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MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

TEMPORARY REVISION NO. 105

TO HOLDERS OF GAS TURBINE ENGINE MAINTENANCE MANUAL 350.2, REVISION 3, DATED 1 SEP 2008.

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
105	72-50-01, 203
	72-50-01, 205/206

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
104	71-00-00, 8
	72-00-00, 630

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
103	72-50-03, 206
	72-50-03, 212

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
102	72-00-00, 704

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TEMPORARY REVISION NO. 101

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
101	75-30-01, 206

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
99	80-00-04, 421

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
100	73-20-01, 211

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
95	72-00-00, 630
	72-60-01, 203
	72-60-01, 206
	73-20-01, 201
	73-20-01, 211

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
98	80-00-04, 414

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THIS TEMPORARY REVISION REPLACES TR 85.

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
96	72-00-00, 630

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THIS TEMPORARY REVISION REPLACES TR 92.

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
97	72-50-02, 201
	72-50-02, 204
	72-50-04, 206
	72-50-04, 207

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
94	72-00-00, 610
	72-00-00, 613
	75-30-03, 201

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
93	80-00-04, 406

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Temporary Revision Number	Applicable Chapter/Section/Subject Number, Page Number
91	70-00-00, 1/2

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88	72-40-07, 201
	72-40-07, 202

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89	72-51-01, 201
	72-51-01, 202

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87	72-00-00, 207
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THE ATTACHED MAINTENANCE MANUAL, ATA NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008, IS ISSUED FOR USE IN SUPPORT OF THE FOLLOWING AIRCRAFT.

ENGINE PART NO.	ENGINE MODEL NO.	APPLICATION
1-000-060-17	T53-L-13B SER NO. SUFF A	AB-205
1-000-060-22	T53-L-13B SER NO. SUFF B	

REVISION NO. 3 DATED SEPTEMBER 1, 2008

This is a COMPLETE revision. The pages revised are listed below together with the Highlights of the revision. Due to the extent of the changes, this publication has been reprinted in its entirety. Please discard the entire manual of previous issue(s) and replace with this complete manual.

HIGHLIGHTS

SUBJECT/PAGE	DESCRIPTION OF CHANGE
350.2	Updated headers and footers throughout the document.
Title Page	
Pages T-1 thru T-3/T-4	Updated to reflect current revision. Added Honeywell Materials License Agreement and Safety Advisory information.
List of Effective Pages	
Page LEP-1/LEP-2	Updated to reflect current revision.
Record of Revisions	
Page RR-1/RR-2	Updated to reflect current revision.
Record of Temporary Revisions	
Pages TR-1 thru TR-8	Added TRs 71 thru 75.
71-00-00 Page 5	Added Paragraph 3.C. per TR 72.
71-00-00 Page 13	Revised Paragraph 11.E.(1).
71-00-00 Page 14	Added Note preceding Paragraph 11.E.(2) per TR71 R1.
71-00-00 Page 28 thru 41	Replaced Engine Shutdown Procedure with VXP Vibe Procedures.
72-00-00 Page 117	Added Trouble Shooting procedure per TR 74.
72-00-00 Page 122 thru 123/124	Added Paragraph E. per TR 75.
72-00-00 Page 207	Added LTCT 31126-0501 Puller to Table 202.
72-00-00 Page 215	Added specification to item 59B in Table 203.
72-40-00 Page 201	Revised Paragraph 1.A.(11).
72-40-00 Page 213	Revised Paragraph 1.B.(21).
72-50-03 Pages 201 thru 212	Replaced entire section.
72-51-00 Pages 206 and 208	Revised Paragraph 1.A.(31). Added Paragraph 1.A.(32) and resequenced subsequent paragraphs.

HIGHLIGHTS (Cont)

SUBJECT/PAGE	DESCRIPTION OF CHANGE
72-60-01 Page 206	Revised note subsequent to Paragraph 2.D.(2).
73-20-01 Page 203	Revised Paragraph 2.B.(1)(d).
75-30-03 Page 201	Revised note subsequent to Paragraph 1 per TR 73.

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MAINTENANCE MANUAL

GAS TURBINE ENGINE

MODEL NO.

T53-L-13B
T53-L-13B SER. NO. SUFF A
T53-L-13B SER. NO. SUFF B

PART NO.

1-000-060-17
1-000-060-22

MARCH 31, 1990
REVISION 3, SEPTEMBER 1, 2008

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LIST OF EFFECTIVE PAGES

RECORD OF REVISIONS

REV NO.	ISSUE DATE	DATE INSERTED	BY	REV NO.	ISSUE DATE	DATE INSERTED	BY
Orig	Mar 31/90						
1	Nov 30/98						
2	Oct 31/06						
3	Sep 1/08						

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72	71-00-00 5						3
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74	72-00-00 117						3
75	72-00-00 122, 123/124						3
76		24 Jun 2009	24 Jun 2009	H			
77		4 Feb 2010	4 Feb 2010	H			
78		4 Feb 2010	4 Feb 2010	H	13 Apr 2015	H	Repl. by 85
79		4 Feb 2010	4 Feb 2010	H			
80		1 Oct 2012	1 Oct 2012	H			
81		1 Oct 2012	1 Oct 2012	H			
82		1 Oct 2012	1 Oct 2012	H			
83		1 Oct 2012	1 Oct 2012	H			
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89		27 Dec 2016	27 Dec 2016	H			
90		6 Mar 2017	6 Mar 2017	H			
91		6 Jun 2017	6 Jun 2017	H			
92		9 Jan 2018	9 Jan 2018	H	10 Sep 2018	H	Repl by TR 97
93		8 Jun 2018	8 Jun 2018	H			
94		25 Jun 2018	25 Jun 2018	H			
95		25 Jan 2019	25 Jan 2019	H			
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100		21 Feb 2019	21 Feb 2019	H			
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105		26 May 2020	26 May 2020	H			

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SERVICE BULLETIN LIST

NOTE: A date listed in the “Incorp.” column is the latest date this report was revised to include changes to text/illustrations caused by the Service Bulletin or its revision. When the words “No Effect” are listed, the Service Bulletin caused no changes within this report.

SERVICE BULLETIN	INCORP.	SERVICE BULLETIN	INCORP.
T53-L-13B-0001, Rev 14	No Effect	T53-L-13B-0052, Rev 2	Inactive
0003, Rev 5	No Effect	0053, Rev 2	Apr 1/85
T53-L-13B-0004	Cancelled	0054, Rev 1	No Effect
T53-L-13B-0005	Cancelled	0055	No Effect
0012, Rev 1	No Effect	T53-L-13B-0056, Rev 2	No Effect
T53-L-13B-0015	Cancelled	0057	No Effect
0016, Rev 1	Mar 15/83	53-0058	Feb 28/97
T53-L-13B-0017	Cancelled	T53-L-13B-0060	No Effect
0019, Rev 1	Cancelled	T53-L-13B-0061	No Effect
T53-L-13B-0020, Rev 3	No Effect	T53-L-13B-0062, Rev 1	No Effect
0023	No Effect	T53-L-13B-0063, Rev 2	No Effect
T53-L-13B-0024, Rev 2	No Effect	T53-L-13B-0064	No Effect
0025, Rev 2	Cancelled	T53-L-13B-0066, Rev 1	No Effect
0026	No Effect	T53-L-13B-0071	No Effect
0027, Rev 1	Cancelled	T53-L-13B-0072, Rev 1	No Effect
0028, Rev 3	Aug 1/81	T53-L-13B-0073, Rev 2	No Effect
0029	No Effect	T53-L-13B SERIES 0079, Rev 1	Inactive
0030, Rev 1	No Effect	T53-L-13B-0082, Rev 1	No Effect
0031	No Effect	T53-L-13B-0086, Rev 1	No Effect
0032	No Effect	T53-L-13B-A0092, Rev 1	No Effect
0036, Rev 1	No Effect	T53-L-13B-0093, Rev 2	Oct 31/06
A0040	No Effect	T53-L-13B-0094, Rev 1	Oct 31/06
0041	No Effect	T53-L-13B-0096, Rev 1	No Effect
0042	No Effect	T53-L-13B-0097	Oct 31/06
0043, Rev 1	No Effect	T53-0098	Oct 31/06
0044	No Effect	T53-L-13B-0099, Rev 1	Oct 31/06
0045, Rev 1	No Effect	T53-L-13B-0100, Rev 2	No Effect
0046, Rev 1	Feb 1/85	T53-L-13B-0102, Rev 2	Inactive
0049	No Effect	T53-L-13B-0103, Rev 4	No Effect
0050	No Effect	T53-L-13B-0104	No Effect
0051	No Effect	T53-L-13B-0105, Rev 1	Oct 31/06

SERVICE BULLETIN	INCORP.	SERVICE BULLETIN	INCORP.
T53-L-13B-0108, Rev 1	No Effect		
T53-L-13B-0110, Rev 1	Oct 31/06		
T53-L-13B-0113, Rev 1	No Effect		
T53-L-13B-0119, Rev 1	No Effect		
T53-L-13B-0120, Rev 1	Oct 31/06		
T53-L-13B-A0121	No Effect		
T53-L-13B-0123	No Effect		
T53-L-13B-0124	No Effect		
T53-L-13B-0125	No Effect		
T53-L-13B-0126	No Effect		
T53-L-13B-0127	No Effect		
T53-L-13B-0128	No Effect		
T53-0129	No Effect		
T53-L-13B-0130	No Effect		
T53-L-13B-0132	No Effect		
T53-L-13B-0133, Rev 1	No Effect		
T53-0135, Rev 1	No Effect		
T53-0136	Oct 31/06		
T53-0138, Rev 1	No Effect		
T53-0139, Rev 1	Inactive		
T53-0141	No Effect		
T53-A0142	No Effect		

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LIST OF CHAPTER/SECTION/SUBJECTS

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INTRODUCTION

1. General

A. This manual provides maintenance instructions for support of T53-L-13B/A and T53-L-13B/B gas turbine engines, designed and manufactured by Honeywell Aerospace, 111 S. 34th Street, P.O. Box 52181, Phoenix, AZ 85072-2181.

B. This manual, as it may be supplemented by Honeywell Service Bulletins, constitutes the authoritative statement of Honeywell Aerospace approved and recommended maintenance procedures for T53-L-13B/A and T53-L-13B/B gas turbine engines.

C. Unusual problems concerning engine maintenance should be presented to the Customer Support Department either through its field service representatives or by direct contact. All possible assistance will be provided toward solution of these problems.

D. Requests for information not presently covered by this publication and suggestions for modification or amplification of these instructions so as to increase their usefulness are welcomed by Honeywell.

Honeywell Aerospace
111 S. 34th
P.O. Box 52181
Phoenix, AZ 85072-2181

Attn: T53 Customer Support Engineer

E. Honeywell has a continuing program to develop repair procedures, refine assembly and test techniques, etc, which will be issued as regular revisions to the manual. Data of a more urgent nature is supplied by Temporary Revisions and keyed to the appropriate sections of the manual. Significant engine modifications are covered by issuance of Service Bulletins.

2. How to Use Maintenance Manual

A. General

In accordance with Air Transport Association Specification No. 100, the manual is divided into chapters, sections and subjects by a numbering system which consists of a three element number separated by dashes.

First and second digits - System/Chapter (Assigned by specification)

Third and fourth digits - Sub-System/Section (Assigned by specification)

Fifth and sixth digits - Unit/Subject (Assigned by manufacturer)

The following example illustrates and describes use of each element of the number.

Typical Chapter - Section - Subject Number - 73-10-06

72- This number designates a major system. Chapter 72 is Engine.

-10- This number designates a section or sub–system breakdown of material in Chapter 72.
In this example: Compressor Section.

-06 This number designates a specific component or unit of a section. In this case, -06 represents Compressor Assembly - Removal/Installation.

The complexity and volume of material contained in the maintenance manual dictates the need for breaking the subjects within manual chapters down into reasonably small topics for ready reference and ease of revision.

To accomplish this, page number blocks are used to separate subjects into topics. It is necessary to use a standard page block system so that topics may be broken out for special distribution. Page number blocks used are as follows:

Description and Operation	1 through 100
Trouble Shooting	101 through 200
Maintenance Practices	201 through 300
Servicing	301 through 400
Removal/Installation	401 through 500
Adjustment/Test	501 through 600
Inspection/Check	601 through 700
Cleaning/Painting	701 through 800
Approved Repairs	801 through 900

In case of relatively simple components, coverage for description, operation and other topics may not be required. In such cases the unused page number blocks are omitted.

When topics are brief they are combined into one topic entitled, for example, Fuel System Installation - Maintenance Practices. Topics covered in this manual are page numbered within the 201 through 300 page number blocks. Maintenance Practices consists of a combination of the following topics: Servicing, Removal/Installation, Adjustment/Test, Inspection/Check, Cleaning/Painting and Approved Repairs.

Maintenance procedures for components and systems are located in various chapters and sections within the manual as outlined in the following list.

(See Air Association Specification No. 100 for a complete listing of all Chapter/Section numbers.) Transportation

Chapter 70 - Standard Practices

Chapter 72 - Engine

72-01-00 Engine Components
72-10-00 Reduction Gear and Shaft Section
72-30-00 Compressor Section
72-40-00 Combustion Section
72-50-00 Turbine Section
72-60-00 Accessory Drive Section

Chapter 73 - Engine Fuel and Control

73-00-00 General
73-10-00 Distribution
73-20-00 Controlling

Chapter 74 - Ignition

74-00-00 General
74-10-00 Electrical Power Supply
74-20-00 Distribution
74-30-00 Switching

Chapter 75 - Air

75-00-00 General
75-10-00 Engine Anti–Ice

Chapter 76 - Engine Controls

76-00-00 General
76-10-00 Power Control

Chapter 77 - Engine Indicating

77-00-00 General
77-10-00 Power
77-20-00 Temperature

Chapter 79 - Oil

79-00-00 General
79-10-00 Storage
79-20-00 Distribution
79-30-00 Indicating

Chapter 80 – Heavy Maintenance

80-00-00 Heavy Maintenance
80-00-01 Inlet Housing and Variable Inlet Guide Vanes (VIGV)
80-00-02 Compressor Rotor Assembly
80-00-03 Diffuser Housing Assembly
80-00-04 Final Engine Assembly

Index tab sheets are used to subdivide this publication for ease in locating specific information. Yellow tab sheets are used to index the introduction and each separate chapter. White tab sheets are used to subdivide Chapter 72. Blue tab sheets are used for Addendum's. A table of contents follows each yellow and white tab to list significant material and location within the tabbed section.

3. Logbook Use

A. A logbook is packaged with each engine and is issued to provide a document for recording maintenance actions, operating time, and cycles, and to provide immediate summary of operating history. Instructions for using the logbooks are located on the first page.

4. Warnings, Cautions, and Notes

A. Warnings, cautions, and notes are found throughout the manual. Warnings and cautions precede the text to which each applies. Notes follow the text to which it applies. Conditions for use are as follows:

WARNING: TO HIGHLIGHT PROCEDURES, ETC, WHICH SHOULD RESULT IN PERSONAL INJURY, OR LOSS OF LIFE, IF NOT CORRECTLY FOLLOWED.

CAUTION: TO HIGHLIGHT PROCEDURES, PRACTICES, ETC, WHICH IF NOT STRICTLY OBSERVED, WILL RESULT IN DAMAGE TO, OR DESTRUCTION OF EQUIPMENT.

NOTE: To highlight essential procedure, conditions, information, etc.

5. Supplementary Publications for T53-L-13B/A and T53-L-13B/B Gas Turbine Engines

A. Engine Overhaul Manual (Honeywell No. 350.3)

B. Illustrated Parts Catalog (Honeywell No. 350.4)

C. Service Bulletin. Service Bulletins are issued as required to provide information or instructions for special inspections or modifying engines or parts. Service Bulletins applicable to the engine models covered by this manual are reflected in the “List of Service Bulletins” in the front of this manual.

D. Service Letters. Service Letters are issued as required to advise operators of changes to maintenance procedures or to highlight information which will enhance engine maintenance or operation.

6. Parts and Service

A. Refer to Illustrated Parts Catalog (Honeywell No. 350.4), Introduction, for information on ordering of parts.

7. Abbreviations

A. The use of abbreviations has been avoided as much as possible. In some instances however, such considerations as space limitations, common usage, etc, have made the use of abbreviations preferable to the use of longer terms (see Tables 1 and 2). Abbreviations used are defined as follows:

Table 1. General Abbreviations

Abbreviations	Definition
AC	Alternating Current
AMS	Aerospace Material Specification
ATA	Air Transport Association
CMM	Component Maintenance Manual
DC	Direct Current
Dia	Diameter
Fig.	Figure
FOD	Foreign Object Damage
ID	Inside Diameter
INSP	Inspection
Max.	Maximum
Min.	Minimum
OD	Outside Diameter
PARA	Paragraph
Ref	Reference
RPM	Revolutions per Minute
SP	Standard Practices
SPM	Standard Practices Manual
Typ	Typical
TIR	Total Indicated Runout

Table 2. Weights and Measure Abbreviations (U.S. Customary System and S.I.)

Abbreviations	Definition
ft	Foot
in.	Inch
phr	Pounds per Hour
psia	Pounds per Square Inch Absolute
psig	Pounds per Square Inch Gage
psid	Pounds per Square Inch Differential
°C	Degrees Centigrade
°F	Degrees Fahrenheit
m	Meter
mm	Millimeter
cm	Centimeter
kg/h	Kilograms per Hour
kPa	Kilopascal
Nm	Newton Meter

STANDARD PRACTICES

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TEMPORARY REVISION NO. 91

INSERT PAGE 2 OF 2 FACING 70-00-00, PAGE 1/2.

Reason: To change Standard Practices Manual, Report No. 286.2 to Standard Practices Manual Report No. 70-00-02 in paragraph for Standard Practices.

Paragraph is changed as follows:

STANDARD PRACTICES

Deleted. Refer to Standard Practice Manual, Report No. 70-00-02.

STANDARD PRACTICES

Deleted. Refer to Standard Practices Manual, Report No. 286.2.

POWER PLANT

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	43	Sep 1/08
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POWER PLANT - GENERAL

1. General

This chapter contains instructions for normal maintenance ground operation of engine installed in aircraft. Also included are fuel data, pre-operational engine inspection requirements, engine operation and limits data, operational checks, and extreme weather precautions.

2. Fuel Requirements

A. Specified Fuels

WARNING: WHEN USING KEROSENE FUELS (JP-5 OR JP-8), RESTARTING ENGINE DURING FLIGHT IS POSSIBLE UP TO AN ALTITUDE OF 8000 FEET MAXIMUM. USE OF THESE FUELS SHOULD BE AVOIDED WHEN STARTING AT AMBIENT TEMPERATURES BELOW 10°F (-12°C).

NOTE: There are no special restrictions or instructions for use of JP-4 fuels, with the exception of restarting engine during flight being limited to altitudes up to 20,000 feet maximum.

The fuels specified for use in these engines conform to Military Specification MIL-DTL-5624 and are either wide-cut type fuels, Grade JP-4, or kerosene type fuels, Grade JP-5. Equivalent fuels, MIL-DTL-83133, Grade JP-8, may be used. (See Step B.)

B. Acceptable Wide Cut and Kerosene Type Engine Fuels and Freezing Points

(1) All engine fuels listed are fully approved for flight operation. In cases where fuels approved by Honeywell Aerospace are not available and other fuels must be substituted, consult with.

Customer Service & Product Support
Honeywell Aerospace
111 S. 34th Street
P.O. Box 52181
Phoenix, AZ 85072-2181

Attention: T53 Customer Support Engineer

NOTE: Variations in wide cut fuel quality or the use of kerosene type fuels can increase the rate of carbon deposit on hot end parts, especially during long periods of steady state operation. Accumulation of deposits can be minimized by changing power levels periodically during operation.

(2) Wide cut type equivalent fuels. The following wide cut fuels may be used.

(a) Commercial wide cut type fuels, freezing point -56°F (-49°C).

CAUTION: COMMERCIAL FUELS ARE COMMONLY MADE TO CONFORM TO AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATION D 1655. ASTM SPECIFICATION FUEL DOES NOT CONTAIN ANTI-ICING ADDITIVES UNLESS SPECIFIED BY BULK PURCHASER. THEREFORE, MORE CARE THAN USUAL MUST BE TAKEN WITH RESPECT TO WATER CONTAMINATION AND FLIGHT CONDITIONS WHEN ACCEPTING SUCH A FUEL.

ASTM Specification	D 1655 Type B
American	American JP-4
Arco	Arcojet B
B.P. Trading	BP A.T.G.
Cal-Tex	Caltex Jet B
Chevron	Chevron B
Continental	Conoco JP-4
Exxon	Exxon Turbo Fuel B
Gulf	Gulf Jet B
Mobil	Mobil Jet B
Phillips	Philjet JP-4
Shell	Aeroshell JP-4
Texaco	Texaco Avjet B
Union	Union JP-4

(b) Military wide cut type fuels, freezing point -72°F (-58°C).

NATO	F-40
Belgium	BA-PF-2B
Britain	D. Eng. R.D. 2486
Canada	3-GP-22f
Denmark	MIL-DTL-5624, GR JP-4
Federal Republic of Germany	VTL 9130-006
France	AIR 3407/A
Greece	MIL-DTL-5624, GR JP-4
Italy	AA-M-C-1421
Netherlands	MIL-DTL-5624, GR JP-4
Norway	MIL-DTL-5624, GR JP-4
Portugal	MIL-DTL-5624, GR JP-4
Turkey	MIL-DTL-5624, GR JP-4
United Kingdom	D. Eng. R.D. 2454
United States	MIL-DTL-5624, GR JP-4

(3) Kerosene type equivalent fuels. The following kerosene type fuels may be used.

(a) Commercial kerosene type fuels, freezing point -38°F (-36°C).

CAUTION: COMMERCIAL FUELS ARE COMMONLY MADE TO CONFORM TO AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) SPECIFICATION D 1655. ASTM SPECIFICATION FUEL DOES NOT CONTAIN ANTI-ICING ADDITIVES UNLESS SPECIFIED BY BULK PURCHASER. THEREFORE, MORE CARE THAN USUAL MUST BE TAKEN WITH RESPECT TO WATER CONTAMINATION AND FLIGHT CONDITIONS WHEN ACCEPTING SUCH A FUEL.

ASTM Specification	D 1655 Type A
American	American Jet Fuel Type A
Arco	Arcojet A
British American	B-A Jet Fuel JP-4
Chevron	Chevron A-50
Cities Service	Citgo A
Continental	Conoco Jet 50
Exxon	Exxon A
Gulf	Gulf Jet A
Mobil	Mobil Jet A
Phillips	Phi1jet A-50
Pure	Purejet Turbine Fuel Type A
Shell	Aeroshell Turbine Fuel 640
Standard	Jet A Kerosene
Texaco	Texaco Avjet A
Union	76 Turbine Fuel

(b) Commercial kerosene type fuels, freezing point -55°F (-48°C).

ASTM Specification	D 1655 Type A-1
Arco	Arcojet A-1
BP Trading	BP A.T.K.
Cal-Tex	Caltex Jet A-1
Chevron	Chevron A-1
Continental	Conoco Jet-60
Exxon	Exxon A-1
Gulf	Gulf Jet A-1
Mobil	Mobil Jet A-1
Pure	Purejet Turbine Fuel Type A-1
Shell	Aeroshell Turbine Fuel 650
Sinclair	Super Jet A-1
Standard	Jet A-1 Kerosene
Texaco	Avjet A-1
Union	76 Turbine Fuel

(c) Military kerosene type fuels, freezing point -40°F (-40°C).

NATO	F-42
France	Air 3404

(d) Military kerosene type fuels, freezing point -58°F (-50°C).

NATO	F-34
Denmark	D. Eng. R.D. 2453
France	Air 3405/B
United Kingdom	D. Eng. R.D. 2453
NATO	F-35
Federal Republic of Germany	D. Eng. R.D. 2494
United Kingdom	D. Eng. R.D. 2494

(e) Military kerosene type fuels, freezing point -51°F (-46°C).

NATO	F-44
Australia	DEF 207
Belgium	BA-PF-6
Canada	3-GP-24
Federal Republic of Germany	D. Eng. R.D. 2452
Italy	AER-M-C-143
Netherlands	D. Eng. R.D. 2498
United Kingdom	D. Eng. R.D. 2498
United States	MIL-DTL-5624, GR JP-5

C. Fuel Additives

(1) The following additives, singly or in any combination, additional to those included in the fuel specification, are approved subject to limitation stated.

NOTE: The following additives should not be added to fuel MIL-DTL-5624, Grades JP-4, JP-5, or MIL-DTL-83133 JP-8 since they are already present in these fuels.

(2) Anti-Corrosion Additive (DERD2461 and APL2461). Additive may be added in quantities not exceeding 4.0 pound per 1000 barrels and phosphorus content of 0.006 parts per million.

CAUTION: ANTI-ICING ADDITIVE IS REQUIRED AT AMBIENT TEMPERATURE OF 32°F (0°C).

NOTE: Biocidal additive (methyl cellosolve) should not be added in combination with anti-icing additive.

(3) Anti-Icing and Biocidal Additives (D. Eng. R.D. 2451). Additive (MIL-I-27696 or any direct equivalent) may be added in concentrations not exceeding 0.15 percent by volume.

(4) Biocidal Additive (Methyl Cellosolve). Additive may be added to fuel in concentrations of 0.15 to 0.25 percent by volume. The lower concentrations being used on a continuous usage or intermittent basis to prevent contamination and the higher concentrations are intended to be used for shock treatment.

CAUTION: MAKE SURE THAT BIOBOR JF IS THE ONLY BIOBOR PRODUCT USED.

(5) Biocidal Additive (Biobor JF). Additive may be used for shock treatment at a concentration not exceeding 270 parts per million (ppm) (20 ppm Boron) or preventive treatment at a concentration of 135 ppm (10 ppm Boron).

(6) Anti-Static Additive (Shell or Royal Lubricants A.S.A.D. Additive may be added to fuel in concentrations as required to bring conductivity within 200 to 600 pico siemens per meter at point and time of delivery into the aircraft as measured with a conductivity meter.

3. Lubricating Oil Requirements

The engine lubrication system oils specified for use in these engines conform to or are similar to Military Specifications MIL-PRF-7808 or MIL-PRF-23699. The oils listed in the following paragraphs are approved for engine flight operation.

A. The following oils are Type I (MIL-PRF-7808) and are satisfactory for engine starting at ambient temperatures down to -65°F (-54°C).

BP Turbo Oil 2389
Brayco 880H
Exxon 2389
Mobil Jet 184A/201A
Royco 808GF
Stauffer Jet I

B. The following oils are Type II (MIL-PRF-23699) and are satisfactory for engine starting at ambient temperatures down to -40°F (-40°C).

BP Turbo Oil 2380
Castrol 205
Exxon 2380
Mobil Jet Oil II
Shell 500
Stauffer Jet II

C. Oil Consumption Limits

Maximum oil consumption of 0.14 U.S. gal/hour.

NOTE: When oils approved by Honeywell Aerospace are not available and other oils must be substituted, consult with.

Customer Service & Product Support
Honeywell Aerospace
111 S. 34th Street
P.O. Box 52181
Phoenix, AZ 85072-2181

Attention: T53 Customer Support Engineer

4. Engine Inspection Before Operation

A. Remove inlet and exhaust protective covers from engine.

B. Inspect engine and inlet areas for foreign objects.

NOTE: Perform necessary abnormal weather maintenance.

C. Inspect tailpipe for presence of fuel, oil, or foreign objects.

D. Check that aircraft fuel and oil tanks are filled to proper level.

E. Visually inspect engine for leaks.

F. Check chip detector for presence of foreign material.

NOTE: Throttle and rotor RPM selector lever should move freely between stops and through the full arc.

G. Check cockpit engine controls for freedom of movement.

WARNING: THE DANGER AREAS AROUND THE AIRCRAFT MUST BE CLEAR OF PERSONNEL BEFORE ENGINE IS STARTED. THE HIGH TEMPERATURE AND VELOCITY OF THE EXHAUST ARE EXTREMELY DANGEROUS. MAKE SURE OTHER AIRCRAFT AND VEHICLES ARE CLEAR OF THESE AREAS.

H. Make sure that all personnel and equipment are well clear of engine air inlet and exhaust areas of engine.

5. Prestart Checks

NOTE: After prestart checks are completed, proceed to engine starting. (Refer to Airframe Flight Manual.)

Perform prestart checks in accordance with instructions in Airframe Manual.

NOTE: The following procedure is not necessary for normal starting.

6. Engine Motoring

A. Motor engine during fuel control unit priming or other operations.

B. Disconnect electrical power input from ignition unit.

C. Connect external power supply to starter.

D. Check that throttle is in OFF position.

WARNING: THE DANGER AREAS AROUND THE AIRCRAFT MUST BE CLEAR OF PERSONNEL, OTHER AIRCRAFT, AND ALL VEHICLES BEFORE ENGINE IS STARTED. THE HIGH TEMPERATURE AND VELOCITY OF EXHAUST ARE EXTREMELY DANGEROUS.

CAUTION: TO PREVENT DAMAGE TO STARTER, DO NOT EXCEED STARTER LIMITATIONS.

E. Motor engine with starter.

NOTE: This procedure is not necessary for normal starting.

7. Fuel Control Priming

Prime fuel control assembly. (See 72-00-00, ENGINE - SERVICING, Paragraph 3.)

8. Engine Starting

Engine shall be started and operated in accordance with instructions in Airframe Flight Manual.

9. Engine Fires

A. Close throttle (N1).

B. Close main fuel valve.

C. Motor engine until fire is extinguished.

WARNING: AVOID INHALATION OF CB FUMES. IF CB CONTACTS SKIN OR EYES, IMMEDIATELY FLUSH WITH RUNNING WATER, THEN WASH THOROUGHLY WITH SOAP AND WATER.

CAUTION: IF CO_2 AGENT WAS APPLIED TO ENGINE AIR INLET WITH ENGINE ROTATING, A HOT END INSPECTION MUST BE PERFORMED.

BROMOCHLOROMETHANE (CB) IS A TOXIC, CORROSIVE AGENT. DILUTION WITH WATER INCREASES ITS CORROSIVE EFFECT ON METALS.

D. If fire persists, extinguish it with suitable fire extinguisher applied to engine air inlet if engine is still rotating, or directly to base of flames if rotation has stopped.

NOTE: If burning in the tailpipe is minor and presents no danger to airframe, it is permissible to allow flames to consume all residual fuel without using fire extinguisher. Danger to aircraft is greater than danger to internal parts of engine.

If fire extinguishing agent Bromochloromethane (CB) was used, immediately purge exposed engine and airframe surfaces with clean, dry air and wash with dry cleaning solvent (72-00-00, 62, Table 203). Clean engine compressor using dry cleaning solvent method. (See SPM, SP C203, 70-00-13.)

If fire extinguishing agent other than CO_2 or Bromochloromethane (CB) was used, remove residue from engine by washing exterior and cleaning compressor using water wash procedure. (See 72-00-00, ENGINE - CLEANING, Paragraph 2.F.)

10. Operating Limits

A. Shaft Torque Versus Torquemeter Pressure

NOTE: Each engine data plate shows value of torquemeter pressure in psi that corresponds to 1125 foot-pounds of torque (T53-L-13B Series).

B. Engine Overtorque Limits

Output shaft torque shall not exceed following values.

NOTE: If limits are exceeded, an engine overtorque inspection must be performed (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.F.)

(1) Takeoff (5 minutes) - 1175 foot-pounds (64 psi)

(2) Maximum (continuous) - 1110 foot-pounds (60 psi)

C. Exhaust Gas Overtemperature Limits

(1) During starts or accelerations, the following EGT limits, must not be exceeded.

(a) 1157 to 1249°F (625 to 676°C) limited duration, 10 seconds.

(b) 1249 to 1400°F (676 to 760°C) limited duration, 5 seconds.

(c) 1400°F (760°C) maximum EGT, do not exceed.

NOTE: If any of the above limits are exceeded, an internal (hot end) inspection must be performed. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.D.)

(2) At takeoff power when EGT exceeds limits indicated in Figure 1.

TEMPORARY REVISION NO. 104

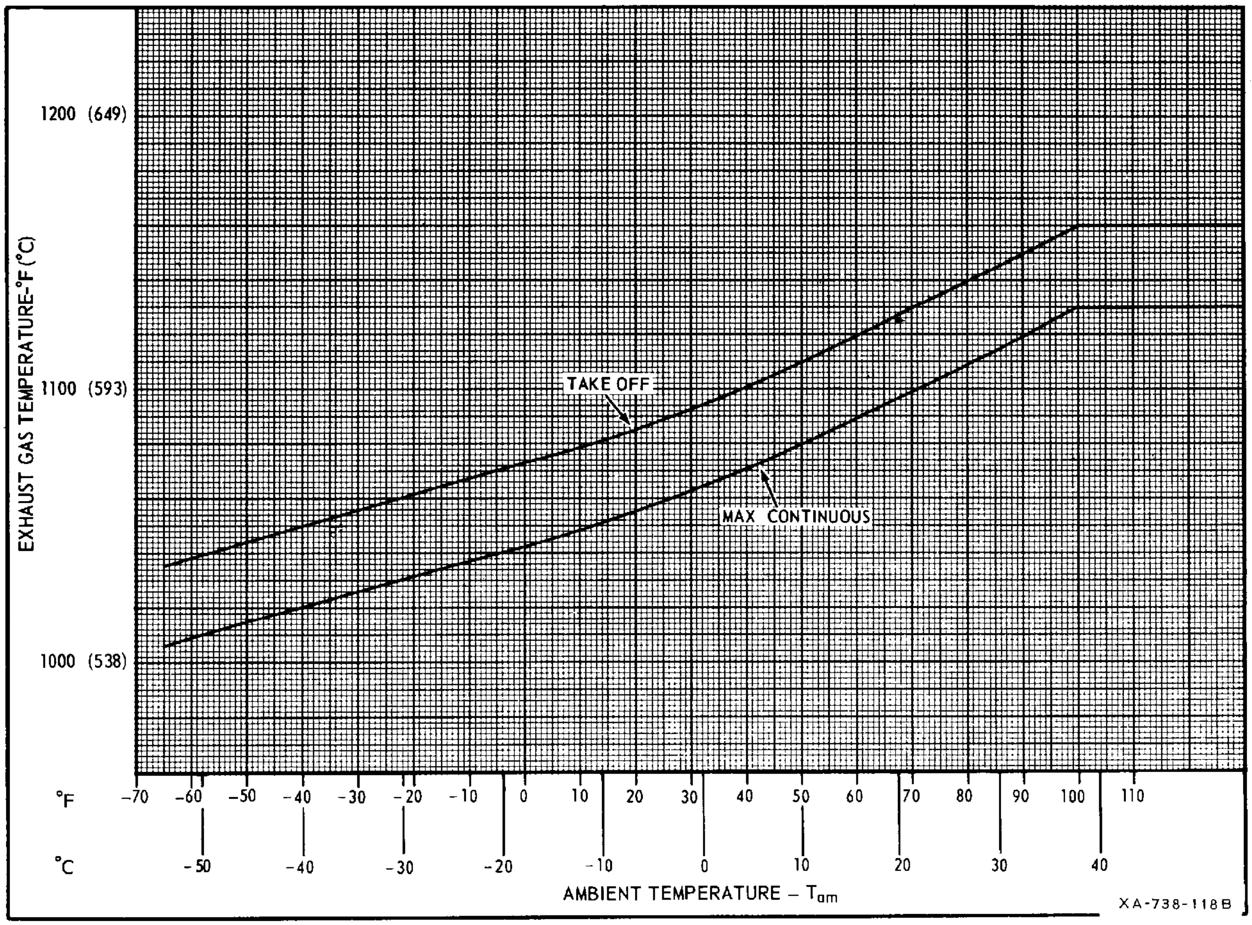
INSERT PAGE 2 OF 3 FACING 71-00-00, PAGE 8.

Reason: To change note in Step 10.C.(1)(c).

Note in Step 10.C.(1)(c) is changed as follows:

10. C. (1) (c)

NOTE: If any of the above limits are exceeded, see the Special Inspection/Turbine Overtemperature Inspection section of 72-00-00 for instructions.



Exhaust Gas Temperature Versus Ambient Temperature
Figure 1

NOTE: If the engine cannot be operated without exceeding takeoff power or maximum continuous rated power EGT limits, this is an indication of operation in excess of normal capabilities, engine malfunction, or instrument error.

(3) At maximum continuous rated power when EGT exceeds limits indicated in Figure 1.

See TR

D. Overspeed Limits

(1) An engine overspeed condition exists under the following conditions.

NOTE: An overspeed inspection must be performed if limits are exceeded. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.J.)

(a) When N1 speed exceeds 102 percent (25,650 rpm) at any time.

(b) When N2 speed exceeds 101 percent (21,300 power turbine rpm, 6637 output shaft rpm) at the takeoff power lever position.

(2) The following maximum steady state N2 speeds may be attained, providing the maximum corresponding torque pressure is not exceeded, without an overspeed condition.

Steady State Combinations

N2 Speed - Maximum	Torque Pressure - Maximum
107% (7032 rpm)	10 PSI
106% (6966 rpm)	21 PSI
105% (6900 rpm)	32 PSI
103% (6769 rpm)	42 PSI
102% (6703 rpm)	53 PSI
101% (6637 rpm)	60 PSI

NOTE: If limits are exceeded, an overspeed inspection must be performed. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.J.)

E. Oil Overtemperature Limits

(1) Oil temperature limits for normal operating conditions.

(a) The maximum (red line) OIL-IN temperature is 210°F (99°C).

(b) A steady state engine OIL-IN temperature of 212°F (100°C) is acceptable, provided an oil overtemperature inspection is performed. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.L.)

(c) At ambient temperatures below 30°C the maximum (red line) “Oil In” temperature is 93°C. Inspect oil filter when the oil temperature exceeds 93°C for more than 10 minutes.

(d) At ambient temperatures of 30°C and above a steady state engine “Oil In” temperature of 100°C is acceptable provided the following requirements and limitations are observed. Inspect oil filter after 50 hours of engine operation for excessive accumulation of carbon or metal particles.

TEMPORARY REVISION NO. 80

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 71-00-00, PAGE 10.

Reason: To add oil consumption limit.

Paragraph E. is revised to read as follows:

E. Oil Over-Temperature and Consumption Limits

TEMPORARY REVISION NO. 81

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 71-00-00, PAGE 11.

Reason: To add oil consumption limits.

Add step (3) after step (2)(b1) as follows:

(3) Oil Consumption Limits

(a) Oil consumption shall not exceed 1 quart per hour. If limit is exceeded, refer to 72-00-00, Table 101. Troubleshooting.

(2) Oil temperatures exceed the above limits, the following procedures apply.

CAUTION: IT MUST BE CLEARLY UNDERSTOOD THAT THERE IS A POSSIBILITY THAT MECHANICAL COMPONENTS MAY SUFFER DAMAGE IF ENGINE OPERATING CONDITIONS ARE EXTENDED BEYOND THESE RECOMMENDED LIMITS.

(a) Oil temperature of 210 to 266°F (99 to 130°C) for 10 minutes or less is acceptable provided an oil filter inspection is performed. (See 79-20-03, Oil Filter Inspection.)

(b) Oil temperature of 210 to 266°F (99 to 130°C) for more than 10 minutes, but less than 30 minutes, is acceptable provided the following is performed.

1 Change oil.

2 Clean oil screens and main oil filter.

3 Perform a 30 minute ground engine run.

4 Inspect filters for carbon and metal particles.

5 Repeat Steps 1 through 4 if contamination is found.

(b1) Oil temperature of 210 to 266°F (99 to 130°C) for more than 30 minutes, perform an oil overtemperature inspection. (See 72-00-00, ENGINE-INSPECTION, Paragraph 2.G.)

11. When oil temperature has reached 302°F (150°C) or above, engine must be returned to overhaul facility for engine overhaul.

A. Engine G-Loading

NOTE: If it is suspected that limits have been exceeded, an excessive G-load inspection must be performed after flight concerned. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.M.)

(1) Vertical - 10G

(2) Side - 4G

(3) Forward - 3G

(4) Aft - 4G

12. Engine Ground Operation Checks

A. Check Run After Initial Installation or Repair/Replacement of Major Components

(1) Perform vibration check as required. (See Paragraph 12.E.).

(2) Start engine and stabilize at flight idle. (See Airframe Flight Manual.)

(3) Check for 70 to 72 percent N1 speed. Check for oil pressure indication. Shut down engine and, if required, adjust idle rpm. (See Airframe Flight Manual.)

(4) Check operation of hot air solenoid valve as follows:

NOTE: A slight rise in EGT will indicate hot air solenoid valve is operational.

This check is to make sure that the anti-icing system is operational and that hot-air solenoid valve closes during normal engine operation.

(a) Open hot-air solenoid valve.

(b) Perform power check and trim adjustment. (See 73-20-01.)

(c) Check operation of emergency (manual) fuel system. (See Paragraph 12.D.)

(d) Shut down engine. (See Airframe Flight Manual.)

B. Initial Check Run

NOTE: The following is the procedure for preparing an engine for check runs.

WARNING: AVOID PROLONGED INHALATION OF SOLVENT VAPORS. WEAR RUBBER GLOVES AND USE HAND CREAM TO PREVENT CONTACT WITH SKIN. DO NOT HEAT SOLUTION.

(1) Remove the main oil filter cover assembly. (See 79-20-03.) Clean the cover assembly in dry cleaning solvent (72-00-00, 62, Table 203) and reinstall. (See SPM, SP C203, 70-15-03.)

CAUTION: INTERMIXING OF LUBRICATING OIL OF DIFFERENT TYPES IS NOT PERMITTED.

(2) Fill aircraft oil tank with oil. (See 72-00-00, ENGINE - SERVICING.)

(3) Start engine. (See Airframe Flight Manual.)

(4) Operate engine for several minutes at flight idle and then shut down.

(5) Inspect engine for leaks and security of mounting of hoses and accessories.

(6) Start engine and run at flight idle for 3 minutes, accelerate gradually until highest power, without gaining flight attitude, is obtained, and temperatures have stabilized.

(7) Decelerate engine to flight idle and run for 2 minutes to allow EGT to stabilize, shut down engine. Inspect engine. (See Paragraph 12.C.)

C. Inspection After Initial Check Run

(1) Inspect engine for leaks and security of mounting provisions, hoses, and accessories.

(2) Inspect engine main oil filter for accumulation of metal chips, lint, or other foreign material in oil filter. (See 79-20-03.)

(a) If there is no accumulation of metal chips, lint, or other foreign material, continue with engine operation checks.

(b) If there is a slight accumulation of metal chips, lint, or other foreign material, clean and reinstall the chip detector and oil filter. Restart engine and perform a second run for several minutes at highest power obtainable without gaining flight attitude. If further accumulation is found, perform oil system contamination trouble shooting. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 2.I.)

TEMPORARY REVISION NO. 86

INSERT PAGE 2 OF 8 THRU PAGE 3 OF 8 FACING 71-00-00, PAGE 13.

Reason: To change the procedure for engine vibration test.

Paragraph 12.E. is changed as follows:

E. Engine Vibration Test

NOTE: Honeywell's VXP BALANCER ANALYZER is the approved replacement for all previously listed obsolete and no longer supported vibration equipment. The Honeywell Chadwick Model 192 Spectrum Analyzer, Model 7460 filter box, LTCT and CEC Kits associated with vibration analysis, and the Model 8500/8510 balancer series, or comparable systems used for vibration testing, have been replaced by the CARRY-ON VXP BALANCER ANALYZER.

(1) An engine vibration test is required after initial installation of the engine in an aircraft if the engine was not vibration tested in accordance with procedures in the overhaul manual with no operating hours since the test cell vibration check. However, establishment of an engine baseline vibration check is recommended upon installation to compare with subsequent checks. A vibration check is also required after each of the following tasks:

(a) After removal, installation, or adjustment of any engine mounts, mount shims, and mount bearings.

(b) After the combustor turbine assembly (hot end) is removed and reinstalled, including hot section inspection.

(c) After compressor blade replacement or compressor blade repair or blending.

(d) When excessive engine vibration is suspected.

(e) As part of the following special inspections, including but not limited to:

1 As part of the inlet blockage inspection.

2 Sudden stoppage inspection.

3 Overspeed inspection.

4 Excessive G-loads.

5 Dropped engine inspection.

TEMPORARY REVISION NO. 86

(1a) Vibration pickups, attached to adapters mounted on engine, transmit electrical impulses through cables to a vibration meter. The vibration meter indicates total amount of engine movement (peak-to-peak displacement) in mils. (See Figure 2 and Figure 3.) Meter indications are recorded on an Engine Vibration Test Data Sheet. The recorded figures are compared with figures given on data sheet for maximum permissible engine vibration. Refer to Figure 5, Engine Vibration Test Data Sheet, for engine N1 and N2 speed specific maximum permissible vibration limits. Stabilize engine N1 and N2 conditions by maintaining each required engine speed for at least 30 seconds before meter indications are recorded. If these maximum figures are exceeded, the cause of the excessive vibration must be found and corrected before engine can be accepted for unrestricted flight.

See TR

(c) If there is an excessive accumulation of metal chips, lint, or other foreign material, perform oil system contamination trouble shooting. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 2.I.)

(3) Remove, inspect, clean, and reinstall fuel control filters. (See 73-20-03.)

D. Operational Check of Emergency (Manual) Fuel System

NOTE: Emergency fuel is intended for use when the fuel regulator is not functioning properly. When the fuel control is operating in this mode there will be a loss of available fuel to the engine. This loss of available fuel will result in a distinct loss of maximum power.

Check operation of emergency fuel system after installing an engine or a fuel control assembly, during the service inspection, or when a special verification of the proper operation of the fuel control emergency (manual) system is required, as follows:

(1) Start engine. (Refer to Airframe Flight Manual.)

CAUTION: SELECT MAXIMUM N2 SPEED WITH THE GOV RPM INCR-DECR BEEP SWITCH BEFORE STABILIZING ENGINE AT 70 TO 72 PERCENT N1 SPEED.

(2) With the fuel control selector switch in the AUTO position, stabilize engine at 70 to 72 percent N1 speed.

(3) Move the fuel control selector switch to the EMER position.

(4) Note indicated N1 speed, it should drop 2 to 5 percent.

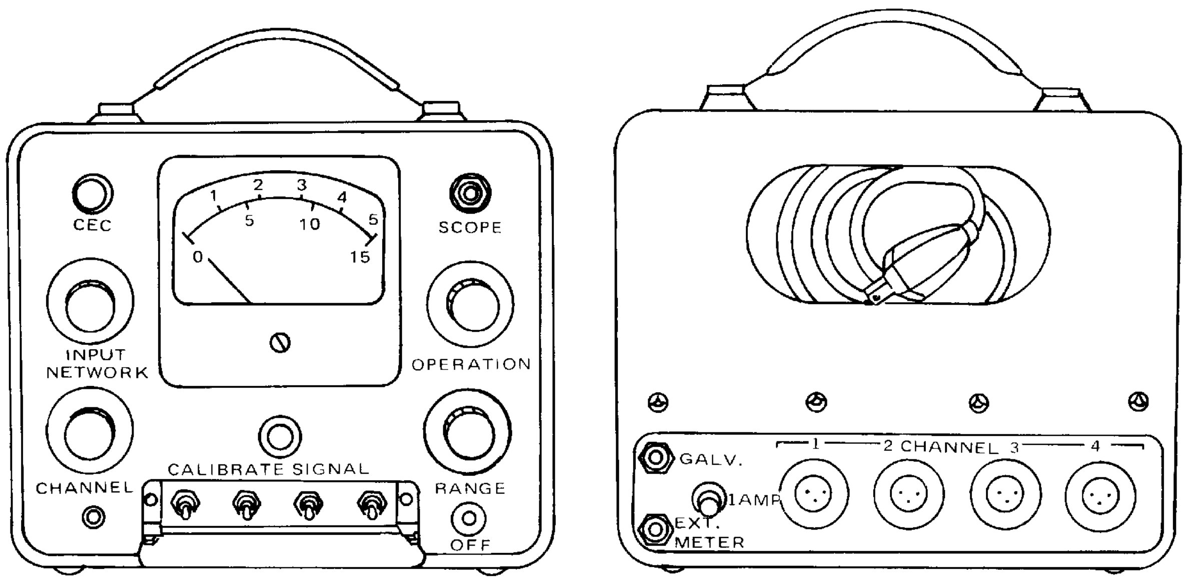
(5) Return fuel selector to AUTO position within 5 seconds.

(6) If power lever has not been moved, N1 speed should return to 70 percent and then stabilize.

E. Engine Vibration Test

NOTE: Vibration pickups, attached to adapters mounted on engine, transmit electrical impulses through cables to a vibration meter. The vibration meter indicates total amount of engine movement (peak-to-peak displacement) in mils. (See Figure 2 and Figure 3.) Meter indications are recorded on an Engine Vibration Test Data Sheet. The recorded figures are compared with figures given on data sheet for maximum permissible engine vibration. If these maximum figures are exceeded, the cause of the excessive vibration must be found and corrected before engine can be accepted for unrestricted flight.

(1) An engine vibration test is required after initial installation of the engine in an aircraft if the engine was not vibration tested in accordance with procedure in the 350.3 manual. This is to take place if there were no operating hours since the test cell vibration check. After combustor turbine assembly (hot end) is removed and reinstalled, after repair of certain engine components, after removal or adjustment of any engine mounts, mount shims, mount bearings, when excessive engine vibration is suspected, and to complete a dropped engine inspection.
An inspection vibration test, using vibration check tool kit LTCT484, LTCT20596-01, or LTCT14664-07, measures vibration at specified N1 and N2 operating speeds.



Vibration Meter
Figure 2

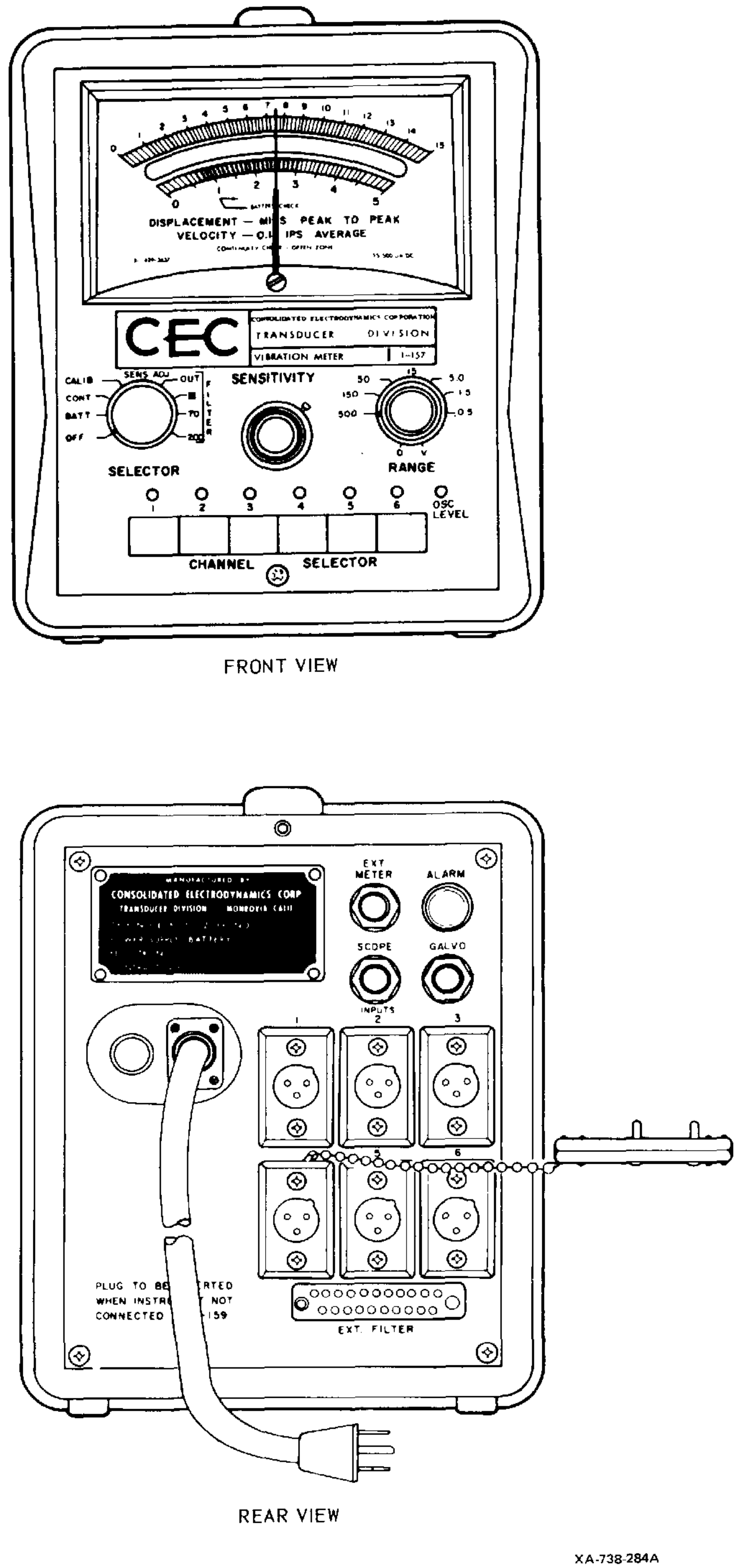
(2) Vibration test preparations. Each of the following procedural steps, including checks and adjustments of vibration equipment, must be repeated each time equipment is assembled for an engine vibration test. All equipment required, with the exception of mount assembly LTCT6756, is included in vibration check tool kit LTCT484, LTCT20596-01, or LTCT14664-07. Each of these sets contains a vibration meter LTCT22031-01 (included in LTCT20596-01) or LTCT9281 (included in LTCT484) or LTCT23844-01 (included in LTCT14664-07). Proceed with following vibration test, using applicable procedures in accordance with the specific vibration meter being used. Operational requirements for vibration check tool kit LTCT484, LTCT20596-01 or LTCT14664-07 are as follows:

NOTE: Acceptable alternative vibration measurement equipment includes the Chadwick Helmuth (CH) 192 Analyzer with the 7460A high-low filter, using CEC 4-118-0107 or 4-128-0101 pickups for normal vibration checks. Follow CH operating instructions and engine vibration limits and testing parameters contained in this section.

(a) Filter inspection, LTCT484 only. (See Step 0.)

(b) Filter inspection, LTCT20596-01 or LTCT14664-07. (See Step (4).)

(c) Preliminary warm up, LTCT484 only. (See Step (5).)



Vibration Meter – Typical
Figure 3

(d) Preliminary warm up, LTCT20596-01 or LTCT14664-07. (See Step (6).)

(e) Operational check of vibration pickups. (See Step (7).)

(f) Installation of vibration equipment. (See Step (8).)

(g) Adjustment of vibration meter. (See Step (9) or (10).)

(h) Vibration test. (See Step (11).)

(i) Check of vibration meter. (See Step (12).)

(j) Evaluation of vibration test data. (See Step (13).)

(k) Correcting vibration. (See Step (14).)

(3) Filter inspection LTCT484 only. If it is not certain that proper filters are at the proper locations, they must be installed as follows:

(a) Remove meter housing.

(b) Plug 70 Hz high pass filter CEC1-003-0070 into INPUT NETWORK socket No. 1.

(c) Plug 200 Hz high pass filter CEC1-003-0200 into INPUT NETWORK socket No. 2.

(d) Secure filters with screws provided.

(e) Install meter housing.

(4) Filter inspection LTCT20596-01 or LTCT14664-07. Vibration meter LTCT22031-01 has filters LTCT20596-01 installed. Install filters LTCT14664-07 in vibration meter LTCT23844-01 as follows:

(a) Remove meter housing.

(b) Plug 70 Hz high pass filter LTCT23842-01 or CEC1-003-0070 into filter socket No. 2.

(c) Plug 200 Hz high pass filter LTCT23843-01 or CEC1-003-0200 into filter socket No. 3.

(d) Secure filters with screws provided.

(e) Install meter housing.

(5) Preliminary warm up, LTCT484 only. Proceed as follows:

WARNING: TO PREVENT A POSSIBLE HAZARD TO PERSONNEL AND DAMAGE TO EQUIPMENT, SET POWER SWITCH TO OFF WHILE CONNECTING TO A POWER SOURCE.

(a) Connect power lead to suitable source of electrical power (105 to 125 volts, 50/60/400 Hertz, 300 watts).

(b) With power switch on, allow approximately 1/2 hour for temperature to stabilize within the meter.

(6) Preliminary warm up LTCT20596-01 or LTCT14664-07. Proceed as follows:

WARNING: TO PREVENT A POSSIBLE HAZARD TO PERSONNEL AND DAMAGE TO EQUIPMENT, SET POWER SWITCH TO OFF WHILE CONNECTING TO A POWER SOURCE.

(a) Connect power lead to suitable source of electrical power (105 to 125 volts, 50/60/400 Hertz) or use 18 vdc battery power supply.

NOTE: With ac power, use connector adapter LTCT9280, supplied with kit, if necessary.

(b) With power switch on, allow approximately 10 minutes for temperature to stabilize within the meter.

(7) Operational check of vibration pickups. Proceed as follows:

CAUTION: HANDLE VIBRATION PICKUPS WITH CARE. IF A PICKUP IS DROPPED, OR STRUCK WITH FORCE, ITS ACCURACY MAY BE IMPAIRED.

(a) While meter is warming up, lay out three cable assemblies CEC49657-0300 or LTCT9283-02, and three vibration pickups CEC4-118-0107, LTCT9282 or CEC4-128-0101.

CAUTION: DO NOT INTERMIX PICKUPS. USE EITHER THREE EACH CEC4118-0107, LTCT9282 OR THREE CEC4-128-0101 PICKUPS. SENSITIVITY SETTINGS DIFFER WITH EACH TYPE AND, THEREFORE, CANNOT BE INTERMIXED.

(b) Connect cables to pickups and to proper CHANNEL receptacle in vibration meter.

(c) Following Steps 1 through 6 apply to meter LTCT9281.

1 Set INPUT NETWORK selectors to OUT.

2 Set OPERATION selector to Dx1. 0.

3 Set CHANNEL selector to 1.

4 Set RANGE selector to 5.

5 Slowly move No. 1 pickup by hand, while observing vibration meter. Indicator should jog or show a slight movement.

NOTE: If indicator does not move, check condition of pickup, connectors, cable, and vibration meter receptacle. Interchange components until defective unit is found. Replace defective component.

6 Set CHANNEL selector to 2, then to 3, and using same procedures, check operation of remaining pickups.

(d) Following Steps 1 through 6 apply to meter LTCT22031-01 or LTCT23844-01.

NOTE: Vibration meter contains an internal plug in ac power supply. The ac power supply may be wired for high or low voltage by changing transformer strapping from 115 vac range to 230 vac range. A battery (18 vdc) power supply is also included in LTCT20596-01 or LTCT14664-07.

1 Connect vibration meter to power source to be used. (If batteries are not to be used.)

2 Ensure connector plug at rear of vibration meter chassis is inserted into external filter receptacle.

3 Set SELECTOR switch to OUT position.

4 Depress CHANNEL selector 1

5 Set MODE switch (inner part of RANGE switch) to D (displacement) position.

6 Set RANGE switch to 5.

7 Slowly move No. 1 pickup by hand while observing meter indication. Indicator should jog or show slight movement.

NOTE: If the indicator does not move, check position of pickup, connectors, cable, and meter receptacle. Interchange components until defective unit is found. Replace defective component.

8 Repeat the preceding steps for the remaining CHANNELS (2 and 3) in use.

(8) Installation of equipment. Proceed as follows:

NOTE: In following Step (a), cable and pickup to CHANNEL 1 will connect to front lifting eye adapter. Cable and pickup to CHANNEL 2 will connect to diffuser flange adapter. Cable and pickup to CHANNEL 3 will connect to oil scavenge line adapter, or to No. 3 and 4 bearing vibration pickup mount assembly LTCT6756, used as an alternate to oil scavenge line adapter on certain airframe applications.

(a) Secure pickup mounting adapters to required engine mounting locations. (See Figure 4.)

(b) Secure each pickup to its adapter with three 4-40 screws and suitable lockwashers.

CAUTION: LEAVE ENOUGH SLACK IN CABLE TO PREVENT UNNECESSARY STRAIN ON PICKUPS AND CONNECTORS. AVOID CONDITIONS THAT WOULD CAUSE CABLES TO DETERIORATE FROM HEAT OR ABRASION.

NOTE: Identify adapter and cable connections with numbers or colors to make certain that pickups will be connected to proper meter CHANNEL receptacles.

(c) Connect proper cable to each pickup.

(d) Secure cable assemblies to engine and aircraft with tape or cord.

WARNING: TO PREVENT A POSSIBLE HAZARD TO PERSONNEL AND DAMAGE TO EQUIPMENT, SET METER POWER SWITCH TO OFF, WHILE BREAKING OR MAKING CONNECTION TO A SOURCE OF ELECTRICAL POWER.

(e) Disconnect meter from source of power used for preliminary warm up, and immediately connect it to aircraft electrical power (105 to 125 volts, 50/60/400 Hertz, 30 watts).

(f) Secure vibration meter with bungee cord (shock cord), or other suitable means, to a cushioned, protected location in aircraft cabin.

NOTE: To prevent cooling off of vibration meter, it must not be without a source of power for more than a few minutes.

(g) Connect cable assemblies to proper CHANNEL receptacles.

(9) Adjustment of vibration meter LTCT9281. Proceed as follows:

(a) Set OPERATION selector to C. Indicator should swing toward right hand side of scale.

NOTE: With OPERATION selector set at C, the INPUT NETWORK selector and RANGE selector may be in any position.

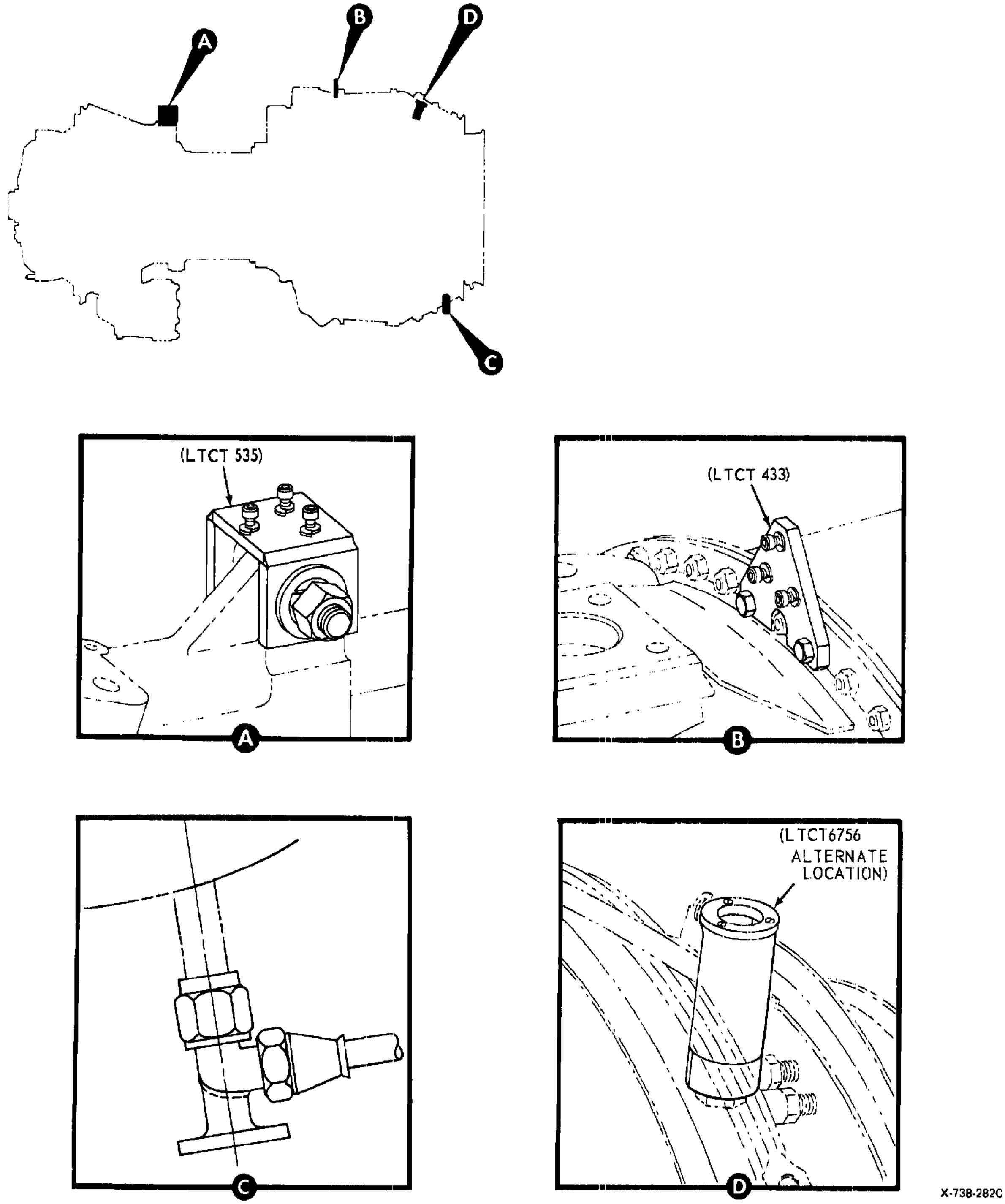
(b) Set CHANNEL selector to 1.

(c) Push in CALIBRATE SIGNAL control. Turn until indication is 10.5 for the CEC4-118-0107 (LTCT9282), or 6.0 for the CEC4128-0101 pickups. Read on the 0 to 15 scale.

(d) Release CALIBRATE SIGNAL control carefully without turning.

(e) Open panel below CALIBRATE SIGNAL control to expose SENSITIVITY controls.

(f) Turn SENSITIVITY control for CHANNEL 1 to obtain analyzer indication of 15.0.



Location of Vibration Pickup Adapters
Figure 4

NOTE: If an indication of 10.5 or 15.0 cannot be obtained, vibration analyzer must be recalibrated internally by qualified personnel.

(g) Confirm proper adjustment of CHANNEL 1 by pushing in and releasing CALIBRATE SIGNAL control, while observing for consistent indications of 10.5 (CEC4-118-0107) or 6.0 (CEC4128-0101) and 15.0.

NOTE: Only one setting of 10.5 (or 6.0) made at CHANNEL 1 is necessary for use with all channels.

(h) Obtain indication of 15.0 for remaining channels by setting CHANNEL selector to proper number and turning SENSITIVITY control for that channel.

(10) Adjustment of vibration meter LTCT22031-01 or LTCT23844-01. Proceed as follows:

CAUTION: TO ENSURE ACCURACY OF VIBRATION TEST, ADJUST VIBRATION METER USING SAME POWER SOURCE THAT IS TO BE USED DURING VIBRATION TEST.

NOTE: If using battery power supply, set SELECTOR switch in OFF position. Battery voltage is sufficient when meter reading on 0 to 5 scale is one volt or greater. Set SELECTOR switch in the BATT position. Again, battery voltage must be one volt or greater.

(a) Connect power source to be used (if batteries are not to be used).

(b) Check continuity of transducer circuits by placing RANGE switch to 500, setting SELECTOR switch to CONT. position, and depressing selected channels on CHANNEL SELECTOR. If circuit is satisfactory, meter will read within the green zone. If channel is open, indicator will deflect full scale. When circuit is shorted, indication will be ZERO.

(c) Place SELECTOR switch to CALIB and adjust OSC LEVEL for full scale meter deflection.

(d) Place SELECTOR switch to SENS ADJ.

(e) Depress CHANNEL SELECTOR 1 and set the SENSITIVITY control to correct transducer sensitivity for type of pickup in use. Either 10.5 or 6.0 for CEC4-118-0107 or CEC4-128-0101 pickups, respectively. Set 10 or 6 into window of control and 5 or 0 on the inside vernier.

(f) Adjust channel gain potentiometer (smallest set screw immediately above the CHANNEL SELECTOR) for CHANNEL 1 to obtain a full scale deflection indication.

NOTE: It is necessary to adjust the SENSITIVITY control on CHANNEL 1 only, to the correct setting for type of pickups in use. This will suffice for remainder of channels in use. However, CHANNEL GAIN, located above the CHANNEL SELECTOR buttons, must be individually adjusted for each channel in use.

(g) Repeat above Step (e) for remaining CHANNELS (2 and 3).

(11) Vibration test. Proceed as follows:

NOTE: Check aircraft engine mounts for looseness, wear, or insufficient torque before attempting vibration test. Ensure that Marman clamps, inlet screens, exhaust pipe, and all clamps, lines, and hoses are secure.

(a) Prepare Engine Vibration Test Data Sheet for engine to be tested by supplying applicable information at top of data sheet. (See Figure 5.)

(b) Following Steps (c) through (g) apply to vibration meter LTCT22031-01 or LTCT23844-01.

(c) If not using batteries, ensure that vibration meter power source is on.

(d) Set SELECTOR switch to proper number for filter to be used as required by data sheet.

(e) Set MODE switch to D position.

(f) Rotate RANGE switch for maximum on-scale meter deflection (usually 5.0).

(g) Depress CHANNEL SELECTOR to CHANNEL 1.

(h) Following Step (j) applies to vibration meter LTCT9281.

(i) Set meter for the test as follows:

1 Set INPUT NETWORK selector to proper number for filter to be used, as required by data sheet.

2 Set OPERATION selector to D X 1.0.

3 Set CHANNEL SELECTOR to 1.

4 Set range selector to 5.

(j) Operate engine at N1 and N2 speeds shown on data sheet.

NOTE: Ground operation at high power settings may not be possible. Aircraft must be hovered or flown to accomplish a complete vibration test.

(k) At each speed setting, record meter indications on data sheet as follows:

NOTE: Stabilize engine conditions by maintaining each required engine speed for at least 30 seconds before meter indications are recorded.

1 Set INPUT NETWORK selector to proper number for meter network and filter to be used, as required by data sheet.

2 Set CHANNEL selector to proper number for meter channel and pickup to be used, as required by data sheet.

TEMPORARY REVISION NO. 86

INSERT PAGE 4 OF 8 THRU PAGE 5 OF 8 FACING 71-00-00, PAGE 23.

Reason: To change the engine vibration test data sheet and change the title for Figure 5 to delete the word (Sample).

Figure 5 and the title for Figure 5 are changed as follows:

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TURBOSHAFT ENGINE VIBRATION TEST DATA SHEET

ENGINE SERIAL NO. ____________ (TSN) ____________

LAST OVERHAUL LOCATION ____________ (TSLO) ____________

AIRCRAFT SERIAL NO. ____________ A/C TIME ____________

TEST LOCATION ____________ DATE ____________

TESTED BY ____________ OBSERVER ____________

ENGINE PASSED TEST-ACCEPTED ☐ ENGINE FAILED TEST ☐

NOTE: STABILIZE ENGINE CONDITIONS BY MAINTAINING EACH REQUIRED ENGINE SPEED FOR AT LEAST 30 SECONDS BEFORE METER INDICATIONS ARE RECORDED.

N_2 SPEED IN PERCENT (±0.5%)	N_1 SPEED IN PERCENT (±0.5%)	NO. 1 PICKUP S/N ____ (200 CPS FILTER)	NO. 2 PICKUP S/N ____ (200 CPS FILTER)	NO. 3 PICKUP S/N ____ (200 CPS FILTER)	REMARKS
92	90	(1.3 IPS)	(1.7 IPS)	(1.7 IPS)	
97	90	(1.3 IPS)	(1.7 IPS)	(1.7 IPS)	
97	95	(1.3 IPS)	(1.7 IPS)	(1.7 IPS)	
97	MAX	(1.3 IPS)	(1.7 IPS)	(1.7 IPS)	
100	95	(1.3 IPS)	(1.7 IPS)	(1.7 IPS)	

NOTE: THE FIGURES GIVEN IN PARENTHESES ARE THE MAXIMUM PERMISSIBLE ENGINE VIBRATION.

ID-571180

Engine Vibration Test Data Sheet
Figure 5

UP781957

See TR

TURBOSHAFT ENGINE VIBRATION TEST DATA SHEET

Engine Serial No. ____________ (TSN) ____________

Last Overhaul Location ____________ (TSLO) ____________

Aircraft Serial No. ____________ A/C Time ____________

Test Location ____________ Date ____________

Tested By ____________ Observer ____________

Engine Passed Test - Accepted ☐ Engine Failed Test ☐

N_2 Speed in Percent (± 0.5%)	N_1 Speed in Percent (± 0.5%)	No. 1 Pickup S/N ____ (70 cps Filter)	(200 cps Filter)	No. 2 Pickup S/N (200 cps Filter)	No. 3 Pickup S/N (200 cps Filter)	REMARKS
92	90	(2.5)	(2.5)	(2.5)	(3.7)	
97	90	(2.5)	(2.5)	(2.5)	(3.7)	
97	95	(2.5)	(2.5)	(2.5)	(3.7)	
97	MAX.	(2.5)	(2.5)	(2.5)	(3.7)	
100	90	(2.5)	(2.5)	(2.5)	(3.7)	

SAMPLE

Note: The figures given in parentheses are the maximum permissible engine vibration.

XA-738-122C

Engine Vibration Test Data Sheet (Sample)
Figure 5

3 Record meter indications in proper space on Engine Vibration Test Data Sheet.

(12) Check of vibration meter LTCT9281. Proceed as follows:

(a) Immediately after last entry is made on the data sheet, set CHANNEL selector to 1.

NOTE: With the OPERATION selector set at C, INPUT NETWORK selector and RANGE selector may be in any position.

(b) Set OPERATION selector to C. Meter indication should be 15.0 on lower scale.

(c) Push in CALIBRATE SIGNAL control. Meter indications should be 10.5 (or 6.0) depending on type of pickup being used.

(d) If meter indications of 15.0 and 10.5 (or 6.0) are not obtained, push in CALIBRATE SIGNAL control, and turn to obtain indication of 10.5 (or 6.0).

NOTE: If check after testing disclosed that adjustment of meter has changed to indicate less than 14.0 or more than 1/16 inch higher than full scale readings, it must be assumed that some meter indications recorded during test were inaccurate. In this case, entire vibration test must be conducted again. If defective pickups are suspected of producing incorrect meter indications, interchange pickups and check their operation with a trial vibration test, conducted at only one combination of N1 and N2 speeds. If comparison with recorded indications on data sheet discloses a defective pickup, entire test must be conducted again, with pickups that are known to be good.

(e) Release CALIBRATE SIGNAL control carefully, without turning. Meter indications, on lower scale, should be approximately 15.0.

(13) Evaluation of vibration test data. Proceed as follows:

(a) Compare indications recorded on Engine Vibration Test Data Sheet with figures given in parentheses for maximum permissible engine vibration. If all recorded figures are below maximum permissible vibration, engine, as installed, has passed the vibration test.

(b) Vibration measured with 70 cps filter will include installation or airframe vibration. If recorded indication, using 70 cps filter exceeds maximum permissible engine vibration figures, but using 200 cps filter is within permissible figures, excessive vibration is caused by the airframe. Corrective action must be taken before aircraft is again tested for vibration, prior to acceptance for unrestricted flight.

(c) Vibration measured with the 200 cps filter represents engine vibration only. If recorded indication exceeds the maximum permissible engine vibration figures, corrective action must be taken before engine is again tested for vibration, prior to acceptance for unrestricted flight.

NOTE: If any vibration reading exceeds the engine operating limits, this operational point should be repeated. Running at this point, vary N1 while holding a constant N2. Then vary N2 while holding a constant N1. This procedure will isolate the vibration source.

(14) Correcting vibration. See Table 1 for vibration sources. See Steps (15) and (16) for corrective action.

(15) Correcting gas producer (N1) vibration. Proceed as follows:

(a) Remove upper half of compressor and impeller housing.

(b) Using a dial indicator, check concentricity of all spacer lands and OD of centrifugal impeller.

1 Maximum allowable runout of each spacer land is 0.003 inch TIR. However, any two lands may have a runout up to 0.0033 inch TIR.

2 Maximum allowable runout on centrifugal impeller OD is 0.0035 inch TIR.

(c) If compressor runouts are exceeded, ship engine to overhaul for corrective action.

(d) If compressor runouts are within limits, remove combustor turbine assembly and check second stage gas producer turbine hub and face runouts and check first stage turbine hub and face runouts. Compare runouts with those obtained during engine buildup.

(e) If runouts have been exceeded, reseat turbine rotor and recheck runouts.

(f) Reinstall combustor turbine assembly and repeat vibration test.

(16) Correcting power turbine (N2) vibration. Proceed as follows:

NOTE: Do not remove combustor turbine assembly completely. Raise it only enough to allow rotation of power turbine rotors without disturbing position of power shaft.

(a) Remove combustor turbine assembly. (See 72-40-00.)

CAUTION: DO NOT USE LEAD PENCIL WHEN MARKING POWER SHAFT AND TURBINE ROTOR. MARKINGS ON HIGH TEMPERATURE MATERIALS SHALL ONLY BE DONE WITH APPROVED MARKER.

(b) Before disengaging power turbine rotors from power shaft, mark power shaft spline and turbine rotor journal to provide an indication for turbine rotor relocation.

(c) Rotate power turbine rotors 180 degrees.

(d) Install combustor turbine assembly. (See 72-40-00.)

(e) Start engine, and repeat test at point where vibration was discovered.

Table 1. Vibration Sources and Corrective Action

Possible Source of Excessive Vibration	Corrective Action
General	
Inlet	Inspect for foreign object damage.
Airframe engine mounts, inlet screens, clamps and hoses	Check for proper installation and torque. If necessary, reinstall properly and tighten as required.
Exhaust and power turbine	Inspect for metal chips or signs of damage incurred while running engine.
Gas Producer (N1) Vibration	
Second stage gas producer rotor not within runout limits	Torque bolts or reposition rotor in relation to first stage rotor.
First stage gas producer rotor not within runout limits	Reposition rotor, clean, reposition, or replace forward and aft cones.
Second stage gas producer bolts and tabwashers	Check that all are of the same weight.
Gas producer turbine rotors out of balance	Reposition turbines diametrically in relation to compressor rotor or reposition second rotor in relation to first rotor.
No. 1 and 2 bearing	Replace defective No. 2 bearing or forward to overhaul facility.
Foreign object damage in compressor	Inspect inlet guide vane assembly and compressor rotor. If damage exceeds limits, replace rotor blades as required.
Compressor rotor assembly not within runout limits	Forward to overhaul facility.
Power Turbine (N2) Vibration	
Loose V-band assembly clamp. Exhaust pipe	Check for proper installation and tighten as required.
First stage power turbine rotor not within runout limits or out of balance	Reposition rotor in relation to second stage power turbine.
Second stage power turbine rotor not within runout limits or out of balance	Replace rotor.
First stage power turbine bolts and tabwashers	Check that all are of the same weight.

Table 1. Vibration Sources and Corrective Action (Cont)

Possible Source of Excessive Vibration	Corrective Action
No. 3 and 4 bearings	Check for wear and replace.
Power shaft bolt bent or shims not properly installed	Check that power shaft bolt is not bent and shims are properly seated.
Damaged rear internal threads of power shaft	Forward engine to overhaul facility
Power turbine rotor to power turbine cylinder clearance is low, causing rub	Replace cylinder.
Combustion chamber to support cone pilot diameters out of squareness or concentricity	Replace parts.
Power turbine rotor location	Relocate in relation to power shaft.
Power shaft out of balance	Forward engine to overhaul facility.
Unbalanced power turbine rotor	Replace rotor.

NOTE: Vibration meter indications will either be within specified limits, or will greatly exceed the original readings. If meter indications are still in excess of specified limits, a second relocation must be accomplished. Perform procedures following in Steps (g) through (h).

If engine does not operate within specified vibration limits following second relocation, relocate power turbine rotors 180 degrees. If engine fails to check out following third relocation, ship engine to overhaul.

(f) Repeat preceding Steps (a) and (b).

(g) Rotate power turbine rotors 90 degrees.

(h) Repeat preceding Steps (d) and (e).

See TR

Basic VXP Kit
Figure 6

F. Installation of Vibration Signature Recorder (LTCT26442-04)

(1) Gain access to the core engine.

CAUTION: HANDLE VIBRATION PICKUPS WITH CARE. IF A PICKUP IS DROPPED, OR STRUCK WITH FORCE, ITS ACCURACY MAY BE IMPAIRED.

(2) Install the applicable vibration transducer adapters on the engine to be tested, removing engine bolts as necessary. (See Figure 7.)

(3) Secure each transducer adapter with appropriate hardware.

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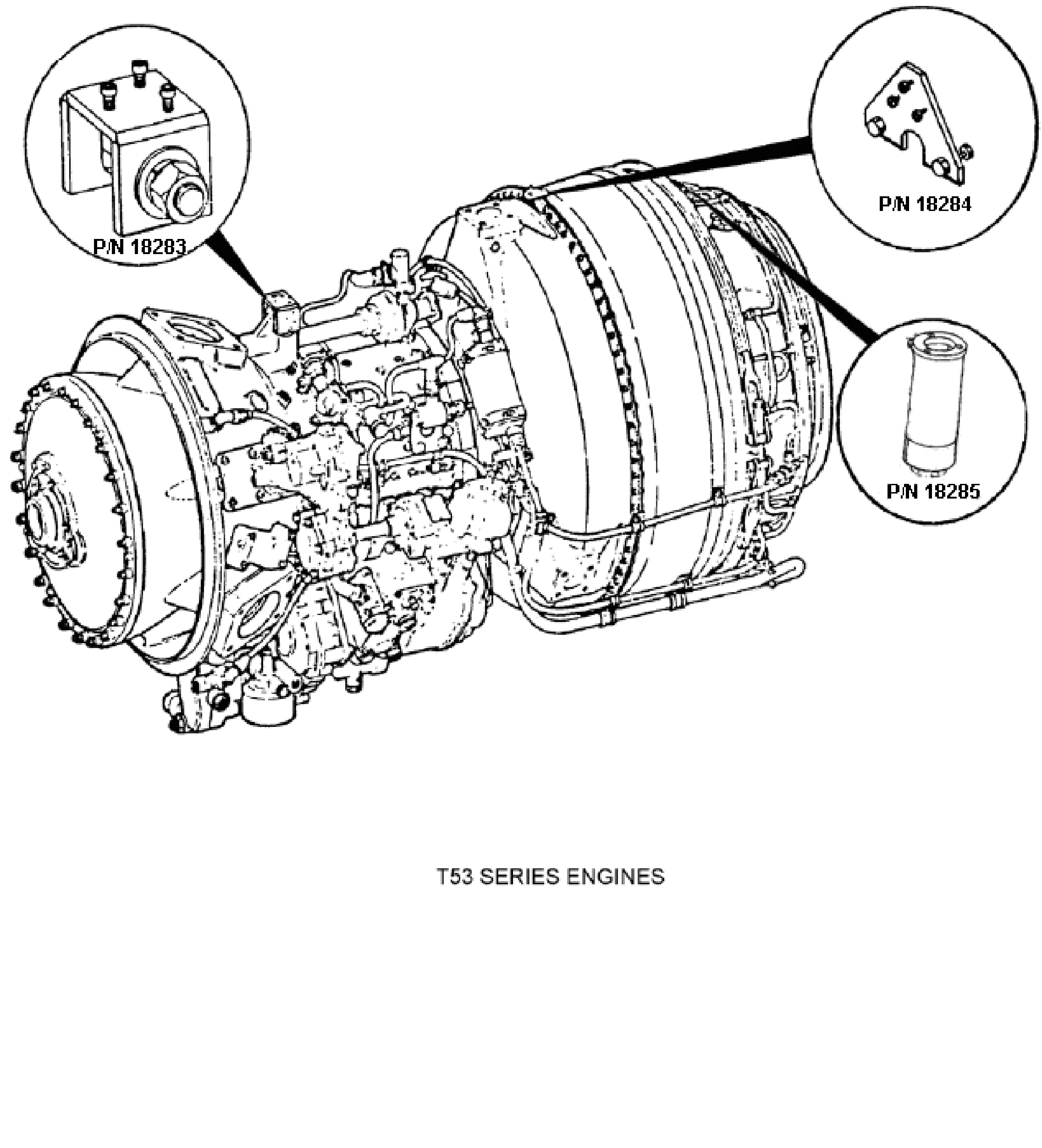
INSERT PAGE 6 OF 8 FACING 71-00-00, PAGE 28.

Reason: To change paragraph title and add a NOTE.

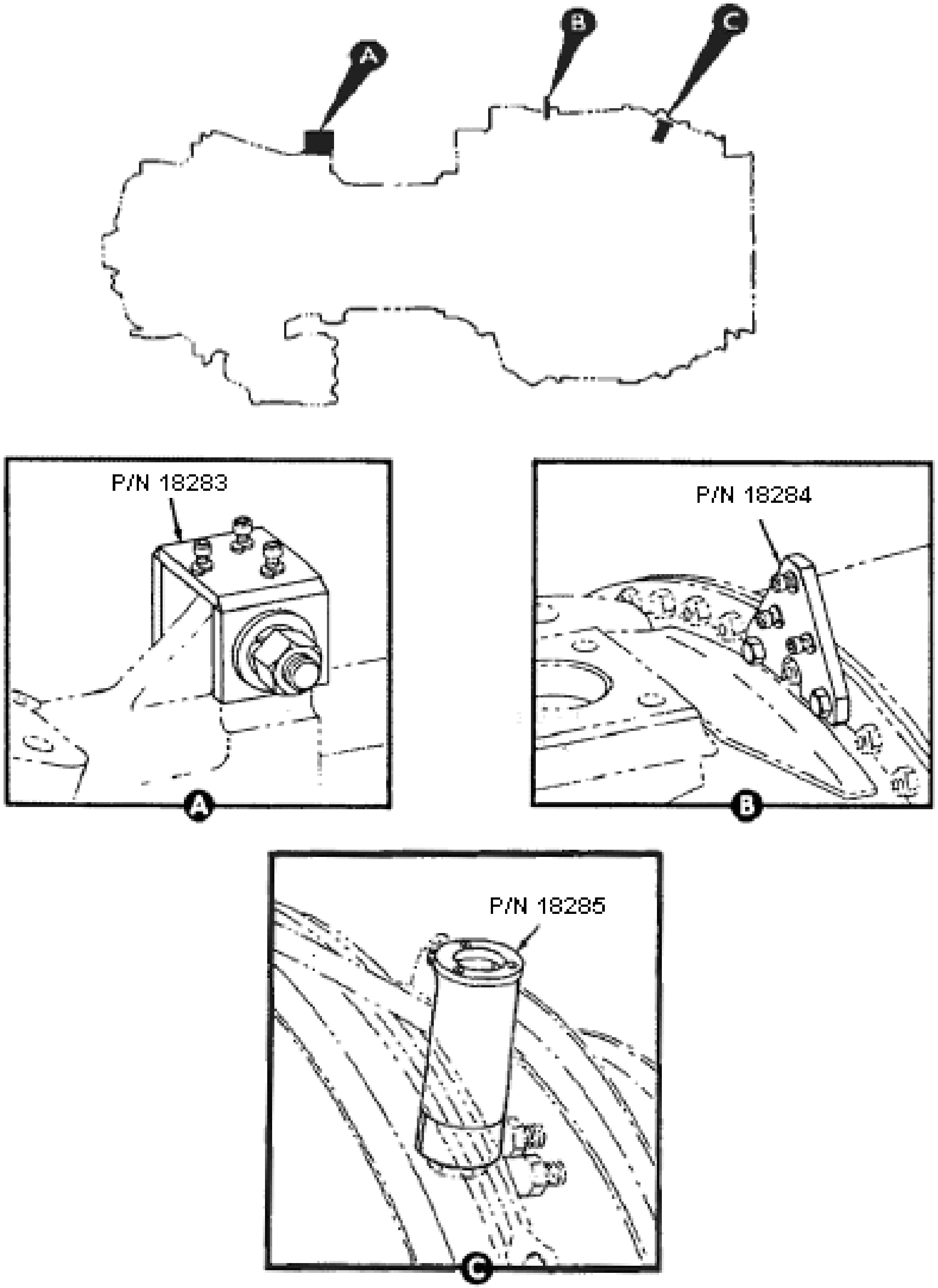
Paragraph 12.F. is changed and a NOTE is added after Paragraph 12.F. as follows:

F. Installation of VXP BALANCER ANALYZER and Vibration Signature Recorder (LTCT26442-04)

NOTE: To check for available software updates or for technical support and parts or software replacement, contact your authorized Health Usage Monitoring System (HUMS) distributor. If you do not know who your distributor is, contact Honeywell Aerospace Contact Team at 800-601-3099 (Toll Free U.S.A./Canada or 602-365-3099 (International).



Location of Vibration Transducer Adapters
Figure 7 (Sheet 1 of 2)



Location of Vibration Transducer Adapters
Figure 7 (Sheet 2)

CAUTION: AVOID KINKS AND SHARP BENDING OF CABLE ASSEMBLIES AND CONDITIONS WHICH WOULD CAUSE CABLE ASSEMBLIES TO DETERIORATE FROM HEAT OR ABRASION.

(4) Connect the 16327-25 cable assembly to each transducer.

(5) Attach high temp accelerometers 10494 to mounts using three internal wrenching screws.

(6) Attach individual leads of cable 16327-25 to the appropriate sensor according to the labels on the cable.

(7) Route cables clear of moving parts. Do not secure cables with excessive strain on the connector. Secure the cables together in the engine compartment and route outside the engine compartment to the nearest cabin door. Tape the cables at intervals of 1 to 2 feet for security.

(8) Connect VXP T-53 engine harness 16327-25 making sure that each cable is attached to the appropriate connector.

(9) Connect cable 17317-12A between the VXP AU and DU.

(10) Connect DC power cable 10813-12 to VXP AU and aircraft 28 VDC power receptacle using adapter cable 3140-1. The 28 VDC receptacle is located under the aft cabin overhead heater blanket.

NOTE: The user may also use cable 16328 for this test.

(11) Check cable connectors are as follows: (Connection on 16327-25 expansion cable)

Table 2. 16327-25 Cable Connection

Mounting Location	Cable Location
Lifting Eye Adapter	HTA 1
Diffuser	HTA 2
Combustor	HTA 3

HTA 4 is not used on the T-53 engine test. Secure cable (Coil and Stowe).

Table 3. 16328 Cable Connection

Mounting Location	Cable Location
Lifting Eye Adapter	Compressor
Diffuser	Combustor 1
Combustor	Combustor 2

(12) Check security of all equipment

NOTE: VXP Software is specific to each engine application and no instrument setup is required.

See TR

G. Setup

(1) Make sure all connectors have been installed correctly to the AU.

(2) Make sure the AU is connected to a 28-VDC power source and powered up.

(3) Connect the RS-232 serial cable for DU and printer connection to the computer port on the AU, using the appropriate connector.

(4) Connect the printer connector (the male connector) to the serial printer.

(5) Connect the DU connector (the female connector) to a communication (COM) port on the PC. The default in the DP is COM port No. 1 (COM1). Make a note of the COM port number to ensure that the DP's communications settings are set to the same port.

(6) Launch the VXP Display Program by double clicking the VXP icon on the desktop shown in Figure 8.

(7) When the Select Task dialog box displays, select the option button labeled Connect to AU shown in Figure 9.

(8) If no error message displays, and if the program displays the Select Procedure window for the subject aircraft, then the operator has successfully connected to the AU shown in Figure 10. The operator is ready to use the DP software.

NOTE: Verify that you have loaded the right application by looking at the top of the software application window.

Additional material may be found in the VXP Getting Started Guide (15612-2) for setup and operation of the VXP system.

VXP Icon
Figure 8

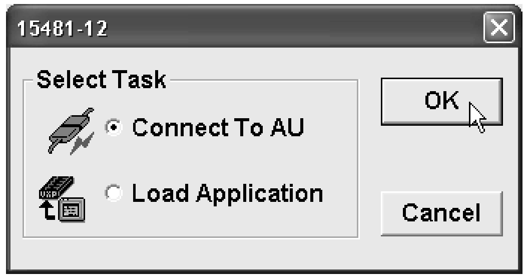
TEMPORARY REVISION NO. 86

INSERT PAGE 7 OF 8 FACING 71-00-00, PAGE 32.

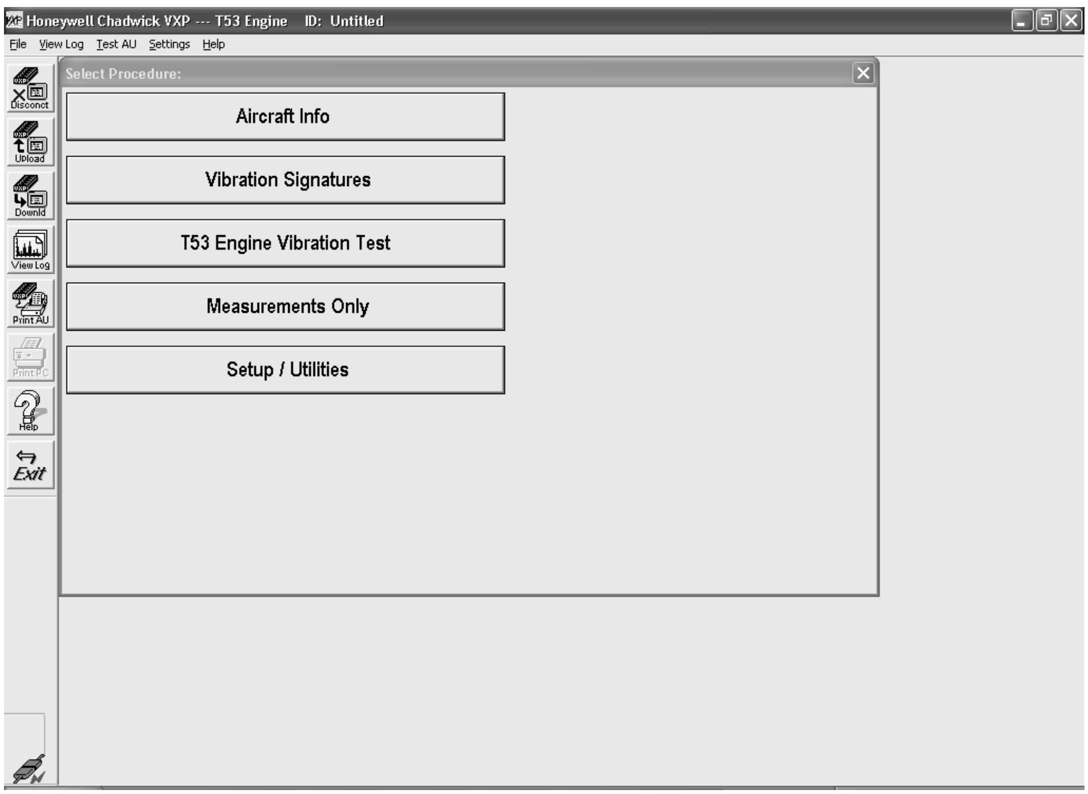
Reason: To delete the second paragraph in NOTE.

The NOTE following Step 12.G.(8) is changed as follows:

NOTE: Verify that you have loaded the right application by looking at the top of the software application window.



Connect To AU
Figure 9



Select Procedure Window
Figure 10

H. Operation

(1) Perform the VXP Vibration Test sequence as follows:

NOTE: Check aircraft engine attach points for looseness, excessive wear and low torque prior to vibration test. Be sure the V Band clamps, inlet screen, exhaust pipe and hoses are secure.

(2) Prepare data on the Engine Vibration Test Sheet Data. (See Figure 5.)

NOTE: There is no warm-up period required for any of the instruments.

(3) Once the APP file has been loaded, select T53 Vibration Test. This will allow you to perform the N1 Vibration Test. (See Figure 11.)

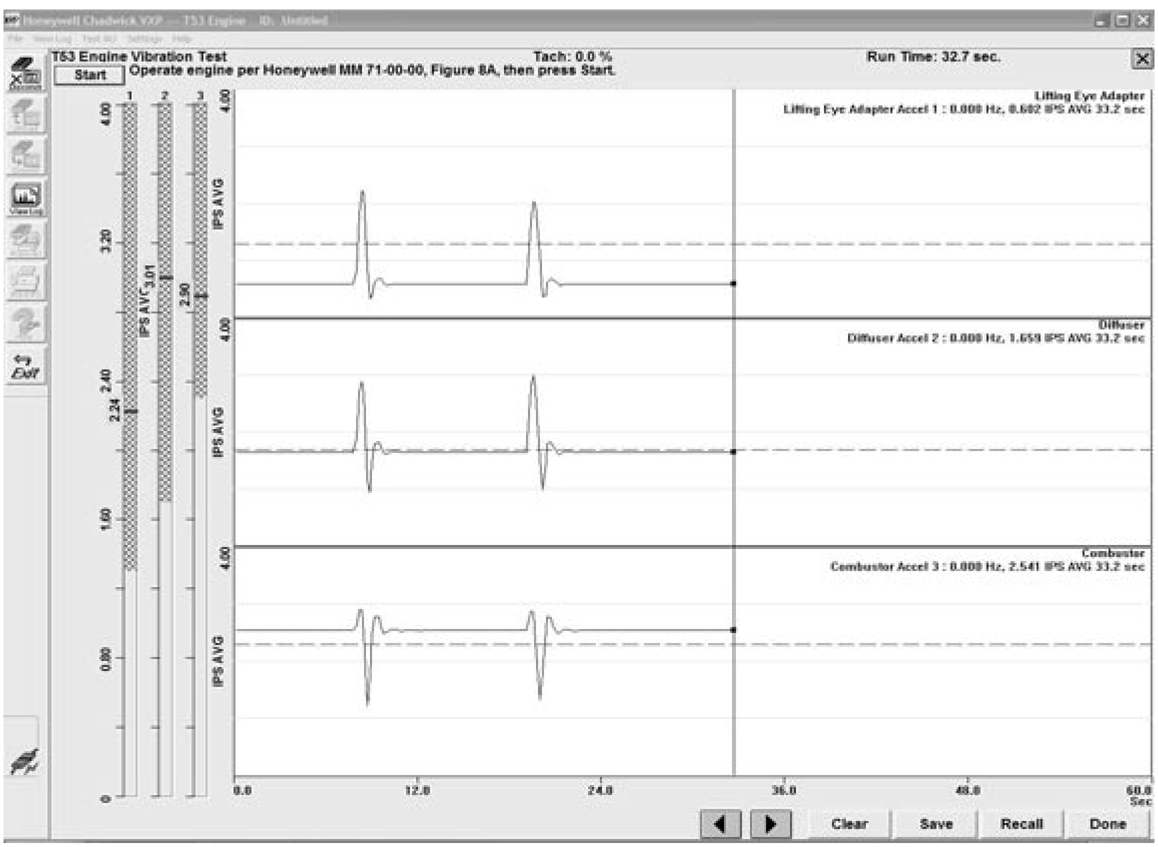
(4) Operate engine at N1 and N2 speeds shown on data sheet and press Start to acquire vibration data from three sensors installed on the engine. (All data from the three sensors is acquired simultaneously for each regime.)

(5) This step will be required for each flight regime listed on the N1 Engine Vibration Test Data Sheet.

NOTE: Operations at high power settings will require hover or forward flight.

Stabilize engine until the VXP acquires data.

(6) At each engine speed, record indication on VXP display unit screen. This data can also be saved and recalled as part of the VXP chart operation. This data can also be printed using the print menu key.



Engine Vibration Test
Figure 11

UP781957

I. Engine Evaluation

(1) If the recorded numbers are less than the established limits, the engine has passed the vibration test and may be released for unrestricted flight. If all readings are within limits proceed to step (4).

NOTE: If any vibration reading exceeds the engine operating limits, this operational point should be repeated while using Table 1. Vibration Sources and Corrective Action.

(2) Vibration measured with 70 Hz high pass filter will include airframe-related vibration. If recorded indication exceeds limit using the 70 Hz filter but is acceptable using the 200 Hz filter, the excessive vibration is caused by the airframe. Refer to Table 1. Vibration Sources and Corrective Action to identify the problem. Corrective action must be accomplished and the engine must be tested again prior to release of the engine for unrestricted flight.

NOTE: If any vibration reading exceeds the engine operating limits, this operational point should be repeated while using Table 1. Vibration Sources and Corrective Action.

(3) Vibration measured with the 200 Hz filter represents engine vibration only. If recorded vibration exceeds the limits as specified, corrective action to the engine must be performed prior to testing the engine again. Refer to Table 1. Vibration Sources and Corrective Action to identify the problem.

CAUTION: Run engine at flight idle for a minimum of 2 minutes until temperatures stabilize.

NOTE: Coast down should occur with no rubbing or abnormal noises.

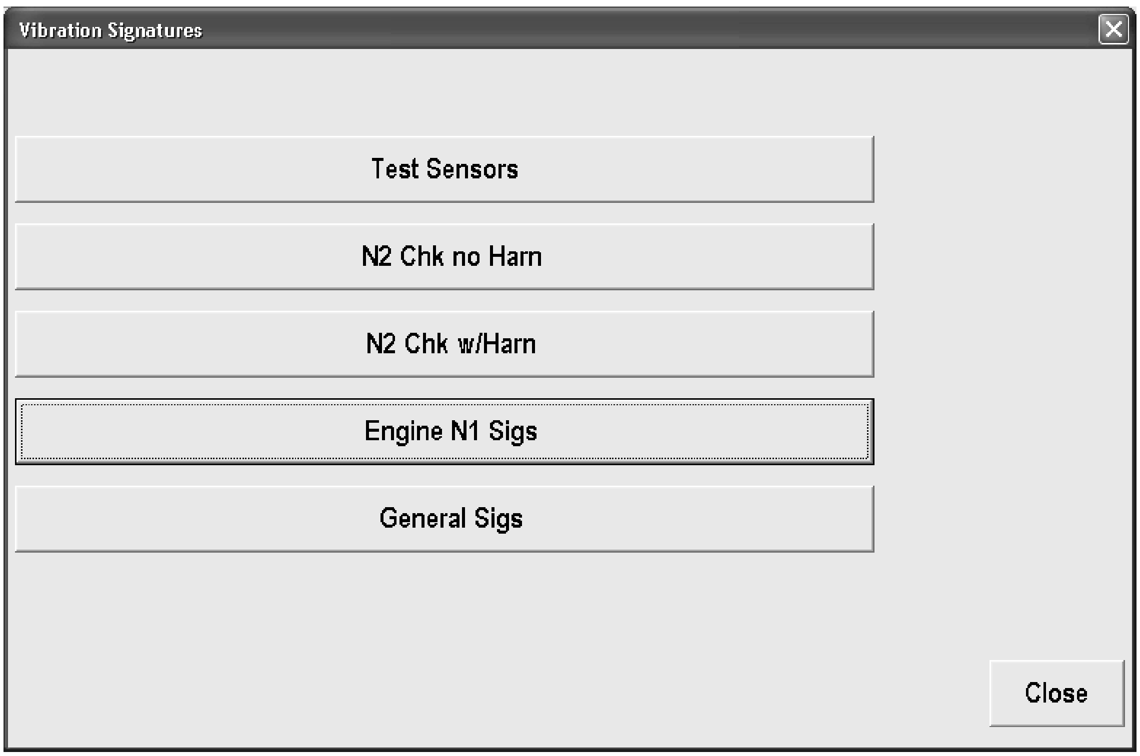
(4) Upon completion of engine check runs, move throttle to idle then shut down.

(5) Install protective covers.

J. Accessing Vibration Signatures

(1) To access the DP software's PM routes, use the Vibration Signatures option button in the Main window. For the T53 engine aircraft, this window offers the user the following option buttons as shown in Figure 12:

- Test Sensors
- N2 Chk no Harn
- N2 Chk w/Harn
- Engine N1 Sigs
- General Sigs

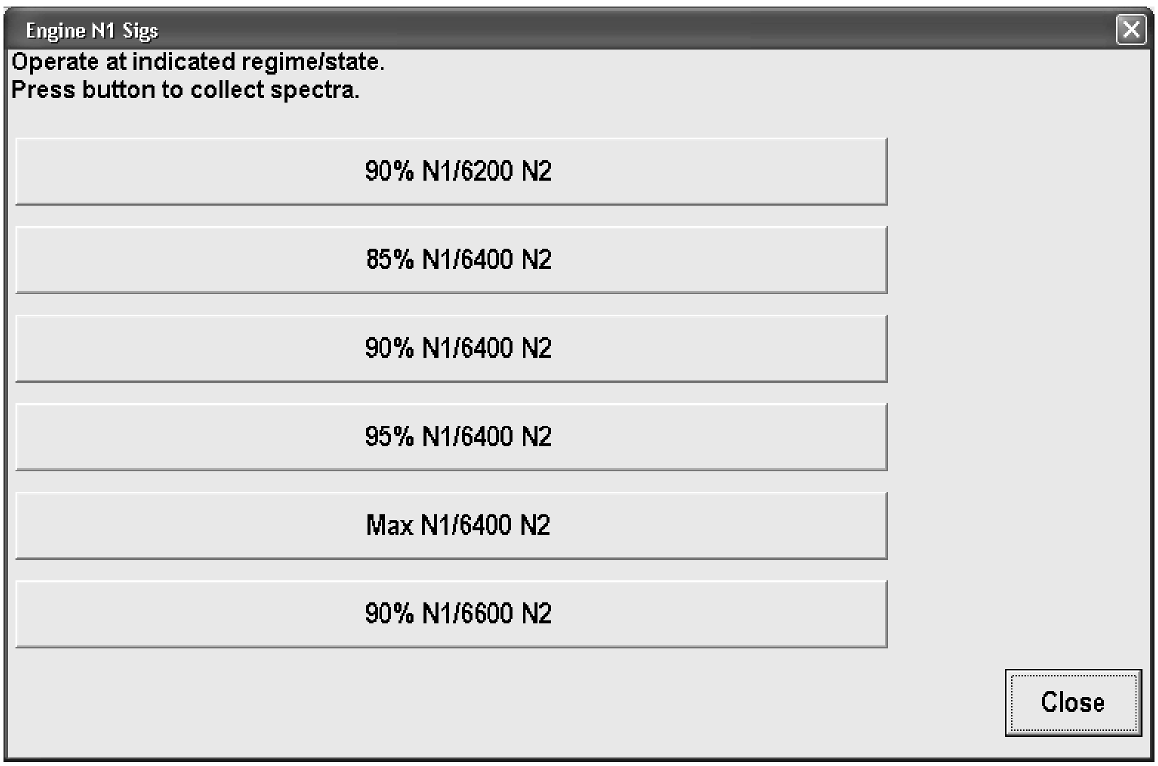


Vibration Signature Window
Figure 12

(2) Select Engine N1 Sigs. This action displays the Engine N1 Sigs window as shown in Figure 13.

(3) Select regime to acquire data.

(4) After data collection, select additional regimes (if required) for data acquisition.



Engine N1 Sigs Window
Figure 13

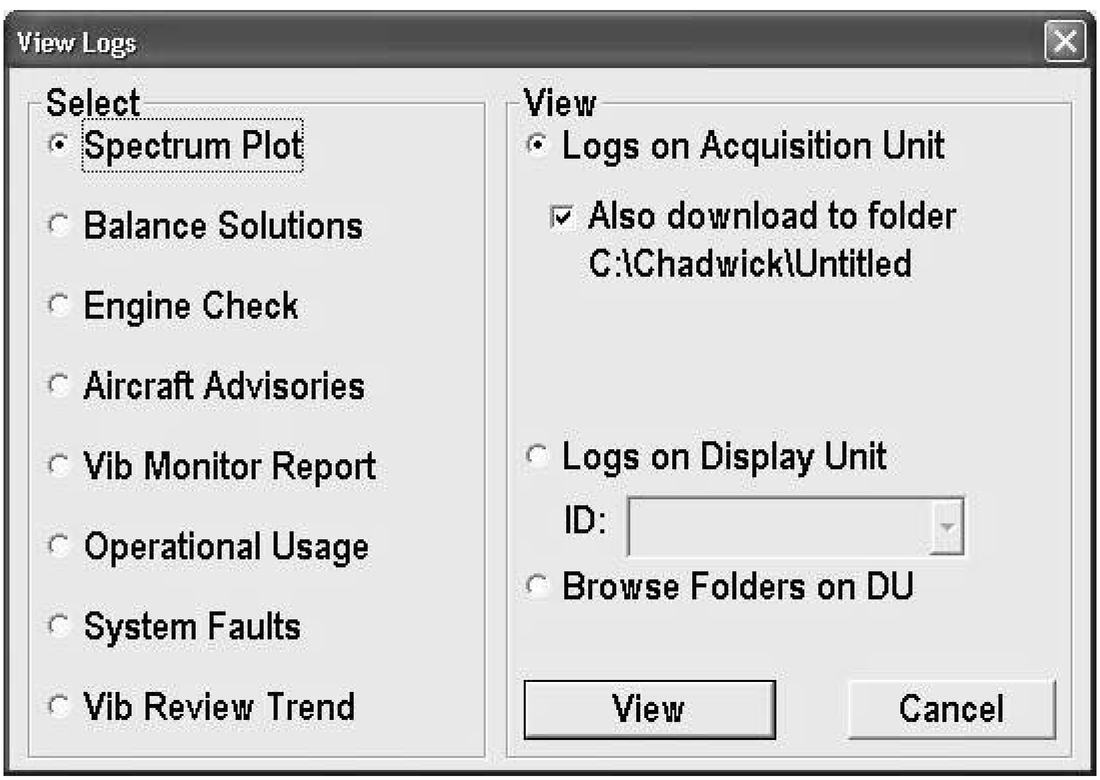
K. Viewing Spectrum Plots (See Figure 14)

(1) To view the collected spectrum plots collected during press the View Log icon in the smart icon bar.

NOTE: The settings in the View Logs screen should be automatically defaulted to these settings.

(2) Select the Spectrum Plot option in the Select area and the Logs on Acquisition Unit option from the View area.

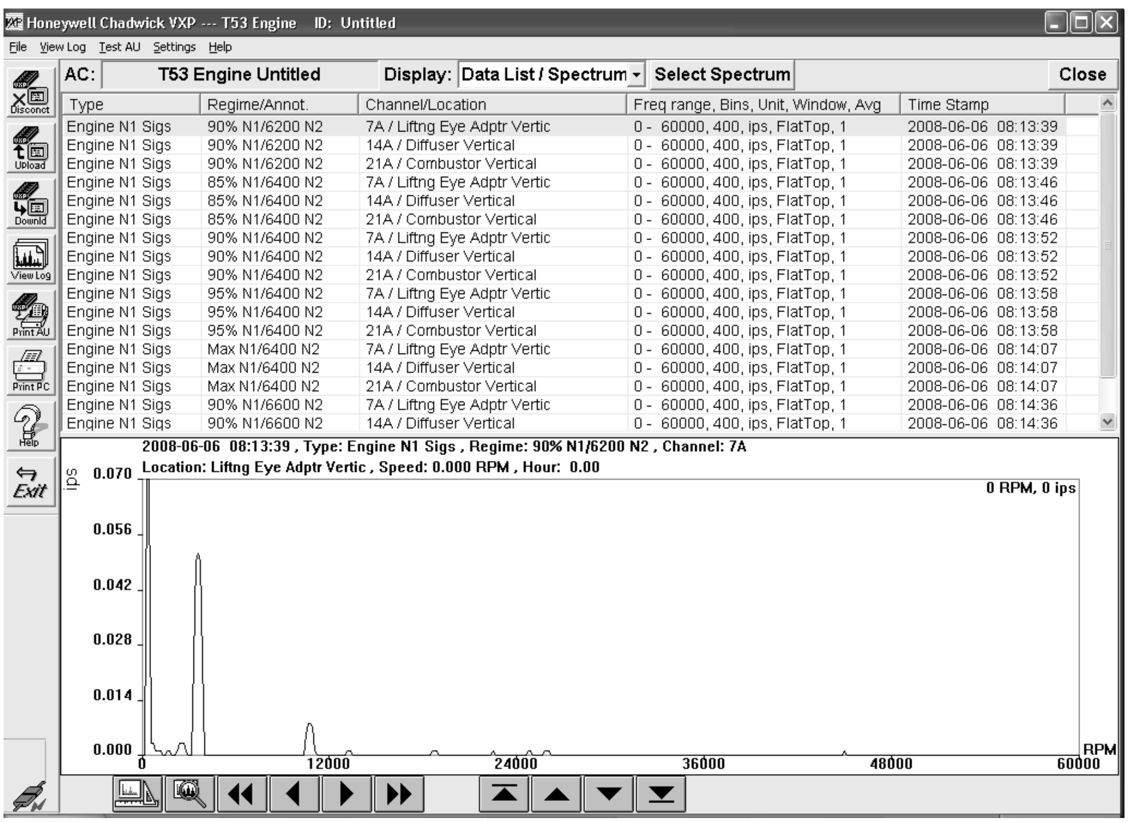
(3) Select the View button. A window will display all the previously recorded measurements during the data acquisition.



View Logs Window
Figure 14

L. Analysis of Vibration Signature

A typical Spectrum display is shown in Figure 15. This screen capture is to be used for demonstration and training proposes only and does not represent the actual aircraft. Interpretation of the graph below the list of spectra is straightforward. The horizontal axis shows the RPM range of the spectra with peaks identifying the speed associated with various components. The vertical axis of the spectra is the amplitude of vibration (how much) in Inches Per Second (IPS) velocity. Clicking on the IPS label will toggle the vertical axis to show two other vibration units of measure, g and mils. The cursor position is shown in the upper right hand corner of the spectral pane. Clicking on the high or low scale IPS labels will range the screen up or down for detail analysis.



Vibration Signatures Reading
Figure 15

M. Downloading Log Files

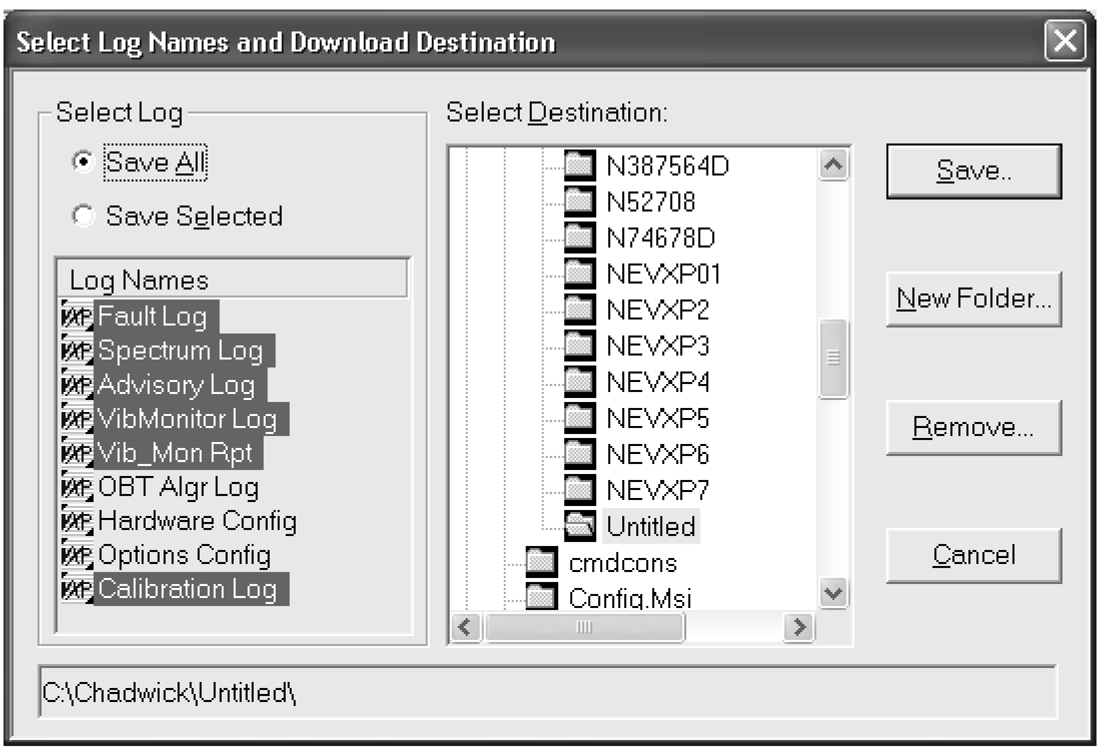
(1) Select the download icon as shown in 0.

Download Icon
Figure 16

(2) The Select Log Names and Download Destination will be displayed. (See Figure 17.) Select desired folder as the destination for the download. The Save All option should be selected.

(3) Select Aircraft folder where the log files will be saved and select Save.

(4) Confirm Download to folder selected. Select Save.



Select Log Names and Download Destination
Figure 17

TEMPORARY REVISION NO. 86

INSERT PAGE 8 OF 8 FACING 71-00-00, PAGE 41.

Reason: To change paragraph title.

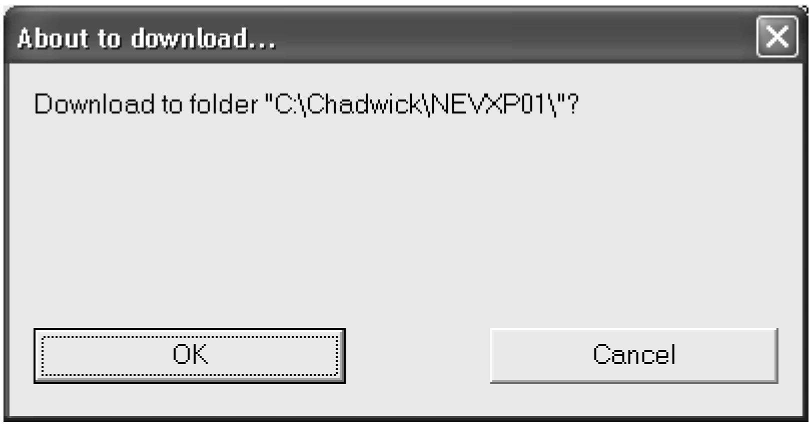
Paragraph 12.P. is changed as follows:

P. VXP Test of Acquisition Unit

(5) Select OK (See Figure 18)

NOTE: The collected Spectrum Routes downloaded can be emailed or viewed at any time.

(6) It is recommended to view the data and verify it has been downloaded. This will prevent the loss of any data.



About to Download
Figure 18

O. Calibration and Test

Consult vendor manuals where applicable for information on calibration and test.

P. VXP Test AU

(1) Power up VXP Acquisition Unit and Display Unit.

(2) Open VXP Display Program.

(3) Select Connect to AU.

(4) Select Test AU from the Menu Bar.

(5) Select the Initiated BIT option from the drop-down Test AU menu.

(6) The VXP Test/Health Status Progress message box displays. When the BIT is completed, the progress box displays the status of the system.

(7) Click on OK to proceed.

13. Extreme Weather Operation

A. Abnormal Weather - General

(1) Abnormal weather maintenance procedures include operation during icing and precipitation, cold weather and arctic operation, and hot weather and desert operation.

(2) Engines are designed to operate at outside air temperatures from -65 to 130°F (-54 to 54°C) and up to an altitude of 25,000 feet.

(3) When engine is operated under conditions of extreme cold or heat, following operating precautions shall be observed.

B. Cold Weather and Arctic Operation

(1) Cold weather operation of engine presents no unusual problems if operator is alert to changing temperature and precipitation conditions.

(2) Use of anti-icing system will provide protection against icing at power levels above 50 percent maximum continuous power.

(3) There is no anti-icing protection below 50 percent maximum continuous power. Operation in icing conditions below this power should be avoided.

(4) Anti-icing system must be placed in operation when both following conditions exist.

(a) Ambient temperature is between +40 to -35°F (+4 to -37°C).

(b) It is raining or free water exists in the air, such as visible fog. (See Airframe Flight Manual for operating instructions.)

(5) Before starting engine, proceed as follows:

(a) Remove accumulation of snow and ice from air inlet area.

CAUTION: DO NOT USE STARTER TO FREE A FROZEN ENGINE.

(b) Manually rotate the compressor rotor to make sure that engine is not frozen.

(c) Use ground heater units to preheat the engine when the engine is frozen.

(d) Inspect drains to ensure normal drainage.

(e) Observe fuel and oil temperature and pressure limitations.

NOTE: Oil pressure may exceed maximum operating pressure for a short period of time after initial engine start up at low ambient temperatures.

(f) Use normal pre-start checks and starting procedures. (See Airframe Flight Manual.)

(6) After engine shutdown, proceed as follows:

NOTE: Do not install engine inlet and exhaust covers until after engine has cooled.

During outside storage, ensure that engine inlet and exhaust covers are installed to protect against rain, sleet, snow, or other foreign matter.

C. Hot Weather and Desert Operation

(1) Hot weather operation of the engine presents no unusual problems. The following maintenance precautions shall be observed.

CAUTION: SEE OIL OVERTEMPERATURE LIMITS. (SEE 71-00-00, PARAGRAPH 10.E.)

(2) Before starting engine, proceed as follows:

(a) Check that the engine inlet is free of sand, heavy dust accumulation, and other foreign matter.

(b) Check all filters more frequently than during normal operation.

(c) Use normal starting procedures. (See Airframe Flight Manual.)

(3) After engine shutdown, proceed as follows:

(a) Install engine inlet and exhaust protective covers immediately after engine cools.

(b) Park aircraft facing into the wind or in sheltered area if possible.

ENGINE

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ENGINE - DESCRIPTION AND OPERATION

1. General

    A. This chapter provides maintenance instructions for Model T53-L-13B S/SA and T53-L-13B S/SB shaft turbine engines, designed and manufactured by Honeywell Aerospace, Phoenix, AZ, U.S.A. Procedures in this manual may be accomplished with the engine installed or removed from the aircraft.

    NOTE: Operators are cautioned that when using this manual for performing maintenance, all limitations and inspections required by Honeywell's maintenance program are to be observed. Refer to Service Bulletins 0001, 0020, and 0024 for TBO and TBI limitations and for life limits on components.

    B. This chapter contains description of the engine, its systems and system components, and the procedures required to maintain the engine. The procedures include trouble shooting, servicing, removal, disassembly, cleaning, inspection, repair, reassembly, installation, adjustment, and testing.

2. Description of Engine

    A. Honeywell gas turbine engines are free turbine power plants.

    B. Engines are shaft turbine engines with a two stage, free type power turbine and a two stage gas producer turbine that drives a combination axial centrifugal compressor. Combustor is an external annular type. Five major sections of the engine are air inlet, compressor, diffuser, combustor, and exhaust.

    C. This manual includes Honeywell Models T53-L-13B S/SA and T53-L-13B S/SB listed in Table 1. Basically, these engines are of the same configuration but differ in some parts or assemblies. Description and information in this manual apply to all the above named models. Where a specific configuration or maintenance procedure of one model differs from another, separate instructions are provided.

3. Directional References

    A. Front: End of engine from which output power is extracted. (See Figure 1.)

    B. Rear: End of engine from which exhaust gases are expelled.

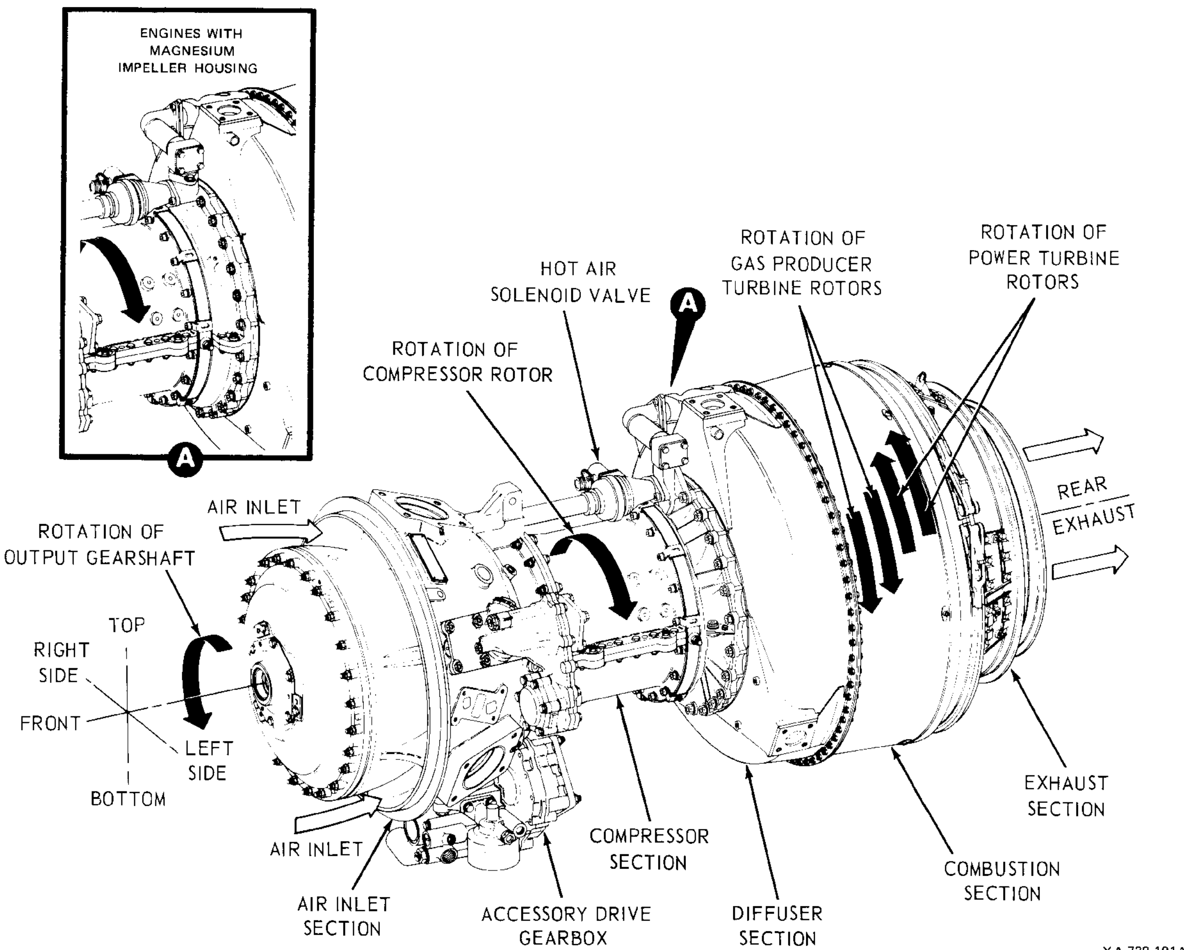
    C. Left and Right: Determined by observing engine from exhaust end.

    D. Bottom: Determined by location of accessory drive gearbox.

    E. Top: Directly opposite, or 180 degrees from, the accessory drive gearbox. (Hot air solenoid valve is at the top of the engine.)

    F. Rotation of Direction: Determined as viewed from rear of engine. Direction of rotation of compressor rotor and first stage turbine is counterclockwise. Second stage turbine and power output gearshaft rotate clockwise.

    G. O'clock: Position expressed as viewed from rear of engine.



Major Sections of Engine and Directional References
Figure 1

4. Specifications

For engine specifications. (See Table 1.)

5. Description of Engine Systems

A. The engine systems are as follows: lubrication, internal cooling, pressurization and anti-icing, fuel, fuel control, electrical, interstage air-bleed and variable inlet guide vane. The systems and their components are described and illustrated separately.

B. Lubrication System. (See Figure 2 and Figure 3.)

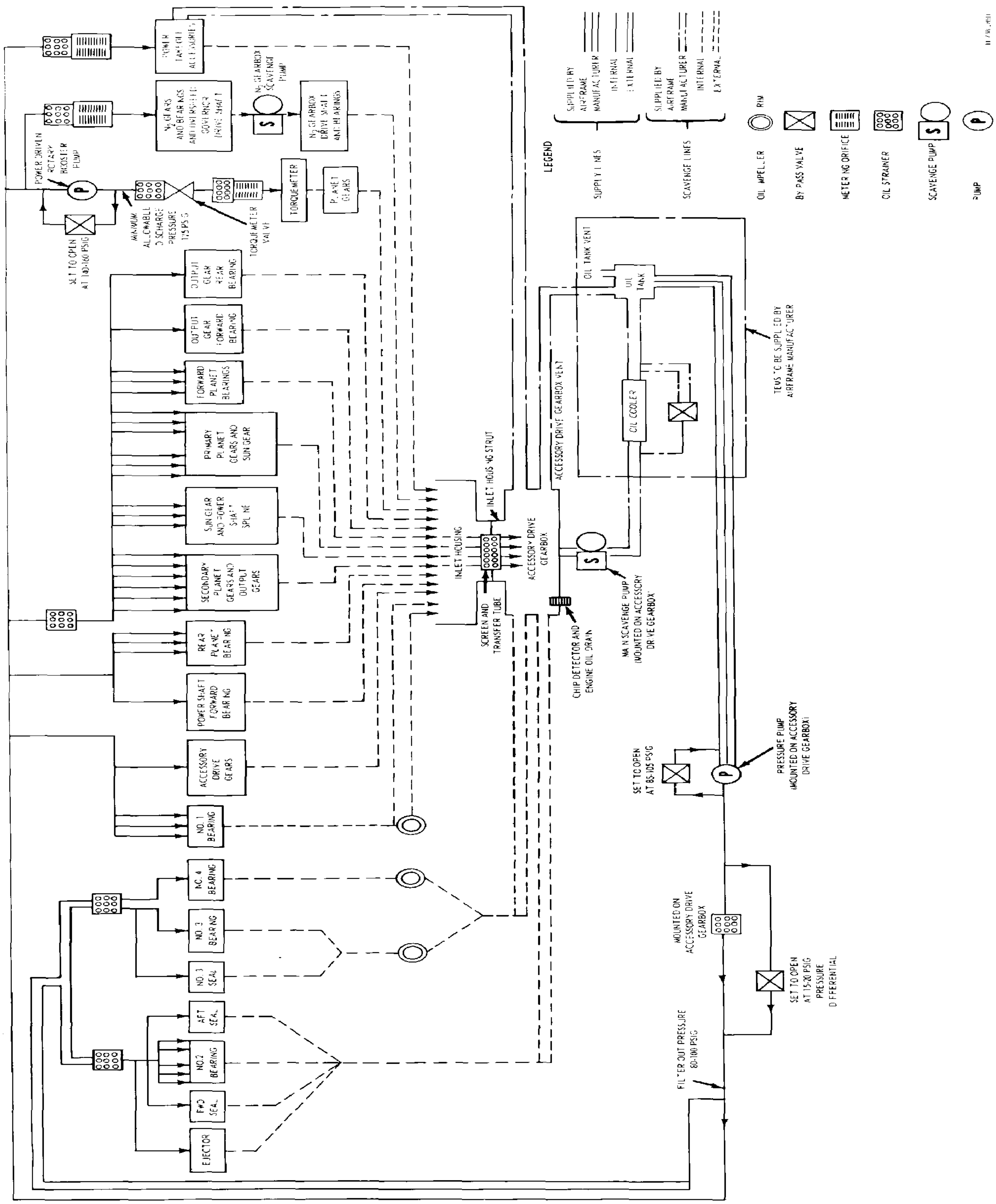
(1) The engine lubrication system consists of main oil pressure supply system and the oil scavenge system. Principal components of lubrication system are lube oil filter assembly, power driven rotary (oil) pump, power driven rotary (booster) pump, and associated external hose assemblies and internal passages.

(2) Main oil pressure supply system. Engine lubricating oil is supplied from an aircraft mounted oil tank. Oil enters power driven rotary (oil) pump mounted on accessory drive gearbox and is discharged through internal passages to lube oil filter assembly. Filtered oil is directed into two main flow paths. One oil path passes through internal passages in inlet housing to supply lubricating oil to front section of engine including reduction gearing, torquemeter, accessory drive gearing, No. 1 main bearing, and power shaft forward bearing. The second oil flow path is through external oil pressure hose assemblies to rear section of engine for lubrication of No. 2, 3, and 4 main bearings and seals at bearing positions.

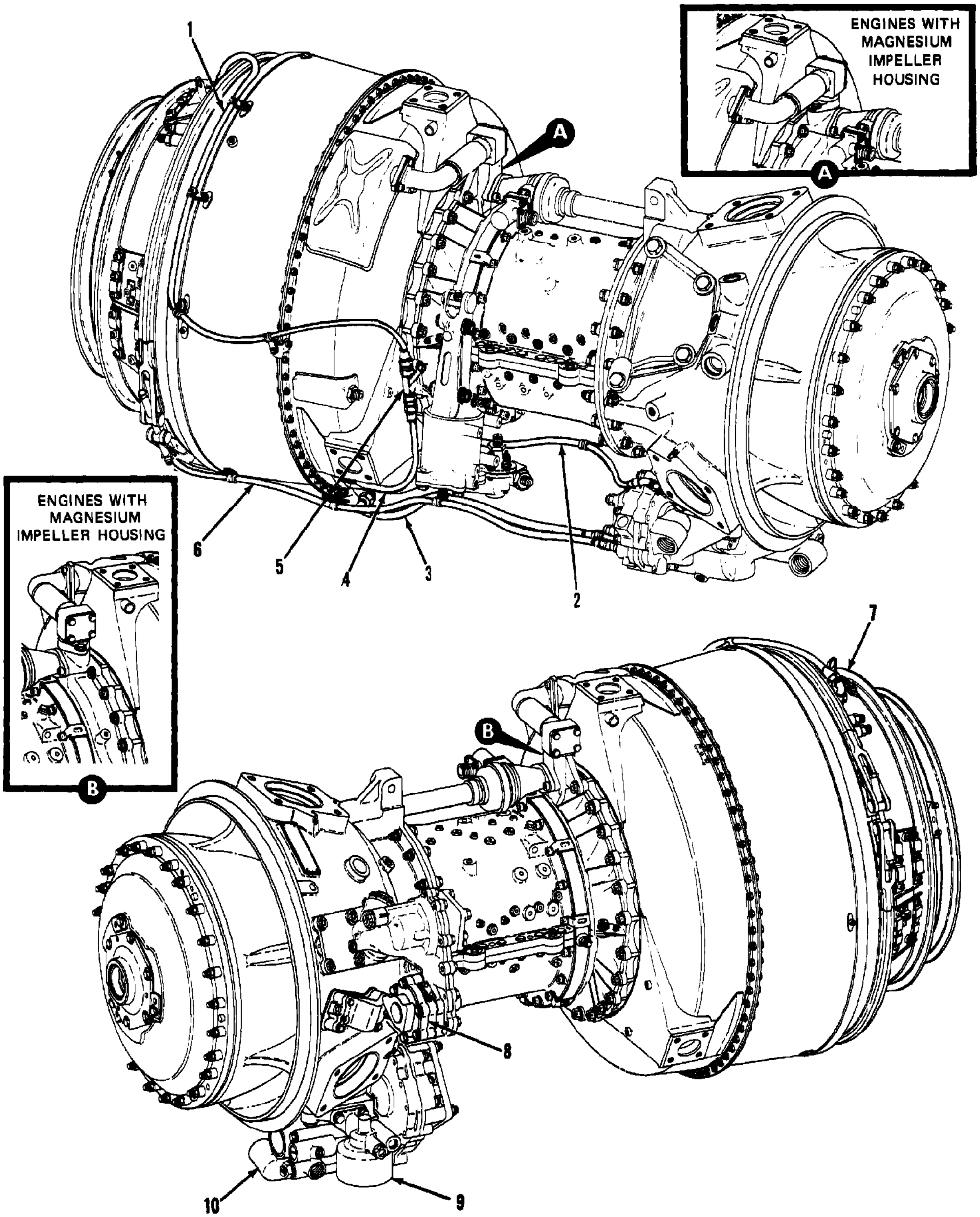
(a) In inlet housing section, oil is directed through accessory drive carrier flanges into annular passage located in rear support flange of carrier. Oil from this passage is directed to oil transfer assembly for forced feed spray lubrication of reduction gears through three oil transfer tubes. Passages in housing provide lubrication to output shaft bearings. No. 1 main bearing and accessory drive pinion gear and power shaft forward bearing are lubricated by a transfer tube from accessory drive carrier assembly. Oil under constant pressure lubricates support bearing. Oil passes through oil transfer tube in oil nozzle located on rear face of front cover housing. Oil flows through two jets in nozzle to lubricate output gearshaft support bearings.

Table 1. Specifications

Model	
Honeywell	T53-L-13B S/SA
Honeywell	T53-L-13B S/SB
Type	
Application	Helicopter Powerplant
Mounting Points Required	Minimum of three required for installation
Dimensions	
Overall Length	47.60 inches (120.904 cm)
Nominal Diameter	23.01 inches (58.445 cm)
Maximum Radius	13.55 inches (34.417 cm)
Weight	
Specification Weight (Dry)	540 pounds (244.944 kg)
Residual Fluids (Estimated)	Oil, 3 pounds, Fuel, 2 pounds
Rotational Direction	
Compressor Rotor	Counterclockwise
Gas Producer Turbines	Counterclockwise
Power Turbines	Clockwise
Power Output Gearshaft	Clockwise
Type Fuel (See 71-00-00, paragraph 2.)	
Type Oil (See 71-00-00, paragraph 3.)	
Miscellaneous	
Combustion Chamber	External annular
Compressor Ratio	7 to 1
Operating Temperature	
Range	-65 to 130°F (-54 to 54°C)
Altitude	25,000 feet minimum guaranteed



Lubrication System Diagram
Figure 2



Lubrication System External Components
Figure 3

KEY TO FIGURE 3

1. OIL PRESSURE HOSE ASSEMBLY TO NO. 3 AND 4 BEARINGS
2. OIL PRESSURE HOSE ASSEMBLY TO LUBE PRESSURE MANIFOLD
3. OIL SCAVENGE HOSE ASSEMBLY FROM NO. 2 BEARING
4. OIL PRESSURE HOSE ASSEMBLY TO NO. 2 BEARING FILTER
5. LUBE PRESSURE MANIFOLD
6. OIL SCAVENGE HOSE ASSEMBLY FROM NO. 3 AND 4 BEARINGS
7. NO. 3 AND 4 BEARING OIL STRAINER HOUSING CONNECTOR
8. POWER DRIVEN ROTARY BOOSTER PUMP
9. LUBE OIL FILTER ASSEMBLY
10. POWER DRIVEN ROTARY OIL PUMP

(b) A third transfer passage from accessory drive carrier is directed up through an inlet housing strut to power driven rotary (booster) pump, which is mounted on, and driven by, the overspeed governor and tachometer drive assembly. This assembly includes a pressure regulating valve that governs output pressure of power driven rotary (booster) pump by circulating excess pressurized oil back to inlet housing. Pressurized oil from power driven rotary (booster) pump is directed back through an inlet housing strut and a strainer to torquemeter valve located on torquemeter cylinder.

(c) An offset passage in overspeed governor mounting flange supplies oil to strainer and metering cartridge in overspeed governor which directs metered oil to overspeed governor and tachometer drive gear train. An additional transfer passage from main transfer support assembly directs oil through internal passages in inlet housing to power takeoff mounting flange. This oil, as required, passes through a strainer and metering orifice to lubricate engine driven accessories on power takeoff mounting flange.

(d) Oil flow to rear section of engine is supplied from an oil pressure port at 5 o’clock position on inlet housing through an external flexible oil hose assembly to lube pressure manifold mounted on forward face of diffuser housing. Oil is directed from bottom of diffuser housing to No. 2 main bearing and forward and aft seals. Oil is directed from top of manifold through a hose assembly and strainer through upper strut in exhaust diffuser to lubricate No. 3 and 4 main bearings.

(3) Oil scavenge system.

(a) All internal scavenge oil from inlet housing section drains through hollow support struts to bottom strut in inlet housing, through a screen and transfer tube, and into accessory drive gearbox. Scavenge oil from output reduction carrier and gear assembly flows by gravity into hollow inlet housing struts.

(b) Scavenge oil from No. 1 main bearing is pumped to inlet housing struts by an oil impeller mounted on rear of bearing. Scavenge oil from No. 2 main bearing flows through a scavenge oil tube in diffuser housing and is directed to accessory drive gearbox by an external scavenge oil hose assembly. Scavenge oil from No. 3 and 4 bearings, aided by two impellers located in bearing housing, flows through oil tube that extends through bottom of exhaust diffuser and is directed to accessory drive gearbox by an external scavenge oil hose assembly. Scavenge portion of the power driven rotary oil pump returns scavenge oil from accessory drive gearbox through aircraft oil cooler and back to oil storage tank.

(4) Torquemeter. The torquemeter is a hydromechanical torque measuring device located in reduction gearing section of inlet housing. The torquemeter uses lubricating oil boosted to a high pressure by power driven rotary booster pump. It consists of a stationary plate, a movable plate attached to planet gear carrier, and 18 steel balls positioned in conical pockets located in both plates. Resistance to rotation of planetary gears, due to load on output shaft, causes carrier mounted plate to rotate slightly. Torquemeter balls are displaced from their individual pockets, forcing rear torquemeter plate to move rearward. Rearward motion of torquemeter plate unseats a spring loaded poppet valve, permitting high pressure oil to enter torquemeter cylinder chamber and equalize force tending to cause rearward movement of torquemeter plate. Torquemeter oil pressure from cylinder and gearbox air pressure is directed to aircraft torquemeter gage which indicates differential torque oil pressure in psi. Differential torque oil pressure is proportional to torque delivered to output gearbox.

C. Fuel System. (See Figure 4 and Figure 5.)

(1) The fuel system consists of the fuel control, starting fuel solenoid valve, main and starting fuel manifolds and hoses, flow divider assembly, starting fuel nozzles, check filter valve (purge) and fuel atomizers. A pressure operated drain valve, at the bottom of the combustion chamber housing, automatically drains unburned fuel from the combustion chamber when the engine is shut down.

(2) Starting fuel system. During engine start, the starting fuel system delivers starting fuel to the combustion chamber. Energizing the start switch opens the starting fuel solenoid valve, allowing scheduled fuel from the fuel regulator to flow through the starting fuel manifold, four starting fuel nozzles, and into the combustion chamber where it is ignited by four igniter plugs. At 40 percent N1 speed, the ignition, starting fuel solenoid valve and starter are deenergized to close and stop the flow of starting fuel. The check filter valve opens and bleeds pressurized air from combustor to purge fuel from starting fuel lines and nozzles.

NOTE: At low ambient temperatures, JP-5 and JP-8 fuel may cause slow engine starts.

(3) Main fuel system. The main fuel system delivers metered fuel from the fuel regulator to the main fuel manifold where it is discharged through 22 fuel nozzles into the combustion chamber. Main fuel is ignited by the burning starting fuel.

(4) Fuel control system. (See Figure 4.) The fuel control system consists of a primary control for the gas producer section and an overspeed governor for the power turbine section. An integral dual fuel pump and emergency (manual) control system are incorporated in the primary control unit. The fuel control incorporates acceleration and deceleration controls and a droop type governor for steady state speed control. The main metering valve of the fuel regulator is the controlling unit by which the main fuel flow is metered to the engine. Its position is determined by the action of the gas producer speed governor, the power turbine overspeed governor, or the acceleration deceleration control, depending upon engine requirements. In regulating the main metering valve, the governor or control that demands the least fuel flow overrides all others, except the deceleration control, to ensure a minimum fuel flow rate.

(a) Functions of gas producer speed control are to govern ground and flight operations, to limit maximum power of engine, and to maintain steady state conditions through all power ranges. Gas producer governor is driven through gearing at a speed proportional to gas producer rotor speed. It regulates gas producer rotor speed to value selected by power lever.

(b) Power turbine rotor speed is regulated by power turbine overspeed governor at rpm selected. Power turbine overspeed governor is driven through gearing at a speed proportional to power turbine rotor speed. Limits for power turbine overspeed governor are set by adjustable stops.

(5) Fuel flow. Fuel enters fuel regulator through inlet screen and flows to dual element fuel pump. It is then pumped through check valves and outlet screen to transfer valve. With transfer valve in normal position for automatic operation, fuel flows to main metering valve at a pressure regulating valve. Position of main metering valve and flow of fuel is automatically controlled by computer section of fuel regulator. Metered fuel flows through open shutoff valve and discharge port to engine flow divider, main fuel manifold, and atomizing nozzles in combustion chamber. When transfer valve is in EMERGENCY position, fuel flows through and is metered by the EMERGENCY (manual) metering valve. Fuel pressure is controlled by emergency pressure regulating valve. Fuel is delivered through the open shutoff valve to fuel discharge port and to engine flow divider, main fuel manifold, and atomizers in combustion chamber. Area of valve opening and resulting flow of fuel are determined by position of power lever controlled from cockpit.

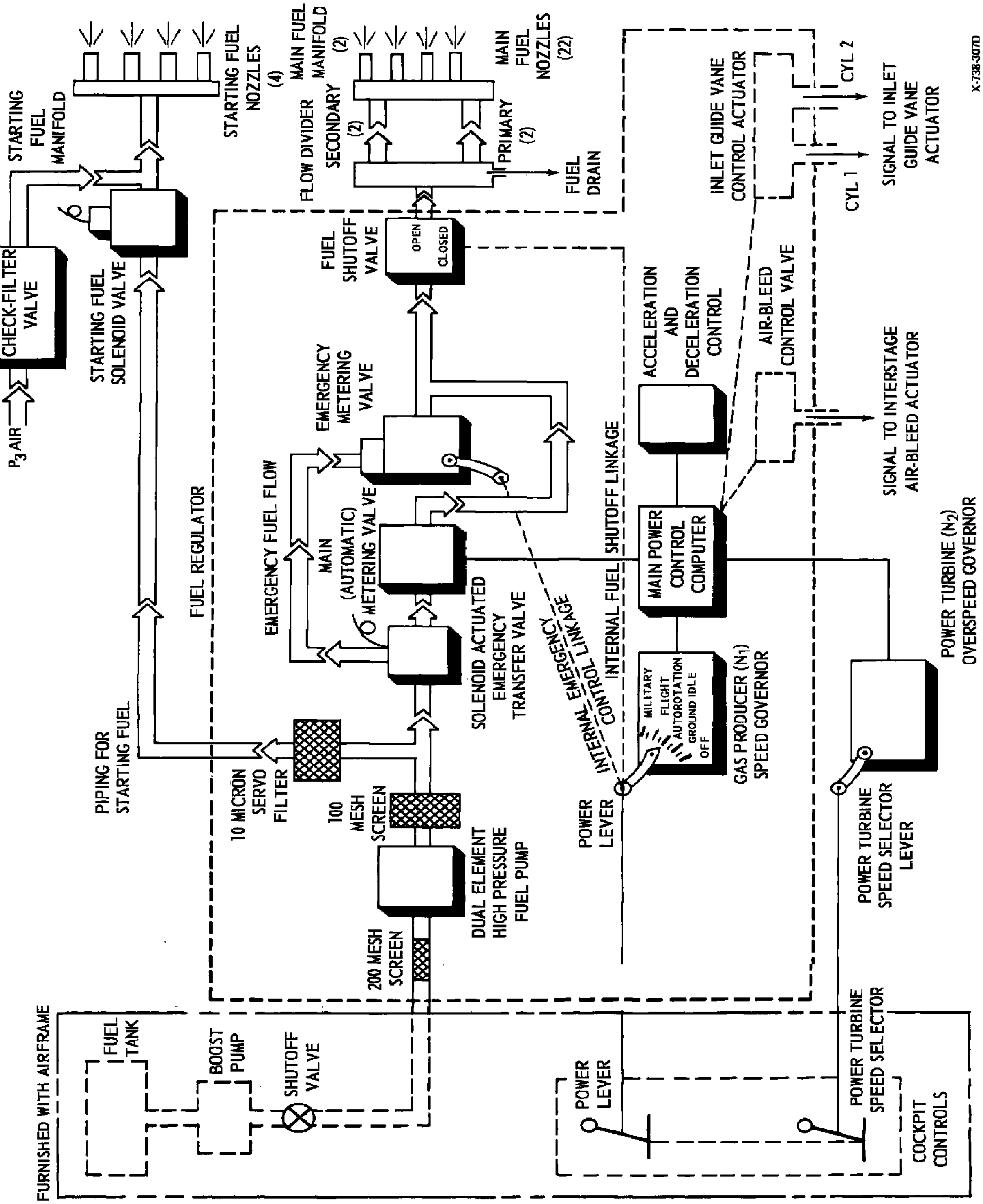
CAUTION: WHEN OPERATING THE EMERGENCY FUEL SYSTEM, THE MAXIMUM ALLOWABLE FUEL FLOW IS LOWER THAN THE AUTOMATIC FUEL SYSTEM.

NOTE: When the engine is started, using the emergency fuel system, the fuel control does not govern fuel flow. Fuel flow is controlled by the pilot.

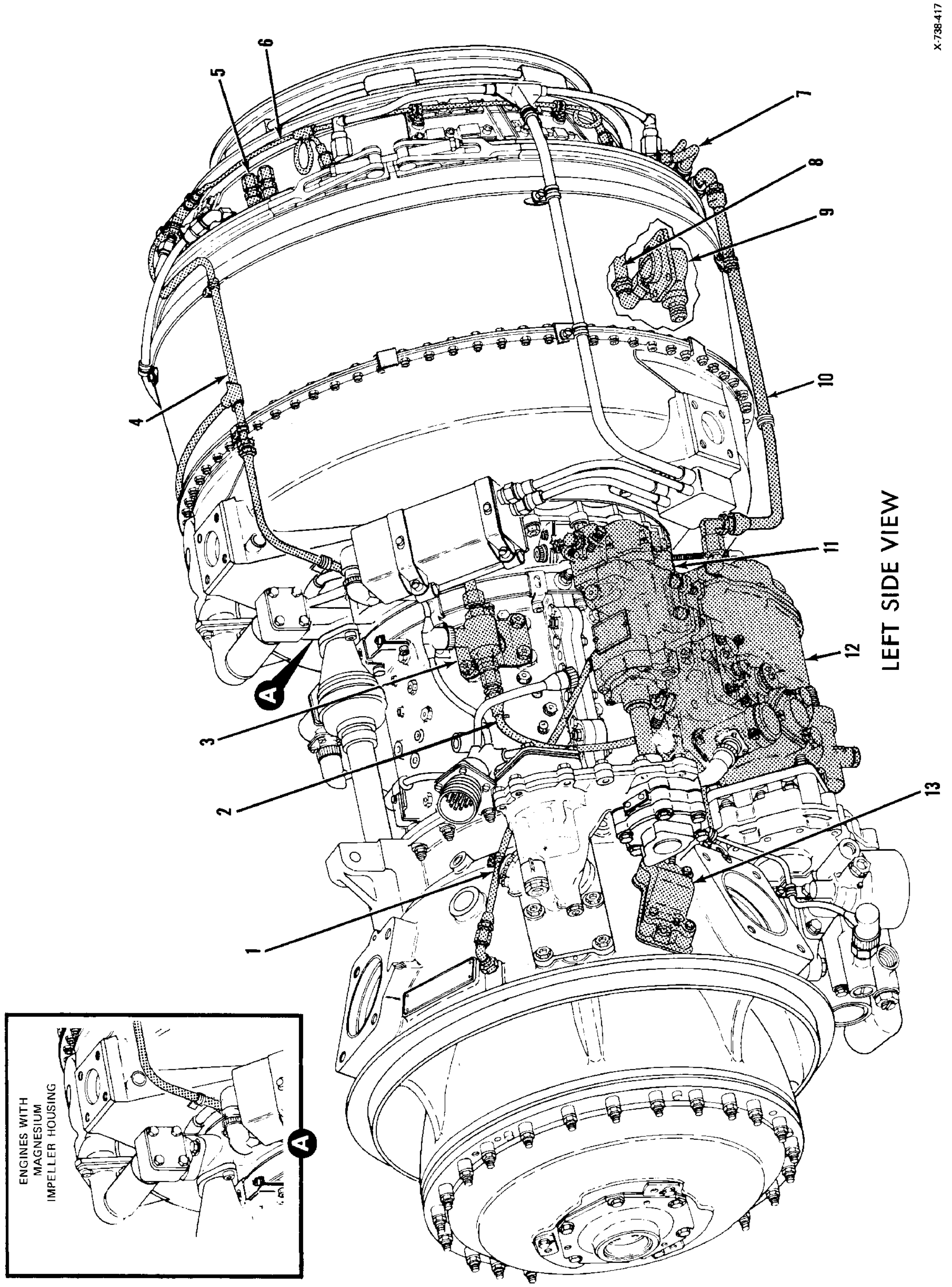
(6) Emergency (manual) fuel system. If the automatic fuel system fails, the emergency fuel system may be selected to sustain engine operation. When the emergency system is in operation, the main metering valve is bypassed. Fuel is metered to the engine by the manual system metering valve, which is positioned from the pilot’s compartment by the power lever. Acceleration and deceleration control is not provided in emergency position.

D. Electrical System. (See Figure 6 and Figure 7.)

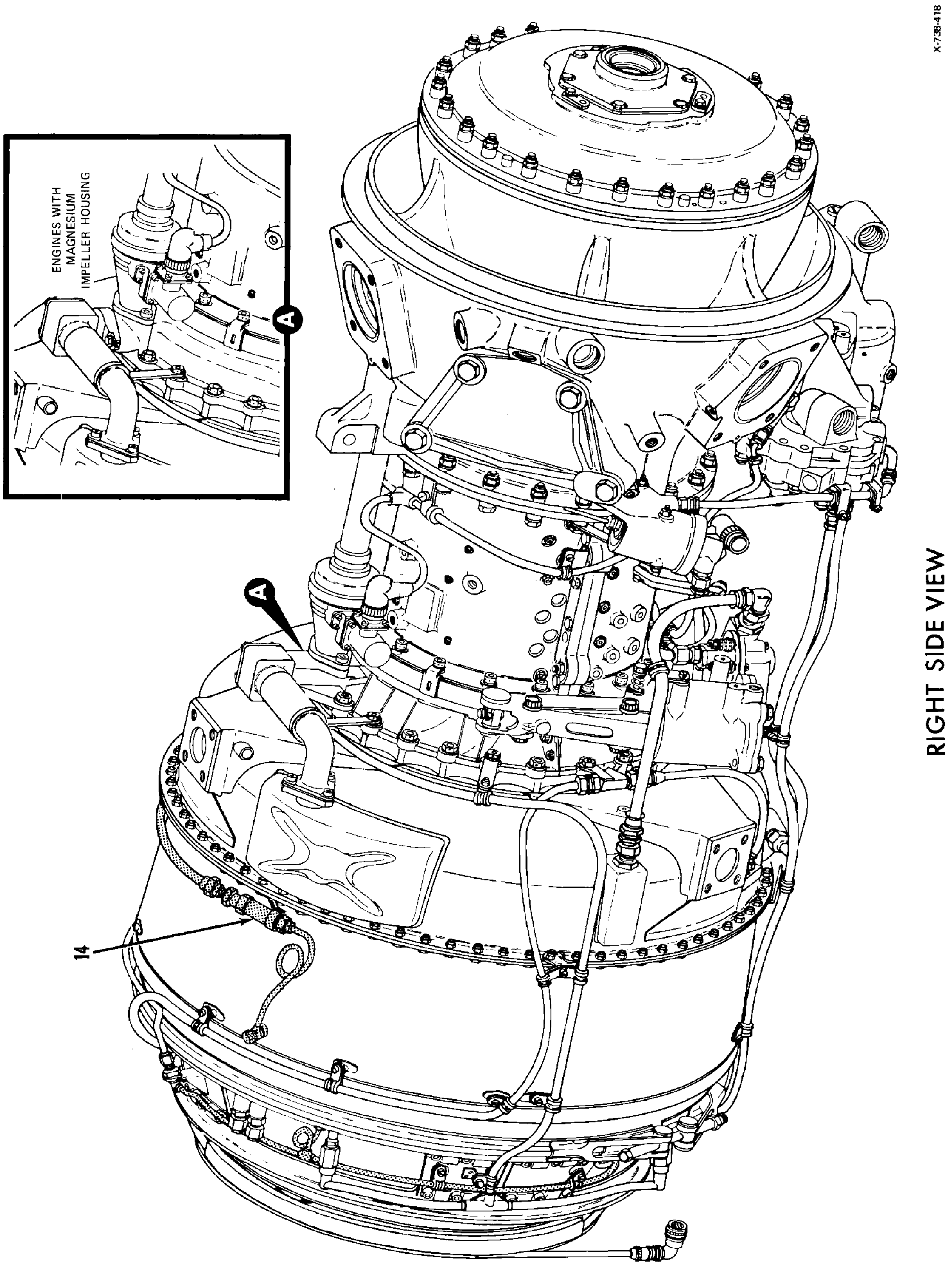
(1) The electrical system provides circuitry for starting and ignition, and for all electrical accessories.



Fuel System Diagram
Figure 4



Fuel System External Components
Figure 5 (Sheet 1 of 2)



Fuel System External Components
Figure 5 (Sheet 2)

KEY TO FIGURE 5

1. AIR PRESSURE SENSING HOSE ASSEMBLY
2. STARTING FUEL HOSE ASSEMBLY
3. STARTING FUEL SOLENOID VALVE
4. STARTING FUEL HOSE ASSEMBLY
5. MAIN FUEL MANIFOLD
6. STARTING FUEL MANIFOLD
7. FLOW DIVIDER AND DUMP VALVE ASSEMBLY
8. FLOW DIVIDER DRAIN HOSE ASSEMBLY
9. COMBUSTION CHAMBER DRAIN VALVE
10. MAIN FUEL HOSE ASSEMBLY
11. OVERSPEED GOVERNOR
12. FUEL REGULATOR
13. TEMPERATURE SENSING ELEMENT
14. STARTING FUEL CHECK FILTER VALVE

(2) Main wiring harness. The main wiring harness incorporates quick disconnect type connectors for aircraft electrical input (main connector) and for engine ignition unit, hot air solenoid valve, starting fuel solenoid valve, inlet oil temperature bulb, emergency fuel transfer solenoid valve, and power turbine (N2) and gas producer (N1) tachometer generators.

(3) Ignition system. The high energy, medium voltage ignition system consists of an ignition unit, an ignition lead and coil assembly, and four igniter plugs. The system requires 24 vdc nominal input at 3.0 amperes.

(4) Exhaust thermocouple assembly. The engine is provided with a thermocouple harness assembly consisting of an electrical connector, shielded manifold, and chromel alumel thermocouples contained in probes inserted through exhaust diffuser into path of exhaust gas and transmits exhaust gas temperatures to cockpit indicator.

E. Internal Cooling, Pressurization, and Anti-Icing Systems

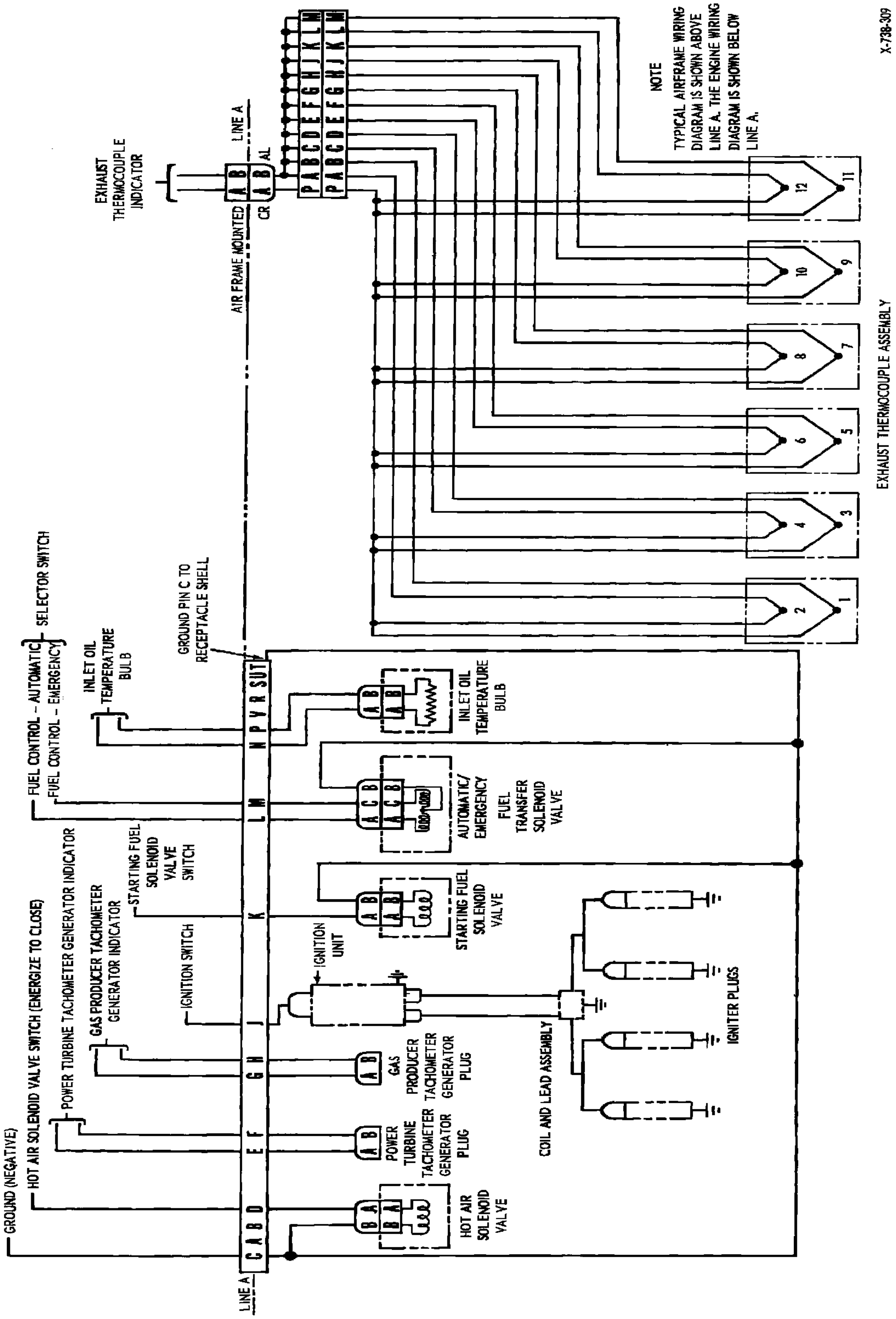
(1) The internal cooling system provides cooling air to internal engine components and pressurizes the No. 2 main bearing intershaft oil seals. The anti-icing system supplies hot air under pressure to prevent icing of the inlet housing areas and inlet guide vanes when the engine is operating under icing conditions.

(2) Internal cooling and pressurization. (See Figure 8.)

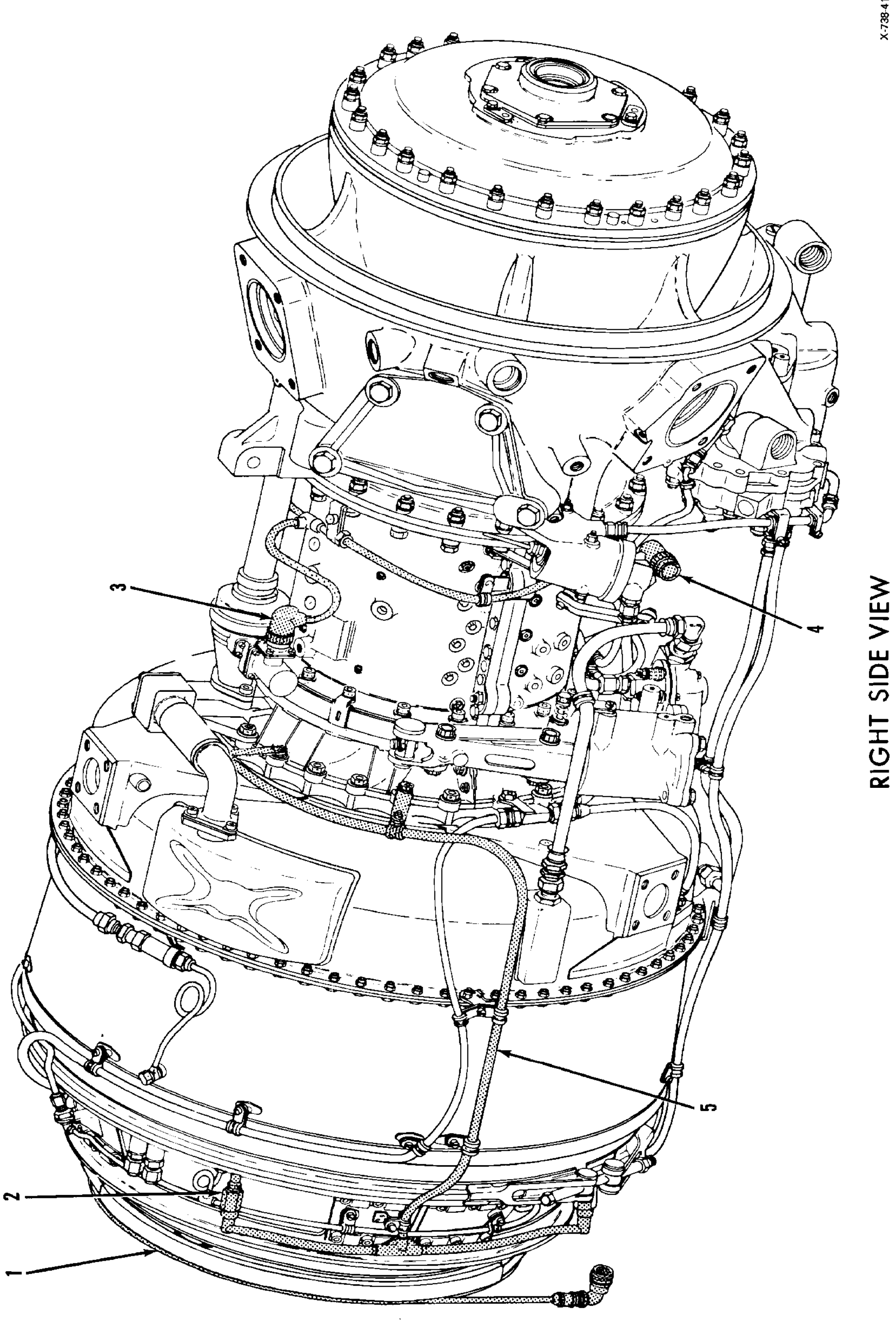
(a) Internal cooling and pressurization air is obtained from four supplies: (1) from tip of centrifugal compressor impeller, (2) from edge of combustion chamber deflector, (3) through first and second stage gas producer nozzle assemblies, and (4) from external air through hollow struts of exhaust diffuser.

(b) Compressed air bled from tip of centrifugal compressor impeller cools forward face of the diffuser housing and pressurizes No. 2 bearing forward seal. It then passes through a series of holes through the rear compressor shaft into space between the compressor rotor assembly and power shaft where it splits into three separate flow paths as follows:

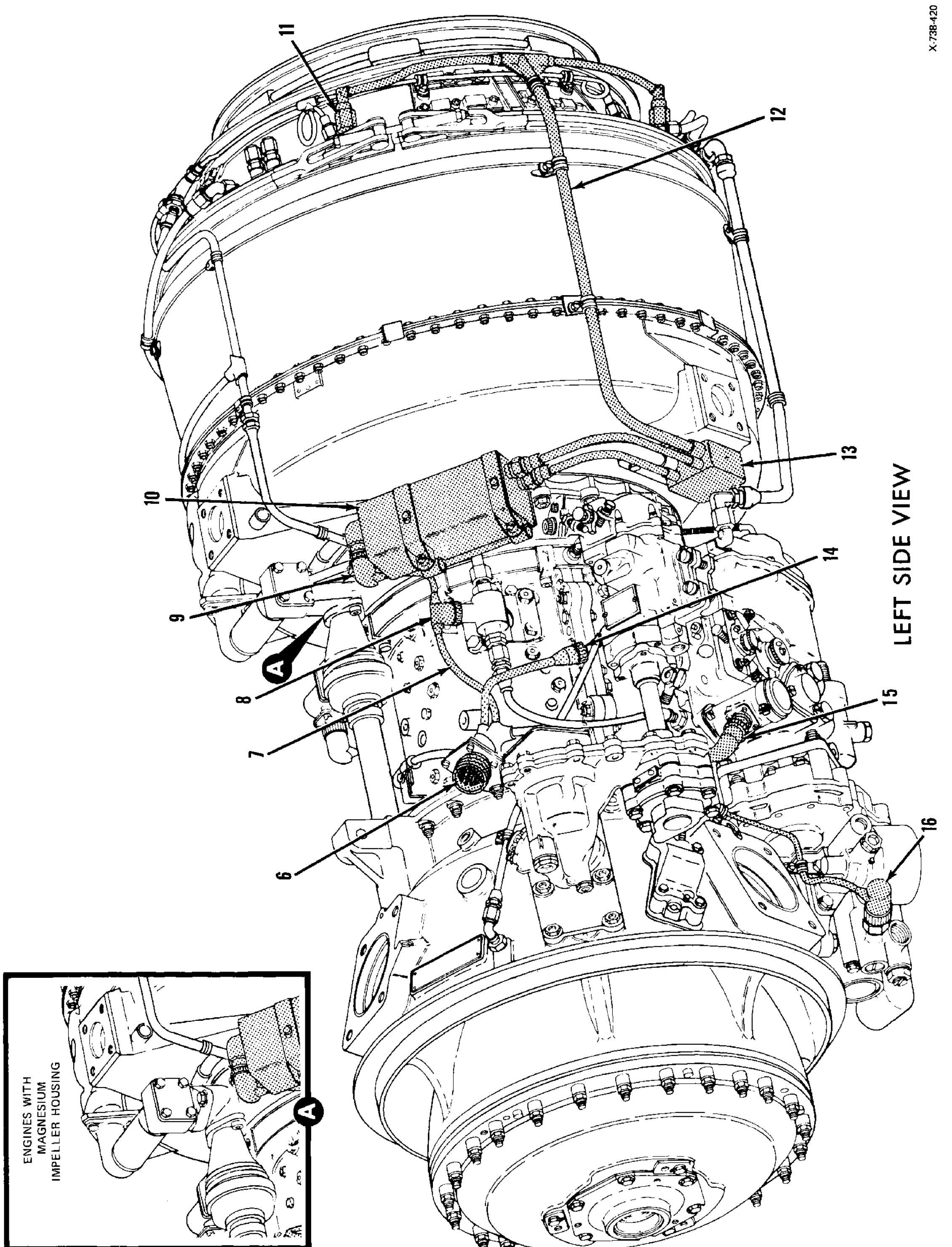
1 Some of the compressed air flows forward over the power shaft to the intershaft seal, located forward of No. 1 bearing.



Electrical System Schematic
Figure 6



Electrical System External Components
Figure 7 (Sheet 1 of 2)



Electrical System External Components
Figure 7 (Sheet 2)

KEY TO FIGURE 7

1. EXHAUSE THERMOCOUPLE ASSEMBLY
2. IGNITER PLUG
3. HOT AIR SOLENOID VALVE CONNECTOR
4. GAS PRODUCER TACHOMETER GENERATOR CONNECTOR
5. RIGHT IGNITION LEAD
6. AIRCRAFT MAIN CONNECTOR
7. MAIN WIRING HARNESS
8. STARTING FUEL SOLENOID VALVE CONNECTOR
9. IGNITION UNIT INPUT CONNECTOR
10. IGNITION UNIT
11. IGNITER PLUG
12. LEFT IGNITION LEAD
13. IGNITION LEAD AND COIL ASSEMBLY
14. POWER TURBINE TACHOMETER GENERATOR CONNECTOR
15. EMERGENCY FUEL TRANSFER SOLENOID VALVE CONNECTOR
16. OIL TEMPERATURE BULB AND CONNECTOR

2 Some of the compressed air flows aft over the power shaft and emerges at the back end of the rear compressor shaft to cool the rear face of the second stage gas producer rotor, the forward face of the first stage power turbine rotor, and first stage power turbine nozzle. The air then passes into the exhaust system.

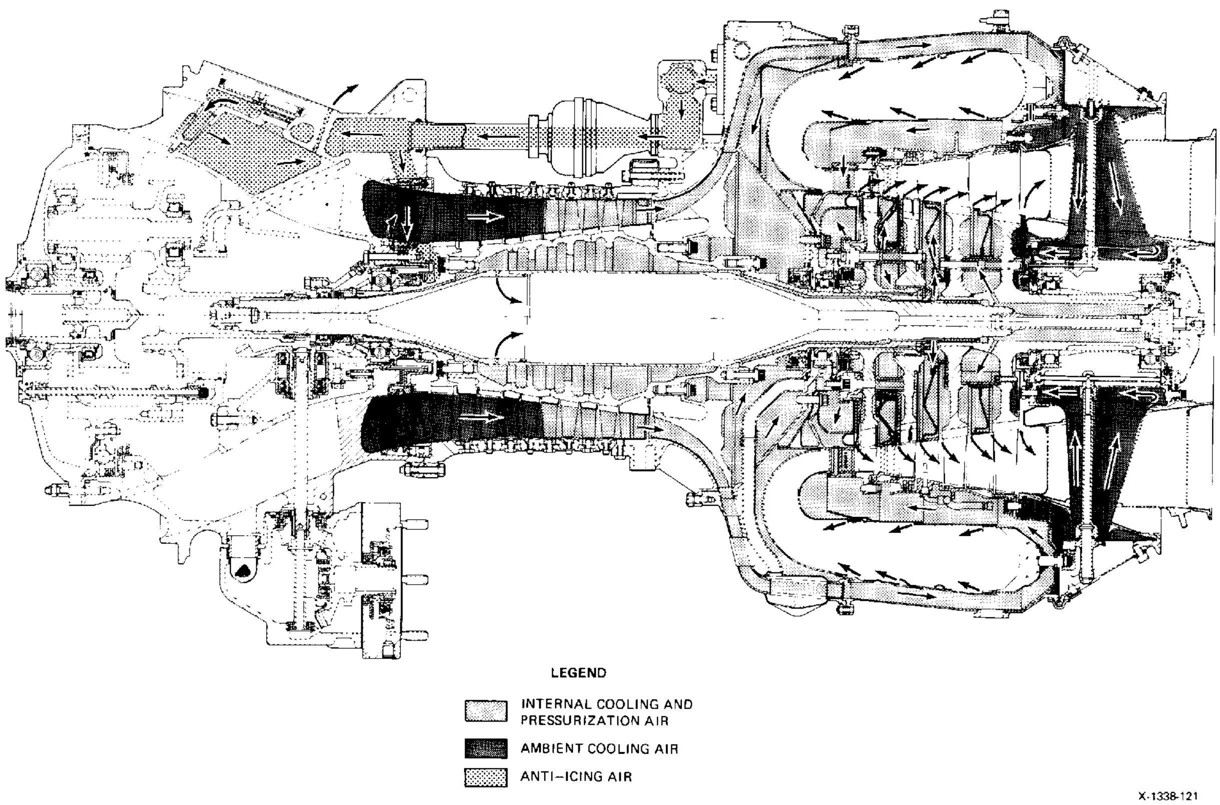
3 The remainder of compressed air flows through a series of holes into power shaft. This air flows aft, through a hole drilled in the power shaft through bolt, and into hollow interior of second stage power turbine rotor assembly. Air then passes through a series of holes in the rotor assembly to cool rear surface of first stage power turbine rotor assembly, forward surface of second stage power turbine rotor assembly, and both faces of second stage gas producer nozzle. The air then passes into the exhaust stream.

(c) Compressed air bled from edge of combustion chamber deflector cools forward face of the deflector, and passes through and cools the No. 2 bearing housing and aft seal. The air splits into two flow paths as follows:

1 Some of the compressed air cools the forward face and blade roots of first stage gas producer rotor assembly, the forward face of first stage gas producer rotor sealing disc, and then passes into the exhaust stream.

2 The remainder of compressed air flows through the first stage gas producer rotor assembly to cool lower parts of the rear face of the first stage gas producer rotor assembly, and lower forward face of second stage gas producer rotor, and out into the exhaust stream through the inner diameter of the second stage gas producer rotor.

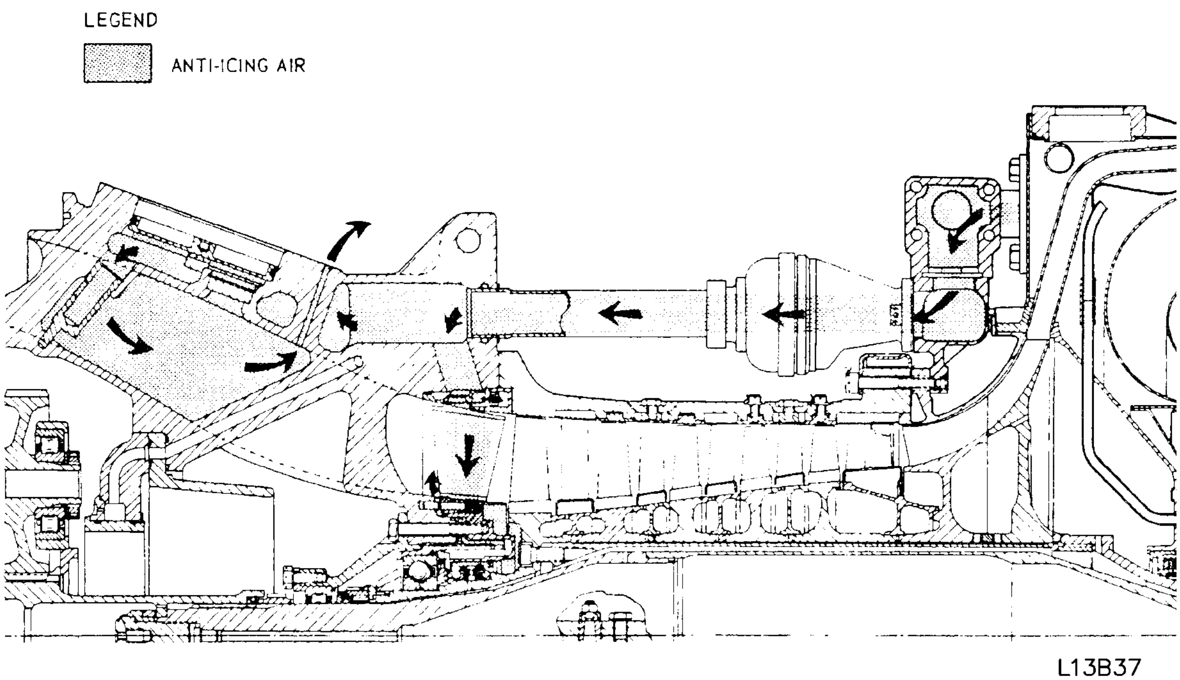
(d) Compressed air passes through and cools the first stage gas producer nozzle assembly, then through the inner shroud and deflector of the first stage gas producer nozzle assembly, and into the exhaust stream.



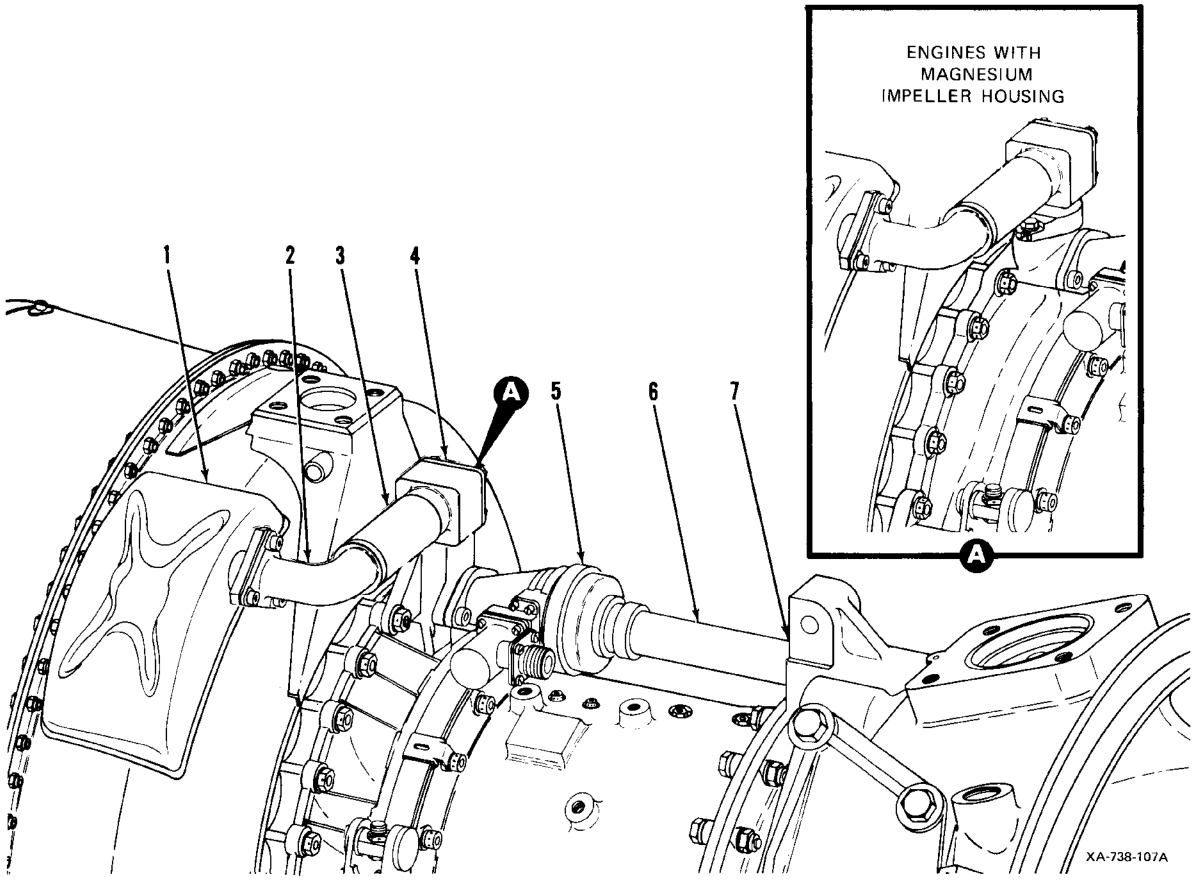
Internal Cooling and Pressurization System
Figure 8

(e) Compressed air passes through holes in the second stage gas producer nozzle assembly and between two inner deflectors, and then out to cool the rear face of the first stage gas producer rotor assembly, front face of the second stage gas producer rotor assembly, and out into the exhaust stream.

(f) Ambient air enters the exhaust diffuser struts, and passes through the exhaust diffuser support cone into the area around the No. 3 and 4 bearing housing. The cooling air moves forward over No. 3 and 4 bearing housing, and past the rear face of second stage power turbine rotor assembly, and into the exhaust stream.



Anti-Icing System Airflow
Figure 9



1. AIR DIFFUSER EXTERNAL BLEED AIR MANIFOLD
2. ELBOW
3. TUBE
4. CUSTOMER BLEED AIR ADAPTER ASSEMBLY
5. HOT AIR SOLENOID VALVE
6. ANTI-ICING AIR REGULATOR TUBE
7. INLET HOUSING PORT

Anti-Icing System External Components
Figure 10

(3) Anti-icing system. (See Figure 9 and Figure 10.)

(a) Pressurized hot air from the air diffuser flows through holes in the aft face of the diffuser vanes and collects in the air diffuser internal bleed air manifold, where it passes to an external manifold located at the 1 o’clock position on the diffuser housing. A connecting manifold, consisting of an external elbow and tubing, is attached to the external bleed air manifold and to an adapter located on top of the impeller housing. The connecting manifold passes air to the hot air solenoid valve.

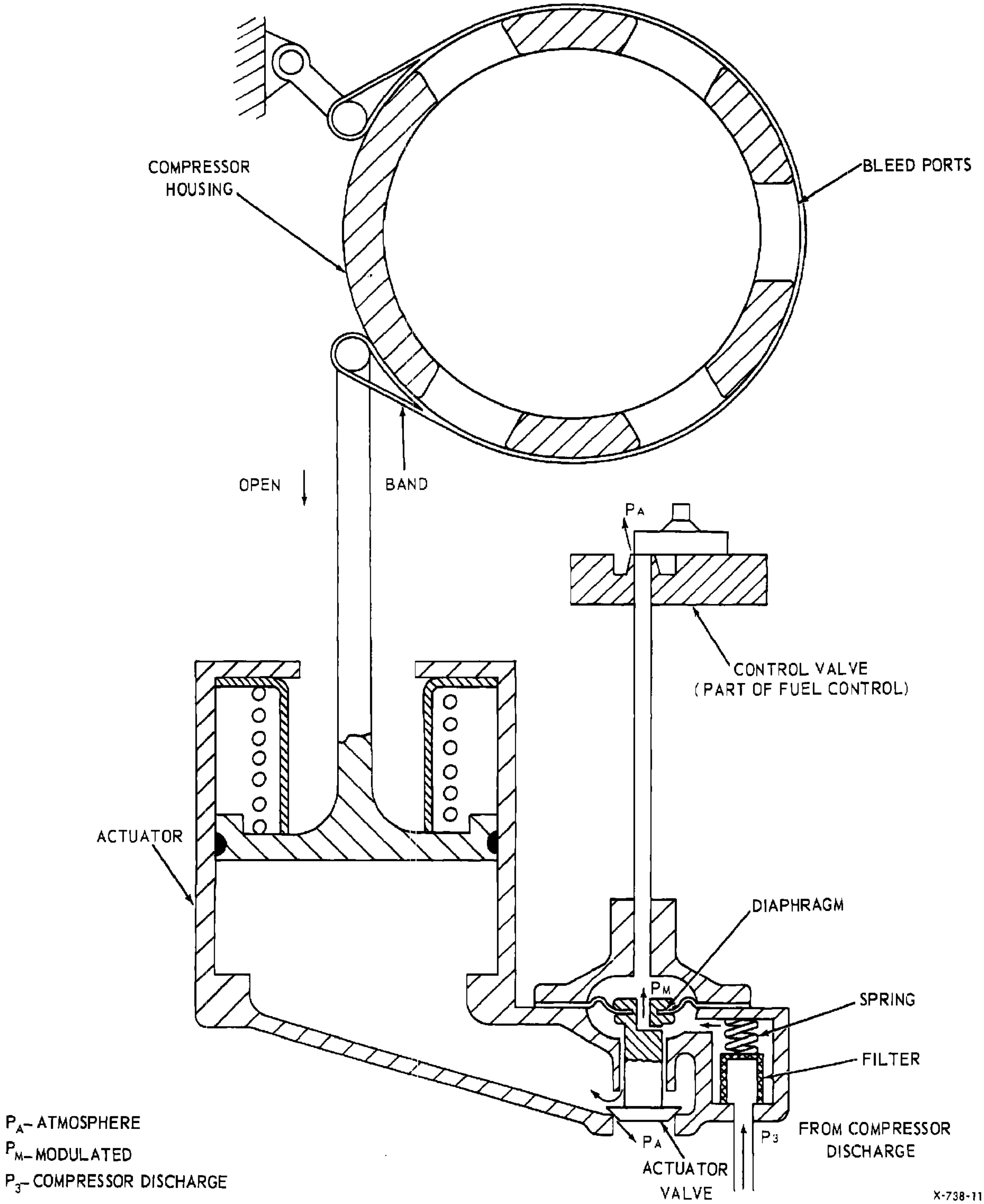
NOTE: On engines with magnesium impeller housings (Pre SB T53-L-13B-0105), pressurized hot air passes through a section of the impeller housing before entering the hot air solenoid valve.

