8. OPERATIONAL DESCRIPTION - MODEL Axcera-LU3000ATD

8.1 General Description

The LU3000ATD is a complete 3000-watt UHF solid-state, digital transmitter. It operates at a nominal visual output power of 3000 watts average.

8.2 Technical Specifications

Type of Emission 6M00K1D

Frequency Range..... 470 MHz to 608 MHz & 614 MHz to 806 MHz

Output Power .....3000 watts average

8.3 Performance Specifications

Operating Frequency Range..... 470 MHz to 608 MHz & 614 MHz to 806 MHz

RF output - Nominal:
Power ..... 3000 watts average
Impedance .....50 ohms
Connector ..... 3-1/8" EIA

Regulation of Output..... 3%
Signal-to-Noise Ratio (SNR) ..... 27 dB or better
Carrier Frequency Stability..... ±1000 Hz

Out of Band:
Compliant with FCC Mask
(Measured in 30 KHz RBW, relative to total average power
Channel Edge ± 500 KHz..... -47 dB or better
6 MHz Channel Edge .....-110 dB or better

Data Interface:
Input Rate.....19.39 Mbps, 6 MHz Channel
Input Interface.....SMPTE 310M, Serial Differential ECL & TTL

Electrical Requirements

Power Line Voltage ..... 230 volts, 50/60 Hz
Power Consumption .....20,500 watts

Environmental

Maximum Altitude .....8,500 feet
Operational Temperature Range .....0°C to +50°C

Mechanical

Dimensions:

Width .....44 inches
Depth .....34 inches
Height.....74 inches
Weight..... 1330 lbs

8.4. System Overview

The LU3000ATD is made up of the trays listed in Table 8-1.

Table 8-1. LU3000ATD Major Trays and Assemblies

MAJOR ASSEMBLY DESIGNATOR	TRAY/ASSEMBLY NAME
A1	UHF Exciter Assembly
A2, A3, A4, A5, A6, A7	External Amplifier Assembly
A8	Optional Axciter Modulator

8.4.1 Exciter Tray/External Amplifier Tray

The output of the Exciter Tray (driver) drives the input to the External Amplifier Tray.

8.4.1.1 DM8 – Internal Digital Modulator Module (Exciter)

The DM8 modulator is an ATSC compliant 8 VSB modulator that slides into the left most slot in the Innovator LX Driver chassis assembly. The DM8 modulator accepts a SMPTE-310 MPEG data stream input and outputs a 6 MHz wide IF output centered at 44 MHz with a pilot carrier at 46.69 MHz. The DM8 modulator provides linear and nonlinear correction capability for the transmission path as well as internal test sources that are used during initial transmitter installation. All of the functions of the DM8 modulator are controlled from the LX Controller LCD display and pushbuttons.

8.4.1.2 Axciter – Enternal Digital Modulator Module (Exciter)

The Axciter modulator is an ATSC compliant 8 VSB modulator that is used externally with the Innovator LX Driver chassis assembly. Like the DM8 modulator, the Axciter modulator also accepts a SMPTE-310 MPEG data stream input and outputs a 6 MHz wide IF output centered at 44 MHz. All of the functions of the Axciter modulator are controlled from the front panel pushbuttons.

8.4.1.3 IF Processor Module – Used with DM8 Only (Exciter)

The IF Processor Assembly contains the IF Processor Board (1301977). The IF Processor provides pre-correction to ensure broadcast quality output signal. The pre-correction consists of amplitude linearity correction, Incidental Carrier Phase Modulation (ICPM) correction and frequency response correction.

The IF Processor module is configured either for an analog or digital system. Pin 13C of the IF Processor module is grounded in analog systems and left not connected in digital systems. An IF Processor Interlock signal is used to report the presence of the IF

Processor module to the Control Monitoring board. If the IF Processor interlock signal is not present, the transmitter/Exciter Driver RF output is Muted (turned off). If an analog IF Processor module is installed and the Modulation Present signal is not true, the transmitter / Exciter Driver output is Muted (turned off).

