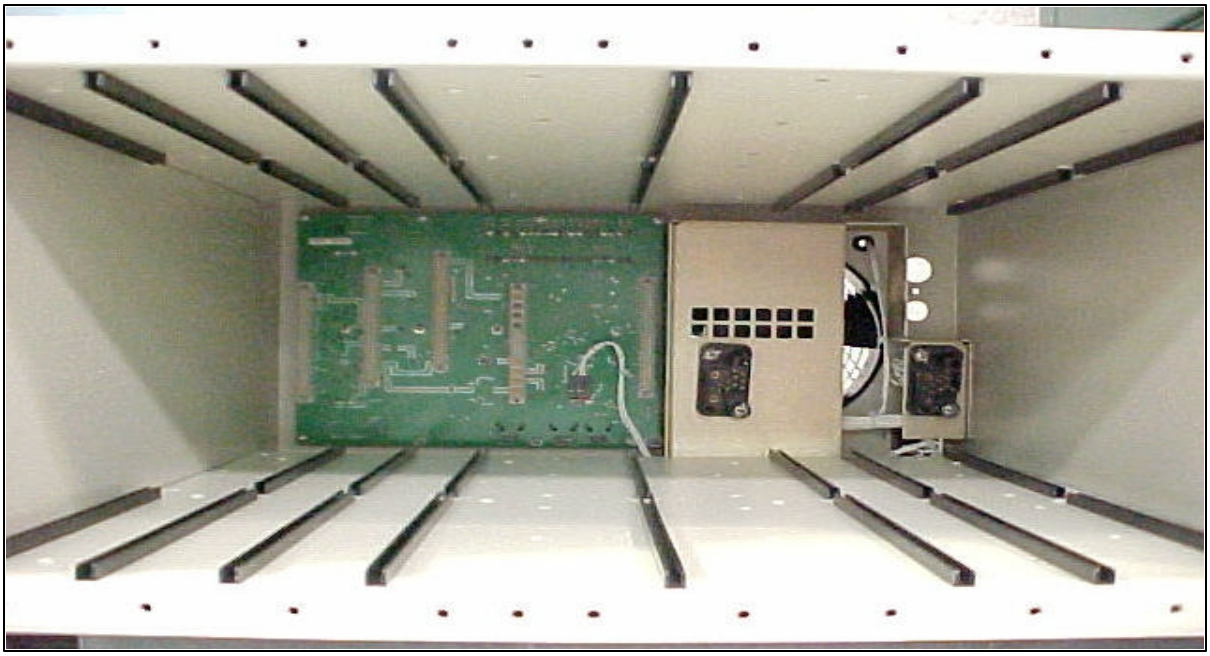
5. USER'S MANUAL

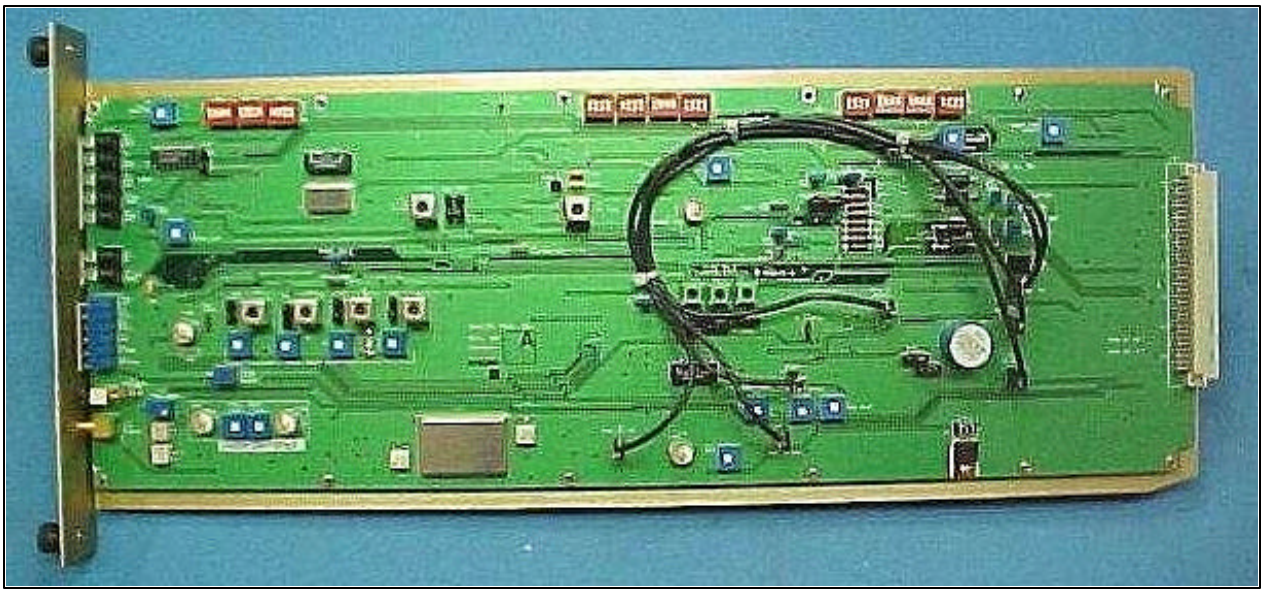
The user's manual for the Axcera-LU2000AT system is provided as separate PDF files.

