INSTRUCTION MANUAL

Innovator
LX Series
Analog Power Amplifier
Assembly

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Introduction

1.1 Manual Overview

This manual explains the installation, setup, alignment, and maintenance procedures for the Power Amplifier Assembly for the Innovator LX Series transmitter. It is important that you read all of the instructions, especially the safety information in this chapter, before you begin to install or operate the unit.

This instruction manual is divided into five chapters and supporting appendices. **Chapter 1**, Introduction, contains information on the assembly numbering system used in the manual, safety, maintenance, return procedures, and warranties. **Chapter 2**, Amplifier Assembly Description, Maintenance & Remote Control Connections, describes the amplifier assembly and includes discussions on control and status indicators and remote control connections. **Chapter 3**, Site Considerations, Installation and Setup Procedures, explains how to unpack, install, setup, and operate the power amplifier assembly. **Chapter 4,** Circuit Descriptions, contains circuit level descriptions for boards and board level components in the power amplifier. **Chapter 5**, Detailed Alignment Procedures, provides information on adjusting the power amplifier and the system for optimal operation. **Appendix A** contains system specifications. **Appendix B** contains assembly and subassembly drawings and parts lists. **Appendix C** contains a transmitter log sheet.

1.2 Assembly Designators

Axcera has assigned assembly numbers, such as Ax (x=1,2,3…), to all assemblies, trays, and boards that are referenced in the text of this manual and shown on the block diagrams and interconnect drawings provided in the appendices. These supporting documents are arranged in increasing numerical order in the appendices. Section titles in the text for assembly or tray descriptions or alignment procedures contain the associated part number(s) and the relevant appendix that contains the drawings for that item.

The cables that connect between the boards within a tray or assembly and that connect between the trays, racks and cabinets are labeled using Brady markers.

Figure 1-1 is an example of a Brady marked cable. There may be as few as two or as many as four Markers on any one cable. These Brady markers are read starting furthest from the connector. If there are four Brady Markers, this marker is the transmitter number such as transmitter 1 or transmitter 2. The next or the furthest Brady Marker is the rack or cabinet number on an interconnect cable or the board number within a tray. The next number on an interconnect cable is the tray location or number. The Brady marker closest to the connector is the jack or connector number on an interconnect cable or the jack or connector number on the board within a tray.

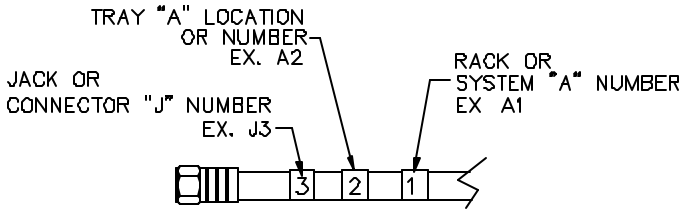


Figure 1-1 Brady Marker Identification Drawing

1.3 Safety

The transmitters and associated power amplifier assemblies manufactured by Axcera are designed to be easy to use and repair while providing protection from electrical and mechanical hazards. Listed throughout the manual are notes, cautions, and warnings concerning possible safety hazards that may be encountered while operating or servicing the transmitter. Please review these warnings and familiarize yourself with the operation and servicing procedures before working on the assembly.

Read All Instructions – All of the operating and safety instructions should be read and understood before operating this equipment.

Retain Manuals – The manuals for the power amplifier assembly and the transmitter should be retained at the transmitter site for future reference. We provide two sets of manuals for this purpose; one set can be left at the office while one set can be kept at the site.

Heed all Notes, Warnings, and Cautions – All of the notes, warnings, and cautions listed in this safety section and throughout the manual must be followed.

Follow Instructions – All of the operating and use instructions for the amplifier assembly should be followed.

Cleaning – Unplug or otherwise disconnect all power from the equipment before cleaning. Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning.

Ventilation – Openings in the cabinets and modules front panels are provided for ventilation. To ensure the reliable operation of the amplifier assembly, and to protect the unit from overheating, these openings must not be blocked.

Servicing – Do not attempt to service this product yourself until becoming familiar with the equipment. If in doubt, refer all servicing questions to qualified Axcera service personnel.

Replacement Parts – When replacement parts are used, be sure that the parts have the same functional and performance characteristics as the original part. Unauthorized substitutions may result in fire, electric shock, or other hazards. Please contact the Axcera Technical Service Department if you have any questions regarding service or replacement parts.

1.4 Contact Information

The Axcera Field Service Department can be contacted by phone at **(724) 873-8100** or by fax at **(724) 873-8105**.

Before calling Axcera, please be prepared to supply the Axcera technician with answers to the following questions. This will save time and help ensure the most direct resolution to the problem.

1. What are the Customers' Name and call letters?
2. What are the model number and type of transmitter?
3. Is the transmitter digital or analog?
4. How long has the transmitter been on the air? (Approximately when was the transmitter installed.)
5. What are the symptoms being exhibited by the transmitter? Include the current control/power supply LCD readings and the status of LEDs on the front panels of the modules. If possible, include the control/power supply LCD readings before the problem occurred.

1.5 Return Material Procedure

To insure the efficient handling of equipment or components that have been returned for repair, Axcera requests that each returned item be accompanied by a

Return Material Authorization Number (RMA#).

An RMA# can be obtained from any Axcera Field Service Engineer by contacting the Axcera Field Service Department at (724) 873-8100 or by fax at (724) 873-8105. This procedure applies to all items sent to the Field Service Department regardless of whether the item was originally manufactured by Axcera.

When equipment is sent to the field on loan, an RMA# is included with the unit. The RMA# is intended to be used when the unit is returned to Axcera. In addition, all shipping material should be retained for the return of the unit to Axcera.

Replacement assemblies are also sent with an RMA# to allow for the proper routing of the exchanged hardware. Failure to close out this type of RMA# will normally result in the customer being invoiced for the value of the loaner item or the exchange assembly.

When shipping an item to Axcera, please include the RMA# on the packing list and on the shipping container. The packing slip should also include contact information and a brief description of why the unit is being returned.

Please forward all RMA items to:

AXCERA, LLC
103 Freedom Drive
P.O. Box 525
Lawrence, PA 15055-0525 USA

For more information concerning this procedure, call the Axcera Field Service Department.

Axcera can also be contacted through e-mail at **info@axcera.com** and on the Web at **www.axcera.com.**

1.6 Limited One Year Warranty for Axcera Products

Axcera warrants each new product that it has manufactured and sold against defects in material and workmanship under normal use and service for a period of one (1) year from the date of shipment from Axcera's plant, when operated in accordance with Axcera's operating instructions. This warranty shall not apply to tubes, fuses, batteries, or bulbs.

Warranties are valid only when and if (a) Axcera receives prompt written notice of breach within the period of warranty, (b) the defective product is properly packed and returned by the buyer (transportation and insurance prepaid), and (c) Axcera determines, in its sole judgment, that the product is defective and not subject to any misuse, neglect, improper installation, negligence, accident, or (unless authorized in writing by Axcera) repair or alteration. Axcera's exclusive liability for any personal and/or property damage (including direct, consequential, or incidental) caused by the breach of any or all warranties, shall be limited to the following: (a) repairing or replacing (in Axcera's sole discretion) any defective parts free of charge (F.O.B. Axcera's plant) and/or (b) crediting (in Axcera's sole discretion) all or a portion of the purchase price to the buyer.

Equipment furnished by Axcera, but not bearing its trade name, shall bear no warranties other than the special hours-of-use or other warranties extended by or enforceable against the manufacturer at the time of delivery to the buyer.

NO WARRANTIES, WHETHER STATUTORY, EXPRESSED, OR IMPLIED, AND NO WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR FREEDOM FROM INFRINGEMENT, OR THE LIKE, OTHER THAN AS SPECIFIED IN PATENT LIABILITY ARTICLES, AND IN THIS ARTICLE, SHALL APPLY TO THE EQUIPMENT FURNISHED HEREUNDER.

☞ WARNING!!!

⋖ HIGH VOLTAGE ⋗

DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS EQUIPMENT UNLESS YOU ARE FAMILIAR WITH ITS OPERATION AND EXPERIENCED IN SERVICING HIGH VOLTAGE EQUIPMENT. LETHAL VOLTAGES ARE PRESENT WHEN POWER IS APPLIED TO THIS SYSTEM. IF POSSIBLE, TURN OFF POWER BEFORE MAKING ADJUSTMENTS TO THE SYSTEM.

★ RADIO FREQUENCY RADIATION HAZARD ★

MICROWAVE, RF AMPLIFIERS AND TUBES GENERATE HAZARDOUS RF RADIATION THAT CAN CAUSE SEVERE INJURY INCLUDING CATARACTS, WHICH CAN RESULT IN BLINDNESS. SOME CARDIAC PACEMAKERS MAY BE AFFECTED BY THE RF ENERGY EMITTED BY RF AND MICROWAVE AMPLIFIERS. NEVER OPERATE THE TRANSMITTER SYSTEM WITHOUT A PROPERLY MATCHED RF ENERGY ABSORBING LOAD ATTACHED. KEEP PERSONNEL AWAY FROM OPEN WAVEGUIDES AND ANTENNAS. NEVER LOOK INTO AN OPEN WAVEGUIDE OR ANTENNA. MONITOR ALL PARTS OF THE RF SYSTEM FOR RADIATION LEAKAGE AT REGULAR INTERVALS.

EMERGENCY FIRST AID INSTRUCTIONS

Personnel engaged in the installation, operation, or maintenance of this equipment are urged to become familiar with the following rules both in theory and practice. It is the duty of all operating personnel to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

RESCUE BREATHING

1. Find out if the person is breathing.

You must find out if the person has stopped breathing. If you think he is not breathing, place him flat on his back. Put your ear close to his mouth and look at his chest. If he is breathing you can feel the air on your cheek. You can see his chest move up and down. If you do not feel the air or see the chest move, he is not breathing.

2. If he is not breathing, open the airway by tilting his head backwards.

Lift up his neck with one hand and push down on his forehead with the other. This opens the airway. Sometimes doing this will let the person breathe again by himself.

3. If he is still not breathing, begin rescue breathing.

-Keep his head tilted backward. Pinch nose shut.
-Put your mouth tightly over his mouth.
-Blow into his mouth once every five seconds
-DO NOT STOP rescue breathing until help arrives.

LOOSEN CLOTHING - KEEP WARM

Do this when the victim is breathing by himself or help is available. Keep him as quiet as possible and from becoming chilled. Otherwise treat him for shock.

BURNS

SKIN REDDENED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Consult a physician.

SKIN BLISTERED OR FLESH CHARRED: Apply ice cold water to burned area to prevent burn from going deeper into skin tissue. Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

EXTENSIVE BURN - SKIN BROKEN: Cover area with clean sheet or cloth to keep away air. Treat victim for shock and take to hospital.

dBm, dBw, dBmV, dBmV, & VOLTAGE EXPRESSED IN WATTS

50 Ohm System

WATTS	PREFIX	dBm	dBw	dBm V	dBµV	VOLTAGE
1,000,000,000,000	1 TERAWATT	+150	+120			
100,000,000,000	100 GIGAWATTS	+140	+110			
10,000,000,000	10 GIGAWATTS	+130	+100			
1,000,000,000	1 GIGAWATT	+120	+ 99			
100,000,000	100 MEGAWATTS	+110	+ 80			
10,000,000	10 MEGAWATTS	+100	+ 70			
1,000,000	1 MEGAWATT	+ 90	+ 60			
100,000	100 KILOWATTS	+ 80	+ 50			
10,000	10 KILOWATTS	+ 70	+ 40			
1,000	1 KILOWATT	+ 60	+ 30			
100	1 HECTROWATT	+ 50	+ 20			
50		+ 47	+ 17			
20		+ 43	+ 13			
10	1 DECAWATT	+ 40	+ 10			
1	1 WATT	+ 30	0	+ 77	+137	7.07V
0.1	1 DECIWATT	+ 20	- 10	+ 67	+127	2.24V
0.01	1 CENTIWATT	+ 10	- 20	+ 57	+117	0.707V
0.001	1 MILLIWATT	0	- 30	+ 47	+107	224mV
0.0001	100 MICROWATTS	- 10	- 40			
0.00001	10 MICROWATTS	- 20	- 50			
0.000001	1 MICROWATT	- 30	- 60			
0.0000001	100 NANOWATTS	- 40	- 70			
0.00000001	10 NANOWATTS	- 50	- 80			
0.000000001	1 NANOWATT	- 60	- 90			
0.0000000001	100 PICOWATTS	- 70	-100			
0.00000000001	10 PICOWATTS	- 80	-110			
0.000000000001	1 PICOWATT	- 90	-120			

TEMPERATURE CONVERSION

°F = 32 + [(9/5) °C]

°C = [(5/9) (°F - 32)]

USEFUL CONVERSION FACTORS

TO CONVERT FROM	TO	MULTIPLY BY
mile (US statute)	kilometer (km)	1.609347
inch (in)	millimeter (mm)	25.4
inch (in)	centimeter (cm)	2.54
inch (in)	meter (m)	0.0254
foot (ft)	meter (m)	0.3048
yard (yd)	meter (m)	0.9144
mile per hour (mph)	kilometer per hour(km/hr)	1.60934
mile per hour (mph)	meter per second (m/s)	0.44704
pound (lb)	kilogram (kg)	0.4535924
gallon (gal) U.S. liquid	liter	3.7854118
(One U.S. gallon equals 0.8327 Canadian gallon)		
fluid ounce (fl oz)	milliliters (ml)	29.57353
British Thermal Unit	watt (W)	0.2930711 per hour (Btu/hr)
horsepower (hp)	watt (W)	746

NOMENCLATURE OF FREQUENCY BANDS

FREQUENCY RANGE	DESIGNATION
3 to 30 kHz	VLF - Very Low Frequency
30 to 300 kHz	LF - Low Frequency
300 to 3000 kHz	MF - Medium Frequency
3 to 30 MHz	HF - High Frequency
30 to 300 MHz	VHF - Very High Frequency
300 to 3000 MHz	UHF - Ultrahigh Frequency
3 to 30 GHz	SHF - Superhigh Frequency
30 to 300 GHz	EHF - Extremely High Frequency

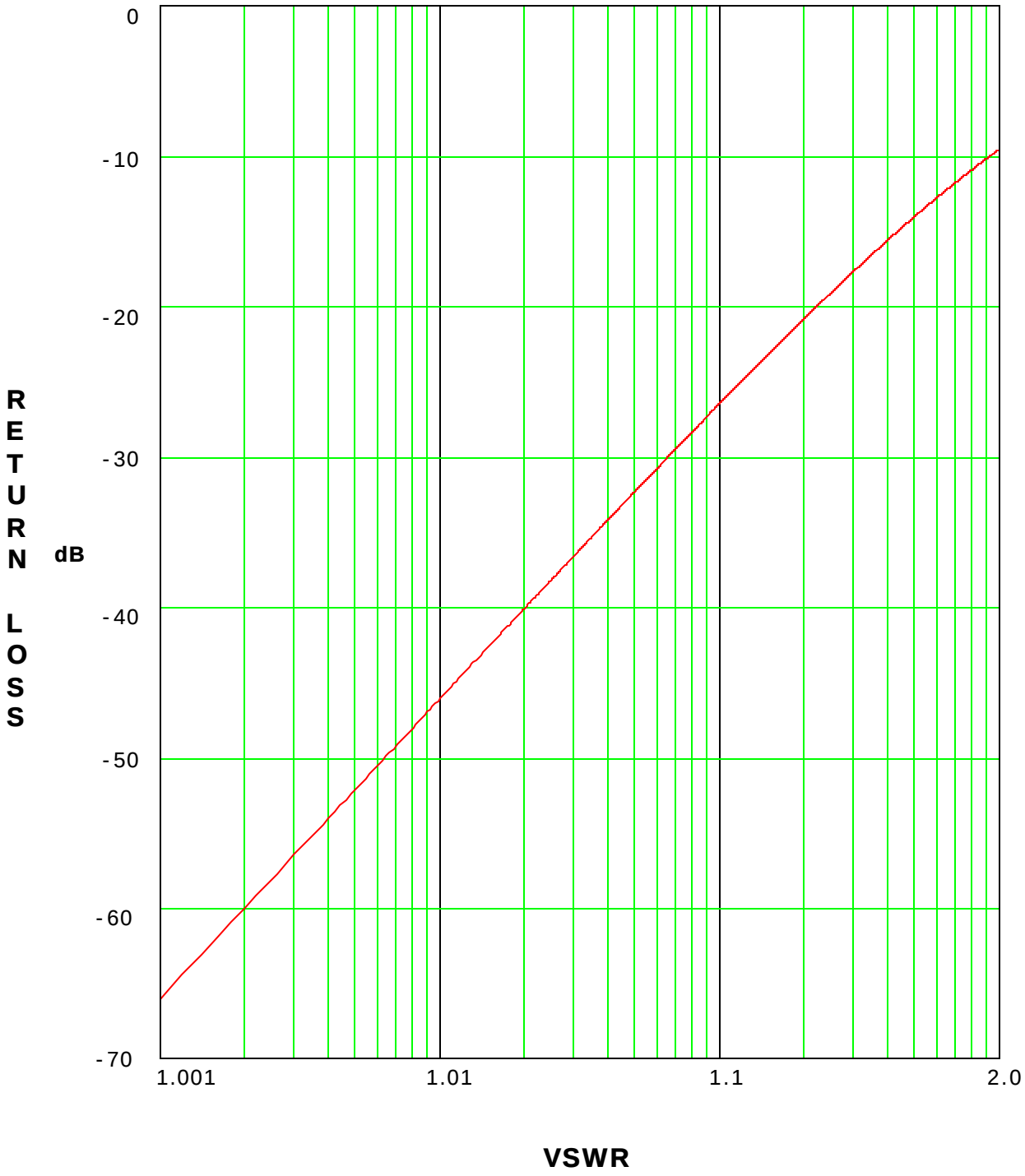
LETTER DESIGNATIONS FOR UPPER FREQUENCY BANDS

LETTER	FREQ. BAND
L	1000 - 2000 MHz
S	2000 - 4000 MHz
C	4000 - 8000 MHz
X	8000 - 12000 MHz
Ku	12 - 18 GHz
K	18 - 27 GHz
Ka	27 - 40 GHz
V	40 - 75 GHz
W	75 - 110 GHz

ABBREVIATIONS/ACRONYMS

AC	Alternating Current
AFC	Automatic Frequency Control
ALC	Automatic Level Control
AM	Amplitude modulation
AGC	Automatic Gain Control
AWG	American wire gauge
BER	Bit Error Rate
BW	Bandwidth
DC	Direct Current
D/A	Digital to analog
dB	Decibel
dBm	Decibel referenced to 1 milliwatt
dBmV	Decibel referenced to 1 millivolt
dBw	Decibel referenced to 1 watt
FEC	Forward Error Correction
FM	Frequency modulation
Hz	Hertz
ICPM	Incidental Carrier Phase Modulation
I/P	Input
IF	Intermediate Frequency
LED	Light emitting diode
LSB	Lower Sideband
MPEG	Motion Pictures Expert Group
O/P	Output
PLL	Phase Locked Loop
PCB	Printed circuit board
QAM	Quadrature Amplitude Modulation

RETURN LOSS VS. VSWR



Chapter 2
Amplifier Assembly Description, Maintenance & Remote Control Connections

2.1 LX Series Power Amplifier Chassis Assembly Overview

The power amplifier chassis assembly in the LX Series contains modular television amplifiers that slide into the assembly each producing approximately 250 Watts peak of sync output. There is also needed one external Power Supply Module Assembly for every two 250 Watt PA modules, which also slide into the Power Amplifier Chassis Assembly, under the PA Modules. Four PA modules and two Power Supply modules are the maximum number of modules in one Power Amplifier Chassis Assembly producing 1 kW analog output power . Two Power Amplifier Chassis Assemblies are required for 2 kW analog output power, three Power Amplifier Chassis Assemblies for 3 kW analog, four Power Amplifier Chassis Assemblies for 4 kW analog, five Power Amplifier Chassis Assemblies for 5 kW analog, and six Power Amplifier Chassis Assemblies are required for 6 kW analog output power.

