



STX 10
10 kW
FM Transmitter
Technical Manual

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STX 10 10kW Transmitter

Technical Manual

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SAFETY PRECAUTIONS

PLEASE READ AND OBSERVE ALL SAFETY PRECAUTIONS

ALL PERSONS WHO WORK WITH OR ARE EXPOSED TO POWER TUBES, POWER TRANSISTORS, OR EQUIPMENT THAT UTILIZES SUCH DEVICES MUST TAKE PRECAUTIONS TO PROTECT THEMSELVES AGAINST POSSIBLE SERIOUS BODILY INJURY. EXERCISE EXTREME CARE AROUND SUCH PRODUCTS. UNINFORMED OR CARELESS OPERATION OF THESE DEVICES CAN RESULT IN POOR PERFORMANCE, DAMAGE TO THE DEVICE OR PROPERTY, SERIOUS BODILY INJURY, AND POSSIBLY DEATH!!



DANGEROUS HAZARDS EXIST IN THE OPERATION OF POWER TUBES AND POWER TRANSISTORS

The operation of power tubes and power transistors involves one or more of the following hazards, any one of which, in the absence of safe operating practices and precautions, could result in serious harm to personnel.

- A. HIGH VOLTAGE** - Normal operating voltages can be deadly. Additional information follows.
- B. RF RADIATION** - Exposure to RF radiation may cause serious bodily injury possibly resulting in Blindness or death. Cardiac pacemakers may be affected. Additional information follows.
- C. HOT SURFACES** - Surfaces of air-cooled radiators and other parts of tubes can reach temperatures of several hundred degrees centigrade and cause serious burns if touched. Additional information follows.
- D. RF BURNS** - Circuit boards with RF power transistors contain high RF potentials. Do not operate an RF power module with the cover removed.

HIGH VOLTAGE

Many power circuits operate at voltages high enough to kill through electrocution. Personnel should always break the primary AC Power when accessing the inside of the transmitter.

RADIO FREQUENCY RADIATION

Exposure of personnel to RF radiation should be minimized, personnel should not be permitted in the vicinity of open energized RF generating circuits, or RF transmission systems (waveguides, cables, connectors, etc.), or energized antennas. It is generally accepted that exposure to “high levels” of radiation can result in severe bodily injury including blindness. Cardiac pacemakers may be affected.

The effect of prolonged exposure to “low level” RF radiation continues to be a subject of investigation and controversy. It is generally agreed that prolonged exposure of personnel to RF radiation should be limited to an absolute minimum. It is also generally agreed that exposure should be reduced in working areas where personnel heat load is above normal. A 10 mW/cm² per one tenth hour average level has been adopted by several U.S. Government agencies including the Occupational Safety and Health Administration (OSHA) as the standard protection guide for employee work environments. An even stricter standard is recommended by the American National Standards Institute which recommends a 1.0 mW/cm² per one tenth hour average level exposure between 30 Hz and 300 MHz as the standard employee protection guide (ANSI C95.1-1982).

RF energy must be contained properly by shielding and transmission lines. All input and output RF connections, such as cables, flanges and gaskets must be RF leak proof. Never operate a power tube without a properly matched RF energy absorbing load attached. Never look into or expose any part of the body to an antenna or open RF generating tube or circuit or RF transmission system while energized. Monitor the tube and RF system for RF radiation leakage at regular intervals and after servicing.

HOT SURFACES

The power components in the transmitter are cooled by forced-air and natural convection. When handling any components of the transmitter after it has been in operation, caution must always be taken to ensure that the component is cool enough to handle without injury.



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1 Overview

The STX HP FM transmitter series is designed to provide a low power cost effective solution for the FM broadcast market. The STX HP is frequency agile and the STX 10 provides power levels from 1 kW to 10 kW in FM analog mode. Refer to the Product Specification section later in this section for various power combinations for HD + analog and HD only modes.

Included in this manual is set up information for 10kW systems with the STXe500 exciter being used for RF drive and control of the high power operation with the STX 10. The manual also included maintenance, and service information for the STXe500 and the STX10 HP cabinet.

1.1 Instructions

Use this STX HP document for the 10kW installation and technical resource for STX HP transmitter systems. Determine broadcast system scope and design. Follow the detailed installation instructions and interfacing descriptions to integrate the STX in your broadcast system. Refer to user interface detail sections for descriptions of front panel LED display dynamics, interfacing through the transmitter control center, web page, enhanced web GUI page, SNMP, backup control, and system troubleshooting. For detailed maintenance directions and, after troubleshooting and diagnosing failures, follow complete sub-system replacement steps.

Some photographs in this manual will show the STX HP system in an optional 19" EIA 35 RU sold-separately rack. Racks sized at 42 RU are available for purchase and installation through Broadcast Electronics. It is highly recommended that customers specify and purchase one of these sold-separately racks for factory setup of new transmitters.

Selected transmitter settings such as frequency, expected output power, Ethernet settings, etc. can be communicated at the time of purchase. After preliminary testing of all systems in the transmitter, technicians use customer settings and verify full system operation under closer conditions compared to the intended installation.

IP network interfacing features are optional, and are only included to the extent of the ETHERNET port interface and setup. Network cables and hardware depend on the desired networking setup and are relatively common. Please consult a local IT professional if more is needed.

1.2 Other Documents

See the STX CPE Software Update Application Guide 597-4200 for software and firmware update details.

For electronic copies of these and other Broadcast Electronics technical documentation please visit <http://www.bdcast.com/information-center/>.



1.3 Installation and Initial Setup Summary

All of the following steps are required to get a standard STX HP system running. This list reflects the headings under the installation and initial setup section:

1. Rack Mount
2. Control Communications
3. Exciter PA RF Drive
4. Transmitter Antenna RF
5. BE-Interface active stub
6. Customer Interface Board & GPIO Cable
7. AC Power Service and Distribution
8. AC Power Installation
9. Turn on AC
10. Set Time and date
11. Frequency
12. 100% peak modulation
13. Power set point
14. Primary program services
15. Turn RF transmission on



1.4 Product Specifications



Figure 1 – STX 10 Front & Rear

Table 1 - Specifications

Parameter	Specification
Physical	
STXe 500 Exciter -	
Height	2 RU, 3.5" (8.89 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	22" (55.9 cm) with connectors, 21" chassis, 25.5" rack.
Weight	25 lbs (11.3 kg) unpacked
Outlet Size	66.5 in ² (492 cm ²), rear of unit
10 kW PA -	
Height	20 RU 35" (88.9 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	29" (73.7 cm) including connectors
Weight	260 lbs (114.0 kg) unpacked
Outlet Size	160 in ² (1032 cm ²), rear and top of unit
RF Output Connector	3 1/8" Rigid Coax Clamp, Male Inner, 50 Ohm (1 5/8" opt.)

Parameter	Specification
Environmental	
Temperature	0°C to +50°C
Altitude	7500ft (2286M) @ 50Hz 10,000ft (3048M) @60Hz
Humidity	95% maximum, non-condensing
STXe500 Exciter	
Air Capacity	160 CFM (4.5 m ³ /Min)
Heat Dissipation	270 W at Rated Output
BTU	927 BTU/H at Rated Output
10 kW PA	
Air Capacity	800 CFM (22.7m ³ /Min)
Heat Dissipation	4300 Watt Rated Output
BTU	14685 BTU/H at Rated Output
AC Input	
Frequency	47-63 Hz
Power Factor	≥0.98 at 230V
Surge Protection	Not included – External surge protection required
10kW PA and STXe 500 Exciter	
Power Consumption	14.25 kW (calculated) at Rated Output
Single Phase -	
Voltage	196 to 252 VAC Split Phase
Power	Disconnect Size 100 Amps
Current Draw	87 Amps Max
Three Phase -	
Voltage	196 to 252VAC Delta or 340 to 435VAC Wye
Power	Disconnect Size 60 Amps
Current Draw	50 Amps Max
RF Output	
Power Range	2500-10000W
Power Control Precision	10W FM-only, 1% of set point FM+Dig and Dig-only
Efficiency	70% or greater typical @10kW, (AC to RF)
Power Accuracy	+/-5% of Total Output Power Setting
Impedance	50 Ohms nominal
VSWR	Rated Power into 1.5:1 VSWR
STXe 500 Exciter	
Asynchronous AM SNR	75 dB below rated power reference carrier with 100% AM modulation at 400 Hz, with no FM modulation present
Synchronous AM SNR	60 dB below rated power reference carrier with 100% AM modulation at 400 Hz, FM modulation +/-75 kHz deviation at 400 Hz



Parameter	Specification
Frequency	
Range	87.5MHz to 108MHz; 10 kHz increments
Stability	+/- 300Hz, 0°C to +50°C Internal TCXO +/-100 Hz, factory calibration, +/-4ppm aging/temp External Input: accuracy of reference
Modulation	
Type	300KF8E Direct-to-Channel, digitally generated FM (no analog up conversion),
Capability	Greater than +/- 350 kHz
RF Harmonics	
Suppression	85dB or better typical, low pass filter standard. FCC, IC, ETSI, ITU-R, CCIR
Composite Input	
Connector	BNC
Impedance	Balanced:10k or 50ohms selectable. Unbalanced: 10kOhm.
Level	3.5V p-p for 100% modulation
Amplitude Response	+/-0.03 dB 20 Hz to 53 kHz; +/-0.1 dB 53 kHz to 99 kHz
Phase Response	+/-0.1°, 53kHz to 100kHz
THD + Noise	0.005% or less @ 400Hz, 10-22 kHz bandwidth, 75uS de-emphasis
IMD	0.01% or less (SMPTE 60/7000 Hz; 1:1 RATIO) 0.005% typical(DIM-B 14 kHz)
FM SNR	88dB or better below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth, unweighted 95dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth, A-weighted filter 100dB typical below100% modulation @ 400 Hz, 10Hz-22Khz bandwidth, CCIR-468 filter
SCA1 & 2 RDS Inputs	
Connector	BNC
Impedance	10k Ohms un-balanced
Response	+/-0.1dB; 53 kHz to 100 kHz
19kHz Output	19kHz synchronization clock for external RBDS/RDS operation. 1V pp into high impedance



Parameter	Specification
AES Input	
Connector	XLR Female
Impedance	110 Ohms, balanced
Bits	16 - 24
Rate	32, 44.1, 48 or 96 kHz
Level	-2 dBFS for 100% modulation Adjustable in 0.1-dBFS steps, 15 dBFS to 0 dBFS
Analog L&R	
Connectors	XLR Female
Impedance	600 Ohms or 10kOhms, selectable, balanced
Level	10dBm into 600 Ohms default for 100% modulation. Adjustable in 0.25 dB steps, -10dBm to +10dBm
Stereo Generation (AES and Analog L&R Inputs)	
Modes	Stereo, Mono (L+R), Mono L, Mono R
Pre-emphasis	None, 50 usec, 75 usec selectable
Amplitude Response	
AES	+/-0.25dB; 20 Hz to 15 kHz
L & R	+/-0.25dB; 20 Hz to 15 kHz
THD + Noise	
AES	0.03 or better @400Hz, measured 10 Hz-22 kHz, 75 uS de-emphasis
L & R:	0.005 typical @400Hz, measured 10 Hz-22 kHz, 75 uS de-emphasis
S / N Ratio	
AES	95dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth, A-weighted filter. 100dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth, CCIR-468 filter.
L & R	86dB or better below 100% modulation @ 400Hz, 10 Hz-22 kHz bandwidth, unweighted
Analog	93 dB typical below 100% modulation @ 400 Hz 10 Hz-22Khz bandwidth, A-weighted filter. 98 dB typical below 100% modulation @ 400 Hz 10 Hz-22Khz bandwidth, CCIR-468 filter.
Stereo	80 dB or better below 100% modulation @ 400 Hz Unweighted



Parameter	Specification
Stereo Separation	70dB or better, 20Hz to 15kHz
AES:	80dB typical, 20 Hz to 15 kHz
L & R	70dB typical, 20 Hz to 15 kHz
Crosstalk	
Linear	90dB below 100% typical; Main into Sub or Sub into Main
Nonlinear	80dB below 100% typical; Main into Sub or Sub into Main
Audio Overshoot	150% Peak Deviation Max
Pilot Output	
Connector	BNC, un-balanced
Level	1V p-p +/- 5% into high impedance
Stability	+/- 0.3, .0°C to +50°C
10 MHz Input	
Connector	SMA un-balanced
Level	1 to 3 V p-p, nominal 2.8 V p-p (13 dBm)
1 Pulse Per Second Input	
Connector	SMA un-balanced
Level	5V TTL Rising Edge
Regulatory	
FCC; IC; CE;	Meets IEC-215 safety requirements

1.5 Default Operation

Every STX 10 transmitter is tested at the factory for quality and reliability. Technicians use settings given to sales representatives at the time of purchase. Unspecified levels are set to nominal levels for testing. Systems are shipped with specified and default settings intact. In the absence of user settings and when a reset to factory defaults command is issued on the front panel user interface, the following default settings are used:

1. Transmitter RF On/Off – Off
2. Frequency – 98.1 MHz
3. Operating Mode – FM Only
4. FM-only Power Set point – 10 kW
5. Digital-only Power Set point – 3400
6. FM+Digital Power Set point – 7700W
7. Sideband power level – -20 dBc
8. Digital PAV – 44.0V
9. Emergency Output Power – 0 W (disabled)
10. 100% Modulation – 75 kHz
11. Pre-emphasis – None
12. Pilot Injection – On, 10%
13. Mono/Stereo Mode - Stereo
14. Audio Input – Composite
15. AES – -2dBFS input level
16. AES Stereo injection – 100%
17. Analog L – -2.5 dB input gain
18. Analog R – -2.5 dB input gain
19. Analog L/R Stereo injection – 100%
20. Composite – +8.0 dB input gain
21. SCA1
 - o Off
 - o -12.0 dB input gain
22. SCA2
 - o Off
 - o -12.0 dB input gain
23. RDS – Off, -12.0 dB input gain
 - o Off
 - o -12.0 dB input gain
24. Real Time Clock – shipped with Quincy, IL time, factory reset does not affect this
25. Note: The internal real time clock is likely to have stopped keeping time and reset to 2000-01-01 00:00:00 during shipping or any other time when the system is unpowered for days.



- 27. Controller Ethernet
 - o DHCP - Disabled
 - o I.P. – 10.2.4.110
 - o Subnet Mask – 255.255.0.0
 - o Gateway – 10.2.1.1
- 28. VPe Ethernet
 - o DHCP - Disabled
 - o I.P. – 10.2.4.111
 - o Subnet Mask – 255.255.0.0
 - o Gateway – 10.2.1.1
- 29. Exgine Ethernet
 - o I.P. – 10.2.4.112
 - o Subnet Mask – 255.255.0.0
 - o Gateway – 10.2.1.1
- 30. All Passwords – 00000000 (invalid)
- 31. AFC Unlock Output Active Level – Low
- 32. Fault Output Active Level – High
- 33. Forward Power Output Power Voltage – Linear Scale
- 34. VPe Calibration – 40.00dB (RF attenuation level)

2 Preparing to Install

2.1 Verify Contents of Shipment

All configurations of the STX HP are disassembled to some level for packaging and shipping. The amount of disassembly may vary depending on shipping carrier and international vs domestic packaging. For most domestic ground carriers with a 150lbs weight limit, the following is a typical packing check list for basic STX 10kW systems with out options.

2.1.1 10kW Systems - Basic

<input type="checkbox"/>	909-1000-206T		STX HP 10kW, 1-5/8", 3PH, DELTA
<input type="checkbox"/>	909-1000-226T		STX HP 10kW, 1-5/8", Single Phase
<input type="checkbox"/>	909-1000-386T		STX HP 10kW, 1-5/8", 3PH WYE
<input type="checkbox"/>	909-1003-206T		STX HP 10kW, 3-1/8", 3PH, DELTA
<input type="checkbox"/>	909-1003-226T		STX HP 10kW, 3-1/8", Single Phase
<input type="checkbox"/>	909-1003-386T		STX HP 10kW, 3-1/8", 3PH, WYE
<input type="checkbox"/>	Box	1	STX HP Cabinet less modules
<input type="checkbox"/>	Box,	2	959-0000 PA Modules
<input type="checkbox"/>	Box,	2	959-0000 PA Modules
<input type="checkbox"/>	Box,	7	540-5205 PA Power Supplies
<input type="checkbox"/>	Box	1	540-5205 STXe 500 Unit p/n
<input type="checkbox"/>	Book 597-4014	1	STX HP 10KW Technical Manual
<input type="checkbox"/>	Bag 979-6300	1	STX HP 10kW Install Kit
<input type="checkbox"/>	682-0910	1	AC Power Cord – (STXe500)
<input type="checkbox"/>	846-4005	1	Ehernet Cable, (COM IN/COM OUT)
<input type="checkbox"/>	846-4010	1	Ehernet Cable
<input type="checkbox"/>	849-3701	1	GPIO Cable, DB37 to DB37 M/F
<input type="checkbox"/>	949-4130	1	Exciter Activation Stub (STXe500)
<input type="checkbox"/>	949-4163	1	RF Coax Cable, RG316,(STXe500 Jumper)
<input type="checkbox"/>	Bag	1	Rack Hardware Kit
<input type="checkbox"/>	420-0007	18	PHILLIPS SCREW 12-24 X 3/4"
<input type="checkbox"/>	420-0710	18	PHILLIPS SCREW 10-32 X 5/8"
<input type="checkbox"/>	421-0002	18	EIA RACK SCREW CLIPS 12-24
<input type="checkbox"/>	423-1018	4	FIBER WASHER .500 X.218 X.030
<input type="checkbox"/>	Bag	1	PA Hardware
<input type="checkbox"/>	420-0518	8	PHILLIPS SCREW 10-32 x 3/8"
<input type="checkbox"/>	422-0106	4	PHILLIPS SCREW 10-32 X 3/8
<input type="checkbox"/>	418-0283	1	37PIN D-SUB FEMALE SOLDERPOT
<input type="checkbox"/>	417-0284	1	37PIN D-SUB SHELL
<input type="checkbox"/>	418-1550-010	4	10PIN CONNECTOR, PLUG
<input type="checkbox"/>	471-6302	1	AIR DAM, PA POWER SUPPLY

2.1.2 10kW Systems – Alternate and Options

1. The basic systems do not include rack installation and other options for the STX HP. However some of the packing information above still applies such as the removal of the PA Modules.



2. If a rack installation is purchased, the 10kW cabinet will remain in the rack and will either be crated or mounted to a wooden pallet for shipping.
3. The EP1 Switcher option and a second STXe500 would be boxed separately if purchased with the basic 10kW system or if the rack installation was purchased, this equipment may be left installed in the rack
4. The option for an 8th PA Power Supply if purchased would be boxed with the other 7 PA Supplies for the basic systems or left in the cabinet on rack installation options

2.2 Items Sold Separately or Not Supplied

- EP1 Standby Exciter Option and 2nd STXe500.
- 19" EIA rack at appropriate height and depth for system type, includes rear support rails
- AC power mains connection wire and main breaker
- Remote station interface controller and solderable wiring for desired connections
- Networking cable(s) and switch(s) for Ethernet connectivity
- Rigid or Semi-Rigid coax and connectors. (1-5/8" or 3-1/8")

2.3 Tools and Materials

The following are tools for connection to the STX HP system

- Small flat blade screwdriver (about 5/32" blade or smaller)
- Large flat blade screwdriver (or 5/16" nut driver)
- #1 Phillips screwdriver
- 3/16" Allen Wrench
- Wrenches for flanged ridgid coax hardware used in site RF system
- Tie-wraps

Remote Station Interface Connections

- Wire - at minimum 2" (5cm), enough for unmute/failsafe jump
- Wire strippers
- Soldering iron and solder
- Heat-shrink tubing - recommended to isolate any tightly packed wire connections

2.4 Estimated Time for Installation

Installation and initial setup should take between 1- 2 hours for installations that already have AC service, RF output and Program & HD equipment in place.

If other equipment is needed to be installed and/or set up other than the STX HP system, addition time will be required.

3 Installation and Initial Setup

This section covers installation requirements for a basic, but full-featured STX HP 10kW transmitter package. Other systems purchased may include optional equipment and/or rack installation. Some of the installation steps may not apply for these optional purchases and may have other documents to augment the installation.

Before assembling the system, please take some time to familiarize yourself with all of the connectivity features in Section 5, Rear Assemblies. Hardware and cables from the Installation Kit will be used in the following steps.

3.1 Rack Mount

Many different 19" EIA rack product variants exist; however the STX HP requires a rack with paths for exhaust air to exit the transmitter and paths for transmission line out to the antenna or load, AC power into the unit, and any external control and communications cabling for remote station control or Ethernet. The STX 10KW does not require rear support rails, however the transmission line must be supported at the exit point of the rack

Placing the transmitter at the top of 60 RU or taller rack creates a top-heavy and potentially hazardous tipping condition when modules or trays are pulled out. The rack must be secured to the floor if a mid-level or top positioning of equipment is to be done to prevent an equipment rack from tipping.

1. Using the dimension information of the 10kW PA cabinet determine its rack location leaving 2RU left open for STXe500 after the PA cabinet is secured in place.
2. Remove the front cover of the amplifier cabinet and all 4 PA modules if not already done. Note: Due to the volume and remaining weight of the cabinet, two people are required to position the cabinet in the rack.
3. Insert the screws and clips if needed for the Rack Hardware Kit and tighten to secure the cabinet in the rack.
4. Install all four PA modules and secure with screws from the PA Hardware Kit.
5. Set the STXe500 in place and insert screws in the provided felt washers, and insert then tighten



Figure 2 – Installation STXe500

3.2 Control Communications

1. Locate Ethernet cable 846-4010 from the Installation Materials Kit and plug into the STXe500 Ethernet connector and the #2 port in the Ethernet Switch. Refer to Figure 3.
2. Locate cable 846-4005 from the Installation Materials Kit and plug into COM IN on the STX 10 to the COM OUT connector on the STXe 500.
3. This cable is already in the wire harness and connected to the #1 port on the Ethernet Switch located on the STX 10 cabinet.

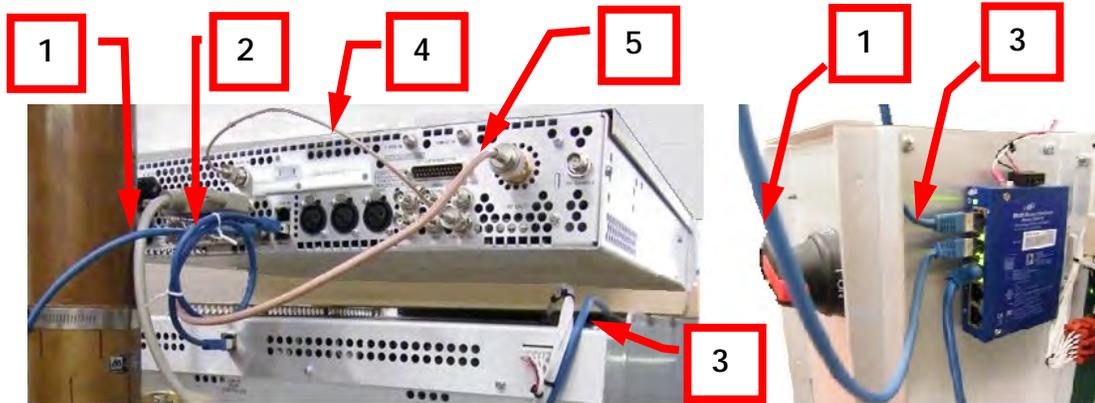


Figure 3 – RF Coax, Comm & Ethernet Cables

3.3 Exciter PA RF Drive

4. Locate coax cable 949-4163 from the Installation Materials Kit and jumper the STXe500 EXC RF OUT to the PA RF IN connector on back of the STXe500.
5. The STX 10 RF Drive Coax Cable is attached to the harness. Fasten the other end of the coax cable to the Type N, RF OUT connector on the STXe500

3.4 BE-Interface Activation Stub

1. Connect the provided exciter activation stub. Secure the two jackscrews with a small flat screwdriver.

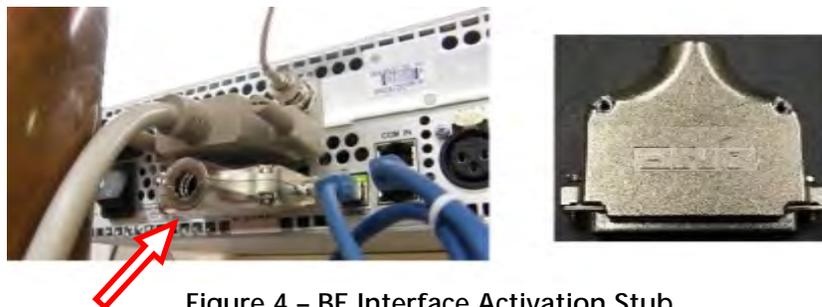


Figure 4 – BE Interface Activation Stub

NOTE: There are system options that utilize this input such as the EP1 switcher and VPe signal generator. If these are included in the broadcast system purchased, the activation stub should be set aside and stored in a safe place.

3.5 Customer Interface Board & GPIO Cable

All STX10 installations require the unmute/failsafe be activated at a minimum. This is done with a jumper across the terminals on Customer Interface Bd as circled in Figure 5 or with a failsafe relay as part of the remote control system wiring.

STX10 remote control installation requires Active Low/Ground Logic. Refer to Table 2 in Section 5.1.7 for terminal details for connections to the Customer Interface Bd.

A GPIO Cable is provided to connect the STX10 Customer Interface Bd to the back of the STXe500 into the GPIO connector. Locate and install the GPIO Cable as shown in the arrows in Figure 5.

