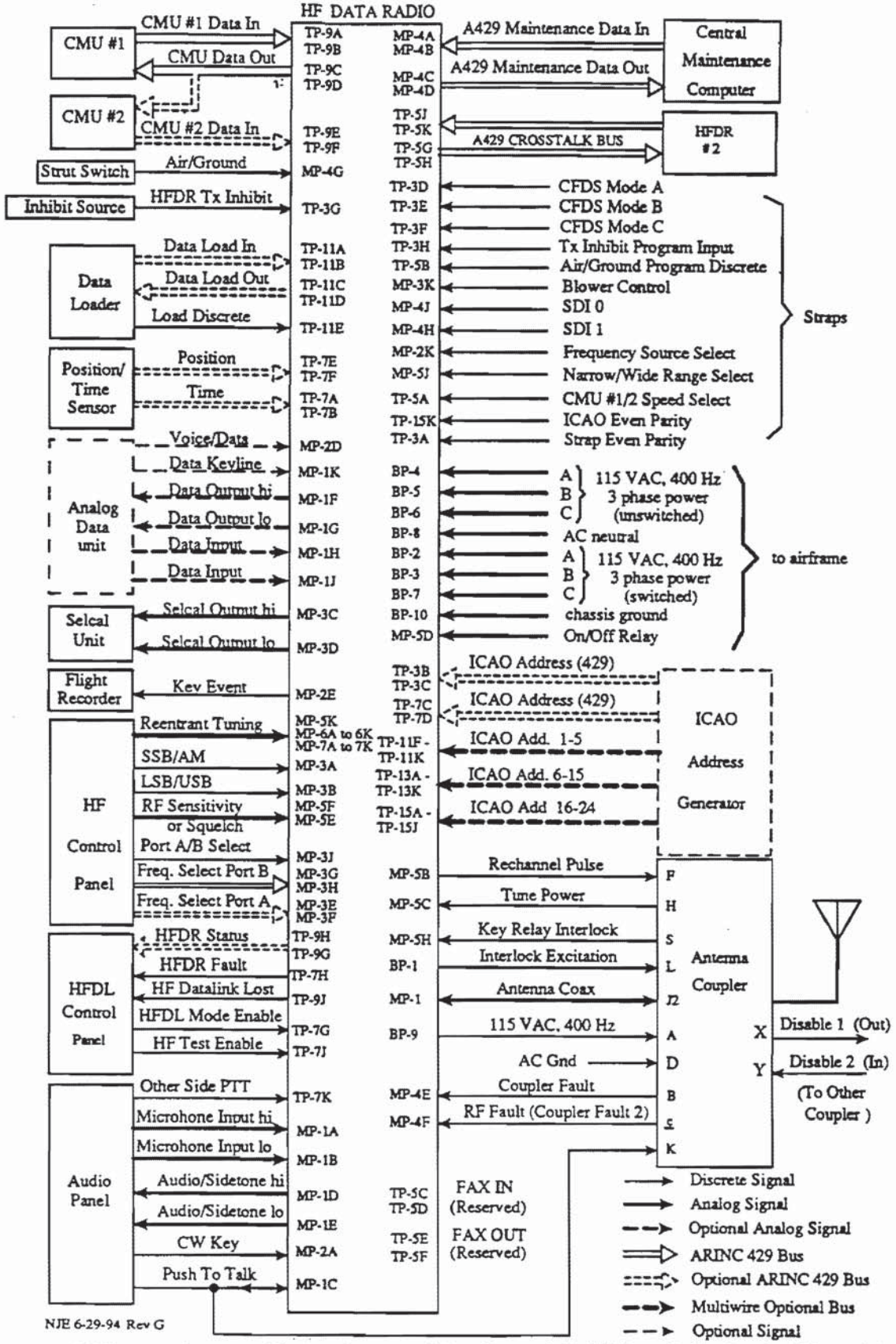
ATTACHMENT 2-1B
HFDR SYSTEM BLOCK DIAGRAM



In the event of differences between this Attachment and Attachment 2-2, HF Data Radio Standard Interwiring, the latter takes precedence.

ATTACHMENT 2-2
HFDR STANDARD INTERWIRING

FUNCTION	Tx/Rx	CONTROL PANEL	⑥ ANTENNA COUPLER	CMU/MU	OTHER	NOTES
ATE ID	TP1A					
ATE ID	TP1B					
ATE ID	TP1C					
ATE ID	TP1D					
Mfg. Reserved	TP1E					
Mfg. Reserved	TP1F					
Mfg. Reserved	TP1G					
Mfg. Reserved	TP1H					
Mfg. Reserved	TP1J					
Mfg. Reserved	TP1K					
ATE ID	TP2A					
ATE ID	TP2B					
ATE ID	TP2C					
Mfg. Reserved	TP2D					
Mfg. Reserved	TP2E					
Mfg. Reserved	TP2F					
Mfg. Reserved	TP2G					
Mfg. Reserved	TP2H					
Mfg. Reserved	TP2J					
Mfg. Reserved	TP2K					
Strap Odd Parity	TP3A					
ICAO Digital ID #1 A	TP3B					
ICAO Digital ID #1 B	TP3C					
CFDS Mode A	TP3D					
CFDS Mode B	TP3E					
CFDS Mode C	TP3F					
TX Inhibit Sense Input	TP3G					
TX Inhibit Program Input	TP3H					
Mfg. Reserved	TP3J					
	TP3K					
Mfg. Reserved	TP4A					
Mfg. Reserved	TP4B					
Mfg. Reserved	TP4C					
Mfg. Reserved	TP4D					
Mfg. Reserved	TP4E					
Mfg. Reserved	TP4F					
Mfg. Reserved	TP4G					
Mfg. Reserved	TP4H					
Mfg. Reserved	TP4J					
Mfg. Reserved	TP4K					
CMU 429 Bus Speed	TP5A	o———	———o	To/From CMU #1/2		26
Air/Ground Program Discrete	TP5B					
FAX Input Reserved	TP5C					
FAX Input Reserved	TP5D					
FAX Output Reserved	TP5E					
FAX Output Reserved	TP5F					
HFDR Crosstalk Output	TP5G					
HFDR Crosstalk Output	TP5H					
HFDR Crosstalk Input	TP5J					
HFDR Crosstalk Input	TP5K					
Mfg. Reserved	TP6A					
Mfg. Reserved	TP6B					
Mfg. Reserved	TP6C					
Mfg. Reserved	TP6D					
Mfg. Reserved	TP6E					
Mfg. Reserved	TP6F					
Mfg. Reserved	TP6G					
Mfg. Reserved	TP6H					
Mfg. Reserved	TP6J					
Mfg. Reserved	TP6K					

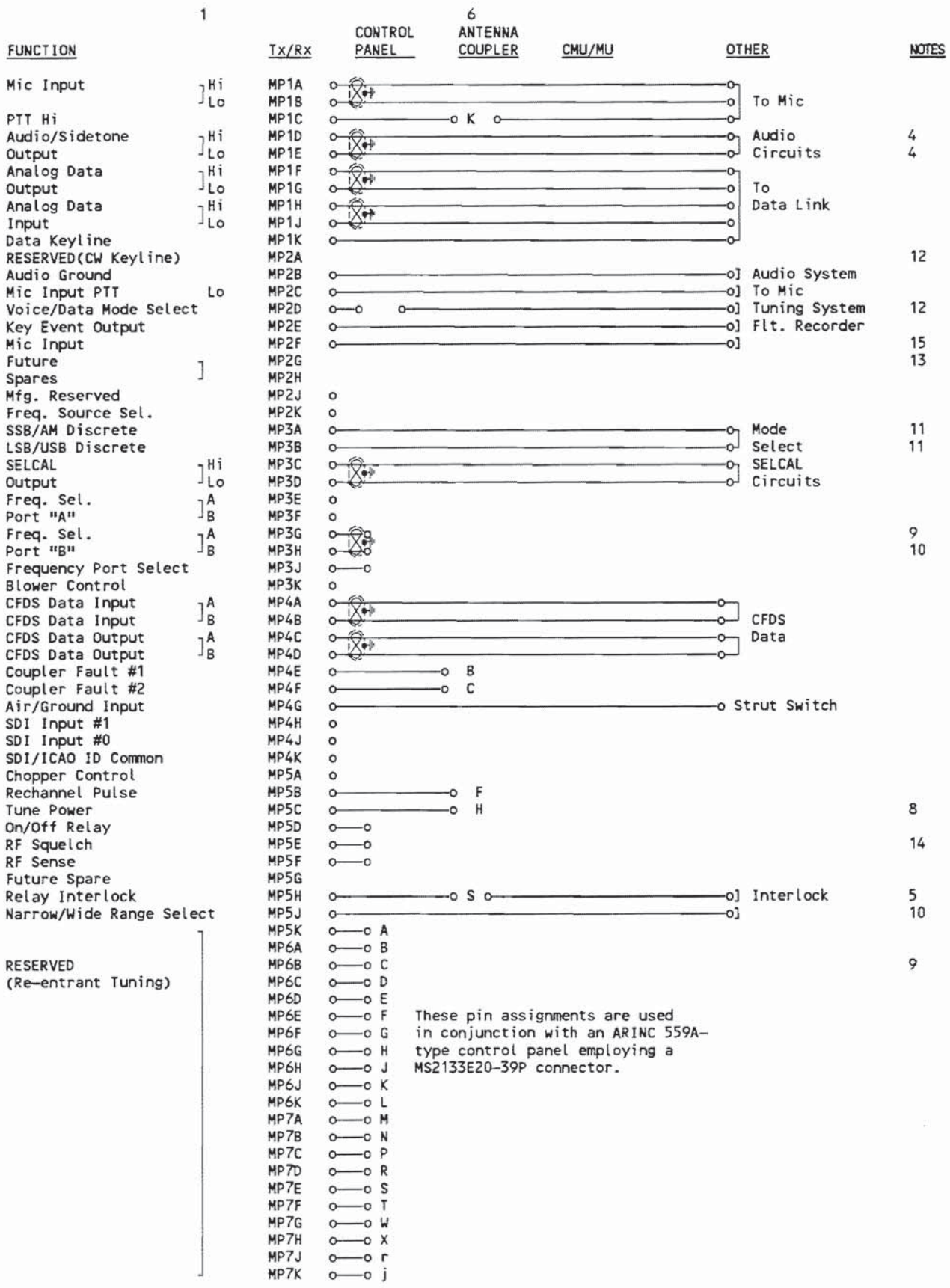
ATTACHMENT 2-2 (cont'd)
HFDR STANDARD INTERWIRING

FUNCTION		Tx/Rx	CONTROL PANEL ①	ANTENNA COUPLER ⑥	CMU/MU	OTHER	NOTES
Time	A	TP7A				To A/C Nav/Time Systems	
Input	B	TP7B					
ICAO Digital ID #2	A	TP7C					
Input	B	TP7D					
Position	A	TP7E					
Input	B	TP7F					
HFDL Date Mode Enable Select Input		TP7G				HFDLCP	
HFDR Fault Output Select Input		TP7H				HFDLCP	17
HF Test Enable		TP7J					18
Other Side PTT		TP7K					19
Mfg. Reserved		TP8A					
Mfg. Reserved		TP8B					
Mfg. Reserved		TP8C					
Mfg. Reserved		TP8D					
Mfg. Reserved		TP8E					
Mfg. Reserved		TP8F					
Mfg. Reserved		TP8G					
Mfg. Reserved		TP8H					
Mfg. Reserved		TP8J					
Mfg. Reserved		TP8K					
CMU #1 Data	A	TP9A			From CMU #1		
Input	B	TP9B					
CMU Data	A	TP9C			To CMU #1 & #2		
Output	B	TP9D					
CMU #2 Data	A	TP9E			From CMU #2		
Input	B	TP9F					
HFDR Status Output	A	TP9G				HFDLCP	
HFDR Status Output	B	TP9H				HFDLCP	
HF DATA LINK LOST Output		TP9J					17
		TP9K					
Mfg. Reserved		TP10A					
Mfg. Reserved		TP10B					
Mfg. Reserved		TP10C					
Mfg. Reserved		TP10D					
Mfg. Reserved		TP10E					
Mfg. Reserved		TP10F					
Mfg. Reserved		TP10G					
Mfg. Reserved		TP10H					
Mfg. Reserved		TP10J					
Mfg. Reserved		TP10K					
Data Loader	A	TP11A					
Input	B	TP11B					
Data Loader	A	TP11C					
Output	B	TP11D					
Data Loader Discrete Input		TP11E					
ICAO ID 1 (MSB)		TP11F					
ICAO ID 2		TP11G					
ICAO ID 3		TP11H					
ICAO ID 4		TP11J					
ICAO ID 5		TP11K					
Mfg. Reserved		TP12A					
Mfg. Reserved		TP12B					
Mfg. Reserved		TP12C					
Mfg. Reserved		TP12D					
Mfg. Reserved		TP12E					
Mfg. Reserved		TP12F					
Mfg. Reserved		TP12G					
Mfg. Reserved		TP12H					
Mfg. Reserved		TP12J					
Mfg. Reserved		TP12K					

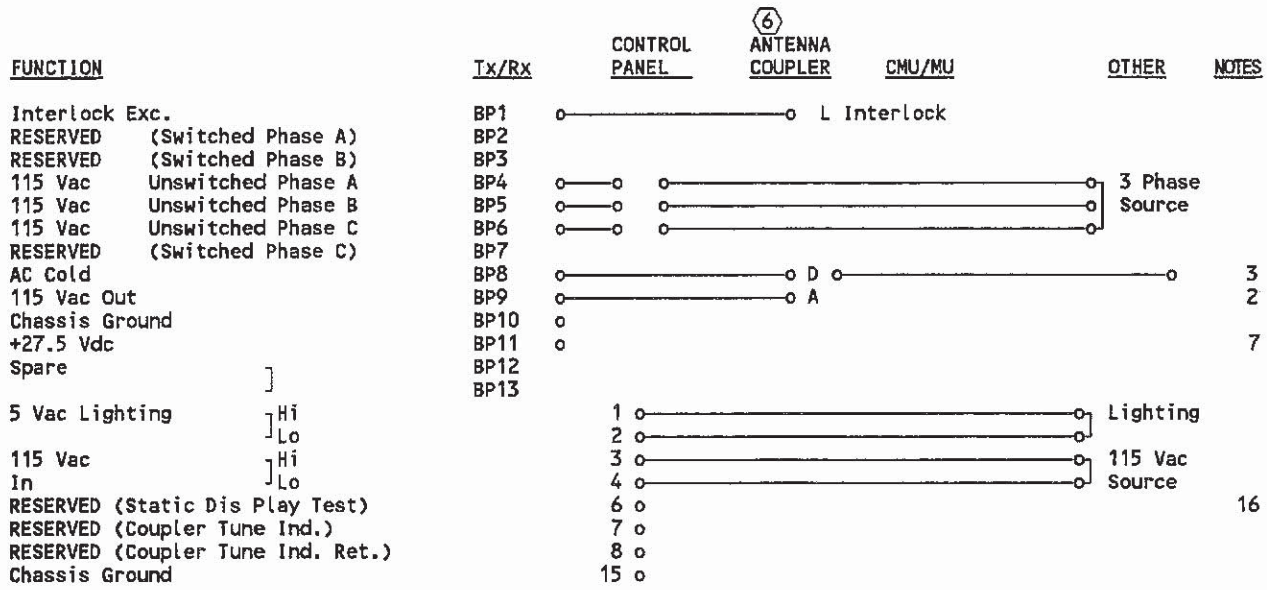
ATTACHMENT 2-2 (cont'd)
HFDR STANDARD INTERWIRING

FUNCTION	Tx/Rx	CONTROL PANEL	⟨6⟩ ANTENNA COUPLER	CMU/MU	OTHER	NOTES
ICAO ID 6	TP13A	o				
ICAO ID 7	TP13B	o				
ICAO ID 8	TP13C	o				
ICAO ID 9	TP13D	o				
ICAO ID 10	TP13E	o				
ICAO ID 11	TP13F	o				
ICAO ID 12	TP13G	o				
ICAO ID 13	TP13H	o				
ICAO ID 14	TP13J	o				
ICAO ID 15	TP13K	o				
Mfg. Reserved	TP14A					
Mfg. Reserved	TP14B					
Mfg. Reserved	TP14C					
Mfg. Reserved	TP14D					
Mfg. Reserved	TP14E					
Mfg. Reserved	TP14F					
Mfg. Reserved	TP14G					
Mfg. Reserved	TP14H					
Mfg. Reserved	TP14J					
Mfg. Reserved	TP14K					
ICAO ID 16	TP15A	o				
ICAO ID 17	TP15B	o				
ICAO ID 18	TP15C	o				
ICAO ID 19	TP15D	o				
ICAO ID 20	TP15E	o				
ICAO ID 21	TP15F	o				
ICAO ID 22	TP15G	o				
ICAO ID 23	TP15H	o				
ICAO ID 24 (LSB)	TP15J	o				
ICAO Odd Parity Strap	TP15K	o				

