Chapter 2
System Description & Remote Control Connections

The analog transmitters in the Innovator LX Series are complete 10W to 100W UHF Analog internally diplexed modular television transmitters that operate at a nominal visual output power of 10 to 100 watts peak sync and an average aural output power of 1 to 10 watts, at an A/V ratio of 10 dB, 10% sound, or .5 to 5 watts at 13 dB, 5% sound.

The LX Series can also be used as a driver. The output power of the driver is determined by the level needed to attain the full output power of the transmitter. The driver's maximum output is 7 Watts peak of sync.

2.1 System Overview

The Analog LX Series driver/transmitter is made up of the modules and assemblies listed in Table 2-1.

Table 2-1: LX Series Trays and Assemblies

ASSEMBLY DESIGNATOR	TRAY/ASSEMBLY NAME	PART NUMBER
A2	Modulator Module (not present in translator)	1301929
A3	IF Processor Module	1301938
A4	Control/Power Supply Module	1301936 (110 VAC) OR 1303229 (220 VAC)
A5	LO/Upconverter Module	1301930
A6	Power Amplifier Module, used in 10-100 Watt Transmitters	1301923
OR A6	Driver Amplifier Module, used in high power transmitters	1302846
A11	Backplane Board	1301941
A12	Switch Board	1527-1406
A20	LCD Display Board	

Exciter Amplifier Chassis Assembly, 110 VAC (1301914) or 220 VAC (1303228); Appendix B

The chassis assembly is factory set for operation using 110 VAC or 220 VAC. All of the modules except the power amplifier module and the power supply section of the Control & Monitoring/Power Supply Module, plug directly into a backplane board. The backplane board provides module to module interconnection as well as interconnection to remote command and control connectors.

2.1.1 (A2) Modulator Module Assembly (1301929; Appendix B)

NOTE: The Modulator module is not present in a translator system

A2 MODULATOR MODULE (NOT USED IN DIGITAL SYSTEMS)	VIDEO I/P: .5 – 1V PK–PK COMPOSITE AUDIO: .5 – 1V PK–PK SAP/PRO: .5 – 1V PK–PK BASEBAND AUDIO: 0 – +10dBm 10MHz I/P: 0 – +6dBm IF OUTPUT: –2 TO +2dBm PK SYNC 44 MHz (6MHz BW) POWER REQUIREMENTS: +12V @ 1.6–1.1A –12V @ 360mA

The (A2) Modulator Assembly contains the Modulator Board (1301797). The modulator is broadcast quality and provides front panel access to control and monitoring points. The video level is controlled through a sync tip clamp and sync and white clipping circuitry. The IF oscillator is oven controlled and locked to a 10 MHz reference for stability. The IF signal is fed through a SAW filter for precise sideband shaping. The Modulator operates using either the baseband audio and video inputs or the 4.5-MHz composite input to produce a diplexed, modulated, and on-channel frequency visual + aural RF output that is cabled to the IF Processing Module.

Table 2-2. Modulator Front Panel Switch

SWITCH	FUNCTION
MAN/AUTO CLAMP SW1	When Manual Clamp is selected, the video level is set by the Manual Bias Pot R67 located on the board. (**NOTE**: The pot is factory set and needs no adjustment by the customer). When Auto Clamp is selected, the video level control circuit will automatically increase or decrease the video to maintain the desired video level.

Table 2-3. Modulator Front Panel Status Indicators

LED	FUNCTION
AUR UNLOCK DS5 (Red)	When lit it indicates that the 4.5 MHz VCO and the 10 MHz reference are not PLL locked.
VIS UNLOCK DS6 (Red)	When lit it indicates that the 45.75 MHz VCXO and the 10 MHz reference signal are not PLL locked.
AUD OV DEV DS4 (Red)	When lit it indicates the deviation level is more than ±80kHz
VIDEO LOSS DS1 (Red)	When lit it indicates the Video Input to the transmitter is lost.
OVER MOD DS3 (Red)	When lit it indicates the Video input level is too high.
ALT IF DS7 (Green)	When lit it indicates that external or alternate 4.5MHZ is present.
10 MHz PRES DS2 (Green)	When lit it indicates that a 10MHz reference is present to the transmitter.