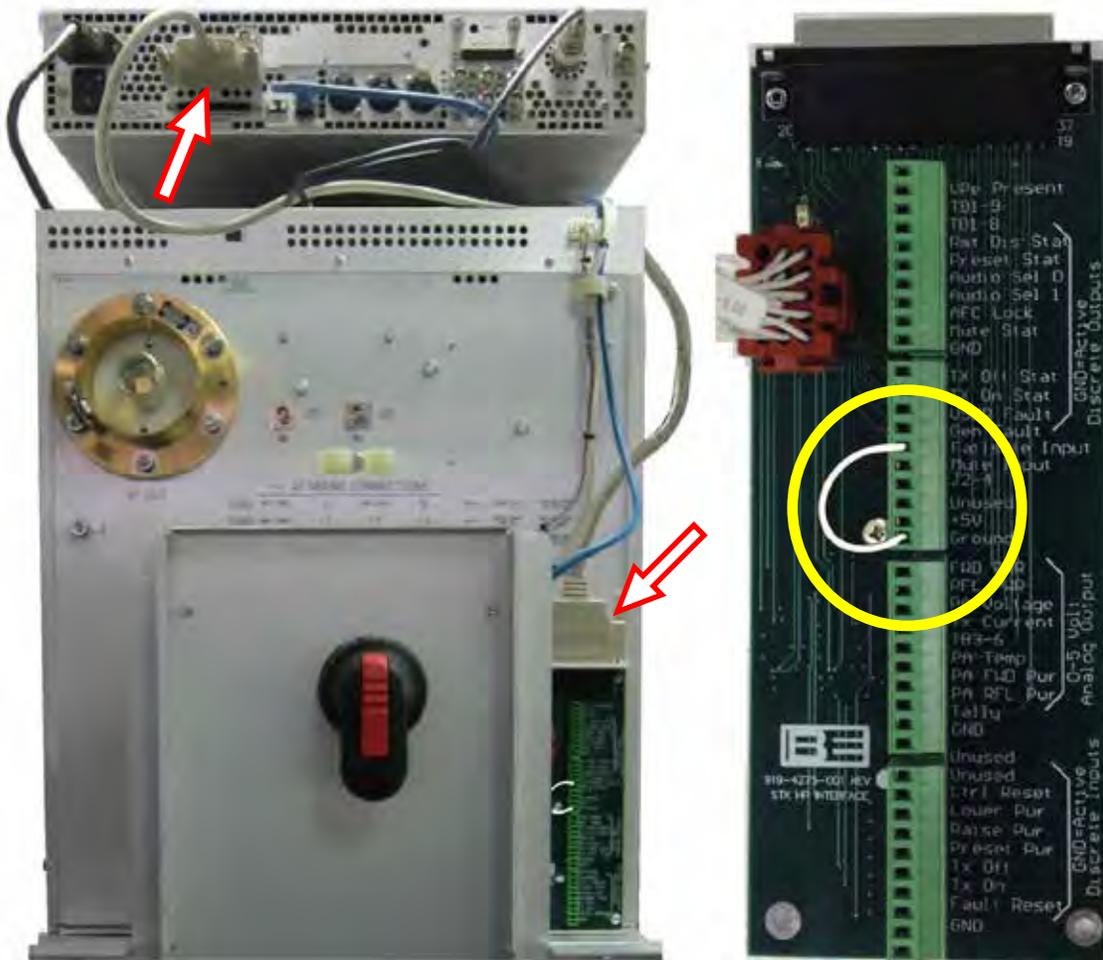


Figure 5 - Customer Interface Board

3.6 Transmitter Antenna RF Out

The 10kW transmitter output is either 1-5/8 or 3-1/8" unflanged coax depending on the system purchased. Use an unflanged elbow to route the coaxial plumbing out of the top of the rack.

1. Loosen the hose clamp that ships attached to the flange and attach the elbow. Ensure that the inner conductor is aligned with the male inner connector on the transmitter and insert the inner and outer into place.
2. Tighten the hose clamp and verify a good mechanical connection between the flange and coax elbow.
3. Secure the coax at the top of the equipment rack.
4. Complete the transmission line run to the sites' RF system, test load & antenna.

NOTE: SUPPORT THE TRANSMISSION LINE AT THE TOP OF THE RACK TO REDUCE WIEGHT AND ANGLE TORQUE FROM DAMAGING THE RF OUTPUT FLANGE CONNECTION INTO COMBINER ASSEMBLY OF THE STX10 CABINET.

3.7 AC Power Service and Distribution



CONSULT YOUR LOCAL ELECTRIC UTILITY PROVIDER AND/OR LICENSED AUTHORITY BEFORE CONNECTING ANY CONDUCTORS TO THE TRANSMITTER. OPERATION FROM AN UNSATISFACTORY POWER SOURCE WILL VOID THIS TRANSMITTER'S WARRANTY.

If the transmitter is to be operated from a three phase power service, the transmitter must be connected to a closed delta or wye. Open delta, V to V, T to T, T to L, and Scott configurations have unsatisfactory performance in this application. Transients and unstable power may damage internal components of the transmitter and will cause degradation of performance, possibly outside specifications.

Proper three phase power service can be identified by the AC mains transformers: three transformers with one winding each or one transformer with three windings. Invalid service configurations use two transformers. Refer to Figure 6 for acceptable main power service configurations

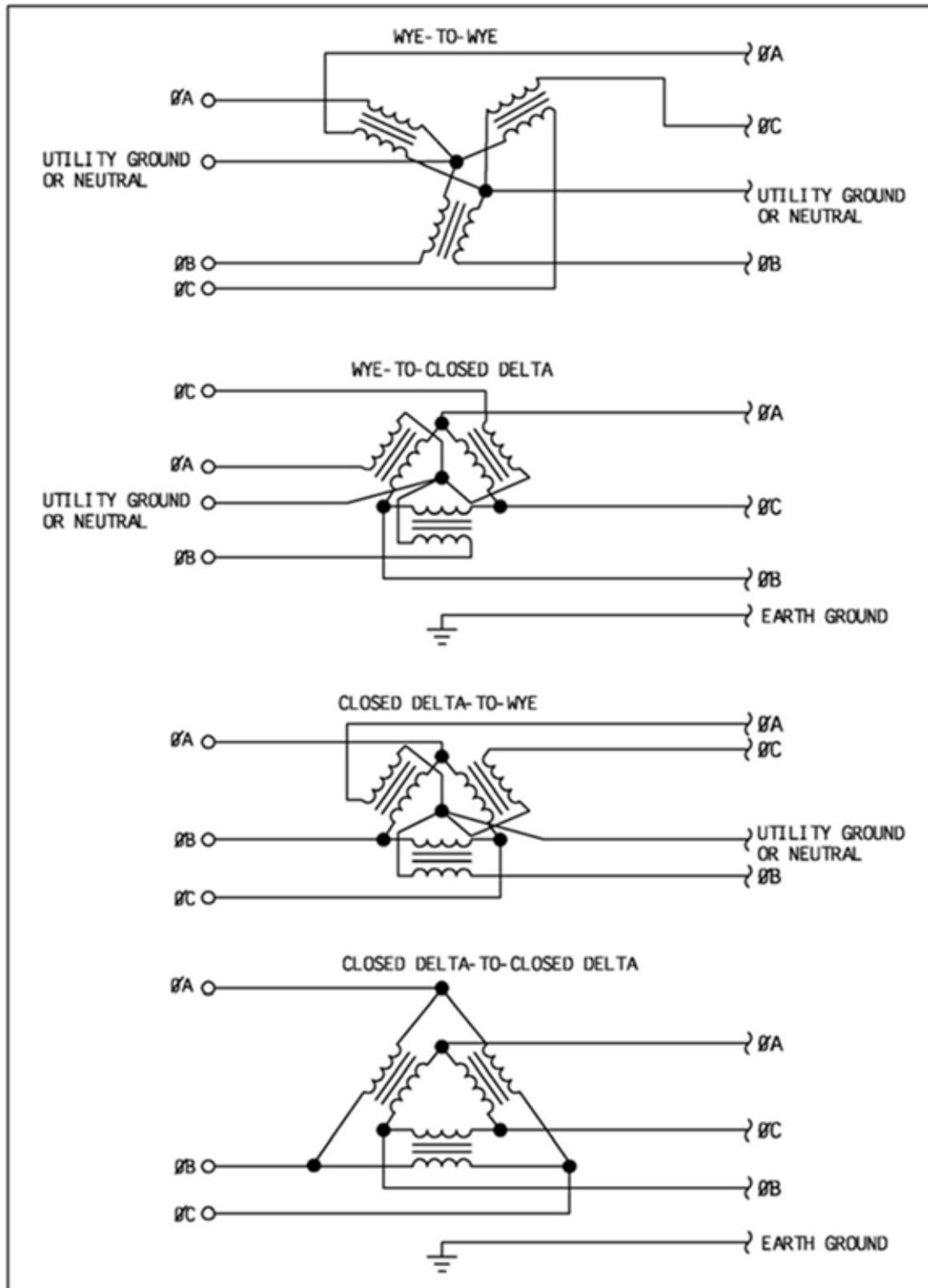


Figure 6 - Three Phase AC Main Configurations

3.8 AC Power Installation

The STX 10KW uses a circuit breaker with a disconnect handle to provide a single point location to connect the AC Mains for the transmitter system. Refer to Figure 7. The circuit breaker is mounted on the rear of the transmitter and is housed in its own enclosure to provide AC power to the various DC supplies used in the PA cabinet. In addition, an IEC-320 AC receptacle is providing for AC power to STXe500 exciter and other ancillary equipment within the rack.

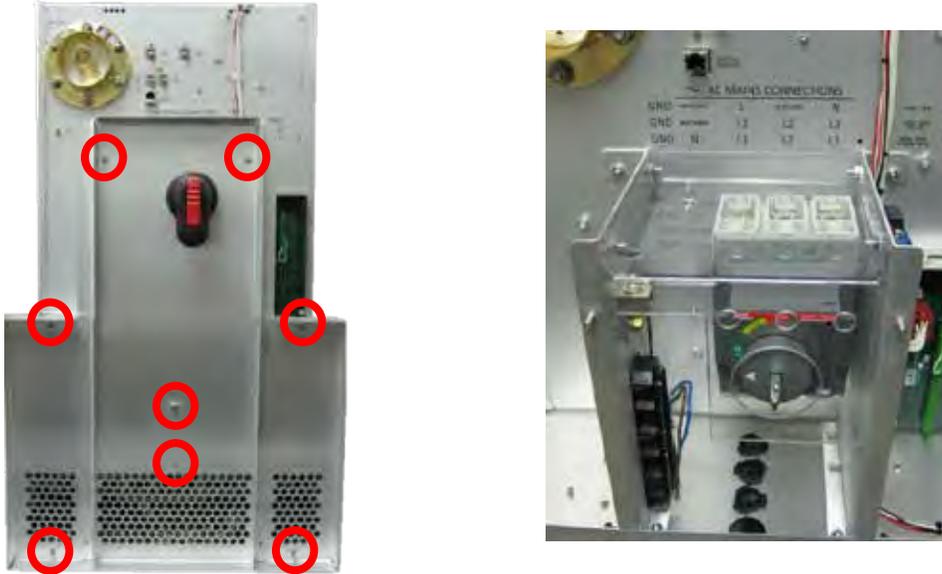


Figure 7 - AC Breaker Disconnect Switch

AC mains connection information is silkscreened on the back above the breaker enclosure enlarged below in Figure 8.

AC MAINS CONNECTIONS						
GND	NOT USED	L	NOT USED	N	220V 1PH	180-264 VAC 47-63 Hz
GND	NOT USED	L1	L2	L3	220V 3PH DELTA	180-264 VAC 47-63 Hz
GND	N	L1	L2	L3	380V 3PH 4 WIRE WYE	328-417 VAC 47-63 Hz

Figure 8 – AC Mains Silkscreen



ENSURE AC MAIN IS DISCONNECTED AND LOCKED OUT BEFORE INTERACTING WITH ANY AC CONNECTIONS.

1. The Handle will remain attached to Rear Access Panel and is required to be in the OFF position to remove the Rear Access Panel
2. Remove the 8 nuts circled on rear panel in Figure 7 to gain access to the circuit breaker and other connection points in the enclosure. The clear Plexiglas cover above the circuit breaker is to remain in place with the mains AC wiring routed through the predrilled holes positioned above their connection points on the breaker

3. A straight blade screwdriver is required for the L1, L2 & L3 terminals on the circuit breaker. Strip the conductor jackets off for termination on the lugs, but leaving the jacket in place entering the safety cover. Refer to Figure 9 and Figure 10.



Figure 9 – Tool Access for AC Connections

4. The safety ground connection requires a 3/16" Allen key. Refer to Figure 9

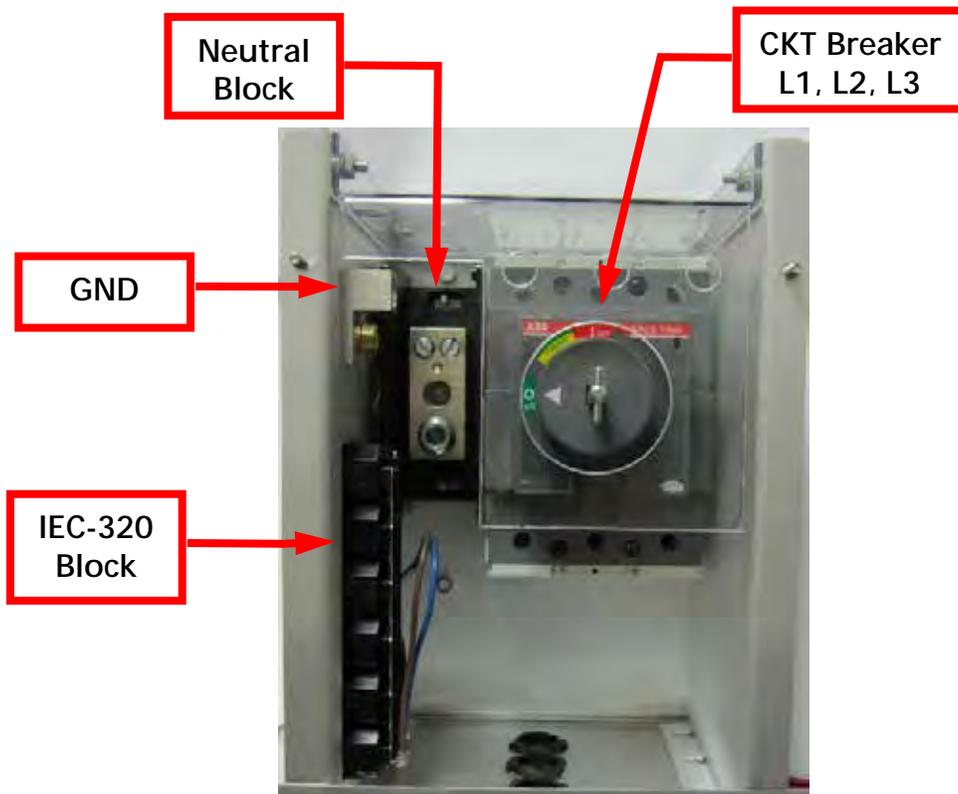


Figure 10 - AC Lines, GND & Neutral Connections

5. The Neutral connection block is only provided for transmitters purchased for WYE configurations. For single phase installations use the L3 location on the circuit breaker as detailed on the cabinet silk screen, Figure 8.
6. Connect the STXe500 AC input to the IEC-320 block with the provided cord.

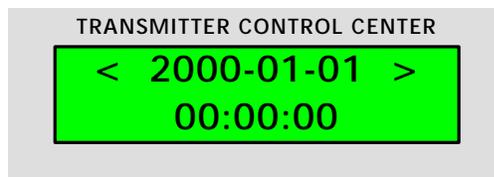
3.9 Turn on AC

1. Put the rear cover back on the STX10 and turn AC Breaker Handle to the On position.
2. Turn on the circuit breaker from the sites disconnect panel.
3. Turn on the power switch in the rear of the STXe500 if not already on.

3.10 Set Time and Date

The internal real time clock holds the current time and date for use in the event log. This is a rudimentary device that supports 24-hour format and does not adjust for daylight saving. If installing during summer in a daylight saving region, following standard non-daylight time is recommended instead (the internal real time clock does not automatically compensate for any daylight saving).

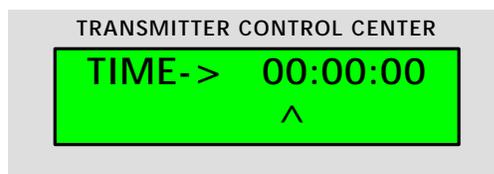
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the Date and Time menu. Press enter to continue.



2. Press up or down to select the time editing screen.



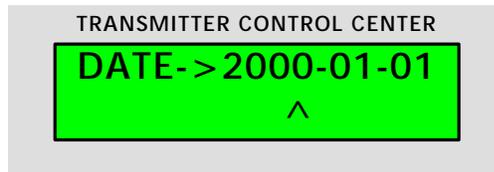
3. Set the local (24 hour non-daylight saving) time. Press left or right to move the cursor and press up or down to increment or decrement the number.



4. Press enter when finished editing for the setting to take effect in the system, save, and start keeping time.
5. Enter the date and time menu again. Press up or down to navigate to the date editing screen.



6. Set the current date. Press left or right to move the cursor and press up or down to increment or decrement the number.



7. Press enter when finished editing for the setting to take effect in the system, save, and keep time.

3.11 Frequency

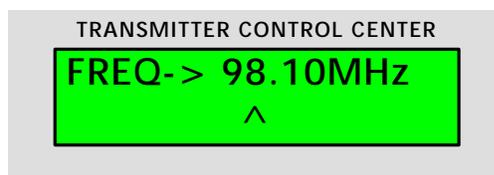
The STX 10 system is built around frequency agile exciter and PA hardware. The frequency can be changed directly from the front panel of the STXe 500. No hardware modifications or tuning procedure are required when the carrier frequency is changed.

If the STX 10 RF output is on ("TX ON") when the frequency is changed, the system will momentarily turn the RF output off, change the frequency, and immediately turn RF back on again with the new frequency

1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the FREQUENCY menu. Press enter to continue.



2. Press left or right to move the cursor between frequency digits. Press up or down on each digit to increment or decrement the number.



3. Press enter when finished editing for the frequency change to take effect.

3.12 100% peak modulation

The STX 10 defaults to 100% modulation being +/- 75 kHz. This section only applies if the STX is being used in an installation where 100% modulation is not +/- 75 kHz.

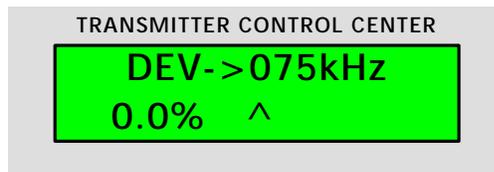
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.



2. Press up or down to select DEV, the FM deviation control setting. Press enter to continue.



3. Press left or right to move the cursor between frequency digits. Press up or down on each digit to increment or decrement the number. This change takes effect immediately in the system without saving the setting to allow for active tuning.



4. Press enter when finished editing to save the deviation control setting.

3.13 Power set point

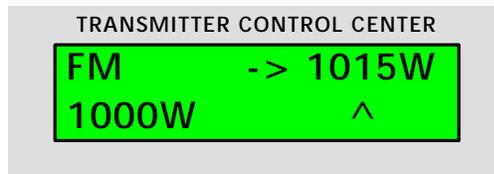
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the PWR SET menu. Press enter to continue.



2. Press up or down to select the power set point for the FM operation mode, which should display as active. Note that digital, FM+digital, and hybrid HD sideband settings require an optional VPe system. Press enter to continue.



3. Press left or right to move the cursor between digits. Press up or down on each digit to increment or decrement the number. Current output forward power measurements are displayed in the lower left of the screen.



4. Press enter when finished editing for the new power set point to take effect.

3.14 Primary Audio Source

The STX 10 provides built-in injection of one primary audio source: AES, Composite, or Analog L/R. Secondary audio sources SCA1, SCA2, and RDS can be enabled and used in any on/off combination with these primary audio sources.

3.14.1 AES

The STXe supports standard AES audio as well as 192 kHz Composite over AES. The 192 kHz Composite over AES operates with various brand name systems including Wheatstone, Omnia and Orban audio processors.

To operate Composite over AES, follow the steps below, but select "AES COMP" rather than "AES" as the input

1. Connect an XLR cable from the desired AES audio source.



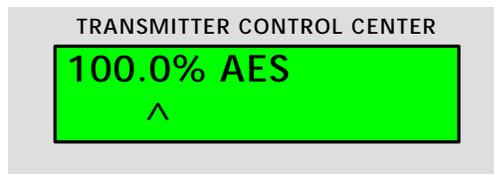
2. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO INPUT menu. Press enter to continue.



3. Press up or down to select AES as the primary audio source. Press enter to continue.



4. The screen will display the injection percentage allocated to AES. This setting allows the customer to budget the modulation when supplementary services are present. Leave this at 100% if there are no supplementary services in use. If supplementary services are present, set the total modulation percentage associated with AES. This can be adjusted from 70% to 100%. Use the left and right arrows to move the cursor. Press up or down buttons for each digit to increment or decrement the number.



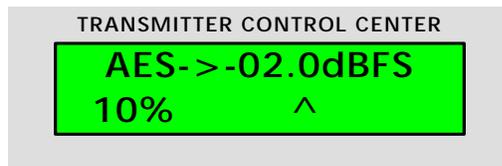
5. Press enter when finished editing for the setting to take effect in the system and save.
6. AES audio levels are expressed in terms relative to Full Scale of the digital signal path selected.
7. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.



8. Press up or down to select "AES". Press enter to continue.



9. The display will show the current peak modulation attributable to the AES input. The level can be adjusted by changing the associated dBFS setting. This has a range of -28.0 dBFS to +0.0 dBFS in 0.1 dB steps. This represents the AES level that will generate the percentage modulation shown on the screen
10. Press left or right to move the cursor. Press up or down on each digit to increment or decrement the number and take effect in the system. This has immediate effect. Do this until the displayed left channel peak hold is the desired value – typically 100%.



11. Press enter when finished editing to exit the sub-menu.

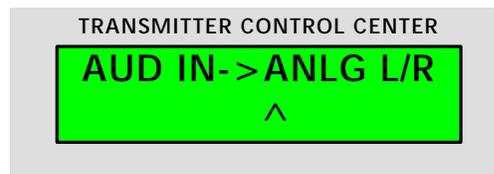
3.14.2 Analog L/R

Connect XLR cables from the desired Analog Left and Right audio sources. Activate the source with constant level tones or typical level real audio on each channel.

1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO INPUT menu. Press enter to continue.



2. Press up or down to select ANLG L/R as the primary audio source. Press enter to continue.



3. Set the stereo injection reduction (to allocate injection budget for secondary services). Leave this at 100% if there are no secondary services.
4. Press left or right to move the cursor. Press up or down on each digit to increment or decrement the number.



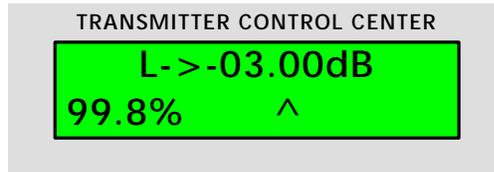
5. Press enter when finished editing for the setting to take effect in the system and save.
6. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.



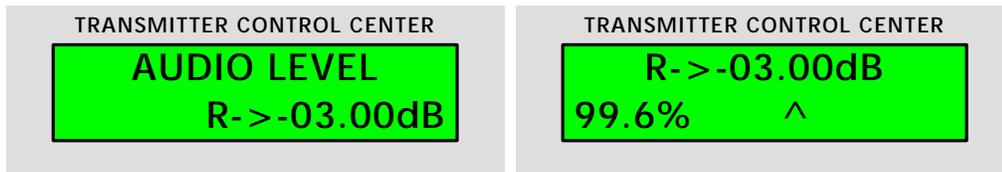
7. Press up or down to select L. Press enter to continue.



8. The display will show the current peak modulation attributable to the Left input. The level can be adjusted by changing the associated gain/attenuation. This has a range of -96.0 dB to +22.0 dB in 0.25 dB steps. Press left or right to move the cursor.
9. Press up or down on each digit to increment or decrement the number and take effect in the system. This has immediate effect. Do this until the displayed left channel peak hold is the desired value – typically 100%.



10. Press enter when finished editing to save the L calibration setting.
11. Repeat these steps 6 – 9 for R.



3.14.3 Composite

1. Connect a BNC cable from the desired unbalanced composite audio source. Activate the source with a constant level tone or typical level real audio.
2. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO INPUT menu. Press enter to continue.



- Press up or down to select COMPOSIT as the primary audio source. Press enter to continue.



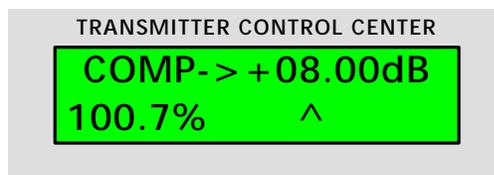
- From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.



- Press up or down to select COMP. Press enter to continue.



- The display will show the current peak modulation attributable to the Composite input. The level can be adjusted by changing the associated gain/attenuation. This has a range of -96.0 dB to +22.0 dB in 0.25 dB steps. Press left or right to move the cursor. Press up or down on each digit to increment or decrement the number. This has immediate effect. Do this until the displayed peak hold is the desired value – typically 100%.
- Note: The Composite input is summed with the supplementary sources SCA1, SCA2, and RDS. When calibrating the Composite input, the supplementary sources should be turned off

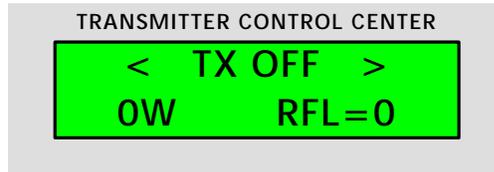


- Press enter when finished editing to save the L calibration setting.

3.15 Turn RF Transmission On

If all setup steps have been completed, including desired optional features in the next section, the system should be ready for operation.

1. At the main screen on the transmitter control center, press the return button



2. Press the button under "ON" to power up the transmitter



4 Optional Installation Steps

4.1 Additional Program Services

The STXe 500 allows operation of three supplementary audio services. These are labelled SCA1, SCA2 and RDS. It is expected that these will be generated by an external system, modulating the audio at the proper frequency between 57 kHz and 100 kHz.

