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Satellite Communications Installation Plan

Howard Meeks

May 1993

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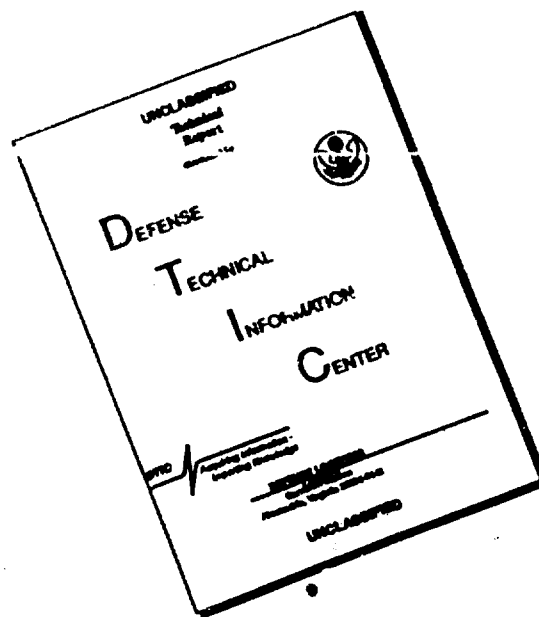
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16. Abstract This installation plan describes the correct installation procedures for installing low rate Satellite Communications (SATCOM) equipment in a Federal Aviation Administration (FAA) Boeing 727 aircraft. The equipment includes an antenna, satellite communications avionics, a data collection computer, and a tape recorder.			
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EXECUTIVE SUMMARY

This installation plan describes the correct installation procedures for installing low rate Satellite Communication (SATCOM) equipment in a Federal Aviation Administration (FAA) Boeing 727 aircraft. The equipment includes an antenna, satellite communications avionics, a data collection computer, and a tape recorder.

INTRODUCTION

This plan describes the installation of the equipment for low rate communications via satellite. The equipment includes an antenna, satellite communications avionics, a data collection computer, and a tape recorder installed in the Federal Aviation Administration (FAA) Boeing 727 (N-40) aircraft.

EQUIPMENT

1. Satellite Data Unit (SDU)
2. Radio Frequency Unit (RFU)
3. Aircraft Communications Addressing and Reporting System (ACARS)
4. High Power Amplifier (HPA)
5. ACARS Control Display Unit (CDU)
6. SDU CDU
7. Low Noise Amplifier (LNA)/Diplexer
8. Low Gain Antenna (LGA)
9. High Gain Antenna (HGA)

EQUIPMENT LIST.

<u>SATCOM:</u>	<u>Height (Inches)</u>	<u>Weight (Pounds)</u>	<u>Power</u>
SDU	7.5	20	115 Vac/400 Hz
RFU	7.5	14	115 Vac/400 Hz
HPA	7.5	15	115 Vac/400 Hz
<u>Data Link:</u>			
ACARS	7.5	7	28 Vac 115 Vac/400 Hz
ACARS CDU	4.5	7	115 Vac/400 Hz 5 Vac
<u>Antenna System:</u>			
Low Gain Antenna	5.75	3	---
LNA/Diplexer	2.0	6	115 Vac/400 Hz
<u>Trays:</u>			
(4) ARINC 600	---	---	115 Vac/400 Hz

Note: Hz = hertz
Vac = volts of alternate current

SDU.

The SDU is capable of sending and receiving at various data rates. This unit converts ACARS messages for transmission on the radio frequency (RF) link using satellite protocols and interfaces with the RFU unit.

RFU.

The RFU receives signals from the SDU at baseband and translates it to the appropriate RF. It also converts the incoming signal from the LNA baseband.

ACARS.

The ACARS is the interface that handles the reception and processing of data communications with the aircraft crew.

HPA.

The HPA amplifies RF signals from the RFU under control of the SDU. The HPA is connected through the LNA/Diplexer (DPX) to the antenna and is controlled to maintain the aircraft Effective Isotropic Radiated Power (EIRP) within limits. The HPA is a class C nonlinear amplifier which provides a maximum power output of 60 watts.

CDU.

The CDU receives and sends data to the ACARS unit. This serves as the input/output (I/O) device for the flight crew.

LNA.

