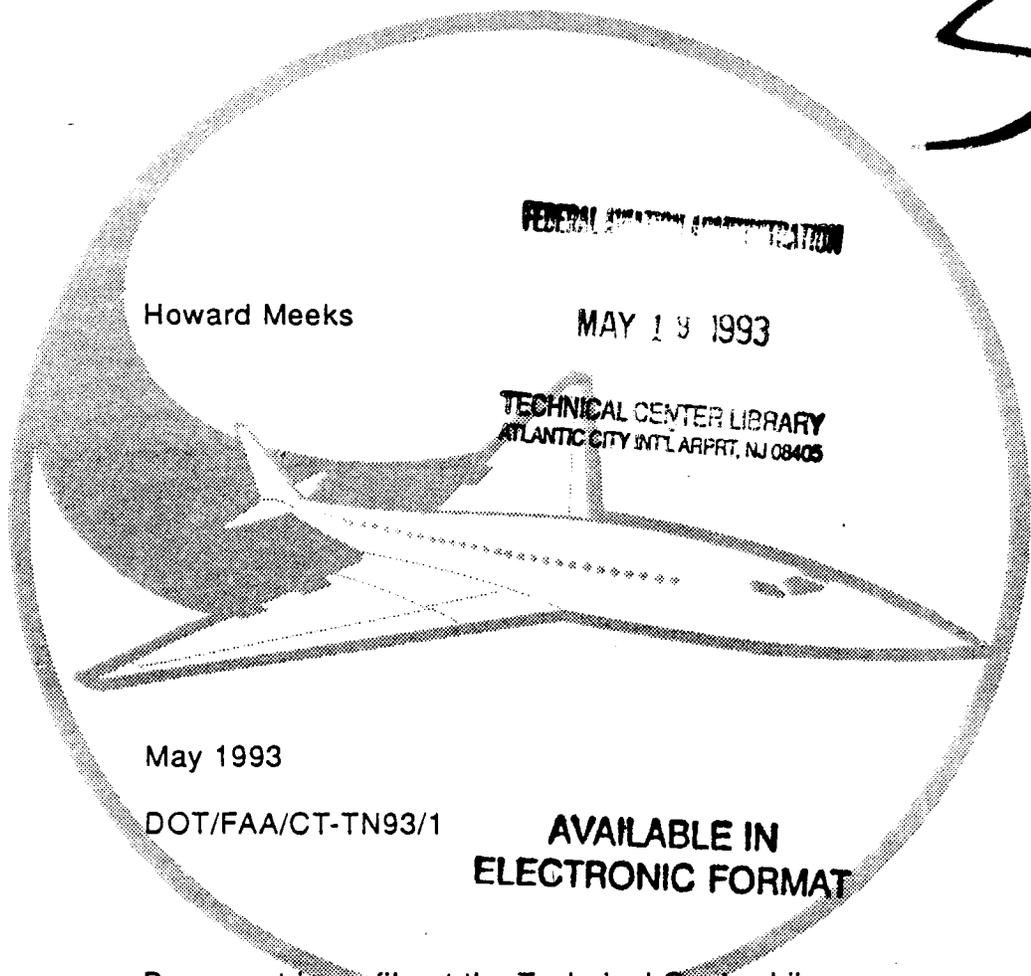


N
B
1
te technical note

COPY 2

Satellite Communications Installation Plan

S



FEDERAL AVIATION ADMINISTRATION

Howard Meeks

MAY 19 1993

TECHNICAL CENTER LIBRARY
ATLANTIC CITY INTL AIRPT, NJ 08405

May 1993

DOT/FAA/CT-TN93/1

AVAILABLE IN
ELECTRONIC FORMAT

Document is on file at the Technical Center Library,
Atlantic City International Airport, N.J. 08405



U.S. Department of Transportation
Federal Aviation Administration

Technical Center
Atlantic City International Airport, N.J. 08405

FAA WJH Technical Center
Tech Center Library
Atlantic City, NJ 08405

AVAILABLE IN
ELECTRONIC FORMAT



NOTICE

This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The United States Government assumes no liability for the contents or use thereof.

The United States Government does not endorse ~~products or manufacturers~~ products or manufacturers' names appear herein solely because they are considered essential to the objective of this report.

