8. OPERATIONAL DESCRIPTION - MODEL Axcera-837B-5

8.1 General Description

The 837B-5 is a complete 5000-watt UHF solid-state, internally diplexed television translator. It operates at a nominal visual output power of 5000 watts peak sync and an average aural output power of 500 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 ..... 5000 watts peak sync
- Aural ..... 500 watts average

Maximum Power Rating
- Visual ..... 5000 watts peak visual
- Aural ..... 500 watts average aural

Power Consumption ..... 13,700 watts

8.3 Performance Specifications

Visual Performance

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

RF output - Nominal:
- Power ..... 5000 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) .....-60 dB
Carrier Frequency Stability.....±1 kHz
Noise Figure w/Input Preamp .....3 dB (Max.)
Input Dynamic Range (no Preamp) ..... -60 to -15 dBm

Aural Performance

RF Output – Nominal
Power ..... 500 watts
Impedance ..... 50 ohms
Connector ..... 7/8" EIA

Electrical Requirements

Power Line Voltage ..... 230 volts, 50/60 Hz
Power Consumption .....17,000 watts

Environmental

Maximum Altitude .....8,500 feet
Operational Temperature Range .....-30°C to +50°C

Mechanical

Dimensions:
Width .....66 inches
Depth .....34 inches
Height.....80 inches
Weight ..... 1,500 lbs

8.4. System Overview

The 837B-5 (1278-1000) is made up of the (4) trays listed in Table 8-1.

Table 8-1. 837B-5 Major Trays and Assemblies

TRAY/ASSEMBLY NAME	DRAWING NUMBER
VHF/UHF Receiver Tray	1265-1100
UHF Exciter	1278-1400
Variable Gain/Phase Trays	1245-1200
Amplifier Trays	1301565

8.4.1 Receiver Tray

The RF Input to the Tray, (-61 dBm to -26 dBm in Level), is fed through J1 to the input 50Ω Filter or through J5 to the 75Ω input Filter, which are of a double tuned design that is adjusted to the desired Input UHF or VHF Channel Frequency. Note: If the input signal is greater then -25dBm, an attenuator should be used to limit the level to -25dBm. +12 VDC, for use by an (Optional) external Preamplifier Assembly, connects to the filter through F1 a 1 Amp Fuse. This +12 VDC is DC Multiplexed onto

the input signal cable from the Preamplifier. DS1 a Red LED located on TB1 in the Tray will be lit if the +12 VDC is present on the input cable. If a Preamplifier is not used, F1 should be removed and DS1 should not be lit.

The signal is next amplified +12 dB to approximately the -49 to -4 dBm level by a low noise amplifier located on the Dual Stage Amplifier Board that is contained in (A8) the Dual Stage Amplifier Assembly. The board has approximately +13 dB or +26 dB of gain, depending on whether Jumper W1 on J5 is in place. The signal is then filtered in (A9) a Channel Filter and then applied back to (A8-A1) the Dual Stage Board where the same amplification takes place. Jumper W1 on J7, located on the Dual Stage Board, should be removed if the Receiver Input level is greater than -40dBm. The output is connected to (A10) the Downconverter Amplifier Assembly that contains (A10-A1) the Downconverter Amplifier Board The RF, at the -47 dBm to -2 dBm Level, connects to the "R" Input Jack of the Mixer Z1 located on the Downconverter Amplifier Board.

The Local Oscillator Signal is derived from a cut to channel crystal mounted in an oven that is factory set at 45° C. The Oscillator operates at 1/8 for UHF, 1/4 for VHF High Band or 1/2 for VHF Low Band of the desired local oscillator frequency. The crystal is mounted on (A4-A1) the Channel Oscillator Board, Dual Oven that is part of the Channel Oscillator Assembly. The oscillator circuitry is a modified Colpitts design operating in a separate oven set at 50° C. for improved stability.

The output of the Channel Oscillator is connected to the (A5-A1) the x8 Multiplier Board for UHF, the x4 Multiplier Board for VHF HB or the x2 Multiplier Board for VHF LB, which is located in (A5) the Multiplier Enclosure. The proper multiplier board takes the output of the Channel Oscillator (+3 dBm) and multiplies it eight, four or two times by a series of three, two or one x2 Broadband Doublers (2x2x2 = x8), which produces the L.O. signal on the desired frequency needed for the upconversion process. The signal is then amplified to the +16 dBm level. A sample of the multiplied L.O. Signal is fed to a detector circuit which lights the Green LED DS1 that indicates that the L.O. is present at the Output Jack J2 of the Multiplier Board. This Green LED is seen through a hole the lid of the Multiplier Assembly and is an indication, when lit, that there is a signal present at the output of the Multiplier Board. The L.O. signal is filtered in (A6) a L.O. Filter and then sent (+15 dBm) to J2 on (A10-A1) the Downconverter Amplifier Board. The L.O. Input to the Downconverter Amplifier Board is connected thru a 3 dB matching pad to the "L" Input of the Mixer (Z1) at a +12 dBm level.

The L.O. and the RF signals are mixed in the Mixer Stage of the Downconverter Amplifier Board to produce the desired IF difference frequency at -55 dBm to -10 dBm in level, depending on the RF Input Level. The Combined IF Signal is routed to (A11-A1) the IF Filter/ALC Board which is mounted in (A11) the IF Filter/ALC Enclosure . The IF Filter/ALC Board contains a Pin Diode Attenuator circuit which is part of the Automatic Level Control (ALC) that controls the level of the IF Signal to the two stage amplifier ICs U1 and U2.

