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U.S.A.

System Description and Installation Manual

HS-600
High Speed Data System

23-20-31

Title Page T-1

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Honeywell

SYSTEM DESCRIPTION AND INSTALLATION MANUAL

HS-600 High Speed Data System

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INTRODUCTION

INTRODUCTION

1. Proprietary, Export, and Precautionary Data

A. Proprietary Notice

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- A CAUTION is an operation or maintenance procedure or condition that, if not obeyed, can cause damage to the equipment.
- A NOTE gives data to make the work easier or gives directions to go to a procedure.

(2) All personnel who operate equipment and do maintenance specified in this manual must know and obey the safety precautions. The warnings and cautions that follow apply to all parts of this manual.

WARNING: BEFORE YOU USE A MATERIAL, REFER TO THE MANUFACTURERS' MATERIAL SAFETY DATA SHEETS FOR SAFETY INFORMATION. SOME MATERIALS CAN BE DANGEROUS.

CAUTION: DO NOT USE MATERIALS THAT ARE NOT EQUIVALENT TO MATERIALS SPECIFIED BY HONEYWELL. MATERIALS THAT ARE NOT EQUIVALENT CAN CAUSE DAMAGE TO THE EQUIPMENT AND CAN VOID THE WARRANTY.

CAUTION: THE HS-600 HIGH SPEED DATA SYSTEM CONTAINS ITEMS THAT ARE ELECTROSTATIC DISCHARGE SENSITIVE (ESDS). IF YOU DO NOT OBEY THE NECESSARY CONTROLS, A FAILURE OR UNSATISFACTORY OPERATION OF THE UNIT CAN OCCUR FROM ELECTROSTATIC DISCHARGE. USE APPROVED INDUSTRY PRECAUTIONS TO KEEP THE RISK OF DAMAGE TO A MINIMUM WHEN YOU TOUCH, REMOVE, OR INSERT PARTS OR ASSEMBLIES.

2. Content Data

A. How to Use This Manual

(1) This manual gives general system description and installation information for the HS-600 High Speed Data System. It also gives block diagram and interconnect information to permit a general understanding of the system interface.

(2) The purpose of this manual is to help you install, operate, maintain, and troubleshoot the HS-600 High Speed Data System. Common system maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

(3) Related publications that are referred to in this manual are identified in Table Intro-1.

Table Intro-1. Related Publications

Publication	Publication No.
Handling, Storage, and Shipping Procedures for Honeywell Avionics Equipment Instruction Manual	A09-1100-001
MCS-3000/6000 Multi-Channel Satellite Communications System Description, Installation, and Maintenance Manual	C15-5111-005
MCS-4000/7000 Multi-Channel SATCOM System Description, Installation, and Maintenance Manual	A15-5111-001

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C. Acronyms and Abbreviations

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(2) The letter symbols for units of measurement are the same as shown in ANSI/IEEE Std 260.

Term	Definition
ACSE	access control and signalling equipment
ACU	antenna control unit
BSU	beam steering unit
CCA	circuit card assembly
CMT	commissioning and maintenance terminal
CNS/ATM	communication, navigation, and surveillance/air traffic management
DLNA	diplexer/low noise amplifier
DLT	data logging terminal
ESD	electrostatic discharge
ESDS	electrostatic discharge sensitive
HGA	high gain antenna
HIRF	high intensity radiated electromagnetic frequencies
HPA	high power amplifier
HSD	high speed data
HSU	high speed data unit
ICAO	International Civil Aviation Organization: Agency of the UN
IPC	Illustrated Parts Catalog
IPDS	Inmarsat Packet Mode Data Service
IRS	inertial reference system
ISDN	Integrated Services Digital Network
LES	land earth station
LESA	land earth station assignment
LRU	line replaceable unit

Term	Definition
M4	multi-media mini-M
MCS	multi-channel SATCOM
MCU	modular concept unit
MEL	minimum equipment list
MES	Mobile Earth Station
MM/HSD	Mini M/high speed data
MTBF	mean-time-between-failures
NCSA	network coordination station assignment
PC	personal computer
PID	personal identification number
PSTN	Public Switched Telephone Network
RF	radio frequency
RFU	radio frequency unit
SATCOM	satellite communications
SCPC	single channel per circuit
SDM	System Definition Manual
SDU	satellite data unit
SU	signal unit
TDM	time division multiplex
TDMA	time division multiple access

3. Customer Assistance

A. Who to Contact

(1) For assistance with installation, operation, or maintenance of the HS-600 High Speed Data System, contact your local Honeywell Dealer or regional Honeywell Customer Support Engineer. Additional assistance can be obtained from:

- Honeywell
  Aviation Services, Customer Response Center (CRC)
  Commercial Electronic Systems
  21111 N. 19th Avenue
  Phoenix, AZ 85027

  TEL: (877) 436-2005 (Toll-Free)
  FAX: (602) 436-1501

SYSTEMS DESCRIPTION
AND OPERATION

SECTION 1
SYSTEM DESCRIPTION AND OPERATION

1. Overview

A. General

(1) The HS-600 high speed data system provides multi-channel Inmarsat Aero cockpit and passenger voice, fax, and data, and multi-media mini-M (M4) circuit-mode services simultaneously. Figure 1-1 shows a block diagram of the high speed data (HSD) system.

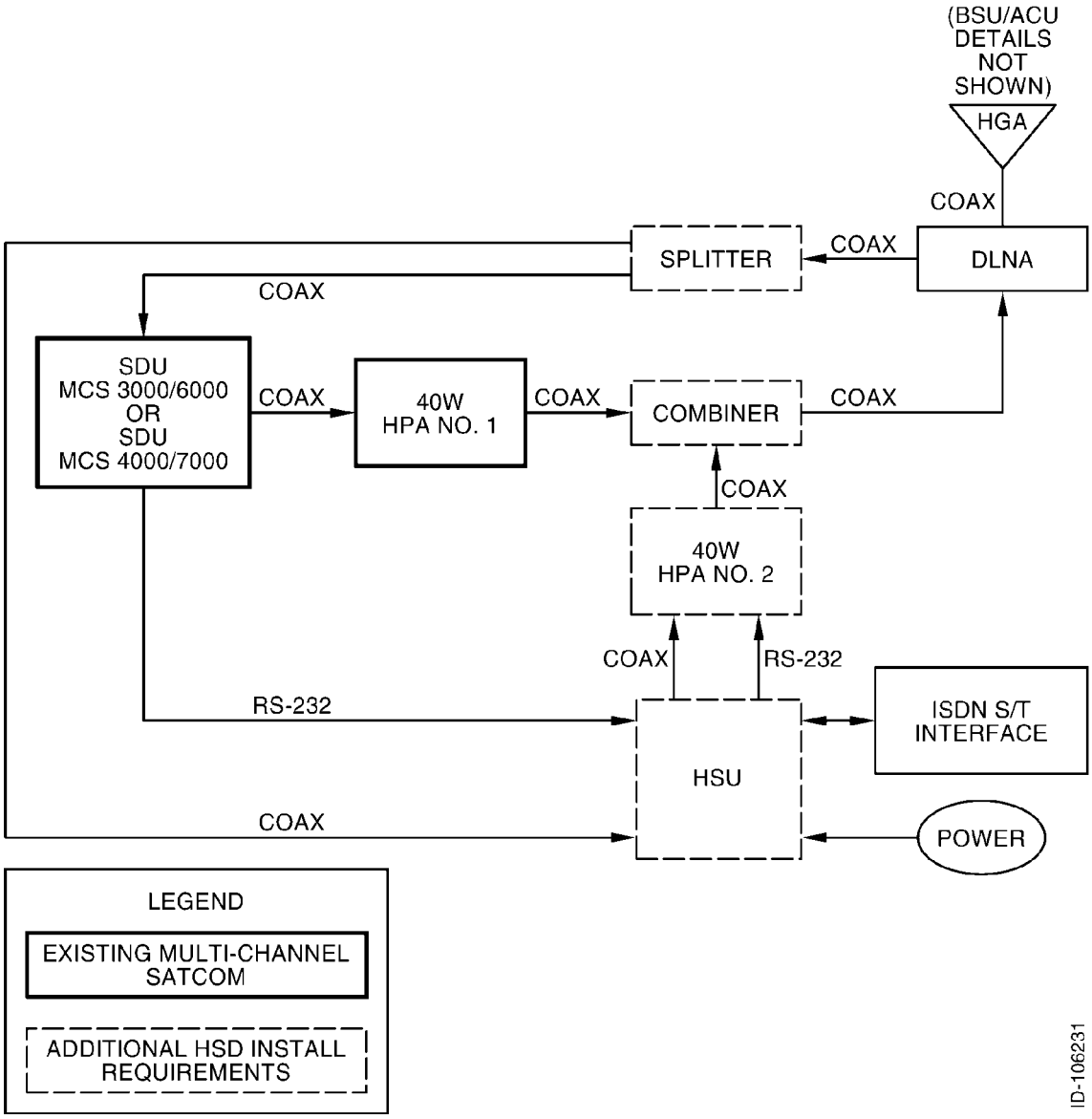

Figure 1-1. High Speed Data System Block Diagram

(2) The HSD system is capable of being integrated with the MCS-3000, MCS-6000, MCS-4000, and MCS-7000 multi-channel (MCS) satellite communications (SATCOM) systems with Aero-H/H+ high gain antennas (HGA). The HSD system is interfaced with its own dedicated 40 W high power amplifier (HPA).

(3) The L-band radio frequency (RF) outputs of the HSD system HPA and the satellite data unit (SDU)/radio frequency unit (RFU) 40 W HPA is combined with a high power combiner. The output of the high power combiner drives a common diplexer/low noise amplifier (DLNA) and a nominal 12 dB gain antenna. The SDU manages the satellite selection and steers the HGA.

(4) The Aero-H/H+ SDU and HPA requires no hardware or operational software modifications, and operates without knowledge of the HSD system presence. However, each SDU used in conjunction with the HSD system will require advance configuration of its data logging terminal (DLT) parameter settings.

(5) The SDU's DLT RS-232 port must be configured to transmit the ASCII data given in Table 1-1, at a rate of approximately 1 Hz, for the functions in Table 1-1 to be performed in the HSD system (SDU to HSU transmit only).

Table 1-1. SDU DLT RS-232 Port Configuration

Data	Function
Satellite Selected	Satellite selection
Position (Latitude/Longitude)	Spot beam selection
Satellite-Relative Velocity	Open-loop Doppler compensation
Current Antenna Gain	Antenna gain variation compensation
Log-On Status	Status of satellite selected indication (stable or not)

(6) The SDU CMT keystrokes given in Table 1-2 (starting from the main menu) are required to configure the SDU to broadcast the desired data from its DLT port.

Table 1-2. SDU CMT Keystrokes

Keystroke	Description
HBA	To logging menu
00020509 <cr>	Enter logging word
B1 <cr>	Set logging period
C60 <cr>	Set heading record frequency
E1 <cr>	Select DLT port for output
D1 <cr>	Enable logging

(7) The DLT configuration settings remain in effect indefinitely, unless subsequently manually changed or a factory settings restart is performed. If the SDU in conjunction with the HSD system is replaced for any reason, the replacement SDU will require its DLT port to be configured appropriately.

(8) The HSD system controls its HPA through the HPA's commissioning and maintenance terminal (CMT) RS-232 input port (HSU to HPA transmit only), dynamically controlling the transmit RF carrier on/off state as well as the HPA's backoff state.

B. Aero-H/H+

(1) Aero-H/H+ is a multi-channel aeronautical system that can operate in both the Inmarsat-3 global and spot beams using either a fuselage- or tail-mounted HGA. The type of antenna and the global/spot beam operation identify the type of service possible as given in Table 1-3.

Table 1-3. Type of Service

Aero Type	Antenna	Global Beam	Spot Beam	Voice 9.6 kbps	Voice 4.8 kbps	Secure Voice 4.8 kbps	Fax (max)	PC Data (max)	Packet Mode Data (max)
Aero-H	High gain	Yes	No	Yes	No	Yes	4.8 kbps	2.4 kbps	10.5 kbps
Aero-H+	High gain	Yes	Yes	Yes	Yes	Yes	4.8/2.4 kbps	2.4 kbps	10.5 kbps

(2) When used within the spot beams, Aero-H+ voice and data rates are lower. Therefore, it requires less power so that call charges are reduced. All Honeywell/Thales aeronautical equipment complies with the International Civil Aviation Organization (ICAO) Agency of the UN requirements for aeronautical safety services. The equipment can be used for communication, navigation, and surveillance/air traffic management (CNS/ATM).

C. Inmarsat High Speed Systems

(1) Aero M4 circuit-mode service provides data rates of up to 64 kbps. M4 land earth stations (LES) serve as gateways to the Public Switched Telephone Network (PSTN) or the ISDN.

(2) M4 is a companion to, but not a replacement for, an Aero-H system. As developments of the Mini-M, they do not comply with the ICAO requirements for aeronautical safety services and cannot be used for CNS/ATM. In other words, they can only be used for non-safety service data communications.

D. System Performance

(1) Currently, the numbers of simultaneous aeronautical voice and M4 data channels can only be obtained from theoretical calculations. Using the assumptions given in Table 1-4, the calculations are given in Table 1-5. The calculations for the total number of calls are given in Table 1-6 thru Table 1-9.

Table 1-4. Assumptions

Item	dB	Watts
Gain cell	12 dB	
R/T power (10.5 Kbps assumed)	20.4 dBW	109.6 W
R/T power (600 bps assumed)	5.9 dBW	3.9 W
HPA power (same assumed for both)	16.0 dBW	40.0 W
Cable Loss	4.7 dB	
Initial HSD channel power	22.5 dBW	177.8 W
Settled HSD channel power	22.5 dBW	177.8 W
Initial 8400 C channel EIRP	14.5 dBW	28.2 W
Settled 8400 C channel EIRP	7.5 dBW	5.6 W
Initial 21000 C channel EIRP	19.5 dBW	89.1 W
Settled 21000 C channel EIRP	13.5 dBW	22.4 W

Table 1-5. Calculations

HGA Gain	dBW	Total Watts	After R/T 600 bps (Watts)	After R/T 10.5 Kbps (Watts)
12	23.3	214.8	210.9	105.2

Table 1-6. Total Number of Calls with Aero-H+ (Spot beam operation) and 10.5 Kbps Packet Data Rate

M4 HSD Channels	8400 Voice Channels	21000 Voice Channels
1	5/6 (Note)	0
1	2	1
NOTE: MCS 6000 = 5, MCS 7000 = 6		

Table 1-7. Total Number of Calls with Aero-H+ (Spot beam operation) and 600 bps Packet Data Rate

M4 HSD Channels	8400 Voice Channels	21000 Voice Channels
1	5/6 (Note)	1
1	0	5
NOTE: MCS 6000 = 5, MCS 7000 = 6		

Table 1-8. Total Number of Calls with Aero-H+ (Global beam operation) and 10.5 Kbps Packet Data Rate

M4 HSD Channels	8400 Voice Channels	21000 Voice Channels
1	0	1/2

Table 1-9. Total Number of Calls with Aero-H+ (Global beam operation) and 600 bps Packet Data Rate

M4 HSD Channels	8400 Voice Channels	21000 Voice Channels
1	0	5

(2) From these calculations the following points should be made:

(a) There is an increased loss of 3.5 dB, due to the addition of the high power combiner with the HS-600 installation. It is essential that a 12 dB antenna is used to be able to support more than one Aero voice channel as well as a simultaneous Aero M4 HSD.

E. FCC Compliance

(1) This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

2. System Components

A. General

(1) Table 1-10 gives the component part numbers supplied by Honeywell. Table 1-11 gives components that are necessary, but are not supplied by Honeywell.

Table 1-10. Components Supplied by Honeywell

Component	Model No.	Honeywell Part No.
High Speed Data Unit	HS-600	7519300-901
High Speed Combiner Assembly	-	7519340-901
RF Power Splitter	-	7519349-1
High Power Amplifier (40 W)	HP-600	7516250-XX050 (Note)
NOTE: The HSD system requires an additional HPA. Only an HPA, Part No. 7516250-XX050 (software Mod F) can be used with the HS-600 system.		

Table 1-11. Components/Parts Not Supplied by Honeywell

Component/Part	Comments
HSU Mounting Tray (4-MCU size unit)	ARINC 600 4-MCU Mount, cooling air required. (Installer to supply mount.)
HSU Mounting Tray (8-MCU size unit)	ARINC 600 8-MCU Mount, cooling air required. (Installer to supply mount.)
NOTE: Refer to paragraph 3.D. and Table 1-15 in this section for mounting tray information.	

3. Component Descriptions

A. HS-600 High Speed Data Unit (HSU)

(1) The HSU is designed to perform reliably under field conditions and provide ease of maintenance when required. The HSU has a modular design to permit easy replacement of each circuit card assembly (CCA). All CCAs are built to standards that qualify them for both airline and business aircraft usage.

(2) The HSU is packaged as a 4 modular concept unit (4-MCU). The mechanical chassis is constructed of aluminum alloy sheet metal. The HSU requires external cooling air in accordance with ARINC 600 or ARINC 404 to maintain the highest possible mean-time-between-failures (MTBF). In installations where this is not available, a mounting tray with an integral fan is required. Refer to Table 1-15. The HSU is shown in Figure 1-2.

(3) Table 1-12 gives the leading particulars for the HSU and Table 1-13 gives the DO-160D categories that this equipment meets or exceeds.

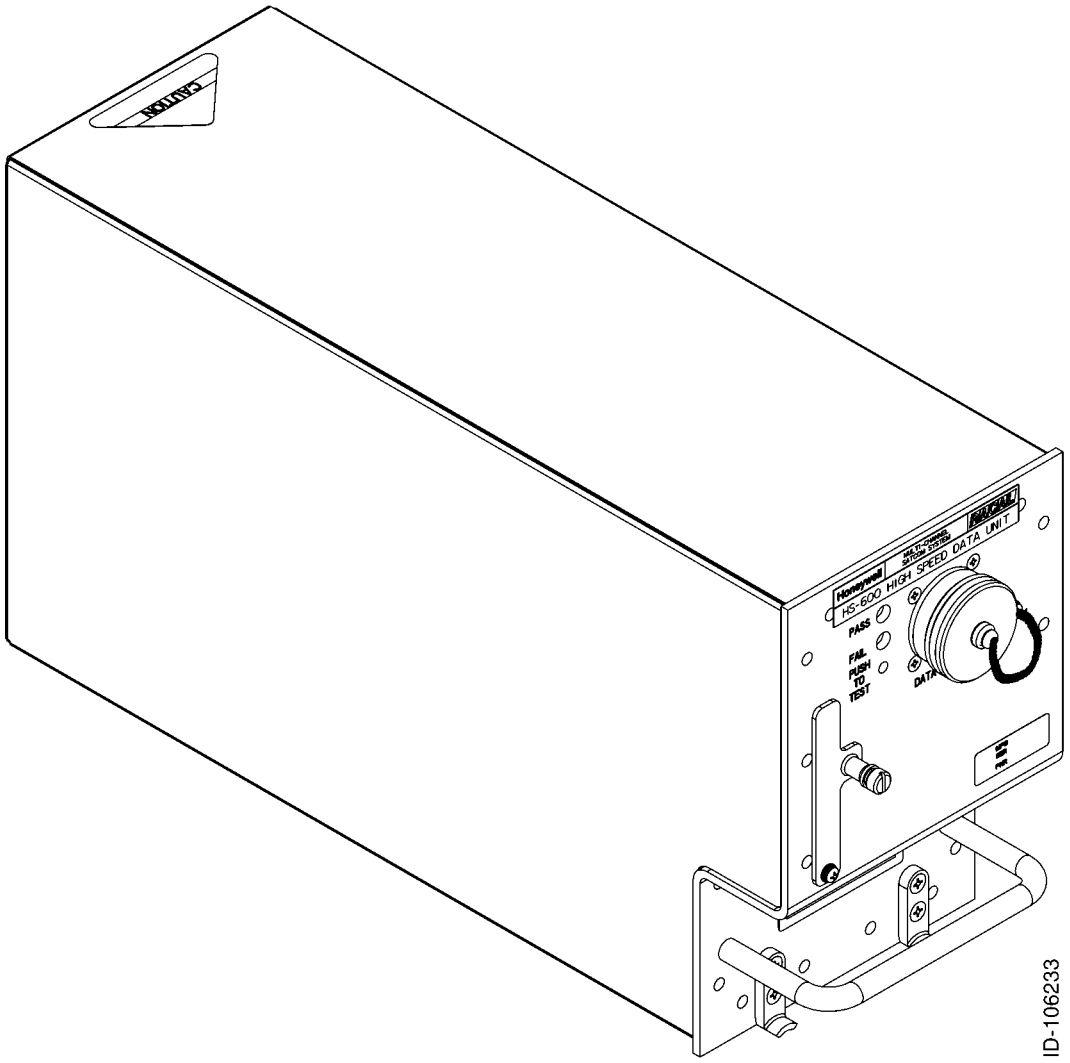

Figure 1-2. HS-600 HSU

Table 1-12. HS-600 Leading Particulars

Characteristic	Specification
Dimensions (maximum):	
• Length	7.64 in. (194.06 mm)
• Width	4.90 in. (124.46 mm)
• Height	15.26 in. (387.60 mm)
Weight (maximum)	11.84 lb (5.37 kg)
Power requirements (AC) (Note):	
• Nominal	115 V rms, 400 Hz
• Maximum	134 V rms, 480 Hz
• Minimum	97 V rms, 320 Hz
Power requirements (DC) Note):	
• Nominal	27.5 V dc
• Maximum	32.2 V dc
• Minimum	20.5 V dc
Power Consumption	25 W nominal, 40 W maximum
Cooling Requirements	Select tray from Table 1-15
Connector P1 (Rear)	Radiall Part No. 620-600-237
Mating Connector (P1)	Radiall Part No. 620-600-238
• 22 AWG Contacts	Radiall Part No. 620-200
• 20 AWG Contacts	Radiall Part No. 620-310
• 16 AWG Contacts	Radiall Part No. 620-330
• 12 AWG Contacts	Radiall Part No. 620-340
• Size 5 Coax Contacts	Radiall Part No. 620-021
Mounting	Tray, ARINC 600 4-MCU Size
Circuit Breaker Ratings:	
• 115 V ac Circuit Breaker	2 Amp typical
• 28 V dc Circuit Breaker	7.5 Amp typical
User Interface (ISDN S/T)	ITU-T 1.430 (S/T interface) DSS1/EuroISDN
Environmental	Unit must be installed inside pressurized bulkhead (cabin).