The diplexer and LNA are combined into one unit for installation purposes. The diplexer unit couples transmit signals from the HPA to the antenna and couples received signals from the antenna to the LNA unit. The LNA amplifies the very low level L-band signal from the antenna to compensate for transmission line losses to the RFU.

INSTALLATION

FIGURE 1: AIRCRAFT LAYOUT.

This view of the equipment will give you an idea where the equipment is located in the aircraft, although the aircraft floor is designed to move the equipment any place you may want it. Future flights may contain a high gain antenna, which will be flush mounted to the top of the fuselage instead atop the engine nacelle.

FIGURE 2: SYSTEMS OVERVIEW.

This is a closeup view of the components and how they are laid out on the mounting racks inside the aircraft.

FIGURE 3: SYSTEMS BLOCK DIAGRAM.

This is an over all view of the components and how they are interfaced with each other.

FIGURE 4: SATCOM AVIONICS RACK DRAWING.

The test rack that the components are mounted on contain three shelves: top, middle, and bottom. The components are mounted on these shelves in a way they can quickly be removed if necessary.

FIGURE 5: SATCOM WIRING PRINTS.

Contains over all wiring of complete circuits.

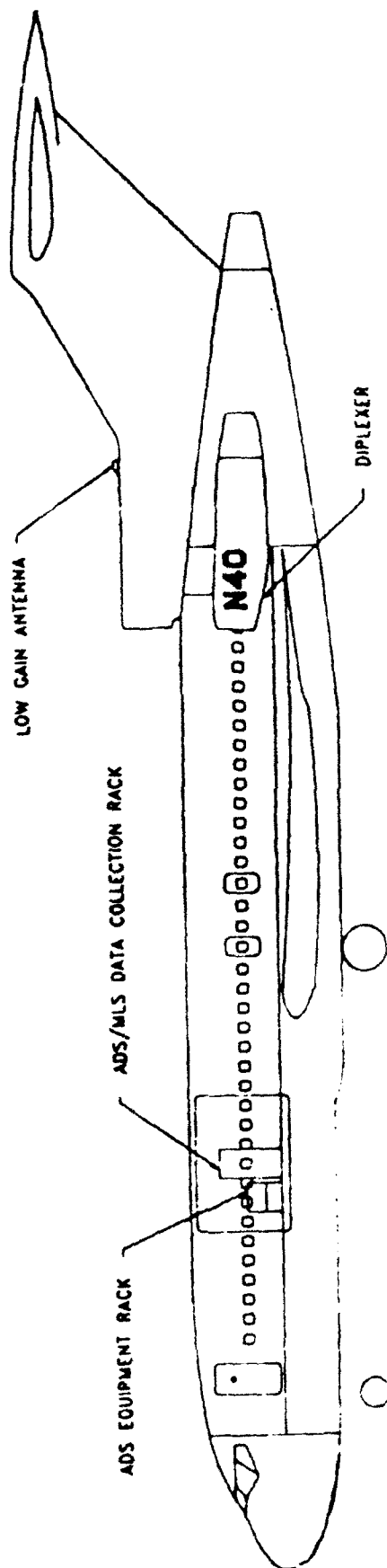