In a 250W system the RF output of the exciter/driver at the “N” connector J25 connects to the (A3) power amplifier chassis assembly at the “N” connector J201.

In a 500W or 1 kW system the RF output of the exciter/driver at the “N” connector J25 connects to the (A3) power amplifier chassis assembly at the “N” connector J200.

In a 2 kW system the RF output of the exciter/driver connects to (A5) a 2 Way Splitter Assembly. The two outputs of the splitter connect to the (A3) and (A6) power amplifier chassis assemblies at J200.

In a 3 kW system the RF output of the exciter/driver connects to (A5) a 4 Way Splitter Assembly. Three outputs of the splitter, the fourth at J5 is 5 Watt terminated, connect to the (A3), (A6) and (A13) power amplifier chassis assemblies at J200.

In a 4 kW system there are two cabinet assemblies (A1 and A2). The (A1) cabinet assembly contains the (A1-A27) exciter/driver assembly and the (A1-A6 and A1-A3) Power Amplifiers. The (A2) cabinet assembly contains the (A2-A6 and A2-A3) Power Amplifiers. The RF output of the exciter/driver connects to (A1-A5) a 4 Way Splitter Assembly. Three outputs of the splitter at J2, J4 and J5 connect to the (A1-A3), (A2-A6) and (A2-A3) power amplifier chassis assemblies at J200. The fourth output of the splitter at J1 is connected through A1-A5-A1, a phase matching line, before it is connected to the input of the (A1-A6) Power Amplifier.

In a 5 kW system there are two cabinet assemblies (A1 and A2). The (A1) cabinet assembly contains the (A1-A27) exciter/driver assembly and the (A1-A6 and A1-A3) Power Amplifiers. The (A2) cabinet assembly contains the (A2-A6, A2-A3 and A2-A13) Power Amplifiers. The RF output of the exciter/driver at J25 connects to (A1-A5-A1) a 2 Way Splitter Assembly. One output of the splitter connects to (A2-A5) a 4 way splitter in the (A2) cabinet and the other output connects to (A1-A5-A2) a 4 way splitter in the (A1) cabinet. Two of the outputs of the (A1-A5-A2) splitter at J1 and J5 connect to the (A1-A6) and the (A1-A3) power amplifier chassis assemblies at J200. The RF outputs at J2 and J4 of the (A1-A5-A2) splitter are terminated. The other output of the (A1-A5-A1) splitter at J2 connects to the (A2) cabinet at J3 of (A2-A5) a 4 way splitter. Three of the outputs of the (A2-A5) splitter at J1, J2 and J4 connect to the (A1-A6), (A1-A3)

and (A1-A13) power amplifier chassis assemblies at J200. The other output of the (A2-A5) splitter at J5 is terminated.

In a 6 kW system there are two cabinet assemblies (A1 and A2). The (A1) cabinet assembly contains the (A1-A27) exciter/driver assembly and the (A1-A6, A1-A3, and A1-A13) Power Amplifiers. The (A2) cabinet assembly contains the (A2-A6, A2-A3, and A2-A13) Power Amplifiers. The RF output of the exciter/driver at J25 connects to (A1-A5-A1) a 2 Way Splitter Assembly. One output of the splitter connects to (A2-A5) a 4 way splitter in the (A2) cabinet and the other output connects to (A1-A5-A2) a 4 way splitter in the (A1) cabinet. Three of the outputs of the (A1-A5-A2) splitter at J1, J2 and J4 connect to the (A1-A3), (A1-A6) and (A1-A13) power amplifier chassis assemblies at J200. The fourth output of the (A1-A5-A2) splitter at J5 is terminated. The other output of the (A1-A5-A1) splitter at J2 connects to the (A2) cabinet at J3 of (A2-A5) a 4 way splitter. Three of the outputs of the (A2-A5) splitter at J1, J2, and J4 connect to the (A2-A3), (A2-A6), and (A2-A13) power amplifier chassis assemblies at J200. The other output of the (A2-A5) splitter at J5 is terminated.

Data and control information for the system is fed through the system serial cable. In a 250W, 500W or 1kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A3) Power Amplifier Assembly.

In a 2 kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A3) Power Amplifier Assembly. The serial cable then connects from J233 on the (A3) power amplifier to J232 on the (A6) power amplifier.

In a 3 kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A3) Power Amplifier Assembly. The serial cable then connects from J233 on the (A3) power amplifier to J232 on the (A6) power amplifier and from J233 on the (A6) power amplifier to J232 on the (A13) power amplifier.

In a 4 kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A1-A3) Power Amplifier Assembly. The serial cable then connects from J233 on the (A1-A3) power amplifier to J232 on the (A1-A6) power amplifier. The serial cable next connects from J233 on (A1-A6) to J233 on the (A2-A3) power amplifier and then from J233 on the (A2-A3) power amplifier to J232 on the (A2-A6) power amplifier.

In a 5 kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A1-A3) Power Amplifier Assembly. The serial cable then connects from J233 on the (A1-A3) power amplifier to J232 on the (A1-A6) power amplifier. The serial cable next connects from J233 on (A1-A6) to J232 on the (A2-A3) power amplifier. The serial cable next connects from J233 on (A2-A3) to J232 on the (A2-A6) power amplifier and then from J233 on the (A2-A6) power amplifier to J232 on the (A2-A13) power amplifier.

In a 6 kW system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A1-A3) Power Amplifier Assembly. The serial cable then connects from J233 on the (A1-A3) power amplifier to J232 on the (A1-A6) power amplifier. The serial cable next connects from J233 on (A1-A6) to J232 on the (A1-A13) power amplifier. The serial cable next connects from J233 on (A1-A13) to J232 on the (A2-A3) power amplifier and then from J233 on the (A2-A3) power amplifier to J232 on the (A2-A6) power amplifier. Finally the serial cable connects from J233 on (A2-A6) to J232 on (A2-A13) power amplifier.

2.1.1 Power Amplifier Chassis Configurations

In the 250W power amplifier chassis assembly the RF from J201 connects to the OSP Jack J111 in the power amplifier assembly. In the power amplifier chassis assemblies above 250W, the RF from J200 connects to the SMA Jack J100 on the 4 way splitter assembly. The 4 outputs, in a 1 kW amplifier power amplifier assembly, connect through the output SMA jacks to OSP input jacks of the four slide in power amplifier module assemblies. J101 connects to jack J111 on power amplifier #1. J102 connects to jack J121 on power amplifier #2. J103 connects to jack J131 on power amplifier #3. J104 connects to jack J141 on power amplifier #4.

2.1.1.1 250 Watt Power Amplifier Chassis Configuration

In a 250 Watt power amplifier chassis assembly, the RF input at J201 is connected to J111 on the power amplifier module. The output of the power amplifier at J112 connects to the RF output jack J203 of the power amplifier chassis assembly.

2.1.1.2 500 Watt Power Amplifier Chassis Configuration

In a 500 Watt power amplifier chassis assembly, Jacks J103 and J104, on the 4 way splitter assembly, are not used and are terminated with 50O. Also, the power amplifier modules #3 and #4 are not used. Finally a 2 way combiner is used in place of the 4 way combiner.

2.1.1.3 1kW Power Amplifier Chassis Configuration

In a 1 kW amplifier power amplifier assembly, the output OSP jacks connect to the OSP input jacks on the four way combiner assembly. J112 connects to J151 on the 4 way combiner. J122 connects to J152 on the 4 way combiner power amplifier #2. J132 connects to J153 on the 4 way combiner. J142 connects to J154 on the 4 way combiner.

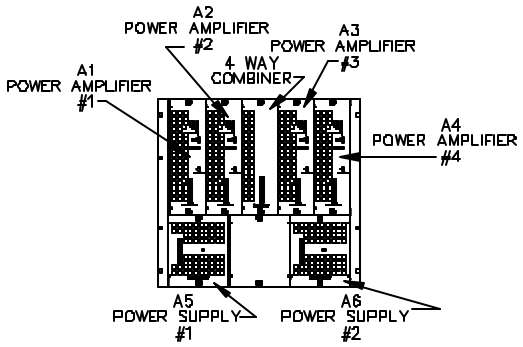


Figure 2-1. 1 kW Power Amplifier Assembly Racking Plan

In a 1 kW amplifier power amplifier assembly, the (A5) power supply #1 provides voltages to the (A1) power amplifier #1 and the (A3) power amplifier #3 assemblies and the (A6) power supply #2 provides voltages to the (A2) power amplifier #2 and the (A4) power amplifier #4.

2.1.2 System Configurations

Table 2-1: Typical LX Series Analog System Configuration Drawings and Parts Lists

ANALOG SYSTEM CONFIGURATIONS	INTERCONNECT	RACKING PLAN	PARTS LIST
250W	1303515	1303383	(Transmitter) 1303865 (Translator) 1303862
500W	(Transmitter) 1303564 (Translator) 1303563	1303383	(Transmitter) 1303864 (Translator) 1303269
1 kW	(Transmitter) 1303564 (Translator) 1303563	1303383	(Transmitter) 1303604 (Translator) 1303272

ANALOG SYSTEM CONFIGURATIONS	INTERCONNECT	RACKING PLAN	PARTS LIST
2 kW	1303685	1303601	(Transmitter) 1303866 (Translator) 1303828
3 kW	1304066	1304075	(Transmitter) 1304068
4 kW	1304127	1304133	(Transmitter) 1304206
5 kW	1304278	1304277	(Transmitter) 1304276
6 kW	1304311	1304310	(Transmitter) 1304325

NOTE: Refer to Table 2-1 for the Interconnect, Racking Plan and Parts List Numbers for your system. The actual drawings and parts lists are located in Appendix B of this manual. A Drawing List of the order the drawings appear in the Appendix is found at the beginning of the section.

2.1.2.1 250 Watt, 500 Watt or 1kW Output System Configurations

In a 250 Watt system, the output of the (A3) power amplifier chassis assembly at the 7/16" connector J203 is cabled to (A9) the bandpass filter for the system. In a 500 Watt or 1 kW system, the output of the (A3) power amplifier chassis assembly at the 7/16" connector J205 is also cabled to the (A9) bandpass filter. The filtered output connects either directly to (A11) the output coupler or first to the Optional 1 section or 2 section trap filter if more filtering is needed and then to the output coupler. The (A11) coupler assembly supplies a forward and a reflected power samples to the (A4) Visual/Aural Metering Board. The Visual/Aural Metering Board supplies reflected, visual and aural output power samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13, the visual sample at TB31-14 and the aural output power sample at TB31-15. The RF output for the transmitter is at J2 the 7/8" EIA connector on the (A11) coupler assembly.

2.1.2.2 2 kW Output System Configuration

In a 2 kW system, the output of the (A3) and the (A6) power amplifier chassis assemblies, at the "7/16" connectors J205, are cabled to (A7) the hybrid combiner for the system, mounted to the input of the bandpass filter. A 500 Watt reject load (A9) connects to J4 on the hybrid combiner to dissipate reject power. A thermal switch (A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly, at TB30-7 & TB30-15, if a problem occurs in the output lines. **NOTE:** If an overtemperature fault occurs, it must be manually reset on the system controller after repairs are made. The combined output of the hybrid combiner at the "7/8" Jack J3 is connected to J1 on the bandpass filter. The filtered output of the bandpass filter is either cabled directly to the (A11) output coupler or first to the 1 or 2 section trap filter and then to the output coupler. The (A11) coupler assembly supplies a forward and a reflected power samples to the (A4) Visual/Aural Metering Board. The Visual/Aural Metering Board supplies reflected, visual and aural output power samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13, the visual sample at TB31-14 and the aural output power sample at TB31-15. The RF output for the transmitter is at J2 the 7/8" EIA connector on the (A11) coupler assembly.

2.1.2.3 3kW Output System Configuration

In a 3 kW system, the outputs of A3, A6 and A13 power amplifier chassis assemblies, at the "N" connectors J205, are cabled to (A7) the hybrid combiner for the system mounting facing the rear of the cabinet. A 500 Watt reject load (A18), mounted on the roof of the cabinet, connects to J4 on the hybrid combiner to dissipate reject power. Another 500 Watt reject load (A9), also

mounted on the roof, connects to J5 on the hybrid combiner to dissipate reject power. Thermal switches (A9-A1 & A18-A1) are mounted to the reject loads and supply overtemperature faults, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines.

NOTE: If an overtemperature fault occurs, it must be manually reset on the system controller after repairs are made.

The combined output of the hybrid combiner is cabled to the externally mounted assemblies, which consist of (A8) the bandpass filter, (A12) the output trap filter and (A11) the output coupler. The output coupler assembly supplies a forward and a reflected sample to the (A44) Visual/Aural Metering Board. The Visual/Aural Metering Board supplies samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13, the visual sample to TB31-14 and aural output power sample to TB31-15. The RF output for the transmitter is at J2 the 3-1/8" EIA connector on the (A11) output coupler assembly.

2.1.2.4 4kW Output System Configuration

In a 4 kW system, the outputs of the four power amplifier chassis assemblies must be combined. This is accomplished by combining two power amplifier chassis assemblies, creating two outputs then combing these into one output. In the (A1) cabinet assembly, the outputs of the (A1-A3 and A1-A6) power amplifiers at the "7/16" connectors J205, are cabled to the (A1-A7) hybrid combiner, mounted to the input jack of the (A1-A8) bandpass filter. A 1 kW reject load (A1-A9), that dissipates reject power, is mounted on a shelf inside the (A1) cabinet and is connected to (J4) on the hybrid combiner. A thermal switch (A1-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A1) amplifier cabinet. The combined output at (A1-A7-J3) of the hybrid combiner connects to the (A1-A8) bandpass filter for filtering before it is connected either directly to the "7/8" Jack J1 on (A3) the 2 way combiner assembly mounted on the roof of the cabinets, or through the optional (A1-A12) trap filter and then to the 2 way combiner.

In the (A2) cabinet, the outputs of the (A2-A3 and A2-A6) power amplifiers at the "7/16" connectors J205, are cabled to (A2-A7) hybrid combiner. A 1 kW reject load (A2-A9) connects to (J4) on the hybrid combiner to dissipate reject power. A thermal switch (A2-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet. The combined output at (A2-A7-J3) of the hybrid combiner connects to the (A2-A8) bandpass filter for filtering before it is connected either directly to the "7/8" Jack J2 on (A3) the 2 way combiner assembly mounted on the roof of the cabinets, or through the optional (A2-A12) trap filter and then to the 2 way combiner. The combined output of the (A3) 2 way combiner at the 1-5/8" connector (A3-J3) is connected to the input of the (A4) output coupler. The output coupler assembly supplies a forward power sample at (A4-J3) and a reflected sample at (A4-J6) to the (A44) Visual/Aural Metering Board. The Visual/Aural Metering Board supplies a reflected power sample to TB31-13, a visual power sample to TB31-14 and aural power sample to TB31-15 on the exciter/driver for metering purposes. The RF output for the transmitter is at J2 the 1-5/8" connector on the A4 output coupler assembly.

2.1.2.5 5kW Output System Configuration

In a 5 kW system, the outputs of the five power amplifier chassis assemblies must be combined. This is accomplished by combining three power amplifier chassis assemblies, creating one combined

output, and combining the other two power amplifier chassis assemblies, creating another combined output. The two combined outputs are then combined into one output. In the (A1) cabinet assembly, the outputs of the (A1-A6 and A1-A3) power amplifiers at the "7/16" connectors J205, are cabled to the J1 and J2 input jacks of (A1-A7) a hybrid combiner. A 500 Watt reject load (A1-A18), that dissipates reject power, is mounted near the top of the (A1) cabinet and is connected to (J4) on the hybrid combiner. A thermal switch (A1-A18-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A1) amplifier cabinet. A 1.5 kW reject load (A1-A9), that dissipates reject power, is mounted beside the 500W load in the (A1) cabinet and is connected to (A3-J4) a 2 way hybrid combiner. A thermal switch (A1-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the transmitter. This fault is in parallel with the other fault line. The combined output of the A1 cabinet at (A1-A7-J3) of the hybrid combiner connects to (J2) one of the input jacks to (A3) the 2 way combiner mounted on the roof of the cabinets.

In the (A2) cabinet, the outputs of the (A2-A6, A2-A3 and A2-A13) power amplifiers at the "7/16" connectors J205, are cabled to (A2-A7) a hybrid combiner. A 500W reject load (A2-A9) connects to (J4) on the hybrid combiner to dissipate reject power. A thermal switch (A2-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the combining of the power amplifiers in the (A2) amplifier cabinet. A 500W reject load (A2-A5) connects to (J5) on the hybrid combiner to dissipate reject power. A thermal switch (A2-A5-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet. . These faults are in parallel with the other fault lines.

The combined output of the A2 cabinet at (A2-A7-J6) of the hybrid combiner connects to the other input jack (J1) on (A3) the 2 way combiner mounted on the roof of the cabinets. J4 on the combiner connects to a 1.5 kW reject load (A1-A9), that dissipates reject power, which is mounted inside the cabinet facing the rear of the (A1) cabinet. A thermal switch (A1-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet. This fault is in parallel with the other overtemperature fault lines.

The combined output of the (A3) combiner at J3 connects to the (A8) bandpass filter for filtering before it is connected through the (A12) trap filter, for additional filtering, to the input of the (A11) output coupler. The output coupler assembly supplies a forward power sample at (A1-A44-J1) and a reflected sample at (A1-A44-J2) to the (A44) Visual/Aural Metering Board, mounted in the (A1) cabinet. The Visual/Aural Metering Board supplies a reflected power sample to TB31-13, a visual power sample to TB31-14 and aural power sample to TB31-15 on the exciter/driver for metering purposes. The RF output for the transmitter is at J2 the 3-1/8" connector on the A11 output coupler assembly.

2.1.2.6 6kW Output System Configuration

In a 6 kW system, the outputs of the six power amplifier chassis assemblies must be combined. This is accomplished by combining three power amplifier chassis assemblies, creating one combined output, and combining the other three power amplifier chassis assemblies, creating another combined output. The two combined outputs are then combined

into one output. In the (A1) cabinet assembly, the outputs of the (A1-A3, A1-A6, and A1-A13) power amplifiers at the "7/16" connectors J205, are cabled to the J1, J2 & J3 input jacks of (A1-A7) a 3 way hybrid combiner. A 500 Watt reject load (A1-A9), that dissipates reject power, is mounted on the roof of the (A1) cabinet and is connected to (J5) on the hybrid combiner. A thermal switch (A1-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A1) amplifier cabinet. Another 500 Watt reject load (A1-A18), that dissipates reject power, is mounted on the roof of the (A1) cabinet and is connected to (J4) on the hybrid combiner. A thermal switch (A1-A18-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A1) amplifier cabinet. This fault is in parallel with the other fault line. The combined output of the A1 cabinet at (A1-A7-J6) of the hybrid combiner connects to one of the input jacks (J1) on (A3) the 2 way combiner mounted on the roof of the cabinets.

