CHAPTER

23

Communications

CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-EFFECTIVE PAGES		
	1 thru 10	Jun 15/2016	
	23-CONTENTS		
O	1	Jun 15/2016	
O	2	Jun 15/2016	
O	3	Jun 15/2016	
	4	Feb 15/2015	
	5	Feb 15/2015	
O	6	Jun 15/2016	
O	7	Jun 15/2016	
	8	Feb 15/2015	
	9	Feb 15/2015	
	10	BLANK	
	23-11-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
	4	Feb 15/2015	
O	5	Jun 15/2016	
O	6	Jun 15/2016	
	7	Feb 15/2015	
	8	Feb 15/2015	
	9	Feb 15/2015	
	10	Feb 15/2015	

	Subject/Page	Date	COC
	23-11-00 (cont.)		
	11	Feb 15/2015	
	12	Feb 15/2015	
	13	Feb 15/2015	
	14	Feb 15/2015	
O	15	Jun 15/2016	
O	16	Jun 15/2016	
	17	Feb 15/2015	
	18	Feb 15/2015	
	19	Feb 15/2015	
R	20	Jun 15/2016	
	21	Feb 15/2015	
	22	Feb 15/2015	
	23	Feb 15/2015	
	24	Feb 15/2015	
	25	Feb 15/2015	
O	26	Jun 15/2016	
O	27	Jun 15/2016	
R	28	Jun 15/2016	
O	29	Jun 15/2016	
O	30	Jun 15/2016	
O	31	Jun 15/2016	
O	32	Jun 15/2016	
O	33	Jun 15/2016	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-11-00 (cont.)		
O	34	Jun 15/2016	
O	35	Jun 15/2016	
O	36	Jun 15/2016	
O	37	Jun 15/2016	
O	38	Jun 15/2016	
O	39	Jun 15/2016	
	40	Feb 15/2015	
O	41	Jun 15/2016	
O	42	Jun 15/2016	
O	43	Jun 15/2016	
O	44	Jun 15/2016	
O	45	Jun 15/2016	
O	46	BLANK	
D	47	Jun 15/2015	
D	48	Jun 15/2015	
D	49	Jun 15/2015	
D	50	BLANK	
	23-12-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
O	4	Jun 15/2016	

	Subject/Page	Date	COC
	23-12-00 (cont.)		
O	5	Jun 15/2016	
O	6	Jun 15/2016	
O	7	Jun 15/2016	
O	8	Jun 15/2016	
O	9	Jun 15/2016	
O	10	Jun 15/2016	
O	11	Jun 15/2016	
O	12	Jun 15/2016	
O	13	Jun 15/2016	
O	14	Jun 15/2016	
O	15	Jun 15/2016	
O	16	Jun 15/2016	
O	17	Jun 15/2016	
O	18	Jun 15/2016	
O	19	Jun 15/2016	
O	20	Jun 15/2016	
O	21	Jun 15/2016	
O	22	Jun 15/2016	
O	23	Jun 15/2016	
O	24	Jun 15/2016	
O	25	Jun 15/2016	
O	26	Jun 15/2016	
O	27	Jun 15/2016	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC		Subject/Page	Date	COC
	23-12-00 (cont.)				23-24-00 (cont.)		
R	28	Jun 15/2016			9	Feb 15/2015	
O	29	Jun 15/2016			10	Feb 15/2015	
O	30	Jun 15/2016			11	Feb 15/2015	
O	31	Jun 15/2016		O	12	Jun 15/2016	
O	32	Jun 15/2016		O	13	Jun 15/2016	
O	33	Jun 15/2016		O	14	Jun 15/2016	
O	34	Jun 15/2016		O	15	Jun 15/2016	
O	35	Jun 15/2016		R	16	Jun 15/2016	
O	36	Jun 15/2016		O	17	Jun 15/2016	
O	37	Jun 15/2016		O	18	Jun 15/2016	
O	38	BLANK		O	19	Jun 15/2016	
D	39	Jun 15/2015		O	20	Jun 15/2016	
D	40	BLANK		O	21	Jun 15/2016	
	23-24-00			O	22	Jun 15/2016	
	1	Feb 15/2015		O	23	Jun 15/2016	
	2	Feb 15/2015		O	24	Jun 15/2016	
	3	Feb 15/2015		O	25	Jun 15/2016	
	4	Feb 15/2015		O	26	Jun 15/2016	
	5	Feb 15/2015		O	27	Jun 15/2016	
	6	Feb 15/2015		O	28	BLANK	
	7	Feb 15/2015		D	29	Jun 15/2015	
	8	Feb 15/2015		D	30	BLANK	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC		Subject/Page	Date	COC
	23-27-00				23-27-00 (cont.)		
O	1	Jun 15/2016			23	Feb 15/2015	
O	2	Jun 15/2016			24	Feb 15/2015	
	3	Feb 15/2015		O	25	Jun 15/2016	
R	4	Jun 15/2016		O	26	Jun 15/2016	
	5	Feb 15/2015			27	Feb 15/2015	
	6	Feb 15/2015			28	Feb 15/2015	
	7	Feb 15/2015			29	Feb 15/2015	
	8	Feb 15/2015			30	Feb 15/2015	
	9	Feb 15/2015			31	Feb 15/2015	
R	10	Jun 15/2016			32	Feb 15/2015	
R	11	Jun 15/2016			33	Feb 15/2015	
R	12	Jun 15/2016			34	Feb 15/2015	
R	13	Jun 15/2016			23-28-00		
	14	Feb 15/2015			1	Feb 15/2015	
	15	Feb 15/2015			2	Feb 15/2015	
R	16	Jun 15/2016			3	Feb 15/2015	
	17	Feb 15/2015			4	Feb 15/2015	
R	18	Jun 15/2016			5	Feb 15/2015	
	19	Feb 15/2015			6	Feb 15/2015	
	20	Feb 15/2015			7	Feb 15/2015	
	21	Feb 15/2015			8	Feb 15/2015	
R	22	Jun 15/2016			9	Feb 15/2015	
					10	Feb 15/2015	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-28-00 (cont.)		
	11	Feb 15/2015	
	12	Feb 15/2015	
	13	Feb 15/2015	
	14	Feb 15/2015	
	15	Feb 15/2015	
	16	Feb 15/2015	
	17	Feb 15/2015	
	18	Feb 15/2015	
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	23-31-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
	4	Feb 15/2015	
O	5	Jun 15/2016	
O	6	Jun 15/2016	
	7	Feb 15/2015	
	8	Feb 15/2015	
	9	Feb 15/2015	
	10	Feb 15/2015	

	Subject/Page	Date	COC
	23-31-00 (cont.)		
	11	Feb 15/2015	
	12	Feb 15/2015	
	13	Feb 15/2015	
	14	Feb 15/2015	
	15	Feb 15/2015	
	16	Feb 15/2015	
	17	Feb 15/2015	
	18	Feb 15/2015	
	19	Feb 15/2015	
	20	Feb 15/2015	
	21	Feb 15/2015	
	22	Feb 15/2015	
	23	Feb 15/2015	
	24	Feb 15/2015	
	25	Feb 15/2015	
	26	Feb 15/2015	
	27	Feb 15/2015	
	28	Feb 15/2015	
O	29	Jun 15/2016	
O	30	Jun 15/2016	
	31	Feb 15/2015	
	32	Feb 15/2015	
	33	Feb 15/2015	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-31-00 (cont.)		
	34	Feb 15/2015	
	35	Feb 15/2015	
	36	Feb 15/2015	
	37	Feb 15/2015	
	38	BLANK	
	23-41-00		
	1	Feb 15/2015	
R	2	Jun 15/2016	
	3	Feb 15/2015	
	4	Feb 15/2015	
	5	Feb 15/2015	
	6	Feb 15/2015	
	7	Feb 15/2015	
	8	Feb 15/2015	
	9	Feb 15/2015	
	10	Feb 15/2015	
	11	Feb 15/2015	
	12	Feb 15/2015	
	13	Feb 15/2015	
	14	Feb 15/2015	
	15	Feb 15/2015	
	16	BLANK	
	23-42-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
R	4	Jun 15/2016	
	5	Feb 15/2015	
R	6	Jun 15/2016	
R	7	Jun 15/2016	
	8	Feb 15/2015	
	9	Feb 15/2015	
R	10	Jun 15/2016	
	11	Feb 15/2015	
R	12	Jun 15/2016	
R	13	Jun 15/2016	
R	14	Jun 15/2016	
	15	Feb 15/2015	
R	16	Jun 15/2016	
R	17	Jun 15/2016	
	18	Feb 15/2015	
	19	Feb 15/2015	
R	20	Jun 15/2016	
R	21	Jun 15/2016	
R	22	Jun 15/2016	
R	23	Jun 15/2016	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-42-00 (cont.)		
O	24	Jun 15/2016	
O	25	Jun 15/2016	
O	26	Jun 15/2016	
O	27	Jun 15/2016	
O	28	Jun 15/2016	
O	29	Jun 15/2016	
O	30	Jun 15/2016	
O	31	Jun 15/2016	
O	32	Jun 15/2016	
O	33	Jun 15/2016	
O	34	Jun 15/2016	
D	35	Jun 15/2015	
D	36	Jun 15/2015	
	23-43-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
	4	Feb 15/2015	
	5	Feb 15/2015	
	6	Feb 15/2015	
	7	Feb 15/2015	
	8	Feb 15/2015	
	23-43-00 (cont.)		
	9	Feb 15/2015	
	10	Feb 15/2015	
	11	Feb 15/2015	
	12	Feb 15/2015	
	13	Feb 15/2015	
	14	Feb 15/2015	
	15	Feb 15/2015	
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	23-51-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
O	4	Jun 15/2016	
O	5	Jun 15/2016	
O	6	Jun 15/2016	
O	7	Jun 15/2016	
O	8	Jun 15/2016	
O	9	Jun 15/2016	
O	10	Jun 15/2016	
O	11	Jun 15/2016	
O	12	Jun 15/2016	
O	13	Jun 15/2016	
O	14	Jun 15/2016	

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CHAPTER 23
COMMUNICATIONS

	Subject/Page	Date	COC
	23-51-00 (cont.)		
O	15	Jun 15/2016	
O	16	Jun 15/2016	
O	17	Jun 15/2016	
O	18	Jun 15/2016	
O	19	Jun 15/2016	
O	20	Jun 15/2016	
O	21	Jun 15/2016	
O	22	Jun 15/2016	
O	23	Jun 15/2016	
O	24	Jun 15/2016	
O	25	Jun 15/2016	
O	26	Jun 15/2016	
O	27	Jun 15/2016	
O	28	Jun 15/2016	
O	29	Jun 15/2016	
O	30	Jun 15/2016	
O	31	Jun 15/2016	
O	32	Jun 15/2016	
O	33	Jun 15/2016	
O	34	Jun 15/2016	
O	35	Jun 15/2016	
O	36	Jun 15/2016	
O	37	Jun 15/2016	

	Subject/Page	Date	COC
	23-51-00 (cont.)		
O	38	Jun 15/2016	
O	39	Jun 15/2016	
O	40	Jun 15/2016	
O	41	Jun 15/2016	
O	42	Jun 15/2016	
O	43	Jun 15/2016	
O	44	BLANK	
D	45	Jun 15/2015	
D	46	BLANK	
	23-61-00		
	1	Feb 15/2015	
R	2	Jun 15/2016	
	3	Feb 15/2015	
	4	BLANK	
	23-71-00		
	1	Feb 15/2015	
	2	Feb 15/2015	
	3	Feb 15/2015	
	4	Oct 15/2015	
	5	Feb 15/2015	
	6	Feb 15/2015	
	7	Feb 15/2015	
	8	Feb 15/2015	

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CHAPTER 23
COMMUNICATIONS

Subject/Page	Date	COC	Subject/Page	Date	COC
23-71-00 (cont.)			23-75-00 (cont.)		
9	Feb 15/2015		5	Feb 15/2015	
10	Feb 15/2015		6	Feb 15/2015	
11	Feb 15/2015		7	Feb 15/2015	
12	Oct 15/2015		R 8	Jun 15/2016	
13	Feb 15/2015		9	Feb 15/2015	
14	Feb 15/2015		R 10	Jun 15/2016	
15	Feb 15/2015		11	Feb 15/2015	
16	Feb 15/2016		R 12	Jun 15/2016	
17	Feb 15/2015		13	Feb 15/2015	
18	Feb 15/2015		14	Feb 15/2015	
O 19	Jun 15/2016		15	Feb 15/2015	
O 20	Jun 15/2016		16	Feb 15/2015	
21	Feb 15/2015		17	Feb 15/2015	
22	Feb 15/2015		R 18	Jun 15/2016	
23	Feb 15/2015		19	Feb 15/2015	
24	Feb 15/2015		20	Feb 15/2015	
25	Feb 15/2015		21	Feb 15/2015	
26	BLANK		22	BLANK	
23-75-00			23-82-00		
1	Feb 15/2015		1	Feb 15/2015	
2	Feb 15/2015		2	Feb 15/2015	
3	Feb 15/2015		3	Feb 15/2015	
4	Feb 15/2015		4	Feb 15/2015	

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CHAPTER 23
COMMUNICATIONS

Subject/Page	Date	COC	Subject/Page	Date	COC
23-82-00 (cont.)					
5	Feb 15/2015				
6	Feb 15/2015				
7	Feb 15/2015				
8	Feb 15/2015				
9	Feb 15/2015				
10	BLANK				

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CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-11-00	HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION	2	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - GENERAL DESCRIPTION	5	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS	8	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - TRANSCEIVER LOCATION	10	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS	12	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - INTERFACES	15	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - TUNING INTERFACES	18	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HF COMMUNICATION TRANSCEIVER	20	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HF ANTENNA COUPLER	22	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HF ANTENNA	24	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HF FUNCTIONAL MODES	26	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HOME/RECEIVE FUNCTIONAL DESCRIPTION	28	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - TUNE FUNCTIONAL DESCRIPTION	30	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION	32	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - HF DATA LINK	34	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - OPERATION	37	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BITE	41	AKS ALL
23-11-00	HF COMMUNICATION SYSTEM - SYSTEM SUMMARY	44	AKS ALL
23-12-00	VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION	2	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-12-00	VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS	6	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS	8	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS	10	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES	12	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES	14	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES	16	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - TUNING INTERFACES	18	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL	20	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER	22	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - VHF ANTENNA	24	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - RECEIVE FUNCTIONAL DESCRIPTION	26	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION	28	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - OPERATION	30	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BUILT IN TEST	32	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - RADIO COMMUNICATION PANEL BITE	34	AKS ALL
23-12-00	VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY	36	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION	2	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS	6	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE	8	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL	10	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER	12	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - AIRCRAFT IDENTIFICATION MODULE	14	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA	16	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION	19	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - BATTERY	22	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - SYSTEM TEST	24	AKS ALL
23-24-00	EMERGENCY LOCATOR TRANSMITTER SYSTEM - SYSTEM SUMMARY	26	AKS ALL
23-27-00	AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION	1	AKS ALL
23-27-00	ACARS - GENERAL DESCRIPTION	4	AKS ALL
23-27-00	ACARS - FLIGHT COMPARTMENT COMPONENT LOCATION	6	AKS ALL
23-27-00	ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS	8	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-27-00	ACARS - POWER, CALL, AND COMMUNICATION INTERFACES	10	AKS ALL
23-27-00	ACARS - DISCRETE INTERFACES	14	AKS ALL
23-27-00	ACARS - DIGITAL INTERFACES	16	AKS ALL
23-27-00	ACARS - COMMUNICATIONS MANAGEMENT UNIT	18	AKS ALL
23-27-00	ACARS - AIRPLANE PERSONALITY MODULE	20	AKS ALL
23-27-00	ACARS - OPERATION - 1	22	AKS ALL
23-27-00	ACARS - OPERATION - 2	25	AKS ALL
23-27-00	ACARS - OPERATION - DOWNLINK REPORTS	28	AKS ALL
23-27-00	ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING	30	AKS ALL
23-27-00	ACARS - SYSTEM SUMMARY	32	AKS ALL
23-28-00	SELECTIVE CALLING SYSTEM - INTRODUCTION	2	AKS ALL
23-28-00	SELCAL SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-28-00	SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS	6	AKS ALL
23-28-00	SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS	8	AKS ALL
23-28-00	SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION	10	AKS ALL
23-28-00	SELCAL SYSTEM - INTERFACES	12	AKS ALL
23-28-00	SELCAL SYSTEM - SELCAL DECODER UNIT	14	AKS ALL
23-28-00	SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE	16	AKS ALL
23-28-00	SELCAL SYSTEM - FUNCTIONAL DESCRIPTION	18	AKS ALL
23-28-00	SELCAL SYSTEM - SYSTEM SUMMARY	20	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-31-00	PASSENGER ADDRESS SYSTEM - INTRODUCTION	2	AKS ALL
23-31-00	PA SYSTEM - GENERAL DESCRIPTION	5	AKS ALL
23-31-00	PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION	8	AKS ALL
23-31-00	PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS	10	AKS ALL
23-31-00	PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION	12	AKS ALL
23-31-00	PA SYSTEM - INTERFACES	14	AKS ALL
23-31-00	PA SYSTEM - CREW ANNOUNCEMENT INTERFACE	16	AKS ALL
23-31-00	PA SYSTEM - INDICATION INTERFACE	18	AKS ALL
23-31-00	PA SYSTEM - PASSENGER ADDRESS AMPLIFIER	20	AKS ALL
23-31-00	PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS	22	AKS ALL
23-31-00	PA SYSTEM - LAVATORY SPEAKERS	24	AKS ALL
23-31-00	PA SYSTEM - ATTENDANT SPEAKERS	26	AKS ALL
23-31-00	PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION	29	AKS ALL
23-31-00	PA SYSTEM - OPERATION - ANNOUNCEMENTS	32	AKS ALL
23-31-00	PA SYSTEM - TRAINING INFORMATION POINT - AMPLIFIER TEST	34	AKS ALL
23-31-00	PA SYSTEM - SYSTEM SUMMARY	36	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - INTRODUCTION	2	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS	6	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS	8	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-41-00	SERVICE INTERPHONE SYSTEM - JACK LOCATIONS	10	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - INTERFACES	12	AKS ALL
23-41-00	SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION	14	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION	2	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION	4	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS	8	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION	10	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES	14	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET	18	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION	20	AKS ALL
23-42-00	FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL	24	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - INTRODUCTION	2	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION	6	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS	8	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - INTERFACES	10	AKS ALL
23-43-00	GROUND CREW CALL SYSTEM - CALL HORN	12	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-43-00	GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION	14	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - INTRODUCTION	2	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS	6	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS	8	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION	10	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - POWER INTERFACE	12	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES	15	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES	18	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE	20	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL	23	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT	28	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH	30	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION	33	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - PTT FUNCTION	36	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION	39	AKS ALL
23-51-00	FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY	42	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-61-00	STATIC DISCHARGERS	2	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - INTRODUCTION	2	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION	6	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - RECORDER LOCATION	8	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - INTERFACE	10	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - VOICE RECORDER UNIT	12	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION	14	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON	16	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION	19	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - TRAINING INFORMATION POINT - MAINTENANCE	22	AKS ALL
23-71-00	VOICE RECORDER SYSTEM - SUMMARY	24	AKS ALL
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTRODUCTION	2	AKS ALL
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - GENERAL DESCRIPTION	4	AKS ALL
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - COMPONENT LOCATIONS	6	AKS ALL
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTERFACES	8	AKS ALL
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA	10	AKS ALL

CHAPTER 23
COMMUNICATIONS

CH-SC-SU	SUBJECT	PAGE	EFFECT
23-75-00	FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - FUNCTIONAL DESCRIPTION	12	AKS ALL
23-75-00	CAMERA CONTROL PANEL	14	AKS ALL
23-75-00	CAMERA CONTROL UNIT	16	AKS ALL
23-75-00	ILLUMINATOR	18	AKS ALL
23-75-00	VIDEO SWITCH	20	AKS ALL
23-82-00	FLIGHT COMPARTMENT PC POWER SYSTEM - INTRODUCTION	2	AKS ALL
23-82-00	FLIGHT COMPARTMENT PC POWER SYSTEM - ISPS - GENERAL DESCRIPTION	6	AKS ALL
23-82-00	FLIGHT COMPARTMENT PC POWER SYSTEM - OUTLET UNITS - GENERAL DESCRIPTION	8	AKS ALL

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HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION

General

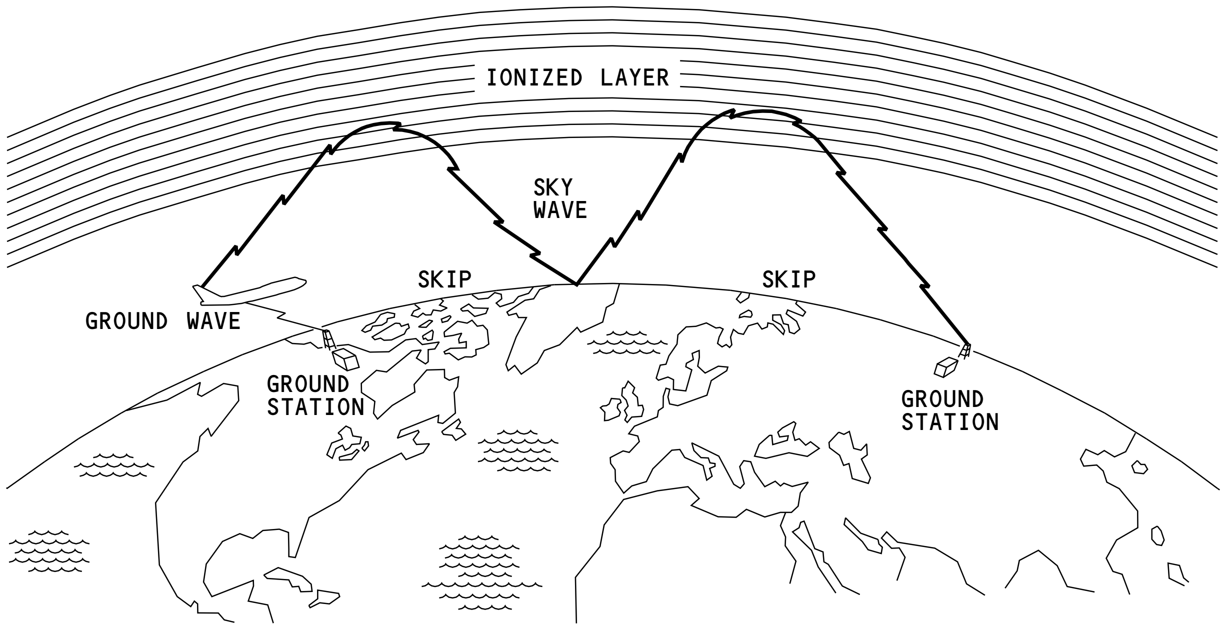
The high frequency (HF) communication system supplies voice communication over long distances. It gives communication between airplanes or between ground stations and airplanes.

The HF system also supplies data communication between ground stations and airplanes.

The HF system operates in the aeronautical frequency range of 2 MHz to 29.999 MHz. The system uses the surface of the earth and an ionized layer to cause a reflection (skip) of the communication signal. The distance between skips changes due to the time of day, radio frequency, and airplane altitude.

Abbreviations and Acronyms

- ACARS - aircraft communications addressing and reporting system
- ACP - audio control panel
- AM - amplitude modulated
- AME - amplitude modulation equivalent
- ARINC - Aeronautical Radio Incorporated
- BITE - built-in test equipment
- comm - communication
- EE - electronic equipment
- EEC - electronic equipment compartment
- FDR - flight data recorder
- FDRS - flight data recorder system
- freq - frequency
- HF - high frequency
- I/C - interphone communication
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- mic - microphone
- PSEU - proximity switch electronics unit
- PTT - push-to-talk
- RCP - radio communication panel
- REU - remote electronics unit
- RF - radio frequency
- R/T - receive/transmit
- SELCAL - selective calling
- sq - squelch
- sql - squelch
- SSB - single side band
- USB - upper side band
- VSWR - voltage standing wave ratio
- xmit - transmit



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HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION

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HF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

General

The HF communication system supplies the flight crew with long range voice communication. The HF communication system can be used to communicate between airplanes and between airplanes and ground stations.

The HF communication system can also supply data communication between airplanes and ground stations.

The HF communication radio uses frequency select and control signals to transmit and receive voice communication. The HF radio modulates an RF carrier signal with voice audio from the flight interphone system. During the receive mode, the HF radio demodulates the RF carrier signal. This isolates the voice audio from the RF signal. The HF transceiver sends the audio to the flight interphone system.

During receive mode, the HF transceiver sends all data communication to the ACARS management unit. The HF transceiver transmits all data from the ACARS management unit to an ACARS ground station.

The HF system operates in the frequency range of 2.000 MHz to 29.999 MHz.

System Components

The HF communication system has these components:

- Radio communication panel
- HF transceiver
- HF antenna coupler
- HF antenna.

The radio communication panel (RCP) supplies selected frequency information and control signals to tune the HF transceivers and make radio selections. You can use the RCP to select amplitude modulated (AM) or upper side-band (USB) operation. Use the RF sensitivity control to improve HF reception. The RCPs can select and control the frequency of any HF communication radio.

You can use the RCP to select data mode.

The HF transceiver transmits and receives information. The transceiver transmit circuits use flight interphone audio to modulate an RF carrier signal. This voice information goes to other airplanes and ground stations. The receive circuits demodulate the received RF carrier signal to isolate the audio. The received audio is used by the flight crew or other airplane systems.

The HF antenna coupler matches the antenna impedance to the transceiver output over the HF frequency range. During the transmit mode, the antenna coupler receives modulated RF from the transceiver and sends it to the antenna. During the receive mode, the antenna coupler receives modulated RF from the antenna and sends it to the transceiver.

The HF antenna transmits and receives audio modulated RF signals.

External Interface

The HF communication system connects with these components/systems:

- Remote electronics unit (REU)
- ACARS management unit
- SELCAL decoder unit
- Air/ground relay
- Flight data acquisition unit (FDAU).

System Operation

The control panel sends selected frequency information and control signals to the transceiver. The audio control panel sends these signals to the REU:

- HF radio select signal
- Receive volume control
- Push-to-talk (PTT).

During transmit, microphone audio and PTT signals go to the HF transceiver through the REU. The transceiver uses the microphone audio to modulate an RF carrier signal generated in the transceiver. The transceiver sends the modulated RF signal through the antenna coupler to the antenna for transmission to other airplanes and ground stations.

Also during transmit, the flight data acquisition unit receives a PTT signal from the transceiver. The flight data acquisition unit uses the PTT for key event marking to record the transmit event.

During transmit in data mode, data signals from the ACARS management unit are used to modulate the RF carrier signal generated in the transceiver. Data transmission frequencies are controlled by the HF transceiver. The transceiver uses time and position data to select an HF frequency. In data mode, the transceiver can transmit automatically.

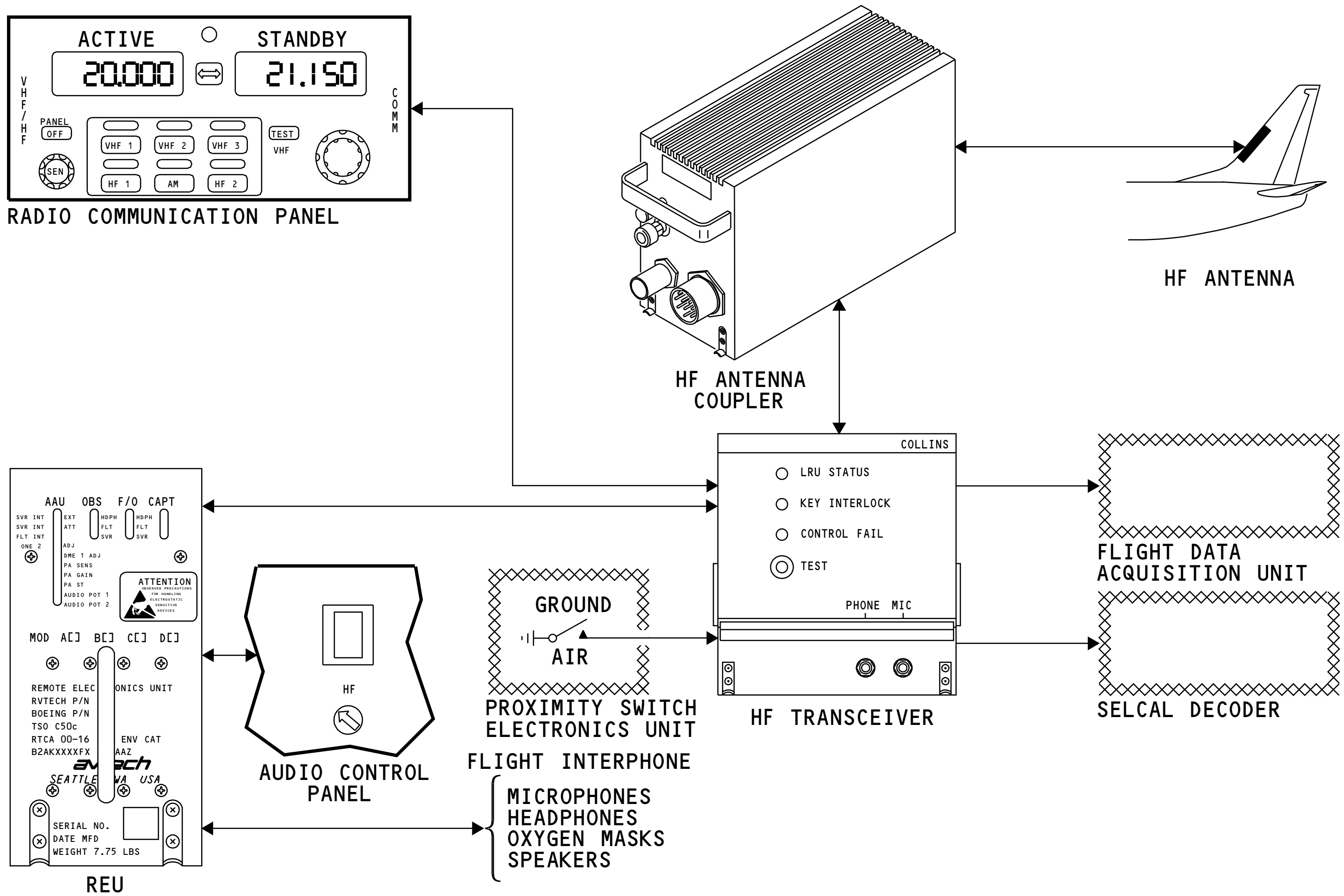
During receive, the antenna receives a modulated RF signal and sends it through the antenna coupler to the transceiver. The transceiver demodulates or isolates the audio from the RF carrier. The received audio goes from the HF transceiver to the flight interphone speakers and headsets through the REU.

During receive in data mode, the transceiver demodulates the data from the RF carrier. The data goes from the HF transceiver to the ACARS management unit.

The SELCAL decoder unit receives audio from the HF transceiver. The SELCAL decoder unit monitors the audio for SELCAL calls that come from the ground station.

The HF transceiver receives an air/ground discrete. The HF transceiver uses the discrete to calculate flight legs for internal fault memory.

The HF transceiver also uses the air/ground discrete to disable the transmit function in the HF data link mode while the aircraft is on the ground.



HF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

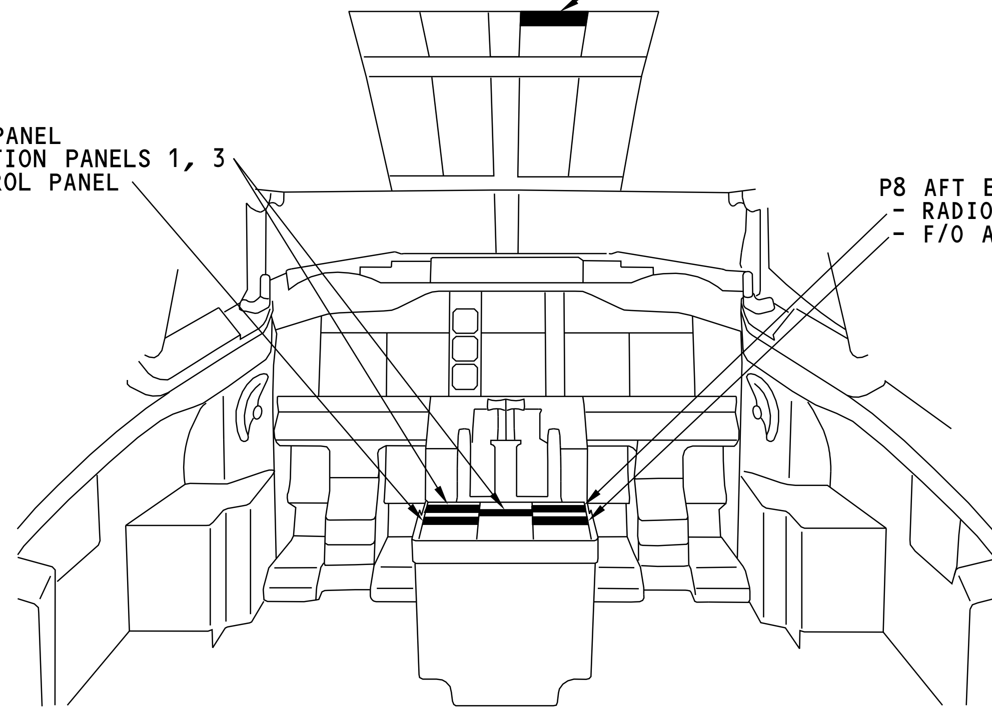
HF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

Flight Compartment

The radio communication panels are on the P8 aft electronics panel.

The audio control panels (ACPs) are part of the flight interphone system. The ACPs have an interface with the HF communication system through the REU. The captain and first officer ACPs are on the P8 aft electronics panel. The first observer ACP is on the P5 aft overhead panel.

The audio control panels (ACPs) are part of the flight interphone system. The ACPs have an interface with the HF communication system through the REU. The captain, first officer, and first observer ACPs are on the P8 aft electronic panel.



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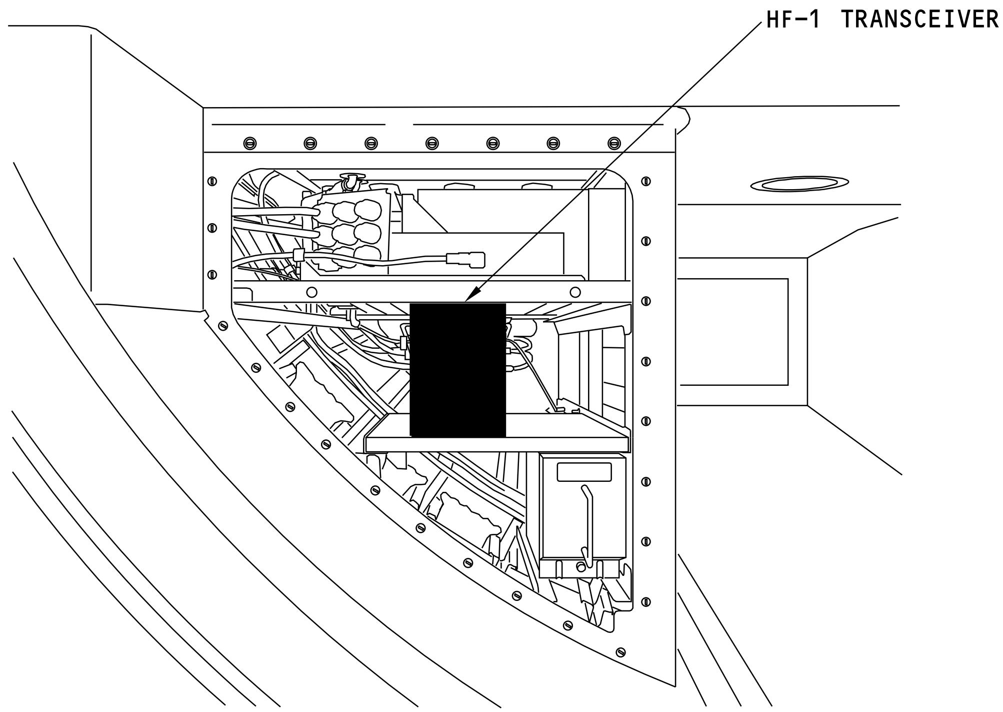
HF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

HF COMMUNICATION SYSTEM - TRANSCEIVER LOCATION

HF Transceiver

The HF transceiver is on the E6-2 shelf.



E6 RACK
(LOOKING AFT)

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HF COMMUNICATION SYSTEM - TRANSCEIVER LOCATION

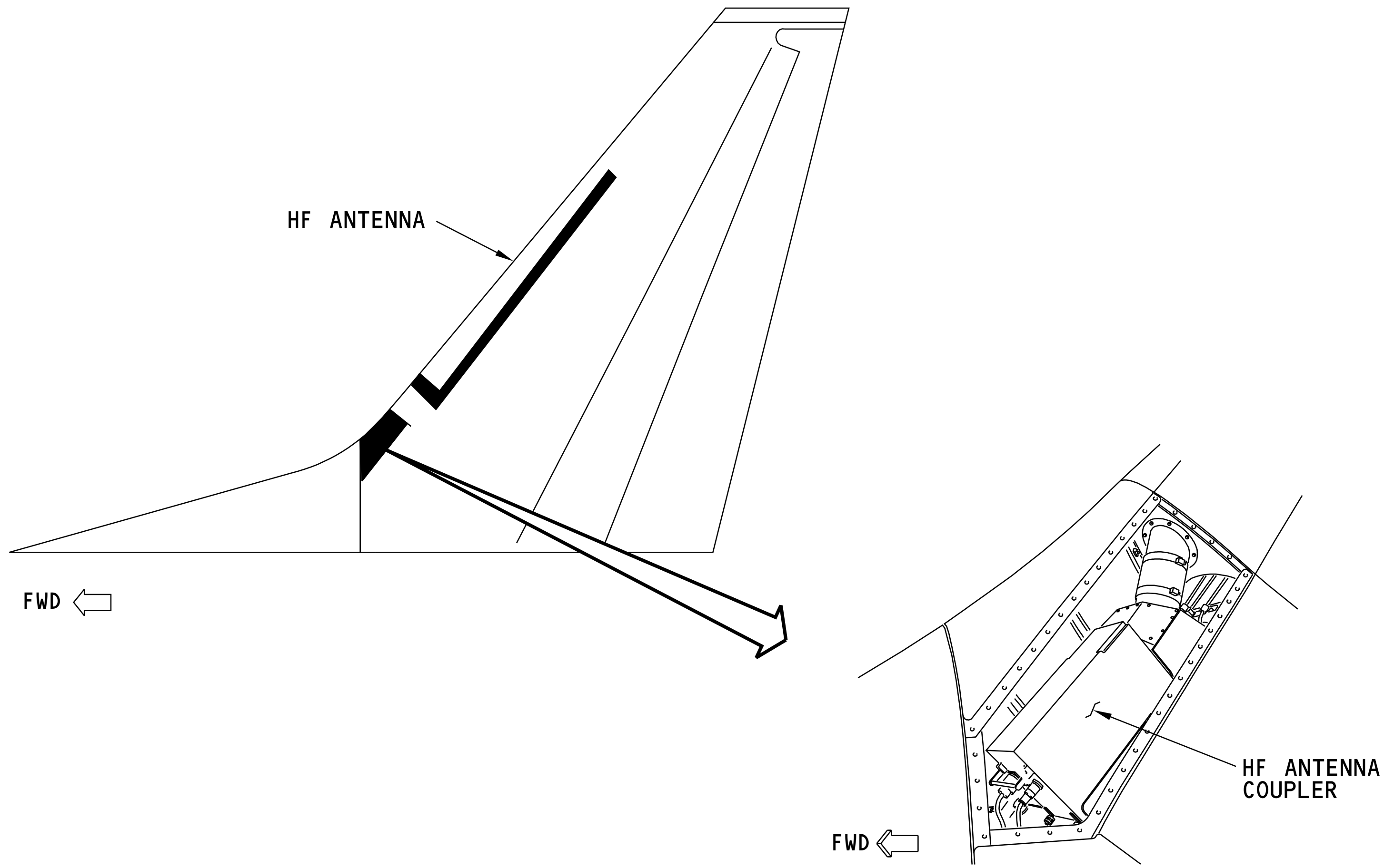
HF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

General

The HF antenna is on the leading edge of the vertical stabilizer.

The antenna coupler is inside the vertical stabilizer.

WARNING: MAKE SURE THAT PERSONNEL STAY A MINIMUM OF 10 FT (3 M) AWAY FROM THE VERTICAL STABILIZER WHEN THE HF SYSTEM TRANSMITS. RF ENERGY FROM THE HF ANTENNA CAN CAUSE INJURIES TO PERSONNEL.



HF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

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HF COMMUNICATION SYSTEM - INTERFACES

Power

The 115v ac transfer (XFR) bus supplies three-phase power to the HF transceiver.

The transceiver supplies 115v ac and 28v dc power to the HF antenna coupler.

HF Transceiver

The HF transceiver has an interface with these components:

- RCP 1, 2, and 3
- Selective calling (SELCAL) decoder
- Remote electronics unit (REU)
- ACARS management unit (MU)
- Flight management computer (FMC)
- HF antenna coupler
- Flight data acquisition unit
- Proximity switch electronics unit (PSEU).

Radio Communication Panel

RCP 1 supplies frequency information to the HF transceiver on an ARINC 429/719 bus to port A. RCP 2 supplies frequency information to the HF transceiver on an ARINC 429/719 bus to port B. For more information about tuning interfaces, see HF Communication System - Tuning Interfaces.

The HF transceiver supplies the condition of the transceiver to the radio communication panels. The condition of the transceiver is one of the two: OK or FAILED.

The radio communication panel supplies these to the HF transceiver:

- Amplitude modulated or single side-band control
- Tuning data
- Voice/data mode control
- Port select discrete.

Antenna Coupler

The antenna coupler supplies these to the transceiver:

- Key interlock
- Tune in progress
- RF fault
- Coupler fault
- Received RF.

The antenna coupler opens the key interlock discrete to stop the transceiver transmit mode. The coupler sends the tune in progress discrete to request tuning power from the transceiver. The RF fault is sent to the transceiver when the coupler detects a fault external to the coupler. The coupler sends the coupler fault discrete to the transceiver when it detects an internal failure. Received RF from the antenna is sent to the transceiver during receive mode.

The antenna coupler supplies transmitted RF to the HF antenna. It receives push-to-talk (PTT) from the REU to enable the coupler tune mode.

The HF transceiver supplies these to the antenna coupler:

- Transmitted RF
- RF carrier during tune mode
- Rechannel pulse.

Modulated RF is sent to the antenna through the antenna coupler to be transmitted. During tune mode, a low wattage RF carrier signal is sent to the coupler to match impedance between the transceiver and the antenna. The transceiver sends the rechannel pulse to start the coupler home sequence mode.

HF Antenna

The HF antenna receives an RF signal from the antenna coupler and transmits the RF signal to other airplane and ground HF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the antenna coupler.

HF COMMUNICATION SYSTEM - INTERFACES

External Interfaces

The HF transceiver has an interface with these components from other airplane systems:

- Remote electronics unit (REU)
- ACARS management unit (MU)
- Flight management computer (FMC)
- Selective calling (SELCAL) decoder
- Flight data acquisition unit
- PSEU.

The remote electronics unit sends flight crew microphone (mic) audio to the transceiver to be transmitted. It also sends a PTT to start the transceivers transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

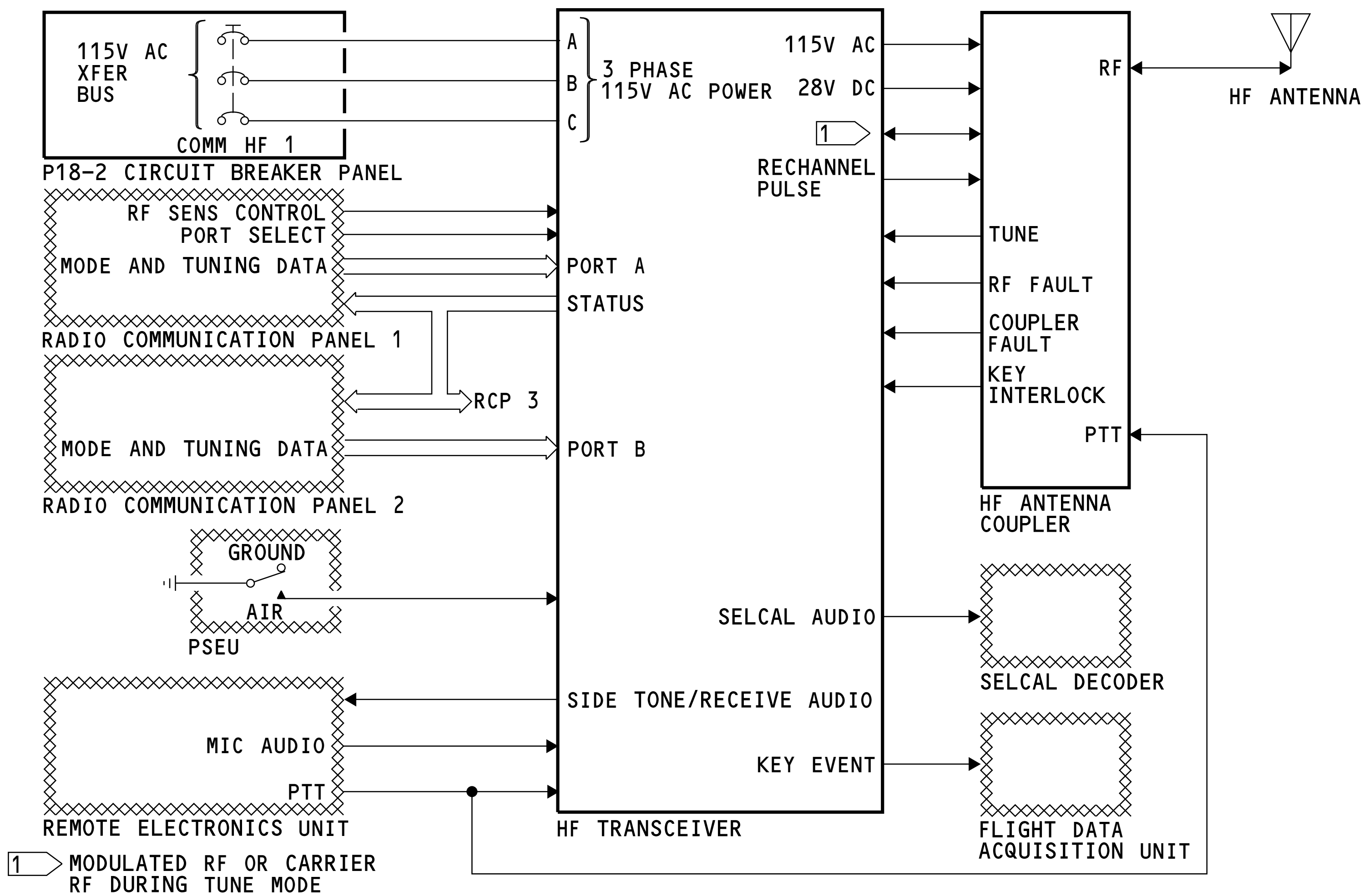
When the HF system is in data mode, data received from an ACARS ground station is sent to the ACARS MU. Data from the ACARS MU is transmitted to an ACARS ground station.

The HF transceiver receives time and position data from the FMC. When the HF system is in data mode, the HF frequency is selected automatically by the HF transceiver. The HF transceiver uses time and position data to select the correct ACARS HF data frequency.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.

The PSEU tells the HF transceiver whether the airplane is on the ground or in the air.



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HF COMMUNICATION SYSTEM - INTERFACES

HF COMMUNICATION SYSTEM - TUNING INTERFACES

General

The HF communication system uses data buses to share tuning information between the radio communication panels (RCPs) and the communication transceivers.

Tuning Bus

Each RCP has one ARINC 429/719 output bus.

The RCPs send tuning data to the communication transceivers. Any RCP can tune any transceiver.

Each RCP sends tuning data and status to the other radio communication panels. This keeps the tuning data synchronized and lets any RCP tune any transceiver.

The RCP keeps the tuning data in memory. Usually, the RCP uses the tuning data from its memory to send on the output bus.

The RCP connects the CROSSTALK 1 bus directly to the output bus. This occurs for these RCP conditions:

- RCP does not have power
- RCP is OFF
- RCP is failed.

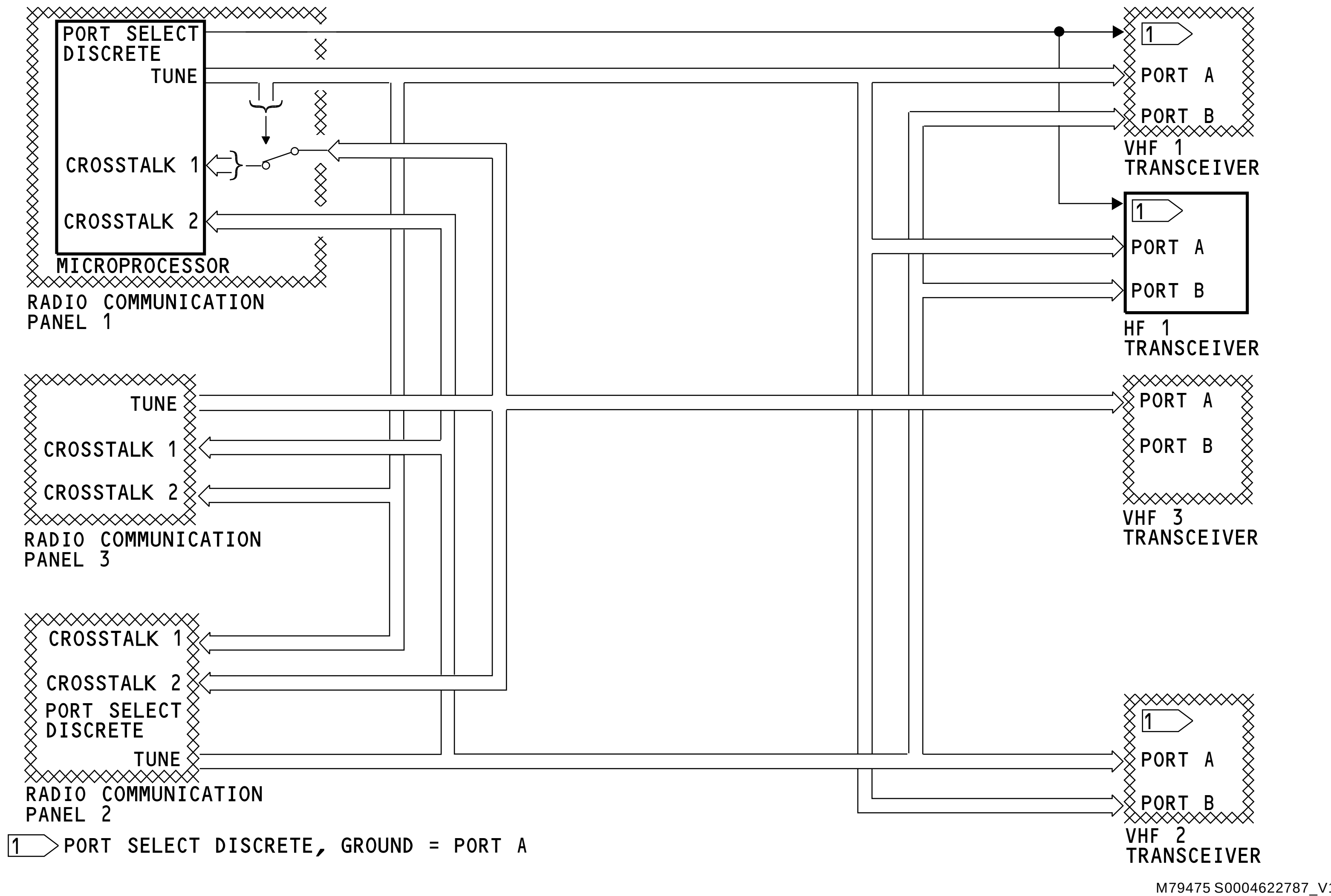
Port Select Discrete

RCP 1 and 2 send the port select discretes to the transceivers.

Each transceiver has two tuning data input ports, port A and port B. The transceiver uses the port select discrete to select the input port. A grounded port select discrete causes the transceiver to use port A. An open port select discrete causes the transceiver to use port B.

Training Information Point

If RCP 1 fails, you can tune the HF 1 transceiver with RCP 2 or 3. RCP 1 port select discrete changes from ground to open, and RCP 2 sends tuning data to input port B. RCP 3 sends tuning data on CROSSTALK 2 bus which is connected to RCP 2. RCP 2 connects this tuning data to the output TUNE bus.



HF COMMUNICATION SYSTEM - TUNING INTERFACES

HF COMMUNICATION SYSTEM - HF COMMUNICATION TRANSCEIVER

Purpose

The HF communication transceiver transmits and receives RF signals for voice communication.

Physical Description

The front panel has these components:

- Three fault LEDs
- A TEST push-button
- A microphone jack
- A headphone jack.

All electrical connections are through connectors at the rear of the transceiver.

Power

The transceiver must have 115 volts, 400 Hz, 3 phase ac power to operate.

Transceiver RF output is 400 watts peak envelope power (PEP) in the single sideband (SSB) mode. It is 125 watts average in the amplitude modulated (AM) mode. In the AM mode the transceiver transmits the amplitude modulation equivalent (AME). AME is the carrier frequency plus the upper side band.

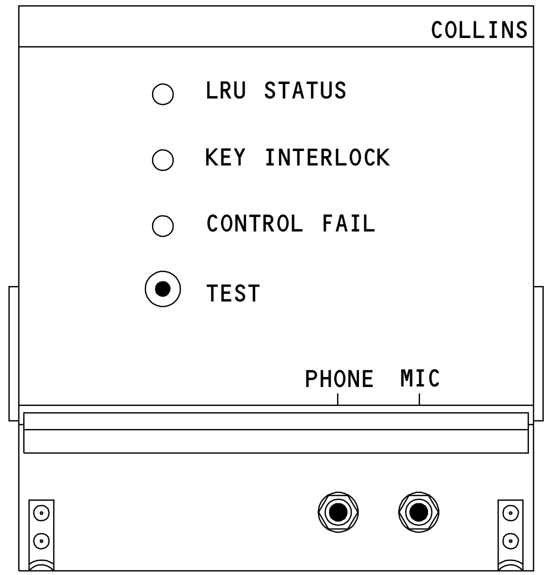
Indications

The KEY INTERLOCK LED comes on red when the transceiver keys and there is a failure in the HF coupler. Transmission is not possible at this time.

The CONTROL FAIL LED comes on red if there is no input from the control panel or if the control panel input goes invalid.

BITE

Push the TEST push button to test the transceiver front panel LEDs and to start a self-test. Connect a headphone to the transceiver front panel microphone jack to hear two short tones, and after one second, one additional tone through the audio system.



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HF COMMUNICATION SYSTEM - HF COMMUNICATION TRANSCEIVER

HF COMMUNICATION SYSTEM - HF ANTENNA COUPLER

Purpose

The HF antenna coupler matches the transceiver 50 ohm impedance output to the antenna impedance at the set frequency. This decreases the voltage standing wave ratio (VSWR) to less than 1.3:1.

Physical Description

The coupler front panel has these components:

- Fill valve
- Electrical connector to transceiver
- Coaxial connector to transceiver
- Pressure nozzle.

The rear panel has the antenna feedline connector.

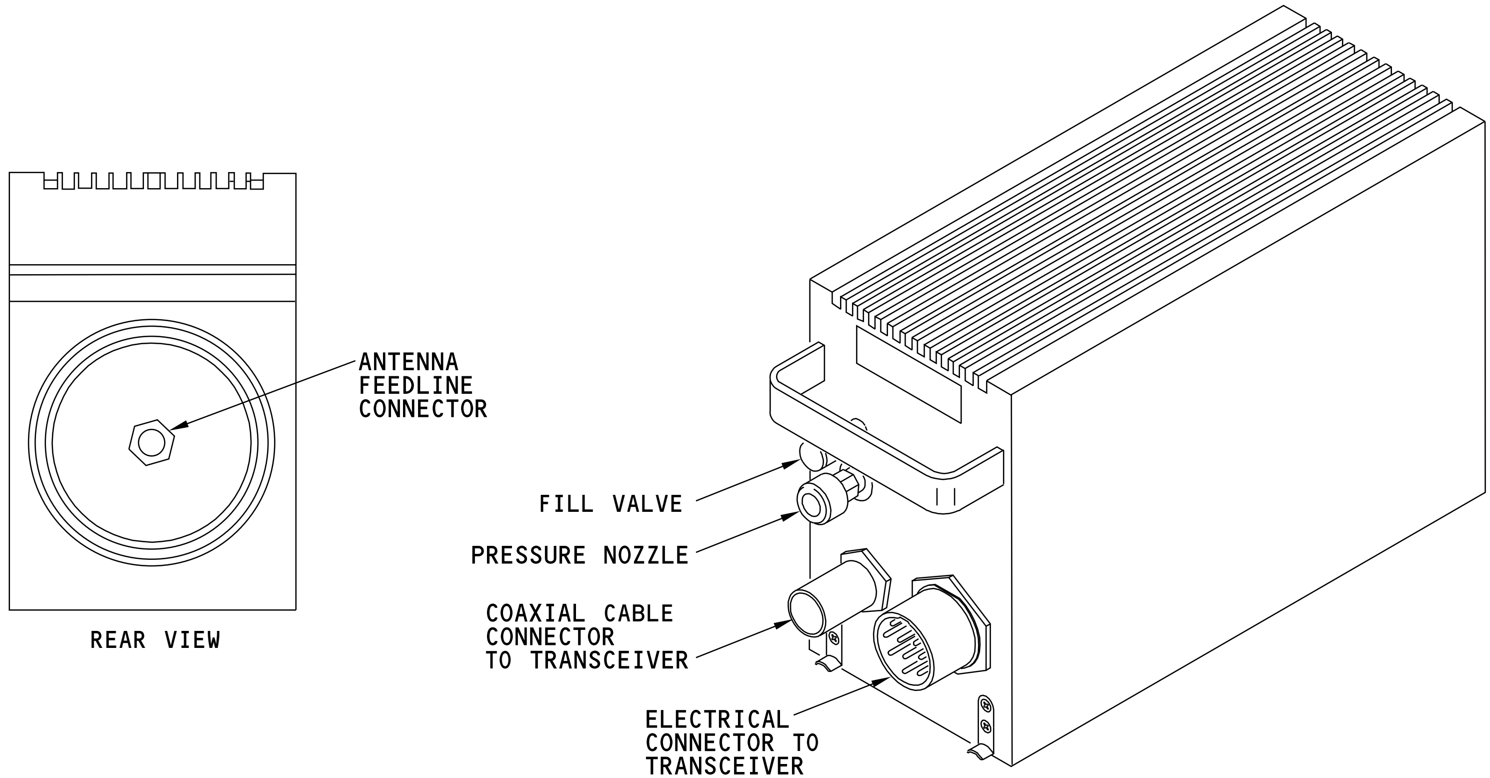
Operation

The coupler uses 115v ac to operate. It does not need special cooling.

The coupler tunes in the aeronautical frequency range of 2 to 29.999 MHz.

The coupler has lightning protection circuitry and an isolation amplifier for system receive performance.

The tune time for a frequency not in memory is 2 to 4 seconds typical, 7 seconds maximum. If HFS-700 or HFS-900 is installed, the tune time for a frequency saved in memory is 1 second typical. The tune tone is pulsed. If using a previously tuned channel, the tune tone may not be audible. But at the first tuning after a cold start, the tune tone is always audible regardless of whether this frequency is stored (average 2 to 4 seconds, 7 seconds maximum). If HFS-900D is installed, the tune time for a frequency saved in memory is 200 milliseconds typical. The tune tone is continuous.



HF COMMUNICATION SYSTEM - HF ANTENNA COUPLER

HF COMMUNICATION SYSTEM - HF ANTENNA

Purpose

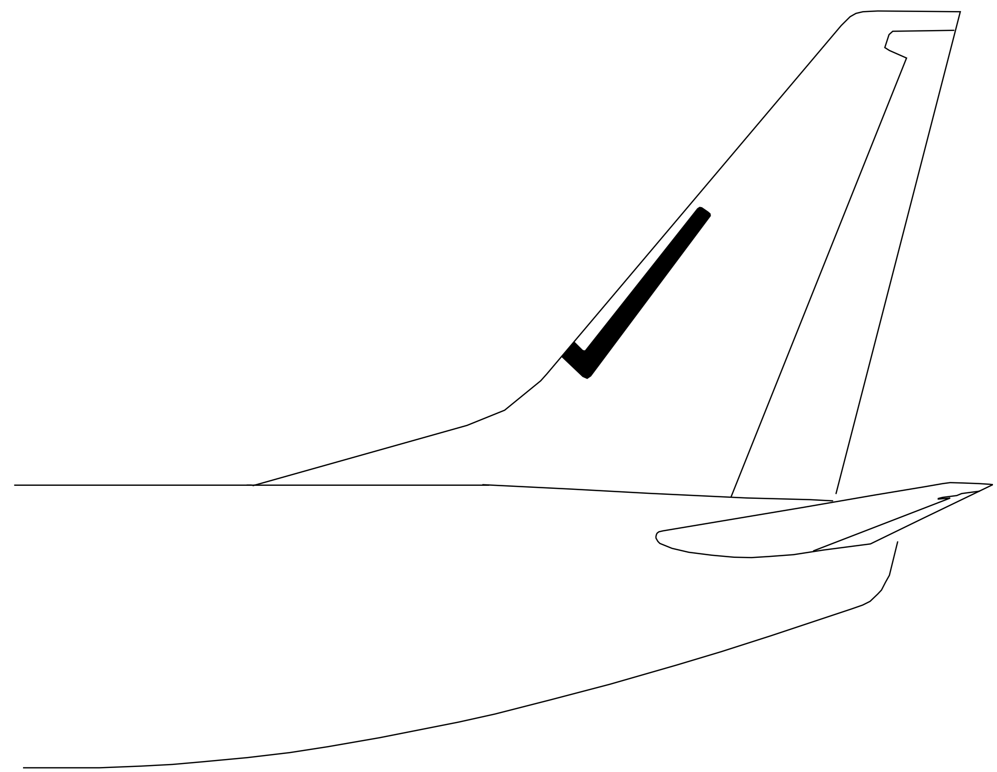
The HF antenna radiates and receives the RF signal.

Physical Description

The HF antenna is a notch type antenna. It is a U-shaped fiberglass material. The antenna is sealed within the leading edge of the vertical stabilizer.

The antenna receives the feed line from the antenna coupler.

WARNING: MAKE SURE THAT PERSONNEL STAY A MINIMUM OF 10 FT (3 M) AWAY FROM THE VERTICAL STABILIZER WHEN THE HF SYSTEM TRANSMITS. RF ENERGY FROM THE HF ANTENNA CAN CAUSE INJURIES TO PERSONNEL.



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HF COMMUNICATION SYSTEM - HF ANTENNA

HF COMMUNICATION SYSTEM - HF FUNCTIONAL MODES

General

The HF communication system uses an antenna coupler to keep a 50 ohm impedance match between the transceiver and the antenna. This impedance match decreases reflected power through the RF output circuit back to the transceiver. The HF communication system uses functional modes to complete the receive, tune, and transmit operation. These are the HF communication system functional modes:

- Home
- Receive/standby
- Tune
- Receive/operate
- Transmit.

The HF system controls the modes in sequence. The modes do not change until all necessary conditions for the modes occur.

Home Mode

The home mode starts at power-up or when a new frequency is set. The transceiver sends a rechannel pulse to the coupler to start the home mode. The antenna tuning elements in the coupler move to the home position. The elements are in a position for minimum attenuation of incoming signals.

Receive/Standby Mode

The receive/standby mode starts when the antenna tuning elements are in the home position.

In the receive/standby mode, the HF system can receive RF signals at the set frequency. The system is ready to key for tuning at any time when it receives a PTT from the REU.

Tune

The tune occurs in these steps:

- Determine Frequency
- Calibrate
- Tune

To Determine the Frequency the HF Coupler activates the tune power input to the HF transceiver; this causes the transceiver to send a bust of reduced tune power (approximately 80 W) to find out the operating frequency. When the frequency is determined it is stored in memory.

For the Calibration step the coupler asks the Transceiver for another brief bust of tune power. The RF Network resistor provides a 50-Ohm resistance to ground for transmit calibration. After this the quick tune is enabled and the coupler sets the tuning element relays to match the last setting at the frequency.

During the tuning step the coupler requests a series of short busts of tune power from the transceiver to determine the voltage standing wave ratio (VSWR). The coupler adjusts the tuning elements to reduce the (VSWR) with each bust of tune power until a VSWR of 1.3:1 or less is accomplished. After the tuning cycle typically 2 to 4 seconds, 7 maximum the coupler is tuned.

If a frequency in memory is used again (quick tune) the coupler is able to tune within a second.

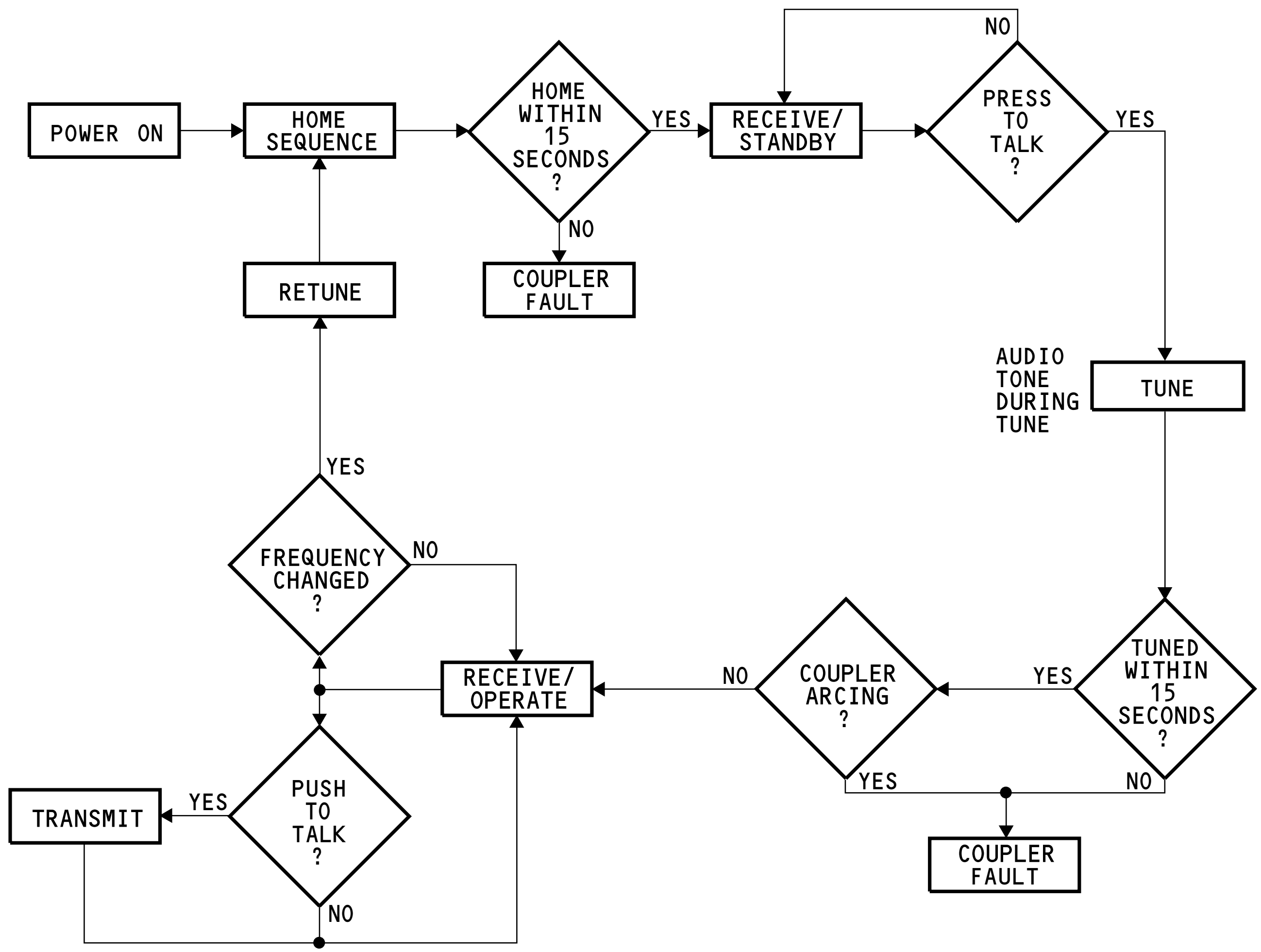
The quick tune allows the coupler to skip the calibration step in the tuning process and reduce the tuning time.

Receive/Operate

The receive/operate mode occurs when tune mode is complete. The key latch is removed. The tuning RF power from the transceiver is tuned off, and the 1 kHz tone stops. The system is ready for reception or transmission.

Transmit

The pilot keys the microphone to transmit. The coupler adjusts the tuning elements to keep the VSWR less then 1.3:1 for modulated transmission. The audio tone through the flight interphone system does not sound at this time.



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HF COMMUNICATION SYSTEM - HF FUNCTIONAL MODES

HF COMMUNICATION SYSTEM - HOME/RECEIVE FUNCTIONAL DESCRIPTION

General

During the home mode, the antenna coupler tuning circuits are adjusted for minimum attenuation of the incoming RF signal. This is called the tuning circuit home position. The tuning circuits are adjusted to the home position at the start of every new tune cycle and at power up. The HF communication system can receive audio modulated RF after the tuning circuits are in the home position and the HF system goes to receive/standby mode.

Home Mode

The control panel sends tune and modulation mode (AM or USB) data to the HF transceiver control circuits. When the control panel sends a change in frequency, the transceiver control circuits send a rechannel pulse to the antenna coupler control logic. This causes the coupler to begin the home sequence mode. The home mode also starts at power up.

During the home mode, the coupler control logic has these functions:

- Tells the tuning circuits to go to the home position
- Energizes relay K6
- De-energizes relays K4 and K5.

The control logic energizes K6 so that the HF system can receive during home mode. When the tuning elements are in the home position, the HF system goes to the receive/standby mode.

Receive/Standby Mode

During the receive/standby mode, relay K1 in the transceiver and K4 and K5 in the coupler de-energize. Relay K6 energizes. Incoming RF signals go to an isolation amplifier and a discriminator in the coupler. The RF output from the coupler goes to the RF section of the transceiver.

The RF section has these functions:

- Amplifies the RF signal
- Mixes, filters, and processes the RF signal to make an intermediate frequency (IF) output.

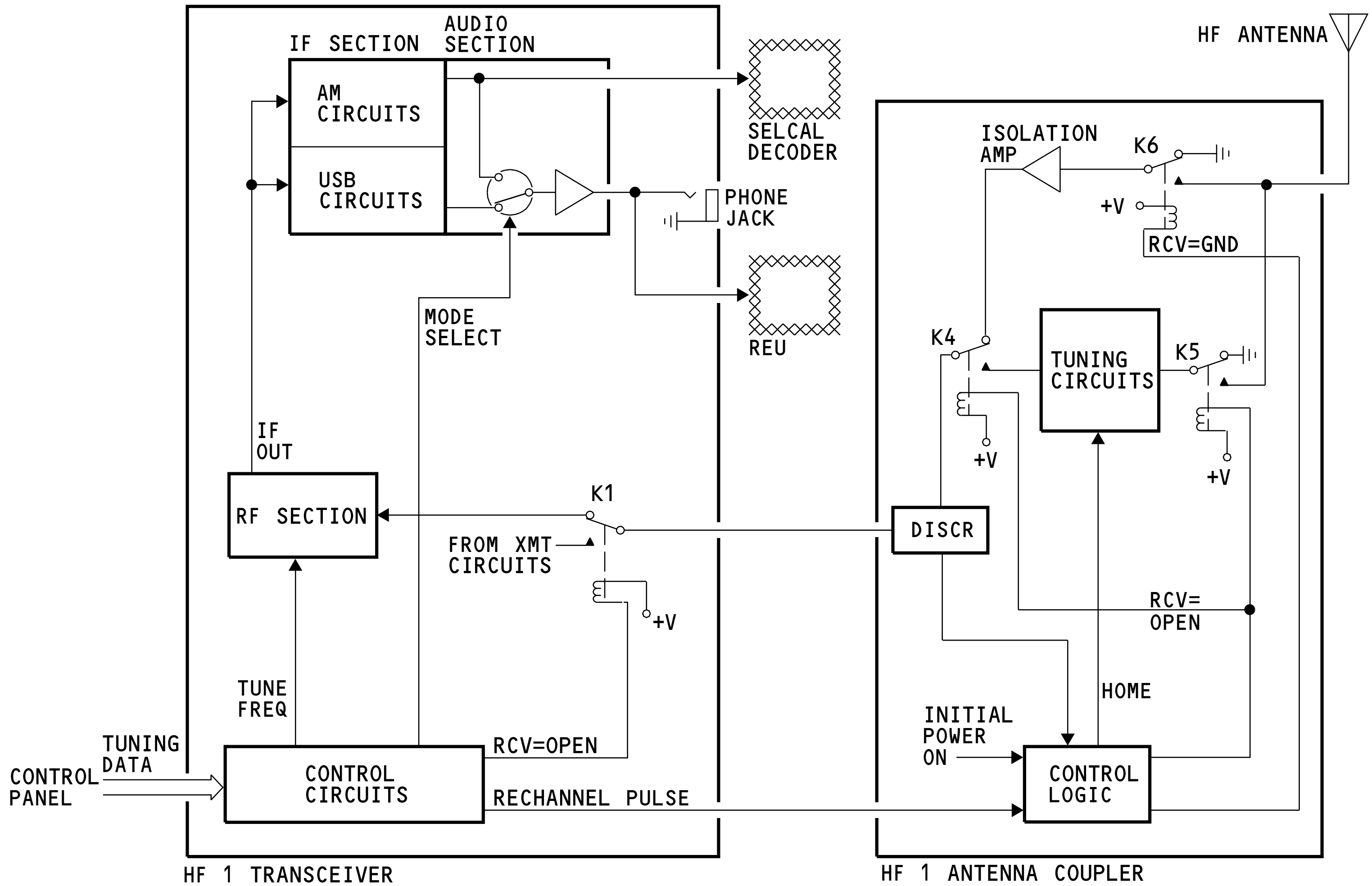
The AM and the USB circuits in the IF section amplify the IF signal and detect the audio from the signal.

The AM section sends the audio to the SELCAL decoder and to a solid state switch.

Audio from the USB detector also goes to this switch. The mode select output, from the transceiver control circuits, selects audio from either the AM section or the USB section.

The mode select output audio goes through an amplifier to these two points:

- A phone jack on the transceiver front panel
- The flight interphone system.



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HF COMMUNICATION SYSTEM - HOME/RECEIVE FUNCTIONAL DESCRIPTION

HF COMMUNICATION SYSTEM - TUNE FUNCTIONAL DESCRIPTION

General

Before the HF communication system can transmit, the antenna coupler must be tuned to match the impedance between the transceiver and the antenna. The antenna coupler tune circuits keep the impedance at 50 ohms over the HF frequency range. The tune sequence begins with the first push-to-talk (PTT) after the tune circuits are in the home position, and the HF system is in the receive/standby mode.

Tune Mode Initiation

Select the HF communication frequency on the control panel and key the mic. The mic sends a PTT signal through the REU to start the tune sequence. The same PTT goes to the control circuits in the transceiver and the control logic circuits in the antenna coupler. The coupler control logic latches the PTT discrete to ground until the tuning is complete.

The coupler control logic energizes relays K4 and K5, and de-energizes relay K6.

The coupler control logic also sends a key interlock signal to the HF transceiver.

The coupler control logic can start tuning only in these conditions:

- There is a ground on the PTT line
- The home sequence is complete
- There are no coupler faults.

Tune Mode Operation

The coupler control logic sends a tune-in-progress discrete to the transceiver when the coupler is in tune mode. This tune-in-progress discrete tells the transceiver to send a RF carrier tuning signal to the coupler.

The tune-in-progress discrete energizes relay K2 in the transceiver. It also goes to the transceiver RF circuits. The RF circuits send a 1 kHz audio tone to the front panel phone jack and to the flight interphone system. This tone tells the operator that the system is in the tune mode.

The control circuits in the transceiver energize relay K1 and tell the RF circuits to send an RF carrier in these conditions:

- There is a PTT signal
- There is no transceiver fault
- There is a key interlock signal from the coupler.

In the tune mode, the RF carrier contains no audio. The carrier goes to relay K2. Because relay K2 energizes in the tune mode, the output goes through the resistor. The resistor reduces the power to 75 watts.

Relay K1 energizes in the tune mode and the RF carrier goes to the coupler. The RF carrier goes through the discriminator, energized relay K4, the tuning elements, and energized relay K5 to the antenna.

During the tune mode, the discriminator samples the RF carrier and sends analog signals to the coupler control logic circuits. The control logic circuits use the signals from the discriminator to generate controls for the tuning circuits. The tune mode continues until the impedance of the transceiver and the antenna are in balance for the frequency the flight crew selects. When the impedance balances, the control logic circuits remove these signals:

- The tune-in-progress discrete
- The ground on the PTT discrete
- The 28v dc key interlock signal.

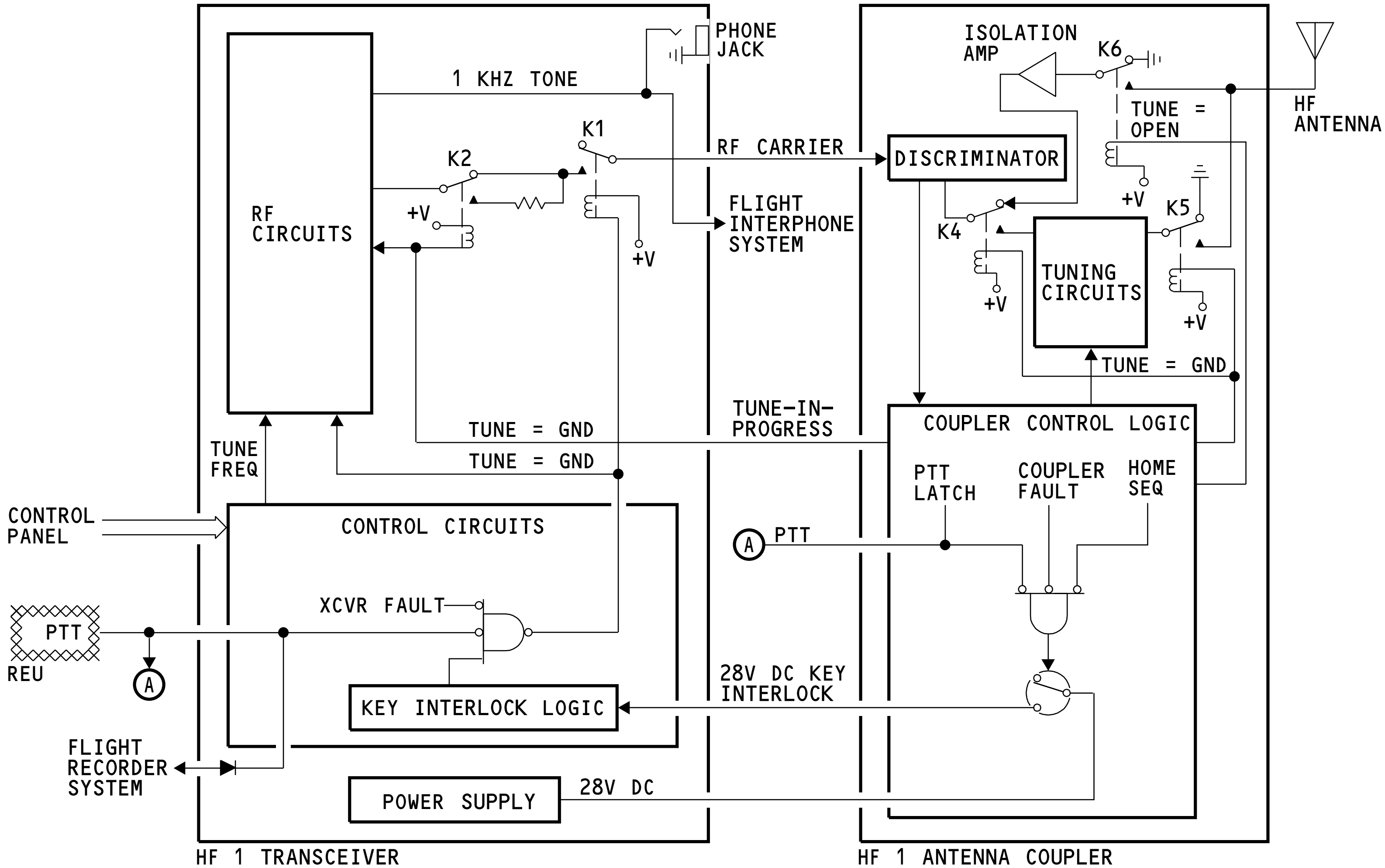
If the tune mode does not end within 15 seconds, the coupler control logic sends a coupler fault to the transceiver.

Operate Mode (Receive)

When the tune mode ends, the HF system begins the operate (receive) mode. Relays K1 and K2 in the transceiver and K4 and K5 in the antenna coupler de-energize. Relay K6 energizes. The HF system is ready to transmit when it receives a PTT signal.

Key Event Output

The PTT discrete goes to the flight recorder system for key event marking.



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HF COMMUNICATION SYSTEM - TUNE FUNCTIONAL DESCRIPTION

HF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

General

When the tune sequence is complete, the HF system goes to the receive/operate mode and is ready to transmit. A PTT discrete starts the operation in the transceiver and antenna coupler.

Transmit Mode

In the receive/operate mode, the PTT discrete from the REU to the transceiver and coupler control logic circuits starts the transmit mode. The coupler control logic circuits energize relays K4 and K5, and de-energize relay K6. This puts a ground on the input to the isolation amplifier. It connects the tuning elements in-line between the discriminator and the antenna.

The coupler control logic sends a key interlock signal to the HF transceiver. The coupler control logic does this only in these conditions:

- There is a ground on the PTT line
- The coupler control logic circuits are not in the home mode
- There are no coupler faults.

The control circuits in the transceiver energize relay K1 and tell the RF circuits to transmit a carrier in these conditions:

- There is a ground on the PTT line
- There is no transceiver fault
- There is a key interlock signal from the coupler.

The RF circuits mix the carrier from the frequency synthesizer with the mic audio. The RF signal goes through these:

- A power amplifier
- The relaxed contacts of relay K2
- The energized contacts of relay K1
- The discriminator in the coupler.

The RF signal then goes through these:

- Energized relays K4 and K5
- The tuning elements.

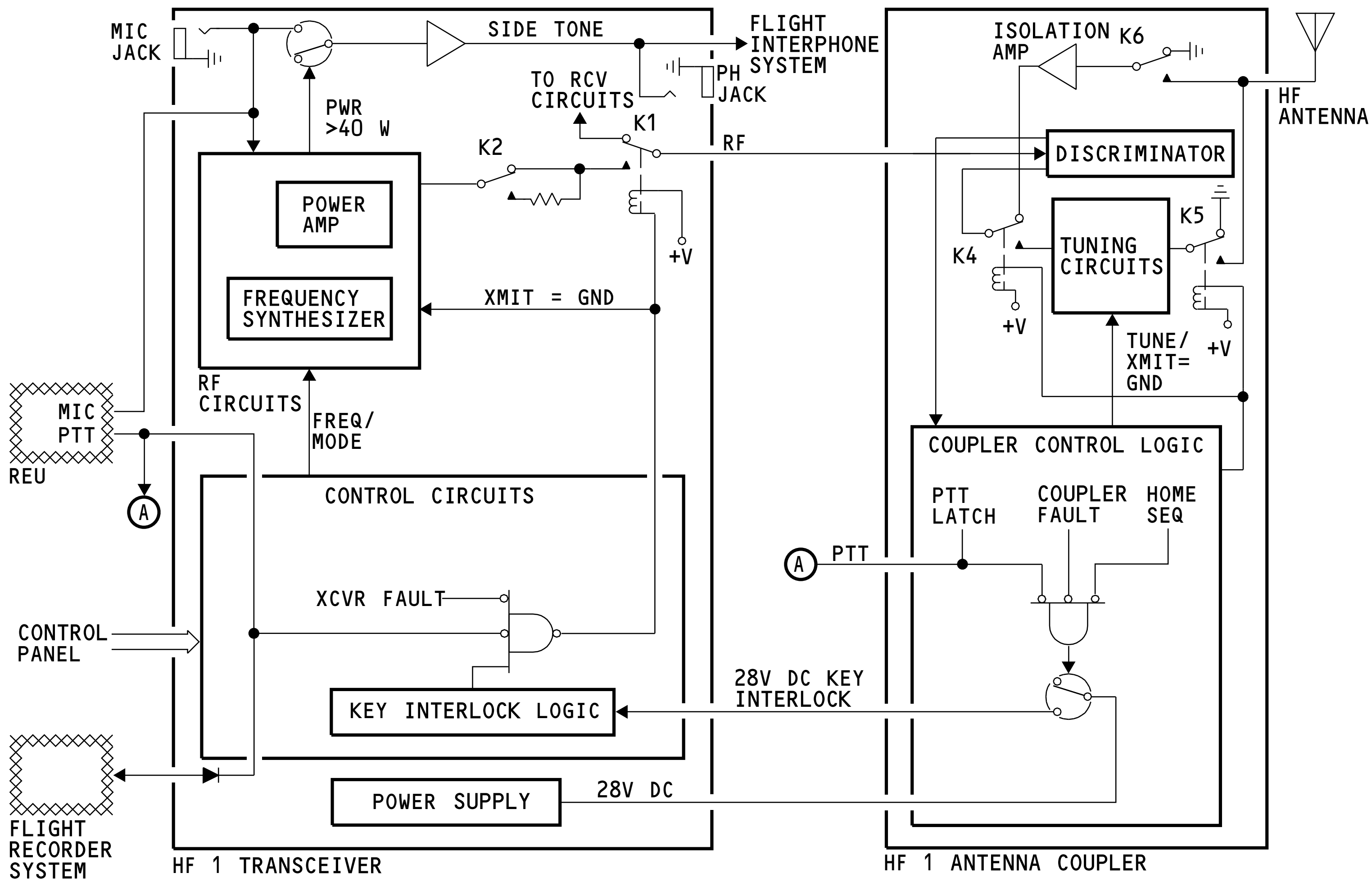
The antenna receives the RF from the tuning elements and transmits it.

Side Tone

When the output from the transceiver power amplifier is more than 40 watts in the AM mode, a switch connects the microphone audio to an audio amplifier. The amplified audio goes to the audio jack and to the flight interphone system for side tone. When the output is less than 40 watts, there is no side tone. When the output is less than 30 watts, an LRU fault occurs.

Key Event Output

The PTT discrete goes to the flight recorder system for key event marking.



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HF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

HF DATA LINK

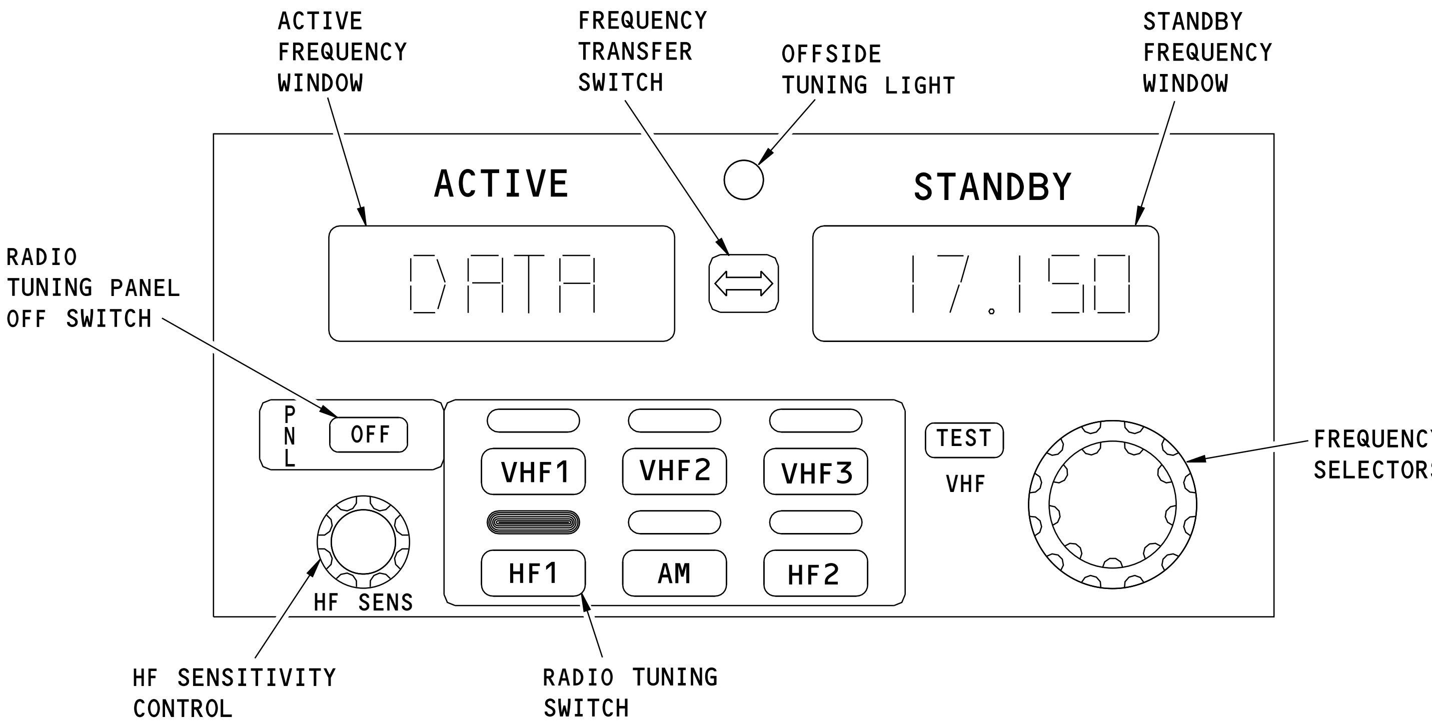
An HF data link is used to automatically receive and transmit ACARS data while the airplane is in the air. On the ground, the transmit function of the HF data mode will be disabled. The HF transceiver operates in data mode to supply the HF data link.