FIGURE 1. AIRCRAFT LAYOUT

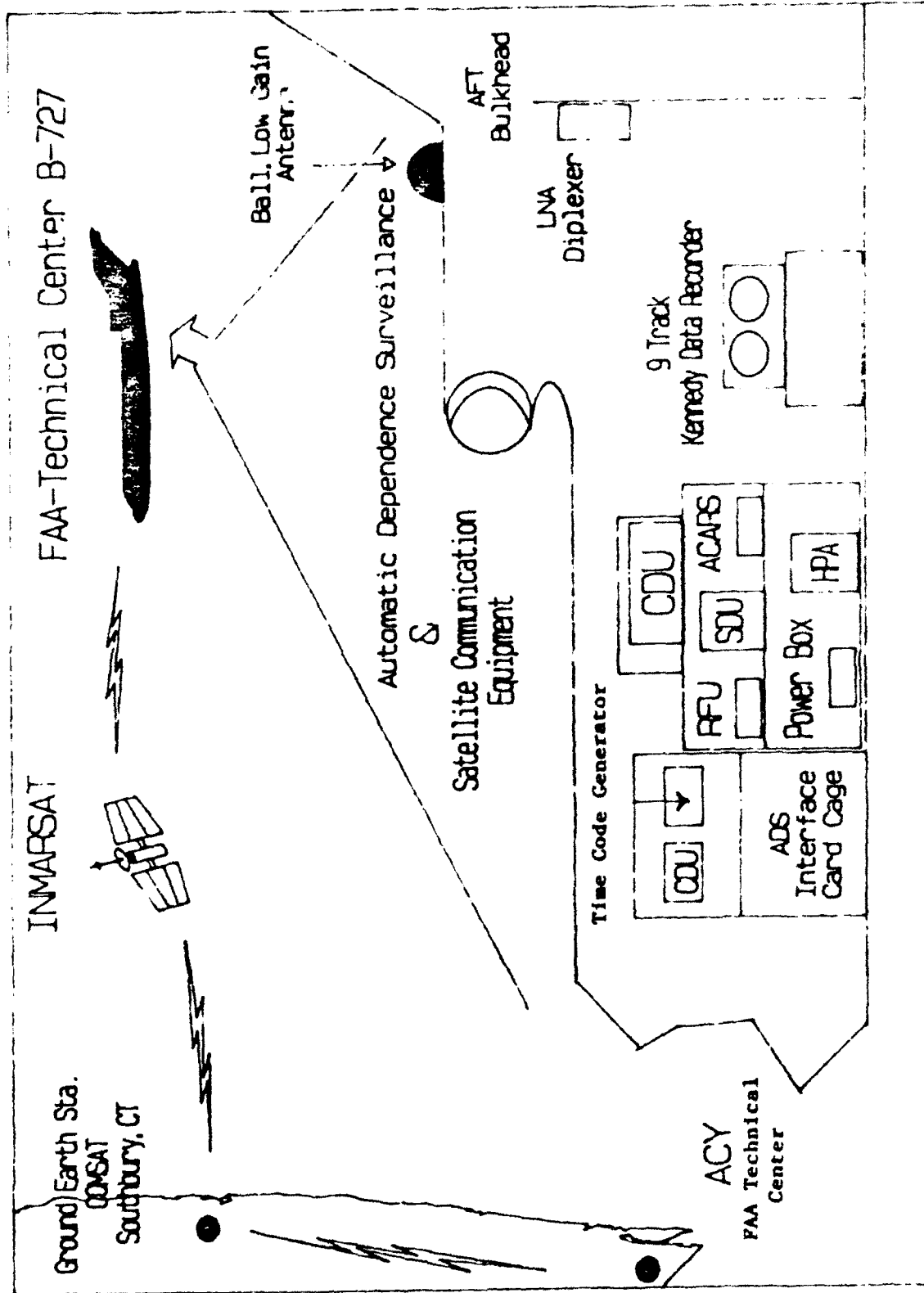


FIGURE 2. SYSTEMS OVERVIEW

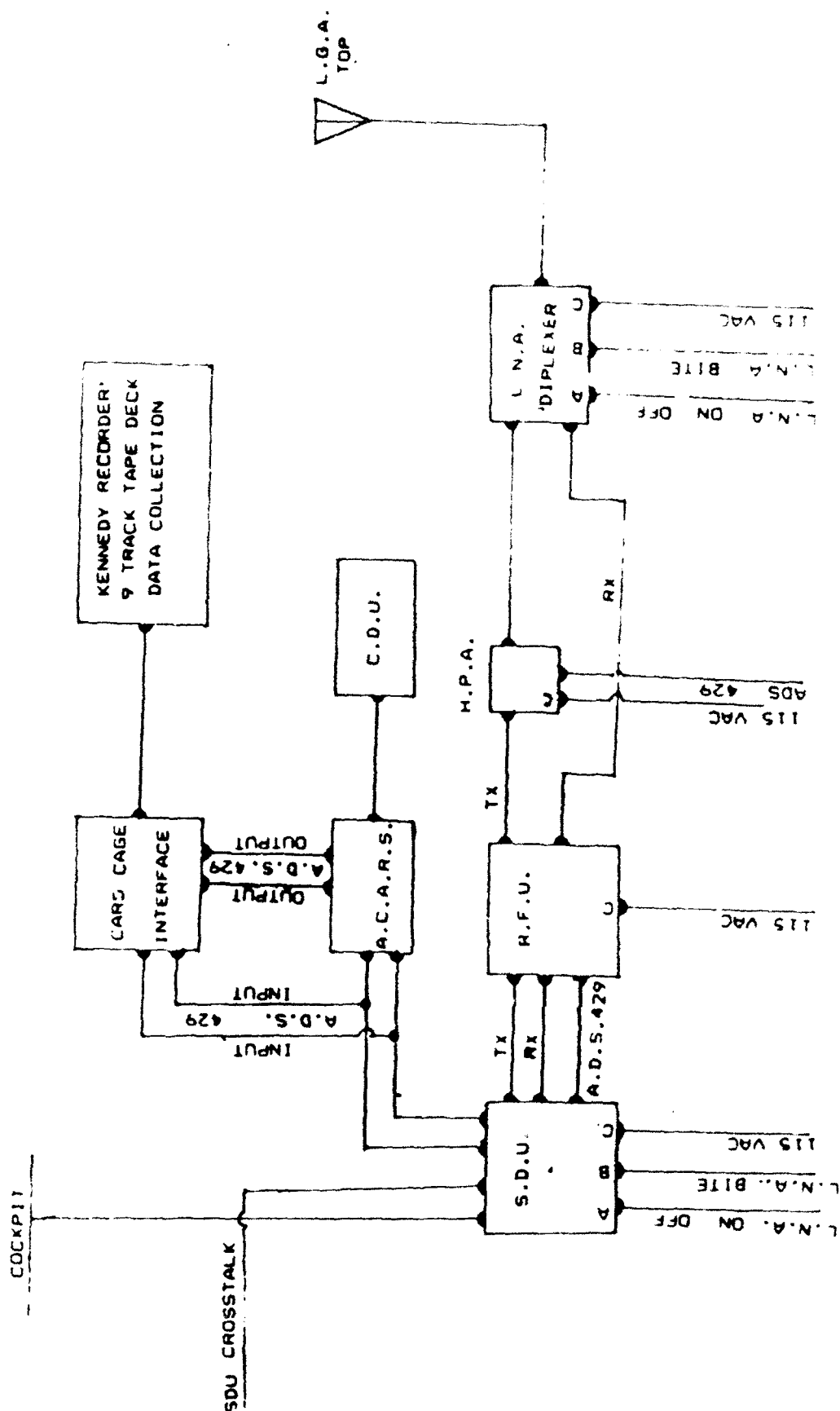


FIGURE 3. SYSTEMS BLOCK DIAGRAM

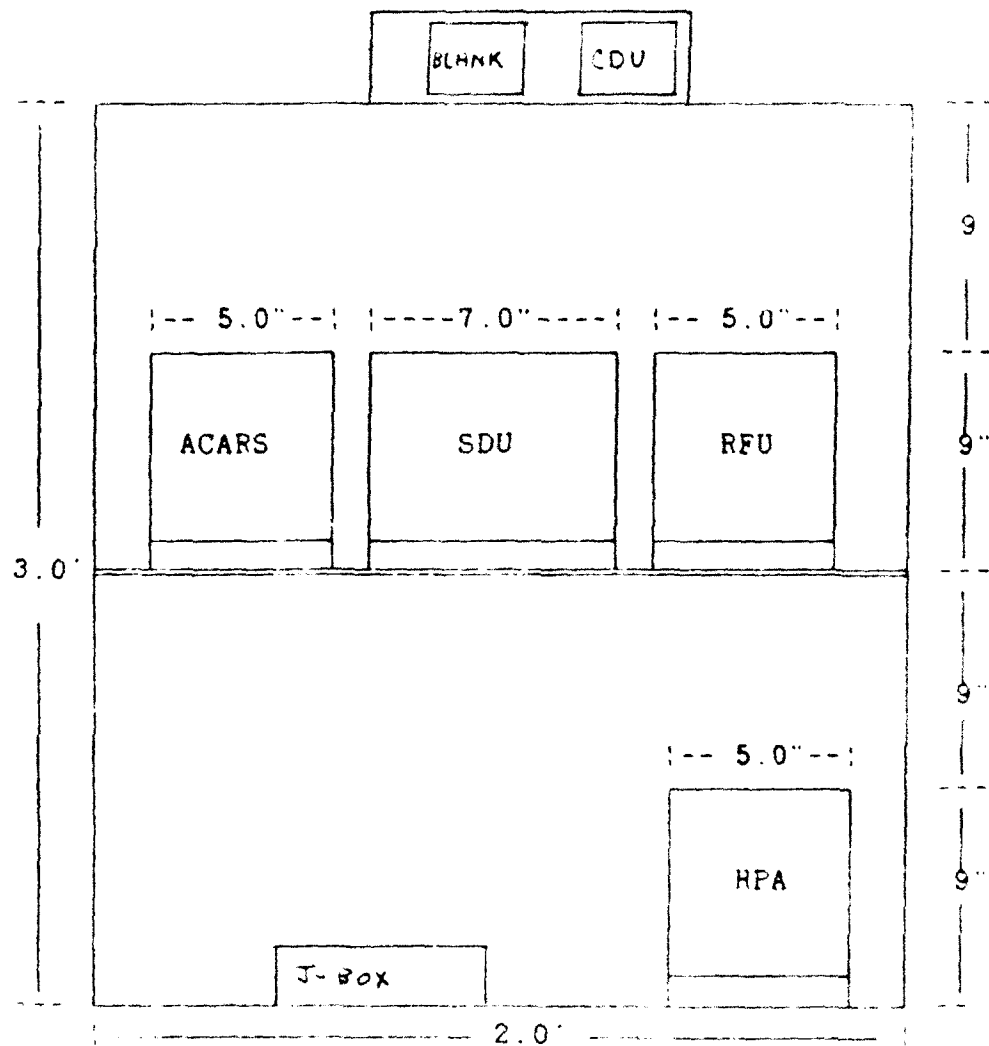
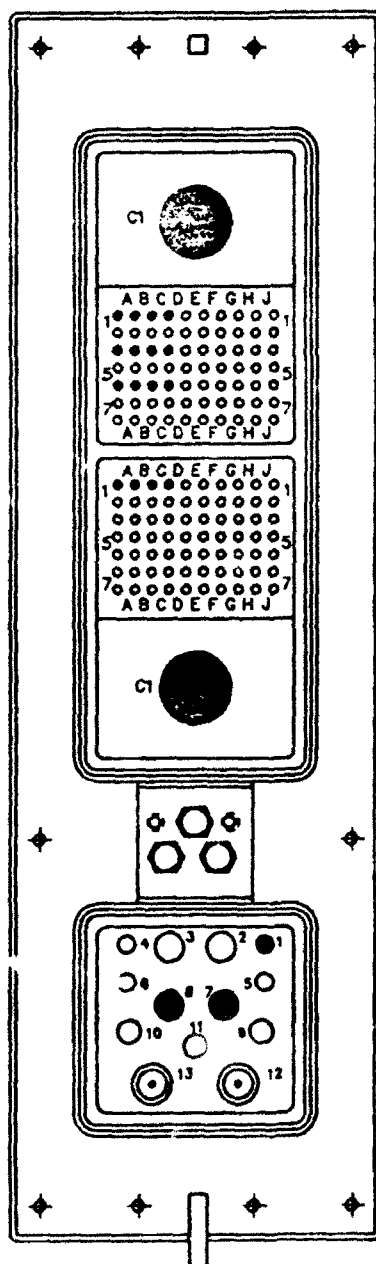


FIGURE 4. SATCOM AVIONICS RACK DRAWING

COLLINS AIR TRANSPORT AVIONICS
 COMPONENT MAINTENANCE MANUAL with IPL
 HPA-900 High Power Amplifier
 PART NO 622-8850-001