In the (A2) cabinet, the outputs of the (A2-A3, A2-A6, and A3-A13) power amplifiers at the "7/16" connectors J205, are cabled to (A2-A7) hybrid combiner. A 500 Watt reject load (A2-A9) connects to (J4) on the hybrid combiner to dissipate reject power. A thermal switch (A2-A9-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet. Another 500 Watt reject load (A2-A18), that dissipates reject power, is mounted on the roof of the (A2) cabinet and is connected to (J4) on the hybrid combiner. A thermal switch (A2-A18-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet.

The combined output of the A2 cabinet at (A2-A7-J6) of the hybrid combiner connects to the other input jack (J2) on (A3) the 2 way combiner mounted on the roof of the cabinets. J4 on the combiner connects to a 1.5 kW reject load (A5), that dissipates reject power, which is mounted inside the cabinet facing the rear of the (A2) cabinet. A thermal switch (A5-A1) is mounted to the reject load and supplies an overtemperature fault, at 175º F., to the driver assembly at TB30-7 & 15, if a problem occurs in the output lines for the (A2) amplifier cabinet. This fault is in parallel with the other overtemperature fault lines. The combined output of the (A3) combiner connects to the (A8) bandpass filter for filtering before it is connected through the (A12) trap filter, for additional filtering, to the input of the (A11) output coupler. The output coupler assembly supplies a forward power sample at (A1-A44-J1) and a reflected sample at (A1-A44-J2) to the (A44) Visual/Aural Metering Board. The Visual/Aural Metering Board supplies a reflected power sample to TB31-13, a visual power sample to TB31-14 and aural power sample to TB31-15 on the exciter/driver for metering purposes. The RF output for the transmitter is at J2 the 3-1/8" connector on the A11 output coupler assembly.

NOTE: If an overtemperature fault occurs in any system configuration, it must be manually reset on the system controller after repairs are made.

The LX Series power amplifier assembly is made up of the modules and assemblies listed in Table 2-3.

Table 2-3: Typical LX Series Power Amplifier Chassis Assemblies

ASSEMBLY DESIGNATOR	ASSEMBLY NAME	PART NUMBER
	125W/250W/500 Watt Chassis Assembly	1303958
	Or 500W Upgradeable & 1 kW Chassis Assembly	1303953
A3 & (Opt A6 & A13)	Power Amplifier Assembly, 250 Watt	1302868
	Power Supply Assembly	1302863
Opt A5	2 or 4 Way Splitter Assembly	1303567 (2 Way) 1303347 (4 Way)
A11	Coupler Assembly	450029
A4 or A44	Visual/Aural Metering Board	1265-1309

2.1.3 Power Amplifier Module Assembly, 250 Watt (1302868; Appendix B)

POWER AMPLIFIER MODULE	RF INPUT/OUTPUT:	470 – 860 MHz
	INPUT LEVEL:	+30dBm ±2dB PK SYNC
	INPUT RETURN LOSS:	-10dB
	OUTPUT LEVEL:	+55dBm (300W PK SYNC)
	POWER REQUIREMENTS:	+32V @ 25A
		+12V @ 0.2A
		-12V @ 0.5A

The 250 Watt Power Amplifier Module Assembly is made up of (A6) an Amplifier Control Board (1303682, 1301962 or 1303702), (A1) a UHF Phase/Gain Board (1303213), (A2) a 150 Watt Driver Pallet Assembly (1303293), (A3 & A4) two RF Module Pallets, Philips (1300116), and (A5) a 2-Way Combiner Board (1303208).

The Power Amplifier Module contains Broadband LDMOS amplifiers that cover the entire UHF band with no tuning required. Each module amplifies the RF to a nominal 300W output power. The Power Amplifier assembly is used to amplify the RF output of the Transmitter/Exciter Driver. A cable, located on the rear chassis, connects the RF output from the Exciter/Driver at J25 to J200 the RF input to the PA Assembly. This module contains RF monitoring circuitry for both an analog and a digital system. Control and monitoring lines to the Power Amplifier module are routed through the floating blind-mate connector of the Control & Monitoring/Power Supply module.

The Transmitter/Exciter Driver Power Amplifier module and any External Power Amplifier modules contain the same control and monitoring board. This board monitors RF output power, RF reflected power, the current draw of amplifier sections, the supply voltage, and the temperature of the PA heat sink. The RF power detector circuit outputs vary with operating frequency. These circuits must be calibrated at their intended operating frequency. The following front panel potentiometers are used to set the Power Amplifier Calibrations in Analog Systems.

R201 Reflected Power Cal
R202 Forward Power Cal
R204 Meter Offset Zero

In analog systems, the Aural power of an Exciter Driver Power Amplifier and the Aural power of any external amplifier will not be reported by the system Control Monitoring module. Additionally the Visual power of these amplifiers, is reported as Forward Power just like in digital systems. In analog systems, aural and visual power will only be reported for the final system RF output.

If the Control Monitoring module is monitoring a 10-100 Watt Analog Transmitter, system power is measured in the Power Amplifier module. The wired connections are transferred through the power supply connector to

the backplane board on a five position header. All four positions of control board switch SW1 must be set on to route these lines as the system's RF power signals. In systems of output power greater than 100 Watts, system power is monitored by an external module that is connected to TB31 and control board SW1 switches must be set off.

The Forward Power of the Transmitter/Exciter Driver Power Amplifier module is routed to the Upconverter module as AGC #1. A system over-drive condition is detected when this value rises above 0.9 VDC. When an over-drive condition is detected, the Upconverter module reduces its RF output level. For values less than 0.9 VDC, the Upconverter uses this voltage for automatic gain.

Table 2-4. Power Amplifier Status Indicator

LED	FUNCTION
ENABLED (Green)	When lit Green, it indicates that the PA is in the Operate Mode. If a Mute occurs, the PA will remain Enabled, until the input signal is returned.
DC OK (Green)	When lit Green, it indicates that the fuse protected DC inputs to the PA module are OK.
TEMP (Green)	When lit Green, it indicates that the temperature of the heatsink assembly in the module is below 78°C.
MOD OK (Green)	When lit Green, it indicates that the PA Module is operating and has no faults.
MOD OK (Red)	If the Module OK LED is Red and blinking a fault is present. 1 Blink indicates Amplifier Current Fault. 2 Blinks indicate Temperature Fault. 3 Blinks indicate +32V Power Supply Over Voltage Fault. 4 Blinks indicate +32V Power Supply Under Voltage Fault. 5 Blinks indicate Reflected Power Fault. 6 Blinks indicate +12V or –12V Power Supply Fault.

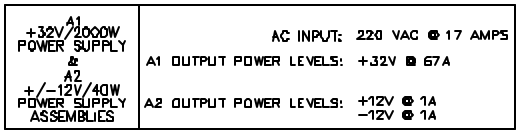
Table 2-5. Power Amplifier Control Adjustments

POTENTIOMETERS	DESCRIPTION
RFL CAL	Adjusts the gain of the Reflected Power monitoring circuit
VISUAL CAL	Adjusts the gain of the Visual / Forward Power monitoring circuit
METER ZERO	Adjusts the offset of the Forward Power monitoring circuit

Table 2-6. Power Amplifier Sample

DISPLAY	FUNCTION
FWD SAMPLE	RF sample of the amplified signal being sent out the module on J25.

2.1.4 Power Supply Module Assembly, LX Series (1302863; Appendix B)



The Power Supply Module Assembly is made up of (A1) a +32V/2000W Switching Power Supply and (A2) a ±12V/40W Switching Power Supply.

The power supply module provides the +32 VDC and the +12 VDC and –12 VDC to the power amplifier module assembly.

2.1.5 Front Panel Display Screens

NOTE: In systems with two exciters and an exciter switcher, first perform the following procedure with Exciter A as the On Air Exciter then select Exciter B as the On Air Exciter and repeat the procedure. Switcher system must be in Manual.

A 4 x 20 display located on the front of the Control & Monitoring/Power Supply Module is used in the LX Series transmitter for control of the operation and display of the operating parameters of the entire transmitter. Refer to Chapter 3 for detailed information on the LCD menu screens.

2.2 System Operation

When the transmitter is in operate, as set by the menu screen located on the Control & Monitoring Module in the exciter/driver assembly. The IF Processor will be enabled, the mute indicator on the front panel will be extinguished. The +32 VDC stage of the Power Supply in the Control & Monitoring Module is enabled, the operate indicator on the front panel is lit and the DC OK on the front panel should also be green. The enable and DC OK indicators on the PA Module will also be green.

When the transmitter is in standby. The IF Processor will be disabled, the mute indicator on the front panel will be red. The +32 VDC stage of the Power Supply in the Control & Monitoring Module is disabled, the operate indicator on the front panel will be extinguished and the DC OK on the front panel should remain green. The enable indicator on the PA Module is also extinguished.

If the transmitter does not switch to Operate when the operate menu is switched to Operate, check that all faults are cleared and that the remote control terminal block stand-by signal is not active.

The transmitter can be controlled by the presence of a modulated input signal. If the input signal to the transmitter is lost; the transmitter automatically cutbacks and the input fault indicator on the IF Processor module lights. When the video input signal returns, the transmitter automatically returns to full power and the input fault indicator is extinguished.

2.2.1 Principles of Operation

Operating Modes

This transmitter is either operating or in standby mode. The sections below discuss the characteristics of each of these modes.

Operate Mode

Operate mode is the normal mode for the transmitter when it is providing RF power output. To provide RF power to the output, the transmitter will not be in mute. Mute is a special case of the operate mode where the +32 VDC section of the power supply is enabled but there is no RF output power from the transmitter. This condition is the result of a fault condition that causes the firmware to hold the IF Processor module in a mute state.

Operate Mode with Mute Condition

The transmitter will remain in the operate mode but will be placed in mute when the following fault conditions exists in the transmitter.

- Upconverter is unlocked
- Upconverter module is not present
- IF Processor module is not present
- Modulator (if present) is in Aural/Visual Mute

Entering Operate Mode

Entering the operate mode can be initiated a few different ways by the transmitter control board. A list of the actions that cause the operate mode to be entered is given below:

- A low on the Remote Transmitter Operate line.
- User selects "OPR" using switches and menus of the front panel.
- Receipt of an “Operate CMD” over the serial interface.

There are several fault or interlock conditions that may exist in the transmitter that will prevent the transmitter from entering the operate mode. These conditions are:

- Power Amplifier heat sink temperature is greater than 78°C.
- Transmitter is Muted due to the conditions listed above.
- Power Amplifier Interlock is high indicating that the amplifier is not installed.

Standby Mode

The standby mode in the transmitter indicates that the output amplifier of the transmitter is disabled.

Entering Standby Mode

Similar to the operate mode, the standby mode is entered using various means. These are:

- A low on the Remote Transmitter Stand-By line.
- Depressing the “STB” key on selected front panel menus.
- Receipt of a “Standby CMD” over the serial interface.

Auto Standby Mode

The FCC requires that certain transmitters automatically switch to standby operation on loss of video input. The LX Series transmitter incorporates this feature as a user configurable setting. When Auto Standby on modulation loss is selected in the set-up menus, the transmitter temporarily switches to standby after ten seconds of modulation loss. When the modulated signal as reported by the IF Processor module is again present, the transmitter automatically returns to Operate mode. This feature is implemented in transmitter software version 1.4 and above.

RF System Interlock

A RF System Interlock signal is provided through TB30-5. When this interlock circuit is completed to ground such as through a jumper between TB30-5 and TB30-15, the transmitter is allowed to operate. If this circuit is opened, the transmitter switches to a Mute condition. The interlock must be in place for the system to operate. This interlock circuit may be completed through coax relay contacts and/or reject load contact closures to assure the RF output system is available to receive the transmitter's output RF signal before the transmitter is allowed to operate. This feature is implemented in transmitter software version 1.4 and above.

Operating Frequency

NOTE: The exact output frequency of the transmitter was set at the factory and needs no customer adjustment.

The LX Series transmitter controller is designed to operate on UHF and VHF frequencies. The frequency can be set to one of the standard UHF or VHF channel frequencies, or it can be set to a custom frequency using the built in software and the set-up menu located on the LCD Display screen. Since RF performance of the transmitter requires different hardware for different frequency bands, not all frequency configurations are valid for a specific transmitter. The Power detectors in the transmitter have frequency dependency, therefore detectors of power amplifiers are calibrated at their frequency of use. The detectors for System RF monitoring are also calibrated at the desired frequency of use. Refer questions about channel changes to the Axcera field support department at 724-873-8100.

2.3 Maintenance

The LX Series Transmitter is designed with components that require little or no periodic maintenance except for the routine cleaning of the fans and the front panels of the modules. The amount of time between cleanings depends on the conditions within the transmitter room. While the electronics have been designed to function even if covered with dust, a heavy buildup of dust, dirt, or insects will affect the cooling of the components. This could lead to a thermal shutdown or the premature failure of the affected modules.

When the front panels of the modules become dust covered, the top covers should be taken off and any accumulated foreign material should be removed. A vacuum cleaner, utilizing a small, wand-type attachment, is an excellent way to suction out the dirt. Alcohol and other cleaning agents should not be used unless you are certain that the solvents will not damage components or the silk-screened markings on the modules and boards. Water-based cleaners can be used, but do not saturate the components. The fans and heatsinks should be cleaned of all dust or dirt to permit the free flow of air for cooling purposes.

It is recommended that the operating parameters of the amplifier assembly and transmitter be recorded from the LEDs on the modules and the LCD system metering on the control/monitoring module at least once a month. It is suggested that this data be retained in a rugged folder or envelope.

2.4 Customer Remote Connections

NOTE: For dual exciter systems refer to chapter 2 of Volume 1 for detailed information.

The remote monitoring and operation of the transmitter is provided through terminal blocks TB30 and TB31 located on the rear of the chassis assembly. If remote connections are made to the transmitter, they must be made through terminal blocks TB30 and TB31 at the positions noted on the transmitter interconnect drawing and Table 2-7.

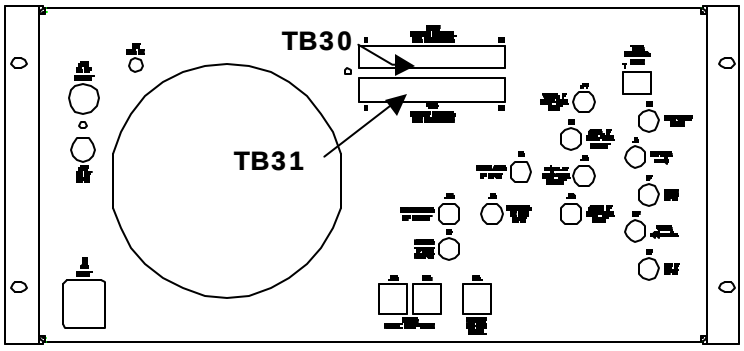


Table 2-7: LX Series Chassis Assembly Hard Wired Remote Interface Connections to TB30 or TB31, which are 18 position Terminal Blocks located on the rear of the Assembly

Signal Name	Pin Designations	Signal Type / Description
RMT Transmitter State	TB30-1	Discrete Open Collector Output - A low indicates that the transmitter is in the operate mode.
RMT Transmitter Interlock	TB30-2	Discrete Open Collector Output - A low indicated the transmitter is OK or completes an interlock daisy chain. When the transmitter is not faulted, the interlock circuit is completed.
RMT Transmitter Interlock Isolated Return	TB30-3	Ground - Configurable ground return which can be either jumpered directly to ground or it can be the “source” pin of an FET so that the transmitter interlock can be daisy chained with other transmitters. This signal does not directly interface to the microcontroller.
RMT AUX IO 1	TB30-4	Discrete Open Collector Inputs, Discrete Open Drain Outputs, or 0 - 5 VDC Analog Input - When used as an output, this line is pulled to +5 VDC with a 1.0 kO resistor for logic high and pulled to ground for a low. A diode allows this line to be pulled up to 12 VDC. When used as a digital input, this line considers all values over 2 Volts as high and those under 1 volt as low. As an analog input, this line is protected by a 5.1 zener diode.
RMT RF System Interlock	TB30-5	When this signal's circuit is completed to ground such as through a jumper between TB30-5 and TB30-15, the transmitter is allowed to operate. If this circuit is opened, the transmitter switches to a Mute condition. Implemented in transmitter software versions 1.4 and above.
RMT Transmitter Operate	TB30-6	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter is to be placed into the operate mode.
RMT Transmitter Stand-By	TB30-7	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter is to be placed into the standby mode.
RMT Power Raise	TB30-8	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter power is to be raised.
RMT Power Lower	TB30-9	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter power is to be lowered.
RMT System Reflect Power	TB30-10	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated “System Reflected Power ” and indicates the transmitter's reflected output power. The scale factor is 25%/3.2V.
RMT System Visual/Forward Power	TB30-11	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated “System Visual/Avg. Power ”. Indicates the transmitter's Visual / Average power. Scale factor is 100%/3.2V.

Signal Name	Pin Designations	Signal Type / Description
RMT System Aural Power	TB30-12	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated “System Aural Power ”. Indicates the transmitter's forward Aural output power. The scale factor is 100%/3.2V.
RMT Spare 1	TB30-13	Remote connection to spare module - Use is TBD.
RMT Spare 2	TB30-14	Remote connection to spare module - Use is TBD.
System Reflect Power	TB31-13	Analog Input - 0 to 1.00 V- This is the input of the “System Reflected Power ” indicating the transmitter's reflected output power. The scale factor is 25%/0.80V.
System Visual/ Forward Power	TB31-14	Analog Input - 0 to 1.00 V- This is the input of the “System Visual / Forward Power ” indicating the transmitter's forward Visual / Forward output power. The scale factor is 100%/0.80V.
System Aural Power	TB31-15	Analog Input - 0 to 1.00 V- This is the input of the “System Aural Power ” indicating the transmitter's forward Aural output power. The scale factor is 100%/0.80V.
IF Processor IF Signal Select	TB31-3	Discrete Open Collector Input - A low indicates that the modulator IF source is to be used by the IF Processor module. When floating an analog IP Processor module may use the Modulated IF Input if the IF Processor sled is so configured.
IF Processor DLC Voltage	TB31-4	Analog Output - 0 to 5.00 V- This is the input of IF Processor module for digital system RF output power control.
UC AGC #2 Voltage	TB31-5	Auxiliary Analog Input - 0 to 1V- This voltage is used by the Upconverter for gain control. Linear signal with display resolution of 0.01 %. Primary signal source is J34-1.
RMT Ground	TB30-15, and 17	Ground pins available through Remote
RMT Ground	TB31-1, 2, 6 to 12, and 17	Ground pins available through Remote
RMT +12 VDC	TB30-16 TB31-16	+12 VDC available through Remote w/ 2 Amp re-settable fuse
RMT -12 VDC	TB30-18 TB31-18	-12 VDC available through Remote w/ 2 Amp re-settable fuse

Chapter 3
Site Considerations, Installation and Setup Procedures

Table 3-1: LX Series Transmitters AC Input and Current Requirements.