The Control & Monitoring/Power Supply module uses the IF Processor module for System output power control. Through the front panel display or a remote interface, an operator can set the transmitter's RF output power. The range of RF power adjustment is between 0% (full off) and 105% (full power plus). A front panel IF Processor module potentiometer sets the upper limit of RF power at 120%. The system's Control Monitoring board compares the RF Power Monitoring module RF power level with the desired level and uses the IF Power Control PWM line to correct for errors.

In digital systems, a digital level control (DLC) voltage is generated on the IF Processor module and sent to the digital modulator. RF power control is implemented by changing the DLC voltage provided to the digital modulator. The 'RF High' potentiometer sets the upper adjusted range of RF control circuit output to 120%.

The IF Processor module provides a reference ALC voltage to the system's Upconverter. When the ALC voltage decreases, the Upconverter automatically lowers the system output power through the AGC circuits.

The IF Processor module has a front panel switch to select Auto or Manual ALC. When Manual ALC is selected, the reference ALC voltage is set by a front panel potentiometer. In this condition, the RF power level control circuit is removed from use. When the ALC select switch is changed to Auto, the RF power level control circuit will start at low power and increase the RF output until the desired output power is attained.

The IF Processor module Modulation Present signal is monitored. If the modulation level is too low or non-existent, a Modulation Present fault is reported to the Control Monitoring board. When the controller detects this fault, it can be set to Automatically Mute the transmitter or in Manual mode the transmitter will continue to operate at 25% output.

The IF Processor module Input Signal level is monitored. If the signal level is too low or non-existent, an Input fault is reported on the Control Monitoring board. When the IF Processor board detects an Input Signal fault it automatically Mutes the transmitter. The system controller does not Mute on an IF Processor Input fault.

8.4.1.4 VHF/UHF Upconverter Module Used with DM8 Only (Exciter)

The VHF/UHF Upconverter Module Assembly contains (A1) a Downconverter Board Assembly (1303834), (A3) a First Conversion Board, LX Series (1303838), (A2) a L-Band PLL Board, LX Series (1303846) and (A4) an Upconverter Control Board (1304760).

A 0 dBm 44 MHz IF input to the upconverter through the backplane board is applied to a mixer mounted on the first conversion board. Also applied to the mixer is a nominal 1 GHz LO1. The mixer converts it to a nominal frequency centered at 1044 MHz. A filter selects the appropriate conversion product, which is then amplified to a level of approximately –4 dBm. The frequency of the first conversion LO1 can be shifted by ± 10 kHz to generate channel offsets of 10kHz. For +offsets the frequency is 999.99 MHz and for –offsets the frequency is 1000.01 MHz.

This signal is applied to a second mixer mounted on the downconverter board that converts it back to a broadcast channel (2-69) by an LO2 that operates in 100kHz steps between 1.1-1.9 GHz depending on the channel selected. The LO2 frequency equals the Channel center frequency plus the LO1 frequency plus 44 MHz. (As an example CH14+: Center Frequency is 473.01 MHz and LO1 is 999.99 MHz therefore LO2 is 473.01 + 999.99 + 44, which equals 1517.00 MHz.)

The output of the mixer is applied to a 900 MHz Low pass filter to remove unwanted conversion products. The resulting signal is amplified and applied to a Pin diode attenuator before it is connected to the output of the upconverter. This pin diode attenuator adjusts the gain of the module and is controlled by an Automatic Gain Control circuit, which maintains a constant power out of the upconverter, and also the transmitter, that connects to the power amplifier module.

8.4.1.5 Control & Monitoring / Power Supply Module (Exciter)

The (A4) Control & Monitoring/Power Supply Assembly is made up of a Control Board (1302021), a Power Protection Board (1302837) and a Switch Board (1527-1406). The Assembly also contains a switching power supply that provides ±12 VDC to the rest of the modules in the chassis and +32 VDC to the Power Amplifier module.

