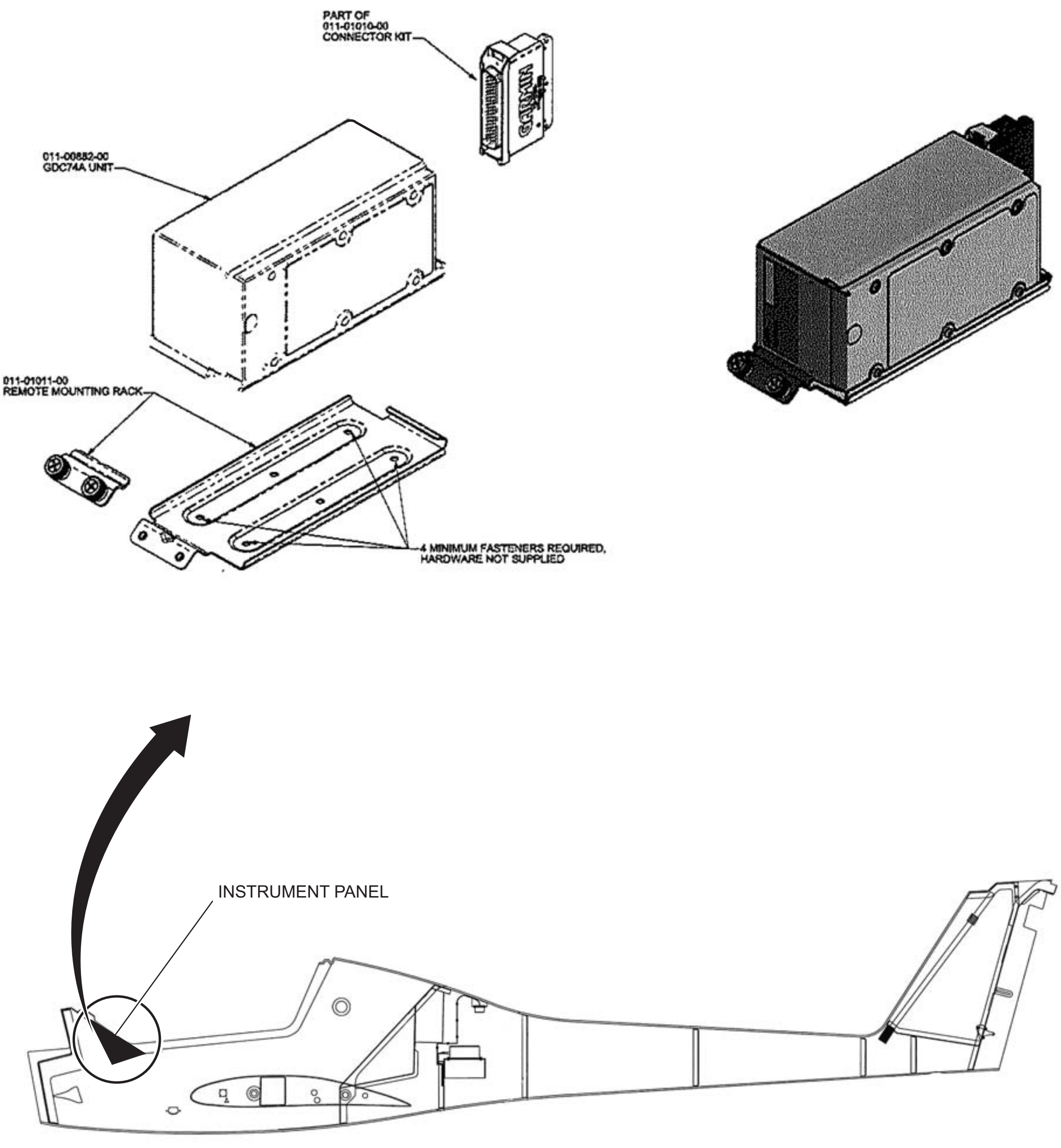

Figure 201 - GDA 74A Air Data Computer (ADC) Installation

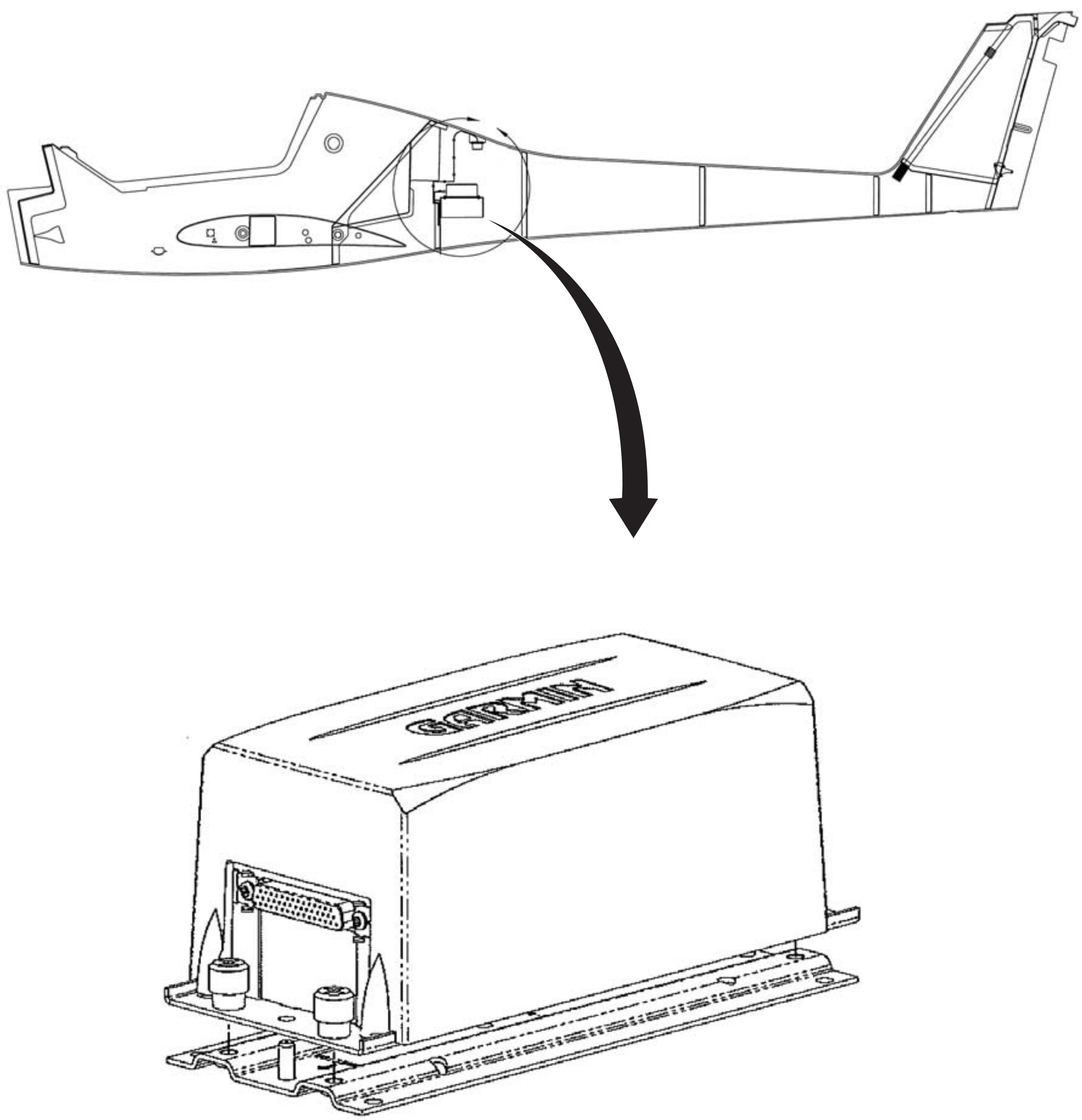

Figure 202 - GRS 77 Attitude, Heading and Reference System (AHRS) Installation

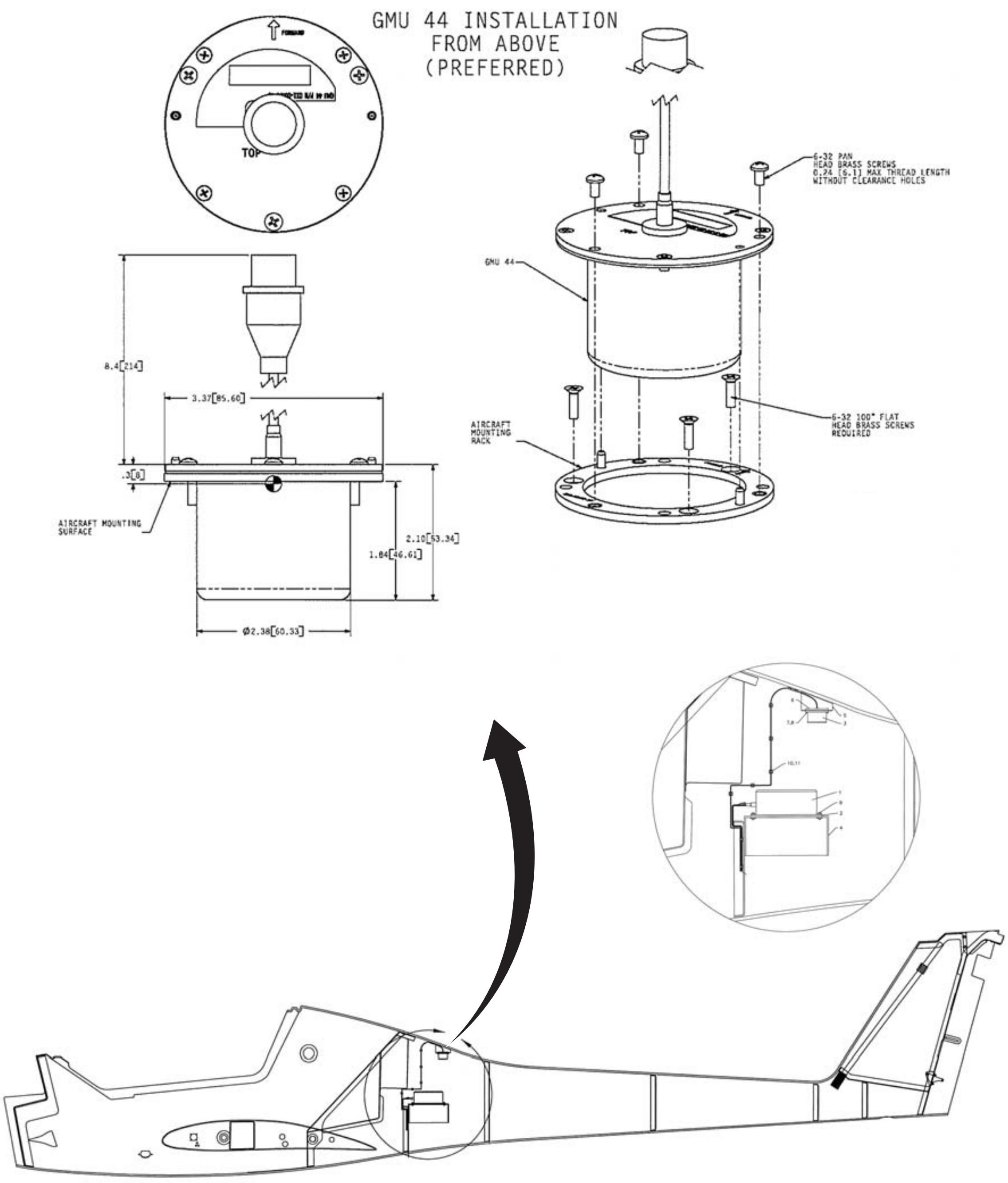

Figure 203 - GMU 44 Magnetometer Assembly Installation

TRAFFIC ADVISORY SYSTEM (TAS) 600 - TROUBLESHOOTING

NOTE: This pageblock is applicable to aircraft with Standard Mod 0190 (Active Traffic System Installation) and Mod 0241 (Garmin 500 with TAS 600 Integration) installed. If traffic on the Traffic Advisory System (TAS) correlates with visual estimates of the range and bearing of nearby aircraft, the requirements for continued airworthiness are met.

1. General

This table explains how to troubleshoot the TAS 600. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
The TAS displays its own transponder. The suppression circuit is disabled.	Internal Suppression fuse is blown.	Check by verifying continuity between the suppression pin and case ground.
	The DME diode is installed backwards, or it is installed unnecessarily.	
	DME diode is not installed when it should be.	
	Open suppression line.	If the circuit is open, the suppression line is open. The processor must be returned to Avidyne for repair. Verify that the circuit is not shorted before reinstalling the Processor.
Erroneous host aircraft altitudes, asterisks instead of an altitude display, or voice annunciation of “Altitude Data Invalid”.	The altitude lines for shorted or open connections.	Make sure the altitude encoder ground on J1 is properly connected to the altitude encoder.
Annunciator light is on all the time.	The annunciator light will remain illuminated when other failure conditions are present.	Check for other failure conditions, such as altitude data invalid (double press the mute button to check this while in Ground Mode)

TROUBLE	POSSIBLE CAUSE	REPAIR
Whine in the audio caused by the TAS.	The TAS audio return line is not connected to the TAS audio port at the Audio Panel.	Check the primary source of the audio noise. Reduce the noise from this source as required. If the problem persists, shield the encoder lines and the audio line. Normally the shield is grounded at one end for optimum effectiveness. Sometimes grounding at both ends is the most effective arrangement. If audio interference is still a problem, contact the factory.
TAS bearing shows opposite to the traffic forward and aft, and it shows correctly left and right.	The antenna coaxes for the single-blade antenna are backwards.	Check the antenna connections; J1 on the antenna connects to J1 on the TAS processor.
TAS bearing shows opposite to the traffic left and right, and it shows correctly forward and aft.	The antenna coaxes for the twin-blade antenna are backwards.	Check the antenna connections.
TAS bearing shows opposite to the traffic sometimes, but not always.	If the traffic shows incorrect bearing sometimes, then one coax is shorted or open.	If the problem is left or right, check the twin-blade antenna coax connectors. If the problem is front or aft, check the single-blade coax connectors.
TAS bearing is unreliable and traffic on the display moves all around. Multiple targets appear on the display, and then disappear.	Determine if the transponder or DME causes the problem.	Check for proper and secure coaxial cables and connectors and verify the antennas are at least the minimum distance identified in the TAS Installation Manual.
TAS never shows distant traffic beyond ten miles away.	Determine if the transponder or DME causes the problem.	Check for proper and secure coaxial cables and connectors and verify the antennas are at least the minimum distance identified in the TAS Installation Manual.
TAS displays the onboard transponder.	Open suppression line.	Check the suppression connection.

TRAFFIC ADVISORY SYSTEM (TAS) 600

NOTE: This pageblock is applicable to aircraft with Standard Mod 190 (Active Traffic System Installation) and Mod 241 (Garmin 500 with TAS 600 Integration) installed. If traffic on the Traffic Advisory System (TAS) correlates with visual estimates of the range and bearing of nearby aircraft, the requirements for continued airworthiness are met.

1. General

The DA20-C1 has an optional installation of Traffic Advisory System (TAS) 600 integrated with the Garmin G500 display system. The system presents active surveillance traffic detection to the flight deck of the aircraft.

For more detailed data about this system and the installation, refer to Avidyne TAS 600 Installation Manual, Part Number 32-2351, latest revision.

For more detailed data about this integrated display system, refer to the Garmin G500 Pilot's Guide for the DA20-C1 aircraft.

The TAS system installed in DA20-C1 aircraft can have the option of installing either the TAS600, TAS610 or TAS620 processor unit.

The TAS 600 consists of the following items:

- Processor
- Transponder Coupler
- Top Antenna
- Bottom Antenna.

2. Description

Refer to Figure 1 for TAS system components.

The TAS 600 is actively interrogating on-board air traffic detection systems used to identify potential collision threats. The TAS computes relative altitude and range of threats from nearby transponder-equipped airplanes. Airplanes with non-Mode C transponders can provide range information. The TAS does not detect airplanes without an operating transponder.

Active-surveillance is vital for traffic systems to provide a full measure of safety in busy terminal areas as well as in non-radar airspace.

Avidyne's TAS 600 system detects and actively interrogates other aircraft transponders within range, displays the surrounding traffic on a host of compatible display systems, and provides audible and visual alerts in the event of a potential traffic conflict. The TAS 600 system provides real-time traffic monitoring and advisories, are not radar-coverage limited, and operates independent of ground-based systems.

TAS 600 system features a 7nm range, a 3,500-foot vertical separation maximum and 18,500 ft service ceiling.

3. Operation

TAS 600 system provides traffic advisories by calculating range, bearing, and altitude of intruder aircraft relative to the host aircraft.

It provides a graphical overlay view and traffic depiction with TCAS symbology on display systems from the Garmin's G500.

The TAS 600 system is designed to meet the specific needs of the aircraft, providing a full 30-second decision time at a closure rate of up to 1200 knots. TAS 600 traffic system interrogates transponders from the nearby aircraft within their respective coverage volume.

It provides a warning to the flight crew when the calculated time to closest approach (CPA) of any intruder and the protected area around the aircraft reaches the 30-second threshold.

A. Processor

The TAS processor communicates to the Garmin G500 system which indicates nearby traffic on the MFD. All functions of the TAS are controlled through the MFD.

B. Transponder Coupler

The transponder coupler is mounted on the remote avionic box of the Garmin G500 system. The transponder coupler supplies the processor with a signal indicating the on-board transponder is transmitting a reply.

C. Antennas

The TAS has two directional antennas. The top antenna is located on top of the fuselage behind the cabin, and the bottom antenna is located on the fuselage bottom.

The TAS 600 system provides the following three levels of alert, so pilots can monitor traffic before it ever becomes a threat. Each of these alerts also provides an altitude separation number and may also include an Arrow pointing up or down denoting that the target is climbing or descending at a rate of 500 feet per minute or greater.

- **Other Traffic** (OT) - Depicted as a hollow Cyan (or White) Diamond and represents traffic that is within the TAS's surveillance area but it is beyond 6nm in range and has an altitude greater than ±1200 feet relative to your aircraft and is not an immediate threat.

- **Proximity Alert** (PA) - Depicted as a solid Cyan (or White) Diamond on the traffic display, when the traffic is within a distance of 6nm range and its altitude is within ±1200 feet, but it is still not considered a collision threat.

- **Traffic Alert** (TA) – Depicted as a solid Yellow Circle, a TA is displayed and an automated voice alert is activated when the calculated intercept course for altitude and direction is within 30 seconds, less than 0.55 nm and less than ±800 ft.

4. Integration with Garmin G500

When TAS 600/610/620 is integrated with the Garmin G500 display system, the Traffic group selection from the Map Setup Page Menu allows the pilot to customize the display of traffic on the Navigation Map. The Traffic function requires the installation of the appropriate traffic device. When the aircraft has a TAS unit installed, the GDU 620 is configured for TAS. If no TAS unit is installed and a GTX Mode-S transponder is installed then the GDU 620 will be configured for Traffic Information System (TIS). The pilot can tell which data is being displayed by the label in the top left corner (TAS OPERATING vs TIS OPERATING). TIS data comes from a GTX transponder. TAS data comes from the TAS unit. Coverage follows the airplane. In the Navigation Map page setup the pilot can select the maximum range at which traffic symbols are shown. Once outside of the selected range, traffic will be decluttered. The Traffic soft key will still be available.

The table below shows the Navigation Map Traffic options:

Traffic Selection	Display Result
Off	No traffic is displayed.
All Traffic	All types of traffic are displayed.
TA/PA	Traffic Alerts and Proximity Alerts are displayed.
TA only	Traffic Alerts only is displayed.

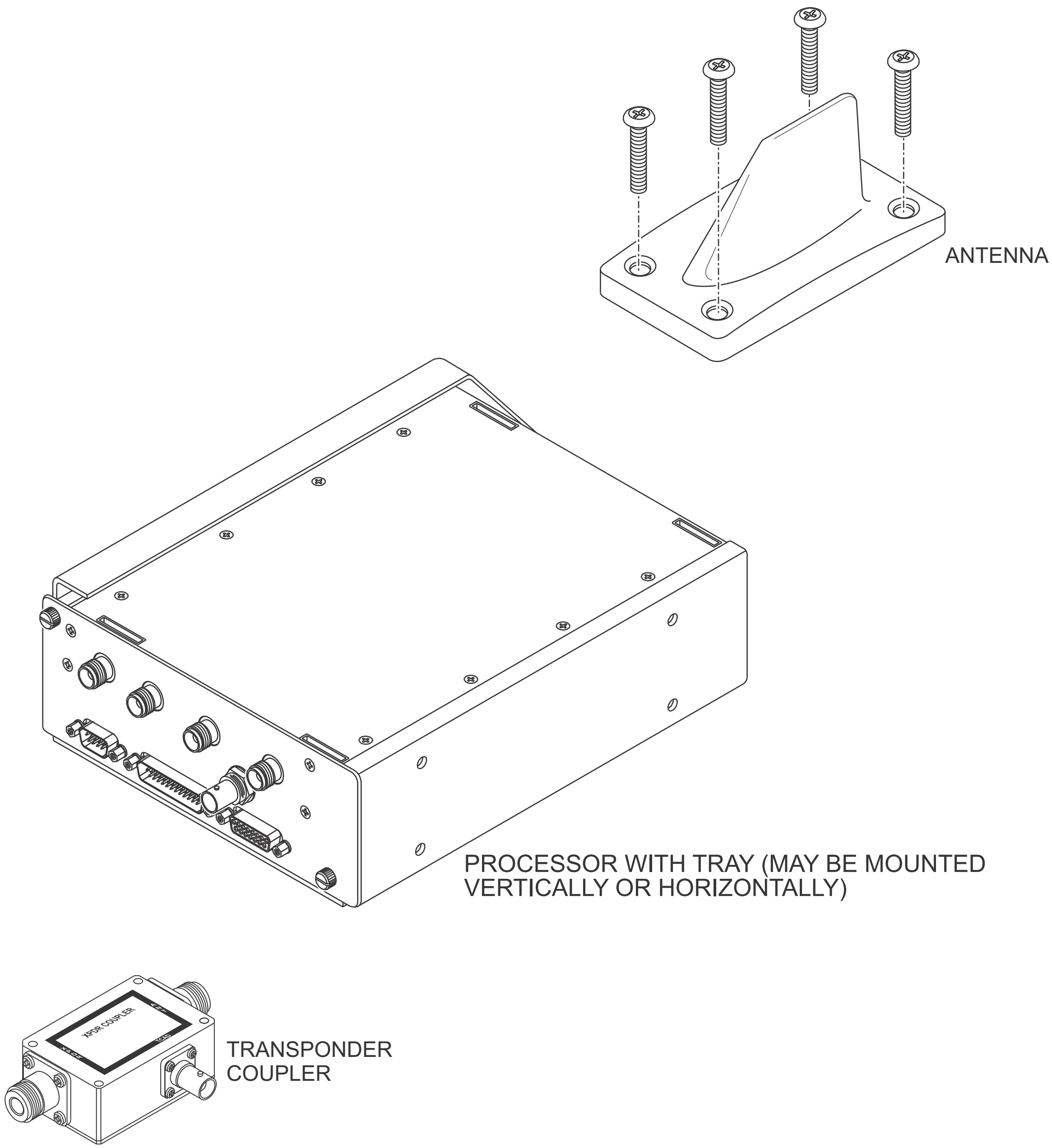

Figure 1 - TAS System Components

TRAFFIC ADVISORY SYSTEM (TAS) 600 - MAINTENANCE PRACTICES

NOTE: This pageblock is applicable to aircraft with Standard Mod 190 (Active Traffic System Installation) and Mod 241 (Garmin 500 with TAS 600 Integration) installed. If traffic on the Traffic Advisory System (TAS) correlates with visual estimates of the range and bearing of nearby aircraft, the requirements for continued airworthiness are met.

1. General

The following maintenance procedures describe how to remove and install the following components of the TAS 600 system. They do not describe how to maintain the components:

- TAS600/TAS610/TAS620 Processor Unit
- TAS Transponder Coupler
- TAS Antenna (Single Blade and Twin Blades)

For more data about maintaining the equipment, refer to Avidyne TAS 600 Installation Manual, Part Number 32-2351, latest revision.

NOTE: Whenever removing or replacing units, remove power from the LRU by removing aircraft power or opening the LRU circuit breaker.

2. Remove/Install the TAS 600 Processor Unit

A. Remove the TAS 600 Processor Unit

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the TAS circuit-breaker.	Instrument panel.
3.	Remove the processor unit: - Disconnect the connectors and antenna cables from the TAS processor. - Loosen the diagonal retaining screws that attach the processor to the mounting tray. - Slide the TAS processor unit from the mounting tray. - Remove the processor unit.	Refer to Figure 201. Along the rails.

B. Install the TAS 600 Processor Unit

	Detail Steps/Work Items	Key Items/References
1.	Open the TAS circuit-breaker.	
2.	Install the TAS processor unit: - Slide the TAS processor unit into the mounting tray. - Install the mounting screws that attach the processor unit to the mounting tray.	Refer to Figure 201.
CAUTION: WRONG CONNECTION OF THE ANTENNA CABLES WILL LEAD TO A WRONG INDICATION.		
	- Visually inspect the connectors to make sure that there are no bent or damaged pins. - Connect the connectors and the antenna cables to the TAS processor unit.	
3.	Close the TAS circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Do an operational test of the Trafiic Advisory System.	Refer to Avidyne TAS 600 Installation Manual, Part Number 32-2351, latest revision.

3. Remove/Install the TAS Transponder Coupler

A. Remove the TAS Transponder Coupler

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the TAS circuit-breaker.	Instrument panel.
3.	Remove the transponder coupler: - Disconnect the coaxial cable to the TAS processor unit. - Disconnect the coaxial pigtail to the TAS antenna. - Disconnect the coaxial cable to the TAS transponder.	Refer to Figure 201.
	- Remove the screws that attach the transponder coupler. - Remove the transponder coupler.	Hold the transponder coupler. Install dust caps to all connections.

B. Install TAS Transponder Coupler

	Detail Steps/Work Items	Key Items/References
1.	Open the TAS circuit-breaker.	
2.	Install the Transponder Coupler: - Remove the dust covers from all connections. - Place the transponder coupler into place. - Connect the coaxial cable from the TAS processor unit. - Connect the coaxial cable from the TAS antenna. - Connect the coaxial cable from the TAS transponder.	Refer to Figure 201. Make sure that the coupler is properly mounted and the connectors on the transponder antenna cable is properly installed. The RF cable must be intact and it should have no bends that exceed the natural radius of the cable. Do not bundle the Coupler output line with any pulse transmission lines
3.	Close the TAS circuit-breaker.	
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Do an operational test of the Trafiic Advisory System.	Refer to Avidyne TAS 600 Installation Manual, Part Number 32-2351, latest revision.

4. Remove/Install the TAS Antenna

A. Remove the TAS Antenna

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Open the TAS circuit-breaker.	Instrument panel.
3.	Remove the baggage compartment if the top antenna is replaced.	Refer to AMM Chapter 25-50.
4.	Remove the pilot's seat if the bottom antenna is replaced.	Refer to AMM Chapter 25-10.
5.	Disconnect the co-axial cable from the antenna that you will replace.	At the antenna.
3.	Remove the antenna: - Remove the four screws that attach the antenna to the structure. - If necessary, use a knife to carefully remove the sealant that seals the antenna to the airplane outer surface. - Remove the antenna.	Refer to Figure 201. Hold the antenna. Make sure that you do not damage the airplane surface.

B. Install TAS Antenna

	Detail Steps/Work Items	Key Items/References
1.	Open the TAS circuit-breaker.	
2.	Make sure that the contact surfaces of the antenna and the ground plane where the antenna will be installed are clean and free of grease.	
2.	Install the Antenna: - Install the four screws that attach the antenna to the airplane. - Apply the sealant around the edge of the antenna base and aircraft skin and smoothen the sealant. - Remove any excess sealant that has been forced out of the joint between the antenna and the airpalne surface.	Refer to Figure 201. Use adhesive, sealant 4000, Marine, for sealing.

	Detail Steps/Work Items	Key Items/References
CAUTION: WRONG CONNECTION OF THE ANTENNA CABLES WILL LEAD TO A WRONG INDICATION.		
	- Connect the coaxial cable to the antenna. - Connect the coaxial cable from the TAS transponder.	
3.	Install the baggage compartment if top antenna was repalced.	Refer to AMM Chapter 25-50.
4.	Install the pilot’s seat if bottom antenna was replaced.	Refer to AMM Chapter 25-10.
5.	Close the TAS circuit-breaker.	
6.	Connect the aircraft battery.	Refer to Chapter 24-31.
7.	Do an operational test of the Trafiic Advisory System.	Refer to Avidyne TAS 600 Installation Manual, Part Number 32-2351, latest revision.

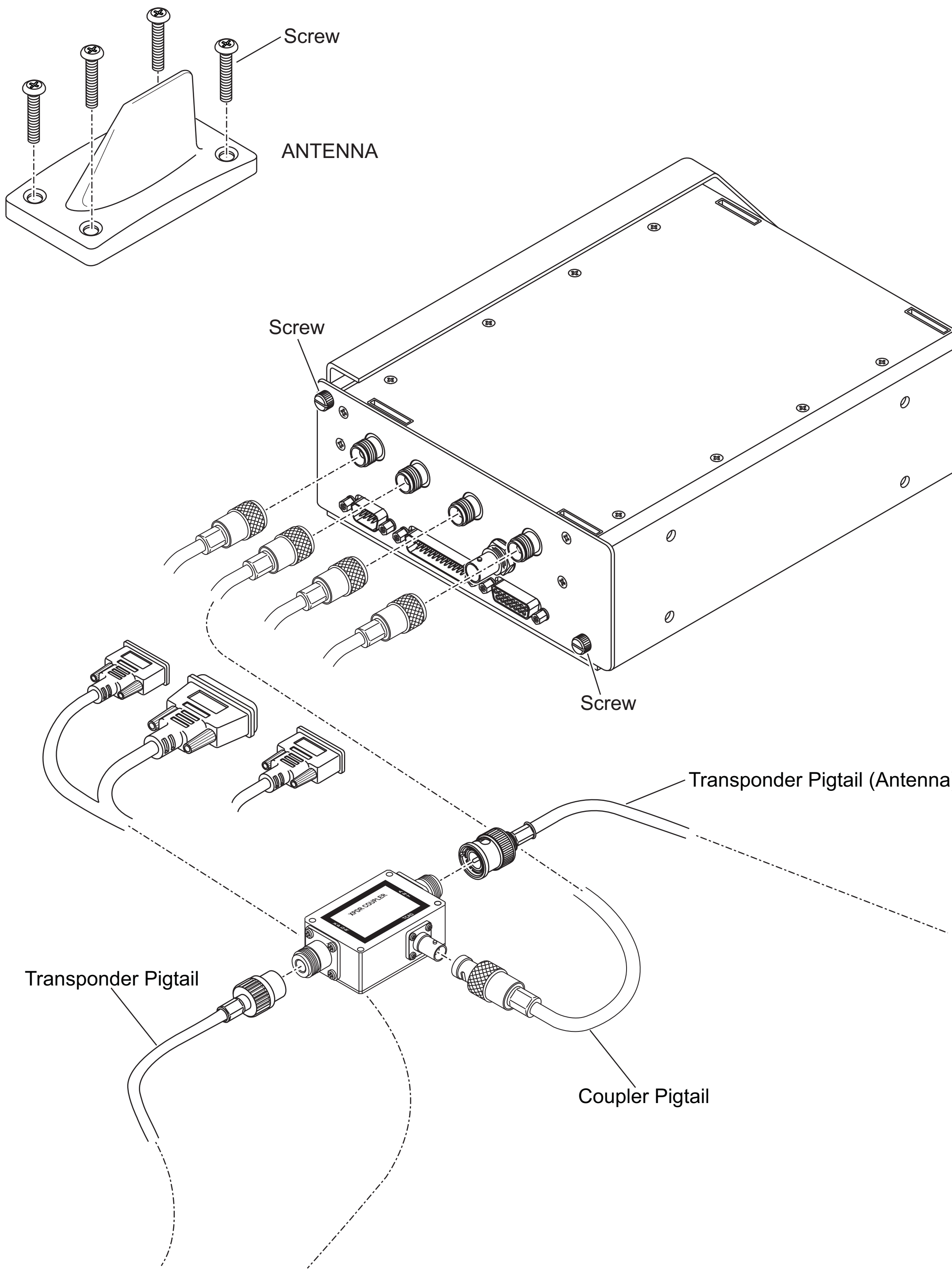

Figure 201 - TAS 600 Installation

CHAPTER 32-00
LANDING GEAR

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LANDING GEAR

1. General

The DA20-C1 aircraft has a fixed tricycle landing gear with a castoring nose wheel. This chapter gives you only the general description and operation.

Refer to Chapter 32-10 for trouble-shooting and maintenance practices for the main gear.

Refer to Chapter 32-20 for trouble-shooting and maintenance practices for the nose gear.

Refer to Chapter 32-40 for trouble-shooting and maintenance practices for the wheels and brakes.

2. Description and Operation

Flat section aluminum leaf-springs make the main gear struts. Two mountings attach each main gear strut to the spar bridge in the fuselage. The bottom of each strut has an aluminum axle and a mounting plate for the GFRP fairing.

The nose gear is a tubular strut. A strong pivot attaches it to the forward fuselage. An elastomer spring pack (elastomer pack) attaches the strut to the engine mount. A pivot at the bottom of the strut has a trailing fork for the wheel. It also holds the GFRP fairing.

Nose and main gear have single wheels with low pressure tires. Each main gear strut carries a disk brake. Toe-brake pedals on the rudder pedals operate the brakes. A parking brake valve allows the brakes to be set ON for parking.

The landing gear absorbs vertical loads (for example, landing loads). Each main gear strut is a leaf-spring which deflects upwards as the load increases. The elastomer pack in the nose gear compresses as the load increases. In each case, the spring returns to the original position when the load is removed.

Pushing on both toe-brake pedals applies both disk brakes. The aircraft will stop in a straight line.

Pushing on one toe-brake pedal only applies the brake on that side. The aircraft will steer to that side.

Pull the parking brake knob fully aft. Then push on both brake pedals to apply the parking brake. Push the parking brake knob fully in to release the parking brake.

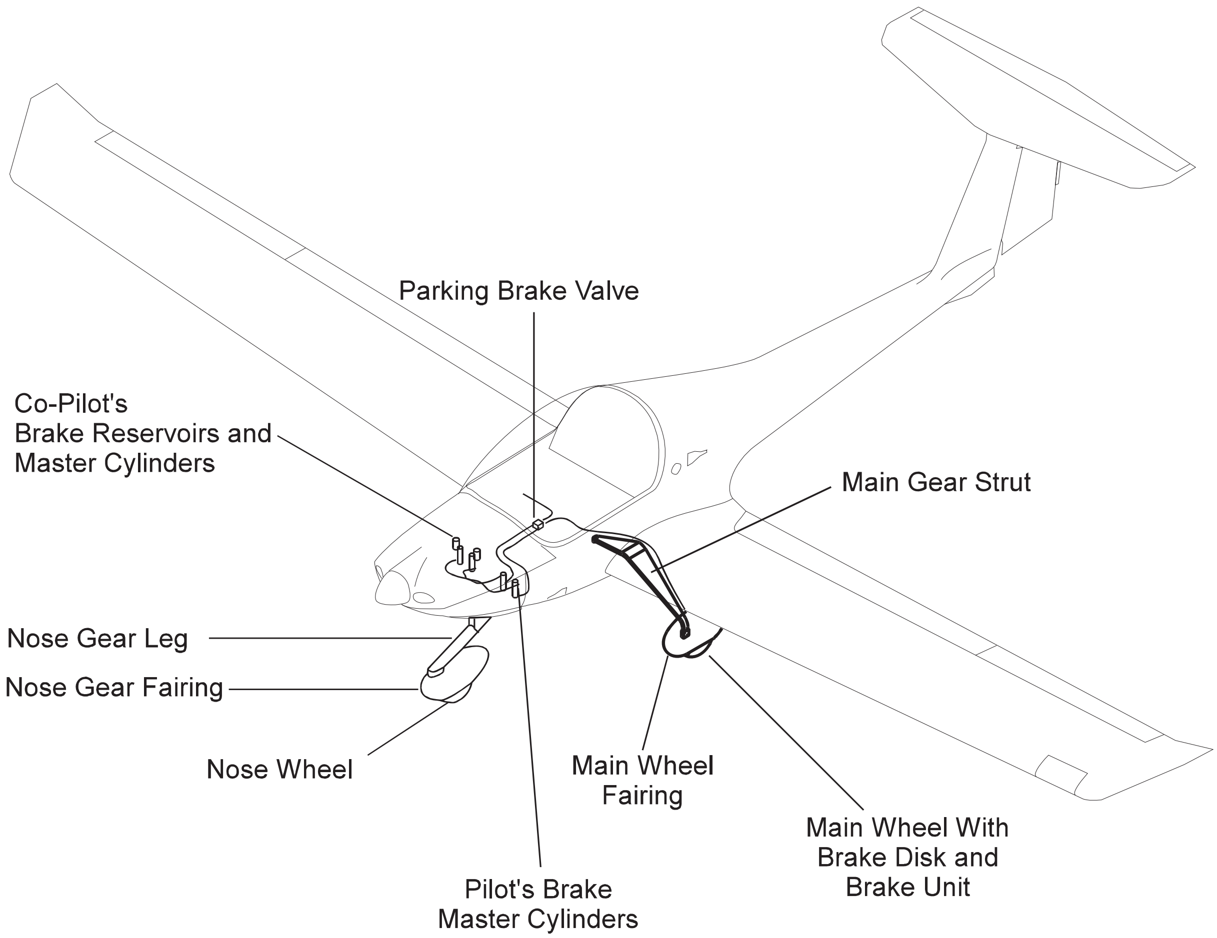

Figure 1 - Location of Landing Gear Components

MAIN LANDING GEAR

1. General

This chapter describes the data for the main landing gear. It gives you the trouble-shooting and maintenance practices. Refer to Chapter 32-40 for data for the main wheels and the brakes.

2. Description and Operation

Each main gear strut is an aluminum alloy leaf spring. Two strong mounts attach each spring to the spar bridge in the fuselage. Small panels with flexible centers seal the gap where each strut goes through the fuselage shell.

The inner mount is a large vertical bolt. The bolt goes through a metal block which attaches to a U-shaped bracket. The bracket goes under and around the spar bridge. Spring washers separate the top face of the spring from the block. A castle-nut pre-loads the spring washers.

The outer mount is an H-shaped bracket. The top arms of the H go fore and aft of the spar bridge. The leaf spring goes between the bottom arms of the H. A retaining bar holds the leaf spring in position. Ultra-high molecular-weight (UHMW) inserts go above and below the leaf spring to prevent chafing damage. Brass strips go each side of the leaf spring.

Four bolts at the outer end of each strut attach the following components:

- An aluminum axle
- A brake torque-plate
- A mount for the GFRP wheel fairing (Optional).

When the aircraft is on the ground, the inner end of the leaf spring pulls down on the inner mounting. The outer end pushes up against the outer mounting. When the aircraft is flying, the inner end of the leaf spring pushes up on the inner mounting. And the outer end pulls down against the retaining bar of the outer mounting.

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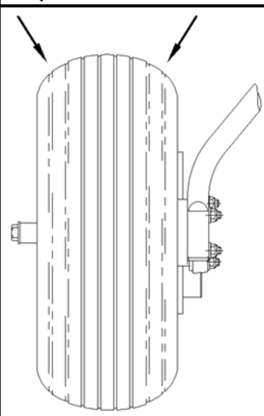
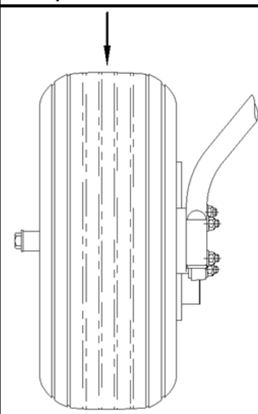
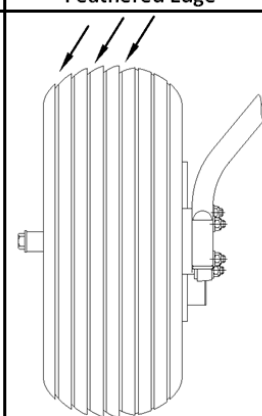
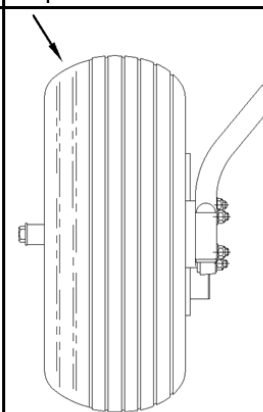
MAIN LANDING GEAR - TROUBLESHOOTING

1. General

The tables below explain how to troubleshoot the main landing gear and MLG tires.

WARNING: YOU MUST DO A HARD LANDING CHECK AFTER A HARD LANDING. HARD LANDINGS CAN CAUSE DAMAGE TO THE STRUCTURE AS WELL AS THE LANDING GEAR.

TROUBLE	POSSIBLE CAUSE	REPAIR
Strut bent	Hard landing	Do a hard landing check. Refer to Chapter 05-50. Replace the strut.
Negative camber	Strut bent, Hard landing	Do a hard landing check. Refer to Chapter 05-50. Replace the strut.

Condition	Rapid Wear At Shoulders	Rapid Wear At Center	Feathered Edge	Rapid Wear On One Side
Effect				
Cause	Tire Under-Inflated	Tire Over-Inflated	Toe Misalignment	Camber Misalignment
Correction	Adjust Tire Pressure As Per Chapter 12-10 When Tires Are Cool		Adjust Toe Angle As Per Chapter 32-10	Adjust Camber Angle As Per Chapter 32-10
			Rotation Of MLG Tires Recommended To Increase Service Life	

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MAIN LANDING GEAR - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the components of the main landing gear. Refer to the manufacturer for further data.

2. Remove/Install the Main Landing Gear

A. Equipment

Item	Quantity	Part Number
Aircraft Jacks	2	Commercial
Tail Former	1	

B. Remove the Main Landing Gear Strut

Refer to Figure 201 (Sheet 1 of 3).

	Detail Steps/Work Items	Key Items/References
1.	Lift the aircraft on jacks.	Refer to Chapter 07-10-00.
2.	Remove the wheel fairing: - Remove the outer bolt - Remove the two screws on the inner side.	If installed.
3.	Remove the back-plate from the brake caliper.	Refer to Chapter 32-40-00.
4.	Remove the wheel.	Refer to Chapter 32-40-00.
5.	Release the brake caliper.	
6.	Release the brake pipe from the strut.	Tie the brake caliper back. Do not stress the brake pipe.
7.	Remove the four bolts that attach the axle. Remove the axle, torque-plate and fairing mount.	Only if you are going to install a different strut.
8.	Disconnect the bonding cable from the strut.	
9.	Remove the nut, the washers and the bolt at the inner mount attachment-bracket.	
10.	Note the stacking arrangement of the inner mount attachment	Refer to Figure 201, Option 1, 2, or 3.

	Detail Steps/Work Items	Key Items/References
11.	Remove the nuts and the washers, the retaining bar, the inserts and the brass strips at the outer mount attachment-bracket.	Hold the strut.
12.	Note the location and thickness of UHMW inserts and brass strips at outer mount attachment.	
13.	Remove the strut.	Move the strut outboard.

C. Install the Main Landing Gear Strut

Refer to Figure 201 (Sheet 1 of 3)

	Detail Steps/Work Items	Key Items/References
1.	Examine the spar bridge in the area of the main gear mountings. Look especially for damage to the GFRP structure.	Refer to Chapter 51-10-00 for GFRP inspection procedures.
2.	Install the retaining bar. Install the bolts, the washers and the nuts to hold the retaining bar to the outer mount attachment-bracket.	Leave the hardware loose.
3.	Apply grease to the brass strips.	Use MIL-G-81322 grease.
4.	Put the inserts and brass strips in position at the outer mount.	If same strut, inserts and brass strips are reinstalled, refer to Step 12 in paragraph 2.B. for the location and thickness of inserts and the brass strips at the outer mount attachment. Try to install brass strip P/N 22-3210-00-14 first. If it is too tight, use brass strip P/N 22-3210-00-19, or a combination of the two. Make sure that maximum of two brass strips in one location. Install symmetrically between LH and RH sides. If new parts are installed, select insert to achieve approximately 0.1 mm compression when assembled.
5.	Put the strut in position.	Move it inboard through the fuselage slot. Make sure that the inserts and brass strips remain in proper location as they tend to slide inboard during the strut installation.

	Detail Steps/Work Items	Key Items/References
6.	Apply grease to the concave and convex washers.	Use MIL-G-81322 grease.
7.	Install the bolts, the washers and the nut at the inner mount attachment bracket.	Refer to Figure 201. If same strut is installed, refer to step 10 in paragraph 2.B. for parts arrangement. If new strut is installed, do as follows: Shim inboard MLG strut to level aircraft side to side as follows: - Shim to high side to level aircraft. Basic inboard landing gear buildup as per option 1. - Use shim as required for allowable stacking arrangements for options 2 and 3.
8.	Tighten the nuts on the outer mount.	Torque to 132-177 lbf-in (15-20 Nm). Make sure that there is no gap between the retaining bar and the outer mount.
9.	Tighten the nut on the inner bolt.	To give a height of the spring washers and 1 flat washer. (Distance from the strut to the outer mount: 5.55 ± 0.1 mm).
10.	Connect the bonding cable to the strut.	If you install a bonding terminal on a new strut, remove the surface protection where the terminal will attach. Then varnish the area with NYCOTE 7-11.
11.	Install the axle, the torque-plate and the fairing mount. Install the four bolts that attach the axle.	Only if you install a different strut. Torque to 120 - 140 lbf-in (13.6 - 15.8 Nm).
12.	Attach the brake line to the strut.	
13.	Install the brake caliper.	Refer to Chapter 32-40-00.
14.	Install the wheel.	Refer to Chapter 32-40-00.
15.	Install the back-plate to the brake caliper.	Refer to Chapter 32-40-00.
	Install the wheel fairing: - Install the outer bolt - Install the two screws on the inner side.	Aircraft with wheel fairing option only.
16.	Lower the airplane with the jacks.	
17.	Do a test for correct adjustment of the landing gear.	See Paragraph 4.

3. Remove/Install the Hardware at the Inner and Outer Mounts of the Main Landing-Gear Strut

A. Equipment

Item	Quantity	Part Number
Aircraft Jacks	2	Commercial
Tail Former	1	

B. Remove the Hardware from the Inner/Outer Mount of the Main Landing-Gear Strut

Refer to Figure 201 (Sheets 1, 2 and 3).

	Detail Steps/Work Items	Key Items/References
1.	Remove the applicable wing.	Refer to Chapter 57-10-00.
2.	Remove the applicable main landing-gear strut.	Refer to Chapter 32-10-00.
3.	Remove the hardware from the inner mount of the main landing-gear strut, as follows: NOTE: The inner mount is not removed.	NOTE: The bolts for the forward side and rear side are different in length. The washers are installed on the bolt side and the nut side.
	- Remove the nuts, bolts and washers at the forward side of the inner mount - Remove the nuts, the bolts and the washers at the rear side of the inner mount.	There are six nuts, six bolts and 12 washers. There are four nuts, four bolts and eight washers.
4.	Make sure that the spar bridge, at the location of the inner mount, is not damaged.	Look especially for cracks, chips or delamination.
5.	Replace the hardware.	Refer to the installation of the hardware.
6.	Remove the hardware from the outer mount of the main landing-gear strut, as follows: NOTE: The outer mount is not removed. - Remove the nuts, bolts and washers at the forward side of the outer mount	NOTE: The bolts for the forward side and rear side are the same in length. The washers are installed on the bolt side and the nut side. There are six nuts, six bolts and 12 washers.

	Detail Steps/Work Items	Key Items/References
	- Remove the nuts, the bolts and the washers at the rear side of the outer mount.	There are six nuts, six bolts and 12 washers.
7.	Make sure that the spar bridge, at the location of the outer mount, is not damaged.	Look especially for cracks, chips or delamination.
8.	Replace the hardware.	Refer to the installation of the hardware.

C. Install the Hardware from the Inner/Outer Mount of the Main Landing-Gear Strut

Refer to Figure 201 (Sheets 1, 2 and 3).

	Detail Steps/Work Items	Key Items/References
1.	Install the hardware from the outer mount of the main landing-gear strut, as follows: NOTE: The outer mount is bonded to the spar bridge.	NOTE: The bolts for the forward side and rear side are the same in length. The washers are installed on the bolt side and the nut side.
	- Install the bolts, the washers and the nuts at the rear side of the outer mount and spar bridge	Apply Mastinox 6856K to the shank of each bolt only. Be careful to not get Mastinox on the threads of the bolt.
	- Torque the bolts to 50 -70 lbf-in (5.6 - 7.9 Nm)	
	- Install the bolts, the washers and the nuts at the forward side of the outer mount and spar bridge	Apply Mastinox 6856K to the shank of each bolt only. Be careful to not get Mastinox on the threads of the bolt.
	- Torque the bolts to 50 -70 lbf-in (5.6 - 7.9 Nm).	
2.	Install the hardware from the inner mount of the main landing-gear strut, as follows: NOTE: The inner mount is bonded to the spar bridge.	NOTE: The bolts for the forward side and rear side are the same in length. The washers are installed on the bolt side and the nut side.
	- Install the bolts, the washers and the nuts at the rear side of the inner mount and spar bridge	Apply Mastinox 6856K to the shank of each bolt only. Be careful to not get Mastinox on the threads of the bolt.
	- Torque the bolts to 50 -70 lbf-in (5.6 - 7.9 Nm)	

	Detail Steps/Work Items	Key Items/References
	- Install the bolts, the washers and the nuts at the forward side of the inner mount and spar bridge - Torque the bolts to 50 -70 lbf-in (5.6 - 7.9 Nm).	Apply Mastinox 6856K to the shank of each bolt only. Be careful to not get Mastinox on the threads of the bolt.
3.	Install the main landing gear strut.	Refer to Chapter 32-10.
4.	Install the wing.	Refer to Chapter 57-10.

4. Test/Adjust the Main Landing Gear

Do this work at the following times:

- After a hard landing
- After any repair to the main landing gear which could affect alignment.

A. Equipment

Item	Quantity	Part Number
Slide Sheets - 2 per side	4	Commercial

B. Procedure

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the airplane is at the empty weight.	See the adjustment report for the aircraft.
2.	Roll the main wheels onto the slide sheets.	
3.	Measure the toe-in.	Refer to Figure 202.
4.	Measure the camber.	Refer to Figure 202.
WARNING: USE ONLY THE SHIMS LISTED FOR THE PURPOSE IN THE AIRCRAFT ILLUSTRATED PARTS CATALOG. OTHER SHIMS COULD CAUSE LANDING GEAR FAILURE.		

	Detail Steps/Work Items	Key Items/References
5.	If necessary, adjust the toe-in and/or camber.	Refer to Chapter 06-00 for limits. Maximum 2° shim per side (camber + toe). Refer to the illustrated parts catalog for the correct shims. Put shims between the strut and the axle. These change the angle between the axle and the airplane longitudinal or vertical axis.
6.	Measure the wheel track.	Across the airplane from the outermost point on one axle to the outermost point on the other axle.
7.	Roll the main wheels off the slide sheets.	

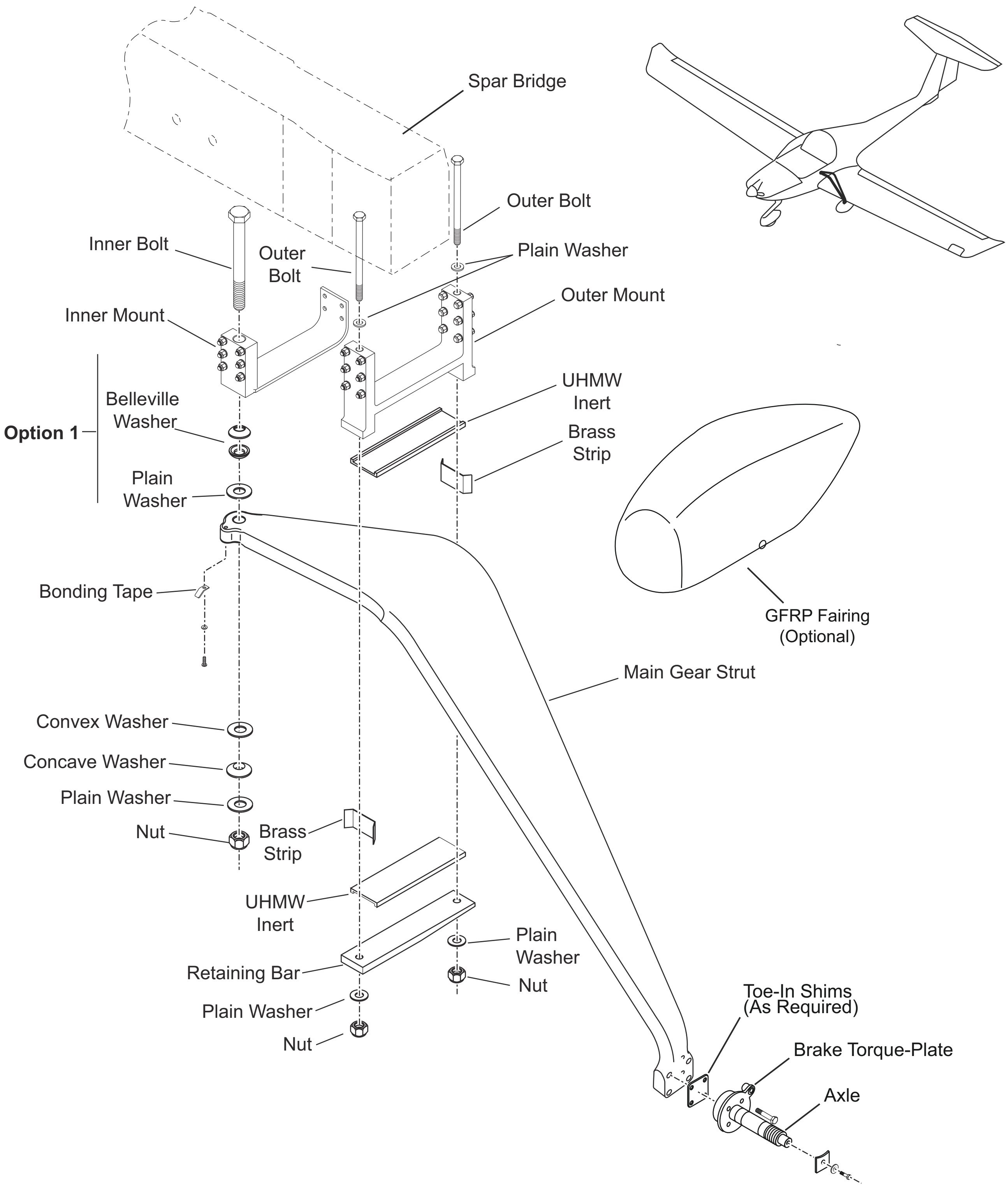

Figure 201 - Main Landing Gear (Sheet 1 of 3)

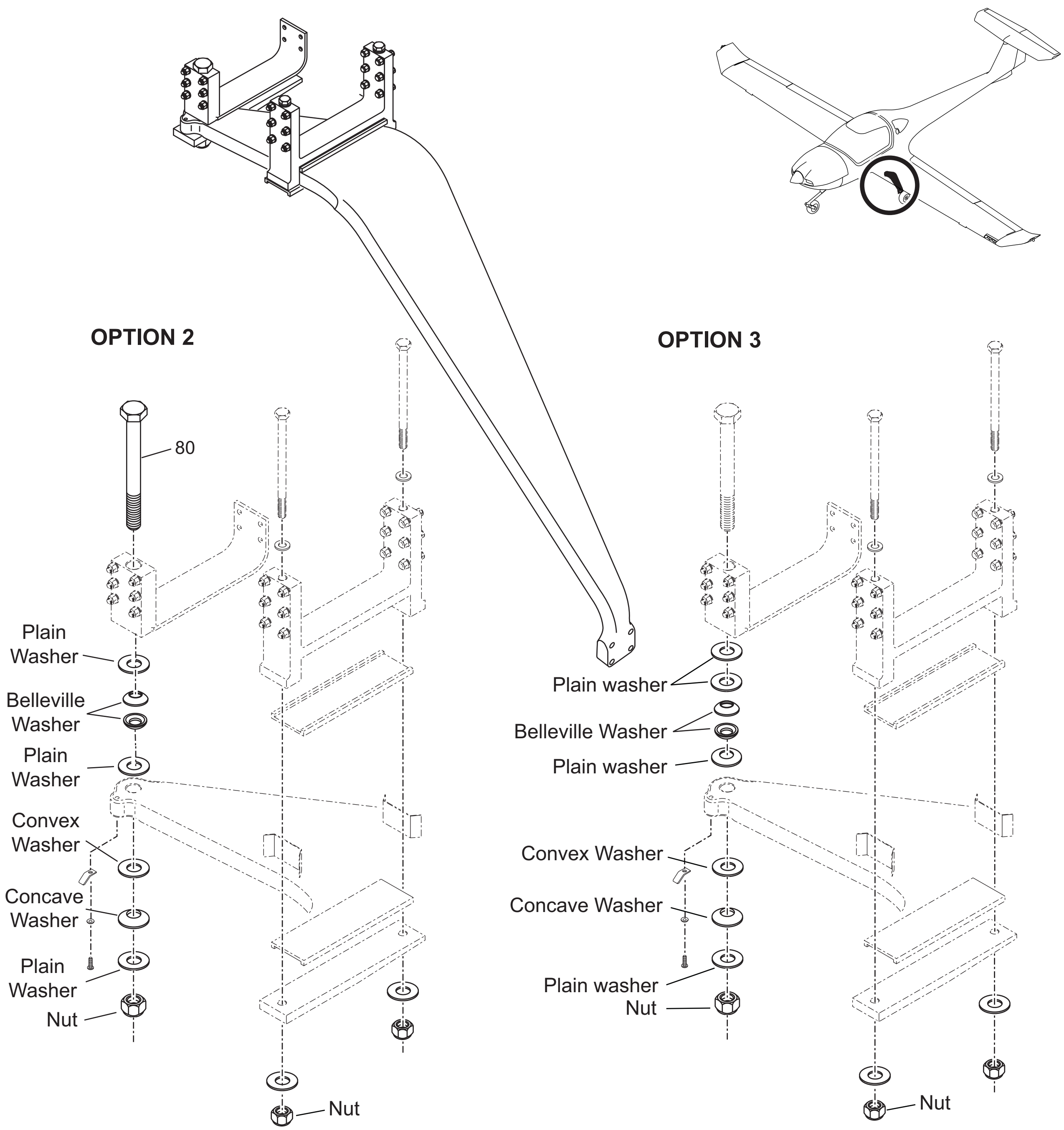

Figure 201 - Main Landing Gear (Sheet 2 of 3)

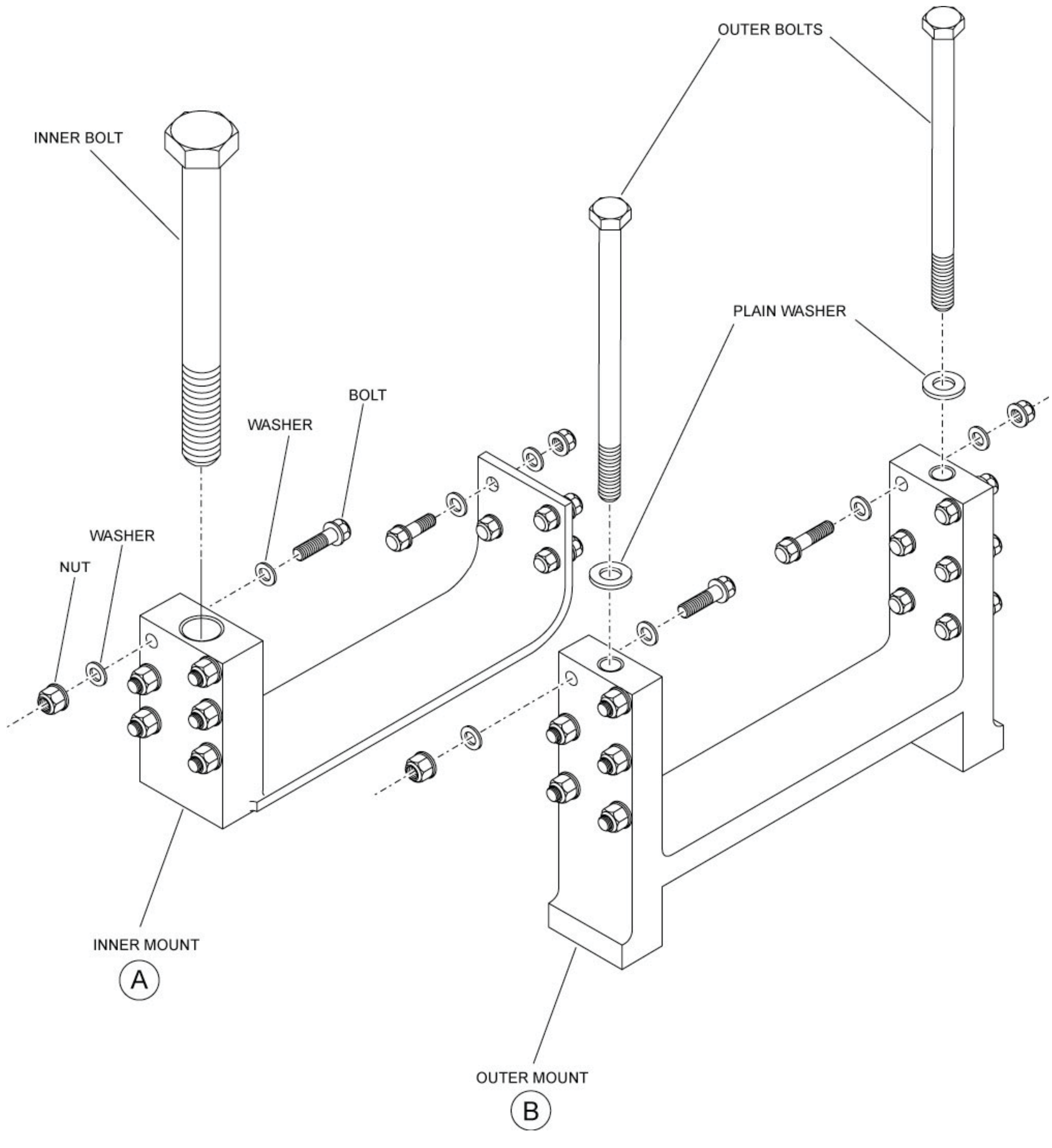

Figure 201 - Main Landing Gear (Sheet 3 of 3)

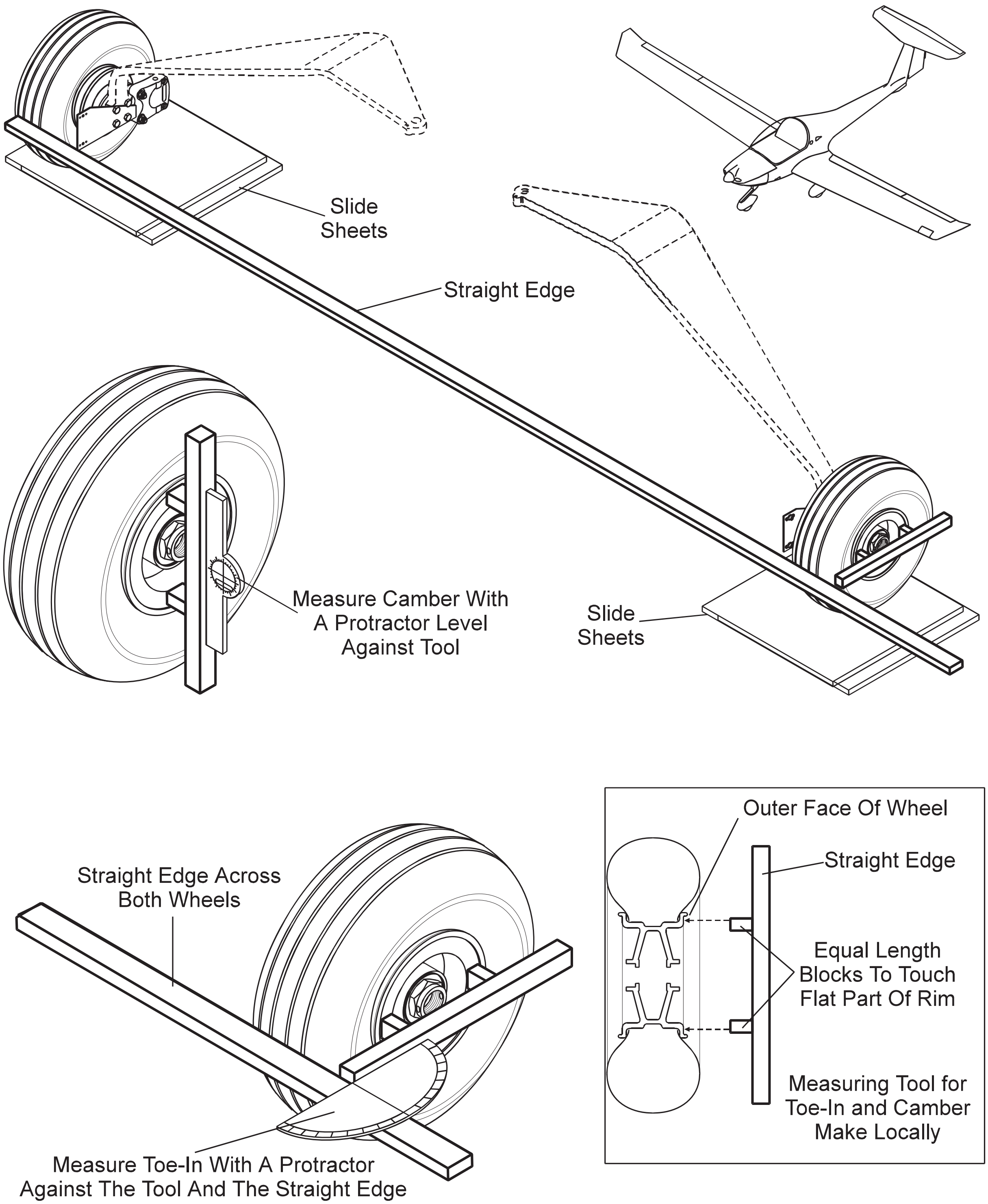

Figure 202 - Measure Toe-In and Camber

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NOSE LANDING GEAR

1. General

This chapter describes the data for the nose landing gear. It gives you the trouble-shooting and maintenance practices. Refer to Chapter 32-40 for data for the nose wheel.

2. Description and Operation

The DA20-C1 aircraft has a fixed nose landing gear with a castoring wheel. The nose gear strut is a welded tubular-steel component. The aft upper end has a transverse tube which holds the main attachment journal-bearings. These journal-bearings allow the strut to move only up and down.

Forward and below the attachment bearing is a welded bracket which holds the bottom of the shock absorber assembly. The upper end of the shock absorber assembly attaches to the engine mount.

The forward bottom end of the nose gear strut has a near-vertical pivot for the nose-wheel fork. This lets the nose wheel caster. Stops limit the caster movement to ± 64 degrees.

When the airplane is on the ground, the shock absorber assembly pushes up against the engine mount. The journal-bearing pulls down against the front fuselage. When the aircraft is flying, the shock absorber assembly pulls down against the engine mount and the journal-bearing pushes up against the front fuselage.

The journal bearing keeps the nose gear strut aligned fore and aft. A side load on the nose wheel causes it to caster. The stiffness (steering friction) of the nose-wheel fork pivot can be adjusted with the nose wheel fork mounting-screw. This prevents nose-wheel shimmy.

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NOSE LANDING GEAR - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the nose landing gear. If you find the trouble in column 1, do the repair given in column 3.

WARNING: YOU MUST DO A HARD LANDING CHECK AFTER A HARD LANDING. HARD LANDINGS CAN CAUSE DAMAGE TO THE STRUCTURE AS WELL AS THE LANDING GEAR.

TROUBLE	POSSIBLE CAUSE	REPAIR
Strut bent.	Hard landing.	Do a hard landing check. Refer to Chapter 05-50. Replace the strut.
Nose-wheel shimmy.	Steering friction too low.	Adjust the nose-wheel fork mounting-screw.

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NOSE LANDING GEAR - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the components of the nose landing gear. Refer to the manufacturer for further data.

2. Remove/Install the Nose Landing Gear (NLG)

A. Equipment

Refer to Chapter 07-10-00 for the equipment required for jacking the aircraft.

B. Remove the Nose Landing Gear Strut

	Detail Steps/Work Items	Key Items/References
1.	Jack the aircraft.	Refer to Chapter 07-10-00.
2.	Remove the engine cowling.	Refer to Chapter 71-10-00.
3.	Disconnect the shock absorber assembly from the nose landing gear strut as follows: - Remove the rivets. Discard the rivets - Remove the two clip retainers - Remove the strut pins.	Refer to Figure 201 and 202. Use a slide hammer to remove the strut pins.
4.	Remove the lock bolt from the journal assembly.	Refer to Figure 202.
5.	Provide adequate support to the NLG strut and slide the large pivot inwards.	
WARNING: DO NOT STAND UNDER THE NOSE LANDING GEAR STRUT. THE ASSEMBLY IS HEAVY AND MAY CAUSE HARM AND INJURY TO PERSONNEL.		
6.	Release the journal assembly unit from the fuselage bearings.	
7.	Carefully remove the nose gear strut from the airplane in a downward direction.	

C. Install the Nose Landing Gear Strut

	Detail Steps/Work Items	Key Items/References
	WARNING: USE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN HANDLING CORROSION PROTECTION AND GREASE. THESE CHEMICALS WHEN MAKE CONTACT MAY IRRITATE OR CAUSE DAMAGE TO SKIN.	
	NOTE: If Installing a new NLG Strut, Step 1 must be completed first. If installing the original NLG Strut proceed to step 2.	
1.	Preparation of a new NLG Strut assembly:	
	- Install strut pivot into strut journal	Use Loctite 680. Refer to Figure 203
	- Install large pivot into strut journal	A new large pivot must be used when a new NLG Strut is installed.
	- Put the NLG strut into position in the aircraft from below	
	- Slide out the large pivot from the journal to engage the bearings in the fuselage	No lateral free play is allowed
	- Drill a 2 mm (+/- 0.015 mm) hole in the large pivot through the pilot hole in the strut journal (one side only)	
	- Slide the large pivot inwards and remove the NLG strut.	
	-Secure the large pivot in the NLG Strut with a MS171466/468 spring pin inserted into the drilled hole.	
	- Drill a 7.9 mm hole through the strut journal and large pivot in order to install the lock bolt.	Hole location is 17mm (+/- 0.5 mm) from the edge of the strut journal and angled 50^{o} (+/- 1^{o}) from the center axis of the strut tube. Refer to Figure 203.
	- Remove and discard the spring pin. Remove the large pivot	
	- Remove burrs and sharp edges from holes	
	- Clean up strut journal and large pivot from foreign objects and any contaminates.	

	Detail Steps/Work Items	Key Items/References
2.	Lubrication prior to final installation: - Liberally apply corrosion protection to the following items: - The inside of the journal assembly - The shank of the lock bolt - Apply a light coat of grease to the Teflon bearings and strut pivots.	 Use Type 5 lubricant. Refer to Chapter 12-20-00. Clean corrosion protection from the threads. Use Type 1 lubricant. Refer to Chapter 12-20-00
3.	Install the large pivot into the strut journal and put the nose gear strut in position in the aircraft from below.	
4.	Slide out the large pivot of the unit to engage the bearings in the fuselage.	Refer to Figure 202.
5.	Install the lock bolt in the journal bearing unit.	
6.	Install the shock absorber assembly to the nose landing gear strut as follows: - Apply a light corrosion protection on strut pins and clip retainers - Install the shock absorber assembly using the strut pins - Install the clip retainers and secure with rivets.	Refer to Figure 202. Use Mastinox (6856K). Clean corrosion protection excess. Use vinyl hammer to secure strut pins.
7.	Adjust the nose wheel steering friction.	Refer to Paragraph 6.
8.	Remove aircraft from the jacks.	Refer to Chapter 07-10-00.
9.	Install the engine cowling.	Refer to Chapter 71-10-00.

3. Remove/Install the NLG Fork Assembly

A. Equipment

Refer to Chapter 07-10-00 for the equipment required for jacking the aircraft.

B. Remove the NLG Fork

	Detail Steps/Work Items	Key Items/References
1.	Jack the aircraft	Refer to Chapter 07-10-00.
2.	Remove fairing if installed	
3.	Remove the cotter pin, castellated nut, washers, and spring disc.	Refer to Figure 205.
4.	Remove the lower spacer, stop plate, thrust washer, and the bushings.	Inspect all parts and replace if necessary.
5.	Remove the fork assembly from the pivot.	

C. Install the NLG Fork Assembly

	Detail Steps/Work Items	Key Items/References
1.	Apply grease to the bearing surfaces of the NLG strut axle	Use MIL-C-81322 grease.
2.	Apply CRC Corrosion shell or CRC SP-400 to the non-painted area at the stud end of the NLG strut axle except the bearing surface prior to assembly.	Do not apply grease to the surfaces. Make sure that you do not contaminate the tire or the fiberglass. Refer to Chapter 12-20-00.
3.	Install the fork assembly on the NLG strut axle as follows: - Install the fork assembly onto NLG strut. - Install the thrust washer, the stop plate and the lower spacer - Install the spring disc, the washers, and the Castellated nut. - Tightened the nut to achieve break out force. - Install the cotter pin.	Refer to Figure 205. Makr sure that both spring discs are installed with open side facing up. Refer to paragraph 6.
4.	Adjust the nose wheel steering friction.	Refer to Paragraph 6.

	Detail Steps/Work Items	Key Items/References
5.	Apply CRC Corrosion shell or CRC SP-400 to the nut and the washers only on the stud end of the NLG strut axle.	Do not apply grease to the surfaces. Make sure that you do not contaminate the tire or the fiberglass. Refer to Chapter 12-20-00.
6.	Install the fairings, if removed.	If fairing is not installed install the fairing attachment screws and washers as shown in Figure 201.
7.	Remove aircraft from the jacks.	Refer to Chapter 07-10-00.

4. Remove/Install the Shock Absorber Assembly

A. Equipment

Refer to Chapter 07-10-00 for the required equipment for jacking the aircraft.

B. Remove the Shock Absorber Assembly

	Detail Steps/Work Items	Key Items/References
1.	Jack the aircraft.	Refer to Chapter 07-10-00.
2.	Remove the engine cowling.	Refer to Chapter 71-10-00.
	WARNING: SUPPORT THE NOSE LANDING GEAR PRIOR TO REMOVAL OF THE UNIT. FAILURE TO SUPPORT THE ASSEMBLY WILL DAMAGE THE EQUIPMENT AND MAY CAUSE HARM OR INJURY TO PERSONNEL.	
3.	Disconnect the shock absorber assembly from the engine mount as follows: - Disconnect the lock-wire - Remove the bolt, the washer, and the nut.	One person should hold the nose landing gear strut. Refer to Figure 202.
4.	Remove shock absorber assembly from the nose landing gear strut as follows: - Remove the rivets. Discard the rivets - Remove the two clip retainers - Remove the strut pins.	Refer to Figure 202. Use a slide hammer to remove the strut pins.

C. Install the Shock Absorber Assembly

	Detail Steps/Work Items	Key Items/References
	WARNING: USE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) WHEN HANDLING CORROSION PROTECTION AND GREASE. THESE CHEMICALS WHEN MAKE CONTACT MAY IRRITATE OR CAUSE DAMAGE TO SKIN.	
1.	Install the shock absorber assembly to the nose landing gear strut as follows: - Apply a light corrosion protection on strut pins and clip retainers - Install the shock absorber assembly using the strut pins - Install the clip retainers and secure with rivets.	Refer to Figure 202. Use Mastinox (6856K). Clean corrosion protection excess. Use vinyl hammer to secure strut pins.
2.	Connect the shock absorber assembly to the engine mount as follows: - Apply corrosion protection to bolt shank - Install the bolt, the washer, and the nut - Install the lock-wire.	Use Type 5 lubricant Refer to Chapter 12-20-00. Clean corrosion protection from the threads.
3.	Remove aircraft from jacks.	Refer to Chapter 07-10-00.
4.	Install the engine cowling.	Refer to Chapter 71-10-00.

5. <u>Replace the Shock Absorber Assembly Elements</u>

You must replace cracked rubber damper.

	Detail Steps/Work Items	Key Items/References
1.	Remove the shock absorber assembly from the airplane.	Refer to paragraph 4.A and 4.B.
	WARNING: DO NOT STAND IN THE LINE OF THE SHOCK ABSORBER ASSEMBLY WHEN YOU REMOVE THE NUT. THE ASSEMBLY MAY EXPAND WITH A LOT OF FORCE. AND CAN CAUSE INJURY TO PERSONNEL.	

	Detail Steps/Work Items	Key Items/References
2.	Disassemble the shock absorber assembly.	If necessary, use heat to break the adhesive.
	- Remove the adjusting nut from the shock absorber assembly. - Remove the washer, and the rubber damper - Remove the shock absorber retainer, nine spacers, and 10 rubber dampers	
3.	Replace rubber dampers and spacers as required.	
4.	Reassemble the 10 rubber dampers, 9 spacers and shock absorber retainer in the reverse order removed	
5.	Install the washer and rubber damper	
6.	Install the adjusting nut.	Refer to Figure 202 and Figure 204. The distance between the center of the rod-end bearing and the center of the shock absorber retainer must be 9.65 in, +/- 0.078in (245 mm +/- 2mm). The rod bearing end should be no higher than 1.38 in, +/- 0.040 in (35 mm +/- 1mm) from the top plate.
7.	Install the shock absorber assembly on the aircraft.	Refer to Paragraph 4C.

6. Adjust the Nose Landing Steering Friction

Steering friction prevents nose wheel shimmy.

A. Equipment

Refer to Chapter 07-10-00 for the equipment required for jacking the aircraft.

B. Procedure

	Detail Steps/Work Items	Key Items/References
1.	Jack the aircraft.	Refer to Chapter 07-10-00.
2.	Remove the nose-wheel fairing.	
3.	Inspect condition of belleville springs, washers, spacer and stop plate.	Replace as required.
4.	Check the NLG friction by application of force to NLG wheel axle in both directions along the axle.	
5.	If required, adjust the nose-wheel fork pivot nut: - Remove the cotter pin (if required) - Adjust the nut - Install a new cotter pin.	The nose-wheel must just caster when you apply a force of 6.75 - 11.25 lb. (30 - 50 N) acting in the direction of the nose wheel axle. Refer to Figure 206 If the cotter pin hole and the nut castellation do not align after adjustment of steering friction install/remove one AN960-616L thin washer. Washer is optional and (if installed) located in between the two AN960-616 washers. It may be necessary to tighten the nut to the next castellation if alignment is not obtained. Refer to Figure 205.
6.	Apply corrosion protection to the stud, nut and washers only.	Use CRC SP-400 or CRC Corrosion shell. Do not contaminate tire or fiberglass.
7.	Install the nose-wheel fairing.	
8.	Remove the trestle from the front fuselage.	
9.	Remove the aircraft from jacks.	Refer to Chapter 07-10-00.

7. Nose Wheel Balancing

Always have a new nose-wheel balanced before installation.

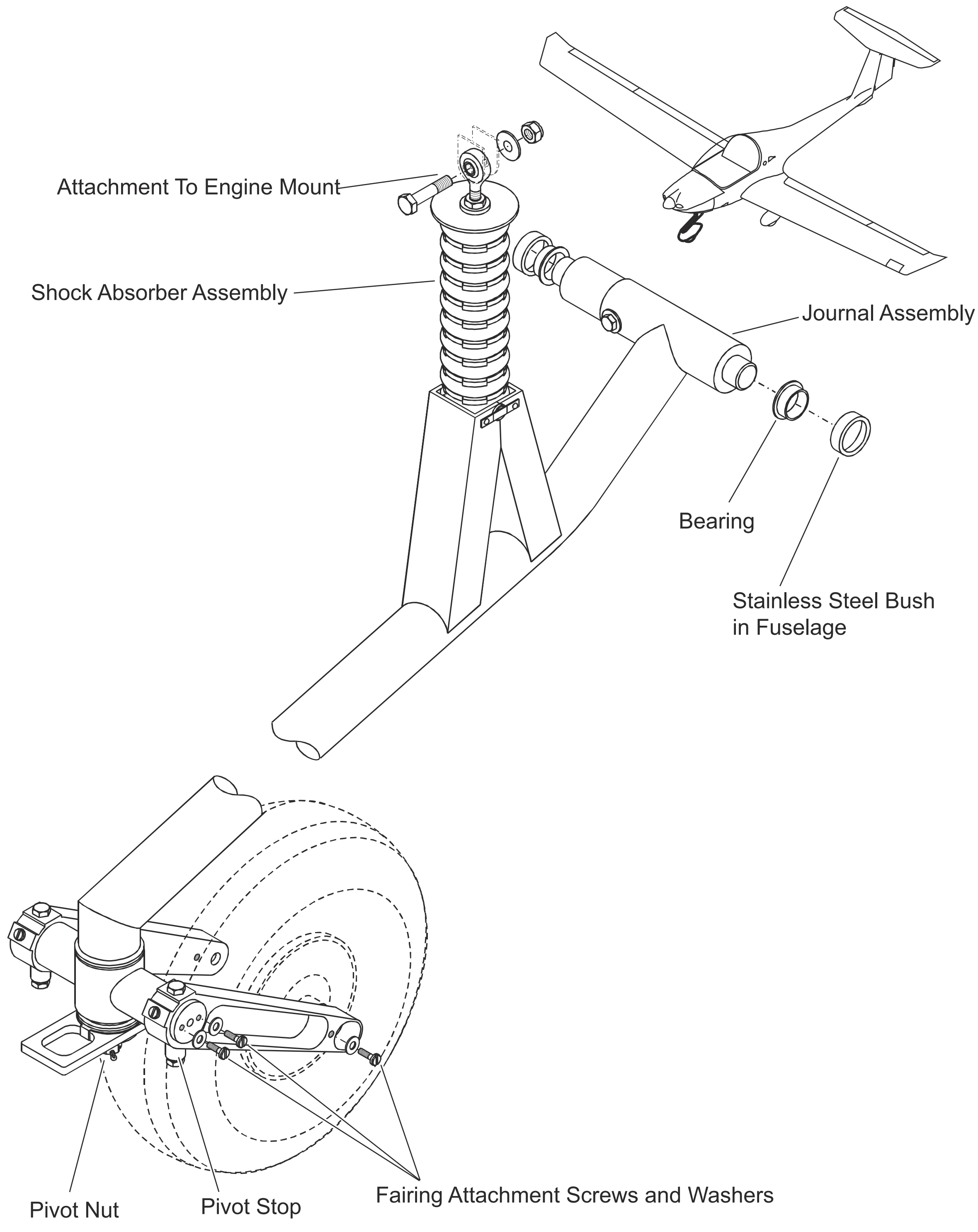

Figure 201 - Nose Landing Gear

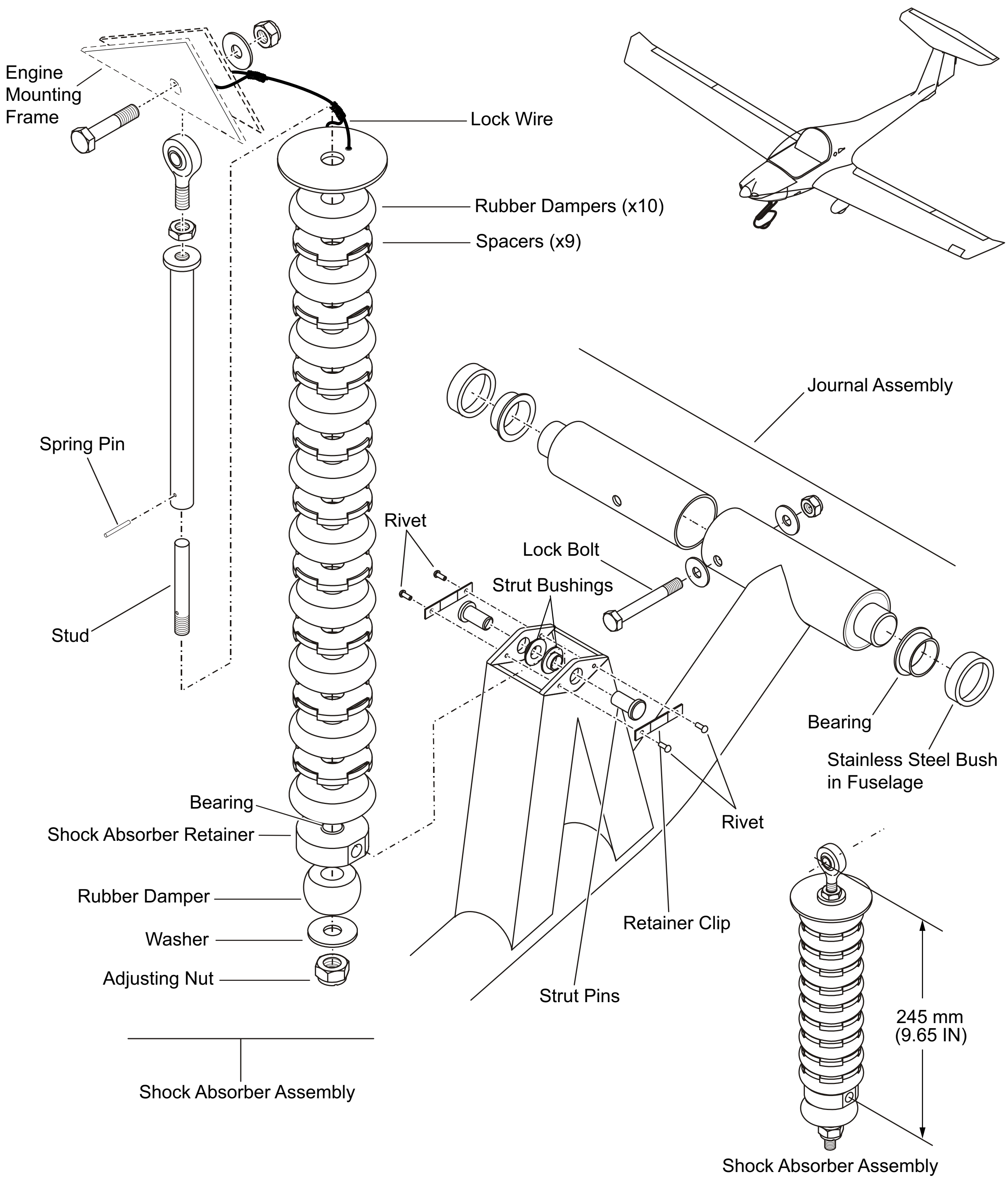

Figure 202 - Shock Absorber Assembly and Journal Assembly

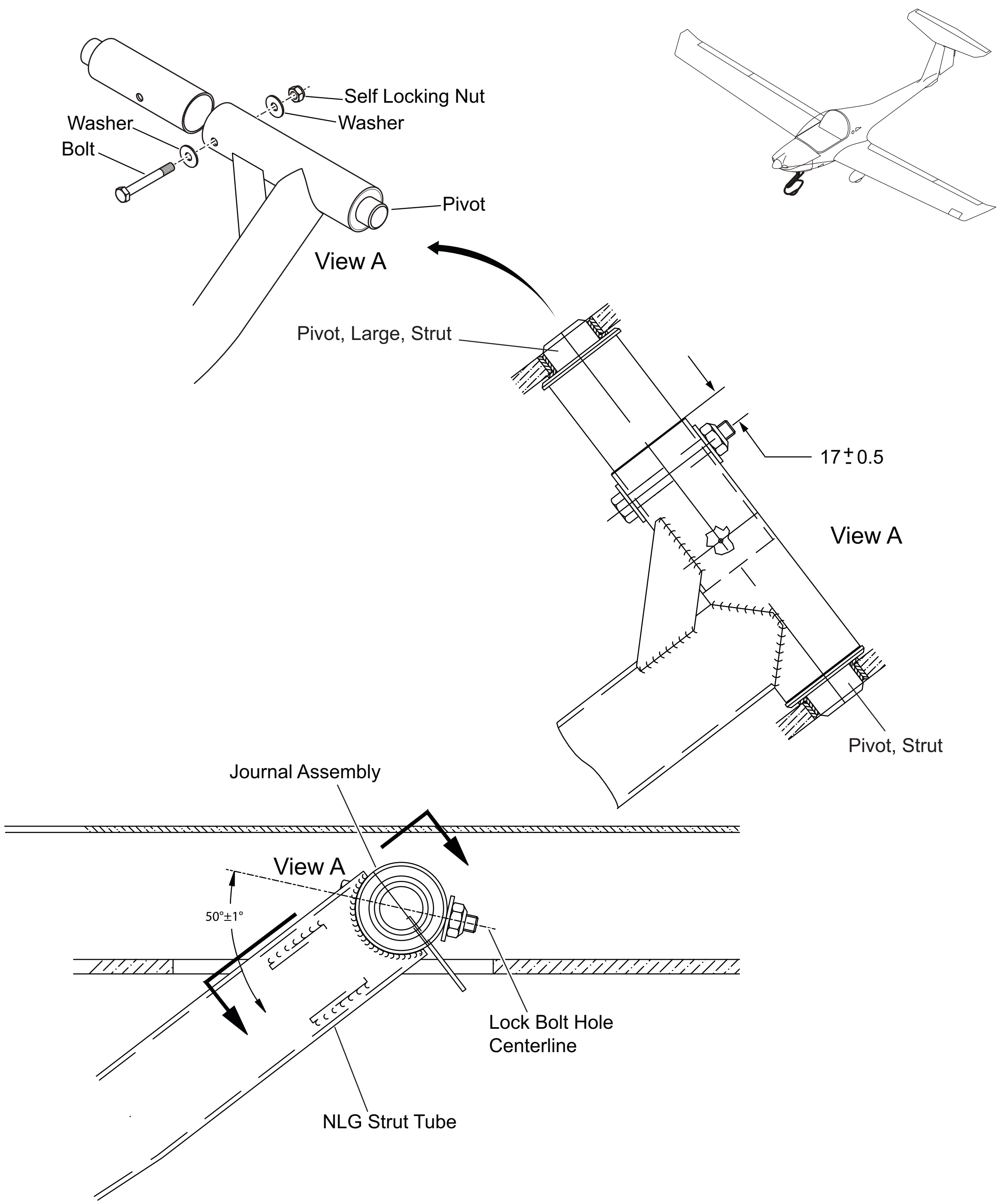

Figure 203 - Lock Bolt Hole Centerline Position

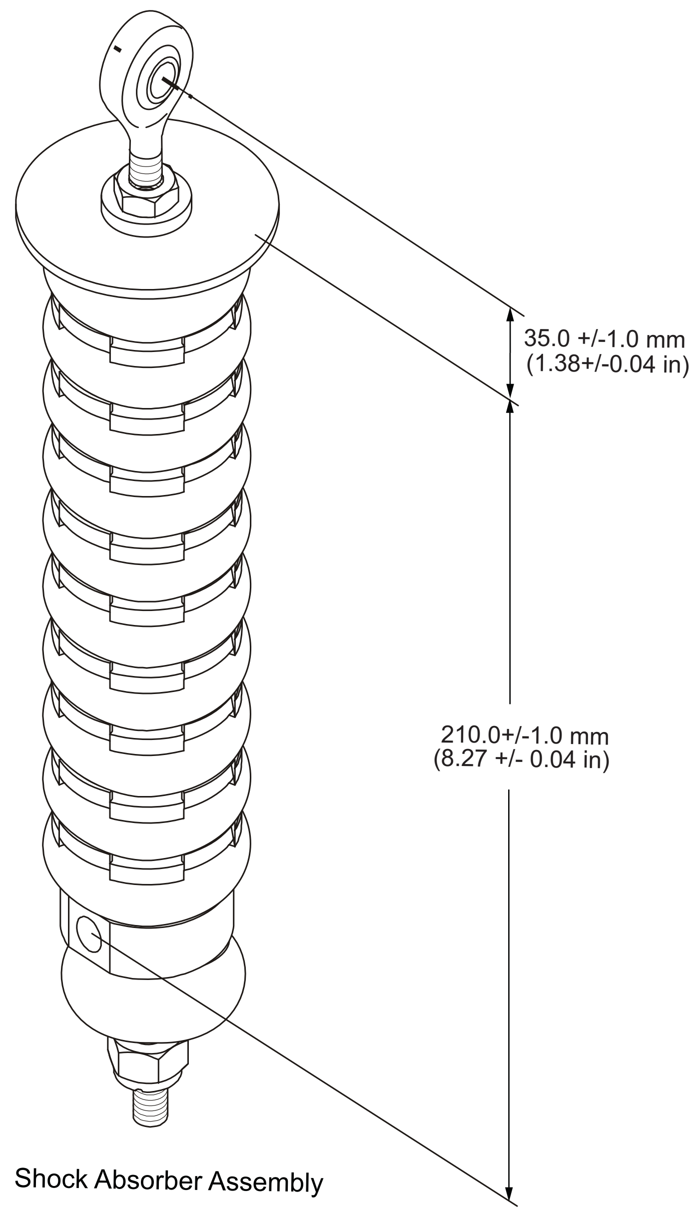

Figure 204 - Shock Absorber Assembly and Journal Assembly

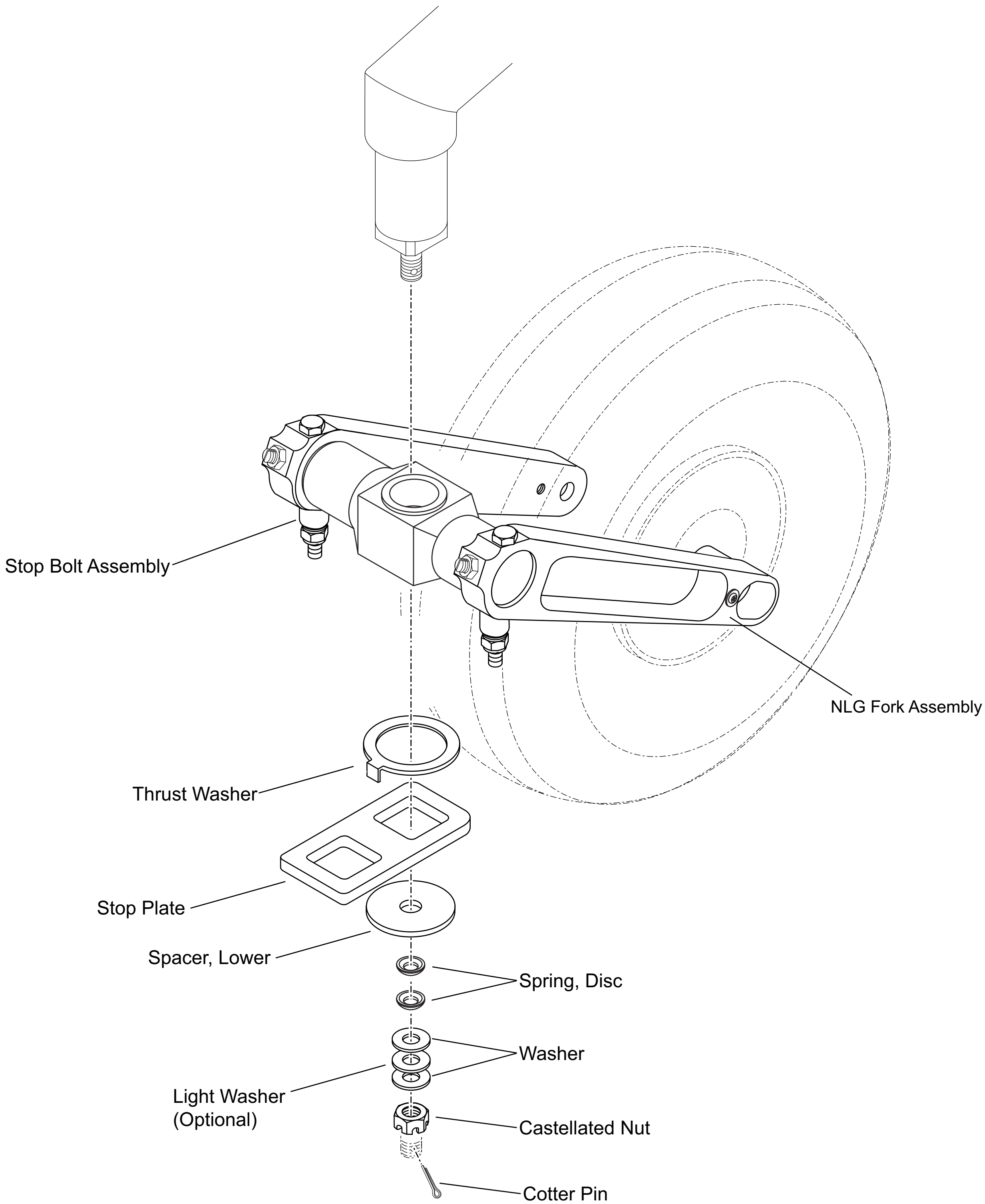

Figure 205 - NLG Fork Installation

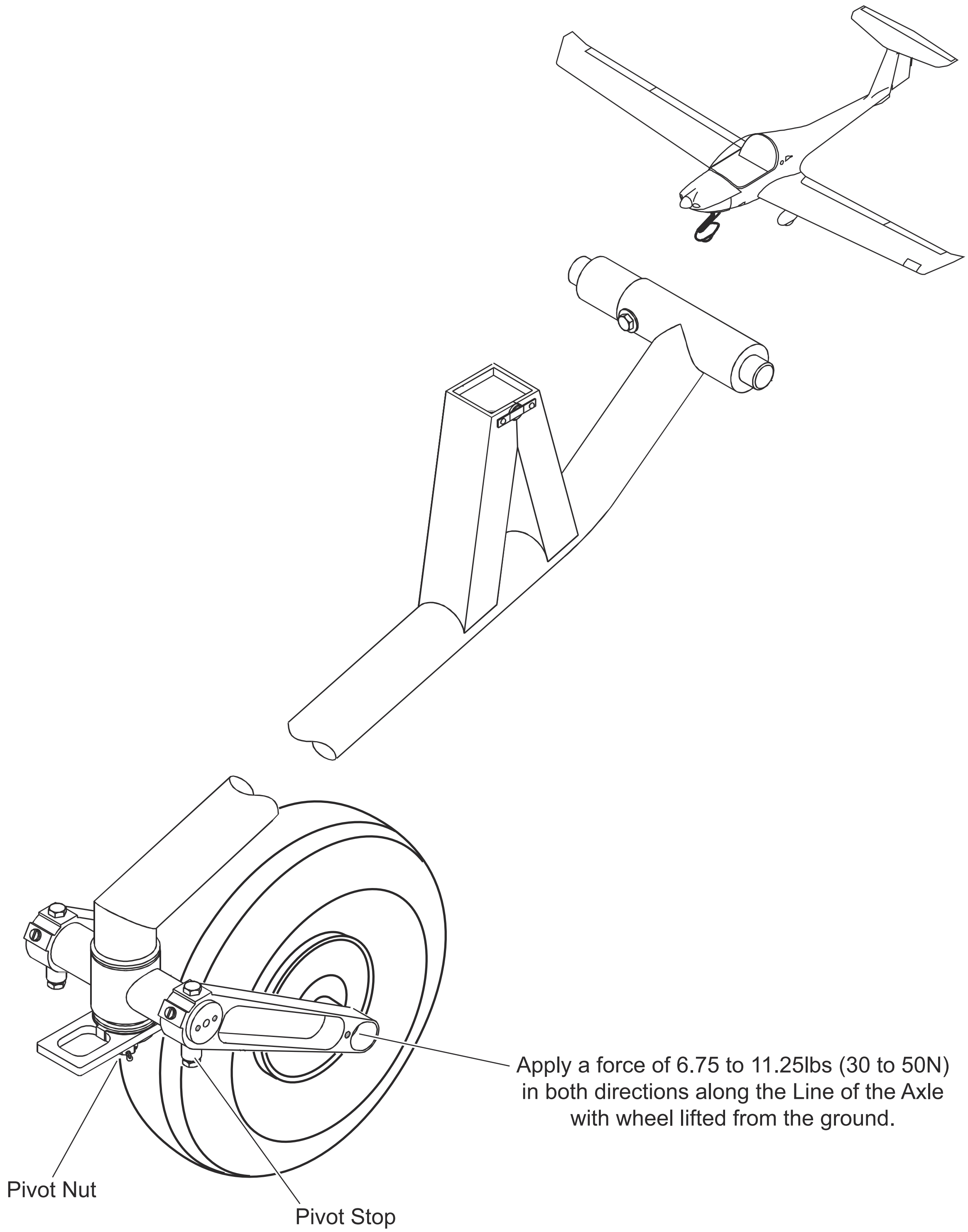

Figure 206 - Adjust the Nose Wheel Steering Friction

WHEELS AND BRAKES

1. General

This chapter describes the data for the main and nose wheels and for the brake system. It gives you the trouble-shooting and maintenance practices.

2. Description and Operation

A. Main Wheel

Figure 1 shows the wheels. The main wheel hub has two aluminum alloy halves. Three bolts hold the two halves together. The bolts also hold a brake disk to the inner half of the hub.

The wheel has a tire with an inner tube. Snap rings hold taper roller bearings and grease seals in each half of the hub. You can remove the bearings for maintenance. The outer half of the hub has a hole for the valve stem.

B. Nose Wheel

The nose has a similar construction to the main wheel. But it has sealed ball bearings.

C. Brake System

Figure 2 shows the brake system schematic diagram. The DA20-C1 aircraft has two separate brake systems. The pilots and co-pilots left rudder pedals operate the left system. It supplies pressure to the left brake caliper. The right rudder pedals operate the right brake caliper.

Figure 3 shows the brake master cylinder and reservoir installation. Each system has a brake fluid reservoir. The reservoir attaches to the master cylinder on the co-pilot's rudder pedal. The outlet from the master cylinder on the co-pilot's rudder pedal connects to the inlet of the master cylinder on the pilot's rudder pedal. The outlet of the master cylinder on the pilot's rudder pedals connects to the parking brake valve. The parking brake valve connects to the brake caliper.

Figure 4 shows the wheel brake assembly.

The parking brake valve shown in Figure 2 is located below the right seat. It contains 2 valves which can seal the brake pressure into the calipers. This keeps the brakes on. The pressure will reduce in time and the brakes will release. A serviceable parking brake valve will hold the brakes on for more than one day.

(1) Co-Pilot's Brake Operation

When you press on the co-pilot's right brake pedal, the following happens:

- The connection to the reservoir is cut off by the initial movement
- Further movement pushes fluid past the piston on the pilot's master cylinder
- The fluid flows through the parking brake valve to the right brake caliper
- The fluid pushes the piston and the pressure plate against the brake disk

- The reaction force on the caliper pulls the back plate against the brake disk

- And the right brake is applied.

In the same way, when you press on the co-pilot's left brake pedal, the left brake is applied.

(2) Pilot’s Brake Operation

When you press on the pilot's right brake pedal, these things happen:

- The connection from the co-pilots master cylinder is cut off by the initial movement. (Note: Any hydraulic pressure from the co-pilot's master cylinder pushes on the back of the piston in the pilot's master cylinder. This increases the brake pressure).

- The fluid flows through the parking brake valve to the right brake caliper

- The fluid pushes the piston and the pressure plate against the brake disk

- The reaction force on the caliper pulls the back plate against the brake disk

- And the right brake is applied.

In the same way, when you press on the pilot's left brake pedal, the left brake is applied.

NOTE: If one side of the system fails, one or both pilots can loose braking on that side. For example, a leak in the pipe between the co-pilot's and pilot's right master cylinders will cause a right brake failure for the co-pilot. The pilot's right brake will operate correctly. If the leak is between the pilots right master cylinder and the right brake caliper, both pilots will have right brake failure.

(3) Parking Brake Operation

To apply the parking brake:

- Press on both pedals

- Pull the parking brake knob fully aft

- Release your foot pressure on the pedals

- If necessary, pump the brake pedals.

To release the parking brake, select control too off.

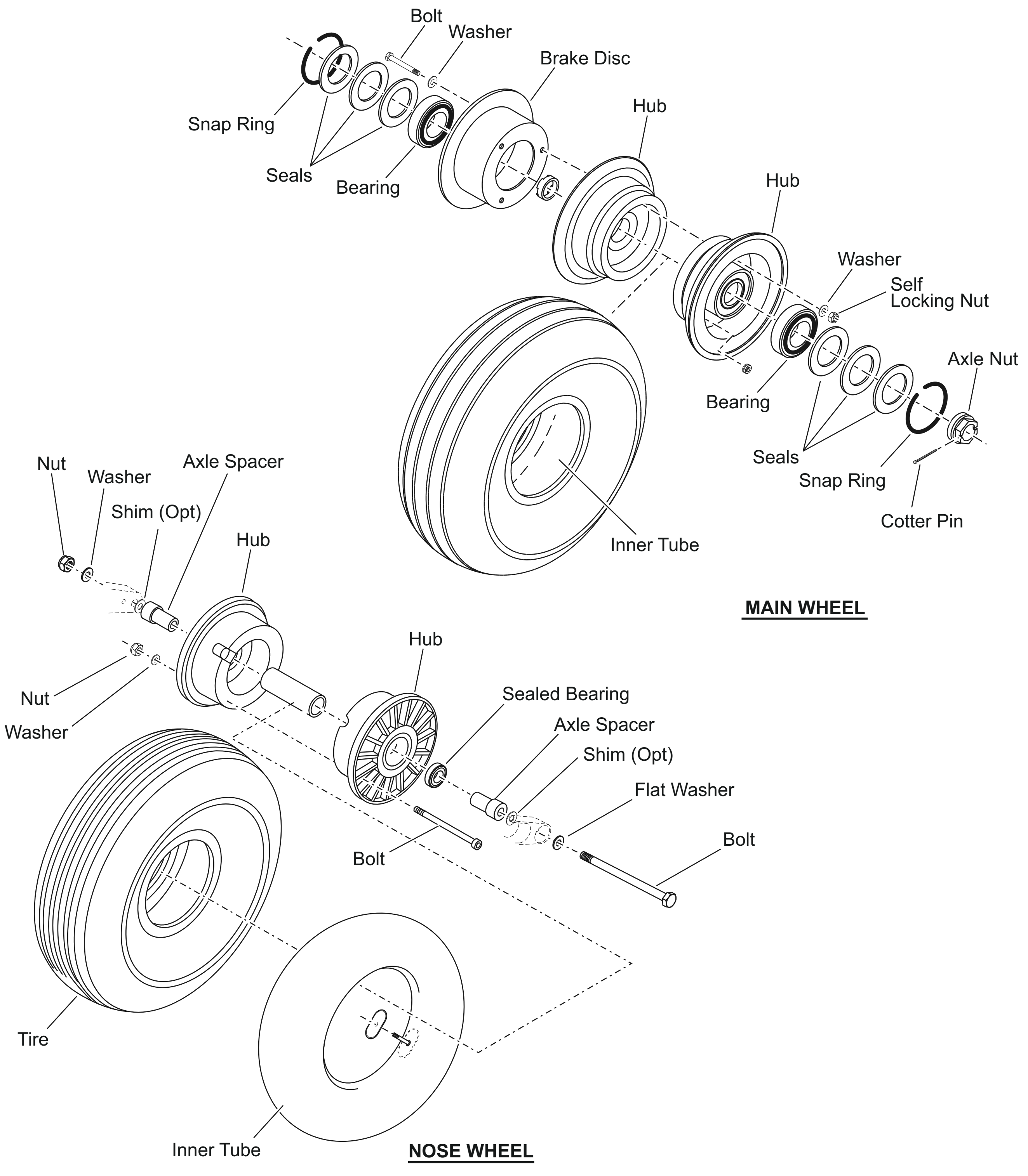

Figure 1 - Main and Nose Wheel

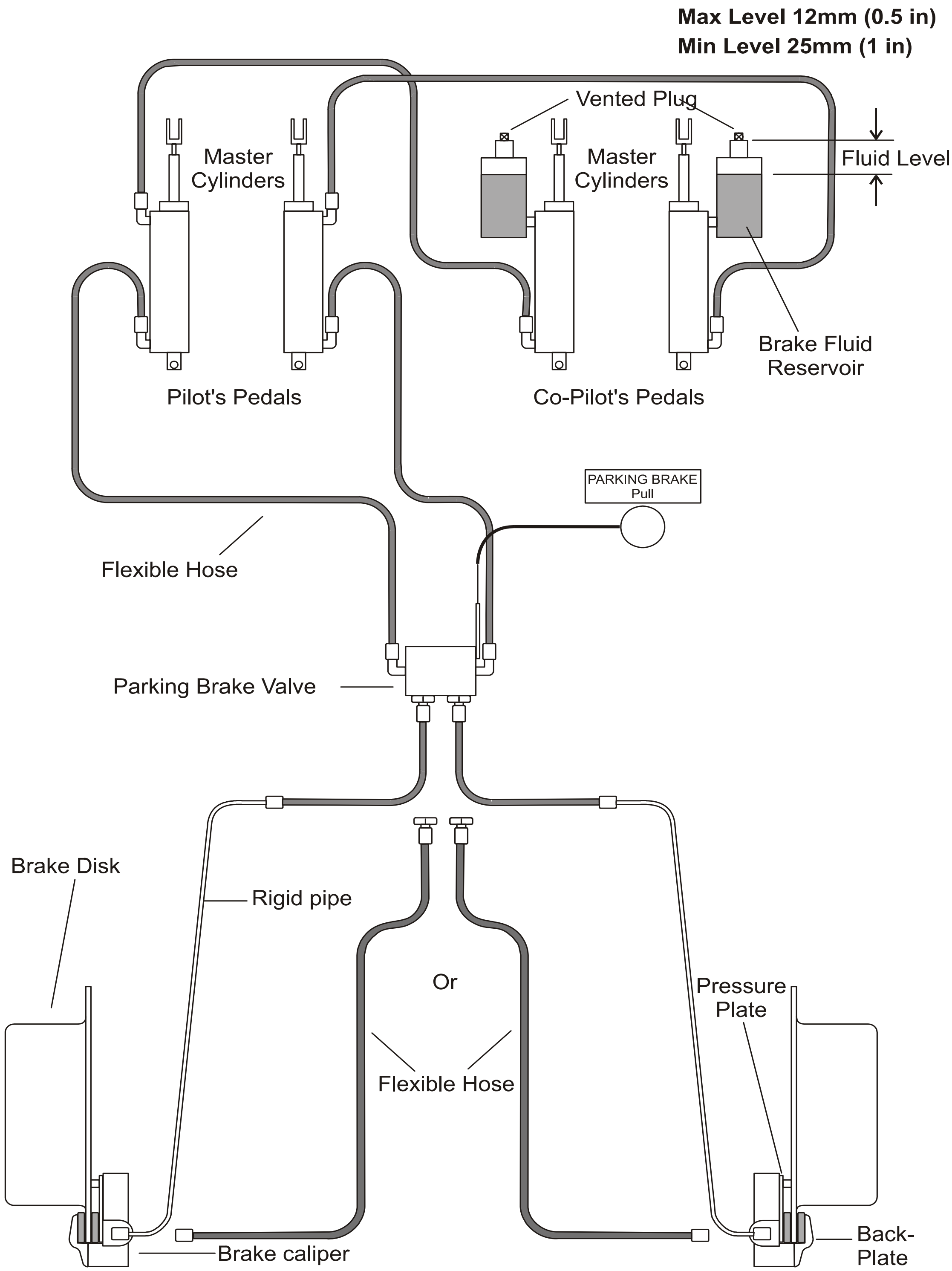

Figure 2 - Brake System Schematic

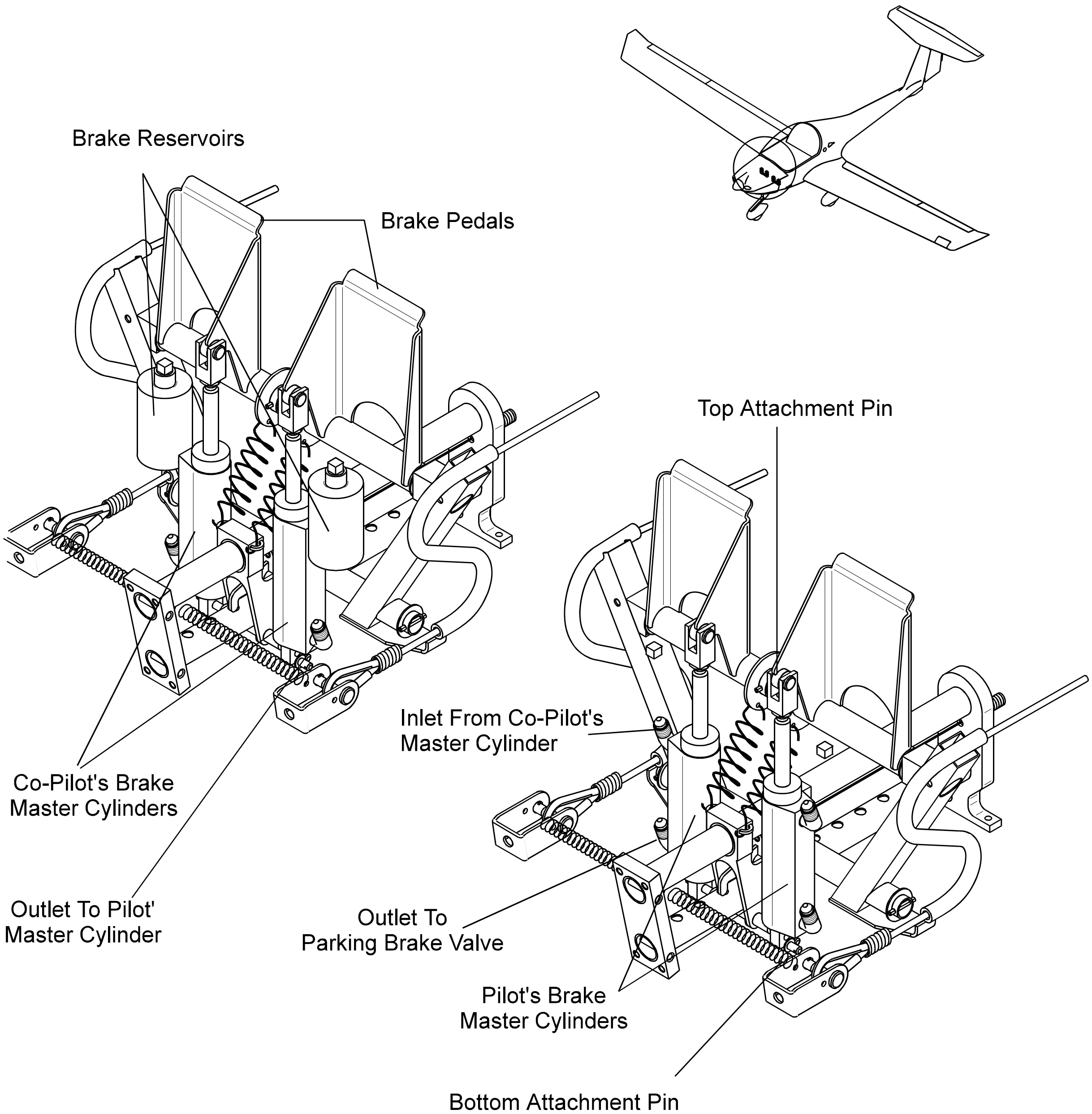

Figure 3 - Brake Master Cylinder and Reservoir Installation

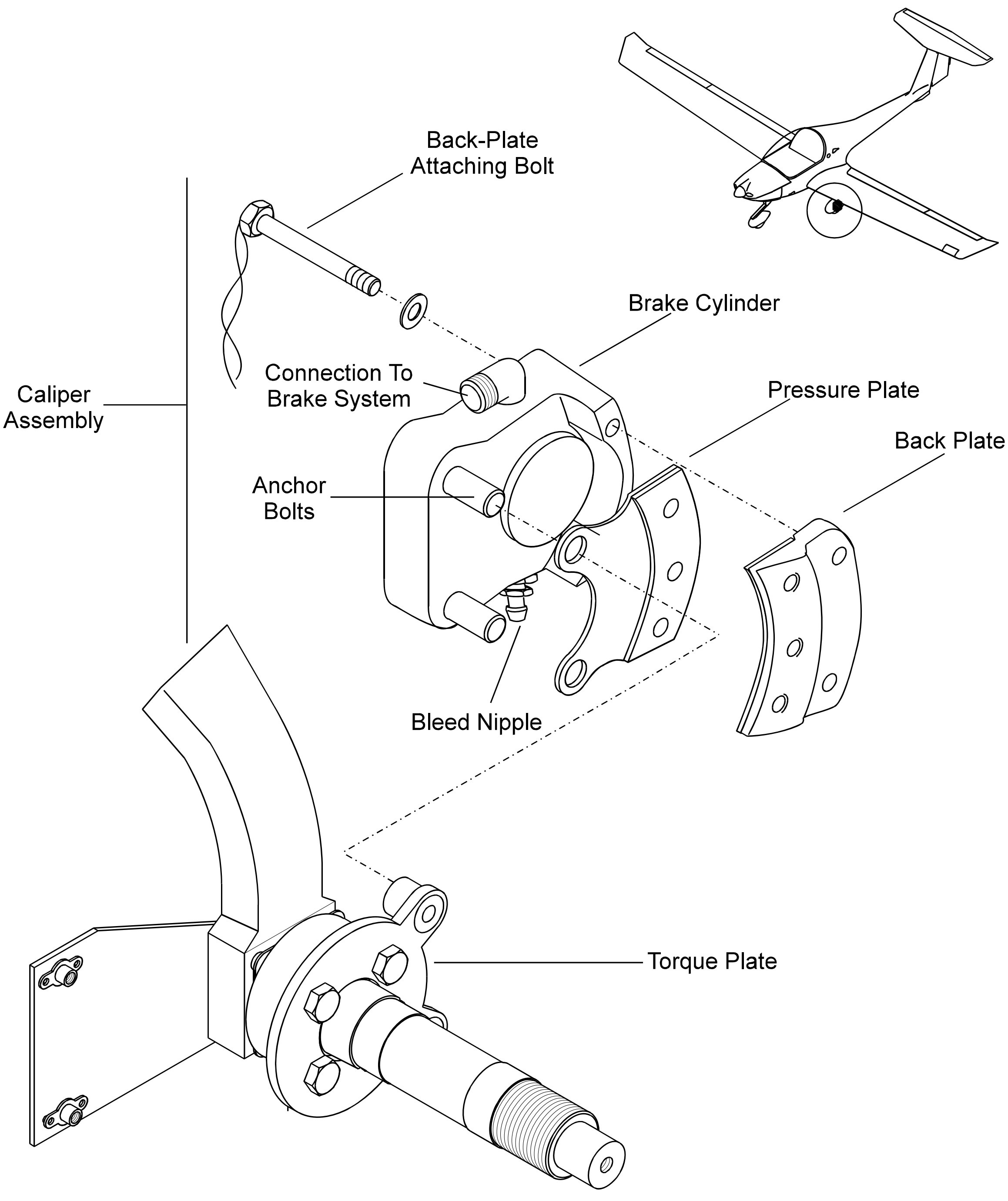

Figure 4 - Wheel Brake Assembly

WHEELS AND BRAKES - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the wheel and brake system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Too much tire wear.	Incorrect toe-in.	Adjust the toe-in. Refer to Chapter 32-10.
Too much axial play in a wheel.	Main wheel incorrectly adjusted.	Adjust the main wheel.
	Defective wheel bearing.	Replace the wheel bearings.
Brake disk distorted.	Brakes applied too hard. Hard landing.	Replace the brake disk
Brakes do not hold static engine run-up with the usual pedal force.	Too much light braking. Brake lining glaze worn away.	Condition the brake linings.
Brake(s) do not operate.	Brake fluid level low.	Fill the system with brake fluid.
	Air in the brake system.	Bleed the brake system.
	Defective master cylinder.	Replace the master cylinder and then bleed the brake system.
	Defective caliper.	Replace the caliper and then bleed the brake system.
	Worn out brake linings.	Replace the brake linings and then bleed the brake system.
	Leaking connector.	Tighten (or replace) the connector and then bleed the brake system.

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WHEELS AND BRAKES - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the components and the conditioning procedure for the brake linings.

Refer to the manufacturer's data (Parker Hannifin Corporation, Cleveland, OH, USA) for other shop data.

2. Remove/Install the Main Wheel

A. Equipment

Item	Quantity	Part Number
Aircraft Jacks	2	Commercial
Tail Former	1	

B. Remove the Main Wheel

	Detail Steps/Work Items	Key Items/References
1.	Remove the wheel fairing: - Remove the outer bolt - Remove the two screws on the inner side.	
2.	Lift the aircraft on jacks.	Refer to Chapter 07-10.
3.	Remove the back-plate from the brake caliper.	Cut the locking wire.
WARNING: DEFLATE THE WHEEL BEFORE THE AXLE NUT IS REMOVED. FAILURE TO DEFLATE THE TIRE BEFORE THE WHEEL REMOVAL COULD RESULT IN SEVERE INJURY TO PERSONNEL.		
4.	Remove the axle nut.	Discard the cotter pin.
5.	Pull the wheel from the axle.	

C. Install the Main Wheel

	Detail Steps/Work Items	Key Items/References
	WARNING: MAKE SURE THAT THE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH. WARNING: INFLATION OF TIRE CAN BE EXTREMELY DANGEROUS AND IT IS RECOMMENDED THAT INFLATION BE PERFORMED IN AN INFLATION CAGE PRIOR TO INSTALLATION ON THE AIRCRAFT.	
1.	Check the tire pressure.	If required, inflate the tire to the specified level.
2.	Apply a light coating of the wheel bearing grease to the felt grease seals.	Make sure that the wheel bearings are installed and lubricated.
3.	Apply a light coating of the wheel bearing grease to the axle bearings installation areas.	Use grease TYPE 1. Refer to Chapter 12-20.
4.	Install the slotted ring or seal axle inner with wheel bearing grease between the slotted ring and the axle.	
	CAUTION: DO NOT MIX AVIATION WHEEL BEARING GREASE WITH EACH OTHER. IF USING OTHER APPROVED GREASE, COMPLETE REMOVAL OF CONTAINED GREASE AND BEARING CLEANING IS REQUIRED. REPLACEMENT OF PREVIOUSLY LUBRICATED FELT GREASE SEALS IS ALSO REQUIRED. (REFER TO CLEVELAND WHEELS AND BRAKES MANUAL AWBCMM0001 LATEST APPROVED REVISION).	
5.	Put the wheel in position on the axle.	Make sure that the brake caliper is correctly engaged on the torque-plate.
	NOTE: Rotate the wheel by hand while you tighten the axle nut.	
6.	Install the axle nut (axle-nut with spacer or the axle-nut assembly).	Torque to 9 lbf-ft (12.2 Nm).
7.	Loosen the axle nut until it is just loose.	
8.	Tighten the axle nut.	Torque to 3.4 - 4.5 lbf-ft (4.5 - 6.8 Nm).
9.	Loosen the axle nut until one of the two holes in the axle aligns with the nut.	Do not loosen the nut more than 30 degrees. (Half of a flat).

	Detail Steps/Work Items	Key Items/References
10.	Measure the end play in the hub assembly.	Wheel must rotate freely without perceptible play.
11.	Install a new cotter-pin.	Bend the ends of the cotter pin against the axle nut. Check security of the wheel installation.
12.	Lower the aircraft with the jacks.	Refer to Chapter 07-10-00.
14.	Install the back-plate to the brake caliper.	Torque to 75 - 80 lbf-in. (8.5 - 9 Nm). Lock with wire.
15.	Install the wheel fairing: - Install the two screws on the inner side - Install the outer bolt.	

3. Remove/Install the Nose Wheel

A. Equipment

Item	Quantity	Part Number
Padded Trestle	1	Commercial
Weight and Strap	1	Commercial

B. Remove the Nose Wheel

	Detail Steps/Work Items	Key Items/References
1.	Remove the wheel fairing: - Remove the six allen screws that attach the left half of the fairing to the right half. - Remove the LH and RH mounting screws	
	- Remove the fairing.	
2.	Use weights to hold the rear fuselage down with the nose wheel clear of the ground.	Use a strap around the rear fuselage.
3.	Put a padded trestle under the front fuselage just aft of the nose gear mounting.	
WARNING: DEFLATE THE WHEEL BEFORE THE AXLE NUT IS REMOVED. FAILURE TO DEFLATE THE TIRE BEFORE THE WHEEL REMOVAL COULD RESULT IN SEVERE INJURY TO PERSONNEL.		

	Detail Steps/Work Items	Key Items/References
4.	Remove the 7/16 nut from the axle bolt.	
5.	Remove the axle bolt.	Hold the wheel.
6.	Remove the wheel from the fork.	
7.	Note the thickness and location of the shims installed between the wheel axle spacers and the fork assembly (if installed).	

C. Install the Nose Wheel

	Detail Steps/Work Items	Key Items/References
	WARNING: MAKE SURE THAT THE AIRCRAFT IS SECURE AND STABLE BEFORE BEGINNING ANY WORK. WORKING UNDER AN IMPROPERLY STABILIZED AIRCRAFT COULD CAUSE INJURY OR DEATH TO PERSONNEL. WARNING: INFLATION OF TIRE CAN BE EXTREMELY DANGEROUS AND MAY CAUSE INJURY TO PERSONNEL. IT IS RECOMMENDED THAT INFLATION BE PERFORMED IN AN INFLATION CAGE PRIOR TO INSTALLATION ON THE AIRCRAFT.	
1.	Check the tire pressure.	If required, inflate the tire to specified level.
2.	Put the wheel in position in the fork.	
3.	Install the axle shims between the wheel axle spacers and the fork assembly.	Select the shims thickness as required to fill the gap.
4.	Divide shim installation evenly from side to side when possible to a maximum of 2 shims.	Maximum difference between sides is 0.010 in. (0.254 mm). If the gap is less than 0.010 in. (0.254 mm), no shim is required.
5.	Install the axle bolt and 7/16 UNJF nut.	Standard Torque. Refer to Chapter 20-00. Put mastinox 6856 K corrosion-inhibitor or LPS-3 on the shank of the bolt. Clean the corrosion inhibitor from the threads.
6.	Turn the nose wheel. Make sure that the valve cap does not touch the fork.	Clearance 0.08 in. (2 mm) minimum.
7.	Remove the trestle from the front fuselage.	
8.	Lower the nose wheel to the floor.	Remove the weights from the rear fuselage.

	Detail Steps/Work Items	Key Items/References
9.	Install the wheel fairing (if applicable): - Put the two halves in position - Install the LH and RH mounting screws - Install the screws that hold the fairings together.	

4. Remove/Install a Brake Master Cylinder

A. Remove a Brake Master Cylinder

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT GET BRAKE FLUID ON YOU. BRAKE FLUID CAN CAUSE DISEASE. CAUTION: CLEAN UP SPILT BRAKE FLUID IMMEDIATELY. BRAKE FLUID CAN DAMAGE PAINT AND OTHER MATERIAL.	
1.	Disconnect the brake pipe(s) from the brake master cylinder.	Catch the brake fluid. Refer to Figure 201. Put the caps on the connections.
2.	Remove the top pivot pin: - Remove the cotter pin - Remove the washer - Remove the pivot pin.	
3.	Remove the bottom pivot pin: - Remove the cotter pin - Remove the washer - Move the master cylinder sideways off the pivot pin.	Refer to 71-10-00.
4.	Lift the master cylinder from the rudder pedal assembly.	

B. Install a Brake Master Cylinder

	Detail Steps/Work Items	Key Items/References
1.	Put the master cylinder in position on the bottom pivot pin.	Refer to Figure 201.
2.	Attach the master cylinder to the bottom pivot pin: - Install the washer - Install the cotter pin	
3.	Install the top pivot pin as follows: - Install the pivot pin - Install the washer - Install the cotter pin.	
4.	Connect the brake pipe(s) to the brake master cylinder.	
5.	Bleed the brake system.	Refer to Paragraph 7.
6.	Do a function test of the brake system:	

5. Remove/Install a Brake Caliper

A. Remove a Brake Caliper

	Detail Steps/Work Items	Key Items/References
1.	Remove the two bolts that hold the back-plate. Remove the back-plate.	Cut the lock-wire.
	WARNING: DO NOT GET BRAKE FLUID ON YOU. BRAKE FLUID CAN CAUSE DISEASE. CAUTION: CLEAN UP SPILT BRAKE FLUID IMMEDIATELY. BRAKE FLUID CAN DAMAGE PAINT AND OTHER MATERIAL.	
2.	Disconnect the brake pipe or hose from the caliper.	Catch the brake fluid. Put the caps on the connections.
3.	Remove the pressure plate and the caliper from the torque-plate.	

B. Install a Brake Caliper

	Detail Steps/Work Items	Key Items/References
1.	Put the caliper and pressure plate in position on the torque-plate.	Use Loctite anti-seize compound 767 on the locating pins.
2.	Connect the brake pipe or hose to the caliper.	
3.	Put the back plate in position on the caliper.	
4.	Install the two bolts which attach the back plate.	Torque to 75 - 80 lbf-in. (8.5 - 9 Nm).
5.	Lock the bolts with wire.	
6.	Bleed the brake system.	Refer to Paragraph 7.

6. Remove/Install the Parking Brake Valve

A. Remove the Parking Brake Valve

	Detail Steps/Work Items	Key Items/References
1.	Remove the right pilot's seat.	Refer to Chapter 25-10-00.
2.	Disconnect the bowden cable:	Refer to Figure 202.
	- Loosen the bolt in the end fitting	
	- Pull the center wire from the end fitting.	
	WARNING: DO NOT GET BRAKE FLUID ON YOU. BRAKE FLUID CAN CAUSE DISEASE. CAUTION: CLEAN UP SPILT BRAKE FLUID IMMEDIATELY. BRAKE FLUID CAN DAMAGE PAINT AND OTHER MATERIAL.	
3.	Disconnect the four brake pipes from the parking brake valve.	Catch the brake fluid. Put the caps on the connections.
4.	Remove the nuts, the bolts and the washers that attach the parking brake valve.	
5.	Remove the parking brake valve.	

B. Install the Parking Brake Valve

	Detail Steps/Work Items	Key Items/References
1.	Put the parking brake valve in position.	
2.	Install the nuts, the bolts and the washers that attach the parking brake valve.	Make sure that the bracket for the bowden cable is in position.
3.	Connect the four brake pipes to the parking brake valve.	
4.	Put center wire of the bowden cable through the end fitting on the parking brake lever. Tighten the bolt	With the brake lever in the center console set to OFF, the lever on the parking brake valve must be fully forward.
5.	Bleed the brake system.	Refer to Paragraph 7.
6.	Do a function test of the parking brake: - Set the parking brake to ON - Pump the foot brake pedals - The brakes must stay on	
	- Set the parking brake to OFF - The brakes must release.	
7.	Install the right pilot's seat.	Refer to Chapter 25-10-00.

7. Bleed the Brake System

A. Equipment

Item	Quantity	Part Number
Pressure bleed equipment with Aero Shell Fluid 41 (MIL-H-5606H) brake fluid.	1	Commercial
Transparent overflow pipe and container	1	Commercial

B. Bleeding Procedure

Do this procedure for each brake system (left and right) as necessary.

	Detail Steps/Work Items	Key Items/References
1.	Clean the area of the brake fluid reservoir cap.	
2.	Remove the cap.	Use a strap around the rear fuselage.
	WARNING: DO NOT GET BRAKE FLUID ON YOU. BRAKE FLUID CAN CAUSE DISEASE. CAUTION: CLEAN UP SPILT BRAKE FLUID IMMEDIATELY. BRAKE FLUID CAN DAMAGE PAINT AND OTHER MATERIAL.	
3.	Connect the transparent overflow pipe to the reservoir.	Put the free end of the pipe in a container.
4.	Clean the area around the bleed nipple.	
5.	Connect the pressure bleed equipment to the bleed nipple below the brake caliper.	Use only Aero Shell Fluid 41 (MIL-H-5606H) brake fluid.
6.	Open the bleed nipple about ½ to 1 turn.	
7.	Use the pressure bleed equipment to fill the brake system.	
8.	Operate the parking brake ON and OFF 10 to 20 times to remove the air from the system.	Continue bleeding the system.
9.	Operate the pilot's brake pedals many times to remove the air from the system.	Continue bleeding the system.
10.	Operate the co-pilot's brake pedals many times to remove the air from the system.	Continue bleeding the system until no more air bubbles come from the reservoir.
11.	Close the bleed nipple. Remove the pressure bleed equipment.	
12.	Remove the overflow pipe and container.	
13.	Measure the fluid level in the reservoir. If necessary, add or remove fluid.	The correct level is ½ in (12 mm) below the top of the filler hole. When the level is 1.0 in (25 mm) below the top of the filler hole you must add fluid to the correct level. Refer to Figure 2, Brake System Schematic.
14.	Install the reservoir cap.	
15.	Do a functional test of the brake system.	

8. Condition of the Brake Linings

The brake linings are a non-asbestos organic material. You must condition new brake linings. Conditioning gives a thin layer of glaze at the friction surface. Usual brake usage keeps the layer of glaze for the life of the brake lining.

Light brake use can wear off the glaze. This reduces brake performance. If the glaze wears off, do the conditioning procedure.

	Detail Steps/Work Items	Key Items/References
1.	Taxi the aircraft for 1500 ft with 1700 engine rpm.	Use the brakes to keep the speed at 5 - 10 mph (8 - 16 km/h).
2.	Let the brakes cool for 10-15 minutes.	
3.	Apply the brakes. Do a high throttle run-up.	The brakes must hold with the usual pedal force.
4.	If the brakes do not hold the static run-up, do steps 1 - 3 again as necessary.	

9. Wheels and Brakes Cleaning Procedures

Do the following inspection and cleaning procedures of the DA20-C1 wheels and brakes.

A. Inspection

	Detail Steps/Work Items	Key Items/References
1.	Remove the main wheel.	Refer to Paragraph 2.B.
CAUTION: DO NOT MIX AVIATION WHEEL BEARING GREASES WITH EACH OTHER. IF USING OTHER APPROVED GREASE, COMPLETE REMOVAL OF CONTAINED GREASE AND BEARING CLEANING IS REQUIRED. REPLACEMENT OF PREVIOUSLY LUBRICATED FELT GREASE SEALS IS ALSO REQUIRED.		
2.	Inspect bearings. Make sure there is enough grease on the bearing.	Apply grease on bearing. Use Mobil Aviation Grease SHC 100.
3.	If felt grease seals are used, lightly coat all surfaces of the seals with bearing grease prior to installing.	
4.	If rubber lip seals are used, lubricate the bearing seal bore with bearing grease.	
5.	Install the main wheel.	Refer to Paragraph 2.C.

B. Cleaning

	Detail Steps/Work Items	Key Items/References
1.	Remove the main wheel.	Refer to Paragraph 2.B.
	CAUTION: DO NOT USE HIGH PRESSURE SPRAY WASH EQUIPMENT. THE USE OF HIGH PRESSURE SPRAY WASH MAY INJECT SOAP SOLUTION AND WATER INTO BEARINGS AND OTHER INTERNAL CAVITIES RESULTING IN CORROSION AND REDUCED SERVICE LIFE.	
2.	Hand wash wheels and brakes with a mild soap and water solution.	Rinse with low-pressure spray.
3.	Install the main wheel.	Refer to Paragraph 2.C.

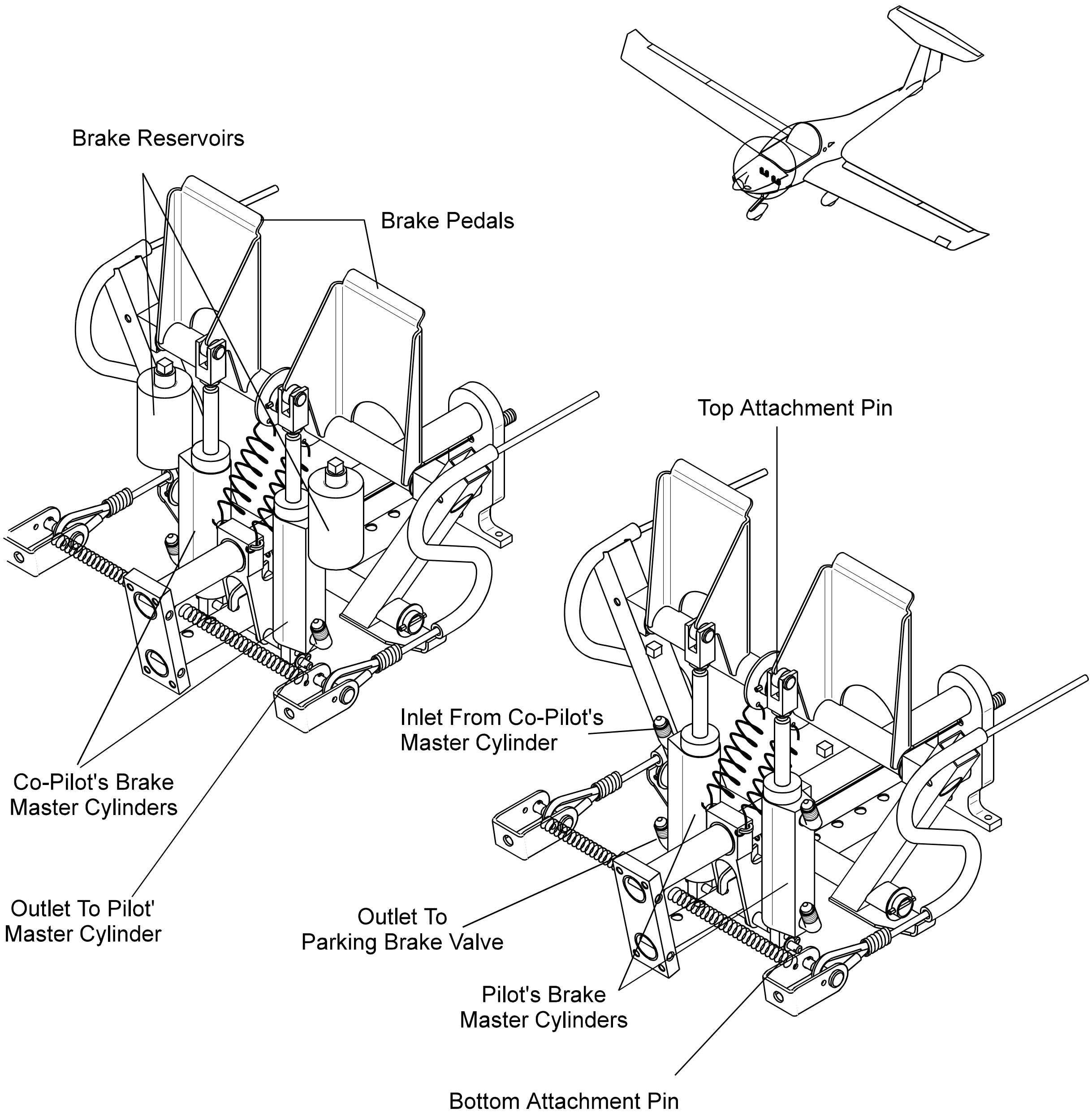

Figure 201 - Brake Master Cylinder and Reservoir Installation

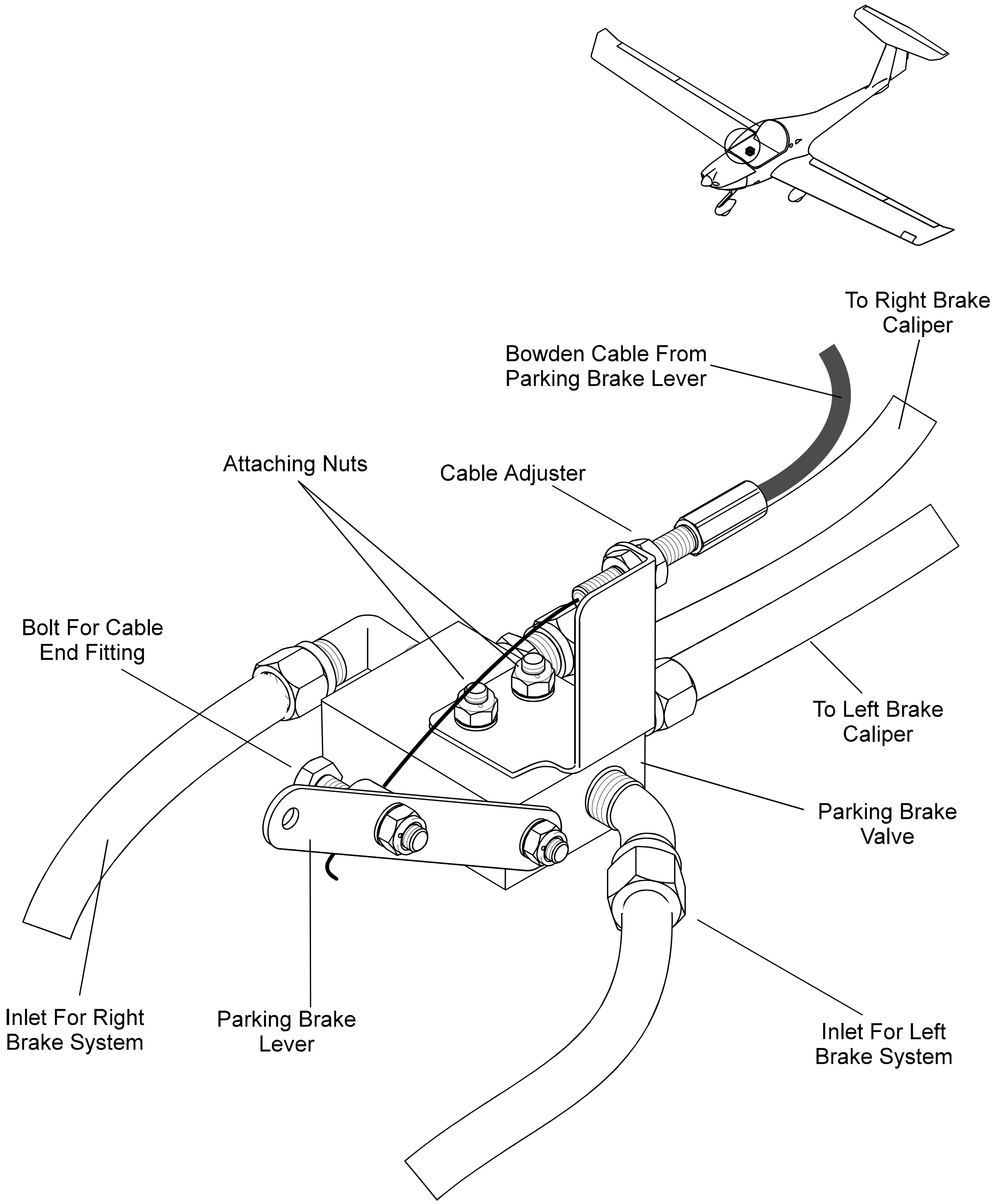

Figure 202 - Parking Brake Valve Installation

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CHAPTER 33-00

LIGHTS

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LIGHTS

1. General

This chapter describes about the cockpit and exterior lighting on the DA20-C1 aircraft. Chapter 33-20 describes about the cockpit lighting. Chapter 33-40 describes about the exterior lighting. Refer to Chapter 92 for wiring diagrams for the lighting systems.