Transmitter	Voltage	Current
250 Watt	220 VAC	10 Amps to the Exciter/Amplifier Cabinet
500 Watt	220 VAC	15 Amps to the Exciter/Amplifier Cabinet
1000 Watt	220 VAC	25 Amps to the Exciter/Amplifier Cabinet
2000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
3000 Watt	220 VAC	65 Amps to the Exciter/Amplifier Cabinet
4000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
	220 VAC	40 Amps to the Amplifier Cabinet
5000 Watt	220 VAC	55 Amps to the Exciter/Amplifier Cabinet
	220 VAC	50 Amps to the Amplifier Cabinet
6000 Watt	220 VAC	65 Amp to the Exciter/Amplifier Cabinet
	220 VAC	60 Amps to the Amplifier Cabinet

3.1 Site Considerations

There are special considerations that need to be taken into account before the LX Series Power Amplifier Assembly and exciter/driver assembly can be installed. For example, if the installation is completed during cool weather, a heat-related problem may not surface for many months, suddenly appearing during the heat of summer. This section provides planning information for the installation and set up of the transmitter.

The AC input and current requirements for LX Series transmitters are as shown in Table 3-1.

NOTES: Transmitters 4000 Watts and above require two 220 VAC Inputs, one to each cabinet.
All currents are with a Black picture.

Check that your site has the needed power requirements. The AC to the transmitter is controlled by the main circuit breaker there is no in-cabinet circuit breaker.

The LX Series Transmitters are designed and built to provide long life with a minimum of maintenance. The environment in which they are placed is important and certain precautions must be taken. The three greatest dangers to the transmitter are heat, dirt, and moisture. Heat is usually the greatest problem, followed by dirt, and then moisture. Over-temperature can cause heat-related problems such as thermal runaway and component failure. Each amplifier module in the transmitter contains a thermal interlock protection circuit that will shut down that module until the temperature drops to an acceptable level.

A suitable environment for the transmitter can enhance the overall performance and reliability of the transmitter and maximize revenues by minimizing downtime. A properly designed facility will have an adequate supply of cool, clean air, free of airborne particulates of any kind, and no excessive humidity. An ideal environment will require temperature in the range of 40° F to 70° F throughout the year, reasonably low humidity, and a dust-free room. It should be noted that this is rarely if ever attainable in the real world. However, the closer the environment is to this design, the greater the operating capacity of the transmitter.

The fans are designed and built into the transmitter will remove the heat from within the modules, but additional means are required for removing this heat from the building. To achieve this, a few issues need to be resolved. The first step is to

determine the amount of heat to be removed from the transmitter room. There are generally three sources of heat that must be considered. The first and most obvious is the heat from the transmitter itself. This amount can be determined for a 1 kW transmitter by subtracting the average power to the antenna (695 watts) from the AC input power (4800 watts) and taking this number in watts (4105) and then multiplying it by 3.41. This gives a result of 13,998, the BTUs to be removed every hour. 12,000 BTUs per hour equals one ton. Therefore, a 1-1/4 ton air conditioner will cool a 1 kW transmitter.

The second source of heat is other equipment in the same room. This number is calculated in the same way as the equation for BTUs. The third source of heat is equally obvious but not as simple to calculate. This is the heat coming through the walls, roof, and windows on a hot summer day . Unless the underside is exposed, the floor is usually not a problem. Determining this number is usually best left up to a qualified HVAC technician. There are far too many variables to even estimate this number without reviewing the detailed drawings of the site that show all of the construction details. The sum of these three sources is the bulk of the heat that must be removed. There may be other sources of heat, such as personnel, and all should be taken into account.

Now that the amount of heat that must be removed is known, the next step is to determine how to accomplish this. The options are air conditioning, ventilation, or a combination of the two. Air conditioning is always the preferred method and is the only way to create anything close to an ideal environment.

Ventilation will work quite well if the ambient air temperature is below 100° F, or about 38° C, and the humidity is kept at a reasonable level. In addition, the air stream must be adequately filtered to ensure that no airborne particulates of any kind will be carried into the transmitter. The combination of air conditioning for summer and ventilation during the cooler months is acceptable when the proper cooling cannot be obtained through the use of ventilation alone and using air conditioning throughout the year is not feasible.

Caution: The use of air conditioning and ventilation simultaneously is not recommended. This can cause condensation in the transmitter.

The following precautions should be observed regarding air conditioning systems:

1. Air conditioners have an ARI nominal cooling capacity rating. In selecting an air conditioner, do not assume that this number can be equated to the requirements of the site. Make certain that the contractor uses the actual conditions that are to be maintained at the site in determining the size of the air conditioning unit. With the desired conditioned room temperature under 80° F, the unit must be derated, possibly by a substantial amount.

2. Do not have the air conditioner blowing directly onto the transmitter. Under certain conditions, condensation may occur on, or worse in the transmitter.

3. Do not separate the front of the transmitter from the back with the thought of air conditioning only the front of the unit. Cooling air is drawn in at the front of all transmitters and in the front and back of others. Any attempt to separate the front of the transmitter from the rear of the unit will adversely affect the flow of cooling air.

4. Interlocking the transmitter with the air conditioner is recommended to keep the transmitter from operating without the necessary cooling.

5. The periodic cleaning of all filters is a must.

When using ventilation alone, the following general statements apply:

1. The blower, with attendant filters, should be on the inlet, thereby pressurizing the room and preventing dirt from entering the transmitter.

2. The inlet and outlet vents should be on the same side of the building, preferably the leeward side. As a result, the pressure differential created by wind will be minimized. Only the outlet vent may be released through the roof.

3. The inlet and outlet vents should be screened with 1/8-inch hardware cloth (preferred) or galvanized hardware cloth (acceptable).

4. Cooling air should enter the room as low as practical but in no case higher than four feet above the floor. The inlet must be located where dirt, leaves, snow, etc., will not be carried in with the cooling air.

5. The exhaust should be located as high as possible. Some ducting is usually required to insure the complete flushing of heated air with no stagnant areas.

6. The filter area must be large enough to insure a maximum air velocity of 300 feet per minute through the filter. This is not a conservative number but a never-exceed number. In a dusty or remote location, this number should be reduced to 150 CFM.

7. The inlet and outlet(s) must have automatic dampers that close any time the ventilation blower is off.

8. In those cases in which transmitters are regularly off for a portion of each day, a temperature-differential sensor that controls a small heater must be installed. This sensor will monitor inside and outside temperatures simultaneously. If the inside temperature falls to within 5° F of the outside temperature, the heater will come on. This will prevent condensation when the ventilation blower comes on and should be used even in the summer.

9. A controlled-air bypass system must be installed to prevent the temperature in the room from falling below 40° F during transmitter operation.

10. The blower should have two speeds, which are thermostatically controlled, and be interlocked with the transmitter.

11. The blower on high speed must be capable of moving the required volume of air into a half inch of water pressure at the required elevation. The free air delivery method must not be used.

12. Regular maintenance of the filters, if used, can not be overemphasized.

13. Above 4000 feet, for external venting, the air vent on the cabinet top must be increased to an 8-inch diameter for a 1-kW transmitter and to a 10-inch diameter for 5-kW and 6-kW transmitters. An equivalent rectangular duct may be used but, in all cases, the outlet must be increased by 50% through the outlet screen.

14. It is recommended that a site plan be submitted to Axcera for comments before installation begins.

In calculating the blower requirements, filter size, and exhaust size, if the total load is known in watts, 2000 CFM into ½ inch of water will be required for each 5000 watts. If the load is known in BTUs, 2000

CFM into ½ inch of water will be required for each 17,000 BTUs. The inlet filter must be a minimum of seven square feet, larger for dusty and remote locations, for each 5000 watts or 17,000 BTUs. The exhaust must be at least four square feet at the exhaust screen for each 5000 watts or 17,000 BTUs.

The information presented in this section is intended to serve only as a general guide and may need to be modified for unusually severe conditions. A combination of air conditioning and ventilation should not be difficult to design (see Figure 3-1).

System interlocking and thermostat settings should be reviewed with Axcera. As with any equipment installation, it is always good practice to consult the manufacturer when questions arise. Axcera can be contacted at (724) 873-8100.

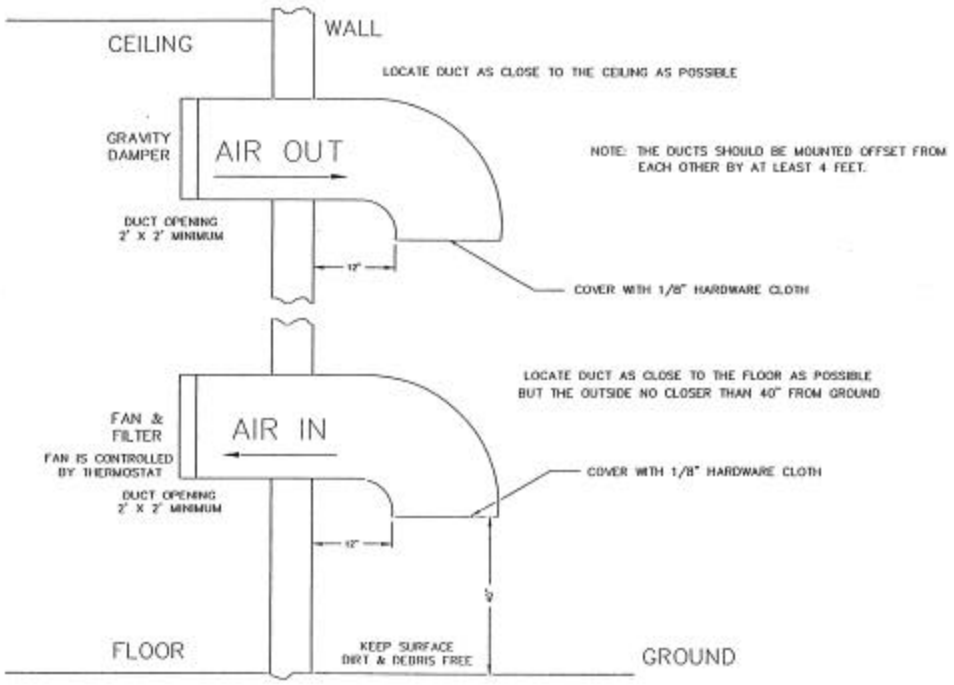


Figure 3-1. 1 kW Minimum Ventilation Configuration

NOTE: Typically the transmitter is shipped already mounted in the cabinets. If this is true the following sections may be skipped.

3.2 Unpacking the Chassis w/modules, bandpass filter and optional trap filter

Thoroughly inspect the chassis with modules and all other materials upon their arrival. Axcera certifies that upon leaving our facility the equipment was undamaged and in proper working order. The shipping containers should be inspected for obvious damage that indicates rough handling.

Remove the chassis and modules, along with bandpass filter and optional trap Filter, from the crates and boxes. Check for dents and scratches or broken connectors, switches, display, or connectors. Any claims against in-transit damage should be directed to the carrier. Inform Axcera as to the extent of any damage as soon as possible.

The modules are mounted to the chassis assembly with slides that are on the top and the bottom of the modules. There are two thumb screws on the front panel that hold each of the modules in place.

3.3 Installing the Chassis w/modules and filters

The exciter/driver and power amplifier chassis assemblies are made to mount in a standard 19" rack. The chassis assemblies mount using the four #10 clearance mounting holes on the ends. The chassis should be positioned; to provide adequate air intake into the front and the air exhaust of the fan in the rear; the ability to slide the modules out for replacement purposes; the installation of the bandpass filter; optional trap filter; the coupler assembly; and output transmission line. The chassis or cabinet in which it is mounted should be grounded using copper strapping material.

NOTE: To remove the driver/power amplifier module, mounted in the exciter/driver assembly, the input and output cables must be removed from the rear of the module and also a 6/32" x ½" Philips screw, mounted between the two connectors, needs to be removed before the module will pull out. After removal of the screw, which is used to hold the module in place during shipping, it does not need to be replaced. (See Figure 3-2)

NOTE: To remove the Combiner Module, found in the power amplifier assembly in high power transmitters, the output cable must be removed from the rear of the module and also two 8/32" x ½" Philips screws, mounted above the connector, need to be removed before the module will pull out. After removal of the screws, which are used to hold the module in place during shipping, they do not need to be replaced.

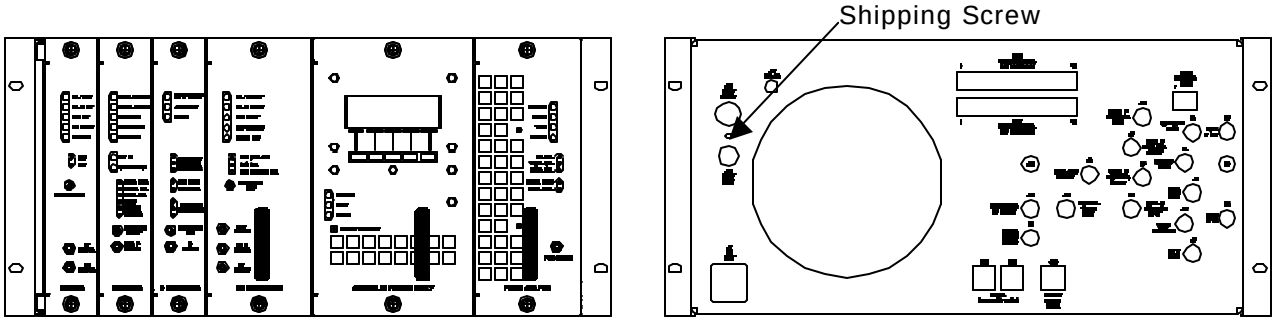


Figure 3-2. Front and Rear View Exciter/Driver

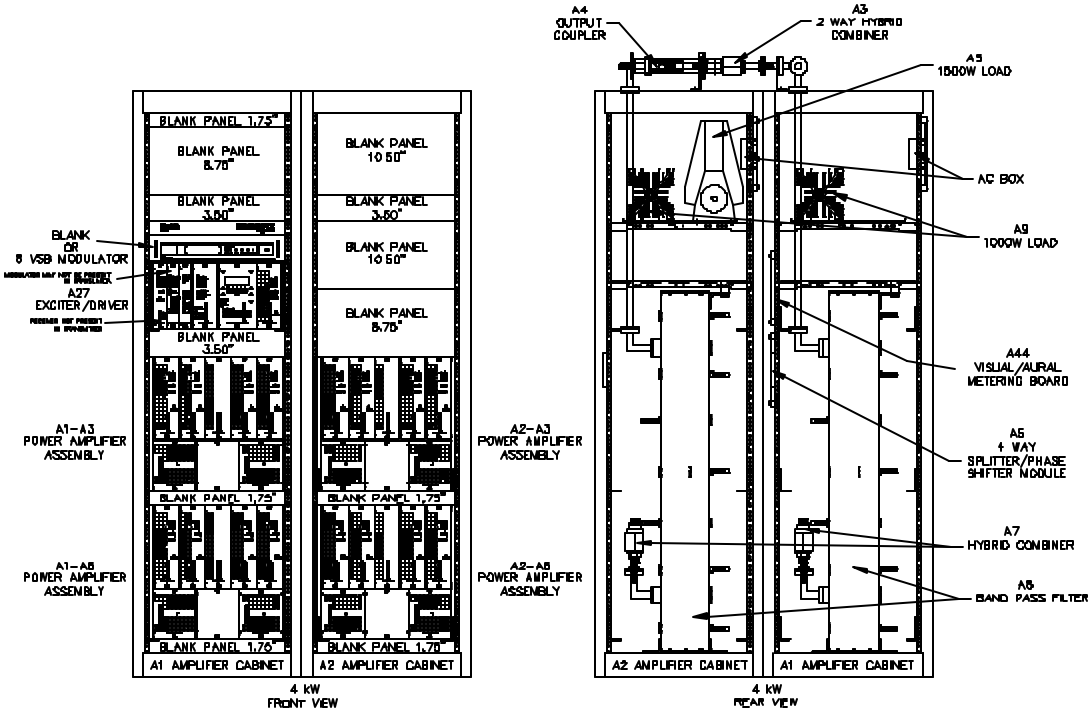


Figure 3-3. Front and Rear View 76" Cabinet Typical 4kW Configuration

Output Connections

Connect the transmission line for the antenna system to the output of the coupler assembly or the Bandpass Filter. If the optional trap filter is present in your system, a BNC sample jack is located on the trap filter and can be used for test purpose.

3.4 AC Input

Once the chassis and output connections are in place, the AC can be connected to the transmitter. The AC Input to the high power transmitter connects to the terminal block mounted in the AC input box located toward the rear, right side near the top of the cabinet. Connect the AC Input Line 1 to Line 1 on the terminal block, the AC Input Line 2 to Line 2 on the terminal block and the AC Input Ground to Ground on the terminal block.

Figure 3-4. AC Input Box Assembly.

Table 3-2: LX Series Transmitters AC Input and Current Requirements.

Transmitter	Voltage	Current
250 Watt	220 VAC	10 Amps to the Exciter/Amplifier Cabinet
500 Watt	220 VAC	15 Amps to the Exciter/Amplifier Cabinet
1000 Watt	220 VAC	25 Amps to the Exciter/Amplifier Cabinet
2000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
3000 Watt	220 VAC	65 Amps to the Exciter/Amplifier Cabinet

Transmitter	Voltage	Current
4000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
	220 VAC	40 Amps to the Amplifier Cabinet
5000 Watt	220 VAC	55 Amps to the Exciter/Amplifier Cabinet
	220 VAC	50 Amps to the Amplifier Cabinet
6000 Watt	220 VAC	65 Amp to the Exciter/Amplifier Cabinet
	220 VAC	60 Amps to the Amplifier Cabinet

NOTES: Transmitters 4000 Watts and above require two 220 VAC Inputs, one to each cabinet.

All currents are with a Black picture.

When the AC is connected to the terminal block in the AC input box, the AC is directly connected to the transmitter.

This completes the unpacking and installation of the LX Series UHF television transmitter. Refer to the setup and operation procedures that follow before applying power to the transmitter.

3.5 Setup and Operation

Initially, the transmitter should be turned on with the RF output at the directional coupler terminated into a dummy load of at least the rated power of the transmitter. If a load is not available, check that the output of the directional coupler is connected to the antenna for your system.

3.5.1 Input Connections

The input connections to the transmitter are to the rear of the exciter/driver chassis assembly for the transmitter or to the receiver tray in a translator.

NOTE: If the system contains two exciter assemblies and an exciter switcher, then the input connections must be made to both exciter/driver assemblies.

Refer to the tables and description that follows for detailed information on the input connections.

NOTE: If both the Receiver and Modulator are present in your system the Modulated IF output from the Receiver or Modulator must be selected. This is accomplished by connecting a low or removing the low to TB31-Pin 3 located on the rear of the exciter/driver assembly. By connecting the low, the Modulator IF output is used by the IF Processor module. By removing the low, the IF from the internal or external Receiver is used.