ATTACHMENT 2-2 (cont'd)
HFDR STANDARD INTERWIRING



ATTACHMENT 2-2 (cont'd)
HFDR STANDARD INTERWIRING

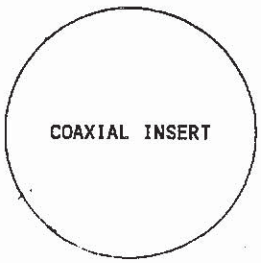


ATTACHMENT 2-3A
HFDR TOP CONNECTOR LAYOUT

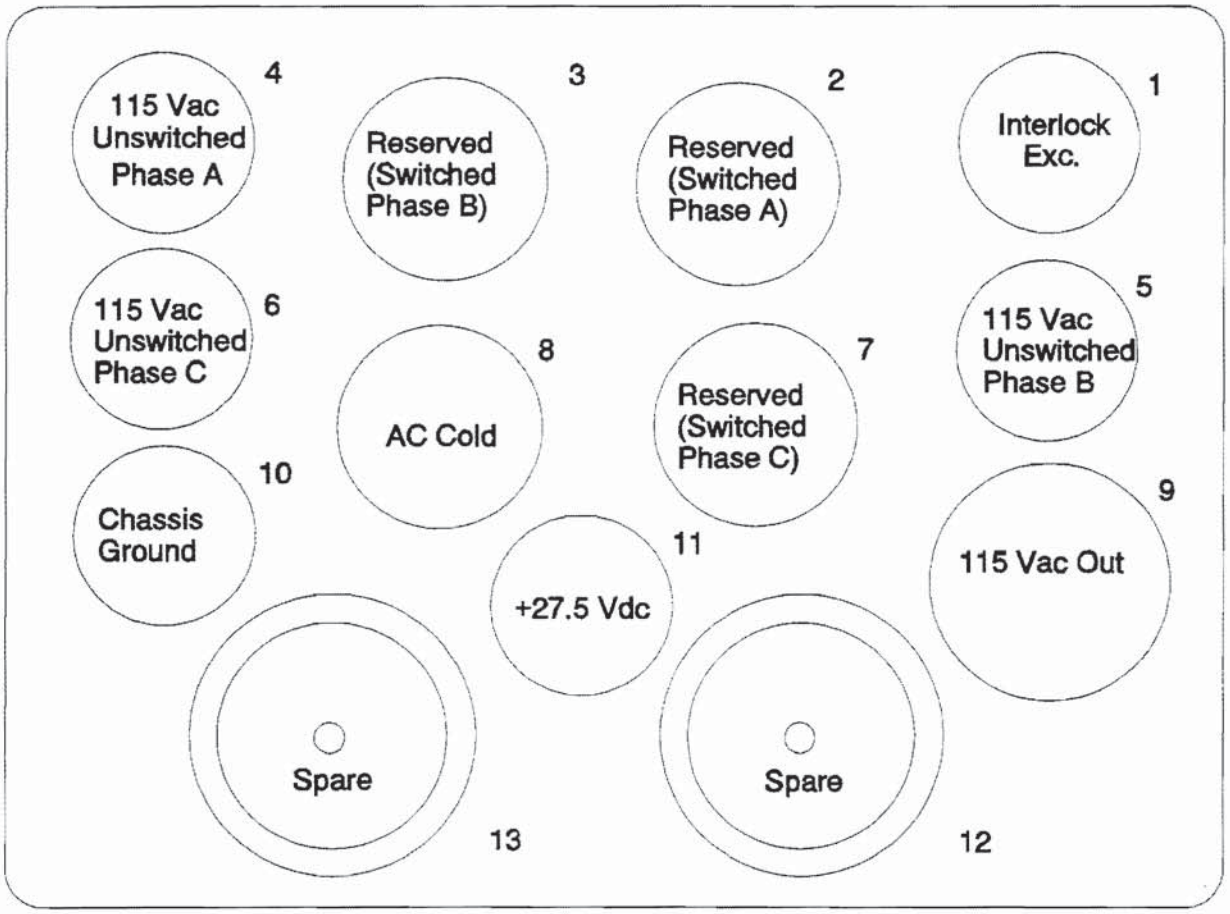
	A	B	C	D	E	F	G	H	J	K
1	ATE ID	ATE ID	ATE ID	ATE ID	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
2	ATE ID	ATE ID	ATE ID	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
3	Strap Odd Parity	ICAO Digital ID #1 A	ICAO Digital ID #1 B	CFDS Mode A	CFDS Mode B	CFDS Mode C	TX Inhibit Sense Input	TX Inhibit Program Input	Mfg. Reserved	
4	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
5	CMU #1/2 CMU Bus Speed Select	Air/ Ground Program Discrete	FAX Input Reserved	FAX Input Reserved	FAX Output Reserved	FAX Output Reserved	HFDR Crosstalk Output	HFDR Crosstalk Output	HFDR Crosstalk Input	HFDR Crosstalk Input
6	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
7	Time Input A	Time Input B	ICAO Digital ID # 2 A	ICAO Digital ID # 2 B	Position Input A	Position Input B	HFDL Mode Enable In	HFDR Fault Output	HF Test Enable	Other Side PTT
8	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
9	CMU #1 Data Input A	CMU #1 Data Input B	CMU Data Output A	CMU Data Output B	CMU #2 Data Input A	CMU #2 Data Input B	HFDR Status Output A	HFDR Status Output B	HF DATA LINK LOST Output Discrete	
10	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
11	Data Loader Input A	Data Loader Input B	Data Loader Output A	Data Loader Output B	Data Loader Discrete Input	ICAO ID (MSB) 1	ICAO ID 2	ICAO ID 3	ICAO ID 4	ICAO ID 5
12	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
13	ICAO ID 6	ICAO ID 7	ICAO ID 8	ICAO ID 9	ICAO ID 10	ICAO ID 11	ICAO ID 12	ICAO ID 13	ICAO ID 14	ICAO ID 15
14	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved	Mfg. Reserved
15	ICAO ID 16	ICAO ID 17	ICAO ID 18	ICAO ID 19	ICAO ID 20	ICAO ID 21	ICAO ID 22	ICAO ID 23	ICAO ID (LSB) 24	ICAO Odd Parity Strap

ATTACHMENT 2-3B
HFDR MIDDLE CONNECTOR LAYOUT

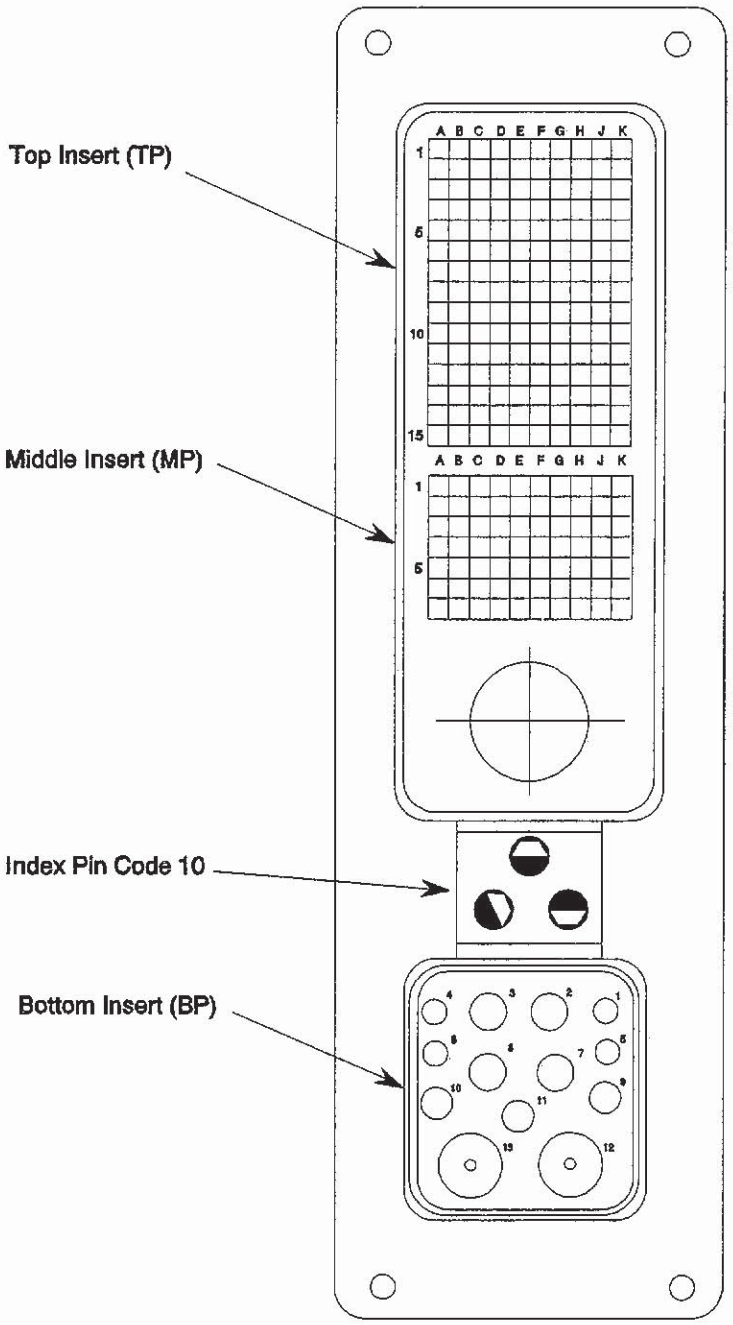
	A	B	C	D	E	F	G	H	J	K
1	Mic Input		Mic PTT	Audio/Sidetone Output		Analog Data Output		Analog Data Input		Data Keyline
	Hi	Lo	Hi	Hi	Lo	Hi	Lo	Hi	Lo	
2	Reserved	Audio Ground	Mic PTT Lo	Voice/ Data Mode Select	Key Event Output	Mic Input Ground	Spare	Spare	Mfg. Reserved	Freq. Source Select
3	SSB/AM Discrete Input	LSB/USB Discrete Input	SELCAL Output		Freq. Select Port "A" Input		Freq. Select Port "B" Input		Frequency Port Select Input	Blower Control Input
			Hi	Lo	A	B	A	B		
4	CFDS DATA INPUT A	CFDS DATA INPUT B	CFDS Data Output A	CFDS Data Output B	Coupler Fault #1	Coupler Fault #2	Air/ Ground Discrete Input	SDI Input #1	SDI Input #0	SDI/ICAO ID Common
5	Chopper Control	Rechannel Pulse	Tune Power Input	On/Off Relay	RF Squelch	RF Sense	Spare	Key Relay Interlock	Narrow/ Wide Range Select	Reserved RE Tune A
6	Reserved RE Tune B	Reserved RE Tune C	Reserved RE Tune D	Reserved RE Tune E	Reserved RE Tune F	Reserved RE Tune G	Reserved RE Tune H	Reserved RE Tune J	Reserved RE Tune K	Reserved RE Tune L
7	Reserved RE Tune M	Reserved RE Tune N	Reserved RE Tune P	Reserved RE Tune R	Reserved RE Tune S	Reserved RE Tune T	Reserved RE Tune W	Reserved RE Tune X	Reserved RE Tune r	Reserved RE Tune j



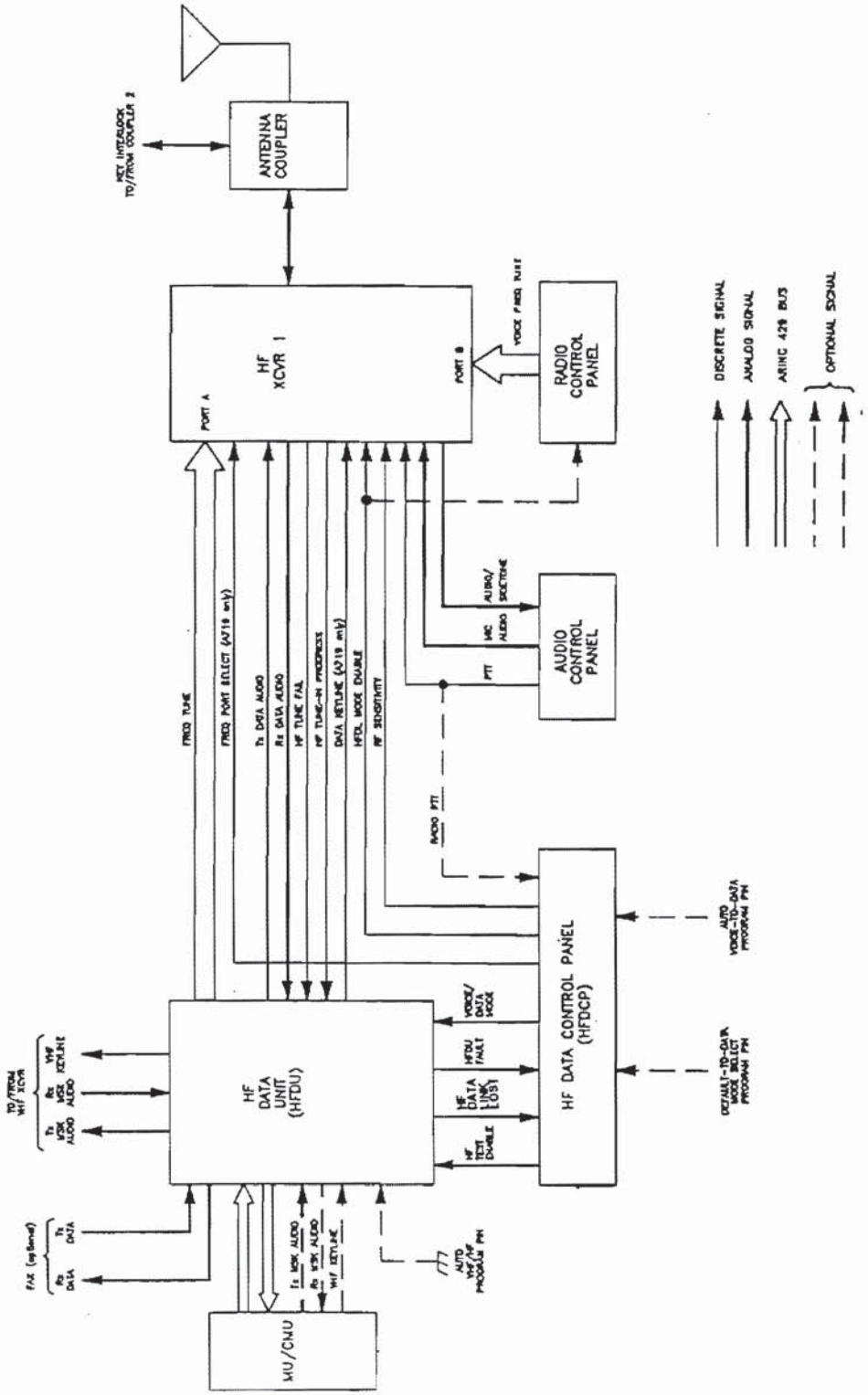
ATTACHMENT 2-3C
HFDR BOTTOM CONNECTOR LAYOUT



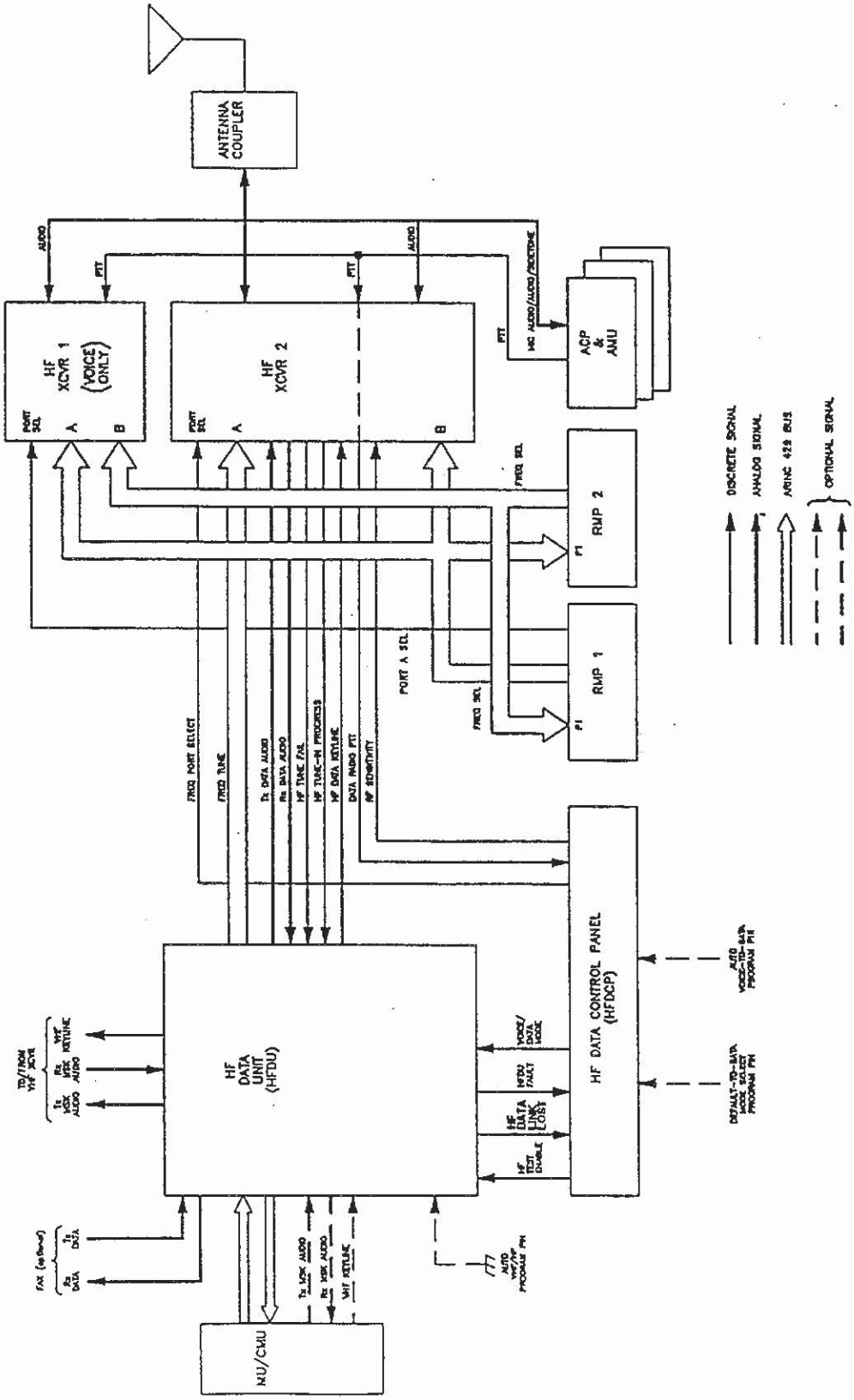
ATTACHMENT 2-3D
ARINC 600 SIZE 2 CONNECTOR - HFDR REAR VIEW