2. Description

Figure 1 shows the location of the lights. The DA20-C1 aircraft has the following cockpit lights:

- General instrument panel lighting from two lights on the bottom face of the roll bar
- A map light on the bottom face of the roll bar
- Internal lighting for the magnetic compass
- Optional internal lighting of all instruments
- Optional electroluminescent map light on instrument panel cover.

Some avionics equipment has internal lighting. Refer to the related chapter and the manufacturers' handbooks for the equipment in your aircraft. The controls for the interior lights are on the instrument panel.

The DA20-C1 aircraft has the following exterior lights in one light-unit at each wing-tip:

- Left and right position lights: The front part of the light-unit has a red (left) or green (right) lens. The light can be seen from the front and the side.
- Rear position lights: The aft part of each light-unit has a clear lens. The lights can be seen from the rear only.
- Anti-collision lights (ACL): The middle part of each light-unit has a clear lens. The filament gives a high-intensity flash. The lights can be seen from all directions. The power-unit for the ACL is located under the left seat.

The DA20-C1 aircraft has the following exterior lights in one housing in the leading edge of the left wing:

- Landing light: The landing light has a clear lens and a 100 watt bulb. It is located inboard in the housing.
- Taxi light: The taxi light has a optic lens and a 100 watt bulb. It is located outboard in the housing.

The switches for the exterior lights are located together on the left instrument panel.

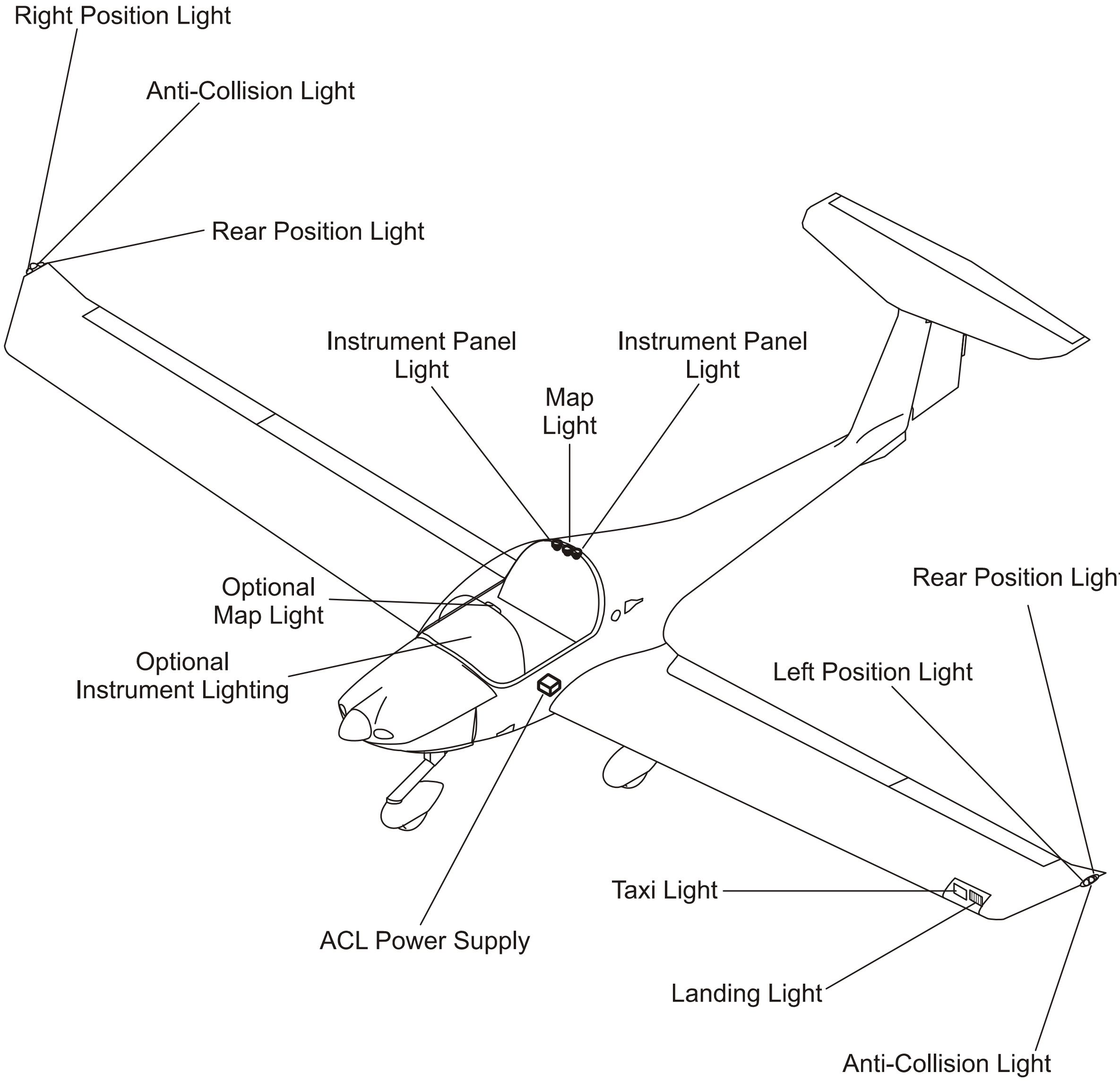

Figure 1 - Cockpit and Exterior Lights

COCKPIT LIGHTING

1. General

This chapter describes about the cockpit lighting on the DA20-C1 aircraft. Refer to Chapter 92 for the cockpit lighting wiring diagrams.

2. Description

The DA20-C1 aircraft cockpit lighting systems:

- General instrument panel lighting from two lights on the bottom face of the roll bar
- A map light on the bottom face of the roll bar
- Internal lighting for the magnetic compass
- Some aircraft have optional backlit instruments
- An optional flood light under the glare shield may be installed.

Some avionics equipment has internal lighting. Refer to the related AMM Chapter and the manufacturers' handbooks for the equipment in your aircraft.

A. General Instrument Panel Lighting

Two lights give general lighting to the instrument panel. They are located below the roll bar. Each light gives a flat beam. You can adjust the angle and direction of the beam. The switch for the instrument panel lighting is located on the instrument panel. The instrument panel rheostat controls the brightness of the lights.

Some aircraft may be equipped with a backlit instruments, controlled by a combined switch/pot located on the instrument panel.

B. Map Light

A map light gives lighting to the inside of the cockpit. The light is located below the roll bar between the instrument panel lights. You can adjust the angle and direction of the beam. The switch for the map light is located on the instrument panel.

C. Instrument Panel Rheostat

The instrument panel rheostat is located beside the instrument panel light switch. It controls the brightness of the general instrument panel lights. In aircraft equipped with backlit instruments the brightness is controlled with a combined switch/pot located on the instrument panel.

D. DIM/BRIGHT Switch

The DIM/BRIGHT switch is located beside the rheostat. It controls the internal light for the magnetic compass. It also controls the brightness of the flap and trim controls. (The switch can also control the brightness of some avionic equipment displays. Refer to the related AMM Chapter or the manufacturers' handbook for more data.). Aircraft equipped with backlit instruments do not contain a DIM/BRIGHT switch.

COCKPIT LIGHTING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the cockpit lighting systems. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Instrument panel lighting does not operate.	Circuit-breaker not set.	Set the circuit-breaker.
	Defective instrument light switch.	Replace the switch.
	Defective rheostat.	Replace the rheostat.
	Defective lighting control module.	Check wiring and repair/replace lighting control module.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
Map light does not operate.	Circuit-breaker not set.	Set the circuit-breaker.
	Defective map light switch.	Replace the switch.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
Compass light does not operate when the DIM/BRIGHT switch is set to DIM. Trim and flap selector switches dim correctly.	Compass light bulb failed.	Replace the bulb.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
Compass light does not operate when the DIM/BRIGHT switch is set to DIM. Trim and flap selector switches do not dim correctly.	Flap circuit-breaker not set.	Set the flap circuit-breaker.
	Defective DIM/BRIGHT switch.	Replace the switch.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.

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COCKPIT LIGHTING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the general instrument light and map light module. Refer to AMM Chapter 92 for details of the electrical wiring.

2. Remove/Install the General Instrument Light/Map Light Module

A. Remove the General Instrument Light/Map Light Module

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
2.	Remove the nuts that attach the module to the fuselage.	
3.	Hold the module and disconnect the wiring harness. - Remove the module.	

B. Install the General Instrument Light/Map Light Module

	Detail Steps/Work Items	Key Items/References
1.	Put the module in position and connect the wiring harness.	
2.	Install the nuts that attach the module to the fuselage.	
3.	Set the GEN/BAT switch to ON. - Close the INST/TAXI light circuit breakers - Set the MAP switch to ON. Make sure that the map light comes on - Set the INST switch to ON. Make sure that the two instrument lights come on - Make sure the dimming control operates correctly - If necessary, adjust the lights to align correctly.	The map light is in the center of the module. The two instrument lights are on the outboard of the module. Cover the canopy with a dark clean cover when you adjust the lights. Refer to Figure 201.

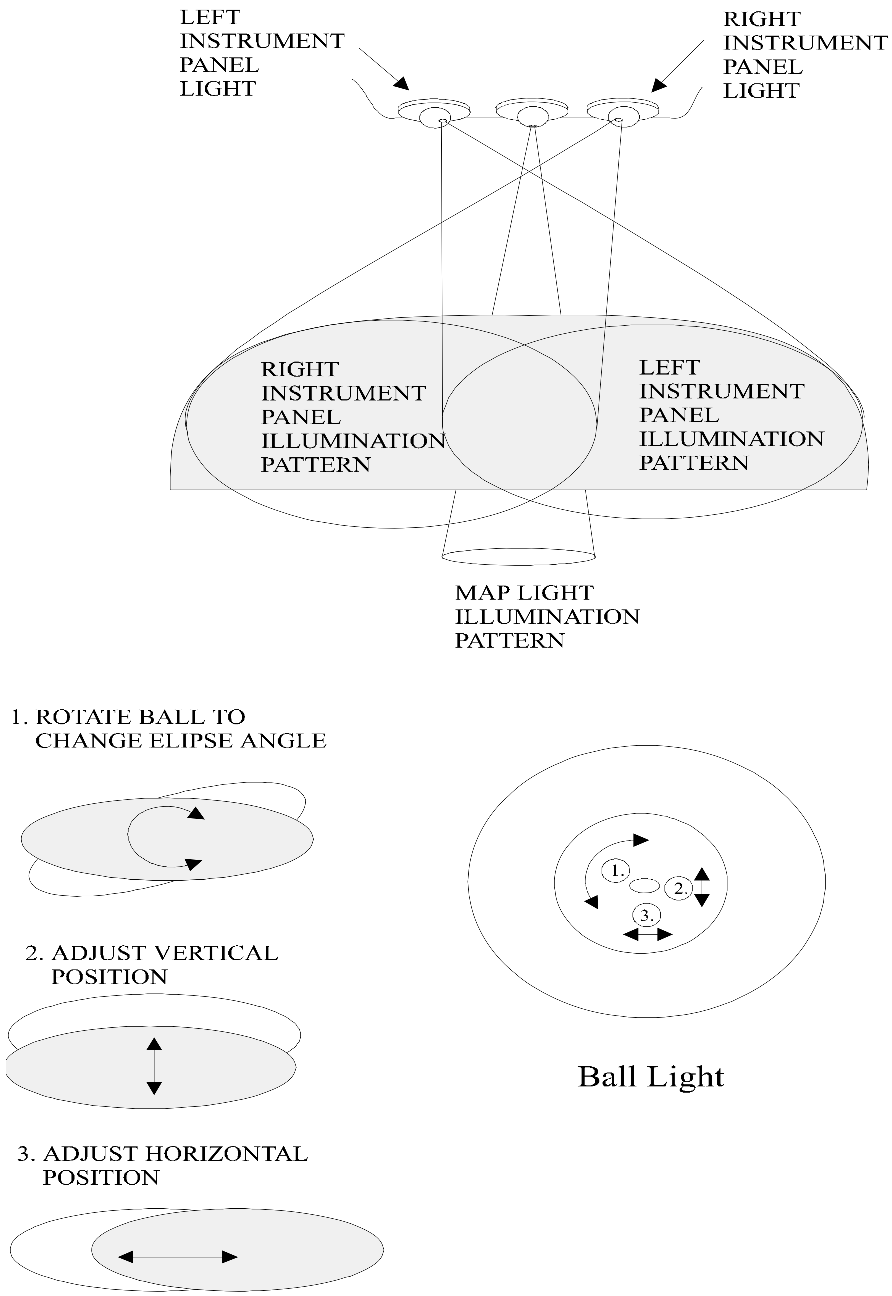

Figure 201 - General Instrument Light/Map Light Adjustment

EXTERIOR LIGHTS

1. General

This chapter describes about the exterior lights.

2. Description

The DA20-C1 aircraft has three exterior lights in one light-unit at each wing-tip. It also has landing and taxi lights in a housing in the left wing. Figure 201 shows the wing-tip light-unit.

A. Position Lights

The DA20-C1 aircraft has left and right position lights. The front part of the light-unit has a red (left) or green (right) lens. The light can be seen from the front and the side.

The light-unit also has the rear position lights. The aft part of each light-unit has a clear lens. The lights can be seen from the rear only.

A switch on the left instrument panel controls the position lights.

B. Anti-Collision Lights (ACL)

The middle part of each light-unit has a clear lens for an ACL. The filament gives a high-intensity flash. This is followed immediately by a less-bright flash. The double flashes occur about 50 times per minute. The ACLs can be seen from all round the aircraft.

The power-unit for the ACLs is located under the left seat. The power unit has separate high-voltage supplies for the left and right ACLs. A switch on the left instrument panel controls the power supply for the ACLs.

The power unit generates electrical pulses of about 600 volts. The pulse ionizes the gas in the ACL lamp which causes a bright flash. A second less powerful pulse follows immediately after the main pulse.

C. Landing Light

The landing light is located in a housing in the leading edge of the left wing. The landing light has a clear lens with a 100 watt bulb. It is located inboard in the housing. Figure 202 shows the landing light. A switch on the left instrument panel controls the landing light.

D. Taxi Light

The taxi light is located in a housing in the leading edge of the left wing. The taxi light has an optic lens with a 100 watt bulb. It is located outboard in the housing. Figure 202 shows the taxiing light. A switch on the left instrument panel controls the taxi light.

E. Recognition lights (optional)

The recognition lights are located in a housing in the leading edge of the left wing. The recognition lights have three optic lens with a 100 watt bulbs. They are located outboard in the housing. Figure 203 shows the recognition light. A switch on the left instrument panel controls the recognition lights.

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EXTERIOR LIGHTS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the exterior lighting systems. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Both position lights do not operate.	Circuit-breaker not set.	Set the circuit-breaker.
	Defective position light switch.	Replace the switch.
	Defective wiring in forward cockpit area.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
One position light does not operate.	Defective bulb.	Replace the bulb.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
Both ACLs do not operate.	Circuit-breaker not set.	Set the circuit-breaker.
	Defective switch.	Replace the switch.
	Defective power supply unit.	Replace the power supply unit.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
One ACL does not operate.	Defective power supply unit.	Replace the power supply unit.
	Defective ACL lamp.	Replace the ACL pump.
	Defective wiring.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
ACL and position light do not operate on one side.	Connector at wing root disconnected.	Connect the connector.

TROUBLE	POSSIBLE CAUSE	REPAIR
Landing light/taxi light not working.	Defective bulb.	Replace the bulb.
	Circuit-breaker not set or defective.	Set/replace the circuit-breaker.
	Defective landing or taxiing light switch.	Replace the switch.
	Defective wiring in forward cockpit area.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
	Loose connector next to the light.	Connect the connector correctly.
Optional recognition lights do not operate.	Defective bulb.	Replace the bulb.
	Circuit-breaker not set or defective.	Set/replace the circuit-breaker.
	Defective landing or taxiing light switch.	Replace the switch.
	Defective wiring in forward cockpit area.	Do a continuity test of the wiring. Repair/replace defective wiring. Refer to Chapter 92 for wiring diagrams.
	Loose connector next to the light.	Connect the connector correctly.

EXTERIOR LIGHTS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- remove and install the defective bulbs and light units
- adjust the landing light and the taxi light
- remove/install components in the system.

Refer to Chapter 92 for details of the electrical wiring.

WARNING: DO NOT OPERATE THE ANTI-COLLISION LIGHTS WHEN PERSONS ARE CLOSE TO THE AIRCRAFT AND DO NOT LOOK DIRECTLY AT THE LIGHT WHEN IT OPERATES. ANTI-COLLISION LIGHTS CAN CAUSE EYE DAMAGE.

WARNING: AFTER YOU SET THE POWER TO OFF, MAKE SURE YOU WAIT FOR A MINIMUM OF FIVE MINUTES BEFORE YOU DO WORK ON THE ANTI COLLISION LIGHTS. THE POWER SUPPLIES TO THE ANTI COLLISION LIGHTS GENERATE HIGH VOLTAGE. HIGH VOLTAGE CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Remove/Install the Taxi Light

A. Remove the Taxi Light

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
2.	Open the TAXI/MAP circuit breaker	
3.	Remove the taxi/landing light cover from the wing. - Examine the white vinyl tape on the cover for damage. If necessary, replace the tape.	
4.	Loosen the lock nuts and remove the screws that attach the taxi light to the wing.	The taxi light is the outboard assembly. Refer to Figure 202.
5.	Hold the taxi light and carefully move the light out from the wing. - Disconnect the electrical connector from the rear of the taxi light. - Remove the taxi light.	

B. Install the Taxi Light

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Hold the taxi light in position at the leading edge of the left wing. - Connect the electrical connector to the rear of the taxi light.	
3.	Install the attaching screws through the taxi light, with lock nuts installed behind the light.	Do not tighten the lock nuts at this time.
4.	Install the taxi light assembly to the wing with the attaching screws.	Refer to Figure 202 (Sheet 2) for the alignment dimensions of the four screws.
5.	When the alignment is complete, tighten the lock nuts of the four attaching screws behind the taxi light.	
6.	Do an operational test of the taxi light: - Set the GEN/BAT switch to ON. - Close the TAXI/MAP circuit breaker - Set the TAXI light switch to ON.	Make sure that the taxi light comes on.
7.	Set the TAXI light switch to OFF.	
8.	Set the GEN/BAT switch to OFF.	
9.	Install the taxi/landing light cover to the wing.	

3. Remove/Install the Landing Light

A. Remove the Landing Light

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
2.	Open the LANDING circuit breaker	
3.	Remove the taxi/landing light cover from the wing. - Examine the white vinyl tape on the cover for damage. If necessary, replace the tape.	

	Detail Steps/Work Items	Key Items/References
4.	Loosen the lock nuts and remove the screws that attach the landing light to the wing.	The landing light is the inboard assembly. Refer to Figure 202.
5.	Hold the landing light and carefully move the light out from the wing. - Disconnect the electrical connector from the rear of the landing light. - Remove the landing light.	

B. Install the Landing Light

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the aircraft is in the same configuration as in the removal task.	
2.	Hold the landing light in position at the leading edge of the left wing. - Connect the electrical connector to the rear of the landing light.	
3.	Install the attaching screws through the landing light, with lock nuts installed behind the light.	Do not tighten the lock nuts at this time.
4.	Install the landing light assembly to the wing with the attaching screws.	Refer to Figure 202 (Sheet 2) for the alignment dimensions of the four screws.
5.	When the alignment is complete, tighten the lock nuts of the four attaching screws behind the landing light.	
6.	Do an operational test of the landing light: - Set the GEN/BAT switch to ON. - Close the LANDING circuit breaker - Set the LANDING light switch to ON.	Make sure that the landing light comes on.
7.	Set the LANDING light switch to OFF.	
8.	Set the GEN/BAT switch to OFF.	
9.	Install the taxi/landing light cover to the wing.	

4. Adjust the Position of the Taxi/Landing Light Beam

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
2.	Open the LANDING/ TAXI/MAP circuit breakers	
3.	Remove the taxi/landing light cover from the wing. - Examine the white vinyl tape on the cover for damage. If necessary, replace the tape.	
4.	Adjust the position of the light beam as follows: - Loosen the four lock nuts behind the light. - Adjust the four attaching screws to the correct alignment dimensions. - When the alignment is complete, tighten the lock nuts of the four attaching screws behind the light.	This procedure is applicable to the landing light and/or the taxi light. Refer to Figure 202 (Sheet 2) for the alignment dimensions of the four screws for the applicable light.
5.	Do an operational test of the taxi/landing light: - Set the GEN/BAT switch to ON - Close the LANDING/ TAXI/MAP circuit breaker - Set the TAXI/LANDING light switch to ON.	Make sure that the applicable light comes on.
6.	Set the TAXI/LANDING light switch to OFF.	
7.	Install the taxi/landing light cover to the wing.	

5. Replace a Bulb in the Wing Tip

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
	WARNING: AFTER YOU SET THE POWER TO OFF, MAKE SURE THAT YOU WAIT FOR A MINIMUM OF FIVE MINUTES BEFORE YOU DO WORK ON THE ANTI COLLISION LIGHTS. THE POWER SUPPLIES TO THE ANTI- COLLISION LIGHTS GENERATE HIGH VOLTAGE. HIGH VOLTAGE CAN CAUSE DEATH OR INJURY TO PERSONS.	
2.	Remove the light unit cover from the wing tip and the lamp glass.	Refer to Figure 201.
3.	Remove the bulb.	Refer to Figure 201.
4.	Install the lamp glass and the light unit cover.	
5.	Do an operational test of the position light.	

6. Remove/Install The Light Unit In The Wing Tip

A. Remove the Light Unit in the Wing Tip

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to OFF.	
	WARNING: AFTER YOU SET THE POWER TO OFF, MAKE SURE THAT YOU WAIT FOR A MINIMUM OF FIVE MINUTES BEFORE YOU DO WORK ON THE ANTI COLLISION LIGHTS. THE POWER SUPPLIES TO THE ANTI- COLLISION LIGHTS GENERATE HIGH VOLTAGE. HIGH VOLTAGE CAN CAUSE DEATH OR INJURY TO PERSONS.	
2.	Remove the light unit cover from the wing tip and the lamp glass.	Refer to Figure 201.
3.	Remove the three light bulbs.	Refer to Figure 201.
4.	Remove the screws that attach the light unit to the wing tip. - Carefully move the light unit out from the wing tip - Disconnect the two electrical connections from the rear of the light unit - Remove the light unit.	

B. Install the Light Unit in the Wing Tip

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td>1.</td><td>Put the light unit in position at the wing tip.
- Connect the two electrical connectors to the rear of the light unit.</td><td></td></tr>
<tr><td>2.</td><td>Install the screws that attach the light unit to the wing tip.</td><td></td></tr>
<tr><td>3.</td><td>Install the three bulbs to the light unit.</td><td></td></tr>
<tr><td colspan="3">WARNING: DO NOT OPERATE THE ANTI-COLLISION LIGHTS WHEN PERSONS ARE CLOSE TO THE AIRPLANE AND DO NOT LOOK DIRECTLY AT THE LIGHT WHEN IT OPERATES. ANTI-COLLISION LIGHTS CAN CAUSE EYE DAMAGE.</td></tr>
<tr><td>4.</td><td>Do an operational test of the position lights
- Set the GEN/BAT switch to ON
- Close the POSITION/STROBE circuit breakers
- Set the position/strobe light switches to ON.</td><td></td></tr>
<tr><td colspan="3">WARNING: AFTER YOU SET THE POWER TO OFF, MAKE SURE THAT YOU WAIT FOR A MINIMUM OF FIVE MINUTES BEFORE YOU DO WORK ON THE ANTI COLLISION LIGHTS. THE POWER SUPPLIES TO THE ANTI- COLLISION LIGHTS GENERATE HIGH VOLTAGE. HIGH VOLTAGE CAN CAUSE DEATH OR INJURY TO PERSONS.</td></tr>
<tr><td>5.</td><td>Set the GEN/BAT switch to OFF.</td><td></td></tr>
<tr><td>6.</td><td>Wait for a minimum of five minutes.
Install the three lamp glasses and the light unit cover.</td><td></td></tr>
</table>

7. Remove/Install the Power Unit for the Anti-Collision Lights

A. Remove the Power Unit for the Anti-Collision Lights

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the left pilot's seat.	Refer to Chapter 25-10.
3.	Disconnect the wiring harness from the power unit.	
4.	Remove the four nuts that attach the power unit to the fuselage. - Remove the power unit.	

B. Install the Power Unit for the Anti-Collision Lights

	Detail Steps/Work Items	Key Items/References
1.	Put the power unit in position and install the four nuts that attach the power unit to the fuselage.	
2.	Connect the wiring harness to the power unit.	
3.	Connect the aircraft battery.	Refer to Chapter 24-31.
WARNING: DO NOT OPERATE THE ANTI-COLLISION LIGHTS WHEN PERSONS ARE CLOSE TO THE AIRPLANE AND DO NOT LOOK DIRECTLY AT THE LIGHT WHEN IT OPERATES. ANTI-COLLISION LIGHTS CAN CAUSE EYE DAMAGE.		
4.	Do an operational test of the position lights - Set the GEN/BAT switch to ON - Close the POSITION/STROBE circuit breakers - Set the position/strobe light switches to ON.	
5.	Install the left pilot's seat.	

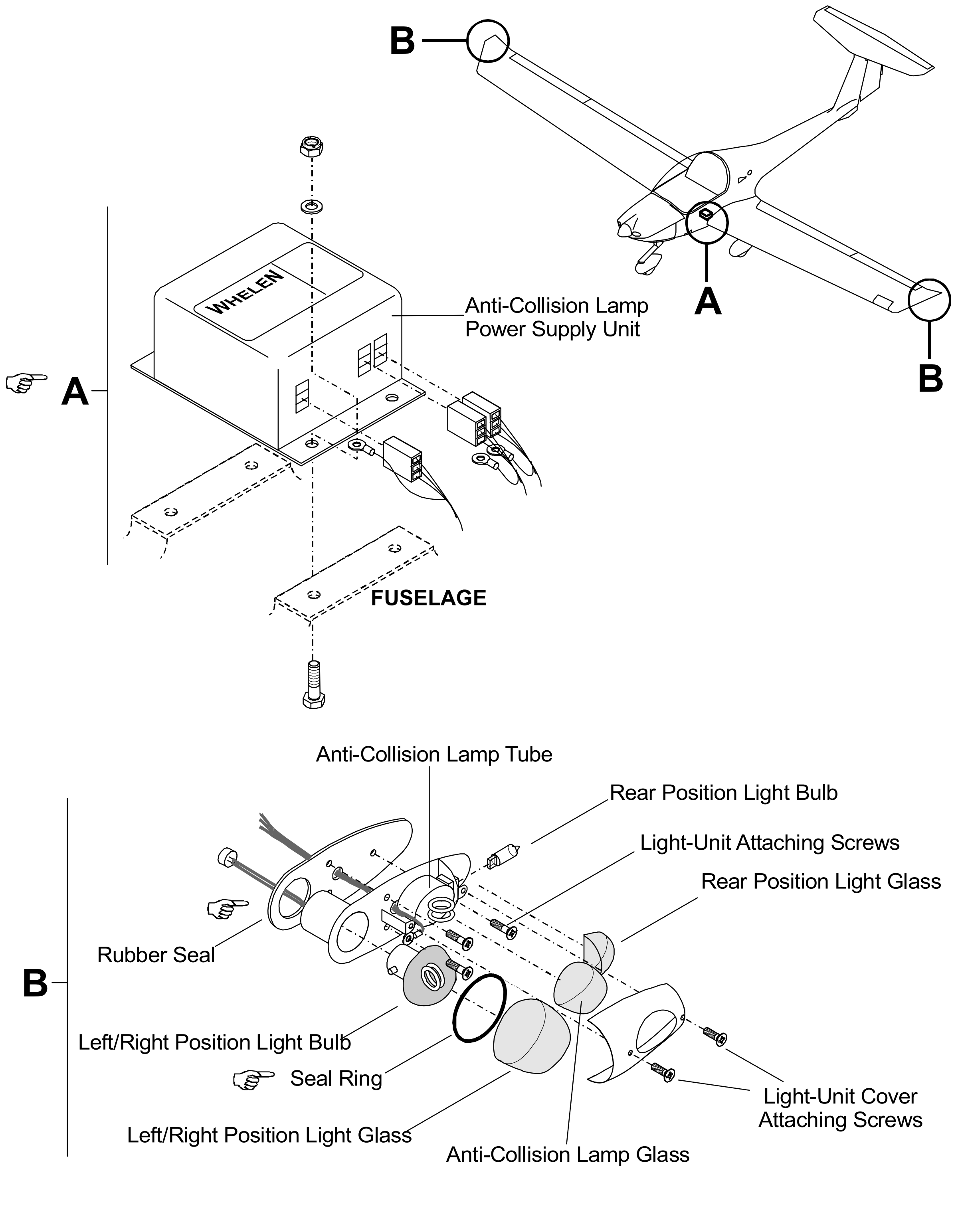

Figure 201 - Wing-Tip Light-Unit and Power Supply

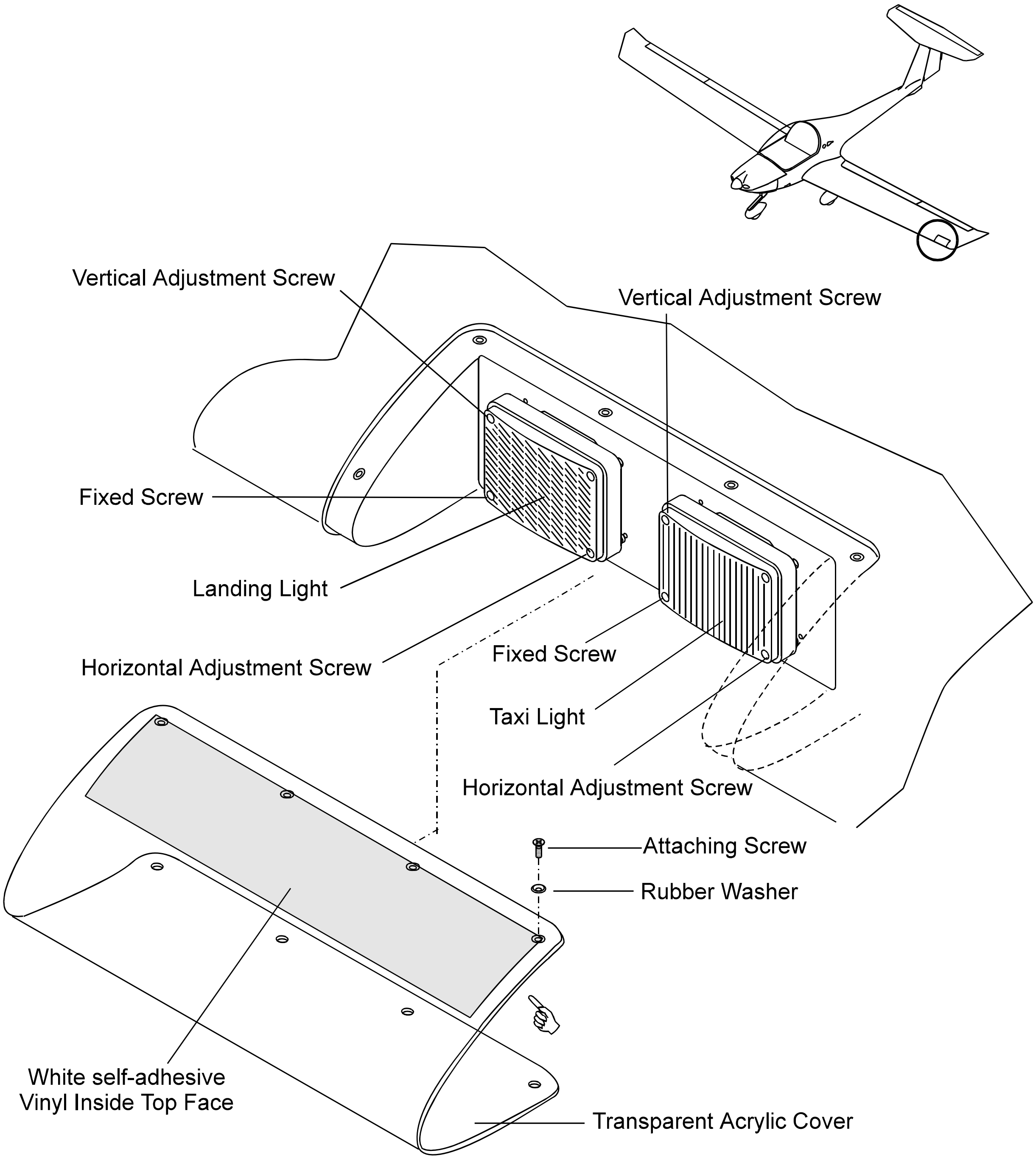

Figure 202 (Sheet 1) - Landing and Taxi Light Installation

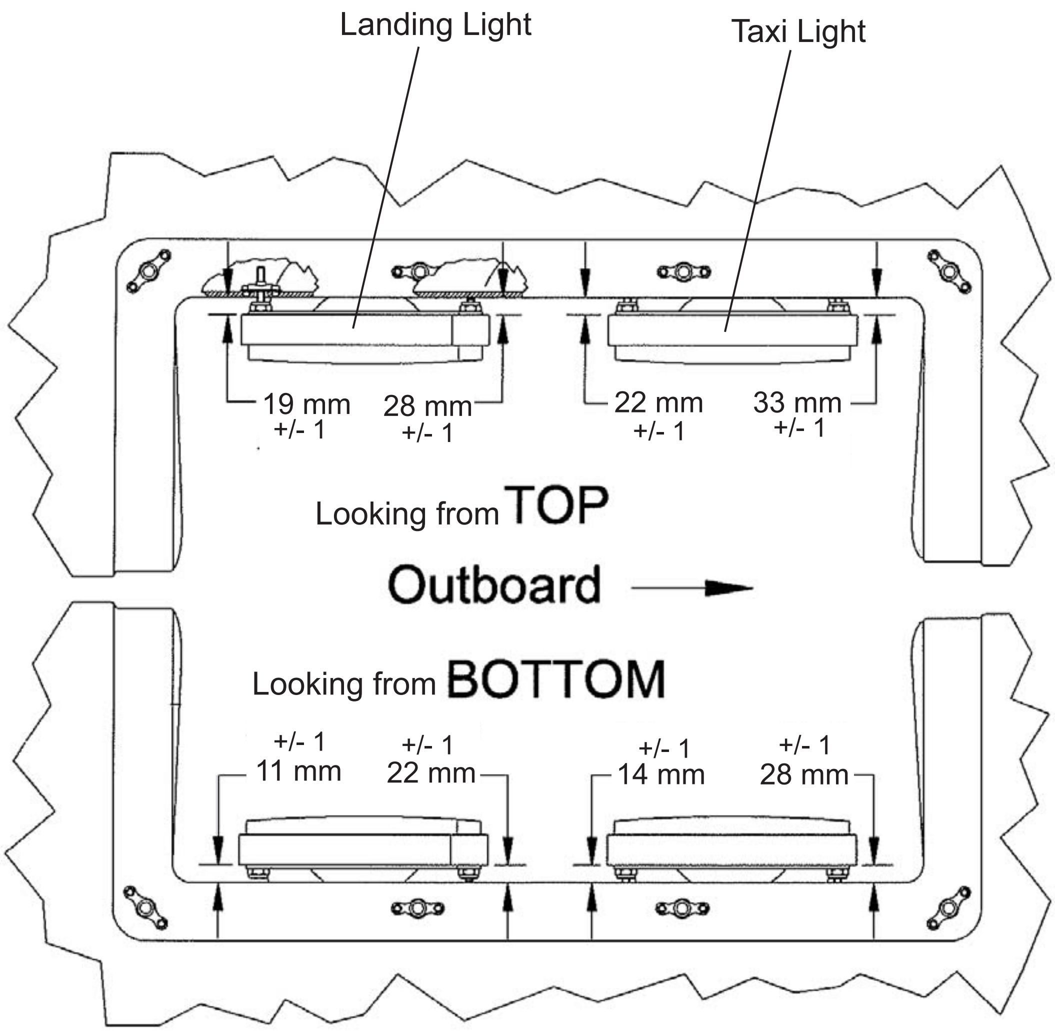

Figure 202 (Sheet 2) - Landing and Taxi Light Installation

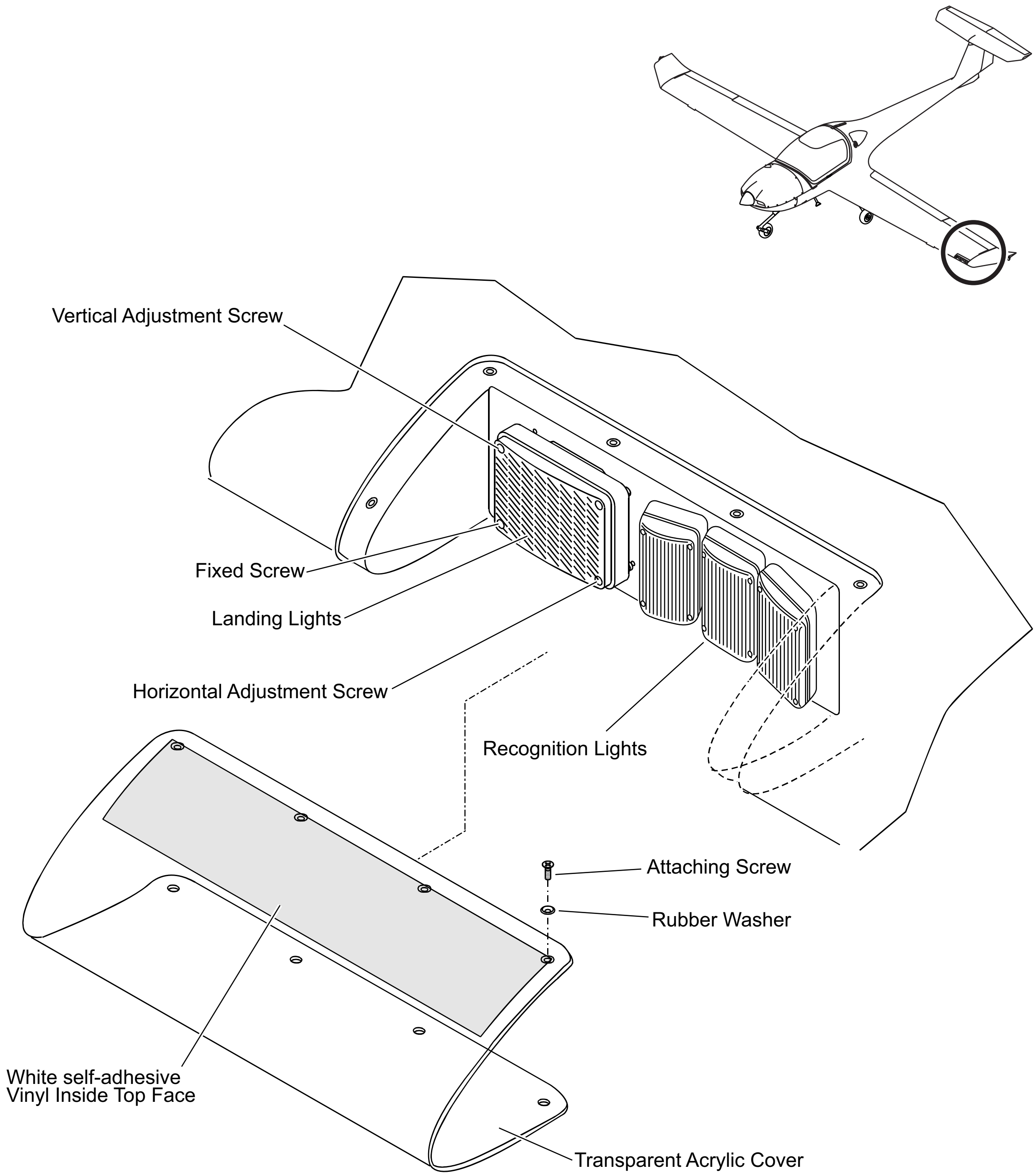

Figure 203 - Landing and Recognition Lights

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CHAPTER 34-00
NAVIGATION

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NAVIGATION

1. General

The following chapters describe about the navigation systems:

- Chapter 34-10: Pitot-static and Outside Air Temperature (OAT)
- Chapter 34-20: Electrically powered gyros, stall warning and magnetic compass
- Chapter 34-30: Radio navigation instruments for landing such as the marker receiver
- Chapter 34-50: Radio navigation instruments that give position data such as the transponder and Global Positioning Systems (GPS).

This chapter describes only the on-aircraft data about the systems and components. Refer to the manufacturers’ handbooks for shop data.

Many different instruments and avionics can be installed as options. This chapter describes about the standard installation.

2. Description

A. Flight Environment Data

(1) Pitot Static System

The pitot-static system has the following components:

- A combined pitot-static probe below the left wing
- An Air Speed Indicator (ASI)
- An altimeter
- A Vertical Speed Indicator (VSI)
- A blind altitude encoder.

(2) OAT

The OAT indicator is a digital instrument with a solid-state sensor.

B. Attitude and Direction

The attitude and direction system has the following components:

- Turn coordinator
- Directional Gyro (DG)
- Attitude gyro
- Magnetic compass
- Stall warning.

C. Landing and Taxiing Aids

The audio control panel has an audio\marker receiver (dual VHF COMM installations only).

D. Dependent Position Determining

The dependent position determining system has the following components:

- VHF radio navigation aids (VOR/LOC)
- NAV indicator/converter
- GPS
- Transponder.

FLIGHT ENVIRONMENT DATA

1. General

This chapter describes about the pitot-static system and OAT indicating system in the aircraft. Refer to the manufacturer's handbook for shop data about an instrument or component.

2. Description

Figure 1 shows the pitot-static system schematic diagram. The pitot-static system component locations are shown on Figures 2 and 3.

A. Pitot-Static System

The pitot-static system supplies pitot pressure and static pressure to the air data instruments. A pitot static probe mounted below the left wing senses pitot and static pressure.

The probe does not have a heater element to prevent icing.

The autopilot if installed has a separate pitot static pressure line that is mounted under the left wing of the aircraft.

Flexible hoses connect the pitot-static probe to the air data instruments. Pitot pipes are green. Static pipes are purple or blue. Push-fit plastic connectors connect the flexible pipes. T-pieces make pipe junctions. There are in-line bulkhead-connectors at the wing root.

Both pitot and static pipes have a water trap in the lowest part of the pipe run. T-pieces divide the pipe into 2 runs. The top run goes directly to the instruments. The bottom run forms a sump before re-joining the top run at a second T-piece. The water traps are below the left seat shell.

B. Blind Altitude Encoder

The blind altitude encoder is located on the aft side of the firewall on the left. In case of reversed panel installation, the blind encoder is mounted on the avionics rack. The new NANO version encoder is mounted on the instrument panel itself. The encoder connects to the static system. The encoder supplies the following outputs:

- To the transponder for mode C operation
- To GPS systems that can receive an altitude input.

You can calibrate the output of the encoder to align with the aircraft altimeter reading. Calibration potentiometers are beside the static port. Table A in Trouble-Shooting lists the logic outputs for altitudes between 1000 and 16200 feet.

C. OAT Indicating System

The OAT indicator is a digital instrument. The indicator and sensor are 1 unit. The indicator operates with the GEN/BAT switch set to ON. The temperature sensor is located in the right NACA inlet.

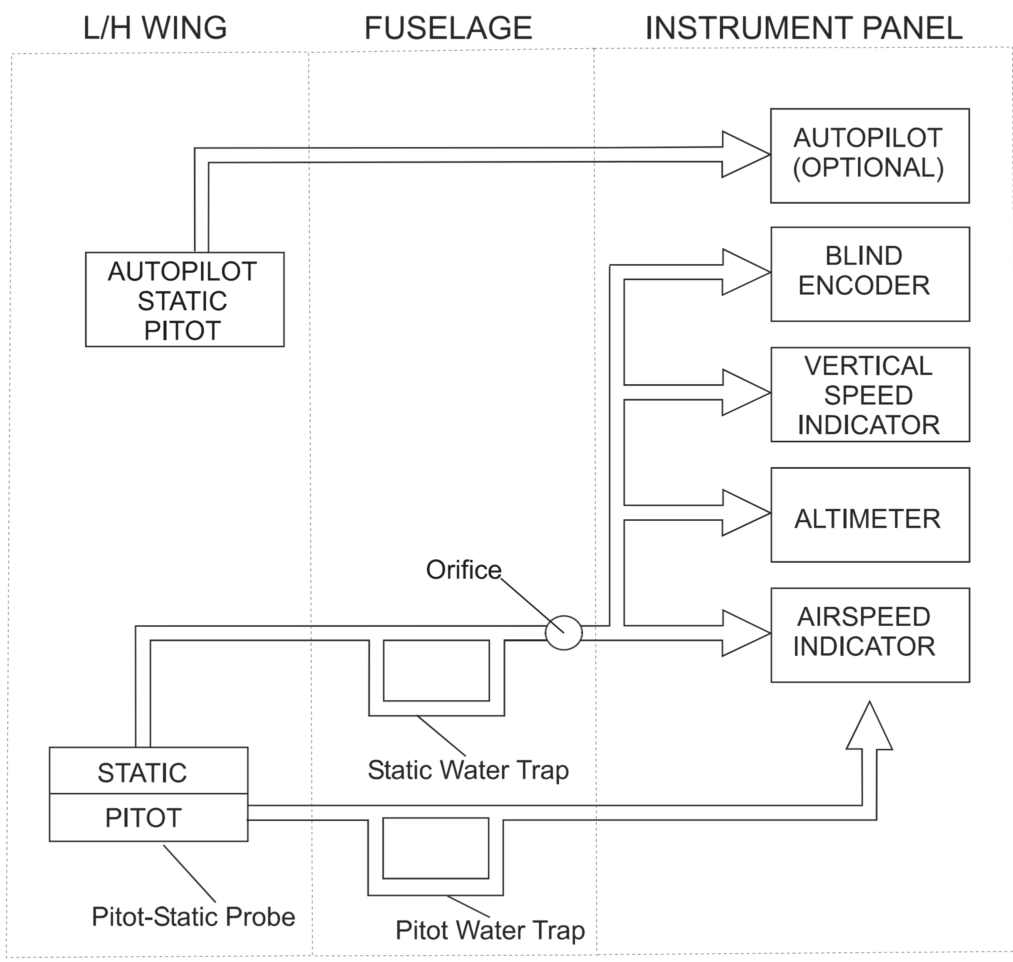

Figure 1 - Pitot-Static System Schematic

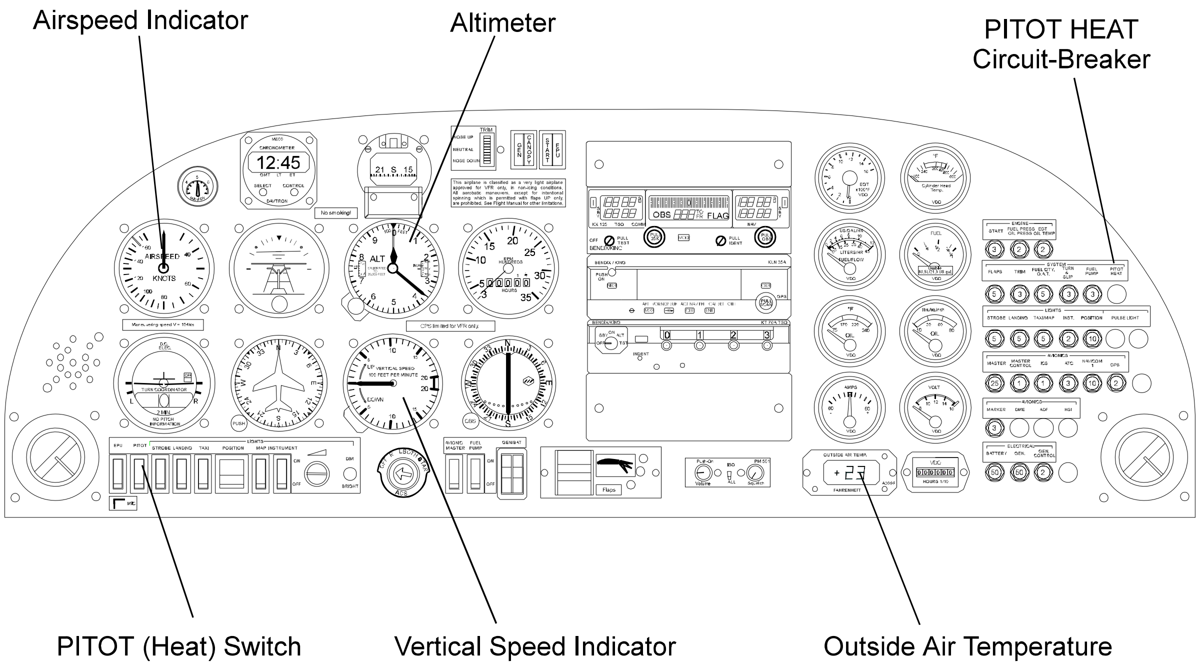

Figure 2 - Instrument Panel Locations

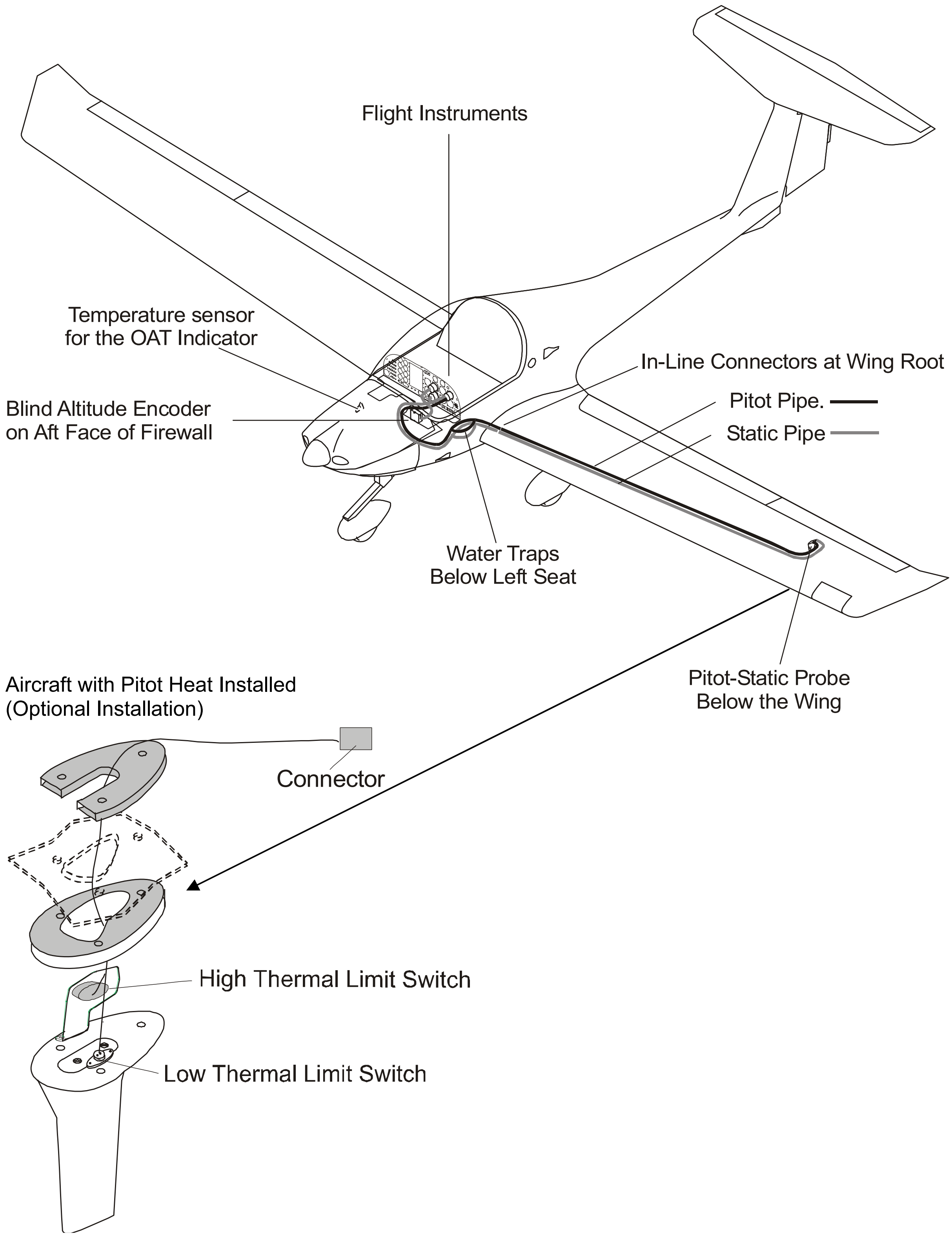

Figure 3 - Component Locations

FLIGHT ENVIRONMENT DATA - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the pitot-static and OAT systems. If you find the trouble in column 1, do the repair given in column 3.

A. Pitot-Static and OAT Systems

TROUBLE	POSSIBLE CAUSE	REPAIR
Altimeter lags or reads incorrectly.	Faulty instrument.	Replace the instrument.
VSI reads incorrectly.	Blocked or kinked static pipe. Water in the system.	Clear the pipe. Drain the water.
Airspeed indicator reads low.	Faulty instrument. Blocked or kinked static pipe. Water in the system.	Replace the instrument. Clear the pipe. Drain the water.
Pitot heat does not operate.	PITOT HEAT circuit-breaker is open. PITOT HEAT circuit-breaker defective. High thermal limit switch is open-circuit Low thermal limit switch is open-circuit (automatic reset defective) Pitot heat wiring is open circuit. Pitot probe defective.	Close the circuit-breaker. If the circuit breaker opens again, do a test for a short-circuit in the pitot heat wiring. Replace the circuit breaker. Reset high thermal switch (located within the inspection panel under wing at the pitot static probe. Replace low thermal switch. Do a continuity test of the wiring. Repair/replace defective wiring. Replace the pitot probe.
OAT indicator gives incorrect indication.	Faulty indicator.	Replace the indicator and sensor.
OAT indicator gives no indication.	OAT circuit-breaker is open or defective. Defective power supply cable.	Close the circuit-breaker or replace the circuit breaker. Repair the cable.

B. Blind Encoder (Mode C Fault Analysis)

(1) Let the encoder warm-up. (The encoder can take between 4 and 45 minutes to warm-up).

NOTE: Use a transponder test set for altitude read-out. Or:

If a KLN 35A or KLX 135/135A or GNS430/GNS530 is installed, read the altitude read-out from the encoder on the GPS display.

(2) Use a pitot static tester to give the altitude where the transponder is not operating.

(3) Monitor the altitude display (encoder output). It must increase consecutively. It must indicate the same altitude as the aircraft altimeter ±125 ft.

(4) If the encoder output is out of limits, calibrate the encoder. Refer to the encoder manufacturers manual.

(5) If the altitude does not increase consecutively, an input code is missing (e.g. A1 code is missing). Use a copy of the SSR automatic pressure (Refer to table A) altitude transmission code with the wiring diagram (Refer to Chapter 92) to find the data code that is missing. Remove the transponder. Do a test for logic high (6v) on the faulty code wire. If you find 6 volts, the transponder is faulty. If you do not find 6 volts, do a continuity test between the transponder and the encoder. If the wiring is serviceable, replace the encoder.

Table A - SSR Automatic Pressure Altitude Transmission Code

ALTITUDE	LOGIC OUTPUT										
FEET	D2	D4	A1	A2	A4	B1	B2	B4	C1	C2	C4
-1000	0	0	0	0	0	0	0	0	0	1	0
-900	0	0	0	0	0	0	0	0	1	1	0
-800	0	0	0	0	0	0	0	0	1	0	0
-700	0	0	0	0	0	0	0	1	1	0	0
-600	0	0	0	0	0	0	0	1	1	1	0
-500	0	0	0	0	0	0	0	1	0	1	0
-400	0	0	0	0	0	0	0	1	0	0	1
-300	0	0	0	0	0	0	0	1	0	0	1
-200	0	0	0	0	0	0	1	1	0	0	1
-100	0	0	0	0	0	0	1	1	0	1	1
0	0	0	0	0	0	0	1	1	0	1	0
100	0	0	0	0	0	0	1	1	1	1	0
200	0	0	0	0	0	0	1	1	1	0	0
300	0	0	0	0	0	0	1	0	1	0	0
400	0	0	0	0	0	0	1	0	1	1	0
500	0	0	0	0	0	0	1	0	0	1	0
600	0	0	0	0	0	0	1	0	0	1	1
700	0	0	0	0	0	0	1	0	0	0	1
800	0	0	0	0	0	1	1	0	0	0	1
900	0	0	0	0	0	1	1	0	0	1	1
1000	0	0	0	0	0	1	1	0	0	1	0
1100	0	0	0	0	0	1	1	0	1	1	0
1200	0	0	0	0	0	1	1	0	1	0	0
1300	0	0	0	0	0	1	1	1	1	0	0
1400	0	0	0	0	0	1	1	1	1	0	0
1500	0	0	0	0	0	1	1	1	0	1	0
1600	0	0	0	0	0	1	1	1	0	1	1
1700	0	0	0	0	0	1	1	1	0	0	1
1800	0	0	0	0	0	1	0	1	0	0	1
1900	0	0	0	0	0	1	0	1	0	1	1
2000	0	0	0	0	0	1	0	1	0	1	0
2100	0	0	0	0	0	1	0	1	1	1	0
2200	0	0	0	0	0	1	0	1	1	0	0
2300	0	0	0	0	0	1	0	0	1	0	0
2400	0	0	0	0	0	1	0	0	1	1	0

Table A - SSR Automatic Pressure Altitude Transmission Code

ALTITUDE	LOGIC OUTPUT										
FEET	D2	D4	A1	A2	A4	B1	B2	B4	C1	C2	C4
2500	0	0	0	0	0	1	0	0	0	1	0
2600	0	0	0	0	0	1	0	0	0	1	1
2700	0	0	0	0	0	1	0	0	0	0	1
2800	0	0	0	0	1	1	0	0	0	0	1
2900	0	0	0	0	1	1	0	0	0	1	1
3000	0	0	0	0	1	1	0	0	0	1	0
3100	0	0	0	0	1	1	0	0	1	1	0
3200	0	0	0	0	1	1	0	0	1	0	0
3300	0	0	0	0	1	1	0	1	1	0	0
3400	0	0	0	0	1	1	0	1	1	1	0
3500	0	0	0	0	1	1	0	1	0	1	0
3600	0	0	0	0	1	1	0	1	0	1	1
3700	0	0	0	0	1	1	0	1	0	0	1
3800	0	0	0	0	1	1	1	1	0	0	1
3900	0	0	0	0	1	1	1	1	0	1	1
4000	0	0	0	0	1	1	1	1	0	1	0
4100	0	0	0	0	1	1	1	1	1	1	0
4200	0	0	0	0	1	1	1	1	1	0	0
4300	0	0	0	0	1	1	1	0	1	0	0
4400	0	0	0	0	1	1	1	0	1	1	0
4500	0	0	0	0	1	1	1	0	0	1	0
4600	0	0	0	0	1	1	1	0	0	1	1
4700	0	0	0	0	1	1	1	0	0	0	1
4800	0	0	0	0	1	0	1	0	0	0	1
4900	0	0	0	0	1	0	1	0	0	1	1
5000	0	0	0	0	1	0	1	0	0	1	0
5100	0	0	0	0	1	0	1	0	1	1	0
5200	0	0	0	0	1	0	1	0	1	0	0
5300	0	0	0	0	1	0	1	1	1	0	0
5400	0	0	0	0	1	0	1	1	1	1	0
5500	0	0	0	0	1	0	1	1	0	1	0
5600	0	0	0	0	1	0	1	1	0	1	1
5700	0	0	0	0	1	0	1	1	0	0	1
5800	0	0	0	0	1	0	0	1	0	0	1
5900	0	0	0	0	1	0	0	1	0	1	1
6000	0	0	0	0	1	0	0	1	0	1	0

Table A - SSR Automatic Pressure Altitude Transmission Code

ALTITUDE	LOGIC OUTPUT										
FEET	D2	D4	A1	A2	A4	B1	B2	B4	C1	C2	C4
6100	0	0	0	0	1	0	0	1	1		0
6200	0	0	0	0	1	0	0	1	1	0	0
6300	0	0	0	0	1	0	0	0	1	0	0
6400	0	0	0	0	1	0	0	0	1	1	0
6500	0	0	0	0	1	0	0	0	0	1	0
6600	0	0	0	0	1	0	0	0	0	1	1
6700	0	0	0	0	1	0	0	0	0	0	1
6800	0	0	0	1	1	0	0	0	0	0	1
6900	0	0	0	1	1	0	0	0	0	1	1
7000	0	0	0	1	1	0	0	0	0	1	0
7100	0	0	0	1	1	0	0	0	1	1	0
7200	0	0	0	1	1	0	0	0	1	0	0
7300	0	0	0	1	1	0	0	1	1	0	0
7400	0	0	0	1	1	0	0	1	1	1	0
7500	0	0	0	1	1	0	0	1	0	1	0
7600	0	0	0	1	1	0	0	1	0	1	1
7700	0	0	0	1	1	0	0	1	0	0	1
7800	0	0	0	1	1	0	1	1	0	0	1
7900	0	0	0	1	1	0	1	1	0	1	1
8000	0	0	0	1	1	0	1	1	0	1	0
8100	0	0	0	1	1	0	1	1	1	1	0
8200	0	0	0	1	1	0	1	1	1	0	0
8300	0	0	0	1	1	0	1	0	1	0	0
8400	0	0	0	1	1	0	1	0	1	1	0
8500	0	0	0	1	1	0	1	0	0	1	0
8600	0	0	0	1	1	0	1	0	0	1	1
8700	0	0	0	1	1	0	1	0	0	0	1
8800	0	0	0	1	1	1	1	0	0	0	1
8900	0	0	0	1	1	1	1	0	0	1	1
9000	0	0	0	1	1	1	1	0	0	1	0
9100	0	0	0	1	1	1	1	0	1	1	0
9200	0	0	0	1	1	1	1	0	1	0	0
9300	0	0	0	1	1	1	1	1	1	0	0
9400	0	0	0	1	1	1	1	1	1	1	0
9500	0	0	0	1	1	1	1	1	0	1	0
9600	0	0	0	1	1	1	1	1	0	1	1

Table A - SSR Automatic Pressure Altitude Transmission Code

ALTITUDE	LOGIC OUTPUT										
FEET	D2	D4	A1	A2	A4	B1	B2	B4	C1	C2	C4
9700	0	0	0	1	1	1	1	1	0	0	1
9800	0	0	0	1	1	1	0	1	0	0	1
9900	0	0	0	1	1	1	0	1	0	1	1
10000	0	0	0	1	1	1	0	1	0	1	0
10100	0	0	0	1	1	1	0	1	1	1	0
10200	0	0	0	1	1	1	0	1	1	0	0
10300	0	0	0	1	1	1	0	0	1	0	0
10400	0	0	0	1	1	1	0	0	1	1	0
10500	0	0	0	1	1	1	0	0	0	1	0
10600	0	0	0	1	1	1	0	0	0	1	1
10700	0	0	0	1	1	1	0	0	0	0	1
10800	0	0	0	1	0	1	0	0	0	0	1
10900	0	0	0	1	0	1	0	0	0	1	1
11000	0	0	0	1	0	1	0	0	0	1	0
11100	0	0	0	1	0	1	0	0	1	1	0
11200	0	0	0	1	0	1	0	0	1	0	0
11300	0	0	0	1	0	1	0	1	1	0	0
11400	0	0	0	1	0	1	0	1	1	1	0
11500	0	0	0	1	0	1	0	1	0	1	0
11600	0	0	0	1	0	1	0	1	0	1	1
11700	0	0	0	1	0	1	0	1	0	0	1
11800	0	0	0	1	0	1	1	1	0	0	1
11900	0	0	0	1	0	1	1	1	0	1	1
12000	0	0	0	1	0	1	1	1	0	1	0
12100	0	0	0	1	0	1	1	1	1	1	0
12200	0	0	0	1	0	1	1	1	1	0	0
12300	0	0	0	1	0	1	1	0	1	0	0
12400	0	0	0	1	0	1	1	0	1	1	0
12500	0	0	0	1	0	1	1	0	0	1	0
12600	0	0	0	1	0	1	1	0	0	1	1
12700	0	0	0	1	0	1	1	0	0	0	1
12800	0	0	0	1	0	0	1	0	0	0	1
12900	0	0	0	1	0	0	1	0	0	1	1
13000	0	0	0	1	0	0	1	0	0	1	0
13100	0	0	0	1	0	0	1	0	1	1	0
13200	0	0	0	1	0	0	1	0	1	0	0

Table A - SSR Automatic Pressure Altitude Transmission Code

ALTITUDE	LOGIC OUTPUT										
FEET	D2	D4	A1	A2	A4	B1	B2	B4	C1	C2	C4
13300	0	0	0	1	0	0	1	1	1	0	0
13400	0	0	0	1	0	0	1	1	1	1	0
13500	0	0	0	1	0	0	1	1	0	1	0
13600	0	0	0	1	0	0	1	1	0	1	1
13700	0	0	0	1	0	0	1	1	0	0	1
13800	0	0	0	1	0	0	0	1	0	0	1
13900	0	0	0	1	0	0	0	1	0	1	1
14000	0	0	0	1	0	0	0	1	0	1	0
14100	0	0	0	1	0	0	0	1	1	1	0
14200	0	0	0	1	0	0	0	1	1	0	0
14300	0	0	0	1	0	0	0	0	1	0	0
14400	0	0	0	1	0	0	0	0	1	1	0
14500	0	0	0	1	0	0	0	0	0	1	0
14600	0	0	0	1	0	0	0	0	0	1	1
14700	0	0	0	1	0	0	0	0	0	0	1
14800	0	0	1	1	0	0	0	0	0	0	1
14900	0	0	1	1	0	0	0	0	0	1	1
15000	0	0	1	1	0	0	0	0	0	1	0
15100	0	0	1	1	0	0	0	0	1	1	0
15200	0	0	1	1	0	0	0	0	1	0	0
15300	0	0	1	1	0	0	0	1	1	0	0
15400	0	0	1	1	0	0	0	1	1	1	0
15500	0	0	1	1	0	0	0	1	0	1	0
15600	0	0	1	1	0	0	0	1	0	1	1
15700	0	0	1	1	0	0	0	1	0	0	1
15800	0	0	1	1	0	0	1	1	0	0	1
15900	0	0	1	1	0	0	1	1	0	1	1
16000	0	0	1	1	0	0	1	1	0	1	0
16100	0	0	1	1	0	0	1	1	1		0
16200	0	0	1	1	0	0	1	1	1	0	0

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FLIGHT ENVIRONMENT DATA - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove, install and test the flight environment systems. Refer to the manufacturer's manuals for further data.

2. Remove/Install a Pitot-Static Instrument

A. Remove a Pitot-Static Instrument

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Disconnect the pitot/static pipe(s) from the rear of the indicator.	
3.	Remove the mounting screws.	Hold the instrument.
4.	Remove the instrument from the panel.	

B. Install a Pitot-Static Instrument

	Detail Steps/Work Items	Key Items/References
1.	Remove the port cover from the new instrument. Install it on the replacement instrument.	
2.	Transfer the pitot/static fitting(s) to the new instrument.	
3.	Put the instrument in position in the panel.	
4.	Install the mounting screws.	
5.	Connect the pitot/static pipe(s) to the rear of the indicator.	
6.	Do a low-range static leak test.	Refer to Paragraph 7.
7.	Do a pitot-static leak test.	Refer to Paragraph 7.
8.	Install the instrument panel cover.	Refer to Chapter 25-10.

3. Remove/Install Pitot-Static Probe (probe without optional Pitot Heat)

A. Remove the Pitot-Static Probe

	Detail Steps/Work Items	Key Items/References
1.	Remove the attaching screws for the probe from below the wing.	Hold the probe.
2.	Move the probe down to give access to the connections.	
3.	Disconnect the pitot and static pipes.	Identify the connections. Put the caps on the pipes.
4.	Disconnect the bonding cable.	
5.	Remove the pitot-static probe.	

B. Install the Pitot-Static Probe

	Detail Steps/Work Items	Key Items/References
1.	Hold the pitot-static probe close to the mounting below the wing.	
2.	Connect the bonding cable.	
3.	Connect the pitot and static pipes.	
4.	Put the probe in position on the mounting.	
5.	Install the attaching screws.	
6.	Do a low-range static leak test.	Refer to Paragraph 7.
7.	Do a pitot-static leak test.	Refer to Paragraph 7.
8.	Put a cap on the pitot-static probe.	

4. Remove/Install and Functional Check of the Pitot-Static Probe (Probe with optional Pitot Heat System).

A. Remove the Pitot-Static Probe

	Detail Steps/Work Items	Key Items/References
1.	Open the PITOT HEAT circuit breaker.	
2.	Open the access panel beside the pitot-static probe.	
3.	Remove the high thermal limit switch.	Disconnect the wiring, remove the two screws. Gently pry between switch and bracket to separate bonding adhesive.
4.	Remove the attaching screws for the probe.	
5.	Remove inner gasket (phenolic).	
6.	Move the probe down to give access to the connections.	
7.	Disconnect the electrical connector.	
8.	Disconnect the pitot and static pipes.	Identify the connections. Put the caps on the pipes.
9.	Disconnect the bonding cable.	
10.	Remove the pitot-static probe with switch bracket.	
11.	Remove pitot -static probe from switch bracket.	Remove outer gasket. Gently pry between bracket and probe to separate the bonding adhesive.

B. Install the Pitot-Static Probe

	Detail Steps/Work Items	Key Items/References
1.	Install switch bracket on pitot static probe. Use NON-SILICONE thermally conductive adhesive (commercially available).	Follow the adhesive manufacturer's instructions.
2.	Hold the pitot-static probe close to the mounting below the wing.	
3.	Connect the bonding cable.	
4.	Connect the pitot and static pipes.	
5.	Connect the electrical connector.	

	Detail Steps/Work Items	Key Items/References
6.	Put the probe in position on the wing.	
7.	Bond high thermal limit switch to bracket with adhesive. Use NON-SILICONE thermal conductive adhesive (commercially available).	Locate with mounting screws. Follow the adhesive manufacturer's instructions.
8.	Install the access cover.	
9.	Close the Pitot Heat circuit breaker.	
10.	Do a test of the pitot heat.	
11.	Do a pitot-static leak test.	Refer to Paragraph 7.
12.	Put a cap on the pitot-static probe.	

C. Pitot Static Heat System

The Pitot Heat system consists of heating elements embedded in the Pitot-Static Probe, a 15 amp circuit breaker, a control relay, thermal limit switches (HIGH and LOW), OFF/ON switch, and a GREEN LED monitor. The control relay closes and supplies electrical current to the Pitot- Static Probe heaters when the PITOT SWITCH is set to ON and the LOW and HIGH thermal limit switches are CLOSED. A current monitoring sensor confirms this by activating the GREEN LED monitor light. The LOW thermal limit switch with automatic reset will cycle the control relay if the system is ON and the probe temperature is over approximately 50 °C. If the LOW temperature limit switch activates it will inhibit Pitot-Static Probe heater operation and the GREEN LED monitor will go OFF until the Pitot-Static Probe temperature drops below approximately 38 °C. In the event that the LOW thermal switch with automatic reset fails the HIGH thermal switch will open, current to the heating elements will stop and the current monitoring light will go OFF. The HIGH thermal switch must be reset manually. The reset button is located on the inboard face of the switch.

D. Pitot Static Heat System Functional Check

Do the pitot static heat functional check as follows:

	Detail Steps/Work Items	Key Items/References
1.	Remove pitot -static probe cap.	
2.	Insert a thermocouple probe between the pitot static probe seal and the wing outer painted surface.	
3.	Switch BAT side of master switch to ON.	Ensure that propeller area is clear.
4.	Switch Pitot Heat to ON.	Green monitoring light should go ON.
5.	Monitor thermocouple probe temperature.	Refer to Paragraph 7.C.

	Detail Steps/Work Items	Key Items/References
6.	Ensure that the monitoring light goes OFF prior to the thermocouple probe temperature exceeding 55 °C.	
7.	Ensure that the monitoring light goes ON prior to the thermocouple probe temperature falling below 30 °C.	This may take up to 15 minutes depending on the air temperature.
8.	Switch Pitot Heat to OFF.	Green monitoring light should go OFF.
9.	Switch BAT side of master switch to OFF.	
10.	Remove thermocouple probe.	
11.	Put a cap on the pitot-static probe.	Wait for probe to cool completely prior to covering probe.

5. Remove/Install the Blind Altitude Encoder

A. Equipment

Item	Quantity	Part Number
Transponder Test Set	1	Commercial
Pitot Static Probe Adapter	1	Commercial
Pitot Static Leak Tester	1	Commercial

B. Remove the Blind Altitude Encoder

	Detail Steps/Work Items	Key Items/References
1.	Open the ATC circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the static hose from the encoder.	Put a cap on the static hose.
4.	Disconnect the electrical connector.	
5.	Release the knurled mounting screw for the encoder.	
6.	Remove the encoder.	
7.	Install a port cover on the static port.	

C. Install the Blind Altitude Encoder

	Detail Steps/Work Items	Key Items/References
1.	Remove the port cover from the encoder.	
2.	If you install a new encoder, install the static fitting from the old encoder on the new encoder.	
3.	Put the encoder in position on the mounting. Install the knurled mounting screw.	
4.	Connect the electrical connector.	
5.	Connect the static hose to the encoder.	
6.	Close the ATC circuit-breaker.	
7.	Do a low-range static leak test.	Refer to Paragraph 7.
8.	Do the adjustment/test procedure.	Refer to Paragraph 5.D.
9.	Install the instrument panel cover.	Refer to Chapter 25-10.

D. Adjust/Test the Blind Altitude Encoder

The encoder will not give an output until it has the correct operating temperature. If the power goes off and then on again, a delay of 6 minutes occurs. The approximate warm-up times are:

- From 70 °F (21 °C) 4 to 6 minutes
- From 0 °F (-18 °C) Up to 10 minutes
- From -55 °F (-48 °C) 30 to 45 minutes.

The adjusters are adjacent to the static port on the encoder. The LO adjuster is towards the outside. The HI adjuster is towards the center.

.

	Detail Steps/Work Items	Key Items/References
1.	Connect the test equipment.	Refer to the equipment manufacturer's manuals.
2.	Set the aircraft altimeter to 29.92 in.Hg.	
3.	Monitor the altitude code. Decrease pressure until the output code just changes to 20,000 ft.	
4.	Make sure that the altimeter reading is within ±125 ft of the encoder reading. If not, adjust the HI adjuster until the change occurs within 30 ft of the altimeter reading.	Lightly tap the altimeter to prevent errors due to friction.
5.	Increase the pressure until the output code just changes to 0 ft.	
6.	Make sure that the altimeter reading is within ±125 ft of the encoder reading. If not, adjust the LO adjuster until the change occurs within 30 ft of the altimeter reading.	Lightly tap the altimeter to prevent errors due to friction.
7.	Repeat steps 2 to 5 until both the 20,000 ft and 0 ft values are within the ±125 ft tolerance.	
8.	Operate the system through the range of 0 ft to 20,000 ft. Make sure that the altimeter and encoder are within the ±125 ft tolerance.	Lightly tap the altimeter to prevent errors due to friction.
9.	Remove the test equipment.	

6. Remove/Install the OAT Indicator

A. Remove the OAT Indicator

	Detail Steps/Work Items	Key Items/References
1.	Open the OAT circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Remove the nut from the temperature sensor.	In the right NACA duct.
4.	Remove the temperature sensor lead from the cable harness and disconnect the electrical connector for the power supply.	
5.	Remove the OAT indicator and sensor from the aircraft.	

B. Install the OAT Indicator

	Detail Steps/Work Items	Key Items/References
1.	Put the OAT indicator in position in the instrument panel.	
2.	Connect the electrical connector for the power supply.	
3.	Put the temperature sensor in position. Attach the sensor with the nut.	In the right NACA duct.
4.	Tie the temperature sensor lead to the wiring harness.	
5.	Close the OAT circuit-breaker.	
6.	Set the GEN/BAT switch to ON.	The OAT indicator must indicate the ambient temperature ± 1%.
7.	Set the GEN/BAT switch to OFF.	
8.	Install the instrument panel cover.	Refer to Chapter 25-10.

7. Pitot and Static Leak Tests

Always do a pitot leak-test after you do maintenance on the pitot system. And always do a low-range static leak-test after you do maintenance on the static system.

CAUTION: OBEY THE FOLLOWING PRECAUTIONS WHEN YOU DO A PITOT OR STATIC LEAK TEST. IF YOU DO NOT OBEY THE PRECAUTIONS, YOU CAN DAMAGE THE AIR DATA INSTRUMENTS.

A. Test Precautions

- The pressure in the pitot system must be equal to (or greater than) the pressure in the static system
- Reversal of the pitot and static pipes can cause damage to the air data instruments
- The applied pressure (and rate of change of pressure) must not be greater than the design limits of the equipment under test
- After doing the test, you must return the system to its usual operating conditions.

B. Equipment

Item	Quantity	Part Number
Pitot Static Probe Adapter	1	Commercial
Pitot Static Leak Tester	1	Commercial

C. Low Range Static Leak Test

	Detail Steps/Work Items	Key Items/References
1.	Obey the precautions at the beginning of this subject.	
2.	Connect the pitot-static leak-tester to the pitot-static probe.	
3.	Apply a partial vacuum to the static port until you get a pressure altitude of 1000 ft above the ambient pressure altitude.	Note the altitude.
4.	Let the pressure stabilize.	
5.	Monitor the system pressure.	The pressure loss must not be more than 100 ft/min.
6.	Compare the test-equipment altimeter and the aircraft altimeter.	The indication error must be less than shown in Table 1 below.

Table 1 - Altimeter Indication Error

Altitude in Feet	Allowable Error in Feet
Sea level	± 20
4000	± 35
8000	± 60
12000	± 90
16000	± 110
20000	± 130

D. Pitot Test

	Detail Steps/Work Items	Key Items/References
1.	Obey the precautions at the beginning of this subject.	
2.	Connect the pitot-static leak-tester to the pitot-static probe.	
3.	Apply a pressure to the pitot port equal to 150 knots.	
4.	Let the pressure stabilize.	
5.	Monitor the system pressure.	The leak rate must not be more than 10 knots/min.
6.	Compare the test equipment Airspeed Indicator (ASI) and the aircraft ASI.	The indication error must be less than shown in Table 2 below.

Table 2 - ASI Indication Error

Airspeed in Knots	Allowable Error in Knots
160	± 4
100	± 4
40	± 1.7

ATTITUDE AND DIRECTION

1. General

This chapter describes about the equipment that shows the attitude and direction. Figures 1 and 2 show the equipment locations. The DA20-C1 aircraft has the following attitude and direction indicators:

- Attitude:
    - Attitude indicator (vacuum, or electrical)
    - Turn coordinator (electrical)
    - Stall warning horn.
- Direction:
    - Magnetic compass
    - Directional gyro (vacuum, or electrical)
    - Artificial Horizon Indicator.

Some aircraft have different direction indicators as customer options. For example, a slaved compass system. Refer to the manufacturer's manuals for data about these instruments.

2. Description and Operation

A. Attitude Indicator

The attitude indicator uses a gyro as an attitude reference. The indicator shows pitch and roll data. Some aircraft use vacuum to operate the gauges. It operates only when the engine is running. The vacuum necessary to operate the attitude indicator is 4.5 to 5.2 in.Hg. The flow rate is 2.1 ft^3/min. Optionally an electrically driven gyro may be installed.

The display shows a blue area for the sky and a brown area for the ground. A small bar shows the aircraft wings. Where the blue and brown touch shows the horizon. Horizontal markings above and below the horizon show pitch up and down. Each graduation is 5°.

The roll display has markings around the circumference of the instrument. The markings are at 10, 20, 30, 60 and 90 degrees of roll.

B. Turn Coordinator

The turn coordinator is an electrically-powered gyroscopic instrument. It operates when the main bus is powered and the turn coordinator circuit-breaker is closed. A warning flag shows when there is no power to the unit. The warning flag goes out of view when the turn coordinator has the correct power.

The turn coordinator has a slip indicator. A ball in a curved tube filled with fluid shows when the aircraft is slipping or skidding. When the ball is in the center, the turn is correctly coordinated.

The turn coordinator shows the rate of rotation of the aircraft about the vertical axis. The turn coordinator has markings for rate 1 and rate 2 turns.

C. Stall Warning

A stall warning horn is located on the left side of the instrument panel. Air pressure operates the horn. A hole in the leading edge of the left wing connects to the horn. When the angle of attack is just less than the stall angle, the airflow through the hole operates the horn.

D. Magnetic Compass

The magnetic compass shows the heading of the aircraft related to magnetic north. Fluid in the compass bowl gives damping. Each graduation on the compass is 5°.

A compass deviation card attaches to the compass. Compensating magnets for compass adjustment are behind the deviation card holder. The compass lighting comes on when the DIM/BRIGHT switch is set to DIM.

You must do a test for correct operation of the compass (compass swing):

- After replacing a major component
- After replacing the compass
- After modification to the aircraft.

E. Directional Gyro (DG)

The DG is a gyroscopic instrument either vacuum or electrically powered. The DG operates when sufficient vacuum is applied. The vacuum powered DG requires differential pressure of 4.5 - 5.2 in.Hg, Flow 2.1 ft^3/min. to operate.

The DG shows the direction of the aircraft related to a preset heading. You set the heading by pushing and turning the knob on the face of the DG. The display has a 360° compass card with 5° graduations.

F. Artificial Horizon Indicator

The Artificial Horizon Indicator incorporates a moving display that simulates the earth's horizon and provides the pilot with a real time visual indication of the aircraft pitch and roll attitude relative to the indicator symbolic airplane.

The Artificial Horizon Indicator incorporates pitch and roll displays that are mechanically linked to a spinning mass gyroscope. The horizon bar moves behind the symbolic airplane. Precession error is corrected by the 4200's erection system or by pulling the "PULL TO CAGE" knob. A warning flag pops into view to indicate that the gyro motor is not receiving sufficient power to operate.

The Artificial Horizon Indicator employs an efficient electrically driven internal vertical gyroscope assembly incorporating a special air erection mechanism. This mechanism simultaneously erects the pitch and roll axes of the gyroscope. Movement of the aircraft generates a reaction of the display that simulates the visual reference seen by the pilot when looking outside at the earth's true horizon line.

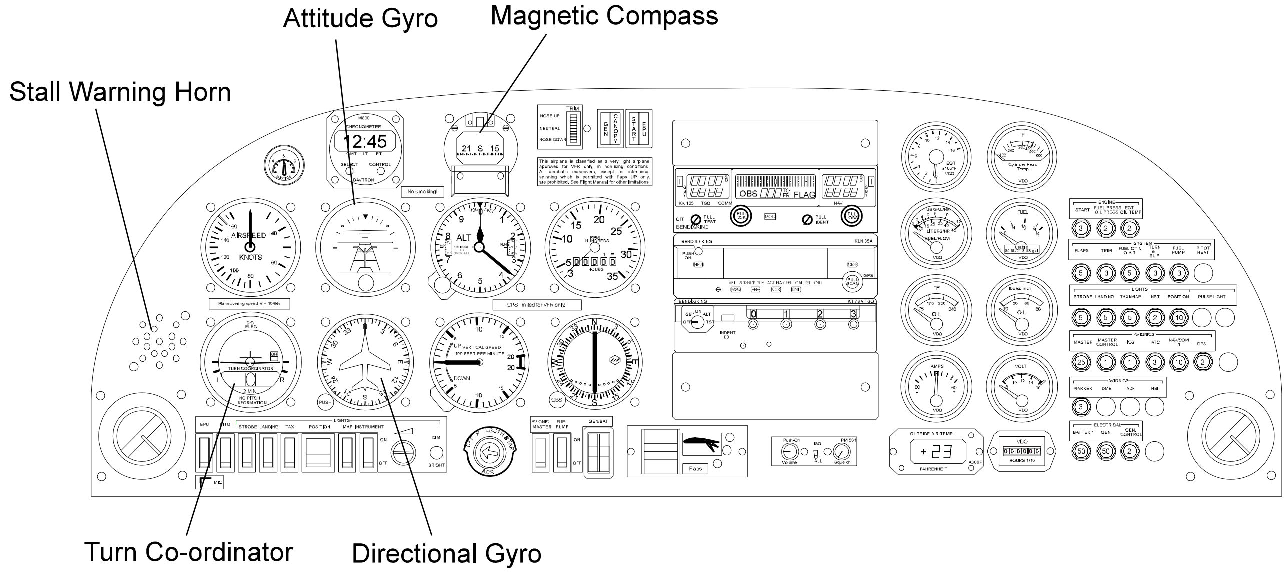

Figure 1 - Instrument Panel Locations

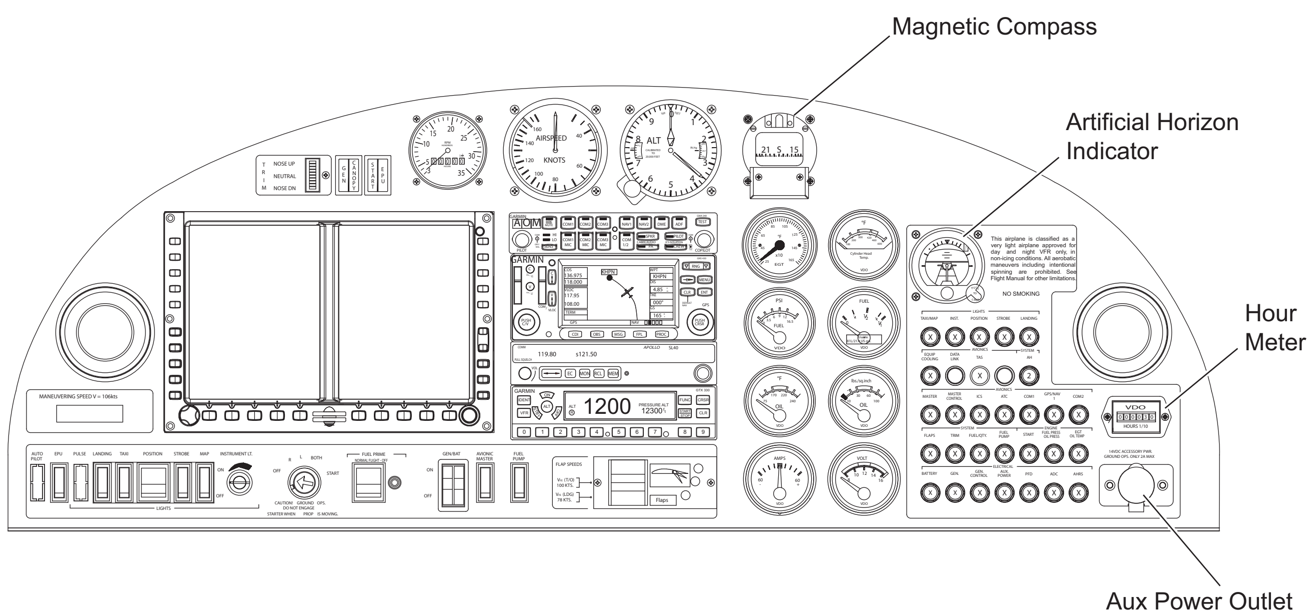

Figure 2 - Instrument Panle Locations - G500 (Artificial Horizon Indicator optional)

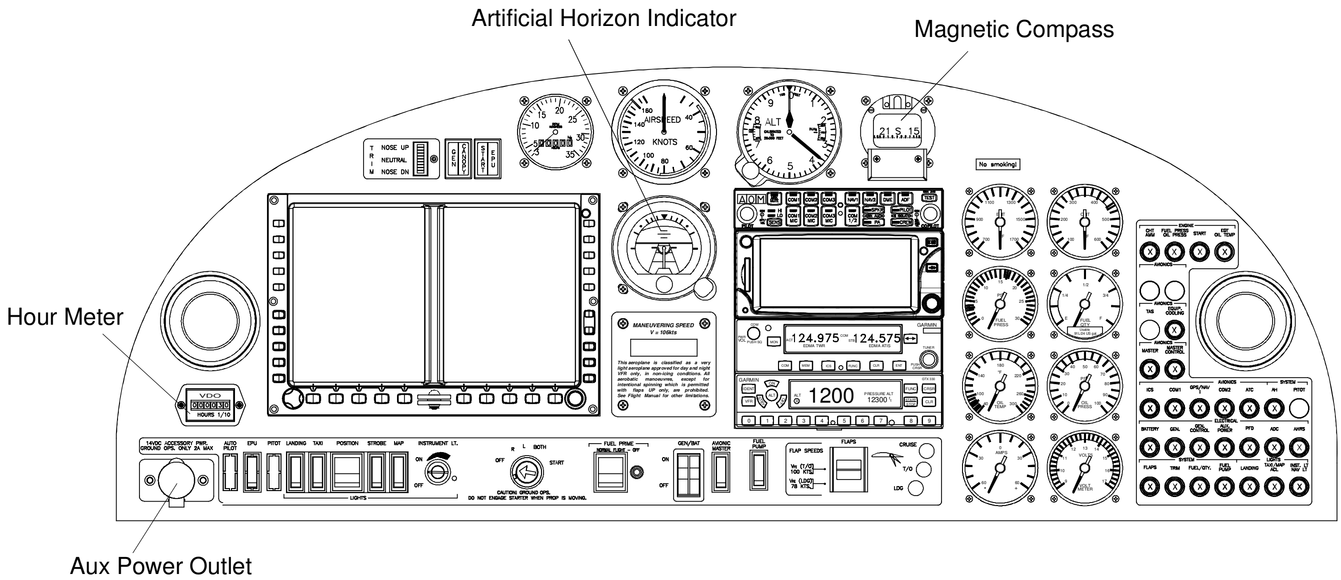

Figure 3 - Instrument Panle Locations - G500 with UMA engine instruments and Garmin GTN 650/GTR 225 (Artificial Horizon Indicator optional)

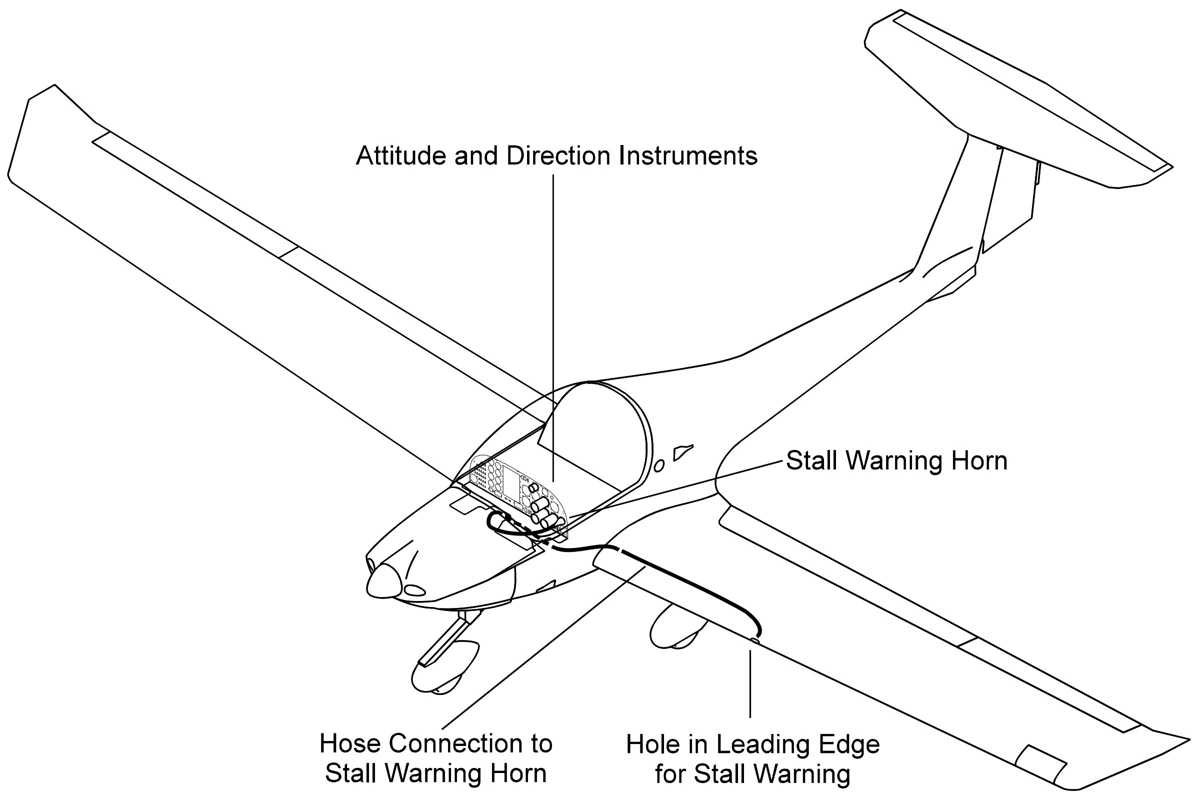

Figure 3 - Attitude and Direction Component Locations

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ATTITUDE AND DIRECTION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the attitude and direction instruments. If you find the trouble in column 1, do the repair given in column 3. Refer to Chapter 92 for wiring diagrams.

TROUBLE	POSSIBLE CAUSE	REPAIR
Turn coordinator warning flag in view.	Turn coordinator circuit-breaker open or defective.	Close or replace the turn coordinator circuit-breaker.
Turn coordinator operation not reliable.	Power supply wiring defective.	Do a test for the correct voltage at the instrument. Repair the power supply wiring/connector.
	Ground connection defective.	Do a test for correct ground connection. Repair the ground wiring/connector.
	Turn coordinator defective.	Replace the turn coordinator.
Attitude indicator or directional gyro operation not reliable.	Vacuum system defective.	Repair vacuum system. Refer to Chapter 37-00.
	Power supply wiring defective.	Do a test for the correct voltage at the instrument. Repair the power supply wiring/connector.
	Ground connection defective.	Do a test for correct ground connection. Repair the ground wiring/connector.
	Instrument defective.	Replace the instrument.
Magnetic compass leaking fluid.	Defective compass housing.	Replace the compass.
Compass deviation more than 10°.	Residual magnetism of a metal component in the aircraft.	Do a test for residual magnetism using a hand-held compass. If necessary, degauss the component.
	Defective compass	Replace the compass.

TROUBLE	POSSIBLE CAUSE	REPAIR
	Compass out of calibration.	Do a compass swing. Refer to the Maintenance Practices in this Chapter.
Stall warning horn does not operate.	Stall warning horn defective.	Refer to the Maintenance Practices in this Chapter.
	Water frozen in the stall warning system.	Drain the water from the stall warning system. Refer to the Maintenance Practices in this Chapter.

ATTITUDE AND DIRECTION - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- remove and install the magnetic compass
- remove and install the stall warning horn
- test and adjust the magnetic compass (compass swing)
- remove and install the backup artificial horizon indicator.

Be very careful when you work on or move gyroscopic instruments. Make sure that the gyro stops turning before you start to remove the instrument. Use only the correct shock-proof container for shipping. Mark the container 'VERY FRAGILE' 'HANDLE LIKE EGGS'.

2. Remove/Install the Magnetic Compass

A. Remove the Magnetic Compass

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Disconnect the lighting plug.	
3.	Remove the mounting screws.	Hold the instrument.
4.	Remove the compass from the panel.	

B. Install the Magnetic Compass

	Detail Steps/Work Items	Key Items/References
1.	Put the compass in position in the instrument panel.	
2.	Install the mounting screws.	
3.	Connect the lighting plug.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do a compass swing.	

3. Test/Adjust the Magnetic Compass

You must do a test for correct operation of the compass (compass swing):

- After replacing a major component
- After replacing the compass
- After modification to the aircraft.

CAUTION: USE ONLY NON-MAGNETIC TOOLS TO ADJUST THE COMPASS.

CAUTION: DO NOT WEAR OR CARRY METALIC MATERIAL (WATCHES, BRACELETS ETC) WHEN YOU ADJUST THE COMPENSATING MAGNETS OR OPERATE THE LAND COMPASS. METALIC MATERIAL CAN CAUSE ERRORS.

NOTE: If possible, use a compass swing area that has been tested for magnetic interference. In any case, use a level area which is away from steel structure, underground pipes, cable, reinforced concrete, other aircraft and ground equipment.

A. Equipment

Item	Quantity	Part Number
Calibrated Land Compass	1	Commercial
0.060” 6-Spline Wrench	1	Commercial

B. Compass Swing

	Detail Steps/Work Items	Key Items/References
1.	Adjust the compensating magnets in the compass to a neutral position.	
2.	Start the engine. Set all electrical loads to ON.	Refer to the DA20-C1 Airplane Flight Manual.
3.	Use a calibrated and reliable land compass to confirm the airplane heading.	
4.	Align the aircraft to magnetic north.	Adjust the N-S compensator so that the compass indicates a heading of 0 degrees.
5.	Align the aircraft to magnetic east.	Adjust the E-W compensator so that the compass indicates a heading of 90 degrees.
6.	Align the aircraft to magnetic south.	Adjust the N-S compensator so that the compass indicates a heading of 180 degrees.

	Detail Steps/Work Items	Key Items/References
7.	Align the aircraft to magnetic west.	Adjust the E-W compensator so that the compass indicates a heading of 270 degrees.
8.	Turn the aircraft through 360 degrees. Record the deviation at each 30 degrees. Prepare a deviation table that shows the corrections that must be applied to each heading	If large deviations occur when you operate electrical equipment/systems, the deviation table must also show the corrections to apply at each 30 degrees heading when the system is operated.
9.	Install the deviation table in the compass card holder below the compass.	

4. Remove/Install the Stall Warning Horn Assembly

A. Remove the Stall Warning Horn Assembly

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to AMM Chapter 25-10.
2.	Remove the hose from the hose barb assembly fitting of the stall warning horn assembly.	
3.	Remove the two mounting screws and nuts that attach the horn assembly to the instrument panel.	
4.	Remove the stall warning horn assembly from the panel. - Remove the protective cloth from the panel.	

B. Install the Stall Warning Horn Assembly

	Detail Steps/Work Items	Key Items/References
1.	Put the protective cloth in position in the instrument panel. Then put the stall warning horn assembly in position in the instrument panel.	
2.	Install the two mounting screws and nuts that attach the horn assembly to the instrument panel.	
3.	Connect the airframe hose to the barb fitting on the stall warning horn assembly	
4.	Install the instrument panel cover	Refer to Chapter 25-10.
5.	Do a flight check of the stall warning system.	Refer to the DA20-C1 Airplane Flight Manual.

5. Procedure to Remove Water from the Stall Warning System

	Detail Steps/Work Items	Key Items/References
1.	Remove the left hand pilot’s seat.	Refer to Chapter 25-10.
2.	Carefully pull the stall warning pipe from the wing root connector.	
3.	Lower the end of the pipe and drain the water from the system.	
4.	Connect the stall warning pipe to the wing root connector.	
5.	Do a flight check of the stall warning system.	Refer to the DA20-C1 Airplane Flight Manual.

6. Remove/Install the Backup Artificial Horizon Indicator

C. Remove the Artificial Horizon Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the connector J3420 from the Artificial Horizon Indicator.	
4.	Remove the three mounting screws that attach the Articificial Horizon Indicator.	Hold the instrument.
5.	Remove the Artificial Horizon Indicator from the panel.	

D. Install the Artificial Horizon Indicator

	Detail Steps/Work Items	Key Items/References
1.	Place the Artificial Horizon Indicator in position in the instrument panel.	Set the voltage control lighting switch to 14V.
2.	Install the three mounting screws.	
3.	Plug in connector J3420 into Artificial Horizon Indicator.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Connect the aircraft battery.	Refer to Chapter 24-31.
6.	Do the functional test of the Artificial Horizon indicator as follows: - Push in the battery circuit breaker and turn the Electrical Master switch to ON. - Make sure that the Gyro Warning flag (red) is pulled out-of-view - Check the indicator internal lighting is working correctly. Turn INSTRUMENT LT knob ON and continue to adjust clock-wise. - Pull the cage knob and confirm the indicators display levels out.	Make sure that the Artificial Horizon's internal lighting turns on, and continues to get brighter.

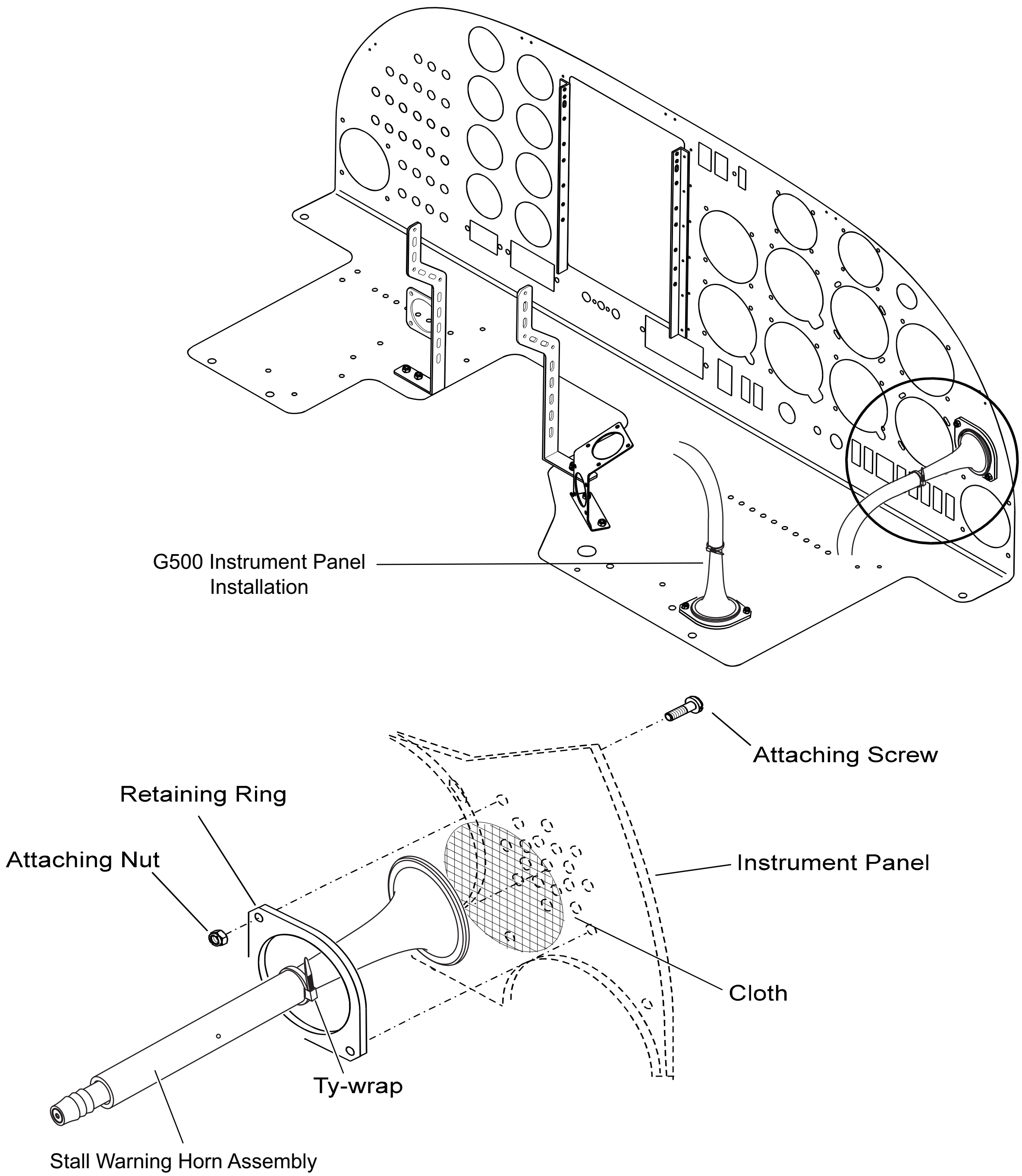

Figure 201 - Stall Warning Horn Assembly

LANDING AND TAXIING AIDS

1. General

Some aircraft with dual VHF COMM equipment have a Bendix\King KMA 24 Audio\Marker receiver. Refer to Chapter 23-50 for data about the audio integration functions of the KMA 24.

The DA20-C1 aircraft can have other marker, localizer, and glideslope receivers as customer options. Refer to the manufacturers manuals for data about the equipment installed as a customer option.

2. Description and Operation

The KMA 24 is an audio selector panel. It also has a marker beacon receiver and a headphone isolation amplifier. The marker beacon receiver receives a 75 MHz carrier signal. The carrier signal is modulated with the following tones:

- Outer marker: 400 Hz
- Middle marker: 1300 Hz
- Airways marker: 3000 Hz.

Three colored lenses show when the aircraft is over the related beacon. The lenses are marked A, O and M.

The KMA 24 has the following controls for the marker beacon functions:

- TST switch: When you push the TST (test) switch, all 3 lights come on
- SENS switch: Push the switch in for HI sensitivity. Push the switch again for LO sensitivity. With HI sensitivity the equipment receives each beacon signal for a longer time. With LO sensitivity the equipment receives each beacon signal for a shorter time.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The ICS and MARKER circuit-breakers must be closed. Turn the MIC selector switch knob clockwise from the OFF position.

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LANDING AND TAXIING AIDS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the audio marker beacon receiver. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Test operates correctly but the marker does not operate.	Faulty marker receiver.	Replace the KMA 24.
	Poor co-ax connections.	Examine the co-ax connectors for condition and security.
	Faulty antenna.	Replace the antenna.
Test does not operate.	No power.	Do a power check. Do a continuity test of the ground and power wires.
	Circuit-breaker open or defective.	Close the circuit-breaker or replace the circuit-breaker.
	Faulty marker receiver.	Replace the KMA 24.

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LANDING AND TAXIING AIDS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove, install and adjust/test the marker beacon system on the aircraft. Refer to Chapter 23-50 for data about the audio integrating functions. Refer to the component manufacturer's manuals for more data and shop data.

2. Remove/Install the Bendix\King KMA 24 Audio/Marker Receiver

A. Remove the Bendix/King KMA 24 Receiver

	Detail Steps/Work Items	Key Items/References
1.	Open the MARKER and ICS circuit-breakers.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 201.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the KMA 24.	

B. Install the Bendix/King KMA 24 Receiver

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack.	Insert a 3/32" allen wrench into the access hole for the locking screw.
3.	Turn the locking screw clockwise.	Until the unit locks.

	Detail Steps/Work Items	Key Items/References
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the MARKER and ICS circuit-breakers.	
6.	Do a function test.	

C. Adjustment/Test Bendix/King KMA 24 Receiver

If possible, do an operational flight check of the marker receiver functions after the intercom has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-00180-0001 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of the marker receiver functions.	
2.	Press the Test Button.	Make sure that the three marker beacon lights come on.
3.	Do a test of the audio panel.	Refer to Chapter 23-50.

3. Connectors

Remove contacts from the connectors in the radio rack with Hand Ejector Tool Molex part number HT-1884. Crimp solderless contact terminals with Molex part number 6115.

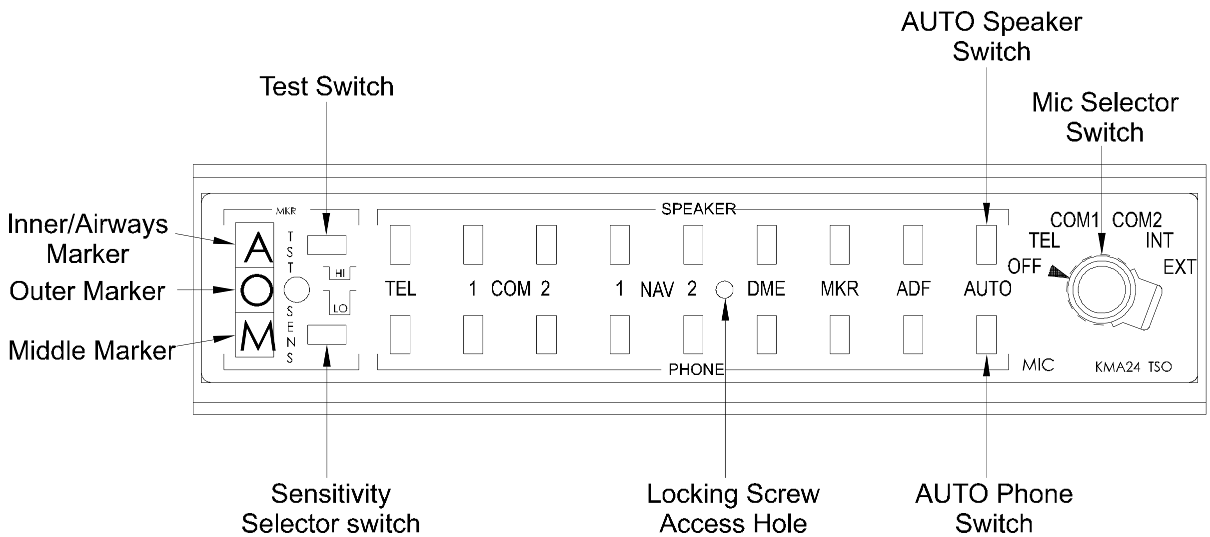

Figure 201 - KMA 24 Audio/Marker Receiver

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DEPENDENT POSITION DETERMINING

1. General

This chapter describes about the equipment that shows dependent position determining. The DA20-C1 aircraft has the following position determining systems:

- NAV - Bendix\King KX 125 VOR, LOC
- NAV - Indicator\Converter - Bendix\King KI 208 VOR, LOC
- GPS - Bendix\King KLN 35A
- GPS - Bendix\King KLX 135\135A. (Option in place of KLN 35A)
- GPS - Garmin GNS430W\GNS530W/GTN 650
- Transponder - Bendix\King KT 76A
- Transponders - Garmin GTX 327 and GTX 330

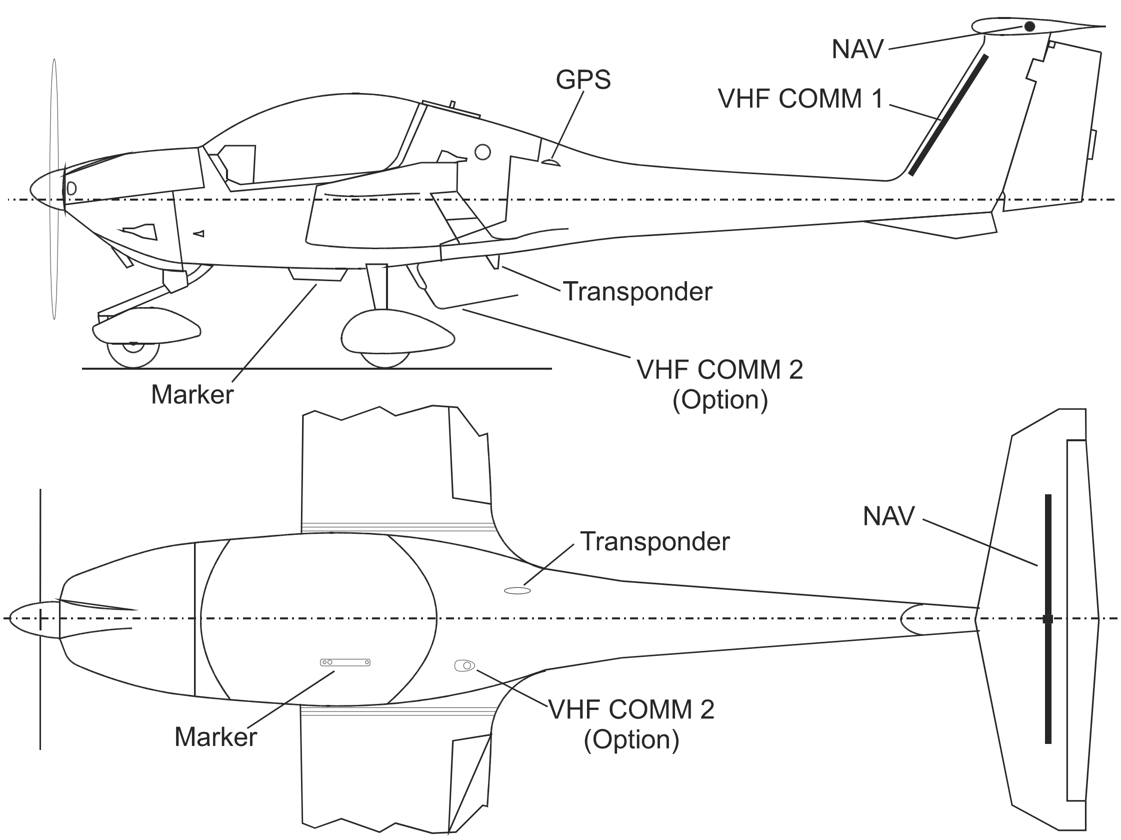

Figure 1 - Antenna Locations

Some aircraft have other dependent position determining equipment as customer options. For example, second VHF radios, DME or ADF. Refer to the manufacturer's manuals for data about these instruments. Figure 1 shows the antenna locations.

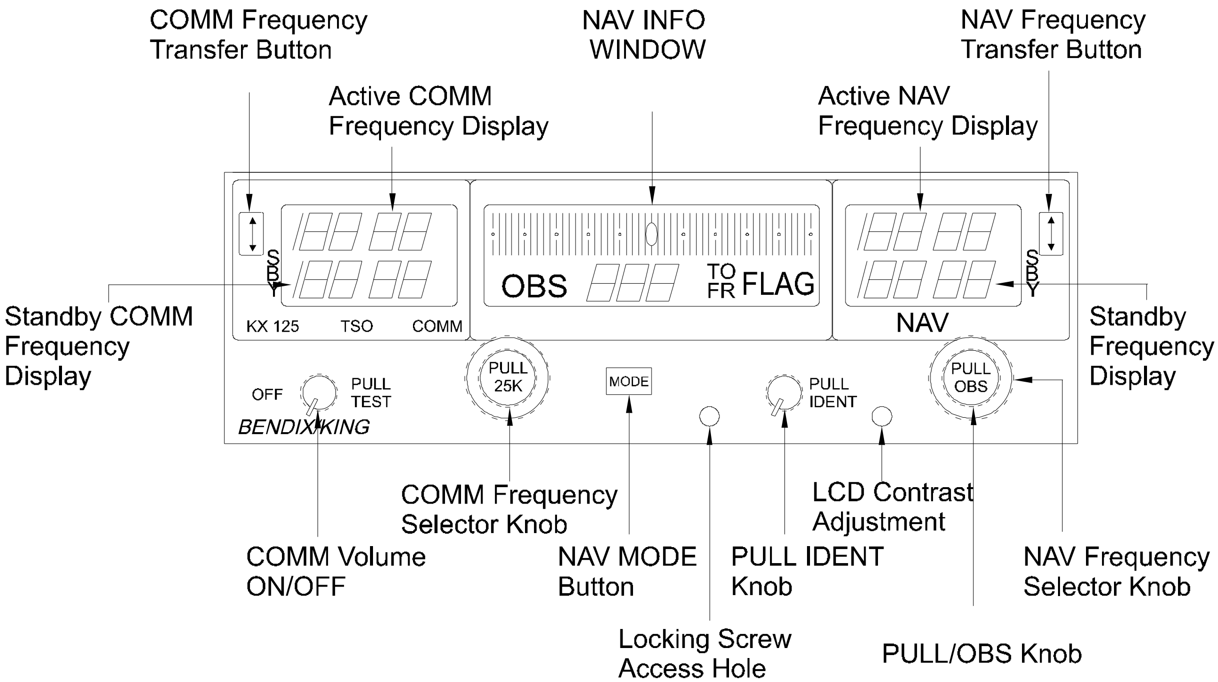

Figure 2 - KX 125 NAV COMM

2. Description and Operation

A. Bendix/King KX 125 NAV COMM

(1) Description

Figure 2 shows the KX 125 NAV COMM. The KX 125 is a communications transceiver and navigation receiver. Refer to AMM Chapter 23-10 for data about the communications functions. The equipment can receive NAV signals from 108.00 MHz to 117.95 MHz with 50 kHz channel spacing. This gives 200 channel operation.

The NAV antenna is located in the horizontal stabilizer. Refer to Figure 1.

The VOR\LOC converter in the equipment gives data for the internal course deviation indicator (CDI). The equipment can also give DME channeling and VOR\LOC composite output when the related equipment options are installed.

(2) Operation

To operate to the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The circuit-breaker must be closed. Turn the COMM volume knob clockwise from the OFF position. The display will show the frequencies last stored in the non-volatile memory.

The NAV frequency selector knobs are located below the NAV frequency display. They operate only when the PULL OBS knob is pushed in. Turn the large knob to change the frequency in 1 MHz increments. Turn the small knob to change the frequency in 50 kHz increments. The frequency will change in the SBY part of the display.

Push the NAV frequency transfer button to toggle the NAV USE and SBY frequencies.

You can enter frequencies directly to the USE display. Push and hold the NAV frequency transfer button for more than 2 seconds. The SBY display will show the blank symbols (---). The frequency selector knobs will control the frequency in the USE display.

You can adjust the NAV audio volume with the NAV volume control (marked PULL IDENT). Pull out the PULL IDENT knob to hear the morse code identifier (IDENT) of the tuned station as well as voice messages. Push in the PULL IDENT knob to turn off the IDENT.

When you set the equipment ON, it will be in the default CDI mode. Momentarily push the NAV MODE button to change the mode to BEARING, RADIAL or back to CDI.

(3) CDI Mode

Tune to an active VOR signal. The NAV INFO window shows:

- An OBS annunciator
- A 3 digit OBS bearing
- A TO or FROM annunciator
- Deviation bars. (Each deviation bar equals 0.4 degrees. Each dot equals 2 degrees. The display limit is ±10 degrees of course deviation).

Pull out the PULL OBS knob to change the OBS setting. Then turn the knob to change the setting. The OBS annunciator will flash. The NAV frequency selectors will not operate.

If the VOR signal cannot be used, the display shows a FLAG annunciator and all of the deviation bars.

(4) NAV Bearing Mode

In the NAV bearing mode the NAV INFO window shows a 3-digit display with a TO annunciator. The received VOR signal bearing is only shown in the TO format.

If the VOR signal cannot be used, the display shows a FLAG annunciator.

(5) NAV Radial Mode

In NAV radial mode, the operation is the same as in the NAV bearing mode. The display shows an FR annunciator. The data is shown in the FROM format.

Press and hold the NAV MODE button for more than 2 seconds to engage the AUTO-TO function. The NAV will enter the CDI mode. The received VOR signal bearing in TO format replaces the OBS setting.

B. Bendix/King KI 208 VOR, LOC Indicator

Figure 3 shows the KI 208 VOR, LOC indicator. The KI 208 indicator receives a composite signal from the KX 125 navigation receiver. The KI 208 converts the composite signal into DC signals that operate the CDI and TO-OFF-FROM meters.

The KI 208 receives electrical power from the navigation receiver (for example the KX 125). The OBS selector knob turns the azimuth card. You set the azimuth card to a bearing that the VOR course can be compared with. The reciprocal course is shown below the bottom course index marker. A NAV warning flag shows when the VOR or LOC signal is not reliable. It also shows if the NAV receiver has malfunctioned.

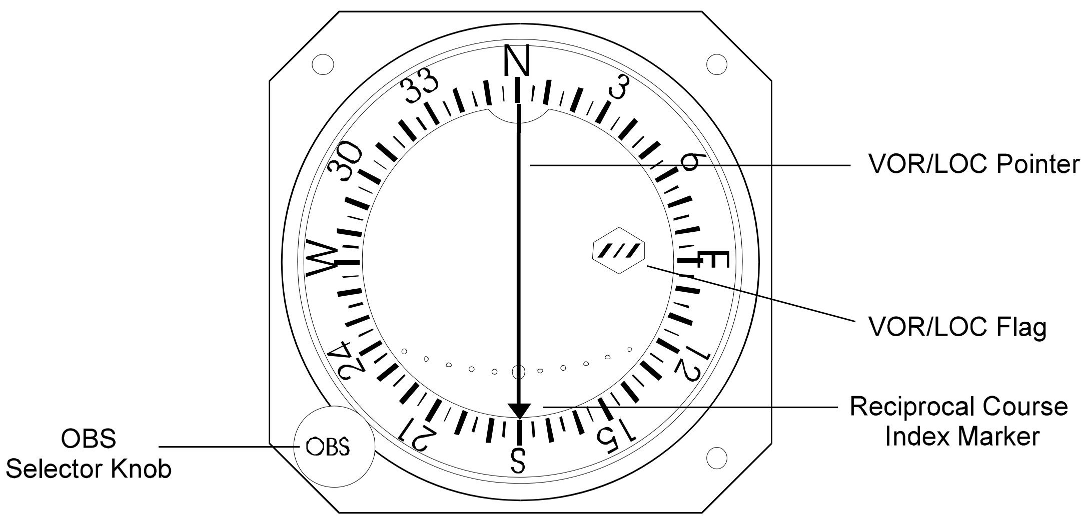

Figure 3 - Bendix/King KI 208 VOR, LOC Indicator

C. Bendix/King KX 155 NAV COM

Figure 4 shows the KX 155 NAV COM. The KX 155 is a VHF communications transceiver and a NAV receiver (Refer to AMM Chapter 23-10 for the COMM functions). The equipment can receive NAV signals from 108.00 MHz to 117.95 MHz in 50 kHz increments. This gives 200 channel operation.

The unit receives glideslope and NAV signals from the NAV antenna (Refer to Figure 1). A diplexer on the instrument panel shelf divides the signals. The equipment can also give VOR\LOC composite output and DME channeling (optional).

The right hand display panel shows NAV frequency data. The left side shows the NAV USE frequency. The right side shows the STBY frequency.

When the power is off, a non-volatile memory holds the frequency that was last used. A photo-cell in the display controls the display brightness.

The KX 155 has the following controls:

- An OFF/PULL TEST switch
- NAV frequency selector knobs
- A NAV frequency transfer button
- A PULL IDENT knob.

The OFF/PULL TEST rotary switch controls power to the equipment. The full counter-clockwise position is OFF. To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COMM OFF/PULL TEST knob clockwise from the OFF position.

To change the frequency, turn the large frequency selector knob for 1 MHz increments. Turn the small frequency selector knob for 50 kHz increments. When you turn the selector knobs, the STBY frequency changes. Push the NAV frequency transfer button to toggle the USE and STBY frequencies.

If you pull the PULL IDENT knob, you hear both voice and ident signals. If you push the knob in, you hear only the voice. Turn the knob to control the volume of both signals.

If the equipment finds an in-valid frequency in the non-volatile memory, both USE and STBY frequencies show 120.00 when power is applied.

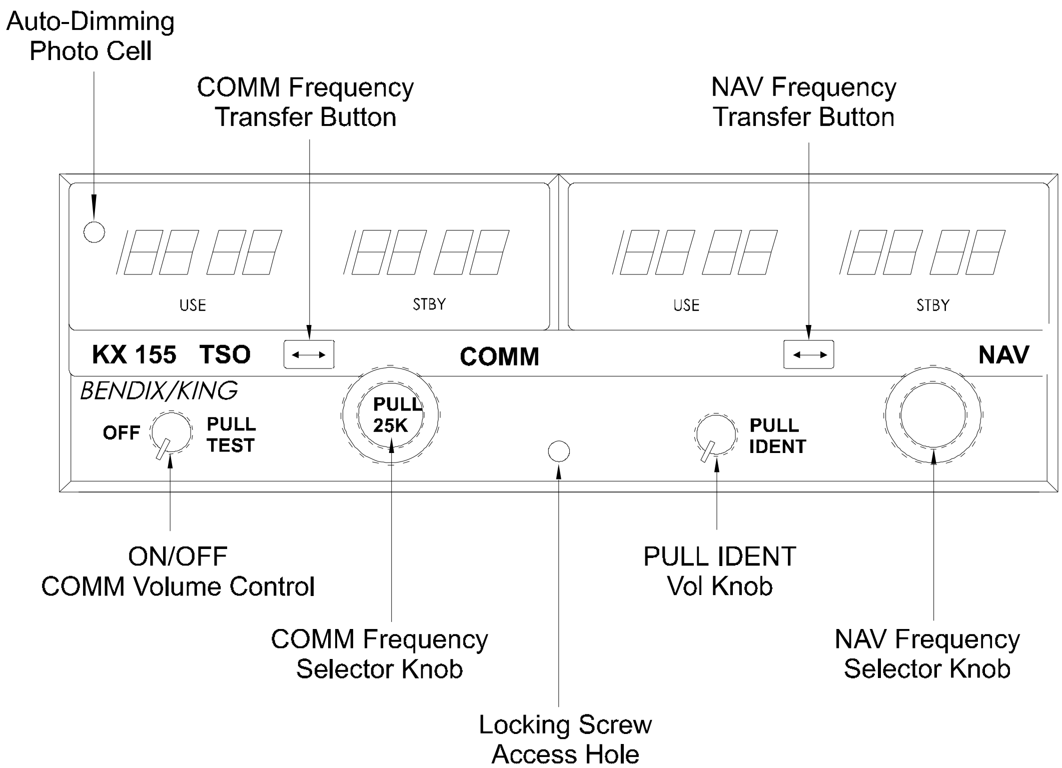

Figure 4 - Bendix\King KX 155 NAV COMM

D. Bendix/King KI 209 VOR, LOC G/S Indicator

Figure 5 shows the KI 209 VOR, LOC, G/S indicator. The KI 209 indicator receives a composite signal from the KX 155 navigation receiver. The KI 209 converts the composite signal into DC signals that operate the CDI and TO-OFF-FROM meters. The KX 155 glideslope receiver operates the glideslope deviation indicator and warning flag.

The KI 209 receives electrical power from the navigation receiver (for example the KX 155). The OBS selector knob turns the azimuth card. You set the azimuth card to a bearing that the VOR course can be compared with. The reciprocal course is shown below the bottom course index marker.

A NAV warning flag shows when the VOR or LOC signal is not reliable. It also shows if the NAV receiver has malfunctioned. The glideslope warning flag shows when the glideslope signal is not reliable. It also shows if the glideslope receiver has malfunctioned.

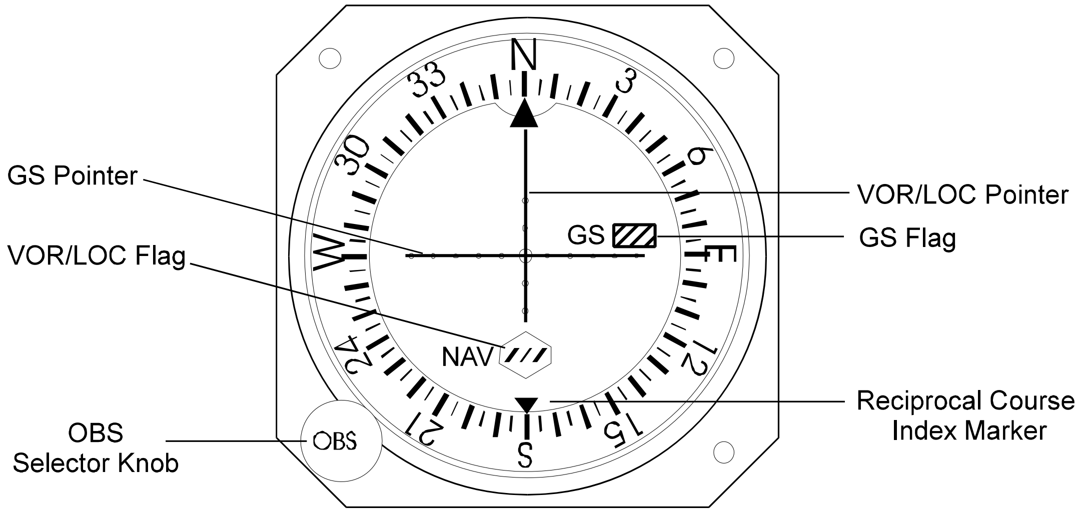

Figure 5 - KI 209 VOR, LOC, G/S Indicator

E. Bendix/King KLN 35A GPS

Figure 6 shows the KLN 35A GPS. The avionics bus supplies power to the KLN 35A. The GEN/ BAT switch and the AVIONICS MASTER switch must be ON to supply power through the circuit breaker to the GPS. The DIM/BRIGHT switch (located in the instrument panel) controls the brightness of the display.

The KLN 35A receives signals from an active antenna. The antenna is located behind the battery box.

The blind altitude encoder provides data to the KLN 35A. Refer to AMM Chapter 34-20 for data about the altitude encoder. You can up-date the KLN 35A data base though a data loading port. The port is below the left instrument panel shelf.

WARNING: DO NOT USE THE GPS WITH AN OUT-OF-DATE DATA BASE. AN OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

Refer to the manufacturers Operator's Handbook provided with the equipment for operating data. (Bendix\King part number 006-08791-0000).

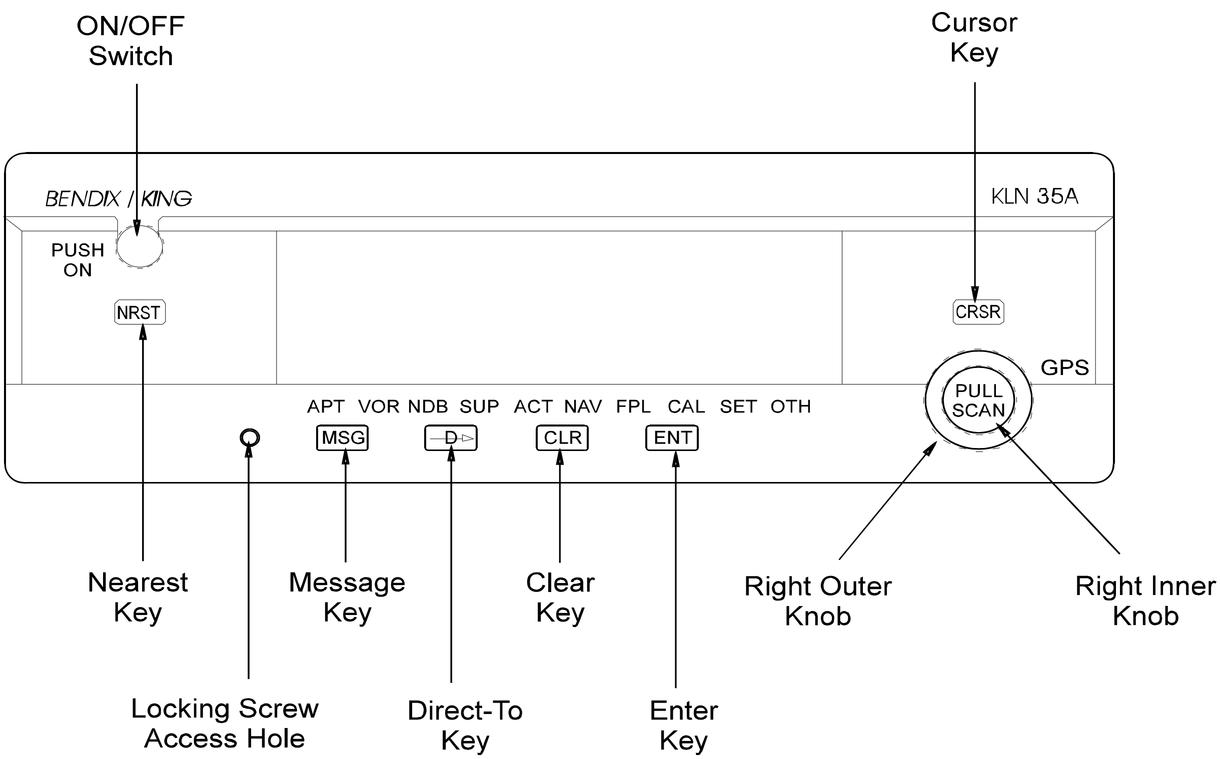

Figure 6 - KLN 35A GPS

F. Bendix/King KLX 135/135A GPS COMM

Figure 7 shows the KLX 135\135A GPS COMM. The KLX 135\135A is a VHF communications transceiver and a GPS receiver. Refer to AMM Chapter 23-10 for data about the VHF COMM part of the equipment.

The avionics bus supplies power to the KLX 135\135A. The GEN/BAT switch and the AVIONICS MASTER switch must be ON to supply power through the circuit breaker to the equipment. The DIM/BRIGHT switch (located in the instrument panel) controls the brightness of the display.

The GPS part of the KLX 135\135A receives signals from an active antenna. The antenna is located behind the battery box.

The blind altitude encoder provides data to the KLX 135\135A. Refer to AMM Chapter 34-20 for data about the altitude encoder. You can up-date the KLX 135\135A data base though a data loading port. The port is below the left instrument panel shelf.

WARNING: DO NOT USE THE GPS WITH AN OUT-OF-DATE DATA BASE. AN OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

Refer to the manufacturers Operator's Handbook provided with the equipment for operating data. (Bendix\King part number 006-08751-0000 for the KLX 135, 006-08789-0000 for the KLX 135A).

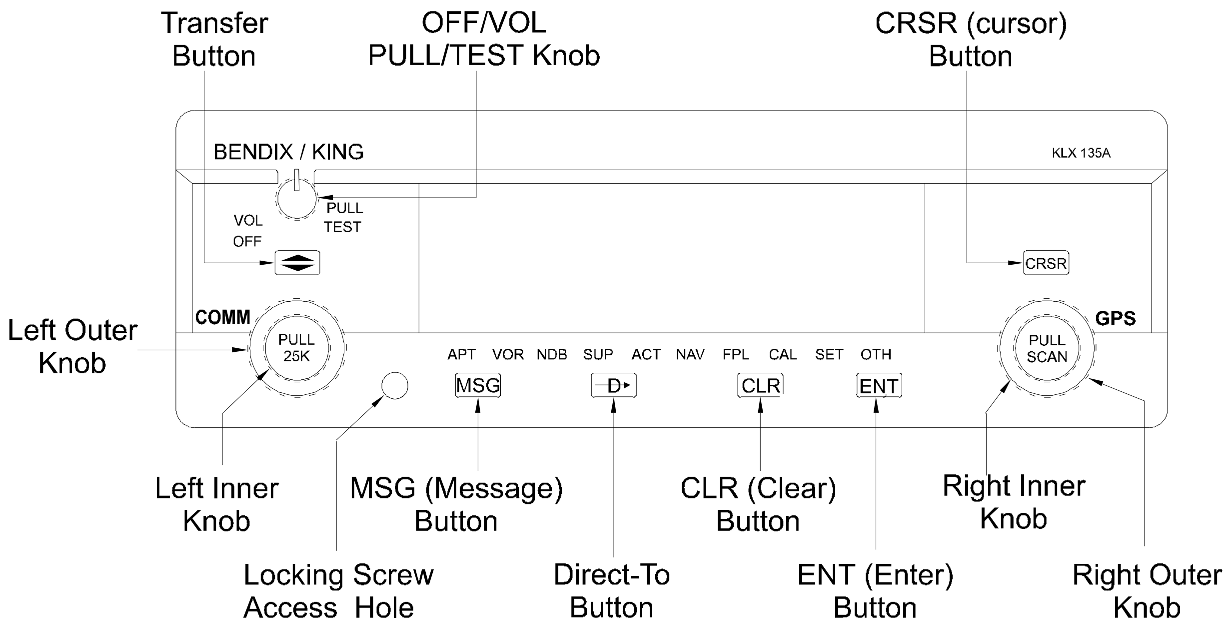

Figure 7 - KLX 135\135A GPS COMM

G. Bendix/King KT 76A Transponder

(1) Description

Figure 8 shows the KT 76A Transponder. The KT 76A transponder is a receiver/transmitter. It transmits transponder code and attitude data to the Air Traffic Control Radar Beacon System (ATCRBS).

The Transponder replies to interrogation signals from the ATCRBS mode A secondary surveillance radar (SSR). The reply signal gives the code which can be set on the cockpit display. A reply lamp comes on when the equipment is transmitting.

The transponder can also give altitude data in reply to mode C interrogation. The transponder transmits data from the blind encoding altimeter to the ATCRBS. Refer to AMM Chapter 34-20 for data about the blind encoding altimeter.

The transponder has an IDENT button. Push the IDENT button to transmit a special identification pulse. The IDENT pulse identifies the aircraft to the air traffic controller.

