

## 8. OPERATIONAL DESCRIPTION - MODEL Axcera-LU6000AL

### 8.1 General Description

The LU6000AL is a complete 6000-watt UHF solid-state, internally diplexed television translator. It operates at a nominal visual output power of 6000 watts peak sync and an average aural output power of 600 watts, at an A/V ratio of 10 dB, 10% sound.

### 8.2 Technical Specifications

|                         |  |
|-------------------------|--|
| Type of Emissions:      |  |
| Visual .....            | 5M75C3F                                |
| Aural .....             | 250KF3E                                |
| Frequency Range.....    | 470 MHz to 860 MHz (any 6-MHz channel) |
| Output Power            |  |
| Visual .....            | 6000 watts peak sync                   |
| Aural .....             | 600 watts average                      |
| Maximum Power Rating    |  |
| Visual .....            | 6000 watts peak visual                 |
| Aural .....             | 600 watts average aural                |
| Power Consumption ..... | 19,900 watts                           |

### 8.3 Performance Specifications

#### Visual Performance

|  |                      |
|--|----------------------|
| Operating Frequency Range .....                      | 470 MHz to 860 MHz   |
| RF output - Nominal:                                 |                      |
| Power .....  | 6000 watts peak sync |
| Impedance .....                                      | 50 ohms              |
| Connector .....                                      | 3 1/8" EIA           |
| Visual Sideband Response:                            |                      |
| -1.25 MHz and below .....                            | -20B                 |
| -0.75 to -0.5 MHz.....                               | +0.5, -2.0dB         |
| -0.5 MHz to +3.58 MHz.....                           | ±0.5 dB              |
| 3.58 MHz to 4.18 MHz.....                            | +0.5, -1.0 dB        |
| Variation of Frequency Response with Brightness..... | ±0.5 dB              |
| Differential Phase .....                             | ±3°                  |
| Incidental Phase Modulation.....                     | ±3°                  |
| Differential Gain .....                              | 5%                   |
| Low Frequency Linearity .....                        | 5%                   |
| Intermodulation Products .....                       | -52 dB (red field)   |
| Output Variation (Over 1 Frame) .....                | 2%                   |
| Regulation of Output.....                            | 3%                   |
| Signal-to-Noise Ratio .....                          | 55 dB                |

2t K-Factor ..... 2%  
 Harmonic Radiation ..... -60 dB  
 Spurious (>3 MHz from channel edge) ..... -50 dB  
 Carrier Frequency Stability .....  $\pm 1000$  Hz  
 Noise Figure w/Input Preamp ..... 3 dB (Max.)  
 Input Dynamic Range (no Preamp) ..... -60 to -15 dBm

#### Aural Performance

##### RF Output – Nominal

Power ..... 600 watts  
 Impedance ..... 50 ohms  
 Connector ..... 3 1/8" EIA

#### Electrical Requirements

Power Line Voltage ..... 230 volts, 50/60 Hz  
 Power Consumption ..... 19,900 watts

#### Environmental

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

#### Mechanical

##### Dimensions:

Width ..... 44 inches  
 Depth ..... 34 inches  
 Height ..... 76 inches  
 Weight ..... 1,330 lbs

### 8.4. System Overview

The LU6000AL (1306589) is made up of the (8) trays listed in Table 8-1.

*Table 8-1. LU6000AL Major Trays and Assemblies*

| MAJOR ASSEMBLY DESIGNATOR | TRAY/ASSEMBLY NAME          | DRAWING NUMBER |
|---------------------------|-----------------------------|----------------|
| A1                        | UHF Exciter                 | 1303268        |
| A2, A3, A4, A5, A6, A7    | External Amplifier Assembly | 1303828        |

The (A2) UHF Exciter can operate using a 45.75 MHz IF carrier from either the (A1) Receiver tray's output, or that from a Modulator tray. Both of these carriers must be diplexed with a 41.25 MHz aural carrier, at an A/V ratio not to exceed -10dB.

#### **8.4.1 Exciter Tray (Driver)/External Amplifier Tray**

The input to the Exciter Tray is a modulated Internally Diplexed IF signal. This signal is connected to the input of the IF Processor Module. The output of the Exciter Tray (driver) drives the input to the External Amplifier Tray.