(b) The hot air solenoid valve is mounted on top of the compressor and impeller housing assembly. The solenoid operated valve controls the flow of anti-icing hot air from the diffuser housing to the inlet housing to prevent the formation of ice. During engine operation, the hot air solenoid valve is normally energized in the CLOSED position by manually actuating a switch in the cockpit. In the event of electrical power failure, the fail safe, spring loaded valve returns to the OPEN position to provide continuous anti-icing air.

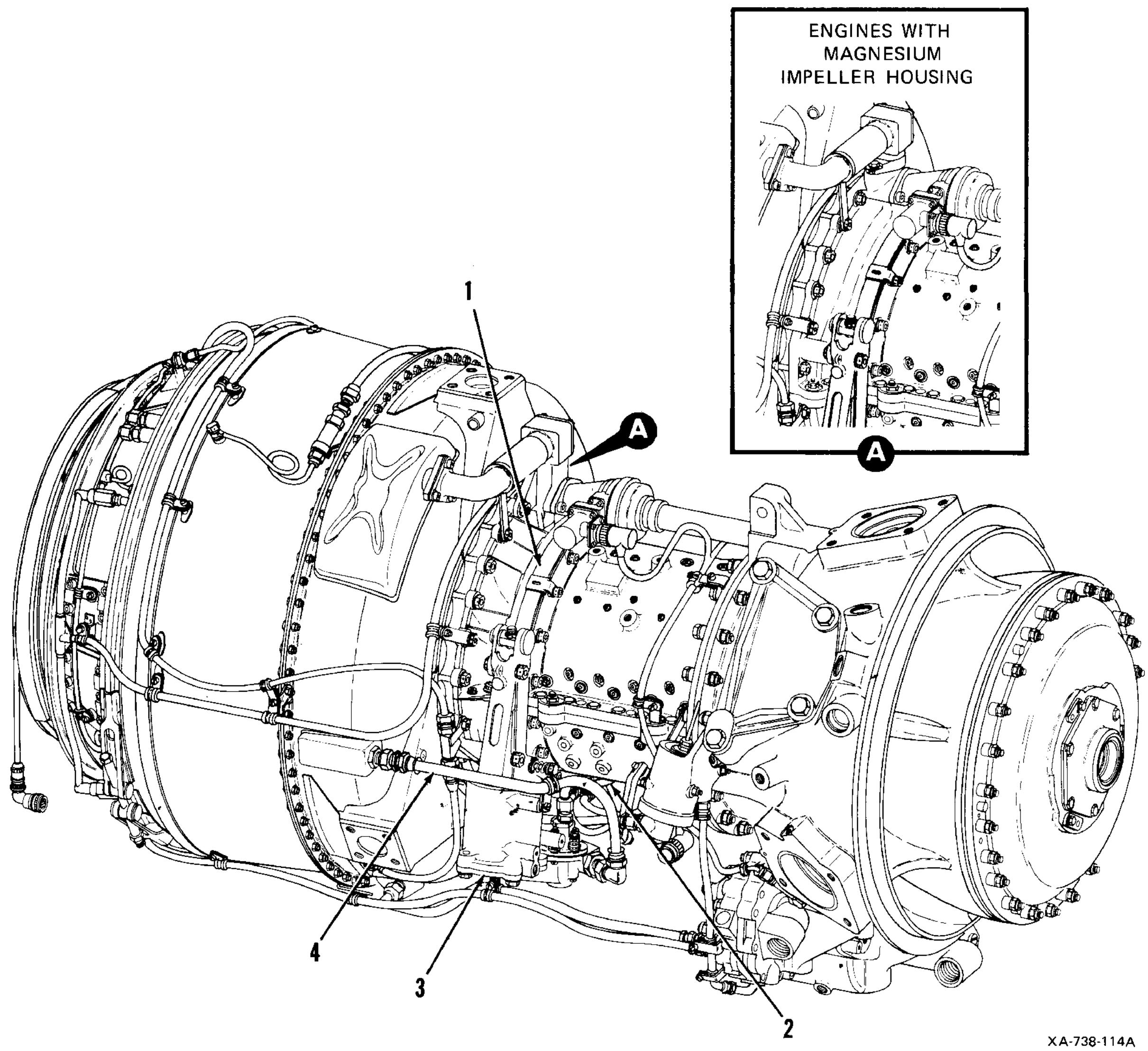
(c) After leaving the hot air solenoid valve, anti-icing air flows forward through a regulator tube into a hollow annulus (port) on top of the inlet housing. This hot air is then circulated through five of the six hollow inlet housing support struts to prevent ice formation in the inlet housing area. Hot air also flows into an annulus in the rear of the inlet housing where it passes through the hollow inlet guide vanes to prevent icing. After passing through the inlet guide vanes, the air flows into the compressor area. In the event of electrical power failure, anti-icing becomes continuous. Hot scavenge oil, draining through the lower strut into the accessory drive gearbox, prevents ice formation in the bottom of the inlet housing area. The anti-icing system is designed to accommodate air at static pressure and to reduce the possibility of the entrapment of solid or liquid particles.

F. Interstage Air-Bleed System. (See Figure 11 and Figure 12.)

(1) An interstage air-bleed system is provided to facilitate acceleration of the compressor rotor assembly. Principal components of the system are an air-bleed actuator and a bleed band assembly. The actuator controls operation of the compressor bleed air by tightening or loosening the bleed bands that encircle a ring of bleed air holes in the compressor housings at the exit guide vane location. The air-bleed system incorporates a transient control feature. The bleed band will be closed at all steady state N1 speeds above 80 percent (approximately), and open during all transients and at N1 speeds below 80 percent at standard day sea level static conditions as directed by the sensors in the fuel control.



Interstage Air-Bleed System Diagram
Figure 11

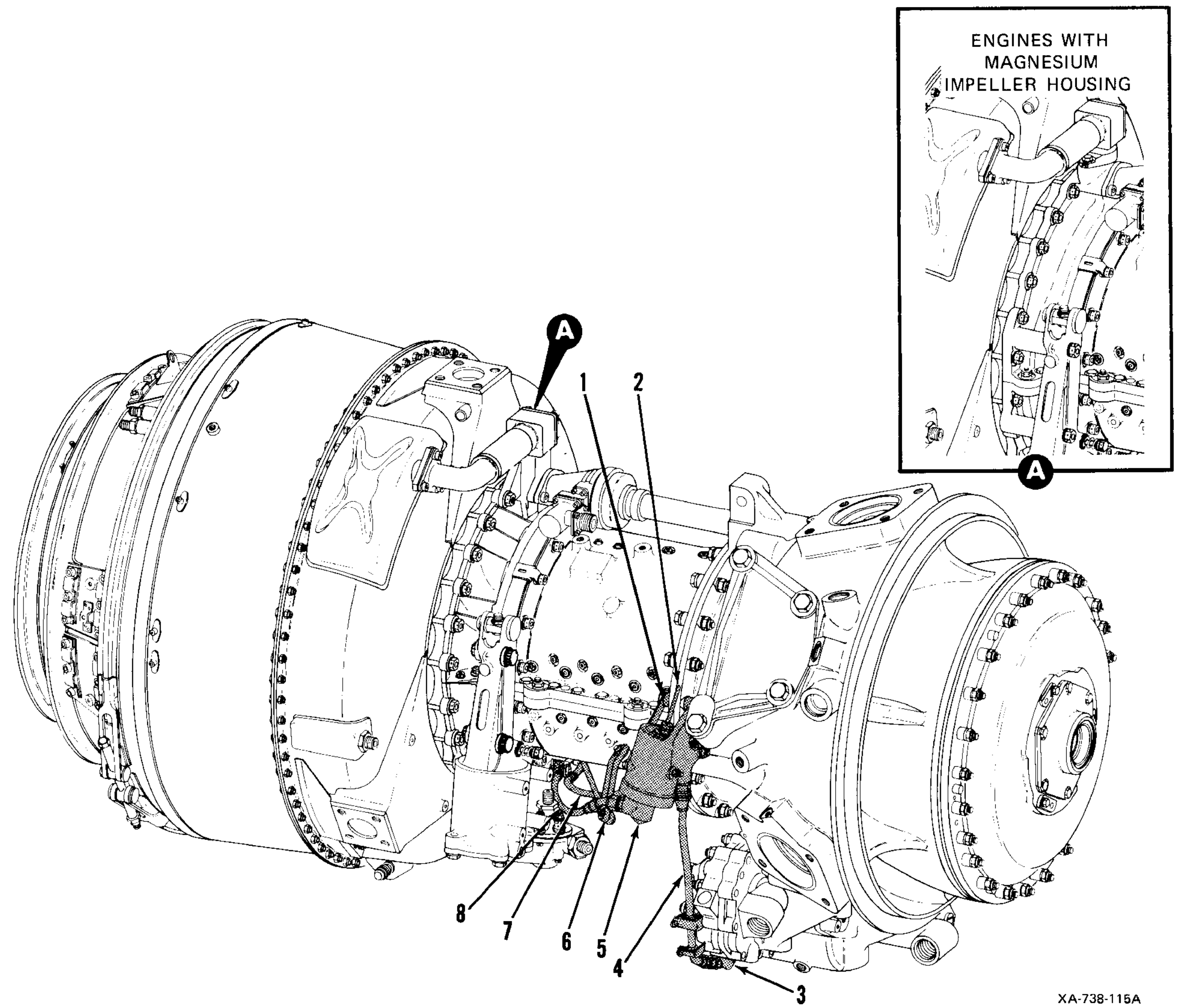


1. BLEED BAND ASSEMBLY
2. FUEL CONTROL TO INTERSTAGE AIR-BLEED ACTUATOR AIR PRESSURE HOSE
3. INTERSTAGE BLEED ACTUATOR
4. AIR DIFFUSER TO INTERSTAGE AIR-BLEED ACTUATOR AIR PRESSURE HOSE

Interstage Air-Bleed System External Components
Figure 12

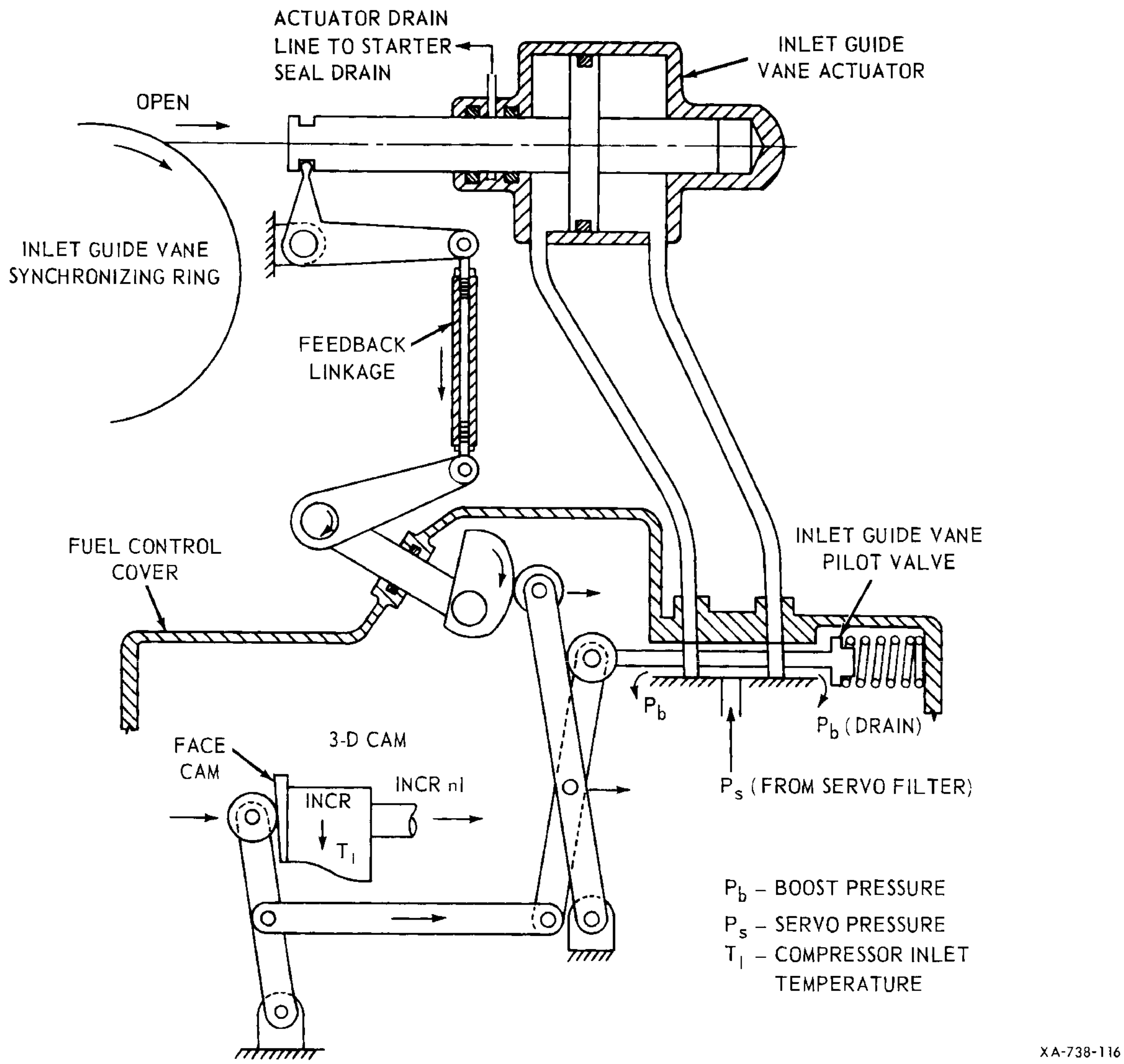
G. Variable Inlet Guide Vane Control System. (See Figure 13 and Figure 14.)

(1) The variable inlet guide vanes change the angle of incidence between inlet air and compressor rotor blades to maintain the air flow requirements of the compressor rotor assembly. At low N1 speeds (0 to 80 percent N1 speed) at standard day sea level static conditions, vanes are in closed (low angle) position. The vanes start to open at 80 percent N1 speed and are fully open (high angle) at 93 to 95 percent N1 speed. The N1 speed at which the inlet guide vanes are fully open (high angle) varies with ambient temperatures. The inlet guide vanes are positioned by the inlet guide vane actuator through a synchronizing ring. The inlet guide vane actuator is positioned by the inlet guide vane actuator pilot valve located in the fuel control as function of N1 speed and compressor inlet temperature (T1). While positioning the guide vanes, the actuator relays changes in its position back to the fuel control through an external feedback rod. This acts to nullify the fuel out pressure signal so that at any steady state N1 speed between 80 to 95 percent, the inlet guide vanes will assume a constant position.



1. CONTROL ROD INDEX PLATE
2. INLET GUIDE VANE ACTUATOR CONTROL ROD
3. INLET GUIDE VANE SEAL DRAIN CONNECTOR
4. SEAL DRAIN HOSE
5. VARIABLE INLET GUIDE VANE ACTUATOR
6. FEEDBACK CONTROL ROD
7. FUEL CONTROL TO INLET GUIDE VANE ACTUATOR OPENING HOSE
8. FUEL CONTROL TO INLET GUIDE VANE ACTUATOR CLOSING HOSE

Variable Inlet Guide Vane Control System External Components
Figure 13



Variable Inlet Guide Vane Control System Diagram
Figure 14

ENGINE - TROUBLE SHOOTING

1. Trouble Shooting

NOTE: Table 101 provides temperature data that will aid in discovering, isolating, and correcting various troubles that may arise in the basic engine or any of its systems during the service period of the engine.

A. Discovering the Trouble

Engine trouble can be either obvious or hidden. If hidden troubles are not detected, serious and considerable damage may occur to the engine. Therefore, it is essential to have a thorough knowledge of the correct turbine gas temperature, fuel flow, lubrication oil pressure, and other important details of normal engine operation.

B. Isolating the Trouble

To properly isolate trouble, it is necessary to have information of previous trouble and work performed on the engine. Check each possible source of trouble until the trouble has been isolated by a process of elimination. Systematic checking is essential for thorough trouble shooting and will save time and promote accuracy. Perform trouble shooting procedures as outlined in Table 101.

Table 101. Trouble Shooting

Trouble	Probable Cause	Corrective Action
Failure to crank.	1. Low available voltage.	Charge or replace battery.
	2. Faulty aircraft electrical system or starter.	(See Aircraft Manual.)
Failure to crank or difficulty encountered in cranking.	1. Faulty starter.	Replace starter.
	2. Power driven oil pump seized.	Replace oil pump.
	3. Gas producer turbines seized.	Remove combustor turbine assembly. Inspect gas producer turbines for foreign object damage, seizure, or rubbing. Repair or replace as necessary.
	4. Compressor rotor frozen.	Duct hot air into inlet housing.
	5. Compressor rotor seized.	Remove one-half of compressor housing and inspect to determine cause. Repair as necessary.
Failure to start.	1. Igniter plugs not firing (no crackling sound heard when starting system is energized).	
	a. Faulty aircraft electrical system.	(See Aircraft Manual.)
	b. Low input voltage to ignition unit.	Check voltage at connector.
	CAUTION: 14 vdc is minimum voltage when cranking through 10 percent n1 speed.	
	c. Faulty igniter.	Check igniter plugs as follows:
		a. Disconnect leads from igniter plugs.
		b. Remove plugs and install into lead assembly. Allow lead assembly and plugs to hang free.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		c. Energize system and check for spark.
		d. If spark is evident on some plugs and not others, the nonsparking plugs are faulty. Install new plugs. (See 74-20-03.)
	d. Faulty ignition unit.	Install ignition unit that is known to be good onto engine. Energize systems and listen for cracking sound. If sound is not heard, proceed to following Step e.
	e. Faulty coil and lead assembly.	If no sound is heard in preceding Step d, replace coil and lead assembly and reinstall old ignition unit. (See 74-20-01.)
	2. No starting fuel (no drainage from combustion chamber drain valve).	
	a. No electrical power to starting fuel solenoid valve.	(See Aircraft Manual.)
	b. Starting fuel nozzles clogged or damaged.	Clean or replace nozzles. (See 73-10-03.)
	c. Faulty starting solenoid valve.	Check starting fuel solenoid valve as follows:
		a. Disconnect hose assembly between solenoid valve and starting fuel manifold at the starting fuel manifold.
		b. Position fuel valve ON.
		c. Turn on aircraft fuel boost pump.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		CAUTION: DISCONNECT INPUT LEAD TO IGNITION UNIT TO PREVENT FIRING OF ENGINE. d. Motor engine. (See 71-00-00, Paragraph 6.) e. If fuel does not flow, replace solenoid valve. (See 73-10-08.) f. Reconnect hose assembly to starting fuel manifold, and connect ignition input lead.
	d. Starting fuel filter or hose assemblies clogged.	Clean or replace clogged starting fuel filter or hose assemblies.
	e. Faulty fuel control assembly.	Check fuel control assembly as follows: a. Disconnect hose assembly between fuel control and starting fuel solenoid valve at the valve. b. Position fuel valve ON. c. Turn on aircraft fuel boost pump. CAUTION: DISCONNECT INPUT LEAD TO IGNITION UNIT TO PREVENT FIRING OF ENGINE. d. Motor engine. (See 71-00-00, Paragraph 6.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		e. If fuel does not flow, replace fuel control assembly. (See 73-20-01.)
		f. Reconnect hose assembly to starting fuel solenoid valve, and connect input lead to ignition.
	3. Low fuel pressure (fuel control pumps worn).	Check fuel control pumps as follows:
		a. Attach two 0 to 200 psi gages to pump pressure tap ports. Disconnect fuel control discharge hose and extend into container.
		CAUTION: DISCONNECT INPUT LEAD TO IGNITION UNIT TO PREVENT FIRING OF ENGINE.
		b. Position power lever to idle and motor engine to 10 to 12 percent N1 speed. If pressure gages do not read 40 psi minimum, and within 15 psig of each other, replace fuel control.
		c. Position power lever to off and reconnect hoses.
	4. No main fuel (exhaust gas temperature stabilizing at approximately 212°F (100°C), and N1 stabilizing at approximately 15 percent, indicates absence of main fuel).	
	a. Main fuel hose assembly clogged.	Clean or replace main fuel hose assembly.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
	b. Flow divider assembly inoperative.	Check flow divider assembly as follows: a. Install flow divider assembly that is known to be good, and connect ignition input lead. b. Attempt to start engine. c. If engine still does not start, reinstall old flow divider assembly and proceed to following Step c.
	c. Faulty fuel control assembly.	Check fuel control assembly as follows: a. Disconnect hose assembly between fuel control assembly and flow divider assembly at flow divider assembly. b. Position fuel valve ON. c. Turn on aircraft fuel boost pump. d. Open throttle. CAUTION: DISCONNECT INPUT LEAD TO IGNITION UNIT TO PREVENT FIRING OF ENGINE. e. Motor engine at 12 to 16 percent N1. (See 71-00-00, Paragraph 6.) f. If fuel does not flow, replace fuel control assembly. (See 73-20-01.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		g. Reconnect electrical input to ignition unit.
Hung start, N1 speed fails to accelerate beyond approximately 30 percent and exhaust gas temperature rapidly approaches overtemperature limit.	1. Excessive fuel used for start.	Perform proper starting procedure.
	2. Insufficient assist from starter.	Check proper voltage, replace starter if voltage is sufficient.
	3. N1 system binding.	Remove combustor turbine assembly, and inspect both stages of the gas producer turbines for foreign object damage, seizure, or rubbing. (See 72-40-00.) Repair or replace parts as necessary.
Hot start (exhaust gas temperature limits have been exceeded).	1. Weak battery.	Charge or replace battery.
	2. Improper starting procedures.	Perform proper starting procedures.
	3. Start fuel solenoid valve fails to shut off.	Disconnect electrical input from ignition unit. Motor engine with aircraft fuel valve open, aircraft boost pump ON, and solenoid valve switch OFF. Check to see that fuel does not flow through the valve. If fuel flows through the valve, replace the valve. (See 73-10-08.) Connect electrical input to ignition unit.
	4. Inlet obstructed.	Check inlet and remove all obstructions, if inlet was obstructed. (See 72-00-00, SPECIAL INSPECTIONS, Step I.)
Torching start (flames shoot from exhaust).	1. Improper starting procedures.	Perform proper starting procedure.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
	2. Accumulation of fuel inside tailpipe of combustion chamber.	Check aircraft quick disconnect from tailpipe drain for proper seating. Remove and inspect combustion chamber drain valve for obstructions and operation. (See 73-10-06.)
	3. Starting fuel check filter valve installed backwards.	Remove and install check filter valve properly. (See 73-10-07.)
	4. Starting fuel check filter valve not seated, contaminated with foreign matter.	Remove, disassemble and clean check filter valve. (See 73-10-07.)
Speed low with throttle in properly rigged FLIGHT IDLE position.	1. Aircraft linkage improperly rigged.	(See Aircraft Manual.)
	2. Selector switch in EMERGENCY position.	Switch to AUTOMATIC position.
	3. Aircraft selector switch improperly wired or faulty.	Refer to aircraft manual for proper wiring. Replace selector switch if necessary.
	4. Fuel flow restricted.	Remove and clean fuel strainers.
Speed high with throttle in FLIGHT IDLE position.	Aircraft linkage improperly rigged.	(See Aircraft Manual.)
Torque above or below engine specified torque value.	1. Error in computations.	Recompute.
	2. Fuel control trim improperly adjusted.	Trim fuel control assembly as necessary. (See 73-20-01.)
	3. Faulty torquemeter system.	(See Aircraft Manual.)
	4. Faulty fuel control assembly.	If fuel control assembly does not respond to adjustments, replace. (See 73-20-01.)
Low N2 speed.	1. Governor arm travel restricted.	Check aircraft rigging. (See Aircraft Manual.)
	2. Faulty overspeed governor.	Replace overspeed governor. (See 72-60-02.)
Excessive droop of N2 speed.	1. Droop compensator out of adjustment.	(See Aircraft Manual.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
	2. Low N2 speed.	(See previous Trouble, low N2 speed.)
N2 overspeed.	1. Faulty overspeed governor.	Replace overspeed governor. (See 72-60-02.)
	2. Selector speed in EMERGENCY position.	(See Trouble, speed low with throttle in properly rigged FLIGHT IDLE position, 2.)
	3. Faulty fuel control assembly.	Replace fuel control assembly. (See 73-20-01.)
High exhaust temperature during steady state operation.	1. External loss of air because hot air solenoid valve being open (engine deicing).	With engine operating, check for flow of hot air from vent holes located in forward engine mounting pads. If air is evident, valve is open. Check for following: a. Ensure that circuit breaker is in. b. Ensure hot air solenoid valve switch is in CLOSED position. c. Ensure proper voltage is available at electrical connector of hot air solenoid valve. (See Aircraft Manual.) d. If preceding items have been checked and valve remains open, replace hot air solenoid valve. (See 75-10-02.)
	2. Dirty or eroded compressor or foreign object damage.	Inspect for FOD. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.A.)
	3. External loss of air due to interstage bleed band not sealing.	Check bleed band as follows: a. Visually inspect band for severe bending. Replace band. (See 75-30-05.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		b. Check bleed band for proper closure. (See 75-30-05.)
	4. External loss of air because combustion chamber drain valve failing to close.	If air leaks from drain valve port with engine operating, repair or replace drain valve. (See 73-10-06.)
	5. Faulty exhaust gas temperature measuring system.	Check out system for continuity and resistance. (See 77-20-01).
	6. Internal loss of air because of leaking seals between gas producer cylinder and power turbine nozzle.	Remove combustor turbine assembly and inspect seals. (See 72-40-01.) Replace seals if necessary.
	7. Internal loss of air because of damaged gas producer nozzles.	Remove combustor turbine assembly and inspect gas producer nozzles. Replace parts required. (See 72-40-00.)
	8. Dirty compressor.	Clean compressor. (See 72-00-00, ENGINE CLEANING.)
High exhaust gas temperature during acceleration.	1. Probable causes will be similar to preceding Trouble, high exhaust gas during steady state operation.	Corrective action will be similar to preceding Trouble, high exhaust gas during steady state operation.
	2. Selector switch in EMERGENCY position.	(See Trouble, speed low with throttle in properly rigged FLIGHT IDLE position, 2.)
Fluctuations or no indication of exhaust gas temperature.	Faulty indication system.	Perform Jetcal test and check out system for continuity and resistance. (See 77-20-01.)
Fluctuation in exhaust gas temperature, N1 and N2 speeds, and torquemeter pressure.	1. Faulty overspeed governor.	Replace overspeed governor. (See 72-60-02.)
	2. Faulty fuel control assembly.	Replace fuel control assembly. (See 73-20-01.)
Slow acceleration.	Faulty fuel control assembly.	Replace fuel control assembly. (See 73-20-01.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
Engine surge during acceleration or bleed band cycling (rapid opening and closing) at high N1 speeds.	1. Selector switch in EMERGENCY position.	(See Trouble, speed low with throttle in properly rigged FLIGHT IDLE position, 2.)
	2. Bleed band not opening during speed transients.	(See Trouble, erratic bleed band operation.)
	3. Improper inlet guide vane operation.	Check rigging. Adjust if required. (See 75-30-02.)
	4. Faulty fuel control assembly.	Replace fuel control assembly. (See 73-20-01.)
	5. Dirty or eroded compressor, or foreign object damage.	Investigate. Perform compressor surge (stall) inspection. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.B.)
	6. Rupture of fuel control temperature sensing tube.	Inspect tube. (See 73-20-01.) Replace fuel control assembly if crack limits are exceeded. (See 73-20-01.)
Low torquemeter indication.	1. Faulty torquemeter pressure transmitter or indicator.	Check torquemeter pressure transmitter and indicator as follows: a. Remove torquemeter and accessory drive gearbox pressure lines from transmitter. b. Attach a direct reading pressure gage to each line. c. Operate engine and note pressures.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		d. Subtract accessory drive gearbox pressure from torquemeter pressure and compare result with pressure indicated on cockpit gage. If direct gage reading is higher than cockpit gage reading, fault is in transmitter or cockpit gage. Replace as necessary. (See Airframe Manual.)
	2. Low torquemeter booster pressure.	Check torquemeter booster pressure as follows:
		a. Attach a direct reading gage to pressure port at forward side of overspeed governor and tachometer drive assembly.
		b. Operate engine and note pressure.
		c. If pressure is less than 120 psi at 92 percent N1 and above, adjust pressure relief valve. (See 79-20-02.)
		d. If pressure is still not within limits, replace torquemeter booster pump. (See 79-20-02.)
		e. If replacement of torquemeter booster pump does not correct torquemeter pressure, replace overspeed governor and tachometer drive assembly. (See 72-60-02.)
	3. Damaged torquemeter sealing ring.	Remove and inspect output reduction carrier and gear assembly. (See 72-10-01.) Replace damaged parts.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
	NOTE: This damage may occur upon reassembly after front end inspection. It is recognized at initial run of engine.	
	4. Packings on torquemeter relief valve assembly improperly installed or damaged (located on overspeed governor and tachometer drive assembly).	Inspect packings for proper installation or damage. (See 72-60-02.)
High torquemeter indication.	1. Faulty torquemeter pressure transmitter or indicator.	(See Trouble, low torquemeter indication, 1.)
	2. Torquemeter valve fails to close.	Check torquemeter valve as follows: a. Remove plug at front of overspeed governor and torquemeter drive gearbox. b. Install fitting, AN919–4D into torquemeter booster pressure port. c. Disconnect pressure line at torquemeter transmitter. d. Apply 100 psi air pressure to installed fitting. e. No air flow will indicate that valve is functioning properly.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		f. If flow is observed, apply 100 psi air pressure to fitting at torquemeter transmitter port on inlet housing. This should free any foreign object and permit valve to close. Apply air pressure alternately to torquemeter booster pump port and torquemeter transmitter port until valve seats properly.
Torquemeter response slow.	Clogged torquemeter filter assembly.	Remove, clean, and reinstall filter assembly located on overspeed governor and tachometer drive assembly. (See 72-60-02.)
No engine oil pressure.		CAUTION: DO NOT OPERATE ENGINE UNTIL IT IS DETERMINED THAT OIL PUMP FAILURE OR OIL STARVATION HAS NOT OCCURRED.
	1. Loose or clogged hose or connections.	Inspect entire lubrication system for leaks and obstructions.
	2. Aircraft oil tank empty or oil shutoff valve closed.	Fill tank or open valve. (See Aircraft Manual.)
	3. Faulty oil pressure transmitting system.	Check system using pressure source to pressure tap.
	4. Oil pump coupling sheared or worn female spline on oil pump drive shaft gear.	If pressure transmitting system check is satisfactory, oil pump coupling may be sheared or spline on oil pump drive shaft gear may be worn. Replace oil pump for sheared coupling and inspect for worn spline on shaft gear. (See 79-20-01 and 72-60-01.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
		If oil pump failure or oil starvation has occurred, check No. 2, 3, and 4 bearing scavenge lines for evidence of metal chips. Replace parts as required and perform oil contamination inspection. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.J.)
Low oil pressure.	1. Low oil level.	Fill to proper level.
	2. Faulty oil pressure transmitting system.	(See Trouble, no engine oil pressure, 3.)
	3. Clogged oil filter.	Clean oil filter. (See 79-20-03.)
	4. Oil pump improperly adjusted.	Adjust pump. (See 79-20-01.) If oil pump does not respond to adjustment, replace. (See 79-20-01.)
High engine oil pressure.	1. Cold oil on start.	Allow engine to reach operating temperature by operating engine at flight idle.
	2. Clogged oil filter.	Clean filter element. (See 79-20-03.)
	3. Oil pump improperly adjusted.	Adjust pump. (See 79-20-01.) If oil pump does not respond to adjustment, replace pump. (See 79-20-01.)
	4. Oil pressure hose assemblies restricted.	Check hose assemblies for restrictions.
	5. Faulty oil pressure transmitting system.	(See Trouble, no engine oil pressure, 3.)
High engine oil temperature.	1. Low oil level.	Fill to proper level.
	2. Clogged oil filter.	Clean filter. (See 79-20-03.)
	3. Faulty oil cooler or transmitting system.	(See Aircraft Manual.)
	4. Oil hose assemblies restricted.	Check hose assemblies for restrictions.

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
Excessive engine oil consumption.	1. Excessive oil in aircraft oil tank.	Drain to proper level. (See Aircraft Manual.)
	2. Leakage at fittings and hose assemblies.	Tighten or replace fittings or hose assemblies.
	3. Output shaft seal damaged.	Replace output shaft seal. (See 72-10-01.)
	4. No. 3 main bearing seal leaking.	Check for smoke from tailpipe and oil stains on rear face of power turbine disc. Replacement of seal is necessary if such indications are evident.
	5. No. 2 bearing aft seal leaking.	Check for smoke from tailpipe and oil stains on the forward face of the first gas producer rotor and curl. Replacement of seal is necessary if such indications are evident.
	6. No. 2 bearing forward seal leaking.	Check for indications of oil leakage onto mating flanges of the diffuser housing and combustion chamber housing assemblies. Replacement of seal is necessary if such indications are evident.
	7. No. 1 main bearing seal leaking.	Check for indications of oil leakage onto variable inlet guide vanes, compressor bleed band holes, or mating surfaces of compressor housings. If evident, engine shall be forwarded to Overhaul for seal replacement.
	8. Cracked pressure or scavenge oil tubes in air diffuser.	Indications are same as preceding Step 7. Brazing of tubes will be required.
Engine fails to shut down or N1 throttle stiff.	1. Faulty linkage.	(See Aircraft Manual.)

Table 101. Trouble Shooting (Cont)

Trouble	Probable Cause	Corrective Action
	2. Binding within fuel regulator, with airframe linkage disconnected N1 lever torque exceeds 15 inch-pounds from 0 degrees to 100 degrees or 25 inch-pounds from 100 degrees back to 0 degrees (cut off).	Turn ground idle trimmer screw counterclockwise in 1/8 turn increments until binding is relieved. (See 73-20-01, Figure 202.)
Coast down noisy.	Internal binding.	Motor engine and check for noise and binding. (See 71-00-00, Paragraph 6, and Trouble, failure to crank or difficulty encountered in cranking.)
Excessive vibration.		Perform vibration test. (See 71-00-00.)
Erratic bleed band operation.	1. Improperly adjusted.	Adjust bleed band. (See 75-30-05). If bleed band does not respond to adjustments, perform following steps.
	2. Clogged strainer element.	Clean strainer. (See 75-30-03.)
	3. Sticking actuator piston.	Replace actuator. (See 75-30-03.)
	4. Ruptured diaphragm.	Replace diaphragm. (See 75-30-03.)
	5. Faulty fuel control assembly.	Replace fuel control assembly. (See 73-20-01.)
Oil leak at Starter Generator Seal	1. Excessive air pressure in gearbox.	Check gearbox vent pressure (Paragraph 1.E.).
	2. Faulty generator seal.	Replace seal. (See 72-60-01.)

C. Lubrication System Contamination Trouble Shooting Procedure

NOTE: It is not unusual for a new engine to “generate” some small chips during the first 5 to 10 hours of operation. Fine particles generally indicate even, although possibly excessive, wear. Pieces of flat metal can be from lock cups, baffles or cotter pins. Pieces of very hard steel can be from chipped splines or gears. Slivers of metal may be machining chips from new parts not thoroughly cleaned before installation. Magnesium is not normally in contact with moving parts. Chips of magnesium indicate an unusual contact between parts. Analysis of steel particles can reveal definite areas that may be suspected such as shafts, gears, and bearings. Bronze material usually comes from bearing cages. Silver is used as plating material for certain bearing cages. Chrome is used as plating material on shafts, etc, and also is present in certain steels.

Whenever an oil contamination inspection has revealed a continuance or an excessive amount of chips in the oil filter or on the chip detector, but output reduction gear carrier and gearbox assembly is free to move and emits no unusual noises, proceed as follows:

WARNING: PROLONGED CONTACT WITH LUBRICATING OIL MAY CAUSE A SKIN RASH. THOSE AREAS OF SKIN AND CLOTHING THAT MAY COME IN CONTACT WITH LUBRICATING OIL SHOULD BE THOROUGHLY WASHED IMMEDIATELY. SATURATED CLOTHING SHOULD BE REMOVED IMMEDIATELY. AREAS IN WHICH LUBRICATING OIL IS USED SHOULD BE ADEQUATELY VENTILATED TO KEEP MIST AND FUMES TO A MINIMUM.

CAUTION: LUBRICATING OIL MAY SOFTEN PAINT UPON CONTACT. IF LUBRICATING OIL IS SPILLED ON PAINTED SURFACES, THESE SURFACES SHOULD BE THOROUGHLY WASHED.

(1) Check main oil filter elements for chip accumulation which could have placed the filter into bypass. Remove chips and retain for analysis. Replace oil filter. (See SPM, SP C203, 70-15-03, and 79-20-03.)

(2) Remove and inspect No. 2 bearing strainer and No. 3 and 4 bearing strainer bore for metal chips. If chips are present, remove and inspect three reduction gear oil transfer tube strainers (72-10-01) and overspeed governor and tachometer drive oil throttle strainer. (See 72-60-02.) Forward engine to Overhaul if metal chips have clogged more than one-third of flow area of any one of previously mentioned strainers. If amount of chips is not excessive, clean and reinstall strainers and proceed to Step (3).

(3) Presence of chips in previously mentioned strainers indicates that bypass of oil filter has occurred. Replace oil filter. (See 79-20-03.)

(4) Drain oil from accessory drive gearbox, aircraft oil tank and oil cooler.

(5) Remove any metal chips from chip detectors. Clean chip detectors with dry cleaning solvent. (See SPM, SP C203, 70-15-03.) Reinstall chip detectors.

(6) Check No. 2 bearing scavenge line for metal contamination. If chips are evident, inspect all oil wetted components for wear, and replace parts as needed. Flush components with dry cleaning solvent and reinstall scavenge line. (See SPM, SP C203, 70-15-03.)

(7) Check No. 3 and 4 bearing scavenge line for metal contamination. If chips are evident, remove combustor turbine assembly, disassemble power turbine and bearing housing assembly, and inspect bearings and other oil wetted components for wear. Replace if required. (See 72-50-04.) Flush components with dry cleaning solvent and reinstall. (See SPM, SP C203, 70-15-03.)

(8) If chips are suspected to come from reduction gearing, remove reduction gearing and inspect its condition and replace, if required. (See 72-10-01.) Flush components with dry cleaning solvent and reassemble. (See SPM, SP C203, 70-15-03.)

(9) Remove accessory drive gearbox. (See 72-60-01.) Remove and inspect shaft gear assembly. Particularly note condition of upper and lower bearings on this shaft. Inspect and clean scavenge strainer. Flush shaft gear assembly and internal components of gearbox with dry cleaning solvent and reassemble. (See SPM, SP C203, 70-15-03.)

(10) Flush aircraft oil system and replace oil cooler on aircraft not equipped with auxiliary external oil filter. (See Aircraft Flight Manual.)

(11) Service oil system with new lubricating oil. (See 72-00-00, 41 or 42, Table 203, and 72-00-00, ENGINE - SERVICING, Paragraph 2.)

CAUTION: ANY FLUCTUATION IN OIL PRESSURE IN EXCESS OF PLUS OR MINUS 5 PSI, OR RAPID RISE IN OIL TEMPERATURE AT ANY PRESET POWER SETTING, IS CAUSE FOR IMMEDIATE ENGINE SHUTDOWN.

(12) Operate engine at 70 to 80 percent N1 for 5 minutes. (See Aircraft Flight Manual.) Shut down engine and allow to cool.

(13) Inspect chip detector and oil filter strainers for chips. Amount of chips noted should be less than original amount. If so, repeat preceding Steps (10), (11), and (12), increasing engine operating time to 10 minutes.

(14) If quantity of chips remains the same after the second engine run, do not reclean filters, strainers, or chip detector.

NOTE: Chips in oil filter may originate in oil supply tank, chips on chip detector originate in engine.

(15) Repeat inspection, servicing and operating cycle, increasing engine operating time to 30 minutes. If no appreciable amount of chips or other contaminants is noted, engine may be returned to service. If amount of chips or other contaminants remains the same or increases, perform oil sample analysis. Forward engine to Overhaul. (See 72-00-00, ENGINE - INSPECTION, Paragraph 1.G.)

(16) Retain chips and oil samples for analysis.

NOTE: The following action is recommended to ensure that oil, chips, or other contaminant samples are available to aid in the diagnosis of the problem. If a Honeywell representative is called in, retain the sample for his/her evaluation and action.

(a) Exercise care to prevent additional contamination of sample.

(b) Mark oil, chips, or contaminant sample to include operator's name, address, location on the engine from which the sample was taken, engine model and serial number, time since new, time since overhaul, and last related maintenance action. Include the oil vendor's name, batch number, and date of manufacture on the sample.

(c) If the engine is being returned for repair or overhaul, return marked sample in engine container.

D. Exhaust Thermocouple System Trouble Shooting Procedure

NOTE: This trouble shooting procedure applies to the engine installed in the aircraft. This procedure may be accomplished whenever exhaust thermocouple system accuracy is questionable, whenever a harness is replaced, whenever an engine is removed and replaced, or whenever any component of the aircraft EGT system is replaced. Jetcal Analyzer BH112JB36 may be utilized to accomplish these trouble shooting procedures.

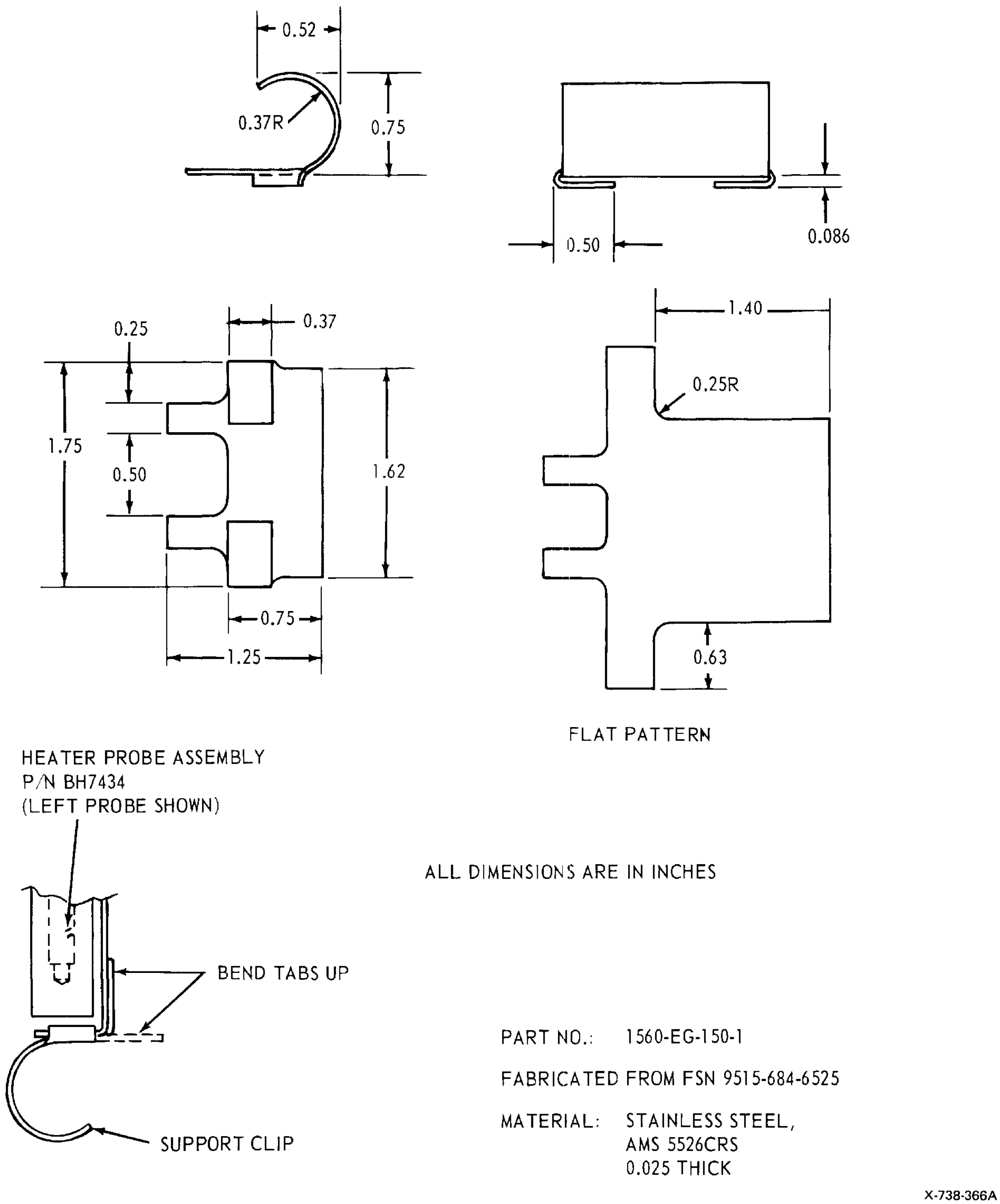
Some harnesses are not dimensionally compatible with existing heater elements. In order to perform a heater check of the EGT system, the heater elements require a support clip to be attached. Instructions for fabricating and attaching this support clip are shown in Figure 101. With the support clip attached, the heater elements will not slip off the thermocouple probes. Future models of the thermocouple harness will have modified probes compatible with the heater elements shown in Figure 102.

(1) Install three heater probe elements BH7434R-40 (right side), and three heater probe elements BH7434L-40 (left side) on thermocouple probes. Connect junction box BH361-8, BH361-10, or BH361-12 to heater probe elements and to Jetcal Analyzer. Advance actual temperature by rheostat on Jetcal Analyzer to 600°C and allow temperature to stabilize. Cockpit indicator shall read 595 to 605°C. If reading is not within limits, proceed as follows:

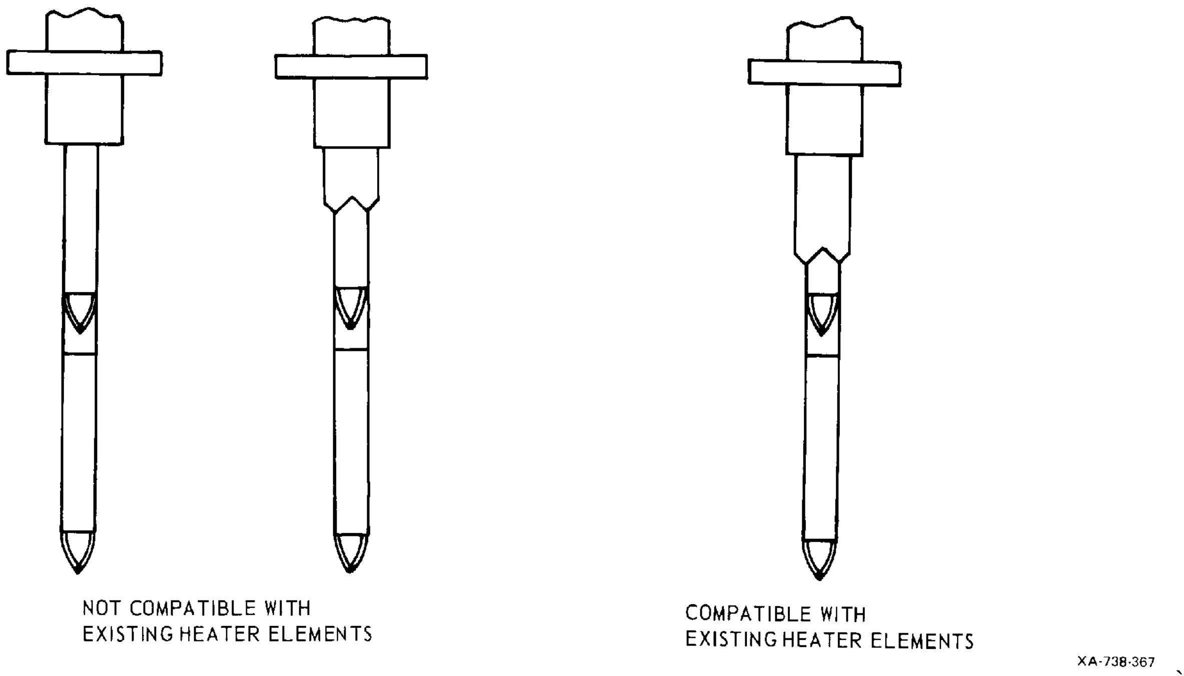
(a) Check each individual thermocouple to ensure that all thermocouples are operative. As heat is applied to each thermocouple, the aircraft EGT indicator must show a temperature rise.

(b) Perform a cockpit EGT indicator check. (See Aircraft Flight Manual.)

(c) Disconnect engine harness from aircraft leads at engine airframe firewall.



Support Clip
Figure 101



Exhaust Thermocouple Assembly – Configurations
Figure 102

(d) Perform an exhaust thermocouple assembly resistance check. (See 77-20-01, Paragraph 23.)

(e) Reconnect thermocouple harness assembly to aircraft leads at engine/aircraft firewall.

(f) Perform a resistance check of the complete EGT circuit and adjust aircraft variable resistance spool as required. (See Aircraft Flight Manual.)

(2) Recheck complete system. (See Step D.)

E. Starter Generator Seal Leak Trouble Shooting

NOTE: The plug in the following step is normally used during engine test and is not illustrated in the IPC.

(1) Check gearbox vent pressure by removing the plug on the accessory gearbox cover that is located to the immediate right of the N1 Tach Generator.

(2) Insert fitting Part No. AN815-6D with a packing Part No. M832481/1-904 to seal the fitting on the AGB cover, tighten fitting.

(3) Using a suitable length of #6 hose, install a 0 to 25 pressure gauge in psi.

(4) Following normal ground run procedures, start engine and stabilize engine speed at flight idle.

(5) Check pressure reading on the gauge, and record the pressure reading.

(6) Following normal procedures, shut down engine and secure.

(7) If pressure reading is over 1.5 psig, further corrective action is needed before replacing starter seal. If under 1.5 psig, proceed with starter seal replacement (Ref chapter 72-60-01).

(8) If pressure reading is over 1.5 psig, the cause of the excessive pressure is one of the following: #2 aft seal, carbon ring on the nut and seal assembly, or the seal installed in the accessory gearbox case for the air oil separator gear. For assistance in determining which is causing high gearbox pressure, contact T53 Customer Support.

ENGINE - TEST EQUIPMENT, SPECIAL TOOLS, AND CONSUMABLE MATERIALS

1. Test Equipment

Table 201 contains a list of all test and ground support equipment required to perform the tasks specified in this manual.

Usage of the following test equipment is not mandatory. Modified standard test equipment or fabricated test equipment that is equivalent to the recommended test equipment may be used. Experience and extent of maintenance performed will dictate customer's test equipment requirements.

2. Special Tools

Table 202 contains a list of all special tools required to perform the tasks specified in this manual.

Usage of these special tools is not mandatory. Modified standard tools or fabricated hardware that is equivalent to the recommended special tools may be used. Experience and extent of maintenance performed will dictate customer's special tools requirements.

3. Consumable Materials

Table 203 contains a list of all consumable materials required to perform the tasks specified in this manual.

Table 201. Test Equipment

Part or Model No.	Nomenclature	Technical Description
AN/PSM 6B or	Multimeter	To check exhaust thermocouple harness.
85	Fluke Multimeter or equivalent	To check exhaust thermocouple harness.
LTCT484 (replaced by LTCT14664)	Vibration Check Tool Kit	To measure engine vibration at critical points to determine engine acceptability.
LTCT6807 (replaced by LTCT13726)	Switch and Coupling Kit	To perform operational check of inlet guide vane actuator.
LTCT14664 (replaces LTCT484) (replaced by LTCT28430)	Vibration Check Tool Kit	To measure engine vibration at critical points to determine engine acceptability.
LTCT13726 (replaces LTCT6807)	Switch and Coupling Kit	To perform operational check of inlet guide vane actuator.
LTCT20596 (replaced by LTCT28430)	Vibration Test Kit, Battery Operated	To measure engine vibration at critical points to determine engine acceptability.
LTCT28430 (replace LTCT14664 and LTCT20596)	Vibration Check Tool Kit	To measure engine vibration at critical points to determine engine acceptability.
TL410	Gerin Turbo-Lube Test Kit	To analyze viscosity of oil.

Table 202. Special Tools

Part No. or Model No.	Nomenclature
LTCT44 (replaced by LTCT4904)	Fixture, Holding
LTCT68	Bushing, Sleeve
LTCT100	Installing Tool, Oil Seal
LTCT107	Wrench, Spanner, Access Gear
LTCT108	Tool, Installing
LTCT109	Bolt, Machine
LTCT115	Holding Fixture, Gear Drive Assembly
LTCT142	Puller, Mechanical
LTCT153	Bar, Locating Button
LTCT205 (replaced by LTCT2099)	Gage, Backlash
LTCT207	Fixture, Test
LTCT215	Socket Wrench, Face Spanner
LTCT256	Installer, Pin
LTCT258	Wrench, Driver
LTCT270	Seal Installer, Accessory Gearbox
LTCT298-07	Stand, Engine Work
LTCT311 (replaced by LTCT2099)	Gage, Backlash
LTCT393	Wrench, Socket
LTCT483	Puller, Mechanical
LTCT484	Tool Kit, Vibration Check
LTCT487	Wrench
LTCT488	Tool, Backup
LTCT501	Installing Tool, Seal
LTCT504	Tool, Removal
LTCT505	Wrench, Socket

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT506	Wrench, Socket
LTCT509	Tool Set
LTCT511	Installation Tool, Seal
LTCT519	Installer and Remover
LTCT526	Alignment Fixture Assembly
LTCT552	Punch and Drift Kit
LTCT675	Puller, Mechanical, Bearing Accessory Gearbox
LTCT691	Puller, Mechanical
LTCT773	Sling, Hoisting Beam
LTCT791	Installing Tool
LTCT862	Protector, Engine Intake
LTCT910 (replaced by LTCT3955)	Bracket
LTCT911	Support Assembly, Socket Wrench
LTCT912	Flow Fixture, Oil
LTCT915	Wrench Assembly
LTCT916	Puller, Mechanical
LTCT962	Fixture, Torque Adjustment
LTCT1218	Puller, Mechanical
LTCT1409	Wrench
LTCT1429	Bolt, Tee Head
LTCT1643	Drift Assembly
LTCT1644	Drift
LTCT2021	Puller, Mechanical
LTCT2027	Puller, Manual Pinion Gear

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT2028	Puller, Mechanical
LTCT2039	Holder Assembly, Gearshaft
LTCT2048	Holder, Pinion Gear
LTCT2072	Staking Fixture Assembly
LTCT2075	Fixture, Holding
LTCT2099	Gage, Backlash
LTCT2121	Puller, Mechanical
LTCT2133	Wrench
LTCT3038	Fixture Assembly VIGV
LTCT3039 (replaced by LTCT6124)	Measuring Tool
LTCT3493	Bushing, Sleeve
LTCT3636	Bushing, Sleeve
LTCT3638	Installation and Removal Tool
LTCT3639	Installation and Removal Tool
LTCT3640	Bushing, Sleeve
LTCT3646	Tool, Installing
LTCT3648	Removal Tool, Seal
LTCT3654	Bushing, Sleeve
LTCT3685	Adapter and Guide
LTCT3706	Driver, Bearing No. 1
LTCT3738	Staking Tool Assembly
LTCT3825	Installation Tool, Seal
LTCT3833	Holder Assembly, Gearshaft
LTCT3938	Wrench

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT3955 (replaces LTCT910)	Bracket
LTCT4002	Wrench, Socket
LTCT4007	Puller, Mechanical
LTCT4013	Installing Tool
LTCT4044	Installing Tool, Seal
LTCT4045	Puller, Mechanical
LTCT4155	Compressor
LTCT4174	Alignment Fixture, Combustion Chamber
LTCT4179	Installation Tool
LTCT4181 (replaced by LTCT13175)	Wrench, Socket
LTCT4182	Fixture, Lifting
LTCT4533 (replaced by LTCT13175)	Fixture, Holding
LTCT4553	Fixture, Holding
LTCT4558	Adapter, Lifting
LTCT4568	Puller
LTCT4571	Arbor
LTCT4572 (replaced by LTCT13070)	Installation Tool
LTCT4576	Installation Tool, Drive Gear
LTCT4602	Guide
LTCT4650	Hand Crank
LTCT4676 (replaced by LTCT6465)	Removal Kit, Nut and Cone
LTCT4680	Puller, Mechanical
LTCT4692	Removal Tool
LTCT4698	Tool, Removal and Installation

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT4700 (replaced by LTCT4846)	Puller, Mechanical
LTCT4713	Fixture, Holding
LTCT4750	Protractor Assembly, VIGV
LTCT4800	Puller, Mechanical
LTCT4809	Puller, Mechanical
LTCT4842	Puller, Mechanical
LTCT4846 (replaces LTCT4700)	Puller, Mechanical
LTCT4895	Tool, Removal
LTCT4904	Fixture, Holding
LTCT4947	Base and Bushing Assembly
LTCT4996	Fixture, Holding
LTCT6000	Tool, Installation
LTCT6124 (replaces LTCT3039)	Measuring Tool
LTCT6465 (replaces LTCT4676)	Tool, Removal, Rear Core
LTCT6740	Removal Tool
LTCT6756	Mount Assembly, Vibration Pick-Up, Power Turbine
LTCT6940	Special Wrench
LTCT9281	Vibration Meter
LTCT13001	Holding Fixture, Horizontal Rotor Assembly
LTCT13020	Gapping and Inspection Tool
LTCT13070 (replaces LTCT4572)	Installing Tool
LTCT13175 (replaces LTCT4533 and LTCT4181)	Fixture, Torque
LTCT13456	Socket Wrench, Face Spanner
LTCT13725	Switch and Coupling Assembly

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INSERT PAGE 2 OF 4 FACING 72-00-00, PAGE 207.

Reason: To add wire gage LTCT14807 to Table 202.

Table 202 is changed as follows:

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT14807	Wire Gage

See TR

Table 202. Special Tools (Cont)

Part No. or Model No.	Nomenclature
LTCT13726	Kit, Switch and Coupling
LTCT14503	Clamp Gage
LTCT14664-07	Vibration Test Set
LTCT14668-01	Combustor Lifting Sling
LTCT14773	Installation Tool
LTCT20596	Vibration Test Kit, Battery Operated
LTCT22031-01	Vibration Meter
LTCT23844-01	Vibration Meter
PD2501	Wrench, Torque
LTCT 31126-0501	Puller
SWE13855 (Deleted)	Stand, Engine Work (Deleted)

Table 203. Consumable Materials

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
1	Acetone	ASTM D329		Guard All Chemical Co, South Norwalk, CT
2	Acid, Nitric	A-A-59105		Allied Chemical Corp, Industrial Chemical Division, Morristown, NJ
				Axton Cross Co, North Haven, CT
3	Adhesive		EA907	Dexter Corp, Windsor Locks, CT
4	Aluminum Alloy	AMS4029		
5	Aluminum Oxide		No. 400	Carborundum Co, Niagara Falls, NY
6	Anti-detonating Injection Fluid		ADI	Lyndhurst Chem Corp, Passaic, NJ
7	Assembly Fluid		Ultrachem Assembly Fluid 1	Ultrachem Inc, Wilmington, DE
8	Bag, Transparent	MIL-B-22020		
9	Barrier Material	MIL-PRF-121, Grade A	Polap 121B1	Weyerhauser Co, Paper Division, Fitchburg, MA
			Super Penguin Pak B-1	H.P. Smith Paper Co, Chicago, IL
			Military Barrier Paper No. 1	International Paper Co, Mobile, AL
			Milgard II	Guardian Packaging Co, Newark, CA
			Green Core Cloth Wrap 510	Minnesota Mining and Mfg Co, Bedford Park, IL
10	Deleted			
11	Chafing Sleeve		94835-1/-2/-3	Titeflex Co, Inc, Springfield, MA
12	Cleaner		Type SKC-2	Magnaflux Corp, Chicago, IL

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
13	Cloth, Crocus	ANSI B74.18	Crocus Cloth	Carborundum Co, Niagara Falls, NY
14	Compound		Turco Compound No. 17	Turco Products Inc, Carson, CA
15	Compound, Anti-Seize Thread	MIL-PRF-83483		Moly Products
			Molykote Type Z	Moly-Lube Products, Great Neck, New York
15A	Compound, High Temperature Anti-Seize Thread	MIL-PRF-907	Bostik Never-Seez Pure Nickel Special	Bostik Findley http://www.distriblocat.bostikfindley-us.com
16	Compound, Carbon Removal	MIL-C-19853	B&B 120S	B&B Chemical Co, Inc, Hialeah, FL
			F2033	Octagon Process Inc, Edgewater, NJ
			Brulin 1208B	Brulin and Co, Inc, Indianapolis, IN
			T-5006 Concentrate	Turco Products Inc, Carson, CA
17	Deleted			
17A	Deleted			
17B	Compound, Cleaning	MIL-PRF-85704	N/A	Those meeting requirements of MIL-PRF-85704
18	Compound, Corrosion Preventive	MIL-C-6529, (Type I)		
19	Compound, Vapor Blast	AMS 3755	Novahone 325	Vapor Blast Mfg Co, Milwaukee, WI
20	Corrosion Preventive, Fingerprint Remover	MIL-C-15074	Braycote 120	Burmah-Castrol Inc, Irvine, CA
			NoxRust 314	Daubert Chemical Co, Nox Rust Division, Chicago, IL
			Convoy FPR	Convoy Oil Corp, Philadelphia, PA

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
21	Corrosion Preventive Oil	MIL-C-8188	Esso Turbo Oil P-16	Exxon Co USA, Houston TX
22	Cutting Oil	A-A-53648		
23	'dag' Dispersion		No. 154	Acheson Colloids Co, Port Huron, MI
24	Desiccant Bag	MIL-D-3464, Type I	Humi-Sorb Lantuck (Heat Sealed) Unit wt. 32 gms	Culligan USA, San Bernardino, CA
			Eagle Gel A Unit wt. 26 gms	Eagle Chemical Co, Inc, Mobile, AL
			Protek-Sorb 121 Lantuck (Sewn) Unit wt. 23.5 gms	W.R. Grace & Co, Davison Chemical Div, Baltimore, MD
		Type II	Humi-Sorb 3H495 Lantuck (Sewn) Unit wt. 32 gms	Culligan USA, San Bernardino, CA
			Sorb-It 16-2-G Lantuck & Reemay (Sewn) Unit wt. 26 gms	N.T. Gates Co, Pennsauken, NJ
			Eagle Gel Promset (Heat Sealed) Unit wt. 23 gms	Eagle Chemical Co, Inc, Mobile, AL
		Type III	Eagle Gel Lantuck (Sewn) Unit wt. 23 gms	Eagle Chemical Co, Inc, Mobile, AL
			Protek-Sorb 121 Lantuck (Sewn) Unit wt. 23.5 gms	W.R. Grace & Co, Davison Chemical Div, Baltimore, MD
25	Developer		Tracer-Tech Form a, b or d	X-Ray Industrial Distributors, Clifton, NJ
26	Developer		Typer SKD-4	Magnaflux Corp, Chicago, IL
27	Enamel	AMS-3125		

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
28	Epoxy, Engine Gray AD		E-2833A Component A	Armitage Co, Inc, Bridgeport, CT
29	Epoxy, Engine Gray A.D.		E-2833A Component B	Armitage Co, Inc, Bridgeport, CT
30	Deleted			
31	Epoxy Catalyst		E-5621B	Miller Protective Coatings, Norwalk, CT
32	Epoxy Catalyst		E-5622B	Miller Protective Coatings, Norwalk, CT
33	Epoxy, Clear Baking		V-4936	Armitage Co, Inc, Bridgeport, CT
34	Epoxy Polyamide Primer	MIL-PRF-23377		
34A	Gear Marking Compound		No. 89	Organic Products Co, Irving, TX
35	Glycerol			
36	Grease	SAE AMS-G-4343	Molykote 55M	Dow Corning Corp, Lubricants Plant, Greensboro, NC
			Cosmolube 615	E.F. Houghton & Co, Valley Forge, PA
			Royco 43 or 43C	Royal Lubricants Co, Inc, East Hanover, NJ
			Aeroshell Grease 43 or 43C	Royal Lubricants Co, Inc, East Hanover, NJ
			Castrolease PS	Royal Lubricants Co, Inc, East Hanover, NJ
37	Gun Blueing		No. 10793 Catalog No. 6G-10793	Sears Roebuck Co, Wichita, KS
38	Hydrogenated Vegetable Shortening	A-A-20100A		
39	Liquid Abrasive, Lorco		Novaculite No. 200	
40	Lockwire	NASM20995C32 MS20995C32		

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
41	Lubricating Oil	MIL-PRF-23699, Type II	PQ Turbine Lubricant 6423, 6700, 3889, 3893, C-3788, 9598	American Oil & Supply Co, Newark, NJ
			Brayco 899, 899G, 899M	Bray Oil Co, El Monte, CA
			Castrol 205	Castrol Oils Inc, Newark, NJ
			EMGARD Synthesized Turbine Lubricant (2952), (2949)	Emery Industries Inc, Cincinnati, OH
			Esso/Exxon Turbo Oil 2380	Exxon Co, USA Houston, TX
			BP Turbo Oil 2380	Air BP, Parsippany, NJ
			HATCOL 3211, 3611, 1639, 1680	Hatco Chemical Corp, Fords, NJ
			Mobil Jet Oil II	Mobil Oil Corp, New York, NY
			Nyco 599A, 599B	Nyco International, Houston, TX
			STO-5700	PVO International Inc, Boonton, NJ
			Royco 889 (C-915), 889B (D-759-3), 899C (D-758), 899HC, 899E-1, 899E-2	Royal Lubricants Co Inc, East Hanover, NJ
			Aeroshell Turbine Oil 500	Royal Lubricants Co Inc, East Hanover, NJ
			Stauffer Jet II (9624), Stauffer STL (E-7306)	Stauffer Chemical Co, Westport, CT
42	Lubricating Oil	MIL-PRF-7808, Type I	PQ Turbine Oil, 8365, 9900, 4236	American Oil & Supply Co, Newark, NJ
			Castrol 399	Castrol Oils Inc, Newark, NJ

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
			Brayco 880H	Bray Oil Co, Los Angeles, CA
			Esso/Exxon Turbo Oil 2389	Exxon Co, USA, Houston, TX
			BP Turbo Oil 2389	Air BP, Parsippany, NJ
			HATCOL 1278, 1280	Hatco Chemical Corp, Fords, NJ
			Mobile Jet 184A/201A	Mobil Oil Corp, New York, NY
			NII 160	NYCO International Inc, Houston, TX
			TURBONYCOIL 160	NYCO S.A., Paris, France
			Royco 808GF	Royal Lubricants Co Inc, East Hanover, NJ
			Aeroshell Turbine Oil 308	Royal Lubricants Co Inc, East Hanover, NJ
			Technolube SYN TURBO Number 3	Technolube Products Co, Los Angeles, CA
43	Lubricating Oil	MIL-PRF-6081, Grade 1010		
44	Lubricating Oil		Univolt 60	Exxon Co, USA, Houston, TX
			Code 1515	Texaco Inc, White Plains, NY
45	Lubricant, Spline		ML7 plus 2	Moly Lubricants Corp, Harahan, LA
			Plastilube Moly No. 3	Warren Refining Div, Parr Inc, Cleveland, OH
46	Lubriplate			Fiske Brothers Refining Co, Newark, NJ
47	Deleted			
47A	Deleted			
48	Methyl Alcohol	O-M-232		

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer’s Designation	Manufacturer
49	Deleted			
50	Molybdenum Disulfide Powder	AMS-M-7866	Metco 63	Metco Inc, Westbury, NY
50A	Paint, Aluminum Enamel		Sermetal-W	Sermetal Co, Division Teleflex Inc
51	Penetrant		SLK3	Magnaflux Corp, Los Angeles, CA
52	Penetrant		Visible Red, Group VI Tracer-Tech P-301	X-Ray Industrial Distributors, Clifton, NJ
53	Petrolatum	W-P-236	Amber Parmo	Exxon Co, USA, Houston, TX
54	Pigment, Iron-Blue			
55	Polyurethane	MIL-C-83286		
55A	Potting Compound		RTV106	General Electric, Silicon Products Div, Waterford, NY
56	Deleted			
57	Reducer, Epoxy		T-64	Armitage Co, Inc, Bridgeport, CT
58	Remover, Visible Dye Penetrant	AMS2644	Tracer-Tech K410A	X-Ray Industrial Distributors, Clifton, NJ
59	Rust Inhibitor and Preservative		LPS-2	LPS Research Laboratories Inc, Los Angeles, CA
				C.P.S. Casella Postale 1020 (Vomero), Naples 80100
			WD40	WD40 Co, San Diego, CA
				Cadulec Chemicals LTD, Old Boston Trading Estate, Penny Lane, Haydock St Helens, Lancashire, England

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INSERT PAGE 2 OF 2 FACING 72-00-00, PAGE 215.

Reason: To change the manufacturer's designation for Item 59B. To add Dow Corning Xiameter PMX-200 as an alternate for Item 59B in Table 203.

Table 203 is changed as follows:

Table 203. Consumable Materials (Cont)

Item No.	Description	Military or Federal Specification	Manufacturer's Designation	Manufacturer
59B	Silicon Oil		SF96-100	General Electric
59C	Silicone Oil		Xiameter PMX-200 (Alternate for Item 59B)	Dow Corning Corp. Lubricants Plant Greensboro, NC

See TR

Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
59A	Silver Marking Pencil		753	Berol Corp, Brentwood, TN
59B	Silicon Oil	SF96-100		General Electric
60	Sodium Dichromate	A-A-59123		E.I. DuPont de Nemours & Co Inc, Industrial and Biochemical Dept, Wilmington, DE
				Axton Cross Co, North Haven, CT
				Allied Chem Corp, Industrial Chemical Div, Morristown, NJ
61	Solvent, Concentrated		B&B 3100	B&B Chemical Co, Inc, Hialeah, FL
			Krankwash	Rochem U.S. Inc, Ridgewood, NJ
			Megapower	John B. Moore Corp, South Amboy, NJ
			Penair M5704	Penetone Corp, Tenafly, NJ
			Pentone 19	Penetone Corp, Tenafly, NJ
			Turco 5884	Turco Products Div, Carson, CA
			Turboclean 2	Trafficair Inc, Alpharetta, GA
62	Solvent, Dry Cleaning	MIL-PRF-680	Mineral Spirits 135	Shell Oil Co, New York, NY
			Varsol 1,2,3, and 5	Exxon Co USA, Houston, TX
			Solvasol No. 5	Mobil Oil Co, New York, NY
63	Surface Conditioner	MIL-S-5002		
64	Tape	A-A-113	Tuck # 205B	Technical Tape Corp, Beacon, NY
			650	3M Co, St. Paul, MN
			2046	Le Page's Inc, Gloucester, MA
65	Tape	A-A-5486	901	Hampton Mfg Co, New Rochelle, NY

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Table 203. Consumable Materials (Cont)

Item No	Description	Millitary or Federal Specification	Manufacturer's Designation	Manufacturer
			354	Johns-Manville Sales Corp, Chicago, IL
			Permacel 69	Permacel Tape Corp, New Brunswick, NJ
66	Deleted			
67	Deleted			
68	Triethylene Tetramine			Union Carbide Corp, South Charleston, WV
69	Varnish, Corrosion Preventive Synthetic Resin	AMS 3132 or MIL-R-3043		
70	Deleted			
71	Deleted			
72	Deleted			
73	Deleted			
73A	White Opaque Marking Ink	A-A-208		
74	Zinc Chromate Primer	MIL-P-85582 Type I, Class 2	E9OYC16	Sherwin-Williams Co, Chicago, IL
			PA3-22	Sinclair Paint Co, Los Angeles,
75	Zinc Chromate Sealant		P6968	The Armitage Co, Bridgeport, CT
			JC5A	Duffay Titanine, Sheldon Durham, England

ENGINE - SERVICING

1. Servicing - Introduction

This section contains procedures for servicing and cleaning the engine or its components as it is installed on the airframe. Procedures include servicing the lubrication oil system, servicing the fuel control assembly, servicing interstage air-bleed actuator assembly, preservation and storage of an engine and components, and activating an engine after storage.

2. Servicing the Lubricating Oil System

A. Lubricating Oils

The engine lubrication system oils specified for use in Honeywell T53 engines conform to, or are similar to, Military Specifications MIL-L-7808 or MIL-L-23699. These oil requirements are listed in 71-00-00, Powerplant, Paragraph 3.

B. Oil Change Interval

(1) Because of variations in environmental and operating conditions, each operator shall establish his own oil change interval, based on an oil analysis program as outlined in following Step (b). If the oil analysis program is not used, oil must be changed every 100 hours. Engines, which operate less than 100 hours in a calendar year, are recommended to have oil changed every 6 months to eliminate accumulated water, contaminants, and oil degradation products.

NOTE: On a new engine, or when an oil change has been completed, the engine shall be run for a minimum of 15 minutes and an oil sample taken for analysis. Analysis results will be the basis for oil sample analysis program in following Step (b).

(a) Operate the engine on the brand and type of oil selected with close monitoring of aircraft and engine oil system maintenance.

NOTE: Intermixing of oils of different brands should be avoided if possible. Intermixing of oils of different types is not permitted except in an emergency. If intermixing of oil types becomes necessary, the oil system must be flushed within 6 hours of engine operation, as outlined in following Steps D or E, using the desired type of oil.

(b) At 100 hour intervals, remove oil sample and analyze for Total Acid Number (TAN) measured in mg KOH per gram of oil. Analyze for viscosity at 100°F (38°C). The Gerin Turbo-Lube Test Kit, TL410, or any reputable laboratory may be used to analyze the oil. Make determination for continued oil usage based on the following criteria:

1	Kinematic viscosity at 100°F (38°C), centistokes or Gerin viscosity temperature	+25 to -10 percent of original value of oil when new
2	TAN	1.0 mg KOH/g maximum

NOTE: Coke or deposit accumulation on filters is reason to change oil.

(c) Based on acceptable results of oil sample in preceding Step (b), repeat preceding Steps (a) and (b) at 100 hour intervals until an oil related problem is revealed or the acidity or viscosity limits are exceeded. The oil must be changed if any of these conditions occur.

NOTE: The oil change interval recommendation applies to engines which are maintained in strict accordance with applicable Honeywell publications and manuals. The individual operator is responsible for the conduct and accuracy of oil sampling and analysis.

(2) Shelf life of approved oils is 3 years. Oils over 3 years old are not recommended for use in Honeywell T53 engines.

C. Draining and Replenishing Engine Oil

WARNING: PROLONGED CONTACT WITH LUBRICATING OIL MAY CAUSE SKIN RASH. THOSE AREAS OF SKIN AND CLOTHING WHICH COME IN CONTACT WITH LUBRICATING OIL SHOULD BE THOROUGHLY WASHED IMMEDIATELY. SATURATED CLOTHING SHOULD BE REMOVED IMMEDIATELY. AREAS IN WHICH LUBRICATING OIL IS USED SHOULD BE ADEQUATELY VENTILATED TO KEEP MIST AND FUMES TO A MINIMUM.

CAUTION: LUBRICATING OIL (72-00-00, 41 OR 42, TABLE 203) MAY SOFTEN PAINT UPON CONTACT. IF LUBRICATING OIL IS SPILLED ON PAINTED SURFACES, THESE SURFACES SHOULD BE THOROUGHLY WASHED IMMEDIATELY.

(1) Place a suitable container under accessory drive gearbox.

(2) Remove magnetic chip detector from accessory drive gearbox (see 79-30-01) and allow oil to drain from accessory drive gearbox. For engines incorporating SB T53-L-13B-0098 the chip detector base must also be removed.

(3) Disconnect No. 2, 3, and 4 bearing scavenge oil hoses from accessory drive gearbox and allow oil to drain from lubricating system. (See 79-20-07.)

(4) Remove lube oil filter element from filter assembly. Clean and inspect filter elements. Reinstall cleaned or replacement element. (See 79-20-03.)

(5) Remove, clean, inspect and install the following filters and strainers.

(a) Power turbine oil strainer. (See 79-20-04.)

(b) Rear bearing housing oil strainer. (See 79-20-05.)

(c) Overspeed governor and tachometer drive filter. (See 72-60-02, Paragraph 2.)

(6) Clean and inspect magnetic chip detector. Install chip detector. (See 79-30-01.) Lockwire chip detector.

(7) Clean scavenge oil hose connections and fittings with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-00-13.) Reconnect scavenge oil hoses. (See 79-20-07.)

CAUTION: THERE IS NO EASILY RECOGNIZED DIFFERENCE IN APPEARANCE BETWEEN TYPE I AND TYPE II OILS. THE ONLY WAY OF DETERMINING WHICH TYPE OF OIL IS IN AN ENGINE IS BY CAREFUL MAINTENANCE OF SERVICING RECORDS.

INTERMIXING OF OILS OF DIFFERENT TYPES IS NOT PERMITTED, EXCEPT IN AN EMERGENCY. IF INTERMIXING OF OIL TYPES BECOMES NECESSARY, THE OIL SYSTEM MUST BE FLUSHED WITHIN 6 HOURS OF ENGINE OPERATION USING THE DESIRED OIL TYPE. (SEE PARAGRAPH 2.D. OR E.)

TO PREVENT OIL CONTAMINATION, USE ONLY UNOPENED CANS.

(8) Fill engine oil system to capacity with the brand and type of lubricating oil selected and noted on aircraft and engine oil system maintenance records. (72-00-00, 41 or 42, Table 203.)

NOTE: Intermixing of oil of different brands should be avoided if possible.

On a new engine, or when an oil change has been completed, the engine shall be run for a minimum of 15 minutes and an oil sample taken for analysis. Analysis results will be the basis for oil sample analysis program in preceding Step B.

D. Changing From Type I (MIL-L-7808) to Type II (MIL-L-23699) Lubricating Oil. Perform the following procedure.

NOTE: Mixing of Type I (MIL-L-7808) oil with Type II (MIL-L-23699) oil is not permitted except in an emergency. If intermixing of oil types becomes necessary, the oil system must be drained and flushed within 6 hours of engine operation.

(1) Drain lubricating oil from engine oil system. Inspect and clean all oil filters and strainers. (See 79-20-03, 79-20-04, and 79-20-05.)

(2) Fill engine oil system with lubricating oil, Type II (MIL-L-23699) (72-00-00, 41, Table 203). Conspicuously mark engine or airframe to indicate type of oil to be used.

(3) Operate engine for a period of 30 minutes to 1 hour to heat oil to operating temperature, which will promote dislodging of residual Type I (MIL-L-7808) (72-00-00, 42, Table 203), carbon and lacquer deposits.

(4) Shut down engine, inspect, and clean oil filters and strainers. (See 79-20-03, 79-20-04, and 79-20-05.) Proceed as follows:

(a) If heavy contamination of filters and strainers is noted, drain oil from engine and discard oil. Refill oil system with new oil, Type II (MIL-L-23699) (72-00-00, 41, Table 203), and repeat preceding Steps (3) and (4).

(b) If little or no contamination of filters and strainers is noted, drain oil from engine and discard oil. Proceed with Steps (5) through (7).

(5) Refill engine oil system with new lubricating oil, Type II (MIL-L-23699) (72-00-00, 41, Table 203). Conspicuously mark engine or airframe to indicate type of oil to be used.

(6) An inspection and cleaning of engine oil filters and strainers is required after 5 and 15 hours of engine operation following oil changeover.

(7) After 15 hour inspection of engine oil filters and strainers, revert to normal inspection intervals.

E. Changing from Type II (MIL-L-23699) to Type I (MIL-L-7808) Lubricating Oil. Perform the following procedure.

NOTE: Mixing of Type II (MIL-L-23699) oil with Type I (MIL-L-7808) oil is not permitted except in an emergency. If intermixing of oil types becomes necessary, the oil system must be drained and flushed within 6 hours of engine operation.

(1) Drain lubricating oil from engine oil system. Inspect and clean all oil filters and strainers. (See 79-20-03, 79-20-04, and 79-20-05.)

(2) Fill engine oil system with lubricating oil, Type I (MIL-L-7808) (72-00-00, 42, Table 203).

(3) Conspicuously mark engine or airframe to indicate type of oil to be used.

(4) Operate engine until oil reaches operating temperature.

(5) Shut down engine, inspect, and clean oil filters and strainers. (See 79-20-03, 70-20-04, and 79-20-05.)

(6) An inspection and cleaning of engine oil filters and strainers is required after 5 and 15 hours of engine operation following oil changeover.

(7) After 15 hour inspection of engine oil filters and strainers, revert to normal inspection intervals.

3. Servicing Fuel Control Assembly

A. Prime Fuel Control Assembly

(1) Disconnect starting fuel hose assembly downstream from solenoid valve. Connect drain line to end of disconnected hose and place in suitable container.

(2) Disconnect main fuel hose assembly downstream from fuel control. Connect drain line to end of disconnected hose and place in suitable container.

(3) Disconnect electrical input cable assembly from ignition unit.

(4) Set throttle (N1) to flight idle.

(5) Turn fuel boost pump ON.

CAUTION: TO PREVENT DAMAGE TO STARTER, DO NOT EXCEED STARTER LIMITATIONS.

(6) Motor engine with starter.

(7) Energize starting fuel solenoid valve and hold.

(8) Cycle throttle (N1) from flight idle to maximum and back a number of times and continue until clear fuel is flowing from main and starting fuel hose assemblies.

(9) Engine speed should be at least 12 percent N1 rpm. De-energize starter. Engine should coast down with no indication of rubbing or unusual noises.

(10) Turn off starting fuel solenoid valve, move throttle to OFF position and turn fuel boost pump OFF.

(11) Connect 28 vdc power source to ignition unit.

(12) Remove drain lines and connect the main and starting fuel hose assemblies.

(13) Visually inspect engine for leaks at next start.

B. Service Fuel Control Assembly With Silicone Oil

(1) Disconnect aft end of P1 pressure sense line 1-300-135-XX from union AN815-4D on fuel regulator. (Refer to Report No. 350.4 for parts orientation.)

NOTE: Suitable fillers include syringes or medicine droppers.

(2) Using a suitable filler and a clean measuring stick, add silicone oil (72-00-00, 59B, Table 203) until fluid level is no lower than 3.5 inches below the P1 fitting boss.

(3) Reconnect aft end of P1 pressure sense line 1-300-135-XX to union AN815-4D on fuel regulator.

4. Servicing Interstage Air-Bleed Actuator Assembly

NOTE: The interstage air-bleed actuator strainer must be cleaned and inspected after each 100 hours of engine operation, or sooner if operating in extremely dusty areas.

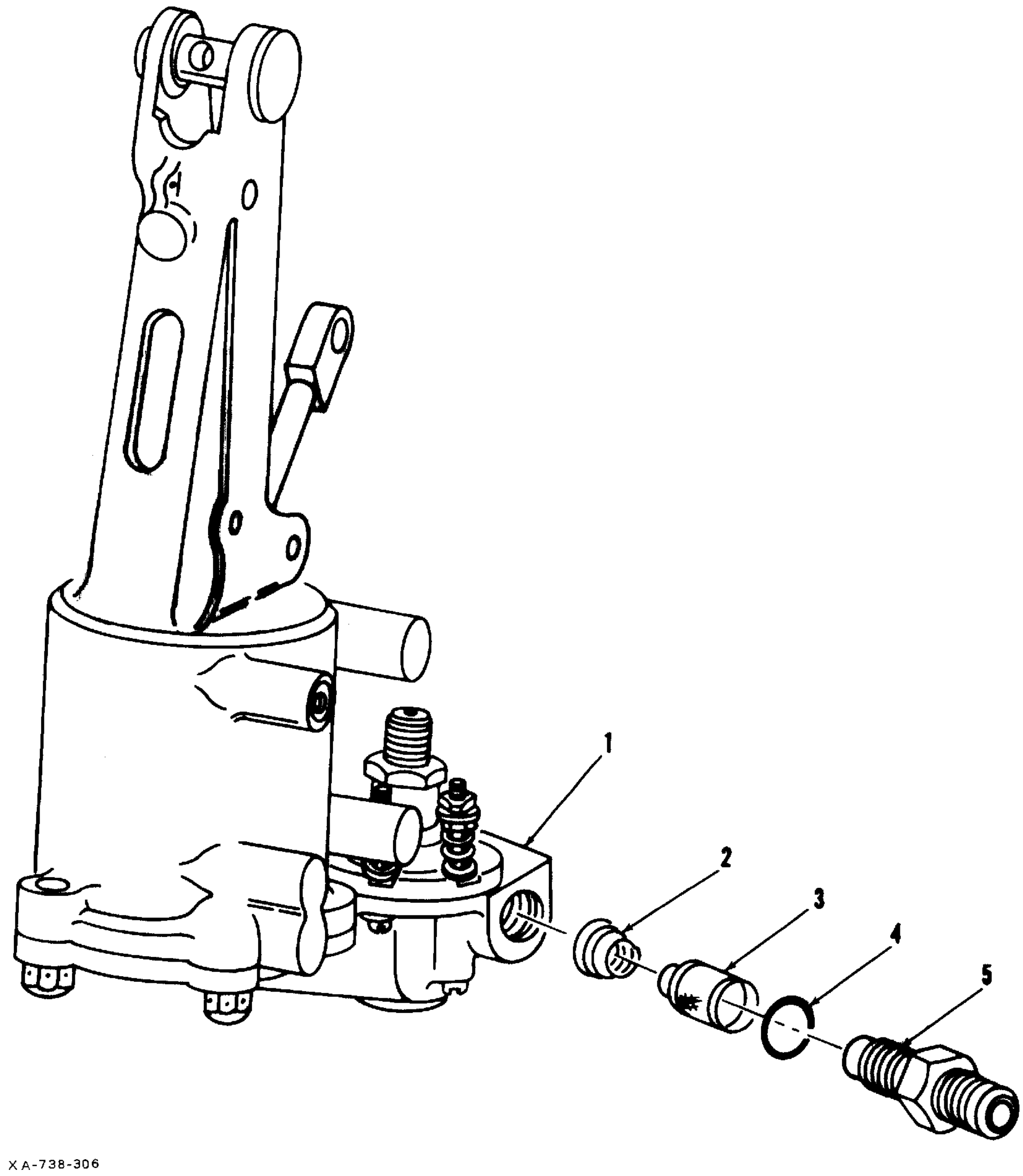
A. Disconnect hose assembly from diffuser housing to actuator assembly at the actuator assembly reducer fitting (5, Figure 301).

B. Remove reducer fitting (5), packing (4), strainer assembly (3), and spring (2) from actuator assembly (1).

C. Inspect strainer assembly (3) for foreign matter or damage.

(1) If foreign matter exists, clean strainer in dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-00-13.)

(2) If foreign matter cannot be removed, or if damage exists, replace with new strainer assembly 2-160-500-01.



1. INTERSTAGE AIR-BLEED ACTUATOR ASSEMBLY
2. SPRING
3. STRAINER ASSEMBLY
4. PACKING
5. REDUCER FITTING

Interstage Air-Bleed Actuator - Strainer Removal
Figure 301

D. Reinstall strainer assembly as follows:

(1) Position smaller end of spring (2) onto flange of strainer assembly (3).

(2) Install spring and strainer assembly into interstage air-bleed actuator assembly (1).

(3) Lightly coat new packing (4) with grease (72-00-00, 36, Table 203) and install on reducer fitting (5).

(4) Install reducer fitting (5) onto actuator assembly ensuring that strainer and spring are properly seated.

E. Install hose assembly from air diffuser housing to reducer fitting (5).

5. Preservation and Storage of Engine and Components

NOTE: All preservation procedures require that accumulation of dirt be removed from engine with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.) Under normal conditions, it will not be necessary to clean the entire external surface of the engine.

A. Preserving Accident Involved Engines

Engines removed from an aircraft that has been involved in an accident in which engine failure or malfunction is known or suspected to have been a factor, should not be treated for corrosion protection. No attempt should be made to operate, motor, or disassemble an accident involved engine.

(1) Without disconnecting lines or fittings, make every effort to prevent remaining fuel and oil in engine from leaking out.

(2) Plug all ports and cap all fittings and lines. Seal all openings with covers or barrier material (72-00-00, 9, Table 203), and secure with tape (72-00-00, 65, Table 203).

B. Preserving Damaged, Cannibalized, or Failed Engines

Inoperable engines that are idle because they require parts, maintenance, or overhaul, shall be preserved as required (depending on storage time), and stored in a shipping container or in a clean, dry area adequately protected from dirt and physical damage.

C. Preserving Engines in Flyable Storage

Preservation of operable engines to be inactive 14 days or less is as follows:

(1) Perform a regular preflight inspection of engine.

(2) Run engine at flight idle and check all instruments for normal engine operation.

(3) Operate engine for 10 minutes at approximately 75 percent N1 speed, or at highest power possible without gaining flight attitude. Make certain that EGT, oil, and engine temperatures stabilize.

(4) Shut down engine.

(5) Perform regular post flight inspection of engine.

NOTE: When covers are not available, an alternate method of protecting installed engines is to cover all openings in the engine cowling with suitable covers or grease proof barrier material (72-00-00, 9, Table 203) and secure with tape (72-00-00, 65, Table 203).

(6) Install engine intake protector LTCT862 and exhaust cover.

D. Preserving Inoperable Engines

(1) Preservation of inoperable engine that can be motored is as follows:

(a) Check oil level and service, if necessary.

(b) Disconnect 28 vdc power supply from ignition unit to prevent accidental firing of engine.

(c) Motor engine to initiate oil flow. (See 71-00-00, Paragraph 6.)

CAUTION: TO PREVENT DAMAGE TO STARTER, DO NOT EXCEED STARTER LIMITATIONS.

(d) Connect 28 vdc power supply to ignition unit. Lockwire connector.

NOTE: When protector and cover are not available, an alternate method of protecting installed engines is to cover all openings in the engine cowling with suitable covers or grease proof barrier material (72-00-00, 9, Table 203) and secure with tape (72-00-00, 65, Table 203).

(e) Install engine intake protector LTCT862 and exhaust cover.

(2) Preservation of inoperable engine that cannot be motored is as follows:

(a) Check oil level and service, if necessary.

NOTE: When protector and cover are not available, an alternate method of protecting installed engines is to cover all openings in the engine cowling with suitable covers or grease proof barrier material (72-00-00, 9, Table 203), and secure with tape (72-00-00, 65, Table 203).

(b) Install engine intake protector LTCT862 and exhaust cover.

E. Preserving Engines for Temporary and Extended Storage

Preservation of engine that can be motored to be inactive 15 to 180 days is as follows:

(1) Check oil level and service, if necessary.

(2) Disconnect 28 vdc power supply from ignition unit to prevent accidental firing of engine.

WARNING: FUEL IS FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. SKIN/EYE PROTECTION REQUIRED. AVOID REPEATED/PROLONGED CONTACT. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE.

(3) Remove fuel inlet strainer, pump discharge strainer, and servo supply filter from fuel regulator. Clean with dry cleaning solvent (72-00-00, 62, Table 203), and reinstall. (See 73-20-03 and SPM, 70-15-03, SP C203.)

(4) Disconnect main fuel hose from main fuel manifold, and starting fuel hose from starting fuel solenoid valve. Install temporary lines on end of hoses to allow drainage into suitable container.

(5) Disconnect fuel inlet line from fuel control and connect hose to a source of lubricating oil, Grade 1010 (72-00-00, 43, Table 203) to fuel control.

(6) Check that engine has cooled enough to prevent auto-ignition.

(7) Set throttle arm to flight idle.

CAUTION: TO PREVENT DAMAGE TO STARTER, DO NOT EXCEED STARTER LIMITATIONS.

(8) Motor engine, with starter, to pump lubricating oil into fuel system. (See 71-00-00, Paragraph 6.)

(9) Open and close throttle and actuate starting fuel solenoid valve to ensure flushing of the fuel control.

(10) Continue motoring until oil is observed draining from hose assemblies into container.

(11) Preserve compressor blades with rust inhibitor and preservative (72-00-00, 59, Table 203). Using 7 or 16 ounce aerosol can with snorkel tube, spray compressor blades as follows:

(a) Using starter, motor engine to starting rpm. With throttle closed, apply material as engine coasts down.

(b) Hold aerosol can and snorkel tube so that it projects into areas between inlet housing struts. Direct jet stream between any two inlet guide vanes onto rotating compressor blades. Move jet stream from base to tip of blades, which will ensure that material covers as much of the blades as possible.

(c) Apply jet stream for 30 seconds.

(12) With engine stopped and throttle closed, spray turbine wheel with sufficient amount of lubricating oil (72-00-00, 41 or 42, Table 203) to cover blades.

(13) Disconnect lubricating hose assembly from fuel control and connect fuel inlet line.

(14) Remove temporary hose assemblies from main and starting fuel hose assemblies, and connect main fuel hose assemblies to main fuel manifold. Connect starting fuel hose to starting fuel solenoid valve.

(15) Connect 28 vdc power supply to ignition unit. Lockwire connector.

(16) Install engine intake protector LTCT862 and exhaust cover.

NOTE: When protector and cover are not available, an alternate method of protecting installed engines is to cover all openings in the engine cowling with suitable covers or grease proof barrier material (72-00-00, 9, Table 203) and secure with tape (72-00-00, 65, Table 203).

(17) Visually check entire engine. Plug all holes, cap all ports, and check that external parts are complete and secure. Bare metal, including internal and external threads, should be covered with a film of lubricating oil (72-00-00, 41 or 42, Table 203). Record date of preservation and maintenance during preservation on engine historical form.

F. Preserving Engines that cannot be Motored

Preservation of engine that cannot be motored is as follows:

(1) Disconnect cable connector, disconnect fuel inlet and outlet hoses, and remove drain plug from fuel control.

WARNING: FUEL IS FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. SKIN/EYE PROTECTION REQUIRED. AVOID REPEATED/PROLONGED CONTACT. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE.

(2) Drain all fuel from fuel control and fuel hose assemblies.

(3) Remove fuel inlet strainer, pump discharge strainers, and servo supply filter from fuel control. Clean with dry cleaning solvent (72-00-00, 62, Table 203) and install. (See 73-20-03.)

(4) Remove overspeed governor. (See 72-60-02.) Drain fuel.

(5) Replace drain plugs, and connect electrical cable and fuel hose assemblies.

(6) Lockwire throttle arm into closed position.

WARNING: PROLONGED CONTACT WITH LUBRICATING OIL (MIL-L-23699) MAY CAUSE A SKIN RASH. THOSE AREAS OF SKIN AND CLOTHING THAT COME IN CONTACT WITH LUBRICATING OIL SHOULD BE THOROUGHLY WASHED IMMEDIATELY. REMOVE SATURATED CLOTHING IMMEDIATELY. AREAS IN WHICH LUBRICATING OIL IS USED SHALL BE ADEQUATELY VENTILATED TO KEEP MIST AND FUMES TO A MINIMUM.

(7) Pour lubricating oil, Grade 1010 (72-00-00, 43, Table 203) into openings made accessible by removal of overspeed governor until fuel regulator is filled.

(8) Pour lubricating oil into overspeed governor while rotating the drive shaft by hand.

(9) Reinstall overspeed governor. (See 72-60-02.)

(10) Preserve compressor blades with rust inhibitor and preservative (72-00-00, 59, Table 203), using 7 or 16 ounce aerosol can with snorkel tube.

(11) Spray the materials in the area between the inlet housing struts and direct the jet stream evenly on all the compressor blades.

(12) Apply jet stream for 30 seconds.

(13) Spray turbine rotors through exhaust with sufficient amount of lubricating oil (72-00-00, 41 or 42, Table 203), to cover blades.

(14) Install engine intake protector LTCT862 and exhaust cover.

NOTE: When protector and cover are not available, an alternate method of protecting installed engines is to cover all openings in the engine cowling with suitable covers or grease proof barrier material (72-00-00, 9, Table 203) and secure with tape (72-00-00, 65, Table 203).

(15) Visually check entire engine. Plug all holes, cap all ports, and check that external parts are complete and secure. Bare metal, including internal and external threads, should be covered with a film of lubricating oil (72-00-00, 41 or 42, Table 203).

(16) Record date of preservation and maintenance during preservation on engine historical form.

G. Preserving Engines in Permanent Storage

Preservation of any engine for permanent storage requires that the engine be installed in a shipping container. Preservation of such engine is the same as for extended storage. (See Paragraph 5.E.)

H. Renewal of Preservation

Preservation may be repeated as often as necessary, but, when conditions warrant it, a permanent preservation should be considered for a flyable or an extended storage engine. Proceed as follows:

(1) Remove inlet and exhaust covers or barrier material.

(2) Inspect openings for foreign material and corrosion. Wipe clean with dry cleaning solvent (72-00-00, 62, Table 203).

(3) Repeat preservation procedure for flyable or extended storage as applicable. (See Paragraph 5.C. and 5.E.)

I. Preserving Fuel Control Assembly removed from Engine

When a fuel control has been removed from an engine and is not to be reinstalled within 48 hours, flush with oil before removing, and cap ports (Paragraph 5.E.), or preserve as follows:

WARNING: FUEL IS FLAMMABLE AND TOXIC TO EYES, SKIN, AND RESPIRATORY TRACT. SKIN/EYE PROTECTION REQUIRED. AVOID REPEATED/PROLONGED CONTACT. GOOD GENERAL VENTILATION IS NORMALLY ADEQUATE.

(1) Remove servo supply filter and pump discharge strainer. (See 73-20-03.) Allow fuel to drain from fuel control.

(2) Reinstall servo supply filter and pump discharge strainer. (See 73-20-03.)

(3) Install high pressure caps on the main and starting fuel outlet and inlet fittings and on pump discharge pressure ports.

(4) Preserve fuel control using procedure in following Step (5) or (6).

NOTE: Procedure in Step (5) is the preferred method for preserving fuel control.

(5) Preserve fuel control as follows:

(a) Connect a 1 to 5 foot pressure head source of clean, unused lubricating oil (72-00-00, 43 or 44, Table 203) to fuel inlet.

(b) Position the fuel control in operating attitude.

NOTE: Drive fuel control in proper direction of rotation. Drive adapter can be made of heavy rubber hose or a spline welded to a square drive socket or adapter.

(c) Using a rotary air gun and a spline adapter which will not damage the fuel control N1 drive, motor the fuel control at 100 to 150 rpm.

(d) Continue procedure until fuel is flushed out by the oil.

(6) Preserve fuel control as follows:

(a) Pour lubricating oil (72-00-00, 43 or 44, Table 203) into fuel control through pump discharge strainer port.

(b) Rotate fuel control pump drive by hand.

(c) Turn fuel control over several times to allow lubricating oil to penetrate all sections.

J. Packing Fuel Control or Governor for Shipment

Cap and plug openings, place fuel control and/or governor in shipping container and properly identify for shipment.

6. Activating Engine After Storage

A. The following procedures apply to engines installed in aircraft. The particular procedure chosen depends on length of time that the engine has been inactive. Examine the preservation record tags and historical records of the engine to determine period of inactivity.

B. Activating Engine in Aircraft Stored for 14 Days or Less

(1) Remove covers or barrier material from inlet and exhaust housings and remove any tape residue with dry cleaning solvent (72-00-00, 62, Table 203).

(2) Engine is ready for ground test.

C. Activating Engine in Aircraft Stored for 15 to 180 Days

(1) Remove inlet and exhaust covers and barrier material.

(2) Inspect openings for foreign material and corrosion. Wipe clean with dry cleaning solvent (72-00-00, 62, Table 203).

(3) Remove chip detector from accessory drive gearbox and drain plugs from fuel control. (See 79-30-01.) Allow oil to drain.

(4) Clean and reinstall chip detector and replace all plugs. (See 79-30-01.)

(5) Disconnect 28 vdc power supply from ignition unit to prevent accidental firing of engine.

(6) Set throttle to idle position.

(7) Disconnect main fuel hose from main fuel manifold and starting fuel hose from starting fuel solenoid valve. Install temporary hoses and place ends into a container of approximately 2 gallon capacity.

(8) Check oil level and service, if necessary. (See Paragraph 2.)

(9) Operate aircraft boost pump to prime fuel system and motor engine with starter. (See 71-00-00, Paragraph 6.)

CAUTION: TO PREVENT DAMAGE TO STARTER, DO NOT EXCEED STARTER LIMITATIONS.

(10) Move throttle arm to maximum and actuate starting fuel solenoid valve until a solid stream of fuel with no air bubbles is observed flowing from temporary hoses into container.

NOTE: Engine lubrication system is fully primed when oil pressure gage shows a steady positive indication.

(11) Connect main fuel hose to main fuel manifold and starting fuel hose to starting fuel solenoid valve. Inspect engine for leakage.

(12) Connect 28 vdc power supply to ignition unit. Lockwire connector.

(13) Start engine and operate for 5 minutes at approximately 75 percent N1 speed. (See Airframe Flight Manual.)

(14) Inspect engine for fuel and oil leaks.

(15) Shut down engine.

(16) Remove oil filter cover assembly. Check for excessive contamination and replace. (See 79-20-03.)

(17) Remove chip detector. Check for excessive contamination, clean, and reinstall. (See 79-30-01.)

(18) Remove fuel inlet and pump discharge strainers and servo supply filter from fuel control. Check for contamination, clean, and replace. (See 73-20-03.)

(19) If no contamination is evident, the engine is ready for operation.

(20) If oil system contaminant accumulation is slight, drain oil and refill system with new oil.

(21) Repeat Steps (13) through (20). Evidence of continued contamination in oil system requires a trouble shooting process. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

D. Activating New, Overhauled, or Permanent Storage Engine

(1) A new, overhauled, or permanent storage engine is preserved in a shipping container. It will be removed from the container and installed on an airframe with proper fuel and oil supplied.

(2) Activate engine in the same manner as outlined for an extended storage engine. (See Paragraph 5.E.)

ENGINE - REMOVAL AND INSTALLATION

1. Removal of Engine From Aircraft

NOTE: Upon removal of engine from the aircraft, it must be properly installed in shipping container if engine is to be returned.

The thermocouple connector (77-20-01, 4, Figure 201) should always remain with the engine. It should not remain connected to the firewall cannon plug when the engine is removed.

Using engine lifting sling LTCT773 and a suitable hoist, remove engine from aircraft. (See Airframe Flight Manual.)

2. Shipping Container

Overall dimensions of the metal shipping container are: length, 74-5/8 inches; height, 43-1/8 inches; width, 39-3/4 inches. Total weight of engine and container is 1207 pounds. Container is pressurized with 4 to 6 psi of dehydrated air. (See Figure 401.)

3. Preservation and Installation of Engine in Metal Shipping Container

A. Preserve engine for extended storage. (See 72-00-00, ENGINE - SERVICING, Paragraph 5.E.)

B. Using wrench LTCT3938, remove starter unit.

C. Remove engine mounted airframe accessories. (See Airframe Flight Manual.)

D. Remove exhaust cone if installed.

NOTE: Prior to installation of starter drive spline cover in following Step E, lubricate starter drive spline socket with a liberal amount of spline lubricant (72-00-00, 45, Table 203). Do not pack socket.

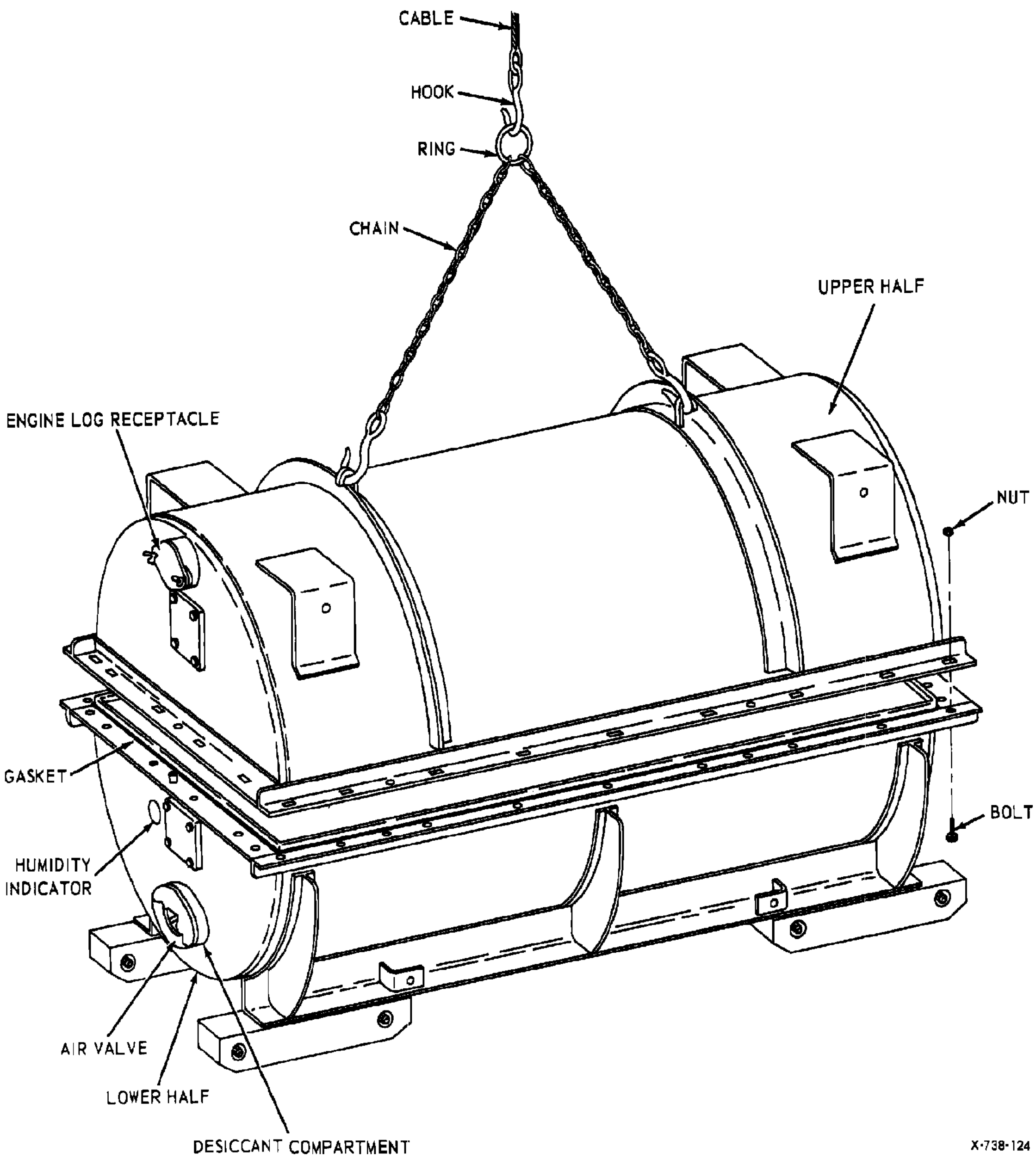
E. Spray exposed power turbine wheel and surrounding area with corrosion preventive oil (72-00-00, 21, Table 203). Inspect engine to ensure that all drain plugs are installed and lockwired, all lines in place and connected, and all attaching parts tightened to required torque values. Close all openings with proper shipping covers, caps, and plugs. Spray all drives with corrosion preventive oil (72-00-00, 21, Table 203) before covering. (See Figure 402.)

F. Release air pressure in container.

G. Remove container flange bolts and nuts.

H. Remove shipping container top half with suitable lifting sling. Remove sealing gasket from shipping container flange.

I. Clean mating flange surfaces and inside of shipping container with a wire brush and broom or a vacuum cleaner.



Remove Shipping Container Cover
Figure 401

J. File smooth any rough projections found on flange. Examine closure gasket, discard and replace it, if badly cracked. Clean and dry gasket, give it a light coating of glycerol (72-00-00, 35, Table 203).

K. Inspect container side rail assembly rubber shock mounts for cure date, cracks, tears, bond separation, and splits. Replace shock mount if older than 4 years or if shock mount shows evidence of damage.

L. Position gasket around flange of bottom half of shipping container. Make certain that it does not twist lengthwise. Check all bolts and nuts on shock mounts for tightness.

M. Remove forward and aft pairs of engine mounting brackets.

NOTE: Prior to installation of mounting brackets on inlet housing in following Step N, inspect inserts in inlet housing mounting pads to ensure that tangs of insert are broken off. If tangs are not broken, use tang breakoff tool 3581-8 (FSN 5120-793-1086) to break tang, and retrieve with a magnet.

N. Bolt engine mounting brackets and gaskets (39, Figure 402) to engine pads with bolts (27, 38) and washers (26, 37). Lockwire bolts.

O. Install gaskets on container mounting brackets to prevent metal to metal contact between engine mounting brackets and corresponding container brackets.

P. Cover air inlet and exhaust diffuser openings with protective covers (2, 24) or grease proof barrier material (72-00-00, 9, Table 203). If grease proof barrier material is used, secure with tape (72-00-00, 65, Table 203).

Q. Check humidity indicator. Replace if necessary.

R. Place 48 units of desiccant (72-00-00, 24, Table 203) in desiccant basket in bottom of container.

S. With engine in hoisting beam sling LTCT773, carefully guide engine into place. Bolt engine mounting brackets to corresponding container brackets.

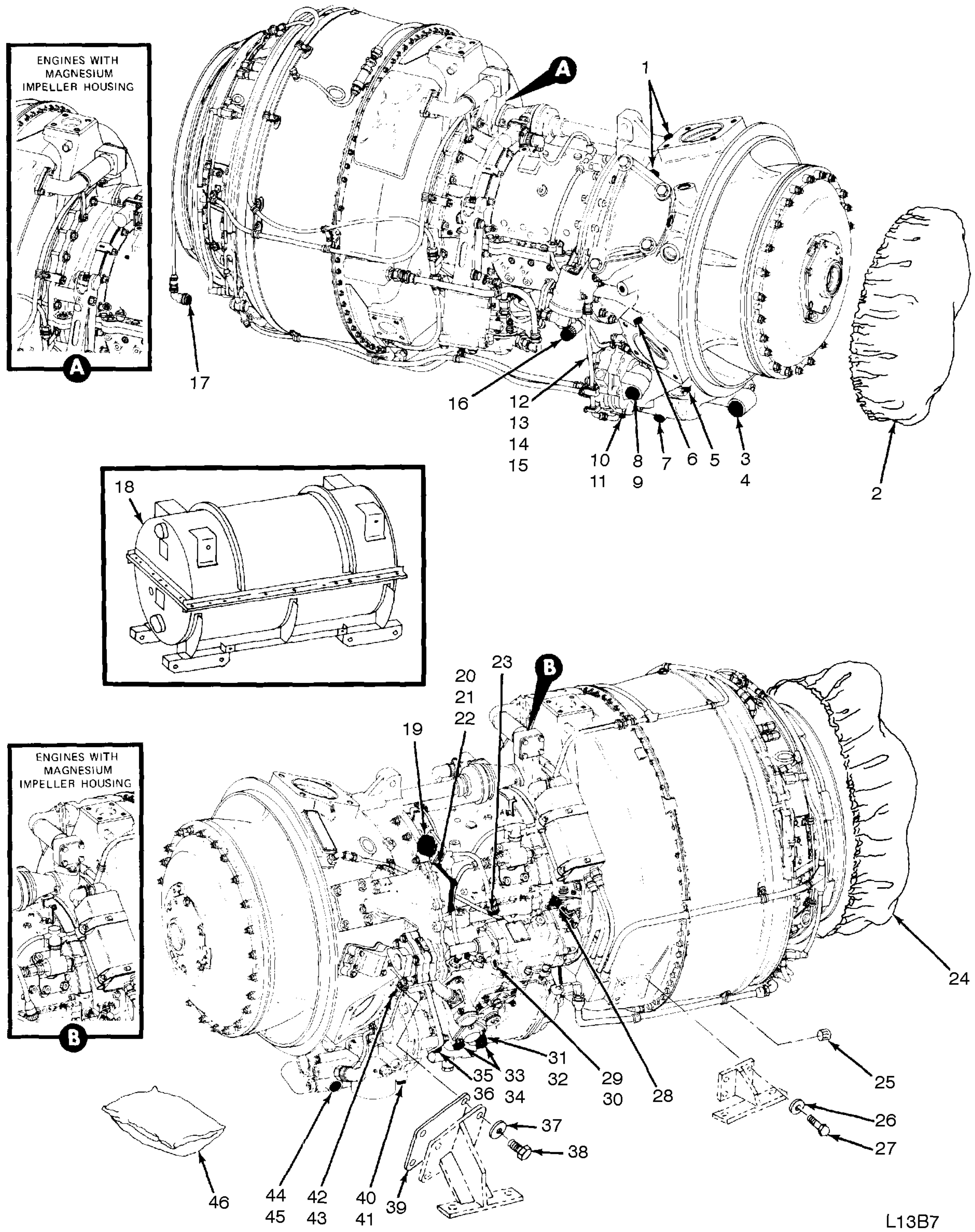
T. Using a suitable chain and alignment pins, lower the top half of shipping container onto bottom half. Install four bolts and nuts, one at each corner, and finger tighten. Check alignment of top and bottom halves of shipping container and alignment of upper and lower flange bolt holes.

U. Install bolts and nuts at midpoints of sides and ends of shipping container flanges, bolts and nuts at the midpoint between them and then install all remaining bolts and nuts. Tighten in order of installation with 500 to 640 inch-pounds torque.

V. Pressurize container with 4 to 6 psi using clean dehydrated air. Check container seals to ensure that they are air tight by applying liquid soap and observing for bubbles.

W. Place completed engine records in record receptacle. Install cover.

X. Fasten a bonding seal through the record holder cover plate wing nuts and two seals through the shipping container flange.



Shipping and Packing Components
Figure 402

KEY TO FIGURE 402

1. PLUG NAS816-11
2. PROTECTIVE COVER 1-010-021-02
3. PLUG NAS818-12
4. PACKING M83248/1-912
5. PLUG NAS818-4
6. PLUG NAS818-4
7. CAP NAS816-17
8. PLUG NAS818-12
9. PACKING M83248/1-912
10. PLUG STD3021-03
11. PACKING NAS617-03
12. NUT MS20365-624
13. WASHER AN960-616L
14. COVER AN100041
15. GASKET 1-080-026-01
16. CAP MS25177-12
17. CAP MS25177-12
18. SHIPPING CONTAINER ASSEMBLY 416BI
19. CAP MS25178-22
20. NUT MS21042-4
21. COVER AN100043
22. GASKET MS9134-01
23. CAP MS25177-12
24. PROTECTIVE COVER 1-010-021-02
25. PLUG NAS817-4
26. WASHER AN960-816
27. BOLT AN104009
28. PLUG NAS817-4
29. PLUG NAS818-3
30. PACKING M83248/1-903
31. CAP NAS817-10
32. PACKING MS29512-10
33. PLUG MS9015-04
34. PACKING M83248/1-904
35. PLUG NAS818-4
36. PACKING M83248/1-904
37. WASHER AN960-616
38. BOLT MS9534-16
39. FORWARD MOUNTING PAD GASKET 1-010-092-01
40. PLUG NAS818-2
41. PACKING NAS617-2
42. PLUG NAS816-23
43. PACKING
44. PLUG NAS818-10
45. PACKING MS29512-10
46. DESICCANT, BAGGED (24, TABLE 203)

4. Marking all Shipping Containers for Shipment

Shipping containers shall be marked as shown in Figure 403.

5. Preservation Maintenance

Preservation maintenance is not representation, but is the regular inspection and replacement of the dehydrating agent. Allow engine awaiting installation to remain in dehumidified shipping container as long as possible.

6. Inspection of Pressurized Containers

NOTE: Immediately upon receipt of engine, and every 90 days (or more frequently) thereafter, check the relative humidity indicator and the internal pressure of the container.

A. If relative humidity is less than 40 percent, and internal pressure is more than 1 psi, no further maintenance is necessary until the next regular inspection.

B. If internal pressure is less than 1 psi and relative humidity is less than 40 percent, container shall be checked for leakage, using soap solution at all closures. When leakage has been corrected, container shall be repressurized to 4 to 6 psi, using clean dehydrated air. Record date of repressurization in appropriate section of engine historical record.

C. If inspection reveals internal relative humidity to be 40 percent or more, an unsafe or corrosive condition exists. Correct as follows:

(1) Depressurize shipping container by opening air valve at front of container.

(2) Allow air pressure to return to zero.

(3) Remove 30 bolts and nuts that secure container halves together.

(4) Remove cover from container and inspect engine to determine its serviceability.

(5) If engine is found to be serviceable, remove it from container, preserve it for extended storage and reinstall in container, or place it in service. (See 70-00-00, ENGINE - SERVICING, paragraph 5.E.)

7. <u>Removal of Engine From Shipping Container</u>

A. Depressurizing Shipping Container

Open air valve at front of shipping container. (See Figure 401.) Allow air pressure to decrease to zero (atmospheric pressure).

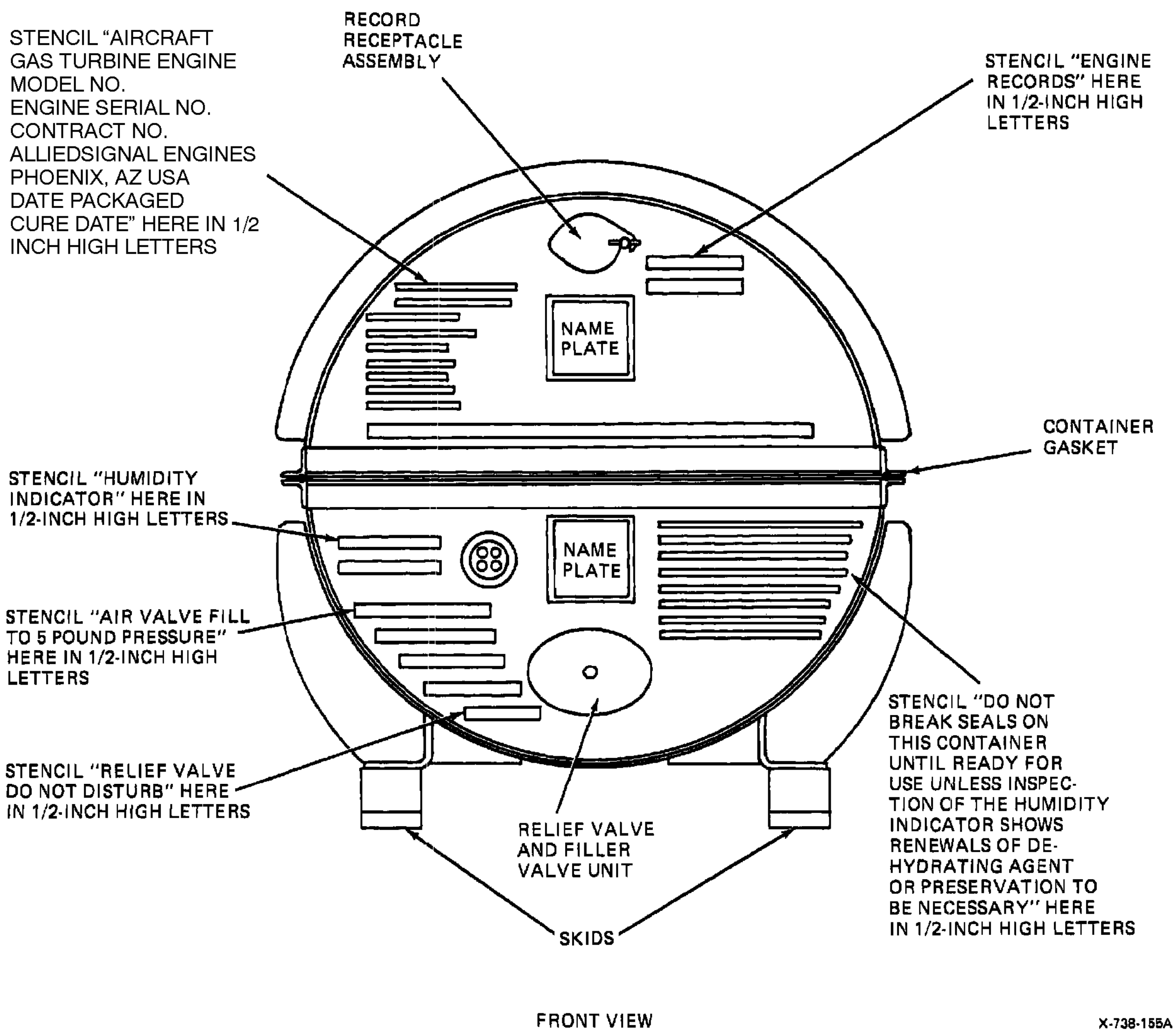
B. Removal

(1) Remove engine records from envelope compartment on container.

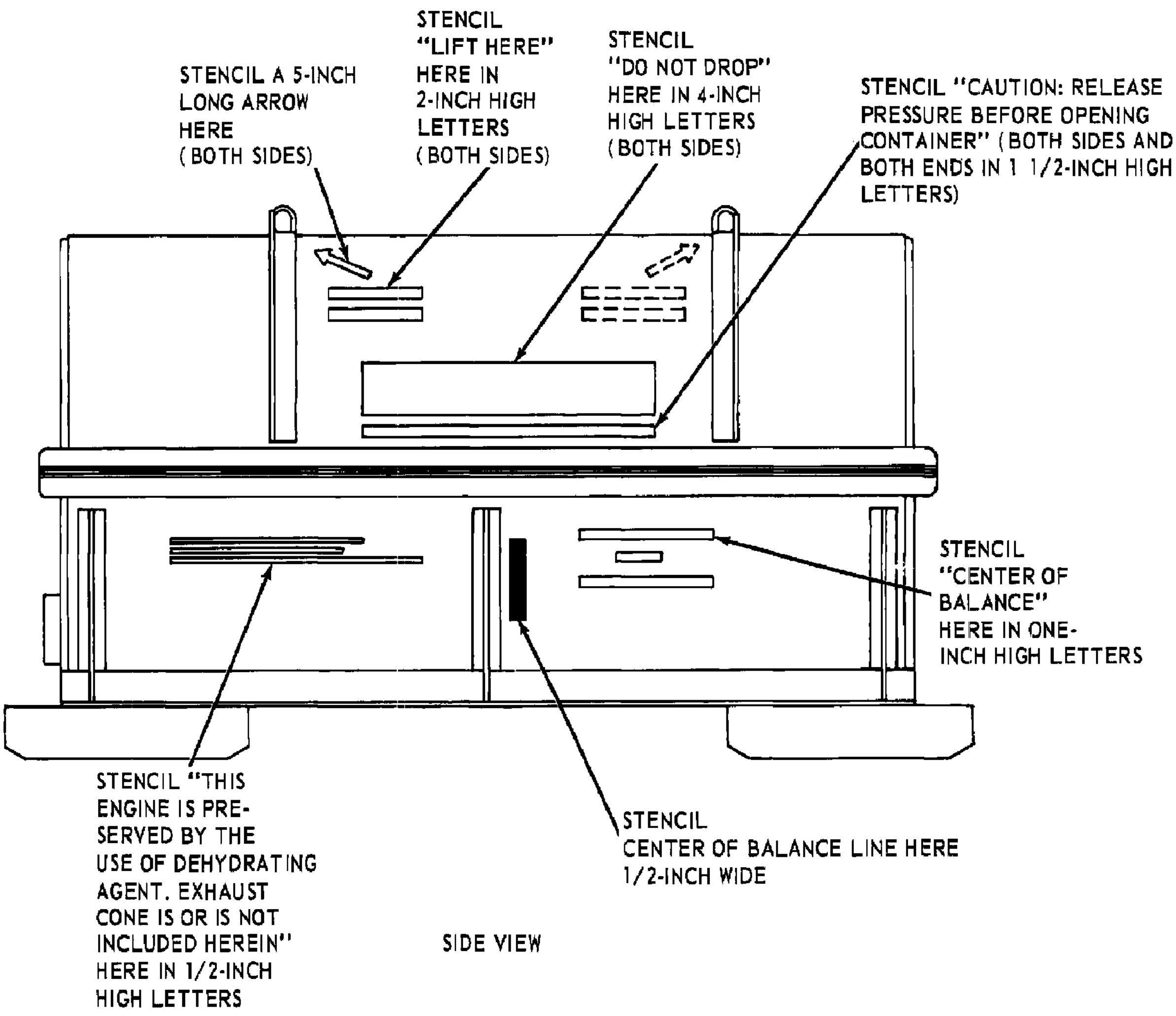
(2) Remove 30 nuts and bolts that secure upper and lower halves of shipping container.

<u>WARNING:</u> MAKE CERTAIN THAT ALL AIR PRESSURE HAS BEEN RELEASED BEFORE LOOSENING NUTS. IF NUTS ARE REMOVED BEFORE PRESSURE IS RELEASED, INTERNAL PRESSURE COULD BLOW OFF COVER.

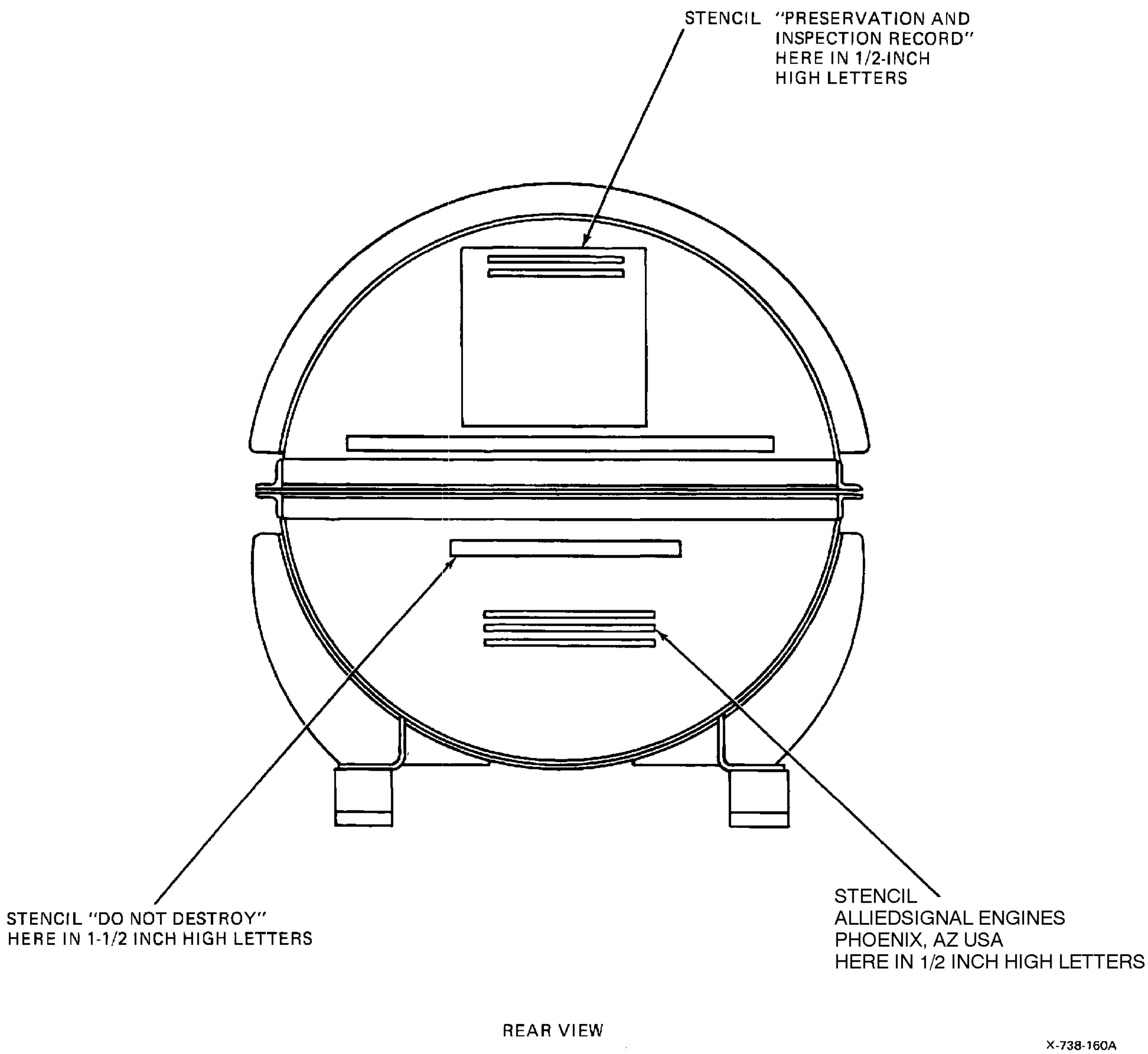
(3) Attach a suitable chain to lifting eyes on upper half of shipping container. Using a suitable hoist attached to chain, lift upper half of shipping container from lower half and set to one side. (See Figure 401.)



Shipping Container Marking
Figure 403 (Sheet 1 of 3)



Shipping Container Marking
Figure 403 (Sheet 2)



Shipping Container Marking
Figure 403 (Sheet 3)

(4) Insert 7/16 inch diameter by 6 1/2 inch long stud through diffuser housing mounting boss. Install engine hoisting beam sling LTCT773 on each end of stud. Secure engine sling with 1 1/2 inch diameter washers and nuts. Tighten nuts.

(5) Insert a 7/16 inch diameter by 5 inch long stud through inlet housing mounting boss. Install engine sling on each end of stud. Secure engine sling cables with 1 1/2 inch diameter washers and nuts. Tighten nuts.

(6) Attach engine sling to suitable hoist. (See Figure 401.)

(7) Remove nuts and washers that secure four shipping trunnions to four shock resistant mounts in lower half of shipping container.

(8) Remove engine from shipping container.

(9) Remove shipping trunnions from engine mounting pads.

CAUTION: TRUNNION BOLTS USED IN SHIPPING ARE NOT TO BE USED FOR INSTALLING ENGINE INTO AIRCRAFT.

(10) Reinstall shipping trunnions in bottom half of shipping container.

(11) Lower top half of shipping container onto bottom half. Install four bolts and nuts, one at each corner, and finger tighten. Check alignment on top and bottom halves of shipping container and alignment of upper and lower flange bolt holes.

(12) Install bolts and nuts at midpoints of sides and ends of shipping container flanges, and bolts and nuts at midpoints between them and then install all remaining bolts and nuts. Tighten, in order of installation to 500 to 640 inch-pounds torque.

(13) Using clean dehydrated air, pressurize shipping container to 4 to 6 psi. Check container seals to ensure they are air tight by applying liquid soap and observing for bubbles.

(14) Remove engine inlet and exhaust covers.

8. Installing Engine on Aircraft

A. Install engine mounted airframe accessories and using wrench LTCT3938 install starter unit.

B. Using engine hoisting beam sling LTCT773 and a suitable hoist, install engine on aircraft. (See Airframe Flight Manual.)

ENGINE - INSPECTION

1. Engine Inspection

NOTE: The preflight inspection is performed prior to the first flight of the day. It consists of a visual inspection and operational checks.

A. Preflight Maintenance Inspection

(1) Remove inlet and exhaust covers. Inspect engine air inlet areas for presence of foreign matter.

(2) Inspect accessible turbine components for burnt or missing material.

(3) Inspect for fuel or oil leaks.

(4) Check that fuel and oil tanks are filled to proper level.

(5) Visually inspect engine for leaks.

(6) Rotate throttle to full open, check that fuel control stop has full contact.

(7) Move collective to full up position, check that N2 governor stop makes full contact.

CAUTION: ONLY A RATED PILOT OR MECHANIC WITH COMPANY AUTHORIZATION SHALL PERFORM OPERATIONAL CHECKS. SERIOUS DAMAGE TO EQUIPMENT OR PERSONNEL INJURY COULD OCCUR.

(8) Position engine controls for prestart checks and proceed with engine ground operation checks in accordance with current flight manual.

NOTE: The postflight inspection is performed after the final flight of the day. It consists of a visual inspection to detect any malfunctions or defects resulting from engine operation. Correct discrepancies prior to the next flight.

B. Postflight Maintenance Inspection

(1) Monitor engine coast down as engine is being shut down and listen for noises, which may indicate interference between moving and stationary parts.

(2) Check combustion chamber drain valve for proper operation (fluid drain on shutdown, no fluid drain during engine operation).

(3) Inspect the following items for foreign object damage (FOD) and partial or complete blockage by rags, paper, or accumulation of other foreign materials. Evidence of blockage requires an inlet blockage inspection. (See 72-00-00.)

NOTE: For engines using air filter, sand and dust separator, and FOD screen, see Step (b).

(a) Inlet housing air ducts, variable inlet guide vanes, and compressor rotor blades and stator vanes (as visible through inlet air ducts) for FOD, partial or complete blockage, and salt, dirt, oil, or varnish deposits.

(b) Inspect FOD screen and separator (for engines using these items) as follows:

1 FOD screen for damage which would permit foreign object entry. If screen is damaged, inspect compressor for damage.

2 FOD screen exterior for presence of foreign material. If present, perform an inlet blockage inspection. (See 72-00-00.)

3 Separator Nonself-Purging Part No. 1-010-500-03/-04, remove upper half of separator and clean collector box. Check collector box for general condition and screens of filters for damage, tears, or abrasions. Perform inspections specified in preceding Step (a).

4 Separator (Self-Purging Part No. 1-010-500-07/-08). Presence of dirt or sand near ejector indicates ejector is operating satisfactorily.

5 At 25 hour intervals, remove upper half of purging separator and perform inspection specified in preceding Step (a).

6 Visually inspect seals and gaskets for tears, lack of adhesion, rips, cracks on metal surfaces, or other damage. If damage is evident, disassemble separator and inspect. Removal, repair, or replacement of seals, gaskets, or other parts shall be accomplished in accordance with instructions in the Particle Separator Maintenance Manual.

NOTE: If pin extension (actuation) recurs during engine run, perform oil contamination inspection (72-00-00). Actuation below 52°F (11°C) with no associated oil contamination is generally caused by a malfunction of indicator's thermal lockout device.

(4) Inspect oil filter bypass indicator for pin extension. If pin is extended, remove filter and clean elements (79-20-03). If unable to clean, replace filter. Reset pin by manually depressing plastic cover.

NOTE: If continuity exists, remove the chip detector. If the accumulation is greater than fuzz, oil contamination trouble shooting process is required. (See 72-00-00, Engine - Trouble Shooting.)

(5) Check for continuity at the chip detector.

(6) Inspect power turbine blades (visible through exhaust diffuser) for cracks, burns, and nicked or missing blades.

(7) Inspect exhaust area for presence of foreign matter. Inspect turbine blade trailing edges for evidence of burning, FOD, and tip rub. Inspect exhaust pipe for evidence of burning or buckling.

(8) Check tailpipe for presence of fuel, oil, or foreign objects.

(9) Install engine inlet and exhaust covers.

(10) Check engine controls for freedom of movement, full travel, from stop to stop.

(11) Check for loose electrical connectors.

(12) Check wire bundles for chafing against fluid lines.

(13) Check fuel and oil levels, service as necessary.

(14) If engine is to be inactive, for a period of 14 days or longer, make sure proper preservation procedures are followed. (See 72-00-00, Engine - Servicing.)

C. Service Inspection Requirement

NOTE: Inspection is conducted at intervals specified in Service Bulletin T53-L-13-0001 Time Between Overhaul (TBO)/Time Between Inspections (TBI) Intervals.

If engine is to be inactive, for a period of 14 days or longer, make sure proper preservation procedures are followed. (See 72-00-00.)

(1) Perform postflight maintenance inspection with the service inspection.

(2) Inspect inlet housing.

(a) Visually inspect inlet housing fillets, exterior air passages, support pads, struts, visible portions of forward and rear flanges for cracks, corrosion, and missing protective coating. Check all engine mounts for cracks, security, and damage. No cracks allowed. If cracks are found, replace inlet housing. No loss of protective coating is allowed. Repair to instructions in SPM, 70-30-00, P517, P524, and P525. No corrosion except for under the V-band flange is allowed. Replace inlet housing, if corrosion is found.

(b) Visually inspect inlet housing V-band flange for corrosion, whenever access is gained (with clamp removed). If limits are exceeded, replace inlet housing. Limits are as follows:

1 Cumulative total of 11 inches (27.94 cm) in length and 0.125 inch (0.3175 cm) depth is allowed.

2 Corrosion areas in 2.5 inches (6.35 cm) in length and 0.312 inch (0.7925 cm) depth are allowed.

3 Individual defects shall be separated by minimum of 1 inch (2.54 cm) of unaffected material.

(c) Inspect housing for evidence of fuel in the P1 fitting area.

1 Inspect the inside of the inlet housing at and around the port that connects to the P1 fitting.

2 If the area appears to be wet or discolored, perform a check of the silicone oil level to the fuel control in accordance with the instructions found in 73-20-01, paragraph 1.B.

3 If this check reveals that the silicone oil level has increased, remove the fuel control for repair.

(3) Inspect compressor housing for damage corrosion and security.

(4) Inspect air diffuser mounts and flanges for cracks, security, and damage.

NOTE: If a crack is found, measure and record length and location of crack. Contact T53 Customer Support Engineering at Fax (602) 231-3800 to determine if continued use of the air diffuser is possible or paul.elliott@honeywell.com.

(a) Inspect external vane brazement for cracks. Cracks in the vane brazement that do not effect engine performance are acceptable. If cracks in the vane brazement or other damage in vane brazement effect engine performance, replace air diffuser.

(b) Inspect brazed joint of air outlet pan assembly boss (P3) for cracks. Replace air diffuser.

NOTE: If there is evidence of cracks, perform non-destructive test (NDT) inspection using fluorescent penetrate materials. Reference SPM, 70-20-00, I305. Cracks are unacceptable. Replace air diffuser, if any cracks are found.

(c) If cracks are found in the braze of the engine mount to the air diffuser or in the parent metal of the engine mount, replace or repair the air diffuser.

NOTE: If distorting allows air leakage or if any cracks are present, replace damaged bleed band half.

(5) Inspect upper and lower bleed bands for distortion and cracks.

(6) Inspect combustion chamber housing, support cone, fireshield, and exhaust diffuser for cracks, hot spots, burned areas, and buckling. (See 72-40-00.)

(7) Inspect overspeed governor and tachometer drive assembly including torquemeter boost pump for leaks, loose fittings, and mounting hardware. No leaks allowed.

(8) Oil filter must be removed and checked for debris at every service inspection, if contaminated replace filter. If no contamination is detected rinse filter with solvent and re-install. (See 79-20-03.)

(9) Inspect fuel control for fuel leaks, damage, loose fittings, and mounting hardware. No leaks allowed.

(10) For all fuel controls (except Part No. 1-170-240-91/-93), perform the following.

(a) Inspect fuel control inlet strainers and clean. (See 73-20-03.)

(b) Inspect fuel control servo strainers. Replace filter. (See 73-20-03.)

NOTE: On Fuel Controls Part No. 1-170-240-91/-93 the wash flow filter is disassembled and cleaned at fuel control overhaul.

(11) For Fuel Controls Part No. 1-170-240-91/-93, perform the following.

(a) Inspect fuel control inlet strainers and clean. (See 73-20-03.)

(b) Remove the wash flow filter and strainer assembly. Inspect the strainer assembly for contamination.

(12) Check fuel control power lever for freedom of movement through full range to each stop.

(13) Inspect engine wiring harness for chafing and loose or damaged connections and loose clamps.

(14) Inspect ignition exciter and leads for cracks, chafing, and secure connections. No cracks or chafing allowed.

(15) Inspect oil lines and hoses for damage, chafing, leakage, and secure connections. No leaks allowed.

(16) Inspect fuel lines and hoses for damage, chafing, leakage, and secure connections. No leaks allowed.

(17) Inspect air line from engine to blower for chafing and secure connections. No chafing allowed.

(18) Inspect exhaust gas temperature (EGT) system as follows:

(a) Inspect harness connector for damaged threads or cracked insulator. Replace, if insulator is cracked or threads are damaged.

(b) Inspect harness for wear, fraying, and loose connectors. Correct all discrepancies.

(c) Inspect connectors for corrosion. Remove corrosion. (See 77-20-01.)

(d) Inspect thermocouple ends for bends or breaks. If bends or breaks are found, perform resistance check of the harness. (See 77-20-01.)

(19) Inspect engine bleed actuator strainer for condition and cleanliness. (See 75-30-03.)

(20) Inspect engine bleed actuator for condition and secure mounting hardware. (See 75-30-03.)

(21) Inspect bleed air tubing for chafing, loose connections, and missing or broken lockwire. Correct all discrepancies.

(22) Inspect accessory drive gearbox for leakage and secure mounting bolts and check that all other accessories mounted on AGB are in good condition with no leaks or loose mounting hardware.

(23) Inspect variable inlet guide vane (VIGV) actuator and feedback rod for security and clearance of feedback rod. Inspect for fuel leaks at actuator fittings. None allowed.

CAUTION: ONLY A RATED PILOT OR MECHANIC WITH COMPANY AUTHORIZATION SHALL PERFORM OPERATIONAL CHECKS. SERIOUS DAMAGE TO EQUIPMENT OR PERSONNEL INJURY COULD OCCUR.

(24) Perform engine preoperational checks in accordance with engine inspection before operation. (See 71-00-00.)

D. Internal Hot End Inspection

NOTE: An internal hot end inspection is to be performed when the EGT limit is exceeded or when the engine operating hour limits specified in applicable Service Bulletins are reached. In addition to the internal inspection items, a complete service inspection is to be performed (Step C).

When engines are operated in a sand and dust environment, it is recommended that the internal inspection interval be reduced to a 300 hour inspection for all engines with first turbine rotor assemblies prior to Part No. 1-100-880-12. A 600 hour inspection interval is recommended for engines with First Turbine Rotor Assemblies Part No. 1-100-880-12 or later configuration. In severe sand and dust conditions, the interval should be further reduced for all engines.

Extension of the 300 hour inspection interval must be based on satisfactory axial clearance between first stage gas producer nozzle and first stage gas producer rotor. Extension of the 600 hour inspection interval is based upon operator experience.

(1) Engine disassembly.

(a) Remove power turbine bearing housing heat deflector. Inspect for cracks at bolt hole and for carbon dust on the forward side. No cracks allowed.

(b) Using suitable tapered feeler gages, measure gap between rear bearing cover and exhaust diffuser in eight equally spaced places. The optimum gap would be 0.005 inch (0.127 mm) at all locations. Up to 0.007 inch (0.1778 mm) is allowable at any point, if the direct opposite measurement does not exceed 0.003 inch (0.0762 mm). If limit is exceeded, proceed as follows:

1 Inspect ID of exhaust diffuser. If average diameter in eight places exceeds 6.066 inches (15.408 cm), remove and replace exhaust diffuser.

2 Inspect OD of rear bearing cover. If average diameter at eight equally spaced locations is less than 6.056 inches (15.382 cm), replace the cover.

(c) Remove combustor turbine assembly in accordance with maintenance manual directions. Insure that the position of the air diffuser to combustion housing is marked with an approved marker. Mark relationship of power shaft to second power turbine rotor for reassembly.

(d) Record power shaft bolt flange depth measurement, dimension A. Subtract dimension B, the distance from top of the locating bar to flange. The resulting distance plus length of LTCT3039 is flange depth, dimension C.

(e) Record thickness of power turbine bolt shims.

NOTE: If nozzle modified by SB T53-L-13B-0130 is installed in this engine, than removal of the second stage power turbine nozzle for inspection is not required unless inspection while the nozzle is installed indicates the need for more stringent inspection.

(f) Disassemble combustor turbine assembly until the second stage power turbine nozzle is removed. Do not continue disassembly unless inspection of the exhaust diffuser, combustion chamber, and second power turbine rotor indicate additional disassembly for inspection or repair is necessary.

(g) Remove second gas producer rotor and nozzle from engine to allow inspection of the first gas producer rotor and nozzle.

(h) During disassembly record the following dimensions.

1 Thickness of first power turbine nozzle spacer.

2 Thickness of second power turbine nozzle.

3 Second stage gas producer tip clearance.

4 First stage gas producer tip clearance.

(2) Engine inspection.

(a) Inspect all hot section parts in accordance with the applicable section of the maintenance manual. Repair/replace any components that do not meet the inspection limits of the maintenance manual.

(b) Fuel manifolds and start nozzles shall be flow checked at a calibrated test bench to check for spray pattern and correct flows. Functional test procedure and limits are in the overhaul manual. Repair as necessary.

(c) Examine the rear second power turbine rotor face for indications of the power turbine bearing housing seal leakage. If this evidence is present, continue disassembly to replace that seal.

(d) If rotor part number is prior to Part No. 1-100-880-12, inspect for minimum of 0.095 inch (0.241 cm) clearance between first gas producer rotor and nozzle. (See 72-40-00, Figure 206.)

(e) Inspect the first gas producer nozzle by inspecting the vanes through the rotor. If necessary, remove the rotor for additional inspection of the nozzle (see limits 72-51-02).

(f) Inspect to determine that there are no oil leaks from the No. 2 seals. If evidence of an oil leak is present, disassemble to repair.

(g) Visually inspect power shaft splines for wear. (See Figure 601.)

NOTE: If wear or fretting is evident, the following limits apply. If limits are exceeded, replace power shaft.

1 Light to medium wear (conditions A and B) is acceptable.

NOTE: Do not lubricate power shaft splines.

2 Heavy wear (condition C) is acceptable up to 0.007 inch (0.0178 cm) depth stepped wear, provided heavy metallic pickup on mating power turbine internal splines is cleaned using a stiff brush and dry cleaning solvent (62, Table 203).

(h) Conduct a visual inspection, in accordance with maintenance manual requirements, of the combustion liner and housing, exhaust diffuser, and power turbine bearing housing without removing from the combustion turbine assembly. If defects appear to exceed limits, remove the components for further inspection.

(i) Measure the second power turbine rotor using the following procedure.

1 Place a No. 35 drill rod 0.108 inch (0.274 cm) diameter into wear step of two splines directly opposite each other. Hold rods in place using petroleum jelly or vegetable shortening.

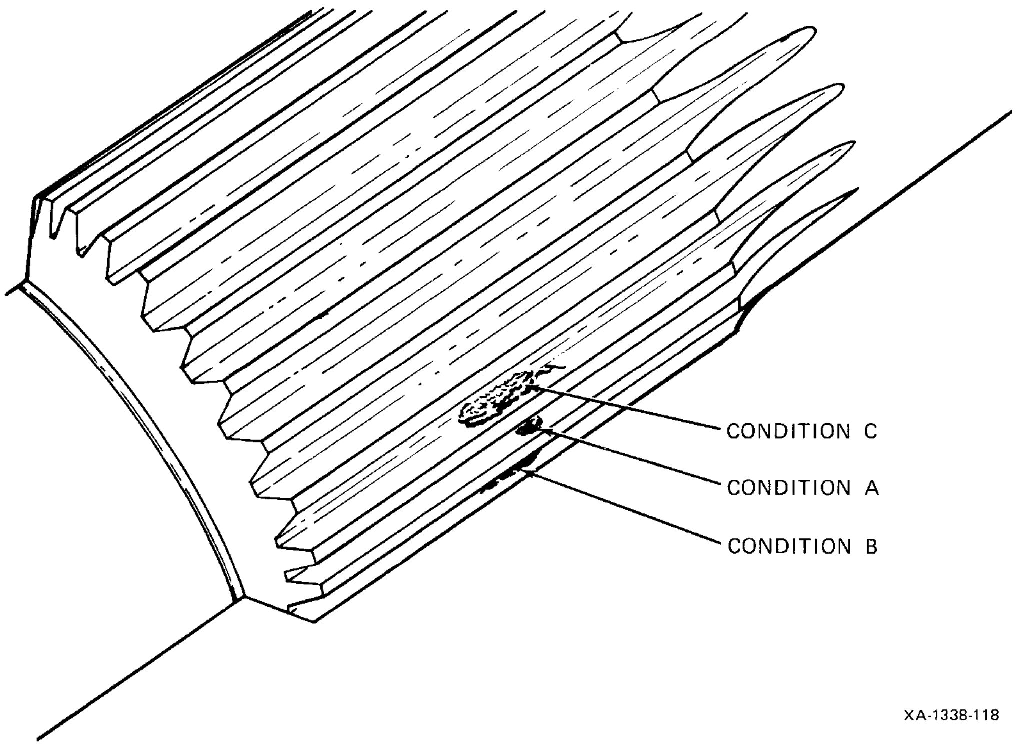
2 Using 0 to 2 inch inside micrometer, measure diameter at three different locations approximately 120 degrees apart.

3 Average the three dimensions, maximum diameter is 1.360 inches (3.454 cm). Record all dimensions.

1st_______2nd______3rd______Average______1.360 inches (3.454 cm) maximum

(j) Visually inspect third row vanes in air diffuser for nicks, burrs, and dents. These conditions are acceptable provided vane mutilation has not occurred and there is no evidence of material cracks or developing cracks. Blend repair surface defects. (Refer to SPM, 70-25-01, SP R401.) Punctures in vanes are acceptable provided engine performance has not been affected and there is no evidence of cracks forming in the punctures.

(k) Visually inspect third vane brazements for minor cracks and voids. Minor cracks and voids are acceptable provided all other inspection requirements are met. Blend repair surface defects and remove sharp projections on vane, where access permits. (Refer to SPM, 70-25-01, SP R401.)



Power Shaft Wear Limits
Figure 601

(l) Inspect V-band coupling bolts for proper torque, 200 inch-pounds.

(m) Inspect for an even gap of 0.281 to 0.469 inch (0.714 to 1.191 mm) between ends of V-band coupling.

(n) Perform visual inspection of EGT harness in accordance with 77-20-01 of the maintenance manual. For EGT harness, perform a functional test of the assembly to ensure absence of shorting and internal damage. (See Figure 205.)

(o) Clean and repack the starter gear splines. (See Starter Drive Spline Inspection, 72-00-00).

(3) Engine assembly.

CAUTION: PRIOR TO COMBUSTOR INSTALLATION, REMOVE N2 TACHOMETER GENERATOR (72-40-00). OBSERVE CAUTION IN MAINTENANCE MANUAL CONCERNING HOT GEAR ENGAGEMENT OF N2 SPUR GEAR.

(a) Reassemble engine in accordance with assembly instructions in the maintenance manual.

1 Record dimensions taken during assembly using dimensional checklist.

NOTE: Component part number and serial number shall be entered into the engine logbook.

2 Record all components replaced during this inspection on the component replacement record.

CAUTION: ONLY A RATED PILOT OR MECHANIC WITH COMPANY AUTHORIZATION SHALL PERFORM OPERATIONAL CHECKS. SERIOUS DAMAGE TO EQUIPMENT OR PERSONNEL INJURY COULD OCCUR.

(b) Perform engine inspection and run checks as required in 71-00-00.

(c) Check and record bleed band closing point.

(d) Check and record VIGV start to open point using LTCT13726 switch and coupling kit.

(e) Perform and record a vibration survey.

E. 2500 Hour Inspection

(1) Perform hot section inspection.

(2) Disassemble to remove and replace the No. 2 aft seal.

TEMPORARY REVISION NO. 94

INSERT PAGE 2 OF 4 FACING 72-00-00, PAGE 610.

Reason: To add the inspection procedure for 2500 Hour Inspection.

Step 1.E.(1)(a) is added as follows:

1. Engine Inspection

E. 2500 Hour Inspection

(1) Perform hot section inspection.

(a) If engine is on the 5000-hour extended TBO program, perform Power Turbine Shroud Tip Gap Check. Refer to sections 72-50-02 and 72-50-04.

Dimensional Checklist

Dimension Required	Actual Measurement
1. Axial clearance between first gas producer nozzle to first gas producer rotor.	____________
2. Tip clearance between first gas producer rotor to cylinder.	____________
3. First gas producer rotor axial runout.	____________
4. First gas producer rotor radial runout.	____________
5. Axial clearance between second gas producer nozzle and first gas producer rotor.	____________
6. Radial clearance between second gas producer nozzle and gas producer spacer.	____________
7. Axial clearance between second gas producer rotor and second gas producer nozzle.	____________
8. Tip clearance, second gas producer rotor.	____________
9. Second gas producer rotor axial runout.	____________
10. Second gas producer rotor radial runout.	____________
11. Clearance between second power turbine rotor and exhaust diffuser.	____________
12. New through bolt measurement must be within 0.010 inch (0.025 cm) of original measurement. Maximum of three shims. Total Shim Thickness	____________
13. Axial clearance between first power turbine rotor and second power turbine nozzle.	____________
14. Radial clearance between second power turbine nozzle and power turbine spacer.	____________
15. Tip clearance, second power turbine rotor. (Required, if second power turbine nozzle was removed.)	____________
16. Axial clearance between first power turbine nozzle and power turbine rotor shroud tips.	____________
17. Tip clearance, first power turbine rotor.	____________
18. Bumper clearance. Clearance between second stage gas producer cylinder and first stage power turbine nozzle.	____________
19. Face runout, first power turbine rotor.	____________
20. Perform rear bearing cover clearance check, record average of eight location checks.	____________

Component Replacement Record

Nomenclature	Part No.	Serial No.

TEMPORARY REVISION NO. 94

INSERT PAGE 3 OF 4 FACING 72-00-00, PAGE 613.

Reason: To add and change the inspection procedure for 2500 Hour Inspection.

Step 1.E.(4)(e) is changed and Step 1.E.(4)(e)1 is added as follows:

1. Engine Inspection

E. 2500 Hour Inspection

(4) Engine disassembly.

(e) Remove the interstage bleed actuator assembly and bleed band from the engine.

1 Replace the actuator relay diaphragm if the engine is on the 5000-hour extended TBO program.

(3) Perform service inspection.

(4) Engine disassembly.

NOTE: Disassemble engine in accordance with applicable section of maintenance manual.

(a) Remove the reduction gearbox from the engine.

(b) Remove the engine accessories and N1 and N2 gearboxes.

(c) Remove the oil support and accessory drive carrier.

(d) Remove the electrical harness, hot air valve, and hot air tube from the engine.

(e) Remove the bleed valve and bleed band from the engine.

(f) Remove the top half of the axial compressor housing and top half of the centrifugal compressor housing.

(5) Compressor section.

NOTE: This inspection shall be in accordance with the applicable section of the maintenance manual.

(a) Inspect all blades for FOD and erosion, repair or replace as necessary.

(b) Inspect the stators for erosion or FOD, repair or replace as necessary.

(c) Inspect the area under the stators for signs of corrosion, if corrosion is present, repair.

(d) Inspect for signs of an impeller rub. Repair if required.

NOTE: Refer to maintenance manual for clearances.

(e) Measure and record the impeller clearances.

Minimum Clearance	Actual Clearance
A-Front	________________
B-Midpoint	________________
C-Rear	________________

Record all inspection results. Repair as necessary.

(6) Front section.

(a) Inspect the oil transfer filters and clean prior to reinstallation.

(b) Reduction gearbox.

1 Inspect the reduction gearbox without further disassembly unless cause is found. Inspect the exposed gear teeth for spalling, frosting, or other signs of wear (refer to SPM, 70-20-00, I308).

2 Record all inspection results and repair as necessary.

(c) Accessory drive carrier.

1 Inspect the accessory drive carrier for condition. Visually inspect the gear teeth for proper pattern. (See 72-60-01.)

2 Spin the N2 drive gear, listen to the bearings for roughness or other signs of distress. If there is any concern for the condition of the bearings, replace bearings.

3 Inspect N1 bevel gear installed on compressor rotor for pattern and backlash.

4 Visually inspect the remainder of the front section of the engine.

5 Record all inspection results and repair as necessary.

(7) Power shaft.

(a) Using a 2 inch micrometer, No. 31 drill rod 0.120 inch (0.305 cm) diameter, and masking tape, inspect power shaft rear splines.

(b) Axially position rod(s) into wear step. Measure outside diameter over wire. Take readings in at least three circumferential locations (120 degrees apart) and average.

1st______2nd______3rd______Average______1.660 inches (4.216 cm) minimum

(c) Record all inspection results and repair as necessary.

(8) Accessory gearbox.

NOTE: If debris is present, determine its origin and correct during this inspection.

(a) Inspect the oil filter and chip detector for metal debris.

(b) Inspect the starter drive gear splines for wear. Replace gear, if worn beyond maintenance manual limit.

(c) Inspect accessories mounted on gearbox and gearbox for security, leaks, loose or missing fasteners, and hardware. Correct all discrepancies.

(d) Inspect inserts for security.

(e) Record all inspection results and repair as necessary.

(9) Inlet housing.

(a) Inspect the inlet housing for loose inserts.

(b) Record all inspection results and repair as necessary.

(c) Inspect for signs of leakage from the number 1 seal. If leakage is evident replace the seal.

(10) Engine assembly.

CAUTION: PRIOR TO COMBUSTOR INSTALLATION, REMOVE N2 TACHOMETER GENERATOR. OBSERVE CAUTION IN MAINTENANCE MANUAL CONCERNING HOT GEAR ENGAGEMENT OF N2 SPUR GEAR (72-40-00).

(a) Reassemble engine in accordance with assembly instructions in the maintenance manual.

1 Record dimensions taken during assembly using dimensional checklist.

NOTE: Component part number and serial number shall be entered into the engine logbook.

2 Record all components replaced during this inspection on the Component Replacement Record.

(b) Make all required engine logbook entries.

CAUTION: ONLY A RATED PILOT OR MECHANIC WITH COMPANY AUTHORIZATION SHALL PERFORM OPERATIONAL CHECKS. SERIOUS DAMAGE TO EQUIPMENT OR PERSONNEL INJURY COULD OCCUR.

(11) Engine operational checks.

(a) Perform engine inspection and run checks as required. Adjust as necessary. (See 71-00-00.)

(b) Check and record bleed band closing point. Adjust as necessary. (See 73-20-01.)

(c) Check and record VIGV start to open point and full open point. Adjust as necessary. (See 75-30-01.)

(d) Perform and record a vibration survey. (See 71-00-00.)

(e) Perform and record a topping check. (See 73-20-01.)

2. Special Inspection

NOTE: A special inspection is performed when foreign object damage is noted, suspected engine compressor stall occurs, engine is dropped during handling, sudden stoppage of engine occurs, following extended use of emergency fuel, or when over limit conditions occur. Overlimit conditions include overtemperature, overspeed, overtorque, oil overtemperature, and G-load. There are no prescribed intervals for special inspections.

A. Foreign Object Damage Inspection

Inspect for foreign object damage (FOD). Open inlet guide vanes manually and conduct a visual inspection of the inlet housing (inlet guide vane and first stage compressor rotor through the inlet ducks).

(1) If damage exceeds limits or appears to extend beyond the first stage compressor rotor, remove the upper compressor housing half and inspect compressor blades, vanes, centrifugal impellers, and compressor housings. (See 72-30-01, 72-30-02, and 75-30-01.)

(2) If centrifugal compressor impeller is damaged beyond limits, return engine to overhaul facility.

(3) Inspect all visible air diffuser vanes for minor nicks, dents, and burrs. Minor nicks, dents, and burrs are acceptable provided that mutilation has not occurred.

B. Compressor Surge Inspection

NOTE: Compressor surge (stall) is characterized by sharp rumbles or reports, severe engine vibration, and a rapid rise in exhaust gas temperature, depending on the severity of the surge.

If it is suspected that compressor surge has occurred, perform the following:

(1) Inspect aircraft and engine logs to determine any history pertinent to the suspected compressor surge condition, discuss discrepancy with pilot concerned or maintenance chief to further evaluate surge circumstances.

(2) Check the following items.

(a) Inspect inlet housing and compressor inlet for obstruction or accumulation of dirt or other foreign matter.

(b) Determine that improper operation of the interstage air-bleed band and actuator, fuel control, and hot-air solenoid valve are not causing the surge.

(c) Inspect the variable inlet guide vane system for proper rigging and operation.

(d) Inspect inlet guide vanes and compressor rotor blades for evidence of foreign object damage. (See Paragraph 2.A.)

(e) Remove upper compressor housing and inspect leading edges and tip areas of compressor rotor blades and stators for cutback due to erosion.

(f) If the above checks reveal no defects or if defects cannot be corrected, forward engine to Overhaul facility.

C. Inspection of Engine Dropped During Handling

NOTE: If engine is in shipping container, inspect container and container engine mounts for damage.

If engine is dropped during handling, proceed as follows:

(1) Check accessory drive gearbox for cracked mount flanges or loose bolts.

(2) Check overspeed governor and tachometer drive for cracks, distortion, and bent shafts.

(3) Check oil filter for loose bolts and damaged filter elements.

(4) Check power driven rotary (oil) pump for loose bolts and cracked flanges.

(5) Check fuel control for cracked flanges.

(6) Check engine mounting pads for cracks.

(7) Check all hose connections for security.

(8) Check all accessories for loose bolts, nuts, connections, and cracked mount flanges.

(9) Check inlet, compressor, and combustor housings for cracks or loose bolts.

(10) Engine must be returned to overhaul facility for inspection of all main bearings if any of the following damage is noted.

Extensive damage to shipping container or shipping container engine mounting system.

(11) Inspect for cracks or loose bolts in any of the following engine areas.

(a) Engine mounts.

(b) Accessory drive gearbox mount flanges.

(c) Accessory mount flanges.

(d) Inlet, compressor, or combustor housings.

(12) Check all accessories for loose bolts, nuts, and connections.

(13) If no visual damage is apparent, accomplish the following inspections.

Perform a complete engine ground operational test (with engine on airframe) and include vibration and coastdown checks. (See 71-00-00, Paragraph 11.)

NOTE: The minimum test time is 30 minutes. Vibration levels must be within established limits. If no defects are noted, engine is considered serviceable.

(14) Perform inspection of oil filter, screens, and chip detector for chips, lint, or other foreign material.

NOTE: In the event that the severity of drop is such that items as called out in Steps (1) through (6) are discrepant, it is recommended that engine be forwarded to a designated overhaul facility for further corrective action.

D. Inspection of Engine Subjected to Sudden Stoppage

NOTE: The following engine inspection must be completed in the event of aircraft drive system stopping, even momentarily. Sudden stoppage is interpreted to include the shock felt by the drive system when the aircraft rotor blades come in contact with the ground, water, trees, or other obstacles that would cause damage requiring aircraft rotor blade change.

It is advised that engines subjected to sudden stoppage be forwarded to a designated overhaul facility for the following inspection, as failure to do so may affect airworthiness. Detailed disassembly, inspection, and assembly instructions are provided in the Honeywell Overhaul Manual No. 350.3.

(1) Inspect output reduction carrier and gear assembly (1-030-350-08 or 1-030-350-12, Pre SB T53-L-13B-0120) (1-030-350-18, Post SB T53-L-13B-0120, Pre SB T53-L-13B-0126) (1-030-330-18, Post SB T53-0136) and sun gearshaft (1-030-192-03 or 1-030-192-04). (See Honeywell Overhaul Manual No. 350.3.)

(a) Visually inspect all parts for cracks or distortion. Repair or replace if detective.

(b) Visually inspect gears and splined parts. Repair or replace if visually detective.

(c) Perform a magnetic particle or fluorescent penetrant inspection on all parts included in the reduction gearing system.

NOTE: Cracking may occur longitudinally along gear teeth. Cracks can be considered partial separation of metal resulting from undue stresses. Chipping and flaking represent various forms of cracking.

(d) Inspect reduction gear strainers for foreign material, cuts, and dents. Inspect filter body. Clean as outlined below.

1 Clean reduction gear strainers and filter body.

a Immerse reduction gear strainers or filter body in tank containing dry cleaning solvent (72-00-00, 62, Table 203) and clean with soft bristled brush. (See SPM, SP C203, 70-15-03.)

b Remove reduction gear strainer or filter body from tank and pressure flush with dry cleaning solvent (72-00-00, 62, Table 203).

2 Remove foreign material from oil transfer tube by pressure flushing with dry cleaning solvent (72-00-00, 62, Table 203).

3 Clean all other parts using dry cleaning solvent method. (See SPM, SP C203 70-15-03.)

(e) Inspect torquemeter balls for scratches, dents, etc. Rework or replace.

(f) Inspect ball sockets or rear torquemeter plate for scratches or dents. Rework or replace.

(2) Inspection of bearings. (See Honeywell Overhaul Manual No. 350.3.)

Inspect the No. 3, 4, 40, 43, 44, and 45 bearings. (See SPM, SP I307, 70-20-07.)

NOTE: The No. 3 and 4 power turbine bearings are located in the center of the exhaust diffuser section and support the power turbine rear shaft. The No. 40 bearing (three each) and No. 43 bearing (three each) support both ends of the planet gears in the reduction gearing section, and No. 44 and No. 45 bearings support the output gearshaft of the output reduction carrier and gear assembly.

(3) Inspect power turbine. (See Honeywell Overhaul Manual No. 350.3.)

(a) Remove the power turbine assembly from the exhaust diffuser.

(b) Disassemble the power turbine assembly for bearing inspection which will isolate the power turbine for inspection.

(c) Perform a fluorescent penetrant inspection on power turbine rotors and check platform area and blade root area for cracks and rubs. Replace turbine rotor if defects exceed limits.

(d) Inspect splined area. Replace turbine rotor if defective.

(4) Inspect exhaust diffuser and rear bearing housing. (See Honeywell Overhaul Manual No. 350.3.)

(a) Perform fluorescent penetrant or magnetic particle inspection for cracks on exhaust diffuser and rear bearing housing.

(b) Inspect exhaust diffuser for distortion and out of round condition. Diameters that are out-of-round and eccentric are unacceptable, and must be repaired.

(c) Repair if defects are found. Check diameters to determine concentricity and squareness with face of mounting flange.

(5) Inspect power shaft.

NOTE: Removal of the power shaft from the compressor rotor is not required for the following inspection.

(a) Inspect forward and rear splined areas for cracks, using dye penetrant method.

(b) Inspect power shaft bolt to determine if it is broken off within the power shaft. Remove broken bolt and clean threads within shaft.

(6) Inspect for oil system contamination.

(a) After initial engine check run, inspect chip detector and main oil filter.

(b) If an excessive accumulation of metallic particles is observed, perform oil contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

E. Overspeed Inspection

(1) If engine has been subjected to an overspeed condition, proceed as follows:

(a) Remove and check oil filter for metal chips or other foreign matter.

(b) Remove and check chip detector for metal chips.

NOTE: If chips are found in oil filter or chip detector, perform an oil contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

(2) If gas producer (N1) overspeed limits are exceeded, proceed as follows:

(a) Perform an INTERNAL (HOT END) INSPECTION. (See Paragraph 1.D.)

(b) Check compressor rotor assembly by mechanically rotating and listening for indications of rubbing.

(3) If output shaft N2 overspeed limits are exceeded, proceed as follows:

(a) Visually inspect power turbine rotor assembly for damaged or missing blades (view through tailpipe).

(b) Perform tip clearance inspection on second stage power turbine blades through exhaust diffuser (0.025 inch minimum).

NOTE: If discrepancies are noted, perform an INTERNAL (HOT END INSPECTION). (See Paragraph 1.D.)

(4) Determine and correct cause of overspeed.

(5) Perform engine operation check. If no discrepancies are noted, the engine is serviceable.

F. Overtorque Inspection

When an engine has been subjected to an overtorque condition, perform the following:

(1) Check chip detector for metal chips.

(2) Check oil filter for metal chips or other foreign matter.

(3) If slight accumulation of foreign matter is observed, clean chip detector and oil filter, operate engine for 10 minutes, then repeat Steps (1) and (2) above.

(4) If excessive accumulation of metal or foreign matter is observed, accomplish the following:

(a) Perform an oil contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

(b) Inspect output reduction carrier and gear assembly.

(5) Repeat Steps (3) above, increasing engine operating time to 30 minutes.

(6) Perform flight test and repeat Steps (1) and (2) above. If no excessive accumulation of metal or foreign matter is noted, engine may be released for normal operation.

G. Oil Overtemperature Inspection

An engine overtemperature condition exists when limits given are exceeded.

(1) Observe the following limits for normal operating conditions.

(a) The maximum (red line) OIL-IN temperature is 212°F (100°C). When oil temperature exceeds 210°F (99°C). (See Paragraph 2.)

(b) A steady state engine OIL-IN temperature of 210°F (99°C) is acceptable provided the oil filter is inspected every 50 hours of engine operation for excessive accumulation of carbon or metal particles.

(2) Under abnormal (emergency) conditions, such as an oil cooling system malfunction or failure, the following procedures and engine OIL-IN temperature limits will minimize the risk involved in operating an engine which has exceeded temperature limits.

CAUTION: IT MUST BE CLEARLY UNDERSTOOD THAT THERE IS A POSSIBILITY THAT MECHANICAL COMPONENTS MAY SUFFER DAMAGE IF ENGINE OPERATING CONDITIONS ARE EXTENDED BEYOND THESE LIMITS.

(3) At oil temperatures exceeding 210 to 266°F (99 to 130°C) for 10 minutes or less, check engine oil screens and main oil filter.

(4) At oil temperature 210 to 266°F (99 to 130°C) for more than 10 minutes, but no more than 30 minutes, proceed as follows:

(a) Change oil, clean all screens and main oil filter.

(b) Ground run engine for 30 minutes and recheck main oil filter for carbon and metal particles. If contamination is found, clean all screens and oil filter.

(c) Repeat oil change and ground run engine.

(5) At oil temperature from 210 to 266°F (99 to 130°C) for greater than 30 minutes, preform oil overtemperature inspection in Step (7).

(6) When oil temperature reaches 268°F (131°C) and above for any length of time, perform the oil overtemperature inspection in Step (7).

(7) Perform oil overtemperature inspection as follows:

(a) Remove combustor turbine assembly. (See 72-40-00.)

(b) Disassemble combustor turbine assembly to permit removal of power turbine rotor and bearing housing assembly.

(c) Disassemble power turbine rotor and bearing housing assembly to permit removal of No. 3 and 4 position main bearings. Determine part numbers of bearings.

1 Replace bearings 1-300-176-04 and 1-300-015-02/-04.

2 Inspect bearing 1-300-176-03 for coke and general conditions. Replace if necessary.

3 Inspect No. 2 main bearing seals for coke/general condition. Replace if necessary.

4 Inspect No. 3 main bearing for coke and general condition. Replace if necessary.

(d) Disassemble gas producer system components to permit removal of No. 2 position main bearing and No. 2 main bearing seals. Determine part numbers of bearings.

1 Replace bearing 1-300-176-04.

2 Inspect bearing 1-300-176-03 for coke and general conditions.

(e) Reassemble gas producer system components, power turbine rotor and bearing housing assembly, and combustor turbine assembly. Reinstall combustor turbine assembly.

(f) Remove accessory drive gearbox.

(g) Disassemble gearbox to permit removal of bearings 1-300-002-01/-02 and 1-300-006-01/02 from pinion gearshaft and bearing assembly, bearings 1-300-006-01/02 from thrust bearing liner assembly and bearings 1-300-012-01/02 from starter generator drive gearshaft assembly. (See 72-60-01.) Determine part number of bearings and proceed follows:

1 Replace bearing 1-300-002-01/-02, 1-300-006-01/-02 and 1-300-012-01.

2 Inspect all remaining installed bearings for coking and heat discoloration. Replace if necessary.

3 Inspect all gears and splined parts for coking and heat discoloration. Replace if necessary.

(h) Remove output reduction carrier and gear assembly.

(i) Inspect accessible gears and splined parts.

H. Excessive G-Loads (Hard Landings and Severe Maneuvers) Inspection

If it is suspected that excessive G-loads have been imposed on an engine, conduct the following inspections immediately after the flight during which the excessive loads occurred.

(1) Inspect accessory drive gearbox for cracked mount flanges or loose bolts.

(2) Inspect overspeed governor and tachometer drive for cracks, distortion, and bent shafts.

(3) Inspect oil filter for loose bolts and damaged filter elements.

(4) Inspect oil pump for loose bolts and cracked flanges.

(5) Inspect fuel control assembly for cracked flanges and loose nuts.

(6) Inspect engine and airframe mounts for cracks, bending, or distortion.

(7) Inspect air, oil, and fuel hose connections for tightness.

(8) Inspect all accessories for loose bolts, nuts, and connections.

(9) Inspect for damage to airframe engine mounts.

(10) Inspect for cracks or loose bolts in any of the following areas.

(a) Engine mounts.

(b) Accessory drive gearbox mount flanges.

(c) Accessory mount flanges.

NOTE: If the aircraft furnished engine mount legs exhibit any cracks, bending, or distortion, it is recommended that the engine be returned to Overhaul as extremely high G-loads have been imposed. It is further recommended that Honeywell Aerospace be contacted to provide additional direction.

(d) Inlet, compressor, or combustor housings.

I. Inlet Blockage Inspection

NOTE: Any time the aircraft is flown in a loose grass/foliage environment, or if it is suspected that rags, paper or other debris could have been ingested, the engine shall be inspected for blockage around the inlet guide vanes. Failure to perform this inspection could result in loss of power. Inlet blockage is defined as: any disruption in airflow caused by foreign material in the engine inlet even for a few seconds is classified as inlet blockage. With the first and second stage blades being transonic the following maintenance are required.

(1) Remove the particle separator (both halves) and airframe inlet screen (if installed), and inspect the engine inlet area.

(2) Inspect the inlet housing struts and each inlet guide vane for rags, paper, grass, foliage or other foreign material blockage or partial blockage.

(3) Completely remove any foreign material that may be lodged on the inlet strut or guide vanes. Special attention should be given to the lower (4 through 8 o’clock) portion of the vane assembly.

(4) If blockage or partial blockage is evident or suspected, remove and scrap all the first and second stage blades and replace with new blades. (See 75-20-01.)

(5) If removed, reinstall particle separator and airframe inlet screen.

(6) Perform standard engine vibration check with the engine installed in the aircraft. (See 71-00-00, Paragraph 11.E.)

I1. Unanticipated Inspection Requirements

Engines that have experienced an incident not addressed elsewhere under Special Inspections, such as immersion in water, etc. should be handled in the following manner. Incidents of this type will be handled on a case by case basis. Inspection recommendations may currently be specified within the Special Inspection Section or can be modified to meet a unique inspection requirement.

(1) Contact Honeywell T53 Customer Support Engineering for inspection recommendations.

(2) Provide as much detailed information as possible describing the incident and current condition of the engine.

J. Oil Sample Analysis

NOTE: The oil sample analysis program provides a procedure for taking samples, testing, and spectrometric analysis of engine lubricating oil. This program will minimize engine deterioration due to oil contamination, maximize time between oil changes, and can provide an advance warning of an excessive wear condition of an engine component or components.

(1) Take oil sample as follows:

(a) On newly installed engines or modules, after engine has run approximately 1 hour.

(b) On engines which have had oil changed, after engine has run 15 minutes minimum.

NOTE: Sample must be taken within 15 minutes of shut down and before addition of any new oil. Do not allow sample to become contaminated.

(c) Shut down engine, using a clean, dry sample bottle, immediately take oil sample from oil tank to 1 to 1.5 inches (25.4 to 38.1 mm) from bottom of tank. Be careful not to touch sides or bottom of tank to prevent contamination.

(2) Perform oil sample test as follows:

(a) Using Gerin Turbo-Lube test kit V-3A or equivalent, test oil sample using procedure provided by oil analysis equipment manufacturer.

NOTE: If Gerin test kit or equivalent, is not available, analysis by a reputable oil laboratory is acceptable.

(b) Change oil if limits are exceeded. Limits are as follows:

NOTE: When an oil change has been completed, the engine shall run for 15 minutes minimum and an oil sample shall be taken for analysis. Analysis results will establish base line acidity, viscosity, and flash point data for oil sample analysis program.

1 Kinematic viscosity or Gerin viscosity at 100°F (38°C) shall be +25 percent to -10 percent that of new oil value.

NOTE: If oil viscosity decreased by 2 centistokes or 10 percent of new oil value, check for fuel in oil by determining oil flash point.

2 Total Acid Number (TAN) shall be 1.0 milligram potassium hydroxide per gram (KOH/g) of oil maximum.

3 Flash Point, Cleveland Open Cut (COC) shall be 400°F (205°C) minimum for Type I oil, or 475°F (246°C) minimum for Type II oil.

(3) Perform spectrometric oil analysis as follows:

(a) Send oil sample to a laboratory capable of emission or atomic absorption testing for parts per million (ppm) of Silicon (Si) and the following wear metals: Aluminum (Al), Chromium (Cr), Copper (Cu), Iron (Fe), Magnesium (Mg), Nickel (Ni), Silver (Ag), and Titanium (Ti).

NOTE: To avoid analysis variations due to test equipment and technique differences, only one laboratory should be used.

(b) Evaluate laboratory reports for wear metal buildup trends from one sample to another. (See Figure 602.)

CAUTION: WEAR METAL IS NORMALLY GENERATED AT A SLOW STEADY RATE. SUCCESSIVE OIL SAMPLES SHOULD SHOW A TREND OF INCREASING WEAR METAL CONTENT. A SUDDEN JUMP OR INCREASE IN WEAR METAL CONTENT BETWEEN SUCCESSIVE OIL SAMPLES INDICATES AN ACCELERATED WEAR RATE. AFTER CONFIRMATION OF AN ACCELERATED WEAR RATE, THE CAUSE SHOULD BE IMMEDIATELY IDENTIFIED AND CORRECTED. ALLOWING ACCELERATED WEAR TO CONTINUE MAY RESULT IN FAILURE OF AN ENGINE COMPONENT.

(c) If an abnormal increase in wear metal is noted, immediately take another oil sample and forward to laboratory for verification of increase.

(d) If increase is verified, change oil sample interval to every 10 operating hours. (See following Step (h) for probable source areas.)

NOTE: If possible, do not add oil, as addition of new oil will mask wear metal increase and confuse the sampling program.

(e) Immediately inspect filters and chip detector. Send any debris to laboratory for analysis of material. (See Table 601 for probable source areas.)

(f) Use borescope, if possible, to detect oil wetted parts distress. For aid in determining location of distress, contact the following, giving as many details as possible.

Customer Service & Product Support
Honeywell Aerospace
111 S. 34th Street
P.O. Box 52181
Phoenix, AZ 85072-2181

Attention: T53 Customer Support Engineer

(g) If wear metal shows no increase during two 10 hour intervals, and does not greatly exceed the guidelines, sampling interval may be increased back to the original sampling interval.

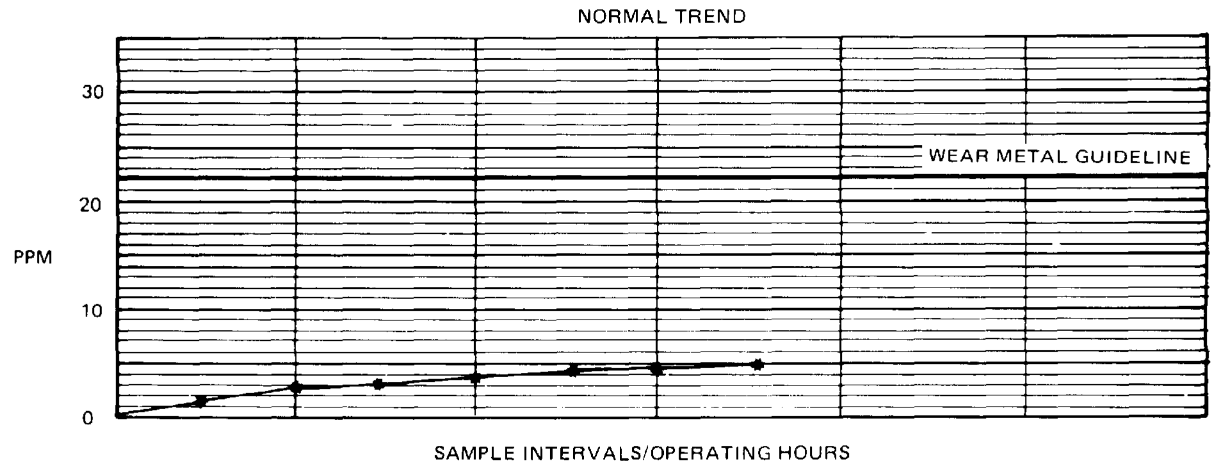
(h) Wear metal sources for use in determining maintenance action requirements or checks are as follows:

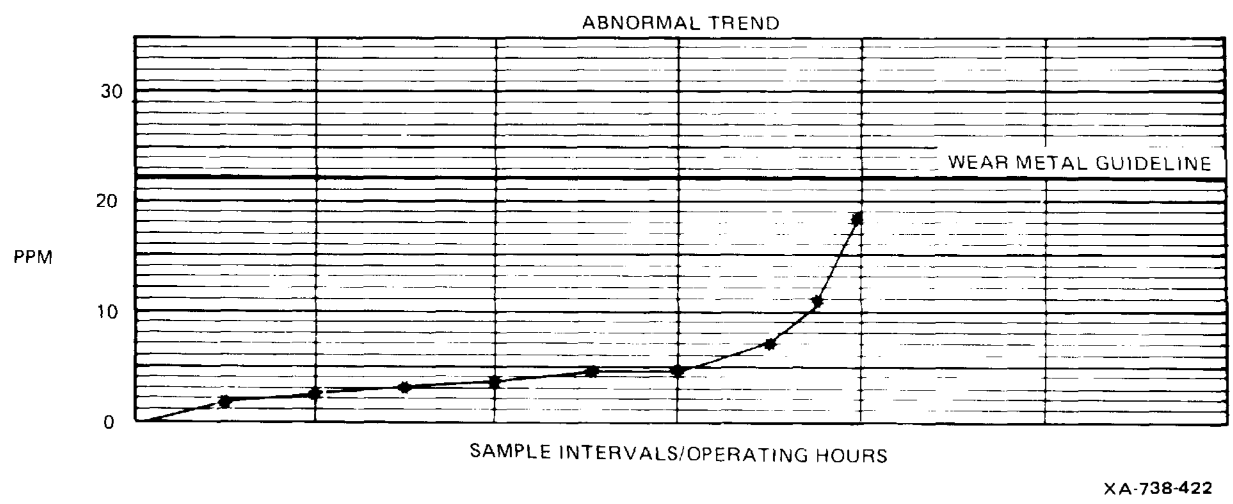
1 Aluminum - oil pump.

2 Chromium - power turbine shaft. (See Iron.)

3 Copper - bearing cages or oil pump.

4 Iron - gears, bearings, bearing liners, oil pump.





Wear Metal Trend (Example)
Figure 602

Table 601. Basic Engine Diagnostics For Oil-Wetted Components

Material	Application	Parts
SAE52100	Bearings	Positions: 1, 4, 5-21, 25, 26, 29-38, 44
M-50	Bearings	Positions: 2, 3, 40, 43, 45
SAE9310	Gears	Overspeed governor drive, tachometer drive, AGB tachometer drive air/oil separator, oil pump drive, fuel control drive, output reduction, lower overspeed governor, accessory drive, sun, planet, output shaft, tachometer drive
Nitralloy 135 Mod	Gearshaft	Output
SAE4130 Steel	Retainer	Bearing
SAE4140 Steel	Gearshaft	Tachometer drive
	Face Plate	Ring gear support
	Retainer	Power shaft bearing
	Liner	Bearing
SAE4340 Steel	Carriers	Reduction gear
321 Stainless	Oil Tubes	Drain diffuser, inlet supply, compressor front bearing transfer
SAE1010 Steel	Bearing Cages	Positions: 11, 12, 14, 15, 29, 30, 35-38
AMS4616	Bearing Cages	Positions: 1-4, 44
M3900	Bearing Cages	Positions: 7, 9, 10, 40, 42, 43, 45
M3905	Bearing Cages	Positions: 8, 13, 16-18, 25, 26, 31-34

5 Magnesium - gearbox, paint.

6 Nickel - (see iron.).

7 Silver - bearing cages.

8 Titanium - support structures, paint, No. 2 bearing housing.

Table 602. Wear Metal

Wear Metal	Normal Wear Range Guideline - parts per million (ppm) by weight
Aluminum (Al)	0 - 10
Chromium (Cr)	0 - 5
Copper (Cu)	0 - 8
Iron (Fe)	0 - 13
Magnesium (Mg)	0 - 10
Nickel (Ni)	*
Silicon (Si)	*
Silver (Ag)	0 - 3
Titanium (Ti)	*

*Report only - no guideline established

NOTE: Wear metal guidelines in general are not go-no-go criteria. They are established just below the level of wear metal content determined to be abnormal based on past experience. The wear metal guideline is that level of wear metal content at which an engine is considered suspect and must be checked. It is not the absolute point at which the engine or module must be removed. These wear metal guidelines have been established based upon experience with a limited number of engines. Each operator is asked to assist in validating these guidelines by forwarding a copy of each laboratory report to:

Honeywell Aerospace
111 South 34th Street
P.O. Box 52181 Box 34-77
Phoenix, AZ 85072-2181

Attention: Manager, Customer Support Engineering

Please include any maintenance actions performed to correct excessive wear metal content.

SEE MULTIPLE TR

K. Inspection of the Fuel Control (Every 1000 Hours)

(1) Disconnect aft end of P1 pressure sense line 1-300-135-XX from union AN815-4D on fuel regulator.

CAUTION: MAKE SURE THE MEASURING STICK IS CLEAN SO THE SILICONE OIL DOES NOT BECOME CONTAMINATED.

(2) Use a clean measuring stick to determine if the silicone oil level is no lower than 3.5 inches below the P1 fitting boss.

(3) If oil level is lower than 3.5 inches, refer to Servicing the fuel control for instructions on adding silicone oil to the proper level.