6. INTERNAL PHOTOS

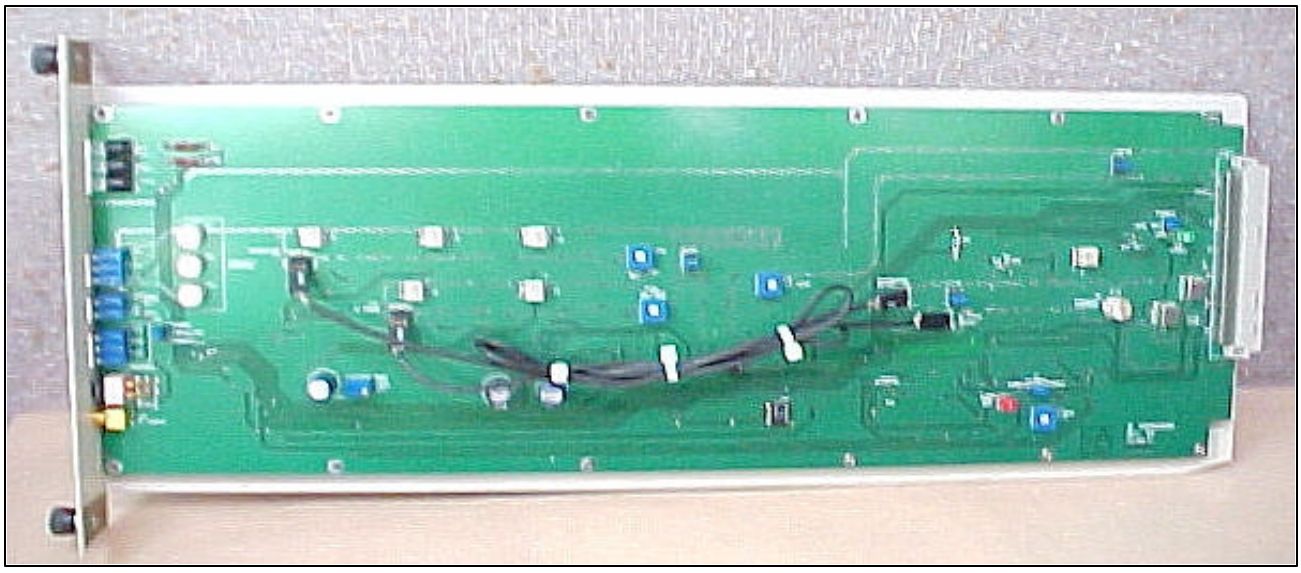
6.1 Front view – Chassis Assembly (Exciter)



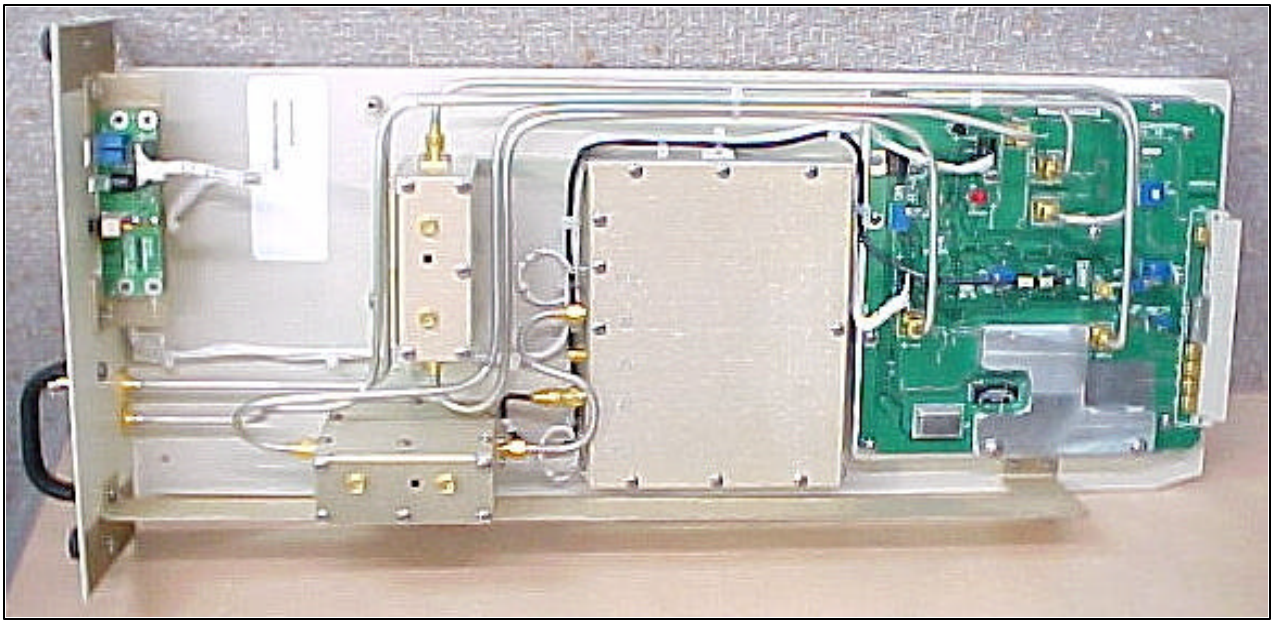
6.2 Side view - Modulator Assembly (Exciter)