In data mode, the HF transceiver is automatically set to maximum sensitivity and the frequency is selected automatically.

The transceiver uses time and the aircraft's position to automatically select a frequency. If no signal is received from an ACARS ground station within approximately 32 seconds, a new frequency is selected.

When an ACARS signal is received, the HF transceiver will automatically transmit to the ACARS ground station. If a reply is received from the ground station, an HF data link is complete and data transmission can begin. If a reply is not received from the ground station, the transceiver will continue to search for a new frequency.

Dual HF transceivers share a common HF antenna. When the other HF transceiver is in voice mode and the PTT is pushed, data transmission is delayed to allow the voice transmission.



RADIO TUNING PANEL (RTP)
(EXAMPLE)

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HF COMMUNICATION SYSTEM - DATA MODE

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HF COMMUNICATION SYSTEM - OPERATION

General

You use these components to operate the HF radio:

- Hand microphone or headset
- Radio communication panel
- Control wheel mic switch
- Remote MIC switch
- Audio control panel.

Receive Operation

You use the radio communication panel and the audio control panel to receive transmissions on the HF radio.

On the audio control panel, push the receiver volume control for the HF radio. Turn the control to adjust the volume from the HF radio.

You hear audio on the headset and the flight interphone speakers. To hear sound from the flight interphone speakers, push the speaker (SPKR) volume control to turn on the speaker. Turn the control to adjust the volume of sound from the speaker.

Use the on/off control to turn on the radio communication panel. When you first turn it on, the radio communication panel tunes the VHF radio. Push the HF 1 switch to make the radio communication panel tune the HF radio. A light above the switch comes on to show which radio the panel controls. The frequency displays show HF radio frequencies (2.000 to 29.999 MHz). The HF radio uses the frequency in the active frequency display.

Use the frequency selectors to tune the radio to a new frequency. The standby frequency display shows the new frequency.

When you are sure the frequency is correct, push the frequency transfer switch. The active frequency display shows the new frequency. The HF radio uses the new frequency.

NOTE: When you select a new frequency, the HF coupler drives its tuning elements to the home position.

Listen for audio from the HF radio on the speaker or headset. Adjust the volume control switches on the audio control panel for a comfortable sound level.

Use the HF sensitivity (HF SENS) control on the radio communication panel to adjust the sensitivity of the HF radio receiver.

Transmit Operation

WARNING: MAKE SURE THAT PERSONNEL STAY A MINIMUM OF 10 FT (3 M) AWAY FROM THE VERTICAL STABILIZER WHEN THE HF SYSTEM TRANSMITS. RF ENERGY FROM THE HF ANTENNA CAN CAUSE INJURIES TO PERSONNEL.

WARNING: DO NOT OPERATE THE HF SYSTEM WHILE THE AIRPLANE IS REFUELED OR DEFUELED. AN EXPLOSION CAN CAUSE INJURIES TO PERSONNEL AND DAMAGE TO THE AIRPLANE.

WARNING: DO NOT OPERATE THE HF COMMUNICATION SYSTEM IN DATA MODE UNLESS IT IS SAFE TO TRANSMIT. IF IT IS IN THE DATA MODE THEN IT CAN TRANSMIT INDEPENDENTLY OF PERSONNEL CONTROL (PUSH-TO-TALK SWITCH). INJURIES TO PERSONNEL AND DAMAGE TO EQUIPMENT CAN OCCUR.

Make sure the active frequency display shows the frequency you want to transmit. Make sure the frequency you select is a valid transmit frequency.

Push the microphone selector switch on the audio control panel for the HF radio.

Listen for transmissions on the frequency you selected. When the frequency is clear, push and release the push-to-talk for the microphone. This causes the HF coupler to tune to the transmission frequency. While the coupler tunes, the HF transceiver supplies a 1 kHz tone. You hear this tone on the speaker and in the headset.

Normally, it takes several seconds for the coupler to tune. When the 1 kHz tone stops, the HF system is ready to transmit.

When the frequency is clear and you want to transmit a message, key the mic and speak into it. You hear sidetone in the headphone and muted sidetone from the flight interphone speaker. The flight interphone system mutes the sidetone to the speaker when you use the boom mic or the hand mic.

You can continue to transmit and receive on the frequency you selected.

When you select another frequency and key the mic to transmit, the HF coupler tunes again. You hear the 1 kHz tone while it tunes.

Non-Normal Indications

If you hear the 1 kHz tone for more than 15 seconds when the coupler tunes, there may be a coupler fault.

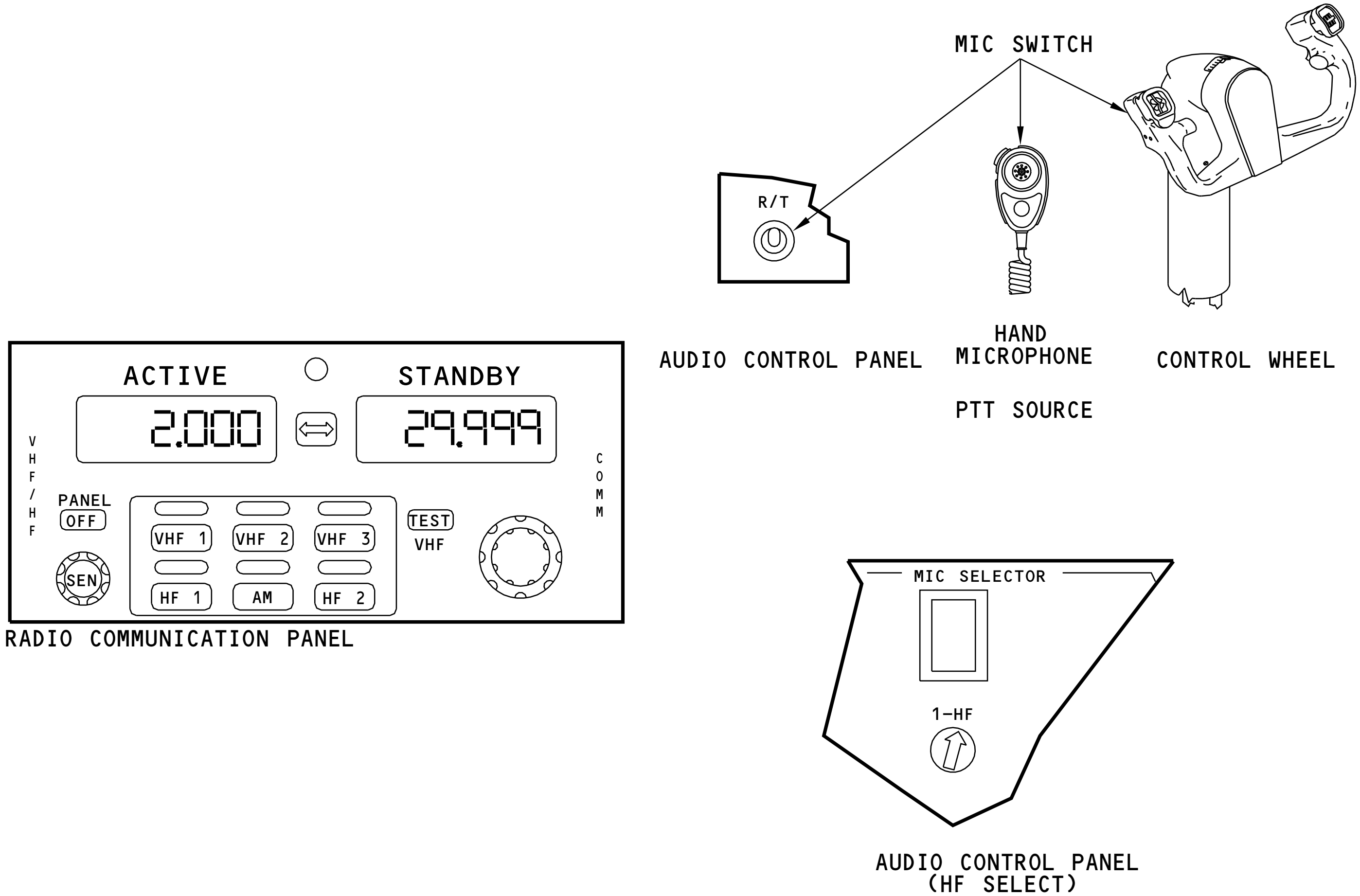
If the tone only lasts as long as you key the microphone, you may have tuned a frequency which is outside the frequency range for the HF transceiver.

HF Data Link Operation

You use the Radio Control Panel (RCP) to receive and transmit ACARS data on HF frequencies. Set the RCP to DATA to start an HF data link. When the HF data link is complete, the HF data link will be available to automatically receive and transmit ACARS data.

When a VHF data link is available, ACARS will use the VHF data link to transmit and receive all ACARS data. When a VHF data link is not available, the ACARS system will use the HF data link or optional SATCOM data link.

The HF data link only operates when the airplane is in the air. The HF data link will not be available when the airplane is on the ground, because the HFDL function is disabled on the ground.



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HF COMMUNICATION SYSTEM - OPERATION

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HF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BITE

Radio Communication Panel BITE Indication

When you push the HF switch on the radio communication panel (RCP), the display usually shows an HF radio frequency. The range of HF radio frequencies is 2.000 MHz to 29.999 MHz.

If the built-in test equipment in the RCP senses a failure, you see one of these displays:

- FAIL FAIL
- PANEL FAIL

If the RCP receives no signal from the HF transceiver, both displays show frequency. This occurs when one of these conditions is true:

- There is no HF transceiver
- The HF transceiver has no power
- The HF transceiver can not send ARINC 429/719 data to the RCP
- The RCP does not receive the ARINC 429/719 data from the HF transceiver
- Wiring from the HF transceiver to the RCP is bad.

If the RCP receives the FAIL WARN signal from the HF transceiver, the display shows FAIL in both displays. This occurs when the BITE in the HF transceiver senses that the transceiver has a failure.

If the RCP has a failure, the display shows PANEL in the active display and FAIL in the standby display.

HF Transceiver BITE Indication

Lights on the front of the HF transceiver only show BITE results when you push the transceiver front panel TEST switch. The lights show these failures:

- LRU STATUS
- KEY INTERLOCK
- CONTROL FAIL.

The LRU STATUS light comes on red if the HF transceiver has a failure. These are examples of failures of the HF transceiver:

- The voltage from the power supply is low
- The microprocessor has a failure
- The frequency synthesizer is not locked-on
- The output power of the RF transmitter is low.

The KEY INTERLOCK light comes on red if the HF coupler has a failure. These are examples of failures of the HF coupler:

- The voltage from the power supply is low
- The microprocessor has a failure
- The frequency synthesizer is not locked-on
- The output power of the RF transmitter is low.

The KEY INTERLOCK light comes on when you key the transceiver and the key interlock signal from the coupler is open.

The HF antenna coupler opens the key interlock signal if one of these conditions occurs:

- The power supply in the HF antenna coupler is not good
- The tuning reactance is not in tolerance
- The time to tune the HF antenna coupler is too long.

The CONTROL FAIL light comes on when the HF transceiver does not receive a signal from the radio communication panel. This occurs when one of these conditions is true:

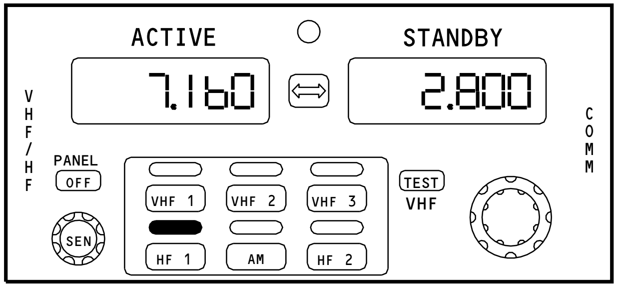
- The RCP is off
- The RCP has no power
- The RCP can not send the ARINC 429/719 data to the HF transceiver
- The HF transceiver does not receive the ARINC 429/719 data from the RCP
- The wiring from the RCP to the HF transceiver is bad.

HF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BITE

HF Transceiver Built-In Test

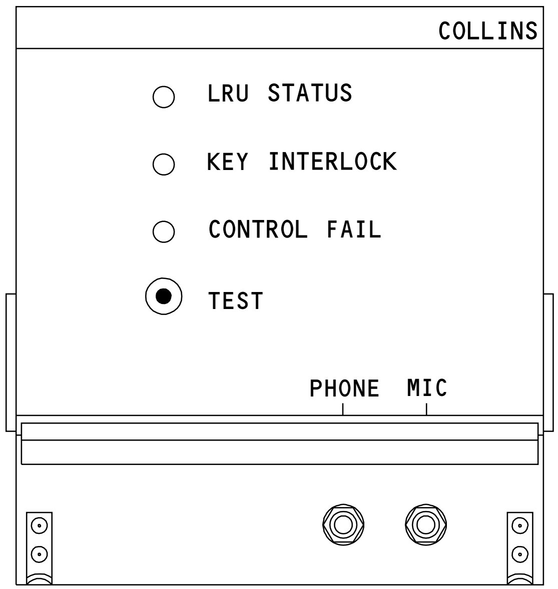
The HF transceiver has a built-in test. To start the test, push the TEST switch on the front of the transceiver. The LRU STATUS, KEY INTERLOCK, AND CONTROL FAIL lights show red for two seconds. Then, the LRU STATUS light shows green for two seconds and the other two lights show red. At the end of two seconds, all lights turn off until the test is complete. Then, the transceiver shows the result of the test for 30 seconds.

The LRU STATUS light comes on red if there is a failure in the HF transceiver. The KEY INTERLOCK light comes on red if there is an HF coupler fault. The CONTROL FAIL light comes on red if there is a control input failure from the control panel.



RADIO COMMUNICATION PANEL

DISPLAY		CONDITION
ACTIVE	STANDBY	
7.160	2.800	VALID FREQUENCY FOR THE HF RADIO (2.000 TO 29.999)
7.160	2.800	RCP RECEIVES NO SIGNAL FROM THE HF TRANSCEIVER
FAIL	FAIL	HF TRANSCEIVER FAILURE
PANEL	FAIL	RCP FAILURE



HF TRANSCEIVER

LED LIGHT SEQUENCE, TIME	TEST INDICATION			TEST RESULT
	LRU STATUS	KEY INTERLOCK	CONTROL FAIL	
0-2 SECONDS	ON-RED	ON-RED	ON-RED	-
2-4 SECONDS	ON-GREEN	ON-RED	ON-RED	-
4-6 SECONDS	OFF	OFF	OFF	-
6-36 SECONDS	ON-GREEN	OFF	OFF	PASS
	ON-RED	OFF	OFF	XCVR FAULT
	ON-GREEN	ON-RED	OFF	ANTENNA COUPLER FAULT
	ON-GREEN	OFF	ON-RED	CONTROL INPUT FAULT
36+ SECONDS	OFF	OFF	OFF	-

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HF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BITE

HF COMMUNICATION SYSTEM - SYSTEM SUMMARY

GENERAL

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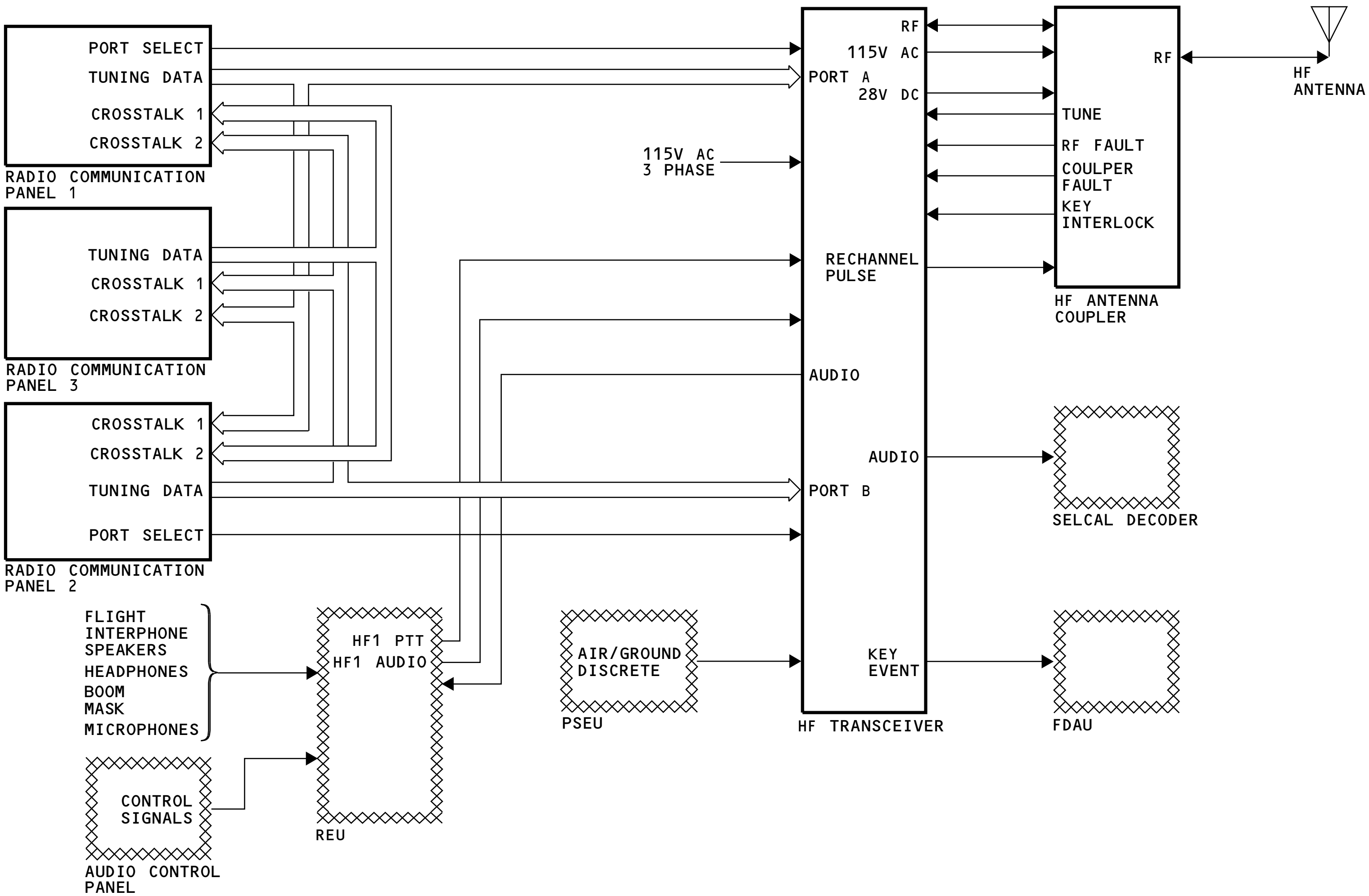

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HF COMMUNICATION SYSTEM - SYSTEM SUMMARY

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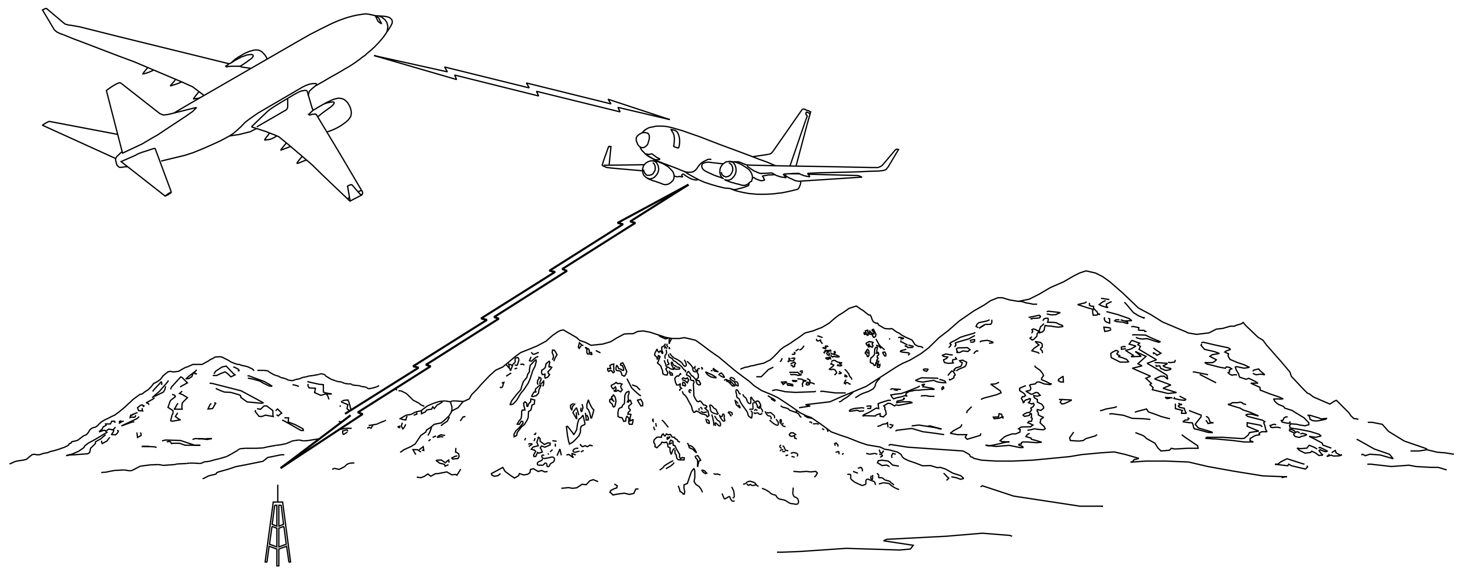
VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION

General

The very high frequency (VHF) communication system supplies communication over line-of-sight distances. It gives communication between airplanes or between ground stations and airplanes.

Abbreviations and Acronyms

- ACARS - aircraft communications addressing and reporting system
- ACP - audio control panel
- AM - amplitude modulation
- ARINC - Aeronautical Radio Incorporated
- BITE - built-in test equipment
- comm - communication
- EEC - electronic equipment compartment
- FDAU - flight data acquisition unit
- FDR - flight data recorder
- freq - frequency
- I/C - interphone communication
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- mic - microphone
- MSEC - milli-second
- PSEU - proximity switch electronics unit
- PTT - push-to-talk
- RCP - radio communication panel
- REU - remote electronics unit
- RF - radio frequency
- R/T - receive/transmit
- SELCAL - selective calling
- sql - squelch
- SSB - single side band
- SSFDR - solid state flight data recorder
- VHF - very high frequency
- VSWR - voltage standing wave ratio
- xmit - transmit



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VERY HIGH FREQUENCY COMMUNICATION SYSTEM - INTRODUCTION

VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

General

The VHF communication system supplies the flight crew with voice and data line-of-sight communication. The VHF communication system can be used to communicate between airplanes and between airplanes and ground stations.

The VHF communication radio is tunable in the frequency range of 118.000 MHz to 136.990 MHz. The VHF radio is used to transmit and receive voice communication.

The VHF communication system operates in the frequency range of 118.000 MHz to 136.990 MHz. The 8.33 kHz spacing is only available for these frequency ranges:

- 118.000 to 121.400
- 121.600 to 123.050
- 123.150 to 136.475.

System Components

The VHF communication system has these components:

- Radio communication panel (RCP)
- VHF transceiver
- VHF antenna.

The RCP supplies selected frequency signals to tune the VHF transceivers. You can use the RCP to select the frequency of any VHF communication radio.

The VHF transceiver transmit circuits modulate an RF carrier signal with voice audio. The receive circuits demodulate the incoming RF carrier signal to detect the audio from the RF carrier. The detected audio is used by the flight crew and other airplane systems.

The VHF antenna transmits and receives RF signals.

External Interface

The VHF communication system connects with these components/systems:

- Remote electronics unit (REU)
- Proximity switch electronic unit (PSEU)
- SELCAL decoder unit
- Flight data acquisition unit (FDAU).

System Operation

The control panel sends selected frequency signals to the transceiver. The audio control panel sends radio select signals and receive volume control to the REU.

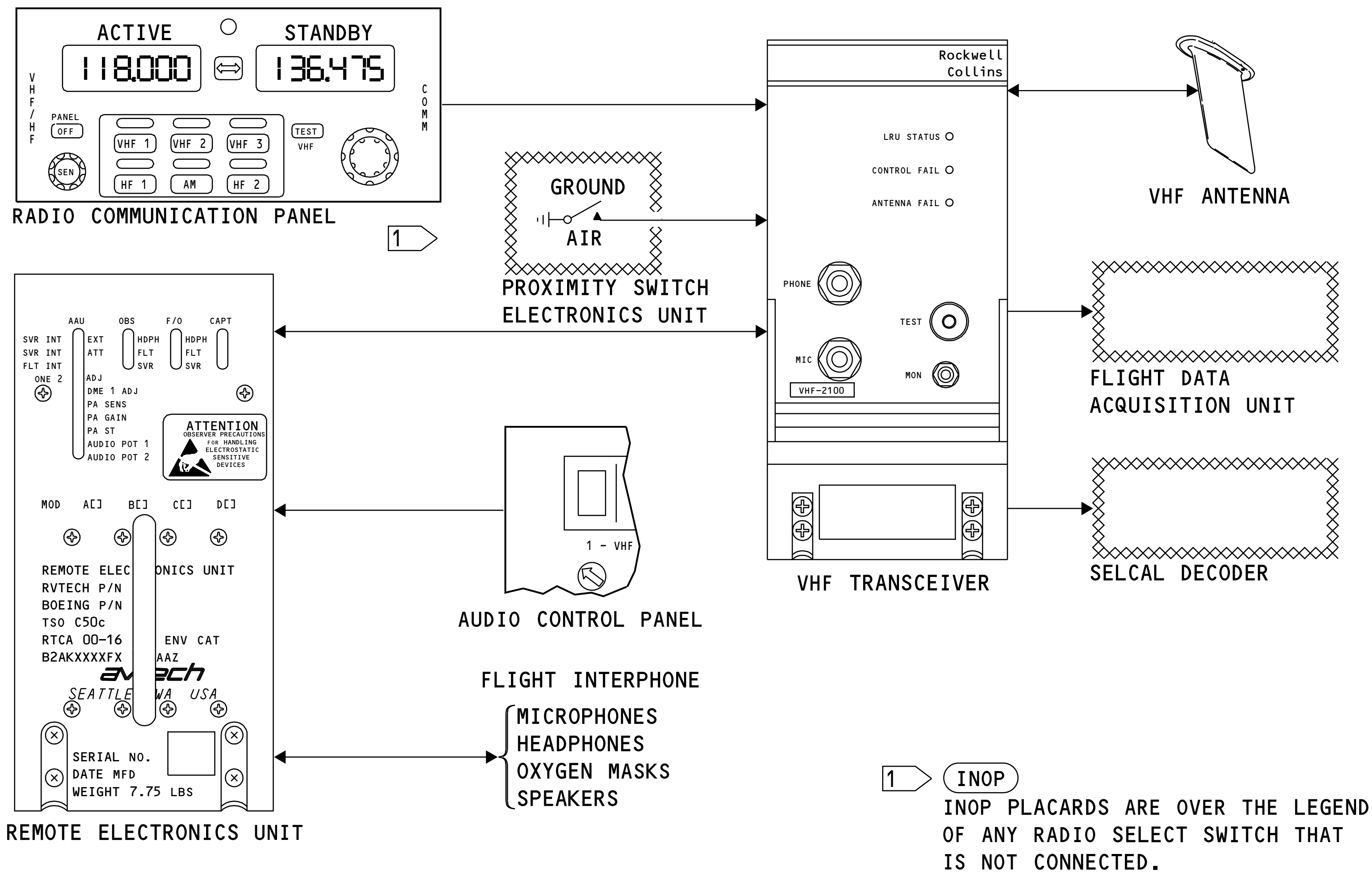
During transmit, microphone audio and PTT signals go to the VHF transceiver through the REU. The transceiver uses the microphone audio to modulate an RF carrier signal made in the transceiver. The transceiver sends the modulated RF signal to the antenna for transmission to other airplanes and ground stations.

During transmit, the flight data acquisition unit receives a PTT signal from the transceiver. The flight data acquisition unit uses the PTT for key event marking to record the transmit event.

During receive operation, the antenna receives a modulated RF signal and sends it to the transceiver. The transceiver demodulates or removes the audio information from the RF carrier. The received audio goes from the VHF transceiver through the REU to the flight interphone speakers and headsets.

The SELCAL decoder unit receives audio from the VHF transceiver. The SELCAL decoder unit monitors the audio for SELCAL calls that come from the ground station.

The VHF transceiver receives an air/ground discrete from the PSEU. The VHF transceiver uses the discrete to calculate flight legs for internal fault memory.



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VHF COMMUNICATION SYSTEM - GENERAL DESCRIPTION

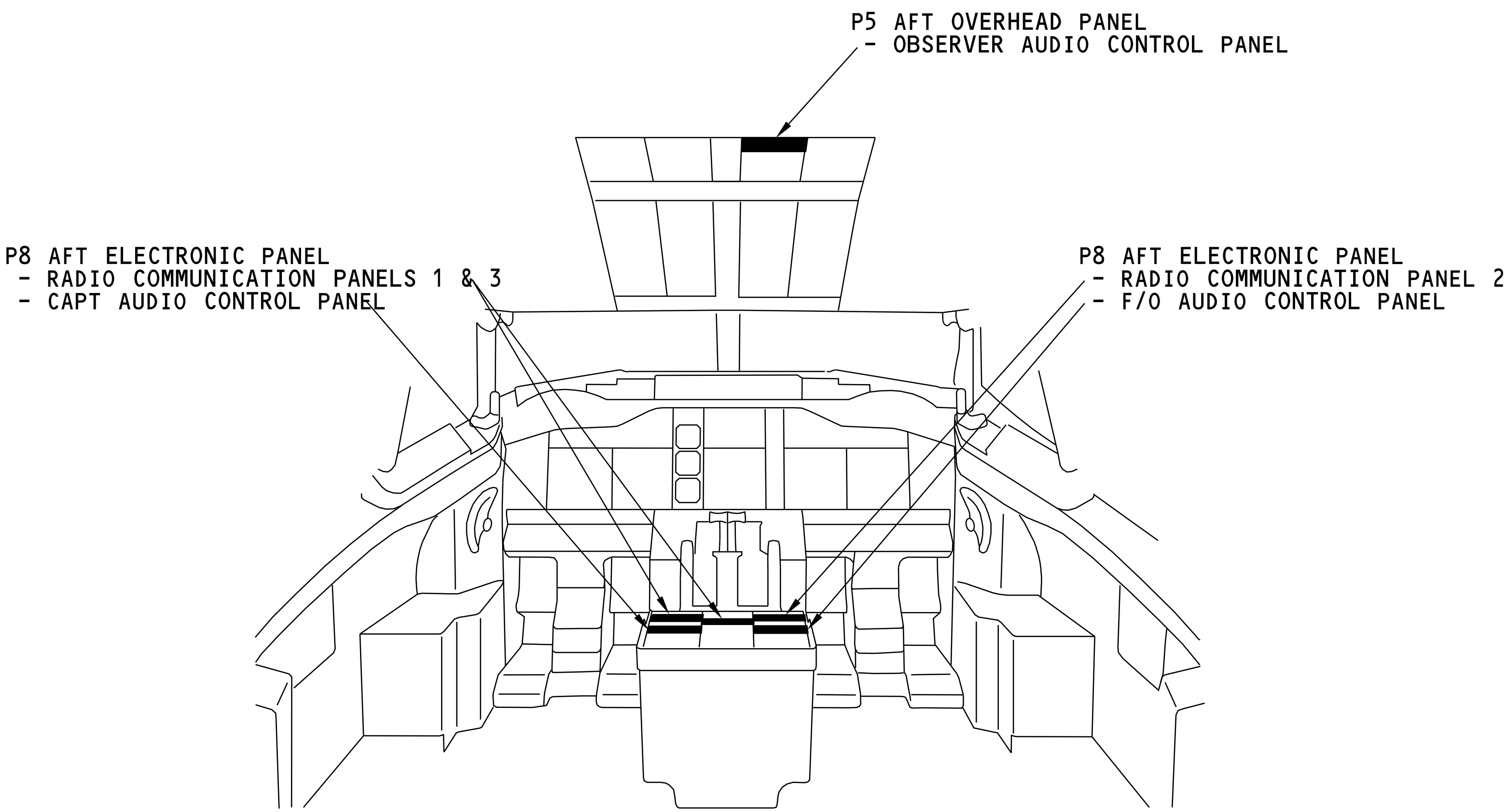
VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

Flight Compartment

The radio communication panels are on the P8 aft electronic panel.

The audio control panels (ACPs) are part of the flight interphone system. The ACPs have an interface with the VHF communication system through the REU. The captain and first officer ACPs are on the P8 aft electronics panel. The first observer ACP is on the P5 aft overhead panel.

The audio control panels (ACPs) are part of the flight interphone system. The ACPs have an interface with the VHF communication system through the REU. The captain, first officer, and first observer ACPs are on the P8 aft electronic panel.



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VHF COMMUNICATION SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

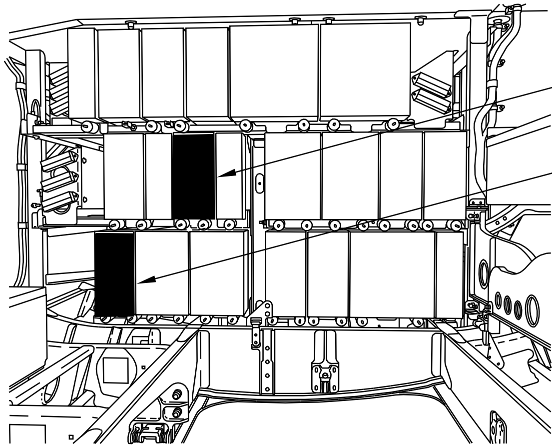
VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS

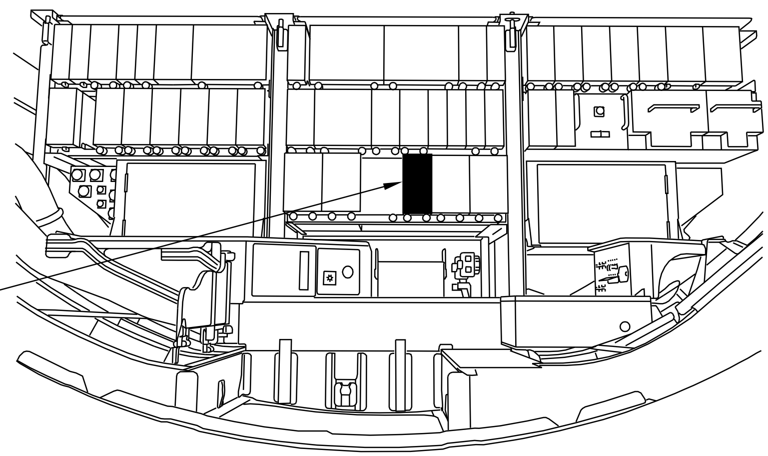
Electronic Equipment Compartment

VHF transceiver 1 is on the E1-3 shelf.

VHF transceiver 2 is on the E1-5 shelf.

VHF transceiver 3 is on the E3-3 shelf.





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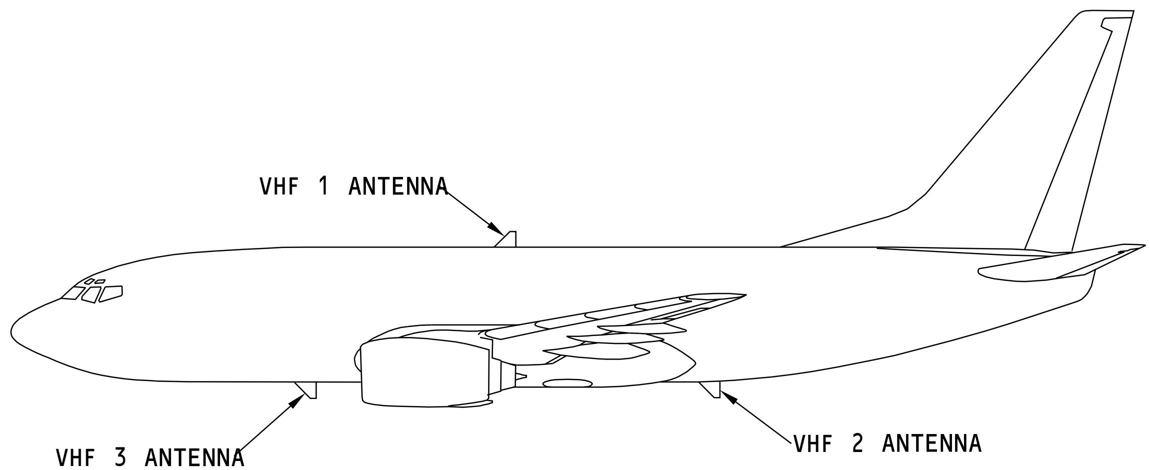
VHF COMMUNICATION SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT (EEC) COMPONENT LOCATIONS

VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

General

The VHF antennas are on the top and the bottom of the airplane fuselage on the centerline.



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VHF COMMUNICATION SYSTEM - ANTENNA COMPONENT LOCATIONS

VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES

Power

The 28v dc standby bus supplies power to the VHF 1 transceiver and radio communication panel (RCP) 1.

VHF 1 Transceiver

The VHF 1 transceiver has an interface with these components:

- RCP 1, 2, and 3
- VHF antenna
- Proximity switch electronics unit
- Remote electronics unit
- SELCAL decoder unit
- Flight data acquisition.

Radio Communication Panel

RCP 1 supplies frequency information to the VHF 1 transceiver on an ARINC 429 bus to port A. RCP 2 supplies frequency information to the VHF 1 transceiver on an ARINC 429 bus to port B. RCP 3 can supply frequency data to the VHF 1 transceiver through RCP 1 or 2. For more information about tuning interfaces, see VHF Communication System - Tuning Interfaces.

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the control panel to provide the capability to tune VHF frequencies at 8.33 kHz spacing.

VHF Antenna

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

External Interfaces

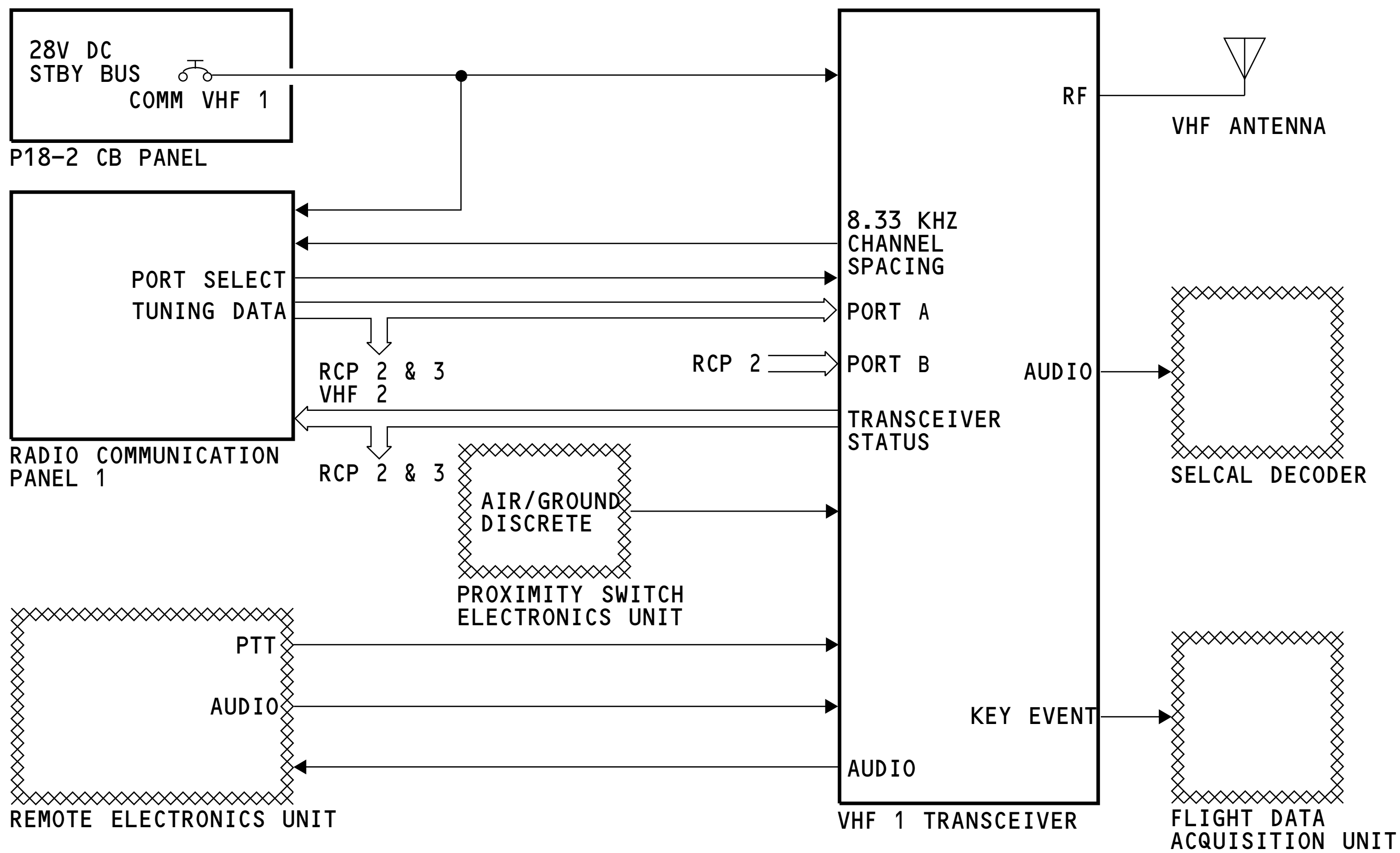
The VHF 1 transceiver has an interface with components from other airplane systems.

The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew microphone (mic) audio to the transceiver to be transmitted. It also sends a PTT to start the transceiver transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.



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VHF COMMUNICATION SYSTEM - VHF 1 TRANSCEIVER INTERFACES

VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES

Power

The dc bus 2 supplies 28v dc power to the VHF 2 transceiver and radio communication panel (RCP) 2.

VHF 2 Transceiver

The VHF 2 transceiver has an interface with these components:

- RCP 1, 2, and 3
- VHF antenna
- Proximity switch electronics unit
- Remote electronics unit
- SELCAL decoder unit
- Flight data acquisition.

Radio Communication Panel

RCP 2 supplies frequency information to the VHF 2 transceiver on an ARINC 429 bus to port A. RCP 1 supplies frequency information to the VHF 2 transceiver on an ARINC 429 bus to port B. RCP 3 can supply frequency data to VHF 2 transceiver through RCP 1 or 2. For more information on tuning interfaces, see VHF Communication System - Tuning Interfaces.

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the RCP to provide the capability to tune VHF frequencies at 8.33 kHz spacing.

VHF Antenna

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives incoming RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

External Interfaces

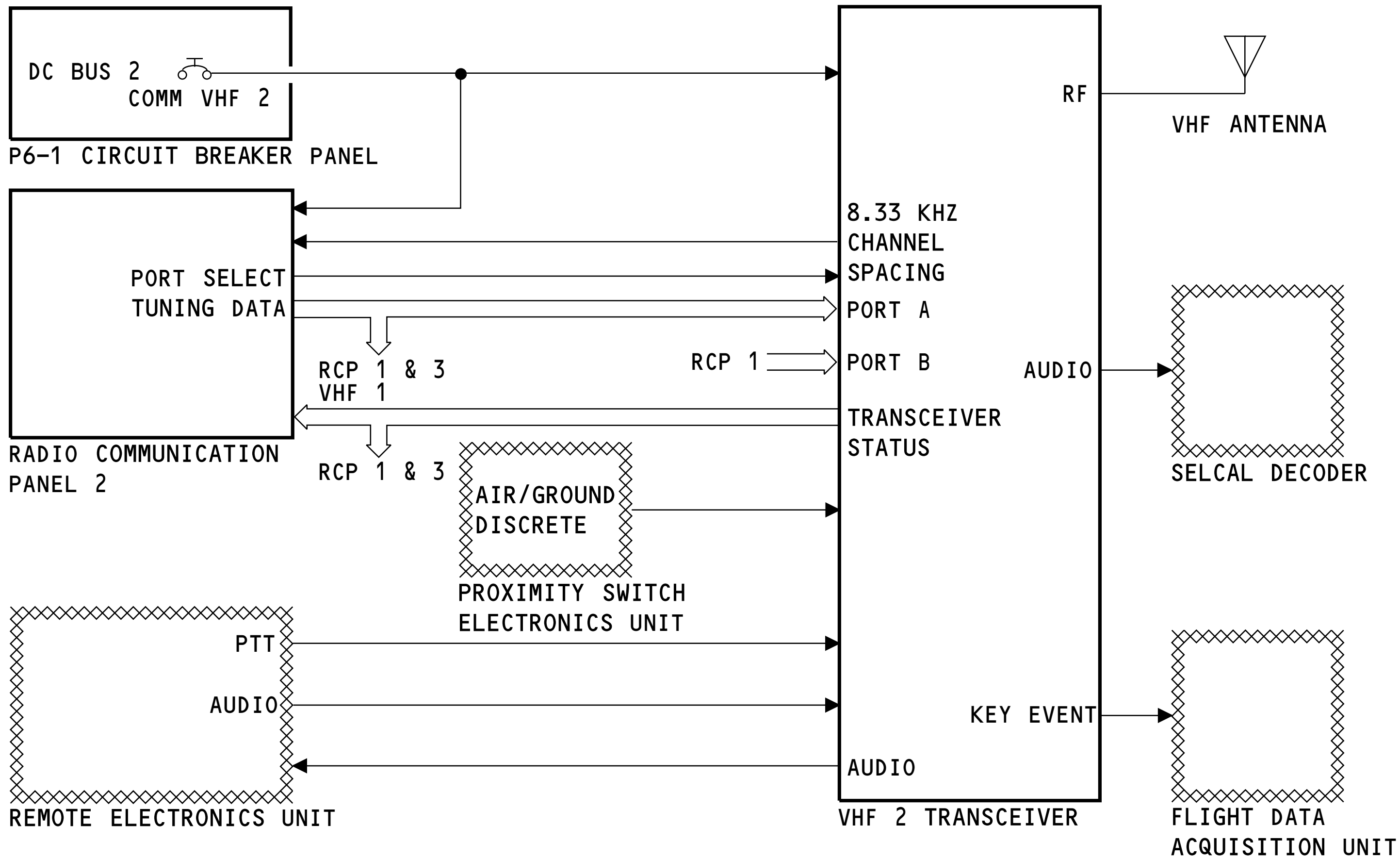
The VHF 2 transceiver has an interface with components from other airplane systems.

The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew audio to the transceiver to be transmitted. It also sends a PTT start the transceiver transmit mode. The transceiver sends side tone and received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.



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VHF COMMUNICATION SYSTEM - VHF 2 TRANSCEIVER INTERFACES

VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES

Power

The DC bus 2 supplies 28v dc power to the VHF 3 transceiver and radio communication panel (RCP) 3.

VHF 3 Transceiver

The VHF 3 transceiver has an interface with these components:

- RCP 1, 2, and 3
- VHF antenna
- Proximity switch electronics unit
- Remote electronics unit
- SELCAL decoder unit
- ACARS communications management unit
- Flight data acquisition unit.
- Voice protection relay (IDU controlled or RTP controlled)

Radio Communication Panel

RCP 3 supplies frequency information to the VHF 3 transceiver on an ARINC 429/750 bus to port B. For more information on tuning interfaces see VHF Communication System - Tuning Interfaces.

The VHF transceiver supplies the status of the transceiver to the RCPs.

The transceiver sends a ground to the radio control panel to give the capability to tune VHF frequencies at 8.33 kHz spacing.

VHF Antenna

The VHF antenna receives an RF signal from the VHF transceiver and transmits the RF signal to other airplane and ground VHF communication systems. The antenna also receives RF signals and sends the RF signals to the VHF transceiver. The transceiver demodulates or detects the audio from the RF carrier signal.

External Interfaces

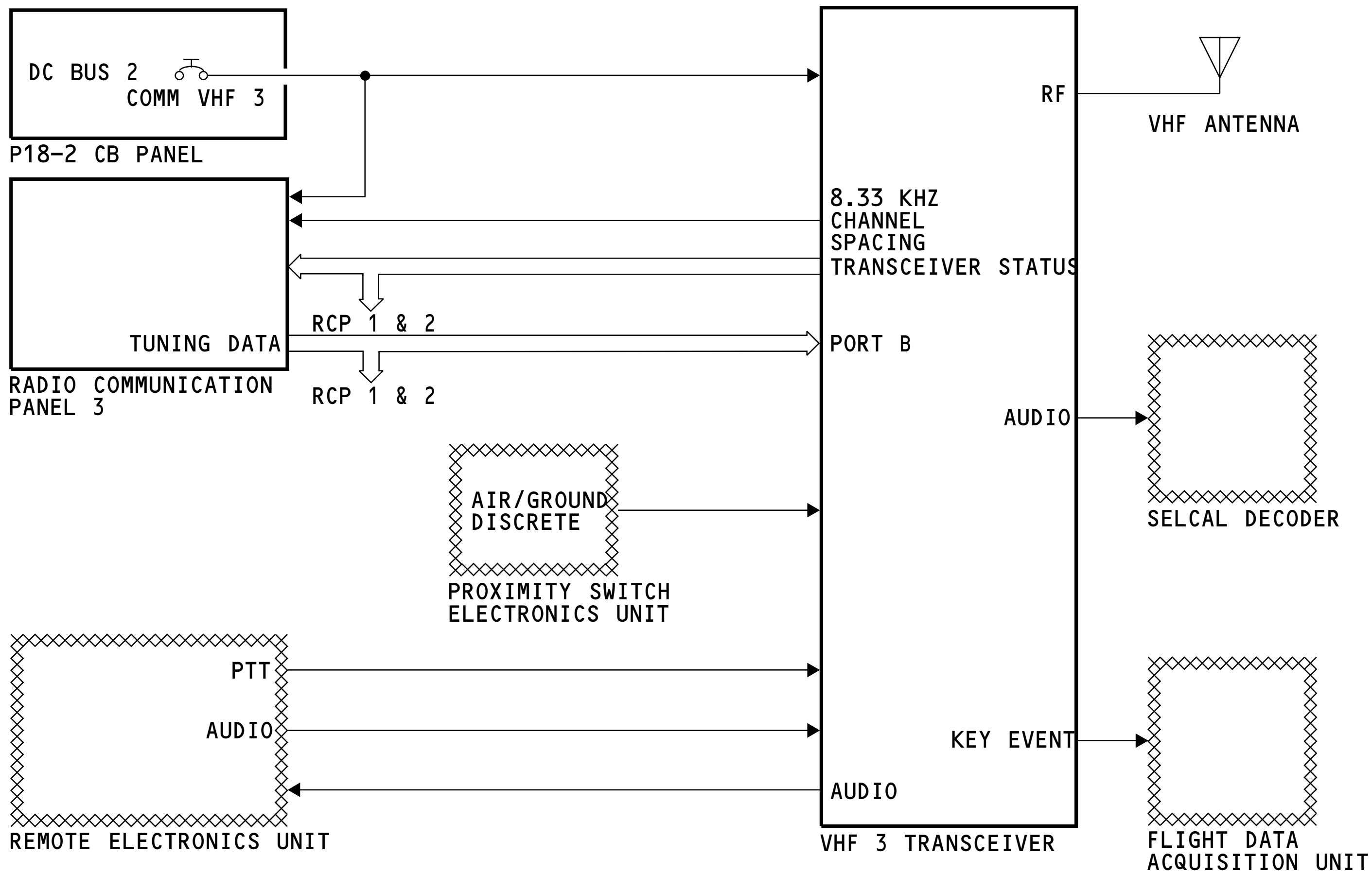
The VHF 3 transceiver has an interface with components from other airplane systems.

The proximity switch electronic unit sends a ground signal to increase the flight leg count to track fault history.

The remote electronics unit sends flight crew audio to the transceiver to be transmitted. It also sends a PTT to start the transceivers transmit mode. The transceiver sends received audio to the REU for the flight interphone system.

The transceiver sends received audio to the SELCAL decoder. The SELCAL decoder isolates the SELCAL code from voice audio.

The flight data acquisition unit receives a PTT from the transceiver for key event marking.



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VHF COMMUNICATION SYSTEM - VHF 3 TRANSCEIVER INTERFACES

VHF COMMUNICATION SYSTEM - TUNING INTERFACES

General

The VHF communication system uses data buses to share tuning information between the radio communication panels (RCPs) and the communication transceivers.

Tuning Bus

Each RCP has one ARINC 429 output bus.

The RCPs send tuning data to the communication transceivers. Any RCP can tune any transceiver.

Each RCP sends tuning data and status to the other radio communication panels. This keeps the tuning data synchronized and lets any RCP tune any transceiver.

The RCP keeps the tuning data in memory. Usually, the RCP uses the tuning data from its memory to send on the output bus.

The RCP can connect the CROSSTALK 1 bus directly to the output bus. This occurs for these RCP conditions:

- RCP does not have power
- RCP is OFF
- RCP is failed.

Port Select Discrete

RCP 1 and 2 send the port select discretes to the transceivers.

Each transceiver has two tuning data input ports, port A and port B. The transceiver uses the port select discrete to select the input port. A grounded port select discrete causes the transceiver to use port A. An open port select discrete causes the transceiver to use port B.

Training Information Point

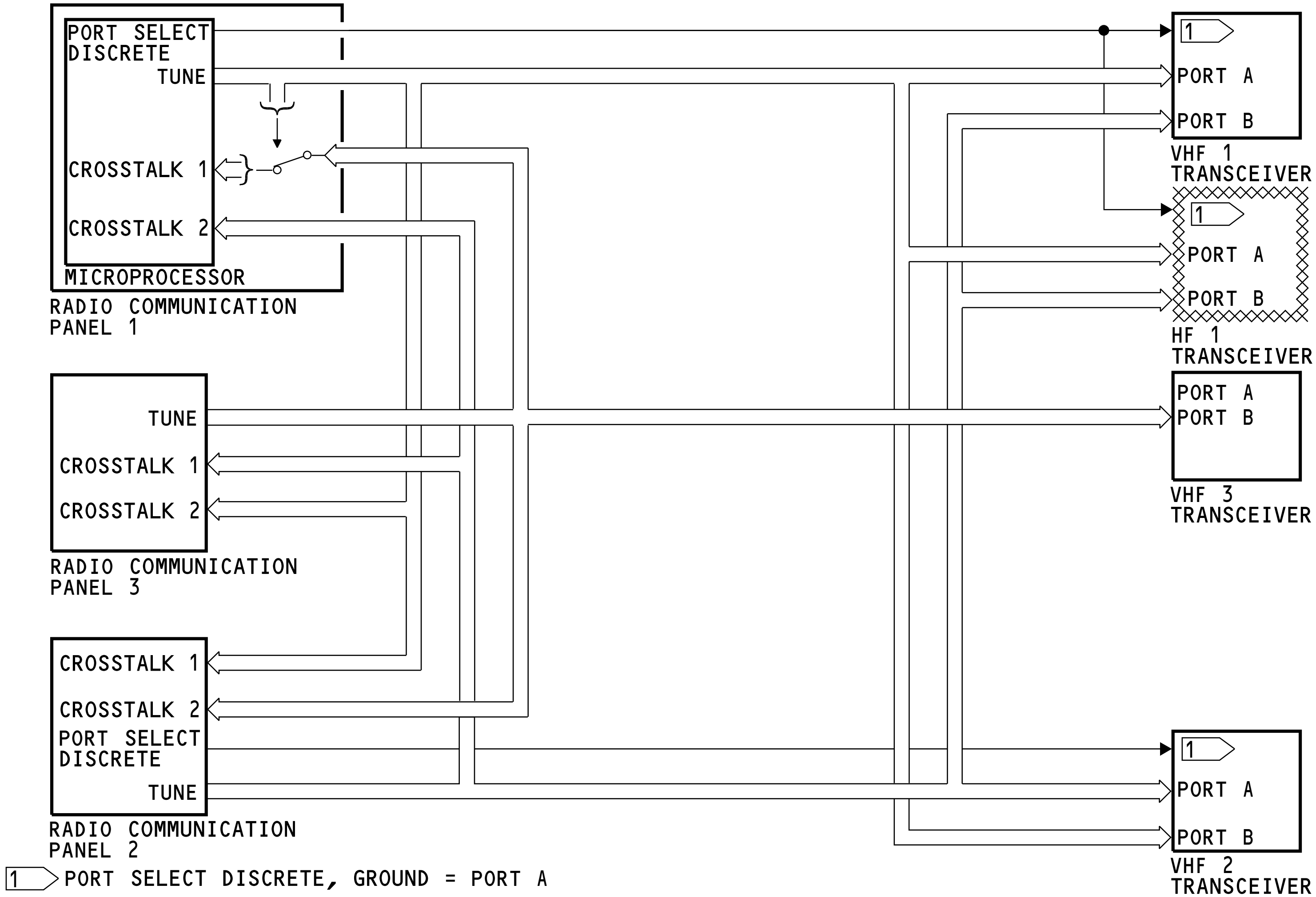
These are the RCP VHF radio selections when the airplane receives power and there are no RCP faults:

- RCP 1 - VHF 1
- RCP 3 - VHF 3
- RCP 2 - VHF 2.

If RCP 1 fails, you can tune the VHF 1 transceiver with RCP 2 or 3. RCP 1 port select discrete changes from ground to open, and RCP 2 sends tuning data to input port B. RCP 3 sends tuning data on CROSSTALK 2 bus which connects to RCP 2. RCP 2 sends this tuning data to the VHF 1 transceiver on the output TUNE bus.

If RCP 2 fails, you can tune the VHF 2 transceiver with RCP 1 or 3. RCP 2 port select discrete changes from ground to open, and RCP 1 sends tuning data to input port B. RCP 3 sends tuning data on CROSSTALK 1 bus which connects to RCP 1. RCP 1 sends this tuning data to the VHF 2 transceiver on the output TUNE bus.

If RCP 3 fails, you can tune the VHF 3 transceiver with RCP 1 or 2. RCP 1 sends tuning data to RCP 2 on CROSSTALK 1 bus. RCP 2 puts RCP 1 tuning data on the output TUNE bus. RCP 2 output TUNE bus is connected to RCP 3 CROSSTALK 1 bus. The bus relay in RCP 3 is closed. The tuning data connects directly to the output TUNE bus and goes to the VHF 3 transceiver. RCP 2 tuning data goes to the RCP 3 CROSSTALK 1 bus and to VHF 3 transceiver on the output TUNE bus.



VHF COMMUNICATION SYSTEM - TUNING INTERFACES

VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL

General

The radio communication panel (RCP) provides these functions:

- VHF and HF radio selection
- Active/standby frequency selection
- HF sensitivity control
- Test initiation to the VHF transceiver
- Mode selection to the HF transceiver
- Off switch.

Controls and Indicators

At power up, RCP 1 controls VHF 1, RCP 2 controls VHF 2, and RCP 3 controls VHF 3.

Any radio communication panel can control any transceiver. Push the radio tuning switch to select the transceiver for that radio communication panel. The light above the switch comes on. Each radio communication panel can tune only one transceiver at a time.

When you select an off-side radio, two off-side tuning lights come on. One light is on the radio communication panel that you use to make the selection. This is the off-side radio. The other light is on radio communication panel of the radio you select. This is the on-side radio.

Set the frequency in the standby frequency indicator. Turn the frequency selectors to set the frequency. The first digit is always 1. The outer knob sets the second two digits (10 MHz and 1MHz) in 1 MHz increments. The inner knob sets the fourth, fifth, and sixth digits (100 kHz, 10 kHz, and 1 kHz) in 8.33 kHz increments.

Push the frequency transfer switch to change the active and standby frequencies.

The HF SENS control sets the RF sensitivity level of the HF transceiver. Rotate the control to adjust the sensitivity of the HF transceiver.

The inactive frequency indicator shows a value between 0 and 99. Maximum sensitivity is 99. Minimum sensitivity is 0. After a delay, the inactive frequency indicator shows the inactive frequency again.

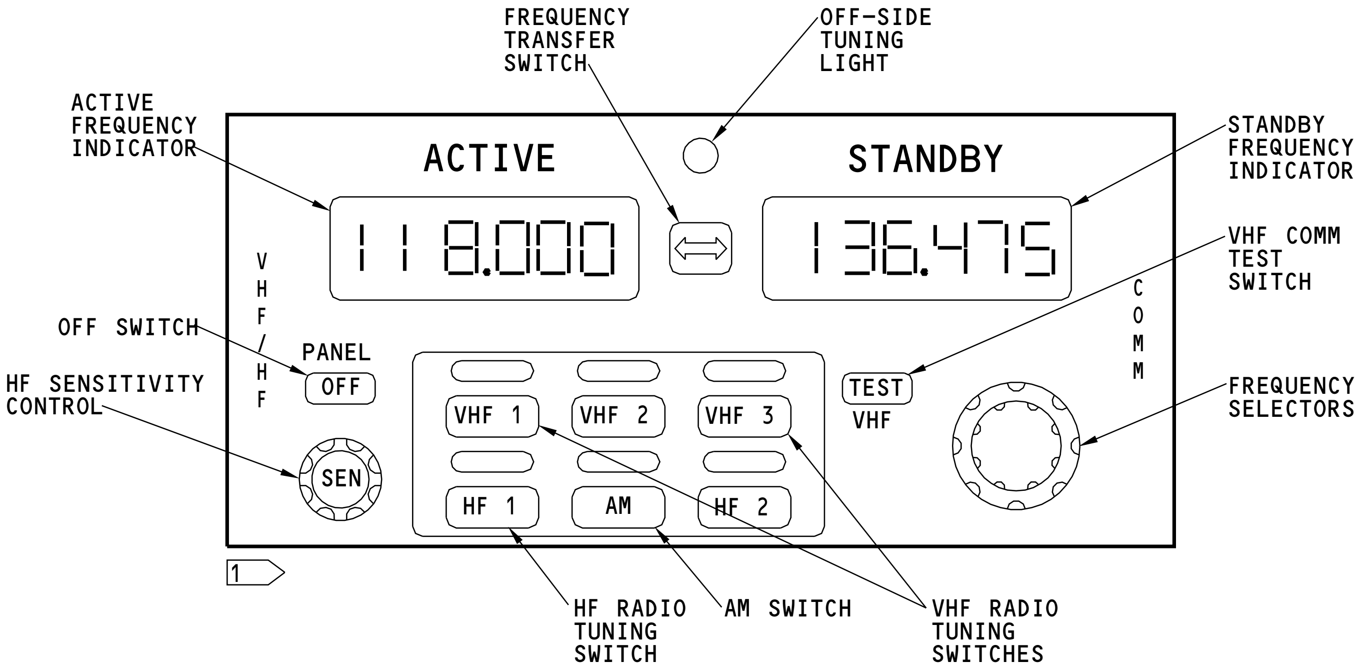
The VHF communication test switch starts a confidence check of the VHF transceiver. Push the VHF communication test switch to stop the squelch in the VHF transceiver. You hear static when you push the switch.

Push the OFF switch to stop the operation of the radio communication panel. The switch shows white when it is off.

BITE

The radio communication panel continuously does a self-test. The frequency indicators show PANEL FAIL when there is an internal failure of the radio communication panel.

The radio communication panel continuously monitors the condition of the transceiver. If the transceiver had failed, the two frequency indicators show FAIL.



1 INOP
INOP PLACARDS ARE OVER THE LEGEND
OF ANY RADIO SELECT SWITCH
THAT IS NOT CONNECTED.

M79577 S0004623039_V1

VHF COMMUNICATION SYSTEM - RADIO COMMUNICATION PANEL

VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER

Purpose

The purpose of the VHF transceiver is to transmit and receive information.

Physical Description

The transceiver is a solid state device. It has these components:

- Power supply
- Frequency synthesizer
- Receiver
- Modulator
- Transmitter
- Microprocessor.

Functional Description

The transceiver has these properties:

- 118.000 to 136.990 MHz frequency range
- 8.33 kHz frequency spacing
- Voice or data operation
- 25 watts output power
- Built-in fault detection and memory.

Power

The transceiver operates with +27.5v dc.

Controls, Indicators, and BITE

Push the TEST switch to start a system self-test. This includes these tests:

- Transceiver self-test
- Input serial tuning word test
- Antenna VSWR test.

The front panel LEDs show the results of the VHF system self-test. These are the front panel LEDs:

- LRU
- CONTROL
- ANTENNA.

The LRU LED shows a failure of the transceiver. The CONTROL LED shows a failure of the ARINC 429 input. The ANTENNA LED shows a failure of the antenna.

All LEDs come on red for two seconds. Then the LRU LED changes to green and the other LEDs stay red for two seconds. Then all 3 LEDs turn off for two seconds and the LRU LED comes on green for 30 seconds while the CONTROL and ANTENNA LEDs remain off.

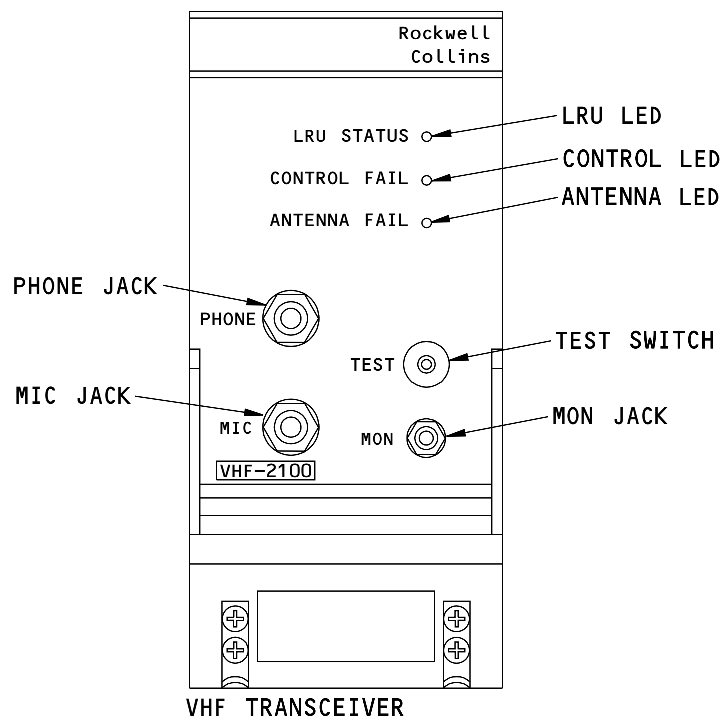
If any of the three LEDs come on red after the self-test a defective condition is present.

Microphone and Headphone Jacks

Microphone (mic) and headphone (phone) jacks give connection points for mic and phone use.

Monitor Jacks

Monitor port to give access to RS-232 debug data being transmitted by the unit.



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VHF COMMUNICATION SYSTEM - VHF TRANSCEIVER

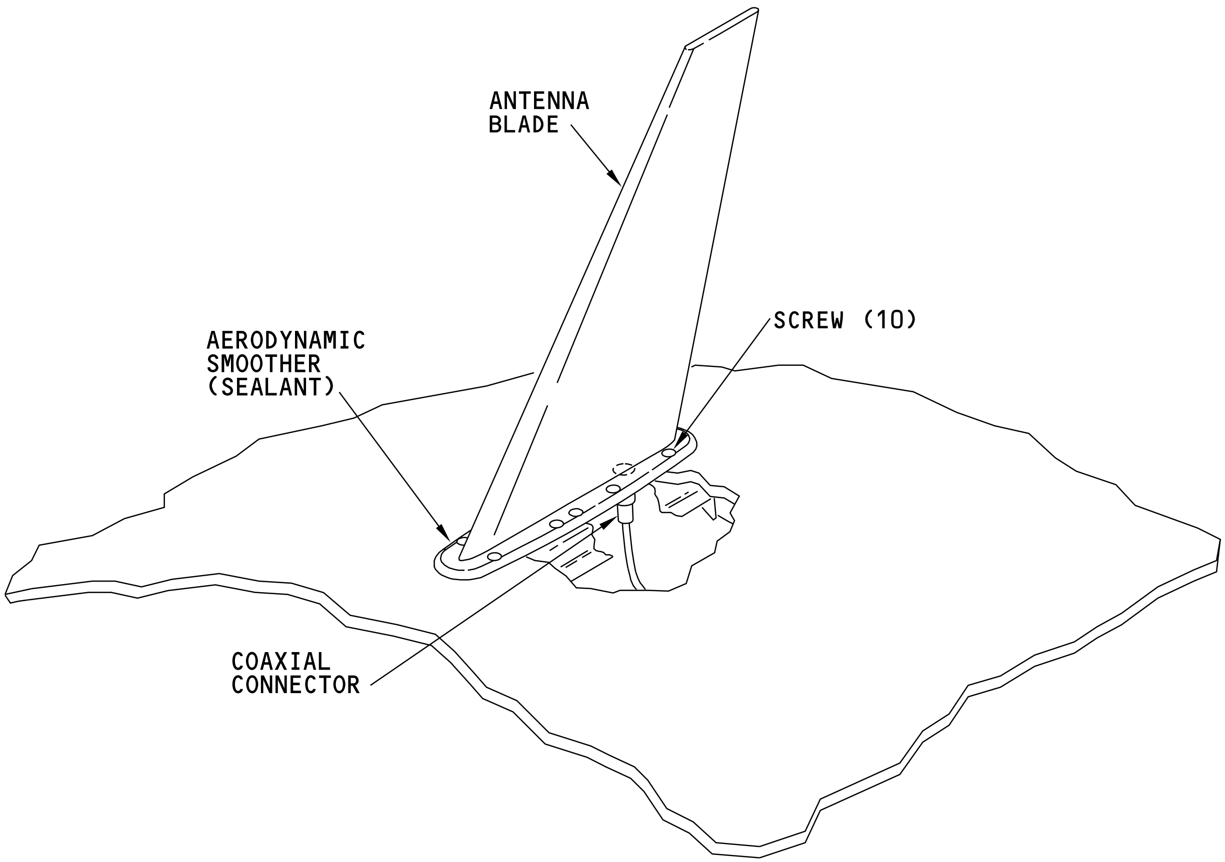
VHF COMMUNICATION SYSTEM - VHF ANTENNA

General Description

The VHF antenna receives and transmits RF signals in the VHF frequency range.

The antenna attaches with 10 screws. There is an aerodynamic smoother around the antenna base. This aerodynamic smoother is a sealant. An o-ring seals the coaxial connector.

NOTE: For the top antenna, the cable can fall through the hole. When you remove the top antenna, make sure you attach the cable to something to prevent this.



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VHF COMMUNICATION SYSTEM - VHF ANTENNA

VHF COMMUNICATION SYSTEM - RECEIVE FUNCTIONAL DESCRIPTION

Receive Operation

The VHF antenna receives RF signals and sends them to the VHF communication transceiver through the coaxial cable. The transceiver sends the RF signal through the receive circuits and then sends the audio to the flight interphone system.

The transceiver also sends data to the selective calling (SELCAL) decoder.

The microprocessor sends the receive frequency to the frequency synthesizer. The frequency synthesizer sets the frequency of the AM receiver.

The microprocessor also sends a logic 1 to the transfer switch when the transceiver is in the receive mode. This closes the transfer switch and sends the RF signal from the antenna to the AM receiver.

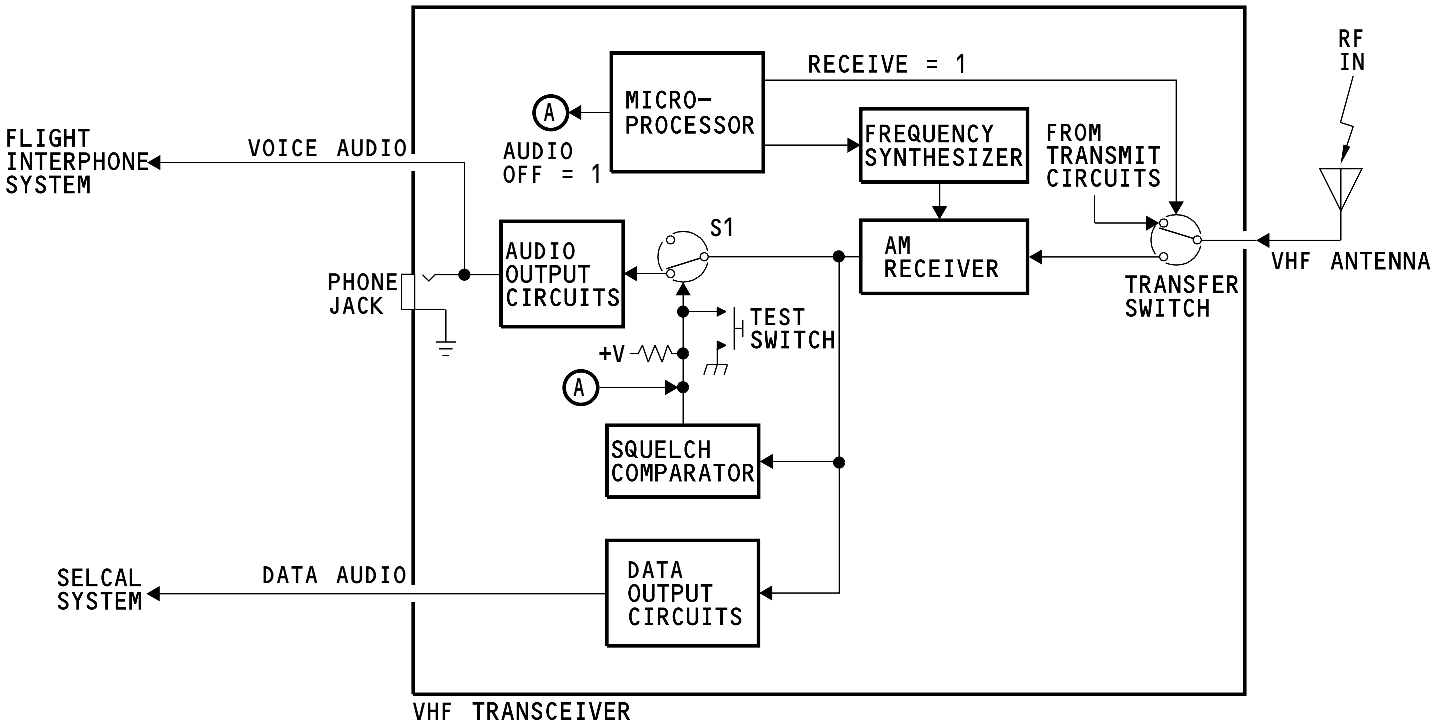
The AM receiver demodulates the RF input and detects the audio signal. The audio output from the AM receiver goes to these circuits:

- Switch S1
- Squelch comparator.

The audio output circuits send the audio signal to the flight interphone system and to the headphone jack.

Do a test of the receive audio circuits with the TEST push button. Push the TEST push button to close switch S1 and send the receive audio to the audio output circuits. This lets the operator hear background noise not normally heard.

The squelch comparator circuit compares the detected audio with a threshold value. If the level of the detected audio is larger than the threshold, the squelch circuits sends a ground to switch S1. Switch S1 closes and sends the audio to the audio output circuits.



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VHF COMMUNICATION SYSTEM - RECEIVE FUNCTIONAL DESCRIPTION

VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

Transmit Operation

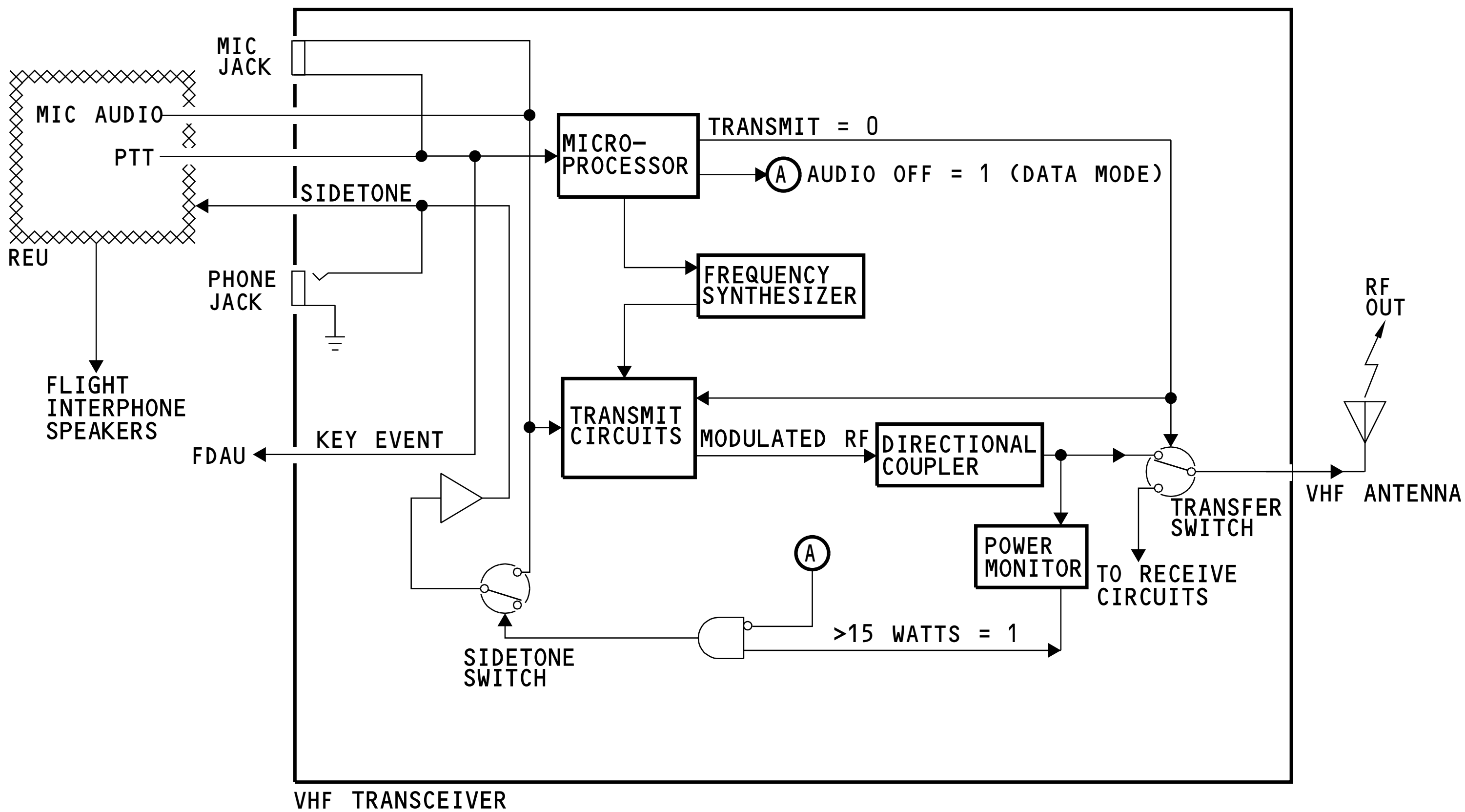
The VHF transceiver receives audio from the remote electronics unit (REU). The transceiver sends the signals through the transmit circuits and then to the antenna for transmission.

During transmission, the microprocessor receives a push-to-talk (PTT) signal from the REU. This causes the microprocessor to send a logic 0 to the transfer switch. The transfer switch connects the output of the transmit circuits to the VHF antenna.

Mic audio from the REU goes to the transmit circuits in the transceiver. The transmit circuits modulate the RF carrier with the mic audio. This makes an amplitude modulated RF signal. The signal goes to the directional coupler and transfer switch. The RF signal goes through the transfer switch and to the antenna. The antenna transmits the RF signal.

The RF output from the directional coupler also goes to the power monitor. The power monitor sends a logic 1 when the output power is larger than 15 watts.

The side tone switch closes when the output power is larger than 15 watts and the transceiver is in the voice mode. The microphone audio goes through the REU to the flight interphone speakers.



M79587 S0004623059_V1

VHF COMMUNICATION SYSTEM - TRANSMIT FUNCTIONAL DESCRIPTION

VHF COMMUNICATION SYSTEM - OPERATION

General

You use these components to operate the VHF radio:

- Microphone or headset
- Control wheel mic switch
- Radio communication panel (RCP)
- Remote mic switch
- Audio control panel.

Receive Operation

You use the radio communication panel and the audio control panel to receive transmissions on the VHF radio.

On the audio control panel, push the receiver volume control for the VHF radio. Turn the control to adjust the volume from the VHF radio.

You hear audio on the headset and the flight interphone speakers. To hear sound from the flight interphone speakers, push the speaker (SPKR) volume control to turn on the speaker. Turn the control to adjust the volume of sound from the speaker.

When you apply power to the airplane, the radio communication panels (RCPs) are on. Initially, RCP 1 tunes VHF 1 and RCP 2 tunes VHF 2. Push the VHF microphone selector switch for the VHF radio you want to use. A light above the switch comes on to show which radio the panel controls. When you push the audio control panel microphone selector switch, the VHF receiver volume control is automatically selected. The frequency indicators show VHF radio frequencies. The VHF transceiver tunes to the frequency in the active frequency indicator.

Use the frequency selectors to tune the radio to a new frequency. The standby frequency display shows the new frequency.

When you are sure the frequency is correct, push the frequency transfer switch. The active frequency indicator shows the new frequency. The VHF radio uses the new frequency.

Listen to the audio from the VHF radio on the speaker or headset. Adjust the volume control switches on the audio control panel for a comfortable sound level.

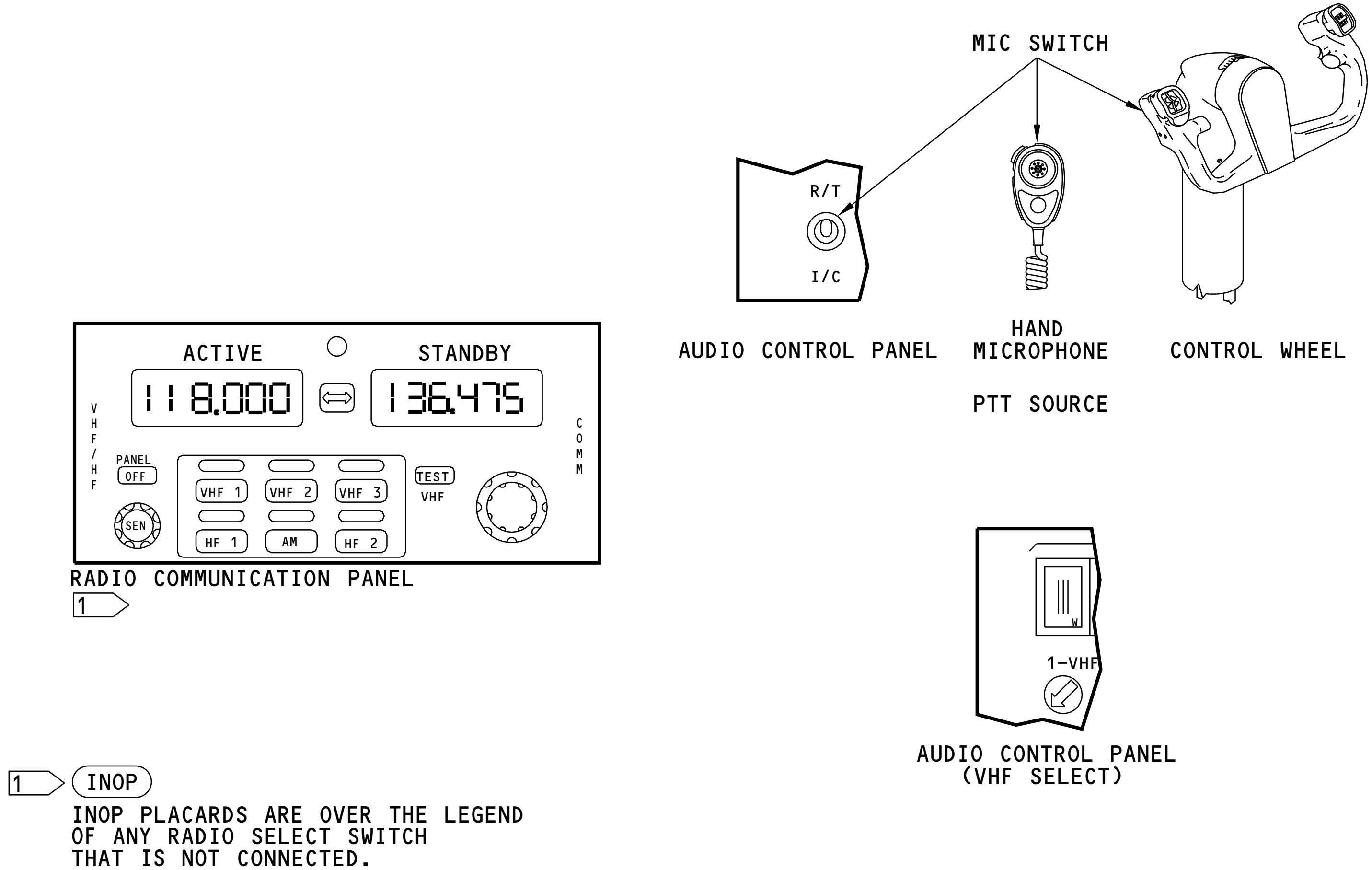
Transmit Operation

Make sure the active frequency indicator shows the frequency you want to transmit. Make sure the frequency you select is a valid transmit frequency.

Push the microphone selector switch on the audio control panel for the VHF radio.

Listen for transmissions on the frequency you selected. When the frequency is clear and you want to transmit a message, key the mic and speak into it. You hear sidetone in the headphone and muted sidetone from the speaker. The flight interphone system mutes the sidetone to the speaker when you use the boom mic or the hand mic.

You can continue to transmit and receive on the frequency you selected.



M79592 S0004623062_V1

VHF COMMUNICATION SYSTEM - OPERATION

VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BUILT IN TEST

General

The VHF transceiver has built-in test equipment (BITE). You start the test on the front of the VHF transceiver.

When you start the test, the built-in test equipment examines the input from the control panel, the internal circuits and processors of the transceiver, and the output to the antenna.

Test Operation

When you push the TEST switch, the transceiver does these checks:

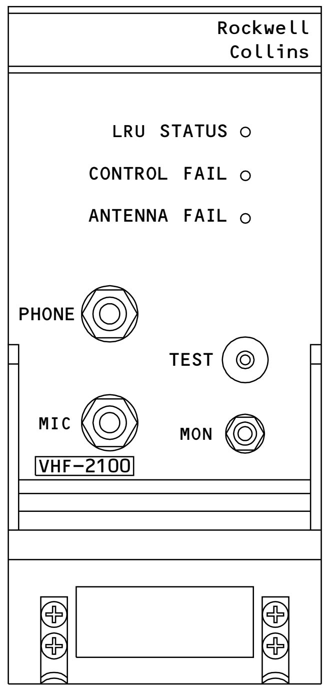
- Monitors the power supply
- Does a test of the memory devices
- Does a test of the input from the control panel
- Does a test of the frequency synthesizer
- Keys the transmitter for 100 ms at 128.475 MHz and does a test of the modulation, power and VSWR (voltage standing wave ratio)
- Does a test of the receiver automatic-gain-control and squelch operation.

Test Indications

Push the TEST switch to start the test. The LRU STATUS, CONTROL FAIL, and ANTENNA FAIL indicators show red for three seconds. Then, the LRU STATUS indicator shows green and the other indicators show red for three more seconds. Then, all indicators go off for three seconds.

Then, the transceiver shows the result of the test for 30 seconds. If the LRU STATUS indicator is green and the CONTROL FAIL and ANTENNA FAIL indicators are not on, then the test result is good. If an indicator is red, then there is a failure.

The red LRU STATUS indicator comes on if there is a failure of the VHF transceiver. The red CONTROL FAIL indicator comes on if there is a failure of the signal from the control panel. The red ANTENNA FAIL comes on if there is a failure of the antenna or the wiring between the transceiver and the antenna.



VHF TRANSCEIVER

TIME, AFTER TEST STARTS	TEST INDICATION			TEST RESULT
	LRU STATUS	CONTROL FAIL	ANTENNA FAIL	
0-3 SECONDS	ON-RED	ON-RED	ON-RED	-
3-6 SECONDS	ON-GREEN	ON-RED	ON-RED	-
6-9 SECONDS	OFF	OFF	OFF	-
9-39 SECONDS	ON-GREEN	OFF	OFF	PASS
	ON-RED	OFF	OFF	XCVR FAULT
	ON-GREEN	ON-RED	OFF	CONTROL PANEL FAULT
	ON-GREEN	OFF	ON-RED	ANTENNA SYSTEM FAULT
39+ SECONDS	OFF	OFF	OFF	-

1302880 S0000220678_V1

VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - BUILT IN TEST

VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - RADIO COMMUNICATION PANEL BITE

Radio Communication Panel BITE Indication

When you push the VHF switch on the radio communication panel (RCP), the display usually shows a VHF radio frequency.

If the built-in test equipment in the RCP senses a failure, you see one of these displays:

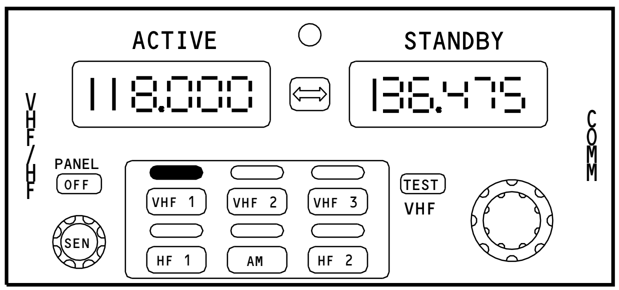
- FAIL FAIL
- PANEL FAIL.

If the RCP receives no signal from the VHF transceiver, both displays show frequency. This occurs for these conditions:

- There is no VHF transceiver
- The VHF transceiver has no power
- The VHF transceiver can not send ARINC 429 data to the RCP
- The RCP does not receive the ARINC 429 data from the VHF transceiver
- Wiring from the VHF transceiver to the RCP is bad.

If the RCP receives the FAIL WARN signal from the VHF transceiver, both displays show FAIL. This occurs when the BITE in the VHF transceiver senses that the transceiver has a failure.

If the RCP has a failure, the active display shows PANEL and the standby display shows FAIL.