The setup of these audio input sources all follow the same pattern as one another Repeat these steps below to utilize any of these inputs.

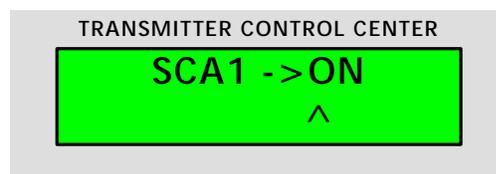
1. Connect a BNC cable from the external signal generator source to the secondary program input. Activate the source with a constant level tone or typical level real audio.
2. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the SCA/RDS menu. Press enter to Continue.



3. Press up or down to select the desired SCA/RDS input.



4. Press up or down to change the setting to ON.



5. Press enter for the on/off setting to save and take effect in the system.

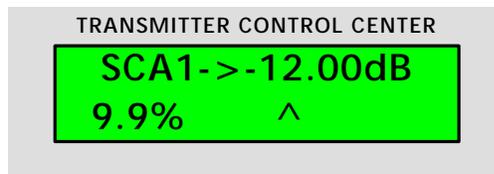
6. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.



7. Press up or down to select the desired input and press enter to continue.



8. Press left or right to move the cursor. Press up or down on each digit to increment or decrement the number and take effect in the system. Do this until the displayed composite peak hold is within a few percent of 100%.
9. Note: SCA1, SCA2, and RDS input signals (that are enabled) also contribute to this composite peak hold value. These sources should be turned off before attempting this calibration.
10. Adjust until the displayed composite peak hold is approximately 10%. Note that enabled SCA1, SCA2, RDS, and composite input signals all contribute to this peak hold value. Other sources should be turned off for calibration of each individual channel.



4.2 Ethernet/IP Network

IP network features are entirely optional. System setup sections below contain procedures based on the LCD interface on the front panel of the main assembly, but there is alternative user interfacing for control of all of these setup parameters in both the web and SNMP interfaces.

The currently used configuration, such as IP address, can be observed in front panel menus. The actual configuration of the system may be determined by DHCP rather than the static settings. Configuration should be made to match whatever network setup is installed.

Consult your network manager or internet service provider to ensure that the correct IP settings are used.

For any network type, connect an Ethernet cable from the ETHERNET port to networking equipment (such as a switch or gateway).

4.2.1 Static IP

Use either this simple static IP setup or dynamic host control setup.

1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the ETHERNET/IP menu. Press enter to continue.



2. Press up or down to select the port to be set up. CONTROLLER is the ETHERNET port on the STX. Engine is the ETHERNET DATA port on the optional VPeXG system. VPe is the ETHERNET VPE port on the optional VPeXG system. Press enter to continue.



3. Press up or down to select the IP parameter to be observed or changed. Press enter to continue.



4. This level displays the current state of the IP port, which includes DHCP, IP address, subnet mask, gateway address, and MAC address. Press up or down to observe the currently active IP configuration (0.0.0.0 IP address typically indicates that the port is not connected), and then press enter to modify the static IP setting.

<p>TRANSMITTER CONTROL CENTER</p> <p>IP ADDRESS 010.002.107.030</p>	<p>TRANSMITTER CONTROL CENTER</p> <p>SUBNET MASK 255.255.000.000</p>
<p>TRANSMITTER CONTROL CENTER</p> <p>GATEWAY ADDRESS 010.002.001.001</p>	<p>TRANSMITTER CONTROL CENTER</p> <p>MAC ADDRESS AABBCCDDEEFF</p>

5. Press left or right to move the cursor to any of the 12 digits. Press up or down to increment or decrement the number. Press enter when finished making the setting change.

TRANSMITTER CONTROL CENTER

192.168.001.010
^

6. Verify that the settings active by connecting to the port.



4.2.2 Dynamic Host Control

Dynamic IP setup using DHCP is appropriate for more sophisticated and secure network setups. Ethernet will not function when DHCP is enabled and a DHCP-based host controller (typically an internet gateway) is missing from the network setup.

Use either this dynamic host control setup or static IP setup.

1. From the main screen on the transmitter control center on the front panel of the main assembly, navigate to the ETHERNET/IP menu. Press enter to continue.



2. Press up or down to navigate to the ETHERNET/IP CONTROLLER. Press enter to continue.



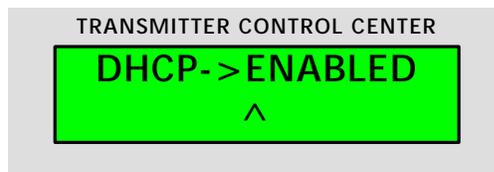
3. Once in the menus, press up or down to select CONTROLLER DHCP and press enter.



4. Once in the menu, press up or down to select DHCP and press enter.



5. Press up or down to change the selection to ENABLED and press enter.



6. Verify that the host control function is active by connecting to the IP port with a web browser. Connect through the managed switch/gateway. Alternatively, view the IP ADDRESS status in these menus to retrieve the current host and access the port through a different local switch.

4.3 Password

The default password is invalid for control access. One or more of the passwords (operator, user, or chief) must be set to be used to control the system through any IP interfaces.

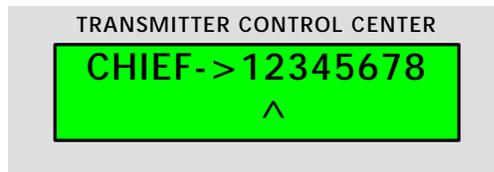
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the PASSWORD menu. Press enter to continue.



2. Press up or down to select the password to be set. Press enter to continue.



3. Press left or right to move the cursor between password digits. Press up or down on each digit to increment or decrement the number password.



4. Press enter when finished editing for the password to take effect in the system.

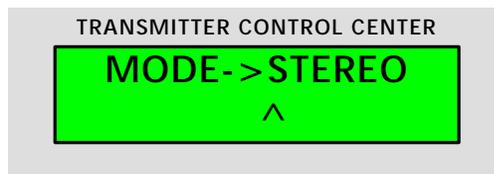
4.4 Stereo Generation and Stereo Pilot Injection

Internal stereo generation utilizing the AES or Analog L/R audio input channels is optional.

1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the MONO/ST MODE menu. Press enter to continue up or down to select STEREO.



2. Press up or down to select STEREO.



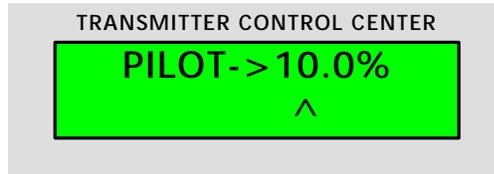
3. Press enter for the selected mono/stereo mode to save and take effect in the system.
4. Note that if changing from any mono mode to stereo, the internally generated 19 kHz stereo pilot will automatically turn on at the previously set level. Change back to mono from stereo automatically turns the stereo pilot off.
5. To change the injection of the 19kHz stereo pilot: from the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the PILOT menu. Press enter to continue.



6. Press up or down to select LEVEL.



- Set the injection level of the pilot in the stereo signal (% peak injection is multiplicative to stereo AES or Analog L/R reduction factors). Press left or right to move the cursor. Press up or down to increment or decrement the number.



- Press enter for the pilot level to save and take effect in the system.

The Pilot has two modes of operation: 1) On, or 2) Stereo. When the On mode is selected, the 19 kHz pilot will always be present. If in Stereo mode, the Pilot will only be present if the STXe is in Stereo mode.

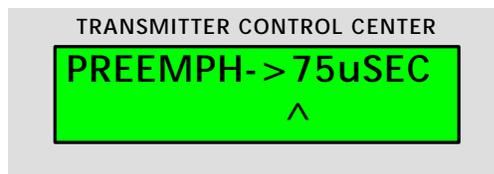
4.5 Pre-Emphasis

Internal pre-emphasis filtering on the AES and Analog L/R audio inputs is another standard option feature tied to internal stereo generation. North American receivers are typically compatible with 75 microsecond filters while European receivers typically utilize 50 μ S.

- From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the pre-emphasis menu. Press enter to continue.



- Press up or down to select the desired filter type.



- Press enter for the filter change to save and take effect in the system.

4.6 Secondary Audio and Silence Timeout

The SECONDARY AUDIO feature allows switching to an alternate source after the PRIMARY AUDIO is absent for the time entered in the SILENCE TIMEOUT setting.



1. From the main screen on the transmitter control center on the front panel of the main



assembly, press up or down to navigate to the SETUP menu. Press enter to continue.

2. Press up or down to select the secondary audio to be set. Press enter to continue.



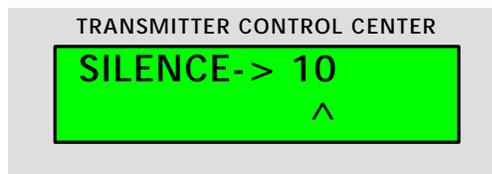
3. Press up or down to select one of the 4 inputs; Composite, Analog L/R, AES, AES Composite, or None if secondary audio isn't used. Injection level setup for Secondary Audio will be same as outlined in section 3.14.



4. Press enter when finished with selection for the secondary audio source to take effect in the system.
5. Press SET UP again.
6. Press up or down to select SILENCE TIMEOUT and press enter to continue.



7. Press up or down, left or right to enter a timeout in seconds.



8. Press enter when finished for the time out setting to take effect in the system.

5 Rear Assemblies & Connections

5.1 STX10 Rear Assemblies

The reference designators in the figure below refers to sub-section numbers. For example, section or equipment pointed out by box 1 in this figure, will have description and details provided in section 5.1.1. Box 2 corresponds to section 5.1.2 and so forth.

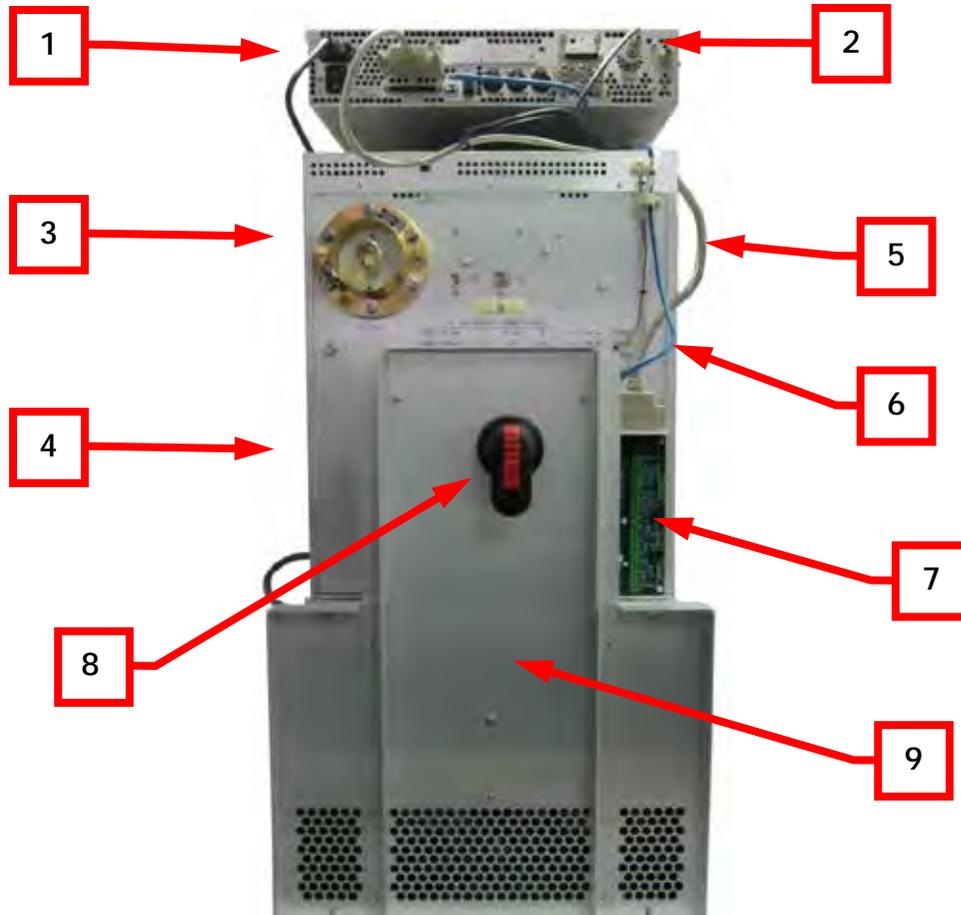


Figure 11 – STX 10 Rear

5.1.1 STXe 500 Exciter

Refer to Section 5.2 on the STXe500 for additional details on the rear connections and features.

5.1.2 RF Drive Coax

Interconnect coax between STXe500 & STX 10 PA Cabinet.

5.1.3 STX10 RF Output

1-5/8" or 3-1/8" RF output to antenna or site RF system. (3-1/8" option shown).

5.1.4 STX10 PA Cabinet

PA cabinet enclosure to house 10kW subassemblies.

5.1.5 GPIO Cable

Connects the STX 10 Customer Interface Board and other PA cabinet control signals to the STXe 500's GPIO connector.

5.1.6 Communication Cable.

Provides CAN Buss communication between the STXe500 and the STX10 cabinet.

5.1.7 Customer Interface Board

The STX Customer Interface Bd is the primary location for any discreet wiring for the sites control and monitoring system. J1 provides I/O to the 10kW STX cabinet, while J2 provides for the GPIO Cable connections into the STXe500. The customer I/O is distributed across TB1, though TB4 terminal screw connections for remote control connections.. Table 2 below defines these connections for TB1, TB2, TB3 & TB4., with the table sequence matching the physical mounting of the connectors from top to bottom on the PWB

Table 2 – Interface Board Connections

Pin	Direction	Name	Description
TB1-1	Input	VPe Present Fault Reset	Indicates the presence of a VPe system in the setup. Checked at system boot for a held low level. Resets all the transmitter faults with an active low edge.
TB1-2	N/A	TB1-9	Pin 10 of STXe500 GPIO. Reserved
TB1-3	N/A	TB1-8	Pin 8 of STXe500 GPIO. Reserved
TB1-4	Output	Rmt Dis Status	Low when Remote is Disabled.
TB1-5	Output	Preset Status	Low when system power is at preset level
TB1-6	Output	Audio Sel 0	Low when primary audio is active
TB1-7	Output	Audio Sel 1	Low when secondary audio is active
TB1-8	Output	AFC Lock	Low when the internal exciter is locked onto the set frequency
TB1-9	Output	Mute Status	Low when the transmitter is muted via input pin 16
TB1-10	N/A	GND	Chassis ground
TB2-1	Output	TX Off Status	Low when system RF output power is off.
TB2-2	Output	TX On Status	Low when system RF output power is on.
TB2-3	Output	VSWR	Low when the affected part of the system is shut down due to reflected power above safe levels
TB2-4	Output	Gen Fault	Low when any fault is active in the system.
TB2-5	Input	Failsafe Input	Transmitter failsafe input. Requires a sustained low to run RF in the system.
TB2-6	Input	Mute	Mutes RF while the input is held low. This essentially performs the function of "Transmitter Off" with a low edge and "Transmitter On" with a high edge.
TB2-7		J2-4	Pin 31 on STXe500 GPIO. Reserved
TB2-8	N/A	Unused	
TB2-9	Output	+5V	Low power logic voltage supply for remote interface logic on this interface. Jumper J26 allows this to be wired for fused or isolated power supply. Isolated current limit is 7.5mA. Fused current limit is 0.5A.

Pin	Direction	Name	Description
TB2-10	N/A	Ground	Chassis ground
TB3-1	Output	FWD PWR	DC voltage for system forward output at the system RF output. Varies linearly from 0V = 0W to 5V = 11000W.
TB3-2	Output	RFL PWR	DC voltage for total reflected power at the system RF output. Varies linearly from 0V = 0W to 5V = 1100W.
TB3-3	Output	PA Voltage	DC voltage representing the variable RF power supply in a PA (select via pin 18). Linear from 0V = 0V to 5V = 50 V.
TB3-4	Output	Tx Current	DC voltage for total RF power supply current for a PA module (select via pin 18). Varies linearly from 0 = 0A to 5 V = 50A.
TB3-5		TB3-6	Pin 35 on STEx500 GPIO. Reserved
TB3-6	Output	PA Temp	DC voltage for heat sink temperature reading for a PA module (select via pin 29). Varies linearly from 0V = 0 degrees C to 5V = 100 degrees
TB3-7	Output	PA FWD Pwr	DC voltage for PA forward power (select via pin 18). Varies linearly from 0V = 0W to 5V = 2750 W.
TB3-8	Output	PA RFL Pwr	DC voltage for PA reflected power (select via pin 18). Varies linearly from 0V = 0W to 5V = 275 W
TB3-9	Input	Tally	Controls which PA is being monitored by other output pins. Each active low edge cycles through selections. The end of the selectable PAs is indicated by all outputs being ~0V. Reserved in 1kW systems
TB3-10	N/A	GND	Chassis ground
TB4-1	N/A	Unused	
TB4-2	N/A	Unused	
TB4-3	Input	Ctrl Reset	Forces hardware reset on the system controller and exciter when active. Hold this line low for up to 5 seconds and release to enable RF output once again. Note: this input is not intended to be used during normal operation of the system and should only be used in extreme circumstances.
TB4-4	Input	Lower Pwr	Lowers the system power 10 Watts for every second that this input is held low.
TB4-5	Input	Raise Pwr	Raises the system power 10 Watts every second that this input is held low.
TB4-6	Input	Preset Pwr	Changes to the system preset power level with an active low edge.
TB4-7	Input	Tx Off	Turns RF power off with and active low edge
TB4-8	Input	TX On	Turns RF power on with and active low edge
TB4-9	Input	Fault Reset	Resets all transmitter faults with an active low edge
TB4-10	N/A	GND	Chassis ground

5.1.8 AC Disconnect Switch

This switch handle provides an internal AC power disconnect and locks the Rear Access Panel when in the ON position. The handle is required to be in the OFF position to remove the Rear Access Panel. The Disconnect Circuit Breaker shaft latches the switch handle when the breaker is in the ON position



5.1.9 Rear Access Panel

Once removed, the PA Cabinet Rear Panel provides access to areas 10 thru 15.

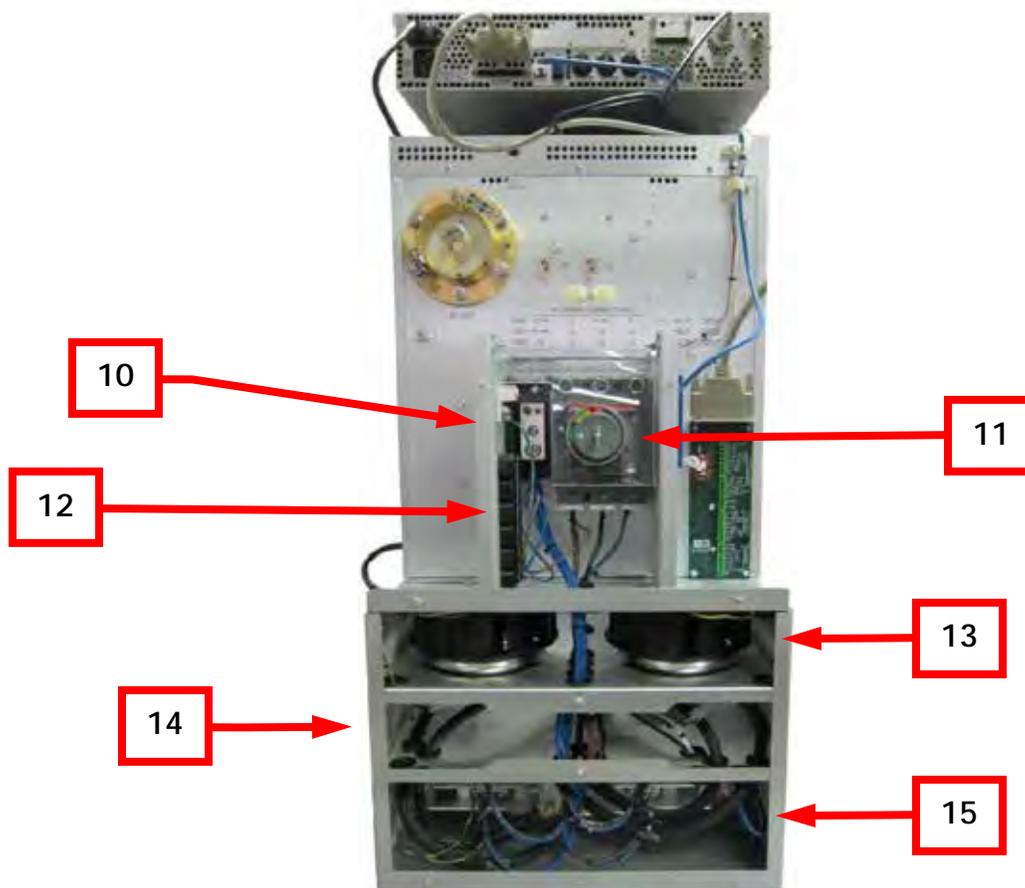


Figure 12 - STX 10 with Rear Panel Removed

5.1.10 AC Input Enclosure

Common connection point for mains AC power input for 10kW system.

5.1.11 Disconnect Circuit Breaker

3-pole circuit breaker.

5.1.12 IEC-320 AC Receptacle Block

Connection point for AC power to STXe 500 exciter and other ancillary equipment

5.1.13 PA Cooling Fan Enclosure

Access location for the two 48V fans used for PA cabinet & module cooling.

5.1.14 DC Power Supply Enclosure

Rear access to cabling for the 24VDC & 48VDC supplies used for 24V control circuits and 48V fans

5.1.15 PA Power Supply Enclosure

Rear access to PA Power Supply Mother Boards and DC supply buss cabling.

5.2 STXe 500 Rear Panel Connections

In addition as being the exciter for the STX10 transmitter system, the STXe500 provides the overall transmitter system control and RF IPA drive for STX10 PA modules. The STXe500 can also operate in stand alone if needed or for troubleshooting on the bench. Note the information on the GPIO Connector in 5.2.1

The reference designators in Figure 13 refer to sub-section numbers. For example, Flag 1 corresponds to details in section 5.1.1, Flag 2 corresponds to section 5.1.2, etc.

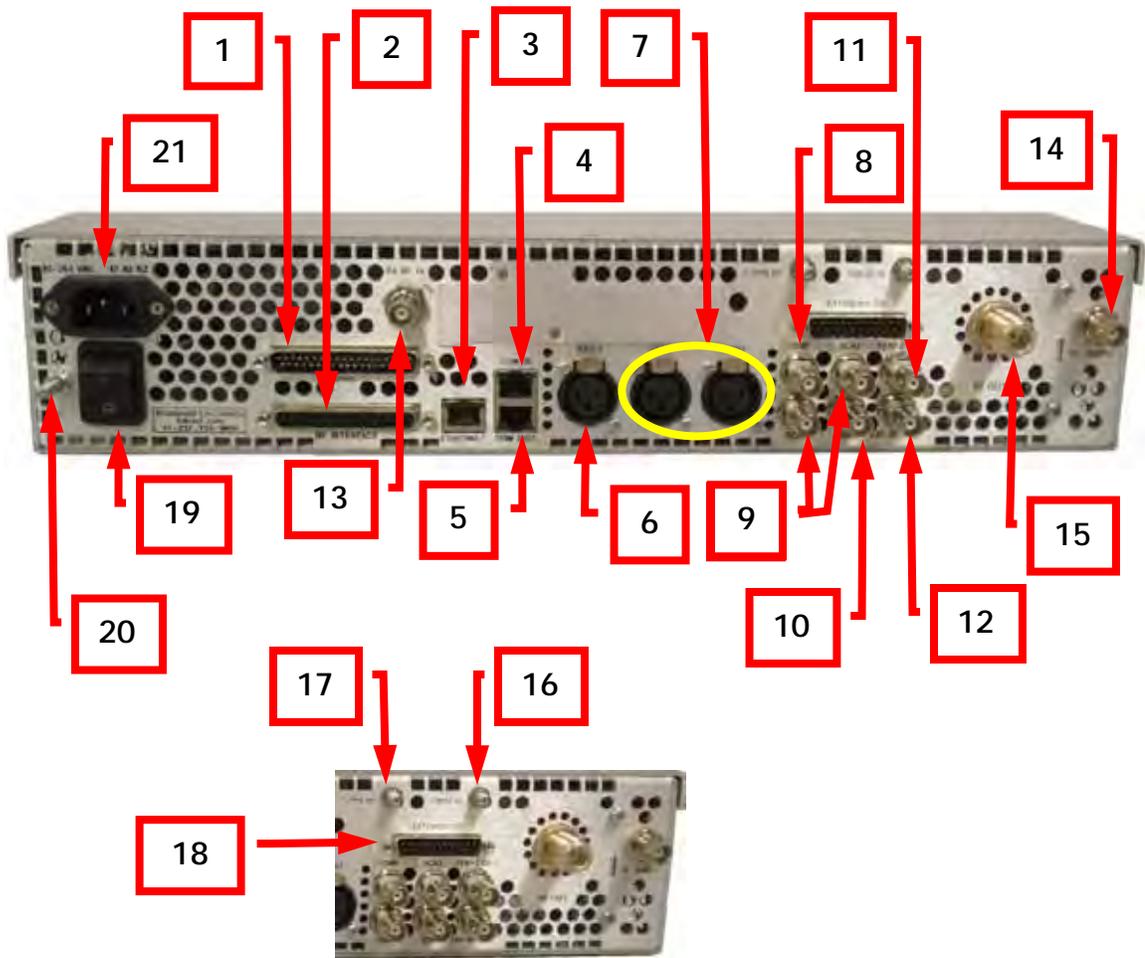


Figure 13 – STXe 500 Rear Panel

5.2.1 STXe 500 GPIO Connection

Normally the GPIO cable is connected here in the STX10 system. If the STXe500 is removed from the STX10 system, and the GPIO Cable is removed, the unmute/failsafe will need to be grounded at this GPIO connector on the back of the STXe500 to operate in stand alone .