The (Optional) (A11-A2) SAW Filter/Amplifier Board is also contained in the IF Filter/ALC Enclosure. The SAW Filter/Amplifier Board connects to J5 and J6 of the IF Filter/ALC Board if more attenuation of the Out Of Band products is needed. If the SAW Filter/Amplifier Board is not needed, a jumper connects the Combined IF from J5 to J6 on the IF Filter/ALC Board.

The Combined IF is then bandpass filtered to the needed 6 MHz IF bandwidth around the 41.25 MHz + 45.75 MHz Combined IF signal and amplified by U3 to the -41 dBm to +4 dBm Level before it is split. One output is detected by U4 for use as the ALC reference level to the Pin Diode Attenuator Circuit. The ALC comparator drives the Pin Diode Attenuator Circuit to maintain the desired output level, typically +2 dBm. The other split output connects to J2 the Combined IF Output of the board that is cabled to the IF Output Jack of the Tray at J4 (+2 dBm).

The AC input to the Tray is 117 VAC or 230 VAC and is directed thru Jack J2, of the (A1) Power Entry Module to the step down Toroid (A2). The Power Entry Module contains an On/Off Switch, a 4 Amp Slo-Blo Fuse and three MOVs which protect the Tray from transients or surges which may occur on the AC Input Lines. When the On/Off Switch is switched On, AC is applied to the (A2) Toroid. The Toroid steps down the voltage into two 16 VAC outputs which are fed to (A3) the +12V(3A)/-12V Power Supply Board The 16 VAC Inputs are connected to the two full wave bridge networks one for +12 VDC and one for -12 VDC. The output of the +12 VDC rectifier is fed to three 7812 IC regulators (U1, U2 and U3) and the output of the -12 VDC rectifier is fed to one 7912 IC regulator (U4). The ±12V Power Supply Board provides the voltage regulated and current limited +12 VDC and -12 VDC to the rest of the boards in the Tray.

8.4.2 UHF Exciter Tray

The standard UHF Exciter Tray uses the Baseband Audio and Video Inputs, which are connected to the rear of the Tray and produces a diplexed RF Output. The UHF Exciter Tray is capable of operation, if the (Optional) 4.5 MHz Composite Input Kit is purchased, using either a 4.5 MHz Composite Input or Baseband Audio and Video Inputs to produce the diplexed RF Output.

The UHF Exciter Tray used in a Translator System with a Receiver Tray does not contain (A5) a Sync Tip Clamp/Modulator Board, (A4) an Aural IF Synthesizer Board or (A6) a Delay Equalizer Board. The Combined IF Output of the Receiver Tray connects to J6 on the UHF Exciter which is cabled to the ALC Board. The description of the UHF Exciter in a Translator System starts with the ALC Board. A Modulator Select must not be present at J11-10 to 28 on the rear of the Tray for the output of the Receiver Tray to be connected through the energized Relays to the rest to the UHF Exciter Tray.

Combined Aural IF + Visual IF Path

The Combined IF Output of the (Optional) Receiver Tray is the input connected to Jack J1 on the ALC Board. The Relays K3 and K4 provide the ability to switch the input of the ALC Board from the IF connected to J1 generated by an (Optional) external Receiver Tray and the internally generated IF connected to J32. The Modulator Select command provides the control of the Relays. The Modulator Select present at J11-10 & 28 located on the rear of the UHF Exciter Tray, de-energizes the Relays and connects the internally generated IF output to the rest of the ALC Board. The Modulator Select removed from J11-10 & 28, energizes the Relays and connects the IF from the Receiver Tray to the rest of the ALC Board.

The ALC Board provides the adjustment of the selected IF level by the input PIN attenuators which are set by the ALC circuitry. The (A20) Power Adjust Pot (R1) located on the Front Panel of the UHF Exciter Tray adjusts this level. The level can also be controlled by the Switch S1 located on the ALC Board, or remotely with a pull

down connected to J16 - 1 & 4 or 6 & 4, if the Remote Power Raise/Lower Option is present.

The ALC adjusted IF is applied to three linearity correctors, also located on the ALC Board. These correctors compensate for the nonlinearities of the final amplifier stages. The correction is achieved by producing the opposite amplitude transfer function, whose shape is set with the potentiometers on the board. The predistorted video leaves the ALC Board at J3 and goes to (A9) the IF Phase Corrector Board, which provides correction for intermodulation products and differential phase distortion generated in the output amplifiers.

The output of the IF Phase Corrector Board is fed back to the ALC Board at J7, where it is connected through an LC network that is adjusted by C63 which sets the frequency response for the IF. The IF is split with one path connected to the ALC circuit. The main path is connected to R99 the Output Level adjust to Jacks J27 and J28. The Jumpers W9 and W10 are moveable to include a 6 dB pad in the circuit if needed. The IF is connected through a Frequency Response circuit set by R103, R106, C71 and C72 to the amplifiers U13 and U14 then to the output of the board at J12. A Sample of the IF is supplied to J11 on the Board.

