INSTRUCTION MANUAL

Innovator
LX Series
Digital 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. Information and drawings on the exciter/driver assembly are contained in Volume 1. 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. **Appendix A** contains system specifications. **Appendix B** contains drawings and parts lists. **Appendix C** contains a transmitter log sheet.

1.2 Assembly Designators

Axcera has assigned assembly numbers, Ax designations such as A1, where x=1,2,3…etc, to all assemblies, modules, and boards in the system. These designations are referenced in the text of this manual and shown on the block diagrams and interconnect drawings provided in the appendices. The Block Diagrams, Interconnects, Schematics, Assembly Drawings and Parts Lists are arranged in increasing numerical order in the appendices. Section titles in the text for assembly or module 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.

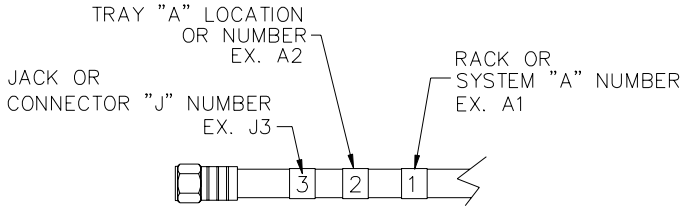


Figure 1-1 Brady Marker Identification Drawing

1.3 Safety

The UHF transmitter systems manufactured by Axcera are designed to be easy to use and repair while providing protection from electrical and mechanical hazards. Please review the following warnings and familiarize yourself with the operation and servicing procedures before working on the transmitter system.

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

Retain Manuals – The manuals for the transmitter should be retained at the transmitter site for future reference. Axcera provides 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 Operating Instructions – All of the operating and use instructions for the transmitter 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 cabinet and module front panels are provided for ventilation. To ensure the reliable operation of the driver/transmitter, 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#).

The 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 exchanged 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 @ (724) 873-8100. 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, bulbs or LEDs.

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 ⋗

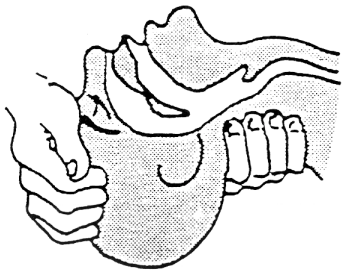
DO NOT ATTEMPT TO REPAIR OR TROUBLESHOOT THIS EQUIPMENT UNLESS YOU ARE FAMILIAR WITH ITS OPERATION AND EXPERIENCED IN SERVICING HIGH VOLTAGE EQUIPMENT. LETHAL VOLTAGES ARE PRESENT WHEN POWER IS APPLIED TO THIS SYSTEM. IF POSSIBLE, TURN OFF POWER BEFORE MAKING ADJUSTMENTS TO THE SYSTEM.

★ 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 a 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, dBμV, & VOLTAGE EXPRESSED IN WATTS