For stand alone operation and troubleshooting, the individual pin functions STXe500 GPIO are described in detail in Table 3.

1. For STXe 500 stand alone operation, use the 37 Pin D-Sub Female Solder connector, p/n 418-0283 from the installation kit to provide a jumper. The connector shell is p/n 417-0284 and is also in the kit.



Figure 14 – Exciter GPIO Connector for Stand-Alone

2. Connect and solder a wire jumper as shown in Figure 14 to the unmute/failsafe pin 2 to ground pin 19.
3. Insert the connector on one of the shell halves and place the other shell half on top and fasten together
4. Plug the assembly on the GPIO connection and secure the screws from the kit.

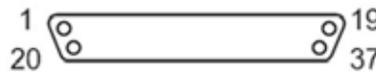


Figure 15 - Standard D-Sub 37 Numbering



THIS SYSTEM USES CMOS LOGIC ON “GPIO” AND “BE INTERFACE” CONNECTIONS. LOGIC VOLTAGES THAT EXCEED +5V WILL DAMAGE CIRCUITRY. THIS TYPE OF DAMAGE REQUIRES HARDWARE SERVICE AT THE USERS EXPENSE AS THE WARRANTY ON THIS SYSTEM WILL BE VOID!

Table 3 – STXe 500 GPIO Pinout

Pin	Direction	Name	Description
1	Input	Fault Reset	Resets all the transmitter faults with an active low edge.
2	Input	Failsafe	Transmitter failsafe input. Requires a sustained low to run RF in the system.
3	Input	Transmitter On	Turns RF power on with an active low edge.
4	Input	Transmitter Off	Turns RF power off with an active low edge.
5	Input	Mute	Mutes RF while the input is held low. This essentially performs the function of “Transmitter Off” with a low edge and “Transmitter On” with a high edge.
6	Input	Raise Transmitter Power	Raises the system power 10 Watts every second that this input is held low.
7	Input	Lower Transmitter Power	Lowers the system power 10 Watts for every second that this input is held low.
8	Input	Reserved	Reserved

Pin	Direction	Name	Description
9	Input	Controller Reset	Forces hardware reset on the system controller and exciter when active. Hold this line low for up to 5 seconds and release to enable RF output once again. Note: this input is not intended to be used during normal operation of the system and should only be used in extreme circumstances.
10	Input	Reserved	Reserved
11	Input	Reserved	Reserved
12	Input	Ground	Alternative isolated ground pin internally connected to pin 19, see below for details.
13	Input	Reserved	Reserved
14	Input	VPe System Present	Indicates the presence of a VPe system in the setup. Checked at system boot for a held low level.
15	Output	Reflected Power	DC voltage for total reflected power at the system RF output. Varies linearly from 0V = 0W to 5V = 100 * Model W (100W for 1kW, 200W for 2kW, etc.).
16	Output	Selected PA Total Current	DC voltage for total RF power supply current for a PA module (select via pin 18). Varies linearly from 0 = 0A to 5 V = 50A.
17	Output	Selected PA Temperature	DC voltage for heat sink temperature reading for a PA module (select via pin 18). Varies linearly from 0V = 0 degrees C to 5V = 100 degrees C.
18	Input	PA Module Select	Controls which PA is being monitored by other output pins. Each active low edge cycles through selections. The end of the selectable PAs is indicated by all outputs being ~0V. Reserved in 1kW systems.
19	N/A	Ground	Isolated ground intended to be used for safe remote input logic connections on this interface. Jumper J9 allows this to be wired to a system-wide chassis ground. Pin 12 provides an alternate connection.
20	Output	General Fault	Low when any fault is active in the system.
21	Output	VSWR Fault	Low when the affected part of the system is shut down due to reflected power above safe levels or VSWR greater than 2.0:1
22	Output	Transmitter On	Low when system RF output power is on.
23	Output	Transmitter Off	Low when system RF output power is off.
24	Output	Mute Status	Low when the transmitter is muted via input pin 5.
25	Output	AFC Lock	Low when the internal exciter is locked onto the set frequency.
26	Output	Power Supply Fault	Low when a power supply fault is detected in any RF power supply.
27	Output	Reserved	Reserved
28	Output	PA Fault	Low when any fault is detected in any PA module.
29	Output	PA Forward Power	DC voltage for PA forward power (select via pin 18). Varies linearly from 0V = 0W to 5V = 1250 W.
30	Output	PA Reflected Power	DC voltage for PA reflected power (select via pin 18). Varies linearly from 0V = 0W to 5V = 100 W.
31	Input	Reserved	Reserved



Pin	Direction	Name	Description
32	Output	+5V	Low power logic voltage supply for remote interface logic on this interface. Jumper J26 allows this to be wired for fused or isolated power supply. Isolated current limit is 7.5mA. Fused current limit is 0.5A.
33	Output	Forward Power	DC voltage for system forward output power. Varies linearly from 0V = 0W to 5V = 1100 * Model Watts (1100W for 1kW, 2200W for 2kW, etc.).
34	Output	PA Voltage	DC voltage representing the variable RF power supply in a PA (select via pin 18). Linear from 0V = 0V to 5V = 50 V.
35	Output	Reserved	Reserved
36	Output	Reserved	Reserved
37	N/A	Ground	Chassis ground

Overall Logic “low” refers to a connection to within 0.8V of isolated ground. The logic “High” level is a connection to a voltage greater than 2.4V compared to the isolated ground. A floating input is at the logic “High” level due to internal pull-up resistors on the inputs. Inactive inputs should be left open/floating and not driven.

Active edge refers to a transition from the inactive state to the active state and the implication is that no action is performed on the transition back to high. A momentary input pulse on an active edge input should be at least 100ms in duration to ensure capture of the event.

Active low refers to an application of the low state. The STXe will treat the input as active as long as it is held low

5.2.2 BE Interface Connector

Broadcast Electronics machine interface. This D-Sub 37 female connector provides conduits for many exciting new product options including a standby system control and exciter, digital radio generators, and much more.

Table 4 – BEI Pins

Pin	Direction	Name	Description
2	N/A	Ground	Chassis Ground
4	Input	Active/Standby	Tie to ground to activate this CPE, open for standby
Other		Reserved	Reserved

5.2.3 Ethernet

Ethernet is provided on a standard 10/100 Mbps RJ45 connector. On an STX10 system, connect is made via the Ethernet switch on the STX10 cabinet to a local area network switch and/or to a gateway using Cat5E cable for access through the network. This interface automatically negotiates speed and hardware interfacing; a crossover cable is not required. Direct connections to a PC or other network controller can be made to the Ethernet switch or the front of the STX10.

IP-based interfaces such as the built-in website and SNMP require this to be connected and the network parameters set up through the front panel interface. There is no explicit limit on the number of concurrent users that can be connected to the STXe; however an excessive number of connections will cause a decrease in performance.



5.2.4 COM IN

System communications bus input. This RJ45 jack is intended to be used in the backup main unit in redundant internal exciter configurations. In this case, a communications cable must be connected from COM OUT on the primary main unit to this input on the standby unit.

This output is not used in typical 10kW configurations. Connecting to this jack improperly may cause internal system communications failures.

5.2.5 COM OUT

System communications bus output. This RJ45 jack is used to wire the communications bus to the rest of the system. For the basic STX10 configuration, this must connect to the COM IN on the STX10 cabinet. For main/backup systems, each STXe500 COM OUT is connected to the inputs on the STX HP Dual Switch Relay Assembly. This assembly is added to the STX10 cabinet when used in conjunction with the STX EP 1 Switcher.

5.2.6 AES

AES/EBU audio input connector. This XLR connector is used for inputting digital audio to the standard stereo generator in the internal exciter. Select AES as the primary audio source to modulate RF with this audio.

Supported bitrates include 32, 44.1, 48, 96, and 192 kbps.

5.2.7 Left and Right

Left and Right balanced analog audio input connectors. These XLR connectors input audio into the standard stereo generator system in the internal exciter. Set Analog L/R as the primary audio source in order to modulate RF with this audio.

An internal hardware jumper allows these inputs to be switched to 10k Ohm impedance.

5.2.8 COMP

Unbalanced composite audio input connector. This BNC connector allows input of baseband audio up to 100 kHz into the internal exciter. Setting Composite as the primary audio source modulates RF with this signal.

5.2.9 SCA1 and SCA2

Subsidiary Communications Authorization audio input connectors. These BNC connectors allow subcarrier programs up to 100 kHz generated by external devices to be injected in the internal exciter. These inputs are enabled and disabled independently.

5.2.10 RDS

Radio Data System input connector. This BNC connector allows input of an externally generated RDS standard signal to broadcast time, station identification, and program service information. This input is enabled and disabled independently.

5.2.11 19 kHz OUT

19 kHz stereo pilot output connector. This BNC connector is used to output the pilot signal for optional use in external synchronization equipment. The output wave form is a constant 1 V peak-to-peak sinusoid when connected to a high impedance termination.

5.2.12 EXC RF OUT

Internal exciter RF output connector. This BNC connector outputs the internally generated exciter power level RF signal. For 10kW, FM systems this should be connected to the PA RF IN using the provided coaxial connector.



5.2.13 PA RF IN

Power Amplifier RF Input BNC connector. This is connected to the EXC RF OUT on basic STX10 systems for FM operation. In a Digital system, it is connected to the optional VPe/XG. (e.g. HD radio or Digital Radio Mondiale).

5.2.14 RF Sample

Power amplifier RF sample connector. This BNC carries a coupled RF signal from the STXe500 PA amplifier which is the IPA in STX10 system..

Nominally generates about 19 dBm at about 10KW output power of the STX10. This not a calibrated output, but may be used for troubleshooting or general instrumentation.

5.2.15 RF OUT

Power Amplifier RF output connector. This Type N connector provides the IPA drive power to the STX10 cabinet. The RF coax cable from the STX10 connects to this RF output

5.2.16 10 MHz IN

10 MHz clock input connector. This BNC synchronizes the exciter's internal clocking to a connected sinusoidal clock signal. To lower the chances of drift, connect high precision clock generators such as GPS receiver modules or digital radio signal generators.

5.2.17 1 PPS IN

The one pulse-per-second BNC input connector synchronizes stereo pilot signals such that rising zero-crossing point in the pilot signal corresponds to the rising edge of this logic clock. A high precision clock generator such as a GPS receiver module or a digital radio signal generator is recommended.

5.2.18 Extended I/O

This interface on the STXe500 is used with legacy Broadcast Electronics transmitters and not used in the STX10 system.

5.2.19 Power Switch

AC power switch. This hand operated switch turns on or off power service to the device. Complete power-down of the module may take a few seconds.

5.2.20 Ground

Ground bolt that should be used to connect chassis ground to the transmitter station ground.

5.2.21 AC Input

The AC power input is the IEC320 C13 connector for use with C14 plug and cable provided for STX10 system.

6 Front Assemblies and Features

The STX 10 transmitter PA cabinet assembly includes the front Control Panel and mechanical mounting provisions for the STXe 500. A removable front access panel allows servicing and removal of equipment in the PA cabinet assembly such as PA modules, PA power supplies, fan and control power supplies.



Figure 16 – STX 10 Front Views

6.1 STXe 500 Exciter Front Panel Features

The main assembly front panel contains LED indicators for the system controller, internal exciter, internal power amplifier, and an LCD user interface.

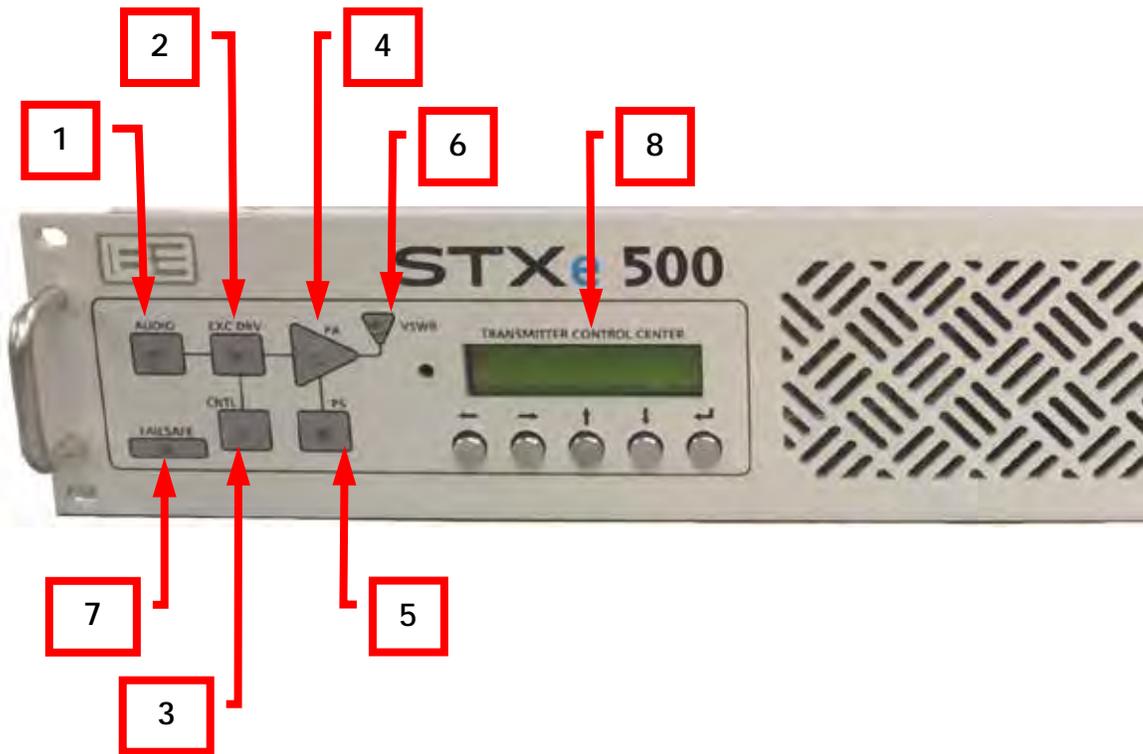


Figure 17 – Front Panel

6.1.1 AUDIO

The audio LED indicates the status of the current primary audio source and remains green until a fault is detected. If an audio peak is detected, this LED turns red and also during a silence condition when no secondary audio is setup. If a secondary audio source is setup, the LED will turn orange after the primary silence timeout. The LED will return to green when the fault is cleared and the exciter switches back to primary. Check the exciter diagnostics for details on what alarms or faults may be active.

6.1.2 EXC DRV

The exciter drive LED indicates the status of any alarms or faults related to the exciter or exciter drive in an internal PA. Green indicates that the exciter has settled into normal operating conditions. Orange indicates an alarm condition. Red shows when the exciter has a fault condition. See Table 11 – Exciter Diagnostics Details in section 13.5 for more information.

Note that there is overlap between internal exciter and internal PA status for drive detection. An exciter drive alarm indication may originate in measurements within the PA.

6.1.3 CNTL

The system control LED shows the status of the system controller. Green indicates normal control operation. Red indicates a loss of monitoring and control communication between controller units. This could be between the system controller and the front panel display, any PA controller, or the combiner controller.

6.1.4 PA

The power amplifier LED shows status of the internal PA. Green indicates normal operation. Orange indicates an alarm condition. Red indicates a fault and PA shutdown condition. See Table 12 – PA Diagnostics Details in section 13.6 for details on what alarms or faults may be active.

6.1.5 PS

The power supply LED shows the status of the RF power supply module. Green indicates normal operation. Orange indicates a self-reported alarm. Red indicates a determined fault. Check PA diagnostics for details on what alarms or faults may be active in the supply connected to the PA.

Note that these power supplies are on the same communications node as the PA they are paired with. A communication fault will illuminate red on both the PA and the PS LEDs.

6.1.6 VSWR

The voltage standing wave ratio LED shows the status of the internal PA output in terms of measured reflected power. Green indicates normal operation into an acceptable load. Orange indicates active foldback protection. Red indicates a fault and shutdown condition.

6.1.7 FAILSAFE

The failsafe LED is coupled to the failsafe input on the back panel when running transmitter modes. Green indicates the failsafe is connected for normal operation. If red the failsafe is not connected and RF power will not turn on.

In exciter setups this LED is turned off.

6.1.8 TRANSMITTER CONTROL CENTER

This front panel LCD interface can be used for control and monitoring of all features in the system. Use the five buttons below the screen to navigate and make modifications. See section 8 Transmitter Control Center for details on how to use this interface.



6.2 Transmitter Control Panel Features

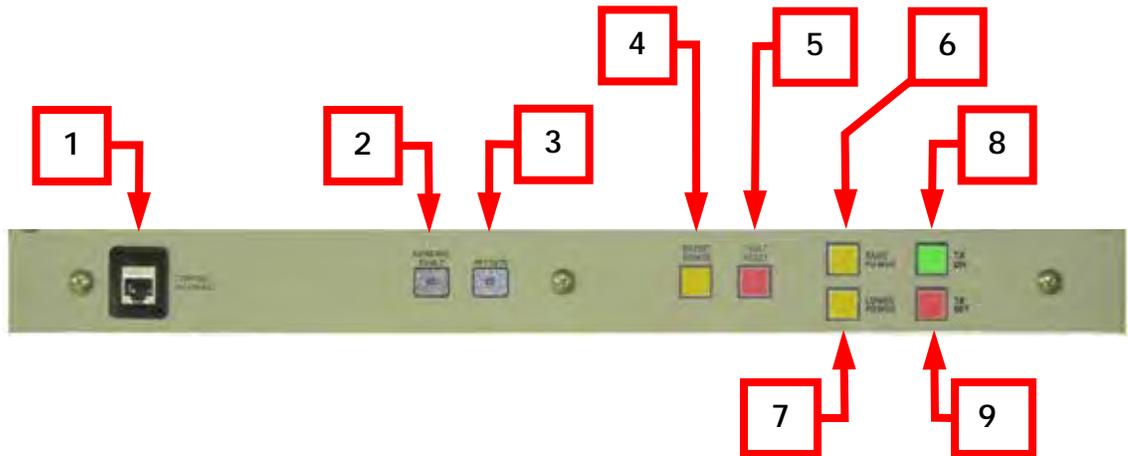


Figure 18 – Transmitter Control Panel

6.2.1 CONTROL INTERFACE

Provides a front RJ45's local access point for STX 10 system Ethernet connection.

6.2.2 GENERAL FAULT

Illuminates when an active fault is present.

6.2.3 RF MUTE

Illuminates when an RF mute is active.

6.2.4 PRESET POWER

Toggles between the preset and normal power settings.

6.2.5 FAULT RESET

Generates a system wide fault reset command. If a fault remains active, the General Fault LED will stay illuminated. Faults will remain stored in the event log.

6.2.6 RAISE POWER

Raises STX 10 transmitter power.

6.2.7 LOWER POWER

Lowers STX 10 transmitter power

6.2.8 TX ON

Turns on RF output in the STX 10

6.2.9 TX OFF

Turns off the RF output in the STX 10

6.3 PA & Power Supply Enclosures

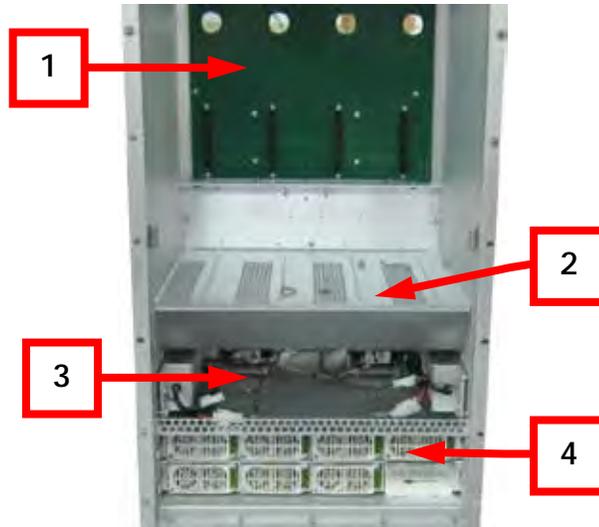


Figure 19 – STX 10 Front Cabinet Compartments

6.3.1 PA Module Enclosure

The STX 10's four PA modules are housed in this enclosure. DC power, RF Input and Control Interface are supplied via the edge connects positioned in lower portion of the motherboard in the rear of the enclosure. PA module RF outputs are connected to the DIN coax connectors in upper portion of the motherboard and RF is routed to the module combiner mounted directly behind the motherboard..

6.3.2 PA Module Air Plenum

Air for cooling the PA modules is routed from the fans in the lower rear of the STX 10 cabinet to four PA modules via this plenum..

6.3.3 Control and Fan Power Supply Enclosure

Two DC power supplies for STX cabinet control circuits and two DC power supplies for the cooling fans are housed in this enclosure. Access and servicing is done through the front of this enclosure, service on the fans are accessed in the rear.

6.3.4 PA Power Supply Enclosure

The seven power supplies that provide the DC PA supply voltage are housed on removable trays in this enclosure. The lower tray has provision for an optional eighth power supply if purchased. These power supplies are hot pluggable.

7 Theory of Operation

Refer to the system block diagram, Figure 20 at the end of this section.

Broadcast Electronics STX 10 FM transmitter systems are equipped with an STXe 500 exciter/control platform, 10kW amplifier cabinet and the necessary cable interconnect between these two assemblies.

The STXe 500 exciter sub-system routes audio and other program service data through digital signal processing, digital up conversion, a numerically controlled oscillator, RF digital to analog conversion, and low-power RF analog signal output. This signal path generates a frequency modulated carrier waveform centered within the traditional FM band.

The STX 10 amplifier cabinet includes control interfaces to provide interfacing between the STXe 500 for control and monitoring of the STX 10 transmitter systems. These control interfaces communicate through controller area network CAN communications.

The STX 10 transmitter systems include numerous built-in safety features. Hardware failsafe can be used to reliably disable RF with external automated or manual controls. Automatic RF power fold-back, and system shutdown mechanisms protect power amplification in events of DC over-currents, excessive reflected RF power, or dangerously high internal temperatures. Dedicated circuits immediately mitigate unsafe conditions while micro-controllers self-determine system problems, take action as necessary, report faults/alarms, and log issues for troubleshooting.

In standard setups, exciter RF is routed from STXe 500 lower power RF out and then back into the STXe 500 for further amplification in order to drive the 10kW RF amplifier assembly. The operating mode setup parameters are defined in the STX HP system controller in the STXe500. This determines the definition of interface with STX amplifier cabinet described in following paragraphs.

STX 10 transmitter systems come standard equipped to run the three standard modes of power amplification. FM-only mode utilizes a fixed exciter RF drive level. Variable final amplifier voltages compress the RF signal in class C amplifier operation, effectively controlling system gain to maximize power efficiency. The FM+Digital and Digital-Only modes utilize fixed gain while operating class AB amplifiers for minimal signal distortions. The exciter drive level varies to control system final output power level, leaving PA amplifier operations such as setting the PA DC power supplies & bias voltage levels to the PA module controllers and control interfaces to the PA power supplies.

Two identical power amplifier PS mother board and tray assemblies are used in the STX amplifier cabinet to create the main PA DC supply buss. Each PS mother board tray assembly houses up to 4 power supplies plus a control interface for the supplies. The DC outputs of the 4 supplies are bussed together and then cabled to the primary mother board's DC supply buss. Each PA supply is self-regulated and protected. A total of 7 PA power supplies are included with the STX 10 transmitter systems. An optional, 8th PA supply can be purchased for additional redundancy.

AC mains power is connected to the AC power distribution enclosure at the rear of the STX 10 amplifier cabinet. From here the AC power is distributed to the PS mother boards and other DC power supplies within the amplifier cabinet and AC out to the STXe 500.

The STX 10 amplifier cabinet and PA module cooling is provided by two 48V DC fans, each with a dedicated power supply for independent operation in the event of a fan or supply failure. The fans use a pulse width modulator input, (PWM) to control fan speed. The PS motherboard provides the PWM signal to control fan speed.

24VDC voltage is used in the PA modules and the various mother boards for their control interface circuitry. Two identical 24VDC supplies are wired in parallel for redundancy. Either supply may be removed for service while the operating supply continues to provide 24VDC.

Transmitters utilize internal digital closed power control based on measured system forward output power. Control mechanisms are adjusted in this manner such that forward power approaches the active system set-point. The exciter is included in this loop when running digital power modes. FM-only closed loop is entirely contained within a PA microcontroller.

PA Power Supply fans have a separate path and do not preheat the PA cooling.

There are two DB-37 connectors and a DB-25 connector to allow the STX to interface with other equipment. This includes transmitters, remote monitoring and control, and signal generation options.