The IF from the ALC Board is connected to the IF Input Jack (J1) of (A11) the UHF Upconverter Board. The Board produces an On Channel RF Output Signal at J3 by mixing in Z1 the Combined IF Signal which is connected to J1 with the Local Oscillator Signal that is connected to J2. The RF signal exits the board at J3 and is filtered by (A12) a UHF Filter. It returns to the UHF Upconverter Board at J4 where it is applied to a pin diode attenuator network whose resistance, gain, is adjusted by R10 the manual gain adjust which sets the RF Output Level of the Tray. The jumper W1 on J10 is in the Manual position during normal operation. The RF is amplified by U2, Q1, Q2 and Q3 before it is sent to the RF Output Jack (J5) of the UHF Upconverter Board. The RF connects to (J15), the RF Output Jack, located on the rear of the Tray. A Sample of the RF is supplied to J6 on the Board. Another RF sample is peak detected and fed through R29, the Meter Calibration pot, to the Meter Output Jack at J7-1 which connects to the Transmitter Control Board.

L.O. Signal Path

The L.O. signal is generated on (A14-A1) the Channel Oscillator Board mounted in (A14) a Channel Oscillator Assembly. The L.O. is produced by a cut to channel crystal, located in an oven set at 50° C, which operates at 1/8 the required L.O. Frequency. If the (Optional) FSK Identifier Kit is purchased, the L.O. signal is generated on (A14-A1) a VCXO Channel Oscillator Board mounted in (A14) a VCXO Channel Oscillator Assembly. The frequency of the VCXO Board is controlled by the EEPROM FSK Identifier Board which Frequency Modulates the Identification Signal in Morse Code, for station identification, onto the L.O. Signal. The crystal is mounted in a Butler Common Base Oscillator Circuit, which is part of the Channel Oscillator Assembly, that has an oven set at 45° C for improved temperature stability. The CW signal from the oscillator is multiplied 8 times by (A15-A1) the x8 Multiplier Board, which is mounted in (A15) a x8 Multiplier Enclosure. The x8 Multiplier is actually three x2 frequency doublers (2x2x2=8). The multiplied oscillator signal, now at the L.O. Frequency, is filtered by (A16) a UHF Filter and connected to J2 on (A11) the UHF Upconverter Board where it is mixed with the IF Signal.

Metering and Control Functions

The (A19) Visual/Aural Metering Board, detects a Forward Sample of the Output Power Level as well as a Sample of the Reflected Power of the Transmitter from (A11) the Coupler Assembly. The Visual/Aural Metering Board generates an indication of the % Visual Output Power Level, the % Aural Output Power Level and the % Reflected Output Level of the Transmitter which connect to (A17) the Transmitter Control Board.

The % Power Levels are displayed on the Front Panel Meter using the Metering Switch S3 to select which is viewed. The levels are also available for remote monitoring through the Remote Jacks J10 and J11 located on rear panel of the Tray. The Transmitter Control Board provides the system control logic for the Transmitter and the adjustments for calibration of the Meter in the Video position using (R20) and Audio position using (R19) in the standard Exciter but in a Translator System the Video and Audio positions are not available. Calibration of the Meter in the ALC position uses (R15). The % Output Power Level of the Exciter also connects to the Front Panel Meter with R29 located on the UHF Upconverter Board used to calibrate the Meter.

The Control and the Status Indications of the Transmitter/Translator are provided by the Meter and the LED indicators located on the front panel of the UHF Exciter. The switches and LED indicators are part of the Transmitter Control Board which is mounted so that the switches and the LEDs are operated or viewed from the front Panel of the UHF Exciter. Switch (S1) is an Operate/Standby Switch that controls the output of the Transmitter/Translator by providing the Enables, when in Operate, needed to turn on the two UHF Amplifier Trays.

In Operate the Green LED (DS2) is On and when in Standby the Amber LED (DS1) is On. Switch (S2) is an Automatic/Manual Switch that controls the operation of the Transmitter by the presence of the Video Input Signal. When the switch is in Automatic, the Green LED (DS3) is lit and if the Video Input Signal is lost, the Transmitter will automatically switch to Standby after a few second delay. When the Video Input Signal returns, the Transmitter will automatically switch back to Operate.

In Manual, the Amber LED (DS4) is lit and the Operation of the Transmitter/Translator is controlled by the front panel switches. During Normal operation of the Transmitter/Translator, Switch S2 should be in the Auto position. The front panel of the UHF Exciter also has LEDs that indicate Video Fault (Loss), Red LED (DS9) and VSWR Cutback, Amber LED (DS7).

±12 VDC Power Supplies

The UHF Exciter Tray contains a ±12V power supply. The power supply is comprised of (A1) the Power Entry Module Assembly, (A2) a step down Toroid and (A3) a ±12V Power Supply Board. The ±12V Power Supply Board has a full wave bridge rectifier (CR9-CR12) for the -12 VDC and two full wave bridges (CR1-CR4 and CR5-CR8) for the +12 VDC. The ±12 VDC Power Supply Board has five one amp regulator ICs, four (U1-U4) for the +12 VDC and one (U5) for the -12 VDC. The Green LEDs DS1-DS4 are associated with the +12 VDC outputs at J3-J6 and are lit if the +12 VDC is present to that Jack. The Green LED DS5 is associated with the -12 VDC outputs at J7 and J8 and are lit if the -12 VDC is present to the Jacks. The +12 VDC and -12 VDC are connected to the rest of the Boards in the Tray. The +12 VDC is also connected from J11 of the UHF Exciter to each of the UHF Amplifier Trays for use by the LED Status

Indicators. The +12 VDC is applied to the UHF Amplifier Trays when the AC Circuit Breaker is switched On for the UHF Exciter Tray.

Faults

If the Reflected Power input increases above the level as set by R22, the VSWR Cutback adjust, the Amber LED DS7 lights and the board cuts back the Power level using the ALC levels. The Overtemperature Fault and the Video Fault are not used in this configuration.