1. Report No. DOT/FAA/CT-TN93/1	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle SATELLITE COMMUNICATIONS INSTALLATION PLAN		5. Report Date May 1993	
		6. Performing Organization Code ACD-330	
		8. Performing Organization Report No. DOT/FAA/CT-TN93/1	
7. Author(s) Howard J. Meeks		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Department of Transportation Federal Aviation Administration Technical Center Atlantic City International Airport, N.J. 08405		11. Contract or Grant No. T0704F	
		13. Type of Report and Period Covered Technical Note	
12. Sponsoring Agency Name and Address Department of Transportation Federal Aviation Administration Automation Systems Division Washington, D.C. 20590		14. Sponsoring Agency Code ARD-100	
15. Supplementary Notes			
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.			
17. Key Words Automatic Dependent Surveillance (ADS) Satellite Communications (SATCOM)		18. Distribution Statement This document is on file at the Technical Center Library, Atlantic City International Airport, New Jersey 08405	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 20	22. Price

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	vii
INTRODUCTION	1
EQUIPMENT	1
Equipment List	1
SDU	2
RFU	2
ACARS	2
HPA	2
CDU	2
LNA	2
INSTALLATION	2

LIST OF ILLUSTRATIONS

Figure		Page
1	Aircraft Layout	4
2	Systems Overview	5
3	Systems Block Diagram	6
4	SATCOM Avionics Rack Drawing	7
5	SATCOM Wiring Prints (8 Sheets)	8

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.

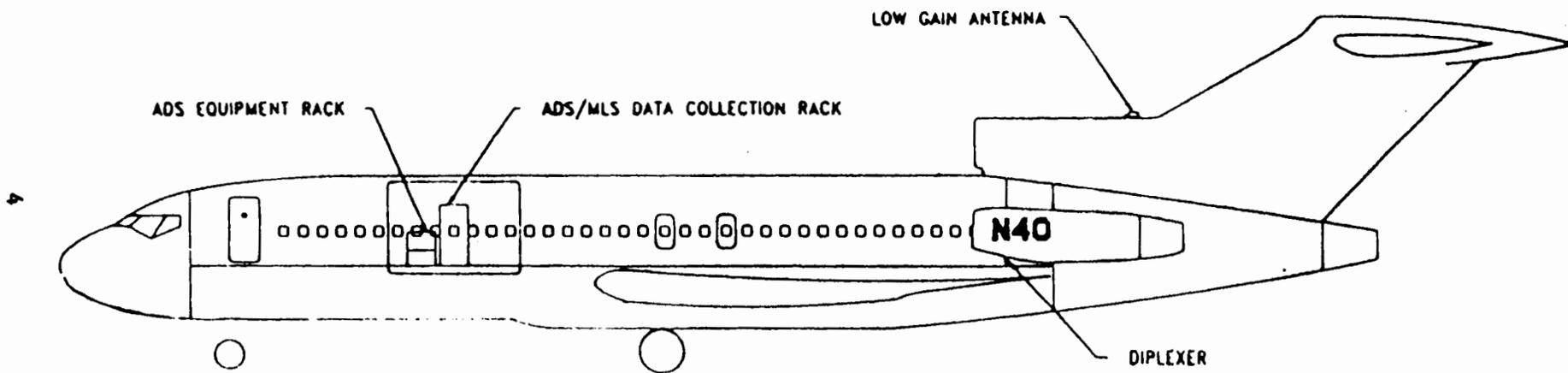
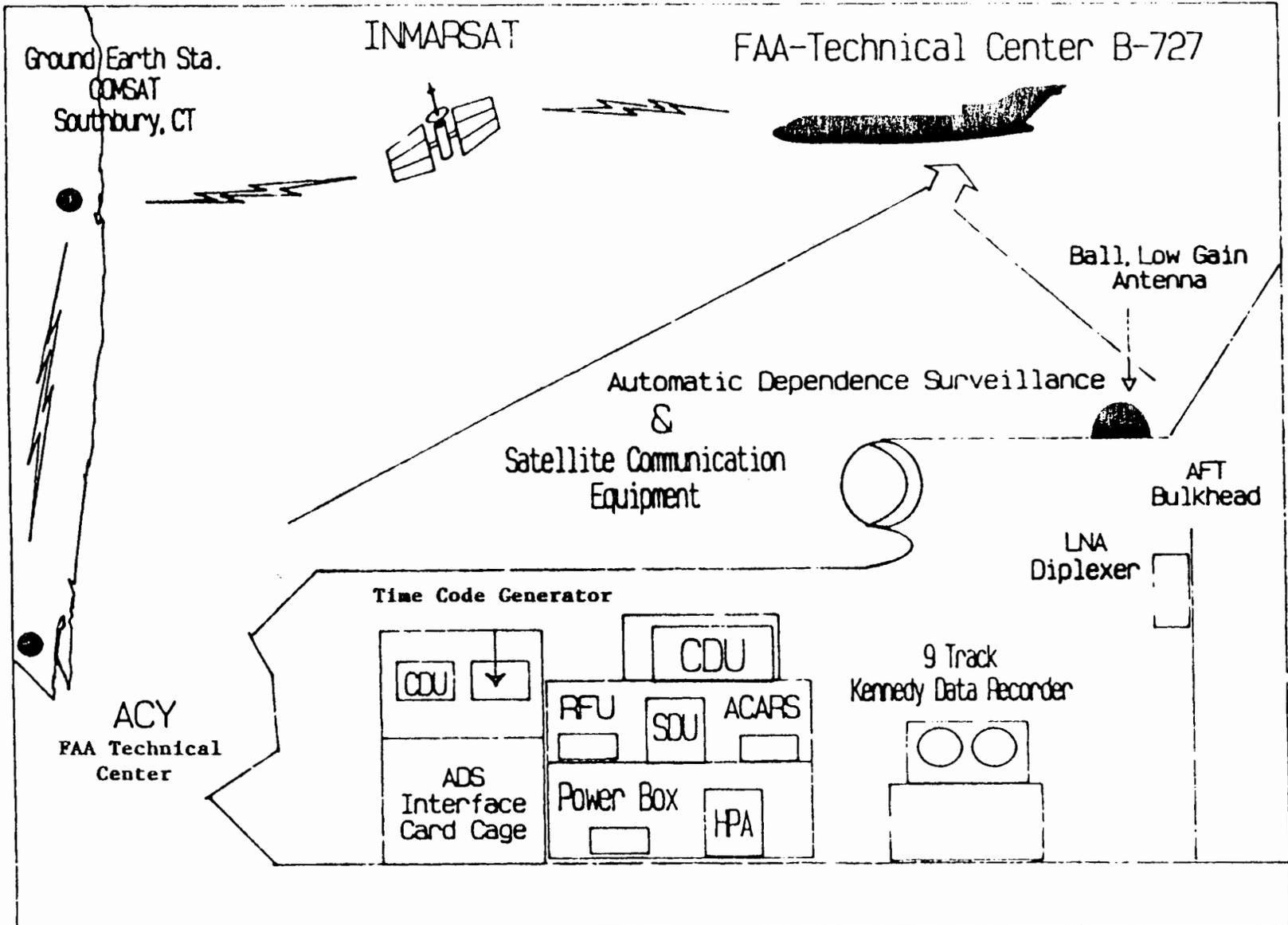