The Assembly provides all transmitter control and monitoring functions. The Front panel LCD allows monitoring of system parameters, including forward and reflected power, transistor currents, module temperatures and power supply voltages.

8.4.1.6 Power Amplifier Module (Exciter)

The (A6) Power Amplifier Module Assembly is made up of a Coupler Board Assembly (1301949), an Amplifier Control Board (1301962), a 1-Watt Module Assembly (1302891), a TFS 40W UHF Module (1206693) and a RF Module Pallet, Philips (1300116).

The Power Amplifier Module contains Broadband LDMOS amplifiers that cover the entire UHF band with no tuning required. They amplify the RF to the 10W to 50W output power level of the transmitter.

The Power Amplifier of the Transmitter/Exciter Driver is used to amplify the RF output of the Upconverter module. A cable, located on the rear chassis, connects the RF output from the LO/Upconverter at J23 to J24 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 50-Watt Transmitter/Exciter Driver Power Amplifier module and any External 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. Front panel adjustment potentiometers are used to calibrate the following:

Table 1: Power Amplifier Calibration Adjustments in Analog Systems

R201 Reflected Power Cal
R202 Visual / Forward Power Cal
R203 Aural Power Cal
R204 Visual Offset Zero
R205 Aural Null

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

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 Transmitter, system power is measured in the Power Amplifier module. The wired connections are transferred through the power supply connector to the backplane board on a five position header.

All four positions of control board switch SW1 must be set on to route these lines as the system's RF power signals. In systems of output power greater than 50 Watts, system power is monitored by an external module that is connected to TB31 and control board SW1 switches must be set off.

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

8.4.1.7 Power Amplifier Module (External Power Amplifier Assembly)

The Power Amplifier Module Assembly is made up of (A6) an Amplifier Control Board (1301962), (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 100-Watt Transmitter/Exciter Driver Power Amplifier module and any External 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. Front panel adjustment potentiometers are used to calibrate the following:

Table 2: Power Amplifier Calibration Adjustments in Analog Systems

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

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

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 or 10-100 Watt Analog Transmitter, system power is measured in the Power Amplifier module. The wired connections are transferred through the power supply connector to the backplane board on a five position header. All four positions of control board switch SW1 must be set on to route these lines as the system's RF power signals. In systems of output power greater than 50 Watts digital or 100 Watts aural, 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.

8.4.1.8 Power Supply Module (External Power Amplifier Assembly)

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

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

8.4.1.9 Axciter Upconverter – Used with Axciter Modulator (Exciter)

The 44 MHz IF input, -6 dBm in level, to the upconverter module assembly is applied through the backplane board from the modulated IF input jack located on the rear of the HX or LX exciter/driver chassis assembly. The 44 MHz IF input to the upconverter/downconverter tray connects through J5, the IF input jack located on the rear panel. The signal connects to the First Conversion board and is converted to a second IF of 1044 MHz by an image rejection mixer located on the First Conversion board. A filter selects the appropriate conversion product, which is then amplified to a level of approximately –8 dBm. The 1 GHz LO frequency is generated externally by the Axciter modulator and is applied to a high pass and low pass filter designed to eliminate any other interfering signals that might be coupled into the 1 GHz LO. The LO is applied to an ALC circuit that maintains the LO level to each mixer of +13 dBm over a wide range of 1 GHz LO input levels. The LO sample is also sent to the Downconverter board inside the tray or to the external Downconverter module for its use.

This second IF signal is then applied to a second mixer mounted on the Final Conversion board that converts it back to a broadcast channel (2-69) by an LO that operates in 1.0 MHz steps between 1.1-1.9 GHz depending on the channel selected. The LO frequency equals the Channel center frequency plus 1044 MHz. (As an example CH: 14: Center Frequency is 473.00 MHz therefore LO2 is 473 + 1044, which equals 1517.00 MHz.)