(4) Reconnect aft end of P1 pressure sense line 1-300-135-XX to union AN815-4D on fuel regulator.

L. Starter Gear Drive Spline Inspection (Every 300 Hours)

WARNING: AVOID PROLONGED INHALATION OF SOLVENT VAPORS. WEAR RUBBER GLOVES AND USE HAND CREAM TO PREVENT CONTACT WITH SKIN. DO NOT HEAT SOLUTION.

(1) Remove old lubricant from splines using dry cleaning solvent (62, Table 203).

(2) Inspect gearbox (female) spline for excessive wear. If wear (indicated by step) exceeds one-half the spline width, replace the starter drive gear and bearings (72-60-01).

NOTE: Whenever the starter generator drive gear is replaced, both bearings must be replaced.

Radial movement can be detected by placing the starter generator vertically on a work surface and tapping the spline with a mallet.

(3) Inspect for radial freedom of starter generator spline. The total radial movement of the spline shall be a minimum of 0.1875 inch (0.4763 cm). Reject the starter when the spline is frozen or fails to move the required distance.

(4) Lubricate splines with Plastilube Moly No. 3 or ML7 plus 2 spline lubricant (45, Table 203).

M. Fuel Manifolds Inspection (Every 600 ±25 Hours)

(1) Remove fuel manifolds (73-10-02).

(2) Clean fuel manifolds (73-10-02).

(3) Inspect fuel manifolds (73-10-02).

(4) Perform flow check in accordance with Overhaul Manual Report No. 350.3, 73-10-02.

NOTE: If manifold is repaired, perform flow check.

(5) Repair as necessary.

TEMPORARY REVISION NO. 95

INSERT PAGE 2 OF 11 FACING 72-00-00, PAGE 630.

Reason: To add Step 2.K.(5) in Inspection of the Fuel Control.

Step 2.K.(5) is added as follows:

K. Inspection of the Fuel Control (Every 1250 Hours)

(5) Inspect fuel control drive shaft for chipped or worn splines (See 73-20-01, step 5.B.).

TEMPORARY REVISION NO. 96

INSERT PAGE 2 OF 3 THRU 3 OF 3 FACING 72-00-00, PAGE 630.

Reason: To replace TR 85 (added a caution regarding fuel manifold cleaning requirements and added procedure for lightning strike inspection) and change Step 2.N.(1) to add steps for arcing inspection.

CAUTION before Step 2.M. and Step 2.N. is added as follows:

CAUTION: DEPENDENT UPON OPERATING ENVIRONMENT THE FUEL MANIFOLD CLEANING MAY BE REQUIRED AT EVERY SERVICE INSPECTION. REFER TO SERVICE BULLETIN T53-L-13B-0001 FOR THE REQUIRED INSPECTION INTERVALS. VERY SEVERE CONDITIONS WILL REQUIRE CLEANING OF THE MANIFOLDS MORE FREQUENTLY THAN THE SERVICE INSPECTION INTERVAL. CONTACT T53 PRODUCT SUPPORT ENGINEERING IF ASSISTANCE IS NEEDED IN DEVELOPING THE CLEANING FREQUENCY NEEDED.

N. Lightning Strike Inspection

(1) Inspect the engine, engine compartment, engine mounts and ground straps for arcing as evidenced by charring, burn marks or pitting. If arcing is found, comply with the following.

(a) Remove engine from the aircraft.

(b) Visually inspect the engine for obvious damage.

(c) Visually inspect and test parts for residual magnetism. Any part found to be magnetized to a level of 3.0 gauss or higher shall be demagnetized per SPM 70-00-02, SP I311. No arc indications allowed.

1 Inspect all main shaft bearings, journal areas, retainers, shims, housings and seals.

2 Inspect all gears, gearshafts and bearings IAW Standard Practice 70-20-07 Bearing Inspection and 70-20-08 Gear Inspection.

3 Inspect thermocouple harness system components for shorts, continuity, and bared or burned insulation.

4 Inspect engine electrical harness for exposed conductor leads, broken conductors, or damaged or burned insulation or shielding.

5 Inspect chip detectors and bypass indicators.

(2) If there are no signs of arcing, manually rotate the N1 and N2 spools while checking for roughness, binding and noise. If roughness, binding or noise is evident, return the engine to a Honeywell approved service center for inspection.

(3) Inspect all chip detectors and oil filter elements for debris.

(4) Perform a 30 minute ground run at 100 percent Np. Cycle between idle and 100 percent Np several times. Listen for abnormal sounds during coastdown. If abnormal sounds are heard or the coastdown time is abnormally short, return the engine to a Honeywell approved service center for inspection. Coastdown time maybe compared to other engine during shutdown.

(5) After completion of the ground run, inspect all chip detectors and oil filter elements for debris. If debris other than fuzz is found, return the engine to a Honeywell approved service center.

CAUTION: ONLY A RATED PILOT OR MECHANIC WITH COMPANY AUTHORIZATION SHALL PERFORM OPERATIONAL CHECKS. SERIOUS DAMAGE TO EQUIPMENT OR PERSONNEL INJURY COULD OCCUR.

TEMPORARY REVISION NO. 104

INSERT PAGE 3 OF 3 FACING 72-00-00, PAGE 630.

Reason: To add Paragraph 2.O. for turbine overtemperature inspection.

Paragraph 2.O. is added as follows:

2. O. Turbine Overtemperature Inspection

NOTE: A turbine overtemperature has occurred when the EGT/MGT limit has been exceeded.

(1) If a turbine overtemperature has occurred, perform an internal hot end inspection in accordance with the instructions provided in section 72-00-00, Paragraph 1.D.

(2) If molten metal deposits are discovered or airfoils have been deformed due to excessive heat, perform an overhaul level inspection of all hot section components. Any rotor blades discovered with molten metal deposits must be replaced.

ENGINE - CLEANING

1. Cleaning - Introduction

General

This section contains instructions for appropriate cleaning of engine installed in the aircraft. Included are procedures for cleaning and preserving the compressor blades and vanes.

2. Cleaning and Preservation of Compressor

A. General

(1) Compressor shall be cleaned if buildup of dirt, oil, or grease is found on engine inlet or compressor rotor blades or whenever engine performance decreases excessively, to remove dirt and oil (Paragraph 2.D), daily when operating within 200 miles downwind of volcanic activity or in a salt laden atmosphere (ten miles inland from or within one thousand feet above surface of a body of salt water (Paragraph 2.E), or when bromochloromethane (CB) has been used as a fire extinguishing agent. (See Paragraph 2.F.)

NOTE: Engines removed from an aircraft which has been involved in an accident in which engine failure or malfunction is known or suspected to have been a factor, should not be preserved until all investigations have been performed.

(1A) The following procedure may be applied when internal cleaning is desired during a mission or at the completion of a mission and a 1 hour cool down period is not possible.

(a) Operate engine at idle for a minimum of 2 minutes to allow EGT to stabilize.

(b) Shut down engine.

NOTE: The engine may have to be motored several times, within starter limitations to make sure that engine temperature has stabilized at 399°F (204°C) or lower.

(c) Motor engine after coastdown with starter motor to lower temperature indication to a stable 399°F (204°C) or lower.

(2) Compressor shall be preserved after cleaning and whenever engine is to be idle for 3 or more days.

B. Precautions

(1) Following engine shutdown, wait 45 minutes or allow the EGT to decrease to 399°F (204°C). Spraying cleaning fluid in the compressor while the metal temperature is to high will cause clearances to decrease with a possibility of metal to metal interference. EGT cooling may be assisted by motoring the engine. Starter limits are to be observed during engine motoring.

(2) At an ambient temperature below 35°F (2°C), use anti-detonating injection (ADI) fluid. (72-00-00, 6, Table 203) or a 40 percent methanol (72-00-00, 48, Table 203) Grade A or B, and 60 percent water mixture, in lieu of fresh water, to prevent freezing.

(3) When using dry cleaning solvent (72-00-0, 62, Table 203), perform the following:

(a) Place a heat resistant nonconductive (rubber) sheet between starter generator and bleed band ports to preclude possibility of igniting solvent that may drip from air-bleed ports onto starter generator.

(b) Cover air-bleed actuator with a plastic bag or suitable substitute to prevent contamination of bleed band actuator O-rings.

(4) Allow water soluble cleaner (72-00-00, 12, Table 203), cleaning compound (72-00-00, 17, Table 203), or dry cleaning solvent (72-00-00, 62, Table 203) to stand in engine for no more than 1.5 hours prior to spraying with fresh water.

C. Precleaning Procedures

(1) Remove all air intake components, including upper and lower halves of particle separator, if installed.

(2) Disconnect P3 line at air diffuser, and install a cap on fitting.

(3) If a source of clean compressed air is available, engine bleed band can be closed to permit more thorough cleaning of centrifugal compressor stage and to preclude cleaning solution from spraying out air-bleed ports.

(a) Disconnect fuel control to interstage air-bleed actuator air pressure hose (2, Figure 12) from fuel control to interstage bleed actuator (3) at union. Cap union with cap AN929-4.

(b) Connect a source of metered compressed air to air diffuser to interstage air-bleed actuator air pressure hose (4) from air diffuser to interstage bleed actuator (3) using union AN815-6 or similar attachment.

NOTE: When air pressure is applied, actuator should close bleed band. Leave bleed band closed and proceed with engine cleaning.

(c) Supply 30 to 40 psi pressure to close bleed band.

(4) Disconnect PI pressure sensing line to fuel control at inlet housing and cap line fitting.

(5) Prior to motoring engine, perform the following:

(a) Pull ignition/start fuel circuit breaker.

(b) Use external power if available, if not, use aircraft battery.

(c) Make sure that fuel valve is in OFF position.

(d) Make sure that anti-icing switch is in OFF position.

NOTE: The dc power must remain on to operate anti-icing solenoid during cleaning and preservation of engine. Do not exceed starter limits.

D. Cleaning Compressor to Remove Dirt and Oil

(1) Using a soft cloth moistened with dry cleaning solvent (72-00-00, 62, Table 203) swab air inlet area, and inlet guide vanes.

NOTE: Use of anything but a fiber brush could cause damage to the compressor blades that would require blade replacement.

(2) Use a stiff fiber (not wire) brush to loosen hard packed or caked dirt.

(3) Repeat previous Step (1).

(4) Rinse air inlet area and inlet guide vanes with water and reinspect. If signs of contaminants are present, repeat previous Steps (1) and (2) and rerinse.

(5) Clean temperature sensing element on inlet housing using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

(6) Using pressure spray equipment, apply cleaning solution comprised of one part water soluble cleaner (72-00-00, 12, Table 203) or cleaning compound (72-00-00, 17, Table 203), and four parts clear fresh water as follows:

NOTE: Dry cleaning solvent (72-00-00, 62, Table 203) may be more effective for removing certain contaminants. Use approximately 2 pints in lieu of cleaning solution while motoring engine.

Water used to clean engine should approximate the following criteria (potable water):

Appearance	-	Free of visible impurities
Total Solids	-	175 PPM maximum
PH Value	-	6.0 to 8.0
Chlorides	-	200 PPM maximum
Sulfates	-	200 PPM maximum
Bromine	-	0.2 PPM maximum

(a) Adjust spray nozzle to discharge a flow of 2.5 gallons of cleaning solution per minute.

(b) With ignition off, motor engine for 40 seconds while spraying cleaning solution evenly into inlet housing. (See 71-00-00, paragraph 6.) Direct spray completely around engine inlet housing to ensure uniform application to all compressor vanes and blades.

NOTE: The 40 second motoring time will allow one-half of the 2.5 gallons of cleaning solution to be sprayed into engine without exceeding starter limitations

(c) Allow solution to stand for a minimum of 15 minutes to loosen dirt.

NOTE: Several spray applications may be required to use up remaining cleaning solution with drying out rate governing exact time interval between applications.

(d) With engine static, spray inlet housing struts and areas leading to compressor section with remaining cleaning solution.

See TR

(7) Using pressure spray equipment, apply clean, fresh water as follows:

(a) Adjust spray nozzle to discharge a flow of 2.5 gallons of water in 40 seconds.

NOTE: The 40 second motoring time will allow a minimum of 2.5 gallons of water to be sprayed into engine without exceeding starter limitations.

(b) With ignition off, motor engine for 40 seconds while spraying water evenly around engine inlet area.

(8) Inspect compressor for cleanliness, repeat cleaning procedure if necessary.

(9) Run engine at flight idle with anti-icing switch ON for a period of 2 to 5 minutes to dry.

CAUTION: PRESERVE COMPRESSOR BY APPLYING RUST INHIBITOR AND PRESERVATIVE IN ACCORDANCE WITH STEP G. ENSURE ENGINE IS COOL BEFORE APPLYING.

(10) Remove protective caps and covers, clean ports and reconnect lines and hoses.

(11) Clean and reinstall air intake components.

E. Cleaning Compressor to Remove Salt Deposits

(1) With ignition off, motor engine for 40 seconds while directing a stream of clean, fresh water evenly into inlet housing at a maximum rate of 5 gallons per minute. Direct stream completely around engine inlet housing to ensure uniform application to all compressor vanes and blades.

NOTE: Water used to clean engine should approximate the following criteria (potable water):

Appearance	-	Free of visible impurities
Total Solids	-	175 PPM maximum
PH Value	-	6.0 to 8.0
Chlorides	-	200 PPM maximum
Sulfates	-	200 PPM maximum
Bromine	-	0.2 PPM maximum

(2) Using clean, fresh water, wash exterior of engine.

(3) Inspect compressor for cleanliness and repeat cleaning procedure if necessary.

(4) Run engine at flight idle with anti-icing switch ON for a period of 2 to 5 minutes to dry.

(5) Remove protective caps and covers, clean ports and reconnect lines and hoses.

(6) Clean and reinstall air intake components.

TEMPORARY REVISION NO. 102

INSERT PAGE 2 OF 2 FOLLOWING 72-00-00, PAGE 704.

Reason: To add Paragraph E1. for the supplemental compressor rinse procedure to remove salt deposits.

Paragraph E1. is added as follows:

E1. Supplemental Compressor Rinse Procedure to Remove Salt Deposits

NOTE: Do the following procedure after each flight in extreme salt-laden atmospheres.

(1) Perform rinse while operating engine at ground idle.

(2) Utilizing a fresh water source, using the same criteria as previous compressor wash procedure delivered at a maximum rate of 2.5 gallons per minute, direct spray at engine inlet from a distance of 6 to 7 feet for a maximum of 5 minutes.

(3) After cleaning has been completed, operate engine for 2 to 5 minutes at flight idle with anti-icing switch ON.

(4) Perform engine shutdown IAW Aircraft Flight Manual or appropriate aircraft documents.

(5) Allow the engine to drain off induced water.

(6) Refer to Aircraft Maintenance Manual for any special instructions relative to dry-out procedures.

F. Cleaning Compressor after use of Bromochloromethane (CB) Fire Extinguishing Agent

WARNING: AVOID INHALATION OF CB FUMES. IF CB CONTACTS SKIN OR EYES, IMMEDIATELY FLUSH WITH RUNNING WATER, THEN WASH THOROUGHLY WITH SOAP AND WATER.

CAUTION: FIRE EXTINGUISHING AGENT, BROMOCHLOROMETHANE (CB) IS A TOXIC, CORROSIVE AGENT AND DILUTION WITH WATER INCREASES ITS CORROSIVE EFFECT ON METAL. IF ENGINE HAS BEEN SUBJECTED TO CB, ALLOW ENGINE TO COOL TO AMBIENT TEMPERATURE AND PURGE EXPOSED ENGINE AND AIRFRAME SURFACES WITH CLEAN, DRY AIR AND WASH WITH DRY CLEANING SOLVENT (72-00-00, 62, TABLE 203).

(1) Motor engine with starter, and spray a minimum of one pint of dry cleaning solvent (72-00-00, 62, Table 203) evenly through all sections of inlet housing.

(2) Let engine stand for 1 hour minimum to permit solvent to neutralize CB agent.

CAUTION: A CLOGGED COMBUSTION CHAMBER DRAIN VALVE/LINE MAY CAUSE PUDDLING OF SOLVENT IN COMBUSTION CHAMBER, CAUSING HOT STARTS.

(3) Preserve compressor. (See Paragraph 2.G.)

(4) Remove protective caps and covers, clean ports and reconnect lines and hoses.

(5) Clean and reinstall air intake components.

G. Preservation of Compressor

(1) Preserve compressor on motorable engines as follows:

CAUTION: ENSURE ENGINE IS COOL ENOUGH, BELOW 204°F (95°C) TO PREVENT AUTOIGNITION.

(a) Motor engine while applying rust inhibitor and preservative (72-00-00, 59, Table 203) for 10 seconds. Direct spray through inlet housing onto rotating compressor blades. Spray from base to tip of blades to ensure material covers entire blade on both sides.

(b) Remove caps from P3 line, air diffuser, and inlet housing connections. Reconnect hoses previously disconnected.

(c) Disconnect external power from aircraft, if used.

(d) Engage ignition/start fuel circuit breaker.

(2) Preserve compressor on nonmotorable engines as follows:

NOTE: Every effort should be made to apply preservative while motoring engine, this ensures deeper penetration of mist.

(a) Apply preservative compound for 30 seconds.

(b) Direct spray into all areas between inlet housing struts and evenly onto all compressor blades.

OUTPUT REDUCTION CARRIER AND GEAR ASSEMBLY AND SUN GEARSHAFT - DESCRIPTION AND OPERATION

1. Description and Operation

The output reduction carrier and gear assembly is mounted at the front of the inlet housing. It consists of the support housing, carrier assembly, three planet reduction gear assemblies, a torquemeter, and power output gearshaft. The assembly is driven by the sun gearshaft splined to the power shaft. The sun gearshaft drives the three helical planet reduction gears mounted in the carrier and gear assembly. The reduction gears drive the power output gearshaft. The rear plate of the torquemeter (the piston) is attached to the carrier.

OUTPUT REDUCTION CARRIER AND GEAR ASSEMBLY AND SUN GEARSHAFT - MAINTENANCE PRACTICES

1. Replacement of Output Gearshaft Seal

Replace output gearshaft seal whenever seal damage is suspected. (See 72-00-00, ENGINE - TROUBLE SHOOTING, excessive engine oil consumption.)

A. Cut and remove lockwire from bolt (1, Figure 201). Remove bolts.

B. Using three bolts as pullers, remove seal housing assembly (2).

C. Remove spacer (7) and packing (6). Discard packing and retain spacer for reassembly.

D. Using fiber drift and soft faced mallet or suitable sleeve and arbor press, remove seal (5) from retainer (3). Discard seal.

E. Remove packing (4). Discard packing.

F. Install new packing (4) in retainer (3).

NOTE: Use care to prevent scratching or depressing seal (5). Ensure seal is clean.

G. Using an arbor press and installation and removal tool LTCT3638, install new seal (5) in retainer (3).

H. Remove faceplate (8) and packing (9) from output gearshaft. Discard packing and faceplate.

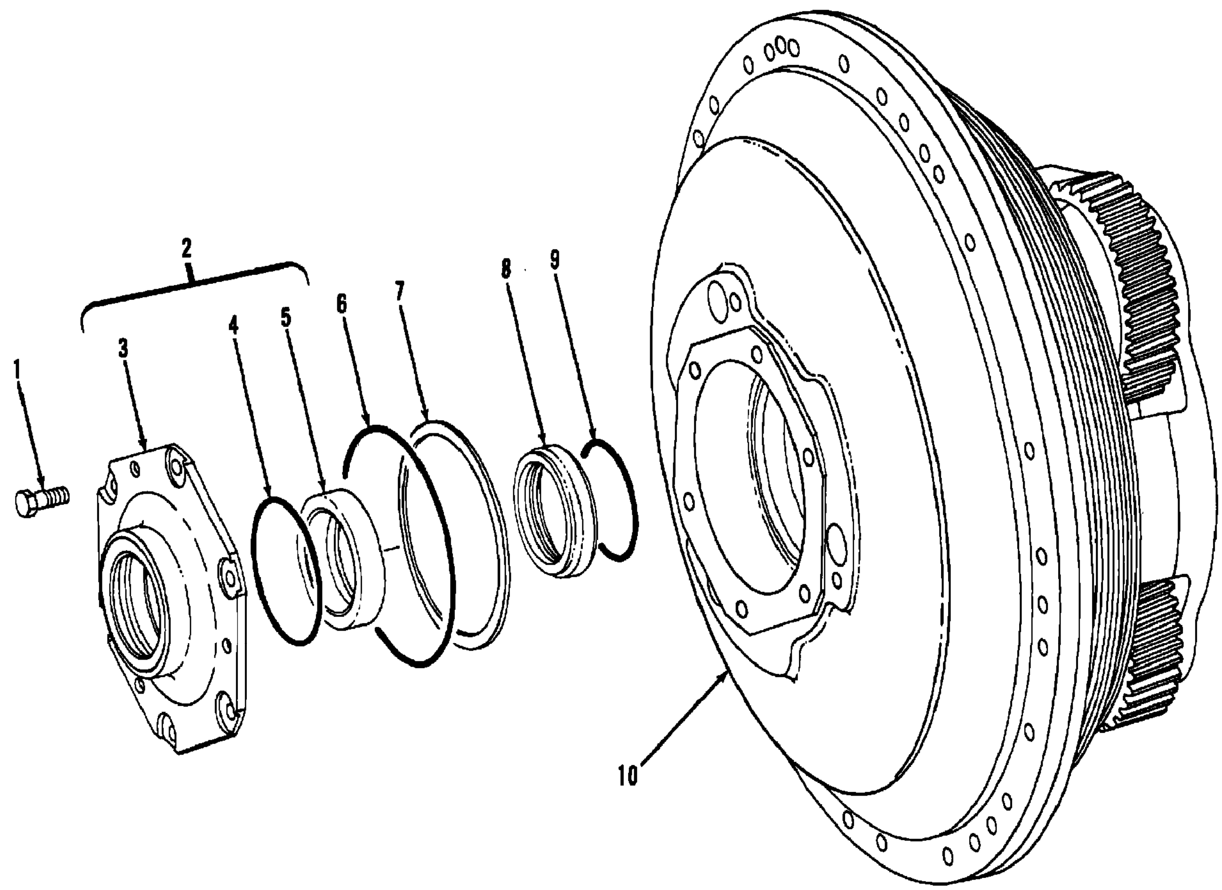
NOTE: Use care to prevent scratching faceplate.

I. Install new packing (9) and new faceplate (8). Position faceplate on output gearshaft.

J. Position new packing (6) on seal housing assembly (2).

NOTE: If original seal housing assembly (2) is used, proceed as indicated in Step K. If seal housing is replaced, proceed as indicated in Steps L and M.

K. Position original spacer (7) removed in Step C in output reduction carrier and gear assembly (10).



1. BOLT
2. SEAL HOUSING ASSEMBLY
3. RETAINER
4. PACKING
5. SEAL
6. PACKING
7. SPACER
8. FACEPLATE
9. PACKING
10. OUTPUT REDUCTION CARRIER AND GEAR ASSEMBLY

Output Gearshaft Seal Replacement
Figure 201

L. Calculate thickness of spacer (7) as follows:

CAUTION: ENSURE BEARING OUTER RACE (2, FIGURE 202) IS BOTTOMED IN BEARING LINER (3).

(1) Using a depth micrometer, measure from face of bearing liner (3) to bearing outer race (2) to determine Dimension A.

(2) Using a depth micrometer, measure from lip of seal retainer (1) to rear surface of seal retainer flange to determine Dimension B.

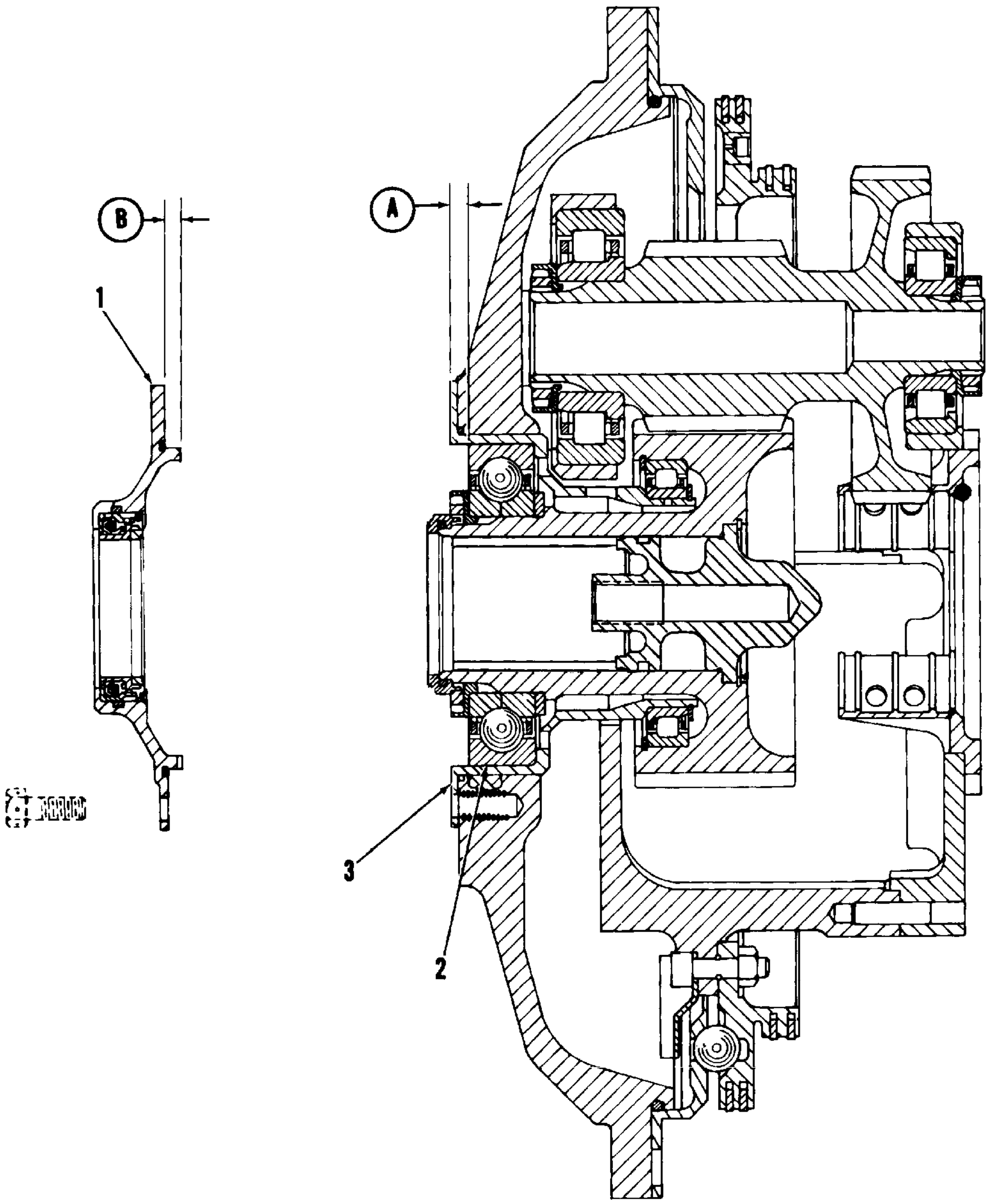
(3) Subtract Dimension B from Dimension A, and add 0.0045 inch. Result will be thickness of spacer required. Select proper spacer part number from Table 201.

M. Position spacer (7, Figure 201) of thickness determined in preceding Step 1.L(3), in output reduction carrier and gear assembly (10).

N. Position seal housing assembly (2) on output reduction carrier and gear assembly (10) and secure with bolts (1). Lockwire bolts.

Table 201. Spacer Thickness

Part Number	Spacer Thickness
1-030-212-01	0.035 to 0.037 inch
1-030-212-02	0.038 to 0.040 inch
1-030-212-03	0.041 to 0.043 inch
1-030-212-04	0.044 to 0.046 inch



1. SEAL RETAINER
2. BEARING OUTER RACE
3. BEARING LINER

Determining Bearing Pinch Fit and Spacer Thickness
Figure 202

2. Removal/Installation

A. Remove output reduction carrier and gear assembly, and sun gearshaft. (See Figure 203.)

(1) Straighten tabwashers (2) and remove bolts (1) and tabwashers from each oil transfer tube (3).

(2) Insert bolt with 1/4-28 thread into one of oil transfer tubes (3) and pull oil transfer tube from output reduction carrier and gear assembly. Remove two remaining oil transfer tubes. Remove strainer (4) and packings (5, 6) from each oil transfer tube (3).

(3) Remove 24 nuts (7), washers (8), and spacers (9).

(4) Thread lifting fixture LTCT4182 into plug.

(5) Thread puller screws (part of LTCT4182) into housing and tighten screws evenly.

(6) Using overhead hoist attached to lifting fixture LTCT4182, remove output reduction carrier and gear assembly (10). Remove packing (11) and seal rings (12, 13).

(7) Remove lifting fixture.

(8) Position sun gear holding fixture LTCT2075 on studs of inlet housing with splines meshed with sun gearshaft (19). Secure with four nuts.

(9) Using tool set LTCT509, hand tighten center rod of tool set into sun gear bolt. Back off one-quarter turn and insert allen wrench into center rod and hold. Align and engage tool set tabs in slot of bolt. Turn handle clockwise to straighten tabs of bolt retainer (21).

(10) Using driver wrench LTCT258, remove bolt (22), bolt retainer (21), and convex washer (20).

NOTE: When removing wrench, the bolt and retainer will be attached.

(11) Hold sun gearshaft (19), and remove sun gear holding fixture from inlet housing.

(12) Remove sun gearshaft and packing (18).

B. Install output reduction carrier and gear assembly, and sun gearshaft. (See Figure 203.)

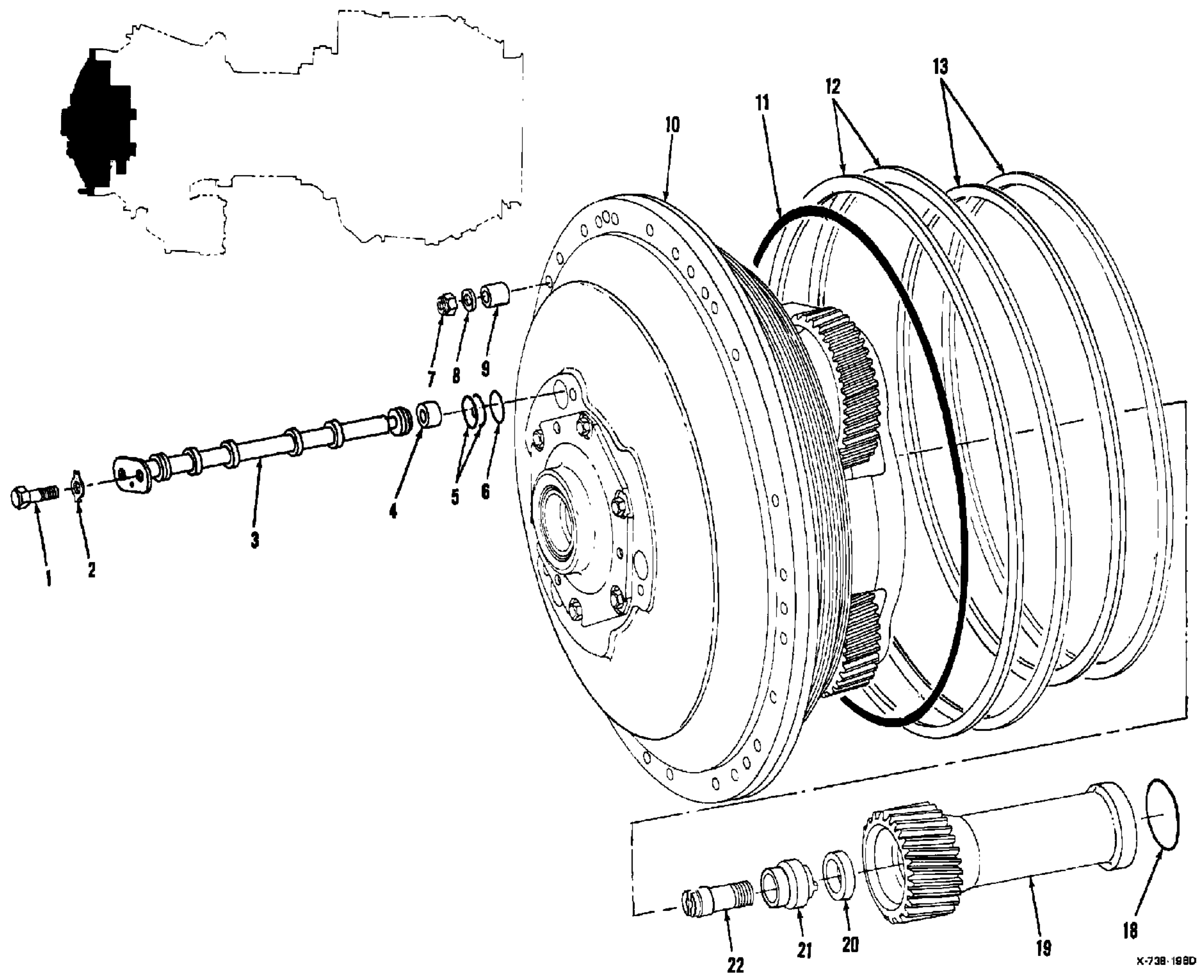
(1) Install packing (18) on OD of spur gear on power shaft.

(2) Place sun gearshaft carefully over power shaft and press end of sun gearshaft over packing (18).

(3) Position sun gear holding fixture LTCT2075 on studs of inlet housing with splines meshed with sun gearshaft.

NOTE: Make sure that washer 1-030-138-04 is installed. Ensure conical surface of washer faces forward end of engine.

(4) Install washer (20) through sun gearshaft into power shaft.



1. BOLT
2. TABWASHER
3. OIL TRANSFER TUBE
4. STRAINER
5. PACKING
6. PACKING
7. NUT
8. WASHER
9. SPACER
10. OUTPUT REDUCTION CARRIER AND GEAR ASSEMBLY
11. PACKING
12. SEAL RING
13. SEAL RING
14. DELETED
15. DELETED
16. DELETED
17. DELETED
18. PACKING
19. SUN GEARSHAFT
20. WASHER
21. BOLT RETAINER
22. BOLT

Output Reduction Carrier and Gear Assembly, and Sun Gearshaft
Figure 203

NOTE: Do not lubricate bolt. Ensure tangs on bolt retainer engage slot in power shaft.

(5) Using guide LTCT4602, install bolt retainer (21) through sun gearshaft into power shaft. Secure bolt retainer and washer (20) to power shaft with bolt (22).

(6) Using driver wrench LTCT258, tighten bolt (22) to 600 to 720 inch-pounds torque. Do not lock bolt at this time.

(7) Using dial indicator, check end play of sun gearshaft. End play shall be 0.020 to 0.046 inch.

NOTE: Push forward on power turbine through exhaust diffuser while taking reading to ensure that movement measured does not include movement of power turbine bearing.

(8) If axial movement is not within limits, check tang engagement or install new bolt retainer or washer. Recheck axial movement.

CAUTION: DO NOT SHEAR BOLT RETAINER.

(9) Using tool set LTCT509, hand tighten center rod of tool set into sun gear bolt. Back off one-quarter turn and insert allen wrench into center rod and hold. Align and engage tool set tabs in slot of bolt. Turn handle clockwise to deform tabs of bolt retainer.

(10) Remove sun gear holding fixture from inlet housing.

(11) Check for 0.004 inch minimum end gap on seal rings (12, 13) in the installed position in torquemeter cylinder. Remove seal rings.

(12) Install new packing (11) on output reduction carrier and gear assembly (10).

(13) Install seal rings (12, 13) in appropriate grooves of rear torquemeter plate.

(14) Thread lifting fixture LTCT4182 into plug.

CAUTION: TO PREVENT DAMAGE TO GEAR TEETH, MESH GEARS CAREFULLY.

(15) Attach overhead hoist to lifting fixture and position output reduction carrier and gear assembly (10) onto inlet housing.

NOTE: Do not lubricate nuts or studs. Position end of spacer with chamfered ID against housing.

(16) Secure output reduction carrier and gear assembly with 24 spacers (9), washers (8), and nuts (7). Tighten nuts to 70 to 80 inch-pounds torque.

(17) Remove installation tool.

(18) Install strainer (4) and packings (5, 6) on each oil transfer tube (3), and install tubes into output reduction carrier and gear assembly. Secure each oil transfer tube with tabwasher (2) and bolts (1). Tighten bolts as required and secure by bending one tab against flat of bolt and one tab into hole provided in oil transfer tube.

3. Inspection/Check

NOTE: Do not disassemble output reduction carrier and gear assembly to perform visual inspection of gears. Do not clean gears prior to inspection. Rotate gears to ensure complete inspection of all teeth. Use a 3 power magnifying glass, pencil flashlight, and a mechanics mirror.

A. Inspect all parts for nicks, burrs, and scratches.

B. Inspect all threaded parts for damaged threads.

C. Visually inspect all parts for cracks, distortion, and excessive wear.

D. Inspect housing assembly for damaged screw thread inserts.

E. Inspect strainers in oil transfer tubes (3, Figure 203) for clogging, cuts, and dents.

CAUTION: IF A PLANET OR OUTPUT GEAR IS FOUND UNACCEPTABLE BECAUSE OF A SURFACE CONDITION, REDUCTION GEAR ASSEMBLY SHALL BE REPLACED.

NOTE: A break-in coating of silver plating was introduced to the Output Gear Part No. 1-030-191-14 and Planet Gear Part No. 1-030-193-05. This coating may wear away in a very short time and/or be displaced to noncontact areas of the output and planet gears, such as the tips of the gear teeth. This is normal and should not be cause for rejection.

F. Visually inspect sun gearshaft (19), three planet gearshafts, and output gearshaft for conditions listed in Table 202. (See Figure 204 for illustration of conditions.)

CAUTION: OUTPUT GEARSHAFT PLUG 1-030-360-04 OR 1-030-234-01 SHALL NOT BE REMOVED EXCEPT AT A HONEYWELL APPROVED OVERHAUL FACILITY.

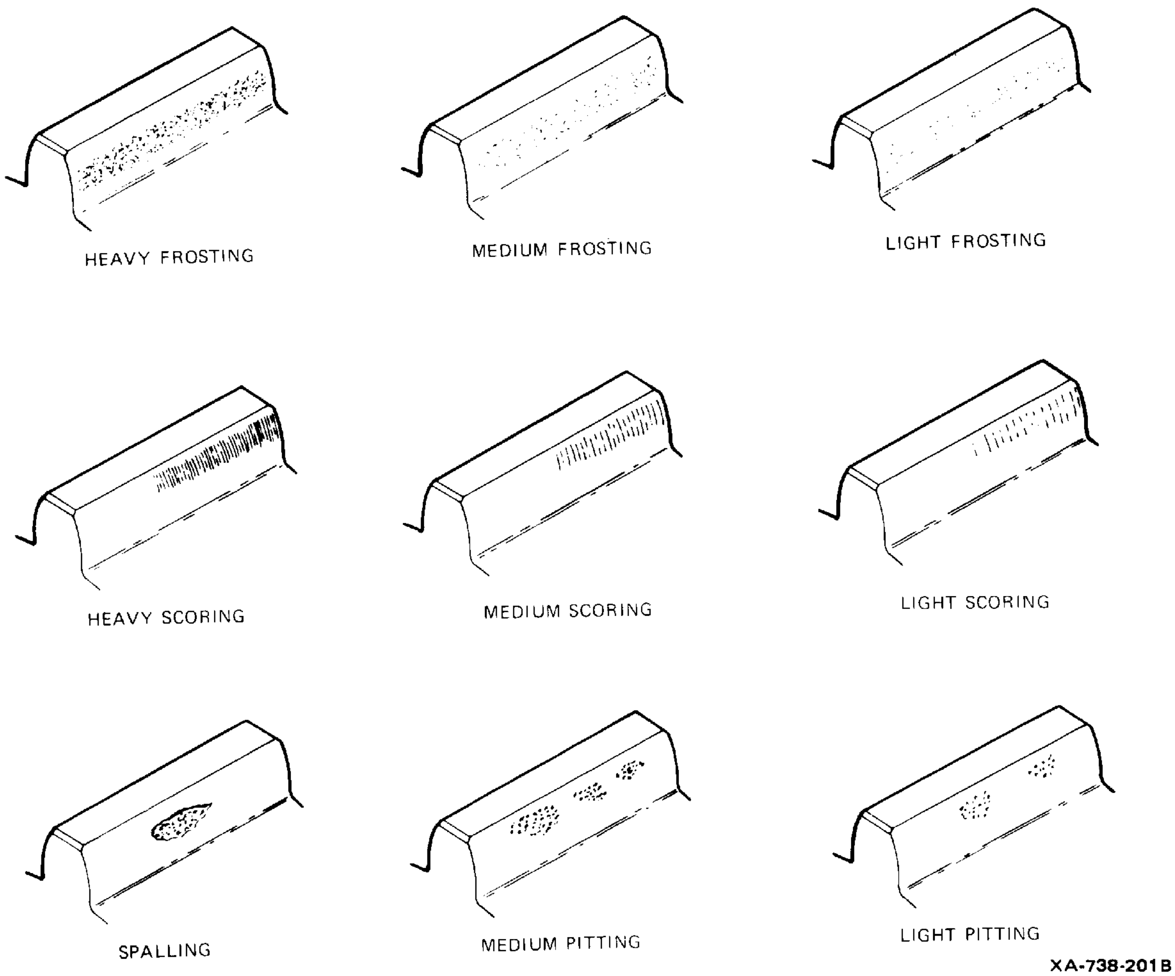
G. Inspect output gearshaft and plug wear.

NOTE: This inspection applies to output reduction carrier and gear assembly 1-030-350-08 and must be accomplished whenever gearshaft and plug wear is suspected. This may be indicated by loss of installation torque on bolt 204-040-813-01 which secures airframe driveshaft adapter to output gearshaft, or by visible wear indication.

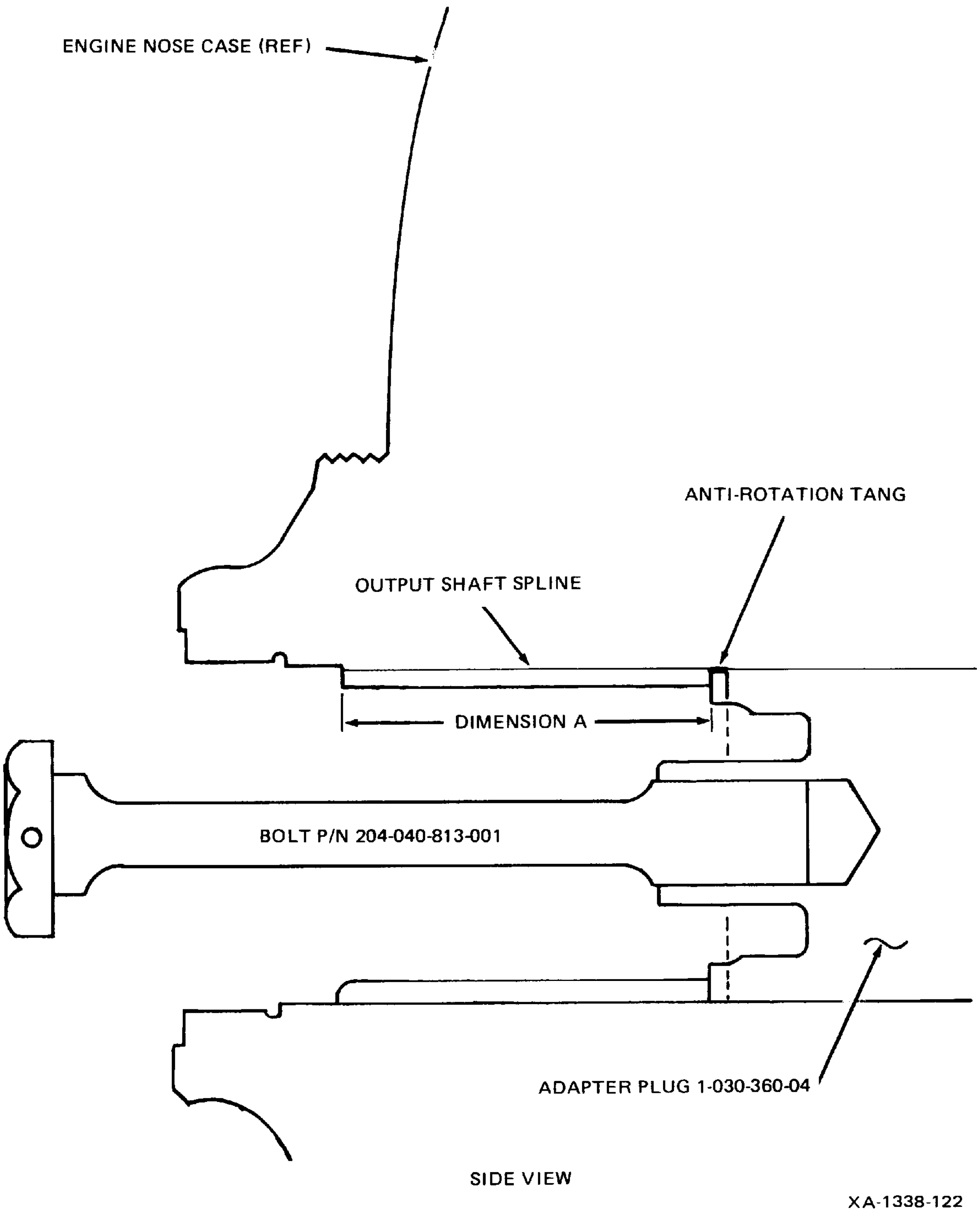
(1) With airframe driveshaft adapter removed, thread bolt 204-040-813-01 into output gearshaft plug, finger tight. (See Figure 205).

(2) Pull plug, by hand, fully forward.

(3) Measure from forward end of spline to anti-rotational tang on plug (Dimension A). If dimension is less than 1.860 inches, forward output reduction carrier and gear assembly and sun gearshaft for disassembly and magnetic particle inspection. (See Honeywell Overhaul Manual No. 350.3.)



Gear Inspection
Figure 204



Inspection for Output Gearshaft and Plug Wear
Figure 205

Table 202. Gear Inspection of Output Reduction Carrier and Gear Assembly

Nomenclature	Scoring	Frosting	Pitting	Spalling	Cracking
Helical Planet Gearshaft (Primary)	Light and medium scoring is acceptable. Heavy scoring is unacceptable. (See Figure 204.)	All frosting is acceptable. (See Figure 204.)	Light pitting is acceptable. (See Figure 204.) Medium and heavy pitting is unacceptable.	Spalling is unacceptable. (See Figure 204.)	All cracking is unacceptable.
Helical Planet Gear (Secondary)	Light and medium scoring is acceptable. Heavy scoring is unacceptable. (See Figure 204.)	All frosting is acceptable. (See Figure 204.)	Light pitting is acceptable. (See Figure 204.) Medium and heavy pitting is unacceptable.	Spalling is unacceptable. (See Figure 204.)	All cracking is unacceptable.
Helical Output Gearshaft	Light and medium scoring is acceptable. Heavy scoring is unacceptable. (See Figure 204.)	All frosting is acceptable. (See Figure 204.)	Light pitting is acceptable. (See Figure 204.) Medium and heavy pitting is unacceptable.	Spalling is unacceptable.	All cracking is unacceptable.
Helical Sun Gearshaft	Light and medium scoring is acceptable. Heavy scoring is unacceptable. (See Figure 204.)	All frosting is acceptable. (See Figure 204.)	Light pitting is acceptable. (See Figure 204.) Medium and heavy pitting is unacceptable.	Spalling is unacceptable.	All cracking is unacceptable.

4. Approved Repairs

A. Repair output reduction carrier and gear assembly, and sun gearshaft as follows:

(1) Repair all threaded parts stripped or crossed threads. (See SPM, SP R409, 70-25-03.) Replace parts having threads damaged beyond repair.

(2) Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

(3) Replace all damaged parts.

CAUTION: IF A PLANET OR OUTPUT GEAR IS FOUND UNACCEPTABLE BECAUSE OF A SURFACE CONDITION, REDUCTION GEAR ASSEMBLY SHALL BE REPLACED.

(4) Replace reduction gear assembly and sun gearshaft that have unacceptable conditions.

B. Replace forward power shaft bearing as follows:

CAUTION: THIS PROCEDURE SHALL BE ACCOMPLISHED WITH ENGINE INSTALLED IN A MAINTENANCE STAND CAPABLE OF POSITIONING ENGINE IN A VERTICAL NOSE DOWN ATTITUDE.

(1) Remove output reduction carrier and gear assembly and sun gearshaft. (See Paragraph 2.A.)

(2) Remove oil transfer support assembly (1, Figure 206) as follows:

(a) Remove 12 bolts (7) and washers (6).

(b) Install three 1/4-20 thread puller screws, 3 inches long, into oil transfer support assembly (1) and tighten screws evenly.

(c) Remove oil transfer support assembly (1) and packings (2, 3, 4, 5). Discard packings.

(d) Remove puller screws.

(3) Remove accessory drive gearbox assembly. (See 72-60-01.)

(4) Remove overspeed governor and tachometer drive assembly. (See 72-60-02.)

(5) Remove accessory drive carrier assembly (1, Figure 207) as follows:

(a) Install three machine bolts LTCT1429 or LTCT109 in face of accessory drive carrier assembly (1). Tighten machine bolts evenly and remove accessory drive carrier assembly.

(b) Remove machine bolts.

(c) Remove oil transfer tube (2) and packings (3).

(d) Remove packings (4, 5).

(6) Remove power shaft bearing retainer (6, Figure 208) as follows:

(a) Using mechanical puller LTCT2021, remove gear (1).

(b) Remove ring (2).

(c) Straighten two tabwashers (4).

CAUTION: PRIOR TO ACCOMPLISHING FOLLOWING STEP, ENGINE SHALL BE POSITIONED IN VERTICAL, NOSE DOWN ATTITUDE AND REMAIN THAT WAY UNTIL BOLTS (3, 5) ARE INSTALLED.

(d) Remove bolts (3, 5) and tabwashers, and remove power shaft bearing retainer (6).

(7) Disassemble power shaft bearing retainer (6, Figure 208) as follows:

(a) Remove bolts (1, Figure 209) that secure clamping plate (2) to retainer assembly (4). Remove plate.

(b) Using suitable drift and arbor press, press roller bearing (3) from retainer assembly (4).

(8) Reassemble power shaft bearing retainer (6, Figure 208) as follows:

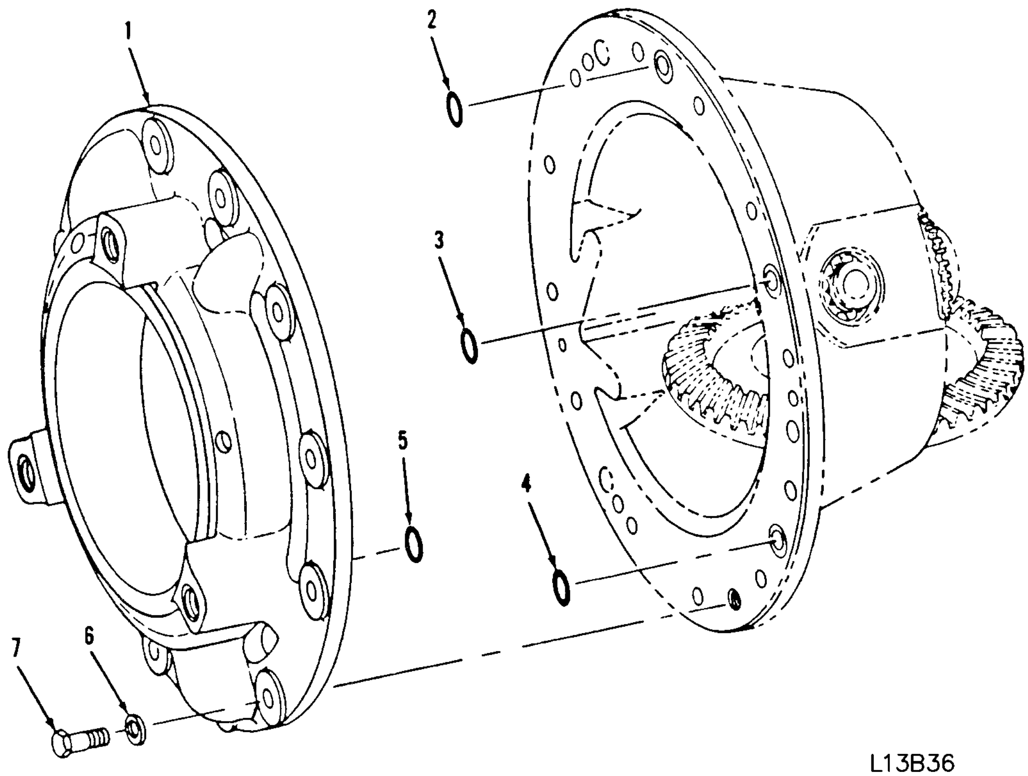
(a) Place retainer assembly (4, Figure 209) on a bench, large end down.

(b) Press roller bearing (3) into bearing retainer assembly and seat firmly.

(c) Measure from edge of bearing retainer assembly down to bearing outer race and record depth measurement.

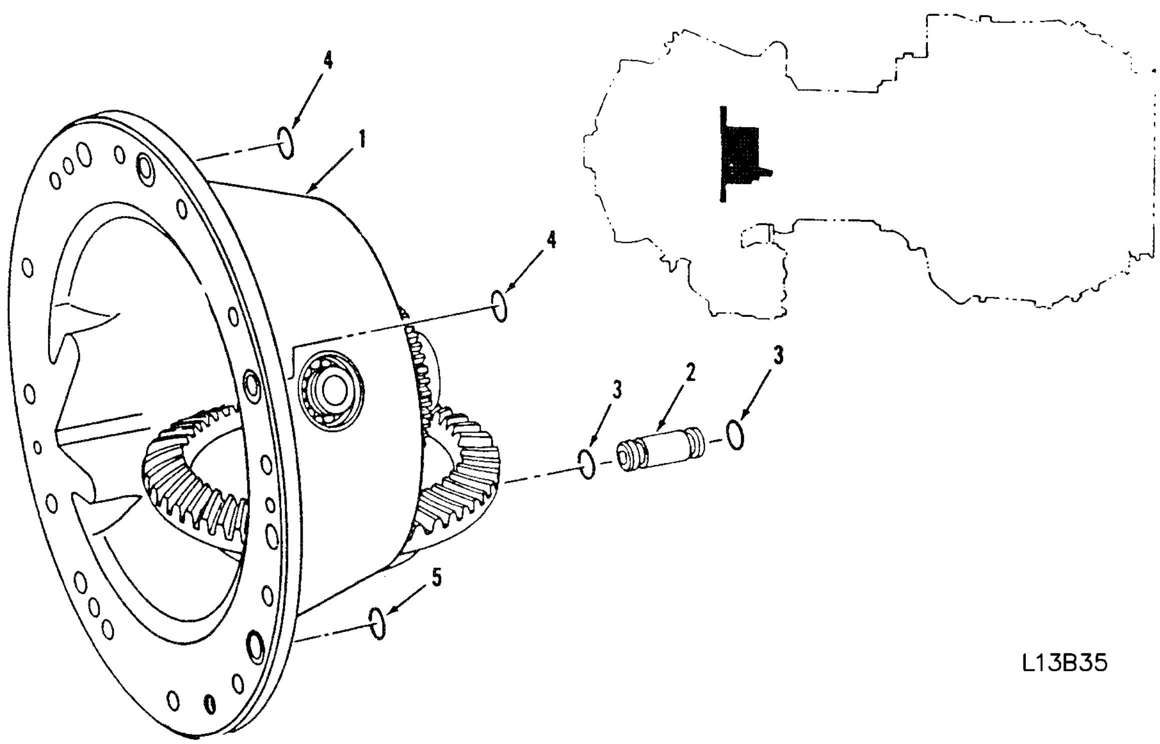
(d) Select clamping plate (2) with hub height that will provide 0.001 to 0.0035 inch pinch on bearing.

(e) Install plate and secure with three bolts (1). Tighten bolts to 40 to 45 inch-pounds torque and lockwire.



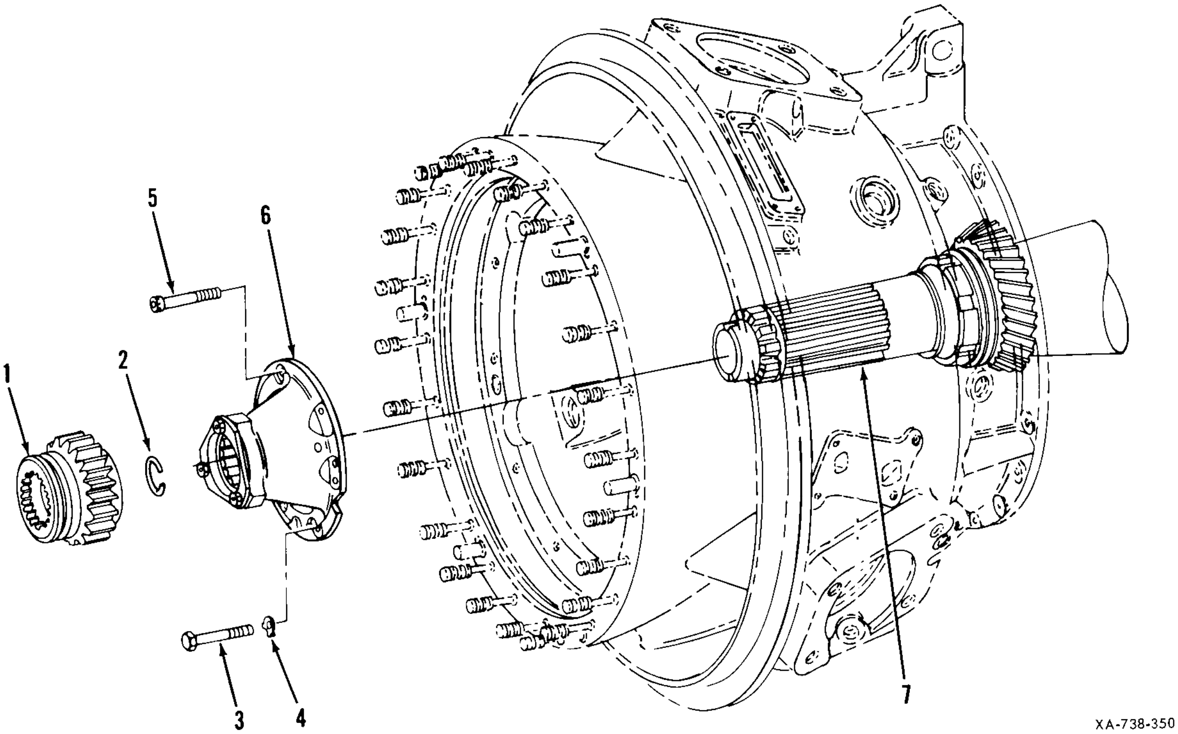
1. OIL TRANSFER SUPPORT ASSEMBLY
2. PACKING
3. PACKING
4. PACKING
5. PACKING
6. WASHER
7. BOLT

Oil Transfer Support Assembly
Figure 206



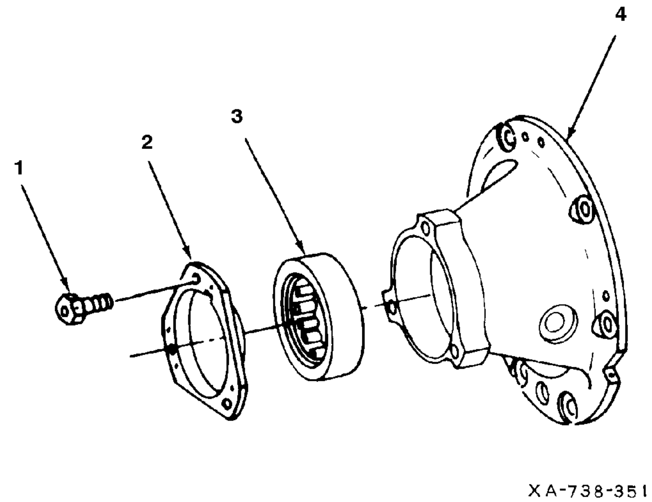
1. ACCESSORY DRIVE CARRIER ASSEMBLY
2. OIL TRANSFER TUBE
3. PACKING
4. PACKING
5. PACKING

Accessory Drive Carrier Assembly
Figure 207



1. GEAR
2. RING
3. BOLT
4. TABWASHER
5. BOLT
6. POWER SHAFT BEARING RETAINER
7. POWER SHAFT

Power Shaft Bearing Retainer
Figure 208



1. BOLT
2. CLAMPING PLATE
3. ROLLER BEARING
4. RETAINER ASSEMBLY

Power Shaft Bearing Retainer
Figure 209

(9) Install power shaft bearing retainer (6, Figure 208) as follows:

(a) Prior to bearing retainer installation, inspect bearing journal of powershaft for indenting, wear track, or corrosion pitting. Limits are as follows:

1 Indenting and wear track are unacceptable if they can be detected with a 0.040 inch radius scribe.

2 Corrosion pitting is unacceptable if it can be detected with a 0.020 inch radius scribe.

3 If limits are exceeded, forward engine to a Honeywell approved Service Center.

(b) Prior to bearing retainer installation, apply shortening (72-00-00, 38, Table 203) to bearings and using installation tool LTCT14773, slide power shaft bearing retainer (6) onto power shaft (7), and position in inlet housing with cutouts for accessory drive driven gears in correct position.

(c) Install four bolts (3) and two tabwashers (4) with two bolts. Tighten bolts to 70 to 95 inch-pounds torque.

NOTE: Do not lubricate bolts.

(d) Lock tabwashers on two bolts. Lockwire four bolts.

(e) Install retaining ring (2) in groove on power shaft.

WARNING: TO PREVENT INJURY TO OPERATOR, ASBESTOS GLOVES MUST BE WORN DURING THIS OPERATION.

(f) Place gear (1) into installation tool LTCT4576 and heat in oven for 30 minutes at 300 to 400°F (149 to 204°C). Remove gear from oven and quickly install on power shaft spline, seating it firmly over retaining ring. If combustor turbine assembly is not installed, power shaft must be pressed forward from aft end of engine.

(g) After installation of gear (1), measure from forward face of power shaft (7) to forward face of gear (1). Dimension shall be 2.020 to 2.040 inches. (See Figure 210.)

(10) Install accessory drive carrier assembly (1, Figure 207) as follows:

(a) Install two packings (4) and one packing (5) on inlet housing.

(b) Install two packings (3) on oil transfer tube (2) and install tube in accessory drive carrier assembly.

NOTE: If accessory drive carrier assembly meets sudden resistance, do not force installation, remove carrier, inspect oil transfer tube for damage, replace packing, and repeat Step (c). If pilot interference is encountered, dimensionally measure diameters and rework carrier mounting flange if necessary.

During and after installation, use an inspection mirror and light, check that spur gears are properly meshed and that tachometer drive gear is in proper axial relationship with spur gear.

(c) Position accessory drive carrier assembly (1) in inlet housing using care to assure oil transfer tube alignment and proper meshing of spur gear (1, Figure 210) and its mating tachometer drive spur gear in the accessory drive carrier assembly.

(11) Install overspeed governor and tachometer drive assembly. (See 72-60-02.)

(12) Install accessory drive gearbox assembly. (See 72-60-01.)

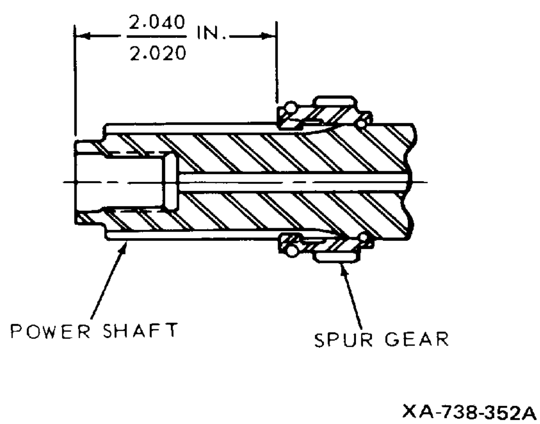
(13) Install oil transfer support assembly as follows:

(a) Install new packings (2, 3, 4, 5, Figure 206) on rim of accessory drive carrier assembly and on rim of oil transfer support assembly.

NOTE: Do not lubricate bolts

(b) Position oil transfer support assembly (1) on flange of accessory drive carrier assembly and secure with 12 bolts (7) and washers (6). Lockwire bolts.

(14) Install output reduction carrier and gear assembly and sun gearshaft. (See Paragraph 2.B.)



Gear to Power Shaft - Installation Dimension
Figure 210

TORQUEMETER VALVE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The torquemeter valve assembly is installed on the torquemeter cylinder. The assembly is used to check pressure from accessory gearbox.

TORQUEMETER VALVE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove torquemeter valve assembly from torquemeter cylinder. (See Figure 201.)

      (1) Using valve installer and remover LTCT519 or a 6-point socket, remove torquemeter valve assembly (1) from torquemeter cylinder (3).

      (2) Remove shim (2).

   B. Install torquemeter valve assembly in torquemeter cylinder. (See Figure 201.)

      (1) Install shims (2) on torquemeter valve assembly (1).

      (2) Install torquemeter valve assembly (1) and shim (2) in torquemeter cylinder (3) and torque to 150 to 200 inch-pounds.

2. Establish Torquemeter Valve Assembly Clearance

   A. Using depth micrometer, measure distance between inlet housing flange face and tip of plunger. Record as Dimension A. (See Figure 202.)

   B. Using depth micrometer, measure distance between inlet housing flange face and torquemeter cylinder inner lip. Record as Dimension B.

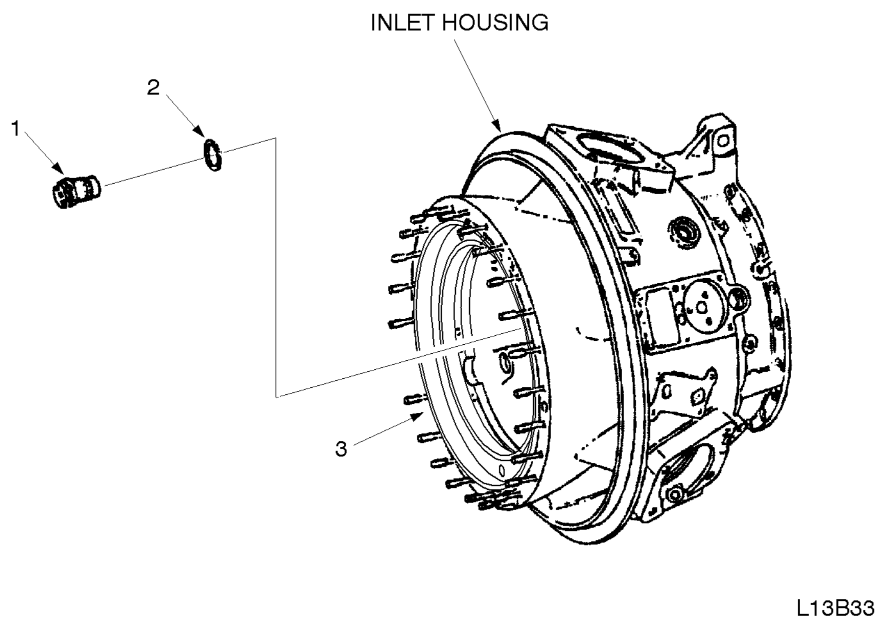
   C. Subtract Dimension A from Dimension B. Record as Dimension C. If Dimension C is not 0.030 to 0.034 inch, add shims as follows:

      (1) Using valve installer and remover LTCT519 or a 6-point socket, remove torquemeter valve assembly (1, Figure 201) from torquemeter cylinder (3).

      (2) Add thickness of shims (2) required to torquemeter valve assembly (1).

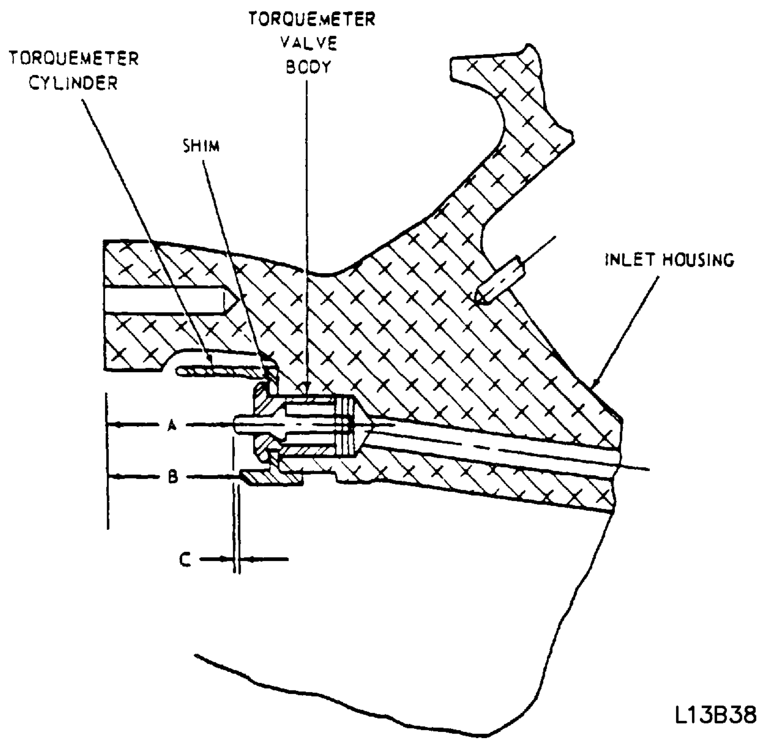
      (3) Install torquemeter valve assembly (1) and shim (2) in torquemeter cylinder (3) and torque to 150 to 200 inch-pounds.

   D. Repeat Steps (2) and (3) until Dimension C is 0.030 to 0.034 inch.



1. TORQUEMETER VALVE ASSEMBLY
2. SHIM
3. TORQUEMETER CYLINDER

Torquemeter Valve Assembly Replacement
Figure 201



Torquemeter Valve Assembly Clearance
Figure 202

COMPRESSOR AND IMPELLER HOUSING ASSEMBLIES - DESCRIPTION AND OPERATION

1. Description and Operation

Compressor and impeller housings each consist of two halves. Housings enclose five stage axial compressor and single stage centrifugal compressor impeller of compressor rotor assembly. Axial compressor stator vane assemblies are bolted to compressor housing halves. An air-bleed actuator is mounted on the right side of the impeller housing. An air-bleed connecting manifold and adapter assembly ducts bleed air from the diffuser housing to the inlet housing. Customer air is available from this adapter assembly, which also directs engine anti-icing air to the inlet housing through the hot-air solenoid valve.

On engines with magnesium impeller housings (Pre SB T53-L-13B-0105), pressurized hot air passes through a section of the impeller housing before entering the hot-air solenoid valve.

The impeller housing halves are cast from either magnesium alloy (Pre SB T53-L-13B-0105) or stainless steel (Post SB T53-L-13B-0105).

COMPRESSOR AND IMPELLER HOUSING ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation

CAUTION: ONLY ONE-HALF OF COMPRESSOR AND IMPELLER HOUSING MAY BE REMOVED AT A TIME.

A. (Pre SB T53-L-13B-0105) Remove Compressor and Impeller Housing Assemblies

(1) Remove lines, hoses, and accessories as necessary.

NOTE: When a bracket is released by removal of a bolt, secure bolt, washer, and nut to bracket until ready for installation. To facilitate installation of housings, identify and mark position of all removed items.

(2) Remove nuts (26, Figure 201), washers (25), and bolts (2) from four locating dowels (1) on compressor housing assembly flanges.

(3) Using mechanical puller LTCT1218, remove four dowels (1).

(4) Remove 12 nuts (24), washers (23), bolts (4), and washers (3) that secure compressor housing assembly upper half (9) to compressor housing assembly lower half (22).

(5) Remove 10 bolts (6) and washers (5) that secure compressor housing assembly upper and lower half (19 or 22) to inlet housing assembly.

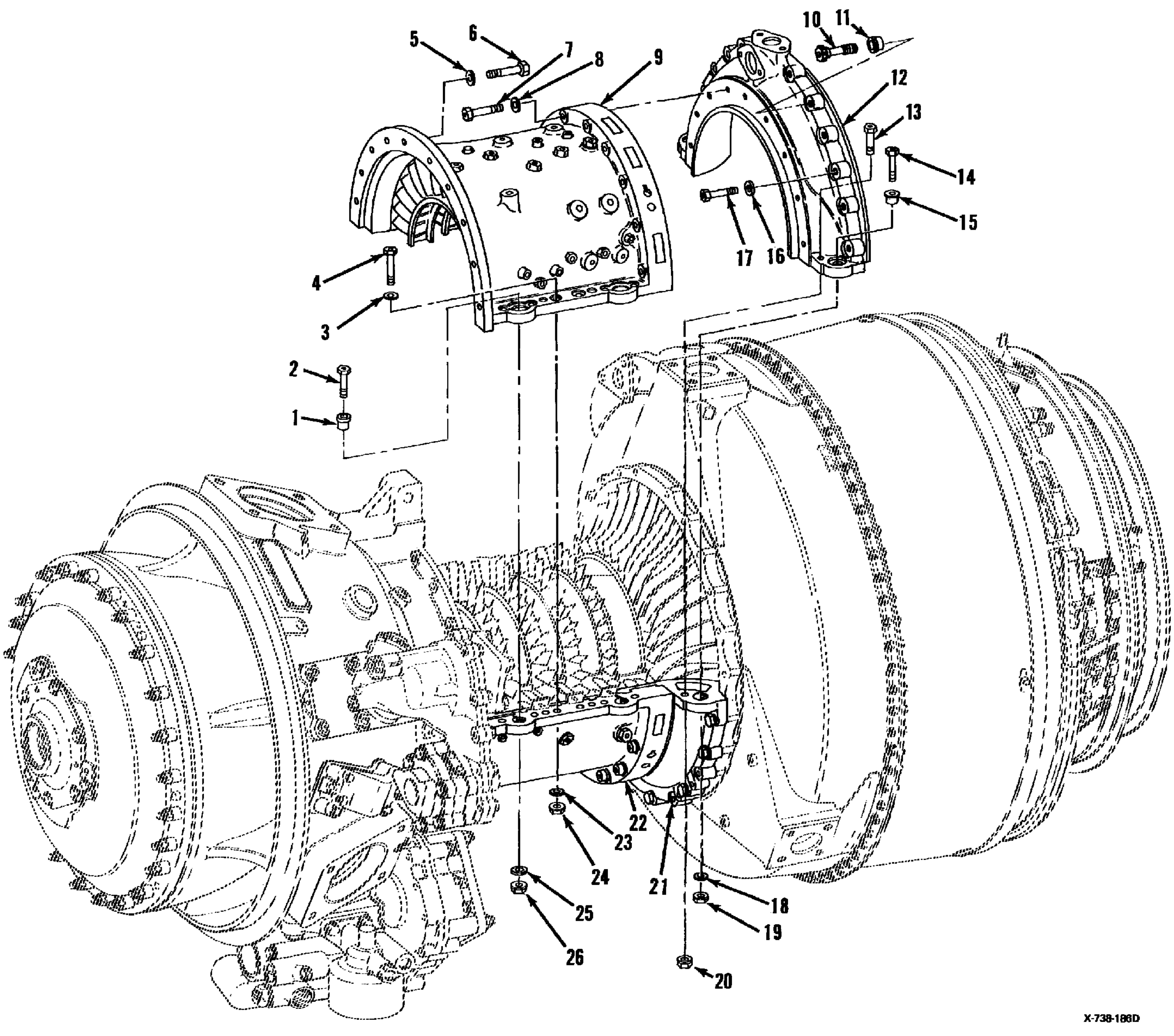
(6) Remove five bolts (7) and washers (8) that secure compressor housing assembly upper and lower half (9 or 22) to impeller housing assembly upper and lower half (12 or 21).

(7) Using four 1/4-28 bolts, AN-4 or equivalent, as jackscrews, remove compressor housing assembly half.

CAUTION: IMPELLER HOUSING ASSEMBLIES HAVE PILOT FLANGES THAT FIT INTO THE COMPRESSOR AND DIFFUSER HOUSING ASSEMBLIES. TO PREVENT DAMAGING THESE FLANGES DURING DISASSEMBLY, ALWAYS REMOVE COMPRESSOR HOUSING ASSEMBLY HALF BEFORE ATTEMPTING TO REMOVE IMPELLER HOUSING ASSEMBLY.

(8) Remove nuts (19), washers (18), and bolts (14) from two locating dowels (15) on impeller housing assembly flanges.

(9) Using removal tool LTCT6740 and mechanical puller LTCT1218, remove two dowels (15).



Compressor and Impeller Housing Assemblies (Engines with Magnesium Impeller Housing)
(Pre SB T53-L-13B-0105)
Figure 201

KEY TO FIGURE 201

1. DOWEL
2. BOLT
3. WASHER
4. BOLT
5. WASHER
6. BOLT
7. BOLT
8. WASHER
9. COMPRESSOR HOUSING ASSEMBLY UPPER HALF
10. BOLT
11. BUSHING
12. IMPELLER HOUSING ASSEMBLY UPPER HALF
13. BOLT
14. BOLT
15. DOWEL
16. WASHER
17. BOLT
18. WASHER
19. NUT
20. NUT
21. IMPELLER HOUSING ASSEMBLY LOWER HALF
22. COMPRESSOR HOUSING ASSEMBLY LOWER HALF
23. WASHER
24. NUT
25. WASHER
26. NUT

(10) Remove two nuts (20) and bolts (13) that secure impeller housing assembly upper half (12) to impeller housing assembly lower half (21).

NOTE: The ignition unit mounting bracket, attached by three of the bolts that secure upper half of impeller housing assembly to diffuser housing assembly, will be released when these bolts are removed. Index bracket location.

(11) Remove six bolts (17), six washers (16), six bolts (10), and six bushings (11) that secure impeller housing assembly upper and lower halves (12 or 21) to diffuser housing assembly.

CAUTION: DO NOT ALLOW IMPELLER HOUSING ASSEMBLY TO STRIKE IMPELLER OR COMPRESSOR BLADES. SUCH CONTACT MAY DAMAGE BLADES OR INNER SURFACE OF HOUSING ASSEMBLY.

(12) Move impeller housing assembly upper and lower halves (12 or 21) forward toward inlet housing assembly, then lift and remove.

B. (Post SB T53-L-13B-0105) Remove Compressor and Impeller Housing Assemblies

(1) Remove lines, hoses and accessories as necessary.

NOTE: When a bracket is released by removal of a bolt, secure bolt, washer, and nut to bracket until ready for installation. To facilitate installation of housings, identify and mark position of all removed items.

(2) Remove nuts (27, Figure 202), washers (26), and bolts (2) from four locating dowels (1) on compressor housing assembly flanges.

(3) Using mechanical puller LTCT1218 remove four dowels (1).

(4) Remove 12 nuts (25), washers (24), bolts (4) and washers (3) that secure compressor housing assembly upper half (8) to compressor housing assembly lower half (23).

(5) Remove 10 bolts (6) and washers (5) that secure compressor housing assembly upper and lower halves (8 or 23) to inlet housing assembly.

(6) Remove one bolt (7), eight bolts (18) and washers (17), or nine bolts (18) and nine washers (17) that secure compressor housing assembly upper and lower halves (8 or 23) to impeller housing assembly upper and lower halves (11 or 22)

(7) Using four 1/4-28 bolts, AN-4 or equivalent, as jackscrews, remove compressor housing assembly upper and lower halves (8 or 23).

CAUTION: IMPELLER HOUSING ASSEMBLIES HAVE PILOT FLANGES THAT FIT INTO COMPRESSOR AND DIFFUSER HOUSING ASSEMBLIES. TO PREVENT DAMAGING THESE FLANGES DURING DISASSEMBLY, ALWAYS REMOVE COMPRESSOR HOUSING ASSEMBLY HALF BEFORE ATTEMPTING TO REMOVE IMPELLER HOUSING ASSEMBLY HALF.

(8) Remove nuts (20), washers (21), and bolts (12) from two locating dowels (13) on impeller housing assembly flanges.

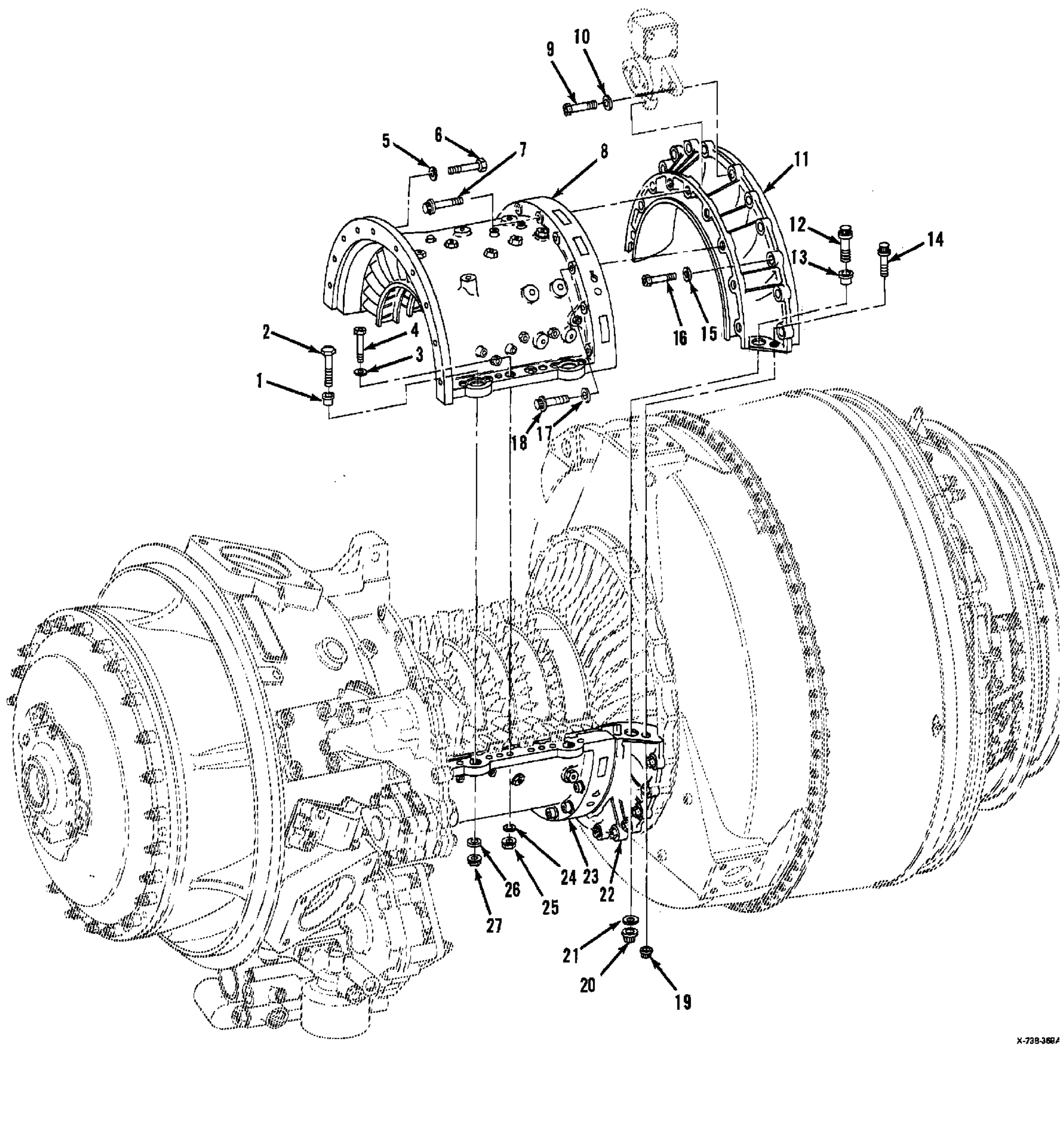
(9) Using removal tool LTCT6740 and mechanical puller LTCT1218, remove two dowels (13).

(10) Remove two nuts (19) and bolts (14) that secure impeller housing assembly upper half (11) and compressor housing assembly lower half (22).

(11) Remove two bolts (9), two washers (10), 10 bolts (16), and 10 washers (15), or 12 bolts (16) and 12 washers (15) that secure impeller housing assembly upper and lower halves (11 or 22) to diffuser housing assembly.

CAUTION: DO NOT ALLOW IMPELLER HOUSING ASSEMBLY HALF TO STRIKE IMPELLER OR COMPRESSOR BLADES. SUCH CONTACT MAY DAMAGE BLADES OR INNER SURFACE OF HOUSING ASSEMBLY.

(12) Move impeller housing assembly upper and lower halves (11 or 22) toward inlet housing assembly, then lift and remove.



Compressor and Impeller Housing Assemblies (Engines with Stainless Steel Impeller Housing)
(Post SB T53-L-13B-0105)
Figure 202

KEY TO FIGURE 202

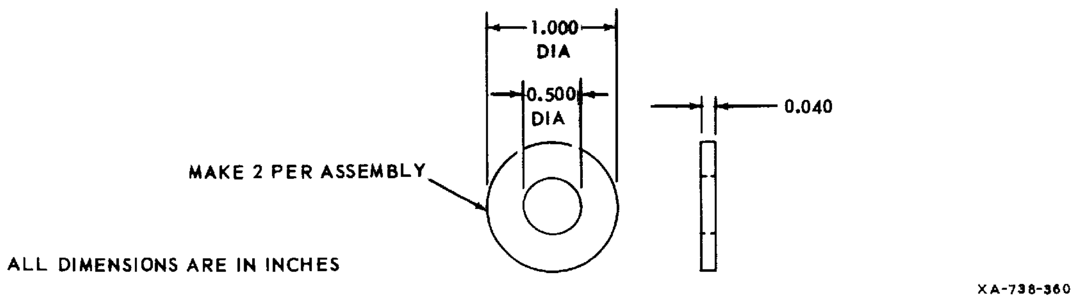
1. DOWEL
2. BOLT
3. WASHER
4. BOLT
5. WASHER
6. BOLT
7. BOLT
8. COMPRESSOR HOUSING ASSEMBLY UPPER HALF
9. BOLT
10. WASHER
11. IMPELLER HOUSING ASSEMBLY UPPER HALF
12. BOLT
13. DOWEL
14. BOLT
15. WASHER
16. BOLT
17. WASHER
18. BOLT
19. NUT
20. NUT
21. WASHER
22. IMPELLER HOUSING ASSEMBLY LOWER HALF
23. COMPRESSOR HOUSING ASSEMBLY LOWER HALF
24. WASHER
25. NUT
26. WASHER
27. NUT

C. (Pre SB T53-L-13B-0105) Install Compressor and Impeller Housing Assemblies

CAUTION: IF A SHIMMED (IMPELLER HOUSING TO COMPRESSOR HOUSING MATING SURFACE) HOUSING IS BEING REINSTALLED, ENSURE SHIMS WERE RETAINED FOR AIR-BLEED ACTUATOR MOUNTING BOSSES. IF ACTUATOR SHIMS WERE NOT RETAINED, FABRICATE TWO NEW SHIMS FROM ALUMINUM ALLOY (AMS4029) (72-00-00, 4, TABLE 203), TO DIMENSIONS SHOWN IN FIGURE 203 AND RETAIN WITH IMPELLER HOUSING FOR USE DURING ACTUATOR INSTALLATION.

(1) Install impeller housing assembly upper half (12, Figure 201) or impeller housing assembly lower half (21).

(2) Check that a gap of 0.010 inch minimum will exist between shroud ends of mating vane assemblies after compressor housing installation. File shroud end, as required, to obtain clearance and install compressor housing.



Aluminum Shims to Reposition Actuator Housing (Pre SB T53-L-13B-0105)
Figure 203

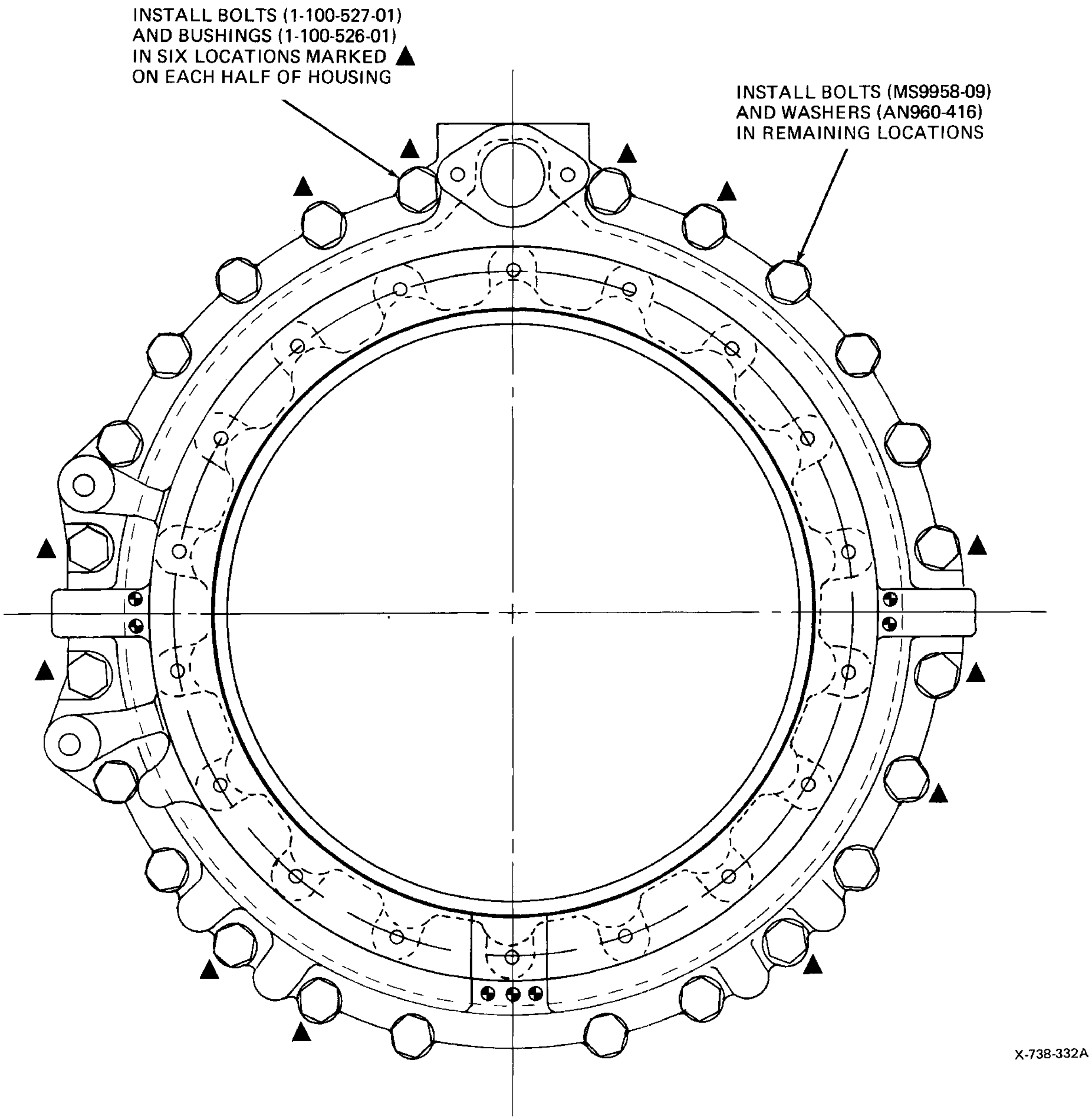
NOTE: In following step, potting compound RTV106 (72-00-00, 55A, Table 203) may be used as a sealer between compressor housing halves having rough or uneven surfaces.

Make sure bolt (14) part number is MS9519-15.

(3) Install compressor housing assembly upper half (9) or compressor housing assembly lower half (22). Install hollow dowels (1, 15) and secure upper and lower halves of impeller and compressor housings with nuts (19, 26), washers (18, 25), and bolts (2, 14). Tighten nuts 70 to 95 inch-pounds torque.

(4) Apply zinc chromate sealant (72-00-00, 75, Table 203) under bolts and install bolts (6) and washers (5) that secure compressor housing assembly upper and lower halves (9 or 22) to inlet housing assembly.

(5) Position clips for air-bleed on proper bolts. Install bolts (7) and washers (8) that secure compressor housing assembly upper and lower halves (9 or 22) to impeller housing assembly upper and lower halves (12 or 21). Tighten bolts to proper torque and lockwire.



Magnesium Impeller Housing Bolt Locations (Pre SB T53-L-13B-0105)
Figure 204

NOTE: Position bracket for ignition unit under three bolts (17) at approximately 10 o'clock position.

Position flange of bushing (11) toward flange of impeller housing assembly.

(6) Install six bushings (11), six bolts (10), six washers (16), and six bolts (17) that secure impeller housing assembly upper and lower halves (12 or 21) to diffuser housing assembly. (See Figure 204). Tighten bolts (10, Figure 201) 90 to 100 inch-pounds torque and lockwire. Tighten bolts (17) and lockwire.

(7) Install bolts (13) and nuts (20) that secure upper and lower halves of impeller housing assembly. Tighten bolts and lockwire.

(8) Install remaining bolts (4), washers (3, 23), and nuts (24) that secure upper and lower halves of compressor housing assembly. Tighten all bolts and lockwire.

(9) Check that all removed brackets have been reinstalled, and install all removed lines, hoses, and accessories.

D. (Post SB T53-L-13B-0105) Install Compressor and Impeller Housing Assemblies

(1) Install impeller housing assembly upper half (11, Figure 202) or impeller housing assembly lower half (22).

(2) Check that a gap of 0.010 inch minimum will exist between shroud ends of mating vane assemblies after compressor housing installation. File shroud end, as required, to obtain clearance and install compressor housing.

NOTE: In following step, potting compound RTV106 (72-00-00, 55A, Table 203) may be used as a sealer between compressor housing halves having rough or uneven surfaces.

(3) Install compressor housing assembly upper half (8) or compressor housing assembly lower half (23). Install hollow dowels (1, 13) and secure upper and lower halves of impeller and compressor housings with nuts (20, 27), washers (21, 26), and bolts (2, 12). Tighten nuts 70 to 95 inch-pounds torque.

(4) Install bolts (6) and washers (5) that secure compressor housing assembly half (8 or 23) to inlet housing assembly.

(5) Position clips for air-bleed band on proper bolts. Coat mating surfaces of compressor housing and impeller housing with nondrying zinc chromate sealant (72-00-00, 75, Table 203). (See SPM, SP P526, 70-00-55.) Apply sealant under heads of bolts and nuts, on both faces of washers and in bolt cavities. Install bolts (7, 18) and washers (17) that secure compressor housing assembly upper and lower halves (8 or 23) to impeller housing assembly upper and lower halves (11 or 22). Tighten bolts to proper torque and lockwire. After assembly is completed, wipe off excess sealant with clean cloth dampened in cleaning compound (72-00-00, 17A, Table 203).

NOTE: Position bracket for ignition unit under three bolts (16) at approximately 10 o'clock position.

(6) Install 12 bolts (9, 16) and washers (10, 15) that secure impeller housing assembly upper and lower halves (11 or 22) to air diffuser housing assembly. (See Figure 205.) Tighten bolts (9, 16, Figure 202) and lockwire.

(7) Install bolts (14) and nuts (19) that secure upper and lower halves of impeller housing assembly. Tighten bolts and lockwire.

(8) Install bolts (4), washers (3, 24) and nuts (25) that secure upper and lower halves of compressor housing assembly. Tighten bolts and lockwire.

(9) Check that all removed brackets have been reinstalled, and install all removed lines, hoses, and accessories.

2. Disassembly/Assembly

NOTE: The procedure applies to either half of compressor housing assembly.

A. Disassemble Compressor Housing Assembly

(1) Place compressor housing assembly half on bench and secure to bench to prevent movement.

(2) Remove bolts (4, 5, 14, 16, Figure 206) and washers (3, 6, 15, 17) that secure first through fourth stage compressor vane assemblies (8, 10, 11, 12). Remove vane assemblies.

(3) Remove two bolts (1) and bolt retainers (2) and three bolts (18) and washers (19) that secure exit guide vane assembly (13). Remove vane assembly.

B. Reassemble Compressor Housing Assembly

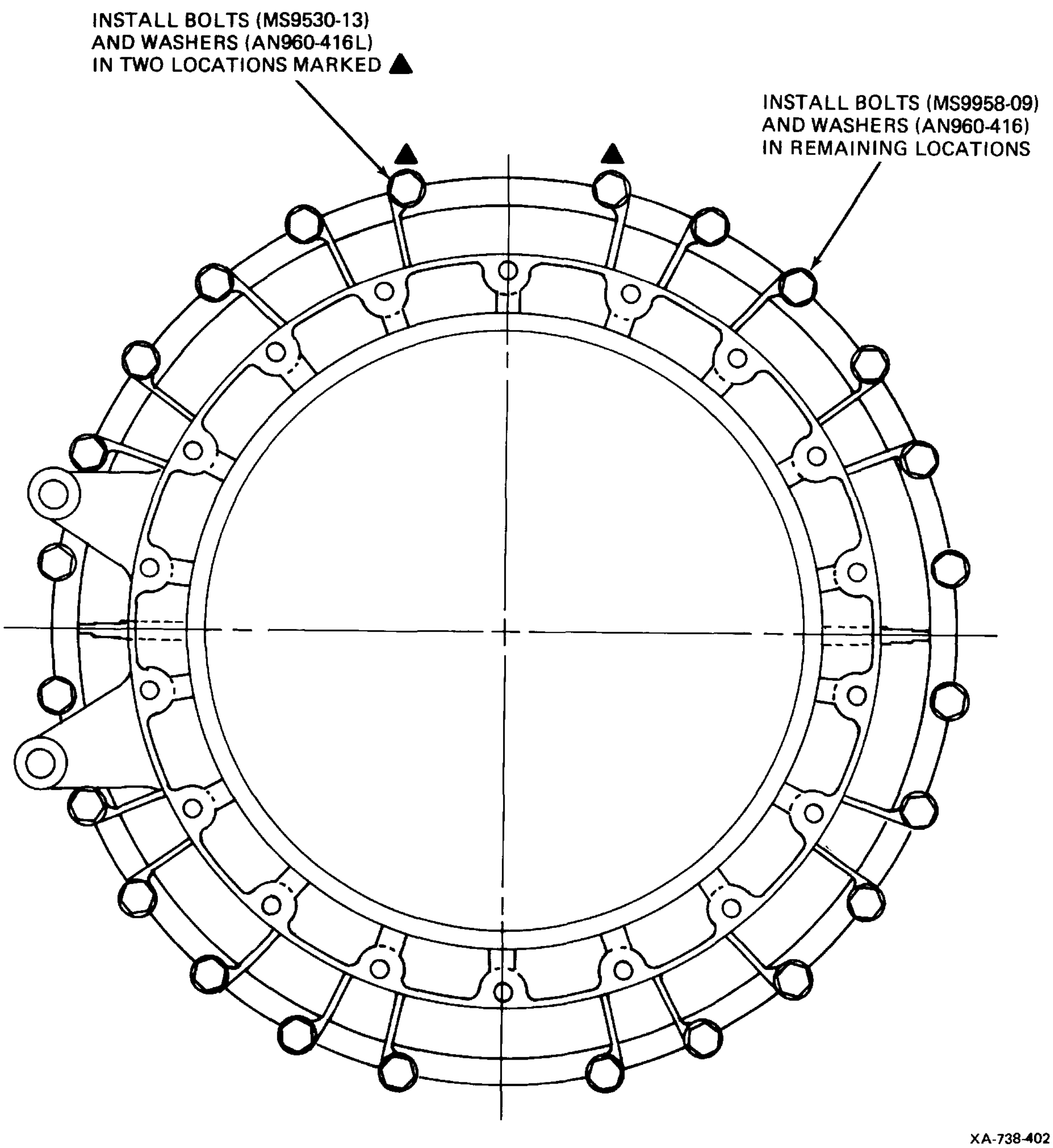
NOTE: Rematched stator vane assemblies shall meet all assembly requirements. Halves of rematched stator shall have approximately the same degree of foreign object damage or erosion, within established limits, an eroded stator half shall not be rematched with a noneroded half.

(1) With removed half of compressor housing assembly on bench, reinsert first through fourth stage compressor vane assemblies (8, 10, 11, 12) and exit guide vane assembly (13) into their appropriate slots.

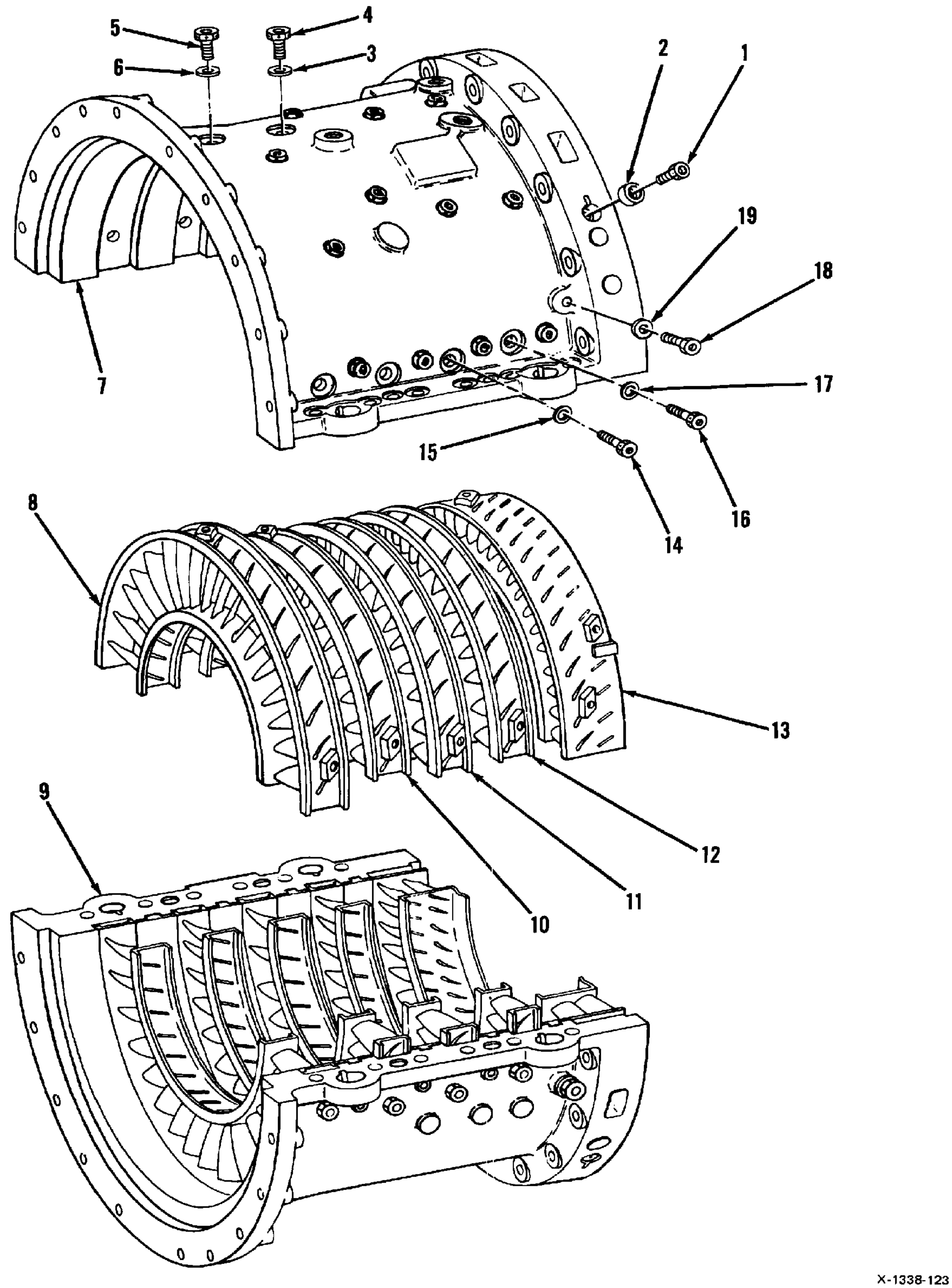
(2) Secure compressor vanes to compressor housing half as follows:

(a) Tighten first through fourth stage vanes with bolts (4, 5, 14, 16), washers (3, 6, 15, 17). Tighten center bolts 44 to 46 inch-pounds torque. Tighten outside bolts to 14 to 16 inch-pounds torque. (See Figure 207.)

(b) Tighten exit guide vane with bolts (1, 18, Figure 206), washers (19), and bolt retainers (2). Tighten center bolts 44 to 46 inch-pounds torque. Tighten outside bolts to 14 to 16 inch-pounds torque. Tighten bolts (1) 30 to 40 inch-pounds torque. (See Figure 207.) Make sure that a gap of 0.000 to 0.010 inch exists between the exit guide vane and the fifth stage insert. (See Figure 208.)



Stainless Steel Impeller Housing Bolt Locations (Post SB T53-L-13B-0105)
Figure 205



Compressor Housing Assembly - Exploded View
Figure 206

KEY TO FIGURE 206

1. BOLT
2. BOLT RETAINER
3. WASHER
4. BOLT
5. BOLT
6. WASHER
7. UPPER COMPRESSOR HOUSING
8. FIRST STAGE COMPRESSOR VANE ASSEMBLY
9. LOWER COMPRESSOR HOUSING
10. SECOND STAGE COMPRESSOR VANE ASSEMBLY
11. THIRD STAGE COMPRESSOR VANE ASSEMBLY
12. FOURTH STAGE COMPRESSOR VANE ASSEMBLY
13. EXIT GUIDE VANE ASSEMBLY
14. BOLT
15. WASHER
16. BOLT
17. WASHER
18. BOLT
19. WASHER

(3) Lockwire bolts and deform retainers into slot in cap screw and slot in housing.

3. Inspection/Check

A. Inspect Compressor Housing Assembly

(1) Visually inspect for nicks and burrs. Repair as necessary.

(2) Visually inspect for foreign material deposits. (See SPM, SP C203, 70-00-13.)

(3) Visually and dye penetrant inspect for cracks. (See SPM, SP I304, 70-00-24.)

(4) Visually inspect housing halves for broken alignment ears.

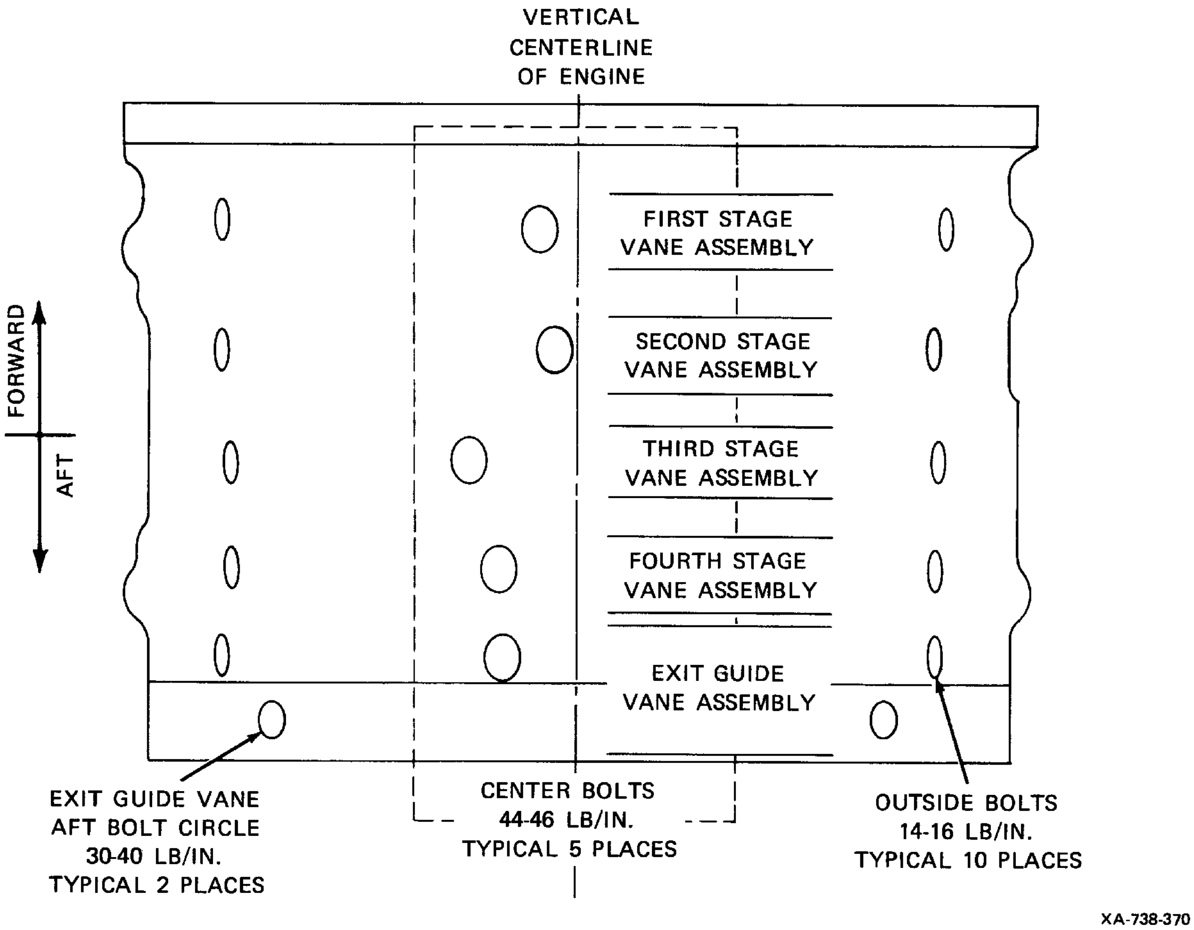
(5) Visually inspect for corrosion. Repair as necessary.

B. Inspect Vane Assemblies

(1) Visually and dye penetrant method inspect for cracks. (See SPM, SP I304, 70-00-24.) Cracks are not allowed other than in the vane to shroud brazement, up to 1/8 inch in length are acceptable.

(2) Visually inspect stator vanes for deformation. Repair as necessary.

(3) Visually inspect vanes for nicks, burrs, pits, and dents. Repair as necessary.



Tightening Compressor Housing Vane Assembly Bolts (Typical Each Half)
Figure 207

C. (Pre SB T53-L-13B-0105) Inspect Magnesium Impeller Housing Assembly

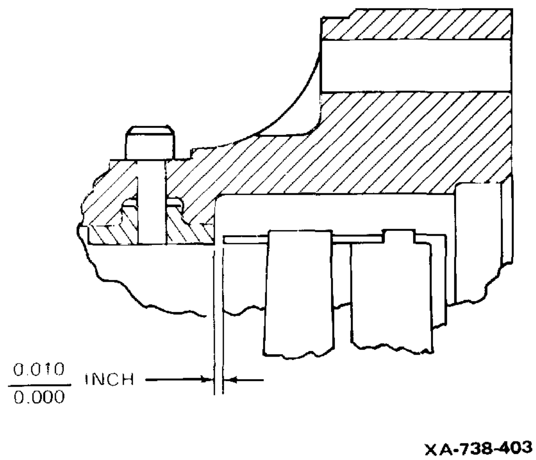
(1) Visually inspect centrifugal impeller housings for nicks and burrs. Repair as necessary.

(2) Visually inspect impeller for cracks. Cracks are not allowed. Replace if cracked.

(3) Visually inspect for broken alignment ears. Broken ears are not acceptable.

D. (Post SB T53-L-13B-0105) Inspect Stainless Steel Impeller Housing Assembly

(1) Inspect for nicks, dents, and rubs. Small scattered nicks and dents up to 0.010 inch in depth allowed. Slight rubs up to 0.005 inch in depth are allowed.



Exit Guide Vane Assembly Gap
Figure 208

(2) Inspect for corrosion. (See Figure 209.)

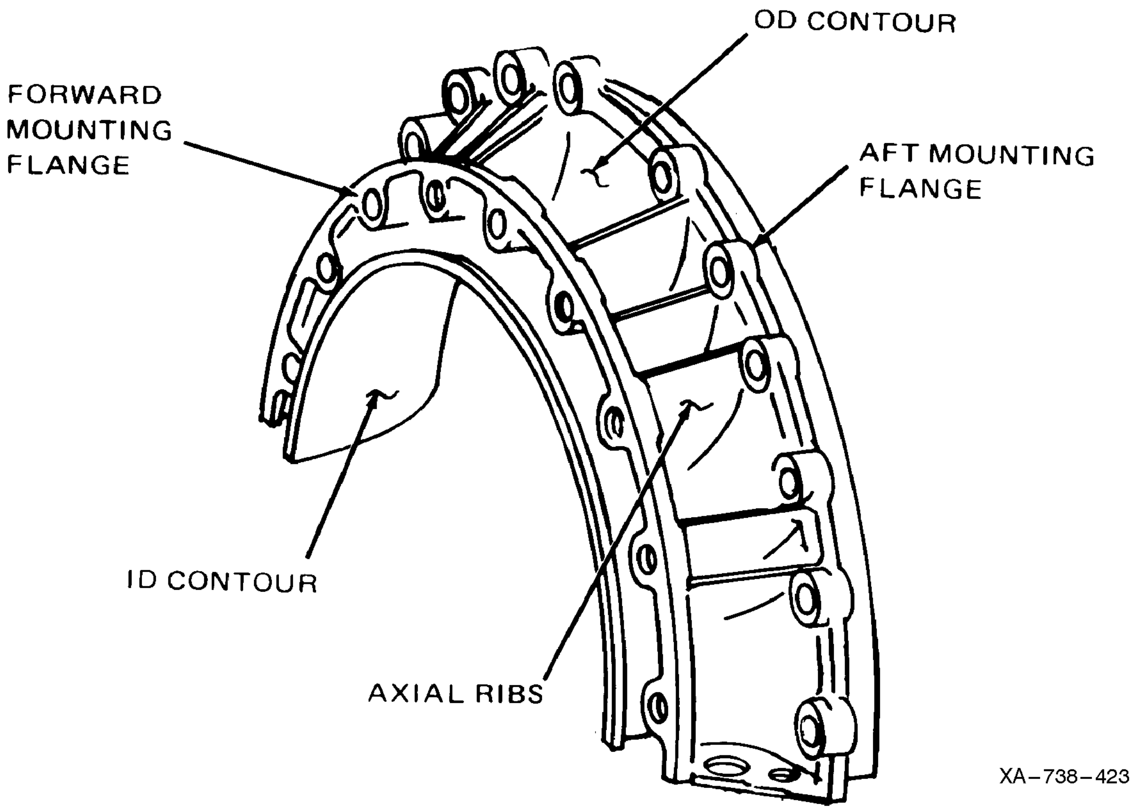
NOTE: Repair corrosion in Steps (a) through (b) which is within limits.

(a) Corrosion pitting on ID/OD contour wall thickness shall not exceed 0.010 inch deep. Replace if limits are exceeded.

(b) Minimum ID/OD contour wall thickness must exceed 0.070 inch. Replace if limits are not met.

(c) Corrosion on forward/aft mounting flange shall not exceed 0.030 inch. Replace if limits are exceeded.

(d) Corrosion on axial ribs shall not exceed 0.030 inch deep. Replace if limits are exceeded.



Stainless Steel Impeller Housing - Corrosion Inspection Areas
Figure 209

4. Approved Repairs

A. Repair Compressor Housing Assembly

CAUTION: IF EITHER HALF OF HOUSING IS DAMAGED BEYOND LIMITS, BOTH HALVES MUST BE REPLACED.

(1) Blend repair nicks and burrs from compressor housing. (See SPM, SP R401, 70-00-29.)

(2) Blend repair cracks. (See SPM, SP R401, 70-00-29.) Cracks that cannot be removed are not allowed. Replace compressor housings.

(3) Mechanically remove corrosion from housing.

(4) Touchup corroded areas. (See SPM, SP P525, 70-00-35.)

B. Repair Stator Vane Assembly.

NOTE: If damage on only one-half of a compressor vane assembly exceeds the maximum permissible limits, only that affected assembly half shall be replaced. Stator vane halves remaining after other halves have been rejected can be matched with another serviceable half provided the replacement half has approximately the same amount of erosion or FOD. Rematched stator vane assemblies shall meet all assembly requirements.

Blend repair shall be made with small diesinker type files and India or carborundum stones. Abrasive crocus cloth (72-00-00, 13, Table 203) shall be used for final polishing. Power tools shall not be used. All repairs shall be blended and finished smoothly. The finish strokes of all repair work shall be parallel to the leading edge of the vane.

The aggregate repair length on any one vane leading or trailing edge shall not exceed 40 percent of its length.

(1) Dents with smooth contours are acceptable without rework provided that they do not exceed repair limits. (See Figure 210.)

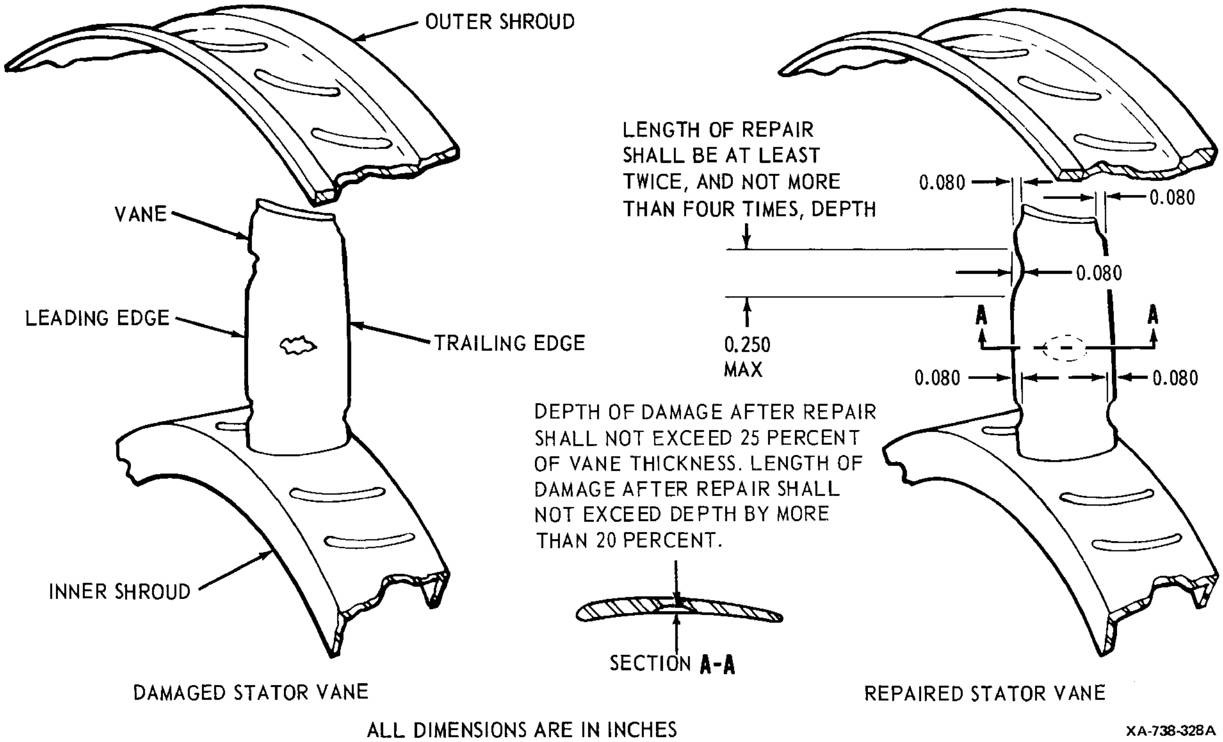
(2) Nicks, burrs, pits, and rough dents on the airfoil shall be blend repaired, provided that damage after repair does not exceed limits given.

(3) Nicks and dents up to 0.080 inch deep after repair are permitted on the leading and trailing edge. Length of repair shall be at least twice, and not more than four times, the depth.

(4) Nicks and dents on vanes in inaccessible areas of repair are acceptable without rework provided that they do not exceed maximum permissible limits.

(5) Bent vanes shall be straightened, using padded pliers or equivalent. If the straightening causes a crack in the vane, the assembly half shall be replaced.

(6) All stator vane halves remaining after other halves have been rejected can be rematched with another serviceable half. Rematched stator vane assemblies shall meet all assembly requirements and shall have approximately the same degree of foreign object damage or erosion. An eroded stator half shall not be rematched with a noneroded half.



Compressor Stator Vane Repair Limits
Figure 210

C. (Pre SB T53-L-13B-0105) Repair Magnesium Impeller Housing Assembly

WARNING: AVOID PROLONGED INHALATION OF SOLVENT VAPORS. WEAR RUBBER GLOVES AND USE HAND CREAM TO PREVENT CONTACT WITH SKIN. DO NOT HEAT SOLUTION.

(1) Remove foreign material, using dry cleaning solvent (72-00-00, 62, Table 203).

(2) Blend repair nicks and burrs from magnesium impeller housings. (See SPM, SP R401, 70-00-29.)

(3) Refinish painted surfaces. (See SPM, SP P525, 70-00-35.)

(4) Remove corrosion and touchup areas on impeller housings. (See SPM, SP P525, 70-00-35.)

D. (Post SB T53-L-13B-0105) Repair Stainless Steel Impeller Housing Assembly

(1) Blend repair nicks, dents, and rubs which exceeds limits. (See SPM, SP R401, 70-00-29.)

(2) Repair corroded ID/OD contour, forward mounting flange, aft mounting flange and axial ribs of stainless steel impeller housing.

(a) Clean corroded areas by hot alkali soak method. Remove corrosion residue using light grit blast. (See SPM, SP C206, 72-15-06, SP C207, 70-15-07, and SP C208, 70-15-08.)

(b) Emulsion degrease impeller housing to obtain clean dry surface. (See SPM, SP C214, 70-15-14.)

WARNING: PAINTS, PRIMERS, LACQUERS, AND VARNISHES MUST BE HANDLED CAREFULLY AND USED ONLY IN WELL-VENTILATED APPROVED AREAS. AVOID PROLONGED BREATHING OF VAPORS. AVOID EYE AND REPEATED SKIN CONTACT. KEEP AWAY FROM SPARKS AND FLAMES.

(c) Apply coating using Sermetal-W paint (72-00-00, 50A, Table 203) 0.0005 to 0.002 inches thick.

WARNING: HEATED COMPONENT PRESENTS A SERIOUS BURN POTENTIAL. TEMPERATURE RESISTANT GLOVES ARE REQUIRED.

(d) Bake impeller housing at 165 to 185°F (74 to 85°C) for 15 minutes. Bake 625 to 675°F (329 to 357°C) for minimum of 30 minutes.

(e) Inspect according to manufacturing requirements (Sermetal Company, Div, of Teleflex Inc, N. Wales, PA). Crazing (cracking) is not allowed.

COMPRESSOR ROTOR AND IMPELLER ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The compressor rotor assembly consists of a stainless steel front shaft assembly, stainless steel compressor rear shaft and a one piece titanium impeller, all of which are bolted to an electron beam welded axial compressor spool consisting of the second through fifth stages of the axial compressor. The gas producer rotor assemblies are mounted on the rear compressor shaft of the compressor rotor assembly. The compressor rotor assembly encloses, but is not connected to, the power shaft.

Two different No. 1 bearing seal designs are used in these engines. A positive contact seal 1-300-214-01/-03 must be used if seal journal in compressor front shaft has a vent hole (Pre SB 0046). If seal journal is solid, with no vent hole, face seal 1-300-585-01, or -02 must be installed (Post SB 0046).

COMPRESSOR ROTOR AND IMPELLER ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

A. Inspect Compressor Rotor Blades

(1) Visually inspect blades for bends or distortion.

CAUTION: IF ANY CRACKS OR CRACKLIKE INDICATIONS ARE FOUND ON ANY FIRST OR SECOND STAGE BLADE, SCRAP ALL FIRST AND SECOND STAGE BLADES. REPLACE WITH NEW BLADES.

NOTE: Prior to performing compressor blade fluorescent penetrant inspection, remove blade from first stage disc or rotor subassembly.

(2) Using a 10 power magnifying glass, visually inspect compressor blades for damage and cracklike indications. If either condition is found, perform fluorescent penetrant inspection, Type I, Method D, Level 3. (Refer to SPM, I305.)

NOTE: To facilitate rework, all damage or defects shall be identified and marked with an approved marking pencil (72-00-00, 59A, Table 203).

(3) Visually inspect blades for nicks, burrs, dents, and other foreign object damage.

(4) Inspect all compressor rotor blades for corrosion and pitting. Pitting is allowed provided.

(a) The major diameter of any pit does not exceed 0.015 inch (0.38 millimeter).

(b) The distance between pits is a minimum of five times the major diameter.

(c) Confirm that pits are corrosion and not erosion or impact damage using magnification as required. Replace defective blades.

NOTE: Varnish will appear as dark film, consisting of oil and dirt deposits that have hardened on blade surfaces.

(5) Visually inspect blades for varnish buildup.

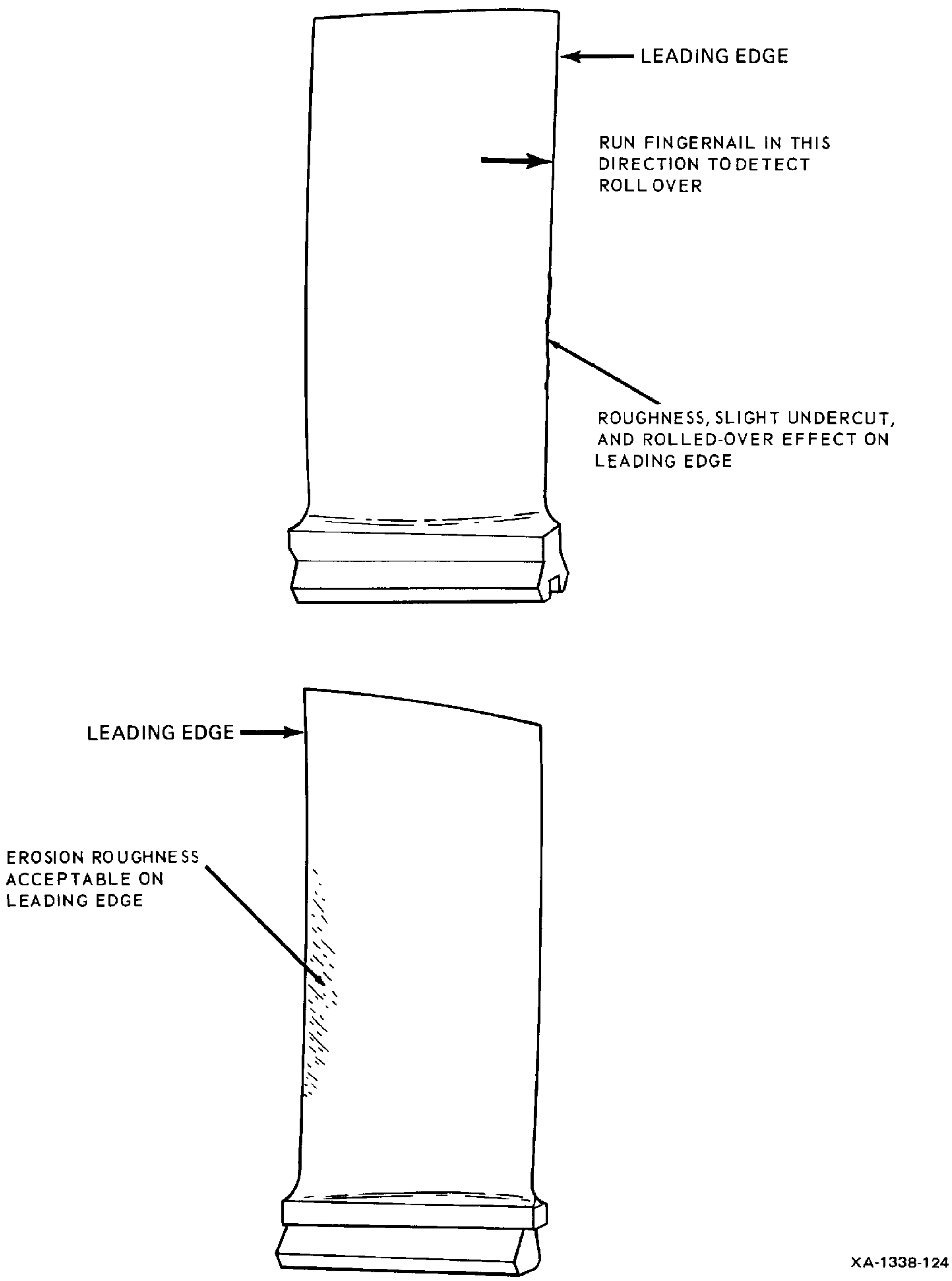
(6) Inspect first stage blades for inlet blockage. (See 72-00-00, ENGINE - INSPECTION, Paragraph 2.I.)

NOTE: Rolled over effect can be defected by running a fingernail along airfoil on convex side until leading edge is contacted.

(7) Using standard inspection equipment, inspect leading edge of blades for undercutting, erosion roughness, and slight rolled over effect. (See Figure 201.)

(a) Using a straight edge (6 inch scale or equivalent) placed slightly above platform radius, and a 0.0156 inch wire gage used as a GO or NO-GO device, determine degree of undercutting. (See Figure 202.) A maximum of 0.0156 inch is permissible along leading edge area between platform radius and tip. A wavy pattern (more than one undercut area) is unacceptable. If within limits, repair by stoning blades on leading edge only (from blade tip to critical area) to remove sharp projections and roll over burrs. Strokes shall be parallel to leading edge.

(b) Erosion roughness and roll over effect is acceptable provided previous requirements and requirements in following Step (8) are met.



Blade Repair Limits for Undercutting, Erosion and Rolled Over Effect
Figure 201

(8) Measure chordal width at midpoint of blades. Blades is acceptable for further use if chordal width is 0.962 inch or greater. (See Figure 202.) If limit cannot be met, replace defective blades.

B. Inspect Centrifugal Compressor Impeller Assembly

(1) Visually inspect blades for nicks, cracks or bending in the critical area. (See Figure 203.) No repair allowed. Smooth dents are acceptable provided they do not exceed 0.040 inch in diameter and 0.010 inch in depth.

(2) Visually inspect blades for cracks or bending in noncritical areas. No repair allowed. Minor dents and nicks are permitted and should be reworked provided a 0.025 inch blade thickness remains.

NOTE: Repair centrifugal compressor impeller assembly or replace, as required.

(3) Inspect leading edge of blades for erosion.

Using a straightedge placed across the forward lip of the centrifugal impeller, determine size of gap between straightedge and impeller blade. (See Figure 204.) A maximum gap of 0.093 inch is permissible. Measure all blades. Reject impeller if a rejected blade is found.

(4) Inspect blades for erosion. (See Figure 201.)

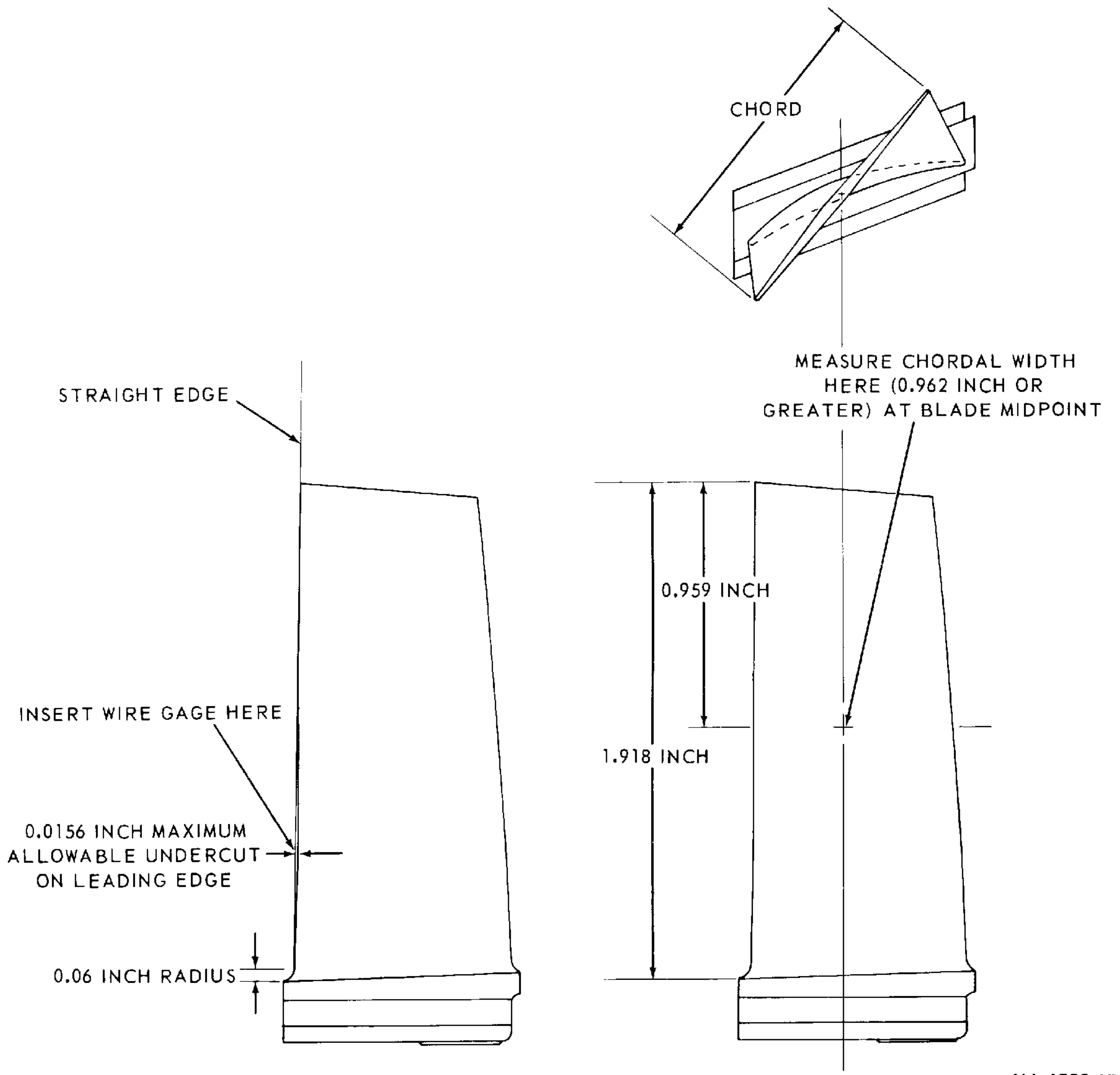
C. Inspect Compressor Rotor Assembly

(1) Inspect rotor areas between blades (spacer area). Minor nicks and dents are permitted without repair.

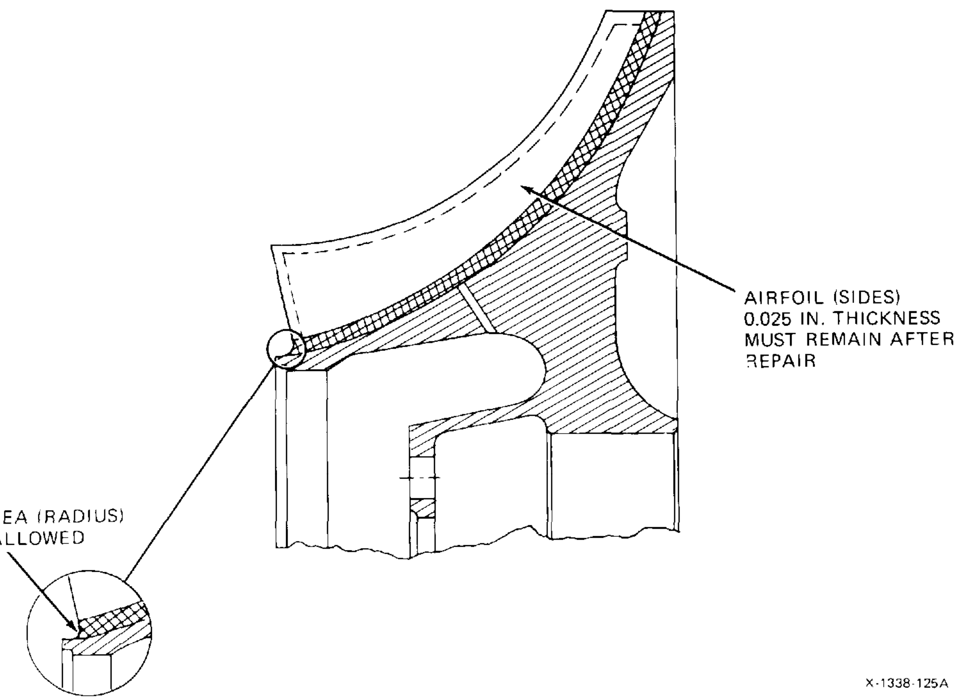
(2) Inspect blade retention areas. Damage other than minor well spaced nicks and dents is not allowed. Blend repair of nicks only to extent of removing sharp protrusions is permitted where access permits. (See SPM, SP R401, 70-25-01.)

D. Inspect Clearance of Compressor Rotor and Centrifugal Impeller

(1) Using a 12 inch feeler gage, take radial blade tip clearances of five compressor stages. Take two clearance readings, 180 degrees apart, for each rotor stage. Take clearance readings from compressor rotor blade tips to compressor housing. Rotate compressor rotor one full turn while taking clearance at each of the ten checkpoints. (See Figure 205.)



Blade Limits for Undercutting
Figure 202



Centrifugal Impeller Repair Limits
Figure 203

(2) Radial tip clearance for compressor rotor blades.

NOTE: When taking blade tip clearances, insert feeler gage 1/4 to 1/2 inch below the compressor housing flange line.

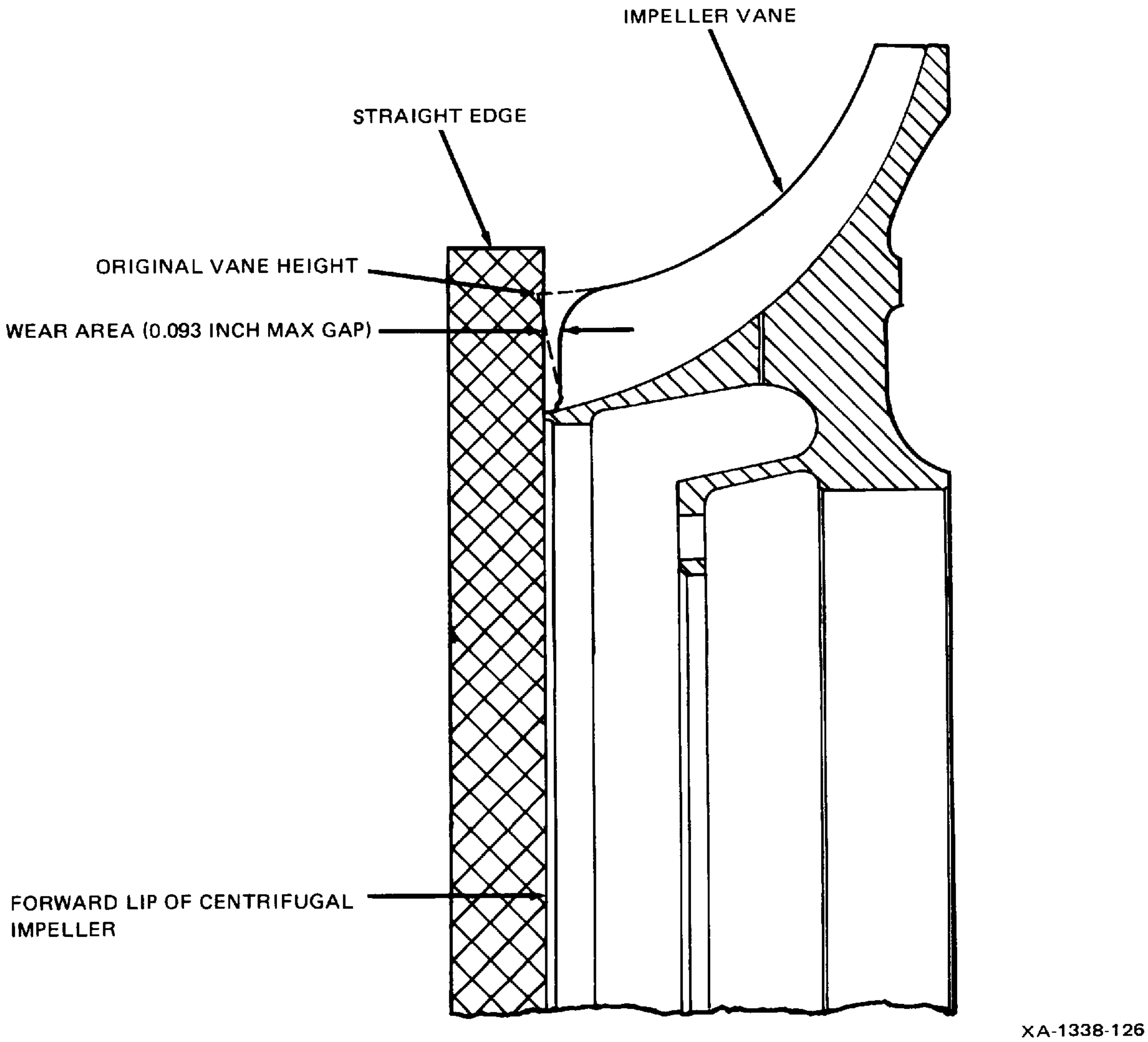
(a) First stage 0.018 inch minimum.

(b) Second stage 0.018 inch minimum.

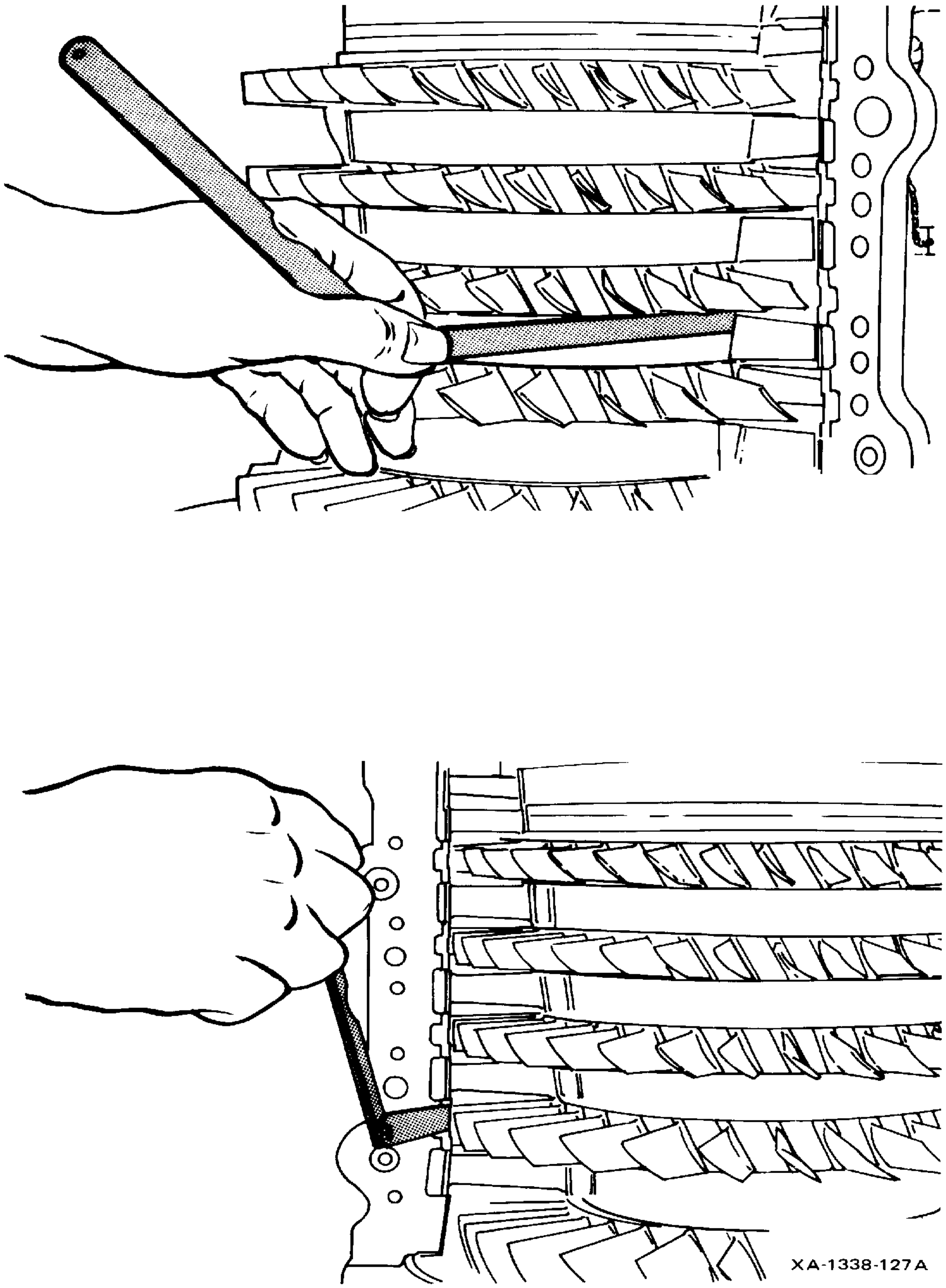
(c) Third stage 0.024 inch minimum.

(d) Fourth stage 0.024 inch minimum.

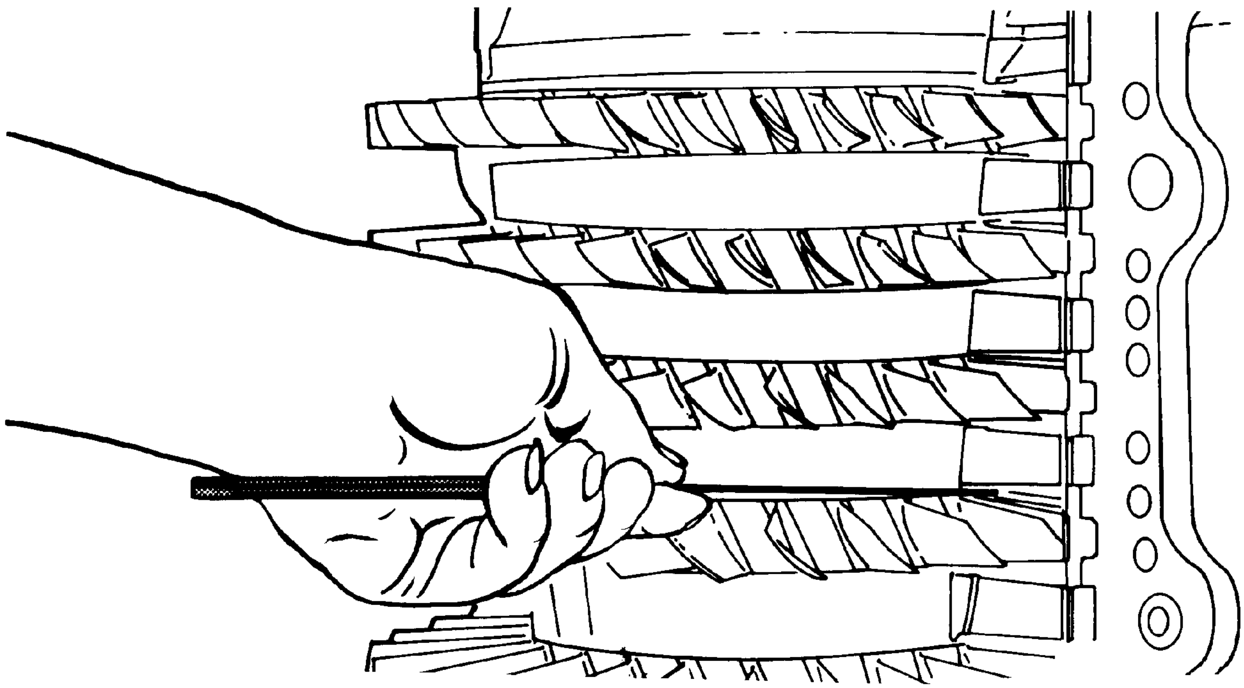
(e) Fifth stage 0.024 inch minimum.



Centrifugal Impeller Blade Erosion Limits
Figure 204



Radial Tip Clearances
Figure 205



Axial Clearance of Compressor Rotor Disc Assembly
Figure 206

(3) Using a 12 inch feeler gage, check radial clearance of four compressor vane assemblies and exit guide vane assembly. Take clearance readings from compressor stator vane to compressor rotor spacers as follows:

(a) Take two clearance readings, 180 degrees apart, from front of first stage compressor vane assembly to first stage compressor rotor spacer. Rotate compressor rotor one full turn while taking clearance readings at each of these two checkpoints.

(b) Take two clearance readings, 180 degrees apart, from rear of first stage compressor vane assembly to first stage compressor rotor spacer. Rotate compressor rotor one full turn while taking clearance readings at each of these two checkpoints.

(c) Take two clearance readings, 180 degrees apart, at front and rear of each compressor vane assembly to each compressor rotor spacer for the second through fifth rotor stages. The exit guide vane assembly requires only one clearance reading at the front. Rotate compressor rotor one full turn while taking clearance readings at each of these two checkpoints. (See Figure 206.)

(d) Radial clearances between compressor vane assemblies and compressor rotor spacers are as follows:

First through fifth stage 0.026 inch minimum clearance.

(4) Using 12 inch feeler gage, take axial clearance of compressor rotor disc assemblies to compressor vane assemblies for first through fifth stages. Take two clearance readings, 180 degrees apart, for each compressor rotor stage. Rotate compressor rotor one full turn while taking clearance readings at each of the 18 checkpoints. (See Figure 206.)

NOTE: If clearances are not within limits, check stator bolt torque.

Axial clearances between compressor rotor disc assemblies and compressor vane assemblies are as follows:

(a) First rotor to first vane 0.040 inch minimum.

(b) First vane to second rotor 0.040 inch minimum.

(c) Second rotor to second vane 0.040 inch minimum.

(d) Second vane to third rotor 0.040 inch minimum.

(e) Third rotor to third vane 0.040 inch minimum.

(f) Third vane to fourth rotor 0.040 inch minimum.

(g) Fourth rotor to fourth vane 0.040 inch minimum.

(h) Fourth vane to fifth rotor 0.040 inch minimum.

(i) Fifth rotor to exit guide vane 0.029 inch minimum.

(5) Using 12 inch feeler gage, take two axial clearance readings, 180 degrees apart, between impeller assembly and exit guide vane assembly. Rotate compressor rotor one full turn while taking clearance readings at each of the remaining checkpoints. Axial clearance between impeller assembly and exit guide vane assembly is 0.048 inch minimum.

NOTE: Tip clearance between impeller blades and impeller housing assembly are as defined in Table 201.

(6) Using 12 inch feeler gage, take radial tip clearance from centrifugal compressor impeller assembly blades to impeller housing assembly. Take clearance readings at forward end, center (midpoint), and rear of impeller blades on right side of engine, and clearance readings at forward end, center (midpoint), and rear of impeller blades on left side of engine. Rotate compressor rotor one full turn while taking clearance readings at each of the six checkpoints.

(7) Using 12 inch feeler gage, take two axial clearance readings, 180 degrees apart, between exit guide vane and impeller housing.

(8) Take two axial clearance readings, 180 degrees apart, between inlet guide vane and first rotor.

(9) With 12 inch feeler gage, take radial tip clearance between centrifugal compressor impeller blades and diffuser housing.

(10) If compressor rotor and centrifugal compressor impeller clearances are within specified limits and no further repair is required to the engine, compressor and impeller housings may be reinstalled.

Table 201. Impeller Blade Tip Clearance

Impeller Blades Impeller Housing Assembly	Direction	Magnesium Housing Clearance (Inches) Minimum	Stainless Steel Housing Clearance (Inches) Minimum
Centrifugal Compressor Impeller Assembly to Im– peller Housing Assembly (Forward End of Impeller Blade) (A Clearance)	Radial	0.017	0.023
Centrifugal Compressor Impeller Assembly (Mid– point of Impeller Blade) (B Clearance)	Radial Axial	0.037	0.037
Centrifugal Compressor Impeller Assembly to Im– peller Housing Assembly (Rear of Impeller Blade) (C Clearance)	Axial	0.052	0.052
Exit Guide Vane to Impeller Housing	Axial	0.000	
Inlet Guide Vane to First Rotor	Axial	0.038	
Impeller Blades to Diffuser Housing	Axial	0.036	

NOTE: All clearances are measured with bearing end play taken up in a forward direction.

2. Approved Repairs

A. Repair Compressor Rotor Blades

NOTE: Repairs shall be made with small diesinker type files and India or carborundum stones. Abrasive crocus cloth (72-00-00, 13, Table 203) shall be used for final polishing. Power tools shall not be used. All repairs shall be blended and finished smoothly. Lines, scratches, or sharp edges that might cause a concentration of stress are not permitted. Finish strokes of all repair work shall be parallel to the leading edge of the blade. When the blade is repaired on the leading and trailing edges, the edges shall be blended to a smooth radius as part of the repair. For typical compressor rotor blade damage before and after repair. (See Figure 207.) All defects in noncritical areas shall be repaired with the exception of smooth dents where burrs are not evident.

(1) Finished repairs to leading or trailing edges shall be limited as follows. (See Figure 207.)

(a) No repairs or damage allowed within first 0.5 inch of blade span as measured from blade root in any area on first and second stage blades. (See Figure 207.)

(b) No repairs are allowed within 1/4 inch from blade root in any area on third, fourth, and fifth stage blades. Smooth dents not exceeding 1/32 inch on longest side and 0.010 inch deep are acceptable without rework. (See Figure 207.)

NOTE: Maximum allowable repair depth decreases as distance L decreases. (See Figure 207.)

(c) Maximum allowable depth of repair on leading and trailing edges of blades is shown in Figure 207.

(d) Repairs to damage within 1/8 inch of blade tip shall be continued to tip. (See Figure 207.)

(e) If distance between two damaged areas is less than 3/32 inch, make one blend repair. If distance is greater than 3/32 inch, make separate repairs.

(2) Finished repairs on blade tip edges shall be limited as follows. (See Figure 207.)

(a) Maximum allowable repair depth is 3/32 inch.

(b) Minimum allowable repair length is three times repair depth.

NOTE: A minimum of 1/2 of blade tip chordal width must remain after blend repairs. (See Figure 207.)

(c) If damage is closer to tip edge than 1/16 inch, blend repair to leading or trailing edge, whichever applies.

(3) Finished repairs to blade airfoil surfaces shall be limited as follows:

(a) Minimum airfoil thickness after repair shall be three-fourths original thickness.

(b) If distance between two damaged areas is less than 3/32 inch, make one blend repair. If distance is greater than 3/32 inch, make separate repairs.

(c) Maximum allowable repair length on blade airfoil areas shall be 13/32 inch.

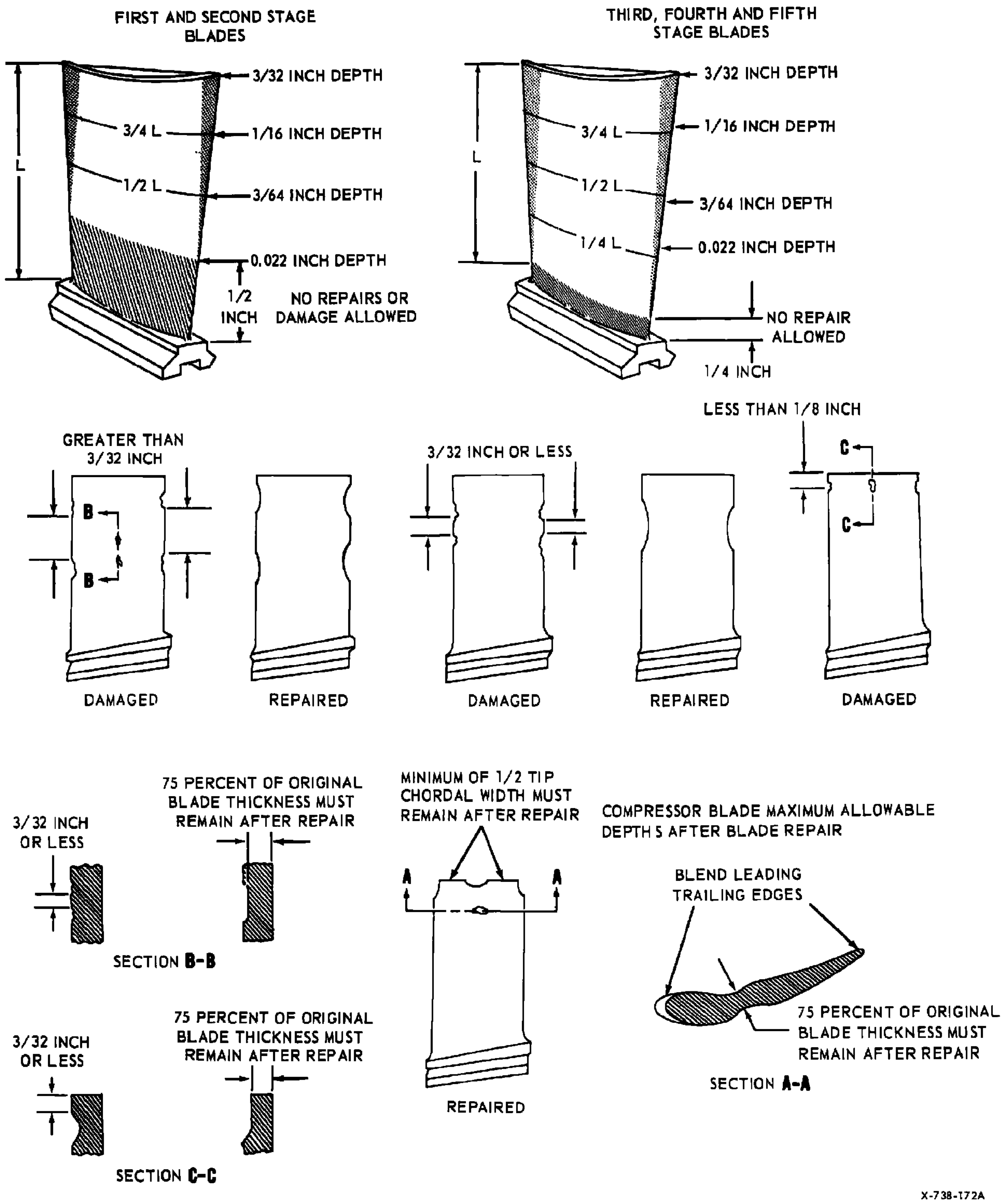
(d) Remove scratches or lines in airfoil areas. Repairs shall be within limits.

(e) No more than 20 percent of total blade material may be removed during repairs.

(4) If damage or repair dimensions exceed allowable limits, replace blade.

CAUTION: DO NOT ATTEMPT TO STRAIGHTEN BENT OR DISTORTED BLADES.

(5) Replace bent or distorted blades.



Compressor Rotor Blade Damage before and after Repair (All Stages)
Figure 207

(6) Remove varnish on airfoil surfaces as follows:

NOTE: Lapping compound is prepared by mixing one part by volume aluminum oxide, Grade 400 (72-00-00, 5, Table 203) with 3 parts cutting oil (72-00-00, 22, Table 203).

(a) Place lapping compound on soft cotton cloth.

CAUTION: MAKE SURE THAT BLADES ARE RUBBED ONLY IN A RADIAL DIRECTION (PARALLEL TO LEADING EDGE).

(b) Using thin piece of wood or plastic to support the cloth, rub coated blades to remove varnish buildup.

(c) Reinspect all blades to ensure that varnish buildup has been completely removed. Repeat preceding Steps (a) and (b), if necessary.

(d) Remove all traces of lapping compound with soft cotton cloth, moistened with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

B. Removal of Compressor Rotor Blades

NOTE: First stage rotor blades are removed rearward. Second through fifth stage rotor blades of compressor rotor subassembly are removed in a forward direction.

(1) Remove upper compressor and impeller housings. (See 72-30-01.)

CAUTION: MAKE CERTAIN TO HOLD LOCKING PLATE AND BLADES SECURELY TO AVOID DROPPING THEM BETWEEN INLET GUIDE VANE AND FIRST STAGE COMPRESSOR ROTOR DISC OR INTO LOWER COMPRESSOR ROTOR HOUSING.

DO NOT ALLOW TOOLS TO CONTACT COMPRESSOR DISC AREA.

(2) Using a drift and a soft faced mallet, straighten tab of locking plate of blade to be removed from first stage disc.

(3) Insert drift assembly LTCT1643 through front of inlet housing and through inlet guide vane to contact base of damaged first stage rotor blade. Inlet guide vane may be moved as necessary to facilitate blade removal. Gently tap remover to remove blade from disc. Remove and discard locking plate after blade removal. Remove pin if damaged.

CAUTION: WHEN A DAMAGED FIRST STAGE ROTOR BLADE IS TO BE REPLACED, THE 16TH BLADE LOCATED COUNTERCLOCKWISE FROM DAMAGED BLADE LOCATION AS VIEWED FROM REAR OF FIRST STAGE ROTOR DISC MUST ALSO BE REMOVED TO MAINTAIN PROPER ROTOR BALANCE.

(4) Using procedures in preceding Steps (2) and (3), remove the 16th blade located counterclockwise from damaged blade location as viewed from rear of first stage rotor disc.

(5) Repeat procedures in Steps (2), (3), and (4) until all blades that are to be replaced have been removed from first stage rotor assembly.

NOTE: Up to 10 sets of blades may be replaced if damage is limited to ten sets or less. If more than ten blade sets are damaged, replace all blades.

(6) Using a brass or nylon drift and soft faced mallet, straighten tab of locking plate of blade to be removed from compressor rotor subassembly.

(7) On second through fifth stage rotor blades of compressor rotor subassembly, use drift LTCT1644 and gently tap blade out of disc. Remove and discard locking plate after blade removal. Remove pin if damaged. (See Figure 208.)

CAUTION: WHEN A DAMAGED SECOND THROUGH FIFTH STAGE ROTOR BLADE IS TO BE REPLACED BY A FIELD REPLACEMENT BLADE, THE BLADE IS LOCATED 180 DEGREES DIAMETRICALLY OPPOSITE TO DAMAGED BLADE MUST ALSO BE REPLACED TO MAINTAIN PROPER ROTOR BALANCE.

(8) Using procedures in preceding Steps (6) and (7), remove rotor blade located 180 degrees diametrically opposite from damaged blade.

NOTE: There is no limit to the number of blade sets that may be replaced. If more than six sets of blades are replaced, an engine vibration check shall be performed. (See 71-00-00, Paragraph 11.E.)

Return to supply all serviceable blades that have been removed in order that they may be made into replacement sets.

(9) Repeat the procedures in Steps (7) and (8) until all blades that are to be replaced have been removed from second, third, fourth, or fifth stage compressor rotor subassembly.

C. Inspection of Blade Root Coating

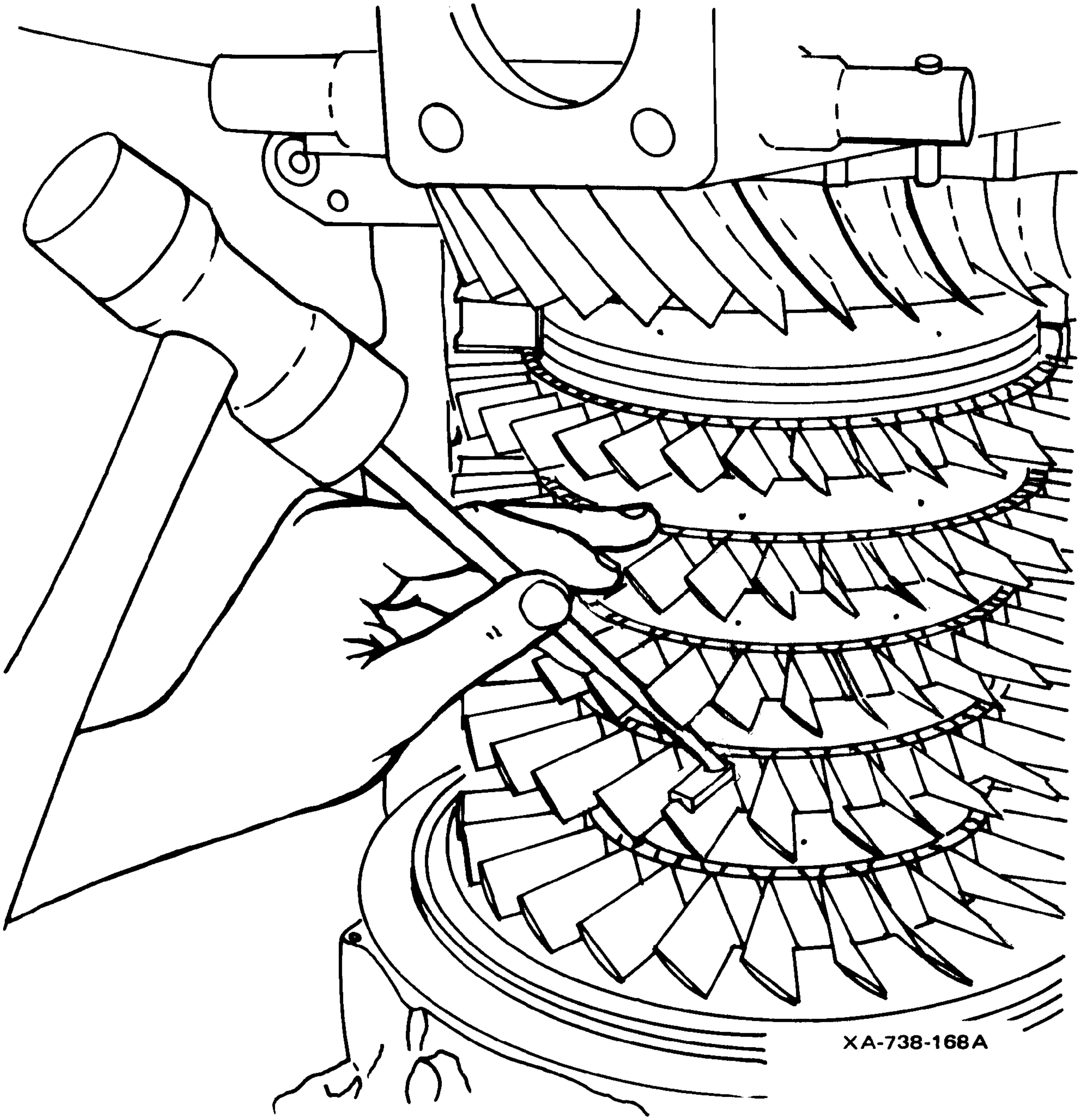
(1) If coating is not present or is damaged on affected blade root surfaces, graphite varnish coat compressor rotor blade roots as follows:

NOTE: If facilities are not available to apply graphite varnish coating to blade roots, then new blades that have coated blade roots shall be installed.

(2) Prepare blade roots for coating as follows:

(a) Clean blades by dry cleaning solvent method. (See SPM, SP C203, 70-15-03.)

(b) Mask airfoil surfaces of blades using two stainless steel plates 1.75 inches wide by 20 inches long by 0.060 inch thick and two pieces of rubber 1.75 inches wide by 18 inches long by 0.125 inch thick. (See Figure 209.)



Removing Compressor Rotor Blade (Typical)
Figure 208

NOTE: Slurry shall be agitated or circulated in such a manner to prevent settling of abrasive.

(c) Prepare wet abrasive slurry, 40 percent liquid abrasive (72-00-00, 39, Table 203) by volume, balance water, and vapor blast blades. (See SPM, SP C205, 70-15-05.)

NOTE: Do not slush in oil.

(d) Remove masking and rinse; first with cold water, then with hot water heated to 160°F (71°C) minimum. Dry in oven for 10 minutes at 335°F (168°C).

(3) Prepare and apply graphite varnish coating as follows:

(a) Using cardboard masks 2 inches wide by 20 inches long, mask airfoil surfaces. (See Figure 210.)

(b) Mix one part corrosion preventive synthetic resin varnish (72-00-00, 69, Table 203) with two parts graphite suspension (colloidal) in “dag” dispersion (72-00-00, 23, Table 203).

(c) Apply graphite varnish as follows. (See Figure 211.)

WARNING: PAINTS, PRIMERS, LACQUERS, AND VARNISHES MUST BE HANDLED CAREFULLY AND USED ONLY IN WELL-VENTILATED APPROVED AREAS. AVOID PROLONGED BREATHING OF VAPORS. AVOID EYE AND REPEATED SKIN CONTACT. KEEP AWAY FROM SPARKS AND FLAMES.

1 Using a Binks spray gun equipped with nozzle 66SD (Binks Company), or equivalent, at an air pressure of 30 psig, make passes at a moderate speed approximately 8 inches from blades.

2 Make one pass in each direction on each side.

3 Wait 3 to 4 minutes for solvent to evaporate.

4 Make one pass in each direction on each side.

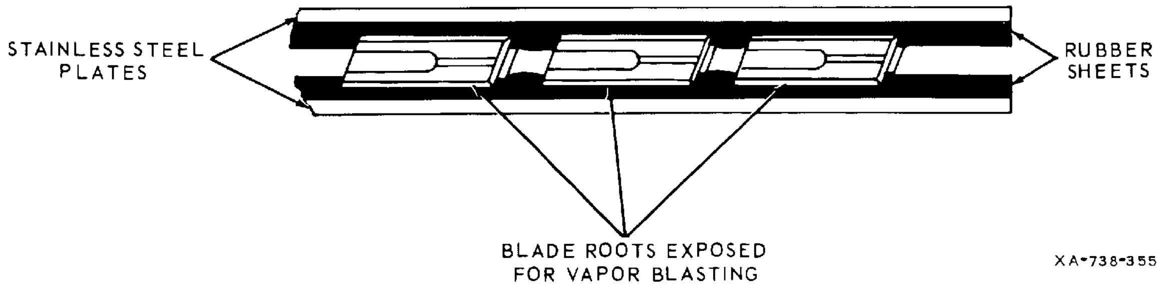
5 Air dry for at least 15 minutes or until dry to touch.

(d) Remove blades from cardboard mask and arrange in oven rack.

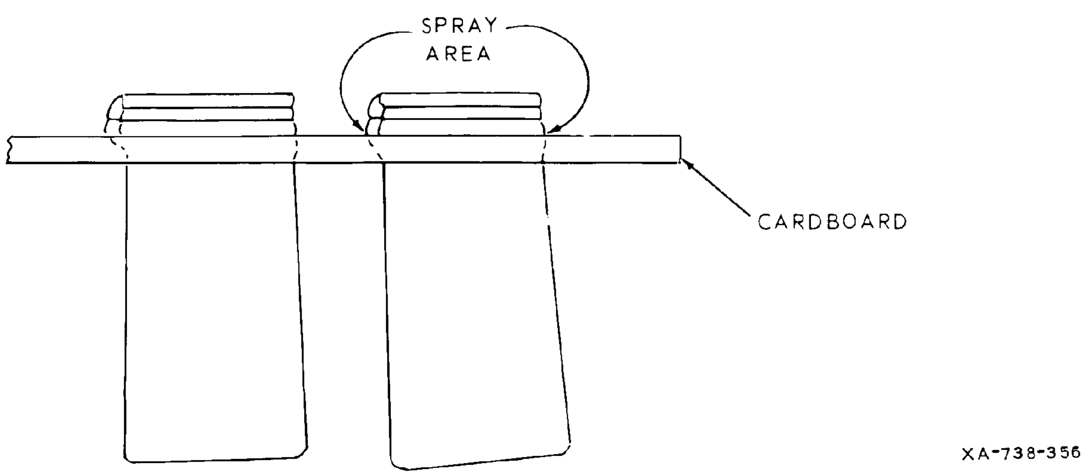
(e) Cure by heating in a hot air circulated oven to 325 to 345°F (163 to 174°C) for 50 minutes or 300°F (149°C) for 1 to 2 hours.

WARNING: HEATED COMPONENT PRESENTS A SERIOUS BURN POTENTIAL. TEMPERATURE RESISTANT GLOVES ARE REQUIRED.

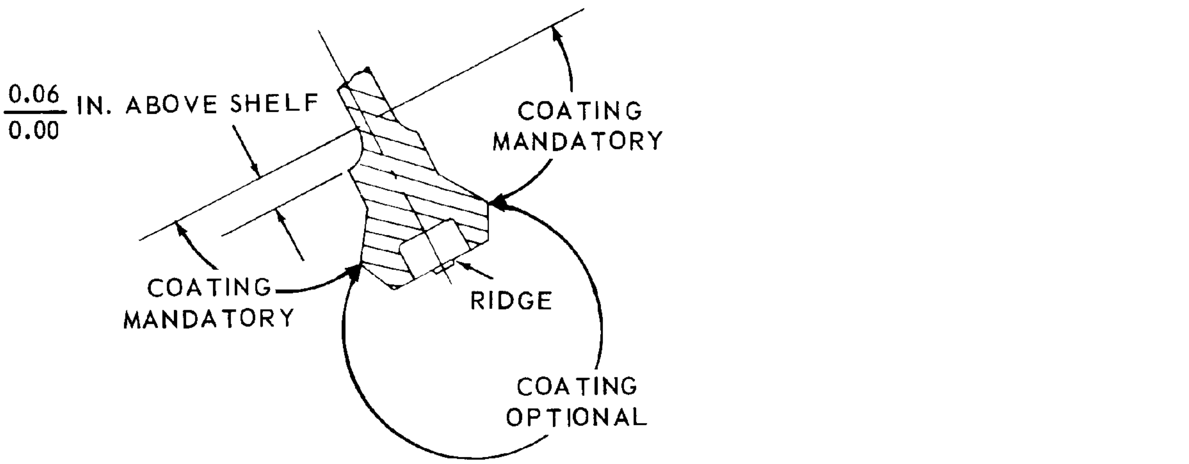
(f) Using temperature resistant gloves, remove blades from oven, and air cool.



Masking Airfoil Surfaces in Preparation for Vapor Blasting of Blade Roots
Figure 209



Masking Shield Preparation Prior to Spraying Blade Roots
Figure 210



Coating of Blade Roots
Figure 211

D. Installation of Compressor Rotor Blades

NOTE: On the third, fourth, and fifth stage rotor discs, six blade sets (12 blades) per rotor disc may be replaced. If more than 6 blade sets are required, forward engine to a Honeywell approved overhaul facility.

Prior to installation of compressor rotor blades in any stage, ensure that affected surfaces of roots are coated with graphite varnish. (See Figure 211.) If coating is not present, or is damaged, blade roots must be coated with graphite varnish. (See Paragraph 2.C.)

All blades replaced in the field shall be replaced in pairs, using special field (shorter) blade sets. Following is a list of field replacement blade sets.

Stage	Part No.
First	1-100-361-05
Second	1-100-286-08
Third	1-100-383-04
Fourth	1-100-384-04
Fifth	1-100-385-04

NOTE: First stage compressor rotor blades are installed from the rear in a forward direction. Blades of second through fifth stages are installed from the front in a rearward direction. Field replacement blades will carry the symbol “O” vibropeened on rear face of blade root. In the event of subsequent damage to one of these blades, it may again be replaced without violating the maximum allowable limits. If a blade carries symbol “O” with an “X” through it, that blade has been a field maintenance replacement at one time, but has since been through overhaul and may now be considered as having no symbol. If replacement blades do not have an “O” on the blade root, they shall be so marked, using a vibropeen marking tool, before they are installed.

(1) Perform the following steps for blade installation of compressor front shaft assembly (first stage disc).

NOTE: The compressor front shaft assembly has a compliment of 31 blades and requires a special assembly procedure. The following steps must be performed for blade installation of the first stage compressor disc only.

Blade weight to the nearest 0.1 gram is stamped on the convex side of each blade. Two blades marked with equal weights are a set and are to be kept together.

(a) Blade sets are to be arranged in a row according to ascending weights.

Step I

EXAMPLE

Set 1-2-3-4-5-6-7-8*-9-10-11-12-13-14-15
Grams 16.6 16.8-- -- -- -- 17.6 17.8

NOTE: As blade set No. 8 requires three blades, take one blade from set No. 9 and place it in set No. 8. Retain other blade No. 9 as a spare. Set No. 10 becomes set No. 9, set No. 11 becomes 10, etc, as only 15 sets are required for installation.

(b) Starting with set No. 2 remove every other set and with these sets make a second row keeping sets in order of descending weights.

Step II

EXAMPLE

Row I- 1-3-5-7-9-11-13-15
Row II-14-12-10-8*-6-4-2

*3 blade set within 0.2 gram of each other.

(c) Reposition row II to the right of row I to form a single row of blade sets that are in assembly order.

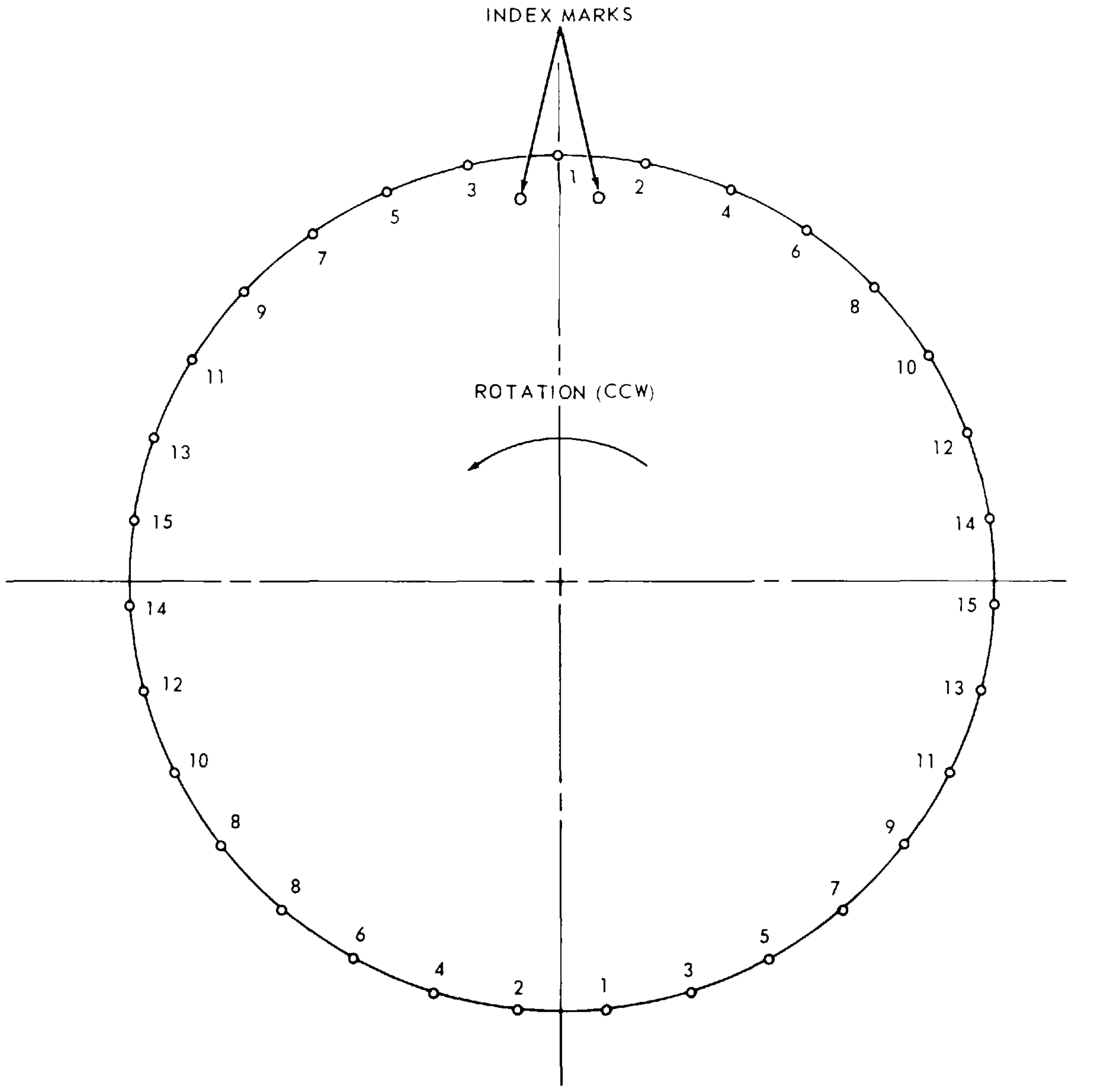
Final Row 1-3-5-7-9-11-13-15-14-12-10-8*-6-4-2

*3 blade set within 0.2 gram of each other.

CAUTION: IF FOR ANY REASON A BLADE MUST BE REPLACED, REPLACEMENT MUST BE ACCOMPLISHED USING A MATCHED SET, USING ONE BLADE OF A SET TO REPLACE THE DAMAGED BLADE AND THE OTHER BLADE OF THE SET TO REPLACE A BLADE ONE PLACE FARTHER, IN THE DIRECTION OF ROTATION, THAN THE THEORETICAL 180 DEGREES OPPOSITE BLADE.

(d) Assemble blades into disc as shown. (See Figure 212.)

(2) Using pin installer LTCT256, install new pins (color coded either red or green), if required.



First Stage Disc Blade Arrangement
Figure 212

(3) Install locking plate on pin in root of disc.

NOTE: When installing blades, press thumb against blade root until blade is seated against pin. If blades cannot be installed by hand, use installation tool LTCT4179 and torque wrench. Installation force should not exceed 30 inch-pounds torque.

(4) Using a soft faced mallet and a suitable brass drift, bend tab of locking plate against blade root.

CAUTION: DO NOT ALLOW TOOL TO CONTACT COMPRESSOR DISC AREA.

(5) Perform the following steps for blade installation of the second through fifth stage of the compressor rotor subassembly.

CAUTION: IF, FOR ANY REASON, A BLADE MUST BE REPLACED, THIS REPLACEMENT MUST BE ACCOMPLISHED USING MATCHED BLADE SETS.

NOTE: Blade sets for each stage are to be selected from random order. No systematic grouping is required.

(6) Assemble blade sets for each stage into proper disc so that each blade in a set is 180 degrees from its mate.

(7) Using pin installer LTCT256, install new pins (color coded either red or green), if required.

(8) Install locking plate on pin in root of disc.

CAUTION: DO NOT ALLOW TOOL TO CONTACT COMPRESSOR DISC AREA.

NOTE: When installing blades, press thumb against blade root until blade is seated against pin. If blades cannot be installed by hand, use installation tool LTCT4179 and torque wrench. Installation force should not exceed 30 inch-pounds torque.

(9) Using a soft faced mallet and a suitable brass drift, bend tab of locking plate against blade root.

(10) Check compressor rotor blade tip clearances. (See Paragraph 1.D.)

(11) Install compressor and impeller housings. (See 72-30-01.)

E. Repair Centrifugal Compressor Impeller Blades

NOTE: Repairs shall be made with small diesinker type files and India or carborundum stones. Abrasive crocus cloth (72-00-00, 13, Table 203) shall be used for final polishing. Power tools shall not be used. All repairs shall be made by removing only as much material as necessary to permit a smooth repair. Minor dents and nicks in noncritical areas should not be reworked provided 0.025 inch blade thickness remains. Repair in critical area is not allowed except as shown. (See Figure 213.)

(1) One blade leading edge may be repaired by removing up to 0.130 inch of material. Should more than one blade require 0.075 to 0.130 inch of material removal, proceed as outlined in following Step (2).

(2) Up to five blades requiring removal of 0.075 to 0.130 inch of material may be repaired as follows:

NOTE: If more than five blades are affected, forward engine to overhaul facility for replacement of centrifugal compressor impeller assembly.

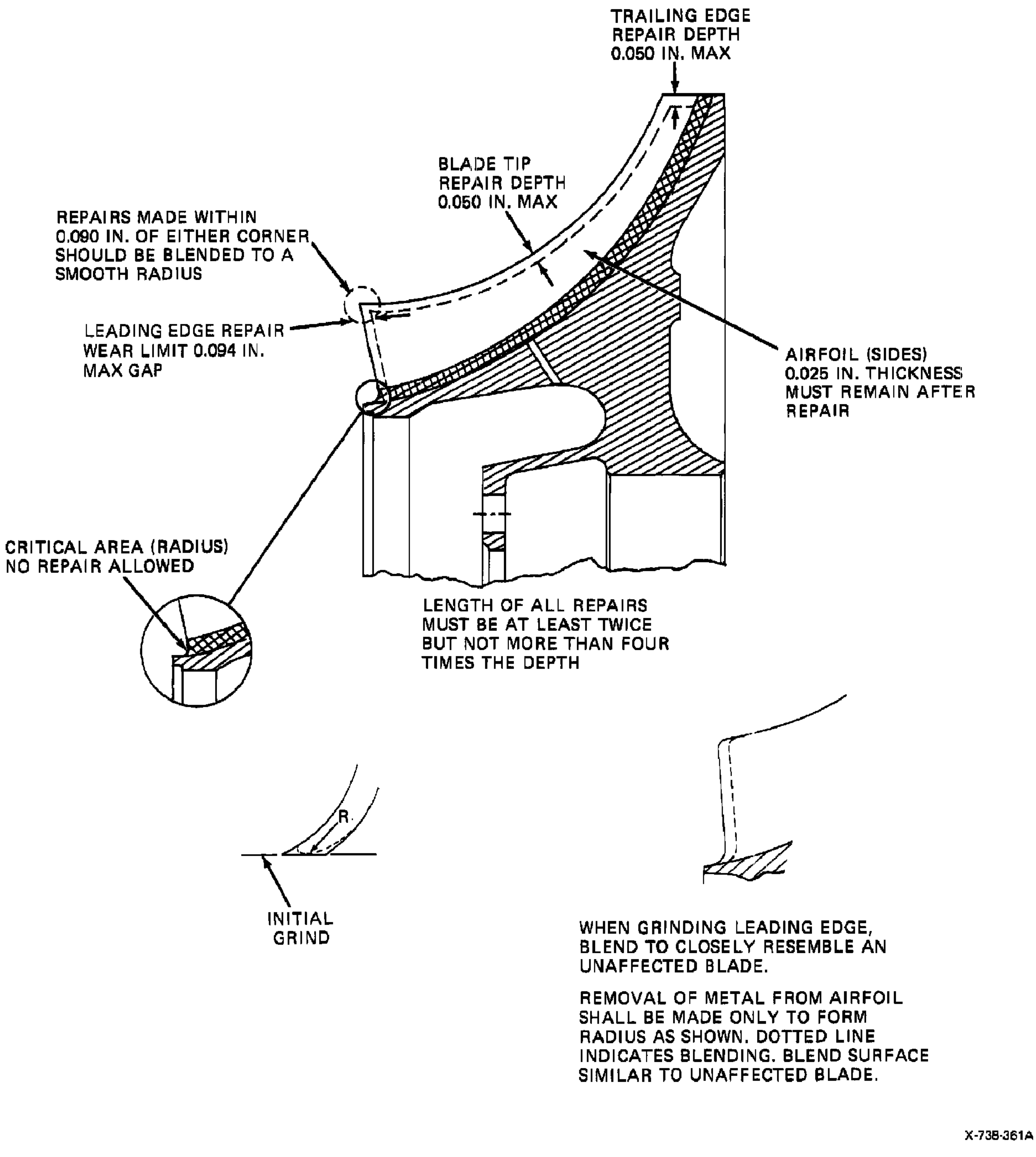
(a) Blend repair leading edge of blade as shown using care not to exceed 0.130 inch of material removal. (See Figure 209.)