##### **8.4.2.1 Receiver Module (Driver)**

The UHF/VHF Receiver converts a low level RF input signal to an IF frequency of 44 MHz, filters off any unwanted out of band energy, and normalizes the level so that it can be applied to the IF processor assembly. It consists of three boards. The RF input is applied first to the UHF/VHF preamplifier board, which filters off out of channel energy and amplifies the input signal. The RF output is applied to the Mixer/PLL board, which converts the signal down to an IF frequency of 44 MHz. The IF output is applied to the IF ALC board, which amplifies the signal, filters off any unwanted out of band energy and controls its own IF gain to make sure that the IF output level is constant.

There is also a provision to apply +12V to the RF input center conductor to power an external preamplifier.

##### **8.4.2.2 IF Processor Module (Driver)**

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 Pioneer 100 Watt Translator/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 Pioneer 100 Watt Translator / 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 translator'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 or DT2B). 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 translator or in Manual mode the translator 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 translator. The system controller does not Mute on an IF Processor Input fault.

#### **8.4.2.3 L.O. / Upconverter Module (Driver)**

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 Pioneer 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 translator power control. Automatic gain control (AGC) circuits set the RF output level of the translator system.

AGC #1 is provided by the 50-Watt Translator/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 its 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 AGC #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 1.5 VDC but it can be as high as +5 VDC.

The Upconverter can operate on either its 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 connect or (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,  $N = 517125 \text{ kHz} / 5 \text{ kHz} = 103425$

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

#### **8.4.2.4 Control & Monitoring / Power Supply Module (Driver)**

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  $\pm 12$  VDC to the rest of the modules in the chassis and +32 VDC to the Power Amplifier module.

The Assembly provides all translator 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.

#### **8.4.2.5 Power Amplifier Module (Driver)**

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 translator.

The Power Amplifier of the Translator/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 Translator/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 Translator, 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 Translator/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.

#### **8.4.2.6 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 Translator/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 Translator/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 Translator, 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 Translator/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.



#### 8.4.2.7 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  $\pm 12$ V/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.

### 8.5 Control and Status

#### 8.5.1 Exciter Tray (Driver)

Table 8-1. Receiver Front Panel Switch

| SWITCH              | FUNCTION  |
|---------------------|---|
| MAN/AUTO ALC<br>SW1 | When Manual ALC is selected, the level is set by the Manual ALC Pot R57 located on the mixer/PLL board. ( <b>NOTE:</b> The pot is factory set and needs no adjustment by the customer).<br><br>When Auto ALC is selected, the level control circuit will automatically increase or decrease the ALC to maintain the desired output level. |

Table 8-2. Receiver Front Panel Status Indicators

| LED                           | FUNCTION   |
|-------------------------------|--|
| PLL1 Fault DS6                | Displays the status of the Local oscillator PLL                        |
| PLL 2 Fault DS8               | Displays status of optional input frequency correcting PLL             |
| DC on center conductor<br>DS4 | Displays whether or not DC is applied to the RF input center conductor |
| Man ALC Gain DS7              | Displays when ALC is switched to Manual bypass                         |
| ALC Fault DS5                 | Displays ALC status  |

Table 8-3. Receiver Front Panel Control Adjustments

| POTENTIOMETERS  | DESCRIPTION  |
|-----------------|--|
| Manual Gain R57 | Adjusts the gain of the receiver when the ALC is bypassed. |
| A/V Ratio R50   | Adjusts the ratio between the visual and aural carriers.   |

Table 8-4. Receiver Front Panel Samples

| SMA CONNECTORS  | DESCRIPTION  |
|-----------------|--|
| Receiver IF J13 | Sample of the IF output of the IF ALC Board.           |
| Receiver LO J2  | Sample of the LO generated on the UHF Mixer PLL Board. |



Table 8-5. IF Processor Front Panel Switch

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

Table 8-6. IF Processor Front Panel Status Indicators

| <b>LED</b>        | <b>FUNCTION</b>   |
|-------------------|---|
| INPUT FAULT (Red) | When lit it indicates that there is a loss of the IF Input signal to the IF Processor. Translator 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 8-7. IF Processor Front Panel Control Adjustments

| <b>POTENTIOMETERS</b>        | <b>DESCRIPTION</b>  |
|------------------------------|---|
| 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 translator when the translator is in the Auto ALC position.   |
| MAN GAIN                     | Adjusts the gain of the translator when the translator 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 8-8. IF Processor Front Panel Sample

| <b>SMA CONNECTOR</b> | <b>DESCRIPTION</b>  |
|----------------------|---|
| IF SAMPLE            | Sample of the pre-corrected IF output of the IF Processor |