Operation of the Tray

When the Exciter Circuit Breaker located on the AC Distribution Panel is switched On, the 220 VAC Input is applied to J14 of (A1) the Power Entry Module. The Power Entry Module contains an On/Off Switch and a 4 Amp Fuse for AC protection. The Input AC is fed to (A2) a Toroid which steps down the AC to two 16 VAC outputs that are connected to the three full wave bridge rectifiers located on (A3) the ±12V Power Supply Board. The ±12 VDC Power Supply Board provides regulation and current limiting of the ±12 VDC Outputs which are then distributed to the rest of the Boards in the Tray, the +12 VDC through Jacks (J3-J6) and -12 VDC through Jacks (J7 & J8). The -12 VDC at J8 Pins 6 & 2 connects to A10 a 12 VDC Fan, located on the rear panel, that will operate. The +12 VDC is connected from J11 of the UHF Exciter to each of the UHF Amplifier Trays for use by the LED Status Indicators.

When the Operate/Standby switch, located on the front panel, is switched to Operate, the latching relay K1 located on the Transmitter Control Board supplies the Enables which are applied to the UHF Amplifier Trays and lights the Green Enable LED. For the Tray to operate, an Interlock Low must be connected to the Transmitter Control Board and if the interlock present the Green Interlock LED DS5 is lit.

8.4.3 Variable Phase/Gain Tray

The Variable Phase/Gain Tray sets the phase and gain adjustments of the RF to provide maximum output when the outputs of the two Amplifier Arrays are combined. There are two Variable Phase/Gain Trays in the 837B UHF Translator, each controlling the phase and gain of one of the two Amplifier Arrays.

8.4.4 LDMOS UHF Amplifier Tray

The LDMOS amplifier tray, with an RF input of approximately +3 dBm, provides a maximum power level of +57.8 dBm, 600W + sound. All the amplifier modules are broadband in nature and require no tuning.

Tray Description

The Input to the LDMOS UHF Amplifier Tray at the BNC type connector Jack J1 is the Diplexed On Channel Visual + Aural Signal. The input RF is connected to (A2-A1) the Variable Gain/Phase Board which is mounted in (A2) the Variable Gain/Phase Enclosure. The Variable Gain/Phase Board contains a voltage variable pin diode attenuator that maintains a constant gain through the Tray by means of an (AGC) automatic gain control circuit. The gain of the Tray is adjusted by the Front Panel mounted 5kΩ Gain Control Pot R6 through the Amplifier Control Board which applies the Gain Bias to the pin diode attenuator circuit located on the Variable Gain/Phase

Board. The phase shift through the Tray is adjusted by the Front Panel mounted 5k ohm Phase Control Pot R5 through the Amplifier Control Board that applies the Phase Bias to the Phasing Circuit L1 located on the Variable Gain/Phase Board. The Phase of the Tray needs to be adjusted to give maximum output power when the outputs of the multiple UHF Amplifier Trays are combined. The Phase and Gain adjusted signal is amplified by (A3-A1) the 1 Watt UHF Amplifier Board. The 1-watt UHF amplifier board assembly provides radio frequency interference (RFI) and electromagnetic interference (EMI) protection, as well as the heatsink, for the 1-watt UHF amplifier board, 32V (1301547) that is mounted inside the assembly. Depending on the frequency of the channel of operation, the assembly has approximately 9 dB of gain. The RF is connected through (A1) a UHF Filter, which is tuned to remove any unwanted out-of-band products.

The output of the UHF filter is connected to the input J1 of (A4-A1) the 40 Watt UHF amplifier assembly that is mounted on (A4) the amplifier enclosure. The (A4-A1) 40 watt UHF amplifier assembly is made up of a (51-5378-308-00) module, which is a class AB module that is a highly linear broadband amplifier for the frequency range of 470 to 860 MHz. It can deliver an output power of 40 watts (CW) at an amplification of approximately 13 dB.

The amplification circuit consists of LDMOS transistors V804 and V805 connected in parallel and operating in class AB. The paralleling network is achieved with the aid of 3 dB couplers Z802 and Z803. A further 3 dB coupler Z801, in conjunction with capacitors C800 and C819, serves as a phase shifter. Phase alignment (for the complete amplifier), as well as quiescent current setting by means of potentiometers R807 and R808. It is factory implemented and should not be altered.

PIN diodes V810/V811 form a variable-damping circuit that is used to adjust the amplification of the 40-watt module. The adjustment is performed with the Gain potentiometer R838. A readjustment of the amplification may be required, e.g., after repair work, to ensure that all amplifiers in a translator deliver the same output power

The UHF coupler assembly is mounted in the A4 amplifier enclosure and provides a forward power sample of the input drive level to the (A4-A3) LDMOS amplifier assembly. The drive-level sample from J3 is cabled to the amplifier control board where it connects to the input of the overdrive-protection circuit.

The RF input to the UHF coupler assembly, from the 40 Watt UHF amplifier module, connects to SMA jack J1. The RF is connected by a stripline track to SMA output jack J2. A hybrid-coupler circuit picks off a forward sample that is connected to SMA type connector jack J3. R1 is a dissipation load for the reject port of the coupler.

The output of the coupler assembly is fed to (A4-A3) the LDMOS amplifier assembly. The LDMOS amplifier assembly is made up of a (51-5379-309-00) module that operates class AB. The module is a broadband amplifier for the frequency range of 470 to 860 MHz. The amplification is approximately 13 dB.