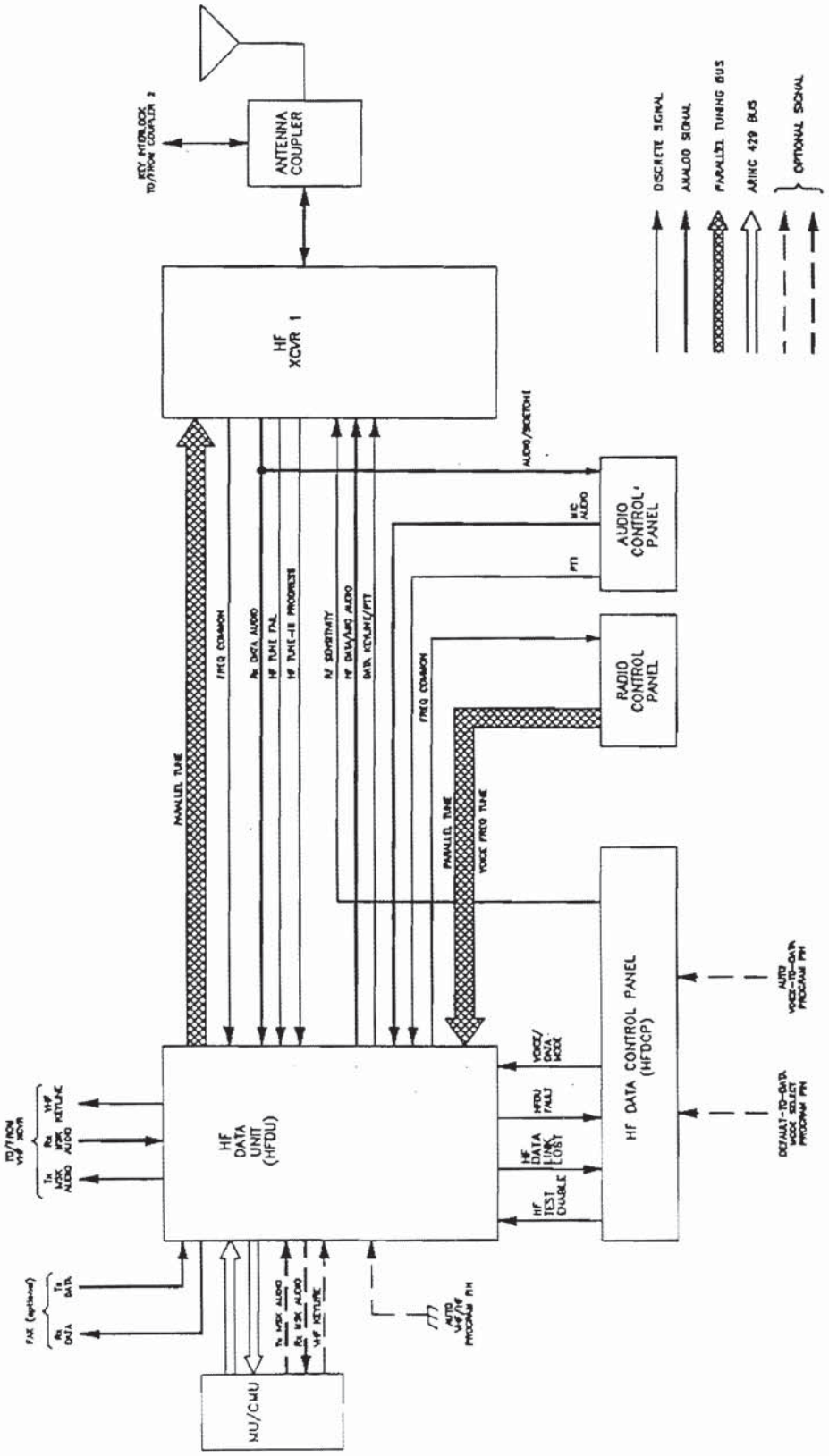
ATTACHMENT 3-1A
HFDU AVIONICS CONFIGURATION B
(USING ARINC 719 HF XCVR WITH DISCRETE VOICE/DATA CONTROL)



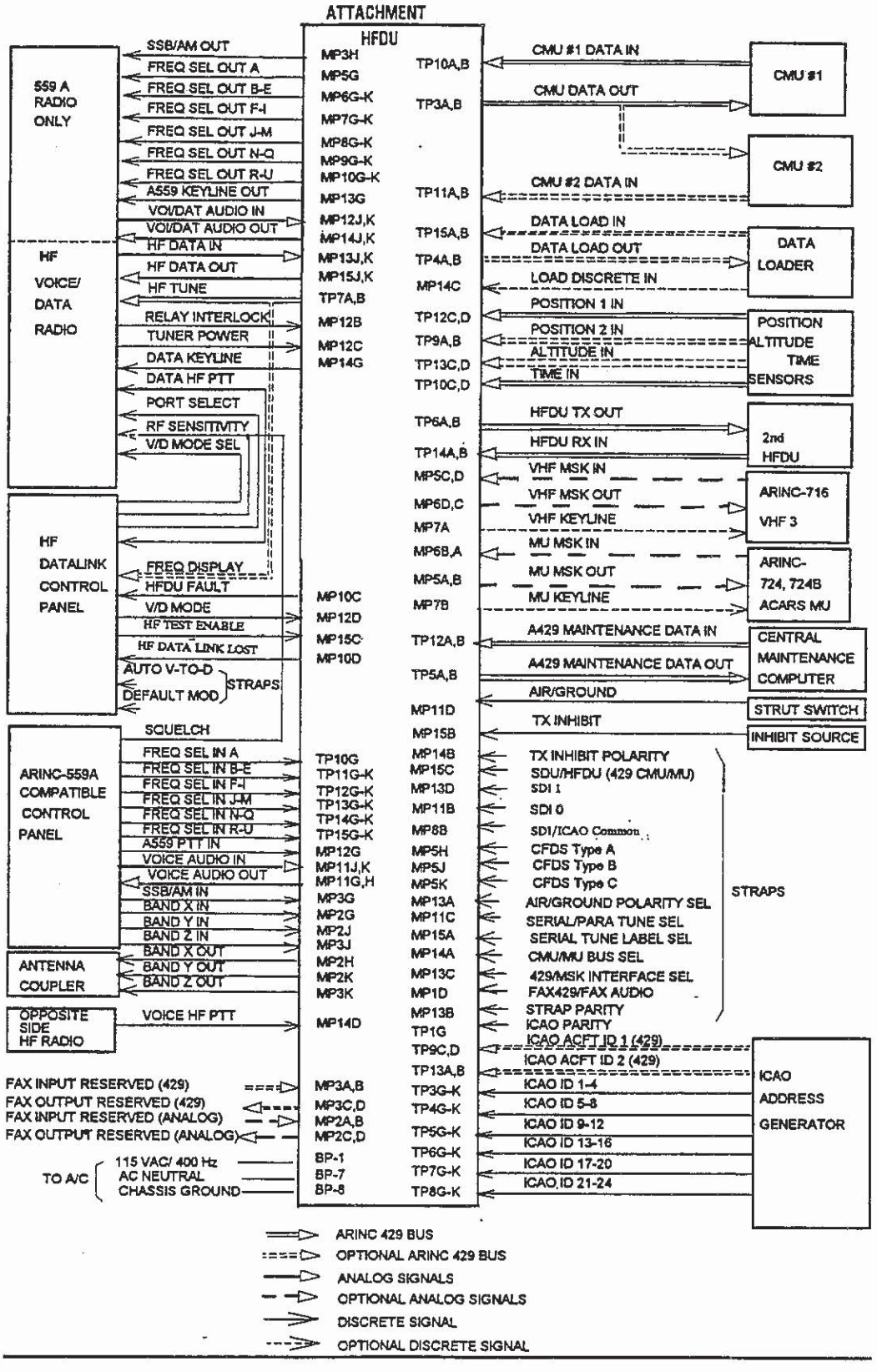
ATTACHMENT 3-1B
HFDU AVIONICS CONFIGURATION B
(USING ARINC 719 HF XCVR WITH ARINC 429 VOICE/DATA CONTROL)



ATTACHMENT 3-1C
HFDU AVIONICS CONFIGURATION B
(USING HF XCVR ARINC 559A TYPE)



ATTACHMENT 3-1D
HFDU SYSTEM BLOCK DIAGRAM



In the event of differences between this Attachment and Attachment 3-2, HF Data Unit Standard Interwiring, the latter takes precedence.

ATTACHMENT 3-2
HFDU STANDARD INTERWIRING

FUNCTION	HFDU	ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
ATE Reserved	TP1A							
ATE Reserved	TP1B							
ATE Reserved	TP1C							
ATE Reserved	TP1D							
Mfg. Reserved	TP1E							
Mfg. Reserved	TP1F							
ICAO Parity	TP1G	o———	———	———	———	———	———o	23
	TP1H							
	TP1J							
	TP1K							
ATE Reserved	TP2A							
ATE Reserved	TP2B							
ATE Reserved	TP2C							
	TP2D							
Mfg. Reserved	TP2E							
Mfg. Reserved	TP2F							
	TP2G							
	TP2H							
	TP2J							
	TP2K							
CMU/MU 429 OUT A	TP3A	o———⊗	———	———o	TO			
CMU/MU 429 OUT B	TP3B	o———⊗	———	———o	CMU/MU 1&2			1, 24
	TP3C							
	TP3D							
Mfg. Reserved	TP3E							
Mfg. Reserved	TP3F							
ICAO ID 1	TP3G							
ICAO ID 2	TP3H							
ICAO ID 3	TP3J							
ICAO ID 4	TP3K							
Data Loader Out A	TP4A	o———⊗	———	———	———	———	———o TO	
Data Loader Out B	TP4B	o———⊗	———	———	———	———	———o ADL	1
	TP4C							
	TP4D							
Mfg. Reserved	TP4E							
Mfg. Reserved	TP4F							
ICAO ID 5	TP4G							
ICAO ID 6	TP4H							
ICAO ID 7	TP4J							
ICAO ID 8	TP4K							
OMS Out A	TP5A	o———⊗	———	———	———	———	———o TO	
OMS Out B	TP5B	o———⊗	———	———	———	———	———o OMS	1
	TP5C							
	TP5D							
Mfg. Reserved	TP5E							
Mfg. Reserved	TP5F							
ICAO ID 9	TP5G							
ICAO ID 10	TP5H							
ICAO ID 11	TP5J							
ICAO ID 12	TP5K							
HFDU TX Out A	TP6A	o———⊗	———	———	———	———	———o TO 2nd	
HFDU TX Out B	TP6B	o———⊗	———	———	———	———	———o HFDU	1
	TP6C							
	TP6D							
Mfg. Reserved	TP6E							
Mfg. Reserved	TP6F							
ICAO ID 13	TP6G							
ICAO ID 14	TP6H							
ICAO ID 15	TP6J							
ICAO ID 16	TP6K							

ATTACHMENT 3-2 (cont'd)
HFDU STANDARD INTERWIRING

FUNCTION		HFDU	ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
HF Tune Out	A	TP7A	MP3E						1
HF Tune Out	B	TP7B	MP3F						1
		TP7C							
		TP7D							
Mfg. Reserved		TP7E							
Mfg. Reserved		TP7F							
ICAO ID 17		TP7G							
ICAO ID 18		TP7H							
ICAO ID 19		TP7J							
ICAO ID 20		TP7K							
		TP8A							
		TP8B							
		TP8C							
		TP8D							
Mfg. Reserved		TP8E							
Mfg. Reserved		TP8F							
ICAO ID 21		TP8G							
ICAO ID 22		TP8H							
ICAO ID 23		TP8J							
ICAO ID 24 (LSB)		TP8K							
Position 2 Input	B	TP9A						TO	1
Position 2 Input	A	TP9B						A/C	
ICAO ACFT ID 1	A	TP9C						From	
ICAO ACFT ID 1	B	TP9D						Mode-S	1
Mfg. Reserved		TP9E							
Mfg. Reserved		TP9F							
		TP9G							
		TP9H							
		TP9J							
		TP9K							
CMU/MU1 429 In	B	TP10A			FROM				
CMU/MU1 429 In	A	TP10B			CMU/MU 1				1, 24
Time Input	A	TP10C							
Time Input	B	TP10D							1, 9
Mfg. Reserved		TP10E							
Mfg. Reserved		TP10F							
Freq Select In A		TP10G						(A)	9
		TP10H							
		TP10J							
		TP10K							
CMU/MU2 429 In	B	TP11A			FROM				
CMU/MU2 429 In	A	TP11B			CMU/MU 2				1, 24
Mfg. Reserved		TP11C							
Mfg. Reserved		TP11D							
Mfg. Reserved		TP11E							
Mfg. Reserved		TP11F							
Freq Select In B		TP11G						(B)	9
Freq Select In C		TP11H						(C)	9
Freq Select In D		TP11J						(D)	9
Freq Select In E		TP11K						(E)	9
OMS Input	B	TP12A						FROM	1
OMS Input	A	TP12B						OMS	
Pos. 1 Input	A	TP12C							
Pos. 1 Input	B	TP12D							1
Mfg. Reserved		TP12E							
Mfg. Reserved		TP12F							
Freq Select In F		TP12G						(F)	9
Freq Select In G		TP12H						(G)	9
Freq Select In H		TP12J						(H)	9
Freq Select In I		TP12K						(J)	9

ATTACHMENT 3-2
HFDU STANDARD INTERWIRING

(1)

FUNCTION	HFDU	ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
ICAO ACFT ID 2 B	TP13A	o					o	FROM
ICAO ACFT ID 2 A	TP13B	o					o	MODE-S 1
ALTITUDE Input A	TP13C	o					o	
ALTITUDE Input B	TP13D	o					o	1
Mfg. Reserved	TP13E							
Mfg. Reserved	TP13F							
Freq Select In J	TP13G	o					o	(K) 9
Freq Select In K	TP13H	o					o	(L) 9
Freq Select In L	TP13J	o					o	(M) 9
Freq Select In M	TP13K	o					o	(N) 9
HFDU Rx Input B	TP14A	o					o	FROM 1
HFDU Rx Input A	TP14B	o					o	2ND HFDU
	TP14C							
	TP14D							
Mfg. Reserved	TP14E							
Mfg. Reserved	TP14F							
Freq Select In N	TP14G	o					o	(P) 9
Freq Select In O	TP14H	o					o	(R) 9
Freq Select In P	TP14J	o					o	(S) 9
Freq Select In Q	TP14K	o					o	(T) 9
Data Loader In B	TP15A	o					o	FROM
Data Loader In A	TP15B	o					o	ADL 1
Mfg. Reserved	TP15C							
Mfg. Reserved	TP15D							
Mfg. Reserved	TP15E							
Mfg. Reserved	TP15F							
Freq Select In R	TP15G	o					o	(W) 9
Freq Select In S	TP15H	o					o	(X) 9
Freq Select In T	TP15J	o					o	(r) 9
Freq Select In U	TP15K	o					o	(j) 9
	MP1A							
	MP1B							
	MP1C							
FAX 429/FAX Audio	MP1D	o					o	23
Mfg. Reserved	MP1E							
Mfg. Reserved	MP1F							
	MP1G							
	MP1H							
	MP1J							
	MP1K							
FAX Res In (Audio)	MP2A							
FAX Res In (Audio)	MP2B							
FAX Res Out (Audio)	MP2C							
FAX Res Out (Audio)	MP2D							
Mfg. Reserved	MP2E							
Mfg. Reserved	MP2F							
Band X In	MP2G	o					o	(f) 9
Band X Out	MP2H	o					o	(C) 6
Band Y In	MP2J	o					o	(g) 9
Band Y Out	MP2K	o					o	(B) 6
FAX Res In (429)	MP3A							
FAX Res In (429)	MP3B							
FAX Res Out (429)	MP3C							
FAX Res Out (429)	MP3D							
Mfg. Reserved	MP3E							
Mfg. Reserved	MP3F							
SSB/AM In	MP3G	o					o	(V) 9
SSB/AM Out	MP3H	o					o BP-40	
Band Z In	MP3J	o					o	(h) 9
Band Z Out	MP3K	o					o	(E) 6