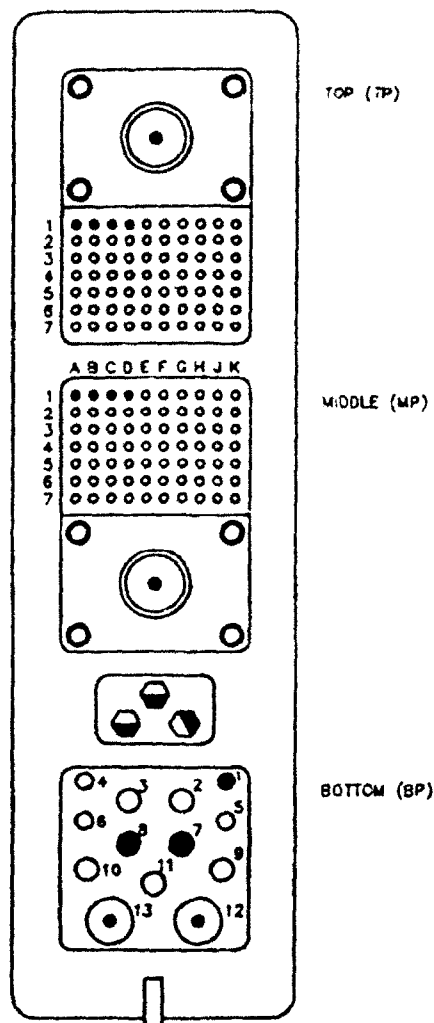
TPC1	RF INPUT
TP1A	MULTICTL A
TP1B	MULTICTL B
TP1C	429 HPA-SDU A
TP1D	429 HPA-SDU B
TP3A	MUTE 1A
TP3B	MUTE 1B
TP3C	MUTE 2A
TP3D	MUTE 2B
TP5A	SDI A
TP5B	SDI B
TP5C	SDI C
TP5D	SDI COM
MPC1	RF OUTPUT
MP1A	RS-232 RCV
MP1B	RS-232 XMT
MP1C	GND
MP1D	RS-232 MON ENABLE
BP1	115 V AC A1
BP7	115 V AC NEUT
BP8	CHASSIS GND

Rear Connector Pin Functions

AD-0636-01

FIGURE 5. SATCOM WIRING PRINTS (SHEET 1 OF 8)

COLLINS AIR TRANSPORT AVIONICS
COMPONENT MAINTENANCE MANUAL with IPL
RFU-900 Radio Frequency Unit
PART NO 622-8849-001



NOTES:

- ① DARKENED SECTION OF CONNECTOR KEYWAY INDICATES CLOSED PORTION.
- ② CONNECTOR CANNON PART NUMBER BKAD2-V155M401-FO (COLLINS PART NUMBER 858-2004-010) MATES WITH CANNON PART NUMBER BKAD2-V155M-301-FO (COLLINS PART NUMBER 858-3400-010).
- ③ FOR PIN FUNCTION INFORMATION REFER TO CHASSIS INTERCONNECT DRAWING IN THE TESTING AND FAULT ISOLATION SECTION.
- ④ TOOLING INFORMATION: SIZE 22 REAR REMOVABLE CONTACT USE INS/EXTR CET-22 (CPN 371-8445-020), SIZE 20 USE INS/EXTR CET-20HDL (CPN 371-8445-040), SIZE 12 INS/EXTR CET-12-4 (CPN 371-8445-XXX). CRIMP TOOL: CONTACTS SHALL BE CRIMPED USING CPN 359-8101-XXX FOR MS22520/1-XX, AND CPN 359-8102-XXX FOR MS22520/2-XX.

CONTACT SIZE	HAND TOOL PART NUMBER	HAND TOOL POSITIONER PART NUMBER	STRIP LENGTH
22	M22520/2-01	M22520/2-23	.130 .100
20	M22520/2-01	M22520/2-08	.167 .147
12	M22520/2-01	M22520/1-11	.270 .230

AD-0666-01

Rear Connector Pin Functions

FIGURE 5. SATCOM WIRING PRINTS (SHEET 2 OF 8)