The amplification circuit consists of the parallel connected push-pull amplifier blocks V1 and V2 operating in class AB. In order to match the transistor impedance to the characteristic impedance of the input and output sides, matching networks are placed ahead and behind the amplifier blocks. Transformers Z3 to Z6 serve to

balance the input and output signals. The paralleling circuit is achieved with the aid of 3 dB couplers Z1 and Z2.

The working point setting is factory implemented by means of potentiometers R9, R11 and R12 and should not be altered.

The output of the (A4-A3) LDMOS amplifier module is connected to (A5-A1) the 4 way splitter board. The 4-way splitter assembly is made up of three 2-way Wilkinson stripline splitters. One RF input to the board provides four, equal RF outputs.

The RF input to the board is connected to the input of the first 2-way splitter that contains R1. R1 is a 100 Ω balancing resistor in which any RF due to mismatching in the first splitter will be dissipated. One of the two outputs from the splitter connects to another 2-way splitter that contains R2. R2 is a 100 Ω balancing resistor in which any RF due to mismatching in the splitter will be dissipated. The other output of the first splitter connects to the third 2-way splitter that contains R3. R3 is a 100 Ω balancing resistor in which any RF due to mismatching in the splitter will be dissipated. The two output splitters provide four, equal RF outputs, two each, which are connected to the inputs of the (A5-A2, A5-A3, A5-A4 & A5-A5) amplifier modules.

The outputs of the splitter assembly are fed to the inputs of the four LDMOS amplifier assemblies. Each of the LDMOS amplifier assemblies is made up of a (51-5379-309-00) module that operates class AB. The module is a broadband amplifier for the frequency range of 470 to 860 MHz. The amplification is approximately 13 dB.

The amplification circuit consists of the parallel connected push-pull amplifier blocks V1 and V2 operating in class AB. In order to match the transistor impedance to the characteristic impedance of the input and output sides, matching networks are placed ahead and behind the amplifier blocks. Transformers Z3 to Z6 serve to balance the input and output signals. The paralleling circuit is achieved with the aid of 3 dB couplers Z1 and Z2.

The working point setting is factory implemented by means of potentiometers R9, R11 and R12 and should not be altered.

The output of the four LDMOS amplifier modules are connected to (A5-A6) the 4 way combiner assembly. The 4-way combiner assembly contains (A5-A6-A1) a 4-way combiner board, (A5-A6-A2) a circulator, (A5-A6-A3) a thermal switch and (A5-A6-A4) another thermal switch.

The 4-way combiner board is made up of three, 2-way Wilkinson stripline combiners. Two of the RF inputs to the board are soldered directly to the inputs for the 2-way combiner that contains R5. R5 is a balancing resistor in which any RF due to mismatching in the combiner will be dissipated. The other two RF inputs are soldered directly to the 2-way combiner that contains R6. R6 is a balancing resistor in which any RF due to mismatching in the combiner will be dissipated. The outputs of the two, input 2-way combiners connect to the third 2-way combiner that contains R7. R7 is a balancing resistor in which any RF due to mismatching in the combiner will be dissipated. The output of the third combiner is connected to the output of the 4-way combiner board that is cabled to an external circulator.

The circulator is connected to the output of the Tray at the "N" type connector Jack J2.

The (A8) Amplifier Control Board, provides an Automatic Gain Control circuit (AGC) to the Tray, output level sample inputs to (A9) the Meter and protection of the Tray against overdrive, overheating and high VSWR conditions. The 4 Way Combiner Board (A5-A6-A1) supplies a Forward and a Reflected Output Power Sample to (A6-A1) the Dual Peak Detector Board, which is mounted in (A6) a Dual Peak Detector Enclosure. The Dual Peak Detector Board takes the Forward and the Reflected Output Power Samples and provides peak detected DC levels to the Amplifier Control Board which uses them for metering and Tray protection purposes. The Amplifier Control Board regulates the gain of the Tray by adjusting the AGC Bias applied to the pin diode attenuators located on (A2-A1) the Variable Gain/Phase Board. If there is an overdrive or high reflected power condition, the Amplifier Control Board lowers the AGC Bias applied to the pin diode attenuators, which reduces the output power of the Tray. If an Overtemperature Fault occurs because one of the Thermal Switches (A5-A6-A3 or A5-A6-A4) closes, due to overheating of the output amplifier heatsink, the +5 VDC Enable to the Switching Power Supply will be removed which Disables the Switching Power Supply eliminating any RF Output Power until the temperature of the heatsink returns to normal. The Amplifier Control Board has adjustments for setting the Cutback Thresholds and Magnitudes and also for calibration of the Front Panel Meter in the Power Supply Position.

Operation of the Tray

The 220 VAC Input needed to operate the Tray connects to the Tray at J4 when the Amplifier Circuit Breaker, located on the AC Distribution Panel, is switched ON. The Input AC connects to (A12) a +32V/2000W Switching Power Supply that supplies the +32 VDC to the three cooling Fans and through the Amplifier Protection Board to the rest of the boards in the Tray when the Tray is Enabled. The Enable is applied to the Tray at J3-9 from the UHF Exciter Tray when the Transmitter is switched to Operate. The outputs of the Switching Power Supply are connected to (A7) the Amplifier Protection Board and also to (A13, A14 & A15) which are three Fans used for cooling the Tray. The Amplifier Protection Board provides 7 Amp fused protection of the +32 VDC outputs before they are distributed to the Amplifier Boards in the Tray. An external +12 VDC needed for operation of the Status LEDs mounted on the Amplifier Control Board is applied to the UHF Amplifier Tray through J3-7 from the UHF Exciter Tray. The +12 VDC is present when the Main AC is applied to the UHF Exciter Tray.