50 Ohm System

WATTS	PREFIX	dBm	dBw	dBmV	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

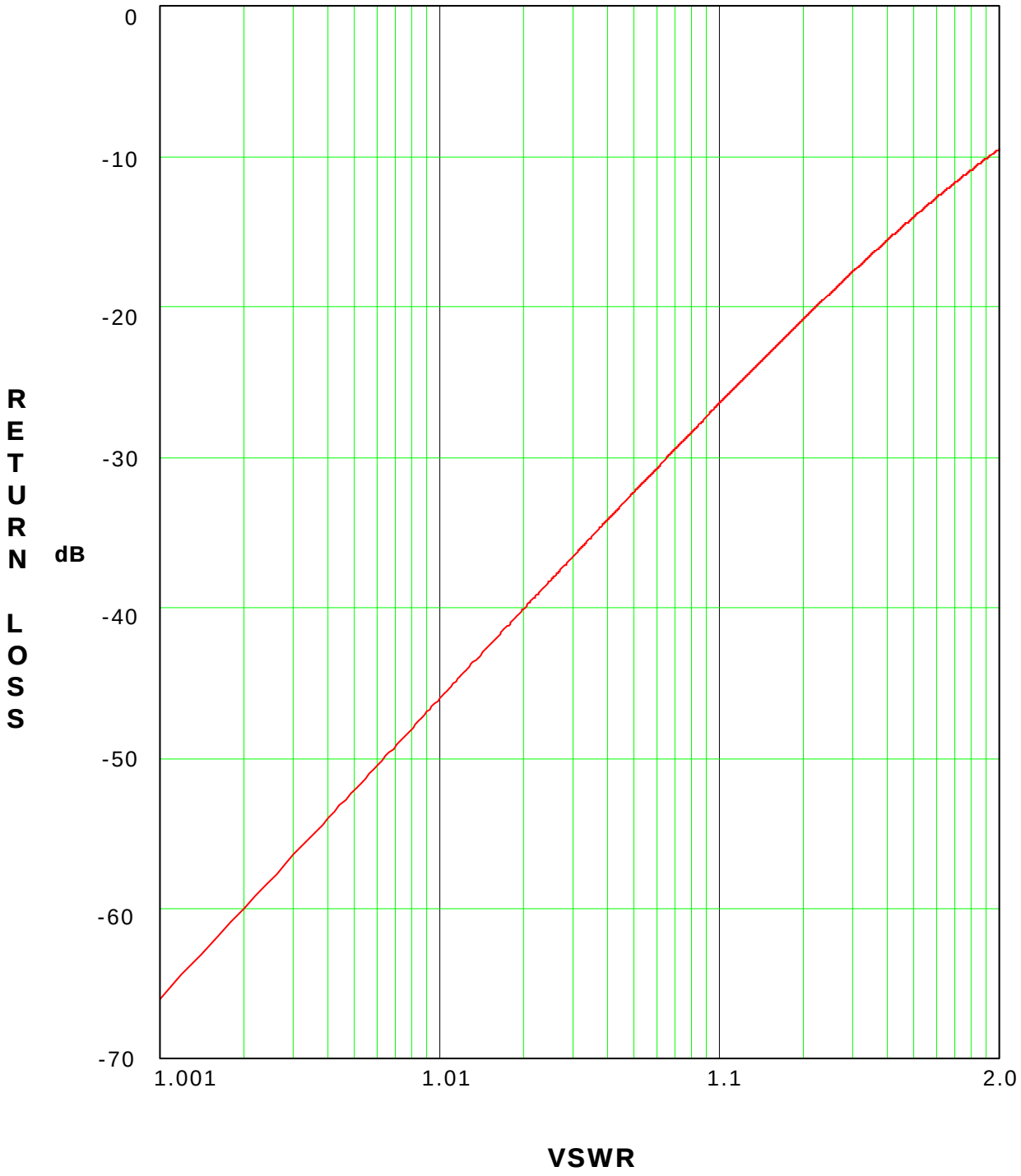
NOMENCLATURE OF FREQUENCY BANDS

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

RETURN LOSS VS. VSWR



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

DTV Digital Television

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

SMPTE Society of Motion Picture and Television Engineers

VSB Vestigial Side Band

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 125 Watts Digital output. There is also needed one external Power Supply Module Assembly for every two 125 Watt PA modules, which also slide into the Power Amplifier Chassis Assembly, under the PA Modules. One On/Off circuit breaker, mounted on the rear of the power amplifier assembly, supplies AC to each power supply assembly. Four PA modules and two Power Supply modules are the maximum number of modules in one Power Amplifier Chassis Assembly producing 500W Digital output power. Two Power Amplifier Chassis Assemblies are required for 1 kW digital output power, three Power Amplifier Chassis Assemblies for 1.5 kW digital, four Power Amplifier Chassis Assemblies for 2 kW digital, five Power Amplifier Chassis Assemblies for 2.5 kW digital, and six Power Amplifier Chassis Assemblies are required for 3 kW digital output power.

In a 125W digital 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 250W or 500W digital 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 1 kW digital 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 1.5 kW digital 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 2 kW digital 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 2.5 kW digital 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-A3) and (A1-A6) power amplifier chassis assemblies at J200. The third and fourth output of the (A1-A5-A2) splitter at J2 and J4 are terminated. The other output of the (A1-A5-A1) 2 Way 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-A3), (A1-A6) and (A1-A13) power amplifier chassis assemblies at J200. The other output of the (A2-A5) splitter at J4 is terminated.

In a 3 kW digital 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 125W, 250W or 500W digital system, the system serial cable connects from J34 on the exciter/driver assembly to J232 on the (A3) Power Amplifier Assembly.

In a 1 kW digital 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 1.5 kW digital 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 2 kW digital 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 2.5 kW digital 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 3 kW digital 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 125W digital 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.

2.1.1.1 125 Watt Digital Power Amplifier Chassis Configuration

In a 125 Watt digital 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.

2.1.1.2 250 Watt Digital Power Amplifier Chassis Configuration

In a 250 Watt digital power amplifier chassis assembly, Jacks J103 and J104, on the 4 way splitter assembly, are not used and are terminated with 50Ω. 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 500W Digital Power Amplifier Chassis Configuration

In a 500W digital 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.

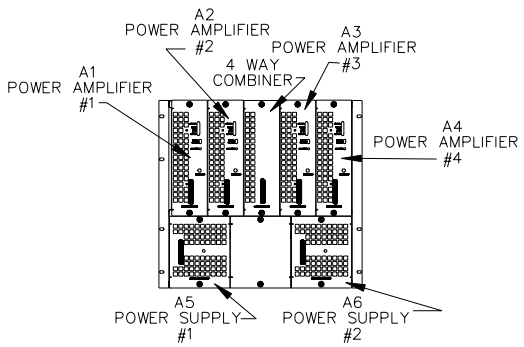


Figure 2-1. 500W Digital Power Amplifier Assembly Racking Plan

In a 500W digital 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 Digital System Configuration Drawings and Parts Lists

DIGITAL SYSTEM CONFIGURATIONS	INTERCONNECT	RACKING PLAN	PARTS LIST
125W	1303940	1303596	1303913
250W	1303940	1303596	1303893
500W	1303940	1303596	1303894
1 kW	1303941	1303596	1303895

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.

2.1.2.1 125 Watt, 250 Watt or 500W Digital Output System Configurations

In a 125 Watt digital 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 250 Watt or 500W digital 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) Dual Peak Detector Board. The Dual Peak Detector Board supplies reflected and forward output power samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13 and the forward sample at TB31-14. The RF output for the transmitter is at J2 the 7/8" EIA connector on the (A11) coupler assembly.

2.1.2.2 1 kW Digital Output System Configuration

In a 1 kW digital 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 digital bandpass filter. The filtered output of the bandpass filter is connected to (A14) the low pass filter assembly. The output of the filter is either cabled directly to the (A11) output coupler or first to an optional 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) Dual Peak Detector Board. The Dual Peak Detector Board supplies reflected and forward output power samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13 and the forward sample at TB31-14. The RF output for the transmitter is at J2 the 7/8" EIA connector on the (A11) coupler assembly.