NOTE: The 10 total blades include any blades previously repaired to the 0.130 inch limit. Total of 10 blades is defined as total number of reworked blades on the impeller assembly.

A vibration check of engine must be made if preceding Steps (1) or (2) have been accomplished. (See 71-00-00.)

(b) Remove same amount of material from blade 180 degrees away (directly opposite) from repaired blade.

(3) All other repairs to impeller blades shall be accomplished in accordance with limits shown in Figure 213.



Centrifugal Compressor Impeller Blade Repair Limits
Figure 213

COMBUSTOR TURBINE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The combustor turbine assembly consists of the exhaust diffuser support cone assembly, fuel manifold assembly, fireshield assembly, exhaust diffuser assembly, power turbine rotor and bearing housing assembly, V-band coupling, combustion chamber assembly, second stage power turbine nozzle, first stage power turbine rotor, and first stage power turbine nozzle. The power turbine rotor and bearing housing assembly consists of the second stage power turbine disc and blades, No. 3 and 4 bearings, bearing seal, and No. 3 and 4 bearing housing. The combustion chamber assembly consists of the combustion chamber liner and combustion chamber housing.

COMBUSTOR TURBINE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Combustor Turbine Assembly

NOTE: The combustor turbine assembly may be removed while the engine is installed in the aircraft.

(1) Remove clamps that secure ignition coil and lead assembly to combustor turbine assembly. Disconnect ignition coil and lead assembly from four igniter plugs, and oil pressure and scavenge hoses. Cap all oil lines.

(2) Remove clamps that secure main fuel hose assembly to combustor turbine assembly. Remove bolt and nuts that secure fuel solenoid valve to combustor turbine. Disconnect main fuel hose assembly from fuel control and flow divider assembly. Remove hose assembly. Cap all open ports.

(3) Remove clamps that secure starting fuel hose assembly to combustor turbine assembly. Disconnect starting fuel hose assembly from starting fuel solenoid valve and tee between halves of starting fuel manifolds.

(4) Remove clamp that secures fuel hose assembly between overspeed solenoid valve assembly and flow divider. Remove hose assembly. Remove hose assembly between fuel control and overspeed solenoid valve.

(5) Remove clamps securing wiring to overspeed solenoid valve. Remove electrical connector valve and remove solenoid valve.

(6) Remove bolt (12, Figure 201) and tablock (11) that secure exhaust diffuser cover (10) to rear bearing cover (8). Remove exhaust diffuser cover (10). Discard tablock (11).

(7) Using suitable tapered feeler gages, measure gap between rear bearing cover (8) and exhaust diffuser in eight equally spaced places. The optimum gap would be 0.005 inch at all locations, but up to 0.007 inch is allowable at any point if the direct opposite measurement does not exceed 0.003 inch. If limit is exceeded, proceed as follows:

(a) Inspect ID of exhaust diffuser. If average diameter in eight places exceeds 6.066 inches, remove and replace exhaust diffuser.

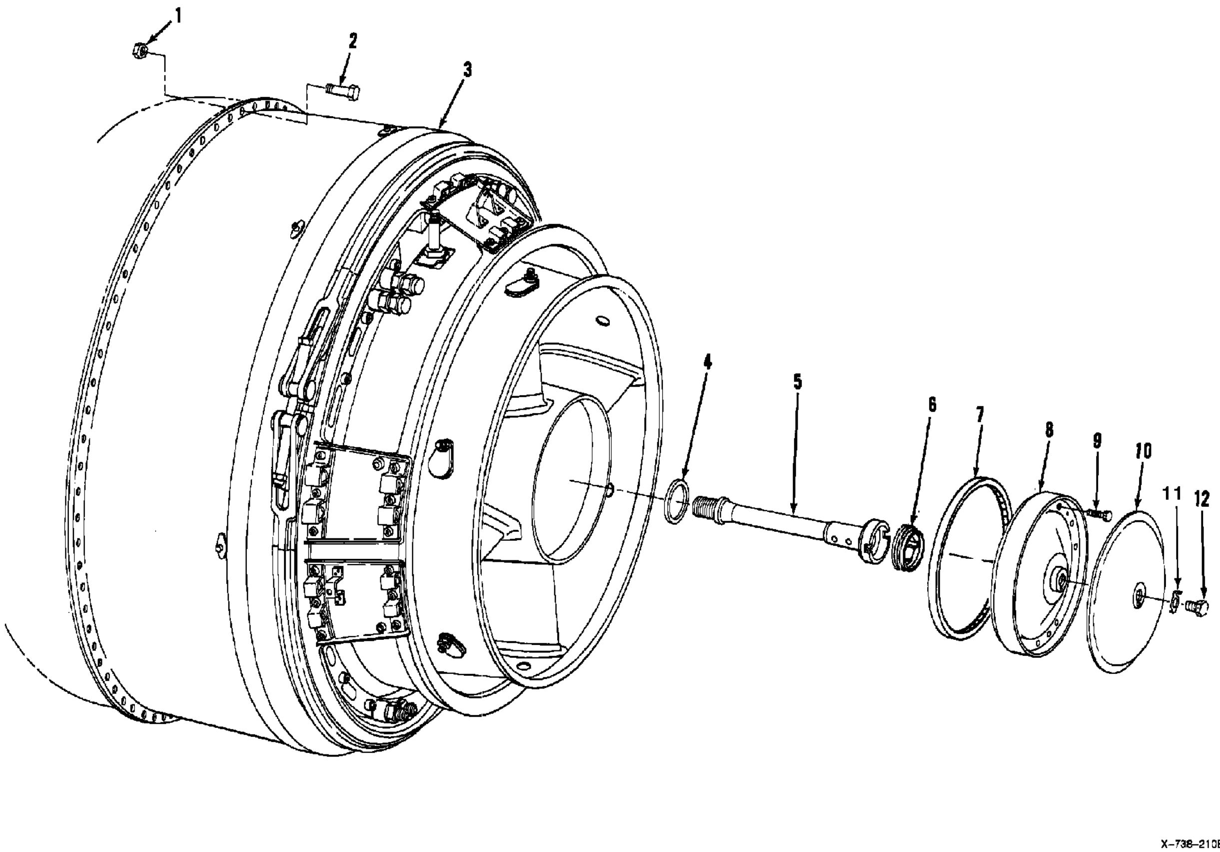
(b) Inspect OD of rear bearing cover (8). If average diameter in eight places is less than 6.056 inches, replace cover.

(8) Remove bolts (9) that secure rear bearing cover (8) to exhaust diffuser.

(9) Install three 1/4-28 threaded pusher screws in rear bearing cover (8) at approximately 1, 4, and 9 o'clock positions. Tighten pusher screws evenly and remove rear bearing cover (8) and seal (7). Seal (7) is reusable.

(10) Straighten deformed rim of power shaft internal wrenching nut (6) at four places.

(11) Install torque adjustment fixture LTCT962 into rear of combustor turbine assembly and engage tangs of locking plate assembly with slots in bearing retainer nut. Secure plate assembly with three bolts.



1. NUT
2. BOLT
3. COMBUSTOR TURBINE ASSEMBLY
4. SHIM
5. POWER SHAFT BOLT
6. NUT
7. SEAL
8. REAR BEARING COVER
9. BOLT
10. EXHAUST DIFFUSER COVER
11. TABLOCK
12. BOLT

Combustor Turbine Assembly
Figure 201

(12) Using socket wrench LTCT505, remove and retain internal wrenching nut (6) for use in following Step (20). (See Figure 202.)

(13) Using socket wrench LTCT506, remove power shaft bolt (5, Figure 201) and shims (4).

NOTE: Record shim thickness and attach shims, nut, and bolt to air diffuser.

(14) Position combustion lifting sling LTCT14668-01, or equivalent, around flange of diffuser support cone. (See **Error! Reference source not found.**.)

(15) Attach suitable hoist to lifting eye of adapter.

(16) Mark relationship of combustor turbine assembly to air diffuser using approved silver marking pencil (72-00-00, 59A, Table 203).

NOTE: Using an approved marking pencil, identify and mark all bolt holes at which brackets were secured.

(17) Using socket wrench LTCT393, remove bolts (2, Figure 201) and nuts (1) that secure combustor turbine assembly (3) to diffuser housing.

CAUTION: WHILE REMOVING COMBUSTOR TURBINE ASSEMBLY, MAKE SURE THE POWER SHAFT DOES NOT MOVE AFT. MOVEMENT OF THE POWER SHAFT COULD CAUSE THE SUN GEARSHAFT TO IMPACT AND DAMAGE THE TACH DRIVE SPUR GEAR.

(18) Remove combustor turbine assembly sufficiently to mark relationship of power shaft to power turbine shaft using approved marker.

NOTE: Marking is required for proper reinstallation of same combustor turbine assembly. Do not rotate engine, combustor turbine assembly, or power turbine until marking is accomplished.

(19) Lower the combustor turbine assembly and place it on a suitable work surface.

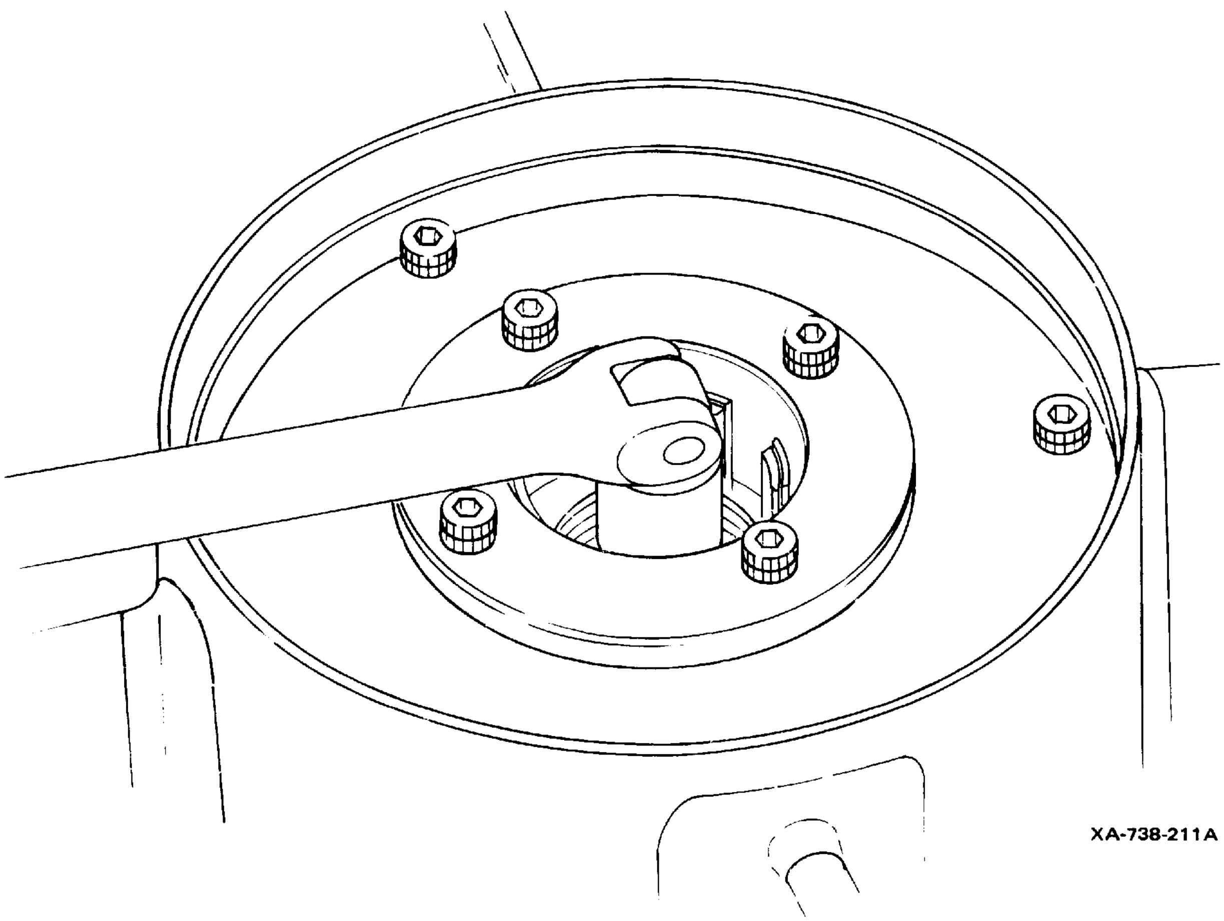
NOTE: The original power shaft bolt flange depth must be measured and recorded for reference during reassembly. Flange depth measurement governs size or number of shims (4) placed under head of power shaft bolt (5) to locate power shaft within engine correctly.

(20) Install original shims (4), power shaft bolt (5), and internal wrenching nut (6). Tighten nut snugly, using socket wrench LTCT505. Remove torque adjustment fixture LTCT962. Position exhaust diffuser down and place locating button bar LTCT153 on combustor flange and install measuring tool LTCT6124 (replaces LTCT3039) in power turbine splines.

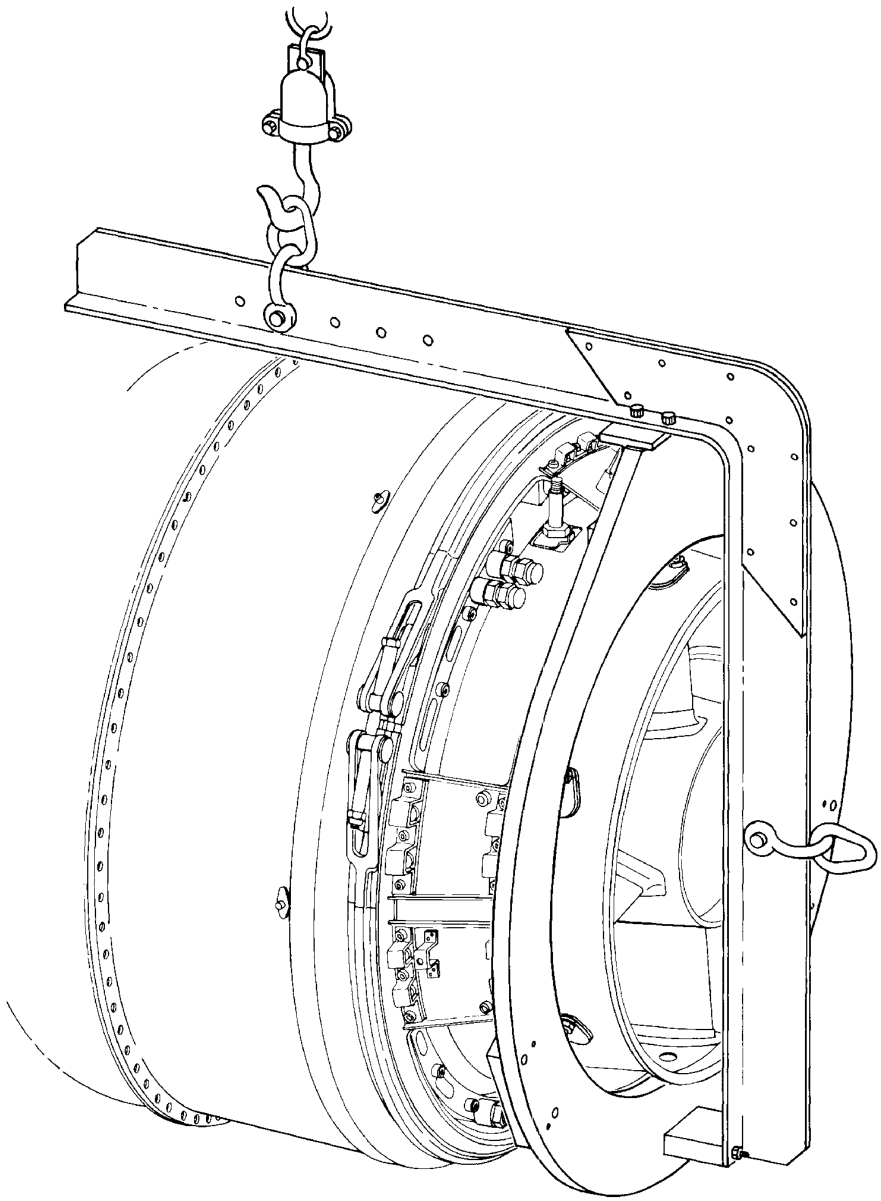
(21) With vernier depth gage, measure from top of bar to top of measuring tool and record as Dimension A, Figure 204.

(22) Subtract distance from top of locating bar to top of flange (Dimension B from Dimension A). Resulting dimension, plus length of tool (Dimension C), is the flange depth. Record and retain this measurement for reference during assembly.

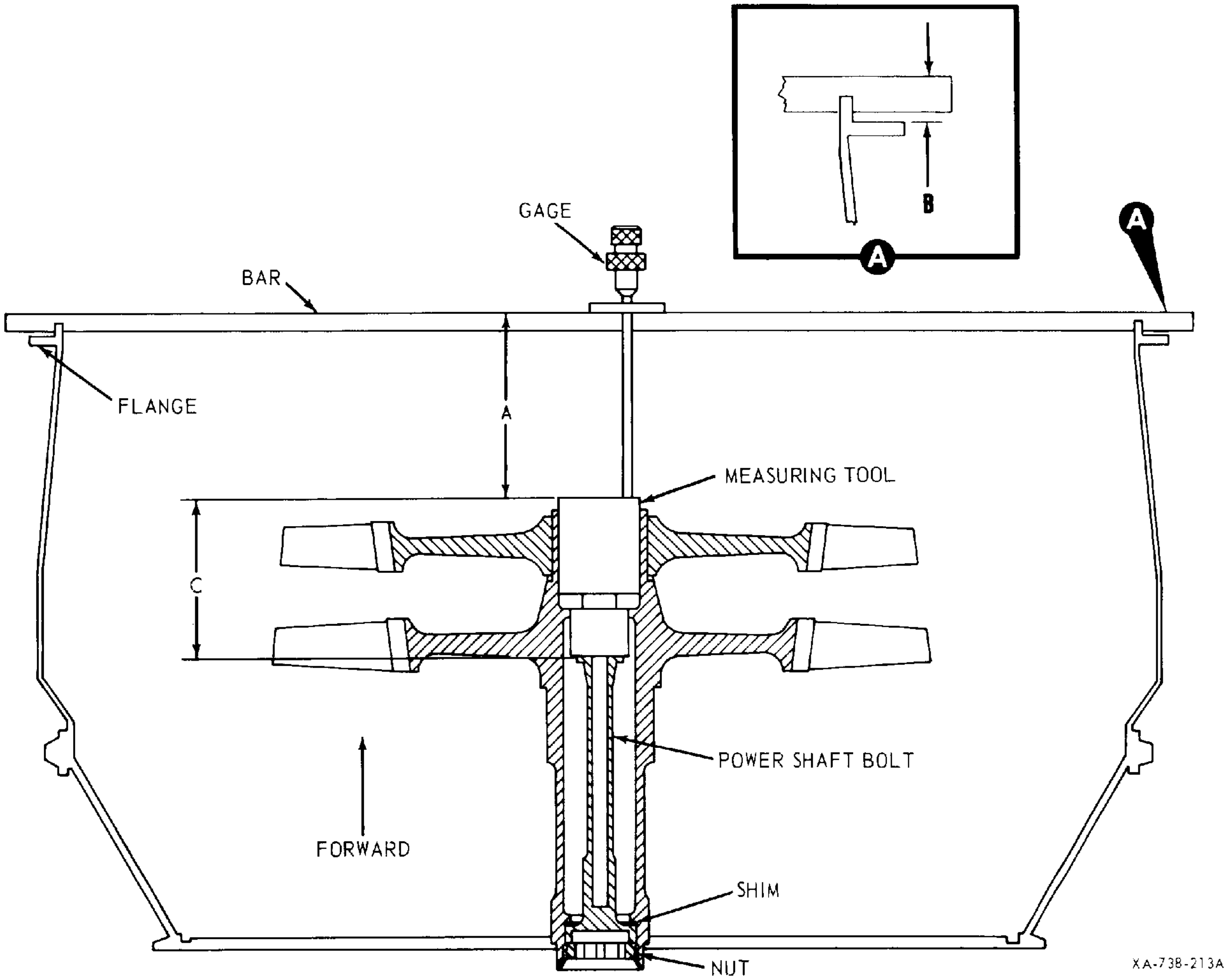
(23) Install torque adjustment fixture LTCT962.



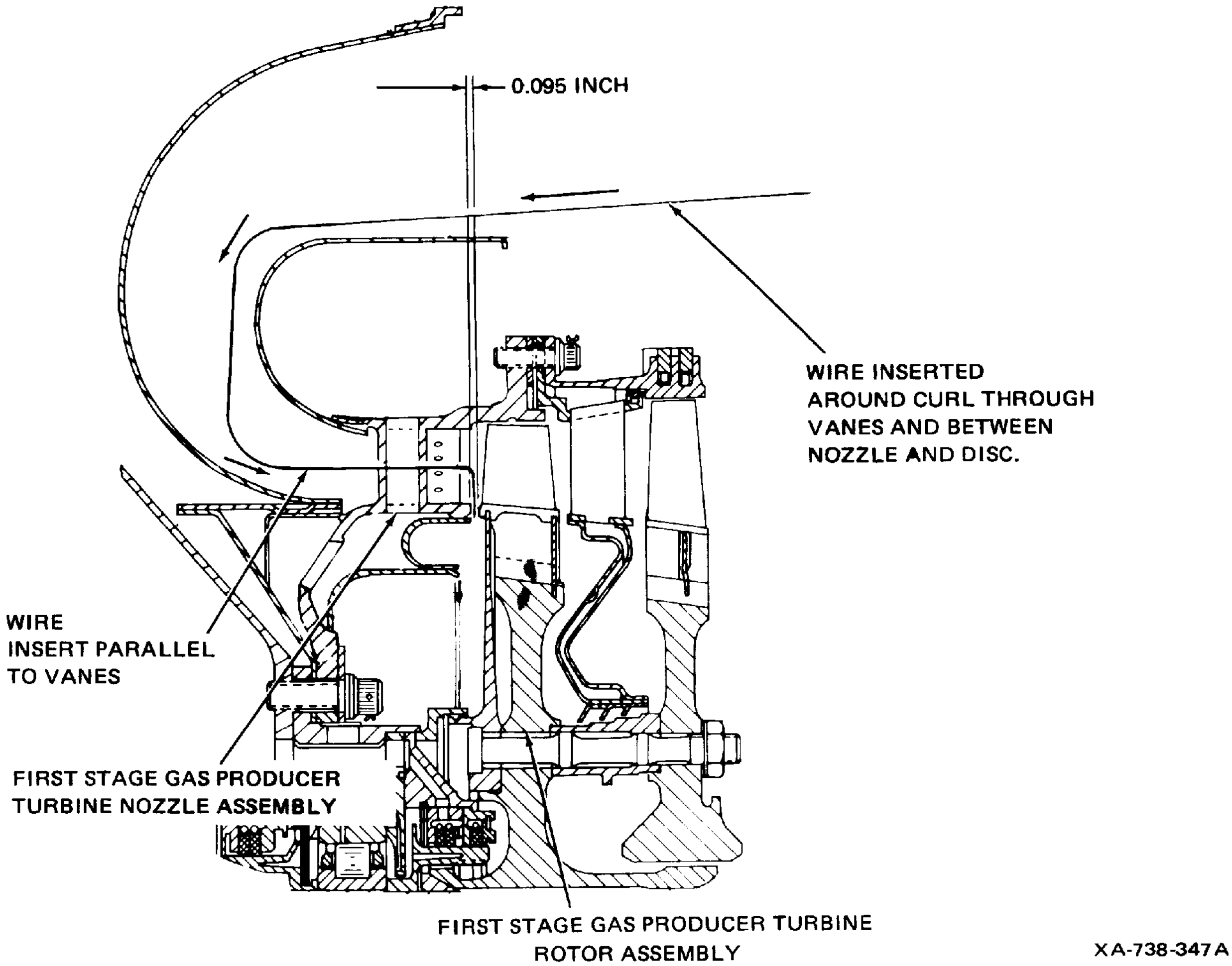
Removing Power Shaft Internal Wrenching Nut
Figure 202



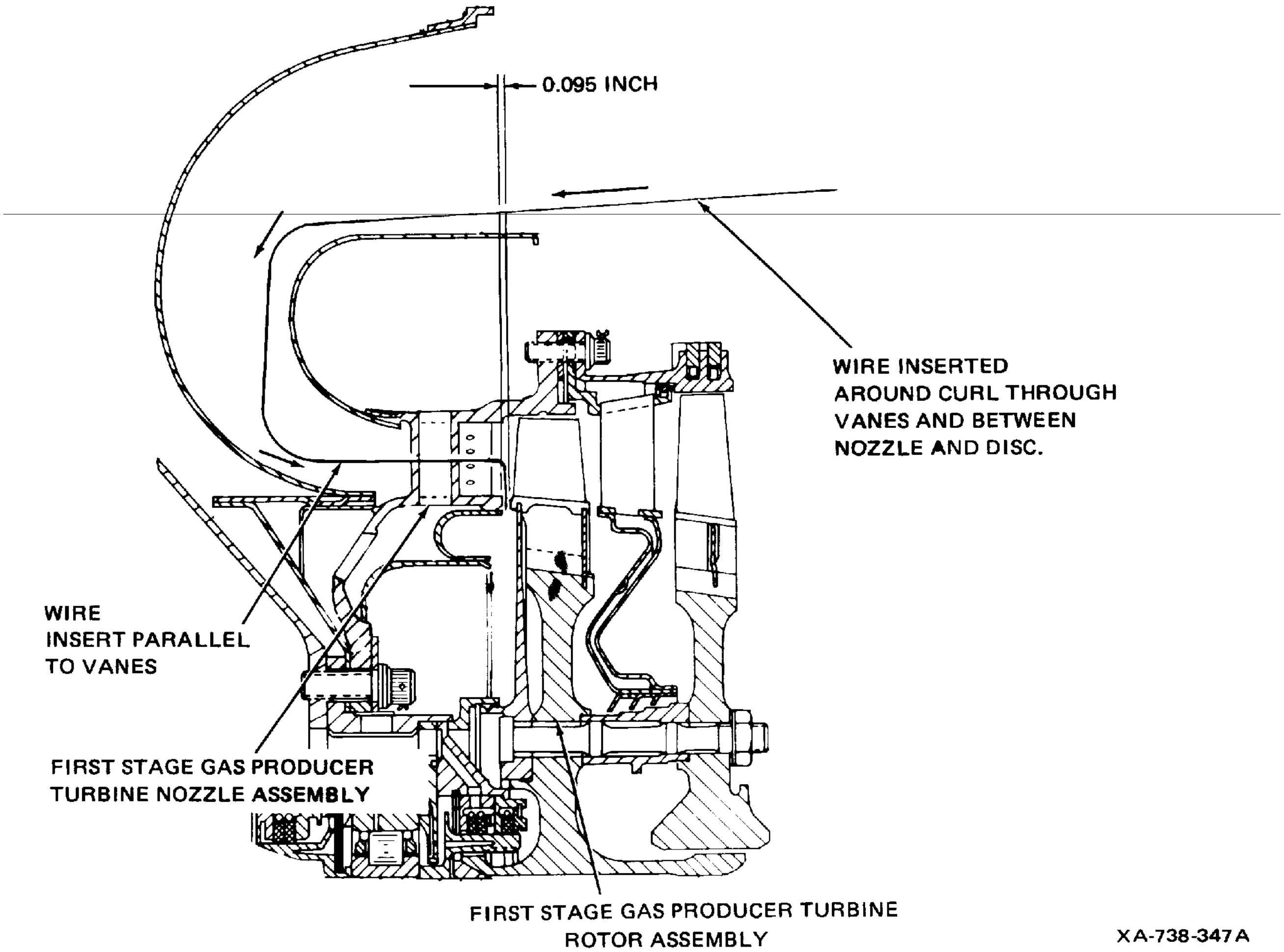
Removing Combustor Turbine Assembly
Figure 203



Measuring Power Shaft Bolt Flange Depth
Figure 204



Wire Gage for Nozzle/Rotor Minimum Clearance
Figure 205



Inspection After Combustion Turbine Assembly Removal
Figure 206

(24) Remove internal wrenching nut (6, Figure 201), power shaft bolt (5), and shims (4). Attach shims to bolt with lockwire.

(25) Remove torque adjustment fixture.

NOTE: The following procedure does not apply when a 1-100-880-12 or later first gas producer rotor is installed in the T53-L-13B.

(26) Using wire gage fabricated as shown in Figure 205, inspect for minimum axial clearance between gas producer nozzle and rotor as follows:

(a) Insert specified wire gage around nozzle curl and with the aid of a flashlight and an inspection mirror, insert gage through first stage gas producer turbine nozzle vanes. (See Figure 206.) Wire gage should be inserted parallel to the nozzle vanes (positioning determined by looking at vane cutouts on nozzle outer shroud). This will ensure ease of wire movement through the nozzle vanes. With wire gage in place, rotate rotor 360 degrees. If wire gage can be inserted between the nozzle and disc assembly and rub is not noted when rotor is rotated, no further action or inspection is necessary.

(b) If wire gage cannot be inserted or rub is noted, inspect.

B. Install Combustor Turbine Assembly

NOTE: Lubrication of power shaft bolt and installation of shims is not necessary at this time.

Install power shaft bolt (5, Figure 201) into power shaft. Finger tighten to check for cleanliness and condition of threads. If any tightness or failure of shoulder to bottom on power shaft exists, clean or repair threads. Clean mating splines of power turbine and power shaft. Do not lubricate.

(1) Establish clearance (Dimension B, Figure 207) between second stage gas producer cylinder and first stage power turbine nozzle as follows:

(a) Position locating button bar LTCT153 over combustion chamber housing flange.

(b) Using depth vernier, measure from bar to step at outer shroud of first stage power turbine nozzle, and record as Dimension A. Subtract bar thickness.

NOTE: Lubrication of power shaft bolt and installation of shims is not necessary at this time.

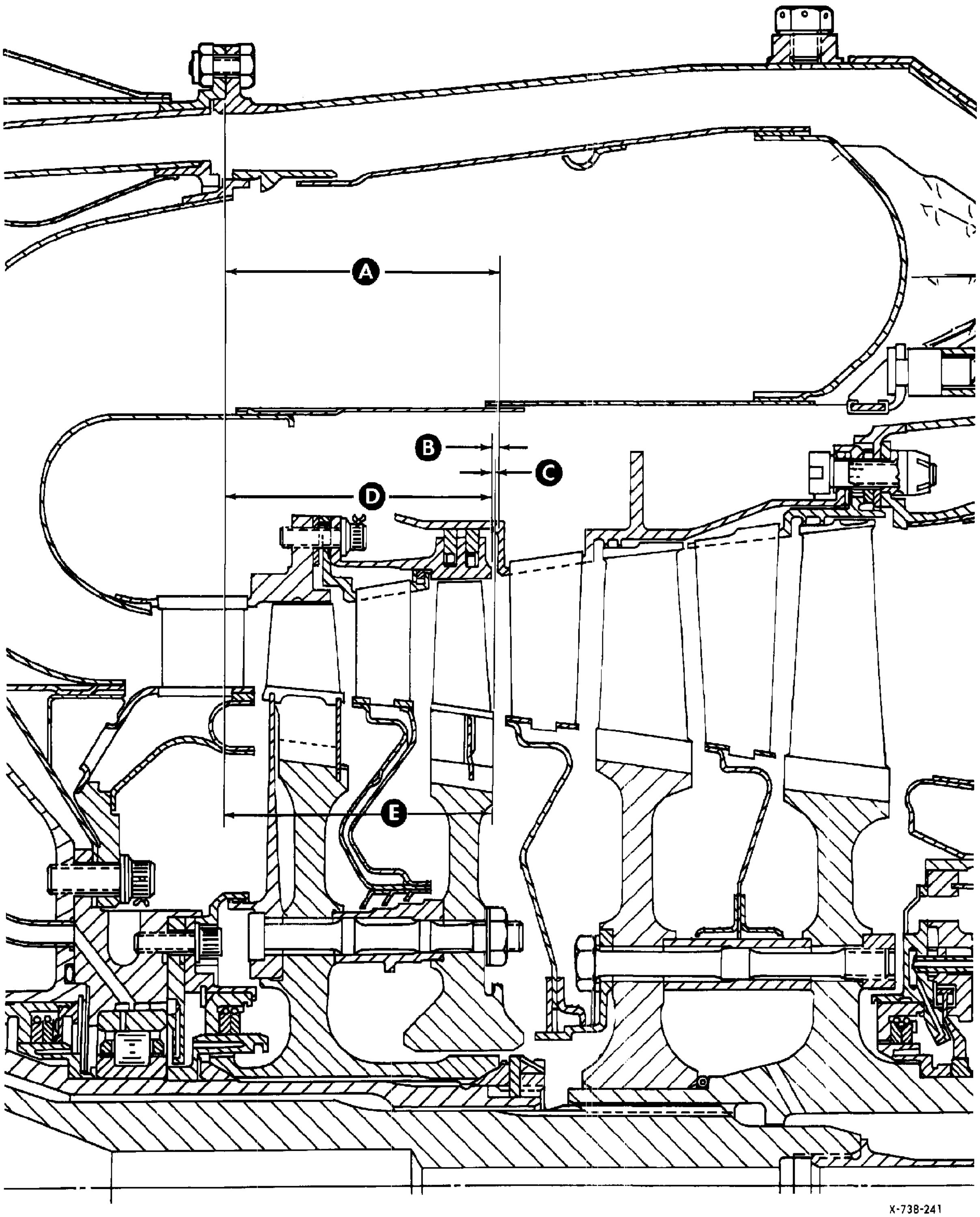
(c) Position locating button bar LTCT153 over second stage gas producer turbine rotor disc.

(d) Using depth vernier, measure from bar to flange of diffuser housing and record as Dimension E.

(e) Using depth vernier, measure from bar to second stage gas producer cylinder and record as Dimension C.

(f) Subtract Dimension C from Dimension E. Result is Dimension D.

(g) Subtract Dimension D from Dimension A. Result is Dimension B.



Determining Clearance Between First Stage Power Turbine Nozzle and Second Stage Gas Producer Cylinder
Figure 207

(h) Dimension B is 0.015 inch minimum to 0.238 inch maximum.

(2) Position mating marks as recorded when combustor turbine was removed. If mating marks were not made at removal, or if a new combustor section or a new power turbine rotor is installed, accomplish following Steps (3) and (4).

(3) Check position of mating mark center punched on face of male spline of power shaft. Using an approved marker, mark position on outside diameter of power shaft spline.

NOTE: If punch marks do not exist on power shaft and/or power turbine rotor shaft splines, the power shaft may be installed in any position relative to the power turbine rotor shaft splines.

(4) Check position of mating mark center punched on face of female spline on second stage power turbine rotor. If not accomplished during assembly, mark position on outside diameter of shaft using an approved marker.

NOTE: Overhauled power turbine rotor may have splines center punched two or more times, depending on the number of times the rotor has been rebladed. Use the mating mark with the greatest number of center punch marks.

If a new combustor section or a new power turbine rotor is installed, position mating marks in preceding Steps (3) and (4) 180 degrees apart during installation.

(5) Center aft end of power shaft within the compressor shaft.

CAUTION: WHEN INSTALLING COMBUSTOR TURBINE ASSEMBLY, THE POSSIBILITY OF GEAR (N2 DRIVE) TRAIN DISENGAGEMENT EXISTS WHEN POWER SHAFT IS PUSHED FORWARD. FOLLOW PROCEDURES IN STEPS (10) AND (11) VERY CAREFULLY.

(6) Position combustor lifting sling LTCT14668-01 around flange of diffuser support cone. (See **Error! Reference source not found.**.)

CAUTION: IF COMBUSTOR TURBINE ASSEMBLY OR MAJOR SUBASSEMBLY HAS BEEN REPLACED, IT IS NECESSARY TO ESTABLISH A NEW POWER SHAFT BOLT FLANGE DEPTH. COMPARE ORIGINAL AND NEW FLANGE DEPTH MEASUREMENTS. (SEE STEPS 1.A(20) THROUGH (22).) IF THEY DIFFER BY MORE THAN 0.010 INCH, ADD OR REMOVE SHIMS TO MAINTAIN ORIGINAL FLANGE DEPTH MEASUREMENT. (SEE FIGURE 204.) A MAXIMUM OF THREE SHIMS MAY BE INSTALLED. IF ORIGINAL MEASUREMENTS CANNOT BE DETERMINED, SEE STEP C.

NOTE: If installing combustor turbine assembly while engine is in vertical position, position lifting eye of adapter to holes nearest attaching points of adapter.

(7) Attach suitable hoist to lifting eye of adapter and install combustor turbine assembly on diffuser housing assembly with combustion chamber drain valve located at 6 o’clock position.

CAUTION: INSPECT AS FOLLOWS BEFORE INSTALLATION, DIMPLES ON ID OF COMBUSTION CHAMBER LINER MUST CONTACT OD OF FIRST STAGE GAS PRODUCER NOZZLE DEFLECTOR. THIS MAY BE ACCOMPLISHED BY APPLYING IRON-BLUE PIGMENT (72-00-00, 54, TABLE 203) TO THE LINER DIMPLES AND MATING THE NOZZLE AND LINER TO SIMULATE HOT END INSTALLATION. IF CONTACT IS NOT EVIDENT THROUGH 360 DEGREES, CAREFULLY BEND LINER TAB(S) INWARD AS REQUIRED.

NOTE: Reinstall all brackets at areas where indicated during removal.

(8) Using socket wrench LTCT393, install bolts (2, Figure 201) and nuts (1) that secure combustor turbine assembly (3) to diffuser housing.

CAUTION: NUMBER OF SHIMS SHALL NOT EXCEED THREE. USE OF AN EXCESSIVE NUMBER OF SHIMS CAN RESULT IN A COCKED BOLT AND CAUSE EXCESSIVE POWER TURBINE VIBRATION. MAKE SURE THAT SHIMS ARE FLAT AGAINST SHOULDER WITHIN ROTOR SHAFT BEFORE INSTALLING POWER SHAFT BOLT. SHIMS MAY BE HELD IN PLACE WITH HYDROGENATED VEGETABLE SHORTENING (72-00-00, 38, TABLE 203) OR ASSEMBLY FLUID (72-00-00, 7, TABLE 203).

(9) Install shims (4) of thickness recorded during removal or as corrected in the CAUTION following Step (6).

(10) Remove N2 tachometer (if installed) from overspeed governor and tachometer drive gearbox and engage 1/4 inch drive extension and handle in tachometer drive gear.

(11) Apply light coating of anti-seize compound (72-00-00, 15, Table 203) to threads of power shaft bolt (5) and install bolt by hand. While installing bolt, rotate the 1/4 inch drive handle slightly to ensure that the driven (N2 drive) gear and the spur gear are engaged properly.

CAUTION: FAILURE TO ENSURE ENGAGEMENT MAY RESULT IN DAMAGE TO DRIVEN GEAR. A FIRM RESISTANCE MUST BE FELT AT HANDLE.

MAKE SURE THAT BOLT AND SHAFT THREADS ARE CLEAN. MAKE SURE THAT BOLT HAS BEEN STARTED AT LEAST SIX TURNS BY HAND PRIOR TO TORQUING.

(12) Install torque adjustment fixture LTCT962 into rear of combustor turbine assembly and engage tangs of locking plate assembly with slots in bearing retainer nut. Secure plate assembly with three bolts.

(13) Using socket wrench LTCT506, tighten power shaft bolt 195 to 200 inch-pounds torque.

(14) Apply light coating of anti-seize compound (72-00-00, 15, Table 203) to threads of a new nut (6) and power turbine rotor shaft.

TEMPORARY REVISION NO. 79

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 72-40-00, PAGE 213.

Reason: To revise torque value requirement.

Step (21) is revised to read as follows:

(21) Install bolt (12) while holding tablock (11) in alignment. Tighten bolt 95 to 100 inch-pounds torque. Check that there is no surface to surface contact between the exhaust diffuser cover (10) and rear bearing cover (8). If there is surface to surface contact, remove the exhaust diffuser cover (10) and apply pressure to the heat shield to flatten cover. Do not use a hammer to bend the heat shield. Reinstall the exhaust diffuser cover (10) and check that there is no surface to surface contact.

See TR

(15) Using socket wrench LTCT505, install new nut (6). Tighten nut to 100 foot-pounds torque. Loosen and remove nut. Retighten power shaft bolt 195 to 200 inch-pounds torque. Install nut (6) and tighten to 50 foot-pounds torque. Remove torque fixture LTCT962.

(16) Using end of suitably rounded punch, or the side of a tapered drift punch, deform collar of nut to extend into three slots of power turbine rotor shaft.

(17) Visually inspect nut for cracks that may have occurred as result of deformations. If nut is cracked, it must be replaced. Remove torque adjustment fixture.

NOTE: Before installing seal (7), the seal shall be inspected for cuts, nicks, tears, cracks, distortion, pliability, and wear. If damage is noted, replace seal.

Ensure groove in rear bearing cover (8) is clean. If seal (7) is to be installed, coat groove in rear cover with hydrogenated vegetable shortening (72-00-00, 38, Table 203) or assembly fluid (72-00-00, 7, Table 203) to facilitate holding seal during assembly.

(18) Install seal (7) or packing in groove of rear bearing cover (8).

NOTE: Prior to installation of bolt (9), apply a light coat of anti-seize compound (72-00-00, 15, Table 203) to threads of bolt.

(19) Install rear bearing cover (8) and secure with bolt (9) and lockwire (72-00-00, 40, Table 203).

(20) Using suitable tapered feeler gage, measure gap between rear bearing cover (8) and exhaust diffuser in eight equally spaced places. The optimum gap would be 0.005 inch at all eight locations, but up to 0.007 inch is allowable at any point if the direct opposite measurement does not exceed 0.003 inch. If limit is exceeded, proceed as follows:

(a) Inspect ID of exhaust diffuser. If average diameter in eight places exceeds 6.066 inches, remove and replace exhaust diffuser.

(b) Inspect OD of rear bearing cover (8). If average diameter in eight places is less than 6.056 inches, replace rear bearing cover.

CAUTION: SHORT TAB MUST GO THROUGH HOLE IN EXHAUST DIFFUSER COVER (10) AND INTO CUTOUT IN REAR BEARING COVER (8). MAKE SURE TAB REMAINS ENGAGED IN BOTH COVERS AFTER TIGHTENING BOLT.

NOTE: Prior to installation of bolt (12), apply a light coat of anti-seize compound (72-00-00, 15, Table 203).

(21) Install bolt (12) while holding tablock (11) in alignment. Tighten bolt 70 to 75 inch-pounds torque. Check that there is no surface to surface contact between the exhaust diffuser cover (10) and rear bearing cover (8). If there is surface to surface contact, remove the exhaust diffuser cover (10) and apply pressure to the heat shield to flatten cover. Do not use a hammer to bend the heat shield. Reinstall the exhaust diffuser cover (10) and check that there is no surface to surface contact.

(22) If N2 tachometer was removed, lubricate splines with spline lubricant (72-00-00, 45, Table 203) and install.

(23) Install igniter.

WARNING: USE THE CORRECT PERSONAL PROTECTION. THIS CHEMICAL SOLUTION CAN CAUSE SKIN, EYE, AND LUNG DAMAGE. THE DANGER AND PRECAUTIONS FOR EACH CHEMICAL IS DIFFERENT.

CAUTION: DO NOT ALLOW THE ANTI-SEIZE COMPOUND TO COME IN CONTACT WITH THE ELECTRODE.

(a) Prior to installing igniter, apply anti-seize compound (72-00-00, Table 203, Item 15A) to the threads only.

(b) Install four starting fuel nozzles and four igniter plugs.

(24) Reconnect ignition leads, main fuel hose assembly, fuel solenoid valve and starting fuel hose assembly. Secure with clamps as necessary.

(25) Install the six probe thermocouple harness at the 2, 4, 6, 8, 10, and 12 o'clock positions of exhaust diffuser. Apply anti-seize compound (72-00-00, 15, Table 203) to studs and tighten nuts to 35 to 45 inch-pounds torque.

NOTE: Perform an engine vibration test upon reinstallation of combustor turbine assembly (hot end) or whenever excessive engine vibration is suspected. (See 71-00-00, POWERPLANT, Paragraph 11.E.)

C. Measure Power Shaft Bolt Flange Depth (See Figure 208.)

NOTE: Perform the following procedure only if original flange depth measurements or flange shims have been lost.

Combustor turbine (hot end) must be installed on the engine.

(1) If installed, remove power shaft bolt (5, Figure 201) and locating shim (4).

CAUTION: IF POWER SHAFT IS NOT IN EXTREME FORWARD POSITION ENGINE FAILURE CAN RESULT.

(2) Using a clean rod (wood or phenolic dowel), gently but firmly push power shaft to extreme forward position.

(3) Place locating button bar LTCT153 across back of exhaust diffuser and note dimension from bar to aft end of power shaft and record as Dimension A, Figure 208.

(4) With bar in the same position, note dimension from bar to power shaft bolt seating shoulder in second stage power turbine rotor assembly and record as Dimension B.

(5) Subtract Dimension B from Dimension A to obtain Dimension C.

(6) Subtract 0.230 inch from Dimension C to obtain Dimension D.

(7) Subtract Dimension D from the power shaft bolt length (5.400 inches) to obtain the required thickness of shim.

(8) Install shims of correct thickness and bolt. (See previous Steps 1.B(9) through (22).)

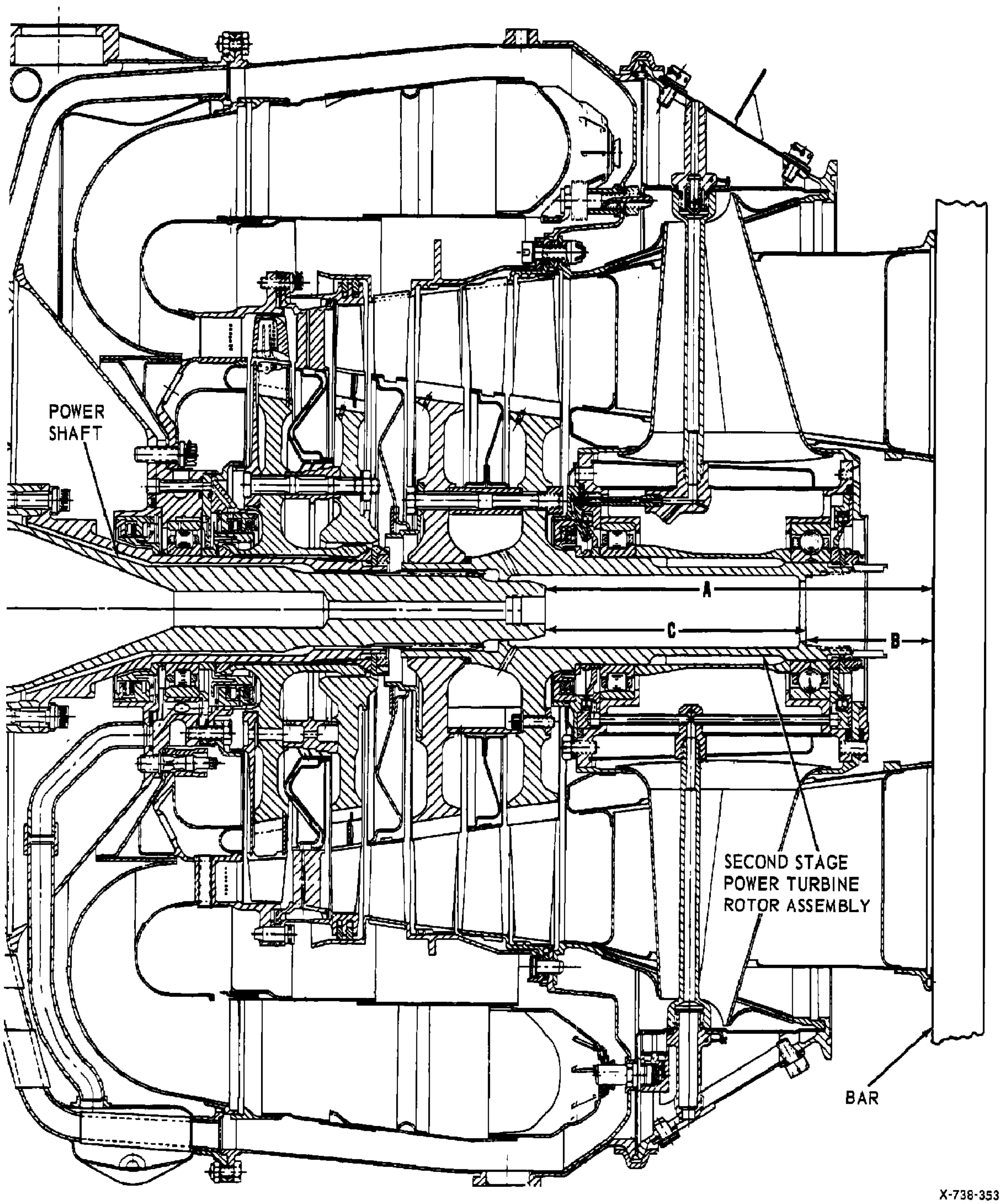
2. Disassembly/Assembly

A. Disassemble Combustor Turbine Assembly (See Figure 209 and Figure 210.)

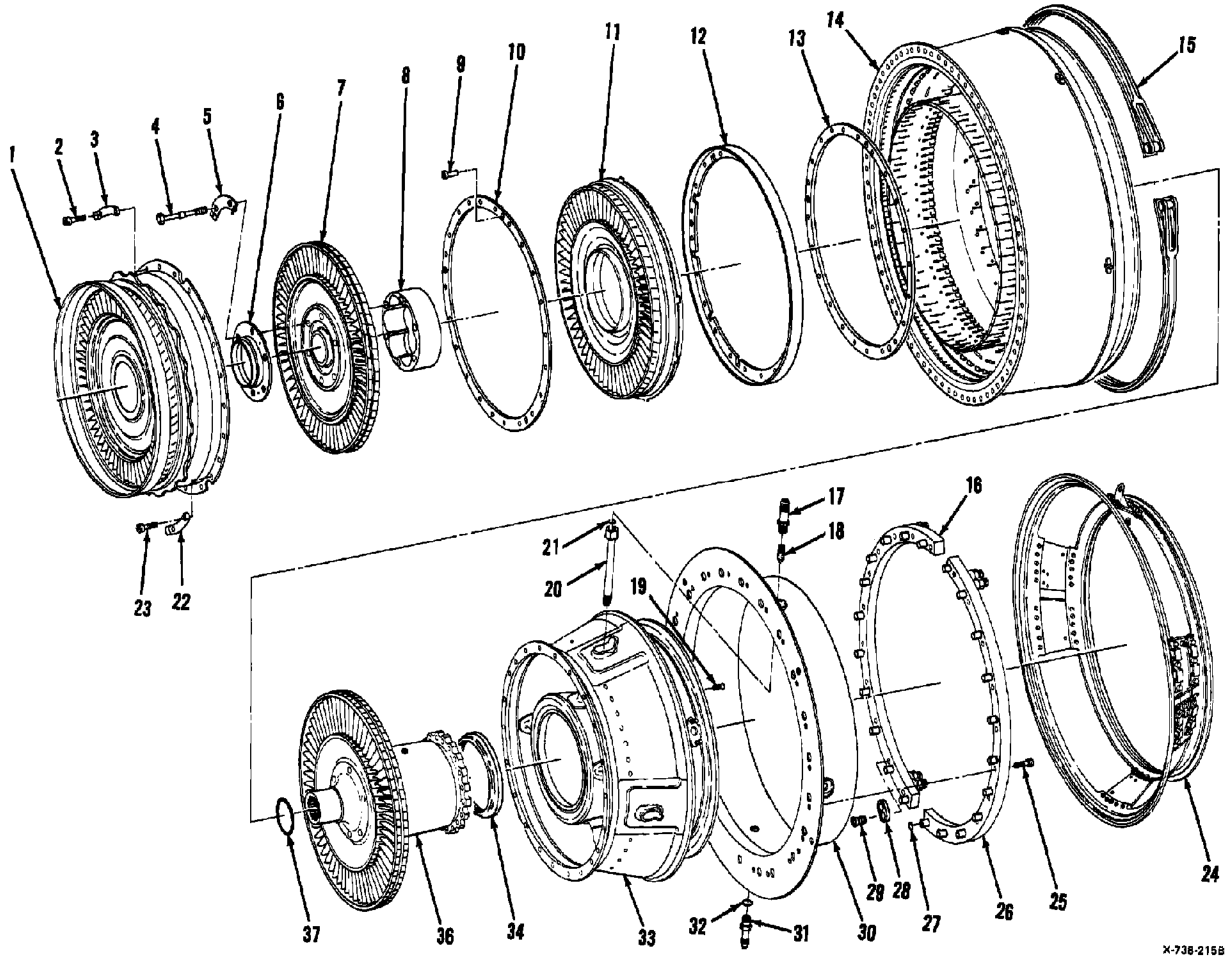
NOTE: Disassemble the combustor turbine assembly only as required to correct visible damage or to replace components.

(1) Remove exhaust thermocouple harness. (See 77-20-01.)

(2) Remove starting fuel manifolds, flow divider, and dump valve hose assemblies. (See 73-10-01 and 73-10-05.) Cap ports on divider and manifolds. Make sure caps are clean.



Measuring Power Shaft Bolt Flange Depth
Figure 208



Combustor Turbine Assembly - Exploded View
Figure 209

KEY TO FIGURE 209

1. FIRST STAGE POWER TURBINE NOZZLE
2. BOLT
3. LOCKING PLATE
4. BOLT
5. LOCKING PLATE
6. SEALING FLANGE
7. FIRST STAGE POWER TURBINE ROTOR
8. POWER TURBINE SPACER
9. PIN
10. SPACER
11. SECOND STAGE POWER TURBINE NOZZLE
12. RING
13. SPACER
14. COMBUSTION CHAMBER ASSEMBLY
15. V-BAND COUPLING ASSEMBLY
16. FUEL MANIFOLD ASSEMBLY
17. OIL STRAINER HOUSING ADAPTER
18. STRAINER
19. SCREW
20. POWER TURBINE OIL TUBE
21. PACKING
22. LOCKING PLATE
23. BOLT
24. SUPPORT CONE ASSEMBLY
25. BOLT
26. FUEL MANIFOLD ASSEMBLY
27. SEAL
28. SEALING GASKET
29. SCREW
30. FIRESHIELD
31. CONNECTOR
32. PACKING
33. EXHAUST DIFFUSER ASSEMBLY
34. SEAL
35. DELETED
36. POWER TURBINE ROTOR AND BEARING HOUSING ASSEMBLY
37. GASKET

(3) Remove V-band coupling assembly (1 or 1A, Figure 210) by one of the following methods.

(a) For V-band coupling assembly (1), disconnect nuts (5) from bolts (2) and remove spacers (3) and (4).

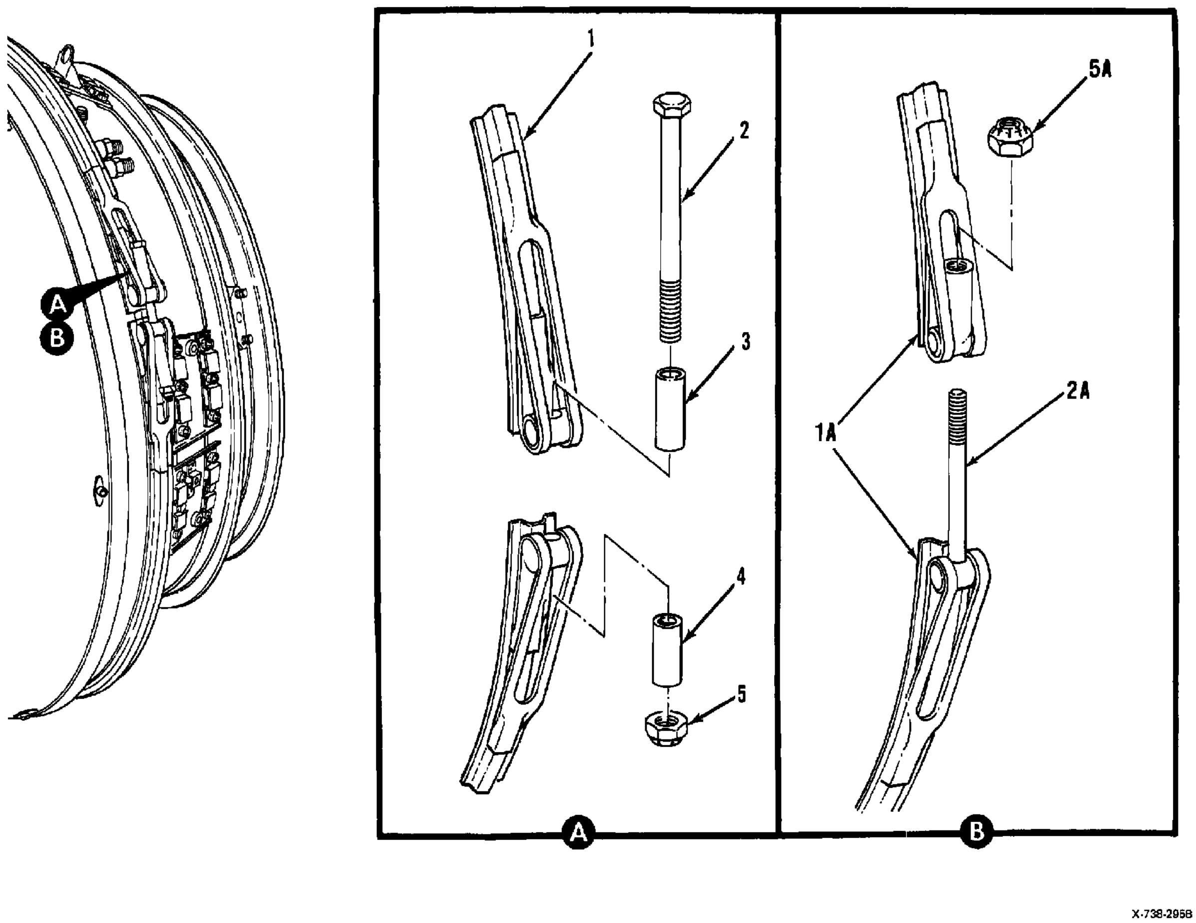
(b) For V-band coupling assembly (1A), disconnect nuts (5A) from bolts (2A).

(4) Remove diffuser support cone assembly (24, Figure 209).

(5) Unscrew and remove oil strainer housing adapter (17) from power turbine oil tube (20) at top of exhaust diffuser. Remove packing (21) and strainer (18).

(6) Unscrew and remove connector (31) from tube at bottom of exhaust diffuser. Remove packing (32).

(7) If installed, remove starting fuel nozzles and igniter plugs. (See 73-10-03 and 74-20-03.)



1.	V-BAND COUPLING ASSEMBLY	3.	SPACER
1A.	V-BAND COUPLING ASSEMBLY	4.	SPACER
2.	BOLT	5.	NUT
2A.	BOLT	5A.	NUT

V-Band Coupling Assembly and Attaching Parts
Figure 210

(8) Remove bolts (25) that secure fuel manifold assemblies (16, 26) to rear of combustion chamber assembly (14). Carefully remove manifolds from combustion chamber housing. Remove seals (27) from fuel nozzles. Remove screw (29) that secures sealing gasket (28) to main fuel manifold. Remove gaskets.

NOTE: Use care when removing manifold to prevent damage to fuel nozzles. Cap open ports and package or set in dust free area. If manifold is to be replaced, enclose manifold in barrier material (72-00-00, 9, Table 203) or in a transparent bag (72-00-00, 8, Table 203) and secure in reusable container. The container should be enclosed in a waterproof cardboard box and identified for shipment.

(9) Remove fireshield (30) from around exhaust diffuser.

(10) Remove two power turbine oil tubes (20) from exhaust diffuser struts.

(11) Straighten locking plates (3, 22) and remove 22 bolts (2, 23). Remove locking plates.

(12) Withdraw three pins (9) from flange of first stage power turbine nozzle (1).

(13) Remove first stage power turbine nozzle (1) from power turbine rotor and remove spacer (10). Record thickness of spacer for reassembly.

(14) Straighten tabs of locking plates (5) and remove bolts (4). Remove locking plates. Using white opaque ink (72-00-00, 73A, Table 203), indicate alignment of sealing flange (6), first stage power turbine rotor (7), power turbine spacer (8), and second stage power turbine rotor.

NOTE: Be sure to mark bolts (4) with white opaque ink, to make sure they are reinstalled in the same location.

(15) Remove sealing flange (6) from face of first stage power turbine rotor.

(16) Using mechanical puller LTCT4680 with arms LTCT4682 (detail of LTCT4680) extended and hooks counterclockwise as viewed from handle end, remove first stage power turbine rotor (7) and power turbine spacer (8) as a unit. Remove gasket (37).

(17) Using mechanical puller LTCT4680 with legs reversed and shortened, remove power turbine spacer (8).

(18) Remove second stage power turbine nozzle (11), ring (12), and spacer (13). Record thickness of spacer for reassembly.

(19) Separate combustion chamber assembly (14) from exhaust diffuser assembly (33).

(20) Position exhaust diffuser, with second stage power turbine rotor assembly down, in holding fixture LTCT4553. Remove torque adjustment fixture LTCT962.

(21) Remove screws (19) that secure power turbine rotor and bearing housing assembly (36) to exhaust diffuser assembly.

(22) Raise assembly slightly from holding fixture. Using mechanical puller LTCT4800, separate turbine rotor assembly from exhaust diffuser.

(23) Remove seal (34), seal is reusable.

B. Reassemble Combustor Turbine Assembly (See Figure 209.)

NOTE: Inspect power turbine rotor splined shaft for center punch. This mark will coincide with yellow H on disc face indicating the heavy point. If punch mark is not evident, mark position on outside diameter of splined shaft using an approved marker.

Before installing seal (34), the seal shall be inspected for cuts, nicks, tears, cracks, distortion, pliability and wear. If damage is noted, replace seal.

Ensure groove in housing is clean. If seal (34) is to be installed, coat groove with hydrogenated vegetable shortening (72-00-00, 38, Table 203) or assembly fluid (72-00-00, 7, Table 203) to facilitate holding seal in groove during assembly.

(1) Place power turbine rotor and bearing housing assembly (36, Figure 209) forward face down into holding fixture LTCT4553. Install seal (34) in groove on aft end of bearing housing.

(2) Place exhaust diffuser assembly (33) over bearing housing and align screw holes.

(3) Temporarily install 1/4-28 bolts and flat washers through exhaust diffuser assembly and into bearing housing. Turn bolts evenly and pull exhaust diffuser over bearing housing.

(4) Secure bearing housing to exhaust diffuser with screws (19). Tighten screws 20 to 30 inch-pounds torque.

NOTE: Using bent 0.070 inch diameter wire, check for 0.070 inch minimum clearance between second stage power turbine rotor and forward face of inner diffuser cone.

(5) Position exhaust diffuser and bearing housing on bench with exhaust diffuser rear face down. Position combustion chamber assembly (14) on flange of exhaust diffuser and align bolt holes on mating flanges.

NOTE: If installed, combustion chamber liner should be removed to facilitate reassembly.

(6) Establish tip clearance between second stage power turbine rotor and second stage power turbine nozzle. (See Step D.)

(7) Install power turbine spacer (8, Figure 209) over end of power turbine rotor and align bolt holes and match marks. Secure spacer with three equally spaced 5/16-24 bolts and washers.

CAUTION: MAKE SURE THAT BOLTS DO NOT BOTTOM AGAINST SEAL HOUSING.

(8) Position second stage power turbine nozzle (11) and using feeler gage, check clearance between power turbine spacer (8) and second stage power turbine nozzle (11). If clearance is less than 0.005 inch, rework nozzle using half round file to obtain 0.010 inch clearance.

See TR

(9) Establish clearance (Dimension G, Figure 211) between first stage power turbine rotor and second stage power turbine nozzle as follows:

NOTE: If go-no-go gauges are available, they can be used to determine if the minimum clearance is established.

(a) Place locating button bar LTCT153 on flange of combustion chamber housing.

(b) Using a vernier depth gage, measure from bar to outer shroud of second power turbine nozzle and record as Dimension A.

(c) Using a vernier depth gage, measure from bar to power turbine spacer (8, Figure 209) and record as Dimension B. (See Figure 211.)

(d) Subtract Dimension B from Dimension A. Result is Dimension C.

(e) Place first stage power turbine rotor (7, Figure 209) on bench with forward face down. Position locating button bar LTCT153 on blade disc.

(f) Using a vernier depth gage, measure from bar to spacer surface and record as Dimension D. (See Figure 211.)

(g) Using a vernier depth gage, measure from bar to shrouded tip of highest blade and record as Dimension E.

(h) Subtract Dimension E from Dimension D. Result is Dimension F.

(i) Subtract Dimension F from Dimension C. Result is Dimension G.

(j) Dimension G must be within 0.062 inch minimum to 0.077 inch maximum. If required dimension is not obtained, spacer is required to position second stage power turbine nozzle.

NOTE: Shimming of the second stage power turbine nozzle will affect the axial clearance between the first stage power turbine nozzle and the first stage power turbine wheel.

(k) Select and install necessary spacer (13, Figure 209). (See Table 201.) Install ring (12), second stage power turbine nozzle (11) and temporarily secure with bolts (2) and pins (9).

(10) Remove bolts and washers installed in preceding Step (3).

(11) Install torque adjustment fixture LTCT962 into rear of exhaust diffuser assembly and engage tangs of locking plate assembly with slots in bearing retainer nut. Secure plate assembly with three bolts. Replace combustor turbine assembly on bench with exhaust diffuser rear face down.

(12) Install gasket (37) over end of power turbine rotor shaft.

(13) Position first stage power turbine rotor (7, Figure 209) over end of power turbine rotor shaft. Locate yellow H on disc face, 180 degrees from punch mark (or other mark) on power turbine shaft. Align match marks that were painted at disassembly.

TEMPORARY REVISION NO. 87

INSERT PAGE 3 OF 4 FACING 72-40-00, PAGE 222.

Reason: To add Dimension H to the clearance reference in Paragraph 2.B.(9). To add Paragraph 2.B.(9)(l) for Dimension H clearance requirements.

Paragraph 2.B.(9) is changed and Paragraph 2.B.(9)(l) is added as follows:

(9) Establish clearance (Dimension G and Dimension H, Figure 211) between first stage power turbine rotor and second stage power turbine nozzle as follows:

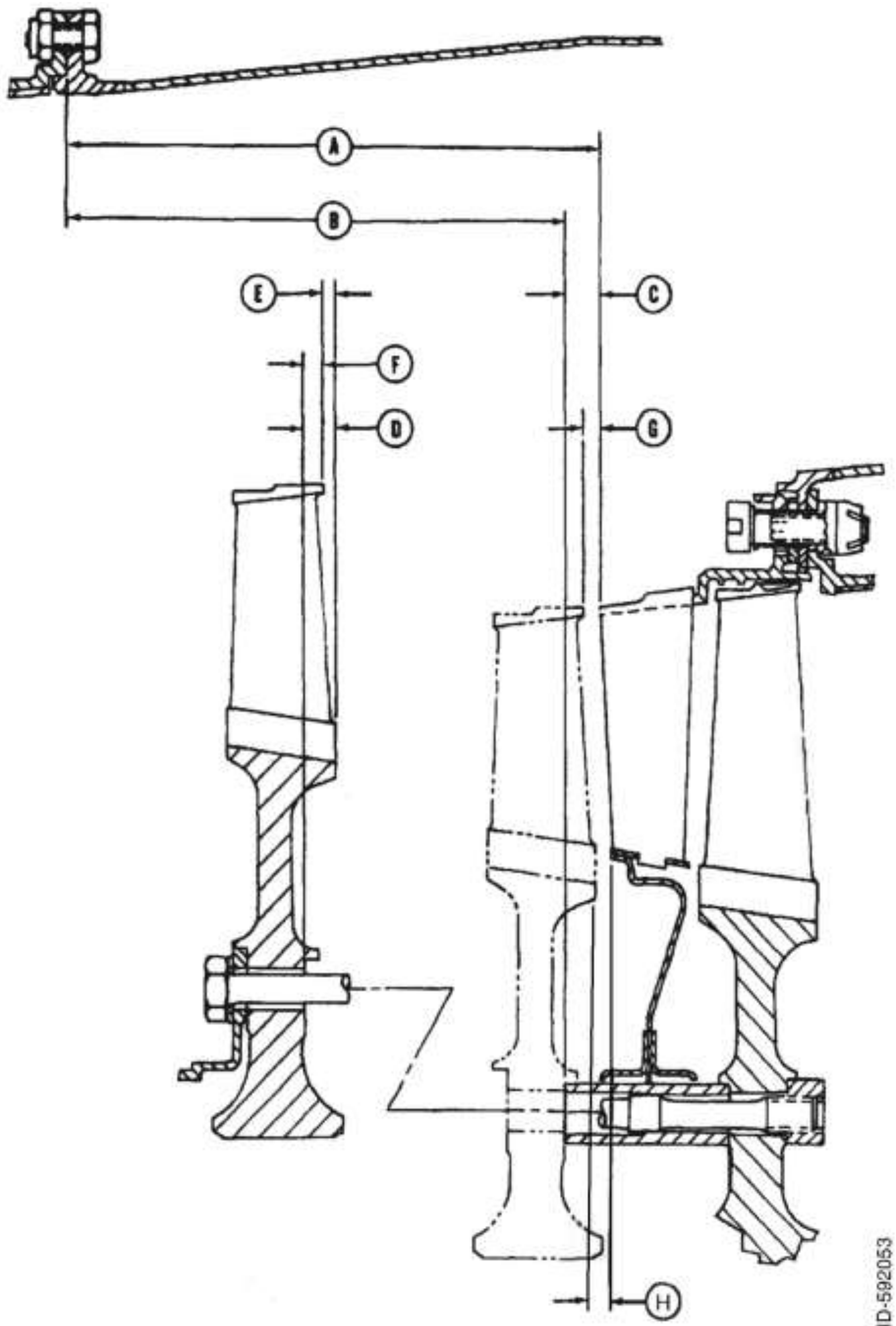
(l) Using wire gage LTCT14807, measure between first stage power turbine aft blade root and second stage power turbine forward nozzle inner shroud. Clearance shall be 0.065 to 0.130 inch (Dimension H).

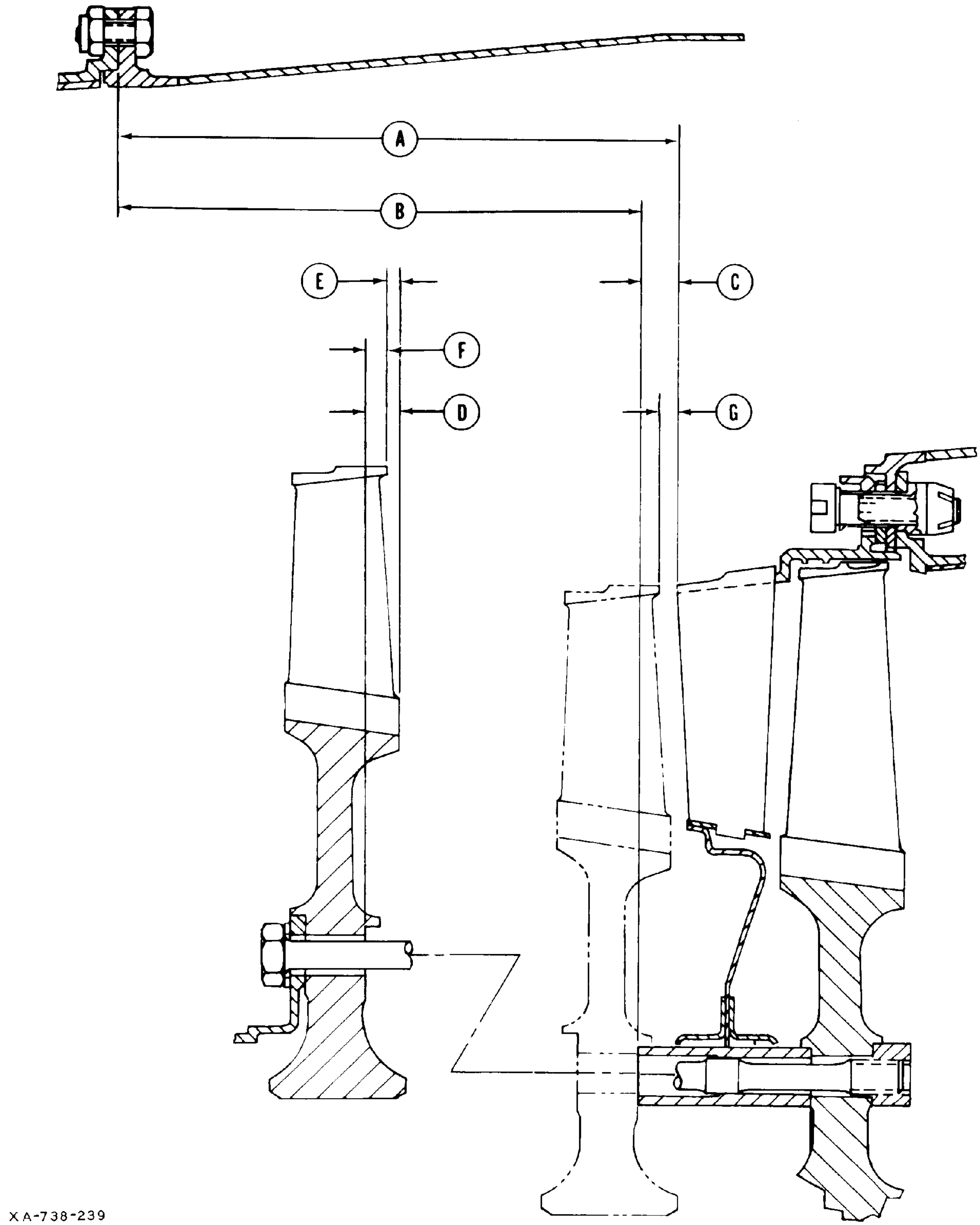
TEMPORARY REVISION NO. 87

INSERT PAGE 4 OF 4 FACING 72-40-00, PAGE 223.

Reason: To add Dimension H to Figure 211.

Figure 211 is changed as follows:





Determining Clearance Between First Stage Power Turbine Rotor Assembly
and Second Stage Power Turbine Nozzle Assembly
Figure 211

Table 201. Spacer Thickness

Part Number	Thickness
1-140-276-01	0.022 to 0.028 inch
1-140-276-02	0.029 to 0.035 inch
1-140-276-03	0.036 to 0.044 inch

NOTE: Prior to installation, apply anti-seize compound (72-00-00, 15, Table 203) to threads of bolts (4).

Make sure that locking plates do not cover the three small air-bleed holes in the sealing flange.

(14) Secure rotor with sealing flange (6), locking plates (5), and install bolts (4) from same position from which they were removed. Tighten bolts 140 to 160 inch-pounds torque. Do not bend locking plate tabs at this time. Remove torque adjustment fixture LTCT962.

(15) Establish clearance (Dimension D, Figure 212) between first stage power turbine nozzle and shrouded tip of first stage power turbine rotor blades as follows:

NOTE: If go-no-go gauges are available, they can be used to determine if the minimum clearance is established.

(a) Place locating button bar LTCT153 on flange of combustion chamber housing.

(b) Using a vernier depth gage, measure from bar to ring (12, Figure 209) installed on combustion housing flange and record as Dimension A. (See Figure 212.)

(c) Using a vernier depth gage, measure from bar to shrouded tip of highest first stage power turbine blades and record as Dimension B.

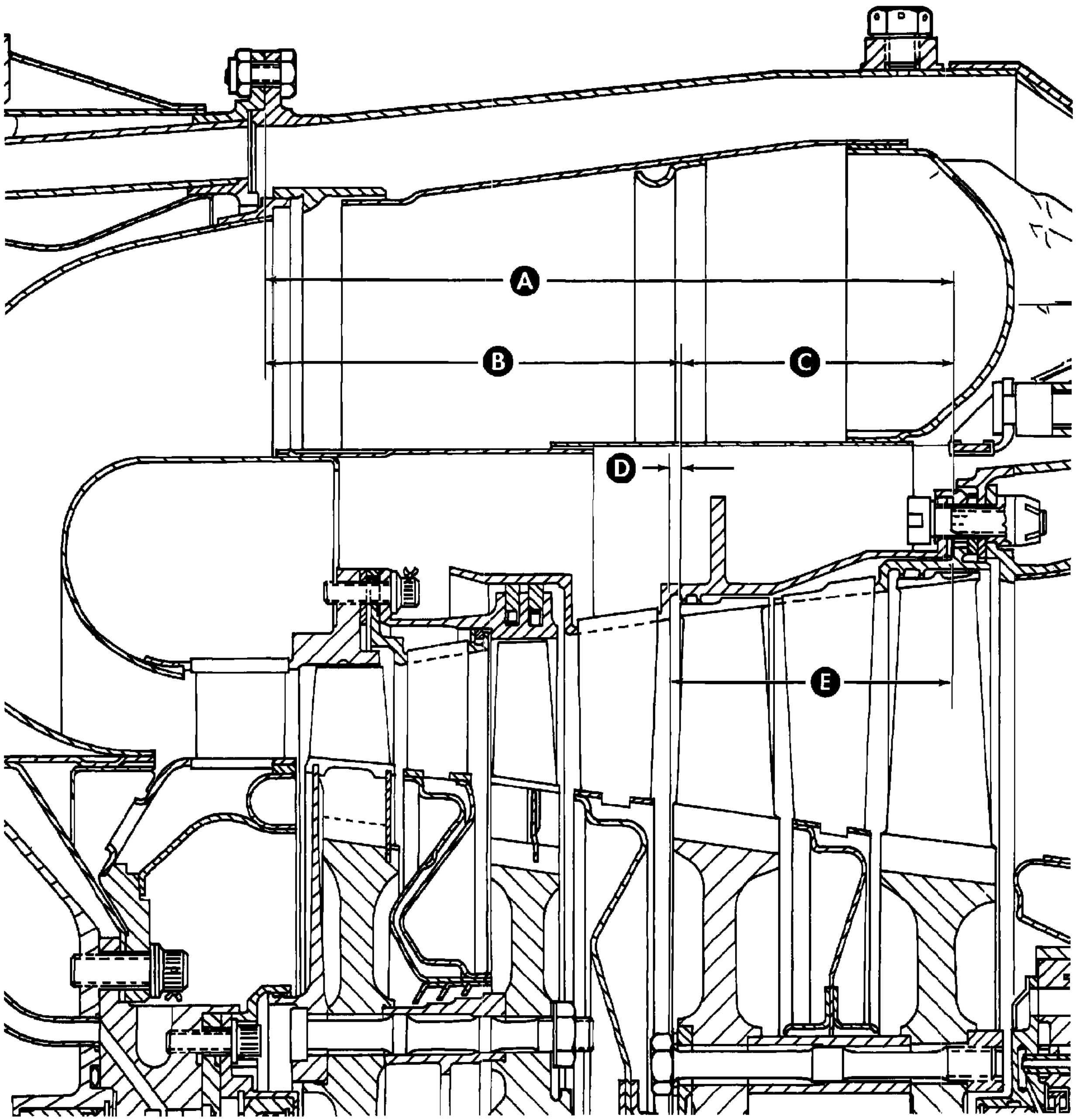
(d) Subtract Dimension B from Dimension A. Result is Dimension C.

(e) Place first stage power turbine nozzle (1, Figure 209) on bench with forward face down. Position locating button bar LTCT153 on aft flange of nozzle.

(f) Using a vernier depth gage, measure from bar to outer shroud and record as Dimension E. (See Figure 212.)

(g) Subtract thickness of locating bar from Dimension E.

(h) Subtract Dimension C from dimension arrived at in preceding Step (g). Result is Dimension D.



Determining Clearance Between First Stage Power Turbine Nozzle and Rotor Assemblies
Figure 212

(i) Dimension D must be within 0.063 inch minimum to 0.078 inch maximum. If desired dimension is not obtained, spacer is required to position first stage power turbine nozzle. Select necessary spacer (10, Figure 209). (See Table 201.)

(16) Establish tip clearance between first stage power turbine rotor and first stage power turbine nozzle. (See Paragraph 2.C.)

<u>NOTE:</u> Bolts (23) may not extend through retaining nuts on exhaust diffuser.

(17) Position spacer (10, Figure 209), selected in preceding Step (15), and ring (12). Install four equally spaced bolts (2, 23) through spacer (10), ring (12), and into exhaust diffuser.

(18) Position combustor turbine assembly at 45 degree angle and support it in this position.

(19) Position dial indicator against a point just inboard of first stage power turbine blade roots. Rotate power turbine assembly and record runout. Runout must be within 0.004 inch TIR. Record runout.

(20) If runout is not within limits, loosen and retorque bolts (4).

(21) Reposition combustor turbine assembly on bench.

(22) Bend locking plate (5) tabs against bolts (4).

(23) Make sure that proper spacer (10), selected in preceding Step (15) is installed. Remove bolts (2, 23) installed in Step (17).

(24) Install first stage power turbine nozzle (1) over power turbine rotor and align bolt holes.

(25) Apply anti-seize compound (72-00-00, 15, Table 203) to threads of bolts (2, 23).

(26) Secure first stage power turbine nozzle with bolts (2, 23) and locking plates (3, 22).

(27) Rotate combustor turbine assembly to horizontal position with combustion chamber drain valve at 6 o’clock position. Using feeler gage, check clearance between first stage power turbine nozzle and sealing flange. If clearance is less than 0.005 inch, rework nozzle using half round file to obtain 0.015 inch minimum clearance.

(28) Bend tabs of locking plates against bolts and stake securely.

<u>CAUTION:</u> TO PREVENT OIL LEAKS, POWER TUBES MUST SEAT PERFECTLY. IF SEATING IS STILL NOT PERFECT, REPLACE TUBES AND REPEAT PRECEDING STEPS (29) THROUGH (31).

<u>NOTE:</u> Do not lubricate power turbine oil tubes (20).

(29) Lightly coat tapered seats of two power turbine tubes (20) with iron-blue pigment (72-00-00, 54, Table 203). Install tubes into top and bottom struts of exhaust diffuser and thread finger tight. Remove tubes and inspect seats.

NOTE: A perfect seal will be indicated by an unbroken ring on the tapered seat of the power turbine tube.

(30) If seating is imperfect, check tubes for clean connectors. Interchange tubes and repeat preceding Steps (29) through (31).

(31) Tighten each power turbine oil tube 100 to 110 inch-pounds torque and lockwire.

(32) Reinstall combustion chamber liner.

(33) Position combustor turbine assembly on work bench with exhaust diffuser side up and remove bolts and washers installed in Step (3).

(34) Position fireshield (30) on combustion chamber housing rear flange and align pin in combustion chamber housing with hole in fireshield assembly. If oil tubes are not concentric with holes in fireshield, remove fireshield and file as required.

(35) To ensure proper alignment of combustion chamber liner with fireshield and combustion chamber housing, position combustion chamber alignment fixture LTCT4174 through these components. Remove fixture.

CAUTION: USE CARE TO PREVENT DAMAGE TO SEALS.

(36) Install seals (27) on fuel nozzles. Install sealing gasket (28) on main fuel manifold and secure with screw (29). Carefully position two fuel manifold assemblies (16 and 26) over fireshield and align fuel nozzles with port holes. Install fuel manifold assemblies and secure with bolts (25). Tighten bolts as required and lockwire.

(37) Install starting fuel nozzles. (See 73-10-03.)

(38) Apply molykote anti-seize thread compound (72-00-00, 15, Table 203) to oil strainer housing adapter (17).

(39) Install strainer (18) into oil strainer housing adapter (17) at 12 o’clock position and tighten finger tight. Install oil strainer housing adapter (17) and packing (21) into oil tube. Tighten adapter 80 to 90 inch-pounds torque and lockwire.

(40) Apply molykote anti-seize thread compound (72-00-00, 15, Table 203) to connector (31).

(41) Install connector (31) and packing (32) into power turbine tube at 6 o’clock position. Tighten connector 80 to 90 inch-pounds torque and lockwire.

(42) Install support cone assembly (24) over fireshield and exhaust diffuser. Position starting fueling manifold bracket at 12 o’clock position.

NOTE: To ensure proper seating of the support cone on the combustion chamber, tap the V-band coupling assemblies, starting at the middle and moving toward the bolts at the ends. Tighten the nuts. Repeat tapping and tightening until the nuts cannot be easily drawn up further.

(43) Position V-band coupling assembly over support cone and combustion chamber flange with attaching ends at approximately 4 and 10 o’clock positions as viewed from the rear. Secure V-band assembly by one of the following methods. (See Figure 210.)

(a) For V-band coupling assembly (1). Secure with bolts (2), spacers (3, 4) and nuts (5).

(b) For V-band coupling assembly (1A). Secure with bolts (2A) and nuts (5A).

(44) Tighten V-band coupling nuts to 200 inch-pounds torque. Seat clamps by tapping with a soft faced mallet. Release torque to zero inch-pounds torque. Retighten 145 to 155 inch-pounds torque. Make sure that an equal gap, plus or minus 3/32 inch, exists between V-band coupling assembly ends. Lockwire nuts and bolts.

C. Establish First Stage Power Turbine Rotor Tip Clearance

(1) Using 0.020 inch copper wire and tape (72-00-00, 64, Table 203), determine actual tip clearances.

(a) Measure thickness of tape.

NOTE: Apply enough thickness of tape on blade tips so that the thickness of wire plus a single layer of tape on top of the wire equals the minimum tip clearance of 0.025 inch.

(b) Secure short length of copper wire on tips of power turbine blades at three locations 120 degrees apart. Place one short length of wire on forward tip of blade and one on aft tip of the same blade.

(2) Paint tape with iron-blue pigment (72-00-00, 54, Table 203).

(3) Remove four bolts (2, 23, Figure 209) installed in ring (12).

(4) Install spacer (10) (thickness determined in Paragraph 2.B(15)) on combustion chamber flange and align bolt holes. Install three pins (9). Pins shall be selectively fit to obtain 0.0005 to 0.001 inch loose fit. Use three pins of same dash number. (See Table 202.)

(5) Carefully position first stage power turbine nozzle (1) over first stage power turbine rotor (7). Align bolt holes.

(6) Use care not to rub against tape.

(7) Secure nozzle to exhaust diffuser with four equally spaced bolts. Tighten bolts evenly to proper torque.

(8) Rotate power turbine rotor one revolution, using hand crank LTCT4650 fitted into spline of second power turbine rotor.

Table 202. Selective Pin Diameters

Part No.	Shank Diameter
1-190-021-01	0.2495 to 0.2505 inch
1-190-021-02	0.2510 to 0.2515 inch
1-190-021-03	0.2520 to 0.2525 inch
1-190-021-04	0.2530 to 0.2535 inch

(9) Remove bolts that secure first stage power turbine nozzle and carefully remove nozzle.

(10) Check tape for signs of rubbing. If rubbing is not evident, tip clearance is acceptable. If rubbing is noted, proceed to Step (11).

(11) If rubbing is evident, determine tip clearance as follows:

(a) Select tape from each diameter which has greatest rub.

(b) If iron-blue pigment has been removed but tape has not been cut, tip clearance is equal to diameter of wire plus total thickness of tape used at that position.

(c) If tape has been cut completely through but wire has not been damaged, tip clearance is equal to diameter of wire plus thickness of tape under wire.

(d) If tape has been cut completely through and wire appears damaged, measure diameter of wire. The tip clearance is equal to minimum wire diameter plus thickness of tape under wire.

(12) Tip clearance determined in preceding Step (10) shall be 0.025 inch minimum. If desired clearance is not obtained, recheck alignment and torquing of bearing housing to exhaust diffuser or replace nozzle.

(13) Remove all installed tapes and wires.

D. Establish Second Stage Power Turbine Rotor Tip Clearance

(1) Using 0.020 inch copper wire and tape (72-00-00, 64, Table 203), determine actual tip clearance.

(a) Measure thickness of tape.

(b) Secure short length of copper wire on tips of power turbine blades at three locations 120 degrees apart. Place one short length of wire on forward tip of blade and one on aft tip of the same blade.

NOTE: Apply enough tape on blade tips so that the thickness of the wire plus a single layer of tape on top of the wire equals the minimum tip clearance of 0.025 inch.

(2) Paint tape with iron-blue pigment (72-00-00, 54, Table 203).

(3) Place spacer of 0.032 inch nominal thickness (13, Figure 209and Table 201) and ring (12, Figure 209) on combustion chamber flange and align bolt holes. Install three pins (9). Select pins to obtain 0.0005 to 0.001 inch loose fit.

(4) Apply anti-seize compound (72-00-00, 15, Table 203) to bolts (25).

(5) Secure ring and spacer with four equally spaced bolts (25). Tighten bolts evenly to proper torque.

(6) Carefully position second stage power turbine nozzle (11) over power turbine rotor and into ring (12).

NOTE: Use care not to rub against tape.

(7) While maintaining downward pressure on nozzle rotate power turbine rotor one revolution, using hand crank LTCT4650 installed in second stage power turbine rotor.

(8) Carefully remove nozzle and check tape for signs of rubbing. If rubbing is not evident, tip clearance is acceptable. If rubbing is noted, proceed to Step (9).

(9) f rubbing is evident, determine tip clearance as follows:

(a) Select tape from each diameter which has greatest rub.

(b) If iron-blue pigment has been removed, but tape has not been cut, tip clearance is equal to diameter of wire plus total thickness of tape used at that position.

(c) If tape has been cut completely through, but wire has not been damaged, tip clearance is equal to diameter of wire plus thickness of tape under wire.

(d) If tape has been cut completely through and wire appears damaged, measure diameter of wire. Tip clearance is equal to minimum wire diameter plus thickness of tape under the wire.

(10) Tip clearance determined in preceding Step (9) shall be 0.025 inch minimum. If desired clearance is not obtained, recheck alignment and torquing of bearing housing to exhaust diffuser or replace nozzle.

(11) Remove all installed tapes and wires.

3. Inspection/Check

A. Visually inspect the combustor turbine assembly.

B. Perform a power shaft bolt flange measurement. (See Paragraph 1.A(20) through (22).)

C. Using a 0.020 inch feeler gage, perform a tip clearance of the second stage gas producer.

D. Using a 0.025 inch diameter wire, perform a tip clearance check of the second stage power turbine rotors.

4. Cleaning/Painting

Clean combustor turbine assembly. (See 72-00-00, ENGINE - CLEANING.)

V-BAND COUPLING ASSEMBLY, OIL STRAINER HOUSING ADAPTER, CONNECTOR, POWER TURBINE TUBES, AND FIRESHIELD ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

   A. Visually inspect threaded parts for crossed or damaged threads.

   B. Visually inspect parts for cracks or distortion. (See Figure 201.)

   C. Visually inspect fireshield for cracks originating from the lockplate areas. Limits are as follows:

      (1) Cracks extending along any two sides of either lockplate are acceptable. Cracks extending along more than two sides are not allowed.

      NOTE: Circumferential cracks appearing on both sides in forward area of lockplate indicate cracking beneath surface. These cracks shall be considered as affecting the width (one side) of lockplate.

      (2) Cracks up to 1 inch in length are acceptable without repair provided limit of preceding Step (1) is not exceeded.

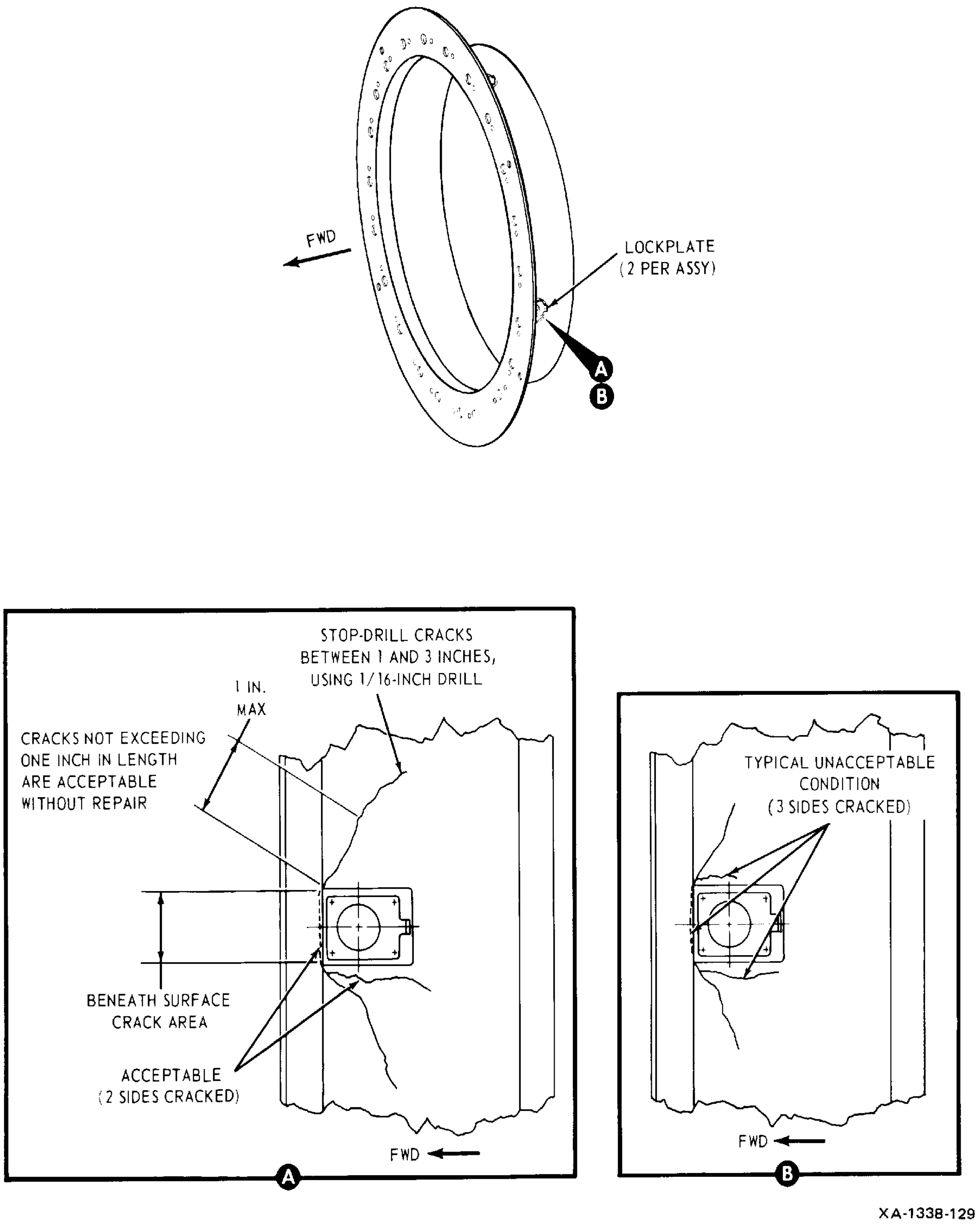
      NOTE: Cracks emanating from below forward area of lockplate need not be stop drilled unless visible portion is greater than 1 inch in length.

      (3) Cracks between 1 and 3 inches in length are acceptable provided they are stop drilled and limit of preceding Step (1) is not exceeded.

2. Cleaning/Painting

   A. Clean all parts using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   B. Clean attaching hardware using dry cleaning solvent. (See SPM, SP C203, 70-15-03.)



Fireshield Crack Limits
Figure 201

3. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair damaged threads. (See SPM, SP R409, 70-25-03.)

C. If crack limits are exceeded on fireshield, repair as follows:

(1) Fusion weld repair cracks, using welding wire (72-00-00, 72, Table 203). (See SPM, SP R402, 70-45-01.)

(2) Blend repair welds. (See SPM, SP R401, 70-25-01.)

(3) After repair, visually and dye penetrant inspect weld areas for cracks. (See SPM, SP I304, 70-20-04.)

D. Replace all parts that are damaged or distorted beyond repair.

EXHAUST DIFFUSER SUPPORT CONE ASSEMBLY - MAINTENANCE PRACTICES

1. Disassembly/Assembly

NOTE: Disassemble the exhaust diffuser support cone assembly only as required to correct visible damage.

A. Disassemble Support Cone Assembly

(1) Cut and remove lockwire from bolts (3, Figure 201).

(2) Remove bolts that secure retainers (1, 2). Remove retainers.

NOTE: Support assembly must be tagged and flanges indexed for support location. Supports are not interchangeable.

(3) Remove pins (9) from support assemblies (4). Remove support assemblies from rear and front flanges (10, 11).

(4) Repeat preceding Steps (1) through (3) for remaining support assemblies (5, 6, 7, 8).

B. Assemble Support Cone Assembly

NOTE: Refer to tags for support assembly locations.

(1) Position support assembly (6) on rear and front flanges (10, 11).

(2) Install pins (9) into support assembly.

(3) Position retainers (1, 2) on support assembly (4) and secure with bolts (3).

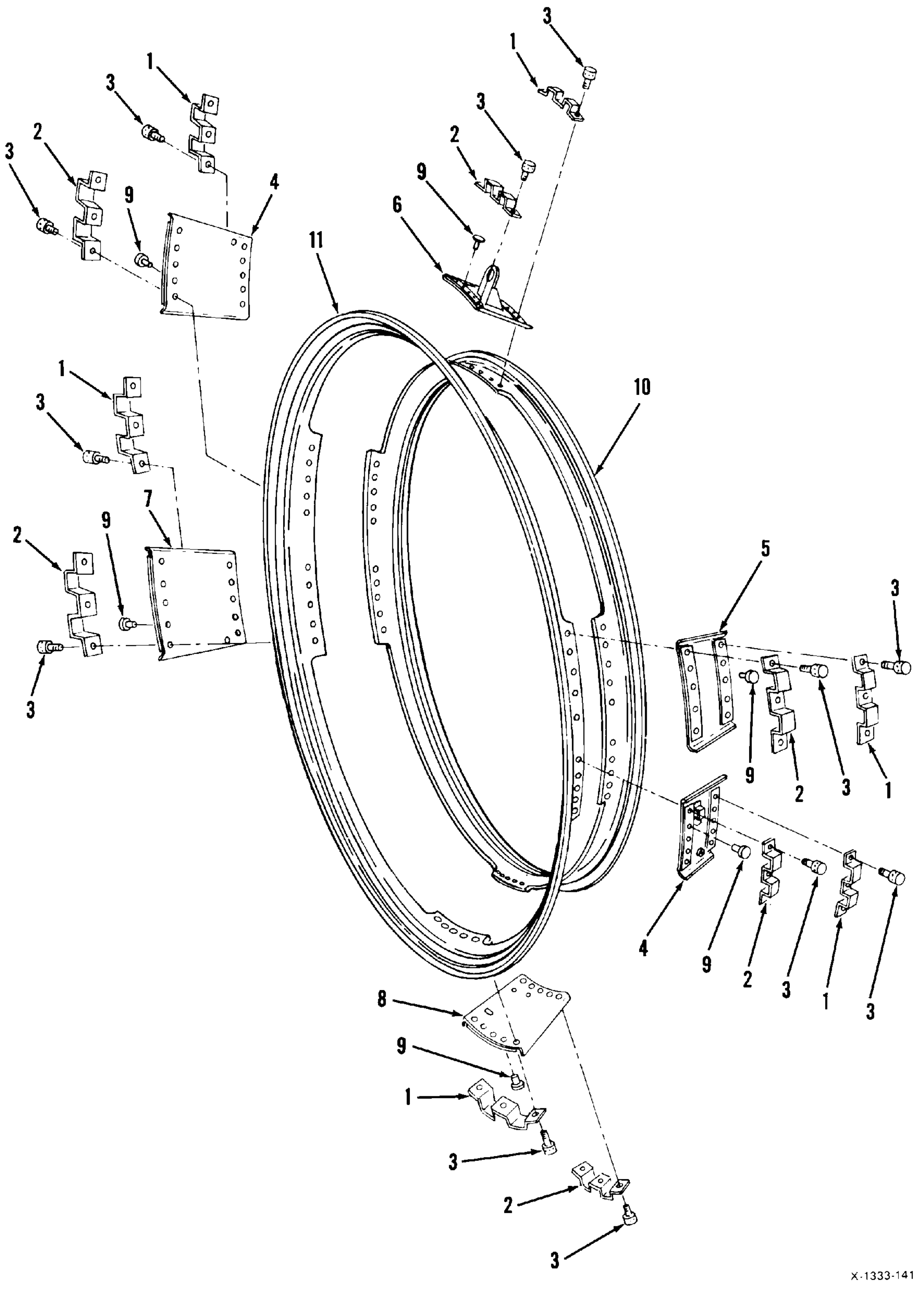
(4) Lockwire bolts.

(5) Repeat preceding Steps (1) through (3) for remaining support assemblies (5, 6, 7, 8).

2. Inspection/Check

A. Visually inspect all parts for cracks and distortion.

B. Inspect all threaded parts for crossed or damaged threads.



Exhaust Diffuser Support Cone Assembly
Figure 201

KEY TO FIGURE 201

1. RETAINER
2. RETAINER
3. BOLT
4. SUPPORT ASSEMBLY
5. SUPPORT ASSEMBLY
6. SUPPORT ASSEMBLY
7. SUPPORT ASSEMBLY
8. SUPPORT ASSEMBLY
9. PIN
10. REAR FLANGE
11. FRONT FLANGE

3. Cleaning/Painting

Clean all parts using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Repair damaged threads. (See SPM, SP R409, 70-25-03.)

B. Replace damaged or distorted cone.

COMBUSTION CHAMBER ASSEMBLY - MAINTENANCE PRACTICES

1. Disassembly/Assembly

A. Disassemble Combustion Chamber Assembly

(1) Straighten tabs on keywashers (4, Figure 201), and remove nuts (5) and keywashers that secure combustion chamber liner assembly (1) to combustion chamber housing assembly (3). Remove liner assembly.

(2) (1-130-780-01 liner only) Remove washers (2) from three liner assembly studs.

(3) (1-130-780-03 liner only) Remove six springs (6).

(4) Remove starting fuel hose assemblies and check filter valve. (See 73-10-07.)

B. Assemble Combustion Chamber Assembly

(1) Install starting fuel hose assemblies and check filter valve.

CAUTION: ALL DIMPLES ON COMBUSTION CHAMBER LINER FORWARD INSIDE SURFACE MUST TOUCH FIRST STAGE GAS PRODUCER NOZZLE LINER. WHEN REQUIRED, CAREFULLY BEND COMBUSTION CHAMBER LINER TABS TO MAKE SURE ALL DIMPLES CONTACT NOZZLE LINER.

NOTE: There are six studs in the liner assembly. Only three of the studs will accommodate washers (2). Do not lubricate studs.

(2) (1-130-780-01 liner only) Place washers (2, Figure 201) on three studs 1-130-256-02 of combustion chamber liner assembly (1) and retain with petrolatum (72-00-00, 53, Table 203).

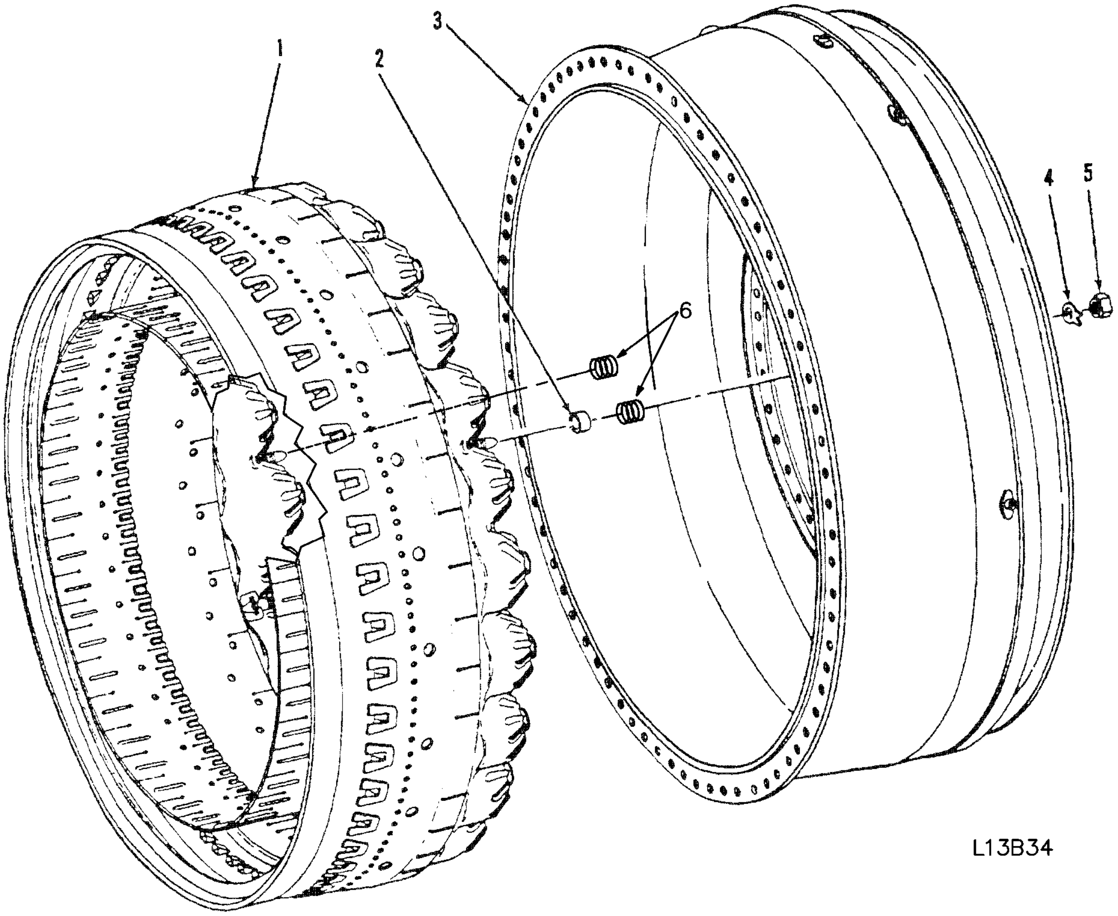
(3) (1-130-780-03 liner only) Place six springs (6) on studs 1-130-256-01/-02 and retain with petrolatum (72-00-00, 53, Table 203).

(4) Rotate all studs to face keyways inward and install liner assembly into combustion chamber housing assembly (3) so that TOP index on housing and TOP index on liner are aligned. Make sure that stud keyways engage with tabs in housing.

CAUTION: DO NOT FORCE LINER INTO HOUSING. CHECK AND REPOSITION STUDS IF REQUIRED.

(5) Install keywashers (4) and nuts (5) on liner assembly studs. Do not tighten nuts.

(6) To ensure proper alignment of combustion chamber liner assembly with housing assembly (3), install two alignment fixtures LTCT4174 on housing assembly.



1. COMBUSTION CHAMBER LINER ASSEMBLY
2. WASHER (USE WITH 1-130-780-01 LINER ONLY)
3. COMBUSTION CHAMBER HOUSING ASSEMBLY
4. KEYWASHER
5. NUT
6. SPRING (USE WITH 1-130-780-03 LINER ONLY)

Combustion Chamber Assembly
Figure 201

NOTE: Protrusion of stud threads beyond nut is not required.

(7) When liner 1-130-780-01 is used, tighten nuts on three studs, without washers, 35 to 40 inch-pounds torque, then tighten nuts on three remaining studs 35 to 40 inch-pounds torque. When liner 1-130-780-03 is used, tighten nuts on all six studs 35 to 40 inch-pounds torque.

(8) Remove alignment fixtures LTCT4174.

COMBUSTION CHAMBER LINER ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

   A. Inspect Liner Assembly for Cracks in all Areas

      (1) Any number of 1/8 inch long cracks are allowed in liner at conical section louvers.

      (2) Any number of cracks progressing to a louver are acceptable in each fuel nozzle area provided that each cracked louver is separated from the next cracked louver by an unaffected louver. (See Figure 201.)

      (3) One of four weldments may be cracked on each fuel nozzle seal guide.

   B. Inspect Inner and Outer Liner for Cracks

      (1) Cracks between two holes are acceptable without repair except in areas shown. Ten nonadjacent cracks per assembly are allowed. (See Figure 202, Sheets 1 and 2.)

      (2) Divergent cracks originating at the base of the slots on the inner and outer liners are acceptable up to 3/4 inch on all slots. Only one crack shall be allowed per slot.

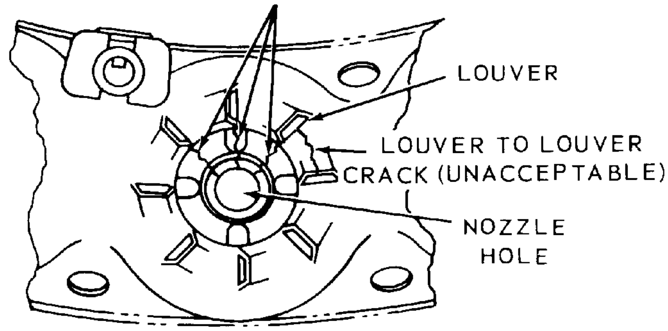
      CAUTION: DO NOT STOP DRILL CRACKS.

      (3) A total of five cracks up to 1 inch in length are acceptable on both inner and outer liners, provided they are nonconvergent, tight lipped, and there is no possibility of material fallout.

      CAUTION: AXIAL CRACKS ONLY, IN INNER LINER TAB AREA ON ADJACENT TABS (SLOTS), ARE ACCEPTABLE. MISSING TABS ARE NOT ACCEPTABLE. RELATIVE TO LINER MATING WITH GAS PRODUCER NOZZLE, MISSING TABS COULD RESULT IN IMPROPER SEALING WITH RESULTANT DOWNSTREAM DAMAGE.

      (4) Cracks in up to 30 resistance welds are acceptable without repair in each liner to liner or liner to flange weldment provided no more than four adjacent tabs are affected.

      (5) One 3/8 inch long crack emanating from saw cut into inner forward tab is acceptable without repair on two nonadjacent tabs.



Combustion Chamber Liner Acceptable Crack Limits
Figure 201

2. Cleaning/Painting

A. Clean liner assembly (72-40-03, 1, Figure 204) using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

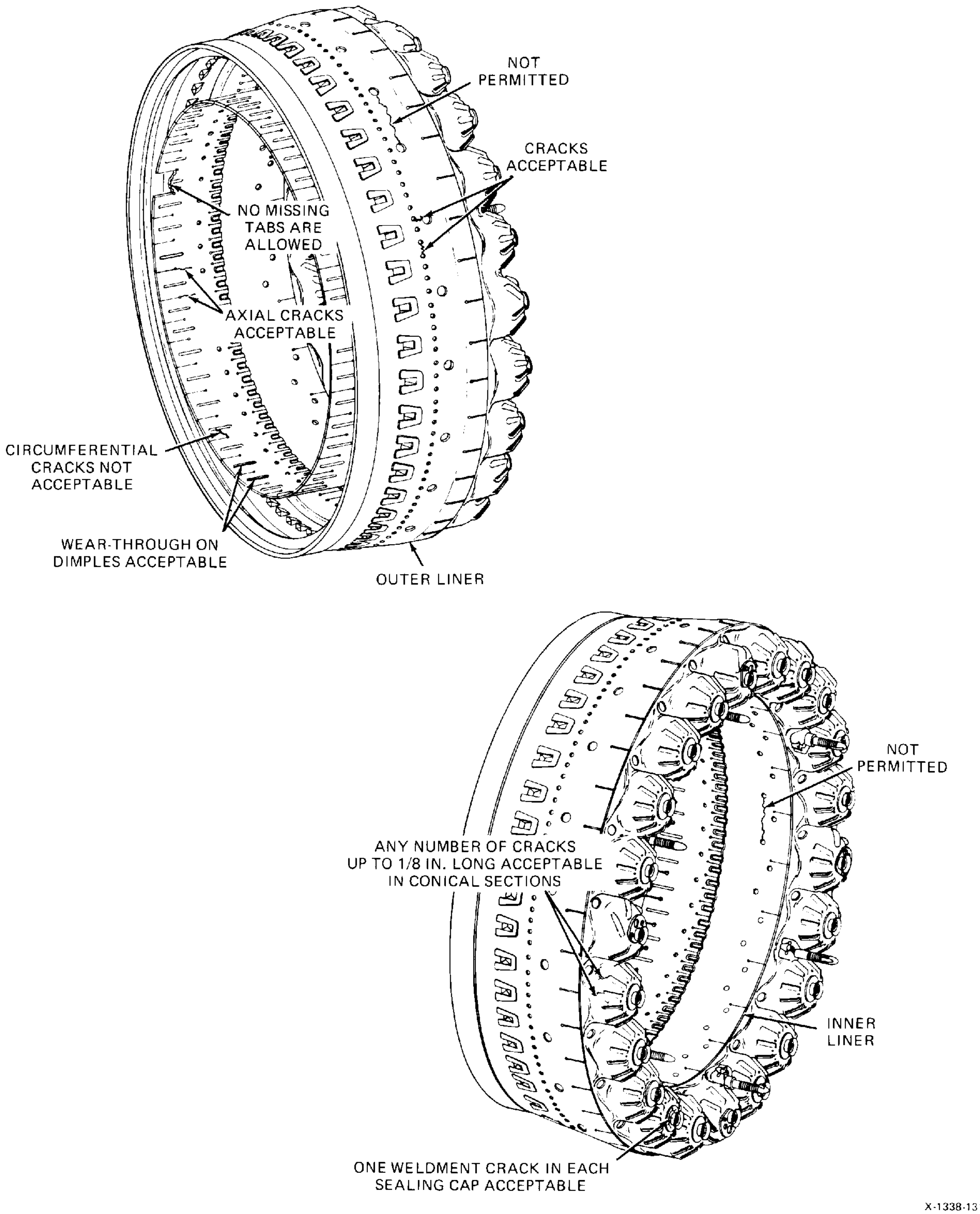
B. If necessary, use solvent immersion method. (See SPM, SP C202, 70-15-02.)

C. If further cleaning is required, use vapor blasting (liquid honing) method. (See SPM, SP C205, 70-15-05.)

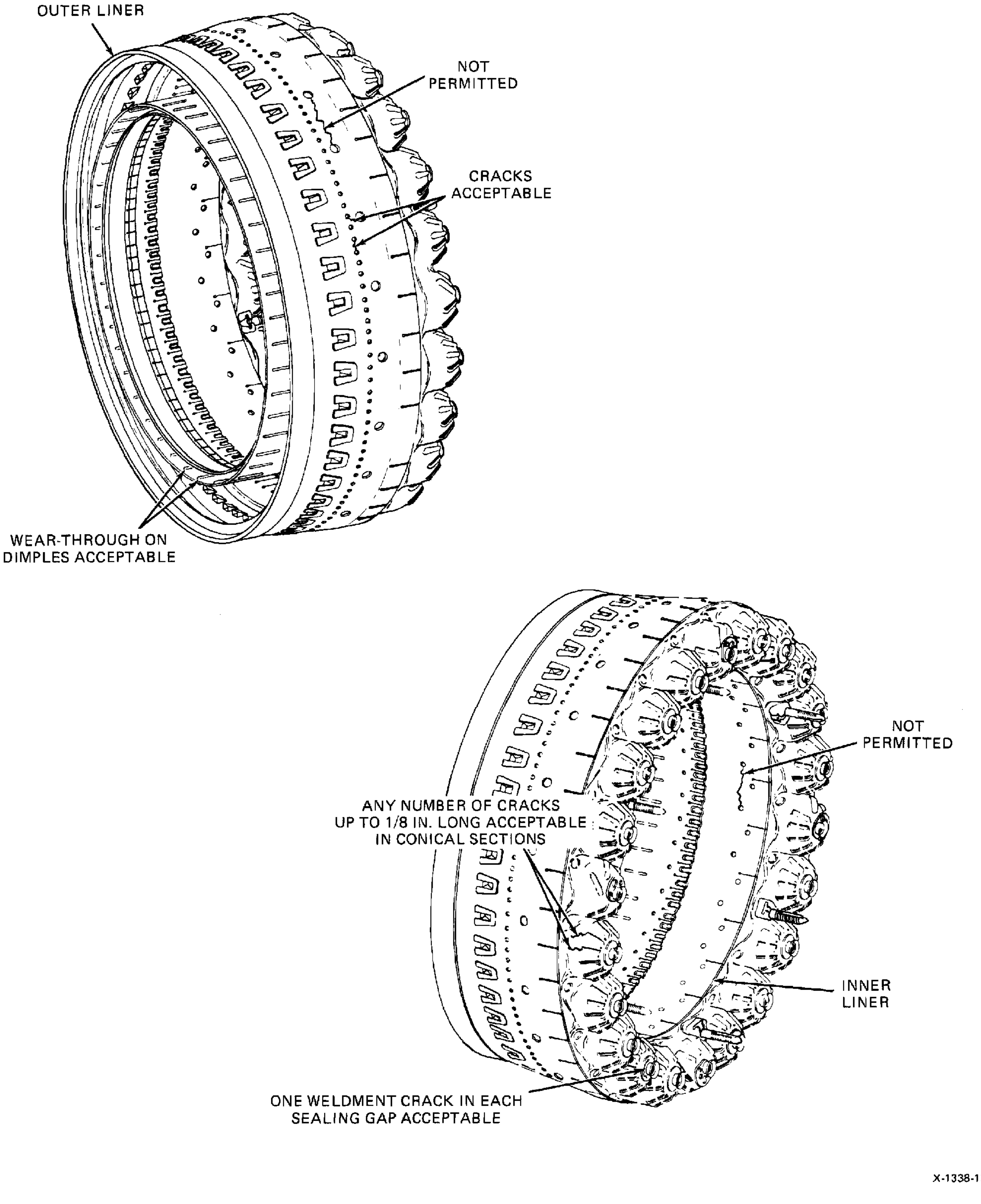
3. Approved Repairs

A. Replace liner assembly if burn through exceeds 1/2 square inch or crack progression will cause material fallout.

B. Replace liner if cracks exceed limits.



Combustion Chamber Liner Crack Limits
Figure 202 (Sheet 1 of 2)



Combustion Chamber Liner Crack Limits
Figure 202 (Sheet 2)

C. Replace liner if one or more tabs is missing.

D. Replace liner assembly if buckling and distortion exceed 0.100 inch from original profile.

E. Reclean liner assembly if air gaps or holes are clogged. Adjust clearances if required. (See Figure 203.)

F. Replace liner bracket or stud if wear exceeds one quarter of original thickness.

G. Using gapping and inspection tool LTCT13022, LTCT13023, or LTCT13024 (details of LTCT13020) adjust air gap as required.

H. Repair damaged threads on studs. (See SPM, SP R409, 70-25-03.) If threads are damaged beyond repair, replace studs as follows:

(1) Remove retainer clip (1, Figure 204) that secures stud (2, 3) to bracket.

(2) Remove damaged stud and replace with new stud having a like part number. Install retainer clip (1).

I. Replacement of Worn or Damaged Seal Guide Assembly 1-130-790-02

CAUTION: USE CARE NOT TO GRIND PARENT METAL OF LINER.

(1) Using a carbide burr, grind tack weld and remove worn or damaged seal guide assembly.

(2) Position new seal guide assembly and tack weld in four places using welding wire (72-00-00, 72, Table 203). (See Figure 205 and Figure 206.) (See SPM, SP R401, 70-25-01.)

J. Replacement of Worn or Damaged Seal Guide Assembly 1-130-800-01

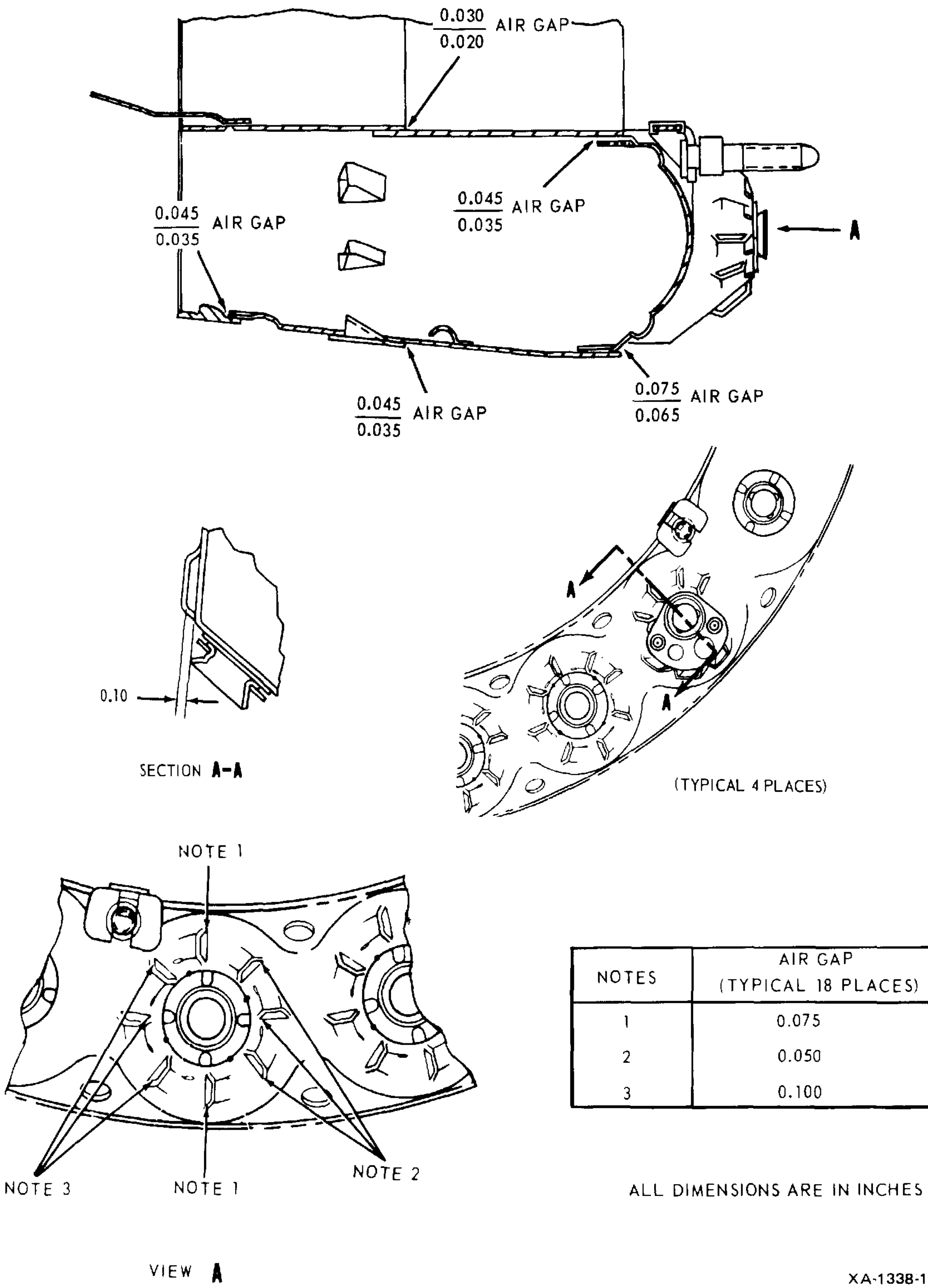
(1) Remove rivets by grinding formed heads.

(2) Remove damaged seal guide assembly, rivets, washers, and gaskets.

(3) Install new gaskets 1-130-261-01 and 1-130-262-02, seal guide assembly, washers 1-130-265-01, and rivets 1-130-264-01.

(4) Head over rivets. Maintain 0.005 to 0.015 inch gap by temporarily inserting shim stock while forming rivet heads.

(5) Remove shim stock and check seal guide assembly for freedom of movement. (See Figure 206.)

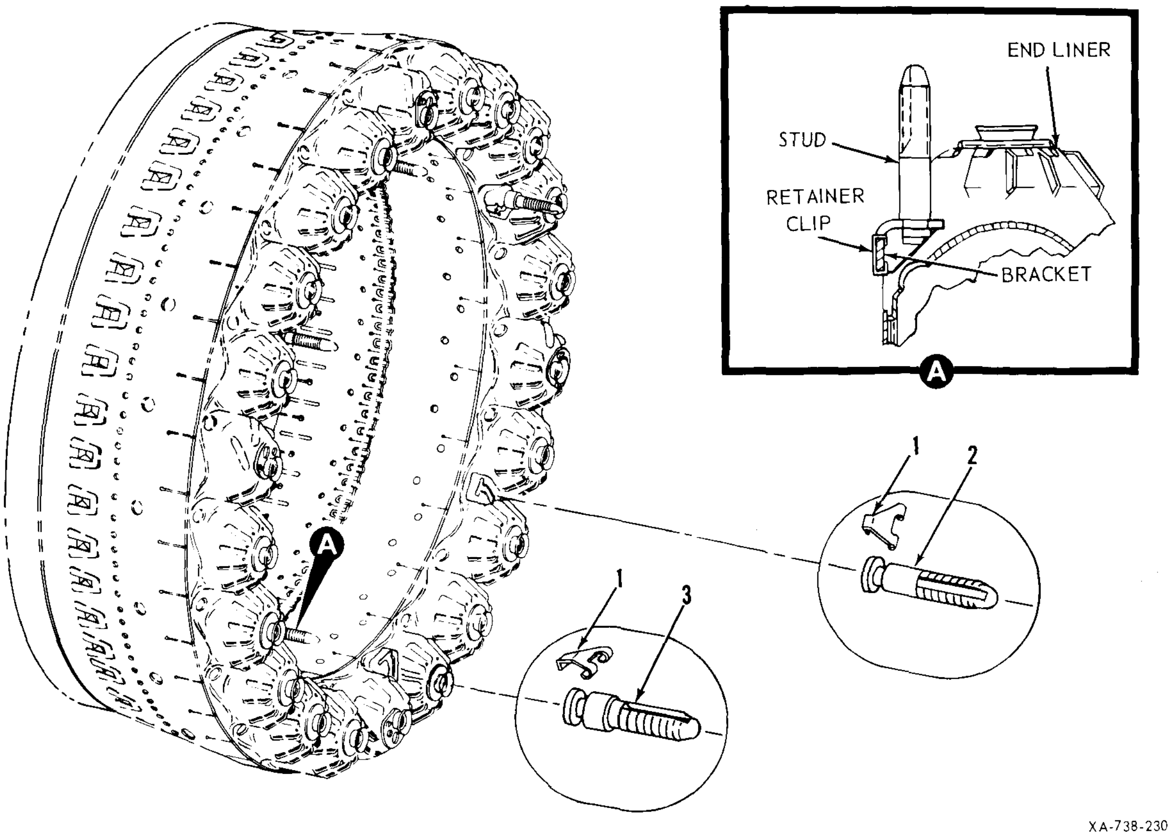


NOTES	AIR GAP (TYPICAL 18 PLACES)
1	0.075
2	0.050
3	0.100

ALL DIMENSIONS ARE IN INCHES

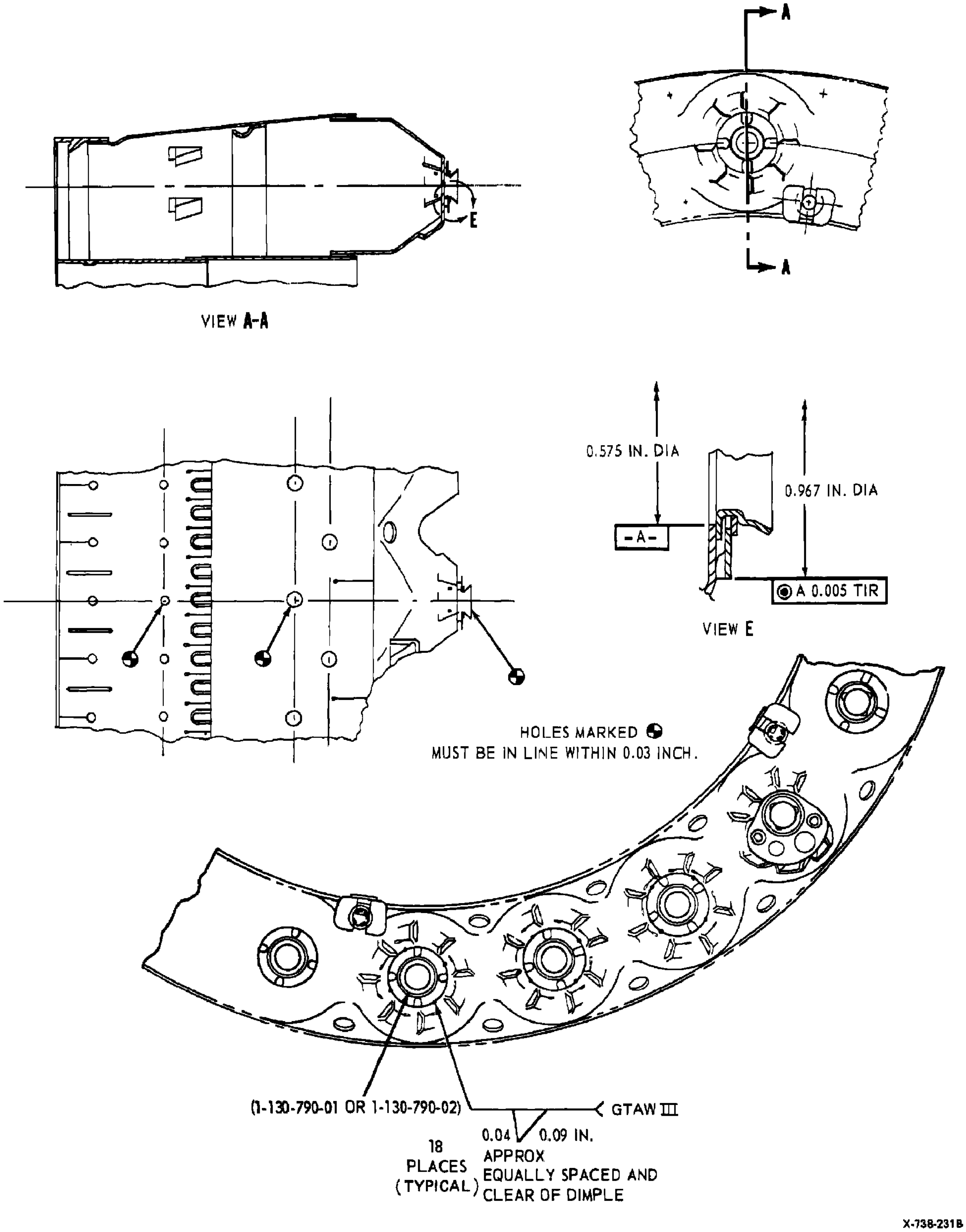
XA-1338-133A

Combustion Chamber Liner Air Gap Limits
Figure 203

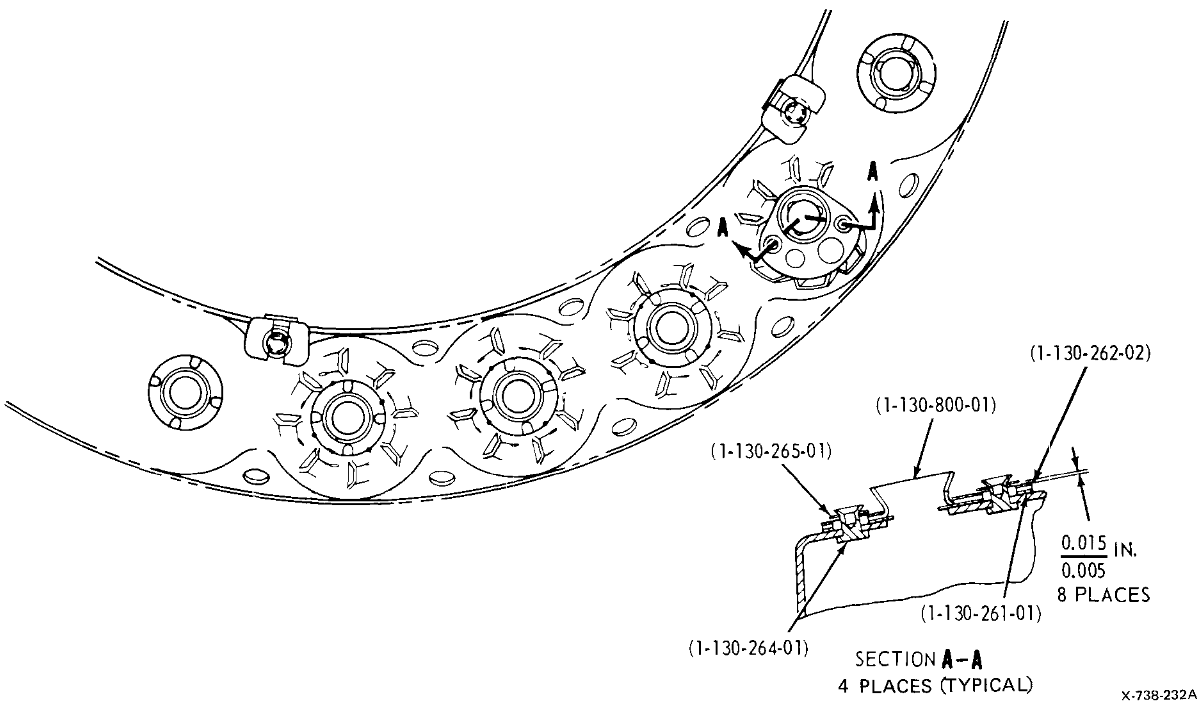


1. RETAINER CLIP (1-130-257-01)
2. STUD (1-130-256-02)
3. STUD (1-130-256-01)

Replacement Liner Studs
Figure 204



Seal Guide Assembly 1-130-790-02
Figure 205



Seal Guide Assembly 1-130-800-01
Figure 206

COMBUSTION CHAMBER HOUSING ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

   A. Inspect housing assembly for nicks, burrs, and scratches. (See 72-40-03, Figure 201.) Nicks, burrs, and scratches are not allowed. Repair such defects.

   B. Inspect housing assembly for damaged threads. Damaged threads are not allowed. Repair threads.

   C. Inspect housing assembly for cracks and distortion. Cracks or distortion are not allowed. Replace housing assembly if either such defect is evident.

   D. Inspect for missing or damaged liner supports. Missing or damaged liner supports are not allowed.

   E. Inspect combustion chamber drain valve mounting boss for cracks or damage. Replace housing assembly if cracked or warped.

2. Cleaning/Painting

   A. Clean housing assembly using dry cleaning solvent (72-00-00, 62, Table 203). (See 72-40-03, Figure 201.) (See SPM, SP C203, 70-15-03.)

   B. If necessary, clean housing assembly using solvent immersion method. (See SPM, SP C202, 70-15-02.)

3. Approved Repairs

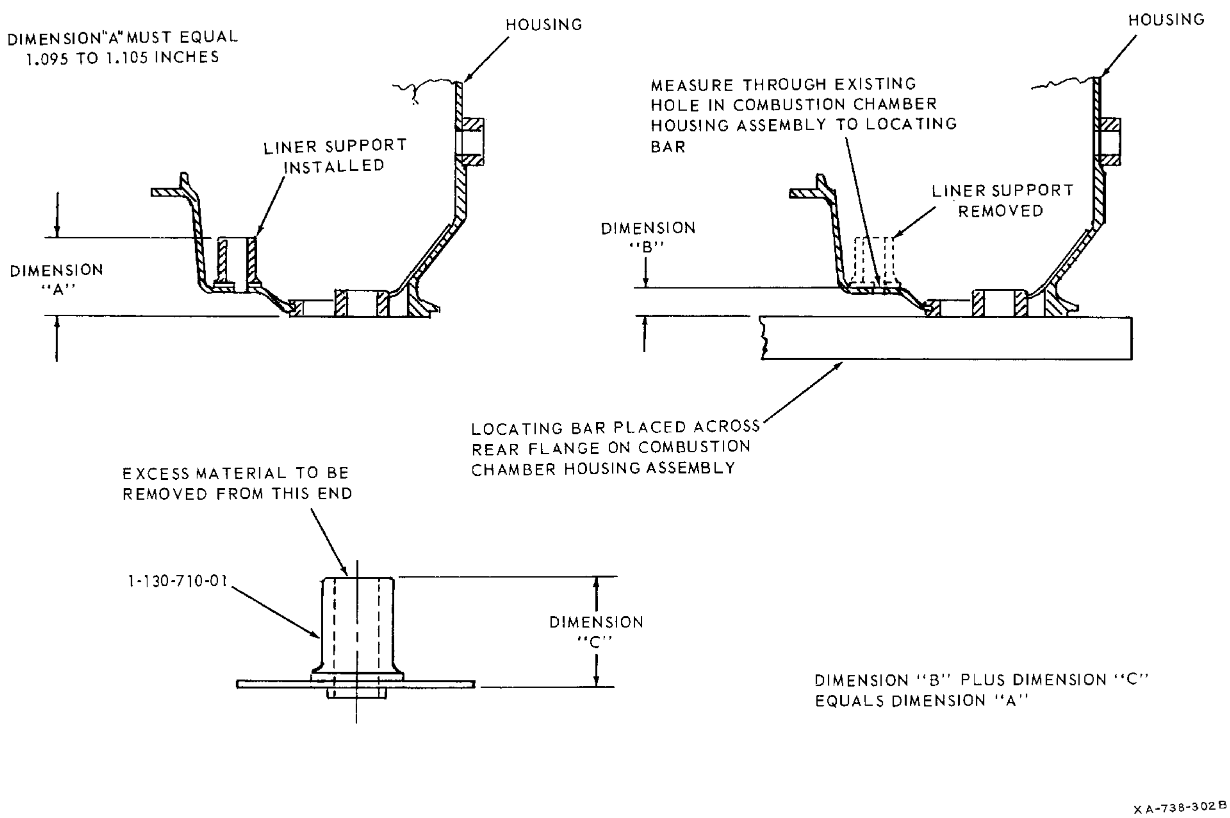
   A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

   B. Repair damaged threads. (See SPM, SP R409, 70-25-03.) If threads are beyond repair, replace housing assembly.

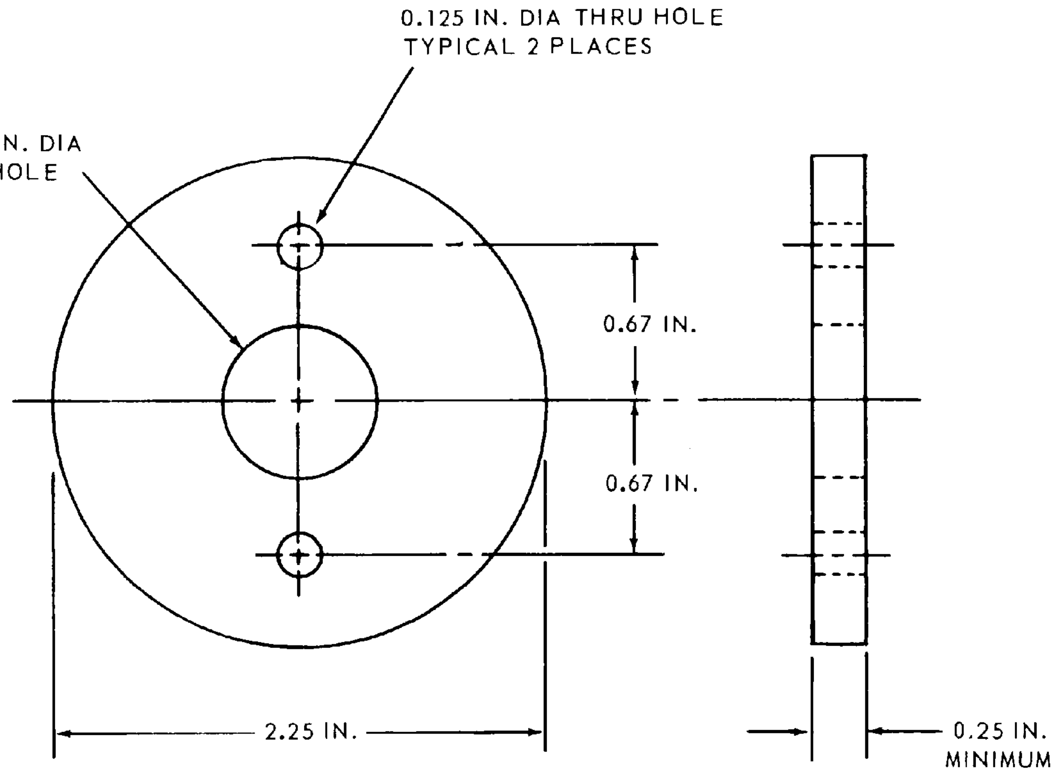
      NOTE: To properly position the combustion chamber liner in the combustion chamber housing assembly, the dimension from the rear flange of the combustion chamber housing assembly to the forward faces of the installed liner support must be maintained at 1.095 to 1.105 inches. (See Dimension A, Figure 201.) Improperly installed liner support can result in preloading and eventual cracking of the combustion chamber liner and also chafing of the fuel manifold nozzles.

   C. Replace missing or damaged liner support 1-130-710-01 as follows: (See Figure 201, Figure 202, and Figure 203.)

      (1) Fabricate a liner support holding fixture as shown in Figure 202.



Determining Dimension for Proper Position of Combustion Chamber Liner
Figure 201

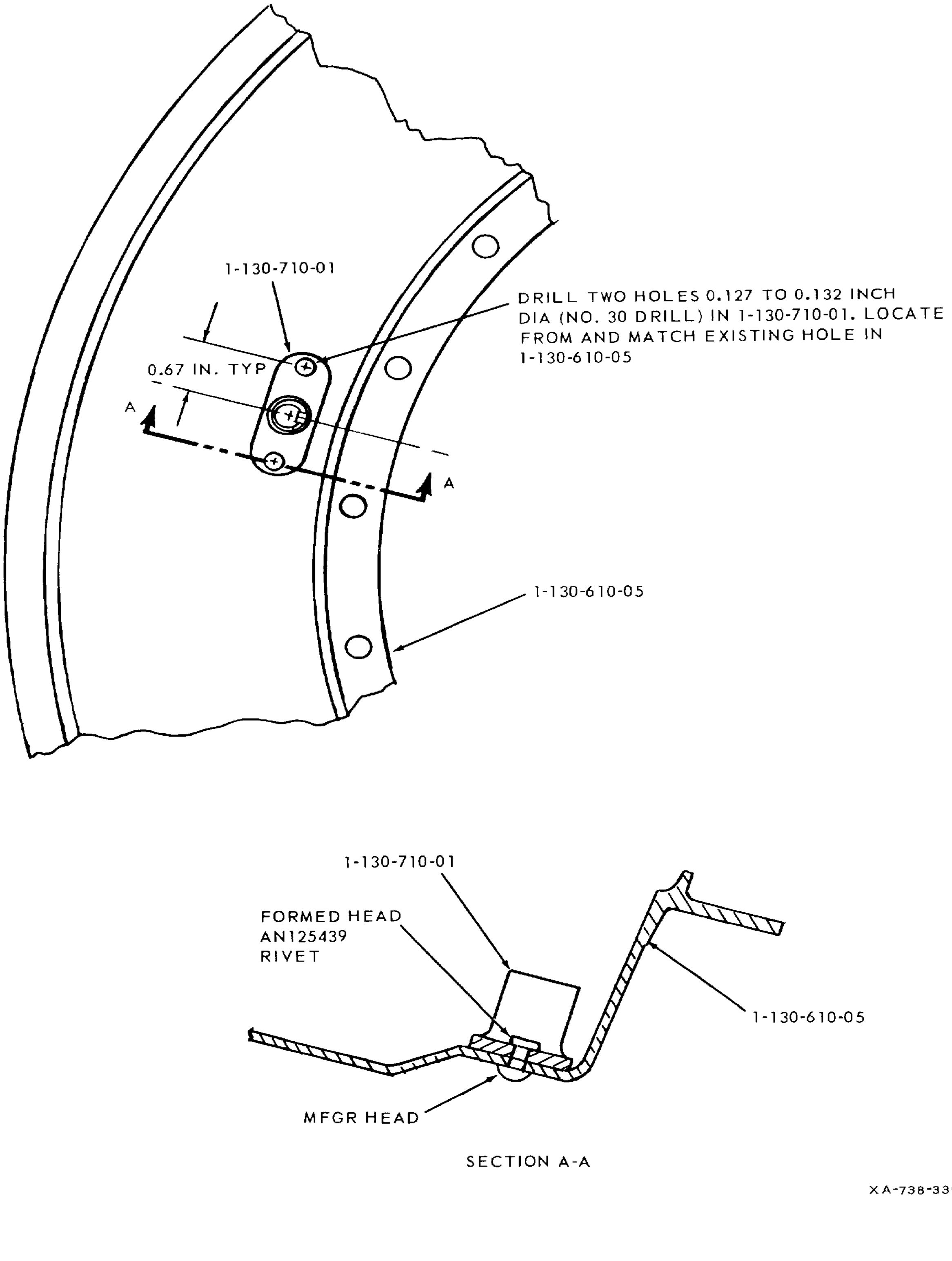


NOTE:

1. FABRICATE FIXTURE FROM ANY COMMON FLAT STEEL STOCK.
2. MOUNT LINER SUPPORT , 1-130-710-01, TO HOLDING FIXTURE USING #4 x 1/2 INCH STEEL SCREWS (P/N MS35266-17), #4 STEEL WASHERS (P/N AN960-4L), AND #4 NUTS (P/N MS21042-04) OR SUITABLE EQUIVALENTS.

XA-738-338

Fixture for Machining Liner Support 1-130-710-01
Figure 202



Replacing Liner Support
Figure 203

(2) Replace missing or damaged liner support assemblies as follows:

CAUTION: IN FOLLOWING STEP, USE CARE TO GRIND ONLY THAT PORTION OF THE RIVET THAT PROTRUDES THROUGH THE LINER SUPPORT AND NOT THE HOUSING PARENT METAL.

(a) Grind existing rivets to remove formed heads. (See Figure 203.) Using a 1/8 inch diameter pin punch, drive rivets from holes and remove damaged supports.

(b) Remove all grinding residue and foreign matter from affected surfaces. Place a locating bar LTCT153 across rear flange of combustion chamber housing. Using a vernier depth gage, measure through the housing to the locating bar and record as Dimension B. (See Figure 201.)

(c) Subtract Dimension B from 1.100 inches. Result will be Dimension C.

CAUTION: IN FOLLOWING STEP, MAKE SURE THAT REWORKED LINER SUPPORT SHOULDER REMAINS 90 DEGREES TO THE PERPENDICULAR.

COMBINED LENGTH OF LINER SUPPORT PLUS DIMENSION B SHOULD EQUAL DIMENSION A (1.095 TO 1.105 INCHES).

(d) Using a suitable lathe and the holding fixture fabricated in preceding Step (1), machine length of replacement liner support to Dimension C, Figure 201.

(e) If not previously accomplished, drill two holes in the replacement liner support, matching holes with existing holes in the combustion chamber housing. Use number 30 drill.

(f) Align holes in the liner support with holes in housing and secure with rivets AN125439. (See Figure 203.)

(g) Repeat, as necessary, Steps (a) through (f) for replacement of any additional damaged or missing liner supports.

D. Replace housing assembly, if cracked or distorted, or if threads are damaged beyond repair.

EXHAUST DIFFUSER - MAINTENANCE PRACTICES

1. Inspection/Check

   A. Inspect all areas for nicks, dents, and distortion. (See Figure 201.) Minor nicks, dents, and distortion are acceptable without repair provided no interference of mating parts occur. (See Figure 202.)

   B. Inspect for major distortion. Damage associated with distortion is cause for rejection of exhaust diffuser.

   C. Using an approved silver marking pencil (72-00-00, 59A, Table 203) mark all cracks that exceed maximum allowable limits. Repair cracks.

   D. Inspect outer cone for cracks. No cracks allowed. (See Figure 202.)

   E. Inspect mid and inner cones for cracks. Any number of tight lipped nonconvergent cracks up to 1/2 inch in length, which do not affect weldments, are acceptable. Circumferential cracks adjacent to mounting flange are not permitted.

   F. Inspect mid and inner cones for burning. No burn through is permitted. Replace exhaust diffuser.

   G. Inspect bearing housing support for cracks. Two tight lipped, nonconvergent cracks up to 1/2 inch in length, which do not affect weldments, are acceptable without repair.

   NOTE: Dents that form on outer strut and produce a gap greater than 1/8 inch between outer strut and outer strut fairing shall be inspected further for cracks.

   H. Inspect outer struts and outer strut fairings for nicks, dents, cracks, and burning.

      (1) Repair nicks and dents which could prevent expansion movement of struts and fairings.

         (a) One crack per strut fairing is allowed up to 1 1/2 inches in length without repair. If limits are exceeded, replace exhaust diffuser.

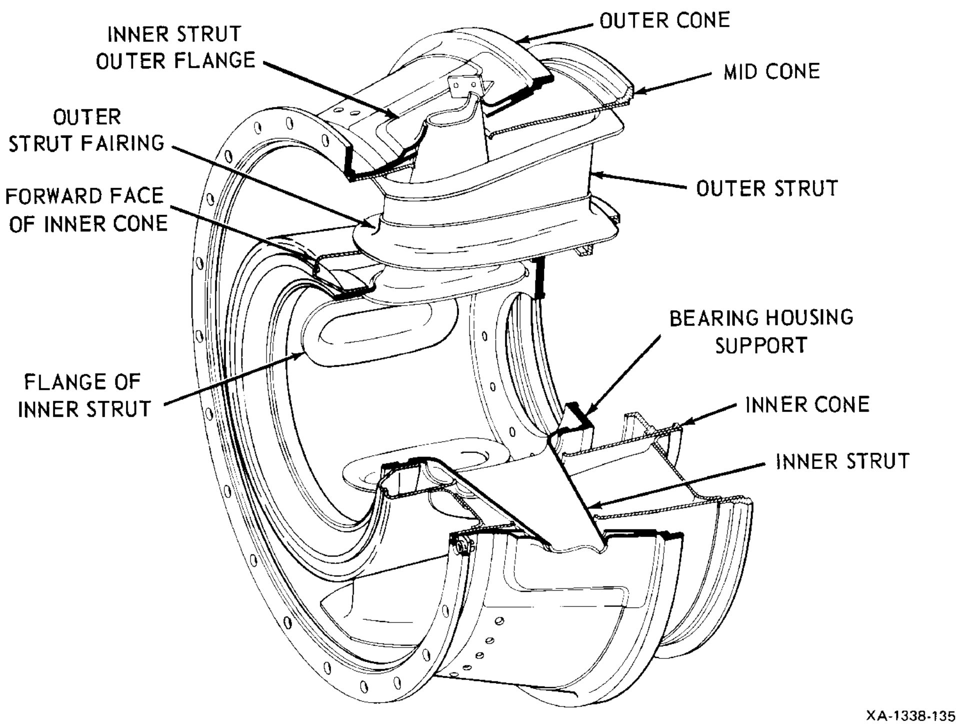
         (b) No burn throughs are permitted. Replace diffuser.

   I. Inspect inner strut flanges for cracks. Two cracks 1/2 inch in length, are acceptable without repair on each inner strut outer flange.

   NOTE: Ends of cracks shall be stop drilled except those in outer strut fairings. (See Figure 202.)

   J. Inspect inner struts for cracks. No cracks allowed.

   K. Inspect mounting flange for damaged or missing nuts. Replace damaged or missing nuts.



Exhaust Diffuser
Figure 201

2. Cleaning/Painting

Clean exhaust diffuser using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

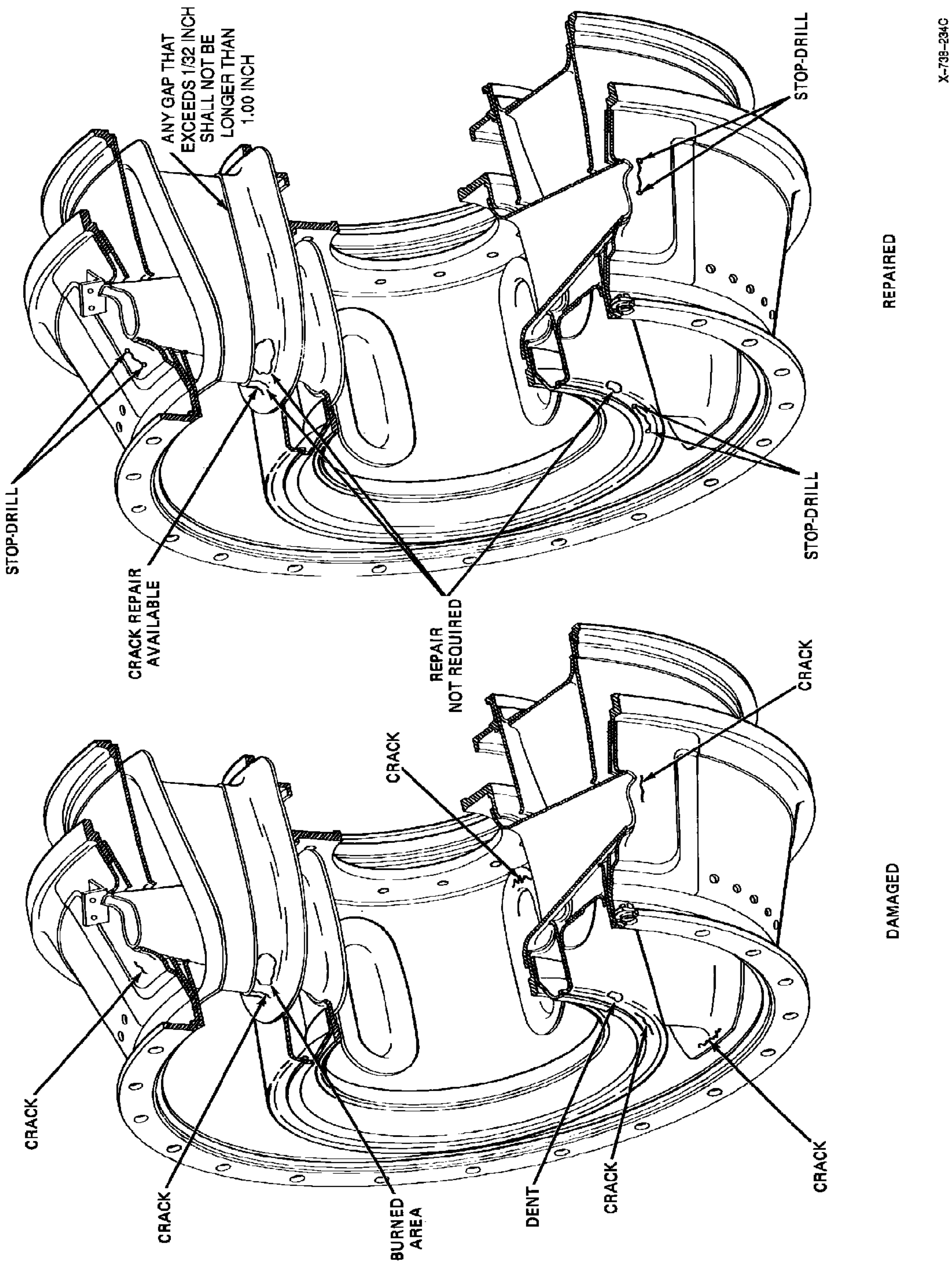
Repair exhaust diffuser. Repair cracks and dents within permissible limits as follows. (See Figure 202.)

CAUTION: WHEN MORE THAN ONE THICKNESS OF METAL IS PRESENT BE CAREFUL NOT TO DRILL THROUGH SECOND THICKNESS.

A. Using a 1/16 inch diameter drill, stop drill ends of cracks, except those in outer strut fairing.

B. Repair dents that create a gap greater than 1/16 inch between outer strut and strut fairing as follows:

(1) Using a rubber or leather headed mallet, deform flange or strut fairing as close to outer strut as possible.



Exhaust Diffuser - Damaged and Repaired
Figure 202

WARNING: WELDING OPERATIONS PRODUCE HEAT, METAL FUMES AND SLAG, INJURIOUS RADIATION, AND AIRBORNE PARTICLES. ADEQUATE VENTILATION IS REQUIRED. WELDING HELMETS/HAND SHIELD, WELDING GOGGLES WITH PROPER TINTED LENSES, APRON/JACKET, WELDING GLOVES, AND WELDERS BOOTS ARE REQUIRED.

(2) Using welding wire (72-00-00, 72, Table 203), tack weld threaded end of a 1/4 inch diameter by 1 inch long, low alloy steel hex head bolt, to center of dent. Tack welds shall be approximately 0.045 inch long and 180 degrees apart.

(3) Apply an outward pressure under head of bolt until dented area conforms (after pressure is released) to contour of undamaged strut and strut fairing areas adjacent to dent.

CAUTION: DURING GRINDING, DO NOT REDUCE STRUT WALL THICKNESS.

(4) Remove bolt by grinding away tack welds.

(5) Visually inspect repaired areas to ensure that strut and strut fairing mating surfaces are closed within allowable limits.

C. Replace damaged or missing nuts 1-300-086-01 on mounting flange of exhaust diffuser, using installation tool LTCT6000.

D. Replace thermocouple studs on exhaust diffuser that are damaged or have stripped threads as follows. (See Figure 203.)

(1) Cut off stud flush to surface of boss.

(2) Using a center drill, start a hole in remainder of stud.

(3) Using No. 8 carbide drill, drill into stud approximately 0.150 inch below face of boss (cutting through lockpin).

(4) Using a punch, drive part of lockpin into hole drilled in preceding Step (3)(c). Remove pin.

(5) Using No. 43 carbide drill, drill through existing pin hole and into remainder of pin in opposite wall of stud to a depth of approximately 0.380 inch.

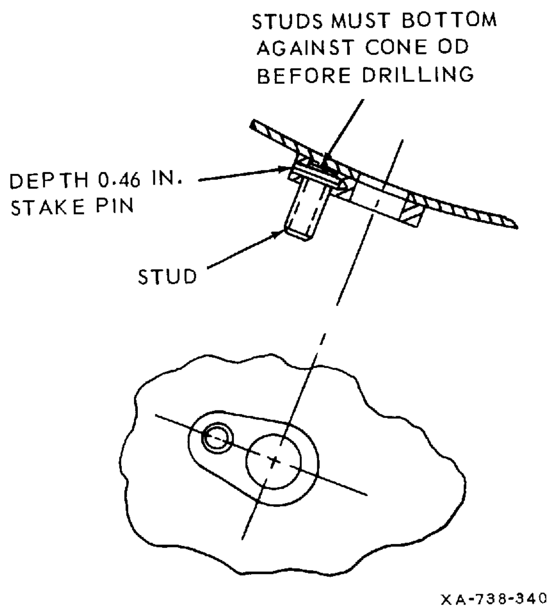
(6) Using suitable tool, remove stud from boss.

(7) Retap stud hole using a 1/4 x 28 UNF-3B bottom tap. Clean threads with compressed air.

(8) Install new stud 1-150-007-02. Make sure stud bottoms on cone OD.

(9) Using No. 43 carbide drill, drill through existing pin hole in boss to a depth of 0.460 inch.

(10) Install new pin 1-140-023-06 flush with boss and stake.



Thermocouple Mounting Stud Replacement
Figure 203

E. If required, repair cracks in outer strut fairings and outer struts as follows:

(1) All cracks shall be routed out prior to weld repair.

CAUTION: DO NOT WELD OUTER FAIRING TO THE STRUT.

(2) Using welding wire (72-00-00, 72, Table 203), TIG weld repair cracks. (See SPM, SP R402, 70-45-01.)

(3) Blend repair area. (See SPM, SP R401, 70-25-01.)

(4) Visually inspect repair. No cracks allowed.

TEMPORARY REVISION NO. 88

INSERT PAGE 2 OF 4 FACING 72-40-07, PAGE 201.

Reason: To add Step 1.C. for reference to thermal barrier coating and to delete Steps 3. and 3.A. thru 3.E.

Step 1.C. is added and Steps 3. and 3.A. thru 3.E. are deleted as follows:

C. For deflector curls with thermal barrier coating Part No. 1-110-500R12 and 1-110-500-13, visually inspect coating surface. (See Figure 201A.) Curls with damaged coatings must be returned for repair at:

Honeywell Aerospace
Greer Repair and Overhaul
85 Beeco Rd.
Greer, SC 29650-1004
Telephone: 864-801-2200

Or

Airborne Engines
7762 Progress Way
Delta, B.C. V4G 1A4
Telephone: 604-244-1668

Or

Global Turbine Component Technologies
125 South Satellite Rd
South Windsor, CT 06074
Telephone: 860-528-4722

3. Deleted

A. Deleted.

B. Deleted.

(1) Deleted.

(2) Deleted.

NOTE: Deleted.

(3) Deleted.

C. Deleted.

D. Deleted.

E. Deleted.

See TR

COMBUSTION CHAMBER DEFLECTOR ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

   A. Inspect for circumferential cracks at seam weld of support to deflector. Cracks totaling 180 degrees or less are acceptable. Repair cracks exceeding limit. (See Figure 201.)

   B. Support for circumferential cracks: Cracks totaling 90 degrees or less are acceptable. For cracks in bolt hole circle: Cracks emanating from bolt holes to the center of the deflector are acceptable. For radial cracks in the deflector (Area 1): Five cracks, 1 inch or less. Converging cracks not allowed.

2. Cleaning/Painting

   Clean combustion chamber deflector using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

   A. Repair or replace deflector if crack limits are exceeded.

   B. Cracks in or near deflector seam weld in excess of 180 degrees cumulative length shall be repaired as follows:

      (1) Tack weld each end of cracks exceeding 30 degrees.

      (2) Whenever possible, additional tacks should be equally distributed to maintain alignment for welding.

         NOTE: Close crack gap with clamps, vise, or block.

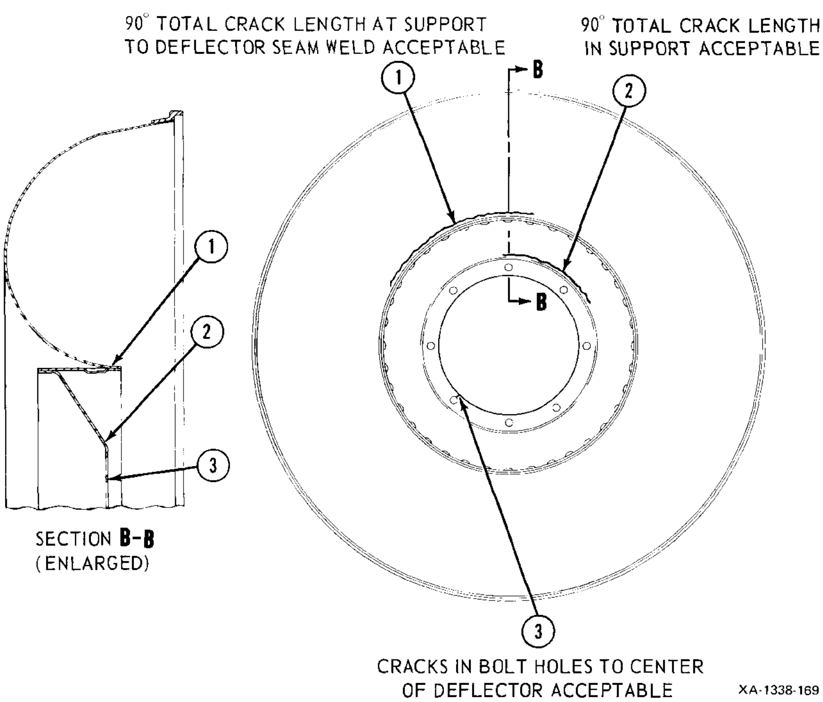
      (3) Fusion weld between tack welds.

   C. Repair cracks in the support (bolt hole ring and surrounding parent metal) by fusion welding, using wire shown in Table 201. (See SPM, SP R402, 70-45-01.)

   D. Repair radial cracks in the deflector by fusion welding, using wire shown in Table 201. (See SPM, SP R402, 70-45-01.)

   E. Visually and fluorescent penetrant inspect weld repairs. (See SPM, SP R402, 70-45-01 for criteria, and 70-00-25, SP I305.)

See TR



Combustion Chamber Deflector Assembly Repair Limits
Figure 201

Table 201. Combustion Chamber Deflector - Weld Repair

Area to be Reworked	Wire
Deflector	Welding wire (72-00-00, 73, Table 203)
Support	Welding wire (72-00-00, 73, Table 203)
Cylinder	Welding wire (72-00-00, 73, Table 203)
Inner Flange	Welding wire (72-00-00, 73, Table 203)

TEMPORARY REVISION NO. 88

INSERT PAGE 3 OF 4 FACING 72-40-07, PAGE 202.

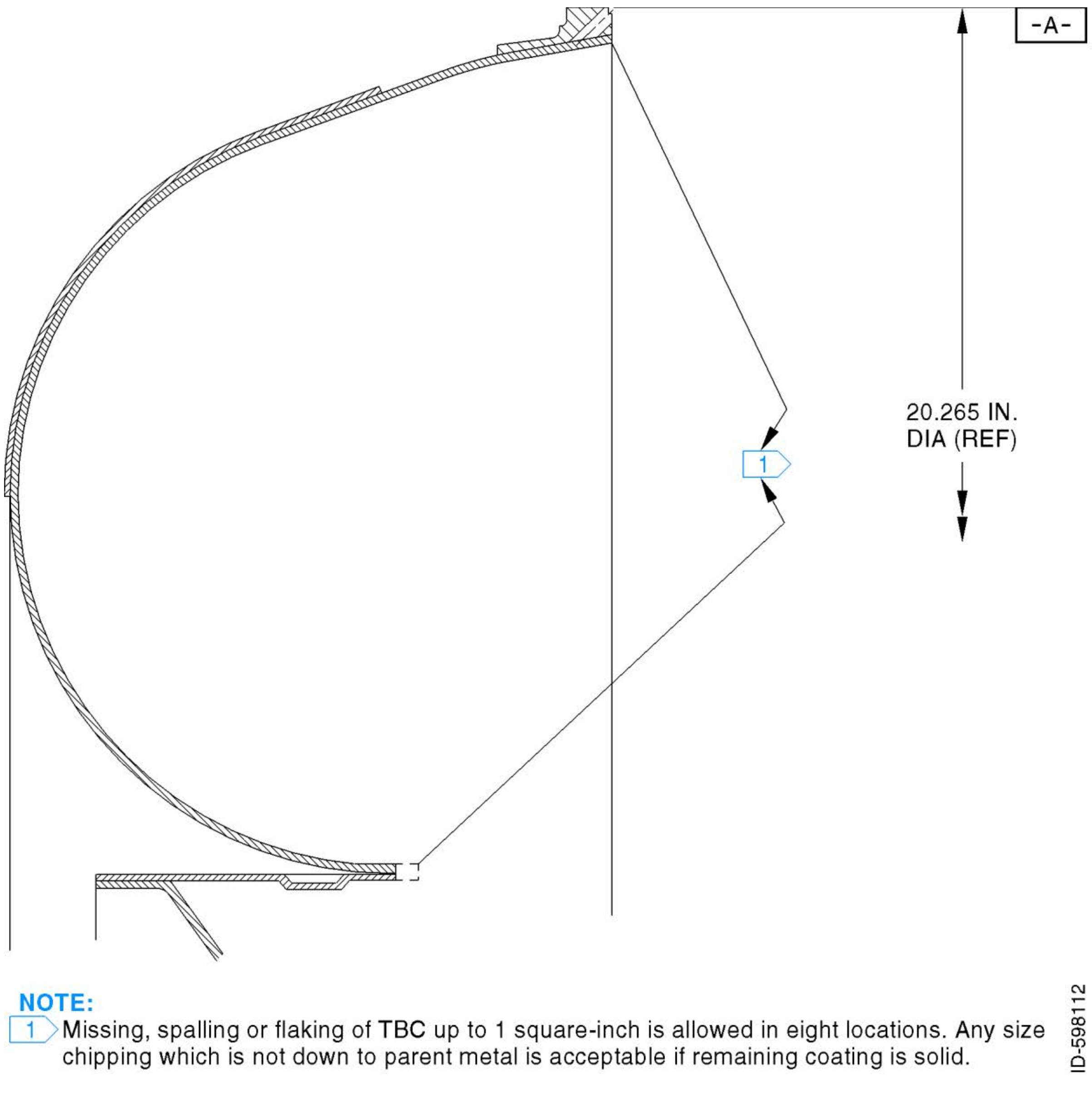
Reason: To delete Figure 201 and Table 201.

TEMPORARY REVISION NO. 88

INSERT PAGE 4 OF 4 FOLLOWING 72-40-07, PAGE 202.

Reason: To add Figure 201A for thermal barrier coating.

Figure 201A is added as follows:



Combustion Chamber Deflector- Thermal Barrier Coating Zone Part No. 1-110-500R12 and 1-110-500-13
Figure 201A

FIRST STAGE POWER TURBINE NOZZLE - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: The leading and trailing edge areas of nozzle vanes may have been blend repaired by the manufacturer (1-190-000-09 and 1-190-050-07). Blend repairs are finished to allow no sharp edges in rework area. Up to three blend repair areas on any one vane may be evident. These blends are on all new nozzles. Inspection limits shall be applied only to those defects caused by engine operation. Defect limits shall be measured, using vane edge as a reference point. Do not measure from any portion of the factory blend areas.

A. Visually inspect first stage power turbine nozzle for cracks. Replace nozzle if inspection limits are exceeded.

(1) Any number of 3/16 inch cracks are acceptable on trailing edge of vanes.

(2) Any number of 1/8 inch cracks are acceptable on leading edge of vanes.

(3) No inspection is required on inner and outer shroud to vane brazements. (See Figure 201.) Cracks are allowed.

(4) Circumferential cracks at inner shroud/seal ring joint up to 1 inch in length (cumulative) at joint or adjacent to joint are permitted. (See Figure 202.) In addition, defects at joint or adjacent to joint, associated with cracks that travel through the inner shroud and into the seal ring area, are acceptable up to 5/8 inch in length (either side) as measured from radial portion of crack.

(5) A maximum of six inner shroud cracks extending into the seal ring area are allowed up to 2 inches in length provided no turbine rub occurs. (See Figure 203.)

(6) On outer shroud ID and OD, a maximum of eight cracks are allowed that progress axially and then radially provided no crack progresses into flange or sealing area as shown in illustration. Three additional cracks exclusive of those that travel to the aft sealing flange are allowed to progress from vane leading edge areas to the forward flange.

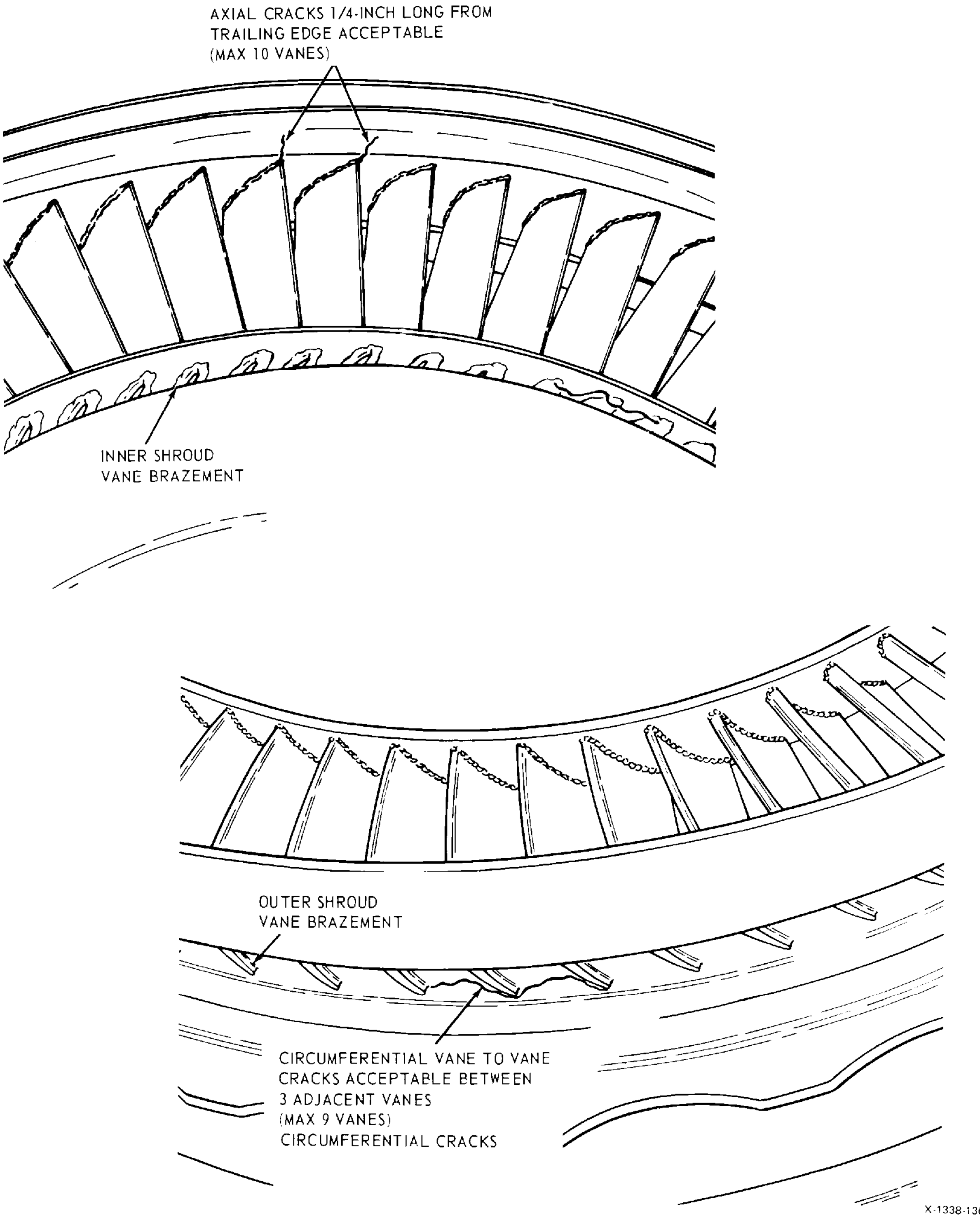
NOTE: Cracks noted in following Steps (7) and (8) are allowed to be either part of or separate from preceding Step (6) cracking conditions. When inspecting, consider all possible combinations.

(7) On outer shroud leading edge, six 1/4 inch cracks are allowed. (See Figure 201.)

(8) On outer shroud trailing edge, ten 1/4 inch cracks are allowed.

(9) Circumferential (vane to vane) cracks in outer shroud between three adjacent vanes (maximum of nine vanes) are allowed. (See Figure 201.)

(10) Radial cracks at bolt holes are permitted.



Inner and Outer Shroud Crack Limits
Figure 201

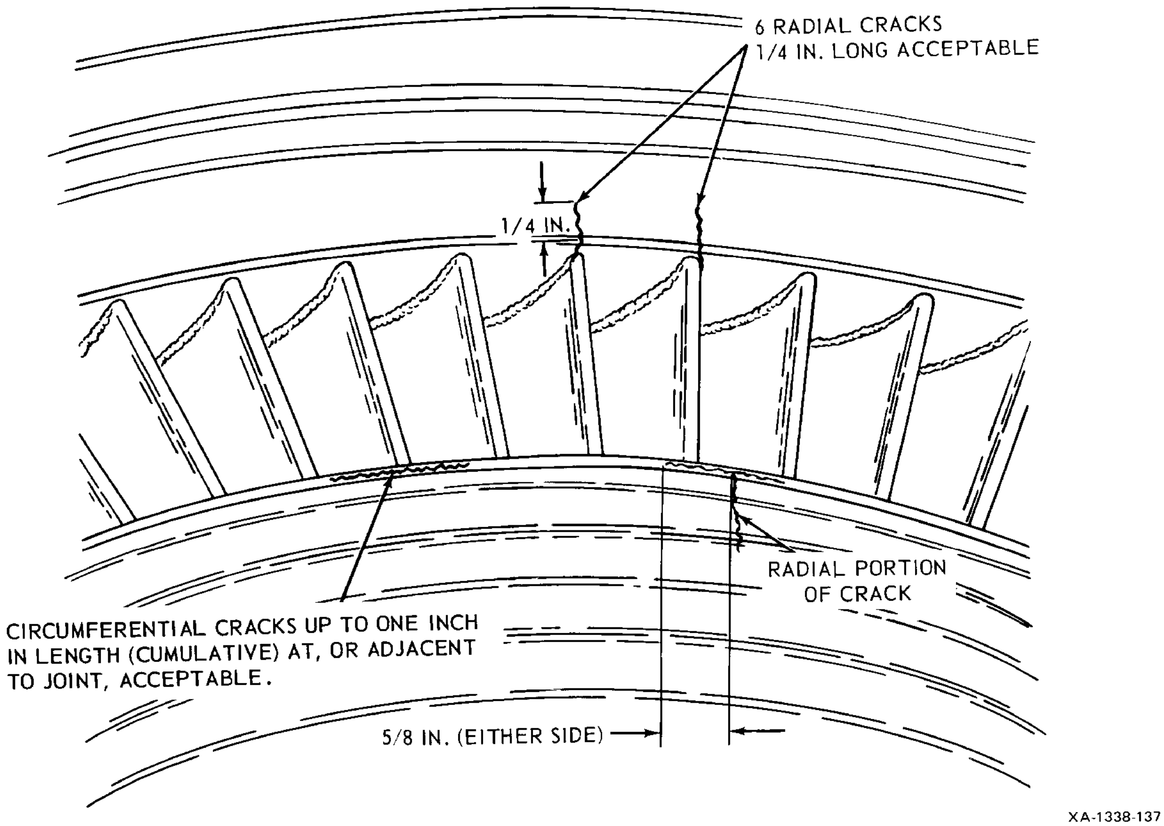
TEMPORARY REVISION NO. 105

INSERT PAGE 2 OF 3 FACING 72-50-01, PAGE 203.

Reason: To add Step 1.A.(12).

Step 1.A.(12) is added as follows:

1. A. (12) (PN 1-190-050-07) Tight-lipped circumferential surface cracks are acceptable up to the width of each thermocouple boss. Through cracks are not acceptable. Axial cracks that intersect these circumferential cracks are not acceptable (see Figure 205).



Circumferential Inner Shroud Crack Limits
Figure 202

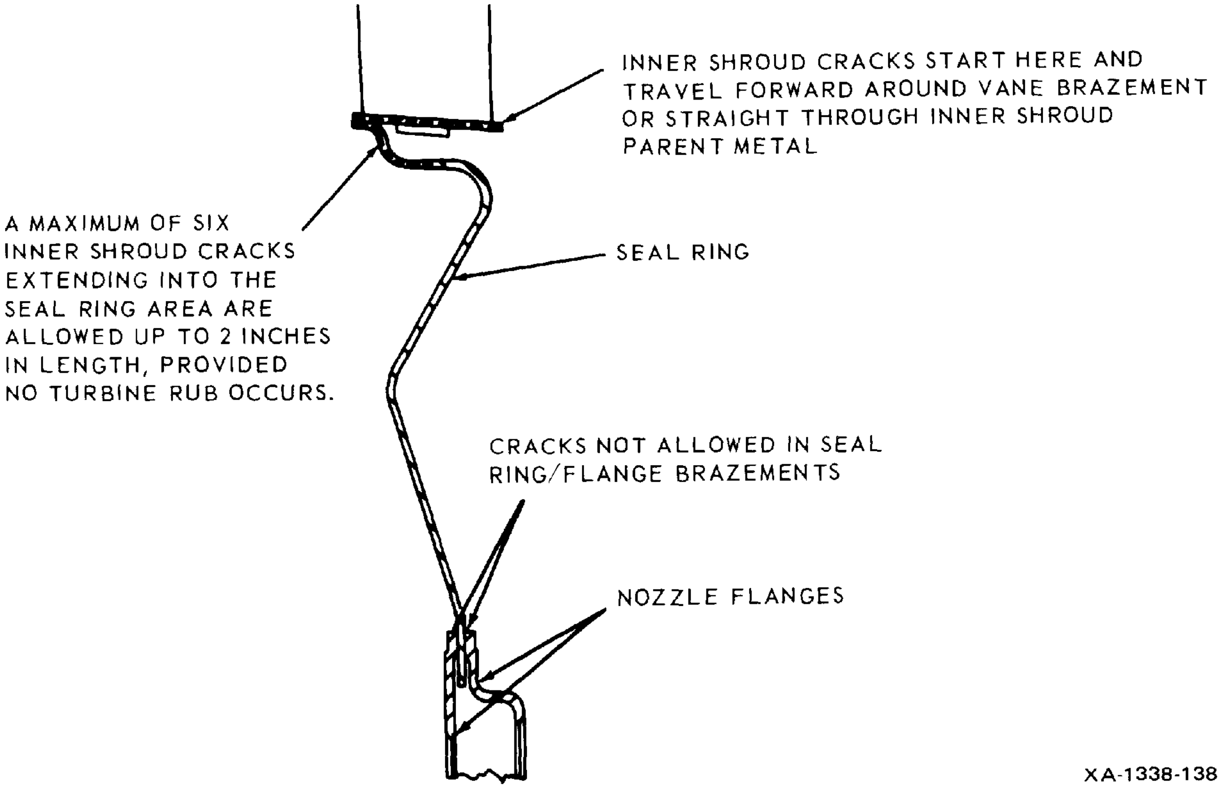
(11) Cracks in seal brazement are not acceptable.

B. Visually inspect first stage power turbine nozzle for rubs. Axial rubs resulting from contact with turbine rotor are not permitted.

C. Visually inspect nozzle sealing area for grooves caused by the sealing rings. Grooves up to 0.020 inch in depth are acceptable for use provided that sharp edges are blended to form a smooth contour. (See Figure 204.)

D. Visually inspect vanes for dents, nicks, and burrs. Blend repair as required.

(1) A maximum of three nicks or dents are allowed on vane leading edge provided that after blend repair, depth of any defect does not exceed 3/32 inch and length does not exceed 1/8 inch. Separation of defects shall be at least twice the length of the shortest defect after blend repair. Smooth dents within limits are acceptable without blend repair.



Inner Shroud Crack Limits
Figure 203

(2) A maximum of three nicks or dents are allowed on vane trailing edge provided that depth of any defect does not exceed 3/32 inch and length does not exceed 1/8 inch after blend repair. Separation of defects shall be at least twice the length of the shortest defect after blend repair. Smooth dents within limits are acceptable without blend repair.

(3) Random nicks and dents on vane airfoil surfaces are acceptable on all vanes. Blend repair to remove nicks.

(4) Burrs are acceptable on vane leading and trailing edges. Blend repair to remove burrs.

