



Comtech EF Data is an
AS9100 Rev B / ISO9001:2000 Registered Company

RC-1160 RC-1260

Redundancy Switch Controllers Installation and Operation Manual

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.



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RC-1160 RC-1260

Redundancy Switch Controllers Installation and Operation Manual

Part Number MN-RC1160RC1260
Revision 1

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Errata A for MN-RC1160RC1260 Rev 1

Comtech EF Data Documentation Update

RC-1160 RC-1260

Redundancy Switch Controllers Installation and Operation Manual

Part Number MN-RC1160RC1260
Revision 1

Subject: Update Section 2.3, Added DC power information

Errata Part Number: ERMNRC111260-EA1 (*Errata documents are not revised*)

PLM CO Number: C-0032355

Comments: See attached page(s). The new information will be included in the next released revision of the manual.

2.2 Rack-Mount Installation

The unit is designed to mount in a standard 19" (48.26 cm) rack cabinet or enclosure. A rack-mount installation requires 1.75" (4.44 cm) of panel height. The rack-mount will extend approximately 16" (40.64 cm) into the cabinet.

The environment around the rack mount should be moisture-free with a moderate indoor temperature. There should also be adequate air ventilation on the sides of the rack mount equipment.

Attach the supplied slide rails to the front and rear of the cabinet and proceed with the power connections.

2.3 Power Connection

The detachable power cords are intended to mate with the AC receptacle/filter at the rear of the unit. The power cords are designed to be connected to two independent power sources, each providing an AC voltage between 90 and 240V. (Although this is not a requirement, the cords enhance the integrity of the redundancy.)



NOTE: Power can be applied to the unit without the output cables connected.

• 2.3.1 DC Filter Input Module, RC-1160

The DC Input Filter Module (shown in Figure 2-1a) has pinouts listed in Table 2-1a. The input voltage is: -48VDC nominal, -36 VDC minimum, -72VDC maximum.

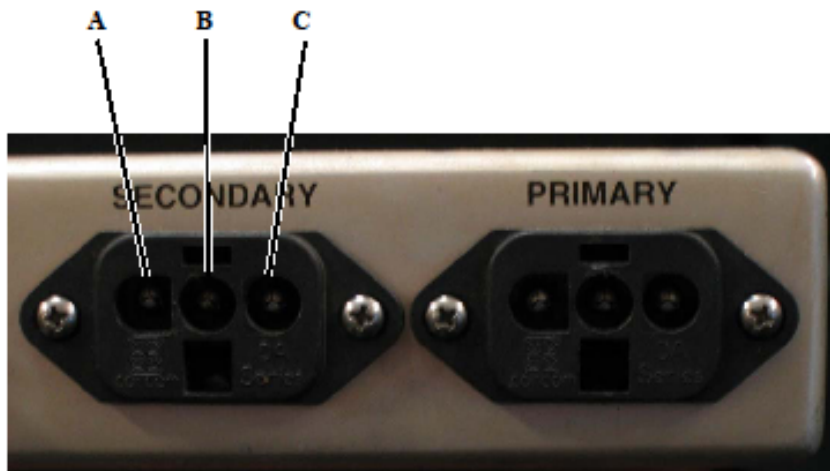


Figure 2-1a. DC Input Filter Module

Table 2-1a. DC Input Filter Module

Pin #	Signal Name	Wire Colors	Wiring Options	
A	Negative	Black	-48 VDC	0 VDC
B	Ground	Green/Yellow	Earth Ground	Earth Ground
C	Positive	Red	0 VDC	+48 VDC

Errata B for MN-RC1160RC1260 Rev 1

Comtech EF Data Documentation Update

RC-1160 RC-1260

Redundancy Switch Controllers Installation and Operation Manual

Part Number MN-RC1160RC1260
Revision 1

Subject: Update Section 1.2, Revised power output information

Errata Part Number: ERMNRC111260-EB1 (*Errata documents are not revised*)

PLM CO Number: C-0032396

Comments: See attached page(s). The new information will be included in the next released revision of the manual.

1.2 Specifications

Parameter	Specification
Power Input	90 to 240 VAC, 47 to 63 Hz, less than 40W Input protected by 2.0A circuit breaker Nominal current 0.65A (standard)
Power Output	14 VDC, 0.5A per LNA/LNB (standard) 14 VDC, 600 mA per LNA/LNB (optional), 150 mA total minimum load, Each outlet protected by a current-limiting regulator.
Physical Dimensions: Depth Height Width (Front Panel) Width (Chassis)	16" (40.64 cm) 1 3/4" (4.44 cm) 19" (48.26 cm) 16.5" (41.91 cm)
Weight	5 lb. (2.27 Kg)
Environmental: Operating Temperature Storage Temperature Humidity	+10 to +50°C (+50 to +122°F) -40 to +100°C (-104 to 212°F) 5 to 85%, non-condensing

1.2.1 Front Panel Controls

Parameter	Specification
LNA 1 ON LINE	Press the switch to place the LNA/LNB 1 on line.
LNA 2 ON LINE	Press the switch to place the LNA/LNB 2 on line.
AUTO SW	Press the switch to the left to place the unit in the Automatic switch-over mode.
MANUAL SW	Press the switch to the right to place the unit in Manual mode.
REMOTE SW	Press the switch to the left to place the unit in Remote mode.
LOCAL SW	Press the switch to the right to place the unit in Local mode.
AUDIO ALARM DISABLE	Toggle the switch to disable the audio alarm.
LAMP TEST SW	Press the switch to activate all LEDs.
BACKUP 1 *	Press the switch to force the backup LNA/LNB to go online for LNA/LNB 1.
BACKUP 2 *	Press the switch to force the backup LNA/LNB to go online for LNA/LNB 2.
PRIORITY 1 SW *	Press the switch to the left to operate with LNA/LNB 1 as priority.
PRIORITY 2 SW *	Press the switch to the right to operate with LNA/LNB 2 as priority.

Applies to the RC-1260 only (1:2 systems).

1.2.2 Rear Panel Controls

Parameter	Specification
AC POWER A	Toggle switch and 2A circuit breaker. Allows the primary power to be turned ON or OFF.
AC POWER B	Toggle switch and 2A circuit breaker. Allows the secondary power to be turned ON or OFF.
CALIBRATION SW	Performs calibration of the LNA/LNB currents.

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PREFACE

About this Manual

This manual gives installation and operation information for the Comtech EF Data RC-1160 RC-1260 Redundancy Switch Controllers. This manual is intended for anyone who installs or operates the unit.

Cautions and Warnings



WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.



CAUTION indicates a hazardous situation that, if not avoided, may result in minor or moderate injury. CAUTION may also be used to indicate other unsafe practices or risks of property damage.



IMPORTANT or **NOTE** indicates information critical for proper equipment function, or a statement that is associated with the task being performed.

Patents and Trademarks

See all of Comtech EF Data's Patents and Patents Pending at <http://patents.comtechefdata.com>.

Comtech EF Data acknowledges that all trademarks are the property of the trademark owners.

Military Standards

References to "MIL-STD-188" apply to the 114A series (i.e., MIL-STD-188-114A), which provides electrical and functional characteristics of the unbalanced and balanced voltage digital interface circuits applicable to both long haul and tactical communications. Specifically, these references apply to the MIL-STD-188-114A electrical characteristics for a balanced voltage digital interface circuit, Type 1 generator, for the full range of data rates. For more information, refer to the Department of Defense (DOD) MIL-STD-188-114A, "Electrical Characteristics of Digital Interface Circuits."

Related Documents

Department of Defense (DOD) MIL-STD-188-114A, Electrical Characteristics of Digital Interface Circuits

Product Support

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Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

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Chapter 1. INTRODUCTION

This chapter provides an overview and specifications for these redundancy switch controllers:

- RC-1160 (1:1)
- RC-1260 (1:2)



Figure 1-1. RC-1160 (1:1)

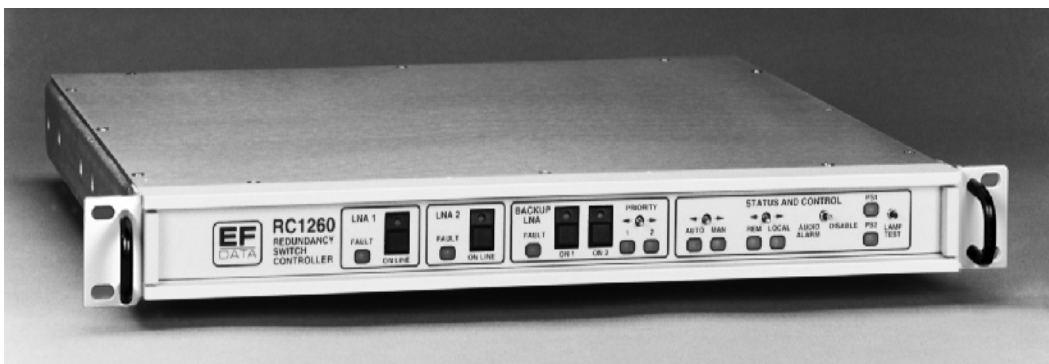


Figure 1-2. RC-1260 (1:2)



CAUTION

This equipment contains parts and assemblies sensitive to damage by Electrostatic Discharge (ESD). Use ESD precautionary procedures when touching, removing, or inserting Printed Circuit Boards (PCBs).

1.1 Overview

A complete redundant system consists of:

- RC-1160 or RC-1260 redundancy switch controller
- Redundant amplifier plate with two or three LNA/LNBs
- Interconnect cable up to 1500 feet (457 meters) in length

The redundancy switch controller performs the following functions:

- Supplies +14V power to the LNA/LNBs.
- Measures LNA/LNB current.
- Performs calibration on LNA/LNB current.
- Signals a fault with abnormal current deviation.
- Sounds audio alarm on fault (can be disabled).
- Switches LNA/LNB on a priority basis in auto mode.
- Controls waveguide and coaxial switch position.
- Provides FORM-A and FORM-C relay contacts for remote status.
- Provides a 9-pin EIA-485/-232 serial interface.
- Normal/maintenance switch online during servicing.

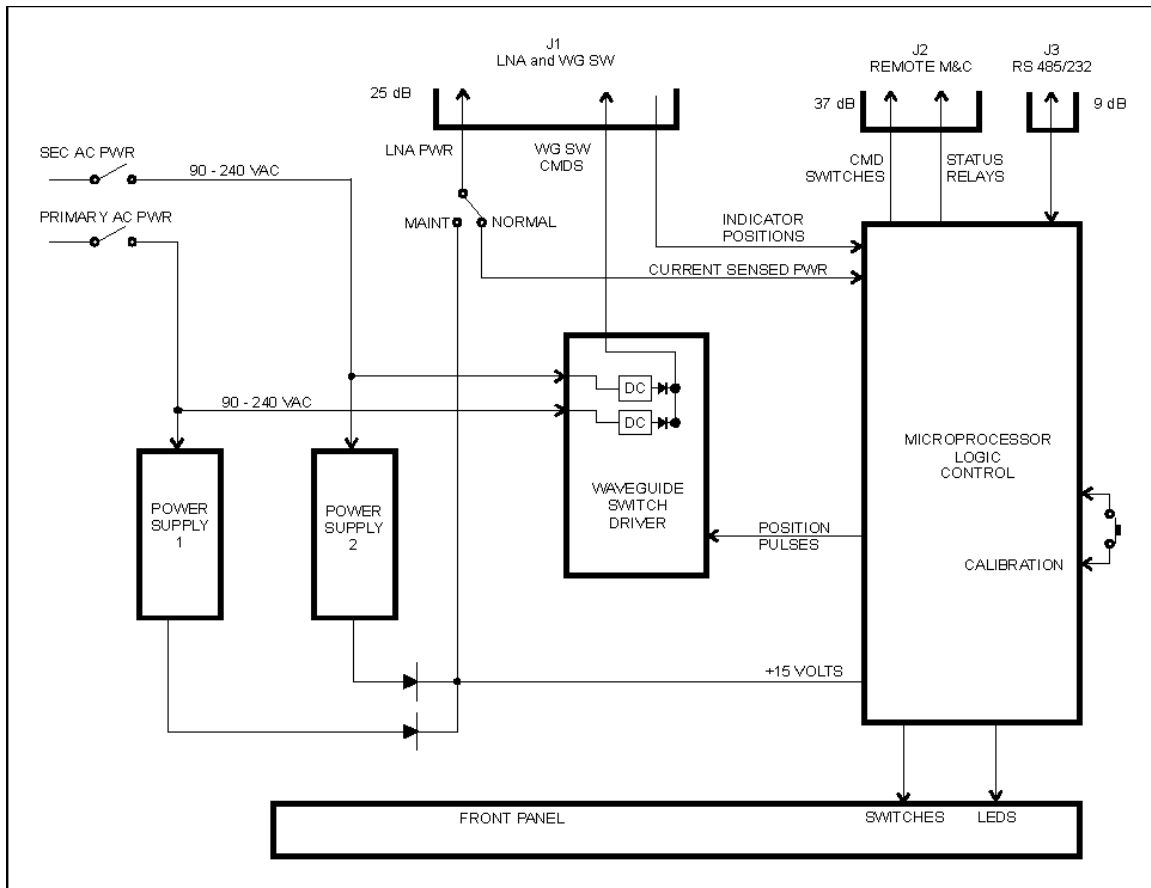


Figure 1-3. Redundancy Switch Controller Block Diagram

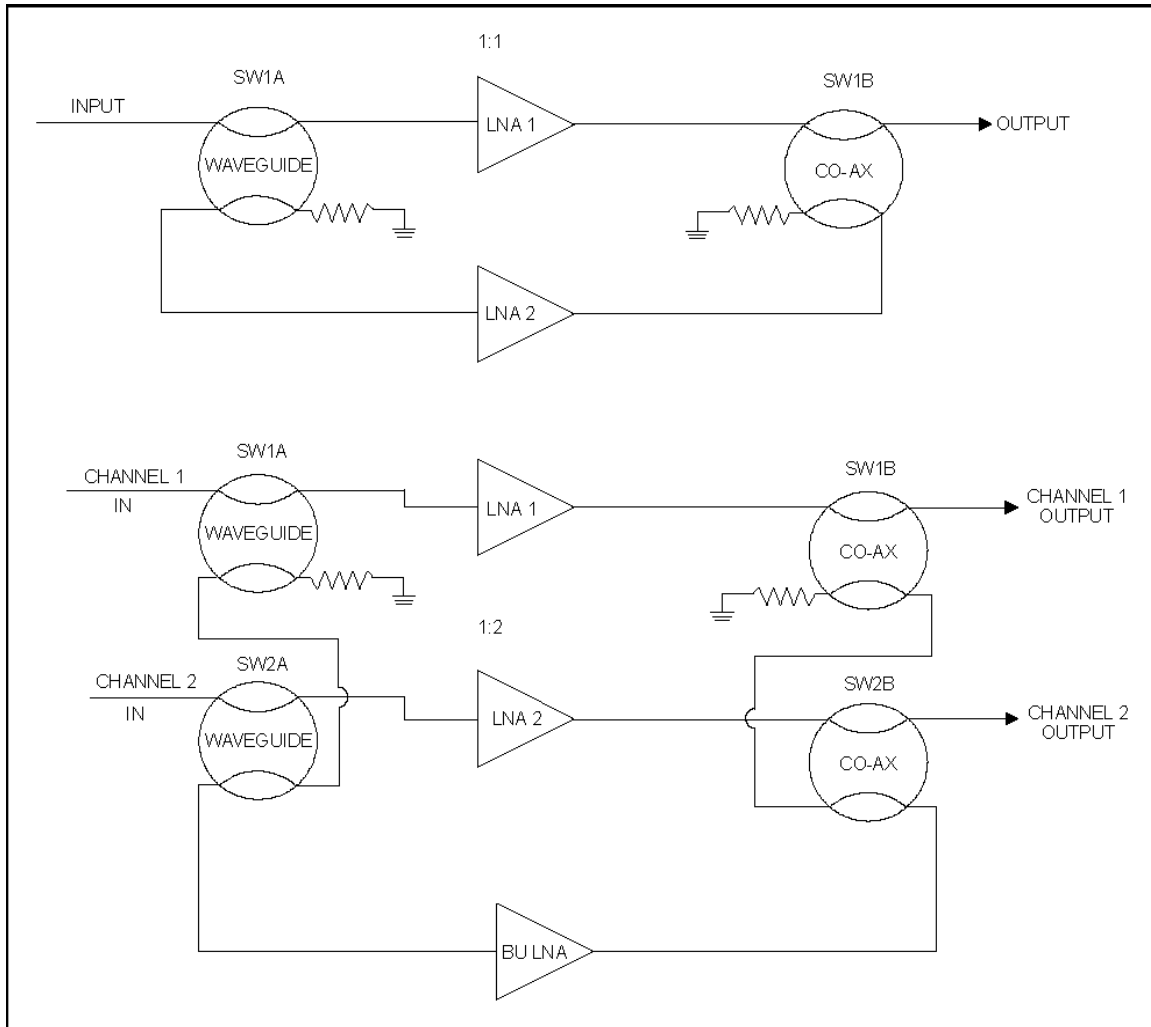


Figure 1-4. LNA/LNB Plate Block Diagram

1.2 Specifications

Parameter	Specification
Power Input	90 to 240 VAC, 47 to 63 Hz, less than 40W Input protected by 2.0A circuit breaker Nominal current 0.65A (standard)
Power Output	14 VDC, 0.5A per LNA/LNB (standard) 14 VDC, 600 mA per LNA/LNB (optional) Each outlet protected by a current-limiting regulator.
Physical Dimensions: Depth Height Width (Front Panel) Width (Chassis)	16" (40.64 cm) 1 3/4" (4.44 cm) 19" (48.26 cm) 16.5" (41.91 cm)
Weight	5 lb. (2.27 Kg)
Environmental: Operating Temperature Storage Temperature Humidity	+10 to +50°C (+50 to +122°F) -40 to +100°C (-104 to 212°F) 5 to 85%, non-condensing

1.2.1 Front Panel Controls

Parameter	Specification
LNA 1 ON LINE	Press the switch to place the LNA/LNB 1 on line.
LNA 2 ON LINE	Press the switch to place the LNA/LNB 2 on line.
AUTO SW	Press the switch to the left to place the unit in the Automatic switch-over mode.
MANUAL SW	Press the switch to the right to place the unit in Manual mode.
REMOTE SW	Press the switch to the left to place the unit in Remote mode.
LOCAL SW	Press the switch to the right to place the unit in Local mode.
AUDIO ALARM DISABLE	Toggle the switch to disable the audio alarm.
LAMP TEST SW	Press the switch to activate all LEDs.
BACKUP 1 *	Press the switch to force the backup LNA/LNB to go online for LNA/LNB 1.
BACKUP 2 *	Press the switch to force the backup LNA/LNB to go online for LNA/LNB 2.
PRIORITY 1 SW *	Press the switch to the left to operate with LNA/LNB 1 as priority.
PRIORITY 2 SW *	Press the switch to the right to operate with LNA/LNB 2 as priority.
Applies to the RC-1260 only (1:2 systems).	