FIGURE 1. AIRCRAFT LAYOUT



5

FIGURE 2. SYSTEMS OVERVIEW

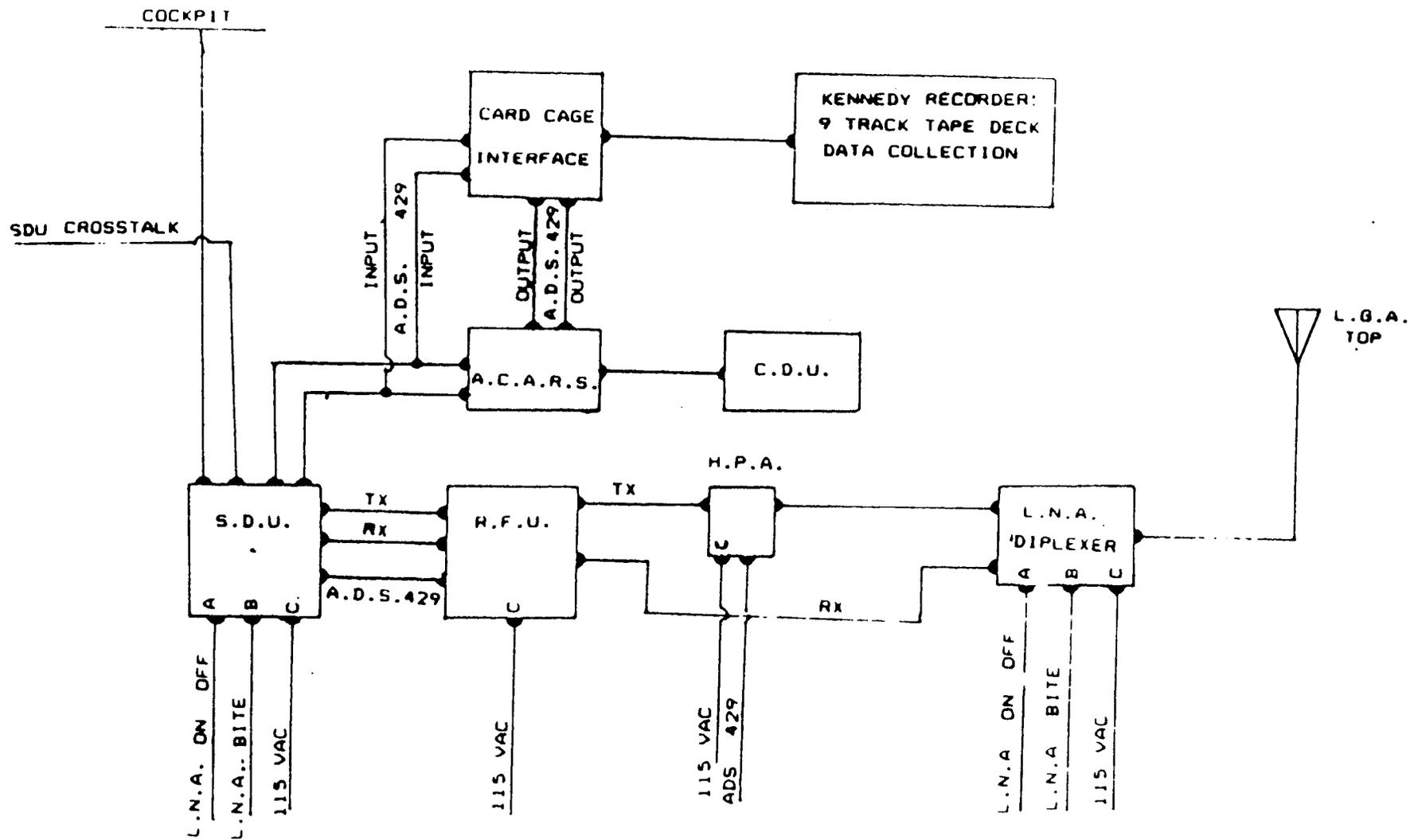


FIGURE 3. SYSTEMS BLOCK DIAGRAM

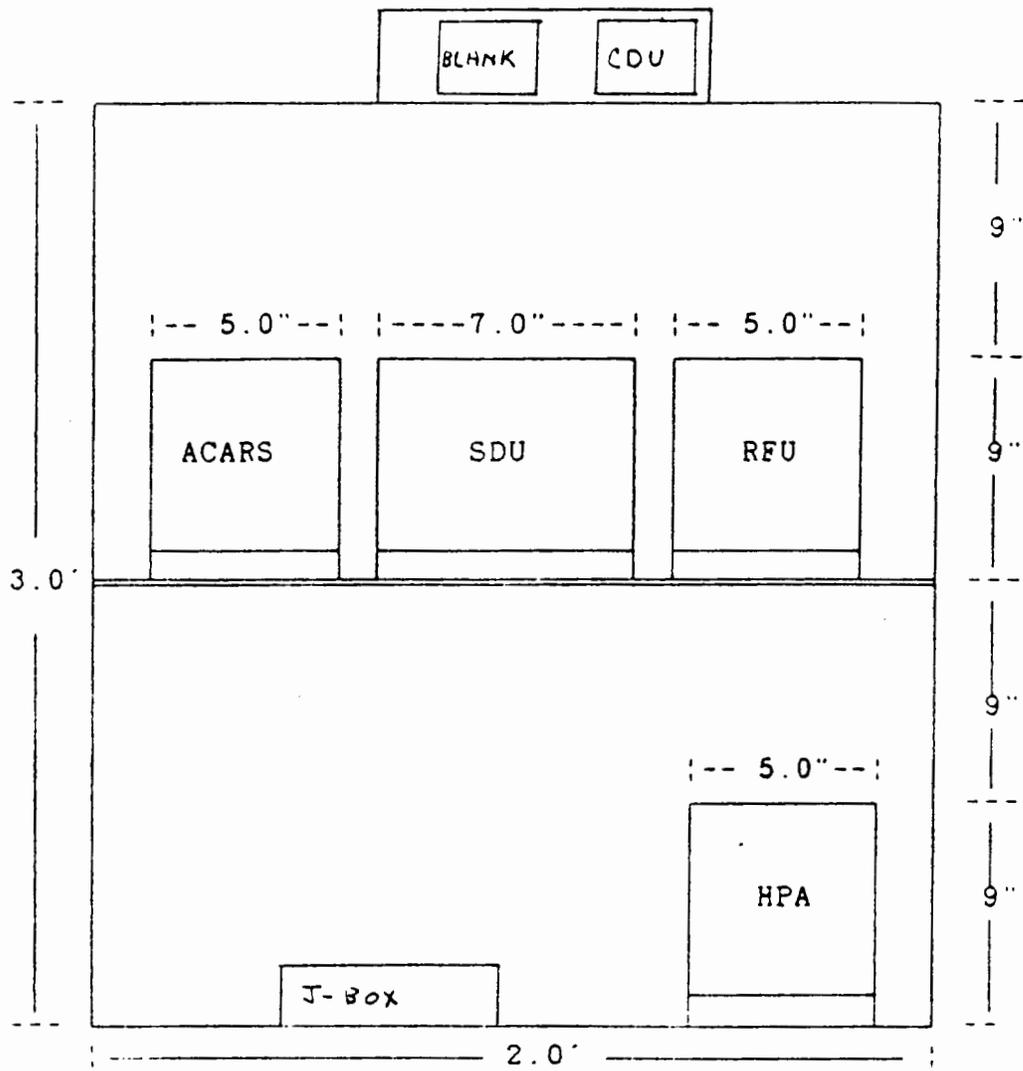
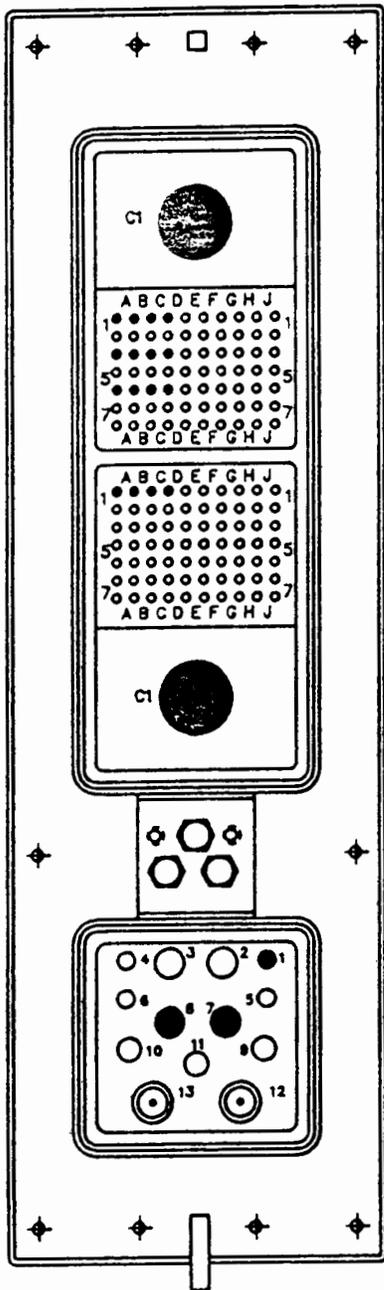


FIGURE 4. SATCOM AVIONICS RACK DRAWING

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



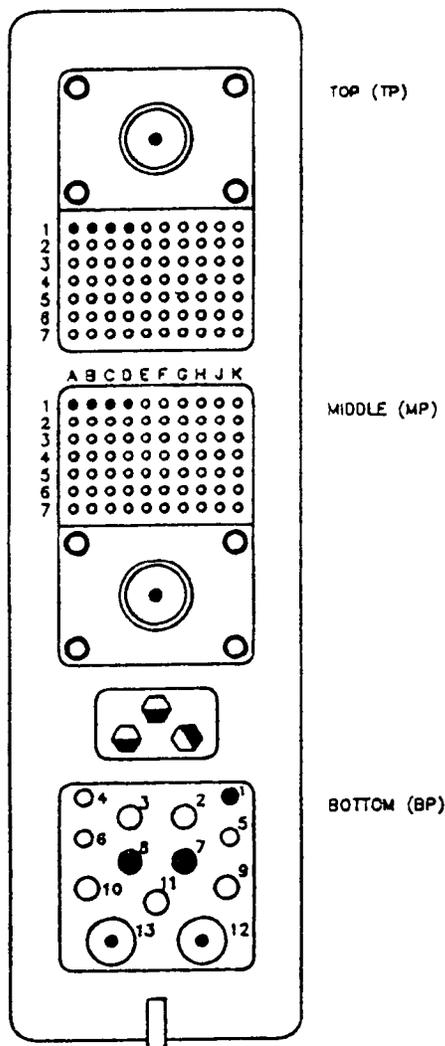
TPC1	RF INPUT
TP1A	MULTICTL A
TP1B	MULTICTL B
TP1C	429 HPA-SDU A
TP1D	429 HPA-SDU B
TP3A	MUTE 1A
TP3B	MUTE 1B
TP3C	MUTE 2A
TP3D	MUTE 2B
TP5A	SDI A
TP5B	SDI B
TP5C	SDI C
TP5D	SDI COM
MPC1	RF OUTPUT
MP1A	RS-232 RCV
MP1B	RS-232 XMT
MP1C	GND
MP1D	RS-232 MON ENABLE
BP1	115 V AC A1
BP7	115 V AC NEUT
BP8	CHASSIS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