2.1.2.3 1.5 kW Digital Output System Configuration

In a 1.5 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 (A15) the digital bandpass filter, (A14) the low pass filter, (A10) the optional output trap filter and (A11) the output coupler. The output coupler assembly supplies a forward and a reflected sample to the (A44) Dual Peak Detector Board. The Dual Peak Detector Board supplies samples to the exciter/driver for metering purposes. The reflected sample connects to TB31-13 and the forward sample to TB31-14. 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 2kW Digital Output System Configuration

In a 2 kW digital 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) Dual Peak Detector Board. The Dual Peak Detector Board supplies a reflected power sample to TB31-13 and a forward power sample to TB31-14 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 2.5kW Digital Output System Configuration

In a 2.5 kW digital 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 (A2) cabinet assembly, the outputs of the (A2-A3, A2-A6, and A2-A13) power amplifiers at the "7/16" connectors J205, are cabled to the J1, J2 & J3 input jacks of (A2-A7) a 3 way hybrid combiner. A 500 Watt reject load (A2-A5), that dissipates reject power, is mounted near the top of the (A2) cabinet facing the rear and is connected to (J5) on the hybrid combiner. 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 combining process for the (A2) amplifier cabinet. Another 500 Watt reject load (A2-A8), that dissipates reject power, is mounted next to the other load also facing the rear of the (A2) cabinet and is connected to (J4) on the hybrid combiner. 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 process in the (A2) amplifier cabinet. This fault is in parallel with the other fault line. The combined output of the A2 cabinet at (A2-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 (A1) cabinet, the outputs of the (A1-A3 and A1-A6) power amplifiers at the "7/16" connectors J205, are cabled to (A1-A7) hybrid combiner. A 500 Watt reject load (A1-A18) connects to (J4) on the hybrid combiner to dissipate reject power. 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 during the combining in the (A1) amplifier cabinet. The combined output of the A1 cabinet at (A1-A7-J3) 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 (A1-A9), which 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 combing of the (A1) and the (A2) amplifier cabinets. This fault is in parallel with the other overtemperature fault lines.

The combined output of the (A3) combiner connects to the (A8) digital bandpass filter for filtering before it is connected through the (A12) low pass 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) Dual Peak Detector Board. The Dual Peak Detector Board supplies a reflected power sample to TB31-13 and a forward power sample to TB31-14 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 3kW Digital Output System Configuration

In a 3 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) Dual Peak Detector Board. The Dual Peak Detector Board supplies a reflected power sample to TB31-13 and a forward power sample to TB31-14 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 2-2.

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

ASSEMBLY DESIGNATOR	ASSEMBLY NAME	PART NUMBER
	500W/1 kW (250W/500W Digital) Chassis Assembly	1303953
A3 & (Opt A6 & A13)	Power Amplifier Assembly, 250W (125W Digital)	1302868
	Power Supply Assembly	1302863(2kW) 1306971(1kW)
Opt A5	2 or 4 Way Splitter Assembly	1303567 (2 Way) 1303347 (4 Way)
A11	Coupler Assembly	450029
A4 or A44	Dual Peak Detector Board	11159965

2.1.3 Power Amplifier Module Assembly, 250 Watt, 125W Digital (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 125 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.

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

In digital systems, the Forward power of an Exciter Driver Power Amplifier and the Forward power of any external amplifier, is reported by the system Control Monitoring module.

If the Control Monitoring module is monitoring a 5-50 Watt Digital 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 50 Watts digital, 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 2-3. 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.

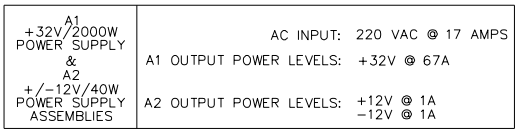
Table 2-4. Power Amplifier Control Adjustments

POTENTIOMETERS	DESCRIPTION
RFL CAL	Adjusts the gain of the Reflected Power monitoring circuit
FORWARD CAL	Adjusts the gain of the Dual Peak Detector Board. Forward Power monitoring circuit
METER ZERO	Adjusts the offset of the Forward Power monitoring circuit

Table 2-5. 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(2kW) or 1306971(1kW); Appendix B)



The Power Supply Module Assembly 1302863 is made up of (A1) a +32V/2000W Switching Power Supply and (A2) a ±12V/40W Switching Power Supply. The Power Supply Module Assembly 1306971 is made up of (A1) a +32V/1000W 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.

There is one On/Off Circuit Breaker, which is mounted on the rear of the power amplifier chassis assembly, which supplies AC to each power supply module assembly.

2.1.5 Front Panel Display Screens

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.

2.2 External Assembly

2.2.1 (A4, A13, A44 or A45) Dual Peak Detector Board (1159965; Appendix B)

The Dual Peak Detector Board provides detected outputs of the Forward at J3-4 that connects to TB31-14 on the Driver/Amplifier Assembly and Reflected at J3-9 that connects to TB31-13 on the Driver/Amplifier Assembly, which are used for monitoring on the controller display. The board also provides adjustments for the calibration of the readings on the meter. These readings are attained from the samples of the Forward Power that connects to J1 and Reflected Power that connects to J3 of the system from the output coupler assembly.

2.3 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 will automatically cutback and the input fault indicator on the IF Processor module will light. When the video input signal returns, the transmitter will automatically return to full power and the input fault indicator will be extinguished.
If alignment or calibration is required to the transmitter, refer to Volume 1, Chapter 5 of the instruction manual.

2.3.1 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

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 greater than 78°C.
- Transmitter is Muted due to 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.

If change of frequency is required, refer to Volume 1 Chapter 5 of the Instruction Manual for more information and to the Axcera field support department at 724-873-8100.

2.4 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.

2.5 Customer Remote Connections

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 2-6.