RADIO COMMUNICATION PANEL
1

DISPLAY		CONDITION
ACTIVE	STANDBY	
118.000	136.475	VALID FREQUENCY FOR THE VHF RADIO (118.000 TO 136.475) OR THE RCP RECEIVES NO SIGNAL FROM THE VHF TRANSCEIVER
FAIL	FAIL	VHF TRANSCEIVER FAILURE
PANEL	FAIL	RCP FAILURE

1 INOP
INOP PLACARDS ARE OVER THE LEGEND OF ANY RADIO SELECT SWITCH THAT IS NOT CONNECTED.

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VHF COMMUNICATION SYSTEM - TRAINING INFORMATION POINT - RADIO COMMUNICATION PANEL BITE

VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY

General

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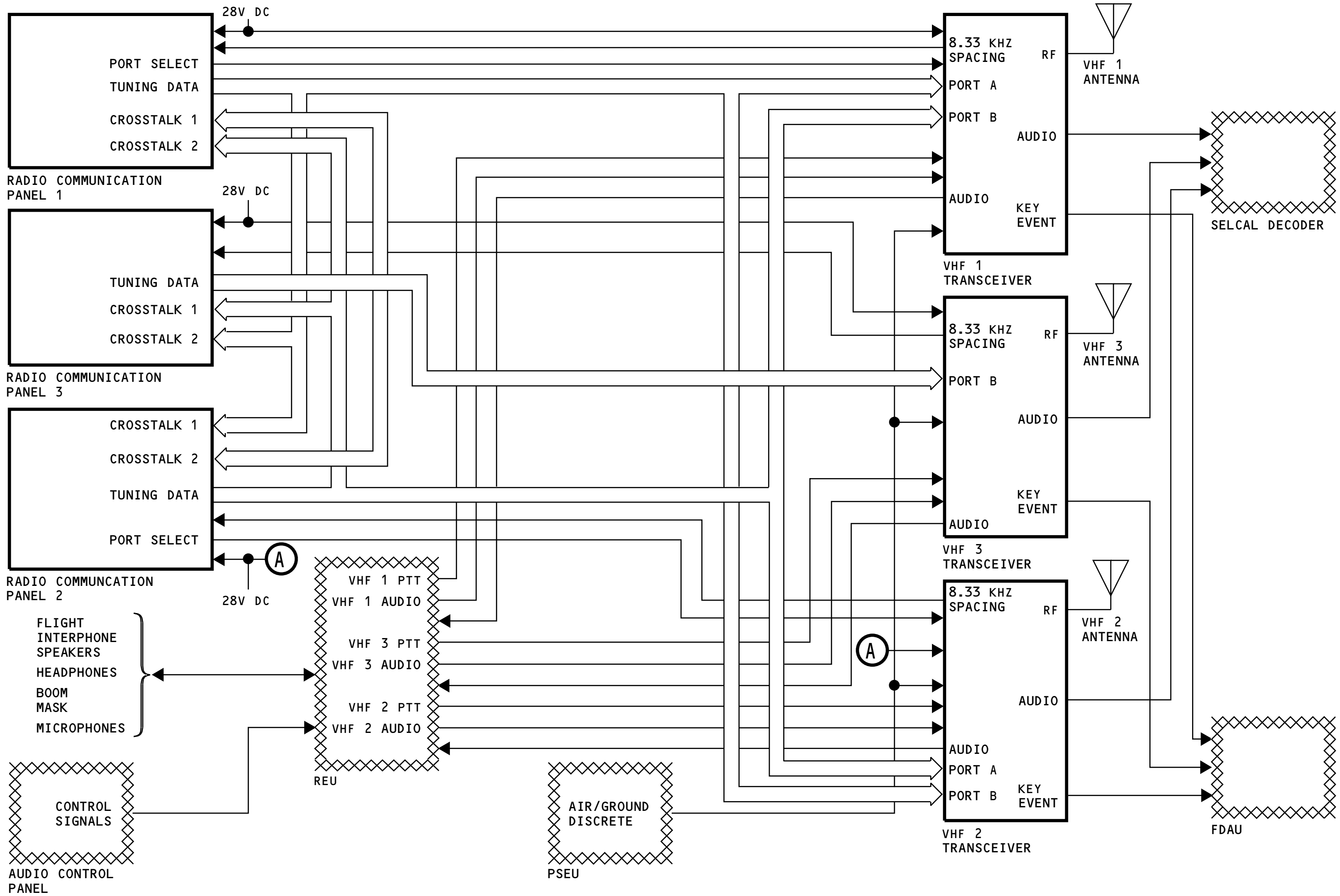

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VHF COMMUNICATION SYSTEM - SYSTEM SUMMARY

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EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION

Purpose

The emergency locator transmitter (ELT) system automatically sends emergency signals when it senses a large change in the airplane velocity.

The flight crew can start the ELT manually at the flight deck with a switch on a control panel.

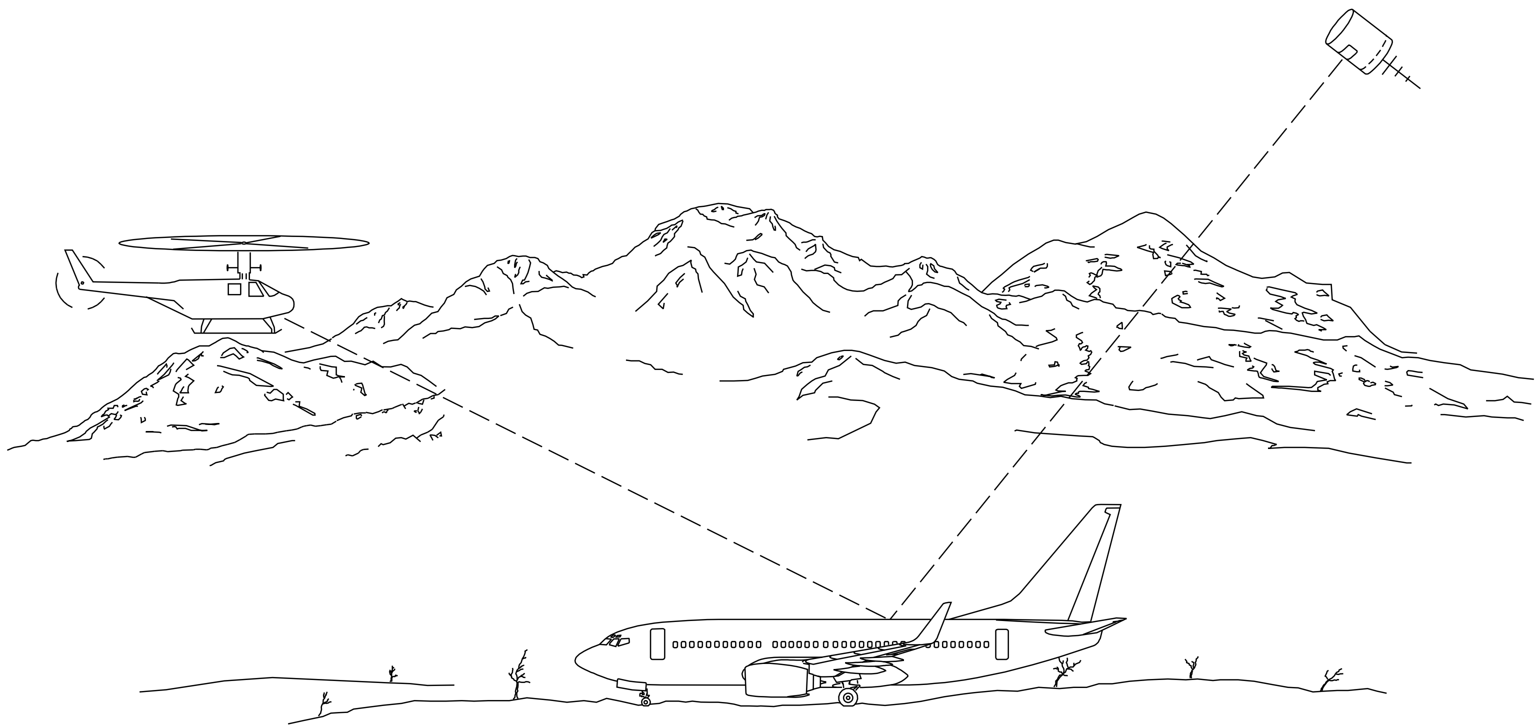
The ELT sends homing signals to search and rescue crews on the VHF and UHF emergency channels.

The ELT also sends emergency signals to satellite receivers. The satellite receivers send this information to ground stations to calculate the location of the emergency signals. This signal also has position coordinates and airplane identification data.

The ELT also sends emergency signals to satellite receivers. The satellite receivers send this information to ground stations to calculate the location of the emergency signals.

Abbreviations and Acronyms

- AIM - aircraft identification module
- ANT - antenna
- C - Celsius
- cm - centimeter
- dc - direct current
- deg - degree
- ELT - emergency locator transmitter
- EXT - external
- in - inch
- kg - kilogram
- lb - pound
- MCC - mission control center
- MHz - megahertz
- mW - milliwatt
- PSM - programmable switch module
- UHF - ultra high frequency
- VHF - very high frequency
- v - volt



M79852 S0004623342_V1

EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTRODUCTION

EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION

General

The emergency locator transmitter (ELT) system has these components:

- Control panel
- Airplane identification module (AIM)
- Program switch module
- Transmitter
- Antenna.

The control panel has a switch that you use to start the ELT manually. It also has a light to show you that the ELT is in operation.

The program switch module sends analog airplane identification to the AIM.

The AIM automatically downloads aircraft identification information (406 MHz message) into the transmitter.

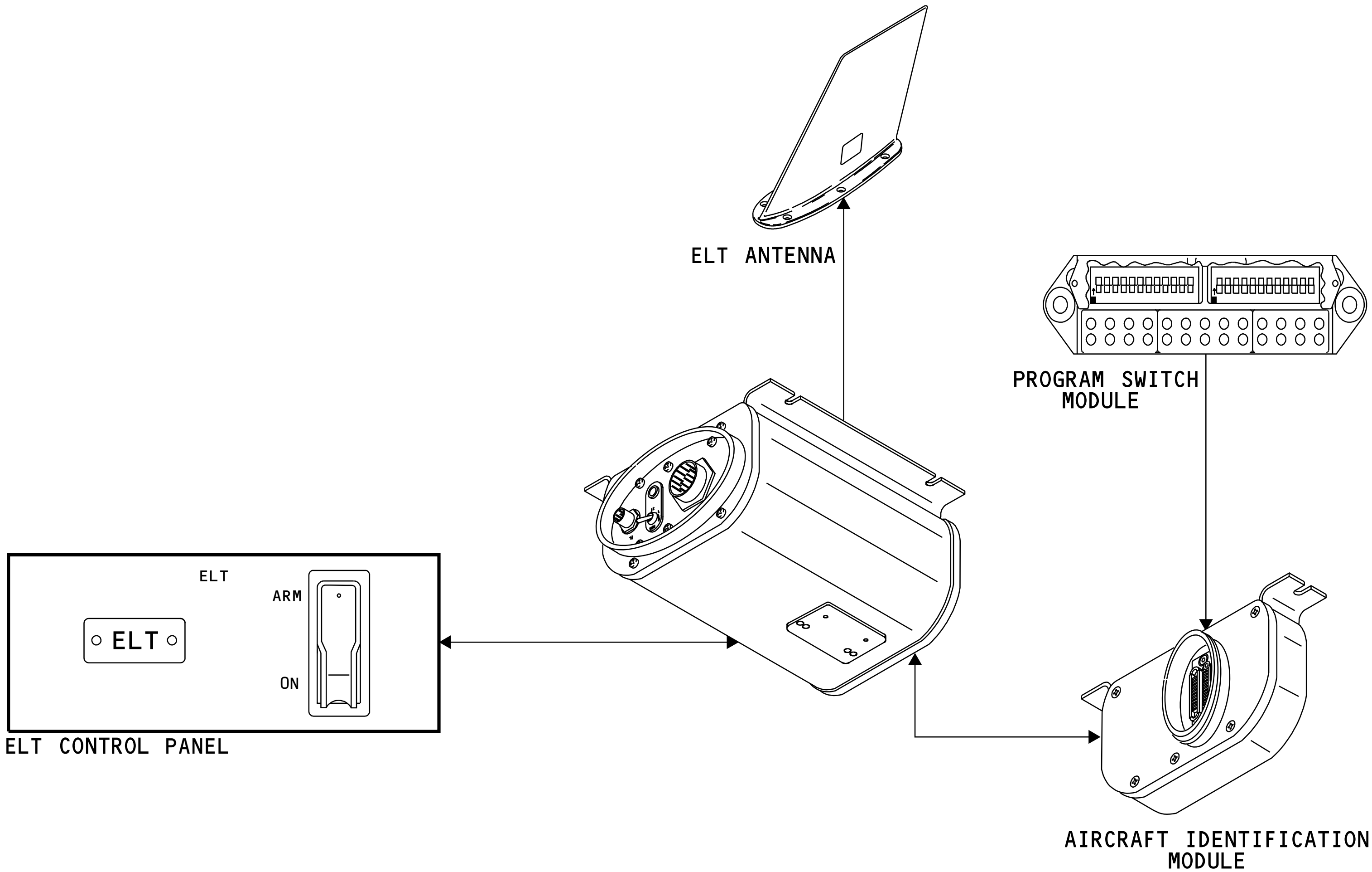
The ELT transmitter has two transmitter sections. One transmitter sends a swept tone on the VHF and UHF emergency channels (121.5 and 243.0 MHz). The other transmitter sends digital data every 50 seconds on the 406 MHz channel.

ELT Connection

The ELT gets control information from the ELT control panel. The control panel sends discrete signals to the ELT to turn the ELT on manually. It also sends a discrete signal to turn off the ELT if it starts to transmit accidentally. To start a self test of the ELT, move the ARM/ON switch to the ON position for less than 15 seconds and then move it back to the ARM position.

The ELT sends the frequency outputs to a blade antenna.

The antenna sends the 121.5/243.0 MHz or 406 MHz transmit signals.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - GENERAL DESCRIPTION

EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS

Flight Compartment

The ELT control panel is on the P5 aft overhead panel.

Passenger Cabin

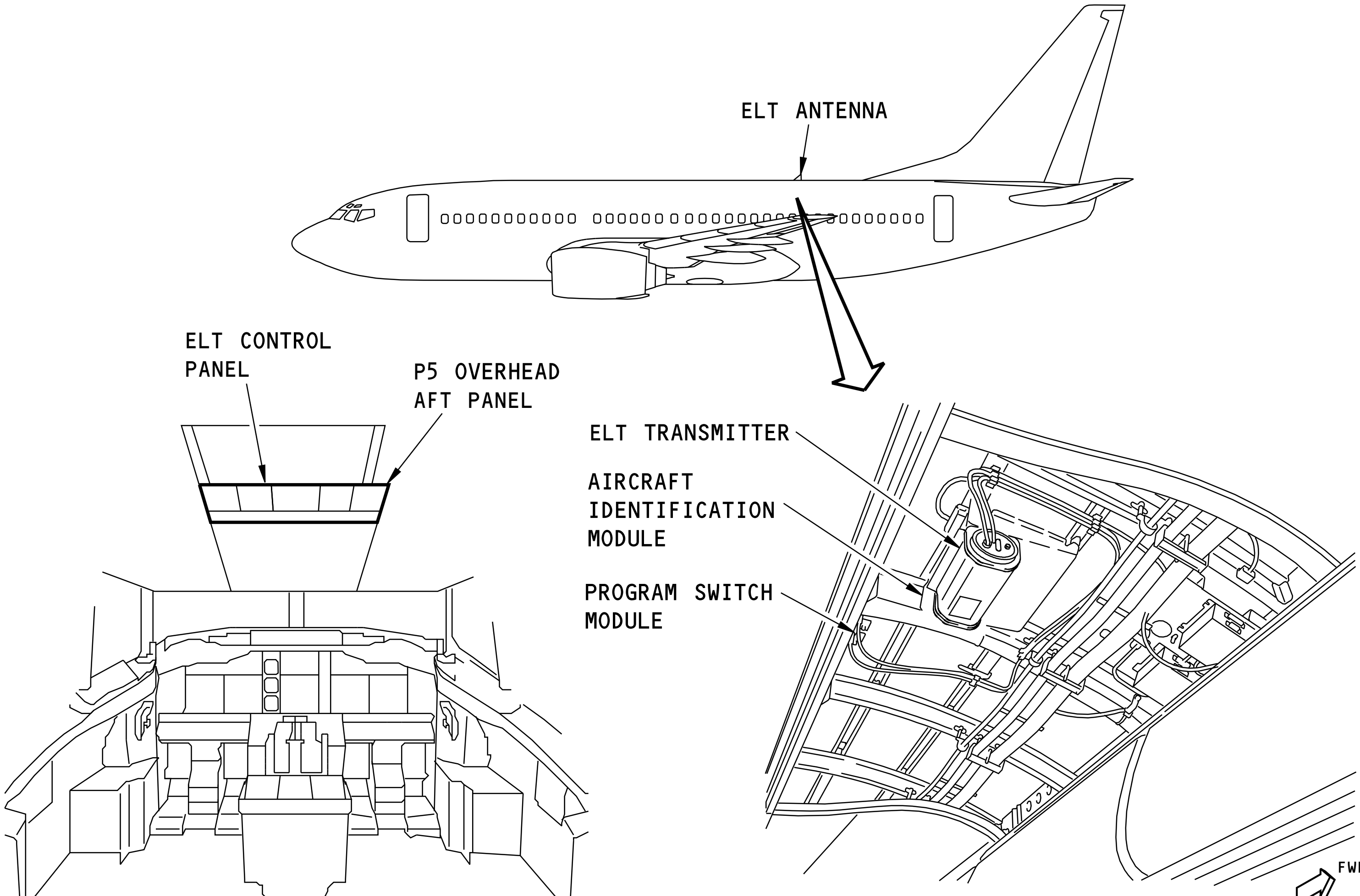
The ELT transmitter is above an access panel in the aft passenger cabin ceiling at station 794.

The aircraft identification module connects to the transmitter but attaches separately to the aircraft structure.

The program switch module is to the right of the ELT transmitter.

Fuselage

The ELT antenna is on top of the fuselage, above and aft of the ELT transmitter at station 795.6.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - COMPONENT LOCATIONS

EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE

Power

The emergency locator transmitter (ELT) control panel gets 28v dc or 16v dc from the master dim and test (MD&T) circuit. This power is for the ELT light.

The ELT uses an internal battery pack. The battery pack has five lithium manganese dioxide cells. The cells connect in series to supply the ELT.

ELT Control Panel

The ELT control panel sends an EXT ON signal to the ELT to start the transmitter. It also sends reset signals to stop the transmitter if it accidentally starts.

The control panel gets the LIGHT signal from the ELT to control the ELT light. It also gets an ELT ON signal to turn on the master caution.

You use the ELT control panel to turn on the ELT or to reset it to the armed mode if there is an accidental activation.

Emergency Locator Transmitter

The ELT supplies these signals:

- ELT ON
- LIGHT
- RF OUT.

The ELT ON and LIGHT signals go to the ELT control panel.

The ELT has two transmitter sections, one for the 121.5/243.0 MHz signal and one for the 406 MHz signal. The two transmitter sections send the RF emergency signals to the ELT antenna on one transmission line.

The ELT receives these signals:

- EXT ON
- RESET 1 and RESET 2
- PWR BAT
- ELT DATA.

The EXT ON signal from the control panel manually starts the transmitter.

The reset signals stop the transmitter if it accidentally starts.

You can hardware select the G-switch to either the North American specification (FAA) or the European specification (JAA).

Aircraft identification module

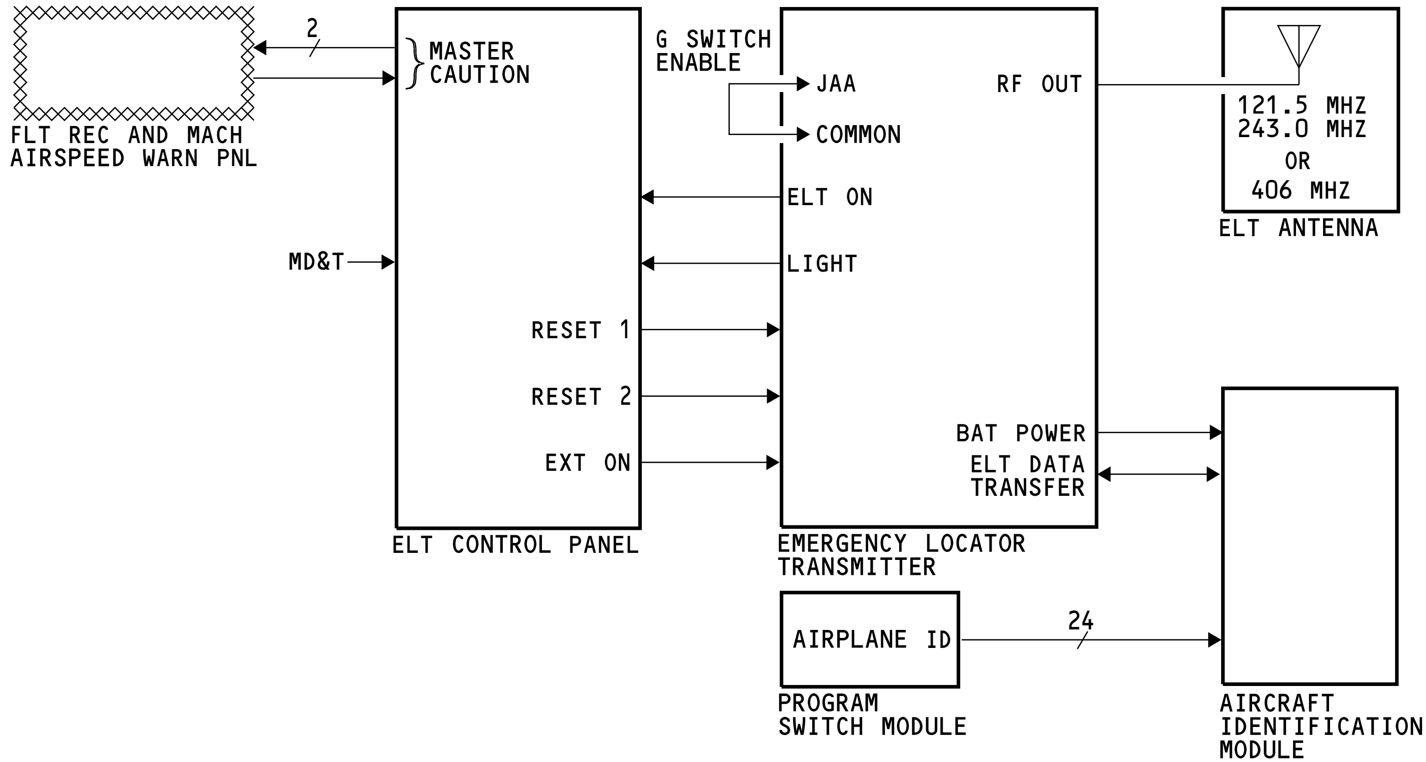
The aircraft identification module (AIM) has an EEPROM that holds the 406 MHz message. When the AIM connects to the transmitter, the 406 MHz message automatically downloads into the transmitter.

Program switch module

The program switch module (PSM) has a series of 24 mechanical switches. It supplies the AIM with the COSPAS-SARSAT 24 bit data for the aircraft address number protocol. For a functional PSM, the AIM must program with a NULL message protocol. If the AIM is programmed with a valid message protocol, the PSM is non-functional.

ELT Antenna

The ELT antenna sends the emergency signals on the VHF and UHF frequencies.



M79863 S0004623356_V1

EMERGENCY LOCATOR TRANSMITTER SYSTEM - INTERFACE

EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL

Purpose

The emergency locator transmitter (ELT) control panel lets you monitor and do a test of the ELT.

You use the emergency locator transmitter (ELT) control panel for these purposes:

- Turn on the ELT
- Reset the ELT after activation
- Set the ELT for automatic operation.

Indication

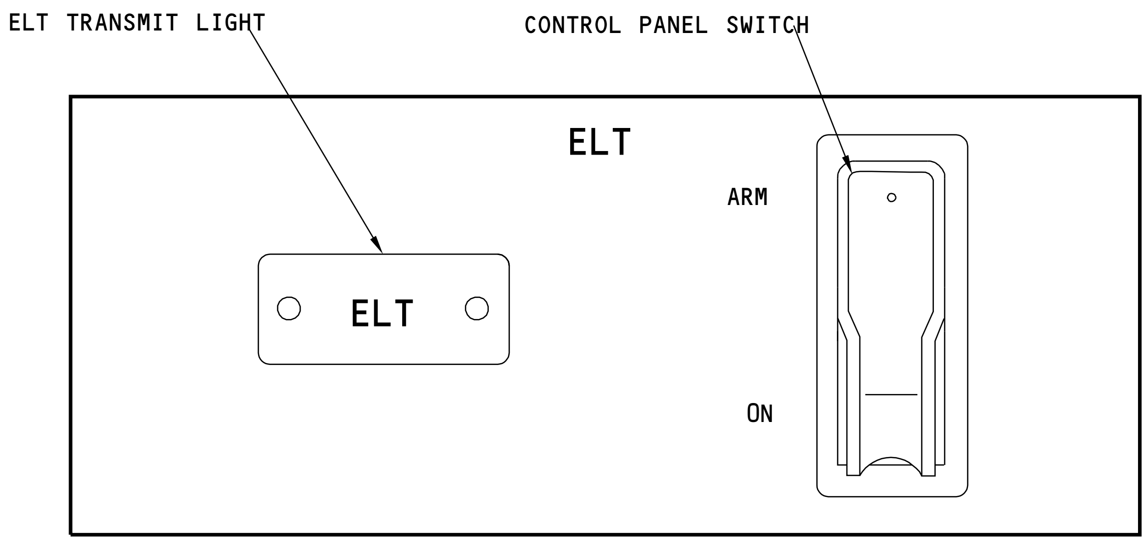
The ELT control panel has an ELT light. The light comes on when the ELT transmits.

Control

The ELT control panel switch has an ON and an ARM position.

The ON position manually turns on the transmitter. The ARM position is the normal position for flight.

The switch has a guard to keep it in the ARM position.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - ELT CONTROL PANEL

EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER

Purpose

The emergency locator transmitter (ELT) sends emergency signals when it sense excessive change in velocity.

When manually or automatically activated, the emergency locator transmitter (ELT) transmits this information:

- 121.5 MHz homing signal
- 243 MHz homing signal.
- 406 MHz aircraft data

The ELT also transmits on 121.5 MHz and 243 MHz continuously except during the 406 MHz transmission. It continues to transmit until the batteries can no longer supply power.

Power

The transmitter does not use aircraft power but has an internal battery pack. The battery pack has five, lithium manganese dioxide batteries connected in series.

Physical Description

The transmitter has five cards that are not line replaceable units. The case is made of an aluminum alloy.

The transmitter has these properties:

- Length - 257 mm (10.14 inches)
- Width - 166 mm (6.54 inches)
- Height - 92 mm (3.62 inches)
- Weight - 3.0 kg (6.6 lbs).

Functional description

The transmitter uses an integrated G-switch to detect a crash and automatically transmits three separate output signals at 121.5 MHz, 246 MHz, and 406 MHz frequencies.

You can set (hardware select) the G-switch to the North American (FAA) or European (JAA) specification.

The transmitter can transmit the 406 MHz digital message using one of these protocols:

- Serialized aviation user protocol
- Aviation user protocol
- 24-bit aircraft address number
- Aircraft operator designator number and serial number
- Serial number protocol.

Front panel

The transmitter front panel has a LED and a toggle switch.

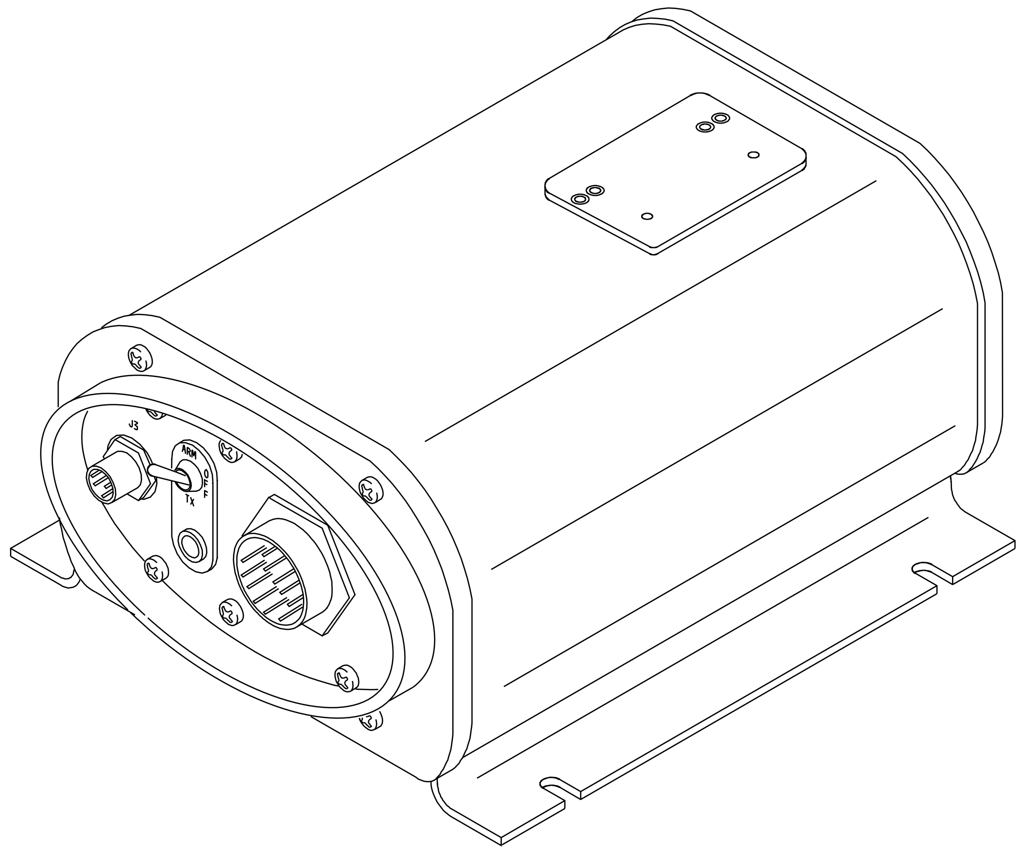
The toggle switch has these positions:

- ARM
- OFF
- TX.

When you set the switch to ARM, the transmitter can detect an activation signal from the G-switch or the ELT control panel. The transmitter also can do a self-test.

When you set the switch to OFF, there is no power from the battery pack to the transmitter. The transmitter can not sense a crash or transmit a rescue signal. Also, the transmitter can not do a self test in this mode.

When you set the switch to TX, the transmitter sends 121.5/243 MHz and 406 MHz rescue signals to the antenna and the LED blinks continuously.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRANSMITTER

EMERGENCY LOCATOR TRANSMITTER SYSTEM - AIRCRAFT IDENTIFICATION MODULE

Purpose

The aircraft identification module (AIM) loads aircraft specific data into the transmitter. It is not necessary to re-program the transmitter.

During the self-test, the AIM downloads the aircraft identification code into the transmitter. It also makes sure the data transferred correctly.

Power

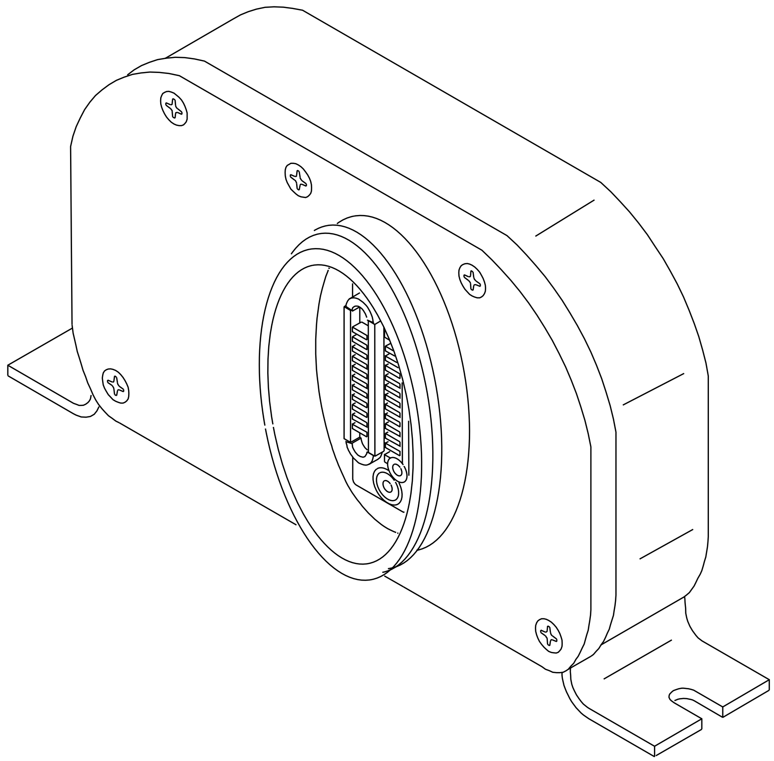
The AIM gets battery power from the transmitter.

Physical description

The AIM case is made of an aluminum alloy.

The AIM has these properties:

- Length - 1.81 inches (46 mm)
- Width - 6.54 inches (166 mm)
- Height - 3.43 inches (87 mm)
- Weight - 1.1 lbs (0.5 kg).



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - AIRCRAFT IDENTIFICATION MODULE

EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA

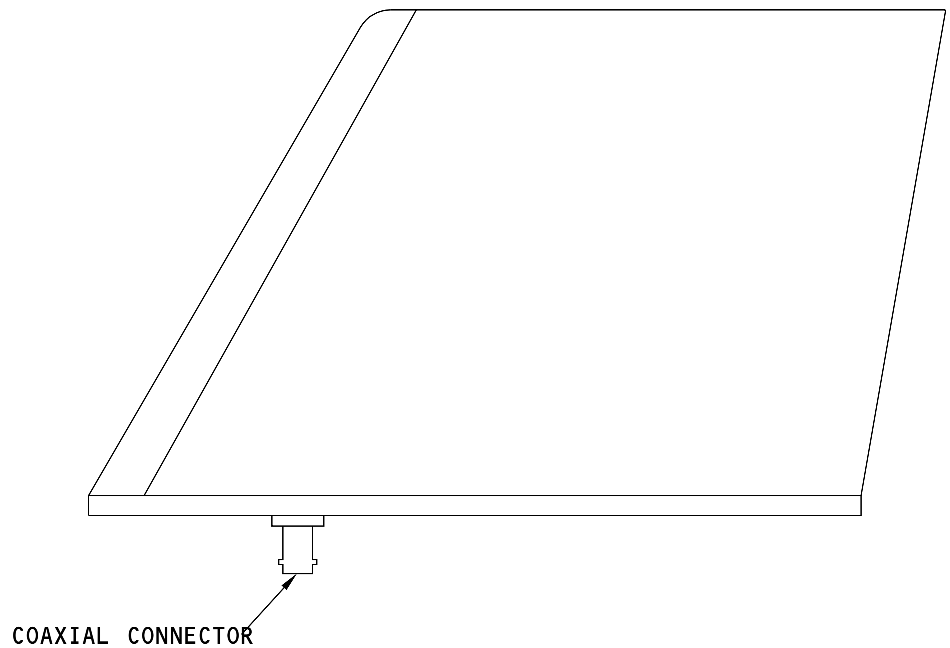
Purpose

The emergency locator transmitter (ELT) antenna sends radio signals in the very high frequency (VHF) and ultra high frequency (UHF) ranges.

Physical description

The antenna is a vertically polarized monopole type with an omnidirectional radiation pattern.

The 121.5 MHz, 243.0 MHz and 406 MHz transmissions come in on the coaxial connector.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - ANTENNA

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EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION

General

The emergency locator transmitter (ELT) has these components:

- 121.5/243 MHz transmitter
- 406 MHz transmitter
- Antenna coupling unit
- I/O and xmtr control
- G-switch
- ON light
- ELT switch
- Battery pack.

121.5/243 MHz transmitter

The 121.5/243.0 MHz transmitter generates the 121.5 MHz and the 243.0 MHz signals. These signals are amplitude modulated, swept-frequency signals. Then, these signals go to the antenna coupling unit.

406 MHz transmitter

The 406 MHz transmitter generates the 406 MHz phase modulated signal and sends it to an amplification circuit and the antenna coupling unit. It also has an EEPROM that stores data for the transmitted message if there is no AIM installed.

Antenna coupling unit

The antenna coupling unit (ACU) combines the three RF output signals from the 121.5/243 and 406 cards into one RF signal. Then, this signal goes to the antenna via a low-loss coaxial cable. The ACU matches the impedance of each RF output signal to the input impedance of the antenna.

I/O and xmtr control

The I/O and xmtr control logic supplies control and data signals between the aircraft identification module (AIM) and the transmitter and the ELT control panel and the transmitter. It also supplies the control and data lines to the 121.5/243 MHz card on the 406 MHz card. It sends +5 volt to the 406 MHz card.

The I/O and xmtr control receives battery power directly from the battery pack.

ELT Transmitter Inputs

The ELT receives these inputs from the control panel:

- EXT ON
- RESET 1
- RESET 2.

The ELT receives the programmed 406 MHz message from the AIM.

ELT Transmitter Outputs

The ELT has these outputs:

- ELT ON
- LIGHT.

The ELT sends the LIGHT and ELT ON signals to the control panel when the ELT transmits.

- The LIGHT signal turns on the ELT light on the control panel.
- The ELT ON signal turns on the master caution lights.

EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION

Normal Operation

In normal operation, the ELT control panel switch is in the ARM position and the ELT transmitter front panel ARM/OFF/TX switch is in the ARM position. In this condition, the ELT is not active. The control panel, the ELT front panel, and the master caution lights are off. The ELT will automatically activate on impact.

ON Operation

To go from normal (ARM) to ON operation, the ELT needs a change of switch position from one of these sources:

- G-switch
- Control panel switch
- ELT front panel switch.

A G-switch jumper wire prevents the ELT from accidental operation while the unit is in transit to the airplane.

The jumper wire arms the G-switch only when the unit front connector is connected. When the switch is armed, the switch changes position when it senses a large change in velocity.

The ELT control panel switch lets you manually start an emergency transmission if the toggle switch on the transmitter is set to ARM. When you put the ELT control panel switch to ON, an EXT ON signal goes to the ELT. This signal manually starts the transmitter from the ELT control panel.

When you set the toggle switch on the transmitter to TX you can manually start the transmitter. The position of the ELT control panel switch is not relevant.

The 121.5/243.0 MHz transmitter operates until the battery pack becomes unserviceable. The battery pack power lasts for at least 50 hours.

The processor synchronizes the operation of both transmitters. Only one transmitter is on at a time. Every 50 seconds, the processor turns off the 121.5/243.0 MHz transmission for a short time (440 msec) and commands the 406.0 MHz-transmitter to send its signal.

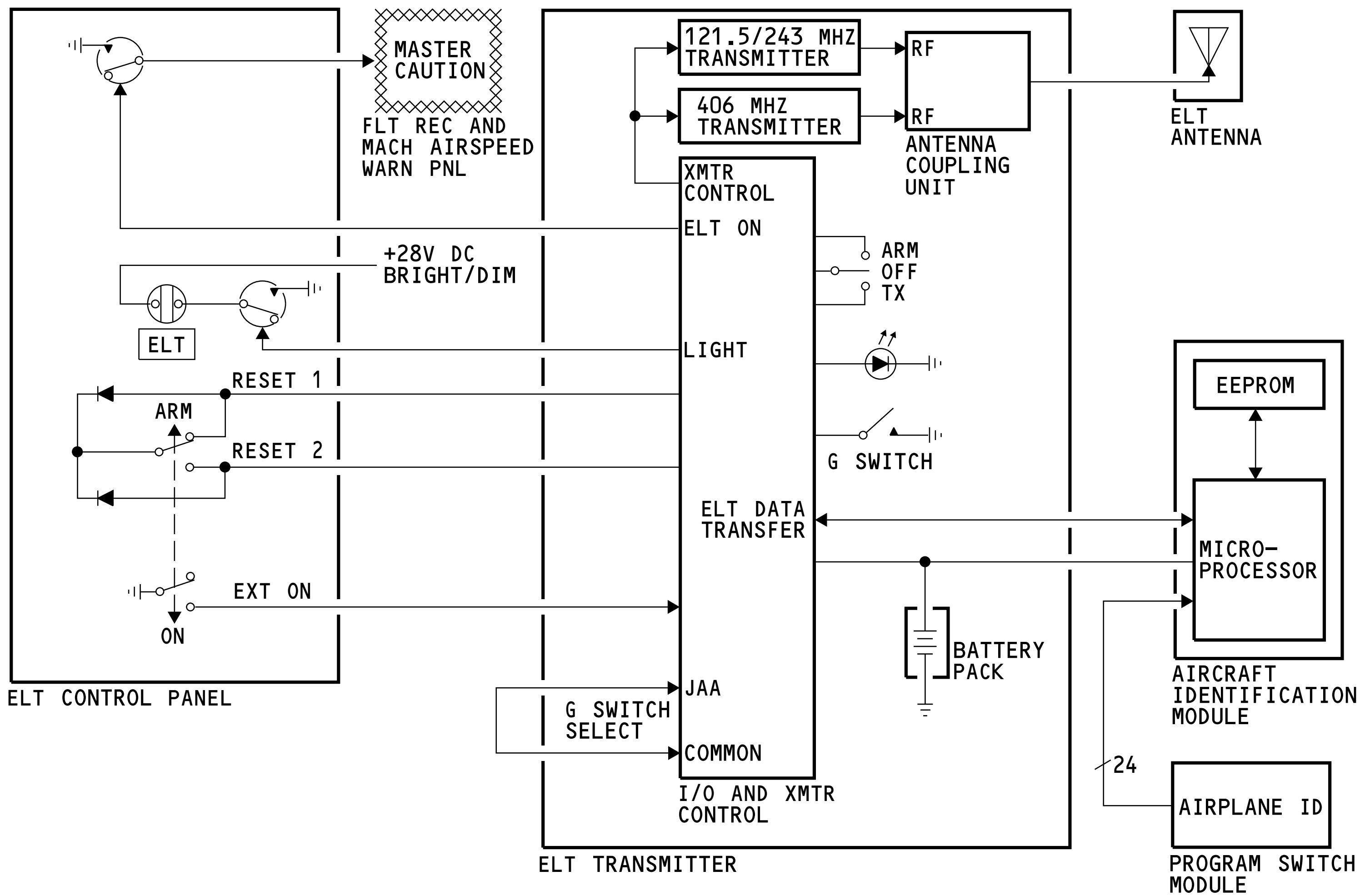
Satellites detect the emergency signals from the 406.0 MHz-transmitter and send this information to ground stations. The ground stations receive and process the emergency signals to find the location of the ELT. The 406.0 MHz-transmitter gives a location precision of approximately 2 Km.

Reset

The RESET 1 and RESET 2 inputs from the control panel let you turn off the transmitter when it comes on accidently. These inputs turn off the transmitter when you put the control panel switch from ARM to ON and immediately back to ARM.

You can also turn off the transmitter when you put the ELT front panel switch from ARM to OFF and immediately back to ARM.

NOTE: The ELT can not be reset if one of the two control-panel-switch or ELT front-panel-switch is in the “ON” position.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - FUNCTIONAL DESCRIPTION

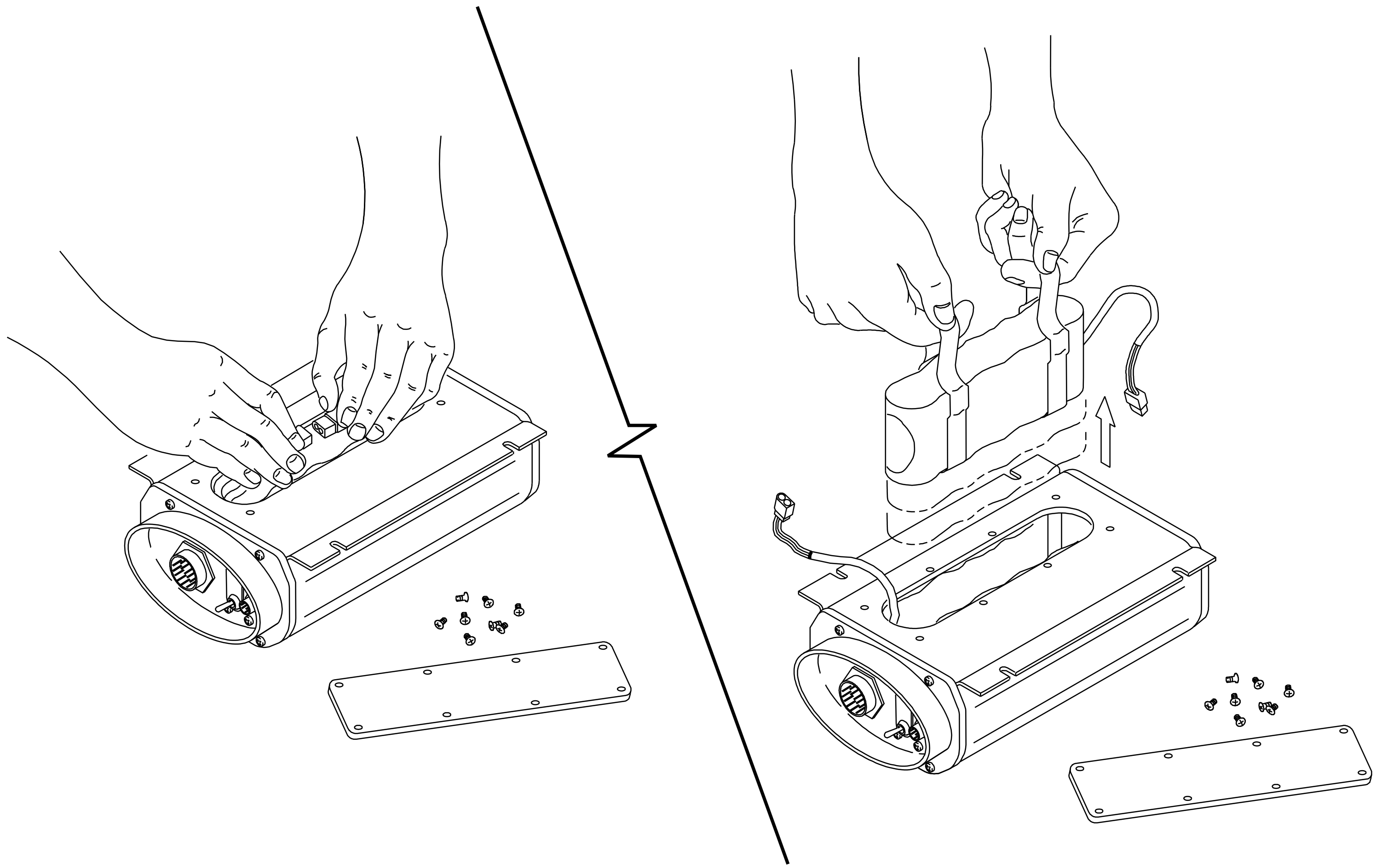
EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - BATTERY

Training Information Point

The internal battery pack for the emergency locator transmitter (ELT) has five D size lithium manganese dioxide cells. The battery pack is in the bottom of the ELT. You must hold the two ends of the battery connector and pull it to disconnect.

Replace the battery pack for one of these reasons:

- After use in an emergency
- After the ELT starts for an unknown amount of time
- If the ELT operates for more than 1 hour total use since battery replacement
- On or before the replacement date on the battery pack
- Visual inspection shows leakage, corrosion, or loose battery leads.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - BATTERY

EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - SYSTEM TEST

General

To make sure the emergency locator transmitter (ELT) system operates properly, inspect and operate the system at the required intervals. Also operate and do a test of the system when you replace the ELT or the ELT transmitter battery pack.

Your regulatory agency controls the requirements for these inspections and tests.

Transmitter Test

In general, follow these precautions:

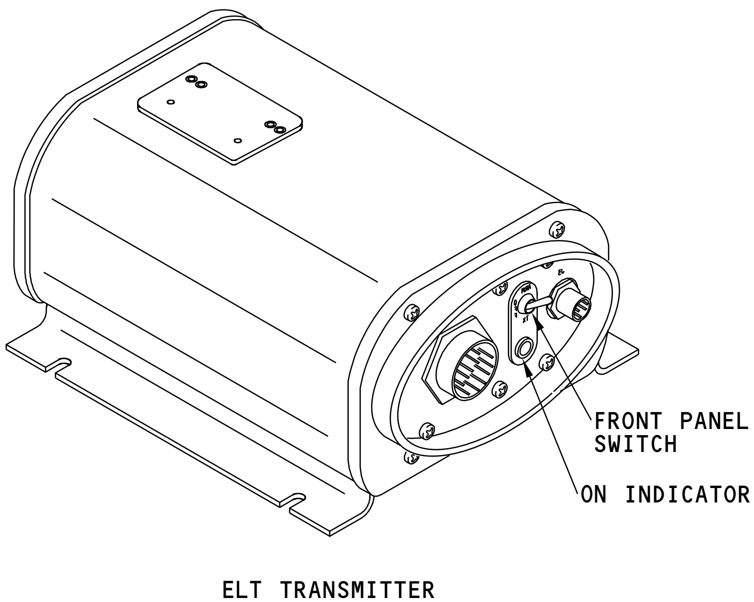
- Tell the control tower of your plan to test the ELT
- Do the tests only within the first five minutes after the hour
- Turn on the ELT for less than 10 seconds.

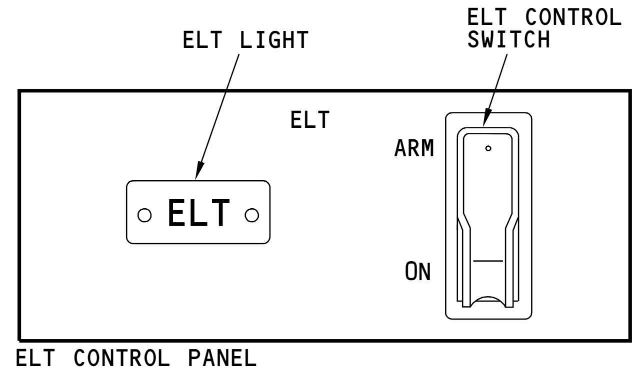
To do a test of the 121.5/243.0 MHz transmitter, use the VHF transceiver whose antenna is farthest away from the ELT antenna to listen to the ELT transmission. This is usually VHF-2.

When you put the ELT control switch to ON, you hear three sweeps of the emergency audio.

The ELT light on the control panel and the master caution lights come on immediately when you put the switch to ON. The ELT light goes off when you put the switch back to ARM.

You use special test equipment to test the 406 MHz transmitter. The test equipment shows the digital data that the ELT sends.





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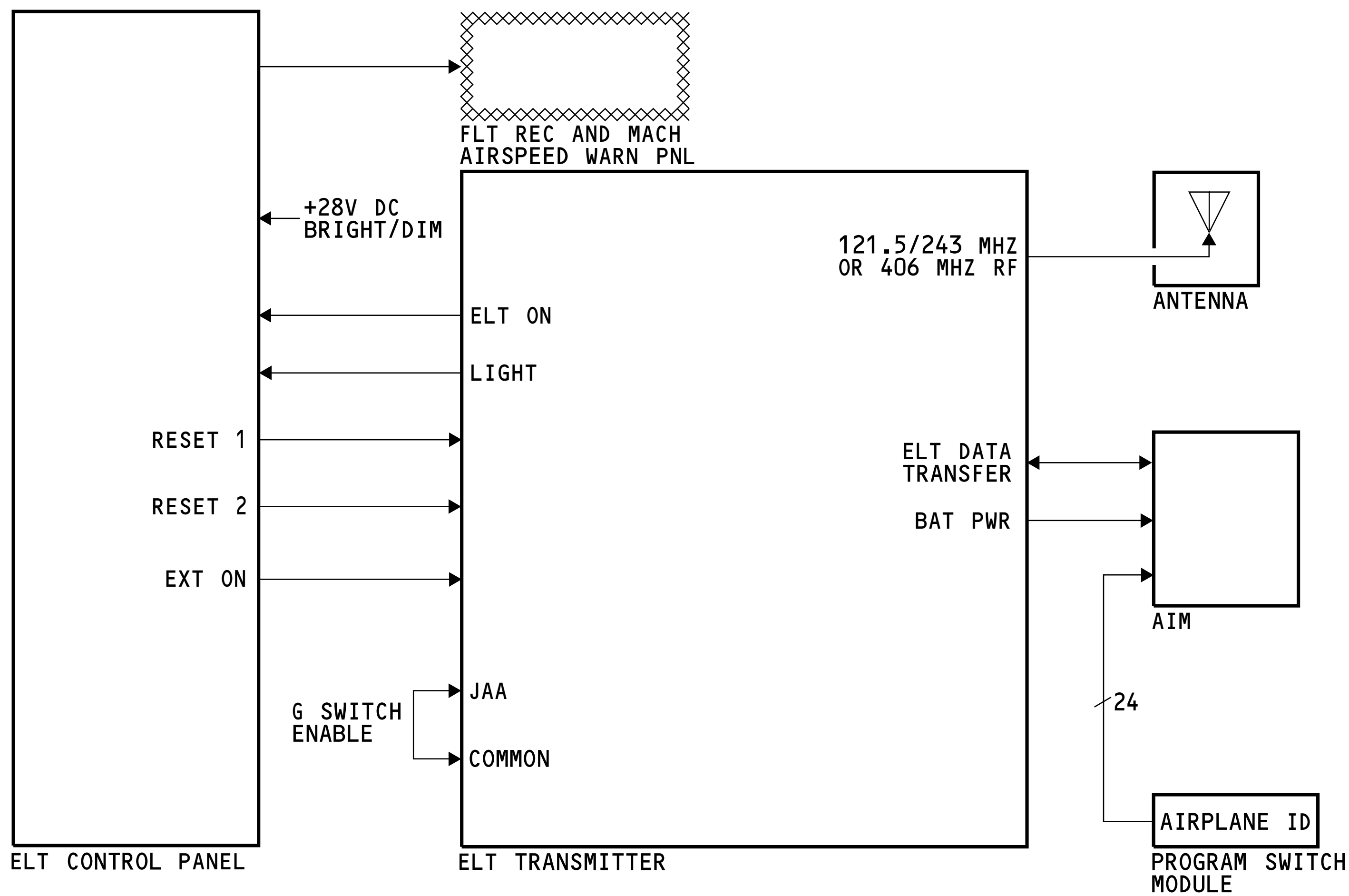
EMERGENCY LOCATOR TRANSMITTER SYSTEM - TRAINING INFORMATION POINTS - SYSTEM TEST

EMERGENCY LOCATOR TRANSMITTER SYSTEM - SYSTEM SUMMARY

General

This page is for reference.

For more details on the Emergency Locator Transmitter System, refer to the wiring diagram and functional schematic manuals.



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EMERGENCY LOCATOR TRANSMITTER SYSTEM - SYSTEM SUMMARY

AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION

Purpose

The aircraft communications addressing and reporting system (ACARS) is a datalink communication system. It lets you transmit messages and reports between an airplane and an airline ground base.

A message or report from the airplane to the airline ground base is called a downlink. A message or report from the airline ground base to the airplane is called an uplink.

ACARS automatically sends reports when necessary and at scheduled times of the flight to reduce crew workload.

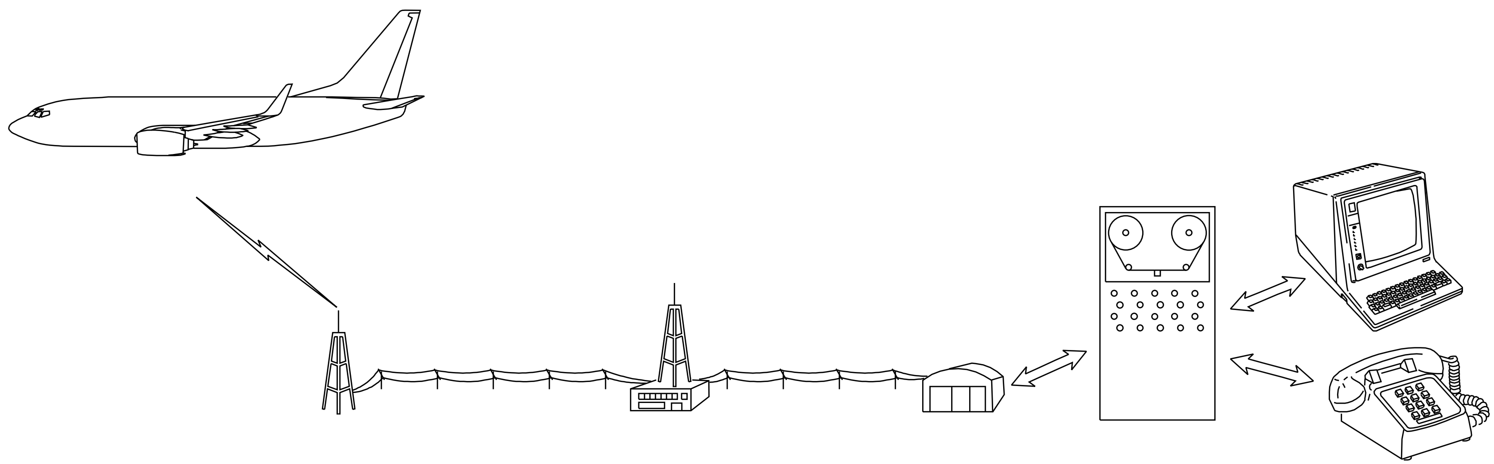
These are typical ACARS reports:

- Crew identification
- Out, off, on, in (OOOI) times
- Engine performance
- Flight status
- Maintenance items.

Abbreviations and Acronyms

- A - amber
- ACARS - aircraft communications addressing and reporting system
- A/C - aircraft
- ac - alternating current
- ACMS - aircraft condition monitoring system
- act - active
- ADL - airborne data loader
- AOC - airline operations control
- APM - airplane personality module
- appl - application
- ARINC - Aeronautical Radio Incorporated
- ATC - air traffic control
- ATE - automatic test equipment
- ATS - air traffic services
- bc - broadcast
- BITE - built-in test equipment
- capt - captain
- CDU - control display unit
- CMU - communications management unit
- comm - communication
- CPDLC - controller pilot data link communication
- curr - current
- D - day
- dc - direct current
- DEU - display electronics unit
- DB - database
- DFDAU - digital flight data acquisition unit
- DIP - dual inline package
- disc - discrete
- EE - electronic equipment
- ETA - estimated time of arrival
- FDAU - flight data acquisition unit
- FMC - flight management computer
- FMCS - flight management computer system
- F/O - first officer
- freq - frequency
- FTX - fast transmit
- GMT - Greenwich mean time
- GPS - global positioning system
- GND - ground
- H - hour
- H/W - hardware
- HF - high frequency

- ID - identification
- ident - identification
- LCD - liquid crystal display
- LED - light emitting diode
- LRU - line replaceable unit
- M - month, minute
- maint - maintenance
- MCDU - multi-function control display unit
- min - minute
- misc - miscellaneous
- msg - message
- MU - management unit
- NOTAMS - notice to airmen
- NVM - non-volatile memory
- OOOI - OUT, OFF, ON, IN
- PARAMS - parameters
- PCMCIA - personal computer memory card international association
- PGM - program
- PM-CPDLC - protected mode controller pilot data link communication
- P/N - part number
- PREFLT - preflight
- PROG - program
- RAM - random access memory
- RCP - radio communications panel
- rcv - receiver
- rec - receive
- req - request
- REU - remote electronics unit
- S - second
- sat - satellite
- SDU - satellite data unit
- SELCAL - selective calling
- SENS - sensor
- SW - software
- S/W - software
- tx - transmit
- V - volts
- VHF - very high frequency
- xcvr - transceiver
- xfr - transfer
- Y - year



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AIRCRAFT COMMUNICATIONS ADDRESSING AND REPORTING SYSTEM (ACARS) - INTRODUCTION

ACARS - GENERAL DESCRIPTION

General

The ACARS is a voice and data communication system to manage flight plan data and maintenance data between the airplane and the airline.

These are the components of the ACARS:

- Airplane personality module (APM)
- Communications management unit (CMU)
- Control display unit (CDU)
- Multipurpose interactive display unit (MIDU)

You use the multipurpose interactive display unit (MIDU) to control the operation of the ACARS.

You use the control display unit (CDU) to control the operation of the ACARS and to show ACARS messages.

The ACARS airplane personality module (APM) provides logic tailoring, airplane identification code and airplane registration number code.

The ACARS CMU receives the ground-to-air digital messages (uplink) and controls the transmission of the air-to-ground digital messages (downlink).

ACARS connects to these components of other systems:

- Audio control panel to signal the flight crew of incoming ACARS messages requiring flight crew attention.
- HF transceiver to transmit to and receive data from the ground.
- Printer to print ACARS reports and messages.
- Proximity switch electronics unit (PSEU) to send discrete signals for out, off, on and in (OOOI) events.
- Remote electronics unit (REU) to distribute the chime annunciation and/or light annunciation signals.
- VHF transceiver to transmit to and receive data from the ground.

ACARS also connects to these systems to upload information from airline operations or download information to airline operations:

- Data loader control panel

AKS 006, 009, 010, 013, 015-018, 020-025, 027; AKS 001-005 POST SB 737-34-2673

- Flight management computers

AKS ALL

The datalink activation occurs when the CMU connects to the CVR by ARINC 429 data buses. This lets the CVR record the datalink messages from the CMU.

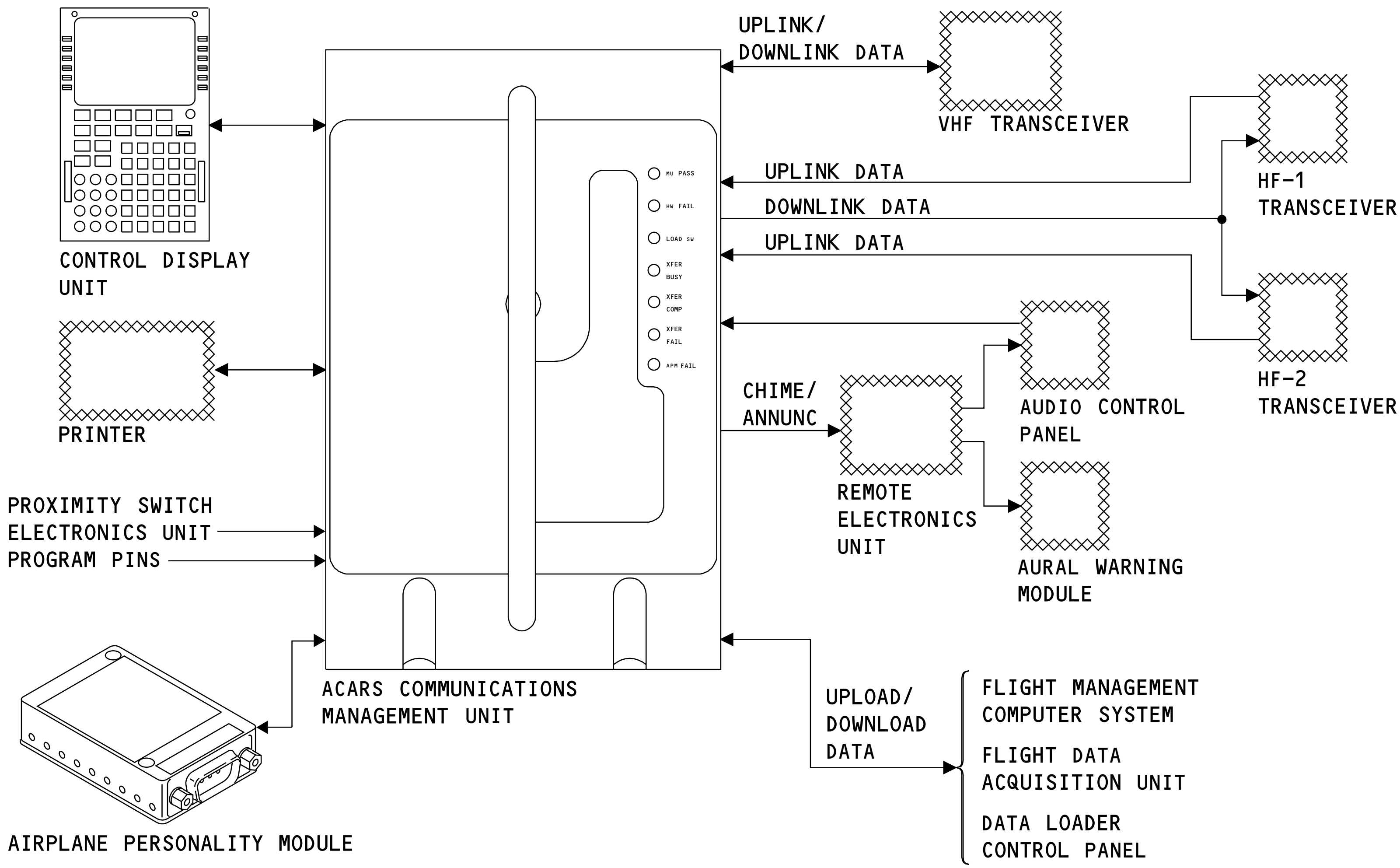
AKS 001-006, 009, 010, 013, 015-018, 020-025, 027

The interface between the IFE Systems and ACARS supplies ground communication from the IFE System to a ground station. The activation occurs when the CMU connects to the System Controller-Audio (SC-A) by ARINC 429 data buses. This will let the CMU send messages related to passenger services or data to the SC-A. The messages will show on the passenger displays or the attendant crew panel.

AKS ALL

The CPDLC system is in the CMU. The CPDLC can start, manage, and stop communication between the ground air traffic control system through the Aeronautical Telecommunications Network (ATN). When there is an applicable connection, the CPDLC system supplies the crew with a procedure to interchange messages with an applicable air traffic controller.

The “Protected Mode” of the CPDLC refers to the end-to-end check mechanism. This occurs on all exchanges to make sure the integrity of the message.



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ACARS - GENERAL DESCRIPTION

ACARS - FLIGHT COMPARTMENT COMPONENT LOCATION

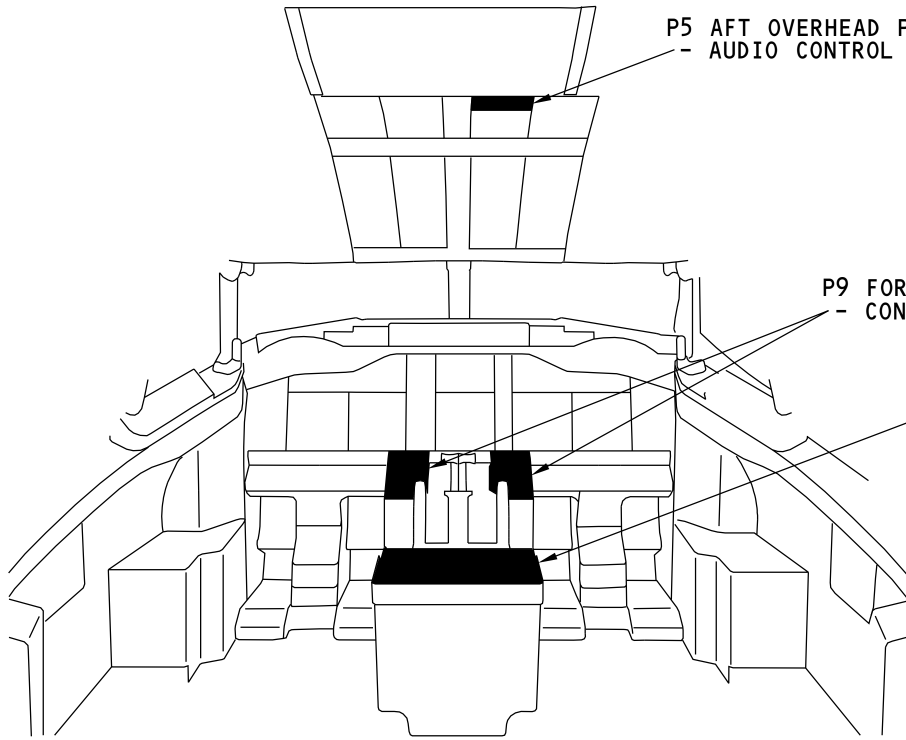
Flight Compartment

The radio communication panels interface with the ACARS system.

The control display unit (CDU) interfaces with the ACARS system.

The audio control panels are on the P8 aft electronic panel and the P5 aft overhead panel.

The printer interfaces with the ACARS system.



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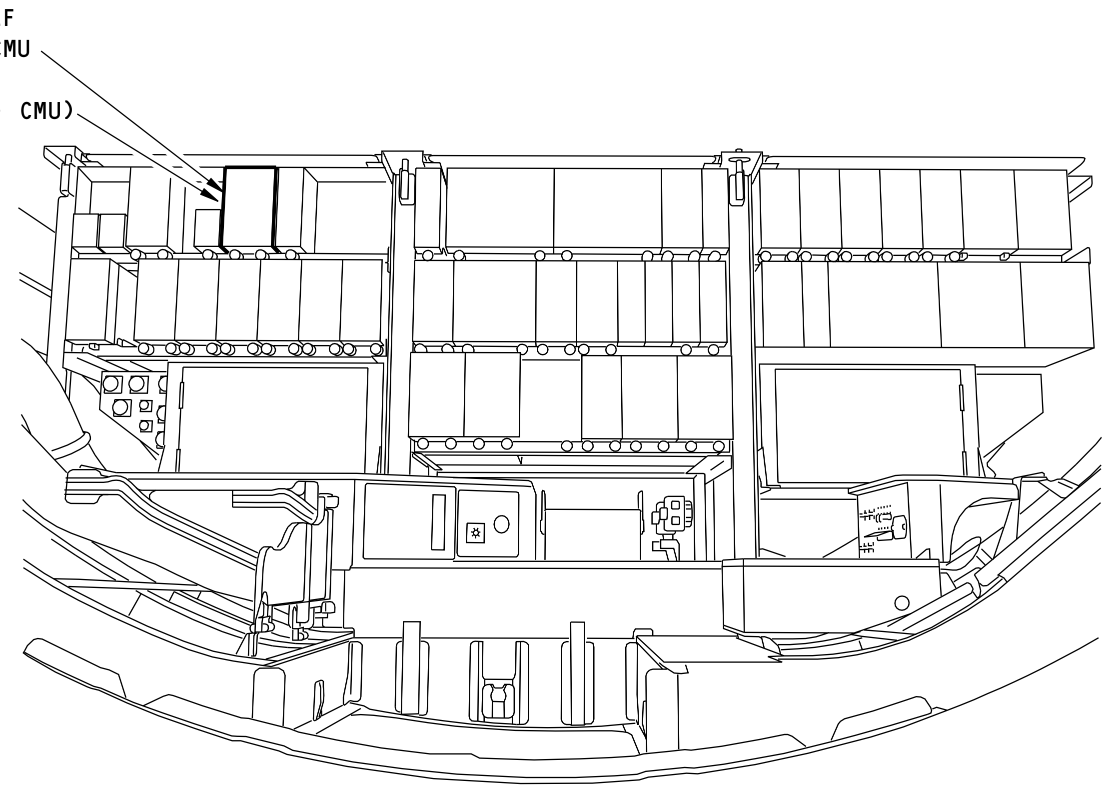
ACARS - FLIGHT COMPARTMENT COMPONENT LOCATION

ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

Electronic Equipment Compartment

The ACARS CMU is on the E4-1 shelf.

The ACARS airplane personality module (APM) is on the E4-1 shelf behind the ACARS CMU.



ELECTRICAL AND ELECTRONICS COMPARTMENT
(VIEW IN THE AFT DIRECTION)

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ACARS - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

ACARS - POWER, CALL, AND COMMUNICATION INTERFACES

General

The ACARS CMU receives this data:

- Uplink data from ground stations
- Digital data from system components
- Discretes from sensors.

After the CMU processes the received data, the CMU sends this data:

- Downlink data to ground stations
- Digital data to user systems.

AKS 001-006, 009, 010, 013, 015-018, 020-025, 027

- Data messages to the System Controller-Audio (SC-A). The messages will show on the passenger displays or the attendant crew panel.

AKS ALL

- When the CPDLC system receives a message, it decodes the data. The CPDLC determines the urgency of the message, the crew alert requirements, and the response requirements. The requirements determine system behavior such as the message display, queuing, visual and aural triggers, and response messages. The CPDLC system gives a means to encode messages for the transmission, a means to log and recall messages, and gives message condition indications.

Power

The ACARS CMU receives 115v ac from transfer (XFR) bus 1.

The ACARS CMU also receives 28v dc from the hot battery bus.

Call Interface

An uplink message tells the flight crew there is an ACARS message. When a message comes, the ACARS CMU gives these indications:

- Chime from the aural warning module
- VHF 3 call light on the audio control panels.

Communications Interfaces

All datalink operation is controlled by ARINC 429 messages that the CMU transmits to, and receives from, the VHF-3 transceiver.

The ACARS CMU sends and receives this data from the VHF transceiver:

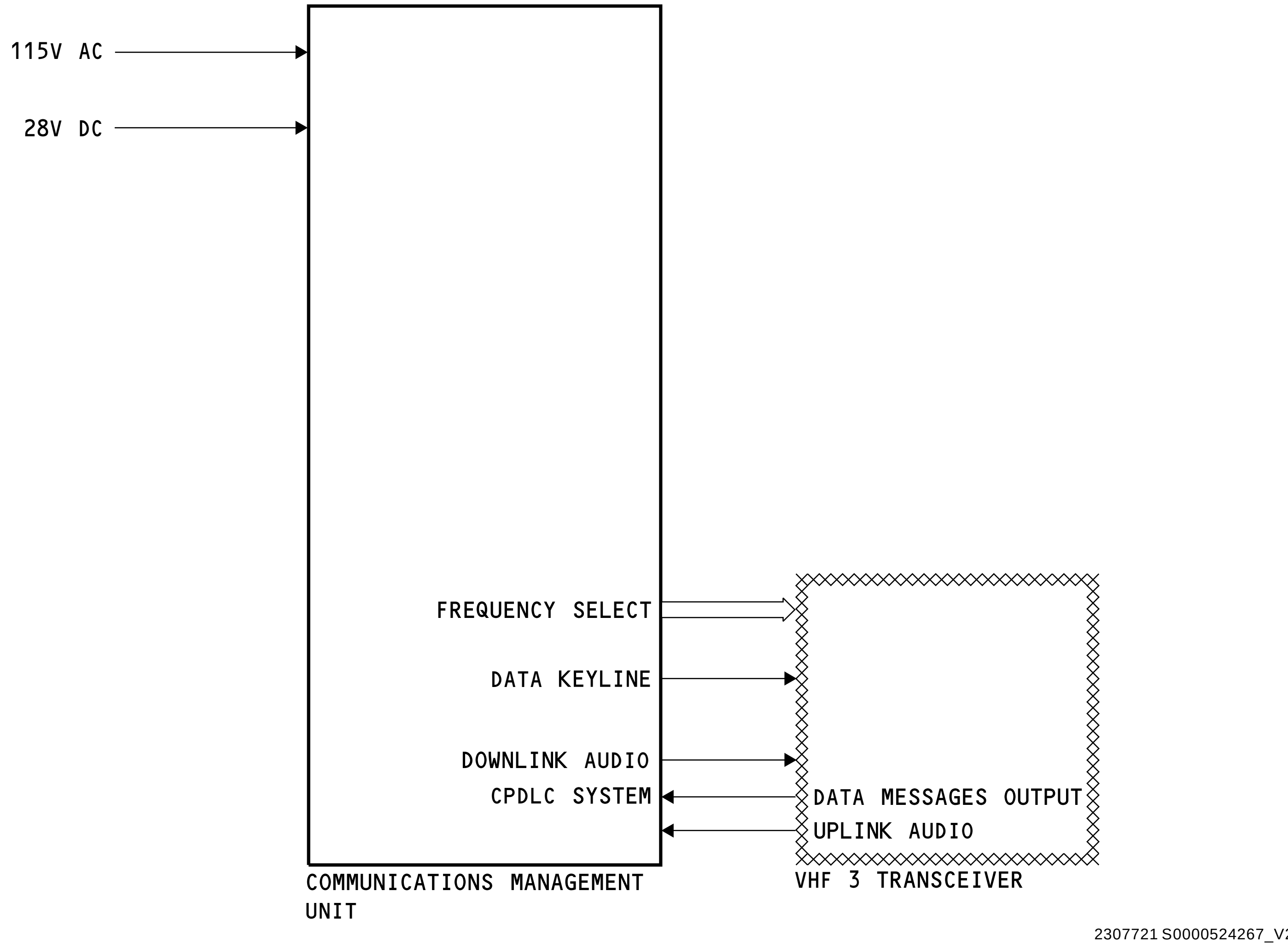
- Frequency to tune the VHF transceiver
- Downlink messages to the VHF transceiver
- Uplinked messages from the VHF transceiver.

HF Communications Interface

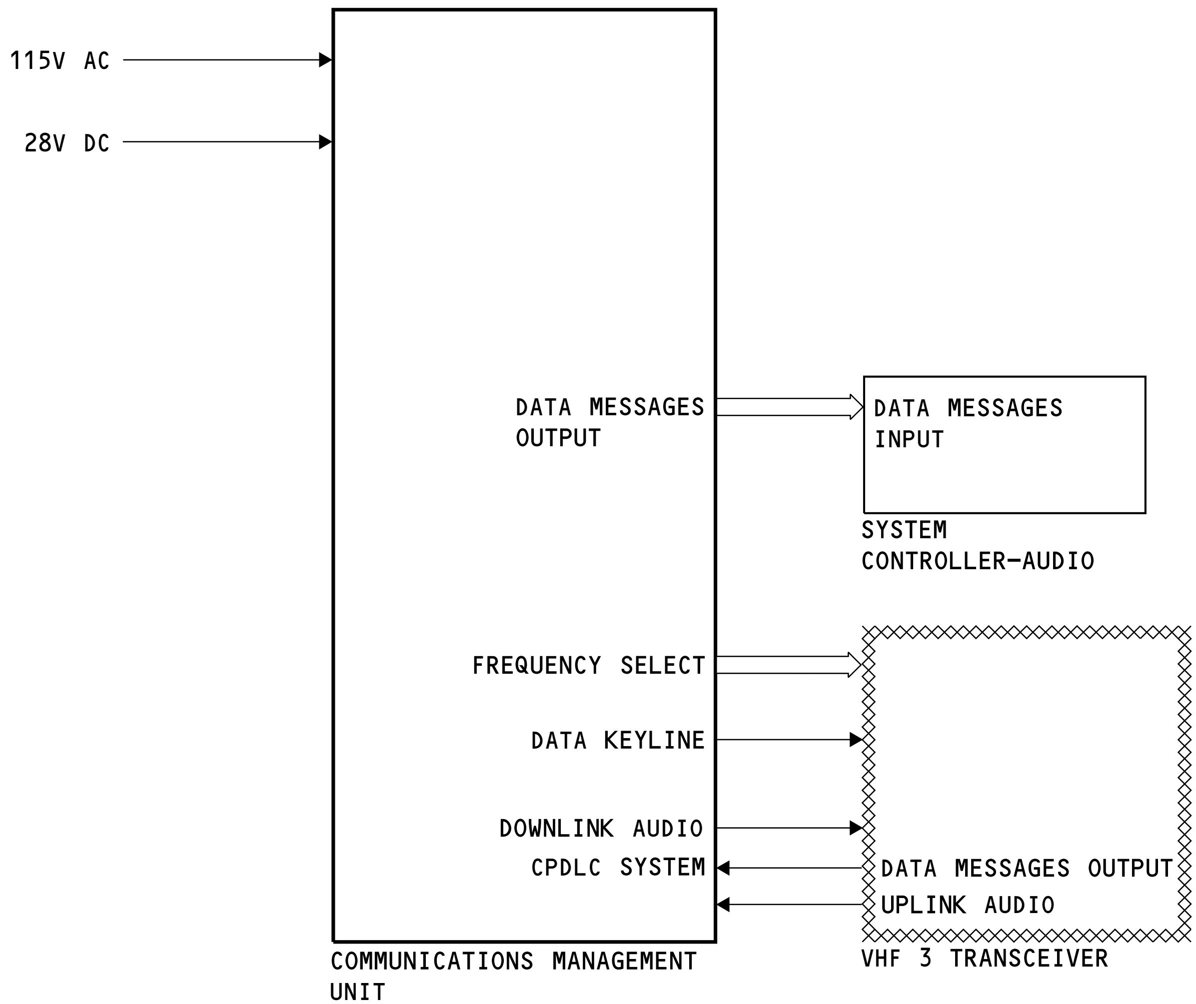
In addition to the VHF communication interface, there is a High Frequency Data Link, using the HF Transceivers.

This datalink is controlled in two ways:

- ARINC 429 messages between the ACARS CMU and the two HF Data Radio transceivers. This is restricted only to uplink and downlink messages.
- The HF Data Radio transceivers. When set to data mode, the transceivers establish the data link with the ground network automatically.



ACARS - POWER, CALL, AND COMMUNICATION INTERFACES



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ACARS - POWER, CALL, AND COMMUNICATION INTERFACES

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ACARS - DISCRETE INTERFACES

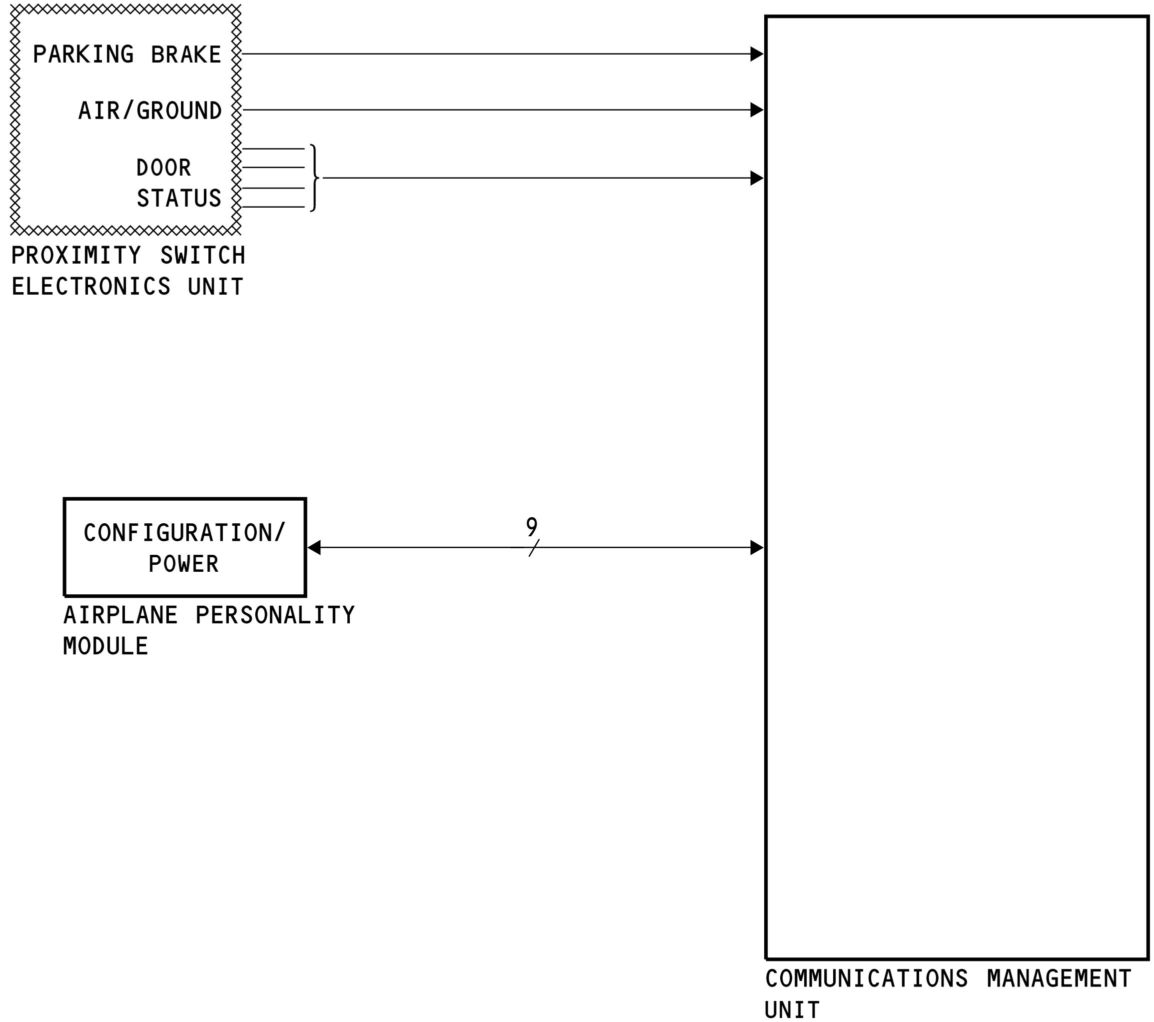
Proximity Switch Electronics Unit

The ACARS CMU receives analog discretes from the proximity switch electronics unit (PSEU). These discretes determine the out, off, on, and in (OOOI) times. The ACARS sends standard reports at the OOOI times. These discretes supply the status for these components:

- Air/ground sensor
- Parking brake
- Electronics equipment compartment door
- Forward and aft cargo doors
- Forward and aft service doors
- Forward and aft entry doors.

Airplane Personality Module

The APM receives power from the ACARS CMU. The APM sends the registration code and airplane identification code to the CMU.



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ACARS - DISCRETE INTERFACES

ACARS - DIGITAL INTERFACES

Digital Inputs

The ACARS CMU gets these digital inputs:

- Status data from the printer

AKS 006, 009, 010, 013, 015-018, 020-025, 027; AKS 001-005 POST SB 737-34-2673

- Route and airplane flight data from the FMCS

AKS ALL

- Report data for downlink from the FDAU
- Software loads from the data loader control panel.

Digital Outputs

The ACARS CMU supplies this digital data:

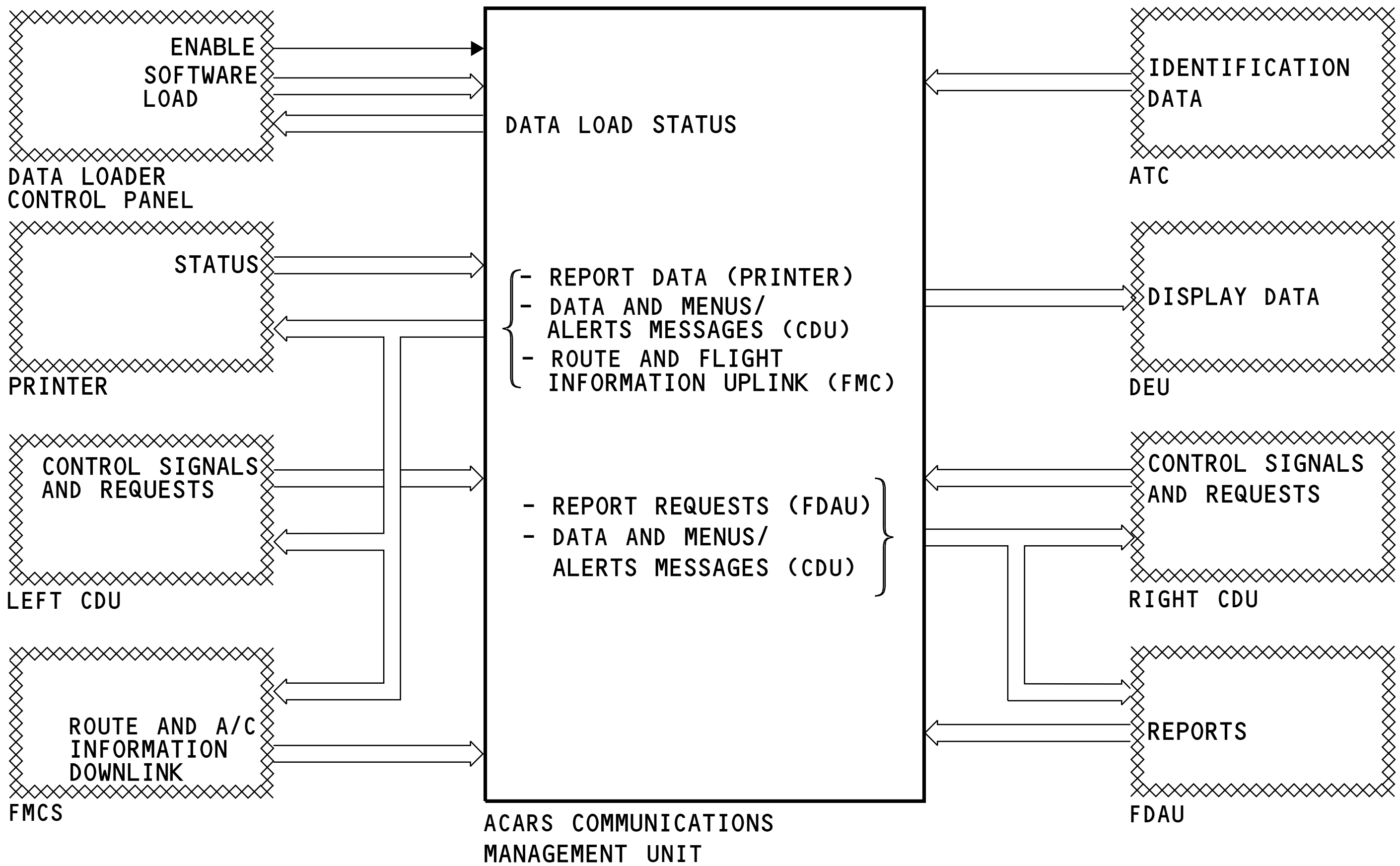
- Report data to the printer

AKS 006, 009, 010, 013, 015-018, 020-025, 027; AKS 001-005 POST SB 737-34-2673

- Route and flight data uplink to the FMC

AKS ALL

- Report request uplink to the FDAU
- Status to the data loader control panel.
- Datalink messages to the CVR.



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ACARS - DIGITAL INTERFACES

ACARS - COMMUNICATIONS MANAGEMENT UNIT

Purpose

The ACARS communications management unit (CMU) receives the uplink data and controls the transmission of downlink data to and from the VHF transceiver.

The ACARS communications management unit (CMU) also receives uplink data from the HF transceivers and sends downlink data to the HF transceivers.