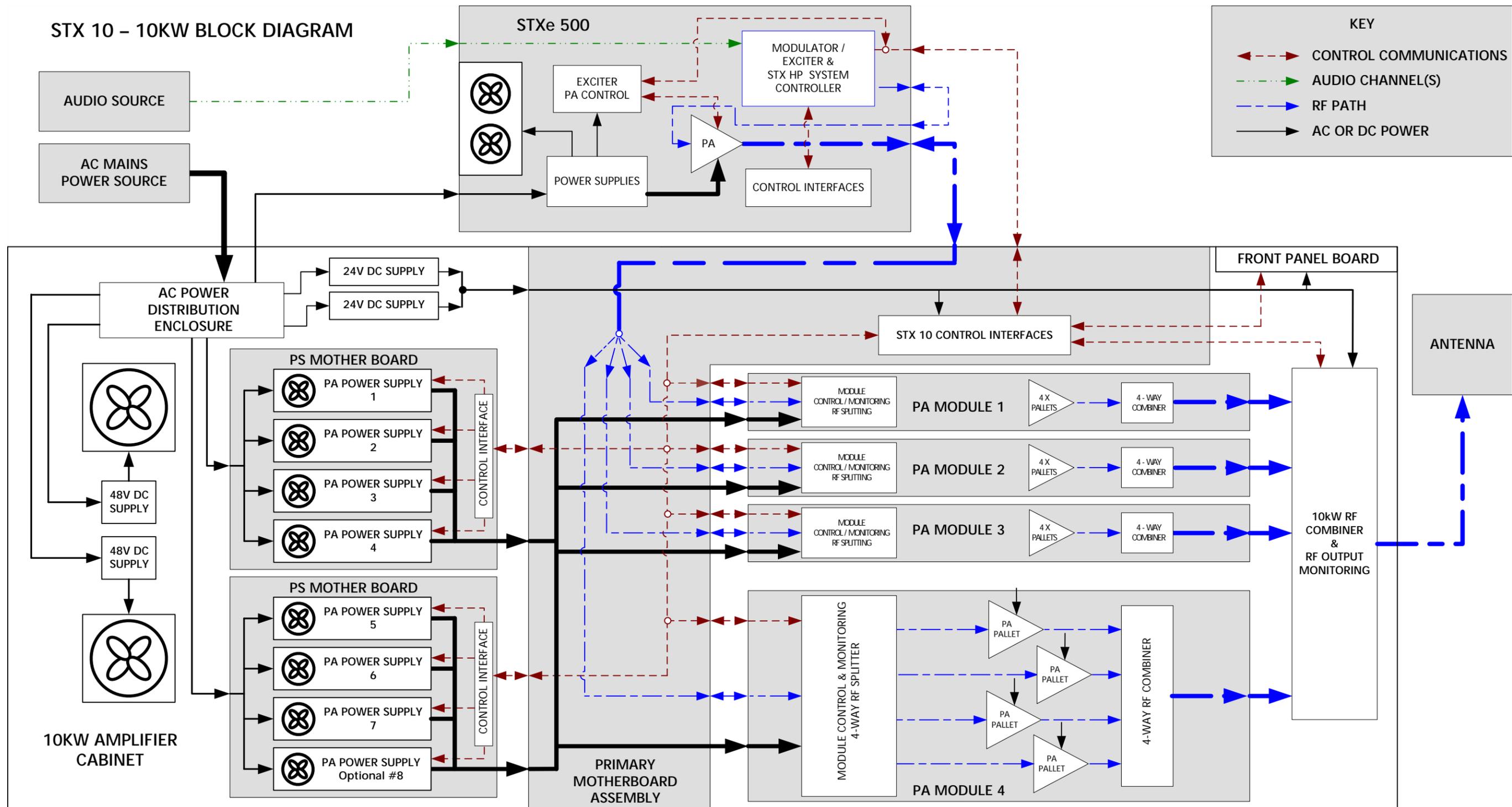


Figure 20 – STX 10 Block Diagram

8 Transmitter Control Center

Initial system setup after installation requires interfacing with the LCD display and buttons on the front of the STXe 500. Once initial setup is complete, almost all configurations accessible on this control center can be modified remotely via Ethernet interfaces.

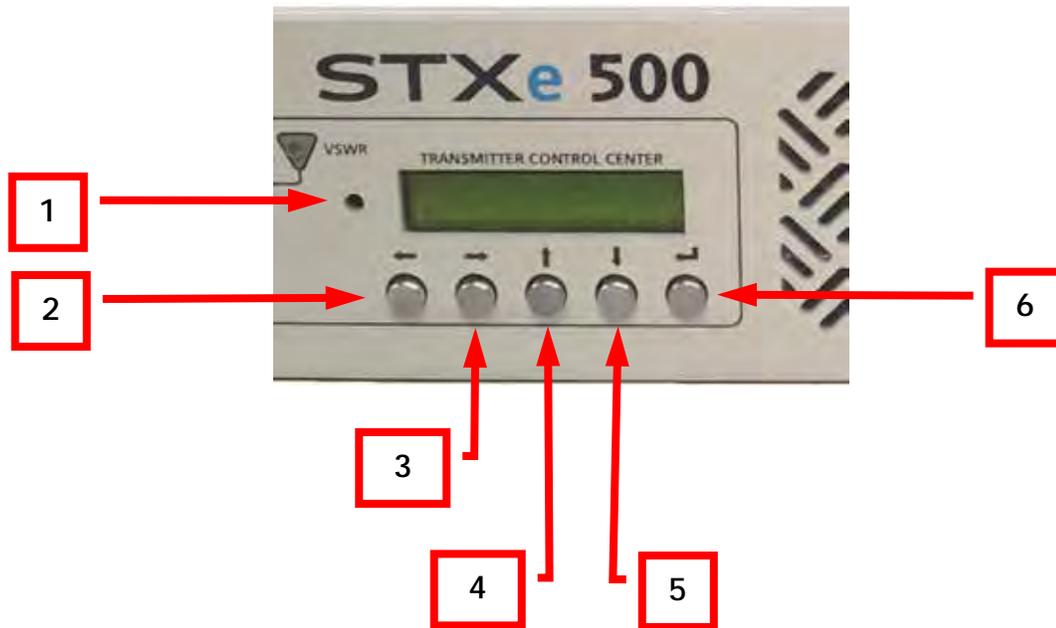


Figure 21 – Transmitter Control Center

8.1 Contrast Control

A potentiometer tuning tool can be used to adjust the contrast on the LCD screen if desired. Turning the potentiometer clockwise reduces contrast, and turning it counter-clockwise increases contrast.

8.2 **f** Left Button

The context dependent left button performs two primary functions. When navigating between screens it allows a return to the main screen from any other navigation screen. When an editing screen is entered this button moves the cursor one space to the left.

8.3 **g** Right Button

The context dependent right button performs two primary functions. When navigating between screens it allows a return to the first screen of the submenu tree. When an editing screen is entered this button moves the cursor one space to the right.

8.4 **h** Up Button

The context dependent up button performs various functions. When navigating between screens through the trunk it selects a new submenu tree. After entering a submenu screen it either selects different branches or cycles through options. When an editing screen is entered this button modifies the object located at the cursor.

8.5 **i** Down Button

The context dependent down button performs various functions. When navigating between screens through the trunk it selects a new submenu tree (in the opposite direction as the up button). After entering a submenu screen it either selects different branches or cycles through options. When an editing screen is entered this button modifies the object located at the cursor.

8.6 **8** Return Button

The context dependent down button performs two primary functions. When navigating between screens through the trunk it enters the next level in the menu. This can lead to submenu screens, options selection, or field editing. Once an editing function has been made this saves the field and returns to the first screen in the submenu tree.

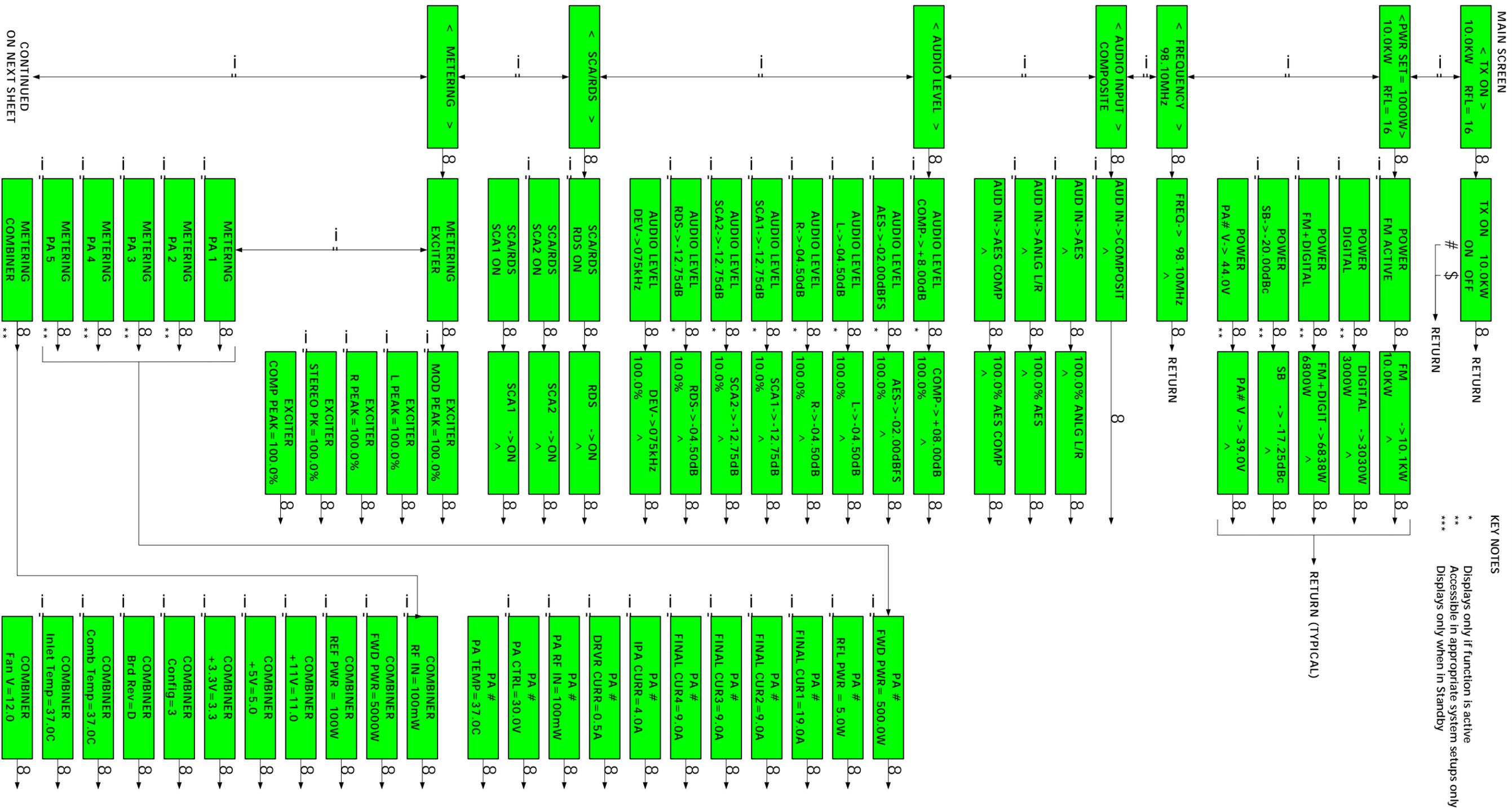
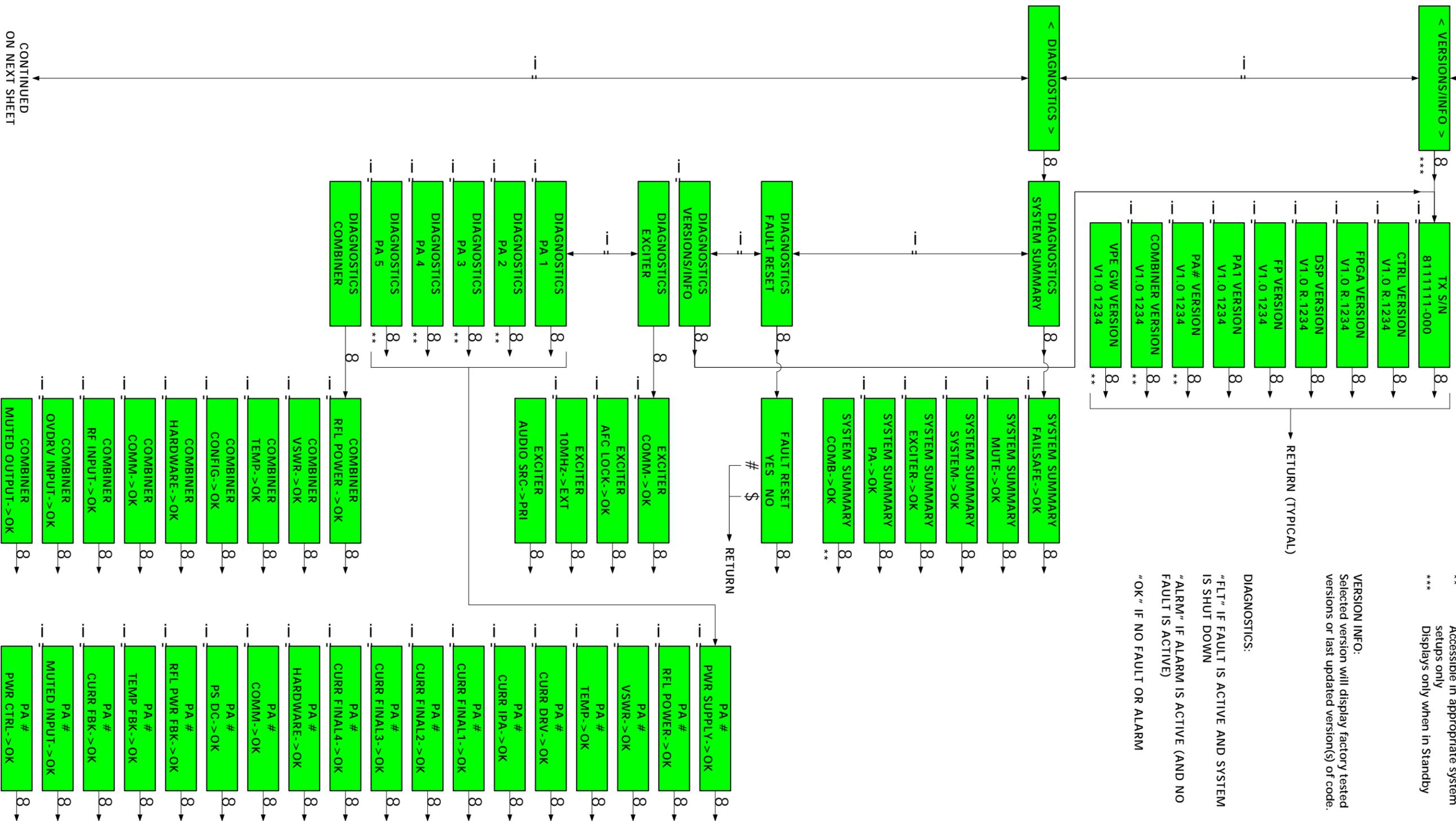


Figure 22 – Transmitter Control Center Menu Sheet 1



CONTINUED FROM
PREVIOUS SHEET



KEY NOTES

- * Displays only if function is active
- ** Accessible in appropriate system setups only
- *** Displays only when in Standby

VERSION INFO:
Selected version will display factory tested versions or last updated version(s) of code.

DIAGNOSTICS:
"FLT" IF FAULT IS ACTIVE AND SYSTEM IS SHUT DOWN
"ALRM" IF ALARM IS ACTIVE (AND NO FAULT IS ACTIVE)
"OK" IF NO FAULT OR ALARM

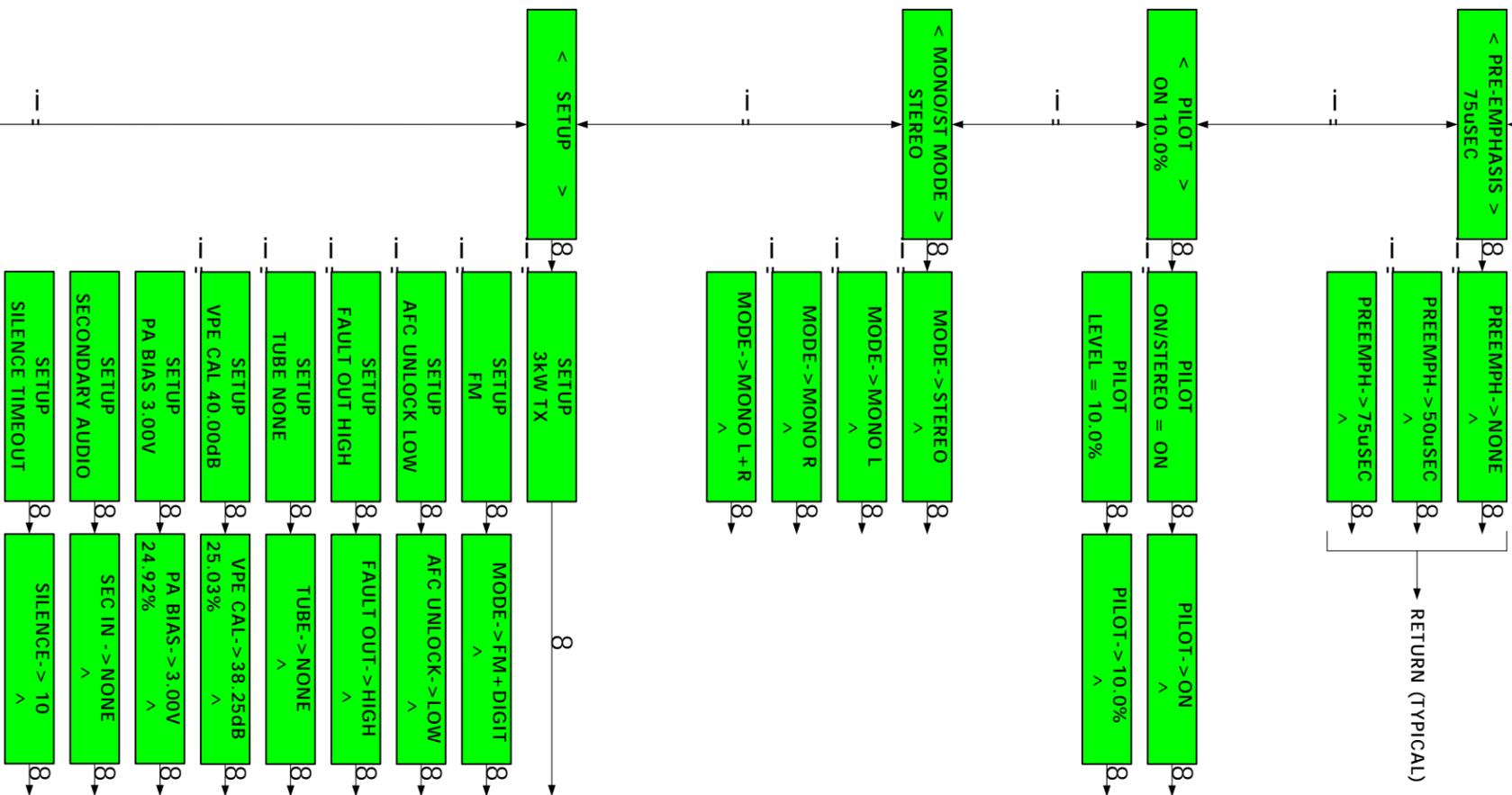
Figure 23 – Transmitter Control Center Menus Sheet 2



CONTINUED FROM
PREVIOUS SHEET

KEY NOTES

- * Displays only if function is active
- ** Accessible in appropriate system setups only
- *** Displays only when in Standby



CONTINUED
ON NEXT SHEET

Figure 24 – Transmitter Control Center Menus Sheet 3





9 Basic Web Page

The STX 10 comes standard with a built in HTTP web server monitoring and control interface. To load this web page, simply direct a standard web browser to the IP assigned to the Ethernet port on the system.

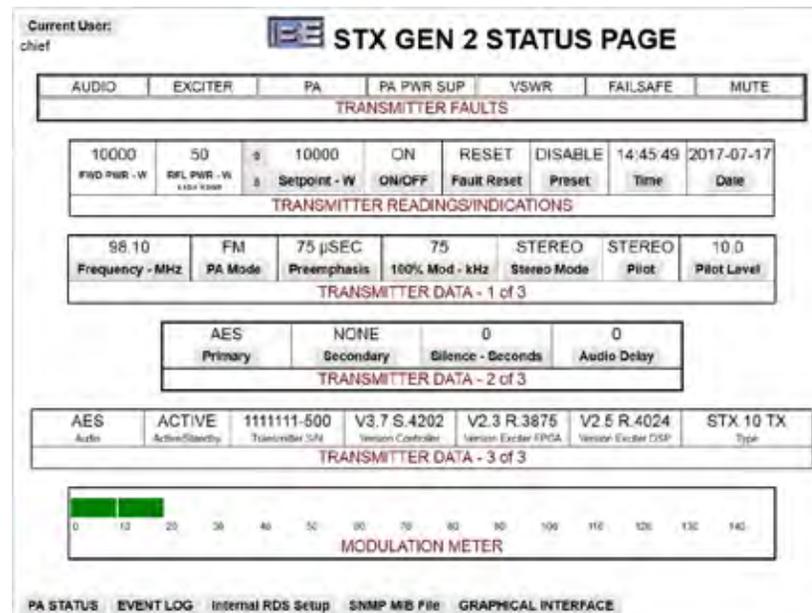


Figure 26 – Web Interface Main Page

The basic settings and monitoring fields in the system are shown in Figure 26. To switch the active users, such as “Chief” or “Operator”, click the “Current User” link in the upper left of the screen. To access additional status and monitoring information, click on “PA STATUS” or “EVENT LOG” links respectively. These views can be seen in Figure 28 and Figure 29.

Posting settings to the exciter that have the text description in bold, requires an appropriate login profile. If the text is not in bold, it is for monitoring only or is disabled for user profiles that do not have permission to modify the setting. Once an adequate profile selection is made, the text field can be clicked to display input/change options window. When the change is attempted an Authentication dialog box will pop up, as shown in Figure 27. Simply enter the active user type (exactly as displayed in the upper left of the page) and the correct 8-digit numerical password that goes with it to save the setting.

NOTE: The transmitter is shipped with both of the passwords set to a default of “00000000”. However, as a security measure, the password “00000000” is not accepted as valid by the transmitter. The customer must change the password to something other than “00000000” before remote operation is allowed. The password can only be changed at the front panel. Refer to section 4.3 regarding setting the passwords.

Password entry times out after 10 seconds. If the password entry session times out, simply try again in a new session. Valid login is remembered for the active session only. If the user changes to a different sub-page in the Standard HTTP interface, the password is lost and it will need to be re-entered.



Figure 27 – Web Interface Authentication

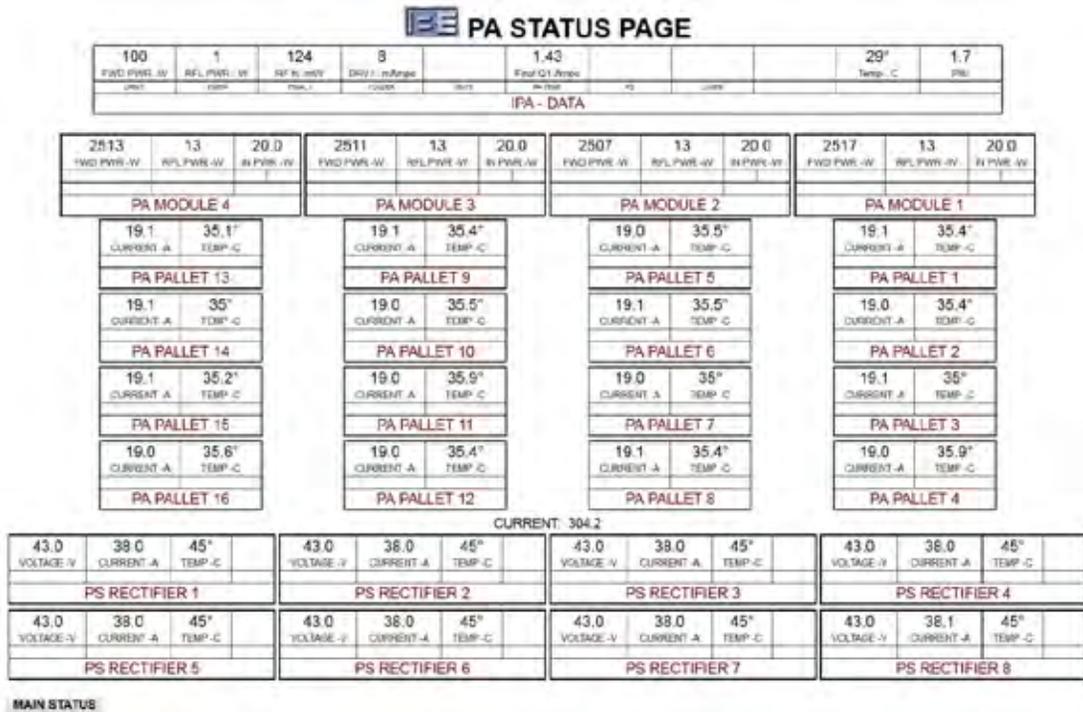


Figure 28 – Web Interface PA Status Page

#	TIMESTAMP	EVENT	SOURCE	TYPE	PARAM	DESCRIPTION
10	2017-07-05 15:15:52	6301	Controller	Event	0	Transmitter On
9	2017-07-05 15:15:32	6302	Controller	Event	0	Transmitter Off
8	2017-07-05 13:29:00	6304	Controller	Event	f	Audio Select Change Analog L+R
7	2017-07-05 13:15:22	6301	Controller	Event	0	Transmitter On
6	2017-07-05 09:43:26	6315	Controller	Event	0	Transmitter Unmuted
5	2017-07-05 09:43:26	6317	Controller	Event	0	System Powerup
4	2017-06-27 14:44:59	6302	Controller	Event	0	Transmitter Off
3	2017-06-27 14:44:49	6301	Controller	Event	0	Transmitter On
2	2017-06-27 13:57:07	6315	Controller	Event	0	Transmitter Unmuted
1	2017-06-27 13:57:07	6317	Controller	Event	0	System Powerup

Figure 29 – Web Interface Events Page

To check the current web page version, simply point a web browser to [IP Address]/rev.htm



9.1 RDS and FSK Setup

To enter static RDS information or FSK ID data such as Translator Identification, use the “Internal RDS Setup” link from the Main Status Web page, Figure 30. This will then display the RDS Setup Page, Figure 31.