E. Visually inspect nozzle vanes for burns. Burned vanes are not allowed.

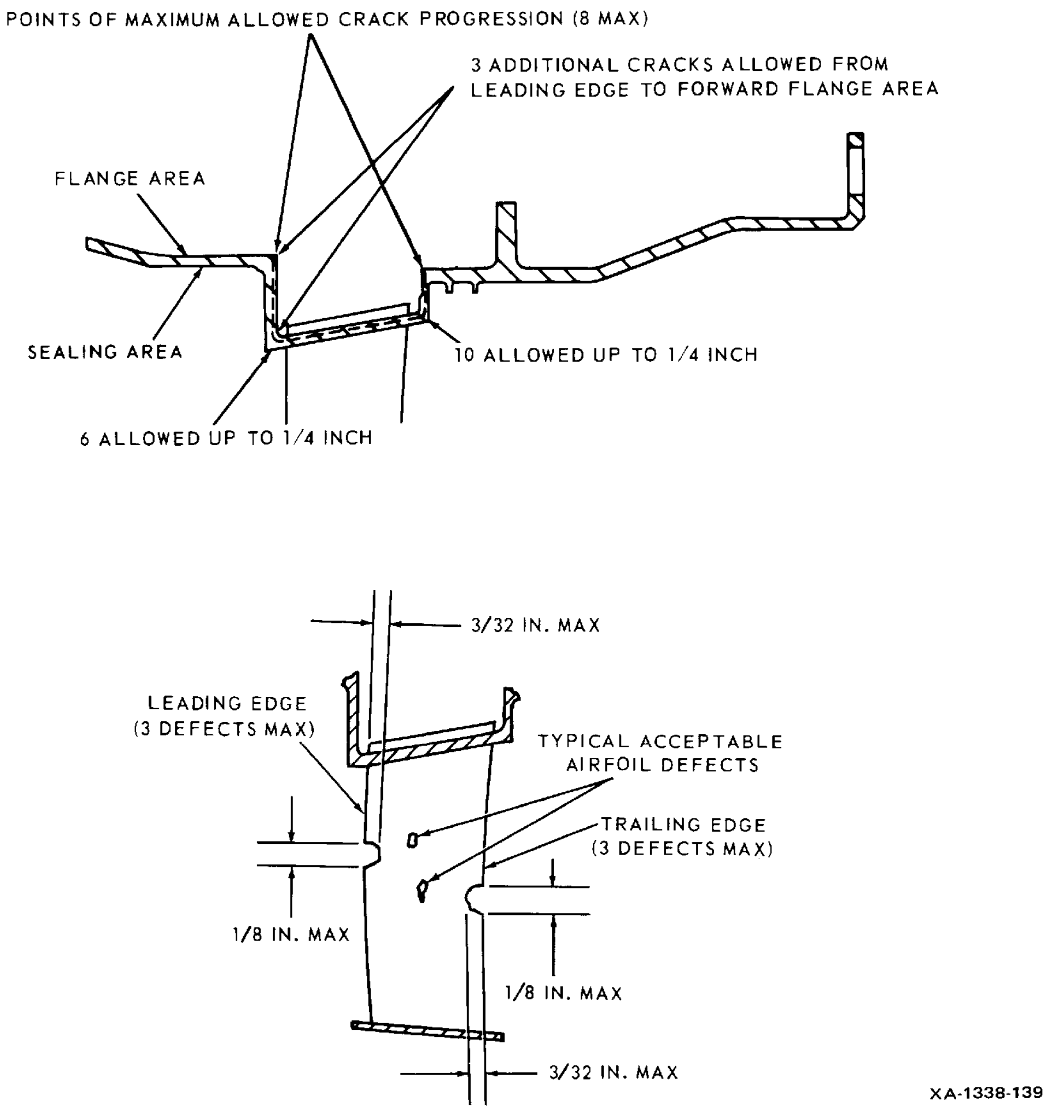
2. Cleaning/Painting

Clean first stage power turbine nozzle using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

A. Repair first stage power turbine nozzle. Replace if inspection limits are exceeded.

B. Blend repair dents, nicks, and burrs. (See SPM, SP R401, 70-25-01.)



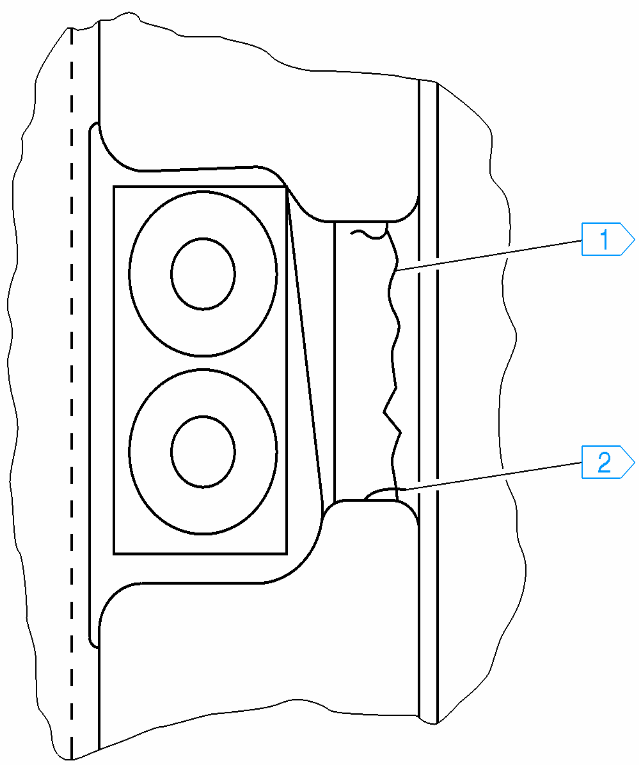
Outer Shroud Crack Limits
Figure 204

TEMPORARY REVISION NO. 105

INSERT PAGE 3 OF 3 FOLLOWING 72-50-01, PAGE 205/206.

Reason: To add Figure 205.

Figure 205 is added as follows:



NOTES:

1. Circumferential tight-lipped surface cracks acceptable in this location.
2. Intersecting cracks not acceptable.

ICN-99193-0000766750-001-02

Outer Shroud Thermocouple Boss Crack Limits
Figure 205

TEMPORARY REVISION NO. 97

INSERT PAGE 2 OF 5 FACING 72-50-02, PAGE 201.

Reason: To replace TR 92 (added Paragraph 1.D1 and Paragraph 1.D1.(1), (2), and (3). Changed Paragraph F, and added Paragraph F.(1) and (2) to show the correct blade platform inspection criteria) and to change “If rotor access permits” to “When performing a 2500-hour inspection” in Paragraph 1.D1.

Paragraph 1.D1. and 1.D1.(1), (2), and (3) are added and Paragraph F.(1) and (2) are changed as follows:

1.

D1. When performing a 2500-hour inspection, dimensionally inspect power turbine rotor for blade shroud gaps by inserting a shim between each pair of A and B blades. Do not force the shims. The shims must be inserted in the following sequence: 0, 180, 90, 270, 45, 225, etc. Any space (clearance) between the A and B blades in a pair should be pinched closed while inserting the shims between pairs. In those areas where a 0.001 inch shim is too loose and falls out, use a 0.002 inch shim or larger until the shim being inserted has a light drag on it. After all shims have been inserted, check each one for drag. Any shim having excess drag is to be removed and a smaller shim inserted with the proper light drag on it. In some instances, it may not be possible to insert a shim between some pairs. Measure the clearances in accordance with the following limits:

(1) On rotors which were completely rebladed, the maximum cumulative gap between all tip shrouds must not exceed 0.165 inch. No individual gap is to exceed 0.010 inch. The minimum cumulative gap must not be less than 0.016 inch. No gap allowed between A and B blades in a set.

(2) On rotors which were not completely rebladed, the maximum cumulative gap between all tip shrouds must not exceed 0.165 inch. No individual gap between pairs of A and B blades must exceed 0.020 inch, (refer to Figure 202A). The minimum cumulative gap must not be less than 0.016 inch. No gap allowed between A and B blades in a set.

(3) If cumulative gap exceeds 0.165 inch, replace blades as necessary to obtain proper gap. If cumulative gap is below 0.016 inch, repair or replace blades in accordance with ATA NO. 72-09-41.

F. Inspect Forward and Aft Face of Disc and Blade Platforms for Circumferential Rubs

(1) Rubs 0.006 inch (0.152 mm) deep by 0.100 inch (2.54 mm) wide are acceptable provided there is no indication of extreme heat.

(2) Light blade platform circumferential rubs are acceptable up to 0.010 inch depth. Blend sharp edges smooth (SP R401).

See TR

FIRST STAGE POWER TURBINE ROTOR, SEALING FLANGE, AND SPACER - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: Conduct visual inspection of the first stage power turbine rotor, using seven power magnifying glass.

A. Inspect Leading and Trailing Edges of Blade for Nicks, Dents, Cracks, and Burns

(1) Maximum permissible finished repair depth is 0.062 inch from leading edge and 0.045 inch from trailing edge. Allowable depths decrease as distance between damage and point A on leading edge or point B on trailing edge decreases. (See Figure 201.)

(2) No cracks are allowed.

(3) No dents are allowed within 0.500 inch of blade platform.

(4) No burns are allowed.

B. Inspect Blade Surfaces Nicks, Dents, Cracks, and Burns

(1) No dents are allowed within 0.500 inch of blade platform.

(2) No cracks or burns are allowed.

C. Inspect trailing edge of blades for erosion occurring immediately under blade shrouds. A notch visible without magnification is not allowed. (See Figure 202.)

D. Inspect Blade Tip (Shroud End) for Cracks and Scoring

(1) Cracks are not permitted.

(2) Scoring shall not exceed 0.030 inch depth.

E. Inspect blade platform, root areas, and turbine disc for cracks. Cracks are not permitted.

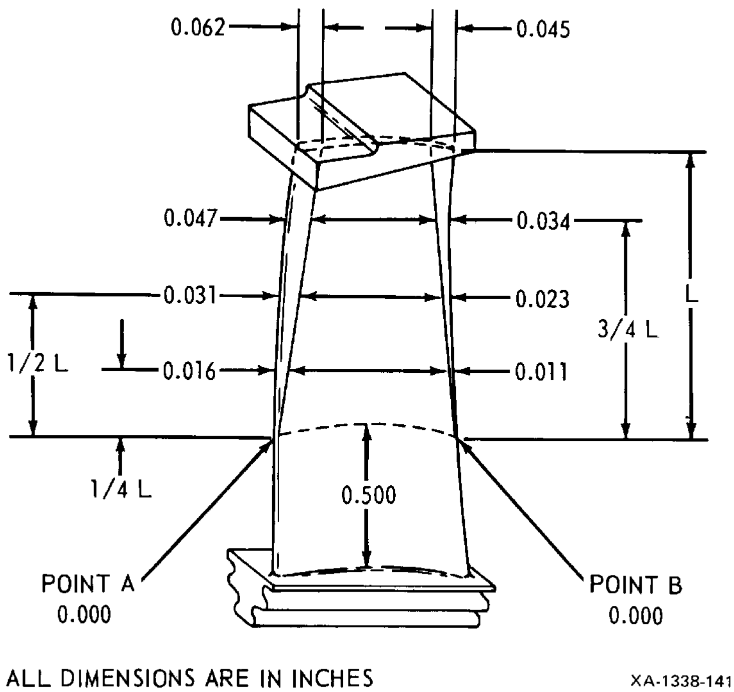
F. Inspect Forward and Aft Face of Disc for Rubs

Rubs 0.006 inch deep by 0.100 inch wide are acceptable provided there is no indication of extreme heat.

G. Inspect Blade Tips for Evidence of Rubbing

Evidence of tip rub is acceptable without repair of damage provided that limits specified for cracks, nicks, or dents are not exceeded and minimum tip clearance of 0.025 inch is maintained.

H. Inspect Blade Tip to First Stage Nozzle Clearance (Radial)



First Stage Power Turbine Blade Maximum Repair Depth
Figure 201

NOTE: This dimensional inspection is not required unless power turbine has been completely disassembled.

If desired clearance is not obtained, rework nozzle cylinder to obtain minimum, clearance. The minimum acceptable clearance is 0.025 inch.

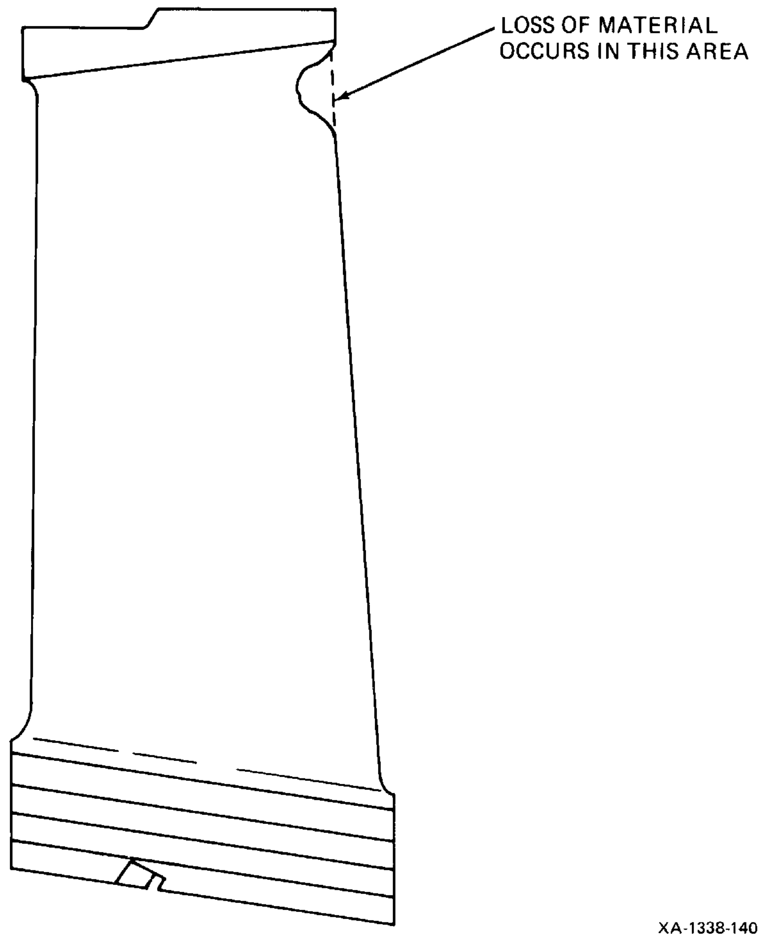
I. Inspect sealing flange for local rubbing. Rub depth shall not exceed 0.015 inch for a circumferential length of 3 inches.

J. Inspect spacer for evidence of scoring. Scoring shall not exceed 0.012 inch in depth.

K. Inspect spacer for evidence of cracks or distortion. Cracks or distortion are not allowed.

NOTE: If blades are damaged beyond limits, forward rotor to overhaul facility for blade replacement.

L. Inspect aft side of rotor disc for blades recessed below disc, if one or more blades are recessed more than 0.025 inch, remove rotor and reseat blades. (See Paragraph 3.E.)



Power Turbine Blade Maximum Repair Depth
Figure 202

2. Cleaning/Painting

Clean first stage power turbine rotor (72-40-00, 7, Figure 209), power turbine spacer (8), and sealing flange (6) using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, C203, 70-15-03.)

3. Approved Repairs

A. Replace power turbine spacer (72-40-00, 8, Figure 209) or sealing flange (6) if scoring exceeds inspection limits or if cracks or distortion is noted.

B. Observe following rules during first stage power turbine rotor blade repair. (See Figure 201.)

(1) Use portable power drill or rotary file equipped with carbide burr. If these are not available, small diesinker type file, India or carborundum stone may be substituted.

(2) Finish strokes are parallel to leading and trailing edges of blades.

(3) Final polishing of area is with crocus cloth (72-00-00, 13, Table 203). All repairs are blended and finished smoothly.

(4) Leading or trailing edge repairs are blended to smooth radius as part of repair. (See Figure 203.)

(5) Finish repair length is blended to minimum of three times depth of damage.

C. Repair leading and/or trailing edges of first stage power turbine blades as follows:

(1) Round bottom dents, 0.010 inch deep or less, require removal of sharp edges only.

(2) If distance between damage and shroud end of blade is less than twice depth of damage, extend repair to include shroud end.

(3) If distance between two damaged areas is less than twice depth of deeper damage, make one repair area. If distance between two damaged areas is greater than twice depth of deeper damage, make separate repair areas. (See Figure 203.)

(4) Damage that cannot be completely eliminated by allowable blade repairs are cause for rotor replacement. (See Paragraph 3.F.)

D. Repair blade surface as follows:

(1) Maximum permissible decrease in thickness at any point on blade shall be 0.010 inch.

(2) Maximum permissible finished single repair on blade surface shall be 0.200 square inch on either concave or convex side.

(3) Repairs shall be blended to a minimum of twice depth of damage.

(4) Total repaired surface area shall not exceed 10 percent of blade surface.

(5) If distance between two damaged areas is less than twice depth of deeper damage, make one repair area. If distance between two damaged areas is greater than twice depth of deeper damage, make separate repair areas. (See Figure 203.)

(6) Damage that cannot be completely eliminated by allowable blade repairs is cause for rotor replacement.

E. Reseat blades recessed more than 0.025 inch below aft face of disc as follows:

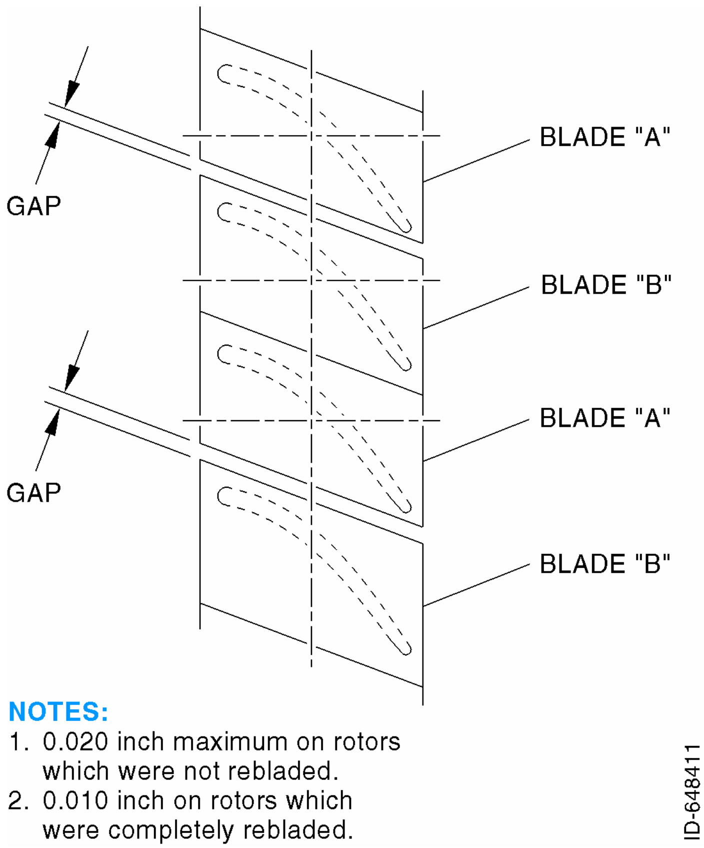
(1) Locate and mark number one blade on both sides using sliver marking pencil (72-00-00, 59A, Table 203).

TEMPORARY REVISION NO. 97

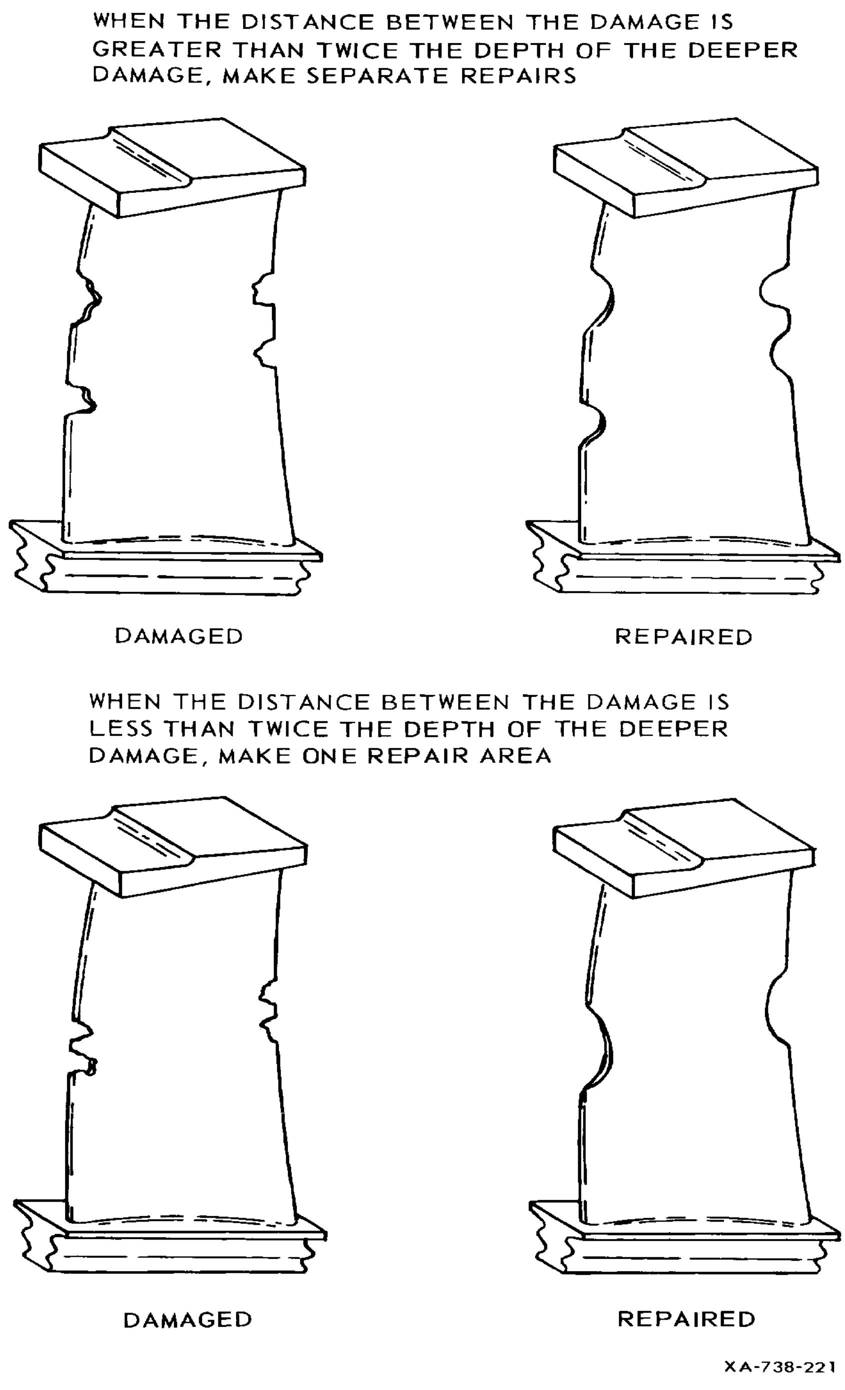
INSERT PAGE 3 OF 5 FACING 72-50-02, PAGE 204.

Reason: To replace TR 92 (added Figure 202A).

Figure 202A is added as follows:



Power Turbine Rotor Blade Shroud Gap
Figure 202A



Power Turbine Blade Damage Before and After Repair
Figure 203

(2) Place rotor, forward face up, in staking fixture assembly LTCT2072.

NOTE: Number one blade is first blade counterclockwise from balancing “O” marking on forward face of disc.

(3) Starting with number one blade, tap all blades flush with aft face of disc using a hammer and a suitable drift from punch and drift kit LTCT552.

CAUTION: MAKE SURE THAT TOOL DOES NOT CONTACT DISC OR BLADES DURING DRIVING OPERATION.

NOTE: Make sure that blade being tapped is not positioned over slot in fixture assembly.

(4) Using a hammer and a drive punch, redrive all pins.

(5) Remove staking tool (if used).

F. Replace first stage turbine rotor if disc is cracked or if rubs on blade tips exceed inspection limits.

NOTE: If both first and second stage power turbine rotors are replaced, the new rotors shall be initially installed with yellow H markings (if present) which denote the heavy balance point 180 degrees apart.

G. Blades damaged beyond established limits shall be replaced. Forward rotor to overhaul facility for blade replacement and balancing.

SECOND STAGE POWER TURBINE NOZZLE ASSEMBLY

1. Inspection/Check

NOTE: If repair is required, refer to 72-09-30.

A. (1-140-470-05) Second Stage Power Turbine Nozzle Assembly - Inspection (See 72-40-00, 10, Figure 101 or 11, Figure 102.)

(1) Inspect for severe damage or mutilation. If unrepairable, replace nozzle assembly.

(2) Perform dimensional inspection in accordance with Figure 301. If dimensions shown in the figure cannot be met, rework nozzles as required.

(3) Inspect for nicks, dents and pits on vane trailing edge visually and using Standard Inspection Equipment (SIE).

(a) Nicks, dents, and pits are acceptable with blend repair to a depth of 0.093 inch and length of 0.187 inch provided no greater than four defects per vane are evident.

(b) Separation shall be at least twice the length of the longest defect.

(c) Blend repair burrs to remove surface projections. (See SPM, SP R401, 70-25-01.)

(d) Replace nozzle vanes, if above limits are exceeded.

(4) Inspect for nicks, dents and pits on vane leading edge visually and using SIE.

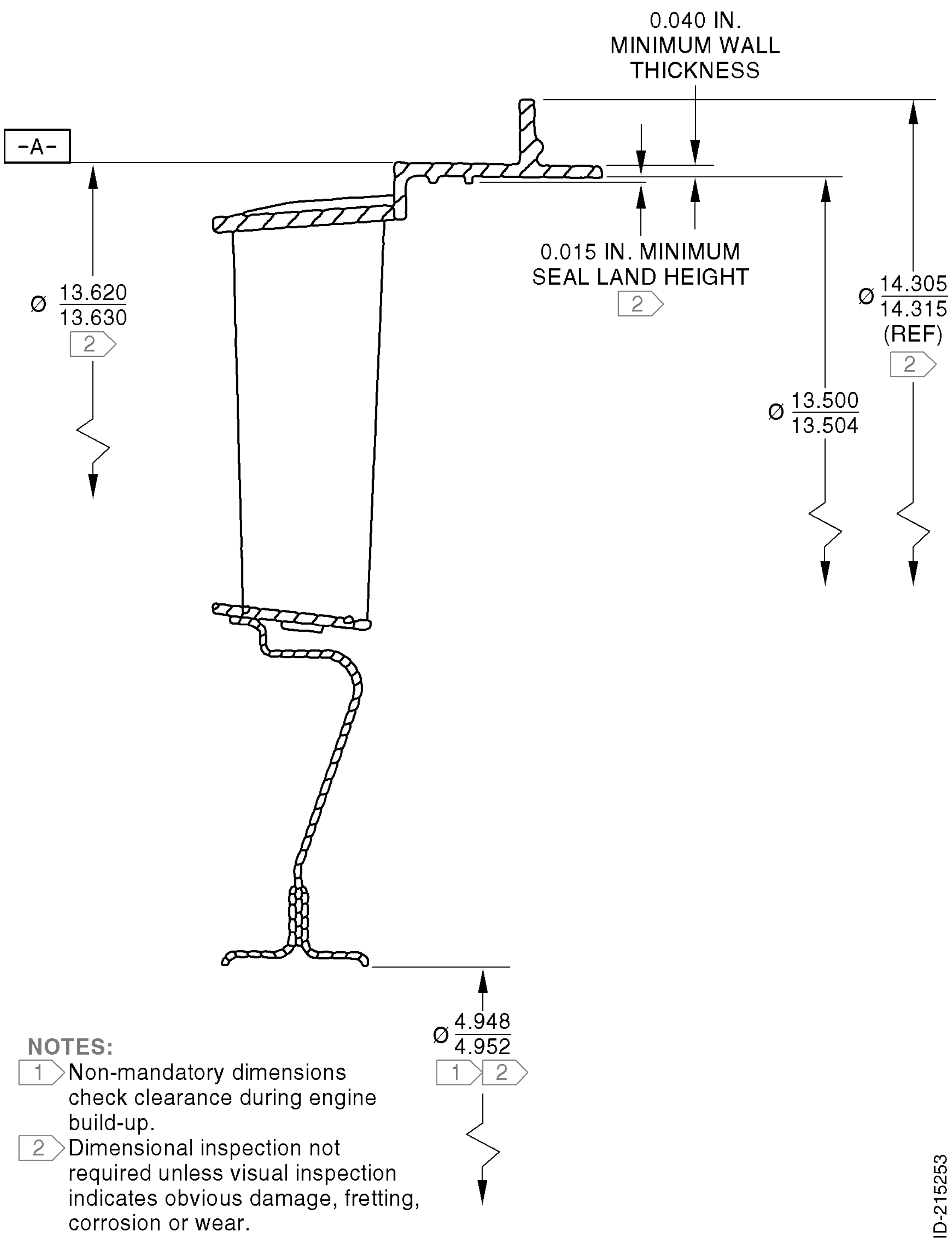
(a) Leading edge nicks, dents, and pits are acceptable with blend repair to a depth of 0.093 inch and length of 0.187 inch provided no greater than four defects per vane are evident.

(b) Separation shall be at least twice the length of the longest defect.

(c) Blend repair burrs to remove surface projections. (See SPM, SP R401, 70-25-01.)

(d) Replace nozzle vanes if above limits are exceeded.

(5) Visually inspect leading edge of nozzle vanes for an erosion undercut (generally adjacent to the outer shroud). This erosion is acceptable on all vanes to a depth of 0.093 inch. Blend sharp edges or roll over on acceptable vanes. Replace unacceptable vanes. If nozzle vanes are thinned out excessively in other areas, replace vanes or nozzle.



NOTES:
1 Non-mandatory dimensions check clearance during engine build-up.
2 Dimensional inspection not required unless visual inspection indicates obvious damage, fretting, corrosion or wear.

Second Stage Power Turbine Nozzle Assembly (1-140-470-05) Dimensional Inspection
Figure 301

(6) Inspect vane leading and trailing edges for burns and surface oxidation. (See Figure 302.)

(a) Remove areas of burning on leading and trailing edge by blend repair to a maximum depth of 0.093 inch and a maximum length of 0.187 inch. (See SPM, SP R401 70-25-01.)

(b) Surface oxidation (discoloration) is acceptable provided warpage or loss of material is not evident.

(c) Replace nozzle vane if above limits are exceeded.

(7) Perform visual inspection on mounting ring. (See 72-40-00, 11, Figure 101 or 12, Figure 102.) Replace part if cracks are evident.

(8) Inspect vanes for metallization.

(9) Inspect nozzle assembly for cracks by fluorescent penetrant method, Type I, Method A, Level 3. (See SPM, SP I305, 70-20-05 and Figure 302.) If limits are exceeded, repair.

(a) Inner and outer shroud brazement cracking up to 0.375 inch cumulative length per vane is acceptable on a maximum of 25 vanes. Five of the 25 vanes are allowed to be cracked on one side of the vane for its entire length provided no cracking exists on the other side. If cracks occur on both sides of the vane, 0.750 inch is maximum allowable accumulative length.

(b) Outer shroud parent metal cracks.

1 Ten axial cracks per assembly are acceptable provided individual crack length does not exceed 0.375 inch.

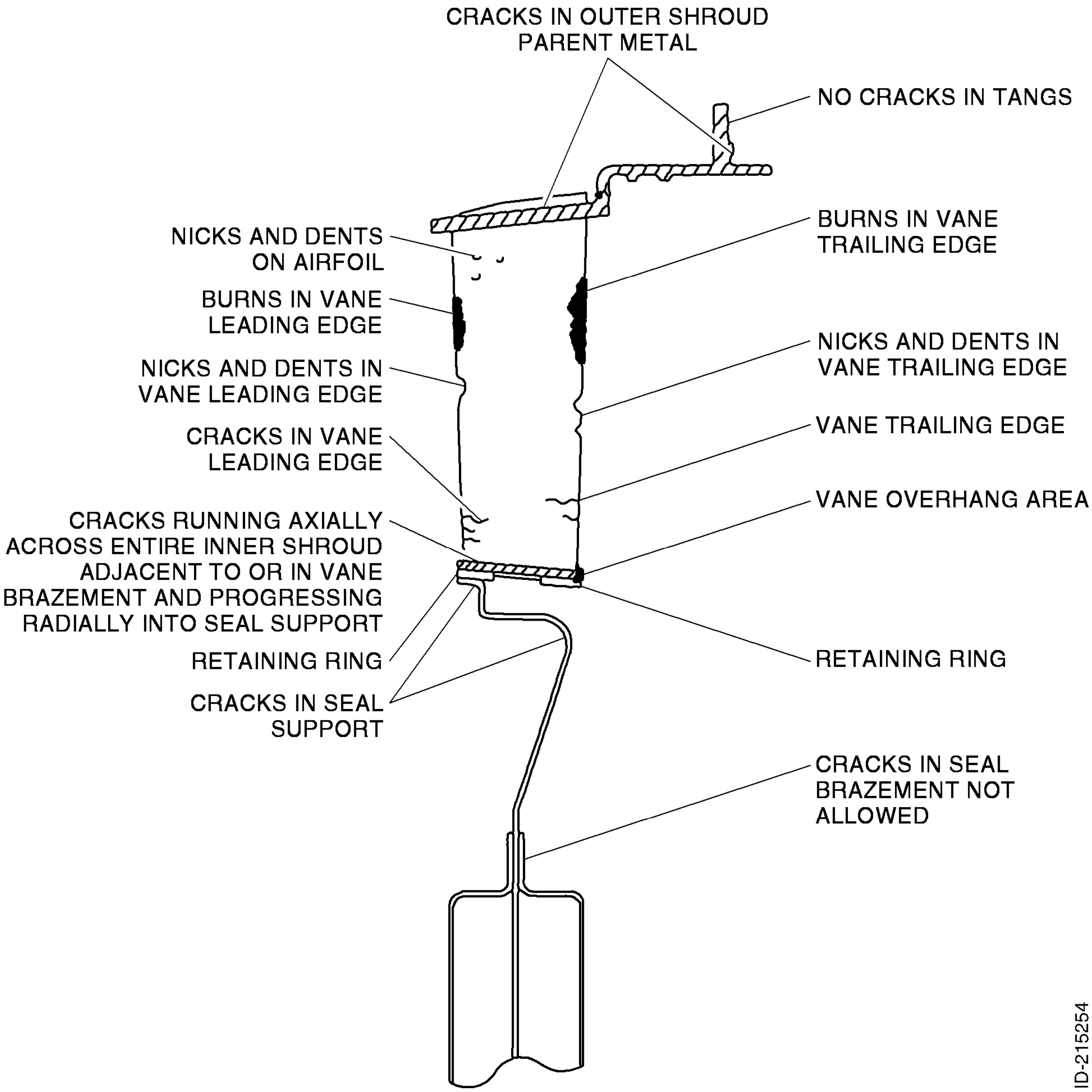
2 Three of the ten cracks are permitted to be cracked up to 0.625 inch and one is acceptable up to 1 inch in length.

3 Circumferential or converging cracks not acceptable.

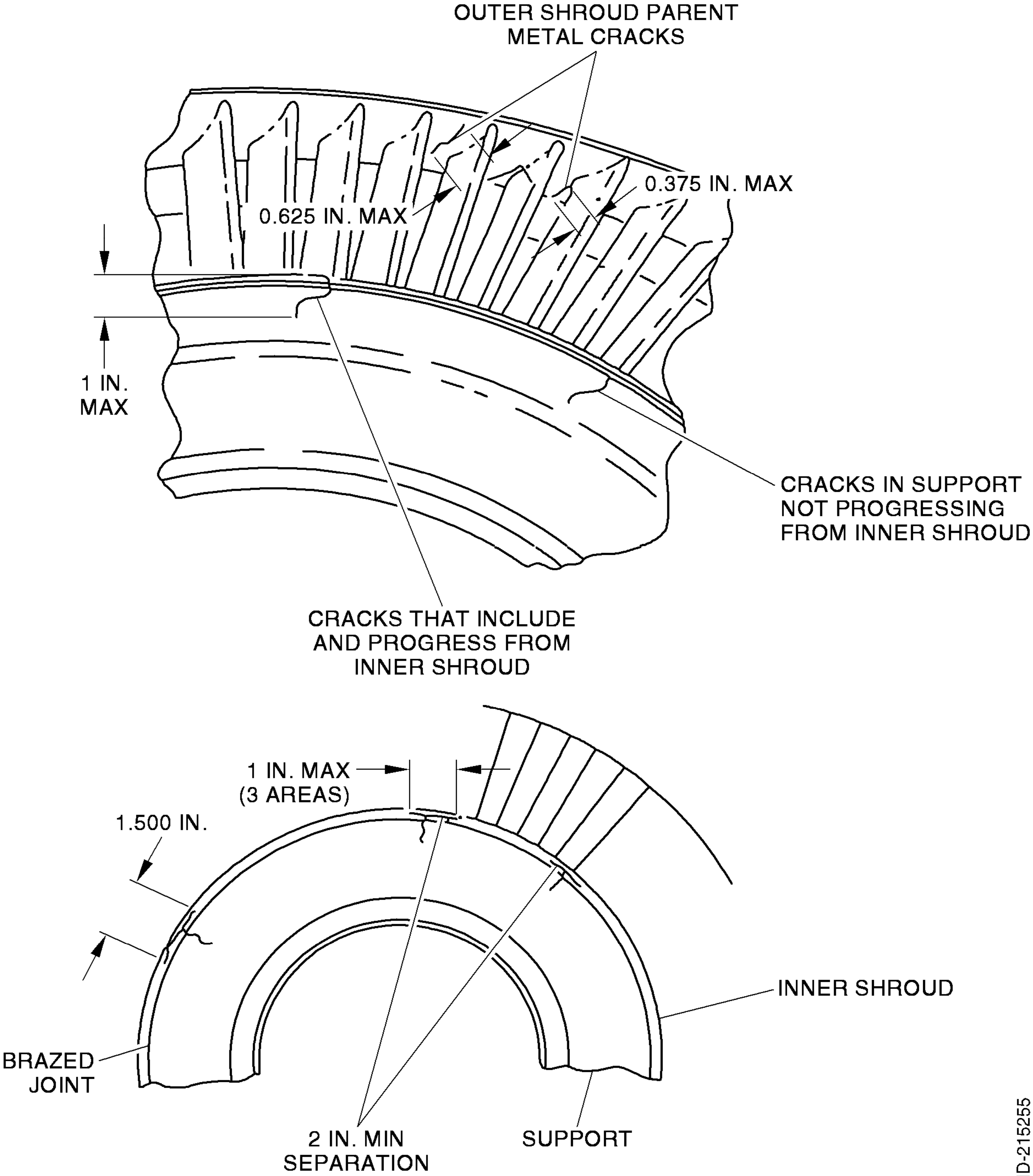
4 Repair nozzle, if above limits are exceeded.

(c) Cracks in vane trailing edge up to 0.100 inch in length are acceptable. Repair nozzle, if limit is exceeded.

(d) Cracks in inner shroud and seal support.



Second Stage Power Turbine Nozzle Assembly (1-140-470-05) Inspection Areas
Figure 302 (Sheet 1 of 2)



Second Stage Power Turbine Nozzle Assembly (1-140-470-05) Inspection Areas
Figure 302 (Sheet 2)

See TR

1 Axial cracks emanating from the forward and/or aft areas of inner shroud are not allowed.

2 Cracks on the inner shroud forward and/or aft retaining rings (if installed at previous overhaul) are not allowed.

3 Circumferential cracks on the inner shroud ID and/or OD are not allowed.

4 Cracks in seal support are not allowed.

5 Circumferential brazement cracks between the inner shroud and seal support are not allowed. Brazement cracks between the inner shroud and forward and/or aft retaining rings (installed on nozzles at a previous overhaul) are not allowed.

6 Cracks at inner shroud vane brazement are not allowed.

7 Repair all cracks in inner shroud.

(e) Cracks in vane leading edge not exceeding 0.050 inch in length are acceptable.

(f) Cracks in cylinder tangs. Replace if cracks are evident.

(10) Inspect for nicks, dents, and pits on vane airfoil. Nicks, dents, and pits are acceptable provided that depth after cleanup does not exceed 0.035 inch. Blend repair to remove surface projections. (See SPM, SP R401, 70-25-01.)

(11) Inspect for out of roundness or distorted seal lands. If not visibly defective, seals are acceptable. Rubs are acceptable provided out of roundness does not exceed 0.020 inch. Repair nozzle if limits are exceeded.

(12) Inspect for worn 4.948 to 4.952 inch seal diameter visually and using SIE. If limits are exceeded, repair.

NOTE: If repair is required, refer to 72-09-30.

B. (1-140-470-10/R-11) Second Stage Power Turbine Nozzle Assembly - Inspection (See 72-40-00, 10, Figure 101 or 11, Figure 102.)

(1) Inspect for severe damage or mutilation. If unrepairable, replace nozzle assembly.

(2) Perform dimensional inspection in accordance with Figure 303. If dimensions shown in the figure cannot be met, rework nozzles as required.

(3) Inspect for nicks, dents, and pits on vane trailing edge visually and using SIE.

(a) Nicks, dents, and pits are acceptable with blend repair to a depth of 0.093 inch and length of 0.187 inch provided no greater than four defects per vane are evident.

(b) Separation shall be at least twice the length of the longest defect.

(c) Blend repair burrs to remove surface projections. (See SPM, SP R401, 70-25-01.)

(d) Replace nozzle vanes, if above limits are exceeded.

TEMPORARY REVISION NO. 103

INSERT PAGE 2 OF 3 FACING 72-50-03, PAGE 206.

Reason: To add Step 1.A.(13) and to move the note from Step 1.A.(12) to Step 1.A.(13).

Step 1.A.(13) is added and Step 1.A.(12), note is moved after Step 1.A.(13) as follows:

1. A.

(13) Minor rubs on leading edge of inner shroud are acceptable after blending (See SPM, SP R401, 70-5-01) if contact with vane leading edge has not occurred.

NOTE: If repair is required, refer to 72-09-30.

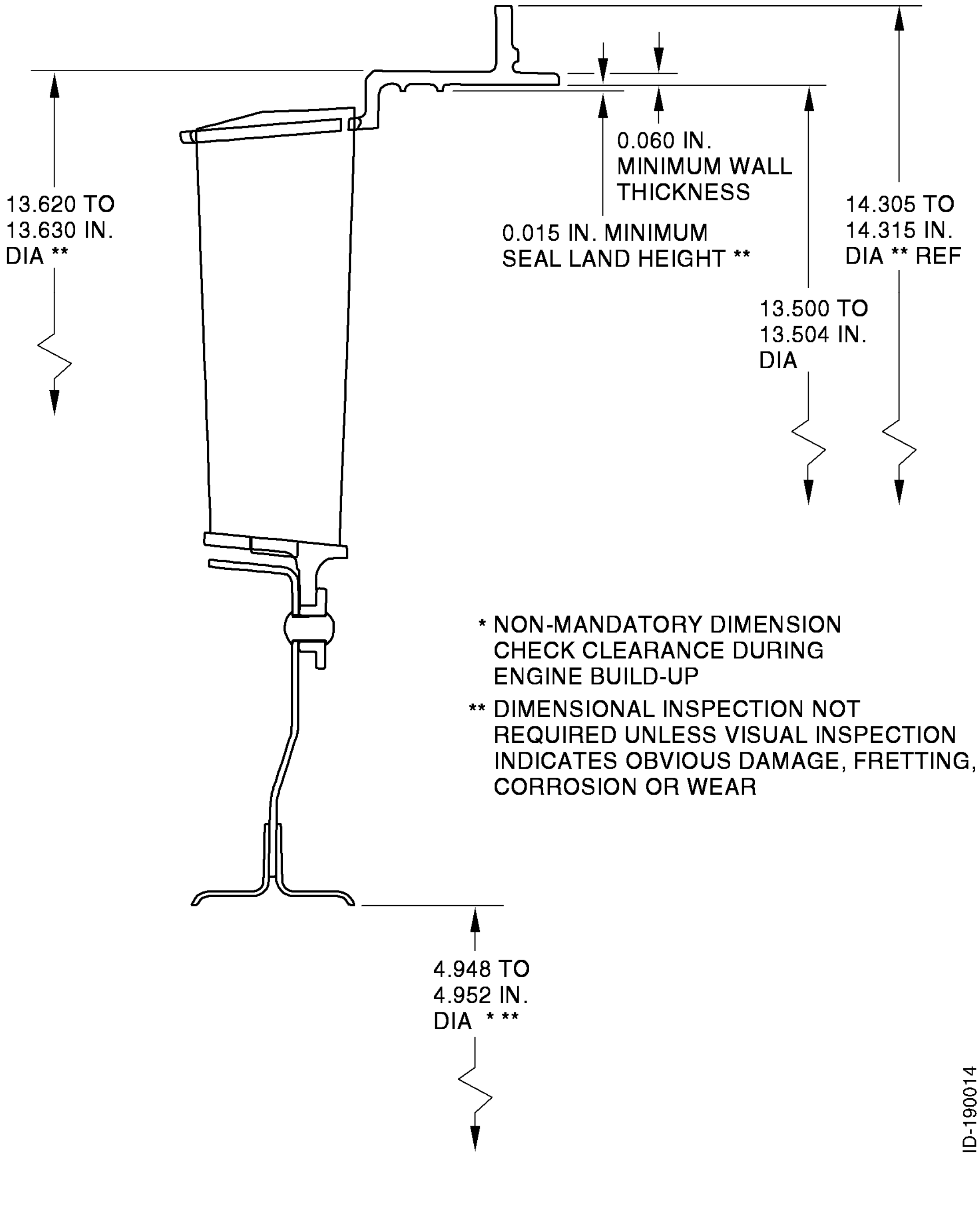
(4) Inspect for nicks, dents, and pits on vane leading edge visually and using SIE.

(a) Leading edge nicks, dents, and pits are acceptable with blend repair to a depth of 0.093 inch and length of 0.187 inch provided no greater than four defects per vane are evident.

(b) Separation shall be at least twice the length of the longest defect.

(c) Blend repair burrs to remove surface projections. (See SPM, SP R401, 70-25-01.)

(d) Replace nozzle vanes if above limits are exceeded.



Stage Power Turbine Nozzle Assembly (1-140-470-10/-R11) Dimensional Inspection
Figure 303

(5) Visually inspect leading edge of nozzle vanes for erosion undercut (generally adjacent to the outer shroud); this erosion is acceptable on all vanes to a depth of 0.093 inch. Blend sharp edges or roll over on acceptable vanes. Replace unacceptable vanes. If nozzle vanes are thinned out excessively in other areas, replace vanes or nozzle.

(6) Inspect vanes leading and trailing edges for burns and surface oxidation. (See Figure 304.)

(a) Remove areas of burning on leading and trailing edge by blend repair to a maximum depth of 0.093 inch and a maximum length of 0.187 inch. (See SPM, SP R401, 70-25-01.)

(b) Surface oxidation (discoloration) is acceptable provided warpage or loss of material is not evident.

(c) Replace nozzle vane if above limits are exceeded.

(7) Perform visual inspection on mounting ring. (See 72-40-00, 11, Figure 101 or 12, Figure 102.) Replace part if cracks are evident.

(8) Inspect vanes for metallization.

(9) Inspect nozzle assembly for cracks by fluorescent penetrant method, Type I, Method A, Level 3. (See SPM, SP I305, 70-20-05 and Figure 304.) If limits are exceeded, repair.

NOTE: Repair procedures for the inner shroud seal are proprietary information. Contact the T53 Customer Service Engineer for a list of authorized repair centers.

(a) Inner and outer shroud brazement cracking up to 0.375 inch cumulative length per vane is acceptable on a maximum of 25 vanes. Five of the 25 vanes are allowed to be cracked on one side of the vane for its entire length provided no cracking exists on the other side. If cracks occur on both sides of the vane, 0.750 inch is maximum allowable accumulative length.

(b) Outer shroud parent metal cracks.

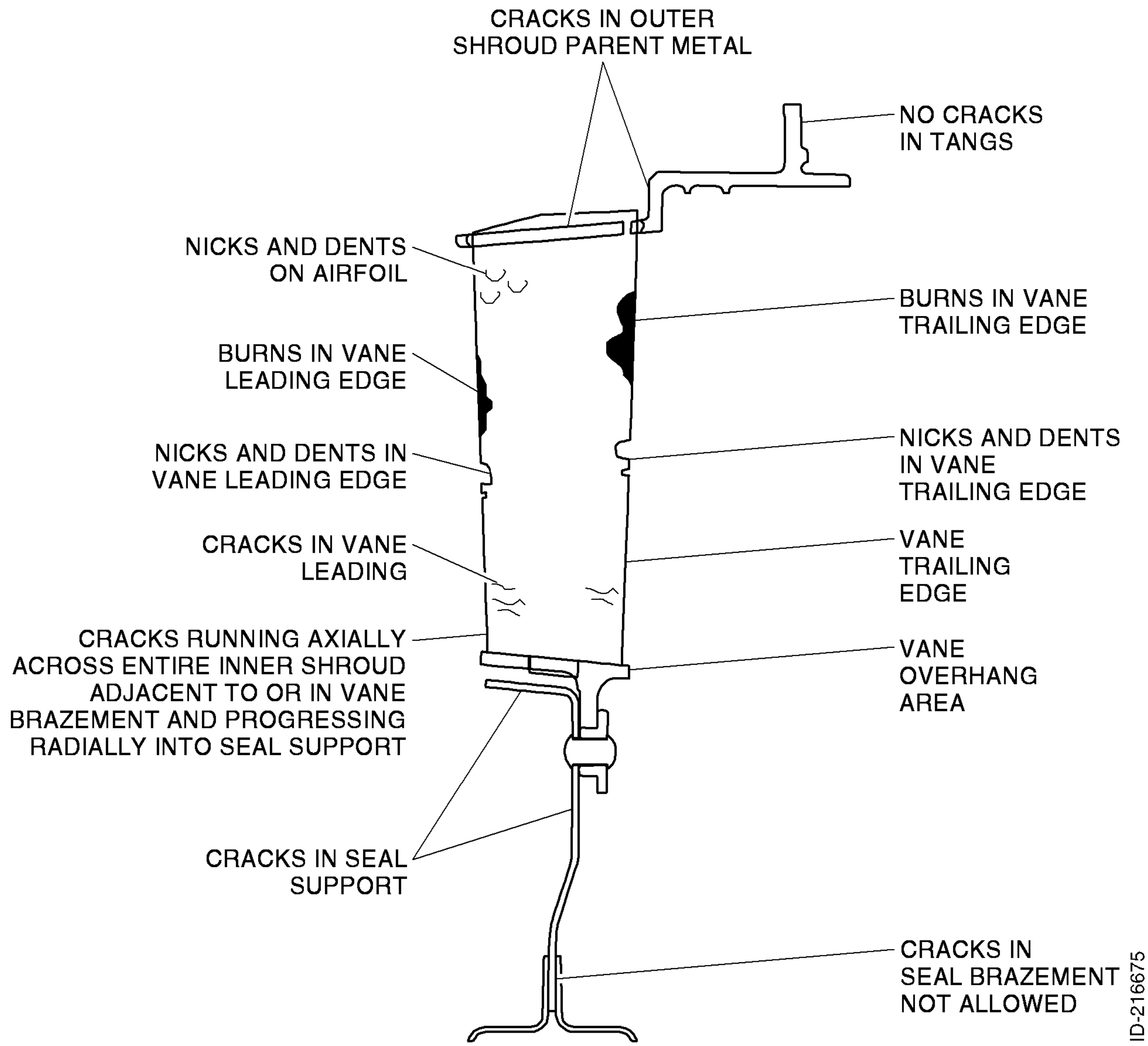
1 Ten axial cracks per assembly are acceptable provided individual crack length does not exceed 0.375 inch.

2 Three of the ten cracks are permitted to be cracked up to 0.625 inch and one is acceptable up to 1 inch in length.

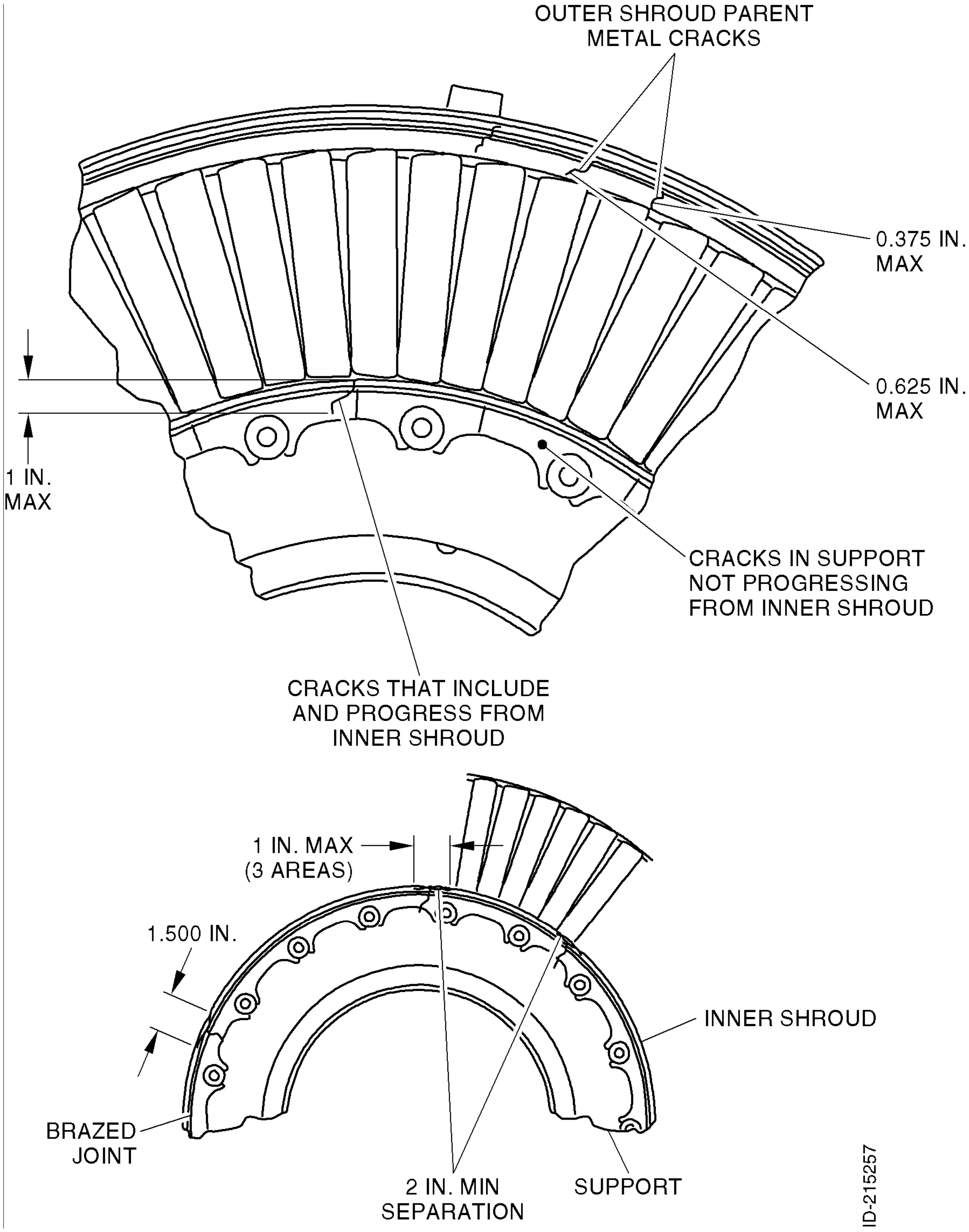
3 Circumferential or converging cracks are not acceptable.

4 Repair nozzle if above limits are exceeded.

(c) Cracks in vane trailing edge up to 0.100 inch in length are acceptable. Repair nozzle if limit is exceeded.



Second Stage Power Turbine Nozzle Assembly (1-140-470-10/-R11) Inspection Areas
Figure 304 (Sheet 1)



Second Stage Power Turbine Nozzle Assembly (1-140-470-10/-R11) Inspection Areas
Figure 304 (Sheet 2)

See TR

(d) Cracks in inner shroud and seal support.

1 Axial cracks emanating from the forward and/or aft areas of inner shroud are not allowed.

2 Cracks on the inner shroud forward and/or aft retaining rings (if installed at previous overhaul) are not allowed.

3 Circumferential cracks on the inner shroud ID and/or OD are not allowed.

4 Cracks in seal support are not allowed.

5 Circumferential brazement cracks between the inner shroud and seal support are not allowed. Brazement cracks between the inner shroud and forward and/or aft retaining rings (installed on nozzles at a previous overhaul) are not allowed.

6 Cracks at inner shroud vane brazement are not allowed.

7 Repair all cracks in inner shroud.

(e) Cracks in cane leading edge not exceeding 0.050 inch in length are acceptable.

(f) Cracks in cylinder tangs. Replace if cracks are evident.

(g) Inspect for loose or damaged rivets. Repair rivets.

(10) Inspect for nicks, dents, and pits on vane airfoil. Nicks, dents, and pits are acceptable provided that depth after cleanup does not exceed 0.035 inch. Blend repair to remove surface projections. (See SPM, SP R401, 70-25-01.)

(11) Inspect for out of roundness or distorted seal lands. If not visibly defective, seals are acceptable. Rubs are acceptable provided out of roundness does not exceed 0.020 inch. Repair nozzle if limits are exceeded.

(12) Inspect for worn 4.948 to 4.952 inch seal diameter visually and using SIE. If limits are exceeded, repair.

TEMPORARY REVISION NO. 103

INSERT PAGE 3 OF 3 FACING 72-50-03, PAGE 212.

Reason: To add Step 1.B.(13).

Step 1.B.(13) is added as follows:

1. B.

    (13) Minor rubs on leading edge of inner shroud are acceptable after blending (See SPM, SP R401, 70-25-01) if contact with vane leading edge has not occurred.

POWER TURBINE ROTOR AND BEARING HOUSING ASSEMBLY - MAINTENANCE PRACTICES

1. Disassembly/Assembly

A. Disassemble Power Turbine Rotor and Bearing Housing Assembly

(1) Place power turbine rotor and bearing housing assembly in holding fixture LTCT4553.

(2) Straighten lock cup (18, Figure 201). Using wrench assembly LTCT915, remove nut (17). Remove lock cup.

(3) Remove screws (19) and cover (20).

(4) Remove impeller (21) and washer (22).

(5) Remove screws (23) and retaining ring (24).

(6) Install bearing housing mechanical puller LTCT4800 on bearing housing (27). Pull bearing housing from turbine rotor (2).

(7) Using hammer and suitable brass drift, tap bearing (25) out of bearing housing. Remove shim (26).

(8) Remove bolts (4) and deflector support (5).

(9) Remove seal housing (10) and impeller (13). Remove retaining ring from seal housing assembly. Using arbor press or base and bushing assembly LTCT4947, press seal (8) out of seal housing. Remove packing (9) from seal housing.

(10) Remove tube (31) and packing (30). Remove packing (32) from bearing housing.

(11) Remove screws (15) and ring assembly (16). Remove seal (11) from bearing housing (27), or packing (12) from ring assembly (16). Discard packing, seal (11) is reusable.

(12) Remove bearing (29) (Pre SB 0066) or (29A) (Post SB 0066) and spacer (28) from bearing housing.

(13) Using mechanical puller LTCT4846, remove seal ring (7) and ring (14).

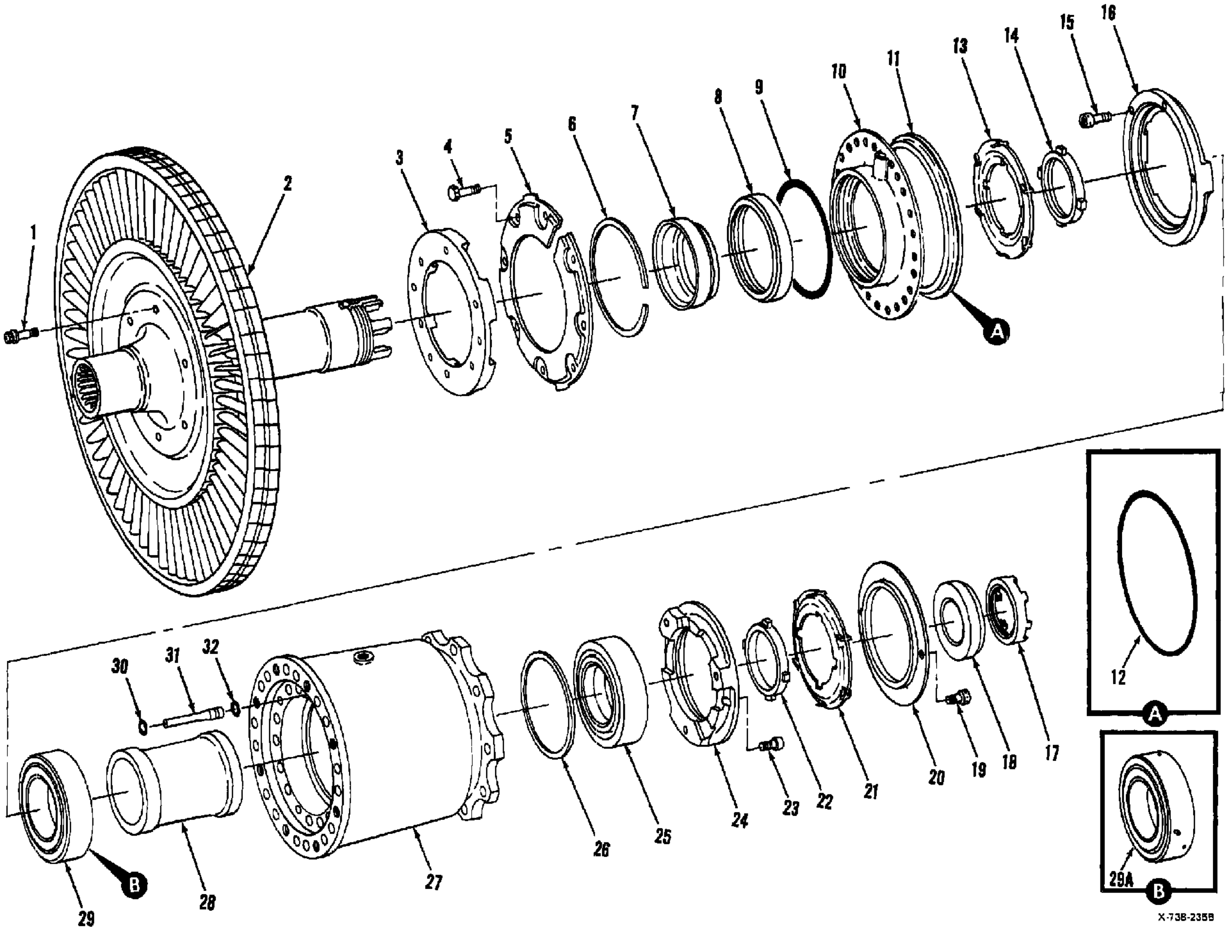
(14) Remove bolts (1) and plate (3) from turbine rotor disc.

B. Assemble Power Turbine Rotor and Bearing Housing Assembly

(1) Select shim (26) to maintain 0.003 to 0.006 inch axial pinch on outer race of bearing (25) as follows:

(a) Using vernier depth gage, measure depth of bearing housing and record as Dimension A. (See Figure 202.)

(b) Using micrometer, determine axial dimension of bearing outer race and record as Dimension B.



Power Turbine Rotor and Bearing Housing Assembly
Figure 201

KEY TO FIGURE 201

1. BOLT
2. TURBINE ROTOR
3. PLATE
4. BOLT
5. DEFLECTOR SUPPORT
6. RETAINING RING
7. SEAL RING
8. SEAL
9. PACKING
10. SEAL HOUSING
11. SEAL
12. PACKING
13. IMPELLER
14. RING
15. SCREW
16. RING ASSEMBLY
17. NUT
18. LOCK CUP
19. SCREW
20. COVER
21. IMPELLER
22. WASHER
23. SCREW
24. RETAINING RING
25. BEARING
26. SHIM
27. BEARING HOUSING
28. SPACER
29. BEARING (PRE SB 0066
29A. BEARING (POST SB 0066)
30. PACKING
31. TUBE
32. PACKING

(c) Subtract Dimension B from Dimension A.

(d) Add nominal 0.005 inch to result of preceding Step (c) to determine thickness of shim.

(2) Install packing (9, Figure 201) into seal housing (10). Lubricate recess in seal housing with hydrogenated vegetable shortening (72-00-00, 38, Table 203). Using arbor press or base and bushing assembly LTCT4947, press seal (8) into seal housing (10). Install retaining ring (6) into seal housing assembly.

CAUTION: TO PREVENT POSSIBLE AXIAL SEAL MOVEMENT, MAKE SURE THAT RETAINING RING (6) IS SEATED PROPERLY.

NOTE: (Post SB T53-L-13B-0094) Make sure pin on seal (8) aligns with hole in housing (10).

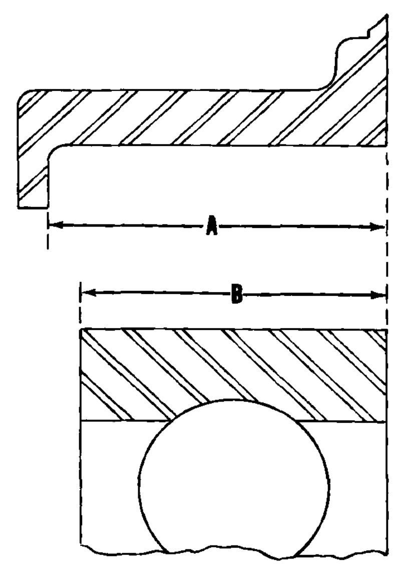
(3) Install packing (32) on tube (31). Install tube in bearing housing (27).

CAUTION: MAKE SURE THAT PIN IN OUTER RACE OF ROLLER BEARING (29) OR (29A) ENGAGES SLOT IN BEARING HOUSING (27).

(4) Using arbor press and suitable brass bushing, press bearing outer race (29) (Pre SB 0066) or (29A) (Post SB 0066) into bearing housing (27).

NOTE: Before installing seal (11), seal shall be inspected for cuts, nicks, tears, cracks, distortion, pliability and wear. If damage is noted, replace seal.

(5) Align screw holes in ring assembly with screw holes in bearing housing (27) and insert ring assembly into bearing housing. Secure ring assembly to bearing housing with screws (15). Tighten screws (15) finger tight (not to exceed 10 inch-pounds), then back off 1/4 to 1/2 turn. Make sure ring is not cocked. Install seal (11) in forward groove of bearing housing (27), or packing (12) on ring assembly (16).



Establishing Shim Thickness
Figure 202

NOTE: If seal (11) is to be installed, make sure that groove in bearing housing (27) is clean. Coat groove with hydrogenated vegetable shortening (72-00-00, 38, Table 203) or assembly fluid (72-00-00, 7, Table 203) to facilitate holding seal in housing.

(6) Install packing (30) on end of tube (31).

(7) Place impeller (13) in ring assembly (16). Install seal housing (10) over impeller. Make sure that tube (31) is properly seated in seal housing.

(8) Position deflector support (5) on seal housing (10) so that cutout in deflector is aligned with boss on seal housing.

(9) Coat threads of bolts (4) with anti-seize compound (72-00-00, 15, Table 203). Thread bolts into bearing housing (27) and tighten 70 to 75 inch-pounds torque. Lockwire bolts.

NOTE: Do not lubricate bolts.

(10) Position plate (3) on turbine rotor (2) and secure plate with bolts (1). Tighten bolts 25 to 30 inch-pounds torque.

(11) Using arbor press and suitable brass bushing, press seal ring (7) onto turbine rotor shaft.

(12) Using arbor press and suitable brass bushing, press ring (14) onto power turbine shaft. Make sure that tangs on rings are aligned with slots in impeller (13).

(13) Install power turbine rotor in suitable holding fixture. Install bearing housing assembly on turbine rotor.

CAUTION: MAKE SURE THAT SEAL (8) RIDES ONTO SEAL RING (7) WITHOUT DAMAGING THE SEAL.

(14) Using arbor press and sleeve bushing LTCT3493, press bearing, inner race and rollers, (29) or (29A) onto power turbine shaft.

CAUTION: DO NOT DAMAGE ROLLERS.

(15) Place spacer (28) on power turbine shaft.

NOTE: Use shim having correct thickness as determined in preceding Step (1).

(16) Install shim (26) into bearing housing (27).

(17) Using arbor press and sleeve bushing LTCT3493, press bearing (25) onto power turbine shaft and into bearing housing.

(18) Install retaining ring (24) into bearing housing and align screw holes. Secure ring assembly to bearing housing with screws (23). Tighten screws (23) finger tight (not to exceed 10 inch-pounds), then back off 1/4 to 1/2 turn. Make sure that ring is not cocked.

(19) Install washer (22). Install impeller (21) and align slots in impeller with tangs on washer.

(20) Install cover (20). Secure cover to retaining ring (24) with screws (19).

NOTE: Do not lubricate nut (17).

(21) Install power turbine rotor in holding fixture LTCT4553. Install lock cup (18) and nut (17). Using wrench LTCT915, tighten nut 225 to 250 foot-pounds torque.

(22) Secure nut (17) by deforming lock cup (18) into slot in nut at two locations.

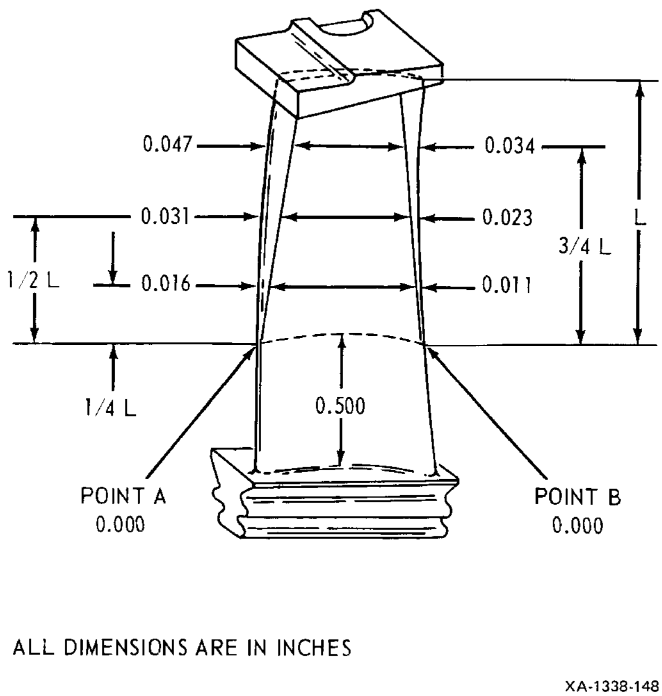
2. Inspection/Check

NOTE: Conduct a visual inspection of the second stage power turbine rotor using a seven power magnifying glass.

A. Inspect leading and trailing edges of blade for nicks, dents, cracks, and burns.

(1) Maximum permissible finished repair depth is 0.047 inch from leading edge and 0.034 inch from trailing edge. (See Figure 203.) Allowable depths decrease as distance between damage and point A on leading edge or point B on trailing edge decreases.

See TR



Second Stage Power Turbine Blade Repair Limits
Figure 203

(2) No dents are allowed within 0.500 inch of blade platform.

(3) No burns or cracks are allowed.

B. Inspect trailing edge of blades for erosion occurring immediately under blade shrouds. (See Figure 204.) A notch visible without magnification is not allowed.

C. Inspect blade surfaces for nicks, dents, cracks, and burns.

(1) No dents are allowed within 0.500 inch of blade platform.

(2) No burns or cracks are allowed.

D. Inspect blade tip at the shroud end for cracks and scoring.

(1) Cracks in shroud are not permitted.

(2) Tip rubs shall not exceed 0.030 inch in depth. Indications of tip rub are acceptable provided tip clearance can be obtained at assembly.

TEMPORARY REVISION NO. 97

INSERT PAGE 4 OF 5 FACING 72-50-04, PAGE 206.

Reason: To replace TR 92 (added Paragraph 2.D1 and Paragraph 2.D1.(1), (2), and (3) to show the correct blade platform inspection criteria) and to change “If rotor access permits” to “When performing a 2500-hour inspection” in Paragraph 2.D1.

Paragraph 2.D1. and 2.D.(1), (2) and (3) are added as follows:

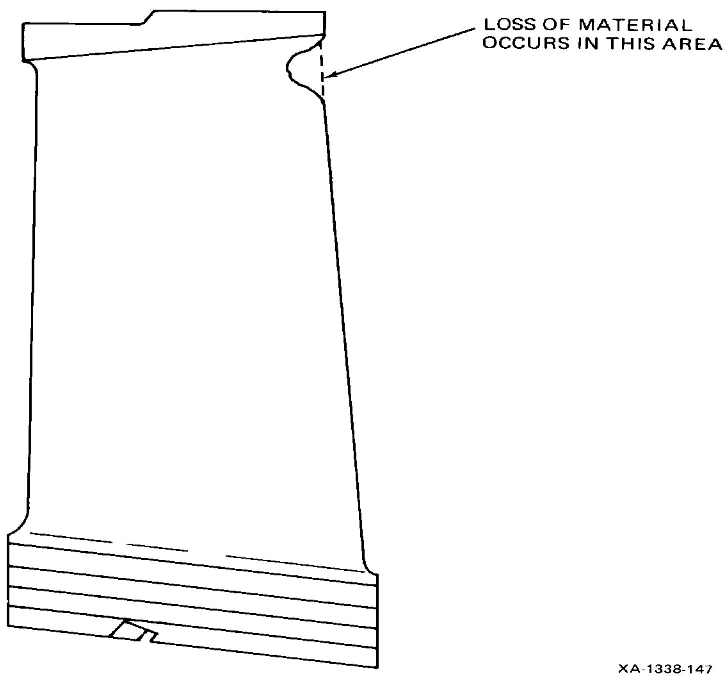
2.

D1. When performing a 2500-hour inspection, dimensionally inspect power turbine rotor for blade shroud gaps by inserting a shim between each pair of A and B blades. Do not force the shims. The shims must be inserted in the following sequence: 0, 180, 90, 270, 45, 225, etc. Any space (clearance) between the A and B blades in a pair should be pinched closed while inserting the shims between pairs. In those areas where a 0.001 inch shim is too loose and falls out, use a 0.002 inch shim or larger until the shim being inserted has a light drag on it. After all shims have been inserted, check each one for drag. Any shim having excess drag is to be removed and a smaller shim inserted with the proper light drag on it. In some instances, it may not be possible to insert a shim between some pairs. Measure the clearances in accordance with the following limits:

(1) On rotors which were completely rebladed, the maximum cumulative gap between all tip shrouds must not exceed 0.165 inch. No individual gap is to exceed 0.010 inch. The minimum cumulative gap must not be less than 0.016 inch. No gap allowed between A and B blades in a set.

(2) On rotors which were not completely rebladed, the maximum cumulative gap between all tip shrouds must not exceed 0.210 inch. No individual gap between pairs of A and B blades must exceed 0.020 inch, (refer to Figure 204A). The minimum cumulative gap must not be less than 0.016 inch. No gap allowed between A and B blades in a set.

(3) If cumulative gap exceeds 0.210 inch, replace blades as necessary to obtain proper gap. If cumulative gap is below 0.016 inch, repair or replace blades in accordance with ATA NO. 72-09-41.



Second Stage Power Turbine Blade Repair Location
Figure 204

E. Inspect blade platform and root areas, and turbine disc for cracks. No cracks are allowed.

F. Inspect aft side of rotor disc for blades recessed below disc, if one or more blades are recessed more than 0.025 inch, remove rotor and reseat blades.

G. Inspect oil passages in ring assemblies and bearing housing for clogging. Use clean, dry air to inspect for clogging. Clogging is not acceptable.

H. Inspect impellers for galling, scoring, and loss of protective finish.

(1) Galling or deep scoring which penetrates into parent metal is unacceptable.

(2) Replace if any degree of surface finish loss is evident.

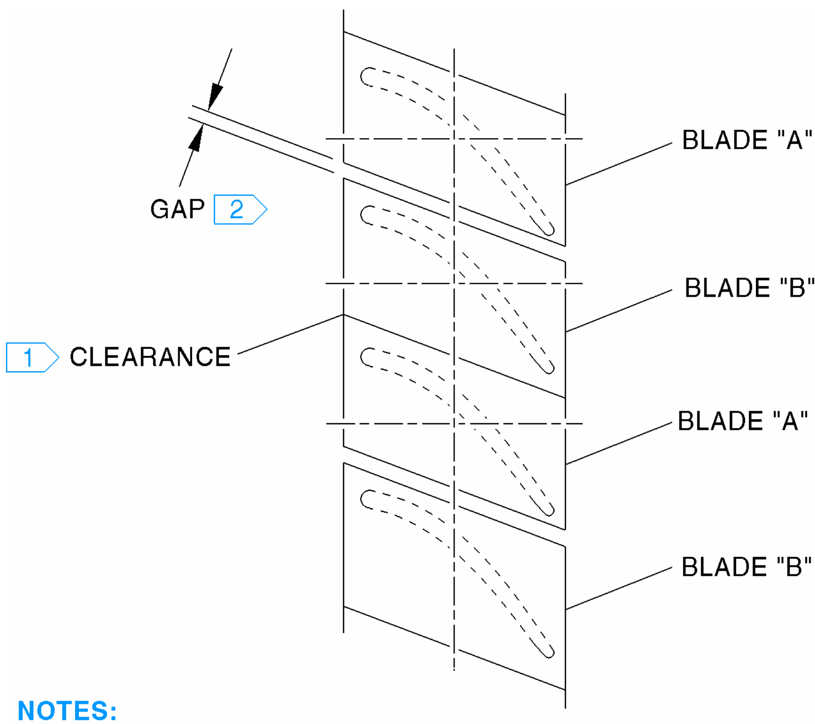
I. Inspect internal spline for wear. Wear up to 0.005 inch depth is acceptable.

TEMPORARY REVISION NO. 97

INSERT PAGE 5 OF 5 FOLLOWING 72-50-04, PAGE 207.

Reason: To replace TR 92 (added Figure 204A).

Figure 204A is added as follows:



NOTES:

1. No clearance on rotors which are rebladed. 0.000 to 0.005 inch clearance on rotors which were not rebladed.
2. Maximum total gap within assembly must not exceed 0.210 inch. Total gap shall not be less than 0.016 inch.
3. Individual gap shall be 0.000 to 0.010 inch rotors which are rebladed.
4. Individual gap shall be 0.000 to 0.020 inch rotor which are not rebladed.

ID-648412

Power Turbine Rotor Blade Shroud Gap
Figure 204A

3. Cleaning/Painting

Clean all parts with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Reclean parts if oil passages are clogged.

B. Observe following rules during power turbine rotor blade repair.

(1) Use portable power drill or rotary file equipped with carbide burr. If these are not available, small diesinker type file, or India or carborundum stone may be substituted.

(2) Finish strokes shall be parallel to leading and trailing edges of blades.

(3) Final polish area with crocus cloth (72-00-00, 13, Table 203). All repairs shall be blended and finished smoothly.

(4) Blend leading or trailing edge repairs to smooth radius as part of repair. (See Figure 203.)

(5) Finish repair length shall be blended to minimum of three times depth of damage.

C. Repair leading and/or trailing edges of power turbine rotor blades as follows:

(1) Round bottom dents, 0.010 inch deep or less, require removal of sharp edges only.

(2) If distance between damage and shroud end of blade is less than twice depth of damage, extend repair to include shroud end.

(3) If distance between two damaged areas is less than twice depth of deeper damage, make one repair area. If distance between two damaged areas is greater than twice depth of deeper damage, make separate repair areas. (See Figure 203.)

(4) Damage that cannot be completely eliminated by allowable blade repair is cause for rotor replacement. Forward rotor to overhaul facility for blade replacement and balancing.

D. Repair blade surfaces as follows:

(1) Maximum permissible decrease in thickness at any point on blade is 0.010 inch.

(2) Maximum permissible finished single repair on blade surface is 0.200 square inch on either concave or convex side.

(3) Blend repairs to minimum of twice depth of damage.

(4) Total repaired surface area shall not exceed 10 percent of blade surface.

(5) If distance between two damaged areas is less than twice depth of deeper damage, make one repair area. If distance between two damaged areas is greater than twice depth of deeper damage, make separate repair areas. (See Figure 203.)

(6) Damage that cannot be completely eliminated by allowable blade repairs is cause for rotor replacement. Forward rotor to overhaul facility for blade replacement and balancing.

E. Reseat blades recessed more than 0.025 inch below aft face of disc as follows:

(1) Locate and mark number one blade on both sides using silver marking pencil (72-00-00, 59A, Table 203).

(2) Place rotor, forward face up, in staking fixture assembly LTCT2072.

NOTE: Number one blade is first blade counterclockwise from balancing “O” marking on forward face of disc.

(3) Starting with number one blade, tap all blades flush with aft face of disc using a hammer and a suitable drift from punch and drift kit LTCT552.

CAUTION: MAKE SURE THAT TOOL DOES NOT CONTACT DISC OR BLADES DURING DRIVING OPERATION.

NOTE: Make sure that blade being tapped is not positioned over slot in fixture assembly.

(4) Using staking tool assembly LTCT3738 on mushroomed pins, or a hammer and a drive punch on recessed pins, redrive all pins.

(5) Remove staking tool (if used).

F. Replace power turbine rotor if disc is cracked or if rubs on blade tips exceed inspection limits.

G. Blades damaged beyond established limits shall be replaced. Forward rotor to overhaul facility for blade replacement and balancing.

GAS PRODUCER SYSTEM COMPONENTS - MAINTENANCE PRACTICES

1. Disassembly/Assembly

A. Disassemble Gas Producer System Components

(1) Removal of gas producer rotor and nozzle assemblies is not required for inspection. Removal is limited to gaining access for necessary repair or replacement of components.

(2) Check second stage gas producer rotor for minimum tip clearances.

(a) Insert feeler gage between second stage gas producer turbine rotor blade tips (41, Figure 201) and second stage gas producer cylinder (49) at the 12 o'clock position.

CAUTION: DO NOT USE LEAD PENCIL TO MARK BLADE.

(3) Rotate turbine rotor and check and record minimum tip clearance (longest blade). Mark longest blade with silver marking pencil (72-00-00, 59A, Table 203).

(4) Check clearance between tip of longest blade and flange at seven additional positions. (See Figure 202.) Hold feeler gage stationary at each position and turn rotor one full turn. If tip clearance at any position is 0.020 inch or less, replace cylinder.

(5) Engage tangs of face spanner socket wrench LTCT13456 (detail of LTCT13175) with nut (50, Figure 201) to prevent compressor rotor shaft from turning.

(6) Straighten tabwashers (42) and remove nuts (43) and tabwashers that secure second stage gas producer turbine rotor (41) to spacer (38).

(7) Using mechanical puller LTCT691, carefully remove second stage gas producer turbine rotor (41) and spacer (38).

NOTE: Use thumbscrews to position the arms into spacer. When arms are in position, firmly lock them with knurled cup and back off thumbscrews at least one-half turn to allow puller to operate freely and prevent binding of thumbscrews.

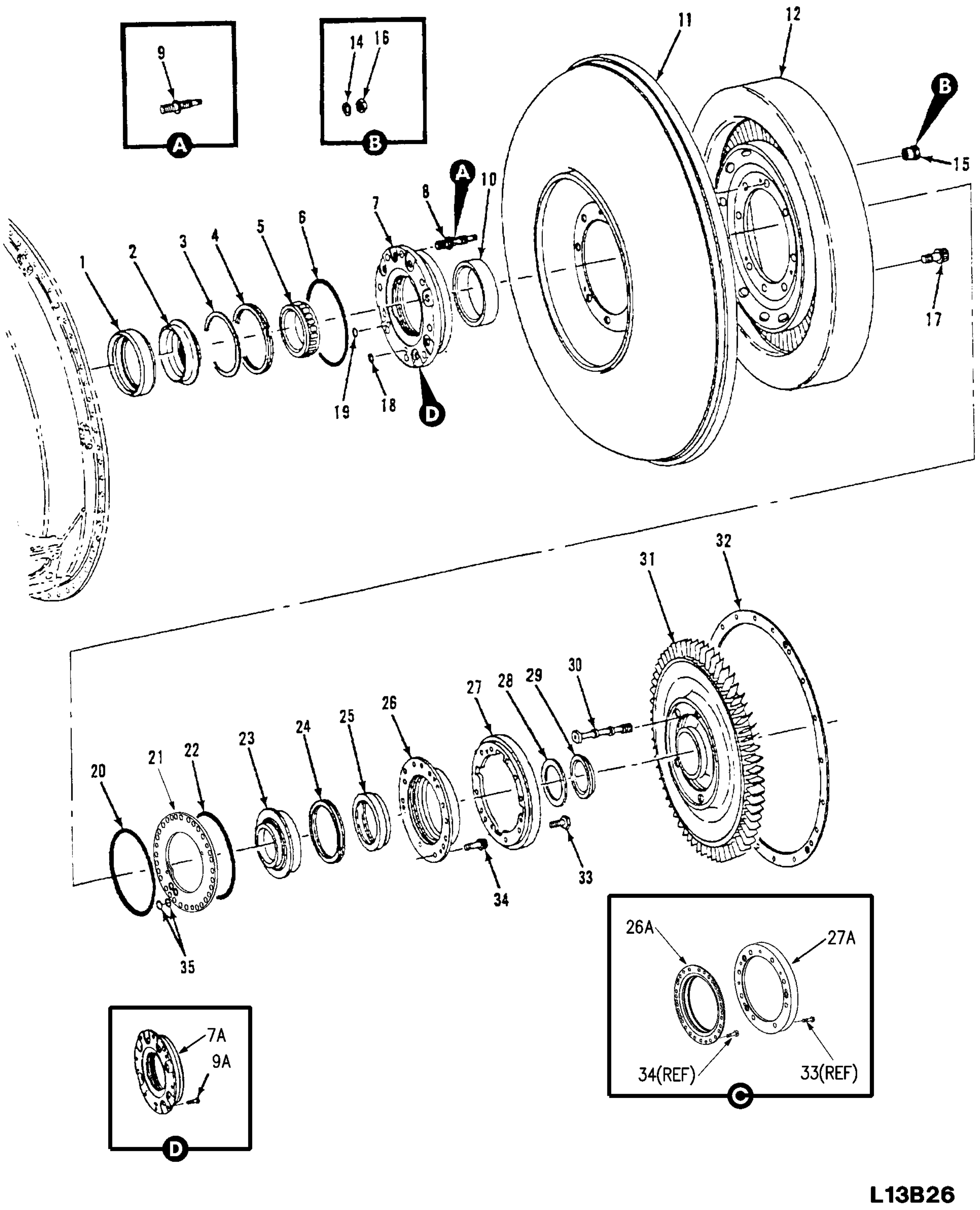
(8) Using spacer mechanical puller LTCT4842, remove spacer (38) from second stage gas producer turbine rotor (41).

(9) Remove two seal rings (46) and four expander springs (45) (if installed) from outside diameter of second stage gas producer cylinder (49).

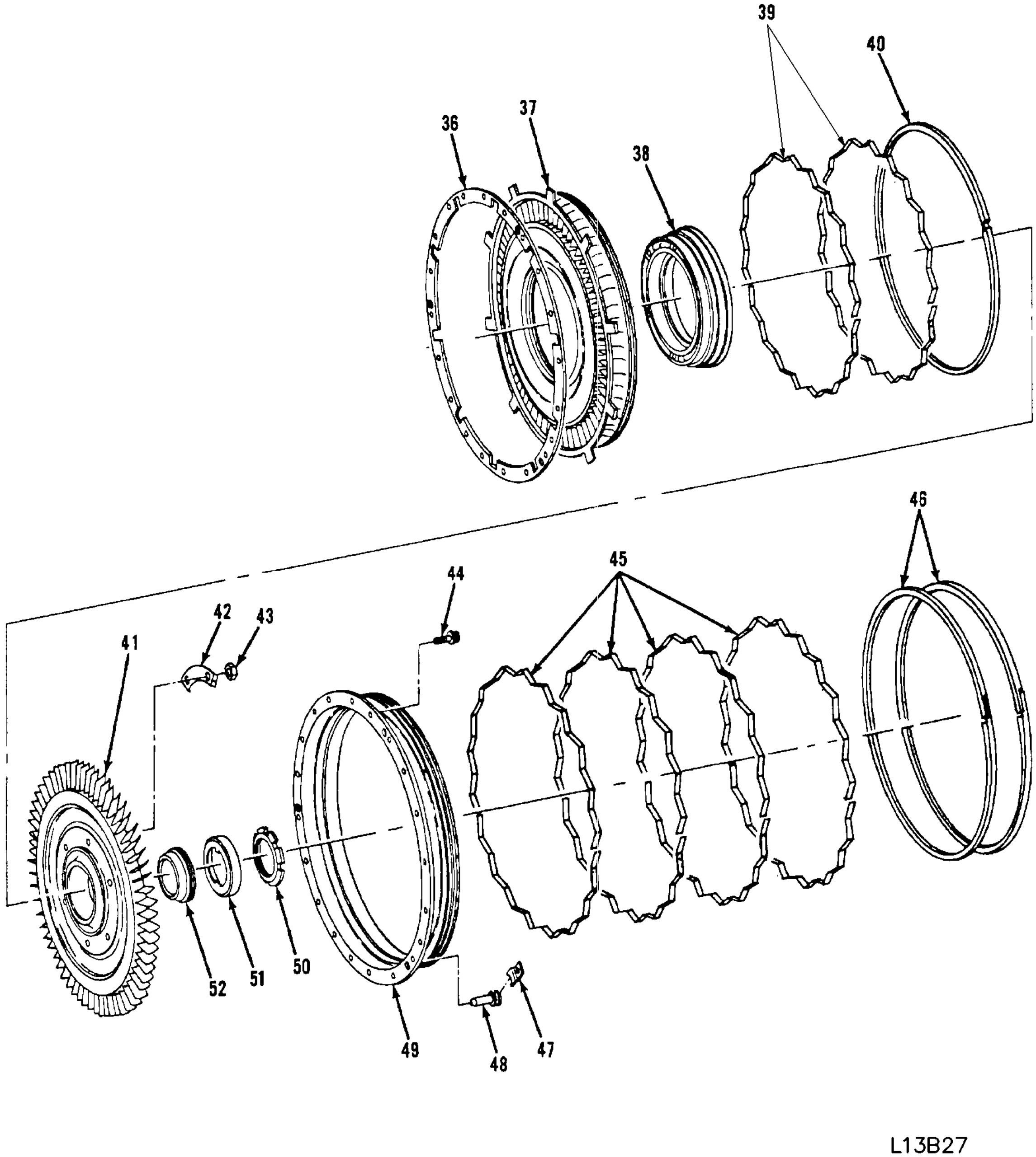
CAUTION: BOLTS (44) ARE NOT TO BE REUSED FOR REASSEMBLY.

(10) Remove 20 bolts (44) that secure second stage gas producer cylinder to first stage turbine nozzle (12). Remove three retaining plates (47). Discard bolts (44).

(11) Using locating pin removal tool LTCT4692, remove pins (48). Remove second stage gas producer cylinder (49).



Gas Producer System Components
Figure 201 (Sheet 1 of 2)



Gas Producer System Components
Figure 201 (Sheet 2)

KEY TO FIGURE 201

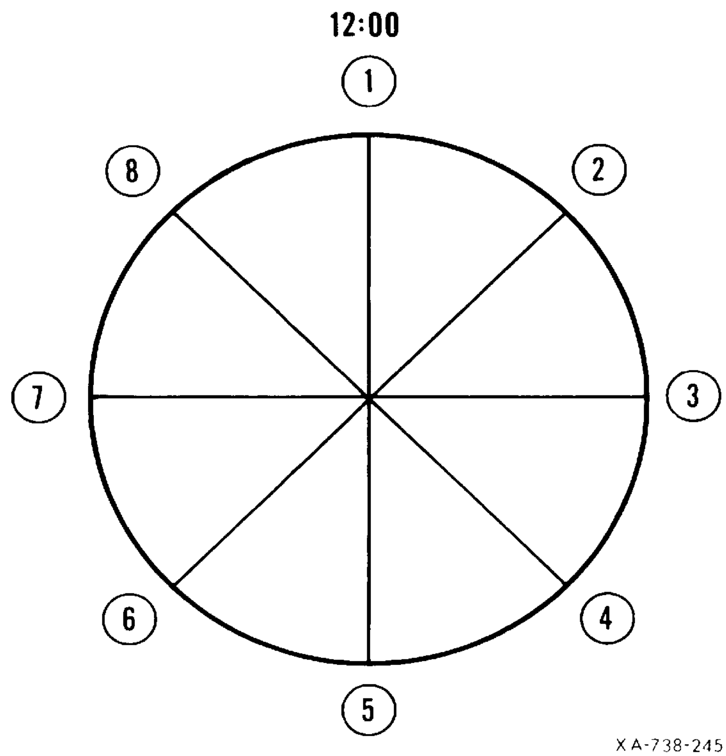
1. FORWARD SEAL
2. FORWARD OIL RING
3. SPACER
4. RETAINING RING
5. BEARING INNER RACE AND ROLLERS
6. SEAL
7. REAR BEARING HOUSING ASSEMBLY (PRE SB 0063)
7A. REAR BEARING HOUSING ASSEMBLY (POST SB 0063)
8. STUD 1-110-131-04 (PRE SB 0063)
9. STEPPED STUD 1-110-131-02 (PRE SB 0063)
9A. SCREW AN115408 (POST SB 0063)
10. BEARING OUTER RACE
11. COMBUSTION CHAMBER DEFLECTOR
12. FIRST STAGE TURBINE NOZZLE
13. DELETED
14. WASHER
15. NUT 1-110-134-01
16. NUT NAS509-4
17. BOLT MS9171-10
18. PACKING
19. PACKING
20. GASKET
21. RETAINING PLATE
22. GASKET
23. AFT OIL RING
23A. SEAL AND RETAINER ASSEMBLY
24. RETAINING RING
25. SEAL
26. RETAINER (PRE SB 0063)
26A. RETAINER (POST SB 0063)
27. SEALING RING (PRE SB 0063)
27A. SEALING RING (POST SB 0063)
28. SHIM
29. FORWARD CONE
30. BOLT
31. FIRST STAGE GAS PRODUCER TURBINE ROTOR
32. SPACER
33. BOLT
34. BOLT
35. PACKING
36. RING
37. SECOND STAGE TURBINE NOZZLE
38. SPACER
39. EXPANSION SPRING
40. SEALING RING
41. SECOND STAGE GAS PRODUCER TURBINE ROTOR
42. TABWASHER
43. NUT
44. BOLT
45. EXPANDER SPRING
46. SEAL RING
47. RETAINING PLATE
48. PIN
49. SECOND STAGE GAS PRODUCER CYLINDER
50. NUT
51. LOCKRING
52. REAR CONE

NOTE: Record thickness of spacer (32) for assembly.

(12) Remove sealing ring (40) and two expansion springs (39) from outside diameter of second stage gas producer nozzle. Remove ring (36), spacer (32), and second stage turbine nozzle (37).

(13) Check first stage gas producer rotor for minimum tip clearances as follows:

(a) Insert feeler gage with 1/4 inch wide tip between first stage gas producer turbine rotor (31) and first stage turbine nozzle (12) at 12 o’clock position.



Checking Positions - Tip Clearance
Figure 202

CAUTION: DO NOT USE LEAD PENCIL TO MARK BLADE.

(b) Rotate turbine rotor and check and record minimum tip clearance (longest blade). Mark longest blade with silver marking pencil (72-00-00, 59A, Table 203).

(c) Check clearance between tip of longest blade and flange at seven additional positions. (See Figure 202.) Hold feeler gage stationary at each position and turn rotor one full turn. If tip clearance at any position is 0.020 inch or less, first stage gas producer nozzle must be reworked or replaced.

(14) Straighten tabs of compressor shaft rear lockring (51, Figure 201).

NOTE: Make sure that bolts are drawn completely through fixture.

(15) Install torque fixture LTCT13175 over bolts (30) of first stage gas producer turbine rotor (31), engaging tangs of face spanner socket wrench LTCT13456 (detail of LTCT13175) with slots in nut (50). Secure fixture with nuts (43).

(16) Using torque wrench PD2501, remove nut (50) and lockring (51).

(17) Remove nuts (43), torque wrench, and torque fixture.

(18) Using rear core removal tool LTCT6465, remove first stage gas producer turbine rotor (31) and rear cone (52).

(19) Using marking pencil (72-00-00, 59A, Table 203), index bolts (30) to rotor assembly (31) for correct reassembly. Remove bolts from rotor assembly.

(20) Remove eight bolts (33) that secure sealing ring (27) or (27A). Remove sealing ring.

(21) Remove three bolts (34) that secure retainer (26) or (26A), retaining ring (24), and seal (25).

(22) Using adapter and guide LTCT3685 and mechanical puller LTCT2121, remove aft oil ring (23), forward cone (29), and shim (28).

(23) Remove gasket (22), retaining plate (21), packings (35) and gasket (20).

CAUTION: BOLTS (17) SHALL BE DISCARDED. INSTALLATION OF USED BOLTS DURING REASSEMBLY MAY RESULT IN BOLT FRACTURE DURING ENGINE OPERATION.

NOTE: Washers (14) are installed only when stepped stud (9) and nut (16) are installed.

(24) (Pre SB 0063) Prevent studs from turning while removing two nuts (15) or (16) and washers (14). Remove six bolts (17), first stage turbine nozzle (12) and combustion chamber deflector (11) to rear bearing housing assembly (7). Discard bolts (17).

(25) (Post SB 0063) Remove eight bolts (17) that secures first stage turbine nozzle (12) and combustion chamber deflector (11) to rear bearing housing assembly (7A). Discard bolts (17).

(26) Remove first stage turbine nozzle (12), and combustion chamber deflector (11).

(27) (Pre SB 0063) Remove two studs (8 or 9). Remove rear bearing housing assembly (7), packings (18, 19) and seal (6). Bearing outer race (10) will remain in rear bearing housing assembly (7). Discard seal (6) and packings (18, 19).

(28) (Post SB 0063) Remove two bolts (9A). Remove rear bearing housing assembly (7A), packings (18, 19) and seal (6). Bearing outer race (10) will remain in rear bearing housing assembly (7A). Discard seal (6) and packings (18, 19).

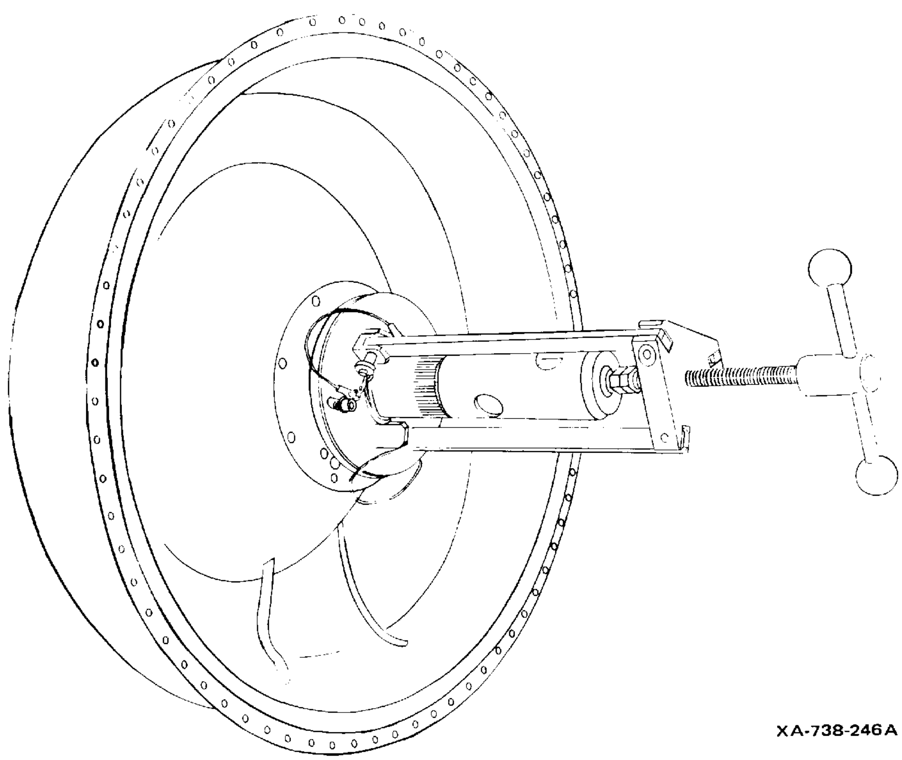
(29) Using arbor press and suitable sleeve, press bearing outer race (10) from rear bearing housing assembly (7).

CAUTION: KEEP BEARING INNER RACE AND ROLLERS (5) AND BEARING OUTER RACE (10) TOGETHER AS A SET.

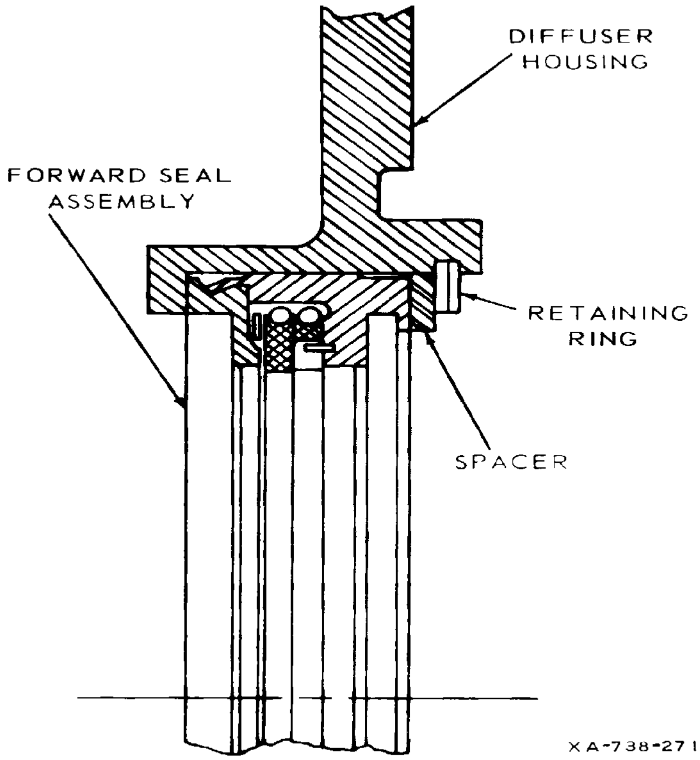
(30) Using mechanical puller LTCT4809, remove bearing inner race and rollers (5) from compressor rear shaft. (See Figure 203.)

(31) (Pre SB T53-L-13B-0113) Using mechanical puller LTCT4846 or LTCT4700, remove forward oil ring (2).

(32) (Post SB T53-L-13B-0113) Using mechanical puller LTCT31126-0501, remove forward oil ring (2).



Removing Compressor Rear Bearing
Figure 203



Proper Installation of Forward Seal
Figure 204

(33) Remove retaining ring (4) and spacer (3).

(34) Using forward seal puller LTCT4568 with arbor LTCT4571 remove forward seal (1).

B. Reassemble Gas Producer System Components

NOTE: Aft seals 1-300-174-02 and -03 (25, Figure 201) are manufactured with a fracture at one of the slot locations on the air side carbon element. This fracture is not a defect and is not considered cause for seal replacement. Forward seals 1-300-173-02, 1-300-173-03 and 1-300-173-04 (1) and aft seals 1-300-174-02 and 1-300-174-03 (25) are manufactured with three splits, 120 degrees apart, on the oil side carbon element. These splits are not defects and are not considered cause for seal replacement.

To prevent tool rotation when using installing tool LTCT13070, engage tangs of tool with cutouts in forward seal (1).

(1) Carefully position forward seal (1) on forward oil ring 1-100-146-04 (2) and using installing tool LTCT13070, install seal and ring as a unit on rear compressor shaft. Ensure top marking on

seal is located at 12 o'clock position and that scalloped side of seal is toward rear of engine. (See Figure 204 for proper seal installation.)

CAUTION: TO PREVENT POSSIBLE AXIAL SEAL MOVEMENT, MAKE SURE THAT RETAINING RING (4) IS SEATED PROPERLY.

(2) Install spacer (3) and retaining ring (4).

(3) Using installing tool LTCT791, install bearing inner race and rollers (5) on compressor rear shaft.

CAUTION: MAKE SURE THAT OIL HOLES IN BEARING OUTER RACE (10) LINE UP WITH OIL PASSAGE IN REAR BEARING HOUSING ASSEMBLY (7) OR (7A) WITH OIL HOLES FORWARD.

MAKE SURE THAT PIN IN OUTER RACE OF BEARING (10) ENGAGES SLOT IN BEARING HOUSING ASSEMBLY (7) OR (7A).

(4) Using arbor press and sleeve bushing LTCT3493, press bearing outer race (10) into rear bearing housing assembly (7) or (7A) with oil holes forward.

(5) Install seal (6) and packings (18, 19) in grooves of diffuser housing assembly.

CAUTION: INSTALL NEW BOLTS (17). INSTALLATION OF USED BOLTS MAY RESULT IN BOLT FRACTURE DURING ENGINE OPERATION.

NOTE: Prior to stud installation, apply anti-seize thread compound (72-00-00, 15, Table 203) to threads. Do not install washers on bolts (17).

(6) (Pre SB 0063) Position rear bearing housing assembly (7) over rear compressor shaft. Install six new bolts (17) and tighten 120 to 165 inch-pounds torque. Install two new stepped studs (9) or studs (8) at the two counterbored holes located at the 12 and 6 o'clock positions.

(7) (Post SB 0063) Apply anti-seize compound (see 72-00-00, 15, Table 203) to threads of screws (9A). Position rear bearing housing assembly (7A) over rear compressor shaft. Install two screws (9A) at the two counterbored holes located at the 12 and 6 o'clock positions.

(8) (Pre SB 0063) Using wrench LTCT1409 mounted at 90 degree angle with torque wrench, tighten stepped studs (9) 70 to 90 inch-pounds torque. Using special wrench LTCT6940 on four large flats of stud (8), tighten studs (8) 70 to 90 inch-pounds torque. Do not lockwire at this time. Remove six bolts (17) from housing.

NOTE: Prior to nut and bolt installation, apply anti-seize compound (see 72-00-00, 15, Table 203) to threads.

(9) (Pre SB 0063) Position combustion chamber deflector (11) and first stage turbine nozzle assembly (12) on rear bearing housing assembly (7) and into diffuser housing assembly. Install two nuts (15) at the 12 and 6 o'clock positions, and six bolts (17).

(10) (Post SB 0063) Position combustion chamber deflector (11) and first stage turbine nozzle assembly (12) on rear bearing housing assembly (7A) and into diffuser housing assembly. Install eight bolts (17).

(11) Tighten bolts (17) 120 to 165 inch-pounds torque.

(12) (Pre SB 0063) Tighten nuts (15) 60 to 90 inch-pounds torque.

(13) (Pre SB 0063) Lockwire studs (8), nuts (15), and bolts (17). (See Figure 205.)

(14) (Post SB 0063) Lockwire bolts (17). (See Figure 206.)

CAUTION: DO NOT INSTALL PACKINGS (35) AND GASKETS UNTIL ROTOR TIP CLEARANCE (0.020 INCH) TAKEN IN STEP (57) HAS BEEN ESTABLISHED.

(15) Using adapter and guide LTCT3685, temporarily install aft oil ring (23, Figure 201) onto shaft. Do not remove adapter and guide LTCT3685 from aft oil ring (23) at this time.

(16) Using installing tool LTCT4013, temporarily install shim (28) and forward cone (29). Make parts bottom against aft oil ring (23).

(17) Determine shim (28) size required to obtain proper clearance between first stage turbine nozzle assembly (12) and first stage gas producer turbine rotor assembly (31). Clearance E is established by using a go-no-go type gage, or equivalent, as follows: (See Figure 207.)

(a) Place two gage blocks (minimum 1/2 inch thickness) of equal thickness on diffuser housing flange. Place locating bar LTCT153 on gage blocks.

(b) Using depth micrometer, measure from bar to inner shroud in four equally spaced locations. Subtract thickness of locating bar LTCT153 from dimension taken at highest point on inner shroud and record result as Dimension A. (See Figure 207.)

(c) With rotor forward face up, measure distance from highest blade forward retention lip to forward face of rotor hub, and record as Dimension X. (See Figure 207.) Turn rotor over, and measure distance from highest blade rear retention lip to rear face of rotor hub. Record as Dimension Y. Measure distance from front face of rotor hub to rear face of rotor hub, and record as Dimension Z. Add Dimension X and Dimension Y, and subtract the sum from Dimension Z. Record the difference as Dimension C. (See Figure 207.)

(d) Install first stage gas producer turbine rotor (31, Figure 201) over power shaft splines and temporarily secure with rear cone (52), lockring (51), and nut (50). Tighten nut 320 to 350 foot-pounds torque.

(e) Place blocks (1/2 inch thickness) on air diffuser flange. Place locating bar LTCT153 on blocks. Using depth vernier, measure from bar to first stage gas producer turbine blades and record as Dimension D. (See Figure 207.)

(f) Add Dimension C to Dimension D. Result is Dimension B.

(g) Subtract Dimension B from Dimension A. Result is Dimension E. Dimension E must be 0.095 inch minimum to 0.120 inch maximum. If required clearance is not obtained, select shim (28, Figure 201) of correct thickness. (See Table 201.)

(h) Remove nut (50), lockring (51), rear cone (52), and first stage gas producer turbine rotor assembly (31). Remove forward cone (29), and shim (28). Using adapter and guide LTCT3685, and mechanical puller LTCT2121, remove aft oil ring (23).

Table 201. Shim Thickness

Part Number	Thickness
1-100-289-01	0.020 to 0.025 inch
1-100-289-02	0.030 to 0.035 inch
1-100-289-03	0.040 to 0.045 inch

NOTE: Apply hydrogenated vegetable shortening (72-00-00, 38, Table 203) to gasket and packings prior to installing.

(18) Install gasket (20, Figure 201) in groove of rear bearing housing assembly (7) or (7A). Install two packings (35) in groove of bearing retaining plate (21). Install bearing retaining plate (21) taking care not to disturb gasket (20) and packings (35).

(19) Using adapter and guide LTCT3685, install aft oil ring (23) onto shaft. Do not remove adapter and guide LTCT3685 from aft oil ring (23) at this time.

(20) Install gasket (22) in groove of bearing retaining plate (21).

CAUTION: EXERCISE CARE DURING INSTALLATION TO PREVENT DAMAGE TO CARBON SEALING ELEMENTS. CAREFULLY GUIDE SEAL AND RETAINER ASSEMBLY (23A) OVER ADAPTER AND GUIDE LTCT3685 AND ONTO AFT OIL RING (23).

(21) Position assembled retaining ring (24), seal (25), and retainer (26) against bearing retaining plate (21) taking care not to disturb gasket (22). Secure with three bolts (34). Tighten bolts to 40 to 45 inch-pounds torque. Remove adapter and guide LTCT3685.

(22) Apply anti-seize compound (72-00-00, 15, Table 203) to threads of bolts (33). Position sealing ring (27) or (27A) on aft face of seal and retainer assembly. Align bolt holes and secure with eight bolts (33). Tighten bolts 85 to 95 inch-pounds torque. After 5 minutes, release torque on bolts (33) and tighten 95 to 105 inch-pounds torque. Lockwire bolts as shown in Figure 208.

(23) Using installation tool LTCT4013, install selected shim (28) and forward cone (29). Make sure parts bottom against aft oil ring (23).

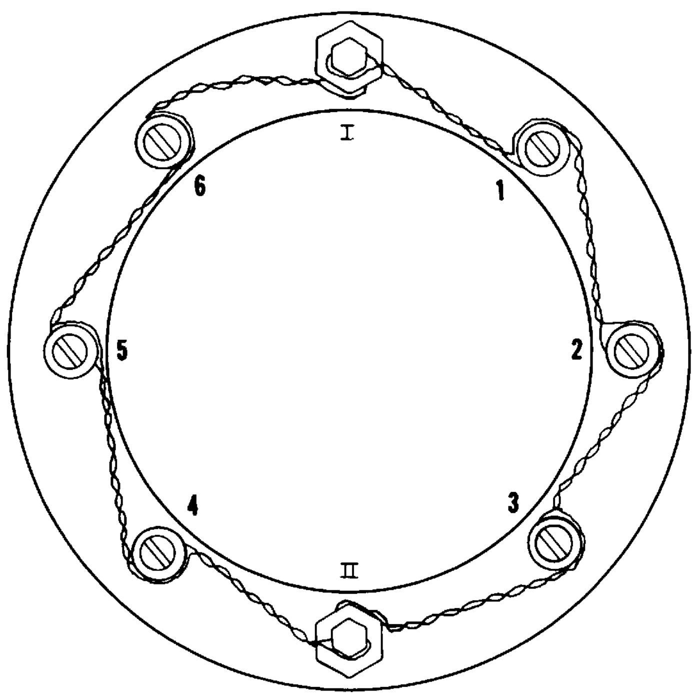
(24) Note index markings on bolts (30) and install bolts (30) through first stage gas producer turbine rotor from forward side.

(25) Install first stage gas producer turbine rotor assembly (31) over compressor rear shaft splines. Make sure alignment marks are properly aligned.

(26) Lubricate threads of nut (50) with anti-seize compound. (72-00-00, 15, Table 203.)

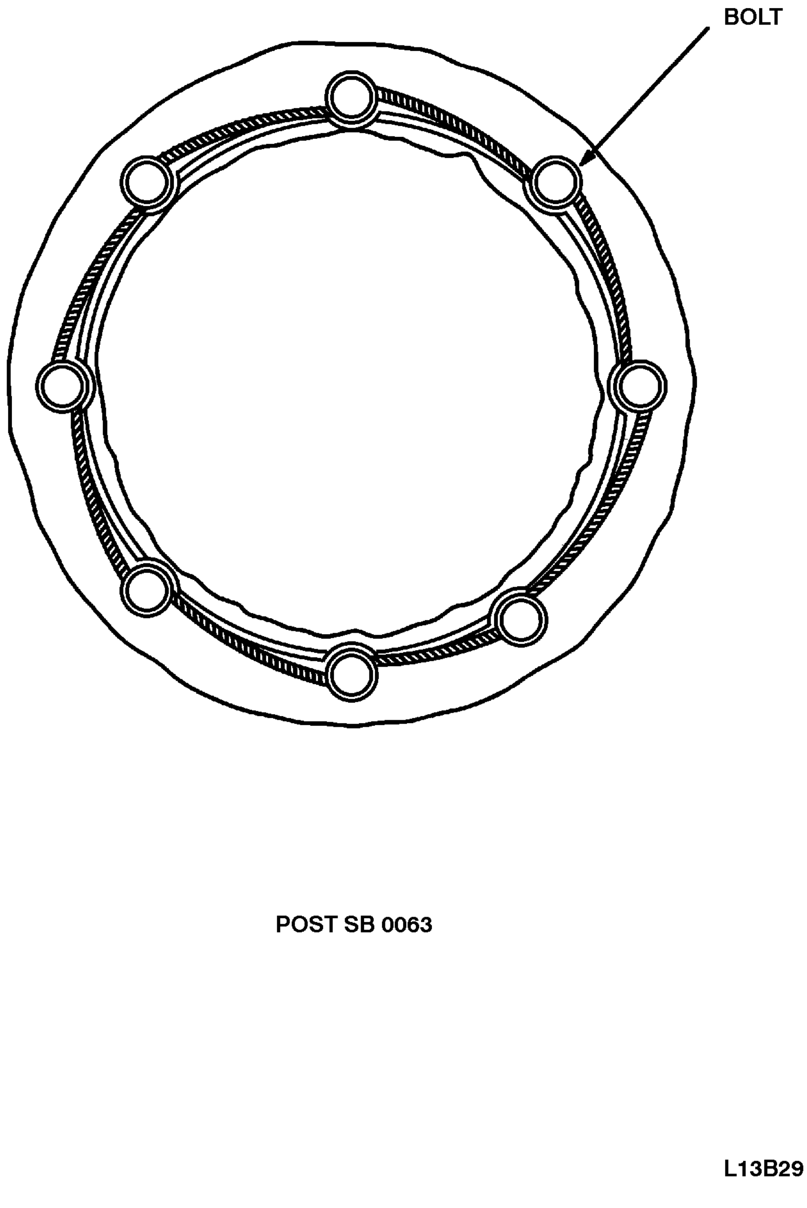
LOCKWIRING PROCEDURE

(1) NUT ON STUD I TO BOLT 6 TO BOLT 5
(2) NUT ON STUD II TO BOLT 3 TO BOLT 2
(3) STUD I TO BOLT 1 TO BOLT 2
(4) STUD II TO BOLT 4 TO BOLT 5

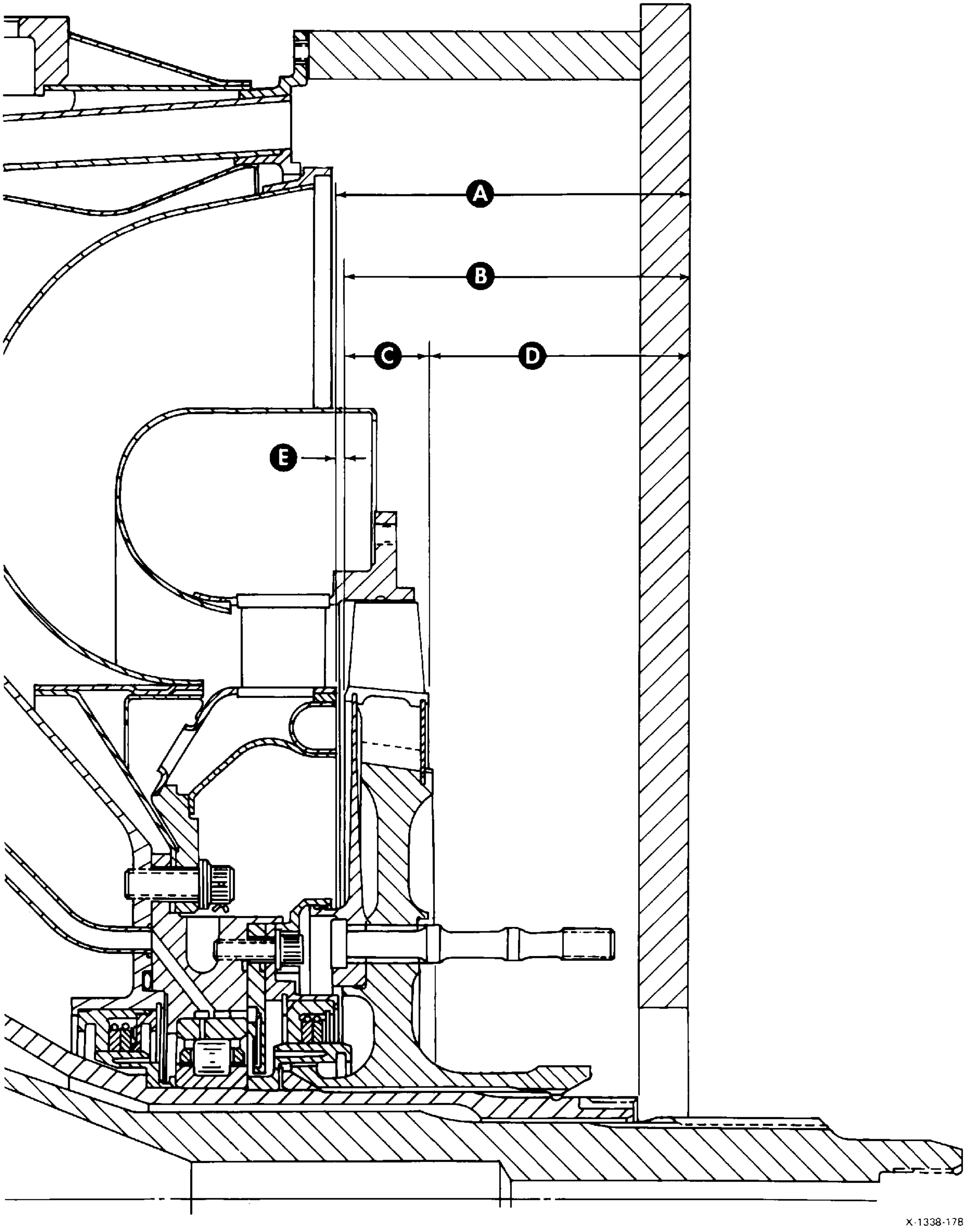


XA-738-334

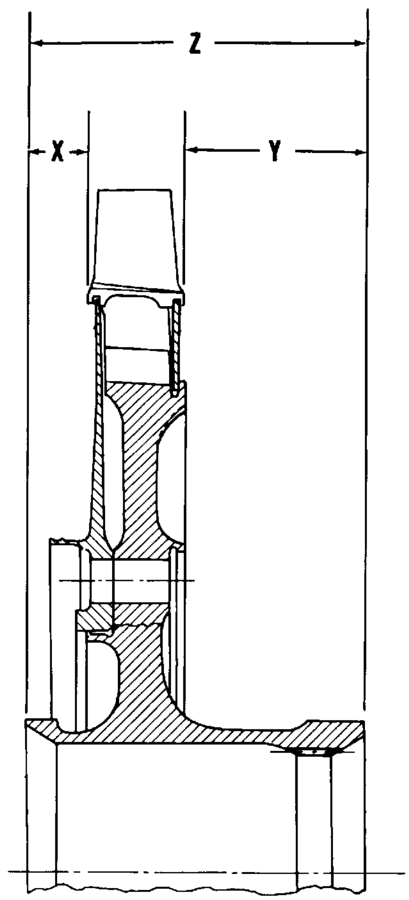
Rear Bearing Housing Studs, Nuts, and Bolts - Lockwiring Procedure
Figure 205



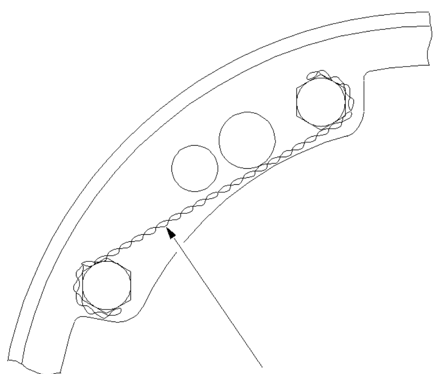
Rear Bearing Housing Studs, Nuts, and Bolts - Lockwiring Procedure
Figure 206



Determining Clearance Between First Stage Turbine Nozzle Assembly
and First Stage Gas Producer Turbine Rotor Assembly
Figure 207 (Sheet 1 of 2)



Determining Clearance Between First Stage Turbine Nozzle Assembly
and First Stage Gas Producer Turbine Rotor Assembly
Figure 207 (Sheet 2)



Lockwire Seal Retainer
Figure 208

(27) Install rear cone (52), lockring (51), and nut (50).

NOTE: Make sure that bolts are drawn completely through adapter.

(28) Install torque fixture LTCT13175 over bolts (30) of first stage gas producer turbine rotor assembly (31), engaging tangs of face spanner socket wrench LTCT13456 (detail of LTCT13175) with slots in nut (50). Secure fixture with nuts (43).

NOTE: Nut (50) shall not extend more than 0.060 inch beyond aft face of compressor rotor rear stub shaft.

(29) Using torque wrench PD2501, tighten nut (50) 320 to 350 foot-pounds torque. Remove torque wrench and torque fixture.

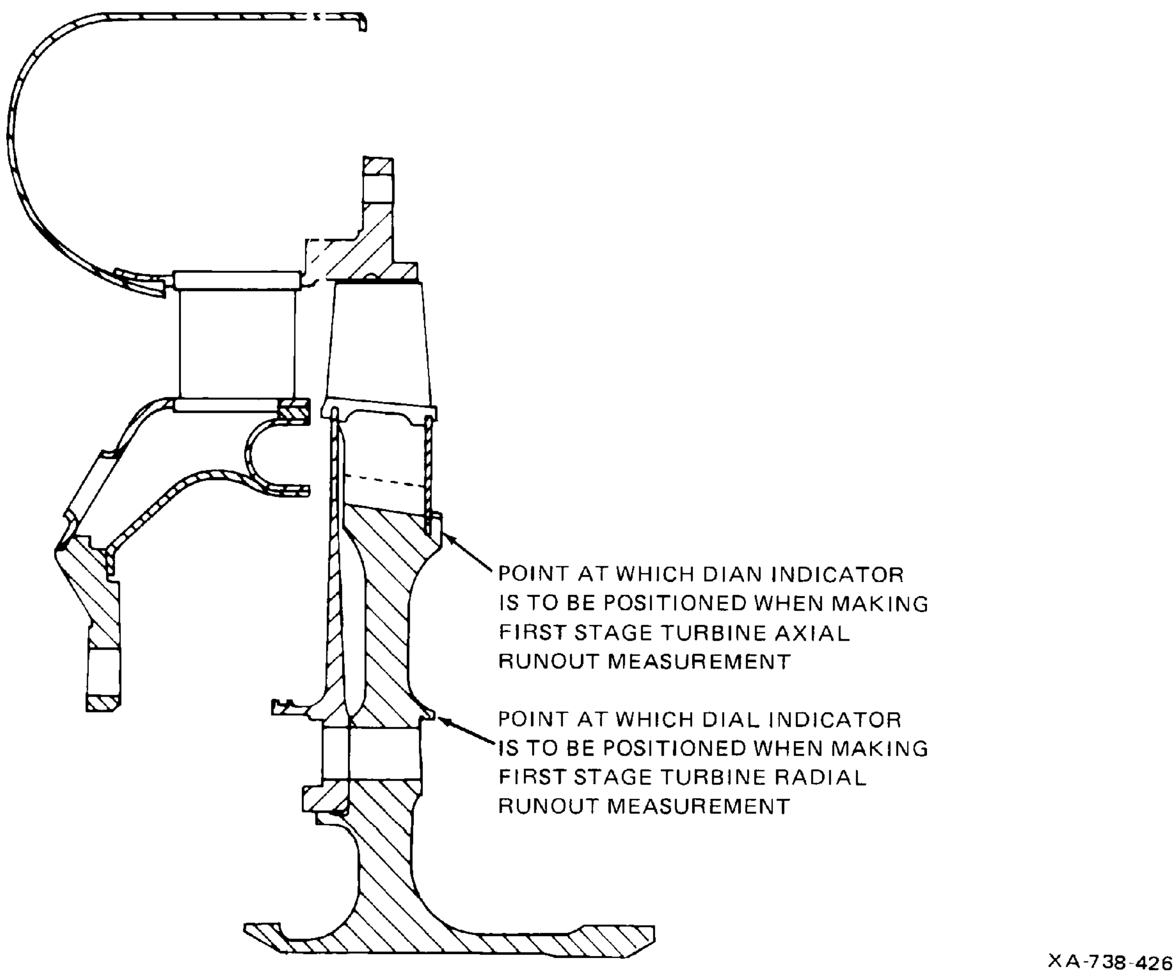
(30) Mount bracket LTCT3955 or LTCT910 on flange of air diffuser.

NOTE: Bracket is used as a base for dial indicator while taking runouts.

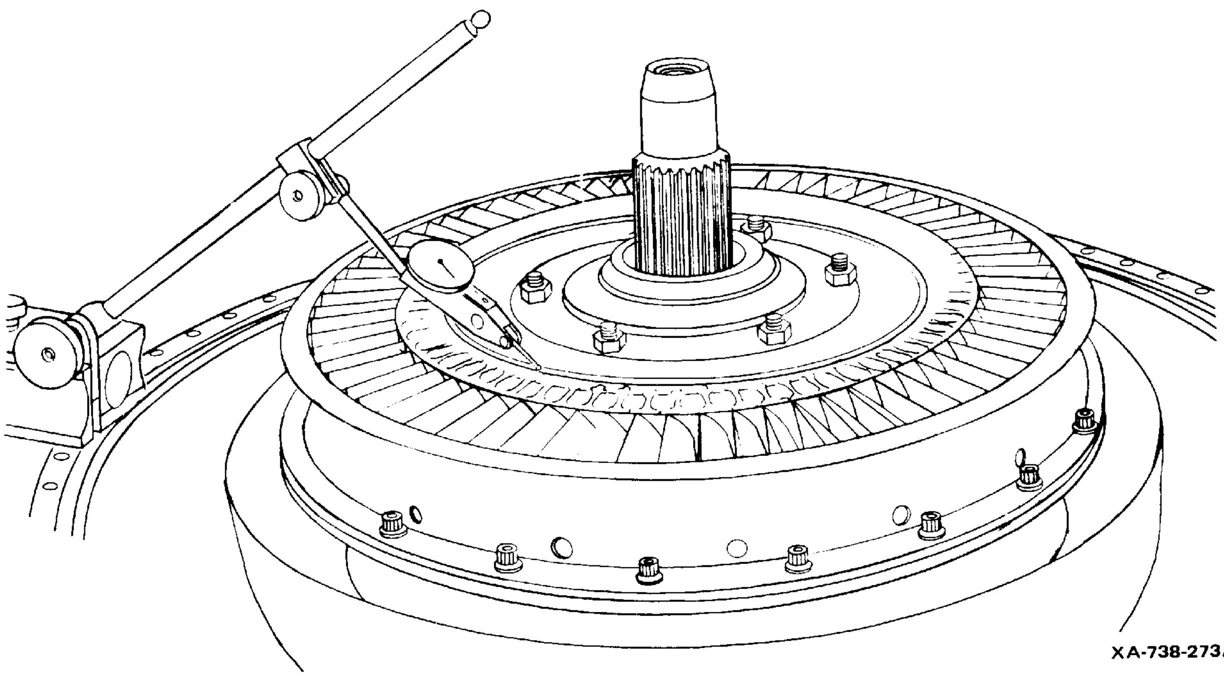
If engine is in a maintenance stand, position engine in approximately 45 degree nose down attitude prior to performing Steps (28) and (29). if engine is installed, push forward on the center of the second gas producer rotor when turning for runout measurement.

(31) Position dial indicator against point just inboard of first stage gas producer turbine blade roots. (See Figure 209.) Rotate gas producer turbine rotor, and record axial runout. Runout shall be within 0.004 inch TIR.

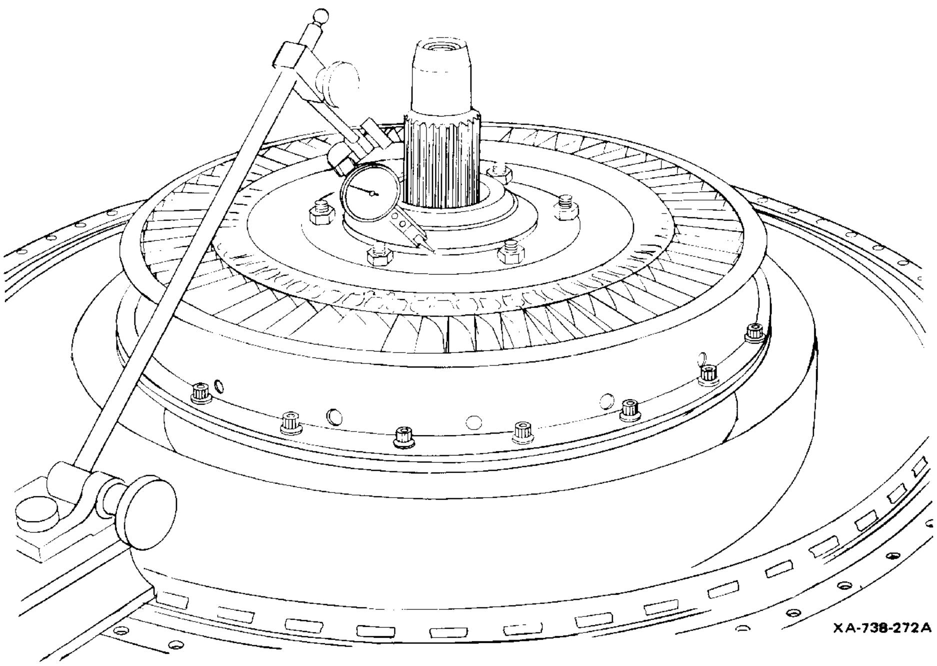
(32) Position dial indicator on rear flange of gas producer turbine rotor. (See Figure 210.) Rotate gas producer turbine rotor, and record radial runout. Runout shall be within 0.003 inch TIR.



First Stage Gas Producer Turbine Rotor Runout Check Dial Indicator Locations
Figure 209



Checking Runout on Second Stage Gas Producer Turbine Rotor
Figure 210 (Sheet 1 of 2)



Checking Runout on Second Stage Gas Producer Turbine Rotor
Figure 210 (Sheet 2)

NOTE: The sum of the runouts in Steps (31) and (32) shall not exceed 0.006 inch TIR.

(33) If runouts are not within limits, remove first stage gas producer rotor, clean cones (29, 52, Figure 201) and reposition rotor 180 degrees from removed position. Repeat preceding Steps (28) and (29). If limits are still exceeded, try 90 degrees or 270 degrees from original position. If limits are still exceeded, replace forward cone (29) and rear cone (52).

(34) Check first stage gas producer turbine rotor for minimum of 0.020 inch tip clearance.

(35) Bend lockring (51) into slots of nut (50) in two places, 180 degrees apart. Do not shear lockring.

(36) Remove bracket LTCT3955 or LTCT910 from air diffuser.

(37) Establish clearance between first stage gas producer turbine rotor and second stage gas producer nozzle as follows:

NOTE: Clearance may be obtained using go-no-go gage.

(a) Place locating bar LTCT153 on disc of gas producer turbine rotor assembly (31, Figure 201).

(b) Using a vernier depth gage, measure from top of locating bar to first stage nozzle cylinder in four locations and record as Dimension A. (See Figure 211.)

(c) Using a vernier depth gage, measure from locating bar to base shroud of highest first stage gas producer blade and record as Dimension B.

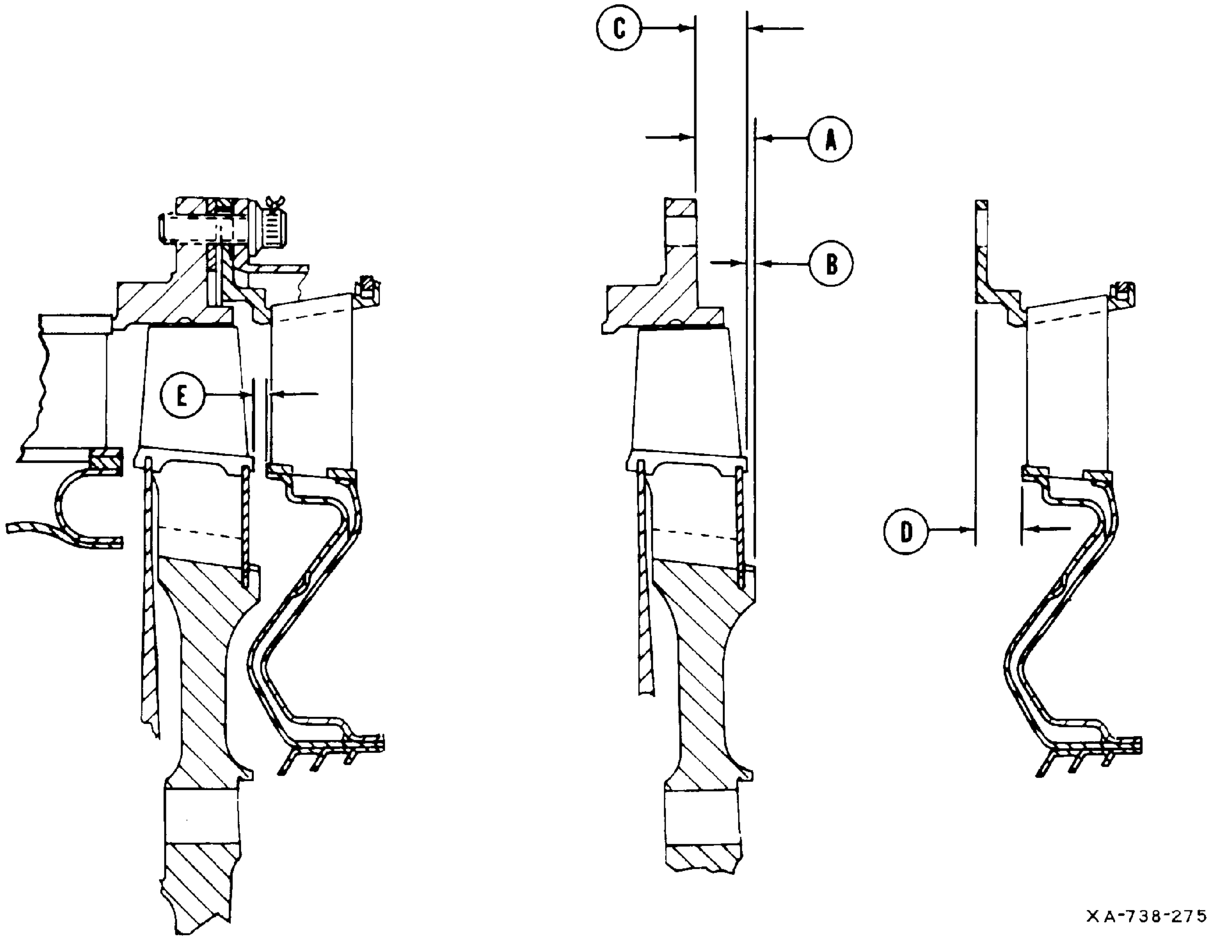
(d) Subtract Dimension B from Dimension A. Result will be Dimension C.

(e) Place second stage gas producer nozzle forward face up on a bench. Place a locating bar across tangs on forward face of nozzle.

(f) Using a vernier depth gage, measure from bar to lip on inner shroud of nozzle in four locations, and subtract thickness of bar (Dimension D) from smallest dimension.

(g) Subtract Dimension C from Dimension D. Result will be Dimension E.

(h) Dimension E must be 0.080 inch minimum to 0.105 inch maximum. If required clearance is not obtained, install spacer (32, Figure 201) as required.



Determining Clearance Between First Stage Gas Producer Turbine Rotor
and Second Stage Gas Producer Nozzle
Figure 211

Table 202. Shim Thickness

Part Number	Thickness
1-120-029-01	0.022 to 0.028 inch
1-120-029-02	0.010 to 0.016 inch
1-120-029-03	0.078 to 0.084 inch

NOTE: When installing sealing ring (40), make sure that pinching or binding does not exist in the sealing ring groove of second stage turbine nozzle.

(38) Install two expansion springs (39) and sealing ring (40) into groove on OD of second stage turbine nozzle.

CAUTION: SPACER 1-120-029-01 OR -03 (32) MUST BE INSTALLED AGAINST THE SECOND STAGE TURBINE NOZZLE FLANGE AT ALL TIMES. ADDITIONAL SPACERS 1-120-029-01/-02/-03 MAY BE INSTALLED AS NECESSARY TO OBTAIN PROPER CLEARANCE. (SEE STEP (53).)

NOTE: A minimum of one spacer 1-120-029-01 or 1-120-029-03 is to be used. Additional spacers 1-120-029-01, 1-120-029-02, or 1-120-029-03 may be used as required, however, spacer 1-120-029-01 or 1-120-029-03 shall always be installed against the second stage gas producer nozzle flange.

(39) Install spacer (32), ring (36), and using ring compressor LTCT4155, install second stage turbine nozzle (37), and second stage producer cylinder (49). Align bolt holes and install pins (48).

CAUTION: DO NOT APPLY LUBRICANT TO UNDERSIDE OF BOLT HEAD, SINCE THIS MAY LEAD TO OVERTORQUING. EXCESSIVE TORQUE MAY CAUSE FRACTURE OF THE BOLTS.

(40) Lubricate threads of new bolts (44) with anti-seize compound (72-00-00, 15, Table 203).

(41) With shims, nozzle, cylinder, alignment pins, and retaining plates in place, install all bolts finger tight.

(42) Tighten all bolts 35 to 40 inch-pounds torque, using standard torque wrench (0 to 50 inch-pounds range) and a 1/4 inch universal socket or wrench extension TMRX-8 (Snap-On Tool Corp, Kenosha, Wisconsin, or equivalent) mounted at 90 degree angle to the torque wrench centerline.

(43) Release torque and turn bolt counterclockwise two full turns.

(44) Using torque wrench (0 to 50 inch-pounds range) rotate clockwise to establish resistance torque of swaged nut.

(45) Tighten bolt an additional 15 to 20 inch-pounds above the resistance torque.

NOTE: If first stage gas producer nozzle incorporates swaged nuts in lieu of tapped holes, lockwiring of the bolt shanks is not required in following step.

(46) Lockwire bolts. The bolt heads shall be double wired with 0.032 inch lockwire in groups of two or three. The shank of bolts MS9705-11 shall be single strand wired with one 360 degree strand of 0.020 inch lockwire.

NOTE: In following step, it is necessary to install four expander springs 1-300-488-01 when seal rings 1-300-351-01 are installed. When seal rings 1-300-487-01 or -02 are installed, expander springs are not required.

(47) Install four expander springs (45) (if required) and two seal rings (46) into grooves on OD of second stage gas producer cylinder.

NOTE: Alignment marks on spacer and first stage gas producer rotor must be aligned.

(48) Position spacer (38) on first stage gas producer turbine bolts.

(49) Rotate gas producer rotor assembly and check for rubbing between second stage turbine nozzle (37) and spacer (38). If rubbing is detected, rework nozzle, using half round file to obtain 0.010 inch clearance.

CAUTION: MAKE SURE THAT FORWARD FACE OF ROTOR IS TOWARDS FRONT OF ENGINE.

(50) Position second stage gas producer turbine rotor (41) on spacer (38). Align all matchmarks.

(51) Lubricate threads of bolts (30) with anti-seize compound (72-00-00, 15, Table 203).

CAUTION: WHEN INSTALLING NUTS (43) IN FOLLOWING STEP, MAKE SURE THAT ONLY NONMAGNETIC 0.200 INCH THICK NUTS 1-100-293-01 ARE USED.

NOTE: Cap screws (4-40 x 3/4 inch long) may be installed in bolts (30) to facilitate alignment and installation of nut (43) while securing second stage gas producer turbine rotor (41).

Nuts (43) have a machined washer surface. This surface must be positioned towards the rotor assembly.

Do not bend tabwashers at this time.

(52) Secure rotor with tabwashers (42) and nuts (43). Engage tangs of face spanner socket wrench LTCT13456 (detail of LTCT13175) with nut (50) to prevent compressor rotor shaft from turning. Tighten nuts evenly to 170 to 180 inch-pounds torque.

(53) Using 0.050 inch wire gage, check clearance between second stage turbine nozzle and the second stage gas producer turbine rotor. Clearance must be within 0.120 inch minimum to 0.190 inch maximum. If desired clearance is not obtained, select spacer (32) as required to obtain clearance. (See Table 202.)

NOTE: If engine is in maintenance stand, position engine in approximately 45 degree nose down attitude prior to performing Steps (54) and (55).

(54) Position dial indicator against point just inboard of second stage gas producer turbine blade roots. (See Figure 208, Sheet 1.) Rotate gas producer turbine rotor, and record runout. Runout shall be within 0.004 inch TIR.

(55) Position dial indicator on step, inboard of bolt circle. (See Figure 208, Sheet 2.) Rotate gas producer turbine rotor, and record runout. Runout shall be within 0.003 inch TIR.

NOTE: The sum of runouts in Steps (54) and (55) shall not exceed 0.006 inch TIR.

(56) If runouts are not within limits, loosen then retighten nuts (43, Figure 201). Bend tangs of tab washers against flats of nuts.

(57) Check second stage gas producer rotor for minimum of 0.020 inch tip clearance.

(58) Establish clearance between first stage gas producer nozzle and rotor. (See Step (17).)

(59) Establish clearance between first stage gas producer turbine rotor and second stage gas producer nozzle. (See Step (37).)

TEMPORARY REVISION NO. 89

INSERT PAGE 2 OF 3 FACING 72-51-01, PAGE 201.

Reason: To add Paragraph 1.A.(8).

Paragraph 1.A.(8) is changed as follows:

(8) Inspect cylinder grooves for fretting. Wear is acceptable provided groove width does not exceed 0.150 inch (See Figure 201) and all raised metal is blended smooth (Refer to SPM, 70-25-01, SP R401).

See TR

SECOND STAGE GAS PRODUCER TURBINE ROTOR ASSEMBLY, SPACER. CYLINDER, AND NOZZLE ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

A. Inspect Second Stage Gas Producer Cylinder (See 72-51-00, 49, Figure 201.)

NOTE: Conduct visual inspection of second stage gas producer rotor, using a seven power magnifying glass.

(1) Visually inspect for cracks using a seven power magnifying glass. If cracks are evident, replace cylinder.

(2) Dye penetrant inspect. (See SPM, SP I304, 70-20-04.)

(3) Inspect ID of cylinder for nicks or dents. Blend repair. (See SPM, SP R401, 70-25-01.)

(4) Inspect cylinder for loss of dry film lubricant coatings. (See 350.3, Overhaul Manual.)

(5) Inspect 12.428 to 12.430 inch diameter of cylinder for grooving. (See Figure 201.) If grooving does not exceed 0.005 inch depth, cylinder is acceptable. Replace if limits are exceeded.

(6) Inspect 12.194 to 12.208 inch diameter at aft edge of cylinder for chipping. Chipping defects within 0.125 inch of aft edge of cylinder are acceptable. Replace if chipping is not within limits.

(7) Inspect cylinder for stripped, crossed, or damaged threads. Replace if damage is evident.

B. Inspect Second Stage Turbine Nozzle (See 72-51-00, 37, Figure 201.)

(1) Inspect second stage gas producer nozzle 1-120-000-06 assembly for cracks, dents, nicks, burns, and burrs. (See Figure 202.)

(a) Any number of 1/8 inch cracks are acceptable on trailing edge of all vanes.

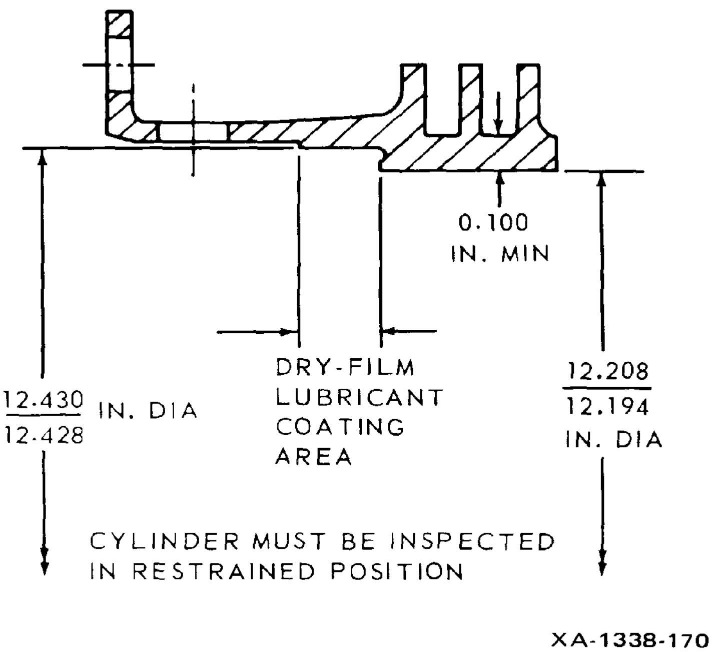
(b) Any number of 1/16 inch cracks are acceptable on leading edge of all vanes. Any number of 1/8 inch cracks are acceptable on leading edge of a maximum of 15 vanes.

(c) Cracks in vane to inner and outer shroud brazements not over 5/8 inch cumulative length per vane are acceptable on all vanes.

(d) Axial cracks in parent metal of outer shroud emanating from vane leading edges that do not exceed 5/16 inch in length are acceptable on a maximum of 10 vanes. Axial cracks in parent metal of outer shroud emanating from vane leading edge that do not exceed 3/16 inch in length are acceptable on a maximum of 30 vanes. Converging cracks that could cause material fallout are not permitted. Circumferential cracking is not acceptable.

(e) Axial cracks in parent metal of outer shroud emanating from vane trailing edge into seal ring are acceptable on two vanes provided there is a minimum of 20 vane separation.

See TR



Second Stage Gas Producer Cylinder Diameter Limits
Figure 201

(f) Cracks through inner shroud, extending a maximum of 1.5 inches in length into forward and aft support, are acceptable on the same vane provided no more than four vanes are affected and a minimum of five unaffected vanes separate the defects. Circumferential cracks are not allowed.

(g) Cracks are not allowed on nozzle tangs.

(h) Axial vane to vane cracks are acceptable on a vane with a 10 vane separation.

(i) A maximum of three nicks or dents are allowed on vane leading edge provided that after blend repair depth of any defect does not exceed 1/16 inch and length does not exceed 3/32 inch. Separation of defects shall be at least twice the length of the shortest defect after blend repair. Smooth dents within limits are acceptable without blend repair.

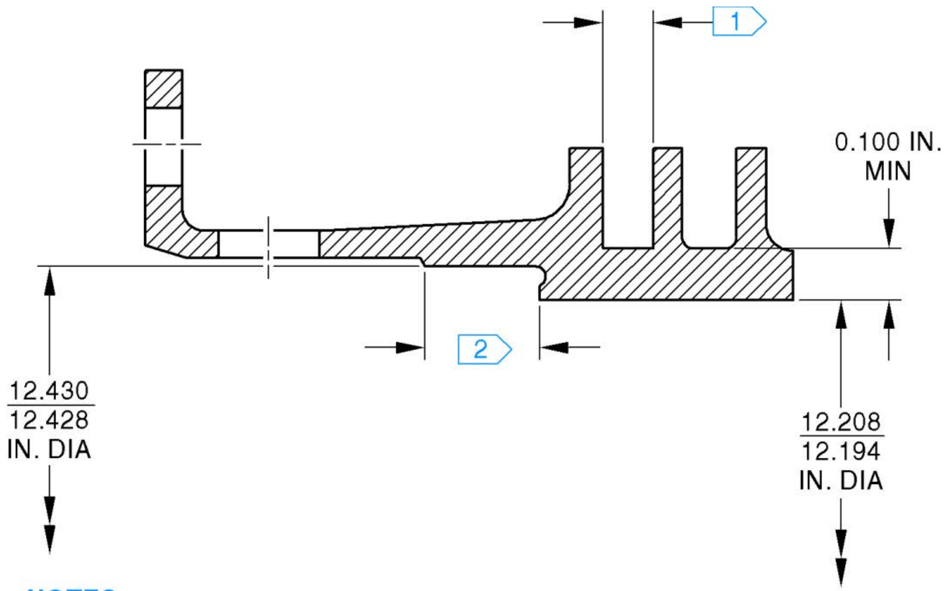
(j) A maximum of three nicks or dents are allowed on vane trailing edge provided that after blend repair depth of any defect does not exceed 3/32 inch and length does not exceed 3/16 inch. (See Figure 203.) Separation of defects shall be at least twice the length of the shortest defect after blend repair. Smooth dents within limits are acceptable without blend repair.

TEMPORARY REVISION NO. 89

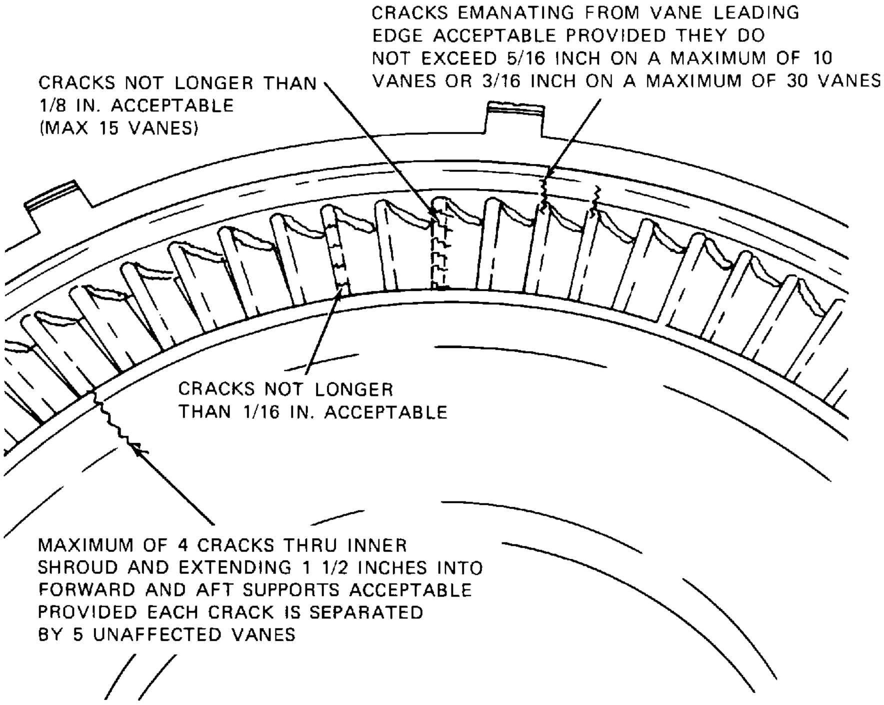
INSERT PAGE 3 OF 3 FACING 72-51-01, PAGE 202.

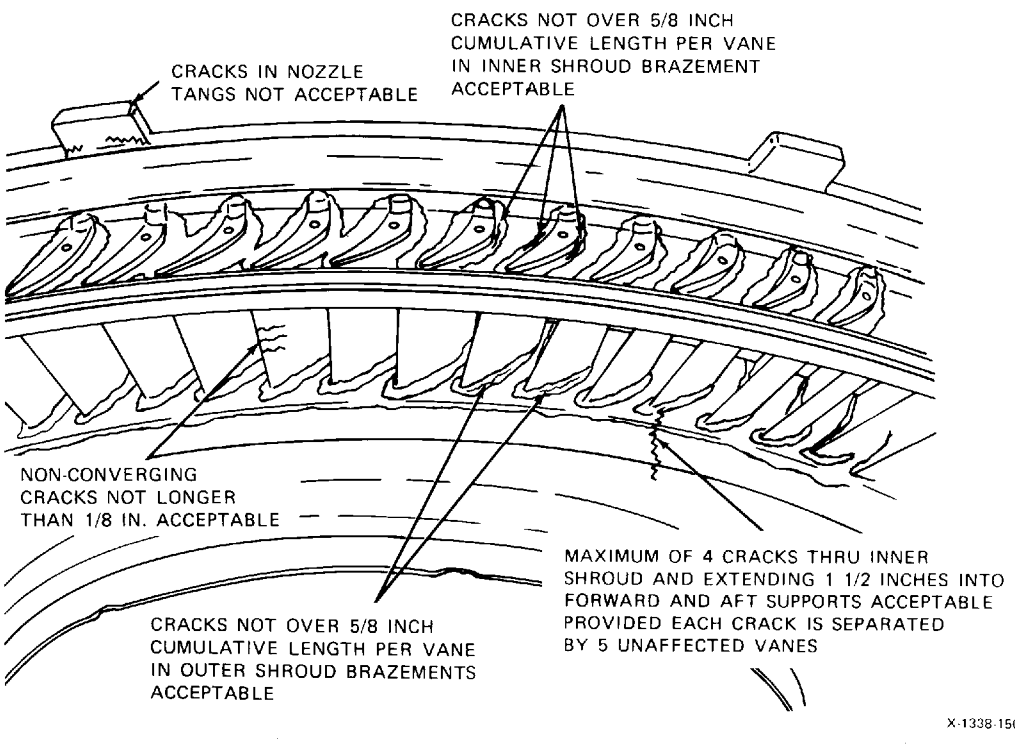
Reason: To change dimensions in Figure 201.

Figure 201 is changed as follows:

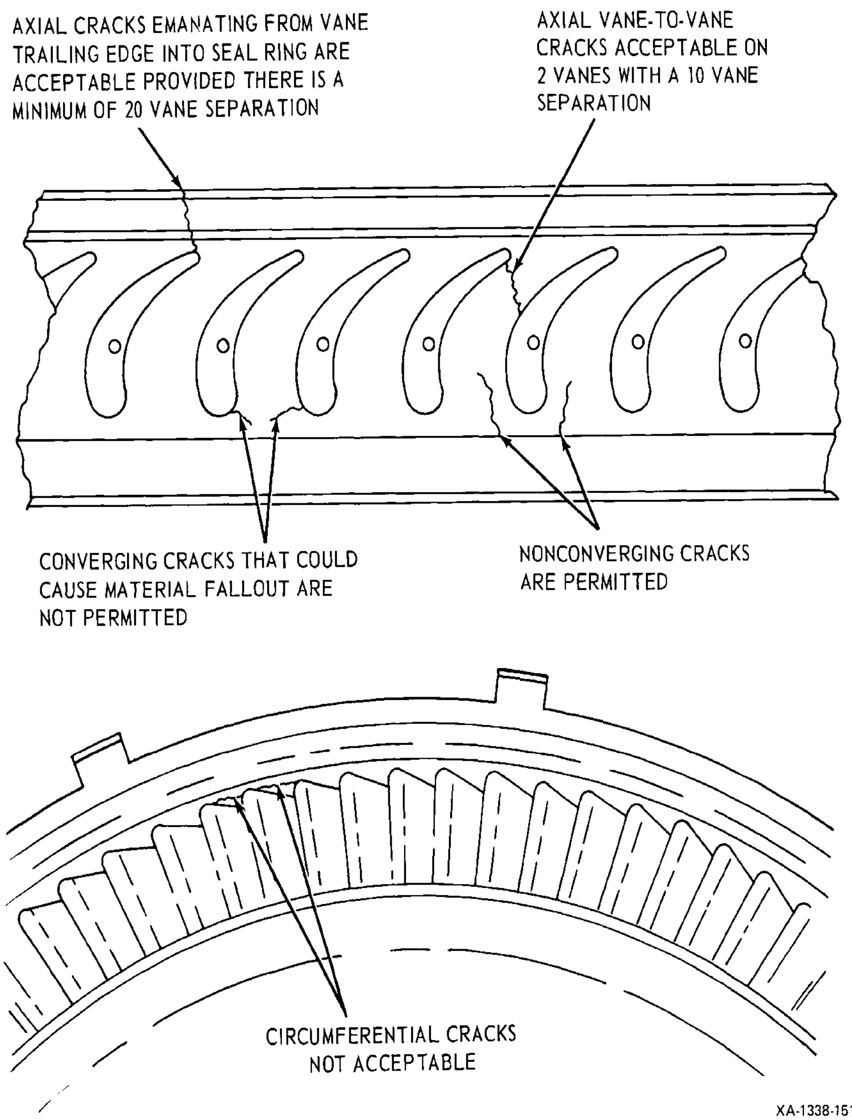


NOTES:
1. Max groove width 0.150 inch (2 places).
2. Dry-film lubricant coating area.
3. Cylinder must be inspected in restrained position.





Second Stage Gas Producer Nozzle Repair Limits
Figure 202 (Sheet 1 of 2)



Second Stage Gas Producer Nozzle Repair Limits
Figure 202 (Sheet 2)

(k) Nicks and dents on vane airfoil surfaces are acceptable on all vanes after blend repair.

NOTE: Replace nozzle if limits specified in above Step (i), (j), and (k) are exceeded.

(l) Burns on leading edge 1/16 inch in length by 3/8 inch in width on maximum of 10 vanes are allowed.

(m) Burns on trailing edge 1/8 inch in length by 1/4 inch in width on maximum of 10 vanes are allowed.

(n) Burrs are acceptable on vane leading and trailing edges after blend repair.

(2) Inspect inner shroud for axial rubs. No rubs are allowed. Replace nozzle.

(3) Inspect tang areas for bending and mutilation.

(a) Tangs that are bent slightly (5 degrees or less) are acceptable provided they are cold straightened. After straightening, inspect area for cracks using dye penetrant method. No cracks are allowed.

(b) Tangs that are nicked, burred, or whose edges show a rolled over effect, may be blend repaired. Cracked or severely mutilated tangs are not acceptable.

NOTE: Replace nozzle assembly if limits in Steps (a) and (b) above are exceeded.

(4) Inspect second stage gas producer nozzle (1-120-000-14) for cracks, nicks, burrs, burning, and spalling.

(a) The leading and trailing edges of the nozzle assembly may exhibit areas which have been blend repaired by the manufacturer. (See Figure 204.) These blend repairs have no significant effect on engine operation. Inspection limits as specified in Steps 1 through 3 below shall be applied only to the manufacturer’s repairs. The manufacturer’s repaired areas are coated subsequent to blending and are acceptable within the following limits.

1 A maximum of three missing parent material areas are permitted on one vane.

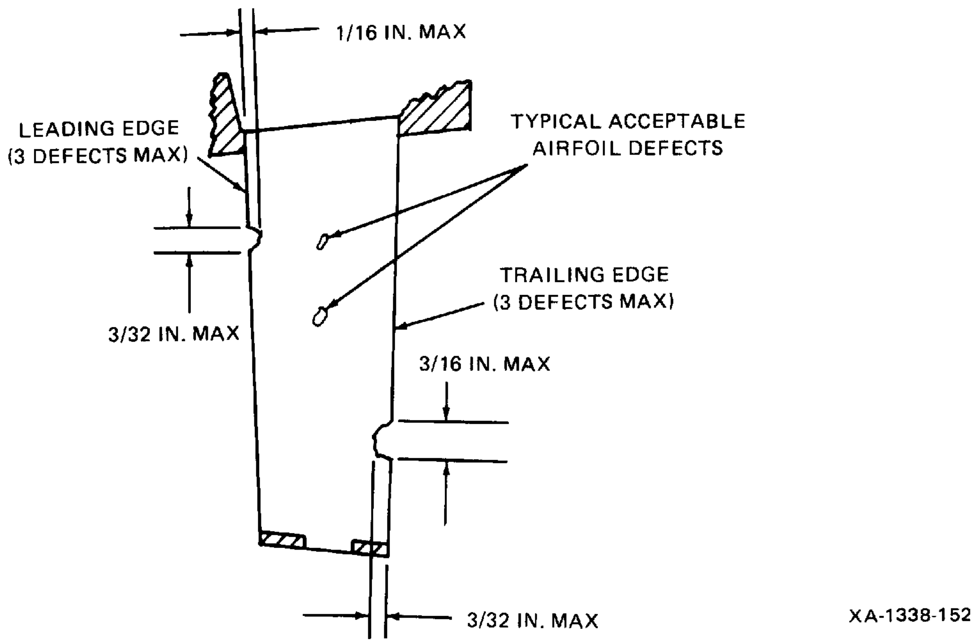
2 No more than 10 missing parent material areas on a nozzle assembly are acceptable.

3 Depth of missing parent material shall not exceed 1/16 inch on leading edge and 7/32 inch on trailing edge as measured from the unaffected portion. Blended areas shall be at least twice as long as the depth.

(b) Any number of 1/8 inch cracks are acceptable on trailing edge of all vanes.

NOTE: Do not measure cracks from any portion of manufacturer’s blend repair. When cracks occur in this area, use vane leading or trailing edge as a reference point.

(c) Any number of 1/16 inch cracks are acceptable on leading edge of all vanes. Any number of 1/8 inch cracks are acceptable on leading edge of a maximum of 15 vanes.



Second Stage Gas Producer Nozzle Repair Limits
Figure 203

(d) Nick and burr damage (FOD) limits are same as for nozzle 1-120-000-06, except that any blending shall be limited to removal of sharp surface projection.

(e) Burn limits are same as for nozzle 1-120-000-06. (See Paragraph 1.B(1)(m).)

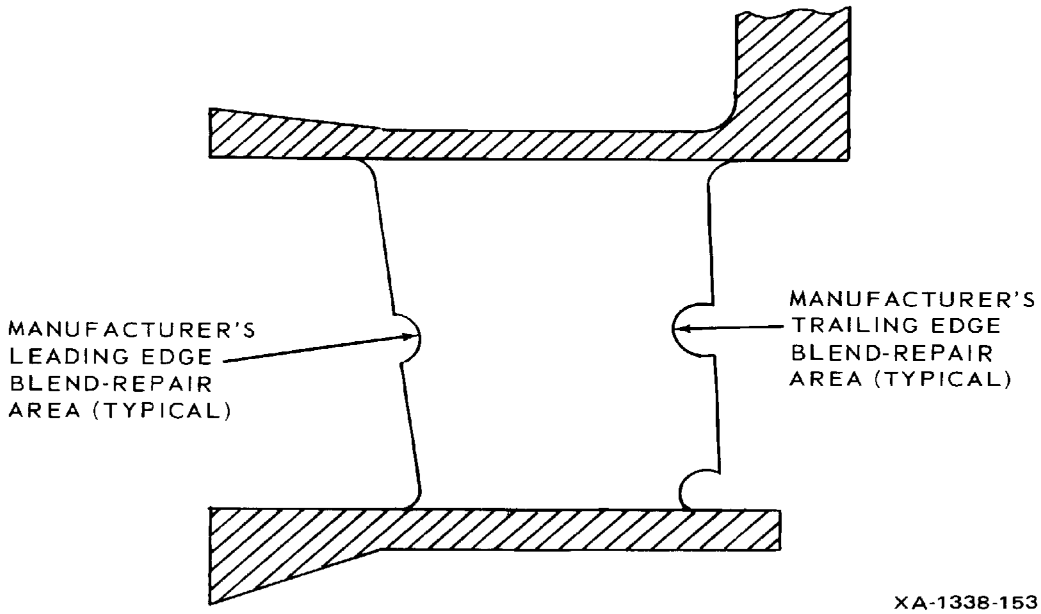
NOTE: Do not include manufacturer's blend repair in measurement of burned area.

(f) Any amount of vane spalling (loss of surface coating) on all vanes is acceptable.

(g) Inspect nozzle outer shroud for cracking. (See Figure 205.)

1 Any number of axial cracks originating at vane leading edge areas and progressing to edge of shroud are acceptable. Ten of these cracks are allowed to continue radially up to forward face to flange radius.

2 Any number of cracks at vane trailing edge and into shroud areas are acceptable up to 1/8 inch in length.



Second Stage Gas Producer Nozzle Repair Limits
Figure 204

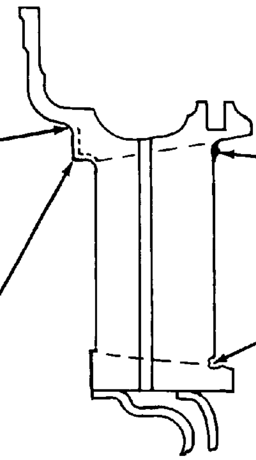
3 Circumferential, converging, and vane to vane cracking is not allowed. Cracks in outer shroud locations, other than those noted in Steps 1 and 2, are not acceptable.

(h) Inspect nozzle tangs for cracks, bending, and mutilation. The limits are same as for nozzle 1-120-000-06. (See Paragraph 1.B(3).)

(i) Inspect inner shroud for cracking, any number of cracks up to 1/8 inch at vane trailing edge and into shroud radius areas are acceptable. No cracking is allowed in other areas of inner shroud.

(j) Inspect inner shroud for axial rubs, axial rubs are not allowed.

(k) Replace nozzle if limits are exceeded.



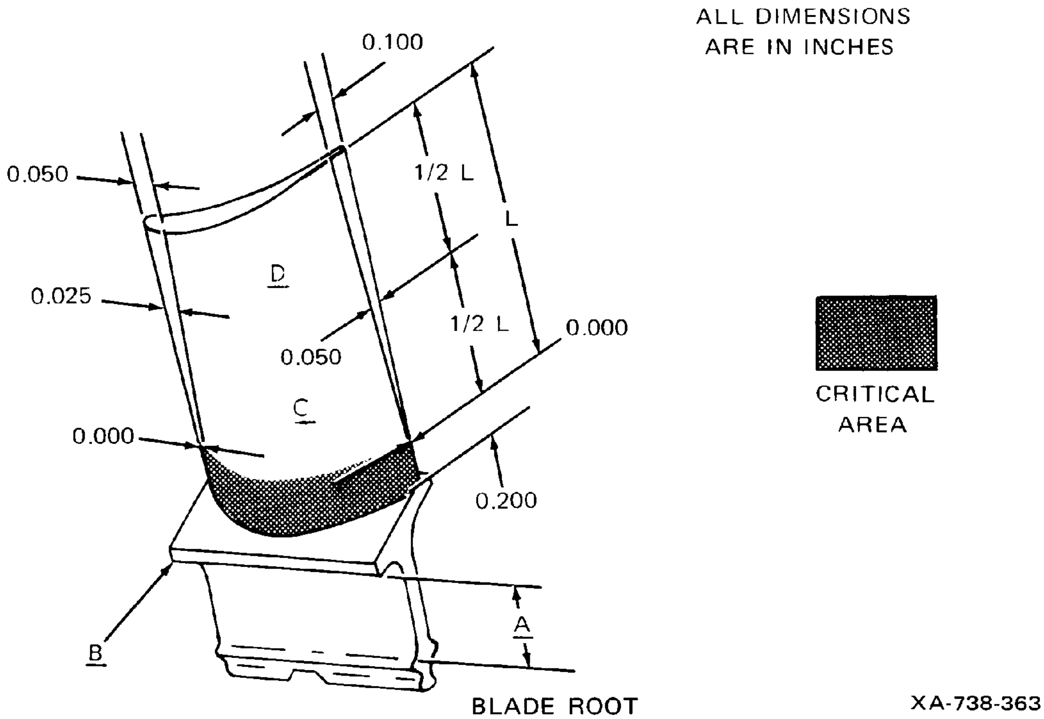
Second Stage Gas Producer Nozzle (1-120-000-14) Inner and Outer Shroud Repair Limits
Figure 205

NOTE: Individually inspect each support with respect to crack separation. Replace nozzle assembly if following limits are exceeded.

(l) Inspect forward and aft supports for radial cracks emanating from the support to inner shroud functions. A maximum of four cracks are acceptable in both supports provided the length does not exceed 3/4 inch, and a minimum of five vanes separate defects. Circumferential cracks are not allowed.

(5) Deleted

Figure 206 Deleted



Second Stage Gas Producer Rotor Assembly Blade Repair Areas
Figure 207

C. Inspect Second Stage Gas Producer Rotor (See 72-51-00, 41, Figure 201.)

NOTE: Conduct visual inspection of second stage gas producer rotor using a seven power magnifying glass

(1) Inspect blades for nicks and dents. Only 20 percent of the blades may have damage to the limits given. Blade replacement is required if limits are exceeded. (See Figure 207.)

(a) Inspect critical area.

1 Smooth dents and nicks not exceeding 0.030 inch on longest side and 0.010 inch deep are acceptable without rework. Damage in excess of these limits is cause for blade replacement. No repair allowed.

(b) Inspect Areas A and B.

Smooth dents and nicks not exceeding 0.190 inch on longest side and 0.015 inch deep are acceptable without rework.

(c) Inspect Area C.

1 Leading edge: Dents and nicks in an area tapering chordwise from 0.000 inch at the critical area to 0.025 inch at the outboard extremity of Area C are acceptable with repair.

2 Trailing edge: Dents and nicks in an area tapering chordwise from 0.000 inch at the critical area to 0.050 inch at the outboard extremity of Area C are acceptable with repair.

3 Sides: Dents or nicks not exceeding 0.300 inch on the longest side and 0.015 inch deep after repair are acceptable provided the original material thickness is not reduced by more than 20 percent.

(d) Inspect Area D.

1 Leading edge: Dents and nicks in an area tapering chordwide from 0.025 inch at blade tip are acceptable with repair.

2 Trailing edge: Nicks and dents in an area tapering chordwide from 0.050 inch at Area C to 0.100 inch at blade tip are acceptable with repair.

3 Blade tips: Dents and nicks not exceeding 0.250 inch on longest side and 0.125 inch from the top are acceptable after repair. Blade tip deformation up to 0.050 inch displacement and 0.100 inch in chordal width and/or radial length is permissible.

4 Sides: Dents and nicks not exceeding 0.300 inch on the longest side and 0.015 inch deep are acceptable after repair provided the original material thickness is not reduced by more than 20 percent. No more than four dents or nicks on either the convex or concave sides, which require blending, are allowable.

NOTE: In following steps, if blades are damaged beyond limits, ship rotor to overhaul facility for blade replacement.

Burning is indicated by melting or loss of metal. Evidence of burning usually denotes that other damage exists to the assembly.

(2) Inspect blades for burning, bending, or distortion. None allowed.

(3) Inspect all turbine rotor blades and disc for cracks. Cracks are not allowed.

(4) Inspect all turbine rotor blades for tip rubs. Tip rubs shall not exceed 0.030 inch in depth. Indications of tip are acceptable provided tip clearance can be obtained at assembly.

(5) Inspect spacer for evidence of scoring. Scoring shall not exceed 0.005 inch in depth.

(6) Inspect spacer for cracks or distortion. Cracks or distortion are not allowed.

(7) Inspect rubs on forward and aft face of disc. Rubs 0.006 inch deep by 0.100 inch wide are allowed provided no indications of extreme heat exists.

(8) Inspect disc for fretting in spacer contact area. Fretting is acceptable up to 0.005 inch deep.

(9) Inspect aft side of rotor disc for blades recessed below disc. If one or more blades are recessed more than 0.025 inch, remove rotor and reseat blades.

D. Inspect Spacer (See 72-51-00, 38, Figure 201.)

(1) Inspect spacer for evidence of scoring. Scoring shall not exceed 0.005 inch in depth. If limits are exceeded replace.

(2) Inspect spacer for cracks or distortion. Cracks or distortion are not allowed.

E. Deleted

2. Cleaning/Painting

Clean second stage gas producer turbine rotor assembly, spacer, cylinder, and nozzle using dry cleaning solvent (72-00-00, 62, Table 203).

3. Approved Repairs

A. Repair second stage gas producer cylinder and second stage nozzle, replace second cylinder or nozzle if inspection limits are exceeded.

B. Repair Second Stage Gas Producer Turbine Rotor Assembly

(1) Replace turbine rotor assembly if blades or disc are cracked or distorted.

(2) Replace spacer if cracked, distorted, or if scoring exceeds a depth of 0.005 inch.

(3) Repair second stage gas producer rotor assembly blades.

(a) Observe the following rules during second stage gas producer rotor assembly blade repair.

1 Only small diesinker type or India or carborundum stone may be used for blend repair.

2 Finish strokes shall be parallel to leading and trailing edges of blades.

3 Final polishing of area shall be made with crocus cloth (72-00-00, 13, Table 203). All repairs should be blended smoothly.

4 Leading or trailing edge repairs shall be blended to smooth radius as part of repair. (See Figure 208.)

5 Finish repair of length shall be blended to minimum of three times depth of damage.

(b) Repair nicks and dents on second stage gas producer rotor blades as follows:

CAUTION: ONLY 20 PERCENT OF THE BLADES MAY HAVE DAMAGE TO THE LIMITS GIVEN. IF BLADES ARE DAMAGED BEYOND LIMITS, FORWARD ROTOR TO OVERHAUL FACILITY FOR BLADE REPLACEMENT AND BALANCING.

1 Inspect critical area. (See Figure 207.)

a No repair allowed.

b Smooth nicks and dents not exceeding 0.030 inch on the longest side and 0.010 inch deep are acceptable without rework. Any damage in excess of these limits is cause for blade replacement.

2 Inspect Area A and B.

a Smooth nicks or dents not exceeding 0.190 inch on the longest side and 0.015 inch deep are acceptable without repair.

b Rework of nicks and dents shall be confined to smoothing and blending of damage not exceeding 0.190 inch on the longest side and 0.015 inch deep after repair.

3 Inspect Area C.

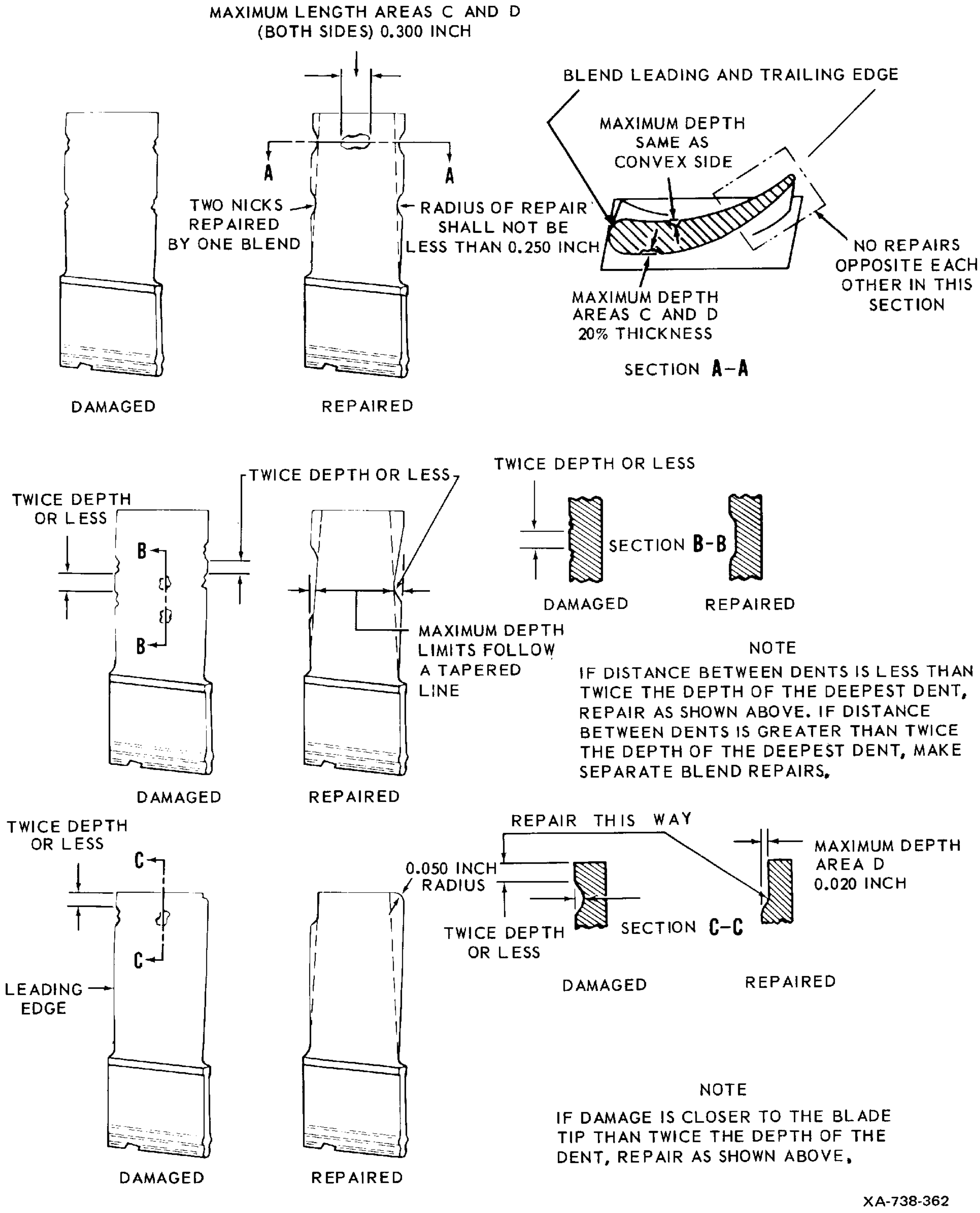
a On leading edge, nicks or dents in an area tapering chordwise from 0.000 inch at the critical area to 0.025 inch at the outboard extremity of Area C may be repaired. Depth of allowable blend repairs shall be 0.000 inch at critical area, gradually increasing to 0.012 inch at midpoint and 0.025 inch at the extremity of Area C, with a maximum of 0.100 inch in length. No more than two repair blends per edge area allowable in any one area. (See Figure 208.)

b On trailing edge, nicks or dents in an area tapering chordwise from 0.000 inch at the critical area to 0.050 inch at the outboard extremity of Area C may be repaired. Depth of allowable blend repairs shall be 0.000 inch at critical area, gradually increasing to 0.025 inch at midpoint and 0.050 inch at the extremity of Area C, with a maximum of 0.200 inch in length. No more than two repair blends per edge area allowable in any one area.

c On blade side, nicks or dents not exceeding 0.300 inch on the longest side and 0.015 inch deep after repair are acceptable, provided the original material thickness is not reduced by more than 20 percent.

4 Inspect Area D. (See Figure 207.)

a On leading edge, nicks or dents in an area tapering chordwise from 0.025 inch at Area C to 0.050 inch at the blade tip may be repaired. Depth of allowable blend repairs shall proportionally be 0.025 inch at Area C, gradually increasing to 0.037 inch at the midpoint and 0.050 inch at the tip, with a maximum length of 0.375 inch. No more than two blend repairs are allowable in any one area.



Second Stage Gas Producer Rotor Assembly Blade Repair
Figure 208

b On trailing edge, nicks or dents in an area tapering chordwise from 0.050 inch at Area C to 0.100 inch at the blade tip may be repaired. Depth of allowable blend repairs shall proportionally be 0.050 inch at Area C, gradually increasing to 0.075 inch at the midpoint and 0.100 inch at the tip, with a maximum length of 0.375 inch. No more than two blend repairs are allowable in any one area.

c On blade tips, nicks or dents not exceeding 0.250 inch, on the longest side and 0.125 inch from the top are acceptable. No more than two repairs blends per tip surface (blend repair on both sides of blade at tip surface counts as two blends). Blade tip deformation up to 0.050 inch displacement and 0.100 inch in chordal width and/or radial length is permissible.

d On blade sides, nicks or dents not exceeding 0.300 inch on the longest side and 0.015 inch deep after repair are acceptable provided the original material thickness is not reduced by more than 20 percent. No more than four dents or nicks on either the concave or convex sides, which require blending, are allowable.

(4) If blades are damaged beyond limits, forward rotor to overhaul for blade replacement and balancing.

(5) Reseat blades recessed more than 0.025 inch below aft face of disc as follows:

NOTE: No. 1 blade is first blade counterclockwise from balancing “0” mark on forward face of disc.

(a) Locate and mark No. 1 blade on both sides using silver marking pencil (72-00-00, 59A, Table 203).

(b) Place rotor, forward face up, in staking fixture assembly LTCT2072.

(c) Starting with No. 1 blade, tap all blades flush with aft face of disc using a hammer and a suitable drift from punch and drift kit LTCT552.

CAUTION: MAKE SURE THAT TOOL DOES NOT CONTACT DISC OR BLADES DURING DRIVING OPERATION.

NOTE: Make sure that blade being tapped is not positioned over slot in fixture assembly.

(d) Using a hammer and a drive punch, redrive all pins.

FIRST STAGE GAS PRODUCER TURBINE ROTOR ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: Conduct visual inspection of first stage gas producer turbine rotor using a seven power magnifying glass.

A. Inspect turbine rotor blades for nicks and dents. Nicks up to 0.010 inch in depth are acceptable. Dents are acceptable if blade is not distorted.

B. Turbine rotor blades and disc for cracks. Cracks are not allowed.

C. Inspect turbine rotor blades for tip rub. Tip rubs not exceeding 0.030 inch in depth are acceptable. Indications of tip rub are acceptable provided tip clearance can be obtained at assembly.

D. Inspect rubs on forward and aft face of disc. Rubs 0.006 inch deep by 0.100 inch wide are allowed provided no indications of extreme heat are evident.

E. Inspect disc for evidence of fretting. Fretting in spacer contact area up to 0.005 inch deep is acceptable.

F. If blades are damaged beyond limits, ship rotor to overhaul facility for blade replacement.

2. Cleaning/Painting

Clean first stage gas producer turbine rotor assembly (72-51-00, 31, Figure 201 and 26, Figure 210) using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

A. Replace turbine rotor assembly if disc is cracked or damaged beyond limits.

NOTE: If both first and second stage gas producer turbine rotors are to be replaced, new rotors shall be initially installed with the yellow H markings, if present, which denote the heavy balance points 180 degrees apart.

B. If blades are damaged beyond limits, forward rotor to overhaul for blade replacement and balancing.

AFT OIL RING, SEALING RING, FORWARD AND REAR CONES - MAINTENANCE PRACTICES

1. Inspection/Check

   Inspect Oil Ring, Sealing Ring, Forward Cone, and Rear Cone (See 72-51-00, 23, 27, 29, 52, Figure 201.)

   A. Inspect oil ring and sealing ring for nicks, burrs, or loss of plating.

   B. Inspect sealing ring for cracks, warpage, or out of round.

   C. Inspect cones for nicks, burrs, and excessive wear.

2. Cleaning/Painting

   Clean oil ring (23), sealing ring (27), forward cone (29), and rear cone (52) using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

   Repair Oil Ring, Sealing Ring, Forward Cone, and Rear Cone (See 72-51-00, 23, 27, 29, 52, Figure 201.)

   A. Blend repair nicks and burrs on oil ring. (See SPM, SP R401, 70-25-01.)

   B. Replace oil ring if plating is damaged.

   C. Replace sealing ring if cracks, warpage, or out of round is noted.

   D. Blend repair nicks and burrs on cones. (See SPM, SP R401, 70-25-01.) Replace if worn.

FIRST STAGE GAS PRODUCER NOZZLE ASSEMBLY - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: Inspections in following Steps A through K are for the first stage gas producer (cast coated) nozzle 1-110-520-19. Inspections in Steps L through O are for first stage gas producer (cast coated) nozzle 1-110-710-06.

The trailing edge areas of the nozzle vanes have been blend repaired by the manufacturer. (See Figure 201.) Blend repairs are finished so as to allow no sharp edges in rework area, nozzle coating is applied after blending. Up to three blend repair areas on any one vane may be evident. These blends are on all new nozzles. Inspection limits, as specified in Steps B through K below, shall be applied only to those defects caused by engine operation.

A. Inspect Trailing Edge of Vanes for Defects

(1) Do not apply burned area limits to the factory blend repair areas described above. Treat them separately. All factory blends are acceptable.

(2) Crack length limits shall remain as specified in following Steps B through K, and be measured using vane trailing edge as a reference point. Do not measure cracks from any portion of the factory blend areas.

(3) Vane spalling limits (loss of surface coating) shall remain as indicated. Only new nozzles are required to have factory blend areas covered with coating as indicated above.

B. Inspect trailing edge of vanes for cracks and burns. (See Figure 202.)

(1) Trailing edge cracks that progress diagonally to or from the outer shroud are acceptable on all vanes.

CAUTION: CONVERGING CRACKS WHICH CREATE THE POSSIBILITY OF MATERIAL FALLOUT ARE NOT ACCEPTABLE. IF CRACKS APPEAR TO BE RADIATING TOWARDS ONE ANOTHER, NOZZLE SHOULD BE REJECTED. THE MINIMUM DISTANCE ALLOWED BETWEEN CONVERGING CRACKS IS 1/4 INCH.