Rear Connector Pin Functions

AD-0638-01

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 859-2004-010) MATES WITH CANNON PART NUMBER BKAD2-V155M-301-FO (COLLINS PART NUMBER 859-3400-010).
- 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 CIET-22 (CPN 371-8445-020), SIZE 20 USE INS/EXTR CIET-20HDL (CPN 371-8445-040), SIZE 12 INS/EXTR CIET-12-4 (CPN 371-8445-XXX). CRIMP TOOL: CONTACTS SHALL BE CRIMPED USING CPM 359-8101-XXX FOR MS22520/1-XX, AND CPM 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 / 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 CDU	y <u>Black</u>	y _____	TP13D
	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

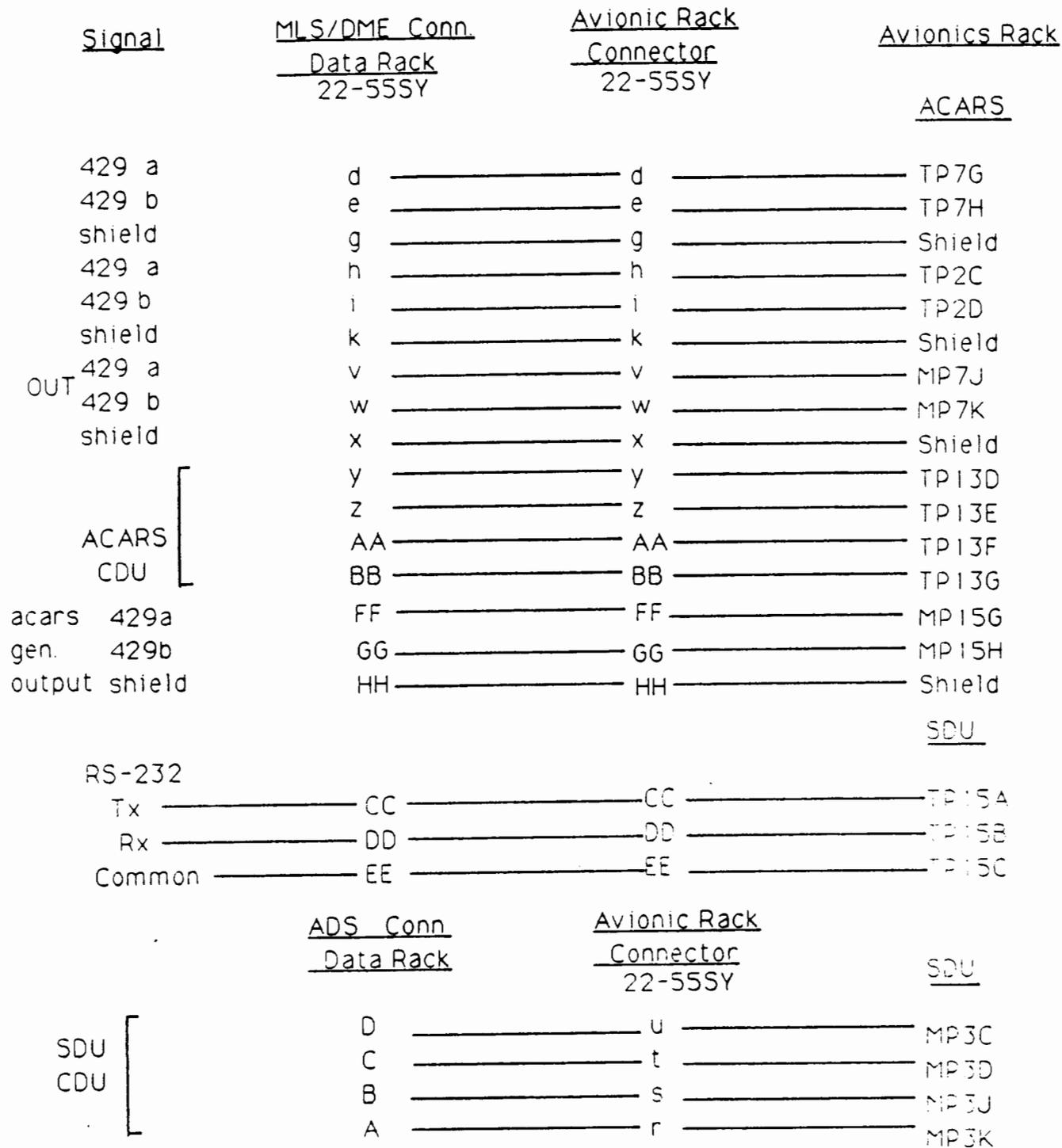
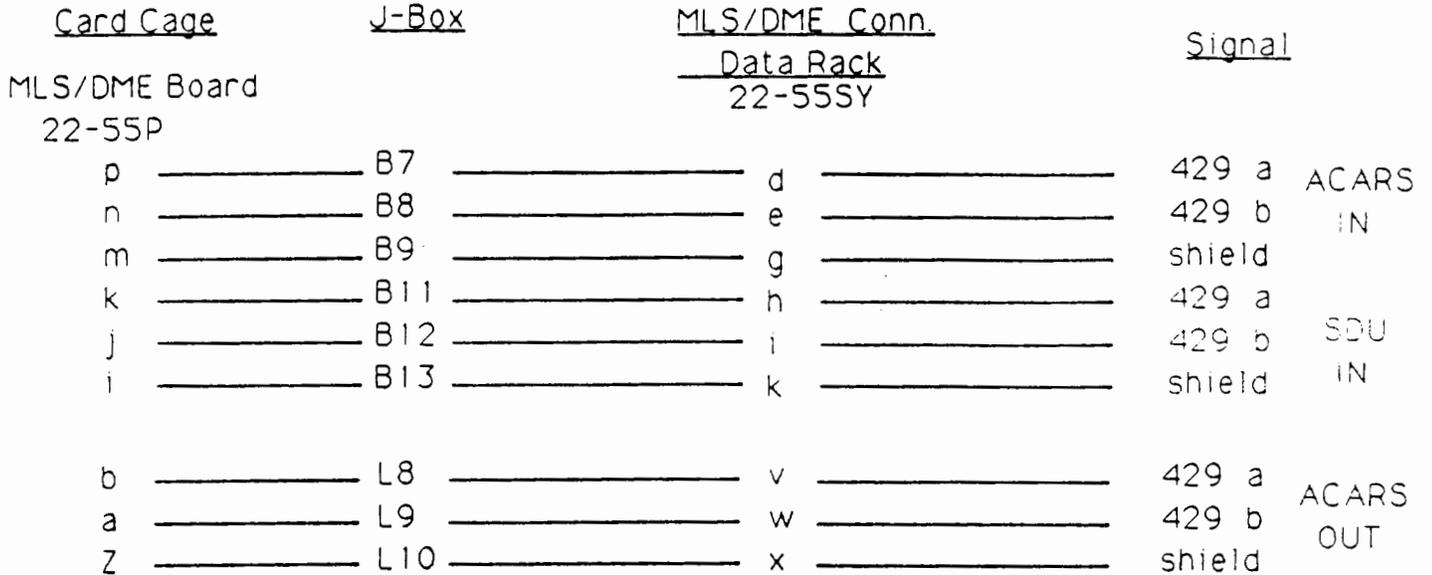


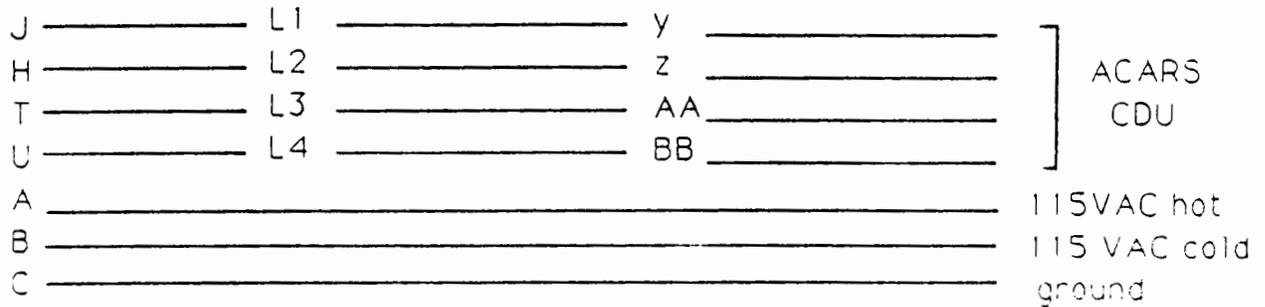
FIGURE 5. SATCOM WIRING PRINTS (SHEET 5 OF 8)