(2) Operation

The avionics bus supplies power to the transponder. The GEN/BAT switch and the AVIONICS MASTER switch must be ON to supply power through the circuit breaker to the transponder. Turn the function selector switch clockwise from the OFF position to set the transponder on. There is a 45 second delay after setting the unit ON from OFF to let the transmitter tube warm-up. The function selector switch has the following positions:

- SBY: The transponder receives signals but does not transmit
- ON: If the transponder receives a mode A interrogation, it transmits the mode A code set by the code selector knobs. You can set any code between 0000 and 7777
- ALT: If the transponder receives a mode C interrogation, it transmits the altitude data from the blind encoder
- TST: This uses a momentary contact switch to operate the transmitter. The reply lamp comes on. The reply lamp shows the operator that the unit is transmitting.

The reply lamp also shows that the IDENT button has been pressed. If you press the IDENT button once, the unit transmits a special identification pulse for each interrogation over the next 15 to 30 seconds.

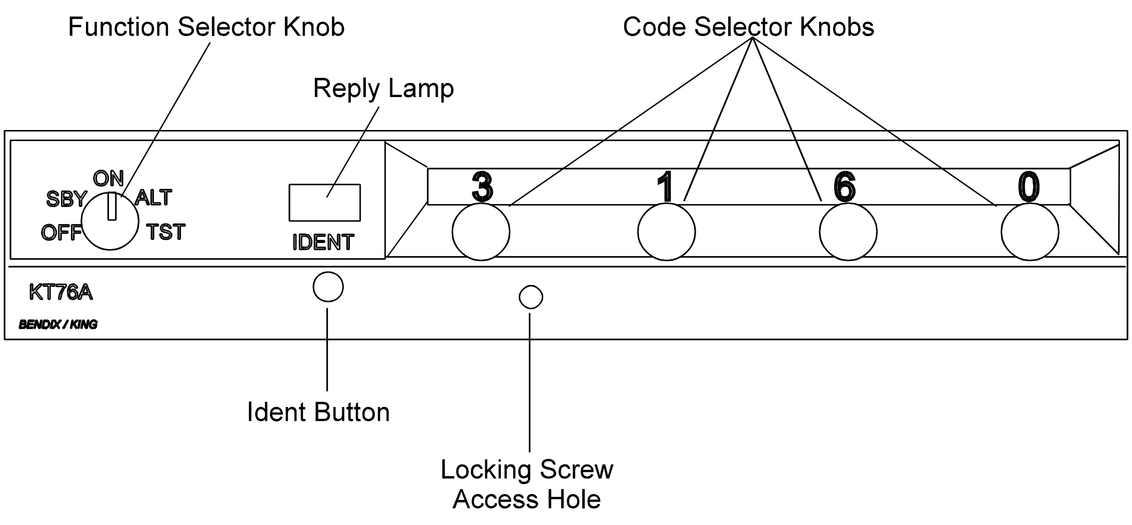

Figure 8 - KT 76A Transponder

H. Garmin GTX 327 Transponder

Refer to Figure 9.

(1) Description

The Garmin GTX 327 is a panel-mounted transponder with the addition of altitude reporting and timing functions. The transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

Provision is made for unit software upgrade by means of RS-232 data transfer through rear connector pins. If the optional connector is placed in the aircraft, transponder removal and reinstallation for software upgrade is not required. The software can be changed while the unit is still mounted inside the aircraft.

(2) Operation

As with other Mode A/Mode C transponders, the GTX 327 replies with any one of 4,096 codes, which differ in the position and number of pulses transmitted. By replying to ground transmissions or TCAS interrogations, the GTX 327 enables ATC to display aircraft identification, altitude and groundspeed on ATC radar screens or TCAS traffic indicators. The GTX 327 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds.

The GTX 327 is configured with all key controls. The layout of the front panel keys and displays segregates the transponder's primary functions from the secondary timing functions. The unit can be configured so the aircraft avionics master bus can turn the unit on.

Figure 9 - GTX 327 Transponder Front Panel

The GTX 327 Transponder has the following functional controls:

Key	Function
OFF	Powers off the GTX 327. Pressing the STBY, ON or ALT key powers on the transponder displaying the last active identification code.
STBY	Selects the standby mode. When in standby mode the transponder will not reply to any interrogations.
ON	Selects Mode A. In this mode, the transponder replies to Mode A and Mode C interrogations, as indicated by the Reply Symbol (“®”), but the replies do not include altitude information.
ALT	Selects Mode A and Mode C. In ALT mode, the transponder replies to identification and altitude as indicated by the Reply Symbol (“®”). Replies to altitude interrogations include the standard pressure altitude (29.92 inches Hg.) received from an external altitude source, which is not adjusted for barometric pressure. The ALT mode may be selected in aircraft not equipped with an optional altitude encoder; however, the reply signal will not include altitude information.
NOTE: Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.	
IDENT	Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying the transponder return from others on an air traffic controller’s screen. During the IDENT period, the word ‘IDENT’ appears in the upper left corner of the display.
VFR	Sets the transponder code to the pre-programmed VFR code selected in Configuration mode (set to 1200 at the factory). Pressing the VFR key again will restore the previous identification code.
NOTE: The VFR key is on (functional) by default, but can be disabled in configuration mode.	
FUNC	Changes the page shown on the right side of the display. Display data includes Pressure Altitude, Flight Time, Count Up and Count Down timers. In the Configuration mode, steps through the function pages.
START/STOP	Starts and stops the Count Up, Count Down and Flight Time. In the Configuration mode, reverses through the function pages.
CRSR	Activates the change fields for the Count Down timer.
CLR	Resets the Count Up, Count Down and Flight timers. Returns cursor to fourth code digit up to five seconds after code entry is complete.

Key	Function
8	Reduces screen Contrast and Display Brightness. Enters the number eight into the Count Down timer.
9	Increases screen Contrast and Display Brightness. Enters the number nine into the Count Down timer

I. Garmin GTX 328/330/330D Transponder

(1) Description

The Garmin GTX 328/330 is a panel mounted Non-Diversity Mode S Transponder while the GTX 330D is a Diversity Mode S Transponder.

The Garmin GTX 328 retains many of the GTX 330 features such as displaying outside air temperature, altitude monitoring, count up and count down timers (using a built-in digitized voice annunciator to alert the pilot when preset altitude limits have been exceeded or timer expiration), density altitude functions, and front-panel input for flight ID.

The GTX 328 has a solid-state design that uses less power, reduces heat emissions and eliminates warm-up time. The GTX 328 is the same as the GTX 330 in most respects however the existing GTX 330 Mode S Transponder provides TIS (Traffic Information Services), EHS (Enhanced Mode S) functionality, and transmits power that exceeds the requirement for VFR aircraft in Europe. The GTX-328 will not offer TIS, EHS or ADS-B functionality.

The GTX 330D employs two antennas, one intended to be mounted on the top and the other on the bottom of the aircraft.

The GTX 330 with software version 4.01 or later, meets Mode S Enhanced Surveillance (EHS) requirements. It provides information consisting of additional aircraft parameters to ground radar systems. Compliance with Enhanced Surveillance may require additional interface between aircraft systems and the GTX 330.

(2) Operation

The GTX 330 transponder is a radio transmitter and receiver that operates on radar frequencies, receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to groundbased radar on a frequency of 1090 MHz. The GTX 330 is equipped with IDENT capability that activates the Special Position Identification (SPI) pulse for 18 seconds.

The GTX 330 replies to ATCRBS Mode A, Mode C and Mode S All-Call interrogation. Mode A replies consist of any one of 4,096 codes, which differ in the position and number of pulses transmitted. Mode C replies include framing pulses and encoded altitude. Mode S interrogations are selective. The Mode S transponders can respond to a single directed interrogation from the ground station or another aircraft.

The GTX 330 is a Level 2 transponder, providing downlink of aircraft information. Ground stations can interrogate Mode S Transponders individually using a 24-bit ICAO Mode S address, which is unique to the particular aircraft. In addition, ground stations may interrogate a GTX 330 for its Transponder data capability and the aircraft's Flight ID, which may be the registration number or other call sign. The GTX 330 makes the maximum airspeed capability available to TCAS systems on-board nearby aircraft to aid in the determination of TCAS advisories.

Figure 10 - GTX 330 Transponder Front Panel

The GTX 330 Transponder has the following functional controls:

Key	Function
OFF	Powers off the GTX 330. Pressing the STBY, ON or ALT key powers on the transponder displaying the last active identification code.
STBY	Selects the standby mode. When in standby mode the transponder will not reply to any interrogations. Pressing and holding the STBY key selects ground (GND) mode if Automated Airborne Determination is not otherwise selected from another source. When GND is annunciated, the transponder does not respond to ATCRBS interrogations but squitters and replies to discretely addressed Mode S interrogations.
ON	Selects Mode A and Mode S. In this mode, the transponder replies to Mode A and Mode C interrogations, as indicated by the Reply Symbol ("®"), but the replies do not include altitude information.
ALT	Selects Mode A, Mode C, and Mode S. In ALT mode, the transponder replies to identification and altitude as indicated by the Reply Symbol ("®"). Replies to altitude interrogations include the standard pressure altitude (29.92 inches Hg.) received from an external altitude source, which is not adjusted for barometric pressure. The ALT mode may be selected in aircraft not equipped with an optional altitude encoder; however, the reply signal will not include altitude information.
NOTE: Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.	
IDENT	Pressing the IDENT key activates the Special Position Identification (SPI) Pulse for 18 seconds, identifying the transponder return from others on an air traffic controller's screen. During the IDENT period, the word 'IDENT' appears in the upper left corner of the display.

Key	Function
VFR	Sets the transponder code to the pre-programmed VFR code selected in Configuration mode (set to 1200 at the factory). Pressing the VFR key again will restore the previous identification code.
NOTE: The VFR key is on (functional) by default, but can be disabled in configuration mode.	
FUNC	Changes the page shown on the right side of the display. Display data includes Pressure Altitude, Flight Time, Count Up and Count Down timers. In the Configuration mode, steps through the function pages.
START/STOP	Starts and stops the Count Up, Count Down and Flight Time. In the Configuration mode, reverses through the function pages.
CRSR	Activates the change fields for the Count Down timer.
CLR	Resets the Count Up, Count Down and Flight timers. Returns cursor to fourth code digit up to five seconds after code entry is complete.
8	Reduces screen Contrast and Display Brightness. Enters the number eight into the Count Down timer.
9	Increases screen Contrast and Display Brightness. Enters the number nine into the Count Down timer

J. Garmin GNC 420W

The GNC 420W is a TSO-certified 760-channel COMM transceiver to the GPS 400W's WAAS navigation capabilities and color display. GNC 420W has all of the IFR GPS and communication features of the GNS 430W minus the VOR, ILS or glideslope capability.

GNC 420W comes with built-in WAAS navigation capabilities and features an advanced 15-channel receiver capable of five position updates per second. GNC 420W integrates built-in terrain and navigation databases. The GNC 420W's huge Jeppesen® database, updated with front-loading data cards, contains location reference for all airports, VORs, NDBs, Intersections, Flight Service Stations, published approaches, SIDs/STARs, Special Use Airspace and geopolitical boundaries. A detailed base map clearly shows airports, cities, highways, railroads, rivers, lakes, coastlines and more. Using information from the built-in terrain and U.S. obstacles databases, the GNC 420W displays color coding to graphically alert the pilot when proximity conflicts loom ahead.

The GNC 420W has the following controls:

(1) Left-Hand Keys and Knobs

See the figure below:

GNC 420W/AW

Left-hand Keys and Knobs

Key/Knob	Function
COM power/volume	Controls unit power and communications radio volume. Press momentarily to disable automatic squelch control.
Large Left Knob (COM/VLOC)	Used to tune the megahertz (MHz) value (to the left of the decimal point) of the standby frequency for the communications transceiver (COM) or the VLOC receiver, whichever is currently selected by the tuning cursor.
Small Left Knob (COM/VLOC)	Used to tune the kilohertz (kHz) value (to the right of the decimal point) of the standby frequency for the communications transceiver (COM) or the VLOC receiver, whichever is currently selected by the tuning cursor. Press this knob momentarily to toggle the tuning cursor between the COM and VLOC frequency fields.
COM flip-flop key	Used to swap the active and standby COM frequencies. Press and hold to select emergency channel (121.500 MHz).

(2) Right Hand Keys and Knobs

See the figure below:

Key/Knob	Function
Range Key (RNG)	Allows to select the desired map scale. Use the up arrow side of the key to zoom out to a larger area, or the down arrow side to zoom in to a smaller area.
Direct-To Key	Provides access to the direct-to function, which allows you to enter a destination waypoint and establishes a direct course to the selected destination.
MENU Key	Displays a context-sensitive list of options. This options list allows you to access additional features or make settings changes which relate to the currently displayed page.
Clear Key (CLR)	Used to erase information or cancel an entry. Press and hold this key to immediately display the Default Navigation Page, regardless of which page is currently displayed.
Enter Key (ENT)	Used to approve an operation or complete data entry. It is also used to confirm information, such as during power on.
Large Right Knob	Used to select between the various page groups: NAV, WPT, AUX or NRST. With the on-screen cursor enabled, the large right knob allows you to move the cursor about the page.
Small Right Knob (CRSR)	Used to select between the various pages within one of the groups listed above. Press this knob momentarily to display the on-screen cursor. The cursor allows you to enter data and/or make a selection from a list of options.

(3) Bottom Arrow Keys

See the figure below:

Key/Knob	Function
Nearest (NRST) Key	Displays the nearest airports page. Then, turning the small right knob steps through the NRST pages.
OBS Key	Used to select manual or automatic sequencing of waypoints. Pressing the OBS key selects OBS mode, which will retain the current “active to” waypoint as your navigation reference even after passing the waypoint (i.e., prevents sequencing to the next waypoint). Pressing the OBS key again will return to normal operation, with automatic sequencing of waypoints. Whenever OBS mode is selected, you may set the desired course to/from a waypoint using the OBS Page, or an external OBS selector on your HSI.
Message (MSG) Key	Used to view system messages and important warnings and requirements.
Flight Plan Key (FPL)	Allows you to create, edit, activate and invert flight plans, as well as access approaches, departures and arrivals. A closest point to flight plan feature is also available from the flight plan key.
Procedures Key (PROC)	Allows you to select and remove approaches, departures and arrivals from your flight plan. When using a flight plan, available procedures for your departure and/or arrival airport are offered automatically. Otherwise, you may select the desired airport, then the desired procedure.

K. Garmin GNS 430W

Refer to Figure 11.

The GNS430W is a VHF communications transceiver and a GPS receiver. Refer to Chapter 23-10 for the COMM functions. It also includes the a Tossed airborne VOR/Localizer and Glideslope receivers. It has two removable data cards, one with a Jeppesen database (inserted in the left-most card slot) and the other the Terrain database (inserted in the right-most card slot).

The GNS430W has the following controls:

(1) Left-Hand Keys and Knobs

Refer to Chapter 23-10 for the COMM functions.

(2) Right Hand Keys and Knobs

Key/Knob	Function
RNG Key	Allows the pilot to select the desired map scale. Press the up arrow to zoom out or the down arrow side to zoom in.
Direct-To Key	Allows the pilot to enter a destination waypoint and establishes a direct course to the selected destination.
MENU Key	Displays a context-sensitive options list. The options list allows making setting changes that relate to the currently displayed page.
CLR Key	Used to erase information or cancel an entry.
ENT Key	Used to approve an operation or complete data entry.
Large Right Knob	used to select between the various page groups: NAV, WPT, AUX or NRST.
Small Right Knob	Used to select between the various pages within one of the groups listed above. Press this knob momentarily to display the on-screen cursor. The cursor allows entering the data and/or making a selection from a list of options.

(3) Bottom Row Keys

Refer to the operators handbook provided with the equipment for additional information.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM Power/Volume knob clockwise from the OFF position.

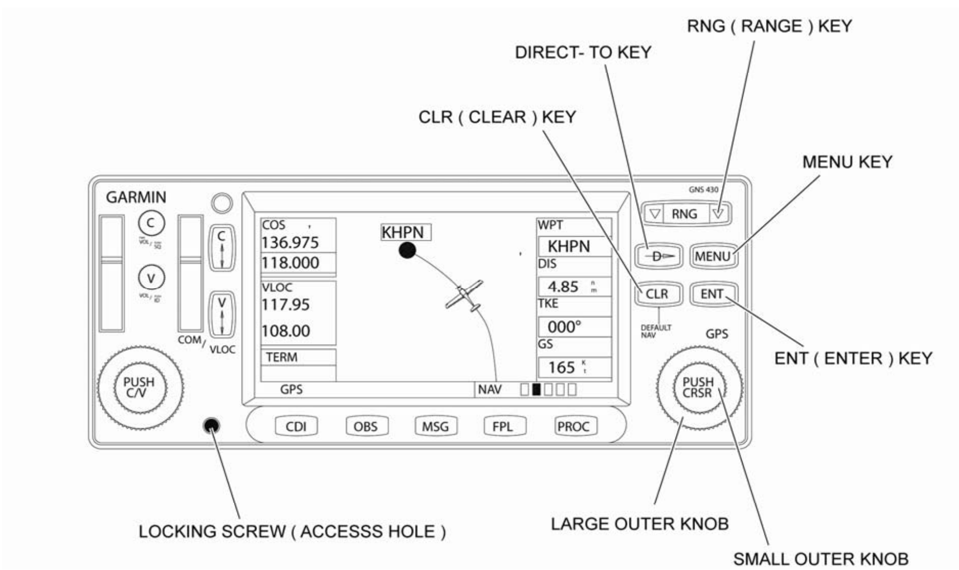

Figure 11 - GARMIN GNS430W NAV

L. Garmin GNS 530W

Refer to Figure 12.

The GNS530W is a VHF communications transceiver and a GPS receiver (see Figure 12). Refer to AMM Chapter 23-10 for the COMM functions. It also includes the a TSO'd airborne VOR/Localizer and Glideslope receivers. It has two removable data cards, one with a Jeppesen database (inserted in the left-most card slot) and the other the Terrain database (inserted in the right-most card slot).

The GNS530W has the following controls:

(1) Left-Hand Keys and Knobs

Refer to Chapter 23-10 for the COMM functions

(2) Right Hand Keys and Knobs

Key/Knob	Function
RNG Key	Allows the pilot to select the desired map scale. Press the up arrow to zoom out a larger area, or the down arrow side to zoom in to a smaller area.
Direct-To Key	Allows the pilot to enter a destination waypoint and establishes a direct course (single-leg flight plan) to the selected destination.
MENU Key	Displays a context-sensitive options list. The options list allows making setting changes that relate to the currently displayed page.
CLR Key	Used to erase information or cancel an entry.
ENT Key	Used to approve an operation or complete data entry. It is also used to confirm information, such as the Database page during power on.
Large Right Knob	used to select between the various page groups: NAV, WPT, AUX or NRST.
Small Right Knob	Used to select between the various pages within one of the groups listed above. Press this knob momentarily to display the on-screen cursor. The cursor allows entering the data and/or making a selection from a list of options.

(3) Bottom Row Keys

Refer to the operators handbook provided with the equipment for additional information.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM Power/Volume knob clockwise from the OFF position.

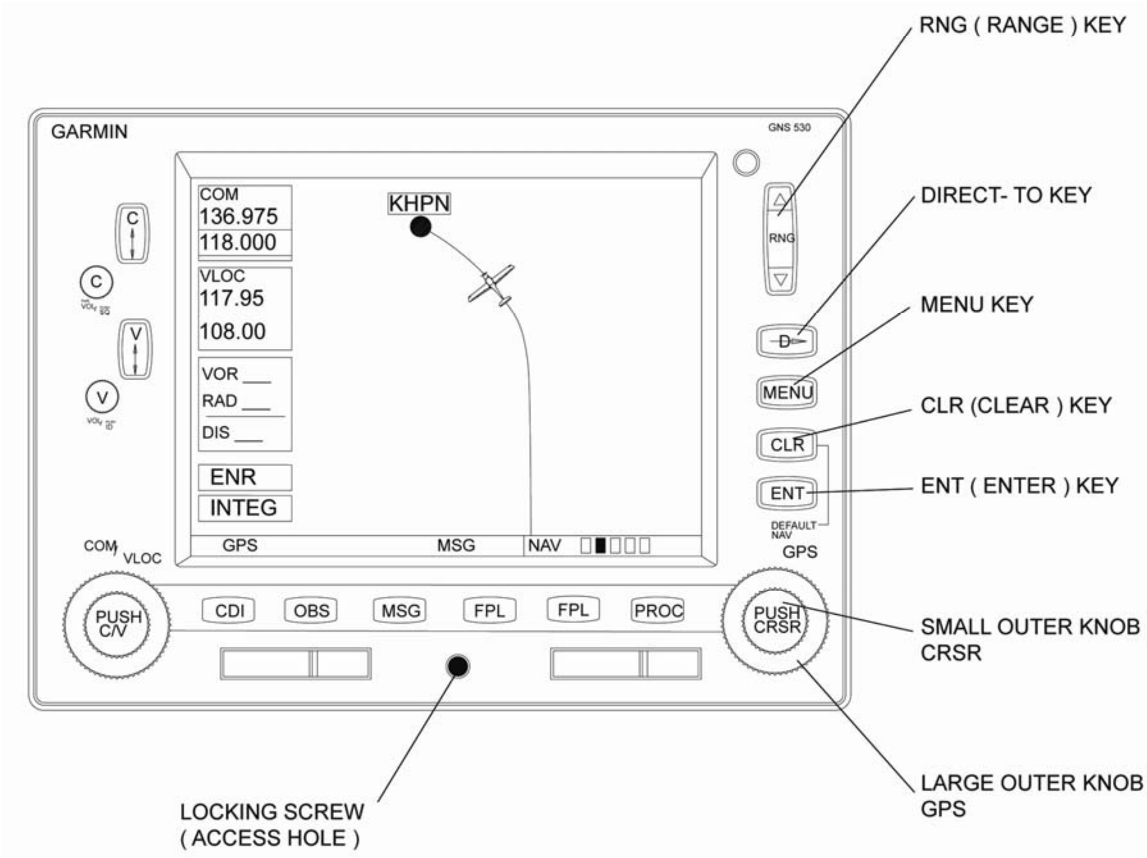

Figure 12 - GNS530W GPS NAV

M. GNS430W/GNS530W VOR, LOC, G/S INDICATOR

Refer to Figure 13.

The navigation indicator is designed to operate with GNS430W/GNS530W VHF and GPS navigational equipment to provide OMNI (VOR), GPS, LOCALIZER (LOC) and Glideslope (GS) information. It is designed to accept DC Left-Right, To-From and Nav warn flags signals from a remote mounted VOR converter. It also accepts DC signals from a glideslope receiver which will drive the UP-DOWN needle along with GS warn meter. The unit has NAV, GPS and VLOC annunciation with photocell dimming.

When the GPS is selected for display, the unit receives inputs from GNS430W/GNS530W to provide visual presentation. The information presented in the navigation indicator is generated from GNS430W/GNS530W.

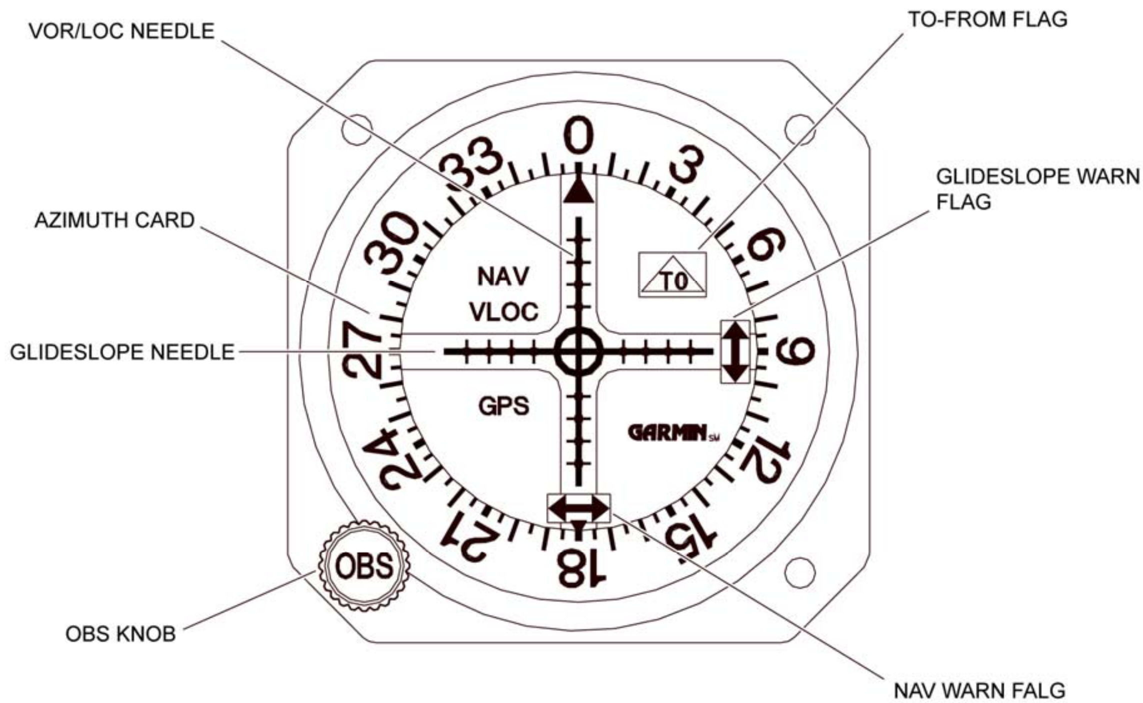

Figure 13 - GARMIN VOR, LOC Indicator

N. GTN 650

The GTN 650 is a VHF communications transceiver and a GPS receiver. (Refer to Chapter 34-50 for GPS functions). It also includes a TSO-d airborne VOR/Localizer and Glideslope receivers. It uses a Secure Digital (SD) card to load and store various types of data. For basic flight operations, the SD card is required for Terrain, Obstacle, and Safe Taxi database storage as well as Jeppesen aviation database updates.The equipment can receive Comm signals from 118.00 MHz to 136.976 MHz in 25 KHz increments. This gives 760 channel operations. The display is a 600 by 266 pixel, 4.9 inch diagonal color LCD with touchscreen controls. See Figure 14

.

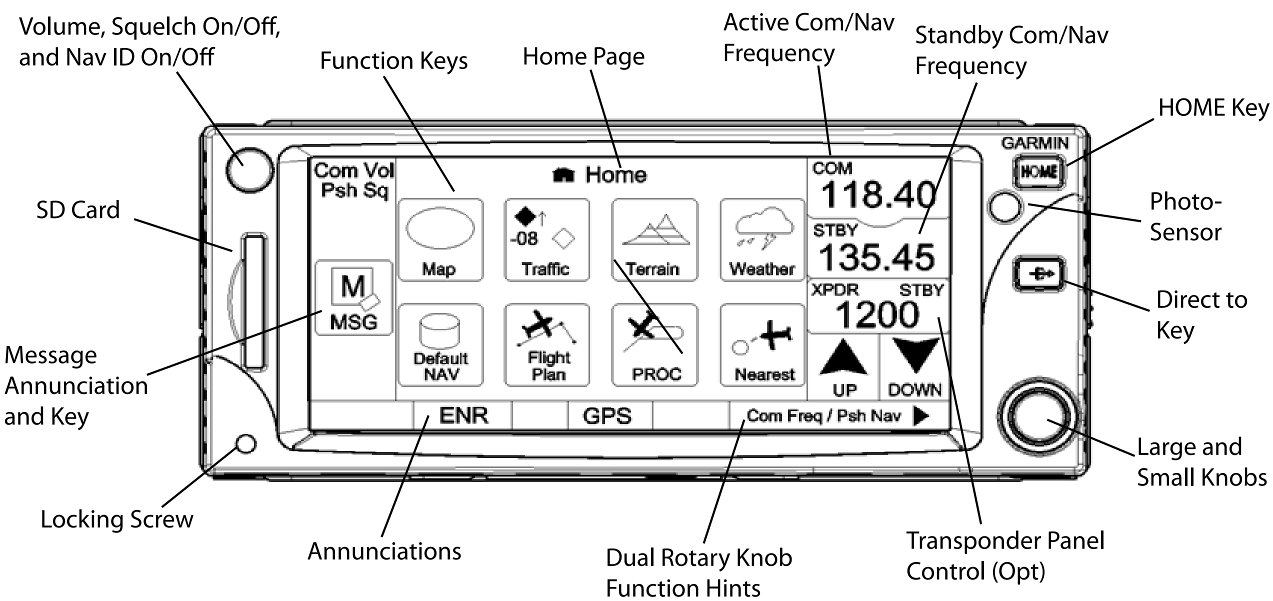

Figure 14- GTN 650 GPS COMM

The GTN 650 has the following controls:

Key/Knob	Function
Left-Hand Knob	Volume / Squelch Knob - controls audio volume for the selected Com radio or Nav receiver and other volume levels for external audio input devices that are controlled via the GTN interface, if installed. Pressing the Volume knob momentarily will disable the automatic squelch control for the Com radio, when active.
HOME Key	Displays the Home page, the main screen for accessing the GTN features. Pressing and holding the HOME key will open the Default Navigation page from any other page.
Direct To Key	Provides access to the direct-to function, which allows you to enter a waypoint and establishes a direct course to the selected destination.
Right-H Large and Small Concentric Knobs	Used for data entry, such as in the Waypoint or Direct-To functions, and to set the frequencies for the communications transceiver or the VOR/Localizer in units so equipped.

To operate the unit set the GEN/BAT switch and AVIONICS MASTER switch to ON. The related circuit-breakers must be closed. Turn the COM power/Volume knob clockwise from the OFF position. The display will show the frequency last stored in the non-volatile memory. The INST. LT knob controls the brightness of the display.

Refer to the operators handbook provided with the equipment for additional information.

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DEPENDENT POSITION DETERMINING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the dependent position determining. If you find the trouble in column 1, do the repair given in column 3.

A. Transponder

TROUBLE	POSSIBLE CAUSE	REPAIR
Unit does not operate. Reply lamp does not come on when TST selected.	Faulty transponder. Poor ground connection.	Replace the transponder. Repair faulty wiring, circuit-breakers etc.
ATC reports no reply. Transponder reply lamp flashes.	Low output power.	Examine the antenna connections. Replace the transponder.
ATC reports no reply. Transponder reply lamp does not flash.	Aircraft out of radar range. Poor received signal. Faulty transponder.	Do a test at higher altitude. Examine the antenna connections. Replace the transponder.
ATC reports mode A does not operate. Mode C operates correctly.	Faulty transponder.	Replace the transponder.
Encoded altitude is wrong at one or more altitudes but is correct at most other altitudes.	Data code bit missing. Faulty encoder. Faulty mode C part of transponder. Wiring open-circuit between encoder and transponder.	Detailed mode C fault analysis (Refer to Chapter 34-10). Replace the encoder. Replace the transponder. Repair the wiring.
Encoded altitude output is too high or too low over a steady range of altitudes. The aircraft altimeter indicates correctly.	Faulty encoder. Encoder requires calibration.	Replace the encoder. Calibrate the encoder. (Refer to Chapter 34-10).
Altitude read-out is -800 ft.	Encoder not warmed-up.	Let the encoder warm up. (Refer to Chapter 34-10).

B. NAV - Bendix\King KX 125 VOR, LOC, KI 208

TROUBLE	POSSIBLE CAUSE	REPAIR
NAV flag on both LCD display and KI 208.	Faulty NAV receiver. Transmitting station is off the air. Poor co-ax connections. Faulty antenna.	Replace the KX125. Tune to a new station. Examine co-ax connections for condition and security. Replace the antenna.
NAV flag on KI 208 only.	Faulty KI 208. Faulty wiring.	Replace the KI 208. Repair the wiring.
LOC indication not accurate on LCD display. KI 208 correct.	Faulty NAV receiver.	Replace the KX125.
LOC indication not accurate on KI 208 display. LCD correct.	LOC centering adjustment needed. Faulty KI 208.	Adjust LOC centering. (Refer to Bendix\King installation manual #006-00140-0002). Replace the KI 208.
VOR indication not accurate on LCD display. VOR indication not accurate on KI 208 display. LCD correct.	Faulty NAV receiver. VOR centering adjustment needed. Faulty KI 208.	Replace the KX125. Adjust VOR centering. (Refer to Bendix\King Installation Manual #006-00140-0002). Replace the KI 208.

DEPENDENT POSITION DETERMINING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove, install and adjust/test the components of the dependent position determining systems on the aircraft. Refer to the manufacturer's component maintenance manuals for more data and shop data.

2. Remove/Install the Bendix\King KX 125 NAV COMM

A. Remove the Bendix/King KX 125 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 201.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix/King KX 125 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Insert a 3/32" allen wrench into the access hole for the locking screw. Refer to Figure 201.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.

	Detail Steps/Work Items	Key Items/References
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related NAV COMM circuit-breaker.	
6.	Do a function test.	

C. Adjustment/Test Bendix/King KX 125 NAV COMM

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-00655-0001 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to this Chapter and Chapter 23-10.
2.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF band.
3.	Test the VOR system at 4000 ft. Select a VOR frequency within 40 miles range. Listen to the station identifier. Test the operation of the tone identifier filter. Fly in-bound and out-bound on a selected VOR radial. Look for the correct LEFT-RIGHT and TO-FROM indications. Monitor the VOR accuracy.	
4.	Do a test of LOC operation and accuracy on a suitable runway.	
5.	Do a test of the DME remote channeling.	If installed.
6.	If necessary, set the viewing contrast of the LCD display.	Through the small hole in the front panel.

3. Remove/Install the Bendix\King KX 155 NAV COMM

A. Remove the Bendix/King KX 155 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 202.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Bendix/King KX 155 NAV COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Insert a 3/32" allen wrench into the access hole for the locking screw. Refer to Figure 202.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the NAV COMM circuit-breaker.	
6.	Do a function test.	See below.

C. Adjustment/Test Bendix/King KX 155 NAV COMM

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-00655-0001 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to this Chapter and Chapter 34-50.
2.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF COMM band.
3.	Test the VOR system at 4000 ft. Select a VOR frequency within 40 miles range. Listen to the station identifier. Test the operation of the tone identifier filter. Fly in-bound and out-bound on a selected VOR radial. Look for the correct LEFT-RIGHT and TO-FROM indications. Monitor the VOR accuracy.	
4.	Do a test of LOC/GS operation and accuracy on a suitable runway.	
5.	Do a test of the DME remote channeling.	If installed.

4. Remove/Install the Bendix\King KLN 35A GPS Receiver

A. Remove the Bendix\King KLN 35A GPS Receiver

	Detail Steps/Work Items	Key Items/References
1.	Open the GPS circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 203.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the GPS.	

B. Install the Bendix/King KLN 35A GPS Receiver

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Insert a 3/32" allen wrench into the access hole for the locking screw. Refer to Figure 203.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the GPS circuit-breaker.	
6.	Do an operational test.	

C. Adjustment/Test Bendix/King KLN 35A GPS Receiver

Refer to the Bendix\King Operator's Handbook #006-08791-0000 for start up and operating procedures.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	
2.	Make sure that the data base date is valid.	
3.	Move the aircraft clear of buildings and ground equipment.	
4.	Bring the unit to the NAV READY status.	If the unit does not reach NAV READY status in 5 minutes, refer to the manufacturer's handbook.

D. Data Base Loading

You load the database with an IBM compatible lap-top computer with a 3.5 in disk drive and an open COM1 or COM 2 port. Use interface kit Bendix\King part number 050-03213-0000.

	Detail Steps/Work Items	Key Items/References
1.	Connect the PC to the data loading port below the left instrument panel shelf.	
2.	Set the KLN 35A to the SET 0 page.	
3.	Put the diskette in the PC.	
4.	Cycle the power of the PC. Follow the menu instructions.	

5. Remove/Install the Bendix\King KLX 135/135A GPS COMM

A. Remove the Bendix\King KLX 135/135A GPS COMM

	Detail Steps/Work Items	Key Items/References
1.	Open the related GPS COMM 1 or 2 circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 204.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the GPS.	

B. Install the Bendix\King KLX 135/135A GPS COMM

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Insert a 3/32" allen wrench into the access hole for the locking screw. Refer to Figure 204.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related circuit-breaker.	
6.	Do an operational test.	

C. Adjustment/Test Bendix/King KLX 135/135A GPS COMM

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King Installation manual #006-10500-0003 for performance specifications.

Refer to the Bendix\King Operator’s Handbook (#006-08751-0000 for the KLX 135 and #006-08789-0000 for the KLX 135A) that gives the start up and operating procedures.

WARNING: DO NOT USE THE GPS WITH AN OUT-OF-DATE DATA BASE. AN OUT-OF-DATE DATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	
2.	Make sure that the data base date is valid.	
3.	Move the aircraft clear of buildings and ground equipment.	
4.	Bring the unit to the NAV READY status.	If the unit does not reach NAV READY status in 5 minutes, refer to the Pilots Guide section 4.6 - Initialization and Time to First Fix.
5.	At a sufficient altitude, contact a ground station at least 50 miles away and another close by.	If possible use frequencies at both the low and high ends of the VHF band.

D. Data Base Loading

You load the database with an IBM compatible lap-top computer with a 3.5 in disk drive and an open COM1 or COM 2 port. Use interface kit Bendix\King part number 050-03213-0000.

	Detail Steps/Work Items	Key Items/References
1.	Connect the PC to the data loading port below the left instrument panel shelf.	
2.	Set the KLX 135/135A to the SET 0 page.	
3.	Put the diskette in the PC.	
4.	Cycle the power of the PC. Follow the menu instructions.	

6. Remove/Install the Bendix\King KI 208/209 Indicator

A. Remove the Bendix\King KI 208 /209Indicator

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM 1 or 2 circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the electrical connector.	
4.	Remove the mounting screws.	Hold the indicator.
5.	Remove the indicator from the instrument panel.	

B. Install the Bendix\King KI 208 /209Indicator

	Detail Steps/Work Items	Key Items/References
1.	Put the indicator in position in the instrument panel.	
2.	Install the mounting screws.	
3.	Connect the electrical connector.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do an operational test of the system.	

C. Adjustment/Test - Bendix\King KI 208 /209Indicator

If possible, do an operational flight check after the indicator has been replaced. Alternatively, use a NAV COMM test set to make sure that the system operates correctly. Refer to the Bendix\King KI 208/209 Installation manual #006-00140-0002 for performance specifications. Refer also for externally accessible adjustment of VOR centering and LOC centering.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to this Chapter.
2.	Test the VOR system at 4000 ft. Select a VOR frequency within 40 miles range. Listen to the station identifier. Test the operation of the tone identifier filter. Fly in-bound and out-bound on a selected VOR radial. Look for the correct LEFT-RIGHT and TO-FROM indications. Monitor the VOR accuracy.	
3.	Do a test of LOC operation and accuracy on a suitable runway.	
4.	Do a test of the glidescope operation and accuracy on a suitable runway.	KI 209 only.

7. Remove/Install the Bendix\King KT 76A Transponder

A. Remove the Bendix\King KT 76A Transponder

	Detail Steps/Work Items	Key Items/References
1.	Open the related ATC circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 205.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the transponder.	

B. Install the Bendix\King KT 76A Transponder

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Refer to Figure 205.
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related circuit-breaker.	
6.	Do an operational test.	

C. Adjustment/Test - Bendix\King KT 76A Transponder

If possible do an operational flight test of the system. Use an ATC test set to make sure that the system operates correctly. Refer to the Bendix\King KT 76A Installation manual #006-00143-0005 for performance specifications.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to this Chapter.
2.	Contact a local ATC center, ask for a transponder check.	Follow the instructions of the ATC.

NOTE: The encoder will not give an altitude output until it has reached its operating temperature. The time taken varies with temperature. Approximate warm-up times are:

- From 21°C (70°F) 4 to 6 minutes
- From -18°C (0°F) Up to 10 minutes
- From -48°C (-55°F) 30 to 45 minutes.

A power interruption causes a further delay of up to 6 minutes.

8. Remove/Install the GTX 327 Transponder

A. Remove the GTX 327 Transponder

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td>1.</td><td>Open the related circuit-breaker.</td><td></td></tr>
<tr><td>2.</td><td>Put a 3/32 allen wrench into the access hole for the locking screw in the front panel. Engage the screw.</td><td>Refer to Figure 206.</td></tr>
<tr><td>3.</td><td>Turn the screw counter-clockwise until the unit disengages from the mounting rack.</td><td></td></tr>
<tr><td colspan="3">CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT.

CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.</td></tr>
<tr><td>4.</td><td>Pull gently on the sides of the unit to remove it from the mounting rack.</td><td></td></tr>
<tr><td>5.</td><td>Install the protective covers on the rear connectors of the unit.</td><td></td></tr>
</table>

B. Install the GTX 327 Transponder

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td>1.</td><td>Remove the protective covers from the rear connectors on the unit.</td><td>Looking at the bottom of the transponder, make sure that the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32 inch allen wrench through the face plate.</td></tr>
<tr><td>2.</td><td>Insert the transponder slowly until the front lobe of the unit touches the mounting rack.</td><td>Refer to Figure 206.</td></tr>
<tr><td>4.</td><td>Insert a 3/32 inch allen wrench into the hole in the front panel.</td><td></td></tr>
<tr><td colspan="3">CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.</td></tr>
<tr><td>5.</td><td>Turn the locking screw clockwise until the screw stops.</td><td></td></tr>
<tr><td>6.</td><td>Close the circuit-breaker.</td><td></td></tr>
<tr><td>7.</td><td>Do an operational test.</td><td>Refer to paragraph 8.C.</td></tr>
</table>

C. Operational Test of GTX 327 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Do the operational test of the transponder as follows: - Adjust the altimeter to a setting of 1013.2 millibars (29.2 inHg) for altitudes from sea level to the maximum certified altitude of the aircraft - Measure the automatic pressure altitude at the output of the transponder when interrogated on Mode C at sufficient altitude levels up to the certified altitude of the aircraft.	Make sure that the difference between the automatic reporting and the altitude displayed on the aircraft altimeter does not exceed 125 ft.

9. Remove/Install the GTX 328 Transponder

A. Remove the GTX 328 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Open the related circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw in the front panel. Engage the screw.	Refer to Figure 207.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the GTX 328 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	Looking at the bottom of the transponder, make sure that the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32 inch allen wrench through the face plate.
2.	Insert the transponder slowly until the front lobe of the unit touches the mounting rack.	Refer to Figure 207.
4.	Insert a 3/32 inch allen wrench into the hole in the front panel.	
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
5.	Turn the locking screw clockwise until the screw stops.	
6.	Close the circuit-breaker.	
7.	Do an operational test.	Refer to paragraph 9.C.

C. Operational Test of GTX 328 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Do the operational test of the transponder as follows: - Adjust the altimeter to a setting of 1013.2 millibars (29.2 inHg) for altitudes from sea level to the maximum certified altitude of the aircraft	
	- Measure the automatic pressure altitude at the output of the transponder when interrogated on Mode C at sufficient altitude levels up to the certified altitude of the aircraft.	Make sure that the difference between the automatic reporting and the altitude displayed on the aircraft altimeter does not exceed 125 ft.

10. Remove/Install the GTX 330 Transponder

A. Remove the GTX 330 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Open the related circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw in the front panel. Engage the screw.	Refer to Figure 208.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the GTX 330 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the rear connectors on the unit.	Looking at the bottom of the transponder, make sure that the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32 inch allen wrench through the face plate.
2.	Insert the transponder slowly until the front lobe of the unit touches the mounting rack.	Refer to Figure 208.
4.	Insert a 3/32 inch allen wrench into the hole in the front panel.	
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
5.	Turn the locking screw clockwise until the screw stops.	
6.	Close the circuit-breaker.	
7.	Do an operational test.	Refer to paragraph 10.C.

C. Operational Test of GTX 330 Transponder

	Detail Steps/Work Items	Key Items/References
1.	Do the operational test of the transponder as follows: - Adjust the altimeter to a setting of 1013.2 millibars (29.2 inHg) for altitudes from sea level to the maximum certified altitude of the aircraft - Measure the automatic pressure altitude at the output of the transponder when interrogated on Mode C at sufficient altitude levels up to the certified altitude of the aircraft.	Make sure that the difference between the automatic reporting and the altitude displayed on the aircraft altimeter does not exceed 125 ft.

11. Remove/Install the Garmin GNC 420W/GNS 430W/GTN 650

A. Remove the Garmin GNC420W/GNS 430W/GTN 650

	Detail Steps/Work Items	Key Items/References
1.	Open the related GPS COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 209/211.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.		
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Garmin GNC 420W/GNS 430W/GTN 650

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 209/211.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.		
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related GPS COMM circuit-breaker.	
6.	Do a functional test.	Refer to paragraph 11.C.

C. Adjustment/Test - Garmin GNC 420W/GNS 430W/GTN 650

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a GPS COMM test set to make sure that the system operates correctly. Refer to the GNC 420W/GNS 430W/GTN 650 installation manual for performance specifications.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATABASE. OUT-OF-DATEDATA CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to appropriate units Pilot's Guide and Reference to test each control function.
2.	Make sure that the database date is valid.	Once the database has been acknowledged, the instrument panel self-test page will appear. Refer to appropriate units Pilot's Guide and Reference for Instrument Panel Self-Test.

D. Data Base Loading

The GNS430W has two data card slots on the face of the unit. The NaVData card is inserted in the left-most slot and the second slot is provided for the terrain card. Refer to GNS430W Pilot's Guide and Reference for NavData card use.

The GTN 650 has one data card slot on the face of the unit. Refer to the GTN 650 PIlot’s Guide and Reference for NAV data card use

12. Remove/Install the Garmin GNS530W

A. Remove the Garmin GNS530W

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM circuit-breaker.	
2.	Put a 3/32 allen wrench into the access hole for the locking screw. Engage the screw.	Refer to Figure 210.
3.	Turn the screw counter-clockwise until the unit disengages from the mounting rack.	
	CAUTION: DO NOT PULL ON THE KNOBS. DO NOT PRY THE FACE-PLATE. YOU CAN DAMAGE THE UNIT. CAUTION: DO NOT TOUCH THE CONNECTOR CARD AT THE REAR OF THE UNIT. THE ELECTROSTATIC CHARGE ON YOUR BODY CAN DAMAGE THE UNIT.	
4.	Pull gently on the sides of the unit to remove it from the mounting rack.	
5.	Install the protective covers on the rear connectors of the unit.	

B. Install the Garmin GNS530W

	Detail Steps/Work Items	Key Items/References
1.	Remove the protective covers from the connectors on the replacement unit.	
2.	Slide the unit into the rack. Engage the locking screw so that the latch front lobe touches the rack.	Refer to Figure 210.
3.	Turn the locking screw clockwise so that the rear lobe engages the mounting rack.	Until the unit locks.
	CAUTION: DO NOT OVER-TIGHTEN THE LOCKING SCREW. YOU CAN DAMAGE THE LOCKING MECHANISM.	
4.	Continue to turn the screw until the unit is fully installed in the mounting rack.	
5.	Close the related GPS COMM circuit-breaker.	
6.	Do a functional test.	Refer to paragraph 12.C.

C. Adjustment/Test - Garmin GNS530W

If possible, do an operational flight check after the radio has been replaced. Alternatively, use a GPS COMM test set to make sure that the system operates correctly. Refer to the GNS530W installation manual for performance specifications.

WARNING: DO NOT OPERATE THE GPS USING AN OUT-OF-DATE DATABASE. OUT-OF-DATE DATABASE CAN CAUSE A FLIGHT SAFETY HAZARD.

	Detail Steps/Work Items	Key Items/References
1.	Do a test of each control function.	Refer to 500W Series Pilot's Guide and Reference to test each control function.
2.	Make sure that the database date is valid.	Once the database has been acknowledged, the instrument panel self-test page will appear. Refer to 500W Series Pilot's Guide and Reference for Instrument Panel Self-Test.

D. Data Base Loading

The GNS530W has two data card slots on the face of the unit. The NaVData card is inserted in the left-most slot and the second slot is provided for the terrain card. Refer to 500W Series Pilot's Guide and Reference for NavData card use.

13. Remove/Install the GNS 430W/GNS 530W VOR, LOC, G/S Indicator

A. Remove the GNS 430W/GNS 530W VOR, LOC, G/S Indicator

	Detail Steps/Work Items	Key Items/References
1.	Open the related NAV COMM 1 or 2 circuit-breaker.	
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3.	Disconnect the electrical connector.	
4.	Remove the mounting screws.	Hold the indicator.
5.	Remove the indicator from the instrument panel.	

B. Install the GNS 430W/GNS 530W VOR, LOC, G/S Indicator

	Detail Steps/Work Items	Key Items/References
1.	Put the indicator in position in the instrument panel.	
2.	Install the mounting screws.	
3.	Connect the electrical connector.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do an operational test of the system.	

14. Antenna

Use a thin coat of 'Penatrox' (Manufacturer: Burndy) or 'Noalox' (Manufacturer: Ideal) corrosion inhibitor between the aluminum antenna backing plate and the copper foil ground plane. Apply a bead of Dow Corning 732 RTV around the base of the antenna where it touches the outer skin to give a waterproof seal.

15. Connectors

Remove contacts from connectors in the radio rack with Hand Ejector Tool Molex P/N HT-1884. Crimp solderless contact terminals with Molex part number 6115.

Remove contacts from KI 208/209 connectors with Burndy P/N RXK20-25 Extraction Tool Tip and P/N RXT20-4P3 Extraction Tool Handle. Crimp Burndy Socket P/N SC20M-6TK6 with Burndy Hytool M8ND.

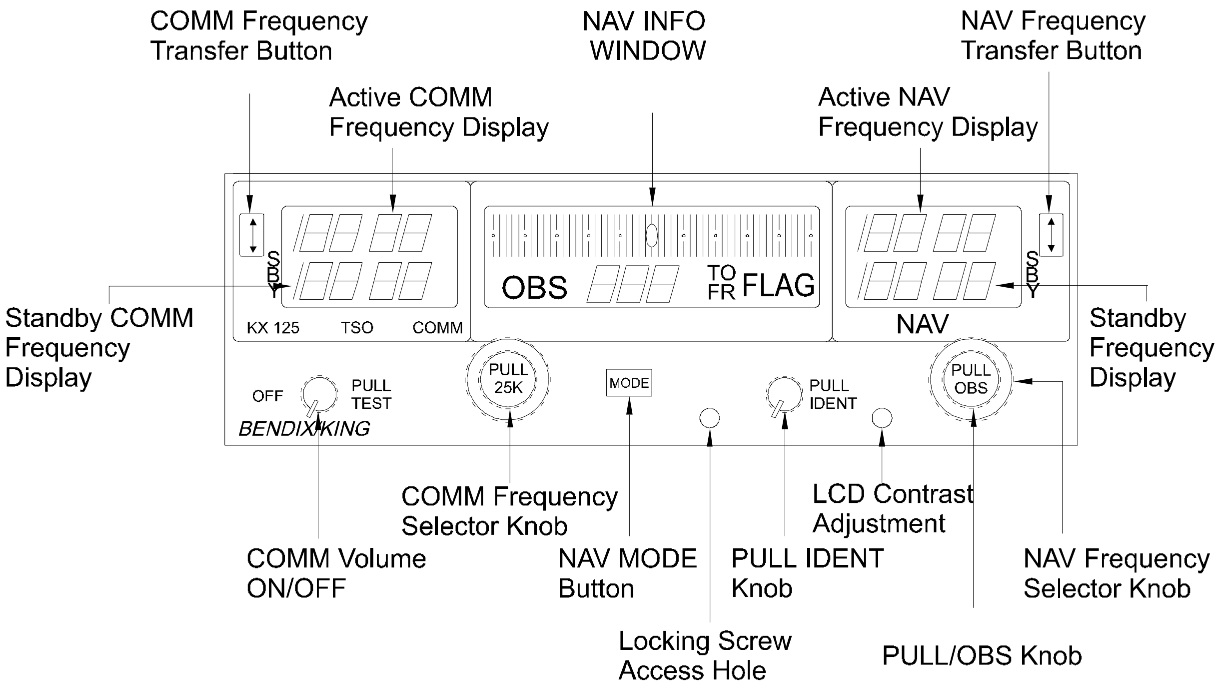

Figure 201 - KX 125 NAV COMM

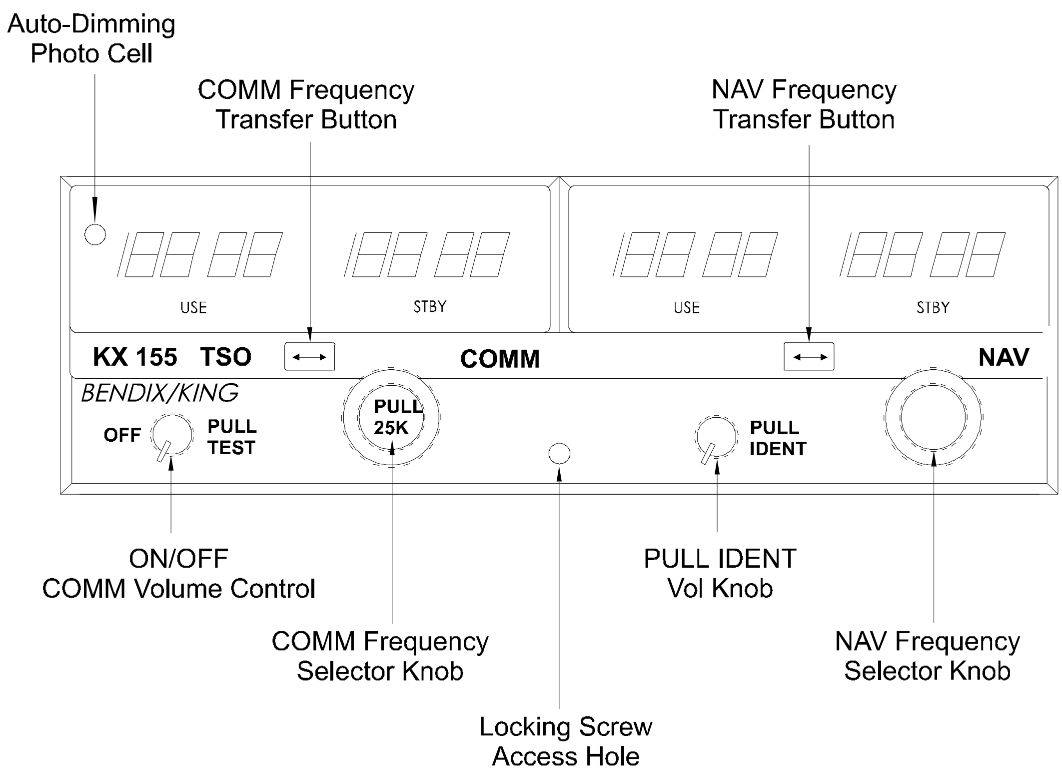

Figure 202 - Bendix\King KX 155 NAV COMM

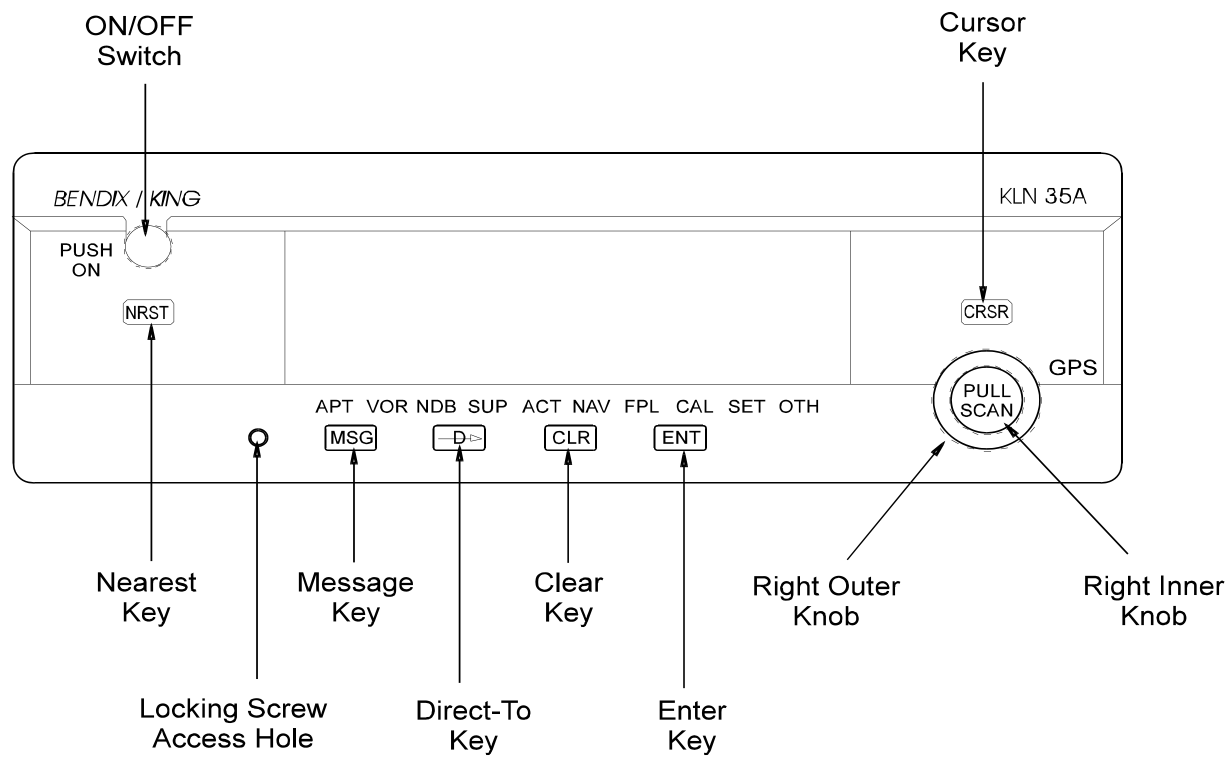

Figure 203 - KLN 35A GPS

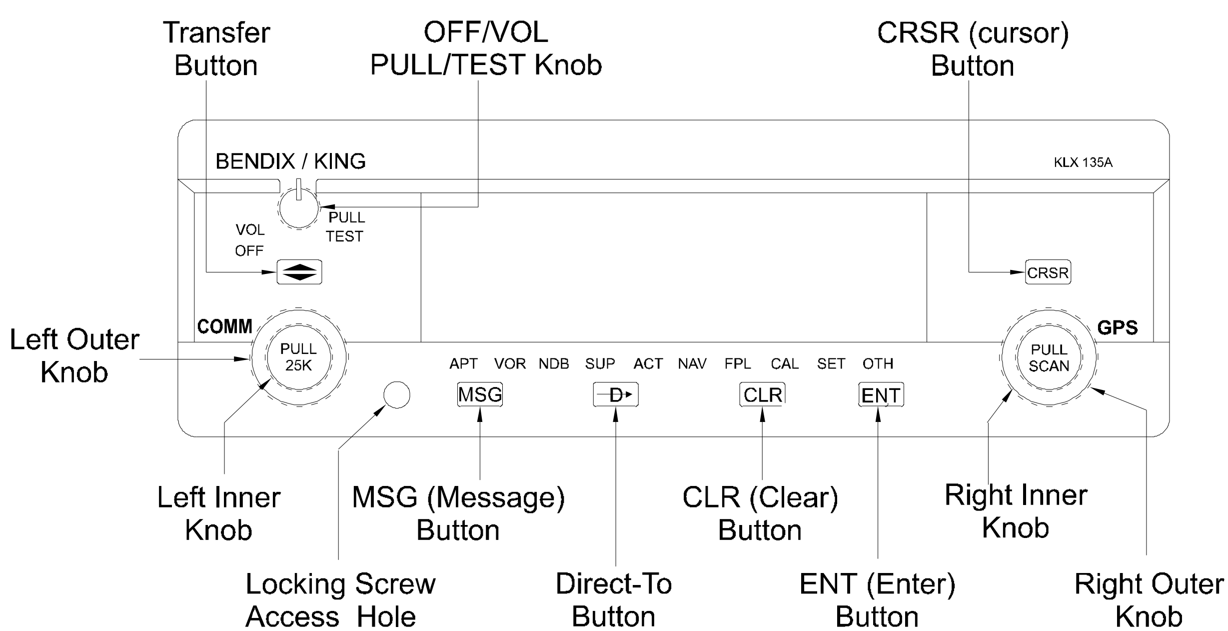

Figure 204 - KLX 135\135A GPS COMM

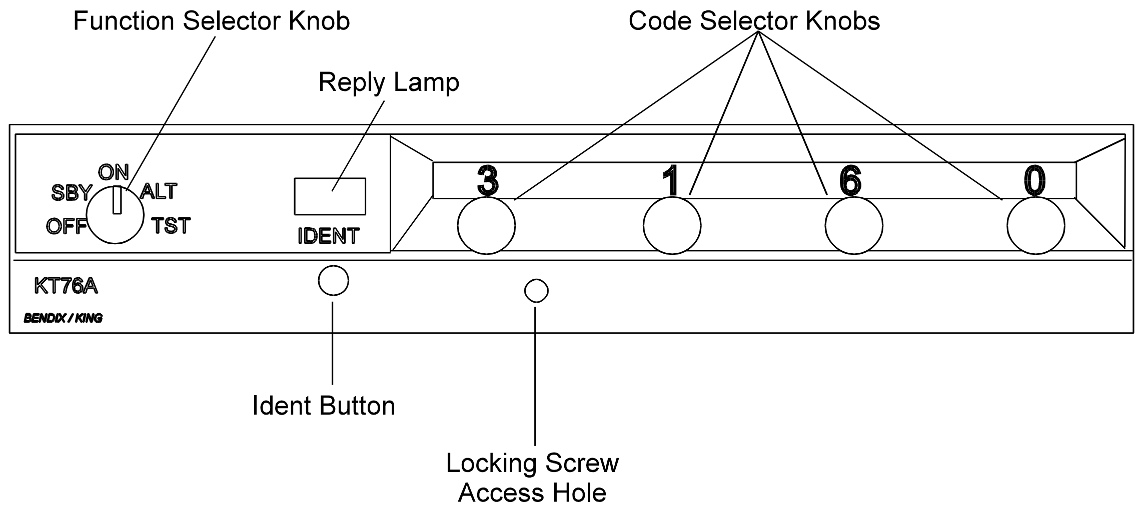

Figure 205 - KT 76A Transponder

Figure 206 - GTX 327 Transponder

Figure 207 - GTX 328 Transponder

Figure 208 - GTX 330 Transponder

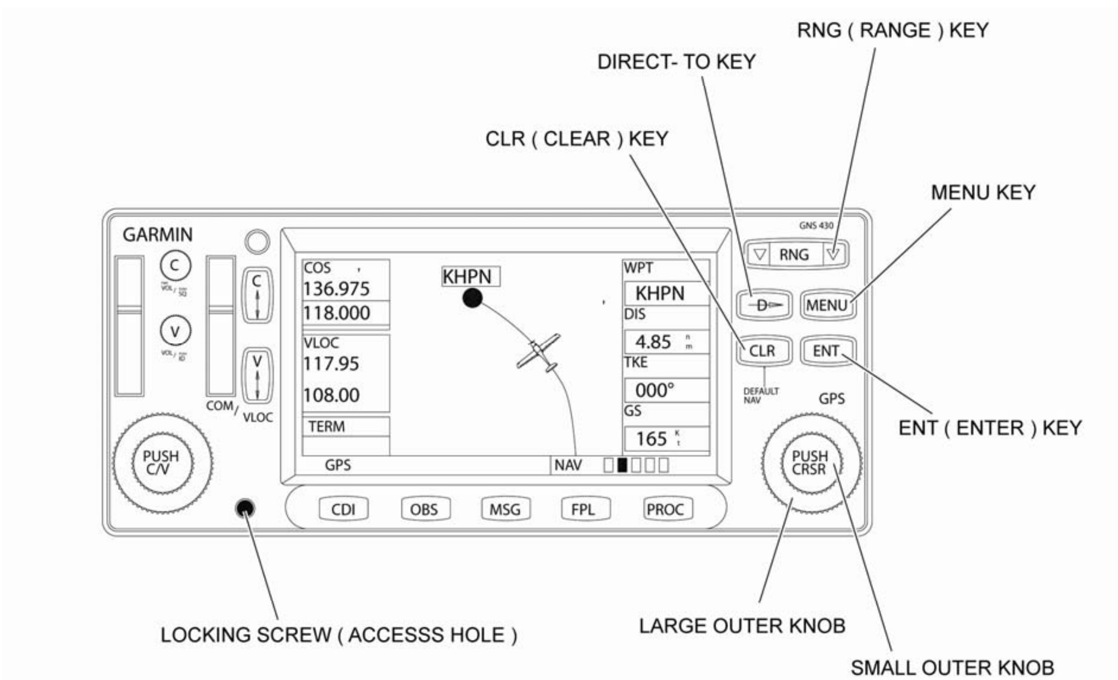

Figure 209 - GARMIN GNS430W NAV

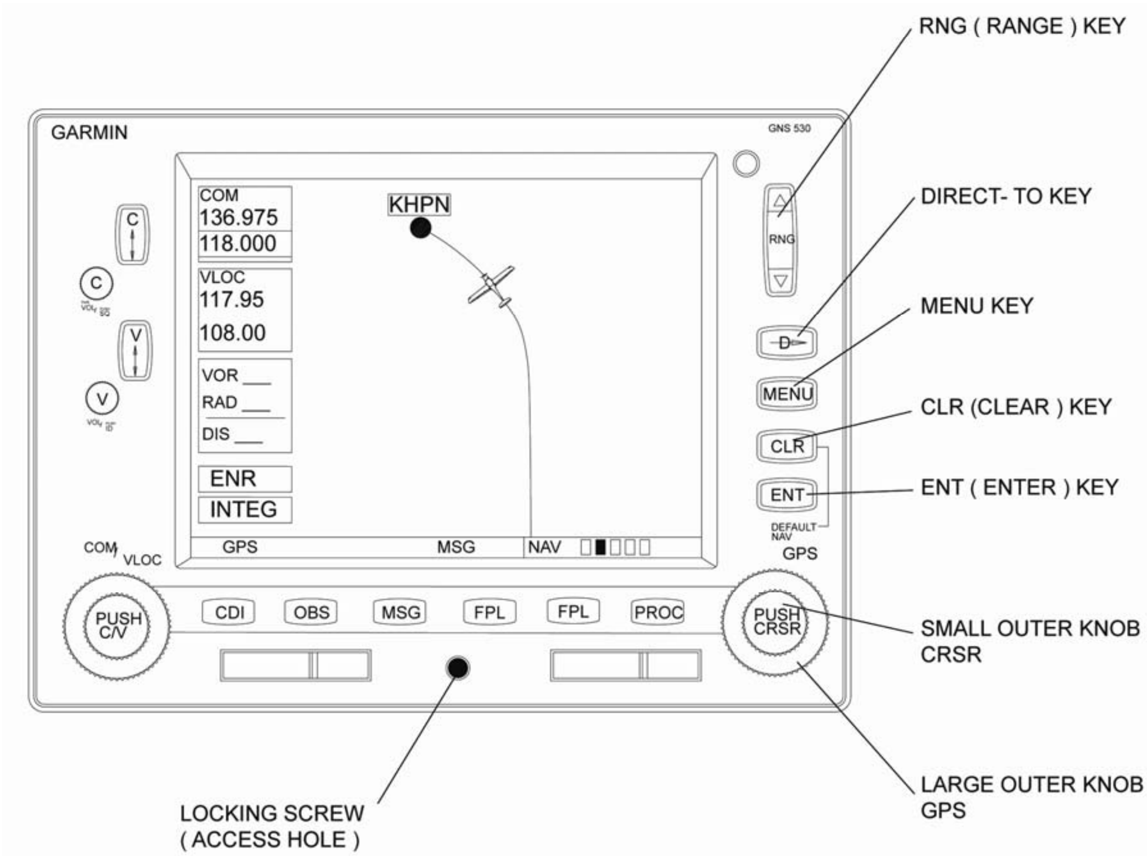

Figure 210 - GNS530W GPS NAV

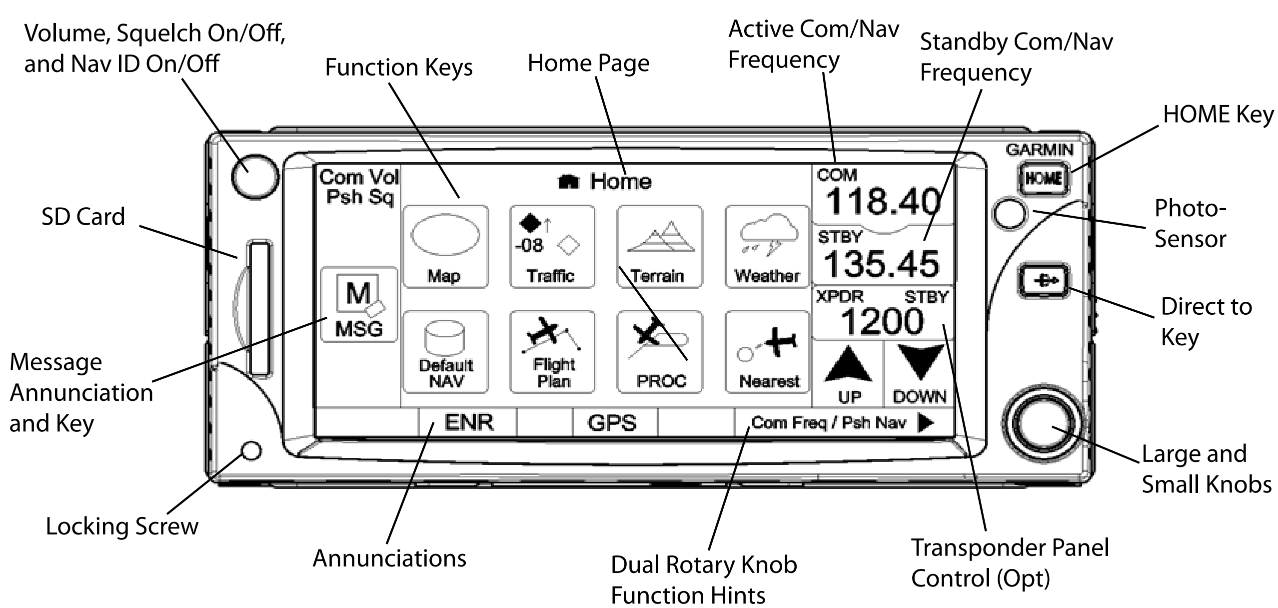

Figure 211 - GTN 650 GPS NAV

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CHAPTER 37-00
VACUUM

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VACUUM

1. General

Some DA20-C1 aircraft have a vacuum system which supplies power for the flight instruments. The vacuum system only operates when the engine runs. Refer to Chapter 34-20 for data about the attitude and direction instruments that use the system.

2. Description

Figure 1 shows the vacuum system schematic diagram. The vacuum system has the following components:

A. Vacuum Pump

Four nuts and studs attach the vacuum pump to the front right of the engine at the bottom of the crankcase. It is a rotary-vane positive-displacement pump. Refer to the manufacturer’s handbook for further data about the vacuum pump.

B. Vacuum regulator

The vacuum regulator attaches to the aft face of the firewall at the top left. The outlet pipe from the regulator goes forward through the firewall. A nut on the outlet pipe holds the vacuum regulator in position.

The vacuum regulator has 2 inlet ports which connect to the attitude and direction instruments. A diaphragm in the regulator senses the pressure at the inlet ports. The diaphragm operates a control valve which can allow air from the cockpit in to the system. A T-bar on the bottom of the regulator lets you adjust the vacuum. A filter prevents dirt from going into the regulator from the cockpit.

C. Vacuum Inlet Filter

Air enters the vacuum system through a filter. The filter is located between the firewall and the instrument panel on the left.

D. Vacuum Gauge

A vacuum gauge measures the value of the suction in the system. It is calibrated in inches of mercury (in Hg).

E. Connections

A rigid aluminum pipe and a short flexible hose connect the vacuum pump to the regulator. Flexible hoses connect all other components.

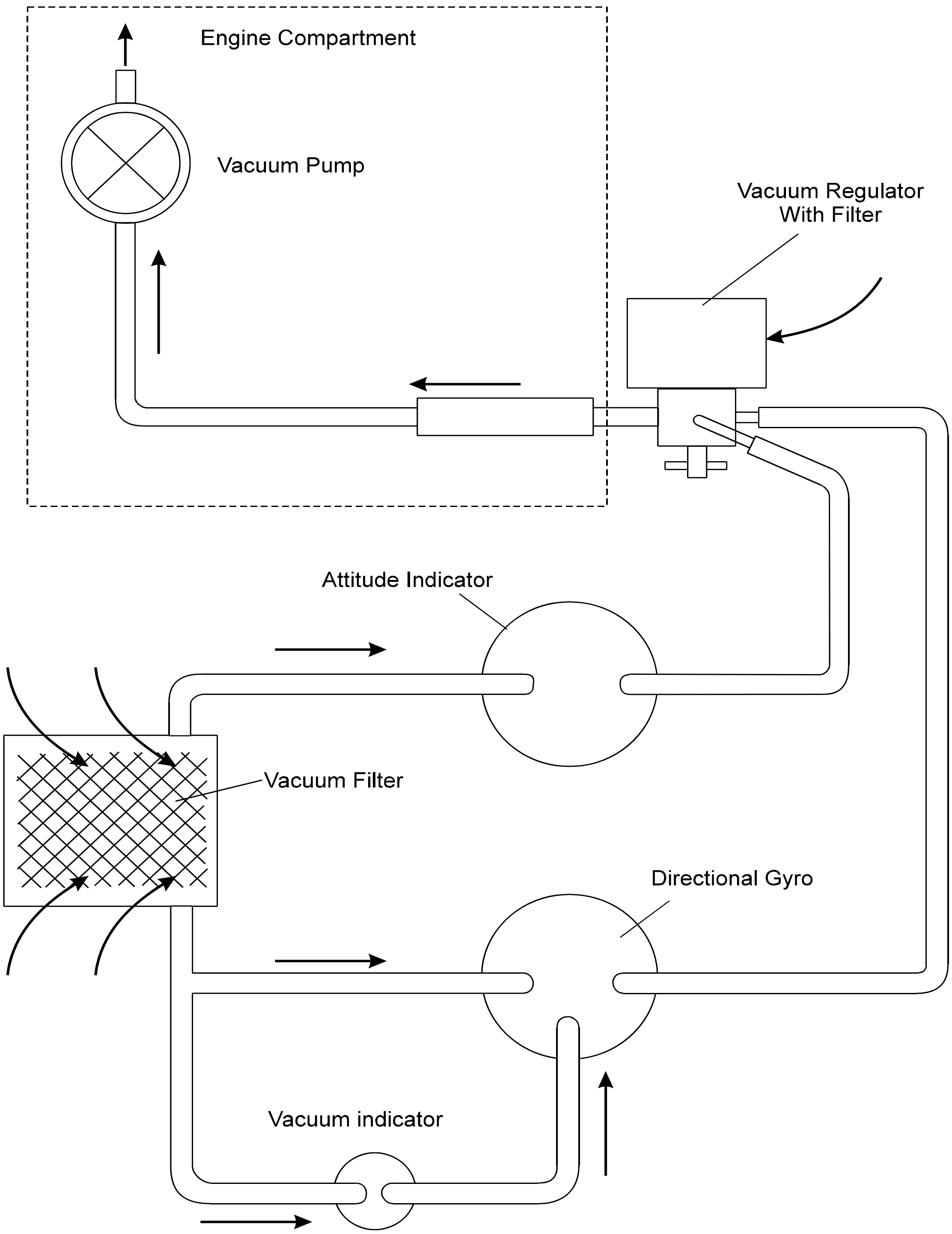

Figure 1 - Vacuum System Schematic Diagram

3. Operation

The vacuum pump pulls air through the system.

- The air goes into the system through the inlet filter
- The air goes through flexible hoses to the attitude indicator, the directional gyro and the vacuum gauge
- The air operates the gyros in the attitude indicator and directional gyro
- The air flows from the attitude indicator and directional gyro to the vacuum regulator
- The vacuum regulator controls the flow of air into the system from the cockpit so that the vacuum to the instruments is 4.8 - 5.4 in.Hg.

The vacuum indicator measures the vacuum across the directional gyro.

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VACUUM DISTRIBUTION

1. General

Refer to Chapter 37-00 for the system description and operation. This section describes the trouble-shooting and maintenance procedures for the vacuum distribution system.

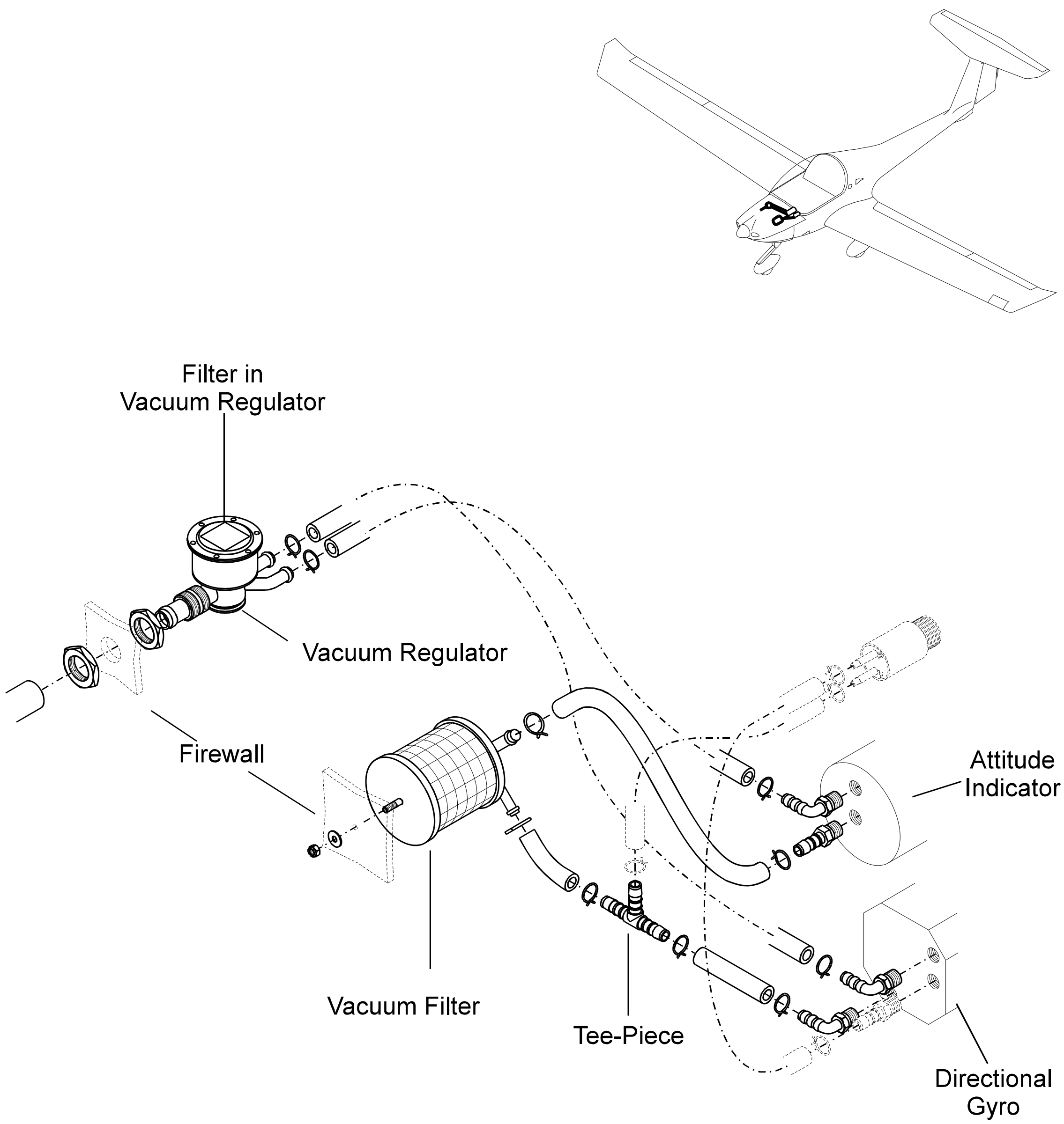

Figure 1 - Vacuum System Installation behind the Firewall

VACUUM DISTRIBUTION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the vacuum system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Vacuum gauge shows no vacuum. Vacuum operated instruments do not operate.	Vacuum pump defective.	Replace the pump.
	Vacuum regulator defective.	Replace the vacuum regulator.
	Vacuum system leaking.	Do a test for leakage. Repair the leak.
Vacuum gauge shows no vacuum. Vacuum operated instruments operate correctly.	Vacuum gauge defective.	Replace the vacuum gauge.
Vacuum gauge shows a low value.	Vacuum regulator out of adjustment.	Adjust the vacuum regulator.
	Vacuum system leaking.	Do a test for leakage. Repair the leak.
Vacuum gauge shows a high value.	Vacuum regulator out of adjustment.	Adjust the vacuum regulator.
	Vacuum inlet filter blocked.	Replace the vacuum inlet filter.
	Vacuum regulator filter blocked.	Replace the vacuum regulator filter.

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VACUUM DISTRIBUTION - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove, install and adjust/test the vacuum regulator. Refer to Chapter 37-00 for the system description and Chapter 37-20 for the vacuum gauge installation.

2. Remove/Install the Vacuum Pump

A. Remove the Vacuum Pump

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Release the pipe to the vacuum pump.	
3.	Release the four nuts and the washers that attach the pump to the engine.	
4.	Remove the pump from the engine.	

B. Install the Vacuum Pump

CAUTION: DO NOT GET OIL IN THE VACUUM PUMP. OIL CAN CAUSE PUMP FAILURE.

	Detail Steps/Work Items	Key Items/References
1.	Put the vacuum pump in position on the engine.	Use a new gasket.
2.	Install the four nuts and the washers that attach the pump to the engine.	
3.	Connect the pipe to the vacuum pump.	
4.	Install the engine cowlings.	Refer to Chapter 71-10.
5.	Do a test for correct operation of the vacuum system. If necessary, adjust the system.	
6.	Do an engine run-up.	Refer to the DA20-C1 Airplane Flight Manual.

3. Remove/Install the Vacuum Regulator

A. Remove the Vacuum Regulator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the battery.	Refer to Chapter 24-31.
2.	Remove the engine cowlings.	Refer to Chapter 71-10.
3.	Clean the area around the regulator outlet.	
4.	Release the pipe to the vacuum regulator. - Put a cap on the regulator outlet.	At the firewall.
5.	Remove the instrument panel cover.	Refer to Chapter 25-10.
6.	Release the two flexible hoses from the vacuum regulator. - Put a cap on the regulator inlet - Put caps on the hose ends.	On the aft face of the firewall.
7.	Release the nut which attaches the regulator to the firewall.	In the engine compartment.
8.	Remove the regulator from the aircraft.	

B. Install the Vacuum Regulator

	Detail Steps/Work Items	Key Items/References
1.	Put the regulator in position on the firewall.	On the aft face of the firewall.
2.	Install the nut which attaches the regulator to the firewall.	In the engine compartment.
3.	Remove the cap from the pipe. Connect the pipe to the regulator.	In the engine compartment.
4.	Remove the caps from the hoses. Connect the two flexible hoses to the vacuum regulator.	On the aft face of the firewall.
5.	Connect the battery.	Refer to Chapter 24-31.
6.	Install the engine cowlings.	Refer to Chapter 71-10.

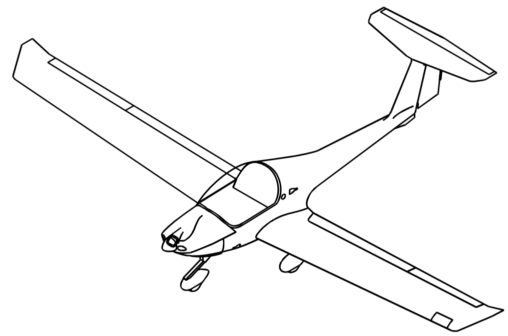
	Detail Steps/Work Items	Key Items/References
7.	Do a test for correct operation of the vacuum system. If necessary, adjust the system.	
8.	Do an engine run-up.	Refer to the DA20-C1 Airplane Flight Manual.
9.	Install the instrument panel cover.	Refer to Chapter 25-10.

4. Replace the Vacuum Inlet Filter

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Release the two flexible hoses from the vacuum filter. - Put caps on the hose ends.	
3.	Release the nut that attaches the filter to the mounting bracket.	
4.	Remove the filter.	
5.	Put the new filter in position on the mounting bracket.	
6.	Install the nut that attaches the filter to the mounting bracket.	
7.	Remove the caps from the hose ends. Connect the two flexible hoses to the vacuum filter.	
8.	Do a test for correct operation of the vacuum system.	
9.	Do an engine run-up.	Refer to the DA20-C1 Airplane Flight Manual.
10.	Install the instrument panel cover.	Refer to Chapter 25-10.

5. Adjust the Vacuum Regulator

	Detail Steps/Work Items	Key Items/References
1.	Do an engine ground run-up.	Refer to the DA20-C1 Airplane Flight Manual.
2.	Make a note of the vacuum value.	
3.	If necessary, adjust the vacuum regulator: - Adjust regulator under right hand side of instrument panel.	The vacuum must be 4.8 - 5.4 in.Hg at 1800 RPM. On the bottom of the regulator. Monitor the vacuum value.
4.	Shut down the engine.	



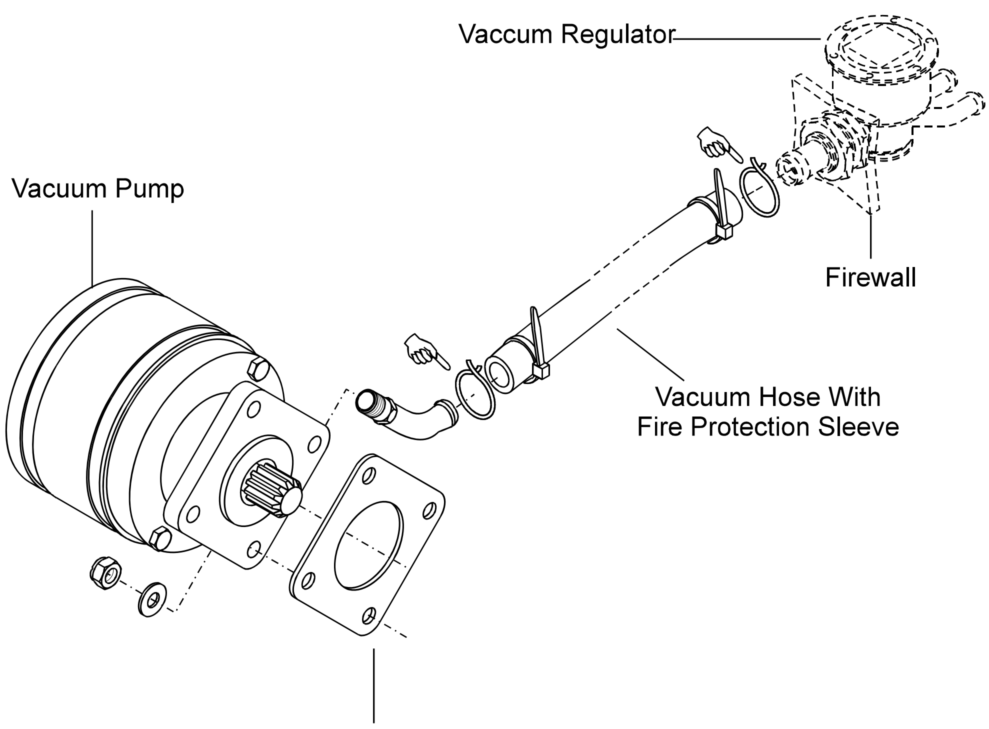


Figure 201 - Vacuum Pump Installation

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VACUUM INDICATING

1. General

Refer to Chapter 37-00 for the system description and operation. This section describes the trouble-shooting and maintenance procedures for the vacuum indicating system.

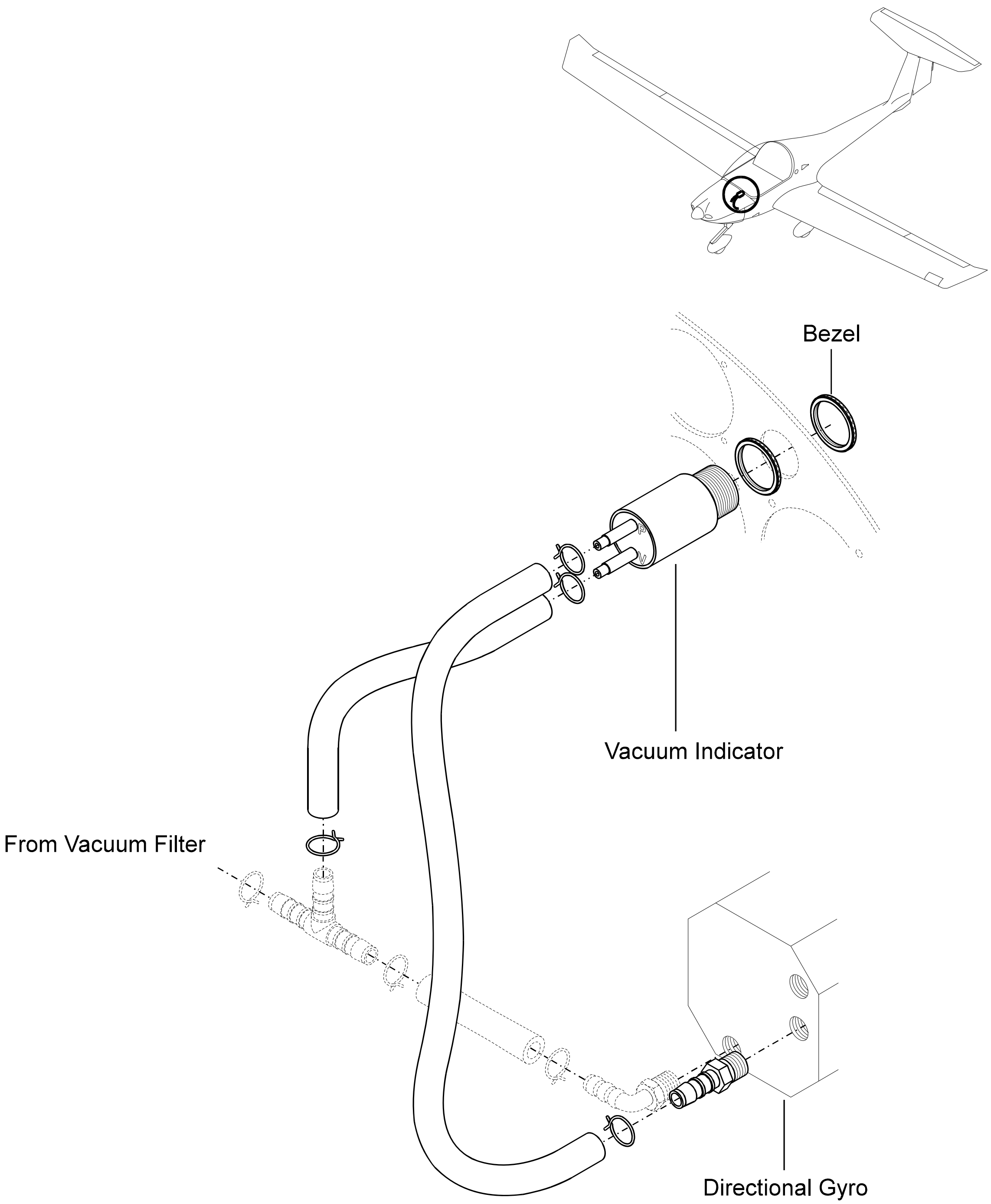

Figure 1 - Vacuum Indicator Installation

VACUUM INDICATING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the vacuum indicating system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Vacuum gauge shows no vacuum. Vacuum operated instruments operate correctly.	Vacuum gauge defective.	Replace the vacuum gauge.

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VACUUM INDICATING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the vacuum gauge. Refer to Chapter 37-00 for the system description and Chapter 37-10 for the vacuum distribution system.

2. Remove/Install the Vacuum Gauge

A. Remove the Vacuum Gauge

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrument panel cover.	Refer to Chapter 25-10.
2.	Release the flexible hoses to the vacuum gauge. - Put caps on the hose ends.	
3.	Release the bezel nut that attaches the gauge to the instrument panel.	
4.	Remove the gauge from the instrument panel.	

B. Install the Vacuum Gauge

	Detail Steps/Work Items	Key Items/References
1.	Put the vacuum gauge in position in the instrument panel.	
2.	Install the bezel nut that attaches the gauge.	
3.	Remove the caps from the hose ends. Connect the flexible hoses to the vacuum gauge.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do a test for correct operation of the vacuum system. If necessary, adjust the system.	
6.	Do an engine run-up.	Refer to the DA20-C1 Airplane Flight Manual.

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CHAPTER 51-00
STANDARD PRACTICES
STRUCTURES

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STANDARD PRACTICES - STRUCTURES

1. General

This chapter describes only the basic data about the structure.

The DA20-C1 aircraft is a single-engine, low-wing monoplane of composite construction. It has a 'T' tail. It also has a fixed tricycle landing gear with a nose wheel that can caster.

The fuselage has a glass fiber skin of semi-monocoque construction with bulkheads and stiffeners.

The tapered cantilever wing has an I-spar. The spar caps are carbon fiber rovings. The wing skin is a sandwich of Glass Fiber Reinforced Plastic (GFRP) with a rigid foam core. Each wing attaches to the fuselage at three places.

The vertical stabilizer is part of the fuselage structure. It has a spar near the rudder hinge line and a full laminate skin. The horizontal stabilizer, elevator and rudder have GFRP skins with rigid foam cores. The ailerons and flaps have GFRP/CFRP skins with rigid foam cores.

The acrylic canopy has a frame made from carbon fiber laminate.

An epoxy filler with a polyurethane paint protects the aircraft against moisture and ultraviolet rays.

2. Structural Classification

When you do a repair, you must identify the area of the structure (Refer to Figures 1, 2, and 3). If the damage is larger than the permitted repair, you must ask the manufacturer for advice.

A. Limited Area 1

In this area repairs are permitted on external skin damage up to 250 mm (10 in) in diameter.

B. Limited Area 2

In this area repairs are permitted on external skin damage up to 50 mm (2 in) in diameter.

C. Prohibited Repair Area

Only the manufacturer (or an approved repair facility) can do repairs in this area.

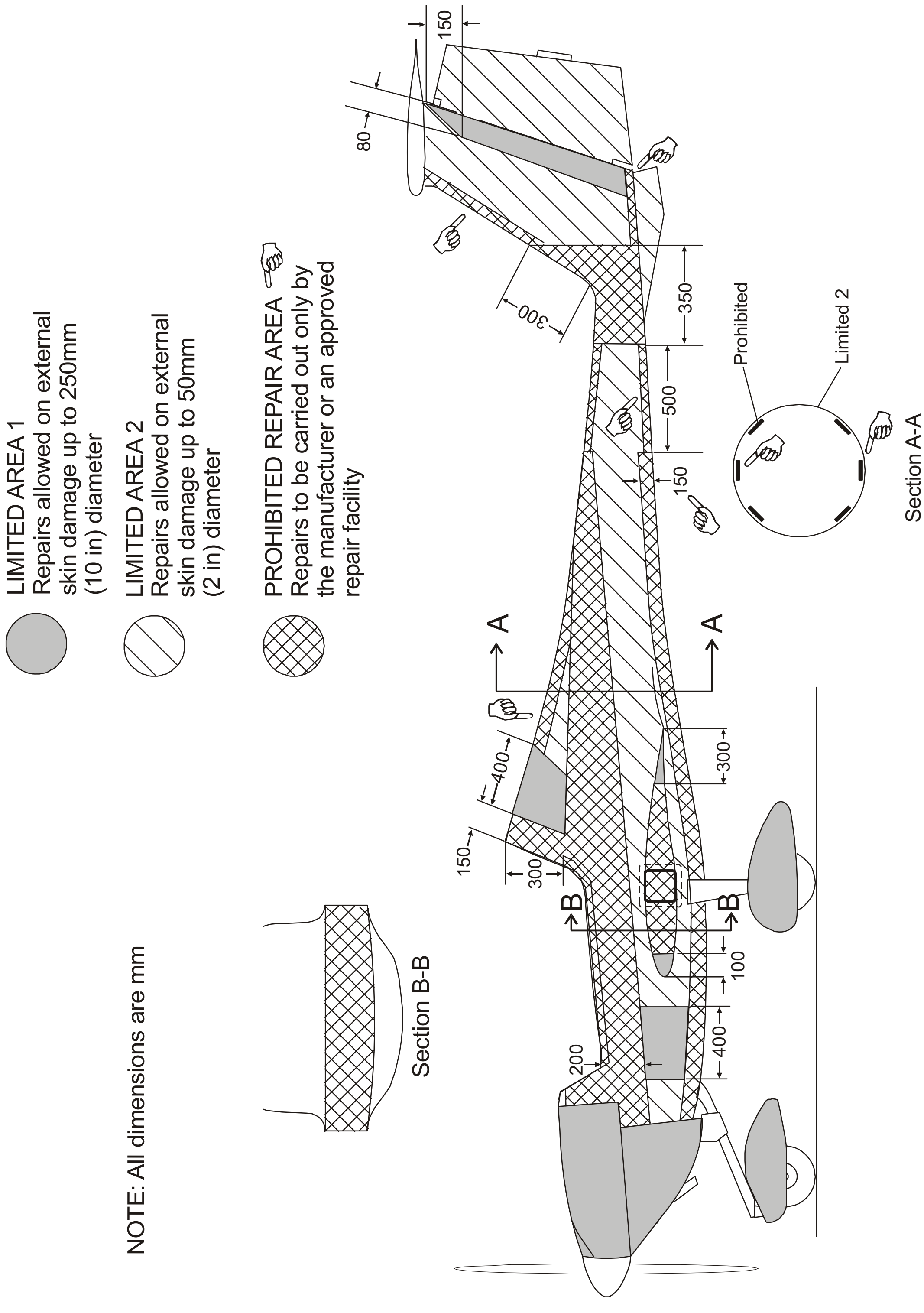

Figure 1 - Fuselage Restricted Area Diagram

3. Design, Dimensions, Clearances and Wear Limits

A. Design Dimensions

The detail drawing for the part shows the design dimensions. Use the design dimensions when manufacturing new parts or for a reconditioning scheme.

B. Clearances and Wear Limits

Where a chapter gives wear limits, the following data is listed:

- The maximum and minimum design dimensions for each part
- The acceptable worn dimensions
- The design assembly and acceptable worn clearances
- The description and location of parts to be examined or inspected
- A remarks column containing recommendations and, where necessary, repair details.

4. The Description and Location of Parts

The Aircraft Maintenance Manual (AMM) gives the description and location of parts. Where a special repair needs more data, it is shown on the repair drawing.

5. Repair Limitations

You cannot do in-service repairs on these components:

- The main spar and the spar bridge
- Damage close to the main attachment fittings for the wing or horizontal stabilizer.

These are major repairs. You must ask the manufacturer for a repair scheme.

Figures 1 and 2 are the Restricted Area Diagrams. They show where you can do external skin repairs.

LIMITED AREA 1
Repairs allowed on external skin damage up to 250mm (10 in) diameter

LIMITED AREA 2
Repairs allowed on external skin damage up to 50mm (2 in) diameter

PROHIBITED REPAIR AREA
Repairs to be carried out only by the manufacturer or an approved repair facility

NOTE: All dimensions are mm

VIEW LOOKING DOWN ON
BOTTOM SKIN OF FUSELAGE

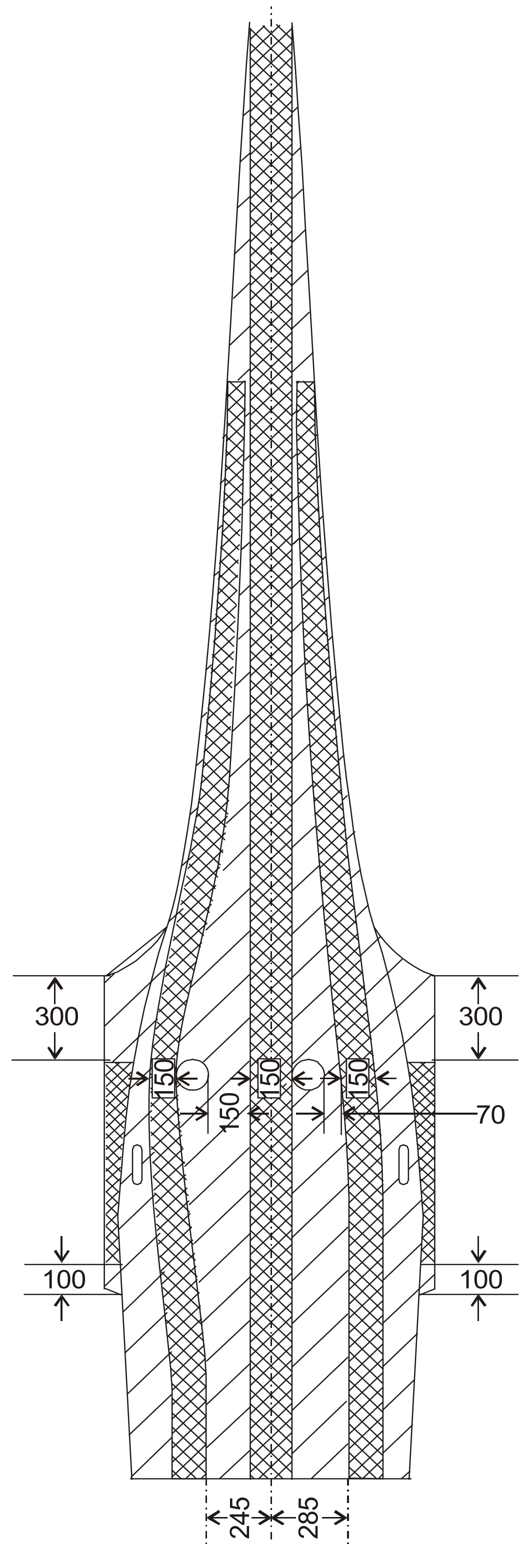

Figure 2 - Diagram Fuselage Bottom Skin Restricted Area Diagram

6. Inspection Techniques

There are different methods of inspecting a damaged composite area. The following gives the procedures for inspecting a damaged Fiber Reinforced Plastic (FRP) area.

A. Examine Visually

Look carefully at the outer surface of an area or component. If the paint has cracks or bubbles, then the composite may be damaged. Surface damage, e.g. dents or scratches may be detected by visual inspection. Look especially in the areas where stones can hit the aircraft below the fuselage and wings. By visual inspection, you can see where fiber breakage or matrix cracking has happened. Damage to the core may also be visible.

A bright light can be used to visually examine the inside of a component. GFRP must be green or brown. If the GFRP has white areas, then it may be damaged. Look especially at areas where components bond to the GFRP.

Carbon Fiber Reinforced Plastic (CFRP) must be black or black/brown. If the CFRP has white areas, then it may be damaged. Look especially at areas where components bond to the CFRP.

B. Light Test

A light test can be used to find delamination on components which do not have rigid foam inside.

CAUTION: DO NOT LET THE COMPOSITE GET HOT. HEAT CAN CAUSE DAMAGE TO THE COMPOSITE.

Point a bright light at the surface of the composite and look at the other side of the surface. Damage shows as a dark area. You can point the light from the inside or from the outside of a component.

NOTE: You can use the light test on thick GFRP but it is difficult to use on CFRP.

C. Coin Tap Test

Damage to the laminate can be detected by tapping a coin on the laminate. The sound of tapping will change its frequency as you move over the damaged area in relation to the sound of other areas of corresponding thickness. By performing a tap test, you can detect disbonds (the separation of one component which is bonded to another component) and delaminations (the separation of individual layers of the glass cloth).

Pay special attention to the area surrounding the damage, because there could be secondary damage, which can remain undetected.

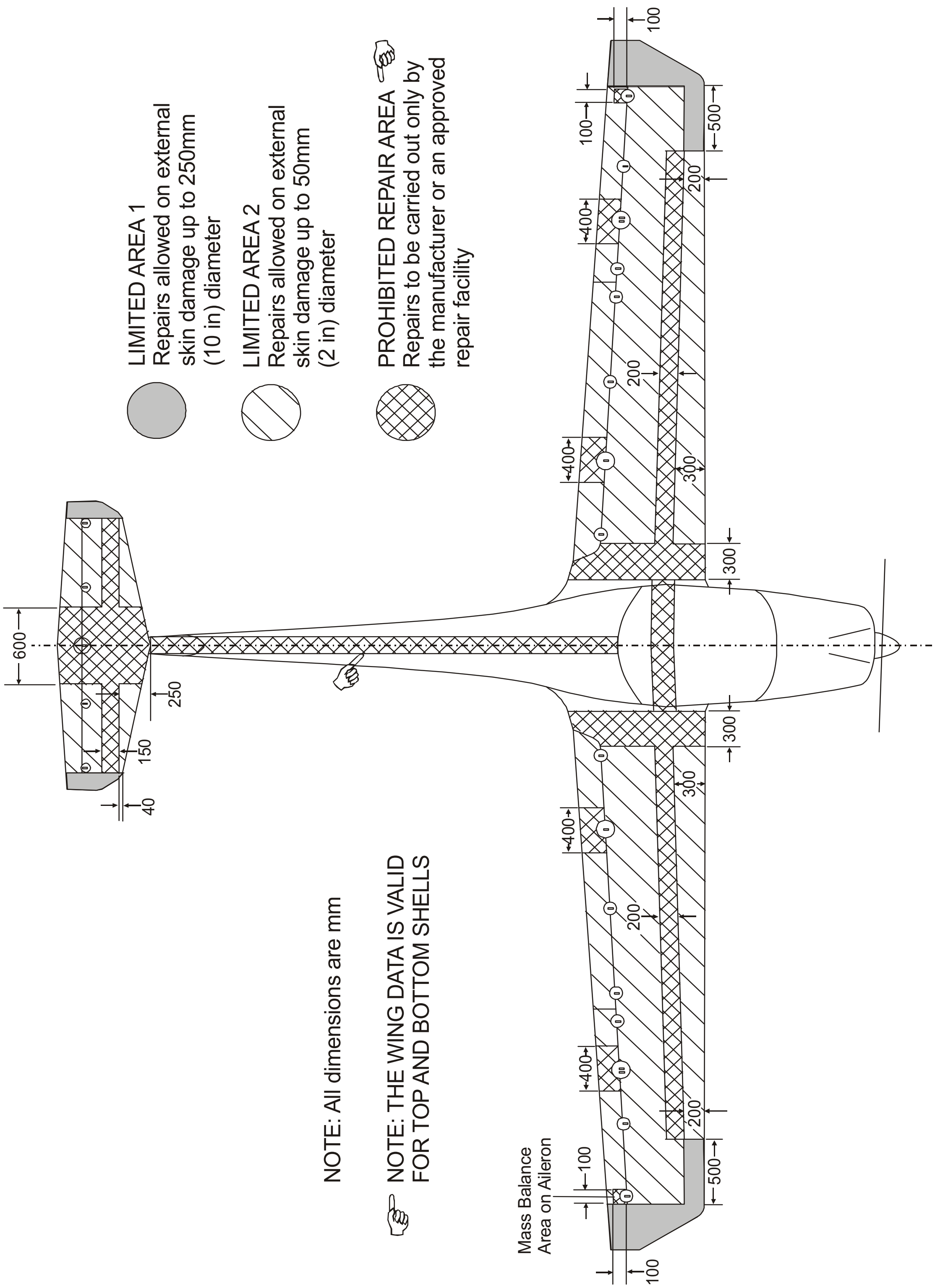

Figure 3 - Wing, Top Fuselage and Horizontal Stabilizer Restricted Area

7. Approved Materials and Suppliers

A. Resin and Hardner

Supplier: Scheufler, D-70327 Stuttgart

Resin:	L160 (100 parts by weight)	Hardener:	163 (28 parts by weight)
Resin:	L285 (100 parts by weight)	Hardener:	286 (40 parts by weight)

NOTE: L285/286 resin shall be used for DA20-C1S/N C0186 to S/N C0199.
L160/163 resin shall be used for DA20-C1up to S/N C0185 and S/N C0200 and higher.

B. Glass Fiber Cloth

Supplier: Interglas Textil Gmbh

Interglas Technologies AG

BenzstraBe 14. D-89155 Erbach, Germany

Cloth	Mass per Area grams/m^2	Interglass No.
Double Twil 2/2	161	92110
Double Twil 2/2	276	92125
Double Twil 2/2	390	92140
Warp reinforced	220	92145
Warp reinforced	433	92146
All cloth is made from alkali free E glass with Volan A Finish or Finish I 550, and complies with LN 9169.		

C. Carbon Fiber Cloth

Supplier:	Interglas Textil Gmbh Interglas Technologies AG BenzstraBe 14. D-89155 Erbach, Germany	C.Cramer & Co Postfach 1163 48613 Heek Nienborg Weberstrabe 21 Germany

Cloth	Mass per Area grams/m^2	P/N
Double Twil 2/2	200	Interglass 98141 Cramer 452T

Approved Materials and Suppliers (Continued)

Product	Part Number/Description	Manufacturer	Supplier
PVC Rigid Foam	H060	Divinycell	Divinycell
Aerosil	Aerosil 200	3M	Stochem 106 Summerlea Road Brampton, ON, L6T 4X3, Canada
Microbaloons	K20	3M	Ashland Chemical Canada 10515 Rue Notre-Dame Motreal, PQ H1B 2V1
Cotton Flocks		Quarry Hill Foundry	Quarry Hill Foundry Supplies 1262 Mcdougall Street Windsor, ON N8X 3M7
Epoxy Primer	Primer EP669 White	BASF	
	Hardener PA897		
	Reducer speed dependant on Application Climate		
Primer/Surfacer (High Build)	Primer DP20	BASF	
	Hardener PH60		
Exterior Topcoat UNO S/N C0001 to C0383	Paint HS82004 (Olympia White)	BASF	
	Hardener DH46		
	Reducer speed dependant on Application Climate		
Exterior Topcoat AF400 S/N C0384 and up	Paint 752891EP (Diamond White)	IMRON	
	Hardener DH46		
	Reducer speed dependant on Application Climate		
Interior Topcoat UNO-HD	Beige #1501A	BASF	
	Hardener DH46		
	Reducer speed dependant on Application Climate		

Product	Part Number/Description	Manufacturer	Supplier
Interior Texture Material	Paint 1109-1240/4	Glasurit	
Instrument Panel Flat Black UNO-HD	Paint SC80	BASF	
	Hardener DH46		
	Reducer type dependant on Application Climate		
Fire Retardant Paint	Paint N56582/T508	PPG Aerospace	PRC-Desoto International Hein-Sass-Weg 29 D-21129 Hamburg-Finkenwerder
	Clear Coat 432-0303		
	Hardener N39/1327 (use for clear coat only)		
	Desothane HS Buffable Clear Coat 9008B900D		
	Hardner 9008B		
	Desothane HS Matt Clear Coat CA8720M0900C		
	Hardner CA8000B		
Interior Baggage Compartment Speckled Paint	Multispec Color MS86-3076 Nightspots	Multicolor Specialties	Multicolor Specialties 2101 South 54th Avenue Cicero, IL 60804-2209
Matt Black	UNO SC804	BASF	
Bonding Material	TEROSTAT M9380	TEROSTAT	

8. Resin Handling

A. Introduction

The following steps establish the procedure for preparing resin.

B. Materials

Use only the epoxy resin systems and adhesives, which have been approved for the fabrication or repair of the aircraft. The approved list of materials and their sources are shown in paragraph 7.

NOTE: L285/286 resin shall be used for DA20-C1S/N C0186 to S/N C0199.
L160/163 resin shall be used for DA20-C1up to S/N C0185 and S/N C0200 and higher.

C. Procedure

(1) Weigh the cut cloths and determine by ratio the resulting mixed resin weight. The ratio for glass fiber cloth to resin is: 100:70 and the ratio for carbon fiber cloth to resin is: 100:85.

(2) Dispense only as much resin and hardener as you are able to use within the "working life" of the resin, at the measured ambient temperature in accordance with the mixture table on paragraph 9. A very common average mass is 100 g resin per pot. The dispensing error for the mixing ratio should not be more than 0.5 percent.

(3) Mix the components thoroughly for several minutes. Always scrape the stirring utensil surfaces as well as the sides of the mixing container, to ensure mixing of all components.

(4) Always thoroughly mix the resin system components before adding fillers or other additives.

(5) Note that small batches tend to have greater dispensing and mixing errors than larger batches. Therefore, even more care is required when mixing small batches.

(6) Avoid dispensing components into different containers prior to mixing. Best accuracy is obtained by weighing the resin and the hardener into a single mixing pot. Dispensing by weight tends to be more precise than dispensing by volume.

(7) Large batches of mixed resin should be poured into flat containers, so that the surface area to volume ratio is increased. This will reduce the risk of an exothermic reaction.

(8) Note that the resin on the rollers, brushes and other tools will also "cure". For this reason, clean the tools regularly when lamination is continuing for an extended period of time. Use only new brushes.

(9) Do not permit resin to become contaminated with foreign substances, other than the specified additives. Solvents and thinners used to clean the equipment should be dried off before commencing work with the tools.

WARNING: Curing of resin / hardener mix happens by an exothermic reaction. Therefore, leftover resin may overheat and is a potential fire hazard. it may cause injury to personnel.

9. Resin to Hardner Mixture

Scheufler L160/H163 (100:28 weight)	
Resin L160 g	**Hardner H163 g**
50	14
75	21
100	28
125	35
150	42
175	49
200	56

Scheufler L285/H286 (100:40 weight)	
Resin L285 g	**Hardner H286 g**
50	20
75	30
100	40
125	50
150	60
175	70
200	80

10. Bonding of Fiber Reinforced Plastics

A. Introduction

The following steps establish the procedure for the bonding of precured fiber reinforced plastic parts.

B. Materials

Resin

Resin Filler/Thickner

(1) Scotchlite K20 (.19g/cc) Microballoons 3M

(2) AerosilFillerStochem

(3) Cotton flocksCotton fibersQuarray Hill

C. Procedure

Preparation of Bonding Paste

Bonding pastes are used primarily for adhesive bonding of precured fiberglass parts. Bonding paste or thickened resin is a mixture of three types of fillers and mixed resins.
Refer to the table below.

The following combination of thickening fillers shall be used for preparation of bonding paste:

microballoons + aerosil: maximum 7% by weight

Cotton Fibers: minimum 7% by weight

Quantity of microballoons and aerosil may be varied to change paste consistency.

The total mix of fillers must not exceed 20% by volume.
Refer to the table below for the recommended mixture.

Material	**Weight in Grams**								
Mixed Resin	50	100	150	200	250	300	350	400	450
Cotton Flocks	5	10	15	20	25	30	35	40	45
Aerosil	1.5	3	4.5	6	7.5	9	10.5	12	13.5
Microballoons	2	4	6	8	10	12	14	16	18

Joining of Precured Parts

(1) Pre-fit the parts to be bonded to make sure that there is adequate clearance and mark out the exact bonding area between the parts as necessary for paste application. Note the gap between the parts.

(2) Disassemble the pre-fitted parts and prepare the surface for bonding by removing the peel-ply or abrading the surface.

(3) Prepare resin.

(4) Prepare bonding paste.

(5) Wet all the bonding surfaces with a thin coat of mixed resin (not thickened).

(6) Apply the bonding paste with a putty knife or a piping bag. Apply bonding paste to a depth appropriate with the bond gap, as determined by the trial fit. Avoid trapping air by contouring the paste higher in the middle of the joint.

(7) Fit the parts and remove excess bonding paste as it is squeezed out.

(8) Immobilize the parts until the pre-cure is complete (approximately 24 hours at 20°C, 68°F).

(9) Do not disturb the bonded parts until the full pre-cured duration has been reached.

11. Curing

A. Introduction

The following steps establish the procedure for curing a composite repair.

B. Material

Curing oven or a temporary enclosure with a heat source.

C. Procedure

(1) Precuring

Temperature: 20 - 25 ^{o}C (68 - 77 ^{o}F)

Time: 24 hours

(2) Postcuring

Temperature: 60 ^{o}C ± 5 ^{o}C (140 ^{o}F)

Time: 15 hours

The post cure may be divided into sections, as long as the total time at the required temperature is at least 15 hours.

(3) If you do not have an oven or a warming room, construct a temporary enclosure around the repair area to entrap heat.

(4) Use a heat source with variable heat control to apply heat to the ambient air around the repair area. Do not point the heat gun directly at the composite material. Ensure that the nozzle of the heat gun is more than 12 inches away from the area being cured. Use a thermocouple probe to measure the surface temperature at the repair. Adjust the heat source to maintain 60 ^{o}C ± 5 ^{o}C (140 ^{o}F).

(5) Measure and record the temperature every 15 minutes for the first hour and then every hour after that.

(6) It is not recommended to leave the repair unattended during the post cure, due to the risk of overheating or fire.

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CONTROL SURFACE BALANCING

1. General

This section describes how to weigh and balance the control surfaces. Refer to Chapter 06-00 for values of weight and balance for each control surface.

WARNING: YOU MUST WEIGH AND BALANCE A CONTROL SURFACE AFTER ANY WORK WHICH COULD AFFECT ITS WEIGHT OR BALANCE. OUT-OF-BALANCE CONTROL SURFACES CAN FLUTTER AND CAUSE STRUCTURAL FAILURE.

Correct control surface balance is critical to flight safety. You must remove a control surface to weigh and balance it after:

- Any repair to the control surface
- Painting the control surface
- Any report of control vibration in flight.

You can use any convenient method to weigh a control surface. If you use anything to connect the weighing device to the control surface, you must weigh it separately. Then subtract its weight from the total value. For example, you use a sling to lift a flap with a spring balance:

- Weight of the flap and the sling = 4.3kg
- Weight of the sling = 0.6kg
- Weight of the flap = 4.3 - 0.6= 3.7kg

When you balance a control surface, the pivot axis must be horizontal. We recommend that for the flaps, ailerons and elevator, you put a 6.4mm (1/4 in) rod through the hinge bearings. Support the rod at 2 points to keep it horizontal.

2. Control Surface Balance

Figures 1 to 4 show you how to balance each control surface. Use a spring balance to measure the force needed to hold the control surface horizontal as shown in the Figure. Measure the arm from the trailing edge where the tape is, to the pivot axis. The moment is the force measured by the spring balance x the arm. Note the optional method for the flaps.

Refer to Chapter 6-00 for the static moments.
Use any suitable method which has low friction to hold the rudder at the hinge line.
Remove the stop-bolts from the lower mounting bracket before weighing and balancing.
The balance includes the lower mounting bracket without stop bolts.
The static moment is tail heavy.

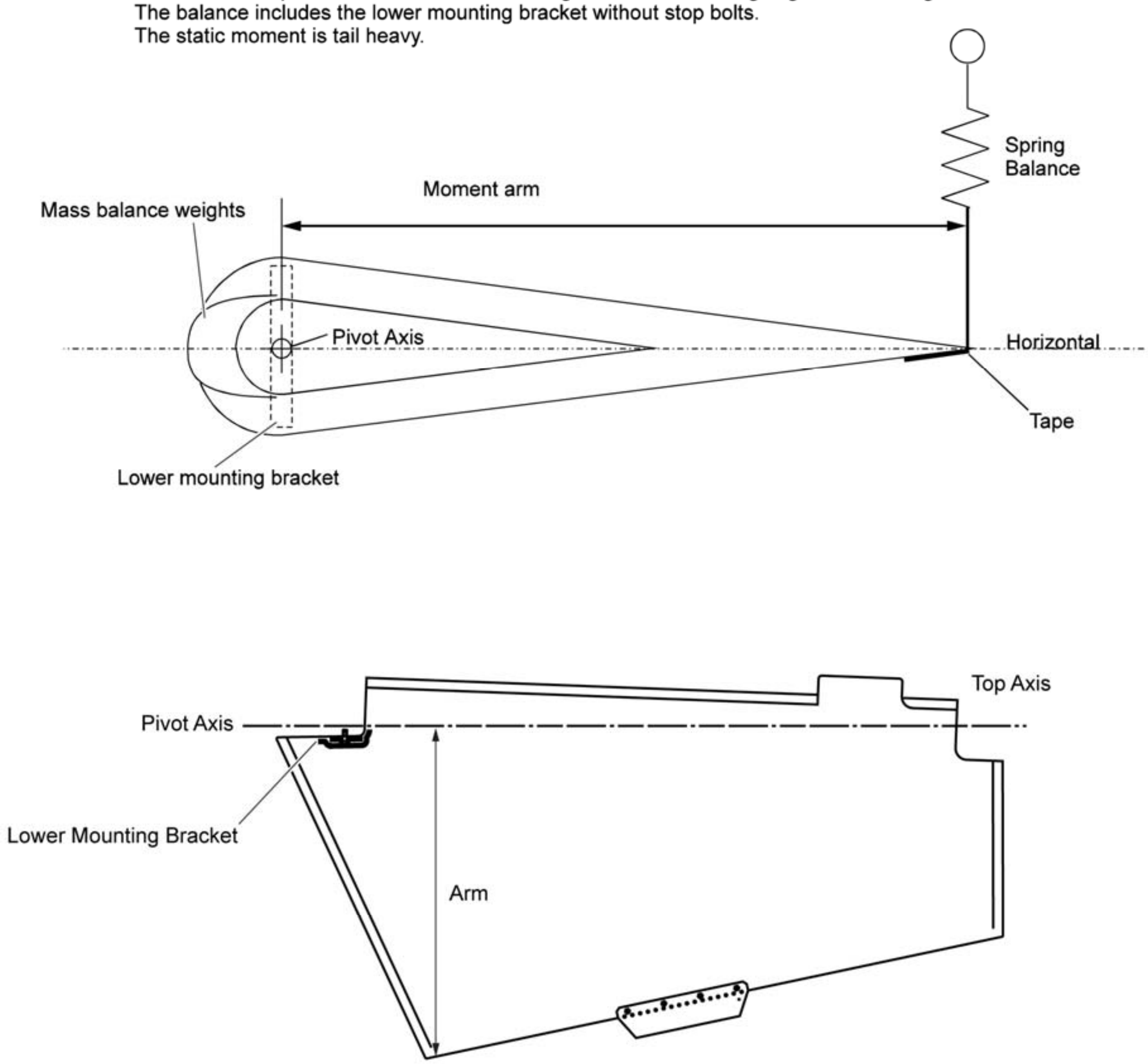


Figure 1 - Rudder Static Balance

Refer to Chapter 6-00 for the static moments.
Use any suitable method which has low friction to hold the elevator at the hinge line.
The balance includes the hinges, elevator horn and mass balance.
The static moment is tail heavy.

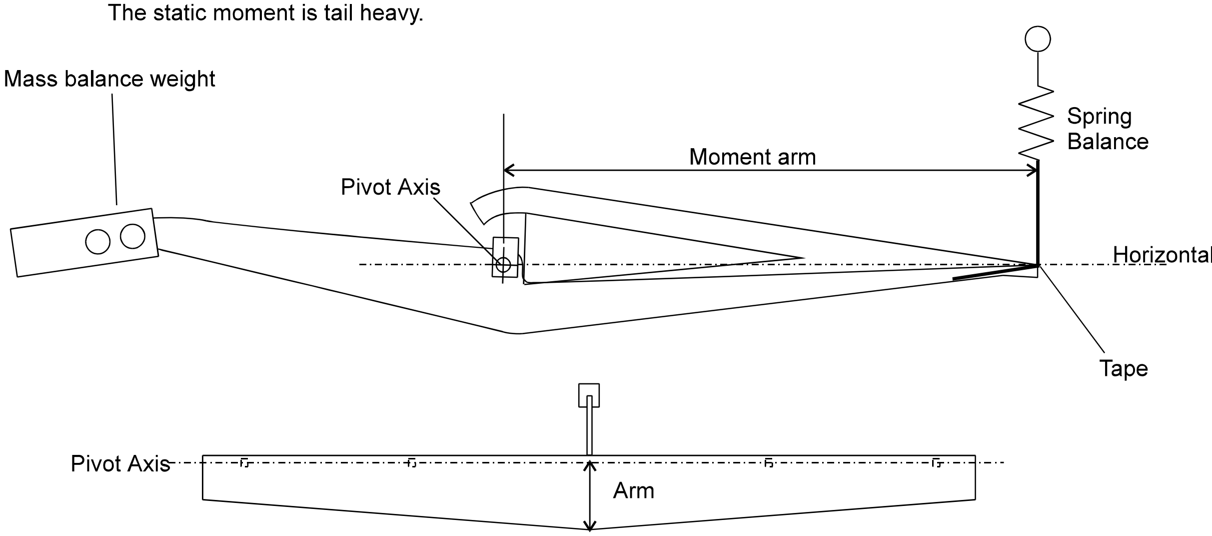


Figure 2: Elevator Static Balance

Refer to Chapter 6-00 for the static moments.
Use any suitable method which has low friction to hold the aileron at the hinge line.
The balance includes the hinges, aileron horn and mass balance weight.
The static moment is tail heavy.

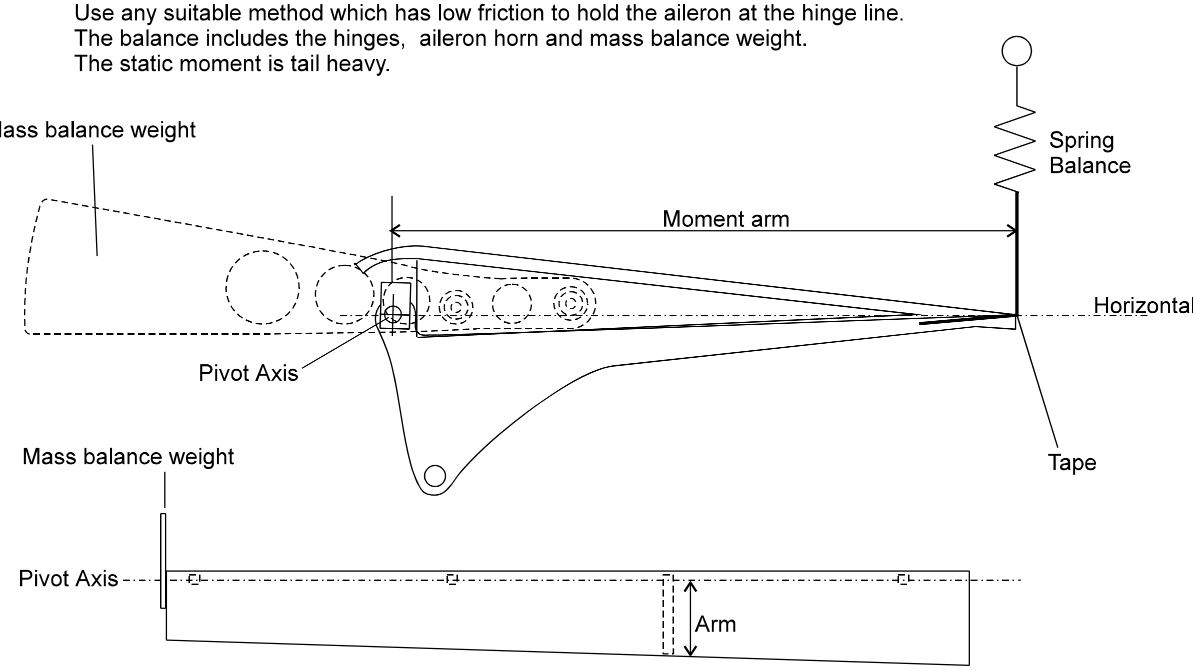
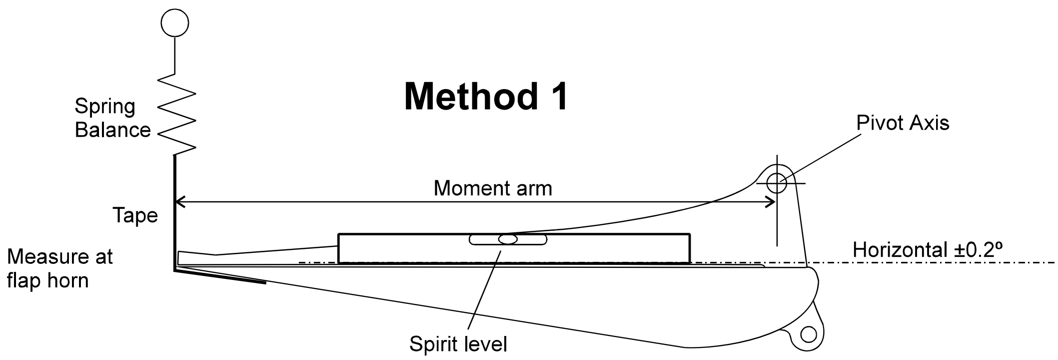
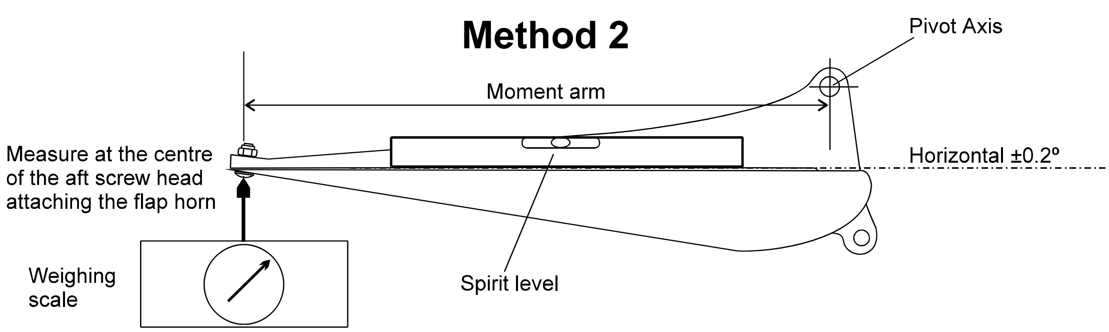


Figure 3 - Aileron Static Balance

Refer to Chapter 6-00 for the static moments.
Use any suitable method which has low friction to hold the flap at the hinge line.
The balance includes the hinges and flap horn.
The static moment is tail heavy.





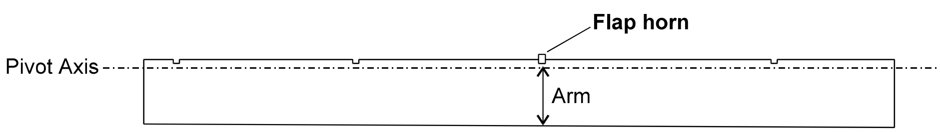


Figure 4 - Flap Static Balance

CHAPTER 52-00
DOORS

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DOORS

1. General

The DA20-C1 aircraft has two types of doors.

- The Canopy which gives access to the cockpit
- Access panels which give access to do maintenance.

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CANOPY

1. General

The DA 20-C1 aircraft has a one-piece lifting canopy. It has a carbon-fiber reinforced plastic (CFRP) frame and one large acrylic transparency. The transparency has two small emergency windows.

The canopy has a hinge at the back and a stabilizing rod on each side. The support arms have counterbalance springs to help operate the canopy.

A locking system locks the canopy closed. Two latch-levers operate the locking system. One lever is on the inside of the canopy on the left side. And one lever is on the inside of the canopy on the right side. Later model aircraft are equipped with handles located on the outside of the canopy in addition to the internal ones.

The canopy has a warning light system. The red warning light comes on when the canopy is not correctly locked. The warning light is on the instrument panel.

2. Description

A. Canopy Structure

Figure 1 shows the canopy. The canopy has a CFRP frame. A one-piece acrylic transparency attaches to the frame with screws and flexible adhesive. The transparency has two sliding side windows. The sliding side windows are on each side of the canopy with move in guide rails.

The canopy has a tubular rubber seal. The seal goes round the edge of the canopy frame. When the canopy is closed the seal touches cockpit sill.

B. Canopy Hinges

The canopy attaches to the fuselage with three hinges. One hinge at the back of the canopy and one at each side. A large spring attaches between each side arm and the rear fuselage. The springs help balance the weight of the canopy.

C. Canopy Locking

A latch mechanism attaches to each side of the canopy. There are two possible configurations of these latches. On older aircraft, there are latch handles on the inside of the canopy only. Newer aircraft have handles on the outside of the canopy in addition to the internal ones.

The latches with internal handles only are constructed as follows (Refer to Figure 201):

- Two steel plates make the body of the latch assembly with aluminum spacers between them. The inboard plate attaches to the canopy frame by four stainless steel screws. One of the aluminum spacers between the plates makes a stop for the canopy handle. Each latch mechanism has a red painted grip that attaches to a steel plate, which serves as the handle and the hook. The hook has a steel boss with an internal PTFE (Teflon) lined plain bearing. The hook turns around an internally threaded steel shaft welded to the outboard side plate. The shaft goes into a clearance hole in the inboard side plate. Also on the shaft are conical washers that provide friction. A steel screw compresses the conical washers so that the friction can be adjusted to obtain the correct latching force.

The latches with external handles are constructed as follows (Refer to Figure 202):

- The single steel plate is attached to the canopy frame by four steel screws and separated from the frame by two steel shims and an FRP spacer at each end. The shaft of the external handle is inserted into a bushing permanently installed in the steel plate. The shaft has an "O"-ring seal that provides friction. The friction is not adjustable on aircraft with outside handles. The internal handle/hook is fastened to the external handle via three screws. A screw to limit the travel of the mechanism is also fastened to the steel plate.

A strike bearing attaches to each side of the fuselage next to the canopy rail. A ball bearing that turns on a stainless steel shaft makes the strike bearing. The strike bearing attaches to an aluminum block. The aluminum block attaches to the underside of the fuselage at the canopy rail. A micro-switch with a roller lever goes behind the bearing. The micro-switch will only operate when the hook completely engages the strike bearing.

The part of the hook that engages the strike bearing is shaped with a small ramp that ends to make a recess. As the grip is pushed forwards, the canopy is pulled downwards to compress the canopy seal. When the bearing drops into the recess the canopy is locked. The force necessary to open the canopy from this position will stop accidental operation. If the electrical power is set to on and both latches are not engaged, the red warning light on the instrument panel will come on.

D. Alignment Pins

A conical pin on each side of the canopy at the rear aligns the canopy when it is closed. The pins engage with conical alignment holes in the bottom of the canopy frame.

3. Operation

With the canopy lock set to open, the hook moves forwards and disengages the strike bearing. The canopy can move up. You can access the canopy lock grips through the canopy sliding side windows externally.

A. Canopy Closed

These actions lock the canopy closed:

- Move the canopy fully down
- Move both grips to the CLOSED position. (Both internal grips fully forward)
- The hook goes to the rear. It fully engages the strike bearing. It also operates the micro-switch. This pulls the canopy against the seals.

B. Canopy Open

These actions unlock the canopy:

- Move both grips to the OPEN position. (Both internal grips to the rear/aft)
- The hook moves forwards and disengages the strike bearing
- Push the canopy up.

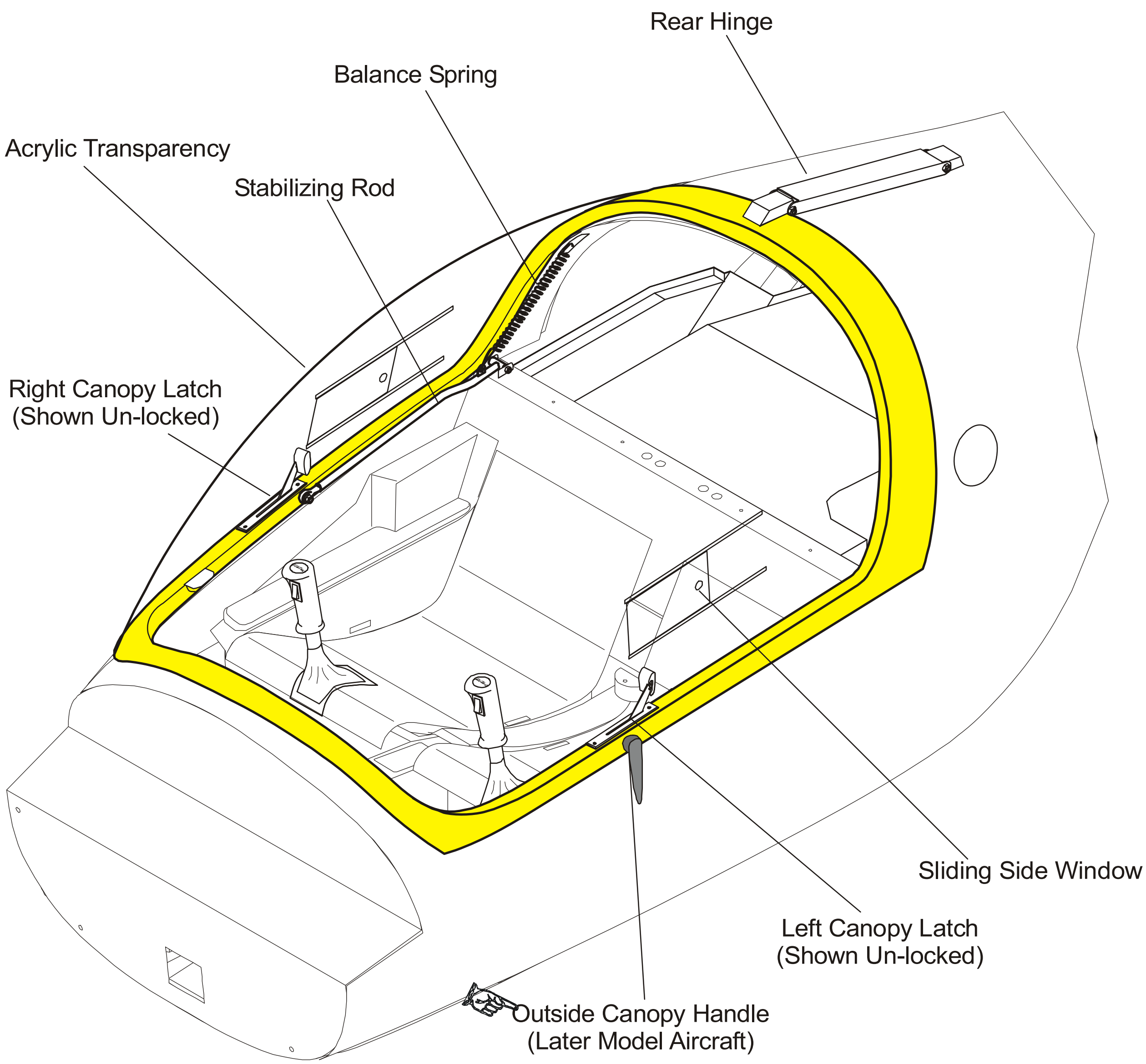

Figure 1 - Canopy

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CANOPY - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the canopy. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Canopy is difficult to move.	Canopy frame damaged.	Replace the canopy.
Canopy unlock/lock grips difficult to move.	Latch mechanism out of adjustment.	Adjust the latch mechanism.
Emergency side windows difficult to move.	Emergency side window guides dirty or damaged.	Clean or replace the side window guides.
Canopy warning light does not operate correctly.	Canopy warning light out of adjustment.	Adjust the canopy warning light micro-switch.

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CANOPY - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the canopy and how to do a canopy latch force test/adjustment.

2. Remove/Install the Canopy

CAUTION: TWO PEOPLE WILL BE NEEDED TO REMOVE/INSTALL THE CANOPY. THE CANOPY WILL BE DAMAGED IF YOU DROP IT.

A. Remove the Canopy

	Detail Steps/Work Items	Key Items/References
1.	Open the canopy.	
2.	Remove the screws that attach the rear hinge to the rear of the canopy.	Hold the canopy.
3.	Remove the rod end bearings from the stabilizing rods at the canopy frame.	
4.	Lift the canopy clear of the aircraft.	