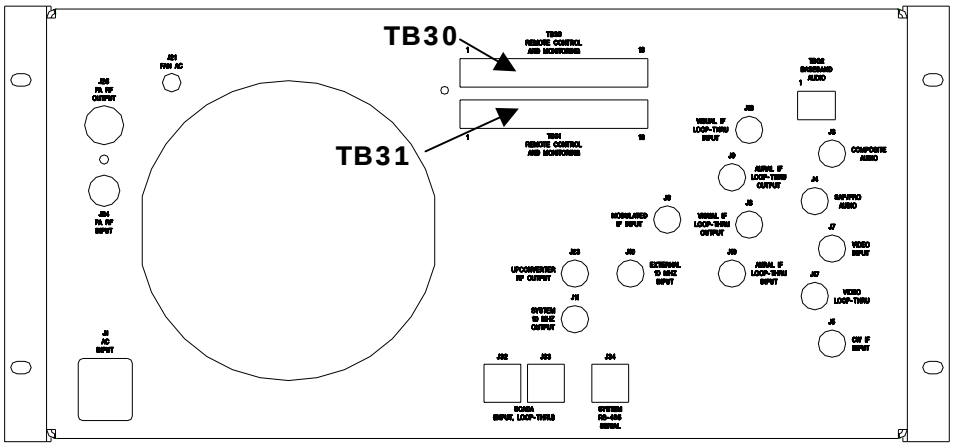


Table 2-6: LX Series Chassis Assembly Hard Wired Remote Interface Connections to TB30 or TB31, which are 18 position Terminal Blocks located on the rear of the Assembly

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 kΩ 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.
*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. May be used as an external interlock with TB30-15.
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.

Signal Name	Pin Designations	Signal Type / Description
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 Forward Power	TB30-11	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated "System Avg. Power ". Indicates the transmitter's Average power. Scale factor is 100%/3.2V.
RMT System Aural Power	TB30-12	(NOT USED) 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 Forward Power	TB31-14	Analog Input - 0 to 1.00 V- This is the input of the "System Forward Power " indicating the transmitter's Forward output power. The scale factor is 100%/0.80V.
System Aural Power	TB31-15	(NOT USED) 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.
*RMT Ground	TB30-15	Ground pins available through Remote for interlock. Typically connected to TB30-5. May be used as an external interlock with TB30-5.
RMT Ground	TB30-17, TB31-1, 2, 6 to 12, and 17	Ground pins available through Remote
*+12 VDC	TB30-16	+12 VDC to Dual Peak Detector Board through 2 Amp re-settable fuse
RMT +12 VDC	TB31-16	+12 VDC available through Remote w/ 2 Amp re-settable fuse
*-12 VDC	TB30-18	-12 VDC to Dual Peak Detector Board through 2 Amp re-settable fuse
RMT -12 VDC	TB31-18	-12 VDC available through Remote w/ 2 Amp re-settable fuse

* Indicates that this function is used by the system and not for remote use.

Table 2-7: (Optional) Exciter Switcher Hard Wired Remote Interface Connections to TB1, 18 pos. Terminal Block are located on the Rear of the Exciter Switcher Tray Assembly.

Signal Name	Pin Designations	Signal Type / Description
Select Automatic Operation	TB1-1	0 = SET, NC = No Change
Select Manual Operation	TB1-2	0 = SET, NC = No Change
Select Exciter A (1)	TB1-3	0 = SET, NC = No Change
Select Exciter B (2)	TB1-4	0 = SET, NC = No Change
Selected Exciter to Operate	TB1-5	0 = SET, NC = No Change
Selected Exciter to Standby	TB1-6	0 = SET, NC = No Change
Selected Exciter Power Raise	TB1-7	0 = SET, NC = No Change
Selected Exciter Power Lower	TB1-8	0 = SET, NC = No Change
	TB1-9	NOT USED IN THIS CONFIGURATION
	TB1-10	NOT USED IN THIS CONFIGURATION
	TB1-11	NOT USED IN THIS CONFIGURATION
Selected Operation	TB1-12	0 = Auto, Open = Manual
Selected Exciter	TB1-13	0 = A, Open = B
Selected Exciter Logged Faults	TB1-14	0 = None, 1 = 1 or More
Selected Exciter Current Errors	TB1-15	0 = None, 1 = 1 or More
Alternate Exciter Logged Faults	TB1-16	0 = None, 1 = 1 or More
Alternate Exciter Current Errors	TB1-17	0 = None, 1 = 1 or More
Ground	TB1-18	Ground

NOTE: In versions previous to 2.0, for the automatic switching to the back up exciter, the Error, Fault, Log in the back up exciter must be cleared of all Previous Faults..

Chapter 3
Site Considerations, Installation and Setup Procedures

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

Transmitter	Voltage	Current
125 Watt	220 VAC	10 Amps to the Exciter/Amplifier Cabinet
250 Watt	220 VAC	15 Amps to the Exciter/Amplifier Cabinet
500 Watt	220 VAC	25 Amps to the Exciter/Amplifier Cabinet
1000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
1500 Watt	220 VAC	65 Amps to the Exciter/Amplifier Cabinet
2000 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
	220 VAC	40 Amps to the Amplifier Cabinet
2500 Watt	220 VAC	45 Amps to the Exciter/Amplifier Cabinet
	220 VAC	60 Amps to the Amplifier Cabinet
3000 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 digital driver/transmitter 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 digital transmitter/drivers are shown in Table 3-1.

NOTES: The transmitter is factory set for either 110 VAC or 220 VAC operation as directed by customer. Transmitters above 125 Watts use 220 VAC Input only.

Transmitters 2000 Watts and above require two 220 VAC Inputs, one to each cabinet.