Table 2-4. Modulator Front Panel Control Adjustments

POTENTIOMETERS	DESCRIPTION
Video Gain (R42)	Adjusts the level of the output video.
Visual Level (R214)	Adjusts the Visual IF level that combines with the Aural IF.
Aural Level (R243)	Adjusts the Aural IF level that combines with the Visual IF.
MONO (R110)	Adjusts the deviation level of the balanced audio input.
STEREO (R132)	Adjusts the deviation level of the composite audio input.
SAP/PRO (R150)	Adjusts the deviation level of the subcarrier audio input.

Table 2-5. Modulator Front Panel Sample

SMA CONNECTOR	DESCRIPTION
MOD IF SAMPLE (J10)	Sample of the combined Aural IF and Visual IF signals.

2.1.2 (A3) IF Processor Module Assembly (1301938; Appendix B)

A3 IF PROCESSING MODULE	IF INPUT: 44MHz, (6MHz BW) INPUT LEVEL: −2 TO +2 dBm PK SYNC. MODULATOR & RECEIVER INPUT RETURN LOSS: > 15dB IF OUTPUT LEVEL: −10dBm TO −0dBm PEP IF SAMPLE LEVEL: −21dB POWER REQUIREMENTS: +12V @ 800mA −12V @ 100mA

The (A3) 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 LX Series 100 Watt 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 LX Series 100 Watt 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 an external digital modulator (DT1C). RF power control is implemented by changing the DLC voltage provided to the external 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.

Table 2-6. 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 2-7. 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 2-8. 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 2-9. IF Processor Front Panel Sample

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

2.1.3 (A5) LO/Upconverter Module Assembly (1301930; Appendix B)

A5 LO/UPCONVERTER MODULE	IF INPUT: 41–47 MHz INPUT RETURN LOSS: 18dB MIN @ 41–47 MHz INPUT LEVEL: –8dBm TO 0dBm PK SYNC. CONVERSION GAIN: 0 ±1.5dB RF OUTPUT: 470–860 MHz, 0 TO +10dBm 10MHz INPUT LEVEL: 0 TO +6dBm LO SAMPLE LEVEL: –7dBm LO TUNING STEP SIZE: 5kHz POWER REQUIREMENTS: +12V @ 1.2–1.1A –12V @ 10mA

The (A5) LO/Upconverter Module Assembly contains a front panel LED display board (1303033), a UHF Filter (1007-1101), a UHF Generator Board (1585-1265) and a LO/Upconverter Assembly (1303039). The LO/Upconverter Assembly contains the LO/Upconverter Board (1302132).

The LX Series Upconverter converts an IF input signal to a RF output signal on the desired channel frequency using a high stability oven controlled oscillator with very low phase noise and an Automatic Level Control (ALC) for stable output signal level.

Several control voltages are used for transmitter power control. Automatic gain control (AGC) circuits set the RF output level of the transmitter system.

AGC #1 is provided by the Transmitter/Exciter Driver Power Amplifier module. This voltage is used by the Upconverter to maintain a constant RF output level at the Power Amplifier module output. If this voltage exceeds 0.9 VDC, the system is in an over-drive condition. The 0.9 VDC over-driver threshold is set by a front panel Upconverter module potentiometer. 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 the AGC #1 voltage for automatic gain control by setting it's RF output to maintain AGC #1 equal to the AGC voltage set by another front panel potentiometer. When the Upconverter is set for manual gain, the RF output of the Upconverter is set by the front panel AGC potentiometer. In manual gain operation, the AGC #1 feedback voltage from the PA is not used to adjust the RF level unless an over-drive condition is detected.

AGC #2 is provided by each of the optional external amplifier modules. Diodes are used in each of the external amplifier forward power circuits to capture the highest detected sample voltage. This voltage is used by the Upconverter to maintain a constant RF output of the system. As with AGC #1, the Upconverter module reduces its RF output level if AGC #2 is too high. AGC #1 and ACG #2 are diode ORed together in the Upconverter gain circuit. Both AGC voltages are first reduced by an on-board potentiometer before being amplified. If an over-drive condition does not exist, the higher of the two AGC voltages is used to control the Upconverter gain circuit. An AFC Voltage is generated to control the VCXO of the UHF Generator portion of the Upconverter module. The typical AFC voltage is 0.5 VDC but it can be as high as +1.5 VDC.

The Upconverter can operate on either it's internal 10 MHz source or on a 10 MHz external reference signal. When an external 10 MHz source is present on J10, it is automatically selected. An external reference present signal is provided to the controller for display purposes. The selected 10 MHz signal from the Upconverter is buffered then

sent to the backplane on two ports. One port is sent to the Modulator module, if present, and the other is routed to a BNC connector (J11) on the backplane for a system 10 MHz output signal.