Table 8-9. LO/Upconverter Front Panel Switch

| <b>SWITCH</b> | <b>FUNCTION</b>  |
|---------------|--|
| MAN/AUTO AGC  | When Manual AGC is selected, the reference AGC voltage is set by the AGC Manual Gain front panel potentiometer.<br><br>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 8-10. LO/Upconverter Front Panel Status Indicator

| <b>LED</b>           | <b>FUNCTION</b>   |
|----------------------|---|
| AGC CUTBACK<br>(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. Translator will cut back power to 25% |

Table 8-11. LO/Upconverter Front Panel Control Adjustments

| <b>POTENTIOMETERS</b>             | <b>DESCRIPTION</b>  |
|-----------------------------------|---|
| MAN GAIN ADJ                      | Adjusts the gain of the translator when the translator is in the Manual AGC position.                             |
| AGC CUTBACK ADJ<br>(AGC OVERRIDE) | Adjusts the point at which the translator will cut back in power when the Translator is in the Auto AGC position. |

Table 8-12. LO/Upconverter Front Panel Samples

| <b>SMA CONNECTOR</b> | <b>DESCRIPTION</b>  |
|----------------------|---|
| 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                               |

Table 8-13. Controller/Power Supply Display

| <b>DISPLAY</b> | <b>FUNCTION</b>   |
|----------------|---|
| 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 8-14. Controller/Power Supply Status Indicator

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

Table 8-15. Controller/Power Supply Control Adjustments

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

Table 8-16. Power Amplifier Status Indicator

| LED                | FUNCTION   |
|--------------------|--|
| ENABLED<br>(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<br>(Green)   | When lit Green, it indicates that the fuse protected DC inputs to the PA module are OK.  |
| TEMP<br>(GREEN)    | When lit Green, it indicates that the temperature of the heatsink assembly in the module is below 78°C.  |
| MOD OK<br>(Green)  | When lit Green, it indicates that the PA Module is operating and has no faults.  |

Table 8-17. 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 8-18. Power Amplifier Sample

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

### 8.5.3 External Power Amplifier Tray

Table 8-19. Power Amplifier Status Indicators (External Power Amplifier Assembly)

| LED                | FUNCTION   |
|--------------------|--|
| ENABLED<br>(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<br>(Green)   | When lit Green, it indicates that the fuse protected DC inputs to the PA module are OK.  |
| TEMP<br>(Green)    | When lit Green, it indicates that the temperature of the heatsink assembly in the module is below 78°C.  |
| MOD OK<br>(Green)  | When lit Green, it indicates that the PA Module is operating and has no faults.  |

Table 8-20. Power Amplifier Control Adjustments (External Power Amplifier Assembly)

| <b>POTENTIOMETERS</b> | <b>DESCRIPTION</b>  |
|-----------------------|---|
| 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 8-21. Power Amplifier Sample (External Power Amplifier Assembly)

| <b>DISPLAY</b> | <b>FUNCTION</b>   |
|----------------|---|
| FWD SAMPLE     | RF sample of the amplified signal being sent out the module on J25. |

## 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   |
| J12  | BNC   | Receiver RF Input           | 50   |
| J13  | BNC   | Receiver IF 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 |

## **8.7 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.

## **8.8 System Operation**

When the translator 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 translator 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 translator 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 translator can be controlled by the presence of a modulated input signal. If the input signal to the translator is lost, the translator will automatically cutback and the input fault indicator on the IF Processor module will light. When the video input signal returns, the translator will automatically return to full power and the input fault indicator will be extinguished.

### **8.8.1 Principles of Operation**

#### **Operating Modes**

This translator 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 translator when it is providing RF power output. To provide RF power to the output, the translator 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 translator. 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 translator will remain in the operate mode but will be placed in mute when the following fault conditions exists in the translator.

- 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 Translator 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 translator that will prevent the translator from entering the operate mode. These conditions are:

- Power Amplifier heat sink temperature greater than 78°C.
- Translator 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 translator indicates that the output amplifier of the translator 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 Translator 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 translator controller is designed to operate on UHF frequencies. The exact output frequency of the translator 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 translator requires different hardware for different



frequency bands, not all frequency configurations are valid for a specific translator. The Power detectors in the translator 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.