Table 1-13. DO-160D Environmental Categories

Description	Category
Temperature and Altitude	XX
In-Flight Loss of Cooling	X
Temperature Variation	X
Humidity	X
Shock	B
Vibration	SB2
Explosion Proofness	X
Waterproofness	X
Fluids Susceptibility	X
Sand and Dust	X
Fungus Resistance	X
Salt Spray	X
Magnetic Effect	X
Power Input	X
Voltage Spike	X
Audio Frequency Susceptibility	X
Induced Signal Susceptibility	X
Radio Frequency (RF) Susceptibility	XXX
Emission of RF Energy	M
Lightning Indirect Effects	XXXX
Lightning Direct Effects	X
Icing	X
Electrostatic Discharge (ESD)	X

(4) Table 1-14 gives a description of the HSU front panel lights during various HSU conditions. The PUSH TO TEST switch on the front panel of the HSU is not operational.

Table 1-14. HSU Front Panel Light Description

Condition	Description
Power Up	Both PASS and FAIL lights are on steady.
Software Boot Complete	Both PASS and FAIL lights are off. The lights should go off within 30 seconds of power up.
Receiver Activity	If the SDU is logged on, the HS-600 is able to pick an LES to listen to, similar to the P-channel for the MCS. Once the receiver synchronizes on this time division multiplex (TDM) channel, the green PASS light flashes. The light flashes for each correctly received signal unit (SU). This should occur within 2 minutes of power up, if the SDU is logged on, or within 30 seconds after the SDU log-on, if beyond the initial 2 minutes. Since the flash rate is related to the received SUs, the rate varies as time goes on; it could even stop flashing with the light on or off. However, during an HSD call, SUs are received at a high rate, so the green PASS light will flash rapidly, appearing to be almost steady on.
Failure	The FAIL light will be on if any error occurs.

B. High Speed Combiner Assembly

(1) The high speed combiner assembly combines the signals from both HPAs which are then sent to the DLNA. Figure 1-3 shows the high speed combiner assembly.

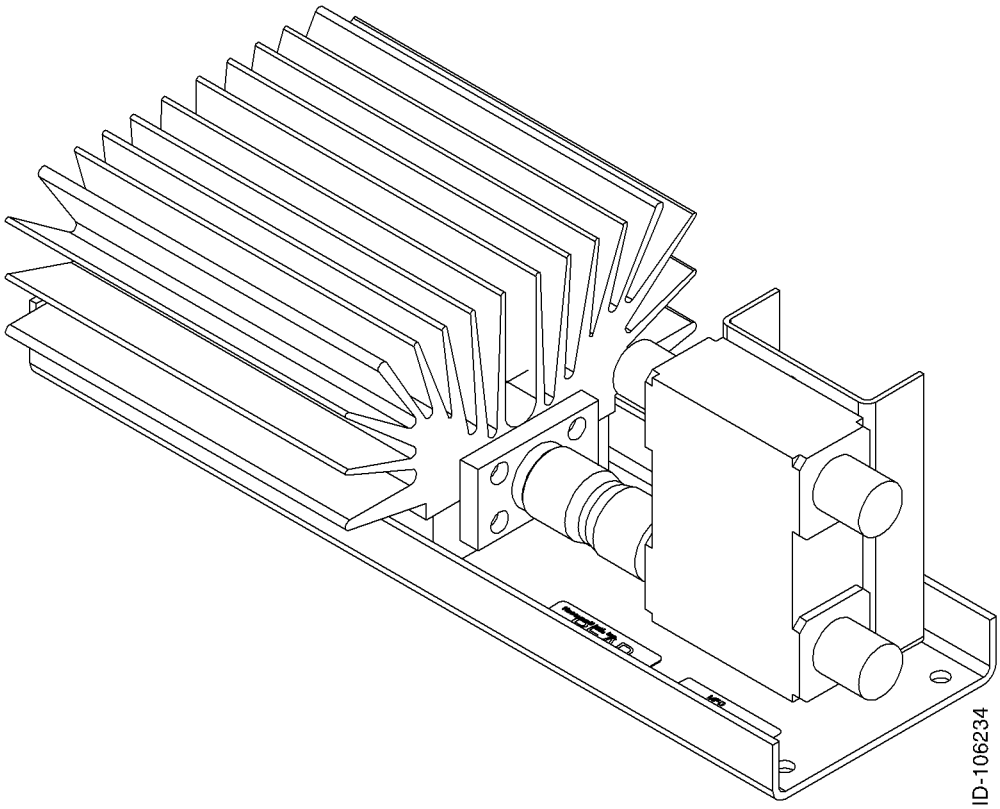

Figure 1-3. High Speed Combiner Assembly

C. RF Power Splitter

(1) The RF power splitter divides the signal from the DLNA which is then sent to the SDU and HSU. The unit weight is 2.5 oz. (70.87 grams). Figure 1-4 shows the RF power splitter.

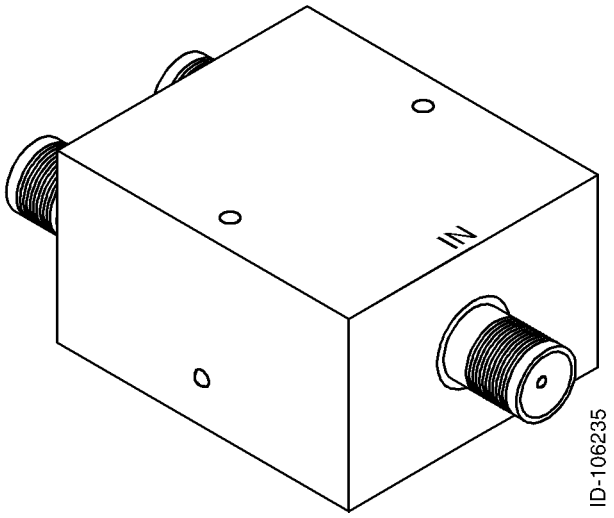

Figure 1-4. RF Power Splitter

D. HSU Mounting Tray

(1) The HS-600 HSU ARINC 600 connector, contacts, and mounting trays can be purchased from ECS or EMTEQ. The addresses for ECS and EMTEQ are as follows:

Electronic Cable Specialists
5300 W. Franklin Drive
Franklin, WI 53132
U.S.A.

Telephone: (414) 421-5300
Fax: (414) 421-5301

EMTEQ
S84 W. 18693 Enterprise Drive
Muskego, WI 53150
U.S.A.

Telephone: (262) 679-6170 / 1-888-679-6170

(2) Table 1-15 gives a list of HSU mounting trays available through ECS. Contact EMTEQ for a list of HSU mounting trays available.

Table 1-15. HSU Mounting Trays

ECS Part No.	Description	Voltage
6050-101	4 MCU S/S tray with bottom fan	115 V ac
6049-101	4 MCU S/S tray with right side fan	115 V ac
6049-102	4 MCU S/S tray with left side fan	115 V ac
6083-102	4 MCU S/L tray with rear fan	115 V ac
6050-102	4 MCU S/S tray with bottom fan	28 V dc
200-89891-101	4 MCU S/S tray with left side fan	28 V dc
200-89892-101	4 MCU S/S tray with right side fan	28 V dc
6083-103	4 MCU S/L tray with rear fan	28 V dc
6292-101	8 MCU S/S standard tray	115 V ac
6288-101	8 MCU S/S tray w/bottom fan	115 V ac
6290-101	8 MCU S/S tray w/left side fan	115 V ac
6284-101	8 MCU S/S tray w/right side fan	115 V ac
6286-101	8 MCU S/L standard tray	115 V ac

MECHANICAL INSTALLATION

SECTION 2
MECHANICAL INSTALLATION

1. Overview

A. General

(1) This section contains information on how and where to mount the HSU, combiner, and splitter. Figure 2-1 shows the HSU dimensions. Figure 2-2 shows the dimensions and mounting hole dimensions of the combiner.

B. Equipment and Materials

(1) For new HSU installations, refer to Table 1-11 for mounting tray information. See the applicable outline and installation diagram in this section for additional mounting information.

2. Mechanical Installation Design

A. HS-600 HSU Provisions

(1) Mechanical installation data for the HS-600 HSU is shown in Figure 2-1. The HSU is mounted in an ARINC 600 4-MCU mounting tray. The HSU requires external cooling air to maintain the highest possible MTBF. A mounting tray with an integral fan is required. Select a mounting tray from Table 1-15. Figure 2-4 shows typical 4-MCU tray assemblies with a fan.

(2) The location of the mounting tray allows the interface cabling to other units to be as short as possible. The location must give protection against rain, condensation, solvents, and hydraulic fluid. The mounting tray must be electrically bonded to the aircraft frame by a low resistance path of less than 0.1 ohm.

B. High Speed Combiner Assembly

(1) Mechanical installation data for the combiner is shown in Figure 2-2.

C. RF Power Splitter Provisions

(1) Mechanical installation data for the splitter is shown in Figure 2-3.

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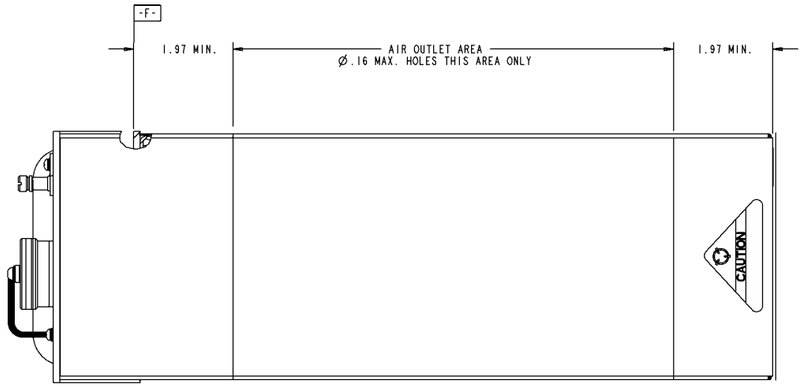
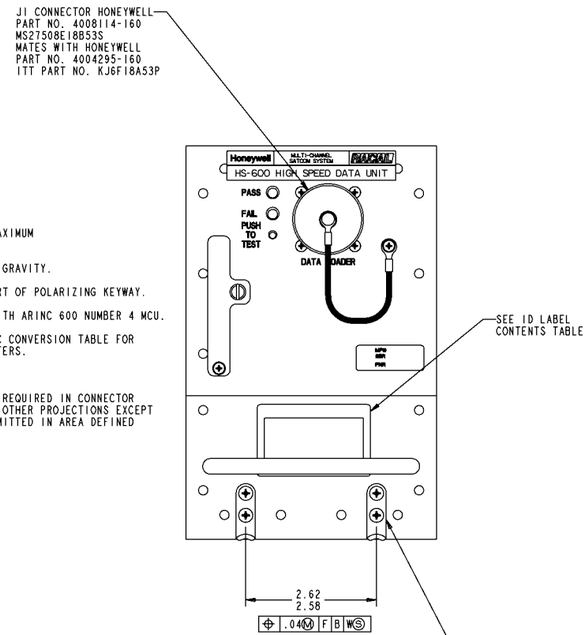
HS-600 UNIT ARINC 600 AIRCRAFT CONNECTOR, CONTACTS AND MOUNTING TRAYS MAY BE PURCHASED FROM ELECTRONIC CABLE SPECIALISTS, FRANKLIN, WISCONSIN. THEY OFFER THE FOLLOWING TRAY ASSEMBLIES:

ECS PART NUMBER	DESCRIPTION	VOLTAGE
6050-101	4 MCU SHORT/SHORT TRAY WITH BOTTOM FAN	115 V ac
6049-101	4 MCU SHORT/SHORT TRAY WITH RIGHT SIDE FAN	115 V ac
8049-102	4 MCU SHORT/SHORT TRAY WITH LEFT SIDE FAN	115 V ac
6083-102	4 MCU SHORT/LONG TRAY WITH REAR FAN	115 V ac
6050-102	4 MCU SHORT/SHORT TRAY WITH BOTTOM FAN	28 V dc
200-89892-101	4 MCU SHORT/SHORT TRAY WITH RIGHT SIDE FAN	28 V dc
200-89891-101	4 MCU SHORT/SHORT TRAY WITH LEFT SIDE FAN	28 V dc
6083-103	4 MCU SHORT/LONG TRAY WITH REAR FAN	28 V dc





NOTES:

1. UNIT WEIGHT: NOMINAL 11.49 POUNDS/MAXIMUM 11.84 POUNDS (5.21/5.37 KILOGRAMS).
2. ⊕ DENOTES APPPROXIMATE CENTER OF GRAVITY.
3. △3 DARKENED PORTION INDICATES SOLID PART OF POLARIZING KEYWAY.
4. THE INSTALLATION IS IN ACCORDANCE WITH ARINC 600 NUMBER 4 MCU.
5. △5 DIMENSIONS ARE IN INCHES. SEE METRIC CONVERSION TABLE FOR CORRESPONDING DIMENSIONS IN MILLIMETERS.
6. UNIT FINISH: CHEMICAL FILM.
7. △7 .10 MAXIMUM REAR PANEL THICKNESS IS REQUIRED IN CONNECTOR MOUNTING AREA DEFINED AS ZONE A. NO OTHER PROJECTIONS EXCEPT CONNECTOR MOUNTING HARDWARE ARE PERMITTED IN AREA DEFINED AS ZONE A.

ID LABEL CONTENTS	
PART NO.	7519300-901
SERIAL NO.	DATE CODE SERIAL NUMBER
WEIGHT	ACTUAL UNIT WEIGHT
MOD	MODIFICATION LETTER/LETTERS

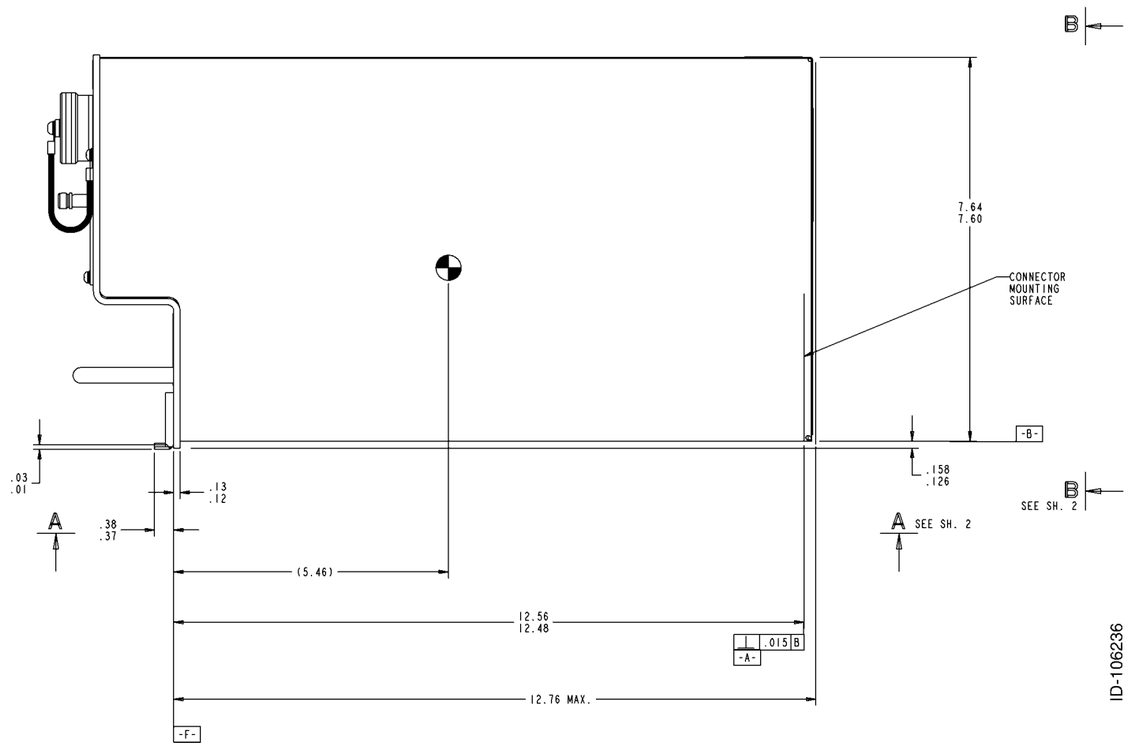
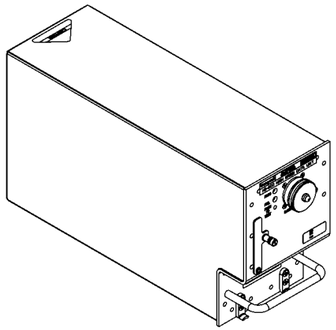
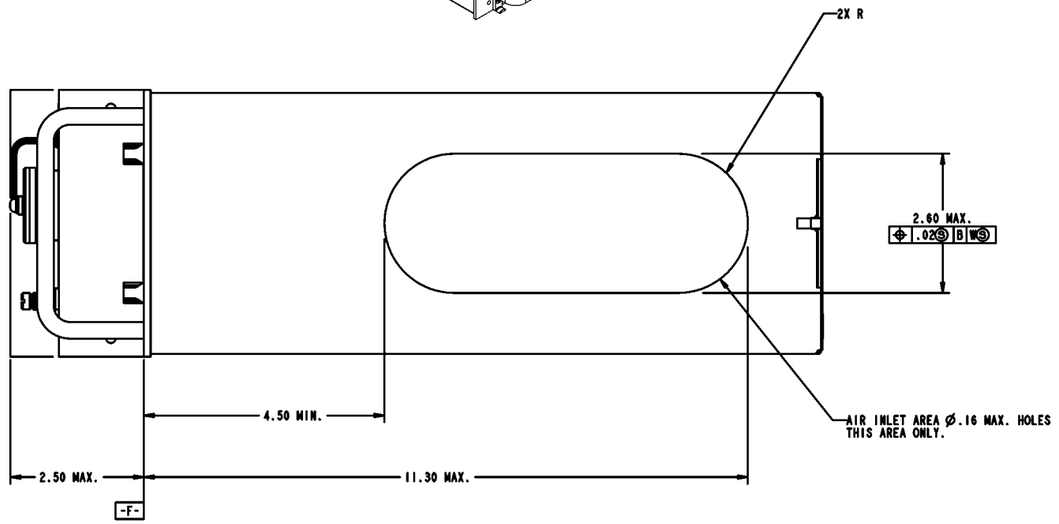


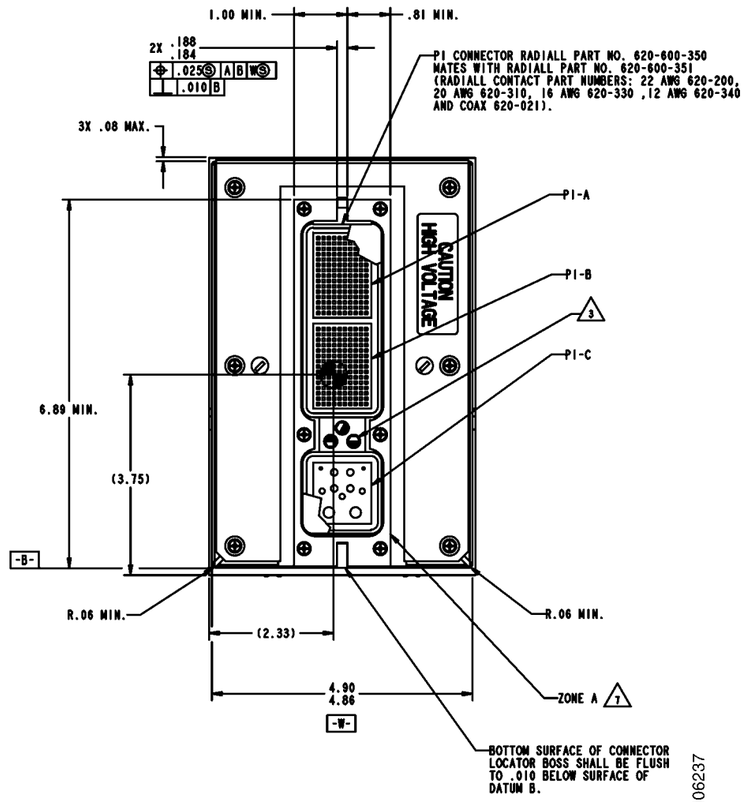
Figure 2-1 (Sheet 1). HSU Outline and Installation Diagram