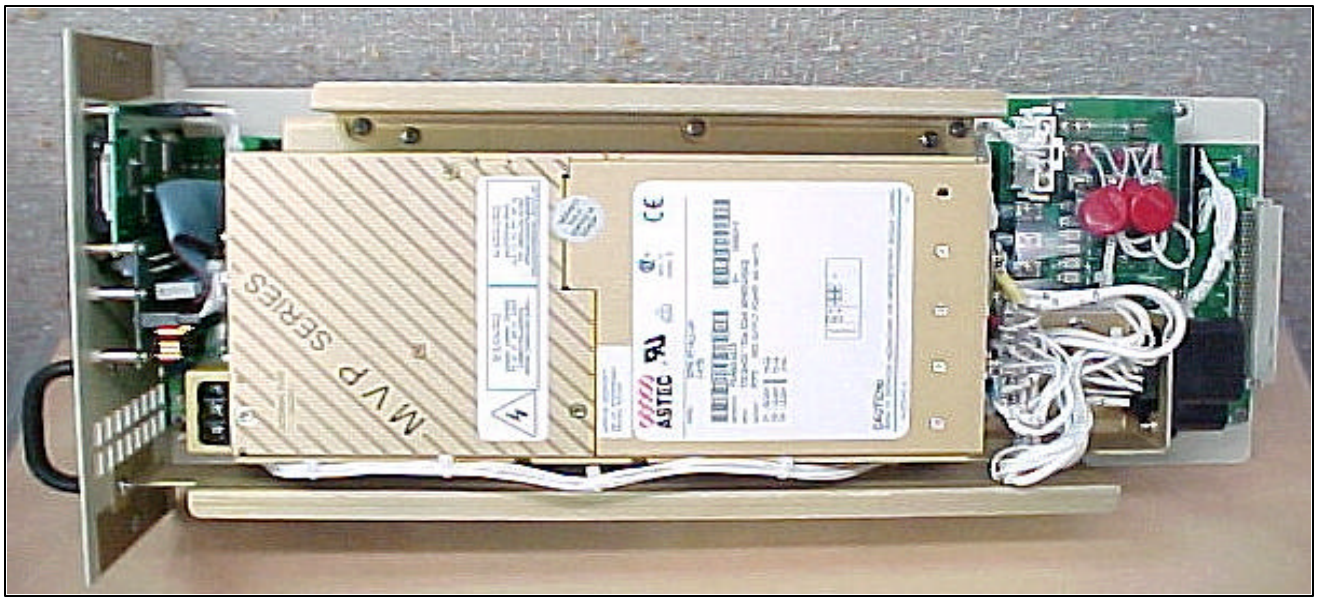
6.3 Side view - IF Processor Assembly (Exciter)



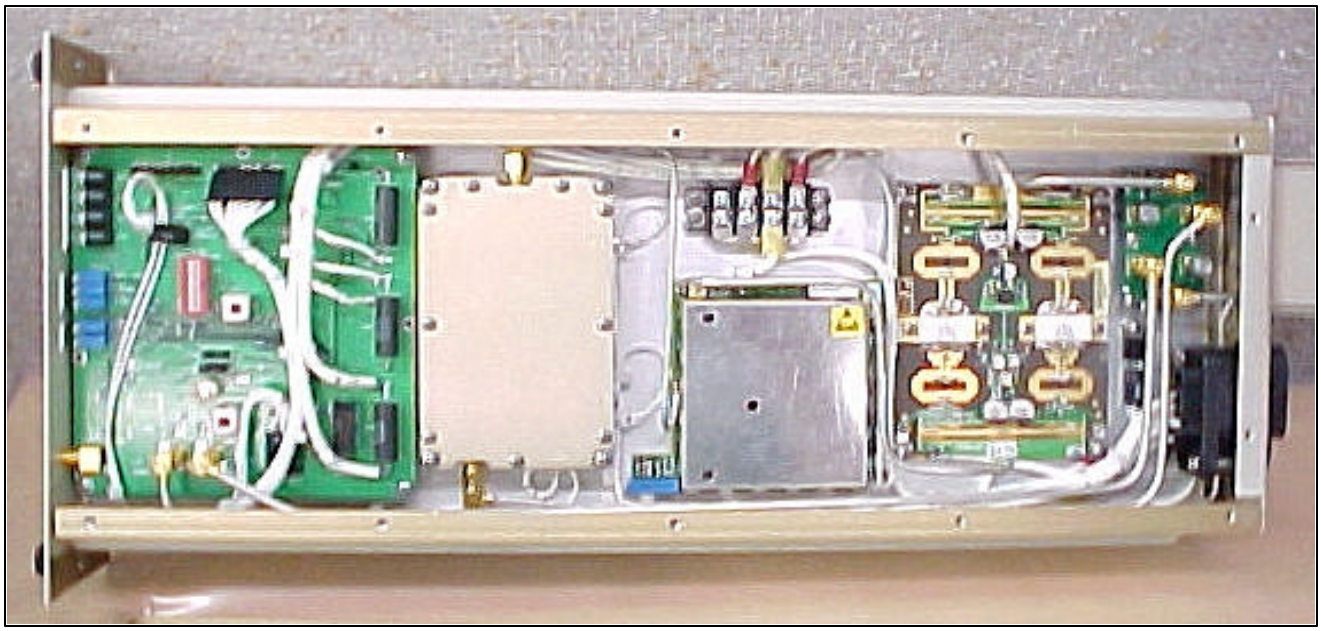
6.4 Side view - L.O. Upconverter Assembly (Exciter)