SATCOM AVIONICS WIRING *

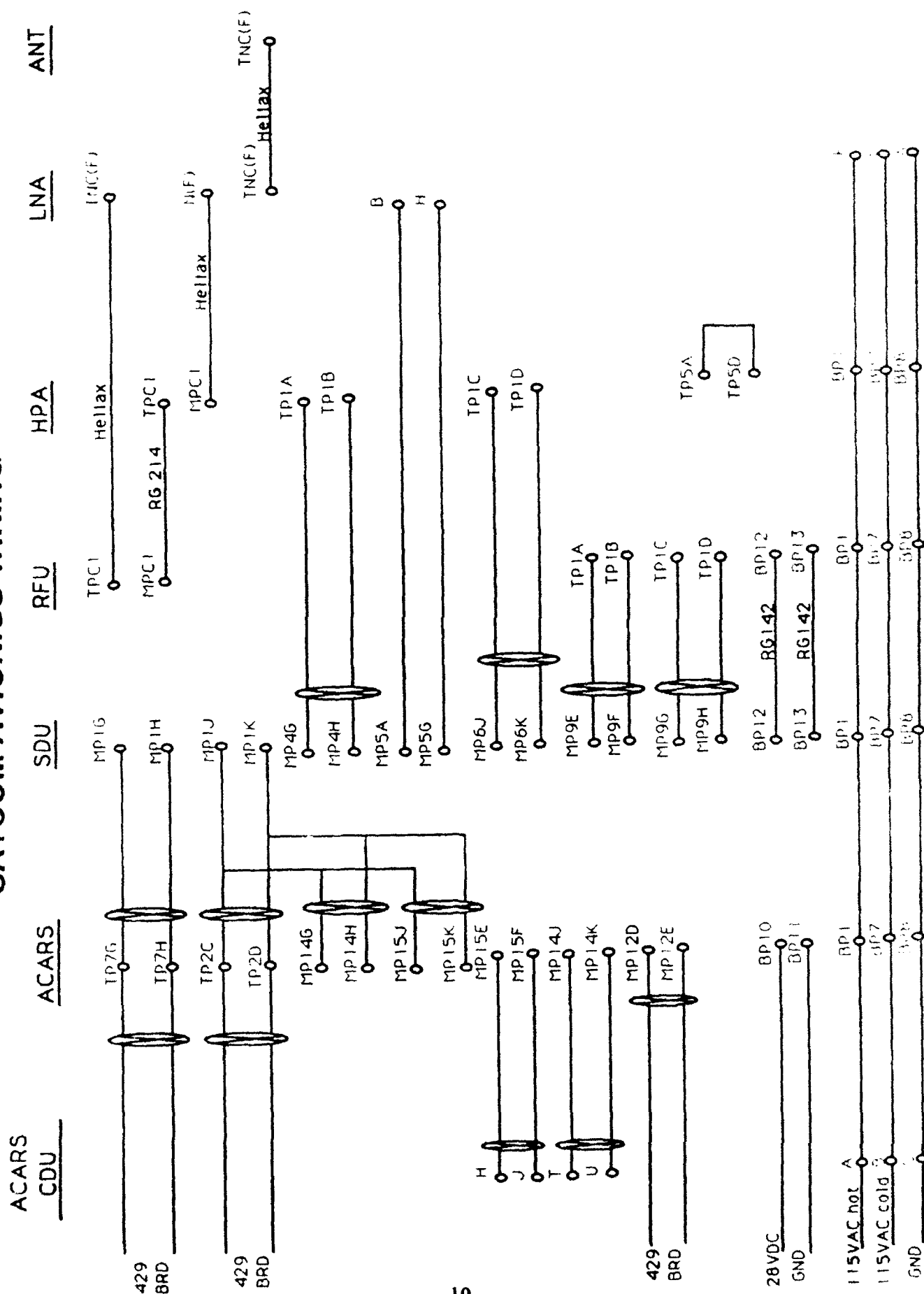


FIGURE 5. SATCOM WIRING PRINTS (SHEET 3 OF 8)

polymerized in the presence of a catalyst.

SATCOM / DATA RACK

<u>Signal</u>	<u>MLS/DME Conn.</u>	<u>Avionic Rack</u>	<u>Avionics Rack</u>
	<u>Data Rack</u>	<u>Connector</u>	
	22-55SY	22-55SY	
			<u>ACARS</u>
429 a	d <u>Blue</u>	d	TP7G
429 b	e <u>white</u>	e	TP7H
shield	g <u>Shield</u>	g	Shield
429 a	h <u>Blue</u>	h	TP2C
429 b	i <u>white</u>	i	TP2D
shield	k <u>Shield</u>	k	Shield
OUT 429 a	v <u>Blue</u>	v	MP12D
429 b	w <u>white</u>	w	MP12E
shield	x <u>Shield</u>	x	Shield
ACARS	y <u>Black</u>	y	TP13D
CDU	z <u>white</u>	z	TP13E
	AA <u>Green</u>	AA	TP13F
	BB <u>Red</u>	BB	TP13G
			<u>SDU</u>
RS-232			
Tx	CC <u>ORANGE</u>	CC	TP15A
Rx	DD <u>white</u>	DD	TP15B
Common	EE <u>Blue</u>	EE	TP15C
			<u>SDU</u>
		SW1 <u>white</u>	MP11E
		SW2 <u>Green</u>	MP11F
		SW3 <u>yellow</u>	MP11G
		SW4 <u>Green</u>	MP11H
		SW5 <u>Blue</u>	MP11J
		SW6 <u>Red</u>	MP11K