ATTACHMENT 3-2 (cont'd)
HFDU STANDARD INTERWIRING

FUNCTION	HFDU	ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
	MP4A							
	MP4B							
	MP4C							
	MP4D							
Mfg. Reserved	MP4E							
Mfg. Reserved	MP4F							
	MP4G							
	MP4H							
	MP4J							
	MP4K							
MU MSK Out Hi	MP5A			TP9C				1, 24
MU MSK Out Lo	MP5B			TP9D				1, 24
VHF MSK In Hi	MP5C					MP13A		1, 24
VHF MSK In Lo	MP5D					MP13B		1, 24
Mfg. Reserved	MP5E							
Mfg. Reserved	MP5F							
Freq Select Out A	MP5G						BP-18	
CFDS Type A	MP5H							23
CFDS Type B	MP5J							23
CFDS Type C	MP5K							23
MU MSK In Lo	MP6A			TP9B				1, 24
MU MSK In Hi	MP6B			TP9A				1, 24
VHF MSK Out Lo	MP6C					MP5B		1, 24
VHF MSK Out Hi	MP6D					MP5A		1, 24
Mfg. Reserved	MP6E							
Mfg. Reserved	MP6F							
Freq Select Out B	MP6G						BP-19	
Freq Select Out C	MP6H						BP-20	
Freq Select Out D	MP6J						BP-21	
Freq Select Out E	MP6K						BP-22	
VHF Keyline	MP7A					MP7D		24
MU Keyline	MP7B			TP5H				24
	MP7C							
	MP7D							
Mfg. Reserved	MP7E							
Mfg. Reserved	MP7F							
Freq Select Out F	MP7G						BP-23	
Freq Select Out G	MP7H						BP-24	
Freq Select Out H	MP7J						BP-25	
Freq Select Out I	MP7K						BP-26	
	MP8A							
SDI/ICAO Common	MP8B							23
	MP8C							
	MP8D							
Mfg. Reserved	MP8E							
Mfg. Reserved	MP8F							
Freq Select Out J	MP8G						BP-27	
Freq Select Out K	MP8H						BP-28	
Freq Select Out L	MP8J						BP-29	
Freq Select Out M	MP8K						BP-30	
	MP9A							
	MP9B							
	MP9C							
	MP9D							
Mfg. Reserved	MP9E							
Mfg. Reserved	MP9F							
Freq Select Out N	MP9G						BP-31	
Freq Select Out O	MP9H						BP-32	
Freq Select Out P	MP9J						BP-33	
Freq Select Out Q	MP9K						BP-34	

ATTACHMENT 3-2 (cont'd)
HFDU STANDARD INTERWIRING

FUNCTION	HFDU	ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
	MP10A							
	MP10B							
HFDU Fault	MP10C		(4)					21
HF DATA LINK LOST	MP10D		(12)					21
Mfg. Reserved	MP10E							
Mfg. Reserved	MP10F							
Freq Select Out R	MP10G						BP-35	
Freq Select Out S	MP10H						BP-36	
Freq Select Out T	MP10J						BP-37	
Freq Select Out U	MP10K						BP-38	
	MP11A							
SDI 0	MP11B							23
S/P Tune Sel	MP11C							23
Air/Ground Input	MP11D						STRUT SWITCH	
Mfg. Reserved	MP11E							
Mfg. Reserved	MP11F							
Voice Audio Out Hi	MP11E						(X)	1,22,29
Voice Audio Out Lo	MP11H						(X)	1,22,29
Voice Audio In Hi	MP11J						(X)	1,22,29
Voice Audio In Lo	MP11K						(X)	1,22,29
	MP12A							
Relay Interlock	MP12B	MP5H						
Tuner Power	MP12C	MP5C						
Voice/Data Mode	MP12D		(18)					21
Mfg. Reserved	MP12E							
Mfg. Reserved	MP12F							
A559 PTT In	MP12G						(X)	22,29
	MP12H							
Voic/Data Aud In Hi	MP12J						BP-62	1
Voic/Data Aud In Lo	MP12K						BP-63	1
A/G Polarity Sel	MP13A							23
Strap Parity	MP13B							23
MSK/429 Interface	MP13C							23
SDI 1	MP13D							23
Mfg. Reserved	MP13E							
Mfg. Reserved	MP13F							
A559 Keyline Out	MP13G						BP-54	
	MP13H							
HF Data In Hi	MP13J	MP1F						1
HF Data In Lo	MP13K	MP1G						1
CMU/MU Speed Sel	MP14A							23
TX Inhibit Pol Sel	MP14B						TO TX INHIBIT SWITCH	23
Data Loader Disc	MP14C						TO ADL	
Voice HF PTT	MP14D						2ND HF PTT	
Mfg. Reserved	MP14E							
Mfg. Reserved	MP14F							
Data Keyline Hi	MP14G	MP1K						
	MP14H							
Voic/Data Aud Out Hi	MP14J						BP-57	
Voic/Data Aud Out Lo	MP14K						BP-58	1
429 Tune Label	MP15A							23
TX Inhibit	MP15B							23
HF Test Enable	MP15C		(1)					21
	MP15D							23
Mfg. Reserved	MP15E							
Mfg. Reserved	MP15F							
Data Keyline Lo	MP15G							
	MP15H							
HF Data Out Hi	MP15J	MP1H						1
HF Data Out Lo	MP15K	MP1J						1

ATTACHMENT 3-2 (cont'd)
HFDU STANDARD INTERWIRING

FUNCTION	HFDU	① ARINC 719 HF RADIO	HFDCP	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
115 VAC/400 Hz Hi	BP1	o———	———	———	———	———	———o	A/C
	BP2							
	BP3							
	BP4							
	BP5							
	BP6							
115 VAC/400 Hz Lo	BP7	o———	———	———	———	———	———o	A/C
Chassis Ground	BP8	o———	———	———	———	———	———o	A/C
	BP9							
	BP10							
	BP11							
	BP12							
	BP13							

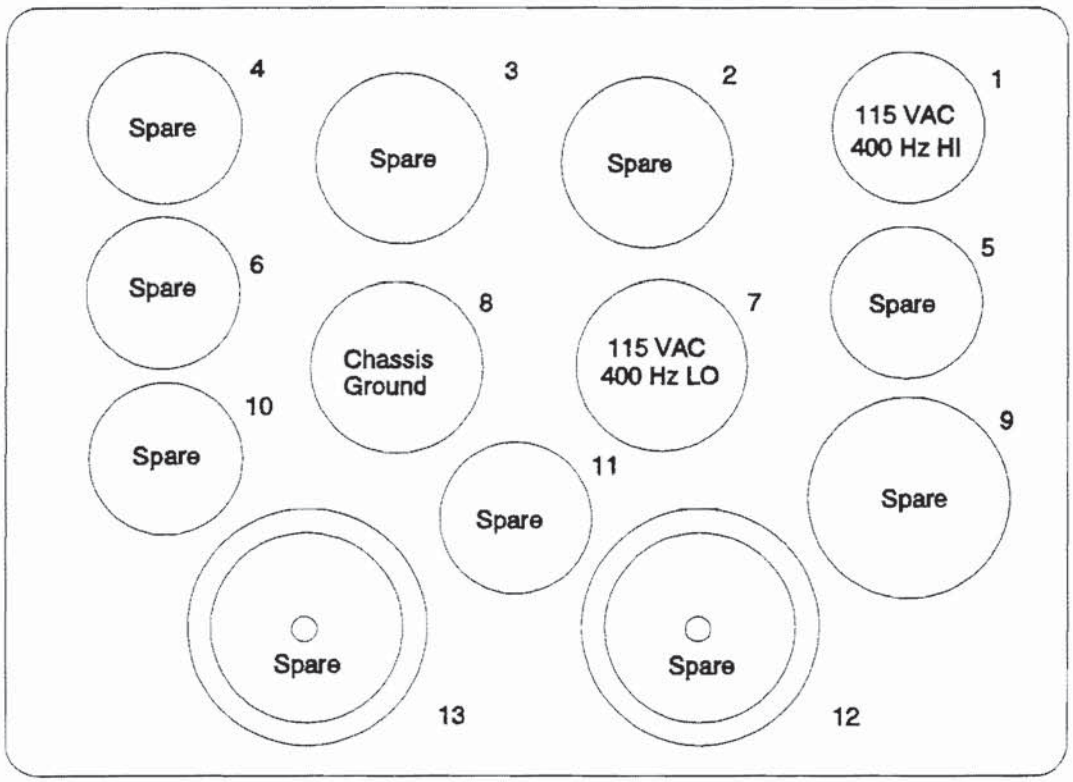
ATTACHMENT 3-3A
HFDU TOP CONNECTOR LAYOUT

	A	B	C	D	E	F	G	H	J	K
1	ATE ID	ATE ID	ATE ID	ATE ID	Mfg. Reserved	Mfg. Reserved	ICAO Parity			
2	ATE ID	ATE ID	ATE ID		Mfg. Reserved	Mfg. Reserved				
3	CMU/MU 429 Output A	CMU/MU 429 Output B			Mfg. Reserved	Mfg. Reserved	ICAO ID 1 (MSB)	ICAO ID 2	ICAO ID 3	ICAO ID 4
4	Data Loader Output A	Data Loader Output B			Mfg. Reserved	Mfg. Reserved	ICAO ID 5	ICAO ID 6	ICAO ID 7	ICAO ID 8
5	OMS Output A	OMS Output B			Mfg. Reserved	Mfg. Reserved	ICAO ID 9	ICAO ID 10	ICAO ID 11	ICAO ID 12
6	HFDU TX Output A	HFDU TX Output B			Mfg. Reserved	Mfg. Reserved	ICAO ID 13	ICAO ID 14	ICAO ID 15	ICAO ID 16
7	HF Tune Output A	HF Tune Output B			Mfg. Reserved	Mfg. Reserved	ICAO ID 17	ICAO ID 18	ICAO ID 19	ICAO ID 20
8					Mfg. Reserved	Mfg. Reserved	ICAO ID 21	ICAO ID 22	ICAO ID 23	ICAO ID 24 (LSB)
9	Position 2 Input B	Position 2 Input A	ICAO 1 Input A	ICAO 1 Input B	Mfg. Reserved	Mfg. Reserved				
10	CMU/MU1 429 Input B	CMU/MU1 429 Input A	Time Input A	Time Input B	Mfg. Reserved	Mfg. Reserved	Freq. Select In A			
11	CMU/MU2 429 Input B	CMU/MU2 429 Input A			Mfg. Reserved	Mfg. Reserved	Freq. Select in B	Freq. Select in C	Freq. Select in D	Freq. Select in E
12	OMS Input B	OMS Input A	Position 1 Input A	Position 1 Input B	Mfg. Reserved	Mfg. Reserved	Freq. Select in F	Freq. Select in G	Freq. Select in H	Freq. Select in I
13	ICAO 2 Input B	ICAO 2 Input A	Altitude Input A	Altitude Input B	Mfg. Reserved	Mfg. Reserved	Freq. Select in J	Freq. Select in K	Freq. Select in L	Freq. Select in M
14	HFDU Rx Input B	HFDU Rx Input A			Mfg. Reserved	Mfg. Reserved	Freq. Select in N	Freq. Select in O	Freq. Select in P	Freq. Select in Q
15	Data Loader Input B	Data Loader Input A			Mfg. Reserved	Mfg. Reserved	Freq. Select in R	Freq. Select in S	Freq. Select in T	Freq. Select in U

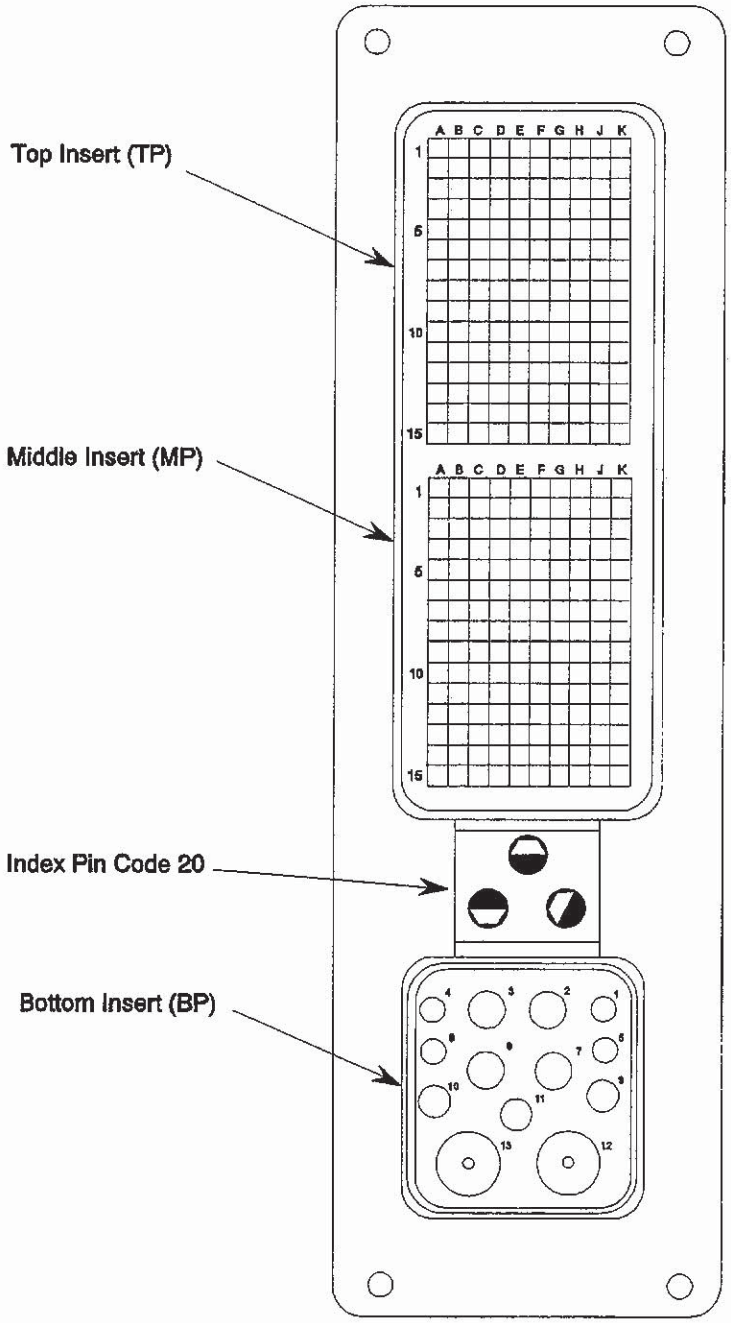
ATTACHMENT 3-3B
HFDU MIDDLE CONNECTOR LAYOUT