6.5 Side view - Control / Power Supply Assembly (Exciter)

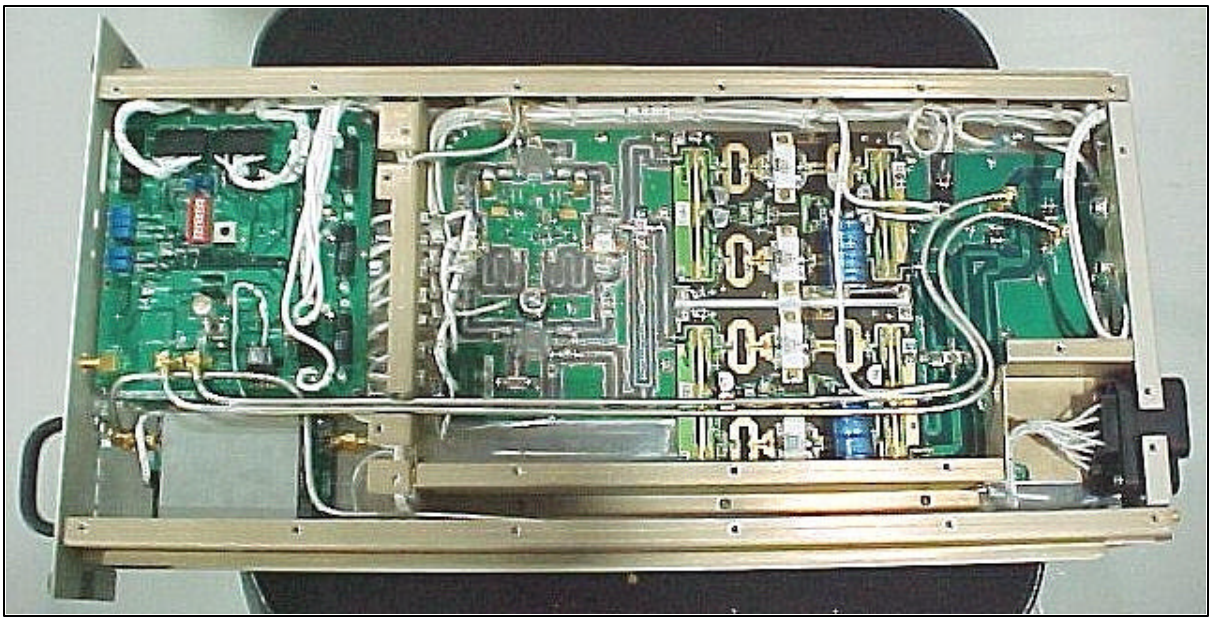


6.6 Side view - Power Amplifier Assembly (Exciter)



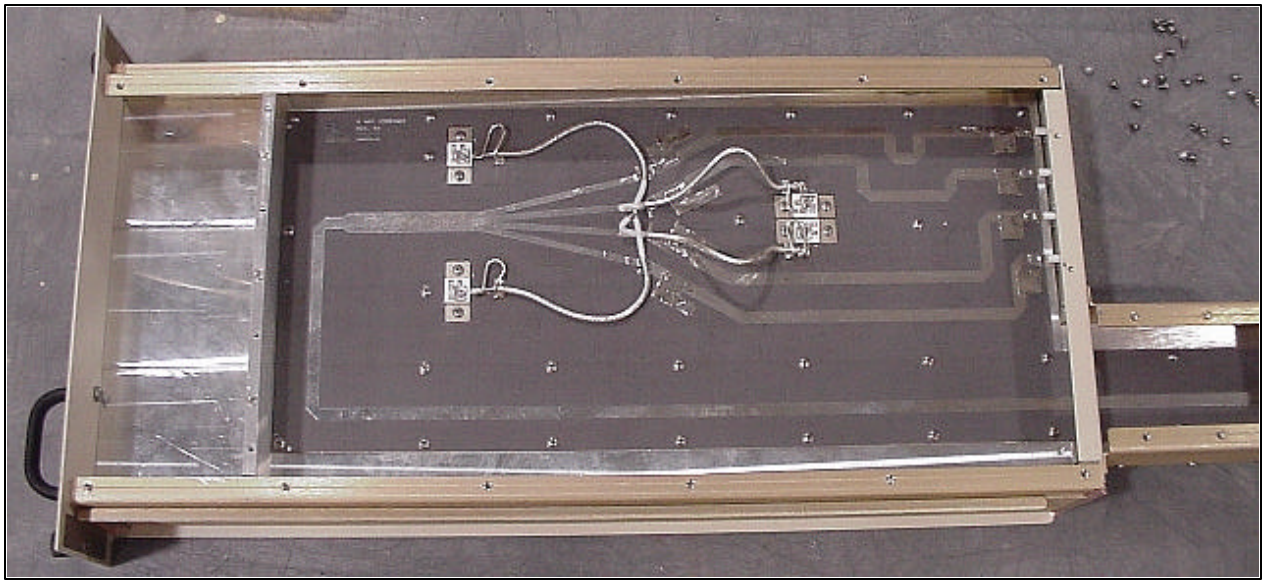
6.7 Front view – Chassis Assembly (External Power Amplifier) x2

6.8 Side view - Power Amplifier Assembly (External Power Amplifier) x8



6.9 Side view – Power Supply Assembly (External Power Amplifier) x4

6.10 Side view – 4-Way Combiner Assembly (External Power Amplifier) x2



7. PARTS LIST/TUNE-UP INFO

7.1 Parts List

The transmitter, can be subdivided as follows:

Exciter Tray:

- Modulator Module
- IF Processor Module
- L.O. / Upconverter Module
- Control & Monitoring / Power Supply Module
- Power Amplifier Module

External Amplifier Tray:

- 4-Way Splitter (Qty of 2)
- Power Amplifier Module (Qty of 8)
- Power Supply Module (Qty of 4)
- 4-Way Combiner (Qty of 2)

7.2 Tune-up Information

The LU2000AT transmitter was aligned at the factory and should not require additional alignments to achieve normal operation.

7.2.1 Exciter/Amplifier Chassis Assembly

This transmitter takes the baseband audio and video inputs or, if the (Optional) 4.5-MHz composite input kit is purchased, either a single composite video + 4.5-MHz input or separate baseband video and audio inputs, and converts them to the desired UHF On Channel RF Output at the systems output power level.

7.2.2 Modulator Module Assembly

Note: Not present in Translator systems.

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

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

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

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

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

AUDIO OVER DEVIATION (DS4) – Red Indicates that the input Audio level is too high. (±75 kHz max)

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

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

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

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