CONVERSION TABLE	
INCHES	MILLIMETERS
.010	.254
.015	.381
.020	.508
.025	.635
.040	1.016
.06	1.52
.08	2.03
.10	2.54
.12	3.05
.126	3.200
.13	3.30
.158	4.013
.16	4.06
.184	4.674
.188	4.775
.25	6.35
.37	9.40
.38	9.65
.81	20.57
1.00	25.40
1.97	50.04
2.33	59.18
2.43	61.722
2.50	63.50
2.58	65.53
2.59	65.79
2.62	66.55
3.63	92.20
3.75	95.25
3.78	96.01
4.50	114.30
4.86	123.44
4.90	124.46
5.46	138.68
5.49	139.45
5.57	141.48
6.89	175.50
7.60	193.04
7.64	194.06
11.30	287.02
12.48	316.99
12.56	319.02
12.76	324.10





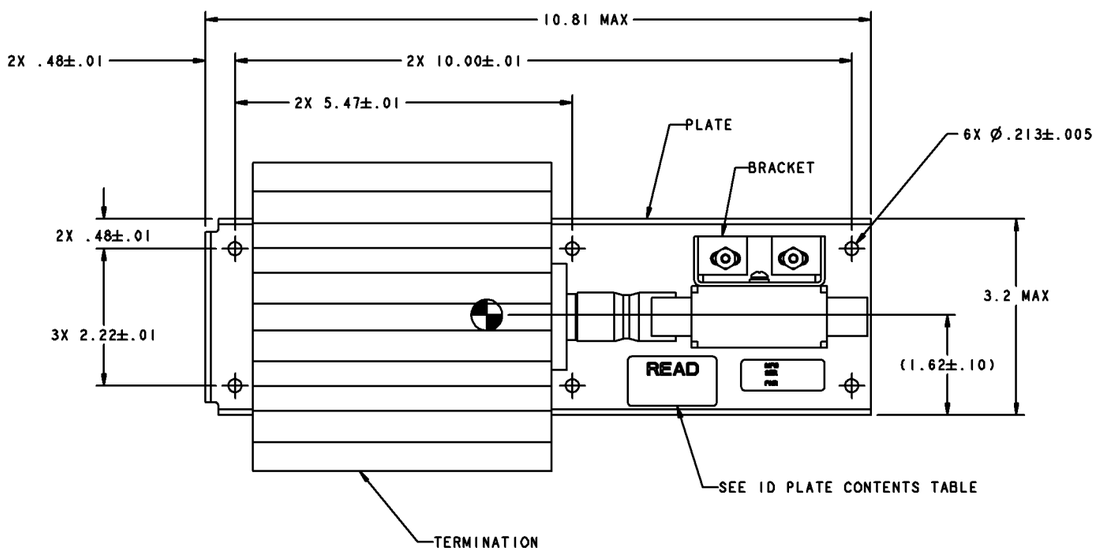
VIEW **A-A**

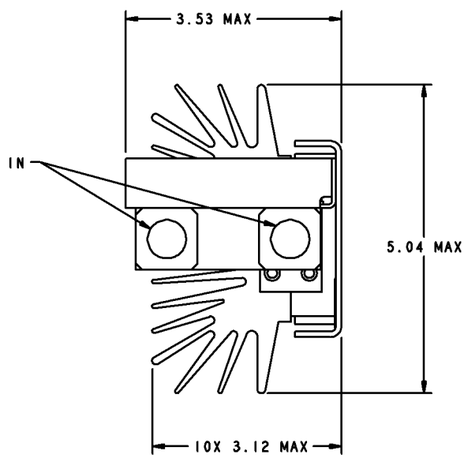


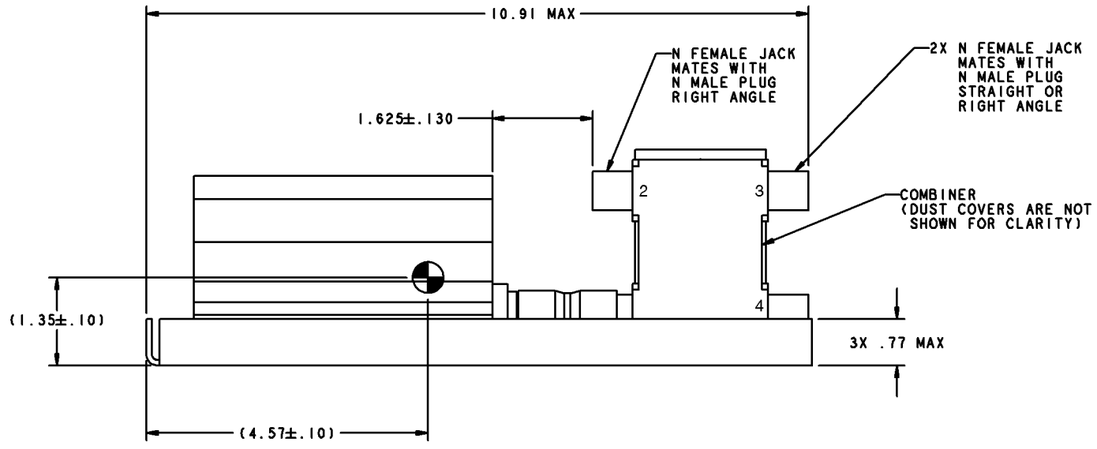
VIEW **B-B**

ID-106237

Figure 2-1 (Sheet 2). HSU Outline and Installation Diagram







△3

CONVERSION TABLE	
INCHES	MILLIMETERS
.005	.127
.01	.254
.10	2.54
.130	3.302
.213	5.410
.48	12.192
.77	19.558
1.35	34.29
1.62	41.15
1.625	41.275
2.22	56.388
3.12	79.248
3.2	81.280
3.53	89.662
4.57	106.08
5.04	128.016
5.47	138.938
10.00	254.000
10.81	274.574
10.91	277.114

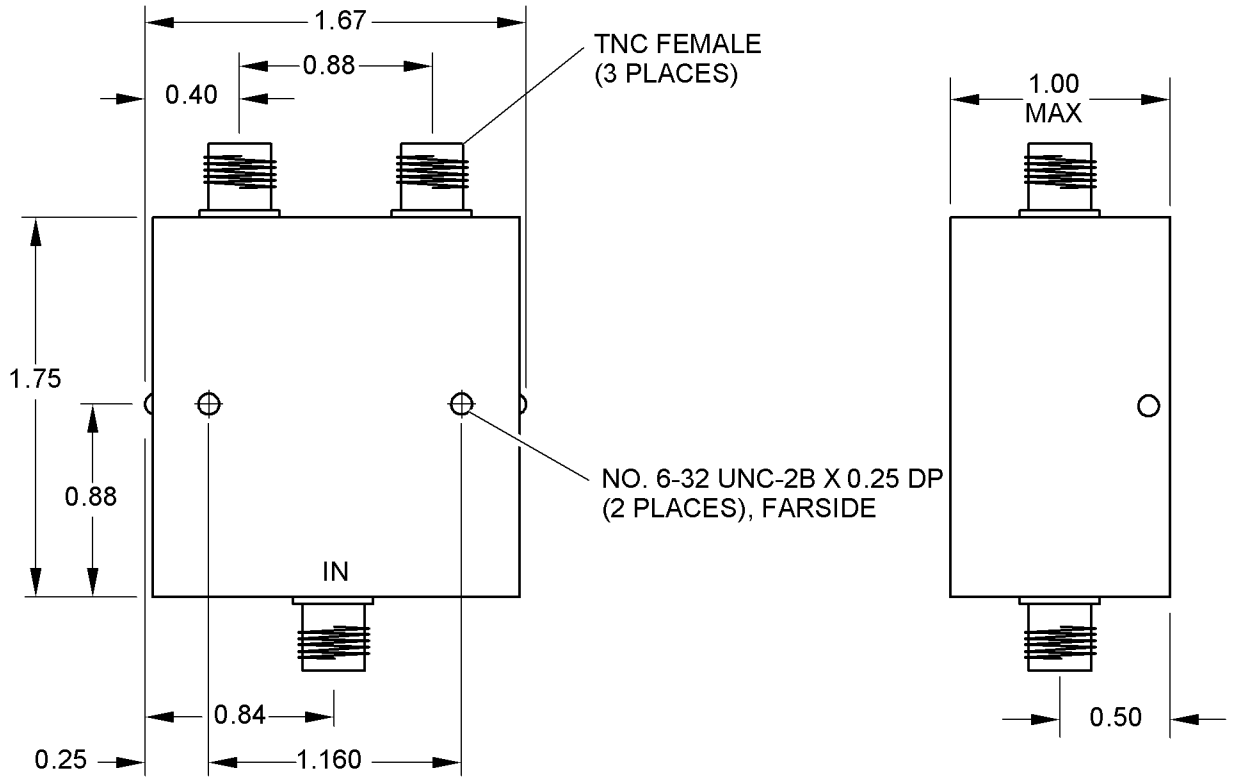
ID LABEL CONTENTS (FOR UNITS SUPPLIED TO BOEING ONLY)	
PART NO.	7519340-901
SERIAL NO.	DATE CODE SERIAL NUMBER
WEIGHT	ACTUAL UNIT WEIGHT
MOD	MODIFICATION LETTER/LETTERS

NOTES:

1. UNIT WEIGHT: 4.59±.14 POUNDS (2.08±.06 KILOGRAMS).
2. ⊕ DENOTES APPROXIMATE CENTER OF GRAVITY.
3. △3 DIMENSIONS ARE IN INCHES. SEE METRIC CONVERSION TABLE FOR CORRESPONDING DIMENSIONS IN MILLIMETERS.
4. FINISH:
   PLATE, BRACKET AND COMBINER: IRIDITE.
   TERMINATION: BLACK PAINT.
5. SUGGESTED CUSTOMER SUPPLIED MOUNTING HARDWARE:
   SIX .190-32UNF PAN OR CAP HEAD STAINLESS STEEL SCREWS.
   SIX #6 STAINLESS STEEL LOCK WASHERS.
6. READ IS FOR ORIENTATION ONLY.

ID-106238

Figure 2-2. High Speed Combiner Outline and Installation Diagram

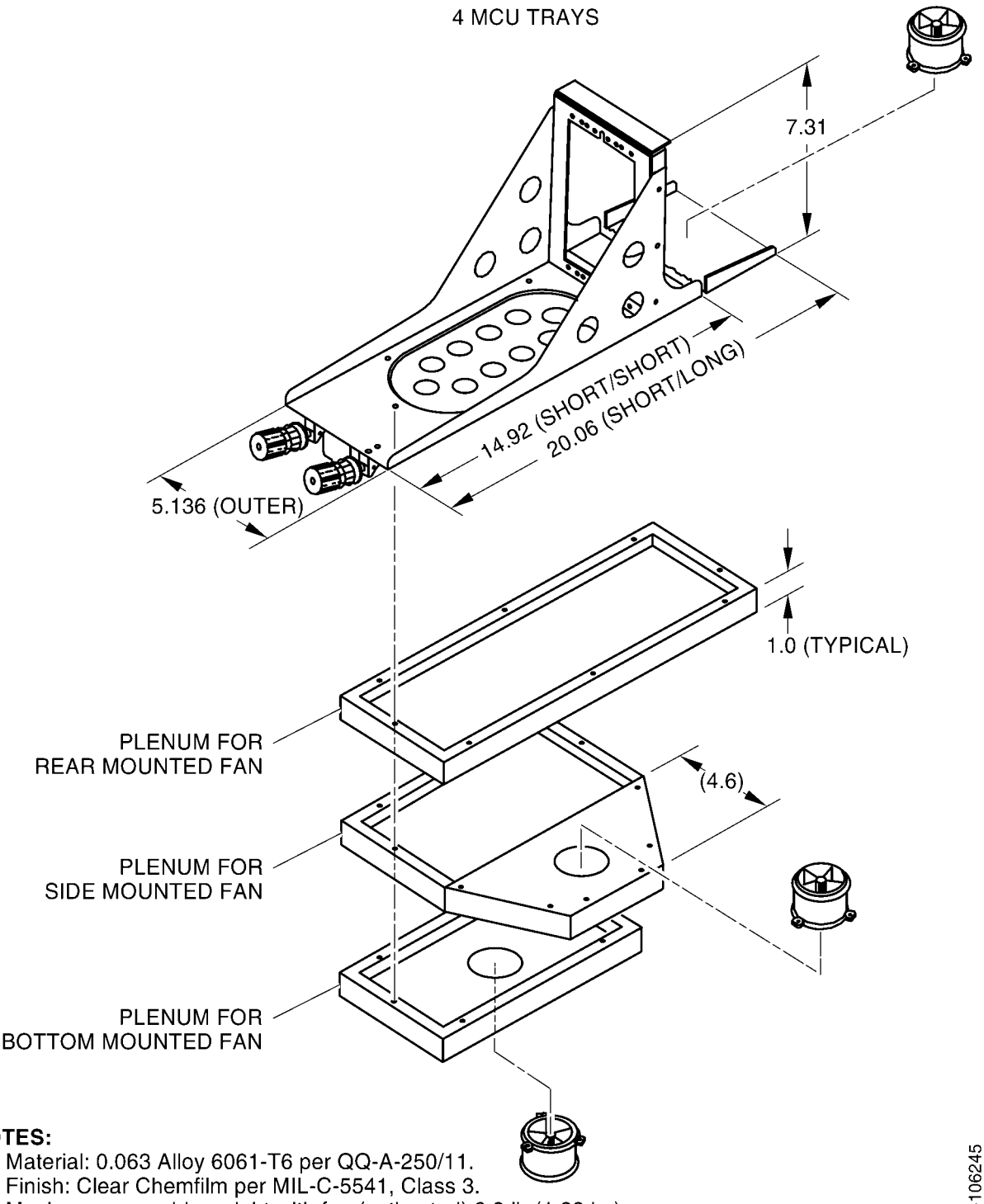


NOTE:

Tolerances:
two place decimal ± 0.02
three place decimal ± 0.005

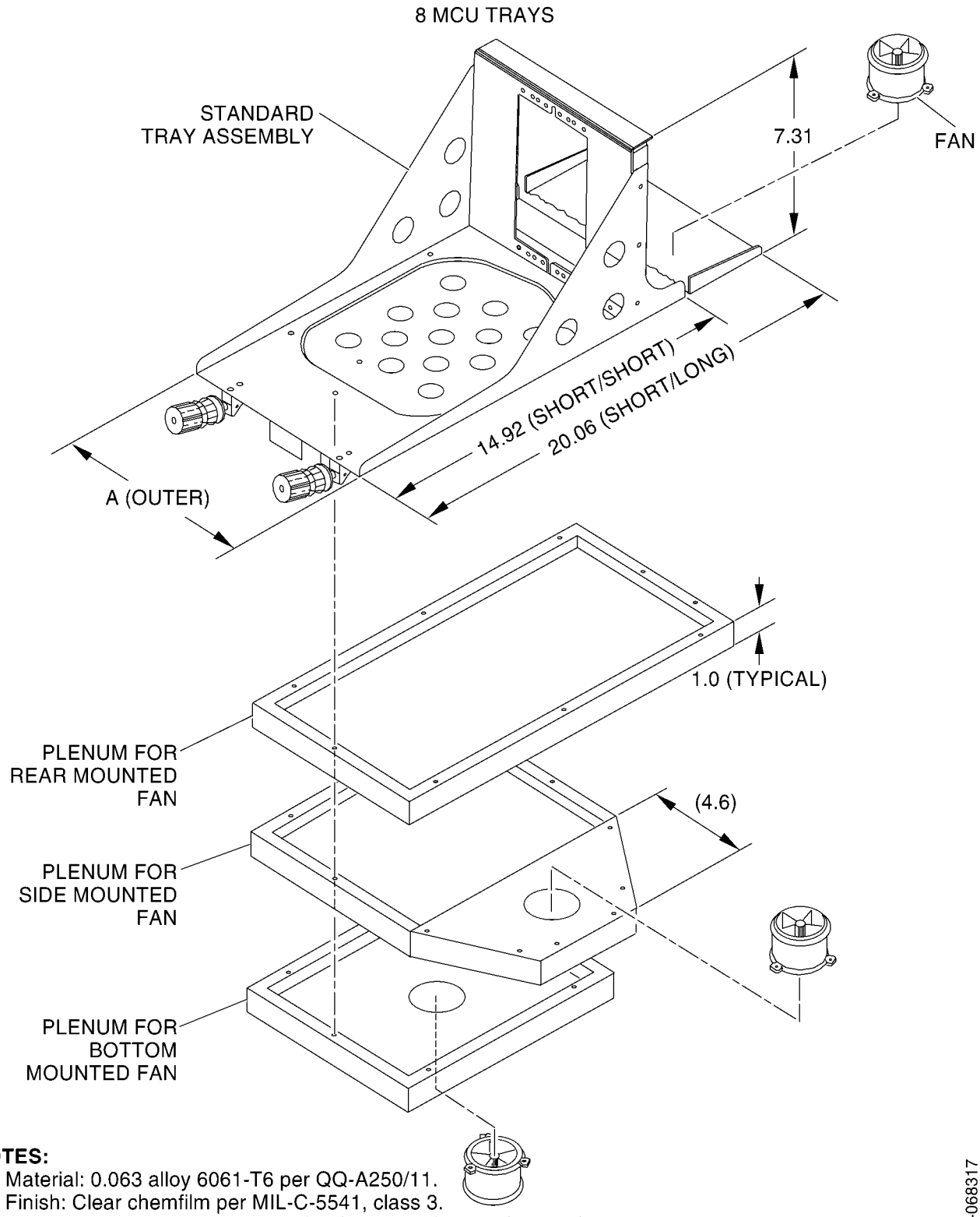
ID-106239

Figure 2-3. RF Power Splitter Outline Diagram



NOTES:
1. Material: 0.063 Alloy 6061-T6 per QQ-A-250/11.
2. Finish: Clear Chemfilm per MIL-C-5541, Class 3.
3. Maximum assembly weight with fan (estimated) 2.9 lb (1.32 kg).

Figure 2-4. Typical Dimensions for 4-MCU Tray Assemblies



NOTES:
1. Material: 0.063 alloy 6061-T6 per QQ-A250/11.
2. Finish: Clear chemfilm per MIL-C-5541, class 3.
3. Maximum assembly weight with fan (estimated) 4.7 lb (2.13 kg).

ID-068317

Figure 2-5. Typical Dimensions for 8-MCU Tray Assemblies

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ELECTRICAL INSTALLATION

SECTION 3
ELECTRICAL INSTALLATION

1. Overview

A. General

(1) This section gives electrical installation procedures, power distribution, and interconnect information for the HSU, combiner, and splitter.

(2) Procedures for proper shield, power, and signal grounding are also provided in this section. In addition, procedures for the various buses are included.

B. Equipment and Materials

(1) See leading particulars table for a list of mating connectors required to do the electrical installation.

2. Electrical Installation Procedure

A. General

(1) The information necessary to provide the electrical interconnects is contained in the following paragraphs.

B. Power Requirements

(1) AC Power – The aircraft ac power inverters must supply single phase 115 V ac (min 97, max 134 V ac) 400± 80 Hz sine wave with a maximum total harmonic distortion of 5%. Under all load conditions, amplitude modulation of the power supply will not exceed 2% at any frequency. (Percent modulation is defined as one-half of the peak-to-peak modulation envelope divided by the carrier amplitude and multiplied by 100.)

(2) DC Power – The aircraft dc power supply must be 28 V dc (nominal). The normal minimum and maximum voltages permitted are 20.5 and 32.2 V dc respectively.

(3) Power supply to the HSU – The voltage level of the power supplied to the HSU is important in this installation. The potential is the difference between the power pins and power ground pins at the line replaceable unit (LRU). Excessive voltage drops in the power wire(s) and power ground wire(s) cause one or more of the following conditions:

- The LRU draws additional current from the aircraft supply system.
- Since the LRU is drawing more current, it produces more heat and more heat causes a lower LRU MTBF.

(4) The recommended maximum total combined voltage drop (voltage drop of the power wire[s] plus voltage drop of the power ground wire[s]) is 1.0 V. Voltage drop is a function of current and resistance (resistance in this case is a function of wire gauge and wire length). See Figure 3-1 for determining proper wire gauge for LRU power and power ground wires.