The output of the mixer is applied to a 900 MHz Low pass filter to remove unwanted conversion products. The resulting signal is amplified and wired to a Pin diode attenuator and then connected to the output of the Upconverter/Downconverter Tray or the output of the Upconverter Module. This pin diode attenuator adjusts the gain of the tray or module and is controlled by an Automatic Gain Control circuit, which maintains a constant power out of the upconverter, and also the transmitter, that connects to the power amplifier module.

The Axciter upconverter module has no need for periodic alignment.

8.4.1.10 Axciter Downconverter – Used with Axciter Modulator (Exciter)

A sample of the transmitter's RF output is applied to the downconverter board, mounted on the downconverter module, at a nominal input level of –6 dBm. The signal is attenuated by a 10 dB pad, and then converted to an IF of 1044 MHz by mixer U1. A sample of the upconversion LO from the L-Band PLL Board mounted in the upconverter module assembly is sent through the exciter's backplane board, or directly to the board in the stand alone tray. On the downconverter board, the LO is amplified and then filtered to remove any spurious energy before being applied to U1.

A filter selects the appropriate conversion product, with the resulting signal being applied to the mixer U9, which converts the signal to a second IF of 44 MHz. A 1 GHz LO frequency that is generated externally, and either sent through the exciter's backplane board to the downconverter module or connected from the 1st conversion board in the stand alone tray. The 1 GHz LO is applied to a high pass and low pass filter designed to eliminate any other interfering signals that might be coupled into the 1 GHz LO. This 44 MHz second IF signal is then applied to a low pass filter to remove any out of band energy, amplified and connected to a frequency response correction circuit intended to compensate for any linear distortions in the downconversion path. Adjustments R50-R52 and C78-C80 are used to control the frequency response of the downconverter. The resulting signal is sent to a pin diode attenuator, which allows the operator to adjust the

gain of the downconversion path. The signal is then amplified again to a level of +4 dBm average and applied to a cascaded high pass low pass filter, which removes any out of band energy that would be aliased in the demodulation process.

8.5 Control and Status

8.5.1 Exciter Tray

Table 8-3. DM8 Digital Modulator Front Panel Status Indicators

LED	FUNCTION
MPEG (Green)	Indicates the presence of a valid MPEG stream at the J1-2B input jack.
PLL A (Green)	Indicates that the DM8 symbol clock is locked to the frequency of the 10 MHz reference.
PLL B (Green)	Indicates that the pilot frequency is locked to the incoming 10 MHz reference.

Table 8-4. DM8 Digital Modulator Front Panel Alignment Port

PORT	DESCRIPTION
RS-232	Serial port used for the initial DM8 modulator alignment.

Table 8-5. DM8 Digital Modulator Front Panel Sample

SAMPLE	DESCRIPTION
IF Sample	Provides a sample of the IF output from the modulator at approximately a –20 dBm level.

Table 8-6. IF Processor Front Panel Switch

SWITCH	FUNCTION
MAN/AUTO ALC	When Manual ALC is selected, the reference ALC voltage is set by the ALC Gain front panel potentiometer. When Auto ALC is selected, the IF level control circuit will automatically increase the IF output until the desired output power is attained.

Table 8-7. IF Processor Front Panel Status Indicators

LED	FUNCTION
INPUT FAULT (Red)	When lit it indicates that there is a loss of the IF Input signal to the IF Processor. Transmitter can be set to Mute on an IF Input Fault.
ALC Fault (Red)	When lit it indicates that the required gain to produce the desired output power level has exceeded the operational range of the ALC circuit. The LED will also be lit when ALC is in Manual.
MUTE (Red)	When lit it indicates that the IF input signal is cut back but the enable to the Power Supply is present and the +32 VDC remains on.