(**NOTE**: The IF Processor board must be configured for external switching by placing jumper W11 on J29 between pins 1 & 2. Normally, this is completed at the factory).

Figure 3-5: Rear View of LX Series Transmitter/Translator

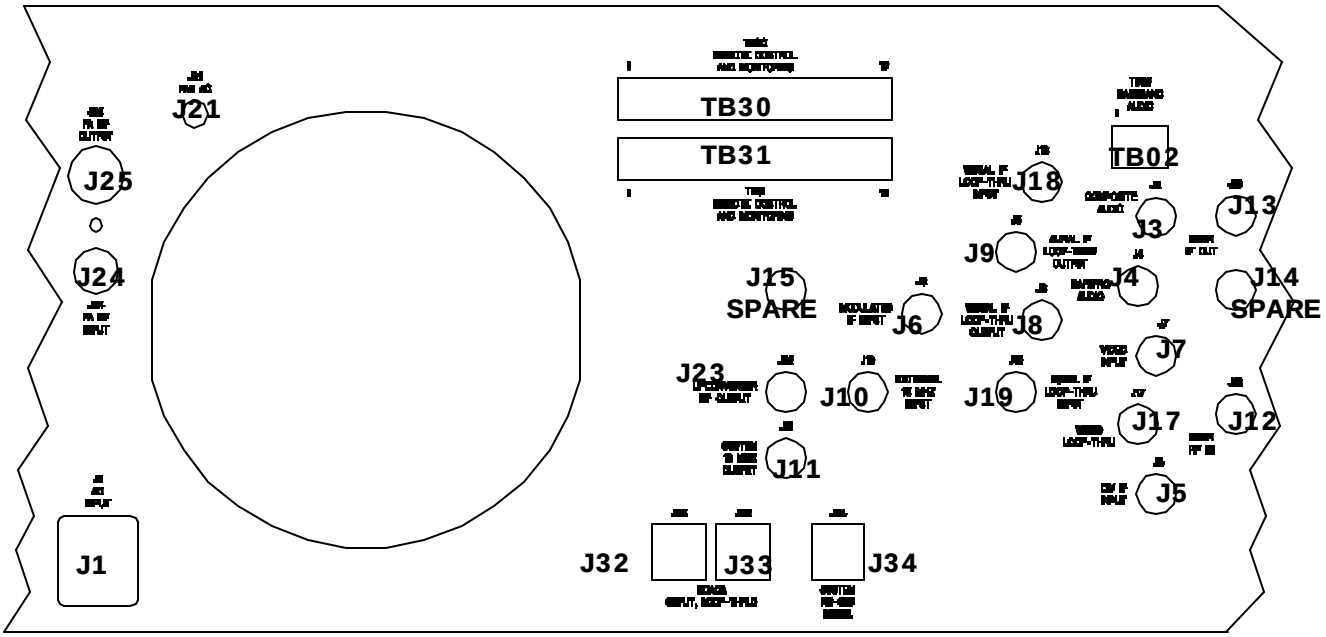


Table 3-3: Rear Chassis Connections for the LX Series Transmitter.

Port	Type	Function	Impedance
J1	IEC	AC Input	N/A
TB02	Term	Base Band Audio Input	600O
J3	BNC	Composite Audio Input	75O
J4	BNC	SAP / PRO Audio Input	50O
J5	BNC	CW IF Input	50O
J6	BNC	Modulated IF Input	50O
J7	BNC	Video Input (Isolated)	75O
J8	BNC	Visual IF Loop-Thru Output	50O
J9	BNC	Aural IF Loop-Thru Output	50O
J10	BNC	External 10 MHz Reference Input	50O
J11	BNC	System 10 MHz Reference Output	50O
J12	BNC	Receiver RF Input	50O
J13	BNC	Receiver IF Output	50O
J14	BNC	RF Spare 2	50O
J15	BNC	RF Spare 1	50O
J17	BNC	Video Loop-Thru (Isolated)	75O
J18	BNC	Visual IF Loop-Thru Input	50O
J19	BNC	Aural IF Loop-Thru Input	50O
J23	BNC	Upconverter RF Output	50O
J24	BNC	Power Amplifier RF Input	50O
J25	N	Power Amplifier RF Output	50O
TB30	Term	Remote Control & Monitoring	N/A
TB31	Term	Remote Control & Monitoring	N/A

Port	Type	Function	Impedance
J32	RJ-45	SCADA (Input / Loop-Thru)	CAT5
J33	RJ-45	SCADA (Input / Loop-Thru)	CAT5
J34	RJ-45	System RS-485 Serial	CAT5

3.5.2 Initial Turn On

Once the unit has been installed and all connections have been made, the process of turning on the equipment can begin. First verify that AC power is present and connected to the transmitter. Verify all cables are properly connected and are the correct type. Once all of these things are done, the unit is ready to be turned on following the procedures below.

NOTE: In systems with two exciters and an exciter switcher; complete the following procedure with Exciter A as the On Air exciter, then repeat with Exciter B as the On Air exciter. The exciter switcher must in Manual.

Turn on the main AC power source that supplies the AC to the transmitter. Check that the AC power plug is connected to J1 on the rear of the chassis assembly.

Monitor the LCD display located on the front of the control/monitoring module as you proceed through this section. When the transmitter is in the operate mode, the STB menu appears. When in the standby mode, the OPR menu appears. Press the NXT key after each menu to continue through to the next sequence.

3.5.2.1 (Optional) Receiver Module LEDs on Front Panel

Fault Indicators:

PLL 1 FLT: This illuminates Red when the Local Oscillator PLL is unlocked.

PLL 2 FLT: This illuminates Red when the optional input frequency correcting PLL is unlocked.

ALC FLT: This illuminates Red when the ALC can not maintain output level.

Status Indicators:

DC ON I/P: This indicator will illuminate Red when DC is applied to the RF input center conductor.

MAN ALC: This illuminates Red when the ALC can not maintain output level..

3.5.2.2 Modulator Module LEDs on Front Panel

Fault Indicators:

AUR UNLOCK: This illuminates Red when the Aural IF PLL is unlocked.

VIS UNLOCK: This illuminates RED when the Visual IF PLL is unlocked.

AUD OV DEV: This indicator will illuminate Red when the audio over-deviates the aural carrier.

VIDEO LOSS: This indicates the loss of Video to the modulator, when Red.

OVER MOD: This illuminates Red when the video is over-modulated.

Status Indicators:

ALT IF CW: This indicates that there is an external IF CW signal applied to the Modulator

10MHz PRES: This indicates the presence of a 10 MHz reference input.

3.5.2.3 IF Processor Module LEDs on Front Panel

Fault Indicators:

INPUT FAULT: This illuminates Red if the input to the module is missing or low.
ALC FAULT: This illuminates RED when the needed ALC value to maintain the output level is beyond the range of the circuitry.

MUTE: This indicator will illuminate Red when the transmitter is muted.

3.5.2.4 VHF/UHF Upconverter Module LEDs on Front Panel

Fault Indicators:

AGC FAULT: This illuminates Red if the required gain to produce the desired output level is beyond the value set by the AGC circuit. AGC out of range.

AGC OVERRIDE: This illuminates Red if the drive to the driver module is too high.

MAN GAIN: This illuminates Red if the AGC is bypassed in Manual.

PLL 1: This illuminates Red if the 1 GHz PLL is unlocked.

PLL 2: This illuminates Red if the 1.1-1.9 GHz PLL is unlocked.

3.5.2.5 Controller Module LEDs on Front Panel

Status Indicators:

OPERATE: This illuminates Green when transmitter is in operate.

FAULT: This illuminates Red when a fault has occurred in the transmitter.

DC OK: This illuminates Green when the DC outputs that connect to the modules in the transmitter are present.

3.5.2.6 Power Amplifier or Driver Module LEDs on Front Panel

NOTE: Both the PA Module and Driver Module have the same front panel LEDs.

Status Indicators:

ENABLED: This illuminates Green when the PA is in operate.

DC OK: This illuminates Green when the DC inputs to the PA module are present.

TEMP: This illuminates Green when the temperature of the heatsink in the PA is below 78°C.

MOD OK: This illuminates Green when the PA module is operating and has no faults.

If the Module OK LED is Red and blinking a fault is present. The meaning of the blinking LED is as follows.

1 Blink indicates Amplifier Current Fault.
2 Blinks indicate Temperature Fault.
3 Blinks indicate +32V Power Supply Over Voltage Fault.
4 Blinks indicate +32V Power Supply Under Voltage Fault.
5 Blinks indicate Reflected Power Fault.
6 Blinks indicate +12V or –12V Power Supply Fault

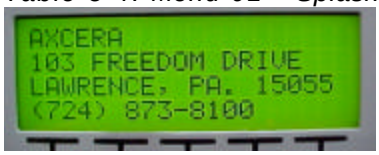
3.5.3 Front Panel Screens for the (Optional) Exciter Switcher Tray in Dual Exciter Systems

(Used in Dual Exciter Systems only)

The following screens are found on the 4 x 20 display located on the front of the single channel exciter switcher tray.

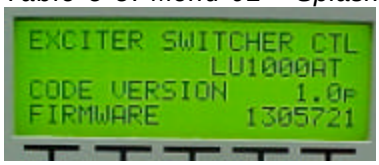
Display Menu Screens for the (Optional) Exciter Switcher Tray

Table 3-4: Menu 01 - Splash Screen #1



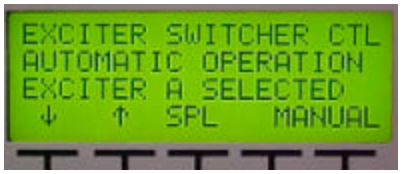
This is the first of the two exciter switcher splash screens that is shown for the first few seconds after reset or after pushing the SPL button on the Main Screen. Will automatically switch to the second splash screen.

Table 3-5: Menu 02 - Splash Screen #2



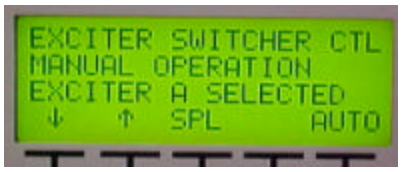
This is the second of the two exciter switcher splash screens. Will automatically switch to the Main Screen. The Name, Model Number, Code Version Number and Firmware Number for your system are displayed on this screen. Make note of these two numbers when conferring with Axcera on software problems.

Table 3-6: Menu 03 – Exciter Switcher Control Screen



This screen indicates that the exciter switcher is in automatic back-up and that Exciter A is selected as the On Air Exciter. By selecting MANUAL the screen is shown as below.

Table 3-7: Menu 04 – Exciter Switcher Control Screen



This screen indicates that the exciter switcher is in Manual operation and that Exciter A is selected as the On Air Exciter.

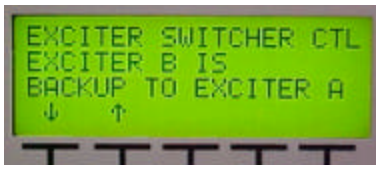
Table 3-8: Menu 05 – Exciter Switcher Control Screen

This screen indicates that there are 20 External Amplifiers reporting serial data in the system. Also indicates that Exciter A is selected as the On Air Exciter and that the system is in Manual, because the USE B option is present on the screen. By pushing the button under USE B you are able to select Exciter B as the ON Air Exciter.

Table 3-9: Menu 06 – Exciter Switcher Control Screen

This screen allows you to cancel the automatic back-up and that Exciter B is selected as the On Air Exciter.

Table 3-10: Menu 07 – Exciter Switcher Control Screen



This screen indicates that Exciter B is selected as Back up to the On Air Exciter A.

Table 3-11: Menu 08 – Exciter Switcher Control Screen

This screen is only displayed when an exciter back up sequence is initiated. The backup sequence runs through 10 steps that are displayed on 10 different screens. 9) Exciter A/B On, 8) Disabling Exciter A, 7) Disabling Exciter B, 6) Changing Relay 1 of 2, 5) Changing Relay 2 of 2, 4) Waiting for Relays, 3) Relay Change Done, 2) Enabling Exciter A, 1) Enabling Exciter B; 0) Exciter Change Done. If a problem occurs during the sequence it will stop on the screen where the problem occurred.

Table 3-12: Menu 09 – External Amplifier Status

These screens indicate the Status of the different Amplifier Modules. This screen is monitoring the power supply for Module 1 in Amplifier Set 1. By arrowing down, the next parameter for that module is viewed and these screens will continue for each individual module in each Amplifier Set.

Table 3-13: Menu 10 – External Amplifier Status with Serial Link Icon

Serial Link Icon
Indicates that this module is not present in your System or the module may be present but no serial communication commands are being received from the device.

3.5.4 Front Panel Screens for the Exciter/Amplifier Chassis Assembly

A 4 x 20 display located on the front of the Control & Monitoring/Power Supply Module is used in the LX Series transmitter for control of the operation and display of the operating parameters of the transmitter. Below are the typical display screens for the system and may vary depending on your system. The ↑ and ↓ characters are special characters used to navigate up or down through the menu screens. Display text flashes on discrete fault conditions for all screens that display a fault condition. When the transmitter is in operate mode, the STB menu appears. When the transmitter is in standby mode, the OPR menu appears.

NOTE: In systems with two exciters and an exciter switcher the following screens appear on the exciter that is selected as the On Air Exciter.

Display Menu Screens for the LX Series Transmitter/Translator

Table 3-14: Menu 01 - Splash Screen #1

This is the first of the two transmitter splash screens that is shown for the first few seconds after reset or after pushing the SPL button on the Main Screen. Will automatically switch to the second splash screen.

Table 3-15: Menu 02- Splash Screen #2

This is the second of the two transmitter splash screens. Will automatically switch to the Main Screen. The Model Number, Code Version Number and Firmware Number for your system are displayed on this screen. Make note of these two numbers when conferring with Axcera on software problems.

Table 3-16: Menu 10 - Main Screen:

This is the default main screen of the transmitter. When the transmitter is in operate, the 'STB' characters appear, allowing an operator to place the transmitter in STANDBY, by pushing the right most button located under to display. When the transmitter is in standby the 'STB' characters are replaced with 'OPR' and the forward power values are displayed as OFF. An operator can change the transmitter from STANDBY to OPERATE by pressing the right most button on the front panel display. If the transmitter is in operate mode but off due to a modulation fault, the display reports the system power as Auto Off. Pushing the SPL button will display the two splash screens.
If the ↓ key is activated the display changes to Menu 11, the System Error List Access Screen. If the ↑ key is activated the display changes to Menu 13, the Transmitter Configurations Access Screen.

Table 3-17: Menu 11 - Error List Access Screen

This screen of the transmitter shows the current number of errors, displayed in upper, right of screen (0), and provides operator access to view Menu 20, the error list screens, by pushing the ENT button. When ENT is pushed, Menu 20, the Error List Display Screen is displayed. If the ↓ key is pushed the display changes to Menu 12, Table 3-18, the Transmitter Device Data Access Screen. If the ↑ key is activated the display returns to Menu 10, the Main Screen.

Table 3-18: Menu 12 - Transmitter Device Data Access Screen

This screen of the transmitter allows access to various parameters of the transmitter system. This is the entry point to Menu 30, the System Details Screens, by pausing the ENT button. When the ENT button is pushed, Menu 30 is accessed. Go to Menu 30, Table 3-23 for set up details. Before pushing the ENT button: if the ↓ key is activated the display changes to Menu 13, Transmitter Configurations Access Screen. If the ↑ key is activated the display returns to Menu 11, the Error List Access Screen.

Table 3-19: Menu 13 - Transmitter Configuration Access Screen

This screen of the transmitter allows access to various software settings of the transmitter system. If ENT is pushed, go to Menu 40, Table 3-24, the access to transmitter configuration and set up. Before pushing the ENT button: if the ↓ key is activated the display returns to Menu 10, Main Screen. If the ↑ key is activated the display returns to Menu 12, the Transmitter Device Data Access Screen.

Table 3-20: Menu 20 - Error List Display Screen

This screen of the transmitter allows access to the system faults screens. Fault logging is stored in non-volatile memory. The transmitter's operating state can not be changed in this screen. The 'CLR' switch is used to clear previously detected faults that are no longer active. The ↑ key and ↓ key allow an operator to scroll through the list of errors that have occurred. The ESC button is used to leave this screen and return to Menu 11, Table 3-17, the Error List Access Screen. **NOTE:** Shown is example of a typical screen.

Menu 30 is entered by selecting ENT at Menu 12, Table 3-8.

Table 3-21: Menu 30 - Transmitter Device Details Screen

This screen allows access to the transmitter parameters of installed devices. The system is configured to know which devices are present. Current values for all installed devices are shown. If a module is not installed, only a "MODULE NOT PRESENT" message will be displayed. The first screen displayed is Menu 30-1, Table 3-22, the System Details Screen.

Table 3-22: Menu 30-1 – System Details Screen

The ↓ and ↑ arrows allow you to scroll through the different parameters of each device as shown in **Table 3-23**. Each System Component is a different screen. The proper IF Processor and the Driver or the Power Amplifier will be programmed for your system. The External Amplifier Modules will only be used in high power transmitters. Examples of External Amplifier Modules displays are: (AMP SET 1 MODULE 1) and (AMP SET 2 MODULE 4).

Table 3-23: Transmitter Device Parameters Detail Screens

System Component	Parameter	Normal	Faulted (Blinking)
Receiver Details (Not used with transmitter.)	AFC 1 LEVEL	0 - 10.00 V	N/A
	PLL 1 CIRCUIT	LOCKED	UNLOCKED
	ALC INPUT	OK	FAULT
	FAULT AT	0 - 10.00 V	FAULT
Modulator Details (May Not be used with receiver.)	PLL CIRCUIT	LOCKED	UNLOCKED
	OUTPUT LEVEL	.24 – 1.00 V	N/A
	AURAL DEVIATION	0 - 125 kHz	N/A
	CW INPUT	PRESENT	NOT USED
	CALL SIGN	NONE	N/A
IF Processor Details	INPUT SIGNAL STATE	OK	FAULT
	MODULATION	OK	FAULT
	INPUT IF	MODULATOR or J6	N/A
	DLC CONTROL LOCK	0 - 5.00 V	N/A
	ALC LEVEL	0 - 5.00 V	N/A
	ALC MODE	AUTO or MANUAL	N/A

System Component	Parameter	Normal	Faulted (Blinking)
Upconverter Details	AFC 1 LEVEL	0 – 5.00 V	N/A
	AFC 2 LEVEL	0 - 5.00 V	N/A
	CODE VERSION	x.x	N/A
	PLL 1 CIRCUIT	LOCKED	FAULT
	PLL 2 CIRCUIT	LOCKED	FAULT
	AGC 1 LEVEL	0 - 5.00 V	N/A
	AGC 2 LEVEL	0 - 5.00 V	N/A
	INT. 10 MHz	IS USED	N/A
System Control Details	SUPPLY ENABLED FOR	xxx HOURS	N/A
Driver and PA Details	POWER SUPPLY STATE, 32V	32 VDC	N/A
	±12V SUPPLY	OK or OFF	FAULT
	FORWARD POWER	xxx%	xxx%
	REFLECTED POWER	xxx%	xxx%
	AMP 1 CURRENT	xx.xA	xx.xA
	AMP 2 CURRENT	xx.xA	xx.xA
	TEMPERATURE	xxC	xxC
	CODE VERSION	x.x	N/A
	PA HAS OPERATED FOR	xxx HOURS	N/A
Ext. Power Amplifier Modules Details (Only in high power systems). Will indicate Amp Set and Module within the Set. Will step through each Set and Module.	POWER SUPPLY VOLTAGE, 32V	31 – 32 VDC	N/A
	32V SUPPLY	ENABLED or DISABLED	FAULT
	FORWARD POWER	xxx%	xxx%
	REFLECTED POWER	xxx%	xxx%
	AMP CURRENT 1	xx.xA	xx.xA
	AMP CURRENT 2	xx.xA	xx.xA
	AMP CURRENT 3	xx.xA	xx.xA
	AMP TEMPERATURE	xxC	xxC
	CODE VERSION	x.x	N/A
	PA HAS OPERATED FOR	xxx HOURS	N/A

Pushing the ↓ Down Arrow, after scrolling through all the detail screens, will put you back to Menu 30, Table 3-21. Push the ESC button to exit the Transmitter Device Parameter Screens to Menu 12, Table 3-18 to the Transmitter Device Parameter Access Screen.