8.4.5 Metering Control Panel

NOTE: This description is for a 837B Translator with two, Side A and Side B, Amplifier Arrays. In a 3 kW Transmitter only Side A is used therefore all references to Side B should be ignored.

The Metering Panel provides three meters, one for Combined, one for Side A Amplifier Array and one for Side B Amplifier Array Outputs. The Side A Meter (A15) displays the % Forward and the % Reflected Power samples for the Side A Amplifier Array. The Side B Meter (A17) displays the % Forward and the % Reflected Power samples for the Side B Amplifier Array. The Combined Meter (A13) displays the % Reject, % Visual, % Aural and the % Reflected Power samples for the Combined Output of the 4-6 kW Transmitter. The Metering Panel also takes the ALC Reference Inputs from the (A4 & A5) Variable Phase/Gain Trays and splits them six ways which are then connected to the UHF Amplifier Trays in the two amplifier arrays.

The Metering Panel (A6) contains (A4, A5, A6 & A11) four Splitter Boards (1181-1002), (A7, A8 & A9) three Dual Peak Detector Modules (1555-1271 or 1159965), (A10) a Visual/Aural Metering Board (1265-1309 or 1265-1325) and (A3) a ±12V Power Supply Board (1062-1013). The (A13) Front Panel Meter is for Combined Output Power which is controlled by (S1) the Meter Control Switch, the (A15) Front Panel Meter is for Side A Output Power with (S2) the Meter Control Switch and the (A17) Front Panel Meter is for Side B Output Power with (S3) the Meter Control Switch. The (A4) Splitter Board (1181-1002) takes the ALC reference from the (A4) Variable Phase/Gain Tray and splits it six ways which connect to the UHF Amplifier Trays mounted in the Side A Amplifier Array. The (A5) Splitter Board (1181-1002) takes the ALC reference from the (A5) Variable Phase/Gain Tray and splits it six ways which connect to the UHF Amplifier Trays mounted in the Side B Amplifier Array.

The (A10) Visual/Aural Metering Board has a Combined Forward Sample from the Output Coupler Assembly of the Transmitter connected to J1 on the Board where it is split. One Forward Sample connects to J2 on the board that is cabled to J9, the Transmitter Output Sample Jack, located on the front panel of the Metering Panel. The Combined Forward Sample on the Visual/Aural Metering Board is split again with one Sample used to produce a Combined Visual Sample, that connects to the front panel Meter (A13) and also to the rear panel for Remote monitoring. The other Combined Forward Sample produces a combined Aural Sample that connects to the (A11) Splitter Board. The (A11) Splitter Board (1181-1002) takes the Combined Aural Sample Input from the (A10) Visual/Aural Metering Board and splits it. One of the split Aural Samples connects to the front panel Meter and the other is used for Remote Monitoring.

The (A8) Dual Peak Detector Module takes a Reflected Sample from the Side B Amplifier Array which is peak detected and connected to the (A17) front panel meter. Another input to the (A8) Dual Peak Detector Module is a Forward Sample from the Side B Amplifier Array which is peak detected and connected to the (A17) front panel meter.

The (A9) Dual Peak Detector Module receives the Reflected Sample from the Side A Amplifier Array which is peak detected and connected to the (A15) front panel meter. Another input to the (A9) Dual Peak Detector Module is the Forward Sample from the Side A Amplifier Array which is peak detected and connected to the (A15) front panel meter.

The ±12 VDC needed to operate the Boards in the Metering Panel are provided by the ±12V Power Supply. The AC Input connects to J8 on (A1) the Power Entry Module Assembly (1227-1206). The input AC connects to (A2) a step down Toroid whose outputs are wired to (A3) the ±12 VDC Power Supply Board (1062-1013). The ±12 VDC outputs of the board are connected to the rest of the boards in the Metering Panel.

8.4.6 AC Distribution Assembly

The AC Distribution Assembly, Single Phase, Amplifier Assembly distributes the Main AC Input, 208/240 VAC @ 100 Amps, to the individual Trays in the Amplifier Cabinet which make up the Amplifier Array.

The 208/240 VAC Single Phase Main AC Input to the Amplifier Cabinet connects to the Terminal Block TB1, Line 1 to TB1-1A, Line 2 to TB1-3A and Safety Ground to TB1-4A.

The 208/240 VAC Main AC Input is wired from the Terminal Block TB1-1B (Line 1) to the 100 Amp Circuit Breaker CB1-1 and TB1-3B (Line 2) to the Circuit Breaker CB1-5. The switched Main AC Input is wired from the main circuit breaker to the up to six 20 Amp Circuit Breakers, CB2-CB7, that distribute the AC to the up to six UHF Amplifier Trays in the Amplifier Array and two 3A circuit breakers CB8 and CB9 which connect the AC to the Fan (A12-A3) mounted on the Reject Load Assembly. The number of 20 Amp circuit breakers is determined by the number of Amplifier Trays which is determined by the output power of the Transmitter in which the Amplifier Assemblies are used. Four circuit breakers, CB2-CB5, are needed for a 4 kW Transmitter, five circuit breakers, CB2-CB6, are needed for a 5 kW Transmitter and six circuit breakers, CB2-CB7, are needed for a 6 kW Transmitter. Three MOVs, for surge and transient protection, are connected to the AC Lines from the Circuit Breaker. VR4 and VR6 connect from the AC Lines to Ground and VR3 connects across the AC Lines.