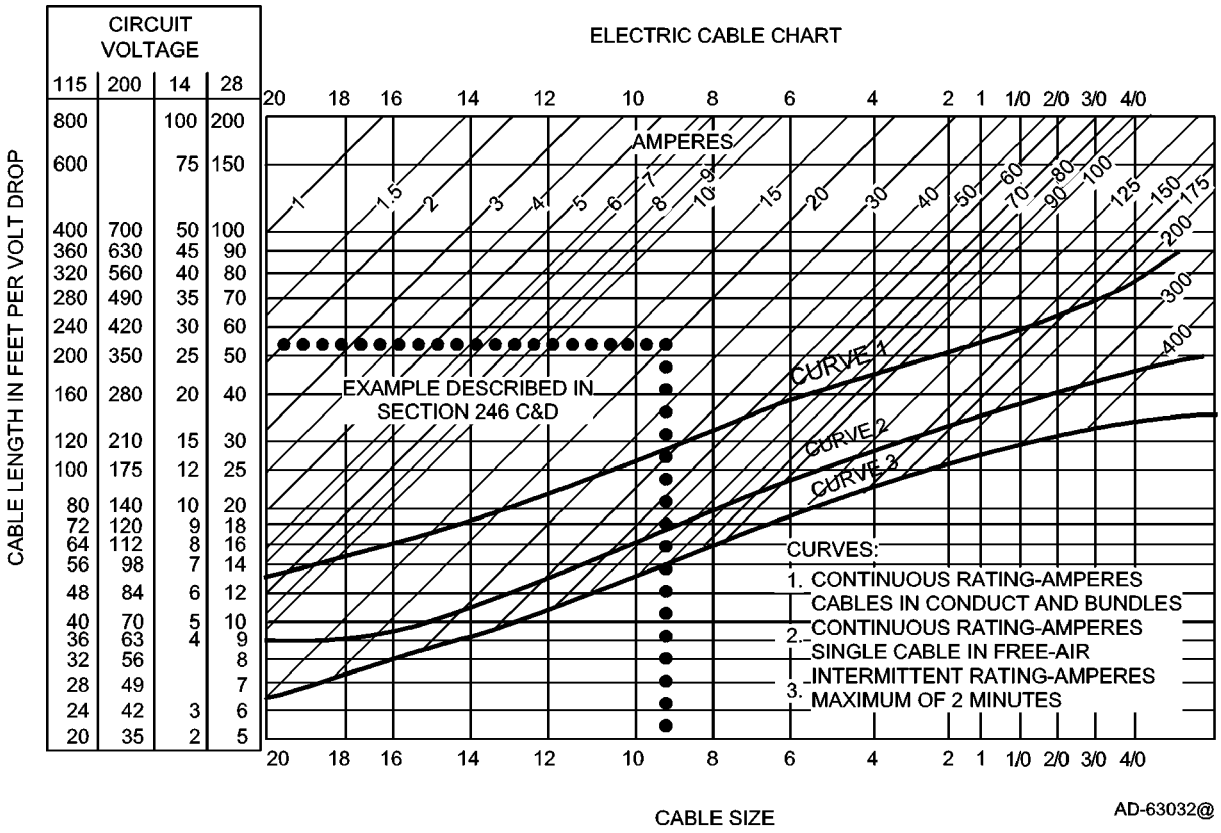


Figure 3-1. Electric Cable Chart

C. Ground Requirements

(1) General

(a) Proper grounding is a key factor in ensuring proper system operation under normal conditions, high intensity radiated electromagnetic frequencies (HIRF), and lightning environments. You must obey this section to satisfy these requirements.

NOTE: HIRF and lightning requirements dictate that the shielded wires meet the requirements of paragraph 2.C.(3). Installation of this system into aircraft manufactured prior to the FAA requirements adheres to these practices whenever feasible.

(2) Chassis Grounding

(a) All rack mount/remote mount units are electrically bonded to the airframe. This is done by making sure the mating surfaces between the LRU mounting tray (or LRU mounting feet if a tray is not used) provide a low impedance (< 0.1 Ω) electrical path.

(b) The mating surfaces must be free of all paint and other non-conductive elements and are burnished to ensure a good bond. If the aircraft mating surface is not conductive, a bonding strap of a least 1/4-inch wide (preferably 1/2-inch wide) tin coated copper braid can be used between the LRU mounting tray (or LRU itself if a tray is not used) and the nearest airframe grounding point.

(3) Shield Grounds

(a) The shield wires in the HSU have the shield grounded at both ends. This is called multi-point grounding and is specified to minimize the adverse effects of HIRF and lightning.

(b) The shield must not be connected to any LRU or bulkhead connector pin.

(c) Examples of multi-point shield grounding methods are shown in Figure 3-2 and Figure 3-3. The shield grounding method for rack mount units is detailed in Figure 3-4. This is the preferred shield grounding method for the HSU rack mount unit.

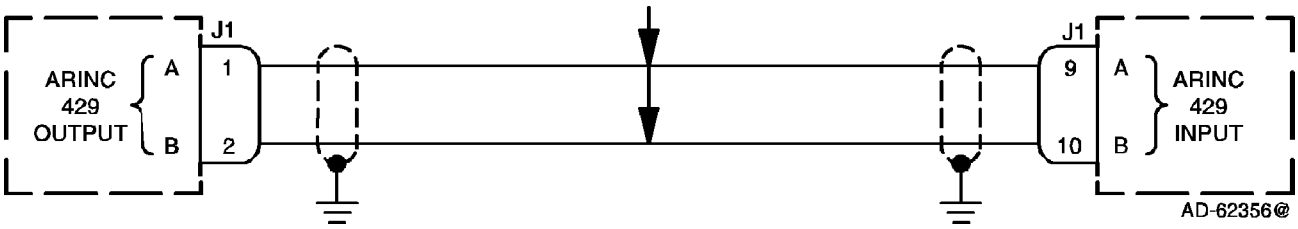


Figure 3-2. Example 1, Multi-point Shield Ground

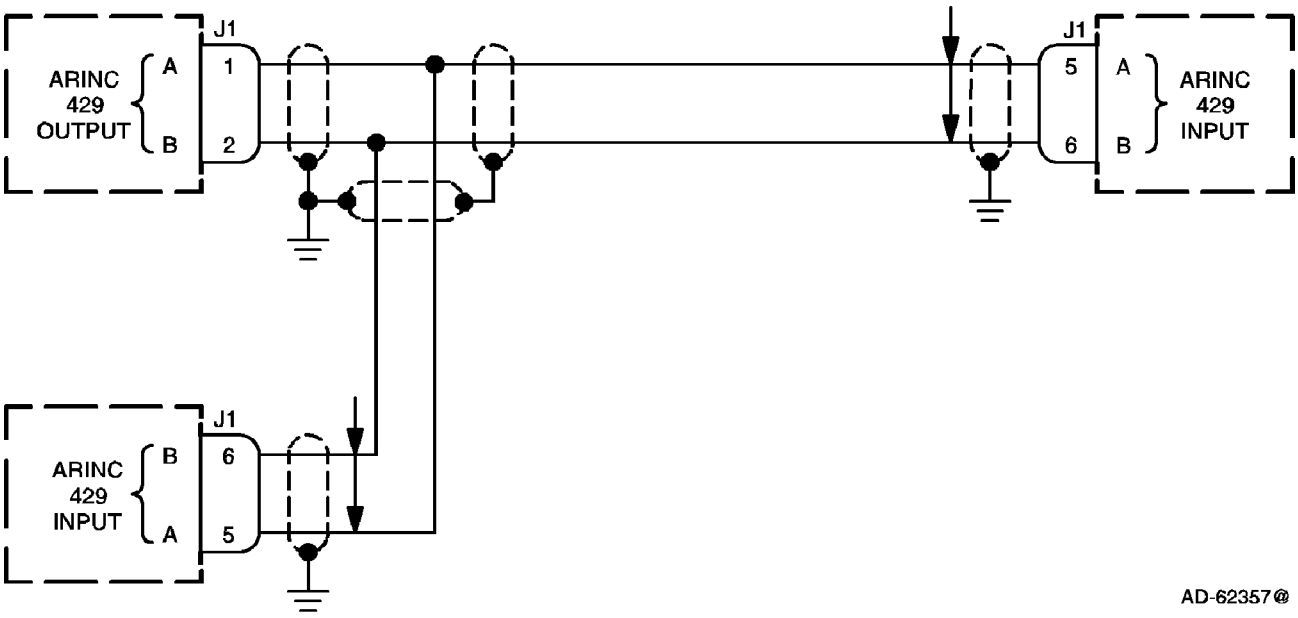


Figure 3-3. Example 2, Multi-point Shield Ground

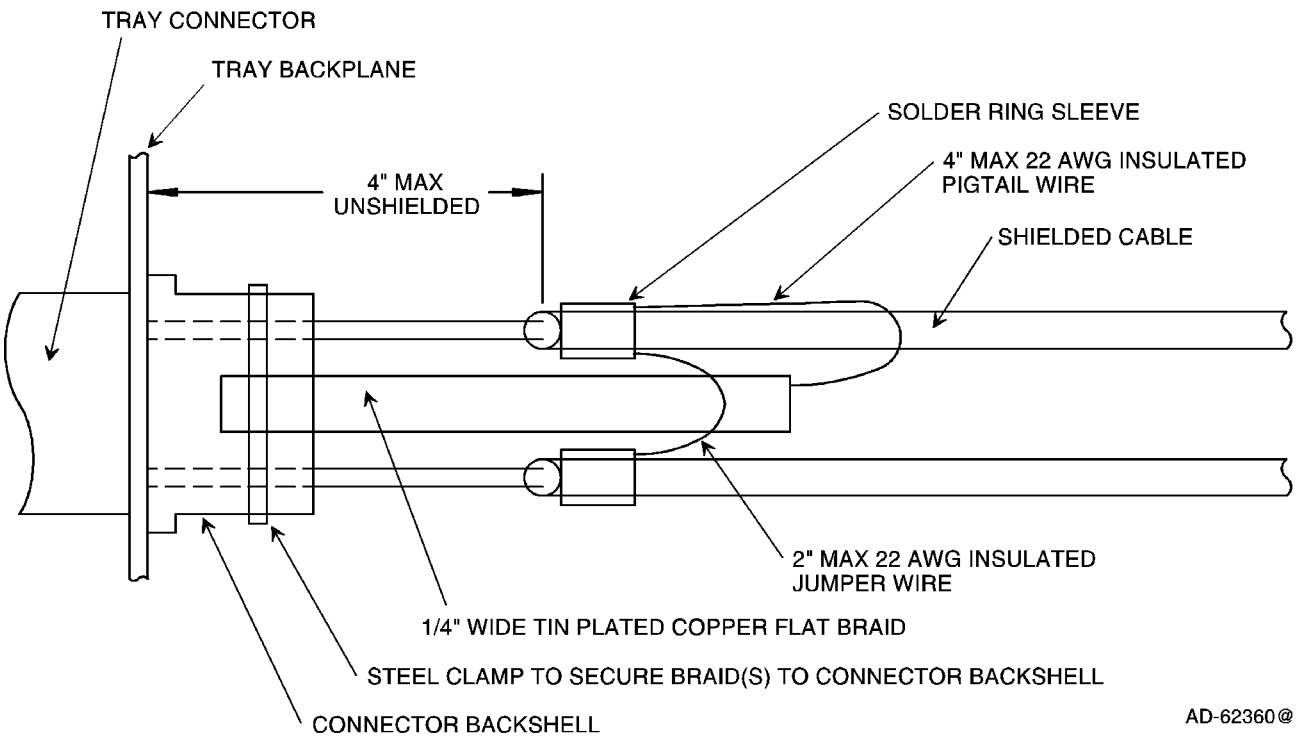


Figure 3-4. Shield Grounding Example for Rack Mount Connectors

(4) Power/Signal Grounds

(a) All dc power grounds are tied together; all ac power grounds are tied together; all signal grounds are tied together; and all lighting grounds are tied together. DC power, ac power, signal and light ground groups are then tied together at a single point and connected to the airframe. Figure 3-5 shows this aircraft grounding method.

NOTE: It is very important this grounding technique be adhered to. Do not tie the various ground wires to multiple aircraft frame points and depend on the aircraft structure to supply a low impedance path for the individual grounds. Only chassis grounds and shield grounds are grounded at multiple points in the aircraft.

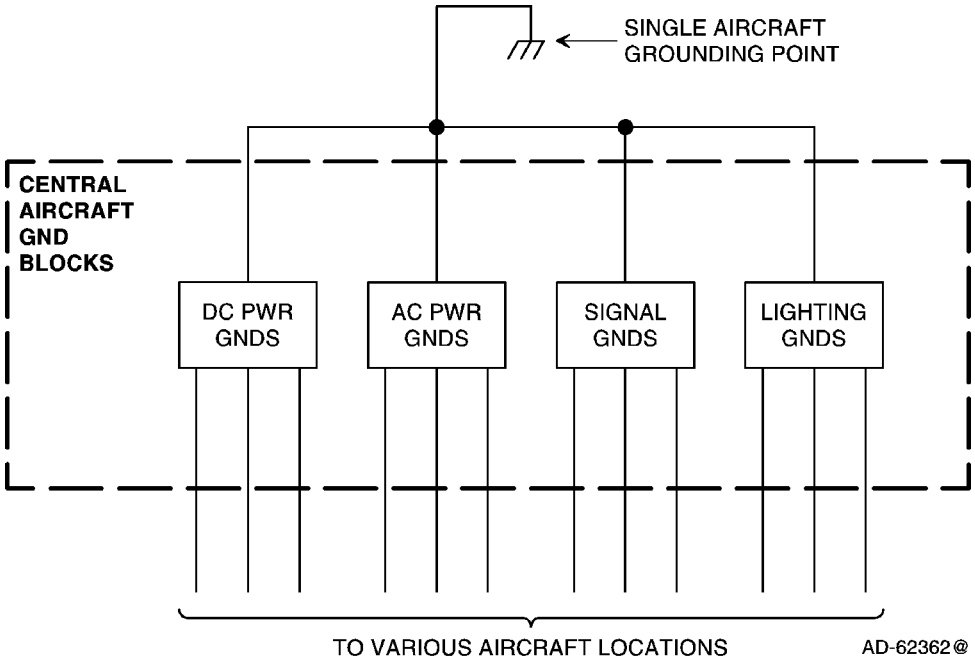


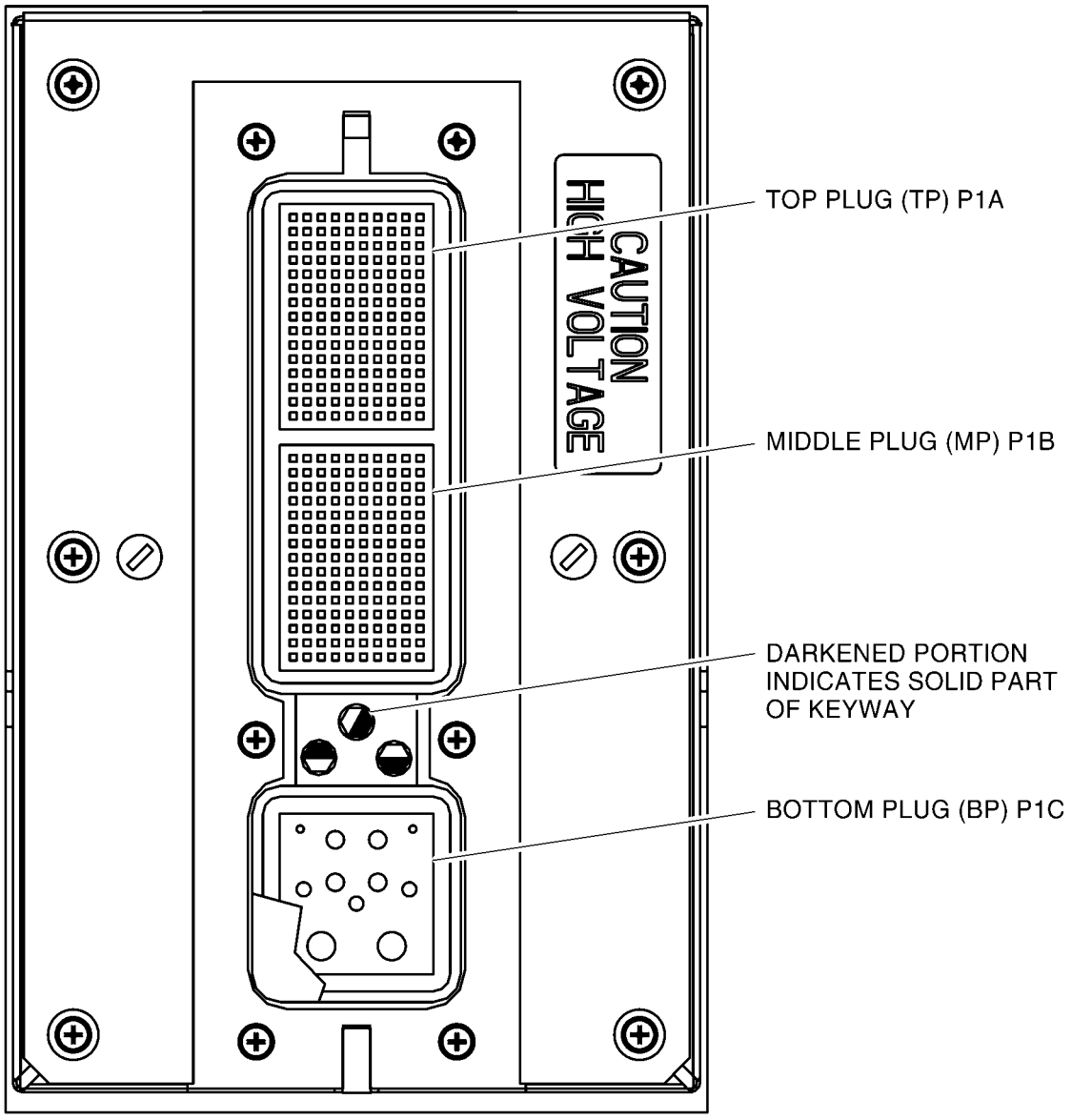
Figure 3-5. Aircraft Grounding

(b) Because signal grounds are low currents, multiple signal grounds can be connected to remote aircraft terminal blocks other than the central grounding blocks as long as these remote terminal blocks are isolated from ground. The various remote signal ground blocks must all be grounded only at the aircraft central grounding point. If 10 signal grounds are connected to a remote terminal block, a minimum of one grounding wire must be run from this terminal block to the aircraft central grounding point.

3. Electrical Installation

A. HS-600 HSU

(1) The HSU rear ARINC 600 connector layout is shown in Figure 3-6. The contact arrangement for the various connector plugs are given in Table 3-1, Table 3-2, and Figure 3-7. Figure 3-8 shows the connector pin layout for the DATA LOADER connector located on the front of the HSU. The system interface is shown in Figure 3-9. See Figure 3-10 for the HSU interconnect information.



NOTE:
For mating connector part numbers, refer to the HSU leading particulars table in Section 1.