Menu 40 (Table 3-24) is entered by selecting ENT at Menu 13.

Table 3-24: Menu 40 - Authorized Personnel Screen

This screen of the transmitter notifies an operator that they are only to proceed if they are authorized to make changes to the transmitter's operation. Changes made within the

following set-up screens can affect the transmitters output power level, output frequency, and the general behavior of the transmitter. Please do not make changes within the transmitter's set-up screens unless you are familiar with the operation of the transmitter. This screen is implemented in transmitter software version 1.4 and above.
Pressing ENT will put you into the Transmitter Set Up Screens for Menu 40.

A safeguard is added to the Set Up Menus in software version 2.5 and above. If a change is made to a screen within the Set Up Menus, when you go to the next menu, a new screen asks if you accept the change or want to return to the previous menu to reconsider the changes made.

To accept the changes, the two buttons located under ACCEPT must be pushed simultaneously.

To return to the previous Menu to make corrections, the two buttons located under the RETURN must be pushed simultaneously.

Upon returning to the previous Menu the correct input must be entered and the above procedure repeated, this time accepting the changes

Accept or Return to previous Menu Screen

Pushing these two buttons Simultaneously will accept the change.

Pushing these two buttons Simultaneously will return you to the previous Menu.

The Set Up Screens are shown in Table 3-25 Menu 40-1 through Table 3-42 Menu 40-18 that follow.

Table 3-25: Menu 40-1 - Transmitter Set-up: Power Control Screen

This screen of the transmitter is the first of several that allows access to transmitter set-up parameters. When + is selected, the Power will increase. When - is selected, the Power will decrease.

Table 3-26: Menu 40-2 - Transmitter Set-up: Model Select Screen

This screen is used to specify which components are expected to be part of the system. By specifying the model number, the transmitter control firmware knows which components should be installed and it will be able to display faults for components that are not properly responding to system commands.

Table 3-27: Menu 40-3 - Transmitter Set-up: Receiver Channel Configuration

This screen of the transmitter allows access to transmitter frequency set-up parameters. The choices of this screen are as follow. **NOTE:** The above screen will only be present if a Receiver is part of the system. Used to set the Receiver Channel designation and for custom Channel Offsets the setting of the PLL operating frequency.

Table 3-28: Menu 40-4 - Transmitter Set-up: Upconverter Channel Select Screen

The choices of this screen are to the standard UHF / VHF channels. The + and – buttons change the desired channel of the transmitter. The PLL frequency is set for custom Offsets within the upconverter frequency. Any change to the channel is immediately set to the LO / Upconverter Frequency Synthesizer PLL circuit.

Table 3-29: Menu 40-5 - Transmitter Set-up: Serial Address Screen

This screen allows the user to set the serial address of the transmitter. The default address is 5. This value and all other set-up parameters, are stored in non-volatile memory.

Table 3-30: Menu 40-6 - Transmitter Set-up: Station ID Screen

This screen allows the user to set the Station ID, Call Sign, in analog transmitters. If blank characters are used for all five positions, then the Station ID feature is disabled. Otherwise the Station ID code is transmitted every 15 minutes. This value and all other set-up parameters, are stored in non-volatile memory. (**NOTE:** If an external Receiver Tray is used in your system, the LX Series Station ID is disabled. Therefore, the Station ID must be set up in the external Receiver Tray.)

Table 3-31: Menu 40-7 - Transmitter Set-up: System Visual Power Calibration

This screen is used to adjust the calibration of the system's visual power. A symbol placed under the '6' character is used to show major changes in the calibration value. When the calibration value is at full value, the character will be full black. As the value decreases, the character pixels are gradually turned off. The calibration value is a value between 0 and 255 but the calibration value symbol only has 40 pixels. Therefore small changes in actual calibration value may not affect the symbol's appearance.

Table 3-32: Menu 40-8 - Transmitter Set-up: System Aural Power Calibration

This screen is used to adjust the calibration of the system's aural forward power. A calibration value symbol is used for this screen as on the previous screen.

Table 3-33: Menu 40-9 - Transmitter Set-up: System Reflected Power Calibration

This screen is used to adjust the calibration of the system's reflected power. Again a calibration value symbol is used for this screen as on the previous screens.

Table 3-34: Menu 40-10 - Transmitter Set-up: Modulated Output Calibration

In analog systems this screen is used to adjust the calibration of the system's modulated output signal detector. The calibration value symbol is again used to graphically represent the modulated output signal detector's calibration value.

Table 3-35: Menu 40-11 - Transmitter Set-up: Aural Deviation Calibration

In analog systems this screen is used to adjust the calibration of the system's aural deviation detector. The calibration value symbol is again used to graphically represent the aural deviation detector's calibration value.

Table 3-36: Menu 40-12 - Transmitter Set-up: Forward Power Fault Threshold Screen

This screen is used to set the minimum forward power fault threshold. When the transmitter is operating, it must operate above this value otherwise the system will shut down with fault for 5 minutes. If after five minutes the fault is not fixed, the transmitter will enable, measure power less than this value and again shut down for five minutes.

Table 3-37: Menu 40-13 - Transmitter Set-up: Reflected Power Fault Threshold

This screen is used to set the maximum reflected power fault threshold. When the transmitter is operating, it must not operate above this value otherwise the system will slowly begin to reduce the forward output power. If the system's reflected output power exceeds the maximum reflected power threshold by five percent or more, the transmitter will shut down with fault for 5 minutes. If after five minutes the fault is not fixed, the transmitter will enable, measure power above this value plus five percent and again shut down for five minutes. If the system's reflected output power exceeds the maximum reflected power threshold due to some condition like the formation of ice on an antenna, the transmitter reduces forward power to a level where the reflected power is less than this threshold. The transmitter will automatically increase its output power to normal operation when the cause of higher than normal reflected power is corrected.

Table 3-38: Menu 40-14 - Transmitter Set-up: Auto Stand-By Control

Certain LX transmitter locations are required to reduce to no output power on the loss of video input. When a LX transmitter is configured for Auto Stand-By On Modulation Loss, the transmitter will switch to stand-by, if a modulated input signal fault is detected by the IF Processor module that lasts for more than ten seconds. Once the modulated input signal fault is cleared, a transmitter in operate mode will return to normal operation. This feature is implemented in transmitter software version 1.4 and above.

Table 3-39: Menu 40-15 - Transmitter Set-up: Receiver ALC Fault Set Up

This screen is used to set up the level of the ALC at which the Receiver will fault. This feature is implemented in transmitter software version 2.0 and above. **NOTE:** The above screen will only be present if a Receiver is part of the system.

Table 3-40: Menu 40-16 - Transmitter Set-up: Inner Loop Gain Control

This screen is used to set up the Inner Loop Gain of the exciter/amplifier assembly. This feature is implemented in transmitter software version 2.0 and above

Table 3-41: Menu 40-17 - Transmitter Set-up: Optional System Control

This screen is used to set up any optional system, including the addition of the optional Modulator in a translator system. This feature is implemented in transmitter software version 2.0 and above.

Table 3-43: Menu 40-19 - Transmitter Set-up: Remote Commands Control

This screen is used to allow or deny the use of remote control commands. When disabled, remote commands are not used. Remote commands are commands received either through the rear terminal blocks or through serial messages.

Push the ESC button to exit the Transmitter Set Up Screens to Menu 13, Table 3-19, the Transmitter Configuration Access Screen.

This completes the description of the menu screens for the LX Series exciter/amplifier chassis assembly.

3.5.5 Operation Procedure

If necessary, connect the transmitter to the antenna. Check that the output is 100% and if needed, adjust the ALC Gain adjust pot on the front panel of the IF Processor to attain 100%. The power raise / lower settings, in the menus, are only to be used for temporary reductions in power. The power set-back values do not directly correspond to the power of the transmitter. Setting for 50% output sets a linear circuit voltage that is controlling a non-linear power circuit. (**NOTE**: For digital transmitters only)

NOTE: In systems with two exciters and an exciter switcher, repeat the proceeding procedure with Exciter B as the On Air exciter. The exciter switcher must in Manual.

This completes the Installation, Set Up and Turn On of the Transmitter.

If a problem occurred during the setup and operation procedures, refer to Chapter 5, Detailed Alignment Procedures, of this manual for more information.

Chapter 4
Circuit Descriptions

Power Amplifier Chassis Assembly

The RF from the exciter/driver assembly connects from the RF Output "N" Jack J25, through a RG-55 cable, to the PA RF Input "N" Jack J200 or J201, located on the rear of the PA chassis assembly. In systems with multiple Power Amplifier Assemblies, the RF output from the exciter/driver is split and then fed to each of the PA RF Input Jacks. In systems with two exciters and an exciter switch the RF outputs from the exciter/drivers are connected to the exciter switcher then the selected exciter output is either connected directly to the PA RF Input "N" Jack J200 or J201, located on the rear of the PA chassis assembly or is split and then fed to each of the PA RF Input Jacks.

The RF Input to the PA assembly is wired through UT-141 cable to the OSP port J111, J121, J131 or J141 on the PA chassis assembly, one for each 250W PA module slide in assembly. Jack J1 on the 250W PA module assembly connects to the OSP port when the module assembly is slid into the PA slot. In the 250W PA module, the RF is amplified and connected to the PA RF Output Jack or J2, located on the rear of the PA Module assembly. Jack J2 on the PA module connects to the J112, J122, J132 or J142 port, on the main chassis assembly, when the module assembly is slid into place. In a 250W system the output at J12 connects directly to J203 the 7/16" Jack that is located on the rear of the PA chassis assembly.

The RF outputs of the PA module assemblies are combined in a 2 way combiner in a 500 Watt system or in a 4 way combiner in a 1 kW system. The RF output jack of the PA chassis assembly is the output of the combiner at the 7/16" Jack J205 that is located on the rear of the PA chassis assembly.

4.1 (A4) Power Amplifier Module Assembly

The Power Amplifier Module Assembly contains (A1) a UHF Phase/Gain Board (1303213), (A2) a 150W Driver Pallet, Dual Output (1303293), (A3 & A4) UHF RF Module Pallet Assemblies (1300116), (A5) a 2 Way UHF Combiner Assembly (1303208), (A6) an Amplifier Control Board (1303682, 1301962 or 1303702) and (A7) a Temperature Sensor IC.

4.1.1 (A1) UHF Phase/Gain Board (1303213; Appendix B)

The RF input from J1 on the PA assembly connects to J1 on the Phase/Gain Board. The UHF phase/gain board provides the circuits that adjust the gain and the phase of the RF signal for the PA amplifier assembly in which it is mounted. The input signal connects to the gain circuit through the capacitor C13. The gain circuit consists of U1, R16, CR4, R22, R17, CR5, R23, R27 and the gain pot, R25. U1 is a 90°, 2-way splitter. The signal at pin 1 of U1 is split and applied to pins 3 and 4. The signal reflects off CR4 and CR5 and is passed to pin 2. The gain between pins 1 and 2 changes with the voltage applied across CR4 and CR5. This voltage is controlled by the gain-adjust pot R25. The more positive the voltage, the more the diodes CR4 and CR5 conduct therefore the less gain through the circuit. The gain controlled output is coupled through C14 and the pi-type divider circuit consisting of R8, R5 and R9 that drops the level before it applied to the phase-shifter circuit.

The level controlled signal connects to the phase-shifter circuit that consists of U2, C20, C21, CR2, and CR3. U2 is a 90°, 2-way splitter. The signal at pin 1 of U2 is split and applied to pins 3 and 4. The signal reflects off CR2 and CR3 and is passed to pin 2. The phase shift between pins 1 and 2 changes with the voltage applied across

CR2 and CR3. This voltage is controlled by the phase-adjust pot R24 through R26, R18 and R19. +12 VDC from an external switching power supply is applied to J3 on the board and is used as the reference that is applied to the phase-control pot. The gain and phase controlled output connects to J2 on the board.

4.1.2 (A2) 150 Watt Driver Pallet Assembly, Dual Output (1303293; Appendix B)

The output of the Phase/Gain Board is connected to the input J1 of (A2) the 150 Watt UHF amplifier assembly. The assembly contains a 150 Watt CW UHF Driver Board, Dual Output (1303169).

4.1.3 150 Watt Driver, Dual Output (1303169; Appendix B)

The board operates class AB and is a highly linear broadband amplifier for the frequency range of 470 to 860 MHz. It can deliver an output power of 150 watts (CW) with approximately 14 dB of gain.

The amplification circuit consists of LDMOS transistors Q1 and Q2 connected in parallel and operating class AB. The paralleling network is achieved with the aid of 3 dB couplers U3 and U4. The quiescent current settings are achieved by means of potentiometers R6 and R10. C39 and C38 are adjusted for best response. The settings are factory implemented and should not be altered.

PIN diode VR1 is a variable-damping circuit that is used to adjust the amplification of the module. The adjustment is performed with the Gain potentiometers R10 and R6. A readjustment of the amplification may be required, after repair work, to ensure that the PAs in multiple PA transmitters deliver the same output power.

4.1.4 (A3 & A4) UHF Module Assembly, RF Module Pallet, Philips (1300116;Appendix B)

The UHF Module Assembly, 250-watt module (Figure 4-1) is a broadband amplifier for the frequency range 470 to 860 MHz. The amplifier is capable of delivering an output power of 70 W_{rms}. The amplification is approximately 13 dB.

The amplification circuit consists of the parallel connected push-pull amplifier blocks V1 and V2 operating in class AB. In order to match the transistor impedance to the characteristic impedance of the input and output sides, matching networks are placed ahead and behind the amplifier blocks. Transformers Z3 to Z6 serve to balance the input and output signals. The paralleling circuit is achieved with the aid of 3-dB couplers Z1 and Z2.

The working point setting is factory implemented by means of potentiometers R9, R11, and R12 and should not be altered.

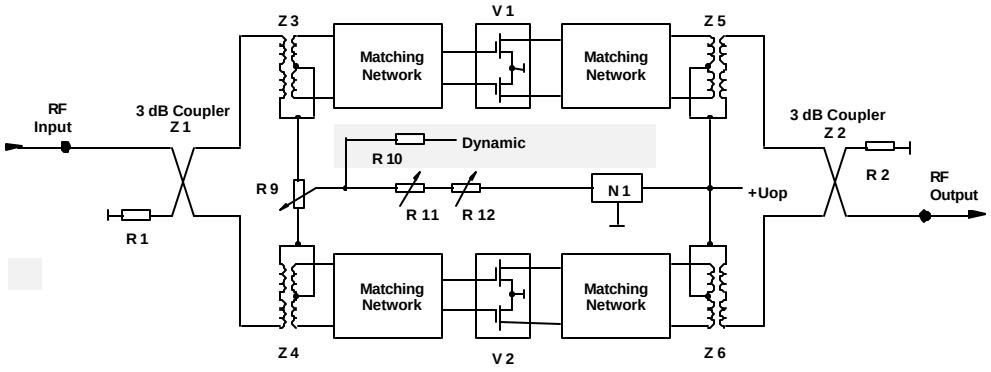


Figure 4-1. UHF Amplifier Module, 250 Watts

4.1.5 (A5) 2 Way UHF Combiner Assembly (1303208; Appendix B)

The 2 Way UHF combiner board assembly combines the two outputs of the UHF Module Assemblies and also provides forward and reflected power samples of the output to (A6) the amplifier control board where it connects to the input of the overdrive-protection circuit.

The RF inputs to the 2 way UHF combiner assembly, from the UHF amplifier modules, are soldered to the external connection points J3 and J4. The RF is combined by the stripline tracks and R5 a 100O matching resistor across the two inputs, to the RF Output solder connection point at J5. A hybrid-coupler circuit picks off a power sample that is connected to SMA type connector jack J1 as the forward power sample. Another power sample is taken from the coupler circuit that is connected to SMA type connector jack J2 as the reflected power sample. Two 50O terminations, created from two 100O resistors in parallel, used as dissipation loads, connect from the forward and reflected ports to ground.

4.1.6 (A5) Amplifier Control Board 1303682, 1301962 or 1303702; Appendix B)

The amplifier control board provides LED fault and enable indications on the front panel of the module and also performs the following functions: overdrive cutback, when the drive level reaches the amount needed to attain 110% output power; and overtemperature, VSWR, and overdrive faults. The board also provides connections to the LCD Display for monitoring the % Reflected Power, % Output Power, and the power supply voltage

If the Module OK LED on the front panel is Red and blinking a fault is present. The meaning of the blinking LED is as follows.

1 Blink indicates Amplifier Current Fault.
2 Blinks indicate Temperature Fault.
3 Blinks indicate +32V Power Supply Over Voltage Fault.
4 Blinks indicate +32V Power Supply Under Voltage Fault.
5 Blinks indicate Reflected Power Fault.
6 Blinks indicate +12V or –12V Power Supply Fault

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U4, located upper center of page, is an in circuit microcontroller. The controller is operated at the frequency of 3.6864 MHz using crystal Y1. Programming of this device is performed through the serial programming port J2. U4 selects the desired analog channel of U1 through the settings of PA0-PA3. The outputs of Port A must be set and not changed during an analog input read of channels PA5-PA7. PA4 of U4 is a processor operating LED that monitors the +/-12 VDC. PA5 is used to monitor the +12VDC supply to the board. PA6 is the selected channel of analog switch U1. PA7 is connected to a via, V10, for future access.

U6 is a serial to RS-485 driver IC. U7 is a watchdog IC used to hold the microprocessor in reset, if the supply voltage is less than 4.21 VDC. U7 momentarily resets the microcontroller if Pin 6 (!ST) is not clocked every second. A manual reset switch is provided but should not be needed. Located in the Upper left corner, U3 is used to determine where the amplifier control board is located. The eight inputs come from the main amp connector and are used to set the SCADA address of the controller. Pull-up resistors set a default condition of logic high.

U5 below U3 is used for getting digital input information of the board. Page two has several monitoring circuits that provide information on the amplifier's status. Many of these circuits automatically shut down the amplifier if a specific fault occurs.

U8 below U5 is used to control four board mounted status LEDs. A FET is turned On

to shunt current away from the LED to turn it Off. U9 below U8 is used to enable different features within the software. Actual use is to be determined.