The LX Series Digital 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 1000W digital transmitter by subtracting the average power to the antenna (1000 watts) from the AC input power (6700 watts) and taking this number in watts (5700) and then multiplying it by 3.41. This gives a result of 19,437, the BTUs to be removed every hour. 12,000 BTUs per hour equals one ton. Therefore, a 1-3/4-ton air conditioner will cool a 1000W digital 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 transmitters.

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.

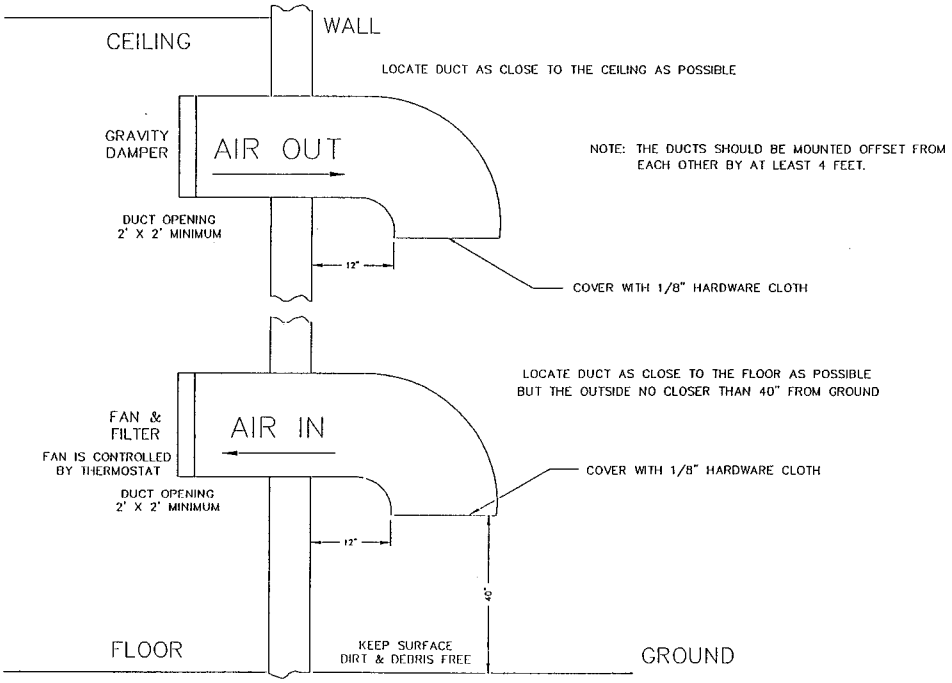


Figure 3-1. 500 Watt Minimum Ventilation Configuration

3.2 Unpacking the Chassis w/modules and bandpass 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.

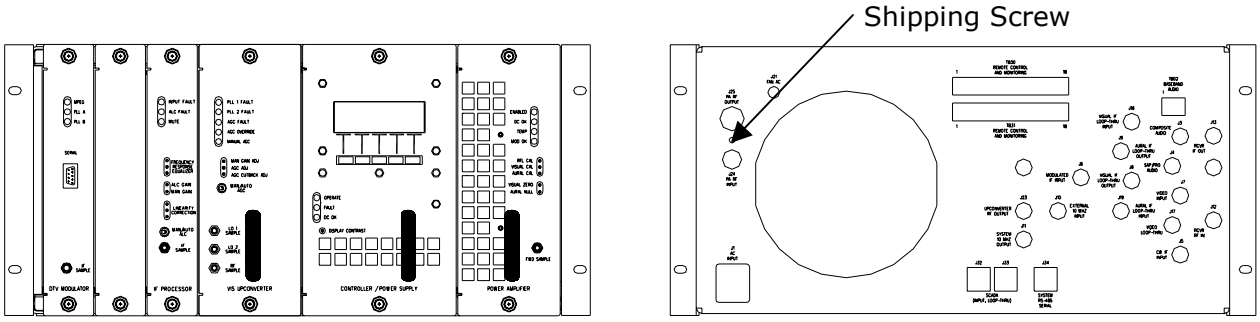


Figure 3-2. Front and Rear View Exciter/Driver

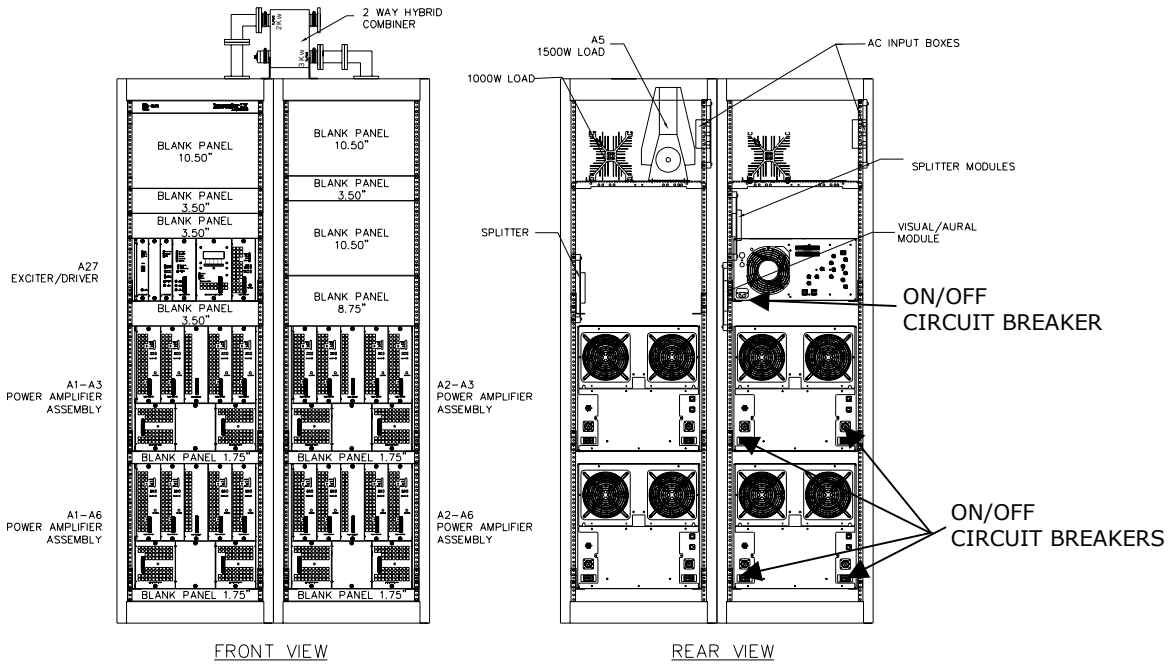


Figure 3-3. Front and Rear View 76" Cabinet Typical 2kW Digital Configuration

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. Refer to Table 3-1 at the beginning of this chapter for typical AC Input and Current requirements for Digital Transmitters.

Figure 3-4. AC Input Box Assembly.

NOTES: Transmitters 2000 Watts and above require two 220 VAC Inputs, one to each cabinet.

An On/Off circuit breaker is located on the rear of the exciter/driver assembly near the AC input jack. One On/Off circuit breaker is located on the rear of the Power Amplifier Chassis Assembly for each Power Supply Assembly.