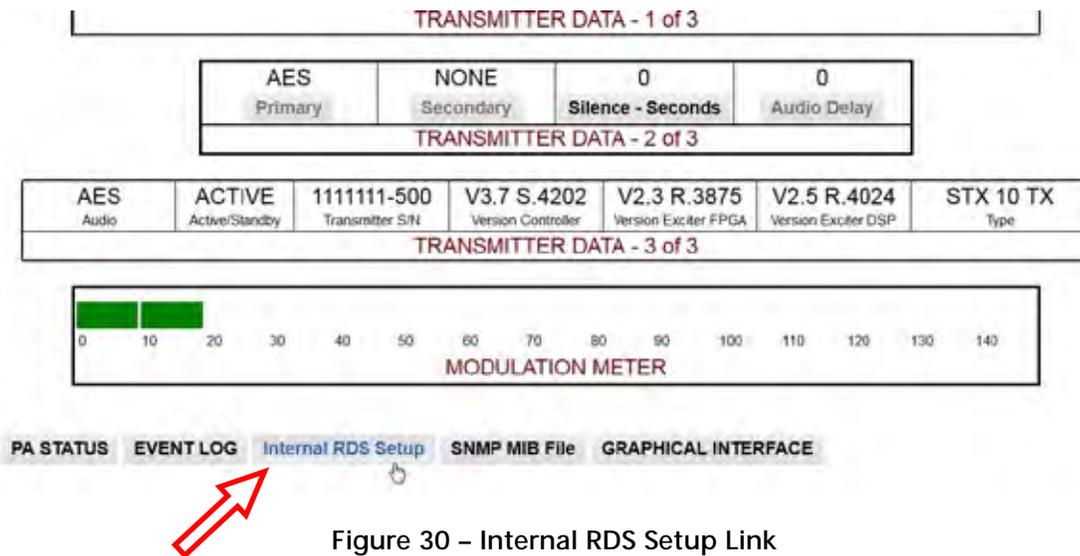


Figure 30 – Internal RDS Setup Link

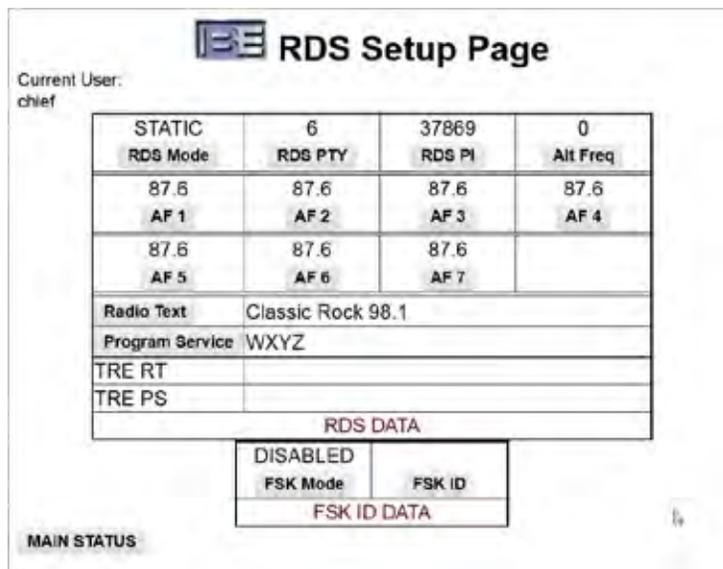


Figure 31 – RDS Setup Page



9.2 Audio Delay Setup

This is an adjustable audio delay to help set up a single-frequency network, or a repeater station by getting the delays of the system in sync.

The audio delay sets the amount of time from when the analog/AES/AES-Comp signal arrives at the rear panel until it affects the modulation of the RF signal. The audio delay is settable with an integer number, (steps) from 0 to 8128, where each step is on the order of 5.3 micro-seconds. This correlates to a delay range from 0 to 43.784 milliseconds .

Current User: chief

STX GEN 2 STATUS PAGE

AUDIO	EXCITER	PA	PA PWR SUP	VSWR	FAILSAFE	MUTE
-------	---------	----	------------	------	----------	------

TRANSMITTER FAULTS

0	0	10000	OFF	RESET	DISABLE	15:35:34	2017-07-17
FWD PWR - W	RFL PWR - W	Setpoint - W	ON/OFF	Fault Reset	Preset	Time	Date

TRANSMITTER READINGS/INDICATIONS

98.10	FM	75 μ SEC	75	STEREO	STEREO	10.0
Frequency - MHz	PA Mode	Preamphasis	100% Mod - kHz	Stereo Mode	Pilot	Pilot Level

TRANSMITTER DATA - 1 of 3

AES	NONE	0	0
Primary	Secondary	Silence - Seconds	Audio Delay

TRANSMITTER DATA - 2 of 3

AES	ACTIVE	1111111-500	V3.7 S.4202	V2.3 R.3875	V2.5 R.4024	STX 10 TX
Audio	Active/Standby	Transmitter S/N	Version Controller	Version Exciter FPGA	Version Exciter DSP	Type

TRANSMITTER DATA - 3 of 3

To enter a delay setting, click on the Audio Delay radio button above, to display the setting window in Figure 31 below. Enter a number calculated from the 5.3 micro-second step amount. The example below of "20" equals a delay of 106 micro-seconds.

TRANSMITTER FAULTS

10000	50	10000	ON	RESET	DISABLE	15:24:40	2017-07-18
FWD PWR - W	RFL PWR - W	Setpoint - W	ON/OFF	Fault Reset	Preset	Time	Date

TRANSMITTER READINGS/INDICATIONS

98.10	FM	75	STEREO	STEREO	10.0
Frequency - MHz	PA Mode	Preamphasis	Stereo Mode	Pilot	Pilot Level

TRANSMITTER DATA - 1 of 3

AES	NONE	0	0
Primary	Secondary	Silence - Seconds	Audio Delay

TRANSMITTER DATA - 2 of 3

AES	ACTIVE	1111111-500	V3.7 S.4202	V2.3 R.3875	V2.5 R.4024	STX 10 TX
Audio	Active/Standby	Transmitter S/N	Version Controller	Version Exciter FPGA	Version Exciter DSP	Type

TRANSMITTER DATA - 3 of 3

Audio Delay

20

OK Cancel

Figure 32 – Audio Delay Web Interface

When finished, press OK to save and exit the menu.

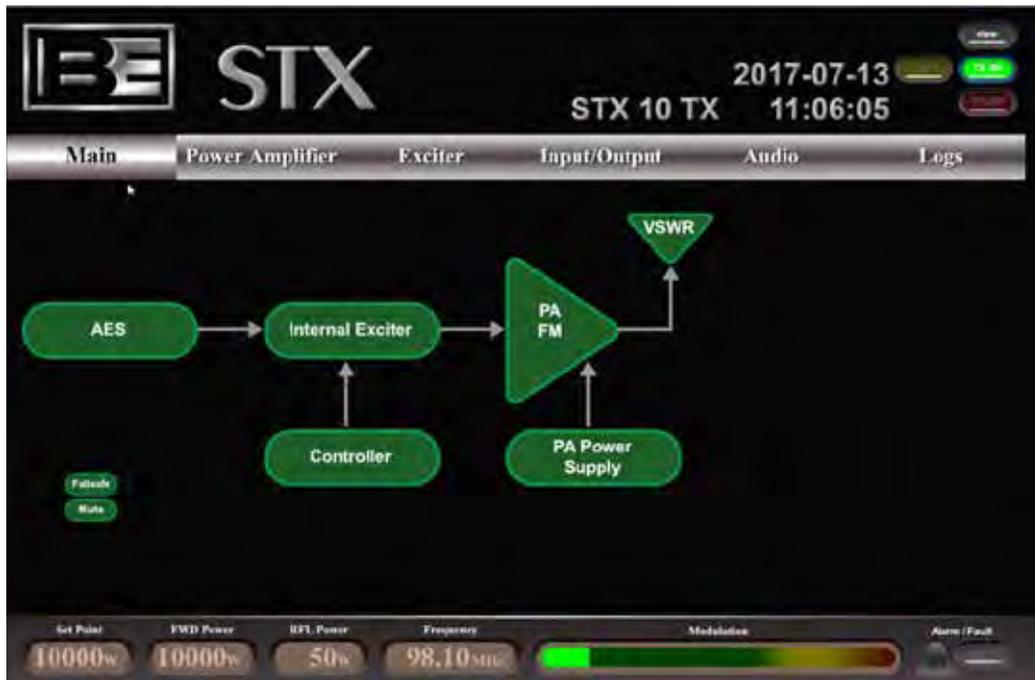


10 Enhanced Web GUI

STX systems comes standard with an enhanced Web GUI. This provides a more intuitive viewing and control experience than the basic STX web GUI while still providing all the features and more. To access this page, click the "GRAPHICAL INTERFACE" link at the bottom of the basic web page.



Figure 33 - Link from Basic Web Page to GUI Main Page



Refer to Fig 33. While navigating the screen pages, buttons with banded in Blue are the current settings. When the PC's mouse pointer icon comes in contact with one these buttons, it will change from the user's default mouse icon, (Arrow) to either the (Hand/Finger) icon or (Not-Allowed) icon, depending on the Login Profile.



Figure 34 - GUI Pointer Icons

10.1 Login Profiles

The default login profile is "View". This does not require a password and allows monitoring only. Basic control of system power is allowed with the "Operator" profile. Full control of all settings that can be modified through the web interface requires the "Chief" login profile.

To change the login profile, move cursor into the "view" button and a popup window will display, [click to change Logged in status] as in Figure A. The previous screen being displayed will change to that in Figure B. Move cursor into the desired profile. In this example "Chief" is being selected.



Figure 35 – Login Profile Selection

Next, a dialog box will pop up requesting password entry. Change browser settings if this dialog box is being blocked by the browser. Enter the password and press enter or click Save and the process displayed will move to "Pending", followed by "Logged in".

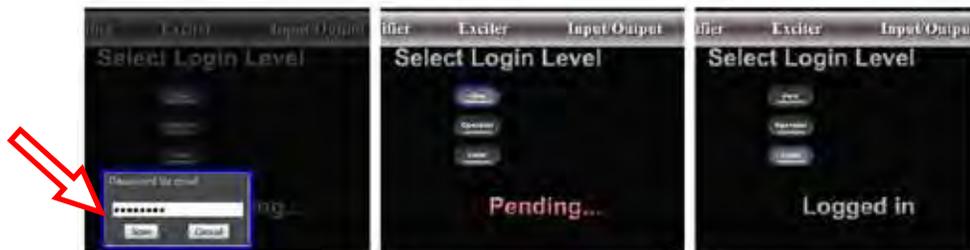


Figure 36 – Password Window



Figure 37 – Profile Logged Out



10.2 Navigation

The primary screens in the GUI can be accessed by clicking on the text in the Navigation Bar near the top of the page.



Figure 38 – Navigation Bar

10.2.1 Features & Items Always Displayed.

The Navigation Bar as well the Features and Items in Figure 39 are displayed in all screens

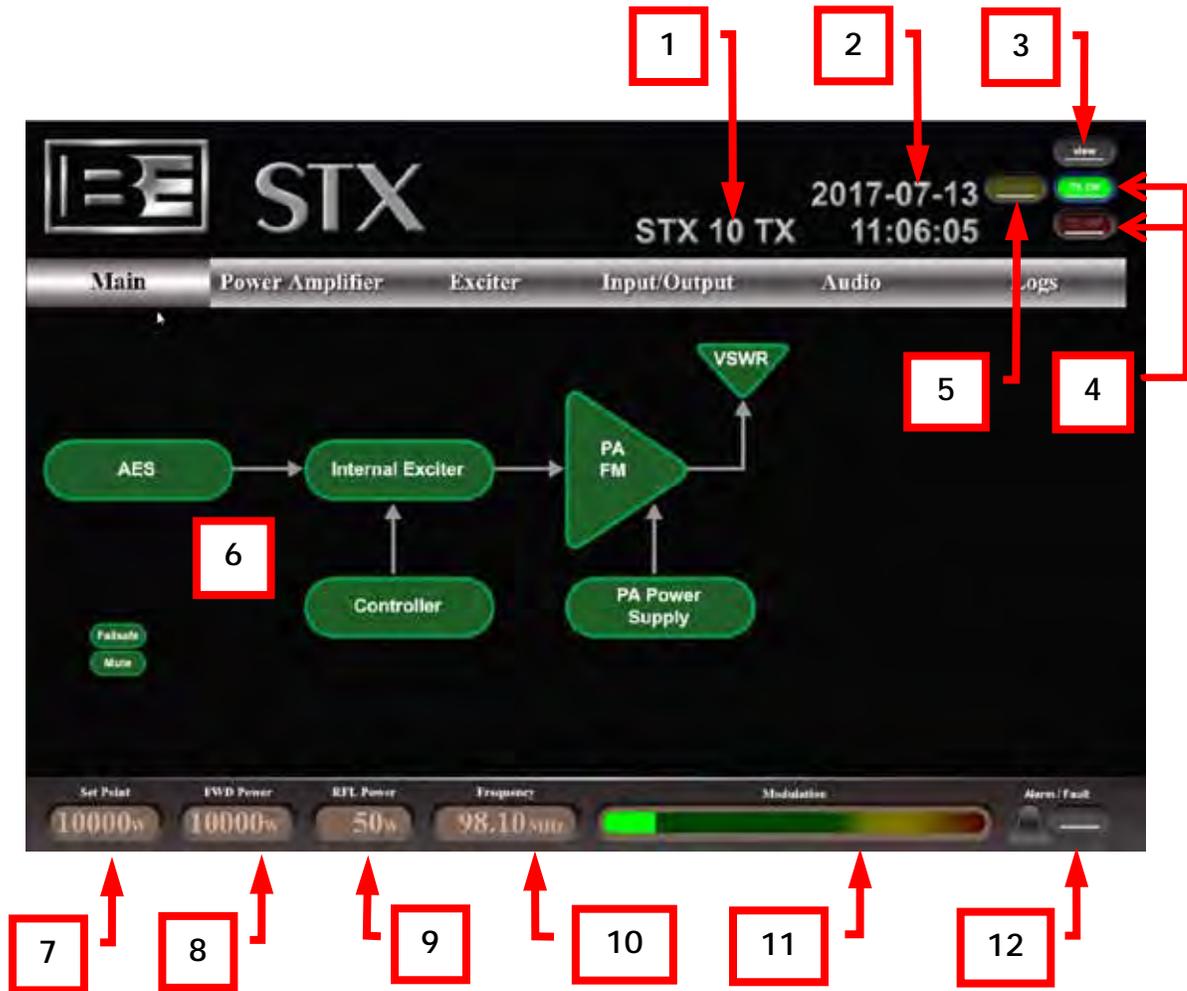


Figure 39 – Main Page

Table 5 – Main Page and Common Features

#	Feature	Description
1.	STX System Type	Currently configured hardware setup type. This is determined during initial setup of the system for 10kW TX (transmitter).
2.	Date and Time	Real time clock data configured during setup.
3.	Login Profile	Active login status displayed as View, Operator, or Chief and control button to change profile.
4.	Transmitter ON/OFF	ON/OFF status of the final RF output (not just the control status). Transmitter setups allow RF to be turned on and off with sufficient login level.
5.	Preset	Provides a secondary APC setpoint for setting power to a lower power level. When Preset is Enabled the setpoint is for the Preset APC setpoint.
6.	System Block Diagram	Overall system status. Green, amber, and red block colors correspond to front panel LED behaviors. See section 6 for details.
7.	Power Control Set Point	Forward power value that automatic power control attempts to converge to. Note that exciter setups do not rely on this. External power control from a transmitter is utilized instead.
8.	Forward Power	Internally measured system forward RF power output reading.
9.	Reflected Power	Internally measured system reflected RF power reading.
10.	Frequency	FM carrier frequency setting.
11.	Modulation	Internal frequency modulation peak hold as a percentage of peak deviation from nominal frequency.
12.	Fault/Alarm	System faults cause this to display red, and alarms in the system cause this to display amber. Check the Logs page for details.

10.2.2 Block Diagram Figures used for Navigation.

Several of the figures in the block diagrams may also provide navigation to another screen.

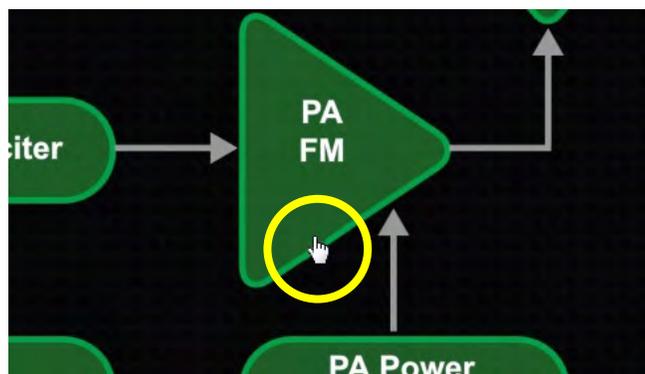


Figure 40 – Block Diagram for Navigation

10.3 Power Amplifier

The Power Amplifier Page contains five columns of detailed information of PA Module Assemblies used in an STX10 high power system. The IPA Data in column 1 is for the amplifier located in STXe500. The remaining four columns provide data for the PA modules located in the STX HP cabinet.

A navigation button has been added in the upper right of the page that links to the PA Power Supply Data Page. When clicked, the page changes displaying the supply data and the button text, "PwrSup" will change to "PA" which allows you to toggle back the PA Amplifier page.

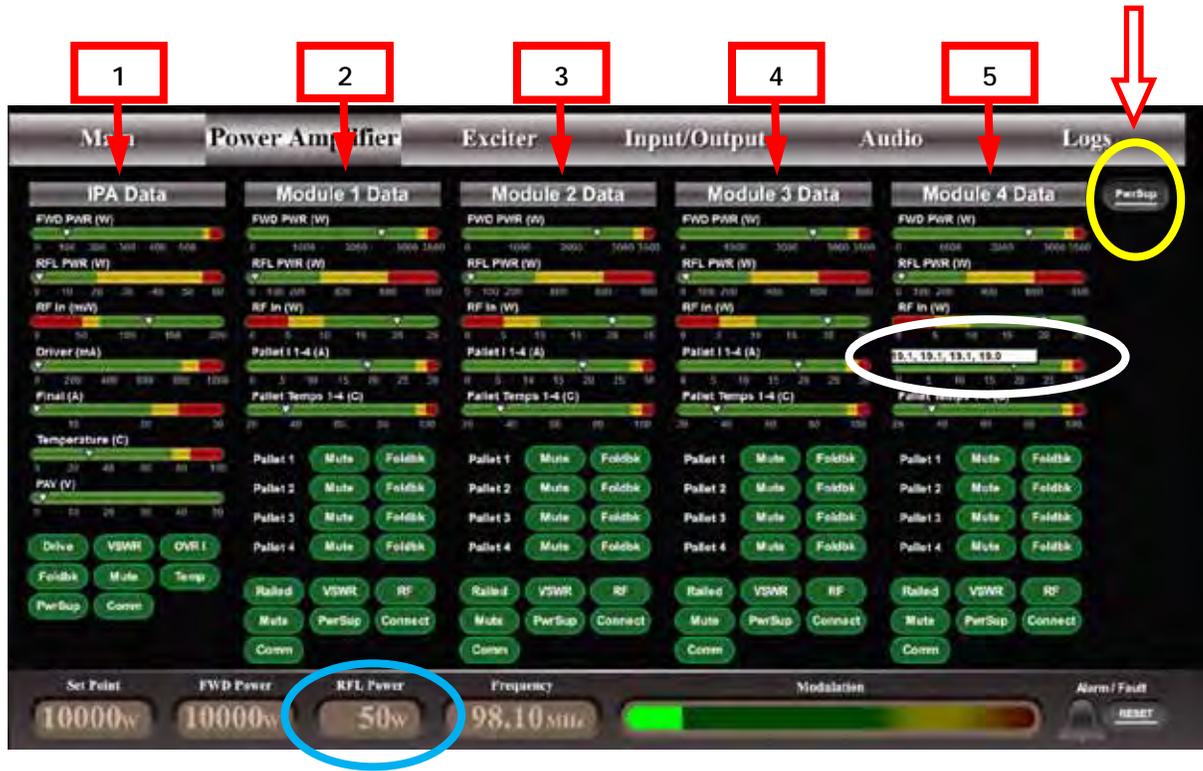


Figure 41 – Power Amplifier Page

Some of the data can be further detailed such as The Pallet 1-4 (A) display feature. Normal view will be the average current of the four PA pallets. If you click on the bar, a detail window will display the individual current in each pallet.

Another feature is to either display Reflected Power or VSWR shown in Figure 42. The display can be toggled to either mode with proper login profile



Figure 42 – RFL Power vs VSWR Feature

10.3.1 IPA Data Features, Column 1

Figure 43 and Table 6 detail the information provided in the first column on PA Amplifier Page

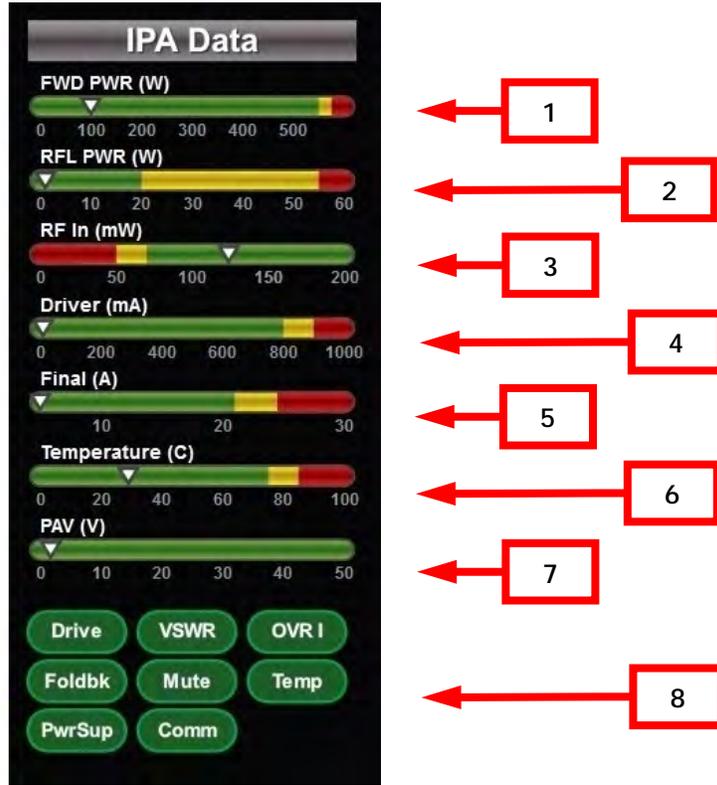


Figure 43 - IPA Data Column Features

Table 6 – IPA Data Column Feature Descriptions

#	Feature	Description
1.	Forward Power FWD PWR (W)	PA forward RF power output reading of the STXe500.
2.	Reflected Power RFL PWR (W)	PA reflected RF power reading in the STXe500.
3.	RF Input Power RF In (mW)	PA RF drive input power reading in Watts in the STXe500.
4.	Driver Current Driver (mA)	Current in milliamperes for the STXe500 driver stage RF power amplifier.
5.	Final Current Final (A)	Current in Amperes for the final stage RF power amplifier of the STXe500.
6.	Temperature Temperature (C)	Internal heat sink temperature measurement of the STXe500 RF Amplifier.
7.	PAV PAV (V)	Final amp drain voltage. This variable voltage supply is sourced from the PA power supply in the STXe500..
8.	Status Balloons	Fault and alarm indications for the PA. These will be red, yellow or green depending on the status of each item Check the log or see Table 12 – PA Diagnostics Details in section 13.6 for details.



10.3.2 PA Modules Data Features, Columns 2, 3, 4 & 5

Figure 44 and Table 7 detail the information provided in the first column on PA Amplifier Page

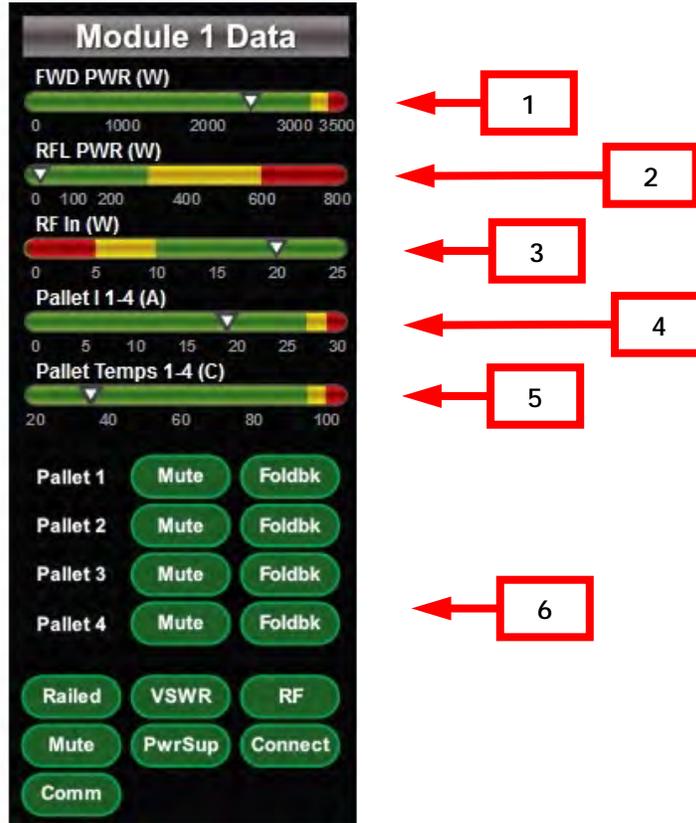


Figure 44 – PA Module Data Column Features

Table 7 – PA Module Column Feature Descriptions

#	Feature	Description
1.	Forward Power FWD PWR (W)	Total PA forward RF power output reading or the Module..
2.	Reflected Power RFL PWR (W)	Module PA reflected RF power reading.
3.	RF Input Power RF In (W)	RF drive input into the PA Module. Power reading in Watts.
4.	Module Pallet Current Pallet 1-4 (A)	Current in Amperes of each RF pallet in the module. Normal display is the average of all 4 currents. When the display bar is clicked, the individual currents will be displayed.
5.	Pallet Temperature Pallet Temps 1-4 (C)	Heat sink temperature measurement of each pallet.
6.	Status Balloons	Individual pallet and overall PA module fault and alarm indications. These will be red, yellow or green depending on the status of each item. Check the log or see Table 10 – PA Diagnostics Details in section 13.6 for details.