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In the lower right corner are voltage regulator circuits. U22 should allow for 0.14 amps of power using its 92 C/W rating if Ta = 60°C max and Tj = 125°C max 0.26 amps can be obtained from U22 if the mounting pad is 0.5 square inches. The controller will not need this much current.

U23 and U24 are low drop out +5 VDC, voltage regulators with a tolerance greater than or equal to 1%. 100mA of current is available from each device but again the controller will not need this much current.

In the upper left section are circuits with U12 and U13. U12 is used to generate a regulated voltage that is about 5 volts less than the +32 VDC supply, approximately +26.25 VDC. When the +32 VDC supply is enabled, the circuitry around U13B is used to provide gate voltage to Q10 that is 5 volts greater than the source pin of this FET. The gate of Q10 can be turned Off by any one of a few different circuits.
U10A is used to turn Off the gate of Q10 in the event of high current in amplifier #1. At 0.886 VDC the current to amplifier #1 should be greater than 5 Amps. U11B is used to turn off the Q10 FET, if high current is detected in amplifier #2. U11A is used to turn off the Q10 FET, if high current is detected in amplifier #3. With 2.257 VDC at Pin 5 of U11B or Pin 3 of U11A, the voltage output of current sense amplifier U17 or U18 at high current shut down should be greater than 15 Amps.

U14B is used to turn Off the gate of Q10 in the event of high power supply voltage, approximately +35.4 VDC.
U14A is used to keep the FET disabled in the event of low power supply voltage, approximately +25.4 VDC.

Current monitoring sections of the board.

The ICs U16, U17 and U18 along with associated components set up the current monitoring sections of the board. R67, R68 and R69 are 0.01O/5W 1% through hole resistor is used for monitoring the current through several sections of the amplifier. The voltage developed across these resistors are amplified for current monitoring by U16, U17 or U18. The LT1787HVCS8 precision high side current sense IC amplifier accepts a maximum voltage of 60 VDC. The 43.2 kO resistor from pin 5 to ground sets the gain of the amplifier to about 17.28. This value is not set with much accuracy since the manufacturer internally matches the resistors of this part but their actual resistance value is not closely defined. A trimming resistor is suggested to give a temperature stability of –200 ppm/C, but instead the microcontroller will determine the exact gain of the circuit and use a correction factor for measurements. Circuit loading components are located in the lower portion of each current monitoring circuit. These components allow for short duration high current loading of the supply. By measuring the current through the sense resistor with and without the additional four 30.1 O 1% resistors. For very short duration pulses, a 1206 resistor can handle up to 60 watts. The processor requires 226 uSec per conversion. A supply voltage of +32 VDC will pass 1.06 amps + 1% through the load resistors.

A6 is a temperature sensor thermistor that is used to monitor the temperature of the module's heat sink. It connects to J6 pins 1 & 2 on the board and is wired to the comparator IC U10B. If the temperature increases above 75°C the output will go Low that is used as a temperature fault output, which generates a Fault alert at U15A and disables Amplifier #1.

Aural, Visual/Average and Reflected power detector sections of the board.

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A Forward Power Sample enters the board at SMA Jack J3 and is split. One part connects to J4 on the board that is cabled to J1, the SMA Forward Power Sample Jack, located on the front panel of the assembly. The other part of the split forward power sample is detected by CR17 and the DC level amplified by U25A. The output of U25A at pin 1 is split with one part connected to the Aural Power sample, which is not used in this digital transmitter. The other split output connects to U265A that is part of the Forward Average Power circuit. The detected level is connected to L4 that is part of an intercarrier notch filter circuit that is tuned to eliminate the 4.5 MHz aural intercarrier, if present. The Average power sample is amplified by U26D and connected through the average calibration pot R166 to U26C. The output of U26C is connected to the comparator IC U26B that has Aural Null and Offset Null, if present in the system, connected to the other input. The output Average Forward power level connects to J9 pin 2 of the board.

A Reflected Power Sample enters the board at SMA Jack J5 and is detected by CR20 and the DC level amplified by U28B. The output of U28B at pin 7 is connected through the reflected calibration pot R163 to U28C. The output is split with one part connected to J9 pin 5, the Reflected Power Output level of the board. The other part of the split from U28C connects to the comparator IC U28D that has a reference level connected to the other input. If the reflected level increases above the reference level a low output is produced and connected to the Reflected Power Shutdown circuit at CR28. The low shuts off Q14 causing pin 3 to go high that is connected to the inverter U15C. The output of U15C goes low producing a Reflected Power Fault that is connected to an output of the board, the Fault Alert circuit and also shuts down Amplifier #1.

Gain of the power measurements is completed through software. Only the Aural Null and Offset Null need to be done through front panel pots.

4.2 Power Supply Assembly (1302863; Appendix B)

The Power Supply Assembly contains (A1) a +32V/2000W switching power supply (1301504) and (A2) a ±12V/40W switching power supply (1303242). The +32VDC connects through J1 (+32VDC) and J2 (RTN) to the rest of the amplifier assembly. The +/-12VDC outputs, the +32VDC control lines and the 220VAC connect to the assembly through Jack J3.

Each Power Supply Assembly supplies voltages to two power amplifier assemblies.

This completes the description of the Power Amplifier Chassis Assembly, the Power Amplifier Module Assembly and the Power Supply Assembly.

Chapter 5
Detailed Alignment Procedures

This Power Amplifier Assembly along with the transmitter was aligned at the factory and should not require additional adjustments to achieve normal operation.

This transmitter takes the baseband audio and video inputs and converts them to the desired UHF On Channel RF Output at the systems output power level.

The Power Amplifier Assembly of the Innovator LX Series transmitter is of a Modular design and when a Module fails that module needs to be changed out with a replacement module. The failed module can then be sent back to Axcera for repair. Contact Axcera Customer Service Department at 724-873-8100 or fax to 724-873-8105, before sending in any module.

5.1 Module Replacement

Module replacement on the LX Series products is a relatively simple process. The power supply and power amplifier modules, plug into a blind mating connector located on the chassis. To replace a module, refer to the following procedure.

Loosen the two grip lock connectors, located on the front panel, at the top and bottom of the module, counterclockwise until the module releases.

NOTE: To remove the driver/power amplifier module, mounted in the exciter/driver assembly, the input and output cables must be removed from the rear of the module and also a 6/32" x ½" Philips screw, mounted between the two connectors, needs to be removed before the module will pull out. After removal of the screw, which is used to hold the module in place during shipping, it does not need to be replaced.

NOTE: To remove the Combiner Module, found in the power amplifier assembly in high power transmitters, the output cable must be removed from the rear of the module and also two 8/32" x ½" Philips screws, mounted above the connector, need to be removed before the module will pull out. After removal of the screws, which are used to hold the module in place during shipping, they do not need to be replaced.

After removal of the failed module, slide the replacement module in place and make certain it connects to the blind mate connector. Replace the two cables on the rear of the PA chassis assembly. If the replacement module does not slide in easily, verify it is properly aligned in the nylon tracks, located on both the top and bottom of the module.

Note: Each Module has an assigned slot and will not fit properly in the incorrect slot. Do not try to place a Module in the wrong slot as this may damage the slot or the blind mate connectors.

5.1.1 Initial Test Set Up

Check that the RF output at the coupler is terminated into a dummy load of at least the rated output of the system. While performing the alignment, refer to the Test Data Sheet for the transmitter and compare the final readings from the factory with the readings on each of the modules. The readings should be very similar. If a reading is way off, the problem is likely to be in that module.

Switch On the main AC for the system.

5.2 Innovator LX Series Exciter/Driver Chassis Assembly

This transmitter operates using the baseband audio and video inputs.

NOTE: In systems that contain two exciters with an exciter switcher, both exciters must have audio and video inputs. Each exciter should be operated one at a time using the following procedure by first selecting Exciter A as the On Air exciter then selecting Exciter B as the On Air exciter. The Exciter Switcher must be in the manual mode.

On the LCD Display, located on the Controller/Power Supply Module, in Transmitter Set-Up, push the right button to switch the transmitter to Operate, STB will be displayed.

The check of and the setup of the Audio and Video input levels are completed using the LCD Display and the front panel adjustments on the Modulator assembly. The level of the RF output includes adjustments of the drive level to the Power Amplifier and the adjustment of the linearity and phase predistortion to compensate for any nonlinear response of the Power Amplifier. The adjustments are located on the front panel of the IF Processor module.

5.2.1 (Optional) Receiver Module Assembly

NOTE: Not present in a Transmitter system.

Connect an on channel RF input to J12 the receiver RF input jack on the rear of exciter/driver assembly. Verify that all LEDs located on the front panel of the Receiver are Green. The following details the meaning of each LED:

PLL 1 Fault (DS6) - Displays the status of the Local oscillator PLL

PLL 2 Fault (DS8) - Displays status of optional input frequency correcting PLL

DC on center conductor (DS4) - Displays whether or not DC is applied to the RF input center conductor*

***Caution: Do not hook up the RF input to any test equipment with the DC bias applied. Always move the jumper W1 on J2 on the UHF Preamplifier board to the Bias off position, between pins 2 & 3, to prevent possible damage to the test equipment.**

5.2.2 Modulator Module Assembly

NOTE: The Modulator Assembly may not be present in a translator system.

The Modulator Assembly has adjustments for video levels and audio modulation levels, and other related parameters.

Connect an NTSC baseband video test signal input (1 Vpk-pk) to the transmitter video input jack J7 on the rear of the tray. Jacks J7 and J17 are loop-through connected; the J17 jack can be used as a video source for another transmitter. Connect a baseband audio input (+10 dBm) to the balanced audio input terminal block TB02-1 [+], TB02-2 [-], and TB02-3 [ground] or, if stereo/composite audio is provided, connect it to BNC jack J3, the composite audio input jack.

Verify that all LEDs located on the front panel of the Modulator are Green. The following details the meaning of each LED:

AURAL UNLOCK (DS5) – Red Indicates that 4.5 MHz Aural IF is unlocked from the 45.75 MHz visual IF.

VISUAL UNLOCK (DS6) – Red Indicates that the 45.75 MHz visual IF is unlocked from the 10 MHz reference.

AUDIO OVER DEVIATION (DS4) – Red Indicates that the input Audio level is too high.

VIDEO LOSS (DS1) – Red Indicates that the input Video level is too low.

OVER MODULATION (DS3) – Red Indicates that the input Video level is too high.

ALTERNATE IF (DS7) – Red Indicates that an external 45.75 MHz IF is not present to the modulator.

10 MHz PRESENT (DS2) – Red Indicates that an external 10 MHz reference in not present to the modulator.

Look at the front panel LCD meter on the Control/Power Supply Module Assembly. Set the LCD screen to the Modulator Details video output level screen, the screen indicates active video from 0 to 1 Vpk-pk. The normal video input level is 1 Vpk-pk on the front panel screen. If this reading is not at the proper level, the overall video level can be changed by adjusting the VIDEO LEVEL control R42 on the front panel of the Modulator to the 1 Vpk-pk level on the front panel screen.

Switch the LCD display to the Modulator Details screen that indicates the AUDIO DEVIATION (modulation level) of the signal from 0 to 100 kHz.

MONO SET UP: The modulator was factory set for a ±25-kHz deviation with a mono, balanced, audio input of +10 dBm. If the reading is not at the correct level, adjust the MONO Audio Gain pot R110, located on the front panel of the modulator, as necessary, to attain the ±25-kHz deviation on the front panel screen.

STEREO SET UP: The modulator was factory set for a ±75-kHz deviation with a stereo, composite, audio input of 1 Vpk-pk. If this reading is not correct, adjust the STEREO Audio Gain pot R132, located on the front panel of the modulator, as necessary, for the ±75-kHz deviation.

SECONDARY AUDIO SET UP: NOTE: Remove any stereo or mono audio modulation input to the transmitter during the set up of the secondary audio. The modulator was factory set for a ±15-kHz deviation with a secondary audio input of 1 Vpk-pk. If this reading is not correct, adjust the SAP/PRO Audio Gain pot R150, located on the front panel of the modulator, as necessary, for the ±15-kHz deviation.

5.2.3 IF Processor Module Assembly

Verify that all red LEDs located on the IF Processor front panel are extinguished. The following details the meaning of each LED when illuminated:

- DS1 (input fault) – Indicates that either abnormally low or no IF is present at the input of the IF Processor module.
- DS2 (ALC fault) – Indicates that the ALC circuit is unable to maintain the signal level requested by the ALC reference. This is normally due to excessive attenuation in the linearity signal path or the IF phase corrector signal path, or that switch SW1 is in the Manual ALC Gain position.
- DS4 (Mute) – Indicates that a Mute command is present to the system.

Switch the transmitter to Standby. The ALC is muted when the transmitter is in Standby.

5.2.4 VHF/UHF Upconverter Module Assembly

Switch the transmitter to Operate. Verify that all LEDs located on the front panel of the Upconverter are Green. The following details the meaning of each LED:

PLL 1 Fault (DS1) - Displays the status of the 1 GHz PLL, Green locked or Red unlocked

PLL 2 Fault (DS2) - Displays status of the 1.1-1.9 GHz PLL, Green locked or Red unlocked

AGC Fault (DS7) - Displays status of AGC, Green normal or Red out of range

AGC Override (DS3) - Displays status of AGC cutback, either Green normal drive level, no cutback, or too much

drive level to driver module, Red cutback.

Manual Gain (DS6) - Displays status of the control of the AGC level, either Green normal, AGC Adj. using R6 or Amber manual, Man Gain Adj. using R7.

5.2.5 Setting Up the Drive Level of the Transmitter Procedure

Setting the Manual AGC

Preset the front panel "Man Gain" pot on the Upconverter full **Counterclockwise**, and the Man/Auto Gain Switch to the **Left, Man.**

NOTE: The MAN/AUTO switch on this upconverter is the opposite polarity to the switch on the old upconverters for the LX transmitter.

Turn the transmitter to Operate, and slowly adjust the Man Gain pot until the desired % output power, as read on the LCD display, has been reached. The Manual AGC is now set. Normal operation of the Transmitter is in the Auto AGC position.

Setting the Auto AGC

With the transmitter in **Standby**, preset the AGC pot on the Upconverter full **Counterclockwise**. Preset the AGC Cutback pot on the Upconverter full **Clockwise**. Move the Man/Auto Gain Switch on the Upconverter to the **Right, Auto**. Switch the transmitter to **Operate** and slowly adjust the AGC pot until the desired output power has been reached.

Monitor the output of the transmitter with a Spectrum Analyzer and turn the power up 1 dB higher than desired using the AGC pot. Enter the Transmitter Set-Up menu on the LCD Control Panel and step through the screens until the screen labeled "Inner Loop Gain" is reached. The inner loop is adjustable from 0-255. Use the **+** button to increase the Inner Loop Gain until the power on the spectrum analyzer just begins to decrease. Use the **–** button to decrease the inner loop gain by 10%. (If it begins to affect power at setting 160, drop it back down to 160-16=144, if it affects power at 100, drop it down by 10 to 90, etc….).
Slowly turn the AGC Cutback Pot **Counterclockwise** until the AGC Override light begins to flicker, and the output power begins to drop. Turn the pot **Clockwise** slightly, so the light just goes out and the power stabilizes. Turn the AGC pot down to get back to the desired % output power level. The Auto AGC is now set. Normal operation of the Transmitter is in the Auto AGC position.

5.2.6 Changing the Transmitter Channel Procedure

Place the transmitter in Standby and go to the Set Up Menu, Transmitter Configuration Access Screen, on the LCD Display. Step through the screens until the screen labeled "Upconverter CH xx" is reached, where xx is the current channel that the upconverter is on. The channel number should be blinking. To change the channel, hit the **+** button to step through the channels until the desired channel is reached.

To select a 10kHz offset to the channel frequency, use the **>** button to move the curser to the LO frequency listed below the Channel number, and keep pressing the **>** button until the desired digit is blinking, and then use the **+** button to change the frequency.

Example:

Nominal LO frequency for Channel 14 = 0517.00 MHz. To generate a + offset, change the LO frequency to 0517.01 MHz. To generate a – offset, change the LO frequency to 0516.99 MHz.

5.2.7 Frequency Response Delay Equalization Adjustment

The procedure for performing a frequency response delay equalization

adjustment for the transmitter is described in the following steps:

The center frequency for the first stage is 45 MHz. Adjust R103, the top frequency response equalizer pot, located on the front panel of the IF Processor Module, for the best depth of frequency response correction at 45 MHz.

The center frequency for the second stage is 43.5 MHz. Adjust R106, the middle frequency response equalizer pot, located on the front panel of the IF Processor Module, for the best depth of frequency response correction at 43.5 MHz.

The center frequency for the third stage is 42 MHz. Adjust R274, the bottom frequency response equalizer pot, located on the front panel of the IF Processor Module, for the best depth of frequency response correction at 42 MHz.

After the three delay attenuation equalizers have been adjusted, fine tune, as needed, for the best frequency response across the channel.

NOTE: The frequency response adjustment is done at IF, so the frequency cut-in points will be reversed at the UHF frequencies.

5.2.8 Linearity Correction Adjustment

As shipped, the exciter was preset to include amplitude and phase pre-distortion.

The pre-distortion was adjusted to approximately compensate the corresponding non-linear distortions of the Power Amplifier.

NOTE: On the IF processor board inside the module, the correction enable/disable jumper W12 on J30 will be in the Enable position, on pins 2 & 3.

Set up a spectrum analyzer with 100 kHz resolution bandwidth and 100 kHz video bandwidth to monitor the intermodulation products of the RF output signal of the Power Amplifier.

A typical red field spectrum is shown in Figure 5-1. There are three Linearity Corrector stage adjustments located on the front panel of the IF Processor Module. The adjustments are threshold settings that are adjusted as needed to correct for any amplitude or phase intermod problems. Adjust the top linearity correction adjustment R211 threshold cut in for the in phase amplitude distortion pre-correction that is needed. Next adjust the middle linearity correction adjustment R216 threshold cut in also for the in phase amplitude distortion pre-correction that is needed. Finally adjust the bottom linearity correction adjustment R231 threshold cut in for the quadrature phase distortion pre-correction that is needed. The above pots are adjusted for the greatest separation between the peak visual carrier and the intermodulation products.

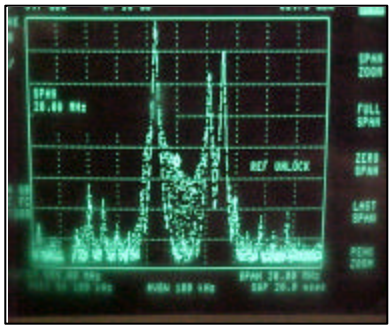

Figure 5-1. Typical Red Field Spectrum

5.3 Bandpass Filter

NOTE: If your system contains a Teracom manufactured tunable filter assembly, refer to the manufacturers manual included with the filter for instructions on tuning and ignore the following sections on the Axcera manufactured Bandpass and Trap Filter Assemblies.

NOTE: The bandpass filter and the (optional) trap filter are factory swept and should not be tuned without the proper equipment. Do not attempt to tune the filters without a sweep generator or, preferably, a network analyzer. If tuning is required, consult with the Axcera Field Support Department before attempting to tune the filters.