	A	B	C	D	E	F	G	H	J	K
1				FAX 429/Audio	Mfg. Reserved	Mfg. Reserved				
2	FAX Res. In Audio	FAX Res. In Audio	FAX Res. Out Audio	FAX Res. Out Audio	Mfg. Reserved	Mfg. Reserved	SSB/AM In	SSB/AM Out	Band X In	Band X Out
3	FAX Res. In 429	FAX Res. In 429	FAX Res. Out 429	FAX Res. Out 429	Mfg. Reserved	Mfg. Reserved	Band Y In	Band Y Out	Band Z In	Band Z Out
4					Mfg. Reserved	Mfg. Reserved				
5	MU MSK Out Hi	MU MSK Out Lo	VHF MSK In Hi	VHF MSK In Lo	Mfg. Reserved	Mfg. Reserved	Freq Select Out A	CFDS Type A	CFDS Type B	CFDS Type C
6	MU MSK In Lo	MU MSK In Hi	VHF MSK Out Lo	VHF MSK Out Hi	Mfg. Reserved	Mfg. Reserved	Freq Select Out B	Freq Select Out C	Freq Select Out D	Freq Select Out E
7	VHF Keyline	MU Keyline			Mfg. Reserved	Mfg. Reserved	Freq Select Out F	Freq Select Out G	Freq Select Out H	Freq Select Out I
8		SDI/ ICAO Common			Mfg. Reserved	Mfg. Reserved	Freq Select Out J	Freq Select Out K	Freq Select Out L	Freq Select Out M
9					Mfg. Reserved	Mfg. Reserved	Freq Select Out N	Freq Select Out O	Freq Select Out P	Freq Select Out Q
10			HFDU Fault	HF DATA LINK LOST	Mfg. Reserved	Mfg. Reserved	Freq Select Out R	Freq Select Out S	Freq Select Out T	Freq Select Out U
11		SDI 0	S/P Tune Sel	Air/ Ground In	Mfg. Reserved	Mfg. Reserved	Voice Audio Output Hi	Voice Audio Output Lo	Voice Audio Input Hi	Voice Audio Input Lo
12		Relay Interlock	Tuner Power	Voice/ Data Mode	Mfg. Reserved	Mfg. Reserved	A559 PTT In		Voice/ Data In Hi	Voice/ Data In Lo
13	A/G Polarity Sel	Strap Parity	MSK/MU Inter-face	SDI 1	Mfg. Reserved	Mfg. Reserved	A559 Keyline Out		HF Data In Hi	HF Data In Lo
14	CMU/MU Speed Sel	TX Inhibit Pol Sel	Data Loader Disc	Voice HF PTT	Mfg. Reserved	Mfg. Reserved	Data Keyline Hi		Voice/ Data Out Hi	Voice/ Data Out Lo
15	429 Tune Label Sel	TX Inhibit	HF Test Enable		Mfg. Reserved	Mfg. Reserved	Data Keyline Lo		HF Data Out Hi	HF Data Out Lo

ATTACHMENT 3-3C
HFDU BOTTOM CONNECTOR LAYOUT



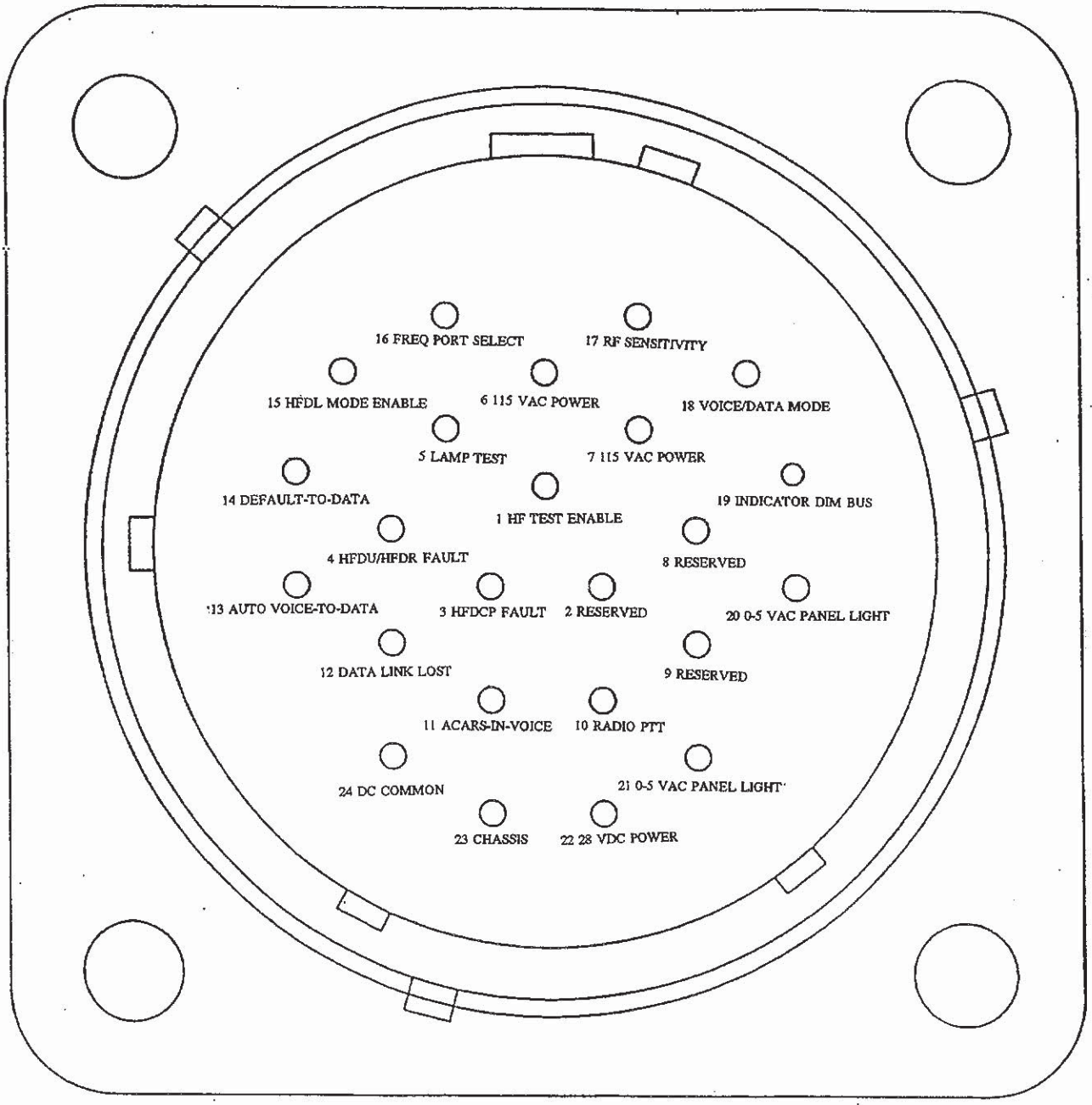
ATTACHMENT 3-3D
ARINC 600 SIZE 2 CONNECTOR - HFDU REAR VIEW



ATTACHMENT 4-1A
HF DATA CONTROL PANEL STANDARD INTERWIRING

FUNCTION	HFDCP 21	HFDU	ARINC 719 HF RADIO	HFDR	CMU/MU	VHF	ARINC 559A HF RADIO	OTHER	NOTES
HF Test Enable Out	1	MP15C							
Mfg. Reserved	2								
HFDCP Fault Out	3							A/C	
HFDU/HFDR Fault In	4	MP10C		TP7H					
Ext Lamp Test In	5							A/C	
115 VAC Panel Power Hi	6							A/C	
115 VAC Panel Power Lo	7							A/C	
Mfg. Reserved	8								
Mfg. Reserved	9								
Voice/Data Radio PTT In	10		MP1C	MP1C					OPT
ACARS-In-Voice In	11				TP5K				24
HFDL DATA LINK LOST In	12	MP10D		TP9J					
Auto Voice-To-Data In	13								23
Default-To-Data-Mode Select In	14								23
HFDL Mode Enable Out	15		MP2D	TP7G			BP-42		25
Freq. Port Select Out	16		MP3J						
RF Sensitivity Out	17		MP5J	MP5F					
Voice/Data Mode Out	18	MP12D							
26.5/12 VDC Indicator Dim Bus Hi	19							A/C Ind Bus	
0-5 VAC Panel Light Power Hi	20							A/C Ltg Bus	
0-5 VAC Panel Light Power Lo	21							A/C Ltg Bus	
28 VDC Panel Power	22							OPT A/C	
Chassis Ground	23							A/C	
DC Common	24								

ATTACHMENT 4-1B
HF DATA CONTROL PANEL CONNECTOR LAYOUT



The HF Data Control Panel should use a MIL-C-26500 type connector for the control and power interconnections identified by part number M83723-72R16247 or equivalent. The HF Data Control panel connector should mate with a cable connector identified by part number M83723-75R16247 or equivalent.

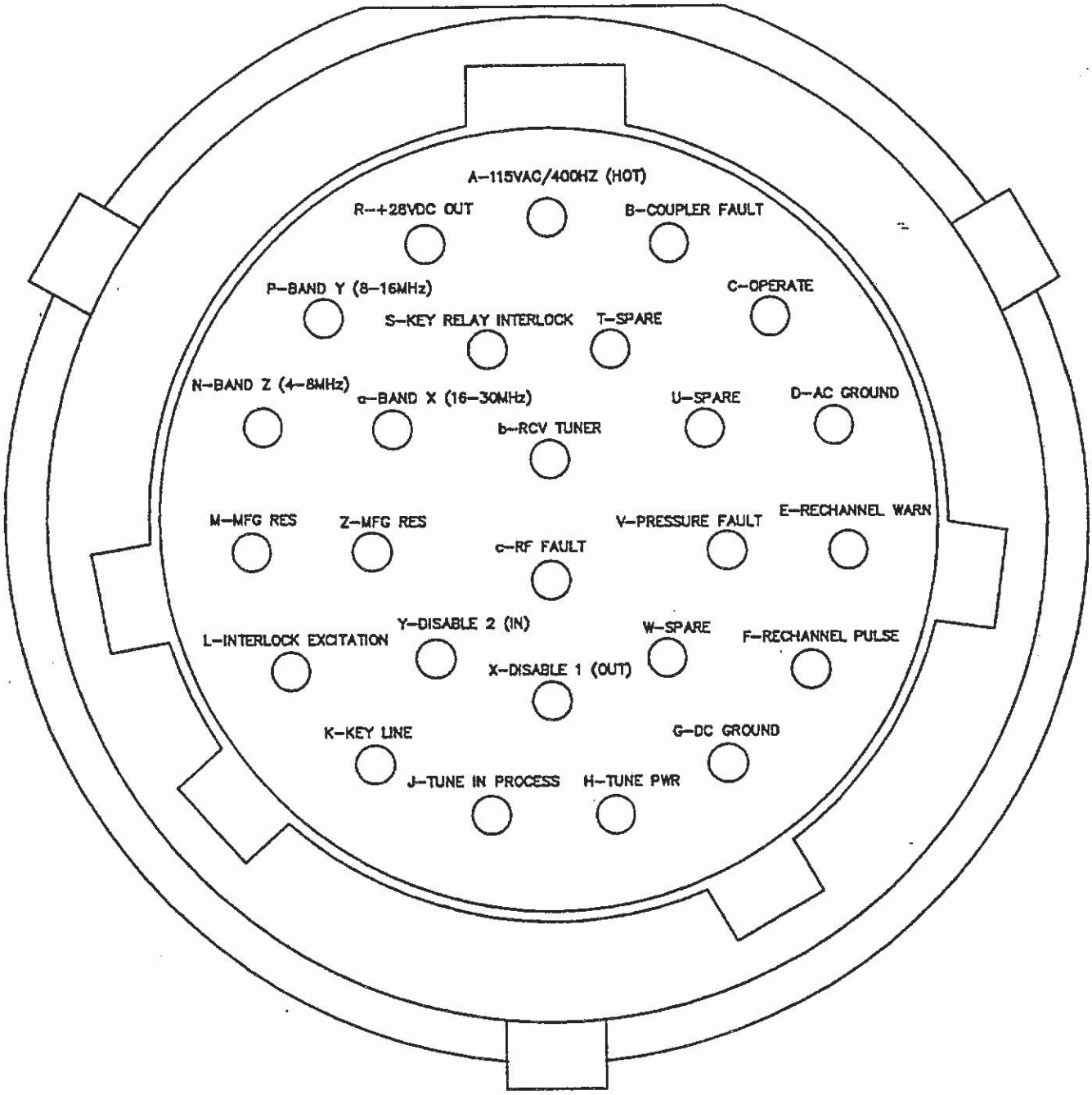
COMMENTARY

Connectors for the aircraft wiring should mate with those specified and meet or exceed the airframe requirements.

ATTACHMENT 4-2A
COUPLER STANDARD INTERWIRING

FUNCTION	COUPLER J1	OTHER
115VAC/400Hz (HOT)	A	BP-9
Coupler Fault	B	MP-4E
Operate	C	
AC Ground	D	Airframe
Rechannel Warn	E	
Rechannel Pulse	F	MP-5B
DC Ground	G	Airframe
Tune PWR	H	MP-5C
Tune In Process	J	
Key Line	K	MP-1C
Interlock Excitation	L	BP-1
Manufacturer Reserved	M	N/C
Band Z (4-8 MHz)	N	N/C
Band Y (8-16 MHz)	P	N/C
+28VDC Out	R	
Key Relay Interlock	S	MP-5H
Spare	T	N/C
Spare	U	N/C
Pressure Fault	V	
Spare	W	N/C
Disable 1 (Out)	X	Disable 2 Other Coupler
Disable 2 (In)	Y	Disable 1 Other Coupler
Spare	Z	N/C
Band X (16-30 MHz)	a	N/C
RCV Tuner	b	
RF Fault	c	MP-4H

ATTACHMENT 4-2B
COUPLER CONNECTOR LAYOUT



The Antenna Coupler should use a MIL-C-26482 type connector for the control and power interconnections identified by part number MS3449H-16-26PN or equivalent. The antenna coupler connector should mate with a MIL-C-26482 type cable connector identified by part number MS3116E-16-26S or equivalent.

COMMENTARY

Connectors for the aircraft wiring should mate with those specified and meet or exceed the airframe requirements.

ATTACHMENT 5
NOTES APPLICABLE TO STANDARD INTERWIRING

NOTE 1: Wire Types should be shielded, twisted or twisted and shielded as indicated where protection from electromagnetic interference (EMI) is deemed appropriate. All shielded wires should have an insulating jacket over the shield to prevent intermittent grounds. All shields for analog circuits should be grounded at one end only and to the same ground stud. Shields for digital circuits should be grounded at every break point.

NOTE 2: The "115 Vac out" power circuits from the SSB R/T Unit provided on pin BP9, may be employed for the various functions within the antenna tuner. However, the maximum drain from the R/T Unit is not expected to exceed the values set forth in Attachment 2-1.

NOTE 3: A three-phase, 5 ampere, ganged circuit breaker should be provided in the standard HFDR installation. Equipment designers should, however, observe the guidance set forth concerning primary power failures in any one of the three phases that may not be protected by the circuit breaker.

NOTE 4: Inasmuch as audio and sidetone outputs from the receiver are fairly low impedance, the mixing circuit for the audio and sidetone should take into consideration any possible interaction due to squelch operation and audio volume control adjustment.

As pointed out in Note 5 below, any external relays required for sidetone or muting operation should be connected as explained in Note 5.

NOTE 5: The Attachment 2 interwiring does not show connections of the interlock with any other HF equipment in the aircraft. It should be noted that the keying relay in the R/T Unit cannot operate unless the "Keyline" lead is energized external to the R/T Unit with 27 Vdc. The "Keyline" lead is connected to ground through the usual push-to-talk switch on the microphone as detailed in Attachment 3 of ARINC Characteristic 719, or this lead may be grounded automatically by the antenna tuner, the 27 Vdc for the keyline interlock lead is provided through the connection of the functional lead (G) on the usual antenna tuner. The tuner either supplies its own 27 Vdc to this lead through the appropriate control circuitry or it may employ function lead (P) to obtain 27 Vdc from the R/T provided on pin BP11. When the SSB equipment is employed with an antenna tuner not providing such a keyline interlock, the user must run a jumper (in the junction box) between pins BP1 and MP5H on the R/T Unit to energize the keyline interlock lead and hence the keying relay.

When external relays are employed to provide special interlock functions or to supply sidetone or audio muting in accordance with Note 4, all such relays in a particular installation should be designed to operate on a total current drain of less than 0.25 amperes at 27 Vdc and the coils of all such relays should be paralleled with the "Keyline" lead MP1K and the "Keyline Interlock" lead MP5H, noting the special case of tuners explained in Note 8 which draw a current pulse.

NOTE 6: The numbers in parentheses under the column "Antenna Tuner" are not specific pin connections on any specific connector but are symbolic connections which are interpreted in terms of specific antenna tuners. No attempt is made in the interwiring of Attachment 2 to show other circuitry and wiring to the antenna tuners other than the standardized interconnections with the SSB System which are specifically shown for symbolic connections (A) through (P). The installer should refer to the antenna tuner manufacturer's manuals and instructions for further information on the various applications of the specific antenna tuners.

Regarding the connection to the symbolic pin (M) on the Antenna Tuner, since none of the Antenna Tuners referenced in Attachment 5 to ARINC Characteristic 719 need 250 Vdc, no pin is assigned for this function on ARINC Characteristic 753 equipment.

NOTE 7: The 27 Vdc output on pin BP11 should supply an impulse relay in some antenna tuners. The average current drawn by the antenna tuner should not exceed 1/2 ampere. However, the peak current may be as high as 8 amperes for a maximum duration of 20 milliseconds. The aircraft interwiring should take this peak load condition into consideration.

NOTE: 8 The tune power provision is deemed necessary on this equipment. Pin MP5C on the R/T Unit should be connected to the functional lead A on the antenna coupler. A ground on this line while the antenna coupler is tuning should reduce the RF output power of the R/T Unit, operate the AM relay, and activate the tune tone circuit to supply a tuning tone to the aircraft audio system.

ATTACHMENT 5 (cont'd)
NOTES APPLICABLE TO STANDARD INTERWIRING

NOTE 9: Pin assignments are for ARINC 559A-compatible control panels. Details on pin functions for the optional re-entrant tuning system may be found in ARINC Characteristic 559A.