B. Install the Canopy

	Detail Steps/Work Items	Key Items/References
1.	Lift the canopy into position on the aircraft. And hold the canopy open.	
2.	Install the rod end bearings to the stabilizing rods at the canopy frame.	
3.	Install the screws that attach the hinged tube to the rear of the canopy.	
4.	Close the canopy and operate both canopy latches.	Make sure the canopy latch mechanism pulls the canopy fully closed.
5.	Set the GEN/BAT switch to ON.	Make sure the canopy warning light goes out. If necessary, adjust the micro switches. (Refer to the micro-switch adjustment procedure)

3. The Canopy Latch Force Test

A. Equipment

Item	Quantity	Part Number
Strap	1	Commercial
Spring Scale	1	Commercial

B. The Canopy Latch Force Test - Canopies With Internal Handles Only

	Detail Steps/Work Items	Key Items/References
1.	Close the canopy.	Make sure both handles are fully forward.
2.	Set the GEN/BAT switch to ON.	
3.	Make sure the canopy warning light goes off. - Set the GEN/BAT switch to OFF.	
4.	Loosen the friction adjusting screw for the canopy handle.	To completely release the pressure on the conical washers.
5.	Put a strap around the canopy grip at the top. Attach the spring scale to the strap. - Pull the spring scale straight aft and up at approximately 30 degrees - Measure and record the force necessary to move the grip to the unlocked position - If necessary, adjust the force required to move the grip.	 Force must be between 10 - 20 lbf (45 - 90 N). Refer to the adjustment procedure.
6.	Open the canopy a small distance.	
7.	Tighten the friction adjusting screw for the canopy handle.	

	Detail Steps/Work Items	Key Items/References
8.	Put a strap around the canopy grip at the top. Attach the spring scale to the strap. - Pull the spring scale straight aft - Measure and record the force necessary to move the grip to the unlocked position - If necessary, adjust the friction adjusting screw to give the correct force.	Force must be between 2.5 - 5 lbf (11 - 22 N).
9.	Do steps 1 through 8 for the other grip.	

C. The Canopy Latch Force Test - Canopies With External Handles

	Detail Steps/Work Items	Key Items/References
1.	Close the canopy.	Make sure both handles are fully forward.
2.	Set the GEN/BAT switch to ON.	
3.	Make sure the canopy warning light goes off. - Set the GEN/BAT switch to OFF.	
4.	Put a strap around the canopy grip at the top. Attach the spring scale to the strap. - Pull the spring scale straight aft and up at approximately 30 degrees - Measure and record the force necessary to move the grip to the unlocked position - If necessary, adjust the force required to move the grip.	Force must be between 15 - 25 lbf (66 - 110 N). Refer to the adjustment procedure.
5.	Do steps 1 through 4 for the other grip.	

4. Adjust the Canopy Latch Force

	Detail Steps/Work Items	Key Items/References
1.	Release the screws which hold the strike block assembly to the fuselage.	Refer to Figure 202.
2.	Lower the strike block assembly and install (or remove) shims as necessary to give the correct latch force.	Shim, strike, P/N 22-5600-00-15 and P/N 22-5600-00-18. Shims may be sanded to reduce their thickness.
3.	Lift the strike block assembly into position.	Do not trap the cable for the canopy lock micro-switch.
4.	Do a latch force test.	Refer to Paragraph 3.

5. Adjust the Canopy Warning Light Micro-Switch

	Detail Steps/Work Items	Key Items/References
1.	Set the GEN/BAT switch to ON.	
2.	Close the canopy.	Make sure both hooks are engaged past the detent.
3.	Bend the micro-switch actuator in the necessary direction to operate the warning light correctly.	Both hooks must be engaged past the detent before the warning light goes out.
4.	Open the canopy and close the canopy.	Make sure both hooks are engaged past the detent when the light goes off.
5.	Make sure the canopy warning light operates correctly.	
6.	Set the GEN/BAT switch to OFF.	

6. Remove/Install the Sliding Side Window

A. Remove the Sliding Side Window

	Detail Steps/Work Items	Key Items/References
1.	Remove the air scoop lock as follows: - Remove the screw and the nut - Remove the two thin washers and a nylon washer - Remove the air scoop lock.	Refer to Figure 203.
2.	Remove the clear and tinted sliding window air scoop as follows: - Remove the screw, the washer, and the nut from the sliding window air scoop hinge - Remove the hinge - Remove the clear/tinted sliding window air scoop.	Refer to Figure 203.
3.	Remove the guide rails as follows: - Remove the nylon screws - Remove the guide rails from the canopy window.	Refer to Figure 203.
4.	Remove the sliding window as follows: - Remove the screws - Remove the hinge block - Remove the sliding window knob - Remove the sliding window.	Refer to Figure 203.

B. Install the Sliding Side Window

	Detail Steps/Work Items	Key Items/References
1.	Assemble the sliding window as follows: - Install the sliding window knob into the sliding window - Install the hinge block using two screws.	Refer to Figure 203.
2.	Install the sliding window with the guide rails.	
3.	Secure the guide rails with eight nylon screws.	
4.	If the sliding window installed does not include the clear/tinted sliding window air scoop and the air scoop lock, install as follows: - Install the hinge with the screw, the washer, and the nut - Install the clear/tinted sliding window air scoop - Install the air scoop lock with the screw, the nut, the two thin washers, and a nylon washer.	

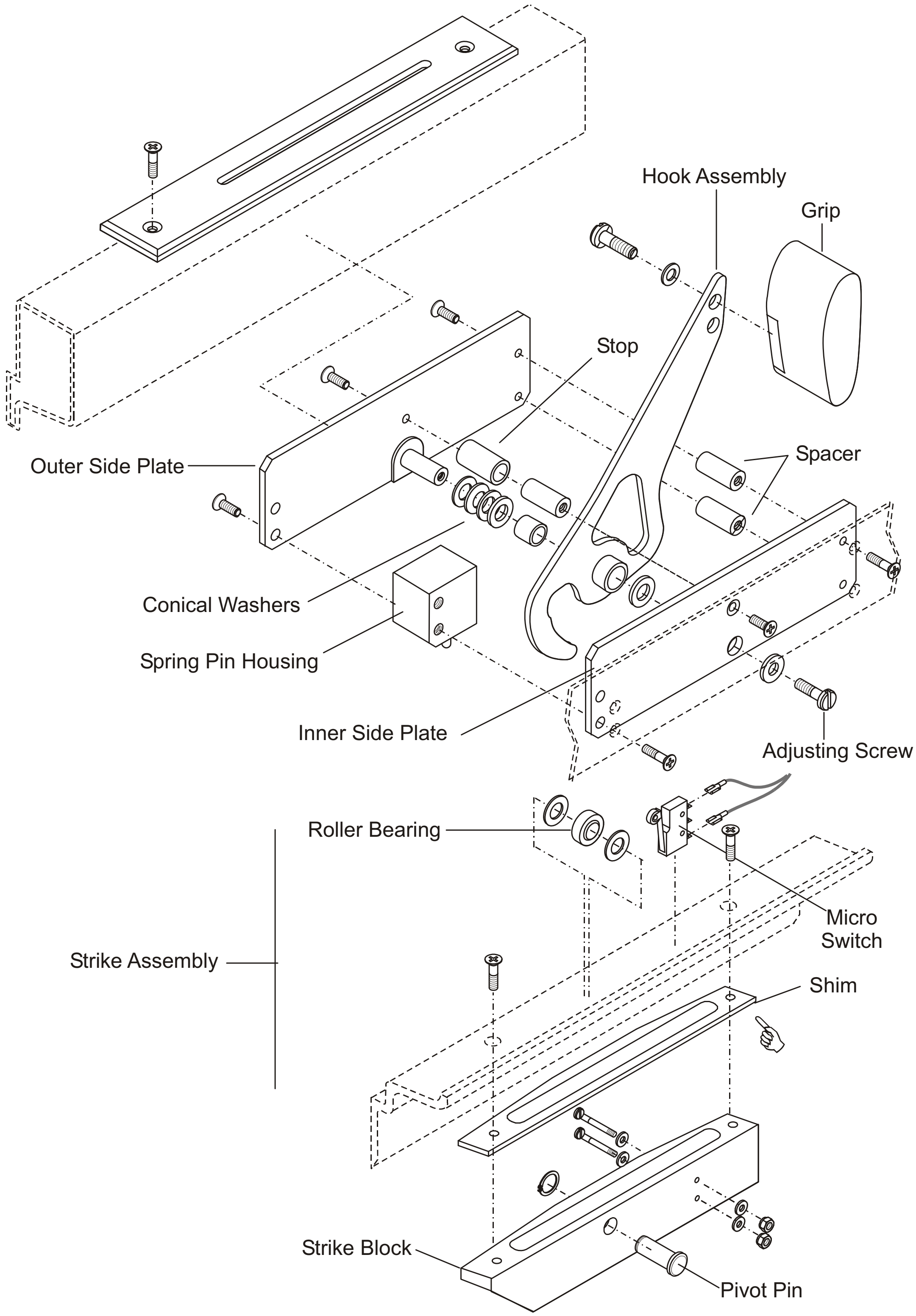

Figure 201 - Canopy Latch Installation without Outside Handles

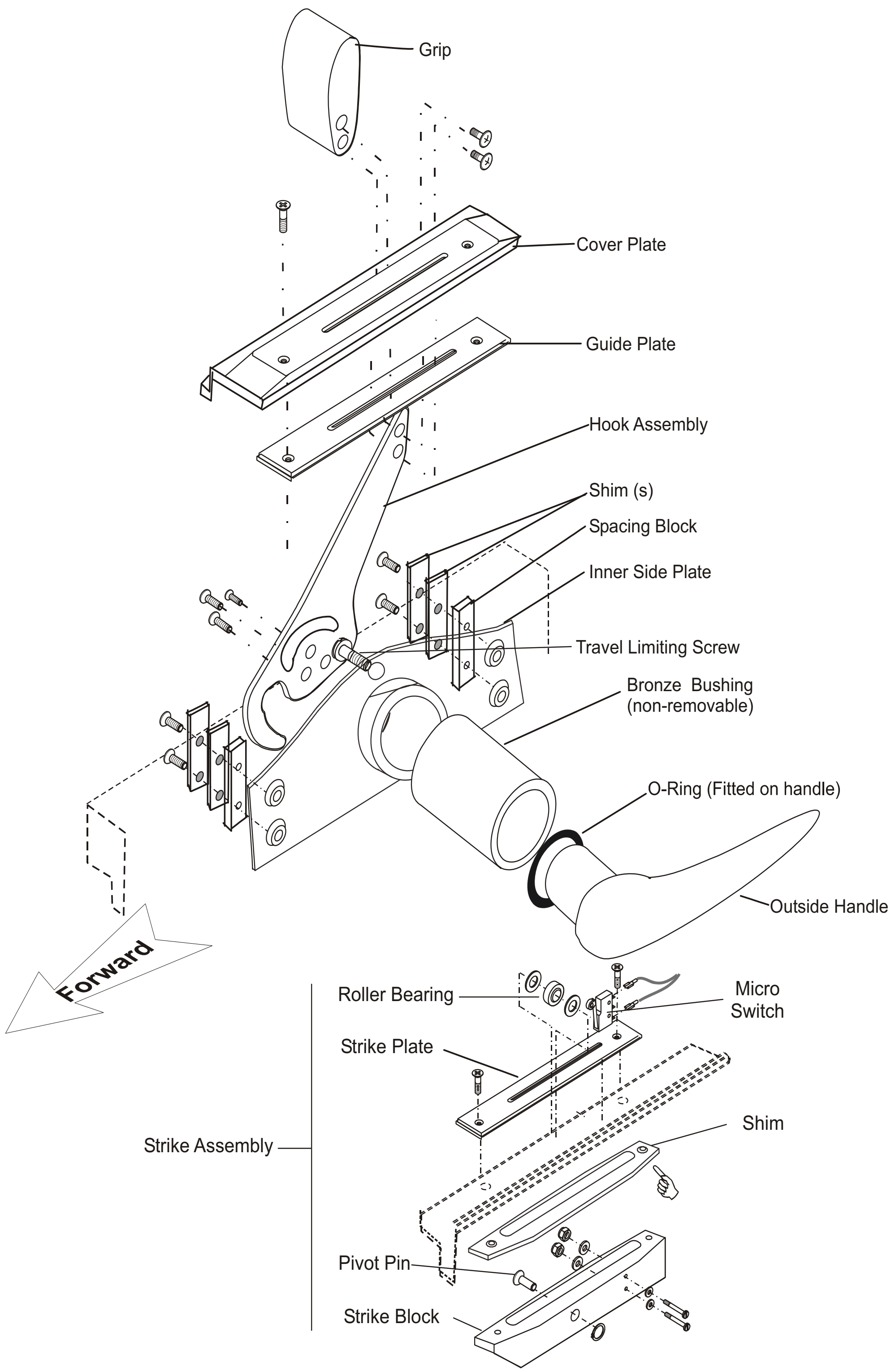

Figure 202 - Canopy Latch Installation with Outside Handles

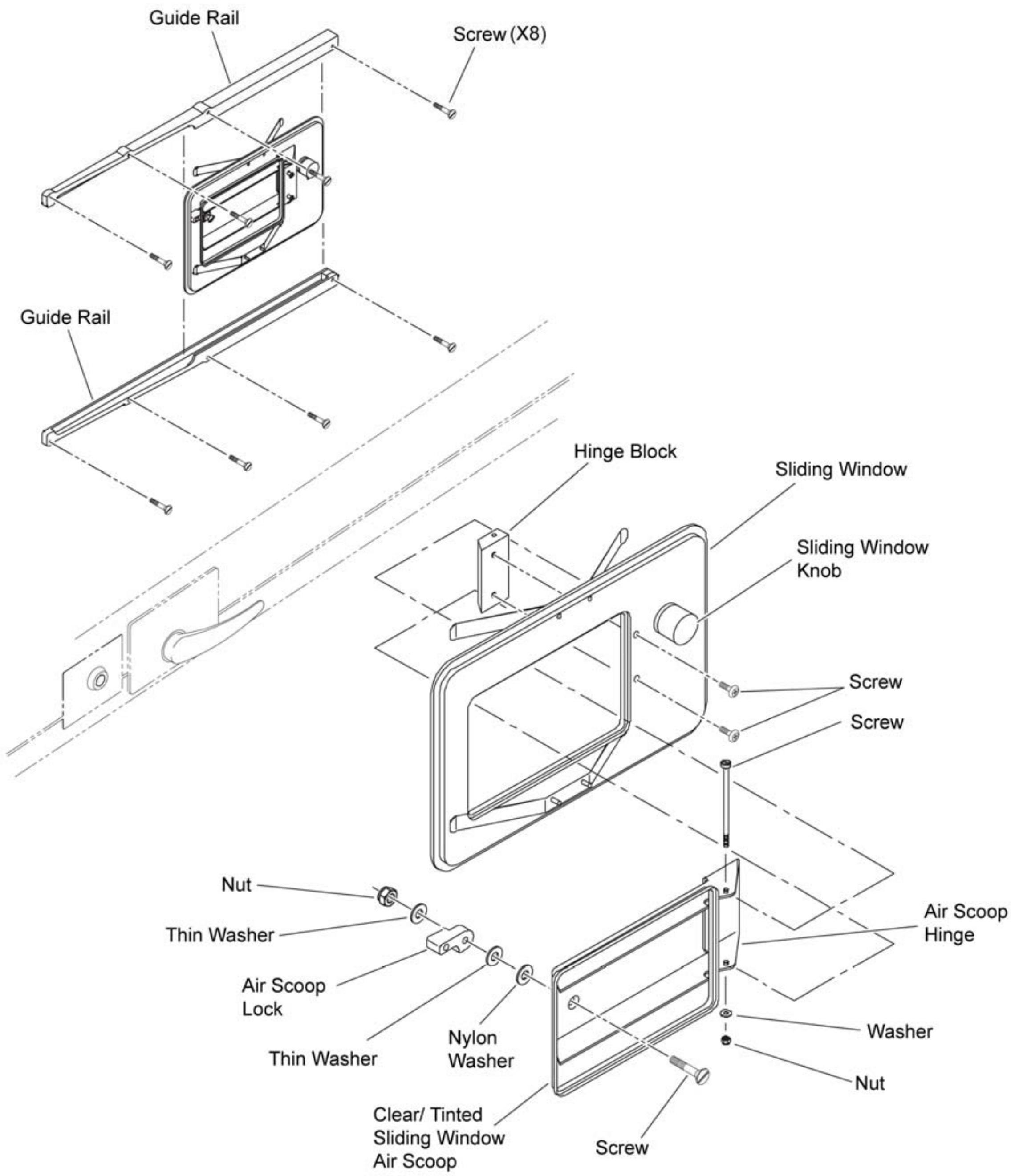

Figure 203 - Sliding Window Assembly

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ACCESS PANELS

1. General

The DA20-C1 aircraft has a small number of access panels. The panels give access for maintenance. Most panels are GFRP moldings. Self-tapping screws or camlock (quick-release) fasteners hold the panels. Refer to Chapter 71-10 for data about the engine cowlings.

Figure 1 shows the access panel locations on the bottom of the airplane.

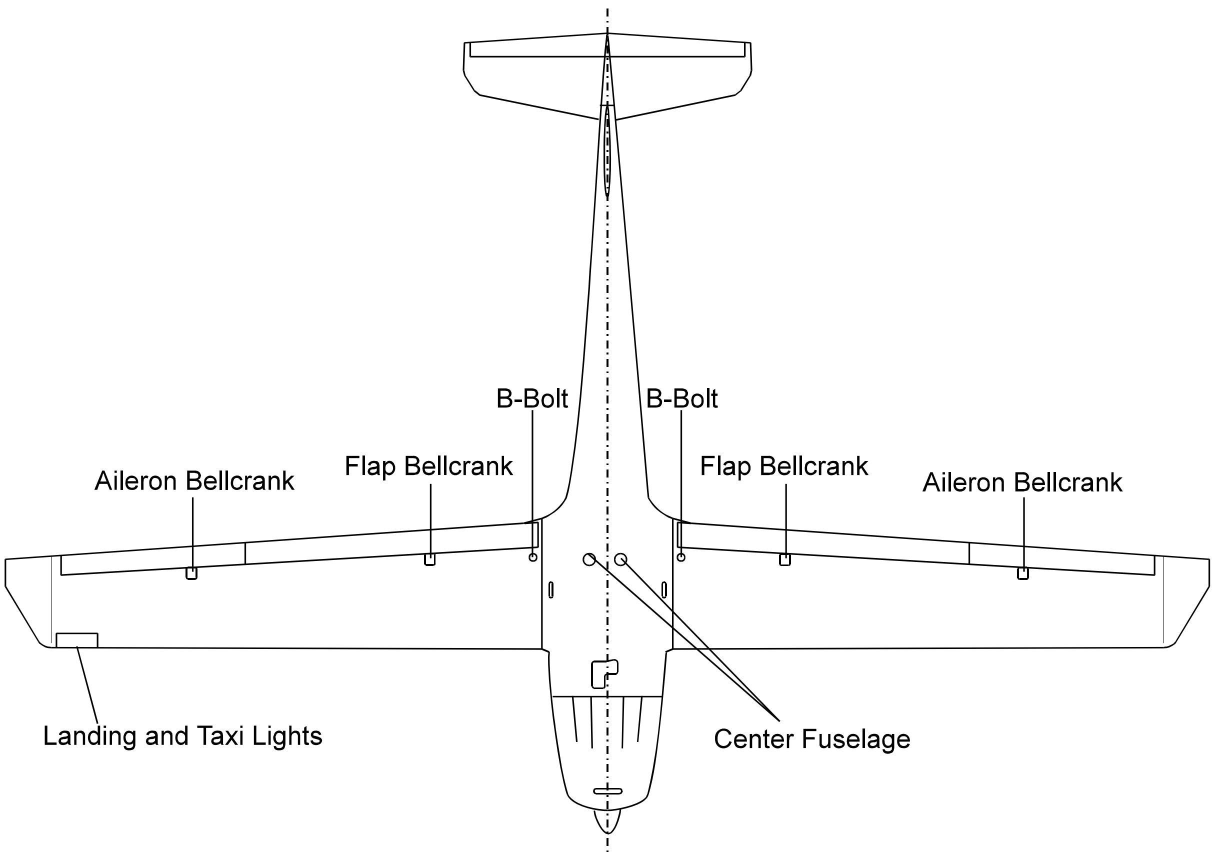

Figure 1 - Access Panel Locations on the Bottom of the Aircraft

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CHAPTER 53-00
FUSELAGE

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FUSELAGE

1. General

The DA20-C1 aircraft fuselage is a semi-monocoque structure. Two GFRP half-shells make the fuselage skin. GFRP frames and webs give strength and stiffness. Each half shell also makes the vertical stabilizer.

The fuselage shells have many layers of glass cloth. Some areas have more glass cloth than other areas. This gives more strength and stiffness where it is needed.

The frames and webs also have many layers of glass cloth. Some areas have layers of carbon fiber cloth to give extra strength. Some components also have inserts for attaching brackets or other components.

Chapter 53-10 gives the data for the fuselage structure.

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FUSELAGE STRUCTURE

1. General

This chapter describes the data about the fuselage structure. It also includes the vertical stabilizer. Refer to Chapter 51-00 for data about repair to the structure. The DA20-C1 aircraft has the following components in the fuselage structure:

- All of the main structural components are GFRP rigid moldings. Many layers of glass cloth bond together to make each molding. Some components have layers of carbon cloth or tape. This gives more strength and stiffness.

- Most components have rigid GFRP inserts. The inserts give strength and stiffness for attaching other components such as brackets for controls.

- Bonding paste (thickened resin) bonds each component to other components. Most components also bond to the fuselage shells.

2. Description

Figures 1 to 4 show the fuselage structure.

A. Fuselage Shells

Two GFRP shells make the outer skin of the fuselage. The shells transmit structural loads. The shells bond to each other at the top and bottom of the fuselage. Each shell has many layers of glass cloth. Some areas of the shell have more layers to give more strength and stiffness.

Thickened resin bonds all other structural components to the shells.

Many small components bond to the fuselage shells. These include:

- Air inlet and outlet ducts

- Conduits for electrical wires, antenna cables and fuel pipes.

B. Firewall

The firewall closes the front of the fuselage. It also holds the attachments for the engine mounting frame. It has holes for the different systems which connect to the engine.

The firewall is a rigid GFRP molding. A special adhesive bonds a fire-resistant ceramic blanket to the front face of the firewall. The adhesive also bonds a stainless-steel sheet to the front of the blanket. Components which go through the firewall also hold the stainless-steel sheet and blanket to the GFRP molding.

A GFRP extension bonds to the top of the firewall. It carries the seal for the engine cowling.

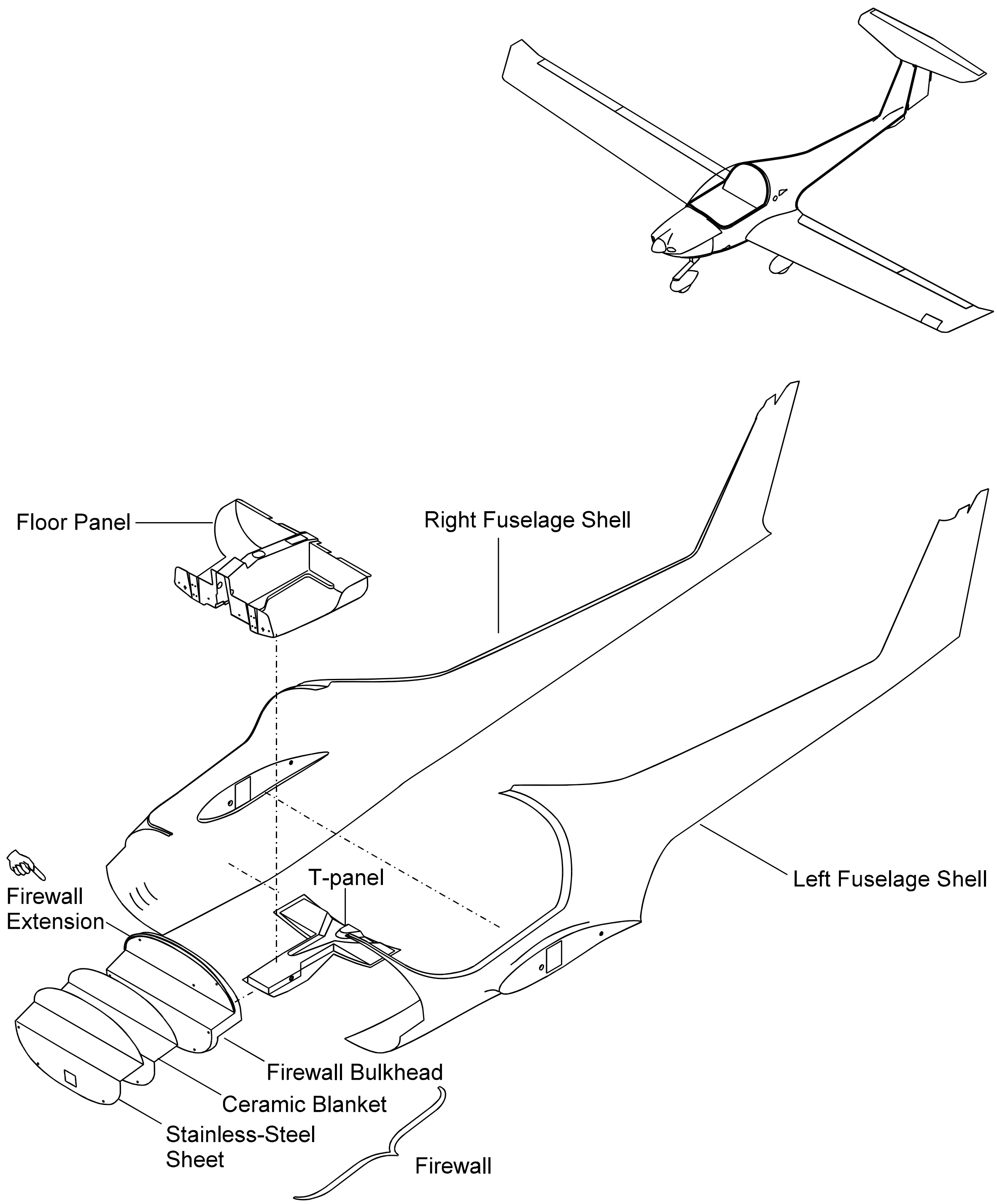

Figure 1 - Fuselage Shells and Front Fuselage Structure

C. T-Panel

The T-panel bonds to the inner-bottom skin of the fuselage behind the firewall. It gives strength and stiffness to the front fuselage. It has mountings for the nose landing gear.

D. Floor

The floor is a rigid GFRP molding. It bonds to the inner-bottom skin of the fuselage shell behind the firewall. It goes over the T-panel. The center part of the floor makes the center console.

The rear part of the floor makes the front support for the pilot's seats. It also holds the front of the control stick support brackets. The rudder pedal assembly for each pilot attaches to the floor element.

E. Forward Control Bulkhead

The forward control bulkhead is a rigid GFRP molding. Rigid GFRP inserts make strong-points which hold the control components. The bulkhead bonds to the fuselage shell, the top of the T-panel and the center-tunnel. The control stick support brackets attach to the front face of the bulkhead.

F. Center tunnel

The center tunnel is a rigid GFRP molding. An insert makes a strong-point which holds the front mounting for the flap actuator. A rigid GFRP insert holds the locking hook assembly for the main pins. The center tunnel bonds to the fuselage shells, the bulkhead, forward control and the spar bridge.

G. Spar bridge

The spar bridge is a rigid GFRP box-section molding. It has layers of carbon cloth on the top and bottom faces. Each end is a strong web. Carbon cloth gives strength and stiffness to the webs. The webs bond to the spar bridge to the fuselage shells at the root rib area.

The center area of the spar bridge has 2 pairs of bushes for the wing main bolts. The webs hold the A and B bolt bushes for the wing attachment. The front face of the spar bridge has a large bracket for the inner end of the A-bolt. Bonding paste and 8 bolts attach each bracket to the spar bridge.

The spar bridge also has four attachments for the main landing gear. Refer to Chapter 32-10 for data about the landing gear attachments.

H. Seat Back

The seat back is a rigid GFRP molding. Carbon tape gives strength and stiffness to the top of the seat back. A rigid GFRP insert bonds inside the top of the seat back. The insert has strong-points for the pilot's safety belts.

The seat back bonds to the top face of the spar bridge. It also bonds to the fuselage shells.

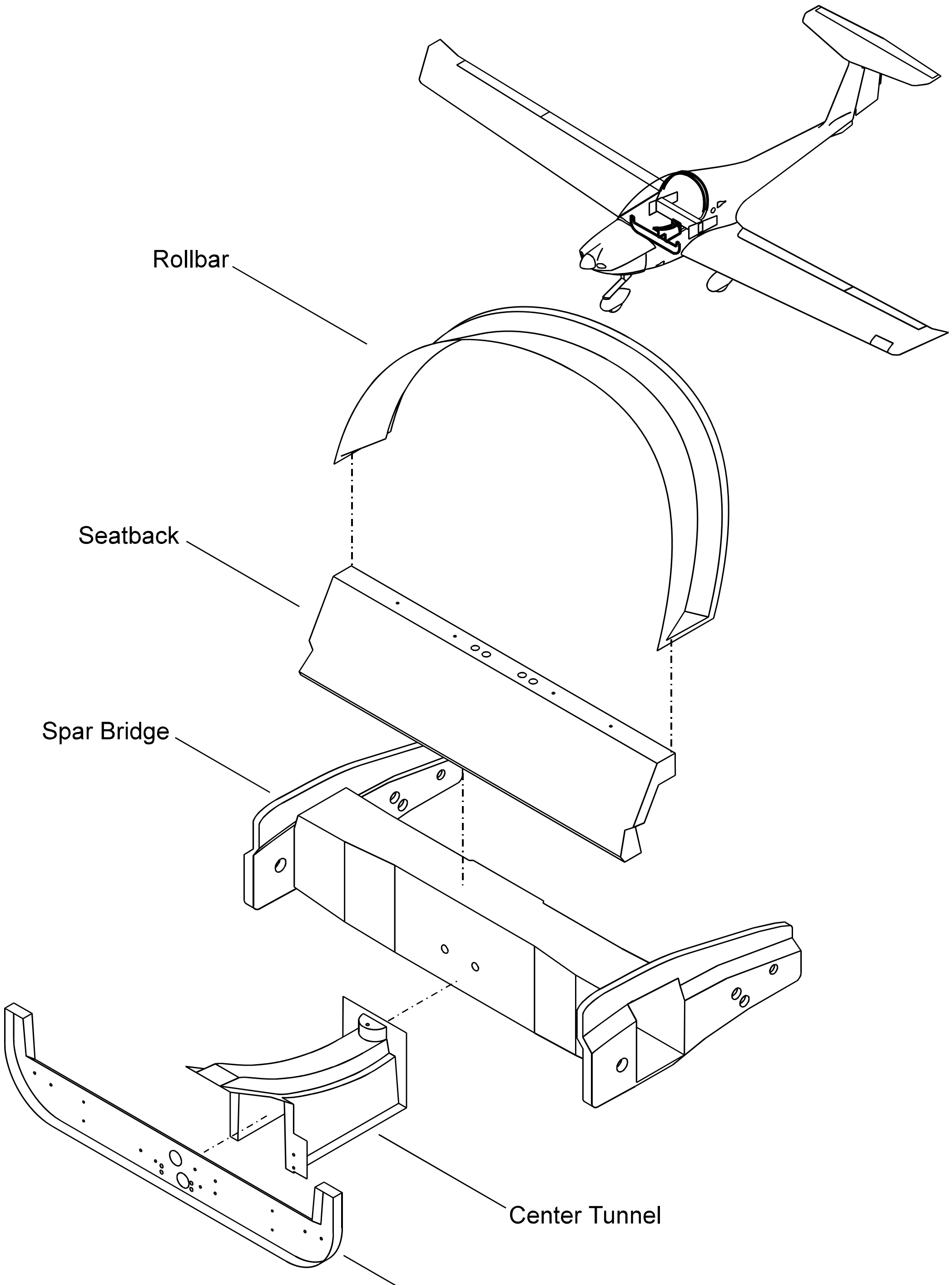

Figure 2 - Front Fuselage Structure

I. Rollbar

The rollbar is a rigid GFRP molding. Carbon tape gives strength and stiffness to the rollbar. The rollbar bonds to the inner face of the fuselage shell around the rear cockpit cut-out.

J. Aft Control Bulkhead

The aft control bulkhead is a rigid GFRP molding. The middle part has top and bottom flanges which hold the control bellcranks. The bulkhead bonds to the aft face of the spar bridge. It also bonds to the fuselage shell.

K. B-bulkhead

The B-bulkhead is a large rigid GFRP molding. The main part of the bulkhead has a slope of about 45°. The middle of the bulkhead makes a box for the fuel tank. The top part has a box for the battery.

L. Half bulkhead

The half bulkhead is a rigid GFRP molding. It bonds to the bottom of the fuselage shell just aft of the B-bulkhead. It has a guide bearing for the elevator control pushrod and holes for the rudder control cables. It has a cut-out on the right side for a cable conduit.

M. Ring-Bulkhead #1

The ring bulkhead #1 is a rigid GFRP molding. It bonds to the fuselage shell just aft of the half bulkhead. It has holes for the elevator control pushrod and the rudder control cables. It has a cut-out on the right side for a cable conduit.

N. Ring-Bulkhead #2

The ring bulkhead #2 is a rigid GFRP molding. It bonds to the fuselage shell half way along the rear fuselage. It has a guide bearing for the elevator control pushrod and holes for the rudder control cables. It has a cut-out on the right side for a cable conduit.

O. Ring-Bulkhead #3

The ring bulkhead #3 is a rigid GFRP molding. It bonds to the fuselage shell just forward of the vertical stabilizer. It has holes for the elevator control pushrod and the rudder control cables. It has a cut-out on the right side for a cable conduit.

P. Ring-Bulkhead #4

The ring bulkhead #4 is a rigid GFRP molding. It bonds to the fuselage shell below the vertical stabilizer. It has a very large cut-out for the elevator control pushrod, the rudder control cables and a cable conduit.

Q. Vertical Stabilizer Lower Rib

The vertical stabilizer lower rib is a rigid GFRP molding. It bonds to the fuselage shell at the bottom of the vertical stabilizer. It also bonds to the spar, vertical stabilizer. It has a large slot for the elevator control pushrod. It has a mount for the VHF antenna at the front.

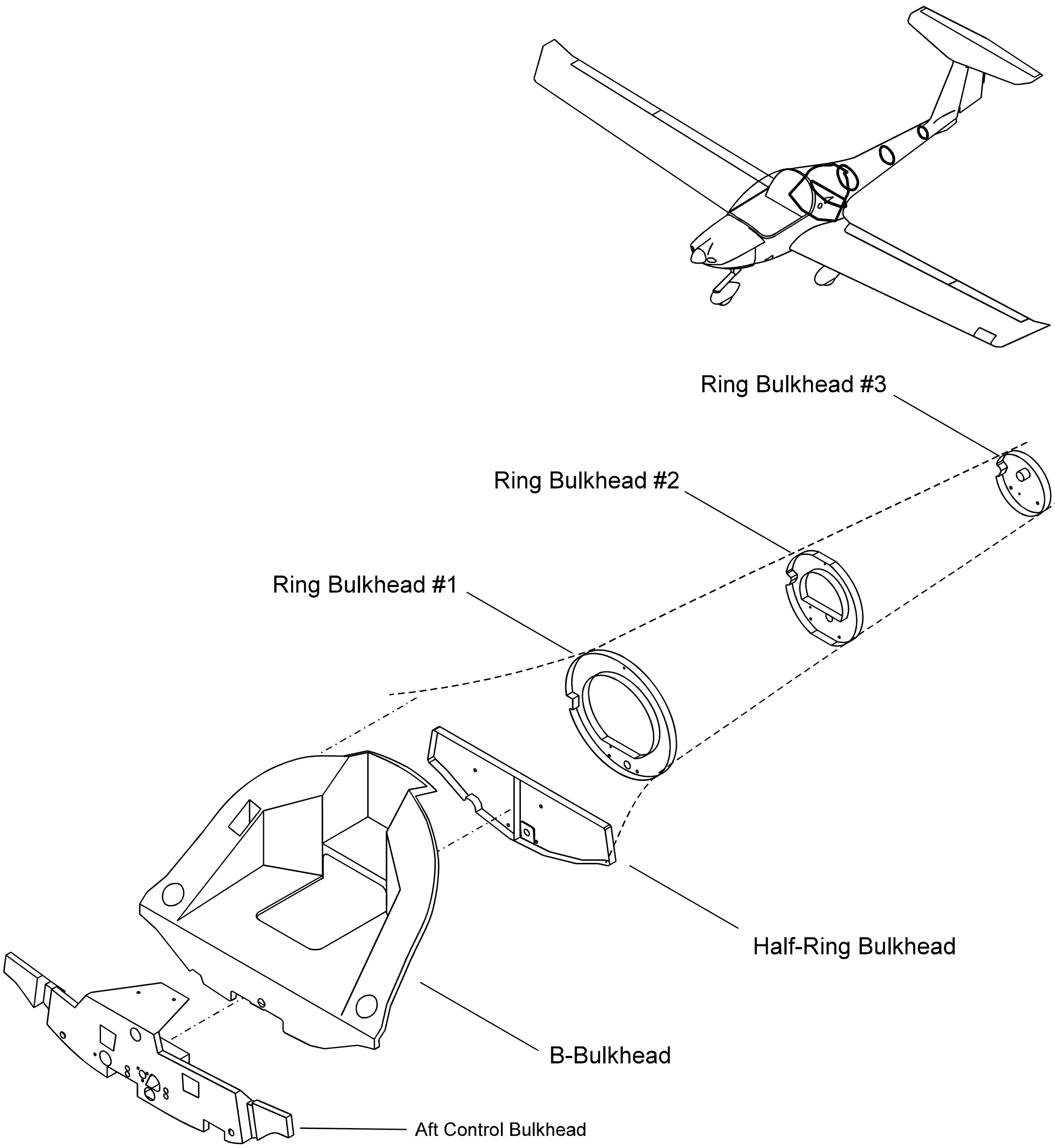

Figure 3 - Rear Fuselage Structure

R. Vertical Stabilizer Upper Rib

The vertical stabilizer upper rib is a rigid GFRP molding. It bonds to the fuselage shell at the top of the vertical stabilizer. It also bonds to the spar, vertical stabilizer. It has the mountings for the horizontal stabilizer.

S. Vertical Stabilizer Spar

The vertical stabilizer spar is a rigid GFRP molding. It bonds to the fuselage shell. It also bonds to the upper and vertical stabilizer lower ribs. The spar has mounting points for these components:

- The elevator bellcrank
- The elevator trim actuator
- The rudder top bearing
- The rudder bottom bearing.

Two anti-flutter brackets bond to the skin and also half way up the spar. The brackets prevent the skin from vibrating in the airflow.

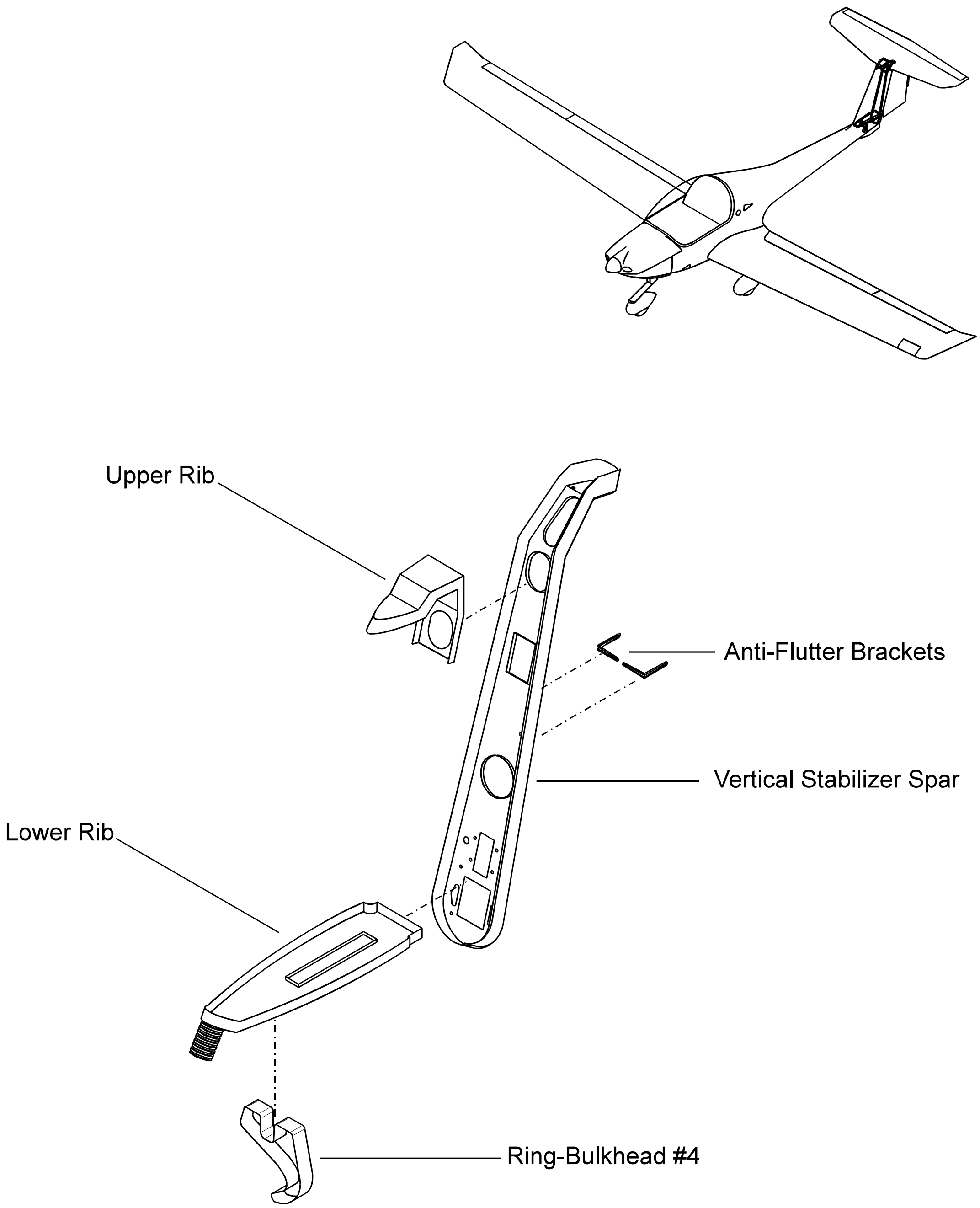

Figure 4 - Vertical Stabilizer Structure

FUSELAGE - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to do a high temperature paint repair of a cowling and in the area underside of the aircraft flight compartment, aft of the engine.

2. High Temperature Paint Repair of a Cowling

NOTE: An equivalent procedure can be used to repair damage in the area underside of the aircraft flight compartment, aft of the engine. This area is a fixed part of the aircraft structure.

	Detail Steps/Work Items	Key Items/References
1.	Remove the cowling that requires repair.	Refer to AMM Chapter 71-10.
2.	Put the cowling on a satisfactory work stand to permit clear access to the area that requires repair.	Make sure that the outside of the cowling is on a protective surface so that it will not be damaged.
3.	Carefully examine the cowling and identify the area(s) that require(s) repair.	At each step of the repair, complete all areas of the cowling in need of repair for that sequence.
4.	Make an estimate of the repair(s) required, and then get the materials and safety equipment satisfactory for the job.	For approved materials and suppliers, refer to AMM Chapter 51-00.

WARNING: OBEY THE SAFETY PRECAUTIONS THAT FOLLOW WHEN YOU DO WORK WITH COMPOSITE MATERIALS:

- DO THE WORK IN AN AREA THAT HAS A GOOD FLOW OF CLEAN AIR
- USE APPROVED EYE, MOUTH, AND BODY PROTECTION. SMALL PARTICLES CAN GO THROUGH USUAL CLOTHING
- DO NOT LET THE MATERIALS TOUCH YOUR EYES, MOUTH, OR SKIN
- IF IRRITATION OCCURS, GET MEDICAL AID IMMEDIATELY
- OBEY THE MANUFACTURER'S INSTRUCTIONS
- DO NOT USE CHEMICAL PAINT REMOVERS. TO REMOVE PAINT FROM COMPOSITES THAT HAVE RESIN, USE ABRASIVE MATERIALS
- DO NOT USE POWER TOOLS TO MAKE A SURFACE ROUGH.

WARNING: YOU CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO EQUIPMENT IF ABOVE SAFETY PRECAUTIONS ARE NOT OBEYED.

	Detail Steps/Work Items	Key Items/References
5.	Prepare the area(s) of the cowling for the application of the high temperature paint, as follows:	For approved materials and suppliers, refer to Chapter 51-00.
	- If dirt or grease is present, wash the area with clean carbon tetrachloride or acetone. Wipe the area off immediately	
	- Abrade the surface with 280 grit sandpaper	Make sure that you do not damage the laminate. Only remove the transparent top coat and the fire resistant paint.
	- Remove the dust with a fully opened tack cloth	
	- Cover the area(s) of the cowling that will not be painted. Use masking tape to hold the cover(s) in place.	

WARNING: OBEY THE SAFETY PRECAUTIONS THAT FOLLOW WHEN YOU USE PAINTS:

- USE SAFETY GOGGLES
- USE SAFETY CLOTHING
- DO NOT LET PAINTS TOUCH YOUR SKIN, EYES, OR MOUTH
- PAINTS ARE POISONOUS
- IF IRRITATION OCCURS, GET MEDICAL AID
- DO THE WORK IN AN AREA THAT HAS A GOOD FLOW OF AIR
- DO THE WORK IN AN AREA THAT DOES NOT HAVE SPARKS, FLAME, OR HOT SURFACES.
- OBEY THE MANUFACTURER'S INSTRUCTIONS.
- THE TEMPERATURE MUST BE BETWEEN 65 AND 120 ^{o}F (18 AND 49 ^{o}C).
- THE RELATIVE HUMIDITY MUST BE BETWEEN 25 AND 80 PERCENT.

WARNING: YOU CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO EQUIPMENT IF ABOVE SAFETY PRECAUTIONS ARE NOT OBEYED

	Detail Steps/Work Items	Key Items/References
6.	Apply the first coat of fire resistant paint with a splatter spray gun, a brush or a roller to a minimum thickness of 0.010 in (250 microns).	For approved materials and suppliers, refer to Chapter 51-00. Make sure that the painting is done in a dust free area.
7.	Let the fire resistant paint dry, in a dust free area, for a minimum of four hours.	The following drying times refer to a normal climate of 23 ºC and 50% humidity: - Dust-free - after 2 hours minimum - Maskable - after 8 hours minimum - Recoatable - after 4 hours minimum (no maximum) - Transparent Top Coat Application - after 24 hours minimum - Transportable - after 8 hours minimum - Full Cure - after 7 days. - Force Dry - Not applicable
8.	Remove any dust that has collected with a fully opened tack cloth.	
9.	After a minimum of four hours, apply the second coat of fire resistant paint with a splatter spray gun, a brush or a roller to a minimum thickness of 0.010 in (250 microns).	Make sure that the painting is done in a dust free area.
10.	Let the fire resistant paint dry, in a dust free area, for a minimum of 24 hours.	
11.	Before the transparent top coat is applied, remove any dust that has collected with a fully opened tack cloth.	
12.	Apply the first coat of transparent top coat with a high pressure sprayer as an even cross coat as follows: For product 9008B0900D: For product CA8720M0900C:	For approved materials and suppliers, refer to Chapter 51-00. Make sure that the painting is done in a dust free area. - Spray viscosity - (ISO 4) - Orifice - 0.060 in (1.5 mm) - Pressure - 3 to 5 bar (40 to 70 PSI). - Spray viscosity - (ISO 4) 27 - 40 sec. - Orifice - 0.060 in (1.5 mm) - Pressure - 3 to 4 bar (40 to 58 PSI).
13.	Allow it to dry for 30 to 45 minutes and apply the second coat.	

	Detail Steps/Work Items	Key Items/References
14.	Apply the two cross coats to achieve the required thickness.	Film thickness: For the first coat: 25 microns For the second coat: 35 microns. Total thickness: 60 microns (0.002 in or 2.3 mil)
15.	Let the transparent top coat dry, in a dust free area as follows: For product 9008B0900D: For product CA8720M0900C:	The following drying times refer to a normal climate of 23 ºC and 50% humidity: - Dry to Tape: 10 to 14 hours - Full cure: 7days - Dry to Tape: 3 to 4 hours - Full cure: 7days
16.	Remove and discard the cover(s) and masking tape from the cowling. Remove any dust that has collected with a fully opened tack cloth.	
17.	Visually inspect the completed high temperature paint repair(s). Make sure that there are no defects, such as bubbles, pinholes, craters, chips, scratches or abrasions.	
18.	Install the cowling.	Refer to AMM Chapter 71-10.

CHAPTER 55-00
STABILIZERS

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STABILIZERS

1. General

The DA20-C1 aircraft has the usual stabilizers. The vertical stabilizer is part of the fuselage. The aft part of the left and right fuselage shells make the left and right shells of the vertical stabilizer. Refer to Chapter 53-10 for data on the fuselage structure.

The horizontal stabilizer has top and bottom shells. Each shell has GFRP skins with a rigid foam core. The horizontal stabilizer has a main spar. The main spar holds the attachment bracket. Center ribs fore and aft give strength to the center area. A trailing edge web holds the hinges for the elevator.

The elevator has top and bottom shells. Each shell has GFRP skins with a rigid foam core. The bottom shell also makes the leading edge spar. The hinges attach to the bottom shell. A large horn with the mass balance weight attaches to the bottom shell at the center.

The lower fin is a GFRP molding. Bolts attach the lower fin to the bottom of the fuselage.

The rudder has left and right shells. Each shell has GFRP skins with a rigid foam core. The shells bond together at a flange. The hinges attach to the top face of the rudder and a flat face near the bottom of the leading edge. The horn near the top makes the rudder mass balance.

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HORIZONTAL STABILIZER

1. General

The DA20-C1 aircraft has the usual horizontal stabilizer. The horizontal stabilizer attaches to the top of the vertical stabilizer. The elevator attaches to the trailing edge of the horizontal stabilizer. Refer to Chapter 55-20 for data about the elevator structure.

2. Description

The horizontal stabilizer has top and bottom shells. Each shell has GFRP skins with a rigid foam core. The top shell has no cut-outs. The bottom shell has a large cut-out at the rear for the elevator horn and mass balance. It also has two small triangular holes forward and aft of the front rib.

The horizontal stabilizer has a main spar. The spar has GFRP skins with a rigid foam core. It also has top and bottom flanges. The main spar bonds to the top and bottom shells with bonding paste.

The main spar has four holes for the mount plate. You can get access to the attachment bolts from below. The mount plate goes down through the large cut-out in the bottom shell. Four more holes in the bottom part of the mount plate attach to the vertical stabilizer top rib.

Fore and aft center ribs give strength to the center area. Both ribs are rigid GFRP moldings. They bond to the other components with bonding paste. The front rib has a triangular shape.

The aft rib has sides with bends and a top face which joins the sides. It closes the sides of the large cut-out in the bottom shell. The aft part has three holes on each side for the center hinge plates for the elevator.

Left and right trailing edge webs close the trailing edges of the top and bottom shells. The webs also hold the hinges for the elevator. Small holes in the bottom shell give access to the nuts which attach the hinges. The webs bond to the top and bottom shells and the aft rib with bonding paste.

A small GFRP rib at each side closes the elevator cut-out. The rib bonds to the other components with bonding paste.

A rigid GFRP fairing goes around the joint between the horizontal stabilizer and the vertical stabilizer. Four screws attach the fairing to the vertical stabilizer.

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HORIZONTAL STABILIZER - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the horizontal stabilizer.

2. Remove/Install the Horizontal Stabilizer

Refer to Figure 201.

A. Remove the Horizontal Stabilizer

NOTE: Use 2 persons to remove/install the horizontal stabilizer.

	Detail Steps/Work Items	Key Items/References
1.	Remove the horizontal stabilizer fairing. - Remove the four screws.	
2.	Remove the bolt that connects the elevator vertical control rod to the elevator horn.	
3.	Remove the two bolts that connect the lower mounting bracket to the upper mounting bracket.	
4.	Remove the four bolts that attach the horizontal stabilizer mount plate to the vertical stabilizer.	Hold the horizontal stabilizer.
5.	Lift the horizontal stabilizer clear of the aircraft.	Use 2 persons.

B. Install the Horizontal Stabilizer

	Detail Steps/Work Items	Key Items/References
1.	Put the horizontal stabilizer in position on the vertical stabilizer.	Use 2 persons.
2.	Install the four mounting plate attaching bolts.	Torque to 15.2 lbf-ft (20.6 Nm)
3.	Install the two bolts that connect the lower mounting bracket to the upper mounting bracket.	Torque to 4.6 lbf-ft (6.24 Nm).
4.	Install the bolt which connects the elevator vertical control rod to the elevator horn.	Torque to 1.2 lbf-ft (1.7 Nm). Make sure that the fork of the elevator trim actuator engages the spring mount on the control rod.
5.	Do a test for correct, full and free movement of the elevator control. If necessary, adjust the elevator control.	Refer to Chapter 27-30.
6.	Install the horizontal stabilizer fairing. - Install the four screws.	

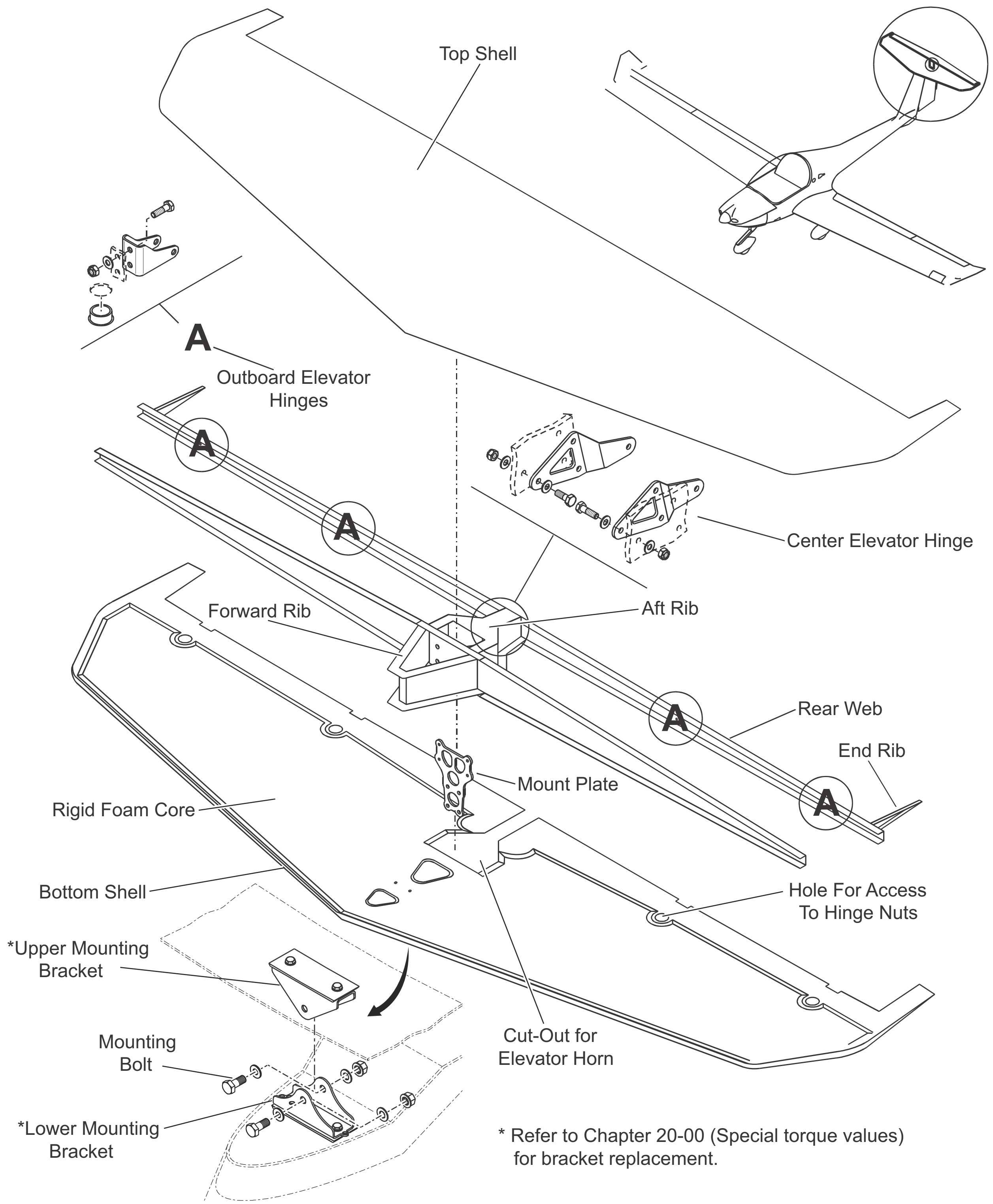

Figure 201 - Horizontal Stabilizer Structure

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ELEVATOR

1. General

The DA20-C1 aircraft has the usual elevator. The elevator attaches to the rear web of the horizontal stabilizer. Refer to Chapter 27-30 for data about the elevator controls.

2. Description

Figure 1 shows the elevator structure.

The elevator has top and bottom shells. Each shell has GFRP skins with a rigid foam core. The bottom shell also makes the leading edge spar. The top edge of the leading edge spar has a flange which goes forward. The shells bond together at this flange and at the trailing edge.

The hinges attach to the bottom shell. Each hinge is a small metal block with a bush. A bolt holds the block to the leading edge spar. A small hole in the bottom shell near each hinge gives access to the attachment.

A large horn attaches to the bottom shell at the center. The attaching bolts for the horn go into the elevator shells at the leading and trailing edges. The top shell has an access hole for the front bolt.

The horn has a hole with a bush for the elevator control rod. The front of the horn has the elevator mass balance weight.

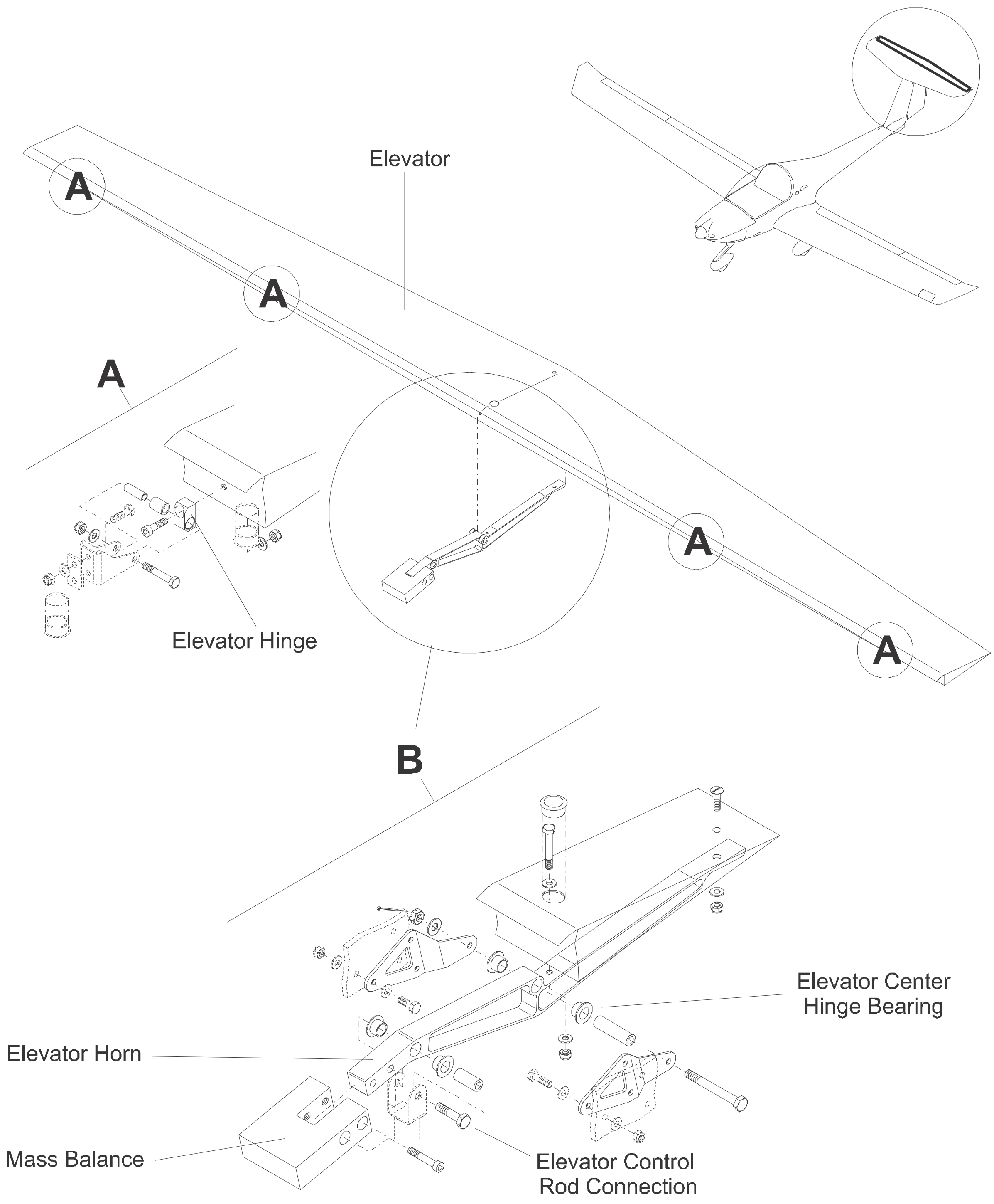

Figure 1 - Elevator Structure

ELEVATOR - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the elevator. Refer to Chapter 27-30 for adjustment data for the elevator control system.

2. Remove/Install the Elevator

A. Remove the Elevator

NOTE: Use 2 persons to remove/install the elevator. Or use control clamps to hold the elevator in position while you remove/install the attaching bolts.

	Detail Steps/Work Items	Key Items/References
1.	Remove the horizontal stabilizer fairing. - Remove the four screws.	
2.	Remove the bolt that connects the elevator vertical control rod to the elevator horn.	
3.	Remove the five elevator hinge bolts.	Hold the elevator. There are two bolts outboard at each side and one center bolt through the control horn.
5.	Lift the elevator clear of the aircraft.	

B. Install the Elevator

	Detail Steps/Work Items	Key Items/References
1.	Put the elevator in position on the horizontal stabilizer.	Use 2 persons.
2.	Install the five hinge bolts.	There are two bolts outboard at each side and one center bolt through the control horn. Refer to Chapter 20 for standard torque values.
3.	Install the bolt which connects the elevator vertical control rod to the elevator horn.	Make sure that the fork of the elevator trim actuator engages the spring mount on the control rod.

	Detail Steps/Work Items	Key Items/References
4.	Do a test for correct, full and free movement of the elevator control. If necessary, adjust the elevator control.	Refer to Chapter 27-30.
5.	Install the horizontal stabilizer fairing. - Install the four screws.	

LOWER FIN

1. General

   The lower fin has three functions. It helps give directional stability. It makes a tail-bumper. It also has a tie-down point.

2. Description

   Figure 1 shows the lower fin. The lower fin is a rigid GFRP molding. Five screws attach the lower fin to the bottom of the fuselage. The bottom aft corner has a hole for a tie-down rope. Some lower fins may be filled with ballast made up of lead shot and epoxy.

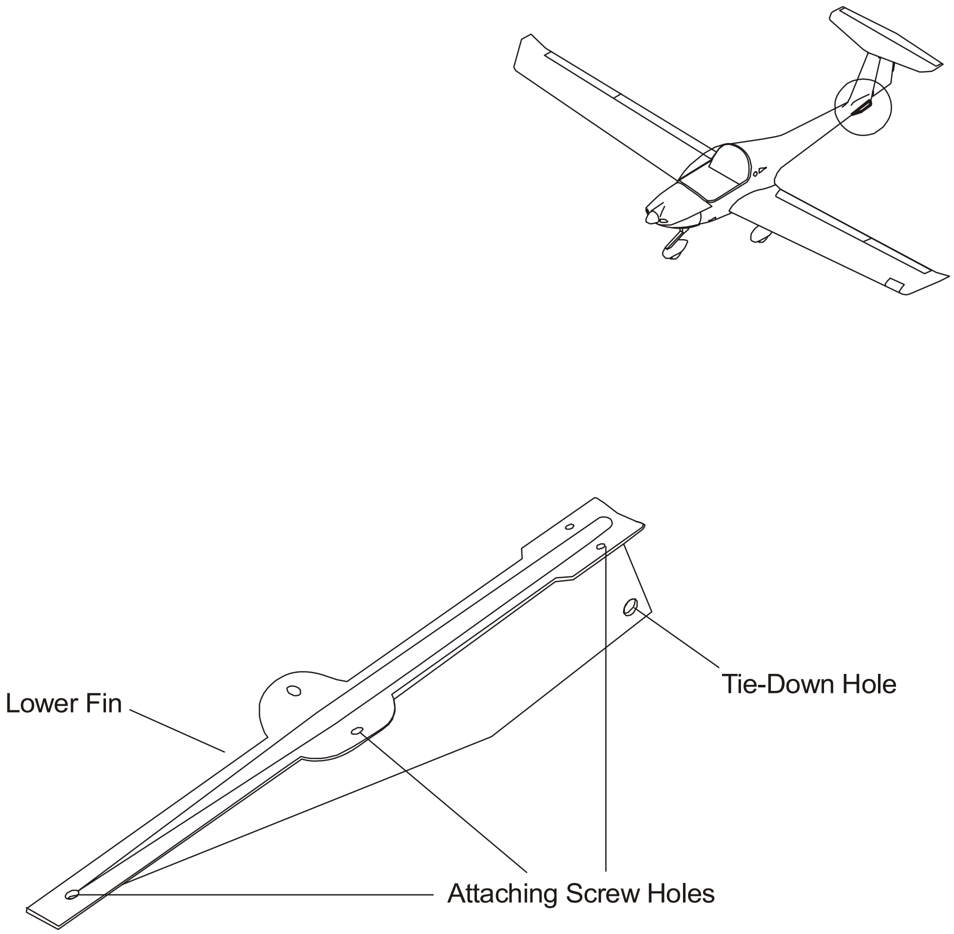

Figure 1 - Lower Fin

LOWER FIN - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the lower fin.

NOTE: If the lower fin is being replaced and the lower fin contains ballast:

- Measure weight of old lower fin;
- Add ballast to new lower fin to get same weight; and
- Use lead balls and epoxy.

Refer to Chapter 51.

2. Remove/Install the Lower Fin

A. Remove the Lower Fin

	Detail Steps/Work Items	Key Items/References
1.	Remove the adhesive tape that seals the joint between the lower fin and the fuselage.	
2.	Remove the five screws that attach the fin to the fuselage.	Hold the fin.
3.	Remove the lower fin from the aircraft.	

B. Install the Lower Fin

	Detail Steps/Work Items	Key Items/References
1.	Put the lower fin in position under the rear fuselage.	
2.	Install the five screws that attach the lower fin.	Seal the joint with Marine Sealant 3M 4000UV P/N 06586.

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RUDDER AND TAB

1. General

   The DA20-C1 aircraft has the usual rudder. The rudder attaches to the spar of the vertical stabilizer. Refer to Chapter 27-20 for data about the rudder controls.

2. Description

   Figure 1 shows the rudder structure.

   The rudder has left and right shells. Each shell has GFRP skins with a rigid foam core. The shells bond together all around with bonding paste.

   The rudder has two pivots. The top pivot pin bonds to the top face of the shells near the leading edge. The top pivot has a bushing. This bushing is a sacrificial point and will require periodic replacement. The bottom pivot is part of the rudder support-bracket assembly. The rudder lower mounting plate (also part of the rudder support-bracket assembly) attaches to the bottom of the leading edge.

   The rudder has a mass balance weight inside the top part of the leading edge. The mass balance weight is bonded to the rudder structure during manufacture.

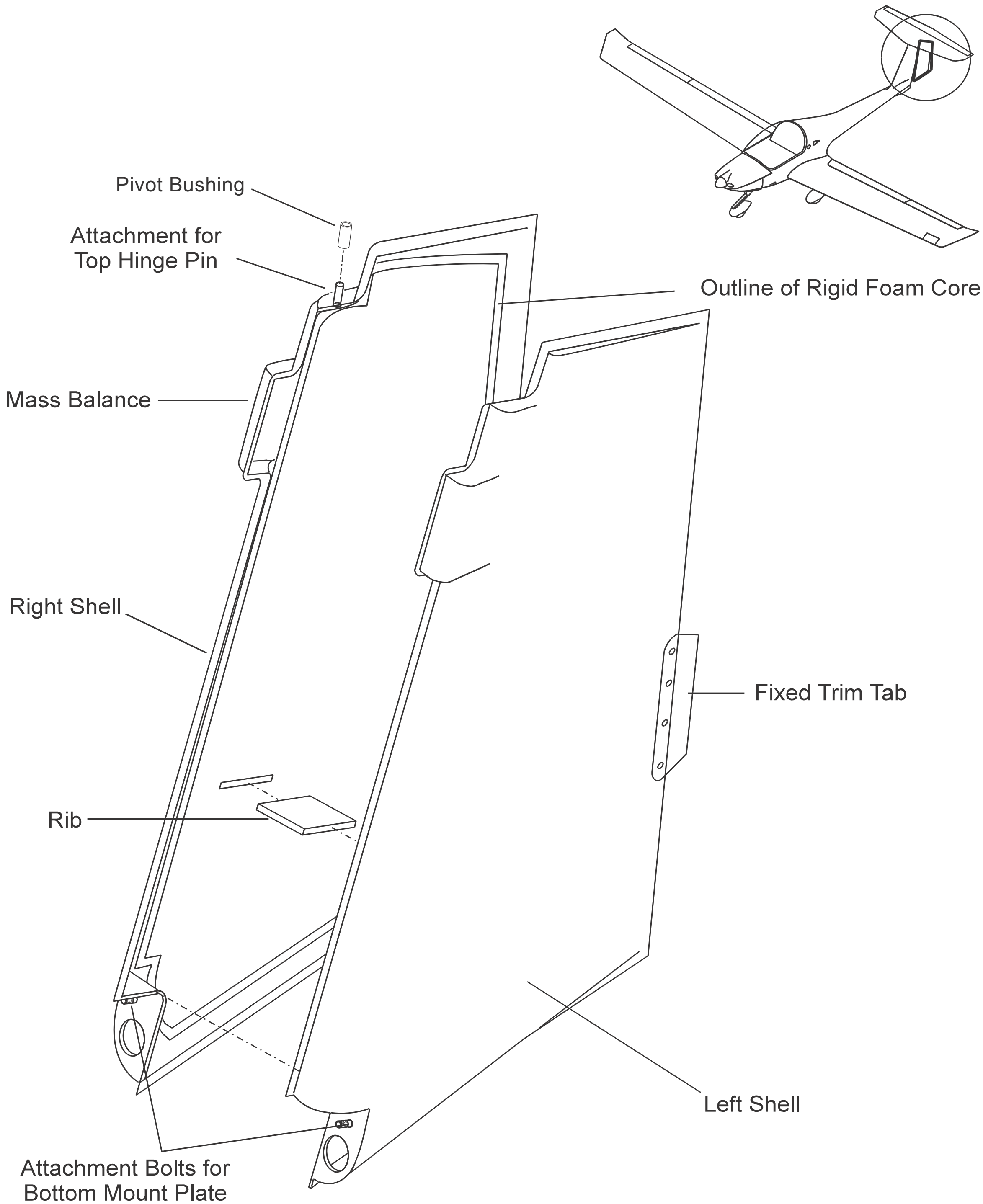

Figure 1 - Rudder Structure

RUDDER AND TAB - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the rudder. Refer to Chapter 27-30 for adjustment data for the rudder controls.

2. Remove/Install the Rudder

A. Remove the Rudder

Figure 201 shows the rudder installation.

NOTE: Use two persons to remove the rudder. Or use supports to hold the rudder in position while you remove/install the attaching bolts.

	Detail Steps/Work Items	Key Items/References
1.	Remove the two nuts and the washers that attach the rudder to the lower mounting plate.	Hold the rudder.
2.	Remove the rudder from the aircraft.	Move the bottom of the rudder aft, then down to release the top pivot.
3.	Inspect the bushing on the pivot rudder pin.	Make sure that the bushing is not loose or damage. Remove and replace bushing when loose or damaged. Apply adhesive Loctite 680 to the replacement bushing and install. Make sure that the bushing is free of adhesive on the outside surface.

B. Install the Rudder

	Detail Steps/Work Items	Key Items/References
1.	Put the rudder in position on the vertical stabilizer.	Make sure that the top pivot engages the rudder bearing plate.
2.	Install the two nuts and washers that attach the rudder to the lower mounting plate.	Hold the rudder. Refer to Chapter 20 for standard torque values.
3.	Do a test for correct, full and free movement of the rudder control. If necessary, adjust the rudder control.	Refer to Chapter 27-30.

3. Remove/Install the Top Pivot Bushing

A. Remove the Top Pivot Bushing

	Detail Steps/Work Items	Key Items/References
1.	Remove the rudder from the aircraft	Move the bottom of the rudder aft, then down to release the top pivot. Refer to Chapter 55-40-00.
2.	Clean/remove all lubrication from the top pivot.	
3.	Apply a small amount of heat using an appropriate heat source (i.e. heat gun) to soften the retaining 680 Loctite.	
4.	Apply a torsional force to the pivot bushing to break it feel from the pivot pin.	

B. Install the Top Pivot Bushing

	Detail Steps/Work Items	Key Items/References
1.	Clean the surface of the pivot pin.	
2.	Apply 680 Loctite to the pivot pin.	
3.	Install the pivot bushing over the pivot pin.	
4.	Clean all 680 Loctite from the outer bushing surface.	
5.	Install the rudder to the aircraft.	Refer to Chapter 55-40-00.

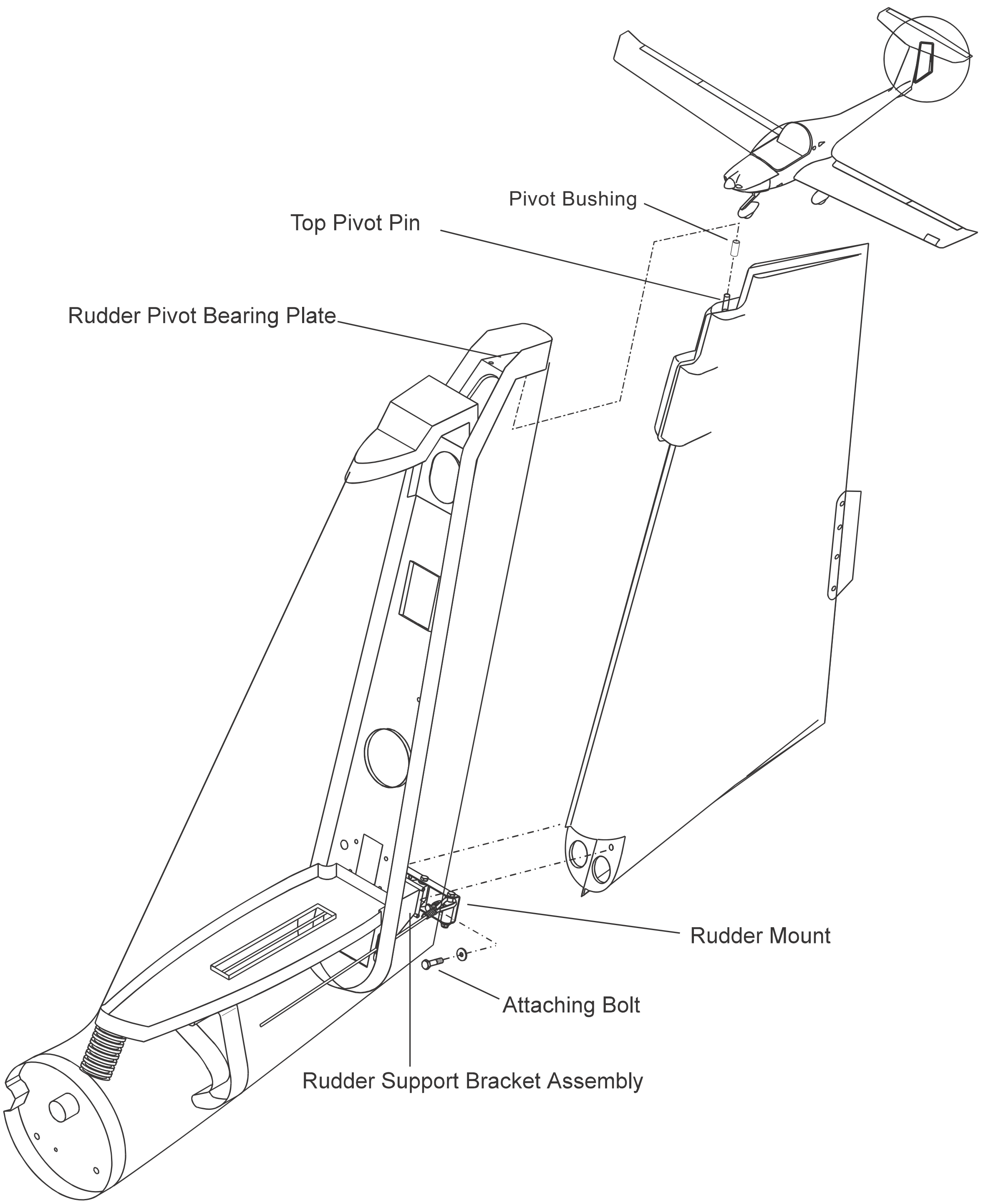

Figure 201 - Rudder Installation

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CHAPTER 56-00
WINDOWS

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WINDOWS

1. General

   Information on the principal canopy repair is given in this chapter.

2. Description

   The DA20-C1 aircraft has a one-piece lifting canopy. It has a carbon-fiber reinforced plastic (CFRP) frame and one large acrylic transparency. The transparency has two small emergency windows.

   The canopy has a hinge at the back and a stabilizing rod on each side. The support arms have counterbalance springs to help operate the canopy.

   A locking system locks the canopy closed. Two latch-levers operate the locking system. One lever is on the inside of the canopy on the left side. And one lever is on the inside of the canopy on the right side. Later model aircraft are equipped with handles located on the outside of the canopy in addition to the internal ones.

3. Removal and Installation

   Refer to Chapter 52-10.

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REPAIR OF THE CANOPY TRANSPARENCY

1. Damage Limits

You must scrap the canopy transparency when:

- The crack is more than 5.9 in (150 mm) long
- There is a crack stop drill hole in the shaded area, as shown in Figure 2.

Otherwise you can use the following repair information. If in doubt, you must contact the aircraft manufacturer, Diamond Aircraft Industries Canada.

2. Tools and Equipment

The following tools and equipment are required for the repair of the cockpit transparency:

- High speed grinder
- Drill
- UV light (cold).

3. Materials

The following materials are required for the repair of the cockpit transparency:

Item	Quantity	Part Number
Filler ACRYFIX 192	A/R	Commercial
Masking Tape	A/R	Commercial
Transparency polish (Micro - Gloss Liquid Abrasive)	A/R	Commercial

NOTE: A UV-light (cold) is required to cure ACRYFIX 192.

4. Fillers

To compensate for the shrinkage of the fillers during the cure process, the filler must be applied proud of the transparency surface. As this is not possible when repairing a vertical crack in-situ, a strip of masking tape must be rolled up over the repair while simultaneously applying the filler. This procedure must be repeated until the filler is proud of the transparency surface.

5. Temporary Repair to the Canopy Transparency

To prevent further propagation of cracks before a permanent repair is possible, stop-drill the ends of the crack with a 0.1 in (2.4 mm) diameter hole.

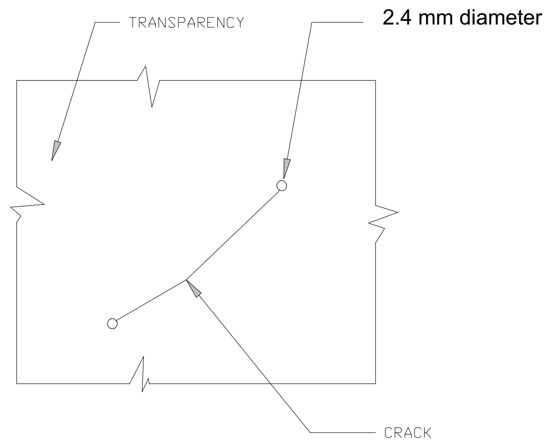


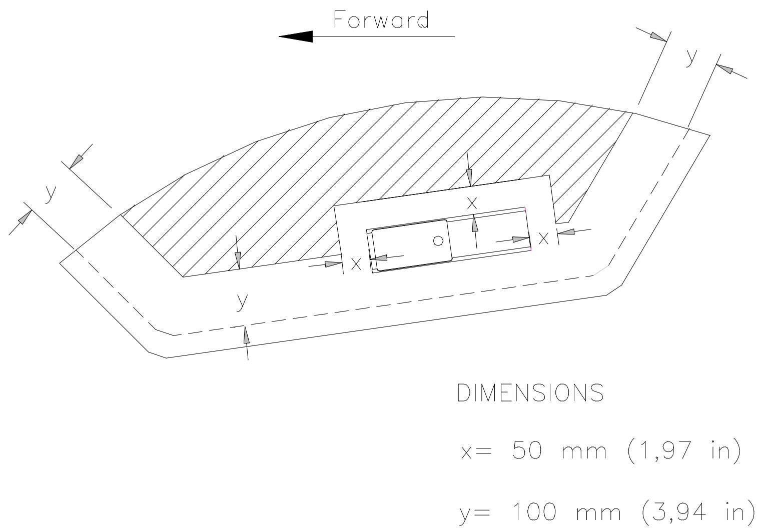
Figure 1 - Temporary Repair

6. Permanent Repair to the Canopy Transparency

To make a permanent repair, do the following standard procedure:

	Detail Steps/Work Items	Key Items/References
1.	If necessary, remove the canopy for the repair. Put the canopy on a firm working surface with the crack horizontal.	Refer to Chapter 52-10.
2.	If the canopy will stay on the aircraft for the repair, put protective covers over the inside of the cockpit.	
3.	Mask the area around the crack on the inner and outer surfaces of the canopy.	
4.	Use a high-speed grinder to cut a groove along the crack on the outer surface of the transparency.	Refer to Step 1 of Figure 3.
5.	On the outer surface, countersink the temporary stop-drill holes.	Refer to Step 1 of Figure 4.
6.	On the inner surface, seal-off the stop-drill holes with masking tape.	
7.	Apply filler to the groove and stop-drill holes until the filler is proud of the transparency surface. Leave the filler to cure.	Refer to Step 2 of Figures 3 and 4.

	Detail Steps/Work Items	Key Items/References
8.	Use a high-speed grinder to cut a groove along the crack on the inner surface of the transparency. Make sure that it cuts into the first layer of filler.	Refer to Step 3 of Figure 3.
9.	On the inner surface, countersink the filler of the temporary stop-drill holes to a depth of approx. 0.04 in (1 mm).	Refer to Step 3 of Figure 4.
10.	Apply filler to the groove and stop-drill holes until the filler is proud of the transparency surface. Leave the filler to cure.	Refer to Step 4 of Figures 3 and 4.
11.	Remove the masking tape from the surfaces of the canopy.	Refer to Step 5 of Figures 3 and 4.
12.	Grind the filler to the contour of the transparency surfaces and polish the repair with the recommended transparency polish.	
13.	If protective covers were used, remove them from the inside of the cockpit.	
14.	If the canopy was removed for the repair, install the canopy.	Refer to Chapter 52-10.



No Cracks are permitted in the shaded area.

The maximum crack length is 150 mm (5.9 in).

Figure 2 - Crack Limits

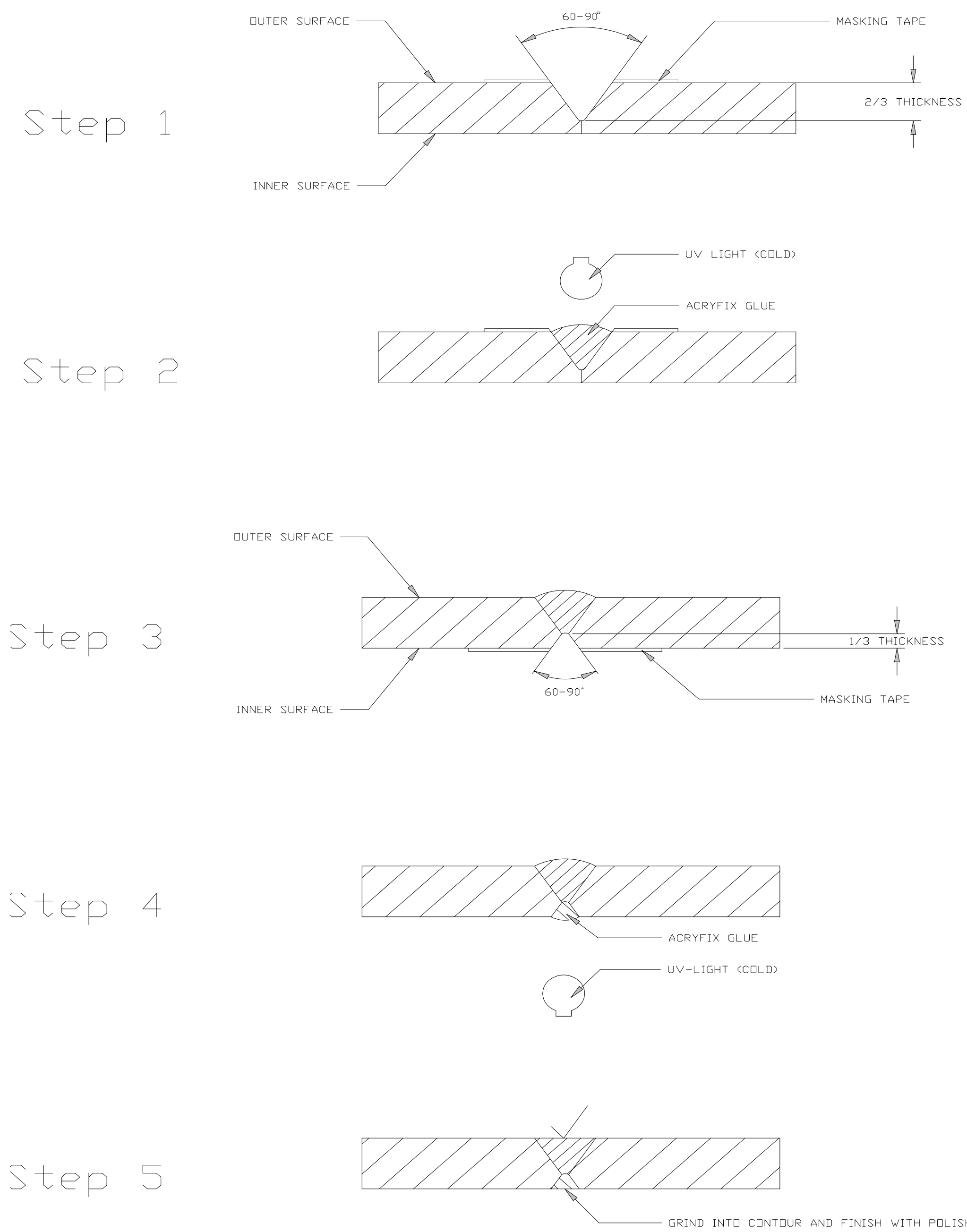


Figure 3 - Crack Repairs

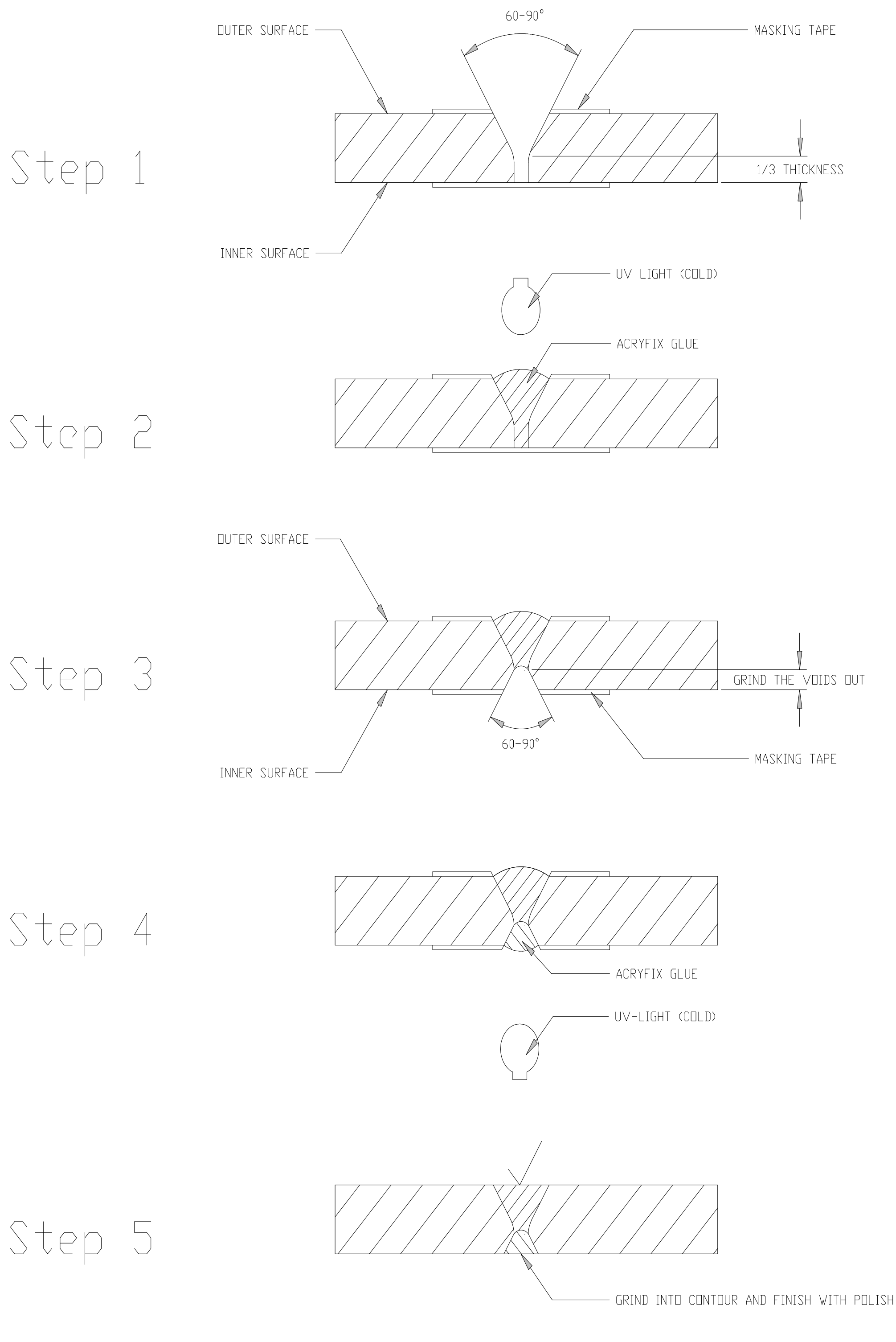


Figure 4 - Store-Drill Hole Repair

REPLACEMENT OF THE REAR WINDOW

1. Damage Limits

The rear windows must be replaced when the crack is more than 2.0 in. (51 mm) long and the windows are damaged. Follow the following replacement information or contact the aircraft manufacturer, Diamond Aircraft Industries, Canada for assistance.

2. Tools and Equipment

The following tools and equipment are required for the replacement of the rear window:

- High speed grinder
- Blade
- Drill
- Jigsaw
- Chisel.

3. Materials

The following materials are required for the replacement of the rear window:

Item	Quantity	Part Number
Adhesive, Terostat MS9380 Loctite 495	A/R	Commercial
Black paintable acrylic caulking PF224, black sealant	A/R	Commercial
Cleaner, Prekleeno 900	A/R	Commercial
Deleted.		
Masking Tape low residue	A/R	Commercial
Sandpaper	A/R	Commercial
Tape Flash Braker I, II	A/R	Commercial

4. Replacement of the Rear Window

Replace the rear window as follows:

	Detail Steps/Work Items	Key Items/References
CAUTION: WEAR MASK AND EYE PROTECTION WHEN GRINDING OUT EXISTING WINDOW. BE CAREFUL NOT TO DAMAGE THE SURROUNDING COMPOSITE STRUCTURE.		
1.	Tape fuselage around the window with 2.0 in. (51 mm) Tape Flash Braker II to protect the fuselage paint from scratches.	
2.	Drill a hole in the window close to the frame, large enough to insert a jigsaw.	
3.	Cut out window all around 3/4 in. (20 mm) from inner edge of fuselage bonding flange.	
4.	Separate the remaining acrylic from fuselage using a sharp blade or chisel and remove it.	Do not damage surrounding composite structure.
5.	Carefully grind or sand away any remaining adhesive from the bonding flange on the fuselage.	Use extreme care not to damage the surrounding composite or the bonding flange.
CAUTION: KEEP BONDING SURFACES CLEAN FROM OIL, DIRT, AND OTHER CONTAMINANTS. CAUTION: WEAR GLOVES, RESPIRATOR, AND EYE PROTECTION WHEN HANDLING RESIN, CLEANER, AND ADHESIVE.		
6.	Vacuum the frame and surrounding areas to remove any dust and debris.	
7.	Glue small gum rubber shims (5 mm x 5 mm) using Loctite 495 around the circumference of the flange to bring the glass flush to the fuselage skin.	There are approximately 12 shims used on the right hand window and 14 shims used on the left hand window.
8.	Pre-fit the acrylic window to the fuselage to make sure that it is correctly trimmed. There should be 3 mm (± 1 mm) gap between the edge of the glass and the edge of the recessed frame.	Refer to Figure 1.
9.	Centre the window vertically and horizontally to get even gaps all around.	
10.	Put match marks on the window and fuselage at the front, rear, top and bottom to allow alignment during bonding.	

	Detail Steps/Work Items	Key Items/References
11.	Remove all dust and debris from the bonding surfaces.	
12.	Prepare bonding surface of the window and the fuselage by sanding with 320 grit paper. Clean with pre-cleano cleaner.	Use the wipe on wet/wipe off dry method.
13.	Allow 20-30 minutes minimum for the cleaned areas to dry.	Allow longer dry times in cooler and/or humid conditions.
14.	Inspect for proper cleaning.	Refer to Chapter 52-10.
15.	Apply adhesive Terostat MS 9380 to the fuselage bonding flange. Apply one continuous bead.	Make sure that the bead cover most of the bonding flange.
16.	Install the window on the fuselage immediately.	Pot lifetime for adhesive Terostat MS 9380 is 10 minutes.
17.	Move the window to align the marks and to make the contour of the acrylic match that of the fuselage as closely as possible.	Avoid excess local pressure as this can lead to a wavy surface.
18.	Inspect for voids and for proper bond line.	
19.	Remove excess adhesive from gap between edge of acrylic and fuselage on the outside and at edge of bonding flange on the inside.	
20.	Apply enough flash tape to the exterior to provide an even and constant pressure.	
21.	Allow adhesive to cure for a minimum of 24 hours.	
22.	Inspect the window for any unbonded and/or voided areas or waviness.	
23.	Remove internal masking tape and external flashing tape.	
24.	Using fresh low residue masking or flash tape, mask off window edges and fuselage edges around gap.	
25.	Fill gap between window and fuselage with black paintable exterior acrylic caulk (PF224, black sealant)	Remove the excess black sealant with plastic scraper or spatula.

	Detail Steps/Work Items	Key Items/References
26.	Allow the caulk to cure overnight.	
27.	Remove masking or flash tape.	
28.	Mask off fuselage and window in preparation for paint application. Paint to original line on fuselage and extend paint line to cover frame line on window. Refer to Figure 2.	Refer to Chapter 51-00.

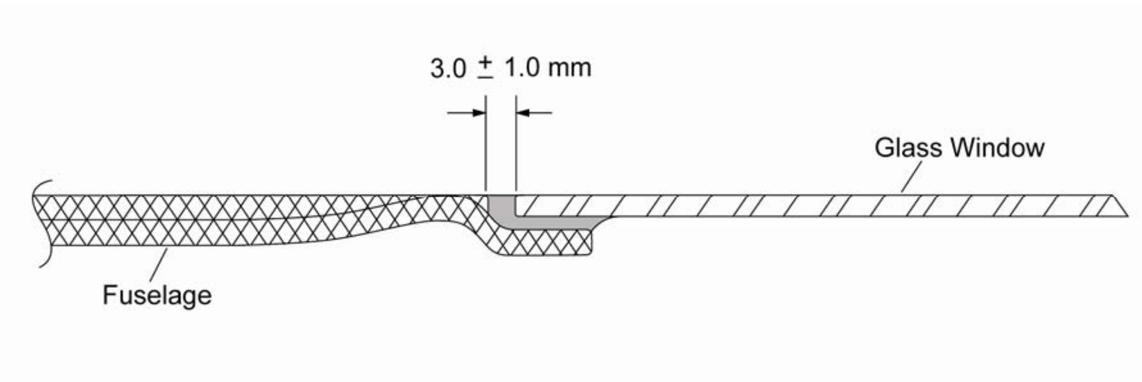


Figure 1 - Acceptable Fuselage and Glass Window Gap

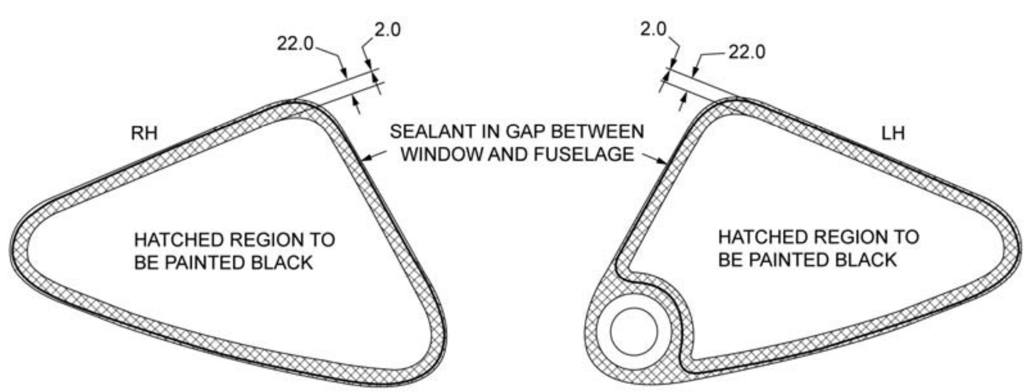


Figure 2 - Paint Dimension on Glass Window

CHAPTER 57-00
WINGS

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WINGS

1. General

The DA20-C1 aircraft has cantilever wings. The wings are set low on the fuselage. Each wing has a flap inboard on the trailing edge. There is an aileron on the outboard trailing edge.

The wings are monocoque structure. Each wing has top and bottom shells. The shells have GFRP skins and a rigid foam core. Each wing has an I-section spar. Carbon fiber rovings make the spar caps. Each wing also has rigid GFRP ribs and webs.

Refer to Chapter 27 for data on the control systems for the flaps and ailerons. Refer to Chapter 51 for general repair data.

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WING STRUCTURE

1. General

The DA20-C1 aircraft has composite wings. The main spar has carbon fiber spar-caps. The wing shells have GFRP skins and a rigid foam core. Rigid GFRP moldings give strength to the structure. Some also hold control levers or bearings.

Refer to the following Chapters:

- Chapter 57-50 for the data about the flaps
- Chapter 57-60 for the data about the ailerons
- Chapter 27-00 for data about the control systems.

2. Description

Figure 1 shows the wing structure. Bonding paste (thickened resin) bonds the wing components to each other. The wing has the following main parts:

A. Wing Shells

Each wing has top and bottom shells. Each shell has GFRP skins with a rigid foam core. The skins have many layers of glass cloth. Some areas have more layers to give more strength. In most cases, the fibers in the cloth lie at ±45° to the lateral axis.

The wing has an anti-vortex tip. The aft end of the wing tip has a mounting for the position light assembly.

The bottom shell of both wings has holes for access panels below the flap and aileron bellcranks. The bottom shell has a hole for an access panel below the B-bolt. This gives access to the B-bolt for removing the wings.

The outer leading edge of both shells in the left wing has a cut-out for the landing and taxi lamps.

A stall strip bonds to the leading edge of both wings at approximately 2/3 span.

B. Spar

The wing has an I-beam spar. Carbon fiber rovings make the spar caps. The number of rovings decreases from the root to the tip.

The spar has a shear web. The web has GFRP skins and a rigid foam core. Glass cloth fillets attach the spar caps to the shear web.

The inboard end of the spar is a stump. Many layers of glass cloth transmit the wing bending loads into the spar stump. The inboard end of the spar stump goes into the spar bridge in the fuselage. The inboard end has a large metal bush for the wing main pin. The main pin transmits the wing bending loads into the spar bridge.

C. Root Rib

The root rib has a forward part and an aft part. Both parts are rigid GFRP moldings with many layers of glass cloth. Many layers of glass cloth bond both parts of the root rib to the spar.

The forward root rib has a bearing housing for the A-bolt. The A-bolt is a small distance in front of the spar. The A-bolt transmits lift loads into the fuselage structure.

The aft part of the root rib has a bearing housing for the B-bolt. The B-bolt transmits some lift loads and lateral loads into the fuselage structure.

D. Aft Inner Web

The Aft Inner Web closes the rear of the wing in front of the flap. It is a rigid GFRP molding. Three rigid GFRP inserts in the web make mountings for the flap hinge brackets. The web goes from the root rib to the outer end of the flap.

E. Aft Outer Web

The Aft Outer Web closes the rear of the wing in front of the aileron. It is a rigid GFRP molding. Three rigid GFRP inserts in the web make mountings for the aileron hinge brackets. The web goes from the outer end of the flap to the outer end of the aileron.

F. Flap Control Support Rib

This small rib is close to the root rib. It is a rigid GFRP molding. It has a guide bearing for the flap control rod.

G. Flap Control Rib

The flap control rib is located half way along the aft inner web. It is a rigid GFRP molding with an insert. It has the mounting for the flap control bellcrank. It bonds to the aft face of the spar, the top and bottom shells and the aft inner web. It has a guide bearing for the aileron control rod.

H. Center Rib

The center rib is located half way along the wing. It is a rigid GFRP molding. It has a guide bearing for the aileron control rod. It bonds to the aft face of the spar, the top and bottom shells and the aft inner web.

I. Aileron Control Rib

The aileron control rib is located half way along the aft outer web. It is a rigid GFRP molding with an insert. It has the mounting for the aileron control bellcrank. It bonds to the aft face of the spar, the top and bottom shells and the aft outer web.

J. Aileron Mass Balance Rib

The aileron mass balance rib makes a cut-out for the aileron mass balance at the outboard end of the aft rear web. It is a rigid GFRP molding.

K. Tie-Down Insert

The tie-down insert gives strength to the tie-down point in the bottom shell.

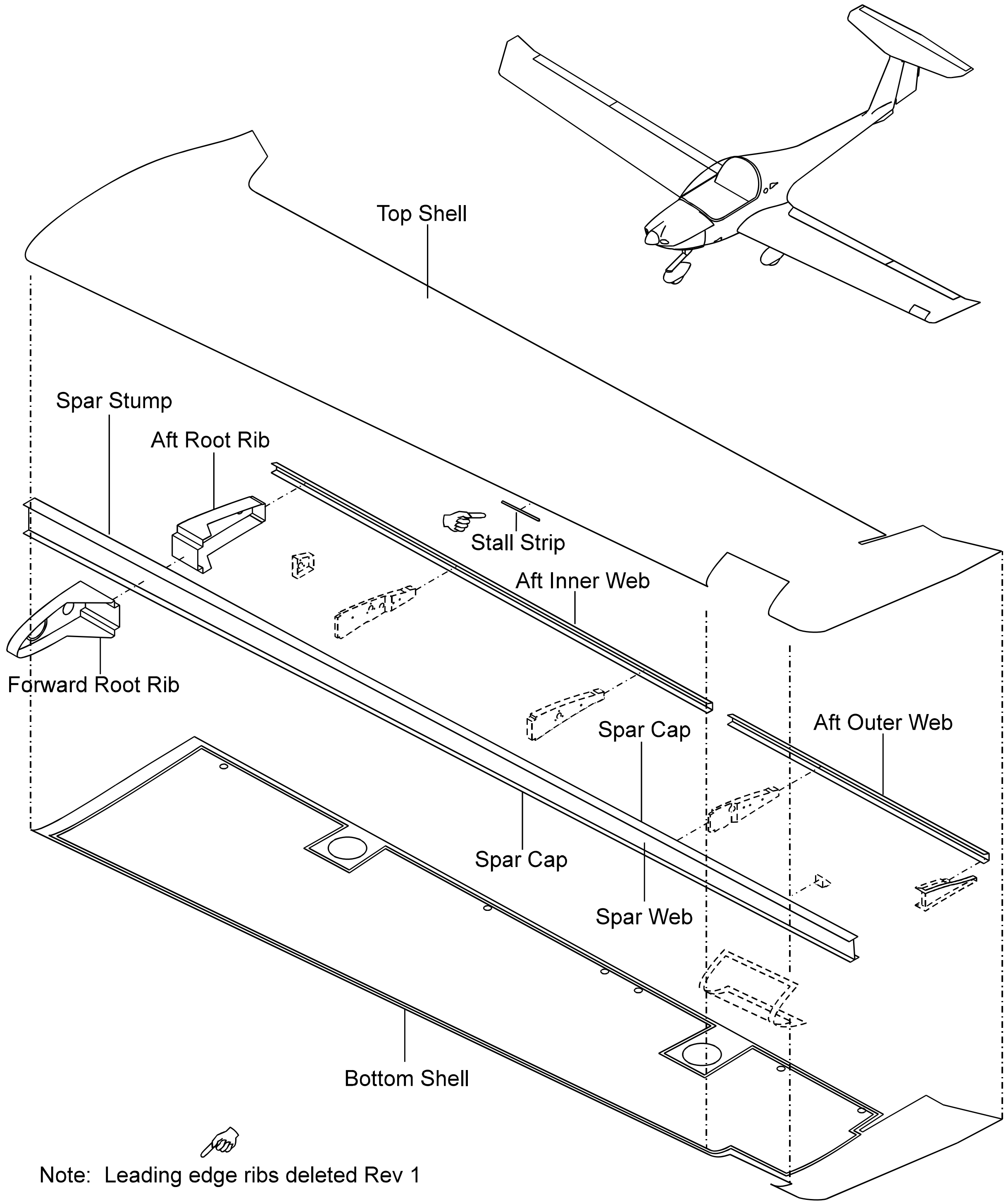

Figure 1 - Wing Structure - Shells, Spar, Root Rib and Webs

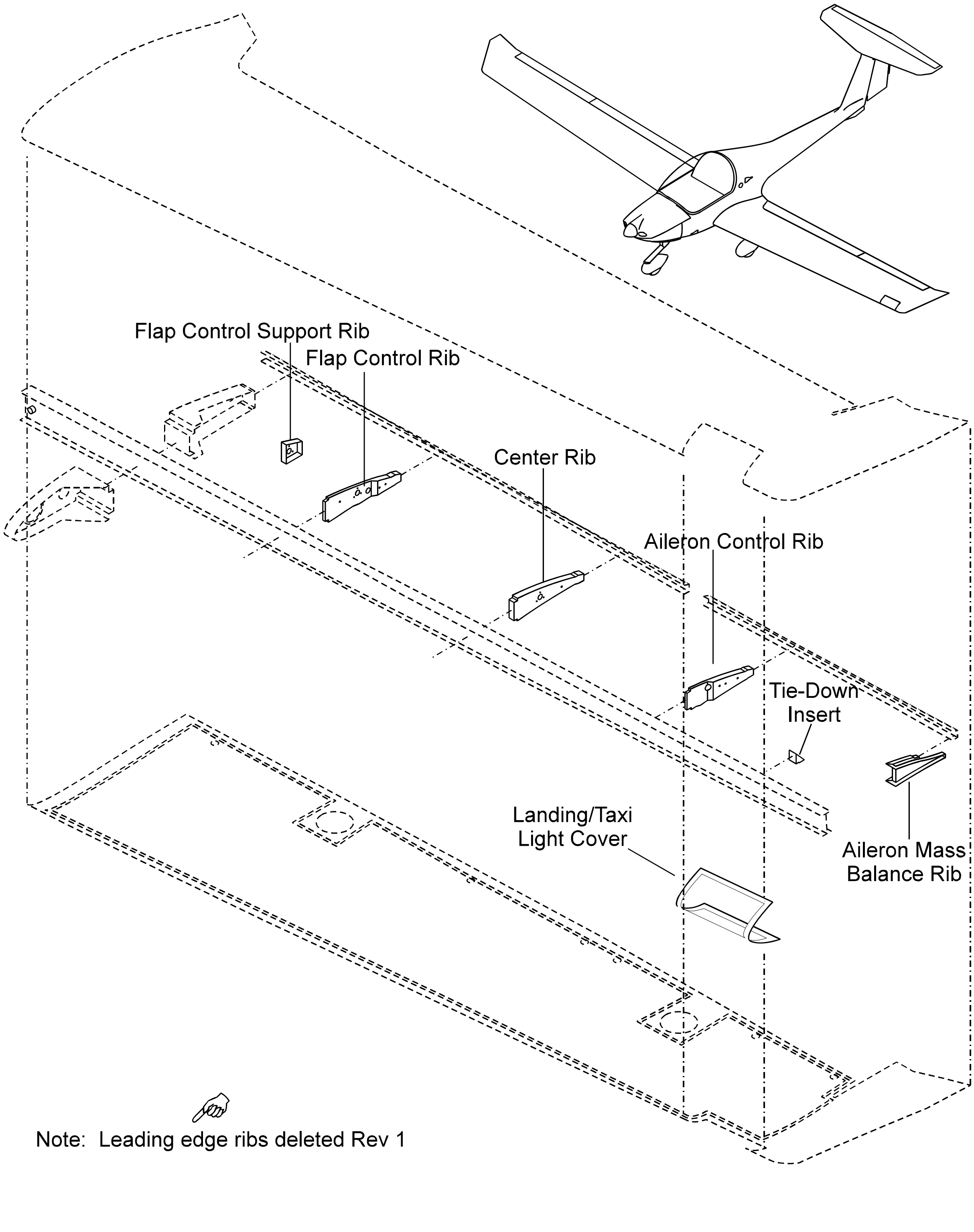

Figure 2 - Wing Structure - Ribs

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WING STRUCTURE - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- Remove and install the wings. The procedure is simple. You need no special tools. Remove/ Install the wing using 3 persons.

- Install a wing spar bushing to a new replacement wing.

2. Remove/Install the Wings

A. Equipment

Item	Quantity	Part Number
Wing Trestles	2	Commercial
Wing Stands	2	Commercial

B. Remove the Wings

	Detail Steps/Work Items	Key Items/References
1.	Remove the following items for access: - Pilots' seats. - Access panels below the fuselage for the control connections. - Access panels below the wing roots for the B-bolts.	 Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 52-40.
2.	Disconnect the aileron control rods at the bell-crank on the bulkhead, aft control.	Refer to Chapter 27-10. Through the panels below the fuselage.
3.	Disconnect the flap control rods at the bell-crank on the bulkhead, aft control.	Refer to Chapter 27-50. Through the panels below the fuselage.
4.	Put the trestles under the wings.	To touch the wing under the spar.
5.	Remove the nut and spacer from the B-bolt.	
6.	Release the locking device for the main bolts.	Pull it up against the spring. Then turn it 180°.
7.	Take the weight of the wing.	One person at the wing tip.
8.	Remove the main bolt.	If necessary, move the wing tip slightly up and down.

	Detail Steps/Work Items	Key Items/References
	CAUTION: DO NOT LIFT ON THE FLAP. ONLY LIFT ON THE WING STRUCTURE. OTHERWISE YOU MAY DAMAGE THE FLAP.	
9.	Move the wing outboard a small distance.	To give access to the connections at the wing root. Use one person on the wing tip, one person at the wing-root leading-edge, and one person at the wing-root trailing-edge.
10.	Let the trestle hold the weight of the wing.	
11.	Disconnect the electrical connector forward of the spar.	
12.	Disconnect the stall-warning hose forward of the spar.	Left wing only. The hose is 3/8 in. (10 mm) diameter. (Transparent Color)
13.	Disconnect the pitot hose forward of the spar.	Left wing only. The hose is 5/16 in. (8 mm) diameter. (Green Color)
14.	Disconnect the static hose forward of the spar.	Left wing only. The hose is 5/16 in. (8 mm) diameter. (Purple Color)
	CAUTION: DO NOT LIFT ON THE FLAP. ONLY LIFT ON THE WING STRUCTURE. OTHERWISE YOU MAY DAMAGE THE FLAP.	
15.	Move the wing away from the fuselage. Put the wing in the wing stand.	Use one person on the wing tip, one person at the wing-root leading-edge and one person at the wing-root trailing-edge.
16.	If necessary, do this procedure again for the other wing.	

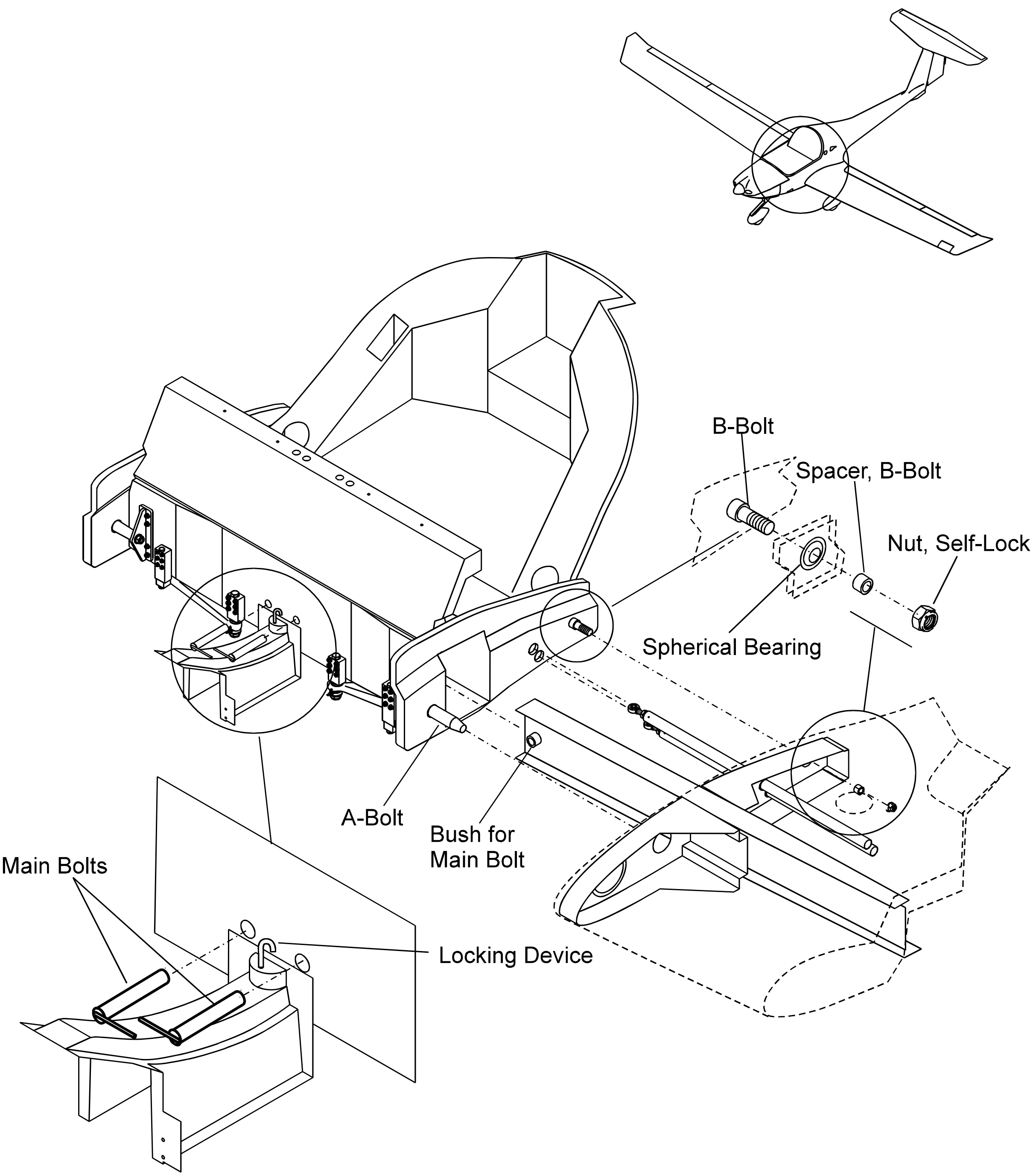

Figure 201 - Wing Attachment Bolts

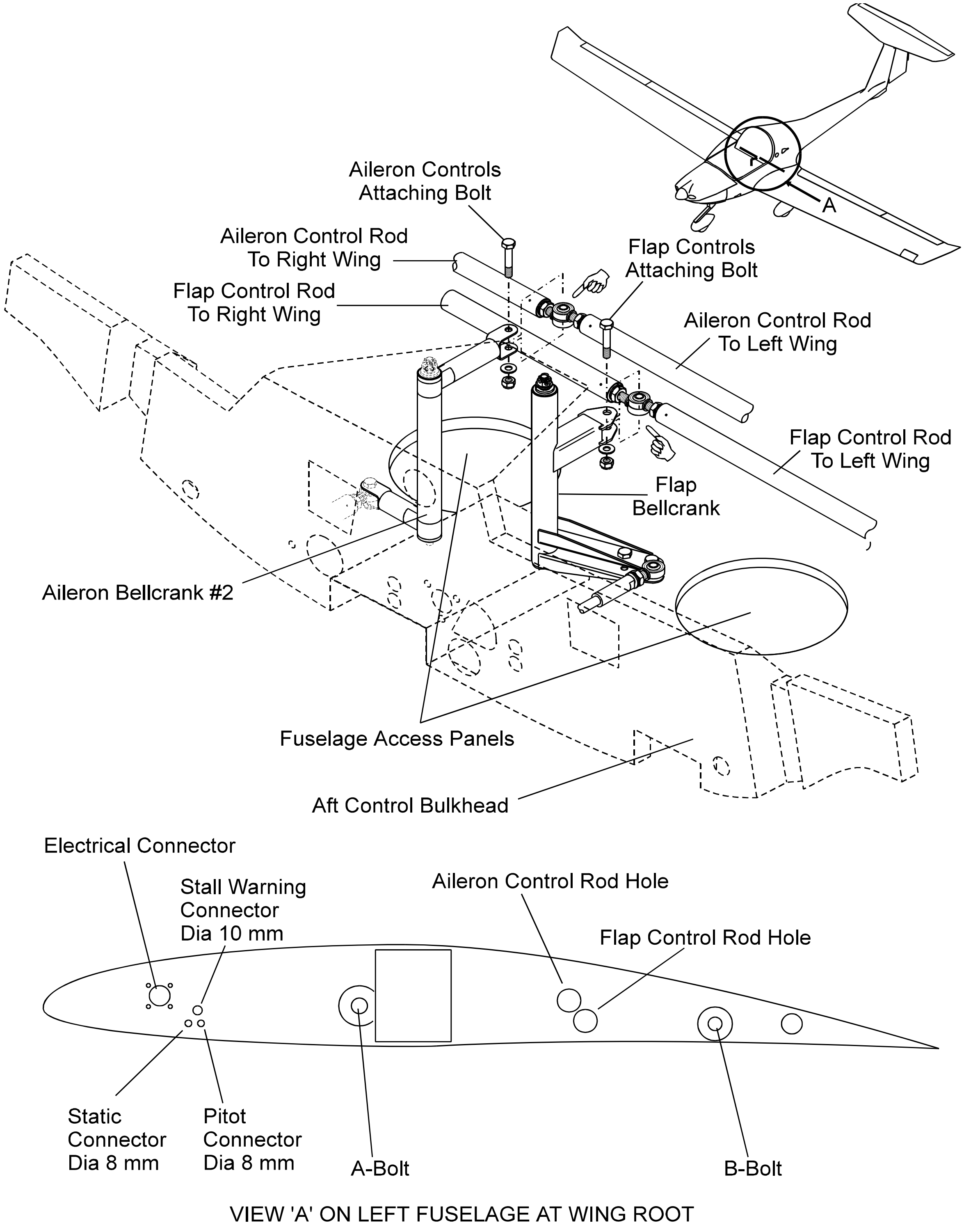

Figure 202 - Wing Connections

C. Install the Wings

	Detail Steps/Work Items	Key Items/References
	CAUTION: DO NOT GET GREASE ON THE THREADS OF THE B-BOLT. GREASE REDUCES THE FRICTION OF THE SELF-LOCKING NUT.	
1.	Clean and lubricate the mounting bolts.	Refer to Chapter 12-20.
	CAUTION: DO NOT LIFT ON THE FLAP. ONLY LIFT ON THE WING STRUCTURE. OTHERWISE YOU MAY DAMAGE THE FLAP.	
2.	Put the wing in position in the fuselage. Leave a gap for access to the system connections.	Use one person on the wing tip, one person at the wing-root leading-edge, and one person at the wing-root trailing-edge.
3.	Hold the wing with a trestle.	To touch the wing under the spar.
4.	Connect the static hose forward of the spar.	Left wing only. The hose is 5/16 in. (8 mm) diameter. (Purple Color)
5.	Connect the pitot hose forward of the spar.	Left wing only. The hose is 5/16 in. (8 mm) diameter. (Green Color)
6.	Connect the stall-warning hose forward of the spar.	Left wing only. The hose is 3/8 in. (10 mm) diameter. (Transparent Color)
7.	Connect the electrical connector forward of the spar.	
	CAUTION: DO NOT LIFT ON THE FLAP. ONLY LIFT ON THE WING STRUCTURE. OTHERWISE YOU MAY DAMAGE THE FLAP.	
8.	Move the wing inboard fully.	Use one person on the wing tip, one person at the wing-root leading-edge, and one person at the wing-root trailing-edge.
9.	Take the weight of the wing(s).	One person at each wing tip.
10.	Install the main bolt.	If necessary, move the wing tip(s) in a circular motion.
11.	Install the spacer and nut on the B-bolt.	Torque to 14.8 lbf-ft (20 Nm).
12.	Let the trestles hold the weight of the wing(s).	
13.	Do this procedure again to install the other wing.	

	Detail Steps/Work Items	Key Items/References
14.	Lock the handles of the main bolts with the locking device.	Pull it up against the spring. Then turn it to engage both of the handles.
15.	Remove the trestles under the wings.	
16.	Connect the flap control rods at the bellcrank on the bulkhead, aft control.	Refer to Chapter 27-50. Through the panels below the fuselage. Refer to Chapter 20 for standard torque values.
17.	Connect the aileron control rods at the bell-crank on the bulkhead, aft control.	Refer to Chapter 27-10. Through the panels below the fuselage. Refer to Chapter 20 for standard torque values.
18.	Do a check of the flap controls for correct connection and operation.	Obey the instructions of your airworthiness authority for control checks.
19.	Do a check of the Aileron controls for correct connection and operation.	Obey the instructions of your airworthiness authority for control checks.
20.	Do a low-range static leak test.	Refer to Chapter 34-10.
21.	Do a pitot leak test.	Refer to Chapter 34-10.
22.	Install the following items: - Pilots’ seats. - Access panels below the fuselage for the control connections. - Access panels below the wing roots for the B-bolts.	 Refer to Chapter 25-10. Refer to Chapter 52-40. Refer to Chapter 52-40.

3. Install a Wing Spar Bushing to a New Replacement Wing

	Detail Steps/Work Items	Key Items/References
1.	Dry fit the bushing in the wing spar and install the wing temporarily.	Refer to paragraph 2.C.
2.	Make sure that there are no fit problems, sweep and dihedral tolerances are within the limits.	Refer to Figure 203.
3.	Remove the wing and spar bushing.	Refer to paragraph 2.B.
4.	Lightly scuff the spar bonding area and the bushing outer surface with 120 grit sand paper or equivalent.	Do not cut into the composite of the spar.
5.	Remove the dust and clean the bonding surfaces with acetone.	Do not let the acetone dry on composite surfaces. Wipe dry. Do not touch clean bonding surfaces with bare hands.
6.	Mix resin.	Refer to Chapter 51-00.
7.	Prepare thickened resin (paste).	
8.	Wet surfaces to be bonded with a thin coat of mixed resin, not paste.	
9.	Apply the paste to the outer surface of the bushing and the spar hole.	
10.	Press the bushing into place.	
11.	Remove any excess paste.	
NOTE: Coat the wing pin with mold release wax or equivalent. This will aid in release if pin comes in contact with thickened resin.		
12.	Install the wing.	Refer to paragraph 2.C.
13.	Make sure that the sweep and dihedral are within tolerance.	Refer to Figure 203.
14.	Pre-cure the bushing at room temperature for 24 hours.	Post cure is required to obtain necessary structural properties of the resin/hardener.
15.	When pre-cure is complete, remove the wing.	Refer to paragraph 2.B.
16.	Post cure at 60 ± 5 °C (140 ± 5 °F) for 15 hours.	Refer to Chapter 51-00.
17.	Construct an enclosure to trap the heat using high temperature resistant materials or blankets.	

	Detail Steps/Work Items	Key Items/References
18.	Use a heat source to heat the ambient air around the bushing installation.	Do not point the heat source directly at the composite material. This will result in damage.
19.	Using a thermocouple probe(s) for temperature, adjust the heat source to maintain 60 ± 5 °C (140 ± 5 °F).	
	NOTE: Make sure that the aircraft is monitored every 15 minutes during post cure to make sure that the temperature remains constant and for safety.	
20.	Re-install the wing.	Refer to paragraph 2.C.

4. Bolt Play

A. Radial Play

The wing connection bolt values given in the table below must not be exceeded.

-	A-bolt in spherical bearing	0.08 mm	0.003 in
-	B-bolt in spherical bearing	0.08 mm	0.003 in
-	Main bolt in spar stump bushing	0.125 mm	0.005 in
-	Main bolt in spar bridge bushing	0.08 mm	0.003 in

To measure radial play, measure the diameter of the appropriate bolt and bearing/bushing. The difference between diameters must not exceed the values given in the above table.

B. Axial Play

Maximum admissible values:

-	Spherical bearing for B-bolt	0.89 mm	0.035 in.

To measure axial play, the wing tip is to move forward, then back, the change in the gap between the fuselage and wing root rib (directly above the B-Bolt), must not exceed the values stated in the above table.

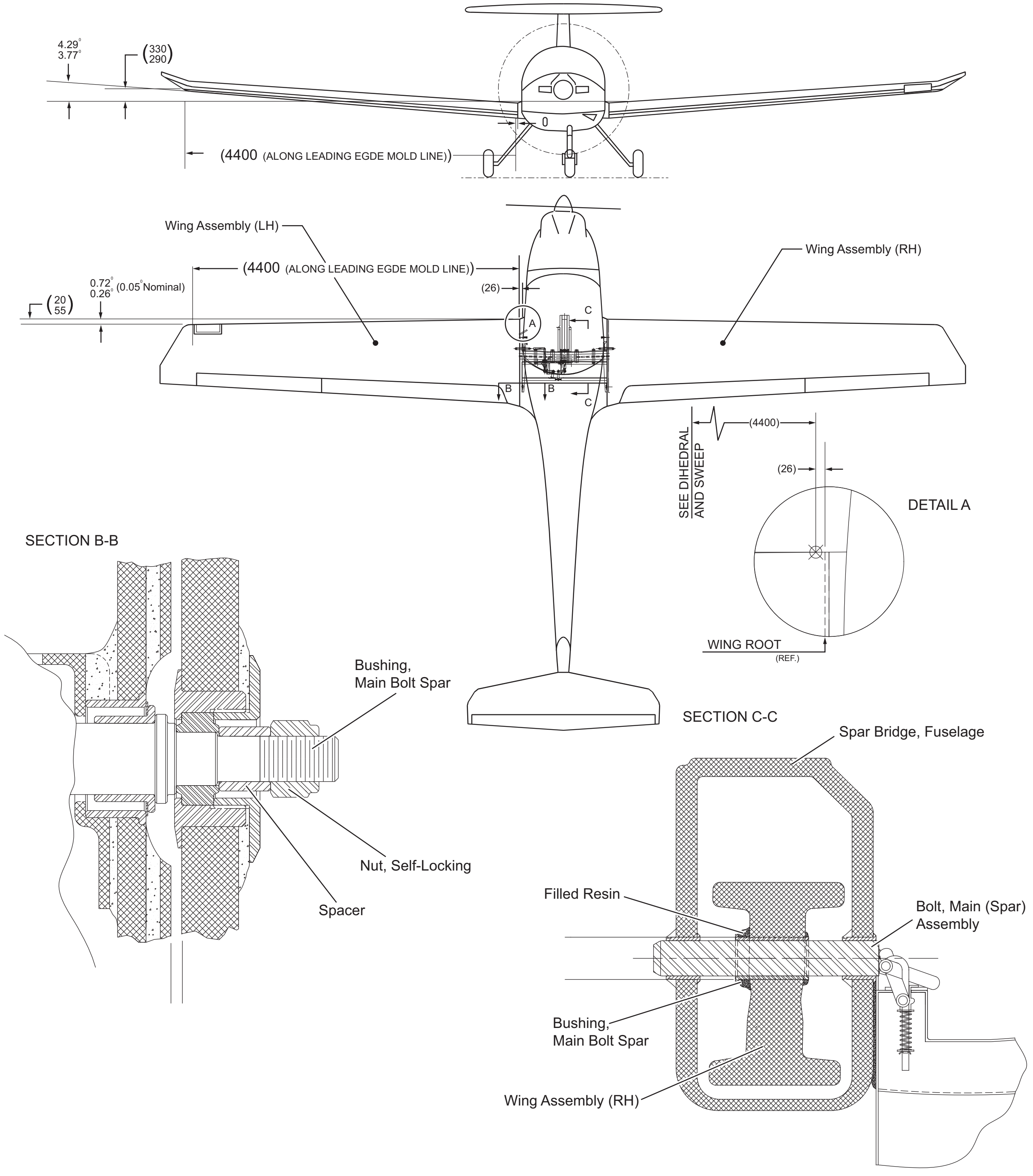

Figure 203 - Installation of Spar bushing to a New Replacement Wing (Sweep and Dihedral Tolerances)

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FLAPS

1. General

This chapter describes about the flap structure. Refer to Chapter 27-50 for data about the flap control system.

The flap hinge axis is below the wing. The flaps move back as they go down.

2. Description

Figure 1 shows the flap structure. Each flap has the following components:

A. Top Shell

The top shell has inner and outer GFRP skins. The skins bond to a rigid plastic foam core. Carbon cloth gives extra strength and stiffness in the outer skin.

B. Bottom Shell

The bottom shell has inner and outer GFRP skins. The skins bond to a rigid plastic foam core. Carbon cloth gives extra strength and stiffness in the outer skin.

C. End Ribs

The end ribs are rigid carbon moldings. They bond to the top and bottom shells.

D. Flap Horn

The flap horn is aluminum alloy. Bolts and nuts attach the flap horn to the flap.

E. Flap Hinges

Each flap has 3 hinges (and the flap horn). The flap hinges are stainless steel. Bolts attach the flap hinges to the flap.

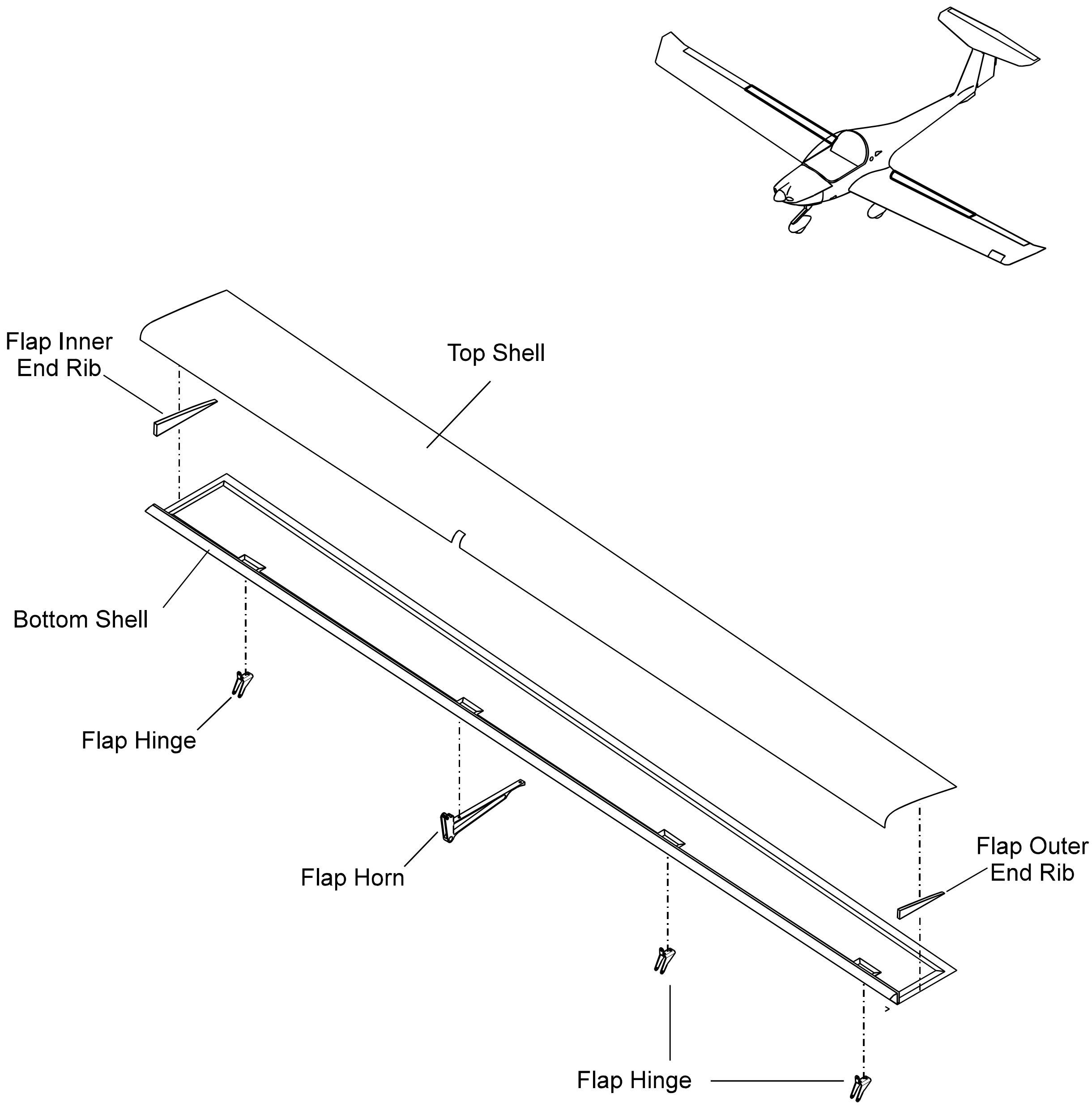

Figure 1 - Flap Structure

FLAPS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the flaps. Refer to Chapter 27-50 for data on adjusting the flap controls.

2. Remove/Install the Flap

A. Remove the Flap

	Detail Steps/Work Items	Key Items/References
CAUTION: MAKE SURE THAT THE AREA UNDER THE FLAPS IS CLEAR BEFORE YOU MOVE THE FLAPS.		
1.	Lower the flaps. - Set the BAT/GEN switch to ON - Set the flap selector to LDG - When the flaps stop moving: - Set the BAT/GEN switch to OFF.	
2.	Remove the bolt which attaches the control rod to the flap horn.	Hold the flap.
3.	Remove the pivot bolts from the hinges and the flap horn.	Hold the flap.
4.	Remove the flap from the aircraft.	

B. Install the Flap

	Detail Steps/Work Items	Key Items/References
1.	Put the flap in position on the aircraft.	Hold the flap.
2.	Install the pivot bolts in the hinges and the flap horn.	Hold the flap. Make sure that there is a gap of 0.12 - 0.20 in (3 - 5 mm) between the flap and the aileron.
3.	Install the bolt which attaches the control rod to the flap horn.	
4.	Install the bushing.	Ream the bushing to Ø 9.525 (+0.010 and +0.050) after installation to fit properly.
5.	Do a test for correct adjustment of the flaps.	Refer to AMM Chapter 27-50.
6.	Do an inspection of the flap controls which you disconnected or adjusted.	
7.	If necessary for your airworthiness authority, do a second inspection of the flap controls.	

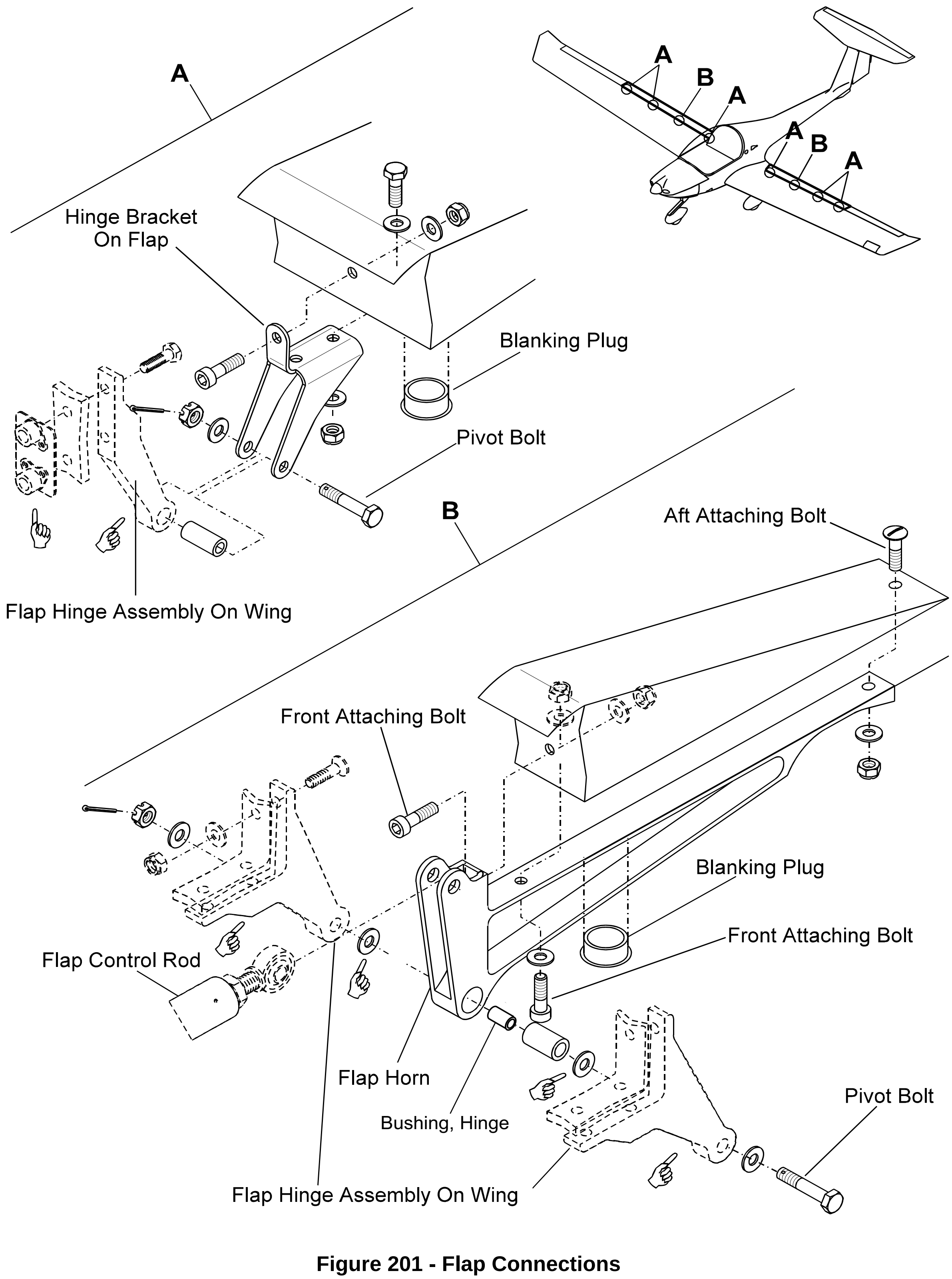

Figure 201 - Flap Connections

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AILERONS

1. General

This chapter describes about the aileron structure. Refer to Chapter 27-10 for data about the aileron control system.