1.2.2 Rear Panel Controls

Parameter	Specification
AC POWER A	Toggle switch and 2A circuit breaker. Allows the primary power to be turned ON or OFF.
AC POWER B	Toggle switch and 2A circuit breaker. Allows the secondary power to be turned ON or OFF.
CALIBRATION SW	Performs calibration of the LNA/LNB currents.

1.2.3 Indicators

Note: Applies to RC-1260 only (1:2 systems).

Parameters		Specification
LNA 1 FAULT	Red LED	Illuminates with a fault in LNA/LNB 1.
LNA 2 FAULT	Red LED	Illuminates with a fault in LNA/LNB 2.
BACKUP LNA FAULT	Red LED	Illuminates with a fault in backup LNA/LNB. (<i>See note</i>)
LNA 1 ONLINE	Green LED	Illuminates when LNA/LNB 1 is online.
LNA 2 ONLINE	Green LED	Illuminates when LNA/LNB 2 is online.
BACKUP ON 1	Green LED	Illuminates when backup LNA/LNB is on Pos 1. (<i>See note</i>)
BACKUP ON 2	Green LED	Illuminates when backup LNA/LNB is on Pos 2. (<i>See note</i>)
AUTO	Green LED	Illuminates when unit is in auto mode.
MANUAL	Amber LED	Illuminates when unit is in manual mode.
PRIORITY 1	Green LED	Illuminates when the unit considers LNA/LNB 1 to be a priority. (<i>See note</i>)
PRIORITY 2	Green LED	Illuminates when the unit considers LNA/LNB 2 to be a priority. (<i>See note</i>)
REMOTE	Green LED	Illuminates when the unit is in remote mode.
LOCAL	Amber LED	Illuminates when unit is in local mode.
PS1	Green LED	Illuminates when output voltage of power supply 1 is greater than 14V. Also denotes voltage present at PS1, when using a Wave Guide (WG) DC Switch.
PS2	Green LED	Illuminates when output voltage of power supply 2 is greater than 14V. Also denotes voltage present at PS2, when using a Wave Guide (WG) DC Switch.

1.2.4 Internal Switches

	Switch	Specification
NORMAL/MAINT	Toggle	Allows service technician to direct the +15V power directly to the LNA/LNB outputs (SW1).
NORMAL/WIDE	Slide	On the logic PWB to change the sensitivity of the current window (SW1).

1.2.5 Internal Indicators

Indicator	LED	Specification
MAINT MODE	Red	Illuminates when the maintenance switch (SW1) is in the maintenance position. Located on the Maint/Power PWB.
+15V1	Green	Illuminates when +15V is present from PS1.
+15V2	Green	Illuminates when +15V is present from PS2.
+5V	Green	Illuminates when +5V is present.
SUMMARY FAULT	Red	Illuminates when any fault is present.

Chapter 2. INSTALLATION

This chapter provides the following information for the switch controller:

- Unpacking
- Installation
- Power connection
- External connections

2.1 Unpacking

The switch controller is packaged in a preformed, reusable cardboard carton containing foam spacing for maximum shipping protection.



CAUTION

Do not use any cutting tool that will extend more than 1 inch (2.54 cm) into the container and cause damage to the unit.

To remove the switch controller:

- 1) Cut the tape at the top of the carton (indicated by OPEN AT THIS END).
- 2) Remove the cardboard/foam spacer covering the switch controller and caddypacks.
- 3) Remove the redundancy switch controller, caddypacks, manual, and power cord from the carton.
- 4) Save the packing material for reshipment purpose.
- 5) Inspect the equipment for any possible damage incurred during shipping.
- 6) Check the equipment against the packing list to ensure that the shipment is complete.

2.2 Rack-Mount Installation

The unit is designed to mount in a standard 19" (48.26 cm) rack cabinet or enclosure. A rack-mount installation requires 1.75" (4.44 cm) of panel height. The rack-mount will extend approximately 16" (40.64 cm) into the cabinet.

The environment around the rack mount should be moisture-free with a moderate indoor temperature. There should also be adequate air ventilation on the sides of the rack mount equipment.

Attach the supplied slide rails to the front and rear of the cabinet and proceed with the power connections.

2.3 Power Connection

The detachable power cords are intended to mate with the AC receptacle/filter at the rear of the unit. The power cords are designed to be connected to two independent power sources, each providing an AC voltage between 90 and 240V. (Although this is not a requirement, the cords enhance the integrity of the redundancy.)



NOTE: Power can be applied to the unit without the output cables connected.

2.4 External Connections

2.4.1 LNA/LNB Connector, J1

The LNA/LNB connector is a 25-pin D socket, and can mate with any 25-pin miniature D connector plug. See Table 2-1 for connector pinouts.

Table 2-1. Controller LNA/LNB Output Connector, J1

Pin #	Name	Description
12	LNA 1 +14 VDC	Output power for LNA/LNB 1.
25	LNA 1 RETURN	Ground.
10	LNA 2 +14 VDC	Output power for LNA/LNB 2.
23	LNA 2 RETURN	Ground.
8	BACK UP +14 VDC	Output power for backup LNA. (<i>See note</i>)
21	BACK UP RETURN	Ground. (<i>See note</i>)
5	1 ONLINE CMD	Places LNA/LNB 1 online, 110 VAC or 28/48 VDC pulse for 400 ms.
4	2 ONLINE CMD	Places LNA/LNB 2 online, 110 VAC or 28/48 VDC pulse for 400 ms.
3	BACKUP 1 CMD	Places BU on 1, 110 VAC or 28/48 VDC pulse for 400 ms. (<i>See note</i>)
2	BACKUP 2 CMD	Places BU on 2, 110 VAC or 28/48 VDC pulse for 400 ms. (<i>See note</i>)
1	WG SW COM	Ties to common of all coils. When coil is pulsed, it becomes the return.
6	WG SW IND 1 OL	Indicator contacts from waveguide switch. Must be wired per Figures 2-1 and 2-2, or equivalent.
19	WG SW IND 2 OL	Indicator contacts from WG switch. Must be wired per Figures 2-1 and 2-2, or equivalent.
7	WG SW IND BU OL	Indicator contacts from WG switch. Must be wired per Figures 2-1 and 2-2, or equivalent. (<i>See note</i>)
17	WG SW IND COM	Logic ground.
9	EXT BACKUP FLT	Opto-isolator input, contact to local ground produces a fault.
11	EXT FAULT 2	Opto-isolator input, contact to local ground produces a fault.
13	EXT FAULT 1	Opto-isolator input, contact to local ground produces a fault.
20	AUX PWR 3	15V for powering external ovens.
22	AUX PWR 2	15V for powering external ovens.
24	AUX PWR 1	15V for powering external ovens.
14	SHIELD GND	Connects shield on cable to chassis ground.
15 16 18		Unused.

See Figure 2-1 and Figure 2-2 for waveguide switch and indicator wiring.

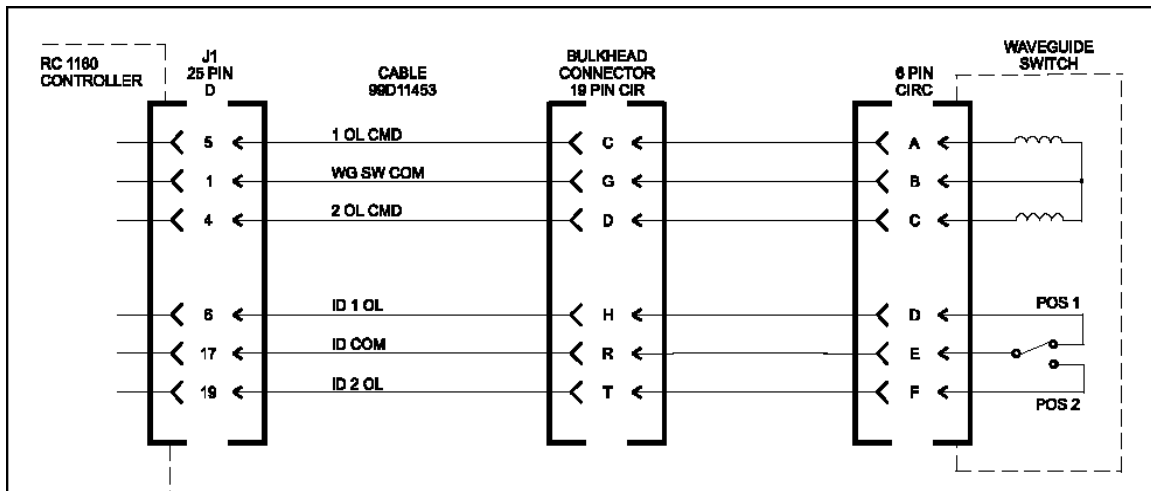


Figure 2-1. Waveguide Switch Wiring 1:1 Configuration

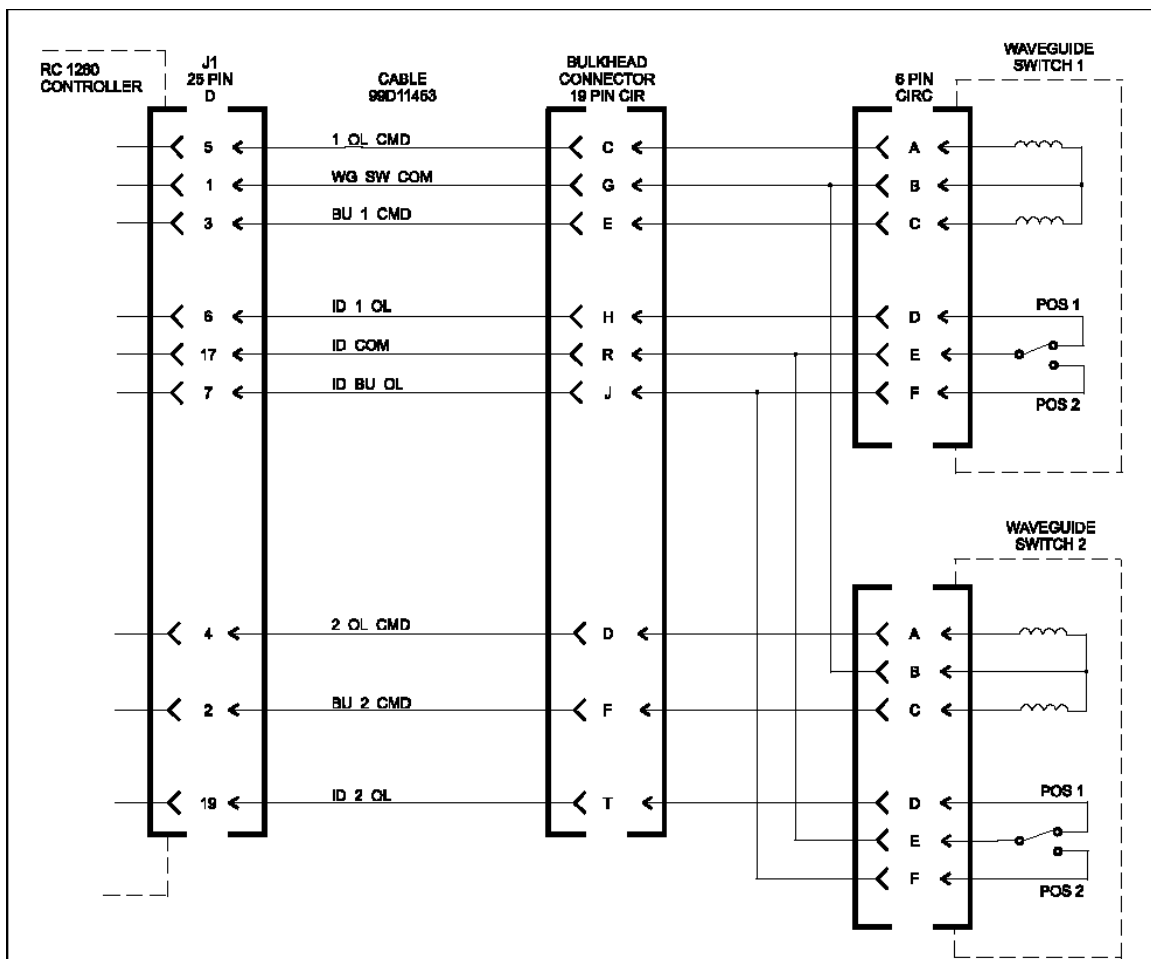


Figure 2-2. Waveguide Switch Wiring 1:2 Configuration, RC-1260 Only

2.4.2 Remote Connector, J2

Remote connector is a 37-pin miniature D connector (Refer to Table 2-2 for connector pinouts). The connector is compatible with any 37-pin miniature D connector plug.

FORM-A relays are rated at 10 VA; FORM-C relays are rated at 3 VA.



NOTE: This connector is applicable for the RC-1260 only.

Table 2-2. Remote Connector, J2

Pin #	Name	Description
13	LNA 1 ONLINE NO	Contact to Status Com when LNA/LNB 1 is online.
15	LNA 2 ONLINE NO	Contact to Status Com when LNA/LNB 2 is online.
23	BU ON 1 NO	Contact to Status Com when BU is on LNA/LNB 1. <i>(See note 1)</i>
2	BU ON 2 NO	Contact to Status Com when BU is on LNA/LNB 1. <i>(See note 1)</i>
25	PS1 ON NO	Contact to Status Com when PS1 is OK.
26	PS2 ON NO	Contact to Status Com when PS2 is OK.
14	STATUS COM	Common for all status relays.
4	FAULT 1 NO	Contact to Fault Com when LNA/LNB 1 is faulted.
6	FAULT 2 NO	Contact to Fault Com when LNA/LNB 2 is faulted.
8	FAULT BU NO	Contact to Fault Com when BU LNA/LNB is faulted. <i>(See note 1)</i>
5	FAULT COM	Common for all fault relays.
12	MANUAL NO	Contact to FORM-C Com when in Manual mode.
10	AUTO NC	Contact to FORM-C Com when in Auto mode.
37	PRIORITY 1 NC	Contact to FORM-C Com when Priority 1 is selected.
36	PRIORITY 2 NO	Contact to FORM-C Com when Priority 2 is selected.
18	SUM FAULT NO	Contact to FORM-C Com when system is OK.
19	SUM FAULT NC	Contact to FORM-C Com when system is faulted.
11	FORM-C COM	Common for all FORM-C relays.
35	LOCAL NO	Contact to L/R Com when in Local mode. <i>(See note 2)</i>
33	REMOTE NC	Contact to L/R Com when in Remote mode. <i>(See note 2)</i>
17	L/R COM	Common for the L/R relay.
34	GROUND	Signal ground.
27	1 OL CMD	Momentary contact to GND places LNA/LNB 1 online.
28	2 OL CMD	Momentary contact to GND places LNA/LNB 2 online.
29	BU 1 CMD	Momentary contact to GND places the BU on 1. <i>(See note 1)</i>
20	BU 2 CMD	Momentary contact to GND places the BU on 2. <i>(See note 1)</i>
1	PRIORITY 1 CMD	Momentary contact to GND selects Priority 1.
30	PRIORITY 2 CMD	Momentary contact to GND selects Priority 2.
31	AUTO CMD	Momentary contact to GND places unit in Auto mode.
32	MANUAL CMD	Momentary contact to GND places unit in Manual mode.
21	REMOTE CMD	Momentary contact to GND places unit in Remote mode.