Figure 3-6. HSU ARINC 600 Connector (P1) Pin Layout

Table 3-1. Contact Arrangements for P1-A Top Insert, HSU ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	RSVD APM POWER	RSVD APM GND	RSVD APM ENABLE 1#	RSVD APM ENABLE 2#	RSVD APM OUT CLK	RSVD POTS RING	ASYNC CTS	RSVD APM OUT DATA	RSVD APM IN DATA	RSVD APM WR PROT 1#
2	RSVD APM WR PROT 2#	RSVD APM RSVD	RSVD POTS TIP	ASYNC TXD	10BT RX-	ASYNC DCD	ASYNC CTS SIG GND	ISDNS/T RX+	10BT RX+	RSVD SPARE 257 GND
3	DISC SPARE A	DISC TX INH	RSVD SPARE D/L 18	RSVD SPARE D/L 17	RSVD SPARE D/L 16	RSVD SPARE D/L 15	RSVD SPARE 174	RSVD SPARE 258	CHASSIS GND GC 2	ISDNS/T TX+
4	CHASSIS GND GC 10	ASYNC RI SIG GND	ASYNC DCD SIG GND	ASYNC TXD SIG GND	10BT TX-	ASYNC RI	HTCE TXD	DISC DM RST*	ISDNS/T TX-	10BT TX+
5	DISC SPARE B	ASYNC DTR	CHASSIS GND GC 3	ISDNS/T RX-	HTCE TXD SIG GND	ASYNC RTS	HTCE RXD SIG GND	HTCE RXD	RSVD SPARE 198	ISDNU TIP
6	ASYNC RXD SIG GND	ASYNC DTR SIG GND	ASYNC DSR	RSVD SPARE 176	RSVD SPARE 175	MAINT 232 RXD	MAINT 232 TXD	MAINT 232 TXD SIG GND	MAINT 232 RXD SIG GND	CHASSIS GND GC 1
7	ASYNC RXD	ISDNU RING	ASYNC DSR SIG GND	ASYNC RTS SIG GND	RSVD SPARE 199	RSVD SPARE 212	RSVD SPARE 103	RSVD SPARE 115	CHASSIS GND	RSVD VHF KEYLINE GND
8	RSVD SPARE LO 26	RSVD SPARE HI 26	RSVD SPARE LO 27	RSVD SPARE HI 27	RSVD SPARE HI 11	RSVD SPARE LO 11	RSVD SPARE 36	RSVD SPARE 85	RSVD SPARE HI 4	RSVD SPARE LO 4
9	RSVD VHF AUDIO OUT HI	RSVD VHF AUDIO OUT LO	RSVD VHF AUDIO IN HI	RSVD VHF AUDIO IN LOW	RSVD SPARE HI 13	RSVD SPARE LO 13	RSVD SPARE 161	RSVD SPARE 162	RSVD SPARE HI 9	RSVD SPARE LO 9
10	RSVD SPARE 29	RSVD SPARE 78	RSVD SPARE 19	RSVD SPARE 68	RSVD SPARE 43	RSVD SPARE 92	RSVD SPARE 107	RSVD SPARE 120	RSVD SPARE HI 1	RSVD SPARE LO 1
11	RSVD SPARE HI 7	RSVD SPARE LO 7	RSVD SPARE 197	CHASSIS GND	RSVD SPARE HI 8	RSVD SPARE LO 8	RSVD SPARE HI 6	RSVD SPARE LO 6	RSVD SPARE 265	CHASSIS GND
12	RESVD SPARE 266	RSVD SPARE 110	RSVD SPARE 123	RSVD SPARE 34	RSVD SPARE 83	RSVD SPARE 202	RSVD SPARE 201	RSVD SPARE 203	RSVD SPARE 204	CHASSIS GND
13	RSVD SPARE HI 5	RSVD SPARE LO 5	RSVD SPARE 207	RSVD SPARE HI 14	RSVD SPARE LO 14	RSVD SPARE HI 12	RSVD SPARE LO 12	RSVD SPARE 105	RSVD SPARE 118	RSVD SPARE 267
14	RSVD SPARE 39	RSVD SPARE 88	RSVD SPARE 40	RSVD SPARE 89	RSVD SPARE 195	RSVD SPARE 196	RSVD SPARE 268	RSVD SPARE 23	RSVD SPARE 72	RSVD SPARE 186
15	RSVD SPARE 177	RSVD SPARE 178	RSVD SPARE 179	RSVD SPARE 180	RSVD SPARE 181	RSVD SPARE 182	RSVD SPARE 183	RSVD SPARE 184	RSVD SPARE 185	CHASSIS GND

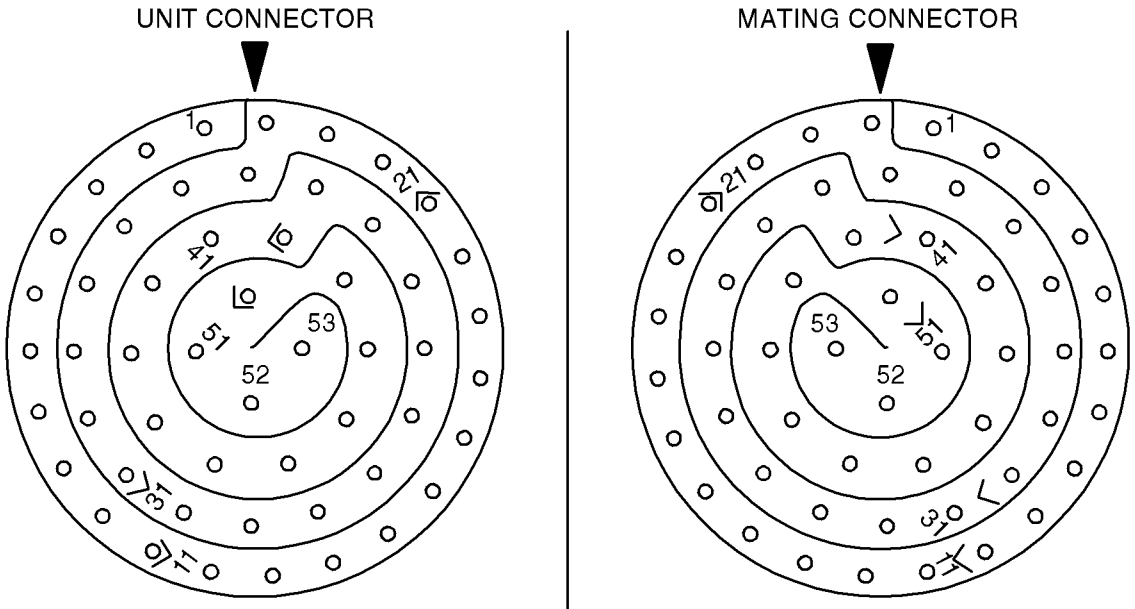
Table 3-2. Contact Arrangements for P1-B Top Insert, HSU ARINC 600 Connector

	A	B	C	D	E	F	G	H	J	K
1	RSVD SPARE 229	RSVD SPARE 230	RSVD SPARE 231	RSVD SPARE 232	RSVD SPARE 233	RSVD SPARE 234	RSVD SPARE 235	RSVD SPARE 236	RSVD SPARE 237	CHASSIS GND
2	RSVD SPARE 187	RSVD SPARE 188	RSVD SPARE 189	RSVD SPARE 190	RSVD SPARE 191	RSVD SPARE 192	RSVD SPARE 193	RSVD SPARE 194	RSVD SPARE 238	RSVD SPARE 239
3	RSVD SPARE LO 24	RSVD SPARE HI 24	RSVD SPARE LO 25	RSVD SPARE HI 25	RSVD SPARE HI 17	RSVD SPARE LO 17	RSVD SPARE LO 28	RSVD SPARE HI 28	RSVD SPARE LO 29	RSVD SPARE HI 29
4	RSVD SPARE 240	RSVD SPARE 241	RSVD SPARE 46	RSVD SPARE 95	RSVD SPARE 242	RSVD SPARE 243	RSVD SPARE 244 GND	RSVD SPARE 245	RSVD SPARE 246	RSVD SPARE 247 GND
5	RSVD SPARE 44	RSVD SPARE 93	RSVD SPARE 248	CHASSIS GND	RSVD SPARE 24	RSVD SPARE 73	RSVD SPARE 248	RSVD SPARE 250	RSVD SPARE 251	RSVD SPARE 252 GND
6	RSVD SPARE 25	RSVD SPARE 74	RSVD SPARE HI 3	RSVD SPARE LO 3	RSVD SPARE 31	RSVD SPARE 80	RSVD SPARE HI 18	RSVD SPARE LO 18	RSVD SPARE 41	RSVD SPARE 90
7	RSVD SPARE HI 19	RSVD SPARE LO 19	RSVD SPARE 32	RSVD SPARE 81	RSVD SPARE 253	RSVD SPARE HI 2	RSVD SPARE LO 2	CHASSIS GND	RSVD SPARE 15	RSVD SPARE 64
8	RSVD SPARE 42	RSVD SPARE 91	RSVD SPARE 27	RSVD SPARE 76	RSVD SPARE 47	RSVD SPARE 96	RSVD SPARE 38	RSVD SPARE 87	RSVD SPARE 35	RSVD SPARE 84
9	RSVD SPARE HI 15	RSVD SPARE LO 15	RSVD SPARE 173	RSVD SPARE 200	RSVD SPARE HI 16	RSVD SPARE 163	RSVD SPARE 164	RSVD SPARE LO 16	RSVD SPARE 206	RSVD SPARE 208
10	RSVD SPARE 33	RSVD SPARE 82	RSVD SPARE 37	RSVD SPARE 86	RSVD SPARE 48	RSVD SPARE 97	RSVD SPARE 20	RSVD SPARE 69	RSVD SPARE 106	RSVD SPARE 119
11	RSVD SPARE 108	RSVD SPARE 121	RSVD SPARE 9	RSVD SPARE 58	RSVD SPARE 10	RSVD SPARE 59	RSVD SPARE D/L 36	RSVD SPARE D/L 35	RSVD SPARE D/L 30	RSVD SPARE D/L 29
12	RSVD SPARE 104	RSVD SPARE 117	RSVD SPARE 7	RSVD SPARE 56	RSVD SPARE 101	RSVD SPARE 113	RSVD SPARE 8	RSVD SPARE 57	RSVD SPARE 3	RSVD SPARE 52
13	RSVD SPARE 28	RSVD SPARE 27	RSVD SPARE 23	RSVD SPARE 22	CHASSIS GND	RSVD SPARE 254	RSVD SPARE 4	RSVD SPARE 53	RSVD SPARE 14	RSVD SPARE 63
14	RSVD SPARE 2	RSVD SPARE 51	RSVD SPARE 12	RSVD SPARE 61	RSVD SPARE 1	RSVD SPARE 50	RSVD SPARE 6	RSVD SPARE 55	RSVD SPARE 13	RSVD SPARE 62
15	RSVD SPARE 255	RSVD SPARE 256	RSVD SPARE 109	RSVD SPARE 122	RSVD SPARE 99	RSVD SPARE 111	RSVD SPARE 102	RSVD SPARE 114	RSVD SPARE 5	RSVD SPARE 54

P1C-4 RSVD SPARE 225 (TO E1)	P1C-3 28 V dc PRMRY GND	P1C-2 28 V dc PRMRY PWR	P1C-1 115 V ac HOT
P1C-6 RSVD SPARE 227 (TO E3)			P1C-5 RSVD SPARE 226 (TO E2)
P1C-10 28 V dc STDBY PWR	P1C-8 CHASSIS GND (SHLDS)	P1C-7 115 V ac COLD	P1C-9 RSVD SPARE 228 (TO E4)
	P1C-11 28 V dc STDBY GND		
	P1C-13 TX SIG (TO HPA)	P1C-12 RX SIG (FROM SPLITTER)	

ID-106242

Figure 3-7. Contact Arrangements for P1-C Bottom Insert, HSU ARINC 600 Connector



NOTES:
1. Views shown are of mating surfaces.
2. For mating connector part numbers, refer to the HSU leading particulars table in Section 1.

ID-106247

Figure 3-8. HSU Data Loader Connector (J1) Pin Layout

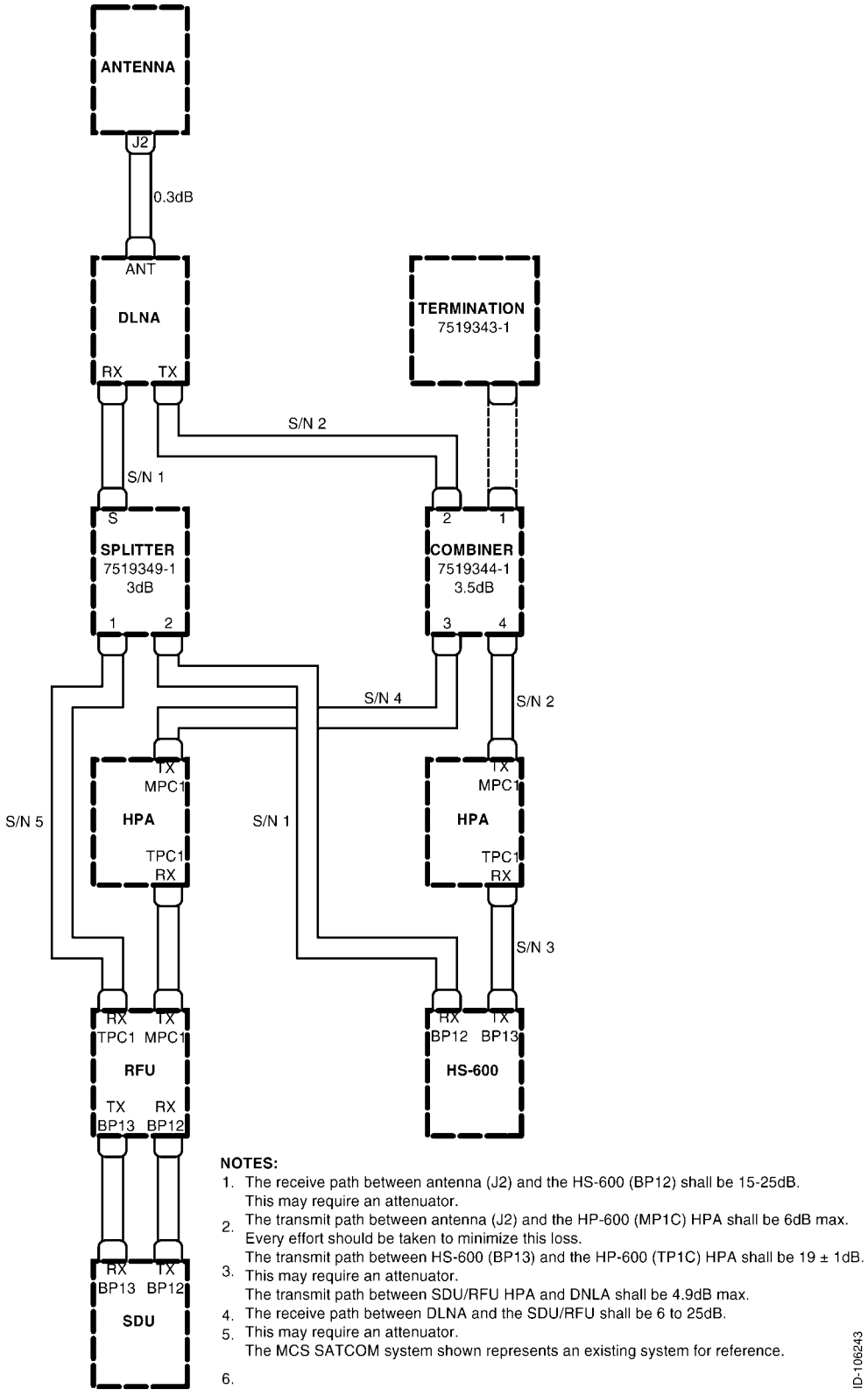
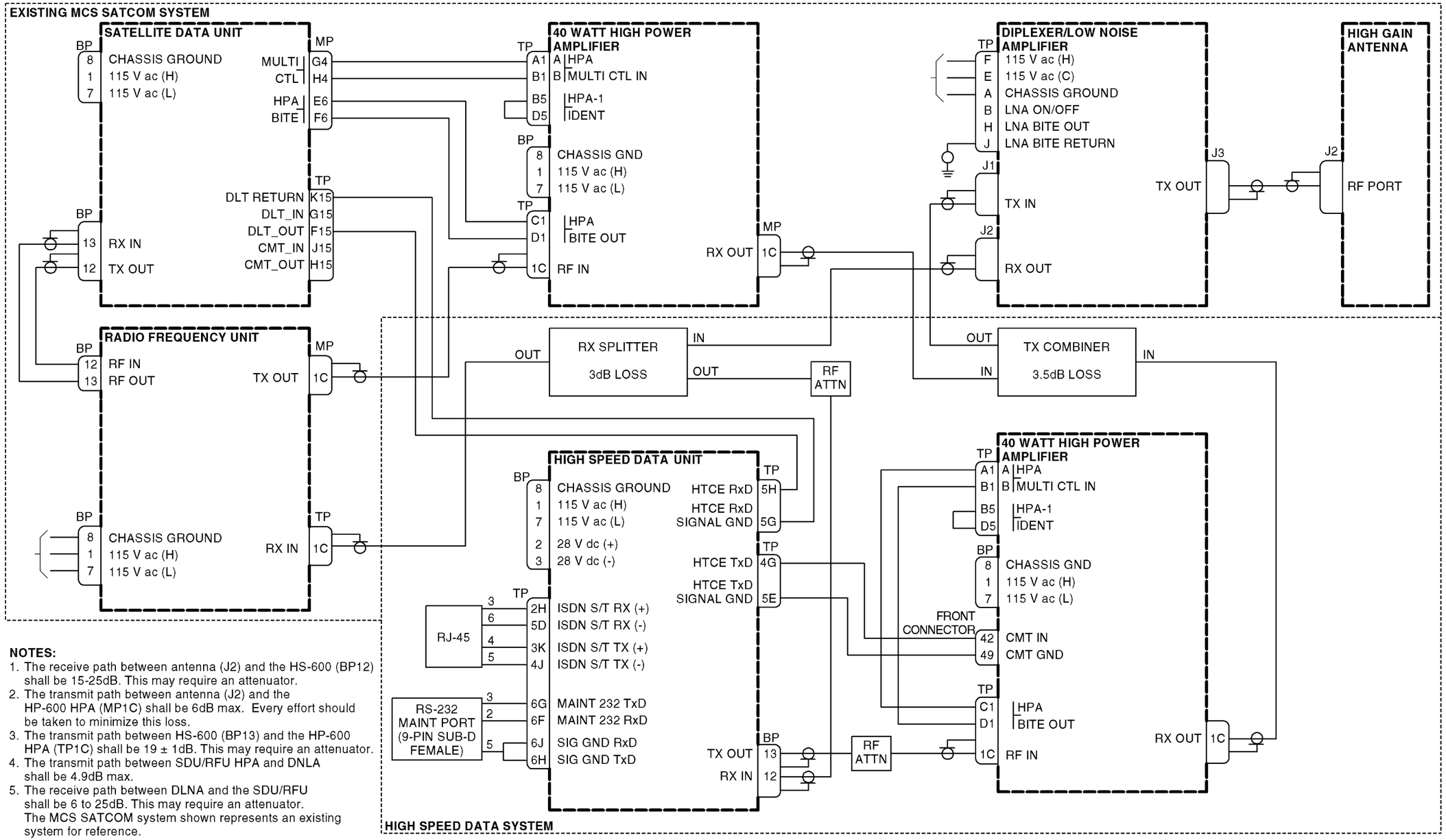


Figure 3-9. RF System Interface



NOTES:

1. The receive path between antenna (J2) and the HS-600 (BP12) shall be 15-25dB. This may require an attenuator.
2. The transmit path between antenna (J2) and the HP-600 HPA (MP1C) shall be 6dB max. Every effort should be taken to minimize this loss.
3. The transmit path between HS-600 (BP13) and the HP-600 HPA (TP1C) shall be 19 ± 1dB. This may require an attenuator.
4. The transmit path between SDU/RFU HPA and DNLA shall be 4.9dB max.
5. The receive path between DLNA and the SDU/RFU shall be 6 to 25dB. This may require an attenuator. The MCS SATCOM system shown represents an existing system for reference.
6. The current MCS installation may not include an RFU.

Figure 3-10. High Speed Data System Interconnect Diagram

INSTALLATION CHECK

SECTION 4
INSTALLATION CHECK

1. Overview

A. General

(1) The procedures that follow are designed to check for the satisfactory installation of the HS-600 HSD system prior to LRU installation.

2. Installation Checkout

A. General

(1) The HSD system aircraft installation checkout should include, but is not limited to, the following steps:

- Cable loss checks
- Power checks
- RF checks.

B. Cable Loss Checks

(1) HS-600 HSU to HPA Path Loss

(a) Measure the total cable and connector losses between the HSU TX output (BP13) to the HPA RF input (TP1C).

(b) If necessary, install an attenuator to achieve a total loss of 19-21 dB.

(2) HPA to Antenna Loss

(a) Measure the total loss between the HS-600 HPA RF output (MP1C) to the antenna RF port (J2).

(b) Enter this value into parameter No. 5 through the HS-600 maintenance port. Do no change any other parameters. Do no forget to save the changes.

(c) Assuming that this value is equal to the SDU HPA to antenna loss, enter the value through the SDU CMT using the keystrokes listed below. If the loss is more than 1 dB different from the HS-600 HPA to antenna loss, measure the loss first before entering the value.

(d) From the SDU main menu, make the following selections:

- F) Physical Layer Menu
- C) Power Control Menu
- D) Manual Power Control Menu
- B) HGA HPA to Antenna Loss.

(e) Enter the loss value. If greater than 5 dB, enter 5 dB.

C. Power Checks

(1) Check the pins listed in Table 4-1.

Table 4-1. Power Checks

LRU	Connector Pin	Signal
HS-600 HSU	BP1	115 V ac (High)
	BP7	115 V ac (Low)
	BP2	28 V dc (High)
	BP3	28 V dc (Low)
HSD System HPA (Note)	BP1	115 V ac (High)
	BP7	115 V ac (Low)
NOTE: The HPA is also available as 28V dc. See Honeywell Pub. No. C15-5111-005 for installation details.		

D. RF Checks

(1) Check the pins listed in Table 4-2. Figure 4-1 shows the receive (RX) path loss and Figure 4-2 shows the transmit (TX) path loss. These losses are achieved by a combination of RF coaxial cable losses and installed RF attenuators (the latter, if required).