The aileron hinge axis is near the lower wing stern.

2. Description

Each aileron has the following components:

A. Top Shell

The top shell has inner and outer GFRP skins. The skins bond to a rigid plastic foam core. Carbon cloth gives extra strength and stiffness in the outer skin.

B. Bottom Shell

The bottom shell has inner and outer GFRP skins. The skins bond to a rigid plastic foam core. Carbon cloth gives extra strength and stiffness in the outer skin.

C. End Ribs

The end ribs are rigid carbon moldings. They bond to the top and bottom shells. The outer end rib has the mounting for the aileron mass-balance.

D. Aileron Horn

The aileron horn is aluminum alloy. Bolts and nuts attach the aileron horn to the bottom shell of the aileron. The horn also makes the middle hinge for the aileron.

E. Aileron Hinges

Each aileron has 3 hinges (and the aileron horn). The aileron hinges are small blocks of aluminum alloy. Bolts attach the aileron hinges to the aileron.

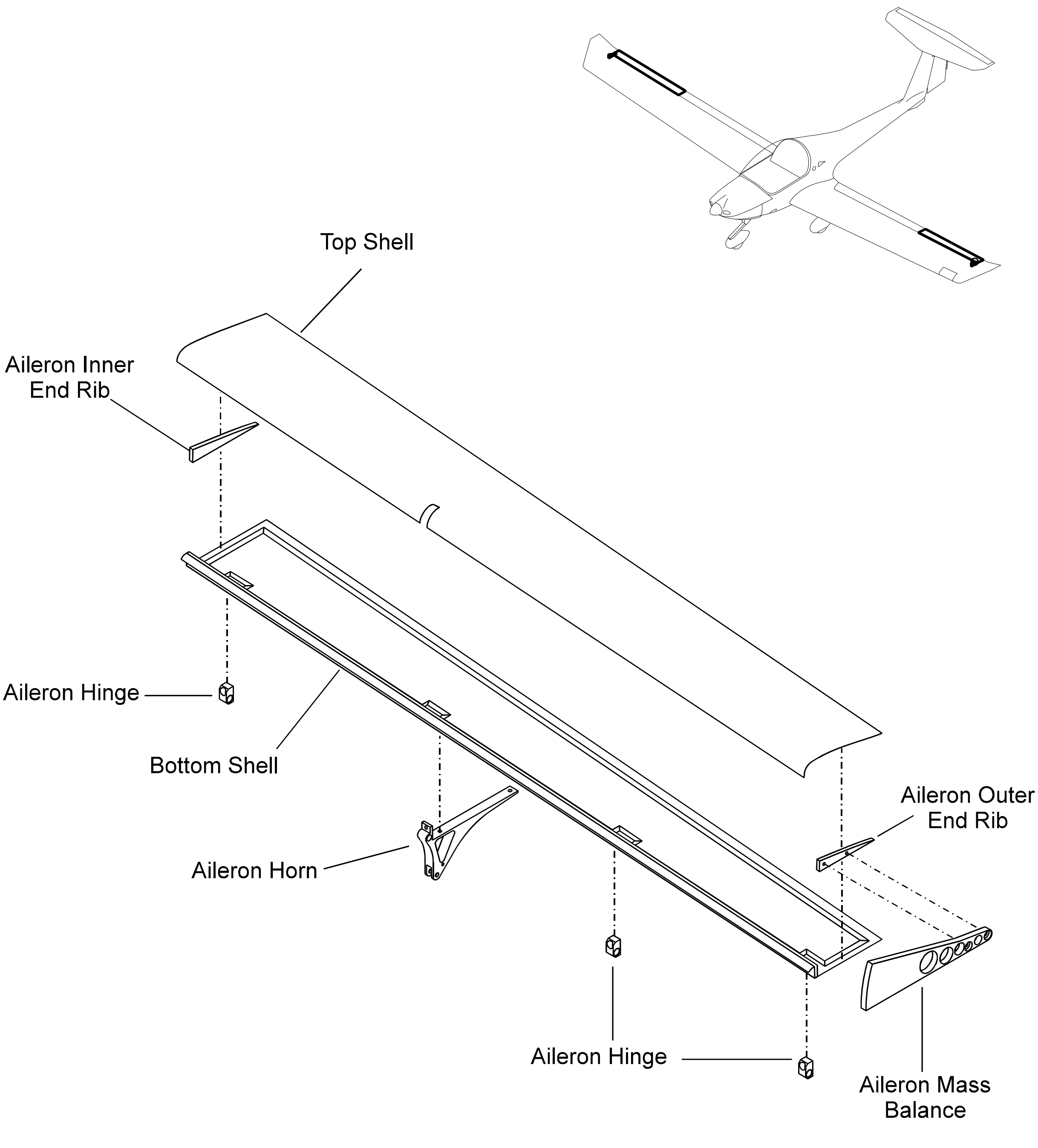

Figure 1 - Aileron Structure

AILERONS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the ailerons. Refer to Chapter 27-10 for data on adjusting the aileron controls.

2. Remove/Install the Aileron

A. Remove the Aileron

	Detail Steps/Work Items	Key Items/References
1.	Remove the bolt which attaches the control rod to the aileron horn.	Hold the aileron.
2.	Remove the pivot bolts from the hinges and the aileron horn.	Hold the aileron.
4.	Remove the aileron from the aircraft.	

B. Install the Aileron

	Detail Steps/Work Items	Key Items/References
1.	Put the aileron in position on the aircraft.	Hold the aileron.
2.	Install the pivot bolts in the hinges and the aileron horn.	Hold the aileron. Make sure that there is a gap of 0.12 - 0.20 in (3 - 5 mm) between the flap and the aileron. Make sure that aileron axial play does not exceed 1 mm. If play exceeds 1 mm, install a washer (P/N NAS1149C0432R) at the control horn hinge to reduce the play. Washer may be installed on inboard or outboard side of the control horn as required for clearance.
3.	Install the bolt that attaches the control rod to the flap horn.	
4.	Do a test for correct adjustment of the ailerons.	Refer to Chapter 27-10
5.	Do an inspection of the aileron controls that you disconnected or adjusted.	
6.	If necessary for your airworthiness authority, do a second inspection of the aileron controls.	

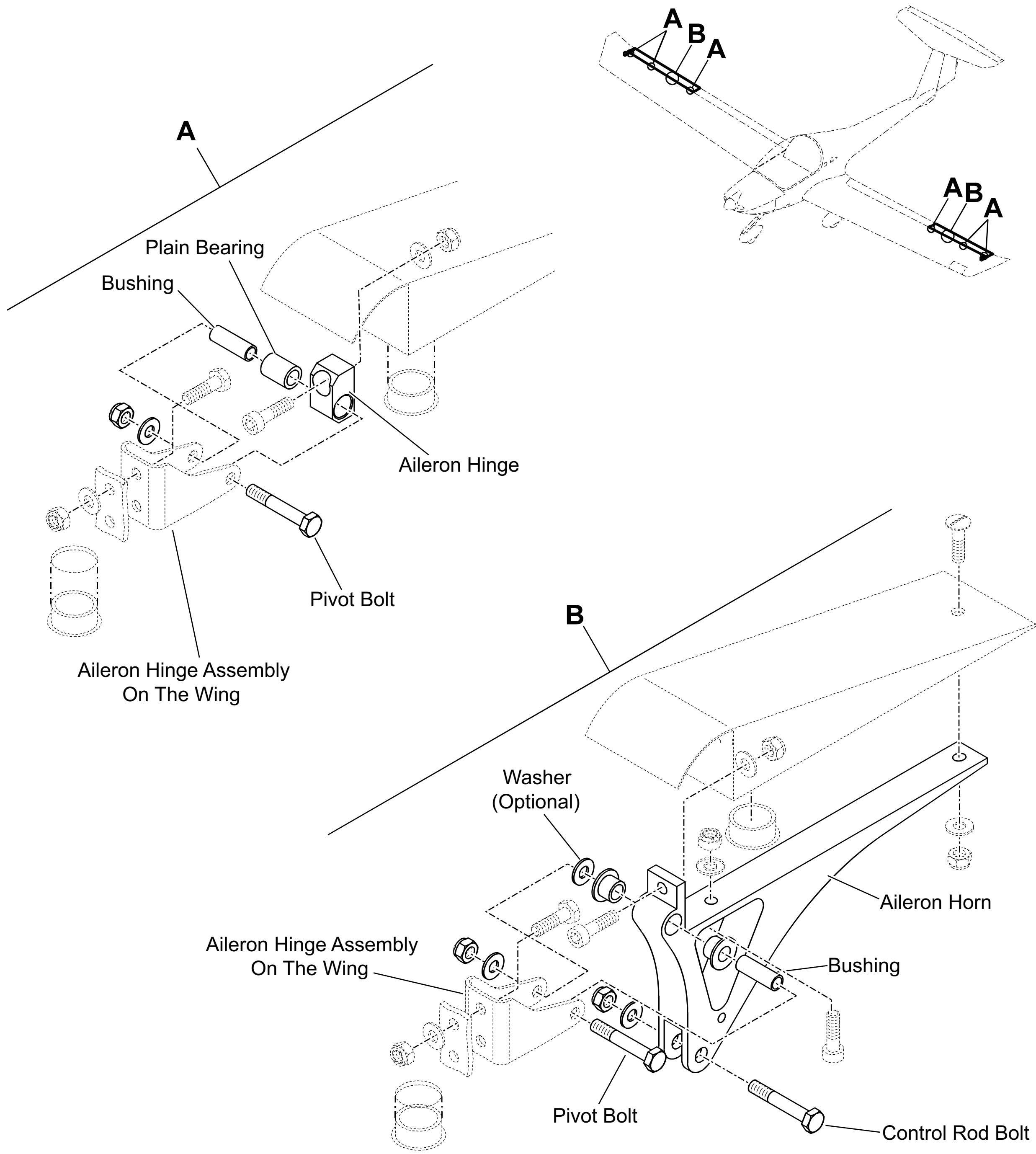

Figure 201 - Aileron Connections

CHAPTER 61-00
PROPELLER

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PROPELLER

1. General

This chapter describes about the propeller installed on the DA20-C1 aircraft.

For data on the propeller, refer to the manufacturer's Owner's Manual.

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PROPELLER ASSEMBLY

1. General

Two types of propeller can be installed on the DA20-C1 aircraft. Some aircraft have a Hoffman fixed pitch propeller and other aircraft have a Sensenich fixed pitch propeller.

Refer to applicable propeller manufacturer's manuals.

- Deleted
- Sensenich 7/16" bolt attachment propeller manual W69EK7-CF
- Sensenich 3/8" bolt attachment propeller manual W69EK-CF

Also refer to applicable manufacturers' Service Bulletins.

2. Description

A. Deleted

B. Sensenich W69EK7-63, W69EK7-63G and W69EK-63 Propeller

Figures 202 and 203 show the Sensenich propeller. It is a Sensenich fixed pitch propeller with two blades. The propeller blades are made of wood laminations. The W69EK7-63G propeller has a thin composite layer covering the wood laminations.

A backing plate attaches to the rear of the propeller. The backing plate holds a spinner with a 2-piece dome. A pressure plate attaches to the front of the blades. The pressure plate holds the rear part of the spinner dome against the propeller hub. 10 screws attach the rear dome to the backing plate. Six screws attach the front dome to the rear dome.

Six bolts attach the propeller assembly to the propeller extension.

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PROPELLER ASSEMBLY - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the propeller. If you find the trouble in column 1, do the repair given in column 3. Refer also to the propeller manufacturers' Owners' Manual - Sensenich Propeller W69EK-CF or W69EK7-CF manual.

TROUBLE	POSSIBLE CAUSE	REPAIR
WARNING: FAILURE TO COMPLY WITH THE FOLLOWING MAY RESULT IN THE LOSS OF THE PROPELLER. THE HUB OF A WOODEN PROPELLER WILL SHRINK OR EXPAND TO MATCH THE AMBIENT CONDITIONS. EXCESSIVE HUB SHRINKAGE, ESPECIALLY POSSIBLE DURING VERY COLD AND/OR DRY AMBIENT CONDITIONS CAN RESULT IN LOSS OF PROPELLER BOLT TORQUE (PRE-LOAD). THIS CAN ALLOW SLIGHT MOVEMENT RELATIVE TO THE DRIVE FLANGE, WHICH MAY RESULT IN DAMAGE TO THE PROPELLER AND/OR THE PROPELLER BOLTS, POSSIBLY EVEN LOSS OF THE PROPELLER. TO PREVENT THIS, PROPER INSTALLATION AND PERIODIC RE-TORQUING IN ACCORDANCE WITH ALL APPLICABLE MAINTENANCE INSTRUCTIONS IS NECESSARY. WARNING: UNDER ALL CIRCUMSTANCES THE INSPECTION INTERVAL MUST NEVER EXCEED 50 HOURS. EXTREME CHANGES IN AMBIENT CONDITIONS (TEMPERATURE/HUMIDITY) MAY REQUIRE SHORTER INSPECTION INTERVALS.		
Engine vibration.	Propeller out of balance.	Examine the propeller. If you find damage, refer to the manufacturer's Owner's Manual.
	The propeller mounting bolts loose.	Torque tighten the propeller mounting bolts in a crosswise pattern. Refer to the Installation procedures, cautions and warnings on the following pages.
	The spinner attaching screws loose.	Torque tighten the spinner attaching screws to 20 -25 lbf-in. (2.25 - 2.8 Nm).
	Blade tracking not correct.	Refer to the manufacturer's Owners' Manual.
	Incorrect propeller alignment.	Remove the propeller. Install the propeller in the correct position. Refer to Chapter 61-10.

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PROPELLER ASSEMBLY - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the propeller. Refer to the manufacturers' Owners' Manual for further data.

2. Deleted

3. Remove/Install the Sensenich Propeller

A. Remove the Sensenich W69EK-63, W69EK7-63 or W69EK7-63G Propeller

WARNING: MAKE SURE THAT THE MAGNETOS ARE SAFE BEFORE YOU DO ANY WORK ON THE PROPELLER. IF THE ENGINE IS TURNED, THE PROPELLER CAN CAUSE INJURY OR DEATH.

	Detail Steps/Work Items	Key Items/References
1.	Make the engine safe.	Make sure that the ignition switch is set to OFF.
2.	Remove the engine cowlings.	Refer to Chapter 71-10.
3.	Release the ignition leads from the spark plugs.	
NOTE: Mark the propeller, spinner, forward bulkhead and aft bulkhead with an index mark. This will help you install these items in the correct position.		
4.	Remove the spinner front dome: - Mark the spinner and backing plate with index marks to aid installation - Release the screws holding the front dome spinner to the rear dome - Remove the front dome forwards.	Refer to Figure 202.
5.	Cut the lock wire on the attaching bolts. Remove the cotter pins from the nuts.	Refer to Figure 202 for W69EK-63 propeller. Refer to Figure 203 for W69EK7-63 or W69EK7-63G propeller with castellated nuts.
6.	Remove the attaching bolts.	Hold the propeller.
7.	Remove the pressure plate.	
8.	Remove the spinner aft dome. - Remove the 10 screws that attach the rear dome to the backing plate.	

	Detail Steps/Work Items	Key Items/References
9.	Remove the propeller by pulling forward with a slight rocking motion.	
10.	Lift the propeller clear of the aircraft.	
11.	If necessary, remove the backing plate.	

NOTE: Following the propeller installation, it is recommended that the assembly be dynamically balanced. Use the balancing equipment manufacturers' instructions for this procedure.

B. Install the Sensenich W69EK-63, W69EK7-63 or W69EK7-63G Propeller

WARNING: FAILURE TO COMPLY WITH THE FOLLOWING MAY RESULT IN THE LOSS OF THE PROPELLER. THE HUB OF A WOODEN PROPELLER WILL SHRINK OR EXPAND TO MATCH THE AMBIENT CONDITIONS. EXCESSIVE HUB SHRINKAGE, ESPECIALLY POSSIBLE DURING VERY COLD AND/OR DRY AMBIENT CONDITIONS CAN RESULT IN LOSS OF PROPELLER BOLT TORQUE (PRE-LOAD). THIS CAN ALLOW SLIGHT MOVEMENT RELATIVE TO THE DRIVE FLANGE, WHICH MAY RESULT IN DAMAGE TO THE PROPELLER AND/OR THE PROPELLER BOLTS, POSSIBLY EVEN LOSS OF THE PROPELLER. TO PREVENT THIS, PROPER INSTALLATION AND PERIODIC RE-TORQUING IN ACCORDANCE WITH ALL APPLICABLE MAINTENANCE INSTRUCTIONS IS NECESSARY.

WARNING: UNDER ALL CIRCUMSTANCES THE INSPECTION INTERVAL MUST NEVER EXCEED 50 HOURS. EXTREME CHANGES IN AMBIENT CONDITIONS (TEMPERATURE/HUMIDITY) MAY REQUIRE SHORTER INSPECTION INTERVALS.

	Detail Steps/Work Items	Key Items/References
1.	Make the engine safe.	Make sure that the ignition switch is set to OFF. Make sure that the ignition leads are disconnected from the spark plugs.
2.	Make sure that the mating faces of the propeller and extension are clean and dry.	Refer to Figures 202 and 203.
3.	Place the backing plate in position.	Make sure to align the index marks.
4.	Push the propeller into position on the propeller extension flange.	Make sure to align the index marks. Install a new propeller as shown in Figure 202.
5.	Put the rear dome in position. - Install the 10 screws that attach the rear dome to the backing plate.	Make sure to align the index marks.

	Detail Steps/Work Items	Key Items/References
6.	Attach the pressure plate to the propeller. - Install the attaching bolts. Tighten the bolts diagonally in pairs in small increments.	For W69EK-63 Propeller, refer to the Sensenich Manual W69EK-CF for torque values. For W69EK7-63 or W69EK7-63G Propeller, refer to the Sensenich Manual W69EK7-CF for torque values. Use new self-locking nuts.
7.	Do a tracking test.	The tips must track within 1/8 in. (3 mm) of each other.
8.	Lock wire the attachment bolts.	Lock wire in pairs. Refer to Figure 202 for W69EK-63 propellers.
	Install the cotter pins.	Refer to Figure 203 for W69EK7-63 or W69EK7-63G propeller (castellated nuts only).
9.	Connect the ignition leads to the spark plugs.	Torque to 110 - 120 lbf-in (12.4 - 13.5 Nm).
10.	Install the engine cowlings.	Refer to AMM Chapter 71-10.
11.	Do an engine ground run-up. Look specially for vibration.	Refer to the DA20-C1 Airplane Flight Manual for engine start/stop procedures.

Following the installation of the propeller:

Check bolt torque after the FIRST FLIGHT, after the first 25 hours and after that as necessary, but at least EVERY 50 HOURS. Refer to the Sensenich propeller manual for torque values and corrective actions.

NOTE: Improper torque values will be obtained by measuring the breaking torque in a loosening direction. The torque should be checked in a tightening direction and adjusted as needed.

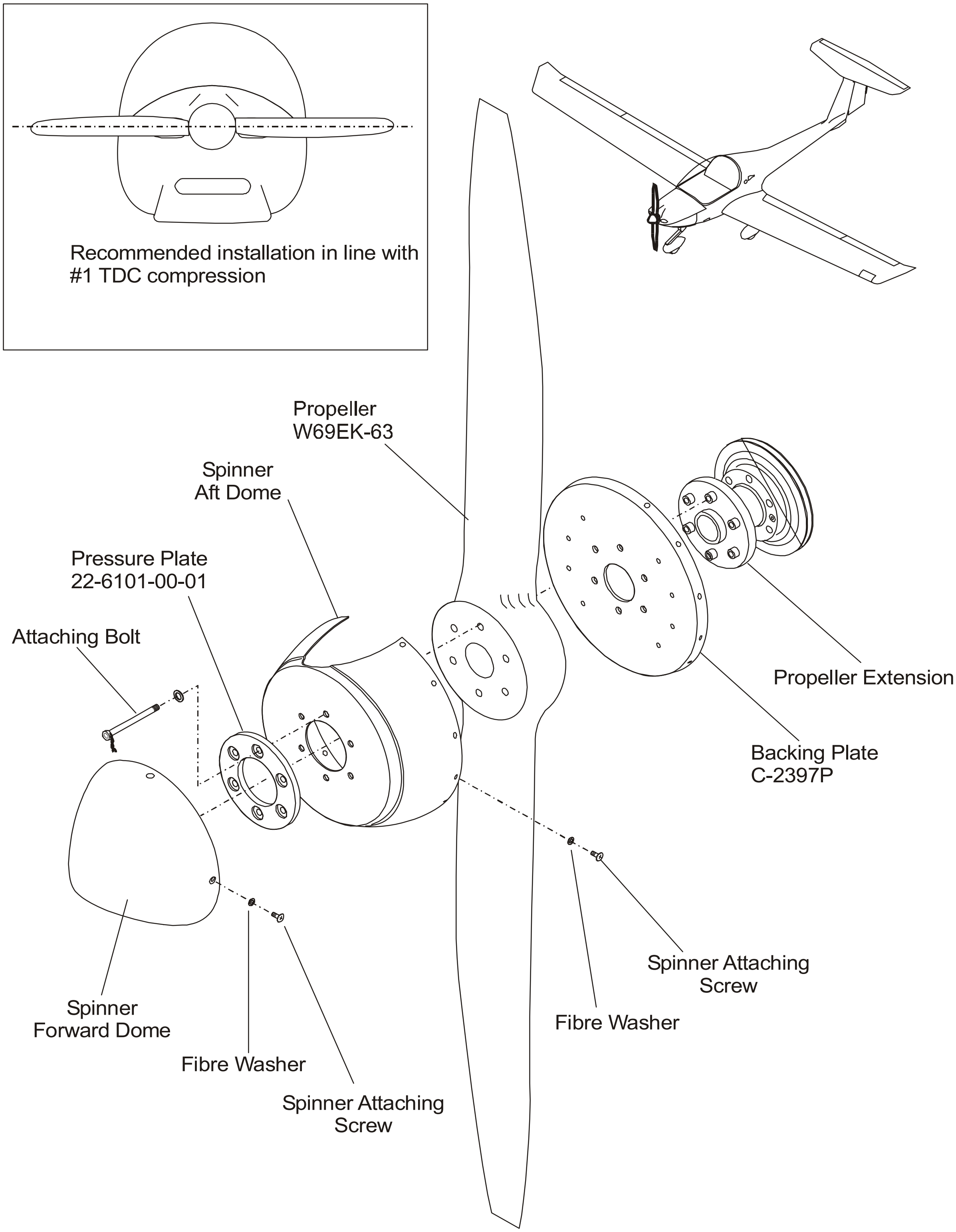

Figure 201 - W69EK-63 Sensenich Propeller Assembly

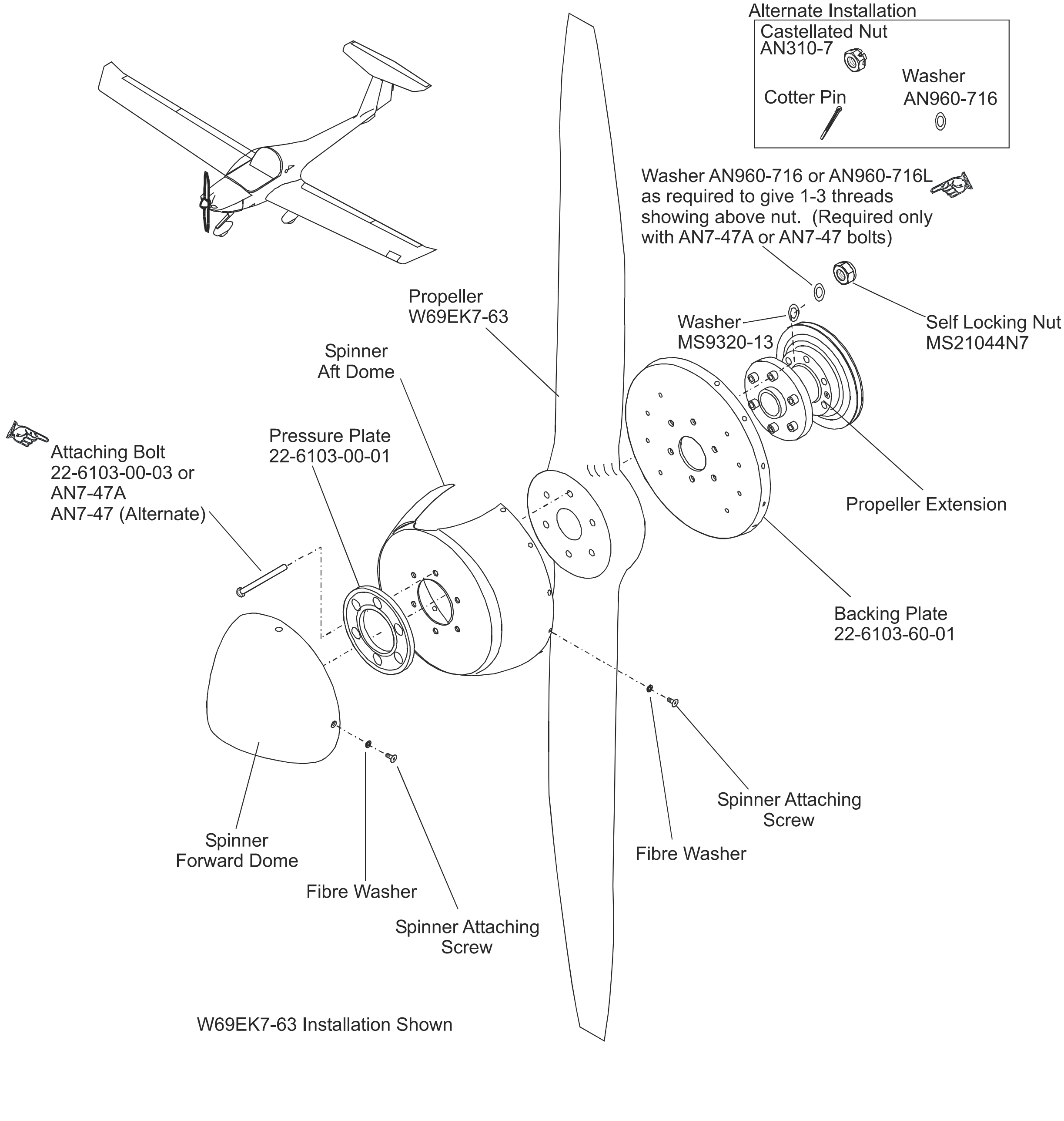

Figure 202 - Sensenich W69EK7-63 and W69EK7-63G Propeller Installation

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CHAPTER 71-00
POWER PLANT

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POWER PLANT

1. General

This chapter describes:

- the power plant installed in the DA20-C1 aircraft
- the components that make the power plant
- how to remove/install the power plant.

For data on the engine test after installation refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for the IO-240B engine. Refer to the DA20-C1 Airplane Flight Manual (AFM) for engine start/stop procedures.

Refer to the following chapters for data about other engine systems:

- Chapter 72-00. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the engine.
- Chapter 73-00. Fuel system indicating. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the fuel injection system.
- Chapter 74-00. Ignition system power supply and installation (routing and attachment) of high-tension cables. Refer to the Slick Maintenance Manual for other data. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the spark plugs.
- Chapter 76-00. Engine controls.
- Chapter 77-00. Engine indicating.
- Chapter 78-00. Exhaust system.
- Chapter 79-00. Oil system components installed in the airframe. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data about the engine oil system.
- Chapter 80-00. Starter system control and installation. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 and the Continental Motors Starter Kit EQ6656 Installation Instructions Manual for other data.

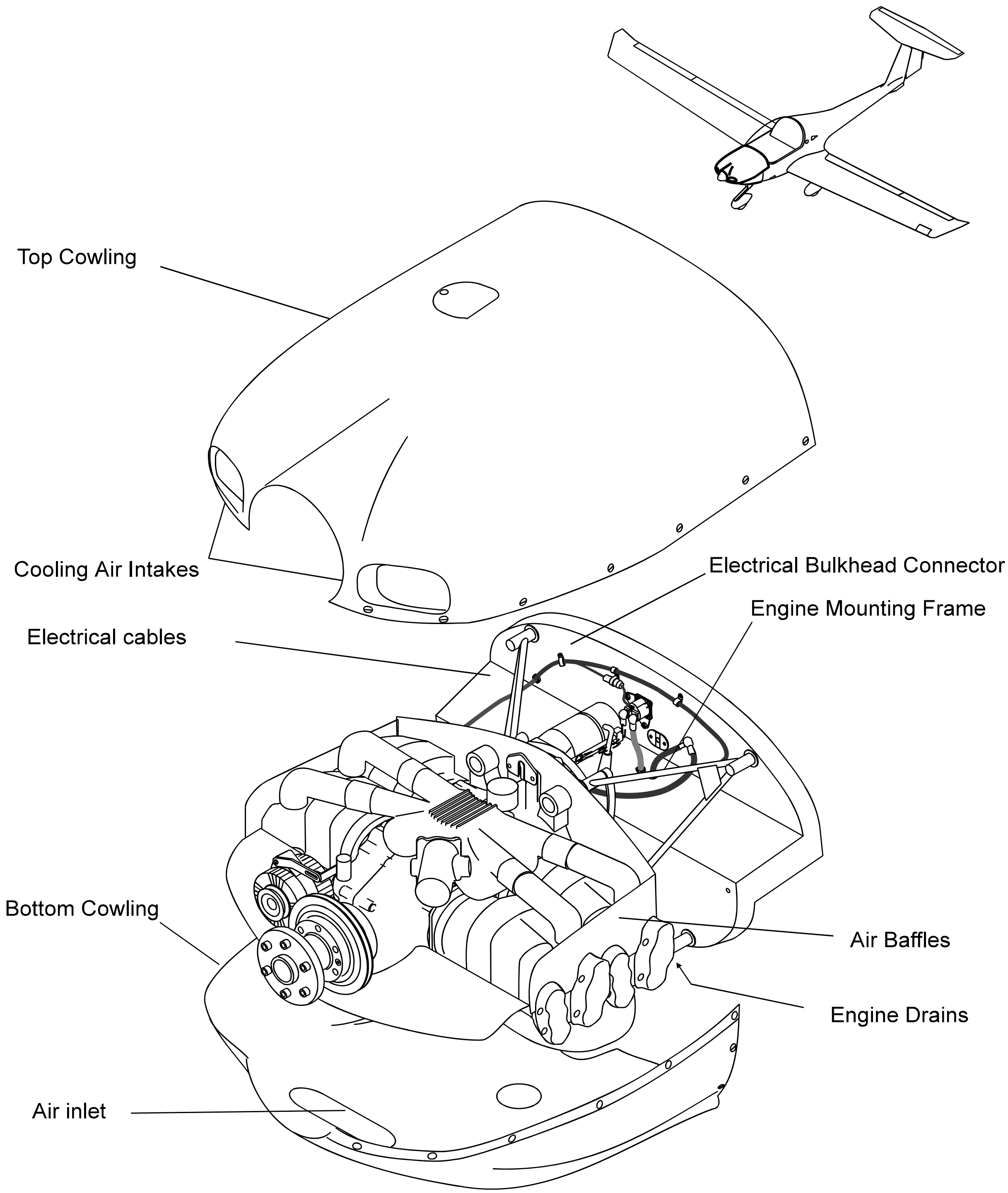

Figure 1 - Power Plant

2. Description and Operation

The power plant in the DA20-C1 aircraft has a Continental Motors IO-240B engine. The engine is air-cooled. It has four horizontally opposed cylinders with overhead valves. It also has a down-draft fuel-injection system.

The IO-240B engines have a doweled propeller flange with six bolt holes. The propeller turns in a clockwise direction, when you look from the cockpit. A propeller extension attaches between the propeller flange and the engine flange.

The power plant has the following components installed:

A. Cowling

The power plant has a top and a bottom engine cowling. The two halves attach to the airframe with camlock fasteners. The top cowling has a left and a right air intake. The bottom cowling has one large air intake.

B. Engine Mounting Frame

The engine-mounting frame attaches to the firewall with bolts and self-locking nuts. Tubular steel makes the mounting frame. The mounting frame attaches to the engine with shock-mounts. Rubber and metal bushings make the engine shock-mounts.

C. Electrical Harness

Electrical cables go through the firewall to connect to the engine. They give electrical supply to the engine starter motor and engine sensors. Electrical cables from the generator supply electrical power to the aircraft bus.

D. Air Intakes

The GFRP air intake attaches below the front of the engine. Two flexible hoses from the air intake go to the exhaust muffler and the induction manifold.

E. Heat-Shield

Two brackets attach a steel heat shield to the engine. The heat shield holds the electrical cables. It also holds the main fuel feed hose and the fuel return hose. The heat shield gives protection to the fuel pipes and electrical cables.

F. Engine Drain Pipes

Each cylinder inlet port has a drain pipe. The drain pipe connects from the cylinder head to a "T" piece connector. From the "T" piece connector the drain pipes connect to a single pipe. The pipe has a check valve installed.

An aluminum drain pipe attached to the mixture control valve gives drainage for the fuel pump.

On aircraft equipped with an altitude compensating fuel pump, an aluminum pipe connects the static reference port of the fuel pump to a "T" connector in the fuel pump drain line.

3. Engine Specifications

The operational limits and specifications recorded in this section are applicable to the IO-240B Series airplane engines. Refer to the Continental Motors IO-240B Operator and Installation Manual, form X30620 for operating data.

ITEM	DATA
Compression Ratio:	8.5:1
Firing Order:	1-3-2-4
Number of Cylinders:	4
Bore:	4.44 in (112.7 mm)
Stroke:	3.88 in (98.5 mm)
Piston Displacement:	240 cu in (3932.9 cu cm)
Brake Horsepower: - Rated Maximum Continuous Operation: - Recommended for Cruise:	 125 HP @ 2800 95 HP @ 2550
Crankshaft Speed: - Rated Maximum Continuous Operation: - Minimum full power ground static rpm: - Idle:	 2800 2100 1000 ± 25
Intake Manifold Pressure at Idle:	(18.5 In. Hg): Max
Fuel Control System:	Continental Continuous Flow Injector
Fuel:	For Fuel grade: Refer to the Teledyne Continental Maintenance Manual
Oil:	For Oil grade: Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6
Oil Pressure: - Idle (Minimum pressure): - Normal Operation: - Maximum (Cold):	 10 psi (1.45 Kpa) 30 - 60 psi (4.35 - 8.7 Kpa) 100psi (14.5 Kpa)
Oil Sump Capacity IO-240-A/B:	6 U.S. Qt (5.67 Liters)

ITEM	DATA
Maximum Oil Consumption:	0.5 US qt/hr (0.47 liters/hr) maximum.
Oil Temperature Limits: - Minimum for Take-Off: - Maximum Allowable: - Cruise:	 75 °F (24 °C) 240 °F (115.6 °C) 170 °F - 220 °F (76 °C - 93 °C)
Cylinder Head Temperature: - Recommended Max at Cruise: - Limit: - * Bayonet Thermocouple AS234 with AS236 adapter.	 380 °F (193 °C) 460 °F (237 °C)
Ignition Timing (Compression stroke, breaker opens): - Right Magneto, degrees BTC (IO-240B): - Left Magneto, degrees BTC (IO-240B):	 26° ± 1° 26° ± 1°
Spark Plugs: - The following Spark Plugs are approved for use in IO-240B engines Spark Plug Gap:	 Continental Motors 630049 Champion RHM 38E You must use the manufacturers specified spark plug gap.

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POWER PLANT - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the power plant. If you find the trouble in column 1, do the repair given in column 3.

It does not give trouble shooting data for the engine or the engine systems. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for engine and engine system trouble-shooting.

WARNING: YOU MUST BE CAREFUL WHEN YOU DO POWER PLANT TROUBLE SHOOTING. OPERATION OF A DAMAGED ENGINE CAN CAUSE MORE DAMAGE TO THE ENGINE. THIS CAN CAUSE INJURY TO PERSONNEL.

TROUBLE	POSSIBLE CAUSE	REPAIR
Engine vibration.	Damaged shock mounts.	Replace the shock mounts.
CAUTION: YOU MUST LET ALL THE FUEL DRAIN FROM THE INTAKE SYSTEM. IF YOU DO NOT DO THIS, STARTING AN ENGINE WITH A FLOODED INTAKE SYSTEM WILL CAUSE HYDROSTATIC LOCK. THIS CAN CAUSE DAMAGE TO THE ENGINE.		
Engine will not start with fuel pressure indication.	Engine flooded - drain system check-valve blocked.	Replace the check valve.

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POWER PLANT - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the engine.

Refer to the DA20-C1 Airplane Flight Manual (AFM) for engine run instructions/data.

WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU TURN THE PROPELLER. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT THE MAGNETO SWITCHES ARE IN THE "OFF" POSITION AND THE "P" LEADS ARE GROUNDED. THE THROTTLE SET TO "CLOSED" AND THE MIXTURE CONTROL SET TO "IDLE CUT-OFF".

WARNING: DO NOT GO BELOW THE ENGINE WHEN YOU LIFT THE ENGINE WITH THE HOIST. THE HOIST CAN FAIL. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.

WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.

CAUTION: YOU MUST ATTACH CAPS TO HOLES/PIPES WHEN YOU REMOVE THE ENGINE. IF YOU DO NOT DO THIS, CONTAMINATION CAN ENTER THE HOLES/PIPES. THIS CAN CAUSE BLOCKAGE TO THE AIRCRAFT SYSTEMS.

2. Remove/Install the Engine

A. Equipment

Item	Quantity	Part Number
Hoist	1	Commercial
Engine Sling	1	Commercial
Engine Stand	1	Commercial
Tail Trestle	1	Commercial
Aircraft Chocks	4	Commercial

NOTE: The remove/install the engine procedure that follows, keeps the mounting frame attached to the engine. This makes the procedures easier.

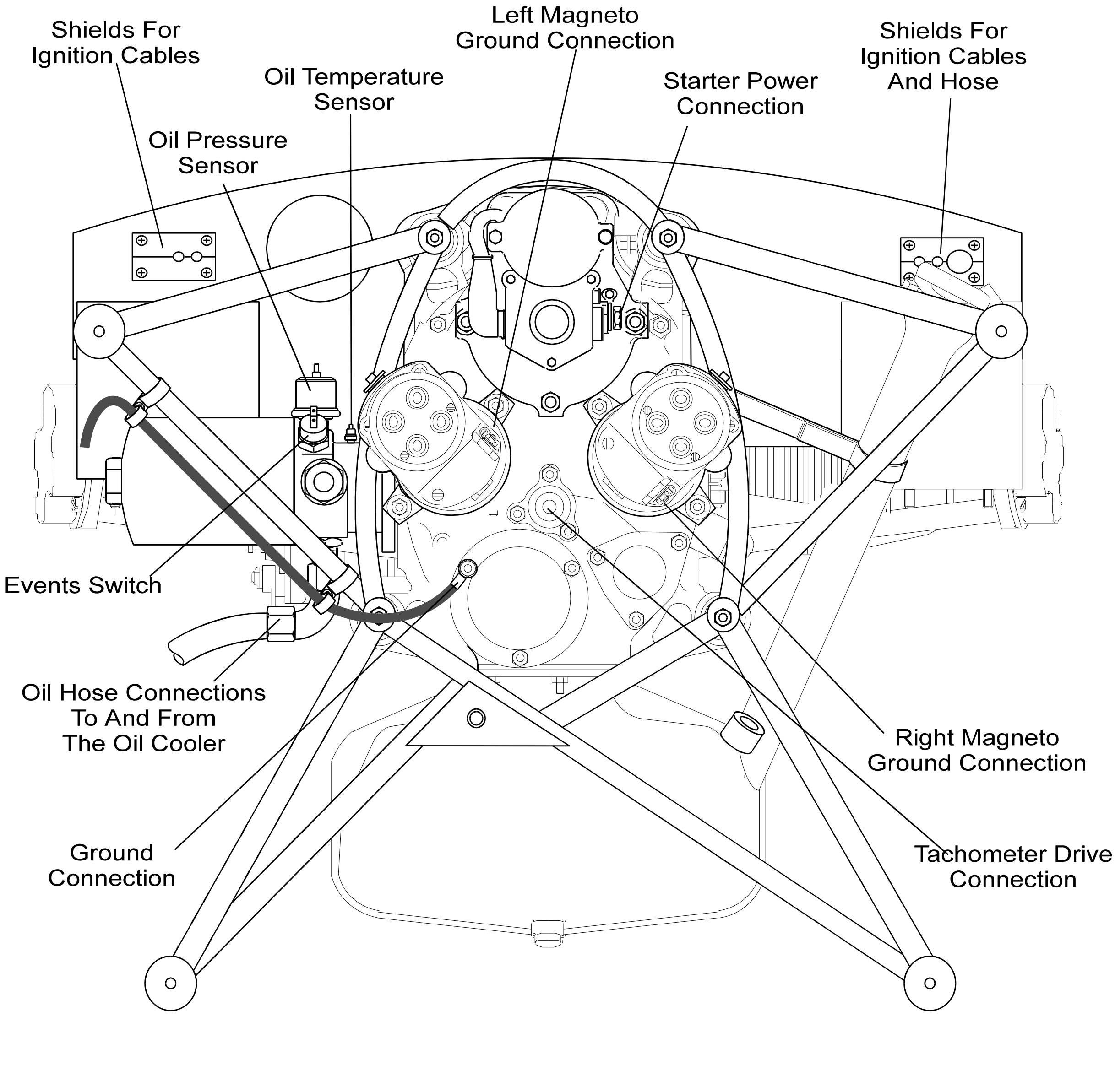

Figure 201 - Connections at the Rear of the Engine

B. Remove the Engine

	Detail Steps/Work Items	Key Items/References
1.	Put the chocks against the main aircraft wheels.	
2.	Set the fuel shut-off valve to CLOSED.	
	WARNING: BEFORE YOU DO WORK ON THE ENGINE, MAKE SURE THAT THE ENGINE IS SAFE. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
3.	Set the throttle lever to IDLE and set the mixture lever to LEAN CUT-OFF.	
4.	Remove the engine cowlings.	Refer to Chapter 71-10.
5.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
6.	Disconnect the spark plug leads from the spark plugs and remove the spark plugs.	
7.	Put blanks in the spark plug holes in the cylinder head.	This will stop contamination going into the cylinders.
8.	Put the tail trestle under the rear fuselage. Put weight attached to straps over the rear fuselage to hold the fuselage against the trestle.	Refer to Chapter 07-10.
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.	
9.	Disconnect the nose-gear elastomer pack at the engine-mounting frame.	Refer to Chapter 32-20.
10.	Remove the propeller.	Refer to Chapter 61-10.

	Detail Steps/Work Items	Key Items/References
11.	Disconnect the engine electrical cables from the following components: - The oil temperature sensor - The oil pressure sensor - The Cylinder Head Temperature (CHT) sensor - The events (hourmeter) switch - The Exhaust Gas Temperature (EGT) sensor - The starter cable (one cable) - The generator (two cables). Remove the P-clips and move the cables clear of the engine.	
12.	Disconnect the engine ground cable from the blanking plate on the engine accessory housing.	
13.	Disconnect the knurled nut of the tachometer drive from the accessory case attachment point. - Carefully pull the flexible drive clear of the engine.	
WARNING:	DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.	
14.	Disconnect the inlet and return fuel hoses from the injector fuel pump. For aircraft fitted with a manifold valve fuel return hose, remove the fuel return hose from the manifold valve.	Put the caps on the two fuel hoses and put the caps on the two injector fuel pump connections. This will stop contamination going into the fuel system. Put the caps on the fuel hose and manifold valve connector.
WARNING:	DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.	
15.	Remove the P-clip that attaches the fuel pump and cylinder drain pipes to the firewall.	

	Detail Steps/Work Items	Key Items/References
16.	Remove the two worm drive clamps from the flexible pipe between the oil cooler and the aft baffle. Remove the flexible pipe.	
17.	Disconnect the inlet and return oil pipes from the oil cooler.	Put the caps on the two oil hoses and put the caps on the two oil cooler connections. This will stop contamination going into the oil system.
18.	Disconnect the vacuum hose from the firewall connection.	Put a cap on the firewall adapter and put a cap on the vacuum feed hose. This will stop contamination going into the vacuum system.
19.	Remove the shield from the right side of the aft baffle. - Remove the manifold fuel pressure hose clear of the aft baffle/engine.	
20.	Remove the two worm drive clamps from the flexible pipe between the muffler and the cabin heat control valve. - Remove the flexible pipe.	
21.	Remove the engine exhaust system. - Remove the eight nuts from the four exhaust port flanges.	Refer to Chapter 78-00. Discard the nuts.
22.	Remove the heat shield from the right side of the engine: - Remove the two screws and the spring washers from the two brackets at the cylinder heads - Remove the heat shield with the fuel pipes and electrical cables attached - Move the heat shield clear of the engine.	

	Detail Steps/Work Items	Key Items/References
23.	Disconnect the throttle control cable from the throttle and metering unit lever as follows: - Remove the nut - Remove the bolt - Remove the three washers - Move the control cable clear of the engine.	
24.	Remove the control cable from the bracket at the top of the plenum assembly as follows: - Remove the adjusting nut from the front of the control cable - Move the throttle control cable clear of the bracket - Remove the rear adjusting nut from the control cable.	
25.	Move the throttle control cable clear of the engine as follows: - Release the P-clamp holding the cable to the engine mounting frame - Carefully pull the throttle control cable through the rubber grommet at the aft baffle.	
26.	Disconnect the mixture control cable from fuel mixture control lever as follows: - Loosen the stiff nut - Remove the control cable from the mixture control lever.	

	Detail Steps/Work Items	Key Items/References
27.	Disconnect the mixture control cable from the front support bracket as follows: For aircraft with a standard fuel pump: - Remove the adjusting nut from the front of the control cable - Move the throttle control cable clear of the bracket - Remove the rear adjusting nut from the control cable. For aircraft with an altitude compensating fuel pump: - Remove the nuts, the washers and the screws that fasten the mixture cable keeper to the bracket - Remove the mixture cable keeper - Remove the mixture control cable from the front support bracket.	
28.	Move the mixture control cable clear of the engine as follows: For aircraft with a standard fuel pump: - Carefully pull the mixture control cable through the rubber grommet at the aft baffle. For aircraft with an altitude compensating fuel pump: - Remove the rod end and jam nut from the end of the mixture control cable - Cut the cable tie that connects the mixture control cable to the #2 cylinder induction tube - Carefully pull the mixture control cable through the rubber grommet at the aft baffle.	

	Detail Steps/Work Items	Key Items/References
29.	Disconnect the control cable from the alternate air lever. Remove the following items: - Nut - Bolt - Two washers - Return spring - Disconnect the control cable.	
30.	Attach the lifting sling to the two engine lifting eyes at the top of the engine.	Make sure the lifting sling has the correct safe working load for the engine.
31.	Attach a hoist to the lifting sling.	Make sure the hoist has the correct safe working load for the engine.
32.	Remove the instrument panel cover.	Refer to Chapter 25-10 to get access to the engine mounting frame bolts.
33.	Examine the engine compartment: - Make sure that all the connections to the engine are clear.	
WARNING: DO NOT GO BELOW THE ENGINE WHEN YOU LIFT THE ENGINE WITH THE HOIST. THE HOIST CAN FAIL. THIS CAN CAUSE DEATH OR INJURY.		
34.	Take up the tension on the hoist.	
35.	Disconnect the engine mounting frame from the firewall as follows: - Hold the heads of the mounting bolts with a wrench - Remove the bottom two nuts and the washers - Remove the top two nuts and washers.	
36.	Move the engine forwards clear of the firewall and install the engine in the engine stand.	

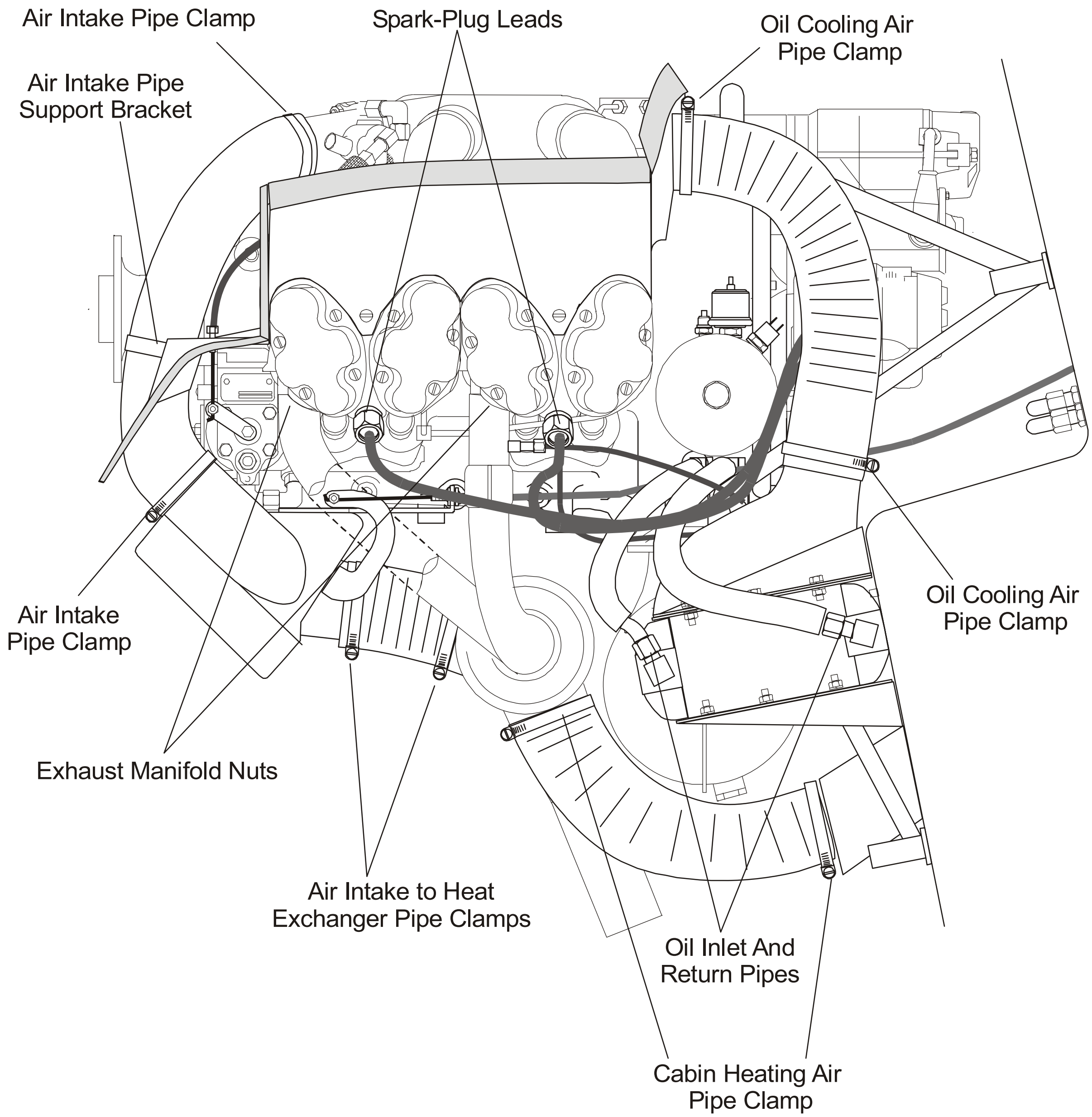

Figure 202 - Connections on the Left of the Engine (1)

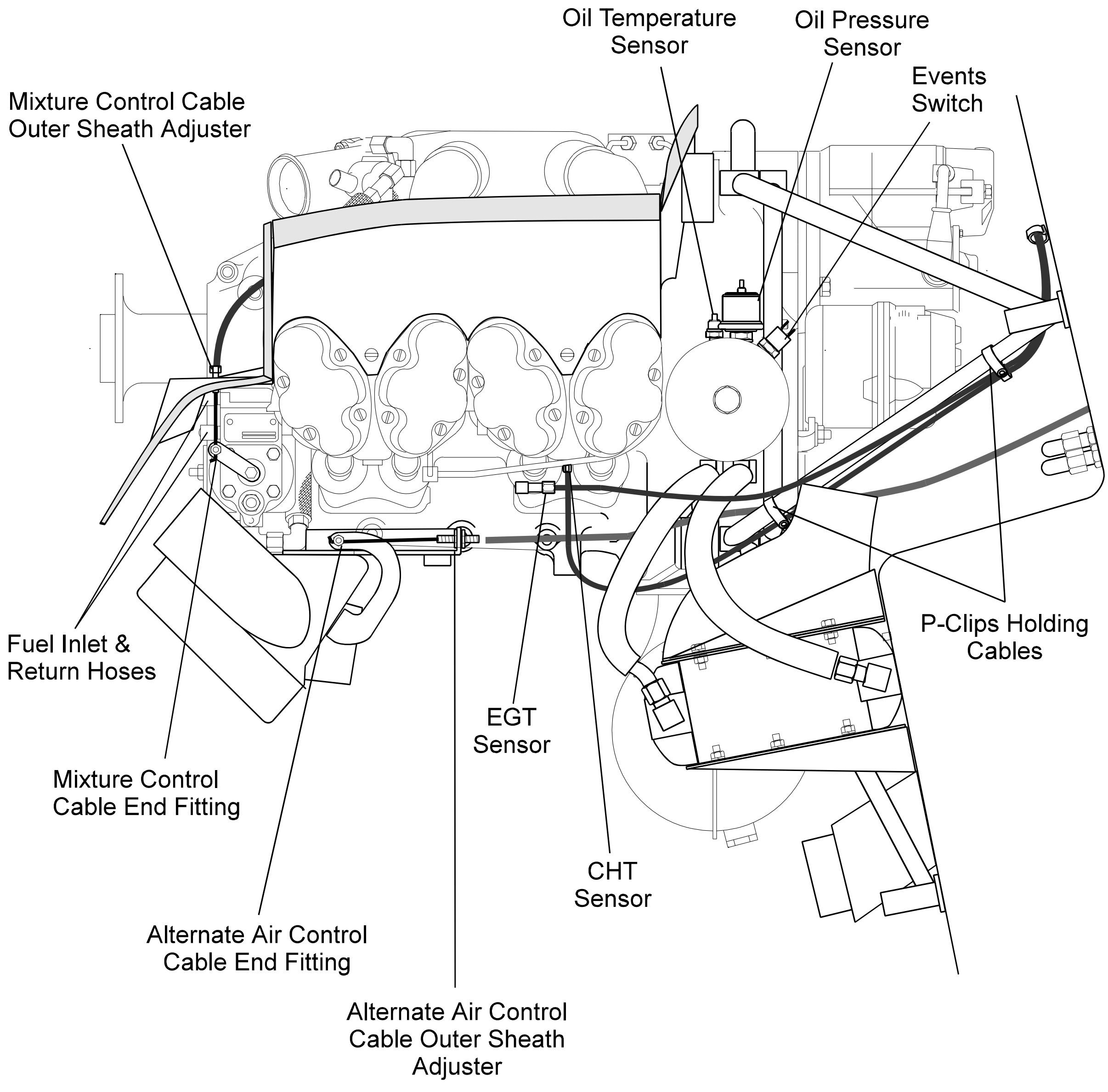

Figure 203 - Connections on the Left of the Engine (2)

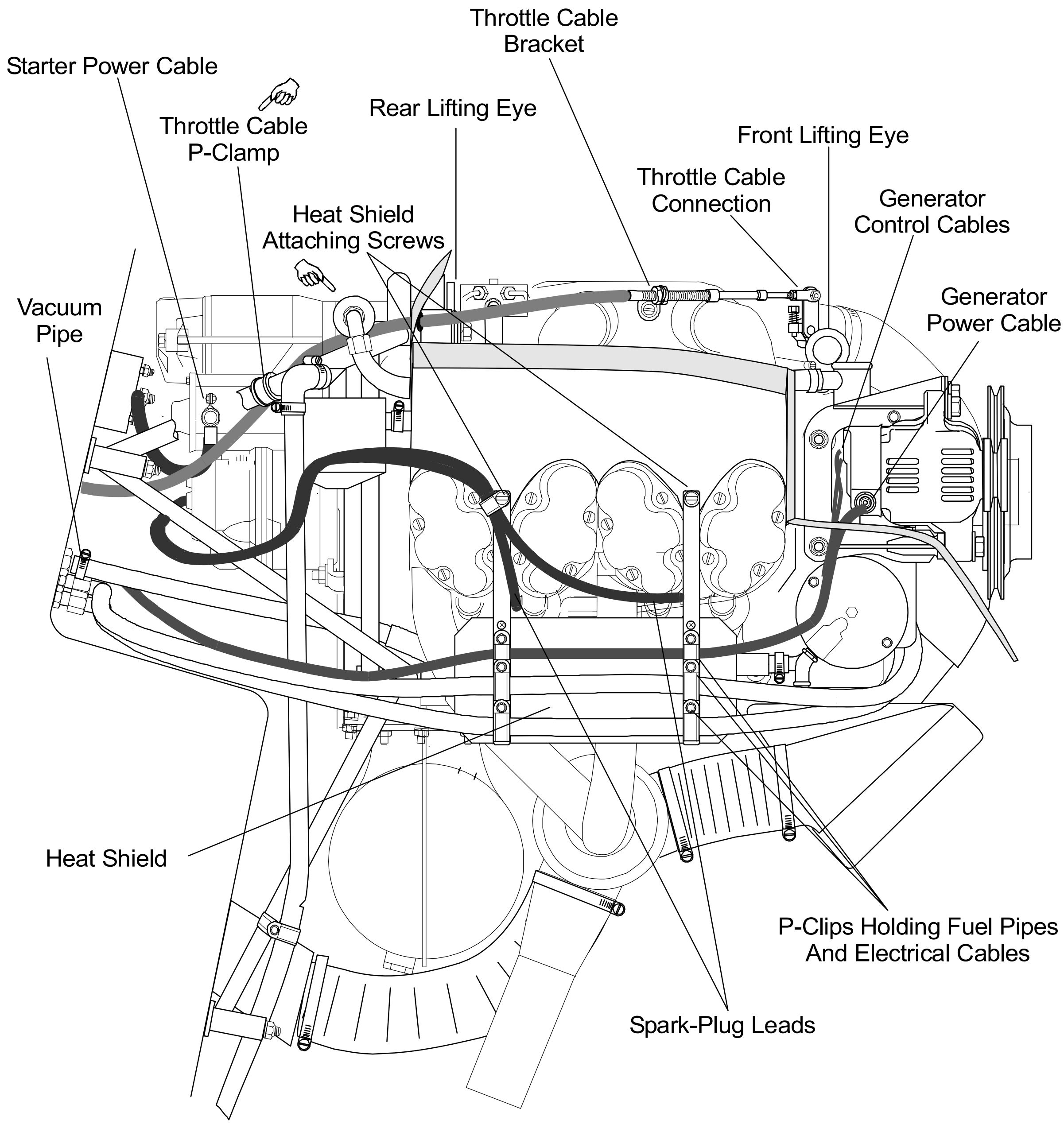

Figure 204 - Connections on the Right of the Engine

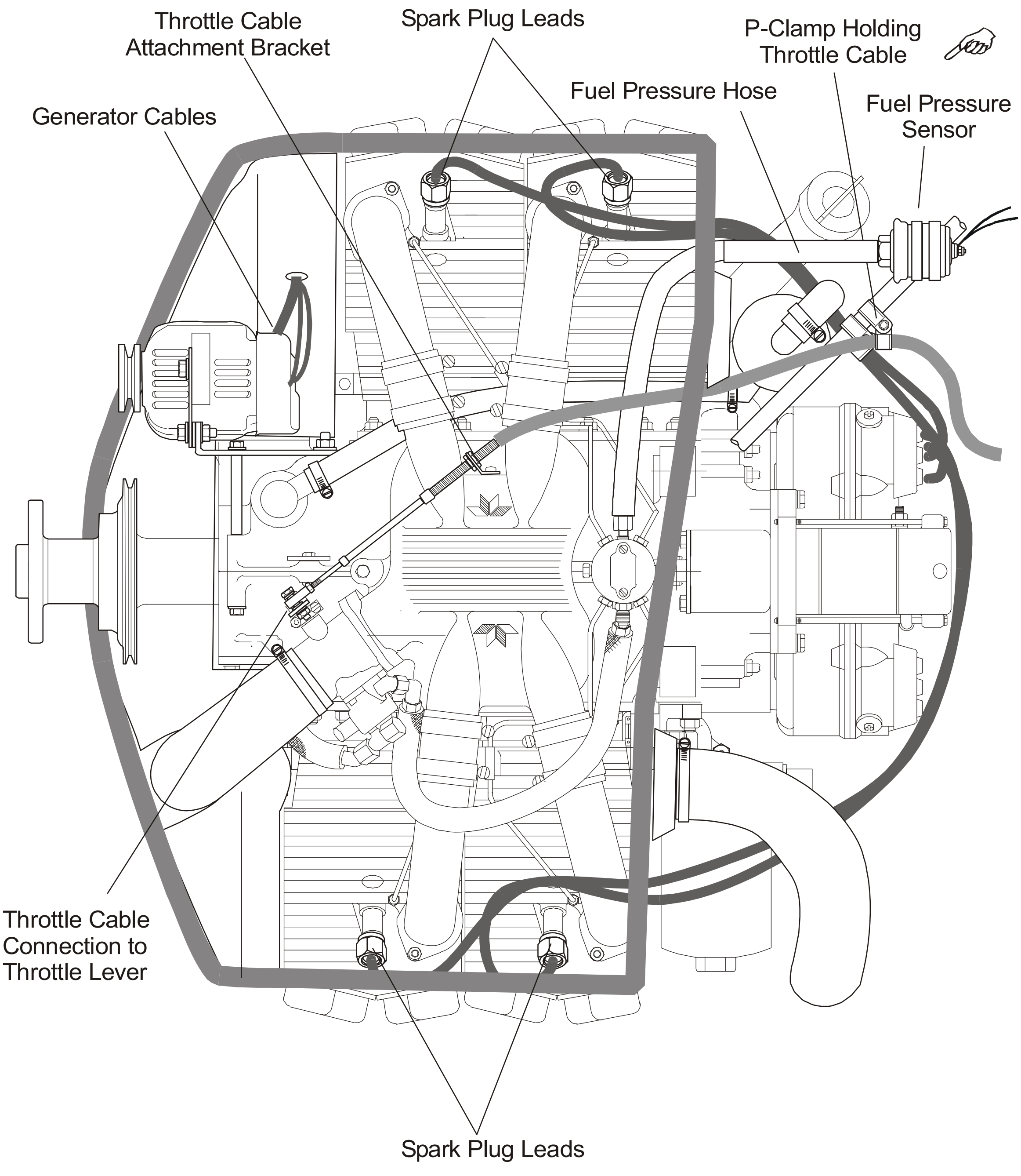

Figure 205 - Connections on the Top of the Engine

C. Install the Engine

	Detail Steps/Work Items	Key Items/References
	WARNING: YOU MUST FLUSH THE AIRCRAFT FUEL TANKS AND FUEL LINES BEFORE YOU ATTACH THE MAIN FUEL INLET TO THE ENGINE FUEL PUMP. IF YOU DO NOT DO THIS, CONTAMINATION CAN CAUSE THE FUEL INJECTION SYSTEM TO OPERATE INCORRECTLY. THIS CAN CAUSE ENGINE FAILURE AND DEATH OR INJURY TO PERSONS.	
1.	Flush the aircraft fuel system.	Refer to Chapter 28-10.
2.	Examine the engine compartment. Look especially for damage and chafing to the following items: - Electrical cables - Engine mounting studs - Firewall - Cabin heat control valve - Ground connection - Oil cooler - Engine control cables - Fuel Hoses	
	NOTE: After you have done the examination of the cabin-heat control-valve, install the flexible hose to the cabin-heat control-valve. This will make the installation of the flexible hose easier.	
3.	Install the flexible hose to the cabin-heat control-valve. - Tighten the worm drive clamp.	
4.	Do an ignition switch test.	Refer to Chapter 74-00.
5.	Examine the engine documentation. Look especially for the correct engine type for the aircraft and engine service hours. Record the data.	

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT GO BELOW THE ENGINE WHEN YOU LIFT THE ENGINE WITH THE HOIST. THE HOIST CAN FAIL. THIS CAN CAUSE DEATH OR INJURY TO PERSONS. CAUTION: REMOVE ALL PROTECTIVE COVERS, PLUGS, CAPS AND IDENTIFICATION TAGS AS EACH ITEM GETS CONNECTED OR INSTALLED.	
6.	Lift the engine into position.	
7.	Carefully move the engine aft to put the mounting frame into position against the firewall. - Install the four mounting frame bolts - Install the four plain washers - Attach the four self-locking nuts - Put a wrench on the heads of the bolts - Tighten the four nuts.	Heads of the bolts on the cockpit side of the firewall. NOTE: The grip length of the bolt can be varied to compensate for differences in the composite thickness. Refer to Chapter 20 for torque.
8.	Install the nose-gear elastomer pack to the engine-mounting frame.	Refer to Chapter 32-20.
9.	Release the tension on the hoist.	
10.	Disconnect the hoist. Remove the sling from the engine.	
11.	Install the heat shield bracket to the engine. - Install the two spring washers and the two screws - Tighten the screws.	
	WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.	

	Detail Steps/Work Items	Key Items/References
12.	Attach the fuel feed hose to the fuel pump inlet. - Tighten the fuel pipe connector.	 Torque to 270 lbf-in (30.5 Nm)
13.	Attach the fuel return hose to the fuel pump outlet. - Tighten the fuel pipe connector.	 Torque to 135 lbf-in (15.2 Nm)
14.	For aircraft fitted with a manifold valve fuel return hose, attach the fuel return hose to the manifold valve return port. - Tighten the fuel pipe connector.	 Torque to 135 lbf-in (15.2 Nm)
15.	Install the shield to the right side of the aft baffle.	
16.	Install the engine exhaust system.	Refer to Chapter 78-00.
17.	Attach the vacuum hose to the firewall connector. Install the worm drive clamp: - Tighten the worm drive clamp.	
18.	Attach the engine ground cable to the bottom of the blanking plate on the engine accessory housing. - Tighten the bolt.	 Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. for the torque value.
19.	Install the tachometer drive shaft. - Put the flexible drive shaft into the engine accessory case at the attachment point - Install the knurled nut to the accessory case housing.	
	WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.	
20.	Connect the inlet and outlet oil hoses to the oil cooler. Tighten the two connections.	Torque to 360 lbf-in (40.67 Nm)
21.	Install the flexible pipe between the oil cooler and the aft baffle. Install the worm drive clamps to the oil cooler and to the aft baffle. Tighten the clamps.	

	Detail Steps/Work Items	Key Items/References
	NOTE: If the generator has been removed, refer to Chapter 24-20 for the installation procedure. NOTE: If the engine baffles have been removed, refer to Chapter 75 for the installation procedure.	
22.	Attach the engine electrical cables to the following components: - The oil temperature sensor - The oil pressure sensor - The CHT sensor - The events (hour meter) switch - The fuel pressure sensor - The EGT sensor - The starter cable (one cable) - The generator (two cables). - Attach the electrical cable to P clips.	
23.	Install the P-clip that attaches the fuel pump and cylinder drain pipes to the firewall.	
24.	Cut the locking wire from the oil sump drain plug: - Remove the oil sump drain plug - Drain the preservation oil from the oil sump into a correct oil container.	
25.	Install the oil sump drain plug. - Tighten the oil sump drain plug - Lock the plug with wire.	Torque to 190 - 210 lbf-in (21.4 - 23.7 Nm).
	CAUTION: USE ONLY THE CORRECT ENGINE OILS. REFER TO THE TELEDYNE CONTINENTAL MAINTENANCE MANUAL FOR THE CORRECT ENGINE OIL SPECIFICATIONS. IF YOU DO NOT USE THE CORRECT ENGINE OIL, THE ENGINE CAN BE DAMAGED.	

	Detail Steps/Work Items	Key Items/References
26.	Fill the engine oil system with the correct specification engine oil.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. for the correct oil specification and quantity.
27.	Install the flexible pipe between the muffler and the cabin heat control valve. - Install the worm drive clamp to the muffler - Tighten the clamp.	
28.	Put the mixture control cable in position through the rubber grommet at the aft baffle.	
29.	Install the mixture control cable into the support bracket at the front of the engine as follows: For aircraft with a standard fuel pump: - Install the rear adjusting nut to the control cable - Put the control cable in position through the bracket - Install the forward adjusting nut to the control cable. For aircraft with an altitude compensating fuel pump: - Insert the end of the mixture control cable through the hole in the apron - Slide the notch in the control cable into the slot of the support bracket - Install the keeper onto the cable and slide it into place - Install the screws, washers and nuts to secure the keeper to the bracket - Tighten the assembly.	

	Detail Steps/Work Items	Key Items/References
30.	Install the mixture control cable to the fuel mixture control lever as follows: For aircraft with a standard fuel pump: - Put the bolt through the lever from the engine side - Put one washer onto the bolt - Put the control cable wire through the hole in the bolt - Put one washer onto the bolt - Attach the nut to the bolt - Tighten the assembly. For aircraft with an altitude compensating fuel pump: - Install the jam nut and rod end onto the mixture control cable - Put the thin washer under the head of the bolt - Insert the bolt into the mixture lever from the inboard side - Put one washer onto the bolt on the other side of the mixture lever - Put the rod end onto the bolt - Put one washer onto the bolt - Put the large diameter washer onto the bolt - Attach the nut to the bolt - Tighten the assembly.	
31.	Put the throttle control cable in position through the rubber grommet at the aft baffle.	

	Detail Steps/Work Items	Key Items/References
	CAUTION: MAKE SURE THAT THE THROTTLE CABLE BRACKET IS ATTACHED TO THE INDUCTION HOUSING WITH A FILLISTER HEAD SCREW AND THE SCREW IS LOCK WIRED. IF YOU DO NOT DO THIS, THE FILLISTER HEAD SCREW CAN LOOSEN AND CAUSE THROTTLE CONTROL PROBLEMS.	
32.	Install the throttle control cable to the bracket at the top of the engine. - Install the rear adjusting nut to the control cable - Put the control cable in position through the bracket	
	- Install the forward adjusting nut to the control cable. Install the P-clamp which holds the throttle cable to the top right tube of the engine mounting frame.	
33.	Install the eye end of the throttle control cable onto the throttle lever: - Put one washer under the head of the bolt - Put the bolt through the eye end of the control cable - Put one washer onto the bolt on the other side of the eye end - Attach the bolt to the throttle lever - Put one washer on the bolt - Attach the nut to the bolt - Tighten the assembly.	Torque to 1.2 lbf-ft (1.7 Nm)
34.	Do a throttle control Freedom of Movement Check and a throttle control Range of Movement Check.	Refer to Chapter 76-00. If necessary, adjust the throttle control.
35.	Do a mixture control Freedom of Movement Check and a mixture control Range of Movement Check.	Refer to Chapter 76-00. If necessary, adjust the mixture control.

	Detail Steps/Work Items	Key Items/References
36.	Install the control cable to the alternate air lever. Install the following items: - Bolt - Washer - Control cable eye-end - Return spring - Lever arm - Washer - Nut Tighten the assembly.	Torque to 1.2 lbf-ft (1.7 Nm)
37.	Do a test for correct, full and free movement of the alternate air control. If necessary, adjust the alternate air control.	Refer to Chapter 76-00.
	WARNING: DO NOT INSTALL THE IGNITION HARNESS "B" NUTS UNTIL THE PROPELLER INSTALLATION HAS BEEN COMPLETED AND THE IGNITION SWITCH TEST HAS BEEN COMLETED. IF YOU DO NOT OBEY THIS INSTRUCTION, INJURY TO PERSONNEL CAN OCCUR.	
38.	Install the propeller to the engine.	Refer to Chapter 61-00.
39.	Connect the aircraft battery.	Refer to Chapter 24-31.
40.	Do an engine oil level check.	Refer to Chapter 12-10.
41.	Install the bottom four spark plugs to the four cylinders. Tighten the four spark plugs.	Torque to 300 - 360 lbf-in (34 - 40 Nm).
42.	Do the engine pre-oil procedure.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
43.	Install the top four spark plugs to the four cylinders. Tighten the four spark plugs.	Torque to 300 - 360 lbf-in (34 - 40 Nm).
44.	Install the spark plug leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 - 120 lbf-in (12.4 - 13.5 Nm).
45.	Bleed the engine fuel system.	Refer to Chapter 73-00.
46.	Do an engine fuel system test.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.

	Detail Steps/Work Items	Key Items/References
47.	Do an engine test. - Record the data from the engine test.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
48.	Install the cowlings.	Refer to Chapter 71-10.
CAUTION:	TELEDYNE CONTINENTAL RECOMMEND THAT YOU DO A FLIGHT TEST BEFORE YOU RELEASE THE AIRCRAFT FOR NORMAL USE. THIS WILL MAKE SURE THE PISTON RINGS HAVE SEATED AND THAT THERE ARE NO LEAKS FROM THE ENGINE SYSTEMS.	
49.	Do an engine flight test.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. and the DA20-C1 Airplane Flight Manual for Operating Limits.

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COWLING

1. General

The DA20-C1 aircraft has two cowlings. It has a top cowling and a bottom cowling. The two halves attach to the airframe with camlock fasteners. The top cowling has a left and a right air intake. It also has an inspection panel to give you access to the engine oil dipstick. The bottom cowling has one large air intake.

Figure 1 shows the two cowlings.

2. Description

GFRP or CFRP moldings make the power plant top and bottom cowlings. A strip of carbon fiber bonded to the edges of the cowlings makes them strong. Camlock fasteners installed around the edge of the cowlings attach them to the airframe. A hinge attaches the oil filler access panel to the top cowling and a rotary lock holds it closed. Polyurethane paint protects the outside skin from ultraviolet rays and humidity. The insides of the cowlings have a layer of fire resistant paint applied for protection.

Two holes at the front of the top cowling supply ram air to cool the engine. The one hole at the front of the bottom cowling supplies ram air to the air intake.

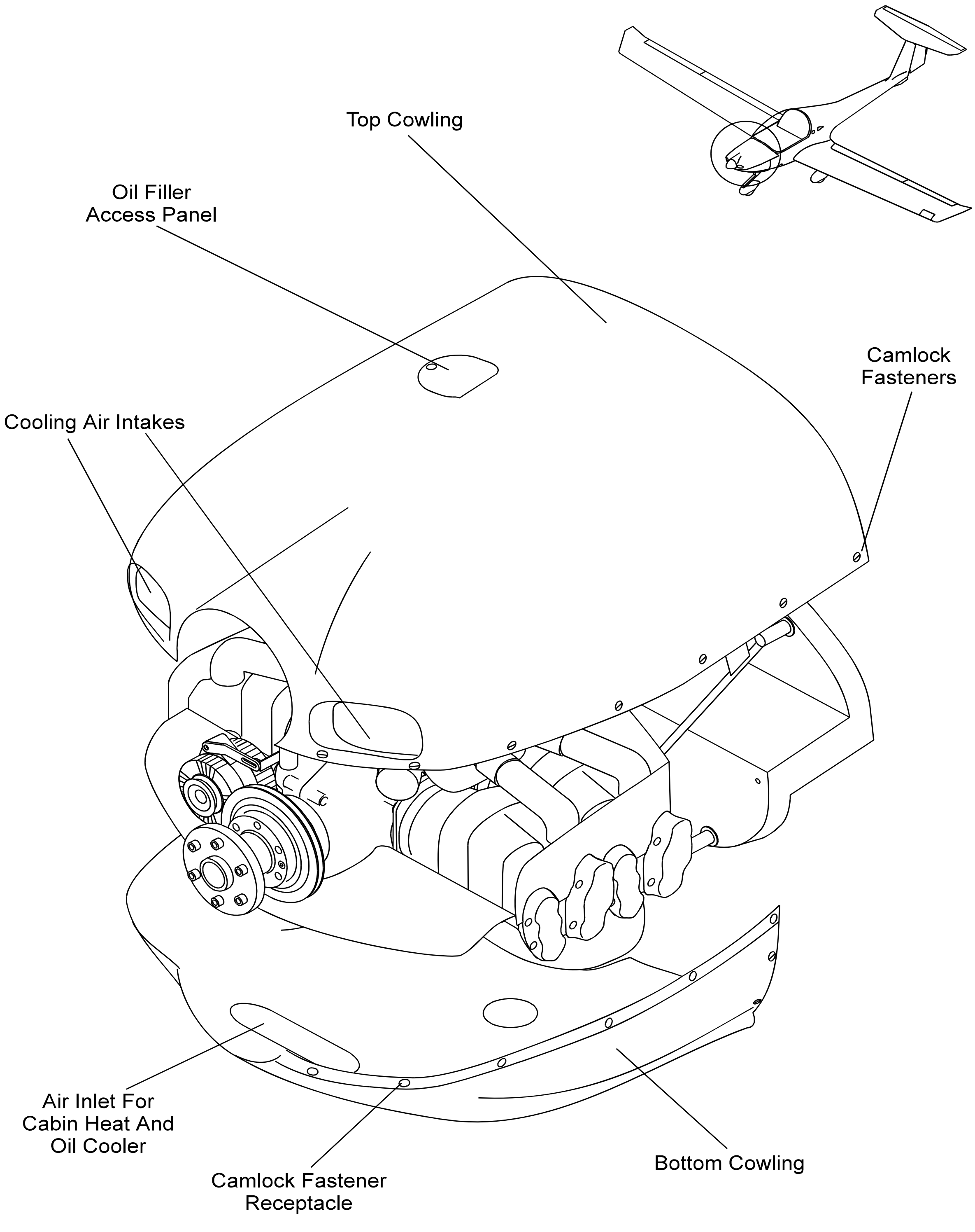

Figure 1 - Engine Cowlings

COWLING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the cowling. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Cowling damaged.	Not installed correctly.	Replace/repair the damaged cowling.
Camlock fastener damaged/ missing.	Camlock fastener defective.	Replace the defective camlock fastener.

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COWLING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the cowlings and how to do a high temperature paint repair of a cowling.

WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Remove/Install the Cowlings

A. Remove the Cowlings

	Detail Steps/Work Items	Key Items/References
1.	Unlock the camlock fasteners from the top cowling.	
2.	Remove the top cowling from the aircraft.	
3.	Unlock the camlock fasteners from the bottom cowling.	Hold the cowling.
4.	Remove the bottom cowling from the aircraft.	

B. Install the Cowlings

	Detail Steps/Work Items	Key Items/References
1.	Inspect the cowlings for damage. Look especially for damage to the camlock fasteners	
2.	Put the bottom cowling in position on the bottom of the aircraft. - Lock the camlock fasteners.	Lightly tap all the fasteners to make sure they are locked correctly.
3.	Put the top cowling in position on the top of the aircraft. - Lock the camlock fasteners.	Lightly tap all the fasteners to make sure they are locked correctly.

3. High Temperature Paint Repair of a Cowling

NOTE: An equivalent procedure can be used to repair damage in the area underside of the aircraft flight compartment, aft of the engine. This area is a fixed part of the aircraft structure.

	Detail Steps/Work Items	Key Items/References
1.	Remove the cowling that requires repair.	Refer to paragraph 2.A.
2.	Put the cowling on a satisfactory work stand to permit clear access to the area that requires repair.	Make sure that the outside of the cowling is on a protective surface so that it will not be damaged.
3.	Carefully examine the cowling and identify the area(s) that require(s) repair.	At each step of the repair, complete all areas of the cowling in need of repair for that sequence.
4.	Make an estimate of the repair(s) required, and then get the materials and safety equipment satisfactory for the job.	For approved materials and suppliers, refer to AMM Chapter 51-00.

WARNING: OBEY THE SAFETY PRECAUTIONS THAT FOLLOW WHEN YOU DO WORK WITH COMPOSITE MATERIALS:

- DO THE WORK IN AN AREA THAT HAS A GOOD FLOW OF CLEAN AIR
- USE APPROVED EYE, MOUTH, AND BODY PROTECTION. SMALL PARTICLES CAN GO THROUGH USUAL CLOTHING
- DO NOT LET THE MATERIALS TOUCH YOUR EYES, MOUTH, OR SKIN
- IF IRRITATION OCCURS, GET MEDICAL AID IMMEDIATELY
- OBEY THE MANUFACTURER'S INSTRUCTIONS
- DO NOT USE CHEMICAL PAINT REMOVERS. TO REMOVE PAINT FROM COMPOSITES THAT HAVE RESIN, USE ABRASIVE MATERIALS
- DO NOT USE POWER TOOLS TO MAKE A SURFACE ROUGH.

YOU CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO EQUIPMENT IF THESE SAFETY PRECAUTIONS ARE NOT OBEYED.

	Detail Steps/Work Items	Key Items/References
5.	Prepare the area(s) of the cowling for the application of the high temperature paint, as follows:	For approved materials and suppliers, refer to Chapter 51-00.
	- If dirt or grease is present, wash the area with clean carbon tetrachloride or acetone. Wipe the area off immediately	
	- Abrade the surface with 280 grit sandpaper	Make sure that you do not damage the laminate. Only remove the transparent top coat and the fire resistant paint.
	- Remove the dust with a fully opened tack cloth	
	- Cover the area(s) of the cowling that will not be painted. Use masking tape to hold the cover(s) in place.	

WARNING: OBEY THE SAFETY PRECAUTIONS THAT FOLLOW WHEN YOU USE PAINTS:

- USE SAFETY GOGGLES
- USE SAFETY CLOTHING
- DO NOT LET PAINTS TOUCH YOUR SKIN, EYES, OR MOUTH
- PAINTS ARE POISONOUS
- IF IRRITATION OCCURS, GET MEDICAL AID
- DO THE WORK IN AN AREA THAT HAS A GOOD FLOW OF AIR
- DO THE WORK IN AN AREA THAT DOES NOT HAVE SPARKS, FLAME, OR HOT SURFACES.
- OBEY THE MANUFACTURER'S INSTRUCTIONS.
- THE TEMPERATURE MUST BE BETWEEN 65 AND 120 ^{o}F (18 AND 49 ^{o}C).
- THE RELATIVE HUMIDITY MUST BE BETWEEN 25 AND 80 PERCENT.

YOU CAN CAUSE INJURY TO PERSONS AND/OR DAMAGE TO EQUIPMENT IF THESE SAFETY PRECAUTIONS ARE NOT OBEYED

	Detail Steps/Work Items	Key Items/References
6.	Apply the first coat of fire resistant paint with a splatter spray gun, a brush or a roller to a minimum thickness of 0.010 in (250 microns).	For approved materials and suppliers, refer to Chapter 51-00. Make sure that the painting is done in a dust free area.
7.	Let the fire resistant paint dry, in a dust free area, for a minimum of four hours.	The following drying times refer to a normal climate of 23 ºC and 50% humidity: - Dust-free - after 2 hours minimum - Maskable - after 8 hours minimum - Recoatable - after 4 hours minimum (no maximum) - Transparent Top Coat Application - after 24 hours minimum - Transportable - after 8 hours minimum - Full Cure - after 7 days.
8.	Remove any dust that has collected with a fully opened tack cloth.	
9.	After a minimum of four hours, apply the second coat of fire resistant paint with a splatter spray gun, a brush or a roller to a minimum thickness of 0.010 in (250 microns).	Make sure that the painting is done in a dust free area.
10.	Let the fire resistant paint dry, in a dust free area, for a minimum of 24 hours.	
11.	Before the transparent top coat is applied, remove any dust that has collected with a fully opened tack cloth.	
12.	Apply the first coat of transparent top coat with a high pressure sprayer as follows: For product 9008B0900D: For product CA8720M0900C:	For approved materials and suppliers, refer to Chapter 51-00. Make sure that the painting is done in a dust free area. - Spray viscosity - (ISO 4) - Orifice - 0.060 in (1.5 mm) - Pressure - 3 to 5 bar (40 to 70 PSI). - Spray viscosity - (ISO 4) 27 - 40 sec. - Orifice - 0.060 in (1.5 mm)

	Detail Steps/Work Items	Key Items/References
		- Pressure - 3 to 4 bar (40 to 58 PSI).
13.	Allow it to dry for 30 to 45 minutes and apply the second coat.	
14.	Apply the two cross coats to achieve the required thickness.	Film thickness: For the first coat: 25 microns For the second coat: 35 microns. Total thickness: 60 microns (0.002 in or 2.3 mil)
15.	Let the transparent top coat dry, in a dust free area as follows: For product 9008B0900D: For product CA8720M0900C:	The following drying times refer to a normal climate of 23 ºC and 50% humidity: - Dry to Tape: 10 to 14 hours - Full cure: 7days - Dry to Tape: 3 to 4 hours - Full cure: 7days
16.	Remove and discard the cover(s) and masking tape from the cowling. Remove any dust that has collected with a fully opened tack cloth.	
17.	Visually inspect the completed high temperature paint repair(s). Make sure that there are no defects, such as bubbles, pinholes, craters, chips, scratches or abrasions.	
18.	Install the cowling.	Refer to paragraph 2.B.

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MOUNTS

1. General

The DA20-C1 aircraft has an engine mounting frame. The mounting frame attaches the engine to the airframe. It also has shock mounts that are installed between the mounting frame and the engine. The shock mounts decrease the vibration transmitted from the engine to the airframe.

Figure 201 shows the engine mounting frame. Refer to the Teledyne Continental Maintenance Manual for data on the engine shock mounts.

2. Description

The engine-mounting frame attaches to the firewall with bolts and self-locking nuts. Tubular steel makes the mounting frame. The mounting frame attaches to the engine with shock-mounts. Rubber and metal bushings make the engine shock-mounts.

P-clips and tie-wraps attach electrical cables to the mounting frame. They also attach pipes and hoses to the mounting frame.

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MOUNTS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the engine mounting frame with the engine removed from the aircraft and also describes how to remove and install the engine shock mounts.

Refer to Chapter 71-00 for the engine remove/install procedure.

Refer to the Teledyne Continental Motors Maintenance Manual for data on the engine. Also refer to the Teledyne Continental Motors Maintenance Manual for data on the shock mounts.

2. Remove/Install the Engine Mounting Frame

A. Remove the Engine Mounting Frame

	Detail Steps/Work Items	Key Items/References
NOTE: The removal procedure of the engine mounting frame that follows, has the engine removed from the aircraft.		
1.	Put a support below the mounting frame before you disconnect it.	
2.	Remove the P-clip that attaches the air/oil separator vent pipe to the mounting frame.	
3.	Remove the P-clip that attaches the fuel pump and cylinder drain pipes to the mounting frame.	
4.	Remove the four nuts that attach to the mounting frame bolts.	
5.	Carefully pull the mounting frame bolts from the mounting frame. - Remove the two support struts - Remove the shock mount assemblies.	
6.	Remove the mounting frame clear of the engine.	

B. Install the Engine Mounting Frame

	Detail Steps/Work Items	Key Items/References
NOTE: The installation procedure of the engine mounting frame that follows, has the engine removed from the aircraft.		
1.	Do an inspection of the mounting frame. Look specially for cracks.	
2.	Do an inspection of the engine mounts. Look specially for damage to the rubber bushings.	
3.	Put the mounting frame in position and put a support below the mounting frame.	
4.	Assemble the top shock mounts as follows:	Refer to Figure 201.
	- Put the top 2 shock mounts into position between the mounting frame and the engine	Make sure the cup washers are installed correctly.
	- Put the two support struts into position	
	- Put the two top bolts through the support struts and mounting frame to hold the engine mounts in position	Heads aft.
	- Put the two shock mounts into position on the two bolts at the forward face of the engine	Refer to the Teledyne Continental Motors Maintenance Manual for shock mount assembly data.
	- Install the two nuts and the washers.	
5.	Assemble the bottom shock mounts as follows:	Refer to Figure 201.
	- Put the bottom two shock mounts into position between the mounting frame and the engine	Make sure the cup washers are installed correctly.
	- Put the two shock mounts into position at the forward face of the engine	
	- Put the two bottom bolts through the shock mounts, mounting frame and support struts	Heads forward. Refer to the Teledyne Continental Motors Maintenance Manual for shock mount assembly data.
	- Install the two nuts and the washers.	

	Detail Steps/Work Items	Key Items/References
6.	Tighten the four nuts.	Torque to 180 - 190 lbf-in (20.4 - 21.5 Nm).
7.	Install the P-clip that attaches the air/oil separator vent pipe to the mounting frame.	
8.	Install the P-clip that attaches the fuel pump and cylinder drain pipes to the mounting frame.	

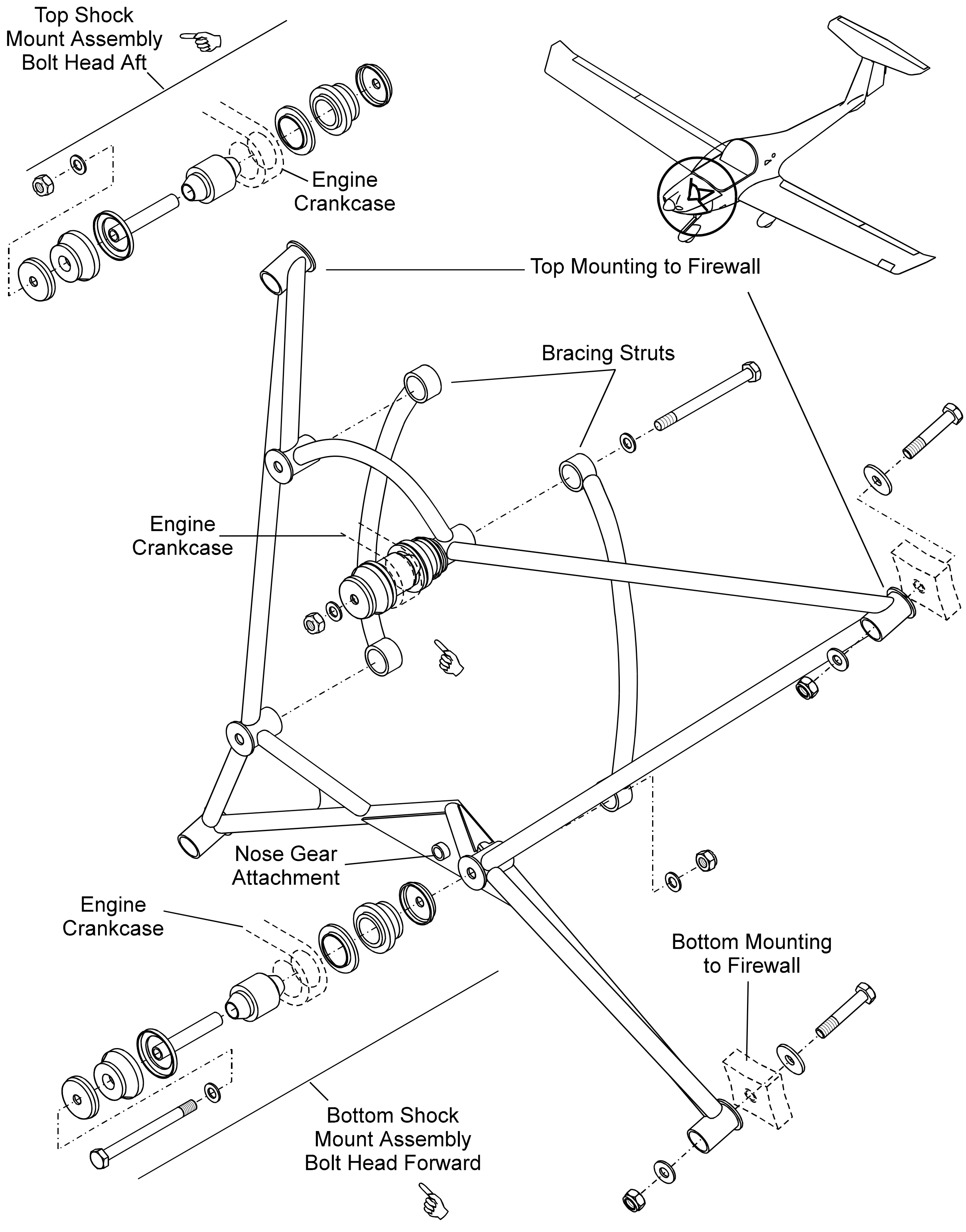

Figure 201 - Engine Mounting Frame

AIR INTAKES

1. General

The DA20-C1 aircraft has a GFRP air intake that attaches below the front of the engine. Two flexible hoses from the air intake go to the exhaust muffler and the engine intake manifold. An opening at the rear of the air intake supplies alternate air to the engine intake manifold.

2. Description

The GFRP air intake attaches to the bottom of the engine at the front. The air intake has three openings. The left opening (primary intake) supplies air through a filter assembly and large flexible hose to the engine intake manifold. The right opening supplies unfiltered air through a duct and large flexible hose to the heat-exchanger on the muffler.

The rear opening (alternate intake) has a door assembly. A bowden cable controls the door position from the cockpit. If the filter in the left opening becomes blocked, you can select the alternate air supply.

A stainless-steel mesh screen bonds into the left opening. The screen holds the air filter.

Refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the induction system and refer to AMM Chapter 21-00 for data on the heat-exchanger.

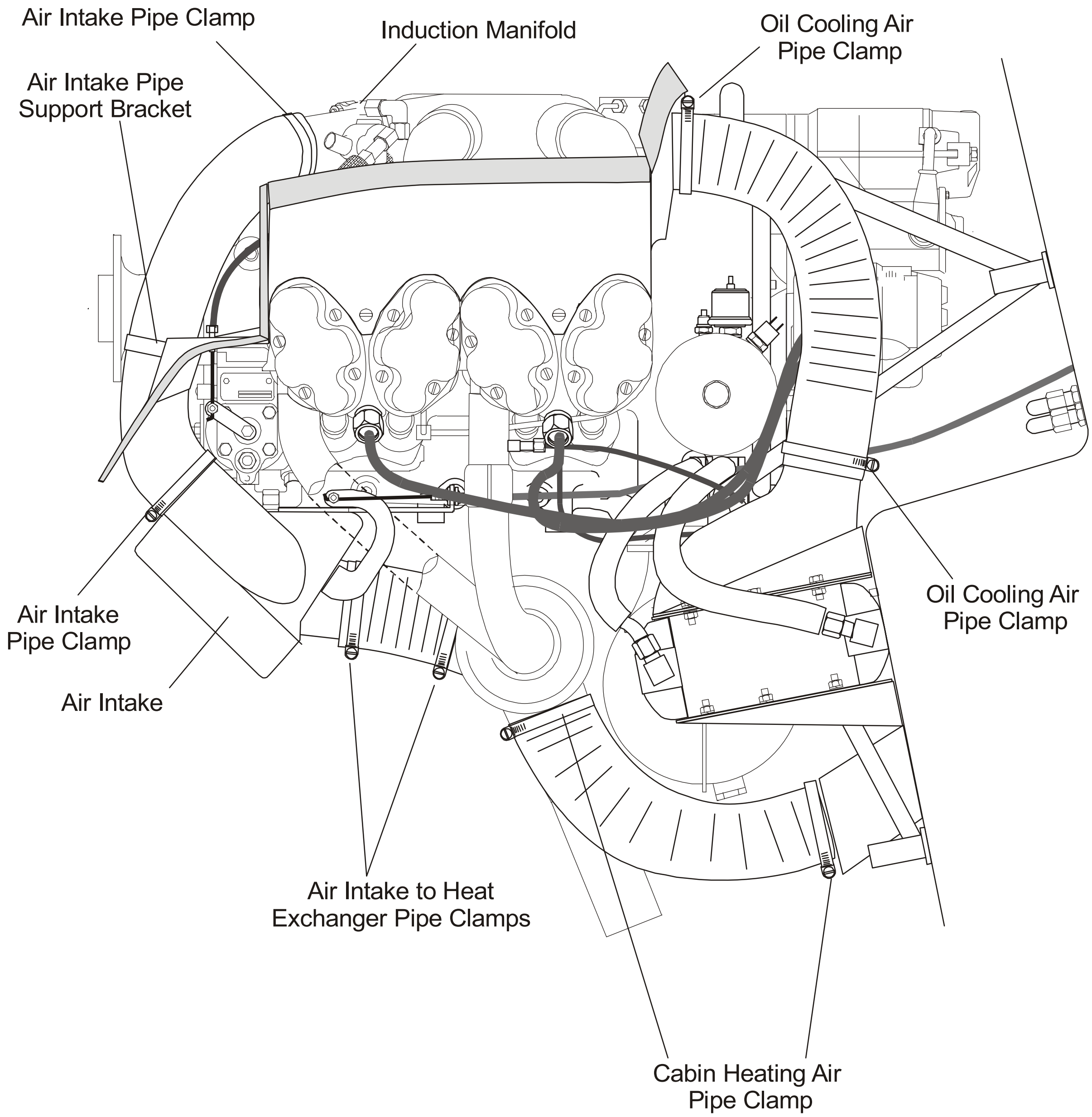

Figure 1 - Air Intakes

AIR INTAKES - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the air intake.

WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Remove/Install the Air Intake

A. Remove the Air Intake

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the control cable from the alternate air lever. Remove the following items: - Nut - Bolt - Two washers - Return spring Disconnect the control cable.	
3.	Remove the air intake from the bottom of the engine.	
4.	Remove the four nuts that attach to the mounting frame bolts. - Remove the two worm drive clamps from the flexible hoses at the air intake - Disconnect the two flexible hoses - Cut the lock wire and remove the two bolts, nuts and washers from the bracket where it attaches to the engine - Remove the air intake.	

B. Install the Air Intake

	Detail Steps/Work Items	Key Items/References
1.	Inspect the air intake for damage. Look especially for cracks and correct attachment of the screen.	
2.	Install the air intake to the bracket at the bottom of the engine: - Put the air intake in position on the bracket - Install the bolts with the nuts and washers - Lock wire the bolts - Make sure the two flexible hoses are clear of debris - Connect the two flexible hoses to the air intake - Install the two worm drive clamps to the flexible hoses at the air intake.	
3.	Install the control cable to the alternate air lever. Install the following items: - Bolt - Washer - Control cable eye-end - Return spring - Lever arm - Washer - Nut Tighten the assembly.	Torque to 1.2 lbf-ft (1.7 Nm).
4.	Do a test for correct, full and free movement of the alternate air control. If necessary, adjust the alternate air control.	Refer to Chapter 76-00.
5.	Install the cowlings.	Refer to Chapter 71-10.

ENGINE DRAINS

1. General

The IO-240B series engine installed in the DA20-C1 aircraft has the following engine drains:

- Fuel drain from the fuel distribution manifold
- Fuel drain from the four cylinders
- Fuel drain from the fuel pump.

Refer to the Teledyne Continental Motors Maintenance Manual for more data on the engine drains.

2. Description

A. Fuel Distribution Manifold Drain

Rubber hose makes the drain pipe for the fuel distribution manifold. The drain pipe connects to the right side of the fuel distribution manifold at the top of the engine. The drain pipe goes rearwards from the fuel distribution manifold through the aft baffle to the right side of the engine. At the bottom of the engine the drain pipe connects to the fuel drain assembly at the bottom of the firewall. Fuel draining from the drain pipe shows you that the internal diaphragm in the fuel distribution manifold has failed.

B. Cylinder Drain

Aluminum alloy makes the drain pipes for the four cylinders. The drain pipes connect from the cylinder heads to a "T" piece connector below the engine. From the "T" piece connector the drain pipes connect to a single pipe on the left side of the engine. The pipe has a check valve installed. Rubber hose connects the outlet from the check-valve to a fuel drain assembly at the bottom of the firewall.

When the engine starts the check valve closes. At engine start and engine shut down remaining fuel from the cylinders drains through the drain pipe at the bottom of the engine cowling.

C. Fuel Pump Drain

The drain pipe for the fuel pump is made of aluminum alloy. The drain pipe connects to the fuel injection pump at the left side of the engine. From the injection pump the drain pipe goes below the engine rearwards where it attaches with P-clips to the engine. Rubber hose connects the aft end of the drain pipe to a fuel drain assembly at the bottom of the firewall. Fuel draining from the drain pipe indicates that the internal fuel pump seal has failed.

On aircraft equipped with an altitude compensating fuel pump, there is an aluminum pipe that runs from the ambient pressure reference port of the fuel pump to the fuel pump drain line. The pressure reference line connects to a "T" fitting installed in the fuel drain line.

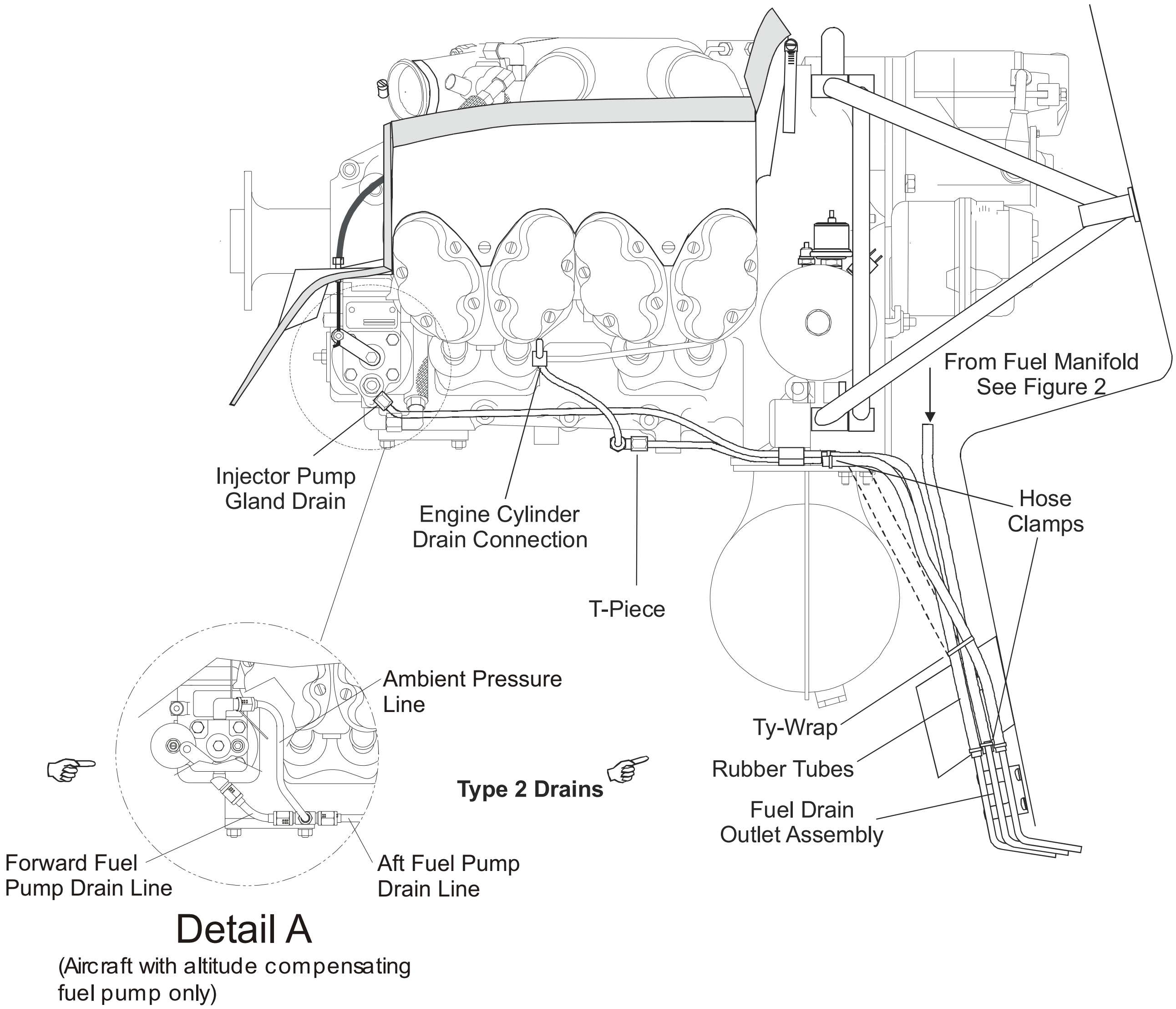

Figure 1 - Drains on the Left Side of the Engine

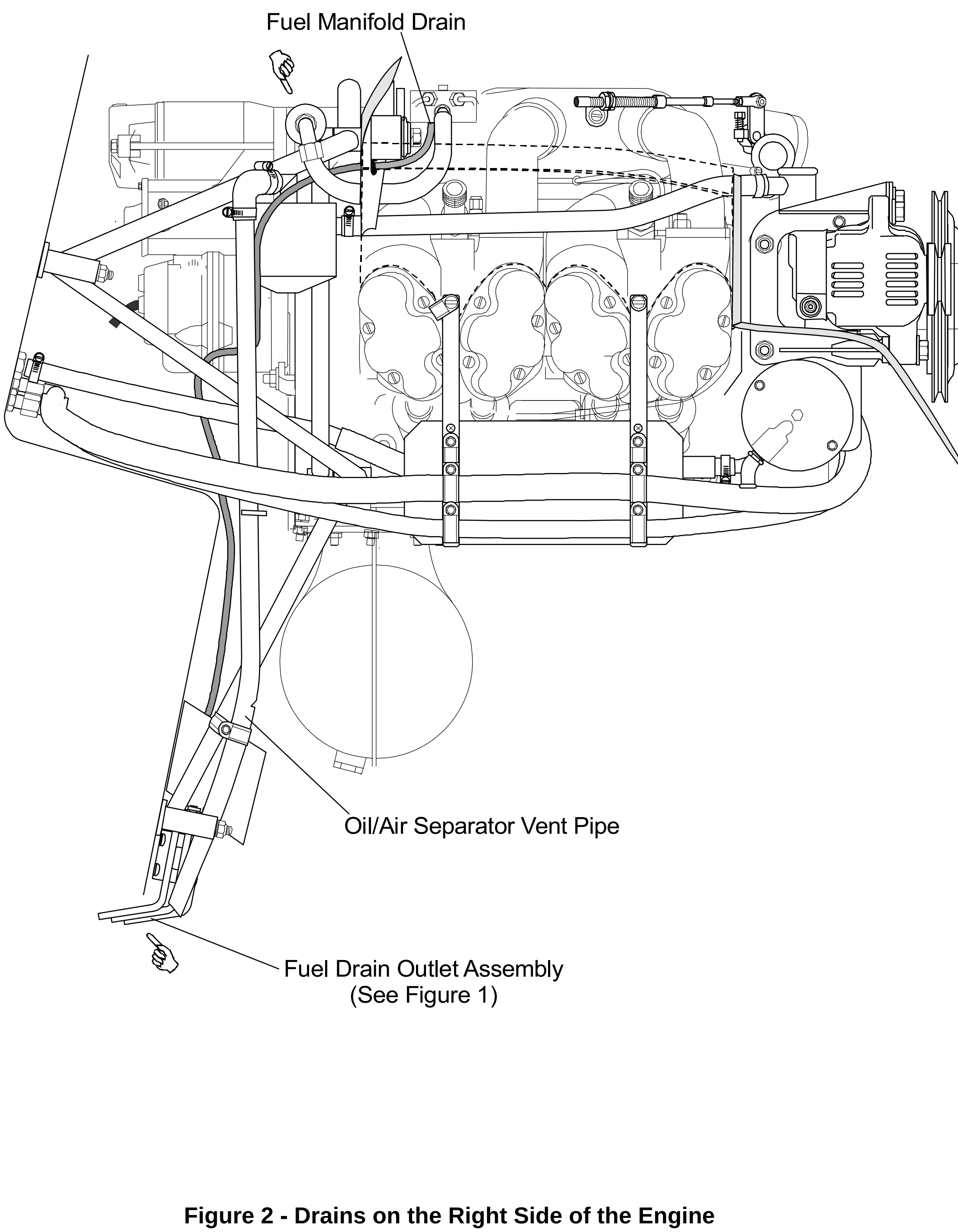

Figure 2 - Drains on the Right Side of the Engine

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ENGINE DRAINS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the engine drains. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Fuel leaks from the fuel distribution manifold drain.	The internal diaphragm of the fuel distribution manifold has failed.	Replace the fuel distribution manifold. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
Fuel leaks from the fuel pump drain.	The internal seal of the fuel pump has failed.	Replace the fuel pump. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.

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ENGINE DRAINS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the engine drains.

Refer to the DA20-C1 Airplane Flight Manual (AFM) for engine run instructions/data.

WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.

WARNING: DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.

2. Remove/Install the Fuel Distribution Manifold Drain

A. Remove the Fuel Distribution Manifold Drain

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Loosen the hose clamp on the fuel drain outlet assembly. Pull the hose from the assembly.	
3.	Remove the drain pipe from the fuel distribution manifold.	
4.	Carefully pull the drain pipe through the aft baffle out of the rubber grommet. Remove the pipe.	

B. Install the Fuel Distribution Manifold Drain

	Detail Steps/Work Items	Key Items/References
1.	Examine the drain pipe. Make sure that the inner bore of the pipe is clear.	
2.	Carefully put the drain pipe through the rubber grommet in the aft baffle.	

	Detail Steps/Work Items	Key Items/References
3.	Install the drain pipe to the fuel distribution manifold.	
4.	Push the drain pipe onto the fuel drain outlet assembly. Install the hose clamp.	
5.	Install the engine cowlings.	Refer to Chapter 71-10.

3. Remove/Install The Cylinder Drain

NOTE: This procedure removes and installs the check-valve, rigid pipe and rubber hose as an assembly. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data about the engine cylinder drain.

A. Remove the Cylinder Drain

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Loosen the hose clamp on the fuel drain outlet assembly. Pull the cylinder drain hose from the assembly.	
3.	Release the fuel drain bracket below the bottom left shock-mount.	
4.	Disconnect the check valve from the "T" piece connector below the engine. Remove the drain pipe and check valve assembly.	

B. Install the Cylinder Drain

	Detail Steps/Work Items	Key Items/References
1.	Examine the drain pipe. Make sure that the inner bore of the pipe is clear.	
2.	Put the drain pipe and check valve assembly in position below the engine. Install the check valve to the "T" piece connector.	
3.	Install the drain pipe to the fuel drain bracket below the bottom left shock-mount.	
4.	Push the rubber hose onto the fuel drain outlet assembly. Install the hose clamp.	
5.	Install the engine cowlings.	Refer to Chapter 71-10.

4. Remove/Install the Fuel Pump Drain

A. Remove the Fuel Pump Drain

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Loosen the hose clamp on the fuel drain outlet assembly. Pull the fuel pump drain hose from the assembly.	
3.	Release the fuel drain bracket below the bottom left shock-mount.	
4.	Disconnect the drain pipe from the injection pump below the engine. On aircraft with an altitude compensating fuel pump, disconnect the ambient pressure reference line from the fuel pump.	
5.	Remove the drain pipe assembly.	

B. Install the Fuel Pump Drain

	Detail Steps/Work Items	Key Items/References
1.	Examine the drain pipe. Make sure that the inner bore of the pipe is clear. On aircraft equipped with an altitude compensating fuel pump, examine the ambient pressure reference line. Make sure the inner bore of the pipe is clear.	
2.	Put the drain pipe and check valve assembly in position below the engine. Install the drain pipe to the injection pump. On aircraft equipped with an altitude compensating fuel pump, install the ambient pressure reference line to the fuel pump.	
3.	Install the drain pipe to the fuel drain bracket below the bottom left shock-mount.	
4.	Push the rubber hose onto the fuel drain outlet assembly. Install the hose clamp.	
5.	Install the engine cowlings.	Refer to Chapter 71-10.

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CHAPTER 72-00
ENGINE

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ENGINE

1. General

This chapter describes the Teledyne Continental IO-240-B engine installed in the DA20-C1 aircraft. It does not give you the data to do maintenance on the engine and it does not tell you about maintenance in the repair shop.

Refer to the Teledyne Continental IO-240-B Maintenance Manual for data/instructions to do maintenance on the engine. Also refer to the newest service bulletins before you do work on the engine.

2. Description

Figure 1 shows a general view of the engine. The engine has the usual parts. The crankcase makes the body of the engine. It supports the crankshaft, camshaft, different gears, accessories, cylinders and support brackets.

The steel crankshaft has three machined journals. The three main journals attach to the bearing saddles in the crankcase. Machined rod journals attach to the four connecting rod assemblies.

An accessory case closes the rear of the crankcase. The accessory case has drive pads for the starter and two magnetos. Refer to Chapter 80-00 for data about the starter. Refer to Chapter 74-00 for data about the ignition system.

Four cylinders attach to the crankcase. Number 1 cylinder is at the rear on the right. Refer to Figure 1 for the cylinder numbering.

An oil sump attaches to the bottom of the crankcase. The oil sump has a filler tube behind the rear right cylinder. A special oil distribution block attaches to the accessory case. The block has the oil filter and the oil system sensors. Refer to Chapter 79-00 for data about the oil distribution block and its components.

The induction system attaches to the top of the crankcase. Air enters through the air metering valve at the front. A plenum assembly supplies the air to four inlet pipes which carry the air to the cylinders.

A fuel pump attaches to the front of the crankcase. The fuel metering unit and fuel manifold valve are on top of the crankcase. Refer to the Teledyne Continental IO-240-B Maintenance Manual for data on the fuel system components.

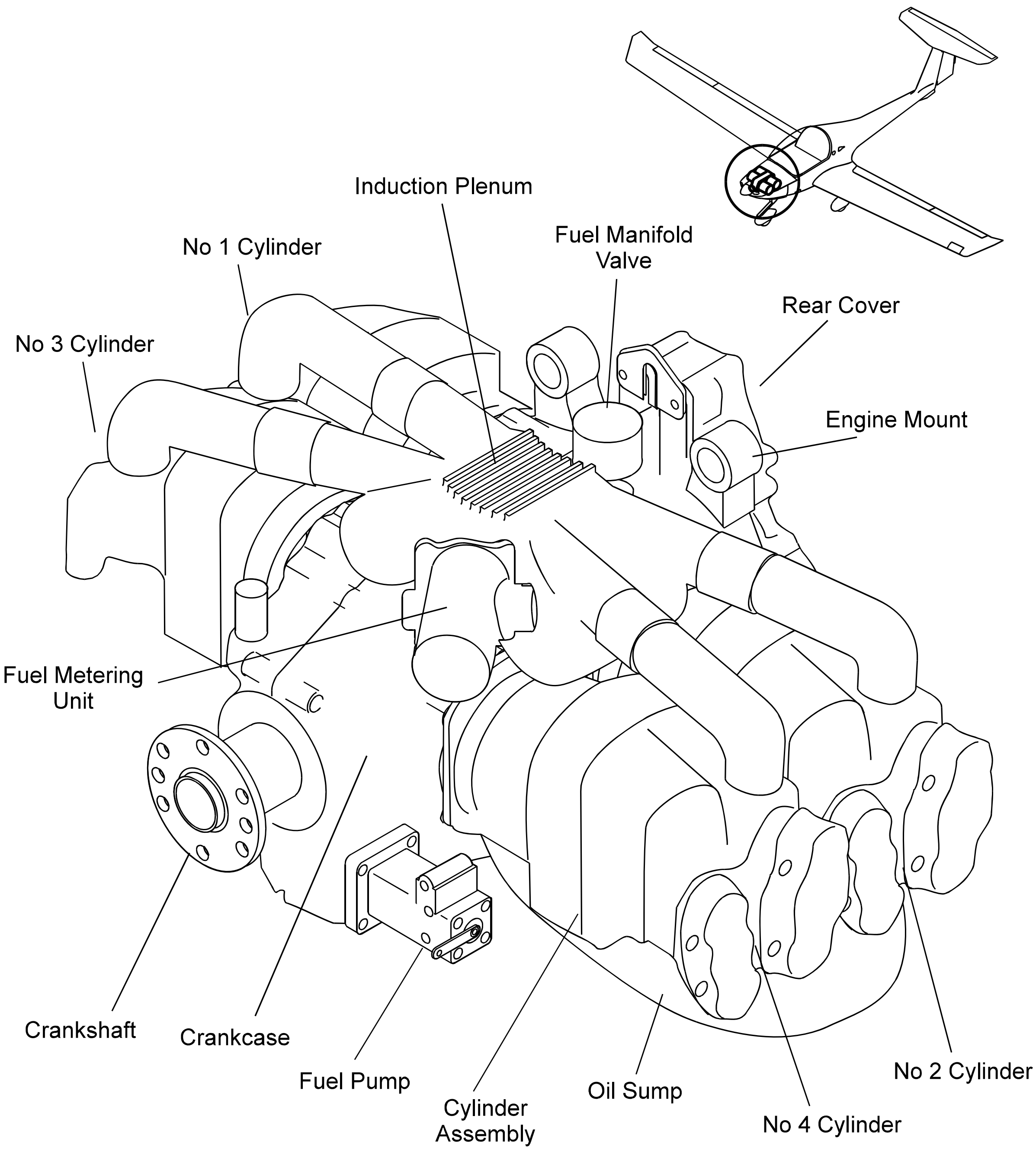

Figure 1 - Engine

CHAPTER 73-00

ENGINE FUEL AND CONTROL

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ENGINE FUEL AND CONTROL

1. General

This chapter describes the DA20-C1 aircraft:

- engine fuel control system
- the engine fuel pressure indicator
- the fuel pressure sensor.

It does not give you the data to do maintenance on the engine fuel control system and about maintenance in the repair shop.

It also describes how to:

- remove/install the engine air filter, fuel pressure sensor and fuel pressure indicator
- trouble-shoot the engine air filter and the fuel flow indication system
- bleed the fuel pipes.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data/ instructions to do maintenance on the engine fuel system. Also refer to the applicable service bulletins before you do work on the engine fuel system.

2. Description

A. Engine Fuel Control

The Continental Motors IO-240-B engines are fuel injected with a down draft induction system. The intake manifold supplies air to the air distribution system. The air distribution system mounts above the engine cylinders, it sends induction air to the cylinder intake ports. The cylinder intake ports are cast into the cylinder head assembly. The air mixes with fuel from the injector nozzles where it enters the cylinders as a combustible mixture.

The fuel injection system uses a low-pressure system to inject fuel into the intake-valve port in the cylinder head. The four basic parts to the fuel injection system are, the fuel pump, fuel-metering unit, fuel manifold valve and fuel nozzles. Fuel flows from the fuel pump to the fuel-metering unit. The fuel then flows from the metering unit to the fuel manifold valve. From the fuel manifold valve the fuel then flows to the four injector nozzles.

The ram air supplied to the intake manifold goes through a filter assembly. The filter assembly attaches to the engine air intake at the left side. Polyurethane foam makes the filter element. A stainless steel screen at the front and the rear of the filter element makes the filter assembly.

B. Indication

Figure 1 shows the location and installation of the components in the aircraft.

The DA20-C1 aircraft has a fuel pressure indicating system. The fuel pressure indication system has the following two components:

- A fuel pressure sensor and
- a fuel pressure indicator.

The fuel pressure sensor is located on the upper right side of the engine mount. It senses pressure at the outlet of the fuel manifold on the engine, which is the pressure of the fuel going to the injection nozzles. A hose and a restricting orifice connect the manifold to the sensor. Alternatively, some aircraft have the pressure sensor located upstream of the manifold valve, in which case it is connected to a tee fitting in the line between the fuel metering unit and the manifold valve. The tee fitting penetrates the aft engine baffle.

The fuel pressure indicator is located on the right side of the instrument panel. It uses the pressure signal from the pressure sensor to set the pointer. The markings are in pounds/square inch

If the fuel pressure in the manifold increases, the flow to the engine injection nozzles increases. The fuel pressure sensor measures the pressure. If the pressure increases, the indicator shows a higher pressure.

C. Fuel Hoses in the Engine Compartment

Figures 2 and 3 show the fuel hoses in the engine compartment. Two hoses connect the engine fuel injection pump to the aircraft fuel system. The fuel supply hose connects to the through nut from the fuel shut-off valve at the firewall. The fuel return hose connects to the return through nut at the firewall. Figure 2 shows the fuel hoses with

On aircraft equipped with the manifold valve fuel vapor separator, a second return line runs from the fuel manifold valve through holes in the aft baffle and splash shield to join the fuel injection pump return line at a tee fitting. The tee fitting is connected to the 90 fitting that is connected to the return through nut at the firewall.

A heat shield on the right side of the engine protects the fuel injection pump supply and return hoses from the exhaust manifold. P-clamps attach the hoses to the heat shield and to the front of the engine.

You must bleed the engine fuel system after any work which allows air into the fuel system. The air can become trapped and cause starting problems. Refer to the bleed procedure in maintenance practices in this chapter.

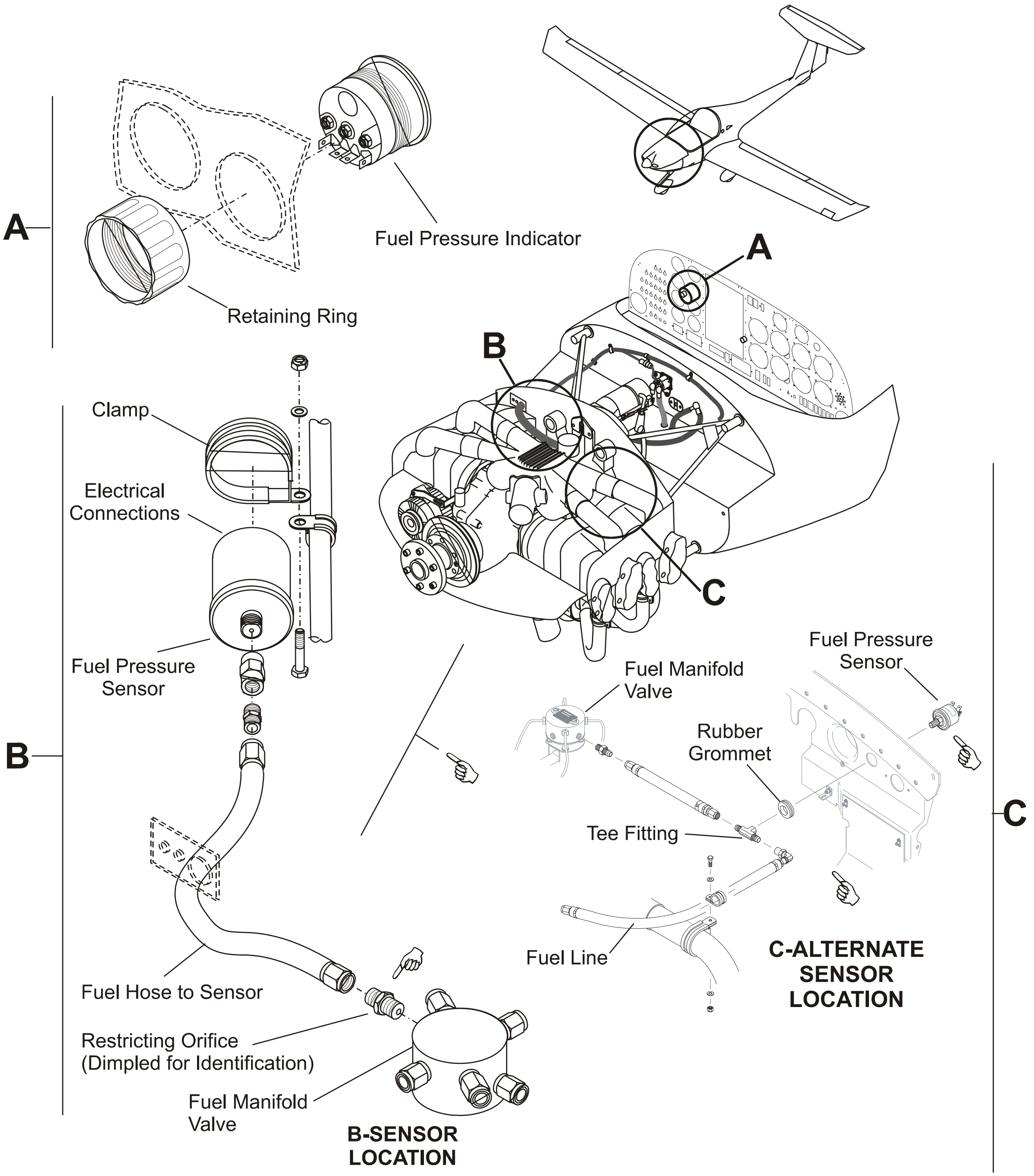

Figure 1 - Location and Installation of the Fuel Pressure Sensor

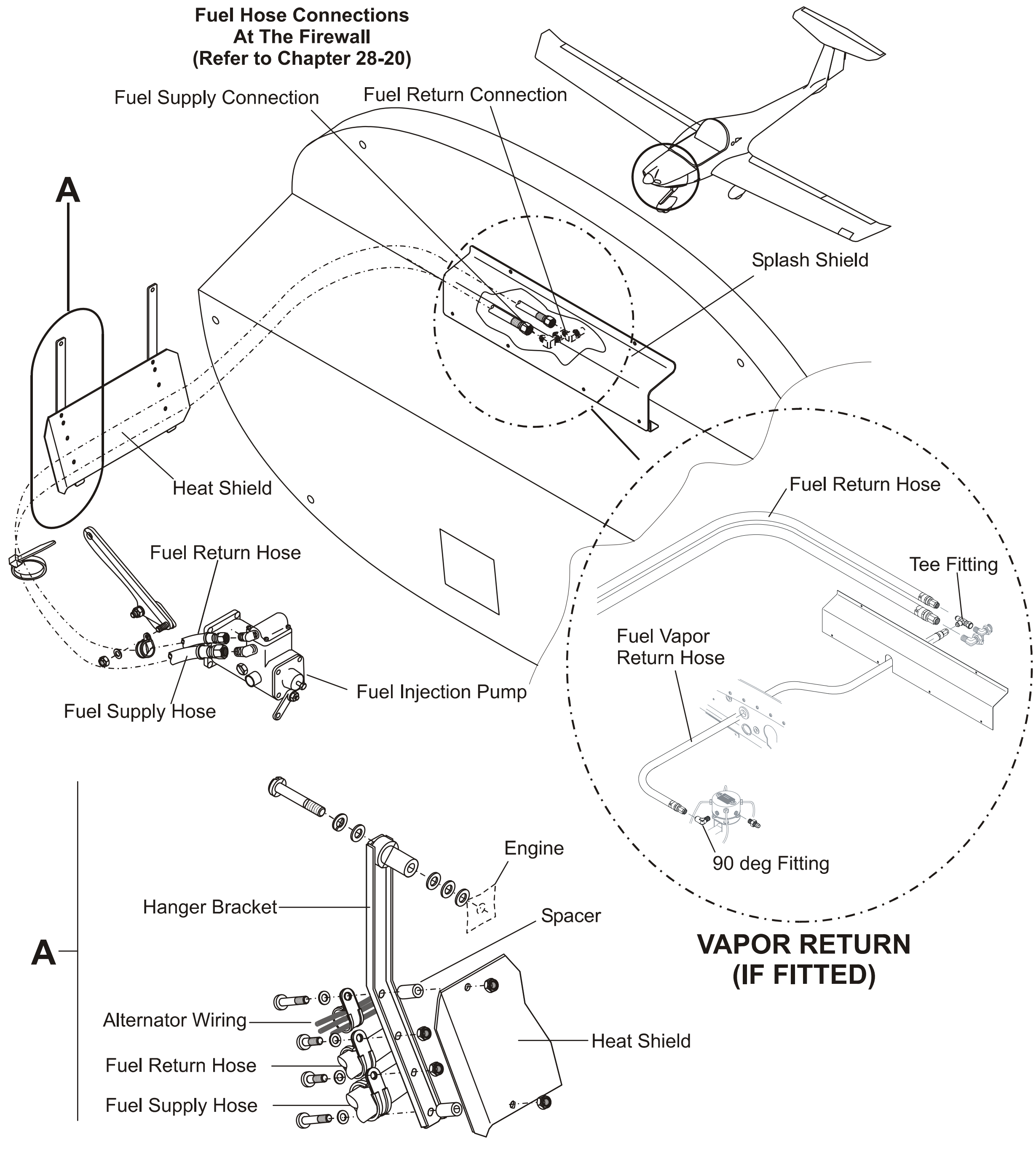

Figure 2 - Fuel Hoses in the Engine Compartment

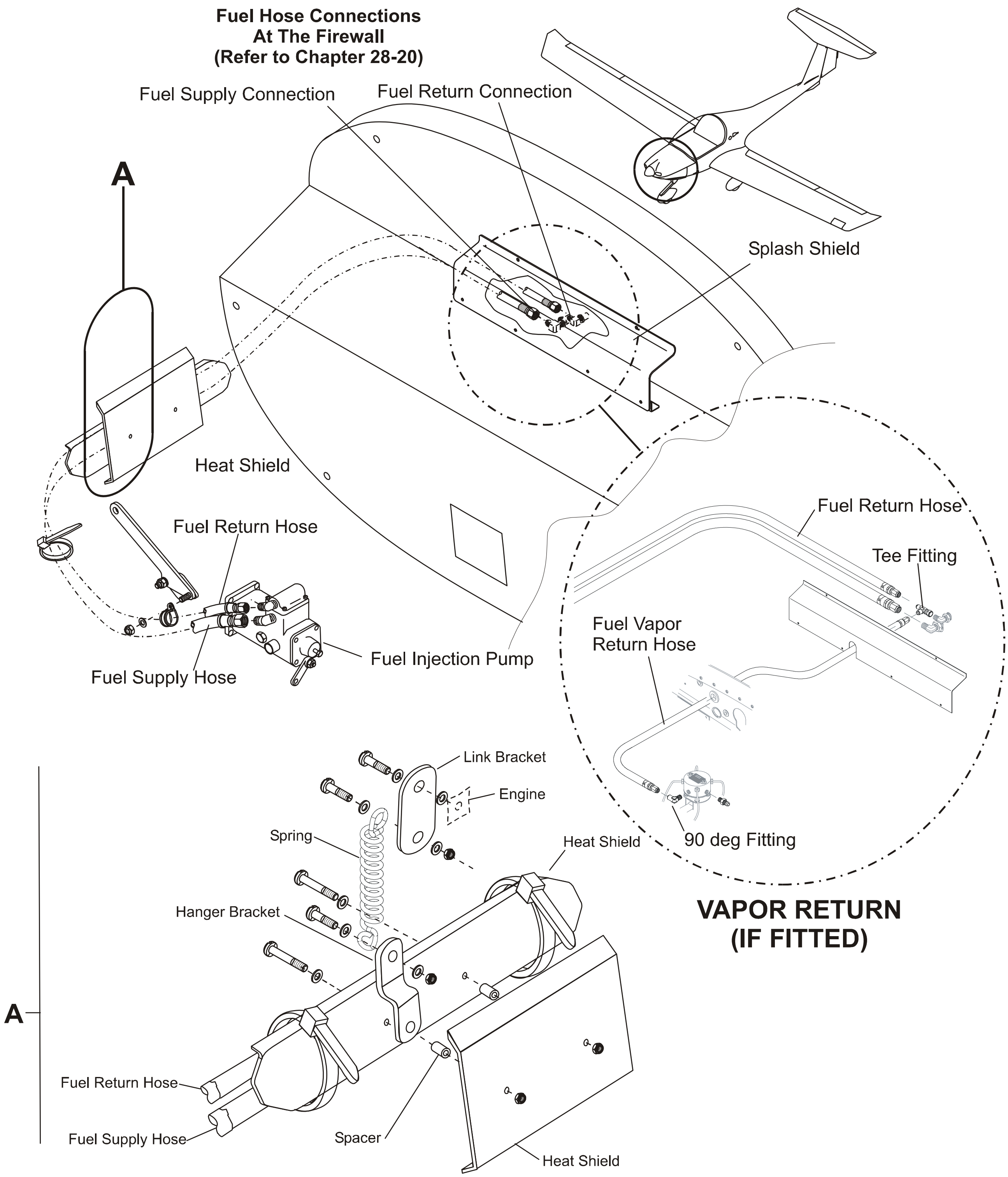

Figure 3 - Fuel Hoses in the Engine Compartment with Light Weight Heat Shield

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ENGINE FUEL AND CONTROL - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the fuel pressure indicating system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
Engine will not start.	Induction air filter blocked.	Replace the blocked induction air filter.
Engine gives low power.	Induction air filter blocked.	Replace the blocked induction air filter.
Engine difficult to start.	Air trapped in the fuel hose to the fuel pressure sensor.	Bleed the fuel system.
Fuel pressure indication incorrect.	Fuel pressure sensor defective.	Replace the pressure sensor
	Fuel pressure indicator defective.	Replace the fuel pressure indicator.
	High resistance or open connection in the electrical wiring from the sensor.	Do resistance and continuity tests between the indicator and the sensor. Repair the defective connection or wire.

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ENGINE FUEL AND CONTROL - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the induction and the fuel pressure indication components and how to bleed the fuel engine system. Refer to Chapter 28-00 for the aircraft fuel system and to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for the engine fuel system.

NOTE: You must bleed the engine fuel system after any work which allows air into the fuel system. The air can become trapped and cause starting problems.

2. Remove/Install the Induction Air Filter

A. Remove the Induction Air Filter

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.		
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Remove the rubber seal from the air intake.	The rubber seal holds the forward screen in position.
3.	Remove the forward screen from the air intake.	
4.	Remove the air filter.	

B. Install the Induction Air Filter

	Detail Steps/Work Items	Key Items/References
1.	Examine the air intake. Look especially for cracks: - Make sure that the air intake is clear of debris.	
2.	Carefully push the new air filter into position against the rear screen of the air intake. - Make sure that you put the air filter in the correct position.	

	Detail Steps/Work Items	Key Items/References
3.	Install the forward screen to the air intake.	
4.	Install the rubber seal to the air intake.	
5.	Install the engine cowlings.	Refer to Chapter 71-10.

3. Remove/Install the Fuel Pressure Sensor

NOTE: The Fuel Pressure Sensor and Fuel Pressure Indicator are a serialized matched set and must be installed together.

A. Remove the Fuel Pressure Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the top engine cowling.	Refer to Chapter 71-10.
3.	Release the electrical connections from the fuel pressure sensor.	Refer to Figure 201.
WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.		
4.	Set the fuel shut-off valve to CLOSED.	Refer to Chapter 28-00.
5.	Release the fuel hose from the pressure sensor. For aircraft with the fuel pressure sensor installed through the aft baffle (refer to Figure 201, Detail C), remove the pressure sensor from the tee fitting.	Put caps on the open connections.
6.	Remove the screw which attaches the clamp for the fuel pressure sensor to the engine mount.	Aircraft with the fuel pressure sensor attached to the engine mount (refer to Figure 201, Detail B) only.
7.	Remove the sensor from the aircraft.	

B. Install the Fuel Pressure Sensor

	Detail Steps/Work Items	Key Items/References
1.	Put the sensor in position with its clamp on the engine mount.	Aircraft with the fuel pressure sensor attached to the engine mount (refer to Figure 201, Detail B) only.
2.	Install the attaching bolt.	Aircraft with the fuel pressure sensor attached to the engine mount (refer to Figure 201, Detail B) only.
WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE.		
3.	Remove the blanking caps from the new sensor and the fuel pipe.	
4.	Connect the fuel pipe to the sensor. For aircraft with the fuel pressure sensor installed through the aft baffle (refer to Figure 201, Detail C), remove the pressure sensor from the tee fitting.	
5.	Set the fuel shut-off valve to OPEN.	Refer to Chapter 28-00.
6.	Connect the electrical connectors.	
7.	Connect the aircraft battery.	Refer to Chapter 24-31.
8.	Bleed the fuel system.	Refer to paragraph 6.
9.	Install the engine cowlings.	Refer to Chapter 71-10.
10.	Do an engine ground run-up test. Look especially for the correct operation of the fuel pressure indication system.	For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual.

4. Remove/Install the Fuel Pressure Indicator

NOTE: The Fuel Pressure Sensor and Fuel Pressure Indicator are a serialized matched set and must be installed together.

A. Remove the Fuel Pressure Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover for access.	Refer to Chapter 25-10.
3.	Disconnect the wires from the fuel pressure indicator.	
4.	Release the ring which attaches the fuel pressure indicator.	
5.	Remove the fuel pressure indicator.	

B. Install the Fuel Pressure Indicator

	Detail Steps/Work Items	Key Items/References
1.	Put the fuel pressure indicator in position in the instrument panel.	
2.	Install the ring that attaches the fuel pressure indicator.	
3.	Connect the wires to the fuel pressure indicator.	Refer to Chapter 92 for wiring diagrams.
4.	Connect the aircraft battery.	Refer to Chapter 24-31.
5.	Do a test for correct operation of the fuel pressure indicator.	See below.
6.	Install the instrument panel cover.	Refer to Chapter 25-10.

5. Fuel Pressure Indicator Functional Test

Do this test in an area where the engine can be run. Only authorized persons can do engine runs.

	Detail Steps/Work Items	Key Items/References
	WARNING: MAKE SURE THAT THE AREA OF THE PROPELLER IS CLEAR BEFORE YOU OPERATE THE STARTER MOTOR. PROPELLERS CAN CAUSE INJURY OR DEATH.	
1.	Start the engine.	Refer to the DA20-C1 Airplane Flight Manual for procedures.
2.	Set the mixture control to FULL RICH for the functional test.	
3.	Operate the engine through the RPM range.	Look especially for correct operation of the fuel pressure indication system.
4.	Stop the engine.	Refer to the DA20-C1 Airplane Flight Manual for procedures.

6. Engine Fuel System Bleeding Procedure

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT ALLOW HEAT OR FIRE NEAR FUEL. FUEL BURNS VIOLENTLY. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT. WARNING: DO NOT GET FUEL ON YOUR SKIN. FUEL CAN CAUSE SKIN DISEASE. WARNING: GROUND THE AIRCRAFT AND FUEL CATCH CONTAINER.	
1.	Remove the engine top cowling.	Refer to Chapter 71-10.
2.	Put a container under the engine drains to catch the fuel.	Refer to Chapter 71-70.
3.	Set the throttle to FULL POWER.	
4.	Set the mixture control to FULL RICH.	
5.	Set the GEN/BAT switch to ON.	
6.	Set the fuel pump switch to ON.	

	Detail Steps/Work Items	Key Items/References
7.	Loosen the fitting that attaches the fuel pressure hose to the fuel pressure sender.	Refer to Figure 201. Catch the fuel in a container or rag. Bleed the system until there is a steady flow of fuel for 15 seconds.
8.	Tighten the fitting that attaches the fuel pressure hose to the fuel pressure sender.	Look for leaks.
9.	Set the fuel pump switch to OFF.	
10.	Set the GEN/BAT switch to OFF.	Wait for several minutes for the fuel to drain from the cylinders. The propeller can be pulled through 2 turns to remove fuel from the cylinders.
CAUTION: DO NOT ATTEMPT TO START THE ENGINE UNTIL ALL FUEL HAS DRAINED FROM THE ENGINE DRAINS. THIS PROCEDURE FLOODS THE INTAKE SYSTEM. ATTEMPTING TO START THE ENGINE CAN CAUSE A HYDROSTATIC LOCK AND SUBSEQUENT ENGINE FAILURE.		
11.	Remove the container for the engine drains.	
12.	Do an engine run-up test: - Set the engine to IDLE RPM - Make sure that the engine operates correctly.	For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for engine data.
13.	Stop the engine.	Look for leaks.
14.	Install the engine top cowling.	Refer to Chapter 71-10.