General

The CMU does these tasks:

- Monitors input signals
- Formats downlink messages
- Monitors downlink data to make sure it is correct
- Monitors uplink messages to make sure they are correct
- Decodes uplink messages
- Controls the mode of operation
- Controls data transmission
- Gives acknowledged/not acknowledged response
- Tunes and controls a VHF radio
- Sends data to printer when commanded
- Monitors system operation.
- Lets the CVR record the datalink messages that the CMU sends.

AKS 001-006, 009, 010, 013, 015-018, 020-025, 027

- Sends data messages to the System Controller-Audio (SC-A). The messages will show on the passenger displays or the attendant crew panel.

AKS ALL

- The Controller Pilot Data Link Communication (CPDLC) lets pilots and controllers exchange messages through the data link.

The CMU processes only uplink messages that come with the airplane registration code. This same code also goes on all downlink messages to identify the airplane.

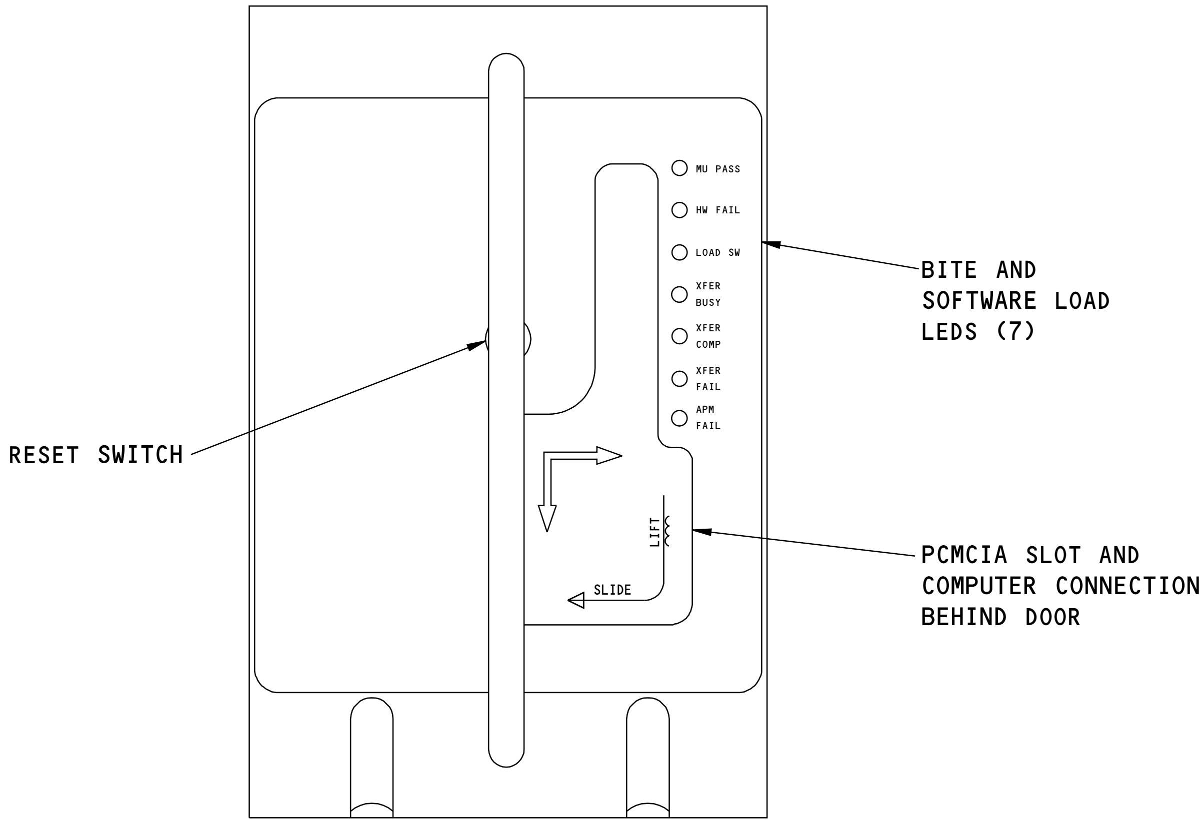
Front Panel Control and BITE Indications

The push button to make the CMU do a power-up test is under the handle. This push button is called the Reset switch. All the LEDs come on momentarily when you push this button.

BITE operates continuously. These are the LEDs on the front of the unit:

- MU PASS (green) - the management unit passed the cold start test
- HW FAIL (red) - BITE detects a failure in the CMU
- LOAD SW (amber) - a software load to the CMU is necessary
- XFER BUSY (amber) - the CMU is loading data from a disk or the data loader control panel
- XFER COMP (green) - the data load is complete
- XFER FAIL (red) - BITE detects a failure during data transfer
- APM FAIL (red) - the aircraft personality module (APM) which holds the airplane type and CMU mode of operation has failed.

Lift and slide the cover adjacent to the LEDs to see the PCMCIA slot and a connector for a personal computer.



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ACARS - COMMUNICATIONS MANAGEMENT UNIT

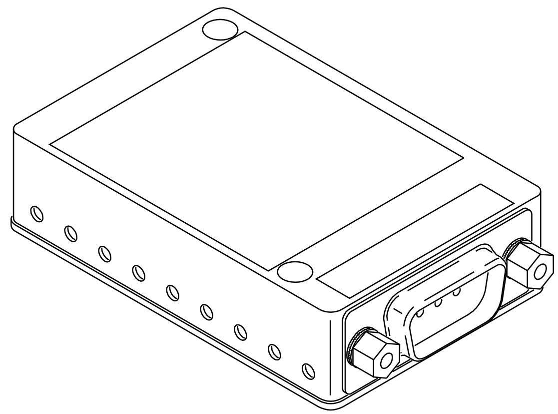
ACARS - AIRPLANE PERSONALITY MODULE

Purpose

The ACARS APM has the airplane's identification and registration codes in memory.

General

The APM sends the unique identification to the ACARS communication management unit when the CMU gets power. You load the airplane identification and registry into the APM with the control display unit.



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ACARS - AIRPLANE PERSONALITY MODULE

ACARS - OPERATION - 1

Purpose

The flight management computer system control display unit (CDU) gives you an interface with the ACARS system. It lets you enter, send, and review downlink/uplink data. The CDU shows ACARS messages in the scratch pad.

Features

The CDU has a MENU key that selects the menu. From the menu page, you can select the flight management computer system (FMC), ACARS, or the flight data acquisition unit (DFDAU). To make the system active on the CDU, push the line select key (LSK) adjacent to the system prompt.

AKS 007, 008, 011, 012, 014, 019, 026, 028-999; AKS 001-005 PRE SB 737-34-2673

If the ACARS is in control of the CDU, the MSG annunciation comes on when the CDU receives an ACARS message. The message shows in the scratch pad.

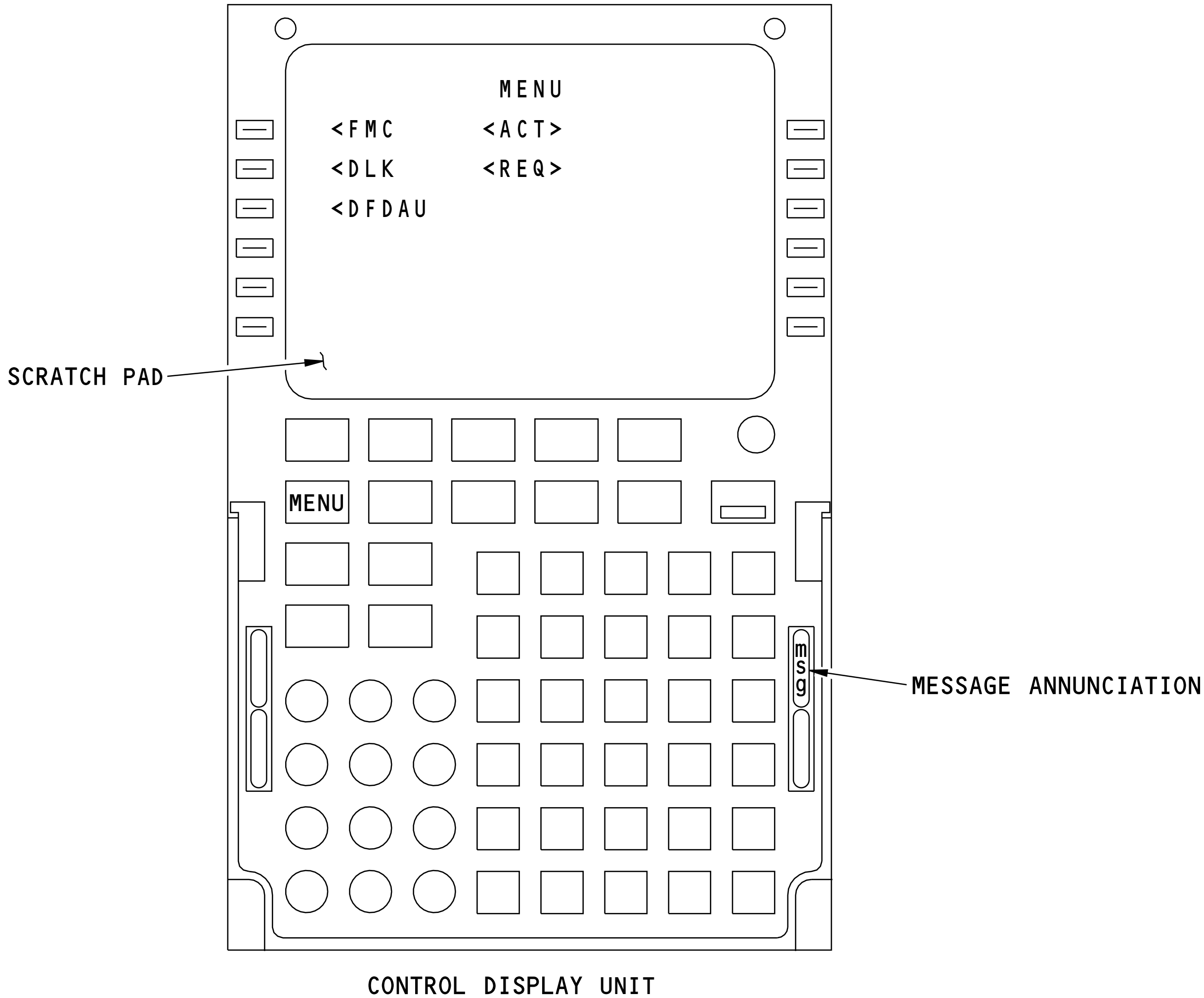
AKS 006, 009, 010, 013, 015-018, 020-025, 027; AKS 001-005 POST SB 737-34-2673

If the ACARS is in control of the CDU or if the FMC receives an ACARS message, the MSG annunciation comes on when the CDU receives an ACARS message. The message shows in the scratch pad.

AKS ALL

These are the ACARS messages:

- ACARS UPLINK - ACARS has received an uplink message
- ACARS NO COMM - no ACARS link available
- ACARS VOICE - ACARS VHF radio set to voice
- ACARS CALL - ground station requests voice-go-ahead
- ACARS VOICE BUSY - ACARS VHF radio voice circuits are busy
- ACARS MU FAIL - ACARS management unit failure
- PRINTER UPLINK - uplink message for printer
- PRINTER FAIL - ACARS reports printer failure
- ACARS ALERT - ACARS requires flight crew action.



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ACARS - OPERATION - 1

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ACARS - OPERATION - 2

MAIN MENU

NOTE: The ACARS menus and prompts described are examples. Airline specific ACARS database software may change or remove the prompts described.

Push the line select key (LSK) next to DLK to see the DATALINK (DLK) MENU.

Push the line select key (LSK) next to ACARS to connect the CDU to ACARS. These pages are available for maintenance:

- ACARS PREFLT MENU
- ACARS MISC
- ACARS MAINTENANCE.

To exit from ACARS, push the CDU MENU key.

MAIN MENU

NOTE: The ACARS menus and prompts described are examples. Airline specific ACARS database software may change or remove the prompts described.

Push the line select key (LSK) adjacent to the DLK prompt to see the DATALINK (DLK) MENU.

Push the line select key (LSK) next to ACARS to connect the IDU/CDU to ACARS. These pages are available for maintenance:

- ACARS PREFLT MENU
- ACARS MISC
- ACARS MAINTENANCE.

To exit from ACARS, push the IDU MENU key.

ACARS PREFLT MENU

The ACARS PREFLT (preflight) menu shows when you push the ACARS LSK on the MENU page.

You use this to get access to other ACARS pages.

The flight crew uses these selections and the control indexes to transmit and receive information from ACARS:

- PREFLIGHT - to put preflight information into ACARS
- FUEL INIT - to put in starting airplane fuel
- CREW REPORT - to make refuel and ground service reports
- ATC - to send reports to air traffic control
- TELEX - to make, address, and send telexes to the ground station
- MISC - to find frequencies, check ACARS parameters, and select the maintenance menu
- WEATHER REQUEST - to get weather information
- VOICE/DATA CONTROL - to change the ACARS radio from voice to data or data to voice
- VOICE CONTACT - to tell operations, engineering, or maintenance to contact the airplane on a voice frequency
- RECEIVED MESSAGES - to view or to print received messages from ground stations.

ACARS MISC Menu

You use the maintenance index page to get access to these functions:

- DATA FREQUENCY - to show the frequencies used for data mode
- OOOI STATUS - to show the status of the out, off, on, or in sensors and the time the sensor changed
- VHF or SAT STATISTICS - to show data about the data radios
- PARAMETER DISPLAY - to display the data coming to the ACARS MU
- MAINT - to select maintenance functions for ACARS.

ACARS MAINTENANCE

You use the maintenance page to get access to the maintenance functions.

ACARS - OPERATION - 2

Part Numbers

When you select LSK 1L <PART NUMBERS, the CDU page shows this information for the MU:

- Part number
- Serial number
- Software part number
- Database part number.

Status

When you select LSK 2L <STATUS, the CDU shows the ACARS status index. From this page you can select this information:

- ERROR LOG - shows a list of any MU detected software errors
- RCV 429 DATA - shows the ARINC 429 data buses that ACARS is receiving on and the status
- TX 429 DATA - shows the ARINC 429 data buses that ACARS transmits on and the status
- LRU status - shows the status (active or inactive) of each LRU connected to ACARS
- DISCRETES - shows the status and connector pin number of all discrete signals sent to ACARS.

HF Link Test

When you select INITIATE below HF LINK on the ACARS TEST page, the ACARS MU does these things:

- Transmits an HF downlink message which requests the time from the ground station. On airplanes with dual HF transceivers, only one HF transceiver can be in data mode. The HF transceiver that is in data mode will transmit the downlink message.
- Receives the HF uplink message in response.

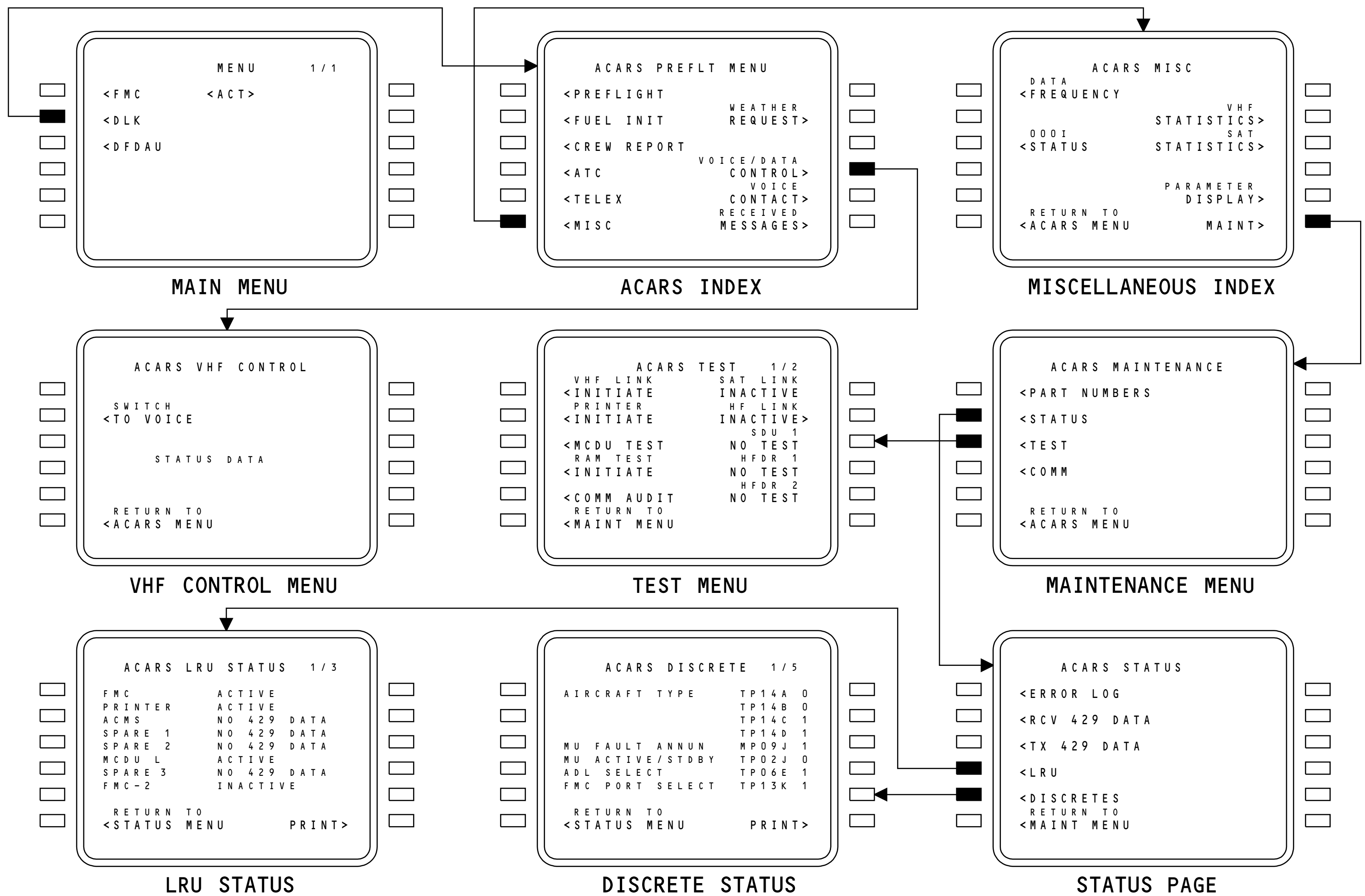
When the MU receives a response to the HF link test, the MU sends the chime signal to the REU to turn on the chime in the aural warning module.

If the HF link test does not pass, these reasons may be the cause:

- The MU cannot make a downlink message. FAIL shows on the line below the HF LINK prompt.
- The ground station does not answer. NO COMM shows in the CDU scratch pad.

COMM

The COMM page shows the status of the link between the ACARS MU and the communication system connected to the MU. The communications system is the VHF radio or the optional satellite communications system or the optional HF data link.



2211310 S0000493474_V1

ACARS - OPERATION - 2

ACARS - OPERATION - DOWNLINK REPORTS

General

There are many ACARS reports. Generally, these reports use short codes to decrease the cost of satellite or ground station use.

All ACARS reports have header information followed by the report data.

Report Header

Typically, the header includes this information:

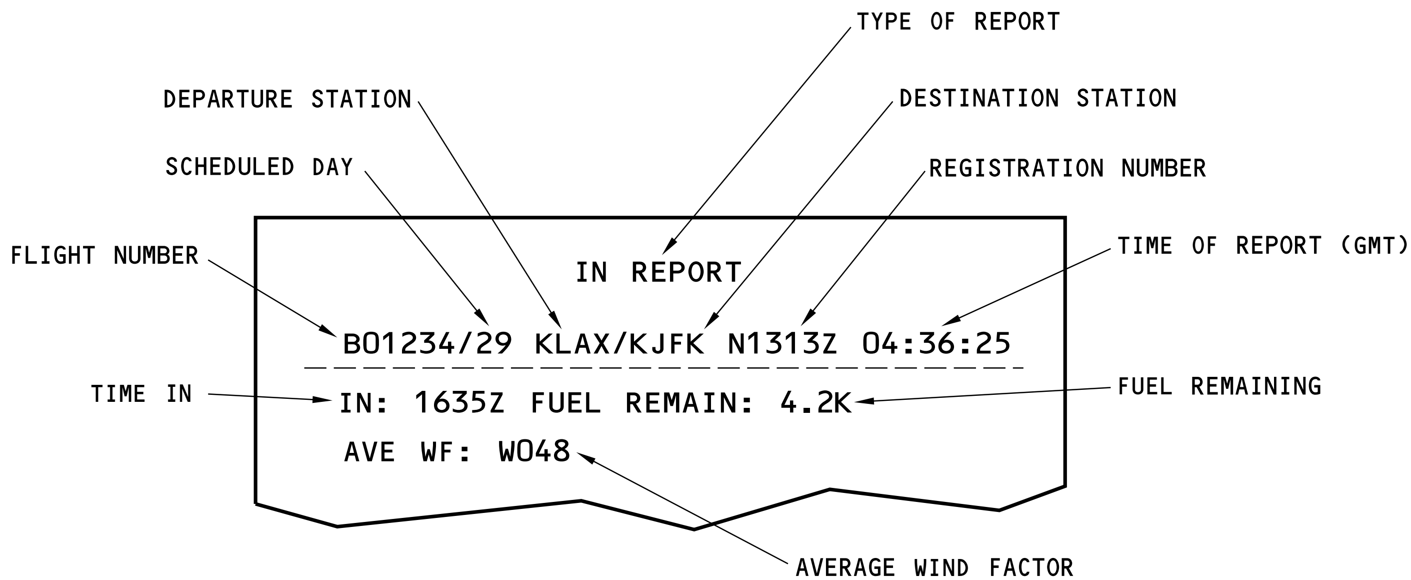
- Report type
- Flight number
- Flight origin and destination
- Registration number
- Date and time sent.

Report Data

An example is the IN report. The ACARS MU automatically sends this report when the airplane gets to the gate.

The IN report typically includes:

- IN event time
- Remaining fuel
- Average wind factor
- Optional scratchpad text.



M80004 S0004623569_V1

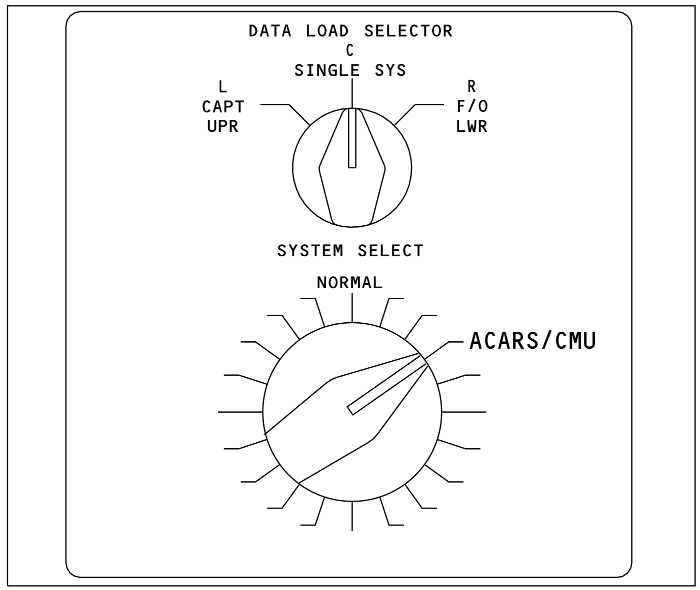
ACARS - OPERATION - DOWNLINK REPORTS

ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING

ACARS Software

You can load software and data base information into ACARS with an airborne data loader or a portable data loader. To load the software, do these tasks:

- Make sure the ACARS system has power
- Set the SYSTEM SELECT switch to ACARS/CMU
- If the ACARS management unit or communications management unit is in the left position, set the top switch to L
- If the ACARS management unit or communications management unit is in the right position, set the top switch to R
- Put the first data disk into the data loader disk drive
- After the last disk is complete, set the data loader control panel switch to NORM.



DATA LOADER CONTROL PANEL

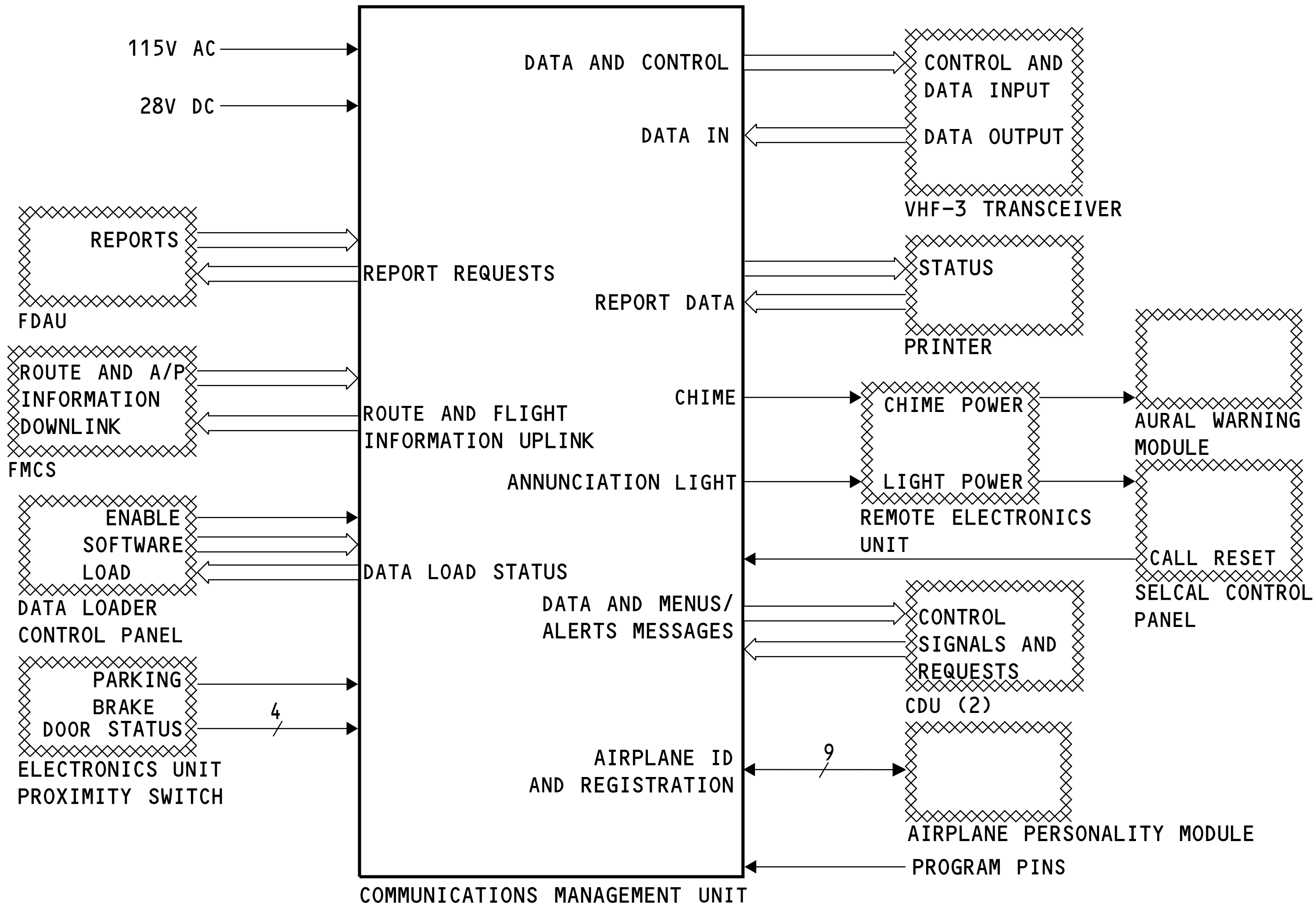
M80027 S0004623572_V1

ACARS - TRAINING INFORMATION POINT - SOFTWARE LOADING

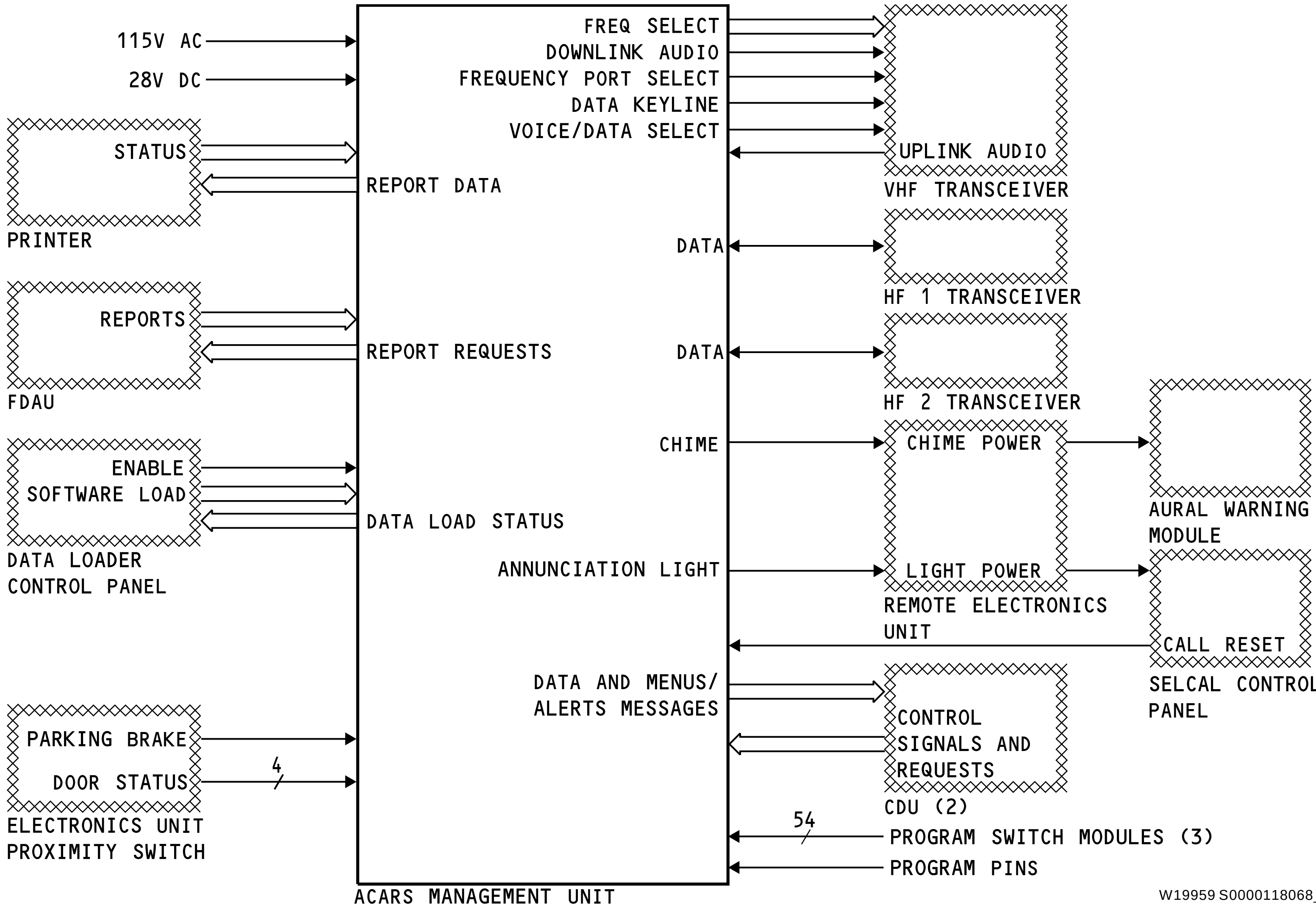
ACARS - SYSTEM SUMMARY

General

This page is for reference purposes.



ACARS - SYSTEM SUMMARY



ACARS - SYSTEM SUMMARY

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SELECTIVE CALLING SYSTEM - INTRODUCTION

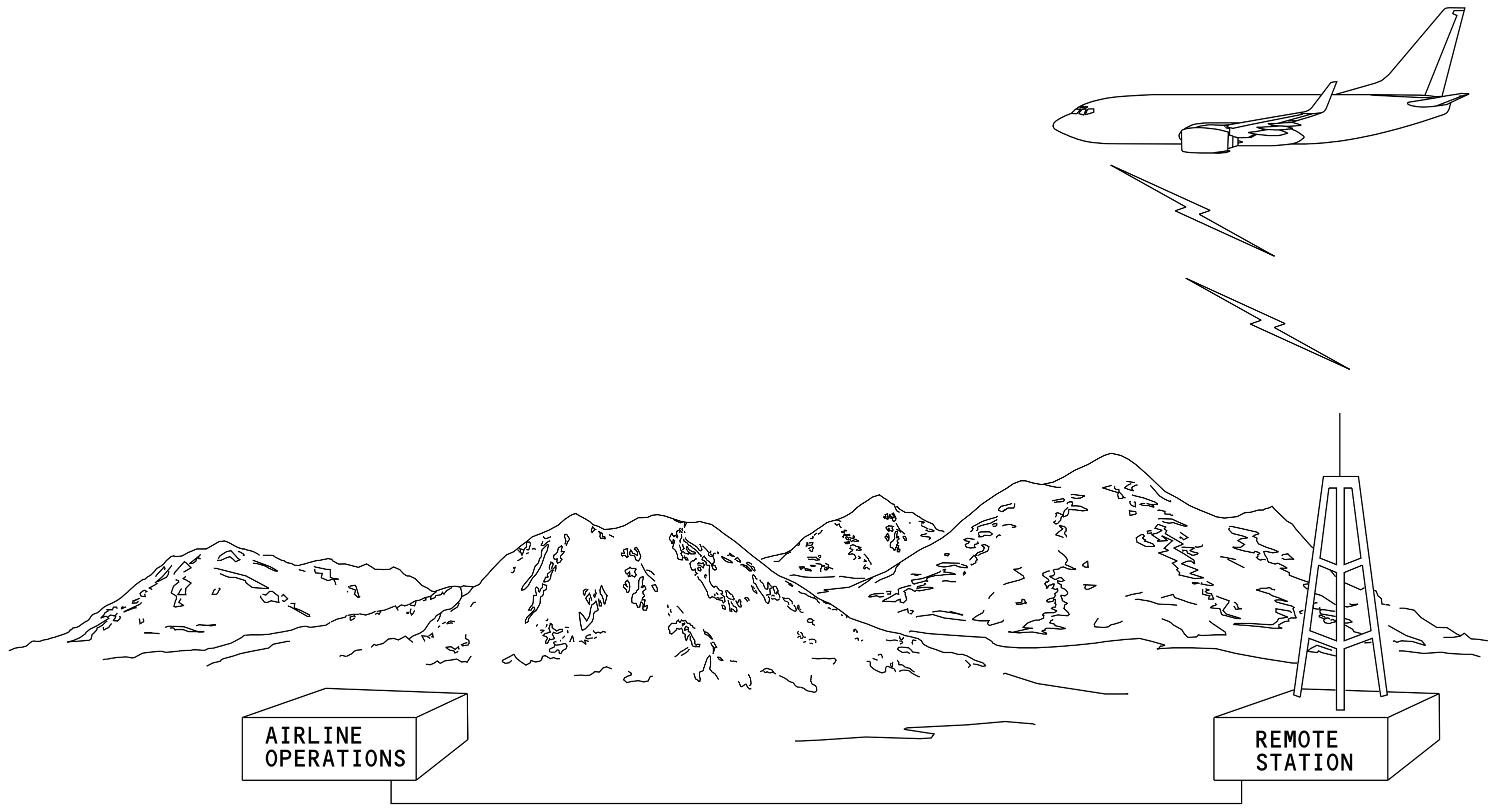
Purpose

The selective calling (SELCAL) system supplies the flight crew with indications of calls that come in from the airline ground stations. It is not necessary for the pilots to continuously monitor company communications channels.

Airline radio networks supply communication between ground stations and airplanes. For SELCAL operation each airplane has a different four-letter code. Each letter in the code equals a different audio tone. The ground stations send the applicable tones to call an airplane.

Abbreviations and Acronyms

- ACP - audio control panel
- comm - communication
- HF - high frequency
- REU - remote electronics unit
- SELCAL - selective calling
- VHF - very high frequency



M80073 S0004623613_V1

SELECTIVE CALLING SYSTEM - INTRODUCTION

SELCAL SYSTEM - GENERAL DESCRIPTION

General

Each airplane has a different SELCAL code. A ground station transmits this code to communicate with an airplane. When the airplane receives its SELCAL code, flight compartment indications come on to tell the flight crew.

System Components

The selective calling system has these components:

- SELCAL decoder
- SELCAL program switch module
- SELCAL aural warning relay.

The SELCAL decoder unit monitors the radio systems for audio tones. If the tones are the same as the code from the program switch module, the decoder sends a signal to the control panel to turn on the alert light. The decoder also sends a ground to energize the SELCAL aural warning relay.

The SELCAL decoder unit also sends a ground to energize the aural warning relay. The energized relay sends 28V dc to the aural warning module through the REU. This tells the module to make the single high/low chime for the aural alert.

The SELCAL program switch module gives the airplane its SELCAL code. When power is applied to the airplane, the program switch module sends the SElCAL code to the SELCAL decoder.

External Interface

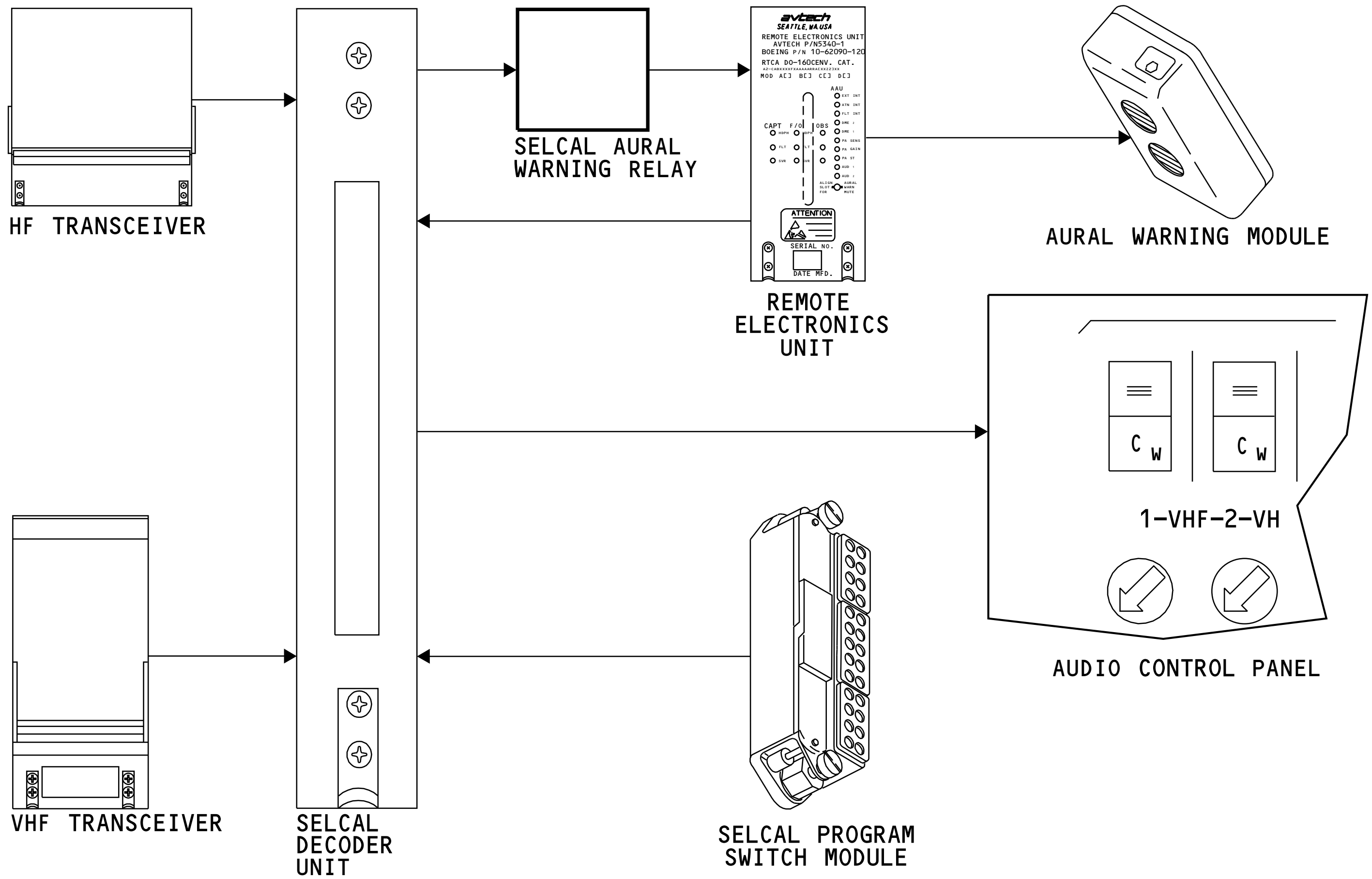
The selective calling system connects with these components:

- VHF transceiver
- HF transceiver
- Audio control panel
- Remote electronics unit
- Aural warning module.

The HF and VHF transceivers receive the SELCAL audio tones from the ground station. The transceivers send the received audio to the SELCAL decoder.

When the SELCAL decoder unit receives a call, it sends ground signals to the audio control panels (ACPs). The ground signals turn on the call light for the transceiver that receives the call. Push the control wheel mic switch or the ACP RT/IC switch to send a reset signal from the REU to turn off the call light.

The SELCAL aural warning relay sends the REU 28V dc. The REU sends the 28V dc to the aural warning module. The aural warning module makes a high/low chime signal for the aural alert.



M80084 S0004623627_V1

SELCAL SYSTEM - GENERAL DESCRIPTION

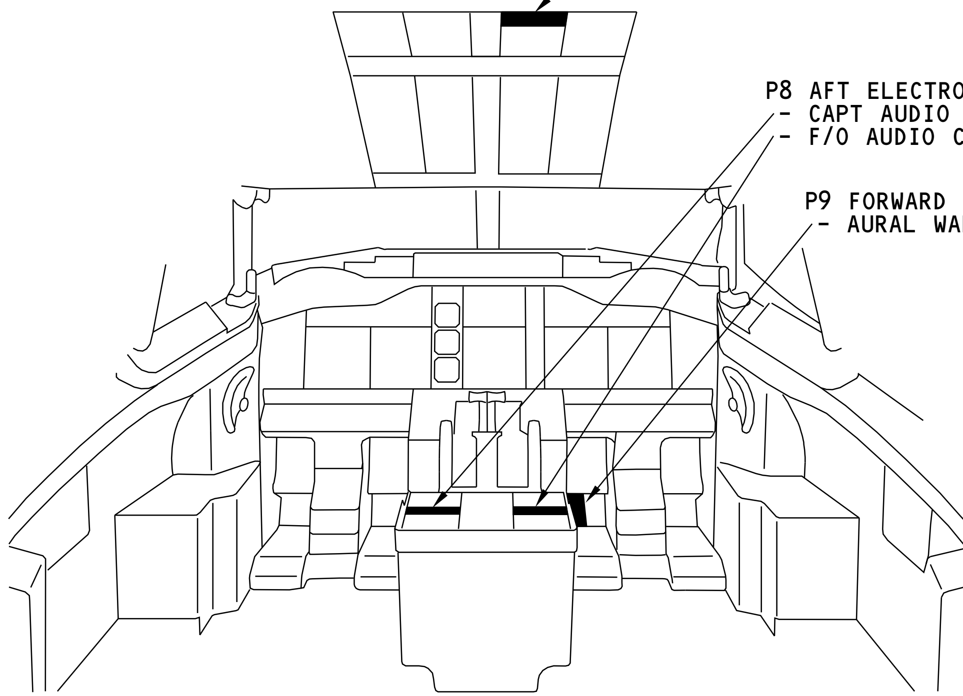
SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

Audio Control Panel

The audio control panels (ACPs) are part of the flight interphone system. The captain and first officer ACPs are on the P8 aft electronic panel. The observer ACP is on the P5 aft overhead panel.

Audio Control Panel

The audio control panels (ACPs) are part of the flight interphone system. The captain, first officer, and first observer ACPs are on the P8 aft electronic panel.



M80094 S0004623636_V1

SELCAL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

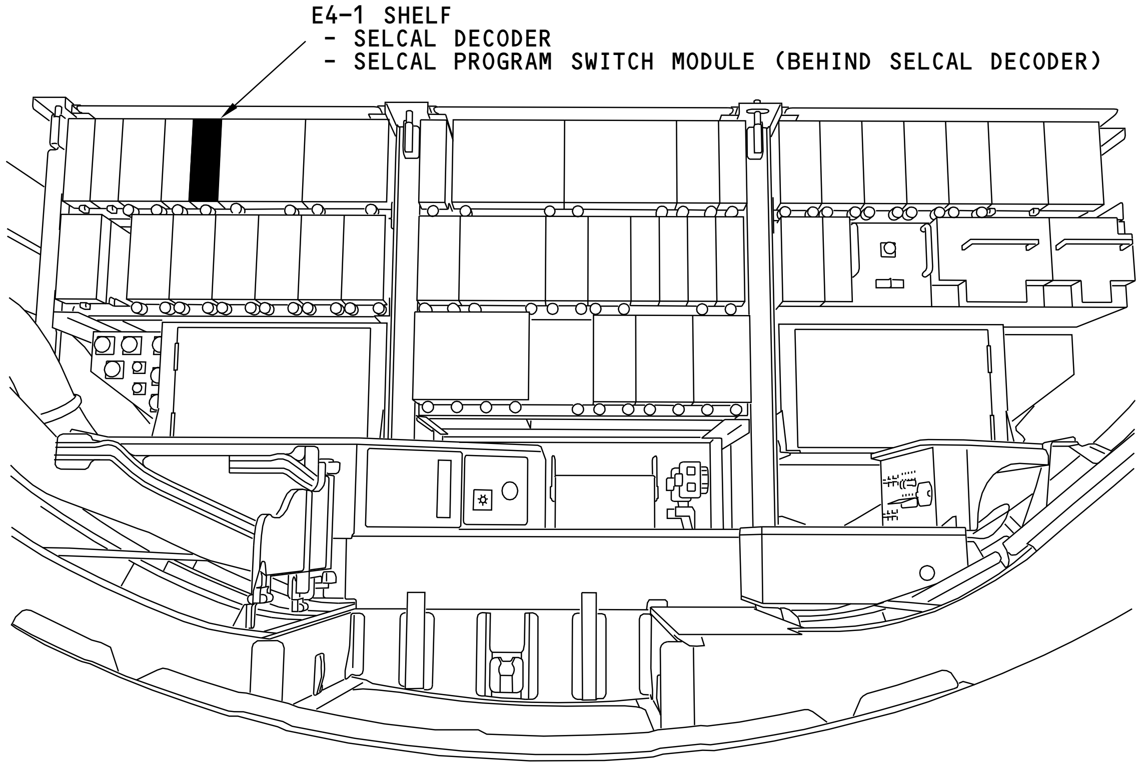
SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

SELCAL Decoder

The SELCAL decoder is on the E-4 rack in the electronic equipment compartment.

SELCAL Program Switch Module

The SELCAL program switch module is behind the SELCAL decoder on the E-4 rack.



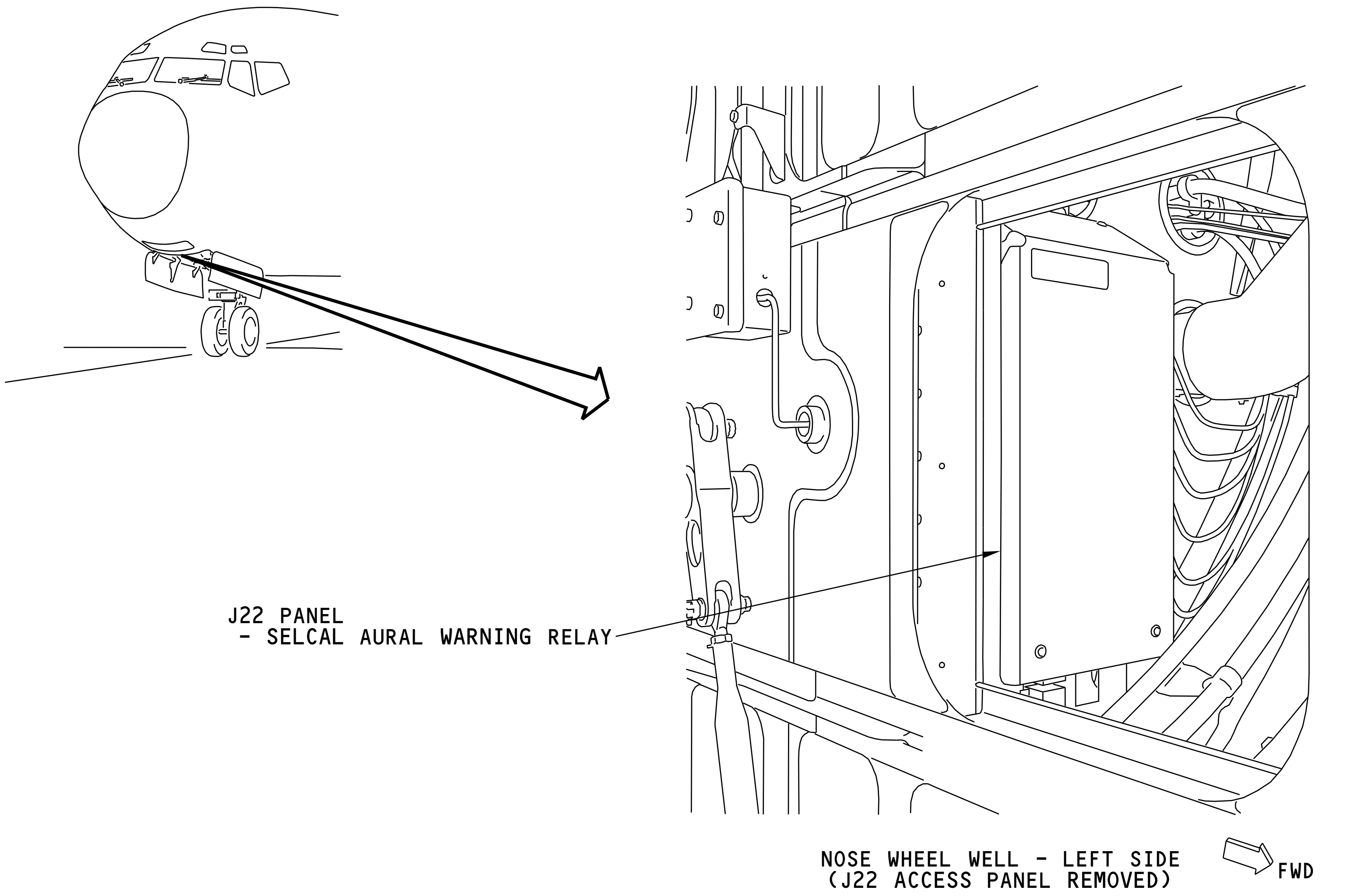
M80097 S0004623643_V1

SELCAL SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION

SELCAL AURAL WARNING Relay

The SELCAL aural warning relay is on the left side of the nose wheel well on the J22 panel.



SELCAL SYSTEM - NOSE WHEEL WELL COMPONENT LOCATION

SELCAL SYSTEM - INTERFACES

Power

The 28v dc bus 1 supplies power to the SELCAL decoder.

SELCAL Decoder Unit

The VHF and HF transceivers send received audio to the SELCAL decoder.

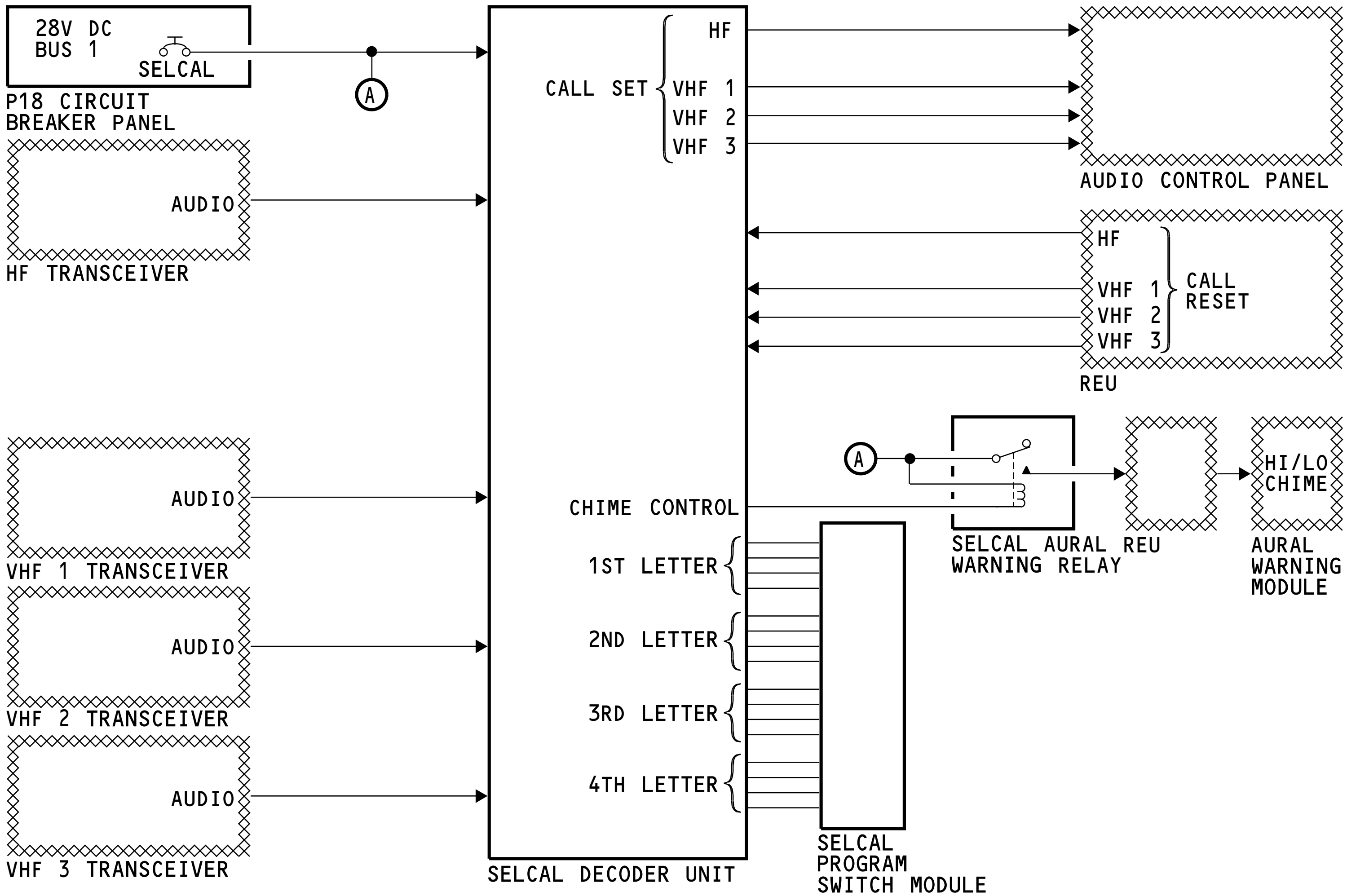
The SELCAL decoder unit tries to match the audio tones sent from the transceiver with the program switch module SELCAL code. If there is a match, then the decoder sends a call set discrete to the audio control panels (ACP). The call set discrete is a ground signal that turns on the call light. There is a different call set discrete for each transceiver.

The REU sends a ground signal to the SELCAL decoder unit to reset the decoder channel. This ground signal is a call reset discrete. There is a different call reset discrete for each transceiver.

The SELCAL decoder unit supplies a ground signal to make a high/low chime in the flight compartment. The ground signal goes to the SELCAL aural warning relay. The energized relay sends a 28v dc signal through the REU to the aural warning module. The aural warning module makes a single high/low chime in the flight compartment.

SELCAL Program Switch Module

The SELCAL program switch module has 24 (16 active) switches. The switches are in groups of four. There are four letters in the SELCAL code. The position of the switches in each group identify one of the four SELCAL code letters. A switch in the ON position sends a ground signal to the decoder. A switch in the OFF position sends an open signal to the decoder.



M80108 S0004623651_V1

SELCAL SYSTEM - INTERFACES

SELCAL SYSTEM - SELCAL DECODER UNIT

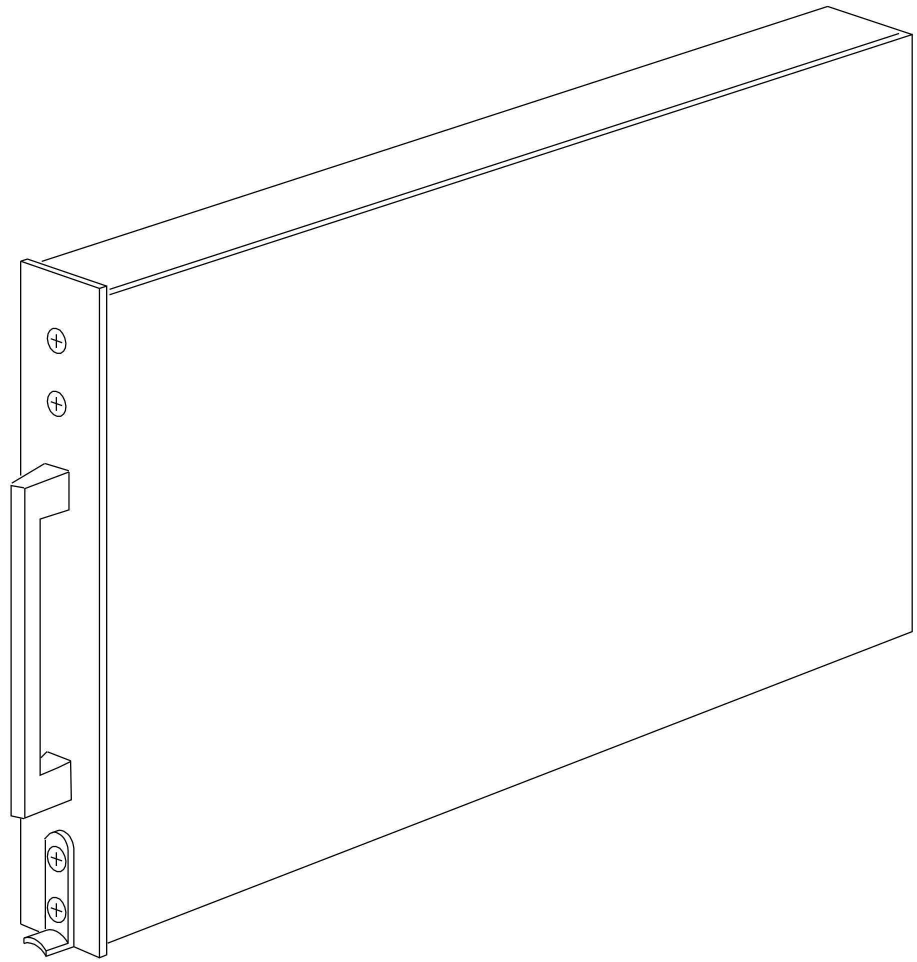
Purpose

The SELCAL decoder unit does these functions:

- Monitors audio from the VHF and HF communication transceivers
- Identifies the SELCAL signal that is the same as its code
- Causes flight compartment visual and aural indications when calls come in.

Controls

There are no lights or switches on the SELCAL decoder front panel.



M80121 S0004623673_V1

SELCAL SYSTEM - SELCAL DECODER UNIT

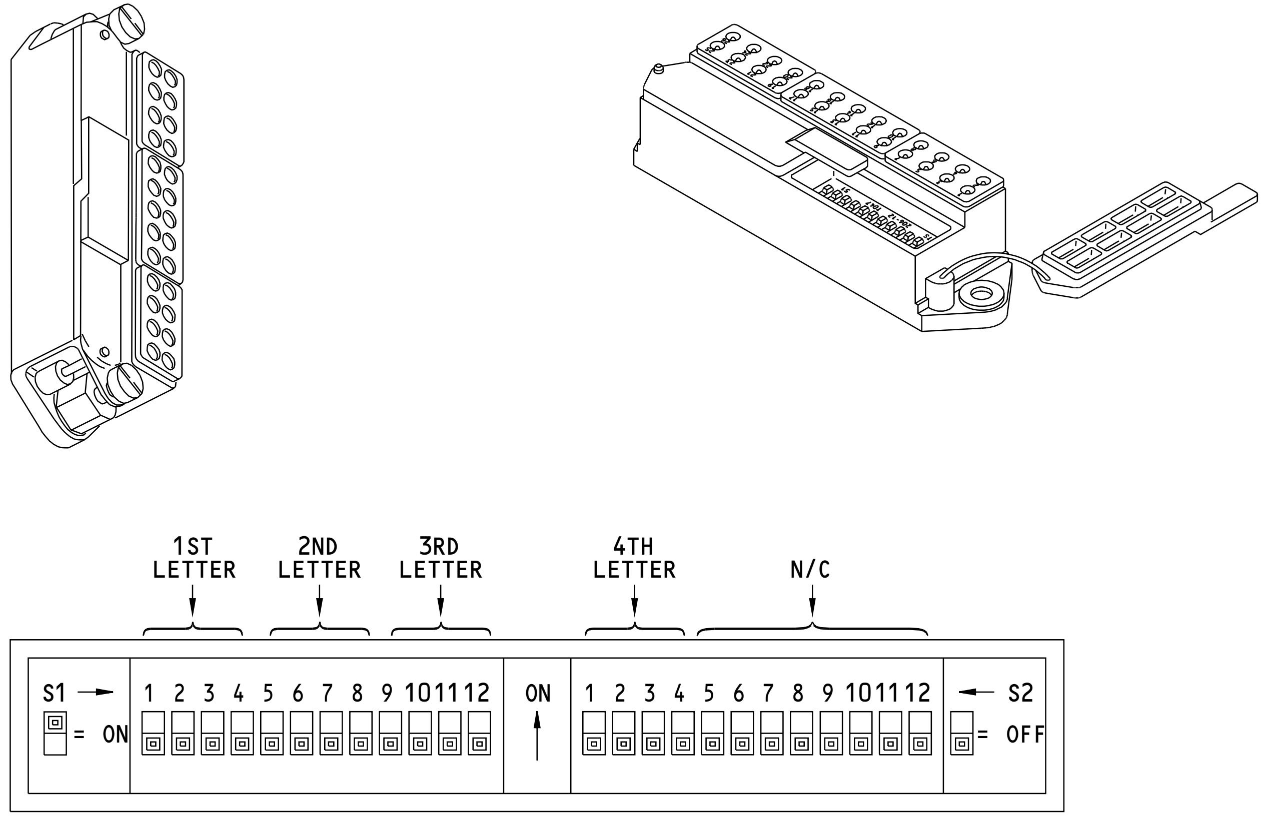
SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE

Purpose

The SELCAL program switch module sets the airplane identification code.

Each dip switch that is up is in the ON position and sends a ground to the SELCAL decoder. Each dip switch that is down is in the OFF position and sends an open to the SELCAL decoder.

Each group of 4 dip switches sets one SELCAL letter. Four letters identify the airplane SELCAL code.



M80122 S0004623675_V1

SELCAL SYSTEM - SELCAL PROGRAM SWITCH MODULE

SELCAL SYSTEM - FUNCTIONAL DESCRIPTION

General

The SELCAL decoder unit has these components:

- Audio compressors
- Filter units
- Analog-to-digital converter
- Microprocessor
- Reset buffer
- Output driver.

Power-Up

At power-up, the SELCAL program switch module sends the microprocessor the airplane SELCAL code. The microprocessor controls the SELCAL decoder.

Call Set

Each VHF and HF transceiver sends audio signals to the related audio compressor. The audio has a SELCAL tone signal. The SELCAL signal is a group of four tones. Each tone represents a letter in the SELCAL code. The audio compressor amplifies or limits the audio signal input to get a constant level. The audio compressor then sends the signal to the related filter unit.

In the filter unit, the signal goes to 16 different filters. Each filter passes only the audio signal that identifies one SELCAL tone or letter.

The filter outputs go to the analog-to-digital converter. The converter changes the analog audio signal to a digital signal and sends it to the microprocessor.

The microprocessor receives the SELCAL tone digital signals and compares them with the airplane SELCAL code from the program switch module. If the digital signals are the same as the airplane's code, then the microprocessor sends a command to the output driver.

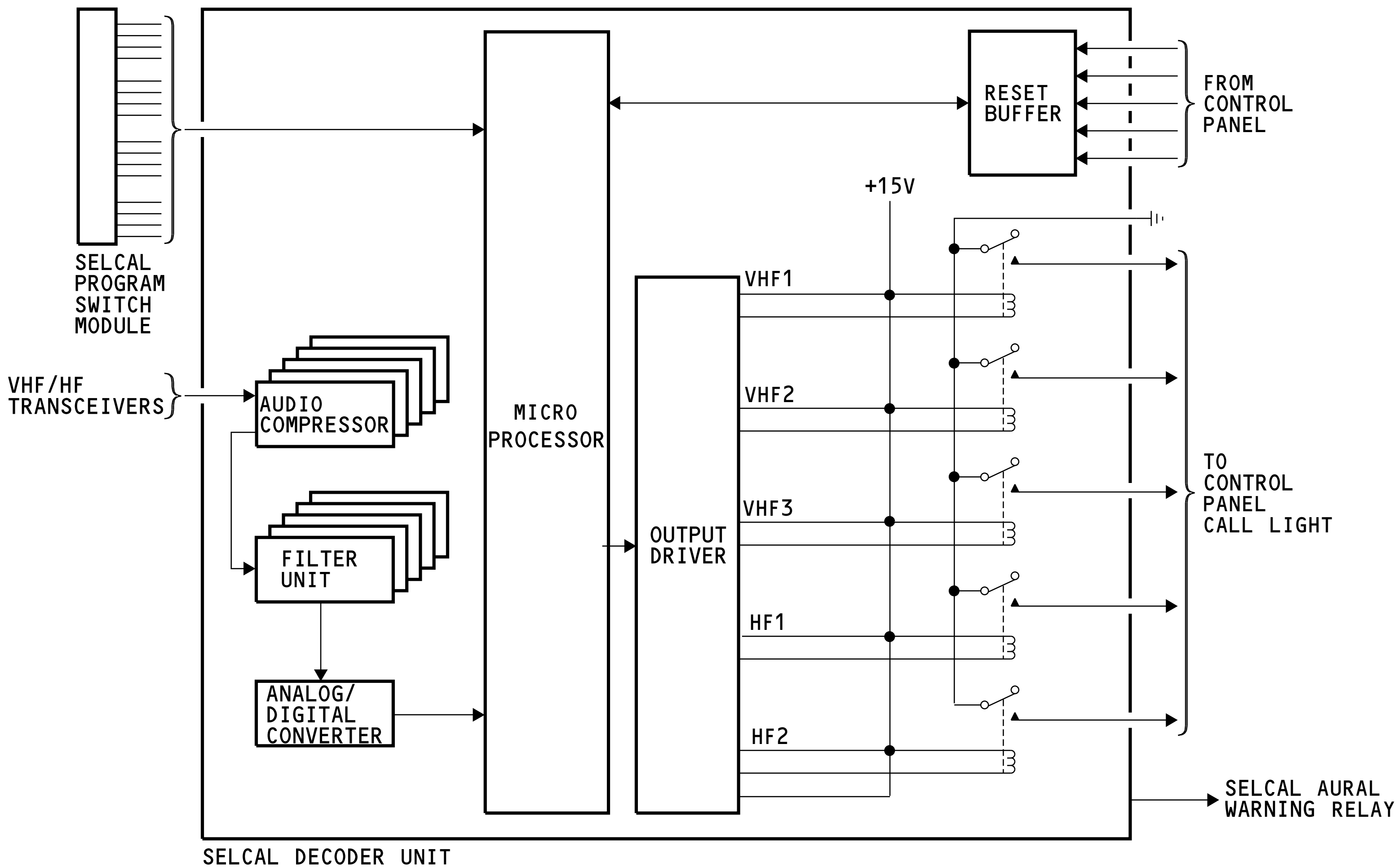
The output driver energizes the output relay. When the relay energizes, the control panel receives a ground signal to turn on the call light.

Call Reset

The REU sends a ground to the reset buffer in the SELCAL decoder. When the reset buffer receives the ground, it supplies a signal to the microprocessor to reset the command to the output driver. When the output driver is reset, all indications go off.

Aural Warning

The SELCAL decoder unit supplies a ground discrete to the SELCAL aural warning relay. The energized relay sends 28V dc to the aural warning system through the REU. The aural warning system makes a single high/low chime that tells the flight crew when a call comes in.



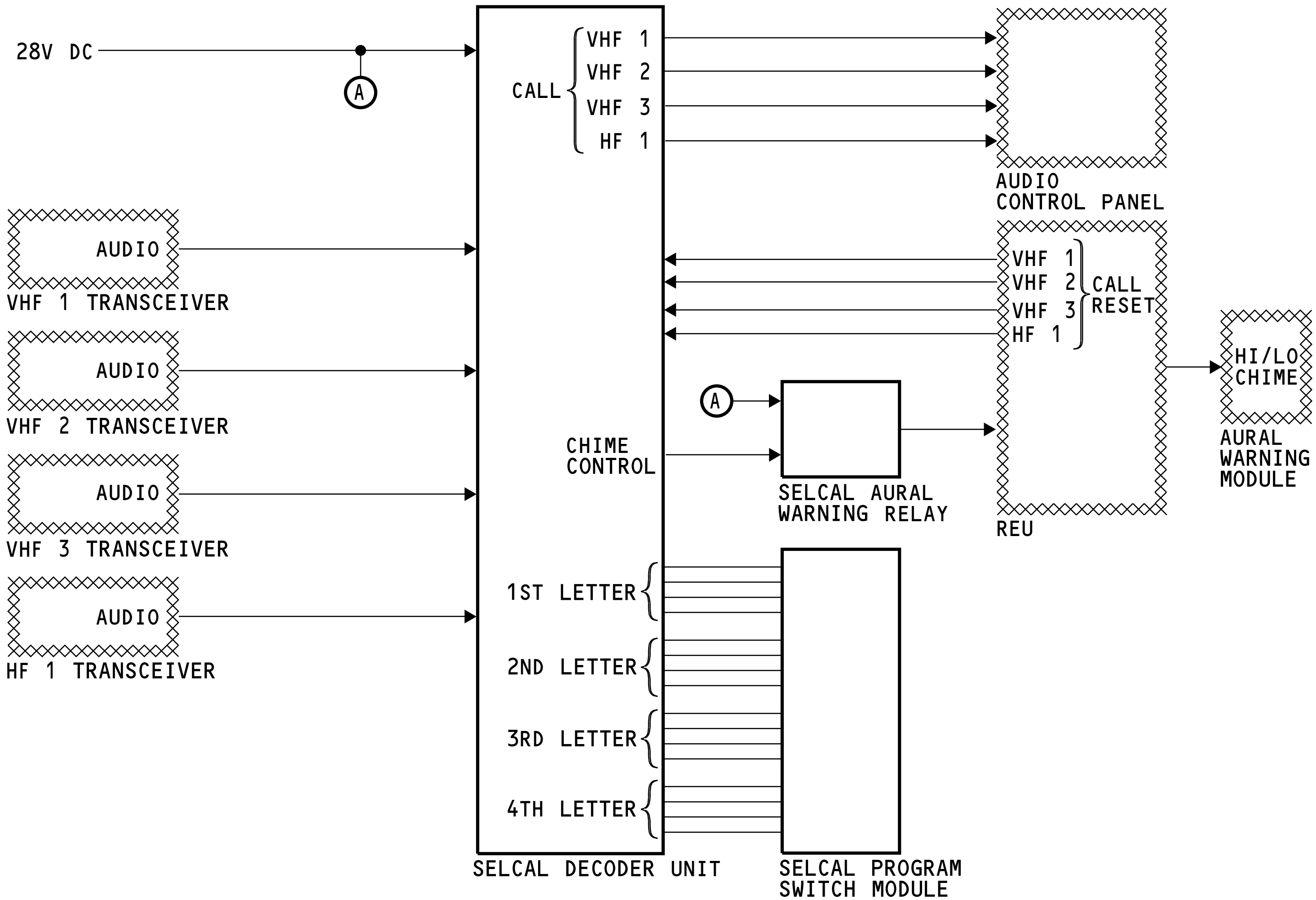
M80124 S0004623680_V1

SELCAL SYSTEM - FUNCTIONAL DESCRIPTION

SELCAL SYSTEM - SYSTEM SUMMARY

General

This graphic is for reference purposes only.



M80140 S0004623687_V1

SELCAL SYSTEM - SYSTEM SUMMARY

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PASSENGER ADDRESS SYSTEM - INTRODUCTION

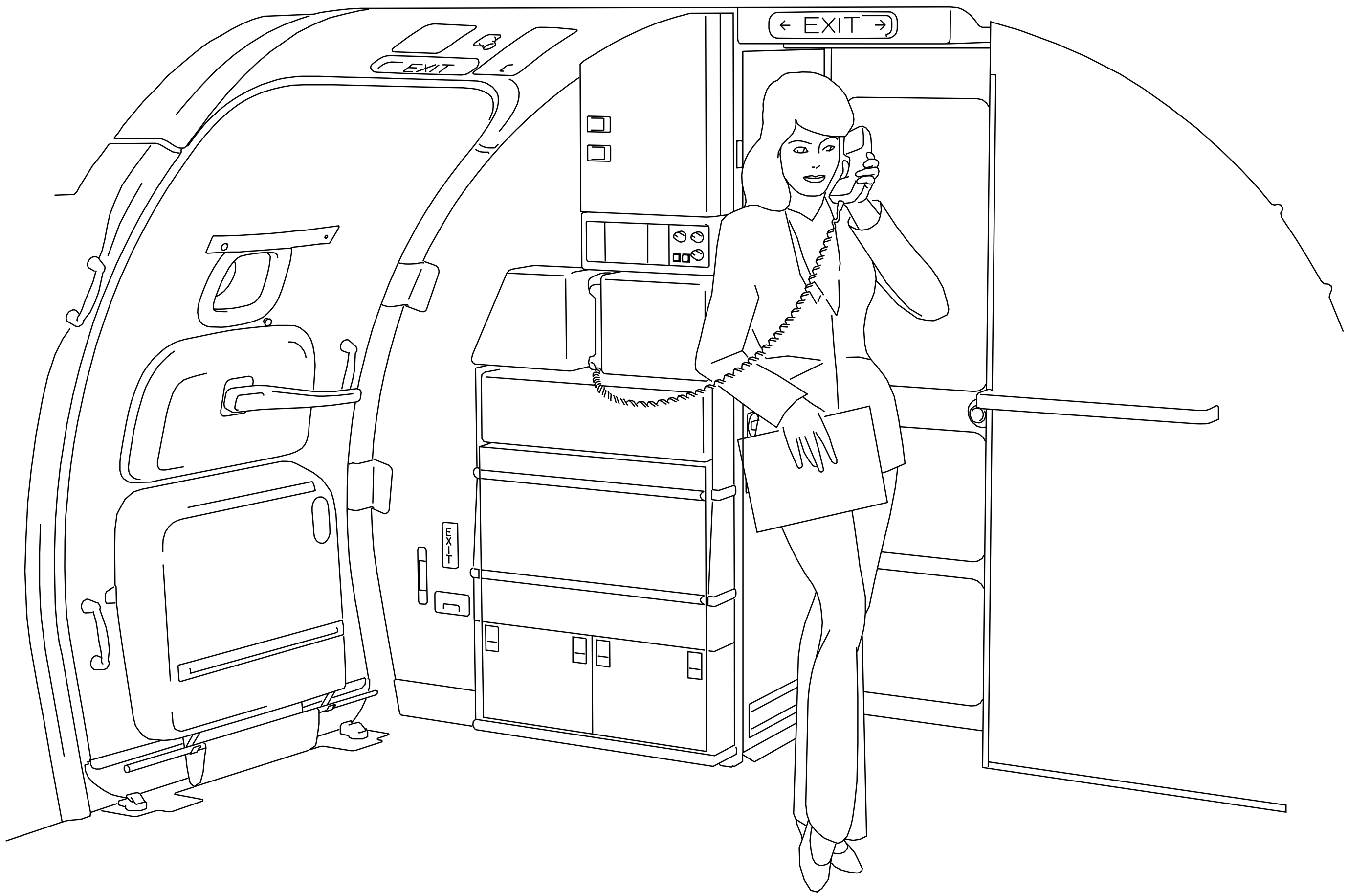
Purpose

The passenger address (PA) system supplies these to the passenger cabin:

- Passenger address announcements
- Chimes.

Abbreviations and Acronyms

- ACP - audio control panel
- amp - amplifier
- annc - announcement
- att - attendant
- BGM - boarding music
- BITE - built-in test equipment
- CDS - common display system
- ckts - circuit
- db - decibel
- DIP - dual-in-line package
- DEU - display electronics unit
- EEC - electronic equipment compartment
- eng - engine
- ent - entertainment
- fwd - forward
- ind - indication
- LCD - liquid crystal display
- LED - light emitting diode
- MCU - modular concept unit
- mic - microphone
- oxy - oxygen
- PA - passenger address
- PES - passenger entertainment system
- PSU - passenger service unit
- PTT - push to talk
- rly - relay
- repr - reproducer
- REU - remote electronics unit
- RV - rated voltage
- SSSV - solid state stored voice
- sw - switch
- typ - type; typical
- VRMS - voltage root mean square
- VSCU - video system control unit
- xfr - transfer



M80150 S0004623715_V1

PASSENGER ADDRESS SYSTEM - INTRODUCTION

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PA SYSTEM - GENERAL DESCRIPTION

General

The passenger address (PA) system supplies this audio to the passenger cabin and flight compartment:

- Flight crew announcements
- Pre-recorded/stored announcements
- Boarding music
- Chimes.

The PA amplifier sets the priority for the audio inputs. Only one audio input signal at a time is processed. The audio inputs come from these sources:

- Pilots
- Attendants.

The PA amplifier sends the audio input that has the highest priority to these components/systems:

- Passenger cabin and lavatory speakers
- Remote electronics unit (REU).

System Components

The PA system has these components:

- PA amplifier
- Passenger signs panel
- Attendant handset
- Cabin and lavatory speakers.

The PA amplifier amplifies the audio input that has the highest priority. The PA amplifier also supplies the chime signals with the other PA audio.

The passenger signs panel has a light that gives the ATTEND call indication. The passenger signs panel has these switches to turn on annunciations and give chimes:

- FASTEN BELTS
- ATTEND
- GRD CALL.

The attendants use the attendant handset to make PA announcements from the forward and aft attendant stations.

The cabin and lavatory speakers change the PA amplifier output signals to audio.

External Interface

The PA system connects with these components:

- REU
- Lavatory speakers
- Passenger service unit speakers
- Pilot PA hand microphone.

System Operation

The PA system audio inputs come from these sources:

- Flight compartment microphone
- Attendant handsets.

The PA amplifier selects the highest priority input. The amplifier amplifies the audio signal and sends it to these LRUs and systems:

- REU
- Cabin speakers
- Lavatory speakers.

The amplified audio goes from the PA amplifier to the cabin and lavatory speakers. The audio also goes through muting circuits in the REU to the FWD and AFT attendant speakers. The on-side attendant speakers are muted during attendant announcements to prevent feedback.

The PA audio goes through the REU to the flight crew headsets as sidetone. It also goes to the flight compartment speakers.

PA SYSTEM - GENERAL DESCRIPTION

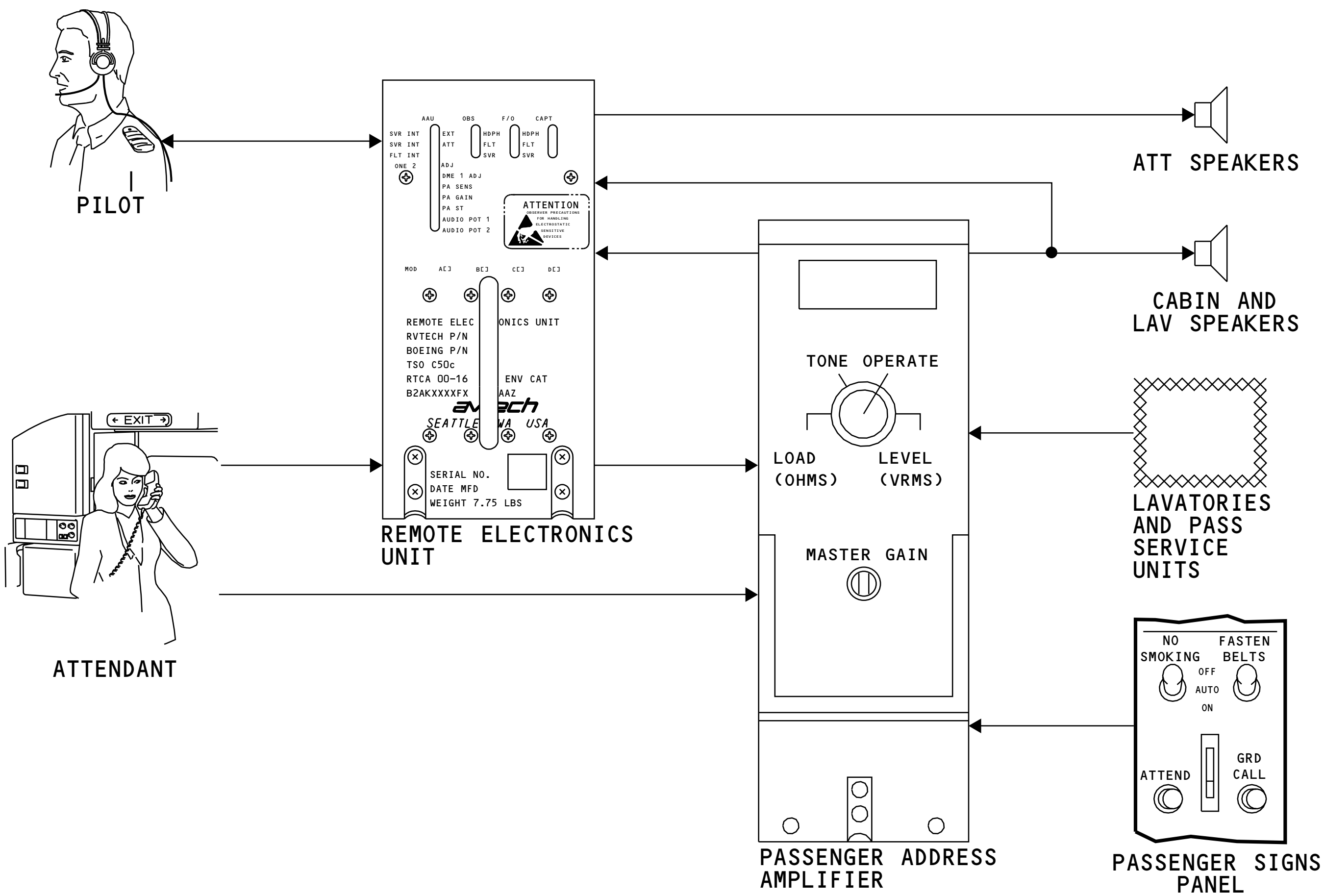
The PA amplifier sets the priority of the input signal. These are the PA system audio priorities:

- Priority 1 - announcement from the flight compartment
- Priority 2 - announcement from an attendant
- Priority 3 - pre-recorded announcement
- Priority 4 - boarding music.

The lavatories and passenger service units send discrete signals to the PA amplifier to make chime signals.

The PA amplifier supplies a chime signal when the flight crew puts the passenger sign panel FASTEN BELTS switch in the ON position or pushes the ATTEND switch.

The chime signals are superimposed on the other PA audio in the amplifier.



M80154 S0004623720_V1

PA SYSTEM - GENERAL DESCRIPTION

PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

Audio Control Panels

The audio control panels have an interface with the PA system.

The captain and first officer ACPs are on the P8 aft electronics panel.

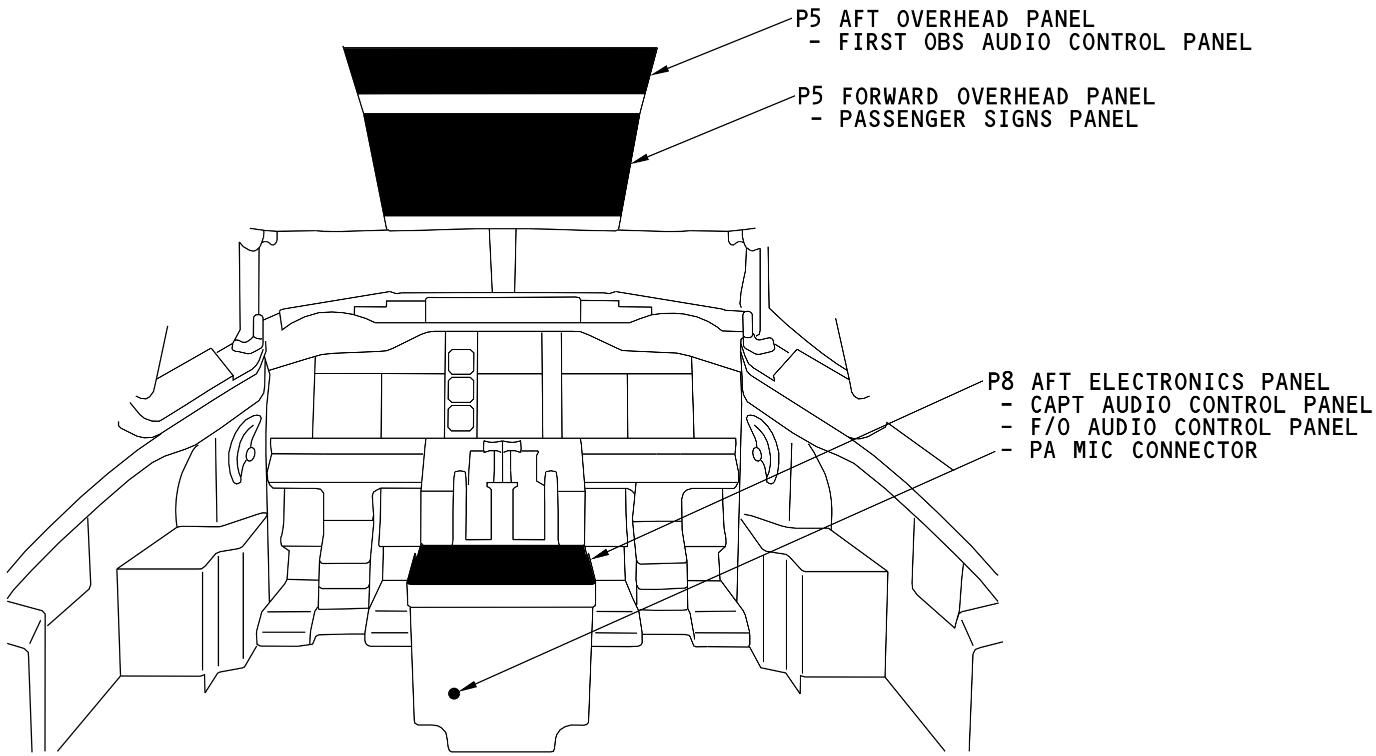
The first observer ACP is on the P5 aft overhead panel.

Passenger Signs Panel

The passenger signs panel has an interface with the PA system. The panel is on the P5 forward overhead panel.

PA Mic Connector

The PA mic connector is on the aft face of the P8 aft electronics panel.



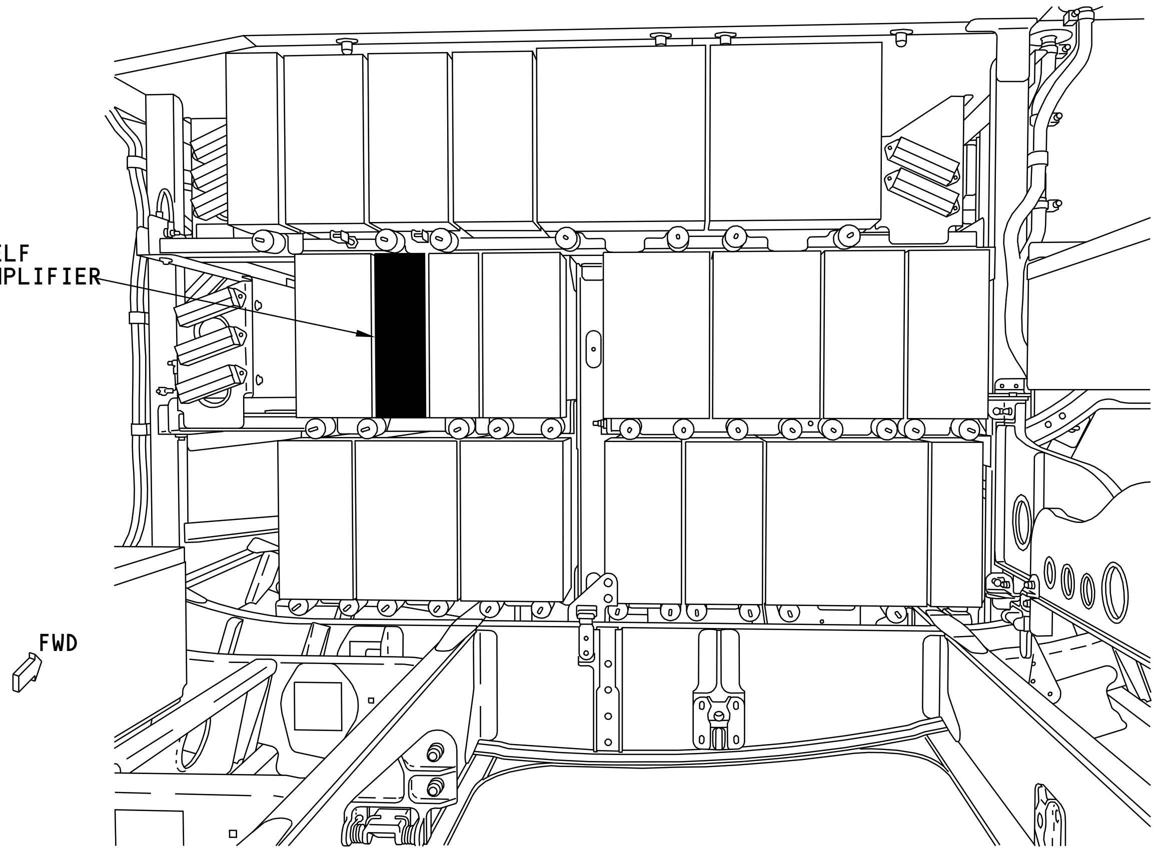
M80184 S0004623748_V1

PA SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

Electronic Equipment Compartment

The PA amplifier is on the E1-3 shelf.