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

Note: An NTSC or FCC composite signal should be used for video metering calibration.

Switch the LCD display to the Modulator Details screen that indicates the AUDIO DEVIATION (modulation level) of the signal up to 75 kHz.

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

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

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

7.2.3 If Processor Module Assembly

On the LCD Display, located on the Controller/Power Supply Module, push the button to switch the transmitter to Operate. The setup of the RF output includes adjustments to the drive level of the Power Amplifier, the adjustment of the linearity and phase pre-distortion to compensate for any nonlinear response of the Power Amplifier on the front panel of the IF Processor module.

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

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

- DS4 (Mute) – Indicates that a Mute command is present to the system.

Switch the transmitter to Standby. The ALC is muted when the transmitter is in Standby. To monitor the ALC, preset R3, manual gain adjust, on the front panel of the Upconverter module, fully CCW. Move switch SW1, Auto/Man AGC, on the front panel of the Upconverter module, to the Manual position. Place the transmitter in Operate. Adjust the ALC GAIN pot on the front panel of the IF Processor to obtain +0.8 VDC on the LCD Display on the Controller/Power Supply in the ALC screen. Move the MAN/AUTO ALC switch back to Auto, which is the normal operating position.

To adjust the AGC Cutback setting, raise the output power of the transmitter to 110%. Adjust R2, AGC Cutback, located on the front panel, CCW until the LED DS1, AGC Cutback, just starts to flash. Return the output power of the transmitter to 100%.

7.2.4 Linearity Correction Adjustment

As shipped, the exciter was preset to include amplitude and phase pre-distortion. The pre-distortion was adjusted to approximately compensate the corresponding non-linear distortions of the Power Amplifier.