Pin #	Name	Description
22	LOCAL CMD	Momentary contact to GND places unit in Local mode.
3	OPTO IN SP1	Input, spare opto-isolator.
24	OPTO IN SP2	Input, spare opto-isolator.
7 9 16		Unused.

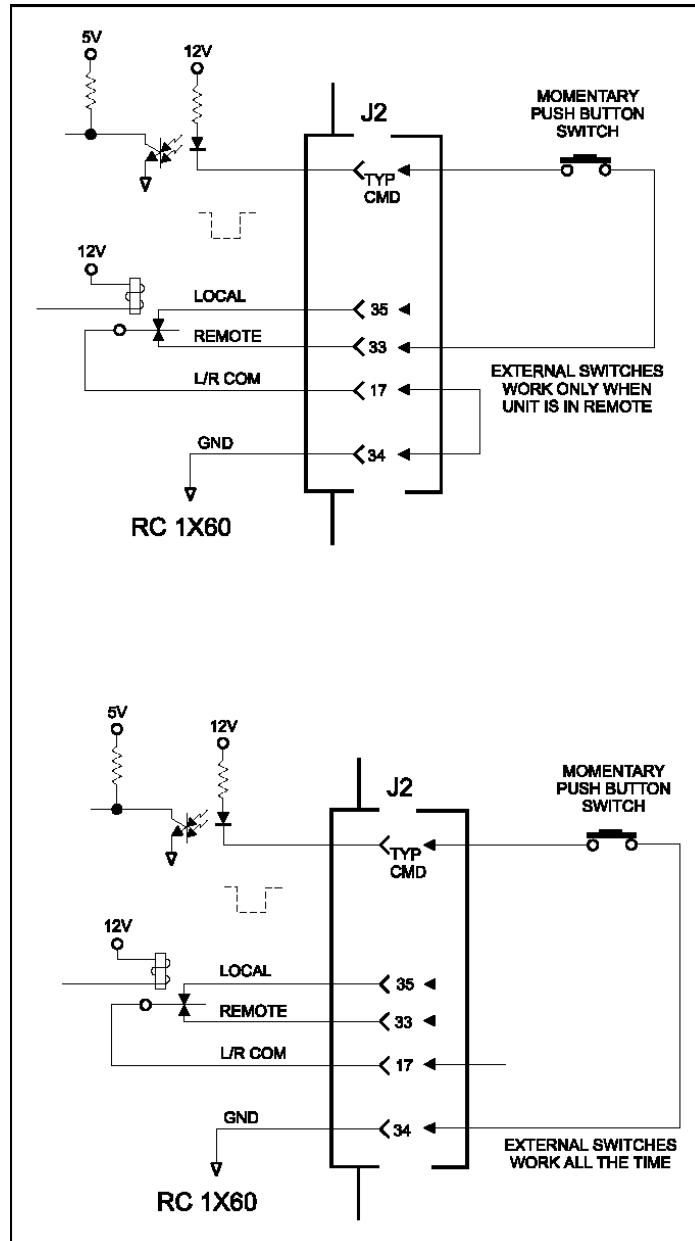


Figure 2-3. External Remote Local Wiring

2.4.3 EIA-485/-232 Serial Connector, J3

The serial connector is a 9-pin miniature D connector socket (refer to Table 2-3 for connector pinouts). EIA-485 signal is 0 to 5V; EIA-232 signal is $\pm 11V$. The connector is compatible with any 9-pin miniature D connector plug.



NOTE: When strapped for EIA-232 operation, CTS is tied to RTS in the RC-1160/-1260.

Table 2-3. EIA-485/-232 Serial Connector, J3

Pin #	EIA-485	EIA
1	GND	
2		TD (TX)
3		RD (RX)
4	+RX/TX	
5	-RX/TX	GND
6		Data Set Ready (DSR), Tied High
7		Ready to Send (RTS) (<i>See note</i>)
8	+RX/TX	Clear to Send (CTS) (<i>See note</i>)
9	-RX/TX	

2.4.4 LNA, LNB, and Waveguide Pinouts

LNAs and LNBs can be supplied with three different connector configurations, depending on the model and options. The most common LNA/LNB pinouts are 3-, 4- and 6-pin.

Waveguide connectors are always 6-pin, but vary in size, depending on the frequency of the switch (C-band, X-band, S-band, and Ku-band). See Table 2-4 for pinouts of the above connectors.

Table 2-4. LNA, LNB, and Waveguide Pinouts

3-Pin LNA/LNB	4-Pin LNA/LNB	6-Pin LNA/LNB	Waveguide Switch
A Power Input	A Power Input	A power input	A Position 1, Command
B GND	B (<i>See Note</i>)	B GND	B Command, Common
C GND	C GND	C FLT, normally closed	C Position 2, Command
	D GND	D FLT, common	D Indicator, Position 1
		E FLT, normally opened	E Indicator, Common
		F N/C	F Indicator, Position 2
Note: This pin is reserved for oven voltage.			

Chapter 3. OPERATION

This chapter describes the following:

- Status and control
- Modes of operation
- Calibration
- Internal adjustments and switches

Before operating the unit from the front panel, check to ensure that the installation is complete. Check the connections from the waveguide switch indicators (shown in Chapter 1).



NOTE: The unit will not be damaged if the waveguide switch indicator connections are not made. However, the online indicators will be erroneous.

3.1 Status and Control

This section describes the various controls and status indicators for the switch controller. Refer to Figure 3-1, Figure 3-2, and Figure 3-3 for switch and indicator locations.

3.1.1 External Controls and Indicators

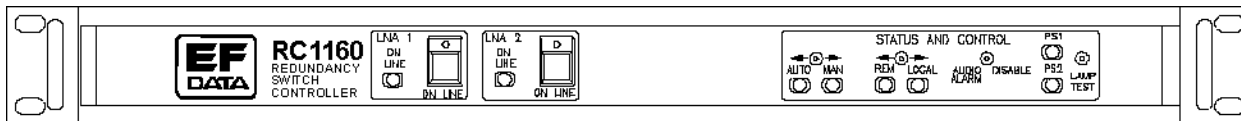


Figure 3-1. RC-1160 Front Panel

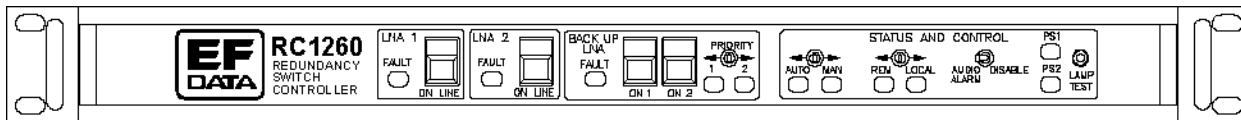


Figure 3-2. RC-1260 Front Panel

Front Panel	
LNA 1 ON LINE	Pressing this momentary switch forces LNA/LNB 1 to be on line.
LNA 2 ON LINE	Pressing this momentary switch forces LNA/LNB 2 to be on line.
AUTO/MANUAL	A center-off, momentary toggle switch. When this switch is placed to either side, it will set the logic to that mode while resetting the other. The present status is indicated by illumination of the appropriate LED.
AUDIO ALARM/DISABLE	If any red fault light should turn ON, the audio alarm will activate to draw attention to the problem. The disable mode will turn OFF the sound. The disable switch position only removes voltage from the alarm. The switch does not reset the fault condition.
REMOTE/LOCAL	Allows operator to select between the front panel controls being active or the remote connector. The present status is indicated by illumination of the appropriate LED. The remote status indicators are present all the time.
LAMP TEST	Push buttons activates all LED indicators.
BACKUP ON 1	Pressing this momentary switch forces the backup LNA/LNB to go on line for LNA/LNB 1. This also places LNA/LNB 2 on line. (See note*)
BACKUP ON 2	Pressing this momentary switch forces the backup LNA/LNB to go on line for LNA/LNB 2 This also places LNA/LNB 1 on line. (See note*)
BACK UP LNA PRIORITY 1/2	Pressing this momentary switch to the left allows the unit to operate with LNA/LNB 1 as priority. (See note*) *Note: Applies to RC-1260 systems only (1:2 systems).

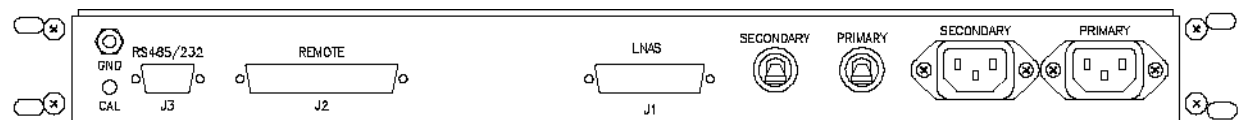


Figure 3-3. Rear Panel, RC-1160 and RC-1260

Rear Panel	
AC POWER A	Toggle switch and 2A circuit breaker. This toggle switch allows the primary power to be turned ON or OFF.
AC POWER B	Toggle switch and 2A circuit breaker. This toggle switch allows the secondary power to be turned ON or OFF.
CALIBRATION	Pressing this push button initiates a calibration on the LNA/LNB current for all LNAs connected.

3.1.2 LED Indicators

LED	Color	Description
LNA 1 FAULT	Red LED	Illuminates with a fault in LNA/LNB 1.
LNA 2 FAULT	Red LED	Illuminates with a fault in LNA/LNB 2.
BACKUP LNA FAULT	Red LED	Illuminates with a fault in backup LNA/LNB. <i>(See note)</i>
LNA 1 ON LINE	Green LED	Illuminates when LNA/LNB 1 is on line.
LNA 2 ON LINE	Green LED	Illuminates when LNA/LNB 2 is on line.
BACKUP ON 1	Green LED	Illuminates when backup LNA/LNB is on Pos 1. <i>(See note)</i>
BACKUP ON 2	Green LED	Illuminates when backup LNA/LNB is on Pos 2. <i>(See note)</i>
AUTO	Green LED	Illuminates when unit is in auto mode.
MANUAL	Amber LED	Illuminates when unit is in manual mode.
PRIORITY 1	Green LED	Illuminates when the unit considers LNA/LNB 1 to be a priority. <i>(See Note)</i>
PRIORITY 2	Green LED	Illuminates when the unit considers LNA/LNB 2 to be a priority. <i>(See note)</i>
REMOTE	Green LED	Illuminates when the unit is in remote mode.
LOCAL	Amber LED	Illuminates when unit is in local mode.
PS1	Green LED	Illuminates when output power of power supply 1 is greater than 14V. Also denotes voltage present at PS1, when using a Wave Guide (WG) DC Switch.
PS2	Green LED	Illuminates when output power of power supply 2 is greater than 14V. Also denotes voltage present at PS2, when using a Wave Guide (WG) DC Switch.
Note: Applies to RC-1260 systems only (1:2 systems).		

3.2 Modes of Operation

3.2.1 RC-1160

The RC-1160 can operate in three different modes:

- Single LNA/LNB
- Dual singles
- 1:1 Redundancy

3.2.2 RC-1260

The RC-1260 can operate as a single, dual single, triple single, 1:1, or 1:2 switch controller. The single and dual modes are covered in Section 3.2.2.1.

3.2.2.1 Single and Dual Mode

The unit remains in the Manual mode at all times for the single or dual modes.

If there is a failure of an LNA/LNB, the respective fault light will illuminate, but no switch over will occur. The RC-1260 performs equally in this mode.

Because there are no indicator contacts from the waveguide switch, the online indicators will not illuminate. For appearance purposes only, the indicator connections could be made in the J1 mating connector to simulate the waveguide switch. Refer to Chapter 1 for more information.

3.2.2.2 1:1 Configuration Mode

In this mode, two LNAs are connected to the same antenna feed through a waveguide switch. Only one of the two LNAs can be connected online. The other LNA/LNB remains on stand-by, although powered at all times.

Either LNA/LNB can be online when the unit is switched from manual to auto mode.

In case of failure of the online LNA/LNB, the switch controller will change the waveguide switch to the opposite position. The controller will then go to manual mode to prevent any future switch backs to the failed unit.

If the stand-by LNA/LNB fails, the switch controller will switch from auto to manual mode.

3.2.2.3 Triple Single Mode

In the triple single mode, the auto/manual switch stays in manual position at all times. This allows the unit to power three independent LNAs.

The redundancy feature of two separate AC power sources combined with two internal power supplies is also an option in this mode.

3.2.2.4 1:1 Redundant Mode

The redundancy feature is a functional mode. However the redundancy feature does not fully utilize all features of the RC-1260.



NOTE: The redundancy feature in the RC-1260 is not recommended.

The requirements are to set the priority switch to the main LNA/LNB. Then, wire the waveguide switch coils and indicator appropriately. The unit behaves like a 1:2 configuration when the non-priority LNA/LNB has failed. The unit then waits for the priority LNA/LNB to fail before the unit switches over and returns to manual mode.

3.2.2.5 1:2 Redundant Mode

In this mode, three LNAs are configured with two LNAs on line and one powered LNA/LNB. However, the LNAs are on stand-by. The operator must select which LNA/LNB has priority, 1 or 2.

If the priority-selected LNA/LNB fails, the backup LNA/LNB will switch the unit on line for that LNA/LNB. The backup LNA/LNB will then change the system to the manual mode.

If the non-priority LNA/LNB fails, the backup LNA/LNB will switch to priority, but the unit will remain in the auto mode.

When the priority LNA/LNB fails, the backup LNA/LNB will leave the non-priority LNA/LNB failed as well. The unit then switches to the backup LNA/LNB and is changed to manual mode. If the backup LNA/LNB should fail while the LNA/LNB is in the backup position, the unit will switch to manual mode.

3.3 Calibration

After the unit is installed and properly cabled, a calibration check must be performed. The calibration push-button is located on the left side of the rear panel.

3.3.1 Calibration Requirement

The calibration of the unit becomes necessary because the controller can operate with LNA/LNB currents from 65 to 600 mA.

During the calibration process, an electronic potentiometer will scale the current reading to the center of the error window. The potentiometer setting is stored in EEPROM and is recalled upon power-up.

Three requirements are necessary to initiate a calibration:

- LNAs intended for service are connected correctly.
- Controller is in local mode.
- Unit is in manual mode.

If the LNA/LNB current deviates from the initial value by approximately $\pm 30\%$, a fault will occur.



NOTE: It is important to calibrate the system only upon initial installation. If the calibration is performed as part of routine maintenance, the upward or downward drift of the current will be constantly adjusted.

3.3.2 Calibration Failure

Upon pressing the calibration push-button, the electronic potentiometer will move up or down to center itself in the error window. Should the LNA/LNB current be ≤ 65 mA or \geq than 600 mA, the circuit will be unable to center itself. The fault LED will be on for the respective LNA/LNB.

3.4 Internal Adjustments and Switches

3.4.1 Power Supply Voltage

This parameter is set at the factory. The output voltage of the power supply can be adjusted from 14.5 to 16.5V. The potentiometer is located next to the green LED by the terminal block at the rear of the power supply.

3.4.2 Current Sensitivity Select (SW1)

SW1 is a sliding switch. Refer to Section 4.5 "Logic Control Assembly". The switch is positioned to "Normal" at the factory. If the LNA/LNB current varies excessively, this switch can be set to "Wide" which opens the error window to approximately 40%.



NOTE: The jumpers terminals JP2, JP3, JP4, and JP5 (refer to Section 4.5, Logic Control Assembly) should be set to pins 2 and 3, if the load currents are ≥ 500 mA.

3.4.3 Normal/Maintenance Switch (SW1)

Toggle switch SW1 (refer to Section 4.2) routes the +15V power directly to the output LNA/LNB fuses. Place this switch in the maintenance position when the system must remain on line while the logic PWB or front panel controls are being replaced.