M80198 S0004623762_V1

PA SYSTEM - ELECTRONIC EQUIPMENT COMPARTMENT COMPONENT LOCATIONS

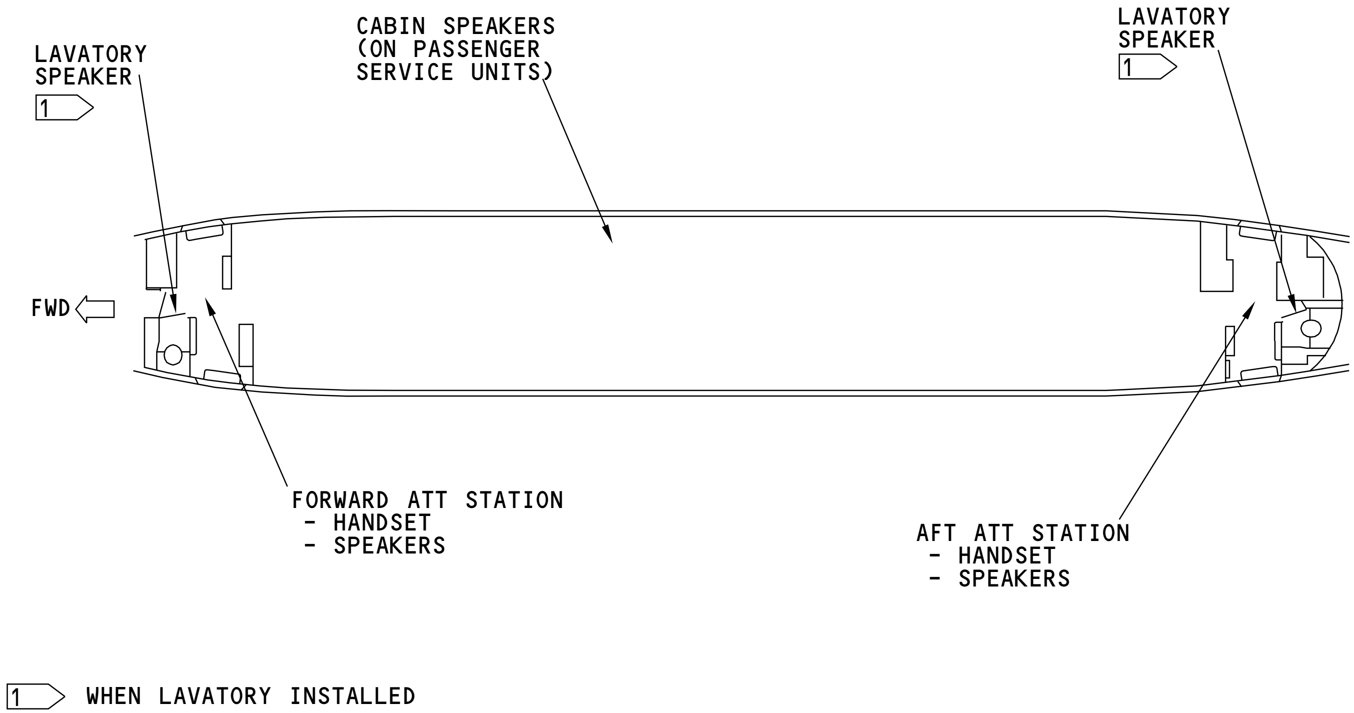
PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION

Speakers

The attendant speakers are at each of the attendant stations and at the galleys. The cabin speakers are in the passenger service units.

Handsets

The handsets are on the cabin attendant panels at each attendant station.



M80210 S0004623767_V1

PA SYSTEM - PASSENGER COMPARTMENT COMPONENT LOCATION

PA SYSTEM - INTERFACES

Power

The passenger address (PA) amplifier gets 28v dc from the 28v dc battery bus.

Audio

The PA system receives audio from these sources:

- Flight compartment microphones
- Attendant microphones.

Flight compartment audio has the first priority. The second priority is from the attendant microphones.

Priority circuits in the PA amplifier receive the audio inputs and set their priority. The audio with the highest priority is amplified and goes to the speakers.

The PA amplifier supplies the side tone to the remote electronics unit (REU). The REU supplies the side tone to the flight crew headsets.

The PA amplifier supplies audio to these components:

- REU mute relays.
- Passenger and lavatory speakers.

The REU supplies audio to the attendant speakers.

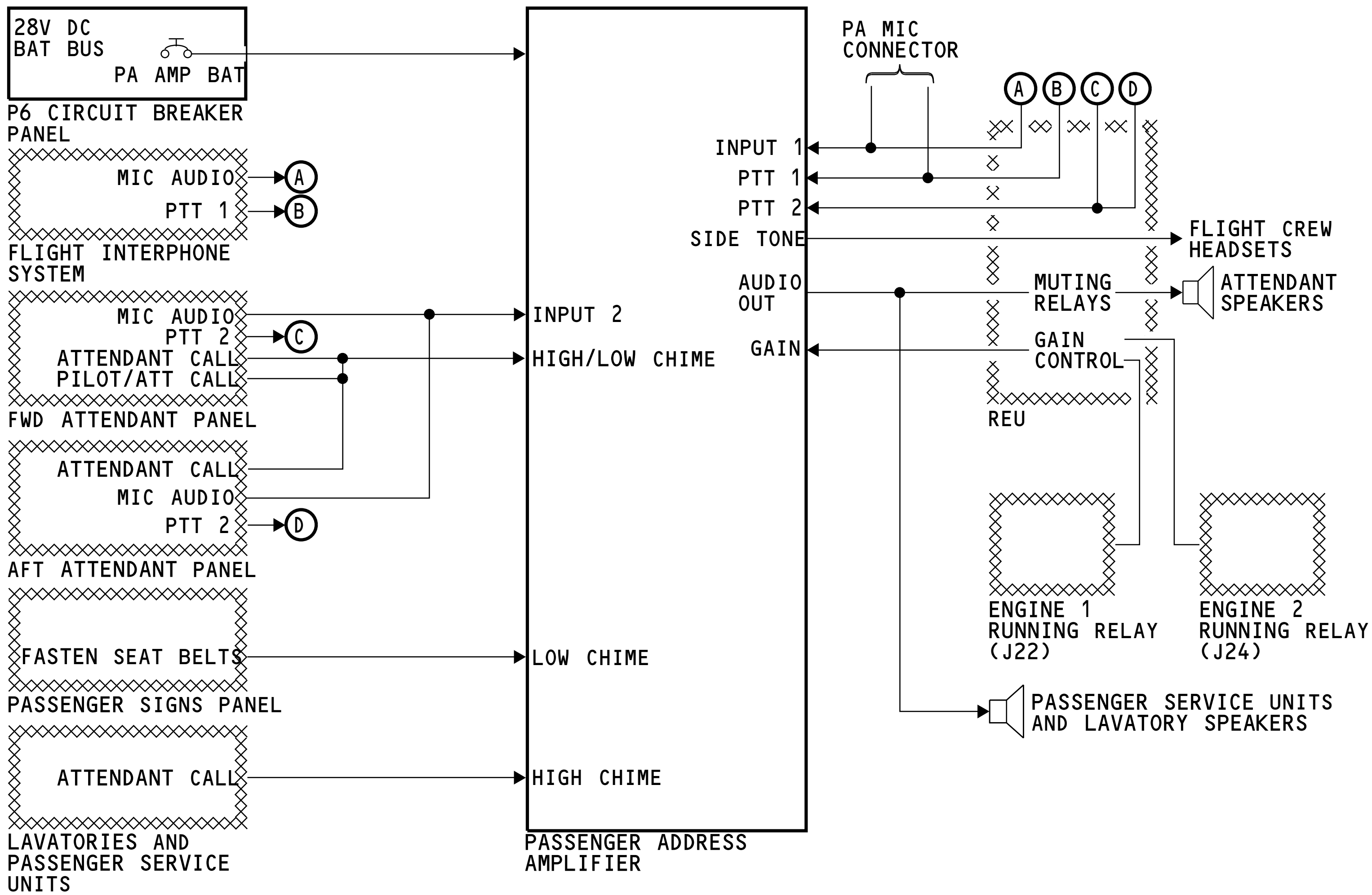
Chimes

The PA amplifier supplies chimes for these conditions:

- FASTEN SEAT BELTS signs operate - low chime
- Attendant call switch operates - high chime from passenger service units and lavatories, high/low chime from the flight compartment and attendant stations.

Gain Control

The PA amplifier receives gain signals from the REU. The REU receives inputs from the engine running relays. When the engines operate, the PA amplifier gain increases to compensate for the increase in the ambient noise level.



U69379 S0000214064_V1

PA SYSTEM - INTERFACES

PA SYSTEM - CREW ANNOUNCEMENT INTERFACE

Power

The PA amplifier gets 28v dc from the battery bus.

Audio

For flight crew and attendant announcements, the PA system receives audio from these sources:

- Flight compartment microphones
- Attendant microphones.

Priority circuits in the PA amplifier receive the audio and PTT inputs and set the priority. The PA amplifier amplifies the audio with the highest priority and sends the audio to the passenger service units and lavatory speakers.

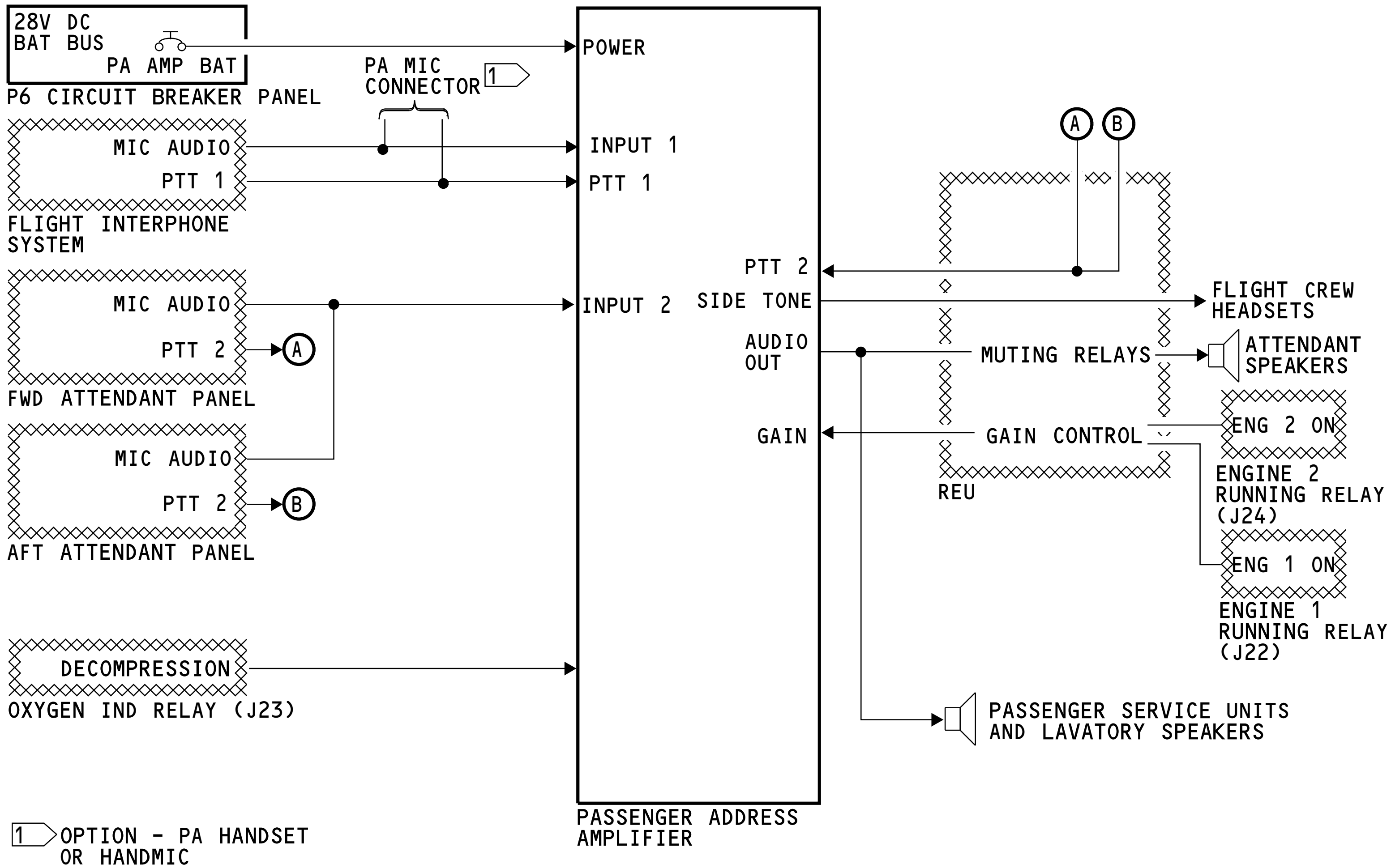
The PA amplifier supplies a side tone through the remote electronics unit (REU) to the flight crew headsets.

Amplified audio goes through the REU mute relays to the attendant speakers.

Gain Control

The PA amplifier receives gain signals from the REU. The REU receives inputs from the engine running relays. When engine number 1 or 2 operates, the PA amplifier gain increases by 6 db to compensate for the increase in the ambient noise level.

The oxygen indicator relay sends a signal to the PA amplifier when the cabin loses cabin pressure. This increases the amplifier gain by 3 db to adjust for the increase in cabin noise level.



M80355 S0004623823_V1

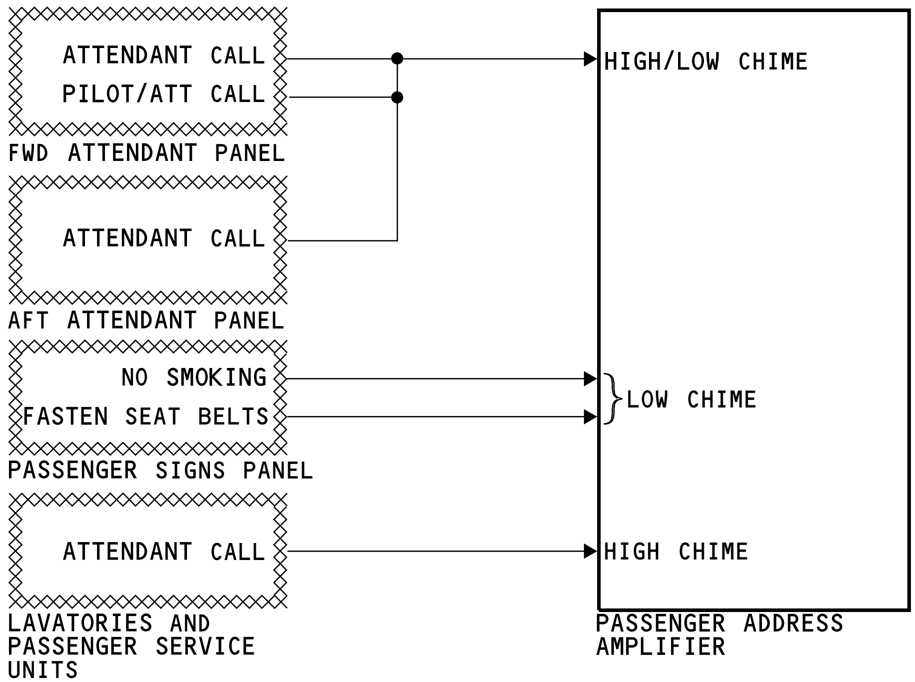
PA SYSTEM - CREW ANNOUNCEMENT INTERFACE

PA SYSTEM - INDICATION INTERFACE

Chimes

The PA amplifier supplies chimes for these conditions:

- NO SMOKING/FASTEN SEAT BELTS switches - low chime
- Attendant call switch from lavatories or passenger service units - high chime
- Attendant call switch from attendant panels or flight compartment - high/low chime.



M80362 S0004623826_V1

PA SYSTEM - INDICATION INTERFACE

PA SYSTEM - PASSENGER ADDRESS AMPLIFIER

Purpose

The PA amplifier prioritizes, amplifies, and sends audio signals to airplane speakers and systems. It also supplies chimes to the attendants and passengers.

AKS ALL; AIRPLANES WITH PA P/N 622-5342-101

Controls and Indications

The function select switch has these positions:

- LOAD (OHMS)
- TONE
- OPERATE
- LEVEL (VRMS).

In the LOAD (OHMS) position, the PA amplifier measures the impedance of the speaker network. The value shows on the light emitting diode (LED) display. Normally, the impedance is more than 30 ohms. The switch is spring-loaded from the LOAD position to the TONE position.

In the TONE position, the PA amplifier does a functional check of all speakers. The high frequency chime is the audible test signal that goes to the speakers.

OPERATE is the normal switch position of the PA amplifier. In this position, the display is blank.

In the LEVEL (VRMS) position, the PA amplifier shows the output ac voltage level of the output audio. The LEVEL position disconnects the speakers from the amplifier circuits. It connects a dummy load to internal amplifier circuits. The voltage shows on the LED display. This switch is spring-loaded from the LEVEL position to the OPERATE position.

Master Gain Control

Turn this potentiometer to increase or decrease the gain of the PA amplifier. Normally, you will turn the potentiometer until the display shows 70.7 volts while the function select switch is in the LEVEL position.

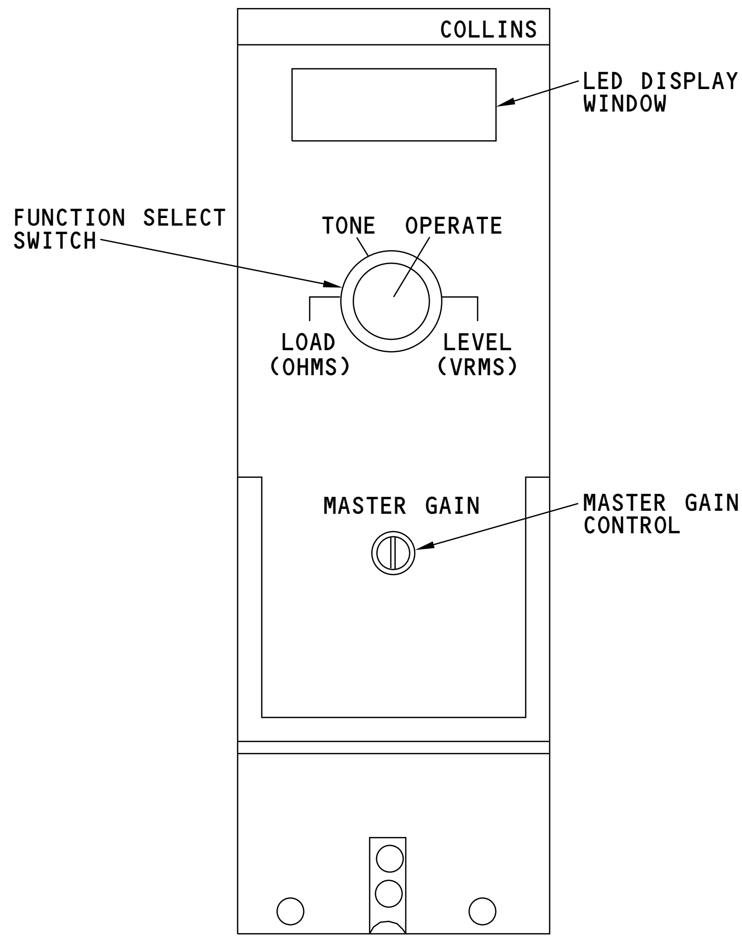
AKS ALL

Characteristics

The PA amplifier is 2.3 inches (5.7 cm) wide, 7.6 inches (19.3 cm) high, and 12.8 inches (32.4 cm) long. It weighs 6.5 pounds (3 kilograms).

Chimes

The chime circuits in the PA amplifier make two frequencies for the chimes.



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PA SYSTEM - PASSENGER ADDRESS AMPLIFIER

PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS

Purpose

The PA system passenger service unit (PSU) speakers supply audio to the passenger cabin.

Features

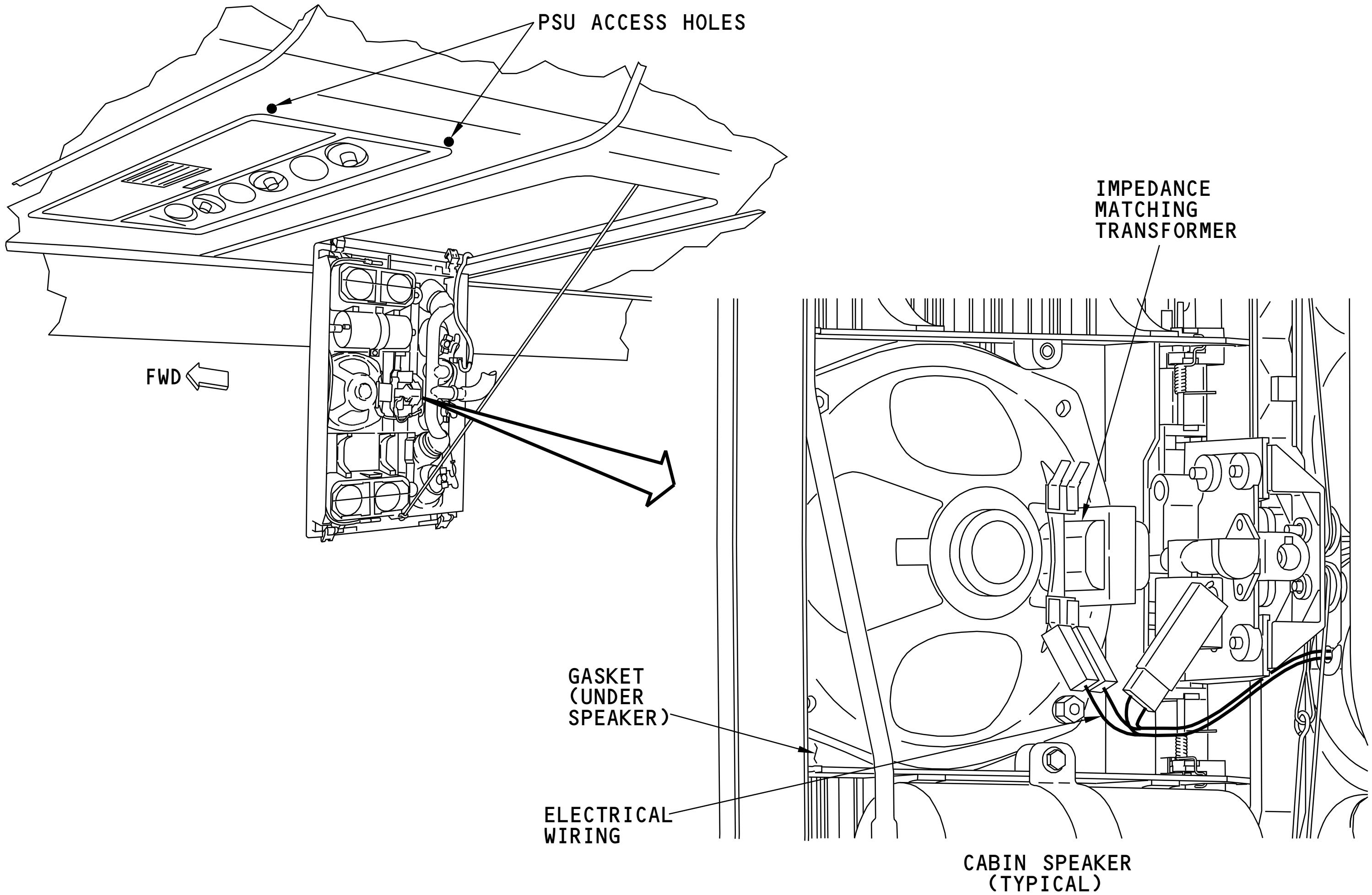
Spring clips hold the PSU assembly closed. To open the assembly, push a small rod in the access holes. Hold the PSU panel and push the rod against the spring clips to open the assembly.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

Training Information Point

When you remove the electrical wires from the speaker transformer terminals, make sure to record the terminal connections. When you replace the speakers, put the electrical wires to the same terminals.

When you remove the speaker from the PSU assembly, make sure you do not damage the speaker gasket. This gasket is between the speaker and the PSU assembly.



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PA SYSTEM - PASSENGER SERVICE UNIT SPEAKERS

PA SYSTEM - LAVATORY SPEAKERS

Purpose

The PA system lavatory speakers supply audio to the lavatories.

Features

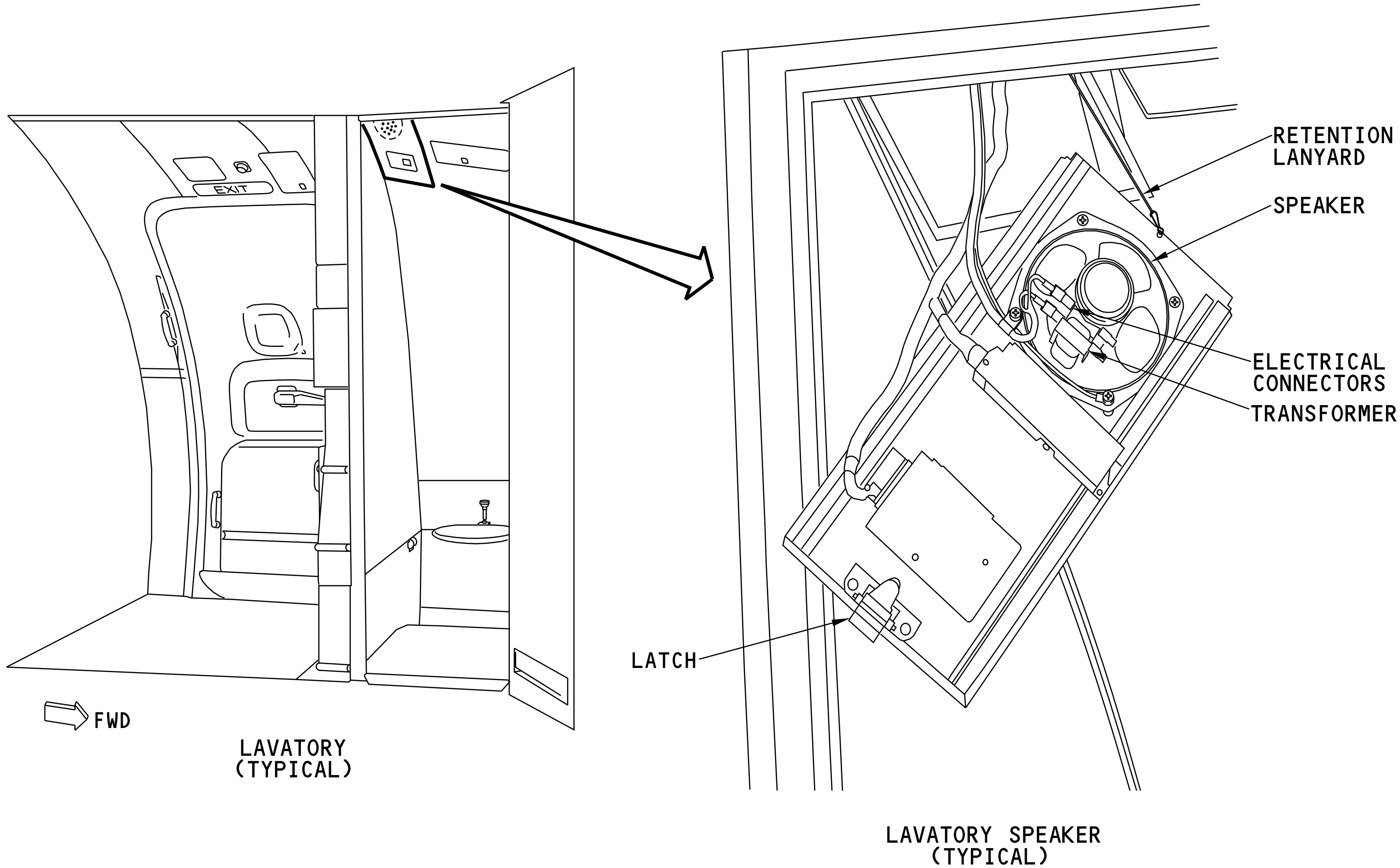
Each lavatory PSU has a 5-inch speaker.

A latch holds the PSU assembly closed. To open the assembly, put a small rod in the access hole. Hold the PSU panel, and push the rod against the spring clip to release the latch. Lower the PSU panel assembly until the lanyard holds the PSU.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

Training Information Point

When you remove the electrical wires from the speaker transformer terminals, make sure to record the terminal connections. When you replace the speakers, put the electrical wires to the same terminals.



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PA SYSTEM - LAVATORY SPEAKERS

PA SYSTEM - ATTENDANT SPEAKERS

Purpose

The PA system attendant speakers supply audio to the attendant stations and galleys.

Features

There is a 5-inch speaker in each attendant station and galley. The audio signal for the attendant speakers goes through mute relays in the remote electronics unit. The mute relays stop the attendant speaker from operating during PA announcements. This prevents feedback through the speakers.

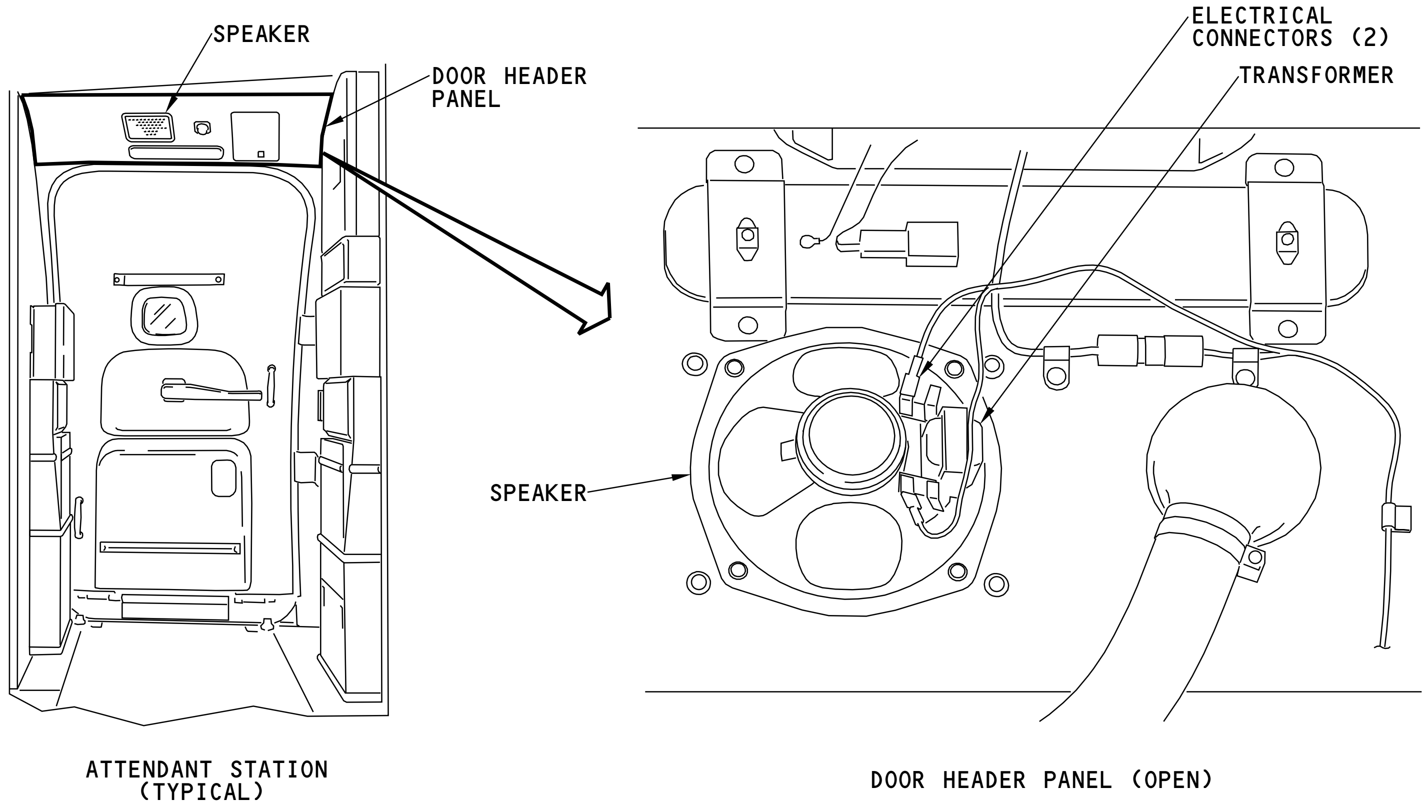
The attendant speaker is in the doorway header panel. To replace the speaker, first remove the doorway header panel. This panel is held by screws and bolts. Plug buttons and a seal depressor cover these retainers.

Each speaker has a transformer. The transformer matches the speaker impedance to the line impedance. Two electrical wires connect the speaker transformer terminals to the PA amplifier. Install and remove the speaker and transformer as one assembly.

Four screws hold the speaker to the doorway header panel.

Training Information Point

When you remove the electrical wires from the speaker transformer terminals, make sure to record the terminal connections. When you replace the speakers, put the electrical wires to the same terminals.



PA SYSTEM - ATTENDANT SPEAKERS

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PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

Power

The PA amplifier receives 28v dc for power.

General

The PA system supplies these outputs:

- Voice audio
- Chimes.

Each audio output has this order of priority:

- Flight compartment announcements
- Flight attendant announcements

The chime audio operates at the same time as other audio. It has no effect on the priority logic.

The input circuits receive the input audio. The amplifier priority logic circuits get the PTT signals.

The priority logic circuits supply a signal to the input circuits. The signal lets the audio with the highest priority go out.

The amplifier and control circuits get the audio from the input circuits. The amplifier circuits amplify the audio and supply it through the REU to the attendant speakers. The audio also goes directly to the passenger service unit speakers and the lavatory speakers.

The amplifier and control circuits receive test signals from the test circuits. The control circuits supply output signals to the front panel LCD display.

Gain Control

The gain control circuit increases the amplifier gain by 6 db when an engine is on. The engine 2 running relay controls the REU gain control relay and the engine 1 running relay controls the signal on the relay contact. With the engines off, the engine running relays send grounds to the REU. This energizes the REU gain control relay. The energized relay contact sends a ground from the engine 1 running relay to the PA amplifier.

The CDS display electronic units (DEUs) control the engine running relays. An engine running relay energizes when one these occurs:

- The engine N2≥50%
- The engine start lever is in idle, the fire switch is reset, and N2≥50%
- The airplane is on the ground, and the start lever is in the idle position for five minutes.

When either engine running relay energizes, the gain control relay removes the ground to the PA amplifier. This increases the amplifier gain by 6 db.

If decompression occurs, the oxygen indication relay energizes. At that time, the relay sends a ground to the amplifier and control circuits in the PA amplifier to increase the amplifier gain by an additional 3 db.

Speaker Mute

The forward and aft muting relays, in the REU, receive audio signals from the PA amplifier. If the audio is from the flight compartment, the mute control relay energizes. This prevents operation of the forward and aft mute relays.

An announcement from an attendant station stops the operation of the speakers at that station. The PTT signal causes the forward or aft mute relay to energize. This stops the audio output to that speaker.

Chimes

The chime circuits supply these chime signals:

- High chime
- Low chime
- High/low chime.

High chimes operate when there is an attendant call signal from a passenger service unit or lavatory.

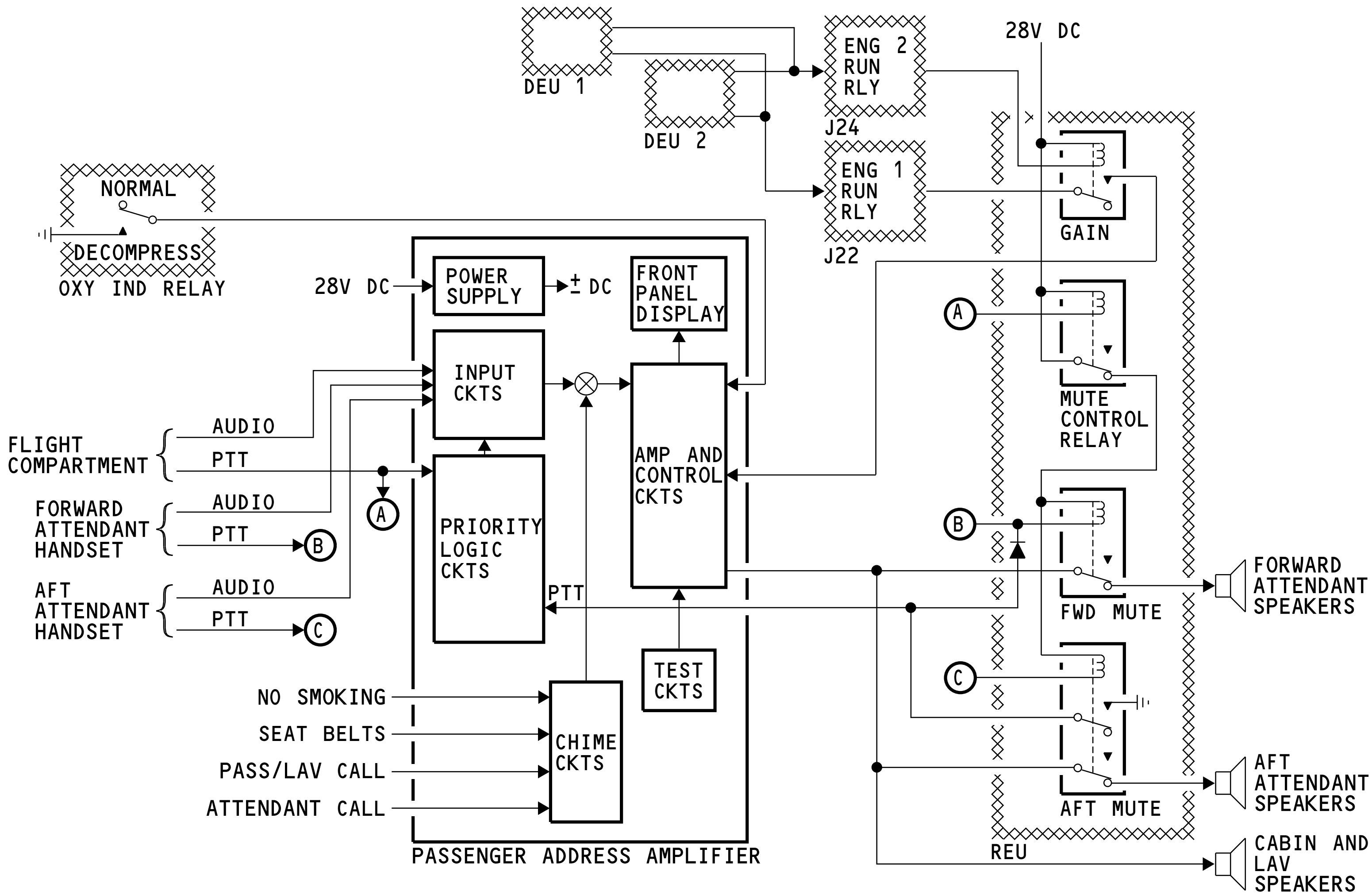
Low chimes operate when the no smoking or fasten seat belts signs come on.

High/low chimes operate when there is an attendant call from the flight compartment or another attendant station.

PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

The high/low chime operates three times for alert calls from the pilots or attendants.

Chime signals operate at the same time as other audio signals.



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PA SYSTEM - AMPLIFIER FUNCTIONAL DESCRIPTION

PA SYSTEM - OPERATION - ANNOUNCEMENTS

Crew Announcements

Crew announcements are made from these locations:

- Flight compartment
- Flight attendant stations.

Flight Compartment

The pilot can make PA announcements with these:

- Boom microphone (mic)
- Oxygen mask mic
- Flight interphone hand mic.

To make an announcement with the boom mic or oxygen mask mic, you must first set the audio control panel. You select the microphone source (boom or mask), and set the microphone selector switch (PA). You adjust for received PA volume with the PA receiver volume control. To key the microphone, you use either the audio control panel PTT switch or the control wheel MIC switch.

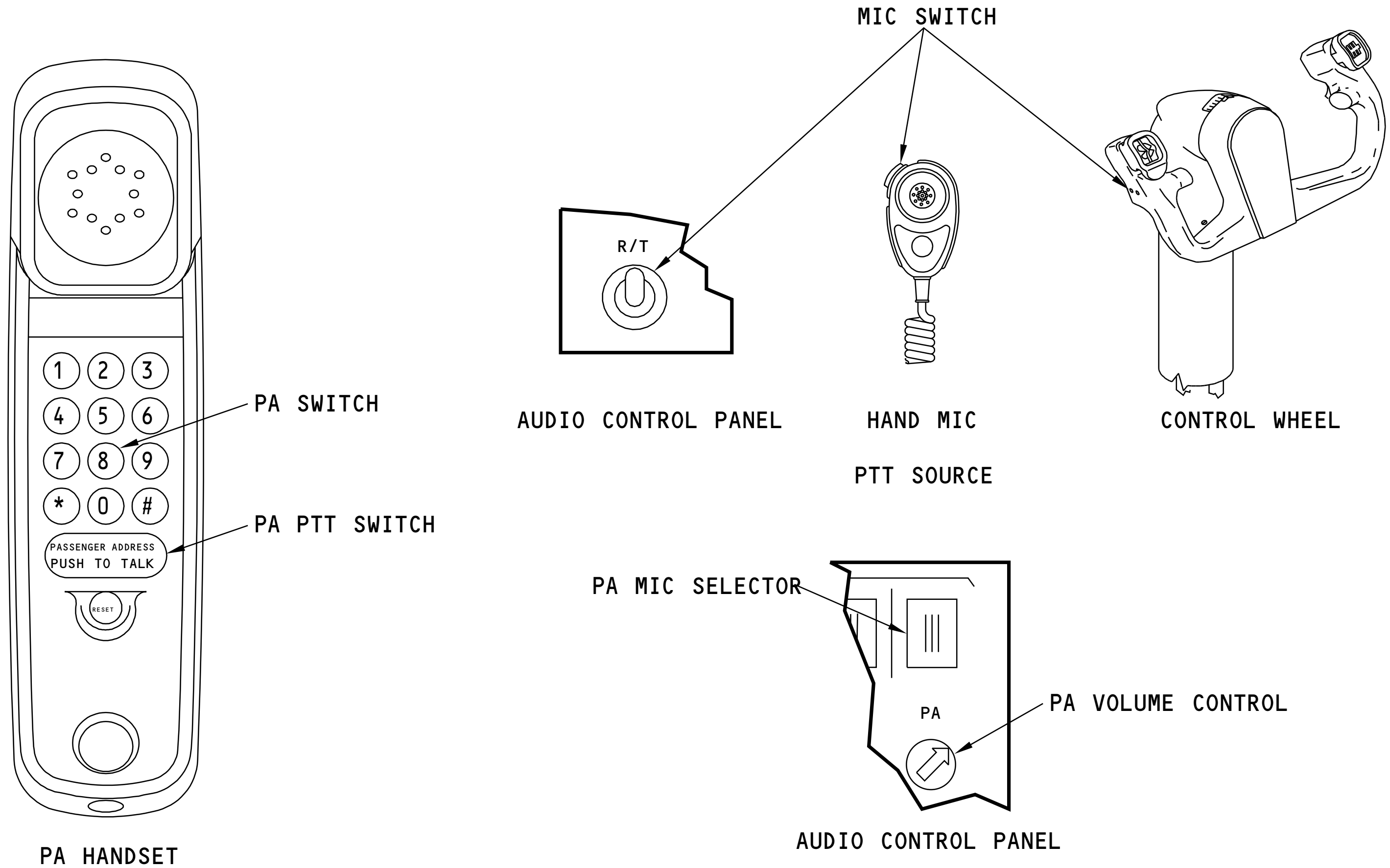
With the audio control panel microphone selector switch set, you can also make an announcement with the flight interphone hand mic. Push the hand mic push to talk switch and speak through the microphone.

Flight Attendant Stations

Flight attendant PA announcements come from the forward and the aft attendant PA handsets.

Do these steps to make a PA handset announcement:

- Push the PA switch (8) on the handset
- Push and hold the PASSENGER ADDRESS PUSH TO TALK switch
- Speak through the handset mouth piece.



M80284 S0004623894_V1

PA SYSTEM - OPERATION - ANNOUNCEMENTS

PA SYSTEM - TRAINING INFORMATION POINT - AMPLIFIER TEST

General

The PA system tests help you to find a system fault. You use the PA amplifier function select switch to test the amplifier and the speakers.

AKS ALL; AIRPLANES WITH PA P/N 622-5342-101

Controls and Indications

The function select switch has these positions:

- LOAD (OHMS)
- TONE
- OPERATE
- LEVEL (VRMS).

In the LOAD (OHMS) position, the speaker impedance shows on the display. Normally, this impedance is more than 30 ohms. If this impedance is less than 30 ohms, there may be a problem with either a speaker or the interface wiring.

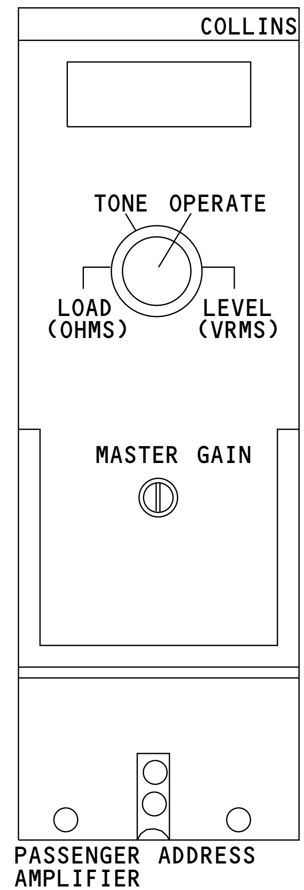
In the TONE position, a continuous tone goes to the speakers. If you do not hear this tone, there may be a problem with either the PA amplifier, the speaker or the interface wiring.

OPERATE is the normal switch position. The display is blank while the switch is in this position.

In the LEVEL (VRMS) position, the output voltage shows on the LED display. This voltage is normally 70.7 vrms. If you do not see the correct voltage, there may be a problem with either the PA amplifier or the output level adjustment.

Use the master gain adjustment to change the output level.

AKS ALL



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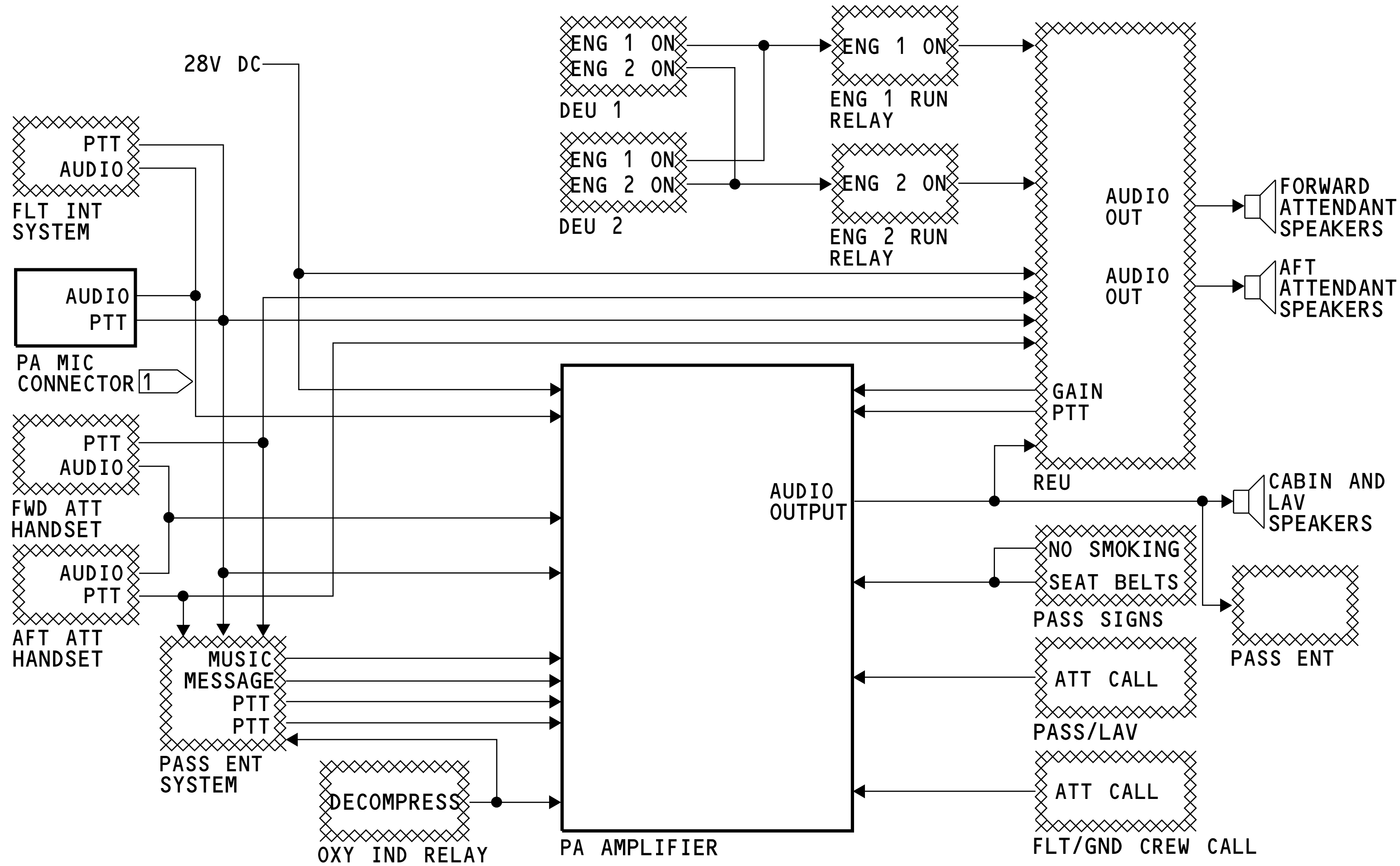
PA SYSTEM - TRAINING INFORMATION POINT - AMPLIFIER TEST

PA SYSTEM - SYSTEM SUMMARY

General

This graphic is for reference purposes only.



1 OPTION - PA HANDSET OR HANDMIC

M80350 S0004623970_V1

PA SYSTEM - SYSTEM SUMMARY

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SERVICE INTERPHONE SYSTEM - INTRODUCTION

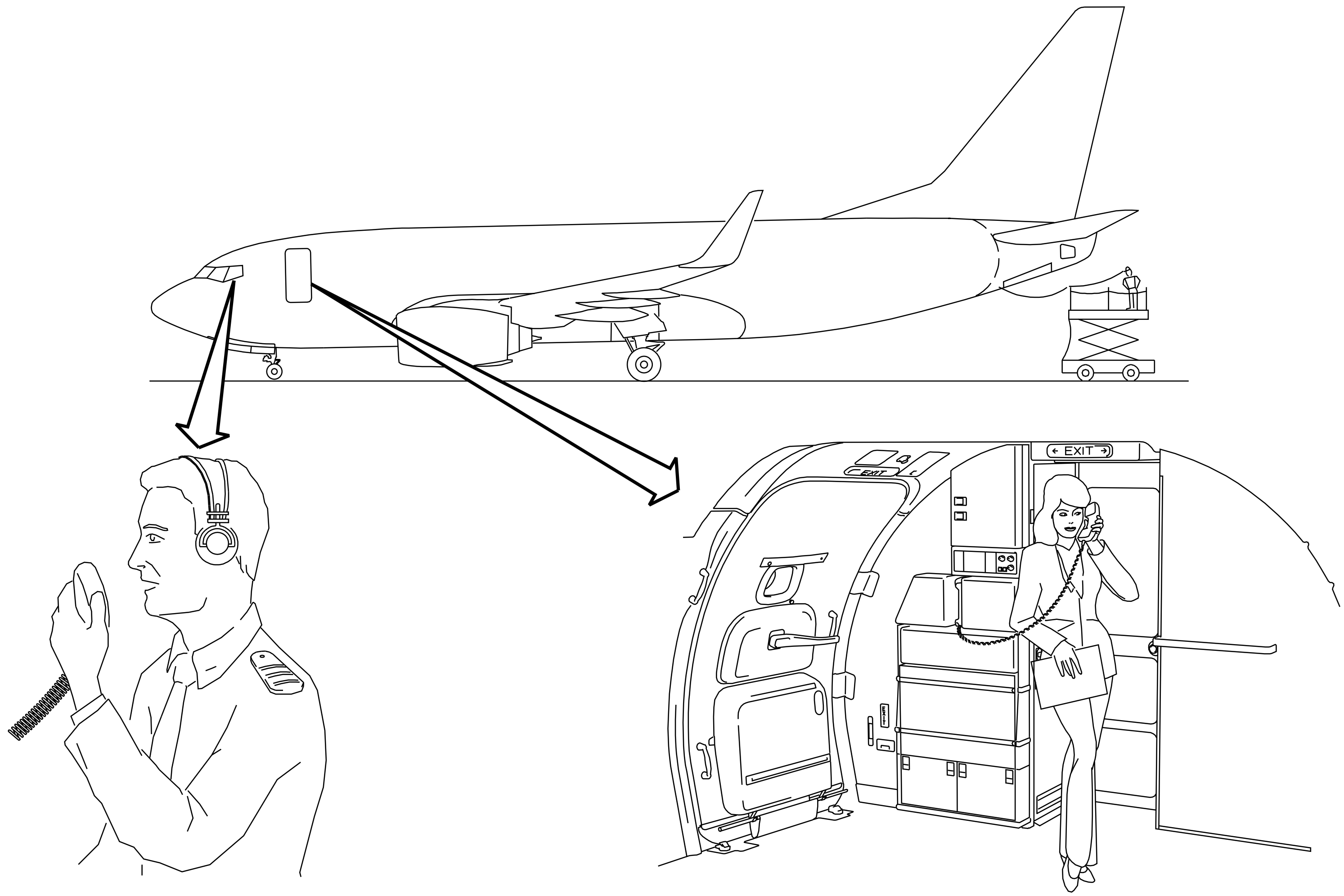
General

The ground crew uses the service interphone system to talk to each other and to the flight crew. Service interphone jacks are at different locations on the airplane.

The flight attendants use the service interphone system to speak with each other and the pilots.

Abbreviations and Acronyms

- AAU - audio accessory unit
- ACP - audio control panel
- ampl - amplifier
- APU - auxiliary power unit
- att - attendant
- bat - battery
- capt - captain
- dc - direct current
- flt - flight
- fwd - forward
- inph - interphone
- lts - lights
- mic - microphone
- PA - passenger address
- PTT - push-to-talk
- REU - remote electronics unit
- v - volt
- warn - warning



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SERVICE INTERPHONE SYSTEM - INTRODUCTION

SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION

General

The service interphone system is for these personnel:

- Flight crew
- Attendants
- Ground crew.

The flight crew selects the service interphone function from the audio control panel (ACP). Flight interphone microphones send audio to the remote electronics unit (REU). Flight interphone headsets and speakers get audio from the REU.

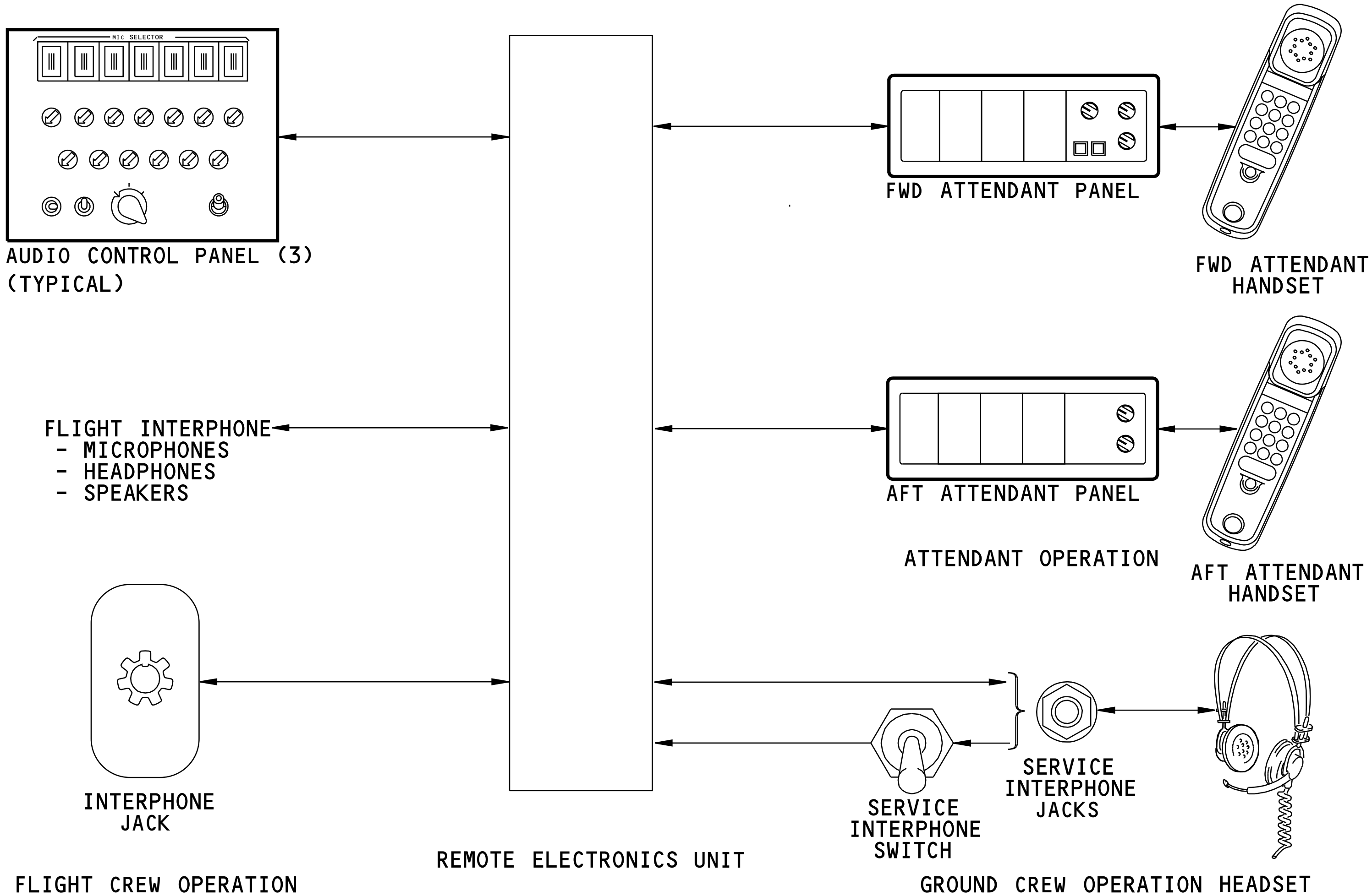
The flight crew can also use a handset to talk on the service interphone system. The interphone jack connects to the system without ACP control.

The attendants operate a handset to connect into the system. An attendant panel connects the handset to the REU.

The ground crew microphones connect into the system through the service interphone switch. You must turn on the service interphone switch to operate the system from the service station jacks. The headset gets audio from the REU.

The REU does these functions:

- Combines audio from the microphones
- Amplifies the audio signal
- Sends audio to handsets, headsets, and speakers.



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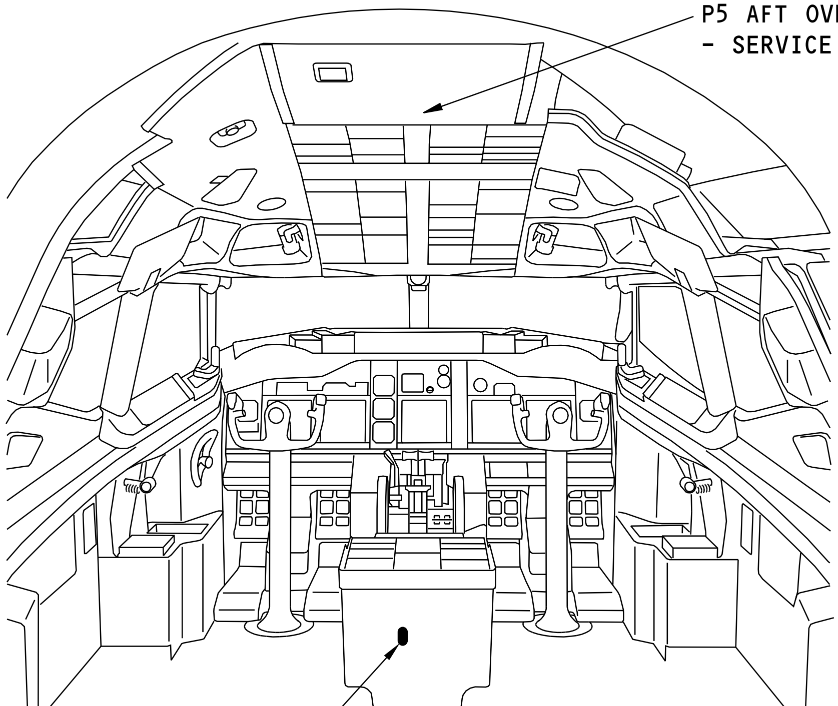
SERVICE INTERPHONE SYSTEM - GENERAL DESCRIPTION

SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS

Service Interphone Component Locations

The service interphone switch is on the P5 aft overhead panel.

The interphone jack for the handset is on the aft face of the P8 aft electronic panel.



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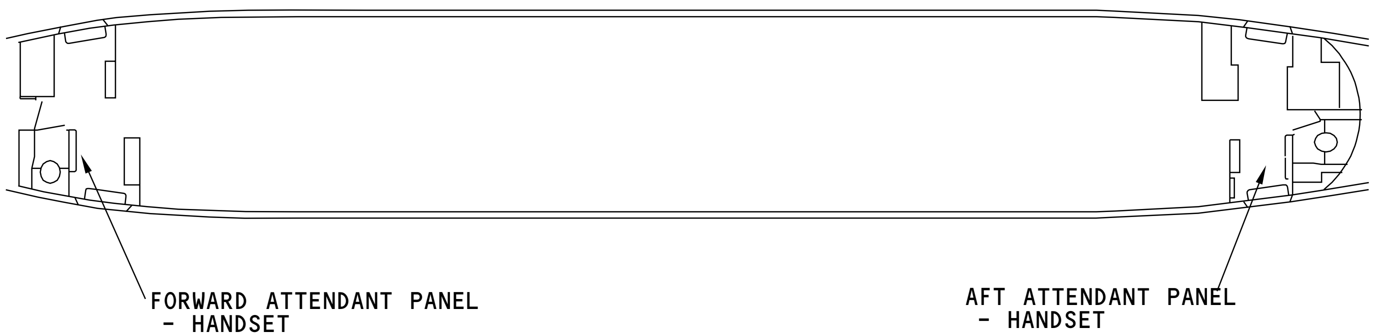
SERVICE INTERPHONE SYSTEM - COMPONENT LOCATIONS

SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS

Handset Locations

These locations have handsets:

- The forward attendant station - below the attendant panel, near the forward entry door.
- The aft attendant station - below the attendant panel, near the aft entry door.



SERVICE INTERPHONE SYSTEM - HANDSET LOCATIONS

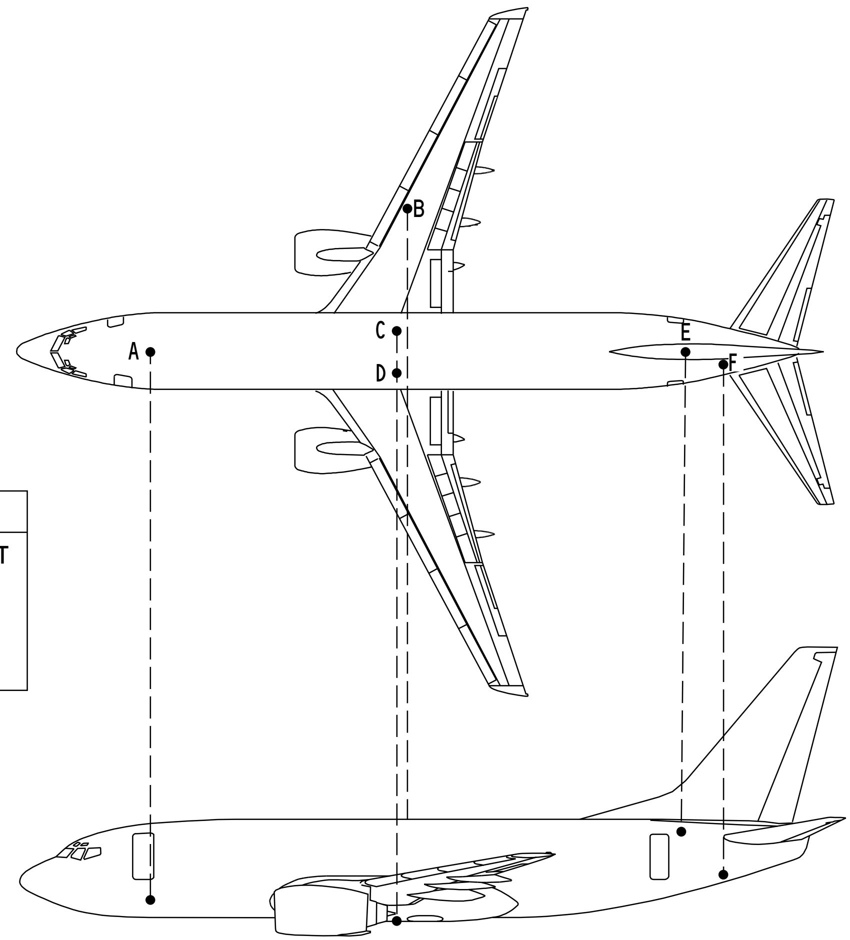
SERVICE INTERPHONE SYSTEM - JACK LOCATIONS

Jack Locations

These locations have service interphone jacks:

- Electronic equipment compartment
- Fueling station, behind the access door on the right wing
- Right wheel well, on the forward wheel well faring exterior
- Left wheel well, on the forward wheel well faring exterior
- Aft cabin, on the ceiling above the attendant station
- APU service area, adjacent to the 48 section access door.

area	SERVICE INTERPHONE JACK
A	ELECTRONIC EQUIPMENT COMPARTMENT
B	FUELING STATION
C	right wheel well
D	left wheel well
E	AFT cabin
F	apu service area



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SERVICE INTERPHONE SYSTEM - JACK LOCATIONS

SERVICE INTERPHONE SYSTEM - INTERFACES

Flight Crew Interface

The flight crew uses microphones and headsets with audio control panel (ACP) control. When the ACP transmitter selector is set to service interphone, the flight crew can use a push-to-talk (PTT) switch to speak with the attendants and the service personnel. The ACP sends the transmitter selection data to the REU on the control input. The ACP sends the PTT signal (R/T-PTT) to the REU.

There is an interphone jack on the aft face of the P8 aft electronic panel. The flight crew can use a handset at this jack to talk on the service interphone.

Attendant Interface

The attendants use a handset at their station. Attendants speak with each other, the flight crew, and the service personnel.

Service Interface

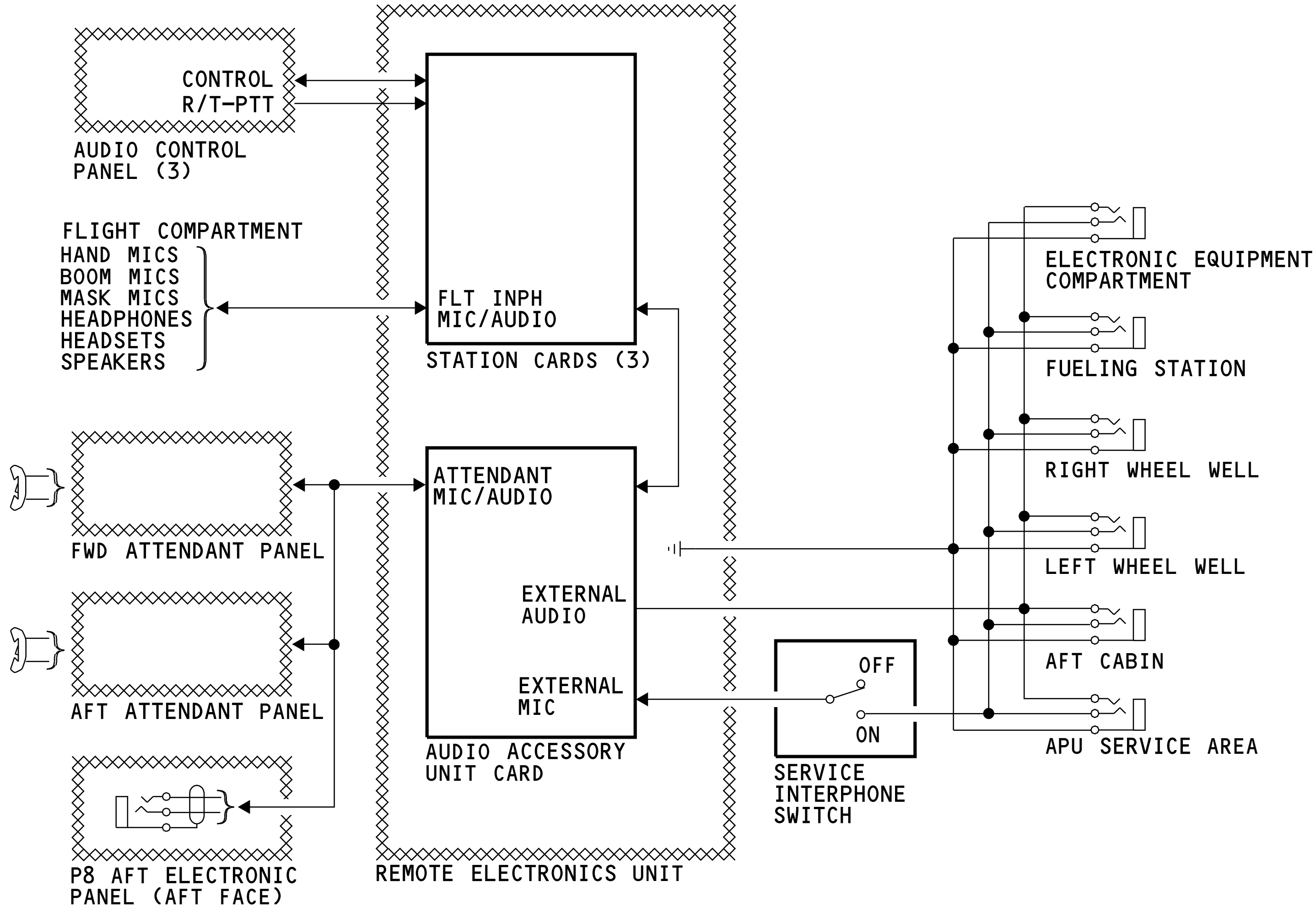
Service personnel use headsets at service interphone jacks locations. When the service interphone switch is ON, they can speak with each other, the flight crew, and the attendants.

The service interphone switch disconnects microphone inputs from the external service interphone jacks. The service interphone audio to the headsets does not go through the switch.

Remote Electronics Unit

The remote electronics unit (REU) has an audio accessory unit (AAU) card that gets microphone inputs from attendant, service, and flight crew interfaces. The AAU card mixes them together, amplifies, and sends the audio signal to these places:

- Forward and aft attendant panel
- Interphone jack on the aft face of P8
- External service interphone jacks
- Captain, first officer, and observer station card.



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SERVICE INTERPHONE SYSTEM - INTERFACES

SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION

General

The remote electronics unit (REU) processes service interphone audio signals. The audio accessory unit (AAU) circuit card in the REU contains service interphone circuits.

The service interphone circuits have an audio mixer. The audio mixer combines the microphone audio from the flight crew station cards, the attendant stations, and the service interphone jacks. The service interphone circuits increase the level of the audio signal. The audio goes to the flight crew station cards, the attendant stations, and the service interphone jacks.

Operation

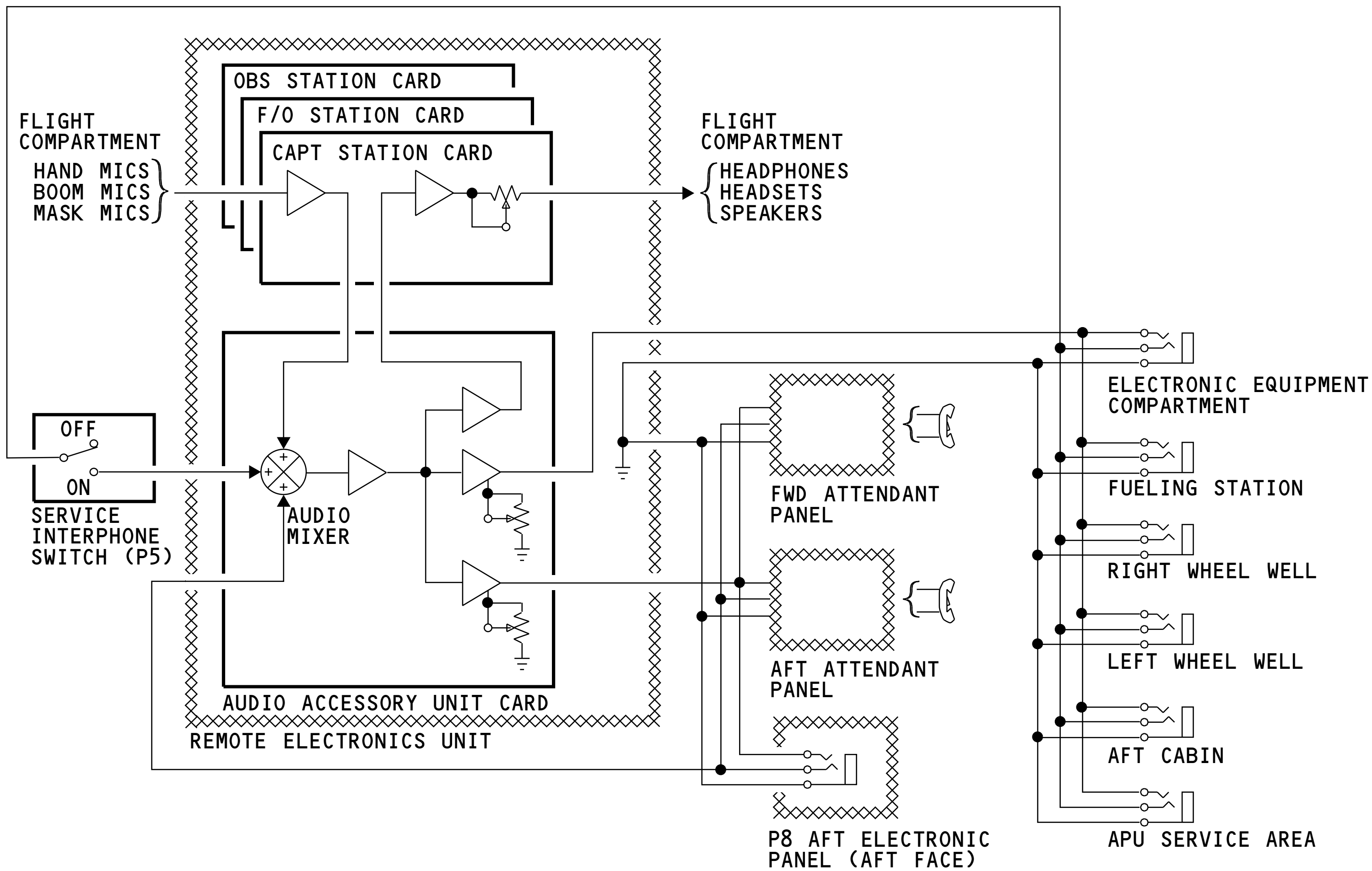
The AAU card mixes these service interphone inputs:

- Flight compartment microphones
- Flight compartment handset microphone
- Attendant handset microphones
- Service interphone microphones when the service interphone switch is on.

Audio from the mixer goes to three audio amplifiers. The amplifier outputs go to:

- Flight compartment speakers and headsets
- Service interphone headsets
- Attendant handsets.

The gain controls are on the REU front panel. They change the amplifier gain. You do these adjustments in the shop. Use the calibration procedures in the maintenance manual.



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SERVICE INTERPHONE SYSTEM - FUNCTIONAL DESCRIPTION

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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION

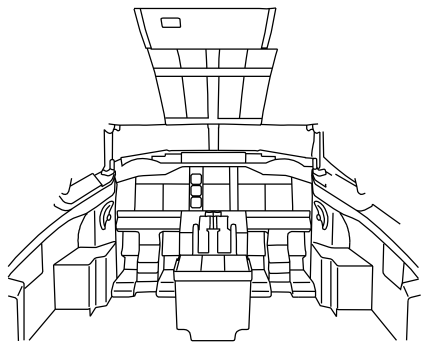
Purpose

The flight crew call system tells:

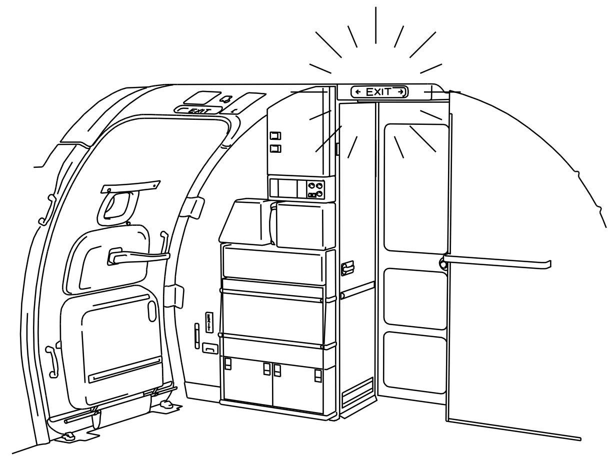
- Flight compartment personnel that there is a call from the cabin attendants
- Attendants there is a call from the flight compartment or another attendant panel.

Abbreviations and Acronyms

- ADIRS - air data inertial reference system
- attend - attendant
- flt - flight
- grd - ground
- IHC - integrated handset controller
- PA - passenger address
- PTT - push-to-talk
- v dc - volts direct current



FLIGHT COMPARTMENT



CABIN

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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTRODUCTION

FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION

General

The flight crew call system lets the flight crew and attendants call each other. These are the calls that can be made:

AKS 006, 009, 010, 013, 015-018, 020-025, 027

- Cabin Ready system

AKS ALL

- Flight compartment to attendant stations
- Attendant station to flight compartment
- Attendant station to attendant station.

Aural and visual indications from the system tell the flight and cabin crew to use the cabin interphone.

AKS 006, 009, 010, 013, 015-018, 020-025, 027

Cabin Ready System

The Cabin Ready system provides an indication that the cabin is ready for takeoff.

The system consists of a CABIN READY function on the forward Attendant Control Panel and the CABIN READY switch on the P5 overhead panel in the flight deck.

The CABIN READY function is activated by Graphical User Interface (GUI) on the LCD/Touch Screen Display of the Attendant Control Panel under Passenger Services menu.

When the CABIN READY function on the Attendant Control Panel or the CABIN READY switch on P5 panel are activated, these are the indications:

- Aural Warning module makes a LO chime in the flight deck
- Light blue indicator light comes on at the CABIN READY function on the forward attendant panel.
- Blue indicator light on P5 overhead panel comes on.

AKS ALL

Flight Compartment to Attendant Stations

You push the ATTEND switch on the passenger signs panel to call the attendant stations from the flight compartment. When you make this call, these are the indications in the passenger cabin:

- Pink light on the forward and the aft exit locator signs comes on
- Passenger address system sends a HI/LO chime to the cabin speakers.

Attendant Station to Flight Compartment

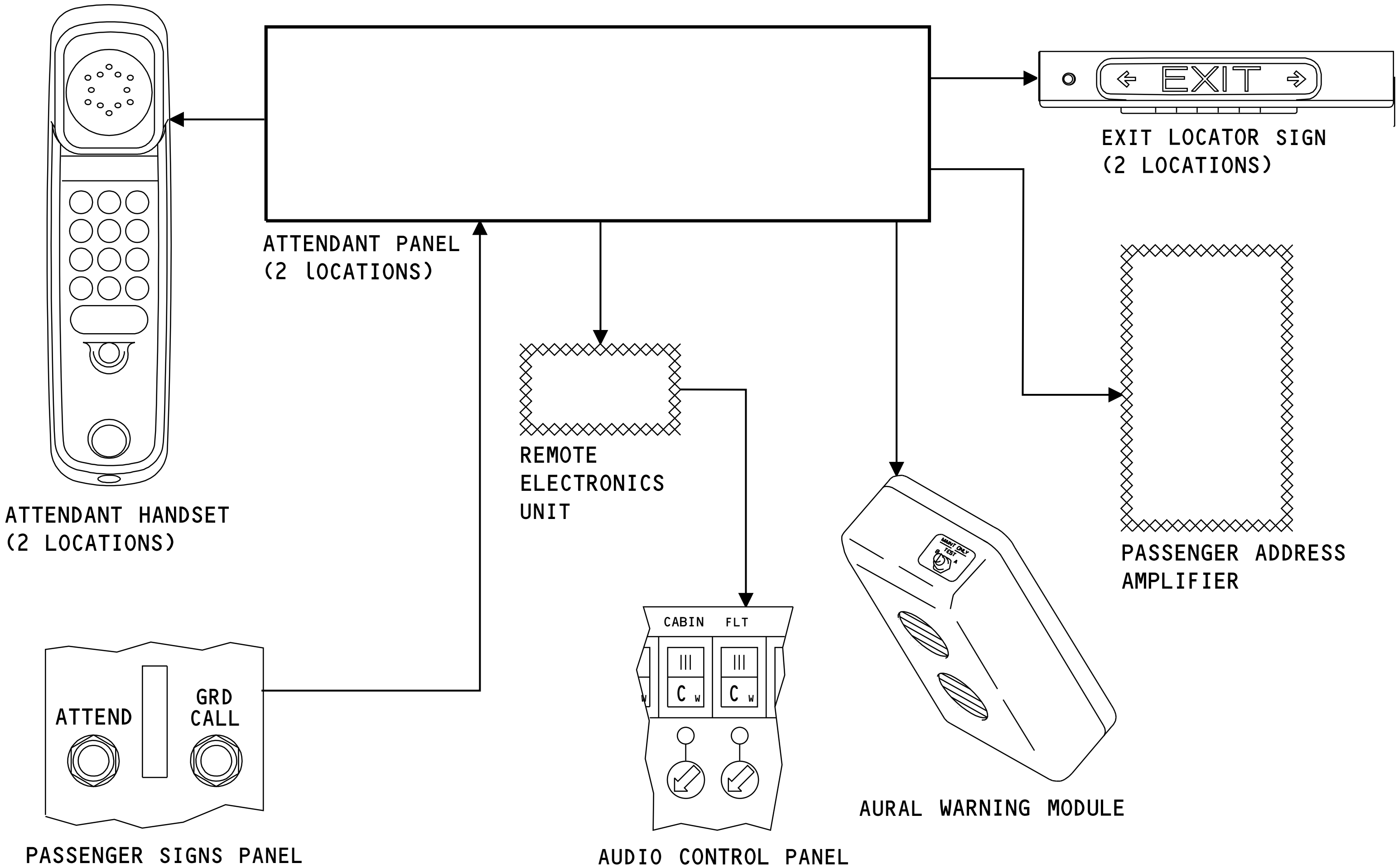
You use the handset to call the flight compartment from an attendant station. When you make this call, these are the indications in the flight compartment:

- Cabin call light on the audio control panel comes on
- Aural warning module makes a HI chime.

Attendant Station to Attendant Station

You use the handset to call one attendant station from another attendant station. When you make this call, these are the indications in the passenger cabin:

- Pink light on the exit locator sign comes on at the other attendant station
- Passenger address system sends a HI/LO chime to the cabin speakers.



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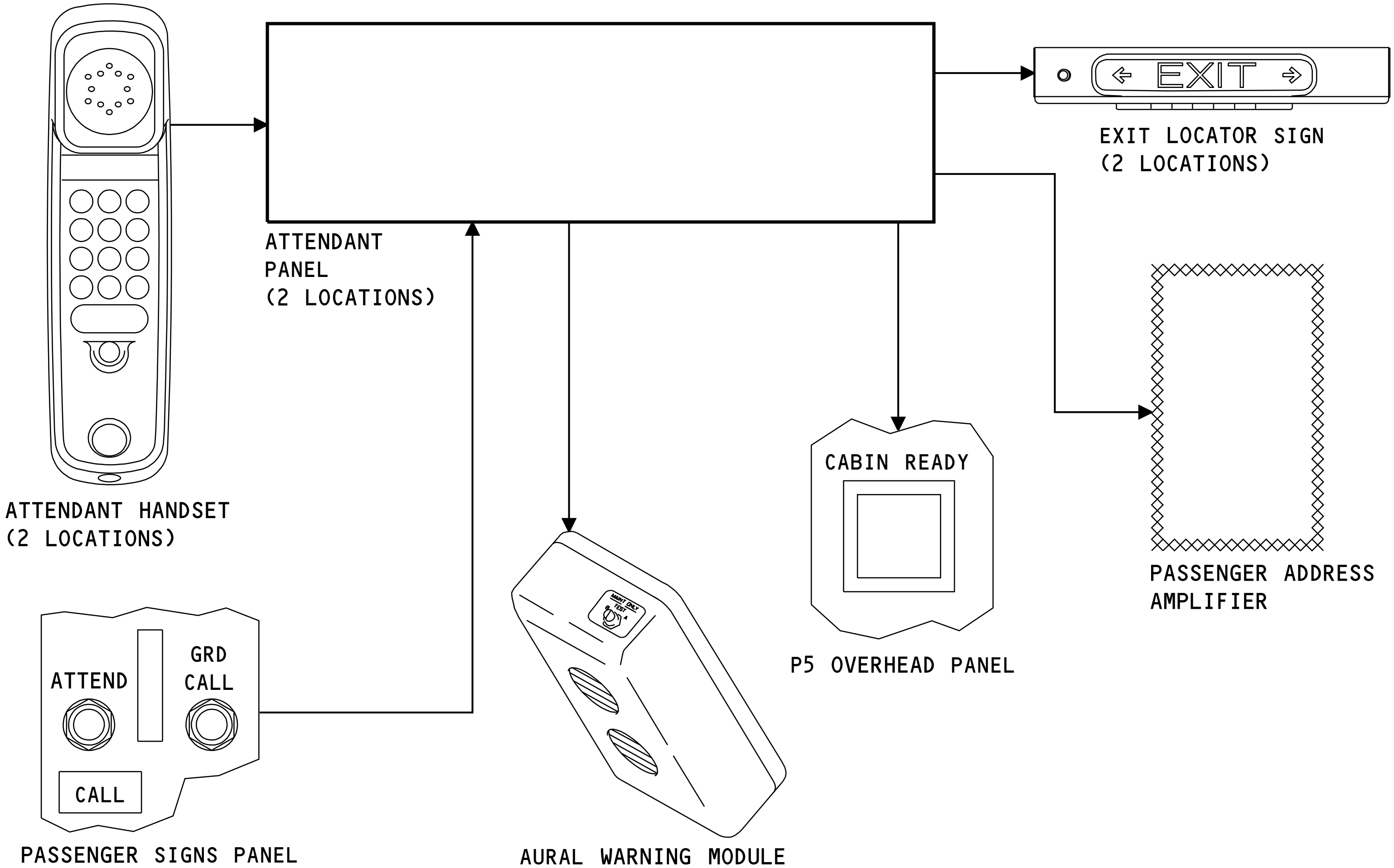
FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION



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FLIGHT CREW CALL SYSTEM/CABIN INTERPHONE - GENERAL DESCRIPTION

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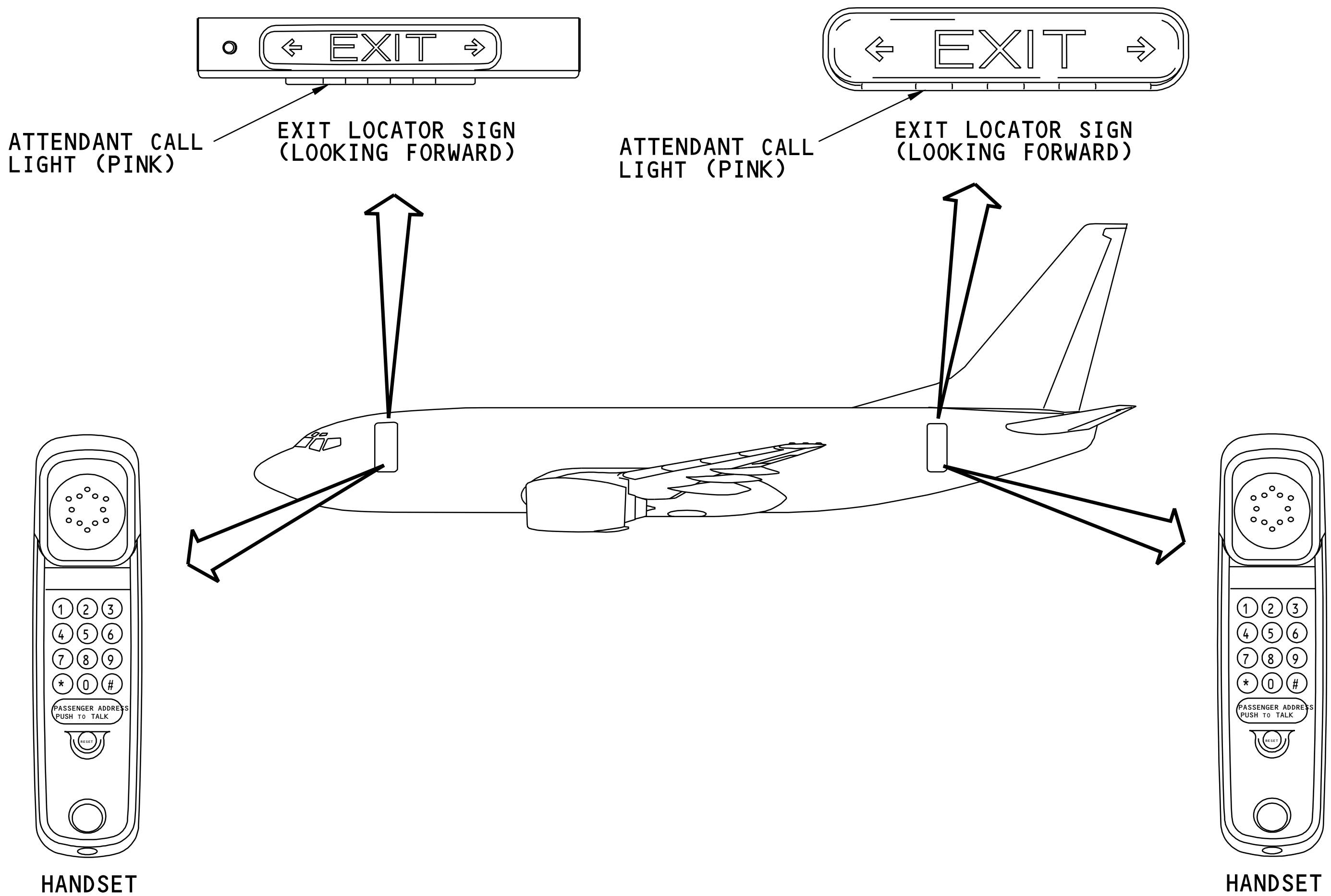
FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS

Handsets

The handsets are below the cabin attendant panels at each attendant station.