A National Semiconductor frequency synthesizer IC is used in the frequency conversion of the IF signal to a RF signal. The frequency synthesizer IC uses a 10MHz reference frequency for signal conversion. Typically the IF input frequency is 45.75 MHz for analog system and 44 MHz for DTV. To obtain different output RF frequencies, the synthesizer IC is serial programmed by the Control Monitoring board. The part is programmed to use a 5 kHz phase detection frequency. With a 10 MHz input signal, the R counter is set to 2000. With these settings the N counter is set to the desired LO frequency in kHz / 5 kHz. The maximum LO frequency setting with these parameters is 1310.715 MHz.

Example:

For a Frequency RF Out = 517.125 MHz, N = 517125 kHz / 5 kHz = 103425

An Upconverter PLL Lock indicator is used to insure that the frequency control circuits are operating properly. When the Upconverter PLL is locked, the frequency synthesizer IC is programmed and the Power Amplifier module(s) can be enabled.

The RF output of the LO/Upconverter Module is at J23 on the rear chassis.

Table 2-10. LO/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 2-11. LO/Upconverter Front Panel Status Indicator

LED	FUNCTION
AGC CUTBACK (Red)	When lit it indicates that the required gain to produce the desired output power level has exceeded the level set by the AGC Cutback (Override) adjust. Transmitter will cut back power to 25%

Table 2-12. LO/Upconverter Front Panel Control Adjustments

POTENTIOMETERS	DESCRIPTION
MAN GAIN ADJ	Adjusts the gain of the transmitter when the transmitter is in the Manual AGC position.
AGC CUTBACK ADJ (AGC OVERRIDE)	Adjusts the point at which the transmitter will cut back in power when the Transmitter is in the Auto AGC position.

Table 2-13. LO/Upconverter Front Panel Samples

SMA CONNECTOR	DESCRIPTION
LO SAMPLE	Sample of the LO signal to the Upconverter as generated by the UHF Generator Board.
RF SAMPLE	Sample of the On Channel RF Output of the Upconverter

2.1.4 (A4) Control/Power Supply Module Assembly (110 VAC, 1301936 or 220 VAC, 1303229; Appendix B)

A4 CONTROL/ MONITORING MODULE	POWER REQUIREMENTS: +12V @ 250mA −12V @ 50mA
A4−A1 POWER SUPPLY	AC INPUT LEVEL: 100−240VAC @ 10A 50/60/400Hz DC OUTPUT LEVEL: +32V @ 15A +12V @ 8A −12V @ 4A

The (A4) Control & Monitoring/Power Supply Assembly is configured at the factory for operation at 110 VAC or 220 VAC. The assembly 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.

Table 2-14. 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 2-15. Controller/Power Supply Status Indicator

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 2-16. Controller/Power Supply Control Adjustments

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

2.1.5 (A6) Power Amplifier Module Assembly, Exciter, 100W Transmitter (1301923; Appendix B)

A6 POWER AMPLIFIER	RF INPUT/OUTPUT: 470 – 860 MHz INPUT LEVEL: +10dBm ±2dB PK SYNC. INPUT RETURN LOSS: –10dB OUTPUT LEVEL: +51dBm (120W PK SYNC) POWER REQUIREMENTS: +32V @ 12A +12V @ 0.2A –12V @ 0.5A

NOTE: The (A6) Power Amplifier Module Assembly (1301923) is used in the 10-100 Watt Transmitter.

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 100W 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 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 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 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 analog, 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 2-17. 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.

Table 2-18. 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 2-19. Power Amplifier Sample

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

2.1.5.1 (A6) Driver Amplifier Module Assembly (1302846; Appendix B)

A6 DRIVER AMPLIFIER MODULE	RF INPUT/OUTPUT:	470 – 860 MHz
	INPUT LEVEL:	+10dBm ±2dB PK SYNC.
	INPUT RETURN LOSS:	−10dB
	OUTPUT LEVEL:	+38.5dBm (7W PK SYNC)
	POWER REQUIREMENTS:	+32V @ 2A
		+12V @ 0.2A
		−12V @ 0.5A

NOTE: The (A6) Driver Amplifier Module Assembly (1302846) replaces the Power Amplifier Module Assembly (1301923) when the amplifier module is used as a driver for any external PA assemblies.

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) and a TFS 40W UHF Module (1206693).