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

Set up a spectrum analyzer with 100 kHz resolution bandwidth and 100 kHz video bandwidth to monitor the intermodulation products of the RF output signal of the Power Amplifier. There are three Linearity Corrector stage adjustments located on the front panel of the IF Processor Module. The adjustments are threshold settings that are adjusted as needed to correct for any amplitude or phase intermod problems. Adjust the top linearity correction adjustment R211 threshold cut in for the in phase amplitude distortion pre-correction that is needed. Next adjust the middle linearity correction adjustment R216 threshold cut in also for the in phase amplitude distortion pre-correction that is needed. Finally adjust the bottom linearity correction adjustment R231 threshold cut in for the quadrature phase distortion pre-correction that is needed. The above pots are adjusted for the greatest separation between the peak visual carrier and the intermod products.

7.2.5 Frequency Response Delay Equalization Adjustment

The procedure for performing a frequency response delay equalization adjustment for the transmitter is described in the following steps:

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

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

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

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

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

7.2.6 Calibration of the Transmitter Forward Output Power Level

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

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

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

Example is for 2000-Watt transmitter.

- Sync + black 0 IRE setup/wattmeter=1190 watts
- Sync + black 7.5 IRE setup/wattmeter=1090 watts

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

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

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

7.2.7 Calibration of the Transmitter Reflected Output Level

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

Switch the transmitter to Standby and move the Reflected power cable on the A11 Coupler back to the “Reflected Port”. Switch the transmitter to Operate and adjust the front panel power pot for a 100% visual power reading. Switch the LO/Upconverter to the Auto AGC position and adjust the ALC Gain adjust pot on the front of the IF Processor module for 100% visual power reading, if needed.

7.2.8 (A9) Bandpass Filter Assembly

The Bandpass Filter Assembly is tuned to reject unwanted distortion products generated when the signals are diplexed and also during the amplification process.

The Bandpass Filter is factory tuned to the proper bandwidth and should not need tuned. If you think tuning is needed consult Axcera Field Support Department before beginning the adjustment.

7.2.9 (A10) UHF Trap Filter Assembly

The Traps on the output Trap Filter are labeled with their Center Frequency relative to the Frequency of the Carrier. (For Example: The Traps labeled -4.5 MHz are tuned for a Center Frequency of 4.5 MHz Lower than the Frequency of the Visual Carrier.) The first section of the Trap Filter filters out the Visual Carrier plus 9 MHz (f_v+9 MHz). The second and fourth sections work together to filter out the lower spurious product (f_v-4.5 MHz). The third section is tuned to remove the (f_v+8.08). The output of the Trap Filter is an "N" Type Connector.

The Trap Sections have been factory tuned and should not need major adjustments. The Trap Filter is comprised of four trap sections connected to the main transmission line.

The Trap Sections are Reflective Notches, adjustable across the entire UHF Frequency Band. The electrical length of the Outer Sleeve and the Center Rod of the Notch can be adjusted to Tune the Notch Frequency. The Depth of the Notch is set by the gap between the Center Conductor of the Trap Section and the Center Conductor of the Main Line. Tight Coupling makes a Deep Notch, while Loose Coupling makes a Shallow Notch.

FINE TUNING of the Notches Center Frequency can be accomplished with the Tuning Bolts located on the side of the Filter Section. Loosen the nut locking the Bolt in place and adjust the Bolt to change the Frequency of the Notch. Monitor the output of the Transmitter with a Spectrum Analyzer and Null the Distortion Product with the Bolt. Red Field is a good Video Test Signal to use to see the +8.08 MHz Product. Tighten the nut when the tuning is completed. Hold the bolt in place with a screwdriver as the nut is tightened to prevent it from slipping.

MAJOR TUNING, such as changing the Notch Depth or moving the Notch Frequency more than 1 MHz, the Outer Conductor and the Center Conductor of the Trap Section must both be moved. This requires a RF Sweep Generator to accomplish. Apply the Sweep signal to the Input of the Trap Filter and monitor the Output. Loosen the Clamp holding the Outer Conductor in place and make the length longer to Lower the frequency of the Notch or shorter to Raise the frequency of the Notch. Loosen the Center Conductor with an Allen Wrench and move it Deeper for a Lower Frequency Notch or out for a Higher Frequency Notch. These adjustments must both be made to change the Notch Frequency. Moving only the Center Conductor or the Outer Conductor will effect the Notch Depth in addition to the Center Frequency. The variable that is being adjusted with this procedure is the length of the Center Conductor inside the Trap Filter. The gap between the Trap and the Main Line should not be changed. Moving only the Inner or the Outer Conductors by itself will effect the Gap and the Notch depth.

To effect the Notch Depth Only, both sections will have to be moved. The Notch Depth is controlled by the Gap between the Center Conductor and the Trap Section. This Gap also has an effect on the Center Frequency. To Deepen the Notch, Shorten the Outer Conductor and pull the Center Conductor Out until the Notch is back in the same place. Move the Sections in the opposite direction to make a Shallow Notch. **NOTE**: THE TRAP FILTER IS TYPICALLY ADJUSTED FOR A NOTCH DEPTH OF 10 dB.

7.2.10 The Effects of Tuning the Output Trap Filter

Lengthening Outer Conductor Only - Notch Frequency Up, Shallower Notch.