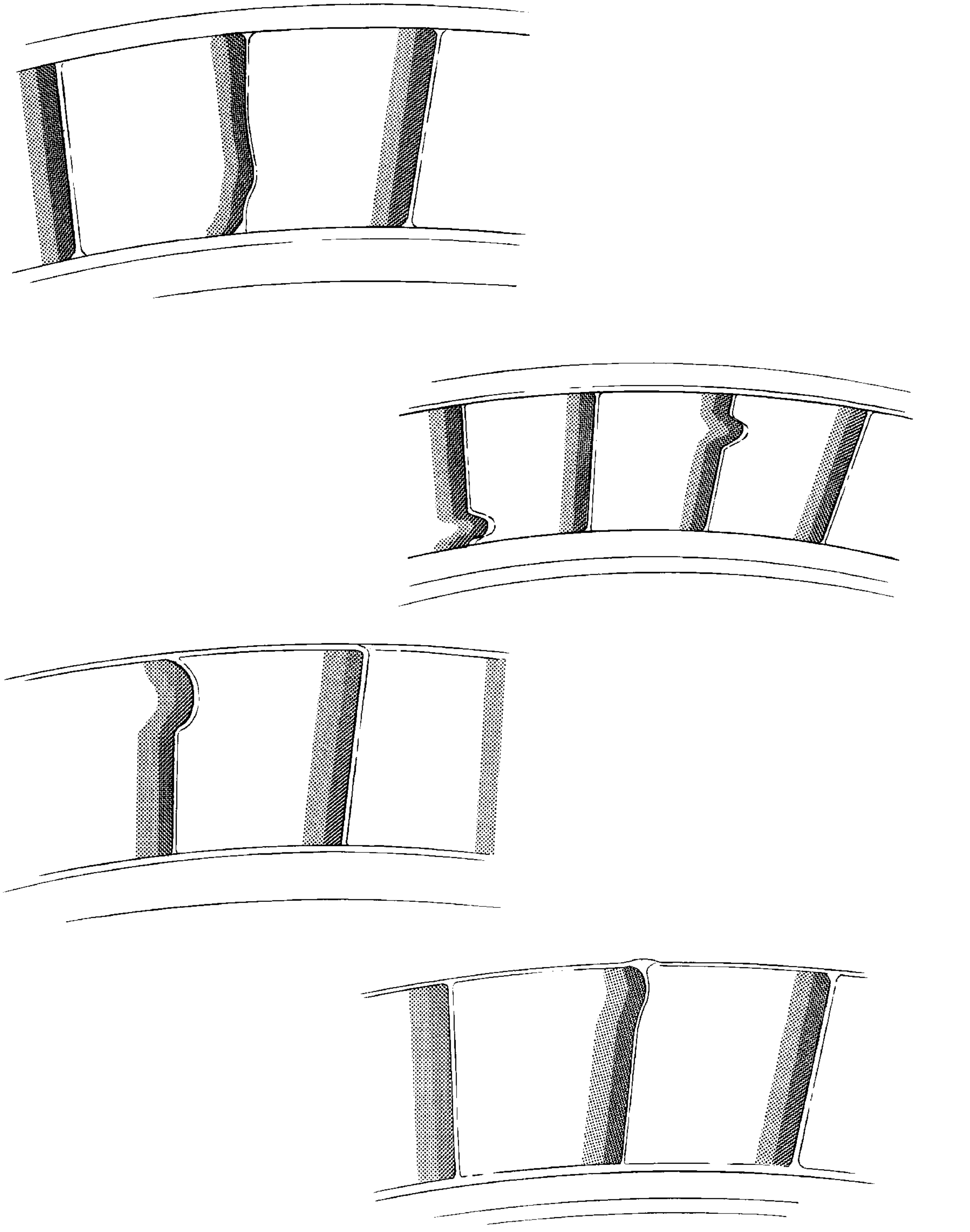
(2) Any number of cracks are acceptable on each vane up to 1/4 inch in length.

NOTE: Cracks progressing to vane cooling holes are acceptable.

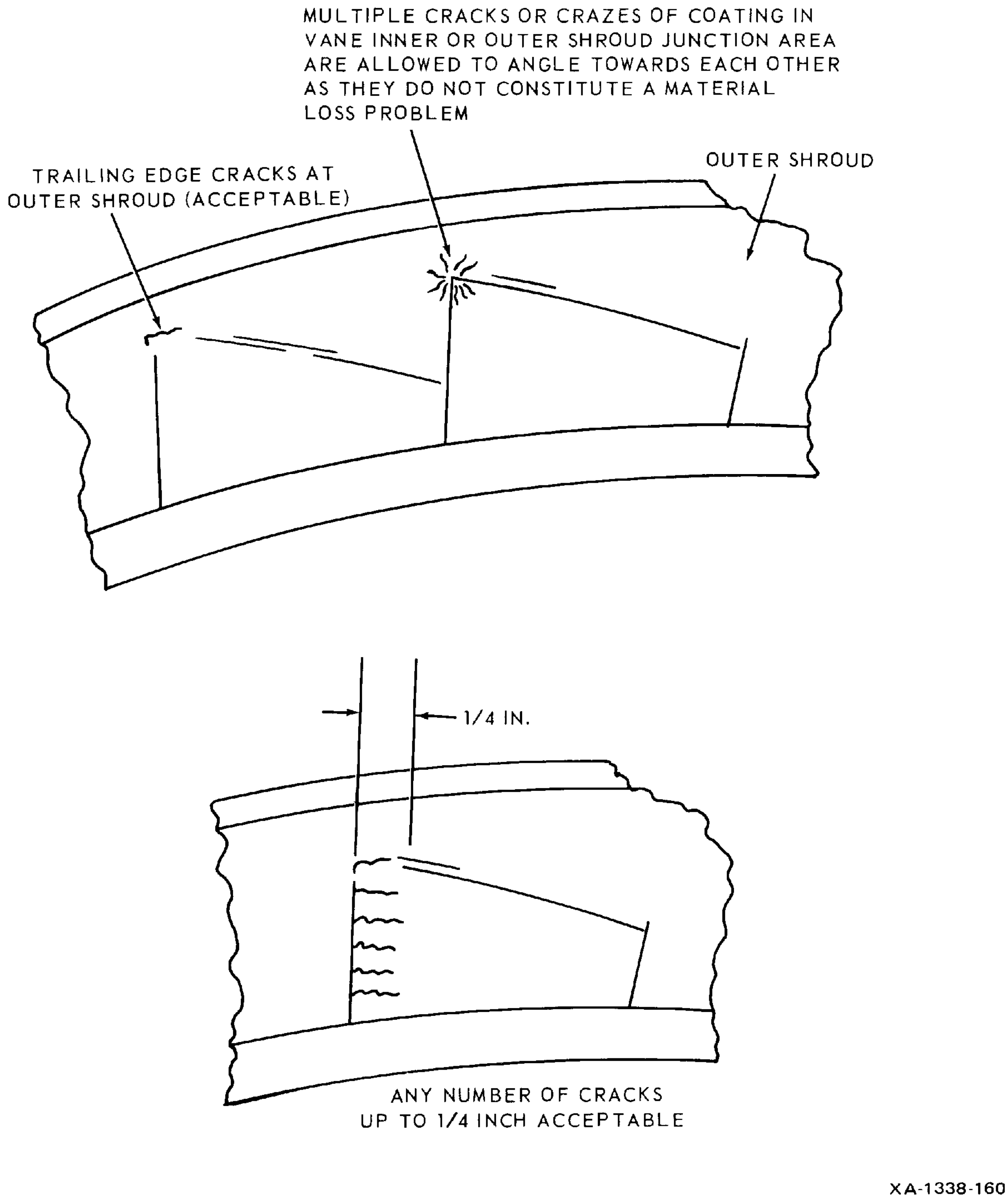
(3) One crack is acceptable on each vane from 1/4 to 1/2 inch in length.

(4) Burned areas not exceeding 3/8 inch radial length by 1/4 inch axial length per vane are acceptable on five vanes.

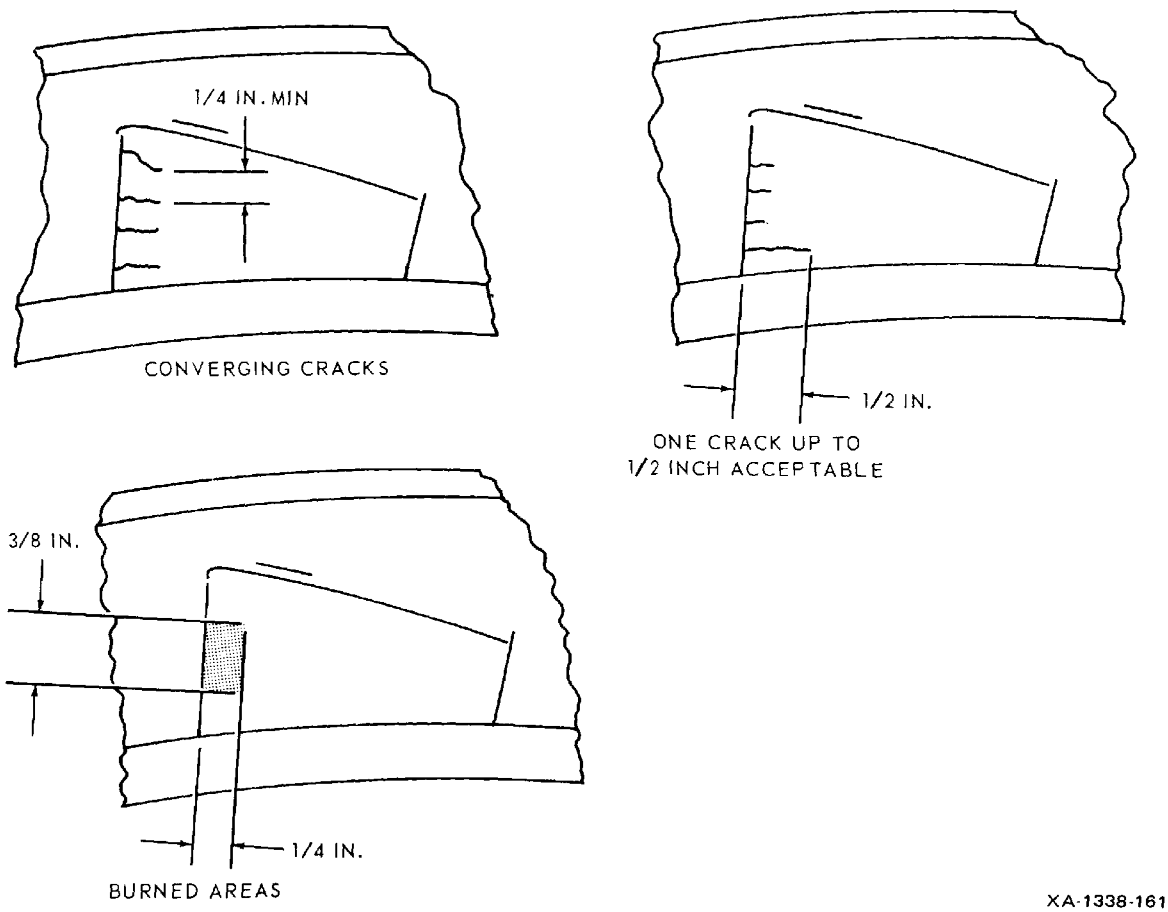
C. Inspect leading edge of vanes for cracks and burns. (See Figure 203.)



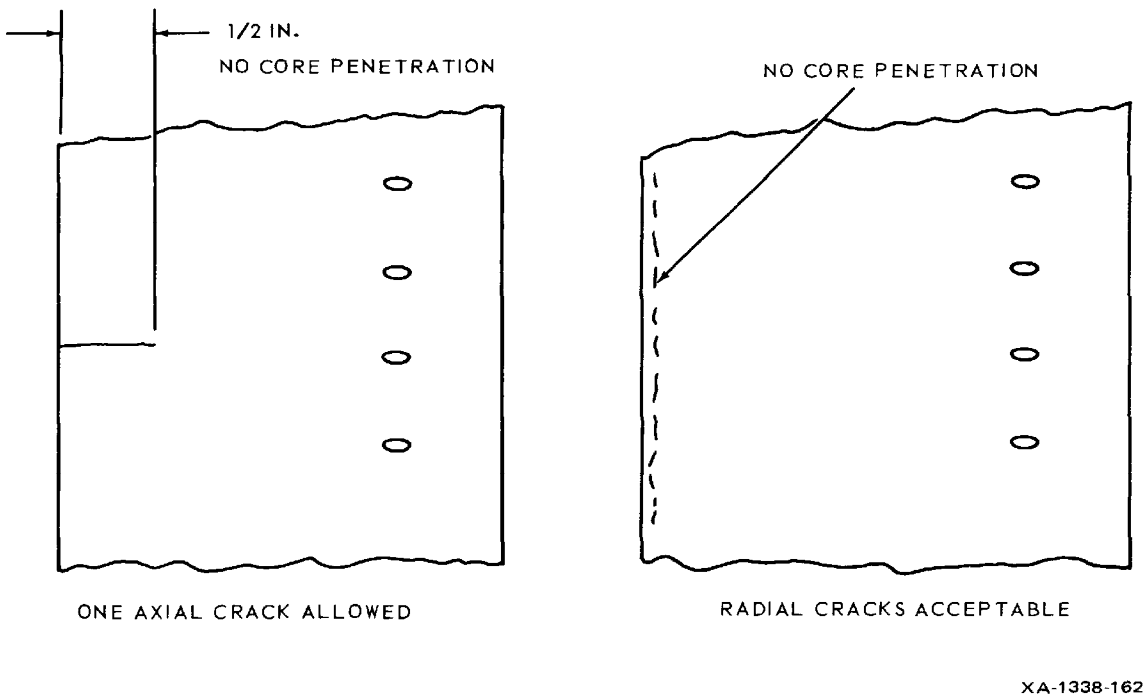
First Stage Gas Producer Nozzle Assembly, Manufacturer’s Blend Repairs
Figure 201



First Stage Gas Producer Nozzle Assembly Trailing Edge Repair Limits
Figure 202 (Sheet 1 of 2)



First Stage Gas Producer Nozzle Assembly Trailing Edge Repair Limits
Figure 202 (Sheet 2)



First Stage Gas Producer Nozzle Assembly Leading Edge Repair Limits
Figure 203

(1) One 1/2 inch axial crack on the leading edge per vane is acceptable provided the core is not penetrated.

(2) Any number or size of radial cracks are acceptable provided the core is not affected.

NOTE: Core is considered affected when crack is breached and core is visible.

(3) Burning is acceptable provided there is no burn through to the core. (See Figure 204.)

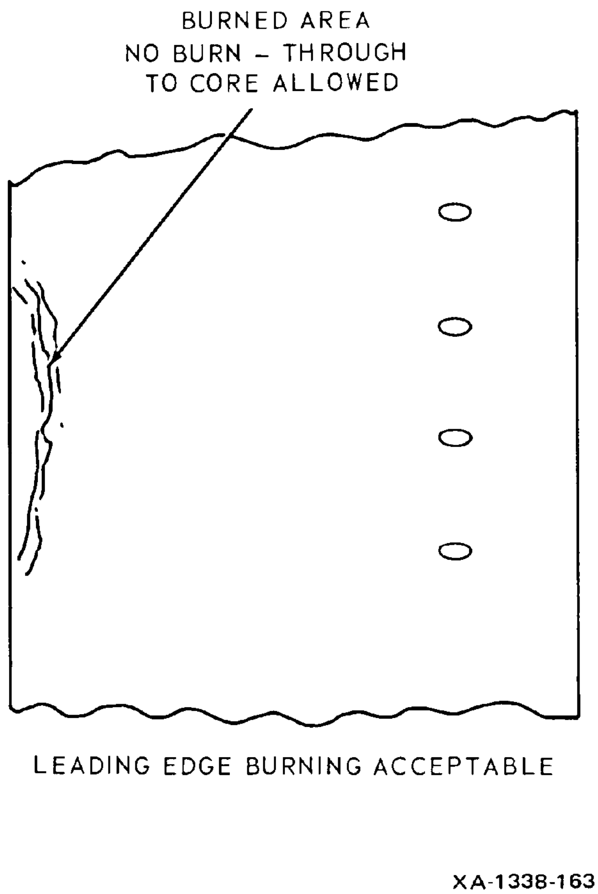
D. Inspect vanes for warpage and distortion. Not acceptable. Replace nozzle assembly.

E. Inspect vanes for nicks, dents, and burrs. Acceptable without repair.

F. Inspect vanes for spalling. Any amount of spalling is acceptable on all vanes.

G. Inspect vane inner and outer shroud and cylinder for cracks. (See Figure 205.)

(1) Circumferential cracking is not allowed.



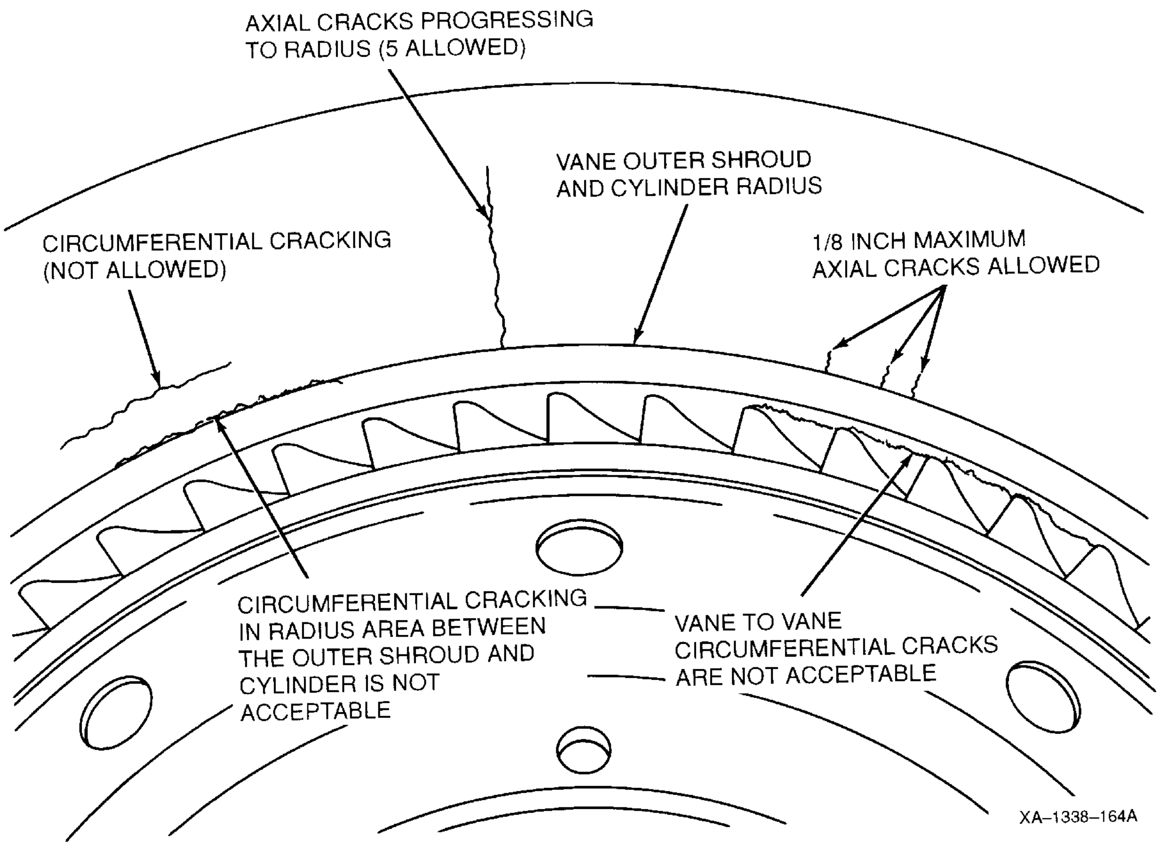
First Stage Gas Producer Nozzle Assembly Leading Edge - Burn Repair Limits
Figure 204

(2) A maximum of five tight lipped axial cracks progressing to the outer shroud cylinder radius are acceptable provided defects are separated by a minimum of eight vanes. Any number of small axial cracks in the radius area up to 1/8 inch length are allowed provided buckling is not evident.

(3) Vane inner shroud cracks at the vane leading edge to inner shroud junction area are acceptable up to 1/4 inch on 20 vanes.

NOTE: Vane to vane and circumferential cracking is not allowed.

(4) Circumferential cracking in radius area between the outer shroud and cylinder are not acceptable.



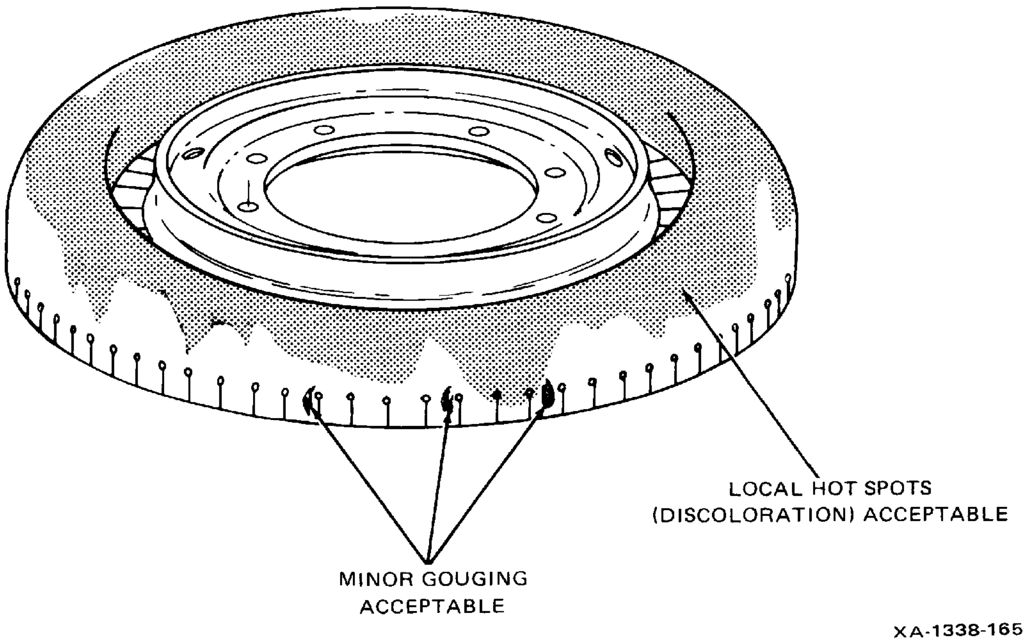
First Stage Gas Producer Nozzle Assembly Inner and Outer Shroud Repair Limits
Figure 205

H. Inspect liner for hot spots and contact gouges. Local hot spot and minor gouging caused by contact with the combustion chamber liner area acceptable. (See Figure 206.)

I. Inspect swaged nuts on forward side of cylinder flange for damage. Replace damaged nuts.

J. Inspect cylinder for cracks. Any number of axial cracks, not exceeding 1/4 inch in length extending forward from back face of flange, are acceptable. No circumferential cracks are allowed.

K. Inspect deflector for cracks. Circumferential cracking is acceptable up to a total length of 7 inches (cumulative or one crack).



First Stage Gas Producer Liner Assembly Repair Limits
Figure 206

NOTE: Inspections in Steps L through O are for nozzle 1-110-710-06 only.

L. Inspect liner for cracks. (See Figure 207.)

NOTE: Axial cracks only are acceptable in tab area on adjacent tabs (slots). Replace nozzle if circumferential cracks are present. Missing tabs are not acceptable.

M. Inspect liner for missing tabs. (See Figure 207.) One 3/8 inch long crack emanating from saw cut into tab is acceptable without repair on two nonadjacent tabs.

N. Inspect liner tab area for axial and circumferential cracks.

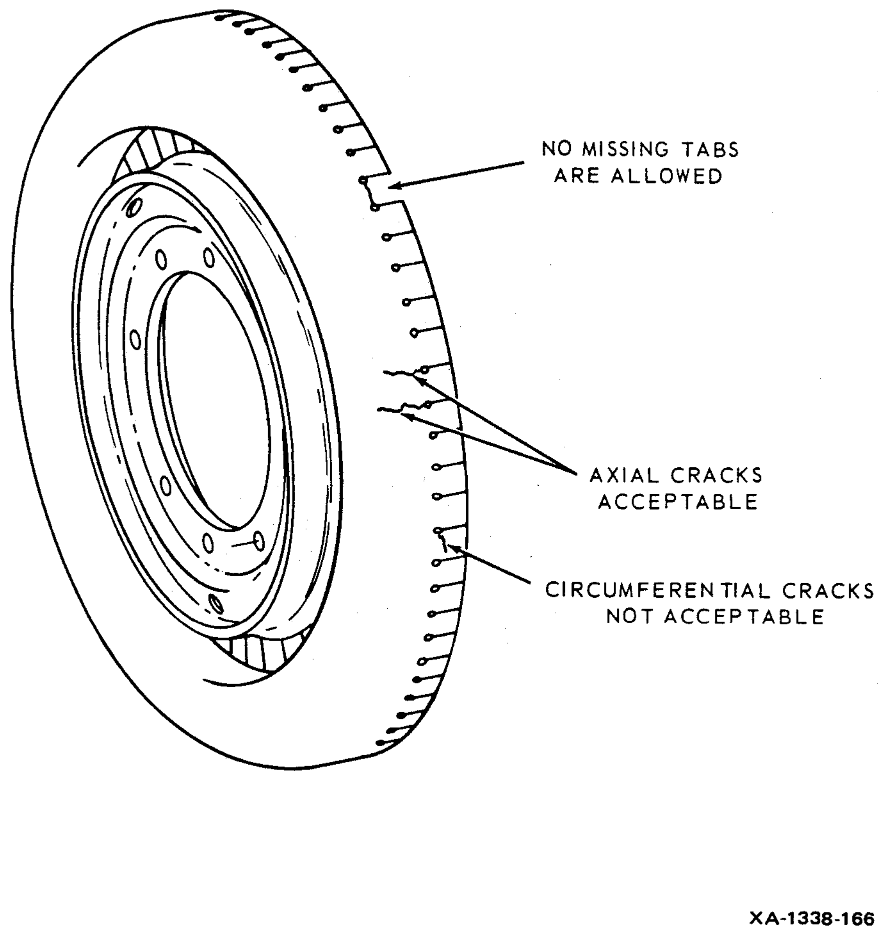
(1) No missing tabs are allowed.

(2) Axial cracks are acceptable in liner tab area. Circumferential cracks are not permitted.

O. Axial cracks that originate at aft edge of outer shroud and extend to midpoint of vane are acceptable under following conditions.

(1) Two adjacent vanes may have one crack per vane extending from outer shroud trailing edge to the midpoint of each vane. Crack must be tight lipped with no edge displacement.

(2) Every third vane must be crack free.



First Stage Gas Producer Liner Repair Limits
Figure 207

2. Cleaning/Painting

Clean first stage gas producer nozzle assembly (72-51-00, 12, Figure 201) using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM SP C203, 70-00-13.)

3. Approved Repairs

A. Replace first stage gas producer nozzle assembly if inspection limits are exceeded.

B. Replace damaged swaged nuts on forward side of cylinder flange. (See Figure 208.)

CAUTION: USE EXTREME CARE NOT TO DRILL INTO FLANGE BASE METAL.

NOTE: Using tape (72-00-00, 65, Table 204) and paper, mask areas of nozzle not to be reworked to prevent chips from entering engine.

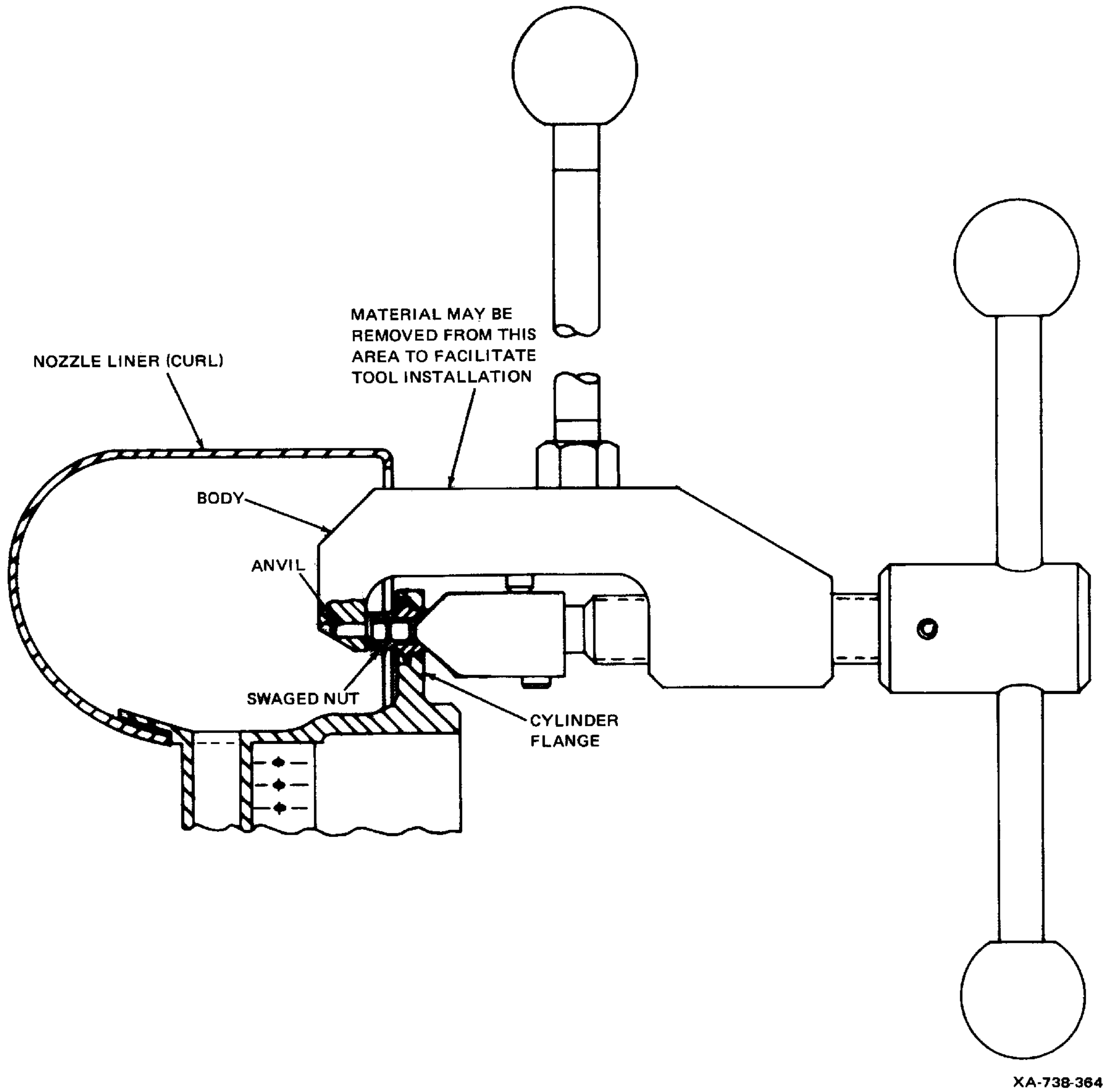
(1) Remove damaged nuts by drilling from aft face with a “G” size drill (0.261 inch diameter). Drill only deep enough to cut swaged portion of insert.

(2) Punch remainder of insert out.

(3) Install replacement nut(s) 1-300-623-01 by placing nut(s) on anvil of installation tool LTCT6000 and positioning as shown. (See Figure 208.)

NOTE: It may be necessary to modify installation tool LTCT6000 by grinding material from body. (See Figure 208.)

(4) With tool positioned, turn handle a sufficient number of turns to swage nut in place against 60 degree chamfer. Back off handle and remove tool. Make sure that nut is swaged securely in place.



Replacement of Swaged Nuts
Figure 208

AIR DIFFUSER, REAR COMPRESSOR BEARING OIL SEAL RETAINER, AFT SEAL, REAR BEARING HOUSING ASSEMBLY, ROLLER BEARING, FORWARD OIL RING, AND FORWARD SEAL - MAINTENANCE PRACTICES

1. Inspection/Check

NOTE: Aft seals 1-300-174-02 and -03 (72-51-00, 25, Figure 201) are manufactured with a fracture at one of the slot locations on the air side carbon element. This fracture is not a defect and is not considered cause for seal replacement. Forward seals 1-300-173-02, 1-300-173-03, and 1-300-173-04 (72-51-00, 1, Figure 201) and aft seals 1-300-174-02 and 1-300-174-03 (72-51-00, 25, Figure 201) are manufactured with three splits, 120 degrees apart, on the oil side carbon element. These splits are not defects and are not considered cause for seal replacement.

A. Inspect all parts for nicks, burrs, and scratches.

B. Inspect rear bearing housing assembly (72-51-00, 7, Figure 201) for damaged threads.

C. Visually inspect all parts for cracks, distortion, and excessive wear.

D. Inspect bearing retaining plate (21) for restricted oil passages.

E. Inspect aft seal (25) for damage. Replace damaged aft seal. (See Paragraph 3.E.)

F. Inspect all accessible vanes for minor nicks, dents, and burrs. Minor nicks, dents, and burrs are acceptable for repair provided mutilation has not occurred.

G. Inspect third row vanes for punctures. Minor punctures are acceptable provided engine performance has not been affected.

2. Cleaning/Painting

Clean all parts using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

3. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair damaged threads in rear bearing housing assembly (72-51-00, 7, Figure 201). (See SPM, SP R409, 70-25-03.) Replace housing assembly if threads are damaged beyond repair.

C. Replace all cracked, distorted, or excessively worn parts.

D. Clear restricted oil passages in bearing retaining plate (21) using suitable drill rod.

E. Replace damaged aft seal (25) as follows:

NOTE: Aft seals 1-300-174-02 and -03 are manufactured with a fracture at one of the slot locations on the air side carbon element. This fracture is not a defect and is not considered cause for seal replacement. Aft seals 1-300-174-02 and 1-300-174-03 are manufactured with three splits, 120 degrees apart, on the oil side carbon element. These splits are not defects and are not considered cause for seal replacement.

(1) Remove retaining ring (24).

(2) Using arbor press and installation and removal tool LTCT3639, press aft seal (25) from oil seal retainer (26) or, using arbor press and installation tool LTCT3825, remove aft seal (25).

(3) Install new seal on base LTCT3826 (detail of LTCT3825) and secure with clamp LTCT3875 (detail of LTCT3825). Place seal with base and clamp in arbor press.

(4) Heat oil seal retainer (26) to 300 to 380°F (140 to 193°C) for 20 to 30 minutes.

WARNING: HEATED COMPONENT PRESENTS A SERIOUS BURN POTENTIAL. TEMPERATURE RESISTANT GLOVES ARE REQUIRED.

(5) Using temperature resistant gloves, remove retainer and place onto seal. Position anvil LTCT3827 (detail of LTCT3825) onto retainer and seal firmly with arbor press.

CAUTION: TO PREVENT POSSIBLE AXIAL SEAL MOVEMENT, MAKE SURE THAT RETAINING RING IS SEATED PROPERLY.

(6) Reinstall retaining ring (24).

F. Repair air diffuser 1-110-230-08/-15, 1-110-300-11 as follows:

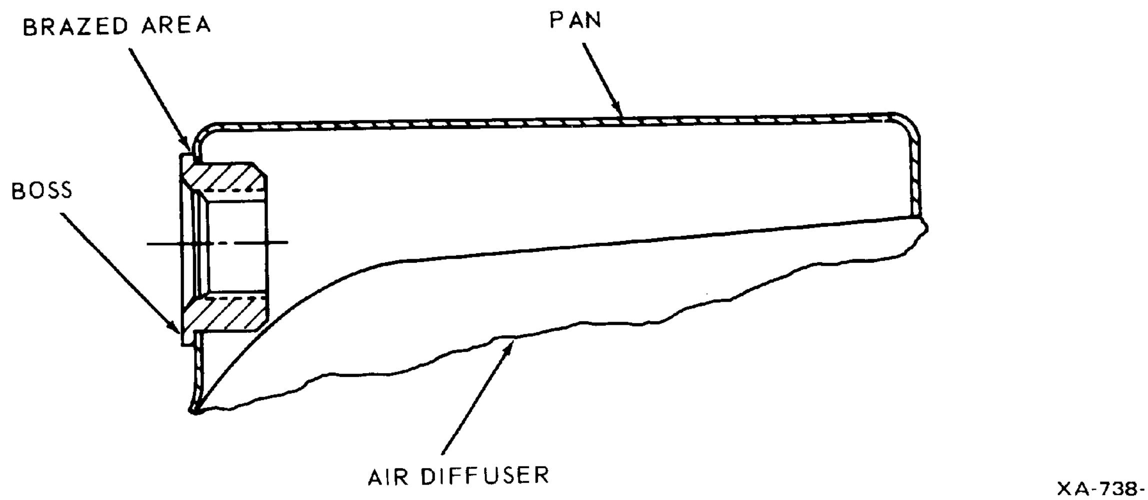
(1) Repair cracks in external vane brazements.

(a) Using stainless steel wire brush and dry cleaning solvent (72-00-00, 62, Table 203), clean area to be repaired. (See SPM, SP C203, 70-15-03.)

(b) Using welding wire (72-00-00, 73, Table 203), weld repair cracks. (See SPM, SP R402, 70-45-01.)

(2) Repair cracks in brazed joints of air outlet pan assembly boss (P3 fitting). (See Figure 201.)

(3) Blend repair minor nicks, burrs, and dents. (See SPM, SP R401, 70-25-01.)



Air Diffuser - Brazed Area Repair
Figure 201

ACCESSORY DRIVE GEARBOX ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

   The accessory drive gearbox assembly is mounted at the 6 o'clock position on the exterior of the inlet housing. It is driven by a shaftgear mated to a driving gear on the compressor rotor. The gearbox provides the drive for the oil pump, fuel control, compressor rotor tachometer generator, and starter generator (not part of the engine). A magnetic chip detector drain plug is installed in the bottom of the gearbox.

ACCESSORY DRIVE GEARBOX ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Accessory Drive Gearbox Assembly

(1) Disconnect lubrication scavenge hose assemblies from accessory drive gearbox assembly. (See Figure 201.)

(2) Cap all hoses.

(3) Disconnect and remove inlet guide vane actuator seal drain hose assembly from gearbox assembly.

(4) Remove power driven rotary oil pump from accessory drive gearbox assembly. (See 79-20-01.)

(5) Remove fuel control. (See 73-20-01.)

(6) Remove starter generator and N1 tachometer generator, if installed.

(7) Remove three bolts (5) and washers (4) that secure gearbox support to rear flange of inlet housing assembly.

(8) Support accessory drive gearbox assembly (6) and remove shouldered bolt (8), bolt (9), two bolts (11) (one not illustrated), and washers (7, 10, 12).

(9) Remove accessory drive gearbox assembly (6) and accessory drive shaft (1) from inlet housing.

(10) Remove packings (2, 3) from mounting face of gearbox.

(11) Remove drive shaft (1), packings (13, 15), and screen and transfer tube (14) from top of accessory drive gearbox.

NOTE: If accessory drive gearbox is to be replaced, retain the power driven rotary (oil) pump, oil filter, screen and transfer tube (14), and chip detector. Remove and retain support (14, Figure 202) and mounting nuts, bolts, and washers.

B. Install Accessory Drive Gearbox Assembly

(1) Install packings (13, 15, Figure 201) on screen and transfer tube (14).

(2) Install screen and transfer tube in accessory drive gearbox assembly (6).

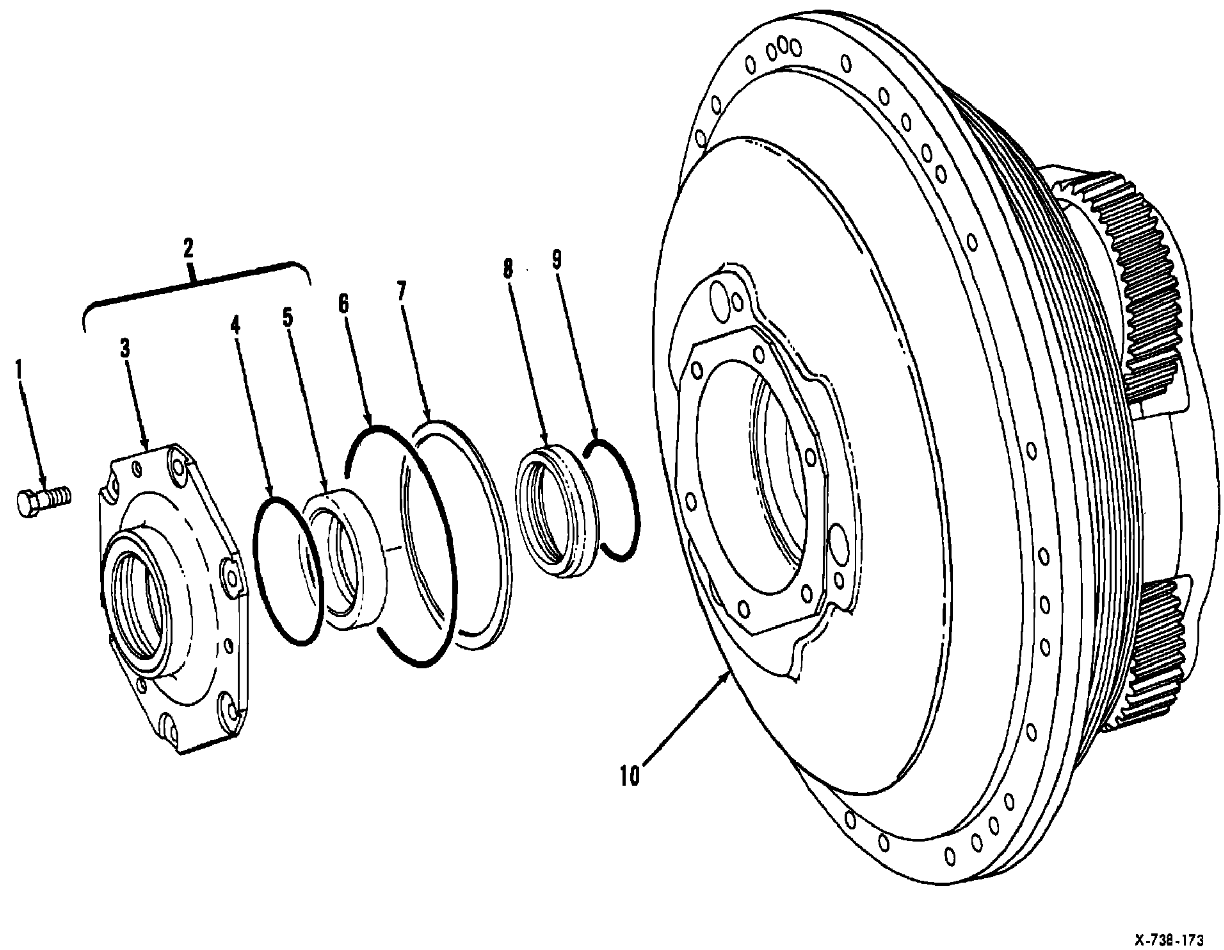
(3) Position packing (2) in groove around drive gear.

(4) Install gearbox support (14, Figure 202) and gasket (33) onto gearbox. Install two washers (15) and nuts (16) to hold support (14) in place.

(5) Position packing (3, Figure 201) in recessed area around duct leading to oil filter.

(6) Insert drive shaft (1) into inlet housing and mesh with internal spline of accessory drive gear and support shaft.

See TR



Accessory Drive Gearbox Assembly
Figure 201

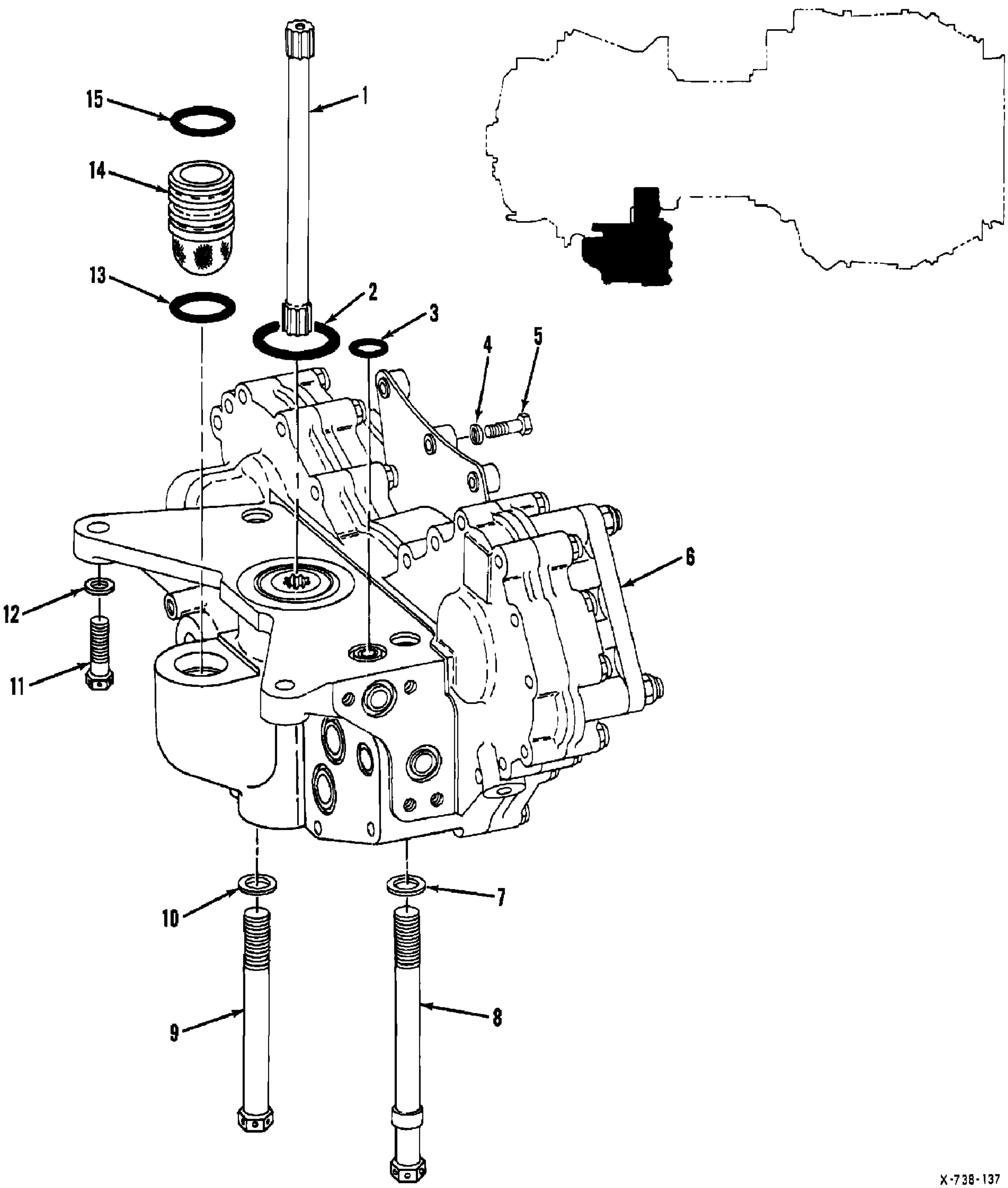
TEMPORARY REVISION NO. 77

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 72-60-01, PAGE 202.

Reason: To provide the correct illustration for Figure 201.

Replace the illustration in Figure 201 with the following:

TEMPORARY REVISION NO. 77



Accessory Drive Gearbox Assembly
Figure 201

TEMPORARY REVISION NO. 95

INSERT PAGE 3 OF 11 FACING 72-60-01, PAGE 203.

Reason: To delete Note and to add Warning in Step 1.B.(18).

Warning is added in Step 1.B.(18) as follows:

(18) Remove two nuts (16, Figure 202) and washers (15) that were installed in preceding Step (4).

WARNING: THE FUEL CONTROL EXTERNAL DRIVE SPLINE AND GEARBOX INTERNAL DRIVE SPLINE INTERFACE IS OIL WETTED. LUBRICATE GEARBOX INTERNAL DRIVE SPLINE FOR FUEL CONTROL DRIVE SHAFT WITH LUBRICATING OIL (72-00-00, TABLE 203, ITEM 41 OR 42). DO NOT LUBRICATE DRIVE SHAFT SPLINE WITH GREASE OR OTHER UNAPPROVED LUBRICANT. USE OF GREASE OR NON-APPROVED LUBRICANT MAY BLOCK PASSAGE WAYS IN THE SPLINE INTERFACE, RESULTING IN SEVERE SPLINE WEAR AND CAN LEAD TO SPLINE FAILURE.

KEY TO FIGURE 201

1. ACCESSORY DRIVE SHAFT
2. PACKING
3. PACKING
4. WASHER
5. BOLT
6. ACCESSORY DRIVE GEARBOX ASSEMBLY
7. WASHER
8. SHOULDERED BOLT
9. BOLT
10. WASHER
11. BOLT
12. WASHER
13. PACKING
14. SCREEN AND TRANSFER TUBE
15. PACKING

(7) Position accessory drive gearbox on engine, ensuring that drive shaft drops and meshes with gearbox.

(8) Carefully raise gearbox, until the spline meshes with accessory drive gear and the gearbox mates with inlet housing.

(9) Place washer 1-080-051-01 (7) on shouldered bolt (8). Insert bolt and finger tighten.

(10) Place washer 1-080-051-01 (10) on bolt (9). Insert bolt and finger tighten.

(11) Place washers (12) on bolts (11). Insert bolts and finger tighten.

(12) Place washers (4) on bolts (5). Insert bolts and finger tighten.

(13) Using 1/4 inch drive extension and ratchet, turn gearbox tachometer drive gear. Check through inlet housing to ensure that compressor rotor is turning. This indicates proper meshing of drive shaft.

(14) Tighten bolts (8, 9) 400 to 475 inch-pounds torque.

(15) Tighten bolts (11) 250 to 325 inch-pounds torque.

(16) Tighten bolts (5) 100 to 120 inch-pounds torque.

(17) Lockwire bolts.

(18) Remove two nuts (16, Figure 202) and washers (15) that were installed in preceding Step (4).

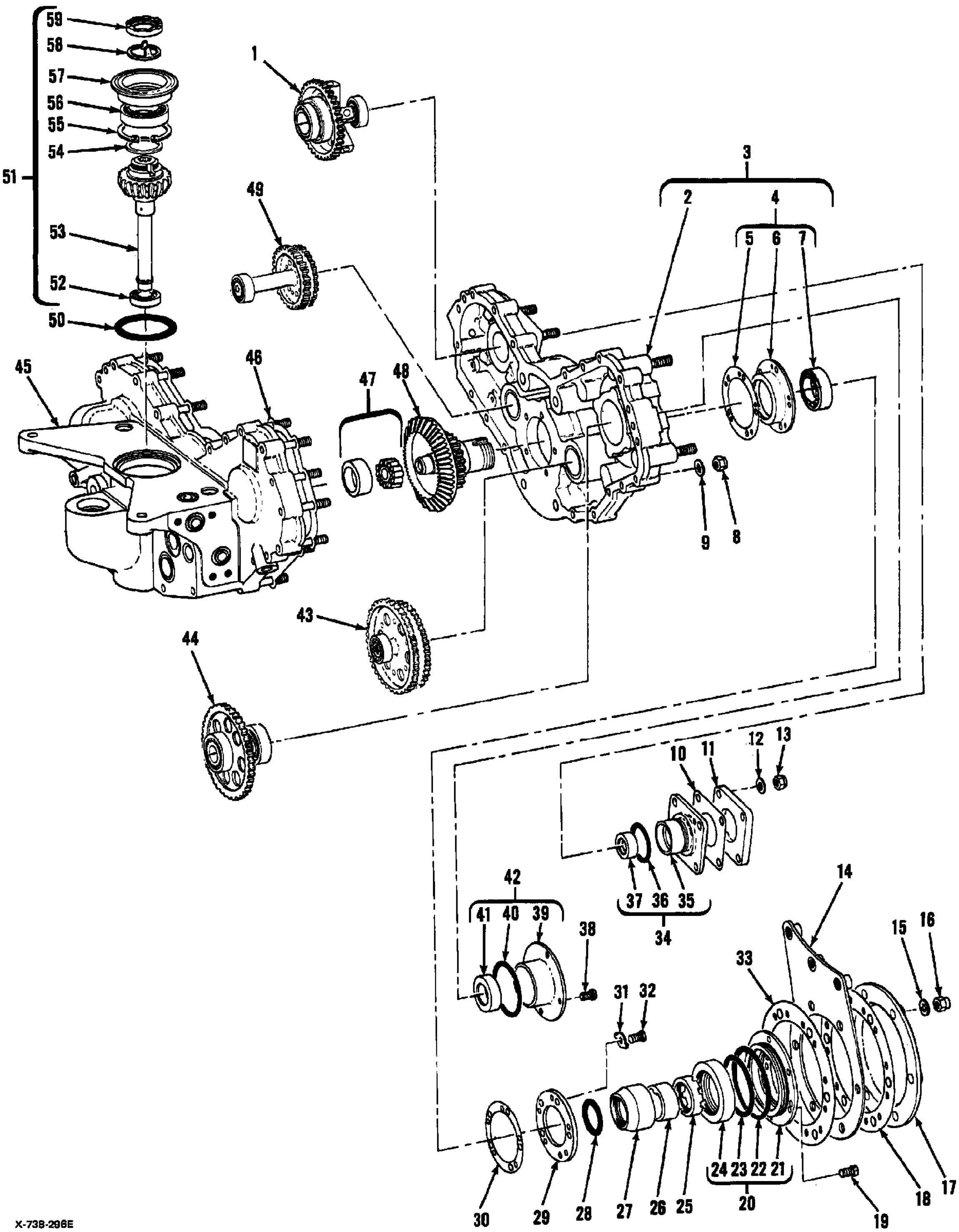
<u>NOTE:</u> Lubricate female splines for fuel control drive shaft with lubricating oil (72-00-00, 41 or 42, Table 203).

(19) Install starter generator gasket (18), and N1 tachometer generator with gasket (10) if removed. Lubricate splines using spline lubricant (72-00-00, 45, Table 203).

(20) Install fuel control. (See 73-20-01.)

(21) Install power driven rotary pump. (See 79-20-01.)

(22) Connect inlet guide vane actuator seal drain hose assembly to adapter fitting on gearbox. Tighten connector as required.



Accessory Drive Gearbox Assembly
Figure 202

KEY TO FIGURE 202

1. GEARSHAFT AND BEARING ASSEMBLY
2. ACCESSORY GEARBOX COVER ASSEMBLY
3. GEARBOX COVER ASSEMBLY
4. THRUST BEARING LINER ASSEMBLY
5. THRUST BEARING SHIM
6. THRUST BEARING LINER
7. THRUST BEARING
8. NUT
9. WASHER
10. GASKET
11. COVER
12. WASHER
13. NUT
14. SUPPORT
15. WASHER
16. NUT
17. COVER
18. GASKET
19. SCREW
20. SEAL AND HOUSING ASSEMBLY
21. OIL SEAL HOUSING
22. PACKING
23. PACKING
24. SEAL
25. SPANNER NUT
26. LOCK CUP
27. SEAL SPACER
28. PACKING
29. RETAINING PLATE
30. THRUST BEARING SHIM
31. TABWASHER
32. BOLT
33. GASKET
34. TACHOMETER DRIVE FLANGE AND SEAL ASSEMBLY
35. FLANGE TACHOMETER DRIVE
36. PACKING
37. SEAL
38. BOLT
39. FUEL CONTROL DRIVE LINER
40. PACKING
41. SEAL
42. SEAL AND LINER ASSEMBLY
43. OIL PUMP DRIVE GEARSHAFT ASSEMBLY
44. FUEL CONTROL DRIVE GEARSHAFT ASSEMBLY
45. ACCESSORY GEARBOX HOUSING ASSEMBLY
46. COVER GASKET
47. ROLLER BEARING
48. STARTER GENERATOR DRIVE GEAR ASSEMBLY
49. OIL-AIR SEPARATOR DRIVE GEARSHAFT ASSEMBLY
50. PACKING
51. PINION GEARSHAFT AND BEARING ASSEMBLY
52. BALL BEARING
53. OUTER PINION GEARSHAFT ASSEMBLY
54. PINION SHIM
55. RETAINING RING
56. BALL BEARING
57. OUTER PINION LINER
58. BEARING KEY WASHER
59. PLAIN ROUND NUT

(23) Reconnect lubrication scavenge hose assemblies to accessory drive gearbox assembly.

2. Inspection/Check

A. Inspect all parts for nicks, cracks, burrs, wear, and distortion.

B. Inspect threaded parts for crossed or damaged threads.

C. Inspect for evidence of leakage at tachometer drive, fuel control drive, and engine accessory drive seals. Replace seals if defective.

D. Inspect starter generator drive gear splines for wear, as follows:

NOTE: Perform the following procedure every 300 hours.

(1) Remove old lubricant from splines using dry cleaning solvent (72-00-00, 62, Table 203).

(2) Inspect gearbox (female) spline for excessive wear. If wear, indicated by following Step (3), exceeds one-half the spline width, replace the starter drive gear and bearings.

NOTE: Whenever the starter generator drive gear is replaced, replace both bearings. (See Paragraph 4.G.)

(3) Inspect for radial freedom of starter generator spline. The total radial movement of the spline shall be a minimum of 3/16 inch. Reject the starter when the spline is frozen or fails to move the required distance.

NOTE: Radial movement can be detected by placing the starter generator vertically on a work surface and tapping the spline with a mallet.

(4) Relubricate splines with Plastilube Moly No. 3 or ML7 plus 2 (72-00-00, 45, Table 203).

3. Cleaning/Painting

A. Clean using dry cleaning solvent (72-00-00, 62, Table 203).

B. Clean damaged paint on gearbox assembly. (See Paragraph 4.B.)

4. Approved Repairs

A. Blend repair nicks, burrs, and scratches, using small diesinker type files and India or carborundum stones. Use crocus cloth (72-00-00, 13, Table 203) for final polishing. All repairs shall be blended and finished smoothly. Lines, scratches, or sharp edges that might cause concentration of stress are not permitted.

B. Refinish painted surfaces. (See SPM, SP P523, 70-30-18.)

C. Replace studs if threaded portion cannot be repaired.

D. Replacement of tachometer drive seal. (See Figure 202.)

NOTE: It is not necessary to remove accessory drive gearbox from engine to replace tachometer drive seal.

(1) Remove nuts (13, Figure 202) and washers (12) that secure tachometer drive flange and seal assembly (34) to accessory gearbox housing assembly (45).

(2) Using two 10-32 puller screws, withdraw tachometer drive flange and seal assembly from accessory drive gearbox, and remove packing (36).

TEMPORARY REVISION NO. 95

INSERT PAGE 4 OF 11 THRU PAGE 7 OF 11 FACING 72-60-01, PAGE 206.

Reason: To add Note and procedure for inspecting accessory drive gearbox fuel control assembly drive shaft gear internal spline.

Note in Step 2.D.(4) and Step D1. are added as follows:

(4) Relubricate splines with Plastilube Moly No. 3 or ML7 plus 2 (72-00-00, 45, Table 203).

NOTE: Perform the following procedure at each access of the drive shaft spline.

D1. Inspect accessory drive gearbox fuel control assembly drive shaft gear and internal spline as follows:

NOTE: It is not necessary to remove accessory drive gearbox from engine to perform this operation.

(1) If evidence of wear debris is found on either the fuel control unit spline or the drive gearshaft spline, proceed to remove seal and liner assembly to clean oil passages and remove debris from spline as well as areas behind seal as indicated in the following steps. If no evidence of wear debris is found, proceed to step (2).

(a) Drain oil from gearbox.

(b) Remove lockwire and bolts (38) that secure seal and liner assembly (42) to accessory gearbox housing assembly (45). (See Figure 202.)

NOTE: Turn puller screws evenly to prevent oil seal housing from cocking or jamming in accessory gearbox housing assembly (45).

(c) Using two 10-32 puller screws, separate seal and liner assembly (42) from accessory gearbox housing assembly (45) and remove packing (40). Discard packing (40).

CAUTION: DURING THIS STEP SPECIAL CARE MUST BE TAKEN TO PREVENT BREAKING THE 0.020 INCH (0.51 MM) SAFETY WIRE, A PIECE OF BROKEN WIRE COULD CAUSE BEARING DAMAGE. MEASURE OVERALL LENGTH BEFORE AND AFTER INSPECTION TO DETERMINE IF A PIECE OF WIRE HAS BROKEN OFF. IF WIRE BREAKS, THE MISSING PIECE MUST BE RETRIEVED PRIOR TO RETURNING ENGINE TO OPERATION.

(d) Clean spline first using a soft bristle brush and minimal dry cleaning solvent (72-00-00, 62, Table 203). Clean outside diameter of gearshaft, check all four oil passages by using 0.020 inch (0.51 mm) safety wire and pushing wire from the outside of the shaft. (See Details A and B, Figure 203.) Special care must be exercised to prevent solvent from contaminating the inside of the gearbox.

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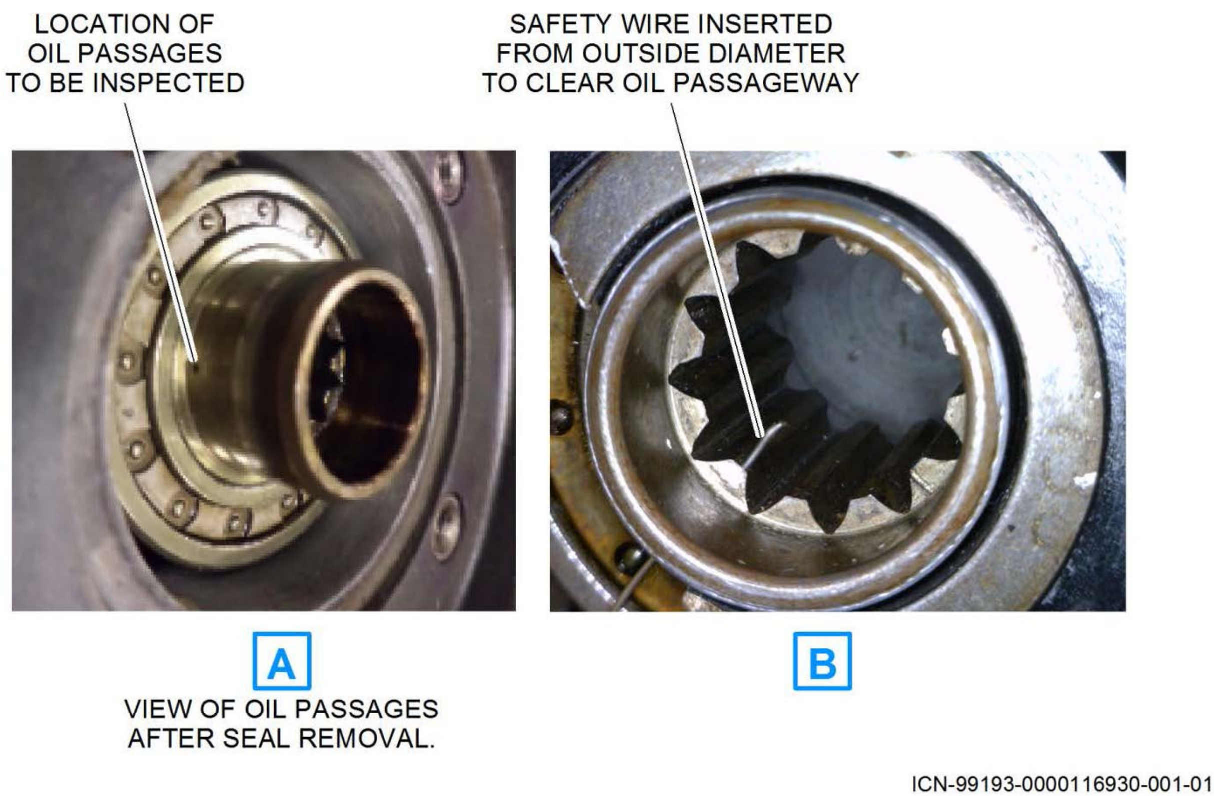

Location and Clearing of Oil Passages
Figure 203

TEMPORARY REVISION NO. 95

(e) Inspect fuel control drive seal for serviceability, replace if required per paragraph 4.E.

CAUTION: THE USE OF GREASE LUBRICANT DURING REASSEMBLY IS NOT ALLOWED. ONLY USE ENGINE OIL TO LUBRICATE PACKING AND BOLTS IF NEEDED.

(f) Install new packing into groove in accessory drive gearbox and secure seal and liner assembly with bolts. If needed, use lubricating oil (72-00-00, 41 or 42, Table 203). Tighten bolts 40 to 45 inch-pounds torque. Lockwire bolts and continue to step (3).

(2) Inspect the accessory drive gearbox fuel control drive shaft internal spline if no evidence of wear debris is found upon removal of fuel control unit as follows:

CAUTION: DURING THIS STEP SPECIAL CARE MUST BE EXERCISED TO PREVENT SOLVENT FROM CONTAMINATING THE INSIDE OF THE GEARBOX.

(a) If no evidence of wear debris is found, clean spline using a soft bristle brush and minimal dry cleaning solvent (72-00-00, 62, Table 203). Proceed to step (3).

(3) Inspect the internal spline contact area as follows:

(a) Perform a visual inspection of internal spline tooth contact areas for areas with wear step or any other defects using a light and at least 4 power magnification. Perform radius probe inspection if any defects or wear steps are seen.

(b) After visual inspection, use a radius probe to inspect for steps in contact areas. No steps allowed. Perform inspection by lightly guiding a 0.072 to 0.079 inch (1.829 to 2.00 mm) diameter probe the full length of the spline tooth checking for mid span steps at engagement areas. (See Figure 204.) Replace gearshaft if any step is found on contact area.

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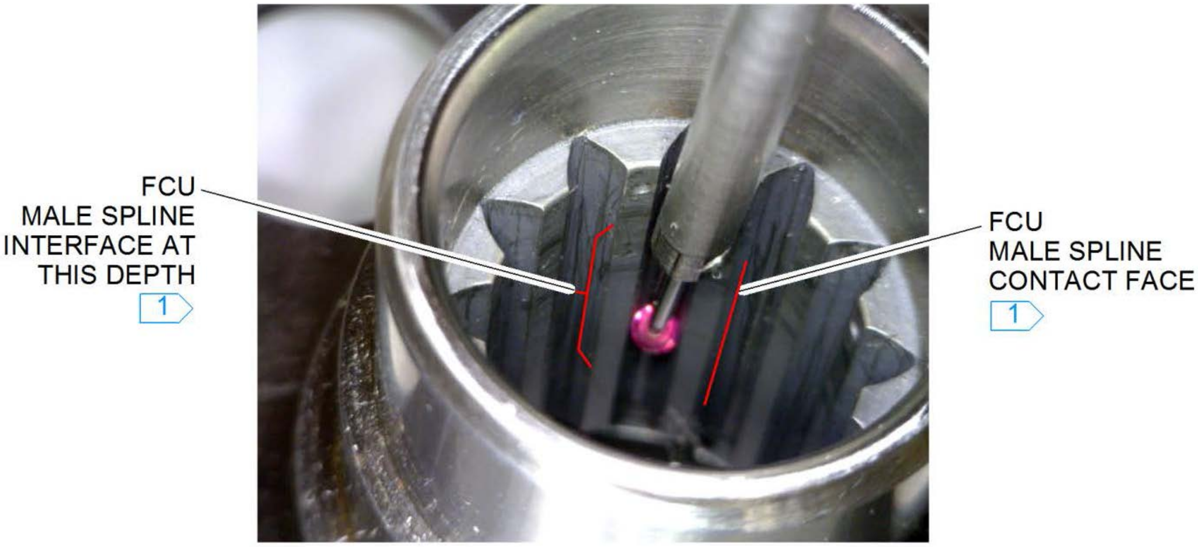

NOTE:
1 Red line indicates FCU external spline contact face. Special attention is needed when inspecting spline engagement area (indicated with brackets).

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Internal Splines Inspection
Figure 204

(3) Using seal installing tool LTCT501 and an arbor press, remove seal (37) from flange tachometer drive (35).

(4) Dip new seal (37) in lubricating oil (72-00-00, 41 or 42, Table 203). Using seal installing tool LTCT501, press seal into flange tachometer drive (35).

NOTE: Seal (37) must be installed with solid side of seal case (side with part number) facing tachometer flange drive housing.

(5) Position packing (36) on outside diameter of flange tachometer drive (35). Place flange and seal assembly over mounting stud, and install gasket (10) and shipping cover (11) (if installed). Fasten with nuts (13) and washers (12).

E. Replacement of fuel control drive seal.

NOTE: It is not necessary to remove accessory drive gearbox from engine to replace fuel control drive seal.

(1) Remove fuel control. (See 73-20-01.)

(2) Remove bolts (38, Figure 202) that secure seal and liner assembly (42) to accessory gearbox housing assembly (45).

(3) Using two 10-32 puller screws, separate seal and liner assembly from accessory gearbox housing assembly, and remove packing (40).

(4) Using oil seal installing tool LTCT100 and an arbor press, remove seal (41) from fuel control drive liner (39).

NOTE: Seal (41) must be installed with solid side of seal case (side with part number) facing oil seal housing.

(5) Dip new seal (41) in lubricating oil (72-00-00, 41 or 42, Table 203). Using oil seal installing tool LTCT100 or suitable drift, press seal into fuel control drive liner (39).

(6) Install packing (40) into groove in accessory drive gearbox and secure seal and liner assembly (42) with bolts (38). Lockwire bolts.

(7) Install fuel control. (See 73-20-02.)

F. Replacement of starter drive seal. (See Figure 202.)

NOTE: It is not necessary to remove accessory drive gearbox from engine to replace starter drive seal. If installed, remove starter. (See Aircraft Instruction Manual.)

(1) Remove bolts (19, Figure 202) that secure seal and housing assembly (20).

NOTE: Turn puller screws evenly to prevent oil seal housing from cocking or jamming in accessory gearbox housing assembly.

(2) Using two 10-32 puller screws, remove seal and housing assembly by turning screws clockwise until seal and housing assembly separates from accessory gearbox housing assembly, and remove packing (22).

(3) Using an arbor press and seal removal tool LTCT3648, press seal (24) from oil seal housing (21). Remove packing (23).

NOTE: Using a mirror, inspect outside diameter of seal spacer for nicks or scoring. If damaged, remove. (See following Steps D through G.)

(4) Straighten rim of lock cup (26). Position gear drive assembly holding fixture LTCT115 on mounting pad studs. Install nuts on studs to hold in place. Make sure that tangs of holding device engage slots of spanner nut (25).

(5) Insert splined tool (part of holding device) and engage internal splines of starter generator drive gear assembly (48). Use suitable wrenches to turn splined tool clockwise to remove spanner nut (25). Remove gear drive assembly holding fixture LTCT115.

(6) Remove spanner nut (25) and lock cup (26). Discard lock cap.

(7) Remove seal spacer (27) and packing (28).

CAUTION: SHORTENING MUST BE USED ON SEAL TO AVOID DAMAGE AND AID IN INSTALLATION.

(8) If seal spacer is being replaced, apply shortening to seal and spacer, then position packing (28) on seal spacer (27) and install spacer. Use shortening on seal and spacer to aid installation.

(9) Install lock cup (26) and spanner nut (25).

(10) Position gear drive assembly holding fixture LTCT115 on mounting studs. Make sure that tangs of device engage slots of spanner nut (25).

(11) Insert splined tool (part of holding device) and tighten nut 420 to 540 inch-pounds torque. Remove splined tool and holding device. Deform locking cup.

NOTE: Seal (24) must be installed with solid side of seal case (side with part number) facing oil seal housing.

(12) Dip new seal (24) in lubricating oil (72-00-00, 41 or 42, Table 203). Position packing (23) and seal (24) inside oil seal housing (21). Using accessory gearbox seal installer LTCT270, press seal into housing.

(13) Place packing (22) on housing. Install seal and housing assembly (20) in accessory drive gearbox cover. Secure seal and housing assembly with bolts (19). Torque as required and lockwire bolts.

(14) Install gasket (18) and install starter generator drive gear assembly (48). (See Aircraft Maintenance Manual.)

G. Replacement of starter generator drive gear. (See Figure 202.)

NOTE: The accessory drive gearbox must be removed from the engine to replace the starter generator drive gear.

(1) Removal of gearbox. (See Paragraph 1.)

(2) Remove pinion gearshaft and bearing assembly (51) and packing (50).

(3) Remove bolts (19) that secure seal and housing assembly (20) to accessory gearbox cover assembly (2).

NOTE: To prevent the seal and housing assembly from jamming in the accessory gearbox cover assembly, thread both puller screws evenly.

(4) Using two 10-32 puller screws, remove seal and housing assembly (20). Turn screws clockwise until seal and housing assembly separates from accessory gearbox cover assembly.

(5) Remove packing (22) from oil seal housing (21).

(6) Straighten rim of lock cup (26). Position gear drive assembly holding fixture LTCT115 on mounting pad studs. Make sure that tangs of holding device engage slots of spanner nut (25). Use nuts on studs to hold fixture. Do not secure nuts. Position nuts toward top half of stud to make sure tool does not come off.

(7) Insert splined tool (part of holding device) and engage internal splines of starter generator drive gear assembly (48). Use suitable wrench to turn splined tool clockwise to remove spanner nut (25). Remove gear drive assembly holding fixture LTCT115.

(8) Remove spanner nut (25) and lock cup (26). Discard lock cup.

(9) Remove nuts (13) and washers (12) that secure cover (11) to accessory gearbox cover assembly (2).

(10) Remove nuts (8) and washers (9) that secure gearbox cover assembly (3) to accessory gearbox housing assembly (45).

NOTE: If one side of the cover sticks, tap the high side with a soft faced mallet. When a gap of one half inch between the cover and housing is obtained, check to make sure that the oil-air separator drive gearshaft assembly (49) and fuel control drive gearshaft assembly (44) are separated from the cover. Lightly tap cover with soft faced mallet to free stuck gearshaft assemblies.

(11) Secure mechanical puller LTCT142 to studs located at 3 and 9 o’clock positions on gearbox cover assembly. Turn handle slowly until cover separates from housing.

(12) Lift gearbox cover assembly from accessory gearbox housing assembly, and remove puller. Remove seal spacer (27) and packing (28). Remove cover gasket (46). Record thickness of cover gasket.

(13) Remove oil-air separator drive gearshaft assembly (49) with bearings installed.

(14) Remove oil pump drive gearshaft assembly (43) with bearings installed.

NOTE: When removing starter generator drive gear assembly, outer race of roller bearing (47) will remain in accessory gearbox housing assembly (45). Extract outer race when bearing is to be replaced.

Following Steps (15) through (25) are done if roller bearing (47) is to be replaced.

(15) Remove bolt (63), screws (64, 65) and spacer (66) that secure baffle (62). Remove packing (67). Remove baffle (62).

(16) Remove starter generator drive gear assembly (48).

NOTE: When removing starter generator drive gear assembly, outer race of roller bearing (47) will remain in accessory gearbox housing assembly (45). Extract outer race when bearing is to be replaced.

(17) Using puller LTCT916, remove inner race of roller bearing (47) from starter generator drive gear assembly (48).

(18) Remove outer race of roller bearing (47) from accessory gearbox housing assembly (45). Discard bearing.

CAUTION: MAKE CERTAIN THAT OUTER RACE IS NOT COCKED DURING INSTALLATION.

(19) Using a brass drift and mallet, install new outer race in accessory gearbox housing assembly (45).

(20) Position packing (67) and install baffle (62). Secure baffle with spacer (66), bolt (63) and screws (64, 65). Lockwire.

NOTE: Position twisted ends of lockwire in a manner so as to prevent interference with gear rotation.

(21) To replace thrust bearing (7), which is done when roller bearing (47) is replaced, perform the following procedure.

(a) Straighten tabs of tabwasher (31), and remove bolts (32) and tabwashers that secure retaining plate (29) to accessory gearbox cover assembly (2).

(b) Remove plate and thrust bearing shim (30). Record thickness of shim, and secure it to plate.

(c) Using two 10-32 puller screws, remove thrust bearing liner assembly (4). Turn screw clockwise evenly until liner assembly separates from accessory gearbox cover assembly (2).

(d) Remove and record the thickness of thrust bearing shim (5). Separate thrust bearing (7) from thrust bearing liner (6).

(e) Measure bore depth of thrust bearing liner (6). Measure width of outer race of bearing installed in liner. Subtract bore depth from bearing width and select thrust bearing shim (30) to obtain a bearing pinch of 0.002 to 0.004 inch.

(22) Install thrust bearing (7) into thrust bearing liner (6).

(23) Position thrust bearing shim (5) and thrust bearing liner (6) in accessory gearbox cover assembly (2).

(24) Position thrust bearing shim (30) and retaining plate (29).

(25) Secure with tabwasher (31) and bolts (32). Bend tabwashers.

(26) Using arbor press and sleeve bushing LTCT3640, press inner race of roller bearing (47) onto journal of new starter generator drive gear assembly (48). Firmly pack inner race of roller bearing (47) with shortening.

(27) Carefully install starter generator drive gear assembly (48) onto inner race of roller bearing (47) into outer race.

(28) Install oil air separator drive gearshaft assembly (49) with bearings installed.

(29) Install oil pump drive gearshaft assembly (43) with bearings installed.

NOTE: Perform a rotation check, being sure all gears turn smoothly.

Select a gasket with thickness as close to original cover gasket.

(30) Install cover gasket (46) on accessory gearbox housing (45). Position gearbox cover assembly (3) onto accessory gearbox housing assembly (45) and journal of starter generator drive gear assembly (48). Secure with washers (9) and nuts (8) using nondrying zinc chromate sealant (72-00-00, 75, Table 203). (See SPM, SP P526, 70-30-21.)

(31) Install packing (28), seal spacer (27), lock cup (26), and spanner nut (25).

(32) Position gear drive assembly holding fixture LTCT115, holding down with nuts on gearbox cover assembly (3). Make sure that tangs of device engage slots of spanner nut (25).

(33) Insert splined tool (part of holding device LTCT115) and tighten nut 420 to 540 inch-pounds torque. Remove gear drive assembly holding fixture LTCT115.

NOTE: Do not deform locking cup at this time.

Make sure that driven gear meshes with starter generator drive gear before tapping.

(34) Coat teeth of outer pinion gearshaft assembly (53) with gear marking compound (72-00-00, 34A, Table 203) and install pinion gearshaft and bearing assembly (51) into accessory gearbox housing assembly (45). Tap gently with soft faced mallet until properly seated.

(35) Rotate gear several times in direction of normal rotation making sure gears rotate smoothly, to establish pattern.

(36) Install holding fixture LTCT4904 on gearbox cover assembly, and in spline of starter generator drive gear assembly (48).

NOTE: Inner line on flag of backlash gage LTCT2099 is used for accessory gearbox backlash check.

(37) Install backlash gage LTCT2099, LTCT311, or LTCT205 in outer pinion gearshaft assembly.

(38) Using dial indicator, check backlash of outer pinion gearshaft assembly and starter generator drive gear assembly (48). Backlash must be 0.006 to 0.012 inch.

(39) Remove pinion gearshaft and bearing assembly (51) from gearbox housing, and examine tooth pattern on outer pinion gearshaft and starter generator drive gear assembly (48) for acceptable gear tooth pattern.

NOTE: If acceptable, proceed as follows. If either backlash or pattern are not acceptable, proceed to following Steps H and I.

(40) Remove pinion gearshaft and bearing assembly (51) and backlash flag. Varsol wash compound off the pinion gearshaft and bearing assembly (51) and starter generator drive gear assembly (48).

(41) Deform locking cup (26) onto nut in three places, 120 degrees apart. Bend tabwashers (31).

(42) Install seal and housing assembly (20) using new packing (22) and coat with hydrogenated vegetable shortening (72-00-00, 38, Table 203) before installing. Install screw (19). Torque as required. Lockwire screw (19). Retorque nuts (8) installed in preceding Step (30) 70 to 95 inch-pounds (7.9 to 10.7 Newton-meters).

(43) Reinstall accessory gearbox. (See Paragraph 1.B.)

(44) Install packing (50) on outer pinion liner (57) and install pinion gearshaft and bearing assembly (51) into accessory gearbox housing assembly.

H. If backlash is not acceptable proceed as follows:

(1) Position gear drive assembly holding fixture LTCT115 on mounting pad studs. Hold in place with two washers (15) and nuts (16). Ensure that the tangs of the holding device engage the spanner nut (25).

(2) Insert splined tool (part of gear drive assembly holding fixture LTCT115) and engage internal splines of starter generator drive gear assembly (48). Use suitable wrenches to turn spline clockwise to loosen spanner nut (25). Remove gear drive assembly holding fixture LTCT115.

(3) Remove spanner nut (25) and lock cup (26). Using two 10-32 puller screws, remove thrust bearing liner assembly (4). Turn screws clockwise evenly until liner assembly separates from accessory gearbox cover (2).

(4) Remove bolt (32), tabwashers (31), retaining plate (29) and thrust bearing shim (30). Attach shim to plate so it will not be misplaced.

(5) Adjust shim as follows:

(a) If pattern is good but backlash is too high, reduce thrust bearing shim (5) by 0.002 inch. Backlash will decrease by 0.001 inch.

(b) If pattern is good, but backlash is too low, increase thrust bearing shim (5) by 0.002 inch, this will increase backlash by 0.001 inch.

(6) Reinstall components removed in accordance with instructions in preceding Steps (3) and (4).

(7) Clean the starter drive gear teeth (48) with varsol.

(8) Recoat the bevel gear teeth with gear marking compound (72-00-00, 34A, Table 203). Perform backlash pattern check. (See Paragraph 4.G(34) through (37).)

I. If pattern is unacceptable proceed as follows:

(1) Remove plain round nut (59) and bearing key washer (58). Remove pinion gearshaft and bearing assembly (51).

(2) Disassemble pinion gearshaft and bearing assembly (51) as follows:

(a) Using long brass drift and arbor press, press outer pinion gearshaft assembly (53) free of outer pinion liner (57).

(b) Remove and record thickness of pinion shim (54).

(c) Install gearshaft holder assembly LTCT3833 or LTCT2039 in a bench vise. Position outer pinion gearshaft assembly in holding tool. Using access gear spanner wrench LTCT107, loosen plain round nut (59). Remove outer pinion gearshaft from holding tool.

(d) Using arbor press and sleeve bushing LTCT3654, press assembled liner out of journal of outer pinion gearshaft assembly.

(e) Remove plain round nut (59) and bearing key washer (58).

(3) To adjust pinion shim (54), proceed as follows:

(a) If the pinion gear pattern is high on convex side and low on concave side (not drive side), add 0.002 inch shim to pinion gear. Pinion shim (54) will decrease backlash 0.001 inch.

(b) If the pinion gear pattern is high on concave side and low on convex side (drive side), subtract 0.002 inch from the pinion gear. Pinion shim (54) will increase backlash 0.001 inch.

(4) Assemble pinion gearshaft and bearing assembly (51) as follows:

NOTE: Shim shall correspond in thickness to shim removed during disassembly.

(a) Install pinion shim (54) on outer pinion gearshaft assembly (53).

(b) Using arbor press and sleeve bushing LTCT3654, press assembled liner onto journal of outer pinion gearshaft assembly. Install bearing key washer (58) and plain round nut (59).

NOTE: Bearing key washer (58) is not locked at this time. This will be accomplished after correct gear pattern and backlash have been established.

(c) Install gearshaft holder assembly LTCT3833 or LTCT2039 in a bench vise. Position outer pinion gearshaft assembly in holding tool. Using access gear spanner wrench LTCT107, tighten nut 300 to 360 inch-pounds torque. Remove outer pinion gearshaft assembly from holding tool.

(5) Clean starter gear teeth with varsol.

(6) Recoat the bevel gear teeth with gear marking compound (72-00-00, 34A, Table 203). Reinstall bevel gear.

(7) Reinstall the pinion gearshaft and bearing assembly (51) and packing (50).

(8) Perform backlash and pattern check. (See Paragraph 4.G(33) and (34).)

OVERSPEED GOVERNOR AND TACHOMETER DRIVE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The overspeed governor and tachometer drive assembly is mounted at the 10 o'clock position on the exterior of the inlet housing, and is driven through shafts and gearing from the power shaft. The drive assembly provides mounts and drives for the power turbine (N2) tachometer generator and power driven rotary (torquemeter booster) pump. The drive assembly also drives the fuel control overspeed governor and incorporates a strainer and metering cartridge for lubrication of the drive gear train. A torquemeter relief valve, located on the upper portion of the housing, allows for the adjustment of the torquemeter boost oil pressure.

OVERSPEED GOVERNOR AND TACHOMETER DRIVE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Overspeed Governor and Tachometer Drive Assembly

(1) Remove power driven rotary (booster) pump. (See 79-20-02.)

(2) Using an 8-32 threaded rod, pull overspeed governor drive shaft (10, Figure 201) through overspeed governor and tachometer drive housing.

NOTE: Shims (6, 11) may or may not be installed.

(3) Remove shims (6, 11) and tag as to their respective positions.

(4) Expand and slide retaining rings (7, 9) to center of shaft tube (8). Slide shaft tube aft into overspeed governor housing.

(5) Disconnect the fuel control air pressure sensing line from bracket under bolt (13).

(6) Remove bolts (5, 13, 15), bracket (4) and washers (14, 16) that secure overspeed governor and tachometer drive assembly to mounting pad on inlet housing.

(7) Remove overspeed governor and tachometer drive assembly, discard packings (2, 3), and withdraw shaft (1) from inlet housing.

B. Install Overspeed Governor and Tachometer Drive Assembly

(1) Insert shaft (1, Figure 201) into inlet housing mounting pad.

NOTE: The fuel control air pressure sensing line mounting bracket is installed under bolt (13).

(2) Using new packings (2, 3), install overspeed governor and tachometer drive assembly (12) on inlet housing mounting pad and secure with bolts (5, 13, 15), bracket (4) and washers (14, 16). Lockwire bolts.

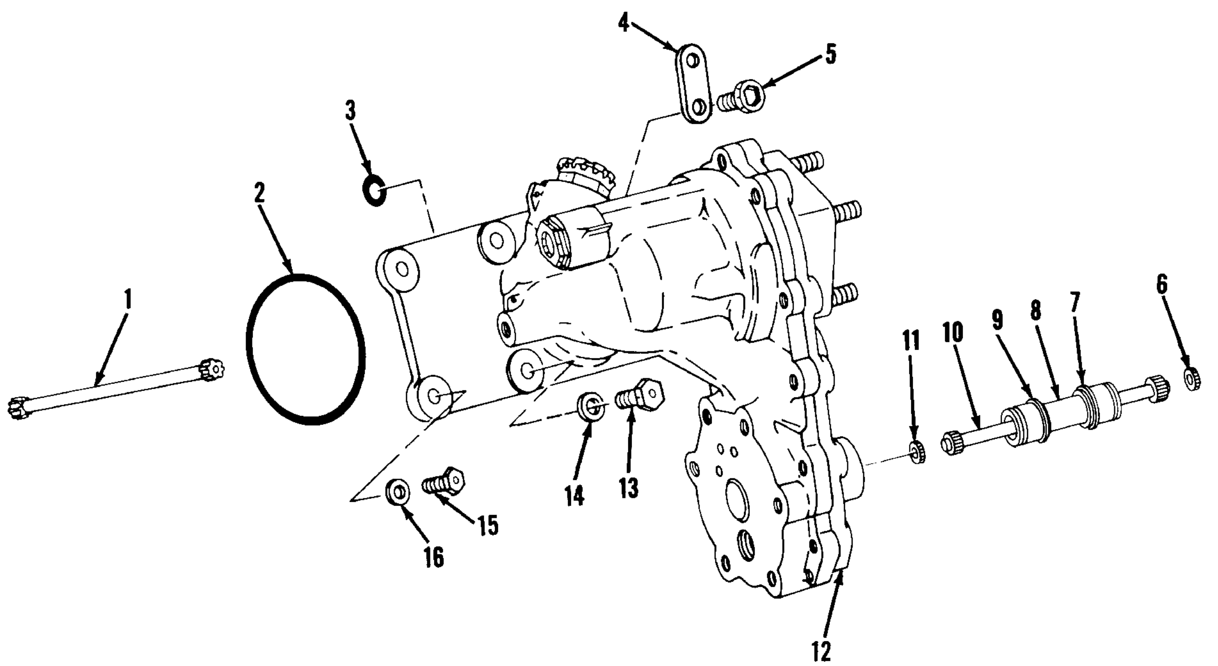
(3) Slide shaft tube (8) forward into overspeed governor and tachometer drive assembly. Expand and slide retaining rings (7, 9) into place.

(4) Install shim (6), if necessary.

(5) Insert overspeed governor drive shaft (10). Add shim (11), if necessary.

NOTE: If new overspeed governor and tachometer drive assembly is being installed, the end float of the overspeed governor drive shaft must be established, before performing Step (6). (See Step C.)

(6) Install power driven rotary (booster) pump. (See 79-20-02.)



1. SHAFT
2. PACKING
3. PACKING
4. BRACKET
5. BOLT
6. SHIM
7. RETAINING RING
8. SHAFT TUBE
9. RETAINING RING
10. OVERSPEED GOVERNOR DRIVE SHAFT
11. SHIM
12. OVERSPEED GOVERNOR AND TACHOMETER DRIVE ASSEMBLY
13. BOLT
14. WASHER
15. BOLT
16. WASHER

Overspeed Governor and Tachometer Drive Assembly
Figure 201

C. Establishing End Float of Overspeed Governor Drive Shaft

NOTE: When the torquemeter booster pump, engine overspeed governor or fuel control is to be installed, end float of overspeed governor drive shaft must be established. Excessive end float can cause wear of the shaft splines and may lead to malfunction or failure of the engine overspeed governor.

(1) Remove torquemeter boost pump. (See 79-20-02.)

(2) Remove shims, if installed, from forward end of overspeed governor drive shaft. Record thickness of shims.

(3) Using 8-32 threaded rod, pull overspeed governor shaft through drive shaft tube.

(4) Using same rod, remove aft shims, if any, from overspeed governor housing. Record thickness of shims.

(5) Reinstall overspeed governor drive shaft and push as far into overspeed governor housing as possible.

(6) Measure and note (in thousandths of an inch) the distance designated Dimension A. (See Figure 202.)

(7) Using a depth micrometer, measure and note (in thousandths of an inch) the dimension designated Dimension B. (See Figure 202.)

(8) Subtract Dimension A from B. This will indicate total existing end float.

(9) If end float is less than 0.090 inch, do not shim drive shaft.

NOTE: Minimum end float tolerance is not established, however, it is important that some end float exist to preclude jamming the overspeed governor drive shaft against the housing and booster pump splined shaft.

(10) If end float is between 0.090 and 0.280 inch, install one shim 1-160-589-02 at fuel control end of drive shaft.

NOTE: Number of shims to be installed is either none, one, or four.

(11) If end float is more than 0.280 inch, install two shims at each end of drive shaft.

2. Disassembly/Assembly

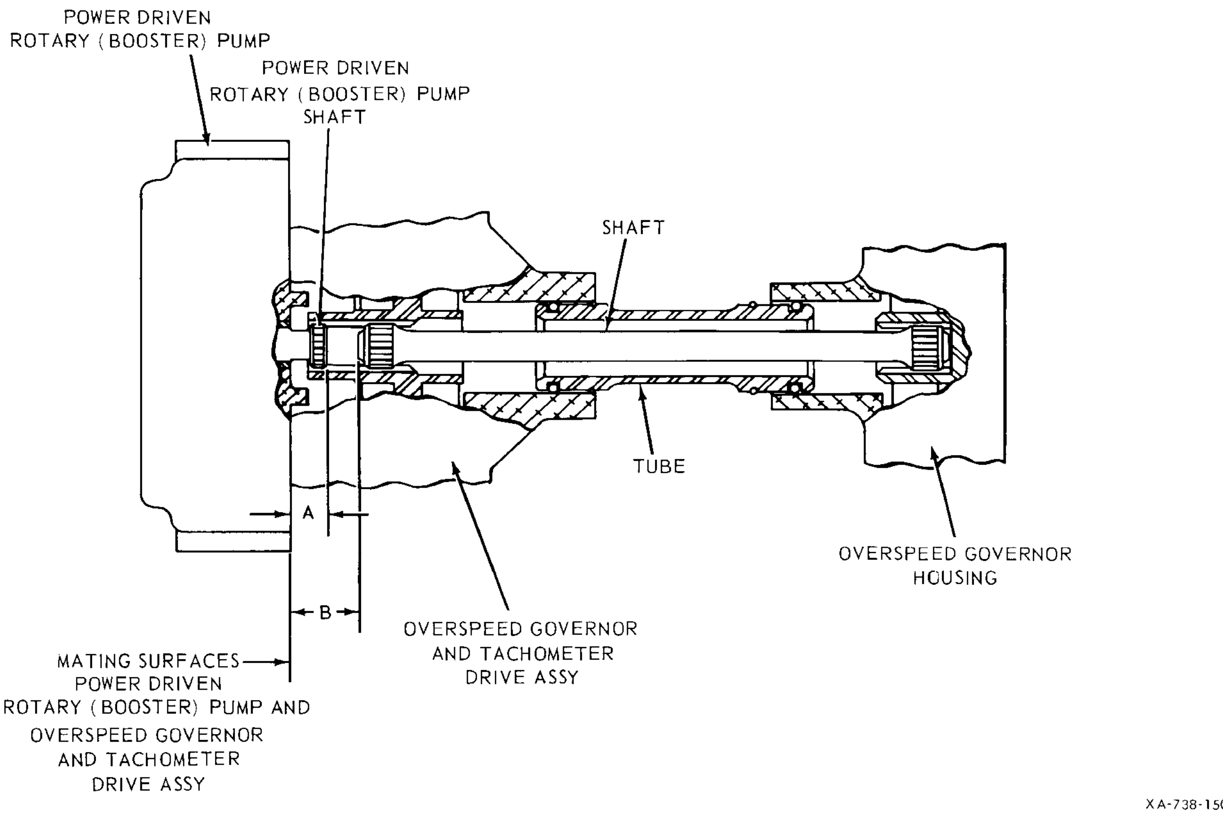
A. Disassemble Overspeed Governor and Tachometer Drive Assembly

(1) Cut lockwire and remove plug (1 or 4, Figure 203). Remove packing (2 or 5) from plug.

(2) Remove filter assembly (3) or filter (6). Remove packing (2) from filter assembly (3).

NOTE: Step (3) is performed if gasket (11) or seal (13) need to be replaced.

(3) Remove bolts (14), washers (15), cover assembly (12), and gasket (11). Press seal (13) out of cover assembly (12), using arbor press and sleeve bushing LTCT3640.



End Float Adjustment of Overspeed Governor Drive Shaft
Figure 202

CAUTION: WHEN REMOVING RELIEF VALVE ASSEMBLY, APPLY FORCE ONLY TO WRENCH FLATS ON RELIEF VALVE ASSEMBLY.

(4) Remove torquemeter relief valve assembly (10).

NOTE: Remove torquemeter relief valve assembly (10) only as required during trouble shooting. (See 72-00-00, ENGINE-TROUBLE SHOOTING, High Torquemeter Indication.)

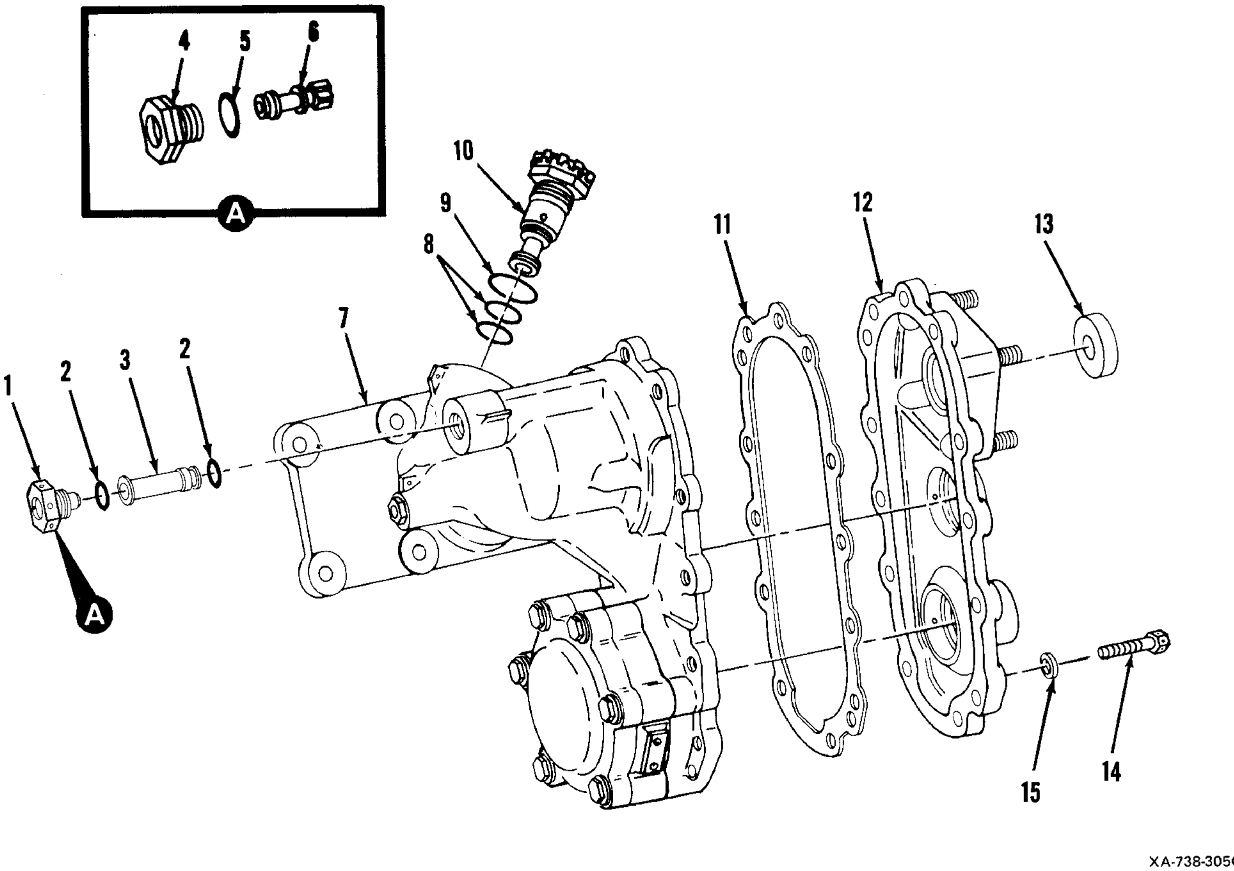
B. Reassemble Overspeed Governor and Tachometer Drive Assembly

CAUTION: HOLD FILTER IN SOFT JAWED VISE TO AVOID DAMAGE TO OUTER SURFACE.

NOTE: If filter (6, Figure 203) is to be installed, perform Steps (1) through (3). If filter assembly (3) is to be installed, perform Steps (4) and (5).

(1) Install filter (6) in plug (4) and tighten 77 to 96 inch-pounds torque.

(2) Position new packing (5) on plug (4).



1. PLUG
2. PACKING
3. FILTER ASSEMBLY
4. PLUG
5. PACKING
6. FILTER
7. OVERSPEED GOVERNOR AND TACHOMETER DRIVE HOUSING ASSEMBLY
8. PACKING
9. PACKING
10. TORQUEMETER RELIEF VALVE ASSEMBLY
11. GASKET
12. COVER ASSEMBLY
13. SEAL
14. BOLT
15. WASHER

Overspeed Governor and Tachometer Drive Assembly
Figure 203

(3) Install plug in housing and tighten 70 to 85 inch-pounds torque. Lockwire plug.

(4) Position new packings (2) on plug (1) and filter assembly (3).

(5) Install filter assembly and plug in overspeed governor and tachometer drive housing assembly (7). Tighten plug (1) 70 to 85 inch-pounds torque.

(6) Lubricate gasket (11), and position gasket on overspeed governor and tachometer drive housing assembly (7).

(7) Lubricate seal (13) and, using seal installing tool LTCT501, press seal into cover assembly (12).

(8) Lubricate bearing liner on cover assembly (12), and position cover assembly on housing assembly. Using soft faced mallet, gently tap cover assembly down until firmly seated. Secure cover assembly to overspeed governor and tachometer drive housing assembly (7) with bolts (14) and washers (15).

CAUTION: IMPROPER INSTALLATION OF TORQUEMETER RELIEF VALVE ASSEMBLY COULD RESULT IN DAMAGED PACKING. THIS COULD CAUSE SECTIONS OF THE PACKING TO ENTER OIL PASSAGES WHICH WOULD RESULT IN A LOW TORQUEMETER READING.

NOTE: Perform following Step (9) if torquemeter relief valve assembly has been removed.

(9) Lubricate packings (8, 9) with hydrogenated vegetable shortening (72-00-00, 38, Table 203), and place on torquemeter relief valve assembly (10). Install torquemeter relief valve assembly into overspeed governor and tachometer drive housing assembly (7), and tighten 80 to 100 inch-pounds torque (9.0 to 11.3 Newton-meters). Wait 20 minutes, then retorque bolts (14) installed in preceding Step (8).

3. Inspection/Check

A. Inspect all parts for nicks, burrs, and scratches.

B. Inspect all threaded parts for damaged threads.

C. Inspect filter assembly (3) for damage. Replace if defective.

4. Cleaning/Painting

Clean overspeed governor and tachometer drive assembly using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

5. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair minor thread damage. (See SPM, SP R409, 70-25-03.)

Honeywell

MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

ENGINE FUEL & CONTROL

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STARTING FUEL MANIFOLD - DESCRIPTION AND OPERATION

1. Description and Operation

The starting fuel manifold is mounted on the aft end of the combustion chamber housing and secured to the support cone. The manifold receives fuel from the fuel regulator through the starting fuel solenoid valve, and delivers it to four starting fuel nozzles.

STARTING FUEL MANIFOLD - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Starting Fuel Manifold

      (1) Remove starting fuel hose. (See 73-10-07.)

      (2) Remove screws (1, 9, 11, 17, Figure 201) that secure clamps (2, 8, 10, 16) to support cone.

      (3) Remove nut (3) and washer (4) that secure tee (6) to support cone bracket.

      (4) Release torque on connector nuts that hold manifold to starting fuel nozzles. Remove left and right hand starting fuel manifold (7, 15) and tee (6) as a unit. Remove washer (5). Immediately cap all openings.

      NOTE: Further disassembly is not normally required unless a manifold or tee is to be replaced.

      (5) Loosen connector nuts and separate left hand starting fuel manifold (7) and right hand starting fuel manifold (15) from tee (6).

   B. Install Starting Fuel Manifold

      NOTE: Do not tighten connector nuts to full torque at this time.

      (1) Position left and right hand starting fuel manifold (7, 15) on tee (6) and hand tighten connector nuts.

      (2) Position washer (5) on tee (6).

      (3) Position manifolds over support cone and insert tee (6) into support cone bracket. Align connector nuts with starting fuel manifolds and hand tighten connector nuts.

      (4) Tighten all connector nuts 35 to 50 inch-pounds torque.

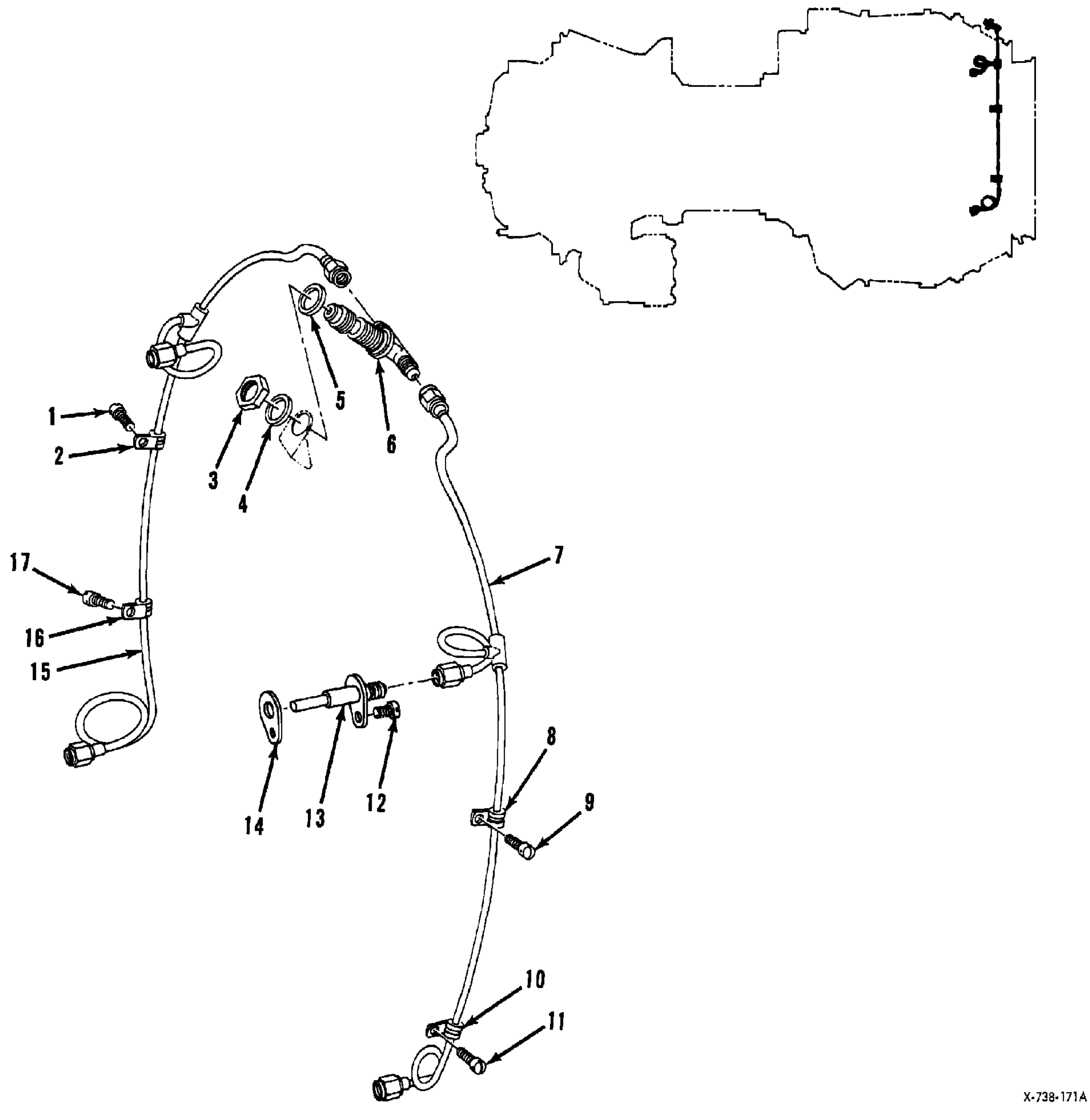
      (5) Install washer (4) and nut (3) on tee (6) and tighten 35 to 50 inch-pounds torque.

      (6) Secure clamps (2, 8, 10, 16) with screws (1, 9, 11, 17) to support cone. Tighten screws as required and lockwire.

2. Inspection/Check

   A. Inspect manifold for breaks, cracks, damaged connectors, and other conditions that would make manifolds unsatisfactory for further use.

   B. Replace manifolds that are damaged or show evidence of clogging.



Starting Fuel Manifolds and Starting Fuel Nozzles
Figure 201

KEY TO FIGURE 201

1. SCREW
2. CLAMP
3. NUT
4. WASHER
5. WASHER
6. TEE
7. LEFT HAND STARTING FUEL MANIFOLD
8. CLAMP
9. SCREW
10. CLAMP
11. SCREW
12. SCREW
13. STARTING FUEL NOZZLES
14. SEALING GASKET
15. RIGHT HAND STARTING FUEL MANIFOLD
16. CLAMP
17. SCREW

3. Cleaning/Painting

Completely clean starting fuel manifold, inside and out, with dry cleaning solvent (see 72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

MAIN FUEL MANIFOLD - DESCRIPTION AND OPERATION

1. Description and Operation

Two main fuel manifolds are secured to the rear of the combustion chamber housing. They receive fuel from the flow divider assembly, and deliver it to 22 fuel nozzles through either of two separate fuel passages.

MAIN FUEL MANIFOLD - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Main Fuel Manifold

CAUTION: TO PREVENT CONTAMINATION, ENCLOSE MANIFOLD IN A CLEAR PLASTIC BAG AND SECURE IN REUSABLE CONTAINER.

(1) Disconnect ignition leads from igniter plugs and clamps that secure leads to support cone. (See 74-20-02.)

(2) Remove starting fuel manifolds and starting fuel nozzles. (See 73-10-01 and 73-10-03.)

(3) Remove nut (1, Figure 201), spacers (2, 3), and bolt (4) that secure V-band (5). Separate from diffuser support cone assembly (6) and remove.

(4) Remove support cone assembly (6).

(5) Disconnect hose assemblies from main fuel manifold assemblies (13) and cap all open connectors.

(6) Remove bolts (7) that secure fuel manifold assembly to rear face of combustion chamber housing. Carefully withdraw manifold assembly from combustion chamber to avoid damage to parts.

(7) Remove seals (8) from fuel nozzles.

(8) Remove screw (9) securing sealing gasket (10) to fuel manifold. Remove gaskets.

B. Install Main Fuel Manifold

NOTE: Manifold assemblies can be used interchangeably on either right or left side of engine.

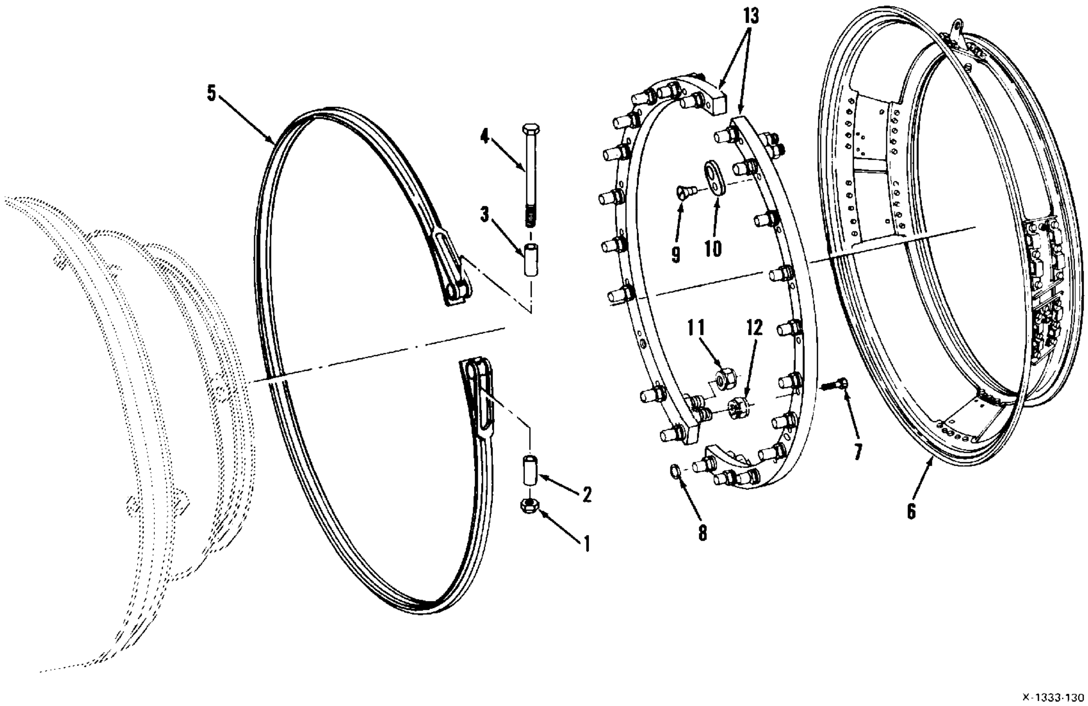
(1) Position sealing gaskets (10) on fuel manifold at 2, 4, 8, and 10 o’clock positions and secure with screws (9). Tighten screws as required.

(2) Position seals (8) on each nozzle.

(3) Remove caps (11, 12) from ports to be used on main fuel manifold assemblies (13).

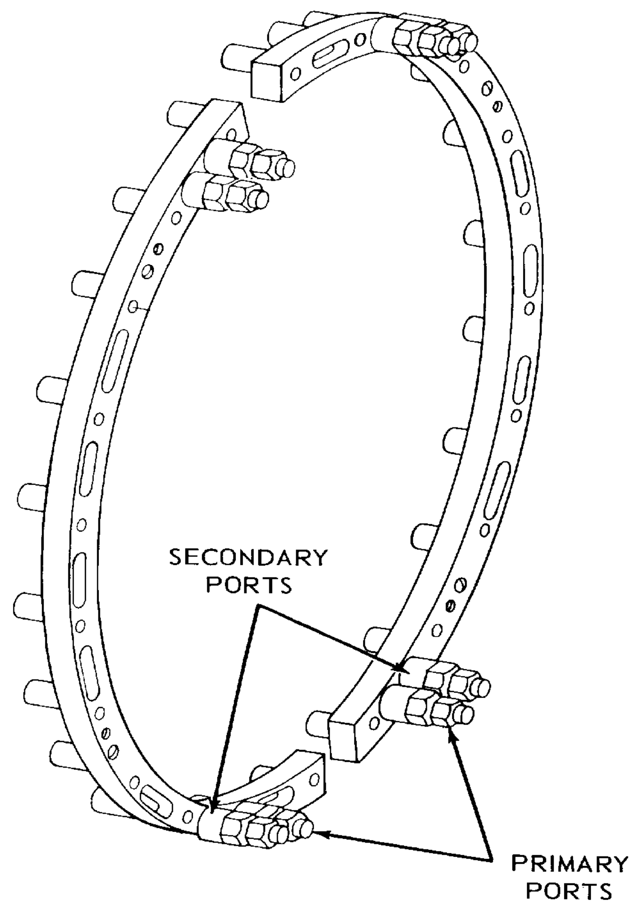
(4) Align primary ports on manifold with primary ports of flow divider and dump valve on rear face of combustion chamber housing. (See Figure 202.) Secure manifold assembly to housing with bolts (7, Figure 201). Tighten bolts as required and lockwire.

(5) Connect hose assemblies from flow divider to fuel manifold. Tighten hose connector 70 to 120 inch-pounds torque.



1. NUT
2. SPACER
3. SPACER
4. BOLT
5. V-BAND
6. SUPPORT CONE ASSEMBLY
7. BOLT
8. SEAL
9. SCREW
10. SEALING GASKET
11. CAP
12. CAP
13. MAIN FUEL MANIFOLD ASSEMBLIES

Main Fuel Manifold Assembly and Attaching Parts
Figure 201



Main Fuel Manifold - Primary and Secondary Ports
Figure 202

2. Inspection/Check

NOTE: Inspect fuel manifold while it is installed.

A. Inspect fuel manifold for leakage. Replace if leakage is noted.

B. Inspect fuel manifold for cracks or damage. Replace if cracks or damage are noted.

C. Inspect main fuel nozzles for chafing or excessive coke buildup. (See Figure 203.) Limits are as follows:

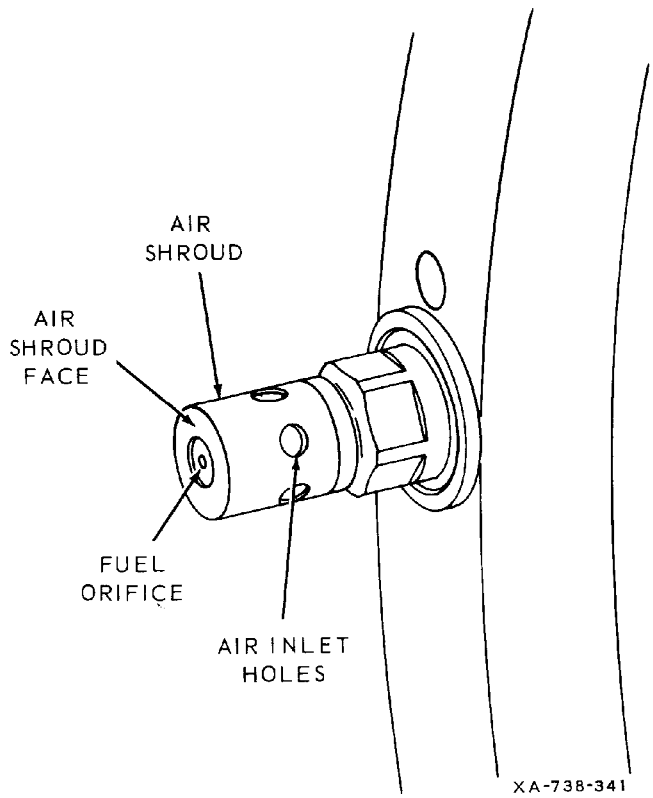
(1) Chafing or rub damage in front of air inlet holes is acceptable provided air shroud is not broken through.

(2) Any evidence of crushing at air inlet holes is unacceptable.

(3) Evidence of heavy coking at the nozzle fuel orifice outlet or at air inlet hoses is unacceptable. Coke buildup on air shroud face is acceptable provided it does not extend into the shroud.

(4) Inspect nozzle for proper torque 80 to 90 inch-pounds.

NOTE: Deleted



Main Fuel Nozzle – Inspection
Figure 203

STARTING FUEL NOZZLES - DESCRIPTION AND OPERATION

1. Description and Operation

   Four starting fuel nozzles, located at the 2, 4, 8, and 10 o'clock positions in the rear of the combustion chamber housing, deliver atomized fuel to the combustion chamber during starting. When the engine comes up to speed, starting fuel flow is stopped, and pressurized air from the combustor is directed through the check filter valve to purge the starting fuel lines and nozzles.

STARTING FUEL NOZZLES - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Starting Fuel Nozzles

      (1) Disconnect left and right hand starting fuel manifolds (73-10-01, 7, 15, Figure 201) from four starting fuel nozzles.

      (2) Remove screws (3, Figure 201) and withdraw starting fuel nozzles (2) from combustion chamber. Remove sealing gaskets (1).

   B. Install Starting Fuel Nozzles

      NOTE: The starting fuel nozzles are installed through mounting pads on the main fuel manifolds at approximately the 2, 4, 8, and 10 o'clock positions.

      (1) Place new sealing gasket (1, Figure 201) on starting fuel nozzles (2). Install starting fuel nozzles (2) into combustion chamber and secure with screws (3). Tighten screws as required and lockwire.

      (2) Connect left and right hand starting fuel manifolds (73-10-01, 7, 15, Figure 201) to nozzles and tighten connector nuts 35 to 50 inch-pounds torque.

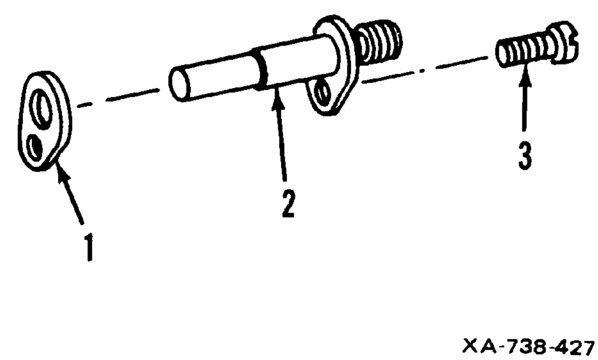
2. Inspection/Check

   NOTE: Perform inspection of starting fuel hose check filter valve if nozzles are clogged or heavily coked.

   Inspect starting fuel nozzles using pressure source of dry filtered air, inspect nozzles for clogging or damage. Replace nozzle if damaged or clogging cannot be removed.

3. Cleaning/Painting

   Clean starting fuel nozzles with fiber brush and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



1. SEALING GASKET
2. STARTING FUEL NOZZLE
3. SCREW

Starting Fuel Nozzle
Figure 201

FLOW DIVIDER AND DUMP VALVE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The flow divider and dump valve assembly is mounted under the exhaust diffuser support cone at the 6 o'clock position. The flow divider assembly receives fuel from the fuel regulator, and delivers it to the main fuel manifold through two passages. At low N1 speeds, the flow divider sends fuel through the primary system of the manifold. As N1 speed increases, fuel pressure increases, and the flow divider opens ports to the secondary system of the main fuel manifold. The flow divider is equipped with a drain port to drain fuel from the main fuel manifold and flow divider during engine shutdown.

FLOW DIVIDER AND DUMP VALVE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Flow Divider and Dump Valve Assembly

      CAUTION: IMMEDIATELY CAP HOSE ASSEMBLY PORTS.

      NOTE: Removal of flow divider and dump valve assembly shall not be accomplished unless replacement is intended.

      (1) Disconnect fuel inlet line and hose assemblies (1, 2, 7, 8, 13, Figure 201) from flow divider and dump valve assembly (6).

      (2) Remove support assembly. (See 72-40-00, Paragraph 2.A(3) and (4).)

      (3) Remove screws (3, 4, 5) that secure flow divider and dump valve assembly to exhaust diffuser support cone.

      (4) Remove flow divider and dump valve assembly (6) and spacer (9) from support cone.

   B. Install Flow Divider and Dump Valve Assembly

      (1) Position spacer (9) and flow divider and dump valve assembly (6) against exhaust diffuser support cone.

      (2) Secure flow divider with screws (3, 4, 5). Tighten screws as required and lockwire.

      (3) Reinstall support assembly. (See 72-40-00, Paragraph 2.B(42) through (45).)

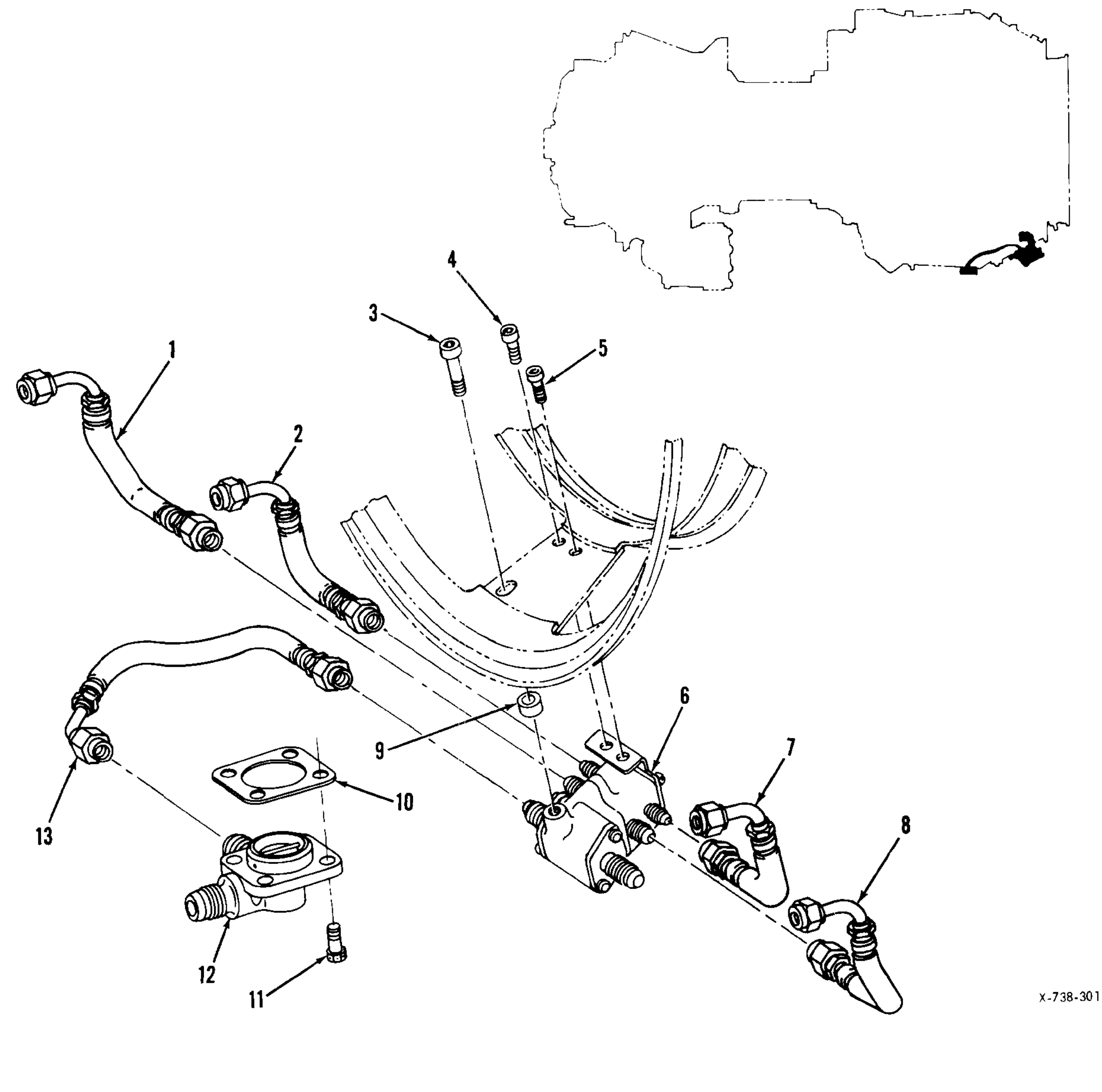
      (4) Connect hose assemblies (1, 2, 7, 8, 13) and fuel inlet line to flow divider. Tighten hose connectors as required.

2. Inspection/Check

   A. Inspect for nicks, burrs, and scratches. Repair flow divider and dump valve assembly.

   B. Inspect all threaded parts for crossed or damaged threads. Repair or replace.

   C. Visually inspect for cracks, distortion, and excessive wear. Replace if defective.



Flow Divider and Dump Valve Assembly and Combustion Chamber Drain Valve Assembly
Figure 201

KEY TO FIGURE 201

1. HOSE ASSEMBLY (SECONDARY)
2. HOSE ASSEMBLY (PRIMARY)
3. SCREW
4. SCREW
5. SCREW
6. FLOW DIVIDER AND DUMP VALVE ASSEMBLY
7. HOSE ASSEMBLY (PRIMARY)
8. HOSE ASSEMBLY (SECONDARY)
9. SPACER
10. GASKET
11. BOLT
12. COMBUSTION CHAMBER DRAIN VALVE ASSEMBLY
13. HOSE ASSEMBLY

3. Cleaning/Painting

Clean flow divider and dump valve assembly parts with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair crossed or damaged threads. (See SPM, SP R409, 70-25-03.) Replace parts having stripped or damaged threads that cannot be repaired.

FLOW DIVIDER HOSE ASSEMBLIES - DESCRIPTION AND OPERATION

1. Description and Operation

The flow divider hose assemblies connected to the flow divider and dump valve assembly are located under the exhaust diffuser support cone between the 5 and 7 o'clock positions. One line transports fuel from the fuel control to the flow divider and dump valve assembly. Four lines transport fuel from the flow divider to the main fuel manifold. One line allows residual fuel to drain from the flow divider to the overboard drain valve.

FLOW DIVIDER HOSE ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Flow Divider Hose Assemblies

CAUTION: IMMEDIATELY CAP FLOW DIVIDER AND FUEL MANIFOLD PORTS.

(1) Disconnect primary hose assemblies (73-10-04, 2, 7, Figure 201) from primary ports of fuel manifold and from primary ports of flow divider and dump valve assembly (6). Remove hose assemblies.

CAUTION: IMMEDIATELY CAP FLOW DIVIDER AND FUEL MANIFOLD PORTS.

(2) Disconnect secondary hose assemblies (1, 8) from secondary ports of fuel manifold and from secondary ports of flow divider and dump valve assembly. Remove hose assemblies.

CAUTION: IMMEDIATELY CAP FLOW DIVIDER AND DRAIN VALVE PORTS.

(3) Disconnect hose assembly (13) from flow divider and from combustion chamber drain valve assembly (12). Remove hose assembly.

B. Install Flow Divider Hose Assemblies

CAUTION: DO NOT REMOVE CAPS FROM PORTS UNTIL THE HOSE ASSEMBLY FOR THE PORT IS TO BE CONNECTED.

(1) Connect hose assembly (73-10-04, 13, Figure 201) to combustion chamber drain valve assembly (12) and to flow divider and dump valve assembly (6). Tighten hose connectors as required.

(2) Connect primary hose assemblies (2, 7) to primary ports of fuel manifold and primary ports of flow divider and dump valve assembly.

(3) Tighten hose connectors as required.

(4) Connect secondary hose assemblies (1, 8) to secondary ports of fuel manifold and secondary ports of flow divider. Tighten hose connectors as required.

2. Inspection/Check

A. Inspect hose assemblies for crossed or damaged threads.

B. Inspect hose assemblies for cuts, fraying, and chafing.

3. Cleaning/Painting

Clean hose assemblies with dry cleaning solvent (72-00-00, 62, Table 203).

4. Approved Repairs

A. Blend repair crossed or damaged threads using fine stone. (See SPM, SP R409, 70-25-03, SP R409.) Replace hose assemblies when threads are stripped or cannot be repaired.

B. Replace hoses that are cut, frayed, or chafed.

COMBUSTION CHAMBER DRAIN VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

The combustion chamber drain valve is at the 6 o’clock position on the combustion chamber housing. The drain valve is spring loaded open to allow drainage of residual fluids during engine shutdown. Internal pressure during engine operation keeps the valve closed. A port is at the side of the drain valve housing to allow unburned fuel to drain from the flow divider assembly through the overboard drain valve during engine shutdown.

COMBUSTION CHAMBER DRAIN VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Combustion Chamber Drain Valve

      (1) Disconnect hose assembly (73-10-04, 13, Figure 201) from combustion chamber drain valve assembly (12) and plug hose.

      (2) Remove bolts (11) that secure drain valve to combustion chamber housing. Remove combustion chamber drain valve assembly (12) and gasket (10).

      (3) Mark position of combustion chamber drain valve assembly (12) and gasket (10).

   B. Install Combustion Chamber Drain Valve

      (1) Position new gasket (10) and combustion chamber drain valve assembly (12) on combustion chamber housing.

      CAUTION: BOLTS MUST NOT EXCEED 3/8 INCH IN LENGTH.

      (2) Secure combustion chamber drain valve assembly with bolts (11). Tighten bolts 35 to 40 inch-pounds torque and lockwire.

      (3) Connect hose assembly (13) to drain valve assembly. Tighten hose connectors as required.

2. Inspection/Check

   A. Inspect Combustion Chamber Drain Valve

      (1) Inspect mounting flange for warpage and cracks. Replace if warpage or cracks are noted.

      (2) Inspect for crossed or damaged threads. Replace valve if threads are damaged.

      CAUTION: BOLTS MUST NOT EXCEED 3/8 INCH IN LENGTH.

      (3) Remove lockwire. Check four bolts (11), which secure combustion chamber drain valve, for 35 to 40 inch-pounds torque. If bolts are loose, drain valve must be removed, then reinstalled with new gasket (10) and secured with bolts (11). Tighten bolts 35 to 40 inch-pounds torque and lockwire.

   B. Check combustion chamber drain valve functioning by depressing plate. If plate does not return to original position, reclean or replace valve.

3. Cleaning/Painting

   Thoroughly clean combustion chamber drain valve assembly with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

STARTING FUEL HOSES AND CHECK FILTER VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

The starting fuel hoses are located on the upper left side of the engine. They direct starting fuel flow from the fuel control to the starting fuel solenoid valve, and then from the solenoid valve to the starting fuel manifold. A check filter valve, mounted on the combustion chamber housing, opens when compressor rotor speed increases to 80 to 87 percent and bleeds pressurized air from the combustion chamber to purge the starting fuel lines and starting fuel nozzles of fuel.

STARTING FUEL HOSES AND CHECK FILTER VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Starting Fuel Hoses and Check Filter Valve

(1) Disconnect elbow (27, Figure 201) from hose assembly (1) and from fuel control. Remove union.

(1a) Disconnect hose assembly (1) from solenoid valve assembly (22). Remove hose assembly.

(2) Remove screw (21) and nut (18) from clamp (20).

(3) Remove screw (16) and nut (13) from clamp (17).

(4) Remove screw (15) from clamp (14) and disconnect hose assembly from check filter valve (8).

(5) Disconnect hose assembly (19) from solenoid valve assembly (22) and from starting fueling manifold. Remove hose assembly.

(6) Remove bolt (10) gaskets (11, 12) from boss on combustor housing. Discard packings.

(7) Disconnect tube assembly (9) from check filter valve (8). Remove tube assembly.

(8) Loosen screw (7) and nut (6) on bracket and clamp assembly (4 or 5) and remove check filter valve (8).

(9) Remove bolt and nut that secure bracket and clamp assembly to combustor housing.

B. Install Starting Fuel Hoses and Check Filter Valve

NOTE: Apply anti-seize compound (72-00-00, 15, Table 203) to threads of bolt (10, Figure 201).

(1) Position tube assembly (9) on combustion chamber housing and secure with bolt (10) and gaskets (11, 12). Do not tighten bolt at this time.

(2) Secure bracket and clamp assembly (4 or 5) to combustor housing with bolt and nut.

(3) Position check filter valve (8) in bracket and clamp assembly (4 or 5) with arrow on top of valve and pointing away from tube assembly (9). Tighten screw (7) and nut (6) on bracket and clamp assembly, lightly.

NOTE: A filter is located at the air inside of check filter valve.

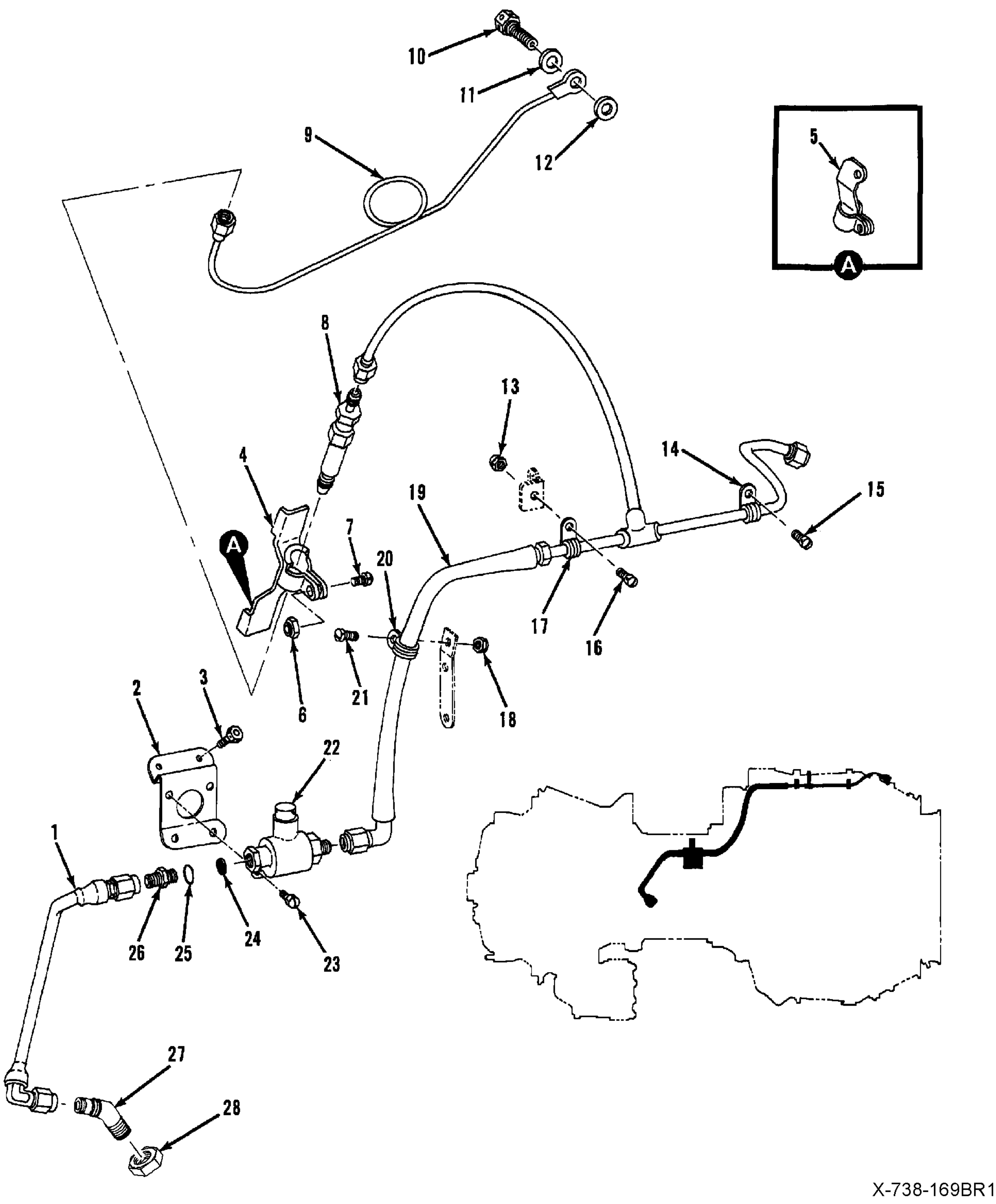
(4) Connect tube assembly (9) to check filter valve and torque as required.

(5) Connect hose assembly (19) to solenoid valve assembly (22), starting fuel manifold, and check filter valve (8). Torque connections as required.

(6) Tighten bolt (10) 90 to 120 inch-pounds torque and lockwire.

(7) Tighten screw (7) that secures valve in bracket and clamp assembly (4 or 5).

(8) Secure clamp (17) with screw (16) and nut (13).



Starting Fuel Hose Assemblies, Solenoid Valve, and Check Filter Valve
Figure 201

KEY TO FIGURE 201

1. HOSE ASSEMBLY
2. BRACKET
3. BOLT
4. BRACKET AND CLAMP ASSEMBLY
5. BRACKET AND CLAMP ASSEMBLY
6. NUT
7. SCREW
8. CHECK FILTER VALVE
9. TUBE ASSEMBLY
10. BOLT
11. GASKET
12. GASKET
13. NUT
14. CLAMP
15. SCREW
16. SCREW
17. CLAMP
18. NUT
19. HOSE ASSEMBLY
20. CLAMP
21. SCREW
22. SOLENOID VALVE ASSEMBLY
23. SCREW
24. FILTER
25. PACKING
26. UNION
27. ELBOW
28. NUT

(9) Secure clamp (20) with screw (21) and nut (18).

(10) Connect hose assembly (1) to solenoid valve assembly (22).

(11) (Post SB T53-L-13B-0099) Connect elbow (27) to hose assembly (1). Torque hose connector 165 to 180 inch-pounds.

(12) (Post SB T53-L-13B-0099) Connect elbow (27) to fuel control with nut (28). Torque nut 135 to 150 inch-pounds.

2. Inspection/Check

A. Inspect check filter valve. If starting fuel nozzles were heavily coked or clogging was evident, perform the following:

CAUTION: INSTALL CHECK VALVE WITH ARROW POINTING LEFT OVER TOP OF ENGINE (AS VIEWED FROM REAR OF ENGINE).

(1) Remove check valve and apply light air pressure to the upstream (air) side of the valve. (Mouth pressure is sufficient to perform test.)

(2) Blow in direction of the inscribed flow arrow.

(3) If unrestricted flow is evident, valve is acceptable for further use provided check valve closes when air pressure is applied to the opposite end.

(4) Replace valve if flow is restricted or check valve fails to close.

B. Inspect hoses for cuts, fraying, or chafing.

C. Inspect for crossed or damaged threads on connector nuts.

D. Inspect valve body for damage. Replace if valve is damaged.

E. Inspect tube assembly for cracks.

F. Visually and fluorescent penetrant inspect bracket and clamp assembly (5) for cracking in and adjacent to welded joints. (See SPM, SP I305, 70-20-05.)

3. Cleaning/Painting

A. Clean hose assemblies and check filter valve with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

B. Clean all other parts with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Repair minor thread damage using small triangular file. (See SPM, SP R409, 70-25-03.) Replace parts having stripped threads or threads damaged beyond repair.

B. Replace hoses that are frayed, chafed, or cut.

C. Replace tube assembly if cracks are noted.

D. Weld repair cracks in and adjacent to welded joints in bracket and clamp assembly (5, Figure 201) using welding wire (72-00-00, 70, Table 203). (See SPM, SP R402, 70-45-01.) Inspect to Class IV weld criteria.

E. Replace check filter valve if damage other than thread damage is noted.

STARTING FUEL SOLENOID VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

The starting fuel solenoid valve is mounted on a bracket which is secured to the compressor housing at the 10 o’clock position. When energized, the valve opens and allows starting fuel from the fuel regulator to flow to the starting fuel manifold.

STARTING FUEL SOLENOID VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Starting Fuel Solenoid Valve

      WARNING: MAKE SURE THAT ALL ELECTRICAL POWER IS DISCONNECTED.

      (1) Disconnect electrical connector from solenoid valve assembly (73-10-07, 22, Figure 201).

      (2) Disconnect hose assemblies (1, 19) from solenoid valve assembly.

      (3) Remove bolts (3) that secure solenoid valve assembly (22) and bracket (2) to compressor housing. Remove screws (23) and separate solenoid valve assembly (22) and bracket (2).

      (4) Remove union (26) and packing (25) from solenoid valve assembly (22).

   B. Install Starting Fuel Solenoid Valve

      (1) Install union (26) and packing (25) into inlet port of solenoid valve assembly (22).

      (2) Secure solenoid valve assembly to bracket (2) with screws (23). Tighten screws as required and lockwire.

      (3) Secure solenoid valve assembly and bracket to compressor housing with bolts (3). Tighten bolts as required and lockwire.

      (4) Connect hose assemblies (1, 19) to solenoid valve assembly. Tighten hose connector 70 to 120 inch-pounds torque.

      (5) Connect connector from main wiring harness to solenoid valve assembly and lockwire.

2. Inspection/Check

   A. Inspect electrical connector on solenoid valve for corrosion, damaged threads, cracked insulator, and bent or broken pins.

   B. Inspect screen on inlet port of solenoid valve to ensure that screen has been thoroughly cleaned and mesh is not damaged.

   C. Inspect inlet port union for damaged threads.

3. Cleaning/Painting

   Clean starting fuel solenoid valve with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Remove corrosion with crocus cloth (72-00-00, 13, Table 203) and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

B. Blend repair minor thread damage on electrical connector. (See SPM, SP R401, 70-25-01.) Replace valve if thread damage cannot be repaired.

C. Replace solenoid valve if insulator is cracked or pins are bent or broken.

D. Replace inlet port union if threads are damaged. Replace packing.

E. Replace screen if damaged.

MAIN FUEL HOSE ASSEMBLIES - DESCRIPTION AND OPERATION

1. Description and Operation

   The main fuel hose assemblies are located on the lower left side of the engine under the combustor housing.

MAIN FUEL HOSE ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Main Fuel Hose Assemblies

      (1) Remove screw (6, Figure 201) and nut (1) from clamp (2).

      (2) Remove screw (5) from clamp (4).

      (3) Disconnect hose assembly (3) from fuel control assembly and from flow divider and dump valve assembly.

   B. Install Main Fuel Hose Assemblies

      (1) Connect hose assembly (3) to fuel control assembly and to flow divider and dump valve assembly. Tighten hose connections 100 to 250 inch-pounds torque.

      (2) Secure clamp (2) to bracket on forward flange of combustion chamber housing with screw (6) and nut (1). Secure clamp (4) with screw (5).

2. Inspection/Check

   A. Inspect for damaged threads on connector nuts.

   B. Inspect hose assemblies for cuts, fraying and chafing.

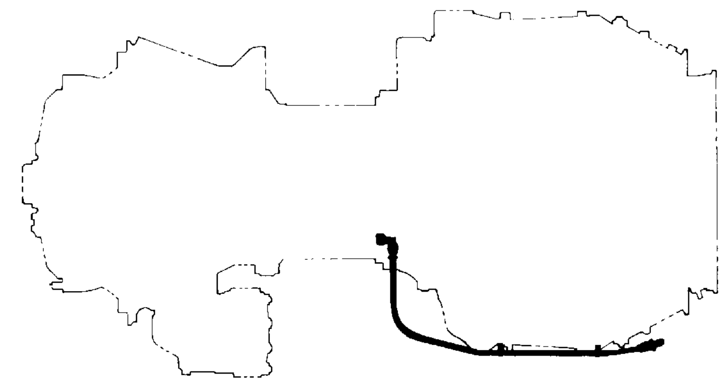
3. Cleaning/Painting

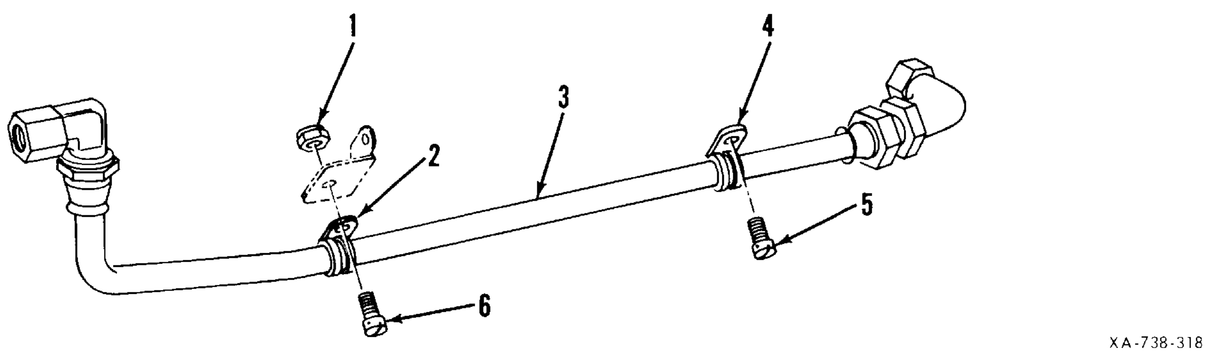
   Clean main fuel hose assemblies by flushing in dry cleaning solvent (72-00-00, 26, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

   A. Blend repair damaged threads using fine stone. (See SPM, SP R401, 70-25-01.) Replace hose assembly when threads are stripped or cannot be repaired.

   B. Replace hose assembly if cut, frayed, or chafed.





1. NUT
2. CLAMP
3. HOSE ASSEMBLY
4. CLAMP
5. SCREW
6. SCREW

Main Fuel Hose Assembly
Figure 201

FUEL CONTROL SYSTEM - DESCRIPTION AND OPERATION

1. Description and Operation

A. Fuel Control System

The fuel control system consists of a primary control for the gas producer section and an overspeed governor for the power turbine section. (See Figure 1.) An integral dual fuel pump and an emergency (manual) control system are incorporated in the primary control unit. The fuel control incorporates acceleration and deceleration controls and a droop type governor for steady state speed control. The main metering valve of the fuel regulator is the controlling unit by which the main fuel flow is metered to the engine. Its position is determined by the action of the gas producer speed governor, the power turbine overspeed governor, or the acceleration deceleration control, depending upon engine requirements. In regulating the main metering valve, the governor or control that demands the least fuel flow overrides all others, except the deceleration control, to ensure a minimum fuel flow rate.

NOTE: The fuel regulator incorporates an emergency (manual) control system.

B. Gas Producer Speed Control

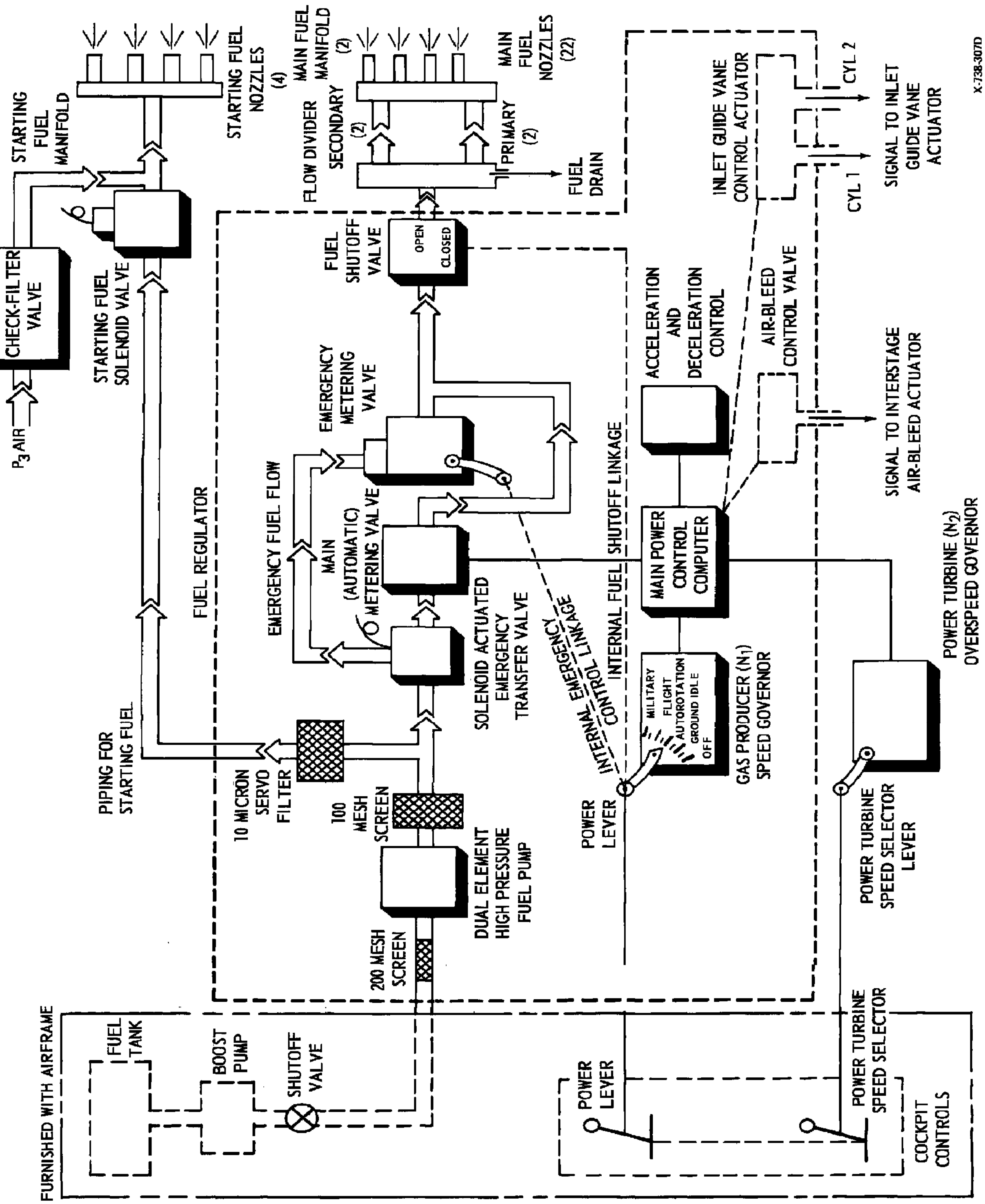
The functions of the gas producer speed control are to govern ground and flight idle operations, to limit the maximum power of the engine, and to maintain steady state conditions through all power regimes. The gas producer speed governor is driven, through gears, at a speed proportional to the gas producer rotor speed. It regulates gas producer rotor speed to the value selected by the power lever. Acceleration fuel flow limits are scheduled over the entire operating range by scheduling maximum fuel flow as a function of gas producer rotor speed and compressor inlet pressure and temperature. The absolute maximum fuel flow for acceleration or steady state operation is determined by the maximum fuel flow stop setting. The deceleration fuel flow limits are scheduled as a function of gas producer rotor speed and compressor inlet pressure. The absolute minimum fuel flow for deceleration or steady state operation is determined by the minimum fuel flow stop setting.

C. Power Turbine Overspeed Control

The power turbine rotor is protected against overspeed operation by the power turbine overspeed control (overspeed governor). The power turbine governor is driven, through gears, at a speed proportional to power turbine rotor speed. Limits for the power turbine governor are set by adjustable stops.

D. Automatic Fuel System Operation

Fuel enters the dual fuel pump after passing through the inlet screen. It is then pumped through the check valves and the outlet screen to the transfer valve. With the transfer valve in the normal position for automatic operation, fuel flows to the main metering valve at a pressure controlled by the main pressure regulating valve. The position of the main metering valve and hence the flow of fuel is automatically controlled by the computer section of the fuel control. The metered fuel flows through the open shutoff valve and the fuel discharge port to the engine flow divider main fuel manifold atomizing nozzles in combustion chamber. When the transfer valve is in the emergency position, fuel flows through and is metered by the emergency (manual) metering valve. Fuel pressure is controlled by the emergency pressure regulating valve, and fuel is delivered through the open shutoff valve to the fuel discharge port and to the engine. The area of the valve opening and the resulting flow of fuel are determined by the position of the power lever controlled from the cockpit.



Fuel System Diagram
Figure 1

E. Emergency (Manual) Fuel System Operation

If the automatic fuel control system fails, a changeover to the emergency (manual) fuel system should be made in accordance with the airframe instructions. (See Figure 1.) When the emergency system is in operation, the main metering valve is bypassed and fuel is metered to the engine by the manual system metering valve, which is positioned from the pilot's compartment by the power lever. Acceleration and deceleration control is not provided in the emergency system.

CAUTION: THE POWER LEVER SHOULD NOT BE MOVED RAPIDLY WHEN THE EMERGENCY FUEL SYSTEM IS IN OPERATION. ENGINE OVERSPEED OVERTEMPERATURE OR POSSIBLE FLAMEOUT COULD RESULT.

NOTE: The emergency fuel system does not affect the operation of the starting fuel system if engine restart is required.

F. Fuel Control Power Lever

The power lever on the fuel control modulates the engine from start to takeoff power. Total travel of the lever is 100 degrees. There is a 3 degree dwell at ground idle position and a 4 degree dwell at flight idle position.

OFF - 0 degrees

Ground idle - 23 to 26 degrees

Flight idle - 38 to 42 degrees

Normal - 83 degrees

Takeoff - 100 degrees

FUEL CONTROL ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The fuel control assembly consists of an overspeed governor and a fuel regulator. The overspeed governor maintains a constant power turbine rotor speed as power requirements change. The fuel regulator is a hydromechanical device containing a dual element fuel pump, compressor rotor speed governor, acceleration and deceleration control, air-bleed control signal mechanism, inlet guide vane control signal mechanism, fuel shutoff valve, and an emergency (manual) control system. Functionally, the fuel regulator is divided into a flow control section and a computer section. The flow control section consists of components that schedule the position of the metering valve of the flow control section as a function of input signals.

TEMPORARY REVISION NO. 95

INSERT PAGE 8 OF 11 THRU 9 OF 11 FACING 73-20-01, PAGE 201.

Reason: To add Note in Step 2.A and to add procedure for performing visual inspection of fuel control unit external drive spline and gearbox internal drive spline interface.

Note in Step 2.A, Step 2.A.(8A), and Figure 201A are added as follows:

2.

A. NOTE: Spline interface of the fuel control external drive spline and gearbox fuel control drive gearshaft internal drive spline must be inspected at each access.

(8A) Upon removal, perform visual inspection of fuel control unit external drive spline as follows:

(a) Visually inspect external drive spline for wear debris on spline surfaces. (See Figure 201A.) If any evidence of wear debris is found on the spline, inspect external spline per paragraph 5. Also clean and inspect internal drive spline per 72-60-01, paragraph 2.

WARNING: THE FUEL CONTROL EXTERNAL DRIVE SPLINE AND GEARBOX INTERNAL DRIVE SPLINE INTERFACE IS OIL WETTED. LUBRICATE GEARBOX INTERNAL DRIVE SPLINE FOR FUEL CONTROL DRIVE SHAFT WITH LUBRICATING OIL (72-00-00, 41 OR 42, TABLE 203). DO NOT LUBRICATE DRIVE SHAFT SPLINE WITH GREASE OR OTHER UNAPPROVED LUBRICANT. USE OF GREASE OR NON APPROVED LUBRICANTS MAY BLOCK OIL PASSAGES IN THE SPLINE INTERFACE. BLOCKAGE OF OIL PASSAGES CAN CAUSE SEVERE SPLINE WEAR AND LEAD TO SPLINE FAILURE.

NOTE: Lubricate with engine oil only, do not use grease. To mesh the splines of the fuel regulator with drive gearshaft, remove N_1 tachometer generator and, using 1/4 inch drive extension and ratchet, turn tachometer drive gear until fuel regulator drive gearshaft splines mesh with splines on fuel regulator. Reinstall tachometer generator.

TEMPORARY REVISION NO. 95

ICN-99193-0000116932-001-01

Fuel Control Unit Drive Spline With Wear Particulate Residue
Figure 201A

See TR

FUEL CONTROL ASSEMBLY - MAINTENANCE PRACTICES

1. Servicing

Fuel Control Priming. (See 72-00-00, ENGINE - SERVICING, Paragraph 3.A.)

2. Removal/Installation

A. Remove Fuel Control Assembly

WARNING: MAKE SURE THAT ALL ELECTRICAL POWER IS DISCONNECTED.

(1) Disconnect and tag all fuel, air, mechanical, and electrical connections. Cap all open ports.

(2) Remove screw (14, Figure 201), spacer (15), and nut (27) that secure clamp (16) to bracket.

CAUTION: EXERCISE EXTREME CARE IN REMOVING AND HANDLING THE LOWER AND UPPER HOUSINGS (10, 11), WHICH CONTAIN THE TEMPERATURE SENSING ELEMENT. NICKS, DENTS, OR SHARP BENDS MAY DESTROY THE CAPILLARY ACTION OF THE TUBE. THE TEMPERATURE SENSING ELEMENT AND CAPILLARY TUBE ARE CALIBRATED TO THE FUEL CONTROL. DO NOT DISCONNECT CAPILLARY TUBE FROM THE FUEL CONTROL. THE TEMPERATURE SENSING ASSEMBLY SHALL BE REMOVED ALONG WITH THE FUEL CONTROL.

(3) Remove bolts (13) and washers (12) that secure upper housings (11) and lower housing (10) to inlet housing. Remove housings and gasket (9).

(4) Remove power driven rotary booster pump. (See 79-20-02.)

(5) Using 8-32 threaded rod, pull shaft (2) and spline nuts (1, 3) through overspeed governor and tachometer drive housing.

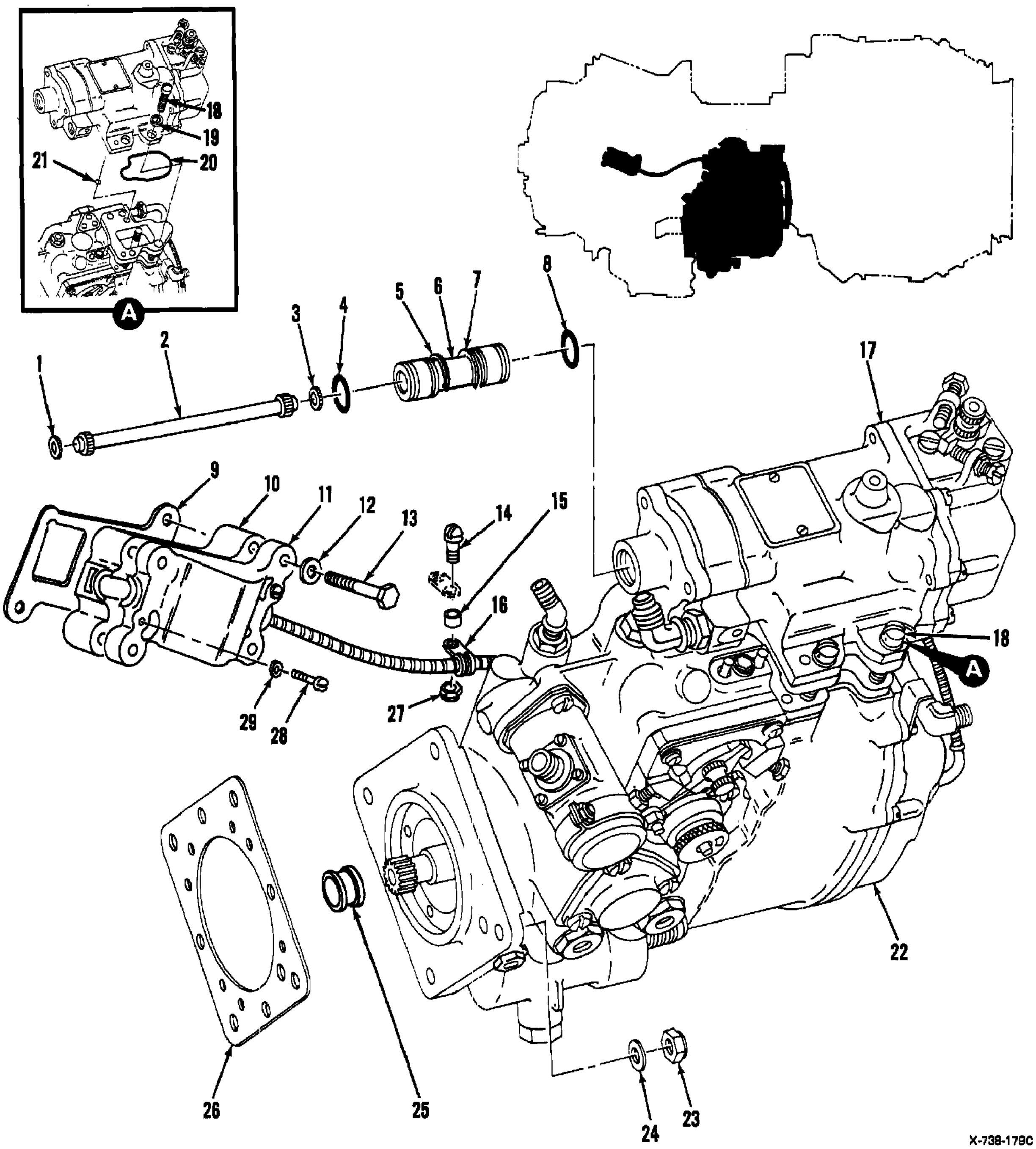
(6) Slide snapring (5) aft toward center of tube (6) and push tube forward into the overspeed governor and tachometer drive housing.

NOTE: Cut lockwire and remove two bolts that secure ignition lead and coil assembly mount bracket and move bracket to eliminate interference with aft movement of fuel control during removal.

(7) Support fuel control assembly and remove nuts (23) and washers (24).

CAUTION: CARE SHALL BE TAKEN WHEN REMOVING OR INSTALLING FUEL CONTROL ASSEMBLY TO PREVENT DAMAGE TO THE DRIVE SHAFT CARBON SEAL. IF CARBON SEAL IS DAMAGED, SERIOUS FUEL LEAKAGE COULD OCCUR.

(8) Withdraw fuel control assembly, keeping it as level as possible to prevent damage to drive shaft carbon seal. Remove gasket (26) and seal (25).



Fuel Control Assembly
Figure 201

KEY TO FIGURE 201

1. SPLINE NUT
2. SHAFT
3. SPLINE NUT
4. PACKING
5. SNAPRING
6. TUBE
7. SNAPRING
8. PACKING
9. GASKET
10. LOWER HOUSING
11. UPPER HOUSING
12. WASHER
13. BOLT
14. SCREW
15. SPACER
16. CLAMP
17. OVERSPEED GOVERNOR
18. SCREW
19. WASHER
20. PACKING
21. PACKING
22. FUEL REGULATOR
23. NUT
24. WASHER
25. SEAL
26. GASKET
27. NUT
28. SCREW
29. WASHER

(9) Preserve fuel control assembly if it is to be removed for more than 48 hours. (See 72-00-00, ENGINE - SERVICING, Paragraph 5.I.)

(10) Remove screws (28, Figure 201) and washers (29) that secure upper housing (11) to lower housing (10) and separate housings. Retain housings for installation of fuel control assembly.

B. Install Fuel Control Assembly

CAUTION: THE TEMPERATURE SENSING ELEMENT AND CAPILLARY TUBE ARE CALIBRATED TO THE FUEL CONTROL. MAKE SURE THAT CAPILLARY TUBE HAS NOT BEEN DISCONNECTED FROM THE FUEL CONTROL. THE TEMPERATURE SENSING ASSEMBLY SHALL BE INSTALLED ALONG WITH THE FUEL CONTROL. USE EXTREME CARE TO AVOID DAMAGE TO THE TUBE. DO NOT SEPARATE THE TUBE FROM THE FUEL CONTROL ASSEMBLY.

(1) Prior to installation of the fuel control, perform the following check of the silicone oil level to the fuel control.

(a) Remove the hose assembly 1-300-135-XX.

(b) With the fuel control positioned in the as installed position, remove fitting AN815-4D from the P1 fitting boss.

CAUTION: MAKE SURE THE MEASURING STICK IS CLEAN SO THE SILICONE OIL DOES NOT BECOME CONTAMINATED.

(c) Use a clean wooden stick, or equivalent, to determine if the silicone oil level is no lower than 3.5 inches below the P1 fitting boss.

(d) If the oil level is low, service in accordance with the instructions found in 72-00-00 3.B.

(e) Reinstall the fitting AN815-4D when the silicone oil level is satisfactory.

(f) Reinstall the hose assembly 1-300-135-XX.

CAUTION: THE TEMPERATURE SENSING ELEMENT AND CAPILLARY TUBE ARE CALIBRATED TO THE FUEL CONTROL. MAKE SURE THAT CAPILLARY TUBE HAS NOT BEEN DISCONNECTED FROM THE FUEL CONTROL. THE TEMPERATURE SENSING ASSEMBLY SHALL BE INSTALLED ALONG WITH THE FUEL CONTROL. USE EXTREME CARE TO AVOID DAMAGE TO THE TUBE. DO NOT SEPARATE THE TUBE FROM THE FUEL CONTROL ASSEMBLY.

(1A) Install packing (8) in groove of tube (6).

(2) Insert tube (6) into overspeed governor and tachometer drive housing.

(3) Position gasket (26) on fuel control pad of accessory drive gearbox and install seal (25).

CAUTION: DO NOT ALLOW THE WEIGHT OF THE FUEL CONTROL TO REST UPON THE DRIVE GEARSHAFT SPLINES. WEIGHT OF THE FUEL CONTROL MUST BE SUPPORTED UNTIL CONTROL IS INSTALLED.

NOTE: Do not lubricate drive shaft splines. To mesh the splines of the fuel regulator with drive gearshaft, remove N1 tachometer generator and, using 1/4 inch drive extension and ratchet, turn tachometer drive gear until fuel regulator drive gearshaft splines mesh with splines on fuel regulator. Reinstall tachometer generator.

(4) Install fuel control assembly on accessory drive gearbox.

(5) Secure fuel control assembly with washers (24) and nuts (23). Tighten nuts 125 to 140 inch-pounds torque.

NOTE: Reinstall lead and coil assembly and mount bracket, and secure with two bolts. Tighten bolts as required and lockwire.

(6) Slide tube aft into overspeed governor.

(7) Position snaprings (5, 7) into grooves on both ends of tube. Adjust tube to allow snaprings to position properly.

CAUTION: DO NOT DAMAGE PACKINGS ON TEMPERATURE SENSING ELEMENT.

(8) Assemble upper and lower housing (10, 11) and secure with screws (28) and washers (29).

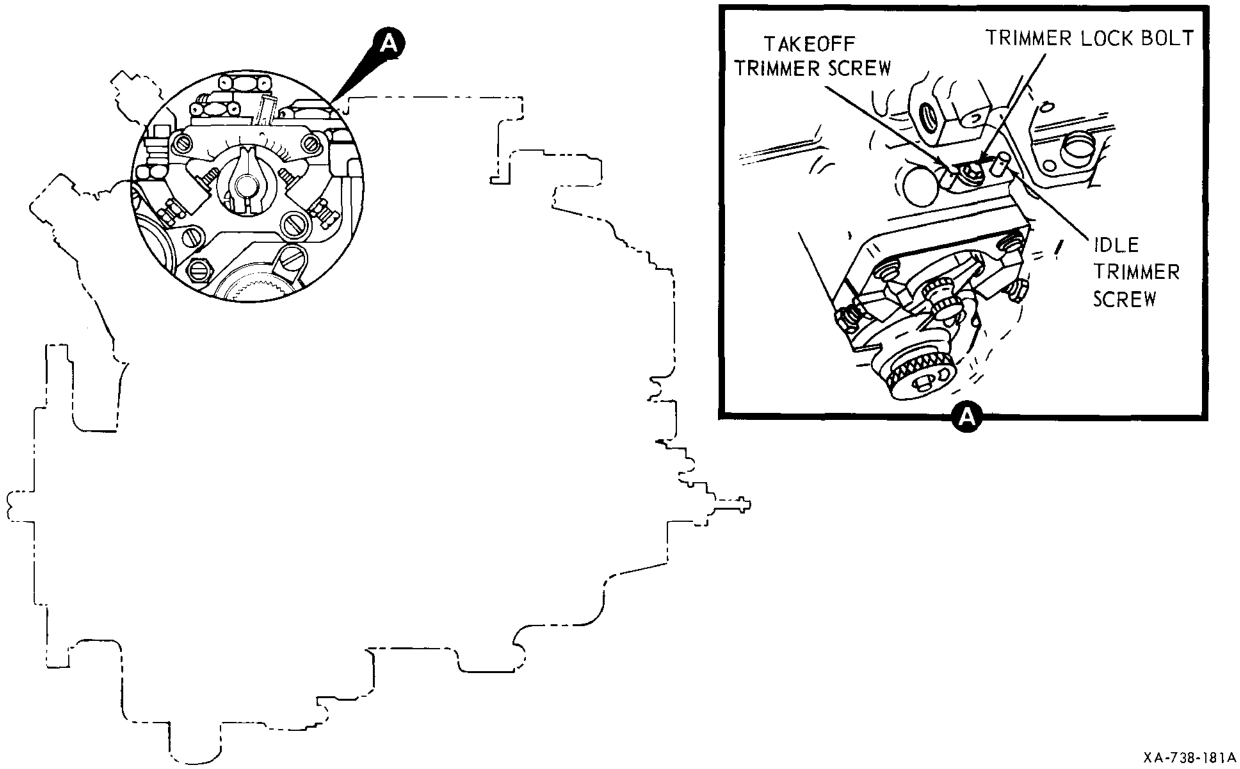
NOTE: Ensure that element is installed in the same position as when removed. The curved ends of the fins at forward end of tube should face inboard.

(9) Perform end float check and install drive shaft. (See 72-60-02.)

(10) Position housings (10, 11) and gasket (9) on inlet housing and secure with washers (12) and bolts (13). Tighten bolts as required and lockwire.

(11) Secure clamp (16) to bracket with screw (14), spacer (15), and nut (27).

(12) Install power driven rotary (booster) pump. (See 79-20-02.)



Fuel Control Assembly Adjustments
Figure 202

CAUTION: MAKE SURE VARIABLE INLET GUIDE VANE CONTROL LINES ARE NOT REVERSED DURING INSTALLATION. ENGINE SURGE COULD RESULT.

NOTE: Make sure that a minimum of five rod end threads are engaged in feedback tube ends and the number of threads exposed on both rod ends is approximately equal.

Washer (20) may be omitted if it causes tube assembly (16) to contact fuel control assembly.

Make sure that end of blast mark area or scribed area on VIGV control rod aligns with scribe mark on rigging plate with VIGV actuator in full open position, and that linkage is free and clear throughout range of movement. (See 75-30-01, Figure 203.)

(13) Connect all fuel, air, mechanical, and electrical connections. To secure VIGV feedback tube assembly to fuel control arm, insert bolt (75-30-01, 23, Figure 201) through washers (22), rod end bearing (21), and washer (20). Screw bolt (23) into fuel control arm, then install one or more washers (19) and safety with cotter pin (18). Secure jam nuts (15, 17) with lockwire.

(14) Prime fuel control assembly. (See 72-00-00, ENGINE - SERVICING, Paragraph 3.A.)

CAUTION: AN IMPROPERLY ADJUSTED AIR-BLEED OR VIGV SYSTEM CAN CAUSE ENGINE SURGE.

(15) After replacement of a fuel control assembly or regulator, an adjustment/test of the fuel control and the variable inlet guide vane system must be performed to ensure that engine will produce required power and that air-bleed and VIGV system operation is within limits. (See Paragraph 3, and 75-30-01, Paragraph 2.)

3. Adjustment/Test

A. The fuel control trim shall be checked and adjusted at installation of a new engine, installation of a new fuel control assembly, installation of a new overspeed governor, or when incorrect adjustment is suspected. Adjustment to the fuel control assembly installed on an engine is limited to bleed band closure point, VIGV, and trim adjustment. (See Figure 202.)

WARNING: ADJUSTMENT TO THE FUEL CONTROL ASSEMBLY MAY AFFECT SAFETY OF FLIGHT. ONLY DESIGNATED AND QUALIFIED PERSONNEL WILL BE PERMITTED TO PERFORM THE ADJUSTMENTS. RECORD ORIGINAL FUEL CONTROL ASSEMBLY SETTINGS BEFORE MAKING ANY ADJUSTMENTS.

NOTE: The engine compressor should be clean prior to adjustment/test of fuel control assembly and an adjustment/test check of the variable inlet guide vane system should be performed. (See 72-00-00, ENGINE - CLEANING, Paragraph 2 and 75-30-01, Paragraph 2.)

B. Power Check and Trim Adjustment

This procedure shall be accomplished after fuel control or nozzle replacement or if engine performance appears to deviate from desirable limits.

(1) Ensure that the throttle is hitting both stops and has freedom of travel through the full arc.

(2) From the engine data plate, note and record the torque psi at 1125 foot-pounds torque.

(3) Start the engine and stabilize for 5 minutes at flight idle. Make sure that the anti-icing and customer air-bleed are off.

(4) Note the Outside Air Temperature (OAT) in degrees centigrade from the cockpit indicator. Add 7°F (3°C) to this reading to compensate for temperature rise through the air inlet duct and record.

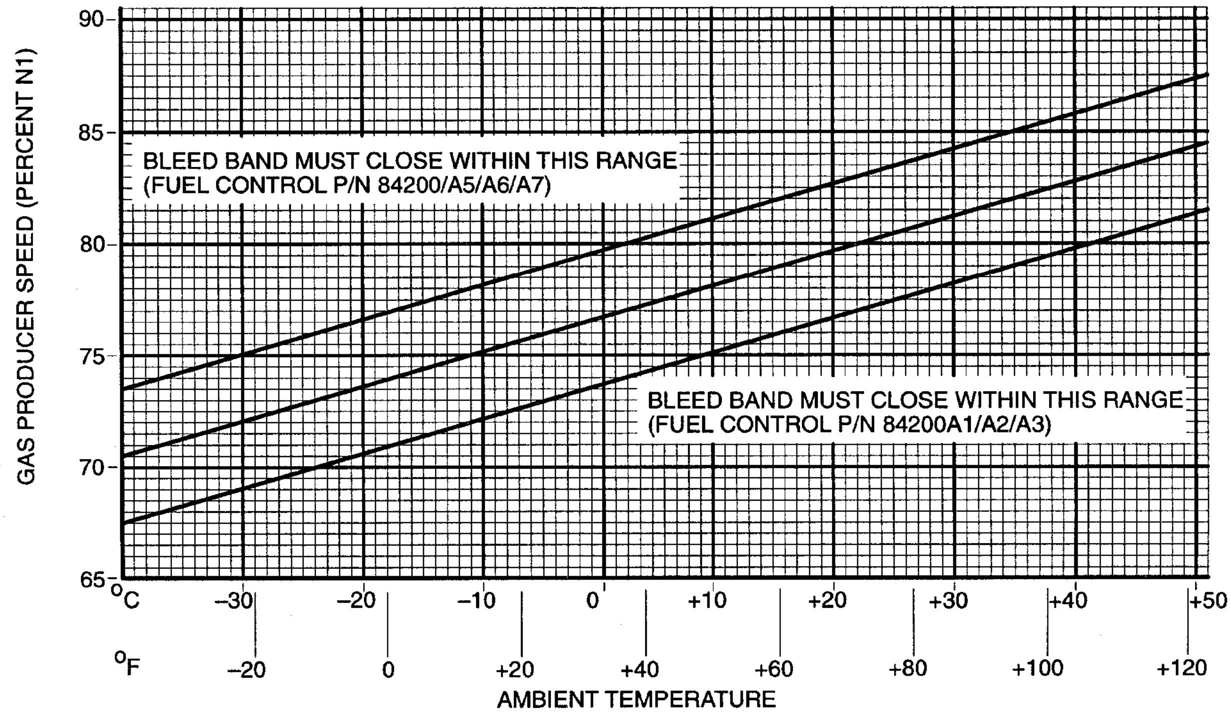
TEMPORARY REVISION NO. 82

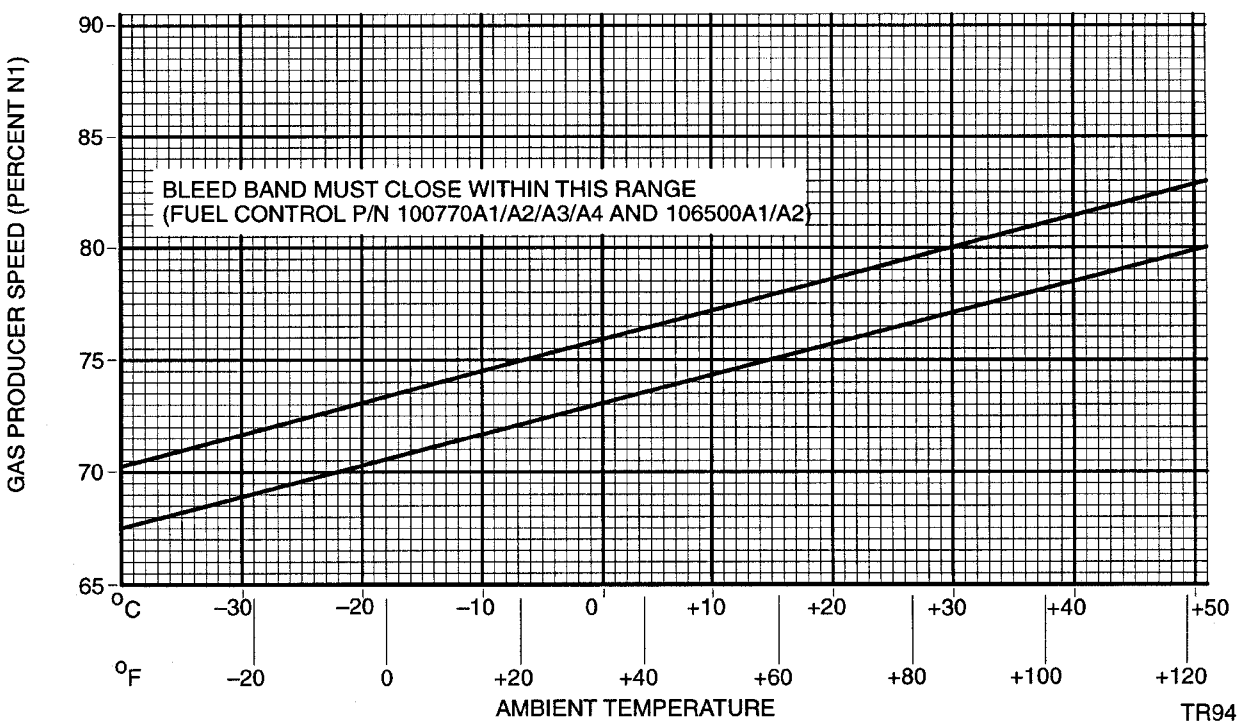
TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 73-20-01, PAGE 206.

Reason: To correct temperature compensation

Paragraph B.(4) is revised to read as follows:

(4) Note the Outside Air Temperature (OAT) in degrees centigrade from the cockpit indicator. Add 3°C to this reading to compensate for temperature rise through the air inlet duct and record





Bleed Band Closure Range (Ambient Temperature vs N1 Speed)
Figure 203

See TR

(5) Slowly open the twist grip throttle and note the N1 speed at which the bleed band closes.

(6) See Figure 203 for correct bleed band opening closing limits or for correct bleed band closure range for the temperature recorded in preceding Step (4). If no adjustment is required, proceed to following Step (8).

CAUTION: THE CHANDLER EVANS PART NUMBER REQUIRED FOR ACCOMPLISHMENT OF THIS PROCEDURE APPEARS ON THE FUEL REGULATOR DATA PLATE. ALL DIGITS OF THE PART NUMBER MUST BE POSITIVELY IDENTIFIED SINCE SOME HAVE THE SAME LAST TWO DIGITS. USE OF THE WRONG PART NUMBER WILL ADVERSELY AFFECT ENGINE PERFORMANCE.

NOTE: Figure 203 is valid regardless of airframe inlet configuration (i.e. sand and dust separator and/or foreign object damage screen). The range differs between fuel regulators as shown in Figure 203. Ensure that the correct portion of the graph is used when making adjustments. The bleed band closing speed for fuel regulators 84200A4/A5/A6/A7 may be reduced to the lower limit for fuel regulators 84200A1/A2/A3 only if necessary to eliminate bleed band cycling.

(7) If the closure point does not fall within the allowable limits, shut down the engine and adjust the fuel control as follows: (See Figure 204.)

(a) Remove safety wire and seal from locknut.

(b) Back out slotted lock screw three-quarters of a revolution from the center of the adjustment screw.

(c) Hold the adjustment screw.

(d) Release the torque on the locknut.

(e) Rotate the adjustment screw as required. (One-quarter turn equals approximately 2 percent N1 speed.)

NOTE: Turning clockwise will shift the bleed band closure point to a higher N1 speed. Turning counterclockwise will shift the bleed band closure point to a lower N1 speed.

(f) Hold adjustment screw and tighten the locknut 30 to 40 inch-pounds torque.

(g) Tighten the slotted lock screw 20 to 30 inch-pounds torque.

(h) Start the engine and run up to verify the correct adjustment. (Repeat preceding Steps (b) through (h), if required.)

(i) Lockwire associated components.

(8) Perform the installed maximum power checks as follows:

(a) Set one of the airframe altimeters at 29.92.

TEMPORARY REVISION NO. 76

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 73-20-01, PAGE 208.

Reason: To add information on adjusting the bleed band.

Delete Caution following step (6) as follows:

CAUTION: DELETED.

Revise Note prior to step (7) as follows:

NOTE: Figure 203 is valid regardless of airframe inlet configuration (i.e. sand and dust separator and/or foreign object damage screen). The range differs between fuel regulators as shown in Figure 203. Ensure that the correct portion of the graph is used when making adjustments. The bleed band closing speed for fuel regulators 84200A4/A5/A6/A7 may be reduced to the lower limit for fuel regulators 84200A1/A2/A3 only if necessary to eliminate bleed band cycling.

When adjusting the Bleed band:

1) Initially, adjust the bleed band setting to an N1 at which the bleed band closes in the middle or lower half of bleed band tolerance range.
2) If surge issues occur during acceleration or deceleration, adjust the bleed band, closing N1 to the high side of the tolerance band.
3) If bleed band inadvertently opens during steady-state operation at high power, adjust bleed band closure N1 to the lower half of tolerance range.

(b) Take off and climb with the twist grip throttle in the full open position. Establish 50 to 90 knots air speed and maintain maximum torque pressure and 100 percent (6600 rpm) N2.

CAUTION: DO NOT EXCEED PUBLISHED MAXIMUM N1 OR EGT OR AIRFRAME TORQUE LIMITS. (SEE 71-00-00.)

(c) Continue to climb until N2 drops to 97 percent (6400 rpm). The altitude at which 97 percent (6400 rpm) N2 is reached is the TEST ALTITUDE.

(d) Fly the aircraft at the TEST ALTITUDE at any convenient power setting and allow the engine and instruments to stabilize for a minimum of 3 minutes.

(e) At the end of the stabilization period, record the pressure altitude from the altimeter previously set at 29.92. Note the Outside Air Temperature in degrees centigrade and record. Add 7°F (3°C) to this reading to compensate for temperature rise through the air inlet duct and record.

NOTE: If torque pressure fluctuation is noted, record the nominal indication.

(f) Allow the aircraft to descend approximately 500 feet below the established TEST ALTITUDE. At 100 percent (6600 rpm) N2, increase collective smoothly and climb at an indicated air speed of 50 to 90 knots. When N2 drops to 97 percent (6400 rpm) at or near TEST ALTITUDE, record the torque pressure and N1 rpm.

(g) Enter chart in Figure 205, at the temperature recorded in preceding Step (e). Go up to the pressure altitude also recorded in preceding Step (e). Proceed to the left of the data plate torque line value which is closest to the value recorded in preceding Step (f). The torque pressure recorded in preceding Step (f) must be within 1 psi of the required torque. (See sample condition.)

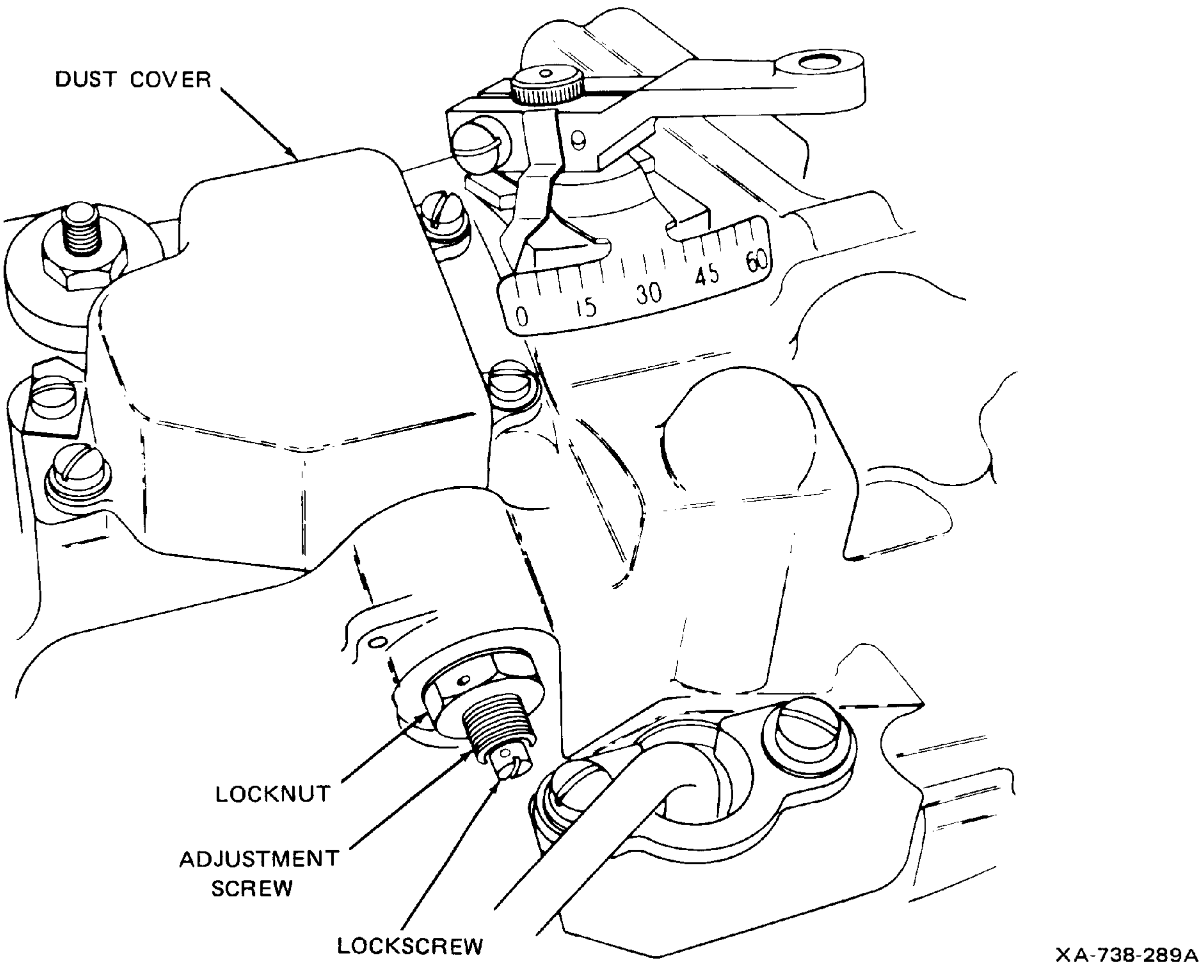
(h) If the torque pressure is not within the limit, make a normal landing and adjust the fuel control as follows: (See Figure 202.)