NOTE 10: Some certifying authorities may require that the transmitter be disabled and a warning tone generated in the audio system whenever the receiver is tuned to a radio frequency on which the transmitter is unable to transmit because of limitations to the aircraft tuning unit. Pin MP5J is reserved for selection of either a narrow (2..8 to 23.9999 MHz) range or a wide (2.0 to 29.9999 MHz) range of operation. An "open" pin selects the narrow range and a grounded pin selects the wide range. If the narrow range is selected and an attempt is made to operate the transceiver outside the 2.8 to 23.9999 MHz range, a warning tone is produced in the audio output and the transmitter is disabled.

NOTE 11: An "open" on pin MP3A selects SSB operation and a "ground" selects AM operation. An "open" on pin MP3B selects USB operation and a "ground" selects LSB operation. These pins select modes only when re-entrant tuning is selected on MP2J.

NOTE 12: Some specialized radios use pin MP2A as a CW keyline. However, none of these radios are expected to be used by airlines. Pin MP2A has been reserved to promote interchangeability.

NOTE: 13 Future Spare (Contact) Contact positions in equipment-mounted service connectors labelled "Future Spare (Contact)" should be furnished with the contact hardware (pin or socket as appropriate) and provisions made within the equipment for their use. Contact positions labelled "Future Spare" may or may not be furnished with connector hardware at the equipment manufacturer's discretion. Contact hardware need not be provided in either type of connector position in aircraft-mounted rack connectors. The "Future Spare (Contact" positions will be the first to be used if and when additional contact assignments are needed.

NOTE 14: When the three-phase power is supplied through these pins, the "state" of power control relay is controlled by pin MP5D. A "ground" on pin MP5D should turn the radio "on". An "open" on pin "MP5D should turn the radio "off".

NOTE 15: Pin MP2F is connected internally to pin MP1B. Pin MP2F can be jumpered to pin MP2B to obtain internal grounding or it may be connected to an external ground.

NOTE 16: For control panels utilizing liquid crystal displays, a "ground" on pin 6 indicates a test of static displays.

NOTE 17: "Open" = 1 = True condition. "Short" = 0 = False condition.

NOTE 18: Reserved

NOTE 19: Connect to the appropriate HF system; e.g., if HF #2 is used for Data, then connect TP7K to HF #2 PTT and MP1C to HF #1 PTT or vice versa if HF #1 is used for Data.

NOTE 20: Reserved

NOTE 21: A High Frequency DataLink Control Panel (HFDCP) or equivalent to be installed in a cockpit to provide the crew with the means to control HF Datalink operation.

NOTE 22: These wires should be connected to the Junction Box for ARINC 559A radio.

NOTE 23: Programming pins for HFDU and HFDCP.

NOTE 24: MSK connections to MU and VHF radio should be used when the MU does not have provisions to communicate with the HFDU via 429 ports.

NOTE 25: This line should be connected to BP-41 of ARINC 559A radio if "Squelch" instead of "RF Sensitivity" is used on the Control Panel.

NOTE 26: 429 bus speed select discrete input. "Open" = 1 = Low speed. "Short" = 0 = High speed.

ATTACHMENT 5 (cont"d)
NOTES APPLICABLE TO STANDARD INTERWIRING

NOTE 27: ARINC 429 Low speed data bus.

NOTE 28: ARINC 429 High speed data bus.

NOTE 29: In an HF Datalink installation these connections between the Audio Control Panel and the ARINC 559A HF radio should be disconnected and connected instead to the HFDU.

ATTACHMENT 6
ENVIRONMENTAL TEST CATEGORIES PER DO-160C

The ARINC 753 HF Data Radio and HF Data Unit should meet as a minimum the RTCA/DO-160C categories shown in the chart. The categories are dependent on location in the airplane. The possible equipment locations are, E/E Rack (Transceiver), Flight Deck (Control Panels), and Fuselage (Antenna Coupler).

RTCA/ DO-160C SECTION	ENVIRONMENT	RACK MOUNTED UNITS	FLIGHT DECK PANELS	FUSELAGE ANTENNA COUPLER ENVIRONMENT (1)	
				Pressurized	Non Pressurized
4	Temperature and Altitude	A2	A2	A2	D2
5	Temperature Variation	B	C	B	A
6	Humidity	A	A	A	B
7	Operational Shocks and Crash Safety	Required			
8	Vibration	Required			
9	Explosion Proofness	Per Airframe Requirements			
10	Water Proofness	X	X	X	S
11	Fluids Susceptibility	X	X	X	F
12	Sand and Dust	X	X	X	D
13	Fungus Resistance	X	X	X	F
14	Salt Spray	X	X	X	S
15	Magnetic Effect	A	A	A	B
16	Power Input	A	A	A	A
17	Voltage Spike	A	A	A	A
18	Audio Frequency	Z	Z	Z	Z
19	Induced Signal Susceptibility	Z	Z	Z	Z
20	Radio Frequency Susceptibility (2)	U or T	U or T	U or T	V
21	Emission of Radio Frequency Energy	Z	Z	Z	Z
22	Lightning Induced Transient Susceptibility	J	J	J	K
23	Lightning Direct Effects	Not Applicable			
24	Icing	X	X	X	C

Note 1: Antenna requirements depend on antenna type and location on the fuselage. Refer to airframe manufacturer requirements.

Note 2: For ATS the value U is the more stringent requirement.

ATTACHMENT 7
MAINTENANCE SYSTEM CODES

Table 7-1. OMS Fault Indication Codes

Fault Code ID	Nomenclature	Description
1	Power Interrupt Recovery	Power interrupt has occurred in the last 3 seconds
2	CMC Activity Fail	No data received from the CMC.
3	CMC Signal Fail	CMC data is invalid.
(optional)		
4	BITE Test Inhibit	Initiated test is inhibited.
5-9	Reserved	
10	HF Data LRU Failure	The HF Data LRU has failed.
11	Coupler Failure	Coupler has failed.
12	Antenna Failure	Antenna has failed.
13	CFDIU input bus	Bus is inactive.
14	Source Selection	Port A, Port B is selected.
15	Input Data	Input data is inactive.
16	Antenna/Coax Status	Antenna or Coax has failed.
17	MU/CMU Input 1	No data received from MU/CMU Input 1.
18	MU/CMU Input 2	No data received from MU/CMU Input 2.
19	Lat/Long Input	Lat/Long Input is inactive.
20	UTC Input	UTC Input is inactive.
21	ICAO Address ARINC 429 Input 1	Input 1 inactive.
22	ICAO Address ARINC 429 Input 2	Input 2 inactive.
23	Strap Odd Parity	Strap Odd Parity failed.
24	Opposite Side HFDL Input	Opposite Side inactive/failed.

Note: Fault ID Codes 1 thru 3 are assigned to generic faults, and Code 4 is assigned to BITE Test Inhibit, based on guidance material in ARINC Report 624.

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7-2-a. Bit-Oriented CFDS BITE Command Summary Word for HFDR

BIT NO.	FUNCTION	BIT STATUS	
		1	0
1 2	Label 227 (Octal)		
3 4 5			
6 7 8			
9 10	SDI		
11 12	Pad		
13 14 15 16	Equipment ID (Hex) - 019		
17 18 19 20			
21 22 23 24			
25 26 27 28 29 30 31	(See Functional Select Table A7.1 in ARINC Report 604.)		
32	Parity (odd)		

NOTE: This Attachment supercedes ARINC Report 604, "Guidance for Design and Use of Built-In Test Equipment (BITE)", dated 1988.

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7-2-b. Bit-Oriented CFDS BITE Command Summary Word for HFDU

BIT NO.	FUNCTION	BIT STATUS	
		1	0
1 2	Label 227 (Octal)		
3 4 5			
6 7 8			
9 10	SDI		
11 12	Pad		
13 14 15 16	Equipment ID (Hex) - 053		
17 18 19 20			
21 22 23 24			
25 26 27 28 29 30 31	(See Functional Select Table A7.1 in ARINC Report 604.)		
32	Parity (odd)		

NOTE: This Attachment supercedes ARINC Report 604, "Guidance for Design and Use of Built-In Test Equipment (BITE)", dated 1988.

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7-3-a. Bit-Oriented CFDS BITE Fault Summary Word for HFDR

BIT NO.	FUNCTION	BIT STATUS	
		1	0
1 2 3 4 5 6 7 8	Label (350) (Octal)		
9 10	SDI 00 = All Call 01 = One 10 = Two 11 = Three		
11	Transceiver Failure	Failed	OK
12	Coupler Failure	Failed	OK
13	Antenna Failure		(Always 0)
14	CFDIU Input Bus	Inactive	OK
15	Source Selection	Port A	Port B
16	Input Data	Inactive	OK
17	Antenna/Coax Status	Failed	OK
18	MU/CMU Input 1	Inactive	OK
19	MU/CMU Input 2	Inactive	OK
20	Lat/Long Input	Inactive	OK
21	UTC Input	Inactive	OK
22	ICAO Address ARINC 429 Input 1	Inactive	OK
23	ICAO Address ARINC 429 Input 2	Inactive	OK
24	Strap Parity	Failed	OK
25	Opposite Side HFDL Input	Inactive	Failed
26	X		
27	X		
28	BITE Test Inhibit	Inhibit	Enable
29	Command Acknowledge	ACK	NAK
30 31	SSM 00 = Failure Warning 01 = Functional Test 10 = NA 11 = Normal Operation		
32	Parity		

NOTE: This Attachment supercedes ARINC Report 604, "Guidance for Design and Use of Built-In Test Equipment (BITE)", dated 1988.

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7-3-b. Bit-Oriented CFDS BITE Fault Summary Word for HFDU

BIT NO.	FUNCTION	BIT STATUS	
		1	0
1 2 3 4 5 6 7 8	Label (350) (Octal)		
9 10	SDI 00 = All Call 01 = One 10 = Two 11 = Three		
11 12 13 14 15			
16	Input Data	Inactive	OK
17	Antenna/Coax Status	Failed	OK
18	MU/CMU Input 1	Inactive	OK
19	MU/CMU Input 2	Inactive	OK
20	Lat/Long Input	Inactive	OK
21	UTC Input	Inactive	OK
22	ICAO Address ARINC 429 Input 1	Inactive	OK
23	ICAO Address ARINC 429 Input 2	Inactive	OK
24	Strap Parity	Failed	OK
25	Opposite Side HFDL Input	Inactive	Failed
26	X		
27	X		
28	BITE Test Inhibit	Inhibit	Enable
29	Command Acknowledge	ACK	NAK
30 31	SSM 00 = Failure Warning 01 = Functional Test 10 = NA 11 = Normal Operation		
32	Parity		

NOTE: This Attachment supercedes ARINC Report 604, "Guidance for Design and Use of Built-In Test Equipment (BITE)", dated 1988.

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7.4 Fault Messages For HFDR BITE

FAULT MESSAGES FOR HFDR BITE	
Type of Failure	Message ATA/Failure Class
Control Input Mode	RMP X (FIN) / HFDR X (FIN) 23-81-12/1 MU/CMU X (FIN) / HFDR X (FIN) 23-24-34/1
CFDS/CMS	CMC X (FIN) / HFDR X (FIN) 45-13-34/3
Internal LRU	HFDR X (FIN) 23-11-33/1
Coupler	HF CPLR X (FIN) 23-11-33/1
Antenna	HF X Antenna (FIN) / Feeder X (FIN) CPLR X (FIN)/COAX 23-11-11/1
Power Supply	Power Supply Interrupt 24-00-00/1

NOTES:

1. X: Side of the LRU (Ex: CMU1)

2. FIN: Functional Item Number of the concerned LRU
(EX: CMC1 (1TM1)
CMC2 (1TM2))

3. Power supply interruption or transients should not be reported as an LRU failure. When the power interruption is longer than 200 ms, the following fault message must be sent to the CMC at the return of the power supply: "POWER SUPPLY INTERRUPT" (external fault).

   For electrical power interrupts between the transparency time and 200 ms, the message "POWER SUPPLY INTERRUPT" must only be generated by the transceivers having a refresh period on their ARINC 429 buses shorter than 80 ms.

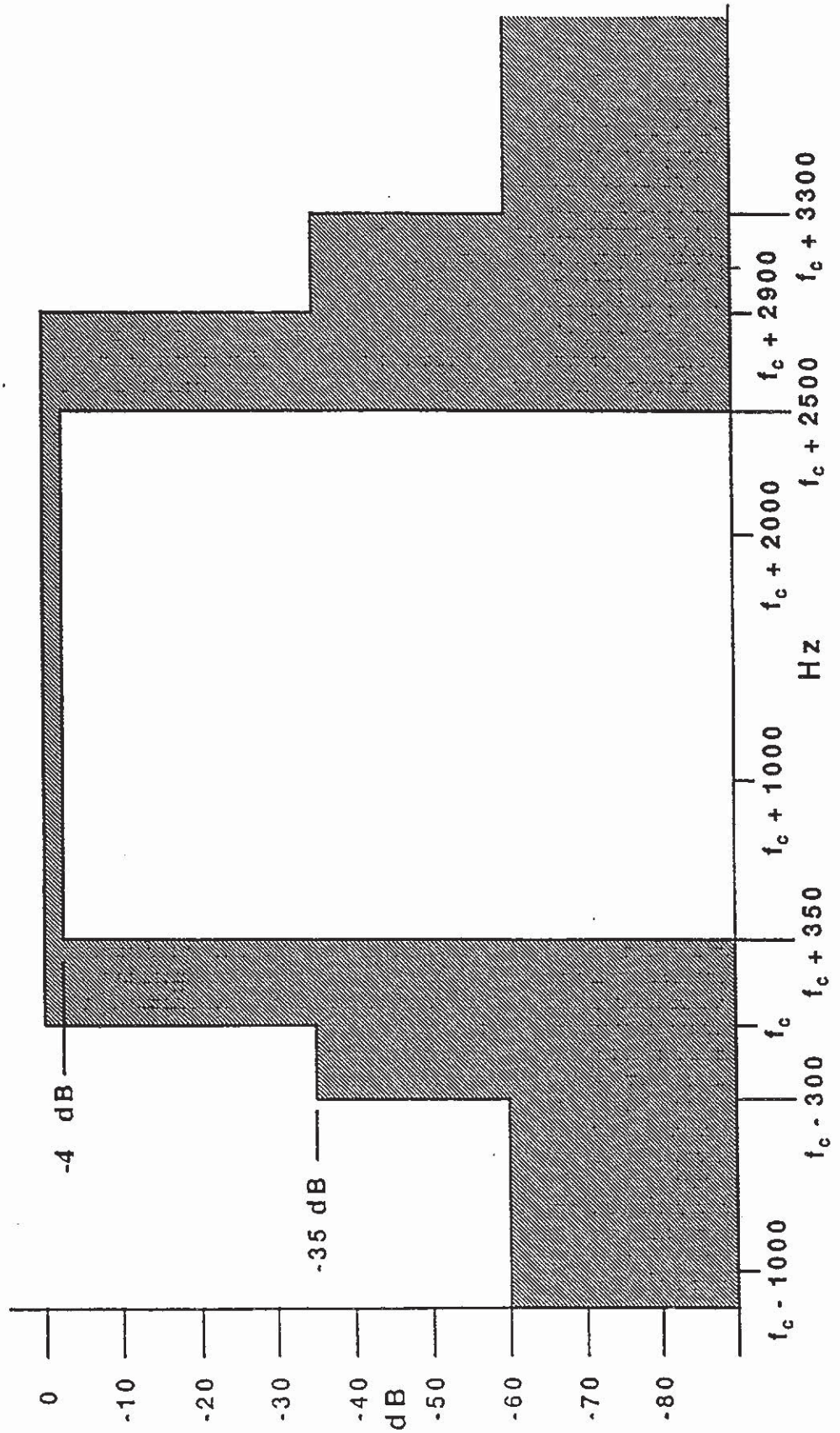
   The ATA chapter relative to this failure is 24-00-00 for all aircraft types

ATTACHMENT 7 (cont'd)
MAINTENANCE SYSTEM CODES

Table 7-5. Maintenance System Type Identification

CFDS TYPE A	CFDS TYPE B	CFDS TYPE C	TYPE
Ground	Ground	Ground	Future Use
Ground	Ground	Open	McDonnell-Douglas CFDS
Ground	Open	Ground	Airbus CFDS
Ground	Open	Open	Future Use
Open	Ground	Ground	Boeing CFDS
Open	Ground	Open	Future Use
Open	Open	Ground	Future Use
Open	Open	Open	CFDS/OMS Not Installed