The Driver Power Amplifier Module contains Broadband LDMOS amplifiers that cover the entire UHF band with no tuning required. They amplify the RF to the power level, 7 Watts Peak of Sync is maximum, that is needed to drive the external amplifiers to the output power level of the transmitter.

The Driver Power Amplifier 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 driver PA Assembly. This module contains RF monitoring circuitry for both an analog and a digital system. Control and monitoring lines to the Driver Power Amplifier module are routed through the floating blind-mate connector of the Control & Monitoring/Power Supply module.

The 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 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 PA amplifiers 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 amplifiers, are reported by the system Control Monitoring module.

If the Control Monitoring module is monitoring a 10-100 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 100 Watts, system power is monitored by an external module that is connected to TB31. In this configuration switches SW1 on the control board must be set off.

The Forward Power of the 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 2-20. Driver 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.

Table 2-21. Driver 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 2-22. Driver Amplifier Sample

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

2.1.6 RF Output Assemblies

The RF output from the driver power amplifier is at the RF output jack, an "N" connector J25, PA RF Output, of the chassis assembly. If this assembly is used as a driver the output connects to the input of the PA Assembly mounted beneath the Exciter Assembly. If this assembly is used as a 10W to 100W transmitter, then the output connects directly to the bandpass filter for the system.

The RF output of the transmitter is typically connected to a bandpass filter and then to a trap filter mounted on the rear of the assembly. The bandpass and trap filters are tuned to eliminate unwanted sideband and harmonic frequencies. Located on the output of the trap filter is a BNC output sample jack that can be used for test purposes.

2.2 Control and Status

The control and status of the exciter/amplifier Chassis assembly are found by operating the front panel display screen on the front of the assembly. Detailed information on the use of the screens is found in chapter 3.

2.2.1 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 transmitter.

2.3 System Operation

When the transmitter is in operate, as set by the menu screen located on the Control & Monitoring Module. 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.

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
- 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.

Table 2-23: UHF Television Frequencies

CH #	FREQUENCY	CH #	FREQUENCY	CH #	FREQUENCY
14	470-476 MHz	38	614-620 MHz	61	752-758 MHz
15	476-482 MHz	39	620-626 MHz	62	758-764 MHz
16	482-488 MHz	40	626-632 MHz	63	764-770 MHz
17	488-494 MHz	41	632-638 MHz	64	770-776 MHz
18	494-500 MHz	42	638-644 MHz	65	776-782 MHz
19	500-506 MHz	43	644-650 MHz	66	782-788 MHz
20	506-512 MHz	44	650-656 MHz	67	788-794 MHz
21	512-518 MHz	45	656-662 MHz	68	794-800 MHz
22	518-524 MHz	46	662-668 MHz	69	800-806 MHz
23	524-530 MHz	47	668-674 MHz	70	806-812 MHz
24	530-536 MHz	48	674-680 MHz	71	812-818 MHz
25	536-542 MHz	49	680-686 MHz	72	818-824 MHz
26	542-548 MHz	50	686-692 MHz	73	824-830 MHz
27	548-554 MHz	51	692-698 MHz	74	830-836 MHz
28	554-560 MHz	52	698-704 MHz	75	836-842 MHz
29	560-566 MHz	53	704-710 MHz	76	842-848 MHz
30	566-572 MHz	54	710-716 MHz	77	848-854 MHz
31	572-578 MHz	55	716-722 MHz	78	854-860 MHz
32	578-584 MHz	56	722-728 MHz	79	860-866 MHz
33	584-590 MHz	57	728-734 MHz	80	866-872 MHz
34	590-596 MHz	58	734-740 MHz	81	872-878 MHz
35	596-602 MHz	59	740-746 MHz	82	878-884 MHz
36	602-608 MHz	60	746-752 MHz	83	884-890 MHz
37	608-614 MHz				

2.4 Customer Remote Connections

The remote monitoring and operation of the transmitter is provided through jacks TB30 and TB31 located on the rear of the chassis assembly. If remote connections are made to the transmitter, they must be made through plugs TB30 and TB31 at positions noted on the transmitter interconnect drawing and Table 2-20.