Shortening Outer Conductor Only - Notch Frequency Down, Deeper Notch.

Inserting Inner Conductor Deeper - Notch Frequency Down, Deeper Notch.

Inserting Less Inner Conductor - Notch Frequency Up, Shallower Notch.

Tuning Bolt In - Notch Frequency Down.

Tuning Bolt Out - Notch Frequency Up.

Moving both Inner and Outer Conductors to keep the Same Gap inside - Center Frequency Moves, Notch Stays the Same.

After tuning has been completed, tighten the Clamp and the Allen Screws that hold the Conductors. Use the Fine Tuning Bolts to bring the Frequency In. The Final Tuning Adjustments should be completed with the Transmitter driving the Output Trap Filter for at least one hour to allow for warm-up drift.

The Transmitter is ready for normal operation.
This completes the detailed alignment procedures for the LX Series transmitter.

8. OPERATIONAL DESCRIPTION - MODEL Axcera-LU2000AT

8.1 General Description

The LU2000AT is a complete 2000-watt UHF solid-state, internally diplexed television transmitter. It operates at a nominal visual output power of 2000 watts peak sync and an average aural output power of 200 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 ..... 2000 watts peak sync
- Aural ..... 200 watts average

Maximum Power Rating
- Visual ..... 2000 watts peak visual
- Aural ..... 200 watts average aural

Power Consumption ..... 6700 watts

8.3 Performance Specifications

Visual Performance

Operating Frequency Range ..... 470 MHz to 860 MHz

RF output - Nominal:
- Power ..... 2000 watts peak sync
- Impedance ..... 50 ohms
- Connector ..... 7/8" 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..... ±1000 Hz

Aural Performance

Frequency Deviation Capability (Transmitters) .....±75 kHz
Distortion 0.5%
FM Noise .....-60 dB
AM Noise .....-55 dB
Visual to Aural Separation .....4.5 MHz, ±100 Hz

Composite Audio Input (Multi-channel sound - Transmitters)
Input Level..... 1V peak, nominal
Input Impedance.....75 ohms, unbalanced

Frequency Range:
±0.1 dB Response .....50 Hz to 50 kHz
±0.5 dB Response ..... 30 Hz to 120 kHz

Monaural Audio Input (Transmitters):
Input Level.....0 to +10 dBm
Input Impedance..... 600 ohms, balanced
Frequency Range (±0.5 dB resp.) .....30 Hz to 15 kHz
Pre-emphasis..... 75 uS

Subcarrier Audio Input (Transmitters):
Input Level..... 1V peak, nominal
Input Impedance.....75 ohms, unbalanced
Frequency Range (±0.5 dB resp.) .....20 kHz to 120 kHz

Electrical Requirements

Power Line Voltage.....230 volts, 50/60 Hz
Power Consumption .....6700 watts

Environmental

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

Mechanical

Dimensions:
Width..... 22 inches
Depth..... 34 inches
Height ..... 55 inches
Weight ..... 550 lbs

8.4. System Overview

The LU2000AT (1303866) is made up of the trays listed in Table 8-1.

Table 8-1. LU2000AT Major Trays and Assemblies

MAJOR ASSEMBLY DESIGNATOR	TRAY / ASSEMBLY NAME	DRAWING NUMBER
A1	UHF Exciter Assembly	1302065
A2	External Amplifier Assembly	1303866

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 Modulator Module (Exciter)

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.

8.4.1.2 IF Processor Module (Exciter)

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 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 Pioneer 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 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 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.

8.4.1.3 L.O. / Upconverter Module (Exciter)

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

AGC #1 is provided by the 50 Watt 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 1.5 VDC but it can be as high as +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 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 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

8.4.1.4 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.

8.4.1.5 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.

8.4.1.6 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 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.

8.4.1.7 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 ±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.

8.5 Control and Status

8.5.1 Exciter Tray

Table 8-2. 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 8-3. 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 8-4. 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 8-5. Modulator Front Panel Sample

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

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. 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 8-11. 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 8-12. 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 8-13. 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

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.

8.6 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

8.7 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 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.

9. CERTIFICATION OF TEST DATA

This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulation. To the best of my knowledge, these tests were performed using measurement procedures consistent with the industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by Axcera, LLC, 103 Freedom Drive, P.O. Box 525, Lawrence, PA 15055-0525

Kenneth Foutz
Chief Operations Officer

Lance Trussa
Engineer

James Mounts
Engineer

MODEL 8821 SPECIFICATIONS

Internal Oscillator Options
B9 (Standard TCXO)
Accuracy while Tracking: 5×10^{-9}

Stability when coasting: Better than $\pm 1 \times 10^{-6}$ 0° C to + 50° C

B4 (Optional OCXO)
Accuracy while Tracking: 1×10^{-9}

Stability when coasting: Better than $\pm 1 \times 10^{-9}$ per day

Synchronization
The position of the antenna is determined by measuring the pseudo-range to four satellites and computing the position of these satellites using ephemeris data. The receiver basic specifications are as follows:

Receiver Description:	L1 C/A code pseudo-ranging
Channels:	Six independent, continuous tracking channels
Frequency:	1575.42 MHz
Acquisition Time:	Typically less than two minutes

Navigation Outputs
Latitude, longitude, and height with a position accuracy of ± 30 meters, 2 drms (without SA) are available on the RS-232 ports.