Attendant Call Lights

The attendant call lights are on the forward and aft exit locator signs. These are on the ceiling at the forward and aft sections of the passenger compartment.



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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - PASSENGER COMPARTMENT COMPONENT LOCATIONS

Flight Compartment Component Location

The passenger signs panel is on the P5 forward overhead panel.

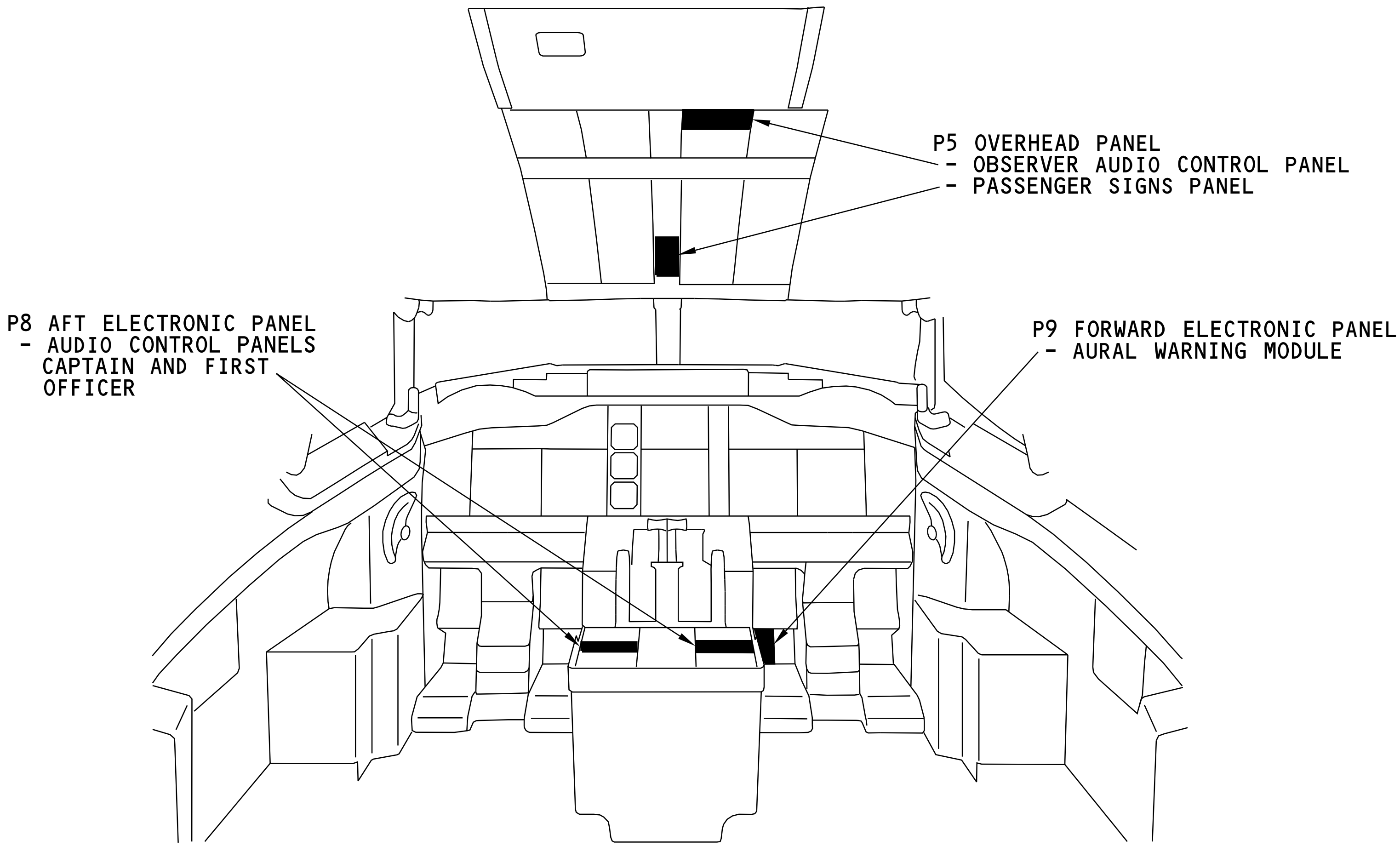
The aural warning module is on the F/O side of the P9 forward electronic panel.

The audio control panels are on the P5 aft overhead panel and on the P8 aft electronic panel.

AKS 006, 009, 010, 013, 015-018, 020-025, 027

The CABIN READY switch is on the P5 forward overhead panel.

AKS ALL



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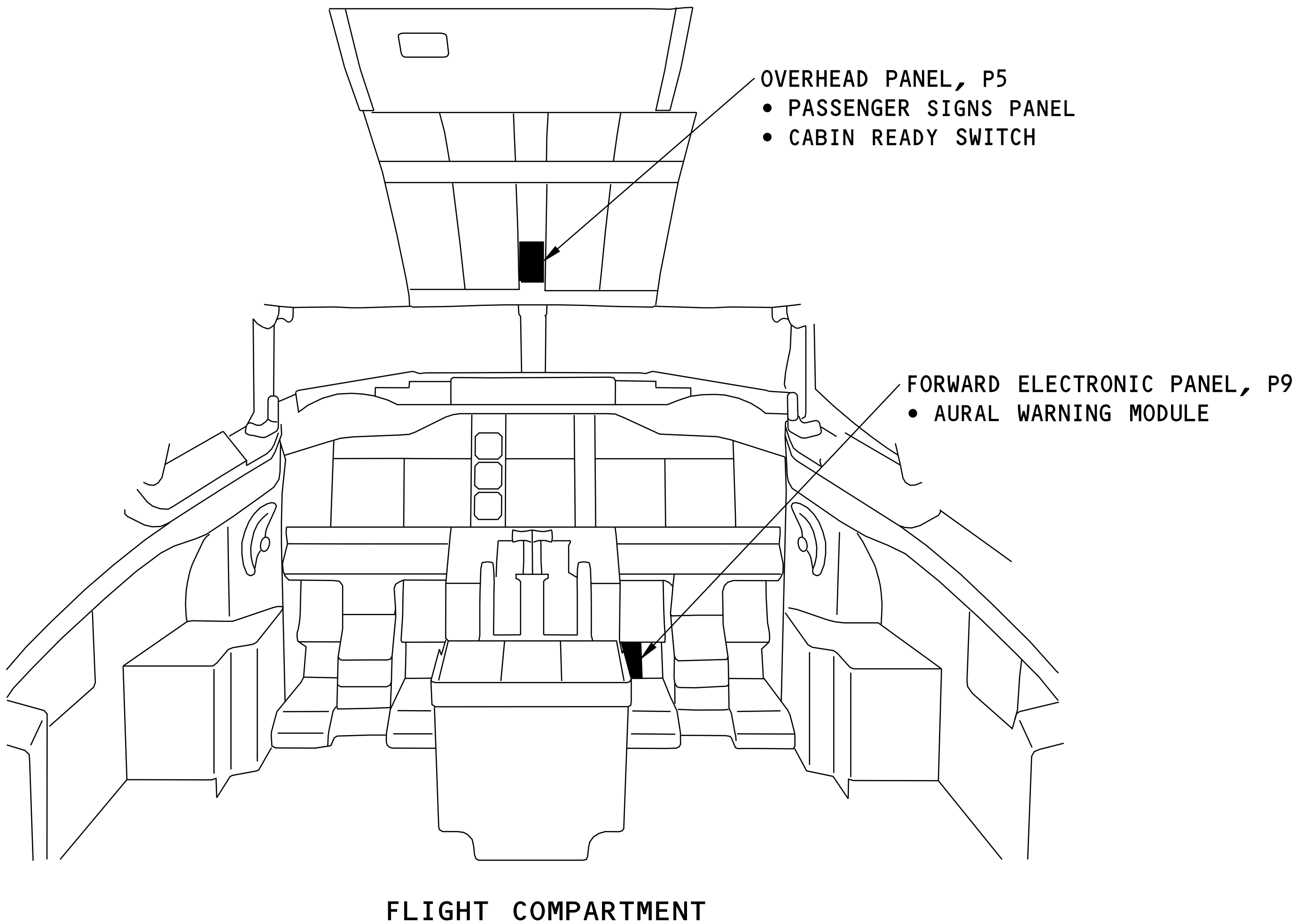
FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION



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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FLIGHT COMPARTMENT COMPONENT LOCATION

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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES

Power

The flight crew call system/cabin interphone gets power from the following sources.

The CREW CALL circuit breaker on the P18 panel supplies 28v dc to:

- The attendant call switch

AKS 006, 009, 010, 013, 015-018, 020-025, 027

- The cabin ready system components in the forward attendant panel

AKS ALL

- The Integrated Handset Controller (IHC) in the forward and aft attendant control panels

The INPH AND WARN and ENTERTAINMENT PA SYS BAT circuit breakers on the P6 panel supply 28v dc to the IHC's in the forward and aft attendant control panels.

The ATTENDANT PANEL circuit breaker on P6 panel supplies 28v dc to the LCD touchscreen of the attendant control panels.

Passenger Signs Panel

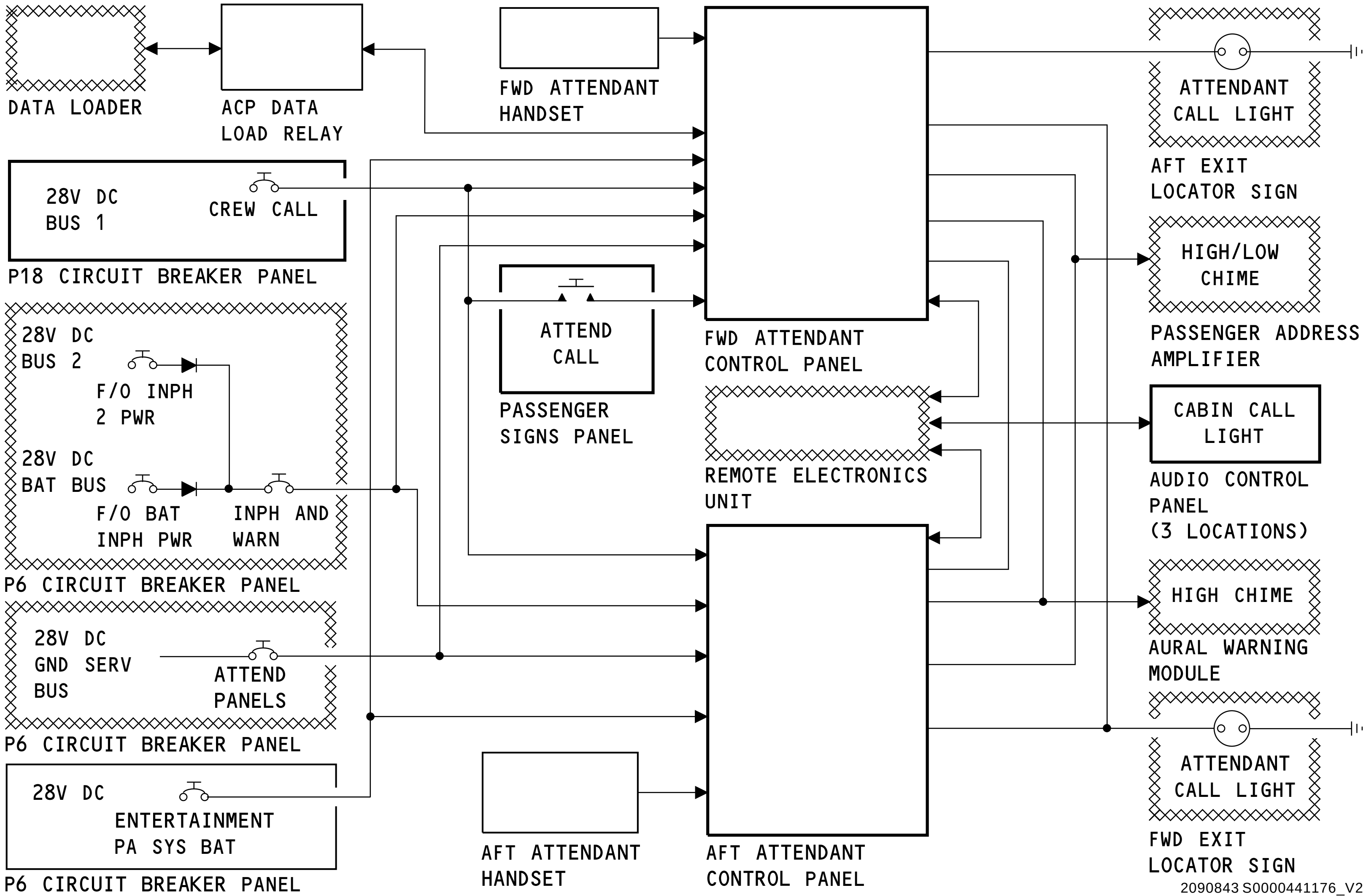
The passenger signs panel has an attendant call switch that sends a call signal to the forward attendant control panel. The attendant control panel turns on the attendant call lights at the two attendant stations, and sends a discrete signal to the passenger address amplifier to make a high/low chime.

Attendant Handsets

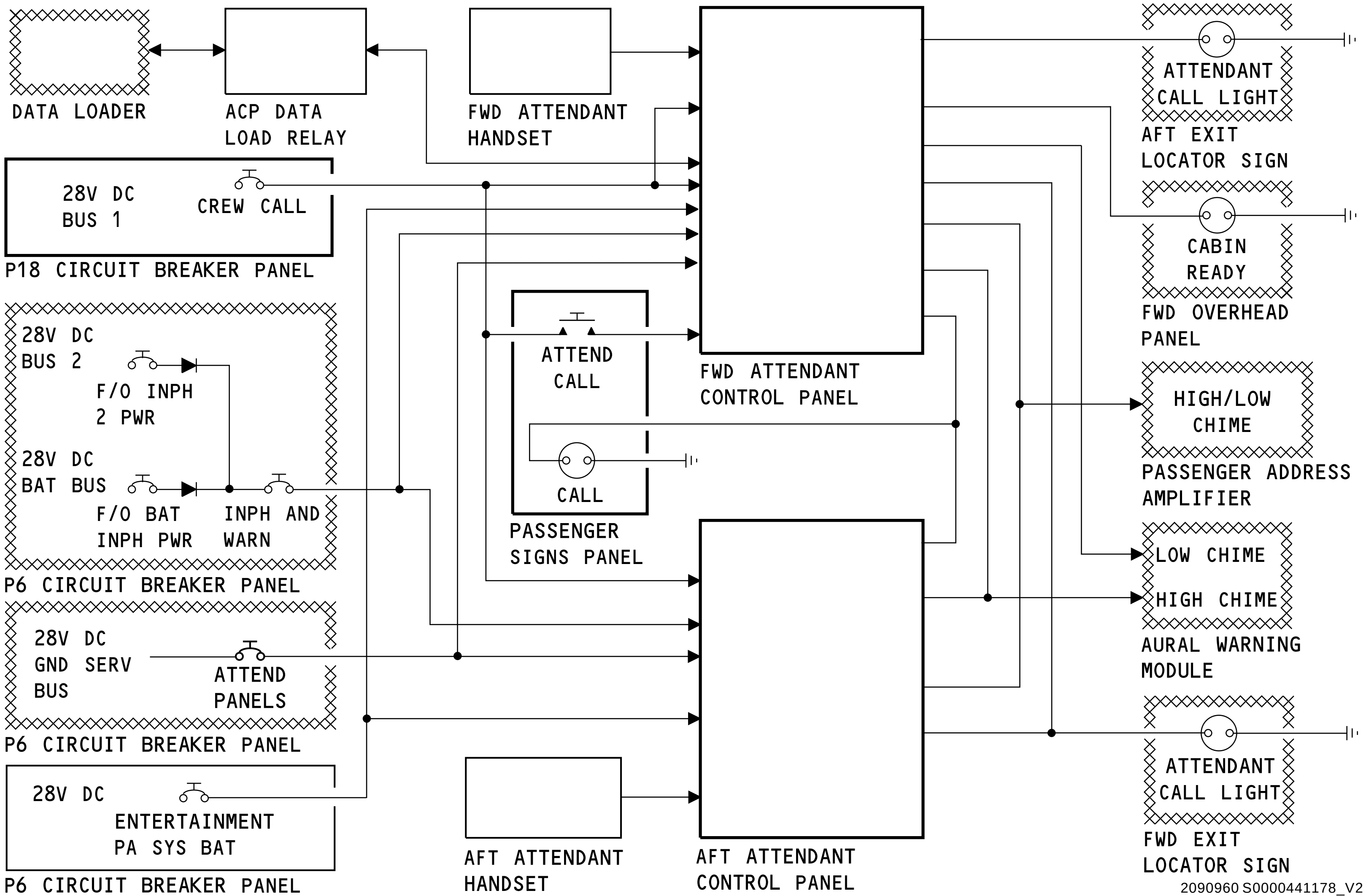
An attendant handset connects to the forward and aft attendant control panels. The handset can send call signals to the flight compartment or the other attendant station.

For calls to the flight compartment, the attendant control panel sends two discrete signals. One discrete signal goes to the REU. The REU turns on the call light in the audio control panels. The other discrete signal goes to the aural warning module to make a high chime.

For calls to the other attendant station, the attendant control panel turns on the attendant call light at that station and sends a discrete signal to the passenger address amplifier to make a high/low chime.



FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES



FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - INTERFACES

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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET

Purpose

The attendants use handsets to speak with each other. They also use them to make announcements on the passenger address (PA) system.

Physical Description

The interphone handset is like a telephone handset. It has these features:

- Earpiece speaker
- Microphone
- Push-button switches.

A handset cradle holds the interphone handset. The cradle has a magnetic strip. The handset uses a magnetically operated reed switch to detect an on-hook or off-hook condition of the handset.

Location

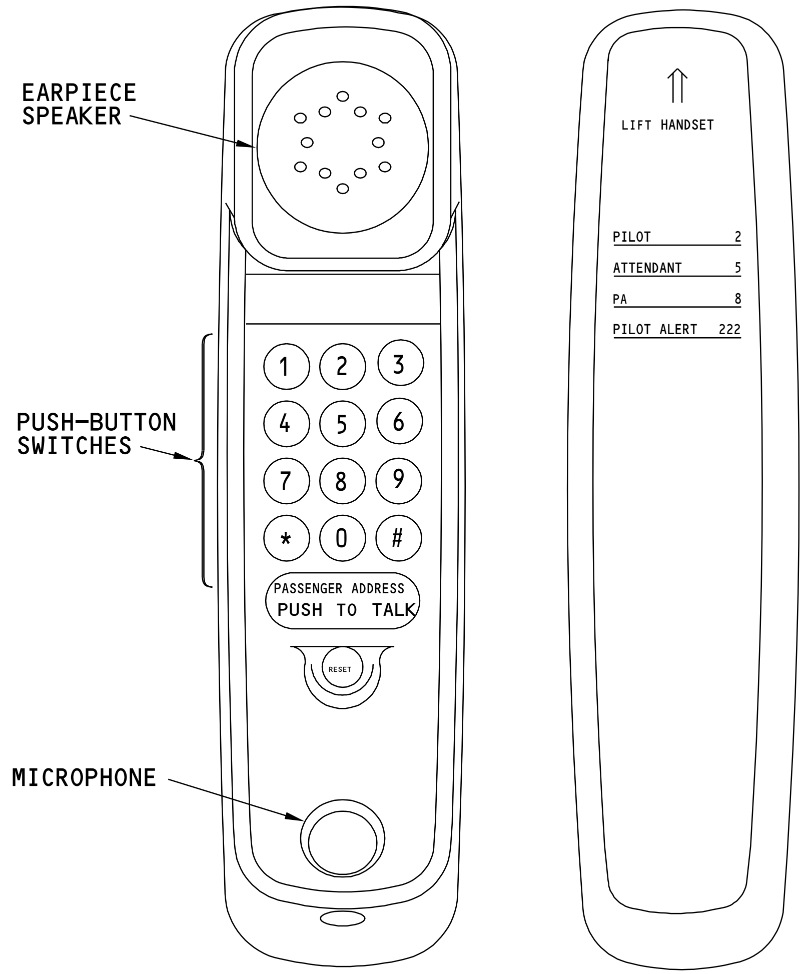
There is a handset at the forward attendant panel and at the aft attendant panel in the passenger compartment.

Operation

Lift the handset off the hook. This connects the handset microphone and speaker to the service interphone system.

The handset push-buttons have these functions:

- Push 2 to call the pilot. This turns on the cabin call light on the audio control panel and makes a high chime in the flight compartment
- Push 5 to call the other attendant station. This turns on the attendant call light at that station and makes a high/low chime in the passenger compartment
- Push 8 to connect the handset to the passenger address system
- Push the push-to-talk button to make PA announcements
- Push the reset button to disconnect the handset from the passenger address system or to cancel the call
- Push 2 more than one time to alert the pilot of an emergency condition. The number of times to push to alert the pilot is shown on the placard of the handset.



FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - HANDSET

FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION

General

You use the flight crew call system to make these calls:

- Pilot to attendant
- Attendant to pilot
- Attendant to attendant

AKS 006, 009, 010, 013, 015-018, 020-025, 027

- Cabin Ready alert

AKS ALL

Pilot to Attendant Call

When you push the ATTEND switch on the passenger signs panel, 28v dc goes to the forward attendant control panel. The panel turns on the attendant call lights at the two attendant stations. The panel also sends a discrete signal to the passenger address (PA) amplifier. The PA amplifier sends a high/low chime to the cabin speakers.

The attendant call lights stay on until you lift one of the handsets from the cradle. If the handset is already out, you can push the handset RESET button to turn off the attendant call lights.

Attendant to Pilot Call

When you push 2 on the attendant handset, an encoded signal goes to the attendant control panel.

NOTE: If the attendant handset is set for PA, then you must push RESET on the handset to make a pilot call.

The attendant control panel sends a discrete signal to the aural warning module to make a high chime in the flight compartment. It also sends a latched 28v dc discrete to the REU to energize a relay. The REU sends a ground discrete to make the CABIN call light on the audio control panel come on.

The light stays on until you push the RESET button on the handset, or put the handset back in the cradle.

Attendant to Attendant Call

When you push 5 on the attendant handset, an encoded signal goes to the attendant control panel.

NOTE: If the attendant handset is set for PA, then you must push RESET on the handset to make an attendant call.

The attendant control panel turns on the attendant call light at the other attendant station. It also sends a discrete signal to the PA amplifier. The PA amplifier sends a high/low chime to the cabin speakers.

When you lift the handset from the cradle at the other attendant station, the call light goes off. If the handset is already out, you can push the handset RESET button to make the attendant call light go off.

AKS 006, 009, 010, 013, 015-018, 020-025, 027

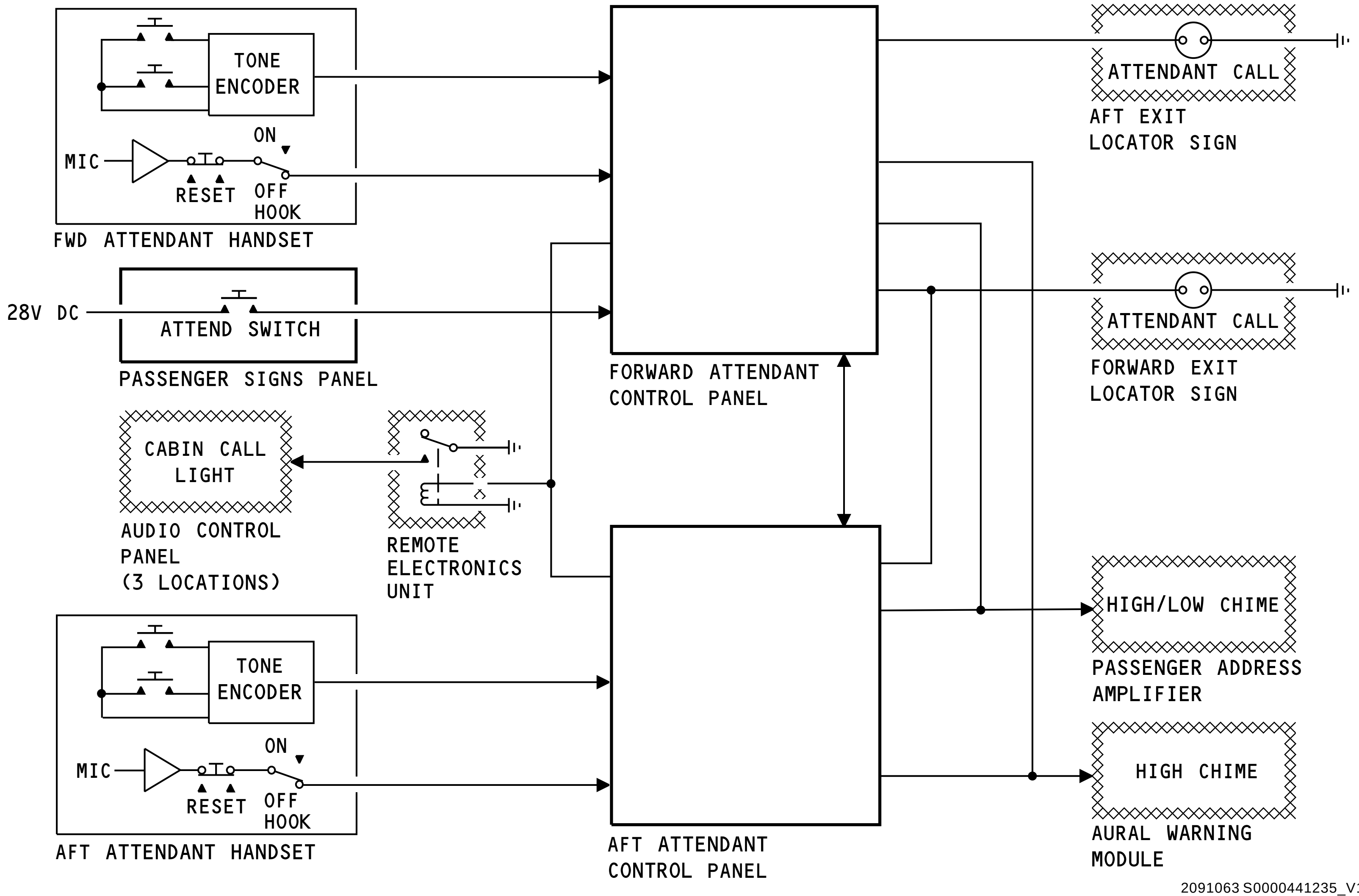
Cabin Ready System

When you activate the CABIN READY soft button on the forward attendant control panel under the Passenger Services menu, the blue indicator light on the panel will come on. The blue indicator light on the P5 overhead forward panel will come on also, and a LO chime will be heard in the flight compartment.

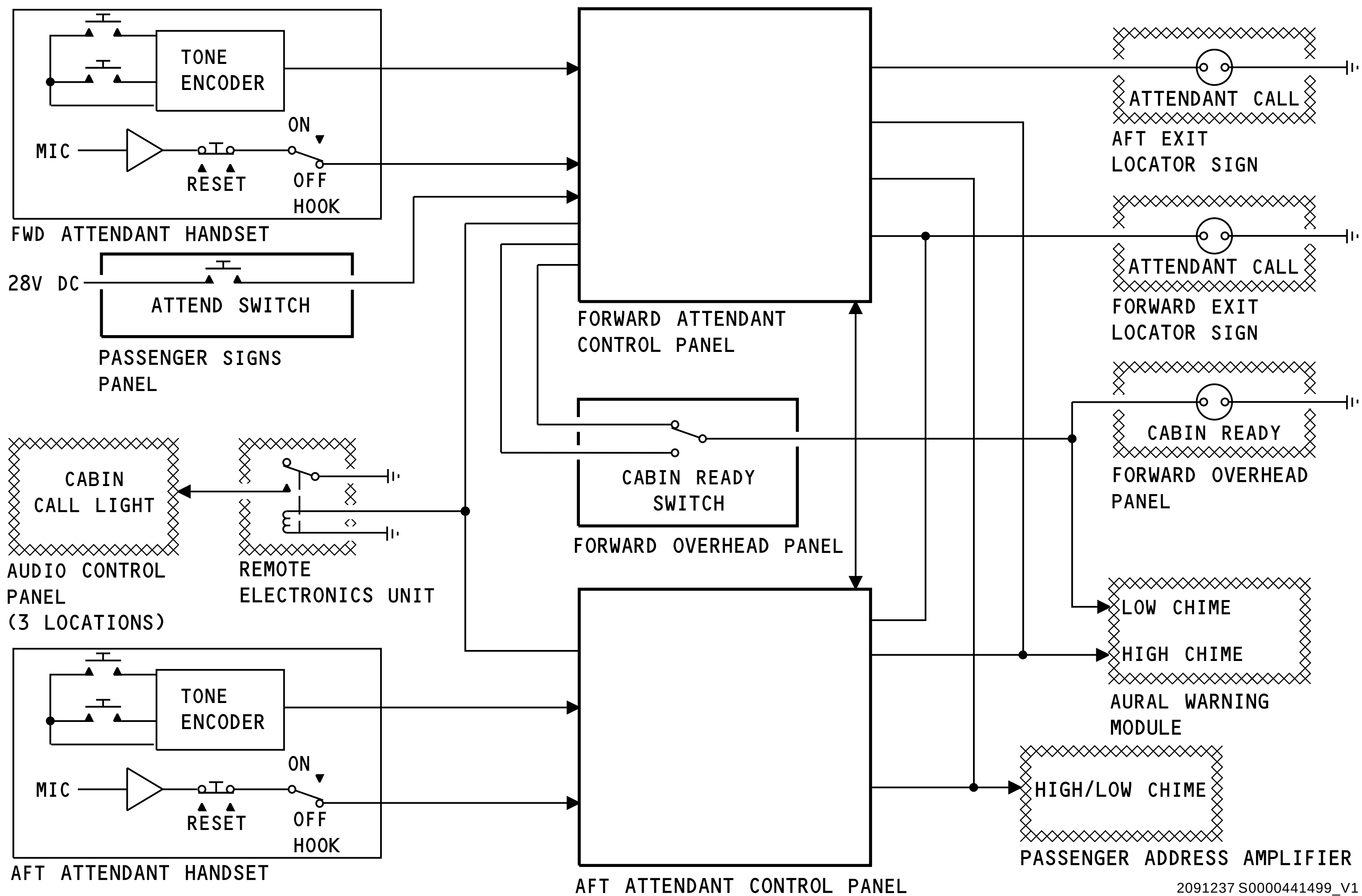
NOTE: The Cabin Ready operates like a three way control with the Graphical User Interface (GUI) activated Cabin Ready function on the attendant control panel and flight compartment switch.

The Cabin Ready alert continues until the pilot acknowledges the alert and presses the CABIN READY switch on the overhead forward panel, or the attendant cancels the alert and push the CABIN READY function on the forward attendant control panel.

AKS ALL



FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION



FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - FUNCTIONAL DESCRIPTION

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FLIGHT CREW CALL SYSTEM / CABIN INTERPHONE - ATTENDANT CONTROL PANEL

Purpose

The Attendant Control Panel (ACP) is used by the flight attendant to monitor and control several cabin features and functions such as lighting, entertainment, PC Power, lavatory smoke detectors, cell phones, air stairs, ground service bus, emergency exit lights, emergency evacuation, cabin ready and cabin temperature.

The ACP functions as the Integrated Handset Controller (IHC) for the Flight Crew Call / Cabin Interphone system.

General Description

The ACP is located at the attendant station. It is mounted on the wall, above the attendant seat headrest.

The ACP panel is 16 “ wide, 9” high and 4.5 “ deep. A shroud covers the ACP unit.

The ACP panel has an Integrated Switch Assembly (ISA), a Liquid Crystal Display (LCD) touch screen and an Integrated Handset Controller (IHC).

The LCD touchscreen includes a Graphical User Interface (GUI) menu. The controls for the GUI menu are defined by configuration database. The database can be modified with the software tool Configuration Database Generator (CDG). The forward and aft ACP's have different menus. Users can activate the touchscreen by touching two opposite corners of the screen sequentially. If the touchscreen is inoperative, users will not be able to provide inputs to systems on the related ACP. In this case, the Cabin light will be converted to white light (default state). The Flight Crew Call / Cabin Interphone system will remain operative.

The ISA contains hard mounted switches located next to LCD touchscreen. The amber LED at the upper left corner of the ISA will turn on when the ACP is not operative. The LED will stay on when there is an over temperature condition in the ACP. The LED will flash when there is an internal fault with the ACP. At power-up the LED will turn on for 2 seconds and then turn off.

The IHC, with the use of the attendant handset, provides Cabin Interphone functionality. The IHC is embedded in the circuit assembly inside the ACP.

Functional Description

The ACP has ability to monitor and control various systems. The basic functions of the ACP are:

- Integrated Handset Controller (IHC) for Cabin Interphone: The ACP interfaces with the flight deck and cabin handsets and provides the capability to switch each handset between Cabin Interphone and Passenger Address modes. The IHC provides a hardwired party line network for the Cabin Interphone system when the handsets are in Cabin Interphone mode. The IHC also controls the illumination of call lights and chime commands for calls from the flight deck or cabin.
- Cabin Lighting Control: The ACP controls lighting in the cabin work areas, the entry ways and the passenger seating area. The flight attendant can select lighting scenes for the passenger seating area through the ACP lighting menu. Standard and custom lighting scenes can be selected from the lighting menu. In case of decompression, the ACP will display the White Bright scene to the passenger seating area, the entry ways and turn on several discrete lights in the attendant work areas. More information on lighting can be found in CHAPTER 33.
- Potable Water Level Monitoring: The ACP displays the potable water level using a color bar graph.
- Vacuum Waste Monitoring: The ACP displays the airplane's waste tank levels and status of the waste tank sensors. This function provides an indication of LAV INOP status when the waste tank is full.
- Ground Service Bus: The ACP allows the flight crew to control ground service power bus.
- Emergency Exit Lights: The ACP allows the flight crew to control the emergency exit light via a hard switch located on the Integrated Switch Assembly.

If selected, the ACP can be used in the following systems:

- In Flight Entertainment: The ACP provides the flight crew the ability to turn system power on and off via a soft button on the touch screen.
- PC Power: The ACP provides the flight crew the ability to turn the system power on and off via a soft button on the touch screen.

- Lavatory Smoke Detector: The ACP will monitor the smoke detector status inside the lavatories and display a pop-up screen when smoke is detected. The flight attendant must reset the smoke detector for the warning to disappear.
- Cell Phone: The ACP allows the flight crew to control the cell phone service via a soft button on the touch screen.
- Air Stairs: The ACP allows the flight crew to control the extension and retraction of the air stairs via a hard switch located on the Integrated Switch Assembly (ISA).
- Emergency Evacuation: The ACP allows the flight crew ability to initiate alerts and shut off warnings during emergency evacuation.
- Cabin Temperature: The ACP allows the flight crew to control the cabin temperature.
- Special Function: The ACP is able to receive up to 3 additional functionalities in the future without engineering modification.

Configuration Check

The ACP Configuration Check can be accomplished at the forward ACP under the Maintenance menu.

The Configuration Check provides hardware and software part number information for the ACP's and each light LRU.

When the system is in Configuration Check mode, all other maintenance soft buttons on the forward ACP are desensitized and the aft ACP displays a message indicating that a maintenance action is in progress.

Lamps Test

The Lamps test turns ON all LEDs (30% bright) to allow mechanic to determine if any LEDs are not working properly.

The Lamps Test is accomplished under the Maintenance menu at the forward ACP. When the system is in Lamps Test mode, all other maintenance soft buttons on the forward ACP are desensitized and the aft ACP displays a message indicating that a maintenance action is in progress.

BITE Test

The Attendant Control Panel can perform BITE (Built-In-Test Equipment) test. The BITE test is achieved at power-on, startup and at specified intervals while the software is running.

Depending on the ACP software version, user can do the BITE test alone or as part of the system test. The system test includes of BITE test and test for the lighting LRU's.

At the end of the test, the ACP will provide the status of the BITE or system test results. The ACP will show the faults (if applicable) with recommended maintenance actions.

The ACP will lock out all commands during the BITE or system test. The test is only available when the airplane is on the ground.

When the ACP detects critical faults or in case of memory failure, the ACP will store a fault code, shut down and illuminate the amber LED on the Integrated Switch Assembly (ISA). When the ACP experiences a critical failure, it will shut down while the IHC function will remain operative.

Data Loading

Data loading for the Operational Software (OPS), Configuration Database (CDB) and Lighting Database (LDB) can be accomplished at the forward ACP under the Data Load section of the Maintenance menu.

AIRPLANES WITH V4 SOFTWARE AND EARLIER;

- The soft button “ADL to ACP” allows data loading from the data loader to the forward ACP.
- The soft button “ACP to ACP” allows data loading from the forward ACP to the aft ACP.
- The soft button “ACP to LRUs” allows data loading from the forward ACP to the Light LRU's. This process give Light LRU its address, zone information, standard and custom scene definition.

AIRPLANES WITH V5 SOFTWARE AND SUBSEQUENT;

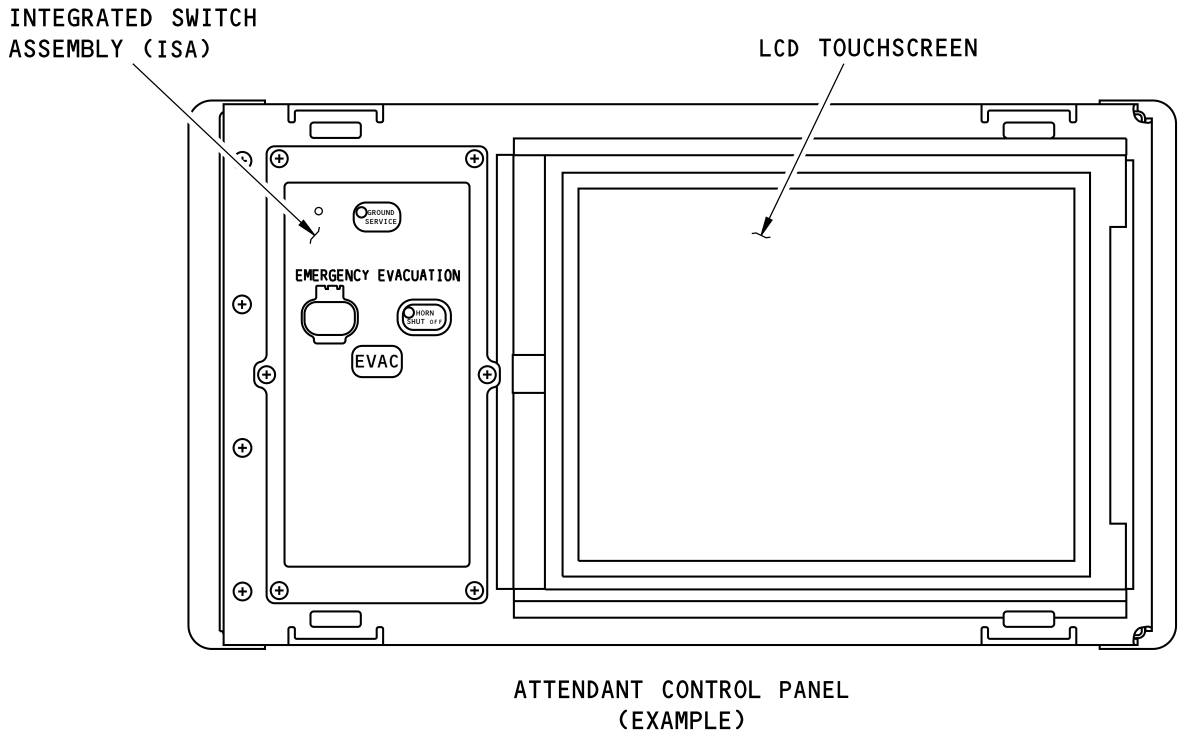
- Phase 1 Data Load allows data loading from data loader to the forward ACP.

- Phase 2 Data Load allows data loading from the forward ACP to the aft ACP and Light LRU's. User can select software from a selection table. This process give Light LRU its address, zone information, standard and custom scene definition.

Touchscreen Menu Pages

The ACP touchscreen's main menu consists of the following pages:

- Lighting: This page displays available and selected lighting scenes for the passenger seating and entry areas.
- Passenger Services: This page consists of soft buttons controlling the following systems (if applicable) : In-flight Entertainment, PC Power, Cell Phone, Cabin Ready.
- Environment: This page controls Cabin Temperature and Smoke Detector systems (if applicable). The aft ACP also displays the Potable Water level, the Vacuum waste level and the LAV INOP status button.
- Maintenance: The forward ACP's Maintenance page provides ability to do BITE Test or System Test, Configuration Check, Clean Screen, Lamps Test and Data Load. The aft ACP's Maintenance page provides ability for BITE Test (if applicable), Vacuum Waste section (LAV INOP Test, LAV INOP, Clean Check Sensors) and Clean Screen. When the maintenance menu is selected, a maintenance password entry screen will pop up requiring the user to enter a password to access to the maintenance menu functions. If the password protection feature is disabled, no password entry screen will come up.
- Special Functions: This page provides Enable and Status buttons for future functions to be added.
- Display functions: The Display function menu is located on the bottom left hand of the LCD touchscreen and includes Clean screen, Screensaver lock, Brightness decrease and Brightness increase. The Clean screen locks the ACP for 30 seconds and ignores user input. The Screensaver locks the ACP by switching to screen saver mode. The user can exit screen saver mode by touching two different corners of the screen sequentially.
- System Test: The Maintenance System Tests provides the ability to run all BITE tests defined by the ACP’s software and display system faults on the screen.
- Saved Data: The ACP has the ability to send data to a floppy disk on the ADL. There are two Maintenance functions that allow this, Save Config Data and Save All. Save Config Data will run Configuration Check and send the data presented on the Maintenance Screen to the ADL. Save All will run Configuration Check and System test and send Configuration Data, System Test data, and Fault Query Responses to the ADL.



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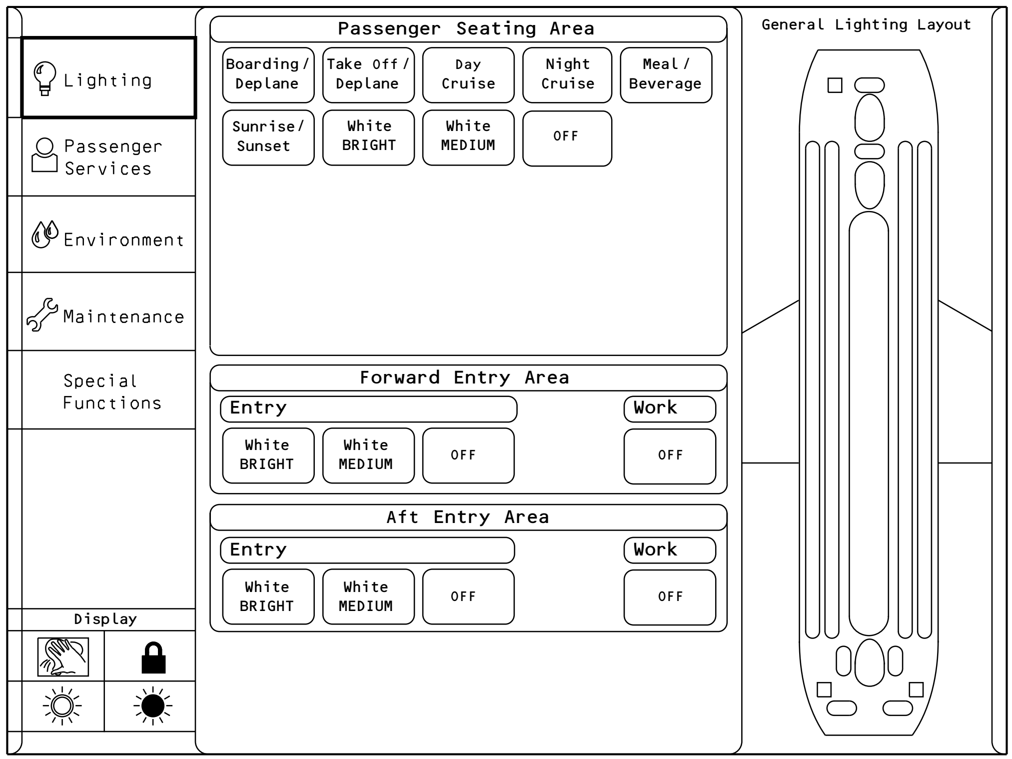
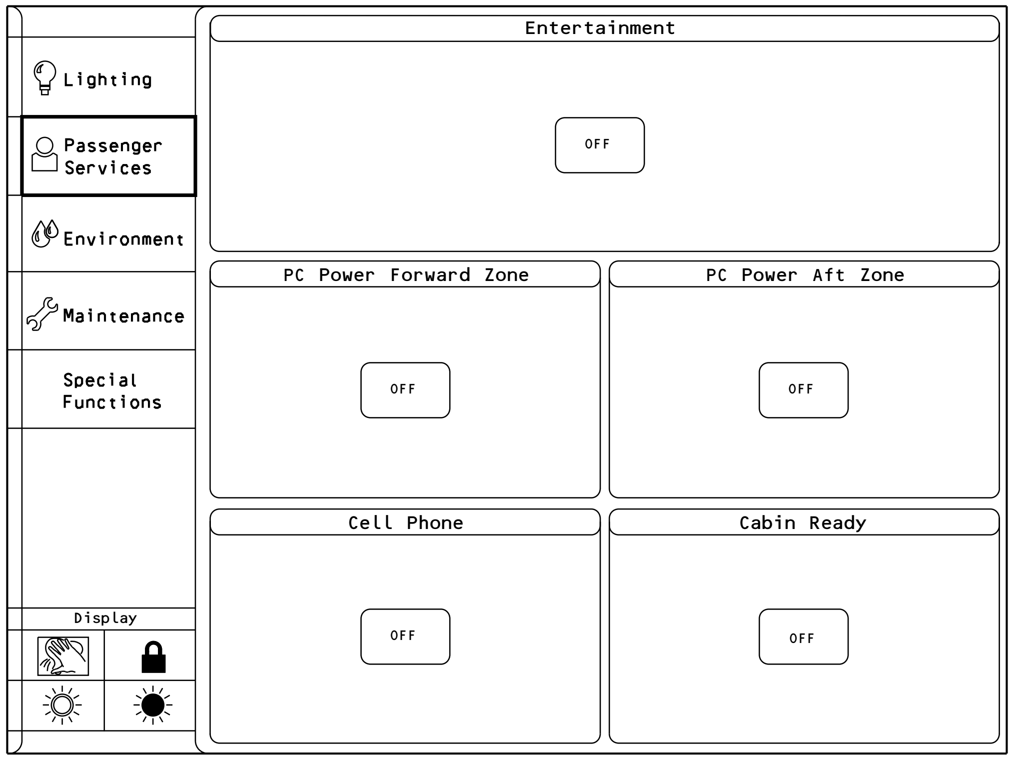
ATTENDANT CONTROL PANEL



LIGHTING MENU
(EXAMPLE)

2086945 S0000440181_V1

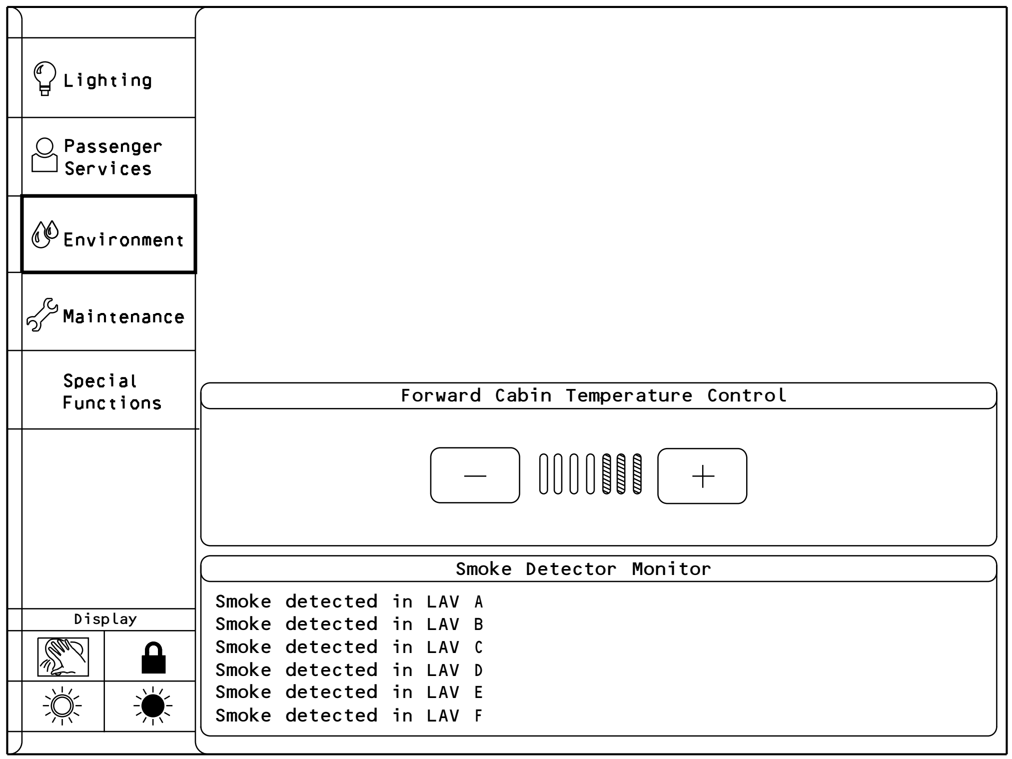
ATTENDANT CONTROL PANEL LIGHTING MENU



PASSENGER SERVICES MENU
(EXAMPLE)

2086968 S0000440188_V1

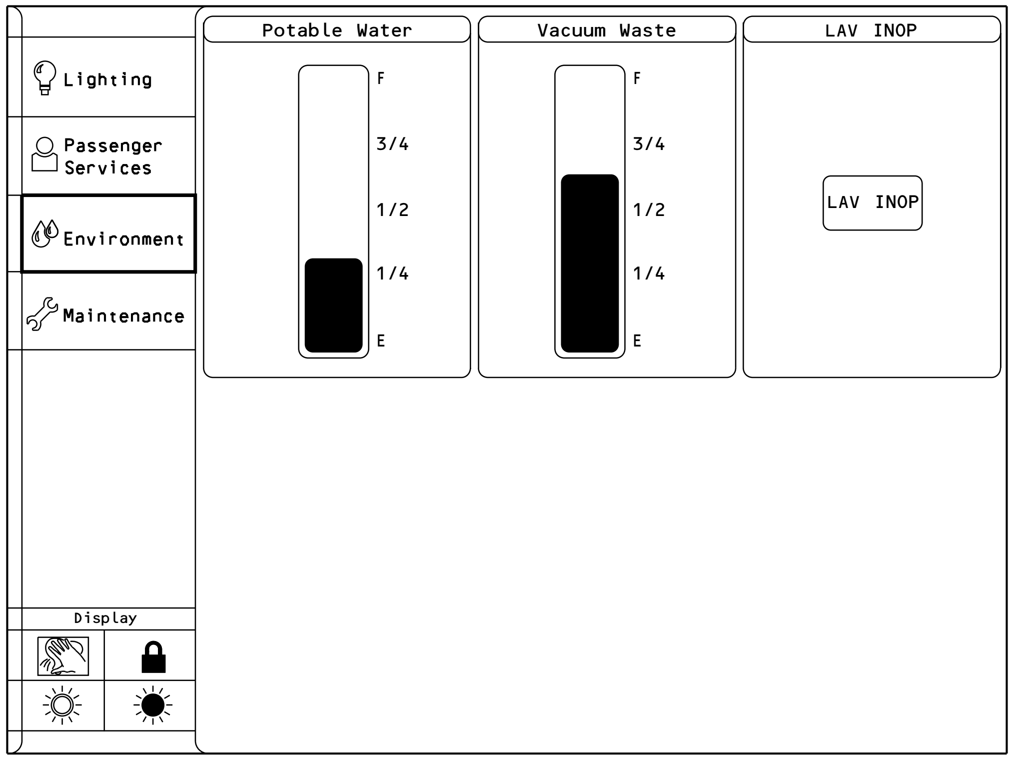
ATTENDANT CONTROL PANEL PASSENGER SERVICES MENU



FORWARD PANEL ENVIRONMENT MENU
(EXAMPLE)

2086990 S0000440189_V1

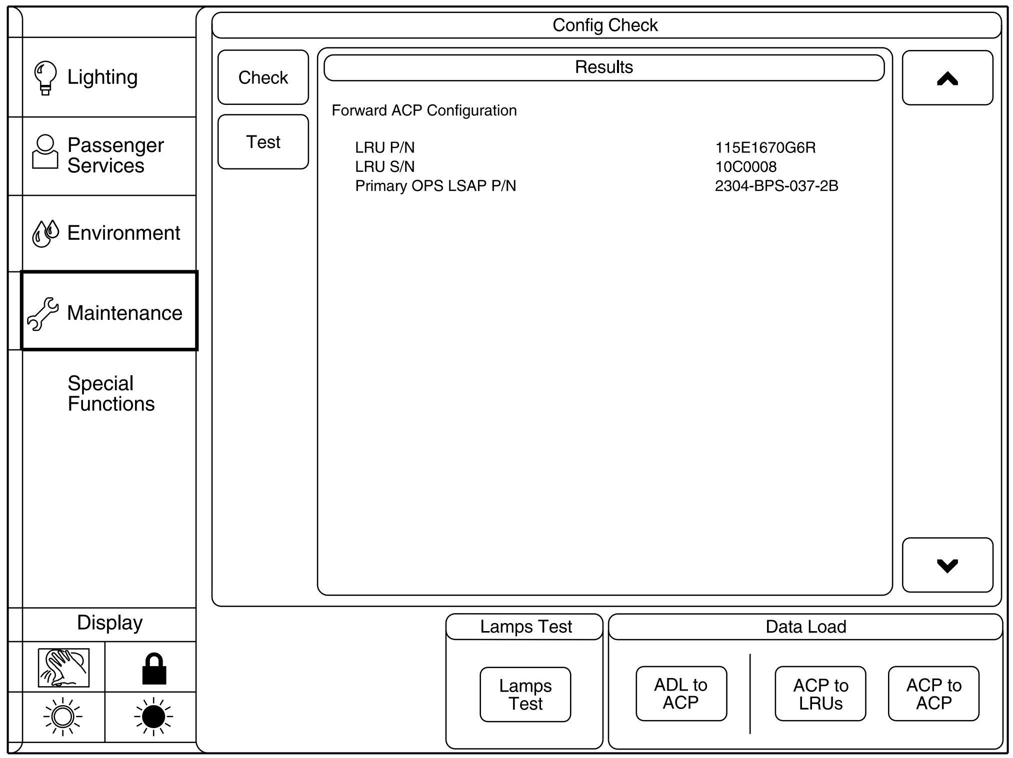
ATTENDANT CONTROL PANEL ENVIRONMENT MENU



AFT PANEL ENVIRONMENT MENU
(EXAMPLE)

2087003 S0000440190_V1

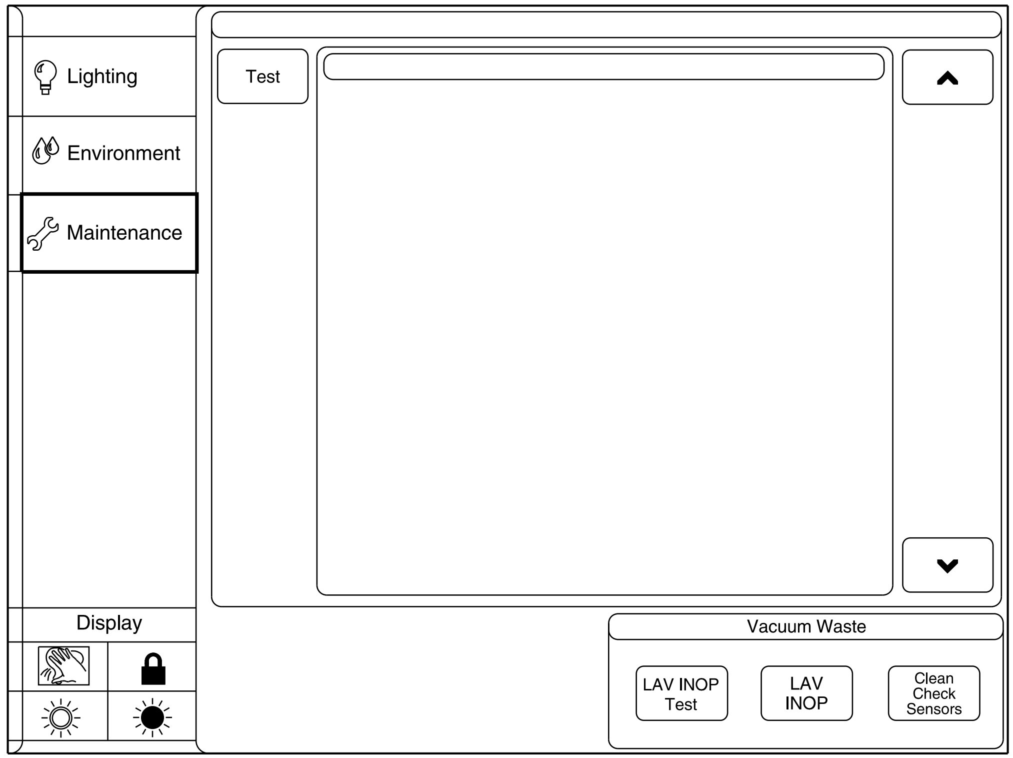
ATTENDANT CONTROL PANEL ENVIRONMENT MENU - AIRPLANES WITH V4 SOFTWARE AND EARLIER



FORWARD PANEL MAINTENANCE MENU
(EXAMPLE)

2087161 S0000440191_V2

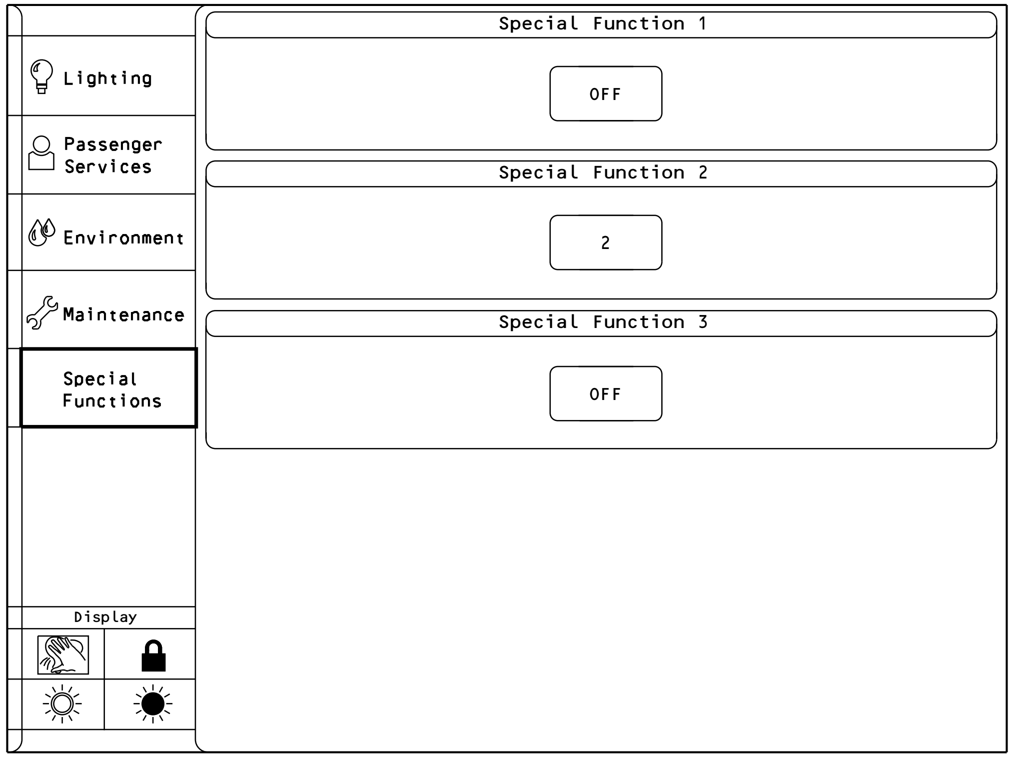
ATTENDANT CONTROL PANEL MAINTENANCE MENU - AIRPLANES WITH V4 SOFTWARE AND EARLIER



AFT PANEL MAINTENANCE MENU
(EXAMPLE)

2087202 S0000440192_V2

ATTENDANT CONTROL PANEL MAINTENANCE MENU



SPECIAL FUNCTION MENU
(EXAMPLE)

2087221 S0000440193_V1

ATTENDANT CONTROL PANEL SPECIAL FUNCTION MENU

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GROUND CREW CALL SYSTEM - INTRODUCTION

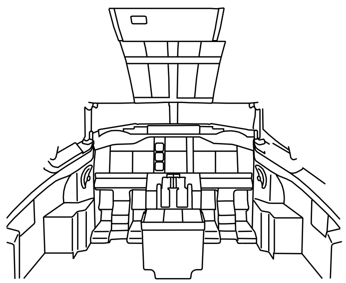
Purpose

The ground crew call system tells:

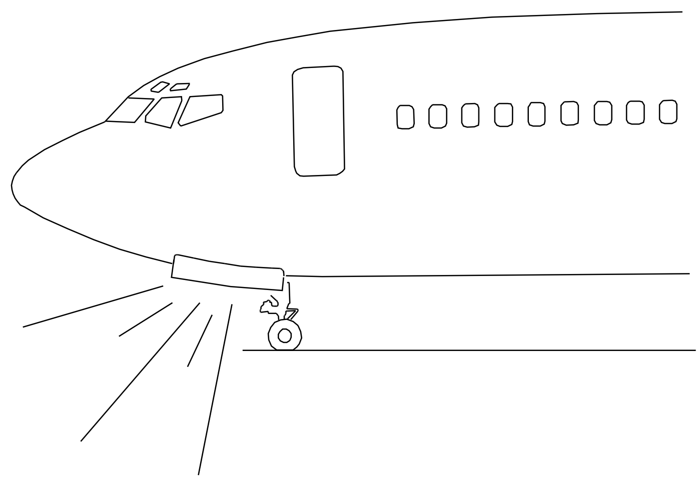
- Flight compartment personnel that there is a call from the ground personnel
- Ground personnel that there is a call from the flight compartment.

Abbreviations and Acronyms

- ACP - audio control panel
- ADIRS - air data inertial reference system
- attend - attendant
- flt - flight
- grd - ground
- IHC - integrated handset controller
- PA - passenger address
- PTT - push-to-talk
- v dc - volts direct current



FLIGHT COMPARTMENT



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GROUND CREW CALL SYSTEM - INTRODUCTION

GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION

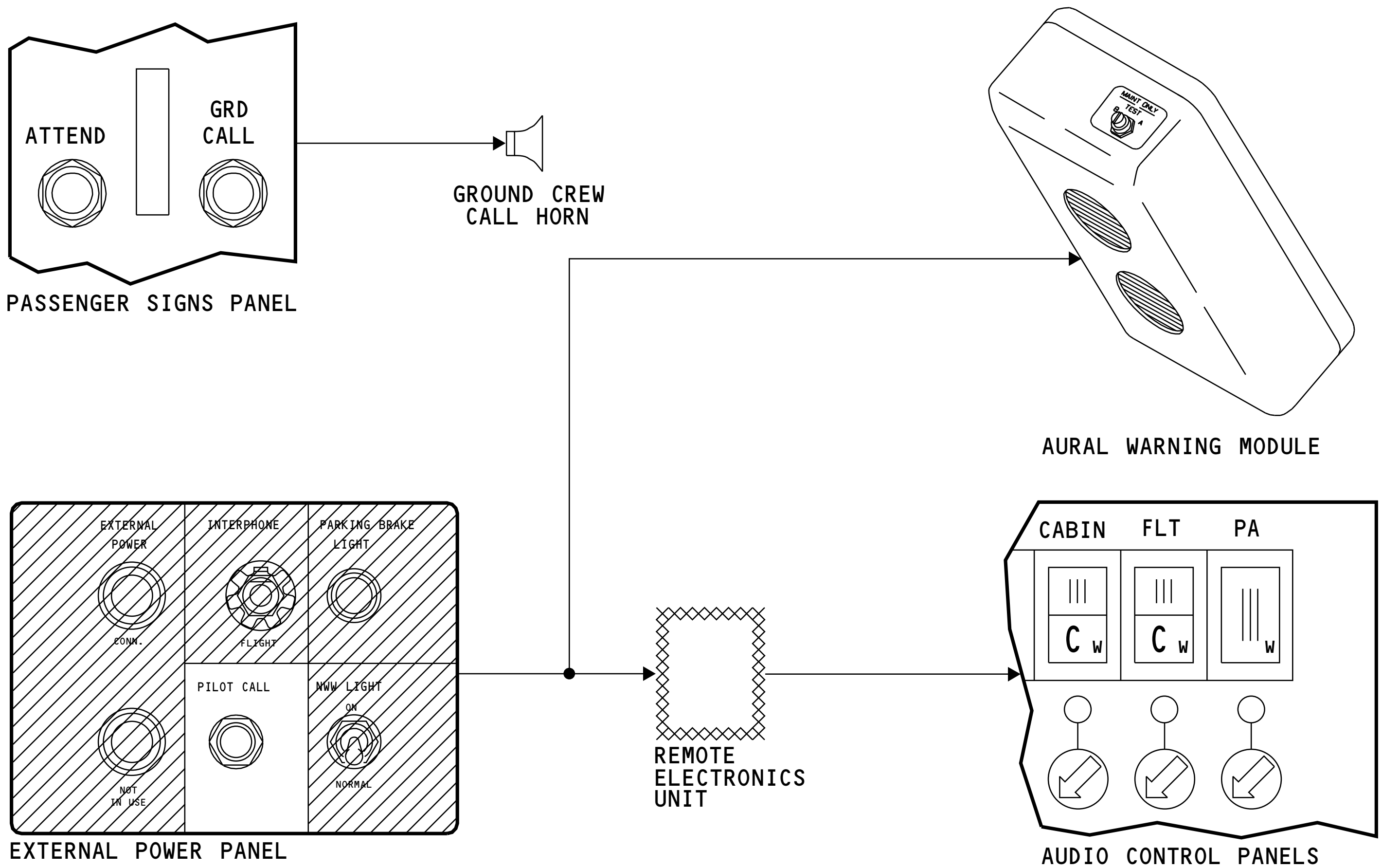
General

The ground crew call system lets the flight crew and ground crew call each other. The system tells people in the flight compartment or outside of the airplane to use the flight interphone system.

Between Flight Compartment and Ground Crew

A crew member pushes the GRD CALL switch in the flight compartment to call the ground crew. The switch is on the passenger signs panel on the P5 forward overhead panel. A horn in the nose wheel well makes a sound when the crew member pushes the switch.

The ground crew pushes the PILOT CALL switch on the external power panel to call the flight crew. That sends a signal to the remote electronics unit and to the aural warning module. The aural warning module makes a high chime. The remote electronics unit sends a signal to make the FLT call light, on the audio control panel, come on. The call light is in the lower half of the FLT microphone selector switch. When the ground crew releases the PILOT CALL switch, the FLT call light goes off.



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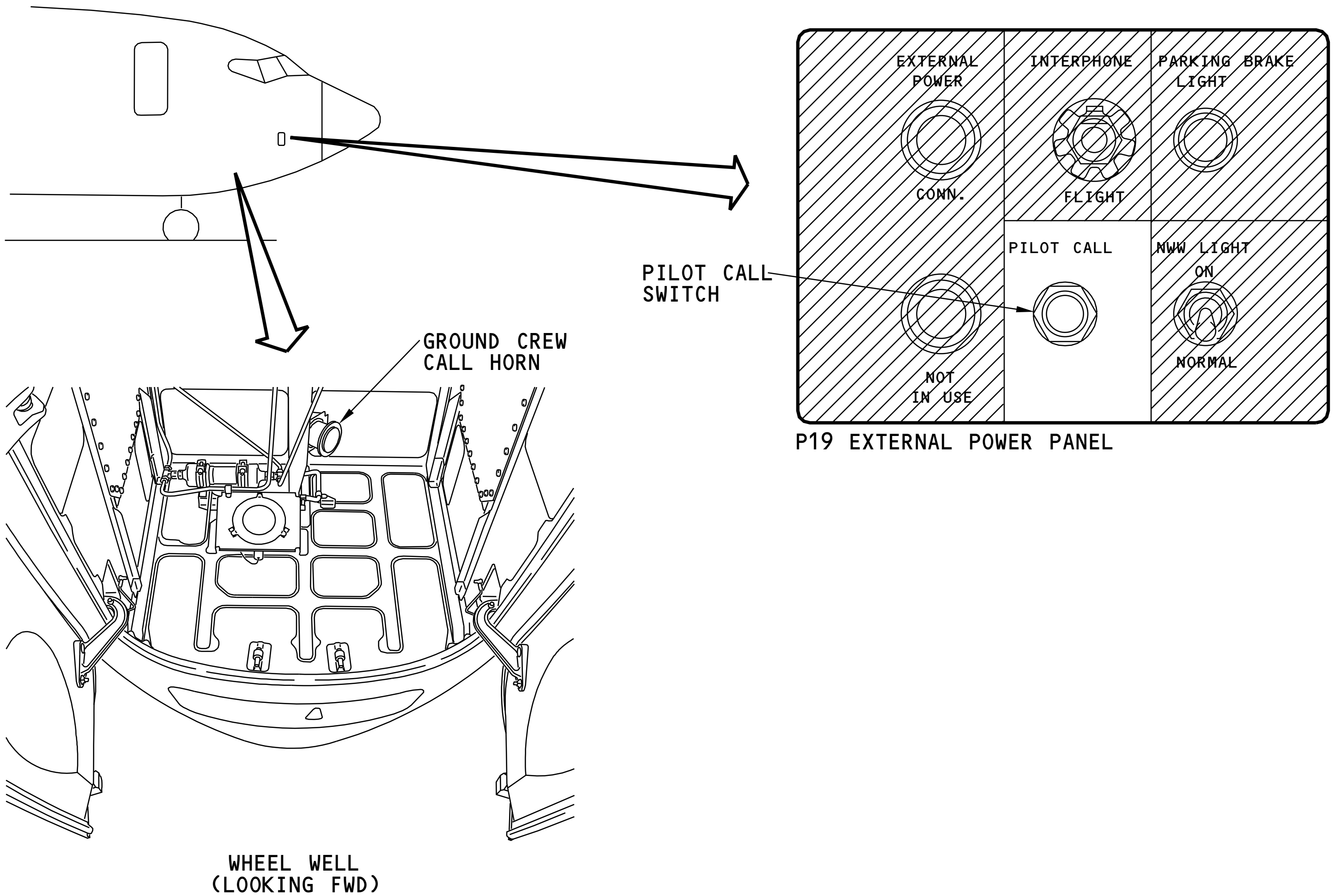
GROUND CREW CALL SYSTEM - GENERAL DESCRIPTION

GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION

Ground Crew Call System Component Locations

The ground crew call horn is on the forward wall of the nose wheel well.

The PILOT CALL switch is on the P19 external power panel. This panel is forward of the nose wheel well on the right side of the airplane.



GROUND CREW CALL SYSTEM - EXTERNAL COMPONENT LOCATION

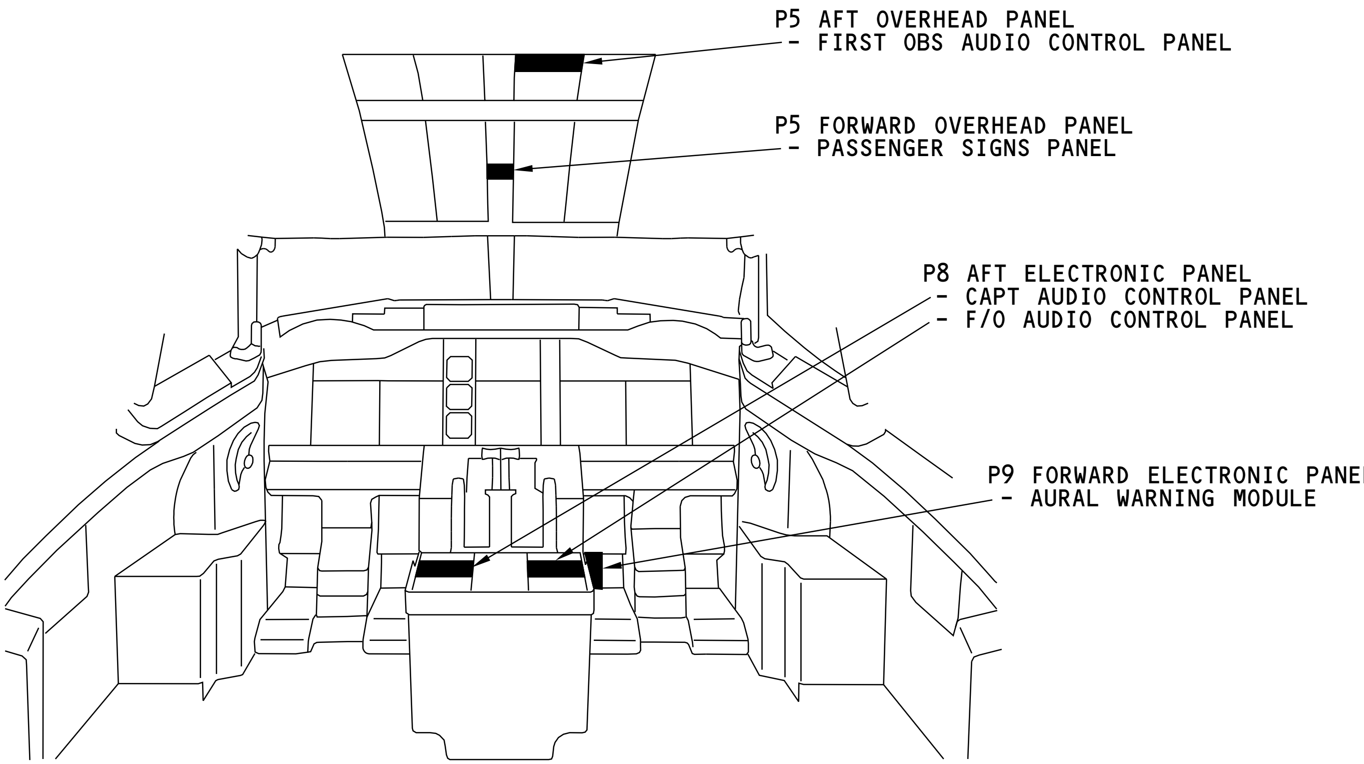
GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

Flight Compartment Component Locations

The passenger signs panel is on the P5 forward overhead panel.

The aural warning module is on the F/O side of the P9 forward electronic panel.

The captain and first officer audio control panels (ACP) are on the P8 aft electronic panel. The observer ACP is on the P5 aft overhead panel.



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GROUND CREW CALL SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

GROUND CREW CALL SYSTEM - INTERFACES

Power

The P18 circuit breaker panel sends 28v dc to these components:

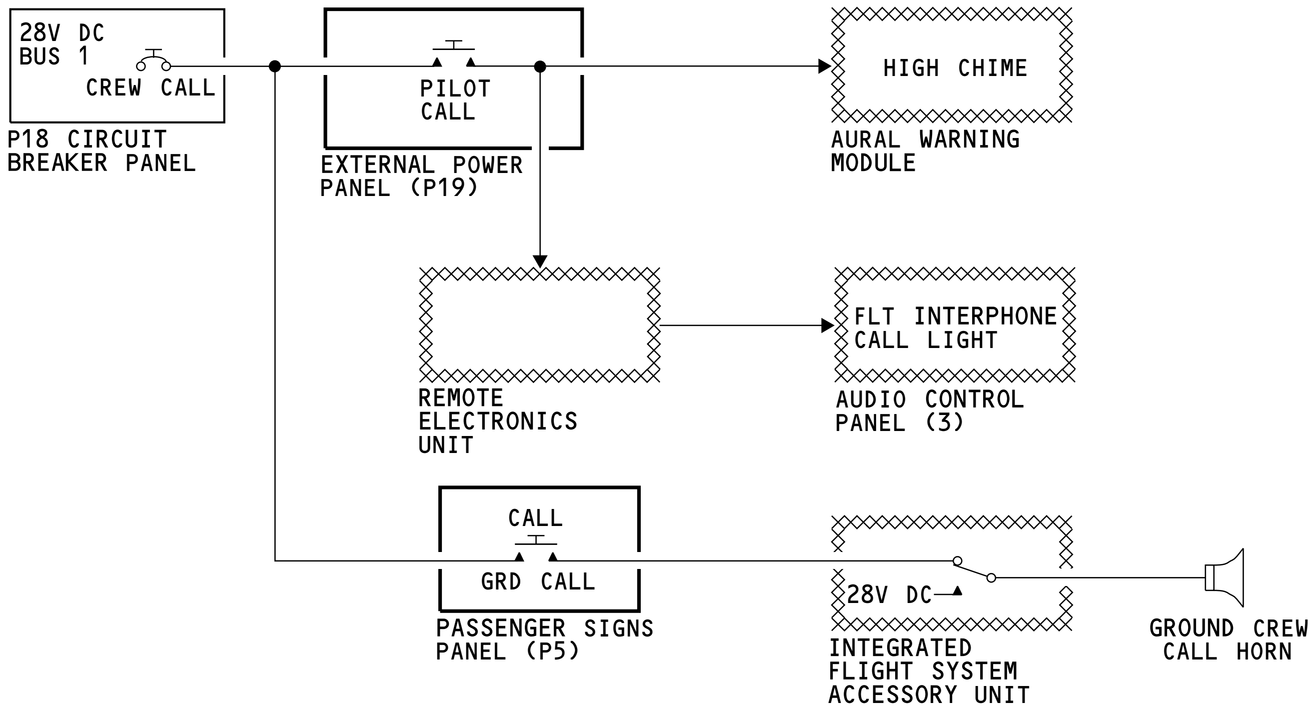
- PILOT CALL switch
- GRD CALL switch.

P19 External Power Panel

When you push the PILOT CALL switch, the pilot call signal goes to the remote electronics unit (REU) and to the aural warning module. The REU sends a discrete to the audio control panel.

Passenger Signs Panel

When you push the GRD CALL switch, the ground crew call signal goes through a relay in the integrated flight system accessory unit and then to the ground crew call horn.



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GROUND CREW CALL SYSTEM - INTERFACES

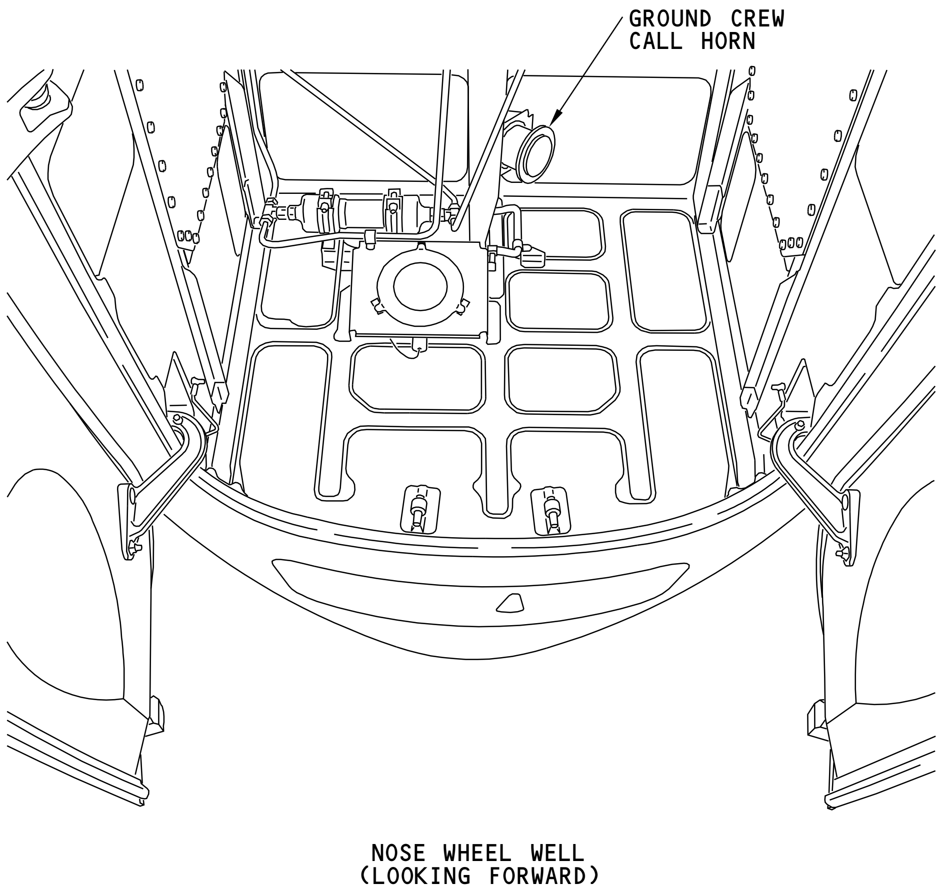
GROUND CREW CALL SYSTEM - CALL HORN

Purpose

When you push the GRD CALL switch, the call horn makes a sound. When you release the switch, the sound stops.

The horn makes a continuous sound when the ADIRS battery warning circuit is active or ADIRS cooling is not sufficient.

The horn makes a sound when the electrical battery is discharging. This happens when the battery charger power is off and the battery switch is on.



M80761 S0004624410_V1

GROUND CREW CALL SYSTEM - CALL HORN

GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION

General

The ground crew calls the flight crew with the PILOT CALL switch. The flight crew uses the GRD CALL switch to call the ground crew.

PILOT CALL Switch

You push the PILOT CALL switch to call the pilot. This switch connects 28v dc to the REU call relay. The call relay energizes and sends a ground discrete to the ACP to set the flight interphone call light. When you release the switch, the REU call relay de-energizes and the CALL light goes off. The 28v dc also goes to the aural warning module to make a high tone chime in the flight compartment.

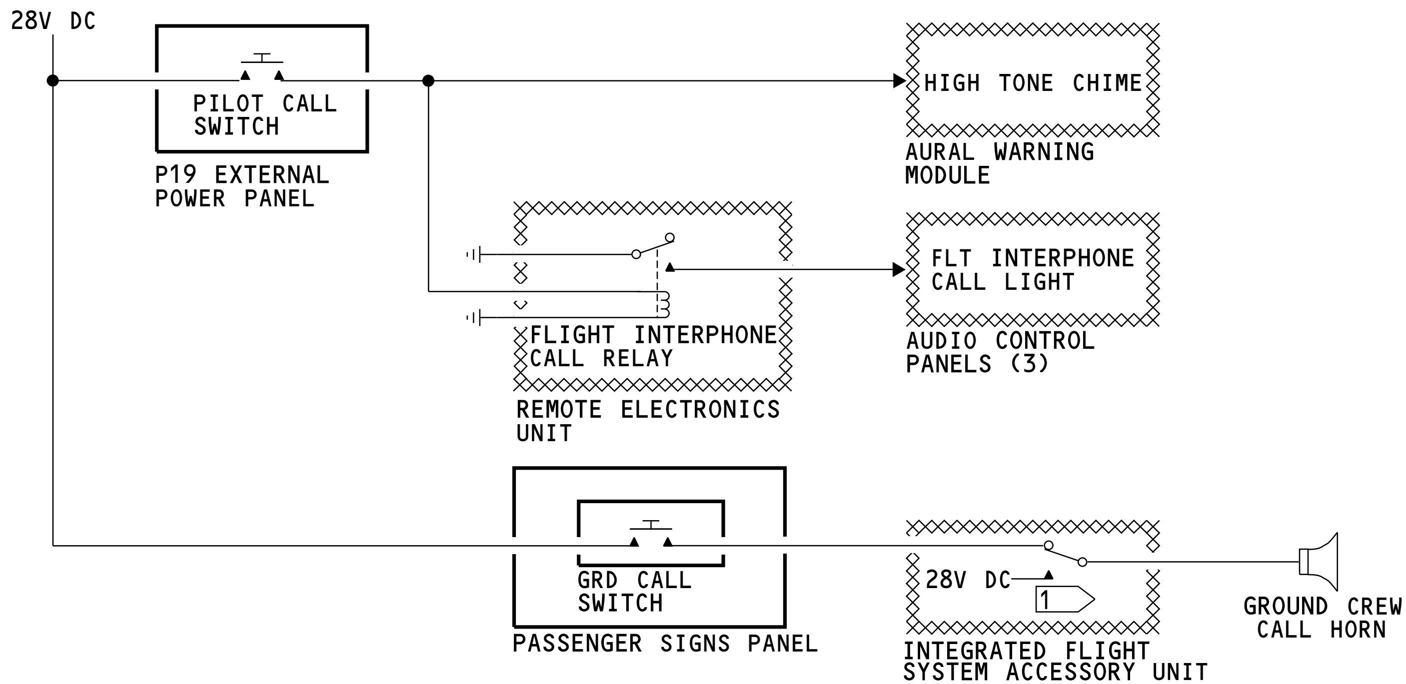
GRD CALL Switch

The pilot pushes the GRD CALL switch to make the ground crew call horn operate. The switch connects 28v dc to the ground crew call horn. The horn stops when you release the switch.

Ground Crew Call Horn

These are the conditions which cause the ground crew call horn to operate:

- Push the GRD CALL switch
- The inertial reference system cooling is not sufficient on the ground
- The inertial reference system (IRS) battery warning circuit is on.
- The electrical system battery is discharging (battery charger is powered off and battery switch is on).



1 ENERGIZED WHEN THE ADIRS OPERATES FROM HOT BATTERY BUS OR WHEN THE ADIRS IS ON AND THE EQUIPMENT COOLING FAN DOES NOT OPERATE.

M80763 S0004624413_V1

GROUND CREW CALL SYSTEM - FUNCTIONAL DESCRIPTION

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FLIGHT INTERPHONE SYSTEM - INTRODUCTION

Purpose

The flight crew uses the flight interphone system to speak with each other and the ground crew.

Flight and maintenance crews use the flight interphone system to get access to the communication systems. You can also use the flight interphone system to monitor the navigation receivers.

Abbreviations and Acronyms

- AAU - audio accessory unit
- ACP - audio control panel
- ADF - automatic direction finder
- ALT - alternate
- CAPT - captain
- COMM - communication
- DFCS - digital flight control system
- DME - distance measuring equipment
- FCC - flight control computer
- F/O - first officer
- GPWC - ground proximity warning computer
- HF - high frequency
- I/C - intercommunication
- ILS - instrument landing system
- INT - interphone
- MD&T - master dim and test
- MEDCOM - medical communications
- MIC - microphone
- MKR - marker
- NORM - normal
- OBS - observer
- PA - passenger address
- PLA - programmed logic array
- PTT - push to talk
- REU - remote electronics unit
- R/T - receive/transmit
- STA - station
- TCAS - traffic alert and collision avoidance system
- VHF - very high frequency
- VOR - very high frequency omni-range system
- XCVR - transceiver

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FLIGHT INTERPHONE SYSTEM - INTRODUCTION

FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION

General

The remote electronics unit (REU) and the audio control panel (ACP) control the audio signals to and from the flight crew. The REU also controls the communication with the service interphone and related electronics equipment. During a system failure, emergency operation bypasses all active system circuitry and keeps airplane-to-ground station communication.

The REU also controls the communication with the service interphone and related electronics equipment. During a system failure, emergency operation bypasses all active system circuitry and keeps airplane-to-ground station communication

Flight Crew Interfaces

This system description shows the captain system. Interfaces and components for other flight crew stations are similar.

The flight crew uses microphone (mic) switches on these components to send audio to the REU:

- Remote mic switch
- Control wheel
- ACP
- Hand microphone.

A microphone on these components lets the flight crew speak on the flight interphone system:

- Oxygen mask
- Headset boom mic
- Hand mic.

The flight crew uses the audio control panels for these functions:

- Listen to the communication and navigation receivers
- Adjust the volume of the received audio
- Select a transmitter and microphone
- Monitor SELCAL
- Monitor Crew Call
- Key the microphone.

The REU sends audio signals to the headsets and to the flight interphone speakers.