CB2 is a 20 Amp Circuit Breaker which protects the AC connected through J1 on the AC Distribution Assembly to J4 on the (A1) UHF Amplifier Tray. CB3 is a 20 Amp Circuit Breaker which protects the AC connected through J2 on the AC Distribution Assembly to J4 on the (A2) UHF Amplifier Tray. CB4 is a 20 Amp Circuit Breaker which protects the AC connected through J3 on the AC Distribution Assembly to J4

8.5 Control and Status

8.5.1 Receiver Tray

There are no external Control and Status indicators or switches for the Receiver Tray.

Table 8-2. Receiver Tray samples

CONNECTOR	FUNCTION
J6 - BNC	Oscillator Sample (front panel)
J7 - BNC	IF Sample (front panel)

8.5.2 UHF Exciter Tray

Table 8-3. UHF Exciter Tray samples

CONNECTOR	FUNCTION
J19 - BNC	RF Output Sample (front panel)
J17 - BNC	Oscillator Sample (front panel)

Table 8-4. UHF Exciter Tray Switches

SWITCH	FUNCTION
Translator S1 Operate/Standby	The momentary switch S1 applies a ground to K1, a latching relay on the transmitter control board. K1 will switch either to Operate or to Standby depending on which

	direction S1 is pushed. When switched to Operate, the low Enable Commands, are applied to the four UHF Amplifier Trays. These Enables will turn on the UHF Amplifier Trays. The opposite occurs when switched to Standby.
Mode Select S2 Auto/Manual	The momentary switch S3 applies a ground to K2, a latching relay on the transmitter control board. K2 will switch the translator to Automatic or Manual depending on which direction S3 is pushed. In Automatic, the input fault command from the ALC board will control the operation of the translator. The translator will switch to Standby, after a slight delay, if the input signal is lost and will switch back to Operate, quickly, when the signal is restored. In Manual, the translator is controlled by the operator using the front panel Operate/Standby switch or by remote control.
Power Adjust (R1)	The 5-kΩ pot sets the ALC level on the ALC board that sets the output power of the translator.

SWITCH	FUNCTION
S3 - % Aural Power	Reads the % Forward Aural Output Power of the UHF Exciter tray.
S3 - % Reflected Power	Reads the % of Reflected Visual Power of the UHF Exciter tray
S3 - % Visual Power	Reads the % Forward Visual Output Power of the UHF Exciter tray.
S3 - % Exciter	Reads the % Exciter Output Power Level needed to obtain 100% Output of the translator.
S3 - ALC	Reads the ALC voltage level.

Table 8-5. UHF Exciter Tray Indicators

INDICATOR	DESCRIPTION
Input Loss (Red)	Indicates that the input signal to the translator has been lost. The fault is generated on the ALC board in the UHF Exciter tray.
VSWR Cutback (Amber)	Indicates that the reflected power level of the translator has increased above 20%; this automatically cuts back the output power level to 20%. The fault is generated on the transmitter control board in the UHF Exciter tray.
Operate (Green)	Indicates that the translator is in the Operate mode.
Standby (Amber)	Indicates that the translator is in the

	Standby mode.
Auto (Amber)	Indicates that the translator is in the Auto mode.
Manual (Green)	Indicates that the translator is in the Manual mode.

8.5.3 Variable Phase/Gain Tray

Table 8-6. Variable Phase/Gain Tray Samples

CONNECTOR	FUNCTION
J4 - BNC	O/P Sample (front panel)

Table 8-7. Variable Phase/Gain Tray Switches

SWITCH	FUNCTION
S1 - % Output Power	Reads the % Output Power
S1 - ALC	Reads the ALC Voltage
A7 - Phase Adjust	Adjusts the phase of the Amplifier Array
A8 - ALC Adjust	Adjusts the output level

There are no external indicators on the Variable Phase/Gain Tray

8.5.4 LDMOS UHF Amplifier Tray

Table 8-8. LDMOS UHF Amplifier Tray samples

CONNECTOR	FUNCTION
J5 - BNC	Module O/P Sample (front panel)

Table 8-9. LDMOS UHF Amplifier Tray Switches

SWITCH	FUNCTION
S2 - % Output Power	Reads the % Output Power of the UHF Amplifier tray, 100% = 600 watts Peak of Sync Visual + Aural.
S2 - % Reflected Power	Reads the % of Reflected Output Power of the UHF Amplifier tray, <20% with all Amplifier trays operating.
S2 - Power Supply	Reads the Power Supply Voltage, +26.5 VDC of the UHF Amplifier tray.
A10-R6 Control	Adjusts the gain of the RF output when the Amplifier Control Board is in the AGC mode.
A10-R5 Control	Adjusts the phase of the RF output, approximately 70 degrees.

Table 8-10. LDMOS UHF Amplifier Tray Indicators

INDICATOR	DESCRIPTION
Enable (Green)	Indicates that Enable, Operate Command, is applied to the UHF Amplifier Tray from the UHF Exciter Tray.
Overdrive (Red)	Indicates that the level of drive is too high. The protection circuit will limit the drive to the set threshold. The fault is generated on the Amplifier Control Board.
VSWR Cutback (Red)	Indicates that the reflected power level of the tray has increased above 50%; this automatically cuts back the output power level to 20%. The fault is generated on the Amplifier Control Board.
Overtemp (Red)	Indicates that the temperature of (A5-A6-A3) & A5-A6-A4) one or both of the thermal switches mounted on the heatsink assembly for the output amplifiers is above 173 degrees F. When this fault occurs, the Enable to the switching power supply in the affected Amplifier tray is removed immediately and it will shut down.
Input Fault (Red)	Indicates that the input RF Level to the Amplifier Trays dropped below the 0 dBm range.