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.

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

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

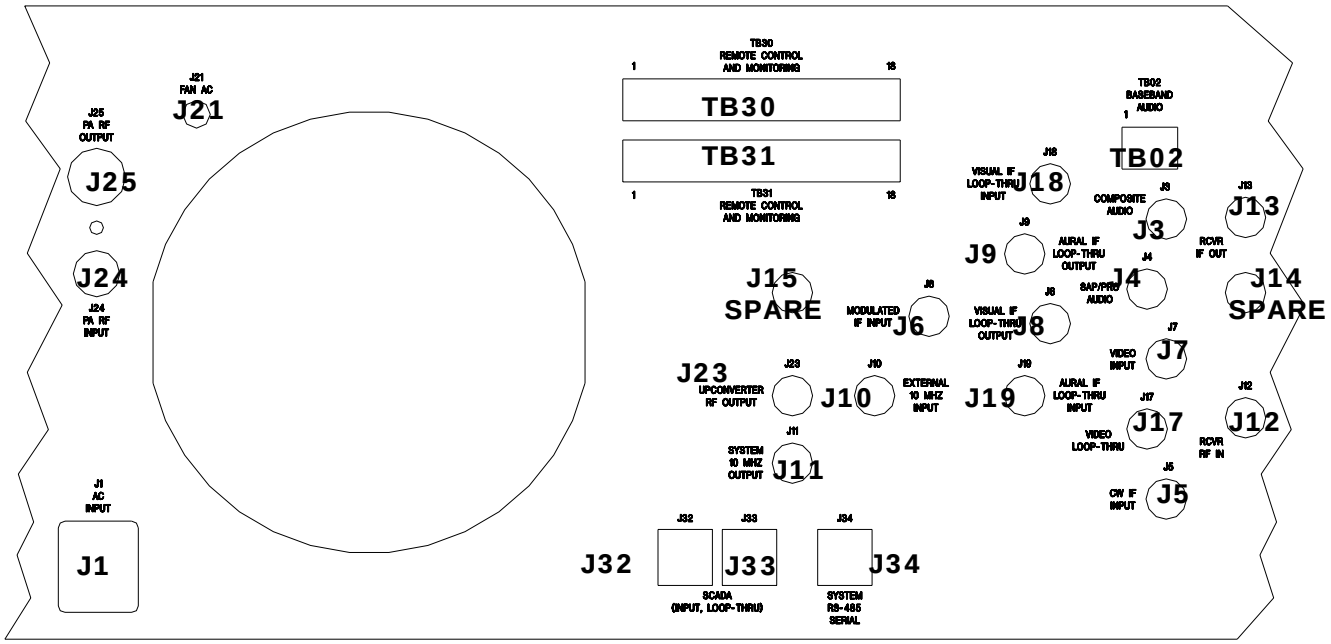


Table 3-2: Rear Chassis Connections for the LX Series Transmitter.

Port	Type	Function	Impedance
J1	IEC	AC Input	N/A
TB02	Term	(Not Used) Base Band Audio Input	600Ω
J3	BNC	(Not Used) Composite Audio Input	75Ω
J4	BNC	(Not Used) SAP / PRO Audio Input	50Ω
J5	BNC	(Not Used) CW IF Input	50Ω
J6	BNC	Modulated IF Input (Jumper from J13)	50Ω
J7	BNC	(Not Used) Video Input (Isolated)	75Ω
J8	BNC	(Not Used) Visual IF Loop-Thru Output	50Ω
J9	BNC	(Not Used) Aural IF Loop-Thru Output	50Ω
J10	BNC	External 10 MHz Reference Input	50Ω
J11	BNC	System 10 MHz Reference Output	50Ω
J12	BNC	MPEG Input	50Ω

Port	Type	Function	Impedance
J13	BNC	8 VSB IF Output (Jumper to J6)	50Ω
J14	BNC	RF Spare 2	50Ω
J15	BNC	RF Spare 1	50Ω
J17	BNC	(Not Used) Video Loop-Thru (Isolated)	75Ω
J18	BNC	(Not Used) Visual IF Loop-Thru Input	50Ω
J19	BNC	(Not Used) Aural IF Loop-Thru Input	50Ω
J23	BNC	Upconverter RF Output	50Ω
J24	BNC	Power Amplifier RF Input	50Ω
J25	N	Power Amplifier RF Output	50Ω
TB30	Term	Remote Control & Monitoring	N/A
TB31	Term	Remote Control & Monitoring	N/A
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 AC Input Box of the transmitter. Verify all cables are properly connected and are the correct type. Once all of these things are completed, the unit is ready to be turned on following the procedures below.