The input to the bandpass filter is the output of the Power Amplifier or the hybrid combiner. The filter is made of aluminum waveguide and has five resonant cavities. The filter has five bolts for tuning adjustments, three located in the middle on the left and two on the right, and four or six rods on the front of the bandpass filter, depending upon the channel, for coupling adjustments between the sections. The bandpass filter also utilizes two integral traps at -4.5 MHz and +9 MHz from F_V at the top and bottom, respectively, of the left-hand side of the bandpass filter, looking from the rear of the cabinet. Figure 5-2 shows the location of the bolts used for making tuning adjustments.

To tune the filter, connect a sweep signal to the input of the filter and adjust the five tuning bolts for a 6-MHz bandwidth and a flat-frequency response across the desired band.

NOTE: The bandpass ripple should be ≤0.25 dB. The 6-MHz band should also have a minimum of 20 dB return loss across the pass band.
See Table 5-1 for typical bandpass values.

Table 5-1. Typical Bandpass Values

FREQUENCY	INSERTION LOSS (dB)	RETURN LOSS (dB)
F_V - 4.5	≥ 35	
F_V - 0.5		≥ 20
F_V	≤ 0.6	≥ 20
F_a	≤ 0.6	≥ 20
F_V + 8.08	≥ 15	
F_V - 9	≥ 30	
$2F_V$	≥ 30	

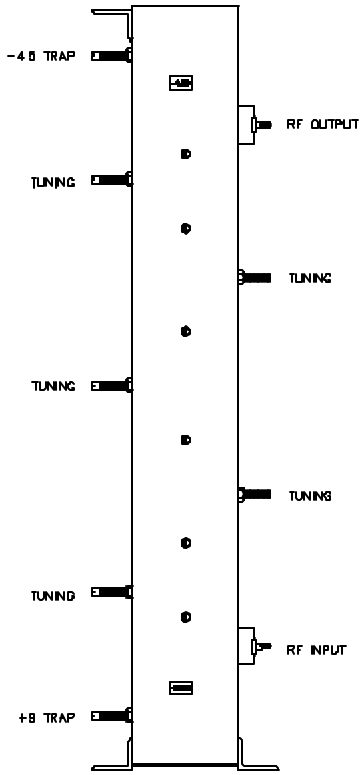

Figure 5-2. Bandpass Filter

5.4 (Optional) One- or Two-Section Trap Filter

The trap sections in the one- or two-section trap filter have been factory tuned and should not need major adjustments. The trap filter is optional and may not be part of this system. The input to the one- or two-section trap filter is the output of the bandpass filter. The trap filter is comprised of 3-1/8" EIA standard transmission line sections connected to the main transmission line. The transmission line assembly consists of 7/8" EIA standard rigid coaxial components.

The traps on the output trap filter are labeled with their center frequency relative to the frequency of the carrier (for example, the traps labeled -4.5 MHz are tuned for a center frequency of 4.5 MHz lower than the frequency of the visual carrier).

The trap sections are reflective notches and can be adjusted across the entire UHF frequency band. The electrical length of the outer sleeve and the center rod of the notch can be adjusted to tune the notch frequency. The depth of the notch is set by the gap between the center conductor of the trap section and the center conductor of the main line. Tight coupling makes a deep notch, while loose coupling makes a shallow notch. A one-section trap filter is shown in Figure 5-3.

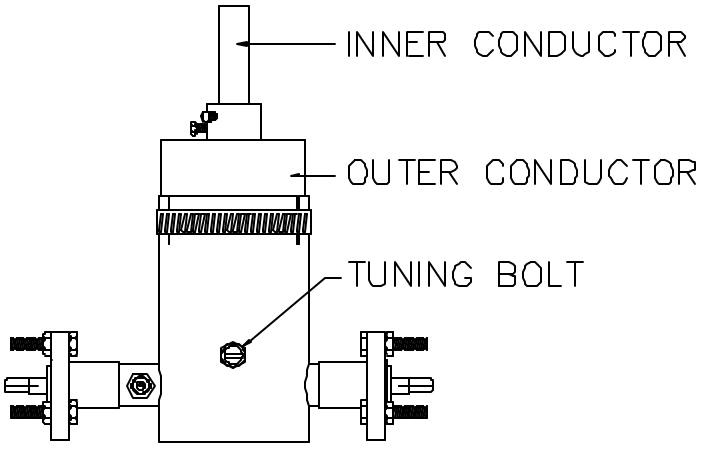

Figure 5-3. One-Section Trap Filter

5.4.1 Fine Tuning

Fine tuning of the center frequency of the notches can be accomplished with the tuning bolts on the side of the filter section. Loosen the nut that locks the bolt in place and adjust the bolt to change the frequency of the notch. Monitor the output of the transmitter with a spectrum analyzer and null the distortion product with the bolt. Red field is a good video test signal to use in order to see the +8.08-MHz product. Tighten the nut when the tuning is completed. Hold the bolt in place with a screwdriver as the nut is tightened to prevent the bolt from slipping.

5.4.2 Major Tuning

For major tuning, such as changing the notch depth or moving the notch frequency more than 1 MHz, the outer conductor and the center conductor of the trap section must both be moved. An RF sweep generator is required to perform major tuning. Apply the sweep signal to the input of the trap filter and monitor the output. Loosen the clamp holding the outer conductor in place and lengthen the conductor to lower the frequency of the notch or shorten it to raise the frequency of the notch. Loosen the center conductor with an Allen wrench and move it deeper for a lower-frequency notch or out for a higher-frequency notch. These adjustments must both be made to change the notch frequency. Moving only the center conductor or the outer conductor will effect the notch depth and the center frequency. The variable that is being adjusted with this procedure is the length of the center conductor inside the trap filter. The gap between the trap and the main line should not be changed. Moving only the inner or the outer conductors will effect the gap and the notch depth.

To only affect the notch depth, both sections have to be moved. The notch depth is controlled by the gap between the center conductor and the trap section. This gap also has an effect on the center frequency. To deepen the notch, shorten the outer conductor and pull out the center conductor until the notch is back in the same place. Move the sections in the opposite direction to make a shallow notch.

NOTE: The trap filter is typically adjusted for a notch depth of 10 dB.

The results of tuning the output trap filter are described in Table 5-2.

Table 5-2. Results of Tuning the Output Trap Filter

TUNING ADJUSTMENT	RESULT
Lengthening outer conductor only	Notch frequency up, shallower notch
Shortening outer conductor only	Notch frequency down, deeper notch
Inserting inner conductor deeper	Notch frequency down, deeper notch
Inserting less inner conductor	Notch frequency up, shallower notch
Tuning bolt in	Notch frequency down
Tuning bolt out	Notch frequency up
Moving both inner and outer conductors to keep the same gap inside	Center frequency moves, notch stays the same

After the tuning has been completed, tighten the clamp and the Allen screws that hold the conductors. Use the fine-tuning bolts to bring in the frequency. The final tuning adjustments should be completed with the transmitter driving the output trap filter for at least one hour to allow for warm-up drift.

5.5 Calibration of the Transmitter Forward Output Power Level

NOTE: Perform the following procedure only if the power calibration is suspect.

Switch the transmitter to Standby and preset R51, the aural null pot on (A4) the visual/aural metering board, fully CCW. Switch the LO/Upconverter sled to Manual Gain. Adjust R48, the null offset pot on the visual/aural metering board, full CW. Adjust CCW until 0% visual output is displayed on the LCD Display in the System Visual Power position. Perform the following adjustments with no aural present by removing the jumper cable, the aural IF loop-through, that is connected on the rear of the exciter/driver chassis. Connect a sync and black test signal to the video input jack of the exciter/driver. Switch the transmitter to Operate.

Next, set up the transmitter for the appropriate average output power level using the Manual Gain pot on the LO/Upconverter sled:

Example is for a 1000 Watt transmitter.

- Sync + black 0 IRE setup/wattmeter=595 watts
- Sync + black 7.5 IRE setup/wattmeter=545 watts

NOTE: The transmitter must have 40 IRE units of sync.

Adjust R28, visual calibration, on the (A4) visual/aural metering board for .8V, at TB30-14 and TB30-12 return, on the exciter/driver assembly, then adjust display to read 100% on the front panel meter in the System Forward Power position.

With the spectrum analyzer set to zero span mode, obtain a peak reference on the screen. Reconnect jumper cable on the rear of the exciter/driver. While in the Visual Output Power position, adjust L3 for a minimum visual power reading on the LCD display. Turn the power adjust pot on the LO/Upconverter sled front panel until the original peak reference level is attained. Peak L1 and C8 for a maximum aural power reading, then adjust R20 for .8V, at TB30-15 and TB30-12 return, on the exciter/driver assembly, then adjust LCD display for 100% system aural power reading. Switch to the Visual Output Power position and adjust R51 for 100% visual power on system LCD display.

5.6 Calibration of the Transmitter Reflected Output Level

On the meter, in the Visual Power position, turn the power adjust pot to 25%. Move the Reflected cable on the (A11) coupler to the unused "INC" port on the coupler. Then adjust R39 on (A4) the visual/aural metering board for a .2VDC, at TB30-13 and TB30-12 return, on the exciter/driver assembly. Then adjust the LED display for 25% reading in the System Reflected Power position. At this 25% reference power reading a reflected power fault should appear on the System Errors Menu. Turn the power adjust pot slightly CCW and the fault should be clearable on the System Error Menu. Turn the pot CW until the Fault appears. The reflected output power is now calibrated.

Switch the transmitter to Standby and move the Reflected power cable on the A11 Coupler back to the "Reflected Port".

Switch the transmitter to Operate and adjust the front panel power pot for a 100% visual power reading. Switch the LO/Upconverter to the Auto AGC position and adjust the ALC Gain adjust pot on the front of the IF Processor module for 100% visual power reading, if needed.

The Transmitter is ready for normal operation.

NOTE: In Dual Exciter Systems, with an exciter switcher, repeat the above procedure with Exciter B selected as the On Air Exciter. The exciter switcher must be in manual.

This completes the detailed alignment procedures for the LX Series transmitter.

If a problem occurred during the alignment, help can be found by calling Axcera field support at 724-873-8100.

APPENDIX A

LX SERIES
SYSTEM SPECIFICATIONS

Low Power Transmitter 10W-6kW

Designed to provide broadcasters with a product that will meet their needs like no other solution on the market, this new low to medium power transmitter line uses the latest LDMOS devices for broadband operation across the entire UHF band. This allows users to minimize spare parts stock, which is especially important to group owners and networks, and also enables simple and inexpensive channel changes.

The very compact and completely modular design uses a chassis/backplane configuration with parallel amplifier and power supply modules that can be removed and replaced while the transmitter is on the air. Additionally, the Innovator LX series was designed to be field upgradable to digital operation.

Configurations are available in power levels from 10 watts to 6 kilowatts analog and up to 3 kilowatts DTV, and all are manufactured in the USA by Axcera - *The RF Experts*.

Low Power Transmitter 10W - 6kW

Visual Performance

Frequency Range	470 to 806 MHz
Carrier Stability *(Transmitters)*	
Standard	±1 kHz
Optional	±350 Hz
w/PFC	±1Hz
Frequency Translation Stability *(Translators)*	
Standard	±1 kHz
Optional	±350 Hz
w/PFC	±1Hz
Regulation of RF Output Power	3%
Output Variation *(Over 1 Frame)*	2%
Sideband Response	
-1.25 MHz and below	-20 dB
-0.75 to -0.5 MHz	+0.5 db, -2 dB
-0.5 to +3.58 MHz	±0.5 dB
+3.58 MHz to +4.18 MHz	+0.5, -1.0 dB
Freq Response vs. Brightness	±0.5 dB
Visual Modulation Capability	1%
Differential Gain	5%
Incidental Phase Modulation	±3°
Linearity *(Low Frequency)*	5%

Visual Performance *(continued)*

Differential Phase	±3°
Signal-to-Noise Ratio	55 dB
2t K-Factor	2%
Noise Factor *(Translators)*	5 dB *(Max)*
w/Input Preamp	3 dB *(Max)*
Input Dynamic Range *(Translators)*	-60 dB to -15 dBm
w/Input Preamp	-75 dBm to -30 dBm
Env. Delay *(Transmitters)*	Per FCC Standard
Video Input *(Transmitters)*	75 ohms (Loop through)
Harmonics	-60 dB or better
Intermodulation Products	-52 dB or better
Spurious *(>3 MHz from channel edge)*	
100W and lower	-50dB or better
Greater than 100W	-60dB or better

Aural Performance

Frequency Deviation Capability (Transmitters)	±75 kHz
Distortion	0.5%
FM Noise	-60 dB
AM Noise	-55 dB
Aural to Visual Separation	4.5 MHz ± 100Hz
Composite Audio Input *(Multi-channel sound) (Transmitters)*	
Input Level	1V peak, nominal
Input Impedance	75 ohms, unbalanced
Frequency Range	
±0.1 dB response	50 Hz to 50 kHz
±0.5 dB response	30 Hz to 120 kHz
Monaural Audio Input *(Transmitters)*	
Input Level	0 to +10 dBm
Input	600 ohms, balanced
Freq Range *(±0.5 dB resp.)*	30 Hz to 15 kHz
Pre-emphasis	75µs
Subcarrier Input *(Transmitters)*	
Input Level	1V peak, nominal
Input Impedance	75 ohms, unbalanced
Freq Range *(±0.5 dB resp.)*	20 kHz to 120 kHz

General

Model Number*	LU10Ax	LU100Ax	LU250Ax	LU500Ax	LU1000Ax	LU2000Ax	LU3000Ax	LU4000Ax	LU5000Ax	LU6000Ax
Power Output *(Watts)*										
Visual *(Peak)*	10	100	250	500	1000	2000	3000	4000	5000	6000
Aural *(Avg.)*	1	10	25	50	100	200	300	400	500	600
Output Connector	N	N	7/8" EIA	7/8" EIA	7/8" EIA	7/8" EIA	31/8" EIA	31/8" EIA	31/8" EIA	31/8" EIA
Power Consumption *(Watts)*	250	675	1100	1900	3500	6700	10,250	13,500	16,700	19,900
Input Power										
Line Voltage *(Volts)*	117/230 ±10%		230 ± 10%							
Power Requirements			Single Phase, 50 or 60 Hz							
Size *(H x W x D)*	8.75"x19"x23" *(Chassis Only)*		55"x22"x34"				76"x22"x34"	76"x44"x34"		
Weight *(lbs.)*	45	45	340	360	400	550	700	1030	1180	1330
Operational Temperature Range	0 to +50°, derate 2°C/1000 ft.									
Maximum Altitude[3]	8500 feet (2600m) AMSL									
Operational Humidity Range	0% to 95% non-condensing									
RF Load Impedance	50 Ω									

** For transmitters use "T" suffix, translators use "L" suffix (ex. LU100AT - 100W Transmitter)*

APPENDIX B

DRAWINGS AND PARTS LISTS

LX Series High Power System

LX Series Transmitter Block Diagrams..... (6 kW) 1304561

LX Series System Typical Racking Plan Drawings..... (6 kW) 1304310

Chassis Assembly, Power Amplifier, LX Series

250W LX Series Power Amplifier Chassis Assembly Block Diagram.....1305195
500W/1 kW LX Series AC Harness Chassis/Airbox I/C.....1303960
500W/1 kW LX Series DC Harness Chassis/Airbox I/C.....1303961
500W/1 kW LX Series Coax Assembly Chassis/Airbox Interconnect.....1303480

Chassis Assembly, Power Amplifier, LX Series - continued

2 Way Splitter/Phase Shifter Assembly (Used with multiple Power Amplifier Assemblies)
2 Way Splitter/Phase Shifter Schematic 1303569

4 Way Splitter Module Assembly (Used with multiple Power Amplifier Assemblies)
Contains a 4 Way Splitter Board (1303234).

4 Way Splitter Board
Schematic 1303237

4 Way Combiner Module Assembly (Used with four Power Amplifier Assemblies)
(This combiner or the 1303545 combiner will be used)
4 Way Combiner Board Schematic 1303655

External Amplifier Signal Board, LX Series
Schematic 1303346

Visual/Aural Metering Board
Schematic 1265-3309

Power Amplifier Assembly, 250 Watt, LX Series
(Each Amplifier Assembly supplies 250 Watts)

Block Diagram.....1303585
Interconnect.....1303510

RF Module Pallet w/o Transistors
Made into a RF Module Pallet, w/ Philips Transistors (1300116).
Schematic ..... 51-5379-309-00 WSP

RF Module Pallet, Philips
Made from a RF Module Pallet w/o Transistors (1152336).

Amplifier Control Board
Schematic 1303683

150-Watt UHF Driver Pallet Assembly
Schematic 1303171

2-Way Combiner Board Assembly
Schematic 1303211

UHF Phase/Gain Board
Schematic 1303216

Power Supply Assembly, 1 kW, LX Series
(One Power Supply Assembly Supplies Power to Two Amplifier Assemblies)

APPENDIX C

TRANSMITTER LOG SHEET

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
DATE READINGS TAKEN						
Model Number						
Code Version						
Firmware Number						
OUTPUT MEASUREMENTS						
% VISUAL POWER						
% AURAL POWER						
RECEIVER DETAILS	**NOT USED WITH TRANSMITTER**					
AFC 1 LEVEL						
PLL 1 CIRCUIT						
ALC INPUT						
FAULT AT						
MODULATOR DETAILS	**MAY NOT BE USED WITH TRANSLATOR**					
PLL CIRCUIT						
OUTPUT LEVEL						
AURAL DEVIATION						
CW INPUT						
CALL SIGN						
IF PROCESSOR DETAILS						
INPUT SIGNAL STATE						
MODULATION						
INPUT IF						
DLC CONTROL LOCK						
ALC LEVEL						
ALC MODE						
UPCONVERTER DETAILS						
AFC 1 LEVEL						
AFC 2 LEVEL						
CODE VERSION						
PLL 1 CIRCUIT						
PLL 2 CIRCUIT						
AGC 1 LEVEL						
AGC 2 LEVEL						
INT. 10 MHz						
SYSTEM CONTROL DETAILS						
Power Supply Enable For						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
DRIVER AND PA DETAILS						
POWER SUPPLY STATE, 32V						
FORWARD POWER						
REFLECTED POWER						
AMP 1 CURRENT						
AMP 2 CURRENT						
TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
EXT. PA AMPLIFIER MODULES	**ONLY IN HIGH POWER SYSTEMS**					
AMP SET 1 MODULE 1	**Will indicate Amp Set and Module within the Set. Will step through each Set and Module.**					
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 1 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 1 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 1 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 2 MODULE 1						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 2 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 2 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 2 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 3 MODULE 1						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 3 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 3 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 3 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 4 MODULE 1						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 4 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 4 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 4 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 5 MODULE 1						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 5 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 5 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 5 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 6 MODULE 1						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 6 MODULE 2						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						
AMP SET 6 MODULE 3						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
AMP SET 6 MODULE 4						
POWER SUPPLY VOLTAGE, 32V						
32V SUPPLY						
FORWARD POWER						
REFLECTED POWER						
AMP CURRENT 1						
AMP CURRENT 2						
AMP CURRENT 3						
AMP TEMPERATURE						
CODE VERSION						
PA HAS OPERATED FOR						

NOTE: The previous Log Sheet readings can be taken from the System Details Screen, Menu 30-1, on the 4 x 20 Display located on the front of the Control & Monitoring/Power Supply Module.