8.5.5 Metering Control Panel

Table 8-11. Metering Control Panel Samples

CONNECTOR	FUNCTION
J9 - BNC	O/P Sample (front panel)

Table 8-12. Metering Control Panel Switches

SWITCH	FUNCTION
S2 - Side A - Forward Power	Reads % of Forward Power of Amplifier Array A
S2 - Side A - Reflected Power	Reads % of Reflected Power of Amplifier Array A
S3 - Side B - Forward Power	Reads % of Forward Power of Amplifier Array B
S3 - Side B - Reflected Power	Reads % of Reflected Power of Amplifier Array B
S1 - Combined - Visual Power	Reads % of Visual Power
S1 - Combined - Reject Power	Reads % of Reject Power

S1 - Combined - Aural Power	Reads % of Aural Power
S1 - Combined - Reflected Power	Reads % of Reflected Power

8.6 Remote Interface Connections, Translator

The Remote Connections, as listed below, are made if the Optional (A17) A/V Input & Remote Interface Assembly **is not present** in your System. Refer to the Interconnect Drawing for the proper Pin Remote Connections.

Function Type	**Connector**	**Interface**
UHF Exciter		
Translator Enable Interlock	J11-24	J11-24 & 23 must be Jumpered together for Normal Operation. (1176-1038) Jumper Jack is used.
Translator Enable Interlock Rtn.	J11-23	
Remote Control Commands:		
Translator Standby (Disable)	J11-22	Contact Closure
Translator Standby/Operate Rtn.	J11-21	
Translator Operate (Enable)	J11-20	Contact Closure
Translator Manual	J11-9	Contact Closure
Translator Auto/Manual Rtn.	J11-36	
Translator Auto	J11-8	Contact Closure
Power Level Raise (Optional)	J10-11	Contact Closure
Pwr Lvl Raise/Lower Rtn (Optional)	J10-13	
Power Level Lower (Optional)	J10-12	Contact Closure
Modulator Select (Optional)	J11-10	Contact Closure
Modulator Select Rtn (Optional)	J11-28	
Remote Status Indications:		
Translator Operate (Enable) Ind.	J10-3	50mA Max. Current Sink
Operate/Standby Ind. Return	J10-16	
Translator Standby (Disable) Ind.	J10-4	50mA Max. Current Sink
Translator Auto Indicator	J11-7	50mA Max. Current Sink
Auto/Manual Indicator Return	J11-32	
Translator Manual Indicator	J11-6	50mA Max. Current Sink
VSWR Cutback Indicator	J11-37	50mA Max. Current Sink
VSWR Cutback Indicator Return	J11-35	
Video Loss (Fault) Indicator	J11-25	50mA Max. Current Sink
Video Loss (Fault) Ind. Rtn.	J11-31	
Receiver Fault Indicator	J11-12	50mA Max. Current Sink
Visual Output Power	J11-26	1V full scale at 1kW
Visual Output Power Rtn	J11-29	source resistance
Aural Output Power	J11-27	1V full scale at 1kW
Aural Output Power Rtn	J11-30	source resistance

Remote Metering:

Reflected Power	J10-5	1V full scale at 1kW
Reflected Power Rtn	J10-17	source resistance
Exciter Output Power	J10-10	1V full scale at 1kW
Exciter Output Power Rtn	J10-22	source resistance

LDMOS UHF Amplifier Trays

Remote Metering:

Forward Output Power (A6) UHF Amp	J3-3	1V full scale at 1kΩ
Forward Output Power (A6) Rtn	J3-4	source resistance
Reflected O/P Power (A6) UHF Amp	J3-5	1V full scale at 1kΩ
Reflected O/P Power (A6) Rtn	J3-6	source resistance
Forward Output Power (A7) UHF Amp	J3-3	1V full scale at 1kΩ
Forward Output Power (A7) Rtn	J3-4	source resistance
Reflected O/P Power (A7) UHF Amp	J3-5	1V full scale at 1kΩ
Reflected O/P Power (A7) Rtn	J3-6	source resistance
Forward Output Power (A8) UHF Amp	J3-3	1V full scale at 1kΩ
Forward Output Power (A8) Rtn	J3-4	source resistance
Reflected O/P Power (A8) UHF Amp	J3-5	1V full scale at 1kΩ
Reflected O/P Power (A8) Rtn	J3-6	source resistance
Forward Output Power (A9) UHF Amp	J3-3	1V full scale at 1kΩ
Forward Output Power (A9) Rtn	J3-4	source resistance
Reflected O/P Power (A9) UHF Amp	J3-5	1V full scale at 1kΩ
Reflected O/P Power (A9) Rtn	J3-6	source resistance

The above connections are made to Jack (J11), the 37 Position "D" Connector and to J10, the 25 Position "D" Connector, located on rear of the (A4) UHF Exciter or to Jack (J3), the 25 Position "D" Connector, located on the rear of the (A6, A7, A8 & A9) UHF Amplifier Trays. Refer to the Interconnect Drawing for the proper Pin Remote Connections.