3.4.4 Selection of EIA-485/232

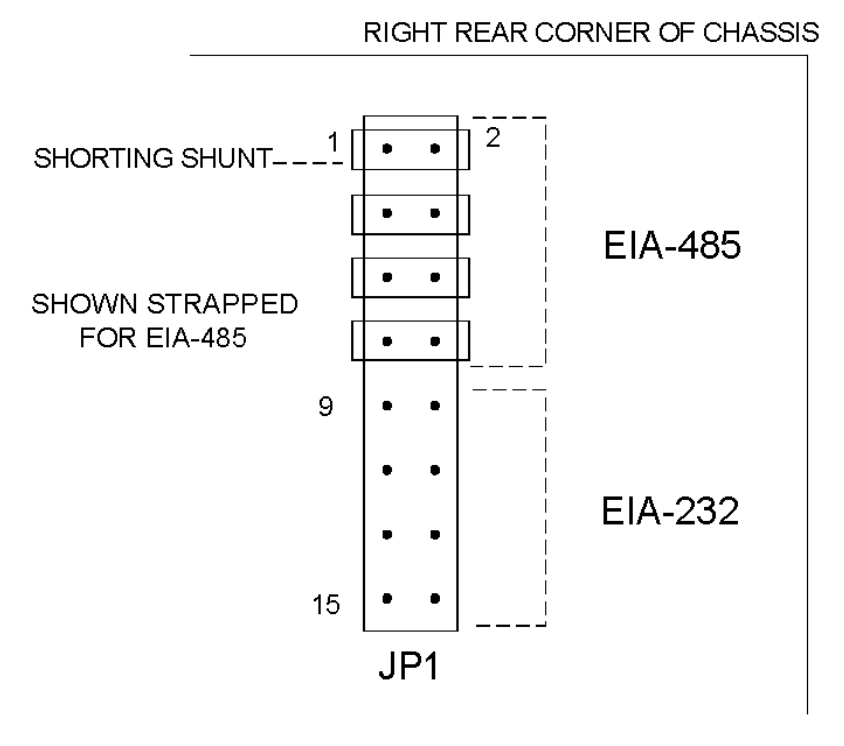


Figure 3-4. Selection of EIA-232/485 Jumpers

EIA-485, jumper terminal JP1 should have four shorting bars between these pins:	EIA-232, jumper terminal JP1 should have four shorting bars between these pins:	Factory Settings
1. First bar between pins 1 and 2	1. First bar between pins 9 and 10	EIA-485
2. Second bar between pins 3 and 4	2. Second bar between pins 11 and 12	9600 baud
3. Third bar between pins 5 and 6	3. Third bar between pins 13 and 14	Even parity
4. Fourth bar between pins 7 and 8	4. Fourth bar between pins 15 and 16	Address 1

Select the desired address and baud rate if it differs (refer to Section A.3).

Chapter 4. MAINTENANCE

This chapter describes maintenance, troubleshooting, and servicing with power ON.

4.1 Maintenance

Under normal conditions, this redundancy system does not require periodic or preventive maintenance.

4.2 Troubleshooting

Most problems, if any, will arise during initial installation. The problems will most often be due to improper cabling. For more information, refer to the waveguide wiring section (Chapter 1).

If the power supply's PS1 or PS2 LEDs do not illuminate with AC power applied, then check the circuit breaker/switch (CB1 and CB2). On the other hand, if the DC waveguide switchboard is installed, check the DC output at test point E-1. If the +14V power does not appear at the LNA/LNB, check the cable wiring.

4.3 Servicing with Power ON



WARNING

110 VAC is applied to the waveguide switch driver PWB pins in maintenance mode.

To perform maintenance with the power ON:

1. Select the appropriate LNA/LNB to be online and remove the lid.
2. Set Normal/Maintenance switch SW1 to "Maintenance" (refer to Section 3.4).
3. The maintenance LED and front panel fault LEDs will light.
4. Disconnect ribbon cables on the board affected.
5. Take care when replacing boards or parts.

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Appendix A. Redundancy Drawings

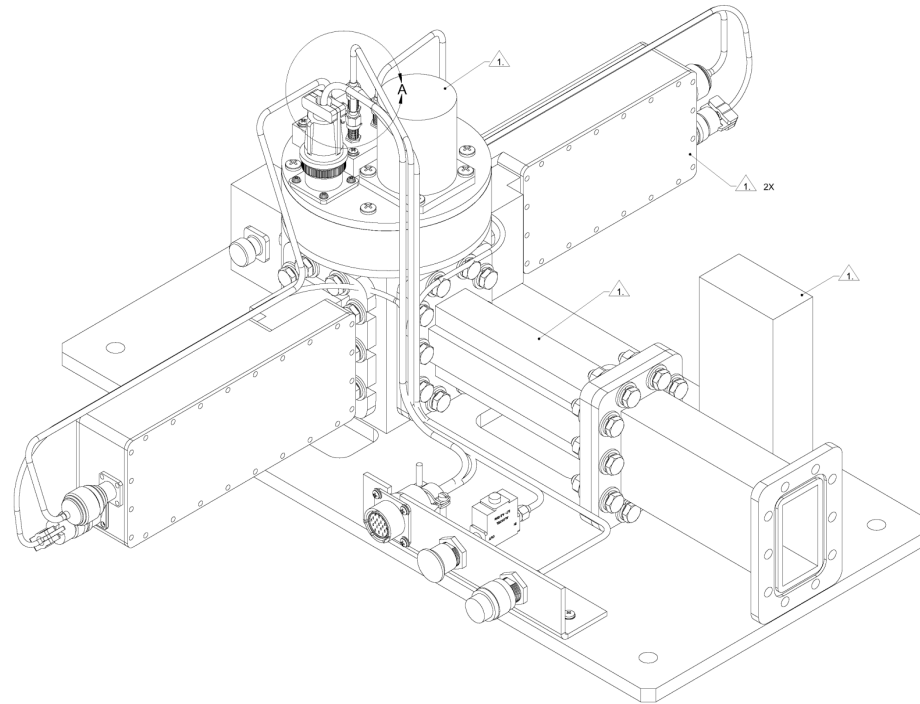


Figure A-1. C-Band LNA 1:1 Redundant System Assembly

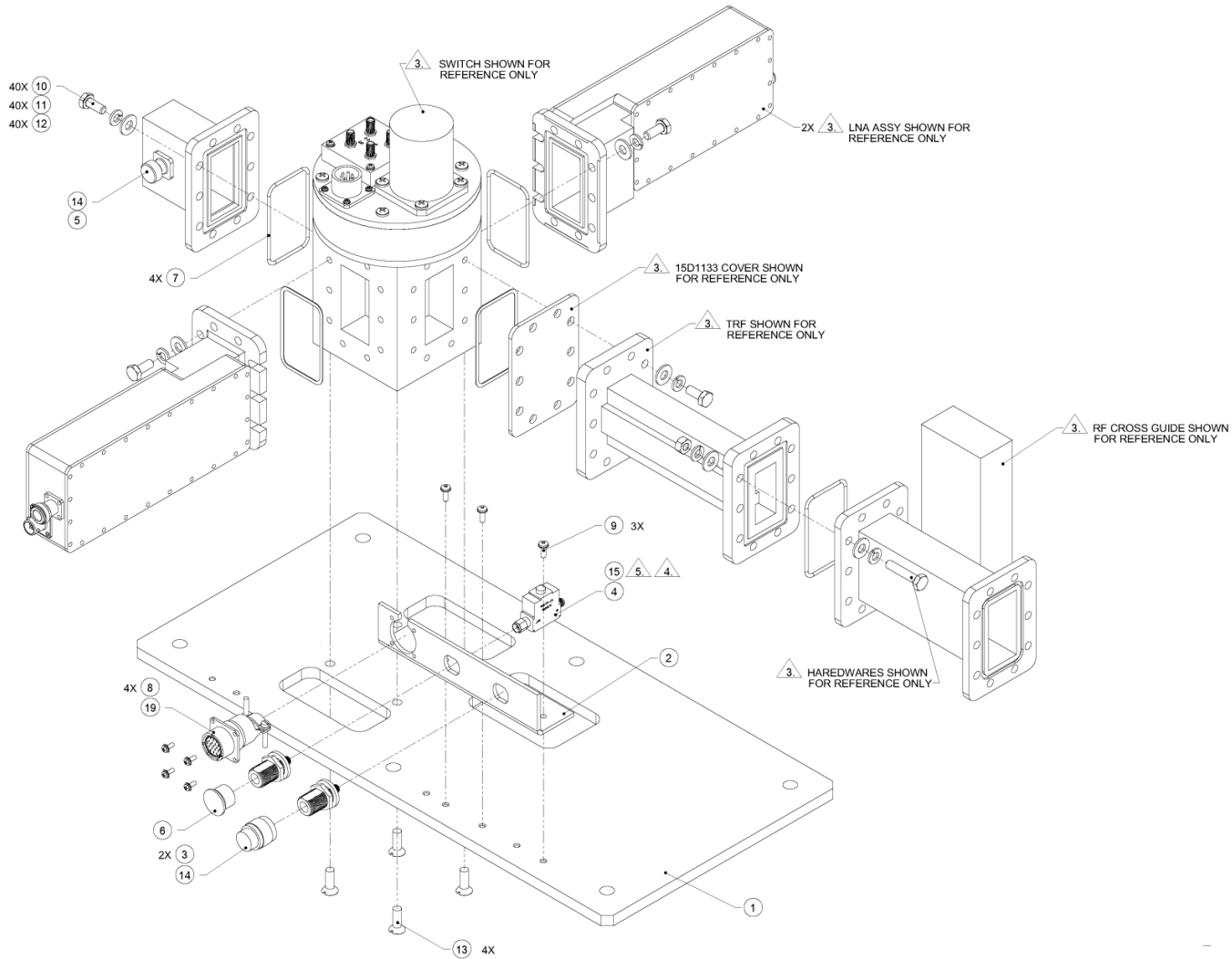


Figure A-2. C-Band LNA 1:1 Redundant System (Exploded View)

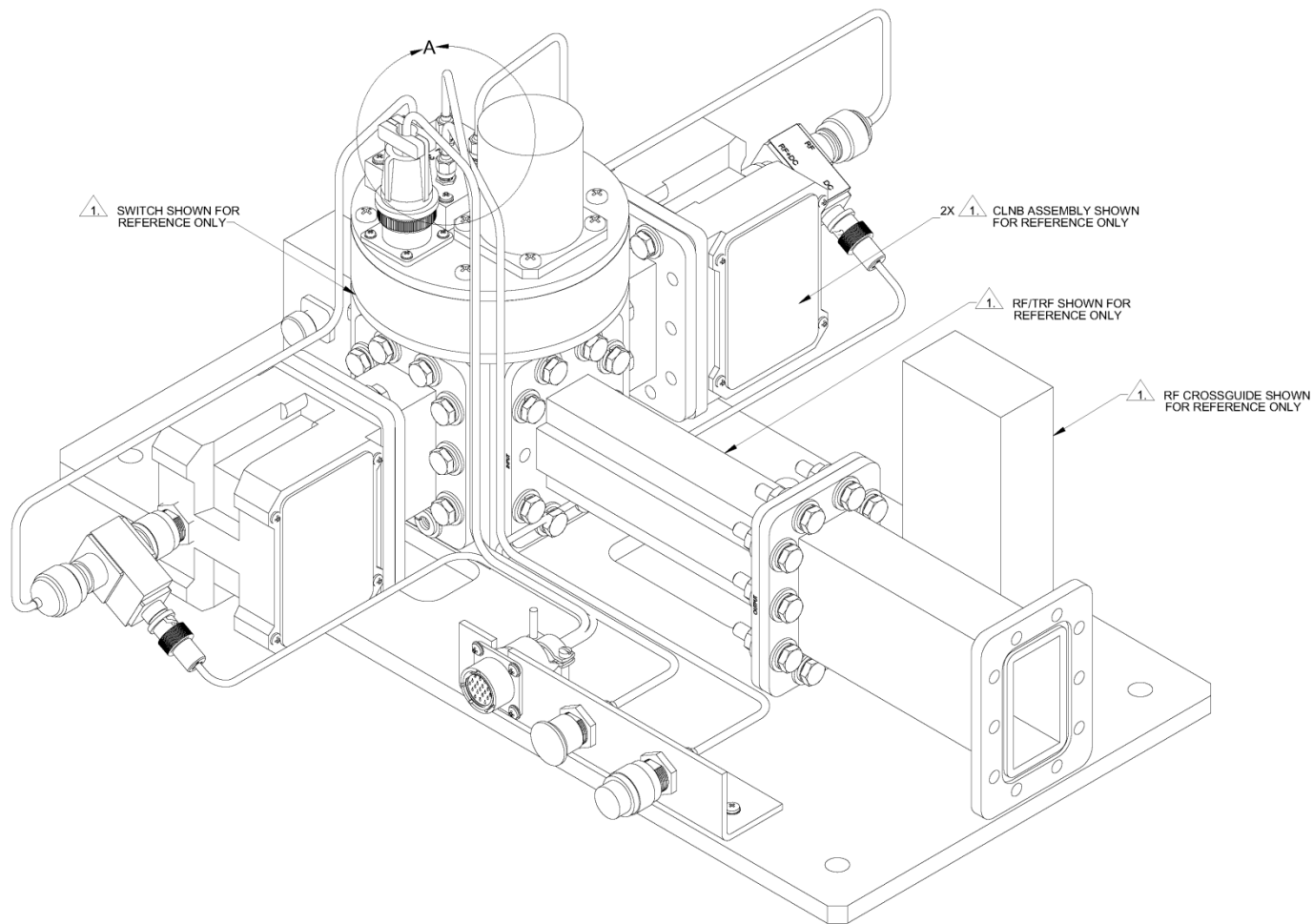


Figure A-3. C-Band LNB 1:1 Redundant System Assembly

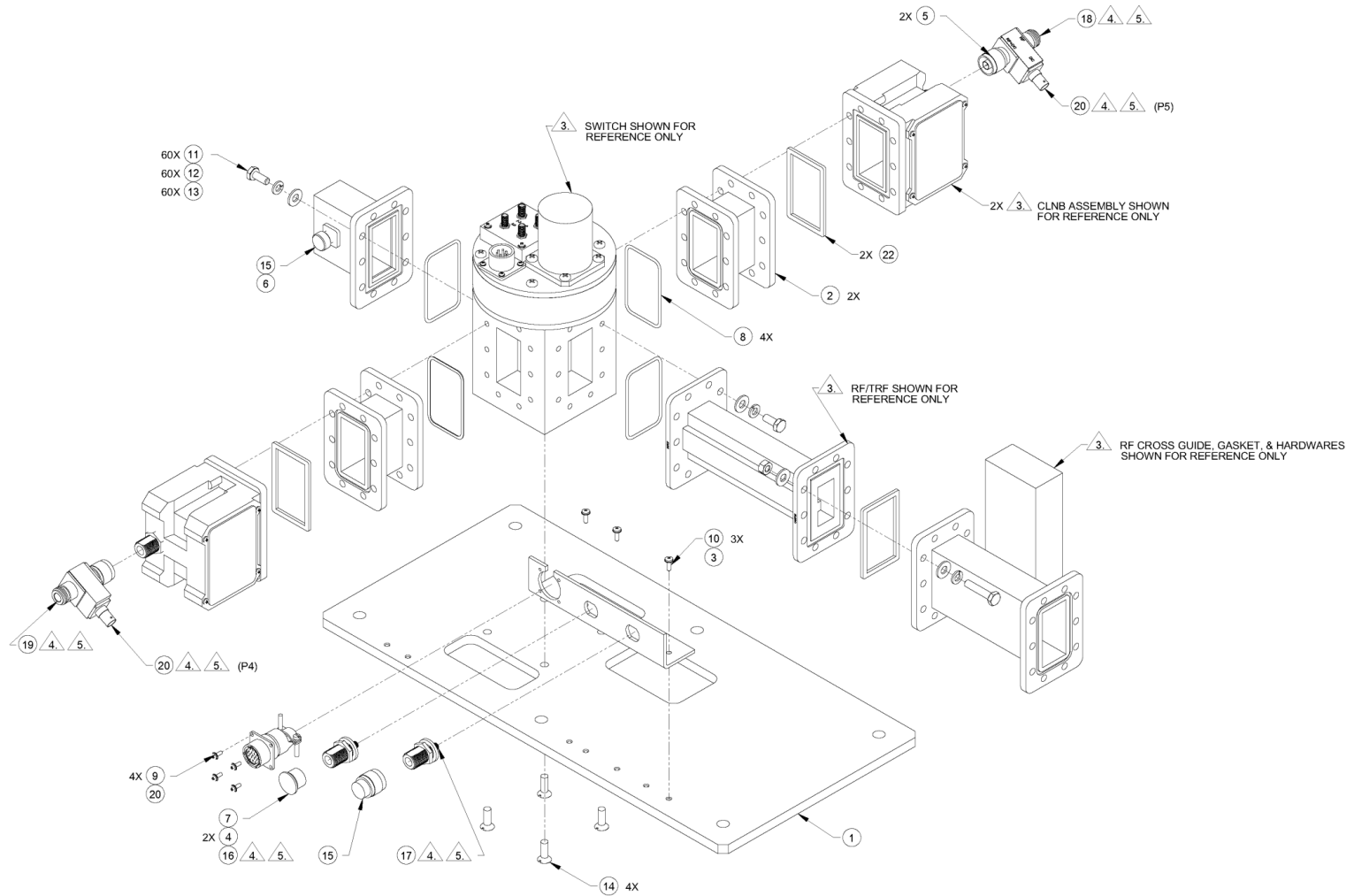


Figure A-4. C-Band LNB 1:1 Redundant System (Exploded View)