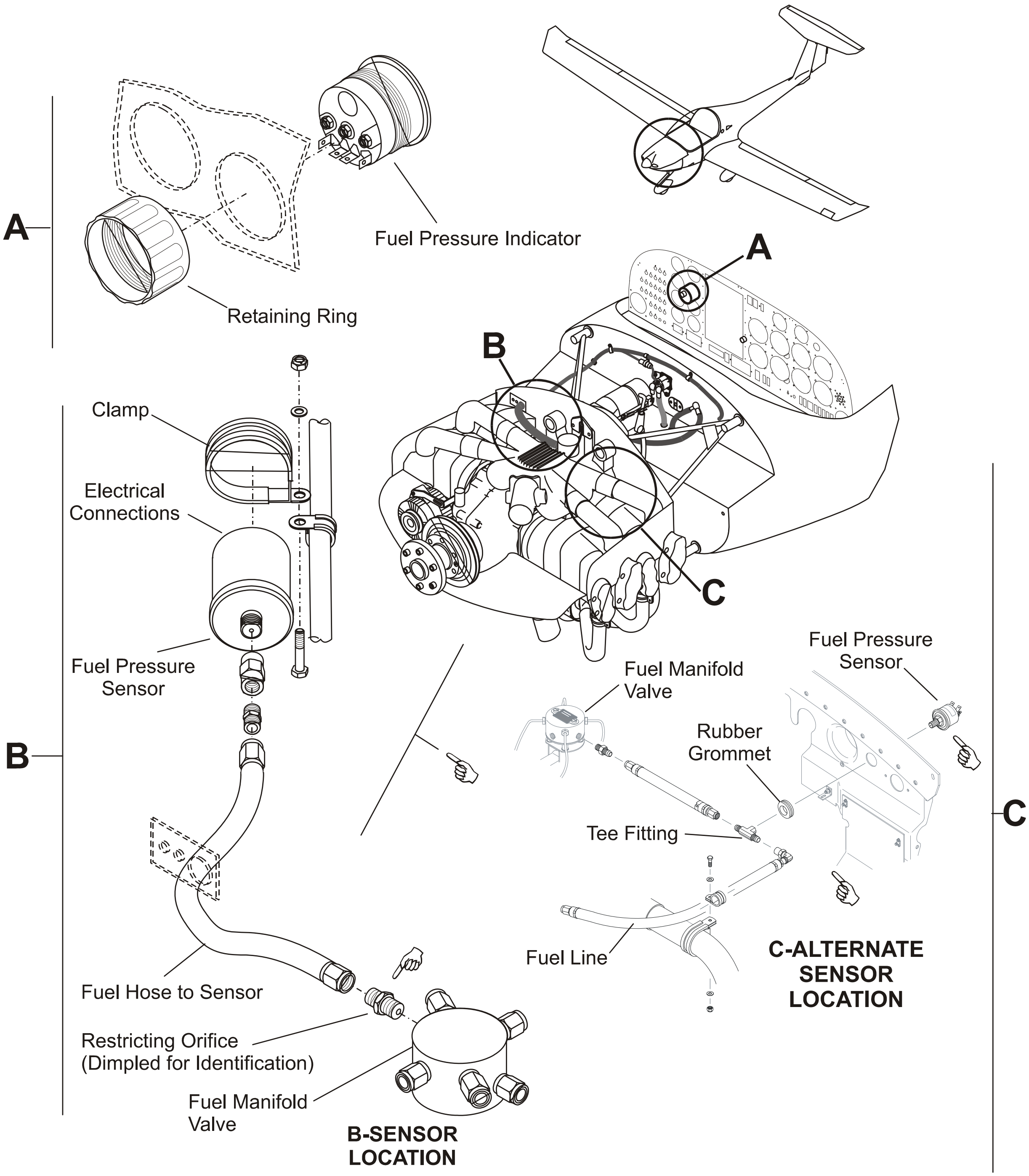

Figure 201 - Location and Installation of the Fuel Pressure Sensor

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CHAPTER 74-00

IGNITION

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NOTE: The Starting Vibrator Battery Test and R&I of the Starting Vibrator Battery have been moved to Chapter 80

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IGNITION

1. General

This chapter describes:

- the ignition system for the engine
- the ignition electrical power supply
- how to remove/install the ignition switch and the ignition switch cables
- how to test the ignition switch
- the trouble-shooting data for the ignition switch and the ignition harness.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the other ignition system components and for the trouble-shooting of the following items.

The ignition system has the following components:

- Ignition Switch
- Ignition cables
- Two Magnetos
- Starting vibrator "Shower of Sparks" system
- Ignition Harness (Spark-plug leads)
- Spark Plugs.

2. Description and Operation

The DA20-C1 aircraft has a dual ignition system. Two Slick magnetos supply the high voltage electrical pulses to the spark plugs. An ignition switch in the cockpit controls the magnetos. Shielded leads connect the magnetos to the spark plugs. Two spark plugs in each cylinder give ignition to the engine.

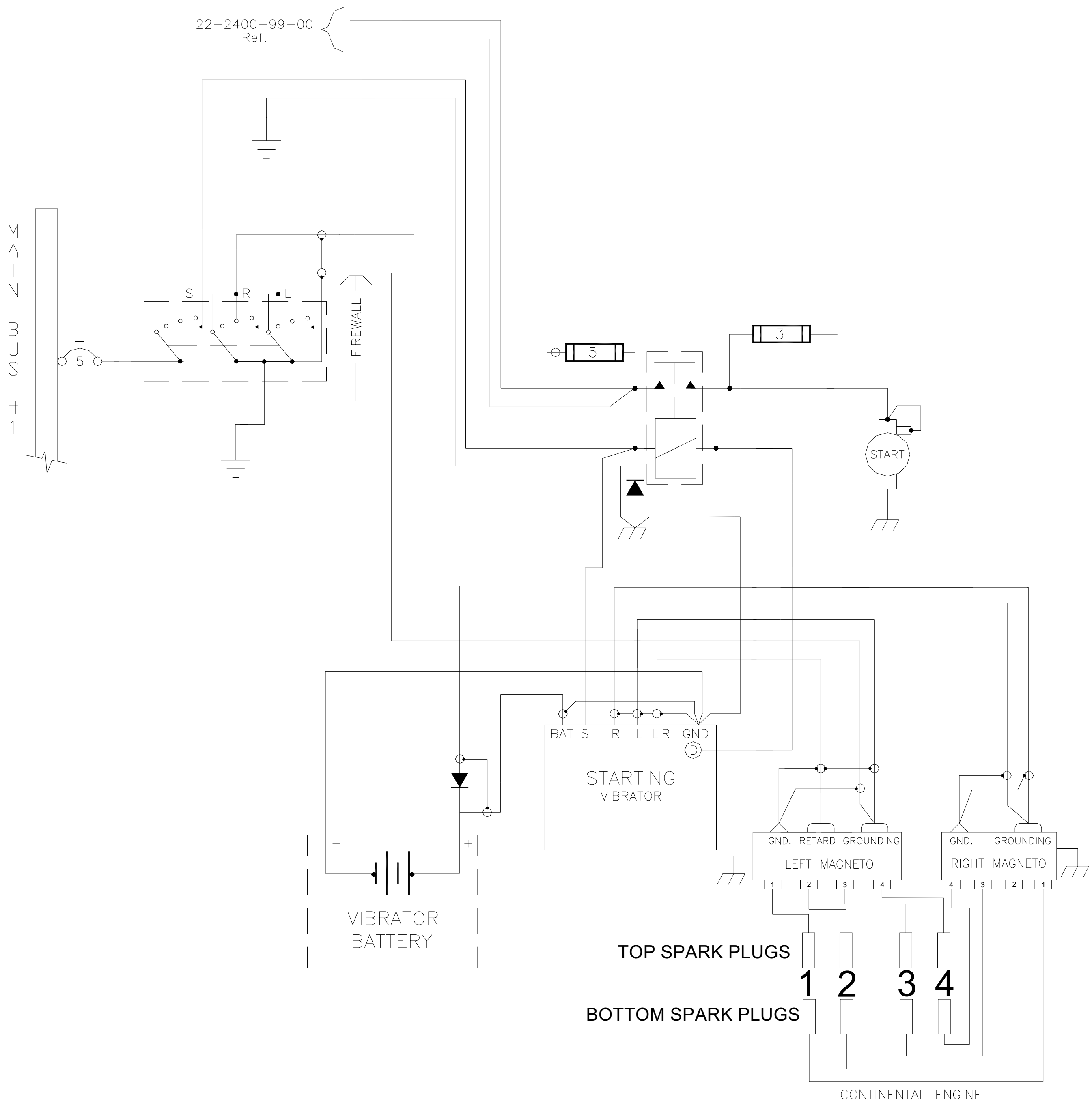

Figure 1 - Ignition System Schematic Diagram

A. Ignition Switch

The ignition switch is in the lower center of the instrument panel. You operate the ignition switch with a key. The ignition switch has the following five positions:

- OFF - Both magnetos grounded
- R - Right magneto live, left grounded
- L - Left magneto live, right grounded
- BOTH - Both magnetos live
- START - Retarded points of left magneto live, Right magneto grounded, starting vibrator energized and starter relay energized.

For data on repairs to the ignition switch refer to the Teledyne Industries Support Manual.

B. Ignition Switch Cables

Shielded cables connect the ignition switch to the left magneto and to the right magneto.

C. Magnetos

The DA20-C1 aircraft has two Slick magnetos. The Slick magnetos supply the electrical pulses to the spark plugs. The left magneto has an additional set of contact points. These points are active only when the engine is being started.

D. High Tension Cables (Ignition Harness)

Each magneto supplies high tension pulses to one spark plug in each cylinder. High tension leads (spark-plug leads) connect the magnetos to the spark plugs. Each lead has a center core which transmits the high tension electricity. It also has a layer of insulation. The outside of each lead has a braided metal screen. The braided metal screen prevents radio interference. P-clips and tie-wraps hold the leads in position.

Each spark plug lead has special end fittings. The end fittings stop water going into the connection. The end fittings also connect the braided metal screen to prevent radio interference

You can test the spark-plug leads with a high tension tester.

E. Spark Plugs

Each cylinder has two spark plugs. The left magneto connects to the top 1-3 spark plugs and the top 2-4 spark plugs. The right magneto connects to the bottom 1-3 spark plugs and the bottom 2-4 spark plugs.

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IGNITION - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the ignition switch and the ignition harness. If you find the trouble in column 1, do the repair given in column 3.

It does not give trouble shooting data for the Continental Motors ignition components. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for troubleshooting the ignition components.

TROUBLE	POSSIBLE CAUSE	REPAIR
Engine does not start/not easy to start.	Ignition switch/switch cable defective.	Do the ignition switch test: If necessary replace the ignition switch: - Refer to the ignition switch remove/install procedure. Replace the ignition switch cables: - Refer to the ignition switch cables remove/install procedure.
	Defective ignition spark-plug leads.	Replace the spark-plug leads: - Refer to the spark-plug leads remove/install procedure.
	Starting Vibrator	Do starting vibrator test. Refer to Continental Motors document X43003-1. Replace starting vibrator if necessary.
	Check vibrator battery voltage	If voltage is below 12 volts, replace battery

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IGNITION - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- test the ignition switch
- remove and install the ignition switch and the ignition switch cables
- remove and install the spark-plug leads.

Refer to the DA20-C1 Airplane Flight Manual for engine run instructions/data.

2. Ignition Switch Test

	Detail Steps/Work Items	Key Items/References
	WARNING: DISCONNECT THE BATTERY BEFORE YOU WORK ON THE IGNITION SWITCH. FAILURE TO DO SO COULD CAUSE INJURY TO PERSONNEL. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
2.	Make sure that the spark plug leads are disconnected from the spark plugs and the battery is disconnected.	Refer to Chapter 24-31-00.
3.	Do a test for the correct operation of the ignition switch:	
	- Disconnect the ignition cables (P leads) from the magnetos	Do a resistance test between each switch cable and ground for each switch setting.
	- Set the ignition switch to OFF	- Both cables zero ohms
	- Set the ignition switch to R	- Left zero ohms, right open circuit
	- Set the ignition switch to L	- Left open circuit, right zero ohms

	Detail Steps/Work Items	Key Items/References
	- Set the ignition switch to BOTH - Set the ignition switch to START - Set the ignition switch to OFF - Connect the ignition switch cables to the magnetos.	- Both cables open circuit - Left retard point cable open circuit, right and left advance cable zero ohms.
4.	Connect the aircraft battery.	Refer to Chapter 24-31-00.
5.	Connect the spark-plug leads to the spark plugs.	Torque to 110 - 120 lbf-in (12.4-13.5 Nm).
6.	Install the engine cowlings.	Refer to Chapter 71-10-00.
7.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

3. Remove/Install the Ignition Switch (Pre-SB DAC1-74-03 Rev 2)

A. Remove the Ignition Switch

WARNING: DISCONNECT THE BATTERY BEFORE YOU WORK ON THE IGNITION SWITCH. FAILURE TO DO SO COULD CAUSE INJURY TO PERSONNEL.

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
3.	Disconnect the spark plug leads from the spark plugs.	
4.	Remove the instrument panel cover.	Refer to Chapter 25-10-00.
5.	Remove the knurled ring from the front of the ignition switch. - Move the ignition switch clear of the instrument panel	
6.	Disconnect the electrical cables from the ignition switch.	Record the cable connections.
7.	Remove the ignition switch from the aircraft.	

B. Install the Ignition Switch

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the spark plug leads are disconnected from the spark plugs and the battery is disconnected.	Refer to Chapter 24-31-00.
2.	Connect the electrical cables to the ignition switch.	Refer to Chapter 92 for wiring diagrams.
3.	Move the ignition switch into position in the instrument panel.	
4.	Install the indicator plate onto the front of the ignition switch.	Make sure that the indicator plate is installed correctly.
5.	Install the knurled ring to hold the front of the ignition switch.	
6.	Do a test for the correct operation of the ignition switch: - Disconnect the ignition cables (P leads) from the magnetos - Set the ignition switch to OFF - Set the ignition switch to R - Set the ignition switch to L - Set the ignition switch to BOTH - Set the ignition switch to START - Set the ignition switch to OFF - Connect the ignition switch cables to the magnetos.	Do a resistance test between each switch cable and ground for each switch setting. - Both cables zero ohms - Left zero ohms, right open circuit - Left open circuit, right zero ohms - Both cables open circuit - Left retard point cable open circuit, right and left advance cable zero ohms.
7.	Install the instrument panel cover.	Refer to Chapter 25-10-00.
8.	Connect the aircraft battery.	Refer to Chapter 24-31-00.
9.	Connect the spark-plug leads to the spark plugs.	Torque to 110 - 120 lbf-in (12.4 - 13.5 Nm).
10.	Install the engine cowlings.	Refer to Chapter 71-10-00.
11.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

4. Remove/Install the Ignition Switch (Optional) (Post-SB DAC1-74-03 Rev 2)

A. Remove the Ignition Switch

WARNING: DISCONNECT THE BATTERY BEFORE YOU WORK ON THE IGNITION SWITCH. FAILURE TO DO SO COULD CAUSE INJURY TO PERSONNEL.

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
3.	Disconnect the spark plug leads from the spark plugs.	
4.	Remove the instrument panel cover.	Refer to Chapter 25-10-00.
5.	Remove the knurled ring from the front of the ignition switch. - Move the ignition switch clear of the instrument panel	
6.	Disconnect the electrical cables from the ignition switch.	Record the cable connections.
7.	Remove the ignition switch from the aircraft.	

B. Install the Ignition Switch

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the spark plug leads from the spark plugs.	Refer to Chapter 24-31-00.
2.	Disconnect the battery.	Refer to Chapter 24-31-00.
2.	Connect the electrical cables to the ignition switch.	Refer to Figure 202.
3.	Move the ignition switch into position in the instrument panel.	
4.	Install the face plate onto the front of the ignition switch.	Make sure that the face plate is installed correctly.
5.	Install the knurled ring to hold the front of the ignition switch.	

	Detail Steps/Work Items	Key Items/References
6.	Do a test for the correct operation of the ignition switch: - Disconnect the ignition cables (P leads) from the magnetos - Set the ignition switch to OFF - Set the ignition switch to R - Set the ignition switch to L - Set the ignition switch to BOTH - Set the ignition switch to START - Set the ignition switch to OFF - Connect the ignition switch cables to the magnetos.	Do a resistance test between each switch cable and ground for each switch setting. - Both cables zero ohms - Left zero ohms, right open circuit - Left open circuit, right zero ohms - Both cables open circuit - Left retard point cable open circuit, right and left advance cable zero ohms.
7.	Install the instrument panel cover.	Refer to Chapter 25-10-00.
8.	Connect the aircraft battery.	Refer to Chapter 24-31-00.
9.	Connect the spark-plug leads to the spark plugs.	Torque to 110 - 120 lbf-in (12.4 - 13.5 Nm).
10.	Install the engine cowlings.	Refer to Chapter 71-10-00.
11.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

5. Remove/Install the Ignition Switch Cables

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT:

- THE IGNITION SWITCH IS IN THE "OFF" POSITION
- THE "P" LEADS ARE GROUNDED
- THE THROTTLE IS SET TO "CLOSED"
- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".

A. Remove the Ignition Switch Cables

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the engine cowlings.	Refer to Chapter 71-10.
3.	Disconnect the spark plug leads from the spark plugs.	
4.	Remove the instrument panel cover.	Refer to Chapter 25-10.
5.	Disconnect the switch cable (P lead) at the left/ right magneto.	
6.	Disconnect the ground connections at the left/ right magnetos.	
7.	Cut the tie-wraps that hold the switch cables.	
8.	Disconnect the left/right electrical cables from the ignition switch.	Record the cable connections.
9.	Disconnect the ground connections at the switch.	
10.	Loosen the bulkhead shield. Pull the ignition cables through he shield. Remove the ignition switch cables.	

B. Install the Ignition Switch Cables

	Detail Steps/Work Items	Key Items/References
1.	Make sure that the spark plug leads are disconnected from the spark plugs and the battery is disconnected.	Refer to Chapter 24-31.
2.	Put the new cables in position through the bulkhead shield. Tighten the bulkhead shield.	
3.	Connect the ground connector to ground.	Refer to Chapter 92 for wiring diagrams.
4.	Do a test for the correct operation of the ignition switch: - Disconnect the ignition cables (P leads) from the magnetos - Set the ignition switch to OFF - Set the ignition switch to R	Do a resistance test between each switch cable and ground for each switch setting. - Both cables zero ohms - Left zero ohms, right open circuit

	Detail Steps/Work Items	Key Items/References
	- Set the ignition switch to L - Set the ignition switch to BOTH - Set the ignition switch to START - Set the ignition switch to OFF	- Left open circuit, right zero ohms - Both cables open circuit - Left retard point cable open circuit, right and left advance cable zero ohms.
5.	Connect the switch cables (P leads) at the left/ right magneto.	Refer to Chapter 92 for wiring diagrams.
6.	Connect the ground connector at the left/right magneto.	Refer to Chapter 92 for wiring diagrams.
7.	Install the tie-wraps that hold the ignition switch cables.	
8.	Install the instrument panel cover.	Refer to Chapter 25-10.
9.	Connect the aircraft battery.	Refer to Chapter 24-31.
10.	Connect the spark-plug leads to the spark plugs.	Torque to 110 - 120 lbf-in (12.4 - 13.5 Nm).
11.	Install the engine cowlings.	Refer to Chapter 71-10.
12.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

6. Remove/Install the Spark Plug Leads

WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT:

- THE IGNITION SWITCH IS IN THE "OFF" POSITION
- THE "P" LEADS ARE GROUNDED
- THE THROTTLE IS SET TO "CLOSED"
- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".

A. Remove the Spark Plug Leads

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the spark plug leads from the spark plugs.	
3.	Disconnect the spark plug leads from the left/ right magneto.	Record the cable connections.
4.	Cut the tie-wraps that hold the spark plug leads.	
5.	Remove the left and right shields from the aft baffle: - Remove the four screws and the nuts from the left shield - Remove the four screws and the nuts from the right shield	
6.	Carefully pull the four spark-plug leads through the aft baffle and remove.	
7.	Remove the four spark plug leads that connect to the bottom spark plugs.	

B. Install the Spark Plug Leads

	Detail Steps/Work Items	Key Items/References
1.	Before you install the spark-plug leads do a test on each cable for a short circuit from the center core to the sheath.	Use a high voltage tester (Megger). If you get a short circuit, then replace the spark-plug lead.
2.	Disconnect the spark plug leads from the left/ right magneto.	Refer to Chapter 92 for wiring diagrams.
3.	Put the top spark plug leads in position through the aft baffle: - The leads for 1 and 3 top spark plugs through the left side of the aft baffle - The leads for 2 and 4 top spark plugs through the right side of the aft baffle.	
4.	Install the left and right shields to the aft baffle.	
5.	Install the tie-wraps that hold the spark plug leads.	
6.	Connect the spark-plug leads to the spark plugs.	
7.	Install the engine cowlings.	Refer to Chapter 71-10-00.
8.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

NOTE: The Starting Vibrator Battery Test and Remove/install of the Starting Vibrator Battery have been moved to Chapter 80

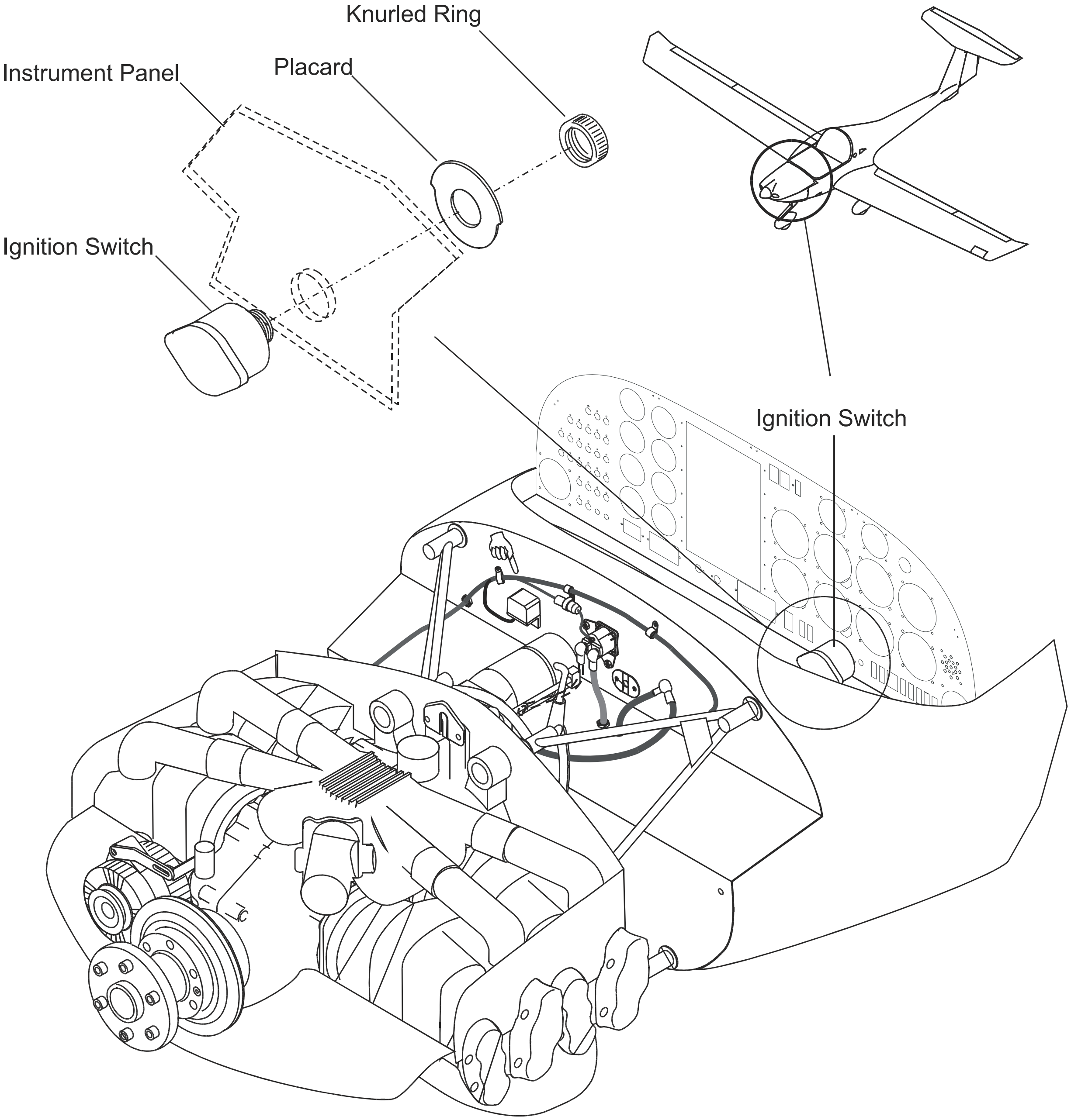
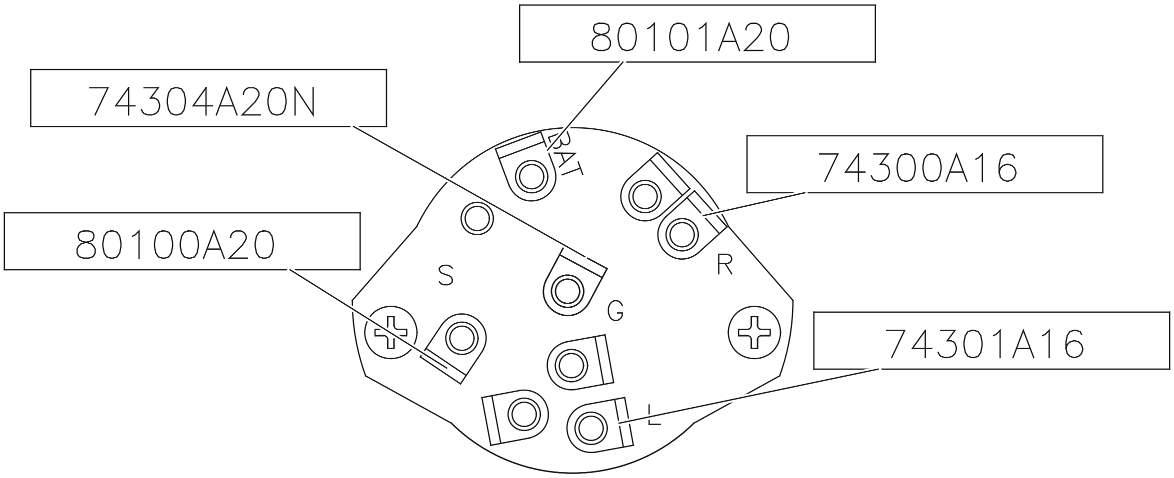
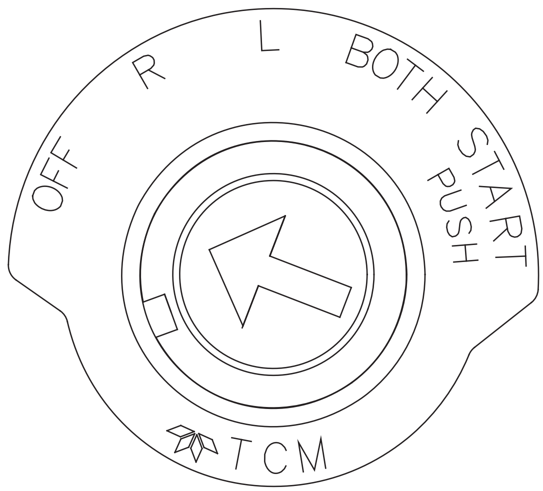


Figure 201 - Ignition Switch Installation (Pre SB DAC1-74-03 Rev 2)



(Wire attachment for new ignition switch)



(Ignition switch with new face plate)

Figure 202 - Optional Ignition Switch Installation (Post SB DAC1-74-03 Rev 2)

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CHAPTER 75-00
AIR

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AIR COOLING

1. General

This chapter describes the data for the engine cooling system. It gives you the maintenance practices to remove/install the baffles. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data about the engine inter-cylinder baffle assembly. Refer to Figure 1 for location data.

2. Description

Baffles control the cooling air flow. Ram air enters the two air intakes at the front of the top engine cowling. The baffle assembly sends the ram air around the engine cylinders. The engine cooling system has the following baffles:

A. Apron Baffle

The GFRP or CFRP apron (front) baffle attaches to the engine by the two inter-cylinder bracket assemblies (Continental parts). Rivets attach aluminum LH and RH forward baffles to the apron baffle. The inter-cylinder brackets are near the base of the cylinders. The apron baffle also attaches outboard to the LH and RH baffles with screws.

B. LH and RH Baffles

Aluminum baffles attach to the engine cylinder heads on each side with two screws (These are the LH baffle and RH baffle). The front part of the LH and RH baffles attaches to the apron baffle. The rear of each baffle bends around the rear cylinder for a short distance. Two screws attach each baffle to the aft baffle.

C. LH Aft and RH Aft Baffles

Aluminum LH aft and RH aft baffles attach to the related LH and RH baffle. They also attach to the bottom of the aft baffle.

D. Aft Baffle

The GFRP or CFRP aft baffle attaches to the inter-cylinder baffles (Continental parts) and the RH and LH aft brackets with screws. It also attaches to the LH and RH baffles with screws. The aft baffle has holes with shields for the ignition leads and the fuel pressure hose. It also has a hole on the left side that supplies air through a flexible hose to the oil cooler. The throttle and mixture control cables go through two holes with grommets.

A rubber seal attaches to the top edge of all of the baffles by rivets. It makes the air seal against the top of the engine cowling.

E. Winter Kit Baffles

The GFRP or CFRP inlet baffles winter kit are attached to the upper cowling using camlocs. The GFRP or CFRP outlet baffles winter kit are attached to the lower cowling using screws. The RH outlet baffle has a cutout with a rubber seal for the oil vent tube. Inlet and outlet baffles can be installed together or separately. Temperature ranges are shown in Supplement 2 of the flight manual.

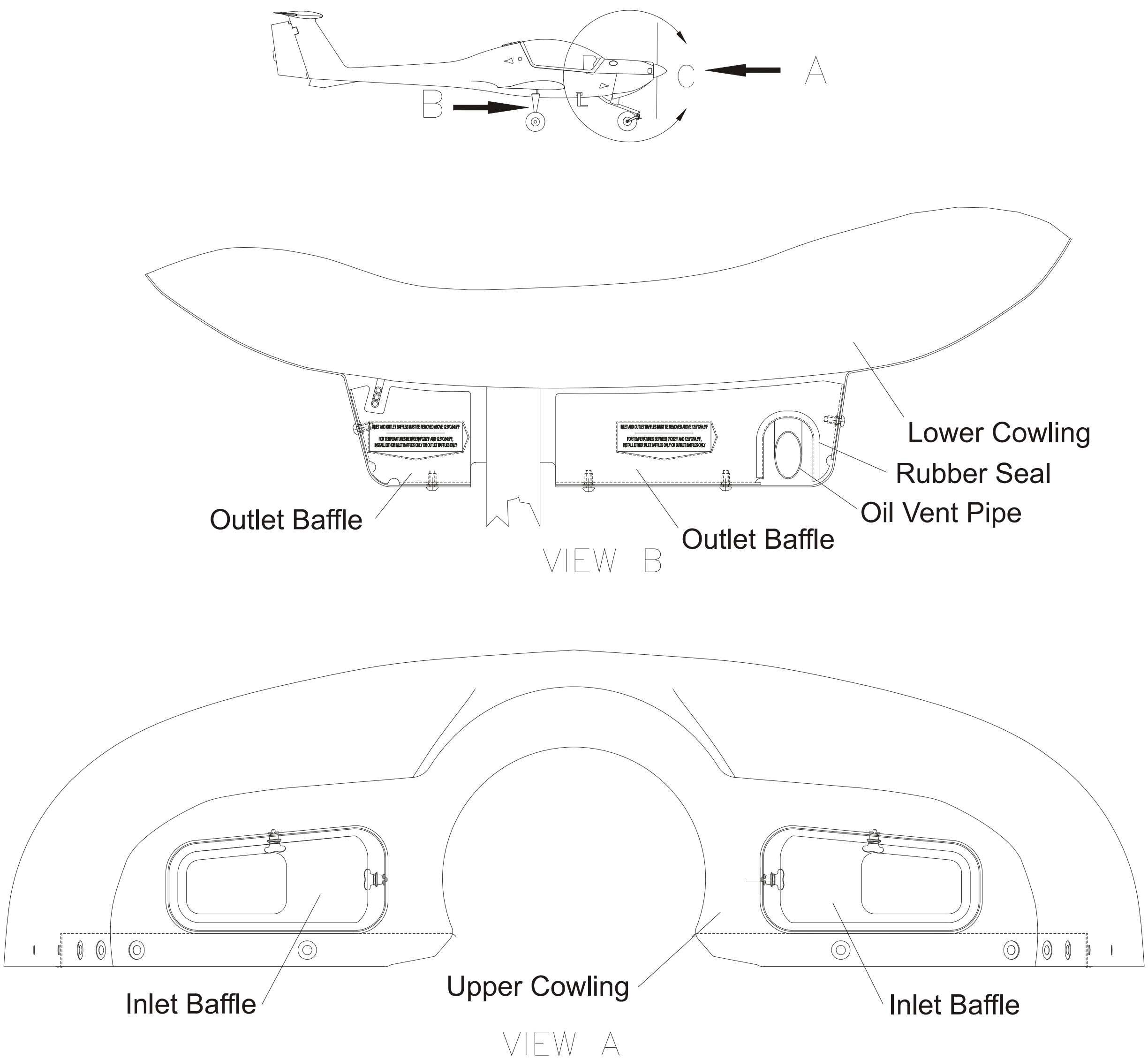

Figure 1 - Winter Baffle Kit Installation

AIR COOLING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the engine baffles. Refer to Figure 1 for location data.

Refer to Chapter 71-00 for data on the engine.

2. Remove/Install the Baffles

A. Remove the Baffles

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td colspan="3">WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: YOU MUST MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU TURN THE PROPELLER. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT:
- THE IGNITION SWITCH IS IN THE "OFF" POSITION
- THE "P" LEADS ARE GROUNDED
- THE THROTTLE IS SET TO "IDLE"
- THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".</td></tr>
<tr><td>1.</td><td>Remove the engine cowlings.</td><td>Refer to Chapter 71-10.</td></tr>
<tr><td>2.</td><td>Make the engine safe:
- Disconnect the spark plug leads
- Make sure the magnetos are set to OFF
- Make sure the "P" leads are grounded
- Set the throttle to IDLE
- Mixture control set to LEAN-CUT OFF.</td><td></td></tr>
<tr><td>3.</td><td>Remove the left and right shields from the aft baffle:
- Remove the screws and nuts from the left shield
- Remove the screws and nuts from the right shield.</td><td></td></tr>
</table>

	Detail Steps/Work Items	Key Items/References
4.	Remove the throttle control cable from the bracket at the top of the plenum assembly: - Remove the two nuts/bolts and the washers.	
5.	Disconnect the mixture control cable from the fuel mixture control lever: For aircraft with a standard fuel pump: - Loosen the stiff nut - Remove the control cable from the mixture control lever. For aircraft with an altitude compensating fuel pump: - Remove the nut - Remove the bolt - Remove the three washers.	
6.	For aircraft with a standard fuel pump: - Remove the mixture control cable and bracket from the apron: - Remove the screw and the spring washer. For aircraft with an altitude compensating fuel pump: - Remove the mixture control cable from the front support bracket: - Remove the nuts, the washers and the screws that fasten the mixture cable keeper to the bracket - Remove the mixture cable keeper - Remove the mixture control cable from the front support bracket.	

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td>7.</td><td>For aircraft with a standard fuel pump:

- Cut the tie-wrap and remove the mixture control cable from the support bracket at the top of the engine.

For aircraft with an altitude compensating fuel pump:

- Remove the rod end and jam nut from the mixture control cable

- Cut the cable tie that connects the mixture control cable to the #2 cylinder induction tube.</td><td></td></tr>
<tr><td colspan="3"><u>WARNING:</u> DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.

<u>WARNING:</u> DO NOT GET FUEL ON YOU. FUEL CAN CAUSE SKIN DISEASE. DO NOT ALLOW FIRE NEAR FUEL. FIRE BURNS AND CAN CAUSE INJURY TO PEOPLE AND DAMAGE TO EQUIPMENT.

<u>CAUTION:</u> YOU MUST ATTACH CAPS TO HOLES/PIPES WHEN YOU DISCONNECT THEM. IF YOU DO NOT DO THIS, CONTAMINATION CAN ENTER THE HOLES/PIPES. THIS CAN CAUSE BLOCKAGE TO THE AIRCRAFT SYSTEMS.</td></tr>
<tr><td>8.</td><td>Disconnect these items and pull them carefully through the aft baffle:

- The throttle control cable

- The mixture control cable

- Fuel pressure hose from the fuel manifold valve

- Fuel drain pipe from the fuel distribution manifold

- Oil breather hose at the oil separator

- Four ignition harness cables.</td><td>

Refer to Chapter 76-00.

Refer to Chapter 76-00.

Attach the blanks to all pipes/hoses and fuel/oil units.</td></tr>
<tr><td>9.</td><td>Disconnect the oil-cooler flexible pipe at the aft baffle.

- Remove the worm drive clamp.</td><td></td></tr>
</table>

	Detail Steps/Work Items	Key Items/References
10.	Remove the LH and RH baffles: - Remove the two screws, the spacers and the washers from the RH baffle that supports the two heat shield brackets. - Remove the three screws and the plain washers from the RH baffle - Remove the five screws and the washers from the LH baffle.	 Move the heat-shield clear. Two screws at the rear of the baffle and one at the front of the baffle. Two screws at the side of the baffle. Two screws at the rear of the baffle and one at the front of the baffle.
11.	Remove the LH and RH aft baffles. - Remove the three screws and the washers from the LH aft bracket - Remove the three screws and the washers from RH aft bracket.	
12.	Remove the aft baffle: - Remove the two screws and the plain washers that attach the aft baffle to the inter-cylinder brackets.	
13.	Disconnect the two electrical connectors from the generator and carefully push them through the apron.	
14.	Remove the apron: - Remove the screw, two washers and the nut that attach the bracket for the induction manifold flexible pipe - Remove the two screws and the washers that attach the apron to the inter-cylinder support brackets.	

B. Install the Baffles

	Detail Steps/Work Items	Key Items/References
1.	Install the apron: - Install the two screws and the washers that attach the apron to the inter-cylinder support brackets - Install the screw, two washers and the nut that attach the bracket for the induction manifold flexible pipe - Tighten the screws.	
2.	Connect the two electrical connectors to the generator: - Carefully put the generator electrical cables through the rubber grommet in the apron - Attach the main electrical supply cable to the generator - Attach the plain washer, spring washer and nut to the stud - Tighten the nut and pull the rubber boot over the connection - Install the electrical (indication) connector to the generator.	
3.	Install the RH baffle: - Attach the two screws, the spacers and the washers to the two heat shield brackets and the RH baffle - Install the two screws into the cylinder heads - Tighten the screws.	

	Detail Steps/Work Items	Key Items/References
4.	Install the LH baffle: - Attach the two screws and the washers to the LH baffle - Install the two screws into the cylinder heads - Tighten the screws.	
5.	Install the two screws and the washers into the apron where it attaches to the RH and LH baffles: - Tighten the screws.	
6.	Install the LH aft baffle: - Install the two screws and the plain washers that attach to the LH baffle - Tighten the screws.	
7.	Install the RH aft baffle: - Install the two screws and the plain washers that attach to the RH baffle - Tighten the screws.	
8.	Install the aft baffle: - Attach the two screws and the washers that attach the aft baffle to the inter-cylinder brackets - Tighten the screws. - Attach the three screws and the washers to the RH aft baffle that attach the aft baffle - Tighten the screws. - Attach the three screws and the washers to the LH aft baffle that attach the aft baffle - Tighten the screws.	

	Detail Steps/Work Items	Key Items/References
9.	Connect the oil-cooler flexible pipe to the aft baffle. Install the worm drive clamp.	
10.	Put these items through the aft baffle. - The throttle control cable - The mixture control cable. Remove the blanks and install: - The fuel pressure hose to the fuel manifold valve. Tighten the connection - The fuel drain pipe to the manifold. Tighten the connection. - The oil breather hose to the oil separator. Attach the worm drive clamp and tighten.	Torque to 135 - 150 lbf-in. (15.2 - 16.9 Nm). Torque to 50 - 65 lbf-in. (5.6 - 7.3 Nm).
11.	Put the ignition cables through the rear baffle.	
12.	Install the two cable shields to the aft baffle. Tighten the nuts and bolts.	
13.	Install the throttle control cable to the support bracket at the top of the plenum assembly: - Position the throttle control cable correctly in the support bracket - Install the two bolts, the washers and the nuts - Tighten the two nuts.	
14.	Install the eye end of the throttle control cable onto the throttle lever: - Put one washer under the head of the bolt - Put the bolt through the eye end of the control cable - Put one washer onto the bolt on the other side of the eye end	Refer to Chapter 76-00.

	Detail Steps/Work Items	Key Items/References
	- Attach the bolt to the throttle lever - Put one washer on the bolt - Attach the nut to the bolt. Tighten the assembly.	
15.	For aircraft with a standard fuel pump: - Install the mixture control cable support bracket to the apron: - Attach the screw and washer. Tighten the screw. For aircraft with an altitude compensating fuel pump: - Install the mixture control cable into the support bracket at the front of the engine: - Insert the end of the mixture control cable through the hole in the apron - Slide the notch in the control cable into the slot of the support bracket - Install the keeper onto the cable and slide it into place - Install the screws, the washers and the nuts to secure the keeper to the bracket - Tighten the assembly.	
16.	Install the mixture control cable to the mixture control lever on the fuel pump: For aircraft with a standard fuel pump: - Put the bolt through the lever from the engine side - Put one washer onto the bolt - Put the control cable wire through the hole in the bolt - Put one washer onto the bolt - Attach the nut to the bolt.	Refer to AMM Chapter 76-00.

	Detail Steps/Work Items	Key Items/References
	For aircraft with an altitude compensating fuel pump: - Install the jam nut and rod end onto the mixture control cable - Put the thin washer under the head of the bolt - Insert the bolt into the mixture lever from the inboard side - Put one washer onto the bolt on the other side of the lever - Put the rod end onto the bolt - Put one washer onto the bolt - Put the large diameter washer onto the bolt - Attach the nut to the bolt. Tighten the assembly.	
17.	For aircraft with a standard fuel pump: - Put the mixture control cable in the support bracket at the top of the engine. Attach the cable to the bracket with a tie-wrap. For aircraft with an altitude compensating fuel pump: - Secure the mixture control cable to the #2 cylinder induction tube using a cable tie.	
18.	Do a throttle control freedom and range of movement check.	Refer to Chapter 76-00.
19.	Do a mixture control freedom and range of movement check.	Refer to Chapter 76-00.

	Detail Steps/Work Items	Key Items/References
20.	Bleed the engine fuel system.	Refer to Chapter 73-00.
21.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 - 120 lbf-in (12.4-13.5 Nm).
22.	Install the top and bottom engine cowlings.	Refer to Chapter 71-10.
23.	Do an engine operational test.	For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual. For the operational test, refer to Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. Refer to the operational checklist in AMM Chapter 05-20 for difference in static RPM settings.
24.	Examine the engine for oil/fuel leaks.	

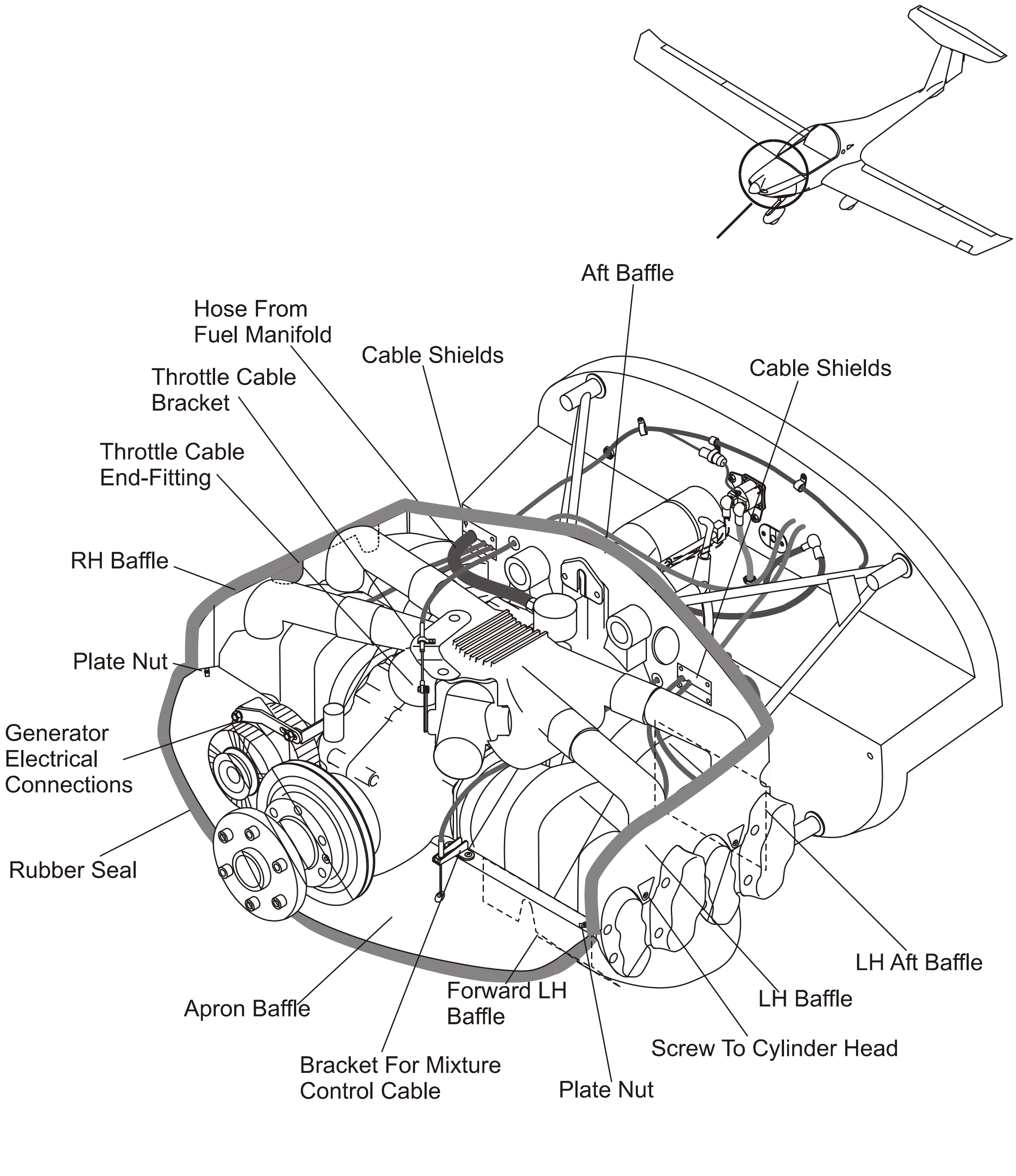

Figure 201 - Air Baffles

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CHAPTER 76-00
ENGINE CONTROLS

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ENGINE CONTROLS

1. General

This chapter describes the DA20-C1 aircraft engine power controls and the alternate air control. Bowden cables transmit the control inputs to the engine.

Figure 1 shows the location of the engine controls.

This chapter includes data on the linkages, cables and levers. It does not include data on the fuel-control units themselves or the alternate air unit. For data on the engine fuel-control units, refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. For data on the alternate air unit, refer to Chapter 71-60.

The DA20-C1 aircraft has the following controls:

- Throttle
- Mixture
- Alternate air.

2. Description and Operation

Figure 1 shows the location and installation of the components in the cockpit. Figures 201 to 204 show details of each control. A control quadrant in the center console holds the control levers. The control quadrant has three control levers and a power-controls friction-adjuster. Tubular spacers in the control quadrant make the stops for the control levers.

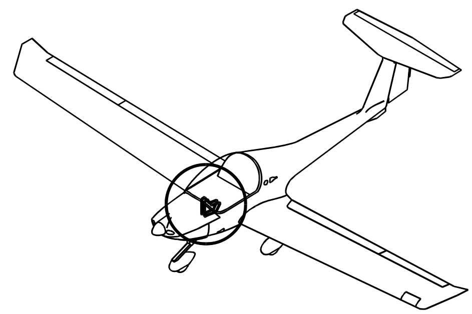
A. Throttle

The throttle controls the engine RPM from IDLE to FULL. The throttle lever is the center lever in the control quadrant. A bowden cable connects between the throttle lever in the cockpit and the throttle valve at the engine. The bowden-cable eye-end attaches to the throttle lever with a bolt. The outer sheath of the bowden cable has a threaded end fitting. Two nuts attach the end fitting to a tab bent from the side of the throttle quadrant.

The bowden cable goes from the center console, up behind the instrument panel and through the firewall to the engine bay. A feed-thru fitting holds the cable in position at the firewall. A fire resistant compound seals the bowden cable where it goes through the firewall.

From the firewall the bowden cable goes through a rubber grommet in the aft baffle on the right hand side. A P-clamp holds the cable to the top right tube of the engine mounting frame. The outer sheath of the bowden cable then attaches to a bracket on the top of the engine with two nuts. The bracket holds the outer sheath of the bowden cable. If you adjust the two nuts, you move the range of movement of the throttle lever.

The control-rod eye-end attaches to the throttle lever at the engine with a bolt, nut and three washers. The eye end is adjustable. You can use it to set the correct range of movement of the throttle valve.



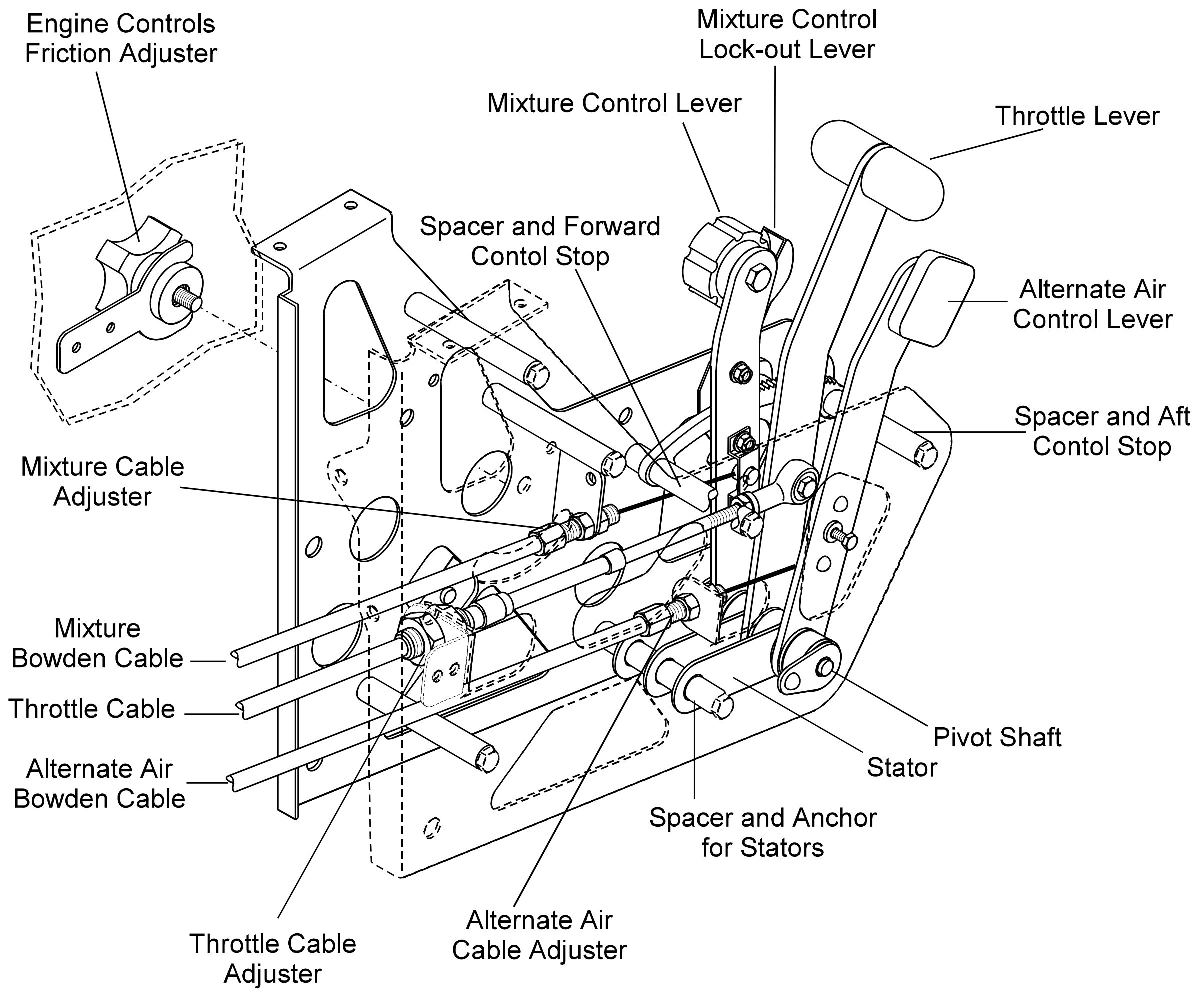


Figure 1 - Engine Controls In The Cockpit

B. Mixture Control

The mixture control sets the fuel mixture between RICH and LEAN. It also stops the fuel supply to the engine when set to CUTOFF. The mixture lever attaches to the control quadrant in the center console. The mixture lever is the right hand lever in the control quadrant.

The mixture control lever has a lock-out lever attached. The lock-out lever prevents accidental movement of the mixture control lever. The spring loaded lock-out lever engages in a toothed rack. The toothed rack attaches to the tubular spacers at the right of the control quadrant.

A bowden cable connects between the mixture lever in the cockpit and the mixture control-lever at the engine. The bowden-cable wire-end attaches to the mixture lever through a hole in a swivel fitting. A screw locks it in position. A bracket holds the inboard end of the swivel fitting. Two rivets attach the bracket to the mixture lever. The outer sheath of the bowden cable has a threaded end fitting. Two nuts attach the end fitting to a tab on the side of the control quadrant.

The bowden cable goes from the center console up, behind the instrument panel and through the firewall to the engine bay. A feed-thru fitting holds the cable in position at the firewall. A fire resistant compound seals the bowden cable where it goes through the firewall. From the firewall the bowden cable goes through a rubber grommet in the aft baffle on the left hand side.

On aircraft equipped with a standard fuel pump, the outer sheath of the mixture control bowden cable has a threaded end that attaches to a bracket at the apron with two nuts, which can be used to adjust the range of movement of the mixture control lever. The bowden-cable wire-end attaches to the fuel-mixture control-lever of the fuel pump through a hole in the attachment bolt. You can adjust the length of the wire at this point to set the correct fuel mixture control position.

On aircraft equipped with an altitude compensating fuel pump, the mixture cable has a notched swivel termination at the engine end. The notch slides onto the mixture support bracket, which is fastened to the apron. A keeper is bolted to the bracket to secure the bowden cable. There is a rod-end attached to the end of the bowden cable that connects the mixture control cable to the fuel mixture lever by a bolt.

C. Alternate Air

The alternate air control opens a by-pass for the engine air filter if it becomes blocked with debris or ice. The alternate air lever attaches to the control quadrant in the center console. The alternate air lever is the left hand lever in the control quadrant.

A bowden cable connects between the alternate air lever in the cockpit and the lever at the air-box. The bowden-cable wire-end attaches to the alternate air lever through a hole in a swivel fitting. A screw locks it in position. A small bracket holds the inboard end of the swivel fitting. Two rivets attach the bracket to the alternate air lever.

The outer sheath of the bowden cable has a threaded end fitting. The end fitting attaches to a tab bent from the side of the quadrant.

The bowden cable goes from the center console, up behind the instrument panel and through the firewall to the engine bay. A feed-thru fitting holds the cable in position at the firewall. A fire resistant compound seals the bowden cable where it goes through the firewall.

From the firewall the bowden cable goes below the engine on the left side. The outer sheath of the bowden cable then attaches to the support bracket at the air intake. You can adjust the range of movement of the alternate air lever at this position. The eye-end of the bowden-cable attaches to the alternate air lever with a bolt, nut, two washers and a return spring. You can adjust the length of the wire at this point to set the correct Alternate air valve position.

D. Friction Adjuster

The friction adjuster adjusts the force necessary to move the three control levers in the throttle quadrant. The friction-adjuster control-knob is on the right hand side of the center console. Nylon washers and 4 spring washers attached to the lever axis adjust the friction when they are compressed or released. To increase the friction on the control levers, turn the control knob clockwise. To decrease the friction on the control levers, turn the control knob counter-clockwise

ENGINE CONTROLS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the engine controls. If you find the trouble in column 1, do the repair given in column 3.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for IO-240-B engine.

TROUBLE	POSSIBLE CAUSE	REPAIR
Engine will not start.	Mixture controls not correctly adjusted.	Do a range of movement check. Adjust the mixture controls.
Engine will not cutoff.	Mixture controls not correctly adjusted.	Do a range of movement check. Adjust the mixture controls.
Cannot control the engine.	Broken throttle bowden cable.	Replace the broken bowden cable.
	Throttle control not set correctly.	Do a range of movement check. Adjust the throttle controls.
	Bowden cable not free to move.	Replace the bowden cable.
Throttle lever hard to move.	Friction adjuster incorrectly set.	Check/adjust friction adjuster.
	Throttle control lever restriction.	Remove the restriction.
Engine does not get to maximum RPM.	Throttle controls not adjusted correctly.	Do a range of movement check. Adjust the throttle controls.
Idle RPM changes each time idle is set.	No bounce in the throttle control at idle.	Do a range of movement check. Adjust the throttle controls.

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ENGINE CONTROLS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- remove and install the bowden cables for the engine power controls
- adjust the bowden cables

They do not describe how to adjust the engine fuel control units.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the engine fuel control units.

WARNING: DO ALL THE STEPS OF THE CONTROL INSTALLATION AND ADJUSTMENT CAREFULLY. ENGINE FAILURE CAN OCCUR IF THE CONTROL INSTALLATION AND ADJUSTMENT ARE NOT DONE CORRECTLY. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

2. Remove/Install The Throttle Bowden Cable

A. Remove the Throttle Bowden Cable

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.

	Detail Steps/Work Items	Key Items/References
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	
4.	Disconnect the throttle eye-end at the engine throttle lever: - Remove the nut, bolt and three washers from the bowden-cable eye-end.	Refer to Figure 201.
5.	Remove the eye-end from the bowden cable. - Loosen the adjustment nut and remove the eye-end.	
6.	Remove the bowden cable from the support bracket at the top of the engine: - Remove the forward nut from the bowden cable - Move the bowden cable clear of the bracket - Remove the rear nut from the bowden cable.	
7.	Remove the P-clamp which attaches the bowden cable to the engine mounting frame.	
8.	Carefully pull the bowden cable through the rubber grommet at the aft baffle.	
9.	Remove the fire resistant sealant from the bowden cable at the firewall.	
10.	Remove the instrument panel cover.	Refer to Chapter 25-10.
11.	Remove the feed-thru from the engine side of the firewall.	

	Detail Steps/Work Items	Key Items/References
12.	Remove the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
13.	Remove the 2 parts of the engine controls face plate from the center console cover. - Remove the four screws.	
14.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
15.	Remove the center console cover from the center console: - Remove the six screws from the two sides of the center console cover.	
16.	Disconnect the eye-end of the throttle bowden cable from the throttle lever at the quadrant. - Remove the bolt and the two washers.	
17.	Disconnect the outer sheath of the throttle bowden cable from the tab at the throttle quadrant frame. - Remove the two nuts.	
18.	Remove the eye-end from the throttle bowden cable. - Loosen the jam nut and remove the eye-end.	
19.	Carefully pull the bowden cable clear from the engine side of the firewall.	

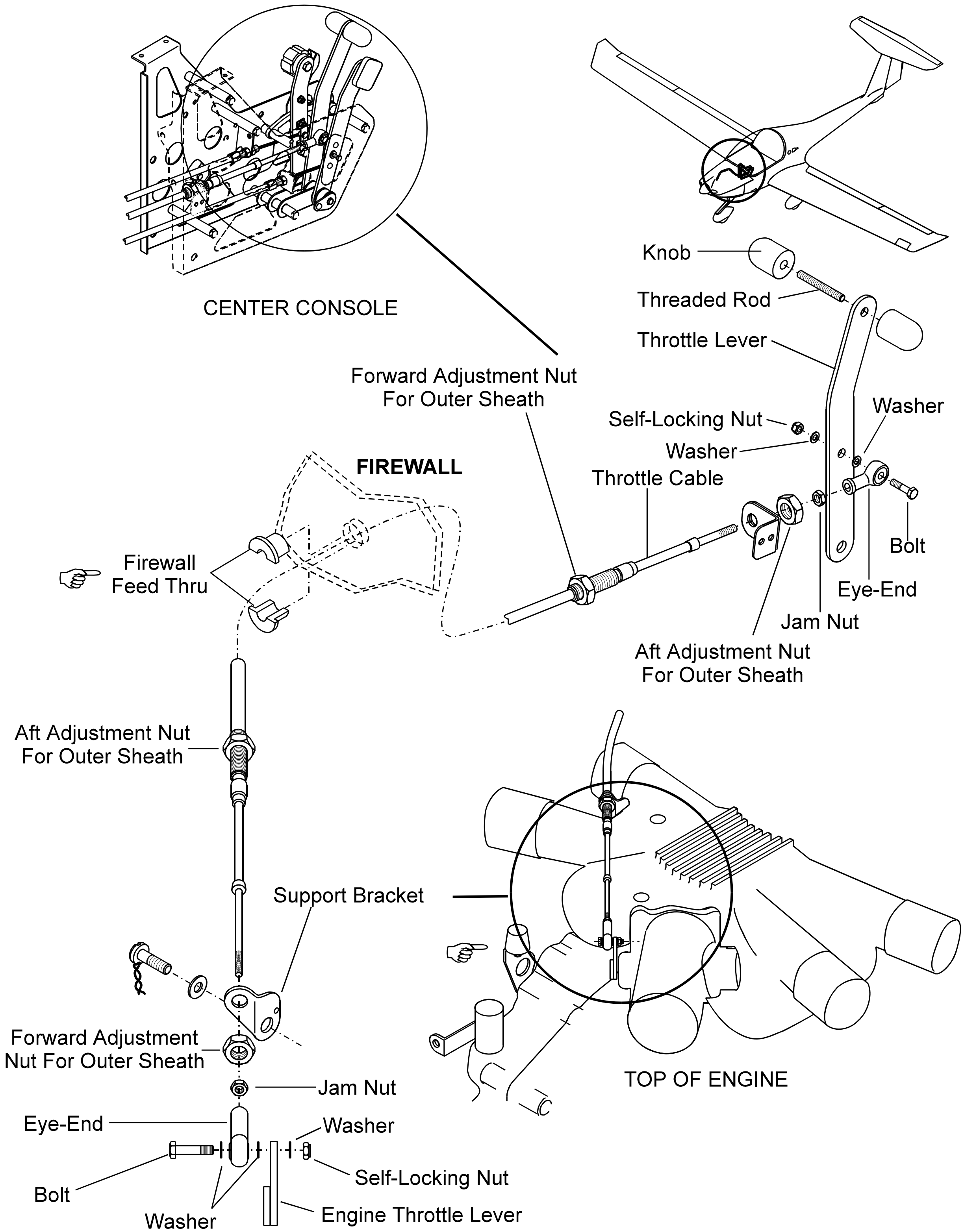

Figure 201 - Throttle Control Installation

B. Install the Throttle Bowden Cable

	Detail Steps/Work Items	Key Items/References
1.	Put the throttle bowden cable through the firewall.	
2.	Put the throttle bowden cable through the tab at the control quadrant: - Install the two nuts that hold the bowden cable to the tab.	Refer to Figure 201.
	WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL CABLE, MAKE SURE THAT THE CONTROL CABLE IS IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL CABLE CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.	
3.	Install the eye-end to the bowden cable at the control quadrant.	Use a piece of lock wire to make sure the eye-end has been installed correctly.
4.	Install the eye-end to the quadrant throttle lever. - Install the bolt, the two washers and the nut.	Refer to Figure 201. Torque to 1.2 lbf-ft (1.7 Nm).
5.	Put the bowden cable through the rubber grommet at the aft baffle.	
	CAUTION: MAKE SURE THAT THE SUPPORT BRACKET IS ATTACHED TO THE INDUCTION HOUSING WITH A FILLISTER HEAD SCREW AND THE SCREW IS LOCK WIRED. IF YOU DO NOT DO THIS THE FILLISTER HEAD SCREW CAN LOOSEN AND CAUSE THROTTLE CONTROL PROBLEMS.	
6.	Install the bowden cable to the support bracket at the top of the engine.	
7.	Install the eye-end to the bowden cable at the engine.	Use a piece of lock wire to make sure the eye-end has been installed correctly.
8.	Install the eye-end to the throttle lever: - Put one washer under the head of the bolt - Put the bolt through the eye end of the control cable - Put one washer onto the bolt on the other side of the eye end	

	Detail Steps/Work Items	Key Items/References
	- Attach the bolt to the throttle lever - Put one washer on the bolt - Attach the nut to the bolt - Tighten the assembly.	
9.	Install the feed-thru to the engine side of the firewall with firewall sealant. - Make sure to seal the firewall correctly.	Use Product PR 812, (MIL-S-38249 Type 1) Fire Wall Sealant.
10.	Do a test for correct range, full and free movement of the throttle control system.	Refer to the Throttle Control Range of Movement Test in this chapter.
11.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
12.	Do a check for loose items in the cockpit.	Look especially in the area of the control quadrant.
13.	Install the instrument panel cover.	Refer to Chapter 25-10.
14.	Install the center console cover to the center console.	
15.	Install the TRIM switch to the face plate.	Push the Trim switch into position in the face plate. Connect the connector below the face plate.
16.	Install the 2 parts of the engine controls face plate to the center console cover.	
17.	Install the control lever knobs to these items: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
18.	Do an engine controls freedom of movement check.	
19.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
20.	Connect the aircraft battery.	Refer to Chapter 24-31.

	Detail Steps/Work Items	Key Items/References
21.	Install the engine cowlings.	Refer to Chapter 71-10.
22.	Do an operational check of the elevator trim control system.	
23.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

3. Remove/Install the Mixture Control Bowden Cable

A. Remove the Mixture Control Bowden Cable

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	

	Detail Steps/Work Items	Key Items/References
4.	Disconnect the cable end at the engine mixture control lever: For aircraft with a standard fuel pump: - Remove the nut from the attachment bolt - Pull the cable clear. For aircraft with an altitude compensating fuel pump: - Remove the nut and outer washers from the attachment bolt - Remove the mixture cable rod-end from the mixture control lever.	 Refer to Figure 202, Sheet 1. Refer to Figure 202, Sheet 2.
5.	Remove the bowden cable from the support bracket at the apron: For aircraft with a standard fuel pump: - Remove the bottom nut from the bowden cable - Move the bowden cable clear of the bracket - Remove the top nut from the bowden cable. For aircraft with an altitude compensating fuel pump: - Remove the nuts, the washers and the screws that fasten the mixture cable to the mixture support bracket - Remove the mixture cable keeper - Remove the mixture cable from the mixture support bracket.	
6.	For aircraft with an altitude compensating fuel pump: - Cut the cable tie that holds the mixture cable to the #2 cylinder induction tube - Remove the rod-end and jam nut from the mixture cable.	

	Detail Steps/Work Items	Key Items/References
7.	Carefully pull the bowden cable through the rubber grommet at the aft baffle.	
8.	Remove the fire resistant sealant from the bowden cable at the firewall.	
9.	Remove the instrument panel cover.	Refer to Chapter 25-10.
10.	For aircraft with a standard fuel pump: - Remove the feed-thru from the engine side of the firewall. For aircraft with an altitude compensating fuel pump: - Remove the two nuts that secure the angled feed through to the firewall - Remove the washers and the screws - Remove the two angled feed-thru halves from the engine side of the firewall.	
11.	Remove the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
12.	Remove the two parts of the engine controls face plate from the center console cover. - Remove the four screws.	
13.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
14.	Remove the center console cover from the center console as follows: - Remove the six screws from the two sides of the center console cover.	

	Detail Steps/Work Items	Key Items/References
15.	Disconnect the cable wire end of the mixture control from the mixture lever at the quadrant. - Loosen the swivel attachment.	
16.	Disconnect the outer sheath of the mixture control bowden cable from the tab at the throttle quadrant frame. - Remove the two nuts.	
17.	Carefully pull the bowden cable clear from the engine side of the firewall.	

B. Install the Mixture Control Bowden Cable

	Detail Steps/Work Items	Key Items/References
1.	Put the mixture control bowden cable through the firewall.	
2.	Put the mixture control bowden cable through the tab at the control quadrant: - Install the two nuts that hold the bowden cable to the tab.	Refer to Figure 202, (Sheets 1 and 2).
3.	Install the cable end to the swivel fitting of the quadrant mixture lever. - Tighten the attachment screw.	
4.	Put the bowden cable through the rubber grommet at the aft baffle.	
5.	Install the bowden cable to the support bracket at the apron. For aircraft with a standard fuel pump: - Install the top nut to the threaded end - Put the bowden cable in position in the bracket at the apron - Install the bottom nut to the threaded end.	

	Detail Steps/Work Items	Key Items/References
	For aircraft with an altitude compensating fuel pump: - Insert the end of the mixture control cable through the hole in the apron - Slide the notch in the control cable into the slot of the support bracket - Install the keeper onto the cable and slide it into place - Install the screws, washers and nuts to secure the keeper to the bracket - Tighten the assembly.	
6.	Install the cable end to the mixture control lever at the engine. For aircraft with a standard fuel pump: - Put the cable end through the hole in the swivel bolt - Tighten the screw in the swivel bolt. For aircraft with an altitude compensating fuel pump: - Install the jam nut and rod end onto the mixture control cable - Put the rod-end on the bolt in the mixture control lever - Put one washer onto the bolt - Attach the nut to the bolt. Tighten the assembly.	
7.	For aircraft with an altitude compensating fuel pump: - Secure the mixture control cable to the #2 cylinder induction tube using a cable tie.	

	Detail Steps/Work Items	Key Items/References
8.	For aircraft with a standard fuel pump:	
	- Install the feed-thru to the engine side of the firewall with firewall sealant.	Use Product PR 812, (MIL-S-38249 Type 1) Fire Wall Sealant.
	- Make sure to seal the firewall correctly.	
	For aircraft with an altitude compensating fuel pump:	
	- Install the angle split bushing halves	Make sure that the upper half is on top of the lower half.
	- Install the screws from the engine side	
	- Install the washers and nuts	
	- Tighten the assembly	
	- Install the engine cowlings	Refer to Chapter 71-10.
	- Look through the left-hand air intake to check clearance between the mixture control cable and the upper cowling.	Make sure that there is at least 5/8 in (15 mm) clearance. Adjust cable as necessary.
	- Install the engine cowlings	Refer to Chapter 71-10.
	- Completely seal the angled split bushing and mixture control cable using firewall sealant.	Use Product PR 812, (MIL-S-38249 Type 1) Fire Wall Sealant.
9.	Do a test for correct range, full and free movement of the mixture control system.	Refer to the Mixture Control Test Procedure in this Chapter.
10.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
11.	Do a check for loose items in the cockpit.	Look especially in the area of the control quadrant.
12.	Install the instrument panel cover.	Refer to Chapter 25-10.
13.	Install the TRIM switch to the face plate.	Push the Trim switch into position in the face plate. Connect the connector below the face plate.
14.	Install the two parts of the engine controls face plate to the center console cover.	

	Detail Steps/Work Items	Key Items/References
15.	Install the control lever knobs to the following items: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
16.	Do an engine controls freedom of movement check.	
17.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
18.	Connect the aircraft battery.	Refer to Chapter 24-31.
19.	Install the engine cowlings.	Refer to Chapter 71-10.
20.	Do an operational check of the elevator trim control system.	
21.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

4. Remove/Install the Alternate Air Control Bowden Cable

A. Remove the Alternate Air Control Bowden Cable

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	
4.	Disconnect the control cable from the alternate air lever. Remove the following items: - Nut - Bolt - Two washers - Return spring.	Refer to Figure 203.

	Detail Steps/Work Items	Key Items/References
5.	Remove the bowden cable from the support bracket at the air intake: - Remove the forward nut from the bowden cable - Move the bowden cable clear of the bracket - Remove the aft nut from the bowden cable.	
6.	Remove the fire resistant sealant from the bowden cable at the firewall.	
7.	Remove the instrument panel cover.	Refer to Chapter 25-10.
8.	Remove the feed-thru from the engine side of the firewall.	
9.	Remove the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
10.	Remove the two parts of the engine controls face plate from the center console cover. - Remove the four screws.	
11.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
12.	Remove the center console cover from the center console: - Remove the six screws from the two sides of the center console cover.	
13.	Disconnect the cable wire end of the alternate air control from the alternate air lever at the quadrant. - Loosen the swivel fitting.	

	Detail Steps/Work Items	Key Items/References
14.	Disconnect the alternate air bowden control cable from the tab at the quadrant frame. - Remove the two nuts.	
15.	Carefully pull the bowden cable clear from the engine side of the firewall.	

B. Install the Alternate Air Control Bowden Cable

	Detail Steps/Work Items	Key Items/References
1.	Put the alternate air control bowden cable through the firewall.	
2.	Put the alternate air control bowden cable through the tab at the control quadrant: - Install the two nuts that hold the bowden cable to the tab.	Refer to Figure 203.
WARNING: IF YOU DO AN ADJUSTMENT OF A CONTROL CABLE, MAKE SURE THAT THE CONTROL CABLE IS IN SAFETY. IF YOU DO NOT DO THIS, THE CONTROL CABLE CAN DISCONNECT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.		
3.	Install the cable end to the quadrant alternate air lever. - Tighten the attachment screw.	
4.	Install the bowden cable to the support bracket at the air intake.	
5.	Install the cable end to the alternate air lever at the air intake.	
6.	Install the feed-thru to the engine side of the firewall with firewall sealant. - Make sure to seal the firewall correctly.	Use Product PR 812, (MIL-S-38249 Type 1) Fire Wall Sealant.
7.	Do a test for correct range, full and free movement of the alternate air control system.	Refer to the Mixture Control Test procedure in this Chapter.
8.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	

	Detail Steps/Work Items	Key Items/References
9.	Do a check for loose items in the cockpit.	Look especially in the area of the control quadrant.
10.	Install the instrument panel cover.	Refer to Chapter 25-10.
11.	Install the center console cover to the center console.	
12.	Install the TRIM switch to the face plate.	Push the Trim switch into position in the face plate. Connect the connector below the face plate.
13.	Install the 2 parts of the engine controls face plate to the center console cover.	
14.	Install the control lever knobs to the following items: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
15.	Do an engine controls freedom of movement check.	
16.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
17.	Connect the aircraft battery.	Refer to Chapter 24-31.
18.	Install the engine cowlings.	Refer to Chapter 71-10.
19.	Do an operational check of the elevator trim control system.	
20.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

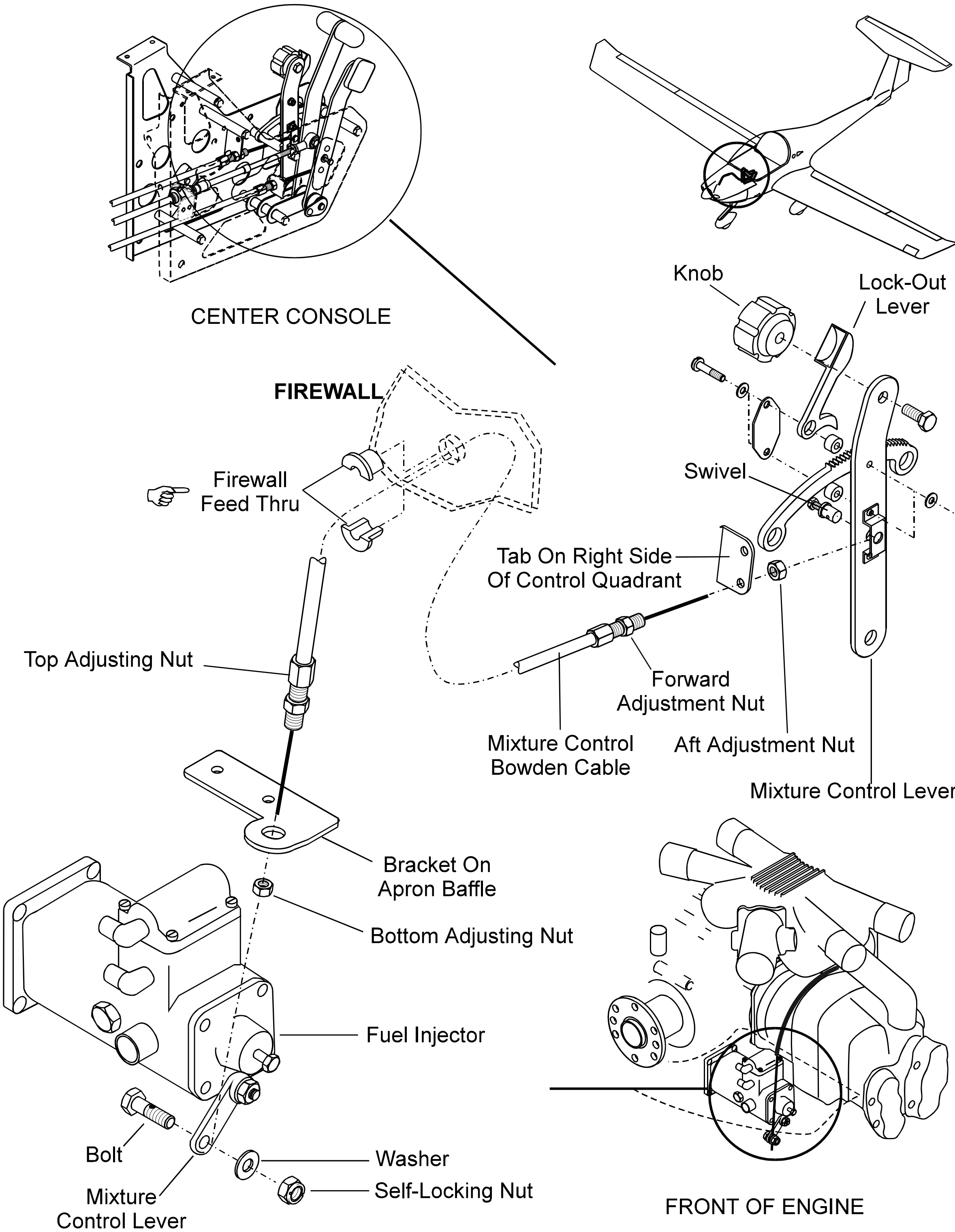

Figure 202 - Mixture Control Installation (Sheet 1 of 2)

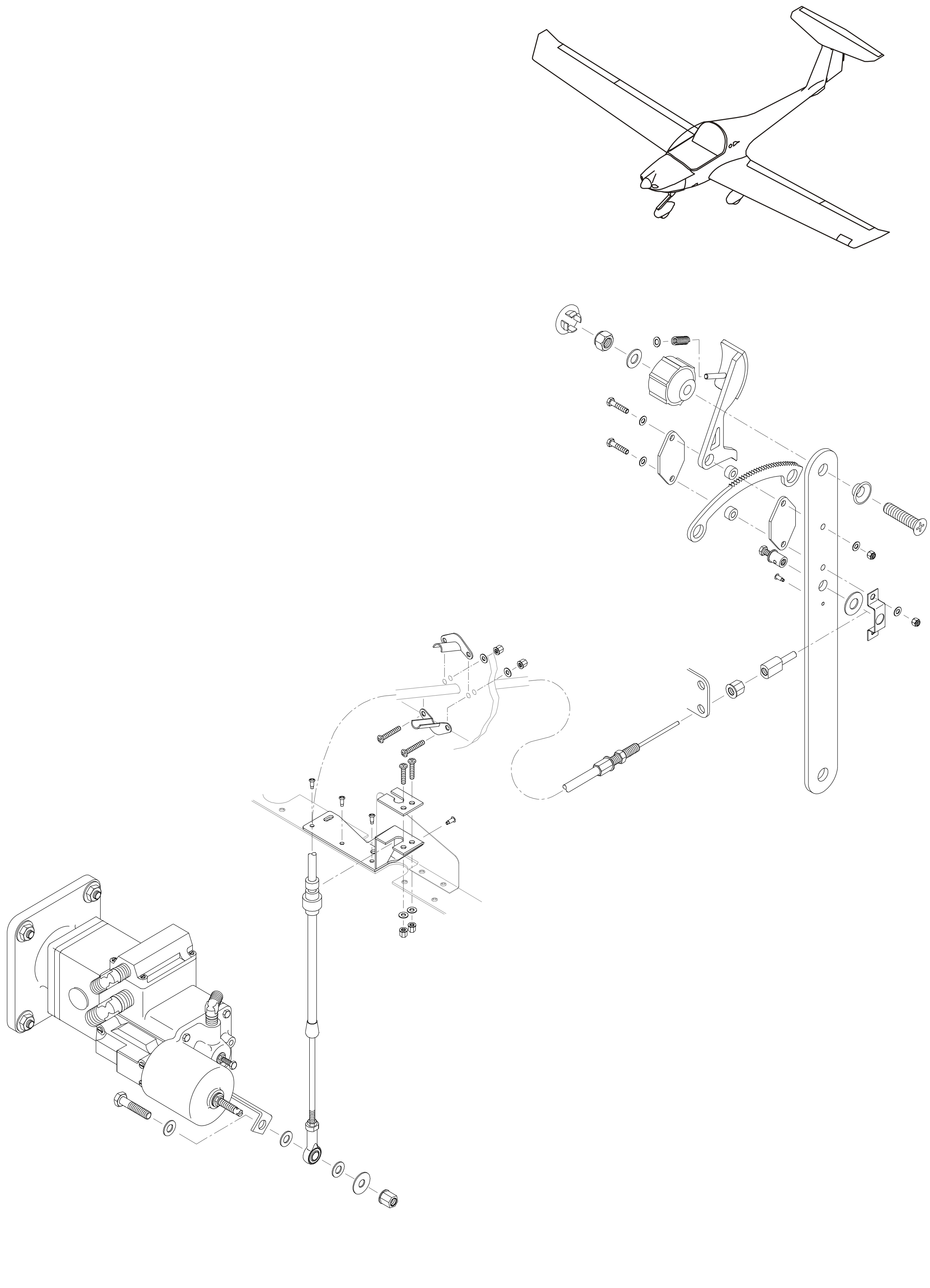

Figure 202 - Mixture Control Installation (Altitude Compensating Fuel Pump) (Sheet 2 of 2)

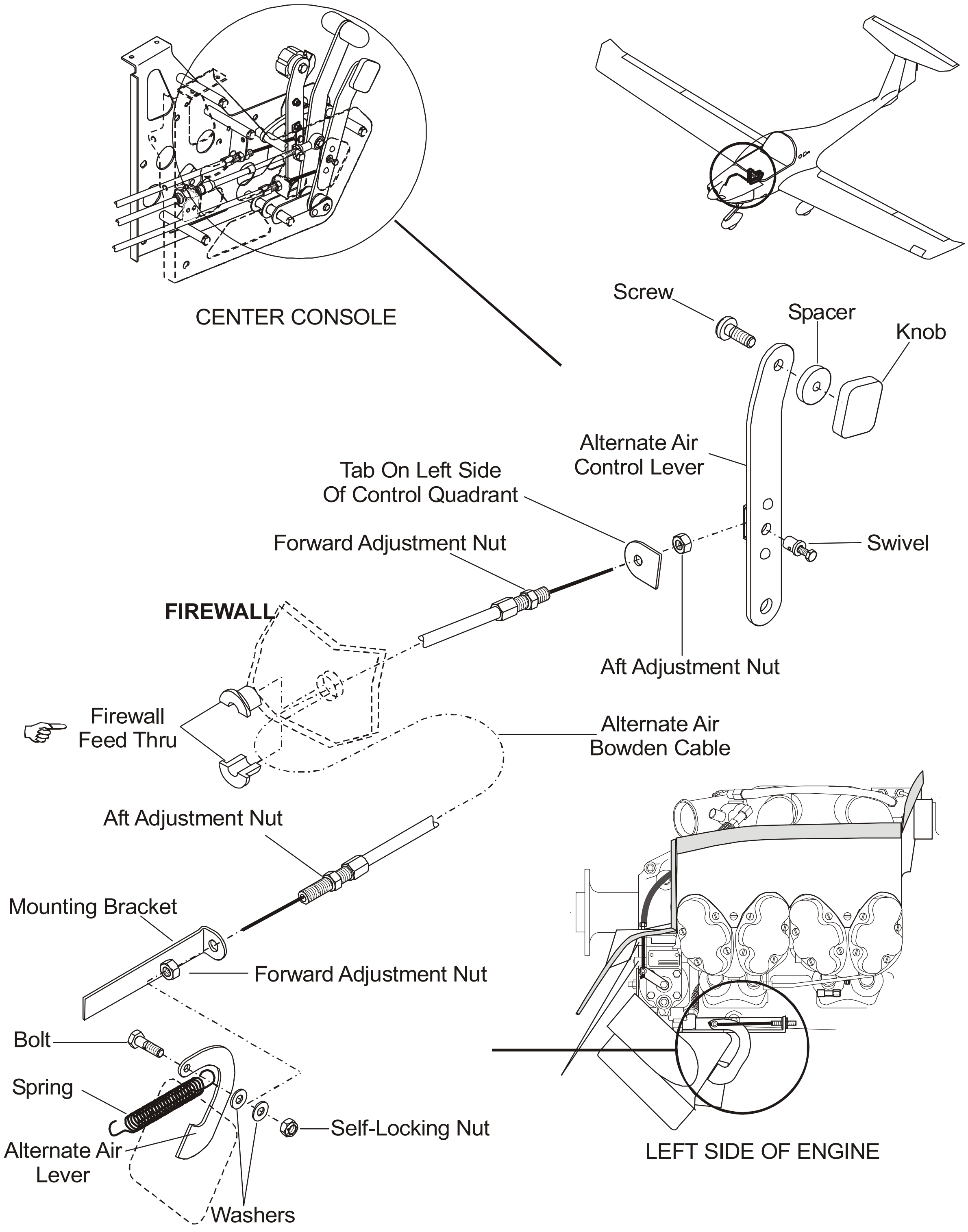

Figure 203 - Alternate Air Control Installation

5. Throttle/Mixture Control Range Of Movement Test

The following procedures describe how to do a throttle and a mixture control range of movement test. They do not describe how to adjust the engine fuel control units. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for data on the engine fuel control units.

Do the throttle/mixture control range of movement test using 2 persons. You must make sure that the throttle/mixture control lever hits the stops on the throttle/mixture valve before it hits the stops on the control quadrant. This will make sure that the throttle/mixture control has the correct range of movement. You should set the controls to give 0.125 in (3 mm) clearance (bounce) at the face plate.

A. Throttle Control Range Of Movement Test

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	

	Detail Steps/Work Items	Key Items/References
4.	Move the throttle control lever between IDLE and FULL. - Make sure the lever moves freely with no restriction.	
5.	Set the throttle control lever to FULL and hold it in position. - Make sure the throttle valve lever hits the FULL stop at the throttle valve. If necessary, adjust the bowden cable outer sheath at the engine support bracket.	With the throttle valve lever on the full stop, there must be a minimum of 0.125 in (3 mm) clearance (bounce) between the face plate and the throttle lever in the cockpit.
6.	Set the throttle control lever to IDLE and hold it in position. - Make sure the throttle valve lever hits the IDLE stop at the throttle valve. If necessary, adjust the bowden cable outer sheath at the engine support bracket.	With the throttle valve lever on the full stop, there must be a minimum of 0.125 in (3 mm) clearance (bounce) between the face plate and the throttle lever in the cockpit.
7.	Move the throttle control lever between IDLE and FULL. - Make sure the lever moves freely with no restriction.	Refer to Chapter 25-10.
8.	Do items 5 and 6 again as necessary to get the correct values.	
9.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
10.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
11.	Connect the aircraft battery.	Refer to Chapter 24-31.
12.	Install the engine cowlings.	Refer to Chapter 71-10.
13.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

B. Mixture Control Range of Movement Test

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	
4.	Remove the control knobs from the following levers at the center console: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
5.	Remove the 2 parts of the engine controls face plate from the center console cover. - Remove the four screws.	

	Detail Steps/Work Items	Key Items/References
6.	Disconnect and remove the TRIM switch from the face plate.	Disconnect the connector below the face plate. Lever the TRIM switch clear.
7.	Remove the center console cover from the center console: - Remove the six screws from the two sides of the center console cover.	
8.	Move the mixture control lever between RICH and LEAN CUT-OFF. - Make sure the lever moves freely with no restriction.	
9.	Set the mixture control lever to RICH and hold it in position. For aircraft with a standard fuel pump: - Make sure the mixture valve lever hits the RICH stop at the mixture valve. If necessary, adjust the bowden cable outer sheath at the apron support bracket. For aircraft with an altitude compensating fuel pump: - Make sure the mixture valve lever hits the RICH stop at the mixture valve. If necessary, adjust the bowden cable outer sheath at the throttle quadrant tab.	With the mixture valve lever on the RICH stop, the mixture lever in the cockpit must contact the forward stop in the throttle quadrant. With the mixture valve lever on the RICH stop, the mixture lever in the cockpit must contact the forward stop in the throttle quadrant.
10.	Set the mixture control lever to LEAN CUT-OFF and hold it in position. For aircraft with a standard fuel pump: - Make sure the mixture valve lever hits the CUT-OFF stop at the mixture valve. If necessary, adjust the bowden cable outer sheath at the apron support bracket. For aircraft with an altitude compensating fuel pump: - Make sure the mixture valve lever hits the RICH stop at the mixture valve. If necessary, adjust the bowden cable outer sheath at the throttle quadrant tab.	With the mixture valve lever on the CUT-OFF stop, the mixture lever in the cockpit must contact the aft stop in the throttle quadrant. With the mixture valve lever on the CUT-OFF stop, the mixture lever in the cockpit must contact the aft stop in the throttle quadrant.

	Detail Steps/Work Items	Key Items/References
11.	Move the mixture control lever between LEAN CUT-OFF and RICH. - Make sure the lever moves freely with no restriction.	
12.	Do steps 5 and 6 again as necessary to get the correct values.	
13.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
14.	Do a check for loose items in the cockpit.	Look especially in the area of the control quadrant.
15.	Install the center console cover to the center console. - Install the six screws to the two sides of the center console cover.	
16.	Install the TRIM switch to the face plate.	Push the Trim switch into position in the face plate. Connect the connector below the face plate.
17.	Install the 2 parts of the engine controls face plate to the center console cover.	
18.	Install the control lever knobs to the following items: - PARKING BRAKE - HEAT control ON/OFF - HEAT distribution DEFROST FLOOR.	
19.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
20.	Connect the aircraft battery.	Refer to Chapter 24-31.
21.	Install the engine cowlings.	Refer to Chapter 71-10.
22.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

6. Alternate Air Control Range of Movement Test

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE ENGINE IS SAFE BEFORE YOU DO WORK ON THE IGNITION SYSTEM. DISCONNECT THE SPARK PLUG LEADS. MAKE SURE THAT: - THE IGNITION SWITCH IS IN THE "OFF" POSITION - THE "P" LEADS ARE GROUNDED - THE THROTTLE IS SET TO "CLOSED" - THE MIXTURE CONTROL IS SET TO "LEAN CUT-OFF".	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
3.	Make the engine safe: - Disconnect the spark plug leads - Make sure that the ignition switch is set to "OFF" position - Make sure the "P" leads are grounded - Set the throttle to IDLE - Set the mixture control to LEAN CUT-OFF.	
4. 5.	Move the alternate air control lever between OFF and ON. - Make sure the lever moves freely with no restriction. Set the alternate air control lever to OFF and hold it in position. - Make sure the alternate air door closes fully against the seal at the air intake. If necessary, adjust the bowden cable outer sheath at the support bracket.	With the alternate air control lever on the OFF stop, there must be a minimum of 0.125 in (3 mm) clearance (bounce) between the face plate and the alternate air control lever in the cockpit.

	Detail Steps/Work Items	Key Items/References
6.	Do a return spring test: - Set the alternate air control lever to OFF and hold in position - Carefully push the door open and release. Make sure that the return spring closes the door fully against the seal.	
NOTE: The alternate air control lever must hit the "ON" stop in the cockpit with no bounce. There is no "ON" stop for the flap at the air box.		
7.	Set the alternate air control lever to ON and hold it in position. - Make sure that the alternate air door opens fully at the air intake.	
8.	Move the alternate air control lever between OFF and ON. - Make sure the lever moves freely with no restriction.	
9.	Do steps 5 and 6 again as necessary to get the correct values.	
10.	Do an inspection of the control connections which you disconnected. If necessary for your airworthiness authority, do a second inspection of the controls.	
11.	Install the ignition leads to the spark plugs. Tighten the "B" nuts.	Torque to 110 120 lbf-in (12.4 - 13.5 Nm).
12.	Connect the aircraft battery.	Refer to Chapter 24-31.
13.	Install the engine cowlings.	Refer to Chapter 71-10.
14.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

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CHAPTER 77-00
ENGINE INDICATING

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ENGINE INDICATING

1. General

This chapter describes the engine performance and temperature indicating systems on the DA20-C1 aircraft. A mechanical system operates the RPM indicator in the DA20-C1 aircraft. The engine has two temperature indication systems. It has the Cylinder Head Temperature (CHT) indication system and the Exhaust Gas Temperature (EGT) indication system. Refer to Chapter 28-00 for the fuel system indicating and Chapter 79-00 for oil system indicating.

The engine indicating system has the following indicators:

- RPM Indicator
- Exhaust Gas Temperature (EGT) Indicator
- Cylinder Head Temperature (CHT) Indicator.

Sensors for the temperature indicators attach to the rear left (number 2) cylinder and to the top left rear exhaust pipe.

Figure 1 shows the location of the engine performance indicators and sensors.

2. Description

A. RPM Indicator

The RPM indicator is located on the left side of the instrument panel. Four mounting screws on the front of the instrument panel hold the RPM indicator in position. A flexible gear shaft that rotates inside a protective cover, gives the drive to the RPM indicator. The flexible shaft connects from the engine through the engine firewall to the rear of the RPM indicator. Gears inside the RPM indicator take the mechanical input from the shaft and turn the indicator needle to give the correct RPM indication.

B. Cylinder Head Temperature (CHT)

The cylinder-head temperature-probe attaches to the bottom of the left rear cylinder. A braided electrical cable connects the probe to the CHT indicator. The CHT indicator is at the top right of the instrument panel adjacent to the EGT indicator. The thermocouple in the cylinder-head temperature probe generates a voltage that operates the cylinder-head temperature indicator.

C. Exhaust Gas Temperature (EGT)

The exhaust-gas temperature-probe attaches to the top of the left rear exhaust pipe. A braided electrical cable connects the probe to the EGT indicator. The EGT indicator is at the top right of the instrument panel adjacent to the CHT indicator. The thermocouple in the exhaust-pipe temperature probe generates a voltage that operates the exhaust-gas temperature indicator.

D. Tanis Engine Preheat System (Optional)

A Tanis Preheat System, when used properly prior to flight, will add to operational efficiency, utility, safety of flight and reduce the problems of engine wear associated with cold starts.

Tanis engine preheat system applies heat directly to the cylinder heads, oil sump, and crankcase. This makes sure thorough heating of the entire engine in a safe and reliable manner. The sump heater element attaches to the aft lower portion of the sump with the power lead to the right. The power lead is secured to the oil line that runs up from the RH side of the sump.

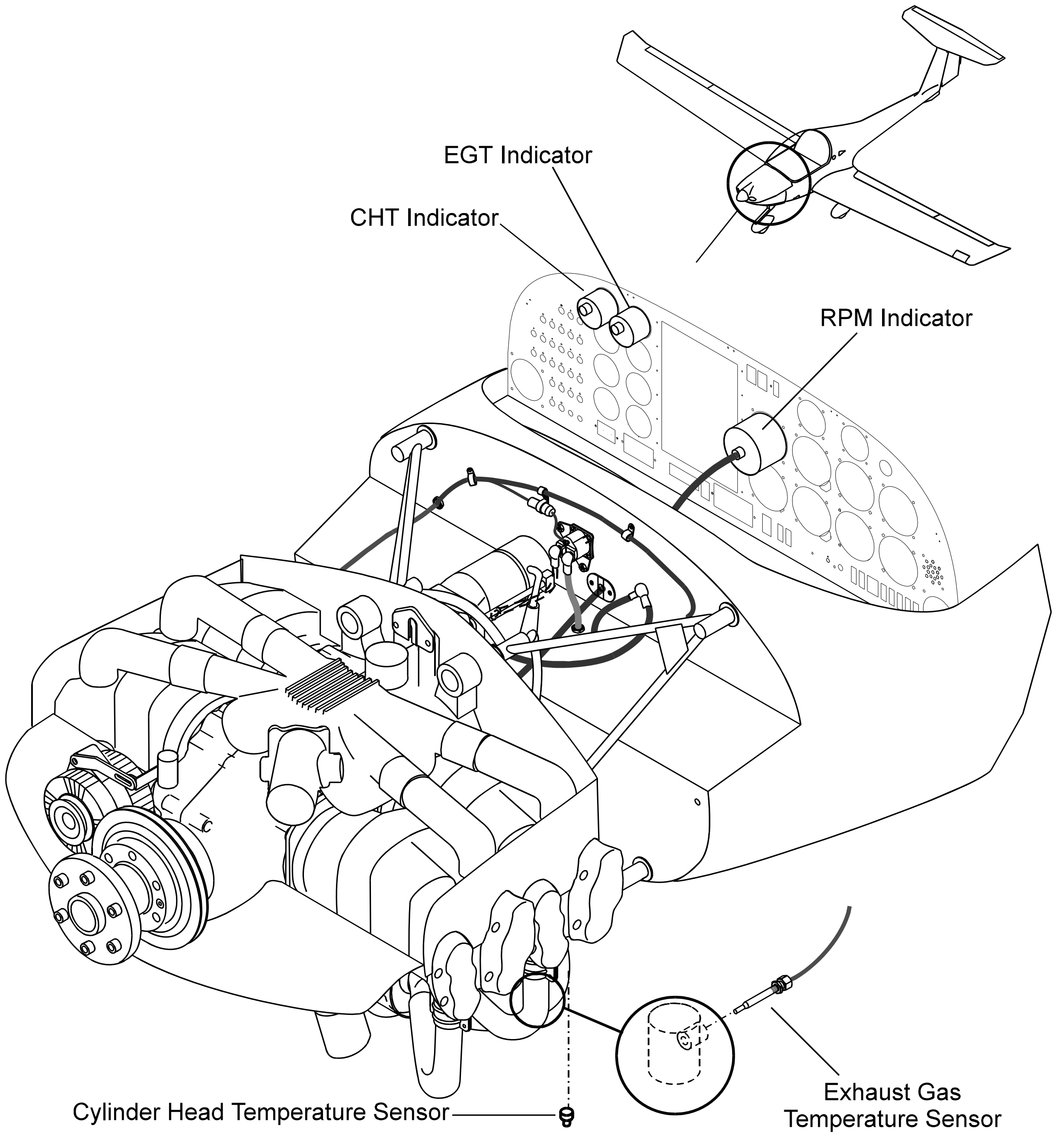

Figure 1 - Locations of Engine Indicating Sensors and Indicators

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ENGINE INDICATING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the RPM indicator and engine temperature indicators. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
No RPM indication.	Defective flexible shaft.	Replace the flexible shaft of the RPM indicator.
	Defective RPM indicator.	Replace the RPM indicator.
Incorrect RPM indication.	Defective RPM indicator.	Replace the RPM indicator.
No cylinder head temperature indication.	Defective thermocouple probe.	Replace the thermocouple probe.
	Defective electrical cable.	Repair the defective electrical cable.
	Defective cylinder head temperature indicator.	Replace the defective cylinder head temperature indicator.
High cylinder head temperature indication.	Defective engine.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
	Defective cylinder head temperature indicator.	Replace the defective cylinder head temperature indicator.
No exhaust gas temperature indication.	Defective thermocouple probe.	Replace the thermocouple probe.
	Defective electrical cable.	Repair the defective electrical cable.
	Defective exhaust gas temperature indicator.	Replace the defective exhaust gas temperature indicator.
High exhaust gas temperature indication.	Defective engine.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
	Defective exhaust gas temperature indicator.	Replace the defective exhaust gas temperature indicator.

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ENGINE INDICATING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the following items:

- RPM indicator
- Flexible drive from the engine to the RPM indicator
- Thermocouple probe for the Cylinder Head Temperature (CHT)
- Thermocouple probe for the Exhaust Gas temperature (EGT)
- CHT indicator
- EGT indicator.

WARNING: MAKE SURE THAT THE EXHAUST SYSTEM IS COOL BEFORE YOU DO WORK ON THE SYSTEM. THE EXHAUST SYSTEM CAN BE HOT. THIS CAN CAUSE INJURY TO PERSONS.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M6 for data on the engine.

2. Remove/Install the RPM Indicator

A. Remove the RPM Indicator

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrumental panel cover.	Refer to Chapter 25-10.
2.	Remove the flexible drive from the rear of the RPM indicator: - Disconnect the knurled nut on the end of the flexible drive from the rear of the RPM indicator - Carefully remove the drive shaft from the RPM indicator.	
3.	Remove the four mounting screws from the RPM indicator at the front of the instrument panel and remove the RPM indicator.	

B. Install the RPM Indicator

	Detail Steps/Work Items	Key Items/References
1.	Position the RPM indicator in the instrument panel and install the four mounting screws.	Refer to Chapter 31-10.
2.	Put the end of the flexible drive shaft into the rear of the RPM indicator and install the knurled nut of the drive shaft onto the rear of the RPM indicator.	
3.	Install the instrument panel cover.	Refer to Chapter 25-10.
4.	Do an engine run up test. Make sure that the RPM indication is correct.	Refer to the DA20-C1 Airplane Flight Manual.

3. Remove/Install the RPM Indicator Flexible Drive

A. Remove the RPM Indicator Flexible Drive

	Detail Steps/Work Items	Key Items/References
1.	Remove the instrumental panel cover.	Refer to Chapter 25-10.
2.	Remove the flexible drive from the rear of the RPM indicator: - Disconnect the knurled nut on the end of the flexible drive from the rear of the RPM indicator - Carefully remove the drive shaft from the RPM indicator.	
WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.		
3.	Remove the engine cowlings.	Refer to Chapter 71-10.
4.	Remove the fire resistant sealant from the engine side of the firewall at the flexible drive attachment bracket.	

	Detail Steps/Work Items	Key Items/References
5.	Remove the flexible drive attachment bracket from the firewall.	
6.	Disconnect the flexible drive knurled nut from the engine accessory case attachment point and carefully remove the drive shaft from the engine.	
7.	Carefully pull the flexible drive through the firewall and remove.	

B. Install the RPM Indicator Flexible Drive

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.	
1.	Position the flexible drive through the firewall.	
2.	Put the flexible drive shaft into the engine accessory case at the attachment point and install the knurled nut to the accessory case housing.	
3.	Put the end of the flexible drive shaft into the rear of the RPM indicator and install the knurled nut of the drive shaft onto the rear of the RPM indicator.	
4.	Install the drive shaft attachment bracket to the firewall and seal the drive shaft with the correct specification fire resistant sealant.	Use Product PR 812, (MIL-S-38249 Type 1). Fire Wall Sealant
5.	Install the instrumental panel cover.	Refer to Chapter 25-10.
6.	Install the engine cowlings.	Refer to Chapter 71-10.
7.	Do an engine run up test. Make sure that the RPM indication is correct.	Refer to the DA20-C1 Airplane Flight Manual.

4. Remove/Install the Cylinder Head Temperature (CHT) Thermocouple Probe

A. Remove the CHT Thermocouple Probe

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS.		
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Only do this if you will install a new CHT thermocouple probe. - Cut the electrical cables close to the CHT thermocouple probe.	
3.	Remove the CHT thermocouple probe from the bottom of the left rear cylinder.	

B. Install the CHT Thermocouple Probe

	Detail Steps/Work Items	Key Items/References
1.	Install the CHT thermocouple probe into the bottom of the left rear cylinder.	
2.	If necessary, connect the electrical cables with in-line splices.	
3.	Install the engine cowlings.	Refer to Chapter 71-10.
4.	Do an engine run up test. Look especially for correct CHT indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M6 for CHT data. For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual..

5. Remove/Install the Exhaust Gas Temperature (EGT) Thermocouple Probe

A. Remove the EGT Thermocouple Probe

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF THE ENGINE STARTS, THE PROPELLER CAN CAUSE DEATH OR INJURY TO PERSONS. WARNING: MAKE SURE THAT THE EXHAUST SYSTEM IS COOL BEFORE YOU DO WORK ON THE EXHAUST SYSTEM. THE EXHAUST SYSTEM CAN BE HOT. THIS CAN CAUSE INJURY TO PERSONS.	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Only do this if you will install a new EGT thermocouple probe. - Cut the electrical cables close to the EGT thermocouple probe.	
3.	Disconnect the EGT thermocouple probe at the left rear exhaust pipe.	

B. Install the EGT Thermocouple Probe

	Detail Steps/Work Items	Key Items/References
1.	Install the EGT thermocouple probe onto the left rear exhaust pipe.	
2.	If necessary, connect the electrical cables with in-line splices.	
3.	Install the engine cowlings.	Refer to Chapter 71-10.
4.	Do an engine run up test. Look especially for correct EGT indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M6 for EGT data. For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual.

6. Remove/Install The Exhaust Gas Temperature (EGT) Indicator

A. Remove the EGT Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3a.	For VDO Indicators: Disconnect the two electrical connectors from the rear of the EGT indicator.	
3b.	For UMA Indicators: Disconnect the electrical connector from the rear of the EGT indicator	
4a.	Remove the two nuts and the washers from the EGT indicator attachment bracket at the rear of the instrument panel. Then remove the EGT indicator from the front of the instrument panel	Hold the EGT indicator while you remove the attachment bracket.
4b.	Remove the four screws from the EGT indicator at the front of the instrument panel. Then Remove the EGT indicator from the rear of the instrument panel	

B. Install the EGT Indicator

	Detail Steps/Work Items	Key Items/References
1a.	For VDO indicators: Position the EGT indicator into the instrument panel at the front.	
1b.	For UMA indicators: Position the EGT indicator into the instrument panel from the rear.	
2a.	For VD Indicators: Install the EGT indicator attachment bracket at the rear of the instrument panel: - Put the bracket onto the two studs - Attach the two washers and the two nuts to the studs - Tighten the two nuts.	Make sure the EGT indicator is positioned correctly before you attach the bracket.
2b.	For UMA indicators: Install the four screws to the EGT indicator from the front of the instrument panel.	Screws mount into tinnerman nuts attached to the EGT indicator.

	Detail Steps/Work Items	Key Items/References
3a.	For VDO indicators: Connect the two electrical connectors to the rear of the EGT indicator.	
3b.	For UMA indicators: Connect the electrical connector to the rear of the EGT indicator.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do an engine run up test. Look especially for correct EGT indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M6 for EGT data. For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual.

7. Remove/Install the Cylinder Head Temperature Indicator

A. Remove the CHT Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the instrument panel cover.	Refer to Chapter 25-10.
3a.	For VDO Indicators: Disconnect the two electrical connectors from the rear of the CHT indicator.	
3b.	For UMA Indicators: Disconnect the electrical connector from the rear of the CHT indicator	
4a.	Remove the locking ring from the CHT indicator attachment bracket at the rear of the instrument panel. Then remove the CHT indicator from the front of the instrument panel	Hold the CHT indicator while you remove the attachment bracket.

B. Install the CHT Indicator

	Detail Steps/Work Items	Key Items/References
1a.	For VDO indicators: Position the CHT indicator into the instrument panel at the front.	
1b.	For UMA indicators: Position the CHT indicator into the instrument panel from the rear.	
2a.	For VD Indicators: Install the CHT indicator attachment bracket at the rear of the instrument panel:	Make sure the CHT indicator is positioned correctly before you attach the bracket.

	Detail Steps/Work Items	Key Items/References
	- Put the locking ring onto the CHT indicator - Turn the locking ring clockwise until the CHT indicator is tight in position.	
2b.	For UMA indicators: Install the four screws to the CHT indicator from the front of the instrument panel.	Screws mount into tinnerman nuts attached to the CHT indicator.
3a.	For VDO indicators: Connect the two electrical connectors to the rear of the CHT indicator.	
3b.	For UMA indicators: Connect the electrical connector to the rear of the CHT indicator.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10.
5.	Do an engine run up test. Look especially for correct CHT indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M6 for CHT data. For the engine run procedures, refer to the DA20-C1 Airplane Flight Manual.

8. Remove/Install the Tanis Engine Preheat System (Optional)

A. Remove the Tanis Engine Preheat System

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31.
2.	Remove the Tanis heating elements from all the cylinder thermocouple wells.	

B. Install the Tanis Engine Preheat System

	Detail Steps/Work Items	Key Items/References
1.	Clean the cylinder thermocouple wells with compressed air.	
2.	Coat the threads of the TAS 100 cylinder heat elements with anti-seize or equivalent.	
3.	Install one cylinder heat element into each cylinder thermocouple well.	Make sure not to flex the power leads more than that is necessary to avoid break away from the heating element.
4.	Torque the heating element.	Make sure that the torque does not exceed 90 lbf-in (10.17 Nm).

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CHAPTER 78-00

EXHAUST

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EXHAUST

1. General

This chapter describes the engine exhaust system. It also describes the muffler and the heat exchanger.

Refer to Chapter 21-00 for more data on the heat exchanger.

The Continental Motors IO-240-B engine installed in the DA20-C1 aircraft has an exhaust system supplied by the aircraft manufacturer.

2. Description

Fabricated welded stainless-steel makes the exhaust system. Each of the engine cylinders has an exhaust pipe. The top of each exhaust pipe attaches to the cylinder exhaust port. Expansion brackets further down the exhaust pipes close the exhaust pipe bellows. The bellows let the exhaust pipes move. And they let the exhaust pipes expand.

The pipes go underneath the engine where they go into the muffler/heat exchanger. The exhaust outlet pipe attached to the bottom of the muffler/heat exchanger goes through the bottom of the lower cowling. This ejects the exhaust gas outside the airplane. An Exhaust Gas Temperature (EGT) probe attaches to the left aft exhaust pipe.

A metal shroud goes round the outside of the muffler. A row of screws along the top of the shroud attach it to the muffler. The shroud has stub-pipes at the front right and back left. The space between the muffler and the shroud makes the heat exchanger for the cabin warm air system.

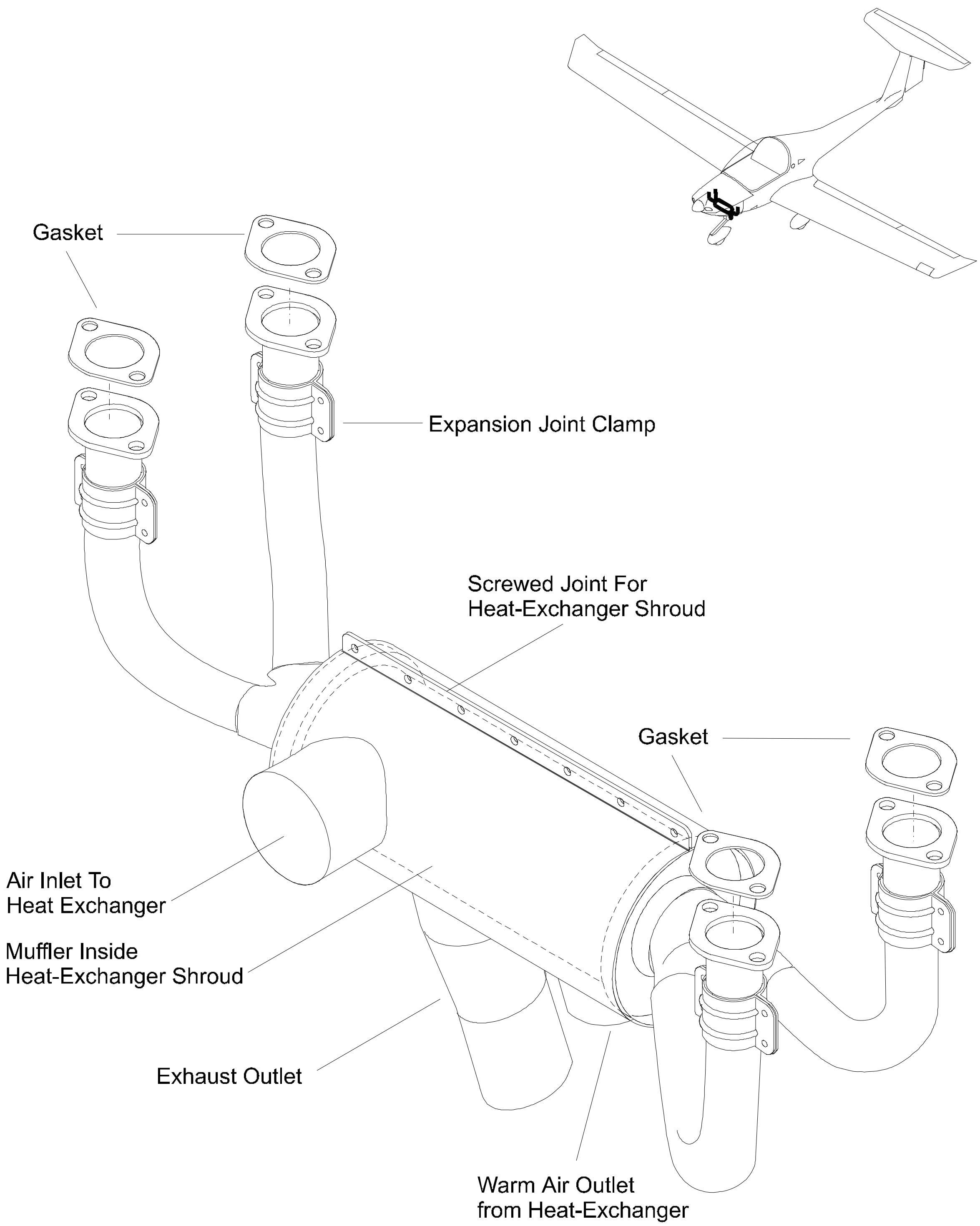

Figure 1 - Exhaust

EXHAUST - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the exhaust system. If you find the trouble in column 1, do the repair given in column 3.

WARNING: MAKE SURE THE EXHAUST SYSTEM IS COOL BEFORE YOU TOUCH IT. THE EXHAUST SYSTEM CAN BE HOT. THIS CAN CAUSE INJURY TO PERSONS.

TROUBLE	POSSIBLE CAUSE	REPAIR
The exhaust system makes too much noise.	A damaged muffler.	Replace the exhaust system.
Cracks in the exhaust pipe.	Too much vibration.	Replace the exhaust system/ weld the crack.
Exhaust gas leaks into the cockpit.	Cracks in the muffler.	Replace the exhaust system.
Indication on engine cowling of exhaust gas leaks.	Defective exhaust pipe gaskets.	Replace defective gaskets.
	The nuts that attach the exhaust pipes to cylinder head are loose.	Torque to 16.7 - 17.5 lbf-ft (22.6 - 23.7 Nm).

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EXHAUST - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the exhaust system.

WARNING: MAKE SURE THAT THE EXHAUST SYSTEM IS COOL BEFORE YOU DO WORK ON THE SYSTEM. THE EXHAUST SYSTEM CAN BE HOT. THIS CAN CAUSE INJURY TO PERSONS.

2. Remove/Install the Exhaust

A. Remove the Exhaust

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF YOU DO THIS, A DAMAGED COMPONENT CAN CAUSE THE ENGINE TO START. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.	
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
2.	Disconnect the EGT probe from the left aft exhaust pipe.	
3.	Remove the two worm-drive clamps from the heat exchanger shroud. - Move the air intake flexible hoses clear of the heat exchanger shroud - Move the warm air to the cabin heat valve flexible pipe clear of the heat exchanger shroud.	
4.	Remove the exhaust system from the engine exhaust cylinder ports. - Remove and discard the eight nuts from the cylinder head studs - Remove the eight spring washers.	Hold the exhaust system.
5.	Remove the exhaust system.	
6.	Remove and discard the four exhaust pipe gaskets from the cylinder heads.	

B. Install the Exhaust

<table>
<tr><th></th><th>Detail Steps/Work Items</th><th>Key Items/References</th></tr>
<tr><td colspan="3">WARNING: DO NOT STAND WITHIN THE DANGER AREA OF THE PROPELLER. IF YOU DO THIS, A DAMAGED COMPONENT CAN CAUSE THE ENGINE TO START. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: YOU MUST DO A THOROUGH EXAMINATION OF THE EXHAUST MUFFLER. A DEFECTIVE MUFFLER WILL LET EXHAUST GAS INTO THE COCKPIT. THIS CAN CAUSE DEATH OR INJURY TO PERSONS.

WARNING: DO NOT USE THE NUTS THAT ATTACH THE EXHAUST PIPE ONTO THE CYLINDER HEAD FLANGE AGAIN. MAKE SURE YOU USE NEW NUTS EACH TIME.</td></tr>
<tr><td>1.</td><td>Assemble the exhaust pipes to the muffler.

- Leave the clamping nuts loose.</td><td></td></tr>
<tr><td>2.</td><td>Install four new gaskets to the cylinder head exhaust ports.</td><td></td></tr>
<tr><td>3.</td><td>Attach the exhaust system to the engine.

- Install the eight nuts

- Tighten the eight nuts in sequence across engine in cross pattern. Tighten nuts progressively in at least two steps.</td><td>

Make sure to use new nuts.

Torque to 16.7 - 17.5 lbf-ft (22.6 - 23.7 Nm).</td></tr>
<tr><td>4.</td><td>Tighten the expansion joint clamp nuts.

- Tighten the eight nuts in sequence across engine in cross pattern

- Use small amount of lubricant when installing the clamps</td><td>

Torque to 20 - 25 lbf-in (2.3 - 2.8 Nm) or until the ears of the clamps are a minimum of 0.120 in (3.05 mm) apart.</td></tr>
<tr><td>5.</td><td>Connect the EGT probe to the left aft exhaust pipe.</td><td></td></tr>
<tr><td>6.</td><td>Attach the air intake flexible hose to the heat exchanger.

- Install the worm drive clamp to the heat exchanger

- Tighten the worm drive clamp.</td><td></td></tr>
</table>

	Detail Steps/Work Items	Key Items/References
7.	Attach the cabin heat valve flexible pipe to the heat exchanger. - Install the worm drive clamp to the heat exchanger - Tighten the worm drive clamp.	
8.	Do an engine ground run. - Do an exhaust system leak check. - Do an EGT system indication check.	Refer to DA20-C1 Airplane Flight Manual.
9.	Install the cowlings.	Refer to Chapter 71-10.

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CHAPTER 79-00

OIL

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OIL SYSTEMS

1. General

This chapter describes the airframe parts of the engine oil system installed on the DA20-C1 aircraft. The oil distribution and cooling system includes the oil filter, oil cooler, thermostatic control valve and hoses. The indicating system has the usual temperature and pressure indicators.

Refer to the Teledyne Continental Motors Specifications MHS24 for data on the engine oil system.

2. Description and Operation

Figure 1 shows a simplified schematic diagram of the oil distribution and cooling system. The engine oil supply is contained in the engine sump. The engine oil pump supplies oil to the oil cooler adaptor (supplied by the aircraft manufacturer).

The oil cooler adaptor holds the oil filter. The oil filter is a full-flow canister. The oil flows through the oil filter to a thermostatic relief-valve (Vernatherm). It also flows to the outlet of the oil cooler.

The vernatherm makes a by-pass between the outlet from the oil filter and the inlet to the engine system. The vernatherm has two functions:

- It senses oil temperature. At less than 110 °F (43 °C) the valve is open and the oil flows through the valve directly to the engine. Between 110 °F and 170 °F (43 °C and 77 °C) the valve gradually closes. The hot oil must flow through the oil cooler

- It senses the differential oil pressure across the oil cooler. If the oil cooler becomes blocked, the valve opens to allow oil to by-pass the cooler.

The oil cooler attaches to two brackets on the front face of the firewall. A GFRP plenum chamber above the oil cooler connects to a large flexible air hose. The hose supplies cold air from the cooling pressure chamber above the engine. Rubber hoses connect the oil cooler to the oil cooler adaptor on the engine.

As the hot oil flows through the oil cooler matrix, ram air from above the engine flows into the air hose at the aft baffle. The air then flows down the hose and over the oil cooler matrix to cool the oil.

There are no adjustments to the oil distribution and cooling system. Refer to the Teledyne Continental Motors IO-240-B Maintenance Manual for adjustment of the engine oil pressure relief-valve.

The engine has an oil breather system. A hose connected to an external connector on the crankcase lets the oil/air mixture flow from the crankcase to the oil/air separator that attaches to the outside of the engine. The oil flows from the oil/air separator back to the sump through a hose and the air gets ejected through the separator vent pipe out through the bottom of the engine cowling.

Figure 2 shows the location of the oil indication components. The oil temperature-sensor is installed at the top of the engine oil cooler adaptor. An electrical cable connects the sensor to the oil temperature indicator. The oil temperature indicator is positioned at the right of the instrument panel adjacent to the oil pressure indicator. The thermistor (temperature sensitive resistor) in the oil temperature-sensor changes its resistance with temperature. The oil temperature indicator uses the resistance to measure the oil temperature.

The oil pressure sensor is installed at the top of the engine oil cooler adaptor. An electrical cable connects the sensor to the oil pressure indicator. The oil pressure indicator is positioned at the right of the instrument panel adjacent to the oil pressure indicator.

A pressure switch installed at the top of the oil cooler adaptor operates the engine operated hour meter. An electrical cable connects the pressure switch to the engine operated hour meter. When the engine oil pressure increases to 0.4 - 0.55 bar (6 - 8 psi) the pressure switch contacts close and when the engine oil pressure decreases below 0.4 - 0.55 bar (6 - 8 psi) the pressure switch contacts open. The pressure switch thus controls the operation of the engine operated hour meter.

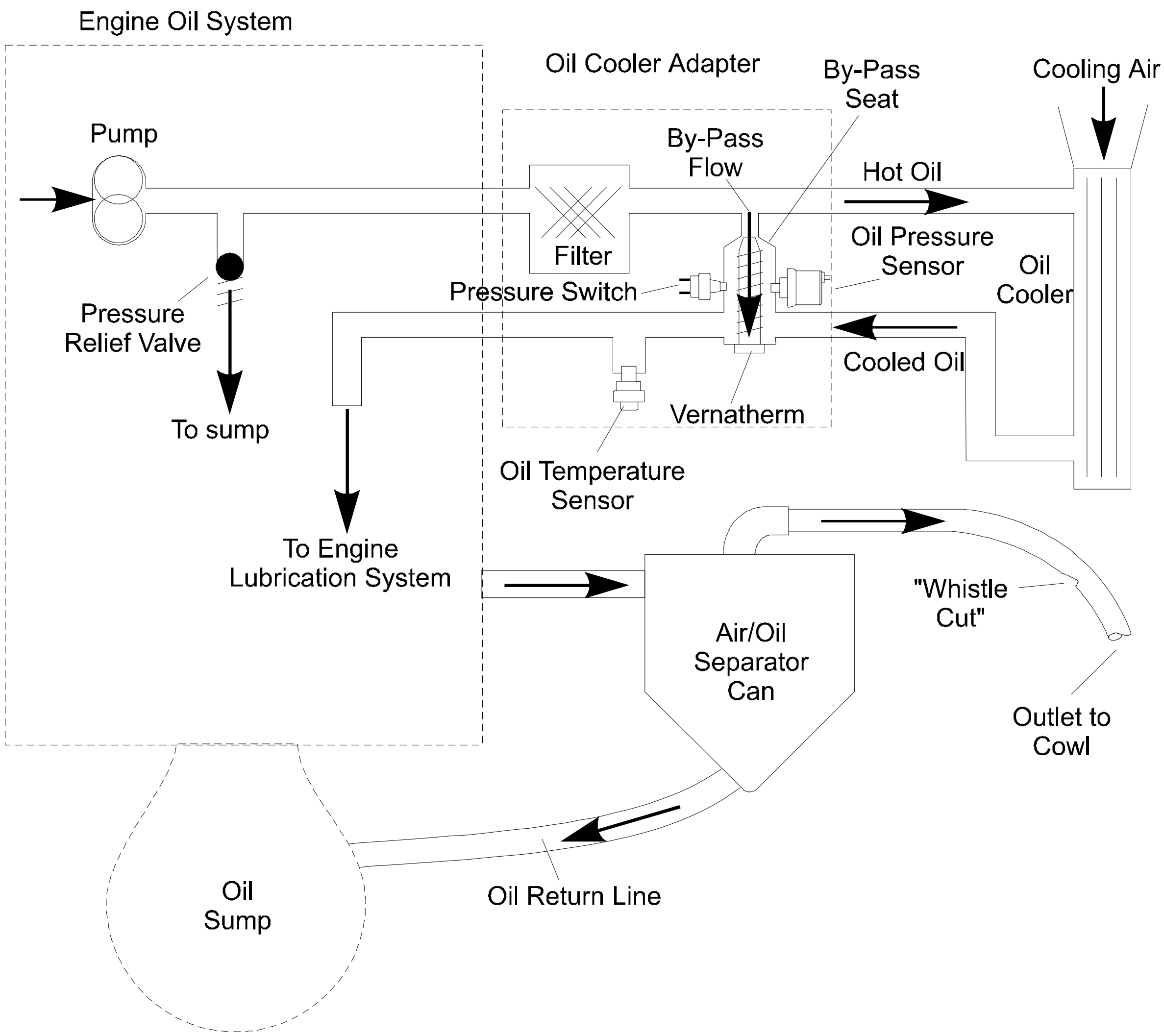

Figure 1 - Oil Distribution and Cooling System Schematic Diagram

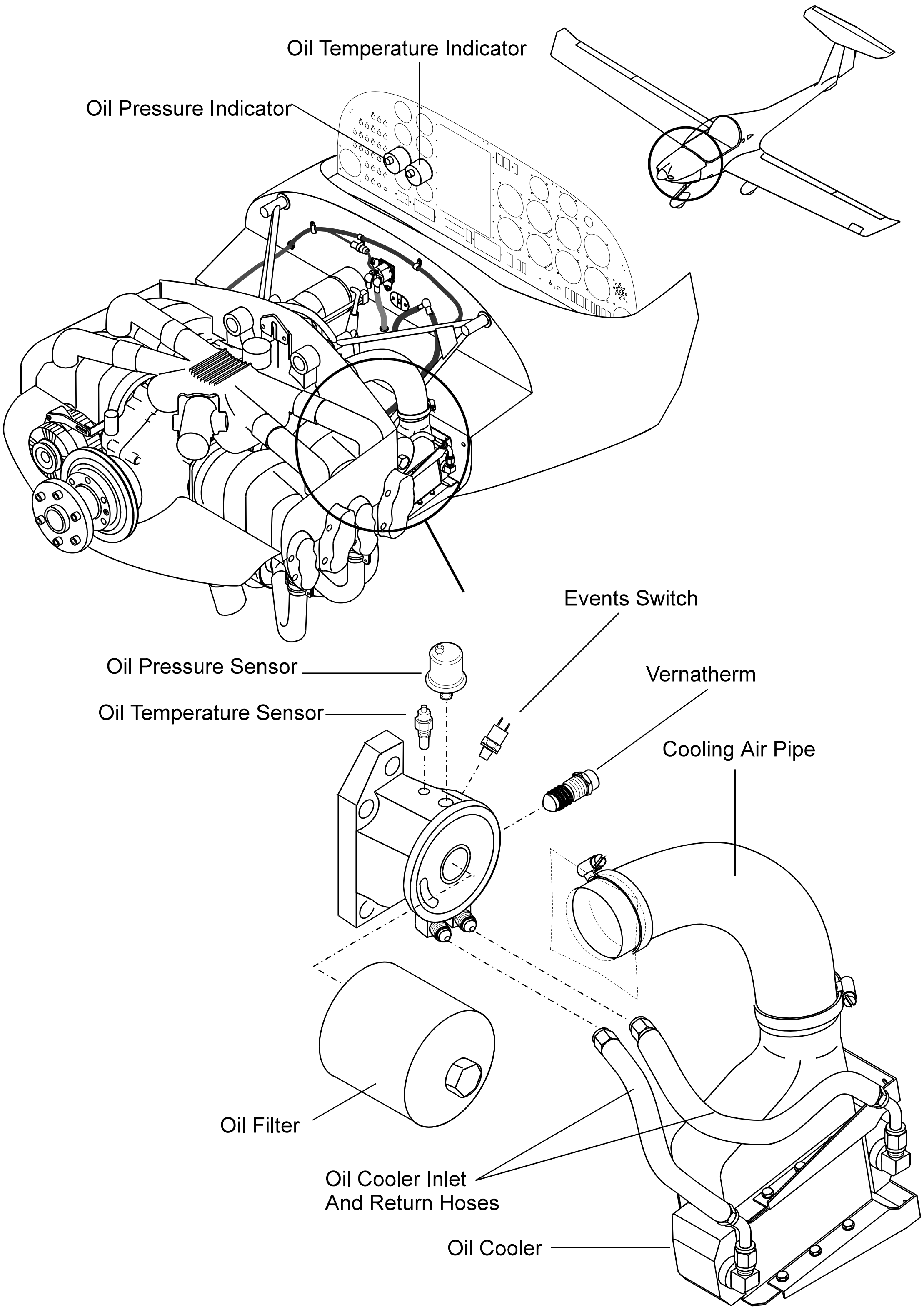

Figure 2 - Oil Indication Component Locations

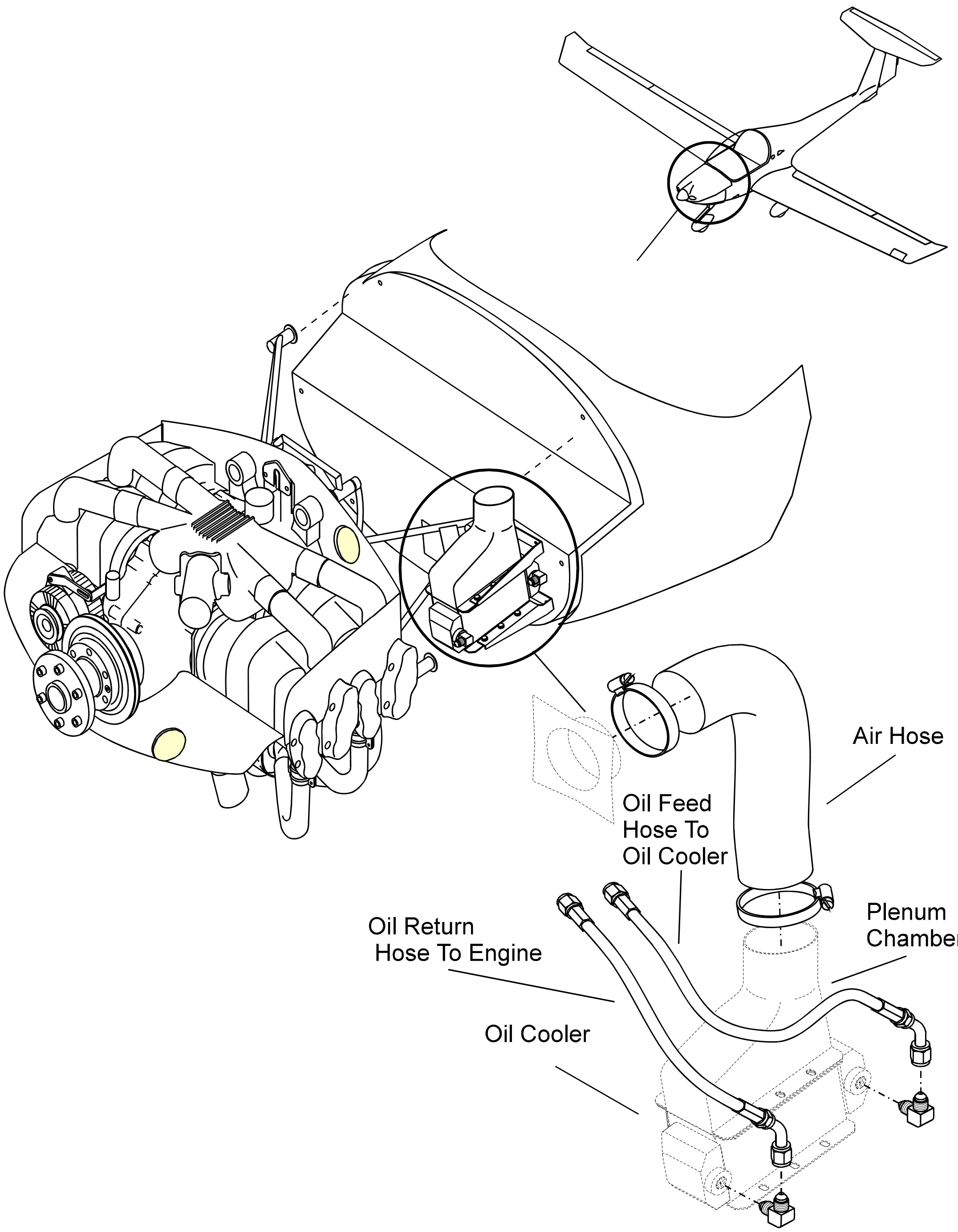

Figure 3 - Oil Cooler Component Locations

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OIL SYSTEMS - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the oil system external to the engine. If you find the trouble in column 1, do the repair given in column 3.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for trouble-shooting the engine oil system.

TROUBLE	POSSIBLE CAUSE	REPAIR
More than usual oil consumption.	Gasket or seal leakage.	Replace the gasket/oil seal.
	Air/Oil separator blocked.	Replace the air/oil separator.
High oil temperature indication.	The oil cooler air holes blocked.	Clean the oil cooler air holes with a soft brush.
	The oil cooler oil passages blocked.	Replace the oil cooler.
	The vernatherm valve held open by debris.	Remove the vernatherm valve. Clean and reinstall the valve. If still not correct replace the valve.
Low oil temperature indication.	Vernatherm valve defective.	Replace the vernatherm valve.
Low oil pressure indication.	Blocked oil filter.	Replace the oil filter.
High oil temperature indication.	Defective temperature sensor.	Replace the temperature sen-sor.
	Defective oil temperature indicator.	Replace the oil temperature indicator.
	Defective engine.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
No oil temperature indication.	Defective temperature sensor.	Replace the temperature sensor.
	Defective electrical cable.	Replace the defective electrical cable.
	Defective oil temperature indicator.	Replace the oil temperature indicator.

TROUBLE	POSSIBLE CAUSE	REPAIR
No indication from the engine operated hour meter.	Defective engine operated hour meter. Defective pressure switch.	Replace the engine operated hour meter. Replace the pressure switch.
High oil pressure indication.	Defective oil pressure sensor. Defective oil pressure indicator. Defective engine.	Replace the oil pressure sensor. Replace the oil pressure indicator. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
No oil pressure indication.	Defective oil pressure sensor. Defective oil pressure indicator. Defective electrical cable. Defective engine.	Replace the oil pressure sensor. Replace the oil pressure indicator. Replace the defective electrical cable. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.
Oil leaks from the air/oil separator vent.	Blockage of the engine oil breather system.	Troubleshoot the engine oil breather system. Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.

OIL SYSTEMS - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to remove and install the following items:

- The engine oil filter
- The vernatherm valve
- The oil cooler
- The oil temperature sensor
- The oil pressure sensor
- The Events Switch
- The oil pressure indicator
- The oil temperature indicator
- The air/oil separator
- The air/oil separator vent.

Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for the procedures on how to remove/install the engine gaskets/seals.

WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.

CAUTION: YOU MUST ATTACH BLANKS/CAPS TO HOLES/PIPES WHEN YOU REMOVE COMPONENTS. IF YOU DO NOT DO THIS, UNWANTED DEBRIS CAN ENTER THE HOLES/PIPES. THIS CAN CAUSE BLOCKAGE TO THE ENGINE OIL SYSTEM.

2. Remove/Install the Engine Oil Filter

A. Remove the Engine Oil Filter

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10.
	WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.	
2.	Remove the oil drain plug. Drain the engine oil into an approved container (with the engine warm).	
3.	Install a new gasket ring to the drain plug.	
4.	Install the drain plug. - Tighten the drain plug - Lock the drain plug with safety wire.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6. Torque to 190 - 210 lbf-in (21.5-23.8 Nm).
5.	Cut the safety wire from the engine oil filter.	
6.	Remove the engine oil filter.	
7.	Cut open the used oil filter. Look for particles of metal.	If the filter contains particles of metal, refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6.

B. Install the Engine Oil Filter

	Detail Steps/Work Items	Key Items/References
	WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.	
1.	Examine the seal on the engine oil filter. Look especially for correct installation. - Wet the seal on the engine oil filter with clean engine oil.	
2.	Install the engine oil filter. - Tighten the oil filter - Lock the oil filter with safety wire.	Torque to 216 - 240 lbf-in (24.5 - 27.2 Nm).
3.	Fill the engine with new oil.	Refer to Continental Motors Service Information Letter SIL99-2B for oil specifications, viscosity, and quantity.

	Detail Steps/Work Items	Key Items/References
4.	Install the engine cowlings.	Refer to Chapter 71-10-00.
5.	Do an engine run up test.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
6.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
7.	Examine the engine for oil leaks.	
8.	Check the oil filter torque again.	Torque to 216 - 240 lbf-in (24.5 - 27.2 Nm)
9.	Install the engine cowlings.	Refer to Chapter 71-10-00.

3. Remove/Install the Oil Cooler

A. Remove the Oil Cooler

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
2.	Disconnect the oil hose from the aft connection at the side of the oil cooler: - Drain the remaining engine oil into an approved container - Put a cap on the hose end.	
3.	Disconnect the oil hose from the forward connection at the side of the oil cooler: - Drain the remaining engine oil into an approved container - Put a cap on the hose end.	
4.	Remove the nuts, the bolts and the washers that attach the oil cooler to the two brackets at the firewall.	
5.	Move the plenum chamber with the flexible air pipe clear of the oil cooler.	
6.	Carefully pull the oil cooler forward and remove the oil cooler. - Put caps on the oil inlet and outlet holes in the oil cooler.	

B. Install the Oil Cooler

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
1.	Remove the caps from the oil inlet and outlet holes on the oil cooler. - Drain the preservation oil from the oil cooler.	
2.	Examine the oil cooler for damage. Look especially for damage to the matrix.	
3.	Carefully position the oil cooler into the brackets at the firewall.	
4.	Put the plenum chamber with the flexible air pipe attached in position on the top of the oil cooler.	
5.	Install the oil cooler. - Tighten the nuts and the bolts.	
6.	Remove the cap from the inlet oil hose. Connect the inlet oil hose to the aft connection at the oil cooler. - Tighten the oil hose connection.	
7.	Remove the cap from the inlet oil hose. Connect the outlet oil hose to the forward connection at the oil cooler. - Tighten the oil hose connection.	
8.	Install the engine cowlings.	Refer to Chapter 71-10-00.
9.	Do an engine run up test.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
10.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
11.	Examine the engine for oil leaks.	
12.	Install the engine cowlings.	Refer to Chapter 71-10-00.