10.4 PA Power Supply

This screen provides data for the PA power supplies mounted in the two PS trays of STX10 cabinet. Figure 45 shows the optional 8th PS included in the configuration. With the standard configuration of 7 power supplies, PS Rectifier 8 and its row will not be displayed



Figure 45 – PA Power Supply Page

Although it not listed on the Navigation Bar in each GUI screen, the PA Power Supply page is linked on both the Main page and the Power Amplifier page. Clicking on either the block diagram shape in the Main page or the link button in the PA Amplifier page, will move you to the PA Power Supply page.



Figure 46 – Navigation Links to PA Power Supply



10.4.1 PA Power Supply Features

Figure 47 and Table 8 below detail the features of the PA Power Supply Page. With the exception of Fan Speed, Item 6, the data on this page is comes from the individual power supplies. Additional information is also provided in Section 13. 7.



Figure 47 – PA Power Supply Page Features

Table 8 – PA Power Supply Page Features

#	Feature	Description
1.	Power Supply Number PS Rectifier 1 - 8	This column identifies the location of the individual PA power supply. The upper tray houses 1 – 4 and the lower ray houses 5 -8
2.	Power Supply Voltage Voltage (V)	DC output voltage of the individual power supply identified in that row of data.
3.	Power Supply Current Current (A)	DC output current of the individual power supply identified in that row of data
4.	Power Supply Temperature Temp (C)	Power supply temperature in Celsius .
5.	Status Balloons	Fault and alarm indications for the induvial power supplies . These will be green, yellow or red depending on the status item of that PS
6.	Cabinet Fans Fan Speed	RPM data from each of the two main cabinet fans that provide the PA amplifier module cooling and cabinet flushing. The fans are animated to rotate as an indication of RPM of the actual fans. This animation can be affected by choice of web browsers.
7.	PA Supply Buss Current Total Current	The total PA amplifier current on the power supply distribution buss is the summed supply currents of all working power supplies.

10.5 Exciter



Figure 48 – Exciter Page

Table 9 – Exciter Page Features

#	Feature	Description
1.	Primary	Primary audio input source selection. Choose one of the listed options. Composite ignores stereo generation settings.
2.	Pre-emph	Pre-emphasis setting for internal stereo generation.
3.	Stereo	Mono/stereo setting for stereo generation.
4.	Pilot	19 kHz pilot on/off and level controls. This automatically updates with changes to the mono/stereo setting. Can be controlled independently.
5.	Modulation	Frequency deviation amount in kilohertz from nominal carrier frequency. This setting represents 100% peak frequency modulation.
6.	Secondary	Secondary Audio input source selections. Choose one of the listed options.
7.	Transmitter Power	Automatic power control set point. Transmitter mode setups attempt to regulate total system forward output power to this value.
8.	Frequency	Nominal FM carrier frequency.
9.	Silence Timeout	Time allowed before loss of primary audio source switches to secondary audio source.
10.	Audio Delay	Audio Delay displayed in steps from 0 to 8128 as detailed in Section 9.2

10.6 Input/Output

The Input/Output page contains information for connections on the GPIO connector. These connections may be used for machine interfaces with remote station controllers/monitors or with other transmission system equipment.



Figure 49 – Input/Output Page

The "Pin#" column identifies the specific pin number. The "Input Description" provides the description/function of the pin number. The "Status" column identifies the current high/low status or analog voltage level.

Refer to Customer Interface Board, Table 2 in Section 5.1.7 for more details and descriptions of the STX 10 system Input/Output.

10.7 Audio



Figure 50 – Audio Page

Table 10 – Audio Page Features

#	Feature	Description
1.	Source	Audio input source selection. Choose one of the listed options. This duplicates function in the Exciter page.
2.	Gain	Gain settings for hardware amplification/attenuation. AES gain is a digital scale factor.
3.	Stereo Injection Scale	Allows the stereo composite to be scaled down to balance modulation budget without changing gain calibration setup. This also scales pilot when in stereo.
4.	Modulation	Peak holds for inputs displayed as effective % of peak modulation. Composite Mod includes Unbalanced Composite, SCA1, SCA2, and RDS inputs.
5.	SCA 1, and SCA 2	Allows on/off control and input hardware amplification/attenuation adjustment.
6.	RDS	Allows on/off for an external RDS or mode control of the internal RDS, (Static vs From TRE)
7.	FSK	Allows on/off control and setting adjustment.

10.8 Logs



Figure 51 – Logs Page

#	Feature	Description
1.	Event#	Event index number. Initially (or after a clear) this starts at 0 and increments for every event. If the log fills, half of the current entries are deleted and numbering resumes. When 65535 entries are created, the log clears itself.
2.	Time Stamp	Date and time of the event based on the system's internal real time clock and calendar.
3.	Code	Unique event code type identification number.
4.	Source	Controller node from which the entry was triggered.
5.	Type	Event type category identification in a readable format.
6.	Parameter	Event-specific value for logging some changes.
7.	Description	Log entry details in a readable format.
8.	Scroll	Click the up and down arrows to scroll through the log.
9.	Clear	Wipes all log entries from memory forever. NOTE: Only displays when in the "Chief" login profile
10.	Serial Number	Displays BE serial number and controller Ethernet MAC.
11.	Software Versions	Listing of all viewable software versions in the system.

11 SNMP

Simple Network Management Protocol is a member of the Internet Protocol standard communications suite. The STX 10 comes with a built-in SNMP agent (SNMP version 2c) for handling all request types included in the protocol – GET, SET, GETNEXT, and GETBULK. The appropriate MIB for the version of SNMP agent installed on the transmitter must be downloaded from the transmitter itself. As with any MIB, this ASCII text file completely defines the data structure within the agent. The MIB also provides textual descriptions for every accessible object.

SNMP IS FOR ADVANCED APPLICATION INTEGRATION. THIRD PARTY APPLICATIONS THAT UTILIZE THE SNMP INTERFACE ARE NOT SUPPORTED BY BE.

To download the file access the web interface using a standard web browser. Right click on the “SNMP MIB File” link and click “Save link as...”, refer to Figure 52. Save a local copy of the MIB file wherever desired for use in an SNMP manager application. Alternatively, click the link and navigate to the file in the browser. Right click anywhere in the viewing space and click “Save as...” Simply remove the .txt extension (leaving only the .mib extension) and save at the desired location.

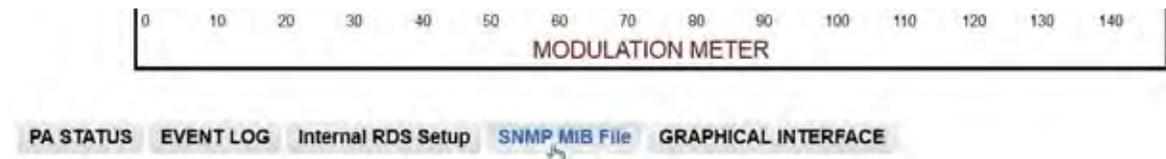


Figure 52 – MIB Download

An SNMP manager application must be utilized in order to access the interface. Integrating a manager into custom station automation programs provides countless possibilities. Alternatively, various third party MIB browser GUI applications are available for free download; however Broadcast Electronics does not endorse any specific application. Simply direct the manager to the Ethernet port for communication across a network.

11.1 Authentication

Data is accessible by using the correct community strings for the desired login level. The formula for these strings is a combination of the login type – chief, user, or operator –, a delimiting '+' character, and the 8 digit numerical password associated with that login type. For example, “chief+12345678” in both the read community and write community passes authentication and allows read and write to essentially every object in the MIB with the appropriate max-access type. User and Operator login types provide more strict control over what settings can be modified and commands issued in the system.

11.2 Objects

The SNMP interface utilizes tables wherever it makes sense to communicate data in an indexed fashion. To accommodate a scalable transmitter product design, for example, almost all PA data is structured as tables by using the PA number as the index. This works by appending “.#” to the object where # is the PA number. Note that a normal “leaf” node is accessed by appending “.0” as in ...38118.2.2.0, the object for system forward power.



12 Backup Control Modes

The STX 10 comes equipped with two backup control methods. Emergency control mode is integrated standard with all systems and simply allows the system to continue functioning in the event of a system controller failure. The backup system control and exciter feature utilizes an entire controller and exciter sub-system to also allow for full control interfacing with an identical synchronized internal standby exciter.

12.1 Emergency Control Mode

In the event of a loss in communications with the system controller, all sub-systems enter emergency control mode. Behavior when in this mode depends on user specified emergency power levels. This must be set to the desired emergency power level in order to enable the feature, which comes from the factory set at 0 W and is effectively disabled. The transmitter will continue to function at full emergency power as long as the exciter maintains drive to all power amplifiers. The power amplifier can only enter emergency power mode from a working state, so it will not unmute or initialize in the emergency power state.

12.2 Standby System Control and Exciter

For complete system control and exciter redundancy an exciter switcher option can be acquired. These packages supply all required hardware for utilization of standby units in the STX 10 transmitter.

Detailed information including installation and operation of this optional configuration are contained in an application guide for the FW EP1 Exciter Switcher. A copy is included in standard kits and/or inserted in the front of the binder containing this manual if shipped as part of the same order. For electronic copies of this and any other technical documentation please visit <http://www.bdcast.com/information-center/> and follow navigation on the left side of the page – authorized login is required.

13 Troubleshooting

Some basic information and troubleshooting steps are included below. If problems persist after basic troubleshooting steps are taken, please contact RF Technical Services. Contact information is located on our website at www.bdcast.com and on page iii in the front of this manual.

A fault in any part of the system indicates a complete disruption in normal operation of at least one part of the transmitter system. Once the problem has been identified, a fault reset command should be issued through diagnostics in any user interface to attempt to recover from fault conditions. If the reset is not successful or a condition that caused a fault still remains, the fault will re-assert.

An alarm typically indicates an abnormal condition that represents a disruption that may resolve itself. Alarms in unexpected situations could indicate serious conditions. Alarms that persist for long periods of time or unexpectedly appear on a regular basis should not be ignored. Use the GUI screens fault and alarms detailed in the sections that follow.

13.1 Event Log

The system event log can be accessed through the web interface log page or in its raw form through the event Log tree in SNMP. An event is defined by its index starting with the first saved event at index 1, a timestamp from the system's internal real time clock, an event identification number, and the sub-system where the event triggered. Some events also have context-based parameters that are embedded in the description of the event.

13.2 Standby

The STX 10 comes with built-in functionality for a standby controller and exciter – see section 12.2 Standby System Control and Exciter. A system that is in standby is muted and not actively controlling the transmitter. This mode is not intended in a setup that has a single system controller and exciter. Standby system control and exciter setups should also be able to have no more than one unit active at a time.

If a system is stuck in standby mode, this typically indicates a setup problem. Single system controller and exciter setups require a stub 949-4130 that activates the transmitter. This must be attached to the BE Interface jack, see section 3.4 BE-Interface Activation Stub. Dual system controller and exciter setups require a switcher that connects to both assemblies through this interface. The switcher must be operated to activate one controller/exciter.

13.3 Failsafe

An asserted failsafe input on the remote station interface is required for operation of the system. The intended usage of this input is to make a loop that passes through safety relays in all critical transmission system components. When any part of the transmission system becomes unsafe, the circuit should open and de-assert the failsafe on the transmitter. When a failsafe condition is active, check all systems that are wired into the failsafe circuit.

13.4 Mute

A mute generally refers to a lack of an RF source in some part of the system, and the affected part depends on the context of the notification. Mute indications can happen at various stages for different reasons, and details STX10 system should be considered.



Additional conditions of a Transmitter mute related to the Exciter:

- There is no power to the exciter
- The transmitter is turned off
- The mute GPIO input pin on the remote station interface is asserted
- Unmute/Failsafe GPIO input is not asserted
- The BE Interface active input is not asserted

13.5 Internal Exciter Diagnostics

Table 11 – Exciter Diagnostics Details

Fault/Alarm	Description
Communication Fault	This fault occurs when communication between the system controller and the internal exciter is nonfunctional.
AFC Unlock Alarm	Automatic frequency control system does not yet have lock.
10MHz Status	Displays INT when exciter is on the Internal reference or EXT for when an External reference is used.
Audio SCR Status	Secondary (SCR) Audio displays PRI for primary audio or SEC for secondary audio

13.6 RF Power Amplifier Diagnostics

Table 12 in provides PA diagonstic and fault data for both the IPA and the RF Amplifier Modules. Examples shown in Figures 53 and 54 explain various fault and status conditions



Figure 53 – VSWR Fault Example

In Figure 53, a failure is simulated to exhibit a VSWR fault on all 4 PA modules. Each PA module self protects and mutes which is statused on each Pallet as well as the module overall Mute. A System Mute status will also be yellow on the Main page. The system mute removed exciter RF drive power so no amplifier including the IPA so it will not display any faults or status changes in this example.



Table 12 – PA Diagnostics Details

Fault/Alarm	Description
RF Power Supply Fault PwrSup	This fault activates when a power source failure is detected.
VSWR Fault VSWR	This fault activates when the measured reflected power is greater than the maximum reflected power/VSWR rating of the system or individual amplifier at any power level.
Temperature Fault Temp	This fault activates when the measured internal heat sink temperature exceeds the safe limit.
Communication Fault Comm	This fault activates when communication between the system controller and the PA or IPA is lost.
PA Pallet Muted Pallets 1,2,3,or 4 Mute	The status balloons assigned to the four RF pallets in a PA Module will change to yellow it's pallet is muted.
RF Amplifier Muted IPA or PA Module Mute	The status balloon for the IPA or an overall PA Modules will change to yellow when muted.
Temperature Foldback Temp	When the internal heat sink temperature approaches a preset value of an amplifier, power is folded back, "Yellow" to keep the transmitter running at reduced power. If the temperature exceeds the value, a temperature fault, Red is statused..
Current Foldback OVR I (IPA) Foldbk (Pallet 1 – 4)	Final RF transistor current is measured and if it approaches a preset value that would exceed device ratings, power is folded back to keep the transmitter running at reduced power.
RF Module Connection Connect	If an PA Module is removed or not seated in its connector on the combiner motherboard, then this status will activate and turn red. The Comm fault will also activate in this condition.
PA Module Rail Railed	This indicates a condition where automatic power control has reached its highest or lowest possible control value indicating that the transmitter cannot reach the RF power set-point. The power control system automatically leaves this state if the condition is resolved.

In Figure 54, a "Comm, (Communication Fault)" is simulated by removing a PA Module. Since the PA Modules all have a "Connect" status, it also changed to red.



Figure 54 – PA Module 3 Removed

13.7 PA Power Supply Diagnostics

Table 13 – PA Power Supply Status Balloon Details



	Description
Standby	Displays Yellow to indicate the power supply is ready, but has not yet received an On command. When Green the supply has received the On command and should be operating.
Imbalance	This status will change from Green to Yellow or Red indicating the power supply is not properly current sharing with the other power supplies.
Failed	When this fault changes from Green to Red, it indicates the power supply has shut down due to one of the following; Over Temp, Over Current, or Over Voltage. This condition may clear automatically, but sometime will require removing the power supply from the transmitter until all indicators of the power supply extinguish.
Communication Fault Comm	This status will change to Red to indicate communication between the system controller and power supply is lost.
Connect	The status indicates supply is seated properly into it's connector position in the power supply tray motherboard.

14 Maintenance STXe500

14.1 Clean Air Filters

STXe 500 comes standard with air filters that are front accessible for servicing without having to remove power from the transmitter. The filters are washable and air filter cleaning should be a part of regular system maintenance. While cleaning air filters, air circulation should also be verified in case fans have stopped functioning (they will eventually break down after years of operation).

1. To remove the filter on the STXe 500 module, use the opening on the bottom to pry the snaps on either side by hand. Repeat on the other side.



Figure 55 – STXe 500 Air Filter Removal

2. Remove the filter material from the case for thorough cleaning. Use compressed air or water to remove debris.
3. Snap the air filters back on all modules once they are clean.
4. Carefully pinch to tighten the snaps if the case became loose enough to rattle.

14.2 STXe 500 Remove the Top Cover

To perform remaining module replacement actions in the maintenance section, the top cover must be removed. Full precautions should be taken against electrostatic discharge. Any such shocks may cause permanent damage to any electronic components, especially printed circuit boards.



ENSURE AC POWER INPUT IS COMPLETELY DISCONNECTED BEFORE ACCESSING ANY INTERNAL MODULES

1. Use a Phillips screwdriver to unscrew all 9 top cover screws and lift the cover.

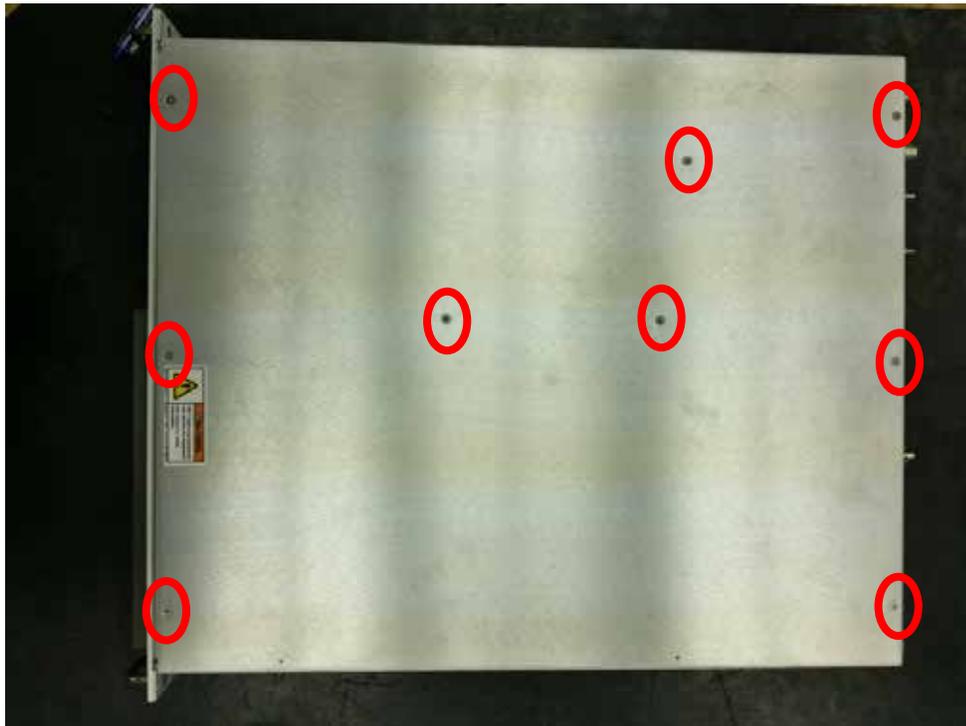


Figure 56 – Top Cover

14.3 STXe 500 Main Power Supply



Figure 57 – STXe 500 Main Power Supply

- 540-0048 Power Supply Board Assembly, 48VDC 1kW
- Phillips Screwdriver

1. Use a Phillips screwdriver to disconnect the red and black DC wiring. Pop the polycarbonate cover off the AC screws and use a Phillips screwdriver to disconnect the three wires.



Figure 58 – STXe 500 Main PS Wires

2. Use a Phillips screwdriver to remove the two screws securing the power supply to the main chassis.



Figure 59 – STXe 500 Main PS Chassis Screws

3. Loosen the internal thumb screws by hand.



Figure 60 – STXe 500 Main PS Internal Thumb Screws

4. Tilt up, slide, and lift the power supply out of the chassis as shown.



Figure 61 – STXe 500 Main PS Extraction

5. Remove the three screws from the main power supply chassis section.



Figure 62 – STXe 500 Main PS Chassis Section

Repeat the previous steps in reverse with the replacement power supply module.

14.4 AC Switch

The AC switch should only be replaced if it is known to have failed. Plastic retaining snaps must be deformed or destroyed to remove the switch from the chassis.



Figure 63 – AC Switch

- 349-0020 1 20A double pull single throw rocker switch
- Phillips screwdriver
- Side cutters
- 3/4" wrench
- 5/8" wrench

1. Use a Phillips screwdriver to remove the five screws that secure the back panel to the main chassis: one on either side and three on the bottom.

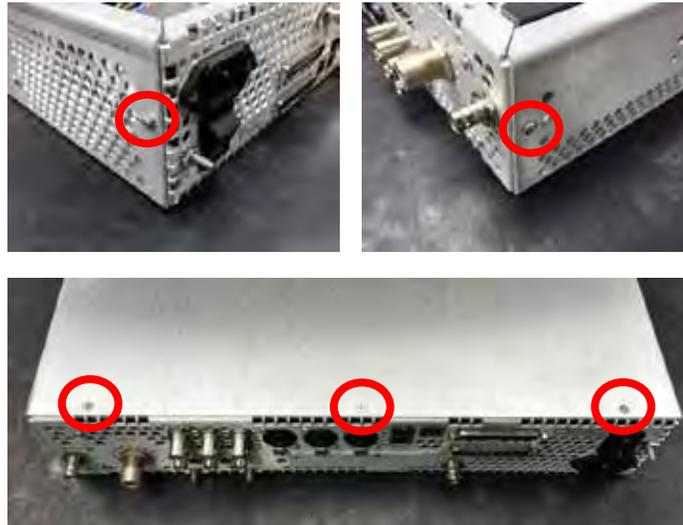


Figure 64 – Back Panel Screws

2. Use a 3/4" wrench to remove the N-Type connector nut and lock washer.



Figure 65 – N-Type Connector Nut

3. Use a 5/8" wrench to remove the sample output BNC nut and lock washer.



Figure 66 – BNC Connector Nut

4. Remove the CPE screw and unsnap the corners.

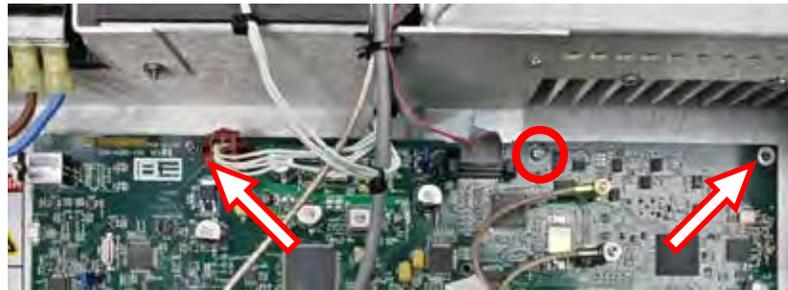


Figure 67 – CPE Screws and Snaps

- Carefully lift and rotate the assembly to gain easy access to the AC switch.



Figure 68 – Displaced Back Panel Assembly

- Use side cutters to cut the AC switch's housing tabs. The switch should then slip through the chassis as shown.

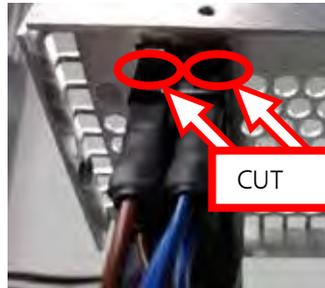


Figure 69 – AC Switch Tabs

- Exchange wires from the old switch to the replacement switch one at a time to ensure that wires are placed in the correct configuration.



Figure 70 – AC Switch Wires

- Insert the switch back into the chassis and repeat the initial steps in reverse to replace the back panel and controller/exciter board.

14.5 AC Input and EMI Filter



Figure 71 – AC Input Replacement Parts

- 339-0006 1 10A 50/60 Hz 250V AC input filter
- 402-0015 1 Cable tie
- 611-1501 4" 1-1/2" diameter heat shrink wrap
- Phillips screwdriver
- Side cutters
- Heat gun

1. Use side cutters to cut the cable tie.

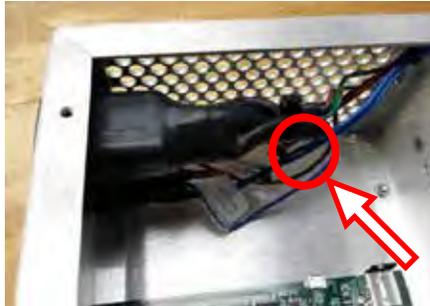


Figure 72 – AC Cable Tie

2. Cut the shrink wrap.



Figure 73 – Cut Shrink Wrap

- Carefully pull the three wires off the exposed internal studs.

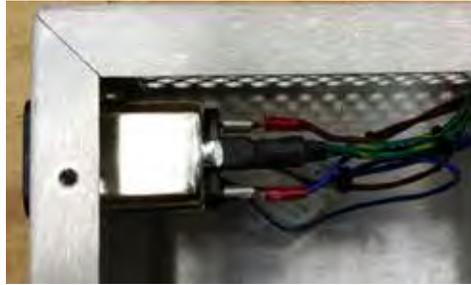


Figure 74 – AC Studs

- Use a Phillips screwdriver to remove the two screws that secure the input shell to the chassis.

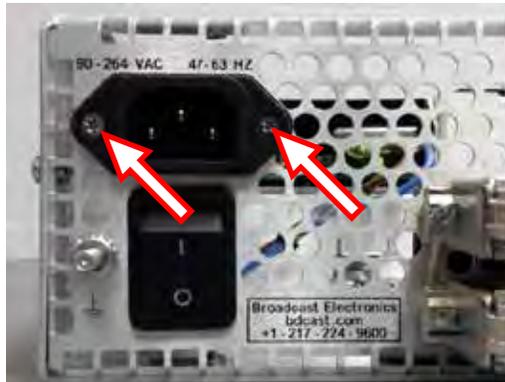


Figure 75 – AC Input Screws

- Slide the AC assembly out of the chassis. Place its replacement in the same spot, and secure it with the Phillips screws.

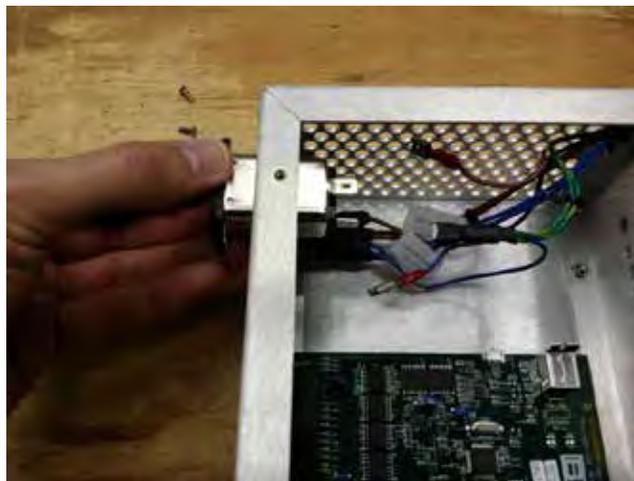


Figure 76 – AC Input Assembly Removal

- Feed the wires through the shrink wrap. Hold the wrap back and secure the wires on the internal studs. Ensure proper wire placement per wire colors indicated in the figure.