Tracking Modes
In its default tracking mode, the Model 8821 automatically tracks one to six satellites, as available, on a stationary platform.

Two other modes, one for use on a moving platform and the other for use with an operator-entered fixed position, can be selected.

Timekeeping
The Model 8821 normally accumulates Universal Time (UTC). By command, this may be changed to local time. When local time is used, automatic daylight savings time adjustments are made at preprogrammed dates. Leap second and leap year adjustments are made automatically. Time is available on the RS-232 ports with a resolution of one millisecond.

IRIG B Output

Format:	Modulated IRIG B 122
Level:	3 Vpp nominal
Drive:	Will drive 50 ohms
Mod. Ratio:	Adjustable 2:1 to 6:1
Phase:	Modulated code on-time mark adjustable to within ± 10 µs of on-time reference.

Rate/DC Code Output

Frequency:	One of the following may be selected: 1 PPH, 6 PPH, 12 PPH, 1 PPM, or 1 PPS - 1 MPPS in decade steps. IRIG B DC may be outputted in place of a selected rate via internal strap.
Levels:	TTL
Drive:	50 ohms.
Coherence:	Within one microsecond of UTC
Connector:	BNC

1 PPS Output

Levels:	TTL
Drive:	50 ohms
Coherence:	Within one microsecond of UTC
Connector:	BNC

High Rate Output

Frequency:	5 or 10 MPPS by internal strap
Levels:	TTL
Drive:	50 ohms
Coherence:	Phase coherent to 1 PPS
Connector:	BNC

Option Sinewave Rate Output
5 or 10 Mhz sinewave into 50 ohms in place of TTL rate above. 1 VRms o/p

Status Output
Three contacts of a form-C relay provide tracking status output on a 9-pin connector. Contact rating is 1/2 A. Also on this connector is status at TTL logic levels.

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Remote Setup and Status
The following is a partial list of setup and status commands via the RS-232 Port.

Set/Request UTC/LOCAL
Set/Request local time offset
Set/Request daylight savings dates
Set/Request satellites to be used (default is automatic selection)
Set/Request output rate
Set/Request local position
Set/Request AUTO/DYN/FIXED nav. mode
Set/Request minimum tracking elevation
Request time output
Request navigation data
Request tracking/locked status
Request time offset data
Request leap second status
Request satellites being tracked
Request firmware version

Time/Status Display (option)
The unit can be ordered with an LED display of time and status.

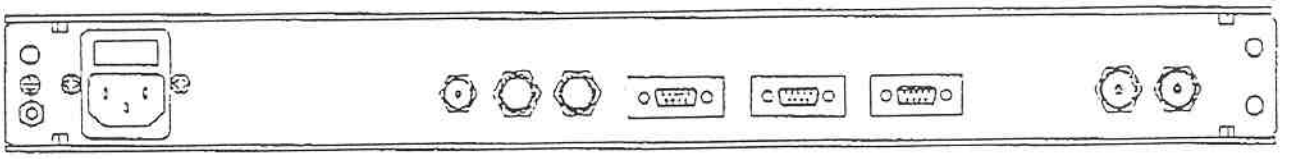
Power Supply
The unit operates on 85-265 Vrms, 48-440 Hz, or 100-370 Vdc. Power required is 25 watts nominal.

Internal Battery
An internal lithium battery maintains setup data and coarse timekeeping during time that no external power is applied.

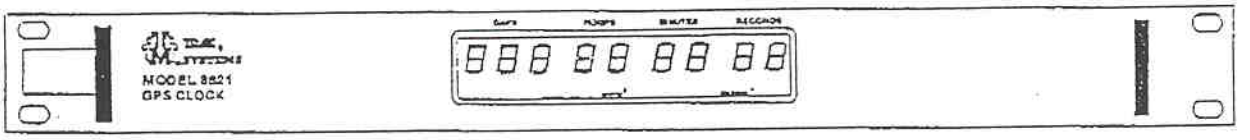
Physical
Chassis is 19" wide X 1.72" high X 14" deep. Weight is 9 pounds.

Antenna unit is 4.25 inches in diameter X 6.5 inches high. Weight is 7 ounces. It is connected to the main chassis via a coaxial cable. A 50 foot cable with TNC connectors is supplied. Optional lead-in systems with coaxial cables and in-line amplifiers are available to 2500 feet. Refer to application note AN-3A for complete details.

Temperature
Main unit:	-10 to + 50° C
Antenna:	-40 to + 70° C



Model 8821 Rear Panel



Model 8821 with Display Option

Specification subject to change without notice.

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