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. Check that the On/Off circuit breakers located on the rear of the exciter/driver and Power Amplifier Chassis Assemblies are switched On. On the Power Amplifier Chassis Assemblies, there is one circuit breaker per Power Supply 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 DM8 Digital Modulator Module LEDs on Front Panel

Status Indicators:

MPEG: This illuminates Green if the MPEG stream at the J1-2B input jack is valid.

PLL A: This illuminates Green if the DM8 symbol clock is locked to the frequency of the 10 MHz reference.

PLL B: This illuminates Green if the pilot frequency is locked to the 10 MHz reference.

3.5.2.2 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.

3.5.2.3 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.

3.5.2.4 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.

3.5.2.5 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 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. 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: A detailed description of the front panel screens is given in Volume 1 Chapter 3.

3.5.4 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.

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

If a problem occurred during the setup and operation procedures, refer to Volume 1 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. The RF Input 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 125W Digital 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 250 Watt system or in a 4 way combiner in a 500W 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.

There is one On/Off Circuit Breaker, two maximum, which is mounted on the rear of the power amplifier chassis assembly. The breaker supplies AC to each power supply assembly. Each Power Supply Assembly supplies voltages to two power amplifier assemblies.

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) 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 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.

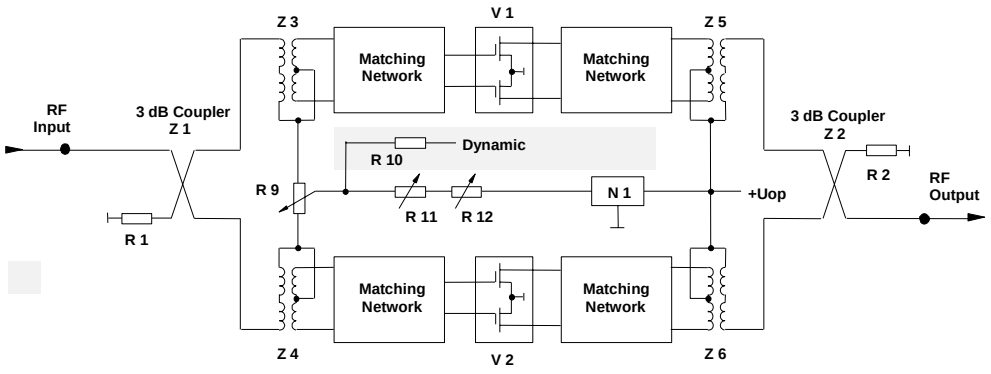


Figure 4-1. UHF Amplifier Module, 125 Watts Digital

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 100Ω 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 50Ω terminations, created from two 100Ω resistors in parallel, used as dissipation loads, connect from the forward and reflected ports to ground.

4.1.6 (A5) Amplifier Control Board 1303682; 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

Page 1

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.

Page 2

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 0.01Ω/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 kΩ 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 Ω 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.

Forward and Reflected power detector sections of the board.

Page 3

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(2kW) or 1306971(1kW); Appendix B)

The 1302863 Power Supply Assembly contains (A1) a +32V/2000W switching power supply (1301504) and (A2) a ±12V/40W switching power supply (1303242). The 1306971 Power Supply Assembly contains (A1) a +32V/1000W switching power supply (1305168) 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.

An On/Off Circuit Breaker, that is mounted on the rear of the power amplifier chassis assembly, supplies AC to the power supply assembly. 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.

4.3 External Assembly

4.3.1 (A4, A13, A44 or A45) Dual Peak Detector Board (1159965; Appendix B)

The function of the dual peak detector board is to detect forward and reflected output power samples and generate output voltages that are proportional to the power levels of the sampled signals for use by the control monitoring assembly in the exciter.

There are two identical signal paths on the board: one for forward power and one for reflected power. A sample of forward output power, from the external DTV mask filter, enters the board at the SMA jack J1. Resistors R1 and R2 form an input impedance-matching network of 50Ω. The forward power signal is detected by CR1, R7, R25, C1, and C7. For digital operation the jumpers, W1 on J6 and W3 on J8, are both between pins 1 & 2. The detected output is buffered by the operational amplifier U1C before it is split. One part is connected to the forward uncalibrated power output jack J4. The other split output is connected to forward power adjust pot R9, which adjusts the gain of U1D. The output of U1D is split with one part connected to J3-4 Forward Power Metering Output #1. The other output of U1D is connected to J3-6 Forward Power Metering Output #2.

A sample of reflected output power, from the external DTV mask filter, enters the board at the SMA jack J2. Resistors R3 and R4 form an input impedance-matching network of 50Ω. The reflected power signal is detected by CR2, R26, R8, C3, and C8. For digital operation the jumper W2 on J7 is between pins 1 & 2. The detected output is buffered by the operational amplifier U1B before it is split. One part is connected to the reflected uncalibrated power output jack J5. The other split output is connected to reflected power adjust pot R10, which adjusts the gain of U1A. The output of U1A is split with one part connected to J3-9 Reflected Power Metering Output #3. The other output of U1A is connected to J3-11 Reflected Power Metering Output #4.