1 Cut the lockwire and loosen trim lock bolt.

2 Increase torque pressure by turning the takeoff trim screw counterclockwise. Decrease by turning the takeoff trim screw clockwise.

NOTE: One-quarter turn of trim screw equals approximately 4 psi torque.

(i) Repeat check. After adjustment is completed, tighten lock bolt to 26 to 30 inch-pounds torque and lockwire bolt to trimmer screws.



Bleed Band Adjustment Provision of Fuel Control
Figure 204

TEMPORARY REVISION NO. 95

INSERT PAGE 10 OF 11 THRU PAGE 11 OF 11 FACING 73-20-01, PAGE 211.

Reason: To add Step 5.B thru 5.B.(c) for inspecting fuel control drive shaft for chipped or worn splines.

Step 5.B is changed and Figure 206 is added as follows:

5. Inspection/Check

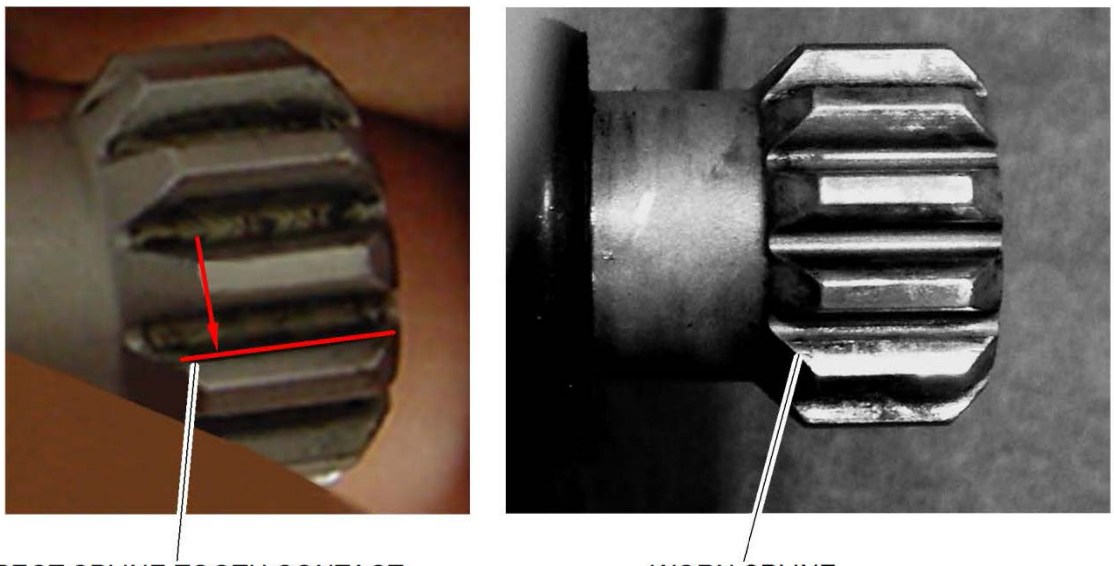
B. Inspect fuel control drive shaft for chipped or worn splines as follows:

(a) Clean spline first using a soft bristle brush and minimal dry cleaning solvent (72-00-00, 62, Table 203).

(b) Visually inspect all spline tooth contact areas for wear step or any other defects using a light and at least 4 power magnification. (See Details A and B, Figure 206.) No visual wear steps allowed on any of the external spline tooth contact surfaces. No visible wear rounding at spline ends is allowed. Replace fuel control unit if any unacceptable condition is observed.

(c) Inspect external spline using a feeler gage as visual comparator to determine step wear. Wear may not exceed 0.001 inch (0.03 mm). Replace fuel control unit if wear exceeds these limits.

TEMPORARY REVISION NO. 95



Drive Spline Inspection
Figure 206

TEMPORARY REVISION NO. 100

INSERT PAGE 2 OF 2 FACING 73-20-01, PAGE 211.

Reason: To add NOTE after Step 5.E.

NOTE is added as follows:

E.

NOTE: Items F. and G. are not applicable if shrink-wrap protection has been applied by an authorized service center. Inspect shrink-wrap protection for security and damage. If underlying sensing tube and shielding has been exposed due to damaged shrink-wrap protection, inspect exposed area per items F. and G.

4. Disassembly/Assembly

A. Disassemble Fuel Control Assembly

NOTE: When required, the overspeed governor may be removed as follows:

(1) Remove four screws (18, Figure 201) and three washers (19).

NOTE: A clamp that retains the temperature sensing tube is attached to the overspeed governor by one of the four screws.

(2) Carefully lift off temperature sensing tube. Avoid mashing or sharp bends.

(3) Remove overspeed governor by lifting it up over the locating pins.

(4) Remove packings (20, 21) from recessed areas of the mating surfaces of the overspeed governor and fuel regulator. Discard packings.

B. Reassemble Fuel Control Assembly

(1) Position packings (20, 21) in recessed areas of mating surfaces of governor and regulator.

(2) Position overspeed governor on fuel regulator and in proper relation to the locating pins.

(3) Place three washers (19) on three screws (18).

(4) Insert screws through the overspeed governor flange and into threaded holes of fuel regulator.

(5) Insert fourth screw through hole in clamp that supports the temperature sensing tube, through hole in overspeed governor flange, and into threaded hole in fuel regulator.

(6) Tighten and lockwire four screws.

NOTE: If new overspeed governor is installed, perform fuel control assembly Adjustment/Test.

5. Inspection/Check

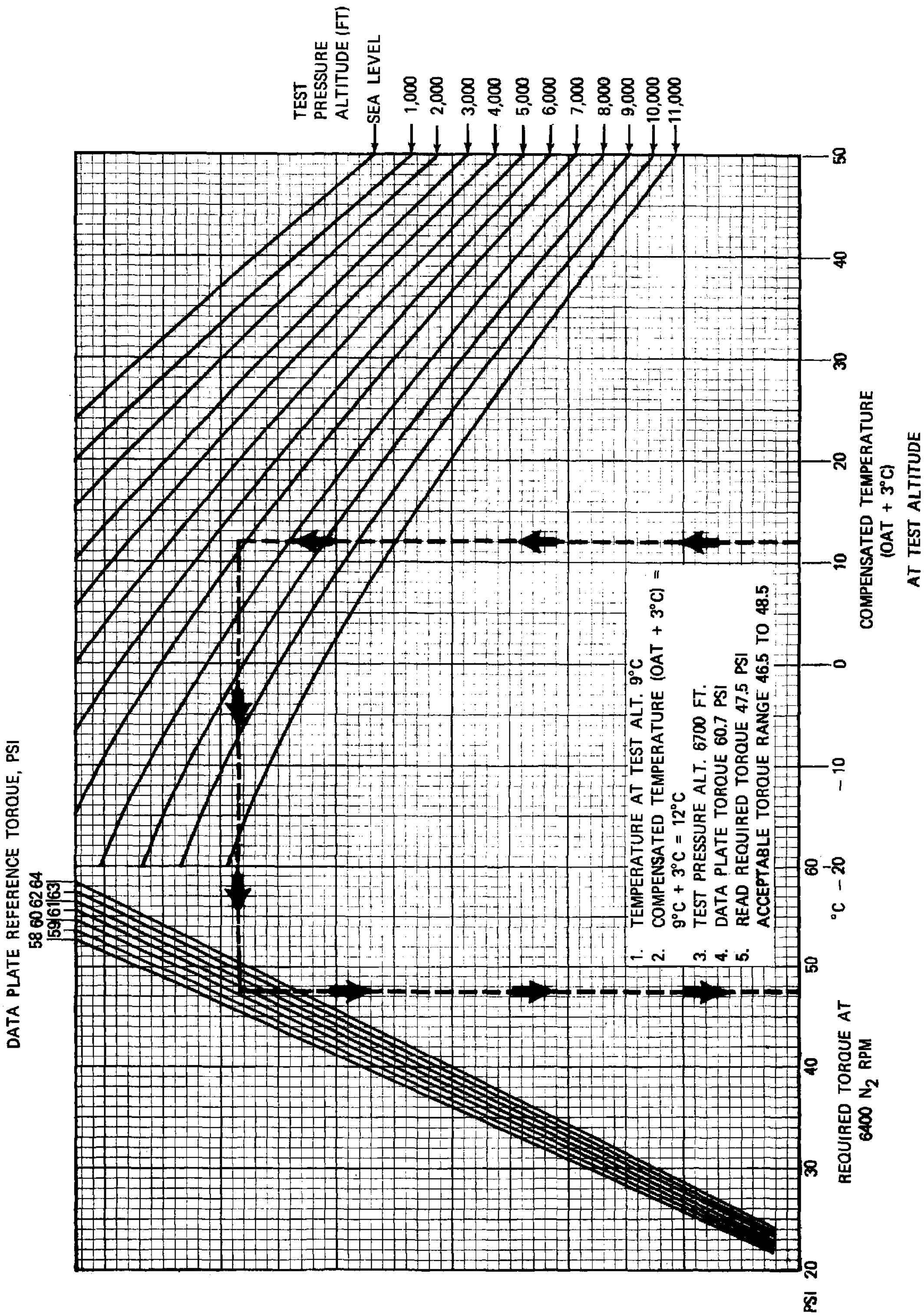
A. Inspect all fittings for damaged or crossed threads.

B. Inspect fuel control drive shaft for chipped or worn splines.

C. Inspect mounting flange for elongated mounting holes and warpage.

D. Inspect solenoid valve for security of mounting, bent, or broken contact pins.

E. Inspect temperature sensing assembly housing for cracks, warpage, and elongation of mounting holes.



Power Adjustment Chart with Barrier Filter, Particle Separator, or Particle Separator with FOD Screen
Figure 205

F. Inspect temperature sensing tube and shielding for security of installation, dents, and sharp bends. Replace fuel control if defective.

G. Inspect temperature sensing tube and shielding for cracks. Crack limits are as follows:

(1) Cracks that are not a result of the shielding being crushed are allowed.

NOTE: Rupture of the tube will be readily discernible by the odor caused by leaking fluid contained in the tube. Also, engine surge problems will be encountered.

(2) Cracks that do not chafe or cut into the tube, creating the possibility of a rupture, are allowed.

(3) Cracks that do not result in circumferential separation of the shielding, allowing a twist or sharp bend in the tube and possible tube rupture, are allowed.

H. Replace fuel control if crack limits are exceeded or if temperature sensing tube is leaking.

I. Inspect overspeed governor for security of installation.

J. If overspeed governor is removed, inspect fuel control assembly for corrosion or contamination.

NOTE: Corrosion is a rust like deposit on surface of internal parts that are exposed when main fuel regulator and overspeed governor are separated. (See Paragraph 3.) Contamination is any foreign matter found in fuel or clinging to surfaces of internal parts.

(1) If corrosion is found in overspeed governor or fuel regulator, replace part.

(2) If contamination is found, flush governor and regulator as follows:

(a) Pour clean fuel (MIL-T-5624, JP-4 or JP-5), into engine overspeed governor through openings in the surface that mates with the fuel regulator.

(b) Shake components by hand for 10 to 15 seconds.

(c) Pour flushing fuel from overspeed governor into clean container. Check for contamination in fuel.

NOTE: Discard contaminated fuel and thoroughly clean containers after each flushing.

(d) Flush governor five times. Replace governor if it cannot be flushed clean in five attempts.

K. If exposed parts are damaged or excessively worn, replace overspeed governor and/or regulator as required.

L. Replace damaged parts.

6. Cleaning/Painting

A. Thoroughly clean drive shaft, mounting flange, overspeed governor drive shaft port, and all threaded areas with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

B. Thoroughly clean drive gearshaft with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

FUEL CONTROL SOLENOID VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

The fuel control solenoid valve is mounted on the fuel control. It is a two position valve, which when positioned to automatic, directs fuel flow to the main (automatic) metering valve. When the valve is positioned to emergency, it directs fuel to the emergency (manual) metering valve.

FUEL CONTROL SOLENOID VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Fuel Control Solenoid Valve

      (1) Remove screws (11, 12, Figure 201) that secure solenoid support bracket (13) to fuel control.

      (2) Loosen nut (10) and screw (14), and slide support bracket from solenoid (15).

      (3) Remove screws (9) that secure solenoid to fuel control.

      (4) Remove solenoid and shim (8). Record thickness of shim, then lockwire it to solenoid to facilitate installation.

      NOTE: Withdraw solenoid (15) only enough to insert finger between solenoid and valve and plunger assembly (7). Holding finger on valve and plunger assembly, continue to remove solenoid. The insert shall remain in the solenoid until solenoid is installed.

      (5) If either sleeve assembly (6) or valve and plunger assembly (7) is damaged, both parts must be replaced. Remove valve and sleeve assembly as follows:

         (a) Using sleeve puller STD63557, remove valve and sleeve assembly from fuel control.

         (b) Remove and discard packings (1, 2, 3, 4, 5).

   B. Install Fuel Control Solenoid Valve

      CAUTION: WHEN REMOVING INSERT, MAKE CERTAIN NOT TO ALLOW RETAINING BALLS IN THE INSERT TO SPRING FREE.

      NOTE: If either the valve and plunger assembly (7) or valve and sleeve assembly (6) is damaged, both parts must be replaced.

      (1) Remove valve and plunger assembly (7) from solenoid (15).

      (2) Remove sleeve assembly (6). (See Paragraph 1.A(5).)

      (3) Install new sleeve assembly, without packings, into fuel control housing.

      (4) Insert new valve and plunger assembly into solenoid.

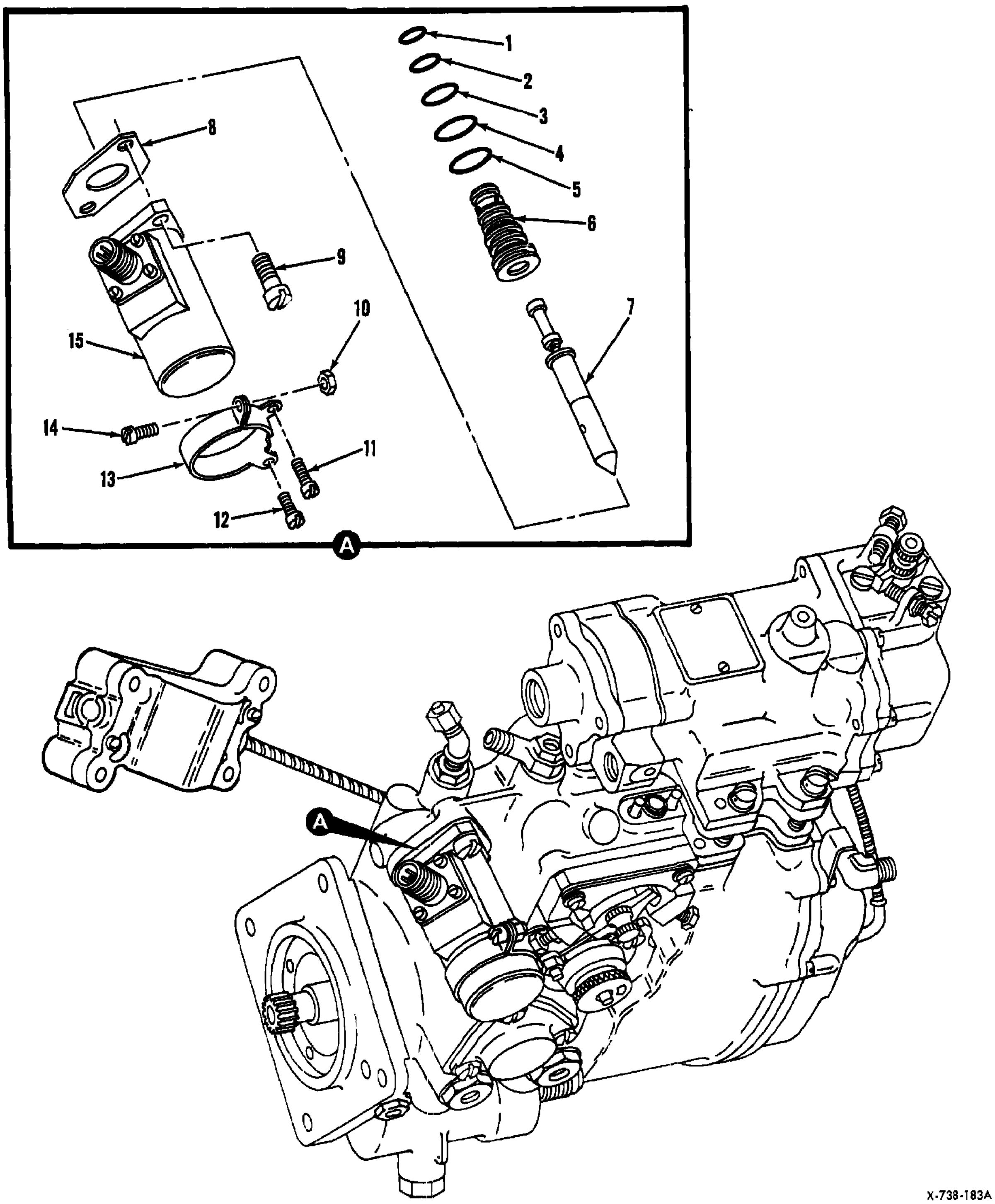
      (5) Using a depth micrometer, measure distance from fuel control housing to top of valve and sleeve assembly and record as Dimension A. (See Figure 202.)

      (6) Using depth micrometer, measure boss of solenoid and record as Dimension B.

      (7) Subtract Dimension A from Dimension B. The difference minus 0.0000 to 0.0025 inch, is the required thickness of shim, Dimension C.

      (8) Using sleeve puller STD63557, remove valve and sleeve assembly.

      (9) Install new packings (1, 2, 3, 4, 5, Figure 201) onto valve and sleeve assembly, and coat packings with petrolatum (72-00-00, 53, Table 203).



Fuel Control Solenoid Valve and Attaching Parts
Figure 201

KEY TO FIGURE 201

1. PACKING
2. PACKING
3. PACKING
4. PACKING
5. PACKING
6. SLEEVE ASSEMBLY
7. VALVE AND PLUNGER ASSEMBLY
8. SHIM
9. SCREW
10. NUT
11. SCREW
12. SCREW
13. SOLENOID SUPPORT BRACKET
14. SCREW
15. SOLENOID

(10) Install sleeve assembly into fuel regulator housing.

(11) Install shim (8) of required thickness. (See Steps (5), (6), and (7).)

(12) Install solenoid (15) and valve and plunger assembly (7). Secure with screws (9). Lockwire screws.

(13) Install support bracket (13), and secure with screws (11, 12).

(14) Secure solenoid to bracket with screw (14) and nut (10).

2. Adjustment/Test

NOTE: After installing an engine or a fuel control, or during the airframe intermediate inspection, or when a special verification of the proper operation of the AUTOMATIC/EMERGENCY system is required, perform the following check.

A. Start engine. (Refer to Airframe Flight Manual.)

CAUTION: SELECT MAXIMUM N2 SPEED WITH THE GOV RPM INCR-DECR ”BEEP” SWITCH, BEFORE STABILIZING ENGINE AT FLIGHT IDLE SPEED.

B. With fuel control selector switch in AUTO position, retard throttle to flight idle stop (70 to 72 percent N1 speed).

C. Move fuel control selector switch to EMER position.

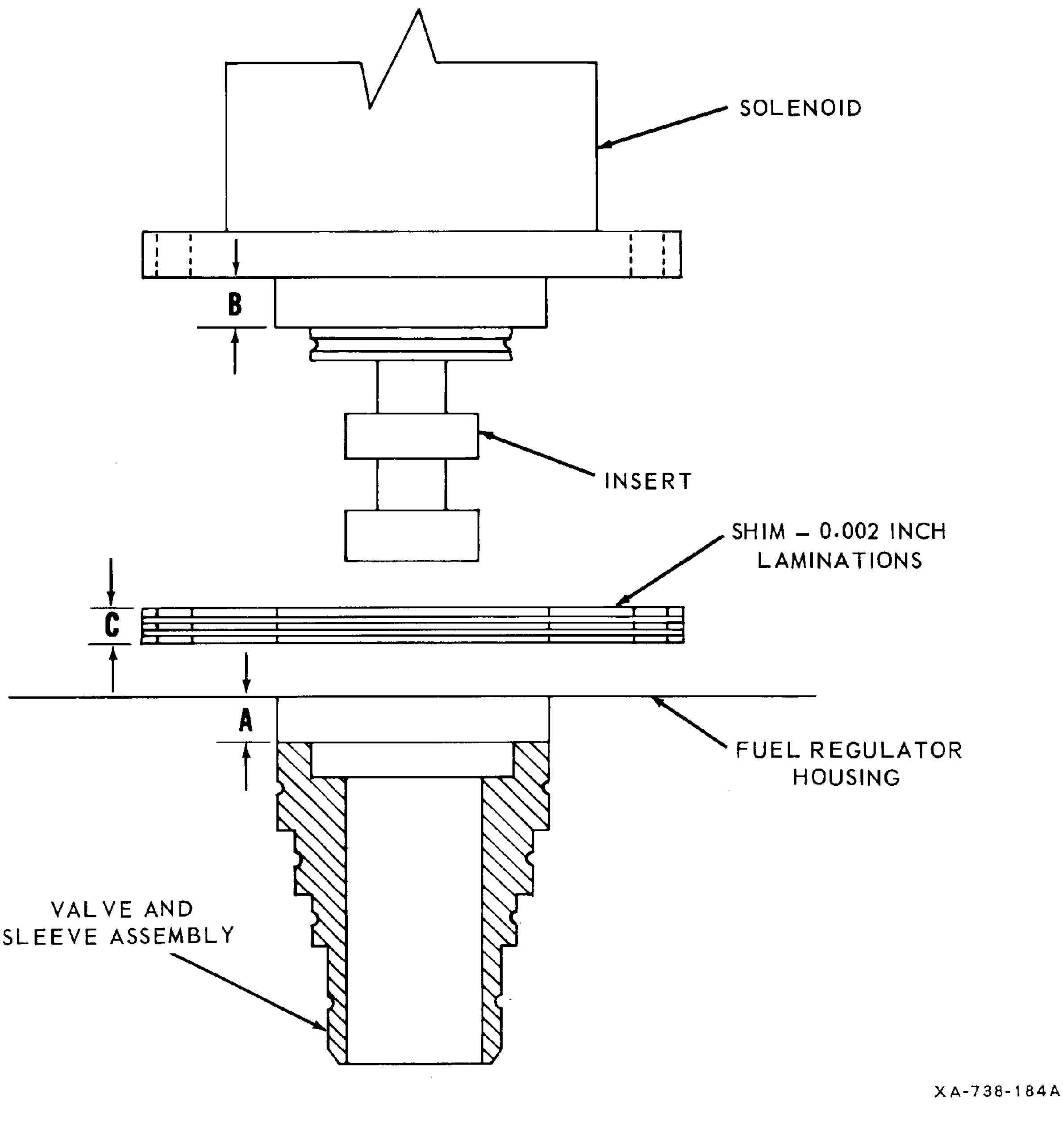
D. Note indicated N1 speed, it should drop.

E. Return fuel selector to AUTO position within 5 seconds.

F. N1 speed should return to flight idle and then stabilize.

3. Inspection/Check

A. Inspect electrical connector on solenoid valve for corrosion, damaged threads, cracked insulator, and bent or broken pins.



Solenoid Valve Assembly Shim Measurement
Figure 202

B. Inspect solenoid (15, Figure 201) and support bracket (13) for cracks or breaks.

C. Inspect valve and plunger assembly (7) and sleeve assembly (6) for damage.

4. Cleaning/Painting

Clean fuel control solenoid valve with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

5. Approved Repairs

A. Remove corrosion with crocus cloth (72-00-00, 13, Table 203) and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

B. Blend repair minor thread damage on electrical connector. (See SPM, SP R409, 70-25-03.)

C. Replace solenoid valve in insulator is cracked or pins are bent or broken.

D. Replace solenoid valve or bracket if evidence of cracks or breaks is noted.

FUEL INLET STRAINER, COVER AND PUMP DISCHARGE STRAINER, AND SERVO SUPPLY FILTER - DESCRIPTION AND OPERATION

1. Description and Operation

The fuel inlet strainer consists of a 200 mesh screen assembly which incorporates a self relieving feature that allows fuel to bypass the screen in the event of clogging or icing. The cover and pump discharge strainer consists of a 100 mesh screen and is incorporated in the fuel control at the pump discharge to protect internal control passages and components. A 10 micron servo supply filter is provided in the fuel control for the fuel under servo supply pressure. A bypass valve is incorporated to permit fuel to bypass the servo filter in the event of clogging or icing.

FUEL INLET STRAINER, COVER AND PUMP DISCHARGE STRAINER, AND SERVO SUPPLY FILTER - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Strainers and Filter

(1) Remove screws (1, Figure 201) from cover and pump discharge strainer (2), and withdraw cover and strainer assembly from fuel control (9).

(2) Remove retaining ring (8) from cover and strainer assembly.

(3) Using twisting motion, carefully pull servo supply filter element (4) and filter housing (6) from cover and pump discharge strainer.

(4) Remove and discard packing (3).

(5) Remove packing (7) from servo supply filter housing (6). Pull servo supply filter element (4) from housing and remove packing (5).

(6) Remove screws (15) from fuel inlet fitting (14). Remove fitting from fuel control.

(7) Remove and discard packing (13) from fitting.

(8) Remove retainer (10) from fuel control.

(9) Carefully withdraw inlet strainer (12) and spring (11) from retainer (10).

B. Install Strainers and Filter

CAUTION: MAKE SURE THAT INLET STRAINER (12) IS INSTALLED IN THE PROPER DIRECTION. THE STRAINER CAN BE INSTALLED BACKWARDS.

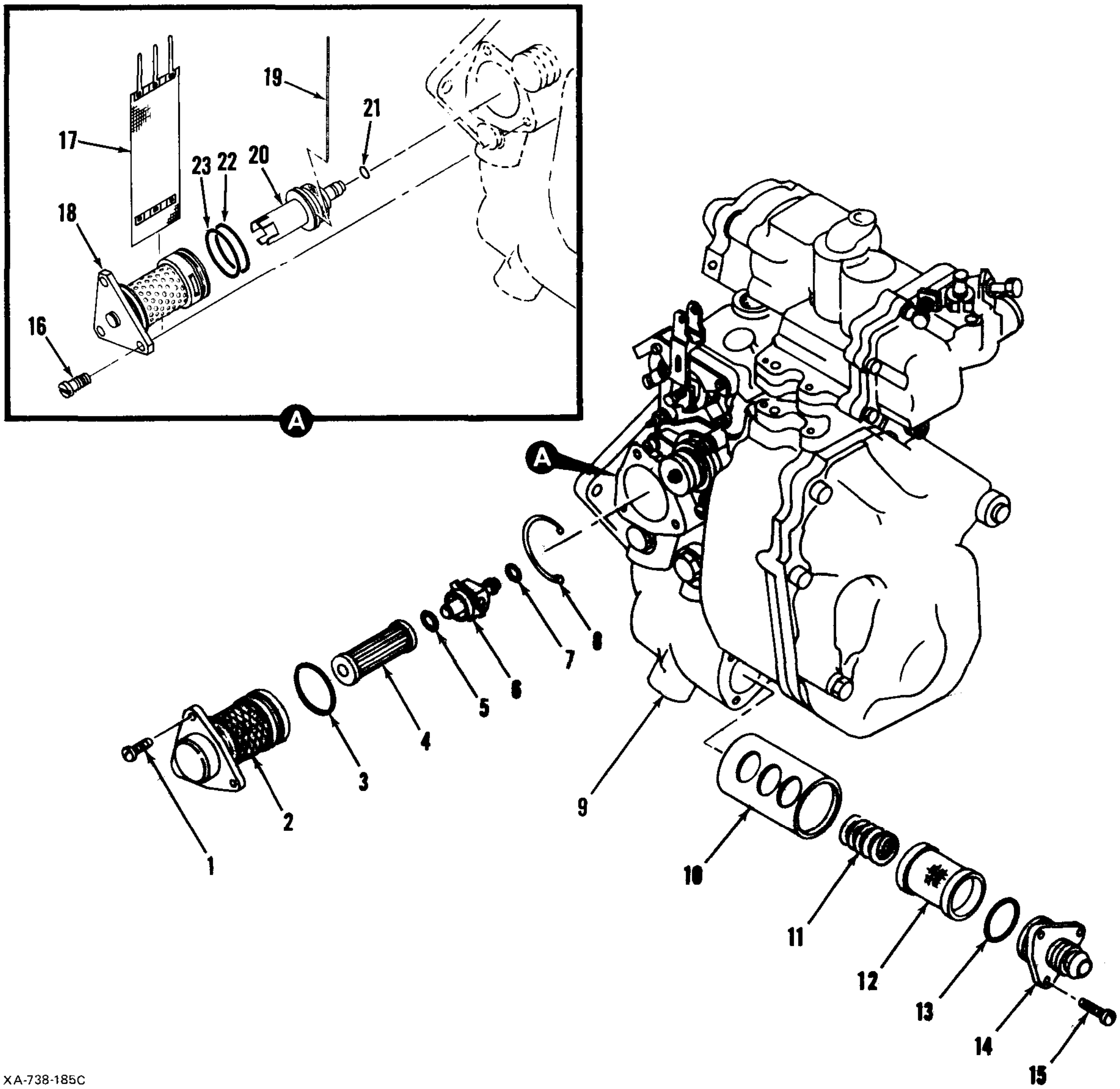
(1) Carefully install spring (11) and inlet strainer (12) into fuel control (9).

NOTE: When installing inlet strainer (12) use a rod to depress spring (11). The rod should be approximately 6 inches long by 1/4 inch in diameter and inserted through retainer to compress the spring.

(2) Carefully install spring (11) and inlet strainer (12) into retainer (10). Install retainer into fuel control (9).

(3) Install packing (13) on fuel inlet fitting (14). Install fuel inlet fitting into fuel control, and secure with screws (15).

(4) Install packing (7) on servo supply filter housing (6), then install packing (5) in servo supply filter element (4). Push element over filter housing (6).



1. SCREW
2. COVER AND PUMP DISCHARGE STRAINER
3. PACKING
4. SERVO SUPPLY FILTER ELEMENT
5. PACKING
6. FILTER HOUSING
7. PACKING
8. RETAINING RING
9. FUEL CONTROL
10. RETAINER
11. SPRING
12. INLET STRAINER
13. PACKING
14. FUEL INLET FITTING
15. SCREW

Fuel Inlet Strainer, Cover and Pump Discharge Strainer, and Servo Supply Filter
Figure 201

NOTE: Deleted

(5) Install packing (3) on cover and pump discharge strainer (2). Using a twisting motion, install filter element (4) and filter housing (6).

(6) Install retaining ring (8) on cover and pump discharge strainer (2).

(7) Install cover and pump discharge strainer into fuel control. Secure cover and pump discharge strainer with screws (1). Lockwire screws.

2. Inspection/Check

WARNING: TO PREVENT INJURY, USE APPROVED PERSONAL PROTECTIVE EQUIPMENT (GOGGLES/FACESHIELD) WHEN USING COMPRESSED AIR. DO NOT DIRECT AIRSTREAM TOWARDS SELF OR OTHER PERSONNEL. AIR PRESSURE IS RESTRICTED TO 30 PSIG MAXIMUM.

NOTE: On the 1-170-240-91 fuel control, the servo supply filter is a wash flow filter that is only cleaned at overhaul. Do not remove this filter.

A. Clean all components, except servo supply filter which is discarded, using fiber brush. Rinse with dry cleaning solvent (72-00-00, 62, Table 203) and dry with filtered compressed air. (See SPM, SP C203, 70-15-03.)

B. Check all screens for clogging, cracks, and dents. Replace screens if clogging cannot be removed or if cracked or dented.

C. Inspect fuel inlet screen for broken, bent, or kinked mesh. Straighten kinks with fingers. Replace strainer or screen only if damaged or if cleaning does not completely remove contamination.

D. Replace servo supply filter element (4) and packing (5).

E. Check cover for cracks and warpage. Replace if defects are noted.

NOTE: Inspect the fuel inlet screen, pump discharge strainer, and servo supply filter at initial installation of new engine in aircraft, completion of initial engine ground runup, after first 5 hours of engine operation, after first 15 hours of engine operation, after every 50 hours of engine operation, except where severe contamination exists. In this case, inspection is required at a more frequent interval.

F. Check fuel inlet fitting for crossed threads, cracks, or distortion. Replace if defects are noted.

3. Cleaning/Painting

A. Clean cover and pump discharge strainer (2) with soft fiber brush and rinse with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.) Clean all other components with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

WARNING: TO PREVENT INJURY, USE APPROVED PERSONAL PROTECTIVE EQUIPMENT (GOGGLES/FACESHIELD) WHEN USING COMPRESSED AIR. DO NOT DIRECT AIRSTREAM TOWARDS SELF OR OTHER PERSONNEL. AIR PRESSURE IS RESTRICTED TO 30 PSIG MAXIMUM.

B. Dry all components with moisture free compressed air.

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IGNITION

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LIST OF EFFECTIVE PAGES

IGNITION UNIT - DESCRIPTION AND OPERATION

1. Description and Operation

The ignition unit is attached to a bracket located at the 10 o'clock position of the impeller housing rear flange. The ignition unit converts low voltage through a vibrator transformer to a high voltage that passes through the ignition lead and coil assembly. The high voltage that is produced ionizes a gap in each igniter plug to produce a spark.

IGNITION UNIT - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Ignition Unit

   WARNING: MAKE CERTAIN ALL ELECTRICAL POWER IS DISCONNECTED.

   (1) Disconnect electrical connectors and spark splitter lead from ignition unit (36, Figure 201).

   (2) Remove screws (42) and nuts (43) that secure ends of the loop clamps (37). Spread loop clamps until slots in the clamps clear the positioning lugs on both sides of the ignition unit ends. Slide clamps toward each other. This releases the ignition unit for removal.

   (3) (Pre SB T53-L-13B-0105) If bracket (34) must be removed, remove bolts (33, 35) and remove bracket from compressor housing assembly.

   (4) (Post SB T53-L-13B-0105) If bracket (34) must be removed, remove bolt (33) and remove bracket from compressor housing assembly.

   B. Install Ignition Unit

   (1) Place ignition unit (36) on bracket. Position loop clamps (37) around unit so that lugs on unit fit into slots in loop clamps. Position clamps on ignition lead under upper screw, and secure loop clamp ends with screws (42) and nuts (43). Lockwire screws.

   (2) Connect electrical connector. Lockwire connector.

   (3) Connect lead from spark splitter coil.

2. Inspection/Check

   A. Inspect connectors on ignition unit for corrosion, cracked insulator, and bent or broken pins. Replace ignition unit if defects are evident.

   B. Inspect connectors on ignition unit for damaged threads. Repair minor thread damage. Replace ignition unit if threads are stripped or cannot be repaired.

   C. Inspect mounting bracket (34). Replace if defective.

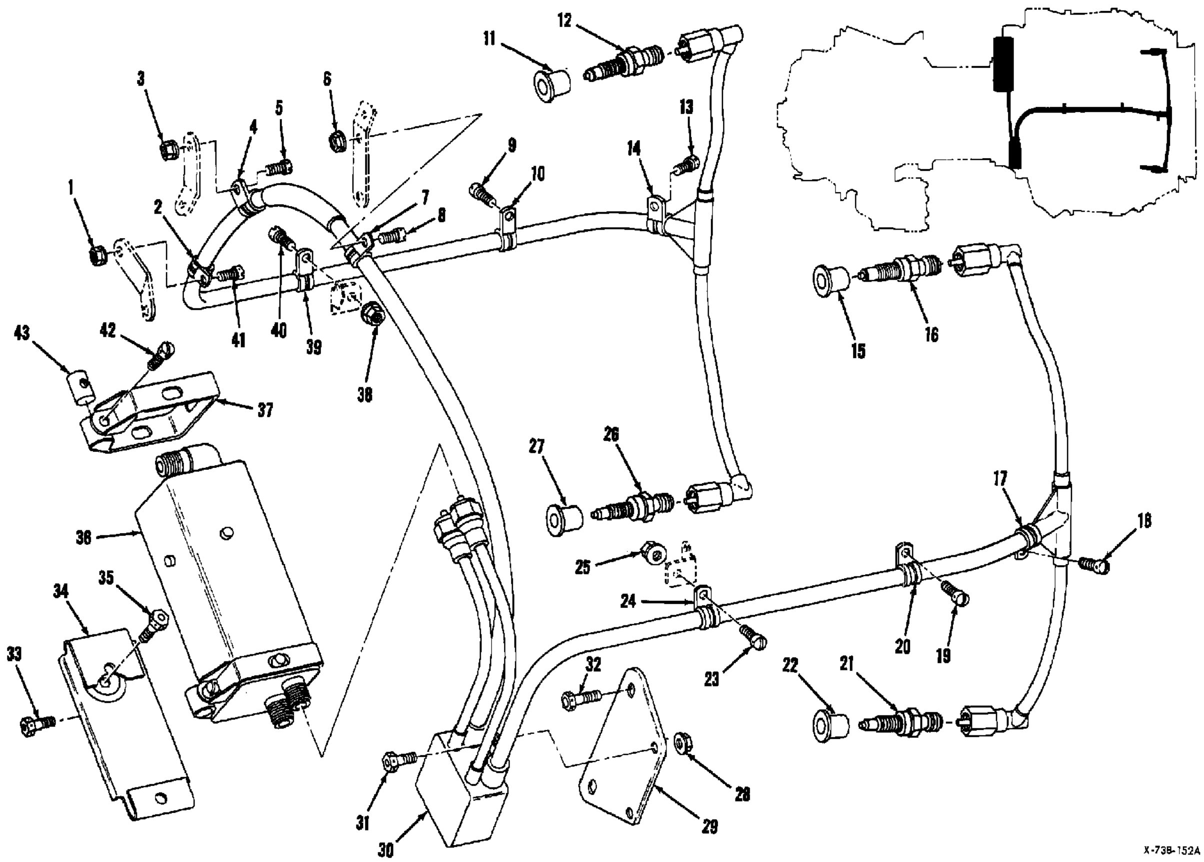
3. Cleaning/Painting

   A. Thoroughly clean ignition unit with a clean cloth moistened with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   B. Remove corrosion with crocus cloth (72-00-00, 13, Table 203).

4. Approved Repairs

   Repair ignition unit minor thread damage. (See SPM, SP R409, 70-25-03.) Replace ignition unit if threads cannot be repaired.



Ignition Lead and Coil, Igniter Plugs, and Ignition Unit (Typical)
Figure 201

KEY TO FIGURE 201

1. NUT
2. CLAMP
3. NUT
4. CLAMP
5. SCREW
6. NUT
7. CLAMP
8. SCREW
9. SCREW
10. CLAMP
11. SPACER
12. IGNITER PLUG
13. SCREW
14. CLAMP
15. SPACER
16. IGNITER PLUG
17. CLAMP
18. SCREW
19. SCREW
20. CLAMP
21. IGNITER PLUG
22. SPACER
23. SCREW
24. CLAMP
25. NUT
26. IGNITER PLUG
27. SPACER
28. NUT
29. BRACKET
30. IGNITION LEAD AND COIL ASSEMBLY
31. BOLT
32. BOLT
33. BOLT
34. BRACKET
35. (PRE SB T53-L-13B-0105) BOLT
36. IGNITION UNIT
37. LOOP CLAMP
38. NUT
39. CLAMP
40. SCREW
41. SCREW
42. SCREW
43. NUT

IGNITION LEAD AND COIL ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The ignition lead and coil assembly (74-20-01, 30, Figure 201) transmits high voltage from the ignition unit to the igniter plugs in the combustion chamber. The spark splitter coil, located below the ignition unit, distributes electrical current to each igniter plug.

IGNITION LEAD AND COIL ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Ignition Lead and Coil Assembly

      (1) Disconnect electrical leads at igniter plugs (74-20-01, 12, 16, 21, 26, Figure 201) and ignition unit (36).

      (2) Remove screws that secure all clamps on ignition lead and coil assembly (30).

      (3) Remove bolts (32) that secure ignition lead and coil assembly to engine.

      (4) Remove ignition lead and coil assembly from engine.

      NOTE: Further disassembly is not required unless the ignition lead and coil assembly is being replaced.

      (5) Remove bolts (31) and nuts (28) that secure lead and coil assembly (30) to bracket (29). Separate ignition lead and coil assembly from bracket.

   B. Install Ignition Lead and Coil Assembly

      (1) If ignition lead and coil assembly (30) and bracket (29) were separated, secure bracket to ignition lead and coil assembly with bolts (31) and nuts (28).

      (2) Position ignition lead and coil assembly on engine and secure with bolts (32). Lockwire bolts.

      (3) Connect two short leads to ignition unit (36). Tighten connectors as required and lockwire. Connect ignition leads to igniter plugs (12, 16, 21, 26). Tighten connectors 40 to 50 inch-pounds torque and lockwire.

      (4) Secure ignition lead and coil assembly clamps to engine with screws and nuts.

2. Inspection/Check

   A. Inspect connectors for damaged threads, broken or cracked ceramic insulators, and damaged or missing springs.

   B. Inspect leads for cuts, fraying, and chafing. Replace if defective.

   C. Inspect connectors for wear, cracks, or damaged lockwire holes. Wear to the extent causing clearance up to 0.032 inch between ferrule and connector is acceptable. One crack, not exceeding 0.0937 inch in length in each connector, is acceptable. Replace ignition lead and coil assembly damaged beyond such limits. Also, replace ignition lead and coil assembly if connector lockwire holes are pulled out.

3. Cleaning/Painting

Clean lead and coil with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

Repair ignition lead and coil, all parts necessary for repair or replacement of ignition lead and coil assembly may be found in Repair Parts Kit 10-88584-10.

IGNITER PLUGS - DESCRIPTION AND OPERATION

1. Description and Operation

Four igniter plugs (74-20-01, 12, 16, 21, 26, Figure 201) are installed in receptacles in the aft end of the combustion chamber at the 2, 4, 8, and 10 o’clock positions. The igniter plugs produce high voltage sparks to ignite the fuel/air mixture in the combustion chamber for starting.

IGNITER PLUGS - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Igniter Plugs as follows:

      (1) Disconnect ignition leads from igniter plugs (74-20-01, 12, 16, 21, 26, Figure 201).

      (2) Remove igniter plugs from the igniter mounts and remove spacers (11, 15, 22, 27) from igniter plugs.

   B. Install Igniter Plugs

      (1) Position spacers.

      WARNING: USE THE CORRECT PERSONAL PROTECTION. THIS CHEMICAL SOLUTION CAN CAUSE SKIN, EYE, AND LUNG DAMAGE. THE DANGER AND PRECAUTIONS FOR EACH CHEMICAL IS DIFFERENT.

      CAUTION: DO NOT ALLOW THE ANTI-SEIZE COMPOUND TO COME IN CONTACT WITH THE ELECTRODE.

         (a) Prior to installing igniter, apply anti-seize compound (72-00-00, Table 203, Item 15A) to the threads only.

         (b) Position spacers (11, 15, 22, 17) with flange toward combustor housing, on igniter plugs (12, 16, 21, 26).

      (2) Install igniter plugs into mounts on rear face of fireshield by hand. If plugs do not bottom, repair threads by using 7/16-28 NEF tap or die.

      (3) Reinstall igniter plugs and tighten 85 to 95 inch-pounds torque.

      (4) Reconnect ignition leads to igniter plugs. Tighten connectors 40 to 50 inch-pounds torque and lockwire.

2. Inspection/Check

   NOTE: If there is any evidence that plug is not functioning properly, even though limits have not been exceeded, it shall be replaced.

   A. Clean dirty igniter plugs. (See Paragraph 3.A.)

   B. Inspect plug gap surface material. If surface is granular or chipped, replace plug.

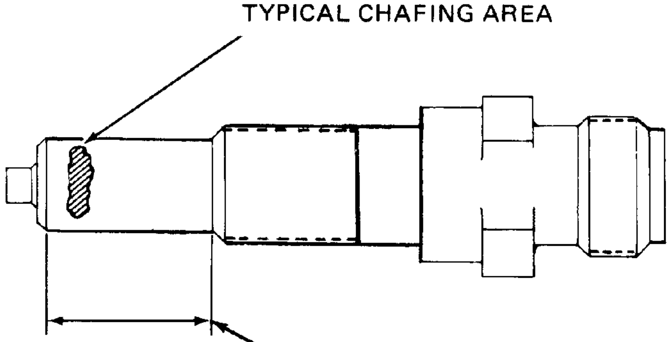
   C. Inspect electrode for burning and erosion. Minor burning (discoloration) or slight eroding away of electrode is acceptable. Replace plugs that exhibit burned off or heavily eroded electrodes.

D. Inspect for dirty and carbonized plugs. Replace plug.

E. Inspect for crossed or stripped threads and broken or chipped insulation at connector end. Replace if these conditions are evident.

F. Inspect plug for chafing or grooving in housing area. (See Figure 201.) If chafing or grooving exceeds depth of 0.020 inch, replace plug.

G. Inspect shank for fretting condition. Replace plug if fretting is excessive.



Igniter Plug Chafing Limits
Figure 201

3. Cleaning/Painting

WARNING: AVOID PROLONGED INHALATION OF SOLVENT VAPORS. WEAR RUBBER GLOVES AND USE HAND CREAM TO PREVENT CONTACT WITH SKIN. DO NOT HEAT SOLUTION.

A. Clean dirty igniter plugs with dry cleaning solvent (72-00-00, 62, Table 203) using fiber brush if electrode carbon buildup is evident.

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AIR

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	203	Sep 1/08
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	205	Sep 1/08
	206	Sep 1/08

ELBOW, TUBE AND BLEED AIR ADAPTER ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

An elbow and tube are connected to the external bleed air manifold and to an adapter on top of the impeller housing. The tube and elbow pass air to the hot air solenoid valve. On engines with magnesium impeller housings, pressurized hot air passes through a section of the impeller housing before entering the hot air solenoid valve.

ELBOW, TUBE AND BLEED AIR ADAPTER ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Elbow, Tube, and Bleed Air Adapter Assembly

(1) Remove bolts (12, Figure 201) that secure bleed air adapter elbow (1) to diffuser housing.

(2) Using twisting motion, remove elbow and bleed air crossover tube (3) from bleed air adapter assembly (5 or 13). Separate elbow and tube and remove gasket ring (2) from elbow.

(3) Remove gasket ring (4) from flange of bleed air adapter assemblies (5 or 13).

(4) (Pre SB T53-L-13B-0105) Remove bolts (14) and washers (15) that secure bleed air adapter assembly (13) to impeller housing.

(5) (Pre SB T53-L-13B-0105) Remove bleed air adapter assembly (13) and gasket (16) from impeller housing.

(6) (Post SB T53-L-13B-0105) Remove bolt (72-30-01, 7, Figure 202) that secures bottom flange of bleed air adapter to compressor housing.

(7) (Post SB T53-L-13B-0105) Remove bolts (9) and washers (10) that secure bleed air adapter to impeller housing.

(8) (Post SB T53-L-13B-0105) Remove bolts (75-10-01, 11, Figure 201) that secure hot air solenoid valve to bleed air adapter assembly (5).

(9) (Post SB T53-L-13B-0105) Remove bleed air adapter assembly (5) and gasket (10) from hot air solenoid valve.

(10) When required, remove bolts (8), cover (7), and gasket (6) from adapter assembly.

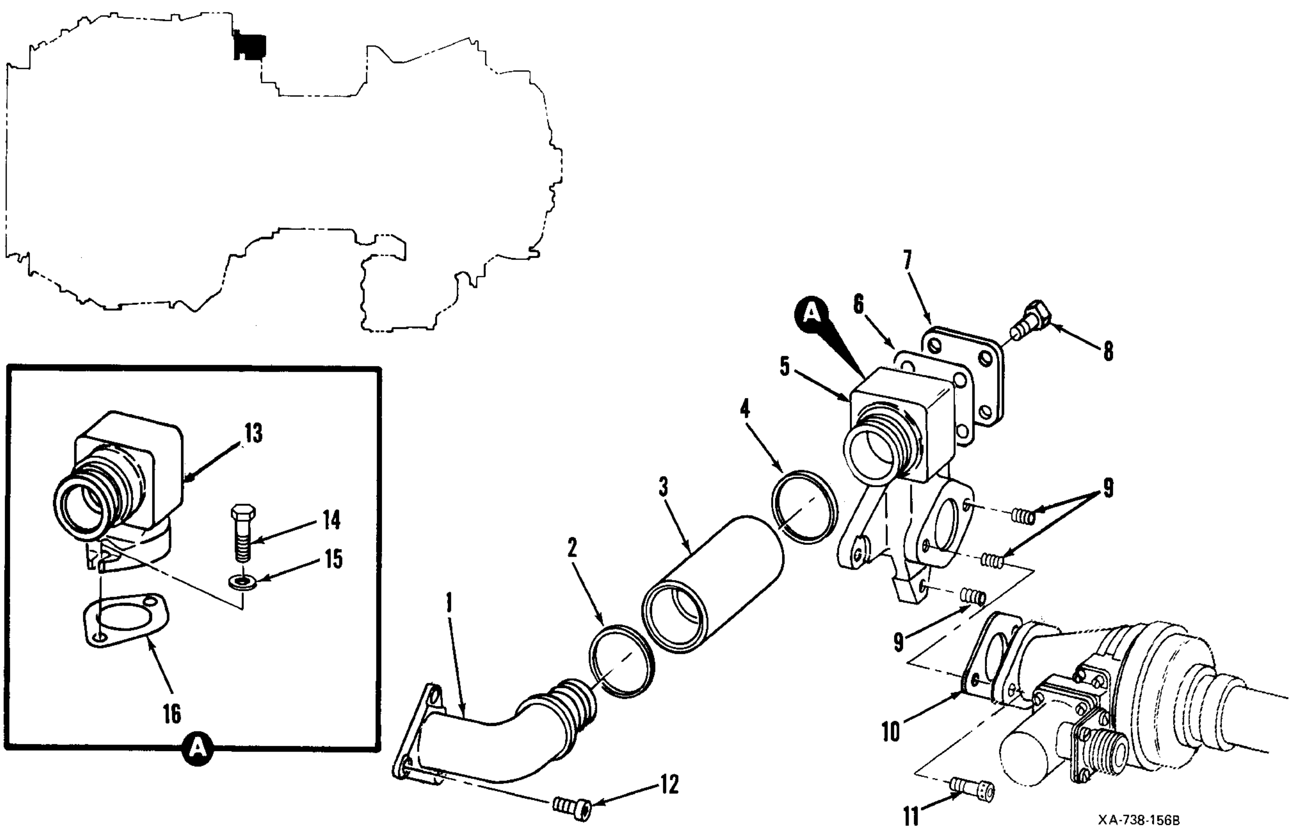
B. Install Elbow, Tube, and Bleed Air Adapter Assembly

(1) (Pre SB T53-L-13B-0105) Position gasket (16) and bleed air adapter assembly (13) on impeller housing and secure with washers (15) and bolts (14).

NOTE: Position flanged port toward right side of engine.

(2) (Post SB T53-L-13B-0105) Position gasket (10) and bleed air adapter assembly (5) on hot air solenoid valve and install bolts (11) to hold in place.

(3) (Post SB T53-L-13B-0105) Install bolts (72-30-01, 9, Figure 202) and washers (10) that secure bleed air adapter assembly (5) to impeller housing.



1. BLEED AIR ADAPTER ELBOW
2. GASKET RING
3. BLEED AIR CROSSOVER TUBE
4. GASKET RING
5. (POST SB T53-L-13B-0105) BLEED AIR ADAPTER ASSEMBLY
6. GASKET
7. COVER
8. BOLT
9. (POST SB T53-L-13B-0105) INSERT
10. GASKET
11. BOLT
12. BOLT
13. (PRE SB T53-L-13B-0105) BLEED AIR ADAPTER ASSEMBLY
14. (PRE SB T53-L-13B-0105) BOLT
15. (PRE SB T53-L-13B-0105) WASHER
16. (PRE SB T53-L-13B-0105) GASKET

Elbow, Tube, and Bleed Air Adapter Assembly
Figure 201

(4) (Post SB T53-L-13B-0105) Install bolt (7) that secures bottom flange of bleed air adapter assembly (5) to compressor housing.

(5) (Post SB T53-L-13B-0105) Tighten bolts (11) as required and lockwire.

(6) (Post SB T53-L-13B-0105) Position gasket ring (4) on flange port of adapter assembly.

(7) Position gasket ring (2) on flange of bleed air adapter elbow (1). Slide bleed air crossover tube (3) over bleed air adapter elbow (1).

(8) Slide bleed air crossover tube (3) over flange port of bleed air adapter assembly (5) and position flange of bleed air adapter elbow (1) against diffuser housing mounting port.

(9) Secure elbow with bolts (12). Tighten bolts as required and lockwire.

2. <u>Inspection/Check</u>

A. Inspect tube, elbow, and adapter for cracks.

B. Inspect adapter assembly for stripped or damaged threads.

3. <u>Cleaning/Painting</u>

Clean all parts with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. <u>Approved Repairs</u>

A. Repair stripped or damaged threads. (See SPM, SP R409, 70-25-03.)

B. If cracks are noted in tube, elbow, or adapter and

C. Replace.

HOT AIR SOLENOID VALVE - DESCRIPTION AND OPERATION

1. Description and Operation

The hot air solenoid valve is mounted on top of the compressor and impeller housing assembly. The solenoid operated valve controls the flow of anti-icing hot air from the diffuser housing to the inlet housing to prevent the formation of ice. During engine operation, the hot air solenoid valve is normally energized in the CLOSED position by manually actuating a switch in the cockpit. In the event of electrical power failure, the fail safe, spring loaded valve returns to the OPEN position to provide continuous anti-icing air.

HOT AIR SOLENOID VALVE - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Hot Air Solenoid Valve

      WARNING: MAKE SURE THAT ALL ELECTRICAL POWER IS DISCONNECTED.

      (1) Disconnect connector from main wiring harness at hot air solenoid valve (2, Figure 201).

      (2) Expand retaining ring (5) at forward end of air regulator tube (4). Slide ring towards rear of tube.

      (3) Remove tube from valve by twisting and sliding it toward front of engine.

      (4) Remove bolts (7) that secure flange of solenoid valve to bleed air adapter assembly.

      (5) Remove hot air solenoid valve (2) and gasket (1). Discard gasket. Remove packing (3) from valve.

      (6) Remove tube and packing (6) from inlet housing. Remove retaining ring (5) from air regulator tube (4).

      (7) Remove packings (3, 6) from hot air solenoid valve housing and inlet housing. Discard packings.

   B. Install Hot Air Solenoid Valve

      (1) Slide retaining ring (5) on air regulator tube (4).

      (2) Place packing (6) in recessed area within inlet housing.

      (3) Insert tube into inlet housing and, using turning motion, push it into inlet housing to allow hot air solenoid valve (2) to clear tube.

      (4) Place packing (3) in recessed area of hot air solenoid valve (2).

      (5) Position gasket (1) and hot air solenoid valve (2) on bleed air adapter assembly with bolts (7).

      (6) Slide tube rearward into valve and install retaining ring (5) firmly against inlet housing.

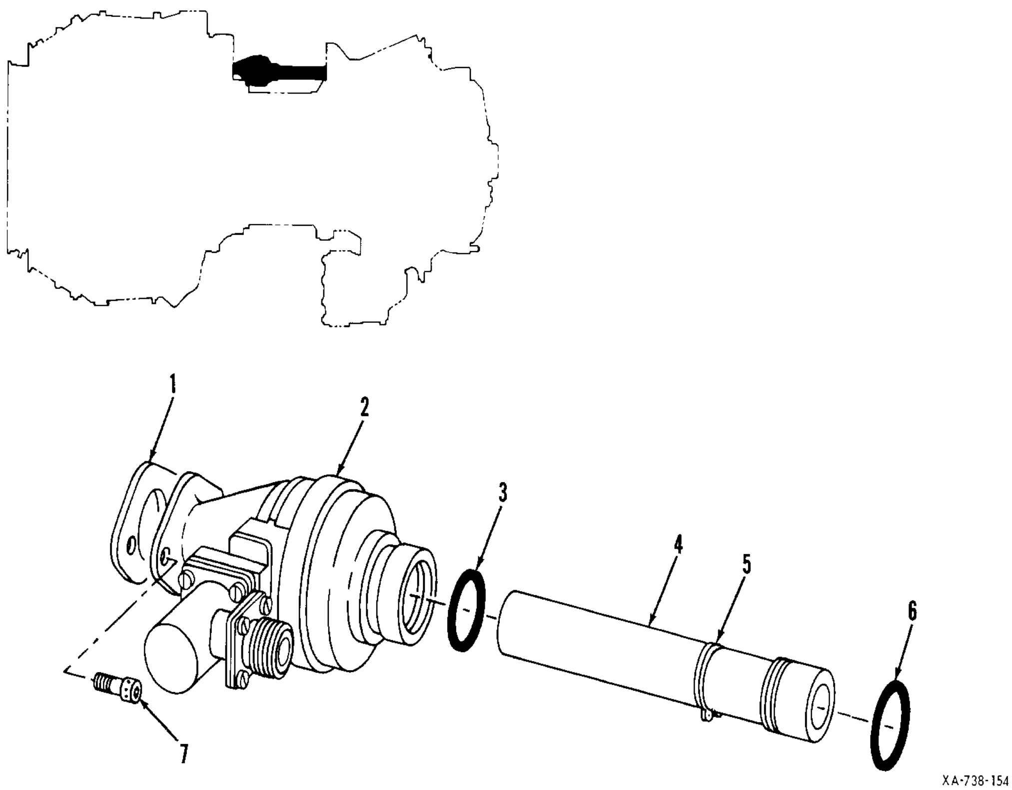
      (7) Tighten bolts (7) as required and lockwire.

      (8) Attach connector from electrical cable assembly on valve connector. Tighten as required and lockwire.

2. Inspection/Check

   A. Inspect electrical connector on valve for corrosion, damaged threads, cracked insulator, and bent or broken pins.

   B. Inspect air regulator tube for cracks.



1. GASKET
2. HOT AIR SOLENOID VALVE
3. PACKING
4. AIR REGULATOR TUBE
5. RETAINING RING
6. PACKING
7. BOLT

Hot Air Solenoid Valve
Figure 201

3. Cleaning/Painting

   A. Wipe exterior of solenoid valve, using a cloth dampened with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   B. Slosh air regulator tube in dry cleaning solvent. Air dry.

4. Approved Repairs

   A. Repair minor thread damage. (See SPM SP R409, 70-25-03.)

   B. Remove corrosion with crocus cloth (72-00-00, 13, Table 203), and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   C. Replace solenoid valve if insulator is cracked or pins are bent or broken.

VARIABLE INLET GUIDE VANE ACTUATOR - DESCRIPTION AND OPERATION

1. Description and Operation

The variable inlet guide vane actuator is mounted on right side of compressor housing assembly at the front flange. Fuel seal leakage is drained through the hose and out the starter generator drive seal drain port on the accessory drive gearbox. The actuator is operated by fuel pressure from the fuel control.

VARIABLE INLET GUIDE VANE ACTUATOR - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Variable Inlet Guide Vane Actuator

NOTE: Prior to removing inlet guide vane actuator, make sure that the actuator is rigged correctly. With fuel lines disconnected, make sure that the scribe line on the plate is aligned to the top of blast mark or top scribe line on the actuator rod. If these are not aligned, remove the engine and return to a Honeywell authorized Service Center. Replacement of the actuator requires an adjustment be performed in the test cell.

(1) Remove pin (25, Figure 201), nut (24), bolts (11) and washers (12, 14, 26). Remove tube assembly (16).

(2) Cut lockwire and loosen nut (5). Unscrew bearing (6) from connector.

(3) Tag and disconnect hose assemblies from inlet guide vane actuator assembly.

(4) Remove bolts (1, 27, 29), washers (2, 28), support (3), spacer (4), and nuts (7, 9, 10).

(5) Carefully remove inlet guide vane actuator assembly (8) from engine.

B. Install Variable Inlet Guide Vane Actuator

(1) Position inlet guide vane actuator assembly (8) on flange of inlet housing.

(2) Secure actuator assembly with bolts (1, 27, 29), washers (2, 28), support (3), spacer (4), and nuts (7, 9, 10). Tighten nuts as required and lockwire. If installed, remove covers or lines from actuator fittings.

NOTE: Install washer (2) as required to prevent threaded end of bolt from rubbing against inlet housing.

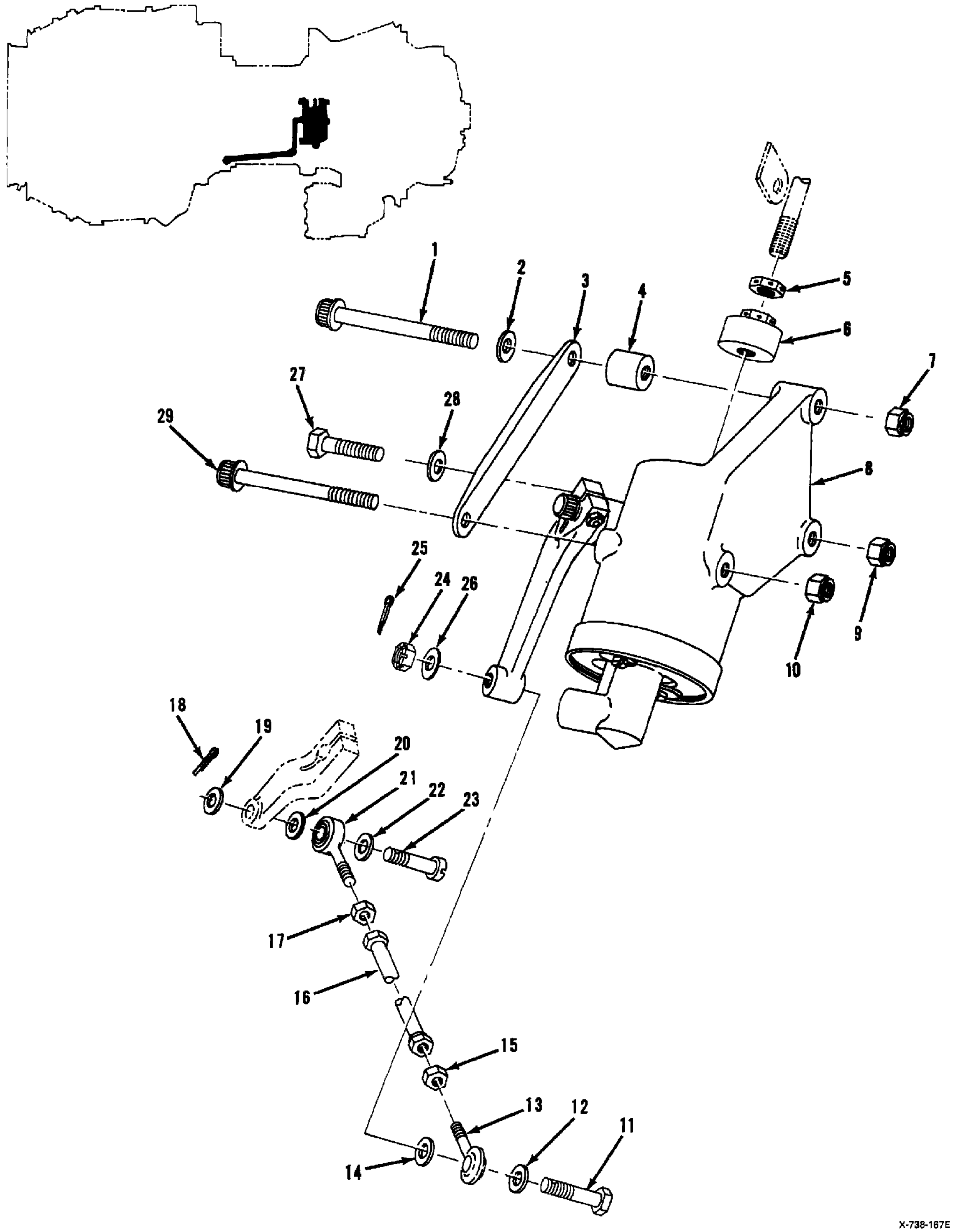
(3) Thread bearing (6) onto connector. Hold actuator full open (piston retracted), adjust bearing until end of blast mark area or scribed line on connector aligns with open scribe mark on rigging plate (located on inlet housing). Tighten nut (5) as required and secure with lockwire.

NOTE: Make sure that a minimum of five rod end threads are engaged in feedback tube ends and the number of threads exposed on both rod ends is approximately equal.

Use quantity of washers (26) as required to obtain minimum clearance between pin (25) and nut (24).

(4) Connect tube assembly (16) to actuator assembly with bolt (11), washers (12, 14, 26), nut (24), and pin (25).

(5) Tighten nuts (15, 17) as required and lockwire.



Inlet Guide Vane Actuator Assembly
Figure 201

KEY TO FIGURE 201

1. BOLT
2. WASHER
3. SUPPORT
4. SPACER
5. NUT
6. BEARING
7. NUT
8. INLET GUIDE VANE ACTUATOR ASSEMBLY
9. NUT
10. NUT
11. BOLT
12. WASHER
13. ROD END BEARING
14. WASHER
15. NUT
16. TUBE ASSEMBLY
17. NUT
18. PIN
19. WASHER
20. WASHER
21. ROD END BEARING
22. WASHER
23. BOLT
24. NUT
25. PIN
26. WASHER
27. BOLT
28. WASHER
29. BOLT

NOTE: If a replacement variable inlet guide vane actuator is installed, an adjustment/test check is required. (See Paragraph 2.)

2. Adjustment/Test

A. Adjust Variable Inlet Guide Vane Actuator

(1) An operational check of the inlet guide vane actuator must be performed whenever fuel control is replaced, inlet guide vane actuator is replaced, or improper operation of the actuator is suspected. (See 73-20-01.)

B. Improperly Adjusted Inlet Guide Vanes

Improperly adjusted inlet guide vanes will have an adverse effect on engine operation. If the inlet guide vanes fail to reach the FULL OPEN position, the engine will exhibit low torque and high N1 speed. If the guide vanes reach the FULL OPEN position at too low an N1 speed, engine surge may occur.

C. Initial Adjustment at the “begin to open” Point

NOTE: The pressure switch should be set to indicate between 70 and 80 psi.

(1) The N1 speed at which the VIGV begins to open may be determined using switch and coupling kit LTCT13726 or equivalent. (See Figure 202.)

NOTE: To preclude damage/distortion to the VIGV components, release the torque on the B nuts to the CYL 1 and CYL 2 lines at the actuator. This will eliminate hydraulic resistance when the actuator arm is manually moved during the rigging check.

(2) If not previously accomplished, check for proper travel of the VIGV control rod and alignment of the blast mark area or scribed area to the rigging plate scribe line. (See Detail A, Figure 203.)

CAUTION: POSITION THE SWITCH AND COUPLING ASSEMBLY TO PROVIDE ADEQUATE CLEARANCE WITH THE FEEDBACK ROD AND ARM THROUGH FULL RANGE OF MOVEMENT.

(3) Install switch and coupling assembly LTCT13725 (detail of LTCT13726) between the VIGV actuator and CYL 2 line. (It may require repositioning of the CYL 2 line to allow installation of the assembly.)

(4) Remove the cannon lug from the engine low oil pressure warning light switch and connect it to the lead from the switch and coupling assembly LTCT13725 (detail of LTCT13726). Tighten all lines to required torque.

CAUTION: DURING THIS TEST, THE ENGINE OIL PRESSURE GAGE MUST BE MONITORED BECAUSE THE WARNING LIGHT ON THE ANNUNCIATOR PANEL IS USED TO INDICATE VIGV BEGIN TO OPEN POSITION.

(5) Start engine and stabilize at flight idle. Check for fuel leaks.

(6) Check that engine anti-icing is off.

(7) Slowly increase N1 speed above flight idle. Record N1 speed and outside air temperature (OAT) when low engine oil pressure warning light actuates. Repeat this check three times to obtain a mean N1 speed.

(8) Enter graph in Figure 204 at lower band at N1 speed and outside air temperature (+3°C) to compensate for temperature rise through air inlet duct obtained in preceding Step (7). Determine that the N1 speed falls within this band.

(9) If N1 speed does not fall within the allowable band, adjust feedback rod as follows:

(a) Shorten feedback rod to decrease N1 speed at which guide vanes "begin to open." Lengthen feedback rod to increase "begin to open" N1 speed. Turn both rod ends an equal number of turns.

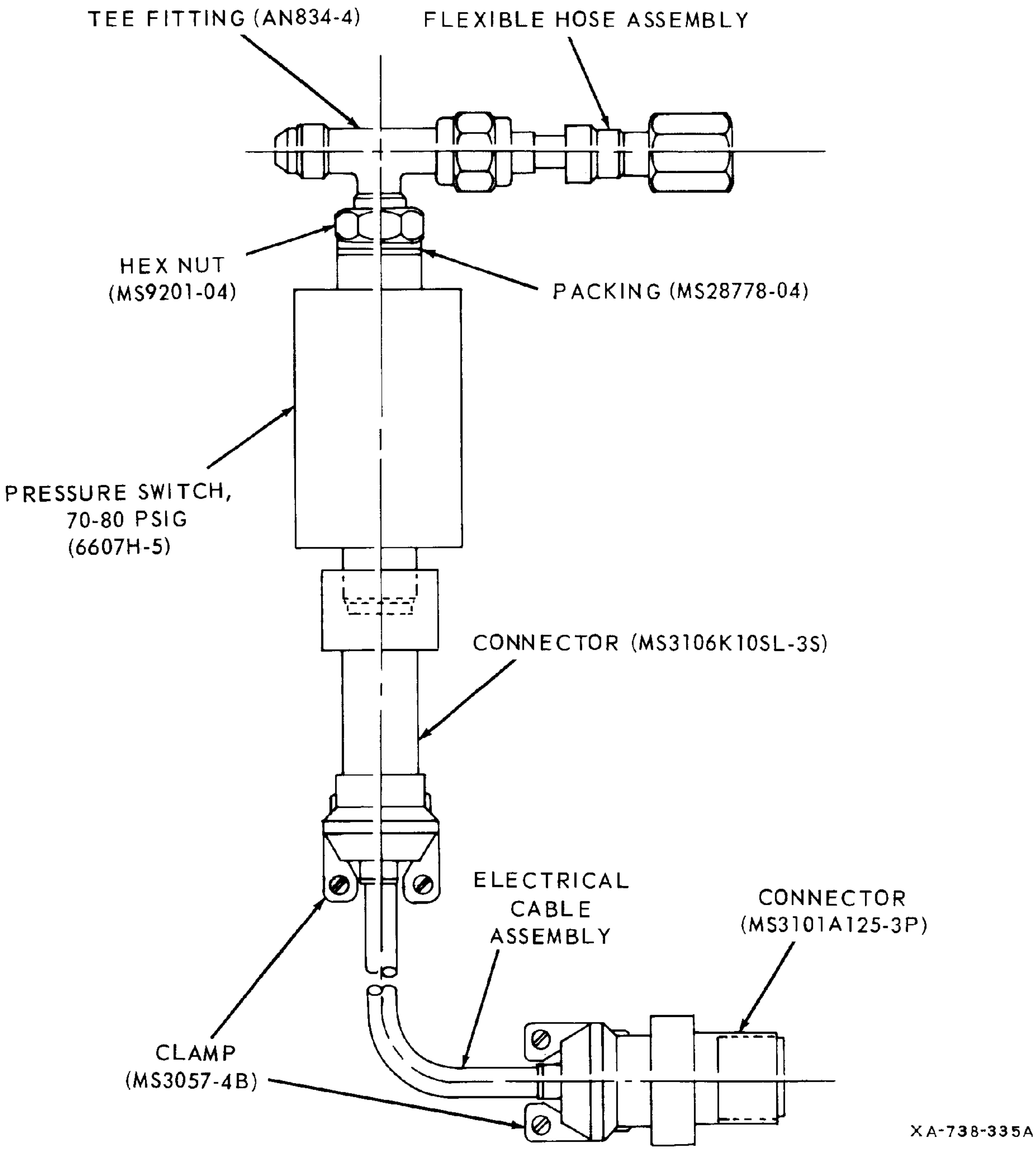
NOTE: Make sure that a minimum of five rod end threads are engaged in feedback tube ends. If thread engagement is insufficient, the feedback lever on the fuel regulator may be reindexed one or two splines counterclockwise.

(b) Two turns on each of the feedback rod ends will result in approximately a 2 percent N1 speed change.

NOTE: Adjustments of the inlet guide vanes should be made in increments of 1 percent N1 speed.

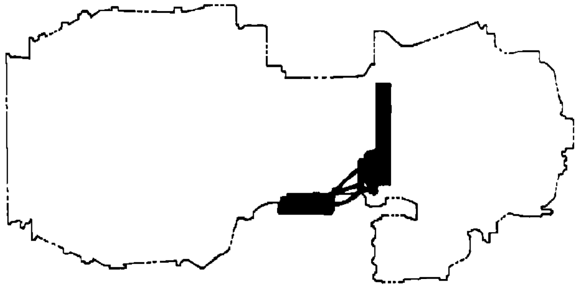
(c) Repeat preceding Steps (5) through (9).

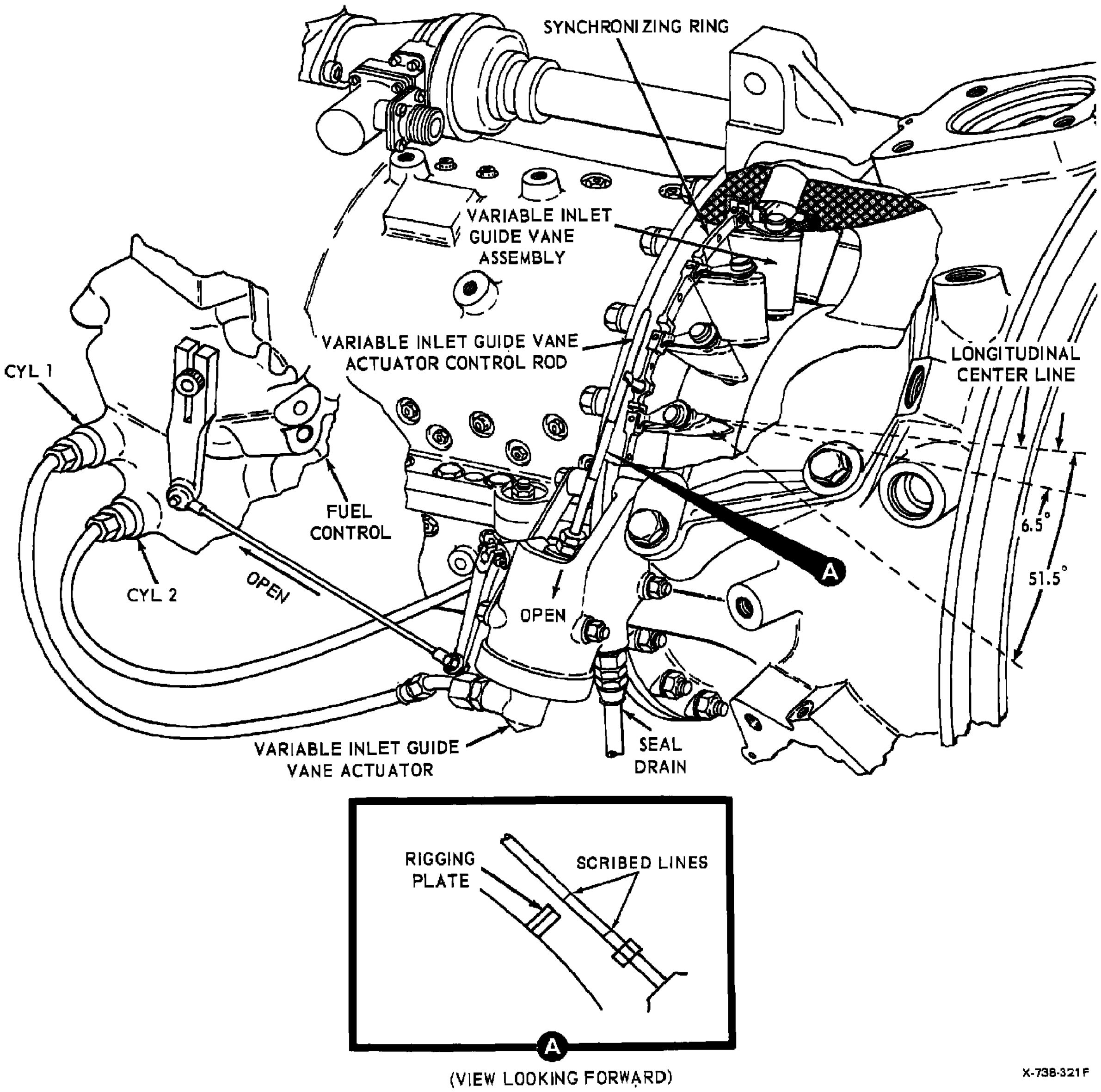
(10) Remove switch and coupling assembly LTCT13725 (detail of LTCT13726) from CYL 2 line. Reconnect CYL 2 line to actuator.



Switch and Coupling Kit LTCT13726
Figure 202

See TR





Variable Inlet Guide Vane System
Figure 203

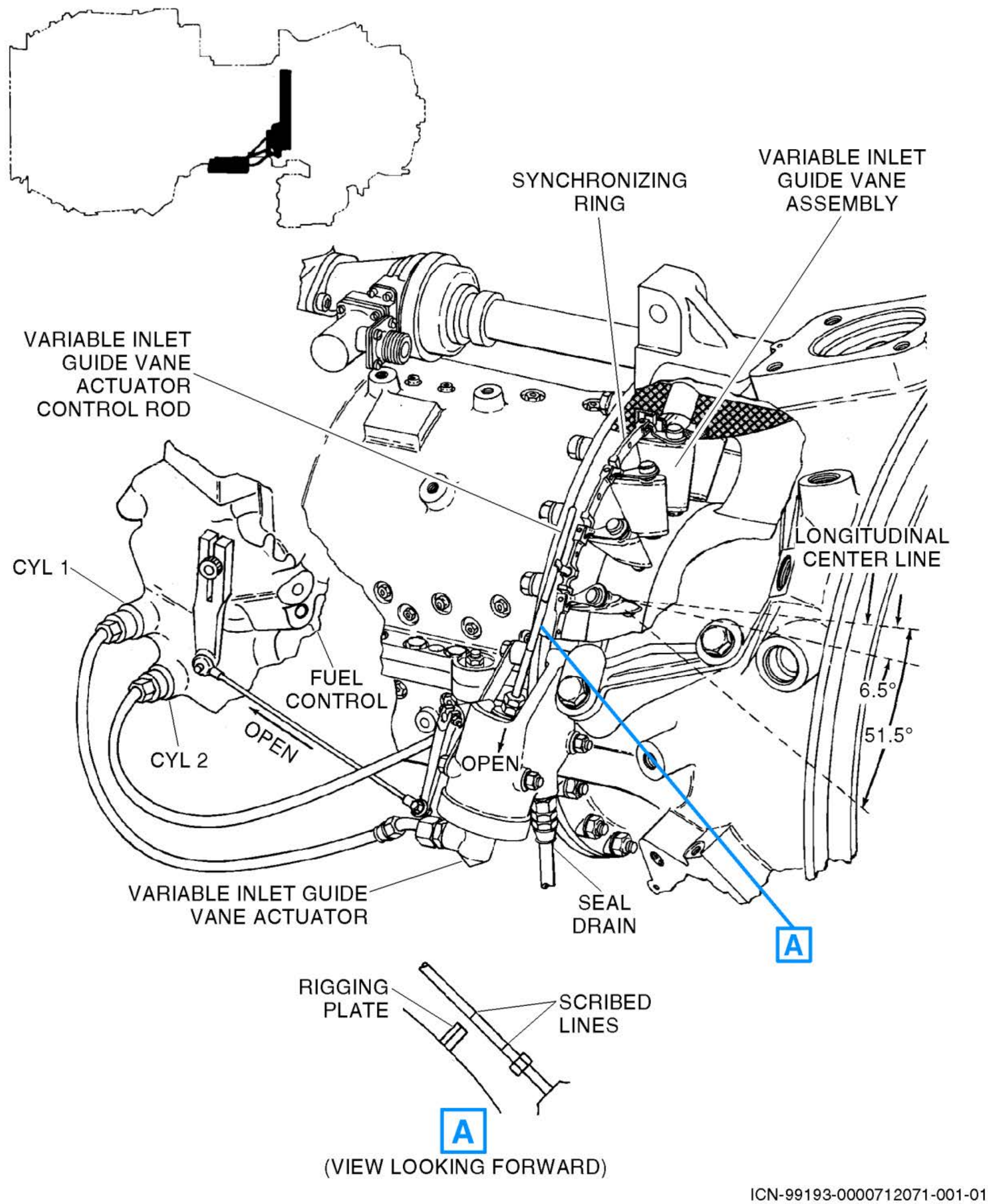
TEMPORARY REVISION NO. 101

INSERT PAGE 2 OF 3 AND PAGE 3 OF 3 FACING 75-30-01, PAGE 206.

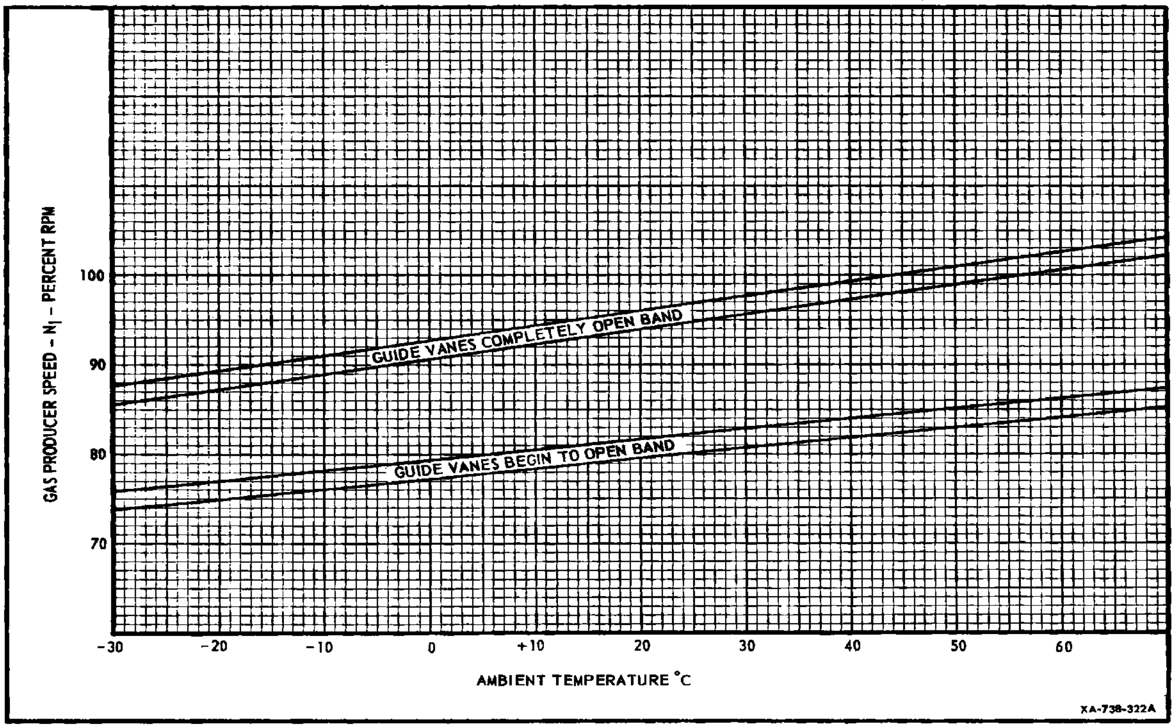
Reason: To change orientation of Cylinder 2 tube on Figure 203, Variable Inlet Vane System.

Figure 203 is changed as follows:

TEMPORARY REVISION NO. 101



Variable Inlet Guide Vane System
Figure 203



Gas Producer Speed at which Variable Inlet Guide Vane Operates versus Ambient Temperature
Figure 204

(11) Install switch and coupling assembly LTCT13725 (detail of LTCT13726) between the VIGV actuator and the CYL 1 line.

(12) Perform final adjustment at the “full open” point.

D. Final Adjustment of the “full open” point.

(1) If not previously accomplished, install switch and coupling assembly LTCT13725 (detail of LTCT13726) between the VIGV actuator and the CYL 1 line and connect to low oil pressure warning cannon plug. Perform leak check prior to flight.

CAUTION: DURING THIS TEST, THE ENGINE OIL PRESSURE MUST BE MONITORED BECAUSE THE WARNING LIGHT ON THE ANNUNCIATOR PANEL IS USED TO INDICATE VIGV FULL OPEN POSITION.

DO NOT EXCEED MAXIMUM N1, AIRFRAME TORQUE, OR EGT LIMITS.

(2) Perform power check and trim adjustment. (See 73-20-01.) Record N1 speed and outside air temperature the instant the annunciator panel low engine oil pressure light goes out (VIGV completely open). Repeat this check three times to obtain a VIGV mean “full open” N1 speed.

(3) Land aircraft.

(4) Enter graph in Figure 204 at upper band at N1 speed and outside air temperature (+3°C) to compensate for temperature rise through air inlet duct obtained in preceding Step (2). Determine that the N1 speed falls within this band.

(5) If N1 speed does not fall within the allowable band, adjust feedback rod as follows:

(a) Shorten feedback rod to decrease N1 speed at which guide vanes are “full open.” Lengthen feedback rod to increase “full open” N1 speed. Turn both rod ends an equal number of turns.

NOTE: Make sure that a minimum of five rod end threads are engaged in feedback tube ends. If thread engagement is insufficient, the feedback lever on the fuel regulator may be reindexed one or two splines counterclockwise in relation to its shaft.

(b) Two turns on each of the feedback rod ends will result in approximately a 2 percent N1 speed change.

NOTE: Adjustments of the inlet guide vanes should be made in increments of 1 percent N1 speed.

(c) Repeat preceding Steps (2) through (5).

(6) Remove switch and coupling assembly LTCT13725 (detail of LTCT13726) at completion of check. Reconnect CYL 1 line to actuator. Reconnect engine low oil pressure warning switch cannon plug. Perform a leak check prior to releasing aircraft for flight.

E. Perform recommended functional check of switch and coupling assembly. A periodic functional check to make sure that proper operation of the switch and coupling assembly LTCT13725 (detail of LTCT13726) is recommended, using the following method.

(1) Cap off one end of switch fitting and attach a controllable (pressure) source of filtered air to other end.

(2) Connect a continuity meter to each pin of pressure switch.

(3) Apply filtered air pressure to switch and observe for continuity between pins. Pressure should indicate 70 to 80 psi. Replace switch if defective.

3. Inspection/Check

   A. All parts for nicks, burrs, and scratches. Repair.

   B. Threaded parts for crossed, stripped, or damaged threads. Repair or replace actuator.

   C. Visually inspect all parts for cracks, distortion, or excessive wear. Replace discrepant parts.

4. Approved Repairs

   A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-03.)

   B. Repair damaged threads. (See SPM, SP R409, 70-25-03.) Replace part if threads are stripped or cannot be repaired.

INLET GUIDE VANE ACTUATOR HOSE ASSEMBLIES - DESCRIPTION AND OPERATION

1. Description and Operation

The inlet guide vane actuator hose assembly consists of three hoses. Two hoses are connected to the actuator and fuel control assembly. Fuel pressure for the operation of the actuator is obtained through these hoses. The third hose is connected from the actuator to the accessory drive gearbox. Fuel seal leakage is drained through this hose and out of the starter generator drive seal port on the accessory drive gearbox.

INLET GUIDE VANE ACTUATOR HOSE ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Inlet Guide Vane Actuator Hose Assemblies

(1) Remove screws (15, 16, Figure 201) and nuts (13, 14) that secure clamps (17) to bracket on accessory drive gearbox assembly.

(2) Tag hose assembly (12) to identify port connections from which it will be removed.

(3) Disconnect hose assembly (12) from reducer (11) and accessory drive gearbox assembly and remove hose assembly. Cap open port on gearbox assembly.

(4) Remove reducer (11) with gasket (10) from inlet guide vane actuator assembly. Remove gasket from reducer. Plug open port on actuator assembly.

(5) Remove screw (4) and nut (22) that secure clamps (3, 21) to clamp on bottom rear flange of compressor housing.

(6) Tag hose assemblies (7, 20) to identify port connections from which they will be removed.

(7) Disconnect hose assembly (7) from unions (5, 8) and hose assembly (20) from unions (1, 8) and remove hose assemblies.

(8) Remove unions (8, 19) with gaskets (9, 18) from inlet guide vane actuator assembly, and unions (1, 5) with gaskets (2, 6) from fuel control. Remove gaskets from unions. Plug all open ports.

B. Install Inlet Guide Vane Actuator Hose Assemblies

(1) Position gaskets (9, 18) onto unions (8, 19) and install unions into fuel control. Tighten unions as required.

(2) Position gaskets (2, 6) onto unions (1, 5) and install unions into inlet guide vane actuator assembly. Tighten unions as required.

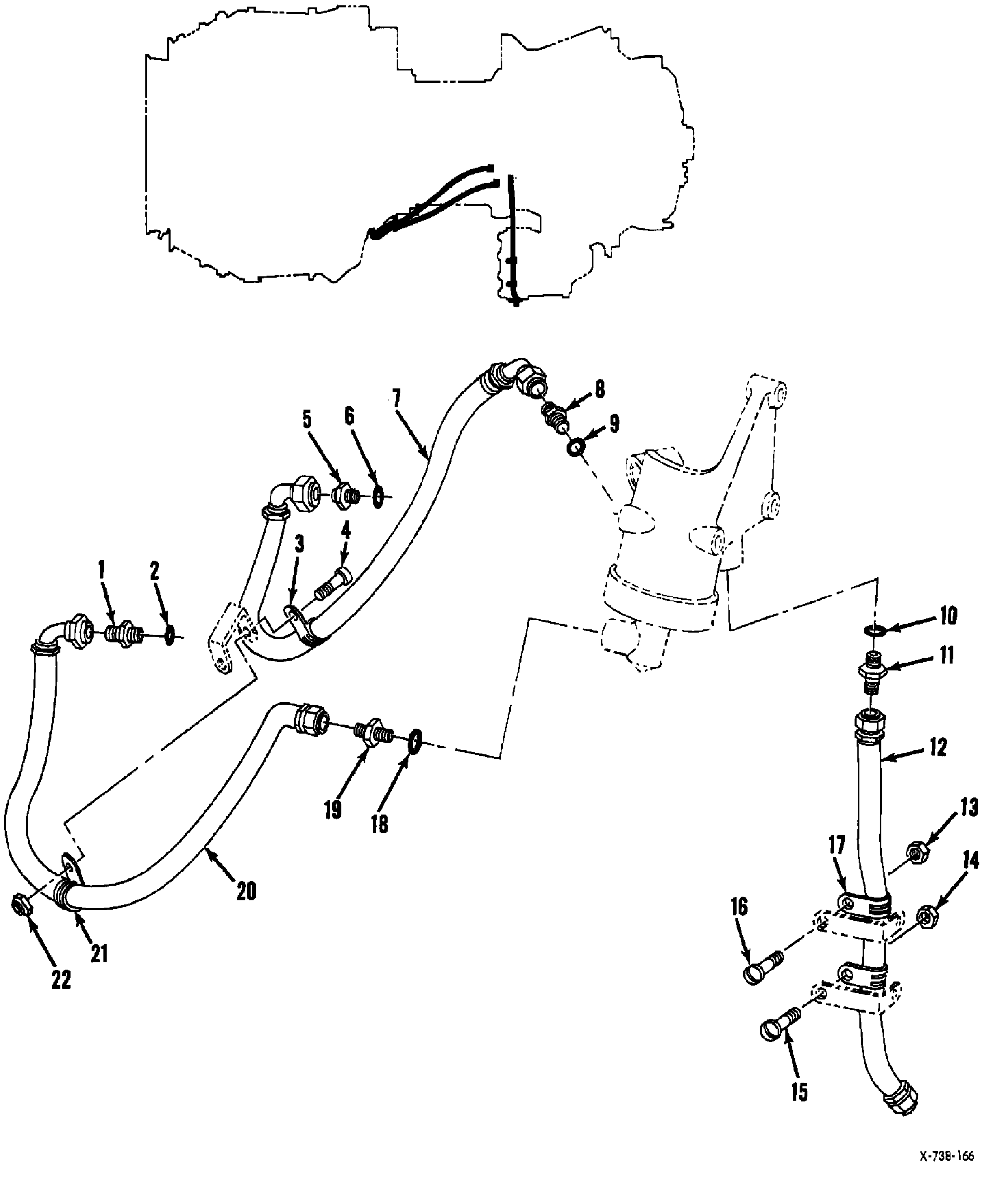
NOTE: Prior to installation of hose assemblies (7, 20), ensure that chafing sleeve (72-00-00, 11, Table 203) is installed and positioned to prevent rubbing against adjacent hoses, impeller housing, air-bleed housing or other hoses.

Refer to identification tags installed at removal to make sure that hose assemblies are connected to proper port.

(3) Connect hose assembly (7) to unions (5, 8) and hose assembly (20) to unions (1, 19). Tighten hose connection 70 to 120 inch-pounds torque.

(4) Secure clamps (3, 21) to bracket on bottom rear flange of compressor housing with screw (4) and nut (22).

(5) Position gasket (10) onto reducer (11) and install reducer into inlet guide vane actuator assembly. Tighten reducer as required.



Inlet Guide Vane Actuator Hose Assemblies
Figure 201

KEY TO FIGURE 201

1. UNION
2. GASKET
3. CLAMP
4. SCREW
5. UNION
6. GASKET
7. HOSE ASSEMBLY
8. UNION
9. GASKET
10. GASKET
11. REDUCER
12. HOSE ASSEMBLY
13. NUT
14. NUT
15. SCREW
16. SCREW
17. CLAMP
18. GASKET
19. UNION
20. HOSE ASSEMBLY
21. CLAMP
22. NUT

(6) Connect hose assembly (12) to reducer (11) and accessory drive gearbox assembly. Tighten hose connectors 70 to 120 inch-pounds torque.

(7) Secure clamps (17) to bracket on accessory drive gearbox assembly with screws (15, 16) and nuts (13, 14).

2. Inspection/Check

A. Inspect hose assemblies for fraying, chafing, and cuts. Replace if defective.

B. Inspect parts for stripped or damaged threads. Repair or replace.

3. Cleaning/Painting

Thoroughly clean inlet guide vane actuator hose assemblies with dry cleaning solvent (72-00-00, 62, Table 203).

4. Approved Repairs

A. Repair damaged threads. (See SPM, SP R409, 70-25-03.) Replace hose assembly if threads are stripped or cannot be repaired.

B. Replace hoses that are frayed, chafed, or cut.

INTERSTAGE BLEED ACTUATOR ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The interstage bleed actuator is mounted on right side of compressor housing assembly. Air pressure for operation of actuator is obtained from a bleed port at right side of diffuser housing. The actuator is controlled by a signal from the fuel control assembly.

TEMPORARY REVISION NO. 94

INSERT PAGE 4 OF 4 FACING 75-30-03, PAGE 201.

Reason: To update Step 1. NOTE to change the replacement schedule for interstage bleed actuator relay valve.

Step 1. NOTE is updated as follows:

NOTE: The interstage bleed actuator strainer must be cleaned and inspected at each Service Inspection, or sooner if operating in extremely dusty area.

Replace the interstage bleed actuator relay valve diaphragm at scheduled engine overhauls and the 2500-hour midpoint inspection for engines on the 5000-hour extended TBO program.

INTERSTAGE BLEED ACTUATOR ASSEMBLY - MAINTENANCE PRACTICES

1. Servicing

NOTE: The interstage bleed actuator strainer must be cleaned and inspected at each Service Inspection, or sooner if operating in extremely dusty area.

Replace the interstage bleed valve actuator relay valve diaphragm at the next Service Inspection closest to 3500 hours since engine was new or overhauled.

A. Remove Strainer Assembly

(1) Disconnect hose from reducer (5, Figure 201).

(2) Remove reducer (5), packing (4), strainer assembly (3) and spring (2) from actuator. Discard packing.

B. Inspect Strainer Assembly

(1) Inspect strainer assembly (3) for foreign matter and damage. If damaged, or foreign matter cannot be removed, replace with a new strainer assembly 2-160-500-01.

(2) Visually inspect all threaded parts for damaged or crossed threads. Replace if damaged.

(3) Visually inspect all springs for damage. Replace if damaged.

(4) Inspect all other parts for damage. Replace any damaged part.

C. Clean strainer assembly using dry cleaning solvent (72-00-00, 62, Table 203), clean strainer assembly (3, Figure 201). If necessary, use a soft bristled brush on strainer. Clean all other parts.

D. Install Strainer Assembly

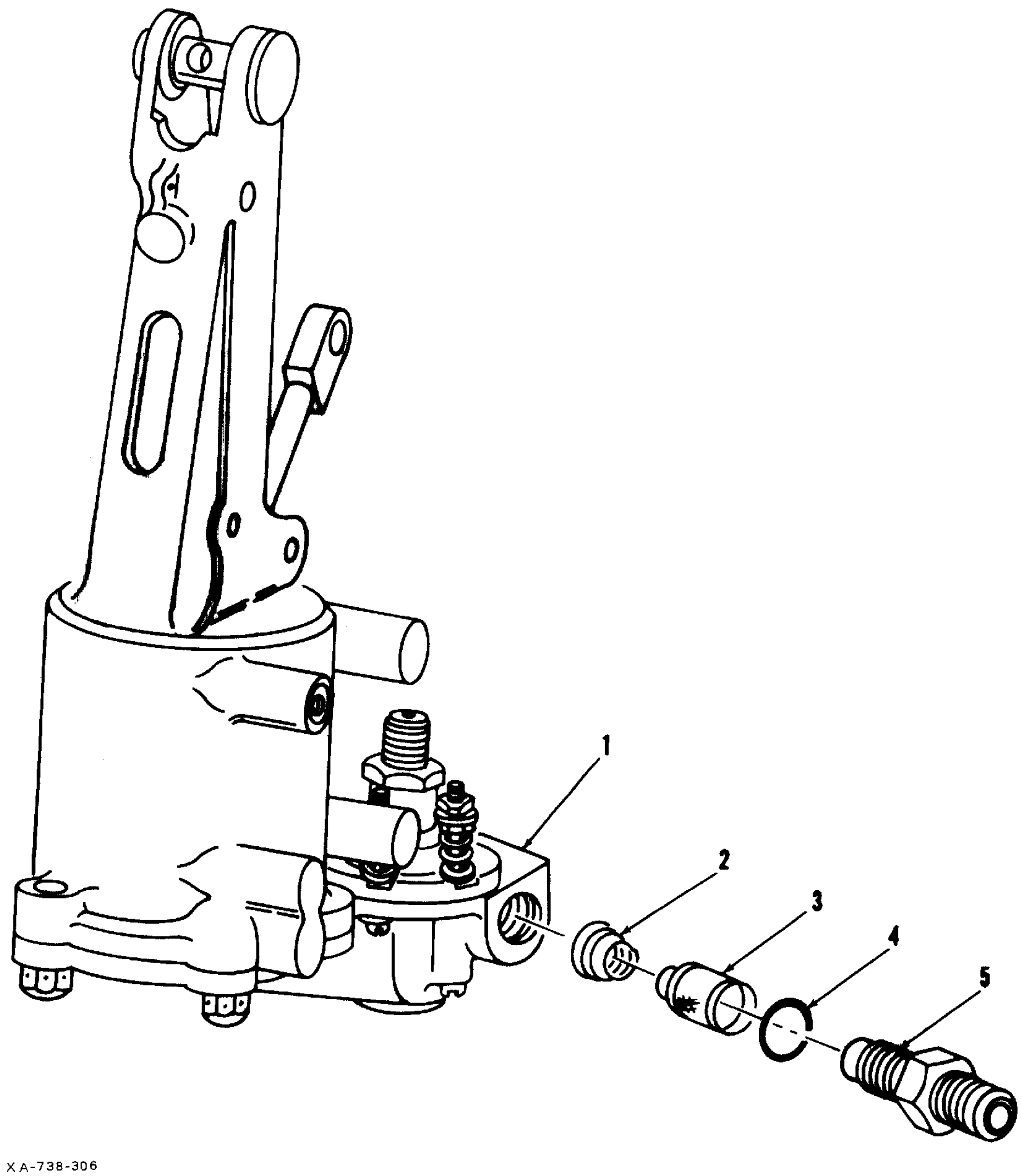
(1) Position tapered end of spring (2) on flange of strainer assembly (3).

(2) Install assembled spring and strainer assembly into actuator.

(3) Lightly coat new packing (4) with grease (72-00-00, 36, Table 203) and install on reducer (5).

(4) Make sure that strainer and spring are properly seated in actuator. Install reducer and tighten.

(5) Connect hose to reducer (5).



1. ACTUATOR
2. SPRING
3. STRAINER ASSEMBLY
4. PACKING
5. REDUCER

Interstage Bleed Actuator
Figure 201

2. Removal/Installation

A. Remove Interstage Bleed Actuator Assembly

(1) Disconnect hose assembly from diffuser housing and fuel control at actuator assembly. (See Figure 202.) Cap all ports and identify hose assemblies. Remove screw that secures hose clamp to actuator housing.

(2) Remove screw and nut that secure lubrication hose assembly clamps to actuator assembly.

(3) (Pre SB T53-L-13B-0105) Remove bolts (22, 23) and washers (21, 24).

CAUTION: IF SHIMS ARE REMOVED FROM IMPELLER HOUSING ACTUATOR MOUNTING BOSSES, THEY MUST BE RETAINED FOR ACTUATOR INSTALLATION.

(4) (Post SB T53-L-13B-0105) Remove bolts (15), nuts (20) and washers (19) that secure interstage bleed actuator assembly (17) to impeller housing.

(5) Pull interstage bleed actuator assembly (17) away from compressor housing to expose connections between rod end (4) and upper band (6), and piston (18) and lower band (12).

(6) Support actuator assembly and remove two pins (14) that secure actuator assembly to bands. Remove actuator.

(7) Remove four bushings (5).

(8) Hold screw (13) and remove nut (11) and washer (10) that secure upper and lower bands (6, 12) together. Remove screw (13). Slide bands through clips (7) and remove bands.

B. Install Interstage Bleed Actuator Assembly

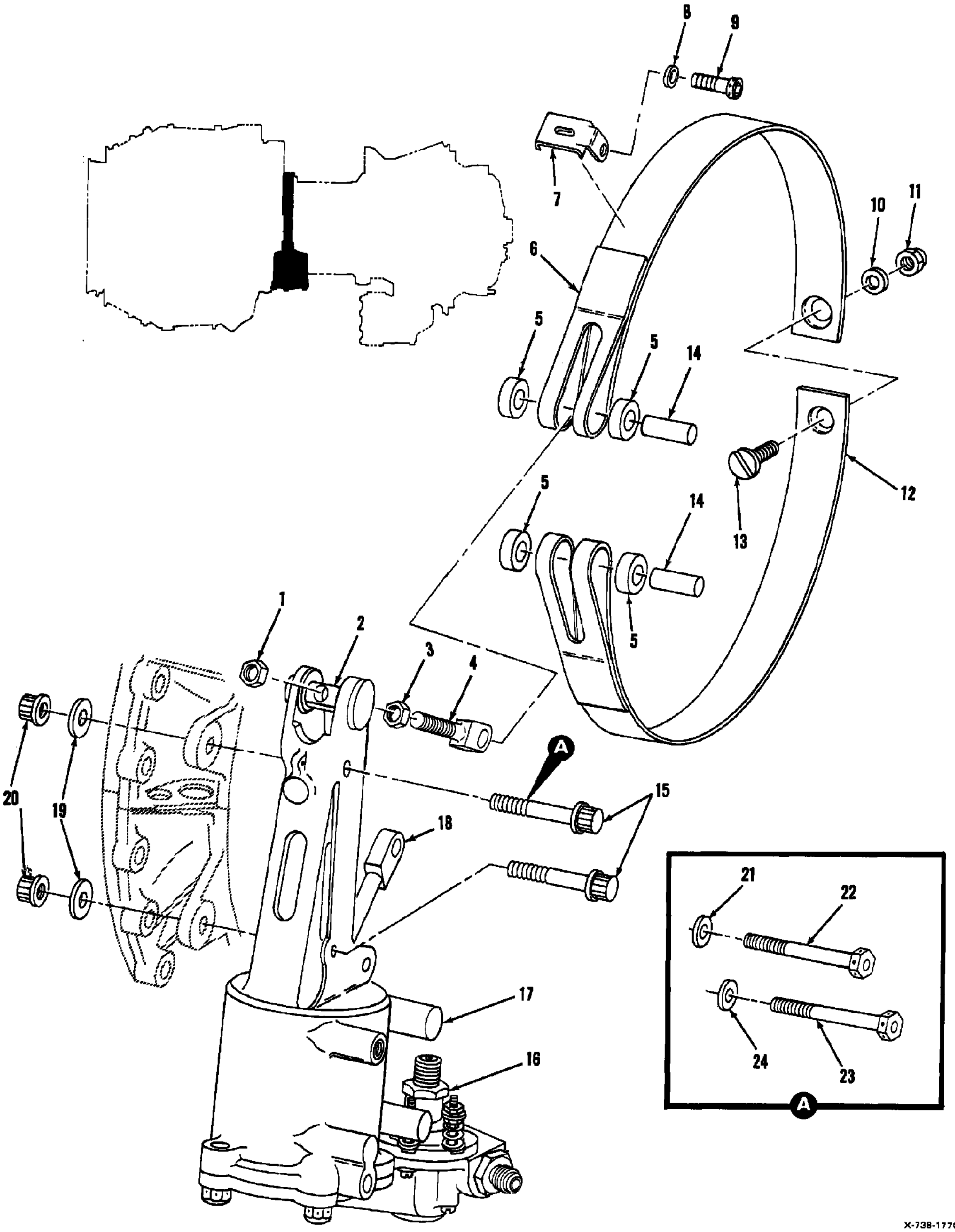
NOTE: The shortest bleed band is installed on top of the compressor.

(1) Install upper band (6) through clips (7) on upper half of compressor housing, and lower band (12) through clips on lower half of compressor housing. Make sure clips are properly installed.

NOTE: The clips are properly installed when legs are so positioned as not to cause bleed band binding. Check all legs and reposition or bend as required. Check assembled bleed band in open and closed position.

(2) Place end of upper band (6) over end of lower band (12). Align screw holes and install screw (13) from inside the bands. Install washer (10) and nut (11) on screw. Hold the screw and tighten nut as required.

(3) Install four bushings (5).



Interstage Bleed Actuator Assembly and Bleed Band
Figure 202

KEY TO FIGURE 202

1. NUT
2. PIN
3. NUT
4. ROD END
5. BUSHINGS
6. UPPER BAND
7. CLIP
8. WASHER
9. BOLT
10. WASHER
11. NUT
12. LOWER BAND
13. SCREW
14. PINS
15. (POST SB T53-L-13B-0105) BOLT
16. UNION
17. INTERSTAGE BLEED ACTUATOR ASSEMBLY
18. PISTON
19. (POST SB T53-L-13B-0105) WASHER
20. (POST SB T53-L-13B-0105) NUT
21. (PRE SB T53-L-13B-0105) WASHER
22. (PRE SB T53-L-13B-0105) BOLT
23. (PRE SB T53-L-13B-0105) BOLT
24. (PRE SB T53-L-13B-0105) WASHER

NOTE: Make sure that spring and strainer element are seated properly before tightening reducer.

(4) Support interstage bleed actuator assembly (17) and attach upper band (6) to rod end (4) with pin (14), and attach lower band (12) to piston (18) with pin (14).

CAUTION: (PRE SB T53-L-13B-0105) INSPECT IMPELLER HOUSING TO COMPRESSOR HOUSING MATING SURFACE TO DETERMINE IF SHIM IS INSTALLED. IF SHIM IS INSTALLED, SHIMS SHALL ALSO BE BONDED TO ACTUATOR MOUNTING BOSSES ON IMPELLER HOUSING. IF A SHIMMED IMPELLER HOUSING IS INSTALLED AND THERE ARE NO SHIMS ON ACTUATOR MOUNTING BOSSES, OR THEY WERE NOT RETAINED WHEN ACTUATOR WAS REMOVED, FABRICATE TWO NEW SHIMS 0.040 INCH THICK, 1.00 INCH OD WITH 0.500 INCH HOLE, FROM ALUMINUM ALLOY AMS4029, AND INSTALL BETWEEN ACTUATOR AND IMPELLER HOUSING. (SEE 72-30-01, FIGURE 205.)

(5) (Pre SB T53-L-13B-0105) Position actuator assembly on mounting face to diffuser housing and secure with bolts (22, 23, Figure 202) and washers (21, 24). Lockwire bolts.

(6) (Post SB T53-L-13B-0105) Position interstage bleed actuator assembly (17) on impeller housing and secure with bolts (15), washers (19) and nuts (20). Tighten as required and lockwire bolts.

(7) Connect hose assembly from diffuser housing to actuator assembly and secure clamp with screw to actuator.

(8) Connect hose assembly from fuel control to actuator assembly.

(9) Connect clamps on lubrication hose assemblies to bracket on actuator assembly with screw and nut.

(10) Adjust bleed bands. (See 75-30-05, Paragraph 2.)

3. Disassembly/Assembly

A. Disassemble Interstage Bleed Actuator Relay Valve

(1) Remove self locking nuts (1, 20, Figure 203), flat washers (2, 19), compression springs (3, 18), flat washers (4, 17), machine screws (12, 14), and flat washers (11, 15).

(2) Lift off relay valve cap (5). Remove plain hex nut (13), shouldered bolt (6), recessed washer (7), relay diaphragm (8), and flat washer (9). Discard relay diaphragm (8).

B. Assemble Interstage Bleed Actuator Relay Valve

(1) Position flat washer (9), new relay diaphragm (8), recessed washer (7), and shouldered bolt (6) in actuator cover (10). Align screw holes in diaphragm with holes in cover.

(2) Thread plain hex nut (13) onto shouldered bolt (6). Tighten nut 10 to 12 inch-pounds torque and lockwire.

CAUTION: ADEQUATELY SUPPORT ACTUATOR COVER (10).

NOTE: Install and adjust bleed bands. (See 75-30-03, Paragraph 2.B. and 75-30-05, Paragraph 2.B.)

(3) Secure relay valve cap (5) to actuator cover (10) with flat washers (4, 17), compression springs (3, 18), flat washers (2, 19), self locking nuts (1, 20), flat washers (11, 15), and machine screws (12, 14). Tighten screws 1 1/2 to 1 3/4 turns after engaging springs.

4. Inspection/Check

A. Inspect parts for nicks, burrs, and scratches. Repair as necessary.

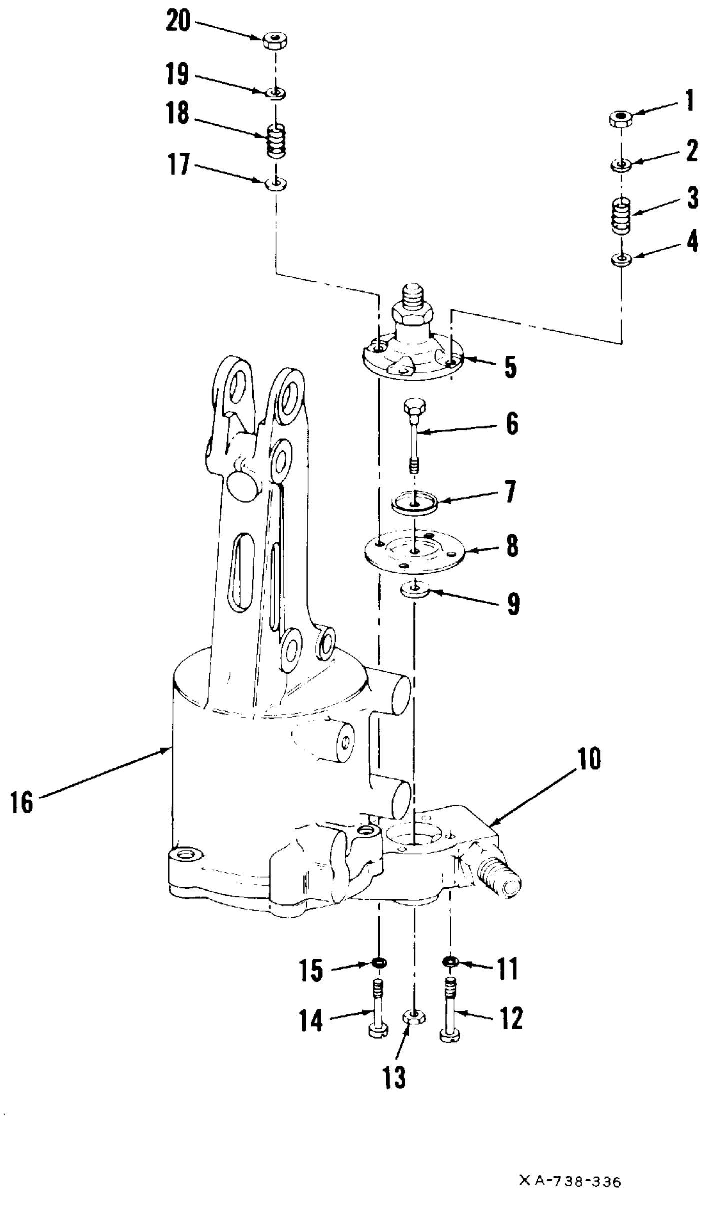
B. Inspect threaded parts for stripped or damaged threads. Repair or replace part.

C. Inspect parts for cracks, distortion, and excessive wear. Replace parts.

D. Inspect relay diaphragm for damage and/or rupture.

5. Cleaning/Painting

Clean interstage bleed actuator assembly thoroughly using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



Interstage Bleed Actuator Assembly - Relay Valve Diaphragm Replacement
Figure 203

KEY TO FIGURE 203

1. SELF LOCKING NUT
2. FLAT WASHER
3. COMPRESSION SPRING
4. FLAT WASHER
5. RELAY VALVE CAP
6. SHOULDERED BOLT
7. RECESSED WASHER
8. RELAY DIAPHRAGM
9. FLAT WASHER
10. ACTUATOR COVER
11. FLAT WASHER
12. MACHINE SCREW
13. PLAIN HEX NUT
14. MACHINE SCREW
15. FLAT WASHER
16. ACTUATOR HOUSING ASSEMBLY
17. FLAT WASHER
18. COMPRESSION SPRING
19. FLAT WASHER
20. SELF LOCKING NUT

6. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair damaged threads. (See SPM, SP R409, 70-25-03.)

C. Replace damaged and/or ruptured relay diaphragm. (See Paragraph 3.)

INTERSTAGE AIR-BLEED HOSE ASSEMBLIES - DESCRIPTION AND OPERATION

1. Description and Operation

The interstage air-bleed hose assemblies consist of two hoses. One hose is connected from the bleed port at right side of diffuser housing to the interstage bleed actuator. Air pressure for operation of the actuator is obtained through this hose. The second hose, connected between the actuator and the fuel control, directs the signal that controls the actuator from the fuel control assembly.

INTERSTAGE AIR-BLEED HOSE ASSEMBLIES - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Interstage Air-Bleed Hose Assemblies

      (1) Remove screw (8, Figure 201) that secures clamp (9) to actuator housing assembly.

      (2) Disconnect hose assembly (1) from diffuser housing and interstage bleed actuator assembly and remove hose assembly. Cap all open ports.

      (3) Remove screw (7) and nut (6) that secure clamp (5) to bracket on bottom rear flange of compressor housing.

      (4) Disconnect hose assembly (4) from fuel control and interstage bleed actuator assembly and remove hose assembly. Cap all open ports.

      (5) Remove union (3) and packing (2) from actuator assembly.

   B. Install Interstage Air-Bleed Hose Assemblies

      (1) Install union (3) and packing (2) into actuator assembly and tighten as required.

      NOTE: Prior to installation of hose assembly (4), make sure that chafing sleeve is installed and positioned to prevent rubbing against nearby hoses and area of contact with aircraft generator.

      (2) Connect hose assembly (4) to fuel control and interstage bleed actuator assembly. Tighten hose connectors 70 to 120 inch-pounds torque.

      (3) Secure clamp (5) to bracket on bottom rear flange of compressor housing with screw (7) and nut (6).

      (4) Connect hose assembly (1) to diffuser housing and interstage bleed actuator assembly. Tighten hose connectors 100 to 250 inch-pounds torque.

      (5) Secure clamp (9) to interstage bleed actuator assembly with screw (8).

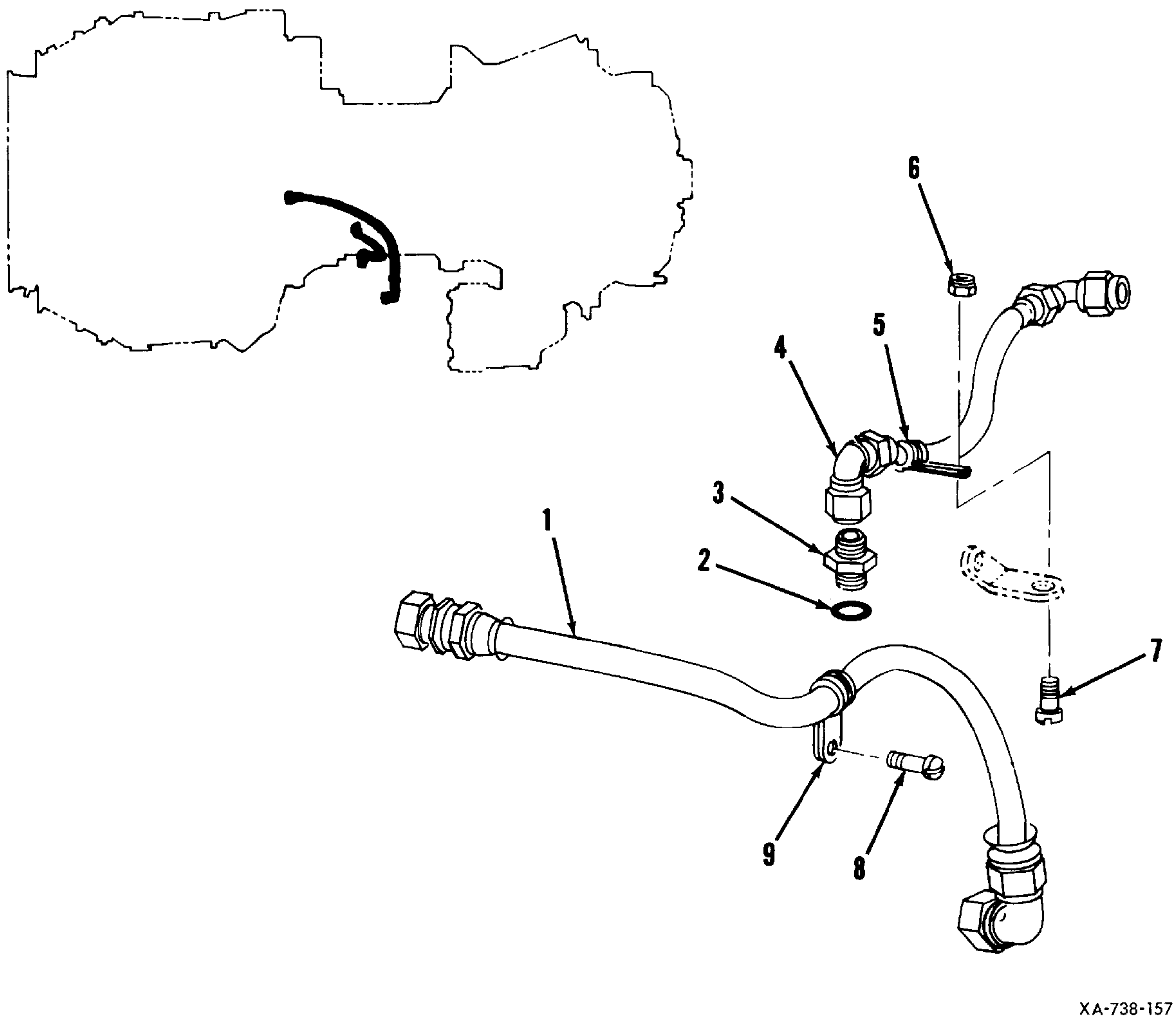
2. Inspection/Check

   A. Inspect hose assemblies for stripped or damaged threads.

   B. Inspect hose assemblies for fraying, chafing, and cuts.

3. Cleaning/Painting

   Clean interstage air-bleed hose assemblies with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



1. HOSE ASSEMBLY
2. PACKING
3. UNION
4. HOSE ASSEMBLY
5. CLAMP
6. NUT
7. SCREW
8. SCREW
9. CLAMP

Interstage Air-Bleed Hose Assemblies
Figure 201

4. Approved Repairs

   A. Repair stripped or damaged threads. (See SPM, SP R409, 70-25-03.)

   B. Replace hose assemblies if frayed, chafed, or cut.

BLEED BAND ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The bleed band assembly consists of two band halves bolted together. It is positioned around the rear portion of the axial compressor housing, and secured by clips bolted to the compressor housing. The looped ends of the bleed band assembly are attached to the air-bleed actuator.

BLEED BAND ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Bleed Band Assembly

      (1) Remove pin (75-30-03, 14, Figure 202) from upper band (6) and rod end (4).

      (2) Remove pin (14) from lower band (12) and piston (17).

      (3) Remove bolts (9), washers (8), and clips (7) from compressor housing.

      CAUTION: DO NOT TWIST OR BEND BLEED BANDS.

      (4) Remove upper and lower bands (6, 12).

   B. Install Bleed Band Assembly

      CAUTION: DO NOT TWIST OR BEND BLEED BANDS.

      (1) Position upper and lower bands (6, 12) on compressor housing.

      NOTE: The shorter bleed band is installed on top of the compressor housing.

      (2) Position clips (7) on compressor housing, and secure with bolts (9), and washers (8). Make sure clips are properly installed. Tighten and lockwire bolts.

      NOTE: The clip is properly installed when legs are so positioned as not to cause bleed band binding. Check all legs and reposition or bend as required. Check assembled bleed band in open and closed position.

      (3) Attach upper band to rod end (4) and lower band to piston (18) with pins (14). Push rod and screw assemblies, bands, and pins into actuator housing.

2. Adjustment/Test

   NOTE: The bleed band shall be adjusted whenever a new band or actuator assembly is installed. The travel of the piston rod and the tightness of the bleed band are adjusted as follows:

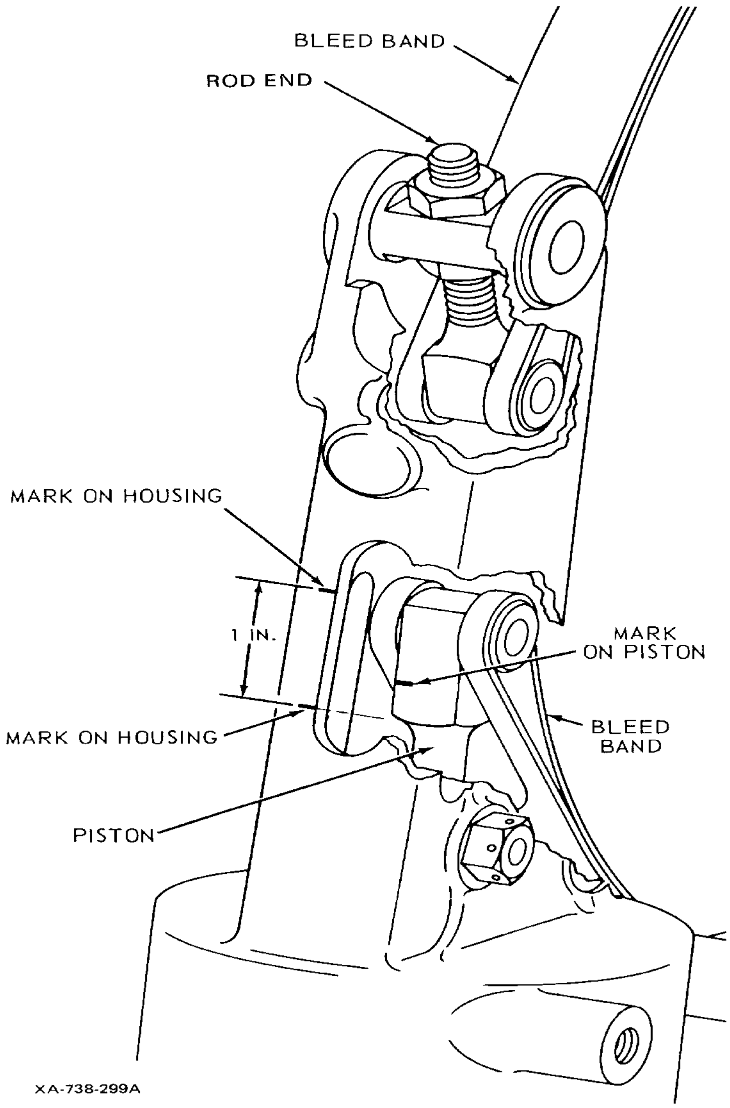
   A. Adjust Bleed Band Assembly

      (1) With piston in retracted position, make a mark on the piston. (See Figure 201.)

      (2) Position a mark on housing in line with mark on piston. Place another mark on housing exactly 1 inch above first mark.

      (3) Disconnect hose assembly from diffuser housing and hose assembly from fuel regulator at actuator assembly.

      (4) Install cap assembly AN929-4 on exposed port from which hose assembly from fuel regulator was removed.



Determining Air-Bleed Actuator Piston Rod Travel
Figure 201

NOTE: At least one thread shall show beyond nut at all times.

(5) Cut lockwire that secures nut on each side of pin (75-30-03, 2, Figure 202). Back off nut (1) to end of rod end (4).

(6) Close bleed bands by applying 60 psig air pressure to actuator assembly reducer fitting.

(7) Measure travel (throw) of rod.

(8) Tighten nut (3) until bleed band is snug against compressor housing.

NOTE: The bleed band is properly positioned when torque on the nut increases.

(9) Release pressure and tighten nut (1). Reapply pressure.

(10) If rod travel is within 1.0 to 1.2 inches, proceed to following Step (13).

(11) If rod travel is below 1 inch limit, replace band or actuator assembly, whichever is required, and repeat preceding Steps (6) through (10).

(12) If rod travel is more than 1.2 inches, continue to tighten nut (3) until travel is within limits.

(13) Apply 60 psig air pressure to actuator assembly reducer fitting.

NOTE: Clearance between compressor housing and bleed band in all bleed port areas must not exceed 0.002 inch drag fit.

(14) Using feeler gage, check clearance between compressor housing and bleed band at each clip and at position where two halves of band meet.

(15) Adjust nuts (1, 3) to obtain required clearance by either of the following methods.

(a) Tighten band by loosening nut (1) and tightening nut (3).

(b) Loosen band by loosening nut (3) and tightening nut (1).

(16) When proper clearance has been established, tighten nuts and lockwire both nuts together.

(17) Disconnect air pressure supply and reconnect hose assemblies.

(18) Perform a bleed band closure test. (See Step B.)

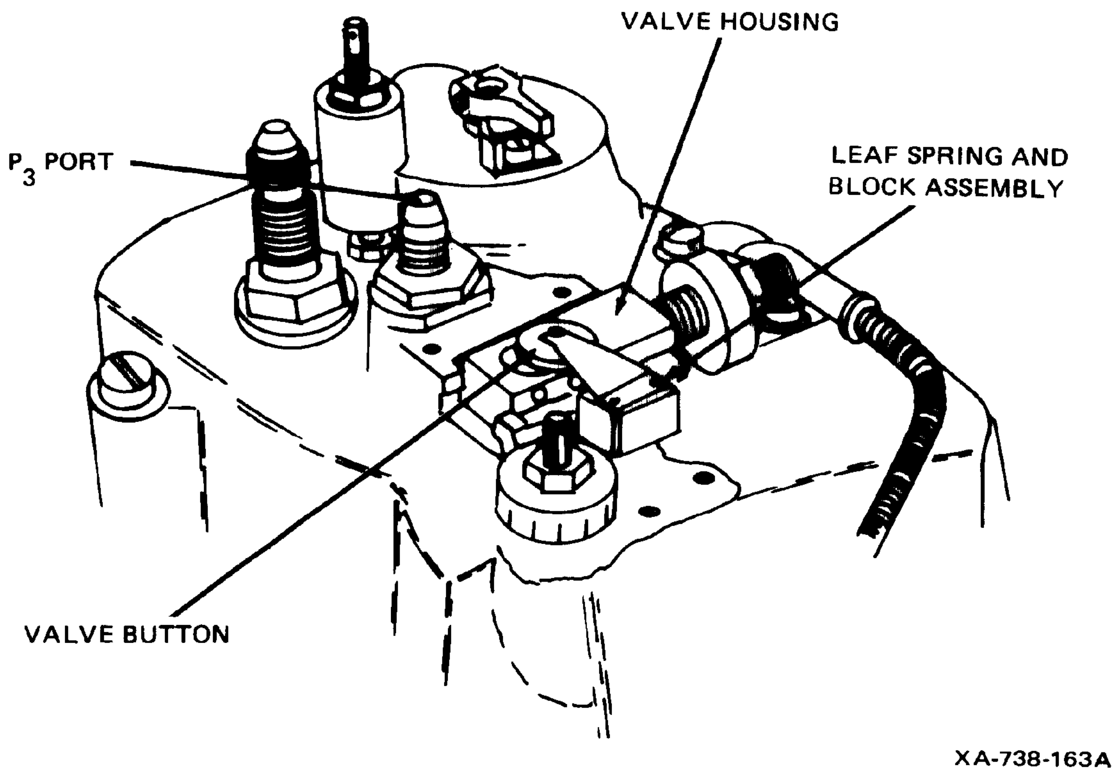
B. Test Bleed Band Assembly. (See 73-20-01, Paragraph 3.A(2)(a) through (g).)

(1) A bleed band closure test should be performed for the following conditions.

(a) When an interstage bleed actuator has been repaired or replaced.

(b) When a fuel control has been replaced.

(c) When air-bleed system malfunction is suspected.



Fuel Control Air-Bleed Valve
Figure 202

(2) If interstage air-bleed system does not function properly, check for the following defects.

(a) Leaks or obstructions in hoses or fittings.

(b) Clogged strainer in interstage bleed actuator.

(c) Sticking of piston in air-bleed actuator.

(d) Improper adjustment of bleed band.

(e) Deposit of dirt and gum that prevents operation of fuel control air-bleed valve on fuel control. (See Figure 202.)

(3) Proceed as follows to correct the defects listed in preceding Step (2).

(a) Disconnect hose between air diffuser and actuator at actuator fitting.

(b) Connect a source of compressed air to hose and blow air through hose to determine that hose and diffuser housing port are unobstructed.

(c) If hose and diffuser housing port are clear, disconnect air-bleed hose between fuel control and actuator and at actuator fitting. Blow air through hose to determine that hose is unobstructed.

(d) Connect the source of compressed air to reducer fitting on actuator.

NOTE: When pressure is applied, actuator should close. Closing will be indicated by rise of rod assembly.

(e) Supply 60 psig maximum metered air pressure to reducer (75-30-03, 5, Figure 201) and block union (75-30-03, 16, Figure 202).

NOTE: When union is uncovered, actuator should open. Opening will be indicated by drop of rod assembly.

(f) Uncover union.

(g) If diffuser housing port is unobstructed, determine cause and remedy. Recheck actuator for proper operation.

(h) If hoses are obstructed, replace hoses. Recheck actuator for proper operation.

(i) If actuator does not open and close as indicated in preceding Steps (d) through (f), replace actuator. Check new actuator for proper operation.

(j) If hoses and port are clear and actuator opens and closes as indicated in preceding Steps (d) through (f), inspect air-bleed valve of fuel control as described in Step (c).

(4) Remove dust cover from fuel control air-bleed valve. Clean cover with dry cleaning solvent (72-00-0, 62, Table 203). (See SPM, SP C203, 70-15-03.)

(5) Connect air-bleed hose to the fuel control P3 port. (See Figure 202.)

(6) Introduce, in the form of spray, dry cleaning solvent (72-00-00, 62, Table 203), through the open end of the hose while simultaneously rotating the leaf spring, block, and valve button assembly. (See Figure 202 and SPM, SP C203, 70-15-03.)

CAUTION: THE LEAF SPRING, BLOCK, AND VALVE BUTTON ASSEMBLY MUST BE ROTATED MANUALLY. USE OF TOOLS IS NOT PERMITTED.

(7) Spray the exterior area of leaf spring, block, and valve button assembly with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

(8) Repeat preceding Step (6).

(9) Reconnect air-bleed hose to air-bleed actuator.

(10) Perform an operational check of interstage bleed actuator assembly. (See preceding Step (3).) Reinstall dust cover over fuel control trigger mechanism.

(11) If bleed band still does not function properly, proceed with Step (12).

(12) Remove fuel control and place on a suitable workbench.

CAUTION: DO NOT USE TOOLS TO ROTATE THE LEAF SPRING, BLOCK, AND VALVE BUTTON ASSEMBLY.

(13) Manually rotate the leaf spring and block assembly to center the valve button over the orifice in the valve housing. (See Figure 202.)

CAUTION: WHEN REMOVING VALVE BUTTON, MAKE SURE THAT THE LEAF SPRING DOES NOT CONTACT THE SURFACE OF THE VALVE HOUSING.

(14) Apply a small amount of liquid soap around the valve button and introduce shop air at 60 psig to the P3 port. Observe button for signs of air leakage. Remove and replace button 76285 if leakage is evident.

(15) Inspect valve housing contact surface for scoring. If valve housing is scored, it will create an abrasive action to erode the button contact surface and cause excessive leakage. Replace fuel control if valve housing is heavily scored.

(16) Reinstall fuel control. (See 73-20-01.)

3. Inspection/Check

A. Inspect bleed band machine screw that joins upper bleed band to lower bleed band. Make certain that screw can be installed flush or below the surface of inside diameter of bleed band assembly.

B. Inspect upper and lower bands for distortion. Replace if distorted.

4. Cleaning/Painting

Clean bleed band assembly thoroughly using dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

Honeywell

MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

ENGINE CONTROLS

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MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

LIST OF EFFECTIVE PAGES

FUEL CONTROL AIR PRESSURE SENSING HOSE - DESCRIPTION AND OPERATION

1. Description and Operation

   The fuel control air pressure sensing hose is located on the upper left side of the engine between the compressor inlet and the fuel control assembly. It provides a means of transferring compressor inlet air pressure signals to the fuel control.

FUEL CONTROL AIR PRESSURE SENSING HOSE - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Fuel Control Air Pressure Sensing Hose

      (1) Remove screw (5, Figure 201) and nuts (12) from clamp (4).

      (2) Remove screw (8) and nut (6) from clamp (7).

      (3) Disconnect hose assembly (9) from elbow (3) and union (10).

      CAUTION: IMMEDIATELY CAP ALL OPENINGS TO PREVENT ENTRY OF FOREIGN OBJECTS.

      (4) Loosen nut (2) and remove elbow (3) with nut and packing (1) from inlet housing assembly. Remove packing and nut from elbow.

      (5) Remove union (10) with packing (11) from fuel control. Remove packing from union.

   B. Install Fuel Control Air Pressure Sensing Hose

      (1) Position packing (11) onto union (10) and install union into fuel control. Tighten union as required.

      (2) Thread nut (2) onto elbow (3) and position packing (1) on elbow. Install elbow with nut and packing into inlet housing assembly. Tighten nut as required.

      NOTE: Prior to installation of hose assembly (9), ensure that chafing sleeve is positioned where hose may come in contact with overspeed governor and tachometer drive gearbox.

      (3) Connect hose assembly (9) to union (10) and to elbow (3). Tighten hose connectors 70 to 120 inch-pounds torque.

      (4) Secure clamp (4) to bracket on overspeed governor and tachometer drive assembly with screw (5) and nut (12).

      (5) Secure clamp (7) to bracket on forward flange of compressor housing with screw (8) and nut (6).

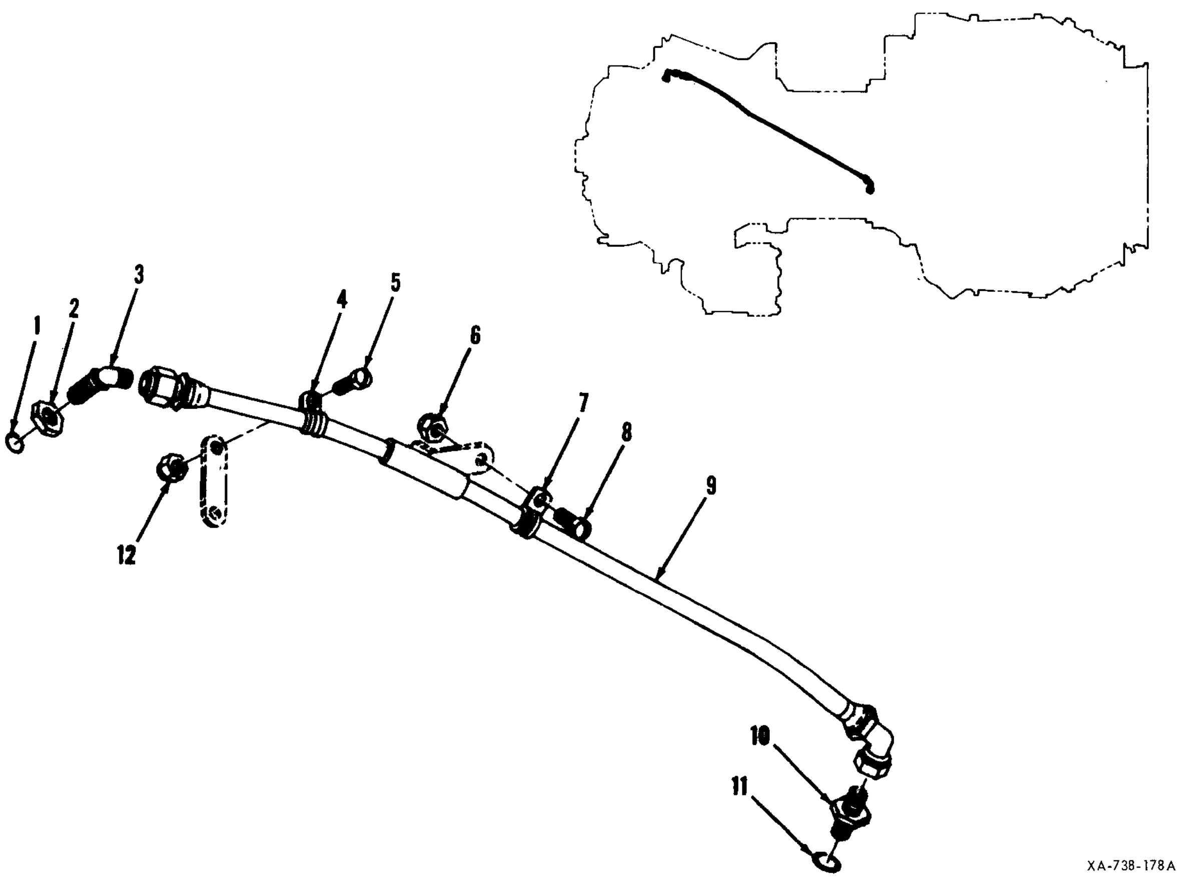
2. Inspection/Check

   A. Inspect for stripped or damaged threads.

   B. Inspect hose assembly for fraying, chafing, and cuts.

3. Cleaning/Painting

   Clean fuel control air pressure sensing hose parts with dry cleaning solvent (72-00-00, 62, Table 203).



1. PACKING
2. NUT
3. ELBOW
4. CLAMP
5. SCREW
6. NUT
7. CLAMP
8. SCREW
9. HOSE ASSEMBLY
10. UNION
11. PACKING
12. NUT

Fuel Control Air Pressure Sensing Hose Assembly
Figure 201

4. Approved Repairs

   A. Blend repair damaged threads using fine stone. (See SPM, SP R401, 70-25-01.) Replace parts with stripped threads or threads that cannot be repaired.

   B. Replace hose assembly if cut, frayed, or chafed.

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ENGINE INDICATING

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	203	Sep 1/08			
	204	Sep 1/08			

EXHAUST THERMOCOUPLE HARNESS - DESCRIPTION AND OPERATION

1. Description and Operation

An exhaust thermocouple harness, consisting of an electrical connector, shielded manifold and chromel-alumel thermocouples, is provided with the engine. The thermocouples, inserted through the exhaust diffuser into the path of exhaust gas, transmit exhaust gas temperatures to a cockpit indicator.

EXHAUST THERMOCOUPLE HARNESS - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Exhaust Thermocouple Harness

(1) If engine is installed in airframe, disconnect thermocouple connector (3, Figure 201) from firewall.

CAUTION: IN THE FOLLOWING STEP, LOOSEN EACH NUT ONE TURN, THEN PROGRESS TO NEXT NUT. DO NOT ATTEMPT TO MOVE HARNESS UNTIL ALL NUTS ARE LOOSE.

(2) Using a 5/16 inch combination wrench GOE X100 (Snap-On), or equivalent, with box end modified (by grinding) to 3/32 inch maximum thickness for a length of approximately 1 inch, remove nuts (2) that retain thermocouple harness (1) to exhaust diffuser.

CAUTION: EXTREME CAUTION SHALL BE TAKEN WHEN REMOVING THERMOCOUPLE ASSEMBLY FROM EXHAUST DIFFUSER (ALWAYS REMOVE END PROBES FIRST). EXCESSIVE FLEXING OF THERMOCOUPLE ASSEMBLY, SPECIFICALLY AT PROBE LOCATIONS, CAN RESULT IN INTERNAL BREAKAGE AND SHORTING. NEVER USE PLIERS OR SHARP OBJECTS TO PRY PROBES OR ADJACENT HARNESS LOOSE FROM DIFFUSER.

NOTE: The thermocouple connector (3) should always remain with the thermocouple harness. It should not remain connected to the firewall cannon plug when the thermocouple harness is removed.

(3) Remove thermocouple harness from studs.

B. Install Exhaust Thermocouple Harness

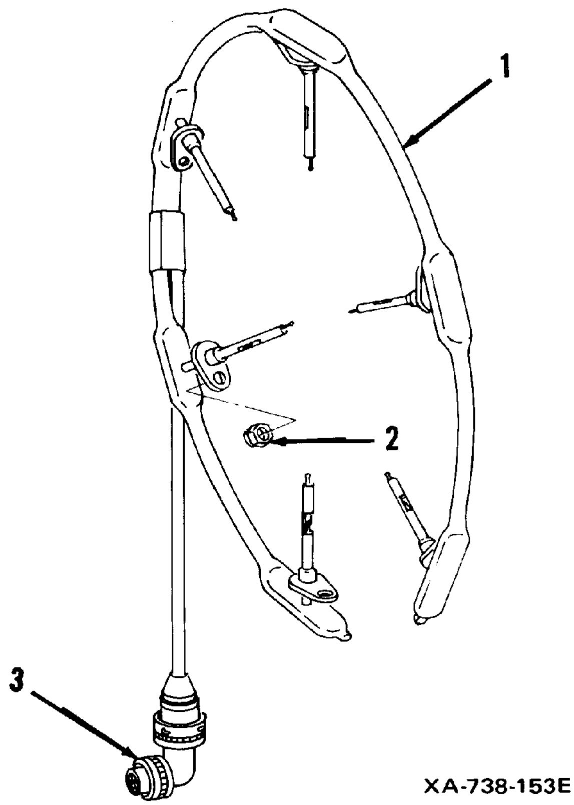
CAUTION: EXTREME CAUTION SHALL BE TAKEN WHEN INSTALLING THERMOCOUPLE ASSEMBLY ON EXHAUST DIFFUSER. EXCESSIVE FLEXING OF THERMOCOUPLE ASSEMBLY, SPECIFICALLY AT PROBE LOCATIONS, CAN RESULT IN INTERNAL BREAKAGE AND SHORTING. NEVER USE PLIERS OR SHARP OBJECTS ON PROBES OR ADJACENT HARNESS.

(1) Insert thermocouple probes in exhaust diffuser bosses.

NOTE: Prior to installation of nuts (2), apply anti-seize compound (72-00-00, 15, Table 203) to threads.

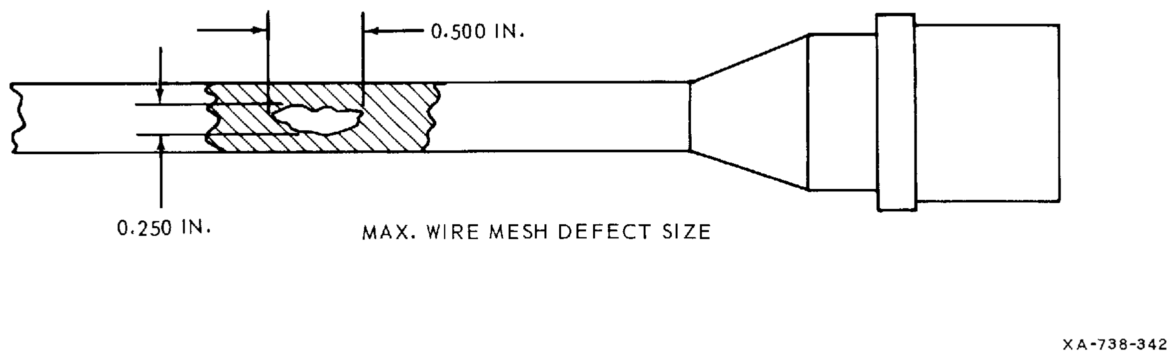
In following Step (2) position the torque wrench axis 90 degrees to the adapter axis. A direct torque can be applied.

(2) Using torque adapter TMR X10 (Snap-on), or equivalent, with open end modified (by grinding) to 5/32 inch maximum thickness for a length of 7/8 to 1 inch, secure exhaust thermocouple assembly to exhaust diffuser with nuts (2). Tighten nuts 35 to 45 inch-pounds torque.



1. THERMOCOUPLE HARNESS
2. NUTS
3. THERMOCOUPLE CONNECTOR

Exhaust Thermocouple Harness
Figure 201



Exhaust Thermocouple Assembly - Chafing and Fraying Inspection
Figure 202

2. Inspection/Check

A. Inspect Exhaust Thermocouple Harness

CAUTION: EXTREME CAUTION SHALL BE TAKEN WHEN HANDLING THE THERMOCOUPLE ASSEMBLY. EXCESSIVE FLEXING OF THE ASSEMBLY, SPECIFICALLY AT THE PROBE LOCATIONS, CAN RESULT IN INTERNAL BREAKAGE AND SHORTING. NEVER USE PLIERS OR SHARP OBJECTS ON PROBES OR ADJACENT HARNESS.

NOTE: A thermocouple assembly that fulfills requirements of the functional check but has chafe damage (not exceeding limits shown in Figure 202) may be repaired as instructed in Paragraph 4. Assemblies having damage exceeding such limits must be replaced.

(1) Inspect thermocouple connector (3, Figure 201) for damaged threads, cracked insulator, or damaged or bent pins. Replace if defects are found.

(2) Inspect harness for wear, fraying, and loose connectors.

(3) Inspect connectors for corrosion.

(4) Inspect thermocouple ends for bends or breaks.

(5) Perform a functional test of the assembly to ensure absence of shorting and internal damage. (See Paragraph 2.B.)

B. Check exhaust thermocouple harness (1) for continuity using Multimeter AN/PSM6B. Harness resistance shall be as shown in Figure 203. If resistance is not within limits as shown in Figure 203, replace harness.

3. Cleaning/Painting

CAUTION: DO NOT IMMERSE HARNESS IN SOLVENT. SOLVENT MAY CAUSE MALFUNCTION OF THERMOCOUPLE PROBES AND DETERIORATION OF INTERNAL WIRING INSULATION.

Wipe clean exhaust thermocouple harness using a clean lint free cloth dampened with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.) After cleaning, wipe with a clean, dry lint free cloth to remove residual solvent.

4. Repair

CAUTION: EXTREME CAUTION SHALL BE TAKEN WHEN HANDLING THE THERMOCOUPLE ASSEMBLY. EXCESSIVE FLEXING OF THERMOCOUPLE ASSEMBLY, SPECIFICALLY AT PROBE LOCATIONS CAN RESULT IN INTERNAL BREAKAGE AND SHORTING. NEVER USE PLIERS OR SHARP OBJECTS ON PROBES OR ADJACENT HARNESS.

A. Repair harness within limit chafe damage on thermocouple harness which is within functional test limits.

(1) Remove projecting wire strands of braid at damaged area.

(2) Using lockwire (72-00-00, 40, Table 203) apply and wind around damaged cable. (See Figure 204.) Wrappings should extend 3/8 inch beyond extremities of damage but should not exceed maximum wrap limit shown.

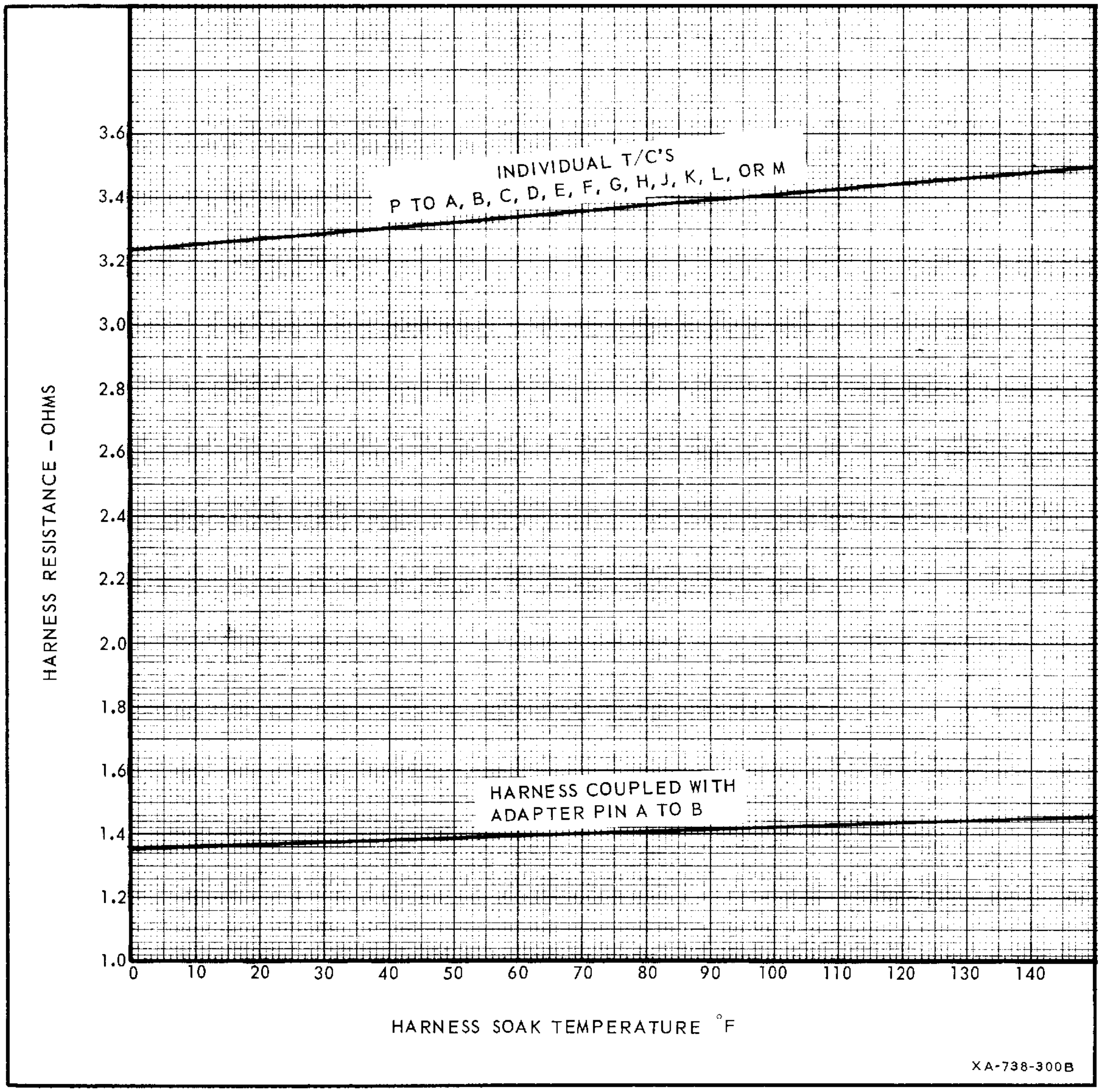
NOTE: In following Step (3) use care when pulling end C. Pull only far enough to firmly anchor end A beneath several wraps of the wire.

(3) Finish wrap with whip finish technique by inserting wire end A through loop B. Hold A taut while pulling C to close loop. Release A and carefully pull C until end A is anchored beneath wrapping. Remove excess wire ends. (See Figure 204.)

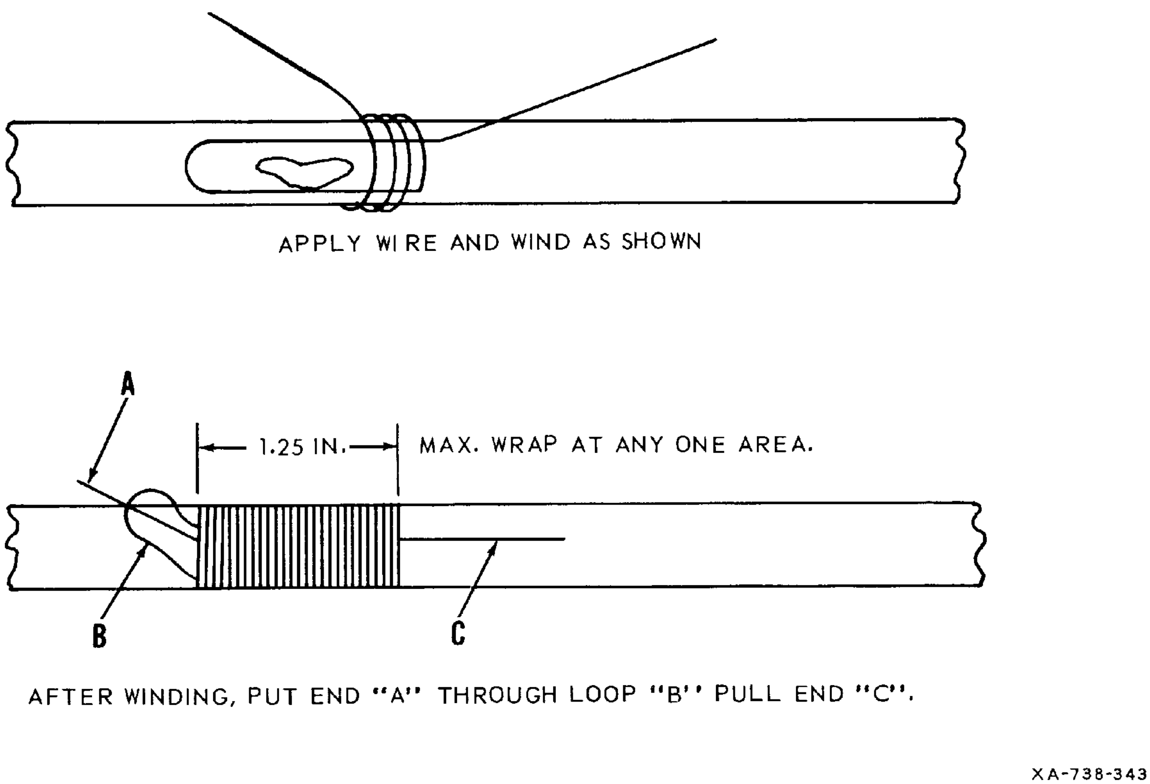
(4) Functional test exhaust thermocouple assembly in accordance with Paragraph 2.B.

B. Remove corrosion on connectors using crocus cloth (72-00-00, 13, Table 203) and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

C. Replace thermocouple harness with bent or broken thermocouple ends.



Harness Soak Temperature/Resistance (Six-Probe Harness)
Figure 203



Exhaust Thermocouple Assembly - Repair of Chafed or Frayed Cable Braid
Figure 204

ELECTRICAL CABLE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The electrical cable assembly contains connections for the ignition unit, hot air solenoid valve, starting fuel solenoid valve, inlet oil temperature bulb, fuel control transfer solenoid valve, and power turbine and gas producer turbine tachometer generators. Quick disconnect plugs are incorporated on the harness.

ELECTRICAL CABLE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Electrical Cable Assembly

      (1) Remove all screws and nuts that secure clamps (4, 7, 12, 21, 22, 27, Figure 201) to the engine.

      NOTE: Index each connector to facilitate reassembly.

      (2) Disconnect electrical plug at airframe main connector (15).

      WARNING: DISCHARGE ANY ELECTRICAL CHARGE STORED IN SYSTEM BY GROUNDING IGNITION LEADS.

      (3) Disconnect cable assembly at each of the following connectors, hot air solenoid valve connector (9), compressor rotor (N1) tachometer generator connector (1), ignition unit connector (16), power turbine (N2) tachometer generator connector (18), starting fuel solenoid valve connector (17), normal/emergency fuel transfer solenoid valve connector (24), and oil temperature bulb connector (28).

      (4) Remove screws and nuts, and remove airframe main connector (15) from bracket.

      (5) Remove cable assembly. Remove sealing washer from each connector. Discard sealing washers.

   B. Install Electrical Cable Assembly

      (1) Position cable assembly on engine so that five connectors are on the left side and two connectors are on the right of the engine.

      (2) Secure airframe main connector (15) to engine bracket.

      (3) Using new sealing washers, attach the cable assembly to components with each of the following connectors, oil temperature bulb connector (28), normal/emergency fuel transfer solenoid valve connector (24), power turbine (N2) tachometer generator connector (18), starting fuel solenoid valve connector (17), ignition unit connector (16), hot air solenoid valve connector (9), and compressor rotor tachometer generator connector (1) (See Figure 202.) Lockwire all connectors.

      (4) Position clamps (4, 7, 12, 21, 22, 27, Figure 201) and secure cable assembly to engine. Lockwire screw (23).

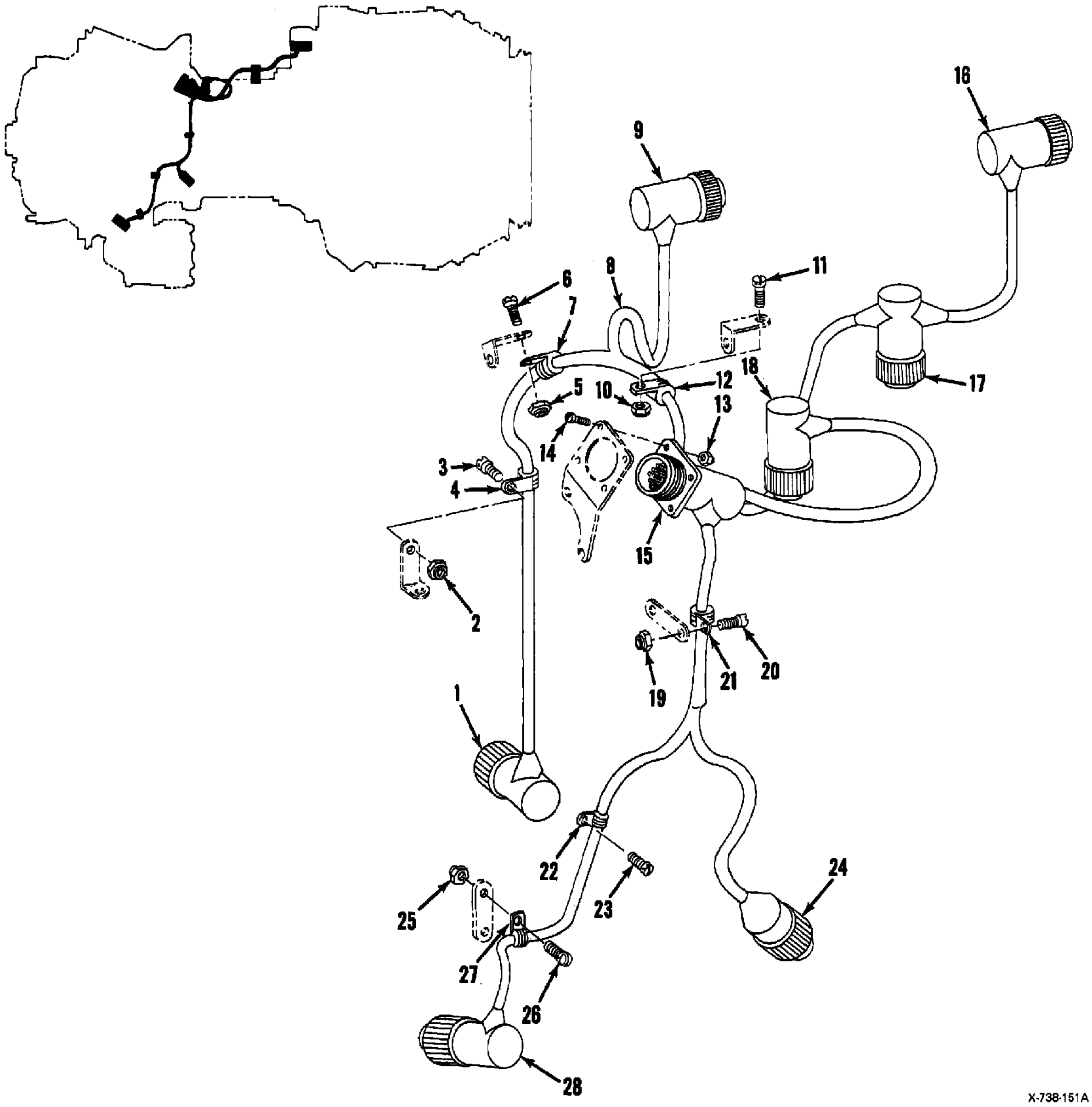
      (5) Connect electrical plug at airframe main connector.

2. Inspection/Check

   A. Inspect Electrical Cable Assembly

      (1) Inspect connectors for corrosion, damaged threads, cracked insulator, and bent or broken pins.

      (2) Inspect cable assembly for loose connectors, chafing, fraying, cuts, and deterioration.



Electrical Cable Assembly
Figure 201

KEY TO FIGURE 201

1. COMPRESSOR ROTOR (N1) TACHOMETER GENERATOR CONNECTOR
2. NUT
3. SCREW
4. CLAMP
5. NUT
6. SCREW
7. CLAMP
8. ELECTRICAL CABLE ASSEMBLY
9. HOT AIR SOLENOID VALVE CONNECTOR
10. NUT
11. SCREW
12. CLAMP
13. NUT
14. SCREW
15. AIRFRAME MAIN CONNECTOR
16. IGNITION UNIT CONNECTOR
17. STARTING FUEL SOLENOID VALVE CONNECTOR
18. POWER TURBINE (N2) TACHOMETER GENERATOR CONNECTOR
19. NUT
20. SCREW
21. CLAMP
22. CLAMP
23. SCREW
24. TRANSFER SOLENOID VALVE CONNECTOR
25. NUT
26. SCREW
27. CLAMP
28. OIL TEMPERATURE BULB CONNECTOR

(3) Replace damaged cable assembly.

B. Check Electrical Cable Assembly

(1) Perform a continuity check.

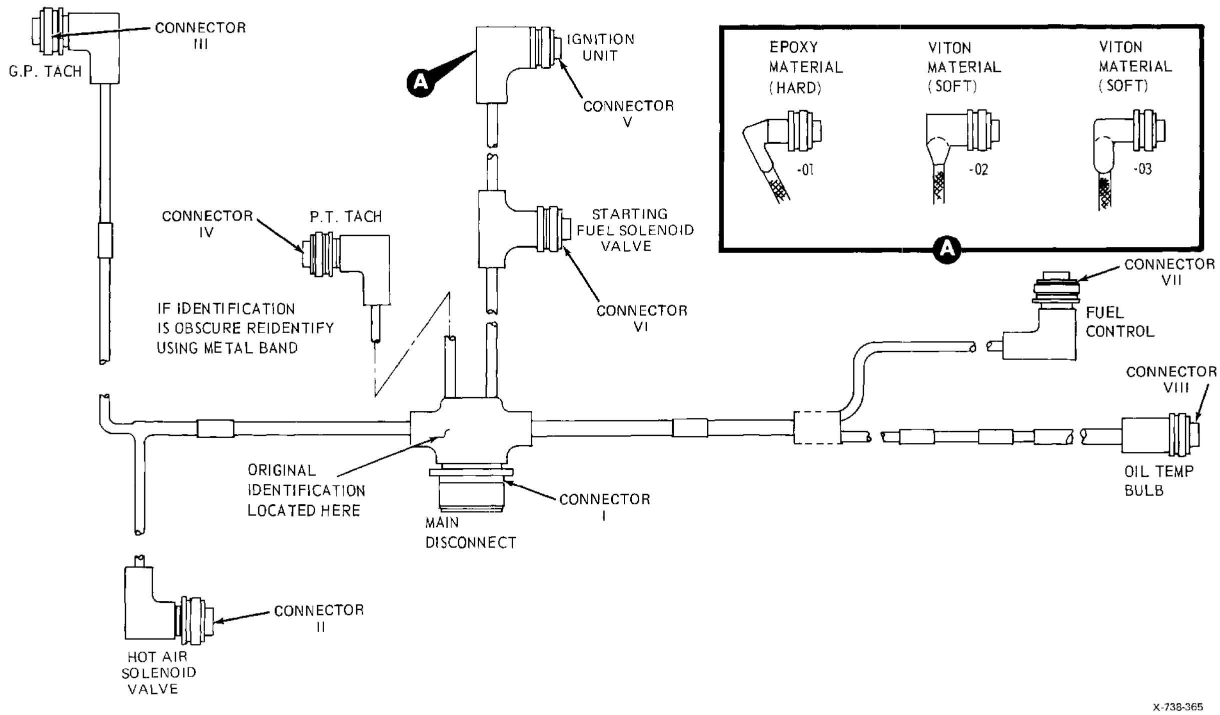
(2) Replace cable if proper continuity is not established.

3. Cleaning/Painting

CAUTION: DO NOT IMMERSE CABLE ASSEMBLY IN SOLVENT, SOLVENT MAY CAUSE DETERIORATION OF INTERNAL WIRING INSULATION.

A. Wipe cable assembly clean, using a clean, lint free cloth dampened with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.) After cleaning, wipe with a clean, dry, lint free cloth to remove residual solvent.

B. Remove corrosion with crocus cloth (72-00-00, 13, Table 203) and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



HONEYWELL PART NUMBER	VENDOR PART NUMBER	
1-300-242-01	DELETED	
1-300-242-02	COOPERATIVE INDUSTRIES 59359	CONNECTOR I DOES NOT REQUIRE A SEALING WASHER
		CONNECTORS II, III, IV, AND VIII REQUIRE TEFLON SEALING WASHER
		CONNECTORS V, VI, AND VII REQUIRE TEFLON SEALING WASHER P/N 50107; ONE WASHER PER CONNECTOR
1-300-242-03	BENDIX 10-321720-1	CONNECTOR I DOES NOT REQUIRE A SEALING WASHER
		CONNECTORS II, III, IV, AND VIII REQUIRE SEALING WASHER
		CONNECTORS V, VI, AND VII REQUIRE SEALING WASHER P/N 10-229957-81; ONE WASHER PER CONNECTOR.
		NOTE: SEALING WASHER MATERIAL IS DUPONT VITON OR EQUIVALENT.

Identification of Electrical Connector Sealing Washers
Figure 202

Honeywell

MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

OIL

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POWER DRIVEN ROTARY OIL PUMP - DESCRIPTION AND OPERATION

1. Description and Operation

The power driven rotary oil pump is a dual element pump. One element supplies lubricating oil pressure; the other element returns scavenge oil to the aircraft mounted oil tank. A common splined drive shaft drives both elements. A pressure relief valve in the power driven rotary oil pump is adjusted to deliver 80 to 100 psig oil pressure at normal rated power, and above, measured at the oil filter discharge port. This setting is rated for a maximum inlet oil temperature of 200°F (93°C). At pressure below relief valve setting, oil pressure is directly proportional to compressor rotor speed.

POWER DRIVEN ROTARY OIL PUMP - MAINTENANCE PRACTICES

1. Removal/Installation

A. Remove Power Driven Rotary Oil Pump

(1) Disconnect electrical cable assembly connector from temperature bulb. (See 79-30-02, Figure 202.)

(2) Disconnect airframe oil inlet and outlet hoses from oil pump.

(3) Support power driven rotary oil pump (7, Figure 201) and remove bolts (1, 9) and washers (2, 8).

(4) Hold pump in position against mounting pad. Slowly pull pump directly from mounting pad. Use care not to damage oil pump drive shaft assembly (3).

NOTE: If pump is to be replaced, remove and retain temperature bulb for installation into new pump.

(5) Remove drive shaft assembly (3) from accessory drive gearbox assembly. Remove and discard packings (4, 5, 6).

(6) (Post SB T53-L-13B-0097) Remove oil filter (10) from oil scavenge port.

B. Install Power Driven Rotary Oil Pump

(1) Install oil pump drive shaft assembly (3) into accessory drive gearbox assembly, mating splined end of drive shaft assembly with internal splines in gearbox. Push drive shaft assembly into gearbox until lockring is engaged.

(1a) (Post SB T53-L-13B-0097) Install new filter (10) in the oil pump scavenge port.

(2) Install new packings (4, 5, 6) over correct port on mounting face of accessory drive gearbox assembly.

(3) Slowly guide shaft of power driven rotary oil pump (7) into drive shaft assembly and position pump on mounting face of accessory drive gearbox assembly.

(4) Support pump and secure with bolts (1, 9) and washers (2, 8). Tighten bolts as required and lockwire.

NOTE: If a new oil pump was installed, install oil temperature bulb. (See 79-30-02, Paragraph 1.B.)

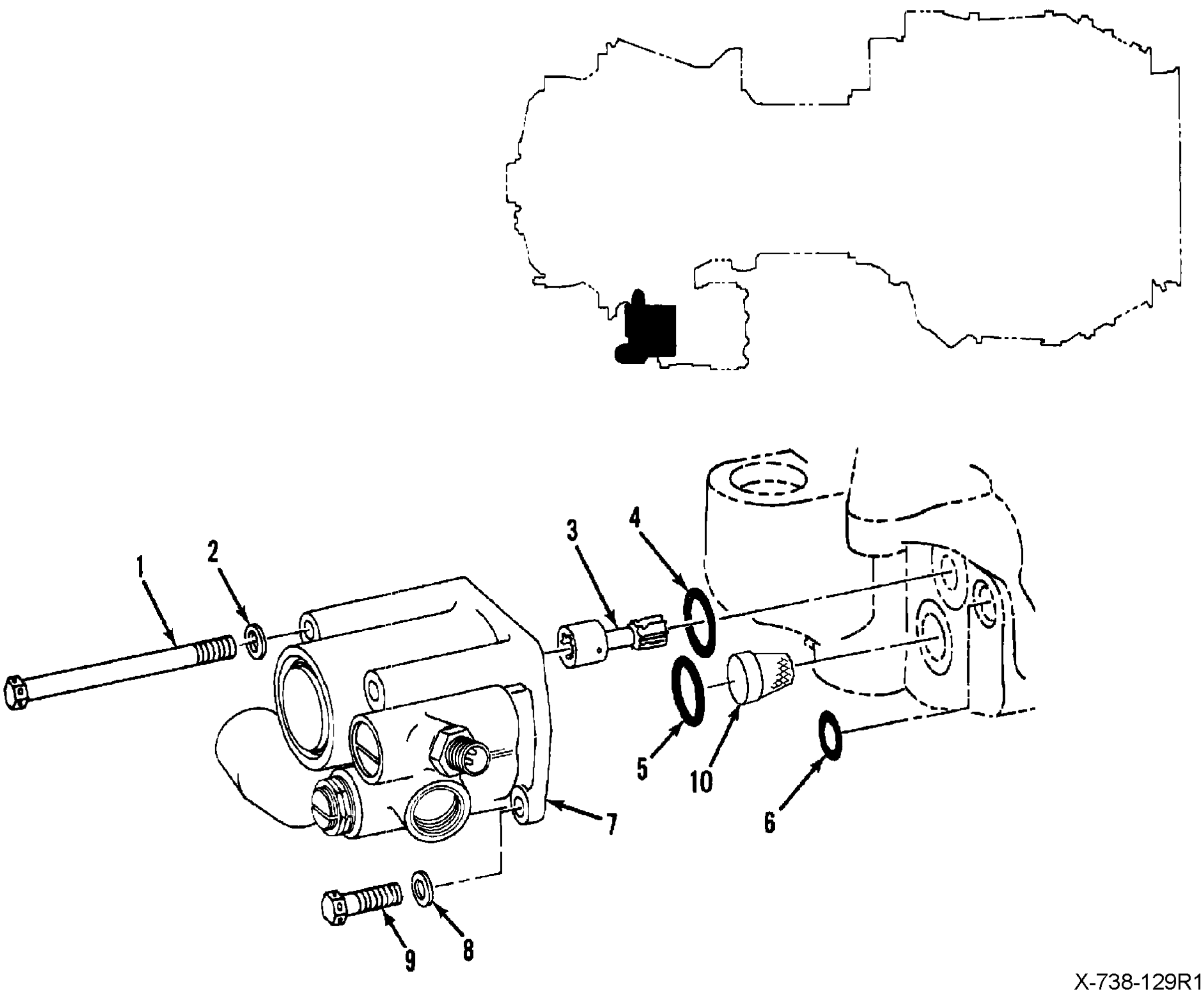
(5) Connect electrical cable assembly connector to temperature bulb and tighten as required. Lockwire connector.

2. Adjustment/Test

A. Before making any oil pump pressure adjustment, thoroughly check the aircraft oil pressure system, including the cockpit gage, for proper operation. (See Airframe Manual.)

B. Check the oil filter for cleanliness.

C. Attach a pressure gage to oil filter pressure tap port. (See Figure 202.)



1. BOLT
2. WASHER
3. OIL PUMP DRIVE SHAFT ASSEMBLY
4. PACKING
5. PACKING
6. PACKING
7. POWER DRIVEN ROTARY OIL PUMP
8. WASHER
9. BOLT
10. (POST SB T53-L-13B-0097) FILTER

Power Driven Rotary Oil Pump
Figure 201

D. Operate engine and check oil pressure. Normal pressures should be 80 to 100 psig at normal rated power and above 25 psig minimum at flight idle. The readings should be taken after the oil pressure and temperature have stabilized.

WARNING: DO NOT MAKE PRESSURE ADJUSTMENTS DURING ENGINE OPERATION.

E. If pressure is not within limits, shut down the engine, and make the following adjustments.

F. Loosen the adjustment screw locknut. (See Figure 202.)

G. Turn the adjustment screw clockwise to increase pressure or counterclockwise to reduce pressure. One full turn will change the oil filter discharge pressure approximately 8 psig. Tighten locknut.

H. Restart the engine. Recheck the oil pressure and repeat adjustments in Step E, as necessary.

I. Tighten the adjustment screw locknut to between 8 and 10 foot-pounds torque. Lockwire adjustment screw.

J. Remove pressure gage and plug oil filter pressure tap port.

3. Inspection/Check

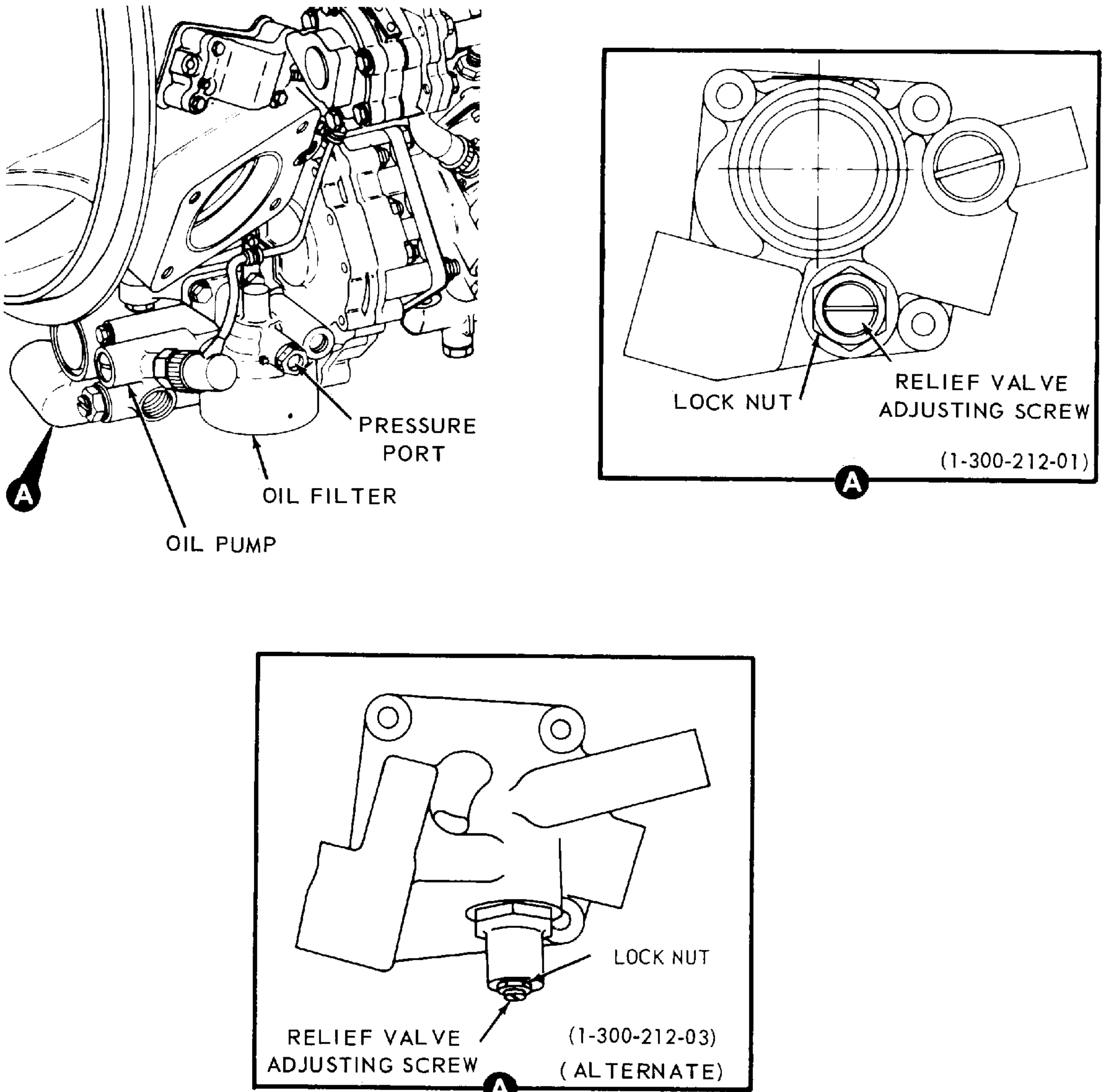
A. Inspect parts for damaged threads.

B. Inspect splined shaft for worn or chipped teeth.

C. Inspect housing for damage.

4. Cleaning/Painting

Thoroughly clean entire power driven rotary oil pump with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



XA-738-130A

Power Driven Rotary Oil Pump Adjustment
Figure 202

POWER DRIVEN TORQUEMETER BOOSTER PUMP - DESCRIPTION AND OPERATION

1. Description and Operation

The torquemeter boost pump, containing the pressure and the scavenge elements, is mounted on and driven by the overspeed governor and tachometer drive assembly. Each element is an individual pumping unit and draws oil from a separate source. The pressure element receives engine lubricating oil at 60 to 80 psig and delivers it, through a filter, to the torquemeter valve at a pressure of 120 psig minimum at normal rated power and above, excess oil flows back to the inlet side of the pump. A relief valve in the overspeed governor and tachometer drive assembly sets the pump outlet pressure. The scavenge element receives oil from the overspeed governor and tachometer drive gear housing and delivers it to the oil return passages in inlet housing assembly.

POWER DRIVEN TORQUEMETER BOOSTER PUMP - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Power Driven Torquemeter Booster Pump

      (1) Remove mounting bolts (1, Figure 201) and washers (2) that secure to the power driven torquemeter booster pump (3) overspeed governor and tachometer drive assembly.

      (2) Remove pump and discard packing (4).

   B. Install Power Driven Torquemeter Booster Pump

      (1) Establish proper end float of overspeed governor drive shaft. (See 72-60-02, Paragraph 1.C.)

      (2) Install nuts on overspeed governor drive shaft, as required.

      (3) Install packing (4) in booster pump housing.

      (4) Mount power driven torquemeter booster pump (3) on overspeed governor and tachometer drive housing, mating its splined shaft with internal spline of overspeed governor drive shaft.

      (5) Secure pump with mounting bolts (1) and washers (2). Tighten bolts. Lockwire.

2. Adjustment/Test

   A. Remove plug from overspeed governor and tachometer drive, and install a pressure gage that provides readings from 0 to 200 psig. (See Figure 202.)

      NOTE: The readings should be taken after oil pressure and temperatures have stabilized.

   B. Operate engine and check torquemeter oil pressure. At normal rated power and above, the required minimum pressure is 120 psig.

   C. If required, shut down the engine, and make the following adjustments.

      (1) Straighten tang on key washer.

      (2) Loosen adjusting screw locknut, using socket wrench LTCT215.

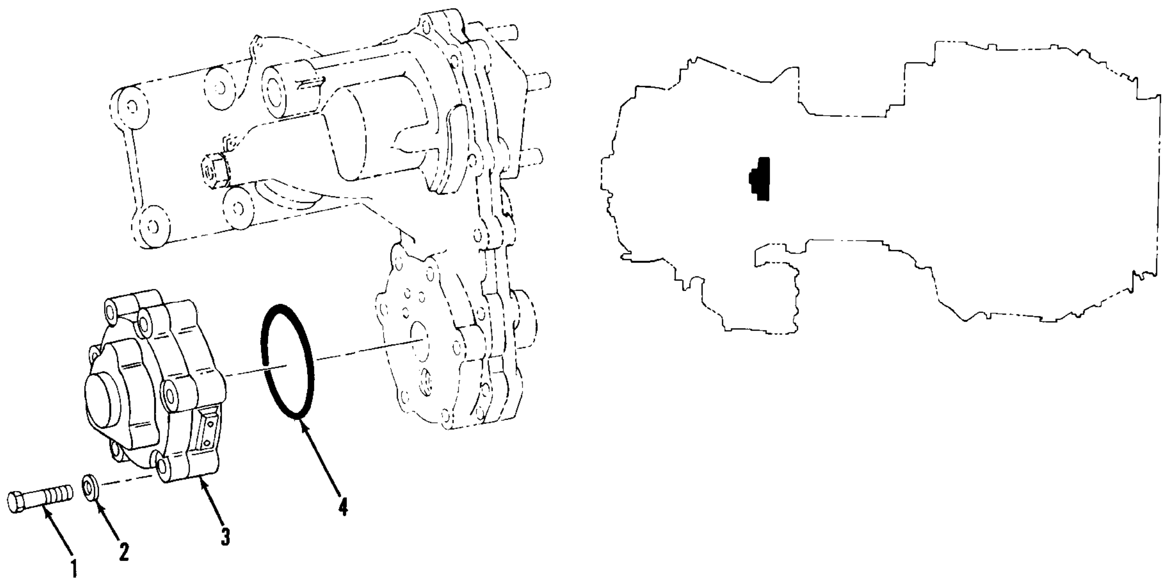
      (3) Turn adjusting screw clockwise to increase pressure or counterclockwise to reduce pressure. One full turn will change pressure approximately 10 psig.

      (4) Using wrench LTCT215, tighten adjusting screw locknut 70 to 80 inch-pounds torque.

      (5) Restart engine. Recheck oil pressure and repeat Step (3), as necessary.

         NOTE: Deform one tang against locknut and one tang against valve body.

      (6) Deform tangs on key washer.



1. BOLT
2. WASHER
3. POWER DRIVEN TORQUEMETER BOOSTER PUMP
4. PACKING

Power Driven Torquemeter Booster Pump
Figure 201

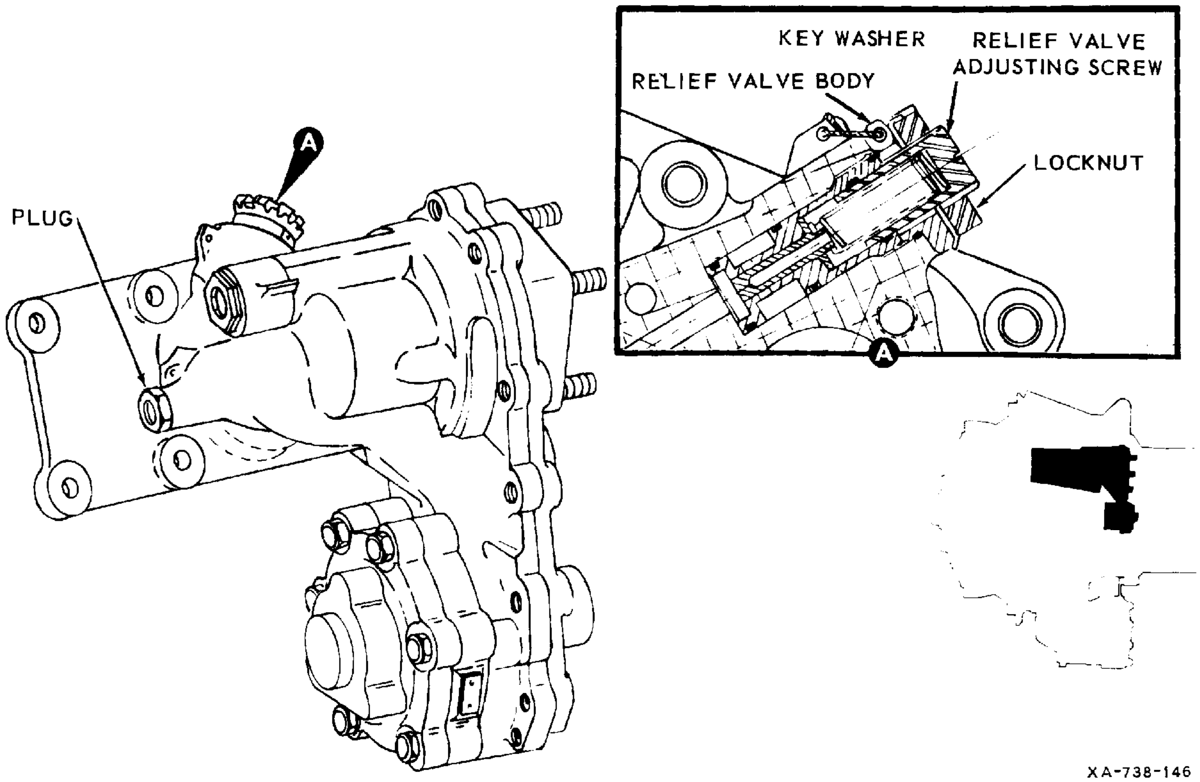
D. Remove pressure gage and reinstall plug.