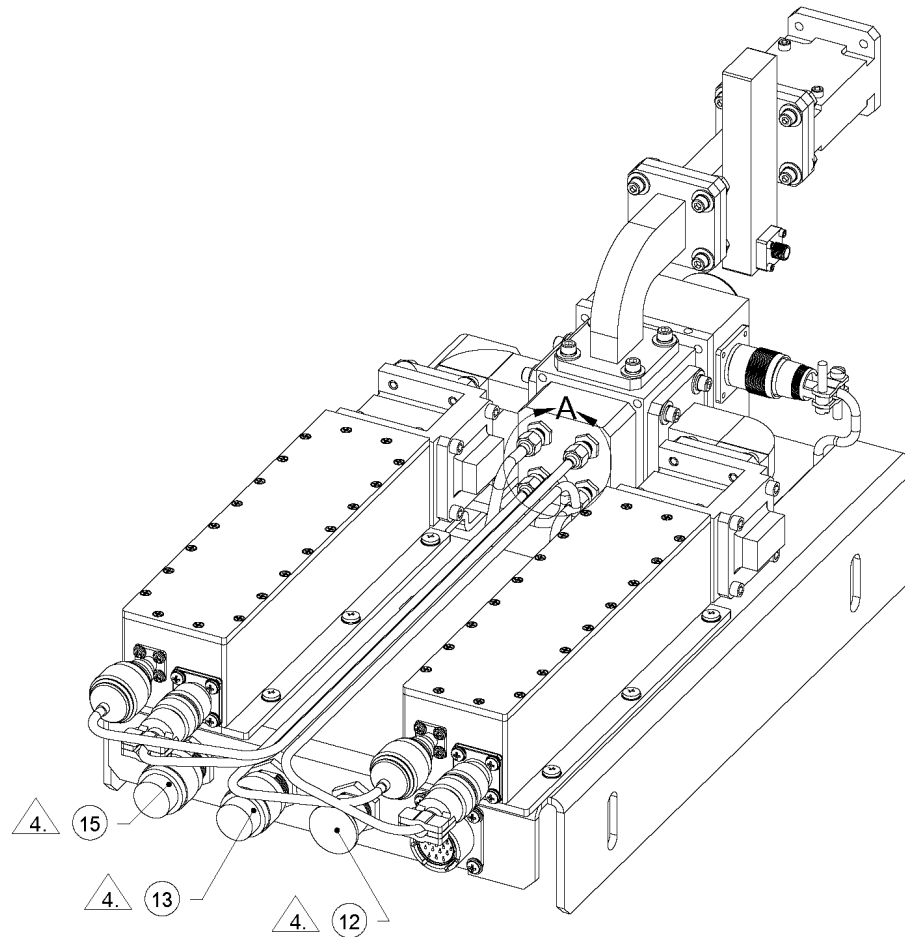


Figure A-5. Ku-Band LNA 1:1 Redundant System Assembly

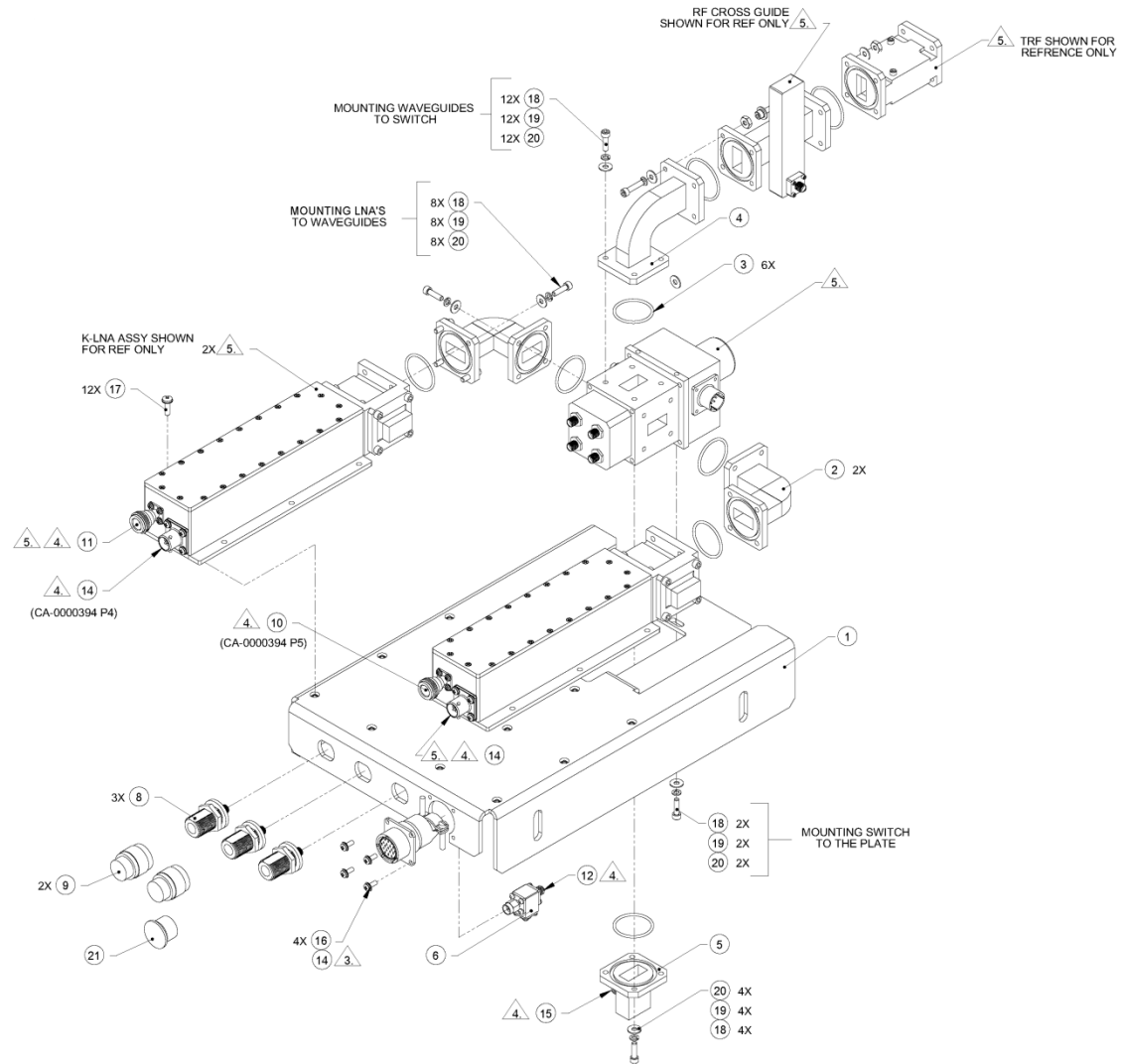


Figure A-6. Ku-Band LNA 1:1 Redundant System (Exploded View)

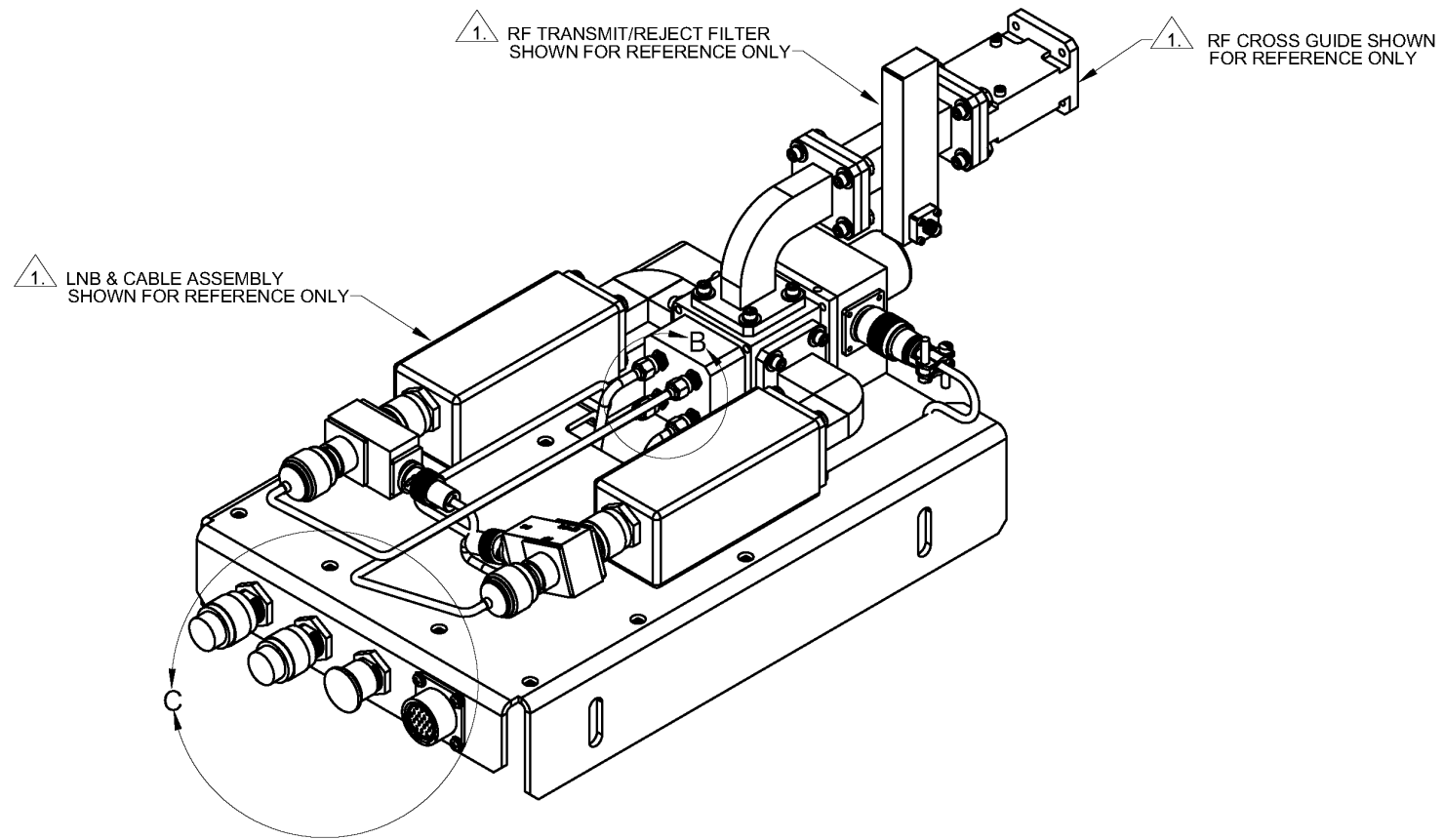


Figure A-7. Ku-Band LNB 1:1 Redundant System Assembly

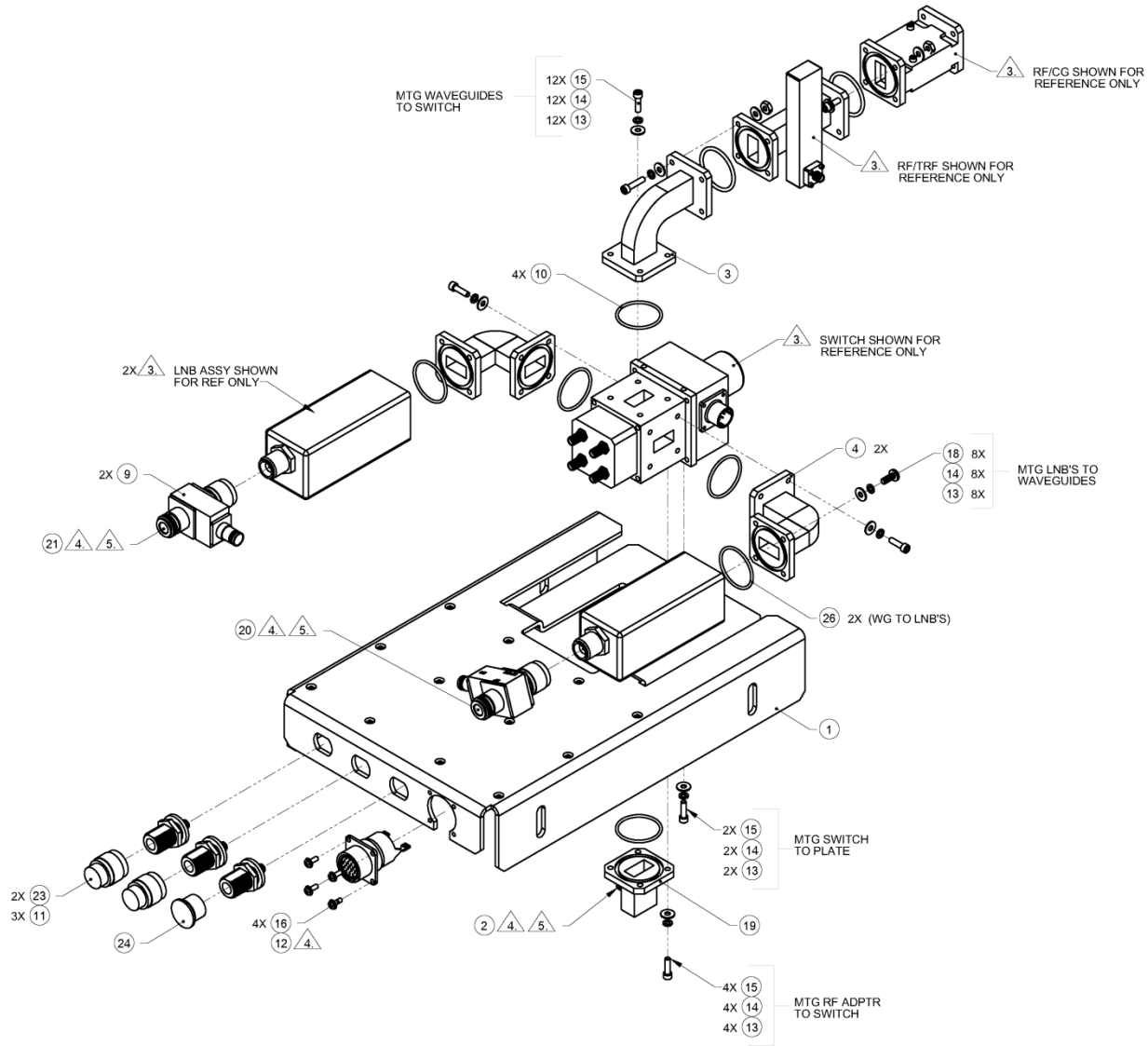


Figure A-8. Ku-Band LNB 1:1 Redundant System (Exploded View)