Table 4-2. RF Checks

From LRU	Connector Pin	To LRU	Connector Pin
RX Splitter	RX IN	DLNA	J2 (RX OUT)
	RX OUT	MCS-3000 SDU or MCS-4000 SDU or MCS-7000 SDU	BP13 (RX IN)
	RX OUT	MCS-6000 RFU	TP1C (RX IN)
	RX OUT	RF Attenuator	IN
RF Attenuator	OUT	HS-600 HSU	BP12 (RX IN)
Combiner	TX OUT	DLNA	J1 (TX IN)
	TX IN	HSD System HPA	MP1C (RX OUT)
	TX IN	SATCOM System HPA	MP1C (RX OUT)
HS-600 HSU	BP13 (TX OUT)	RF Attenuator	IN
RF Attenuator	OUT	HSD System HPA	TP1C (RF IN)

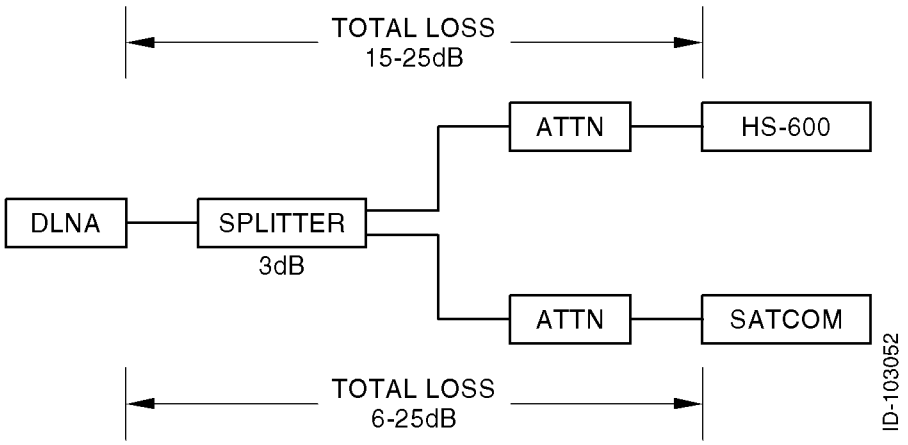


Figure 4-1. RX Path Loss

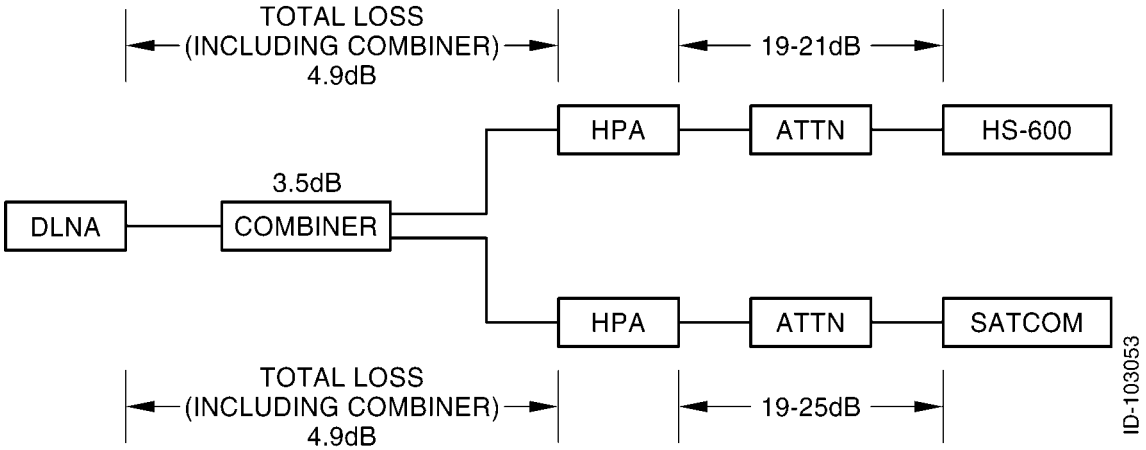


Figure 4-2. TX Path Loss

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ADJUSTMENT/TEST

SECTION 5
ADJUSTMENT/TEST

1. Overview

A. General

(1) This section provides instructions for adjusting/testing the HS-600 HSD system.

2. Details

A. General

(1) Access to the maintenance functions is obtained by connecting a personal computer (PC) to the RS-232 maintenance port connector. The maintenance port connector is a 9-pin sub-D connector that is connected to the HSU mounting tray connector.

(2) To operate with a PC, the initial settings of the maintenance port must be as follows:

- Speed, normally 115,200 bps
- 8 data bits
- No parity
- 1 stop bit
- Turn caps lock ON.

B. Software

(1) The software can be any communications package that can send and receive ASCII at 115,200 baud rate, 8 bits with no parity bit, and 1 stop bit. Among the programs that have been used are ProComm and HyperTerminal from Windows.

C. System Initialization

(1) Apply power to the SATCOM and HS-600 systems.

(2) Connect a cable from the PC to the front of the SDU as given in Table 5-1. The cable connector that attaches to the front of the SDU is a 53-pin male connector. The cable connector that attaches to the PC is a 9-pin female sub-D connector. Refer to Figure 5-1.

Table 5-1. SDU to PC Wire List

From SDU Front Connector Pin	To PC Connector Pin
42	3
43	2
49	5

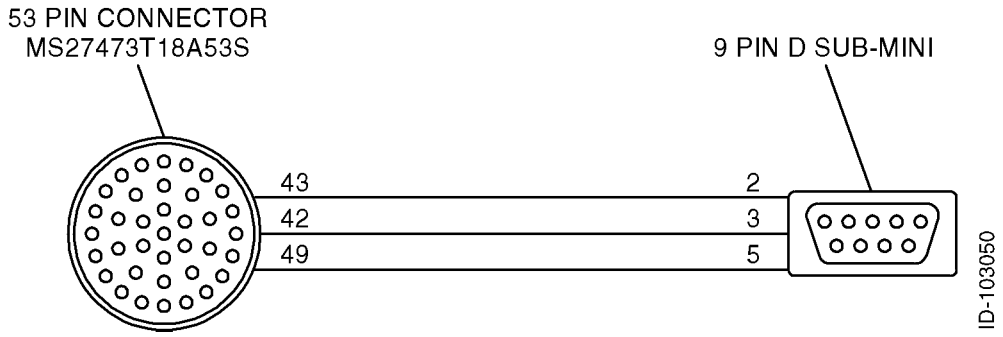

Figure 5-1. SDU to PC Cable

(3) Connect the PC using HyperTerminal, ProComm, or equivalent.

(4) Set the terminal settings to: Direct Connect to Comm 1, 9600 N 81.

(5) Press ENTER to see the SDU main menu.

NOTE: Refer to paragraph 1.A.(5) in section 1 for the periodic data word setup.

(6) Align the inertial reference system (IRS).

(7) Remove the cable from the SDU to the PC.

(8) Connect a cable from the HSU to the RS-232 maintenance port as given in Table 5-2.

Table 5-2. HSU to RS-232 Maintenance Port Wire List

From HSU Connector Pin	To RS-232 Maintenance Port 9-Pin Female D-Type Connector Pin
TP6G	3
TP6F	2
TP6J, TP6H	5

(9) Connect a cable from the RS-232 maintenance port to the PC as shown in Figure 5-2. The cable connector that attaches to the HSU RS-232 maintenance port is a 9-pin male sub-D connector. The cable connector that attaches to the PC is a 9-pin female sub-D connector.

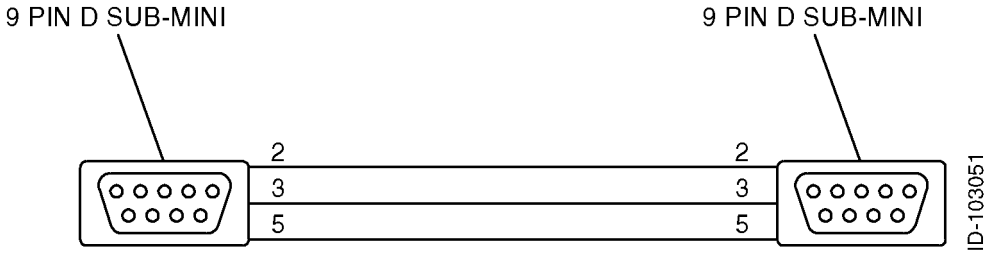

Figure 5-2. HSU RS-232 Maintenance Cable

(10) Set up the terminal according to paragraph 2.A.(2) of this section.

(11) Once the SATCOM system is logged on, then the HS-600 system will log on.

(12) View the maintenance port information for a typical start-up. Refer to paragraph 2.D. of this section.

(13) Once WAIT FOR CALL is indicated, the system is ready for use.

D. Typical Maintenance Port Start-Up Information

(1) The information given in Table 5-3 is the typical output from the HS-600 maintenance port following a power cycle. The information assumes that the IRS has aligned and the multi-channel SATCOM has logged on.

Table 5-3. Typical HS-600 Maintenance Port Information

```
************** M4-IDU BOOT HEADER ************


(1.)  Download IDU Flash
(2.)  Boot from Flash (default), wait . . .
Please input your choice:  . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
Time Out Booting from Flash Now, please wait . . .


00.250:MNS-NS |MNS_CONFIG_RQ    |ff:ff: 0#270: 00 00 00 01 00 01 08 02 08 08
00.270:NS-MNS |MNS_CONFIG_CO    |ff:ff: 0#270: 02 02 53 01 00 01 08 02 08 08
00.280:SM -CC  |SM_CONFIG_RQ     |ff:ff:ff#264:  00 00 00 01 00 41 61 10 00 80
00.290:CC -SM  |SM_CONFIG_CO     |ff:ff:ff#264:Config CC  OK 02 00 43 01 00 41
00.290:SM -APP|SM_CONFIG_RQ      |ff:ff:ff#0:
```

Table 5-3. Typical HS-600 Maintenance Port Information (cont)

```
 Glocom Multi Channel M4 Terminal IDU software start up...
 IDU SW Version: A1.00 04/05/2002


 Initializing channel 0...
 copy bulletin board from flash memory ok, issue no is 23
 Initializing channel 1...
 copy bulletin board from flash memory ok, issue no is 23
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

   Waiting for LOG ON message from HTCE!!!

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Power Control: PH(0) = 15.0
             EIRP(0) = 25.0
               PM(0) = 9.5
               GH(0) = 58.0
              Obo(0) = 2.0

       Set Economy Flag = 0

▯IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIˉ
§                                                        §
§        Press [ENTER] to start Maintenance Setting       §
§                                                        §
EIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII▯

00.900:APP-SM |SM_CONFIG_CO   |ff:ff:ff#0:Config APP OK

(    20), ISDN module buffer allocated=  1

(    40), ISDN module buffer allocated=  1

* Have found “Format B”

(    60), ISDN module buffer allocated=  1

(    80), ISDN module buffer allocated=  1

(   100), ISDN module buffer allocated=  1

* Have found “Format B”

(   120), ISDN module buffer allocated=  1

(   140), ISDN module buffer allocated=  1
```

Table 5-3. Typical HS-600 Maintenance Port Information (cont)

```
* Waiting for MSG_LOGON_ACK from ACSE.
CHNL 0(T=14109) changed to OC-Reg 2
* Current state is LOG_ON.
CHNL 0(T=14111) , got sync response from ODU,now request DSP setting...
CHNL 0(T=14112) , got DSP settings , now load FPGA program...
Oscillate correction= -125 (i.e. FFFFFF83)!
CHNL 0 Set Tx channel to 2AB4.
CHNL 0(T=14228) ,DSP load FPGA ok,now load TDM code...
CHNL 0(T=14228) ,STATE CHANGE FROM 0 --->1
CHNL 0(T=14233) ,TDM Rx stopped!
CHNL 0 Set Tx channel to 2AB4.
 CHNL 0 : Rx is 2ab4
CHNL 0(T=14233) ,STATE CHANGE FROM 1 --->2
CHNL 0(T=14233) ,DSP load TDM ok,now tune to NCSC...
CHNL 0(T=14300) ,Got frame synchronization ...
CHNL 0(T=14300) ,Bulletin Board Update Ok...Issue No 23
CHNL 0(T=14300) ,STATE CHANGE FROM 2 --->3
CHNL 0(T=14300) ,BB Update Ok,wait for SBS finishing...
CHNL 0(T=14300) ,Init/ReInit SBS!!
CHNL 0(T=14300) ,SBS started!!
Position: Lat=33.000000, Long=-112.003326
CHNL 0 SBS ID = 6
CHNL 0(T=14303) ,SBS finished!!
 CHNL 0 : Rx is 24cc
CHNL 0(T=14304) ,STATE CHANGE FROM 3 --->6
CHNL 0(T=14304) ,Start ocean region registration...
CHNL 0(T=14306) ,get sync on NCRA channel, continue ORR...
Chl 0 wait timer TM081 for 2630
CHNL 0(T=14569) ,TM081 timer out !
CHNL 0 MESRR Tx: 249C

CHNL 0 burst backoff 16 dBm
CHNL 0 PwrCtrl cmd: 29 00 A0 00 00
CHNL 0 Set Tx channel to 249C.
CHNL 0 Tell DSP Tx idle channel is 2AB4.
CHNL 0(T=14569) ,send orr burst
 CHNL 0 : Rx is 2ab4
CHNL 0(T=14780) ,STATE CHANGE FROM 6 --->4
CHNL 0(T=14780) ,Mes is in idle ,wait for call...
CHNL 0(T=14780) ,TDM Rx stopped!
CHNL 0 Set Tx channel to 2AB4.
 CHNL 0 : Rx is 2ab4
CHNL 0(T=14780) ,STATE CHANGE FROM 4 --->2
CHNL 0(T=14827) ,Got frame synchronization ...
CHNL 0(T=14827) ,Wait for  call...
CHNL 0(T=14827) ,STATE CHANGE FROM 2 --->4
(   160), ISDN module buffer allocated=  1

(   180), ISDN module buffer allocated=  1

* Have found “Format B”
```

E. Maintenance Menu Items

(1) The maintenance menu items given in Table 5-4 can be accessed through the maintenance port by pressing the ENTER key after the HS-600 system has booted up. (See paragraph 2.D. in this section.)

NOTE: Items listed in Table 5-4 are for reference only and will be set by the manufacturer.

NOTE: Changes to the parameters listed in Table 5-4 should only be accomplished by qualified personnel or after consulting your Honeywell representative.

Table 5-4. Maintenance Menu Items

```
Maintenance Parameters Setting
 1. P(tx) Initial EIRP: 25.0dBW
 2. Ref. oscillator correction factor:  -125Hz
 3. Transmit Doppler compensation adjustment rate:  60Hz/sec
 4. G(M-H) ISE MTU-to-HPA output gain:  40dB
 5. HPA output to antenna input loss:   2dB
 6. G(Amin) Minimum usable reported antenna gain:   7dB
 7. P(omin) Max. allowed HPA average output power: 17.0dBW
 8. Enabled BEARE Service Interface:   0
 9. Min. Frame No. for TX port:   3
 A. HPA Format Selection: N
 S. Save setting and Exit
```

```
Enter your selection: 1

P(tx) Initial EIRP, range 20 to 25dBW in 0.5dBW steps: 25.0Hz
Please enter new value between 20.0 to 25.0):
 Keep current value!
```

```
Enter your selection: 2

Reference oscillator correction factor
range +/-2200Hz, in 1Hz step:  -125Hz
Please enter new value between -2200 to  2200(+/-XXXX):
 Keep current value!
```

```
Enter your selection: 3

Transmit Doppler compensation adjustment rate, default is 60Hz/sec.
Please make your choice :
  1. 30Hz/sec.
  2. 60Hz/sec.
 Enter your choice:

Use default Transmit Doppler compensation adjustment rate, 60Hz/sec.
```

Table 5-4. Maintenance Menu Items (cont)

Enter your selection: 4 ISE MUT-TO-HPA output gain range 36 to 42 dB, in 1 dB steps: 40Hz Please enter new value between 36 to 42: Keep current value!
Enter your selection: 5 HPA output to antenna input loss, range 1-6 dB, in 1dB steps: 2Hz Please enter new value between 1 to 6: Keep current value!
Enter your selection: 6 Minimum usable reported antenna gain below which the ISE ceases operation of the HSD channel range 7 to 12 dB, in 1dB steps: 7Hz Please enter new value between 7 to 12: Keep current value!
Enter your selection: 7 Maximum allowed HPA average output power, range 20 to 60W, or 13 to 18 dBW, in 0.5dB steps: 17.0Hz Please enter new value between 13.0 to 18.0): Keep current value!
Enter your selection: 8 Enabled Bearer Service Interface, 0 for ISDN S/T and 1 for PCM: 0Hz Please enter new value between 0 to 1: Keep current value!
Enter your selection: 9 Min. frame number for ack TX port: 3Hz Please enter new value between 2 to 12: Keep current value!
Enter your selection: A (NOTE: Must be Upper Case) “A” or “B” for different HPA types: N Please enter your new character (A-B): Keep current value!

Table 5-4. Maintenance Menu Items (cont)

Enter your selection: S (NOTE: Must be Upper Case) Maintenance Parameters have been saved. The new maintenance parameters will be used by system. Please wait for system setup... NOTE: Must power cycle HS-600 for parameter save to take effect.
********** Main Menu ********** 1.Protocol Mode 2.Manual Mode 3.Change Password Enter your selection: 1 NOTE: Press <ESC><ESC> or power cycle to exit from this menu.
********** Menu in protocol mode ********** 1.Event Log ESC. Exit Enter your selection:
********** Menu in protocol mode ********** 1.Event Log ESC. Exit Enter your selection: 1
********** Event Log Menu ********** 1.Display last 20 Event Log records 2.Display specified range of Event Log records 3.Display all Event Log records V.Verify a specified Event Log Record in Hex format C.Clear all Event Log records ESC. Exit Enter your selection:
********** Menu in protocol mode ********** 1.Event Log ESC. Exit Enter your selection:

FAULT ISOLATION

SECTION 6
FAULT ISOLATION

1. Overview

A. General

(1) To be supplied.

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MAINTENANCE PRACTICES

SECTION 7
MAINTENANCE PRACTICES

1. Overview

A. General

(1) This section provides instructions for removing, reinstalling, and adjusting the HS-600 HSU, combiner, and/or splitter that has been previously installed by the aircraft manufacturer or completion center. Adjustment information is called out as required.

CAUTION: SHOULD ANY INSTALLATION CRITICAL CASES ARISE WITH THE REINSTALLATION OF ANY UNIT, YOU MUST COMPLY 100 PERCENT WITH THE INSTRUCTION.

CAUTION: TO PREVENT DAMAGE TO EQUIPMENT, TURN AIRCRAFT POWER OFF WHEN REMOVING OR INSTALLING LRUS.

B. Equipment and Materials

(1) No additional special equipment or materials, other than those commonly used in the shop, are required to install the units in existing trays and clamps, and adjust the system. Do not over tighten mounting screws. Where torque values are not given, it is acceptable to finger tighten the mounting screws.

2. Procedure for the HS-600 HSU

A. Removal and Reinstallation Procedures

(1) Remove the HSU.

(a) Remove power from the HSU and the interfacing subsystems (such as SATCOM. Circuit breakers for the systems are typically located on the flight deck.

(b) Loosen the mounting tray holddown clamps by rotating in a counterclockwise direction.

(c) Slowly pull forward on the unit handle to separate the unit and tray connectors and slide the unit out of the tray, lifting slightly to clear the holddown clamps.

(d) Place electrostatic protective covers on the HSU rear connector to protect the pins from damage.

(e) Place the HSU in a protective static-resistant bag and protective carrying case.

(2) Reinstall the HSU.

(a) Remove the HSU from the protective carrying case and protective static-resistant bag.

(b) Remove the electrostatic protective covers from the HSU rear connector.

(c) Slide the unit into the mounting tray.

CAUTION: WHEN PLACING THE UNIT ON THE MOUNTING TRAY, DO NOT FORCE FIT. IF MATING IS DIFFICULT, REMOVE THE UNIT AND CHECK FOR CONNECTOR PINS THAT CAN BE BENT OR OUT OF ALIGNMENT. ALSO VISUALLY CHECK THE ALIGNMENT OF THE RECEPTACLE ON THE MOUNTING TRAY.

(d) Gently slide the unit backwards until its connectors are fully engaged with the mating connectors of the mounting tray.

(e) Put the holddown clamps in place and tighten the knobs in a clockwise direction until the proper torque is applied (clutch engages).

(f) Reapply power to the HSU and its interfacing equipment.

NOTE: Upon applying primary power, the HSU will automatically power up and start a POST.

B. Adjustment Procedures

(1) Not applicable.

C. Repair Procedures

(1) Not applicable.

D. Return to Service Procedures

(1) Refer to test procedures in the INSTALLATION CHECK section of this manual.

3. Procedure for the Combiner/Splitter

A. Removal and Reinstallation Procedures

(1) Remove the combiner.

(a) Remove power from the HSU. Circuit breakers for the HSU are typically located on the flight deck.

(b) Locate the combiner.

(c) Disconnect the aircraft connectors from the combiner and place protective covers on the connectors.

(d) Remove the six screws holding the combiner in position.

(2) Reinstall the combiner.

(a) Attach the combiner using six screws.

(b) Remove the protective covers from the connectors and install the aircraft connectors on the combiner.

(c) Reapply power to the HSU and its interfacing equipment.

(3) Remove the splitter.

(a) Remove power from the HSU. Circuit breakers for the HSU are typically located on the flight deck.

(b) Locate the splitter.

(c) Disconnect the aircraft connectors from the splitter and place protective covers on the connectors.

(d) Remove the two screws holding the splitter in position.

(4) Reinstall the splitter.

(a) Attach the splitter using two screws.

(b) Remove the protective covers from the connectors and install the aircraft connectors on the splitter.

(c) Reapply power to the HSU and its interfacing equipment.

B. Adjustment Procedures

(1) Not applicable.