ATTACHMENT 8
USB SELECTIVITY

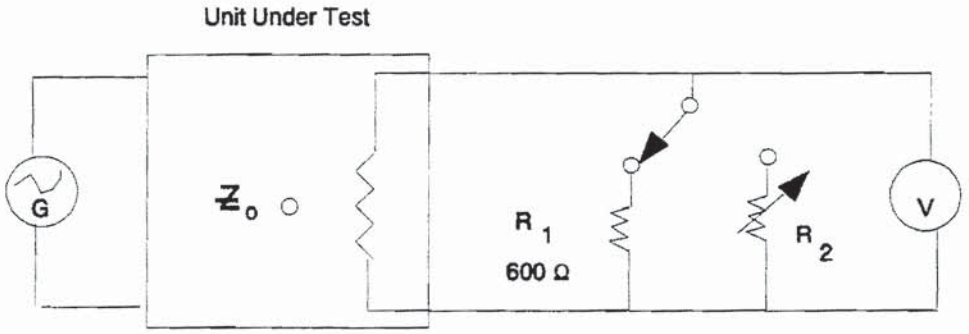


Notes:

1. Receive data input audio signal amplitude should be within shaded portion of curve.
2. f_c is the carrier frequency.

ATTACHMENT 9
TYPICAL TEST PROCEDURES

AUDIO OUTPUT

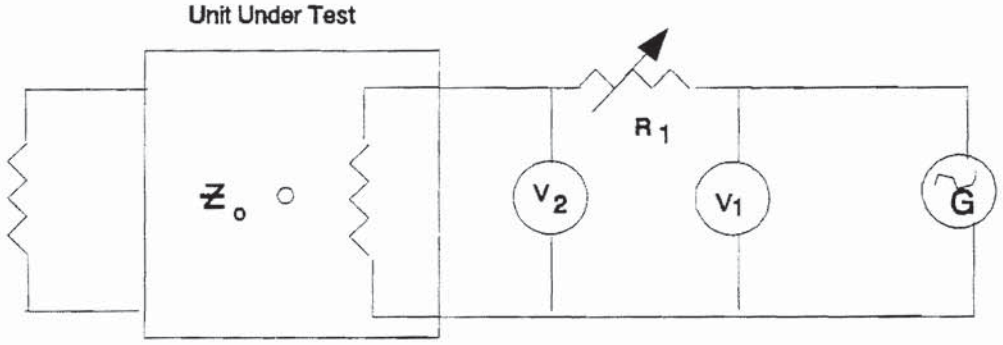


a) Select R_1, adjust input and unit under test for desired output level V_1 (up to rated output)

b) Select R_2, adjust R_2 for $V_2 = .9\ V_1$

c) $Z_o = \frac{60\ R2}{540 - R_2}$

Figure 1



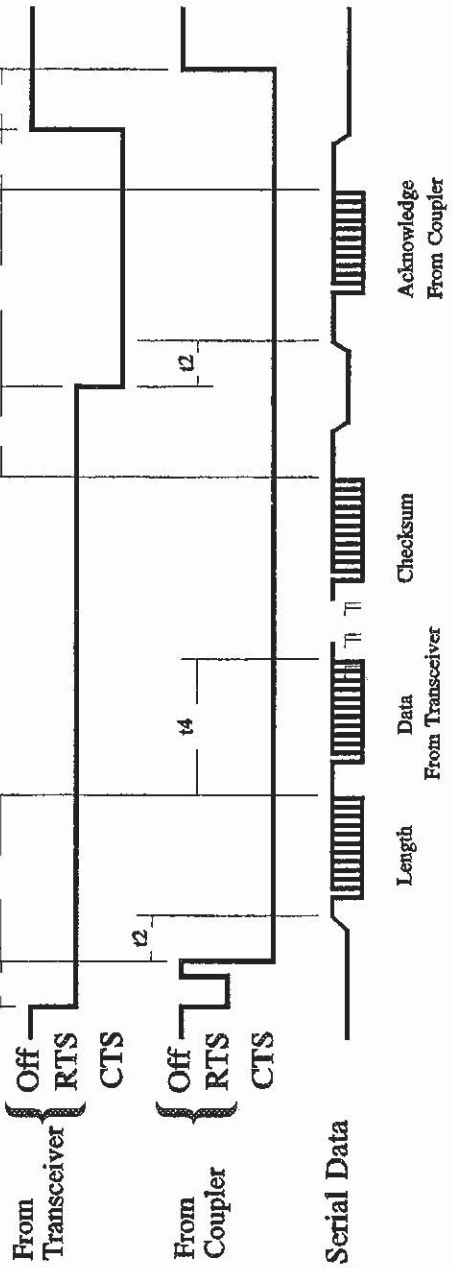
a) adjust and maintain signal source (G) at $V_1 = 30$ mV

b) adjust R_1 until $V_2 = 1/2\ V_1$

c) $Z_o = R_1$

Figure 2

ATTACHMENT 10
TYPICAL MESSAGE TRANSFER DIAGRAM



ATTACHMENT 11
COUPLER CMC FLIGHT DATA

Flight Phase(8)	0: Ground, 1: Flight (DC2), 2: Flight (DC1)
Date (24)	Six BCD digits,
	LSW: Tens of year, Units of year
	2, Word: Tens of month, Units of month
	MSW: Tens of day, Units of day
Time (UTC)(16)	Four BCD digits
	LSW: Tens of minutes, Units of minutes
	MSW: Tens of hours, Units of hours
Flight Leg Number(8)	Integer 0 to 63
Aircraft Identification(56)	7 ISO #5 Character
	LSW: 1.Aircraft Tail Character
	2.word: 2.Aircraft Tail Character
	3.word: 3.Aircraft Tail Character
	4.word: 4.Aircraft Tail Character
	5.word: 5.Aircraft Tail Character
	6.word: 6.Aircraft Tail Character
	MSW: 7.Aircraft Tail Character
Aircraft Type(8)	Integer 0 to 256
	0: Aircraft without CMC/CFDS
	1: MD-11
	2: A340/330
	3: A320
	4: Boeing 747-400
	5 to 255: Future spare
Frequency(32)	Binary coded frequency in Hertz, LSW first, MSW last
Mode of Emission(8)	Integer: 0:SSB/USB, 1:SSB/LSB, 3:AM(E)

APPENDIX A
HF TRANSMISSION REQUIREMENTS

1. General Description

This appendix provides a short introduction to the physical environment of the HFDL with a brief description how electromagnetic wave are propagating in HF range. The peculiarities of the HF channel are discussed because the properties of this channel have decisive influences to the system design of an HFDR.

The HFDL is an integral part of the ACARS/ATN communications subnetwork.

2. Requirements Concerning HF Transmission

The short wave or HF range in the electromagnetic spectrum is characterized by the frequencies from 2 Mhz to 30 MHz or equivalently by the wavelengths from approximately 10 m to approximately 150 m. The operational possibilities of signal transmission methods depend on the physical properties of the radio channel. Therefore the main specifics applicable to the HF range are covered below.

3. Electromagnetic Wave Propagation

3.1 The Ionosphere

The ionosphere is that area of the atmosphere, at an altitude from 60 km through 400 km, which is conductive due to ionization. The degree of ionization is mainly determined by the intensity of solar radiation and particle density in the ionosphere. Hence the degree of ionization (as density of the free charge carrier per unit of volume) depends on altitude and the kind of elements in different layers. HF wave propagation is mainly influenced by four layers (D, E, F1, and F2).

The heights and densities of the ionospheric layers as well as their electron concentrations depend on:

- time of day,
- season,
- sunspot number.

The sunspot number is subject to immense fluctuations. During the time of a sunspot number minimum the concentrations of free charge carriers in the ionosphere are in average distinctly less than the concentrations during a sunspot number maximum.

At lower level of charge carrier concentrations the reflecting ability of the ionospheric layers decreases, which means that electromagnetic wave penetrate and pass the layers more easily and are not reflected.

The frequency which is still reflected when perpendicularly incident to a layer is referred to as the critical frequency. If an electromagnetic wave strikes on ionospheric layer not perpendicularly, but obliquely, the electron density for that wave is effectively greater and it will therefore be more strongly reflected than the perpendicularly incident wave. At a fixed frequency the angle of reflection varies according to the angle of incidence and thus results in different propagation distances. The limit frequency, at which the ionospheric layer still reflects, also varies with the angle of incidence.

3.2 Peculiarities of Propagation in the Short Wave Range

Electromagnetic waves in the HF range propagate in form of ground waves as well as in form of sky waves. Due to the finite electrical conductivity of the earth's surface, energy from the ground wave penetrates it and is absorbed. This leads to a high attenuation and short ground wave's propagation. The attenuation is less over sea (high salt content, good conductivity) than over land. When skywave in the HF range are reflected by the ionosphere then return to the earth's surface at distant point. There are two regions around transmitter:

- the ground wave zone,
- the sky wave zone.

The extent of those zones depend on:

- transmitters, receivers, and antennas (power, frequency, radiation conditions),
- constitution of the ground (for the ground wave),
- state of the ionosphere (for the sky wave).

Ground wave operation is extensively free of all other influences. Naturally the wave can be received only within the transmitter's ground wave distance, i.e. the intercept distance is limited as far as ground wave propagation is regarded.

Where skywave propagation is concerned the electromagnetic waves are reflected by the ionosphere as a function of angle of incidence and the frequency used. Multi-reflections also occur
frequently thus covering long distances.

Electromagnetic waves are attenuated when passing the ionospheric layers; this applies particularly to the D-layer, which is present only during the day.

During skywave propagation in the HF range, transient fluctuations of the signals propagation time occur, which are due to changes in the altitude of the reflecting layer in the ionosphere and to multipath propagation. A short transmission signal appears as a series of signals at the receiver and a longer signals are extended.

Therefore the implementation of dedicated HF Modems with adaptive echo cancelers becomes necessary.

APPENDIX A (cont'd)
HF TRANSMISSION REQUIREMENTS

3.3 Propagation Predictions

The possibilities of transmitting HF signals from one location to another are determined by

- the lowest usable frequency (LUF) and
- the maximum usable frequency (MUF).

The LUF depends mainly on the state of the D and the E layers, it decreases with increasing transmitter power. The variation of the LUF is mainly influenced by the sunspot number.

The Upper frequency, at which traffic between two radio stations is possible by sky wave operation, is the MUF. The MUF cannot be influenced by increasing transmitter power, it depends upon time of the day, season, and sunspot number.

The frequency of optimum traffic (FOT) is fixed empirically at 0.85 of the monthly median value of the MUF for a given link.

Propagation predictions contain details about ground wave distances, LUF, MUF, and about skywave distances to be expected.

On the basis of propagation prediction, modern HF communication systems use adaptive frequency management to select the optimum frequency for a link to be established.

3.4 Fading

Occasional reductions of received signal strength are referred to as fading. Fading may effect the complete radio channel or only some specific narrow frequencies within the channel. Single tone modems provide adequate robustness against fading.

3.5 Noise

Unavoidable random interference which affects communication is addressed as noise. Such random interferences are added to the signal and cause fluctuations of received signal.

Equipment internal generators, converters, or consumers of electrical power are sources for internal random noise.

External random noise is caused for example by interference fields at antenna sites. Electromagnetic interference fields are created by:

- industrial activities (man made noise),
- terrestrial thermal radiation,
- atmospheric occurrences (thunderstorms, currents in the ionosphere), and
- cosmic radiation.

4. Frequency Selection

To ensure reliable connections, modern HF data radios use automatic channel selection, i.e. they operate with a frequency pool. Of course the frequency tables on-ground and on-board have to be identical.

Before link setup, the chosen frequency is sensed for the occupation by the sending station.

APPENDIX B
ACARS MU-HFDU MSK INTERFACE

1. Introduction

This appendix describes an alternate interface between the HF Data Unit (HFDU) and the ACARS Management Unit (MU) for aircraft equipped with ACARS MUs which do not have two spare ARINC 429 bus ports for HF downlink transmission and uplink reception. In these installations, the HFDU should interface to the MU via the Minimum Shift Key (MSK) audio ports and to the VHF and HF transceivers as shown in Attachment 3-1. Decisions regarding the switching between VHF ACARS and HFDL should be made in the HFDU.

COMMENTARY

This type of installation is not intended to support the full range of AOC and ATC services available via HF Datalink. It may be used in the interim for AOC communications until the ACARS MU is replaced or upgraded with HF Datalink provisions.

2. MSK Audio Interface Definition

The HFDU may be installed in aircraft where the ACARS MU does not have the necessary HF Datalink provisions. In these installations the HFDU should communicate with the ACARS MU using a transmit/receive pair of MSK audio ports. These ports should be connected to the MSK audio receive and transmit ports normally used by the ACARS MU to communicate with the VHF transceiver. For a detailed definition of the MSK audio interface refer to Section 4.4 of ARINC Specification 618.

In these installations the only data exchanged via the MSK audio ports will be ACARS data blocks since the ACARS MU will most likely not have HF Datalink provisions. The format of this data is defined in Appendix A of ARINC Specification 618.

3. HF/VHF Switching Functions

When the HFDU-MU interface is via MSK audio ports, the HFDU is responsible for deciding when ACARS data is to be exchanged via the VHF or HF Datalink subnetworks and for the routing of the data between the HF and VHF transceivers and the ACARS MU.

3.1 HF/VHF Mode Selection

The HFDU should be configurable via a discrete programming pin to switch between HF and VHF data modes either automatically based on aircraft position (latitude and longitude) information or manually based on crew selection.

3.1.1 Manual Switching Mode

When the HFDU is configured for manual switching mode, the cockpit crew should use the HF voice/data switch in the HF Datalink Control Function (HFDCF) to control when ACARS data is to be sent via HFDL and when it is to be sent via VHF. The HFDU should monitor the HF voice/data discrete input from the HFDCF and default to VHF data mode when the HF voice/data discrete input is "high". When the HF voice/data discrete is "low" it should default to HF data mode.

3.1.2 Automatic Switching Mode

When the HFDU is configured for automatic switching, the HFDU should have stored in memory maps of HF and VHF coverage areas. The HFDU should switch between HF and VHF data modes by comparing its current position (latitude and longitude) with the coverage maps.

3.2 MU-VHF Transceiver Interfaces Switching

The HFDU should intercept the MSK audio and the VHF data keyline connections between the ACARS MU and the VHF transceiver. When the HF voice/data discrete input is "high", the MU-VHF transceiver connections should be closed. When the HF voice/data discrete input is "low", the MU-VHF transceiver audio and data keyline connections should be closed if the HFDU is in VHF data mode and open if it is in the HF data mode. In the event of an HFDU failure, the MU-VHF connections should default to closed.

APPENDIX C
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

1.1 Frequency and Mode Control Serial Bus Inputs

ARINC 719-5 Section 3.1, 3.2

The HFDR has 2 input ports to accept ARINC 429 Mark 33 DITS low speed serial data. The ARINC 429 bus uses two lines with return-to-zero bipolar modulation. The frequency and mode control bus inputs are received on the following pin numbers:

Frequency Select Port A line A MP-3E
Frequency Select Port A line B MP-3F

Frequency Select Port B line A MP-3G
Frequency Select Port B line B MP-3H

The HFDR will respond to frequency and mode control words through Frequency Select Port A or B, depending on the state of the PORT SELECT discrete input. All data on the non-selected port is ignored.

The HFDR will tune to a new frequency within 1 second after receiving all necessary ARINC 429 control data.

1.1.1 037 HF COM Frequency and Control Words

ARINC 429 Section 3.1

When the FREQUENCY SOURCE SELECT discrete is open, the HFDR is controlled by ARINC 429 label 037. Refer to section 3.1 of ARINC 429 for a description of the 037 HF Communications control words. SSB and AME Mode information and BCD frequency information down to 0.001 MHz resolution is contained in 037 word #1. CW Enable and 100 Hz BCD frequency information is contained in 037 word #2. Label 037 word #1 and #2 need not come in any particular order.

CW mode is enabled only when 037 word #1 is set for SSB USB mode and the CW Enable bit is set in 037 word #2. CW mode is disabled if 037 word #1 is set for SSB LSB mode or AME mode, even if the CW Enable bit is set in 037 word #2.

037 word #2 is optional and needs to be sent to the HFDR only when the desired frequency has non-zero 100 Hz data, or when CW mode is desired. If 037 word #2 is not received for at least 5 refresh intervals (approximately 1.3 seconds), the HFDR will assume the 100 Hz frequency control data is zero, and it will assume CW mode is disabled. Thus, loss of 037 word #2 is considered a frequency change.

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

1.1.2 205 & 206 HF COM Frequency Words

ARINC 429 Section 3.1

When the FREQUENCY SOURCE SELECT discrete is grounded, the HFDR will respond to label 205 or 206 frequency control words. Only those words whose SDI matches the installation number of the HFDR as set by the SDI program pins or whose SDI is "all-call" will be accepted by the HFDR. All other data will be ignored.

BCD frequency information down to 0.001 MHz resolution is contained in 205 or 206 word #1. 100 Hz BCD frequency information is contained in 205 or 206 word #2. The 205 or 206 words #1 and #2 need not come in any particular order. The data fields in the 205 and 206 words are identical and the HFDR does not distinguish between the two. Naturally, the 205 and 206 words should never appear on the same bus with differing frequency control data.

205 and 206 word #2 is optional and needs to be sent to the HFDR only when the desired frequency has non-zero 100 Hz data. As with the 037 word #2, if 205 or 206 word #2 is not received for at least 5 refresh intervals (approximately 1.3 seconds), the HFDR will assume the 100 Hz frequency control data is zero. Loss of 205 or 206 word #2 is considered a frequency change.