4. Remove/Install the Vernatherm Valve

A. Remove the Vernatherm Valve

	Detail Steps/Work Items	Key Items/References
NOTE: You can remove the vernatherm valve with the oil filter installed. But it will be easier to remove the vernatherm valve with the oil filter removed.		
1.	Remove the engine cowlings.	Refer to AMM Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
2.	Remove the engine oil filter.	Refer to Paragraph 2.A.
3.	Cut the safety wire from the vernatherm valve.	
4.	Remove the vernatherm valve from the oil cooler adaptor. - Discard the oil seal.	

B. Install the Vernatherm Valve

	Detail Steps/Work Items	Key Items/References
1.	Install a new oil seal to the vernatherm valve and install the vernatherm valve to the oil cooler adaptor. - Tighten the vernatherm valve. - Lock the vernatherm valve to the oil cooler adaptor with safety wire.	Torque to 440 - 460 lbf-in (49.6 - 52.1 Nm).
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
2.	Install the engine oil filter.	Refer to Paragraph 2.B.
3.	Install the engine cowlings.	Refer to Chapter 71-10-00.
4.	Do an engine run up test.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
5.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
6.	Examine the engine for oil leaks.	
7.	Install the engine cowlings.	Refer to Chapter 71-10-00.

5. Remove/Install the Oil Temperature Sensor

A. Remove the Oil Temperature Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
3.	Remove the electrical connector from the oil temperature sensor at the oil cooler adaptor.	
4.	Remove the oil temperature sensor from the oil cooler adaptor. - Put a cap in the oil cooler adaptor hole.	

B. Install the Oil Temperature Sensor

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
1.	Remove the cap from the oil cooler adapter.	
2.	Install the oil temperature sensor. - Tighten the oil temperature sensor.	
3.	Connect the electrical connector to the oil temperature sensor at the oil cooler adaptor.	
4.	Install the top engine cowling.	Refer to Chapter 71-10-00.
5.	Do an engine run up test. Look especially for correct oil temperature indications.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
6.	Remove the top engine cowling.	Refer to Chapter 71-10-00.
7.	Examine the engine for oil leaks.	
8.	Install the top engine cowling.	Refer to Chapter 71-10-00.

6. Remove/Install the Oil Pressure Sensor

NOTE: The VDO type Oil Pressure Sensor and Oil Pressure Indicator are a serialized matched set and must be installed together.

A. Remove the Oil Pressure Sensor

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
3.	Remove the electrical connector from the oil pressure sensor at the oil cooler/oil filter adaptor.	
4.	Remove the oil pressure sensor from the oil cooler/oil filter adaptor. - Put a cap in the oil cooler/oil filter adaptor hole.	

B. Install the Oil Pressure Sensor

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
1.	Remove the cap from the oil cooler/oil filter adapter.	
2.	Install the oil pressure sensor. - Tighten the oil pressure sensor.	
3.	Connect the electrical connector to the oil pressure sensor at the oil cooler/oil filter adaptor.	
4.	Install the top engine cowling.	Refer to Chapter 71-10-00.
5.	Do an engine run up test. Look especially for correct oil pressure indications.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
6.	Remove the top engine cowling.	Refer to Chapter 71-10-00.
7.	Examine the engine for oil leaks.	
8.	Install the top engine cowling.	Refer to Chapter 71-10-00.

7. Remove/Install the Events Switch

A. Remove the Events Switch

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
3.	Remove the electrical connector from the events switch at the oil cooler/oil filter adaptor.	
4.	Remove the events switch from the oil cooler/ oil filter adaptor. - Put a cap in the oil cooler/oil filter adaptor hole.	

B. Install the Events Switch

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
1.	Remove the cap from the oil cooler/oil filter adapter.	
2.	Install the events switch. - Tighten the events switch.	
3.	Connect the electrical connector to the events switch at the oil cooler/oil filter adaptor.	
4.	Install the top engine cowling.	Refer to Chapter 71-10-00.
5.	Do an engine run up test. Look especially for correct oil pressure indications.	For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.
6.	Remove the top engine cowling.	Refer to Chapter 71-10-00.
7.	Examine the engine for oil leaks.	
8.	Install the top engine cowling.	Refer to Chapter 71-10-00.

8. Remove/Install the Oil Pressure Indicator

NOTE: The VDO type Oil Pressure Sensor and Oil Pressure Indicator are a serialized matched set and must be installed together.

A. Remove the Oil Pressure Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
3.	Disconnect the two electrical connectors from the rear of the oil pressure indicator.	
4a.	For VDO Indicator: Remove the locking ring from the oil pressure indicator.	Hold the oil pressure indicator while you remove the locking ring.
4b.	For UMA indicator: Remove the attaching screws from the front of the instrument panel	
5.	Remove the oil pressure indicator from the instrument panel into the cockpit.	

B. Install the Oil Pressure Indicator

	Detail Steps/Work Items	Key Items/References
1.	Position the oil pressure indicator into the instrument panel from the cockpit.	
2a.	For VDO indicator: Install the oil pressure indicator:	Make sure that the oil pressure indicator is positioned correctly before you attach the locking ring.
2b.	For UMA indicator: Install the oil pressure indicator using the attaching screws	Make sure that the oil pressure indicator is positioned correctly before you install the screws.
3.	Connect the electrical connector to the oil pressure indicator.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10-00.
5.	Do an engine run up test. Look especially for correct oil pressure indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for oil pressure data. For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.

9. Remove/Install the Oil Temperature Indicator

A. Remove the Oil Temperature Indicator

	Detail Steps/Work Items	Key Items/References
1.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
3.	Disconnect the two electrical connectors from the rear of the oil temperature indicator.	
4.	Remove the locking ring from the oil temperature indicator.	Hold the oil temperature indicator while you remove the locking ring.
5.	Remove the oil temperature indicator from the instrument panel into the cockpit.	

B. Install the Oil Temperature Indicator

	Detail Steps/Work Items	Key Items/References
1.	Position the oil temperature indicator into the instrument panel from the cockpit.	
2.	Install the oil temperature indicator: - Put the locking ring onto the oil temperature indicator. - Turn the locking ring clockwise until the oil temperature indicator is tight in position.	Make sure that the oil temperature indicator is positioned correctly before you attach the locking ring.
3.	Connect the electrical connector to the oil temperature indicator.	
4.	Install the instrument panel cover.	Refer to Chapter 25-10-00.
5.	Do an engine run up test. Look especially for correct oil temperature indications.	Refer to the Continental Motors IO-240 Series Engine and Overhaul Manual, Publication M-6 for oil temperature data. For the engine run procedure, refer to the DA20-C1 Airplane Flight Manual.

10. Remove/Install the Air/Oil Separator

A. Remove the Air/Oil Separator

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
2.	Remove the worm drive clamp from the rubber hose/vent pipe connection on the top of the air/oil separator.	
3.	Remove the worm drive clamp from the rubber hose/oil sump connection at the air/oil separator.	
4.	Remove the worm drive clamp from the rubber hose/breather pipe connection at the air/oil separator.	
5.	Carefully pull the air/oil separator clear of the rubber hoses. Remove the air/oil separator.	

B. Install the Air/Oil Separator

	Detail Steps/Work Items	Key Items/References
WARNING: DO NOT GET OIL ON YOU. OIL CAN CAUSE SKIN DISEASE.		
1.	Examine the hoses for blockage.	Remove any blockage.
2.	Put the air/oil separator in position. Attach the three hoses.	Make sure you connect the correct hoses to the inlet, outlet and vent connections on the air/oil separator.
3.	Install the worm drive clamps to the following connections:	Refer to Chapter 71-10-00.
	- Vent pipe connection on the top of the air/oil separator - Breather pipe connection at the air/oil separator. - Oil sump connection at the air/oil separator.	
4.	Install the engine cowlings.	Refer to Chapter 71-10-00.

11. Remove/Install the Air/Oil Separator Vent

A. Remove the Air/Oil Separator Vent

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
2.	Remove the P-clip that attaches the vent pipe to the engine mounting frame.	
3.	Remove the worm drive clamp that attaches the vent pipe to the oil/air separator.	
4.	Cut the three tie-wraps that attach to the fuel distribution manifold drain.	
5.	Carefully pull the vent pipe from the rubber hose at the oil/air separator. Remove the vent pipe.	

B. Install the Air/Oil Separator Vent

	Detail Steps/Work Items	Key Items/References
1.	Examine the vent pipe. Make sure that the inner bore of the pipe is clear.	
2.	Put the vent pipe in position in the oil/air separator.	
3.	Install the worm drive clamp that attaches the vent pipe to the oil/air separator.	
4.	Install the P-clip that attaches the vent pipe to the engine mounting frame.	
5.	Install the three tie-wraps that attach to the fuel distribution manifold drain.	
6.	Install the engine cowlings.	Refer to Chapter 71-10-00.

CHAPTER 80-00
STARTING

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STARTING

1. General

This chapter describes the engine starting system installed on the DA20-C1 aircraft. Figure 1 shows the location of the starter system components. Refer to Continental Motors IO-240 Series Engine Maintenance and Overhaul Manual, Publication M-6 for data on the starter motor and the engine.

2. Description and Operation

A Continental Motors electrically operated starter-motor attaches to the Continental Motors IO-240-B series engine. The starter motor attaches to the rear of the accessory drive case.

The starter has a DC motor. During starting, the motor turns the engine through a reduction gear and a clutch. A solenoid attaches to the bottom of the motor. The solenoid moves the pinion gear of the starter to engage with the engine crankshaft gear. It also operates contacts to supply power to the motor. The starter electrical circuit has 2 parts. It has a control circuit and a heavy current circuit.

The main bus supplies power for the starter control circuit through a circuit-breaker. The control circuit has the usual key-operated ignition switch. The ignition switch is located near the bottom center of the instrument panel.

The fully clockwise START position of the ignition switch gives a positive supply to the starting vibrator which switches power to the starter relay. In all other switch positions, there is no supply to the starter relay.

Heavy cables from the output side of the battery relay supply the electrical power to the starter relay. A heavy cable connects the output of the starter relay to the starter.

When you set the ignition switch to START battery power energizes the starter motor. The starter solenoid that attaches to the starter motor pushes a pinion gear forwards to engage the crankshaft gear. At this point the starter motor turns the pinion gear through a pair of reduction gears that turn the crankshaft. When the engine starts and the ignition switch is released, the pinion gear retracts from the crankshaft gear. A start annunciator light comes on when the starter relay closes.

When you turn the ignition switch to the START position with the GEN/BAT switch ON, the following happens:

- The main bus supplies power to the ignition switch
- The ignition switch gives a positive supply to the starter relay
- The starter relay energizes. The relay contacts close
- The start light comes on
- The starter solenoid energizes. This moves the starter pinion to engage the crankshaft gear
- The contacts in the solenoid close to complete the power circuit to the starter motor
- The motor turns the engine.

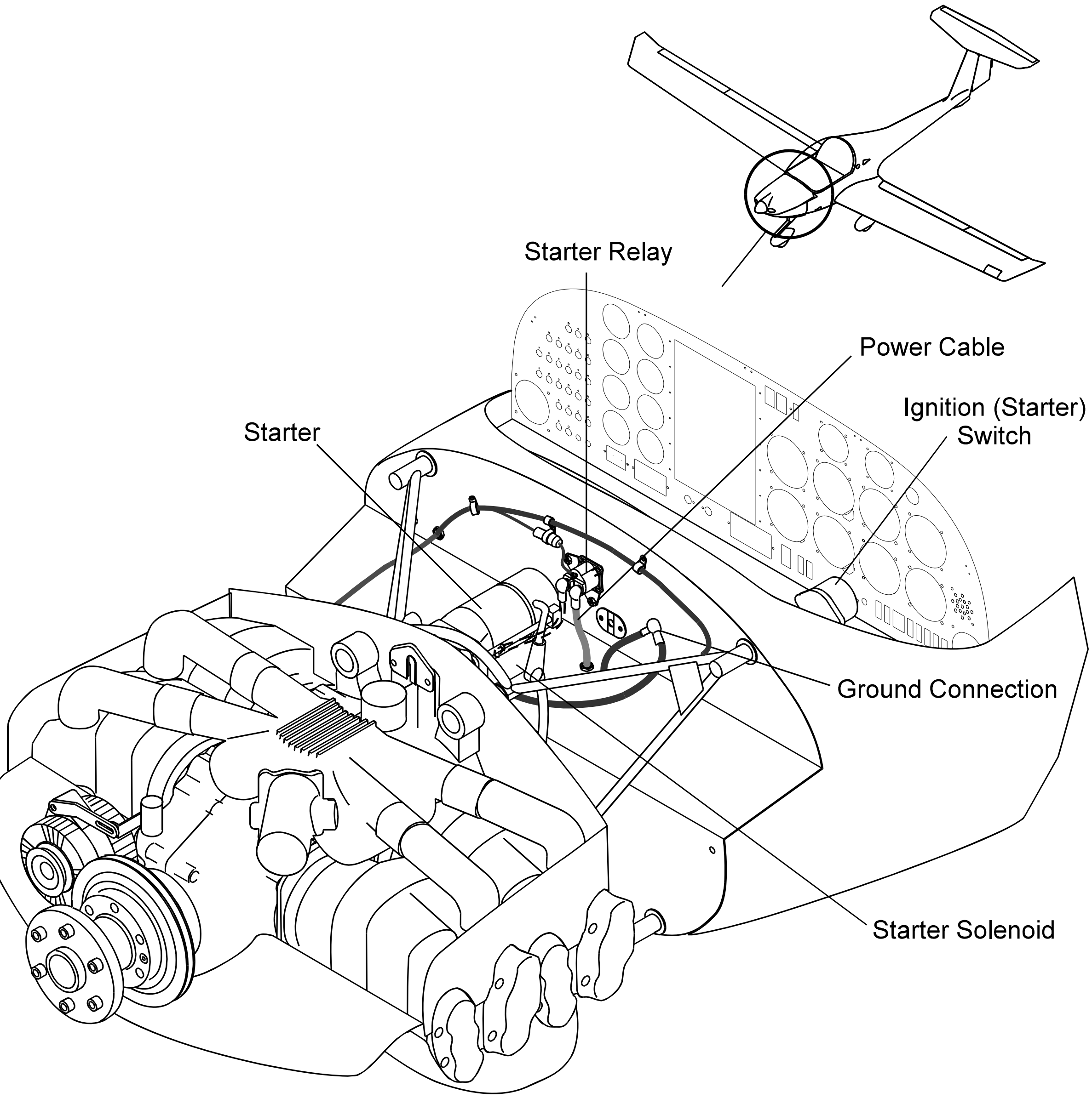

Figure 1 - Starter System Component Locations

STARTING - TROUBLESHOOTING

1. General

This table explains how to troubleshoot the engine starting system. If you find the trouble in column 1, do the repair given in column 3.

TROUBLE	POSSIBLE CAUSE	REPAIR
The starter motor will not operate.	The aircraft battery voltage is low.	Do a battery voltage check. Charge or replace the battery.
	Starter switch circuit defective.	Do a continuity test. Refer to Chapter 92 for wiring diagram 74-39-00. Ref Vibrator Interlock.
	Starter motor malfunction.	Refer to the Teledyne Continental Motors Maintenance Manual.
The starter motor rotates but does not turn the crankshaft.	Starter motor drive train malfunction.	Refer to the Teledyne Continental Motors Maintenance Manual.
The starter motor rotates slowly.	The aircraft battery voltage is low.	Do a battery voltage check. Charge or replace the battery.
	Starter motor malfunction.	Refer to the Teledyne Continental Motors Maintenance Manual.

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ENGINE STARTING - MAINTENANCE PRACTICES

1. General

The following maintenance practices describe how to:

- test the starting vibrator battery
- remove and install the starting vibrator battery.

Refer to the DA20-C1 Airplane Flight Manual for engine starting instructions/data.

Refer to 74-00-00 of the AMM for the ignition system schematic diagram.

2. Starting Vibrator Battery Test

	Detail Steps/Work Items	Key Items/References
1.	Set Battery switch to OFF.	
2.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
3.	Measure voltage between positive and negative terminals of starting vibrator battery	Replace starting vibrator battery if voltage below 12V.
4.	Install the engine cowlings.	Refer to Chapter 71-10-00.

3. Remove/Install The Starting Vibrator Battery

A. Remove the Starting Vibrator Battery

	Detail Steps/Work Items	Key Items/References
1.	Remove the engine cowlings.	Refer to Chapter 71-10-00.
2.	Disconnect the aircraft battery.	Refer to Chapter 24-31-00.
3.	Disconnect leads from starting vibrator battery terminals.	
4.	Loosen gear clamp and remove starting vibrator battery.	

B. Install the Starting Vibrator Battery

	Detail Steps/Work Items	Key Items/References
1.	Place starting vibrator battery in bracket with terminals facing forward.	
2.	Tighten gear clamp.	
3.	Connect the battery positive lead to the starting vibrator battery positive terminal.	
4.	Connect the battery negative lead to the starting vibrator battery negative terminal.	
5.	Connect the aircraft battery.	Refer to Chapter 24-31-00.
6.	Install the engine cowlings.	Refer to Chapter 71-10-00.
7.	Do an engine run up test.	Refer to the DA20-C1 Airplane Flight Manual.

CHAPTER 92-00
WIRING DIAGRAMS

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WIRING DIAGRAMS

1. General

This Subject describes the Wiring Diagram/Schematic for each system installed on the DA20-C1 aircraft. The Wiring Diagrams/Schematics use the ATA Chapter-Section-Subject numbering system.

2. List of Wiring Diagrams/Schematics

CH-SE-SU	Title	Drawing No.	No. of Pages
92-10-00	SCHEMATIC, BATTERY FORWARD, DC GENERATION AND DISTRIBUTION	22-2400-98-00	1
92-10-00	SCHEMATIC, BATTERY FORWARD, DC GENERATION AND DISTRIBUTION WITH UMA ENGINE INSTRUMENTS INSTALLED	22-2400-97-00	1
92-10-00	SCHEMATIC, EPU INSTALLATION, OPTIONAL	22-2442-99-00	1
92-10-00	SCHEMATIC, TRIM DISPLAY	22-2720-10-00	1
92-10-00	SCHEMATIC, TRIM, CIRCUIT BOARD	22-2720-99-00	1
92-10-00	SCHEMATIC, ELECTRICAL SYSTEM FLIGHT CONTROLS	22-2732-99-00	1
92-10-00	SCHEMATIC, ELECTRICAL SYSTEM FLIGHT CONTROLS	22-2751-99-00	1
92-10-00	SCHEMATIC, FLAP/TRIM	22-2752-99-00	1
92-10-00	SCHEMATIC, FUEL SYSTEM	28-00-00	1
92-10-00	SCHEMATIC, 2-SPEED ELECTRIC FUEL PUMP	22-2820-99-00	1
92-10-00	SCHEMATIC, FUEL QUANTITY TIMER	22-2843-99-00	1
92-10-00	SCHEMATIC, HEATER, PITOT STATIC	22-3030-99-00	1
92-10-00	SCHEMATIC, DIGITAL CLOCK, HOUR METER & OAT	22-3120-99-00	1
92-10-00	SCHEMATIC, CANOPY SWITCHES	22-3160-99-00	1
92-10-00	SCHEMATIC, FLOOD LIGHT	22-3310-97-00	1
92-10-00	SCHEMATIC, INTERNAL LIGHTING	22-3310-99-00	1
92-10-00	SCHEMATIC, INTERNAL LIGHTING, ASPEN	22-3312-98-00	1
92-10-00	SCHEMATIC, INTERNAL LIGHTING	22-3312-99-00	1
92-10-00	SCHENATIC, DIMMING REGULATOR & PLACARDS	22-3313-99-00	1

CH-SE-SU	Title	Drawing No.	No. of Pages
92-10-00	SCHEMATIC, EXTERNAL LIGHTING	22-3340-99-00	1
92-10-00	SCHEMATIC, RECOGNITION LIGHT, OPTIONAL	22-3342-99-00	1
92-10-00	SCHEMATIC, LED EXTERNAL LIGHTING	22-3343-99-00	
92-10-00	SCHEMATIC, TURN AND SLIP	22-3420-99-00	1
92-10-00	SCHEMATIC, FUEL PRESS	22-7300-99-00	1
92-10-00	SCHEMATIC, IGNITION AND STARTING	22-7432-99-00	1
92-10-00	SCHEMATIC, UMA ENGINE INSTRUMENTS	22-7700-99-00	1
92-10-00	SCHEMATIC, EGT GAUGE	22-7721-99-00	1
92-10-00	SCHEMATIC, CHT GAUGE	22-7722-99-00	1
92-10-00	SCHEMATIC, ENGINE INSTRUMENTATION	22-7930-99-00	1
92-10-00	SCHEMATIC, INSTRUMENT PANEL INTEGRAL LIGHTING	33-10-01	1
92-30-00	SCHEMATIC, AUTOPILOT, INTERCONNECTS-SYS 30	22-2210-99-00	1
92-30-00	SCHEMATIC, NAV COMM, KX-155	22-2310-21-00	1
92-30-00	SCHEMATIC, GPS COMM, KLX-135A	22-2310-22-00	1
92-30-00	SCHEMATIC, NAV/COMM KX-125	22-2310-23-00	1
92-30-00	SCHEMATIC, AUDIO PANEL, PMA 6000	22-2350-20-00	1
92-30-00	SCHEMATIC, NAVIGATION, COMMUNICATION EQUIPMENT	22-3400-99-00	2
92-30-00	SCHEMATIC, PFD, ASPEN EFD1000, FIXED PROVISIONS	22-3421-99-00	1
92-30-00	SCHEMATIC, PFD, AUTOPILOT, FIXED PROVISIONS	22-3422-99-00	1
92-30-00	SCHEMATIC, BACKUP ARTIFICAL HORIZON INDICATOR	22-3424-99-00	1
92-30-00	SCHEMATIC, TRANSPONDER KT-76C	22-3450-20-00	1
92-30-00	SCHEMATIC, KLN 35A, GPS RECEIVER	22-3450-21-00	1
92-30-00	SCHEMATIC, GMA 340	22-9223-50-01	1
92-30-00	SCHEMATIC, GMA 340H USAFA-IFTP	22-9223-50-02	1

CH-SE-SU	Title	Drawing No.	No. of Pages
92-30-00	SCHEMATIC, IC-A200	22-9223-50-03	1
92-30-00	SCHEMATIC, SL40	22-9223-50-04	1
92-30-00	SCHEMATIC, GMA 340 H	22-9223-50-05_1	1
92-30-00	SCHEMATIC, ELT 200	22-9225-60-01	1
92-30-00	SCHEMATIC, GARMIN G500 INTEGRATED DISPLAY SYSTEM	22-9231-00-00	5
92-30-00	AVIONICS SCHEMATIC, G500 WITH GTN 650 and GTR 225	22-9231-00-01	5
92-30-00	SCHEMATIC, GNS 530 - 430	22-9234-50-01	1
92-30-00	SCHEMATIC, GNC 420	22-9234-50-02	1
92-30-00	SCHEMATIC, GTX-327	22-9234-50-03	1
92-30-00	SCHEMATIC, GTX-330	22-9234-50-04	1
92-30-00	SCHEMATIC, TAS600 OPTION - G500 SYSTEM	22-9234-50-06X01	1
92-30-00	SCHEMATIC, GNS 530-430 ASPEN FXED PROVISIONS	22-9234-50-07	1
92-30-00	SCHEMATIC, GNC420W / PM1000	22-9234-50-08	1

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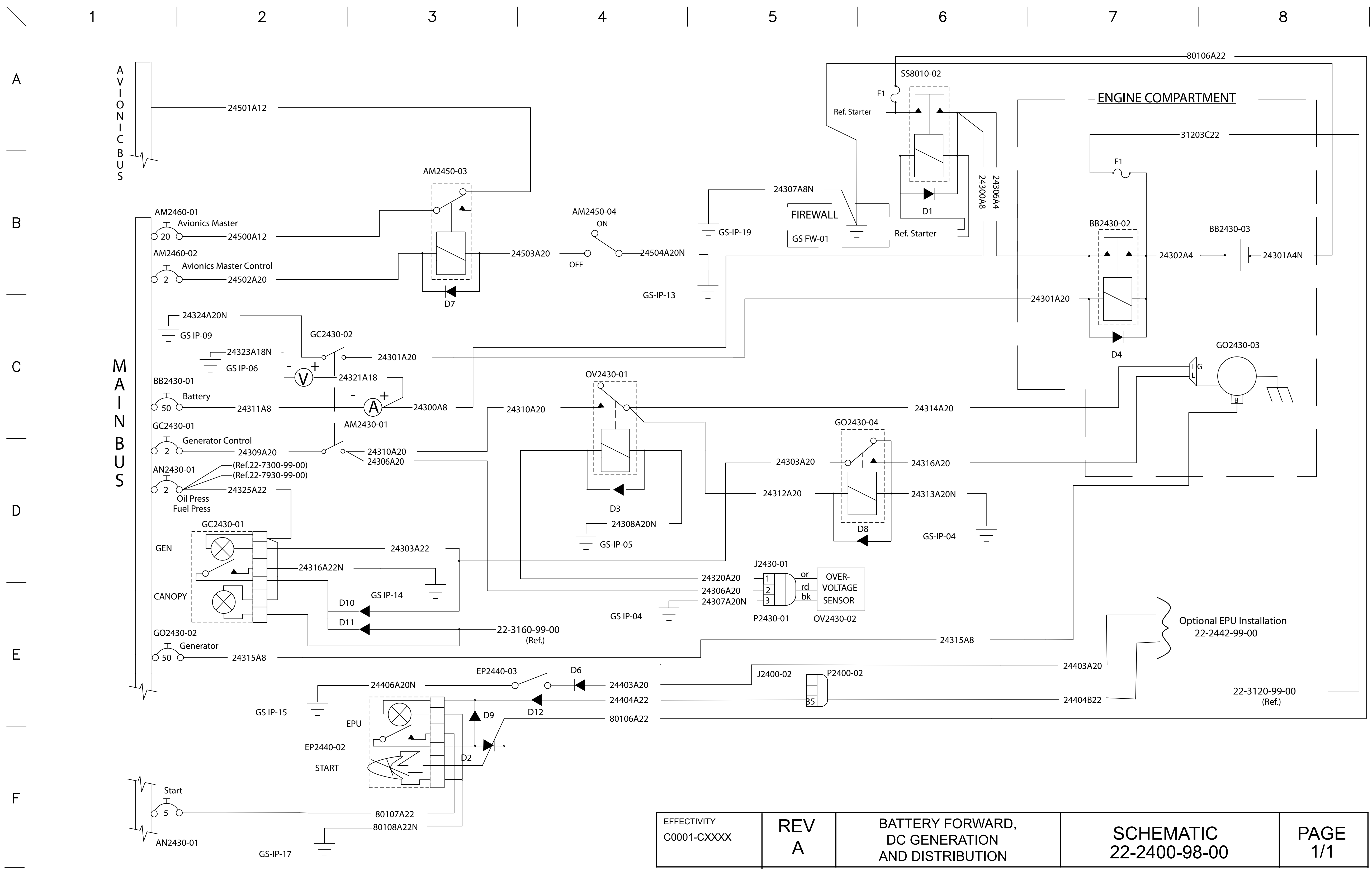
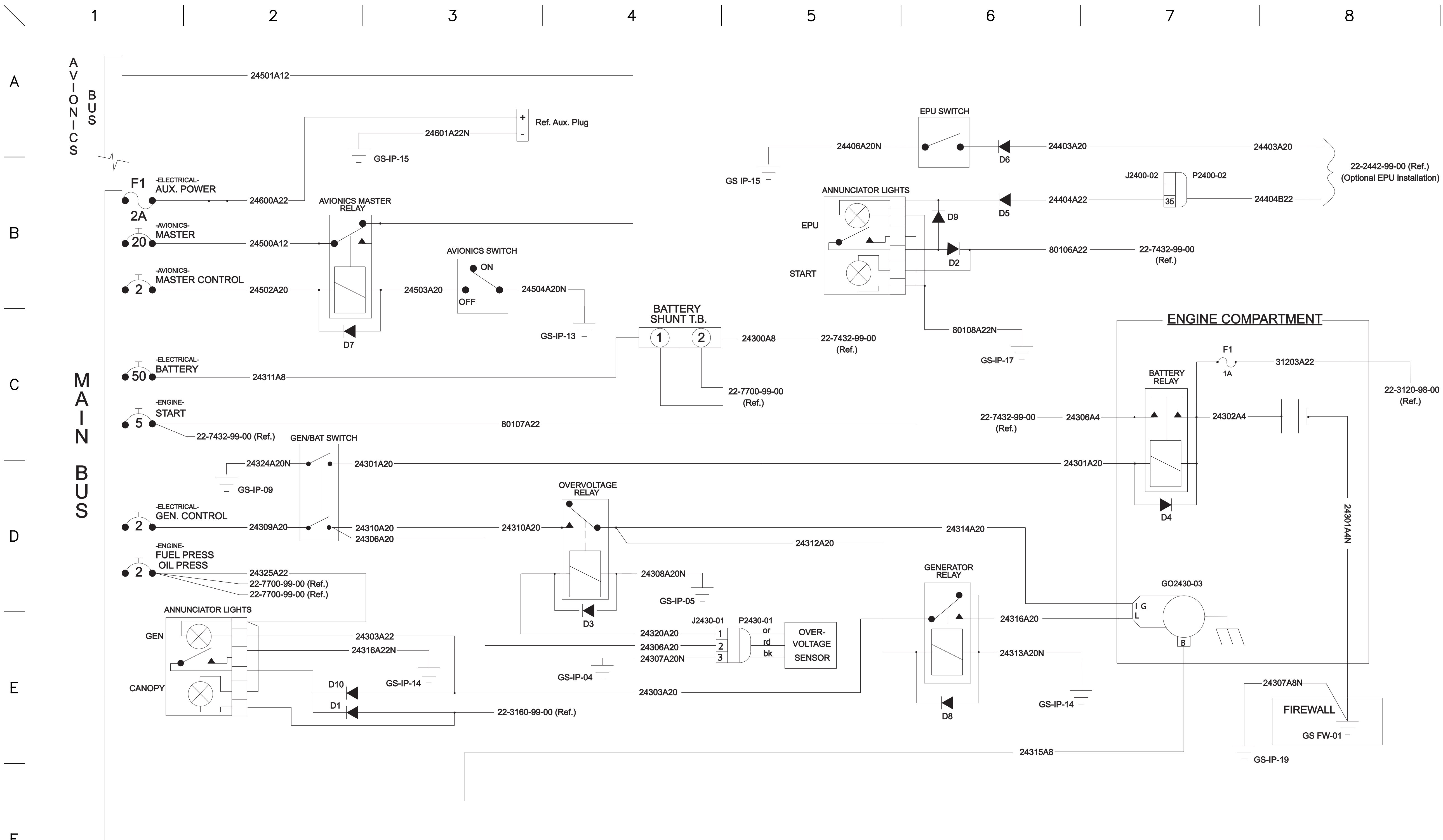


EFFECTIVITY C0001-CXXXX	REV A	BATTERY FORWARD, DC GENERATION AND DISTRIBUTION	SCHEMATIC 22-2400-98-00	PAGE 1/1



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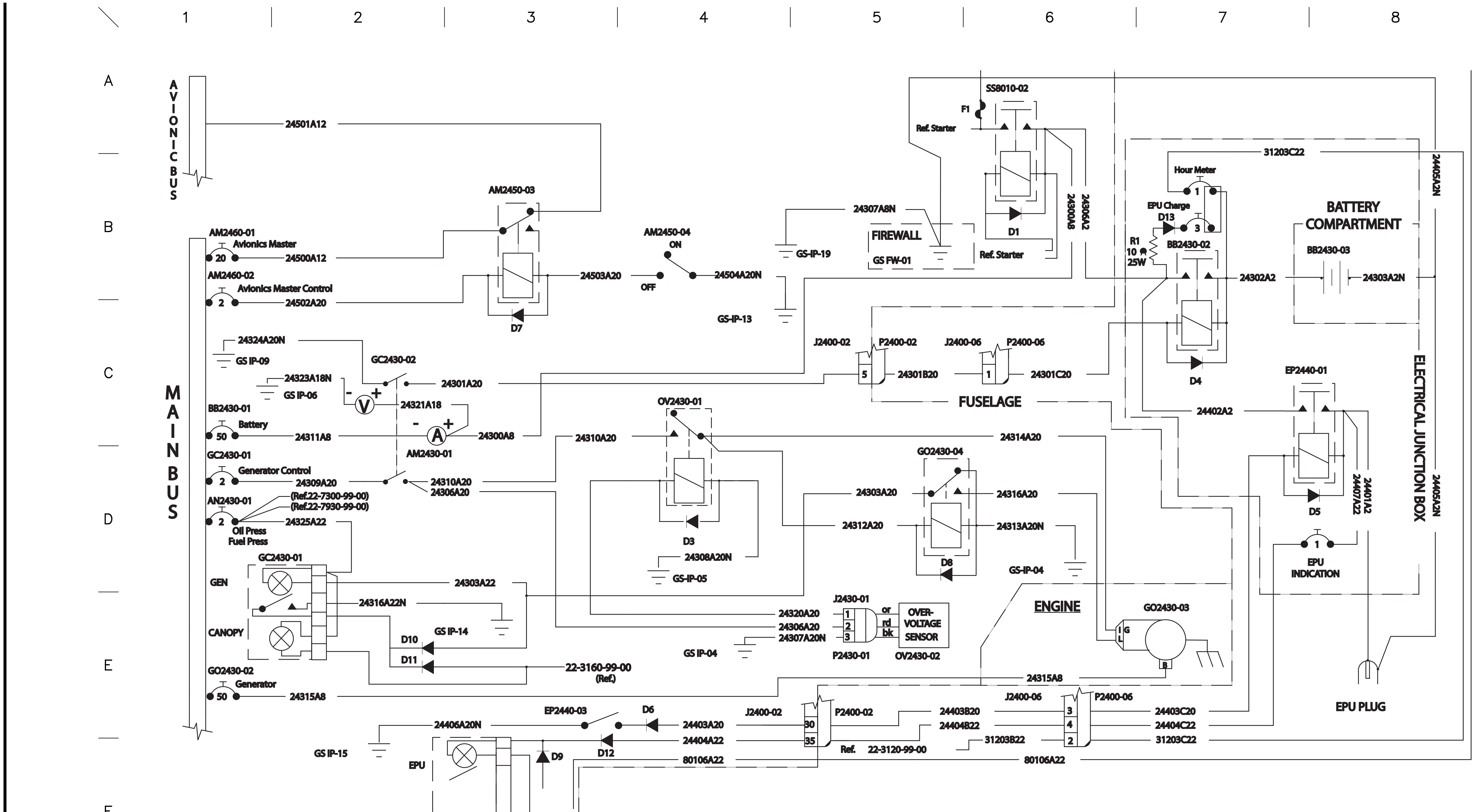
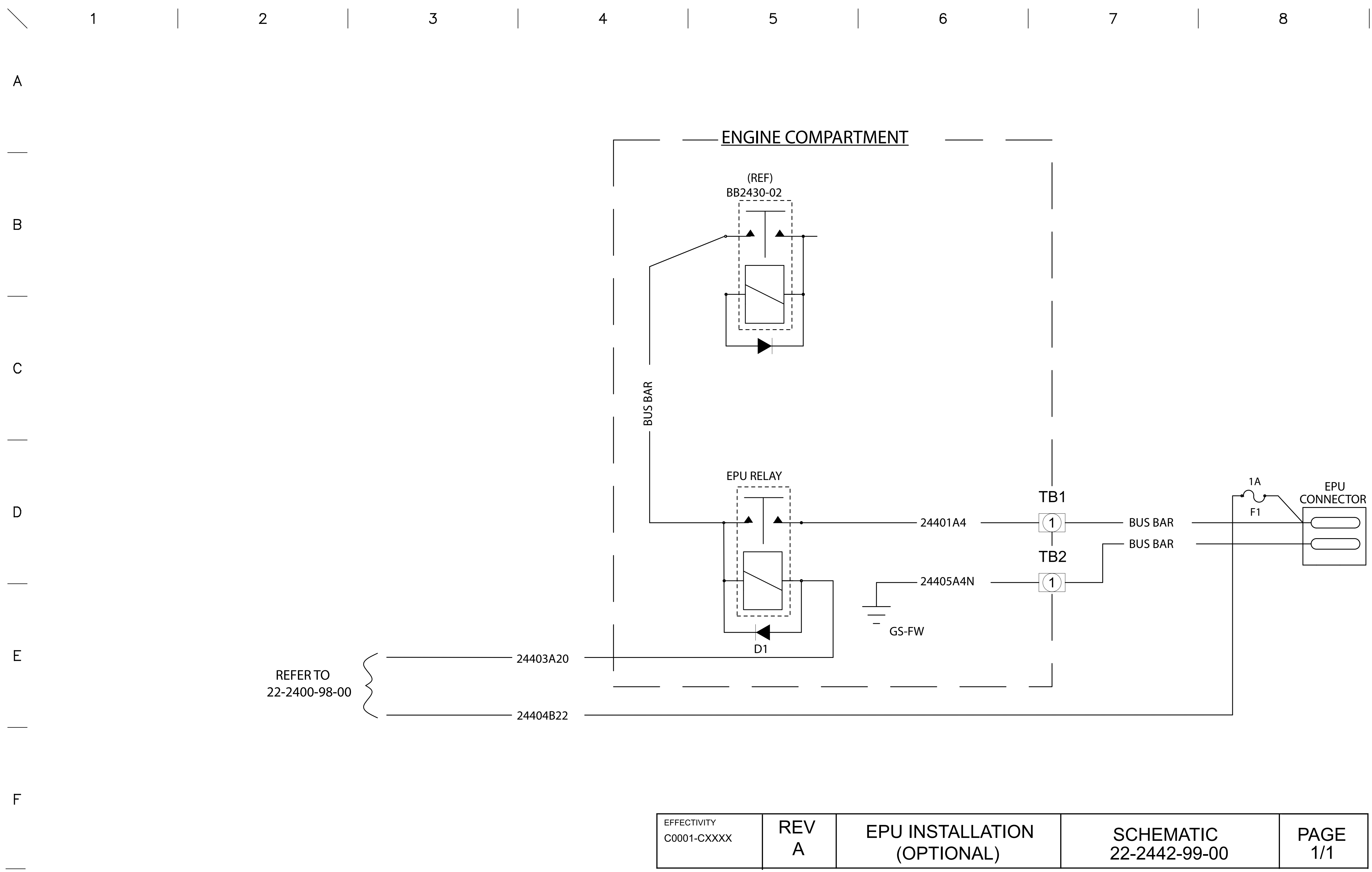
C0648-CXXXX	A	ELECTRICAL SYSTEM WIRE DIAGRAM, BATTERY FORWARD	SCHEMATIC 22-2400-97-00	PAGE 1/1



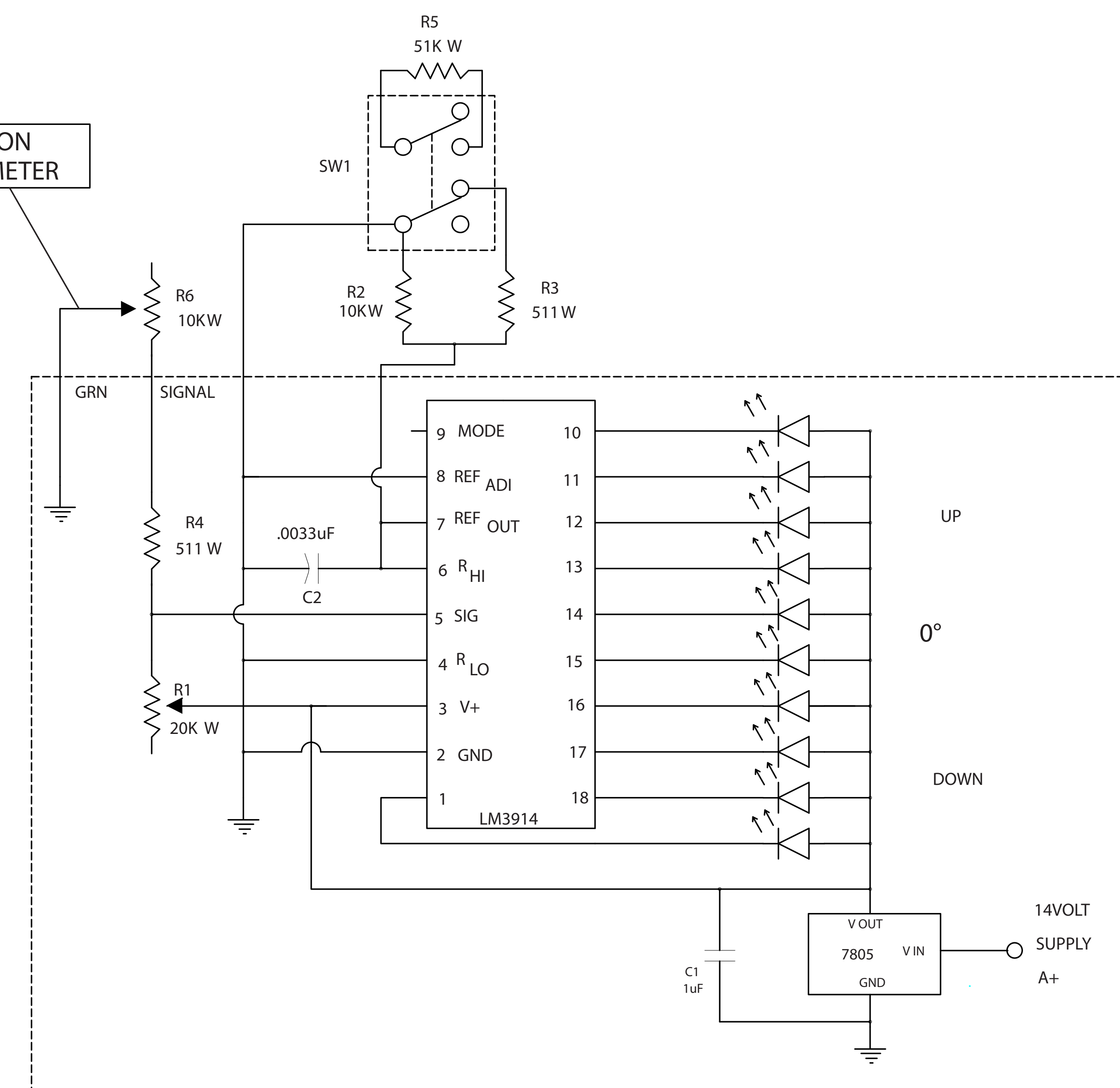
EFFECTIVITY C0001-CXXXX	REV A	ELECTRICAL SYSTEM WIRE DIAGRAM	SCHEMATIC 22-2400-99-00	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV A	EPU INSTALLATION (OPTIONAL)	SCHEMATIC 22-2442-99-00	PAGE 1/1

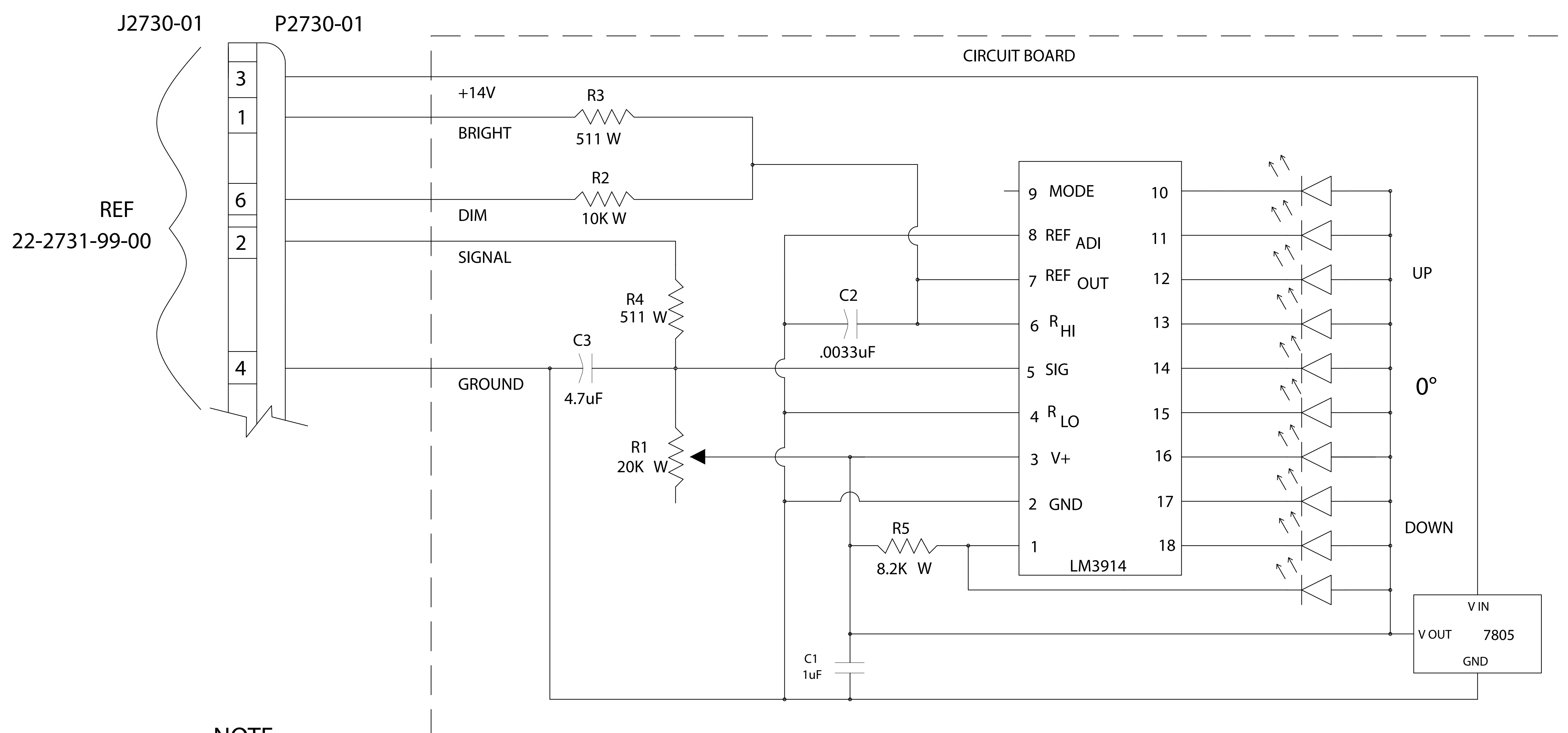
1 2 3 4 5 6 7 8

A B C D E F



NOTE: TO ACHIEVE CENTRE INDICATION ON THE LED DISPLAY, ADJUST R1 WHEN TRIM ACTUATOR IS CENTERED.

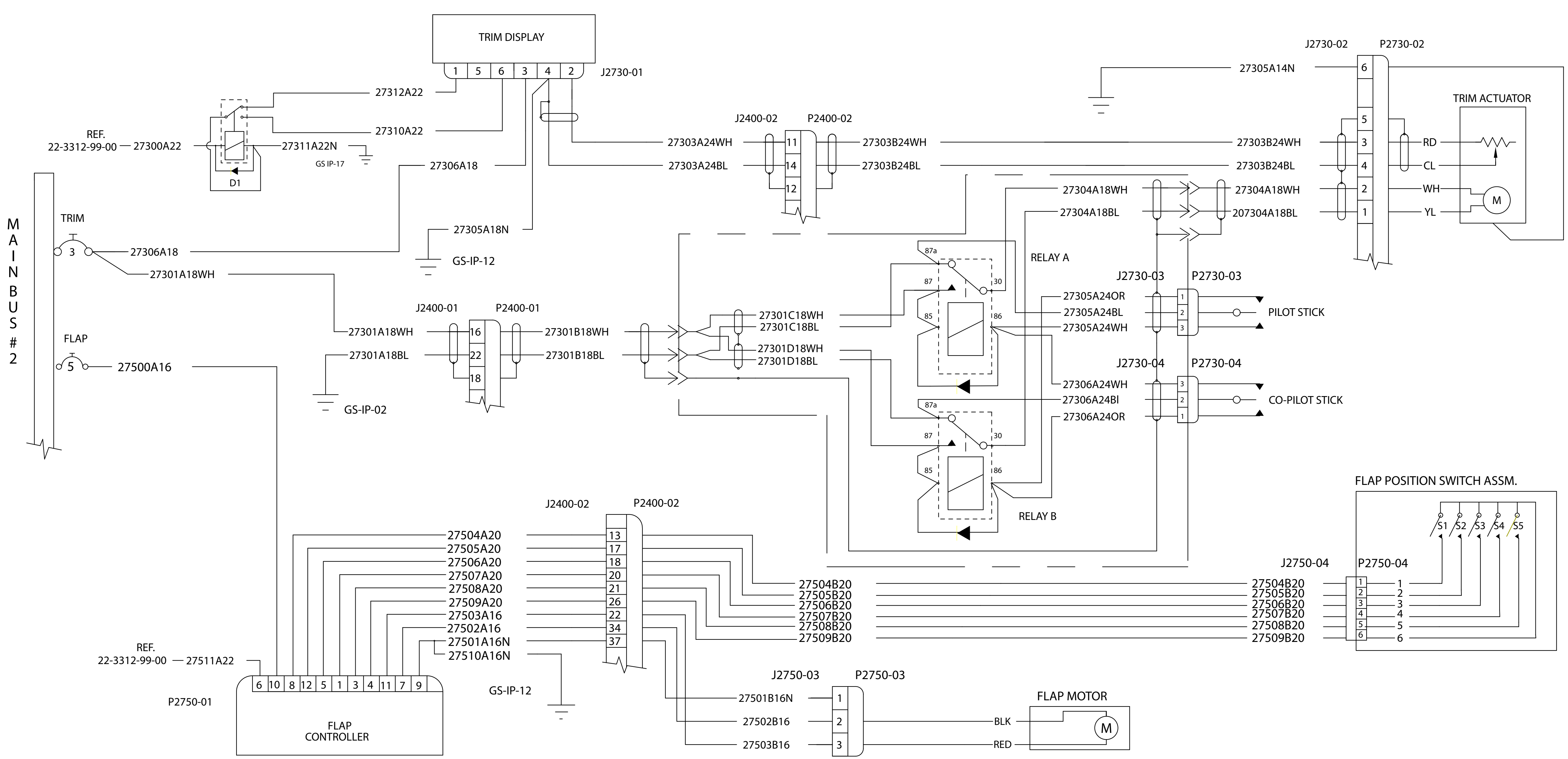
EFFECTIVITY	REV	TRIM DISPLAY	SCHEMATIC	PAGE
C0001-CXXXX	A		22-2720-10-00	1/1



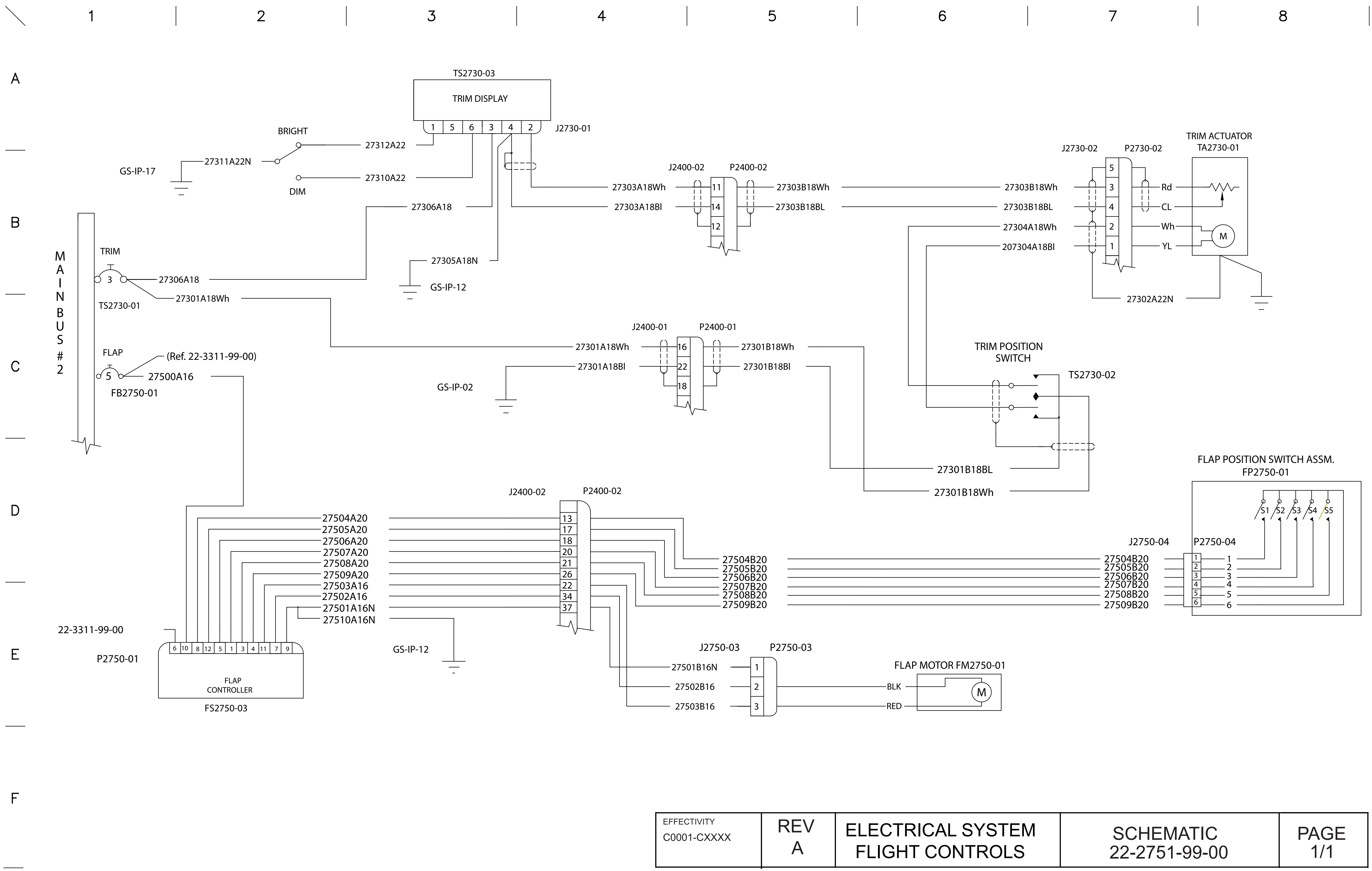
NOTE:

TO ACHIEVE CENTRE INDICATION ON THE LED DISPLAY, ADJUST R1 WHEN TRIM ACTUATOR IS CENTERED.

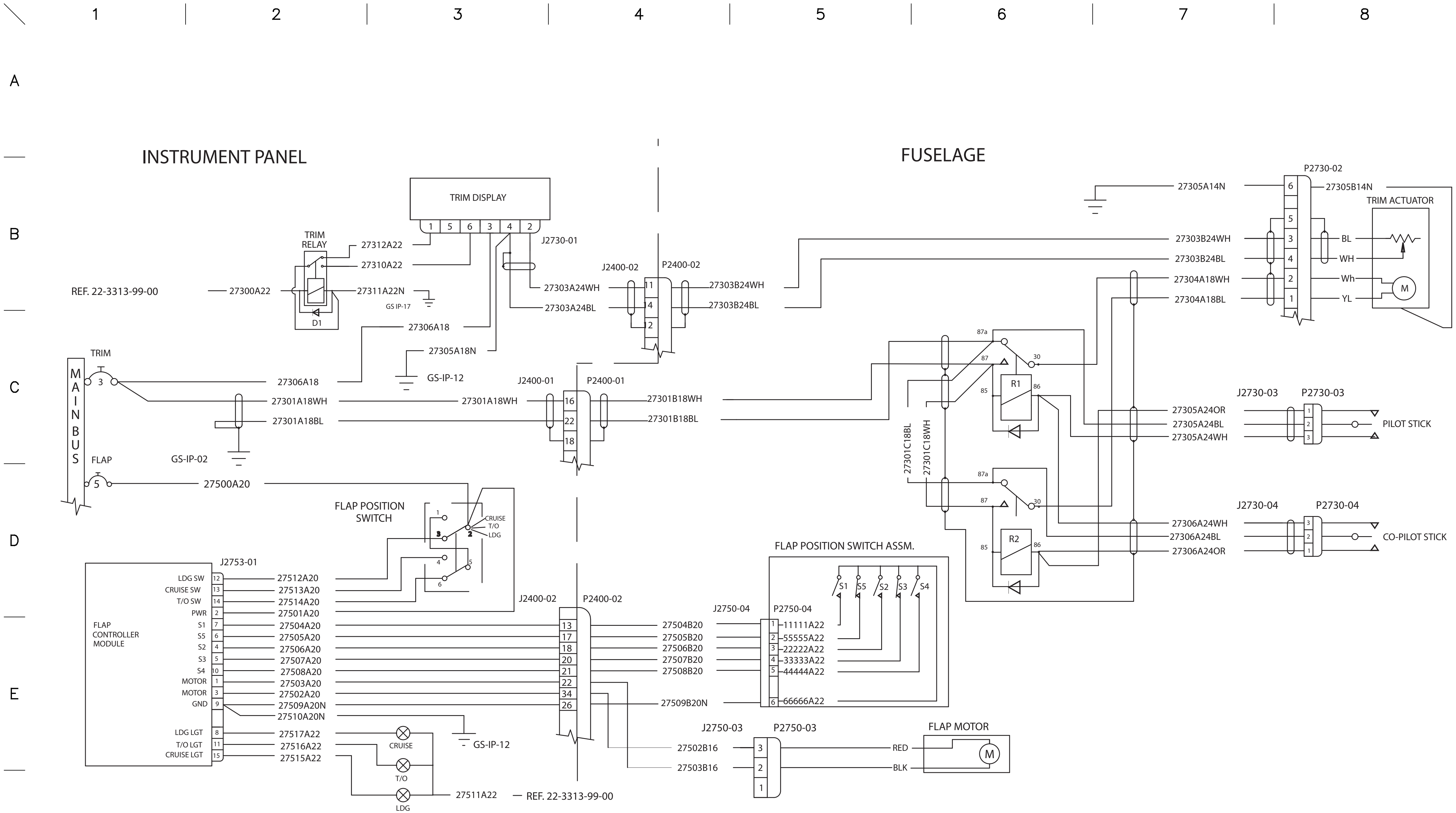
EFFECTIVITY C0001-CXXXX	REV A	TRIM, CIRCUIT BOARD	SCHEMATIC 22-2720-99-00	PAGE 1/1



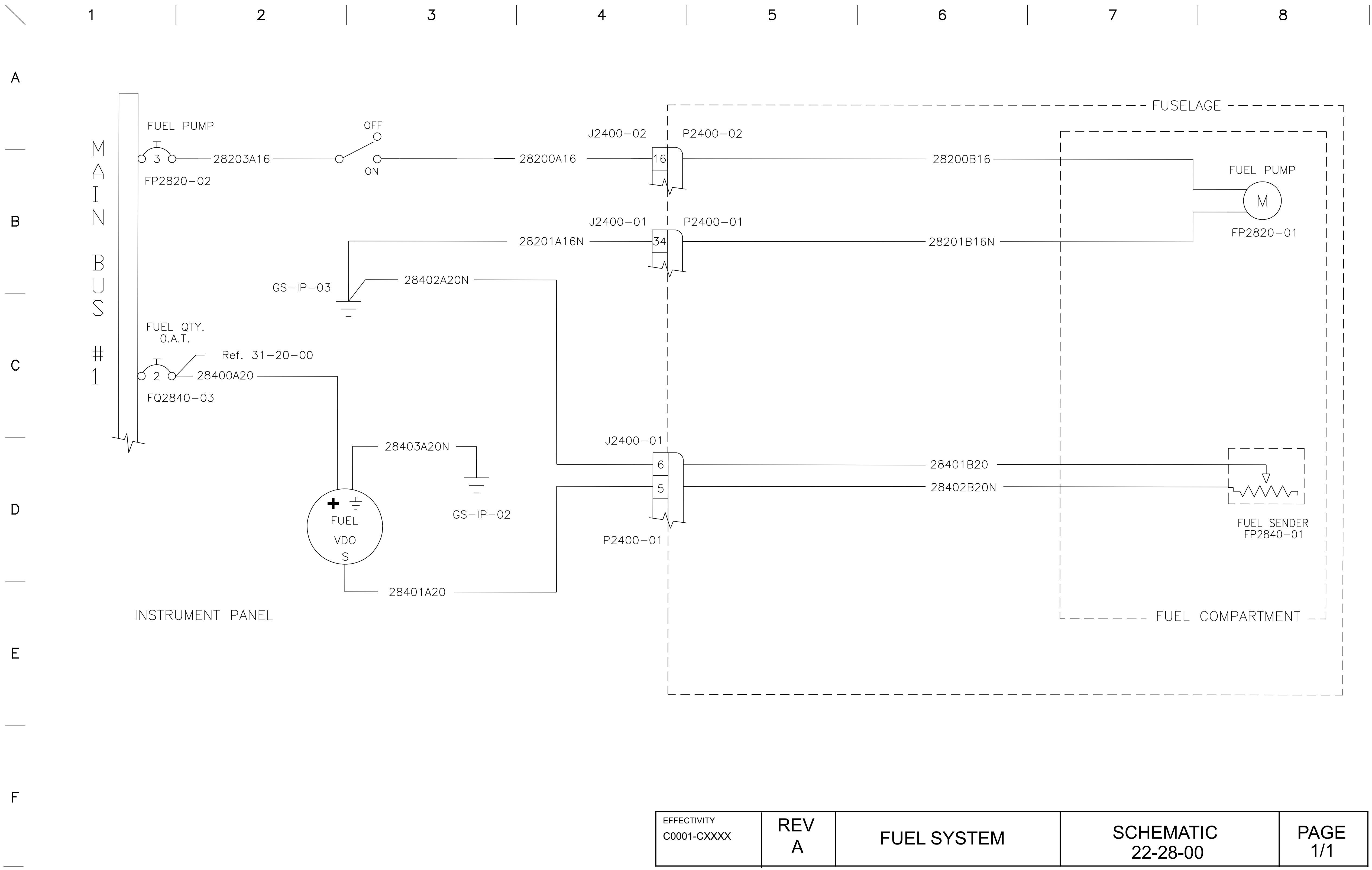
EFFECTIVITY	REV	ELECTRICAL SYSTEM	SCHEMATIC	PAGE
C0001-CXXXX	A	FLIGHT CONTROLS	22-2732-99-00	1/1



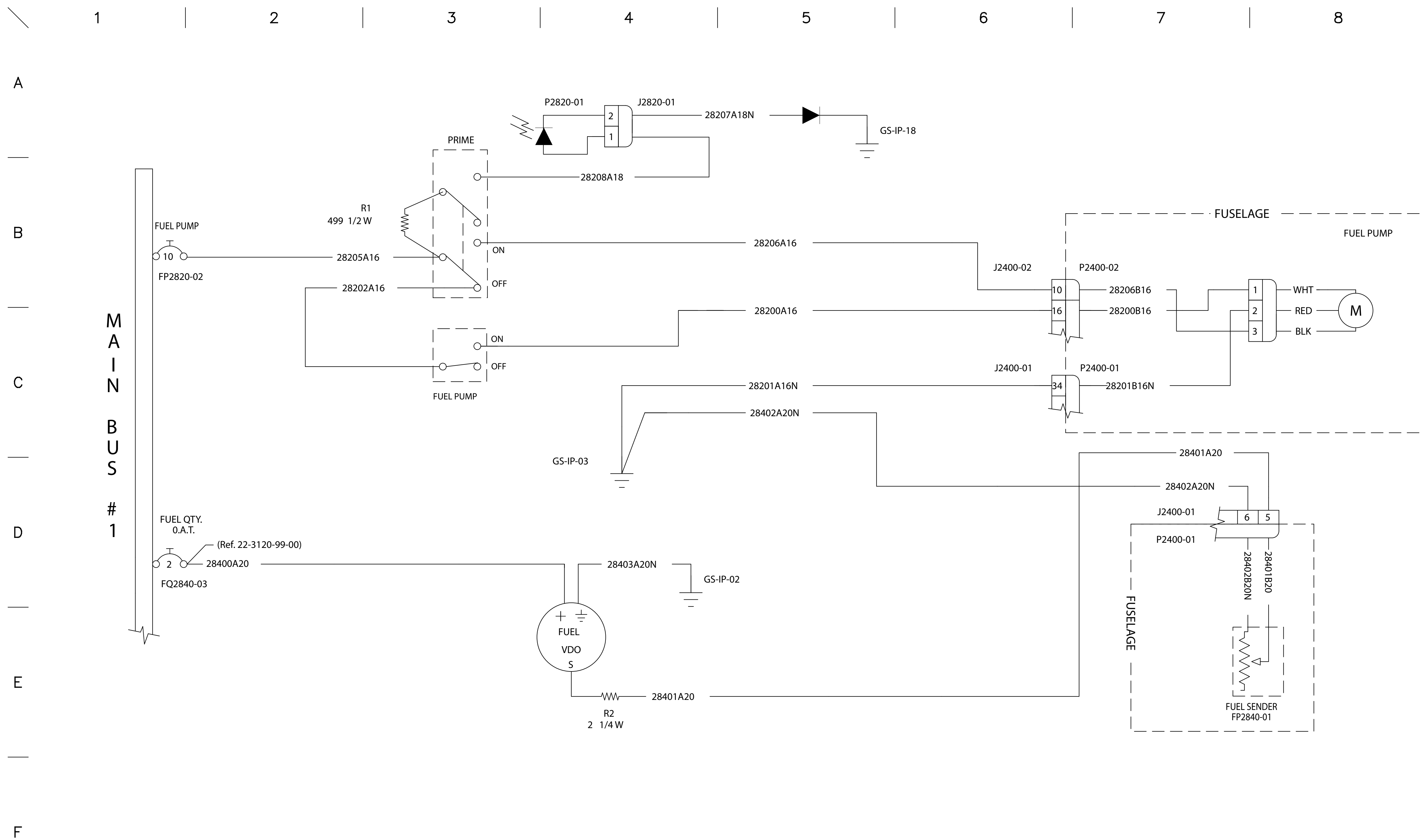
EFFECTIVITY C0001-CXXXX	REV A	ELECTRICAL SYSTEM FLIGHT CONTROLS	SCHEMATIC 22-2751-99-00	PAGE 1/1



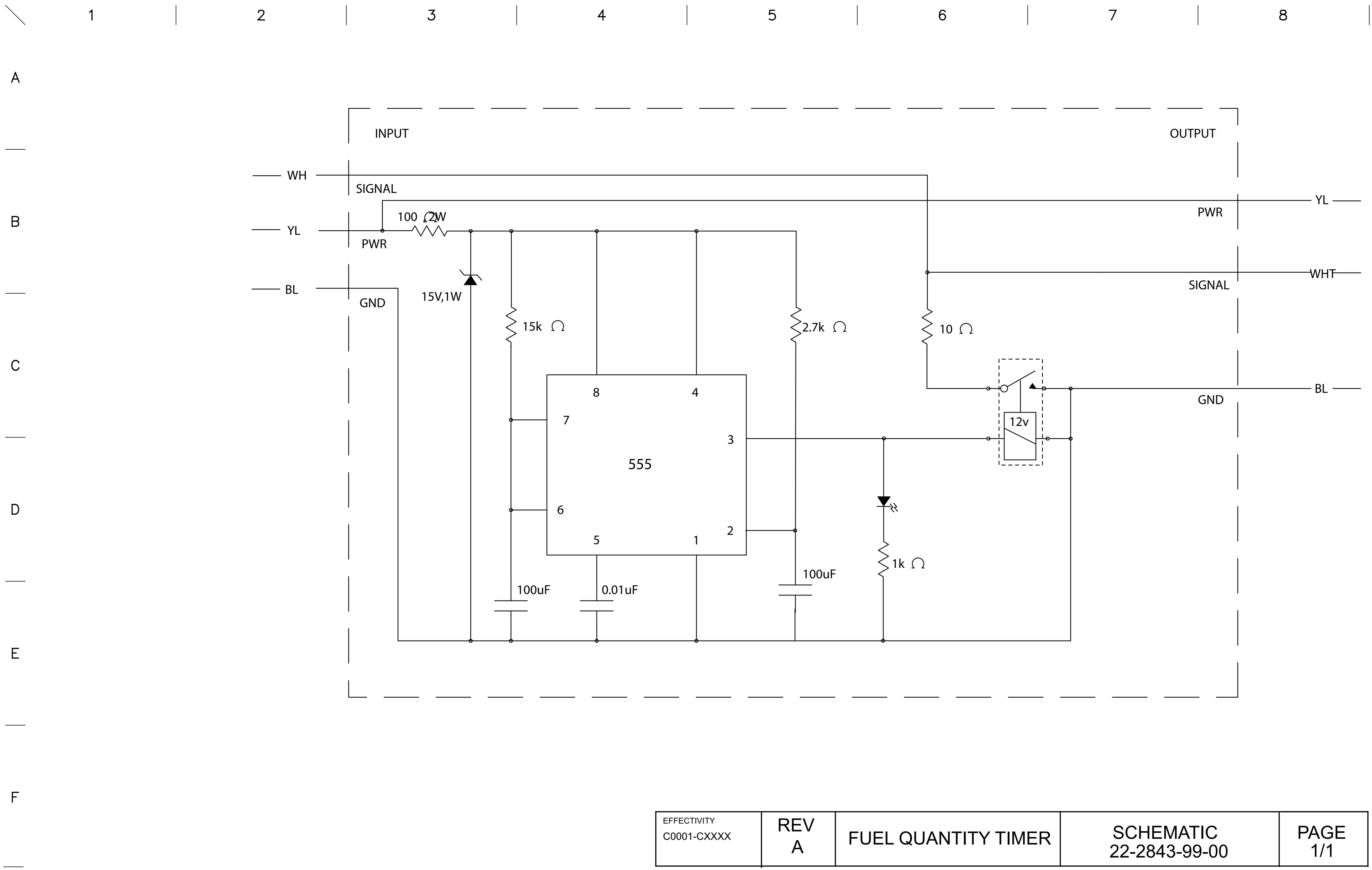
EFFECTIVITY C0648-CXXXX	REV A	SCHEMATIC FLAP/TRIM	SCHEMATIC 22-2752-99-00	PAGE 1/1



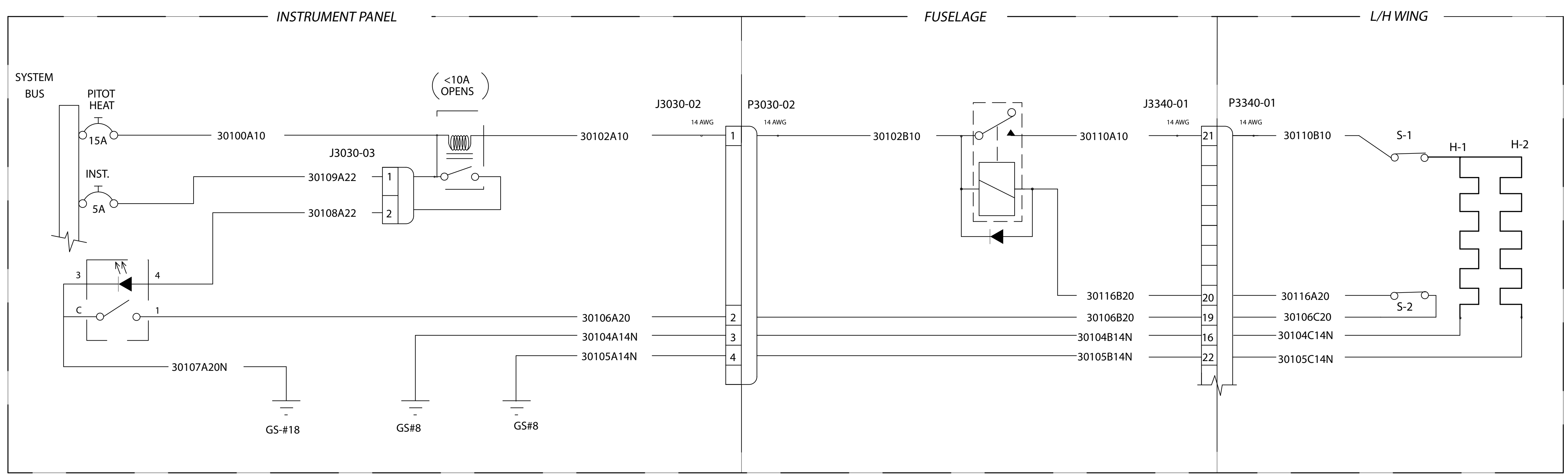
EFFECTIVITY C0001-CXXXX	REV A	FUEL SYSTEM	SCHEMATIC 22-28-00	PAGE 1/1



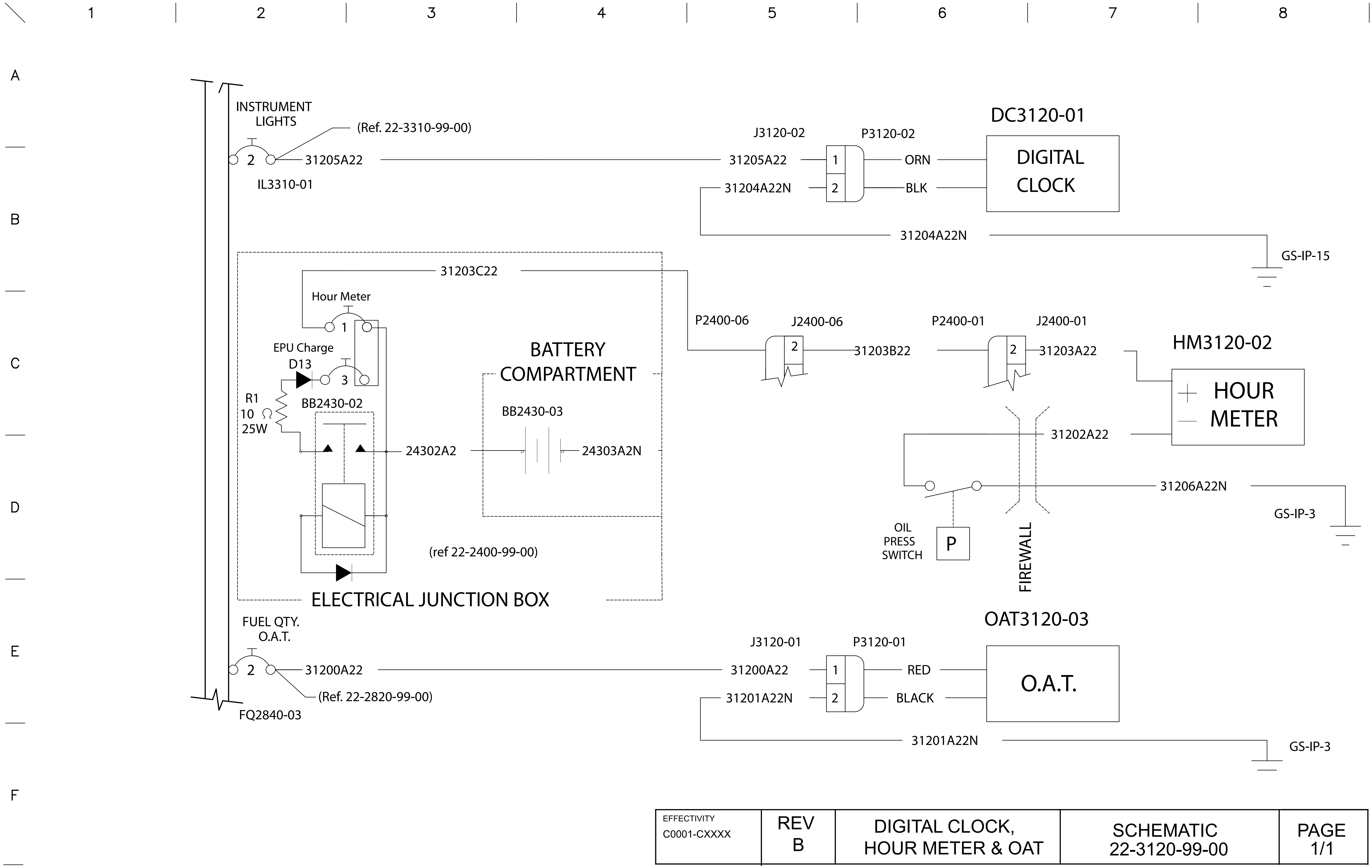
EFFECTIVITY C0001-CXXXX	REV E	2-SPEED ELECTRIC FUEL PUMP	SCHEMATIC 22-2820-99-00	PAGE 1/1



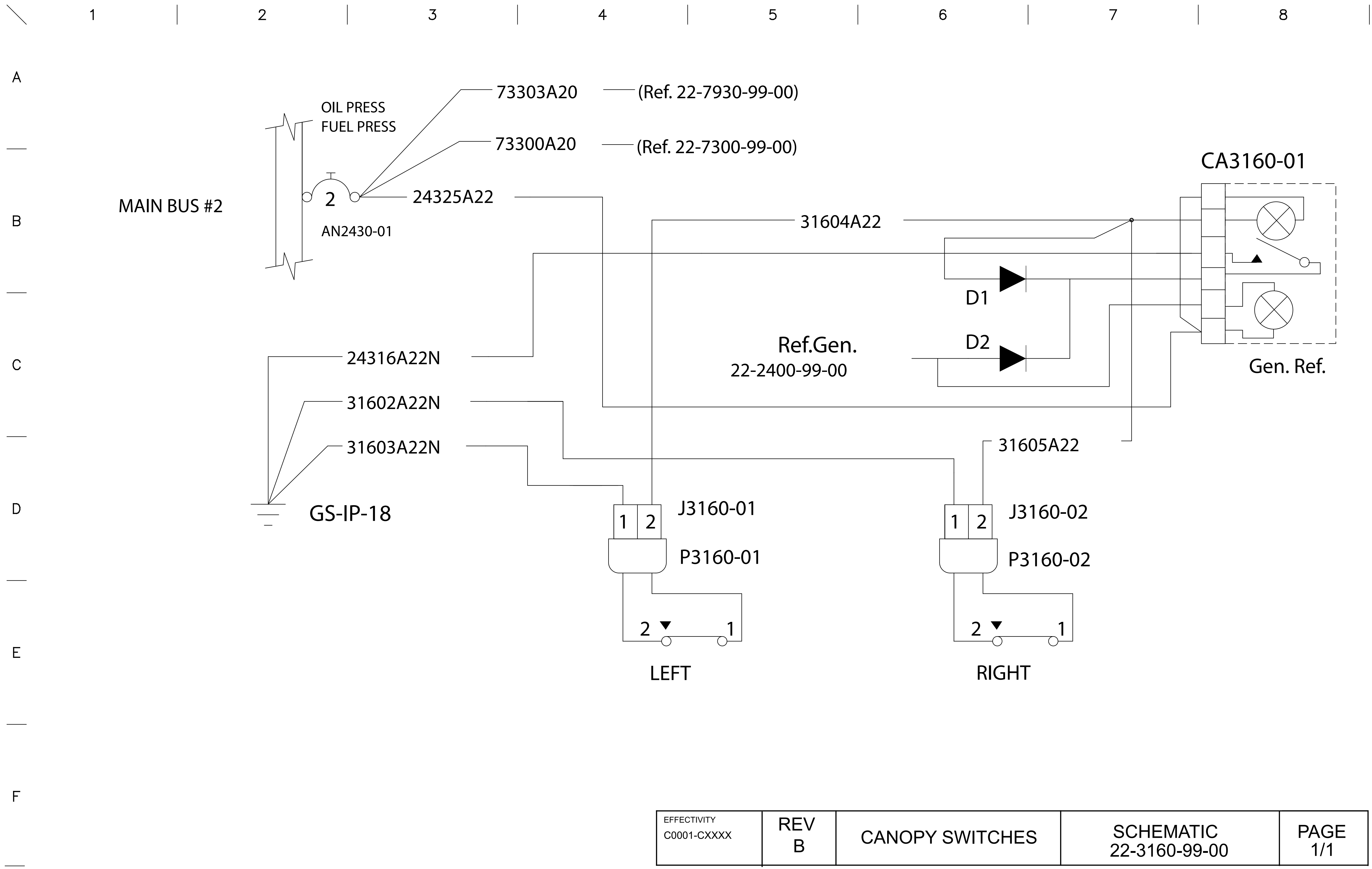
EFFECTIVITY C0001-CXXXX	REV A	FUEL QUANTITY TIMER	SCHEMATIC 22-2843-99-00	PAGE 1/1



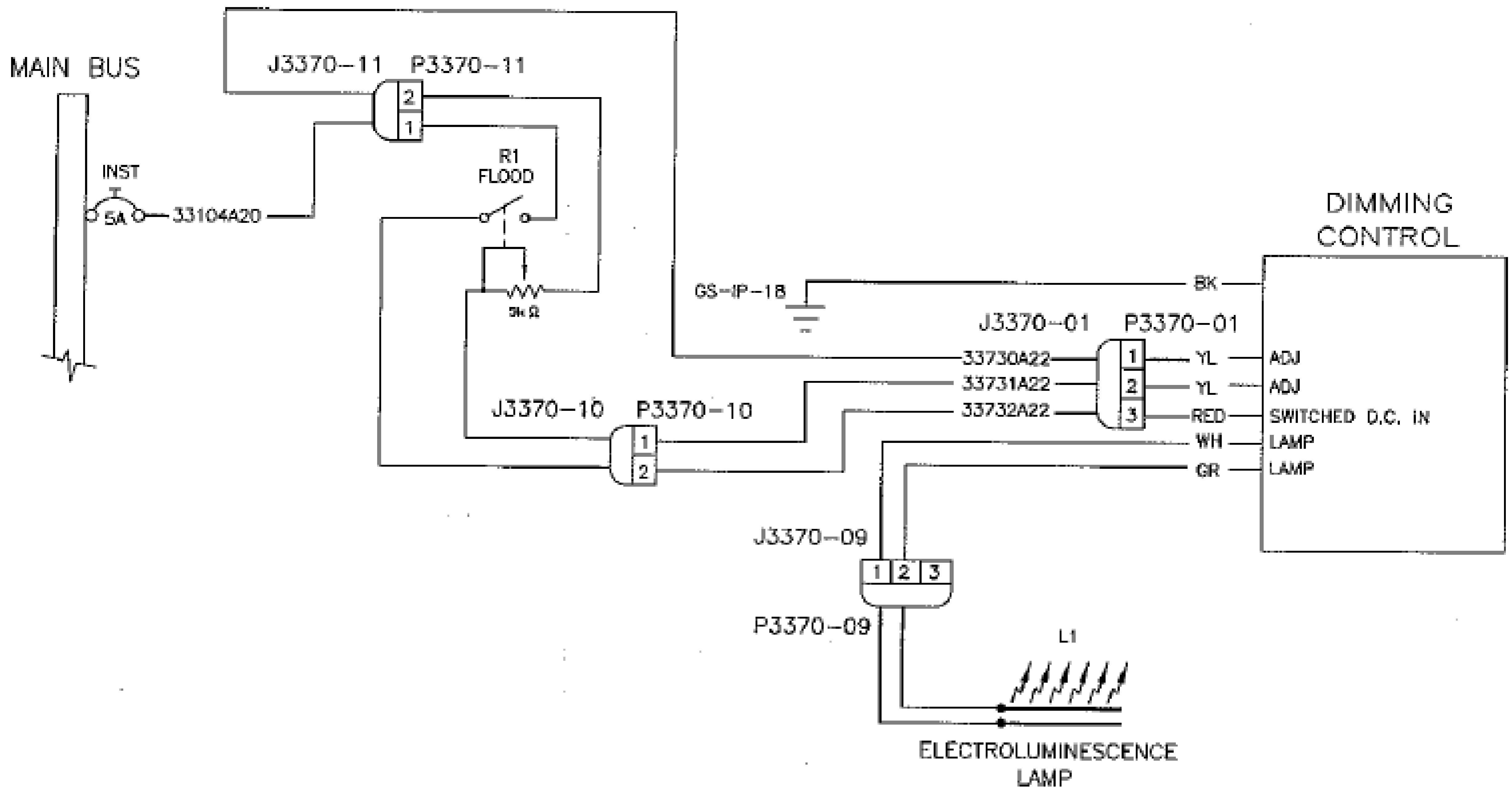
EFFECTIVITY C0001-CXXXX	REV B	HEATER, PITOT STATIC	SCHEMATIC 22-3030-99-00	PAGE 1/1



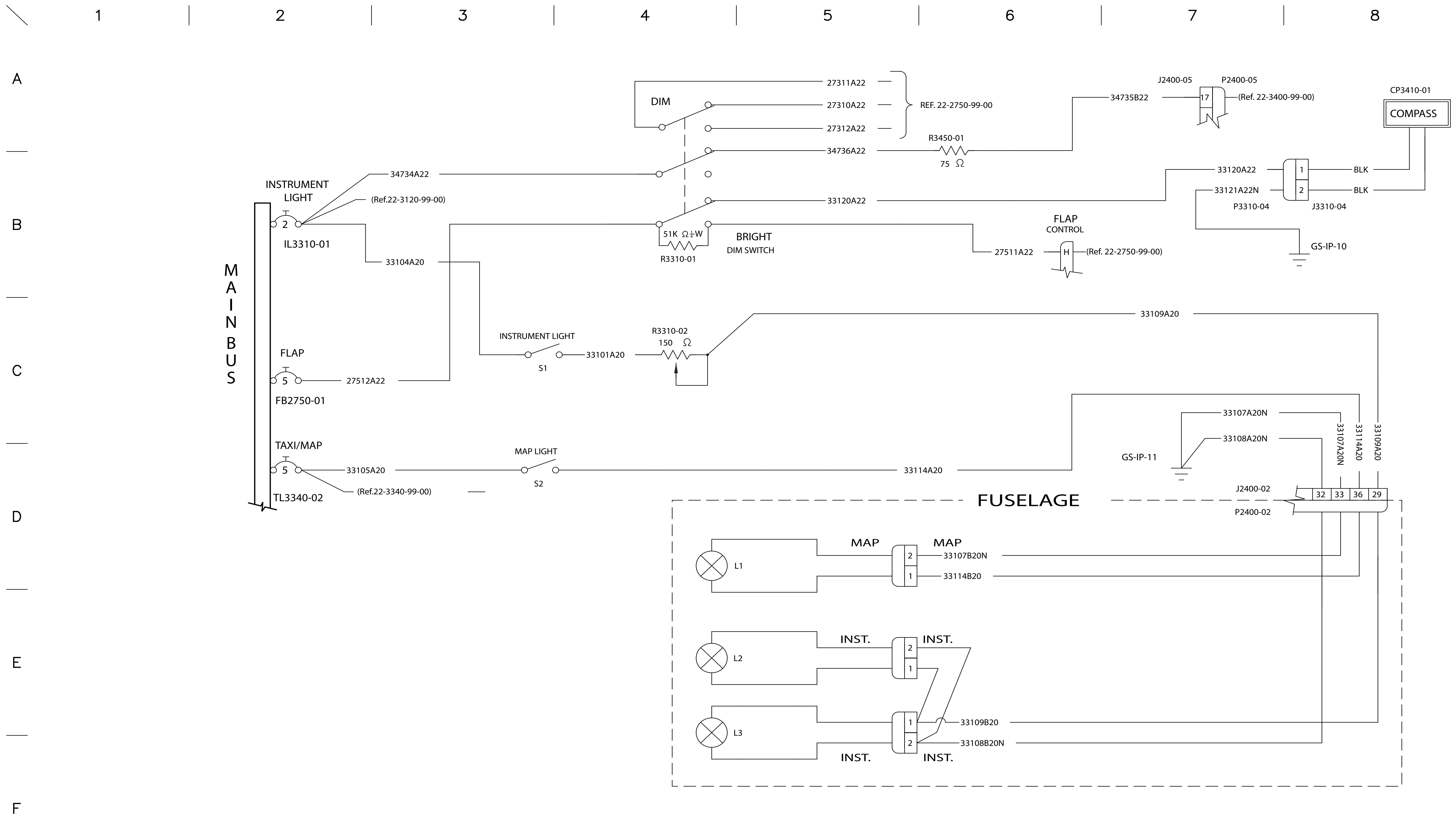
EFFECTIVITY C0001-CXXXX	REV B	DIGITAL CLOCK, HOUR METER & OAT	SCHEMATIC 22-3120-99-00	PAGE 1/1



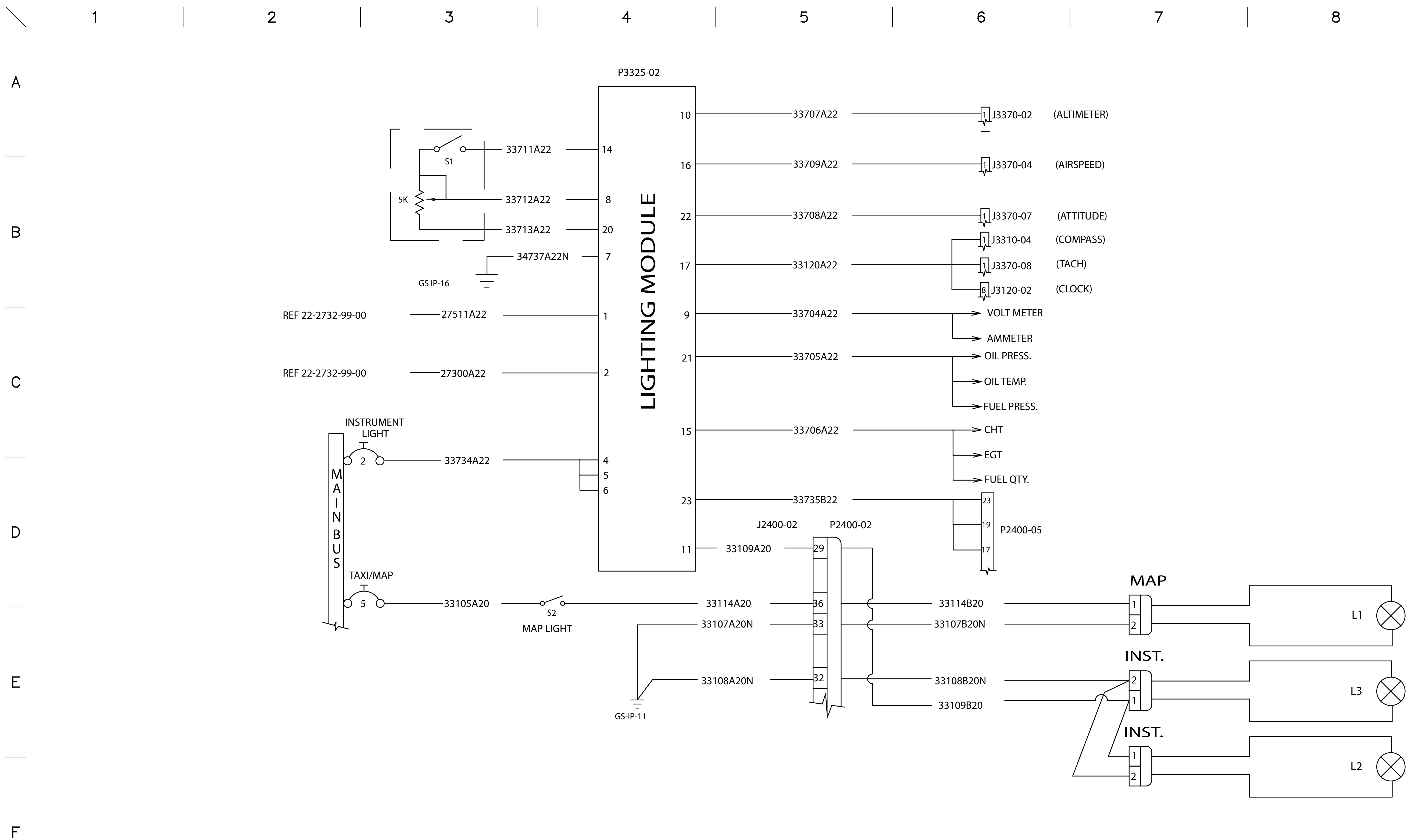
EFFECTIVITY C0001-CXXXX	REV B	CANOPY SWITCHES	SCHEMATIC 22-3160-99-00	PAGE 1/1



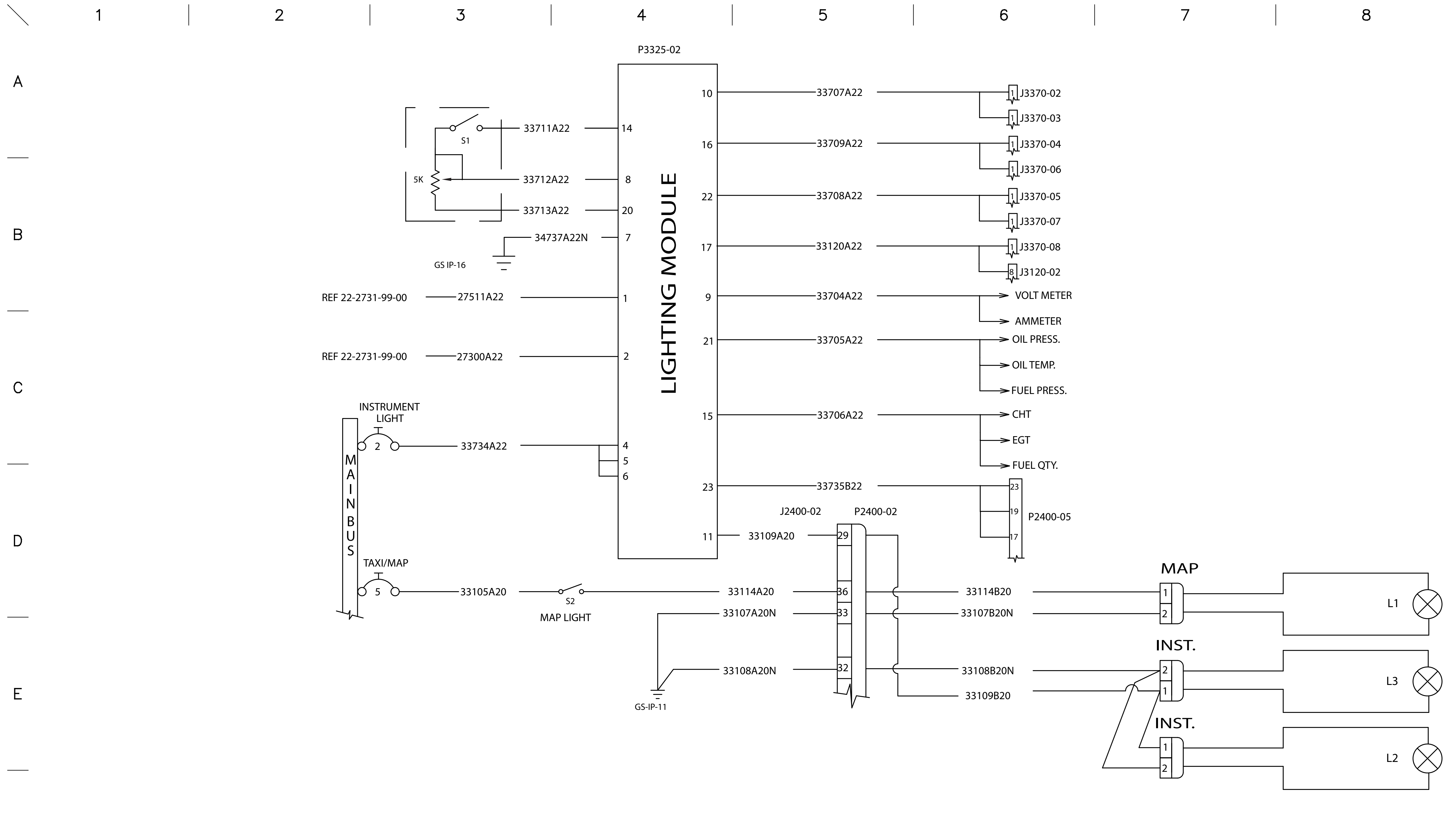
EFFECTIVITY C0001-CXXXX	REV A1	FLOOD LIGHT	SCHEMATIC 22-3310-97-00	PAGE 1/1



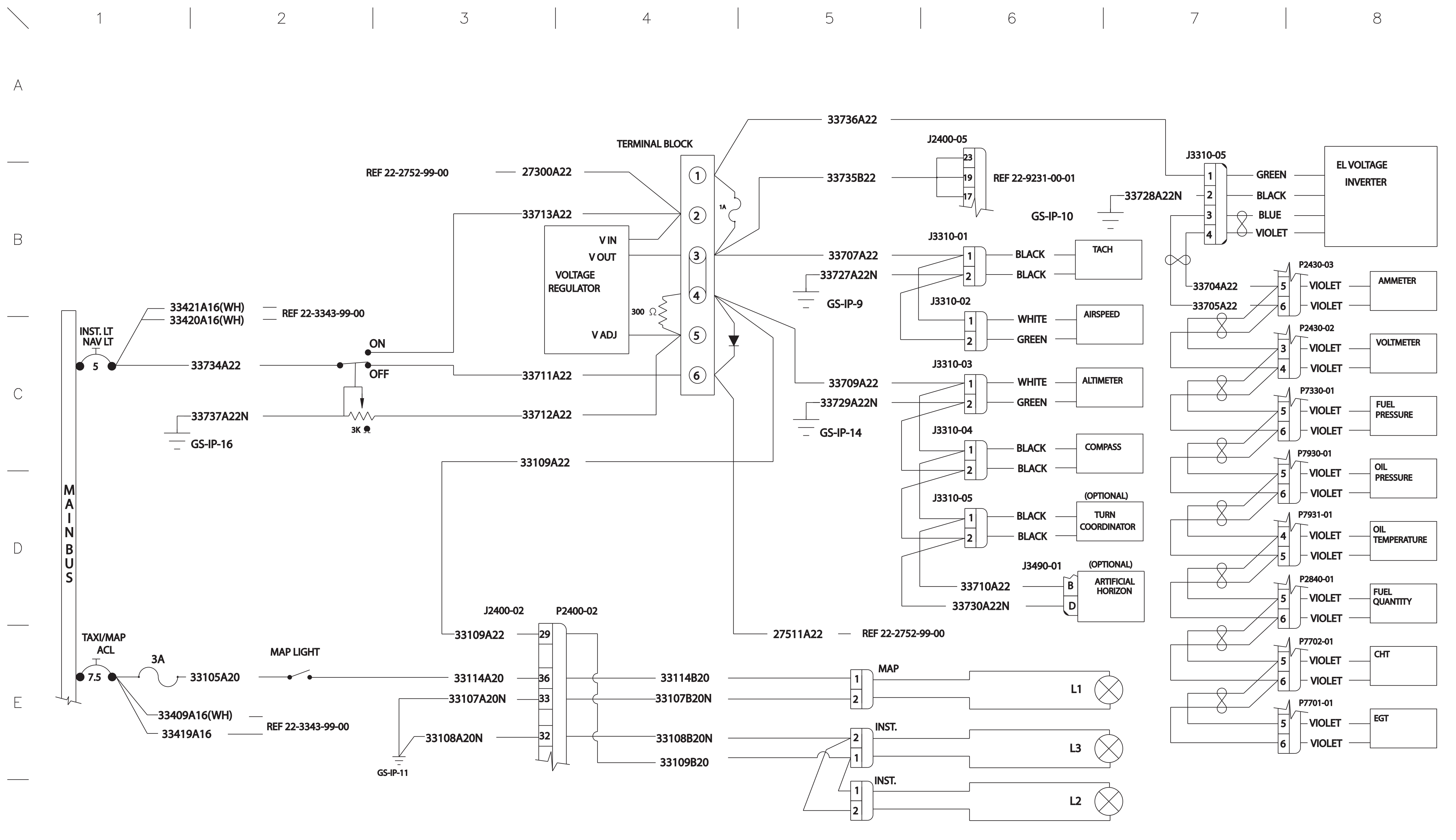
EFFECTIVITY C0001-C0501	REV B	INTERNAL LIGHTING	SCHEMATIC 22-3310-99-00	PAGE 1/1



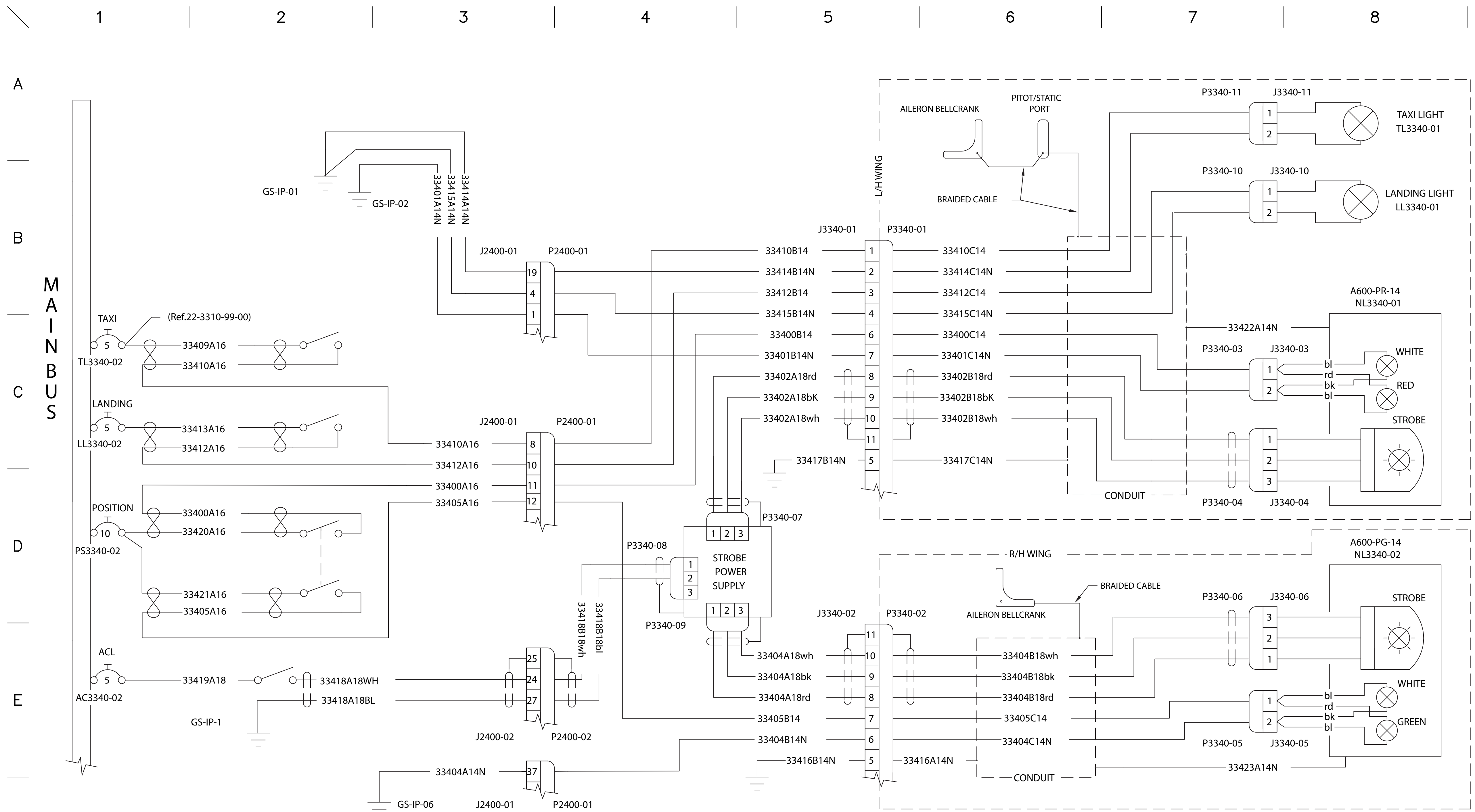
EFFECTIVITY C0528 - C0XXX With ASPEN	REV A	INTERNAL LIGHTING (ASPEN Installed)	SCHEMATIC 22-3312-98-00	PAGE 1/1



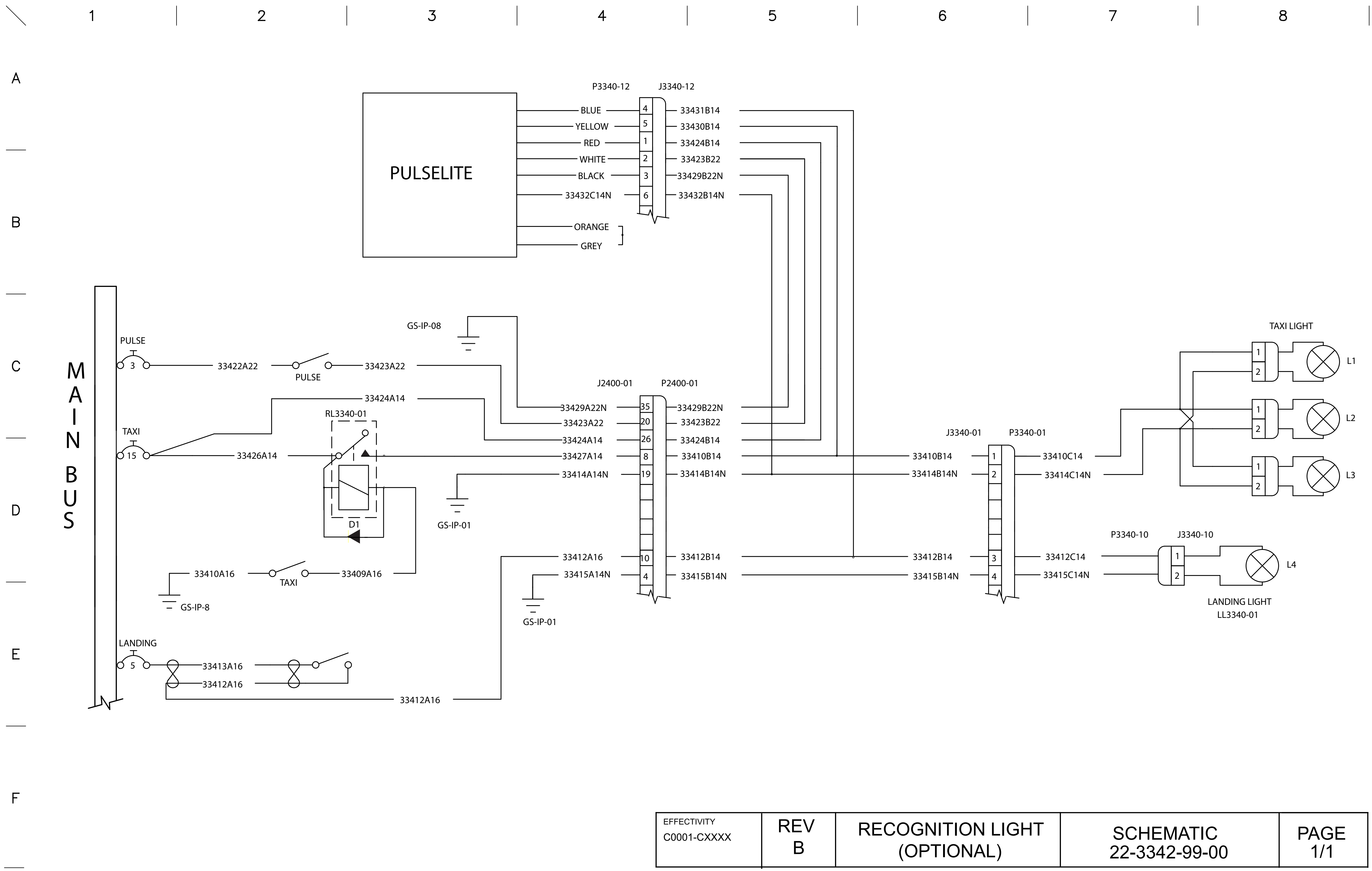
EFFECTIVITY C0502-CXXXX	REV A	INTERNAL LIGHTING	SCHEMATIC 22-3312-99-00	PAGE 1/1



EFFECTIVITY C0648-CXXXX	REV A	SCHEMATIC DIMMING AND REGUALTOR PLACARDS, UMA INTRUMENTS	SCHEMATIC 22-3313-99-00	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV B	EXTERNAL LIGHTING	SCHEMATIC 22-3340-99-00	PAGE 1/1



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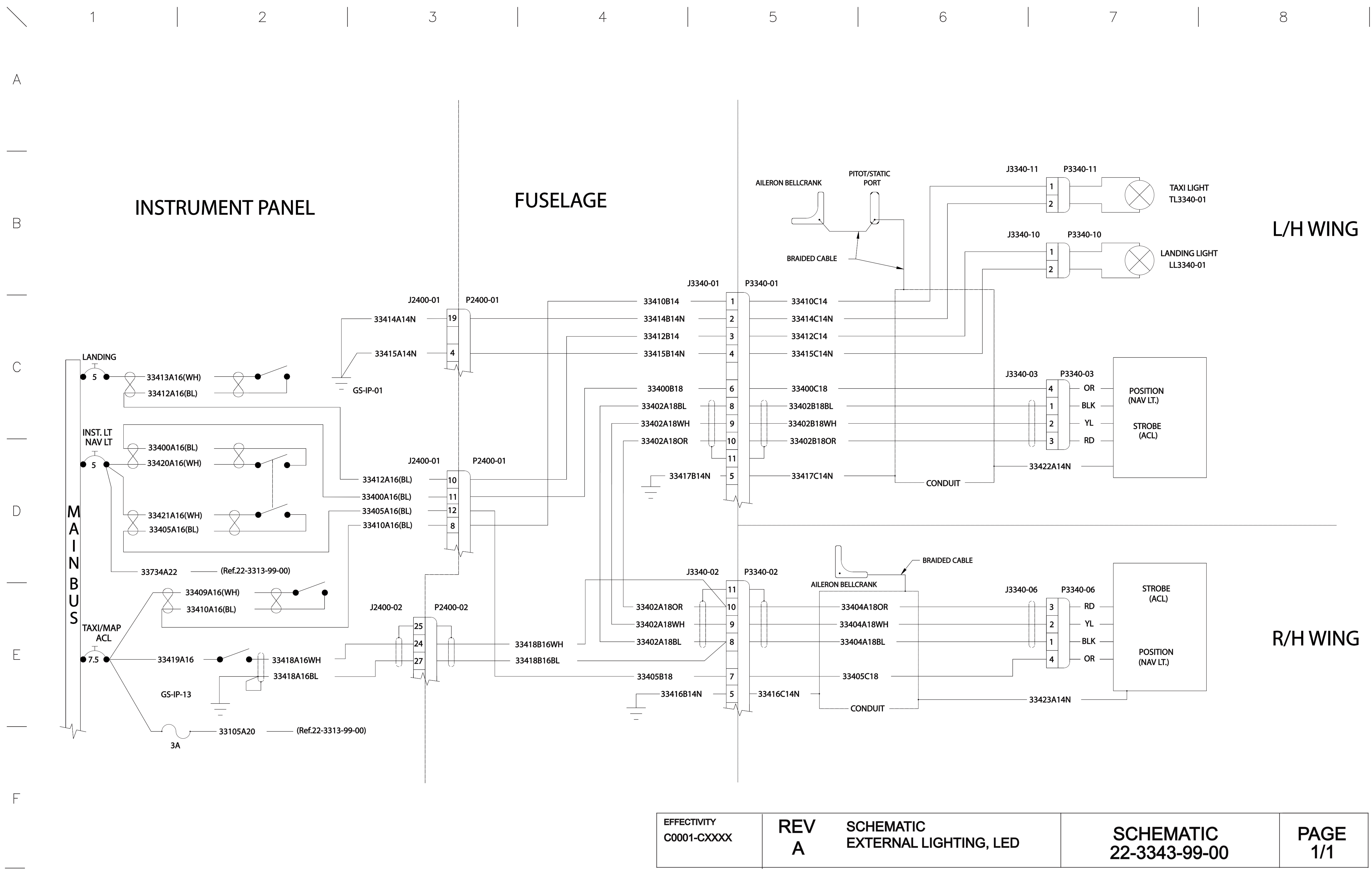
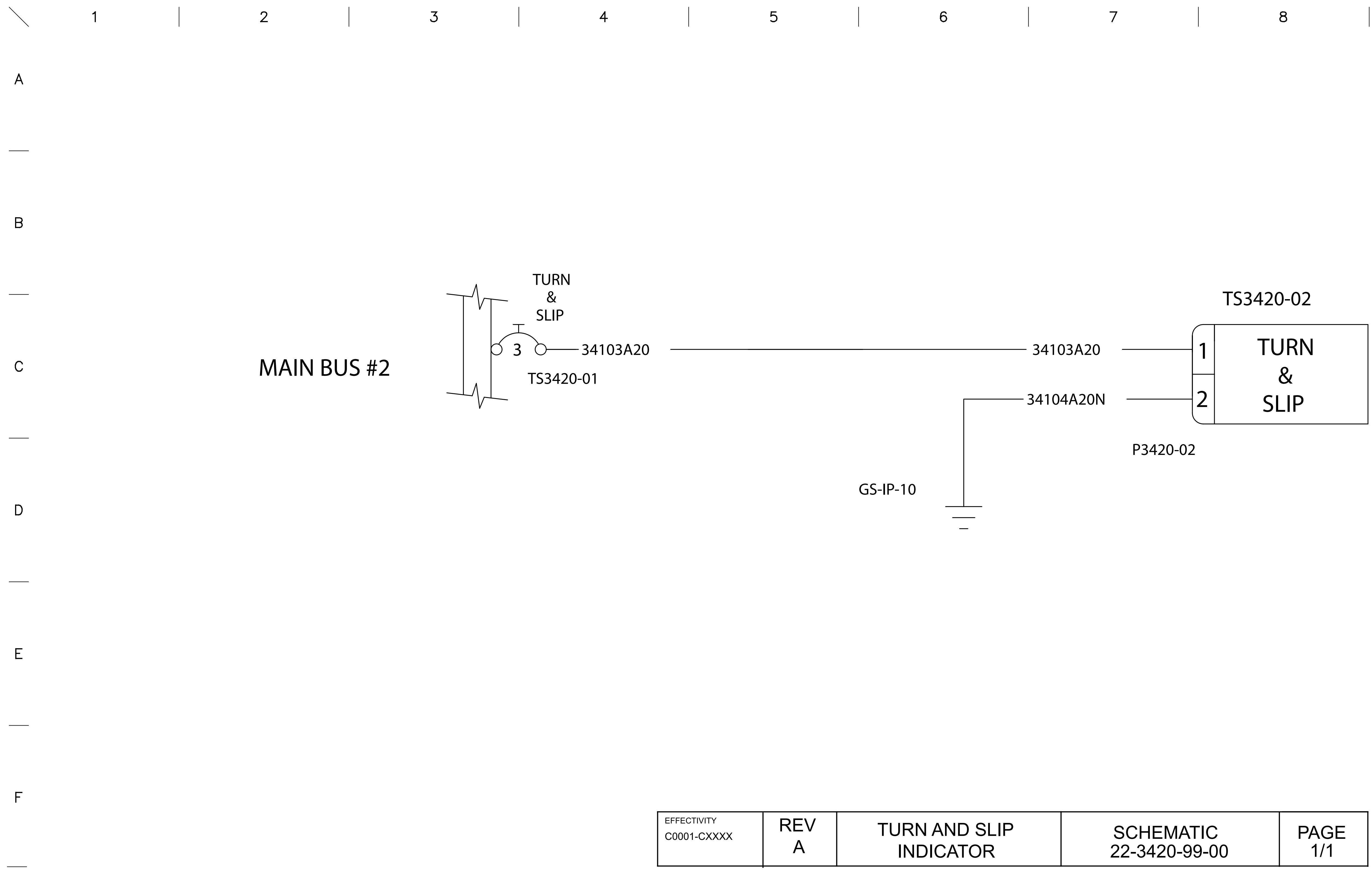
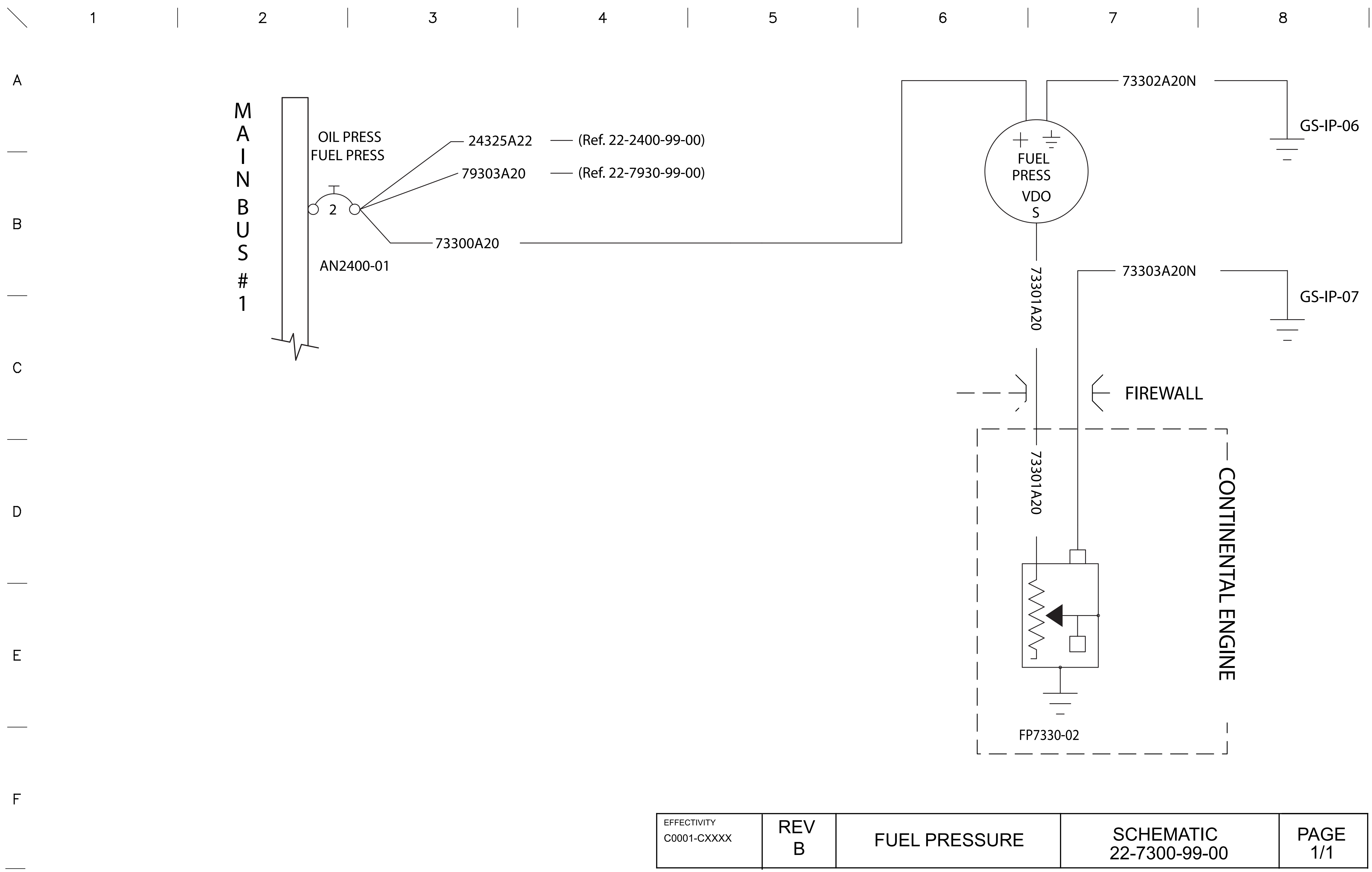


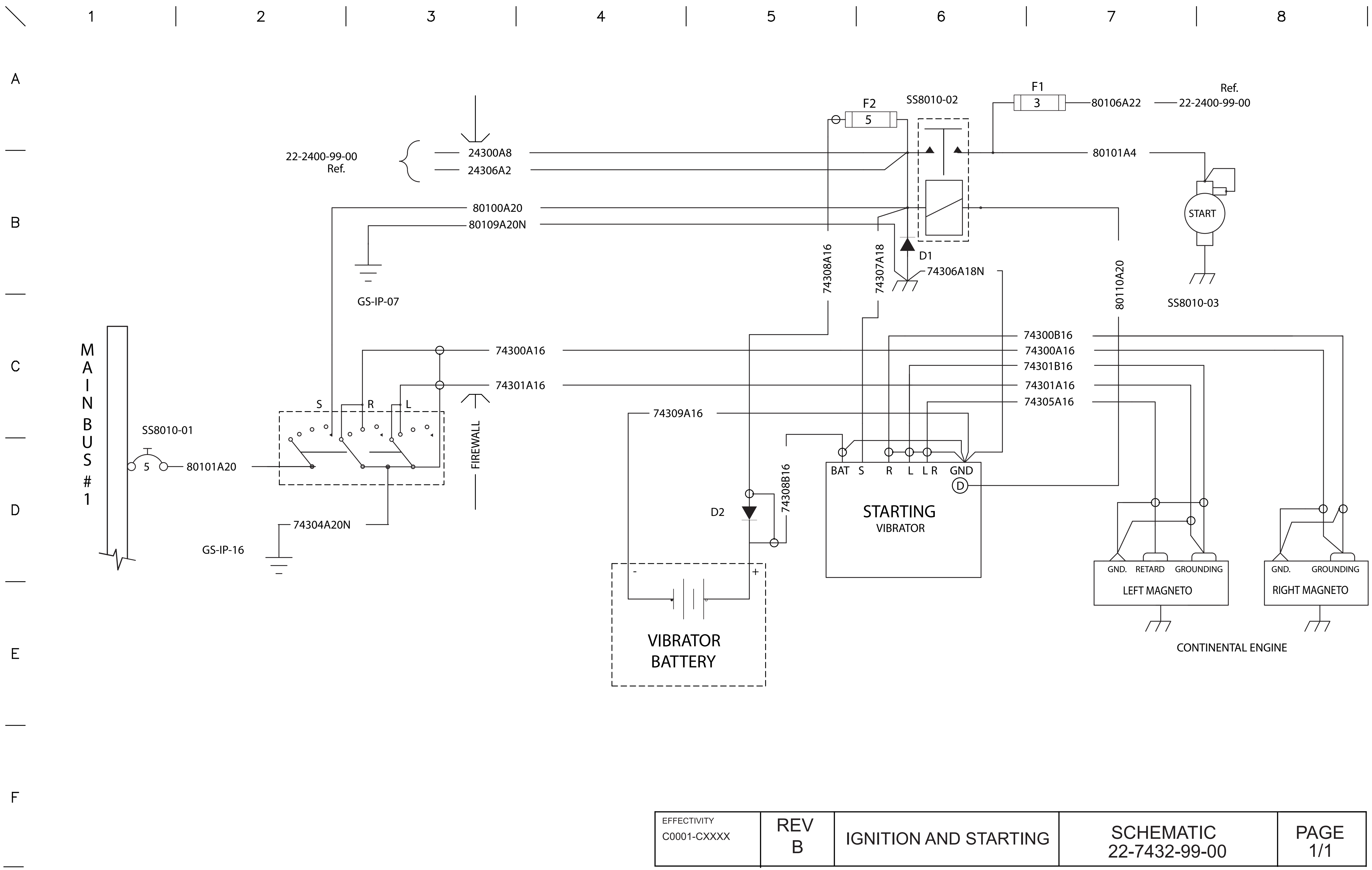
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC EXTERNAL LIGHTING, LED	SCHEMATIC 22-3343-99-00	PAGE 1/1



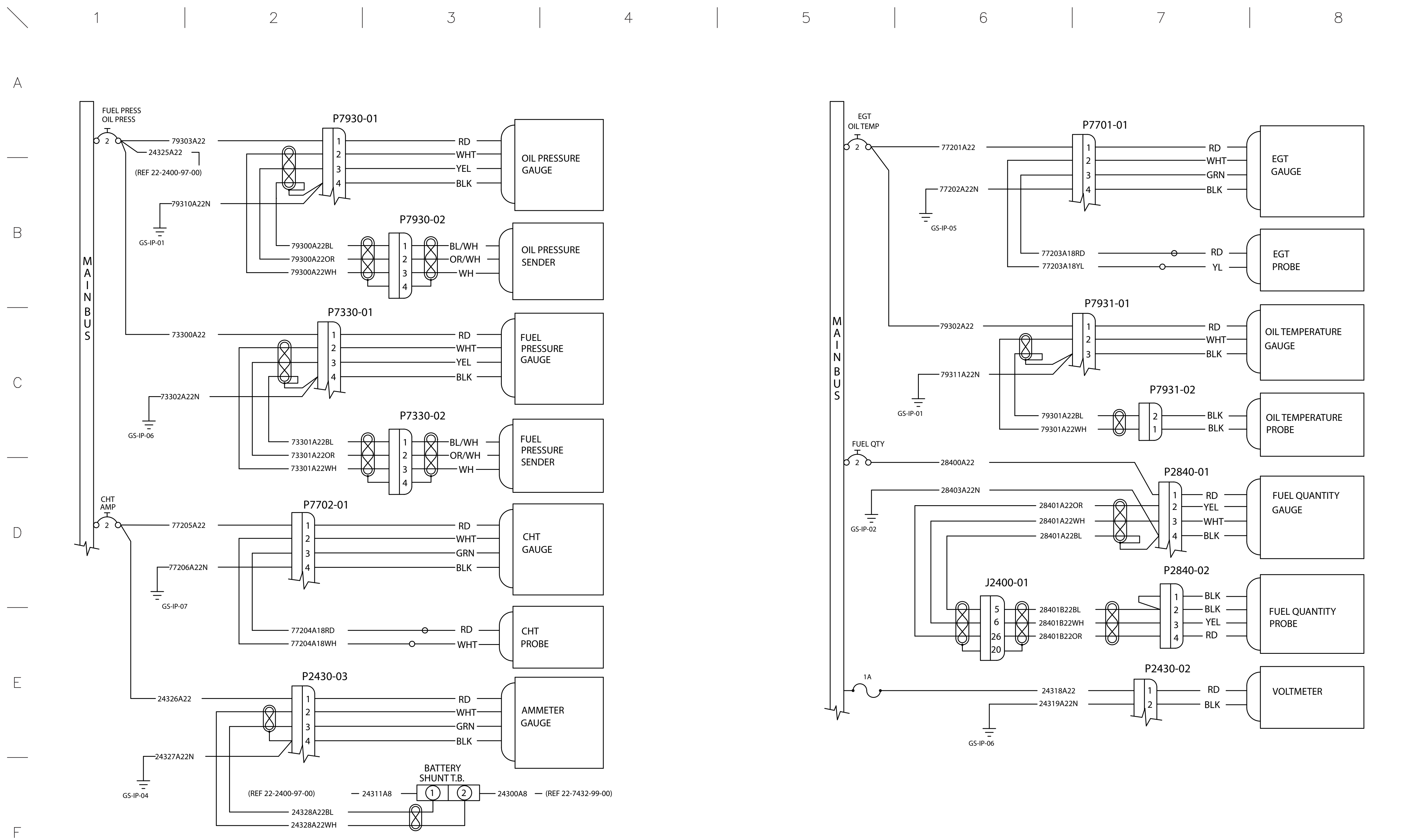
EFFECTIVITY C0001-CXXXX	REV A	TURN AND SLIP INDICATOR	SCHEMATIC 22-3420-99-00	PAGE 1/1



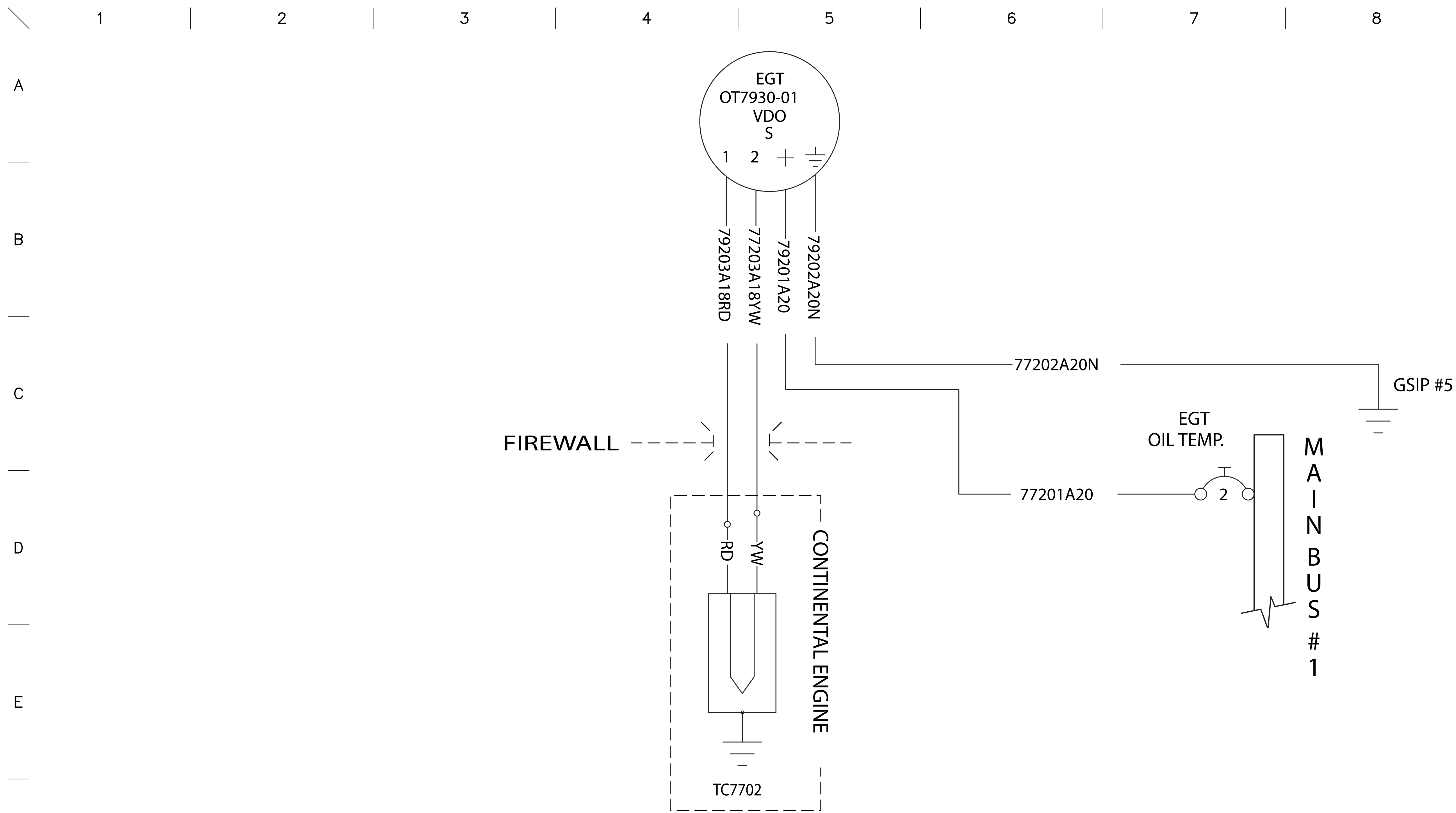
EFFECTIVITY C0001-CXXXX	REV B	FUEL PRESSURE	SCHEMATIC 22-7300-99-00	PAGE 1/1



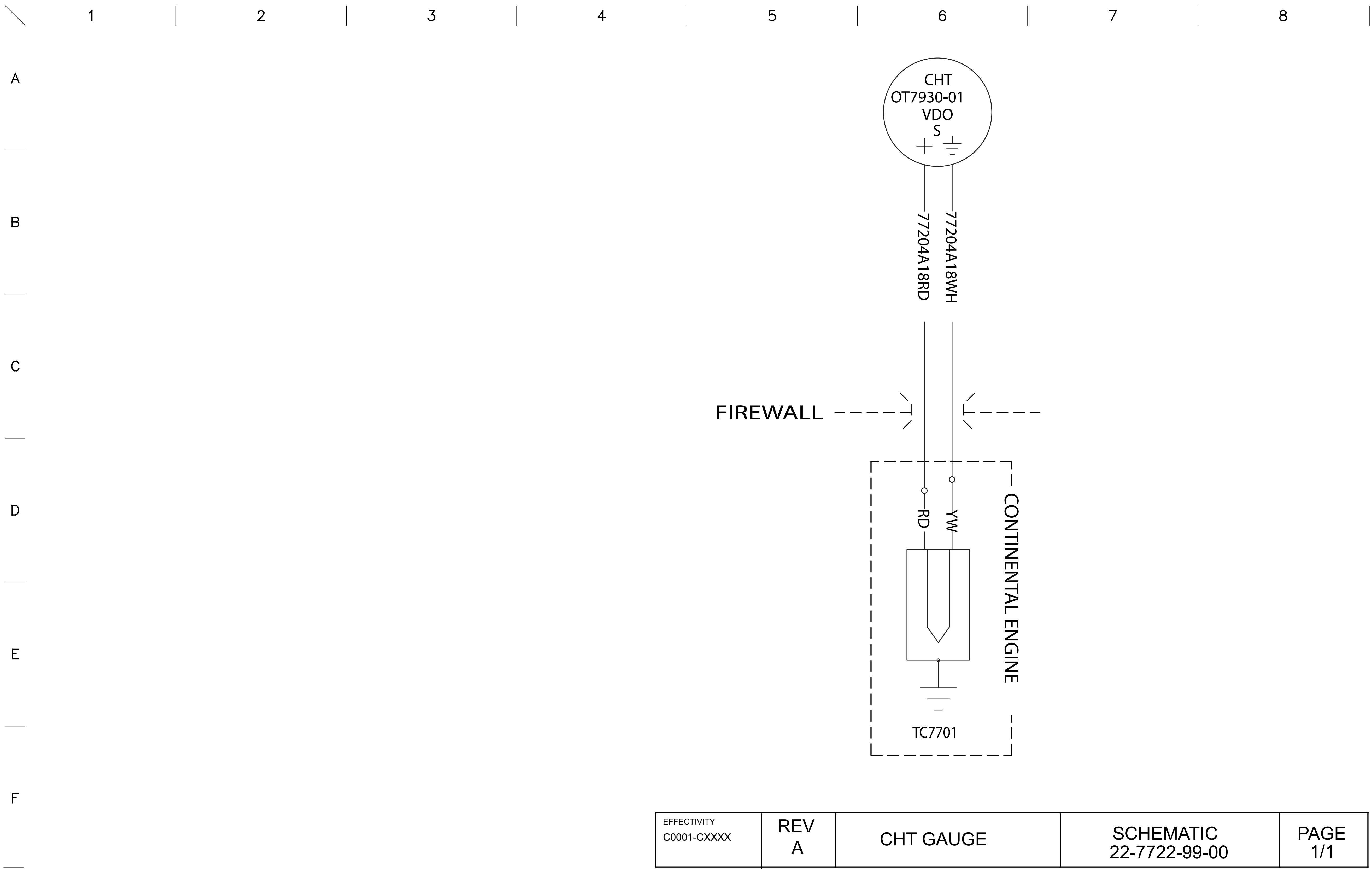
EFFECTIVITY C0001-CXXXX	REV B	IGNITION AND STARTING	SCHEMATIC 22-7432-99-00	PAGE 1/1



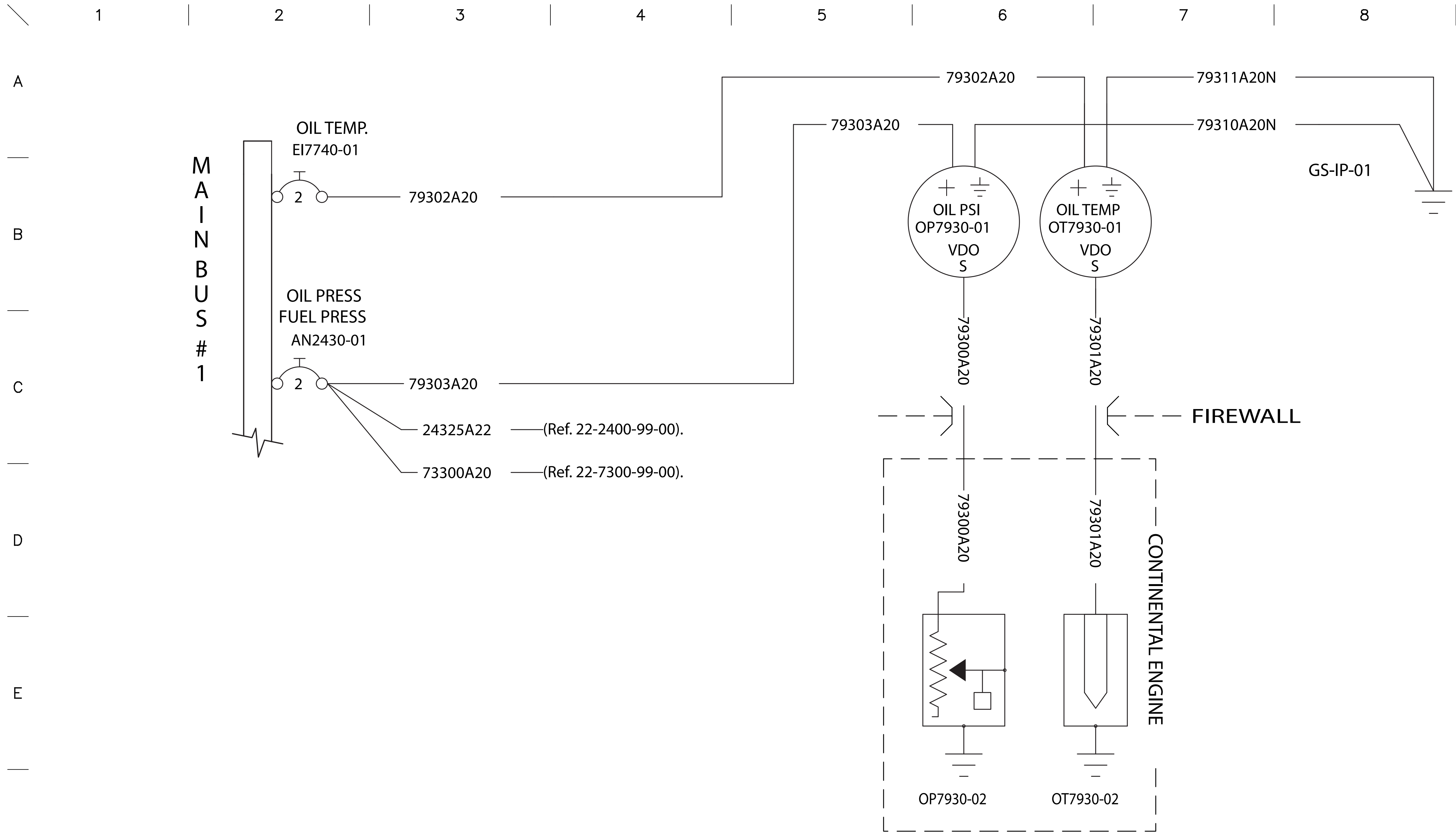
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC UMA ENGINE INSTRUMENTS	SCHEMATIC 22-7700-99-00	PAGE 1/1