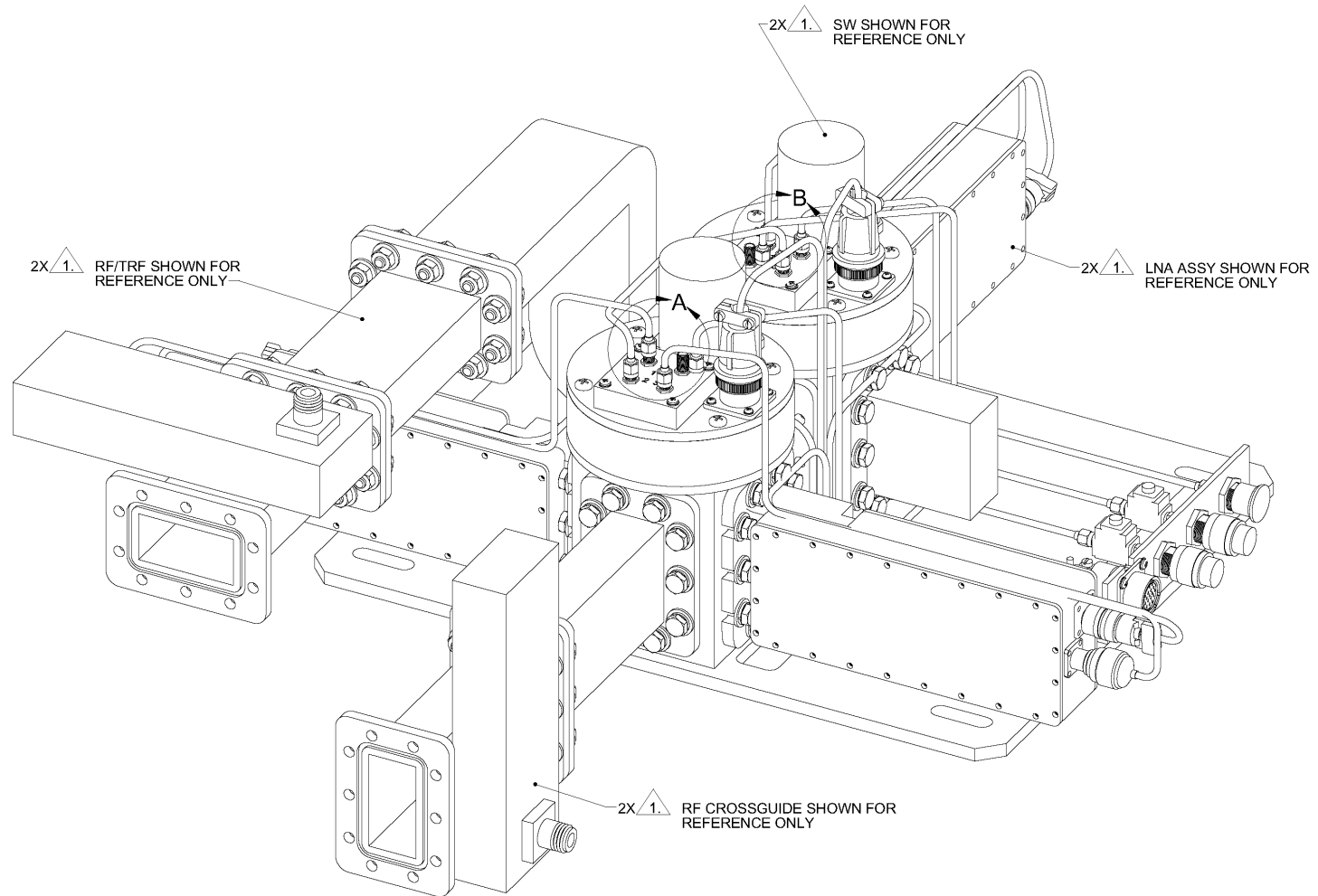


Figure A-9. C-Band LNA 1:2 Redundant System Assembly

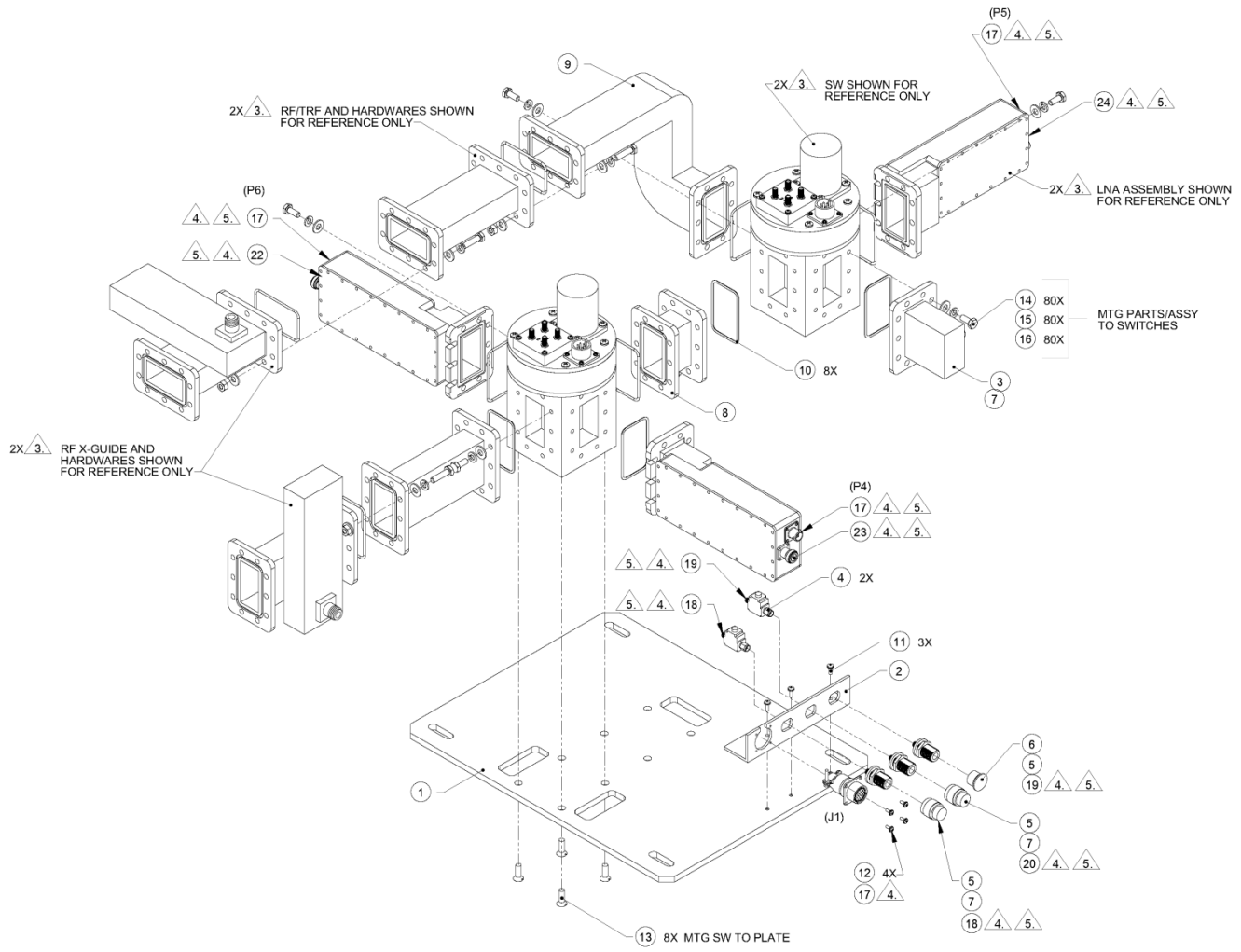


Figure A-10. C-Band LNA 1:2 Redundant System (Exploded View)

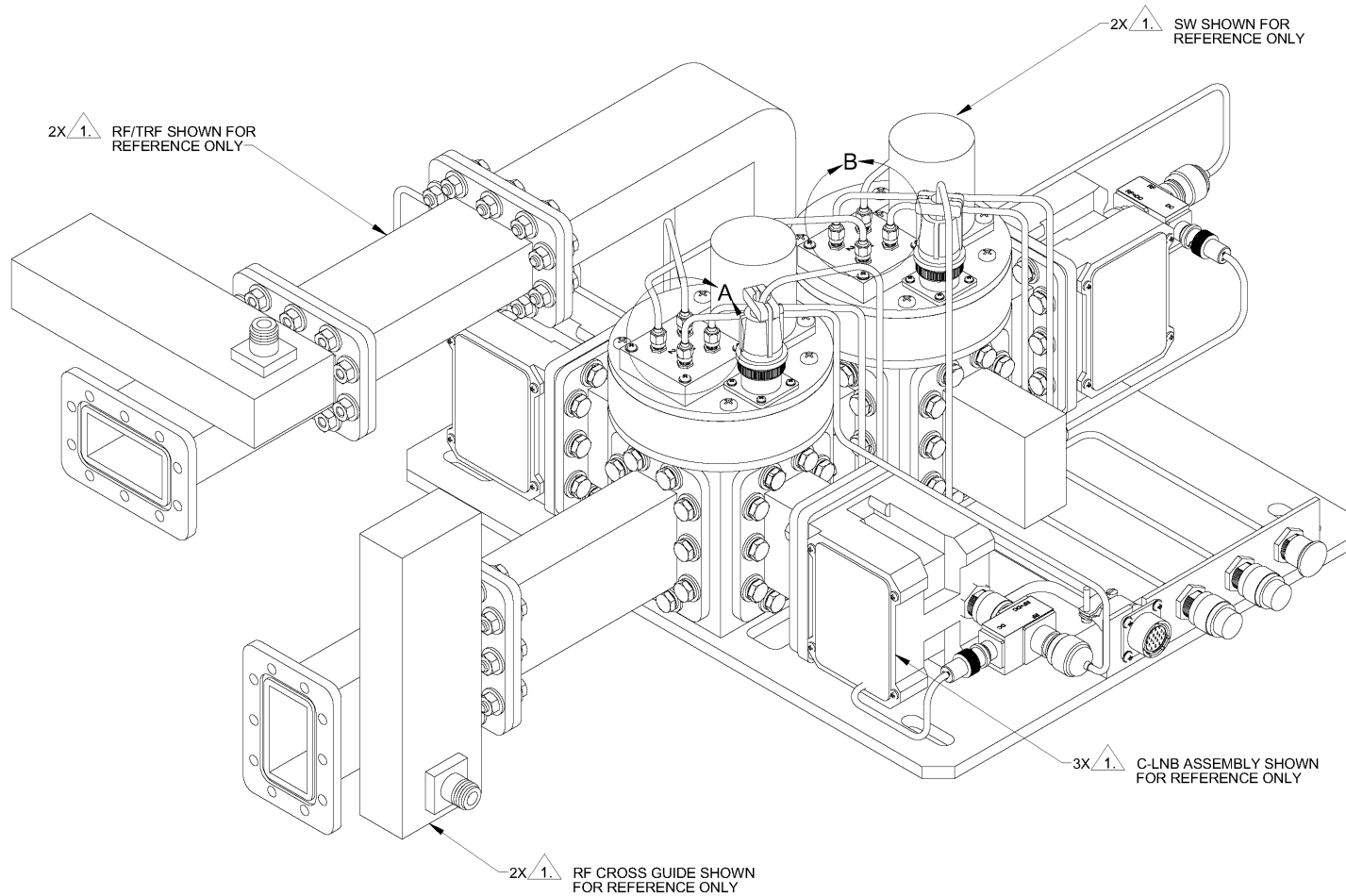


Figure A-11. C-Band LNB 1:2 Redundant System Assembly

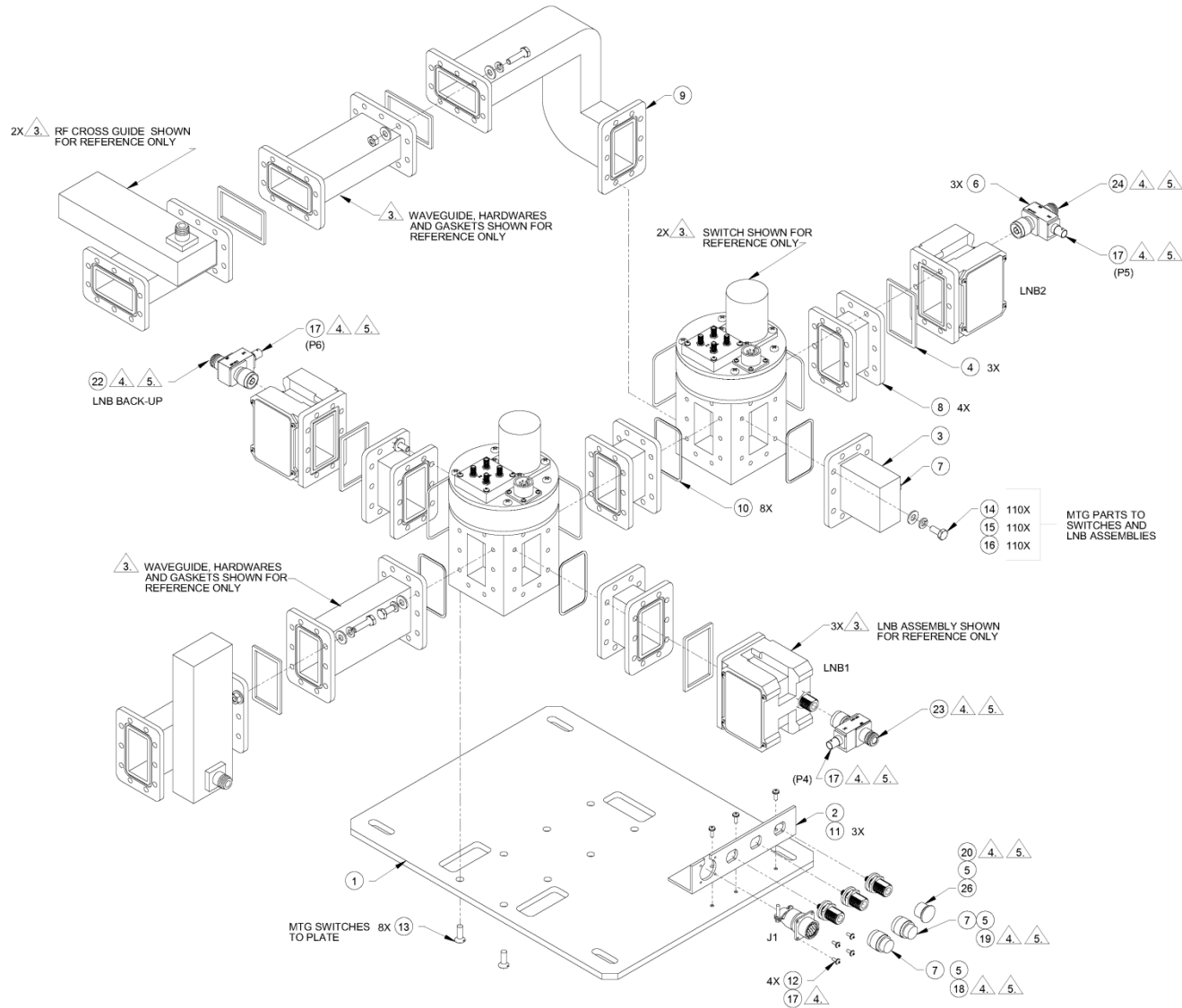


Figure A-12. C-Band LNB 1:2 Redundant System (Exploded View)