C. Repair Procedures

(1) Not applicable.

D. Return to Service Procedures

(1) Refer to test procedures in the INSTALLATION CHECK section of this manual.

4. Instructions for Continued Airworthiness, Code of Federal Regulation CFR 91.213

A. General

(1) Maintenance requirements and instructions for continued airworthiness of the HS-600 HSU components are contained in the following paragraphs:

(2) Installation of the HSU on an aircraft by Supplemental Type Certificate or Form 337 obligates the aircraft operator to include the maintenance information provided by this manual in the operator's Aircraft Maintenance Manual and the operator's Aircraft Scheduled Maintenance Program.

B. Instructions

(1) Maintenance information for the HSU (system description, removal, installation, testing, etc.) is contained in this manual.

(2) LRU part numbers and other necessary part numbers contained in this manual should be placed into the aircraft operator's appropriate aircraft Illustrated Parts Catalog (IPC).

(3) Wiring diagram information contained in this manual should be placed into the aircraft operator's appropriate aircraft Wiring Diagram Manuals.

(4) The high speed data system components are considered on-condition units and no additional maintenance is required other than a check for security and operation at normal inspection intervals.

(5) If a system component is inoperative, remove unit, secure cables and wiring, collar applicable switches and circuit breakers, and placard them inoperative. Revise equipment list and weight and balance as applicable prior to flight and make a log book entry that unit was removed. Refer to section 91.213 of the CFR or the aircraft's minimum equipment list (MEL).

(6) The HSU components can be repaired only at a factory authorized repair center or an appropriately rated FAA Part 145 repair station.

(7) Once repaired, reinstall the LRU in the aircraft in accordance with the original Form 337 approved data or instructions in this manual. Do a return-to-service test of the system and approve it for return to service with a log book entry required by section 43.9 of the FAR.

(8) Scheduled Maintenance Program tasks to be added to the aircraft operator's appropriate aircraft maintenance program are as follows:

(a) Recommended Periodic Scheduled Servicing Tasks: None Required

(b) Recommended Periodic Inspections: None Required

(c) Recommended Periodic Scheduled Preventative Maintenance Tests (Tests to determine system condition and/or latent failures): None Required

APPENDIX A

APPENDIX A
M4 CALL CAUSE CODE LIST

1. Overview

A. General

(1) The following list of cause codes in Table A-1 describes the various conditions of a failed M4 terminal call.

Table A-1. Call Cause Code List

Cause Code	Description	Note
0001	Invalid LES code entry.	
0003	Selected land earth station (LES) does not support M4 services.	
0004	Invalid dialing sequence detected.	
0005	Out of memory capacity.	
0101	Cannot obtain the network coordination station assignment (NCSA) channel from the Bulletin Board.	
0102	Cannot obtain the land earth station assignment (LESA) channel from the Bulletin Board.	
0103	Failed to stop the time division multiplex (TDM) receive command before tuning to the NCSA/LESA channel.	
0104	Failed to synchronize to the NCSA/LESA channel frequency.	
0105	User cleared call before the single channel per circuit (SCPC) channel was assigned.	
0106	Failed to receive the channel assignment.	
0107	85H code (instead of channel assignment) received.	
0108	DSP failed to reset after call clear.	
0109	DSP failed to reset before loading the Mini M/high speed data (MM/HSD) service code.	
0110	DSP failed to load the M1/M4 service code.	
0111	Incorrect channel received from the channel assignment SU (86h).	
0120	Erroneous frame number detected on 81H SU. Response SU (82H) not sent.	
0121	Erroneous slot number detected on 81H. Response SU (82H) not sent.	
0122	Failed to obtain the MESRP channel from the Bulletin Board.	
0123	DSP did not report after response SU before it transmitted.	
1001	Normal Clearing. Mobile Earth Station (MES) is clearing the call as instructed by the relevant MES terminal equipment (i.e., normal clearing due to MES terminal “on-hook” etc.).	**1.**
1011	MES Busy. MES is rejecting the call because the specified MES terminal number is currently busy, and MES has not been authorized to divert calls which are addressed to that number.	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
1012	MES is clearing the fixed-originated call because subsequent to the acceptance of the call and signaling of the identity of the mobile terminal to which the call will actually be routed, that terminal has become busy and therefore cannot be rung.	1.
1021	Call Failed, MES Time-out, No Answer MES is clearing the call because appropriate "off-hook" signaling has not been received from the addressed MES terminal (including any authorized diversions) within the allowed time limit.	1.
1081	Call Failed, MES Terminal # Not Installed MES is rejecting the call because the specified MES terminal number has not been installed, and MES has not been authorized to divert calls which are addressed to that number.	1.
1091	Call Failed, MES Terminal # out of Service MES is rejecting the call because the specified MES terminal number is currently out of service, and MES has not been authorized to divert calls which are addressed to that number.	1.
1092	MES is clearing the fixed-originated call because subsequent to the acceptance of the call and the signaling of the identity of the mobile terminal to which the call will actually be routed, that terminal has become out-of-service and therefore cannot be rung.	1.
1141	Call Cleared, pre-empted at MES MES clear: pre-emption for higher priority call.	1.
1142	Call Refused due to Distress Call from MES MES clear: (Fixed) MES has initiated a distress call.	1.
1143	Call Cleared, pre-empted at MES Fixed-originated call cleared by MES due to SATCOM reporting that it is no longer logged on.	1.
1144	Attempted Call pre-empted by MES Distress MES clear: (mobile) MES has initiated a distress call.	1.
1145	Call Cleared, pre-empted by MES Mobile-originated call cleared by MES due to SATCOM reporting that it is no longer logged on.	1.
1146	Attempted Call Abandoned by MES Terminal MES is prematurely clearing the mobile-originated call which is in the process of being established because the MES user has abandoned the call (by placing, the originating terminal "on-hook).	1.
11A0	LES is clearing the call because the credit card being used is not valid (at this LES) for calls to the country indicated in the "Service Address' information received from the MES.	1.
11D1	Call Failed, Request Data Invalid LES is rejecting the call because the "Service Nature" and/or "Service Type" and/or "Channel parameter" information received from the MES is invalid (e.g., not currently defined in the SDM, mutually contradictory, or not applicable to a MES-originated call.)	1.

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
11D2	Call Failed, Insufficient Digits in Service Address LES is clearing the call because the "Service Address" information received from the MES is invalid (e.g., less than 2 digits). If the customer is dialing a valid phone number or prefix code, verify that the MES has a corresponding Inmarsat mobile number (IMN)s in the LES access control and signalling equipment (ACSE) database.	**1.**
11D3	Call Failed, Invalid Service Address LES is clearing the call because the "Service Address" information received from the MES is a 2-digit address which is either undefined or which is currently unavailable at this LES.	**1.**
11D4	LES is clearing the call because the "credit card data" information received from the MES is invalid. (This does not imply that the credit card itself is invalid.)	**1.**
11D5	LES is clearing the call because the "Service Address" information received from the MES contains a country code which is regarded (by this LES) as invalid.	**1.**
11D6	LES is clearing the call because the "PID" information received from the MES in the "scrambling vector" message (type 8D) is not consistent with the personal identification number (PID) information in the fixed/MES-originated (PID) and PID/MES Registration Tables at the LES as it relates to this call.	**1.**
11D7	LES is failing the call because the service requested by the MES in the distress, urgency or safety access request is not 4.8 kbps AMBE telephony.	**1.**
11D8	LES is clearing the call because the service address received from the MES requesting distress, urgency or safety priority is not a two or three-digit code.	**1.**
11E0	LES is clearing the call because the credit card PIN received from the MES is not considered (at this LES) to be valid.	**1.**
11E1	LES is clearing the call because it has been determined that an excessive number of consecutive call attempts with invalid credit card have been made.	**1.**
1201	MES ack: received a simplex call.	**1.**
1202	(Spot Beam Handover): MES is ready to make the transition from the current beam to the next beam.	**1.**
1261	MES ack: received a simplex call (unstable).	**1.**
1262	Call Cleared, MES Timeout Distress Test MES clear: distress test call has not been cleared in 120s.	**1.**
1281	Call Failed, MES Cannot Accept MES is rejecting the call because the MES is not equipped to provide the specified service.	**1.**
1291	Call Failed, MES Cannot Accept at Present MES is rejecting the call because although it is equipped to provide the specified service, it is not currently able to do so.	**1.**
12B1	Call Cleared by MES for Unspecified Reason MES is rejecting or clearing the call for a reason which is not covered by any of the currently defined "Cause" events.	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
12C1	Call Faded, No Scrambling Vector Ack MES clear: Scrambling Vector Ack (95) not received by the MES.	**1.**
12C2	MES is clearing the call because a "Credit Card Valid" message (type A7) has not been received by the MES within the allowed time limit.	**1.**
12C3	Call Failed, MES Timeout, No Terrestrial Answer MES is clearing the call because an "LES Connect" message (type 8C) has not been received by the MES within the allowed time limit.	**1.**
12C4	MES is clearing the call because the "authentication query" ISU message (type B4) and/or the "authentication query" SSU message (type B5) have not been received by the MES within the allowed time limit.	**1., 2., 13., 14., 15.**
12C5	MES is clearing the call because an expected supplementary services SU(s) has (have) not been received by the MES within the allowed time limit.	**1.**
12C6	MES is clearing the call because the "supplementary services interrogation" ISU (type B2H), and/or "subscriber digits" SSU (type AD H) messages have not been received by the MES within the allowed time limit.	**1.**
12C7	MES is clearing the call because a "SCPC channel release" SU (type 8AH) has not been received by the MES, in response to the transmission of a "notification acknowledge" message (type BAH) during the supplementary services call diversion information retrieval process, within the allowed time limit.	**1.**
12C8	(Spot Beam Handover): MES is clearing the call session in the next beam because the MES did not detect the LESH carrier on the new frequency.	**1.**
12D1	Call Failed, Spot Beam Data Invalid LES is rejecting the call because the "spot beam ID" information received from the MES is invalid, i.e., ID is not allocated on the satellite in use.	**1.**
12D2	Call Failed, Invalid Scrambling Vector (LES is clearing the call because the "Scrambling Vector" information received from the the MES is invalid; i.e., 0000 H, 6959 H or 7 FFF H).	**1.**
1351	MES is clearing the call because the MES currently has insufficient free memory in which to store the short message.	**1.**
1361	Call Cleared by MES; Cable Unwrap MES is clearing the call because the above-decks equipment is about to "cable unwrap".	**1.**
1362	Call Cleared, Long Interruption Reception MES is clearing the call because a long-term interruption (16 sec) in reception of LES carrier has occurred. The definition of a "long-term interruption" depends upon the service type.	**1., 3.**
1363	Call Cleared, MES Antenna Repointed (WS clear: switching ocean regions) A secondary functional center of Multi-channel MES is clearing the call because the primary functional center has commanded the above-decks equipment to repoint to a different ocean region.	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
1391	Aero Class MES only: MES is clearing the call because the call has lasted more than 700 km in linear travelled distance.	**1.**
1392	Aeronautical Class MES only: MES is clearing the call because it has moved out of spot beam coverage.	**1.**
1393	Aeronautical Class MES only: MES in “cooperative mode” is clearing the call because of a preemption request from the master entity. Call cleared by MES due to reported antenna gain falling below the antenna gain threshold setting (Maintenance parameter #6) for more than 10 seconds.	**1.**
1393	Call cleared by the MES due to the reported antenna gain falling below the antenna gain threshold setting (maintenance parameter #6).	**1.**
1451	Call Failed, Terrestrial Circuits Congested LES is rejecting the call because an appropriate terrestrial circuit is not currently available at this specific LES.	**1.**
1452	Call Failed, LES Congested LES is rejecting the call because an appropriate channel unit and associated terrestrial circuit are currently not available at this LES.	**1.**
1502	(Spot Beam Handover): LES is ready to make the transition from the current beam to the next beam and is clearing the call session in the current beam (normal clear).	**1.**
1541	Call Cleared, pre-empted at LES. (LES clear: pre-empted by higher priority call.)	**1.**
1551	Call Failed, LES Congested, No Channel LES is rejecting the call because an appropriate satellite channel is not currently available at this specific LES.	**1.**
1552	LES reject: appropriate time division multiplex (TDM)/time division multiple access (TDMA) time slot not available.	**1.**
1581	Call Failed, Service Not Provided at this LES LES is rejecting the call because the requested service is not provided by this specific LES.	**1.**
1591	LES is rejecting the call because the requested service is temporarily not available at this specific LES.	**1.**
1592	LES is clearing the call because the specified credit card type is not currently supported by this specific LES.	**1.**
15A1	LES is rejecting the call because the specified MES is not authorized for any service (except Distress) at this specific LES. For a COMSAT LES, the phone is technically barred. For other LESs, the phone is either financially or technically barred. If the customer’s ISP or AA are authorized through this LES, verify that the MES ID has corresponding IMNs in the LES ACSE database. If the call setup proceeds to the point where the ACSE passes the call to the switch, check to see 1) if the area code is invalid, 2) if a valid area code is missing in the switch, 3)check to see if the ACSE passes the correct ICD message including the IMN (not all 9’s) to the switch.	**1., 4.**
15A2	LES is rejecting the call because the specified MES is not authorized to use specific requested service via this specific LES.	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
15A3	LES is clearing the call because the “credit card data” information received from the MES has been rejected by the credit card authorization process.	**1.**
15A4	LES is clearing the call because the data received from the MES in the “Authentication Reply” message (type B6) has been declared “invalid” by the LES authentication process.	**1., 5.**
15A5	LES is rejecting the call because the specified PID is not authorized for any service at this specific LES.	**1.**
15A6	LES is rejecting the call because the specified PID is not authorized to use specific requested service via this specific LES. (User not authorized/barred for service in the LES database.)	**1.**
15A7	LES is clearing the call because the service address received from the MES is not authorized for the requested priority.	**1.**
15B1	Call Cleared by LES for Unspecified Reasons LES is rejecting or clearing the call for a reason which is not covered by any of the currently defined “Cause” events.	**1.**
15C1	Call Failed, LES Timeout, No Assignment LES is rejecting the call because an appropriate “Channel Assignment” message has not been received from the NCS by the LES within the allowed time limit.	**1.**
15C2	LES is clearing the call because the “Service Address” information has not been received by the LES from MES within the allowed time limit.	**1.**
15C3	Call Failed, LES Timeout, No Scrambling Vector LES is clearing the call because a “Scrambling Vector” message (type 8D) has not been received by the LES from the MES within the allowed time limit.	**1.**
15C4	Call Failed, No Service Address or Vector LES is clearing the call because neither the “Service Address” information nor a “Scrambling Vector” message (type 8D) has been received by the LES from the MES within the allowed time limit.	**1.**
15C5	LES is clearing the call because the complete “credit card data” information has not been received by the LES within the allowed time limit.	**1.**
15C6	Call Failed, LES Timeout, No Return Carrier ID LES is clearing the call because the Return Carrier Identifier (8B) was not received.	**1.**
15C7	LES is clearing the call because an “MES Connect” message (type 99) has not been received by the LES within the allowed time limit.	**1.**
15C8	LES clear: SES Answer back not received.	**1.**
15C9	LES is clearing the call because an “Authentication Reply” message (type B6) has not been received by the LES within the allowed frame limit.	**1., 6.**
15CA	LES is clearing the call because a “notification acknowledge” message (type BAH) has not been received by the LES within the allowed time limit.	**1.**
15CB	LES is clearing the call because the request sequence number contained in the received “notification acknowledge” message (type BA) is not valid (i.e. either not ‘0’ or not the next value in the sequence).	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
15CC	Aeronautical Class MES only: (Spot Beam Handover): LES is terminating the procedure because it did not receive a response to the Handover Request from the NCS.	**1.**
15CD	(Spot Beam Handover): LES is clearing the call session in the next beam because the MES did not indicate that it was ready to make the transition (possibly because the MES did not receive the Channel Assignment).	**1.**
15D1	LES is rejecting the call because the "Channel Assignment" message received from the NCS contains inappropriate or conflicting information.	**1.**
15D2	LES is clearing this MES ID and channel number in the busy lists at LES and NCS because a new call to/from this MES is being set-up (and thus any previous call to/from **this** MES cleared).	**1.**
15E1	Call Cleared, MES still Transmitting Fault LES is attempting to clear an MES which has sent an SCPC channel release message but is found still to be transmitting 5.12 sec later.	**1.**
1651	Call Failed, LES Congested, No Channel Unit LES is rejecting the call because an appropriate channel unit is not currently available at this specific LES.	**1.**
1661	Call Failed, Long Interruption in Reception LES is clearing the call because of an interruption in reception of the MES carrier exceeding the allowed time limit of 62 seconds.	**1.**
16C1	LES clear: SEST carrier not received.	**1.**
16C2	LES is clearing the call because an appropriate SCPC MES carrier has not been received by the LES (at the commencement of the call) within the allowed time limit.	**1.**
16C3	(Spot Beam Handover): LES is clearing the call session in the next beam because the LES did not detect the MESH carrier on the new frequency	**1.**
1790	LES is clearing the call because of a malfunction in the credit card validity checking database or in the communications links.	**1.**
1791	LES is clearing the call because of a malfunction in the authentication checking database or in the communication links.	**1.**
1811	NCS is rejecting the call because the specified MES ID is in the "S busy" list at the NCS.	**1.**
1812	NCS is rejecting the call because the specified MES is busy with an IPDS call at the NCS.	**1.**
1841	NCS is pre-empting the call in order to free the MES for an incoming call with priority 1.	**1.**
1842	NCS is pre-empting the call in order to free the MES for an incoming call with priority 2.	**1.**
1843	NCS is pre-empting the call in order to free the MES for an incoming call with priority 3.	**1.**
1844	NCS is pre-empting the call in order to assign the channel to another call with higher priority.	**1.**
1851	NCS is rejecting the call because an appropriate SCPC channel is not currently available.	**1., 7., 8.**
1852	NCS is rejecting the call because no SCPC channel exists at the NCS which matches the contents of the Channel Parameters, Service Nature, Service Type, MES Category, Spot Beam ID and Priority fields contained in the Request for Channel Assignment.	**1., 9., 10., 11., 12.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
1853	NCS is rejecting the call because no SCPC channel is currently available for the specified leasemarked MES. Contact the NCS to verify that the MES has frequencies in a lease pool available or request that the MES ID be removed from the leasemark pool.	**1.**
1854	NCS is rejecting the call because the MES is outside the spot beam coverage area.	**1.**
1855	NCS is rejecting the call because an appropriate SCPC channel is not currently available and channel pre-emption failed.	**1.**
1856	NCS is rejecting the call because the requested spot beam indicates failed spot beam selection ("FF") and an appropriate global SCPC channel is not currently available.	**1.**
1857	(Spot Beam Handover) NCS is rejecting the Handover Request because an appropriate SCPC channel is not available in the next beam.	**1.**
18A1	NCS is rejecting the call because the specified MES ID was not found in the "Forward and Return MES ID" cross-reference table.	**1.**
18A2	NCS is rejecting the call because the specified MES is not authorized for any service (except for Distress calls) at the NCS.	**1.**
18A3	NCS is rejecting the call because the specified LES is not authorized for the requested service at the NCS.	**1.**
18A4	Reserved.	**1.**
18B1	NCS is rejecting or clearing the call for a reason which is not covered by any of the currently defined "Cause" events.	**1.**
18B2	NCS is rejecting the call because the requested service variant is invalid.	**1.**
18C1	NCS is rejecting the call because no message was received from the specified MES (in reaction to a Call Announcement message) within the allowed time limit.	**1.**
18C2	Reserved for B.	**1.**
18C3	NCS is rejecting the call because the specified MES was busy and the MES pre-emption failed (i.e. no response within the allowed time limit).	**1.**
18D1	NCS is rejecting the call because the Request for Call Announcement or Request for Channel Assignment contains invalid or inappropriate information.	**1.**
18E1	NCS is rejecting the call because the specified MES ID is in the "MES busy" list at the NCS, and is listed as being busy with a call through the same LES that is now requesting a "call announcement" addressed to that MES.	**1.**
18E2	NCS is rejecting the call because the specified MES is busy with an IPDS call through the same LES which is requesting the call announcement.	**1.**
1C61	LES clear: LES to MSSC call set-up failure.	**1.**
1F01	LES is clearing the call because of the receipt of "on-hook" signaling from the relevant terrestrial circuit (i.e., normal clearing).	**1.**
1F11	LES is clearing the call because the terrestrial called party is engaged (busy).	**1.**

Table A-1. Call Cause Code List (cont)

Cause Code	Description	Note
1F21	Call Failed, LES Timeout, No Answer LES is clearing the call because appropriate "off-hook" signaling from the terrestrial called party has not been received by the LES within the allowed time limit.	**1.**
1F61	Call Failed, Terrestrial Circuit Failure LES is clearing the call because of the detection of a failure in the relevant terrestrial circuit.	**1.**
1F62	Call Failed, Early Clear Terrestrial Circuit LES is clearing the call before the "MES Connect".	**1.**

NOTES:

1. These cause codes are defined by the Inmarsat System Definition Manual (SDM).
2. The user probably attempted to place a call too soon after logging in or too soon after the last call attempt. The user must wait at least 20 seconds before making a mobile-originated call. Ask the customer to be patient and try again.
3. If this cause code occurs during call setup, there could be a problem with a particular LES channel unit. The channel unit may need to be reset. This cause code may also occur after the call has been connected. This problem may also occur during an NCS outage.
4. Check which ISP or AA commissioned the phone or smart card.
5. Verify that the customer's smart card information (including the Ki) is entered in the ACE database at the LES. For fixed-16-mobile calls through non-COMSAT LESs. Please dial the terminal IMN instead of the smart card IMN.
6. Verify that the customer's smart card information (including Ki) is entered in the ACE database at the LES.
7. Verify that the appropriate NCS is operational. NCS channels for a particular spot beam could be blocked or unavailable.
8. Frequencies/channels at the NCS for a particular spot beam and for a specific service could be blocked or unavailable/not assigned or congested.
9. Verify that the LES is enabled for the particular service at the NCS
10. Verify that the MES/LES is lease-marked if appropriate
11. Verify that the Aero-HSD/F MES is using the new generation of signaling units
12. Verify that the MES is enabled for the particular service at the NCS; e.g., MPDS.
13. The antenna was not pointed correctly or is blocked.
14. The antenna cable is defective.
15. The M4 LES Channel Unit needs to be reset from the front panel.