FIGURE 5. SATCOM WIRING PRINTS (SHEET 4 OF 8)

SATCOM / DATA RACK

<u>Signal</u>	<u>MLS/DME Conn</u> <u>Data Rack</u> 22-55SY	<u>Avionic Rack</u> <u>Connector</u> 22-55SY	<u>Avionics Rack</u> <u>ACARS</u>
429 a	d	d	TP7G
429 b	e	e	TP7H
shield	g	g	Shield
429 a	h	h	TP2C
429 b	i	i	TP2D
shield	k	k	Shield
OUT 429 a	v	v	MP7J
429 b	w	w	MP7K
shield	x	x	Shield
ACARS CDU	y	y	TP13D
	z	z	TP13E
	AA	AA	TP13F
	BB	BB	TP13G
acars 429a	FF	FF	MP15G
gen. 429b	GG	GG	MP15H
output shield	HH	HH	Shield
<u>SDU</u>			
RS-232			
Tx	CC	CC	TP15A
Rx	DD	DD	TP15B
Common	EE	EE	TP15C
<u>ADS Conn</u> <u>Data Rack</u>			
<u>Avionic Rack</u> <u>Connector</u> 22-55SY			
SDU CDU	D	u	MP3C
	C	t	MP3D
	B	s	MP3E
	A	r	MP3A

FIGURE 5. SATCOM WIRING PRINTS (SHEET 5 OF 8)

DATA RACK INTERNAL WIRING

<u>Card Cage</u>	<u>J-Box</u>	<u>MLS/DME Conn</u>	<u>Signal</u>
MLS/DME Board		<u>Data Rack</u>	
22-55P		22-55SY	
p _____	B7 _____	d _____	429 a ACARS
n _____	B8 _____	e _____	429 b
m _____	B9 _____	g _____	shield
k _____	B11 _____	h _____	429 a
j _____	B12 _____	i _____	429 b
i _____	B13 _____	k _____	shield
b _____	L8 _____	v _____	429 a ACARS
a _____	L9 _____	w _____	429 b
z _____	L10 _____	x _____	shield

ACARS CDU

MS -3112 E20-41P

J _____	L1 _____	Y _____	] ACARS CDU
H _____	L2 _____	Z _____	
T _____	L3 _____	AA _____	
U _____	L4 _____	BB _____	
A _____			115VAC hot
B _____			115 VAC cold
C _____			ground

SDU CDU

J _____	L17 _____	D _____	] SDU CDU
H _____	L16 _____	C _____	
T _____	L15 _____	E _____	
U _____	L14 _____	A _____	

RS-232

25 D _____	L5 _____	CC _____	<u>RS-232</u>
3 _____	L6 _____	DD _____	Tx
2 _____	L7 _____	EE _____	Rx
7 _____			Common

FIGURE 5. SATCOM WIRING PRINTS (SHEET 6 OF 8)

ADS RACK / N40 CABLE

<u>SIGNAL</u>	<u>ADS RACK</u>	<u>N-40 JUNCTION PANEL</u>
	LNA	MS 3126E12-10PX
On/Off	B _____	B
Bite	H _____	H
Shield	C _____	C
115VAC hot	F _____	F
115VAC cold	E _____	E
Ground	A _____	A
Shield	G _____	G

FIGURE 5. SATCOM WIRING PRINTS (SHEET 7 OF 8)

Kennedy Tape Deck Wiring

Card Cage	Kennedy
A -----	10
B -----	11
C -----	12
D -----	13
E -----	14
F -----	15
G -----	16
H -----	17
J -----	6
K -----	7
L -----	8
M -----	9
N -----	18
P -----	5
R -----	1
S -----	2
T -----	3
U -----	4
V -----	21
W -----	25
X -----	30
Y -----	35

FIGURE 5. SATCOM WIRING PRINTS (SHEET 8 OF 8)