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

1.1.3 207 HF COM Mode Control Word

ARINC Project Paper 736 Attachment 10

When the FREQUENCY SOURCE SELECT discrete is grounded, the HFDR will respond to label 207 mode control word. Only those words whose SDI matches the installation number of the HFDR as set by the SDI program pins or whose SDI is "all-call" will be accepted by the HFDR. All other mode control data will be ignored.

Note 1: The HFDR does not use bits 20, 21 or 23 through 29 of the label 207 control word.

Note 2: All zeros = 0 ohms, all ones = 5000 ohms. 5000 ohms = minimum RF sensitivity or maximum squelch threshold, 0 ohms = maximum RF sensitivity or minimum squelch threshold.

Note 3: If the Frequency Source Select programming pin MP-2K is open, indicating label 037 tuning, then voice/data mode selection is controlled by the VOICE/DATA SELECT discrete at rear connector pin MP-2D. If MP-2K is grounded, indicating label 205/206/207 tuning, then voice/data mode selection is controlled by bit 11 of label 207.

Note 4: CW mode will be enabled only when SSB USB mode is also selected. CW mode will be disabled when SSB LSB mode or AME mode is selected.

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

1.1.4 Control Input Faults for label 037

The Frequency Control processor will report a Control Input Fault to the Maintenance processor and to the front panel CONTROL INPUT FAIL LED under any of the four following conditions:

1. Label 037 word #1 is not received over the selected input port for at least 270 msec.

2. Label 037 word #1 has even parity.

3. The word gap between label 037 word #1 and any preceding word is shorter than the minimum gap specified in ARINC Specification 429.

4. The frequency control data is not a valid BCD value, or is out of the range 2.0000 to 29.9999 MHz.

When a control input fault exists, the HFDR will remain at the last selected frequency and mode, and the fault will be reported until valid control data is received.

Loss of 037 word #2 will not be reported as a Control Bus fault, although such a loss will automatically tune the 100 Hz data to zero and disable CW mode as described in Section 2.7.1.

If the HFDR is strapped for the narrow band, 2.8000 to 23.9999 MHz, and it receives frequency control data that is between 2.0000 and 2.7999 MHz or between 24.0000 and 29.9999 MHz, it will tune to the selected frequency, but the transmitter will be disabled and a 1 kHz tone will be inserted in the sidetone audio output when the PTT is activated.

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

1.1.5 Control Input Faults for labels 205/206/207

The Frequency Control processor will report a Control Input Fault to the Maintenance processor and to the front panel CONTROL INPUT FAIL LED under any of the four following conditions:

1. Label 205 or 206 word #1, or label 207 is not received over the selected input port for at least 270 msec.

2. Label 205 or 206 word #1, or label 207 has even parity.

3. The word gap between label 205 or 206 word #1, or label 207 and any preceding word is shorter than the minimum gap specified in ARINC Specification 429.

4. The frequency control data is not valid BCD value, or is out of the range 2.0000 to 29.999 MHz.

When a control input fault exists, the HFDR will remain at the last selected frequency and mode, and the fault will be reported until valid control data is received.

Loss of 205 or 206 word #2 will not be reported as a Control Bus fault, although such a loss will automatically tune the 100 Hz data to zero and disable CW mode as described in Section 2.7.2.

If the HFDR is strapped for the narrow band, 2.8000 to 23.9999 MHz and it receives frequency control data that is between 2.0000 and 2.7999 MHz or between 24.0000 and 29.9999 MHz, it will tune to the selected frequency, but the transmitter will be disabled and a 1 kHz tone will be inserted in the sidetone audio output when the PTT is activated.

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

Label: 037
Name: HF COM Frequency Word #1
Refresh interval: 100 - 200 milliseconds

Bit	Value	
1	0	LABEL 037
2	0	"
3	0	"
4	1	"
5	1	"
6	1	"
7	1	"
8	1	"
9	0, Word #1 Ident	
10	SSB/AME Mode, 1 = SSB, 0 = AME	
11	USB/LSB Mode, 1 = USB, 0 = LSB	
12	0.001 MHz, BCD least significant	
13	"	
14	"	
15	0.001 MHz, BCD most significant	
16	0.01 MHz, BCD least significant	
17	"	
18	"	
19	0.01 MHz, BCD most significant	
20	0.1 MHz, BCD least significant	
21	"	
22	"	
23	0.1 MHz, BCD most significant	
24	1 MHz, BCD least significant	
25	"	
26	"	
27	1 MHz, BCD most significant	
28	10 MHz, BCD least significant	
29	10 MHz, BCD most significant	
30	SSM bit 0	
31	SSM bit 1	
32	odd parity	

Sign Status Matrix Definition

bit 1	bit 0	Definition
0	0	normal operation
0	1	NCD, HFDR ignores freq. and mode data
1	0	Functional Test (Squelch is open)
1	1	normal operation

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

Label: 037
Name: HF COM Frequency Word #2
Refresh interval: optional - 0 when 100 Hz frequency control data is zero, 100 - 200 milliseconds when 100 Hz frequency control data is non-zero

Bit	Value	
1	0	LABEL 037
2	0	"
3	0	"
4	1	"
5	1	"
6	1	"
7	1	"
8	1	"
9	1, Word #2 Ident	
10	CW Enable, 1 = enabled, 0 = disabled	
11	not used	
12	not used	
13	not used	
14	not used	
15	not used	
16	not used	
17	not used	
18	not used	
19	not used	
20	not used	
21	not used	
22	not used	
23	not used	
24	not used	
25	not used	
26	0.1 kHz, BCD least significant	
27	"	
28	"	
29	0.1 kHz, BCD most significant	
30	SSM bit 0	
31	SSM bit 1	
32	odd parity	

Sign Status Matrix Definition

bit 1	bit 0	Definition
0	0	normal operation
0	1	NCD, HFDR ignores frequency data
1	0	Not used by HFDR
1	1	normal operation

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

Label: 205 or 206
Name: HF COM Frequency Word #1
Refresh interval: 100 - 200 milliseconds

Bit	Value	
1	1 (1)	LABEL 205 (206)
2	0 (0)	"
3	0 (0)	"
4	0 (0)	"
5	0 (0)	"
6	1 (1)	"
7	0 (1)	"
8	1 (0)	"
9	SDI least significant bit	
10	SDI most significant bit	
11	0, Word #1 Ident	
12	0.001 MHz, BCD least significant	
13	"	
14	"	
15	0.001 MHz, BCD most significant	
16	0.01 MHz, BCD least significant	
17	"	
18	"	
19	0.01 MHz, BCD most significant	
20	0.1 MHz, BCD least significant	
21	"	
22	"	
23	0.1 MHz, BCD most significant	
24	1 MHz, BCD least significant	
25	"	
26	"	
27	1 MHz, BCD most significant	
28	10 MHz BCD least significant	
29	10 MHz, BCD most significant	
30	SSM bit 0	
31	SSM bit 1	
32	odd parity	

Sign Status Matrix Definition

bit 1	bit 0	Definition
0	0	normal operation
0	1	NCD, HFDR ignores frequency data
1	0	Not used by HFDR
1	1	normal operation

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

Label: 205 or 206
Name: HF COM Frequency Word #2
Refresh interval: optional - 0 when 0.1 kHz frequency control data is zero, 100 - 200 milliseconds when 0.1 kHz frequency control data is non-zero

Bit	Value	
1	1 (1)	LABEL 205 (206)
2	0 (0)	"
3	0 (0)	"
4	0 (0)	"
5	0 (0)	"
6	1 (1)	"
7	0 (1)	"
8	1 (0)	"
9	SDI least significant bit	
10	SDI most significant bit	
11	1, Word #2 Ident	
12	not used	
13	not used	
14	not used	
15	not used	
16	not used	
17	not used	
18	not used	
19	not used	
20	not used	
21	not used	
22	not used	
23	not used	
24	not used	
25	not used	
26	0.1 kHz, BCD least significant	
27	"	
28	"	
29	0.1 kHz, BCD most significant	
30	SSM bit 0	
31	SSM bit 1	
32	odd parity	

Sign Status Matrix Definition

bit 1	bit 0	Definition
0	0	normal operation
0	1	NCD, HFDR ignores frequency data
1	0	Not used by HFDR
1	1	normal operation

APPENDIX C (cont'd)
ARINC 429 CONTROL WORD FORMATS FOR THE HFDR

Label: 207
Name: HF COM Mode Control Word
Refresh interval: 100 - 200 milliseconds

Bit	Value	
1	1	LABEL 207
2	0	"
3	0	"
4	0	"
5	0	"
6	1	"
7	1	"
8	1	"
9	SDI least significant bit	
10	SDI most significant bit	
11	1 = Data Mode, 0 = Voice Mode, see note 3	
12	voice mode keying	
13	(reserved), data mode keying	
14	1 = SSB Mode, 0 = AME Mode	
15	1 = USB Mode, 0 = LSB Mode	
16	1 = CW Mode on, 0 = CW Mode off, see note 4	
17	on/off control	
18	not used	
19	not used	
20	LSB, who has control of SENS/SQUELCH, see note 1	
21	MSB, who has control of SENS/SQUELCH, see note 1	
22	1 = RF sensitivity control, 0 = squelch control	
23	SENS/SQUELCH control, least sig. bit, see notes 1 & 2	
24	"	
25	"	
26	"	
27	"	
28	"	
29	SENS/SQUELCH control, most sig. bit, see notes 1 & 2	
30	SSM bit 0	
31	SSM bit 1	
32	odd parity	

Sign Status Matrix Definition

bit 1	bit 0	Definition
0	0	normal operation
0	1	NCD, HFDR ignores mode data
1	0	Functional Test (Squelch is open)
1	1	normal operation

APPENDIX D
DOCUMENTS LIST

The following documents are referenced in this Characteristic. Designers should be aware that many of these documents are in the continuing process of being supplemented.

ARINC Specification 404A, "Air Transport Equipment Cases and Racking"

ARINC Report 413A, "Guidance for Aircraft Electrical Power Utilization and Transient Protection"

ARINC Characteristic 429, "Mark 33 Digital Information Transfer System (DITS)"

ARINC Characteristic 559A, "Mark 2 HF SSB/AM System"

ARINC Characteristic 597, "Mark 2 Aircraft Communications Addressing and Reporting System"

ARINC Specification 600, "Air Transport Avionics Equipment Interfaces (NIC Phase 1)"

ARINC Report 604, "Guidance for Design and Use of Built-In Test Equipment (BITE)"

ARINC Specification 608A, "Design Guidance for Avionics Test Equipment"

ARINC Report 609, "Design Guidance for Aircraft Electrical Power Systems"

ARINC Report 615, "Airborne Computer High-Speed Data Loader"

ARINC Specification 616, "Avionics Subset of ATLAS"

ARINC Specification 618, "Air-Ground Character-Oriented Protocol Specification"

ARINC Report 624, "Design Guidance for Onboard Maintenance System"

ARINC Specification 626, "Standard ATLAS Subset for Modular Test"

ARINC Specification 631, "Aviation VHF Packet Communication (AVPAC) Functional Description"

ARINC Specification 635, "HF Data Link Protocols"

ARINC Specification 637, "Internetworking Specification"

ARINC Specification 638, "Upper Layer Specifications (End System Communication Specifications)"

ARINC Characteristic 714, "Mark 3 Airborne SELCAL System"

ARINC Characteristic 719, "Airborne HF/SSB System"

ARINC Characteristic 720, "Digital Frequency/Function Selection for Airborne Electronic Equipment"

ARINC Characteristic 724, "Mark 2 Aircraft Communications Addressing and Reporting System"

ARINC Characteristic 724B, "Aircraft Communications Addressing and Reporting System (ACARS)"

ARINC Characteristic 748, "Communications Management Unit (CMU)"

RTCA Document DO-160C, "Environmental Conditions and Test Procedures for Airborne Electronic/Electrical Equipment and Instruments".

RTCA Document DO-163, "Minimum Performance Standards for Airborne HF Radio Communications Transmitting and Receiving Equipment Operation Within the Radio Frequency Range of 1.5 to 30 MHz"

RTCA Document DO-170, "Audio Systems Characteristics and Minimum Operational Performance Standards - Aircraft Microphones (Except Carbon), Aircraft Headsets and Speakers, Aircraft Audio Selector Panels and Amplifiers"

RTCA Document DO-178B, "Software Considerations in Airborne Systems and Equipment Certification"

APPENDIX E
ACRONYM LIST

AAC	Airline Administrative Communications
AC	Alternating Current
ACARS	Aircraft Communications Addressing and Reporting System
ACK	Acknowledge
ACP	Audio Control Panel
ADL	Airborne Data Loader
ADLP	Airborne Data Link Processor
AEEC	Airlines Electronic Engineering Committee
AF	Audio Frequency
A/G	Air-ground
AGC	Automatic Gain Control
AHLC	Aviation HF Link Control
AM	Amplitude Modulation
AME	Amplitude Modulated Equivalent
AOC	Airline Operational Control
APC	Airline Passenger Communications
ARINC	Aeronautical Radio, Inc.
ATC	Air Traffic Control
ATE	Automatic Test Equipment
ATLAS	Abbreviated Test Language for Avionics Systems
ATM	Air Traffic Management
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
AVLC	Aviation HF Link Control
AVPAC	Aviation (VHF) Packet Communication
BCD	Binary Coded Decimal
BER	Bit Error Rate
BIT	Built-In Test
BITE	Built-In Test Equipment
BNR	Binary Number
BOP	Bit-Oriented Protocol
BP	Bottom Plug
BW	Bandwidth
CAA	Civil Aviation Authority
CCIR	International Radio Consultative Committee
CCITT	International Telephone and Telegraph Consultative Committee
CCS	Cabin Communications System
CFDIU	Centralized Fault Display Interface Unit
CFDS	Centralized Fault Display System
CMC	Central Maintenance Computer
CMS	Central Maintenance System
CMU	Communications Management Unit
CPLR	Coupler
CTS	Clear to Send
CTU	Cabin Telecommunications Unit
CW	Continuous Wave
dB	Decibel
dBm	Decibels relative to 1 milliwatt
DC	Direct Current
DCE	Data Circuit-terminating Equipment
DITS	Digital Information Transfer System
DTE	Data Terminal Equipment
DTS	Data Transfer State
DXE	Data Exchange Equipment

APPENDIX E (cont'd)
ACRONYM LIST

EMI	Electromagnetic Interference
EOM	End of Message
FAX	Facsimile
FCS	Frame Check Sequence
FMC	Flight Management Computer
FMS	Frequency Management System
FOT	Frequency of Optimum Transmission
GMT	Greenwich Mean Time
GPS	Global Positioning System
HF	High Frequency
HFDCF	High Frequency Data Control Function
HFDCP	High Frequency Data Control Panel
HFDL	High Frequency Data Link
HFDR	High Frequency Data Radio
HFDU	High Frequency Data Unit
HFPAC	HF Packet
HFRCP	HF Radio Control Panel
HW	Hardware
Hz	Hertz
ICAO	International Civil Aviation Organization
ID	Identifier
IEEE	Institute of Electrical and Electronic Engineers
ISO	International Organization for Standardization
kHz	kiloHertz
kW	kiloWatt
LED	Light Emitting Diode
LRU	Line Replaceable Unit
LSB	Least Significant Bit/Byte
LSB	Lower Sideband
LWS	Local Wait State
LUF	Lowest Usable Frequency
MAC	Media Access Control
MCDU	Multifunction Control Display Unit
MCU	Modular Concept Unit
MHz	MegaHertz
MP	Middle Plug
ms	millisecond
MSB	Most Significant Bit/Byte
MSI	Multi-wire Serial Interface
MSK	Minimum Shift Keying
MU	Management Unit
MUF	Maximum Usable Frequency
NAK	Negative Acknowledge
NCTS	Not Clear to Send
OOR	Out of Range
OSI	Open Systems Interconnection
OMC	Onboard Maintenance Computer
OMS	Onboard Maintenance System
PEP	Peak Envelope Power
PSK	Phase Shift Keying
PTT	Push-to-Talk
RAM	Random Access Memory
RCP	Radio Control Panel

APPENDIX E (cont'd)
ACRONYM LIST

RF	Radio Frequency
RMP	Radio Management Panel
RMS	Root-mean-Square
RNR	Receive Not Ready
ROM	Read Only Memory
RR	Receive Ready
R/T	Receive/Transmit
RTS	Request to Send
SAL	System Address Label
SDI	Source Destination Identifier
SDU	Satellite Data Unit
SELCAL	Selective Calling
SITA	Societe Internationale de Telecommunications Aeronautiques
SNR	Signal-to-Noise Ratio
SQP	Signal Quality Parameter
SRU	Shop replaceable Unit
SSB	Single Sideband
SW	Software
SYN	Synchronization
TEST	Test Frame
TP	Top Plug
UTC	Universal Coordinated Time
USB	Upper Sideband
VDR	VHF Data Radio
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
W	Watt
XCVR	Transceiver
XID	Exchange Identity