Other Component and System Interfaces

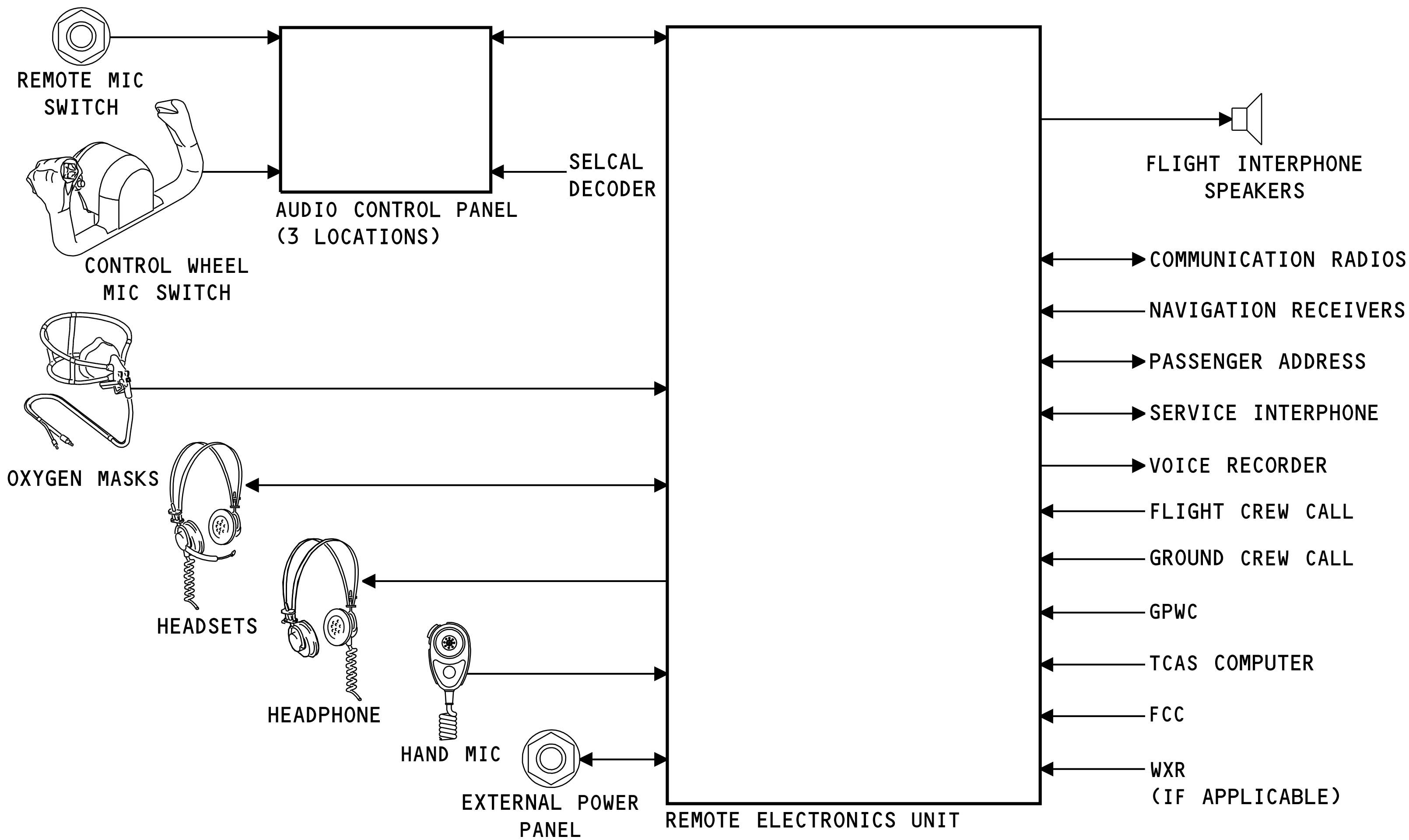
The REU connects to these other components:

- Communications radios - the REU sends push-to-talk (PTT) and microphone audio to the transceivers and receives audio back from them
- Navigation receivers - the REU receives voice and Morse code identification tones.

The flight interphone system also has an interface with these other systems:

- Passenger address system - lets the flight crew make announcements to passengers
- Service interphone system - lets the flight crew speak with attendants and service personnel
- Voice recorder - records the flight crew microphone and receive audio
- Flight crew call - gives discrete for call light
- Ground crew call - gives discrete for call light
- Ground proximity warning computer (GPWC) - lets flight crew monitor warning signals
- Traffic alert and collision avoidance system (TCAS) - lets the flight crew monitor TCAS signals
- Flight control computer (FCC) - gives discrete signals to the REU. This signal activates an altitude alert tone generator.

Aural alerts for TCAS, ground proximity, and altitude are heard at the captain, first officer, or observer headphones and at the flight interphone speakers.



FLIGHT INTERPHONE SYSTEM - GENERAL DESCRIPTION

FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

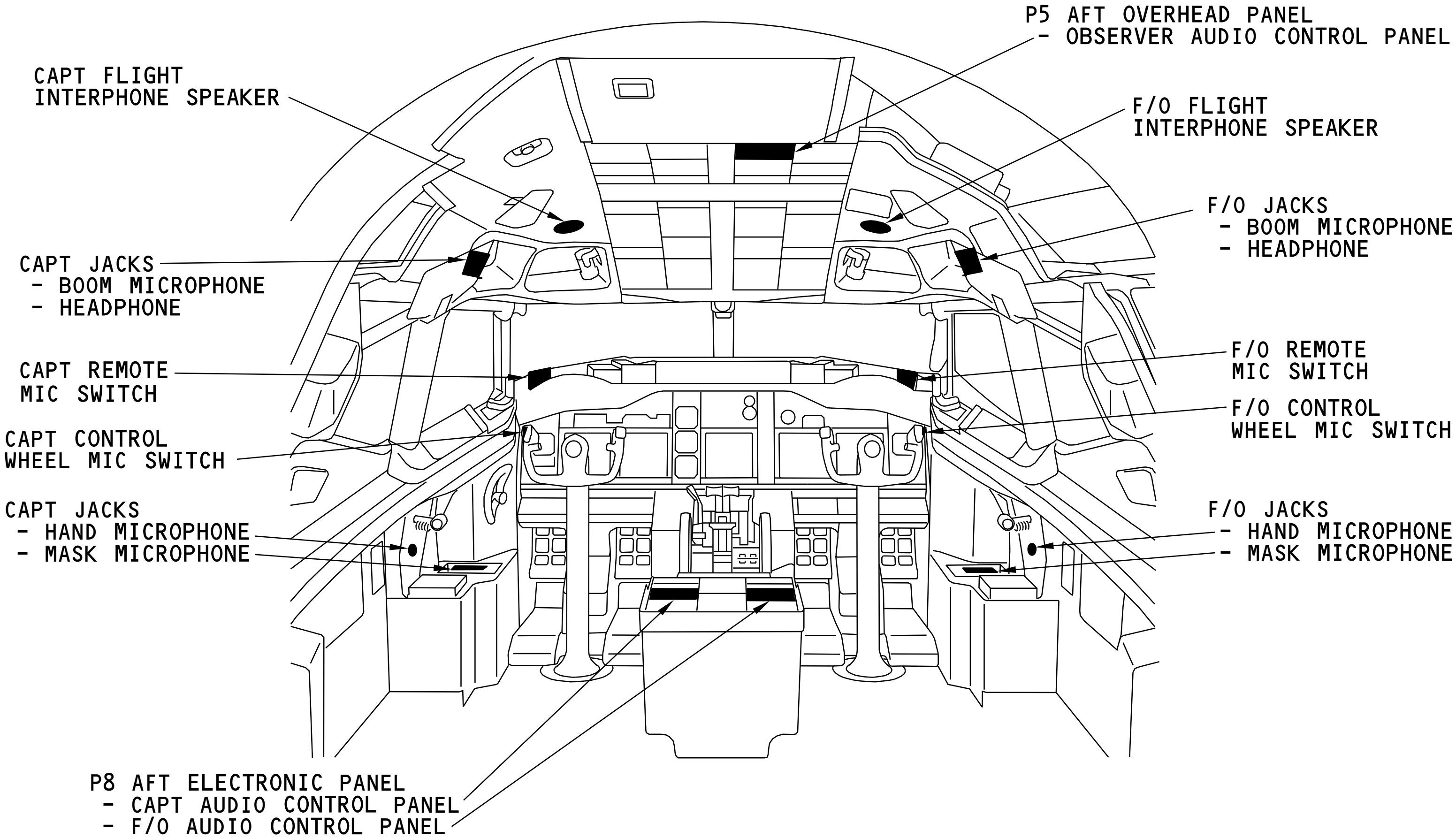
Flight Compartment Component Locations

These are the captain and first officer flight interphone system components:

- Remote mic switch
- Control wheel mic switch
- Flight interphone speaker
- Hand mic jack
- Oxygen mask mic jack
- Boom mic jack
- Headphone jack
- Audio control panel.

The observer has these flight interphone components:

- Hand mic jack
- Oxygen mask mic jack
- Headphone jack
- Audio control panel.



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FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATIONS

FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS

Flight Interphone Component Locations

There are flight interphone system components in these locations:

- Electronic equipment compartment
- Flight compartment.

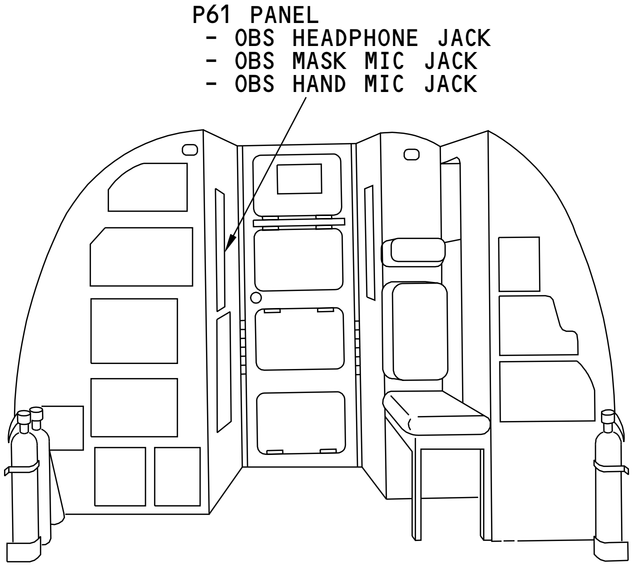
Electronic Equipment Compartment

The REU is on the E4-1 rack.

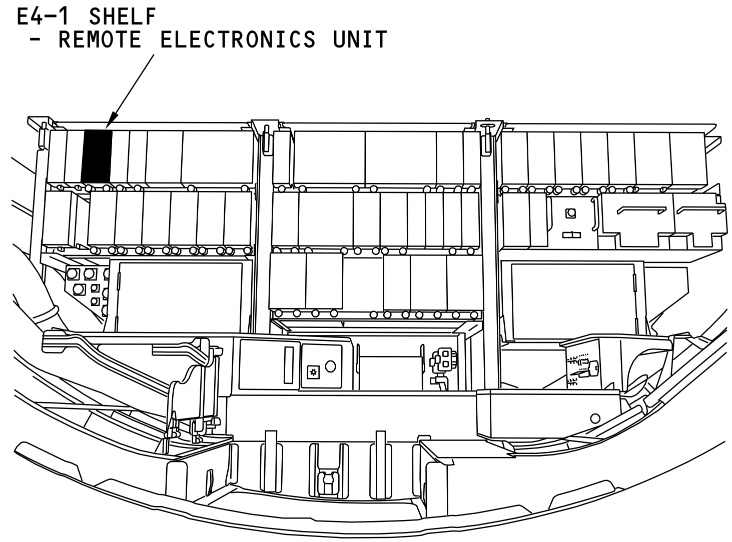
Flight Compartment

These are the flight interphone system components in the aft portion of the flight compartment:

- Observer headphone jack
- Observer mask microphone
- Observer hand microphone.



FLIGHT COMPARTMENT
(LOOKING AFT)



ELECTRONIC EQUIPMENT COMPARTMENT
(LOOKING AFT)

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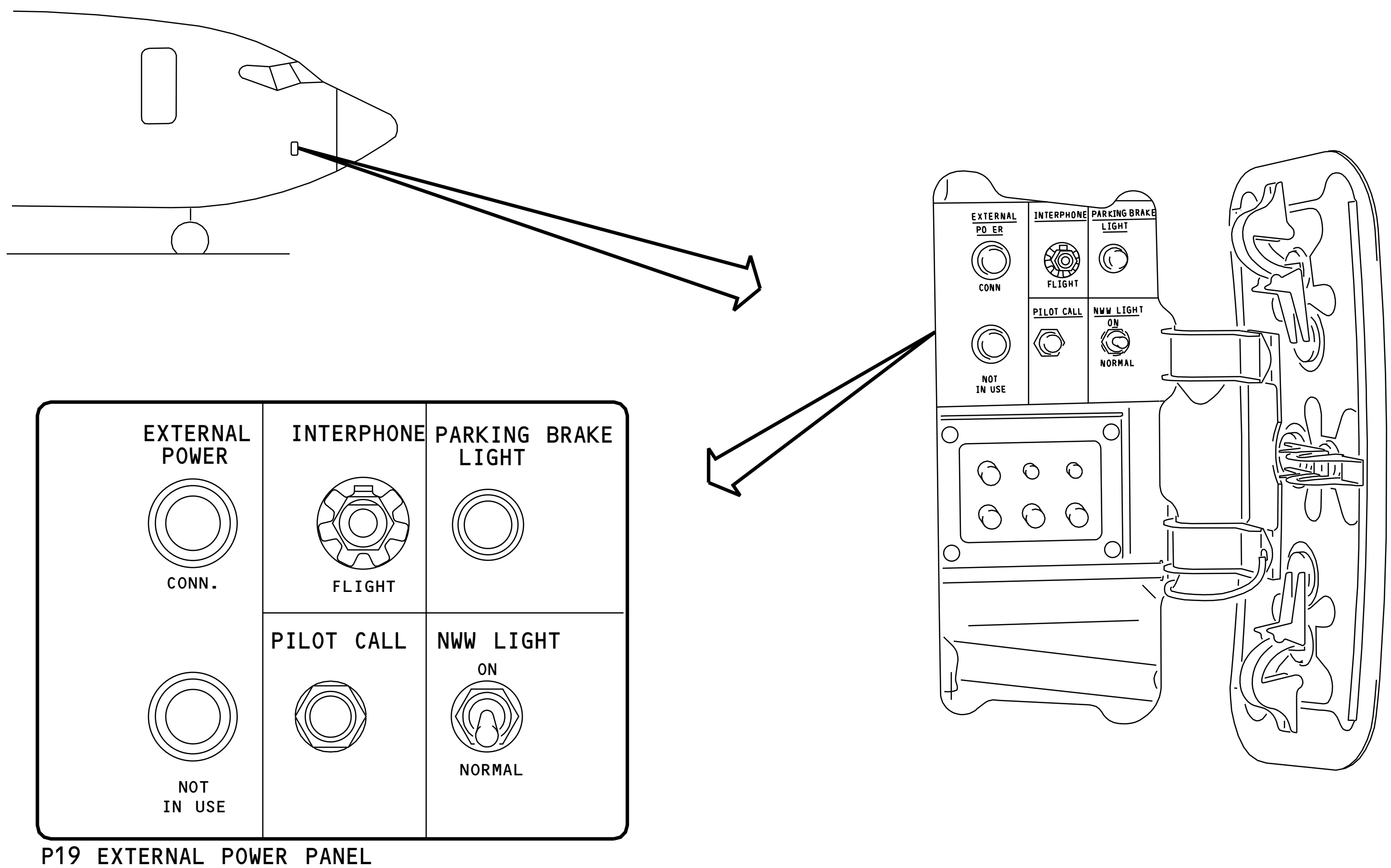
FLIGHT INTERPHONE SYSTEM - COMPONENT LOCATIONS

FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION

Flight Interphone Jack

There is a flight interphone jack on the P19 external power panel.



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FLIGHT INTERPHONE SYSTEM - EXTERNAL FLIGHT INTERPHONE JACK LOCATION

FLIGHT INTERPHONE SYSTEM - POWER INTERFACE

General

Power for the flight interphone system comes through circuit breakers in the P6-2 circuit breaker panel.

The REU has three station cards and an audio accessory unit (AAU) card. Each card has a power supply for internal operation. The station cards supply 15v dc to the audio control panels (ACP).

CAPT AUDIO Circuit Breaker

The CAPT AUDIO circuit breaker supplies 28v dc to the captain station card in the remote electronics unit. The captain station card supplies 15v dc to the captain ACP.

F/O AUDIO Circuit Breaker

The F/O AUDIO circuit breaker supplies 28v dc to the first officer station card in the remote electronics unit. The F/O station card supplies 15v dc to the first officer ACP.

OBS AUDIO Circuit Breaker

The OBS AUDIO circuit breaker supplies 28v dc to the observer station card in the remote electronics unit. The observer station card supplies 15v dc to the observer ACP.

INPH AND WARN Circuit Breaker

The INPH AND WARN circuit breaker supplies power to the audio accessory unit card in the remote electronics unit.

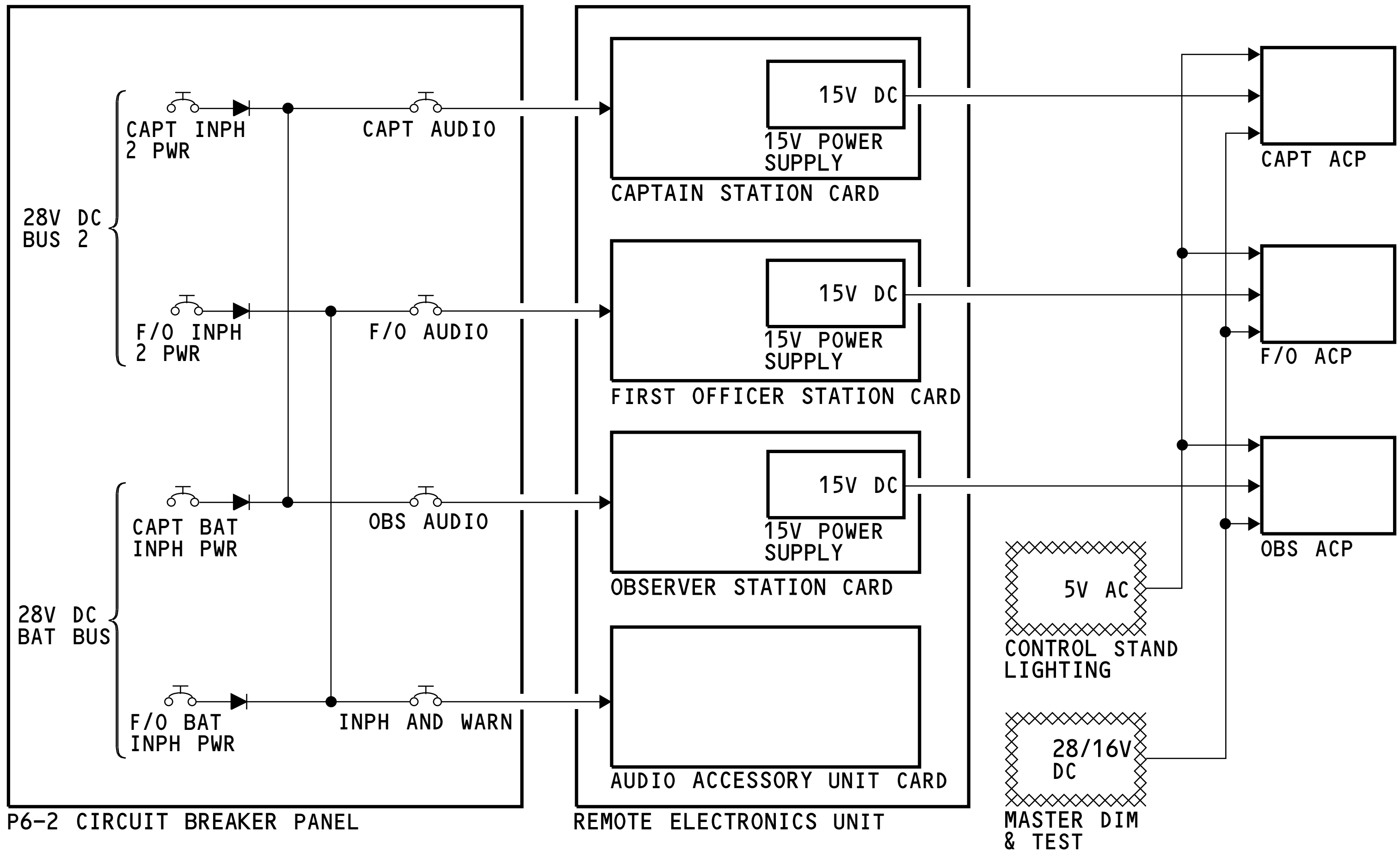
Master Dim and Test

Each ACP gets 28v dc from the master dim and test (MD&T) system when the BRT/DIM/TEST switch on the captains main instrument panel is in the BRT position, and 16v dc when the switch is in the DIM position. This voltage supplies power for the lamps in the mic selector switches.

The MD&T system also supplies power to the call lamps in the mic selector switches.

Panel Lighting

Each ACP gets 5v ac from the airplane electrical system to supply power for the edgelit panel lighting.



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FLIGHT INTERPHONE SYSTEM - POWER INTERFACE

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FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES

General

The flight interphone system has these flight compartment stations:

- Captain
- First officer
- Observer.

The REU gets control and PTT signals from the audio control panels (ACPs). The REU sends a clock signal to the ACPs to control the data multiplexing.

The remote electronics unit (REU) has three station cards that supply an interface to each station. Each station card:

- Receives control inputs from the audio control panel (ACP)
- Supplies push-to-talk (PTT) and microphone audio signals to communication systems
- Supplies audio from communication and navigation receivers to the stations.

Captain and First Officer Stations

The captain and the first officer station cards have an interface to these components:

- Control wheel PTT switch
- Remote mic switch
- Audio control panel
- Hand microphone
- Oxygen mask stowage panel
- Headset
- Headphone
- Flight interphone speaker.

The control wheel PTT switch connects in parallel with the ACP RADIO - INT (or R/T - I/C) switch. The remote mic switch is in parallel with the control wheel MIC switch.

When you select MIC on the control wheel switch, push the remote mic switch or select RADIO (or R/T) on the ACP, the ACP sends the R/T-PTT discrete signal to the REU.

When you select INT on the control wheel switch or INT (or I/C) on the ACP, the ACP multiplexes the interphone-PTT signal with other control signals and sends the control signal to the REU.

The PTT discrete signal from the hand mic goes directly to the REU.

The microphone audio can come from these sources:

- Hand microphone
- Oxygen mask microphone
- Headset boom microphone.

The oxygen mask stowage panel sends a door discrete, MASK MIC ON/OFF signal, to the audio control panel. An open discrete, mask mic off, is door closed and a ground discrete, mask mic on, is door open.

The REU sends audio to the headset, the headphone, and the flight compartment speaker at each station.

When you use the hand microphone or the boom microphone, the REU decreases the volume to the flight compartment speakers.

Observer Station

The observer station card has an interface to these components:

- Audio control panel
- Hand microphone
- Oxygen mask microphone
- Headphone.

When you select RADIO (or R/T) on the ACP, the ACP sends a R/T-PTT discrete signal to the REU.

When you select INT (or I/C) on the ACP, the ACP multiplexes the interphone-PTT signal with other control signals and sends the control signal to the REU.

The microphone audio can come from the hand microphone or the oxygen mask microphone.

When you use the hand microphone, the REU decreases the volume to the flight compartment speakers. The PTT discrete signal from the hand mic goes directly to the REU.

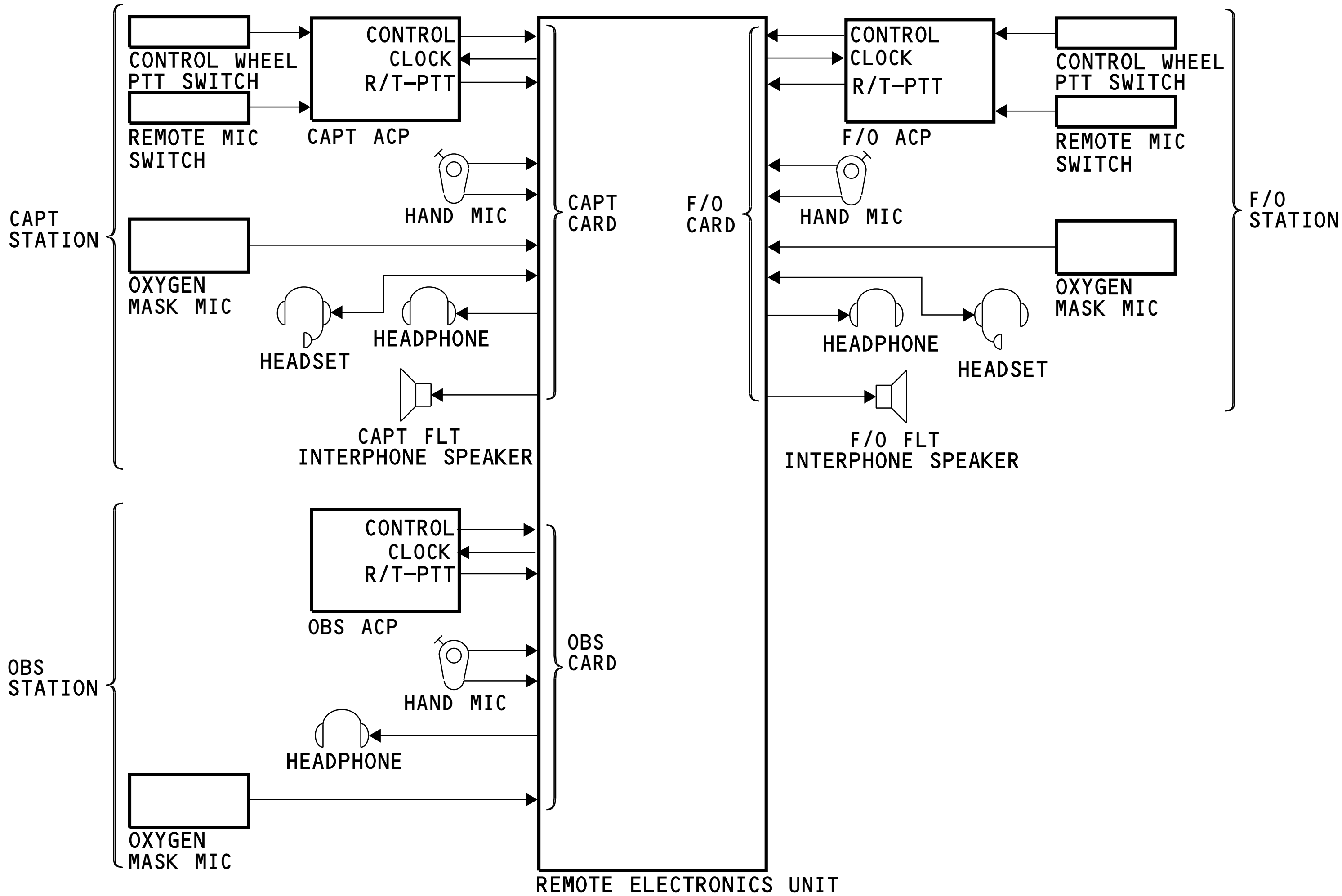
The REU sends audio to the headphone.

Medical Communications System

The observer station card also has an interface with the medical communications jacks.

The medical communications hand microphone jacks are wired in parallel to the First Observer's hand microphone input to the REU. The medical communication headphone jacks are wired in parallel to the First Observer's headphone output from the REU.

The flight crew controls access to the medical communications system through select switches on the First Observer's ACP.



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FLIGHT INTERPHONE SYSTEM - FLIGHT COMPARTMENT INTERFACES

FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES

Remote Electronics Unit

The REU controls the audio in the flight interphone system.

The REU gets control and PTT signals from the audio control panels (ACPs). The REU sends timing signals to the ACPs to control the data multiplexing.

Communication Transceivers

The communication transceivers get microphone audio and PTT discretes from the REU. The transceivers send audio outputs to the REU. The REU uses these transceivers:

- Very high frequency (VHF)
- High frequency (HF).

Passenger Address Amplifier

The REU sends audio and PTT signals to the passenger address (PA) amplifier. The REU receives sidetone audio from the PA amplifier.

REU front panel potentiometers, PA SENSE and PA GAIN, connect to the PA amplifier. The PA SENSE sets the PA amplifier microphone input level. The PA GAIN sets the PA amplifier main power amplifier output level.

Voice Recorder

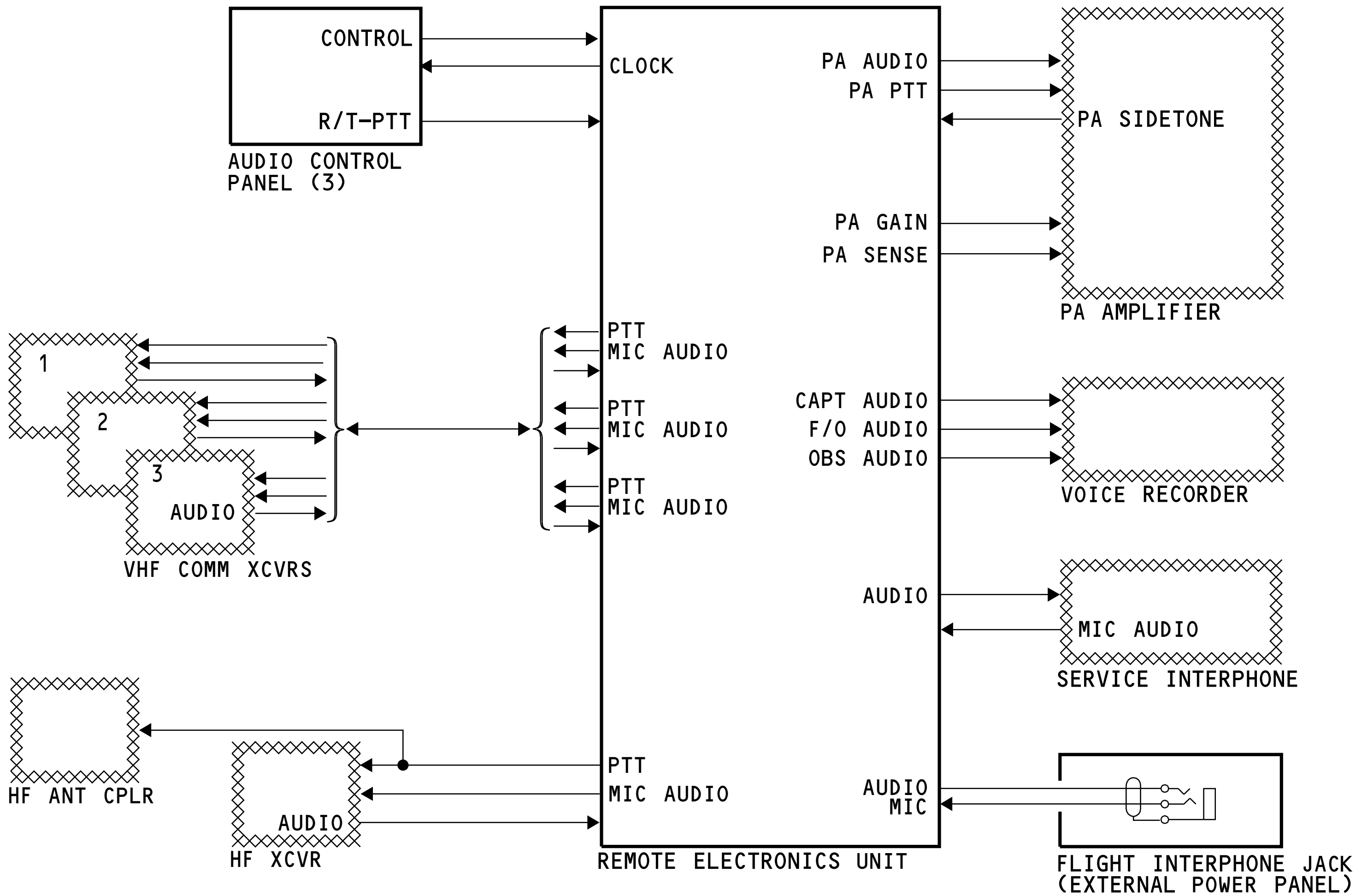
The REU sends audio from the captain, first officer, and observer to the voice recorder.

Service Interphone System

The REU sends audio to the service interphone system when you select service interphone on the ACP. Service interphone audio is available at all service interphone stations and attendant handsets.

Flight Interphone Jack

The ground crew uses the flight interphone jack at the P19 external power panel to talk to the flight crew.



FLIGHT INTERPHONE SYSTEM - COMMUNICATION SYSTEM INTERFACES

FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE

Navigation Interfaces

These navigation radio systems send audio signals to the REU:

- Multi-mode receiver (MMR)
- VHF omnidirectional range (VOR)/marker beacon system
- Automatic direction finder (ADF) system
- Distance measuring equipment (DME) system.

The REU pairs the DME with either the MMR or VOR audio. The REU sets the DME audio level at a lower level than the MMR or VOR audio.

Audio Alerts

These systems send audio alert signals to the REU:

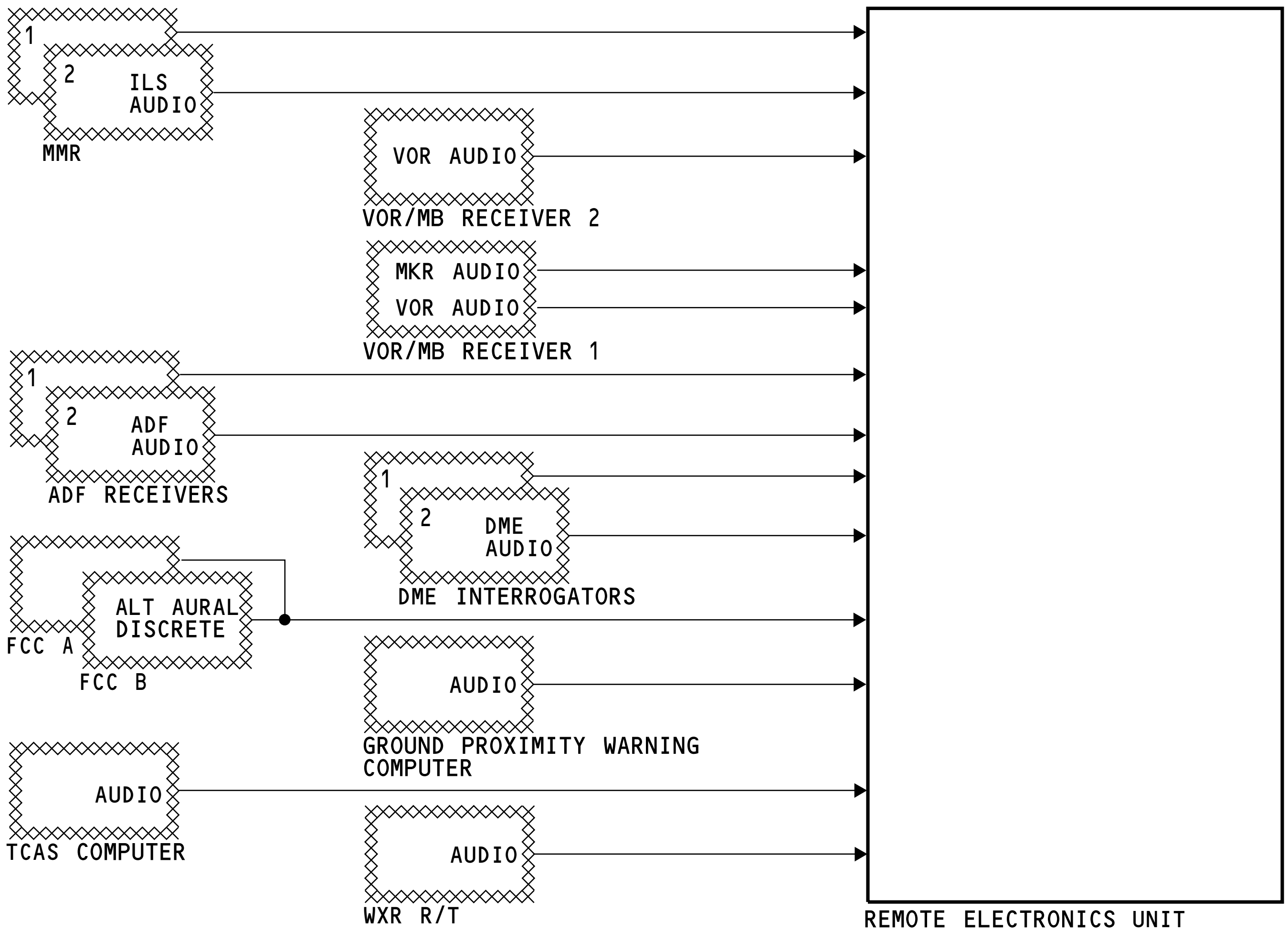
- Flight control computer (FCC) - altitude alert
- Traffic alert and collision avoidance system (TCAS)
- WXR receiver transmitter
- Ground proximity warning computer (GPWC).

The FCC sends a ground discrete to start the altitude alert signal. The REU supplies a C-chord aural with each ground discrete. The REU sums and amplifies TCAS, GPWC, WXR, and C-chord audio alert signals.

You can hear alert signals on the flight components below:

- Interphone headsets
- Headphones
- Speakers.

You can not turn off or adjust the volume of the alerts.



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FLIGHT INTERPHONE SYSTEM - NAVIGATION INTERFACE

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FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL

Purpose

The flight crew uses the audio control panels (ACPs) to control audio for the communication and navigation systems. Each ACP controls one station.

Controls

These are the controls on the ACP:

- Transmitter selectors
- Receiver switches
- Radio-Intercom PTT switch
- Filter switch
- ALT-NORM switch.

Microphone Selector Switches

The flight interphone system gets audio from these microphones:

- Boom
- Oxygen mask
- Hand-held.

You push a transmitter selector to select a communication transmitter or system. You can select only one system at a time.

When you push a transmitter selector, this happens:

- The selector switch light comes on
- The lamps in the selector switch are field replaceable.
- The received audio comes on at the volume set by the receiver volume control
- The microphone audio and PTT signals are enabled for that system.

The transmitter selectors (except PA) have call lights in the switch. The call lights come on when the flight crew get any one of these calls:

- SELCAL on a VHF or HF radio
- Ground crew call (FLT light)
- Flight crew call (CABIN light).

To turn off the call light, the flight crew selects the system and sends a PTT to that system.

When you push a PTT switch, the microphone audio and PTT signals go to the system set by the selector switches.

When the ACP initially gets power, the flight interphone system is active.

Receiver Switches

Push the receiver switch (push-on, push-off) to listen to communication or navigation system audio. Turn it to adjust the volume. You can monitor any combination of systems at any time.

CAUTION: DO NOT PULL THE RECEIVER SWITCH KNOBS. THE RECEIVER SWITCHES ARE PUSH-ON/PUSH-OFF TYPE. THE KNOB IS IN WHEN THE CONTROL IS ON, AND OUT WHEN OFF. IF YOU PULL THEM, YOU MAY DAMAGE THEM.

Radio-Intercom PTT Switch

The radio-intercom PTT switch is a three-position switch with momentary contacts in the R/T and I/C positions. In the R/T position, the microphone audio and PTT signals go to the communication system set by the transmitter selectors. In the I/C position, the boom or mask microphone jacks connect to the flight interphone system. The radio-intercom PTT switch is in parallel with the PTT switch on the control wheel.

Filter Switch

The filter switch controls the filter that processes the navigation audio you receive. This switch has these positions:

- V (voice) position passes only voice frequencies through the filter and blocks the 1020 hz range frequency.
- B (both) position passes voice and range (coded station identification) frequencies through the filter to the audio output.
- R (range) position passes only range frequencies through the filter and blocks voice frequencies.

FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL

ALT-NORM Switch

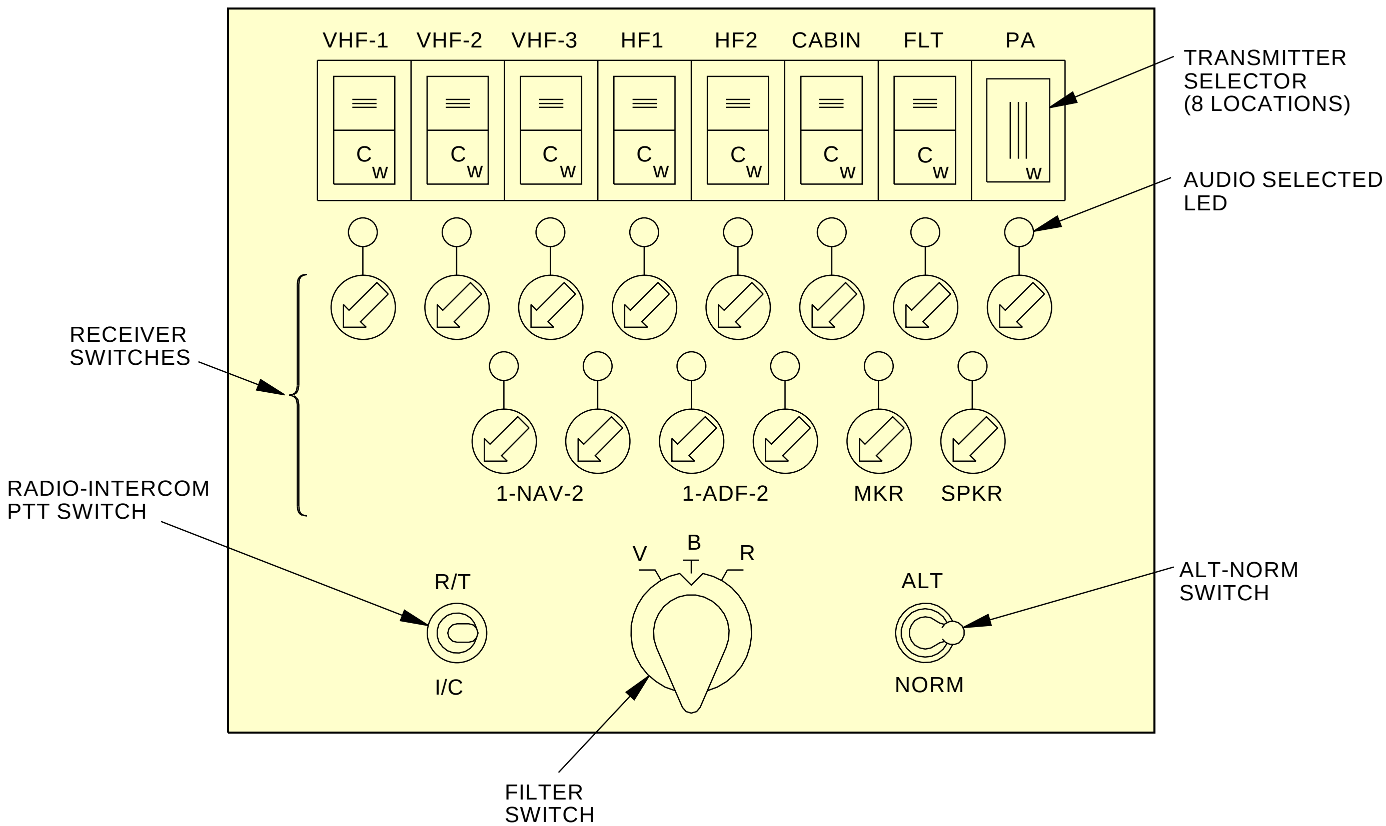
You use the ALT-NORM switch to select either normal or emergency operation of the flight interphone system. Each station operates independently.

When you select NORM, the flight interphone system operates as usual.

When you select ALT, the flight interphone system operates in the emergency mode. The only ACP control that operates is the R/T position of the PTT switch. The hand-mic does not operate.

When you select ALT on the captain or observer ACP, you hear receiver audio from the VHF-1 transceiver at the headphone and headset jacks. When you key the MIC, the audio and PTT signals go to the VHF-1 transceiver.

When you select ALT on the first officer ACP, you hear receiver audio from the VHF-2 transceiver at the headphone and headset jacks. When you key the MIC, the audio and PTT signals go to the VHF-2 transceiver.



INOP

AUDIO CONTROL PANEL (EXAMPLE)

1 INOP PLACARDS ARE OVER THE LEGEND OF ANY TRANSMITTER SELECTOR OR RECEIVE SWITCH THAT IS NOT CONNECTED.

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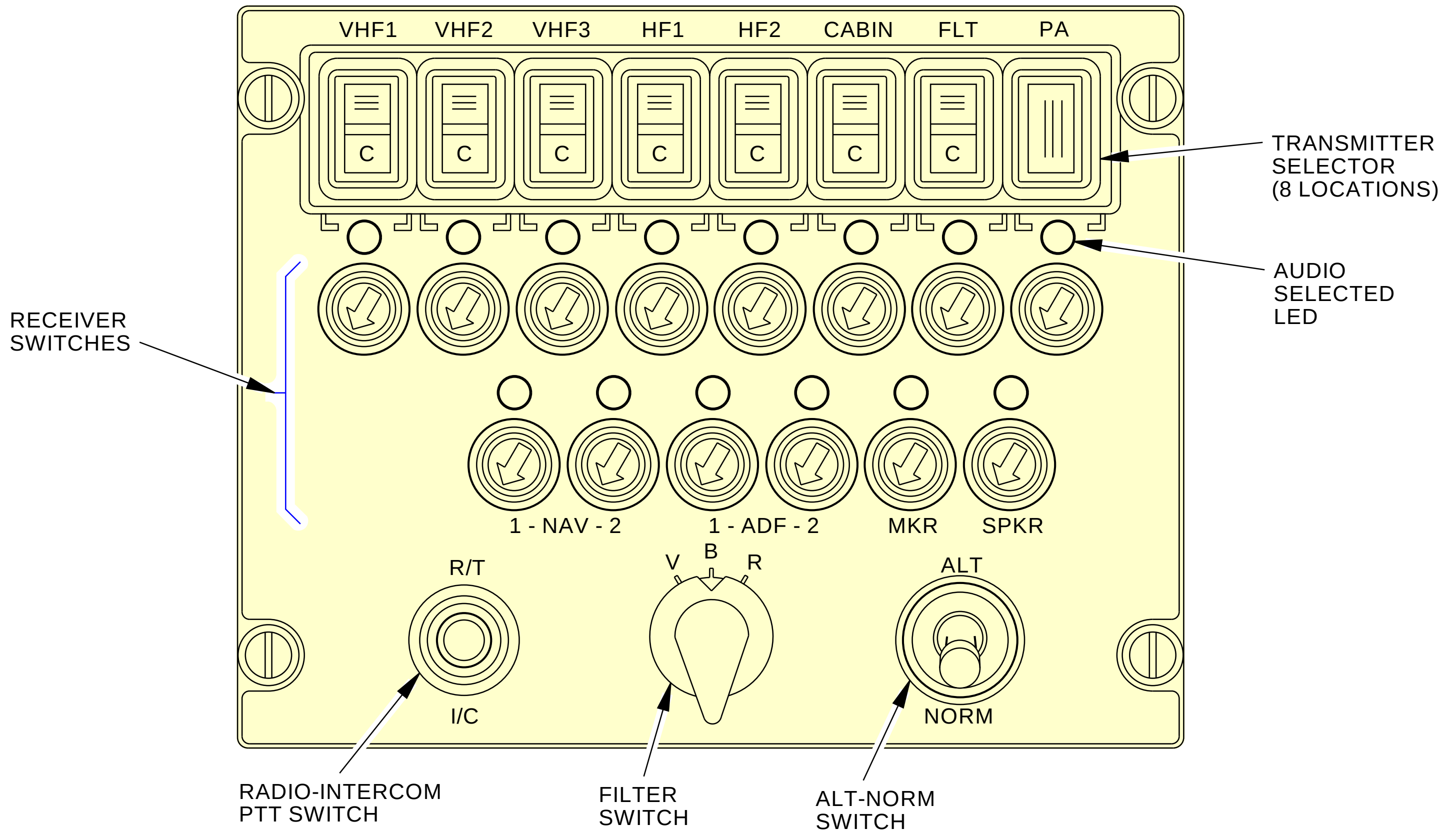
FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL



AUDIO CONTROL PANEL (EXAMPLE)

INOP

1 INOP PLACARDS ARE OVER THE LEGEND OF ANY TRANSMITTER SELECTOR OR RECEIVER SWITCH THAT IS NOT CONNECTED.

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FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL

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FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT

Purpose

The remote electronics unit (REU) controls audio signals in the flight interphone system.

Physical Description

The REU has these physical properties:

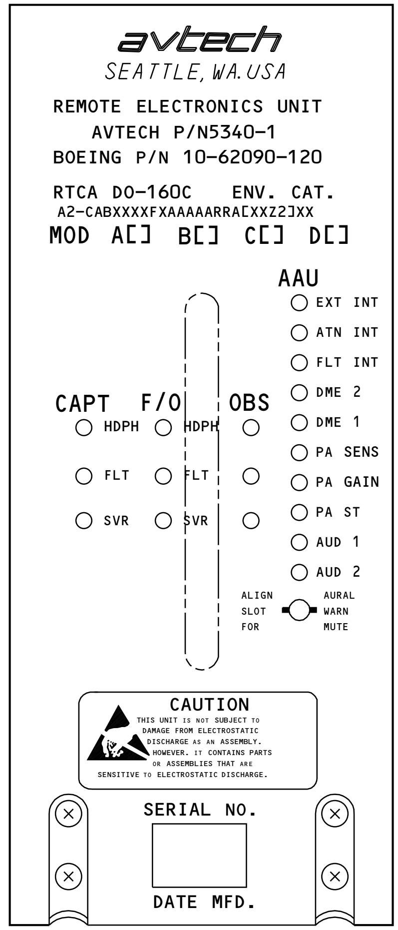
- Length is 17.6 in. (320 mm)
- Height is 7.62 inches (194 mm)
- Width is 3.58 inches (90.0 mm)
- Weight is 7.75 pounds (35.2 kg).

Functions

The REU uses the ACP selections to connect these signals:

- Communication transceiver audio
- Navigation receiver audio
- Passenger address audio
- Service interphone audio
- Flight interphone.

The AURAL WARN MUTE switch on the front panel of the REU activates the muting of the aural warning signal in the headphones. The switch is a ten position rotary switch. The switch is in the active muting position when it is horizontal to the bottom edge of the front panel.



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FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT

FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH

Purpose

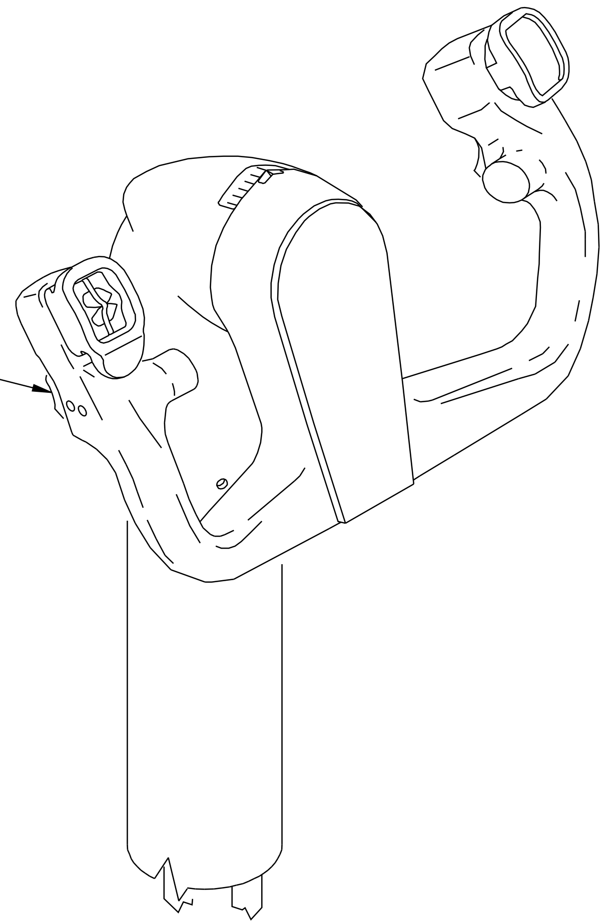
The control wheel PTT switch gives push-to-talk input for the boom or oxygen mask microphones.

Description and Controls

The control wheel PTT switch is a three position switch. It is on the outboard horn of the captain's and the first officer's control wheel. These are the switch positions:

- MIC - microphone audio and PTT signals go to the communication system you select
- OFF - The ACP PTT switch can key the microphone
- INT - microphone audio goes to the flight interphone system (ACP selection is not changed).

The switch is spring loaded to the middle OFF position.



CAPTAIN CONTROL WHEEL

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FLIGHT INTERPHONE SYSTEM - CONTROL WHEEL PTT SWITCH

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FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION

General

You use the audio control panel (ACP) to select the audio for headsets and flight interphone speakers. ACPs also select a communication system.

ACPs show SELCAL and crew calls.

ACP Components

The ACP has these components:

- Power supply
- Front panel lights and switches
- Switching multiplexer
- Volume control multiplexer
- Select circuits
- Emergency circuit.

Power Supply

The ACP gets 15v dc from the REU. The ACP converts this voltage to 12v dc and 5v dc which gives power for electronic circuits.

Master dim and test (MD&T) sends 28v dc or 16v dc to the microphone selector lamps and the call lamps. The airplane electrical system sends 5v ac for panel lighting.

Front Panel Lights and Switches

The ACP has these front panel components:

- Microphone select switches with mic select lights and call lights
- Filter switches
- Receiver select switches and volume controls.

The mic select lights get 28v dc or 16v dc from the MD&T circuits. A mic select light turns on when it gets a ground from the electrical interlock programmed logic array (PLA) circuit.

The VHF or HF call lights turn on when SELCAL comes for that radio. To turn off these call lights, push the microphone select switch and key the mic. When you push the pilot call switch at the external power panel, the FLT call light and CABIN call lights come on. When you release the pilot call switch, the FLT call light goes off. The CABIN call light goes off after 40 seconds. The CABIN call light comes on when the cabin crew makes a pilot call. When the cabin crew pushes reset on the handset or puts the handset into the cradle, the CABIN call light goes off.

When you push the microphone select switch, it sends 5v dc to the PLA. The PLA is an electrical interlock circuit. It makes a 4 bit binary code for the selected switch.

System selection is latched into the PLA. The PLA sends the applicable code to the switching multiplexer. The PLA also sends a signal to turn on a receiver volume control when you push the microphone select switch.

Push the receiver volume control to hear audio from the related system. The receiver volume control switch sends a dc voltage from a potentiometer (0 to 12v dc) to the multiplexer. The multiplexer sends this voltage to the REU to set the radio output volume level. When the audio volume control switch is off, 12v dc goes to the REU and you cannot hear the system audio.

Switching Multiplexer

The switching multiplexer gets these signals:

- Microphone select binary code from the PLA circuit
- DC voltages from filter switches
- DC voltages from the service interphone, PA, and speaker volume controls.

The switching multiplexer sequentially selects the inputs. The data output goes to the REU as a control system data word. This multiplexer operation stops when the volume control multiplexer operates.

Volume Control Multiplexer

The volume control multiplexer gets DC voltages from the remaining receiver volume controls.

FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION

The volume control multiplexer sequentially selects the inputs. The data output goes to the REU as a control system data word. This multiplexer operation stops when the switching multiplexer operates.

Select Circuits

A multiplexer selects each input in sequence for a given time. A clock in the REU increases the value of a counter. This counter provides the select address for the two analog multiplexers.

Two multiplexers combine the data from all the switches and the controls. The scan inhibit circuits prevent the operation of one multiplexer output while the other scans.

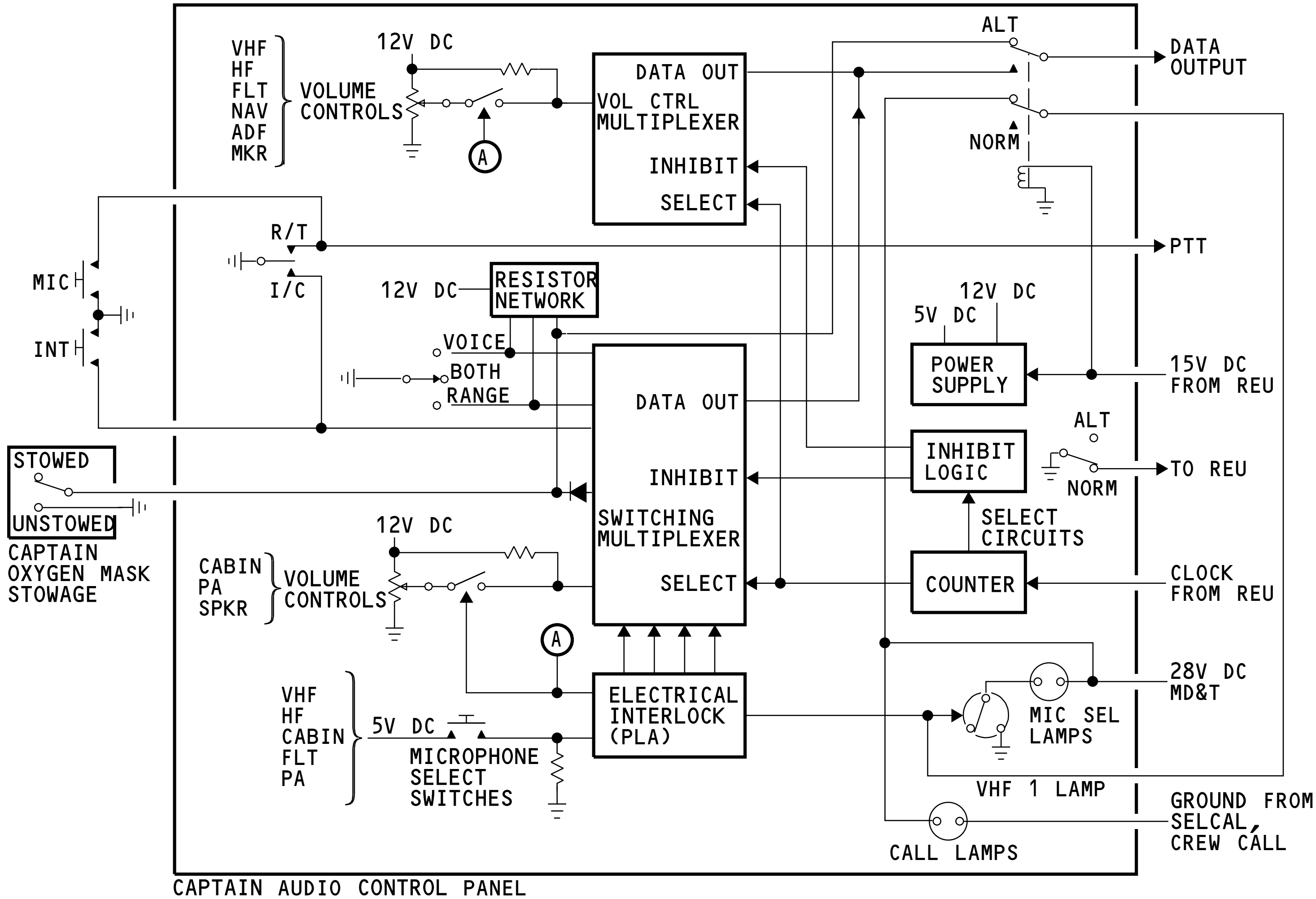
Emergency Circuits

The REU gives power for the ACP. You lose ACP power when for these conditions:

- REU has no power
- ACP has the ALT selection.

These conditions occur when you lose power in the ACP:

- The ALT/NORM relay has no power
- The data line to the REU identifies the mask storage compartment discrete status
- 28 volts from MD&T goes through the ALT/NORM relay contacts to the VHF 1 mic selector switch lamp for the captain and observer, and VHF 2 mic selector switch lamp for the first officer.



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FLIGHT INTERPHONE SYSTEM - AUDIO CONTROL PANEL FUNCTIONAL DESCRIPTION

FLIGHT INTERPHONE SYSTEM - PTT FUNCTION

General

These components send a push-to-talk (PTT) signal to the remote electronics unit (REU):

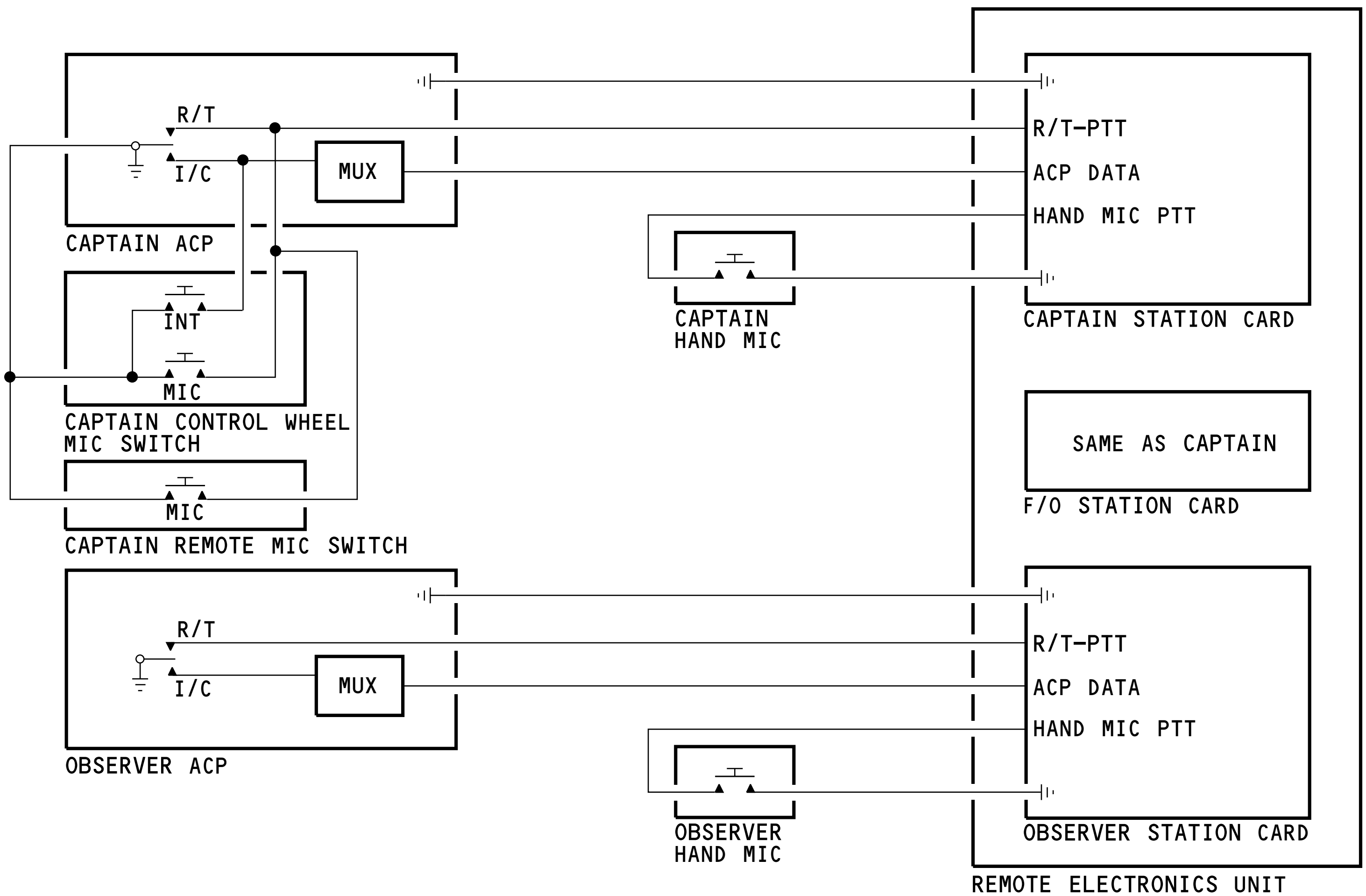
- Audio control panel (ACP) radio-intercom PTT switches
- Control wheel PTT switches
- Remote mic switches
- Hand microphone PTT switches.

Set the radio-intercom PTT switch on the ACP to R/T to send a PTT signal to a communications system. Set the switch to I/C to talk on the flight interphone system.

Push the remote mic switch on the glareshield to send a PTT signal to a communication system.

Set the control wheel PTT switch to MIC to send a PTT signal to a communications system. Set the switch to INT to talk on the flight interphone system.

The observer can only send a PTT from the hand microphone or ACP.



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FLIGHT INTERPHONE SYSTEM - PTT FUNCTION

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FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION

General

The remote electronics unit (REU) controls the communication between these:

- Three flight deck stations
- Service interphone
- Flight interphone
- All related electronics equipment.

The REU contains three identical station cards. The cards are for these crew members:

- Captain
- First officer
- Observer.

The REU also has an audio accessory unit (AAU) card. The card contains circuitry for flight and service interphone, alert tone generation and various audio accessory functions.

REU cards process these signals:

- REU inputs
- REU outputs
- AAU signals
- Emergency signals.

REU Inputs

Each station card in the REU receives audio from these sources:

- Flight compartment microphones
- Communication transceivers
- Navigation receivers
- Passenger address amplifier
- AAU card aural alerts.

The station cards get control inputs from the audio control panels (ACPs) and microphone push-to-talk (PTT) switches.

The mux receiver, in the REU, sends a data clock to the ACP. The ACP replies back with crew selected receiver audio, navigation signals, volume and particular transmitter.

The mux receiver responds to the crew inputs and sends control signals to the following circuits:

- Receiver circuits
- Mic/PTT select logic
- Transmitter circuits
- Speaker mute/volume logic.

The receiver circuits receive audio inputs from the communication and navigation systems, passenger address amplifier, service interphone and flight interphone. The circuits process the crew selected audio. The audio goes to summing amplifiers. The summing amplifiers send the audio to the speaker mute/volume logic circuits, CVR amplifier and headphone amplifier.

The mux receiver sends boom/mask and interphone PTT signals to the mic/PTT select logic. The mic/PTT select logic processes input microphone audio and PTT signals. It routes the selection to the transmitter circuits. The mic/PTT select logic circuits process speaker mute signals and hot mic audio.

The transmitter circuits route the microphone audio and/or PTT to the selected communication system.

The speaker mute/volume logic circuits process flight compartment speaker muting and set the speaker volume to the level as commanded from the mux receiver.

REU Outputs

Each station card sends audio to these:

- Headphones
- Headsets

- Voice recorder
- Flight compartment speakers from CAPT and F/O station cards
- Communication transceivers
- Passenger address amplifier.

The station cards also send PTT signals to the communication transceivers and the passenger address amplifier.

AAU Signals

The AAU uses these audio signals:

- Altitude alert
- Ground proximity alert
- Flight interphone
- Service interphone.

The flight control computers (FCCs) send an altitude alert discrete to the AAU card. This input starts a C-chord generator.

The ground proximity computer and the weather radar receiver transmitter send alert audio to the AAU card. The AAU card combines this audio with the output from the altitude alert tone generator and sends it to each station card summing amplifier. The summing amplifier combines the AAU alert audio with TCAS audio. Station cards amplify these signals and send them to the voice recorder and speakers.

The flight interphone amplifier amplifies microphone audio from station cards. Microphone audio goes to the flight interphone jack.

The AAU card amplifies audio from the external flight interphone jack and sends it to station cards.

The service interphone amplifier amplifies these inputs:

- Audio from attendant handsets
- Audio from service interphone jacks
- Microphone audio when service interphone is set on the ACP.

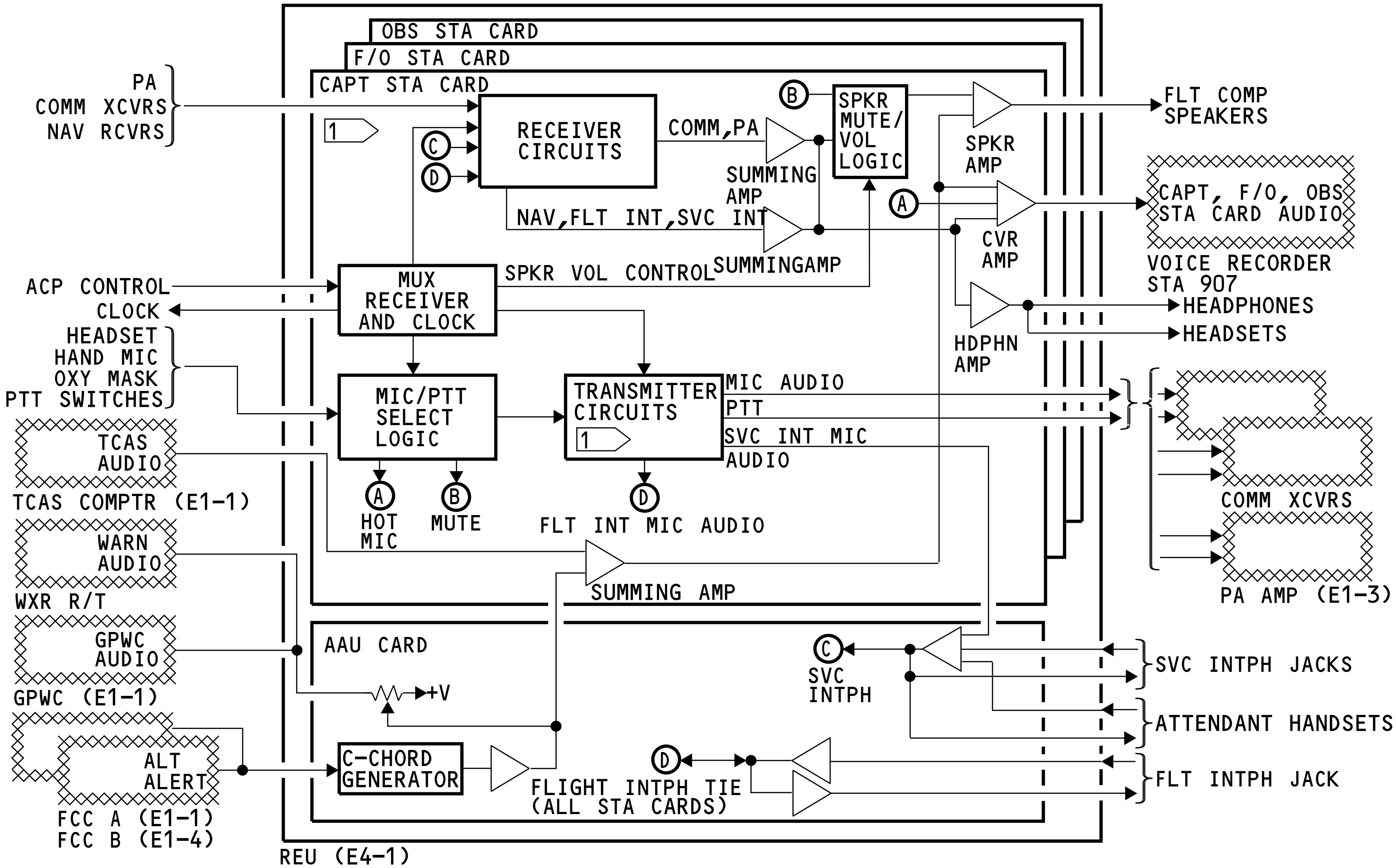
This audio goes to service interphone jacks and station cards.

Emergency Signals

Emergency operation bypasses all active circuitry in the system to maintain communications between the aircraft and ground stations.

Microphone audio and PTT signals from the CAPT and OBS stations go directly to the VHF 1 transceiver. Microphone audio and PTT signals from the F/O station goes to the VHF 2 transceiver.

Received audio from the VHF 1 transceiver goes to the CAPT and OBS station headsets. Received audio from the VHF 2 transceiver goes to the F/O station headset.



1 EMERGENCY - MIC AUDIO AND PTT DIRECT TO VHF 1 FOR CAPT AND OBS. VHF 2 FOR F/O. RECEIVE AUDIO DIRECT TO HEADPHONE AND HEADSET OUTPUT.

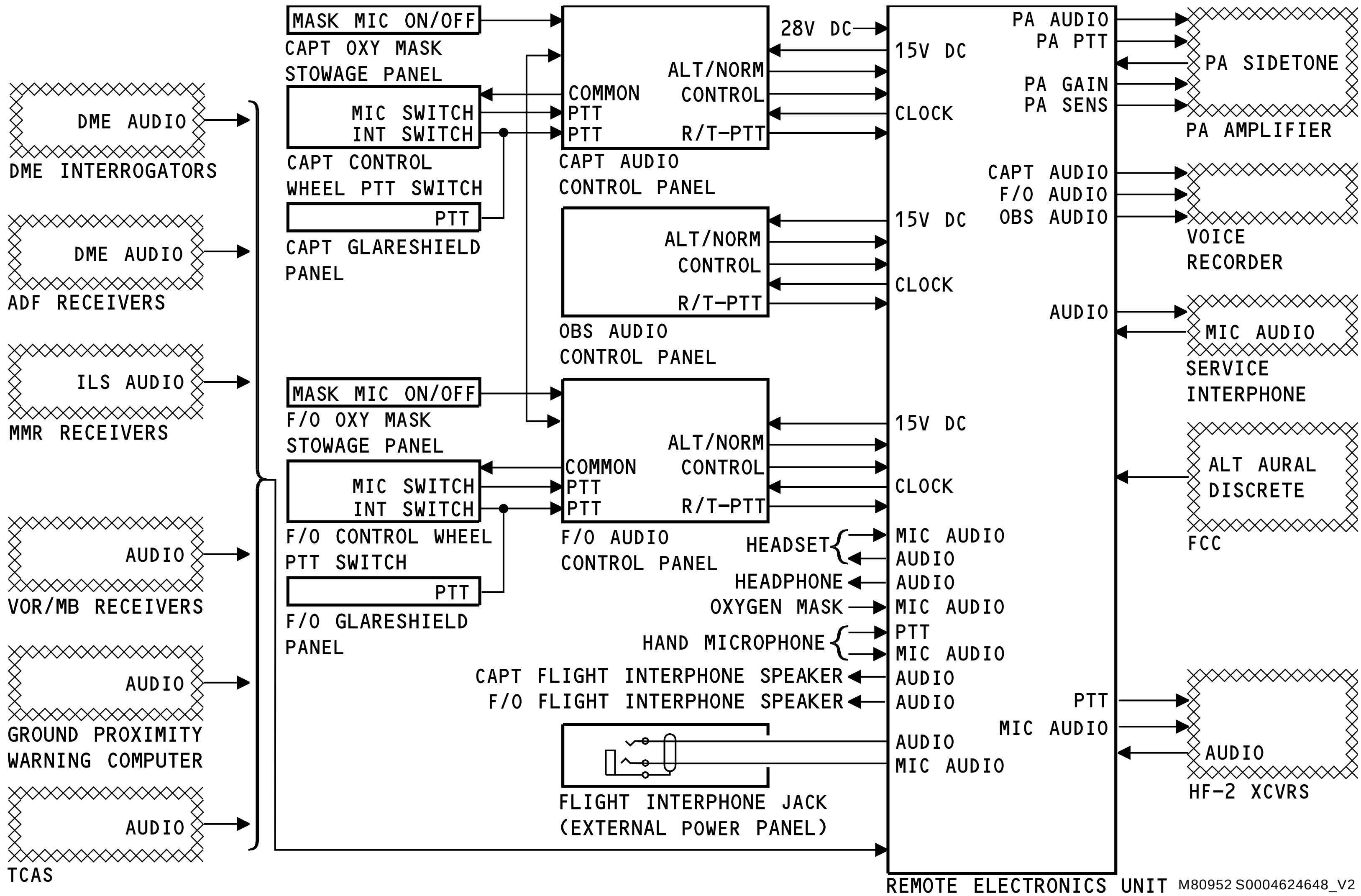
M80947 S0004624631_V1

FLIGHT INTERPHONE SYSTEM - REMOTE ELECTRONICS UNIT FUNCTIONAL DESCRIPTION

FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY

General

This page is for reference.



FLIGHT INTERPHONE SYSTEM - SYSTEM SUMMARY

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STATIC DISCHARGERS

Purpose

There are static dischargers on the airplane to decrease radio receiver interference. The static dischargers discharge static at points as far from the fuselage as possible. This makes sure there is the least amount of coupling into the radio receiver antennas.

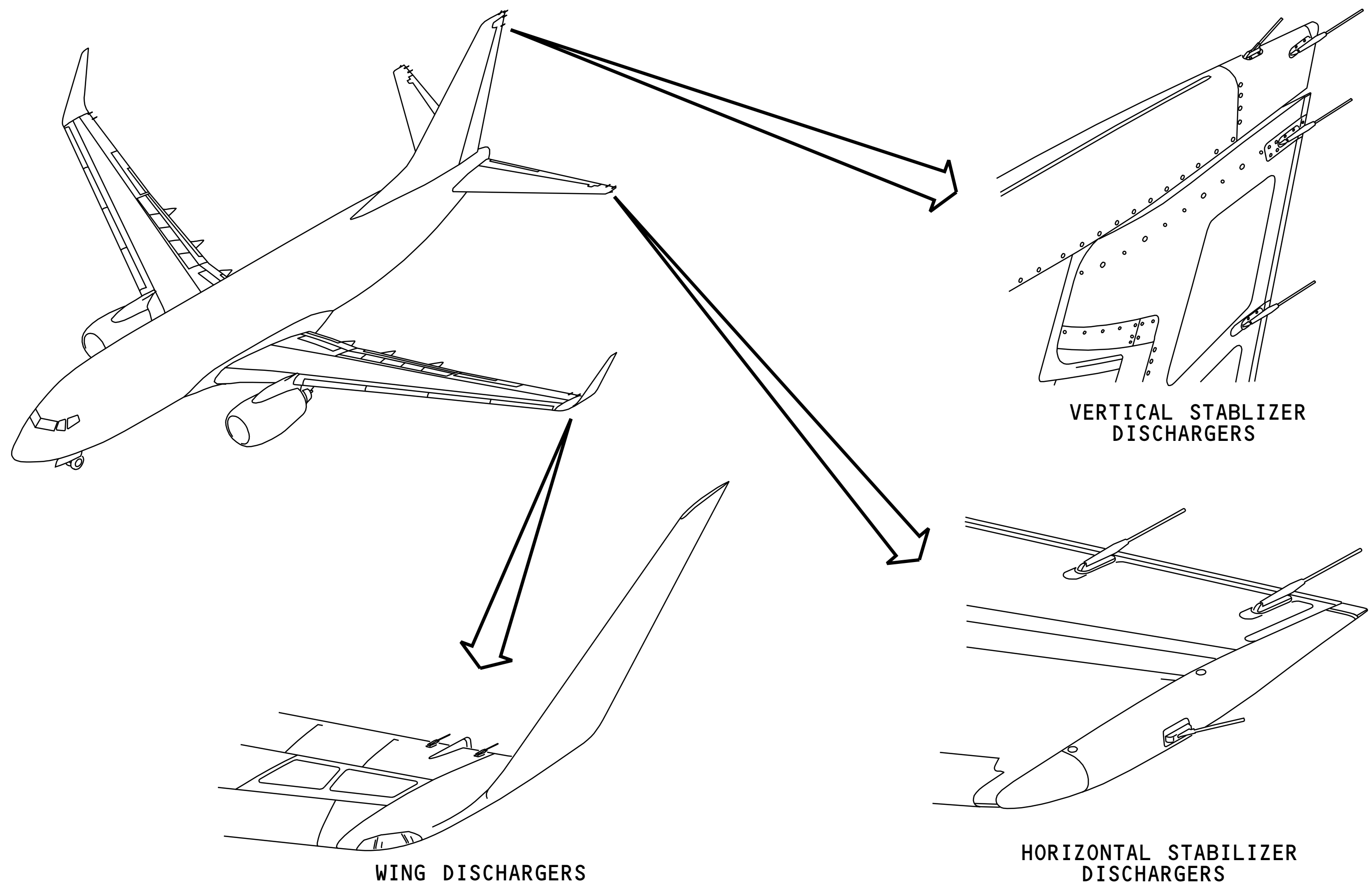
Characteristics

Each discharger has a carbon fiber tip at the end of a slender rod. The rod is a resistive (conducting) material and attaches to a metal base. The base attaches and bonds to the airplane surface.

There are trailing edge and tip dischargers. The tip dischargers are smaller than the trailing edge dischargers.

Location

Each wing has two trailing edge dischargers. The vertical fin has a tip discharger and three trailing edge dischargers. Each side of the horizontal stabilizer has a tip discharger and two trailing edge dischargers.



STATIC DISCHARGERS

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VOICE RECORDER SYSTEM - INTRODUCTION

General

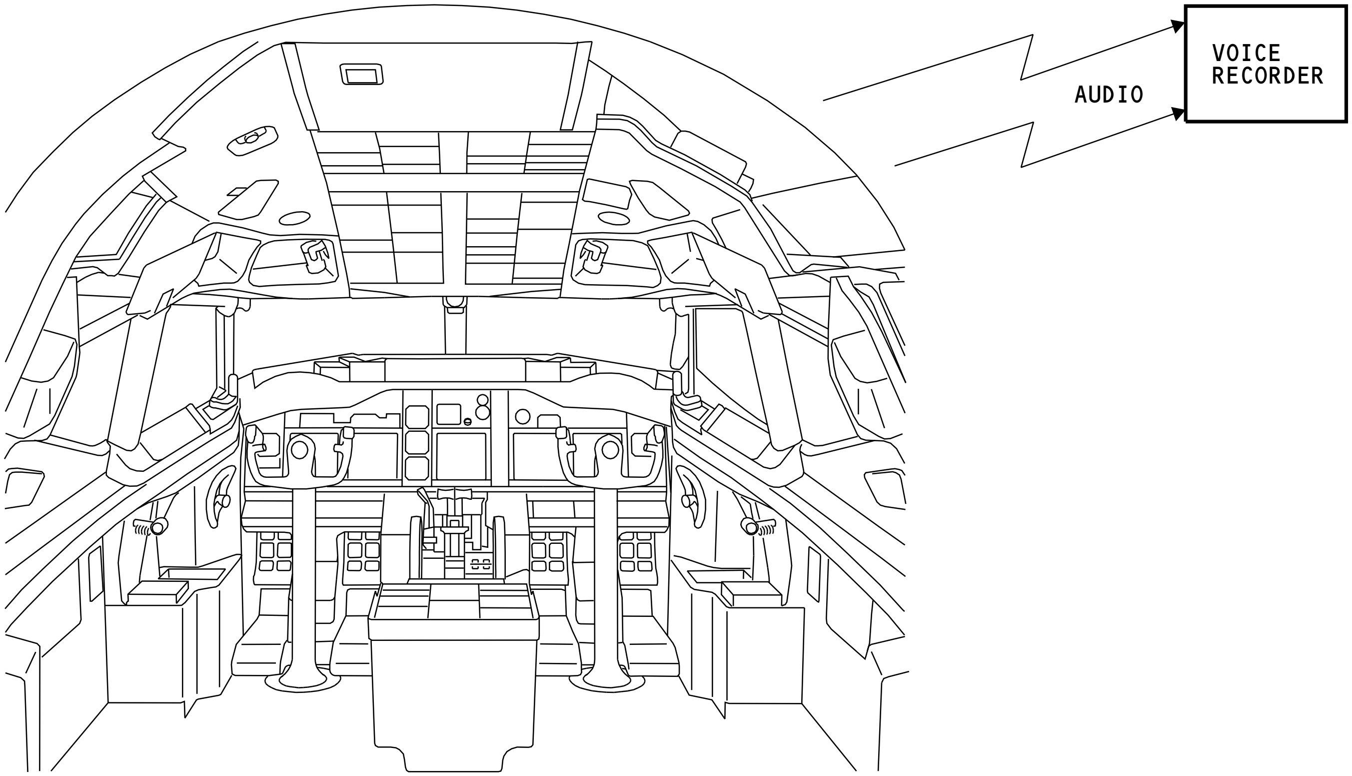
The voice recorder continuously records these:

- Flight crew communications
- Flight compartment sounds.

The voice recorder keeps the last 120 minutes of audio.

Abbreviations and Acronyms

- ACP - audio control panel
- A/D - analog-to-digital
- ARINC - aeronautical radio incorporated
- BITE - built in test equipment
- capt - captain
- CSMU - crash survivable memory unit
- D/A - digital-to-analog
- F/O - first officer
- F/OBS - first observer
- Hz - hertz
- mic - microphone
- REU - remote electronics unit
- ULB - underwater locator beacon
- V AC - volts alternating current
- V DC - volts direct current
- VR - voice recorder
- xfr - transfer



M80999 S0004624687_V1

VOICE RECORDER SYSTEM - INTRODUCTION

VOICE RECORDER SYSTEM - GENERAL DESCRIPTION

General

The voice recorder unit makes a continuous record of flight crew communication and flight compartment sounds. It erases the communication data automatically so that the memory stores only recent audio.

The voice recorder unit keeps the last 120 minutes of communication data in memory.

The voice recorder unit receives audio from the remote electronics unit (REU) and the area microphone. The area microphone is in the cockpit voice recorder panel.

The voice recorder unit receives time from the clock system for reference.

Components

The voice recorder system has these components:

- Cockpit voice recorder panel
- Voice recorder unit.

Functional Description

The voice recorder unit collects these audio at the same time:

- Captain microphone and headphone
- First officer (F/O) microphone and headphone
- First observer (F/OBS) microphone and headphone
- Area microphone on the cockpit voice recorder panel.

The voice recorder unit also receives time from the clock system.

The inputs from the captain, first officer, and first observer microphones go to the REU. The REU mixes each station microphone audio with that station headphone audio. The REU then increases the audio signal and sends it to the voice recorder.

The area microphone collects flight compartment sounds, such as voices and aural warnings. The cockpit voice recorder panel increases the audio signal from the area microphone and sends it to the voice recorder unit.

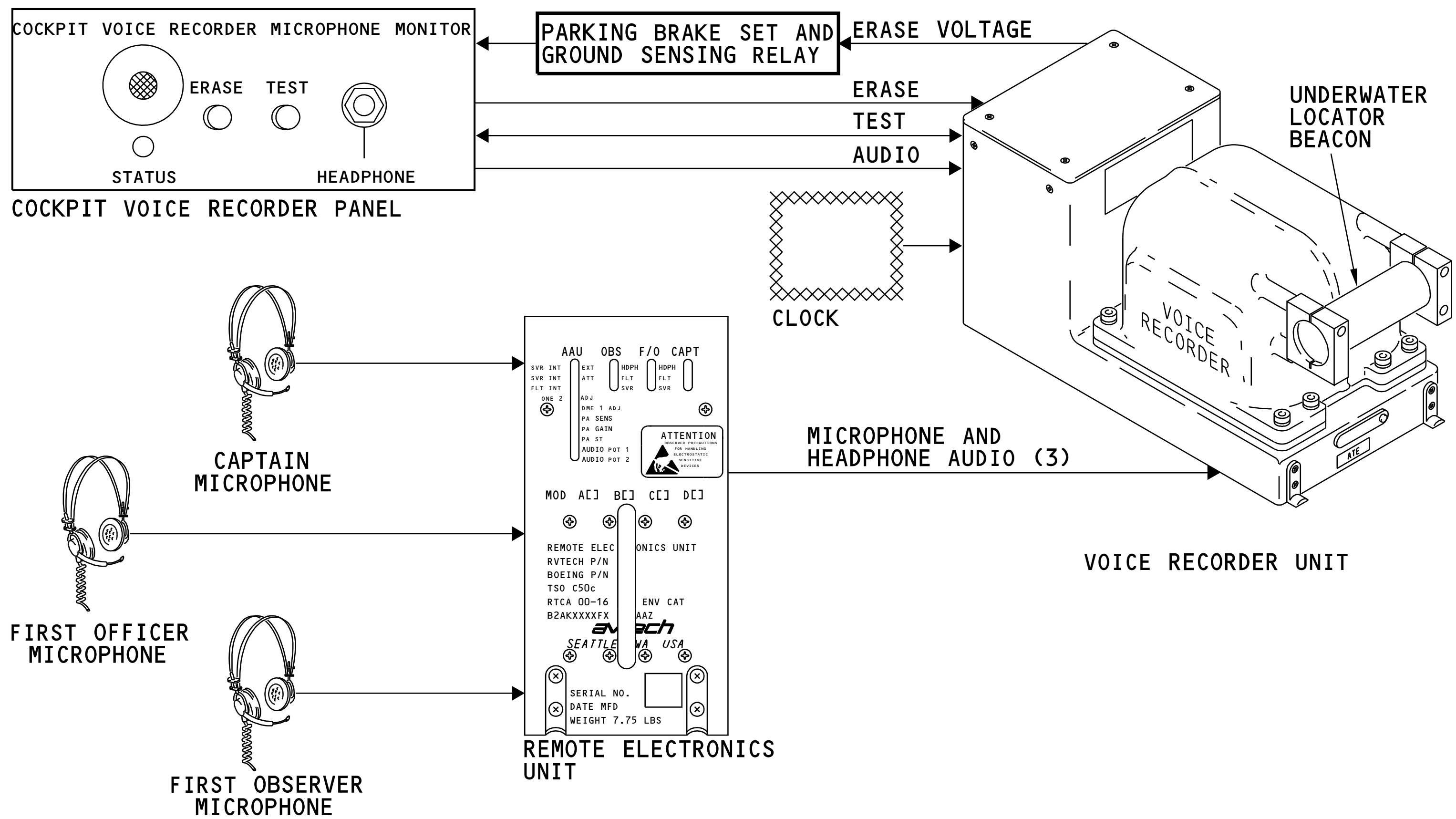
You can monitor the voice recorder recorded audio if you connect a headphone to the phone jack at the cockpit voice recorder panel.

An erase switch on the voice recorder control panel removes all the audio that the voice recorder keeps. You can only erase data when the airplane is on the ground and the parking brake is set.

A test switch on the cockpit voice recorder panel starts a test of the voice recorder system. A status indicator LED on the cockpit voice recorder panel shows the results of the test.

An underwater locator beacon is on the front panel of the voice recorder unit.

The CVR records the datalink messages from the ACARS system. The CSMU keeps the datalink messages that it receives from the ACARS system.



M81008 S0004624689_V1

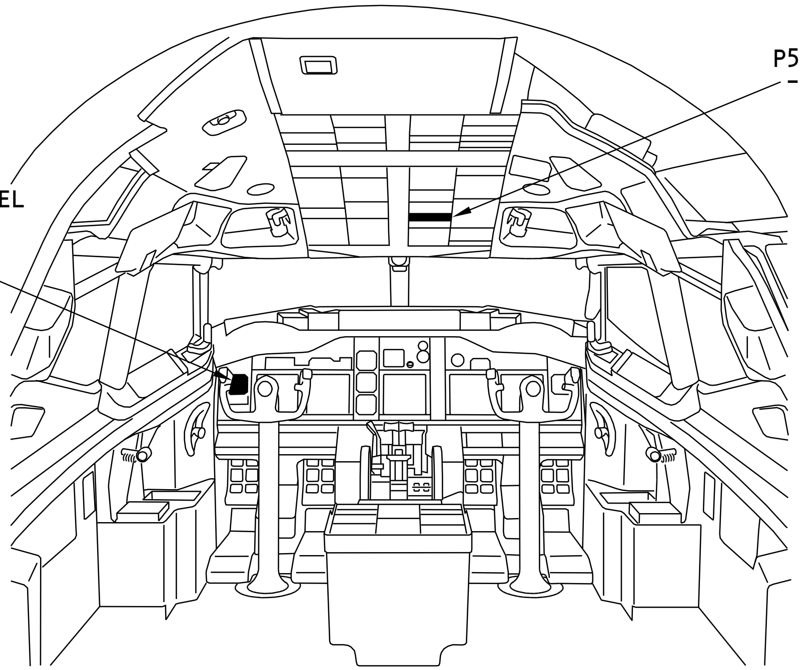
VOICE RECORDER SYSTEM - GENERAL DESCRIPTION

VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

General

The cockpit voice recorder panel is on the P5 forward overhead panel.