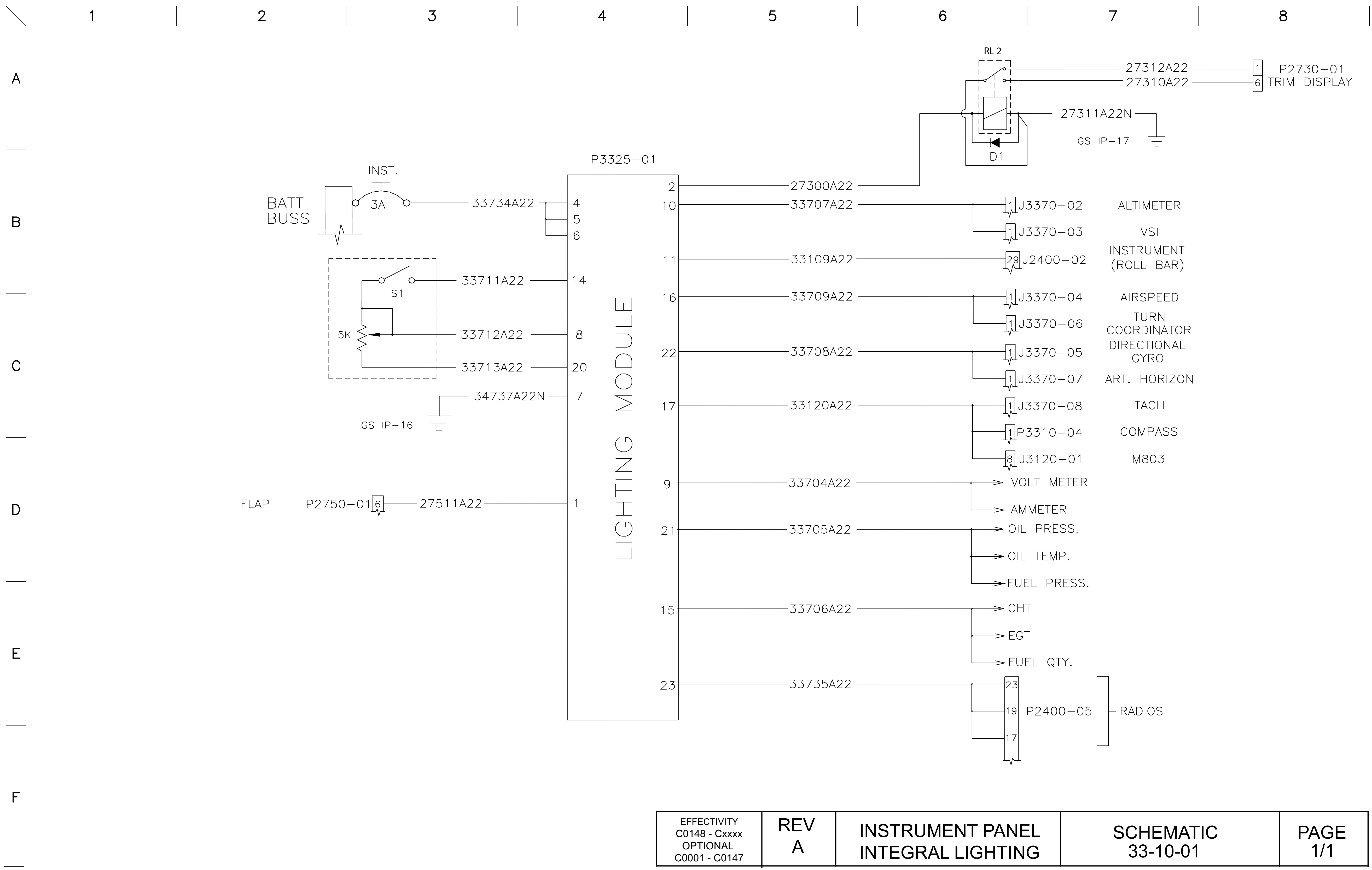
EFFECTIVITY C0001-CXXXX	REV A	EGT GAUGE	SCHEMATIC 22-7721-99-00	PAGE 1/1



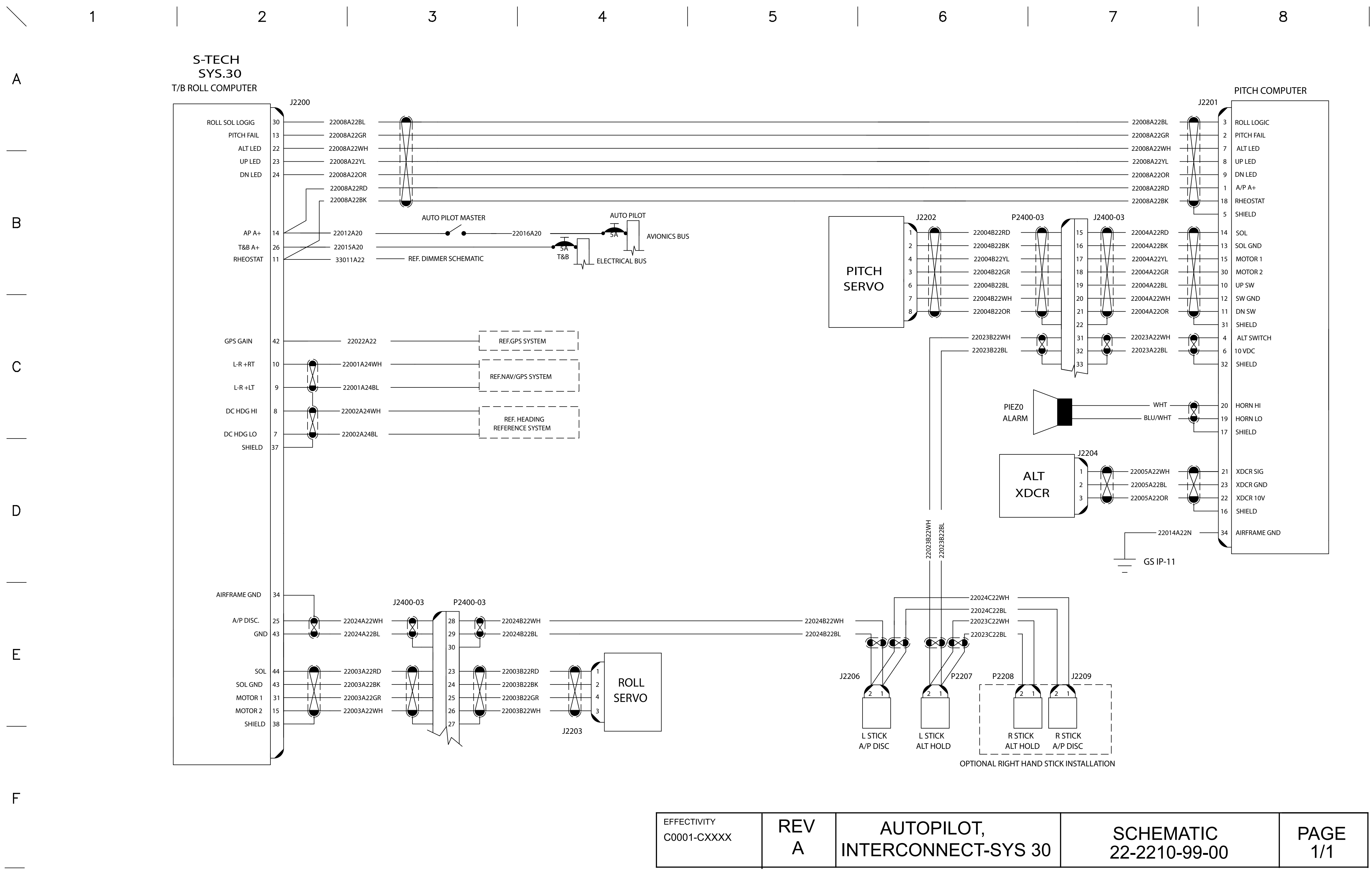
EFFECTIVITY C0001-CXXXX	REV A	CHT GAUGE	SCHEMATIC 22-7722-99-00	PAGE 1/1



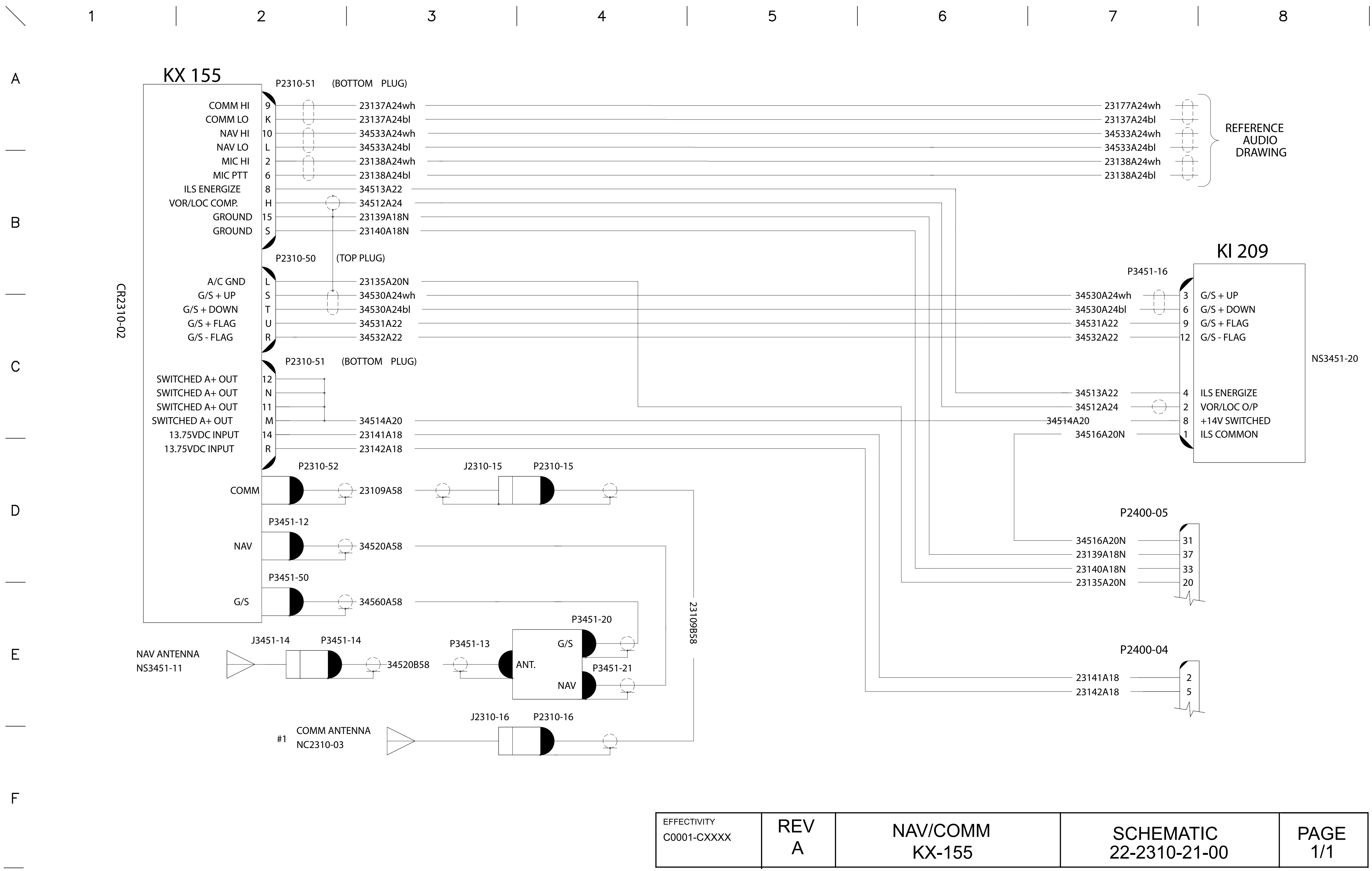
EFFECTIVITY C0001-CXXXX	REV B	ENGINE INSTRUMENTATION	SCHEMATIC 22-7930-99-00	PAGE 1/1



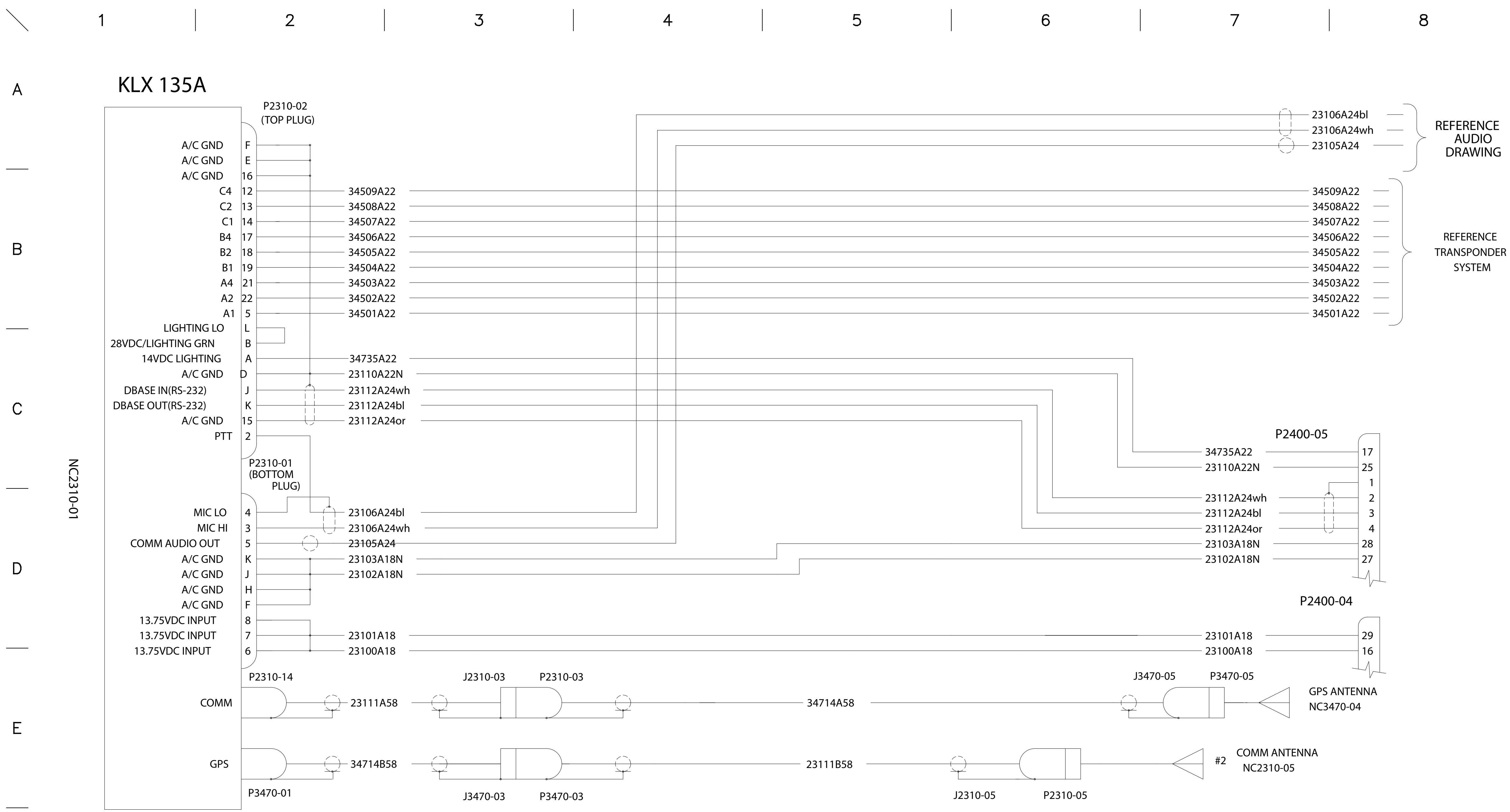
EFFECTIVITY C0148 - Cxxxx OPTIONAL C0001 - C0147	REV A	INSTRUMENT PANEL INTEGRAL LIGHTING	SCHEMATIC 33-10-01	PAGE 1/1



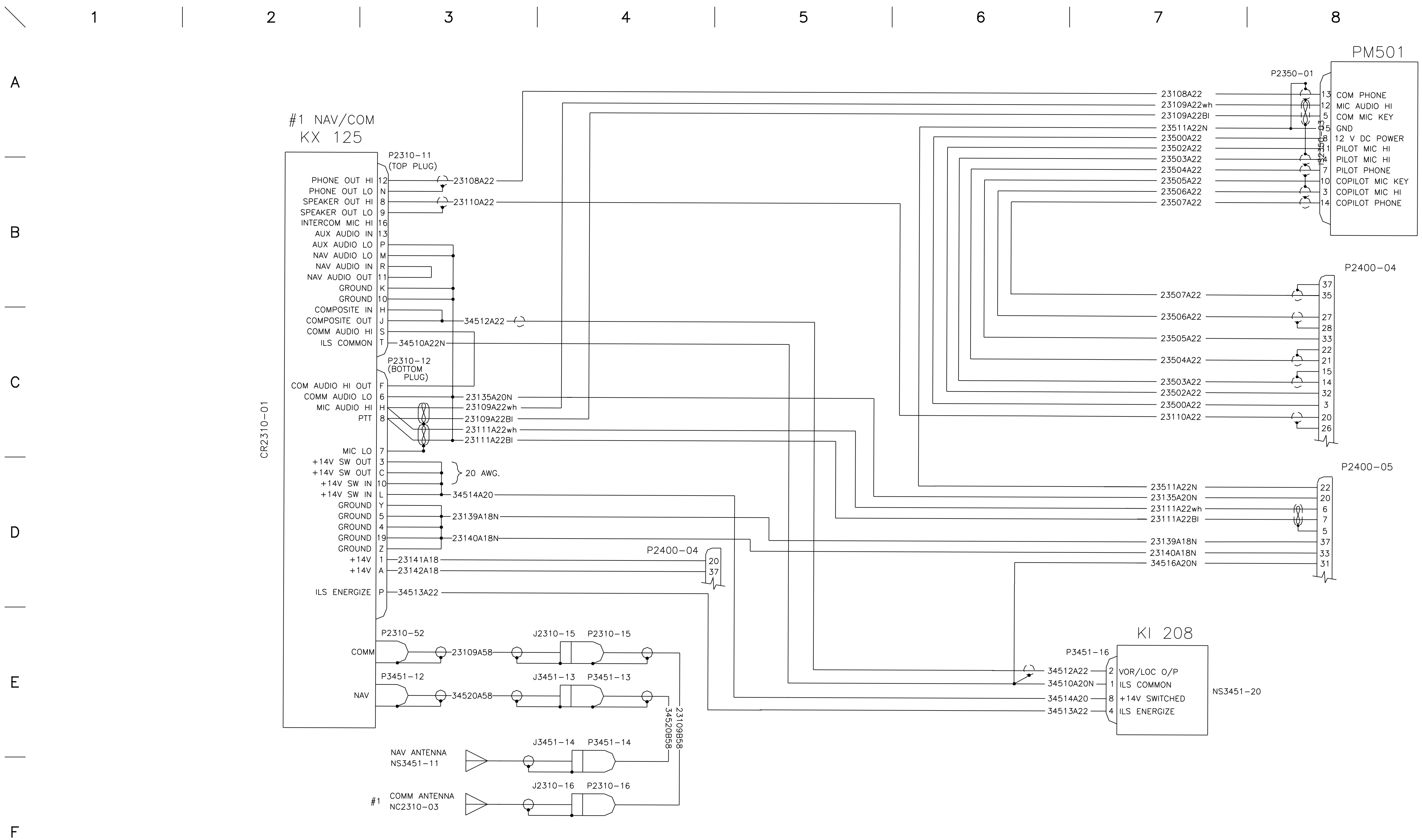
EFFECTIVITY C0001-CXXXX	REV A	AUTOPILOT, INTERCONNECT-SYS 30	SCHEMATIC 22-2210-99-00	PAGE 1/1



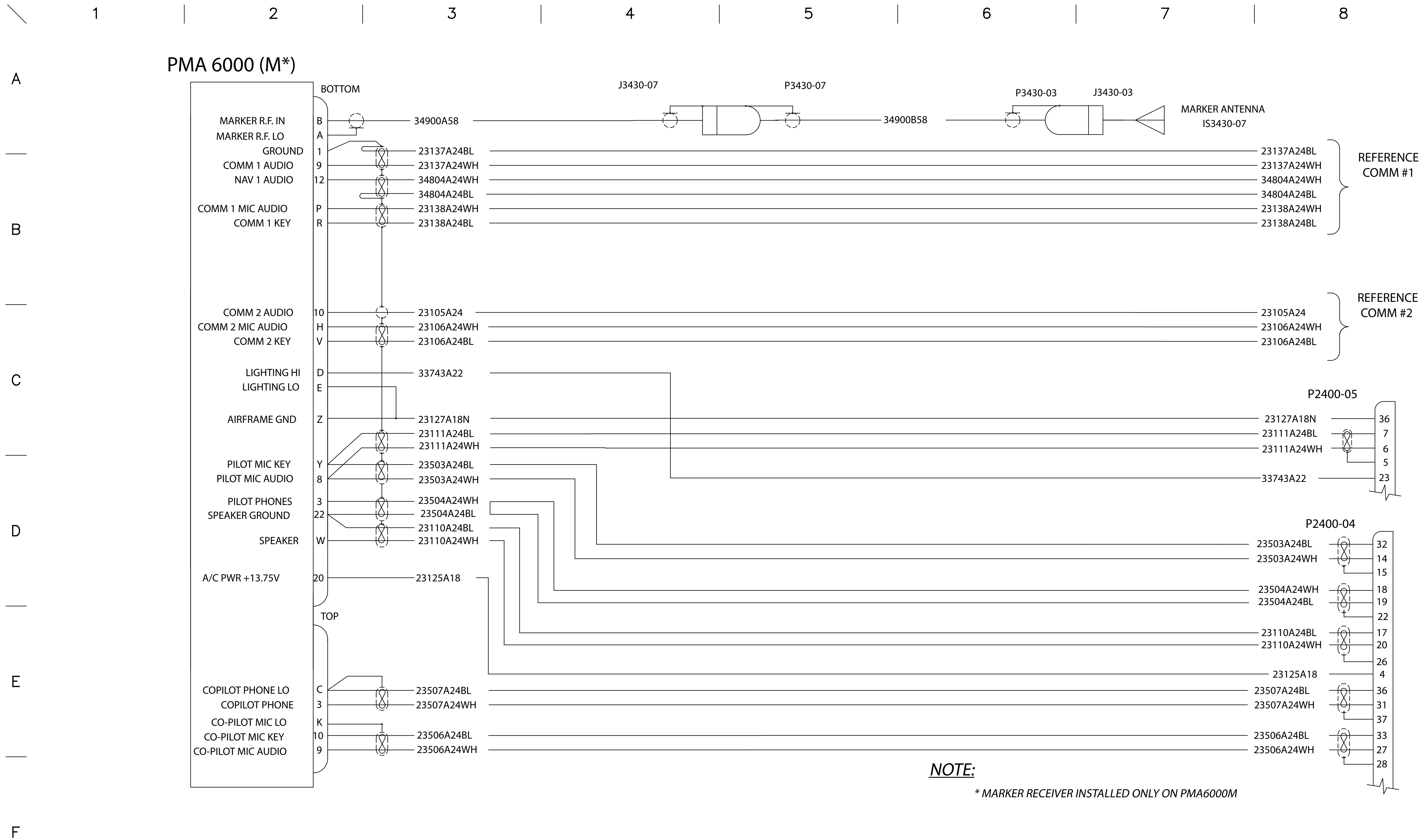
EFFECTIVITY C0001-CXXXX	REV A	NAV/COMM KX-155	SCHEMATIC 22-2310-21-00	PAGE 1/1



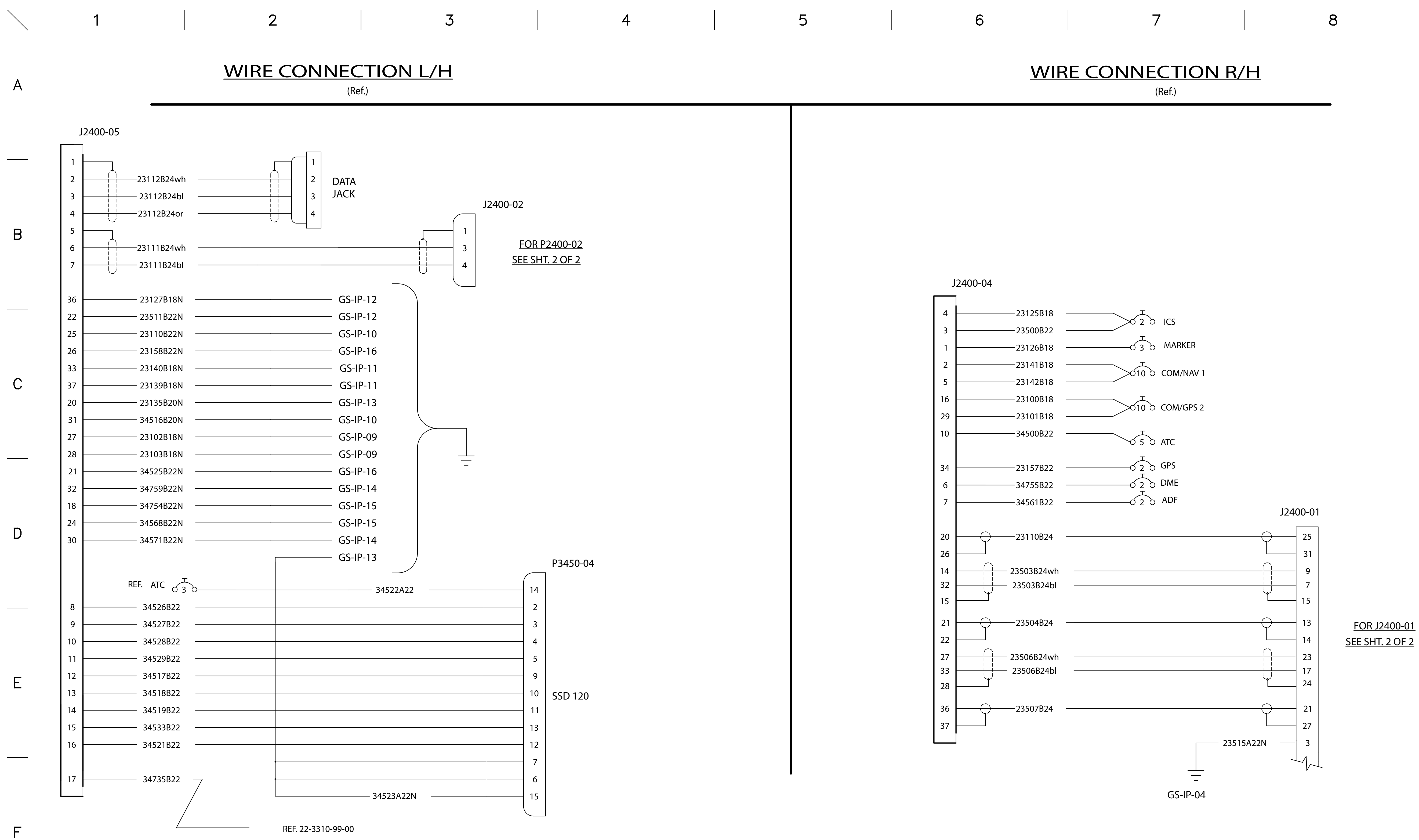
EFFECTIVITY C0001-CXXXX	REV A	GPS/COMM KLX-135A	SCHEMATIC 22-2310-22-00	PAGE 1/1



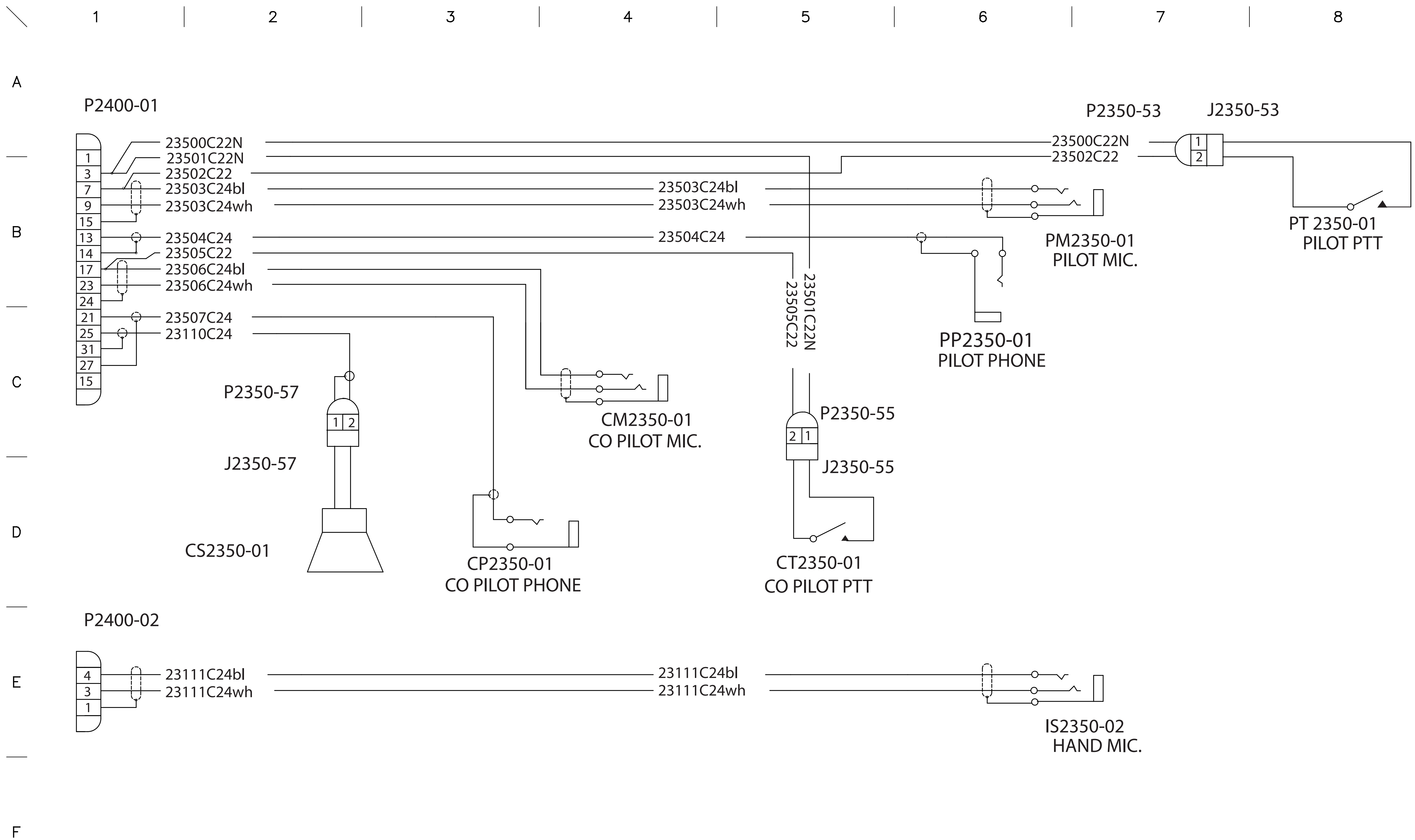
EFFECTIVITY C0001-CXXXX	REV B	NAV/COMM KX-125	SCHEMATIC 22-2310-23-00	PAGE 1/1



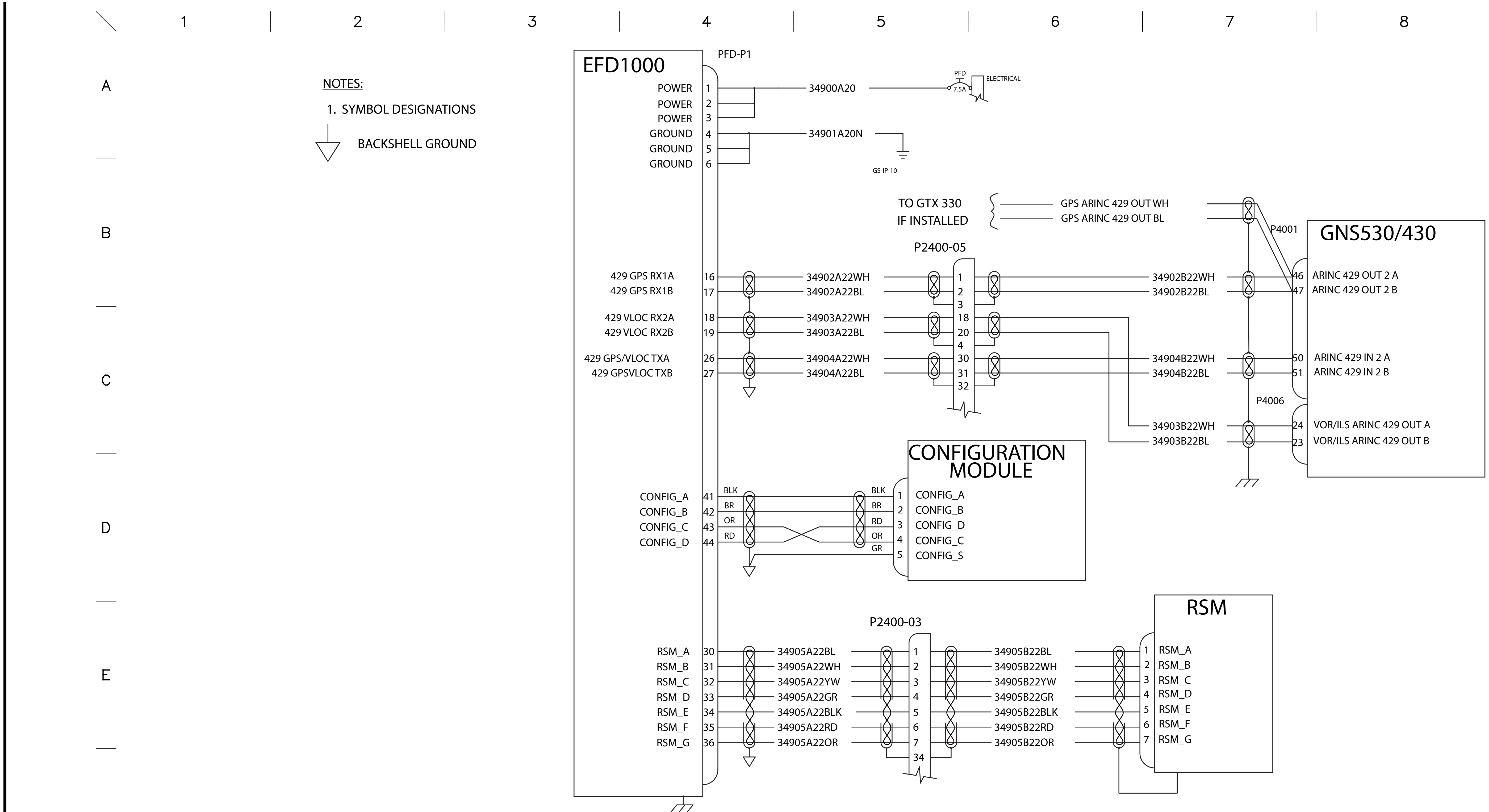
EFFECTIVITY	REV			
C0001-CXXXX	C	AUDIO PANEL PMA 6000	SCHEMATIC 22-2350-20-00	PAGE 1/1



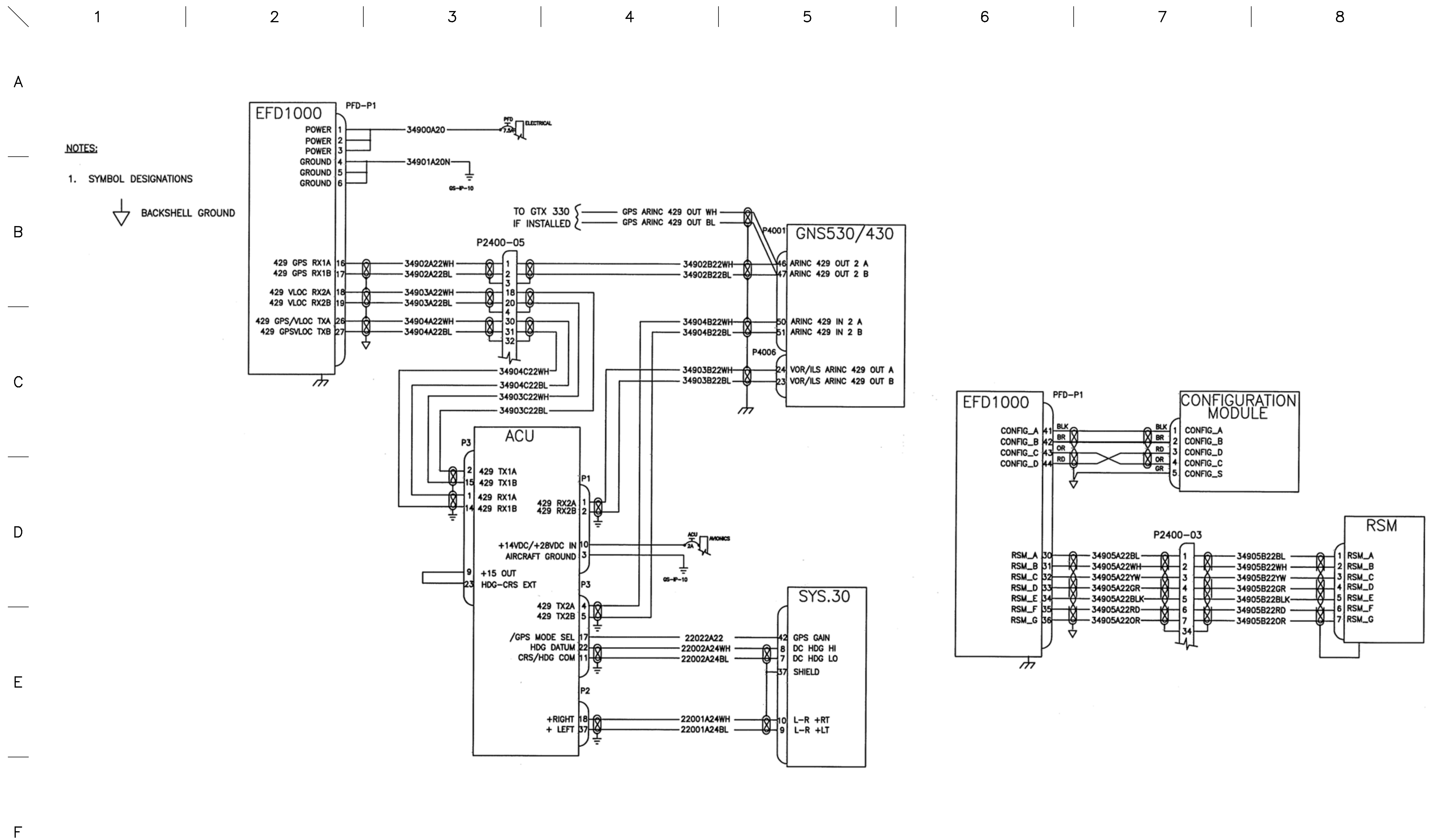
EFFECTIVITY	REV			
C0001-CXXXX	C	NAVIGATION/COMMUNICATION EQUIPMENT	SCHEMATIC 22-3400-99-00	PAGE 1/2



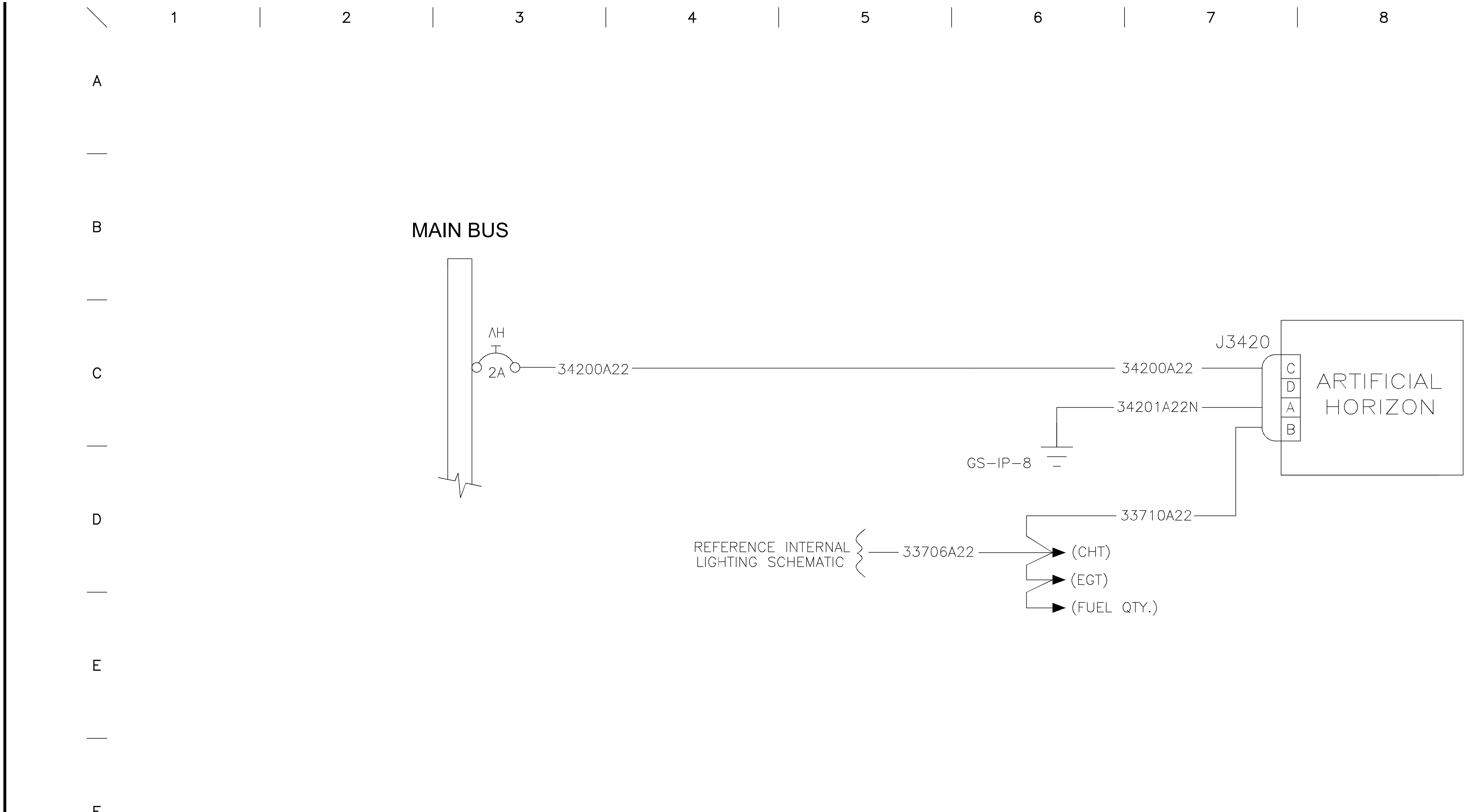
EFFECTIVITY C0001-CXXXX	REV C	NAVIGATION/COMMUNICATION EQUIPMENT	SCHEMATIC 22-3400-99-00	PAGE 2/2



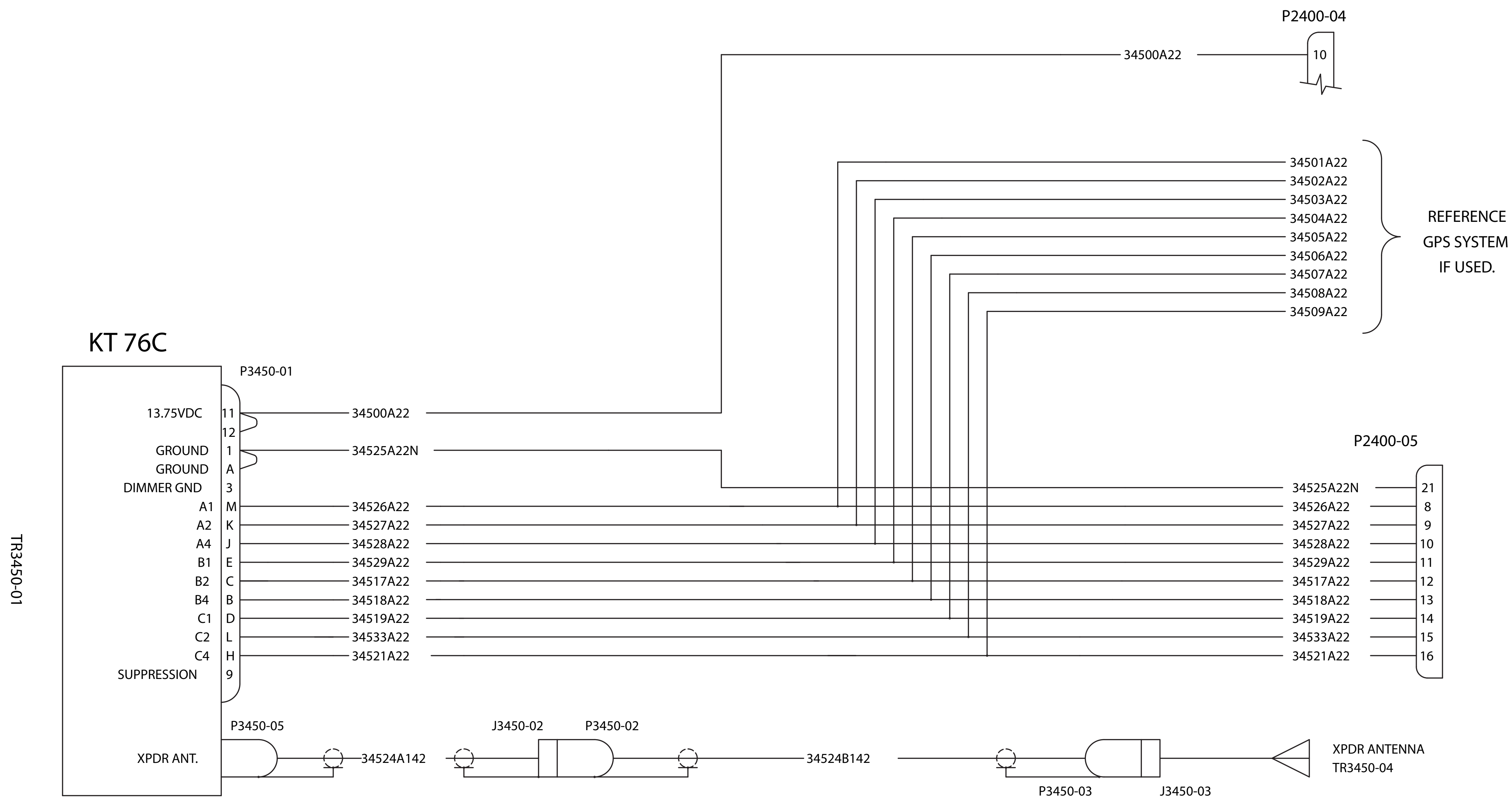
EFFECTIVITY	REV	PFD, ASPEN EFD1000 FIXED PROVISIONS	SCHEMATIC	PAGE
C0001-CXXXX	B		22-3421-99-00	1/1



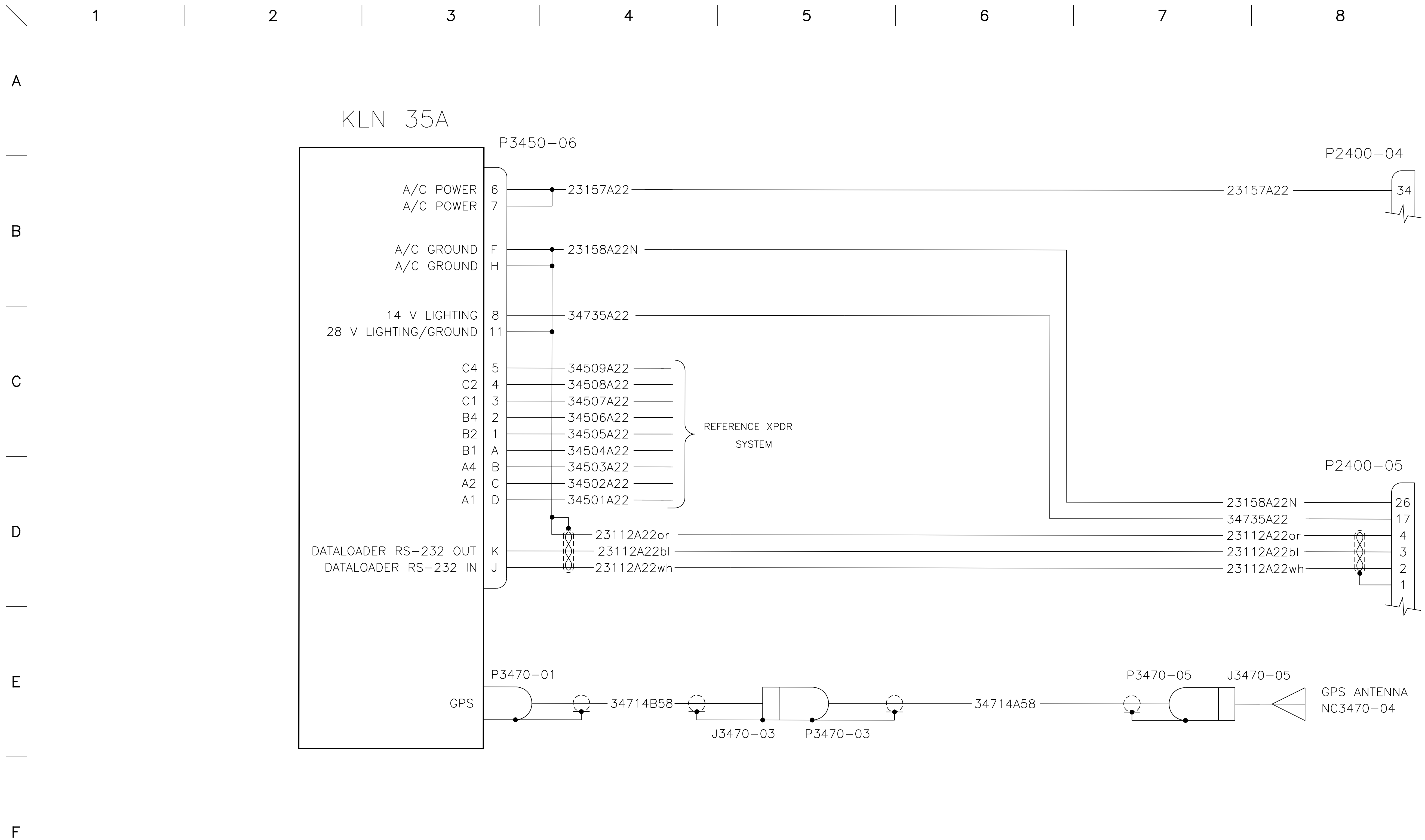
EFFECTIVITY: ON ALL AIRCRAFT WITH THE ASPEN EFD1000 SYSTEM INSTALLED	REV A	PFD, AUTOPILOT FIXED PROVISIONS	SCHEMATIC 22-3422-99-00	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV A	BACKUP ARTIFICIAL HORIZON	SCHEMATIC 22-3424-99-00	PAGE 1/1



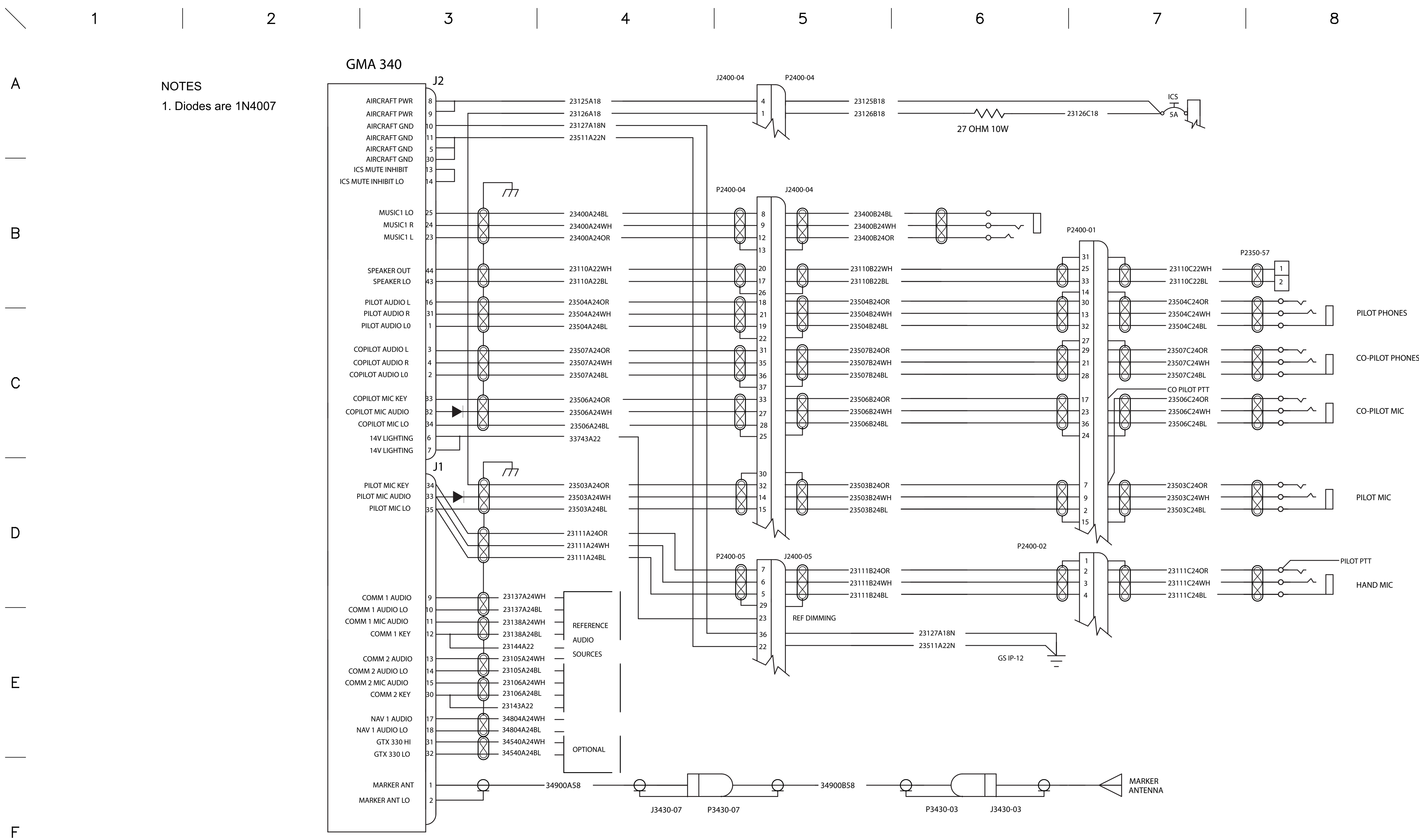
EFFECTIVITY C0001-CXXXX	REV A	TRANSPONDER, KT-76C	SCHEMATIC 22-3450-20-00	PAGE 1/1



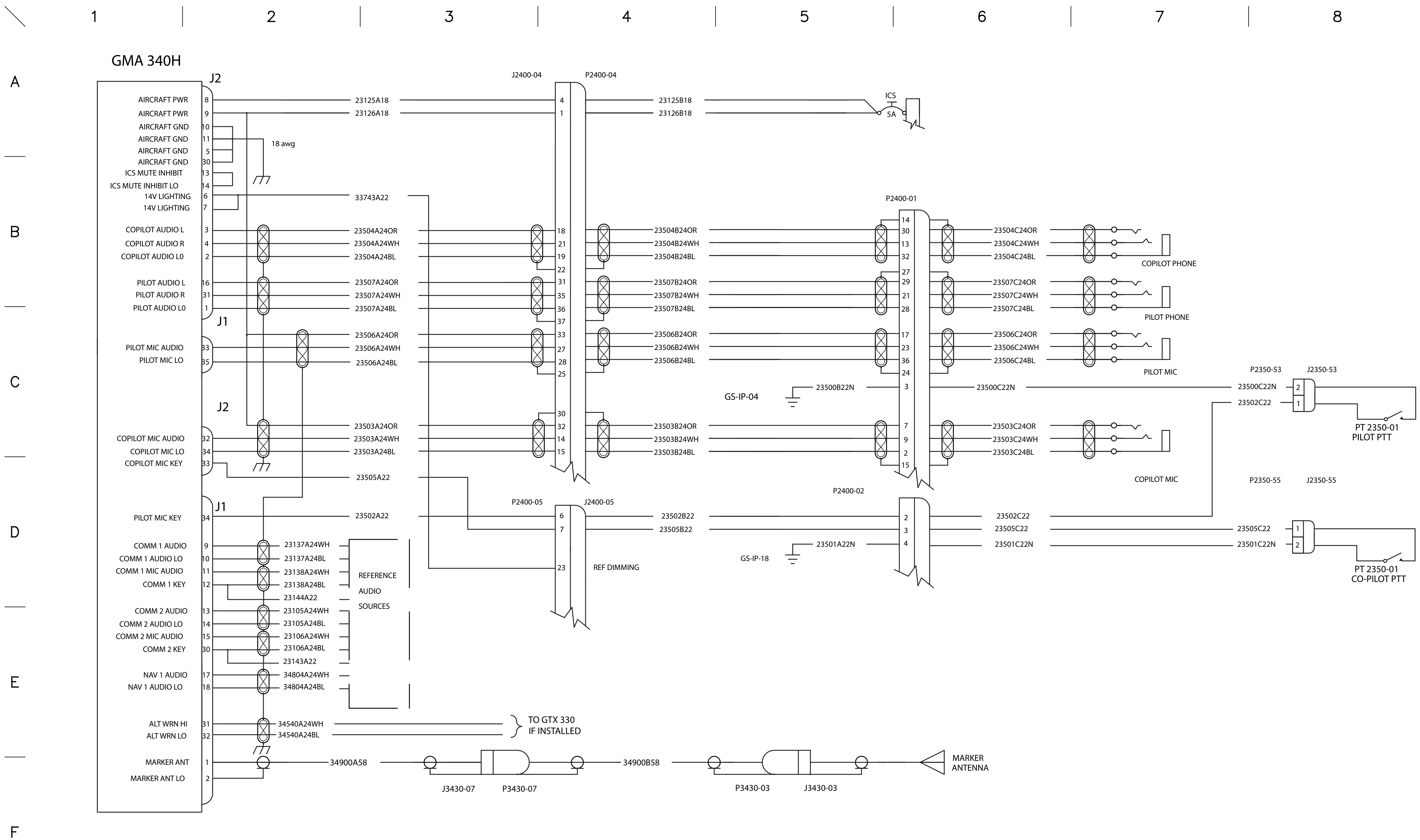
EFFECTIVITY C0001-CXXXX	REV A	KLN 35A GPS RECEIVER	SCHEMATIC 22-3450-21-00	PAGE 1/1

NOTES

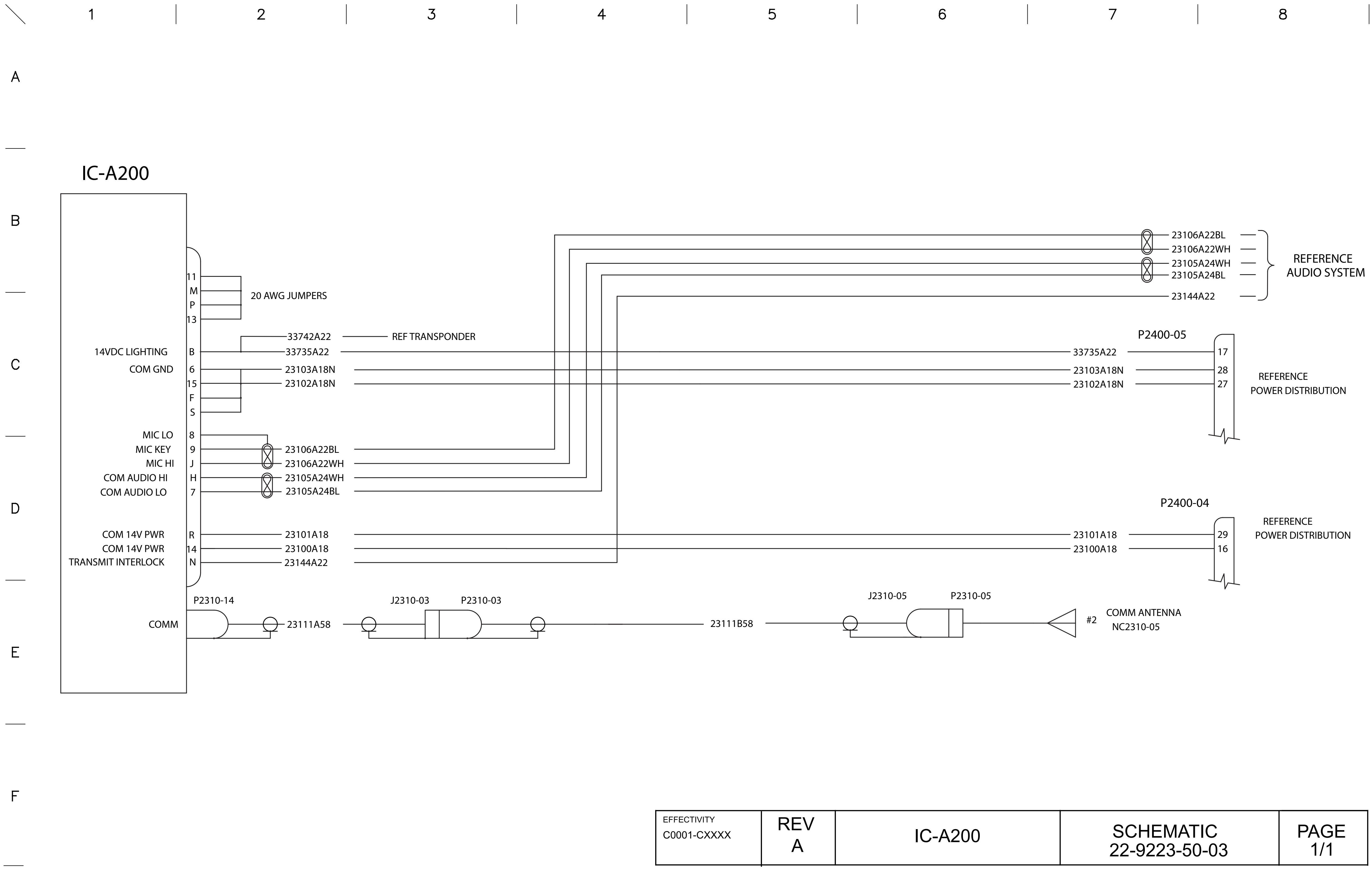
1. Diodes are 1N4007



EFFECTIVITY C0001-CXXXX	REV E	GMA 340	SCHEMATIC 22-9223-50-01	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV B	GMA 340H USAFA-IFTP	SCHEMATIC 22-9223-50-02	PAGE 1/1



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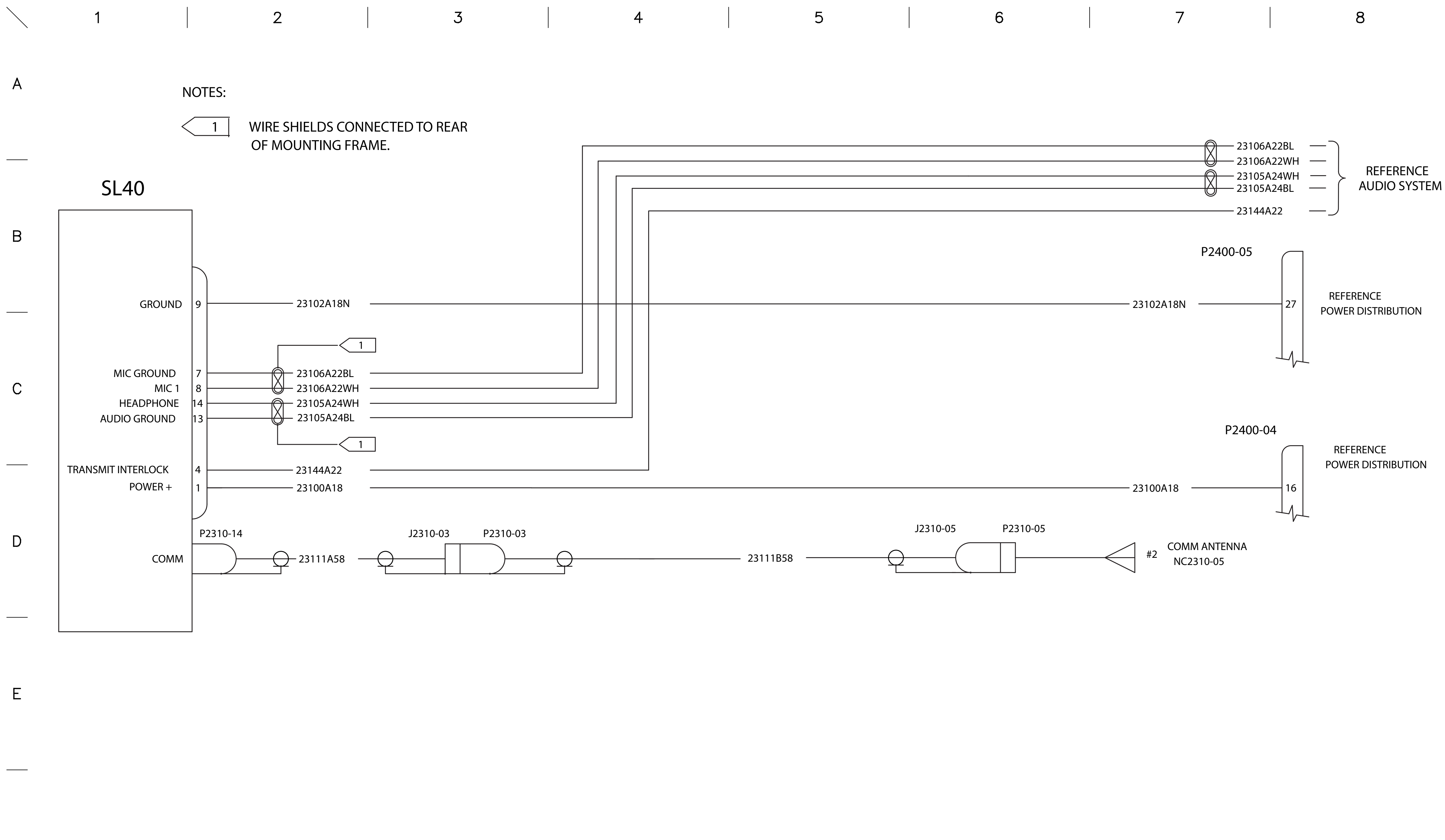
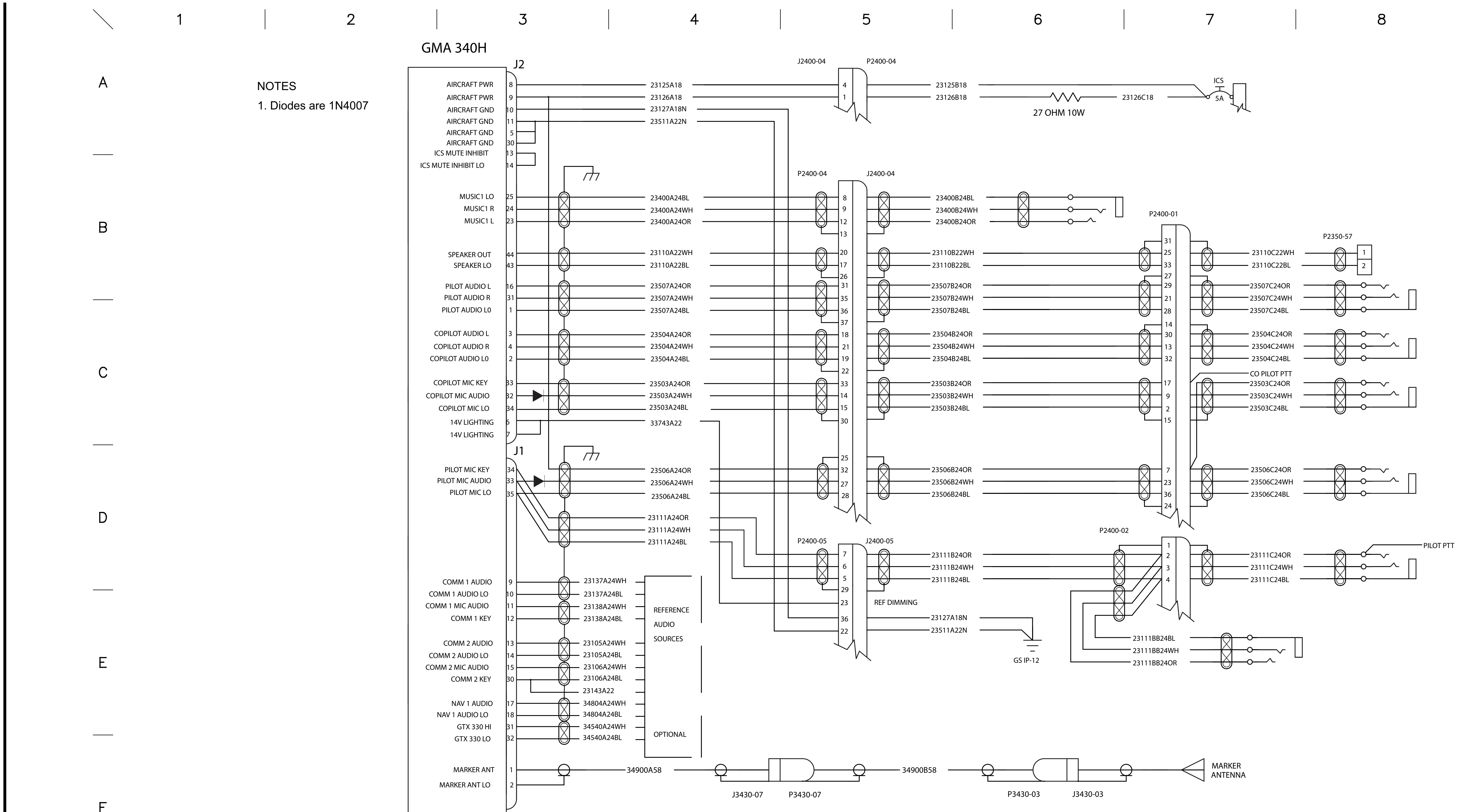
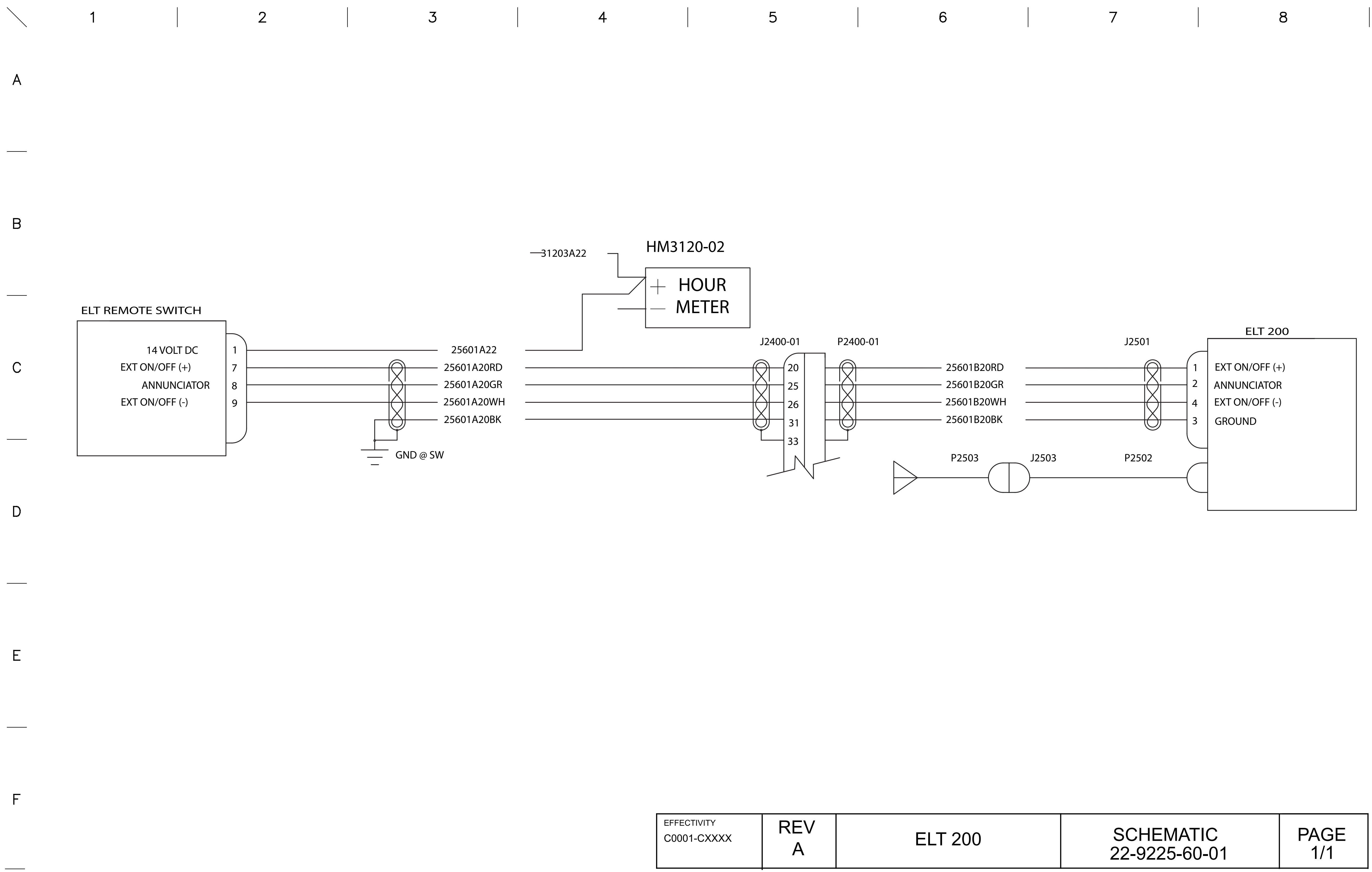


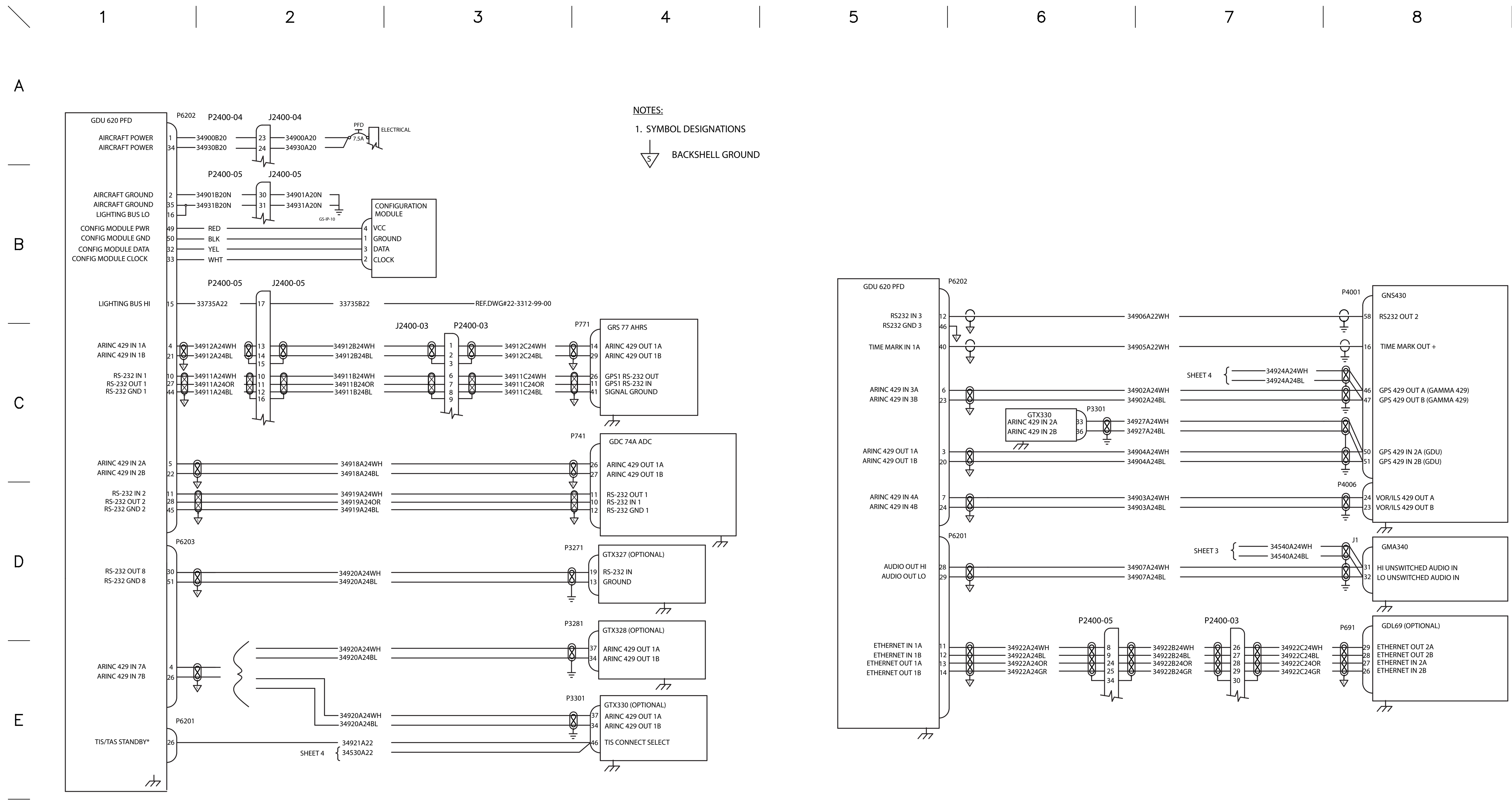
EFFECTIVITY C0001-CXXXX	REV A	SL40	SCHEMATIC 22-9223-50-04	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV A	GMA 340H	SCHEMATIC 22-9223-50-05_1	PAGE 1/1



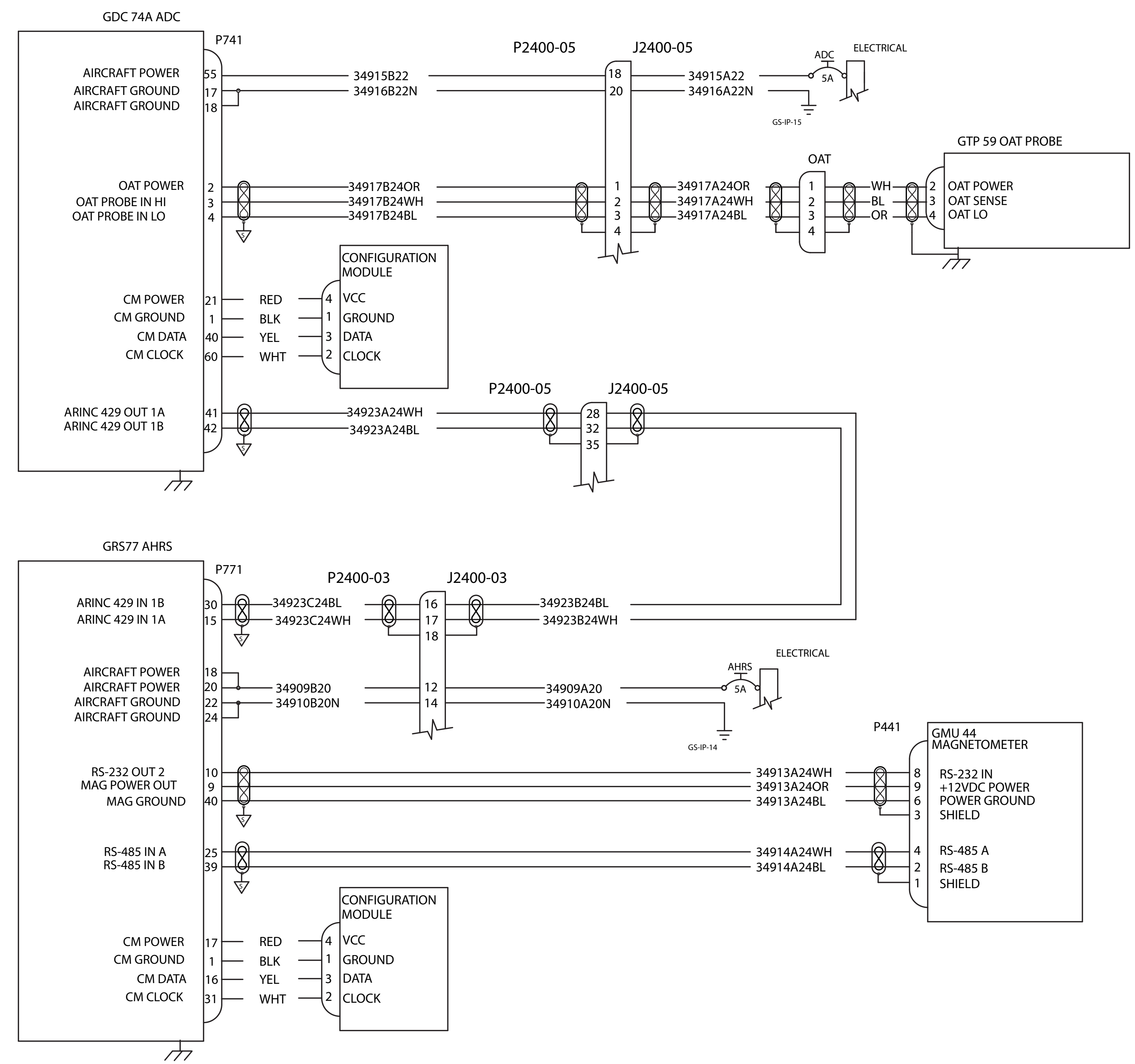
EFFECTIVITY C0001-CXXXX	REV A	ELT 200	SCHEMATIC 22-9225-60-01	PAGE 1/1



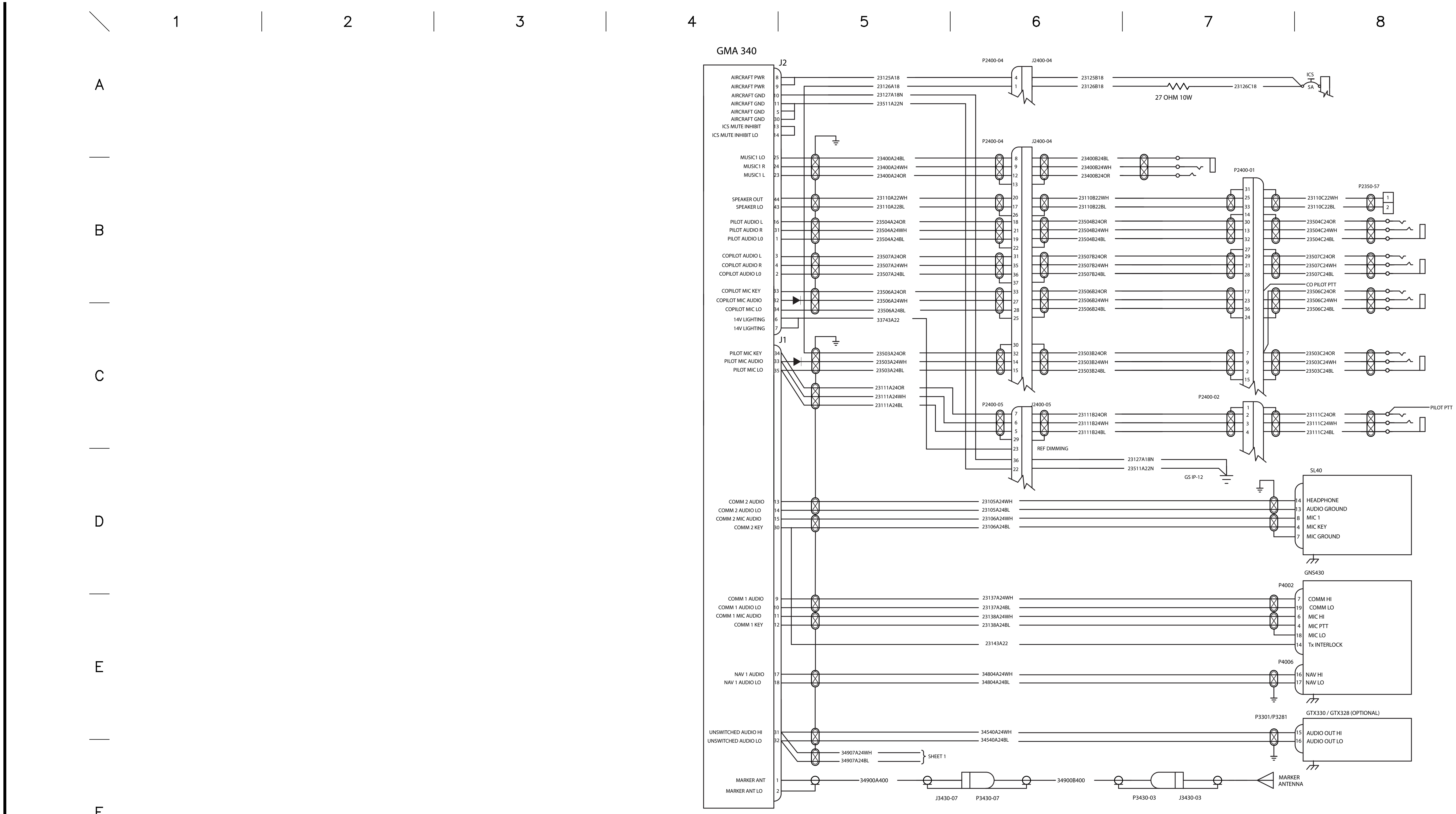
EFFECTIVITY C0001-CXXXX	REV C	GARMIN G500 INTEGRATED DISPLAY SYSTEM	SCHEMATIC 22-9231-00-00	PAGE 1/5

1 2 3 4 5 6 7 8

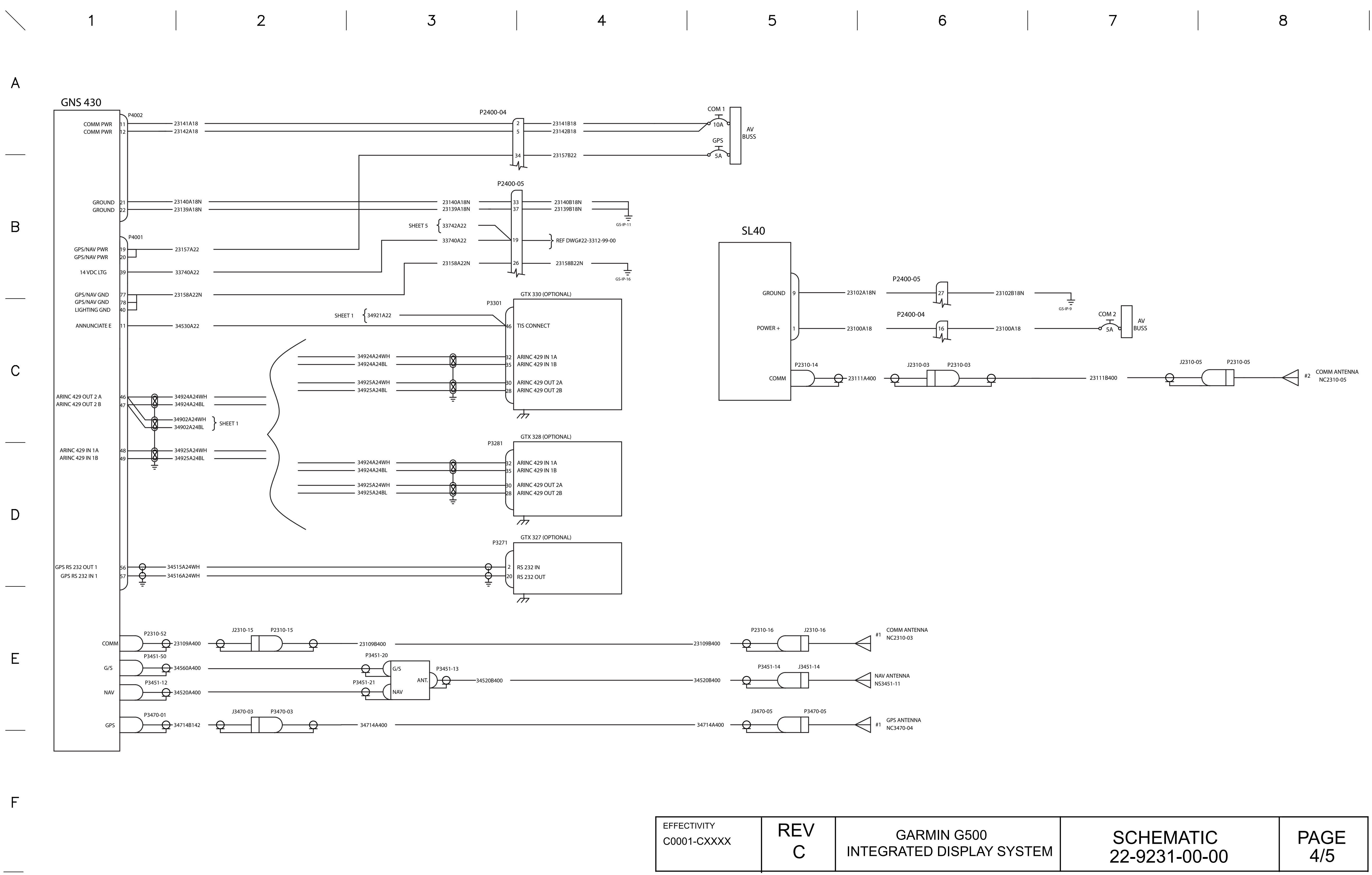
A B C D E F



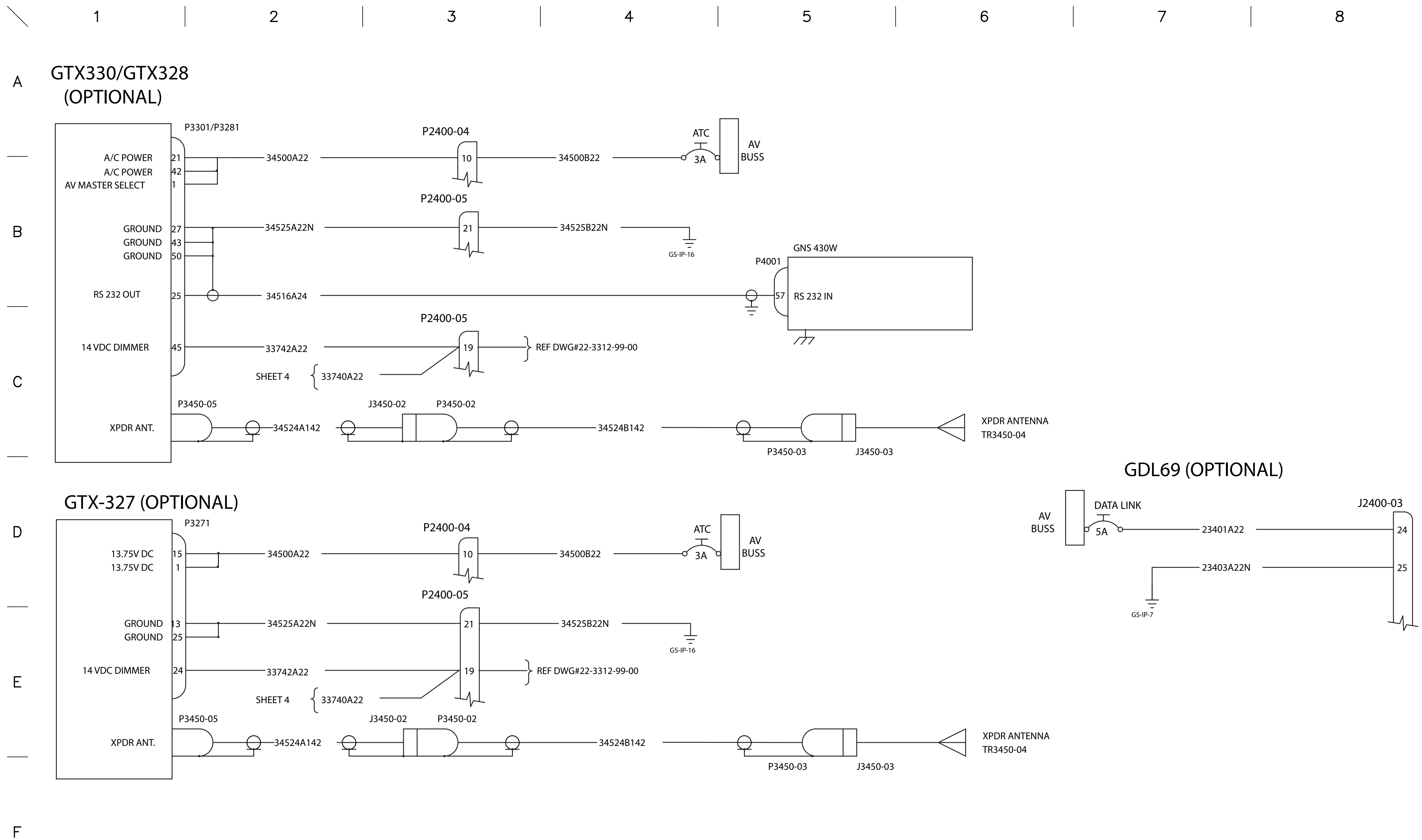
EFFECTIVITY	REV			
C0001-CXXXX	C	GARMIN G500 INTEGRATED DISPLAY SYSTEM	SCHEMATIC 22-9231-00-00	PAGE 2/5



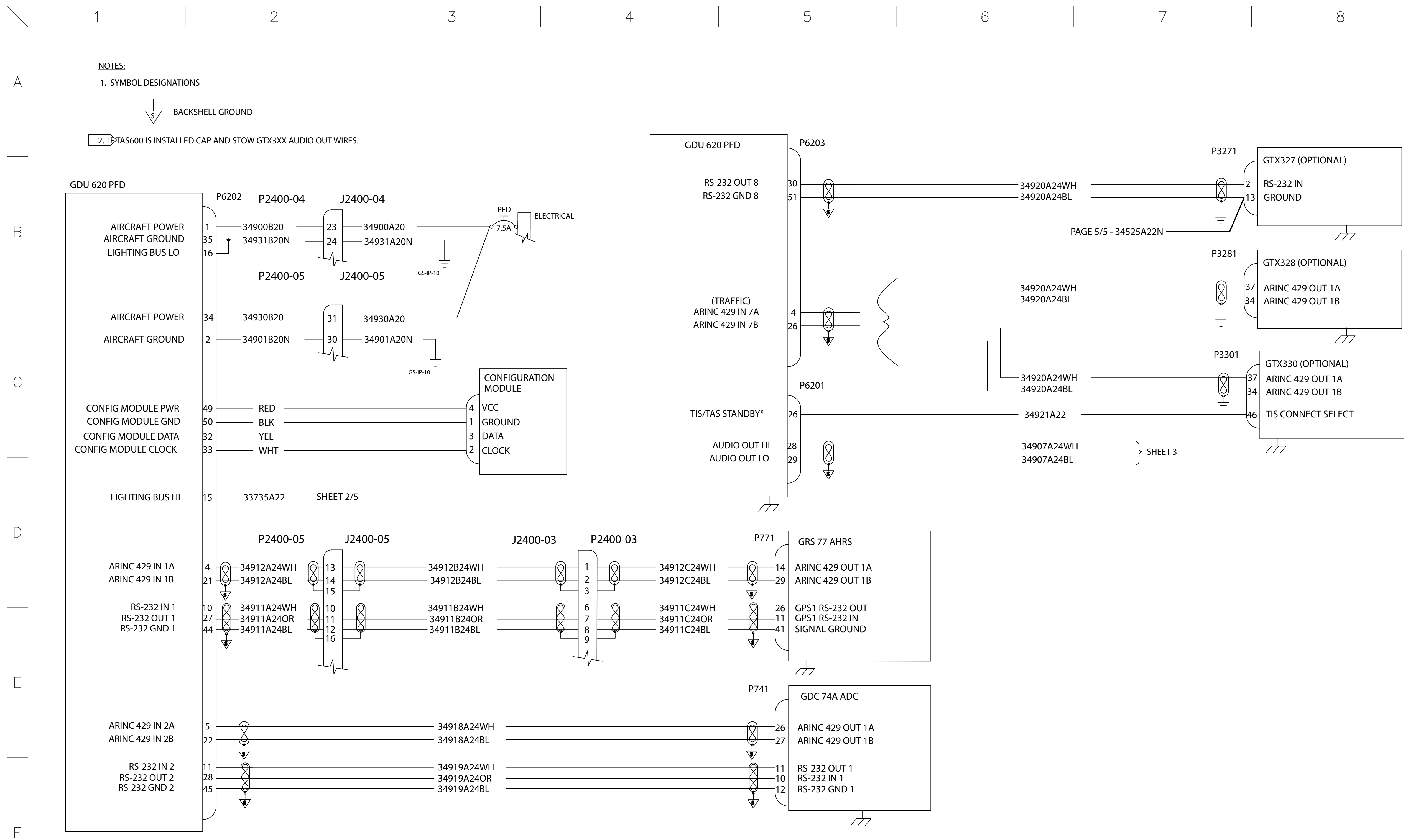
EFFECTIVITY C0001-CXXXX	REV C	GARMIN G500 INTEGRATED DISPLAY SYSTEM	SCHEMATIC 22-9231-00-00	PAGE 3/5



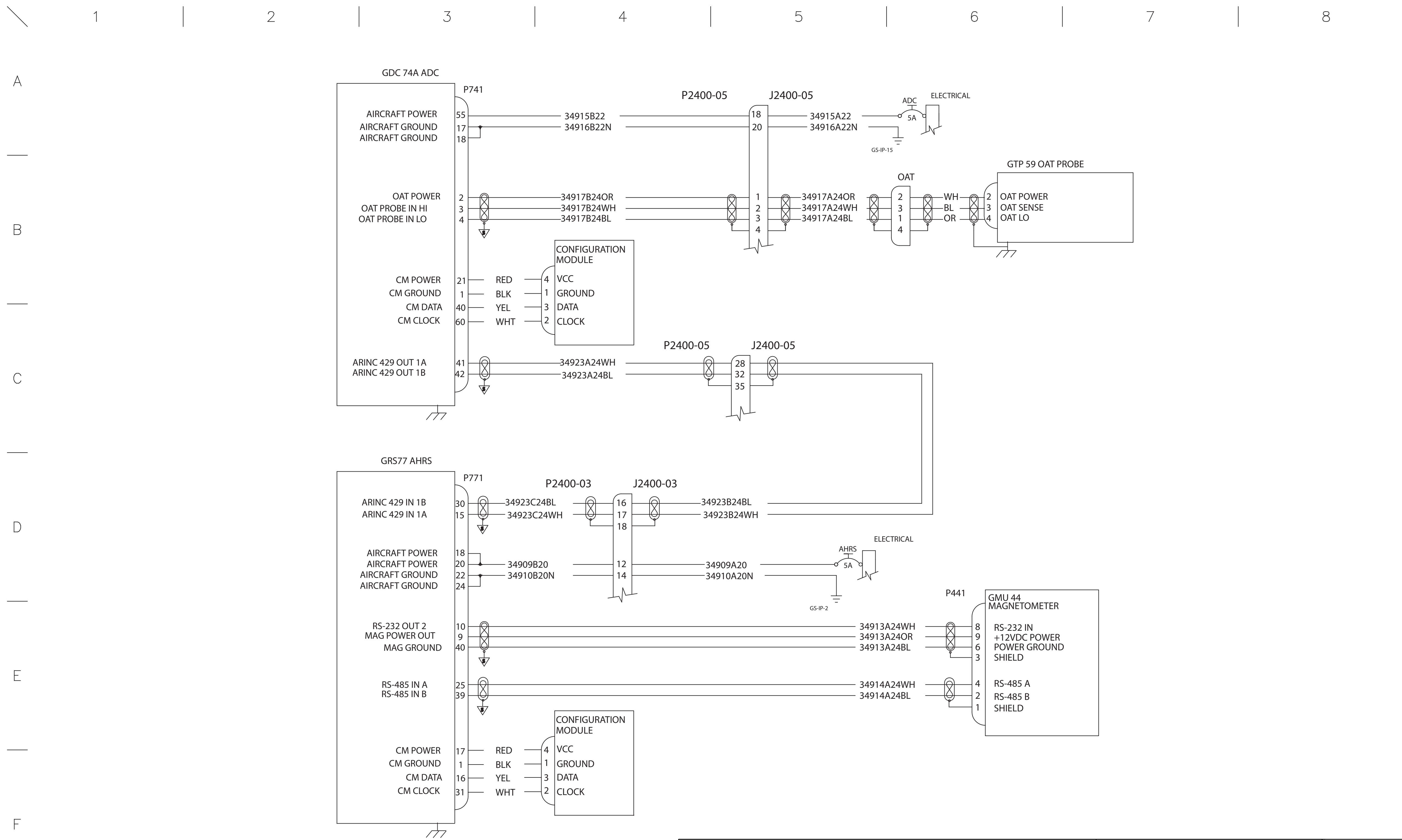
EFFECTIVITY C0001-CXXXX	REV C	GARMIN G500 INTEGRATED DISPLAY SYSTEM	SCHEMATIC 22-9231-00-00	PAGE 4/5



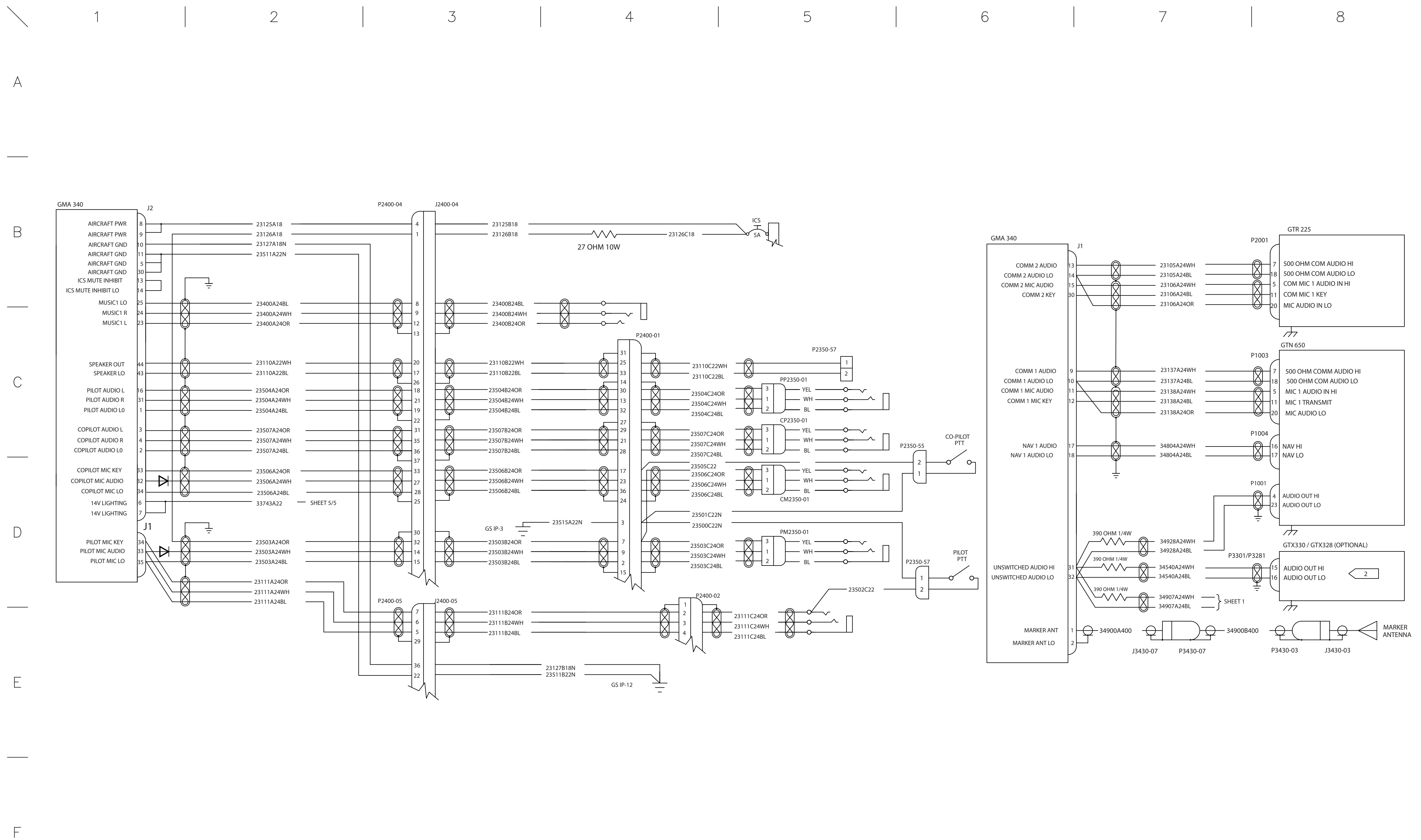
EFFECTIVITY	REV			
C0001-CXXXX	C	GARMIN G500 INTEGRATED DISPLAY SYSTEM	SCHEMATIC 22-9231-00-00	PAGE 5/5



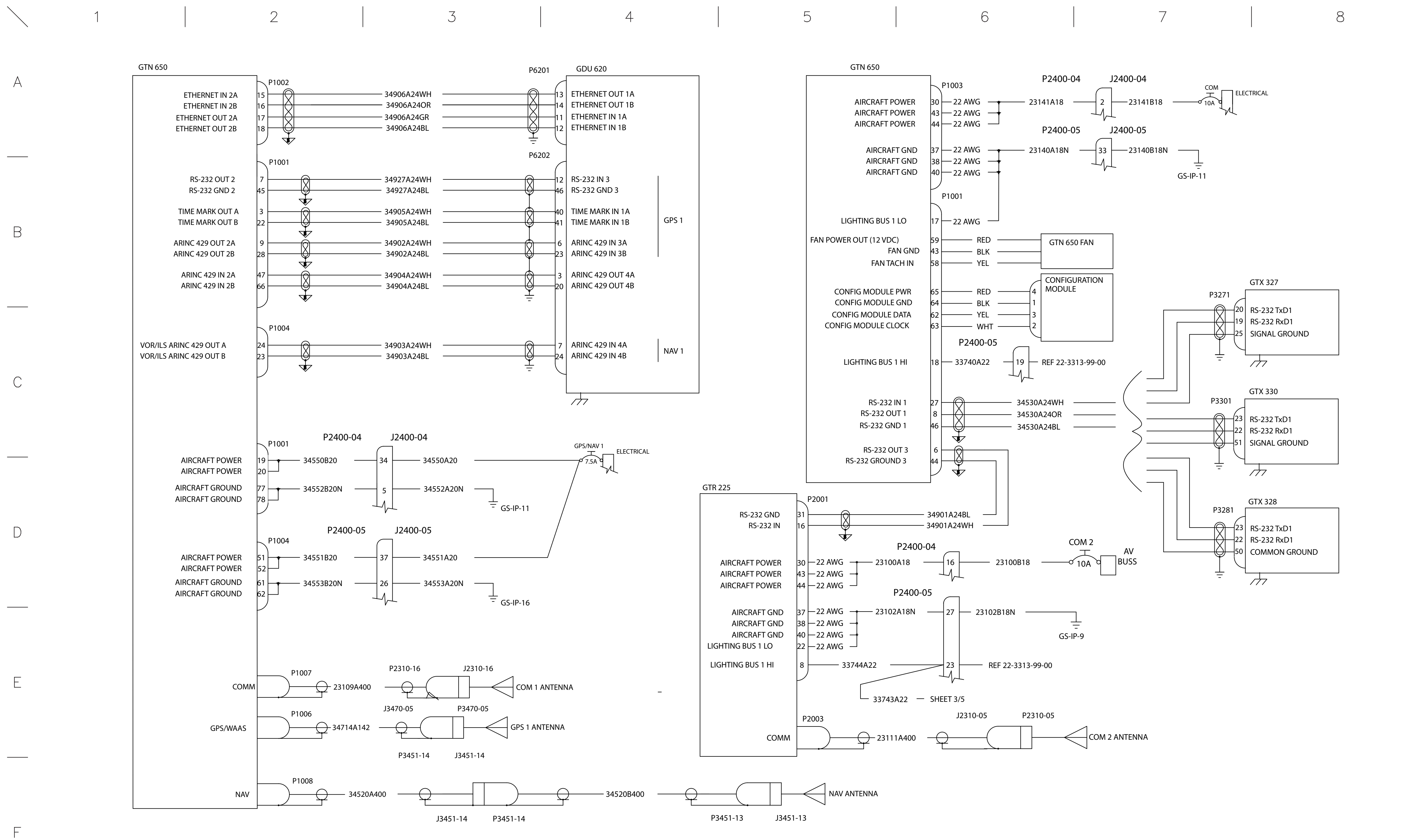
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC G500 AVIONICS WITH GTN 650 AND GTR 225	SCHEMATIC 22-9231-00-01	PAGE 1/5



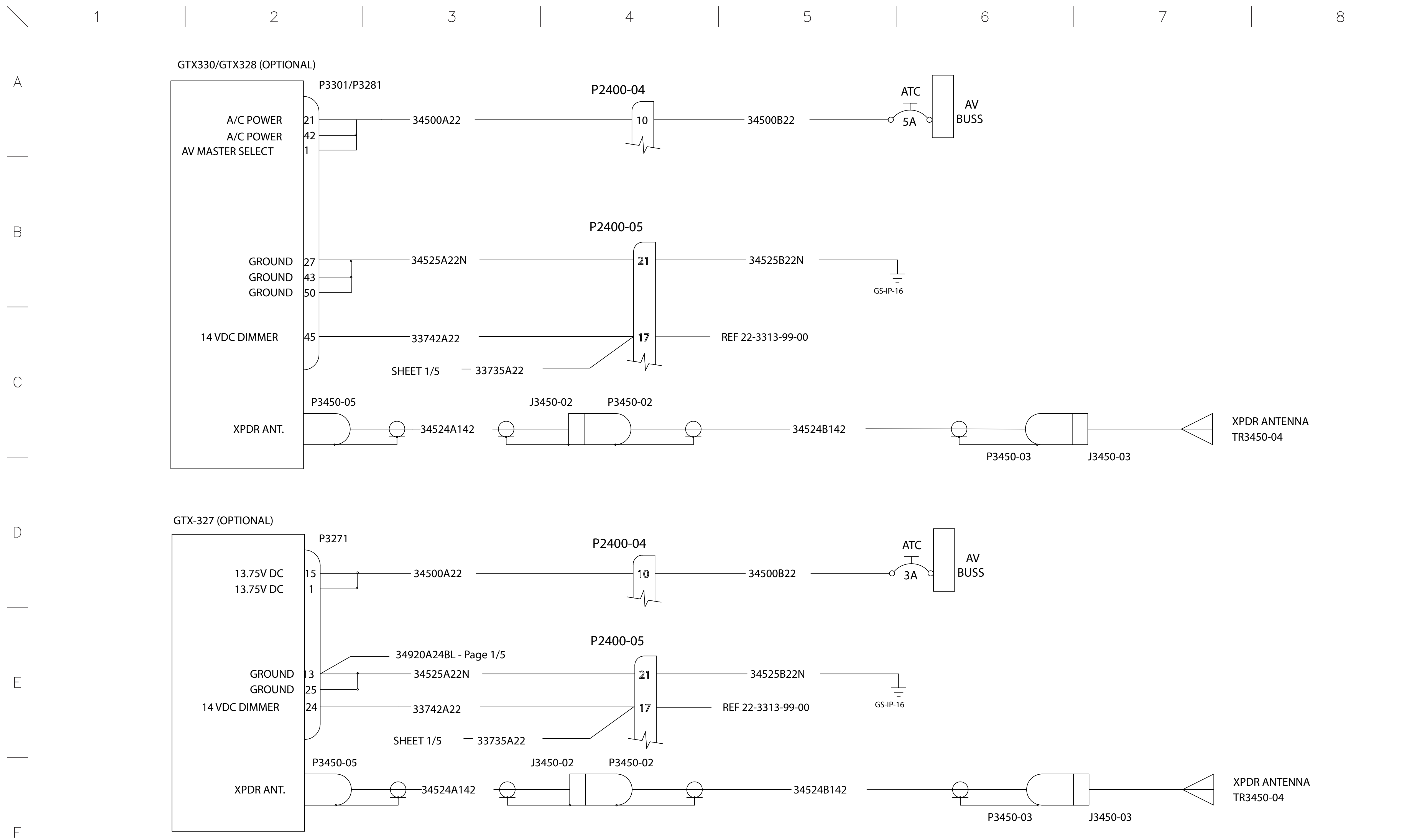
EFFECTIVITY	REV	SCHEMATIC	SCHEMATIC	PAGE
C0001-CXXXX	A	G500 AVIONICS WITH GTN 650 AND GTR 225	22-9231-00-01	2/5



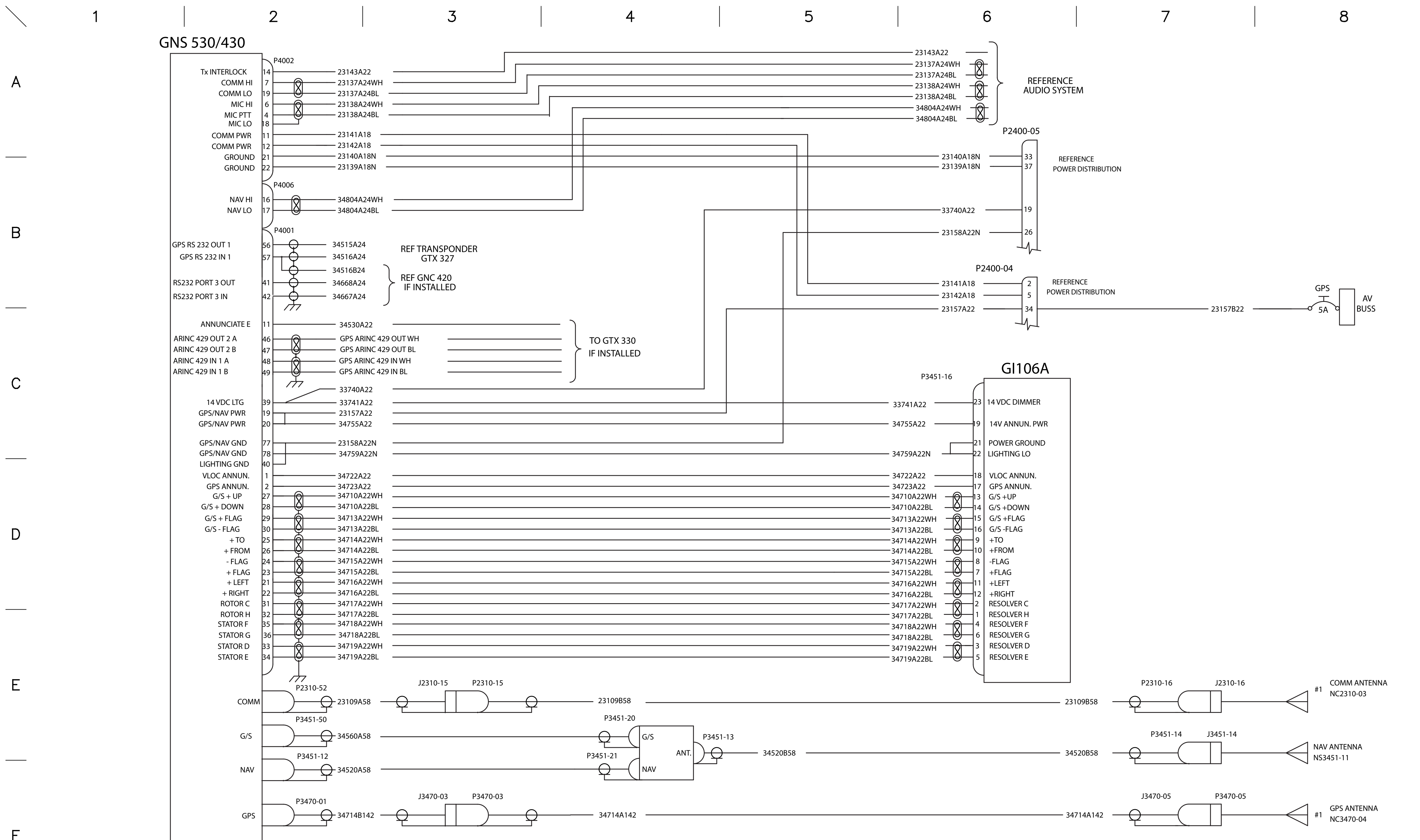
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC G500 AVIONICS WITH GTN 650 AND GTR 225	SCHEMATIC 22-9231-00-01	PAGE 3/5



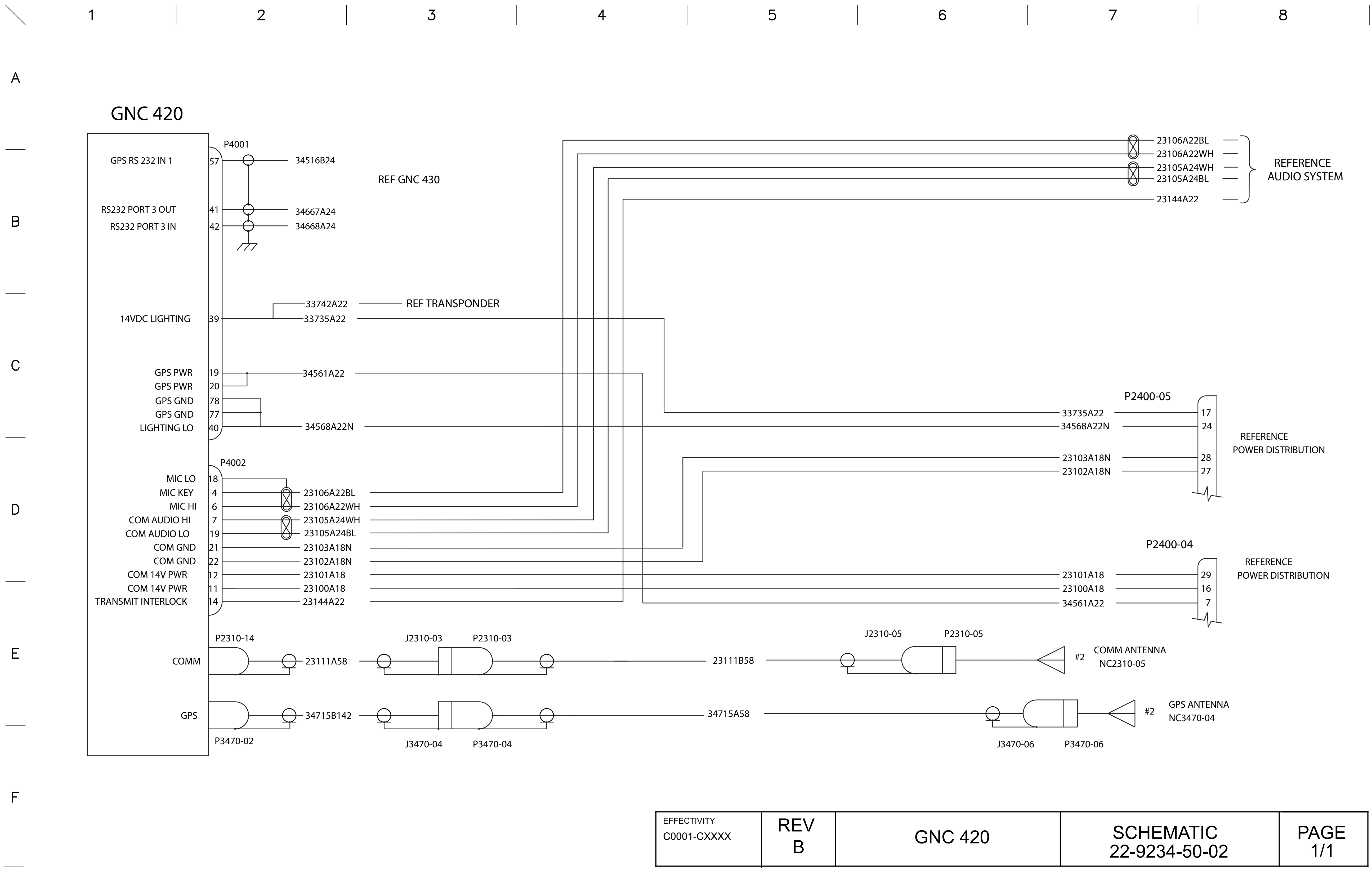
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC G500 AVIONICS WITH GTN 650 AND GTR 225	SCHEMATIC 22-9231-00-01	PAGE 4/5



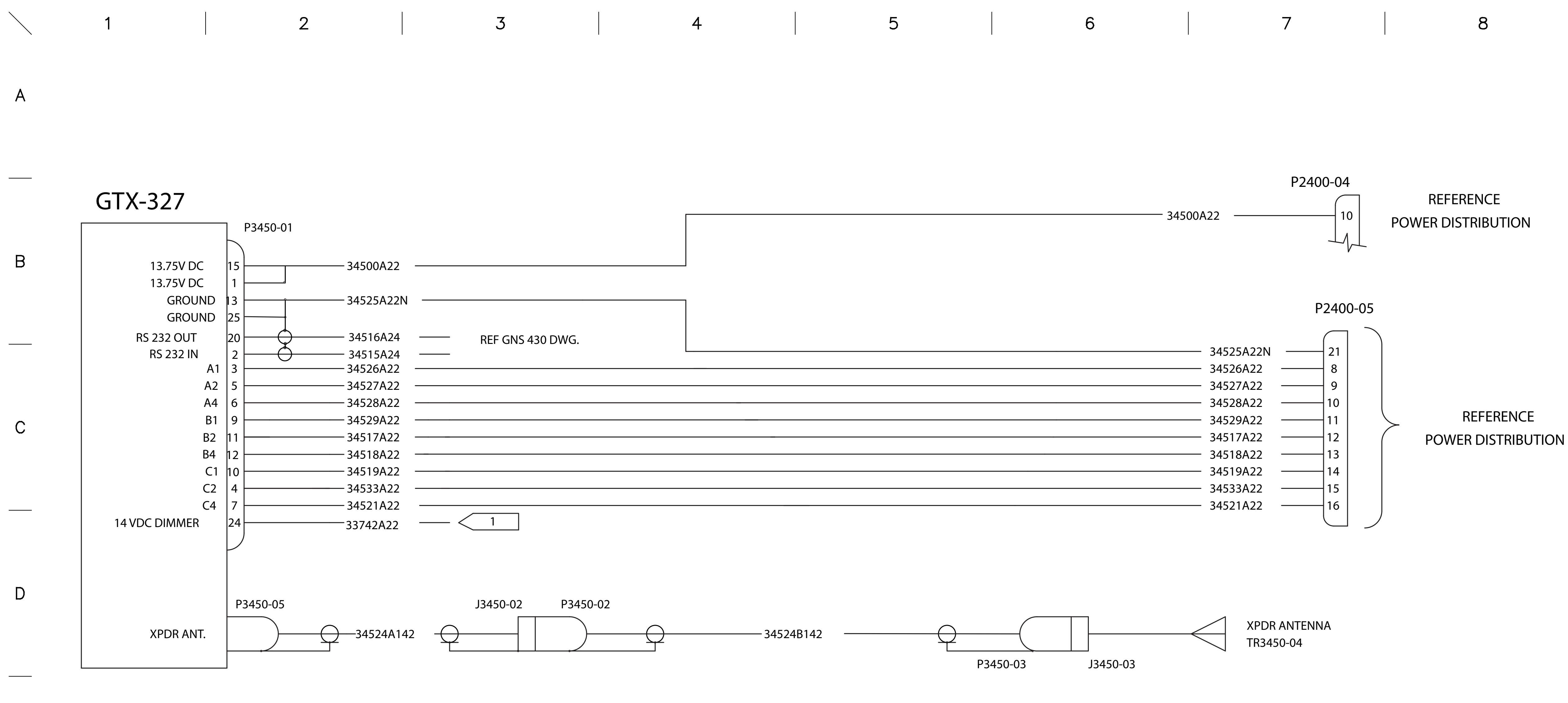
EFFECTIVITY C0001-CXXXX	REV A	SCHEMATIC G500 AVIONICS WITH GTN 650 AND GTR 225	SCHEMATIC 22-9231-00-01	PAGE 5/5



EFFECTIVITY	REV			
C0001-CXXXX	E	GNS 530 / 430	SCHEMATIC 22-9234-50-01	PAGE 1/1



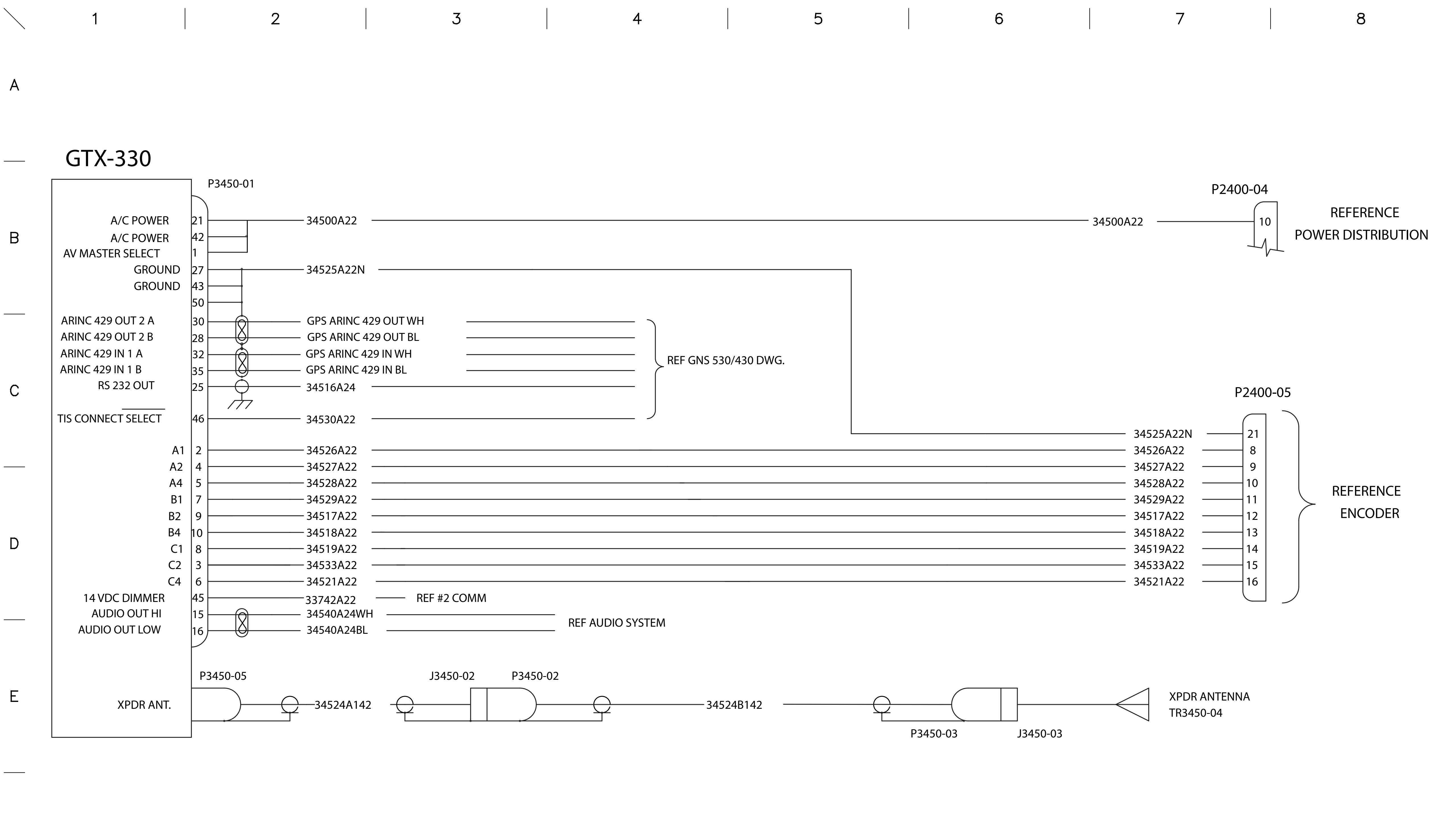
EFFECTIVITY C0001-CXXXX	REV B	GNC 420	SCHEMATIC 22-9234-50-02	PAGE 1/1



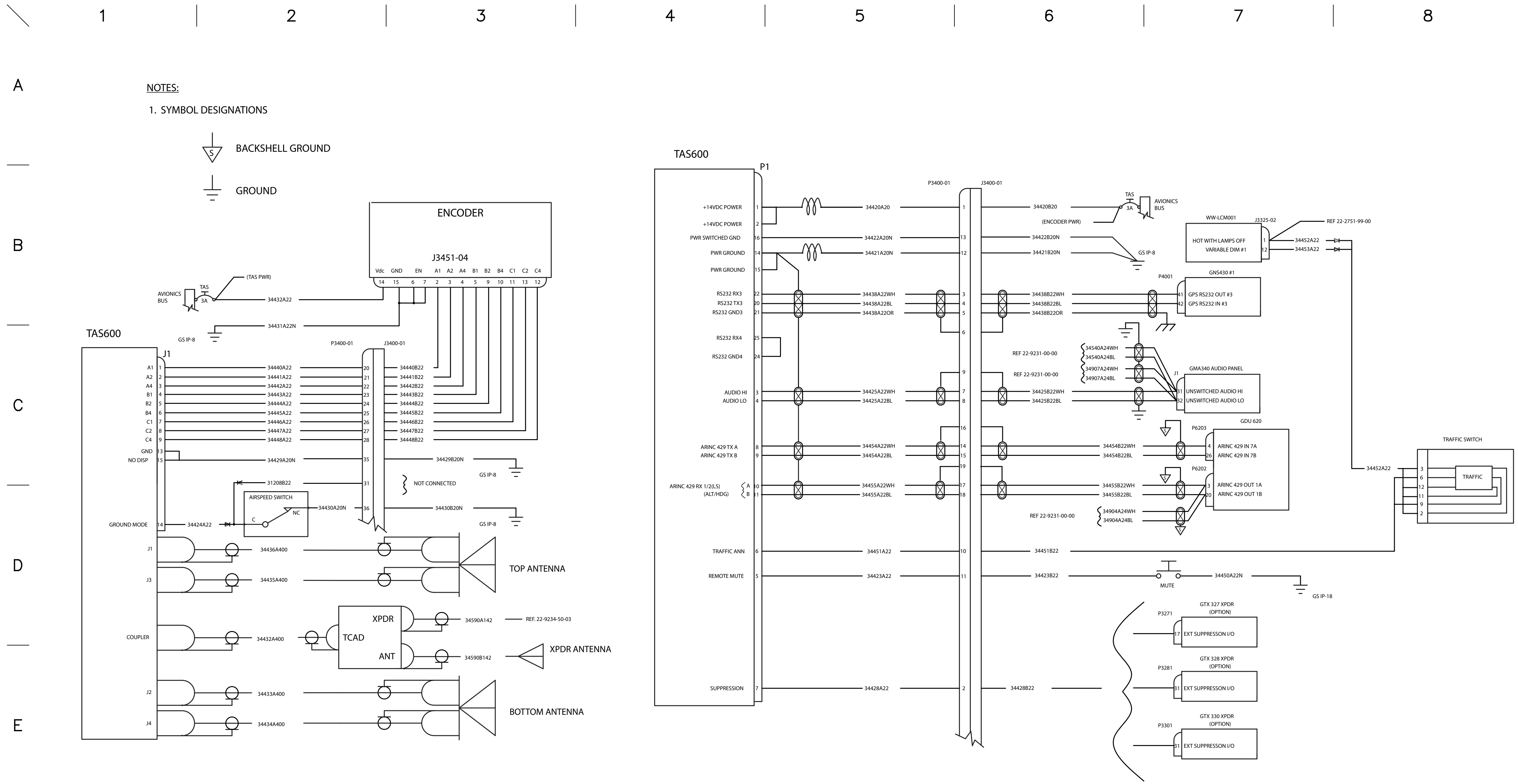
NOTES:

1 REF GNC 420 DRAWING OR IF NOT INSTALLED ROUTE WIRE TO P2400-05 PIN 17.

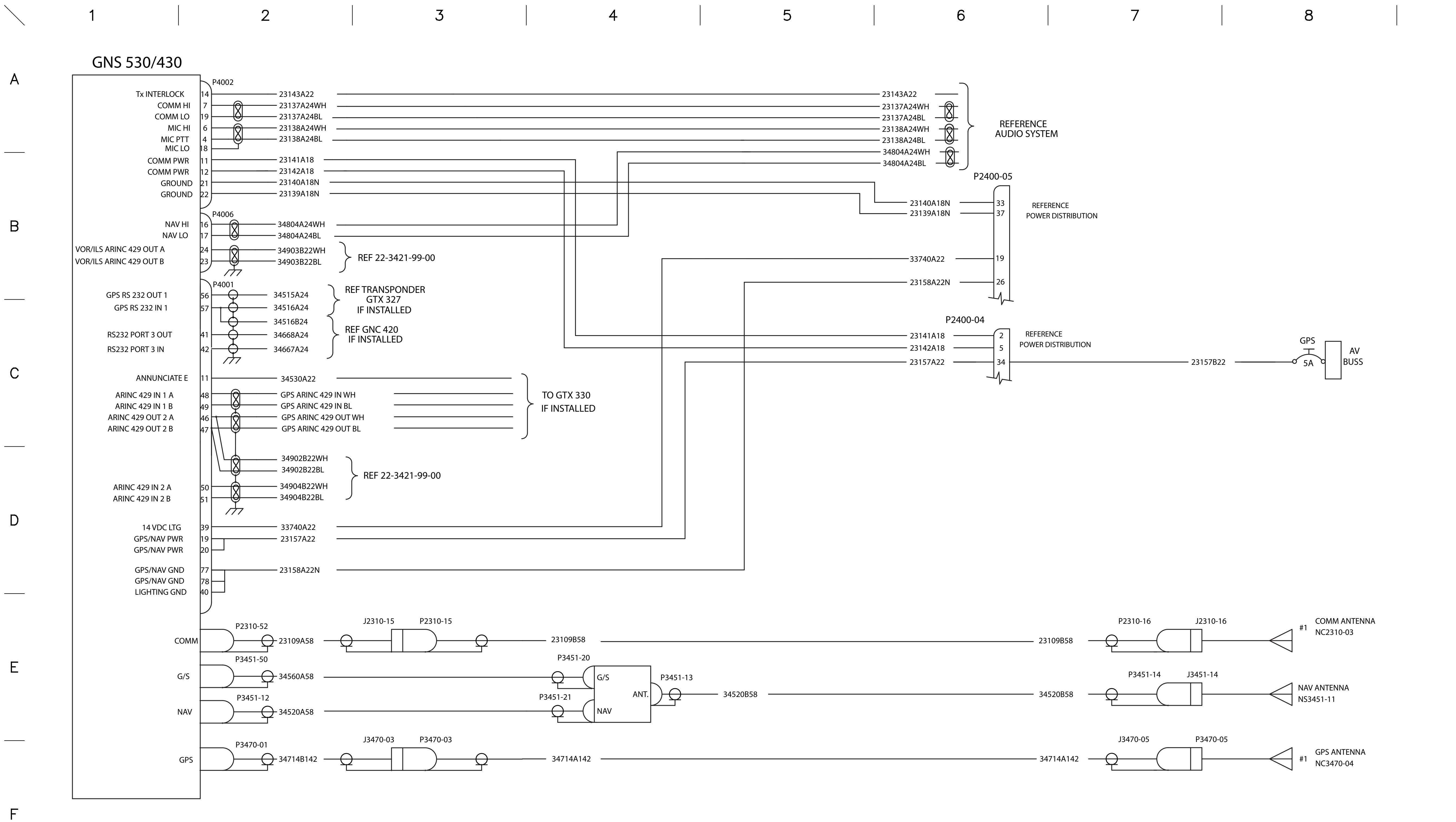
EFFECTIVITY	REV		SCHEMATIC	PAGE
C0001-CXXXX	D	GTX-327	22-9234-50-03	1/1



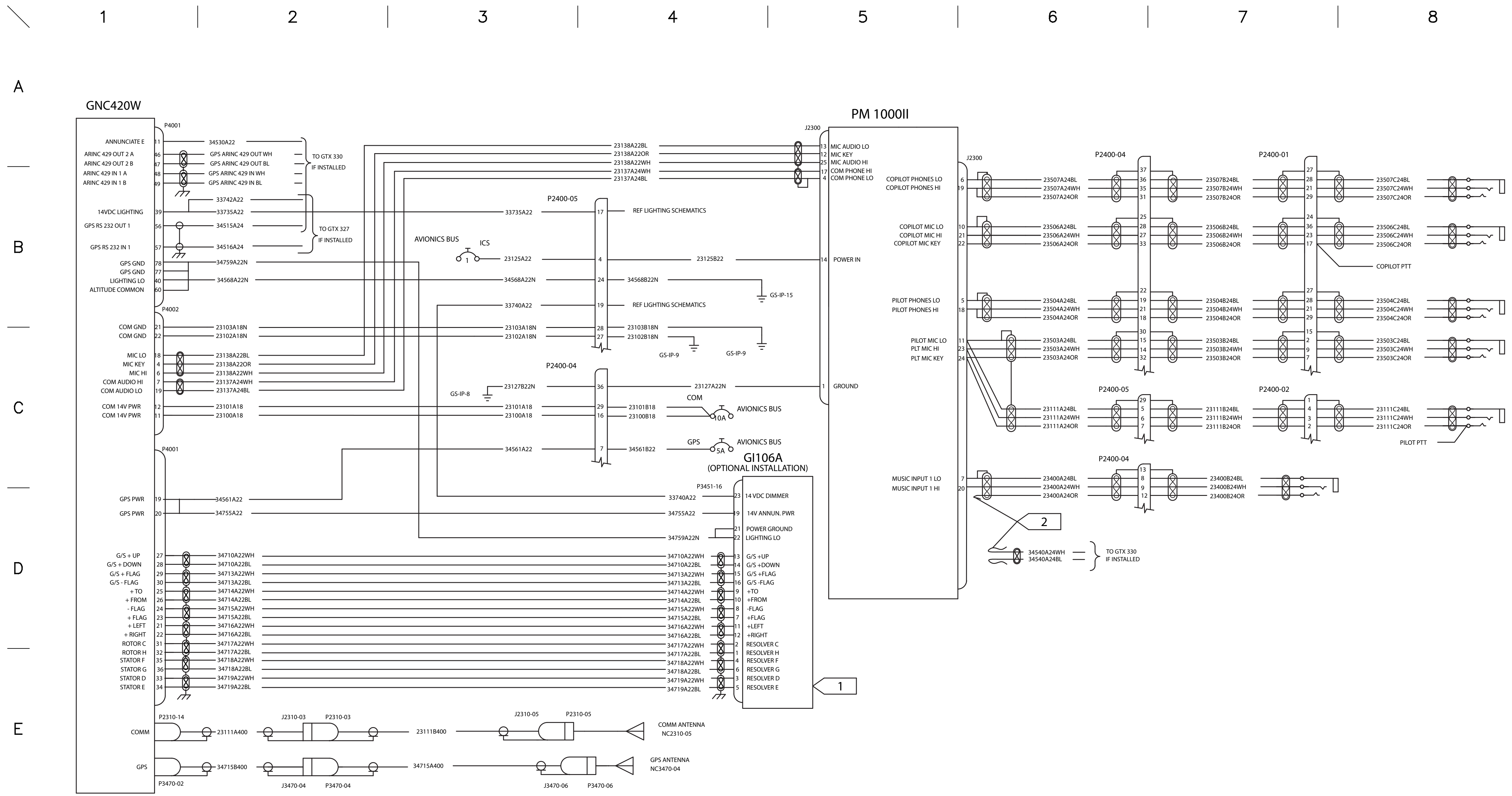
EFFECTIVITY C0001-CXXXX	REV A	GTX-330	SCHEMATIC 22-9234-50-04	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV B	TAS600 OPTION G500 SYSTEM	SCHEMATIC 22-9234-50-06X01	PAGE 1/1



EFFECTIVITY C0001-CXXXX	REV B	GNS 530 / 430, ASPEN FIXED PROVISIONS	SCHEMATIC 22-9234-50-07	PAGE 1/1



NOTES:

1. WIRES ARE CAPPED AND STOWED IF NOT INSTALLED.

2. WIRES ARE CAPPED AND STOWED.

EFFECTIVITY C0001-CXXXX	REV B	GNC420W_PM1000	SCHEMATIC 22-9234-50-08	PAGE 1/1