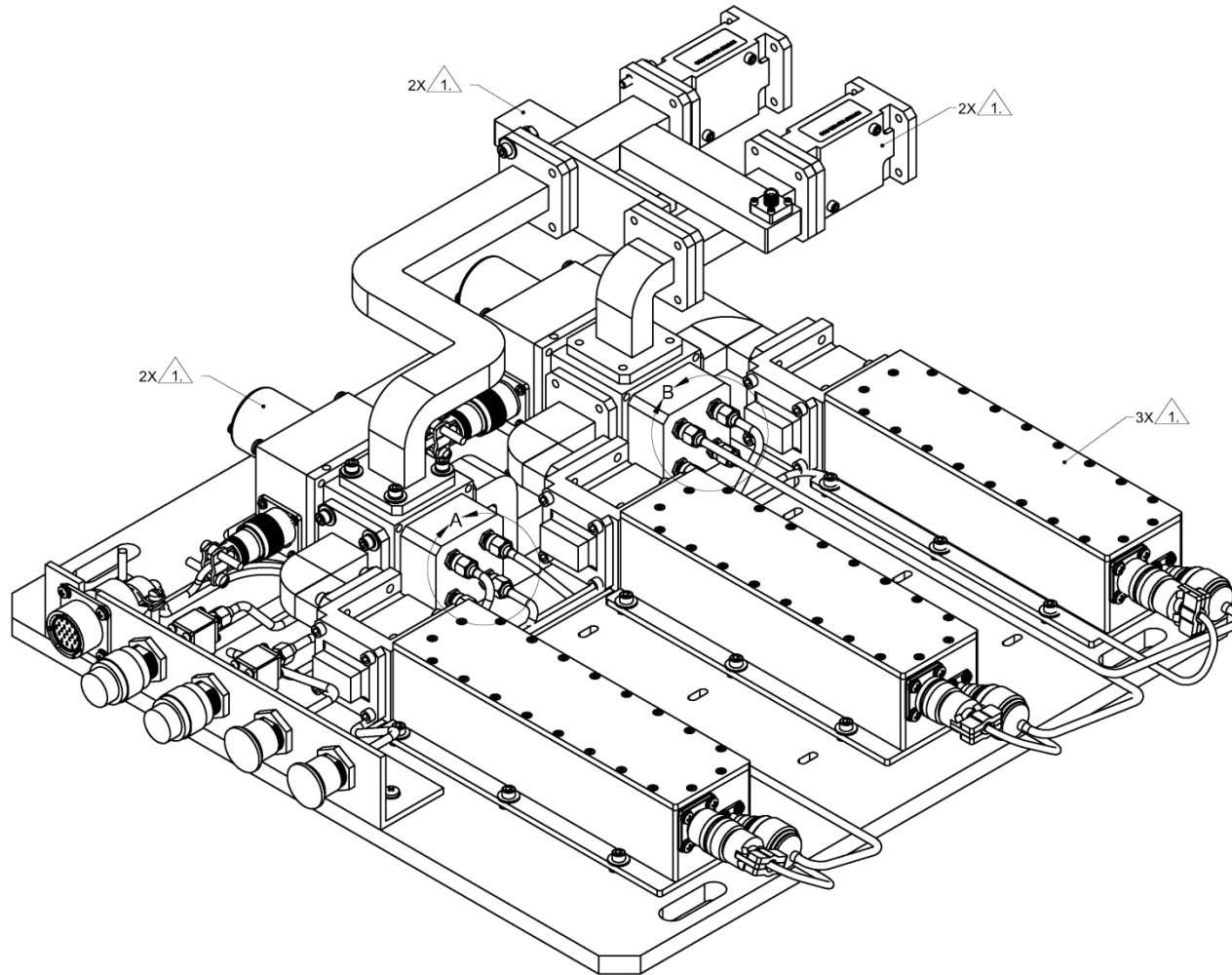


Figure A-13. Ku-Band LNA 1:2 Redundant System Assembly

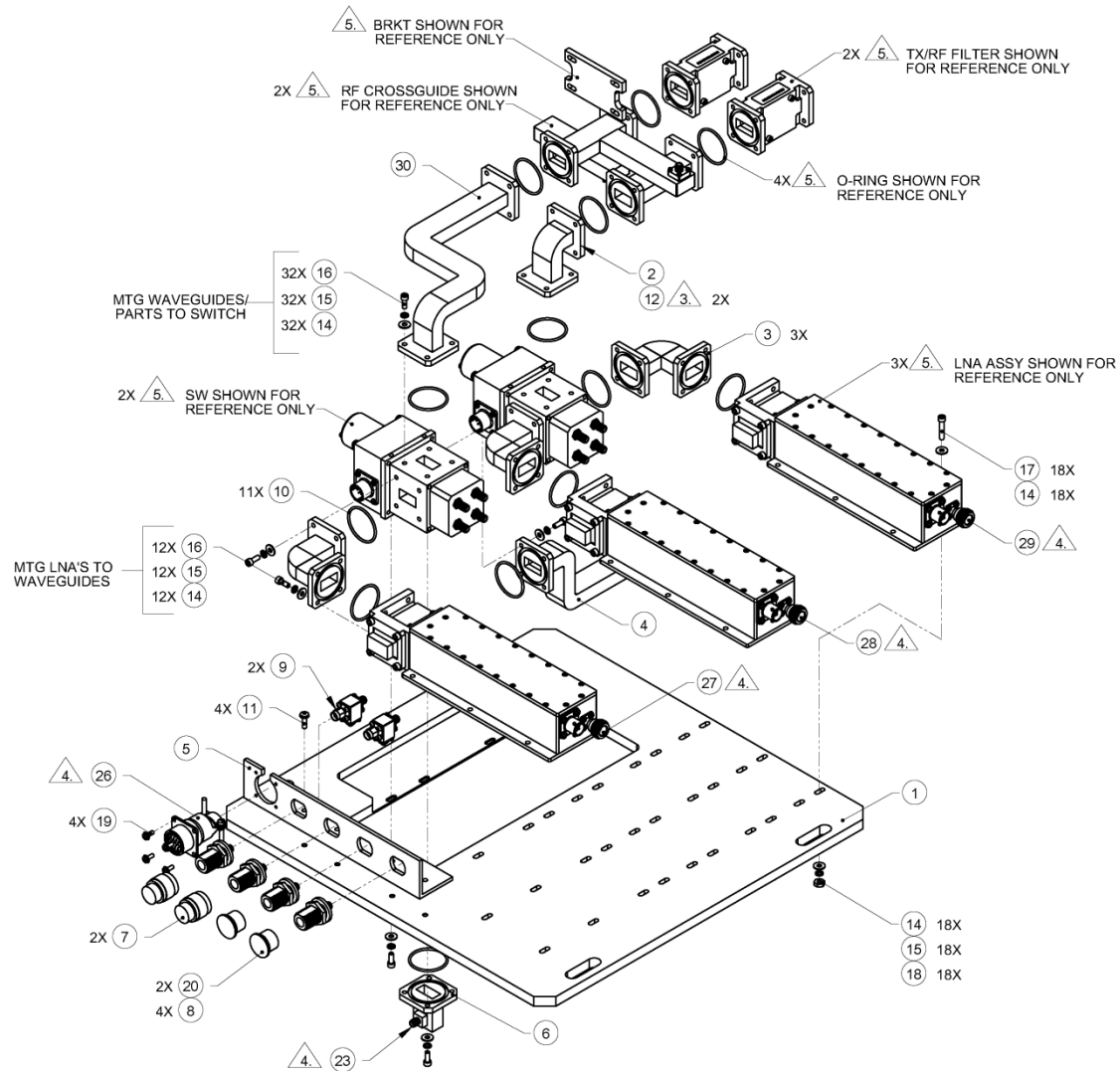


Figure A-14. Ku-Band LNA 1:2 Redundant System (Exploded View)

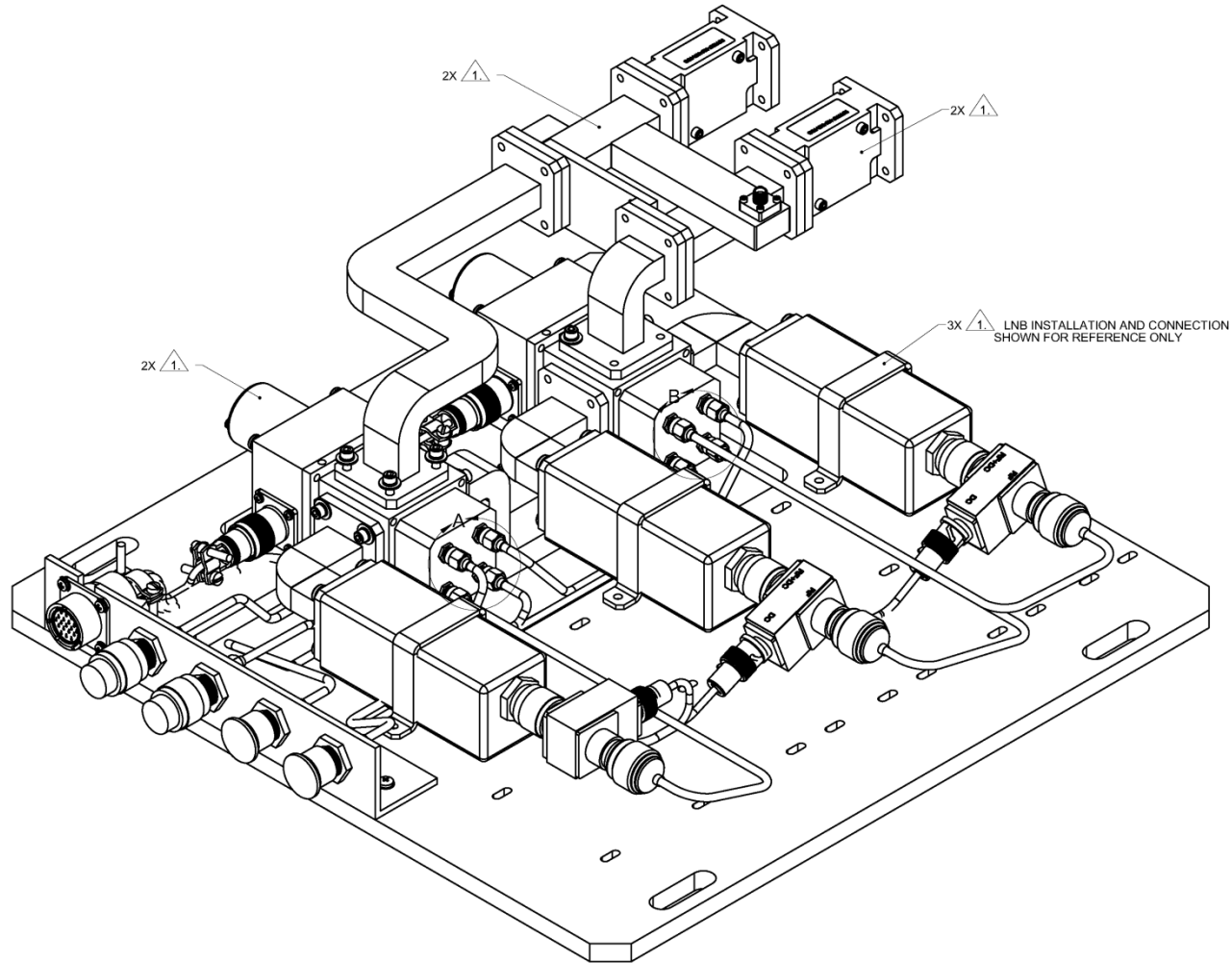


Figure A-15. Ku-Band LNB 1:2 Redundant System Assembly

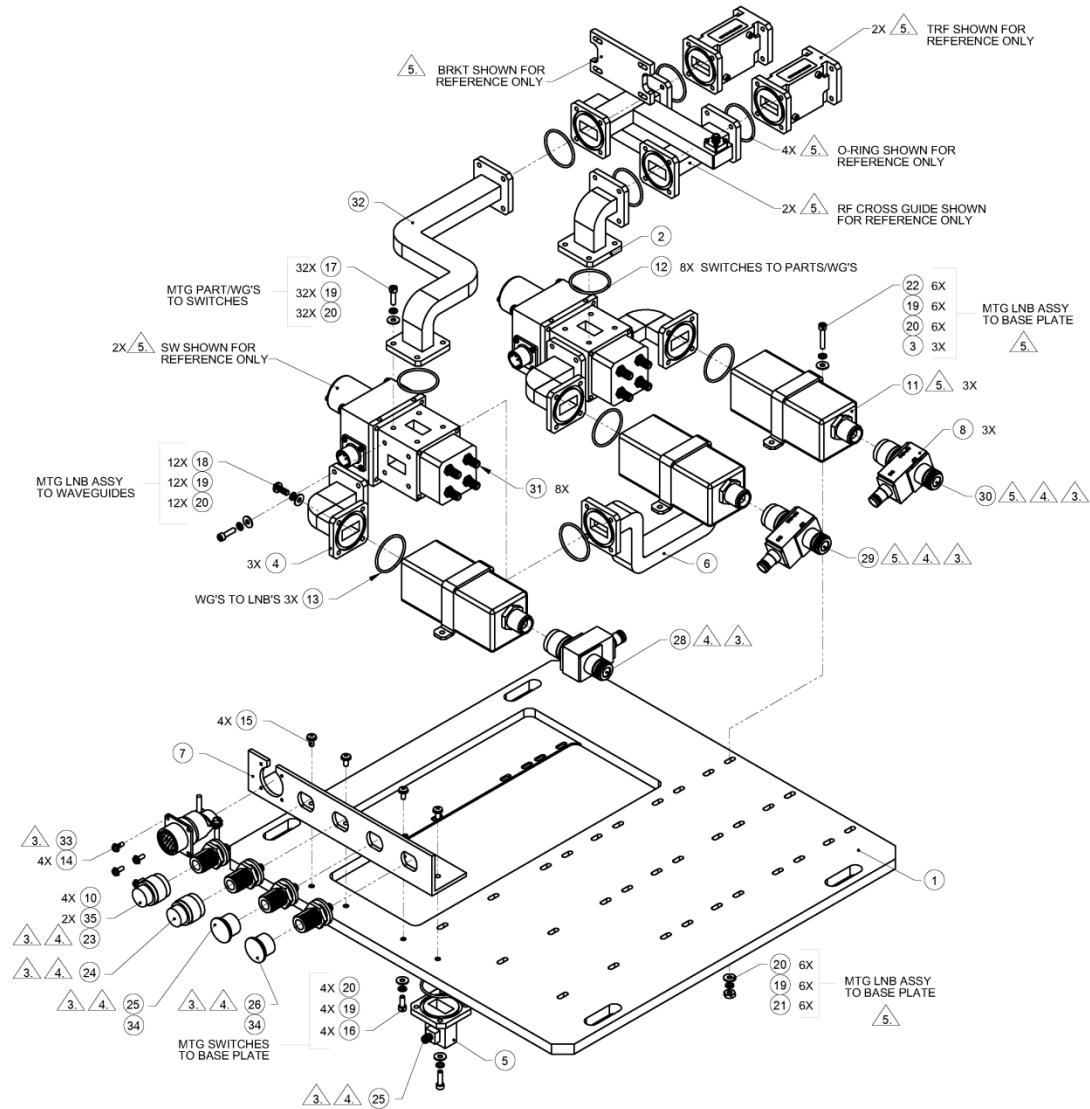


Figure A-16. Ku-Band LNB 1:2 Redundant System (Exploded View)

Appendix B. Remote Control

This document defines the protocol and command structure for remote control and status monitoring of the RC-1160/-1260 Redundant Switch Controller.

- Firmware number: FW/3634-1
- Software version: 1.00

B.1 General

Remote controls and status information are transferred via an EIA-485 (optional EIA-232) serial communications link.

Commands and data are transferred on the remote control communications link as US ASCII-encoded character strings.

The remote communications link is operated in a half-duplex mode.

Communications on the remote link are initiated by a remote controller or terminal. The RC-1160/-1260 never transmits data on the link unless it is commanded to do so.

B.2 Message Structure

The ASCII character format used requires 11 bits/character:

- 1 start bit
- 7 information bits
- 1 parity bit
- 2 stop bits

Messages on the remote link fall into the categories of commands and responses.

Commands are messages which are transmitted to the RC-1160/-1260, while responses are messages returned by the RC-1160/-1260 in response to a command.

The general message structure is as follows:

- Start Character
- Device Address
- Command/Response
- End of Message Character

B.2.1 Start Character

A single character precedes all messages transmitted on the communications link. This character flags the start of a message. This character is:

- “<” for commands
- “>” for responses

B.2.2 Device Address

The device address is the address of the RC-1160/-1260 which is designated to receive a transmitted command, or which is responding to a command.

Valid device addresses are 1 to 3 characters long, and in the range of 1 to 255. Address 0 is reserved as a global address which simultaneously addresses all devices on a given communications link. Devices do not acknowledge global commands.

Each RC-1160/-1260 which is connected to a common remote communications link must be assigned its own unique address. Addresses are software selectable at the RC-1160/1260, and must be in the range of 1 to 255.

B.2.3 Command/Response

The command/response portion of the message contains a variable-length character sequence which conveys command and response data.

If an RC-1160/-1260 receives a message addressed to it which does not match the established protocol or cannot be implemented, a negative acknowledgment message is sent in response. This message is:

- **>add/?ER1_PARITY ERROR'cr"lf]**
(error message for parity errors)
- **>add/?ER2_INVALID PARAMETER'cr"lf]**
(error message for a recognized command which can not be implemented or has parameters which are out of range)
 - **>add/?ER3_UNRECOGNIZABLE COMMAND'cr"lf]**
(error message for unrecognizable command or bad command syntax)
 - **>add/?ER4_CONTROLLER IN LOCAL MODE'cr"lf]**
(RC-1160/-1260 in local mode, use the CM command to go to remote mode)
 - **>add/?ER5_CONTROLLER IN AUTO MODE'cr"lf]**
(RC-1160/-1260 in auto mode, use the OM command to go to manual mode)

Note: “add” is used to indicate a valid 1 to 3 character device address in the range between 1 and 255.

B.2.4 End Character

Each message is ended with a single character which signals the end of the message:

- “cr” Carriage return character for commands
- “]” End bracket for responses

B.2.5 Example Command (Unit in default State)

To query the operating mode of the unit.