The captain clock is on the P1 captain instrument panel.



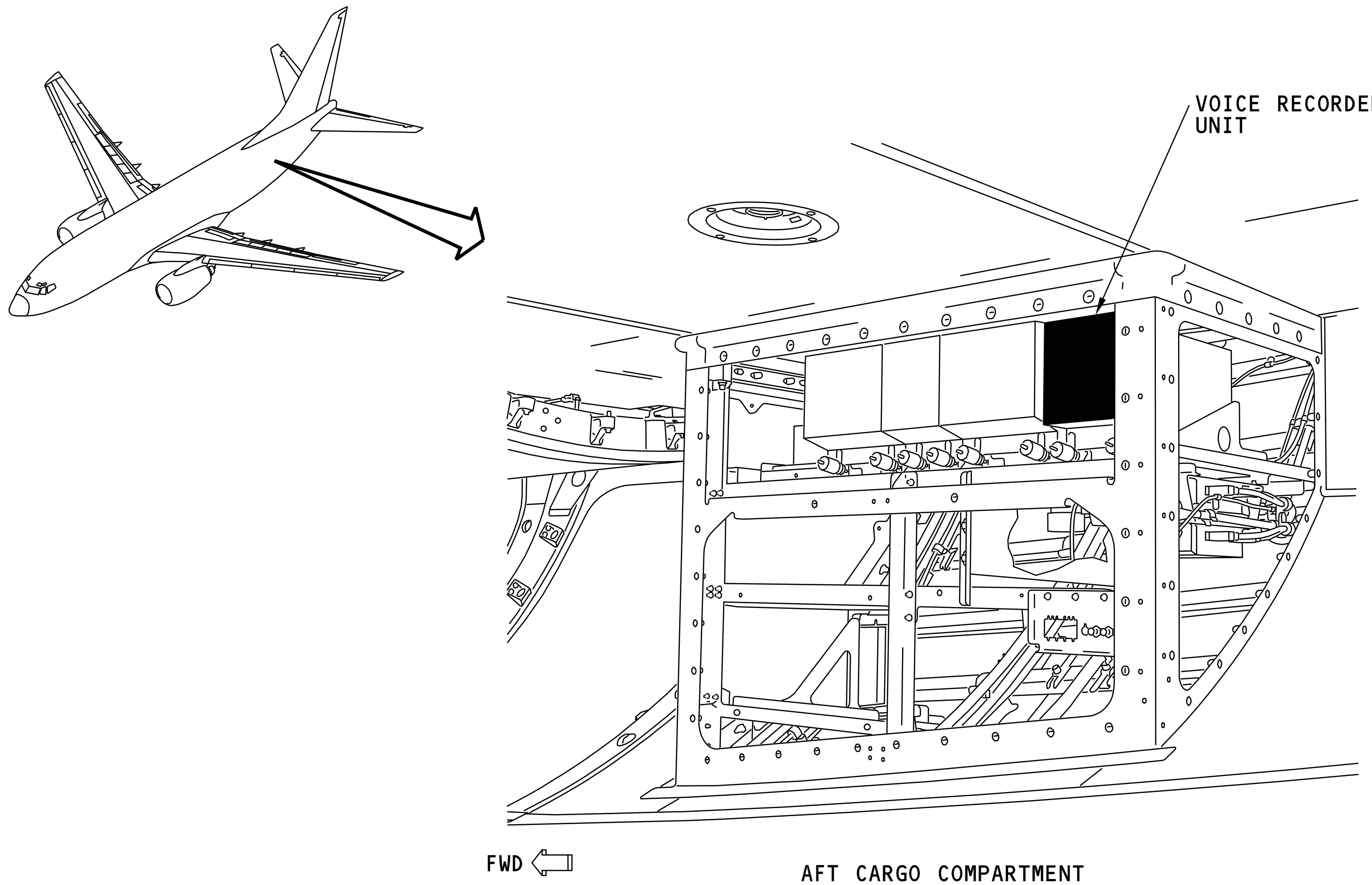
M81014 S0004624704_V1

VOICE RECORDER SYSTEM - FLIGHT COMPARTMENT COMPONENT LOCATION

VOICE RECORDER SYSTEM - RECORDER LOCATION

General

The voice recorder unit is in the aft cargo compartment on the E6 rack.



M81019 S0004624710_V1

VOICE RECORDER SYSTEM - RECORDER LOCATION

VOICE RECORDER SYSTEM - INTERFACE

Power

The voice recorder unit gets 115v ac from the voice recorder circuit breaker. The voice recorder unit supplies 18v dc to the audio amplifier in the cockpit voice recorder panel.

Cockpit Voice Recorder Panel

The cockpit voice recorder panel sends these signals:

- Erase discrete to the voice recorder (if applicable)
- Test discrete to the voice recorder
- Area audio to the channel 4 input of the voice recorder.

PSEU

The proximity switch electronics unit (PSEU) gets 30v dc from the voice recorder unit. A park and ground relay in the PSEU closes when the parking brake is set and the airplane is on the ground. When it closes, the relay sends 30v dc to the erase switch on the cockpit voice recorder panel.

Remote Electronics Unit

The remote electronics unit (REU) sends these signals to the voice recorder unit:

- Observer audio
- First officer (F/O) audio
- Captain audio.

Clock

Clock data from the captain clock goes to the voice recorder on an ARINC 429 data bus.

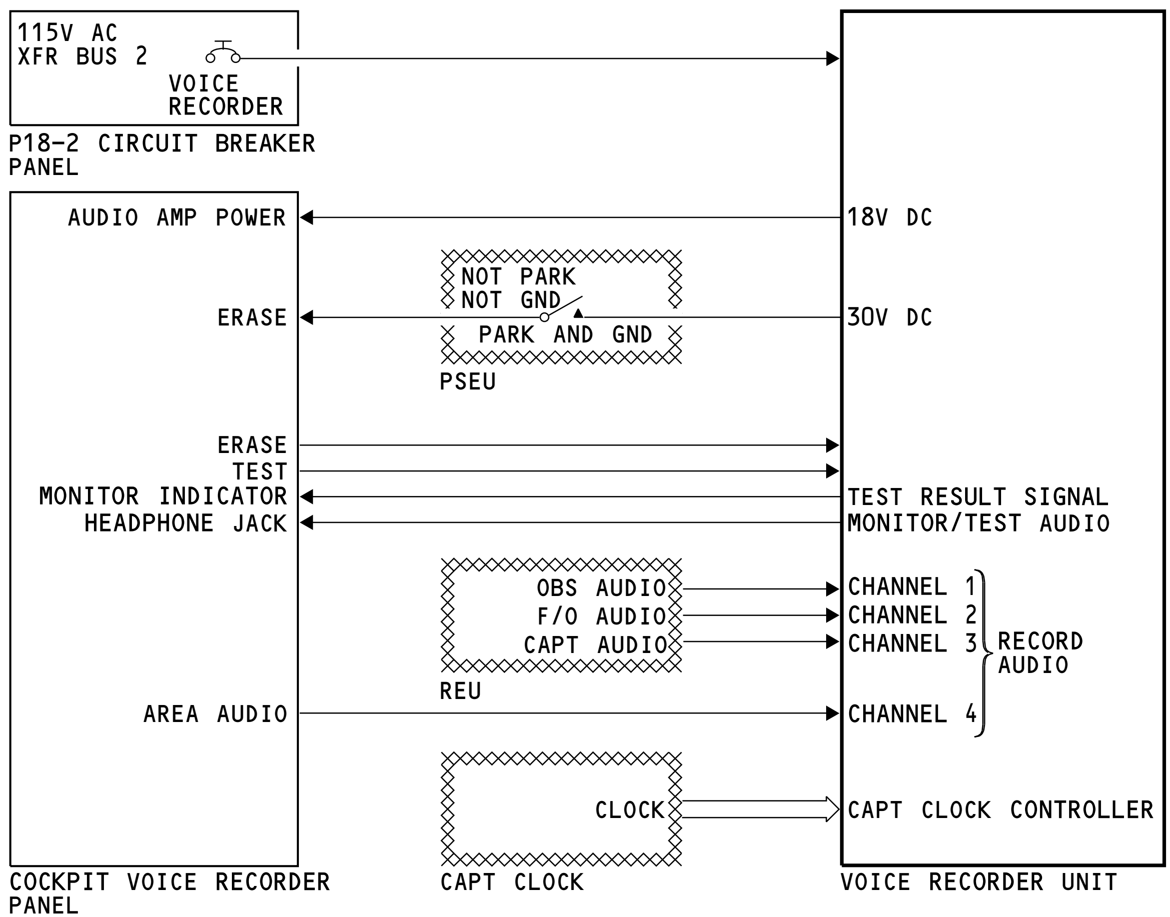
Voice Recorder Unit

The voice recorder unit sends 30v dc to the park and squat ground sensing relay. It also sends these signals to the cockpit voice recorder panel:

- Test indication to the monitor indicator
- Monitor/test audio to the headphone jack.

Datalink Recording Activation

The datalink activation occurs when the CMU connects to the CVR by ARINC 429 data buses. This lets the CVR record the datalink messages from the CMU.



M81020 S0004624715_V1

VOICE RECORDER SYSTEM - INTERFACE

VOICE RECORDER SYSTEM - VOICE RECORDER UNIT

Purpose

The voice recorder unit continuously records these:

- Time
- Flight crew communications
- Flight compartment sounds.

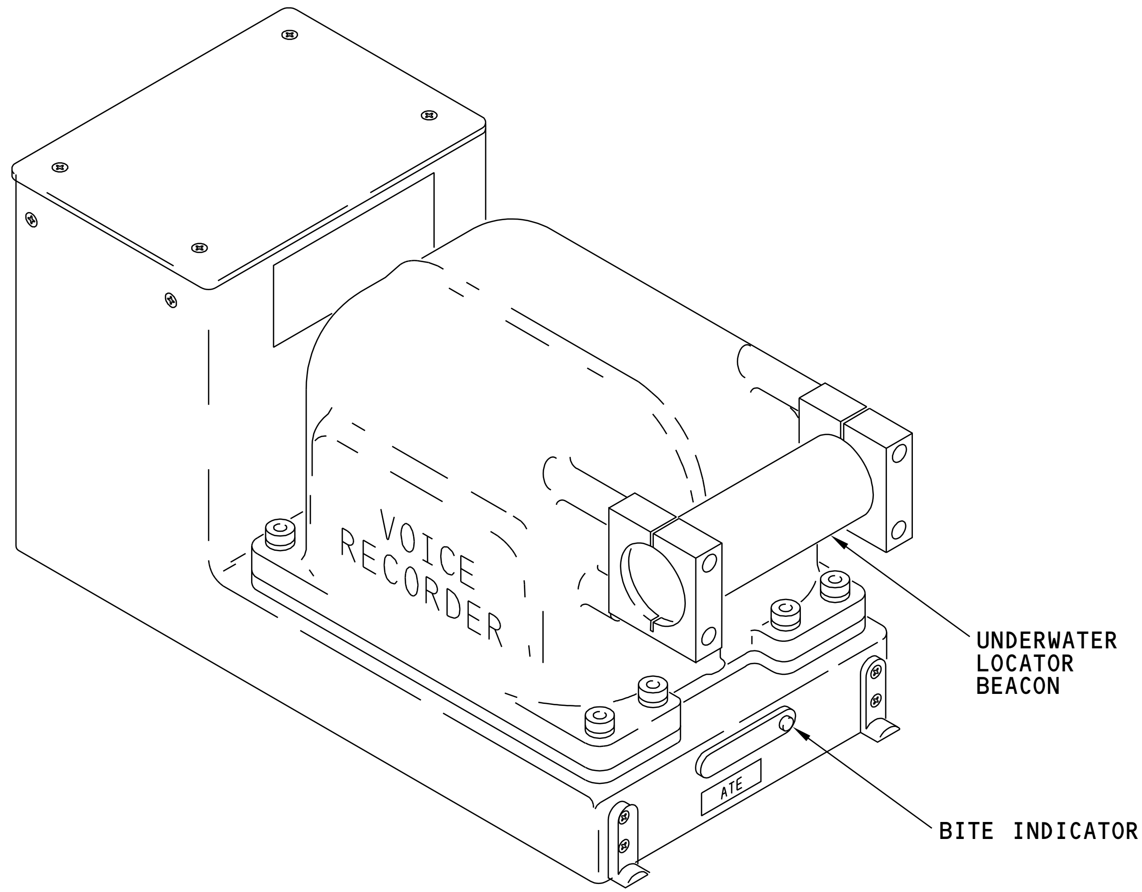
Physical Description

The container for the voice recorder unit has these properties:

- Watertight
- Shock resistant
- Heat resistant.

The voice recorder unit has an underwater locator beacon (ULB) on the front panel. The ULB helps find the voice recorder unit in water.

The voice recorder unit has a BITE indicator on the front panel. This indicator comes on when there is a voice recorder unit fault.



M81025 S0004624719_V1

VOICE RECORDER SYSTEM - VOICE RECORDER UNIT

VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION

Purpose

You can do these functions at the cockpit voice recorder panel:

- Monitor the recorded audio
- Erase the recorded audio (if installed)
- Test the voice recorder system.

Features

The cockpit voice recorder panel has these controls and indicators:

- Status indicator
- Erase switch
- Test switch
- Headphone jack.

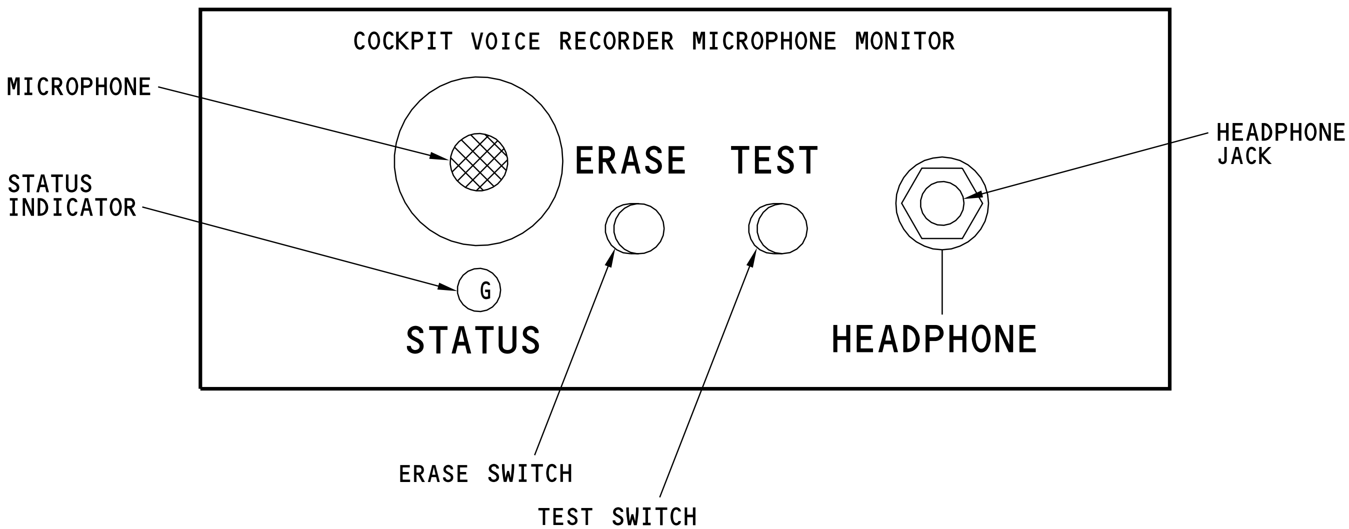
The status indicator shows the test results.

You can erase the audio with the ERASE switch if the airplane is on the ground and the parking brake is set.

The TEST switch starts a BITE test.

You can monitor the four audio channels at the headset jack.

An area microphone sends flight compartment sounds to the voice recorder.



M81031 S0004624724_V1

VOICE RECORDER SYSTEM - COCKPIT VOICE RECORDER PANEL OPERATION

VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON

Purpose

The underwater locating device (ULD) is an ultrasonic beacon. It makes the cockpit voice recorder (CVR) easier to find if it is under water.

Physical Description

The ULD is a line replaceable unit that is 1.3 inches (3.3 cm) in diameter and 4 inches (10.2 cm) long. It weighs less than 12 ounces (0.34 kg).

Functional Description

The ULD has these operation characteristics:

- Operates when it is put into water
- Operates to a maximum depth of 20,000 feet (6096 meters)
- Has a detection range of 7,000 (2134 meters) to 12,000 feet (3658 meters)

AKS 001-022

- Can operate under water for a minimum of 30 days

AKS 023-999

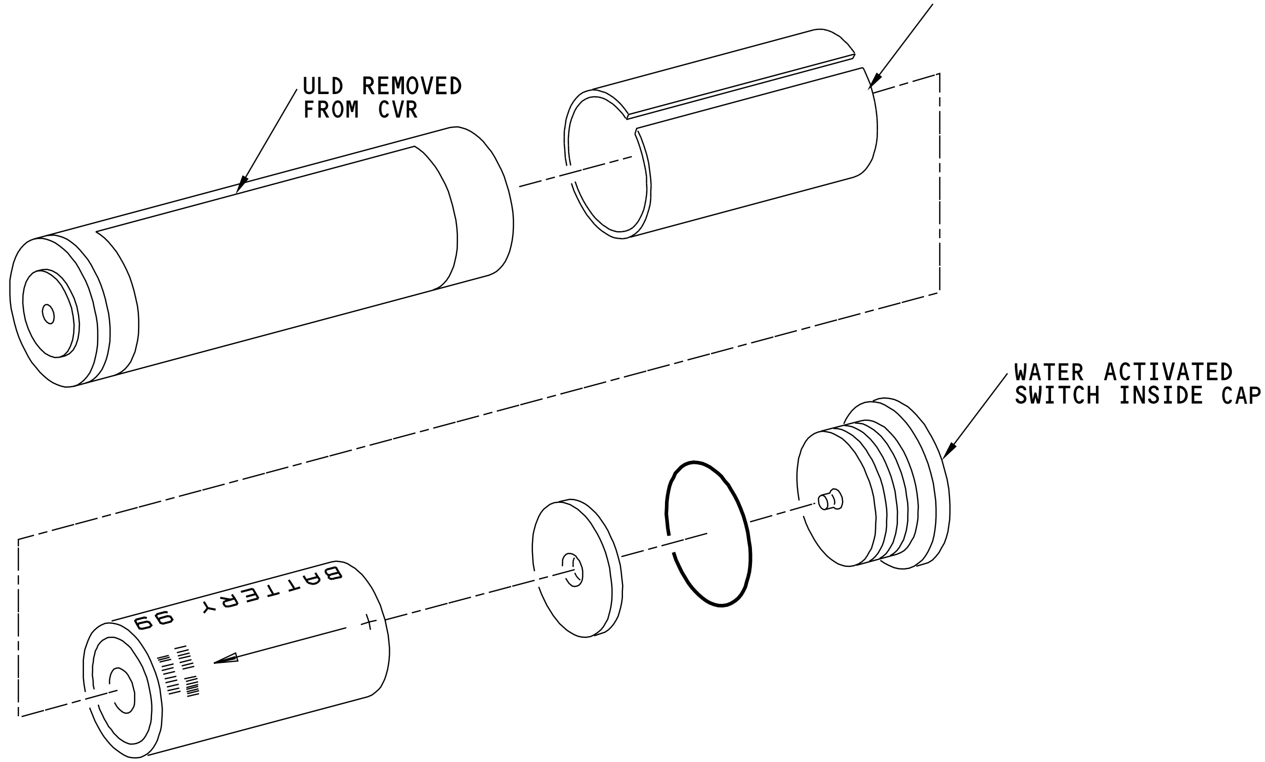
- Can operate under water for a minimum of 90 days

AKS ALL

- Sends out an acoustic pulse tone of 37.5 khz at a rate of one pulse-per-second.

Training Information Point

You replace the underwater locator beacon or the battery on or before the date shown on the replacement label.



M81032 S0004624729_V1

VOICE RECORDER SYSTEM - UNDERWATER LOCATOR BEACON

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VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

General

The voice recorder system receives flight compartment sounds and flight crew communications. It keeps this audio in a solid state memory. The voice recorder system has these modes of operation:

- Normal
- Test
- Erase.

Normal Operation

The voice recorder operates continuously when the airplane has power and the voice recorder circuit breaker is closed.

Four audio channels go to the voice recorder. The remote electronics unit gives audio to channels 1, 2, and 3. Each channel gets audio from one person in the flight crew. The audio on each channel is the sum of these signals:

- Hot mic audio (microphone audio without push-to-talk)
- Received audio that crew members select on an audio control panel (ACP)
- Sidetone audio to the crew member.

Channel 4 audio is from the area microphone on the cockpit voice recorder panel. The area microphone sends flight compartment audio to the voice recorder unit. The preamplifier in the cockpit voice recorder panel gets 18v dc from the voice recorder unit. The preamplifier increases the strength of the channel four audio.

All the audio that the voice recorder unit receives goes to the voice recorder controller. The controller has these functions:

- Changes the audio signals to digital
- Changes the digital signals to audio
- Controls the audio record process
- Controls the self test.

The analog-to-digital (A/D) circuits change the four input audio signals to digital data. The processor sends the digital data to the crash survivable memory unit (CSMU). The CSMU records the digital data.

The processor sends a memory address to the CSMU on the address bus. The memory address tells the CSMU where to keep the digital audio data.

The processor mixes the four digital data words from the A/D circuits. The mixed signal goes to the digital to analog (D/A) circuits. The D/A circuits change the digital data to audio. The mixed audio goes to the headphone jack on the cockpit voice recorder panel.

Test

Push and hold the TEST switch on the cockpit voice recorder panel to start the voice recorder self test. Hold the switch for at least 1/2 second. The cockpit voice recorder panel sends a test signal to the processor in the voice recorder.

The processor starts a tone generator that sends an 800 Hz tone to the A/D circuits. The tone goes to each of the four audio inputs. The A/D circuits change the tone to digital test data.

The processor lets the CSMU keep the digital test data for each channel. Next, the processor gets the digital test data from the CSMU and mixes it. The D/A circuits change the mixed digital test data to an audio signal. This mixed audio tone goes to the headphone jack on the control panel. The processor also sends a signal to turn on the status indicator.

When the processor gets test data it sends a signal to turn on the status indicator. The status indicator comes on with no faults.

During the test, the processor monitors test data for faults. When the processor finds a fault, it stops the signal to the status indicator and stops the audio tone.

The status indicator comes on momentarily with no faults. At the same time you hear the 800 Hz tone at the headphone jack.

A BITE indicator on the voice recorder comes on with a faulty voice recorder unit.

VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

Erase

You erase the memory of the voice recorder unit with these conditions:

- Airplane is on the ground
- Parking brake is set
- Push and hold the ERASE switch for one half second.

You push the ERASE switch to send an erase signal to the processor on the voice recorder. The processor disables the A/D and the D/A circuits. The circuits send an erase signal to the CSMU. The CSMU erases all the audio data in the memory.

While in erase, you hear a 400 Hz tone at the headphone jacks. You hear this tone for five seconds.

Clock Input

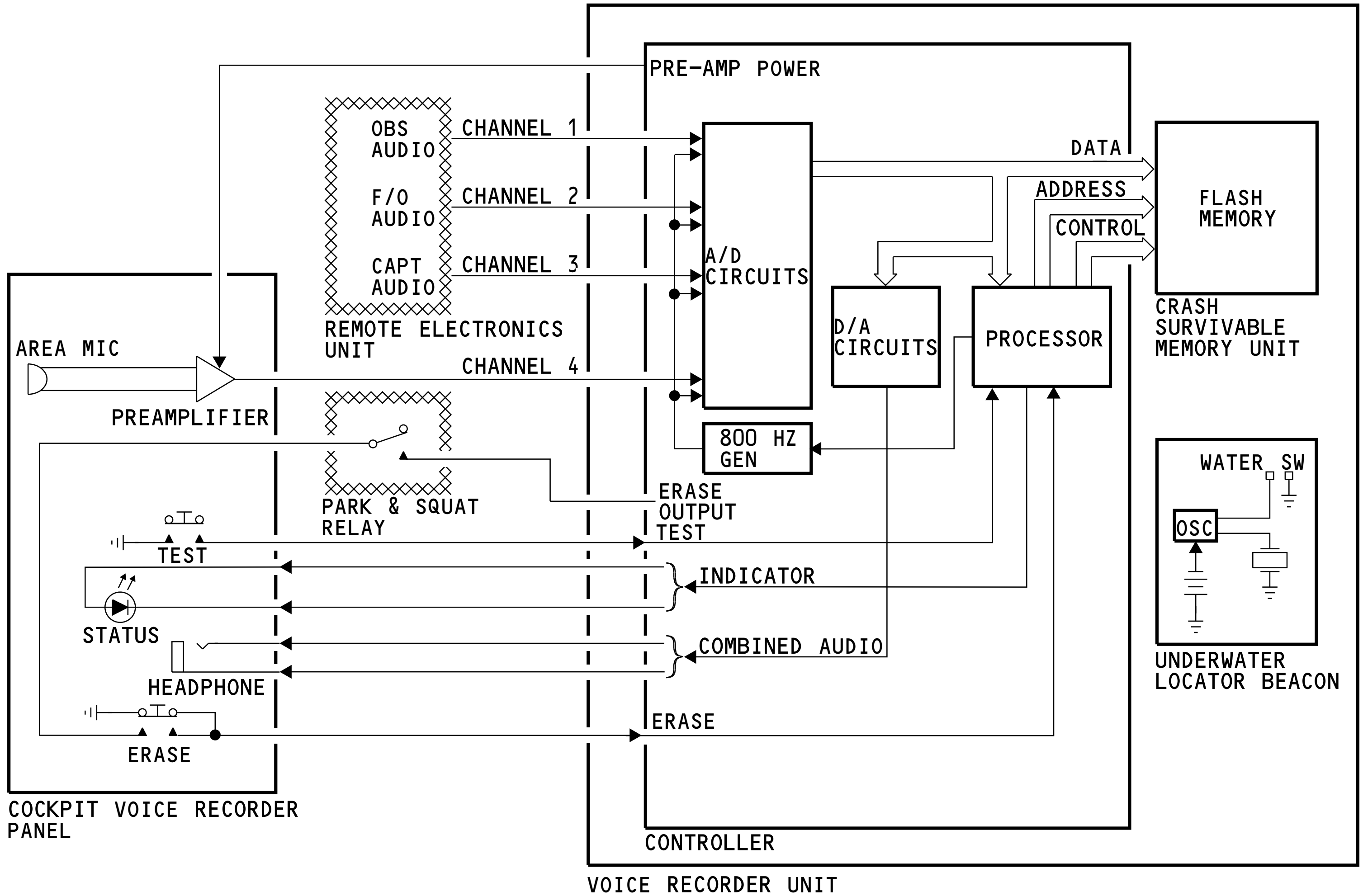
The captain clock data comes into the voice recorder on an ARINC 429 bus. This puts the time data into memory. The clock input gives a time relation between the voice recorder and the flight data recorder.

Underwater Locator Beacon Functions

The underwater locator beacon (ULB) sends a sound signal when in the water. It uses a battery for power. The battery sends power to the oscillator that operates at 37.5 Khz. The transducer changes an electrical signal to a sound signal and transmits the signal once per second.

Datalink Recording Activation

The CMU sends the CVR datalink messages. The CVR records the datalink messages and keeps the datalink messages in its CSMU.



M81037 S0004624732_V1

VOICE RECORDER SYSTEM - FUNCTIONAL DESCRIPTION

VOICE RECORDER SYSTEM - TRAINING INFORMATION POINT - MAINTENANCE

General

The cockpit voice recorder system has an internal BITE circuit that lets you monitor and do a test of system operation.

A TEST switch on the control panel lets you manually start the system test.

BITE Operation

The recorder does an automatic test at power up. It also does continuous monitoring while in normal operation. When a failure happens, the BITE stores the failure in memory and turns on the BITE indicator.

You use BITE to do a test of all the recorder circuitry. When you push the control panel TEST switch, BITE makes a test tone. The recorder stores this test tone on each channel. BITE then monitors the stored tone to make sure it has the correct frequency and amplitude.

Operational Test

When the voice recorder has power, you can start the test.

You hear a tone on the headphone jack and the green status indicator comes on for a short time.

The voice recorder BITE indicator stays off.

These are the results if the test fails:

- Green status indicator stays off
- Voice recorder BITE indicator comes on
- No tone on the headphone jack.

System Test

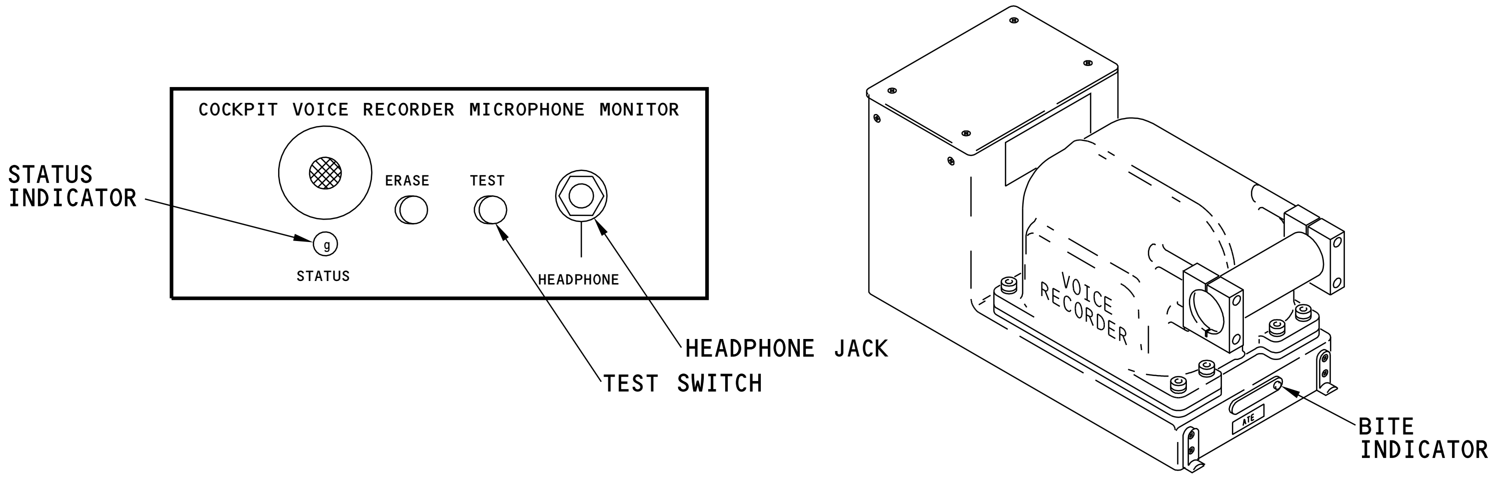
The system test does not do a check of the audio circuits to the voice recorder. To do a test of these circuits, you must make a test recording.

Do these steps to do a test of the captain, first officer, and first observer input channels:

- Disconnect all microphones and cover the area microphone
- Connect a headset to the control panel HEADPHONE jack
- Connect a microphone into a station that you want to monitor
- Speak into microphone and monitor the recorded audio from the HEADPHONE jack.

Do these steps to do a test of the area microphone input:

- Disconnect the microphones for the captain, first officer, and first observer input channels
- Connect a headset to the control panel HEADPHONE jack
- Speak into the area microphone and monitor the recorded audio from the HEADPHONE jack.



TEST		RESULTS
POWER UP AND CONTINUOUS MONITORING	PASS	NO INDICATION, NORMAL AUDIO
	FAIL	STATUS INDICATOR OFF, BITE INDICATOR ON
SYSTEM TEST	PASS	STATUS INDICATOR COMES ON ONCE, 800 HZ TONE ON HEADPHONE
	FAIL	NO INDICATION, NO TONE
OPERATIONAL TESTS FOR EACH CHANNEL		CHANNEL AUDIO

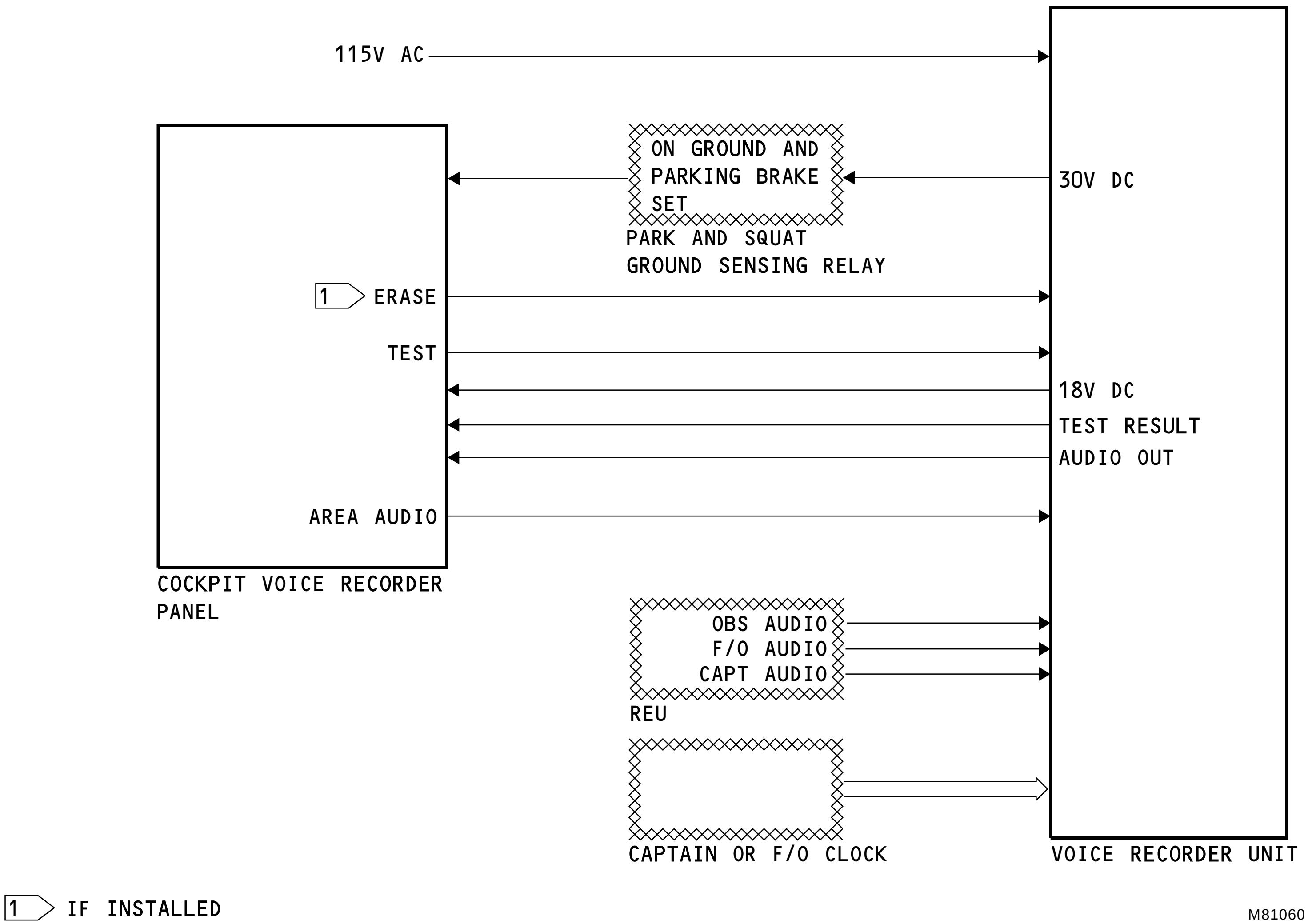
M81051 S0004624751_V1

VOICE RECORDER SYSTEM - TRAINING INFORMATION POINT - MAINTENANCE

VOICE RECORDER SYSTEM - SUMMARY

General

This graphic is for reference purposes.



M81060 S0004624767_V2

VOICE RECORDER SYSTEM - SUMMARY

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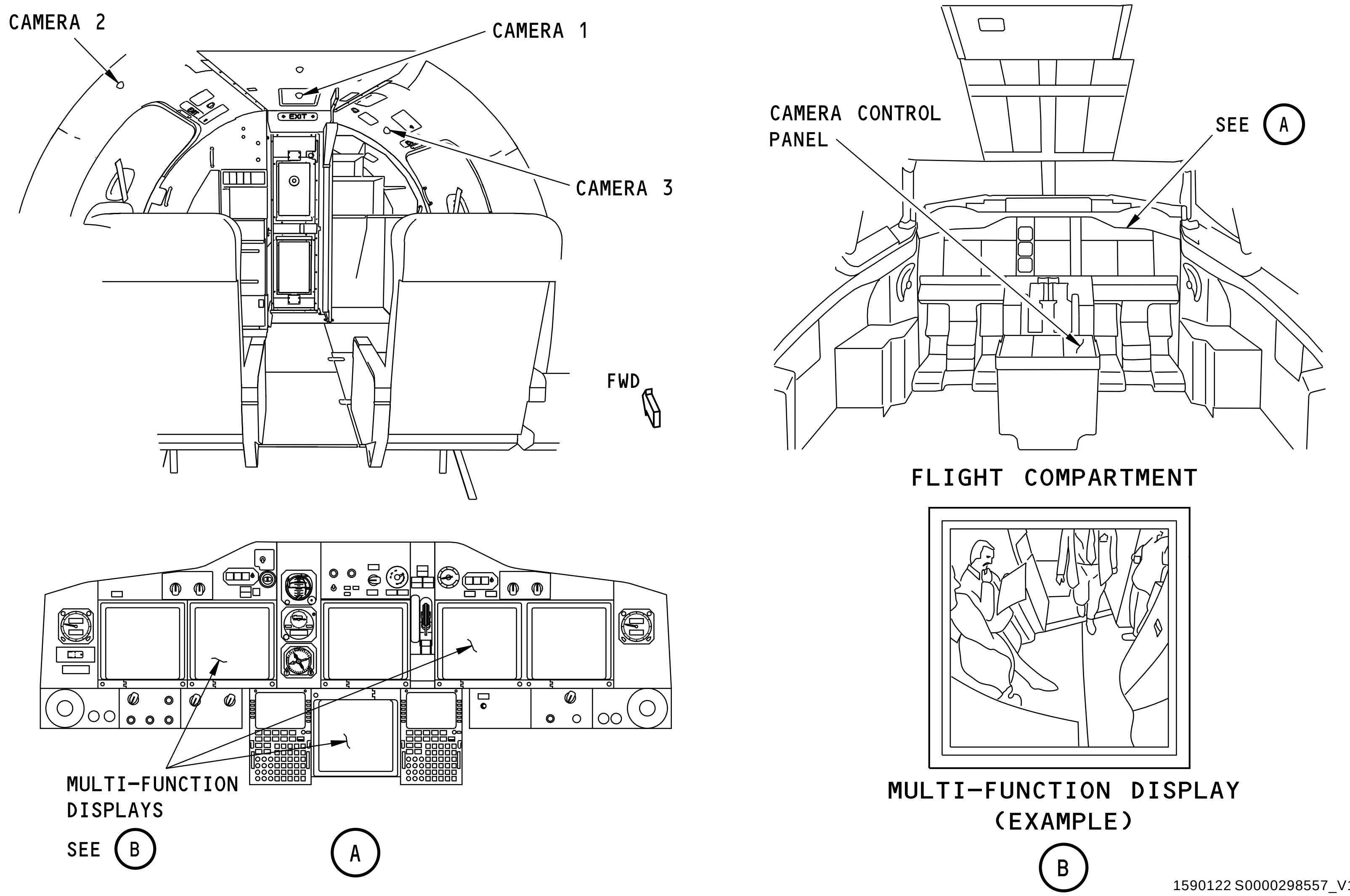
FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTRODUCTION

General

The Flight Deck Entry Video Surveillance System (FDEVSS) is a video system that gives the flight crew surveillance capability of the flight deck entry door, airplane door 1-left, and door 1-right.

Abbreviations and Acronyms

- CCU - camera control unit
- CDS - common display system
- CCP - camera control panel
- DSPL - display (command)
- FDEVSS - flight deck entry video surveillance system
- IR - infra-red
- MFD - multi-function display
- VS - video switch



INTRODUCTION

FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - GENERAL DESCRIPTION

General

The Flight Deck Entry Video Surveillance System (FDEVSS) is a video system that provides video surveillance of the cockpit door and surrounding area. This lets the flight crew, before they allow entry, see the person who wants access to the flight compartment.

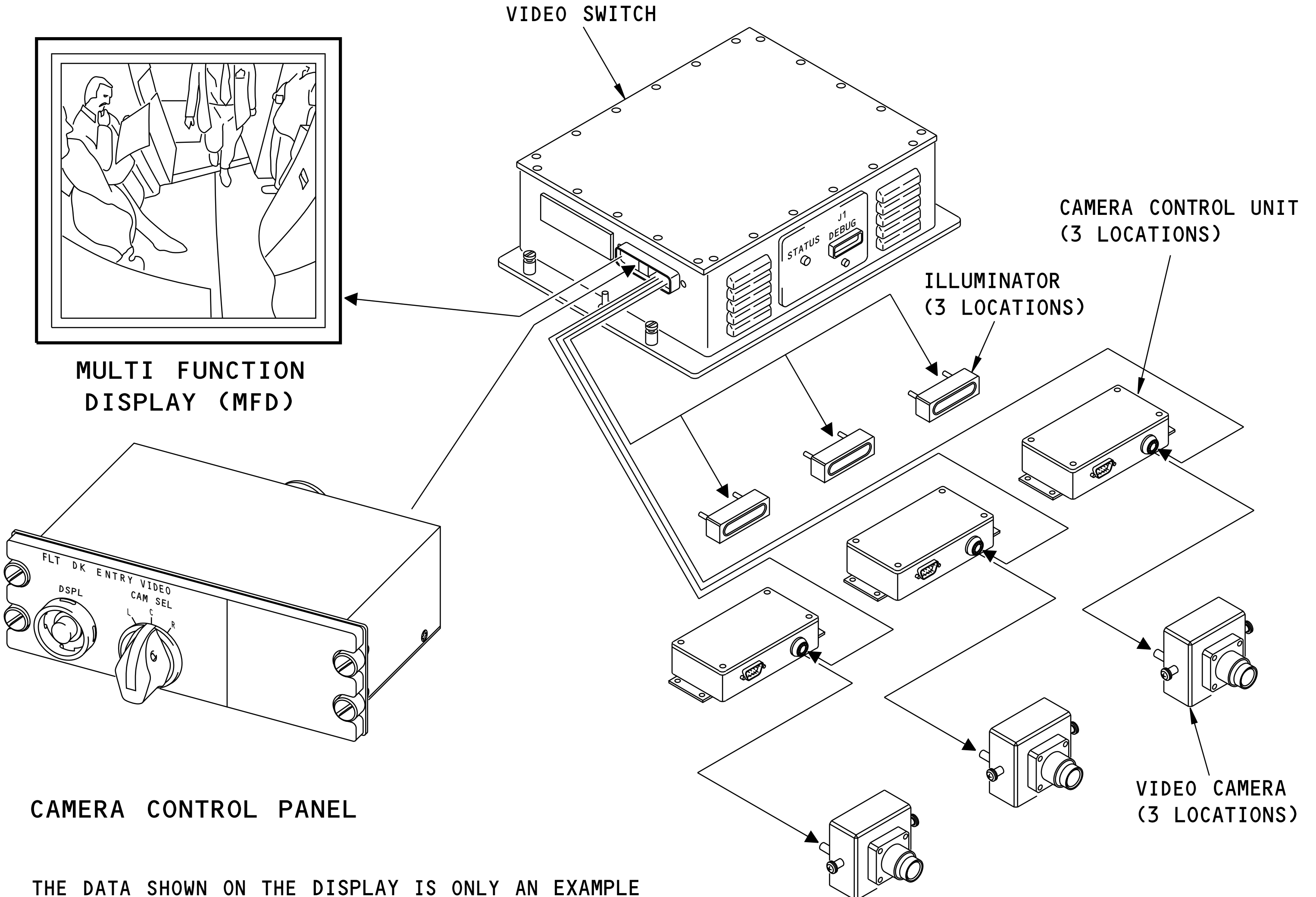
Components

The FDEVSS consists of the following components:

- Camera control panel (CP), M3000
- Video Switch (VS), M3001
- Three monochrome cameras, M3002, M3026, and M3004
- Three camera control units (CCU), M3005, M3030, and M3009.
- Three infrared (IR) illuminators, M3006, M3031, and M3010.

The FDEVSS video can show on the lower-center multi-function display (MFD), N190. This component is part of the common display system (CDS).

NOTE: Only the lower-center MFD can show flight deck entry video. The inboard-left, and inboard right MFDs are connected to FDEVSS. However, to show video successfully, the optional video-capable MFDs are required.



NOTE: THE DATA SHOWN ON THE DISPLAY IS ONLY AN EXAMPLE

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GENERAL DESCRIPTION

FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - COMPONENT LOCATIONS

General

The Flight Deck Entry Video Surveillance System (FDEVSS) has components in the flight compartment and in the passenger cabin area.

Flight Compartment

In the flight compartment, the camera Control Panel (CP) is installed aft of the throttles, on the P8 aisle stand,

The output of the FDEVSS transmits video to the common display system (CDS). The CDS shows video on the center-lower multi-function display (MFD).

Passenger Cabin

In the passenger cabin, the video switch (VS), M3001, is installed in a frame above the ceiling panel at STA 344, BL 0, WL 250.

Three video cameras are mounted to monitor activity around the flight deck entry door. Each camera position has one camera, one camera control unit (CCU), and one infra-red illuminator (IR) installed.

The components at position 1 are installed on the backside of the ceiling panel. The components are as follows:

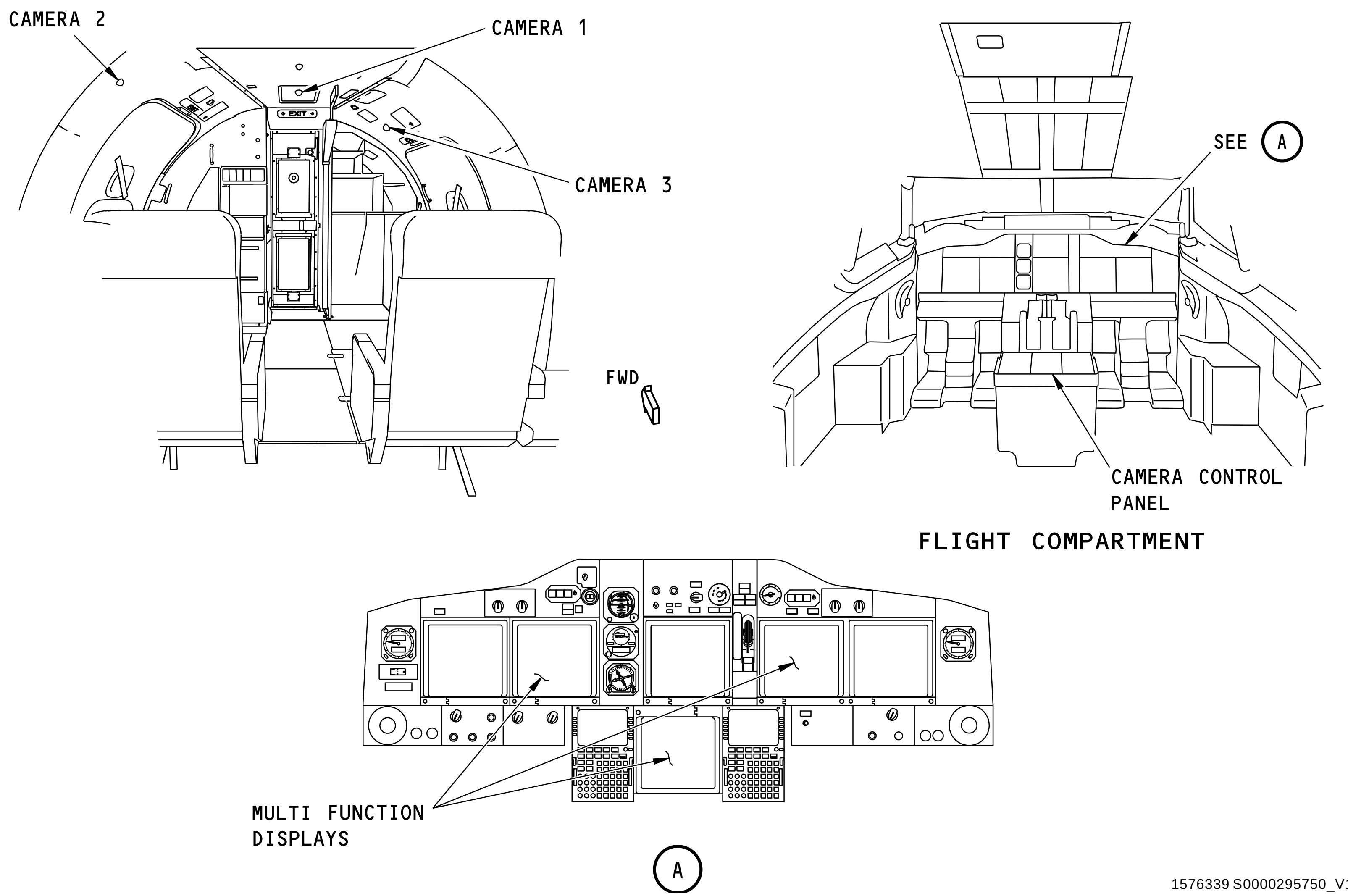
- Camera 1, M3002, is installed at STA 285, BL 0.
- CCU 1, M3005, at STA 285, BL 0.
- Illuminator (IR) 1, M3006, at STA 285, BL 0.

The camera at position 2 is installed on the appearance-side of the ceiling panel. The other components are installed on the far-side of the ceiling panel. These are the components:

- Camera 2, M3026, is installed at STA 340, LBL 28.
- CCU 2, M3030, at STA 340, LBL 28.
- IR 2, M3031, at STA 340, LBL 28.

The camera at position 3 is installed on the appearance-side of the sidewall panel. The other components are installed on the far-side of the panel. These are the components:

- Camera 3, M3004, is installed at STA 300, RBL 17, It is mounted on the appearance-side of the forward entry ceiling assembly.
- CCU 3, M3009, at STA 300, RBL 23.
- IR 3, M3010, at STA 300, RBL 23.



FDEVSS COMPONENT LOCATIONS

FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INTERFACES

Video Switch (VS)

The video switch (VS) receives 115V ac (volts alternating current) from transfer bus 1. Power is controlled by the Surveillance Camera circuit breaker, C01641, on panel P6 -12 . The VS also supplies 28V dc (volts direct current) power to three camera control units, and three infrared illuminators. The video input, and output is analog.

The VS has these interfaces:

- Receptacle J1 - identified as Debug, used only for depot maintenance.
- Receptacle J2 - primary connection (80 pin) for all inputs and outputs.

Camera Control Unit

The video switch has video, and power interfaces to three camera control units (CCU). Each CCU has a transformer to supply reduced voltage to the cameras. The CCU also receives and processes the analog video signal from the camera, and supplies it to the VS.

Infrared Camera

Each CCU is supports one infrared camera. The 10 pin connector, permanently attached to the camera, has the functions that follow:

- Receives 9V dc for camera operation
- Transmits a continuous video output signal.

Illuminator

The video switch supplies 28V dc to three infrared illuminators.

Camera Control Panel

The camera Control Panel (CP) has one interface:

- Input Output (I/O) connector (J1).

The CP has a variable-brightness plastic light plate that requires 5V dc. Brightness is controlled by the aislestand panel lighting control. The CP has no other power requirement.

Multi-Function Display

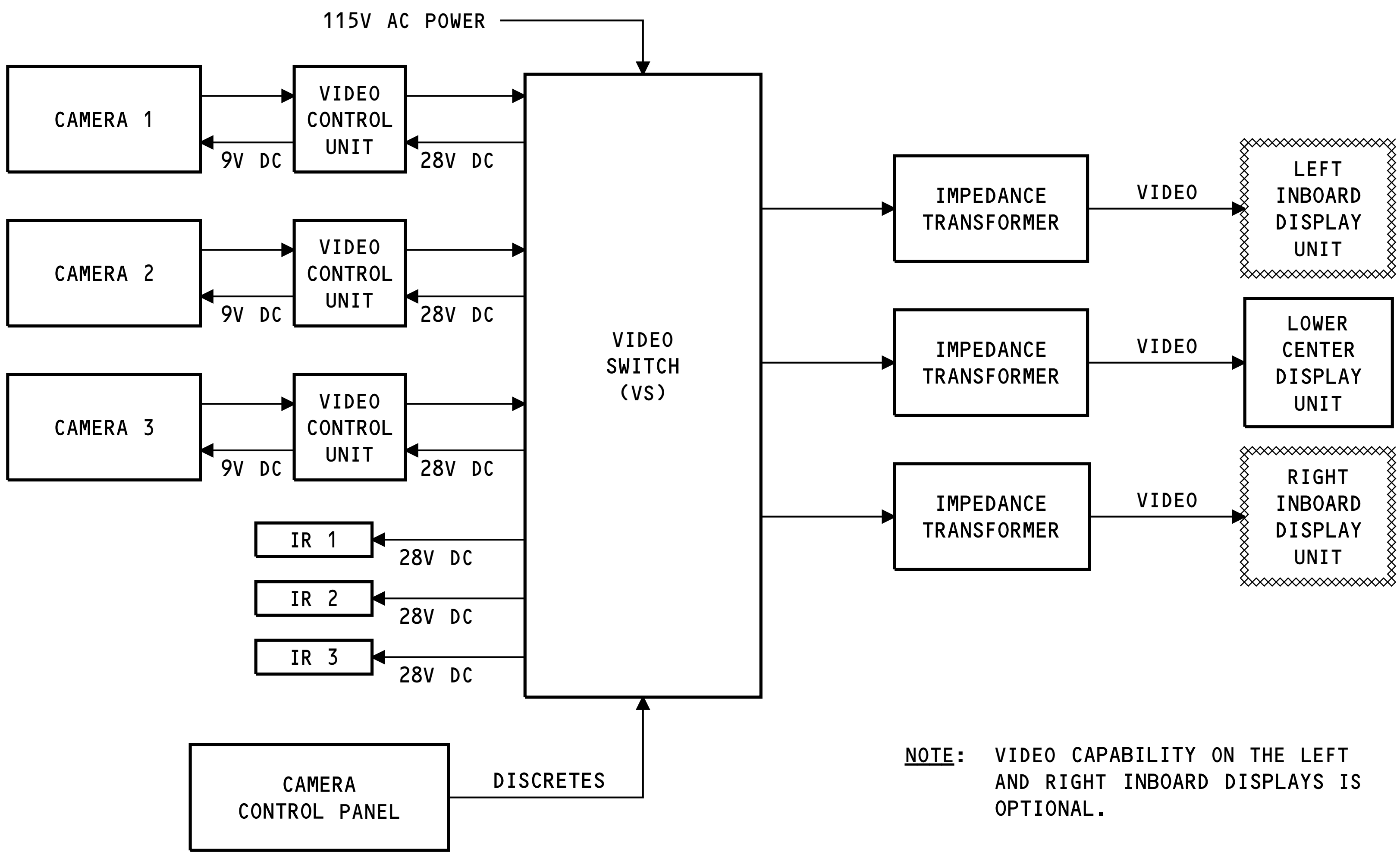
The Multi-Function Display (MFD) is a component of the common display system (CDS). When the CDS is set to show flight deck video, the applicable MFD receives and shows video from the video switch.

NOTE: Only the lower-center MFD can show flight deck entry video. The inboard left, and inboard right MFD units are connected to FDEVSS. However to show video successfully, the optional video-capable MFDs are required.

Automatic Load Shed System

The automatic load shed system for the galleys, and main busses supplies electrical power the flight deck entry video circuit breaker. This system must be ON for FDEVS to operate.

The switch for this system is the IFE/PASS SEAT switch on P5-13, the electrical meters, battery, an galley power module.



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FDEVSS INTERFACES

FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - INFRARED CAMERA

General

The infrared (IR) camera is a sealed component that senses the strength and position of IR light reflected by an object, and converts that to an analog signal. The cameras produce a monochrome (black and white) image in NTSC format. The camera is line-replaceable, and can not be modified, or repaired in the field.

The camera has physical characteristics as follows:

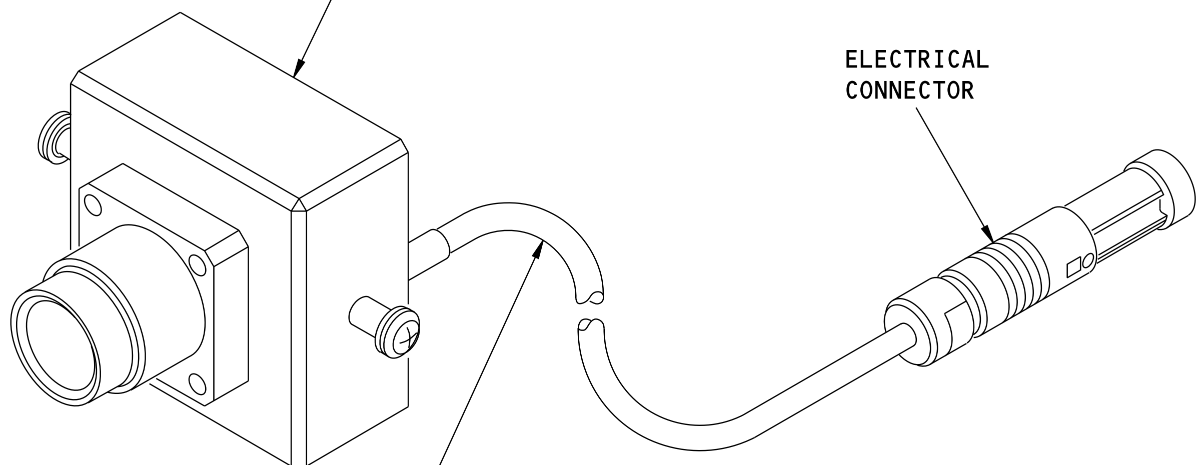
- Width - 1.2 in. (29.5 mm)
- Height - 1.2 in. (29.5 mm)
- Depth - 1 in. (26 mm), approximately
- Weight - 2 oz (52 g), approximately, including wires.

The camera has one lead with a single 10-pin connector. Power to the camera is supplied by the camera control unit (CCU). The camera and CCU are matched for impedance and voltage, and are set by the specified part numbers.

CAUTION: THE REPLACEMENT COMPONENTS MUST HAVE THE SAME PART NUMBERS AS THE COMPONENTS WHICH WERE REMOVED. INCORRECT COMPONENTS CAN CAUSE DAMAGE TO THE SYSTEM.

The features that follow are set by the camera manufacturer's part number.

- Lens aperture (size)
- Camera resolution (lines)
- Input voltage
- Impedance
- Lead length and material.



1345022 S0000239730_V1

INFRARED CAMERA

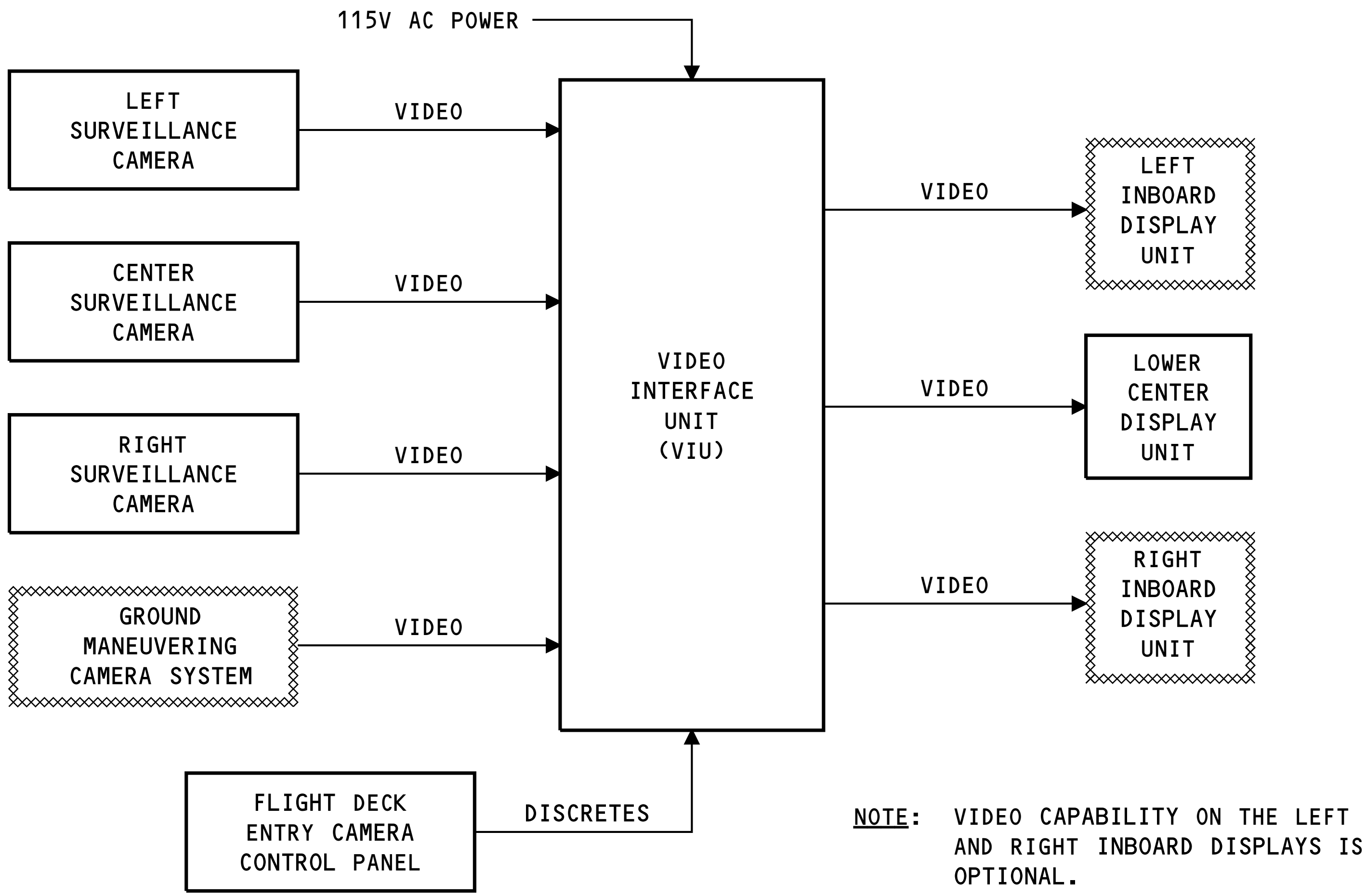
FLIGHT DECK ENTRY VIDEO SURVEILLANCE SYSTEM - FUNCTIONAL DESCRIPTION

General

The video switch (VS) receives video images from three analog cameras installed aft of the flight deck entry door. One of the three signals is sent to the common display system (CDS), and shows on the center-lower multi-function display (MFD).

The camera control panel (CP) selects which of the three signals is sent to the MFD. On the control panel (CP), the rotary switch is set to R (right), C (center),or L (left). The push-button marked display (DSPL) on the control (CP) sets the VS selection.

NOTE: The FDEVSS can show only the signal from a single camera at one time.



FDEVSS FUNCTIONAL DESCRIPTION

CAMERA CONTROL PANEL

General

The camera Control Panel (CP) sets the video switch (VS) to transmit one of three available camera signals (camera 1, 2, or 3) to the common display system (CDS). The CDS can show the flight deck entry video only on the display at the lower center position, on panel P9.

Physical Description

The face of the CP has one rotary knob, and one push-button. The rear of the unit has one multi-pin connector. The unit has four captive fasteners to attach the unit to the mounting rack.

The CP has these physical characteristics:

- Height - 1.9 in. (47.5 mm)
- Width - 6 in. (146 mm)
- Depth - 2.6 in. (65.9 mm)
- Weight -1.1 lb (0.5 kg), maximum.

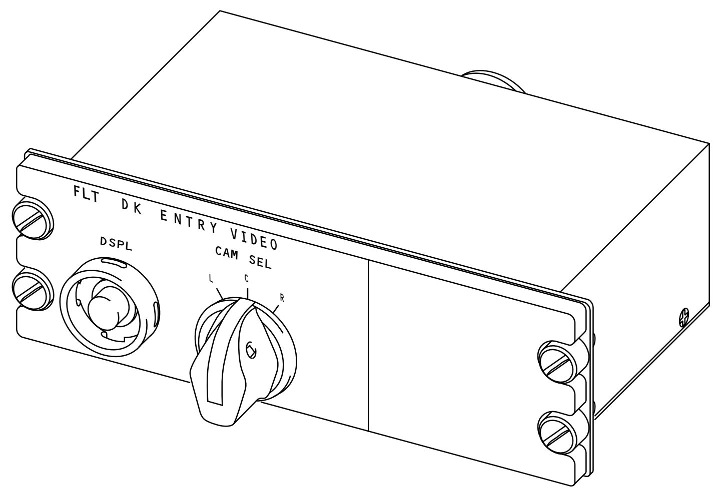
Functional Description

The CP has a three-position rotary switch to select the left, center, or right camera video signal. Adjacent to the rotary switch, a push button marked DSPL (DISPLAY) tells the VS to transmit the selected video signal to the multifunction display.

The relationship between the rotary switch position, image selection, and camera number (wiring diagram) is as follows:

SWITCH POSITION	IMAGE VIEW	CAMERA NUMBER
L	Door 1 Left	2
C	Flight Deck Door Entry	1
R	Door 1 Right	3

For illumination, the CP receives 5.0V ac (volts alternating current) from the pilot's control stand lighting circuit breaker, C1115.



FLIGHT DECK ENTRY VIDEO
CAMERA CONTROL PANEL

U72964 S0000215417_V1

CAMERA CONTROL PANEL

CAMERA CONTROL UNIT

General

The camera control unit (CCU) is an analog interface unit between the video switch, and infrared camera. One CCU is installed adjacent to each camera.

The CCU is line-replaceable, and can not be serviced in the field.

Physical Description

Each CCU has properties as follows:

- Length - 5.5 in. (139.7 mm)
- Width - 2.5 in. (64 mm)
- Height - 1.6 in. (41.6 mm)
- Weight -7.8 oz (220 g) maximum.

The housing is aluminum, with an attachment flange on each side. There is a tamper-proof label on the cover.

There are two electrical connectors as follows:

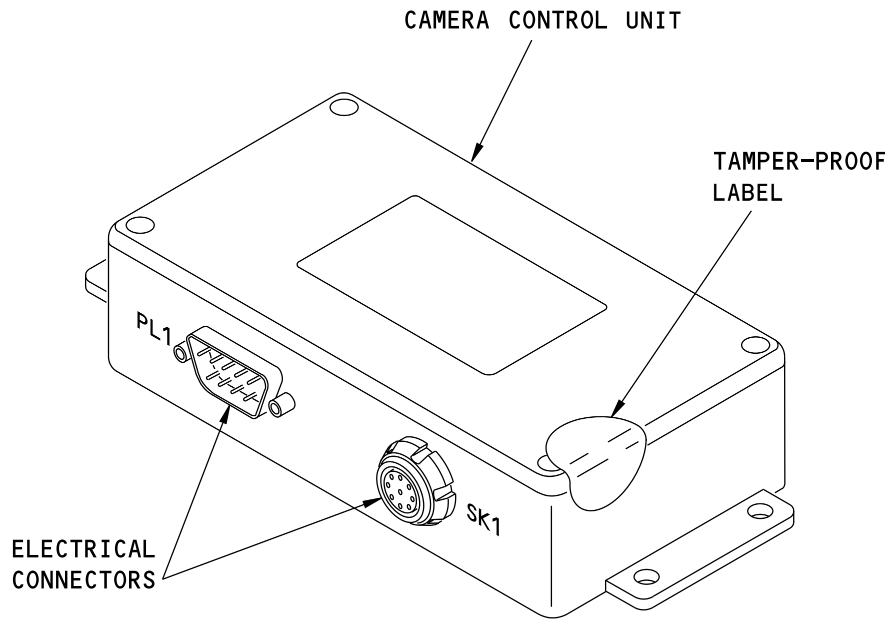
- Round 10 pin, SK1, connects to the camera.
- Trapezoid 9 pin, PL1, connects to the video switch.

The CCU is cooled by convection. No forced-air cooling is required.

Functional Description

The CCU has these functions:

- Receives 28V dc (volts direct current) from the video switch (VS)
- Supplies 9V dc to one camera
- Changes unbalanced analog video from the camera, to balanced analog video for the VS
- Changes the camera output impedance from 75 ohms, to the value required for the VS.
- For cameras with lens heaters, the CCU senses and controls the activation of the heaters.



1348148 S0000240813_V1

CAMERA CONTROL UNIT

ILLUMINATOR

General

The illuminator emits a wide beam of near-infrared light that is invisible to the eye, but is sensed by the flight deck entry cameras. Typically, there is one illuminator installed near each camera.

The illuminator is a sealed assembly, and can not be repaired.

Physical Description

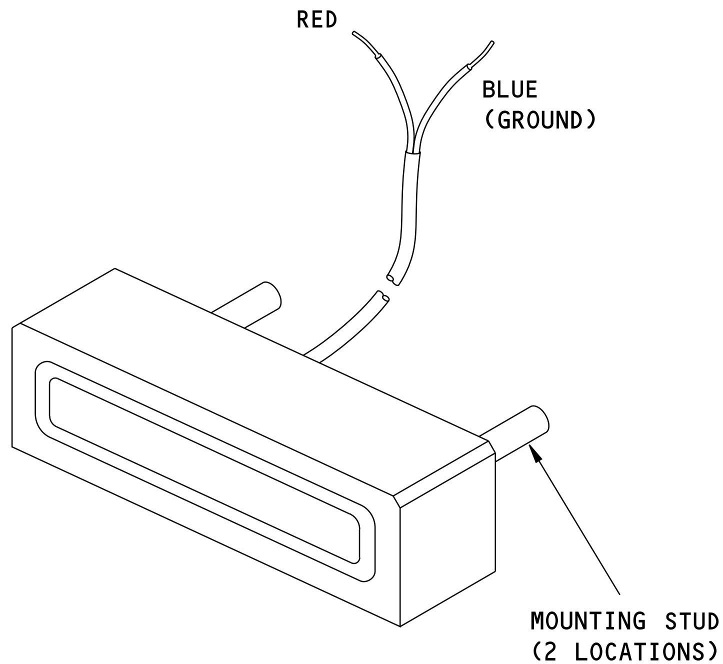
Each illuminator has properties as follows:

- Height - 0.6 in. (14.3 mm)
- Width - 1.7 in. (44.3 mm)
- Depth - 0.9 in. (23.8 mm)
- Weight - 0.5 oz (14.2 g) maximum, excluding the wires.

The housing is plastic, with two threaded attachment posts on the rear face. The assembly includes two wire leads (red receives power, blue goes to ground).

Functional Description

The illuminator operates continuously using 24V dc (volts direct current) from the video switch, M3001. The unit emits light at the frequency of approximately 880nm (nanometers). The projected beam is approximately 150 degrees wide.



1344476 S0000238962_V1

ILLUMINATOR

VIDEO SWITCH

General

The video switch (VS) functions as a video router, and power transformer for components of the flight deck entry video surveillance system.

The VS has interfaces with three camera control units, three illuminators, and the camera control panel. The video output goes to the flight deck common display system. The selected camera image shows on the lower-center multi-function display (MFD), as set by the camera control panel.

Physical Description

The video switch has the physical characteristics that follow:

- Height - 4.3 in. (109.0 mm)
- Width - 15 in. (374.0 mm)
- Depth - 10.9 in. (278.0 mm)
- Weight - 11 lb (5 kg), maximum.

The face of the unit has a status indicating lamp, and RS-232 connector identified as J1 Debug. To one side, the unit has one connector, identified as J2, with two insert modules. Each J2 module has 40 pins. The base has four (4) captive screws, and one (1) ground post.

The VS is vented, and cooled by natural convection. No forced-air cooling is required.

Functional Description

The video switch functions as a power transformer, and video signal router. Control of the VS is through the camera control panel.

The VS receives 115V ac (volts alternating current) power from the surveillance camera circuit breaker, C1641, located on panel P6-12. The VS has a transformer that supplies 28V dc (volts direct current) power to three camera control units (CCU), and three illuminators. Each CCU then supplies 9V dc to one camera.

The camera control panel, M3000, sets the VS to transmit one of the three signals to the common display system (CDS). Only the lower-center multi-function display can show flight deck entry video.

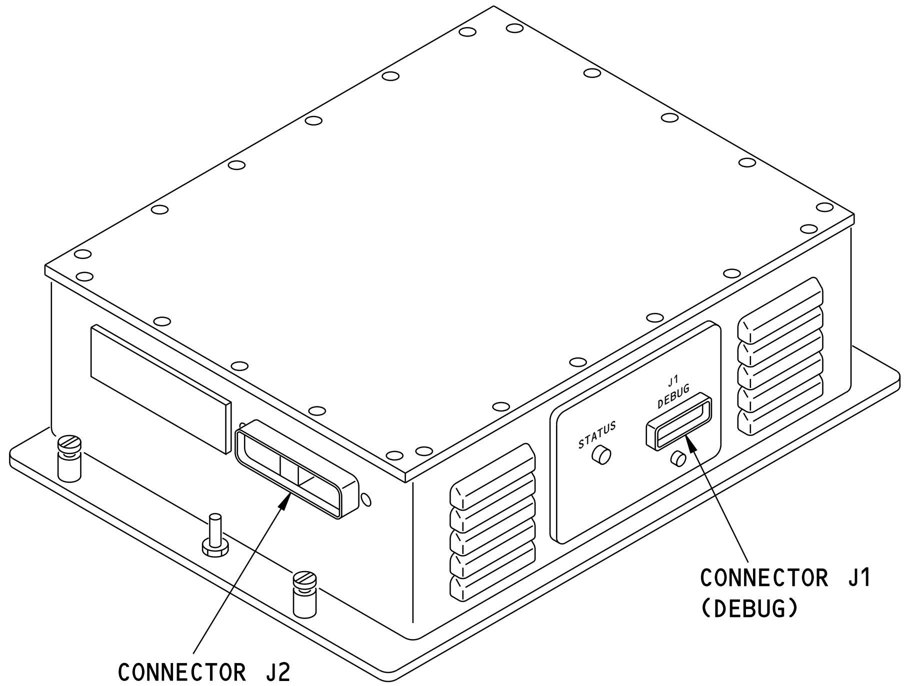
NOTE: The aircraft is wired so that the video switch sends video to three displays: the center-lower, inboard-left, and inboard-right. However, only the center-lower MFD is video-capable.

Operational Description

The VS receives continuously three isolated video signals, one from each camera control unit.

Camera selection is set by the rotary dial, and push-button on the camera control panel. One of the three positions (left, center, or right) is selected, and the DSPL (display) button is pressed. This sets the VS to transmit the selected video image to the common display system (CDS).

NOTE: The camera control panel sets the VS to transmit the left, center, or right camera signal. The CDS uses the captain's, and first officer's display select panel to choose the FDEVSS signal, or other data, to show on the applicable MFD.



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VIDEO SWITCH

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FLIGHT COMPARTMENT PC POWER SYSTEM - INTRODUCTION

General

The Flight Compartment PC Power System provides 110 VAC/60Hz electrical power for use by the flight crew. The interface to the PC Power System is through outlets installed in the flight compartment. The user connects a laptop computer or other personal electronic device (PED) to the outlets.

The Flight Compartment PC Power System receives 115 VAC/400 Hz aircraft power and converts it to 110 VAC/60 Hz power for flight crew use.

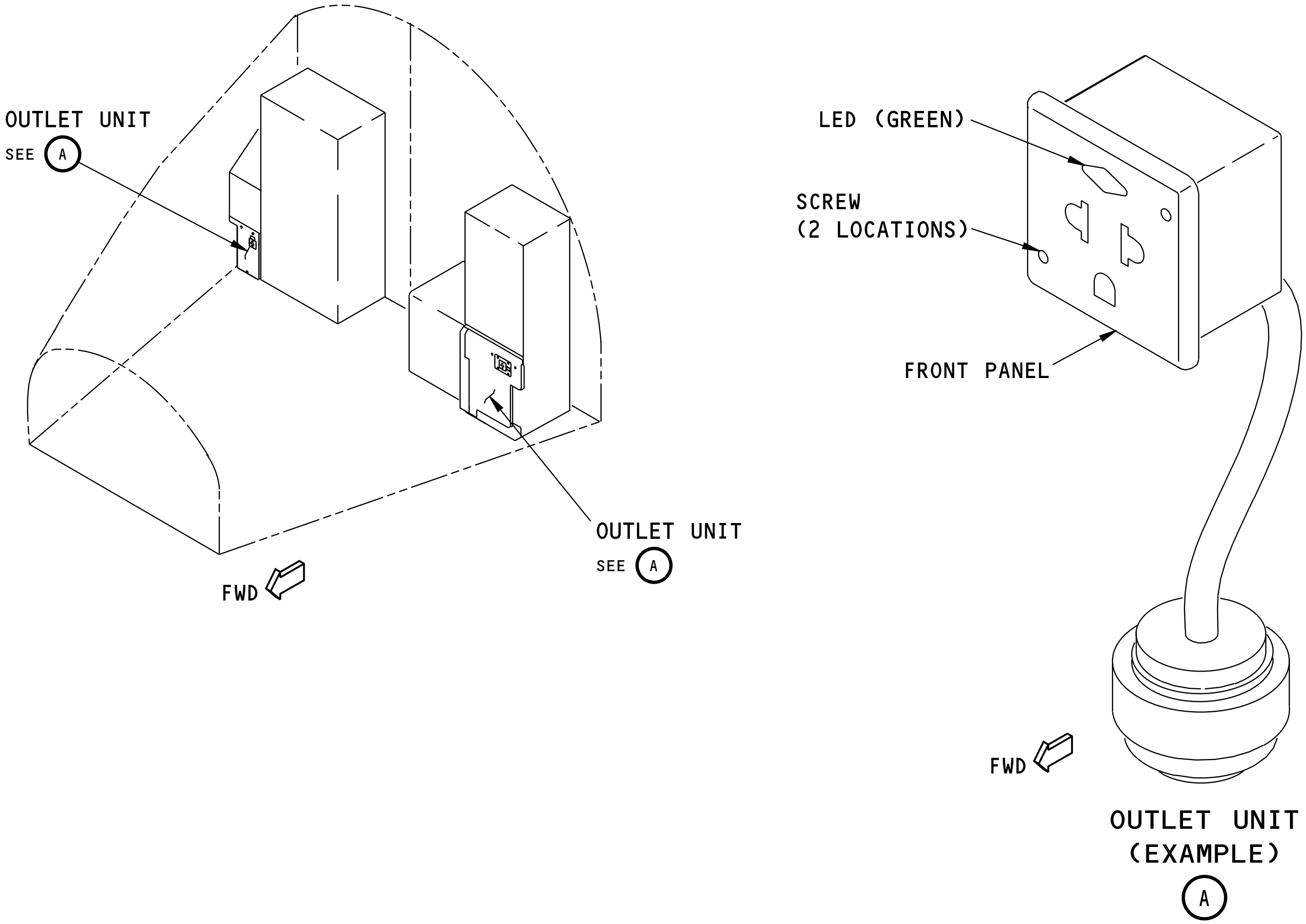
The PC Power System has the following components:

- In-Seat Power Supply (ISPS)
- Outlet Units (OU)

Component Location

Two PC Power Outlet Units (OUs) are installed in the flight compartment. The OUs are installed on the forward face of the P18 and P6 panels, behind the captain and first officer's seats.

An In-Seat Power Supply (ISPS) is installed in the Electrical and Electronics (EE) compartment.



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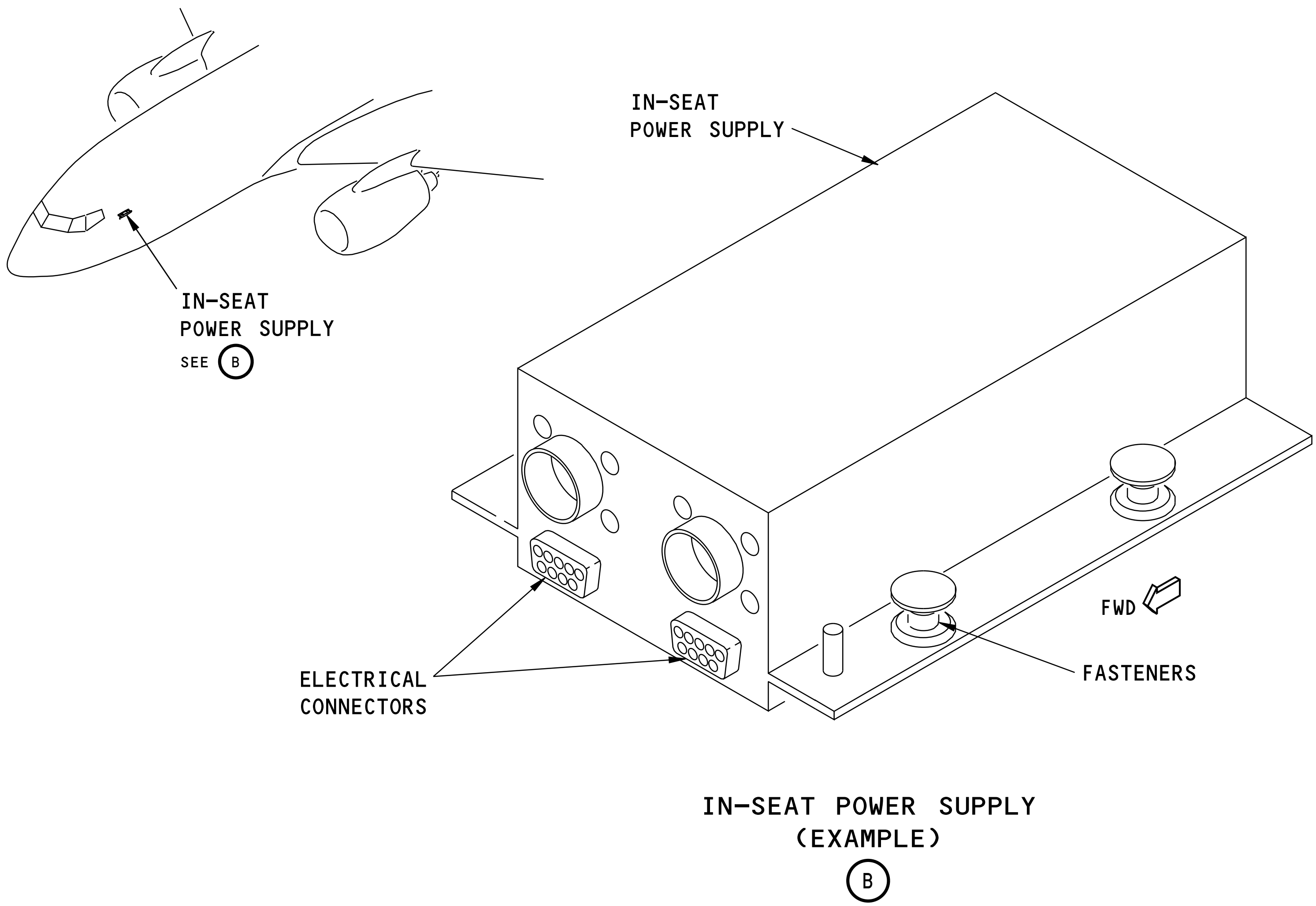
FLIGHT COMPARTMENT PC POWER SYSTEM - COMPONENT LOCATION



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FLIGHT COMPARTMENT PC POWER SYSTEM - COMPONENT LOCATION

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FLIGHT COMPARTMENT PC POWER SYSTEM - ISPS - GENERAL DESCRIPTION

General

The In-Seat Power Supply (ISPS) supplies power to operate a laptop computer or PED and recharge its battery.

The ISPS is a rectangular box with connectors for input power, input data, output power and output data. The ISPS can provide power to two or three Outlet Units (OUs).

The ISPS is installed in the Electrical and Electronics (EE) compartment. Four fasteners hold the ISPS in place.

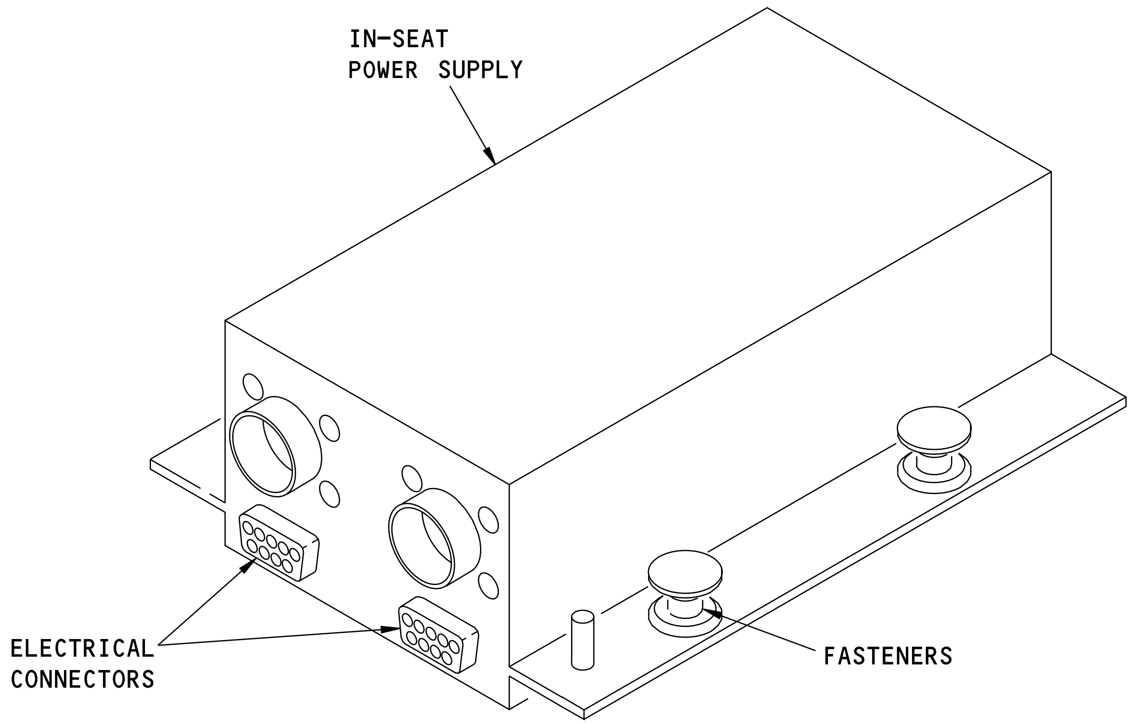
Functional Description

The ISPS monitors power output load and provides automatic shutoff in case of over-current, over-voltage, under-voltage and Ground Fault Interrupt (GFI) fault.

The ISPS provides Electro-Magnetic Interference (EMI) filtering.

The ISPS indicates system availability by using the LEDs on the OUs.

The ISPS provides Built-In-Test (BIT) at power-on. The internal housekeeping power supplies input control and GFI TRIP signals are monitored for status. If BIT senses a failure of internal voltages or if the GFI circuitry reports a fault, the outputs are latched off and the FAULT output is active until power is cycled.



IN-SEAT POWER SUPPLY
(EXAMPLE)

1341892 S0000237492_V1

IN-SEAT POWER SUPPLY - GENERAL DESCRIPTION

FLIGHT COMPARTMENT PC POWER SYSTEM - OUTLET UNITS - GENERAL DESCRIPTION

General

The Outlet Unit (OU) connects to the In-Seat Power Supply output.

The Outlet Unit supplies a power socket to operate a laptop computer or a passenger electronic device (PED) and recharge its battery.

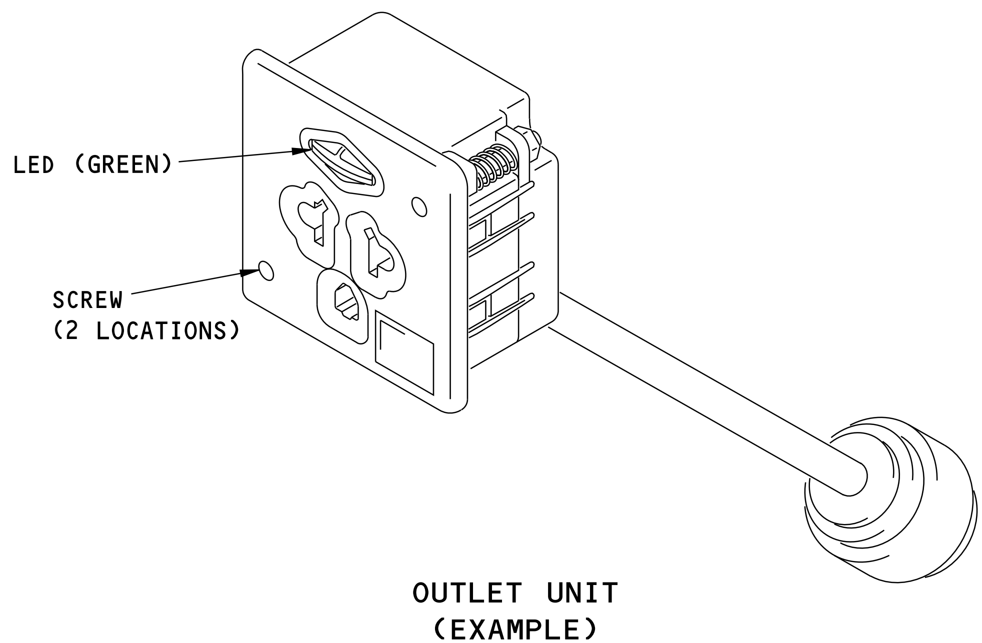
The Outlet Unit is used in conventional 110 VAC systems.

The Outlet Unit has an LED to show the status of the power system.

The Outlet Unit LED light causes a reflection in the flight deck window so a flap is installed over the outlet unit to cover the LED.

LED Indicator

- Shows a red light when there is a fault with the ISPS.
- Shows a green light when power is available and/or in use at the OU.
- Is extinguished when power is not available.



1341895 S0000237510_V1

OUTLET UNIT - GENERAL DESCRIPTION