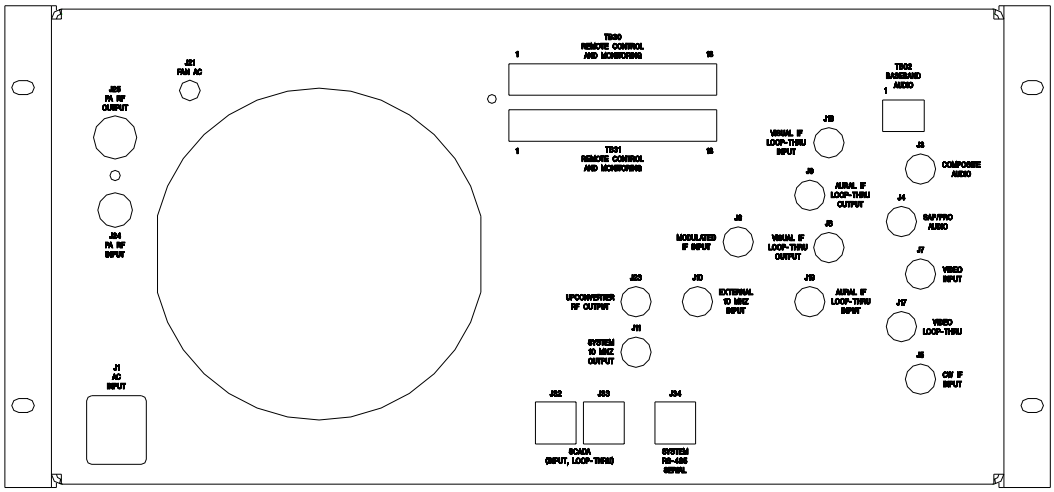

Table 2-24: LX Series Chassis Assembly Hard Wired Remote Interface Connections to TB30 or TB31, 18 pos. Terminal Blocks Located on the Rear of the Assembly

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 a 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.
RMT AUX IO 2	TB30-5	
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.

Signal Name	Pin Designations	Signal Type/Description
RMT Transmitter Stand-By	TB30-7	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter is to be placed into the standby mode.
RMT Power Raise	TB30-8	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter power is to be raised.
RMT Power Lower	TB30-9	Discrete Open Collector Input - A pull down to ground on this line indicates that the transmitter power is to be lowered.
RMT System Reflect Power	TB30-10	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated "System Reflected Power " and indicates the transmitter's reflected output power. The scale factor is 25%/3.2V.
RMT System Visual/Forward Power	TB30-11	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated "System Visual/Avg. Power ". Indicates the transmitter's Visual / Average power. Scale factor is 100%/3.2V.
RMT System Aural Power	TB30-12	Analog Output - 0 to 4.0 V- This is a buffered loop through of the calibrated "System Aural Power ". Indicates the transmitter's forward Aural output power. The scale factor is 100%/3.2V.
RMT Spare 1	TB30-13	Remote connection to spare module - Use is TBD.
RMT Spare 2	TB30-14	Remote connection to spare module - Use is TBD.
System Reflect Power	TB31-13	Analog Input - 0 to 1.00 V- This is the input of the "System Reflected Power " indicating the transmitter's reflected output power. The scale factor is 25%/0.80V.
System Visual / Forward Power	TB31-14	Analog Input - 0 to 1.00 V- This is the input of the "System Visual / Forward Power " indicating the transmitter's forward Visual / Forward output power. The scale factor is 100%/0.80V.
System Aural Power	TB31-15	Analog Input - 0 to 1.00 V- This is the input of the "System Aural Power " indicating the transmitter's forward Aural output power. The scale factor is 100%/0.80V.
IF Processor IF Signal Select	TB31-3	Discrete Open Collector Input - A low indicates that the modulator IF source is to be used by the IF Processor module. When floating an analog IP Processor module may use the Modulated IF Input if the IF Processor sled is so configured.
IF Processor DLC Voltage	TB31-4	Analog Output - 0 to 5.00 V- This is the input of IF Processor module for digital system RF output power control.
UC AGC #2 Voltage	TB31-5	Auxiliary Analog Input - 0 to 1V- This voltage is used by the Upconverter for gain control. Linear signal with display resolution of 0.01 %. Primary signal source is J34-1.
RMT Ground	TB30-15, and 17	Ground pins available through Remote
RMT Ground	TB31-1, 2, 6 to 12, and 17	Ground pins available through Remote

Signal Name	Pin Designations	Signal Type/Description
RMT +12 VDC	TB30-16 TB31-16	+12 VDC available through Remote w/ 2 Amp re-settable fuse
RMT -12 VDC	TB30-18 TB31-18	-12 VDC available through Remote w/ 2 Amp re-settable fuse