Table 8-8. IF Processor Front Panel Control Adjustments

POTENTIOMETERS	DESCRIPTION
FREQUENCY RESPONSE EQUALIZER	These three variable resistors, R103, R106 & R274, adjust the depth of gain for the three stages of frequency response correction.
ALC GAIN	Adjusts the gain of the transmitter when the transmitter is in the Auto ALC position.
MAN GAIN	Adjusts the gain of the transmitter when the transmitter is in the Manual ALC position.
LINEARITY CORRECTION	These three variable resistors adjust the threshold cut in for the three stages of linearity pre-correction. R211 and R216, the top two pots, are adjusted to correct for in phase amplitude distortions. R 231, the bottom pot, is adjusted to correct for quadrature phase distortions.

Table 8-9. IF Processor Front Panel Sample

SMA CONNECTOR	DESCRIPTION
IF SAMPLE	Sample of the pre-corrected IF output of the IF Processor

Table 8-10. VHF/UHF Upconverter Front Panel Switch

SWITCH	FUNCTION
MAN/AUTO AGC	When Manual AGC is selected, the reference AGC voltage is set by the AGC Manual Gain front panel potentiometer. When Auto AGC is selected, the RF power level control circuit will automatically increase the RF output until the desired output power is attained.

Table 8-11. VHF/UHF Upconverter Front Panel Status Indicator

LED	FUNCTION
PLL 1 Fault (Red)	When lit it indicates that the 1 GHz PLL is unlocked
PLL 2 Fault (Red)	When lit it indicates that the 1.1 –1.9 GHz PLL is unlocked
AGC Fault (Red)	When lit it indicates that the AGC is out of range.
AGC Override (Red)	When lit it indicates that the AGC is cutting back due to too much drive to the driver module.
Man Gain (Amber)	When lit it indicates that the AGC is bypassed in Manual.

Table 8-12. VHF/UHF Upconverter Front Panel Control Adjustments

POTENTIOMETERS	DESCRIPTION
MAN GAIN ADJ	Adjusts the gain of the upconverter and transmitter when in the Manual AGC position.
AGC ADJ	Adjusts the gain of the upconverter and transmitter when in the Auto AGC position.
AGC CUTBACK ADJ	Adjusts the point at which the transmitter will cut back in power,

(AGC OVERRIDE)	due to too much drive, when the Transmitter is in Auto AGC.

Table 8-13. VHF/UHF Upconverter Front Panel Samples

SMA CONNECTOR	DESCRIPTION
LO1 SAMPLE	Sample of the 1 GHz nominal LO1 signal in the Upconverter as generated on the L-Band PLL Board.
LO2 SAMPLE	Sample of the 1.1-1.9 GHz LO2 signal in the Upconverter as generated on the First Conversion Board.
RF SAMPLE	Sample of the On Channel RF Output of the Upconverter

Table 8-14. Controller/Power Supply Display

DISPLAY	FUNCTION
LCD	A 4 x 20 display providing a four-line readout of the internal functions, external inputs, and status. See Chapter 3, Controller/Power Supply Display Screens, for a listing of displays.

Table 8-15. Controller/Power Supply Status Indicators

LED	FUNCTION
OPERATE (green)	When lit it indicates that the transmitter is in the Operate Mode. If transmitter is Muted the Operate LED will stay lit, the transmitter will remain in Operate, until the input signal is returned.
FAULT (red or green)	Red indicates that a problem has occurred in the transmitter. The transmitter will be Muted or placed in Standby until the problem is corrected.
DC OK (red or green)	Green indicates that the switchable fuse protected DC outputs that connect to the modules in the transmitter are OK.

Table 8-16. Controller/Power Supply Control Adjustments

POTENTIOMETERS	DESCRIPTION
DISPLAY CONTRAST	Adjusts the contrast of the display for desired viewing of screen.

Table 8-17. Power Amplifier Status Indicators

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.

Table 8-18. Power Amplifier Control Adjustments

POTENTIOMETERS	DESCRIPTION
RFL CAL	Adjusts the gain of the Reflected Power monitoring circuit

VISUAL CAL	Adjusts the gain of the Visual / Forward Power monitoring circuit
AURAL CAL	Adjusts the gain of the Aural Power monitoring circuit
VISUAL ZERO	Adjusts the offset of the Forward Power monitoring circuit
AURAL NULL	Adjusts the offset of the Forward Power monitoring circuit based on the Aural signal level..