3. Inspection/Check

A. Inspect housing for damage.

B. Inspect splined shaft for worn or chipped teeth.

C. Replace booster pump if damaged.



Torquemeter Oil Pressure Adjustment
Figure 202

4. Cleaning/Painting

Thoroughly clean power driven torquemeter booster with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

LUBE OIL FILTER ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

The lube oil filter assembly is bolted to the accessory drive gearbox. The filter contains a bypass valve, set to open at a 15 to 20 psig differential pressure, that allows the oil flow to bypass the filter elements and supply oil to the engine if the filter is clogged. A differential pressure indicator, which pops out at 9 to 13 psig differential pressure indicating impending bypass, is incorporated on lube oil filter assemblies 1-080-460-01 and 1-080-460-02. The standard oil filter 1-300-241-01 does not have a differential pressure indicator. Filter element is either one piece stainless steel screen type, or wafer disc type. Both types are cleanable.

LUBE OIL FILTER ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Lube Oil Filter Assembly

      (1) Straighten tabwashers (4, Figure 201) under two bolts (5).

      (2) Support lube oil filter assembly (8) and remove two bolts (5), tabwashers (4), rigid connecting link (3), two bolts (7), and washers (6).

      (3) Remove lube oil filter assembly (8) and packings (1, 2). Discard packings.

   B. Install Lube Oil Filter Assembly

      (1) Place new packings (1, 2, Figure 201) on mounting face of accessory drive gearbox assembly.

      (2) Position lube oil filter assembly (8) on mounting face and secure with two bolts (7) and washers (6) through bottom holes of filter housing.

      NOTE: Rigid connecting Link (3) shall be perpendicular to centerline of engine.

      (3) Install one bolt (5) and tabwasher (4) through top forward hole of filter housing and another bolt (5), tabwasher (4), and rigid connecting link (3) through remaining hole.

      (4) Tighten bolts (5, 7) evenly. Lockwire bolt (7). Lock bolt (5) by bending tabwasher (4).

2. Disassembly/Assembly

   NOTE: Disassemble lube oil filter assembly only to replace damaged parts or clean filter element (4, Figure 202) or seven filter elements (5).

   A. Disassemble Lube Oil Filter Assembly

      NOTE: If, upon removal of cover, an excessive amount of metal chips is noted, perform lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

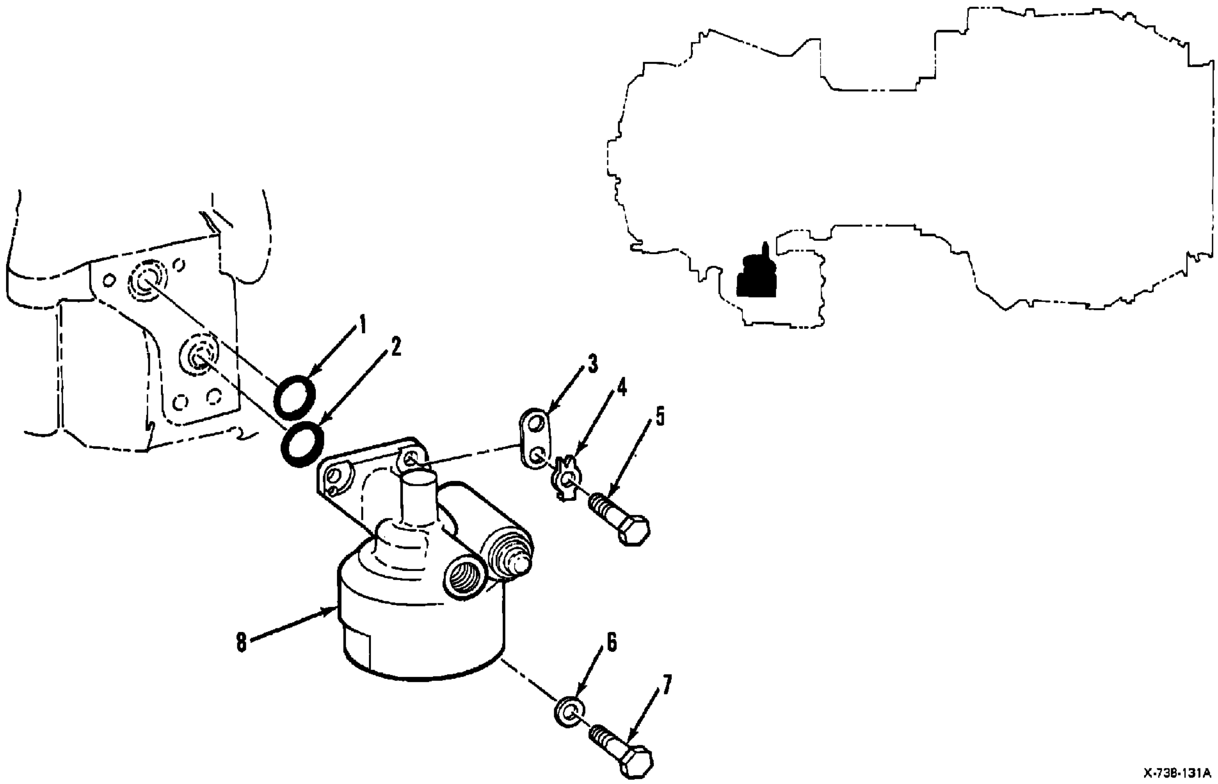
      (1) Loosen bolt (11) that secures cover (8) to filter housing subassembly (1) and withdraw cover. Remove preformed packing (6).

      (2) Remove retaining ring (2) and end plate (3).

      (3) Carefully lift filter element (4) or seven filter elements (5) from cover (8).

      (4) Using two suitable wrenches, hold nut (7) and turn bolt (11) until it is free of nut.

      (5) Remove bolt (11), washer (10), packing (9), and nut (7).



1. PACKING
2. PACKING
3. RIGID CONNECTING LINK
4. TABWASHER
5. BOLT
6. WASHER
7. BOLT
8. LUBE OIL FILTER ASSEMBLY (TYPICAL)

Lube Oil Filter Assembly
Figure 201

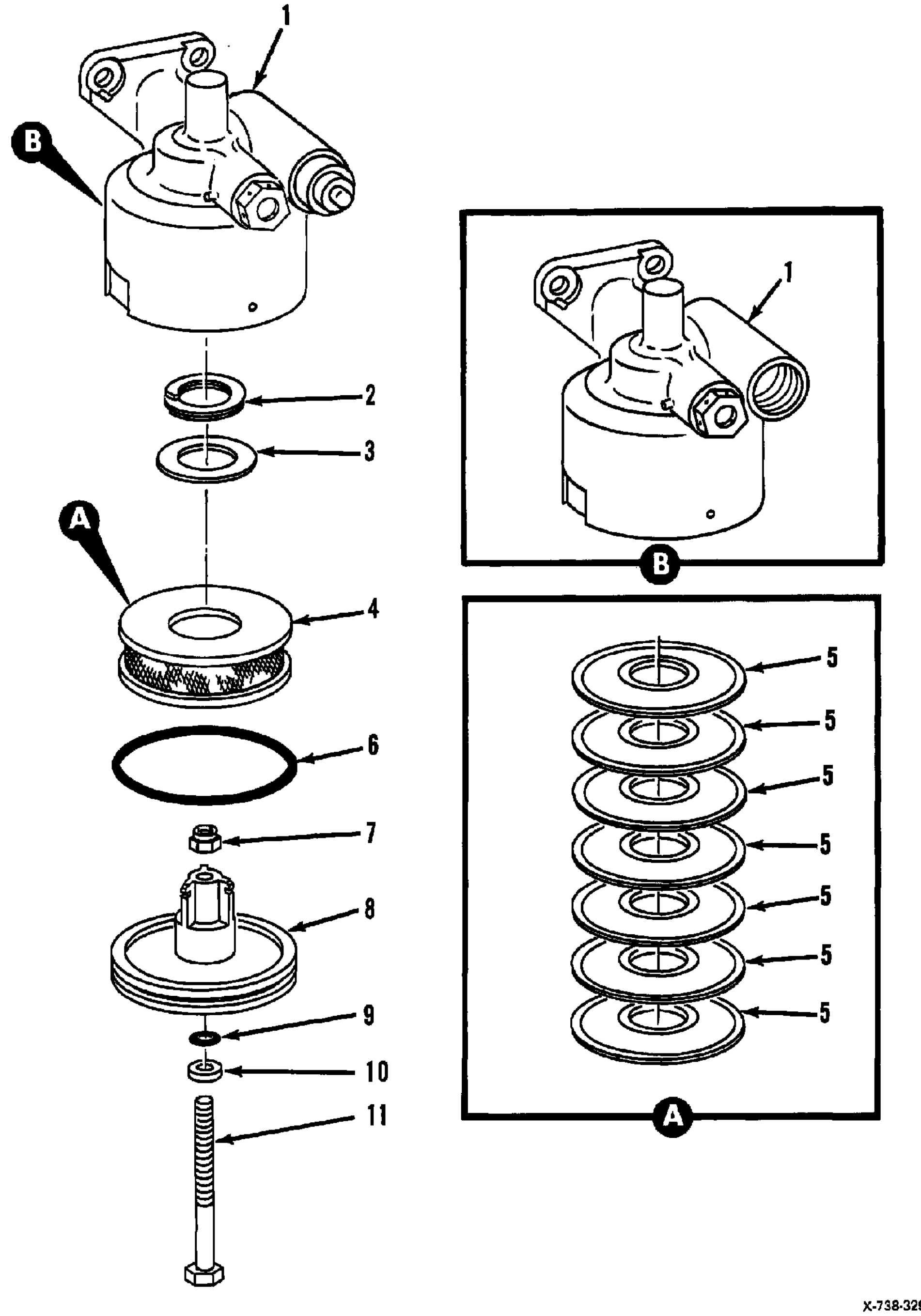
NOTE: Do not remove the relief valve assembly or the differential pressure indicator on filter assembly 1-080-460-01 or 1-080-460-02. Removal and functional test are to be accomplished at overhaul.

B. Assemble Lube Oil Filter Assembly

CAUTION: DO NOT INTERCHANGE PLUG FROM OIL FILTER 1-300-241-01 WITH DIFFERENTIAL PRESSURE INDICATOR FROM OIL FILTER, 1-080-460-01 OR 1-080-460-02. INTERNAL MALFUNCTION OF OIL FILTER WILL RESULT.

(1) Install packing (9) in groove on face of cover (8).

(2) Install washer (10) on bolt (11).



Lube Oil Filter Assembly
Figure 202

See TR

KEY TO FIGURE 202

1. FILTER HOUSING SUBASSEMBLY
2. RETAINING RING
3. END PLATE
4. FILTER ELEMENT (NOTE 1, 2)
5. FILTER ELEMENTS (NOTE 3, 4)
6. PREFORMED PACKING
7. NUT
8. COVER
9. PACKING
10. WASHER
11. BOLT
12. HELI-COIL (NOTE 3)

NOTE: 1. Used on 1-080-460-013. Used on 1-300-241-01
2. Used on 1-080-460-024. Alternate on 1-080-460-01 and 1-080-460-02

CAUTION: DO NOT APPLY TORQUE TO NUT (7), DAMAGE TO THREADS OF BOLT AND NUT CAN RESULT.

(3) Install bolt (11) and washer (10) through cover (8). Using suitable wrenches, thread nut (7) on bolt only until nut bottoms.

(4) Carefully install filter element (4) or filter elements (5) on cover (8). Install end plate (3) and secure with retaining ring (2).

(5) Install preformed packing (6) in groove on OD of cover (8).

(6) Install filter cover (8) into filter housing subassembly (1).

(7) Using a suitable wrench, tighten bolt (11) 20 to 35 inch-pounds torque. Lockwire bolt to housing.

3. Inspection/Check

NOTE: Disassemble oil filter only to replace damaged parts or to clean filter cover.

A. If upon removal of cover (8), an excessive amount of metal chips or carbon particles are noted, perform lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

B. Disassemble filter.

C. Clean housing using dry cleaning solvent (72-00-00, 62, Table 203).

D. Inspect filter element (4 or 5) for damage. Replace damaged elements.

E. Inspect bolt and housing for damage. Replace parts if defective.

F. If filter housing subassembly (1) is disassembled for any reason, measure thickness of filter elements (5) at inner ring. Thickness shall be 0.122 to 0.138 inch. If not within limits, replace elements.

G. On lube oil filter assembly with one piece elements, inspect for mutilation, damage, contamination or collapsed condition. Replace element if damage or contamination is found.

TEMPORARY REVISION NO. 83

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 79-20-03, PAGE 204.

Reason: To correct note formatting.

The NOTE following the Key to Figure is revised to read as follows:

NOTE: 1. Used on 1-080-460-01 3. Used on 1-300-241-01
2. Used on 1-080-460-02 4. Alternate on 1-080-460-01 and 1-080-460-02

NOTE: If pin extension (actuation) recurs during engine run, replace filter assembly. Actuation below 52°F (11°C) with no associated oil contamination is generally caused by a malfunction of indicator's thermal lockout device.

If excessive metal contamination is found in the oil then lubrication system contamination procedures must be performed. (See 72-00-00.) When excessive metal contamination is found notify:

Customer Service & Product Support
Honeywell Aerospace
111 S. 34th Street
P.O. Box 52181
Phoenix, AZ 85072-2181

Attention: T53 Customer Support Engineer

H. If installed, inspect oil filter bypass indicator for pin extension. If pin is extended, remove filter, clean elements, and reset pin by manually depressing plastic cover, then run engine.

4. Cleaning/Painting

A. If filter element (4, Figure 202) or filter elements (5) were not removed from cover (8), clean filter elements as follows: (See Figure 203.)

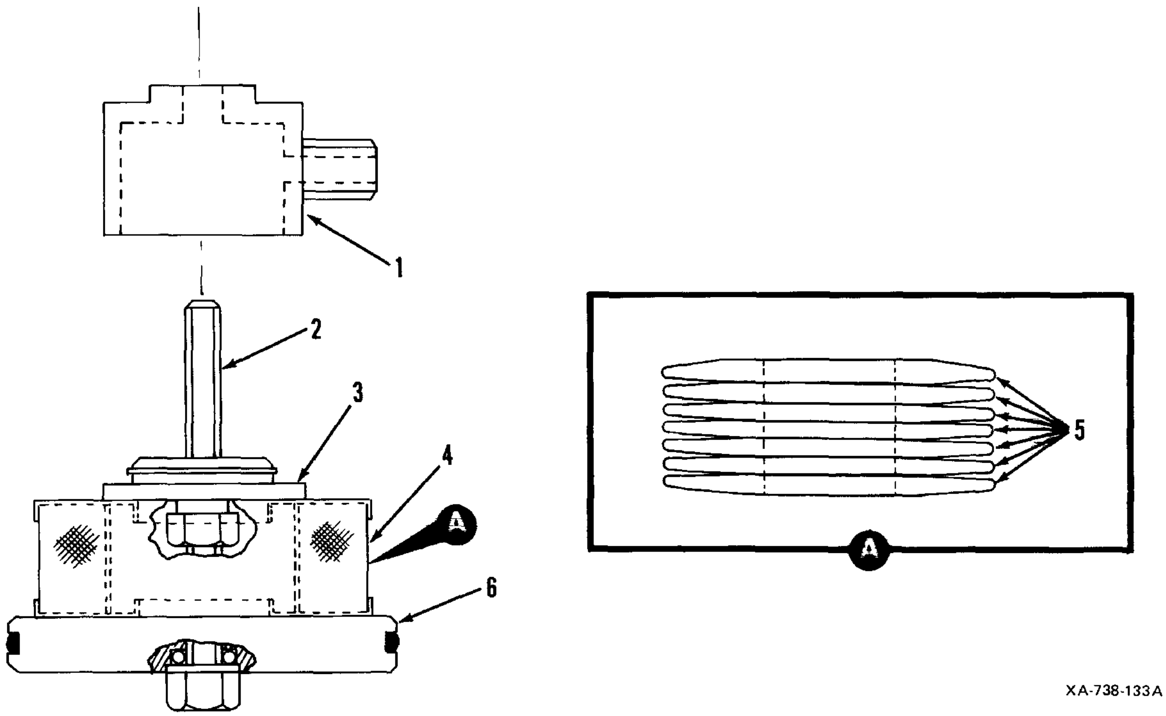
NOTE: The fixture prevents particles larger than 40 microns from entering inside section of filter elements. It shall be installed immediately upon removal of cover from housing.

(1) Place the cleaning fixture SPT107 (1) on bolt (2) and turn it down until it fits snugly against end plate (3). Install plug or cap on pipe nipple of fixture.

WARNING: AVOID PROLONGED INHALATION OF SOLVENT VAPORS. WEAR RUBBER GLOVES AND USE HAND CREAM TO PREVENT CONTACT WITH SKIN. DO NOT HEAT SOLUTION. USE IN WELL-VENTILATED AREA.

(2) Immerse and soak cover (6), filter element (4), or filter elements (5) with cleaning fixture installed, in dry cleaning solvent (72-00-00, 62, Table 203), until contaminant is removed from external surfaces of filter elements. (See SPM, SP C203, 70-15-03.)

(3) Remove cover (6) and filter element (4) or filter elements (5) from solvent. Remove cap or plug.



1. CLEANING FIXTURE SPT107
2. BOLT
3. END PLATE
4. FILTER ELEMENT
5. FILTER ELEMENTS (ALTERNATE)
6. COVER

Lube Oil Filter Element - Cleaning Fixture
Figure 203

WARNING: AIR PRESSURE USED FOR CLEANING OR DRYING OPERATIONS SHALL BE REGULATED BETWEEN 5 AND 30 PSIG (35 TO 172 KN/M^2). USE APPROVED SAFETY EQUIPMENT (GOGGLES/ FACESHIELD) TO PREVENT INJURY TO THE EYES. DO NOT DIRECT JET OF COMPRESSED AIR AT SELF OR OTHER PERSONNEL.

CAUTION: ONLY CLEAN, PRESSURIZED AIR SHALL BE USED TO DRY FILTER ELEMENTS.

(4) Remove cleaning fixture from bolt (2). Dry cover (6) and filter element (4) or filter elements (5) with compressed air.

B. If filter elements (4 or 5, Figure 202) were removed from cover (8) clean filter elements as follows:

(1) Install filter elements on a shaft having the same diameter as the filter element orifice.

CAUTION: PERFORM THIS CLEANING OPERATION IN A WELL-VENTILATED AREA.

(2) Immerse shaft and elements in an agitating bath of compound (72-00-00, 14, Table 203) at 160 to 200°F (71 to 93°C) or dry cleaning solvent (72-00-00, 62, Table 203) until all contamination is removed. (See SPM, SP C203, 70-15-03.)

CAUTION: ONLY CLEAN, PRESSURIZED AIR SHALL BE USED TO RINSE FILTER ELEMENTS.

(3) Blow clean air through filter elements at 100 psig maximum.

(4) Remove filter elements from shaft.

5. Approved Repairs

A. Blend repair nicks, burrs, and scratches. (See SPM, SP R401, 70-25-01.)

B. Repair damaged threads. (See SPM, SP R409, 70-25-03.) Replace parts having threads damaged beyond repair.

C. Replace all cracked, distorted, or excessively worn parts.

D. Replace filter elements (5, Figure 202) that do not have inner ring thickness of 0.122 to 0.138 inch.

POWER TURBINE OIL STRAINER - DESCRIPTION AND OPERATION

1. Description and Operation

The power turbine oil strainer located at the 12 o’clock position on the combustion turbine assembly filters oil which is directed to the No. 3 and 4 bearings.

POWER TURBINE OIL STRAINER - MAINTENANCE PRACTICE

1. Removal/Installation

   A. Remove Power Turbine No. 3 and No. 4 Bearing Oil Strainer

      (1) Disconnect hose assembly connector from power turbine oil strainer housing adapter (1, Figure 201).

      (2) Unscrew and remove adapter and power turbine strainer (2), remove packing (3).

      (3) Unscrew strainer from within adapter.

      NOTE: If, upon removal of oil strainer, an excessive amount of metal chips are noted, perform lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

   B. Install Power Turbine No. 3 and No. 4 Bearing Oil Strainer

      (1) Position packing (3, Figure 201) on power turbine oil strainer housing adapter (1).

      (2) Screw power turbine oil strainer (2) into power turbine oil strainer housing adapter (1), finger tight.

      NOTE: Exercise care when installing adapter into tube to prevent damage to packing during installation.

      (3) Install packing (3) and thread adapter into tube and tighten 80 to 90 inch-pounds torque. Lockwire adapter.

      (4) Connect hose assembly to oil strainer housing adapter and tighten 50 to 100 inch-pounds torque.

2. Inspection/Check

   A. Inspect power turbine oil strainer (2) for contamination and damage. Replace if damaged.

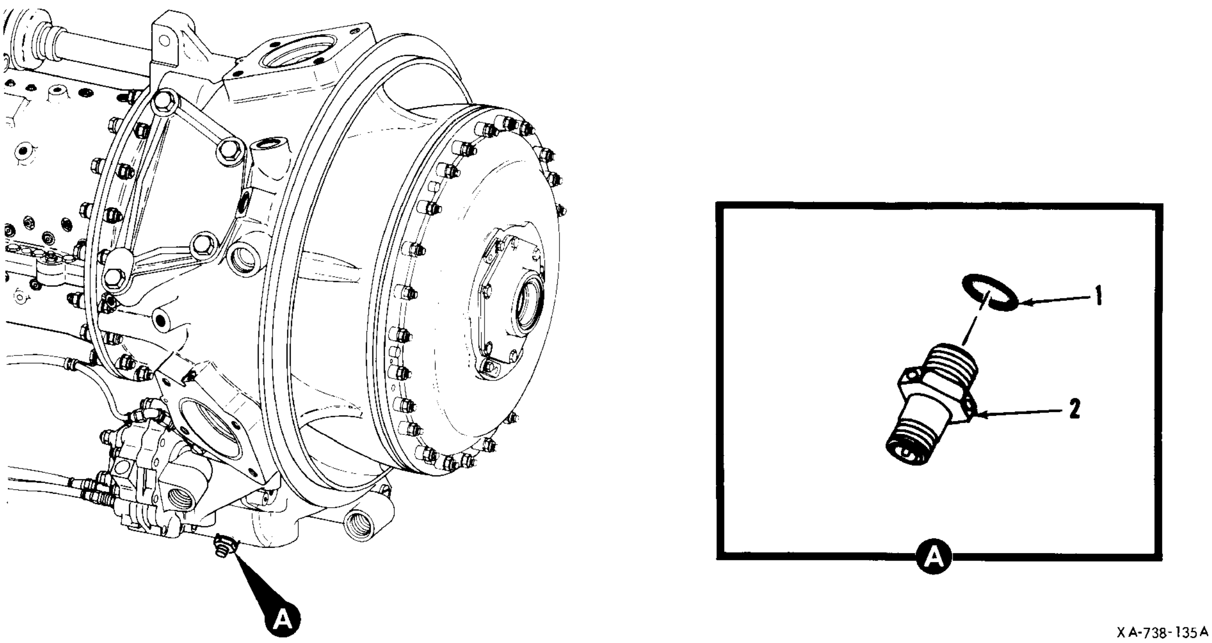
   B. Inspect power turbine oil strainer housing adapter (1) for stripped and/or damaged threads. Replace adapter if damage cannot be repaired.

3. Cleaning/Painting

   A. Clean oil strainer, using a fiber brush and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   B. Rinse strainer with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

See TR



1. POWER TURBINE OIL STRAINER HOUSING ADAPTER
2. POWER TURBINE OIL STRAINER (NO. 3 AND NO. 4 BEARING)
3. PACKING
4. REAR BEARING HOUSING OIL STRAINER (NO. 2 BEARING)
5. METAL GASKET

Removal of Power Turbine and Rear Bearing Housing Oil Strainers
Figure 201

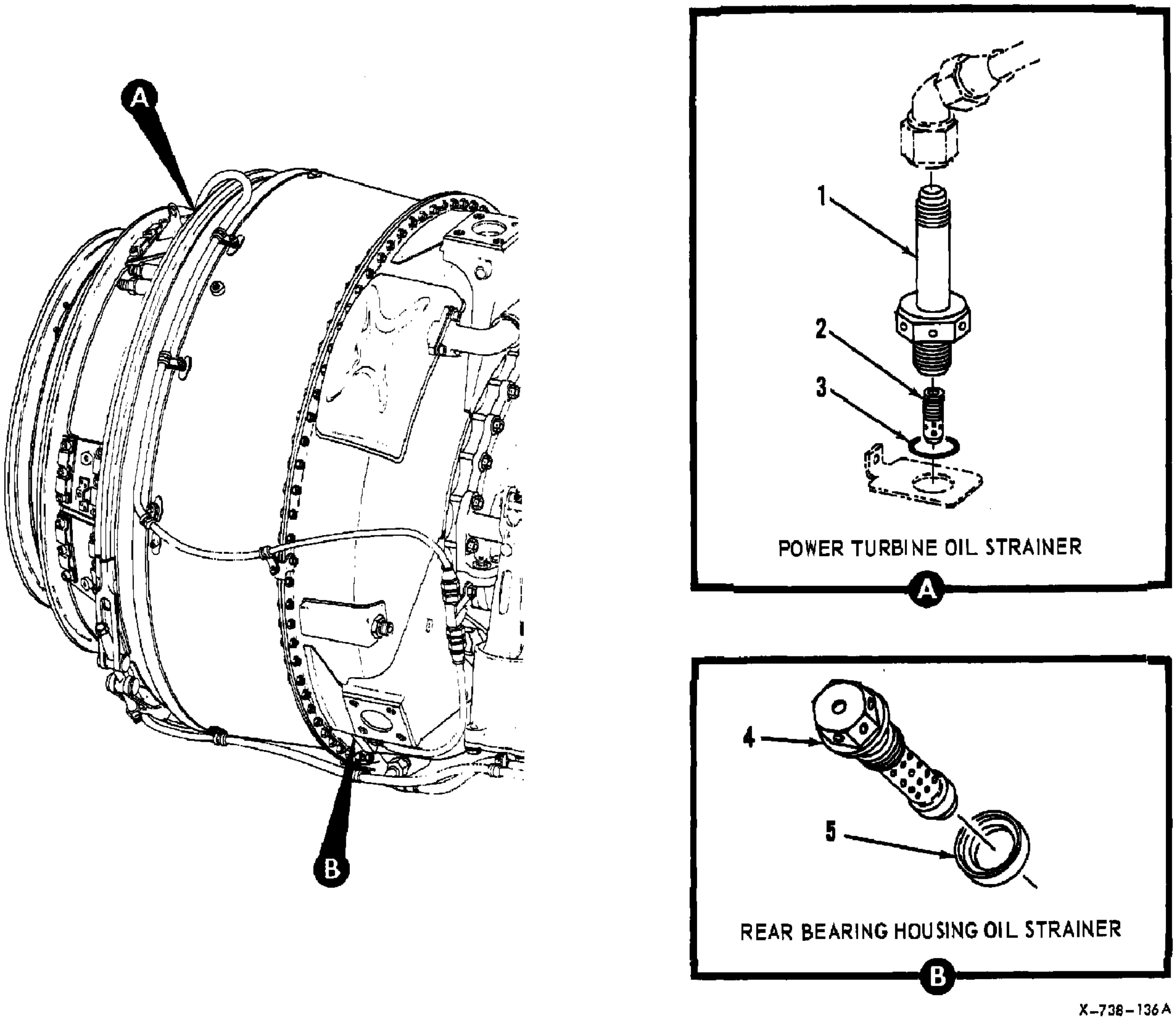
TEMPORARY REVISION NO. 84

TO: HOLDERS OF MAINTENANCE MANUAL, REPORT NO. 350.2, REVISION 3, DATED SEPTEMBER 1, 2008. INSERT FACING PAGE 79-20-04, PAGE 202.

Reason: To provide the correct illustration for Figure 201.

Replace the illustration in Figure 201 with the following:

TEMPORARY REVISION NO. 84



1. POWER TURBINE OIL STRAINER HOUSING ADAPTER
2. POWER TURBINE OIL STRAINER (NO. 3 AND NO. 4 BEARING)
3. PACKING
4. REAR BEARING HOUSING OIL STRAINER (NO. 2 BEARING)
5. METAL GASKET

Removal of Power Turbine and Rear Bearing Housing Oil Strainers
Figure 201

REAR BEARING HOUSING OIL STRAINER - DESCRIPTION AND OPERATION

1. Description and Operation

The rear bearing housing (No. 2 bearing) oil strainer screws into a fitting at the 4 o'clock position on the diffuser housing and filters oil directed to the No. 2 bearing.

REAR BEARING HOUSING OIL STRAINER - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Rear No. 2 Bearing Housing Oil Strainer

      (1) Turn hexagon portion of rear bearing housing oil strainer (79-20-04, 4, Figure 201) counterclockwise and lift out strainer.

      NOTE: If, upon removal of oil strainer, an excessive amount of metal chips are noted, perform lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

      Note part number of rear bearing housing oil strainer.

      (2) Remove and discard gasket (5).

   B. Install Rear No. 2 Bearing Housing Oil Strainer

      (1) Install new metal gasket (79-20-04, 5, Figure 201) on rear housing housing oil strainer (4).

      NOTE: Only strainer 1-110-114-08 shall be installed.

      (2) Screw strainer into diffuser housing. Tighten strainer to 80 to 100 inch-pounds torque, and lockwire.

2. Inspection/Check

   A. Inspect rear bearing housing oil strainer (4) for contamination and damage. Replace strainer if damaged.

   NOTE: Use strainer 1-110-114-08 only.

   B. Clean strainer. (See Paragraph 3.A.)

   NOTE: Deleted.

3. Cleaning/Painting

   A. Clean strainer using a soft fiber brush and dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

   B. Rinse strainer with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

POWER TAKEOFF COVER AND POWER TAKEOFF OIL SUPPLY NOZZLE ASSEMBLY - DESCRIPTION AND OPERATION

1. Description and Operation

An oil transfer passage from the main transfer support assembly directs oil through internal passages in the inlet housing to the power takeoff mounting flange. This oil, as required, passes through the power takeoff oil supply nozzle assembly where it is filtered and metered and subsequently supplies engine driven accessories mounted on the power takeoff flange.

POWER TAKEOFF COVER AND POWER TAKEOFF OIL SUPPLY NOZZLE ASSEMBLY - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Power Takeoff Cover and Power Takeoff Oil Supply Nozzle Assembly

      (1) Remove bolts (1, Figure 201) and washers (2) that secure power takeoff cover (3) to inlet housing.

      (2) Remove cover and packings (4, 5) from inlet housing.

      (3) Remove retaining ring (8) that secures oil supply nozzle in inlet housing. Remove power takeoff oil supply nozzle assembly (7) by inserting a 5/16-24 screw into nozzle assembly and withdrawing from inlet housing assembly.

      (4) Remove packing (6) from filter.

   B. Install Power Takeoff Cover and Power Takeoff Oil Supply Nozzle Assembly

      (1) Place packing (6) on outside of oil supply nozzle assembly (7), and insert nozzle assembly into inlet housing and secure with retaining ring (8).

      (2) Place packings (4, 5) in starter pad, and secure rear takeoff cover (3) of inlet housing with bolts (1) and washers (2). Tighten bolts as required and lockwire.

2. Inspection/Check

   A. Inspect studs on inlet housing for crossed or damaged threads.

   B. Inspect all parts visually for cracks, wear, or other damage.

   C. Inspect power takeoff cover (3) for cracks, nicks, burrs and scratches.

   D. Inspect oil supply nozzle assembly (7) for cracks, cuts, dents, and crossed or damaged threads.

3. Cleaning/Painting

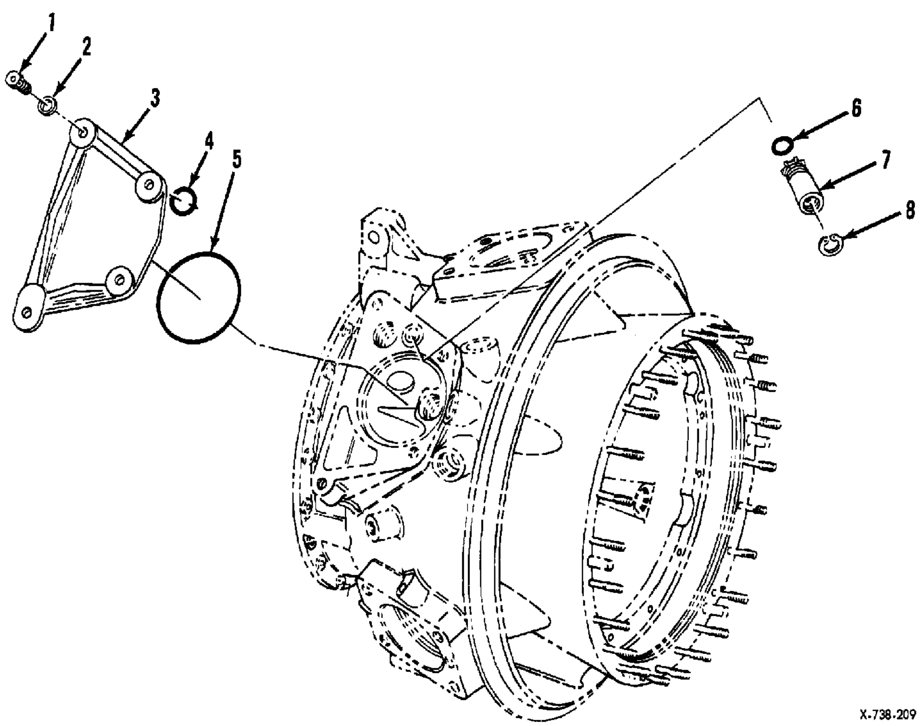
   Clean all starter pump cover and power takeoff oil supply nozzle assembly parts with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

   A. Replace nozzle assembly if defective or threads are crossed or stripped or if thread damage cannot be repaired.

   B. Repair all other damaged threads. (See SPM, SP R401, 70-25-01.)

   C. Blend repair nicks, burrs, and scratches. (See SPM, SP R409, 70-25-03.)



1. BOLT
2. WASHER
3. POWER TAKEOFF COVER
4. PACKING
5. PACKING
6. PACKING
7. OIL SUPPLY NOZZLE ASSEMBLY
8. RETAINING RING

Power Takeoff Cover and Power Takeoff Oil Supply Nozzle Assembly
Figure 201

D. Replace defective studs on inlet forward housing flange.

(1) If stud is broken off below surface of flange, drill out damaged stud, using 3/16 inch drill. This will allow sufficient wall thickness to permit use of bolt extractor.

(2) If stud is broken off 1/2 inch or more above flange, remove with vise grip.

CAUTION: WHEN INSTALLING OR REMOVING STUDS, USE CARE TO GRIP ONLY FLAT SURFACE OF STUD.

(3) Remove metal particles from stud hole using moisture free compressed air.

(4) Coat threads of new stud with zinc chromate primer (72-00-00, 74, Table 203).

(5) Thread stud into housing approximately 1/2 inch. Tighten stud 50 to 110 inch-pounds torque.

(6) If required torque cannot be obtained, use first oversized stud STD3001B121N. If required torque still cannot be obtained, use a second oversized stud STD3001B12P.

(7) After stud has been properly tightened, distance from inlet housing flange to end of stud shall be 1.5600 to 1.5800 inches.

LUBRICATION HOSES AND PRESSURE MANIFOLD - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Lubrication Hoses and Pressure Manifold

      (1) Drain engine oil.

      (2) Remove screws (2, 4, 6, Figure 201) from clamps (3, 5, 7). Remove screw (8) and nut (10) from clamp (9).

      (3) Disconnect hose assembly (1) from oil strainer housing adapter on top of combustion chamber assembly and from lubrication pressure manifold (21) and remove hose assembly.

      (4) Disconnect hose assembly (20) from No. 2 bearing oil pressure fitting on diffuser housing assembly and from lubrication pressure manifold (21) and remove hose assembly.

      (5) Remove screw (17) and nut (11) from clamp (12).

      (6) Disconnect hose assembly (13) from adapter (14) and lubrication pressure manifold (21) and remove hose assembly.

      (7) Remove connector (16), packings (15), and adapter (14) from inlet housing.

      (8) Remove bolts (18, 19) that secure lubrication pressure manifold (21) to engine and remove manifold.

      NOTE: Because of the inaccessibility of bolt (19), the interstage air-bleed actuator assembly will have to be removed before the lubrication pressure manifold (21) can be removed. (See 75-30-03, Paragraph 2.A.)

      (9) Remove screw (15, Figure 202) from clamp (14). Remove nut (11) and screw (13) from clamp (12). Remove nut (2) and screw (10) from clamps (1, 9).

      (10) Disconnect hose assembly (8) from connector (16) at bottom of combustor turbine assembly and from union (7) on accessory drive gearbox assembly and remove hose assembly. Remove connector and packing (17) from combustor turbine assembly. Remove packing from connector.

      (11) Disconnect hose assembly (3) from oil tube connector at diffuser housing assembly and from union (4) on accessory drive gearbox assembly and remove hose assembly.

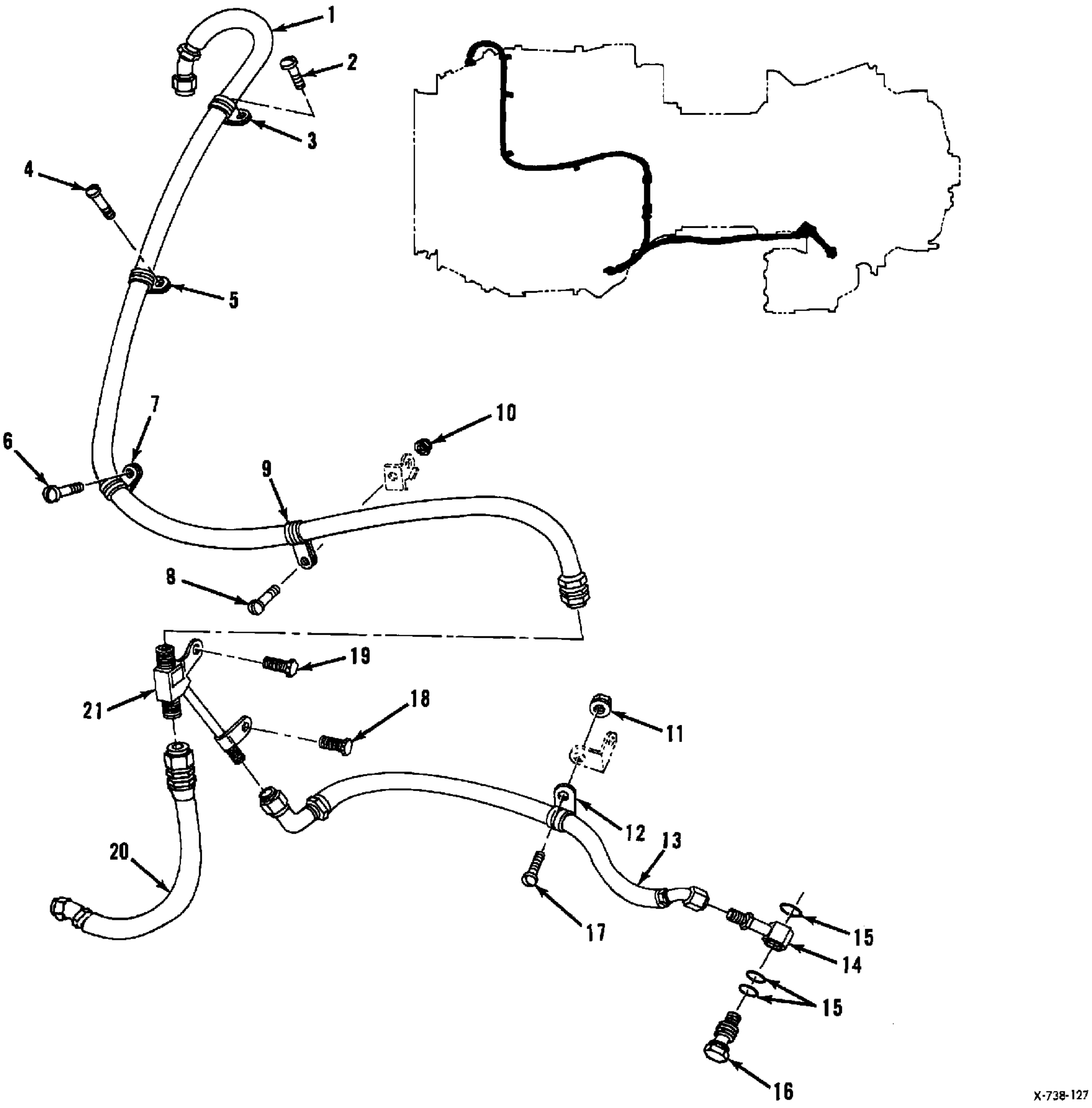
      (12) Remove unions (4, 7) and packings (5, 6) from accessory drive gearbox assembly. Remove gaskets from unions.

   B. Install Lubrication Hoses and Pressure Manifold

      (1) Position lubrication pressure manifold (21, Figure 201) on rear flange of impeller housing assembly and secure with bolts (18, 19).

      (2) Reinstall interstage bleed actuator assembly. (See 75-30-03, Paragraph 2.)

      (3) Position packings (5, 6, Figure 202) onto unions (4, 7) and install unions into accessory drive gearbox assembly. Tighten unions as required.



1. HOSE ASSEMBLY
2. SCREW
3. CLAMP
4. SCREW
5. CLAMP
6. SCREW
7. CLAMP
8. SCREW
9. CLAMP
10. NUT
11. NUT
12. CLAMP
13. HOSE ASSEMBLY
14. ADAPTER
15. PACKING
16. CONNECTOR
17. SCREW
18. BOLT
19. BOLT
20. HOSE ASSEMBLY
21. LUBRICATION PRESSURE MANIFOLD

Lubrication Pressure Hoses and Oil Manifold (Typical)
Figure 201

(4) Connect hose assembly (3) to oil tube connector at bottom of diffuser housing assembly and to union (4) on accessory drive gearbox. Tighten hose connectors as required.

(5) Position packing (17) onto connector (16) and install connector into bottom of combustor turbine assembly. Tighten connector as required and lockwire.

(6) Connect hose assembly (8) to connector (16) and to union (7) on accessory drive gearbox. Tighten hose connectors as required.

(7) Position clamps (1, 9), one on each side of bracket located at bottom of interstage bleed actuator assembly, and secure with screw (10) and nut (2).

(8) Secure clamp (12) to bracket on forward flange on combustion chamber housing with screw (13) and nut (11). Secure clamp (14) with screw (15).

(9) Install packings (15, Figure 201) onto connector (16). Secure adapter (14) to inlet housing with connector.

NOTE: Do not tighten connector until hose assembly (13) has been installed; repositioning of adapter may be necessary.

(10) Connect hose assembly (13) to lubrication pressure manifold (21) and to adapter (14). Tighten hose connectors as required.

(11) Secure clamp (12) to bracket on compressor housing with screw (17) and nut (11).

(12) Connect hose assembly (20) to lubrication pressure manifold (21) and to No. 2 bearing oil pressure fitting to diffuser housing assembly. Tighten hose connectors as required.

NOTE: When tightening connector on oil strainer housing adapter, use one wrench on adapter and one on connector to prevent adapter from turning.

(13) Connect hose assembly (1) to lubrication pressure manifold (21) and to oil strainer housing adapter on top of combustion chamber assembly. Tighten hose connector on manifold and connector on oil strainer housing adapter as required.

(14) Secure hose assembly (1) to bracket on forward flange of combustion chamber housing with screw (8) and nut (10).

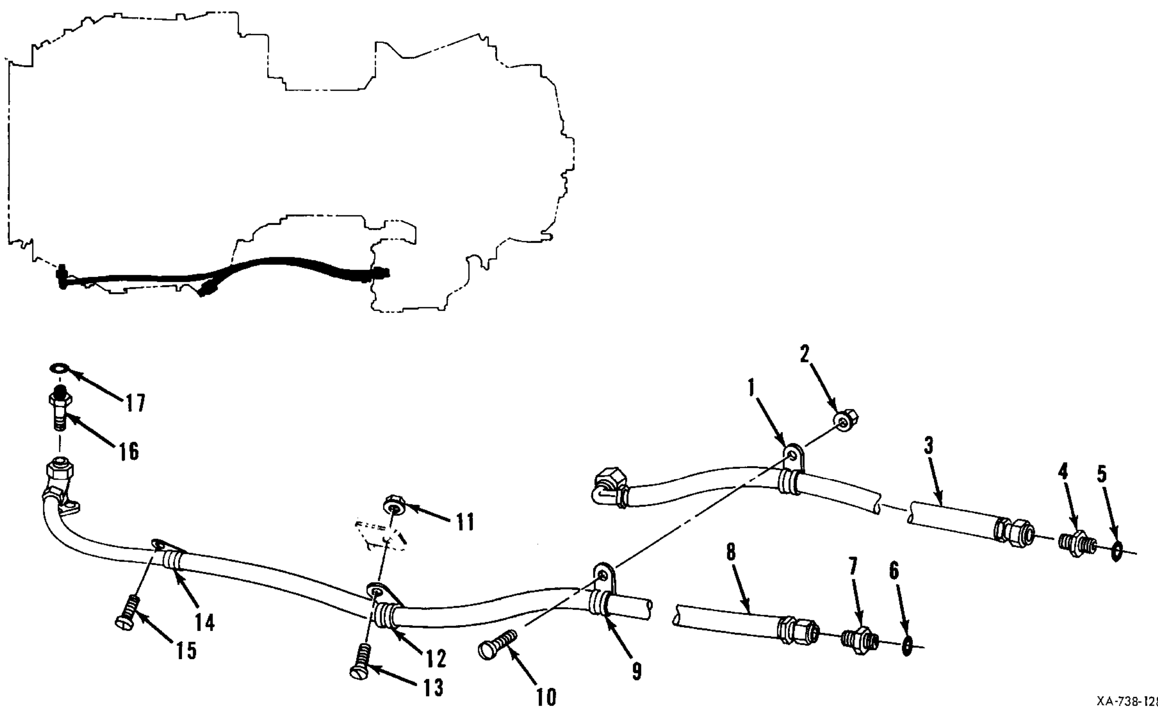
(15) Secure clamps (3, 5, 7) to combustion chamber housing with screws (2, 4, 6).

2. Inspection/Check

A. Inspect hoses for cuts, fraying, or chafing.

B. Inspect pressure manifold (21) for cracks. Replace if cracks are evident.

C. Inspect pressure manifold for damaged threads on manifold connectors.



1. CLAMP
2. NUT
3. HOSE ASSEMBLY
4. UNION
5. PACKING
6. PACKING
7. UNION
8. HOSE ASSEMBLY
9. CLAMP
10. SCREW
11. NUT
12. CLAMP
13. SCREW
14. CLAMP
15. SCREW
16. CONNECTOR
17. PACKING

No. 2, 3, and 4 Bearings Scavenge Oil Hoses (Typical)
Figure 202

3. Cleaning/Painting

Clean lubrication hoses and pressure manifold with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)

4. Approved Repairs

A. Replace hoses that are cut, frayed, or chafed.

B. Repair damaged threads on manifold connectors, or replace manifold if threads are damaged beyond repair. (See SPM, SP R409, 70-25-03.)

CHIP DETECTOR - DESCRIPTION AND OPERATION

1. Description and Operation

A chip detector is installed in the lower right side of the accessory drive gearbox. The chip detector will provide an indication of the presence of metal particles in the engine lubrication system when a continuity check is performed. Provisions exist for airframe wiring to provide in-flight indications of contamination.

CHIP DETECTOR - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Chip Detector

      (1) (Pre SB T53-0098) Unscrew and remove chip detector (2, Figure 201) and packing (1).

      (2) (Post SB T53-0098) Remove the chip detector assembly (3) by pushing in the probe (4) and twisting in a counterclockwise direction. Remove valve (5).

      (3) Discard packing (1).

      NOTE: If contamination is evident upon removal of chip detector, record type and amount on the engine historical record. Perform lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING, Paragraph 1.C.)

   B. (Pre SB T53-0098) Install Chip Detector

      (1) Position new packing (1, Figure 201) on chip detector (2).

      CAUTION: TORQUE ON CHIP DETECTOR MUST BE 90 TO 100 INCH-POUNDS.

      (2) Install chip detector in accessory drive gearbox. Torque chip detector to 90 to 100 inch-pounds.

   C. (Post SB T53-0098) Install Chip Detector Assembly

      (1) Install packing (1) on valve (5).

      CAUTION: TORQUE ON VALVE (5) MUST BE 50 TO 60 INCH-POUNDS.

      (2) Install valve (5) in the accessory drive gearbox assembly. Torque valve to 50 to 60 inch-pounds. Safety wire using a 0.032 inch lockwire.

      (3) Install probe (4) on valve (5). The probe grip aligns with the hex points on the housing when the probe is in locked position.

2. Inspection/Check

   A. Inspect chip detector for buildup of metallic particles.

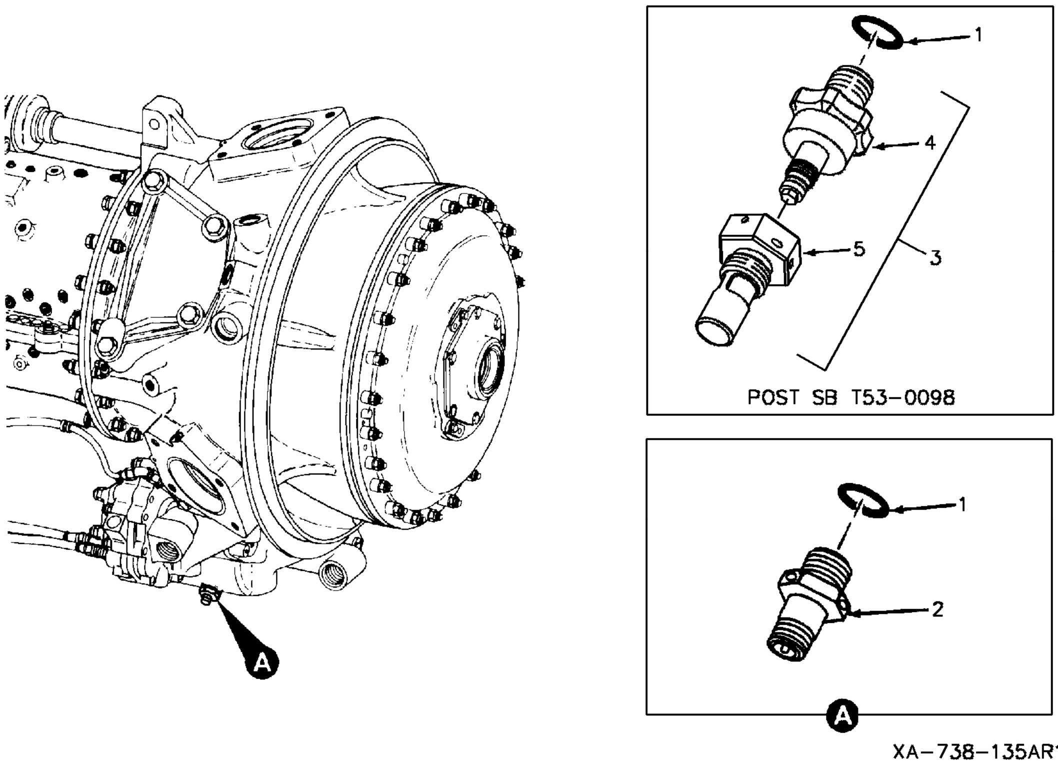
      (1) A small amount of metallic powder is normal and acceptable.

      (2) Course chips or an excessive amount of metallic powder are symptoms of possible failure. This condition requires a lubrication system contamination trouble shooting procedure. (See 72-00-00, ENGINE - TROUBLE SHOOTING - Paragraph 1.C.)

   B. Inspect chip detector and threaded hole in gearbox for damaged threads. Replace chip detector if stripped or damaged beyond repair.

3. Cleaning/Painting

   Clean chip detector with dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



1. PACKING
2. (PRE SB T53-0098) CHIP DETECTOR
3. (POST SB T53-0098) CHIP DETECTOR
4. (POST SB T53-0098) PROBE
5. (POST SB T53-0098) VALVE

Chip Detector
Figure 201

OIL TEMPERATURE BULB - DESCRIPTION AND OPERATION

1. Description and Operation

The oil temperature bulb is screwed into the power driven rotary oil pump. It senses oil temperature at that point. The bulb generates an electrical signal which is transmitted to a matched direct reading temperature gage.

OIL TEMPERATURE BULB - MAINTENANCE PRACTICES

1. Removal/Installation

   A. Remove Oil Temperature Bulb

      (1) Disconnect electrical connector from oil temperature bulb (2, Figure 201).

      (2) Remove oil temperature bulb and packing (1) from power driven rotary oil pump.

   B. Install Oil Temperature Bulb

      (1) Install packing (1) on oil temperature bulb (2).

      (2) Install oil temperature bulb into power driven rotary oil pump and tighten.

      CAUTION: DO NOT TWIST WIRING HARNESS CONNECTOR DURING INSTALLATION.

      (3) Connect oil temperature bulb electrical connector and lockwire.

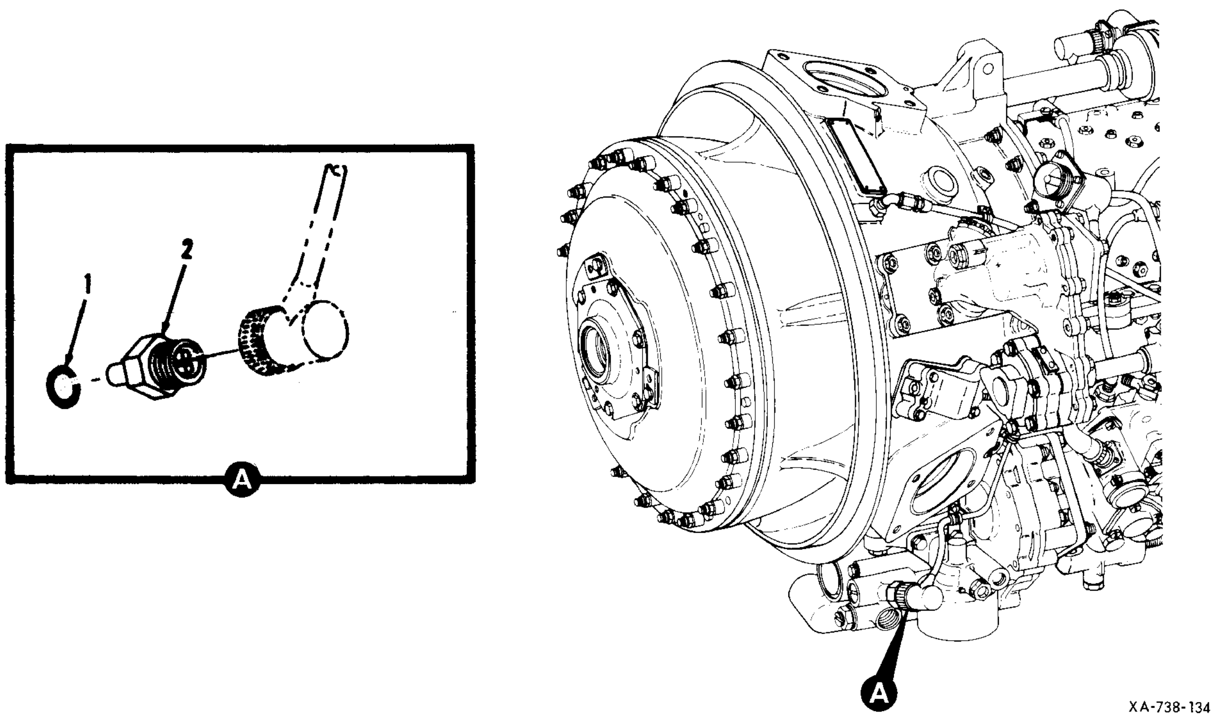
2. Inspection/Check

   A. Inspect for damaged threads. Replace if threads are damaged.

   B. Inspect for bent or broken pins or probe. Replace if defects are noted.

3. Cleaning/Painting

   Wipe clean oil temperature bulb using cloth moistened in dry cleaning solvent (72-00-00, 62, Table 203). (See SPM, SP C203, 70-15-03.)



1. PACKING
2. OIL TEMPERATURE BULB

Oil Temperature Bulb
Figure 201

HEAVY MAINTENANCE

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Honeywell

MAINTENANCE MANUAL
T53-L-13B Series, Part No. 1-000-060-17/-22

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HEAVY MAINTENANCE

This chapter provides instructions to perform heavy maintenance for the T53-L-13B engines for operators whose maintenance capability exceeds that of the average operator. Included are procedures required to replace the following components.

Inlet Housing Assembly

Variable Inlet Guide Vane Assembly

*Variable Inlet Guide Vanes (individual replacement)

No. 1 Bearing

No. 1 Seal

Compressor Rotor Assembly

Air Diffuser Housing Assembly

NOTE: If the compressor rotor assembly or variable inlet guide vane assembly is replaced, the engine must be performance tested at a Honeywell authorized service center.

Since replacement of major assemblies do not lend themselves to a simple disassembly process, procedures are broken down into four major sections.

80-00-01 Removal of Inlet Housing and Variable Inlet Guide Vanes

80-00-02 Removal of Compressor Rotor Assembly

80-00-03 Removal of Diffuser Housing Assembly

80-00-04 Final Engine Assembly

NOTE: Final engine assembly is written as one continuous procedure, for assembly of an engine which has undergone a partial teardown, disregard those steps not applicable to that level of assembly.

*Replacement of individual variable inlet guide vanes is limited to a maximum of six.

INLET HOUSING AND VARIABLE INLET GUIDE VANES (VIGV) - REMOVAL

1. Removal

   A. Remove Inlet Housing

      (1) Install engine onto work stand LTCT7298-07. Position engine horizontally. (See 72-00-00, Table 202.)

      (2) Drain oil from engine. (See 72-00-00, ENGINE - SERVICING, Paragraph 2.C.)

      (3) Remove piping and accessories (as required). Refer to applicable sections.

      (4) Remove fuel control assembly, rotary oil pump, and accessory drive gearbox. (See 72-60-01, 73-20-01, and 79-20-01.)

      (5) Remove torquemeter boost pump and overspeed governor and tachometer drive assembly. (See 72-60-02, 73-20-01, and 79-20-02.)

      (6) Remove oil transfer tubes, output reduction carrier and gear assembly, sun gearshaft, oil transfer support assembly, and accessory drive carrier assembly. (See 72-10-01.)

      NOTE: Removal of torquemeter cylinder and torquemeter valve are not required unless visual inspection indicates damage or inlet housing is to be replaced with another serviceable housing.

      (7) Remove power shaft bearing retainer. (See Figure 401.)

         (a) Using mechanical puller LTCT2021, remove gear (2) and packing (1).

         (b) Remove packing (1) from gear. Discard packing.

         (c) Remove ring (3) and retain for reuse.

         (d) Straighten two tabwashers (5) and remove bolts (4). Discard tabwashers. Remove bolts (6). Remove power shaft bearing retainer (7).

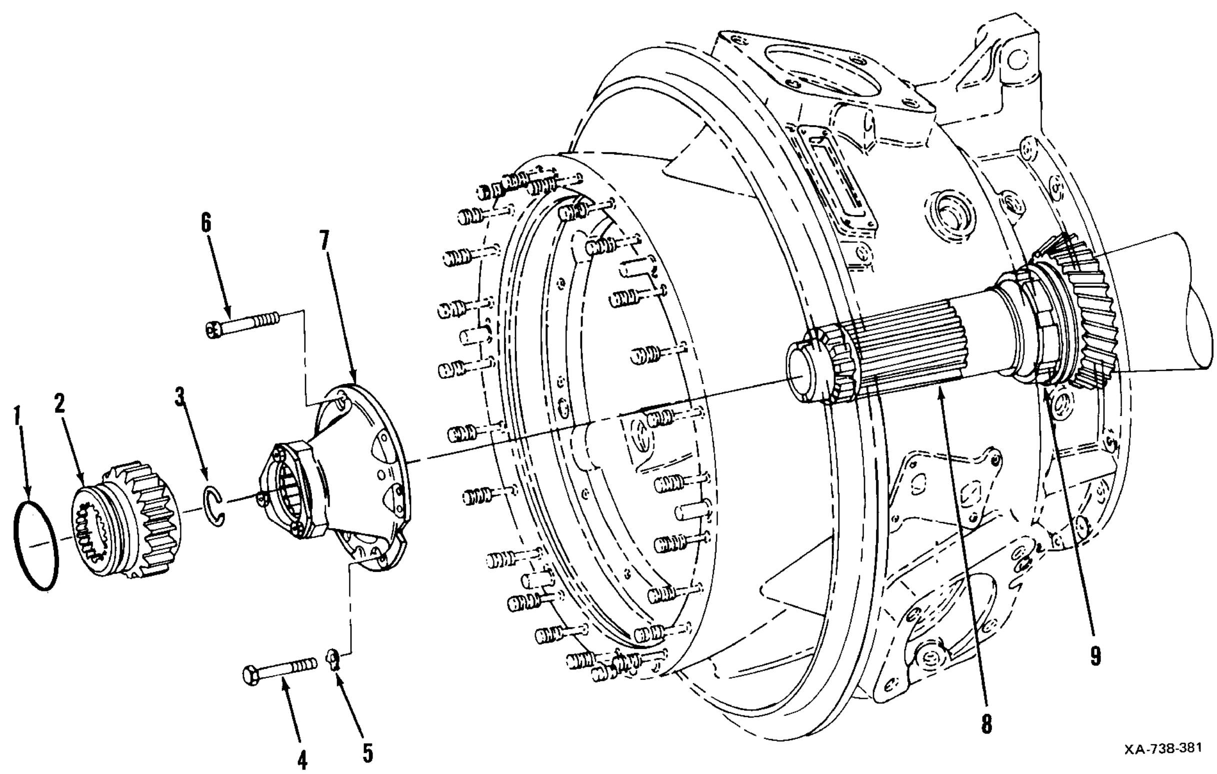
         NOTE: Perform Steps (e) through (i) only if No. 1 bearing or No. 1 seal is to be replaced.

         (e) Open locking cup (2, Figure 402).

         (f) Position pinion gear holder LTCT2048 in inlet housing assembly and align pins of holder with accessory drive pinion gear (3).

         CAUTION: TO MAKE SURE COMPLETE SEATING OF COMPRESSOR ROTOR, SLAVE BOLTS MUST BE 0.25 INCH SHORTER THAN BOLTS INSTALLED AT FINAL ASSEMBLY.

         (g) Secure holder to inlet housing with a minimum of four 1/4-28 UNF slave bolts.



1. PACKING
2. GEAR
3. RING
4. BOLT
5. TABWASHER
6. BOLT
7. POWER SHAFT BEARING RETAINER
8. POWER SHAFT
9. NUT AND SEAL ASSEMBLY

Power Shaft Bearing Retainer
Figure 401

NOTE: Do not remove nut and seal assembly at this time.

(h) Using socket wrench support assembly LTCT911 with socket wrench LTCT4002, loosen nut and seal assembly (1).

(i) Remove special tooling and securing bolts.

(j) Install four slave bolts to secure compressor rotor where holder LTCT2048 was removed.

(8) Remove compressor/combustor turbine assemblies from inlet housing.

(a) Position combustor lifting sling LTCT14668 to flange of exhaust diffuser support cone. Make sure top clamping adapter is correctly positioned and secured.

(b) Position lifting eye so as to hold engine in vertical position.

(c) Rotate engine to vertical position.

(d) Remove slave bolts installed in Step 1.A(7)(j).

(e) Attach suitable hoist to eye of combustor lifting sling LTCT14668.

(f) Using an approved marking pencil, index 12 o'clock position of compressor housing to inlet housing flange and location of all brackets mounted on compressor to inlet housing bolt circle.

NOTE: Prior to removal of inlet guide vane actuator, make sure end of blast mark area on connector aligns with scribe mark on variable inlet guide vane rigging plate when actuator is in full open position. (See 75-30-01, Figure 203.)

(g) Remove bolts (75-30-01, 1, 27, 29, Figure 201), washers (2, 28), nuts (7, 9, 10), and spacer (4) that secure inlet guide vane actuator.

(h) Remove bolts (8, 35, Figure 403), washers (28, 31, 36), and nuts (29, 30) that secure compressor housing to inlet housing.

(i) Lift compressor/combustor turbine assemblies away from inlet housing.

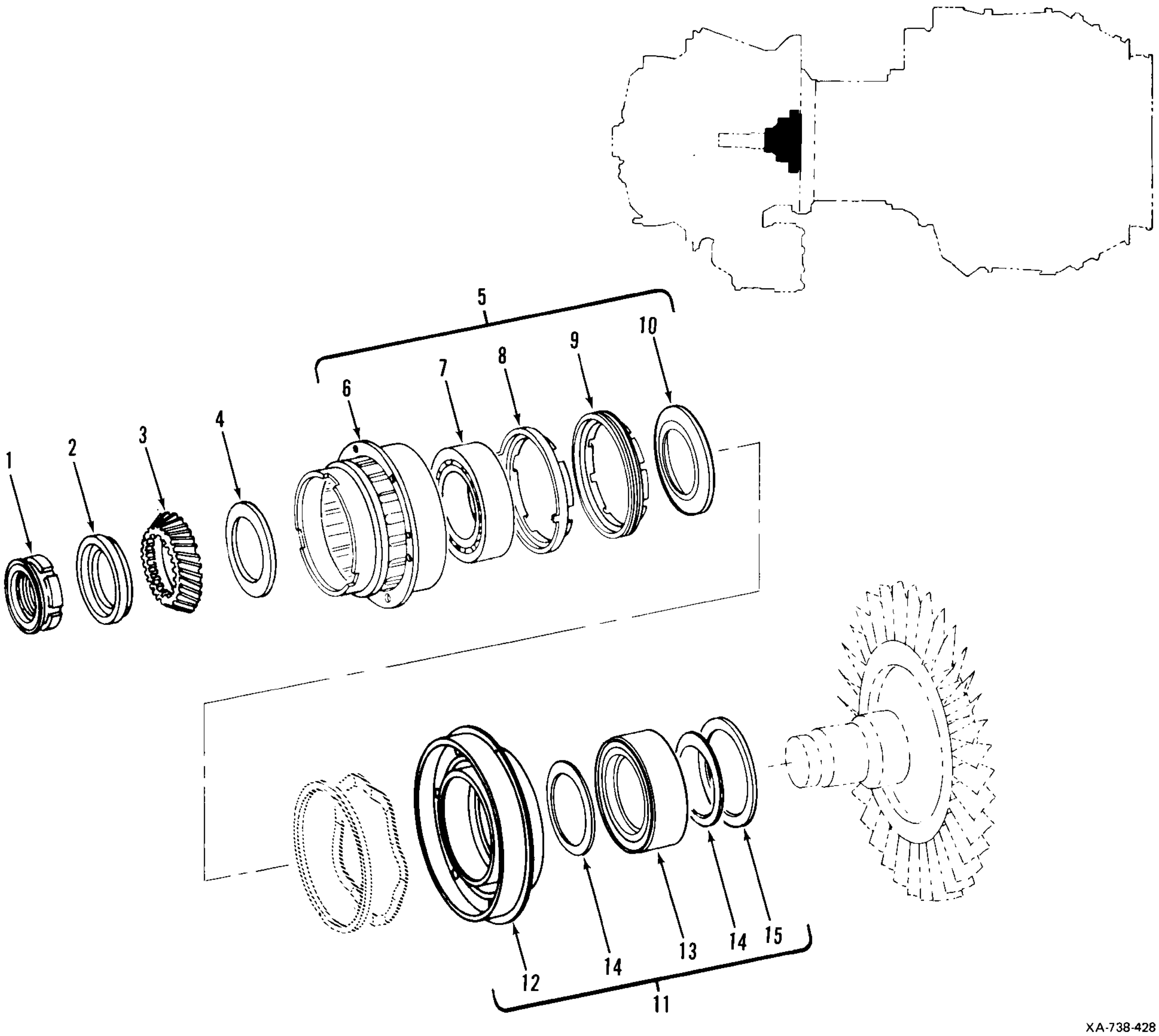
(j) Remove wave washer (3, Figure 404) and shim (4) from inlet housing. Record thickness of shim.

(k) Using 1/4-28 UNF bolts as pullers, withdraw sleeve (5) from inlet housing assembly.

(l) Remove and record thickness of shim (6).

(m) Remove and discard packing (7).

(n) Using a sharp pointed instrument, remove and discard packing. (14, Figure 407)



1. NUT AND SEAL ASSEMBLY
2. LOCKING CUP
3. ACCESSORY DRIVE PINON GEAR
4. SHIM
5. NO. 1 BEARING HOUSING ASSEMBLY
6. NO. 1 BEARING HOUSING
7. BEARING
8. LOCKING CUP
9. NUT
10. OIL IMPELLER
11. NO. 1 SEAL HOUSING ASSEMBLY
12. SEAL HOUSING
13. SEAL
14. PACKING
15. RETAINING RING

No. 1 Bearing and Seal Housing Assemblies
Figure 402

NOTE: Perform following Step B only if No. 1 bearing and/or No. 1 seal is to be replaced. Otherwise, proceed to Step C.

B. Remove No. 1 Bearing and Seal

(1) Remove nut and seal assembly (1, Figure 402) and locking cup (2).

(2) Using puller LTCT2027, remove accessory drive pinion gear (3).

(3) Remove shim (4) and record thickness.

(4) Using mechanical puller LTCT483, remove No. 1 bearing housing assembly (5) as follows:

(a) Using 1/4-28 UNF bolts, 2.5 inches long, as pullers, slide No. 1 seal housing assembly (11) aft.

(b) Insert puller legs through channels of bearing retainer assembly and position behind oil impeller (10). Legs of puller must be aligned with slots of nut (9) and locking cup (8).

(c) Pull No. 1 bearing housing assembly (5) from compressor shaft.

(d) Remove puller from bearing housing.

(5) Remove No. 1 seal housing assembly (11) from compressor rotor.

(6) Secure No. 1 bearing housing assembly (5) in holding fixture LTCT4713, forward end down. Straighten locking cup (8) and using wrench LTCT487, remove nut (9). Remove and discard locking cup.

(7) Using tooling, remove bearing (7) from No. 1 bearing housing (6).

(8) Remove retaining ring (15) from No. 1 seal housing assembly (11).

(9) Using suitable adapter and arbor, press out seal (13) with packing (14) if installed. Face type seal does not use packing. Discard seal and packing.

NOTE: Face type seal does not use packing.

C. Remove Variable Inlet Guide Vane Assembly

CAUTION: MAKE SURE VANES ARE IN OPEN POSITION.

(1) Remove bolt (1, Figure 405), before attempting to remove inlet guide vane assembly.

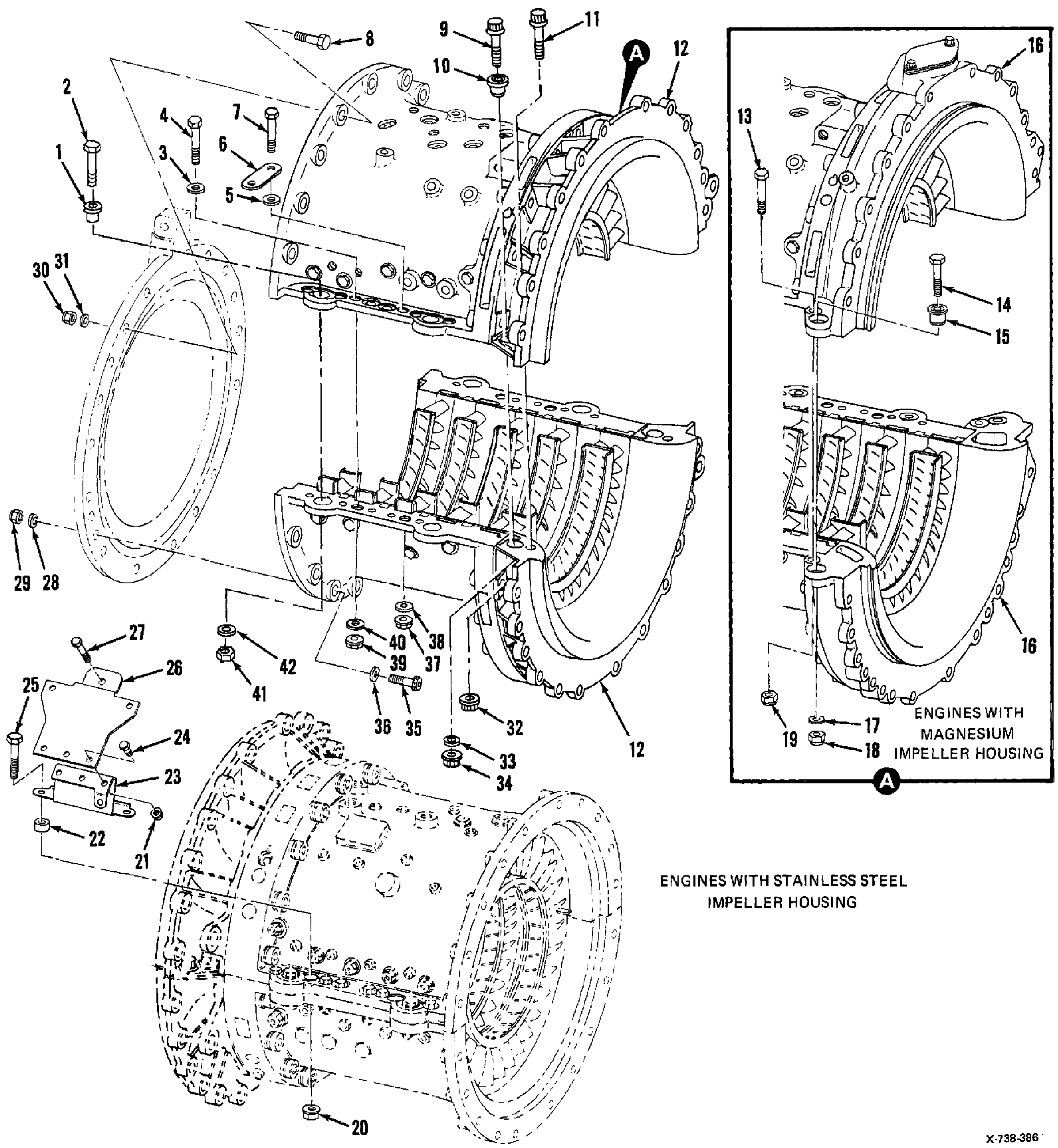
(2) Remove outer rear fairing ring (8).

(3) Remove screw (3) and plate (4).

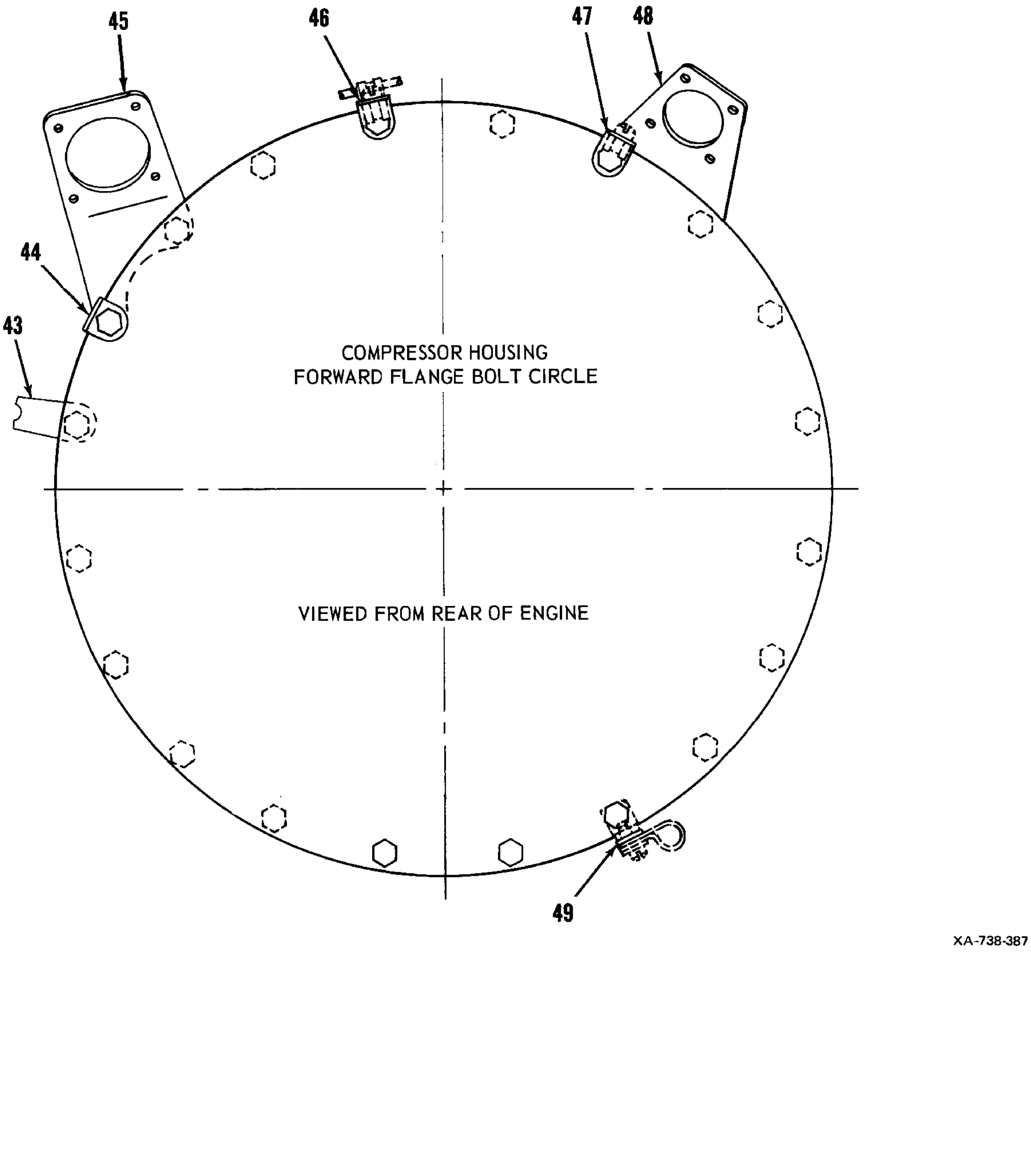
(4) Using mechanical puller LTCT4007, remove inlet guide vane assembly (7). (See Figure 406.)

(5) Remove connector rod assembly (6, Figure 405) and guides (5).

(6) Remove and discard packing (2).



Compressor and Impeller Housing Assemblies, and Bracket Locations
Figure 403 (Sheet 1 of 2)



Compressor and Impeller Housing Assemblies, and Bracket Locations
Figure 403 (Sheet 2)

KEY TO FIGURE 403

1. DOWEL
2. BOLT
3. WASHER
4. BOLT
5. WASHER
6. BRACKET
7. BOLT
8. BOLT
9. BOLT
10. DOWEL
11. BOLT
12. COMPRESSOR AND IMPELLER HOUSING
13. NUT
14. NUT
15. SPACER
16. BRACKET
17. SCREW
18. BOLT
19. BRACKET
20. SCREW
21. WASHER
22. NUT
23. NUT
24. WASHER
25. NUT
26. WASHER
27. NUT
28. WASHER
29. WASHER
30. NUT
31. WASHER
32. NUT
33. WASHER
34. NUT
35. BOLT
36. WASHER
37. BRACKET
38. BRACKET
39. BRACKET
40. BRACKET
41. BRACKET
42. BRACKET

D. Replace Individual Variable Inlet Guide Vanes

NOTE: The maximum amount of vanes that can be replaced is six.

(1) Remove variable inlet guide vanes (1, Figure 407).

(a) Using removal and installation tool LTCT4698, remove spring pins (2) on affected vanes from unison ring (7). Discard spring pins.

(b) Install variable inlet guide vane assembly (7, Figure 405) into fixture LTCT3038.

NOTE: Make sure the 0.250 inch slot on forward rim face is located over flattened pin fixture.

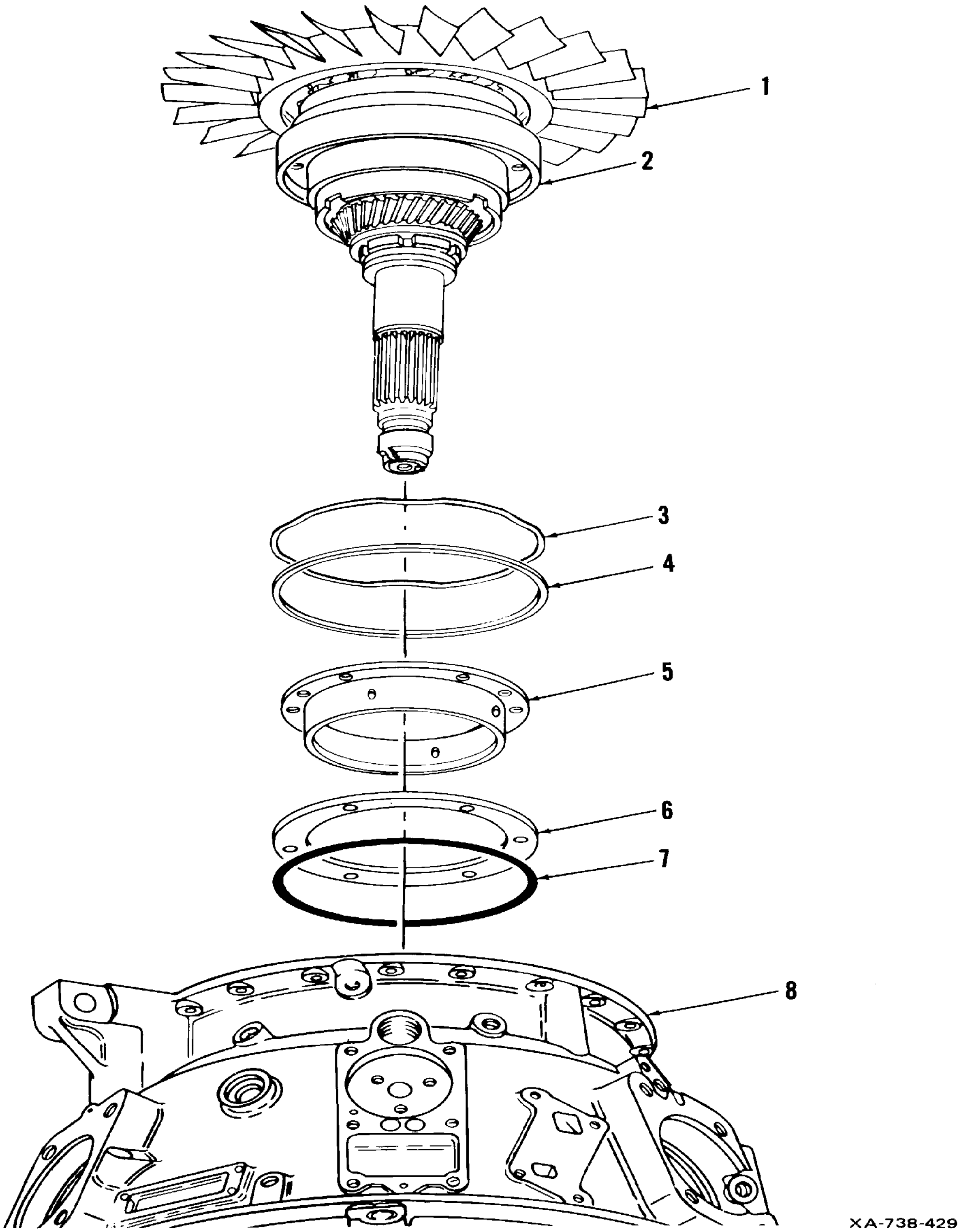
(c) To locate variable inlet guide vane assembly, install a bolt through counter bored hole in wall of fixture and into 0.375 inch diameter hole in raised boss on periphery of outer forward fairing (8, Figure 407).

(d) Install fixture clamp and secure.

(e) Turn fixture over and remove screws (11).

(f) Turn fixture over and remove clamp.

(g) Lift off inner rear fairing (4).



Compressor Rotor Assembly Removal and Installation
Figure 404

KEY TO FIGURE 404

1. COMPRESSOR ROTOR
2. SEAL HOUSING
3. WAVE WASHER
4. SHIM
5. SLEEVE
6. SHIM
7. PACKING
8. INLET HOUSING

(h) Rotate vanes counterclockwise and lift variable inlet guide vanes (1) free.

(2) Clean variable inlet guide vanes (1) by emulsion degreasing method. (See SPM, SP C214, 70-10-11.)

(3) Inspect variable inlet guide vanes.

(a) Visually inspect each vanes leading edges, trailing edges and airfoil surfaces for minor nicks, dents, burrs, and pits. (See Figure 408.) Blend repair nicks, dents, burrs, and pits that are within limits. (See Paragraph 1.D(4).)

(b) Slight distortion is acceptable without repair provided it does not impair the full opening and closing of the vanes and does not exist on more than five vanes. If distortion is less than 0.125 inch, vanes may be cold straighten repaired. Replace vanes that are distorted in excess of 0.125 inch. (See Paragraph 1.D(4).)

(c) Major distortion, bowing, mutilation is not acceptable. Replace vane.

(d) Tears in leading and trailing edges with resultant loss of material are not acceptable and are cause for vane replacement.

(e) Cracks are acceptable without repair provided they are tight lipped, nonconvergent and within limits outlined in Figure 408.

NOTE: Acceptable defects shall be limited to three for leading edge, three for trailing edge and five per side for airfoil. Replace vanes if limits are exceeded.

(f) Visually inspect and fluorescent penetrant inspect. (See SPM, SP I305, 70-20-05.) Brazement voids on trailing edge of each vane where upper and lower caps join airfoil half are acceptable provided loss of brazement has not caused a separation of mating surface and otherwise meets the requirements of the proceeding steps.

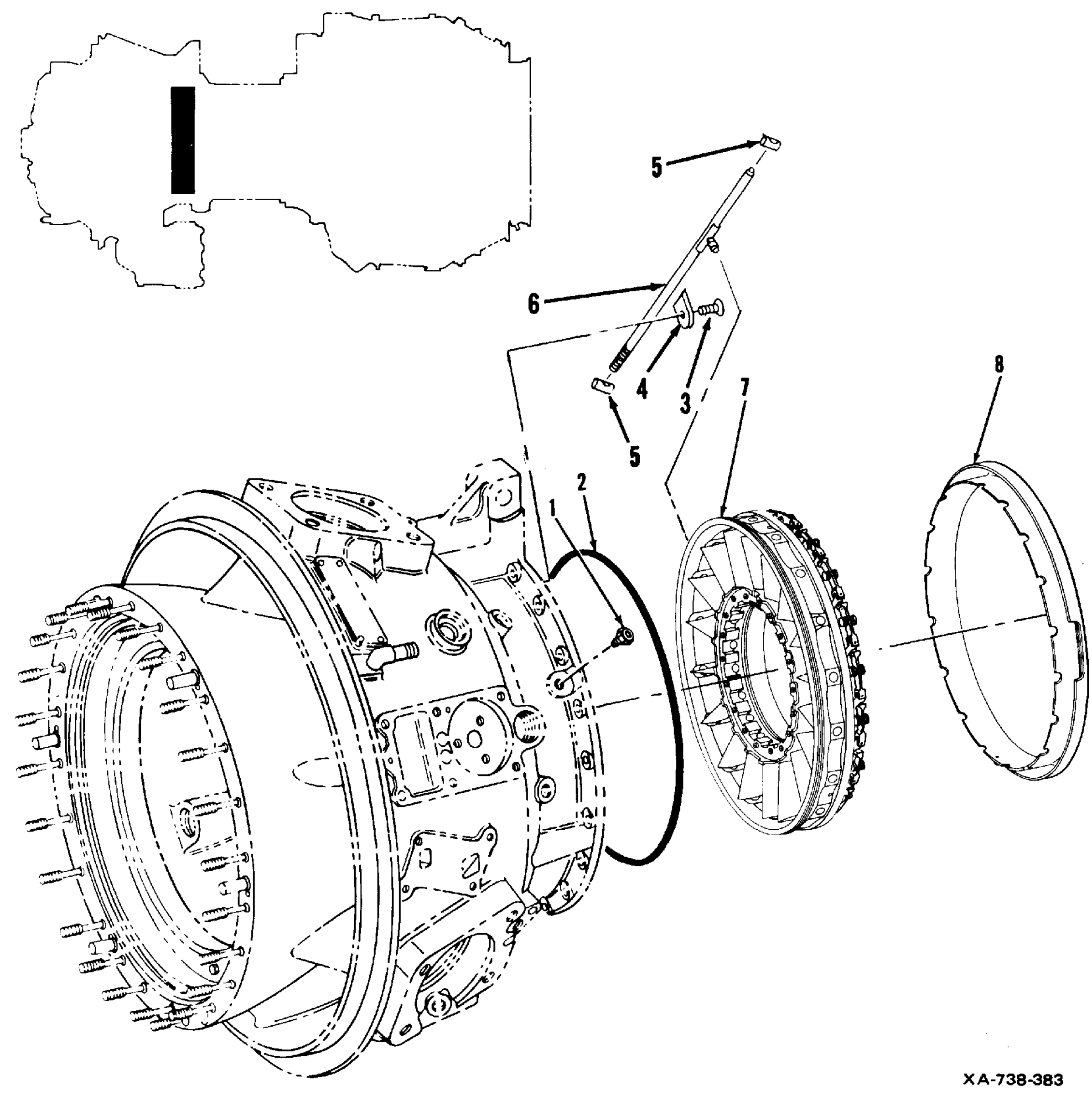
(4) Repair variable inlet guide vane (1, Figure 407).

(a) Blend repair minor nicks, burrs, pits, and dents. (See SPM, SP R401, 70-25-01.)

(b) Cold straighten bowed or distorted vanes.

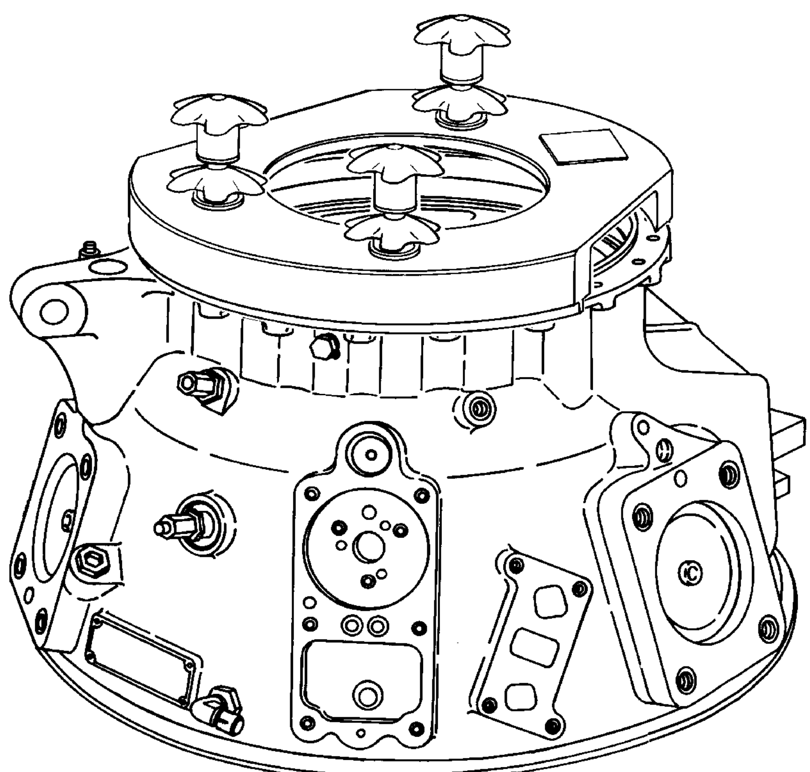
1 Place vane between two wooden forming blocks contoured to vane airfoil.

2 Using fluorescent penetrant method, inspect straightened vanes for cracks. (See SPM, SP I305, 70-20-05.) Cracks are not permitted. Replace vane.

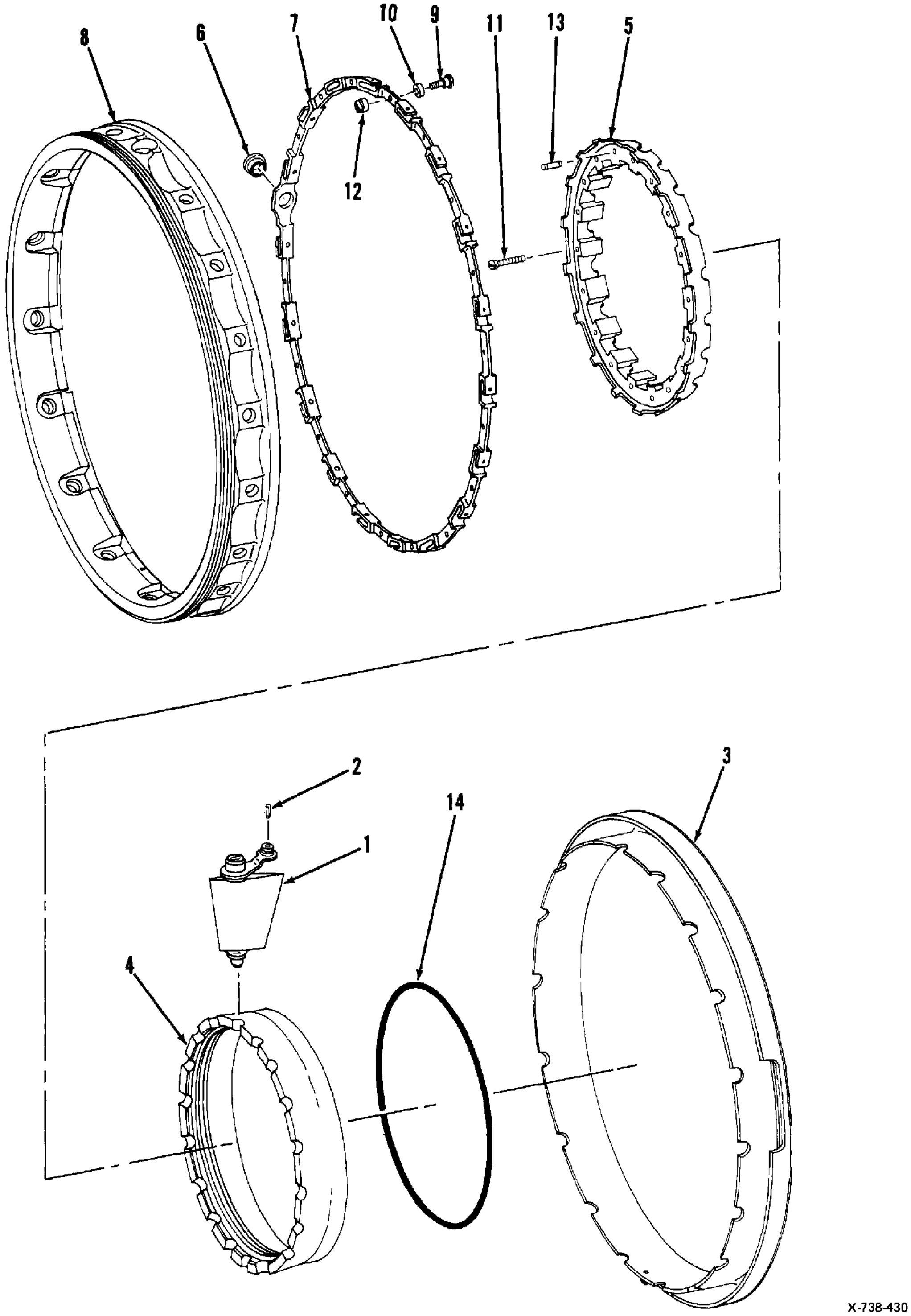


1. BOLT
2. PACKING
3. SCREW
4. PLATE
5. GUIDES
6. CONNECTOR ROD ASSEMBLY
7. INLET GUIDE VANE ASSEMBLY
8. REAR FAIRING RING

Variable Inlet Guide Vane Assembly
Figure 405



Variable Inlet Guide Vane Assembly Removal
Figure 406



Variable Inlet Guide Vane Assembly
Figure 407

KEY TO FIGURE 407

1. VARIABLE INLET GUIDE VANE
2. SPRING PIN
3. FAIRING ASSEMBLY
4. INNER REAR FAIRING
5. INNER FORWARD FAIRING
6. BEARING
7. UNISON RING
8. OUTER FORWARD FAIRING
9. SCREW
10. UNISON RING ROLLER
11. SCREW
12. NUT
13. DOWEL PIN
14. PACKING

(5) Install variable inlet guide vane (1, Figure 407).

CAUTION: GUIDE LEVERS MUST BE ALIGNED WITH THEIR RESPECTIVE SLOTS IN UNISON RING (7).

(a) Install variable inlet guide vanes (1) into inner rear fairing (4) and outer forward fairing (8).

NOTE: The maximum amount of vanes that can be replaced is six. Position unison ring (7) so that bearing (6) is in approximate center of actuator and rod slot in the fixture assembly VIGV LTCT3038.

(b) Position inner rear fairing (4) over inner forward fairing (5) and vane journals. Align dowel hole in inner forward fairing.

NOTE: The three dowel pin holes are not equally spaced.

(c) Install fixture clamping plate (detail of LTCT3038) and secure in place.

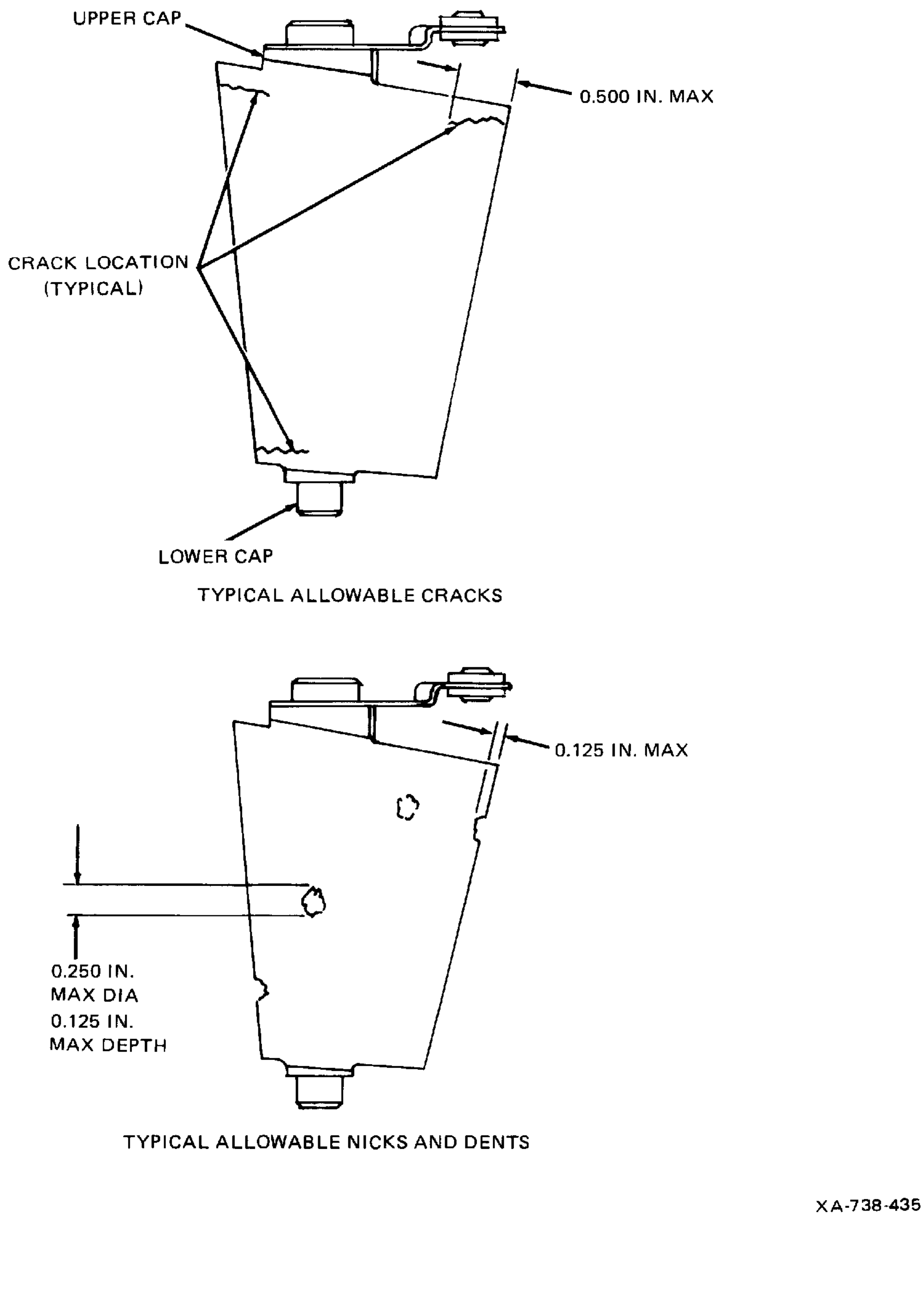
(d) Verify that freedom of movement exists in all vanes (1).

(e) Secure inner forward fairing (5) to inner rear fairing (4) with 15 screws (11). Tighten screws 6 to 7 inch-pounds torque.

(f) Release clamps and remove guide vane assembly (7, Figure 405) from fixture LTCT3038.

(g) Using tool LTCT4698, install new spring pins (2, Figure 407) in affected variable inlet guide vanes (1).

(h) Lockwire screws (11).



Variable Inlet Guide Vane Inspection
Figure 408

COMPRESSOR ROTOR ASSEMBLY - REMOVAL

1. Removal

   A. Remove Compressor Housing Assembly

      (1) Install engine onto work stand LTCT7298-07. Position engine horizontally. (See 72-00-00, Table 202.)

      (2) Drain oil from engine. (See 72-00-00, ENGINE - SERVICING, Paragraph 2.C.)

      (3) Remove piping and accessories (as required). Refer to applicable sections.

      (4) Remove front end components:

         (a) Remove inlet housing and variable inlet guide vanes, accessory drive gearbox, overspeed governor and tachometer drive assembly, output reduction carrier and gear assembly, sun gear shaft, oil transfer support assembly, accessory drive carrier assembly, and power shaft bearing retainer. (See 80-00-01.)

         (b) Untorque nut and seal assembly. (See 80-00-01.)

         NOTE: Do not remove nut and seal assembly at this time.

      (5) Remove combustor turbine assembly. (See 72-40-00, Paragraph 1.A.)

      (6) Remove gas producer system components. Remove second gas producer turbine rotor, second gas producer turbine nozzle, first gas producer turbine rotor, first gas producer turbine nozzle, combustion chamber deflector, No. 2 aft seal, No. 2 bearing, and No. 2 forward seal. (See 72-51-00.)

         NOTE: Diffuser housing can be removed without removing No. 2 forward seal.

      (7) Index impeller housing to diffuser housing.

      (8) Remove diffuser housing. (See 80-00-03, Paragraph 1.A.)

      (9) Index compressor housing to inlet housing.

      (10) Rotate engine to a front down vertical position.

      (11) Remove compressor housing assembly as follows:

         NOTE: Upper and lower housings must be removed. Separation of impeller housing from axial housing is not required.

         (a) Remove bolts (80-00-01, 2, 4, 7, 18, Figure 403), and bolts (9 and 11), washers (3, 5, 26), washers (31, 33, 35), and nuts (25, 27), and nuts (13, 30, 32, 34).

         (b) Using mechanical puller LTCT1218, remove hollow dowels (1) and (10 or 15).

         (c) Remove variable inlet guide vane actuator. (See 75-30-01.)

(d) Remove bolts (80-00-01, 8, 28, Figure 403), washers (21, 24, 29), and nuts (22, 23) that secure compressor and impeller housing (12) to inlet housing assembly.

(e) Remove housing halves (12) straight out until compressor rotor blades are cleared.

B. Remove Compressor Rotor Assembly

(1) Position lifting adapter LTCT4558 and suitable lifting hoist on compressor rotor assembly.

<u>CAUTION:</u> TO AVOID DAMAGE TO COMPRESSOR ROTOR BLADES, USE CARE WHEN REMOVING BLADES.

(2) Remove compressor rotor assembly from inlet housing and install compressor rotor in holding fixture LTCT13001.

(3) Remove wave washer (80-00-01, 3, Figure 404) and shim (4) from inlet housing. Record thickness of shim (4).

(4) Using three 1/4-28 UNF bolts as pullers, withdraw sleeve (5) from inlet housing assembly (8).

(5) Remove and record thickness of shim (6).

(6) Remove and discard packing (7).

(7) Using sharp pointed instrument, remove and discard packing (80-00-01, 14, Figure 407).

C. Remove No. 1 Bearing and Seal

<u>NOTE:</u> The power shaft, compressor rotor subassembly, centrifugal impeller, assembly bolts and lockcups, and front and rear shafts will remain together as an assembly for shipment to a Honeywell approved overhaul facility.

Remove No. 1 bearing and No. 1 seal. (See 80-00-01, paragraph 1.B.)

DIFFUSER HOUSING ASSEMBLY - REMOVAL

1. Removal

   A. Install engine onto work stand LTCT7298-07. Position engine horizontally. (See 72-00-00, Table 202.)

   B. Drain oil from engine. (See 72-00-00, ENGINE - SERVICING, Paragraph 2.C.)

   C. Remove piping and accessories (as required). Refer to applicable sections.

   D. Remove combustor turbine assembly. (See 72-40-00, Paragraph 1.A.)

   E. Remove gas producer components. Remove second gas producer turbine rotor, second gas producer turbine nozzle, first gas producer turbine rotor, first gas producer turbine nozzle, combustion chamber deflector, No. 2 aft seal, No. 2 bearing, and No. 2 forward seal. (See 72-51-00.)

   NOTE: Prior to removal of the No. 2 bearing housing, rotate engine to vertical position.

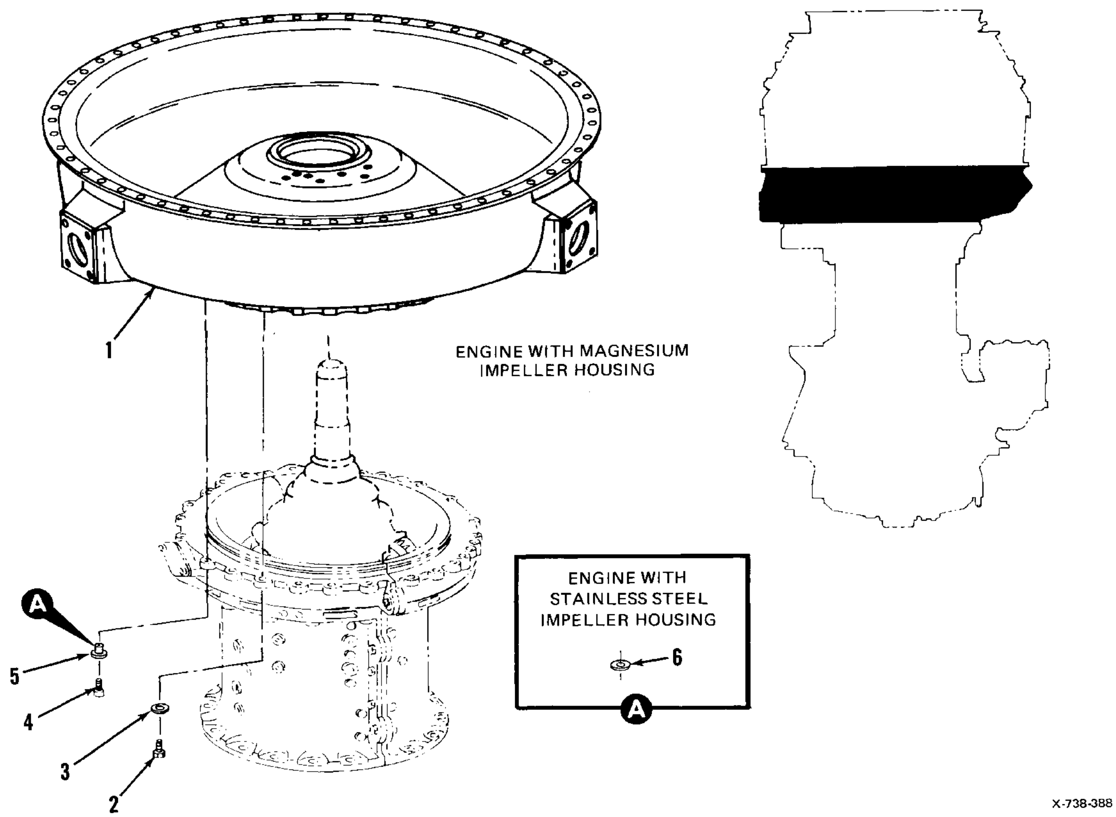
   F. Remove diffuser housing as follows:

      (1) Identify and mark all bolt holes at which clamps and brackets are installed. (See Figure 401.)

      (2) Remove bolts (2), washers (3), bolts (4), and washers (5).

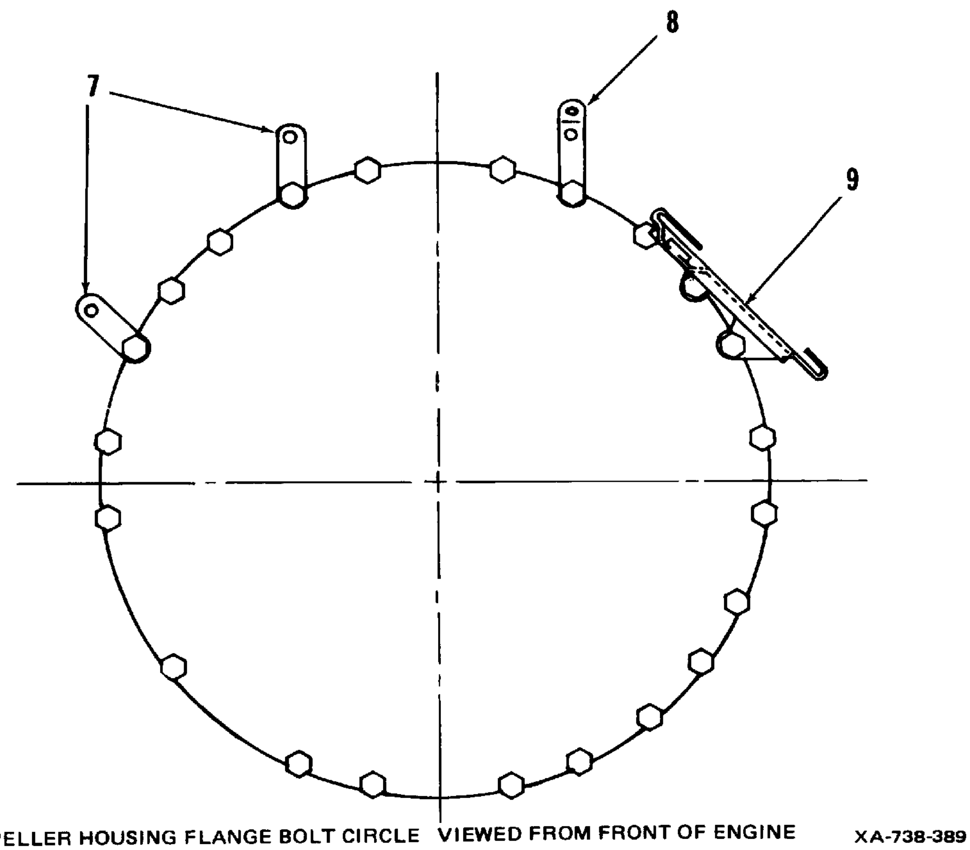
      (3) Carefully lift diffuser housing off compressor rotor assembly shaft.

      (4) If diffuser housing is to be replaced, remove and transfer external hardware to the replacement diffuser housing.

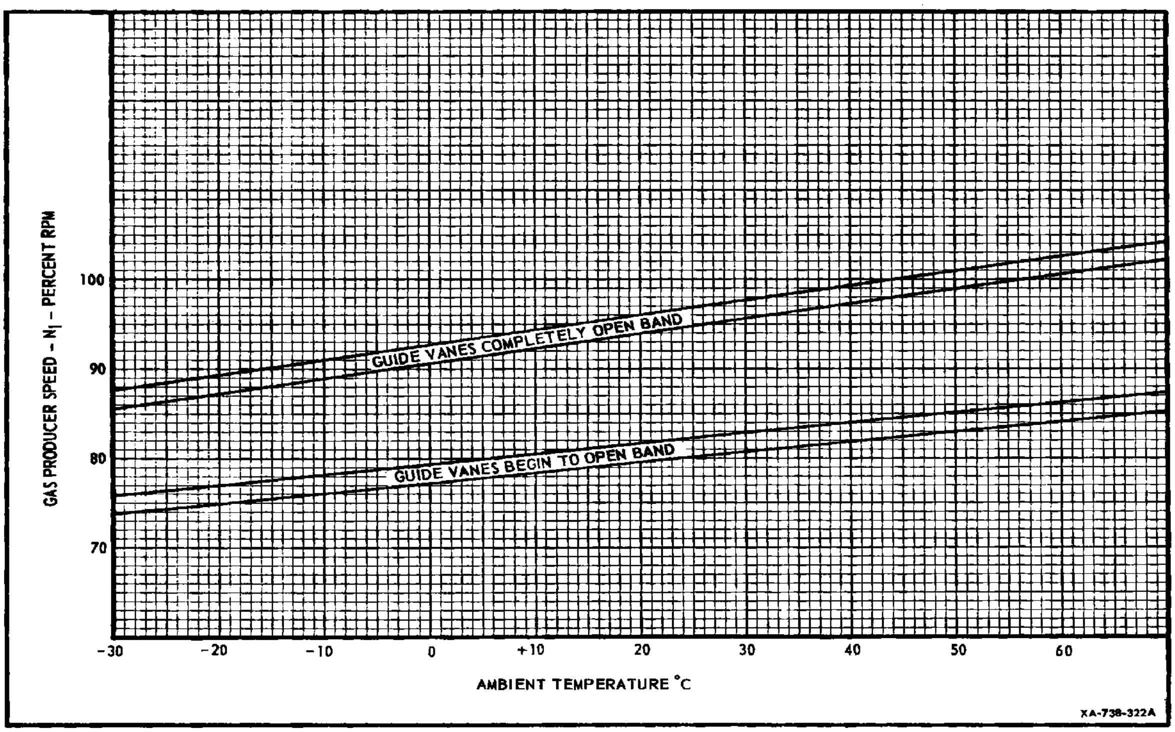


1. DIFFUSER HOUSING
2. BOLT
3. WASHER
4. BOLT
5. WASHER
6. BRACKET
7. BRACKET
8. BRACKET

Diffuser Housing, Bracket, and Bolt Location
Figure 401 (Sheet 1 of 4)

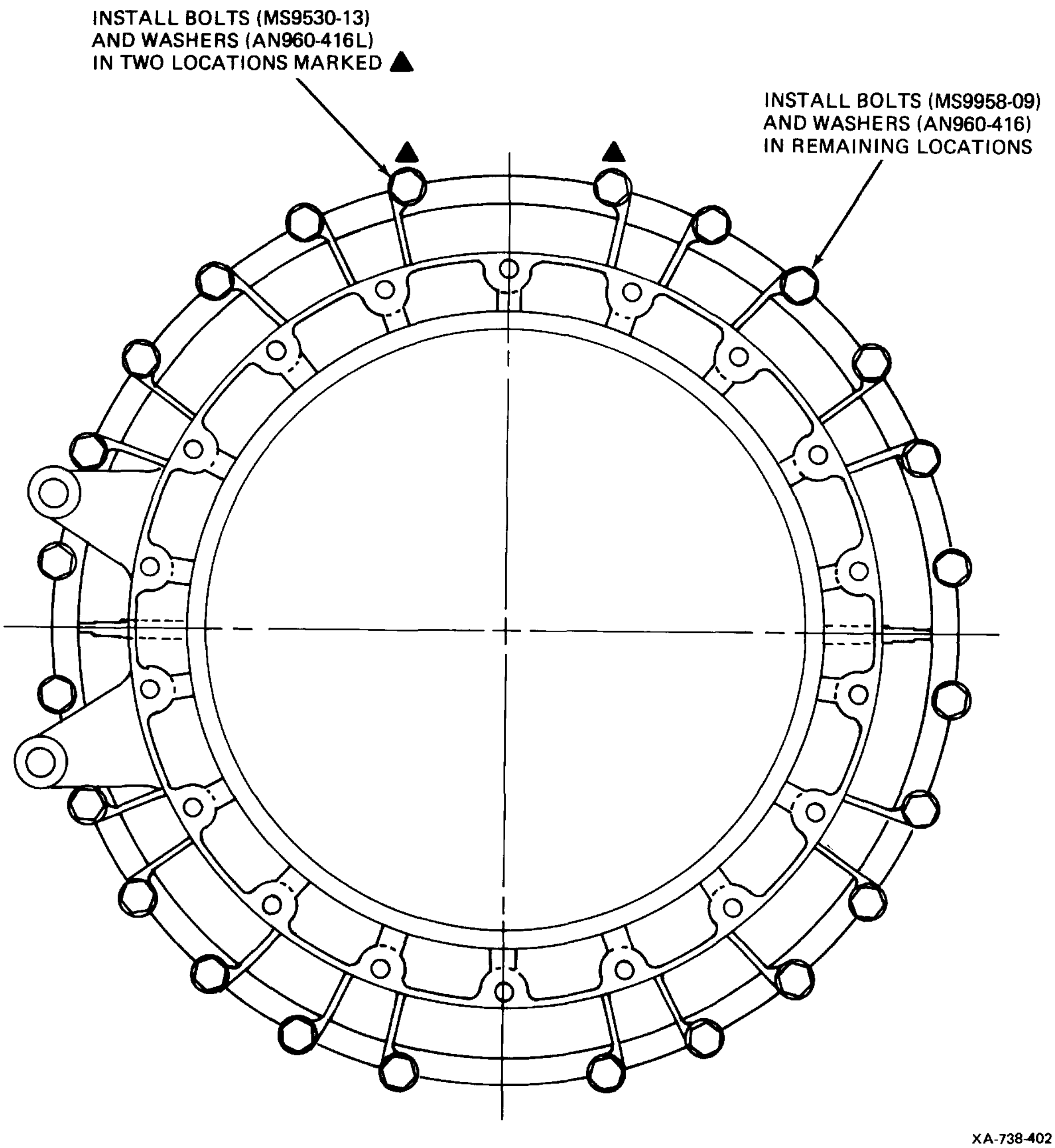


Diffuser Housing, Bracket, and Bolt Location
Figure 401 (Sheet 2)



Impeller Housing Bolt Location

Diffuser Housing, Bracket, and Bolt Location
Figure 401 (Sheet 3)



Stainless Steel Impeller Housing Bolt Location

Diffuser Housing, Bracket, and Bolt Location
Figure 401 (Sheet 4)

FINAL ENGINE ASSEMBLY

1. Final Engine Assembly

NOTE: Inspect all parts for serviceability. Particular attention should be paid to mainshaft seals in order to eliminate possible air leaks.

A. Install Inlet Housing Assembly

(1) Install inlet housing on work stand SWE13855 and secure. Rotate to vertical position.

(2) If replacement housing is to be installed, make sure all hardware is transferred to replacement housing.

B. Install Variable Inlet Guide Vane Assembly

CAUTION: MAKE SURE PACKING IS INSTALLED WITHOUT KINKING OR TWISTING.

(1) Install new packing (80-00-01, 2, Figure 405) on inlet housing.

(2) Slide two guides (5) onto connector rod assembly (6).

(3) Carefully insert pin of connector rod assembly (6) into ball socket of variable inlet guide vane assembly (7).

(4) Install both variable inlet guide vane assembly (7) and connector rod assembly (6) into inlet housing assembly as follows:

(a) Insert guides (5) into holes and position shaft of connector rod assembly (6) in groove on rear face of inlet housing assembly.

(b) Align key on inlet housing assembly with keyway in inner fairing of inlet guide vane assembly (7).

NOTE: In following Step (c), install variable inlet guide vane assembly with pressure by hand only. If some difficulty is encountered, use a suitable fibre drift and hammer. Lightly tap until assembly is seated in inlet housing.

(c) Using suitable drift, align bolt hole in outer fairing of variable inlet guide vane assembly (7) with bolt in inlet housing assembly.

(d) Install plate (4) and screw (3). Tighten screw.

(5) Install bolt (1). Tighten 60 to 90 inch-pounds torque.

CAUTION: MAKE SURE THAT VANES MOVE FREELY THROUGH FULL TRAVEL. REWORK VANES AS REQUIRED FOR FREE MOVEMENT.

(6) Install rear fairing ring (8).

C. Initially Adjust New Inlet Vane Assembly

NOTE: This procedure will be accomplished only if entire variable inlet guide vane assembly was replaced with a new assembly.

(1) Set protractor assembly LTCT4750 at 6-1/2 degrees and install on inlet housing. (See Figure 401.)

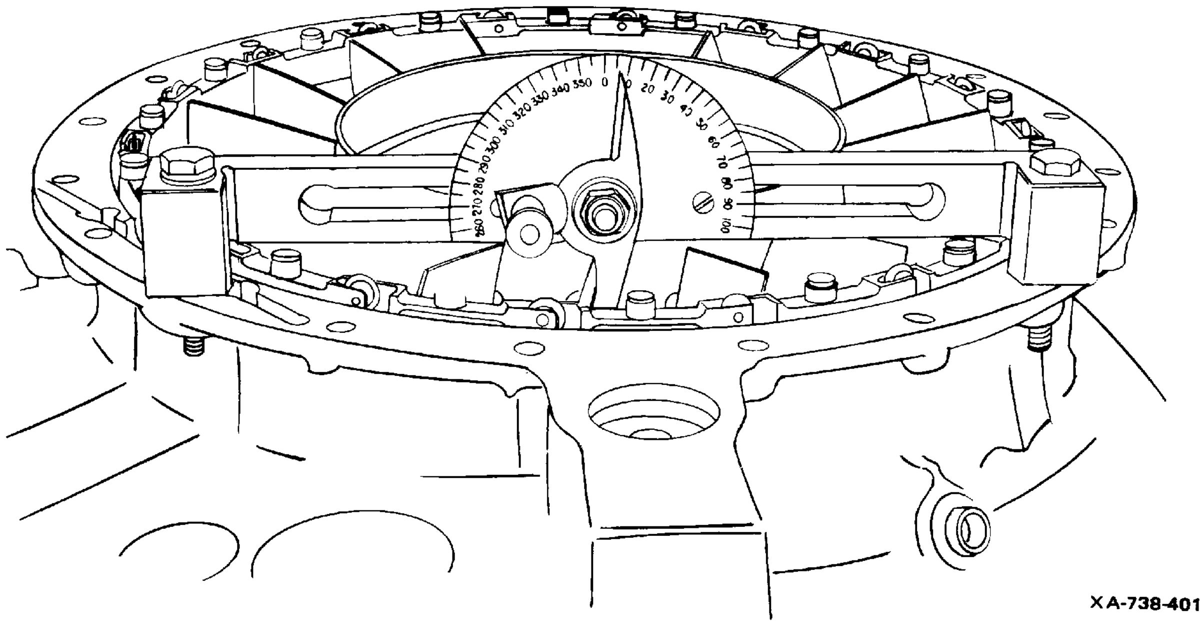
NOTE: Air inlet vanes must be in open position before adjustment is made.

(2) Slide indicator on tool until vane is flush with arm of protractor.

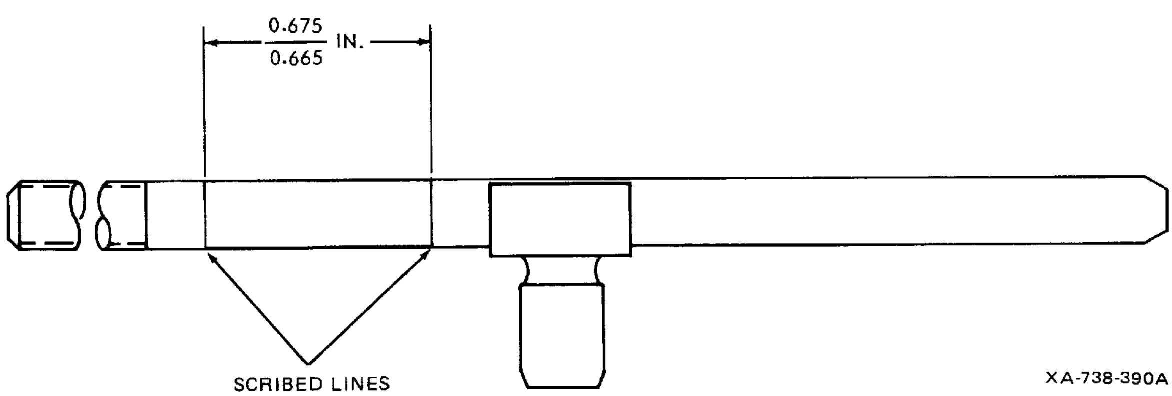
NOTE: Pencil mark should be lined up within 0.002 inch with end of shot peened area on connector rod. (See Figure 402.) Newer connector rods will have two scribe marks. Pencil mark should line up within 0.0002 inch of the top mark. Final adjustment of connector rod will be performed at a Honeywell approved engine test facility.

(3) Using masking tape, temporarily mask index plate. Using a pencil, draw a line on masked index plate located on flange on inlet housing assembly.

D. Deleted



Protractor LTCT4750 Installed
Figure 401



Variable Inlet Guide Vane Connector
Figure 402

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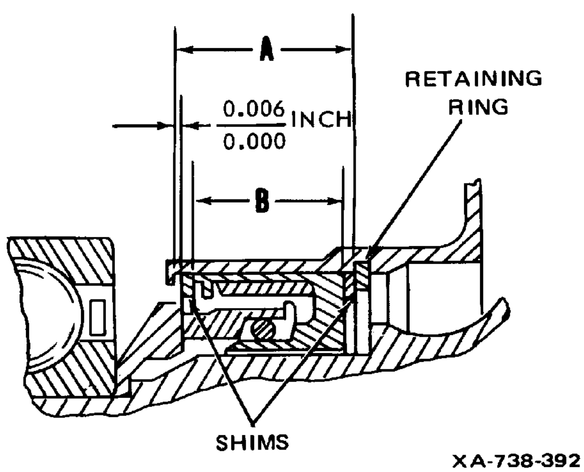
Figure 403



Installing No. 1 Face Type Seal
Figure 404

E. Install No. 1 Bearing and Face Type Seal Housing Assemblies

NOTE: This procedure to be used on engines that have Service Bulletin No. 0046 face type seal installed. Compressor rotor front shaft shall not have three seal air pressure holes located in the seal journal area.

(1) Install retaining ring into seal housing. (See Figure 404.)

(2) Measure Dimension A.

(3) Measure width of seal, Dimension B.

(4) Subtract Dimension B from Dimension A.

(5) Select two shims of equal thickness to be placed fore and aft of seal casing to obtain 0.000 to 0.005 inch loose fit.

(6) Install one shim in housing and, using suitable sleeve and arbor press, press seal into housing.

NOTE: Install seal so carbon element faces forward (face down).

(7) Install remaining shim and secure seal with retaining ring.

(8) Position No. 1 seal housing assembly (80-00-01, 11, Figure 402) onto compressor front shaft.

(9) Install oil impeller (10) onto compressor shaft, making sure sealing side mates to face seal.

(10) Install No. 1 bearing housing (6) into holding fixture LTCT4713.

(11) Using a suitable sleeve and arbor press, press bearing (7) into bearing housing (6).

(12) Install new locking cup (8) and nut (9) into bearing housing.

(13) Using wrench LTCT487, tighten nut 75 to 125 foot-pounds torque. Align slots in nut with slots in locking cup (8) and lock nut (9) by deforming locking cup (8) into slots 180 degrees apart. Do not shear locking cup.

(14) Align bolt holes in No. 1 bearing housing assembly with mating holes in No. 1 seal housing assembly (11).

(15) Install two guide pins 1/4-28 UNF threads, 2.5 inches long into seal housing assembly and using driver LTCT3706, press bearing housing assembly into seal housing.

F. Install Gear Nut and Seal Assembly

(1) Install shim (4) of the same thickness as the one removed during disassembly.

(2) Install accessory drive pinion gear (3) on first stage compressor disc assembly.

See TR

NOTE: Do not torque and lock nut and seal assembly at this time. This operation will be performed after gear pattern and backlash have been established.

(3) Install new locking cup (2) and nut and seal assembly (1) hand tight.

G. Install Compressor Rotor Assembly into Inlet Housing Assembly

CAUTION: MAKE SURE THAT PACKING IS INSTALLED WITHOUT KINKING OR TWISTING.

(1) Lubricate and install new packing (80-00-01, 14, Figure 407) into groove in inner rear fairing.

(2) Lubricate new packing (80-00-01, 7, Figure 404) and install into groove of inlet housing (8).

(3) Record thickness of shim (6) for reference when compressor rotor axial clearances are checked.

(4) Install shim (6) (of same thickness of that recorded during removal) and sleeve (5) on inlet housing (8) and line up bolt holes.

(5) Install shim (4) on inner fairing.

NOTE: Size of shim (4) will be determined by thickness of locating shim (6) within plus or minus 0.002 inch.

(6) Install wave washer (3) on shim (4).

(7) Make sure the two guide pins installed in Step E are still installed.

(8) Install suitable adapter onto compressor assembly and attach hoist to lifting eye.

(a) If installing compressor rotor only, use lifting adapter LTCT4558.

(b) If installing compressor/combustor turbine assembly use combustor lifting sling LTCT14668.

(9) Lower compressor rotor assembly into inlet housing assembly.

CAUTION: TO MAKE SURE OF COMPLETE SEATING OF COMPRESSOR ROTOR, SLAVE BOLTS MUST BE 0.25 INCH SHORTER THAN BOLTS INSTALLED AT FINAL ASSEMBLY.

(10) Remove guide pins and install six slave bolts securing No. 1 bearing housing to inlet housing.

(11) Draw compressor rotor assembly into position with slave bolts until it is seated properly. Tighten bolts 70 to 75 inch-pounds torque.

(12) If inlet housing was separated from engine without splitting the compressor housing, install bolts (80-00-01, 8, 35, Figure 403), washers (28, 31, 36), and nuts (29, 30).

TEMPORARY REVISION NO. 93

INSERT PAGE 2 OF 2 FACING 80-00-04, PAGE 406.

Reason: To delete “Tighten bolts 70 to 75 inch-pounds torque” in Step 1.G.(11), and to add Steps 1.G.(11)(a), (b) and (c).

Step 1.G.(11) is changed and Steps 1.G.(11)(a), (b) and (c) are added as follows:

(11) Draw compressor rotor assembly into position with slave bolts until it is seated properly.

(a) Remove slave bolts.

(b) Using socket wrench LTCT4002 and support assembly LTCT911, tighten nut and seal assembly (see 80-00-01, 9, Figure 1) to 320 foot-pounds torque.

NOTE: Do not stake locking cup (see 80-00-01, item 2, figure 402) at this time. Staking will be accomplished after gear pattern and backlash have been established.

(c) Reinstall slave bolts and tighten 70 to 75 inch-pounds torque.

NOTE: Average of the three measured clearances shall be 0.0043 to 0.0047 inch.

(13) With engine in vertical position, use feeler gage to measure radial clearance between sleeve (80-00-01, 5, Figure 404) and No. 1 bearing housing assembly (80-00-01, 5, Figure 402). Measure at three places, 120 degrees apart. Clearance shall be between 0.0034 and 0.0056 inch. If minimum clearances are not obtained, loosen torque on slave bolts and reposition rotor, then retorque slave bolts.

H. Install Compressor and Impeller Housing Assemblies

CAUTION: COMPRESSOR ROTOR ASSEMBLY MUST NOT BE ROTATED DURING INSTALLATION OF COMPRESSOR AND IMPELLER HOUSING ASSEMBLIES. ROTATION OF COMPRESSOR ROTOR ASSEMBLY MAY RESULT IN DAMAGE TO IMPELLER HOUSING ASSEMBLIES OR TO COMPRESSOR BLADES.

TO PREVENT DAMAGE TO COMPRESSOR ROTOR BLADES OR COMPRESSOR VANE ASSEMBLIES, GUIDE COMPRESSOR AND IMPELLER HOUSING ASSEMBLIES ONTO INLET HOUSING ASSEMBLY IN AS STRAIGHT A LINE AS POSSIBLE.

(1) Position lower half of compressor and impeller housing assemblies on inlet housing assembly. Align match marks on inlet housing assembly and compressor housing assembly.

(2) Position upper half of compressor and impeller housing assemblies on inlet housing assembly.

(3) Align and secure upper and lower compressor housing assembly halves (80-00-01, 12, Figure 403) using four dowels (1, 10), bolts (2, 9), washers (33, 42), and nuts (31, 34). Tighten nuts to 40 to 45 inch-pounds torque.

NOTE: Do not lubricate bolts installed in compressor housing halves.

(4) Secure upper and lower compressor housing assembly halves (12) with bolts (4, 7, 11), eight washers (38, 40), and nuts (32, 37, 39). Tighten nuts 40 to 45 inch-pounds torque.

(5) Secure upper compressor housing half to inlet housing assembly with four bolts (8), washers (31), and nuts (30). Secure lower compressor housing half to inlet housing assembly with four bolts (35), washers (28, 36), and nuts (29). Tighten nuts 70 to 95 inch-pounds torque.

I. Install Diffuser Housing.

(1) Lower diffuser housing over compressor rotor assembly to mate to impeller housing assembly. Align match marks on diffuser housing and compressor housing.

NOTE: Accomplish Steps (2), (3), (4) and (5) if air diffuser housing or inlet housing has been replaced or if index markings are illegible.

(2) Install alignment fixture assembly LTCT526 by aligning fixture pads with 4 and 8 o’clock inlet housing mounting pads and securing with lock bushings.

NOTE: Use of bolts in mounting pad holes is not necessary.

(3) Align 4 and 8 o’clock diffuser housing pads within fixture and engage locators (part of LTCT526). Shift diffuser housing until locators rotate freely.

(4) Secure diffuser housing to impeller housing with 10 bolts (80-00-03, 2, Figure 401), washers (3) and two bolts (4) and washers (6). Bolt locations are illustrated. (See 80-00-03, Figure 401, Sheet 3.) Tighten bolts 90 to 100 inch-pounds torque.

(5) Remove alignment fixture assembly LTCT526.

J. Install No. 2 Bearing and Seals (See 72-51-00.)

K. Check Compressor Rotor Clearance

(1) With engine in vertical position, remove bolts, washers, nuts and hollow dowels, using mechanical puller LTCT1218 and removal tool LTCT6740, that secure upper half of axial compressor housing to lower half.

(2) Remove bolts (80-00-01, 8, Figure 403), washers (24), and nuts (23) that secure upper half of compressor housing to inlet housing.

(3) Remove bolts and washers that secure upper half of compressor housing to impeller housing.

(4) Remove upper half of compressor housing straight out until rotor blades are cleared.

(5) Remove bolts and washers that secure upper impeller housing to diffuser housing.

(6) Remove upper impeller housing by lowering impeller housing until free of diffuser housing.

(7) Using feeler gage, check radial and axial clearances between compressor rotor and housings. (See Table 401.)

CAUTION: IF CLEARANCES DIFFER FROM THOSE LISTED IN TABLE 401, BUILD UP OF ENGINE SHALL BE STOPPED AND CONDITION REMEDIED. THESE CLEARANCES DEPEND ON THICKNESS OF SHIM (80-00-01, 6, FIGURE 404). ENGINE MUST BE DISASSEMBLED TO THAT STAGE OF ASSEMBLY IMMEDIATELY BEFORE COMPRESSOR ROTOR INSTALLATION AND SHIM MUST BE MODIFIED. IF CLEARANCE SHOWS COMPRESSOR ASSEMBLY IS POSITIONED TOO FAR REARWARD, SHIM THICKNESS MUST BE REDUCED. IF CLEARANCE SHOWS COMPRESSOR ASSEMBLY IS POSITIONED TOO FAR FORWARD THICKNESS OF SHIM MUST BE INCREASED.

(8) When clearances have been established, install and completely secure compressor housing assemblies. (See 72-30-01.)

L. Check Accessory Drive Carrier Assembly Gear Pattern and Backlash

(1) Rotate engine to a horizontal position.

(2) Remove six slave bolts and install pinion gear holder LTCT2048 on accessory drive pinion gear (80-00-01, 3, Figure 402). Secure locking plate with six slave bolts. Using support assembly LTCT911 and socket wrench LTCT4002, tighten nut and seal assembly (1) to 320 foot-pounds torque. Do not deform locking cup (2).

(3) Remove pinion gear holder LTCT2048 and six slave bolts. Reinstall six slave bolts.

(4) Coat accessory drive driven gear (80-00-04, 8, Figure 406, Pre SB T53-L-13B-0093) or (6, Figure 407, Post SB T53-L-13B-0093) with gear marking compound (72-00-00, 34A, Table 203). Do not coat gear on compressor rotor assembly (80-00-01, 3, Figure 402).

NOTE: The accessory drive carrier assembly is installed temporarily to establish gear pattern and backlash.

(5) Install accessory drive carrier assembly in inlet housing and temporarily secure with bolts.

(6) Turn engine to vertical position.

(7) Rotate compressor rotor assembly several turns in each direction to obtain gear pattern of accessory dive pinion gear (80-00-01, 3, Figure 402) and accessory drive driven gear (80-00-04, 8, Figure 406, Pre SB T53-L-13B-0093) or (6, Figure 407, Post SB T53-L-13B-0093).

NOTE: The gear pattern for accessory drive pinion gear (80-00-01, 3, Figure 402) and accessory drive driven gear (8, Figure 406, Pre SB T53-L-13B-0093) or (6, Figure 407, Post SB T53-L-13B-0093) is governed by thickness of shim (80-00-01, 4, Figure 203) behind gear (3). If gear pattern is unsatisfactory it may be necessary to change thickness of shim (4).

(8) Install backlash gage LTCT2099 into accessory drive driven gear through shaft opening of inlet housing assembly. Set up dial indicator with magnetic base to contact flag of backlash gage. (See Figure 408.)

NOTE: Outer line on flag of backlash gage LTCT2099 is used for accessory drive carrier backlash check.

(9) With backlash gage flag set at minimum end of backlash stroke, position dial indicator to zero. Using fingers, rotate flag back and forth. Amount of flag travel indicated on dial indicator is backlash between gears. Backlash shall be between 0.006 and 0.012 inch.

(10) Remove backlash gage flag.

(11) Turn engine to horizontal position.

(12) Remove accessory drive carrier assembly from inlet housing assembly and inspect gear pattern. Use puller screws, if necessary.

(a) If pattern shows accessory drive pinion gear (80-00-01, 3, Figure 402) is too far from accessory drive driven gear (marks on toe of gear teeth) increase thickness of shim.

(b) If pattern shows accessory drive pinion gear (3) is too close to accessory drive driven gear (marks on heel of gear), decrease thickness of shim.

Table 401. Compressor Rotor Clearances

Tip Clearances	Dir Meas	Blueprint Clearance Min	Max.	Clearance Min	Max.	Figure 405 Index
First disc blade to compressor housing	Radial	0.022	0.037	0.018	0.041	2
Second disc blade to compressor housing	Radial	0.022	0.033	0.018	0.035	3
Third disc blade to compressor housing	Radial	0.022	0.033	0.024	0.034	4
Fourth disc blade to compressor housing	Radial	0.022	0.032	0.024	0.033	5
Fifth disc blade to compressor housing	Radial	0.022	0.032	0.024	0.032	6
Impeller to centrifugal housing – front (A clearance)	Radial	0.023 *0.017	0.035 *0.032	0.023 *0.017	0.035 *0.032	7
Impeller to centrifugal housing – midpoint (B clearance)	Radial/ Axial	0.037	0.053	0.037	0.053	8
Impeller to centrifugal housing – rear (C clearance)	Axial	0.052	0.064	0.052	0.064	9
Impeller to diffuser	Radial	0.036	0.044	0.036	0.050	10
First disc to inlet vane shroud	Axial	0.040	0.151	0.040	0.151	1
First disc to first vane	Axial	0.040	0.106	0.040	0.106	21
First vane to second disc	Axial	0.040	0.099	0.040	0.099	20
Second disc to second vane	Axial	0.040	0.098	0.040	0.098	19
Second vane to third disc	Axial	0.040	0.105	0.040	0.105	18
Third disc to third vane	Axial	0.040	0.098	0.040	0.098	17
Third vane to fourth disc	Axial	0.040	0.107	0.040	0.107	16
Fourth disc to fourth vane	Axial	0.040	0.097	0.040	0.097	15
Fourth vane to fifth disc	Axial	0.040	0.105.	0.040	0.105	14
Fifth disc to fifth vane	Axial	0.040	0.101	0.029	0101	13
Fifth vane to impeller	Axial	0.063	0.159	0.063	0.159	11

Table 401. Compressor Rotor Clearances (Cont)

Tip Clearances	Dir Meas	Blueprint Clearance Min	Blueprint Clearance Max.	Clearance Min	Clearance Max.	Figure 405 Index
Centrifugal housing to fifth vane	Axial	0.000	0.034	0.000	0.074	12
First spacer to first vane-front	Radial	0.026	0.032	0.026	0.034	22
First spacer to first vane-rear	Radial	0.026	0.032	0.026	0.034	23
Second spacer to second vane-front	Radial	0.026	0.032	0.026	0.034	24
Second spacer to second vane-rear	Radial	0.026	0.032	0.026	0.034	25
Third spacer to third vane-front	Radial	0.026	0.032	0.026	0.034	26
Third spacer to third vane-rear	Radial	0.026	0.032	0.026	0.034	27
Fourth spacer to fourth vane-front	Radial	0.026	0.032	0.026	0.034	28
Fourth spacer to fourth vane-rear	Radial	0.026	0.032	0.026	0.034	29
Fifth spacer to fifth vane-front	Radial	0.026	0.032	0.026	0.034	30
Fifth spacer to fifth vane-rear	Radial	0.026	0.032	0.026	0.034	31

* Clearances for engine with magnesium impeller housings (Pre SB T53-L-13B-0105).

(13) If proper backlash is not obtained, remove and disassemble accessory drive carrier assembly and adjust shims. (See Step M (Pre SB T53-L-13B-0093) or Step N (Post SB T53-L-13B-0093).)

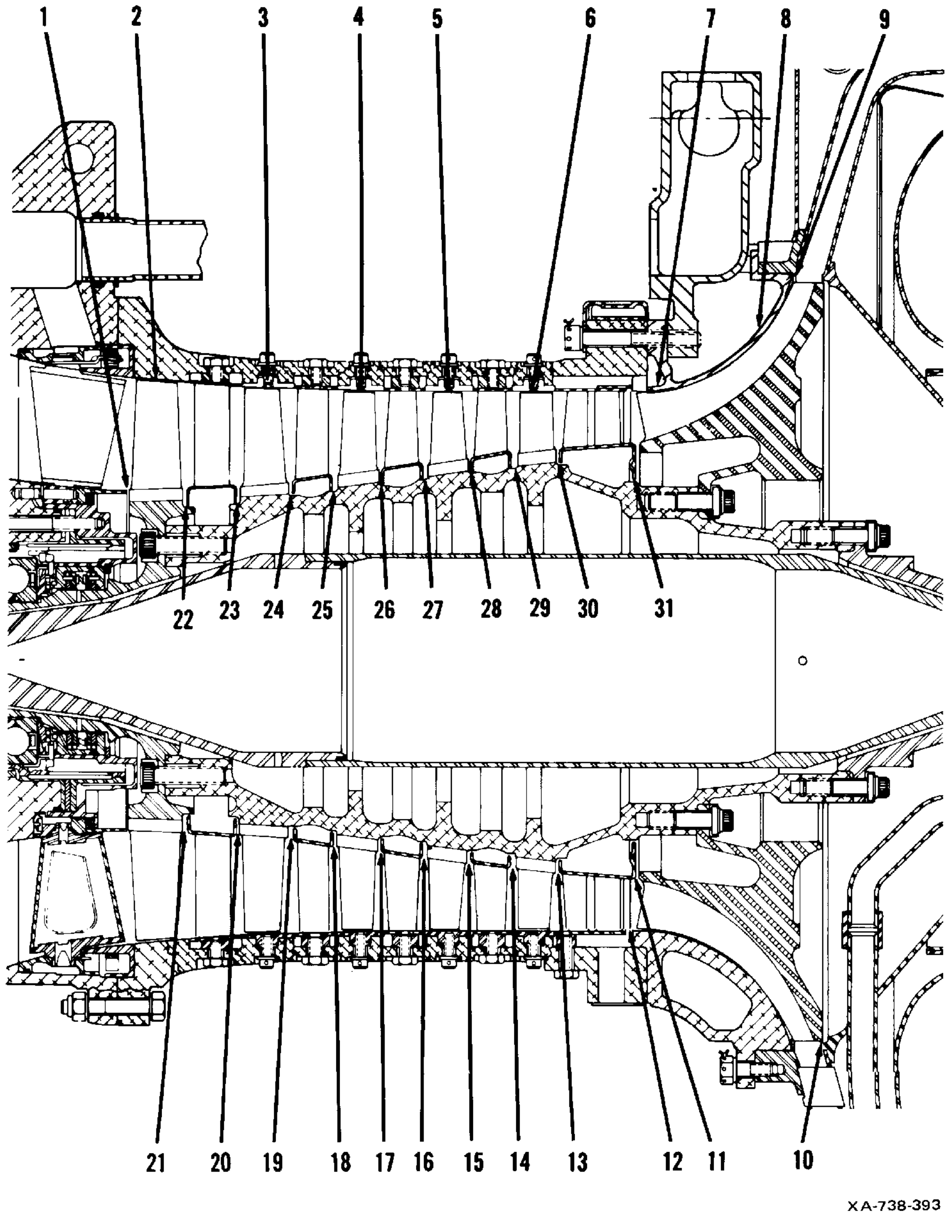
(14) Reassemble accessory drive carrier assembly and reinstall into inlet housing assembly.

(15) Repeat gear pattern and backlash check.

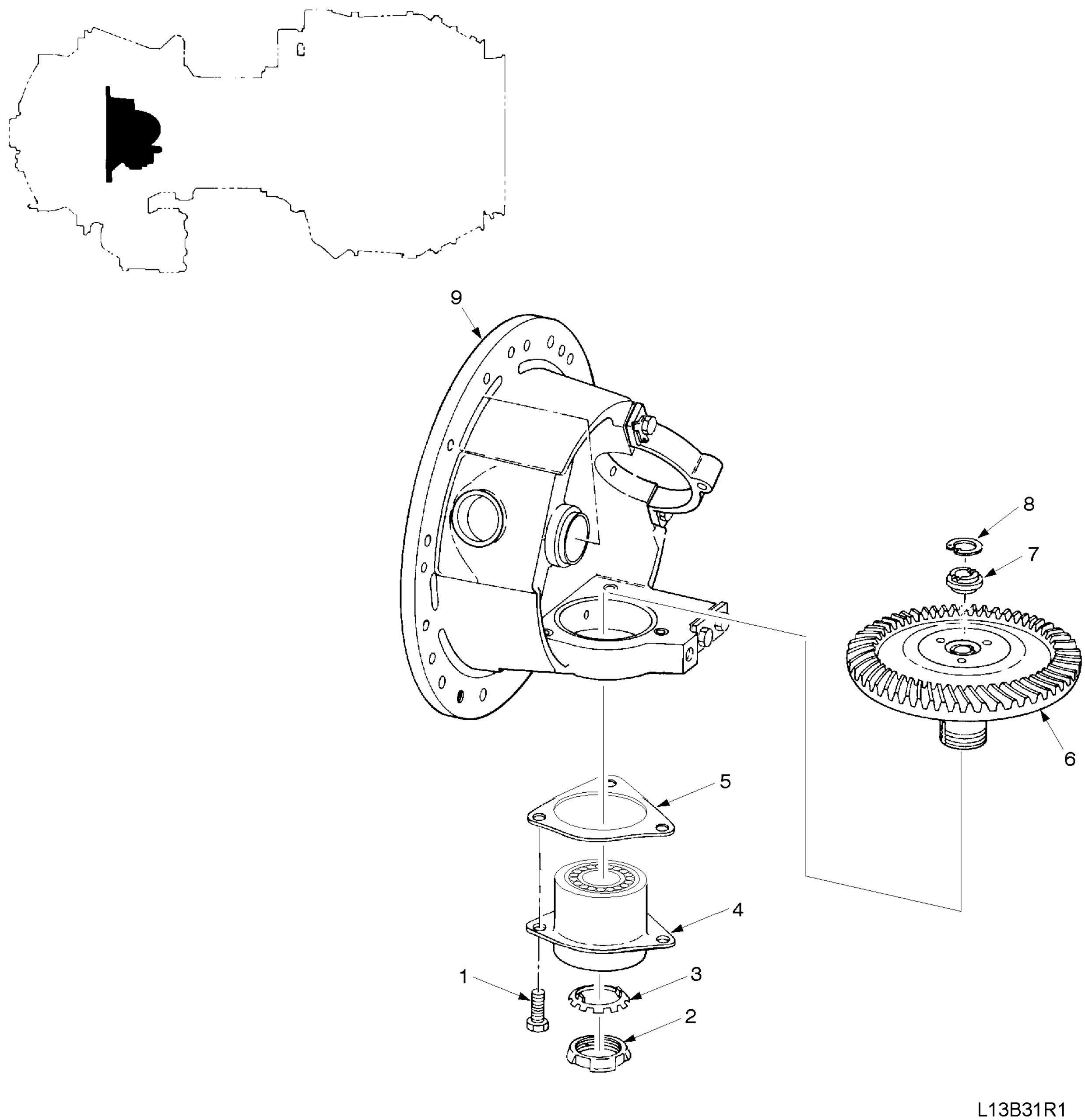
(16) Deleted

(17) Remove accessory drive gear carrier assembly from inlet housing assembly. Use puller screws if necessary.

(18) Wash coloring from gears.



Compressor Rotor Clearance Locations
Figure 405



Accessory Drive Carrier Assembly (Pre SB T53-L-13B-0093 and Pre SB T53-L-13B-0110)
Figure 406

KEY TO FIGURE 406

1. BOLT
2. NUT
3. WASHER
4. LINER
5. SHIM
6. SPACER
7. BEARING
8. GEAR
9. STOP
10. RING
11. ACCESSORY DRIVE CARRIER HOUSING

(19) (Pre SB T53-L-13B-0093) Bend tabs of washers (3, Figure 406) into slots of nuts (2), lockwire bolts (1).

(20) (Post SB T53-L-13B-0093) Bend tabs of washers (3, Figure 407) into slots of nuts (2), lockwire bolts (1).

NOTE: If torque on nut and seal assembly (80-00-01, 1, Figure 402) was released, it must be retightened to proper torque.

(21) Stake locking cup (80-00-01, 2, Figure 402) to nut and seal assembly (1) at two places 180 degrees apart. Do not shear cup.

M. (Pre SB T53-L-13B-0093) Shim Accessory Drive Carrier Assembly (See Figure 406.)

(1) Position accessory drive carrier housing (11) in holding fixture LTCT4996.

(2) Straighten tabs of washer (3). Using wrench LTCT2133, remove nut (2) and washer (3).

(3) Remove accessory drive carrier housing (11) from holding fixture.

(4) Remove three bolts (1) that secures liner (4) to accessory drive carrier housing (11).

(5) Mark gear (8) to make sure it is reassembled in the same position from which it was removed.

(6) Install mechanical puller LTCT2028 on gear (8). Turn handle of puller and remove assembled gear (8). Using soft faced mallet, tap bearing and liner assembly from carrier.

(7) Remove and record thickness of shim (5).

(8) Adjust thickness of shims (5) as required.

NOTE: Shims (5) are made in 0.002 inch thick laminations.

(9) Install required thickness of shim (5) on liner (4) and install liner into accessory drive carrier housing (11). Secure liner to carrier housing with bolts (1). Tighten bolts to 40 to 45 inch-pounds torque. Do not lockwire bolts at this time.

(10) Using installing tool LTCT108 and arbor press, press assembled bearing (7), spacer (6), gear (8) stop (9), and ring (10) into liner (4).

(11) Mount accessory drive carrier housing (11) in holding fixture LTCT4996.

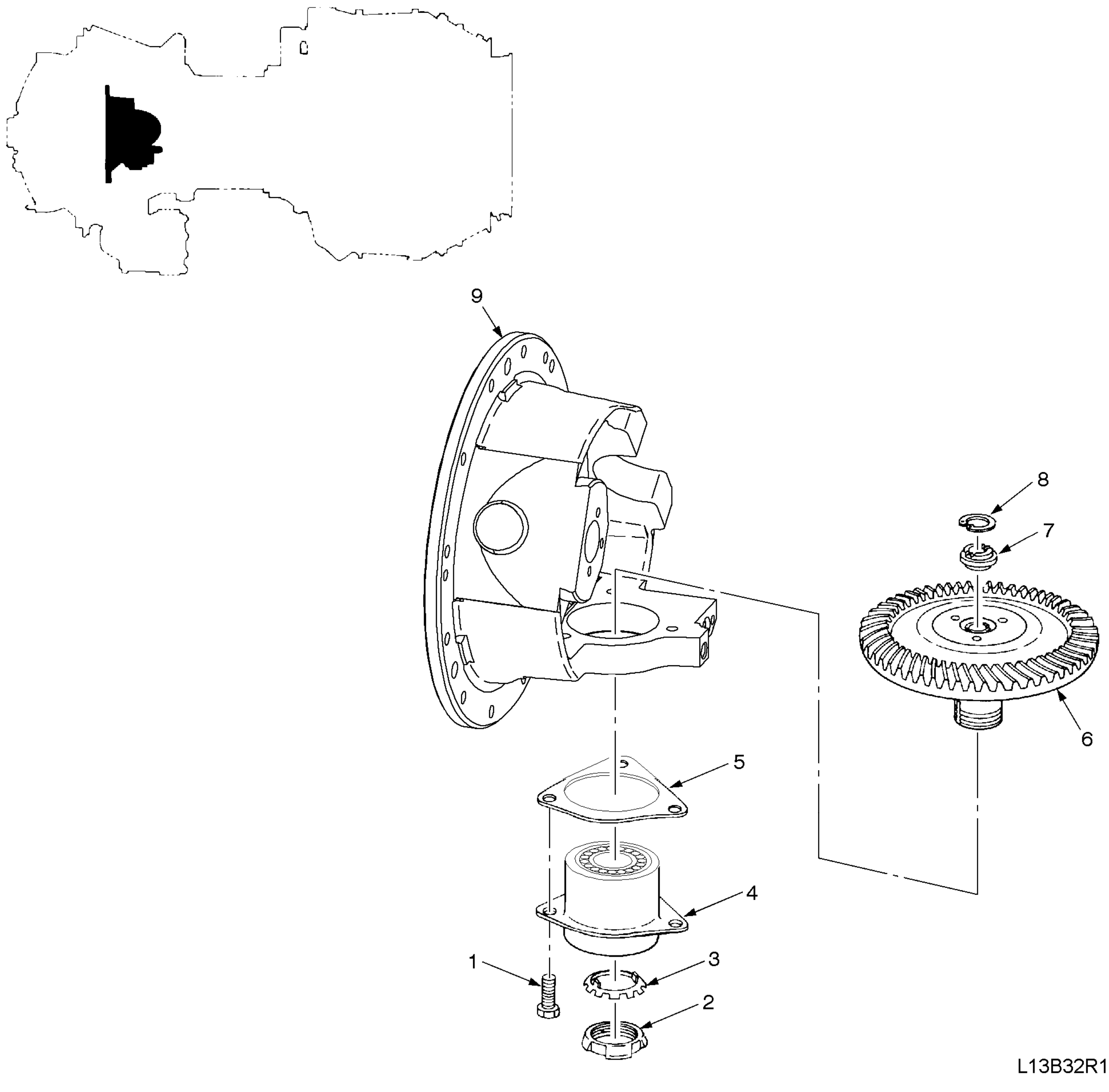
TEMPORARY REVISION NO. 98

INSERT PAGE 2 OF 2 FACING 80-00-04, PAGE 414.

Reason: To change Step 1.L.(21) for the nut and seal assembly (1) to four places at 90 degrees apart.

Step 1.L.(21) is changed as follows:

1. L. (21) Stake locking cup (80-00-01, 2, Figure 402) to nut and seal assembly (1) in four places 90 degrees apart. Do not shear cup.



Accessory Drive Carrier Assembly (Post SB T53-L-13B-0093 and Post SB T53-L-13B-0110)
Figure 407

KEY TO FIGURE 407

1. BOLT
2. NUT
3. WASHER
4. DUPLEX BEARING
5. SHIM
6. GEAR
7. STOP
8. RING
9. ACCESSORY DRIVE CARRIER HOUSING

NOTE: Do not bend lockwasher at this time.

(12) Install washer (3) and nut (2). Tighten nut 275 to 300 inch-pounds torque, using wrench LTCT2133.

N. (Post SB T53-L-13B-0093) Shim Accessory Drive Carrier Assembly (See Figure 407.)

NOTE: Use kit LTCT30741 as required to disassemble and reassemble the accessory drive carrier assembly.

(1) Position carrier housing (9) in holding fixture LTCT4996.

(2) Straighten tabs of washer (3). Using wrench LTCT2133, remove nut (2) and washer (3).

(3) Remove accessory drive carrier housing (9) from holding fixture.

(4) Remove three bolts (1) that secures duplex bearing (4) to bearing housing (9).

(5) Mark gear (6) to make sure it is reassembled in the same position from which it was removed.

(6) Install puller LTCT2028 on gear (6). Turn handle of puller and remove assembled gear (6). Using soft faced mallet, tap bearing and liner assembly from carrier.

(7) Remove and record thickness of shim (5).

(8) Adjust thickness of shims (5) as required.

NOTE: Shims (5) are made in 0.002 inch thick laminations.

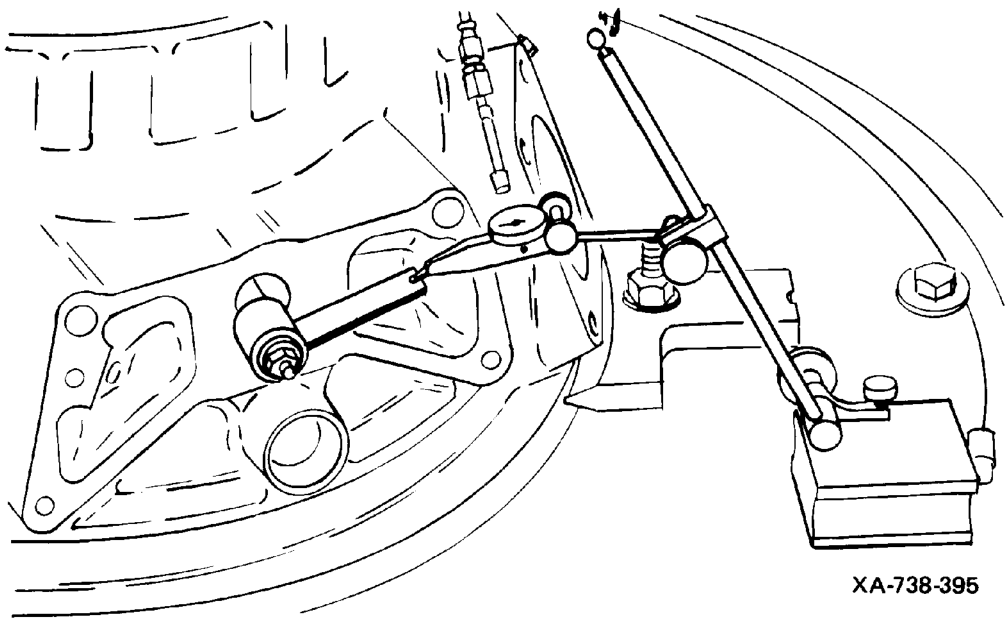
(9) Install required thickness of shim (5) on duplex bearing (4) and install into accessory drive carrier housing (9). Secure duplex bearing (4) to carrier housing with bolts (1). Tighten bolts 40 to 45 inch-pounds torque. Do not lockwire bolts at this time.

(10) Using installing tool LTCT108 and arbor press, press assembled bearing gear (6), stop (7), and ring (8) into duplex bearing (4).

(11) Mount carrier housing (9) in holding fixture LTCT4996.

NOTE: Do not bend lockwasher at this time.

(12) Install washer (3) and nut (2). Tighten nut 275 to 300 inch-pounds torque, using wrench LTCT2133.



Accessory Drive Carrier Assembly Gear Backlash Check
Figure 408

O. Determine Mean Position of Power Shaft

NOTE: This procedure must be accomplished only when the compressor rotor is replaced.

(1) Install locating bar LTCT153 across forward face of inlet housing.

(2) Pull power shaft forward.

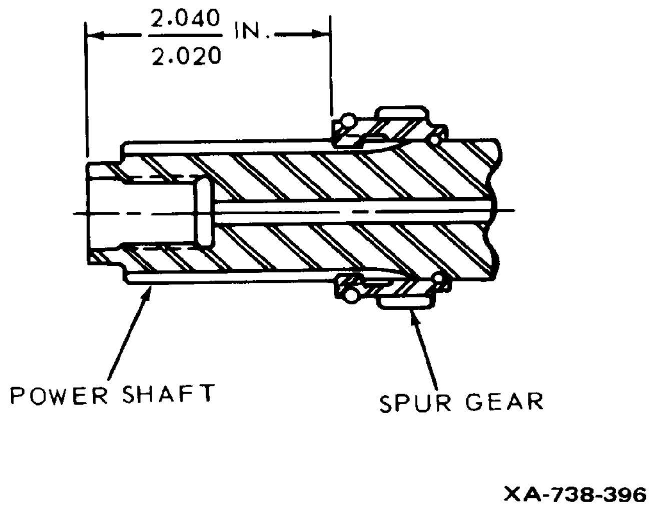
(3) Using vernier depth gage, measure distance from locating bar to forward end of power shaft. Record dimension.

(4) Push power shaft toward rear of engine. Repeat preceding Step (3).

(5) Add two dimensions obtained, then divide by two to obtain mean position.

NOTE: This dimension is used during engine assembly to locate power shaft 0.020 to 0.025 inch forward of mean position.

(6) Record mean dimension.



Gear to Power Shaft - Installation Dimension
Figure 409

(7) Remove locating bar.

P. Install Power Shaft Bearing Retainer

NOTE: Establish gear pattern and amount of backlash of accessory drive driven gears before installation of power shaft bearing retainer. (See Step M or N.)

(1) Remove previously installed slave bolts.

(2) Slide power shaft bearing retainer (80-00-01, 7, Figure 401) onto power shaft and position into inlet housing assembly with cutouts for accessory drive gears in correct position. Guide pins may be used to assist in aligning retainer.

(3) Install bolts (4) and tabwashers (5) at the 6 o'clock position. Install bolts (6). Tighten all bolts 70 to 90 inch-pounds torque.

NOTE: Do not lubricate bolts.

(4) Lock tabwashers on bolts. Lockwire bolts.

(5) Install ring (3) in groove on power shaft.

WARNING: HEATED COMPONENT PRESENTS A SERIOUS BURN POTENTIAL. TEMPERATURE RESISTANT GLOVES ARE REQUIRED.

(6) Install gear (2) into installation tool LTCT4576, then heat gear in oven for 30 minutes at 300 to 400°F (149 to 204°C). Using temperature resistant gloves, remove gear from oven and quickly install gear on power shaft spline, seating it firmly over ring.

NOTE: If combustor/turbine is installed, power turbine rotor must be pushed forward.

(7) Allow gear to cool and install new packing (1) in groove on gear (2).

(8) After installation of gear (2), measure from forward face of power shaft to forward face of gear. Dimension shall be 2.020 to 2.040 inches. (See 80-00-04, Figure 409.)

(9) Install combustion chamber deflector, first gas producer turbine nozzle, first gas producer turbine rotor, second gas producer turbine nozzle, and second gas producer turbine rotor. (See 72-51-00.)

Q. Install Combustor Turbine Assembly

NOTE: If compressor rotor assembly was not replaced, install combustor turbine assembly. (See 72-40-00.) If compressor assembly was replaced, proceed as follows:

(1) Install power shaft bolt into power shaft finger tight to check cleanliness and condition of threads. If any tightness or failure of shoulder to bottom on power shaft exists, clean or repair threads.

NOTE: Lubrication of power shaft bolt and installation of shims is not necessary at this time.

(2) Establish clearance (Dimension B), between second stage gas producer cylinder and first stage power turbine nozzle as follows. (See Figure 410.)

(a) Rotate engine to vertical position.

(b) Position locating bar LTCT153 over combustion chamber housing flange.

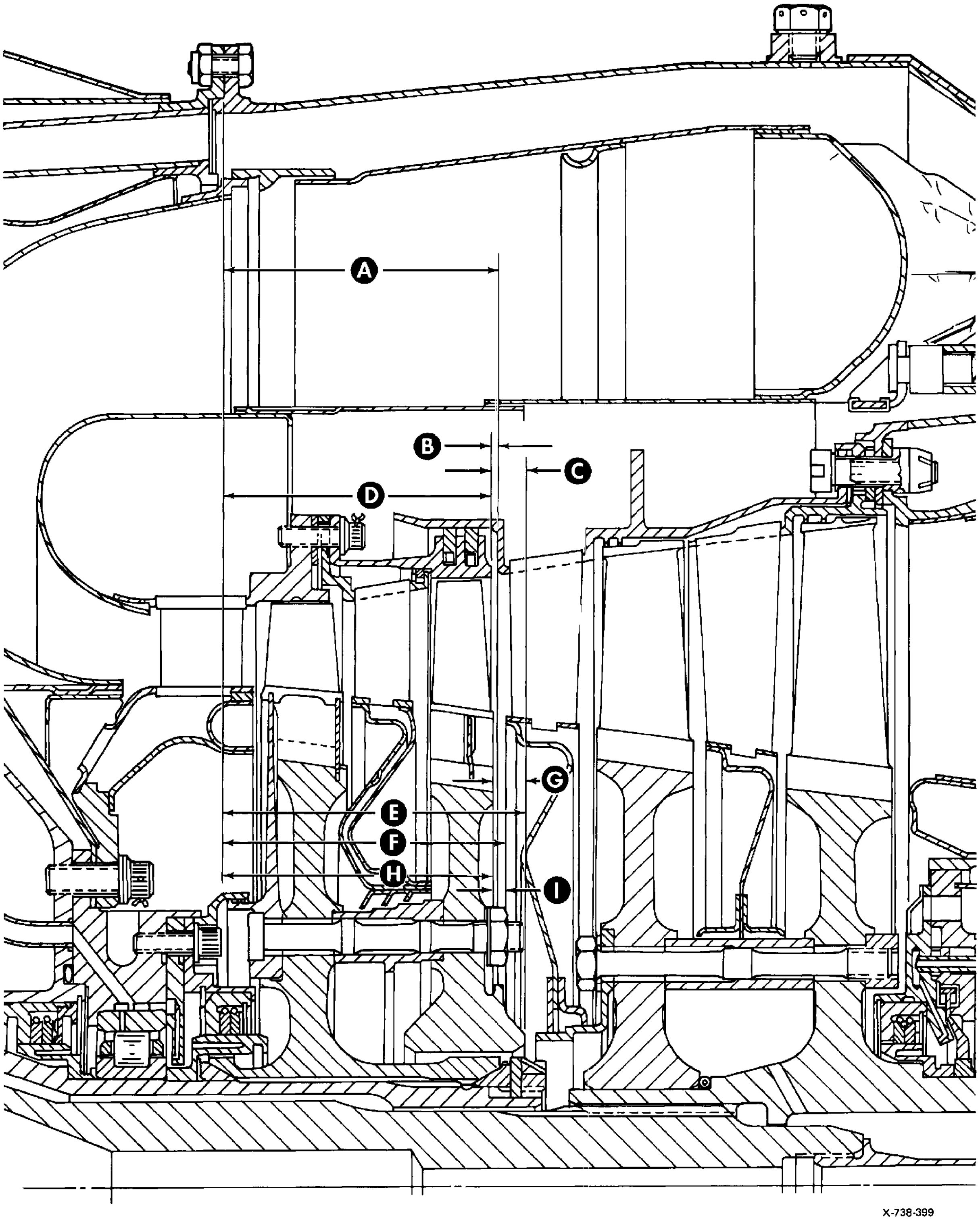
(c) Using depth micrometer, measure from bar to step at outer shroud of first stage power turbine nozzle and record as Dimension A.

(d) Position location bar LTCT153 over second stage gas producer turbine rotor hub.

(e) Using depth micrometer, measure from bar to flange of diffuser housing and record as Dimension E.

(f) Using depth micrometer. measure from bar to second stage gas producer cylinder and record as Dimension C.

(g) Subtract Dimension C from Dimension E. Result will be Dimension D.



Determining Clearance Between Combustor Turbine Assembly and Second Stage Gas Producer Turbine Rotor Assembly
Figure 410

TEMPORARY REVISION NO. 99

INSERT PAGE 2 OF 2 FACING 80-00-04, PAGE 421.

Reason: To change “0.0238 inch” to “0.238 inch” in Step 1.Q.(2)(i).

Step 1.Q.(2)(i) is changed as follows:

(i) Dimension B shall be 0.015 inch minimum to 0.238 inch maximum.

(h) Subtract Dimension D from Dimension A. Result will be Dimension B.

(i) Dimension B shall be 0.015 inch minimum to 0.0238 inch maximum.

(3) Establish clearance (Dimension I), between second stage gas producer rotor and first stage power turbine nozzle as follows: (See Figure 410)

(a) Position locating bar LTCT153 over combustion chamber housing flange.

(b) Using depth micrometer, measure from bar to first stage power turbine nozzle and record as Dimension F.

(c) Position locating bar LTCT153 over second stage gas producer rotor hub.

(d) Using depth micrometer, measure from bar to flange of diffuser housing and record as Dimension E.

(e) Using depth micrometer, measure from bar to second stage gas producer rotor and record as Dimension G.

(f) Subtract Dimension G from Dimension E. Result will be Dimension H.

(g) Subtract Dimension H from Dimension F. Result will be Dimension I.

(h) Dimension I shall be 0.080 inch minimum to 0.225 inch maximum.

(4) Position combustor lifting sling LTCT14668 to flange of diffuser support cone.

NOTE: If installing combustor turbine assembly while engine is in vertical position, use lifting eye in center of adapter.

(5) Attach suitable hoist to lifting eye of adapter and install combustor turbine assembly on diffuser housing assembly, with combustion chamber drain valve located in the 6 o'clock position.

CAUTION: BEFORE INSTALLATION, INSPECT AS FOLLOWS. DIMPLES ON ID OF COMBUSTION CHAMBER LINER MUST CONTACT OD OF FIRST STAGE GAS PRODUCER NOZZLE DEFLECTOR. THIS MAY BE ACCOMPLISHED BY APPLYING IRON-BLUE PIGMENT TO THE LINER DIMPLES AND MATING THE NOZZLE AND LINER TO SIMULATE HOT END INSTALLATION. IF CONTACT IS NOT EVIDENT THROUGH 360 DEGREES, CAREFULLY BEND LINER TAB(S) INWARD AS REQUIRED.

NOTE: Prior to mating, visually inspect to ensure power shaft aft splines and power turbine wheel internal splines are clean and free of foreign material. Do not lubricate.

(6) Position mating marks as recorded when combustor turbine was removed. If mating marks were not made at removal, or if a new combustor section or a new power turbine rotor is installed, accomplish following Steps (7) and (8).

(7) Check position of mating mark center punched on face of male spline of power shaft. Using an approved marker, mark position on outside diameter of power shaft spline.

(8) Check position of mating mark center punched on face of female spline on second stage power turbine rotor. If not accomplished during assembly, mark position on outside diameter of shaft using an approved marker.

NOTE: Overhauled power turbine rotor may have splines center punched two or more times, depending on the number of times the rotor has been rebladed. Use the mating mark with the greatest number of center punched marks.

If a new combustor section or a new power turbine rotor is installed, position mating marks in preceding Steps (7) and (8) 180 degrees apart during installation.

(9) Lubricate bolts (2, Figure 411) with molybdenum disulfide (72-00-00, 50, Table 203). Using socket wrench or equivalent, install bolts (2) and nuts (1) that secure combustor turbine assembly (3) to diffuser housing. Remove combustor lifting sling LTCT14668.

NOTE: Reinstall all brackets at areas where indicated during removal.

(10) Install torque adjustment fixture LTCT962 into rear of combustor turbine assembly and engage tangs of locking plate assembly with slots in bearing retainer nut. Secure plate assembly with three bolts.

(11) Apply light coating of anti-seize compound (72-00-00, 15, Table 203) to threads of power shaft bolt (5). Install power shaft bolt with no shims into rear of turbine rotor and power shaft.

(12) Using socket wrench LTCT506, tighten power shaft bolt 195 to 200 inch-pounds torque.

(13) Apply light coating of anti-seize compound (72-00-00, 15, Table 203) to nut (6). Using socket wrench LTCT505, install and tighten nut to 100 foot-pounds torque.

(14) Turn engine to horizontal position and install locating bar LTCT153 across forward face of inlet housing.

(15) Using vernier depth gage, measure distance from locating bar to forward end of power shaft. Compute thickness of shim (4) required to position power shaft 0.020 to 0.025 inch forward of its mean position within compressor rotor assembly. (See Step O to determine mean position of power shaft.)

CAUTION: NUMBER OF SHIMS SHALL NOT EXCEED THREE. USE OF AN EXCESSIVE NUMBER OF SHIMS CAN RESULT IN A COCKED BOLT AND CAUSE EXCESSIVE POWER TURBINE VIBRATION. MAKE SURE SHIMS ARE FLAT AGAINST SHOULDER WITHIN ROTOR SHAFT BEFORE INSTALLING POWER SHAFT BOLT. SHIMS MAY BE HELD IN PLACE WITH SHORTENING COMPOUND.

(16) Remove nut (6) and power shaft bolt (5) and install shims (4) of proper thickness in the second power turbine rotor shaft.

(17) Apply light coating of anti-seize compound (72-00-00, 15, Table 203) to threads of power shaft bolt (5).

(18) Using socket wrench LTCT506, tighten bolt 195 to 200 inch-pounds torque.

(19) Apply light coating of anti-seize compound to threads of internal wrenching nut (6).

(20) Using socket wrench LTCT505, install nut (6). Tighten nut to 100 foot-pounds torque. Loosen and remove nut. Retighten power shaft bolt (5) to 195 to 200 inch-pounds torque. Install nut (6) and tighten to 50 foot-pounds torque.

(21) Recheck to assure proper location of power shaft. (See preceding Step (15).)

(22) Remove torque adjustment fixture LTCT962.

(23) Using end of suitably rounded punch, or the side of tapered drift punch, deform collar of nut (6) into power turbine shaft in three places, 120 degrees apart.

(24) Visually inspect nut for cracks that may have occurred as a result of deformation. If nut is cracked, it must be replaced.

(25) Install new seal (7) or packing (8) in groove of cover (9) and install cover. Apply light coating of anti-seize compound to threads of bolts. Install bolts (10) and tighten as required. Lockwire bolts using lockwire.

(26) Make sure groove in cover (9) is clean. Coat groove of cover with hydrogenated vegetable shortening (72-00-00, 38, Table 203) to facilitate holding seal in groove during assembly.

(27) Position cover (11) over cover (9), aligning slots in both covers.

(28) Install tabwasher (12) into slots of covers. If tab does not fit into slots, file cover (11) to obtain a snug fit.

NOTE: Tab with lockwire hole must face forward.

(29) Install bolt (13) while holding tablock in alignment. Tighten bolt 70 to 95 inch-pounds torque.

CAUTION: AFTER TIGHTENING BOLT, INSPECT TABLOCK TO MAKE SURE PROPER ENGAGEMENT IN SLOTS OF COVERS (9) AND (11).

(30) Lockwire tablock to bolt.

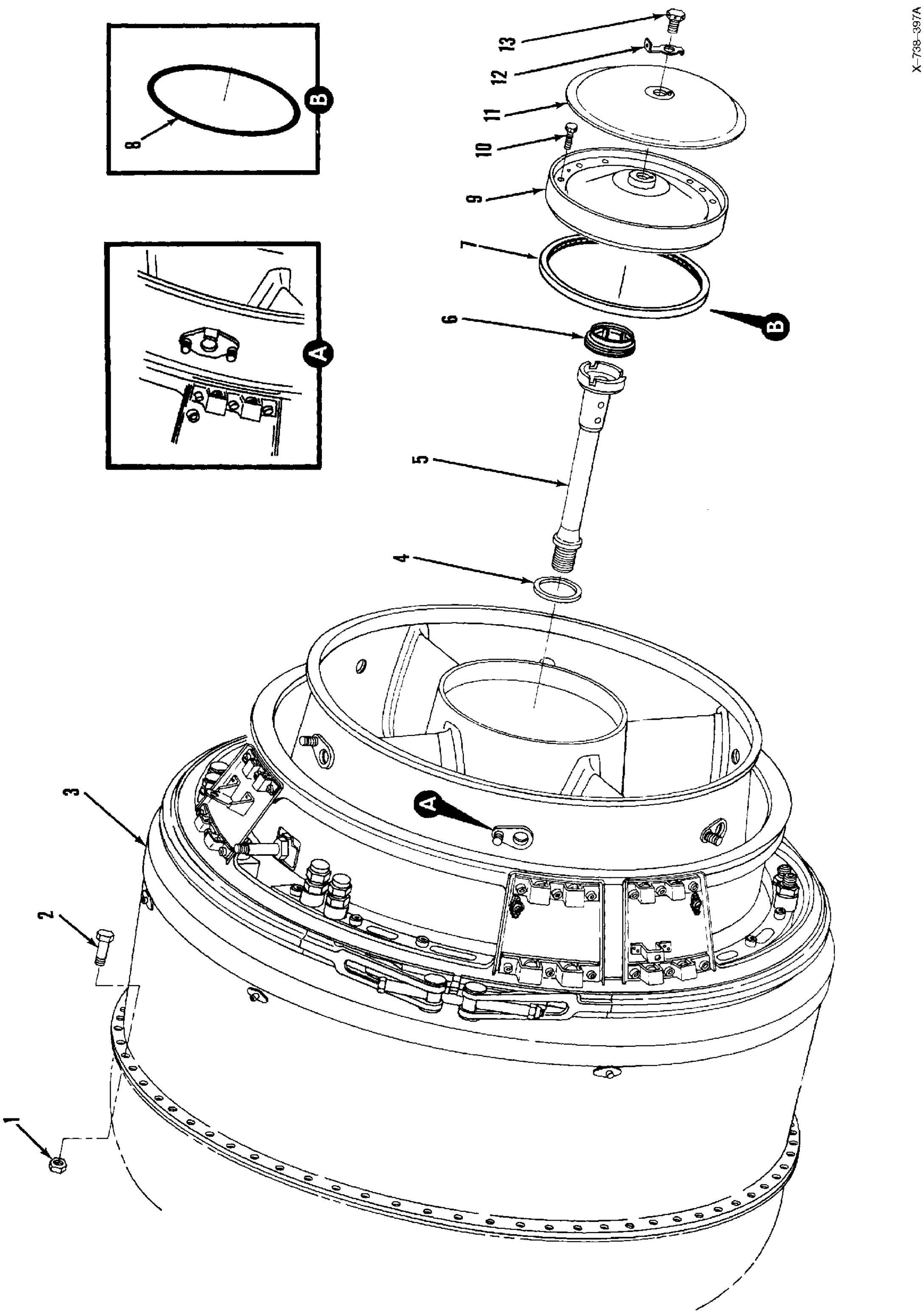
R. Install Accessory Drive Carrier Assembly

Establish gear pattern and amount of backlash of accessory drive driven gears before installing accessory drive carrier. (See Step L.) Install accessory drive carrier assembly. (See 72-10-01.)

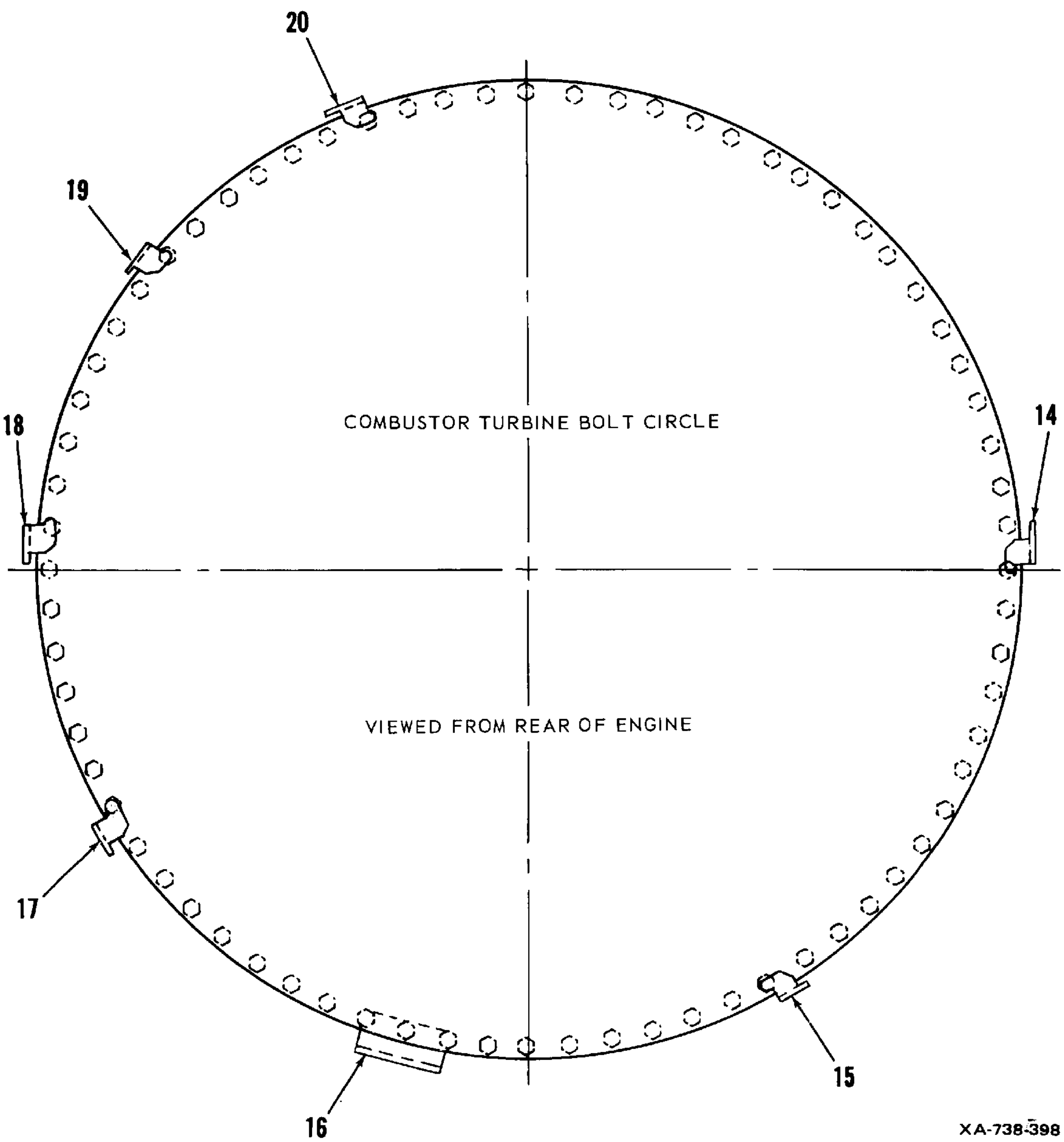
S. Install Oil Transfer Support Assembly (See 72-10-01.)

T. Install Output Reduction Carrier and Gear Assembly and Sun Gearshaft (See 72-10-01.)

U. Install Overspeed Governor and Tachometer Drive Assembly (See 72-60-02.)



Combustor Turbine Assembly and Bracket Locations
Figure 411 (Sheet 1 of 2)



Combustor Turbine Assembly and Bracket Locations
Figure 411 (Sheet 2)

KEY TO FIGURE 411

1. NUT	11. COVER
2. BOLT	12. TABWASHER
3. COMBUSTOR TURBINE ASSEMBLY	13. BOLT
4. SHIM	14. BRACKET
5. POWER SHAFT BOLT	15. BRACKET
6. NUT	16. BRACKET
7. SEAL	17. BRACKET
8. PACKING	18. BRACKET
9. COVER	19. BRACKET
10. BOLT	20. BRACKET

V. Install Accessory Drive Gearbox (See 72-60-01.)

W. Install all piping and accessories using procedures contained in applicable sections.

X. Perform required engine tests if compressor rotor assembly or variable inlet guide vane assembly were replaced, engine must be forwarded to a Honeywell service center for performance testing.

Y. Perform required fuel control tests, adjust/test fuel control and variable inlet guide vane assemblies. (See 73-20-01 and 75-30-01.)