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APPENDIX B

APPENDIX B
INMARSAT REGISTRATION FORM

1. Overview

A. General

(1) This appendix provides an example of the Inmarsat registration form required to activate the HSD system.

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Registration for service activation of Aircraft Earth Station (AES)

PSA use only code ☐☐☐☐

All Sections are to be completed by all customers
Tick Boxes as appropriate
Please write in block capitals

Application number

Date

Customer's reference number

1. Your details (See note A)

Your name or the name of your organisation:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Email Address:

Contact person:

Title: Department:

What is their telephone number and/or extension? + Country code ( ) Area code ( ) Telephone number ( )

2. Paying the bill (See note B)

With whom have you arranged payment of calls for this AES?

The Service Provider What is their code: ☐☐☐☐ If the Code is unknown, enter their name: (only Aero-C, mini-M & Swift 64)

OR

The Accounting Authority What is their code: ☐☐☐☐ If the Code is unknown, enter their name: (ALL)

OR

If the bills are to be settled directly by the Aircraft Owner/Operator please enter details below: (only H, H+, I & L)

Name:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Contact person:

Title: Department:

3. What type of Aeronautical Earth Station (AES) are you registering? (See note C)

Installed on an Aircraft ☐ Fixed Installation ☐

The System

Aero-C ☐ Aero H ☐
Mini-M Aero ☐ Aero H+ ☐
Aero Swift64 ISDN ☐ Aero I ☐
Aero Swift64 MPD ☐ Aero L ☐

What will be the primary use of the AES?

Government ☐
Commercial Air carrier ☐
Private/Corporate ☐

What will be the country of registry of this AES:

4. Technical Details for H, H+, I and L Services (See Note D)

AES Manufacturer : AES Model (Access Approval Number) :

Antenna Type:

5. What services are you applying for?

a) Aero-C Mobile Earth Stations (AES) (See Note E)

Enter your Aeronautical Earth Station (AES) Serial number

Privacy ☐ Telex answerback ☐☐☐☐ PSA *use only* Inmarsat Mobile number 4☐☐☐☐☐☐☐☐

b) Mini-M Aero, Swift64 and SIM card services (See note F)

Enter your Inmarsat Serial number (ISN) 7 6☐☐☐☐☐☐☐☐☐☐

Enter SIM card serial number (SSN) ☐☐☐☐☐☐☐☐☐☐☐☐

Service	Privacy	Service code	PSA *use only* Inmarsat Mobile number	Service	Privacy	Service code	PSA *use only* Inmarsat Mobile number
4.8 Kbits Voice ☐	☐		76		☐		
2.4 kbit/s Fax ☐	☐		76		☐		
2.4 kbits/s Data ☐	☐		76		☐		
64 kbit/s Data ☐	☐		60		☐		
56kbit/s Data ☐	☐		60		☐		
SPEECH ☐	☐		60		☐		
AUDIO 3.1 ☐	☐		60		☐		
MPDS ☐	☐		60		☒		

To enter more services copy and complete this page as required

c) Aero-H, -H+, -I and -L Services (Classic Aero Services) (See Note G)

ICAO 24 bit technical address

☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐ ☐☐☐

PSA use only: Inmarsat Mobile number: 5☐☐☐☐☐☐☐ (above converted into octal)

Number of Voice Channels: 9600 bps ☐ 4800 bps ☐

PSA use only
DDI number issued

Direct dialling-in (alternate) number required (Y/N): Voice: ☐ Available for Aero-H, -H+ and -I _____
Fax: ☐ Only available for Aero-H+ and -I _____
Data: ☐ Only available for Aero-H+ and -I _____

Credit Card Option Required: YES ☐ NO ☐ Dual AES installed: YES ☐ NO ☐

Please select Service/s required (tick in appropriate boxes):

Service:		Privacy required?
Voice	☐	☐
Fax	☐	☐
Packet-Mode Data 2 (ACARS)	☐	☐
Packet-Mode Data 3 (OSI)	☐	☐

6. Emergency Contact Details (See note H)

ALL USERS MUST COMPLETE THIS SECTION

Who should we contact:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Alternative 24 hour emergency telephone + Country code ( ) Area code ( ) Telephone number ( )

7. Installation details (See Note I)

Complete only if installed on an AIRCRAFT

What is the aircraft's tail number (registration number): Fuselage/airframe number:

In which country is the aircraft registered:

Aircraft Manufacturer: Aircraft Model:

If Commercial, please name Airline:

Complete only if installed in a FIXED LOCATION

Complete only if you are installing an Aircraft Earth Station (AES) on a **FIXED** location (including simulators)

Fixed Location:

Description of Use:

8. Integrator Details (See Note J)

Name:

Address:

Town/city: State/province:

Post/ZIP code: Country:

Telephone + Country code ( ) Area code ( ) Telephone number ( )

Facsimile + Country Code ( ) Area code ( ) Facsimile number ( )

Contact person: Position:

9. Certification and agreement (See note K)

☐☐☐☐ Accepts the above Account. AA Signature:
(Enter AA Code)

I _____

the owner, have read and agree to comply with the 'Terms and Conditions for the use of the Inmarsat space segment', in particular with all applicable national laws and regulations relating to the use of Inmarsat Mobile Terminals

Signed _____ Date _____

I _____

the representative of the Point of Service Activation (PSA) received this form completed and signed by the owner.

Signed Date

_____ _____

TERMS AND CONDITIONS FOR THE UTILIZATION

**OF THE INMARSAT SPACE SEGMENT
BY AIRCRAFT EARTH STATIONS (AESs)**

**Article 1
Scope of Terms and Conditions**

(A) These Terms and Conditions shall apply to the authorization between Inmarsat Limited ("the Company") and the Licensee of the Aircraft Earth Station ("AES") ("the AES Licensee") described in the applicable Service Activation Registration Form ("SARF") with respect to the utilization of the Inmarsat space segment by the AES.

(B) For the purpose of these Terms and Conditions:

(1) "SARF" means an application made by the AES Licensee for the utilization of the Inmarsat space segment;

(2) "Point of Service Activation (PSA)" means the entity responsible for processing the SARF.

(C) The AES Licensee shall ensure that any operator or user of the AES ("the AES Operator") is informed of and complies with these Terms and Conditions, as far as applicable, at all times.

**Article 2
AES Performance, Criteria and Operations**

(A) Authorization Subject to Compliance with Technical and Operating Requirements

(1) Throughout the utilization of the Inmarsat space segment:

(a) the AES shall comply with the criteria and performance standards to which it was access-approved;

(b) the AES shall be controlled by an operator holding a licence or certificate issued or recognized by the State under whose authority the aircraft is operating (AES Operator); and

(c) AES Operators shall be required to comply with the Company's AES operating procedures, and with these Terms and Conditions as far as applicable, and any amendments thereto, as notified by the Company to the AES Licensee at any time or times.

(2) The AES shall be used exclusively for peaceful purposes.

(3) The AES Licensee shall notify the PSA promptly of any change in the Accounting Authority or Inmarsat Service Provider (ISP) or other billing entity, as specified in the SARF.

(4) The authorization to utilize the Inmarsat space segment shall be conditional upon compliance with this Article 2. The AES Licensee and AES Operators shall not utilize the Inmarsat space segment in a manner contrary to the environmental usage and distress and safety conditions specified in the SARF or contrary to these Terms and Conditions, without the prior written consent of the Company.

(B) Sanctions in the Case of Non-Compliance

(1) The Company shall be entitled, at any time or times, and with immediate effect, unilaterally to modify, restrict, suspend or terminate, temporarily or permanently, the authorization, by notification to the AES Licensee and the AES Operator, if the Company deems the AES or the AES Licensee or an AES Operator to not so comply, or to practise a utilization not so authorized, no matter what the cause or causes of such non-compliance or practice.

(2) The Company shall also send a copy of the notification to the PSA.

(3) Unless the authorization has been terminated, the Company shall lift such modification, restriction or suspension, if it is demonstrated to the Company's satisfaction that compliance has been resumed and will be maintained, or that such unauthorized practice has been and will be discontinued by the AES Licensee or the AES Operator.

(C) Suspension and Termination in Special Circumstances

(1) The authorization shall be deemed to be suspended during any period in which persistent malfunction or any operation of the AES that degrades the performance of the Inmarsat space segment occurs.

(2) The authorization shall be deemed to be terminated if any of the following circumstances occurs:

(a) reconfiguration of the AES while retaining the same configuration number;

(b) any modification or change to the AES configuration or installation that will result in an installation with a different configuration number from that provided at the time of commissioning; and
(c) any change in the information contained in the SARF which would require a change in the International AES Number.

(3) The Company shall be notified promptly in writing via the PSA by the AES Licensee of any of the events specified in sub-paragraphs (1) and (2) above.

(4) Upon suspension of the authorization for the reasons set forth in sub-paragraph (1) above, the Company shall inform the AES Licensee whether any retesting is required, and when the suspension has been lifted.

(5) Upon the termination of the authorization for any of the reasons set forth in sub-paragraph (2) above, recommissioning and the issue of a new Commissioning Certificate shall be required in order for the AES to recommence utilization of the system.

(D) Suspension for Non-Payment of Accounts and Other Causes

(1) Without prejudice to any of the other remedies and provisions of these Terms and Conditions or at law, the Company and any or all of the GES Operators in the Inmarsat system may, individually or jointly, suspend the authorization due to non-payment of accounts for the telecommunications services provided by the GESs, loss or theft of the AES, fraudulent use of the AES, request by the aircraft owner or fleet operator to bar the AES for at least ten (10) days as the aircraft is about to be grounded or other non-compliance with these Terms and Conditions, or any other reason established under the Company's Barring Procedures in force at the relevant time.

(2) Upon being satisfied that the causes of the suspension have been remedied, the Company and the GESs Operators may lift the suspension.

(3) The suspension shall not restrict the AES from transmitting a distress alert and distress priority message. The Company shall use reasonable efforts to restore access to the space segment for subsequent safety communications associated with the distress situation.

(4) In connection with the administration of the Company's Barring Procedures, the Company and the GES Operators may share information about the status of the AES with each other and with Nominated Barring Authorities designated by GES Operators.

(E) Compliance with National and International Regulations

(1) The issue of the Commissioning Certificate shall be without prejudice to the compliance by the AES with any laws, standards and procedures applicable to the installation, operation and use of the AES for any types of aeronautical communications. In utilizing the Inmarsat space segment, the AES Licensee and the AES Operators shall, respectively, be required to ensure compliance with:

(a) the conditions of any licence, certification or other authorization for the installation and operation of the AES on board the aircraft, issued by the State under whose authority the aircraft is operating;

(b) the conditions of the AES Operators' licences or certificates issued or recognised by the State under whose authority the aircraft is operating, relative to the use of the AES; and

(c) all applicable national laws and regulations governing the use of radio communications of any State in which the AES is located at any time, and any applicable international regulations.

(2) The AES Owner shall indemnify the Company and any GES Operator concerned against any loss incurred by them as a result of any non-compliance with this paragraph (E). The Company shall hold the benefit of this indemnity as trustee for any such GES Operator.

Article 3
Financial Obligations

The establishment of charges for the telecommunications services provided by any ground earth station (GES) is the prerogative of the owner and/or operator of the GES. The AES Licensee without delay must pay all accounts for telecommunications services via any GES. In the event of delayed payment, the GES concerned may discontinue telecommunications services for the AES in default, except for the exchange of distress or safety-related traffic, as provided in Article 2 (D) (3) above. If a GES Operator is unable to collect charges from the Accounting Authority, ISP or other billing entity specified in the SARF, personal and corporate details of the AES Licensee may be disclosed to the GES Operator for the purposes of debt collection.

Article 4
Telecommunications Disclaimer

(A) This Article applies to the Company for itself and as trustee for the benefit of the lessors, manufacturers, or other providers of the Inmarsat space segment; the owners or operators of GESs; and the directors, officers, employees, agents or assignees, of any of them ("the other indemnities").

(B) Subject to paragraph (D) below, neither the Company nor any of the other indemnities shall be liable for any claims attributable to any unavailability, delay, interruption, disruption or degradation in or of the Inmarsat space segment capacity; modification, restriction, suspension or termination of the authorization in accordance with Article 2(D)(1) above, failure to restore access in accordance with Article 2(D)(2) or (3) above, or sharing of information about the status of the AES in accordance with Article 2(D)(4) or Article 3 above, regardless of the cause or causes thereof. Such waiver of claims shall also extend to any direct or consequential loss, damage, liability or expense, loss of revenue or business harm of any kind.

(C) The AES Licensee agrees to indemnify the Company and the other indemnities and hold them harmless from any claims that might be made by the AES Operator or any other entity or person, attributable to any of the causes referred to in paragraph (B) above.

(D) Nothing in this Article 4 shall exclude or limit liability for death or personal injury in any jurisdiction where, as a matter of law, such liability cannot be excluded or limited.

Article 5
Language and Communications

(A) These Terms and Conditions and all documentation and communications required there under shall be in the English language.

(B) All communications pertinent to the authorization or to these Terms and Conditions shall be made or confirmed by telex, facsimile, data transmission or other written form. Communications by the Company to the AES Licensee and the PSA shall be sent to their respective_addresses as specified in the SARF or other last known addresses. Communications to the AES Licensee shall be sent to the AES Operator.

Article 6
Amendments

The Terms and Conditions as herein stated are subject to amendment by the Company such amendment to become effective upon the date specified by the Company, but not less than thirty (30) days after the date of notification of the amendment to the AES Licensee and the PSA.

Article 7
Certification and Agreement

I the owner have read and agree to comply with the above Inmarsat "Terms and Conditions".

Name (Print) _____

Signed: _____

Date: _____

Relevant Aircraft TAIL Number _____

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Notes for Completing the Aeronautical Earth Station (AES) Service Activation Registration Form.

Introduction.

This registration Form applies to all Aeronautical customers. The Form should be completed and signed by the owner of the AES who will ultimately be responsible for the payment of communications traffic bills incurred by the AES.

To obtain the authorisation to activate the AES, this Registration Form should be submitted either directly to the Point of Service Activation (PSA) or to the Inmarsat Service Provider (ISP). For further information on PSAs and ISPs please contact the Inmarsat Customer Activation Unit at the following address:

Customer Activation Unit
Inmarsat
99 City Road
London EC1Y 1AX
United Kingdom

Telephone +44 207 728 1020
Facsimile +44 207 728 1142
Internet address: customer_services@inmarsat.com

Note A Your Details.

Enter the complete name and address of the Company, Organisation or Individual who will be ultimately responsible for the payment of bills for traffic incurred by this AES. Ensure that country and area codes are entered within the appropriate brackets for telephone and facsimile numbers. Enter the name of the contact person who will be responsible for dealing with queries concerning the AES.

Note B Paying the bill

Aero-C, Mini-M Aero and Swift64 only:
Enter the Inmarsat Service Provider (ISP) or Accounting Authority (AA) details that will be responsible for handling and managing your traffic account. This is the entity to which invoices from the LES will be sent. The customer must ensure that prior agreement with either the ISP or AA has been secured before completing this section.
Aero-H, -H+, -I and -L only:
Enter the entity that will be responsible for handling and managing the AES traffic account. This is the entity to which invoices from the GES will be sent. It can be **EITHER** an Accounting Authority (AA), **OR** the owner or operator of the AES. The AES operator may be a commercial aircarrier, private/corporate aircraft owner, government institution or other category. The AES operator may elect and agent to pay invoices on their behalf. If an AA is used the customer must ensure that prior agreement with the AA has been secured before completing this section.

Note C What type of Aeronautical Earth Station (AES) are you registering?

This section determines the environment where the AES will be used, the system applied for, and the primary use of the AES. This section also identifies the model of the AES and the country where it will be registered.
Indicate whether the AES will be installed on an Aircraft or at a Fixed Location.

The System:-	Under System, enter the type of AES to be activated
Primary use of the AES:-	Tick the box that represents the primary use of the AES
Country of Registry:-	The country of registry is the country where the Aircraft is registered

Note D Technical Details for H, H+, I and L Services

AES Manufacturer and Model:
Enter the name of the AES manufacturer and the complete AES Model name, which is also known as the Access Approval Number. The manufacturer must supply this. Additionally, the Antenna type must also be entered by the applicant.

IMPORTANT: What services are you applying for? The Customer should complete the section pertaining to the type of the AES

Note E Aero-C Aircraft Earth Stations (AES)

Enter the AES Serial Number, which should be found, on the outside casing of the AES.
Enter the privacy required by entering 'Y' or 'N' on the Privacy box. . (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)
Enter the 4-letter telex answerback. (Numbers and special characters are not allowed.)
Leave the Inmarsat Mobile Number (IMN) blank. The PSA will assign the IMN for each service requested.

Note F Mini-M Aero, Swift64 and SIM card services

If applying for activation of a Mini-M Aero or Swift 64, enter the Inmarsat Serial Number (ISN) that should be found on the outside casing of the AES. The first two digits have been entered for you. If applying for a SIM Card enter the SIM Card Serial Number (SSN).
Enter the services required by ticking the corresponding boxes and entering 'Y' or 'N' on the Privacy box. (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)
Enter the service code if known. If not, the PSA or ISP will provide the service code.
Leave the Inmarsat Mobile Number (IMN) blank. The PSA will assign the IMN for each service requested. If applying for both Mini-M Aero and SIM Card, the AES and the SIM card will be allocated separate IMNs.

Note G Aero H, H+, I and L Services

When the aircraft is registered, the Civil Aviation Authority in the country of registry will provide the ICAO technical address, which will also be used for other communication systems on board. This is a 24-bit binary number that will be converted into an equivalent eight digit octal number. This number which is preceded by the "T" digit "5" forms the Primary ID and will be known as the IMN. This number will be confirmed to the applicant by the PSA.
Enter the number of voice channels, either 9600bps or 4800bps as applicable. Aero-I operates at the lower voice rate of 4800bps only. Aero-L does not have a voice channel and this information must then be left blank.
The IMN is used for communications with the AES that originate from the ground. If required, however, the AES may be assigned a Direct Dialling-In (DDI) number, sometimes known as an Alternate ID, which is assigned by the PSA. The PSA provides the first 6 digits whilst the owner or operator of the AES provides the last 2 digits. This will enable multiple ground-to-air communications with the AES. For Aero-I and Aero-H+ AESs the applicant may request additional DDI's for Fax and/or Data. The Applicant must indicate with a Y if a DDI number is required and for which services it is required.
Mark 'YES' if credit cards are to be used for payment for the use of the AES as this facility must be tested. This test is normally conducted with the AES calling the commissioning desk at the GES
Mark 'YES or NO' if this is to be a Dual Installation. Make a duplicate of this page and complete the second ICAO 24-bit code for the 2nd installation on the copied page and insert this page here.
Enter the services required by ticking the corresponding box(es) and entering 'Y' or 'N' on the Privacy box. (If Privacy=Y, any inquiries regarding the AES will not be permitted by Inmarsat.)

Note H Emergency Contact Details

All AES users must complete this section for emergency contact details. You must provide the complete information required.

Note I Installation Details

If the AES is installed on an aircraft, the aircraft tail number (registration number), the country where the aircraft is registered, the name of the aircraft manufacturer, aircraft model and the airframe number must be entered.

If the AES is being installed in a fixed location, the location of the AES and description of its use should be entered in this part of the form.

Note J Integrator Details

Enter the name of the organisation that is providing maintenance and support to the AES operations. Ensure that country and area codes are entered within the appropriate brackets for telephone and facsimile numbers. Enter the name of the contact person who will be responsible for dealing with queries concerning maintenance and support.

Note K Certification and Agreement.

To assist the PSA's, this is an entry for the AA to verify they accept the account, by placing their code and signature in the required sections.
This section must be signed by the person who owns the AES and has the ultimate responsibility for ensuring payment of traffic incurred by the AES.
This section must be signed by the PSA to whom this form has been submitted for approval and activation.