Table 8-19. Power Amplifier Sample

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

8.5.2 External Power Amplifier Tray

Table 8-20. Power Amplifier Status Indicators (External Power Amplifier Assembly)

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.

Table 8-21. Power Amplifier Control Adjustments (External Power Amplifier Assembly)

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

Table 8-22. Power Amplifier Sample (External Power Amplifier Assembly)

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

8.5.3 External Axciter Digital Modulator Tray

Please refer to the Axciter Operating Manual for status indicators and controls.

8.6 Remote Interface Connections

8.6.1 Remote Interface Connections (Exciter)

Port	Type	Function	Ohm
J1	IEC	AC Input	N/A
TB02	Term	Base Band Audio Input	600
J3	BNC	Composite Audio Input	75
J4	BNC	SAP / PRO Audio Input	50
J5	BNC	CW IF Input	50
J6	BNC	Modulated IF Input	50
J7	BNC	Video Input (Isolated)	75
J8	BNC	Visual IF Loop-Thru Output	50
J9	BNC	Aural IF Loop-Thru Output	50
J10	BNC	10 MHz Reference Input	50
J11	BNC	10 MHz Reference Output	50
J17	BNC	Video Loop-Thru (Isolated)	75
J18	BNC	Visual IF Loop-Thru Input	50
J19	BNC	Aural IF Loop-Thru Input	50
J23	BNC	Upconverter RF Output	50
J24	BNC	Power Amplifier RF Input	50
J25	N	Power Amplifier RF Output	50
TB30	Term	Remote Control & Monitoring	
TB31	Term	Remote Control & Monitoring	
J32	RJ-45	SCADA (Input / Loop-Thru)	CAT5
J33	RJ-45	SCADA (Input / Loop-Thru)	CAT5
J34	RJ-45	System RS-485 Serial	CAT5

8.6.2 Remote Interface Connections (External Power Amplifier Assembly)

Port	Type	Function	Ohm
J220	Circular-3	AC Input #1	N/A
J221	Circular-3	AC Input #2	N/A
J200	N	Power Amplifier RF Input	50
J205	7-16	Power Amplifier RF Output	50
J232	RJ-45	System RS-485 Serial Input	CAT5
J233	RJ-45	System RS-485 Serial Output	CAT5

8.6.3 Remote Interface Connections (Axciter Digital Moduator)

Please refer to the Axciter Operating Manual for all Remote Interface Connections.

8.7 AC Input

8.7.1 Exciter Tray

The AC input to the Exciter Tray is 117 VAC or 230 VAC (factory selectable). The AC input is applied to the tray through Jack J1. MOV's are provided to protect the Tray from transients or surges, which may occur on the AC Input Lines.

8.7.2 Power Amplifier Tray

The AC input to the Power Amplifier Tray is 230 VAC. The AC input is applied to the tray through Jacks J220 and J221. MOV's are provided to protect the Tray from transients or surges, which may occur on the AC Input Lines.

8.7.3 External Axciter Digital Modulator

The AC input to the Axciter Modulator Tray is 117 VAC or 230 VAC (factory selectable). The AC input is applied to the internal switching power supply.

8.8 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.

8.8.1 Principles of Operation

Operating Modes

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

Operate Mode

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

Operate Mode with Mute Condition

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

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

Entering Operate Mode

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

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

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

- Power Amplifier heat sink temperature 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.

Operating Frequency

The LX Series transmitter controller is designed to operate on UHF frequencies. The exact output frequency of the transmitter can be set to one of the standard UHF frequencies, or it can be set to a custom frequency using software set-up menus. Since RF performance of the transmitter requires different hardware for different frequency bands, not all frequency configurations are valid for a specific transmitter. The Power detectors in the transmitter have frequency dependency, therefore detectors of power amplifiers are calibrated at their frequency of use. The detectors for System RF monitoring are also calibrated at the desired frequency of use.