<1/OM_{cr} Proper response >1/OM_M

B.3 Configuration Commands/Responses

Operating Mode	Command: Response: Status: Response:	<add/OM_x'cr' >add/OM_x'cr"lf] <add/OM_'cr' >add/OM_x'cr"lf]	Where: x = M (MANUAL) or A (AUTO). This command places the controller in either MANUAL or AUTO mode.
Disable Auto Shutdown	Command: Response: Status: Response:	<add/DS_x'cr' >add/DS_x'cr"lf] <add/DS_'cr' >add/DS_x'cr"lf]	Where: x = N (NO) or Y (YES). This command is used to control whether the RC-1260 automatically switches from AUTO mode to MANUAL mode on the occurrence of a fault on the priority channel. The default state is 'Disable Shutdown' equal NO (N) meaning that a switchover from AUTO to MANUAL will occur. However, this action can be overriding by setting 'Disable Shutdown' equal to YES (Y).
Config. Control Mode	Command: Response: Status: Response:	<add/CM_x'cr' >add/CM_x'cr"lf] <add/CM_'cr' >add/CM_x'cr"lf]	Where: x = L (LOCAL) or R (REMOTE). This command places the controller in LOCAL or REMOTE configuration.
LNA/LNB On-line Command	Command: Response: Status: Response:	<add/LA_x'cr' >add/LA_x'cr"lf] <add/LA_'cr' >add/LA_x'cr"lf]	Where: x = 1 (LNA/LNB 1) or 2 (LNA/LNB 2). x = 1, 2, B (Both) or A (Abnormal) This command places the specified LNA/LNB on line. Note: A (Abnormal) indicates that the state of the online indicators from the wave guide switch currently does not reflect a valid operating state.
Back-up LNA/LNB Command (1:2 system only)	Command: Response: Status: Response:	<add/BU_x'cr' >add/BU_x'cr"lf] <add/BU_'cr' >add/BU_x'cr"lf]	Where: x = 1 (backup LNA/LNB 1) or 2 (backup LNA/LNB 2). x = 1, 2, N (Neither) or A (Abnormal). This command places the back-up LNA/LNB on-line to either LNA/LNB 1 or 2. Note: A (Abnormal) indicates that the state of the online indicators from the wave guide switch currently does not reflect a valid operating state.
Priority 1 or 2 Switch (1:2 system only)	Command: Response: Status: Response:	<add/PR_x'cr' >add/PR_x'cr"lf] <add/PR_'cr' >add/PR_x'cr"lf]	Where: x = 1 (LNA/LNB 1) or 2 (LNA/LNB 2). This command selects which LNA/LNB has back-up priority in a 1:2 system.
Address Select	Command: Response: Status: Response:	<add/AS_xxx'cr' >add/AS_xxx'cr"lf] <add/AS_'cr' >add/AS_xxx'cr"lf]	Where: add = current address. xxx = new address, 1 to 255 (Default address = 1).
Baud Rate Select	Command: Response: Status: Response:	<add/BR_xxxx'cr' >add/BR_xxxx'cr"lf] <add/BR_'cr' >add/BR_xxxx'cr"lf]	Where: xxxx = 110 to 9600 (In standard settings of 110, 150, 300, 600, 1200, 2400, 4 800, 9 600) (Default = 9600).

Appendix C. Theory of Operation

C.1 Controller AC Power Supplies

The system is powered by primary and secondary 90 to 240 VAC applied at the rear of the controller unit.

Within the controller unit, both the AC HOT and RTN are interrupted by rear panel circuit breakers/switches.

The AC power supplies, of the international series, operate with input voltages between 90 and 240 VAC.

The unit contains a built-in EMI failure system approved by the FCC and VDE for class B operation and approved for safety by UL, CSA, IEC, and VDE.

The output is derived by high efficiency 125 kHz switching techniques utilizing surface mount technology. Each supply contains a green LED indicating output voltage is present, and a potentiometer for adjusting the output between 13V and 16V.

C.2 Power/Maintenance Board

The power/maintenance board (refer to Figure C-1) receives primary and secondary AC power on J4 and J5 pins. This board then routes the primary and secondary AC power to the power supply connectors J6 and J7.

Connectors J4 and J5 are also routed to the waveguide switch PWB on header P9.

The DC power from the power supplies enters on J6 and J7 and is ORed together by CR1 and CR2. The DC power is then routed to the logic control PWB through header P8.

The DC power is also routed to the maintenance switch, SW1. In maintenance mode, the DC power would be switched directly to the LNA/LNB outputs on J1.

Commands to position the waveguide switch enter on header P9. The commands are then routed directly to the LNA/LNB output connector J1.

Position indicator information from the waveguide switch enters on the LNA/LNB connector J1. The information is then routed to the logic control PWB through header P8.

The common connection to the indicator sensors is tied to ground on pin 17 of J1. This feature makes the active indicator signal a logic zero. The inactive signals (floating lines) are pulled up to +5 VDC through pull-up resistors on the logic control PWB.

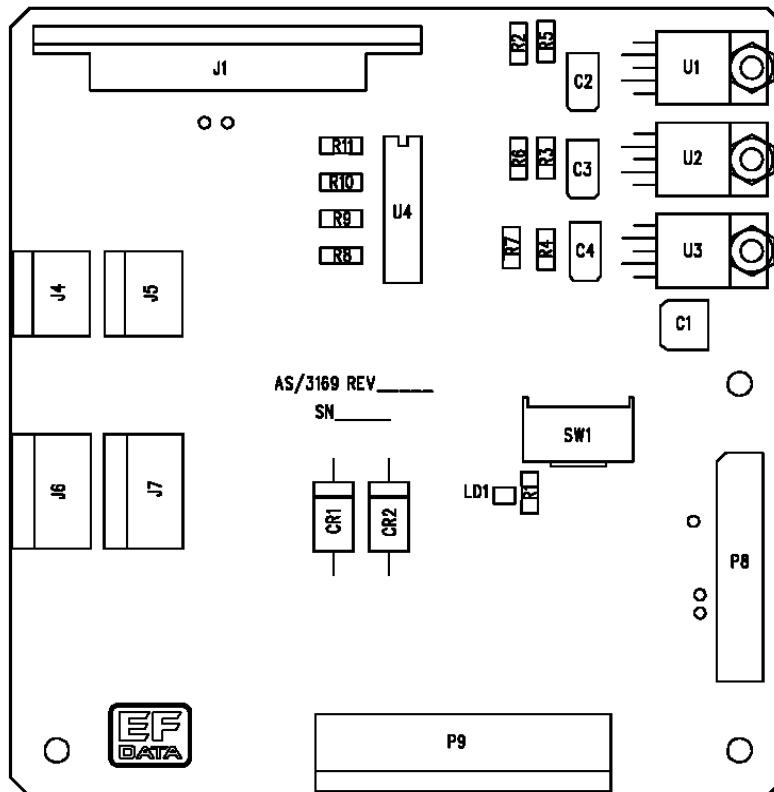


Figure C-1. Power/Maintenance Board

C.3 Waveguide Switch Driver

The AC waveguide switch assembly (PL/6208), converts the CMOS pulses that enter on header P11 from the logic control PWB. The pulses range from 90 to 240 VAC. The pulses go through IC modules U1 through U5.

- Modules U2 through U5 will automatically activate, depending on the requested configuration.
- Module U1, the AC power return, is triggered on all commands.

The modules contain opto-isolators, zero voltage cross-over detectors, and triac output drivers with snubbers to ensure noise-free switch-over.

Relay K1, in a de-energized state, switches primary AC to the waveguide modules through resistor R1.

The logic control board will energize K1 when there is a loss of the primary +15 VDC. In case a waveguide switch command is accidentally tied to ground externally, resistor R1 will limit the current, preventing damage to modules U1 to U5.

The DC waveguide switch board (PL/6209), uses two AC/DC power supplies (PS1 and PS2). Primary and secondary power sources facilitate both units. PS1 and PS2 outputs are selected at either 28 or 48 volts by slide switch "S1"; they are then "or'd" together through diode CR5.

The pulse switching modules U1 through U8 act together to create the DC pulse on one of the four outputs. The two DC voltages are also divided down with resistors R2 and R3 and sent to the logic control board for monitoring.

C.4 Front Panel Display

The front panel display receives the logic low active signal from the logic control board and illuminates the appropriate LED. When the unit is in local mode, connector P16, pin1 will be at logic zero, which enables the Lamp test and other momentary command switches. All front panel switches are enabled.

The local/remote switch, S6, is tied to ground, at all times, to retain the ability to switch to local control.

For RC-1160 only: Jumper JP1 ties to ground only, which is sampled by the microprocessor on power-up. This function allows the controller to configure for a 1:1 redundancy.

C.5 Logic Control Assembly

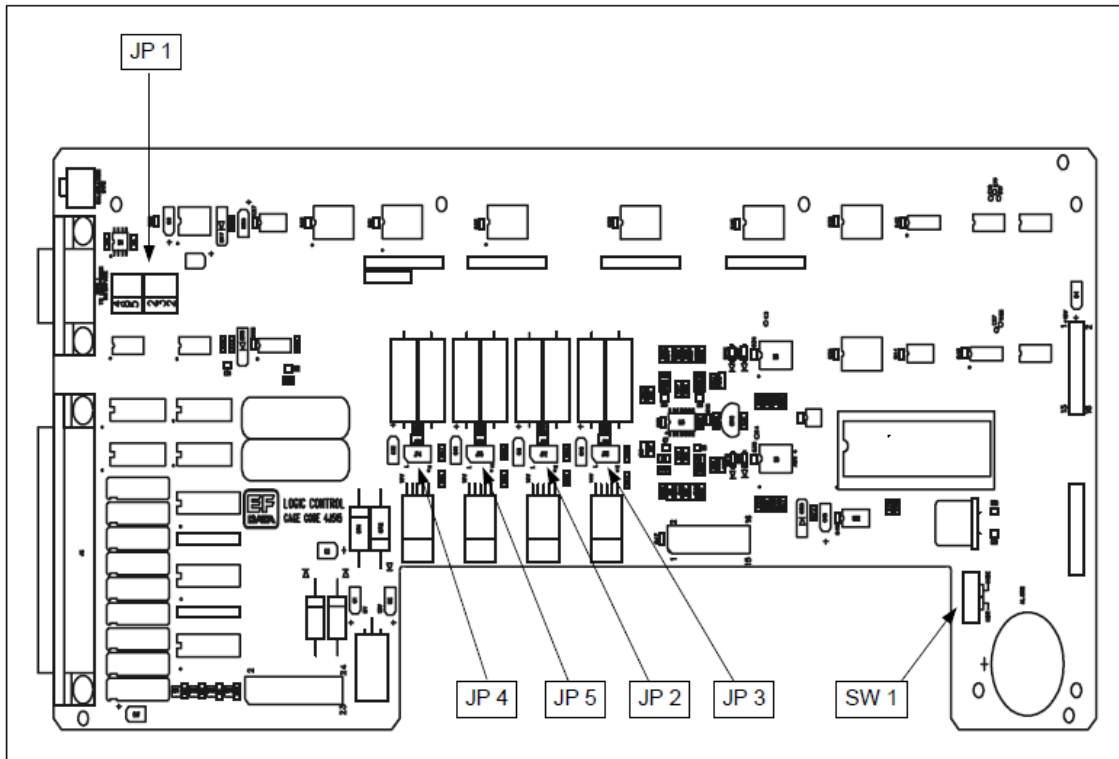


Figure C-2. Logic Control Board Assembly

The Logic Control Assembly (Figure C-2) creates the necessary voltages to allow the system to operate properly. Voltages include:

- •+13V for all LEDs and relays
- •+5V for the CMOS/TTL logic
- •11V for the EIA-232 serial interface

Analog/Digital (A/D) converters U8 and U9 monitor the input voltages directly from the power supplies. The A/D converters produce a fault if either voltage drops below 13V.

Microcontroller U16, 87C51 cycles in one of two repetitive loops, depending on whether the unit is in auto or manual mode. The microcontroller constantly monitors the required inputs.

- In Manual mode, the switch command inputs are observed.
- In Auto mode, the faults are observed, analyzed, and the necessary configuration changes are implemented.

If the microcontroller jumps out of one of the designated loops and hangs up, the watch dog timer will time-out in approximately 5 seconds. The watch dog timer will then reset the microcontroller, thus re-initializing the unit. This initialization is identical to the power up which places the unit in the last configuration it was in before power was turned Off.

The microcontroller monitors the LNA/LNB voltage from the AC/DC power supply, and the wave guide switch DC voltage (DC systems only), from the wave guide switch power output. If either voltage is missing or too low, the corresponding PS1 or PS2 front panel LED will be turned Off.

Bus driver chip U22 buffers the microprocessor outputs to the waveguide switch driver PWB. The bus driver chip supplies the necessary current to activate the opto-isolator switches. Time constant C18 and R73 form a power-up delay holding U22 outputs in a tri-state position. This action prevents indeterminate states of the microprocessor from pulsing the waveguide switch commands until after the switch controller is initialized.

Lamp test is initiated from the front panel in the Local mode by depressing the push-button, supplying a ground to the logic board on P14 pin-2. This pulls the diode clamp line low on pin-9 of U15, U19, and U20. the output relays are activated directly from the microprocessor through the drivers U17 and U18 to the relay coils. The inductive spikes produced by the de-energizing of the coils is forward conducted from their pin-9's to the +13V supply.

C.6 Analog Current Sense

All three LNA/LNB current-sensing circuits are identical. Only LNA/LNB 1 will be discussed.

Differential amplifier U14A measures and amplifies the voltage across the 1 Ω resistor, R61.

Refer to Figure C-2 for a plot of the voltage at the output of U14A versus LNA/LNB current from 90 to 300 mA. Load currents ≥ 500 mA require setting a jumper shunt across JP2 pins 2 and 3, thus reducing the sense resistor to 0.25 Ω .

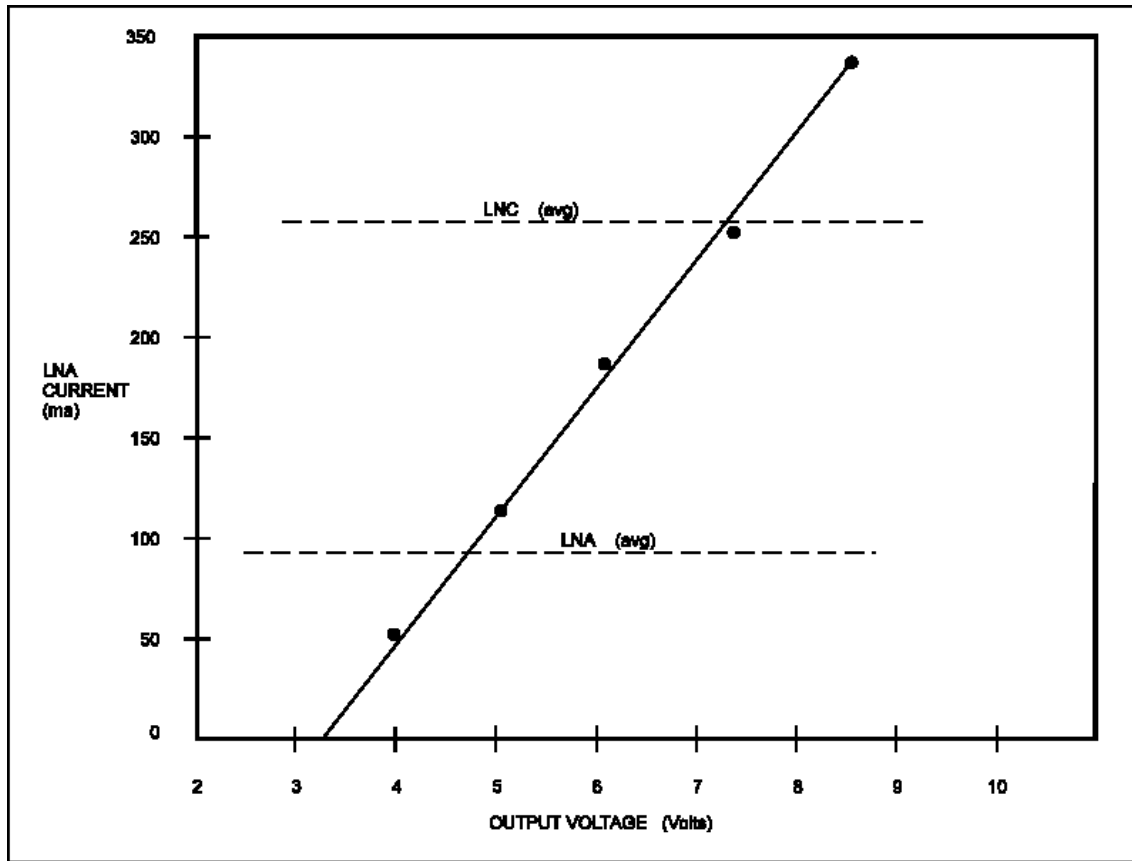


Figure C-3. LNA/LNB Current/Voltage Output

The output voltage from U14A is converted to an 8-bit byte by A/D converter U9 and stored in EEPROM U7.



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