The +12 VDC needed for the operation of U1 on the board enters the board at J3-2 and is connected through a filter and isolation circuit consisting of C5, C9 and L3 before it is connected to U1. The -12 VDC needed for the operation of U1 on the board enters the board at J3-8 and is connected through a filter and isolation circuit consisting of C6, C12 and L6 before it is connected to U1.

This completes the circuit description of the external power amplifier assembly and external assemblies.

APPENDIX A

LX SERIES
SYSTEM SPECIFICATIONS

Low Power DTV Transmitter 5W - 3kW

LU1000AT Shown

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 which can be removed and replaced while the transmitter is on the air.

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 DTV Transmitter 5W - 3kW

Performance

Frequency Range[1]	470 to 860 MHz
Output Impedance	50 Ω
Frequency Stability	±1kHz *(max 30 day variation)*
w/Precise Frequency Option	±2Hz
Regulation of RF Output Power	3%
Out of Band -Compliant with FCC Mask[2]	
Channel Edge ±500kHz	-47 dB or better
6MHz from Channel Edge	-110 dB or better
Signal to Noise (SNR)	27 dB or better
Data Interface	
Input Rate	19.39 Mbps, 6 MHz Channel
Input Interface	SMPTE 310M, Serial Differential ECL & TTL
Test Signals	Internal PRBS 23 MPEG Stream

Options

Dual Exciter with Automatic Switcher
AC Surge Protector
Precise Frequency Kit
Spare Parts Kit

[1] Other Frequencies - Consult Factory
[2] Measured in 30 KHz RBW, relative to total average power
[3] Above 8,500 feet - Consult Factory

General

Model Number	LU5ATD	LU50ATD	LU125ATD	LU250ATD	LU500ATD	LU1000ATD	LU1500ATD	LU2000ATD	LU2500ATD	LU3000ATD
Power Output *(Average)*	5 W	50 W	125 W	250 W	500 W	1000 W	1500 W	2000 W	2500 W	3000 W
Output Connector			7/8" EIA					3 1/8" EIA		
Power Consumption *(Watts)*	250 W	650 W	1000 W	1700 W	3400 W	6700 W	10,500 W	13,500 W	17,000 W	20,500 W
Input Power										
Line Voltage *(Volts)*	117/230 ±10%		230 ± 10%							
Power Requirements	Single Phase, 50 or 60 Hz									
Size *(H x W x D)*	55"x22"x34"						76"x22"x34"	76"x44"x34"		
Weight *(lbs.)*	300	300	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									

103 Freedom Drive, PO Box 525, Lawrence, PA 15055 t: 724-873-8100 f: 724-873-8105

APPENDIX B

DRAWING LISTS

LX Series Digital High Power System

LX Series Transmitter Block Diagrams .....(50W-1 kW Digital) 1302633,

LX Series Digital Transmitter Interconnects..... (125W, 250W & 500W) 1303940,

LX Series 50-1000 Watt Digital Transmitter Typical Racking Plan 1303596

Chassis Assembly, Power Amplifier, LX Series

Power Amplifier Chassis Assembly Block Diagram 1303962
500W or 1 kW LX Series Power Amplifier Chassis Assembly Interconnect .. 1303807
500 Watt LX Series DC Harness Chassis/Airbox Interconnect 1303964
500 Watt LX Series AC Harness Chassis/Airbox Interconnect..... 1303965
500 Watt LX Series Coax Assembly Chassis/Airbox Interconnect 1303963
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

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

2 Way Combiner Module Assembly (Used with two Power Amplifier Assemblies)
2 Way Combiner Board Schematic 1303580

4 Way Combiner Module Assembly (Used with four Power Amplifier Assemblies)
4 Way Combiner Board Schematic 1303655

External Amplifier Signal Board, LX Series
Schematic..... 1303346

Dual Peak Detector Board
Schematic..... 1159976

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

APPENDIX C

TRANSMITTER LOG SHEET

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
DATE READINGS TAKEN						
Model Number						
Code Version						
Firmware Number						
OUTPUT MEASUREMENTS						
% FORWARD POWER						
% REFLECTED POWER						
DM8 DIGITAL MODULATOR DETAILS						
MODE						
SOURCE						
LINEAR EQ						
NON-LINEAR EQ (Settings Customized per System)						
EQL PEAK LEVEL						
PSF PEAK LEVEL						
AGC MODE						
AGC LEVEL						
D/A PEAK DETECT						
TAP ENERGY						
CLIP DETECTOR STATUS						
AGG						
ISL						
D/A						
HBF						
IFC						
COR						
ODC						
CODE VERSION						
IF PROCESSOR DETAILS						
INPUT SIGNAL STATE						
MODULATION						
INPUT IF						
DLC CONTROL LOCK						
ALC LEVEL						
ALC MODE						
UPCONVERTER DETAILS						
AFC 1 LEVEL						
AFC 2 LEVEL						
PLL 1 CIRCUIT						
PLL 2 CIRCUIT						
AGC 1 LEVEL						
AGC 2 LEVEL						

DESCRIPTION OF PARAMETER	**TRANSMITTER READING FROM LCD DISPLAY**					
INT. 10 MHz						
IF INPUT LEVEL						
SYSTEM CONTROL DETAILS						
Power Supply Enable For						
DRIVER AND PA DETAILS						
POWER SUPPLY STATE, 32V						
FORWARD POWER						
REFLECTED POWER						
AMP 1 CURRENT						
AMP 2 CURRENT						
TEMPERATURE						
CODE VERSION						
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						
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						
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						

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						
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						
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						
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						

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						
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						
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						
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						

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						
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						
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						
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						

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						
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						
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						
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						

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						
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						
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						
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						

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						

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.