DATA RACK INTERNAL WIRING

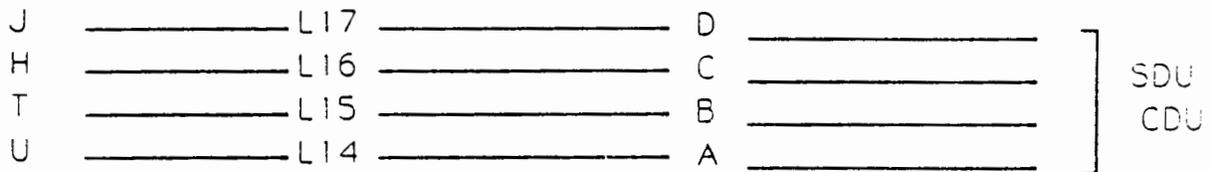


ACARS CDU

MS -3112 E20-41P



SDU CDU



RS-232

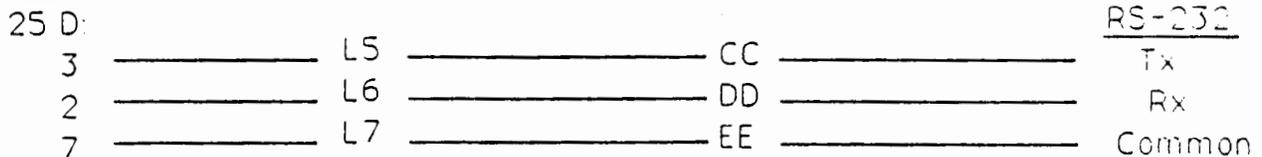


FIGURE 5. SATCOM WIRING PRINTS (SHEET 6 OF 8)

ADS RACK / N40 CABLE

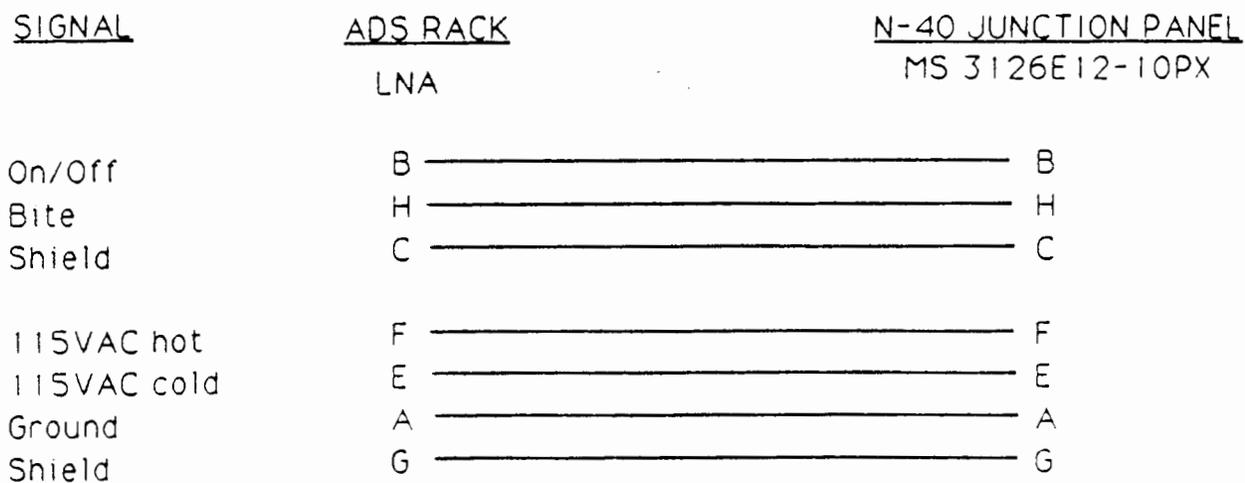


FIGURE 5. SATCOM WIRING PRINTS (SHEET 7 OF 8)

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)