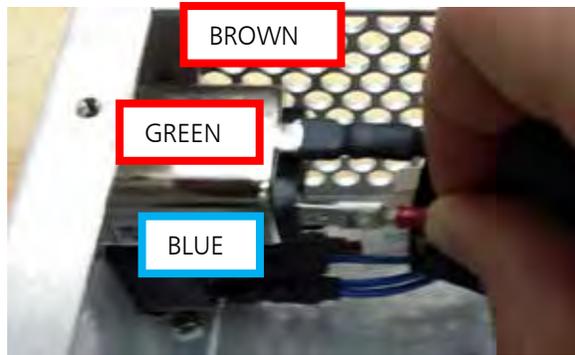


Figure 77 - Internal AC Connections

7. Slide the shrink wrap all the way up and over the AC input assembly. Apply heat with a heat gun.



Figure 78 - Shrink Wrap

8. While the shrink wrap is still malleable, secure it with the cable tie.

14.6 Fan Power Supply



Figure 79 – Fan Power Supply

- 540-5024 1 Power Supply Board Assembly, 24VDC 50W
- Phillips Screwdriver



POWER SUPPLY PARTS MAY HOLD THEIR CHARGE FOR MINUTES AFTER AC POWER IS DISCONNECTED. SHOCKS AND BURNS MAY RESULT IF JACKS OR PART LEADS ARE TOUCHED, ESPECIALLY ON THE BOTTOM OF MODULES!

1. Disengage latches on wire connectors and unplug them.



Figure 80 – Fan Power Supply Connectors

2. Use a Phillips screwdriver to remove the four screws that secure the power supply.



Figure 81 – Fan PS Screws

- Carefully lift the power supply out of the chassis.



Figure 82 – Fan PS Extraction

- Repeat the previous steps in reverse with the replacement power supply module. The cable latches should engage when the cables are fully plugged. Ensure solid latching on all cables.

14.7 Fan



Figure 83 – Fan

- 380-9008-001 1 or 2 Fan with Connector, 24V 80 mm X 38 mm
- Phillips Screwdriver

- Slide the fan assembly straight up and out of the chassis by lifting the polycarbonate.



Figure 84 – Fan Assembly Extraction

2. Pinch connector latches and then pull apart to disconnect wires.

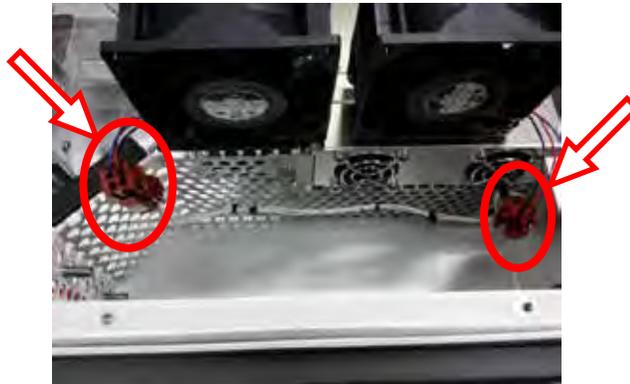


Figure 85 – Fan Connectors

3. Note the front/back and wired corner orientations relative to the polycarbonate cutout.

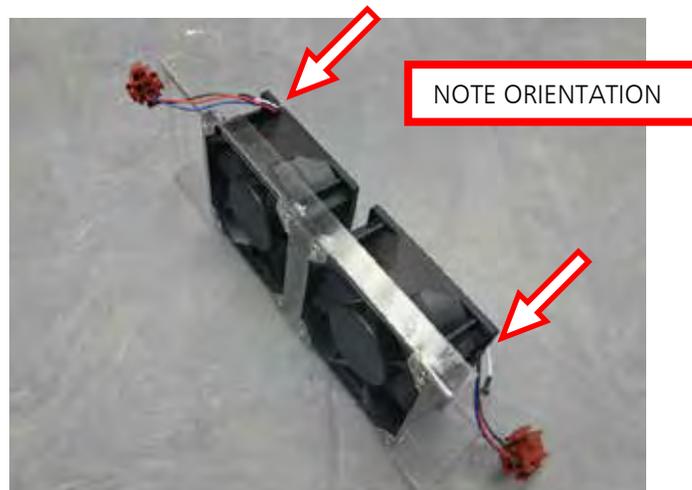


Figure 86 – Fan Orientations

4. Use a Phillips screwdriver to remove the four (or eight) screws and self-locking nuts that secure the fan(s) to the case.

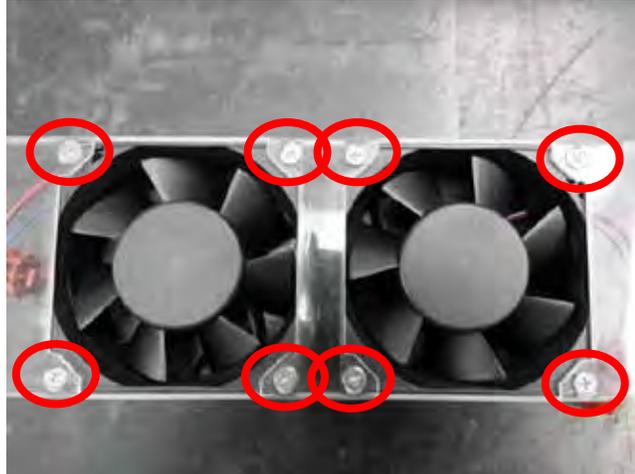


Figure 87 – Fan Screws

5. Repeat the previous steps in reverse with the replacement fan(s). Ensure fan direction and orientation in the case is proper to direct airflow and minimize strain on cables.

14.8 Fuse – DC Regulator



Figure 88 – 20A DC Fuse

- Digital multi-meter with Ohm metering
- 330-0062 1 20A Fuse
- Phillips Screwdriver
- Tweezers
- Soldering Iron(s)
- Solder

1. Use a Phillips screwdriver to remove the two screws securing the power supply to the main chassis.



Figure 89 – Main PS Chassis Screws

2. Loosen the internal thumb screws by hand.

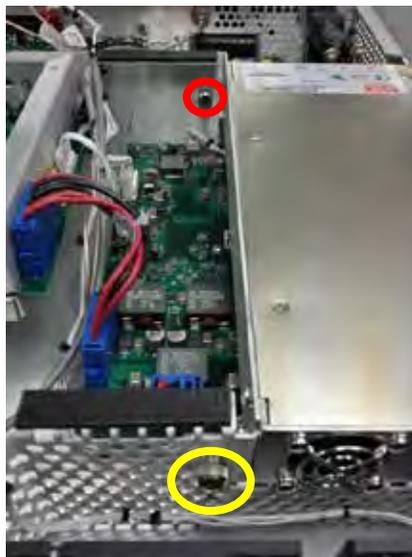


Figure 90 – Main PS Internal Thumb Screws

3. Tilt up, slide, and lift the power supply out of the chassis. Carefully set the power supply unit aside as shown.



Figure 91 – DC Regulator Fuse Access

4. Locate the fuse and verify failure with an Ohm meter. A normal fuse will be a short circuit near 0 Ohm, and blown fuses will be an open circuit with a very high Ohm reading.

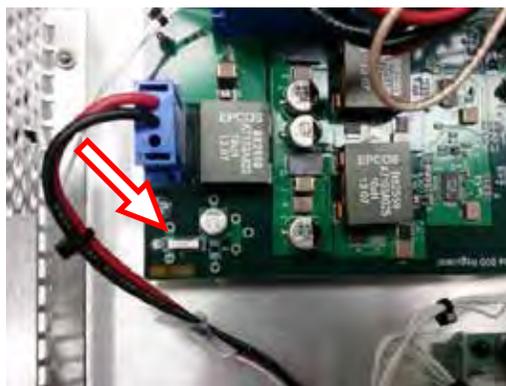


Figure 92 – DC Regulator Fuse Location

5. Use soldering irons to carefully remove the fuse from the circuit board.
6. Use tweezers to hold the new fuse in place on the pads. Use a soldering iron to apply heat and add solder as needed.

14.9 DC Regulator



Figure 93 – DC Regulator Board Assembly

- 919-4212 1 DC Regulator Board Assembly
- Phillips Screwdriver

1. Disengage latches on the blue connectors and pull them. Pull the three white cable connectors. Set the cable ends aside.

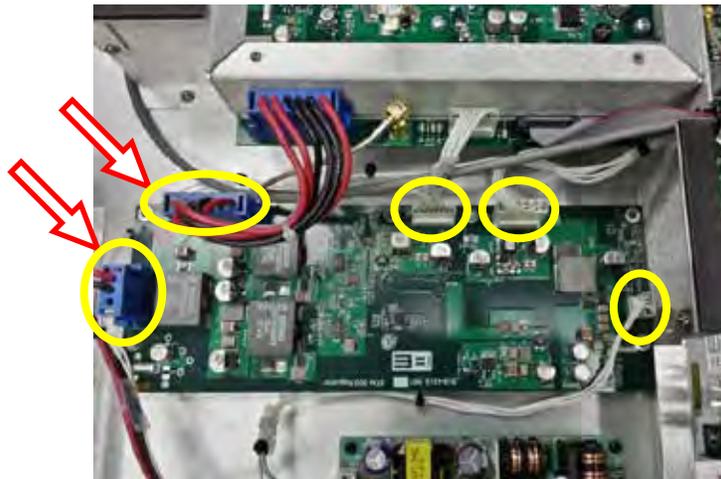


Figure 94 – DC Regulator Cables

2. Use a Phillips screwdriver to remove the three screws.

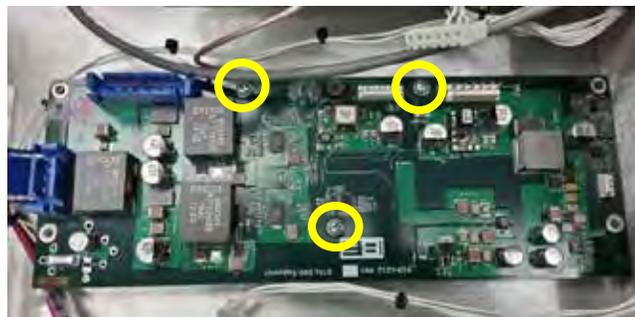


Figure 95 – DC Regulator Screws

3. Pop the board assembly off the four corner snaps.



Figure 96 – DC Regulator Snaps

4. Lift the board out of the chassis.



Figure 97 – DC Regulator Extraction

5. Repeat the previous steps in reverse with the replacement DC regulator board assembly.

14.10 Fuse – Low Voltage



Figure 98 – 1.5A Low Voltage Fuse

- Digital multi-meter with Ohm metering
- 330-0006 1 1.5A Fuse
- Tweezers
- Soldering Iron(s)
- Solder

1. Locate the fuse and verify failure with an Ohm meter. A normal fuse will be a short circuit near 0 Ohm, and blown fuses will be an open circuit with a very high Ohm reading.



Figure 99 – Low Voltage Fuse Location

2. Use soldering irons to carefully remove the fuse from the circuit board.
3. Use tweezers to hold the new fuse in place on the pads. Use a soldering iron to apply heat and add solder as needed.

14.11 Fuse – Driver Power Amplifier



Figure 100 – 1.5A Driver Amplifier Fuse

- Digital multi-meter with Ohm metering
- 330-0006 1 1.5A Fuse
- Tweezers
- Soldering Iron(s)
- Solder

1. Locate the fuse and verify failure with an Ohm meter. A normal fuse will be a short circuit near 0 Ohm, and blown fuses will be an open circuit with a very high Ohm reading.



Figure 101 – Driver Fuse Location

2. Use soldering irons to carefully remove the fuse from the circuit board.
3. Use tweezers to hold the new fuse in place on the pads. Use a soldering iron to apply heat and add solder as needed.

14.12 Fuse – Final Power Amplifier



Figure 102 – 25A Final Amplifier Fuse

- Digital multi-meter with Ohm metering
- Tweezers
- 330-0063 1 25A Fuse
- Soldering Iron(s)
- Solder

1. Locate the fuse and verify failure with an Ohm meter. A normal fuse will be a short circuit near 0 Ohm, and blown fuses will be an open circuit with a very high Ohm reading.



Figure 103 – Final Amplifier Fuse Location

2. Use soldering irons to carefully remove the fuse from the circuit board.
3. Use tweezers to hold the new fuse in place on the pads. Use a soldering iron to apply heat and add solder as needed.

14.13 Drive Power Amplifier Part

RF power transistors should only be replaced if they are known to have failed. Bending leads to separate from boards during the removal process will cause damage. Fuses and other components in surrounding circuitry may also be damaged depending on the failure mode.

This is a difficult process that should only be attempted by skilled technicians.



Figure 104 – Driver Stage Power Amplifier

- 210-2918 RF Power Amplifier
- 700-0028-004 Thermal Compound
- 6 lb-in (0.6-0.75 Nm) Torque Phillips Screwdriver
- Pliers/tweezers
- Solder
- Soldering Irons
- Solder Wick

1. Identify the amplifier device to be replaced.



Figure 105 – Driver Amp Location

2. Use a soldering iron to remove the capacitor and resistor



Figure 106 – Driver RC Parts

3. Use a Phillips screwdriver to remove the mounting screws.
4. Use a soldering iron and pliers to bend up and separate leads from the circuit board. Remove the part when finished.
5. Solder wick residual solder to remove it from the circuit board to prevent lead strain.
6. Apply a thin film of thermal compound to the bottom of the replacement amplifier part where the base of the part contacts the heat sink.



Figure 107 – Driver with Thermal Compound Applied

7. Place the part and look at the notch to ensure the proper orientation. Use the Phillips torque wrench to tighten the screws with about 6 in-lb of Torque.



Figure 108 – Driver Placement

8. Use pliers and a soldering iron to gently bend the end of a lead to the board one at a time and apply solder. Minimize strain on the leads. Do this for all four leads.
9. Place the leaded resistor and the capacitor in series across the part just as before.

Performance of the module after the amplifier part replacement process has been completed may depend on part to part variations of the amplifier parts and surrounding circuitry. If there is degradation in performance please contact BE technical services to arrange to ship the module/system for diagnosis, repair, and re-tuning.

14.14 Final Power Amplifier Part

This is a difficult process that should only be attempted by skilled technicians. The FPA Pallet that the part is mounted on can be removed for ease of access. Follow directions in section 0 if desired.

- 210-0188 Final Amplifier Part
- 700-0028-004 Thermal Compound
- 6 lb-in (0.6-0.75 Nm) Torque 3/32" Allen (hex key) wrench
- Pliers/tweezers
- Solder
- Soldering Irons
- Solder Wick

1. Use soldering irons to remove the input inductor.

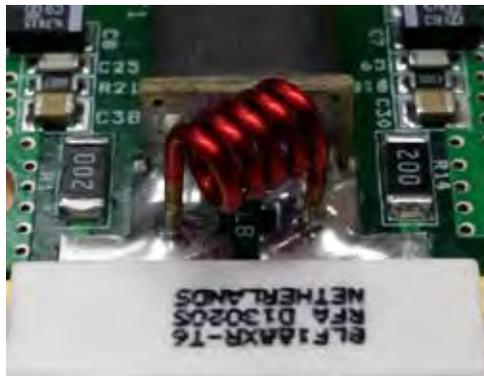


Figure 109 – Final PA Input Inductor

2. Use soldering irons to disconnect the white coaxial cable ends.



Figure 110 – Final PA Output Coaxial Cables

3. Use 3/32" Allen wrench to remove the two mounting screws and all washers.



Figure 111 – Final PA Mounting Screws and Washers

4. Use soldering irons on each of the four leads to disconnect the part from the circuit board.
5. Lift the part up and out of the Pallet.
6. Use solder wick with remove residual solder where the new part leads will go.
7. Apply a thin film of thermal compound to the entire bottom of the new part.
8. Place the part in the mounting location (note the notch location) and secure the screws and washers with a 6 lb-in Torque 3/32" Allen wrench.
9. Apply solder to all four leads.
10. Use soldering irons and solder as necessary to place the output coaxial cables. Refer to Figure 110.
11. Place the input inductor. Refer to Figure 110.
12. Bend each coaxial cable such that they are both 0.55" +/-0.030" from the highest point to the circuit board surface.

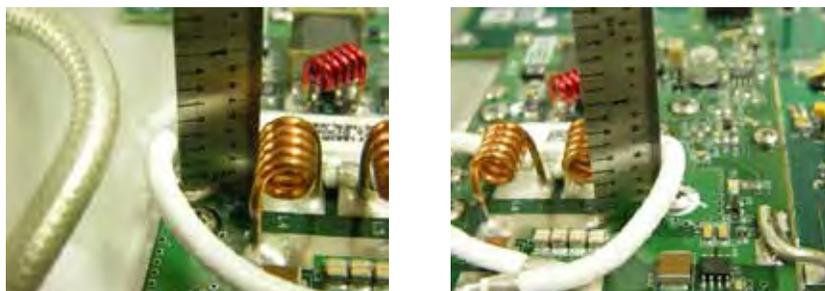


Figure 112 – Final PA Coaxial Cable Heights

Performance of the module after the amplifier part replacement process has been completed may depend on part to part variations of the amplifier parts and surrounding circuitry. If there is degradation in performance please contact BE technical services to arrange to ship the system for diagnosis, repair, and re-tuning. Final Power Amplifier Pallet



Figure 113 – Power Amplifier Pallet

- 959-4500 Palate PA Assembly
- 700-0028-004 Thermal Compound
- Phillips screwdriver
- Pliers/tweezers
- Solder
- Two Large Soldering Irons
- 1" Form Brush

1. User large soldering irons to disconnect DC power input.

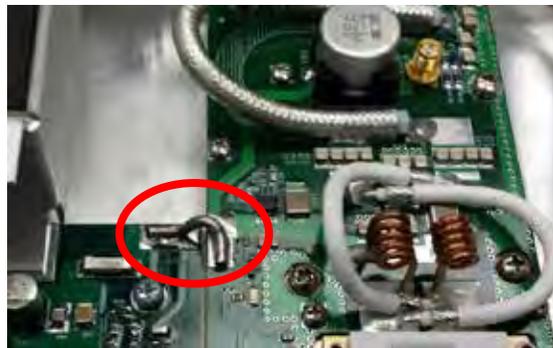


Figure 114 – Pallet DC Input

2. User large soldering irons, one on the outer conductor and one on the inner conductor, to lift the RF output coaxial cable.



Figure 115 – Final RF Output

3. Remove only the 7 palate mounting screws and lock washer that hold the Pallet to the heatsink. Bend the white coaxial cable up or down as needed.



Figure 116 – Pallet Screws

4. Lift the palate straight up to disengage the connector J1 being careful not to damage any of the pins.
5. Clean the surface area of the aluminum heat sink and then spread a thin film of thermal compound on the copper heat spreader using a foam brush.



Figure 117 – Pallet with Thermal Compound

6. Repeat steps 1 through 4 in reverse to install the new final PA palate.
7. Check the bend of both white coaxial cables such that they are both $0.55'' \pm 0.030''$ from the highest point to the circuit board surface. Bend the output coax such that it is $0.80'' \pm 0.030''$ from the highest point to the circuit board surface.



Figure 118 – Pallet Coaxial Cable Heights

14.15 Power Amplifier and Low Pass Filter Assembly

This section details a difficult process that should only be attempted by skilled technicians.



Figure 119 – Power Amplifier Assembly

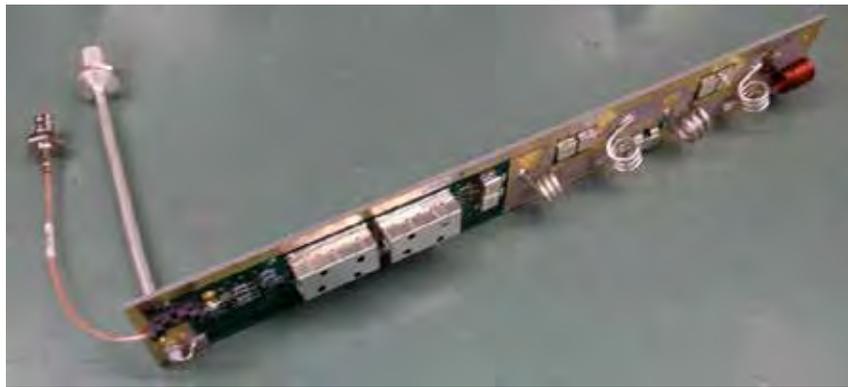


Figure 120 – Low Pass Filter Circuit Board Assembly

- | | | |
|---------------------------------------|---|--------------------------------|
| <input type="checkbox"/> 959-4500-100 | 1 | 500W PA Assembly |
| And/Or | | |
| <input type="checkbox"/> 919-4060-100 | 1 | Low Pass Filter Board Assembly |
-
- Phillips Screwdriver
 - Extra-Long/Short Phillips Screwdriver
 - 3/4" wrench
 - 5/8" wrench
 - 5/16" Nut Driver

1. Use a Phillips screwdriver to remove the two circled screws on the bottom of the unit.

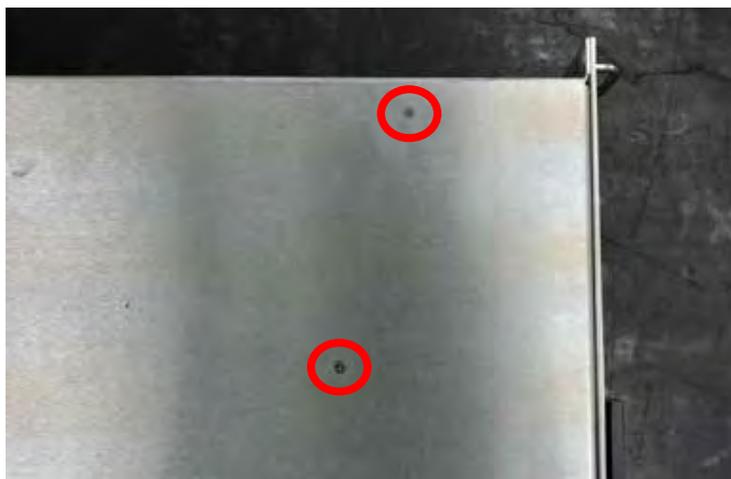


Figure 121 – Bottom PA Screws

2. Use a Phillips screwdriver to remove the screw on the side.



Figure 122 – Side PA Screw

3. Insert an extra-long Phillips screwdriver through the hole in the back of the chassis and unscrew the PA screw. An extra-short Phillips screwdriver that can fit inside the cavity is also valid.



Figure 123 – Front PA Screw

4. Use a 3/4" wrench to remove the N-Type connector nut and lock washer.



Figure 124 – RF OUT Nut

5. Use a 5/8" wrench to remove the sample output BNC nut and lock washer.



Figure 125 – RF Sample Nut

6. Disconnect all cables from the PA assembly.

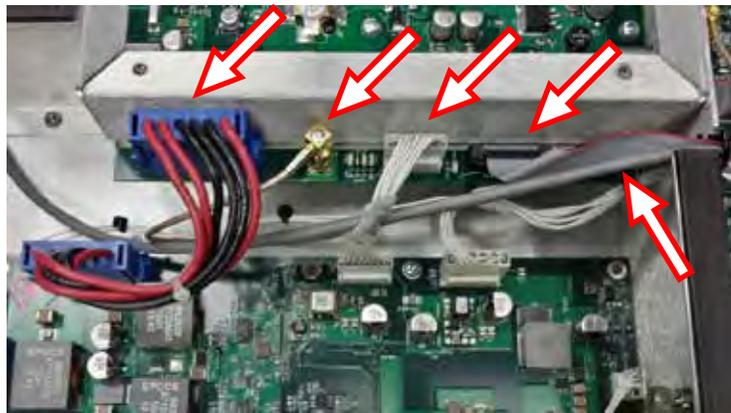


Figure 126 – PA Assembly Cables

7. Slide the N-Type and BNC connectors out of their D-holes and displace the PA assembly.

8. Remove the CPE board screw and gently lift the board off the corner snap.



Figure 127 – CPE Screw and Snap

9. Gently flex the board to move the low pass filter ribbon cable out from beneath the board assembly.



Figure 128 – Low Pass Filter Ribbon

10. Lift the PA assembly straight up out of the chassis and set it next to the system.
11. Use a Phillips screwdriver to remove the five screws that secure the low pass filter board assembly.



Figure 129 – Low Pass Filter Screws

12. Disconnect the ribbon cable from the board assembly.



Figure 130 – Low Pass Filter Ribbon

13. Gently flex the board forward and slide the ribbon cable back through the slot in the chassis.

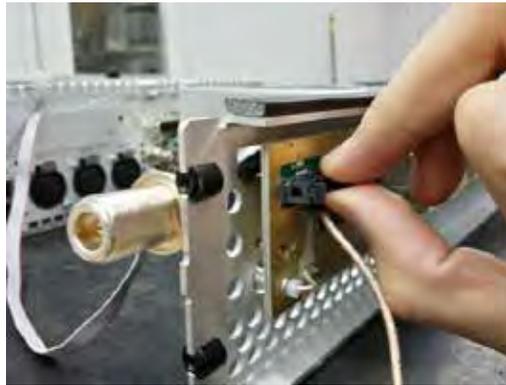


Figure 131 – Low Pass Filter Ribbon Extraction

14. Prop the PA assembly up so that the low pass filter board assembly is almost horizontal (this keeps solder from dripping out of control). Use large soldering irons to disconnect the coaxial cable, one on the center conductor and one on the outer conductor.

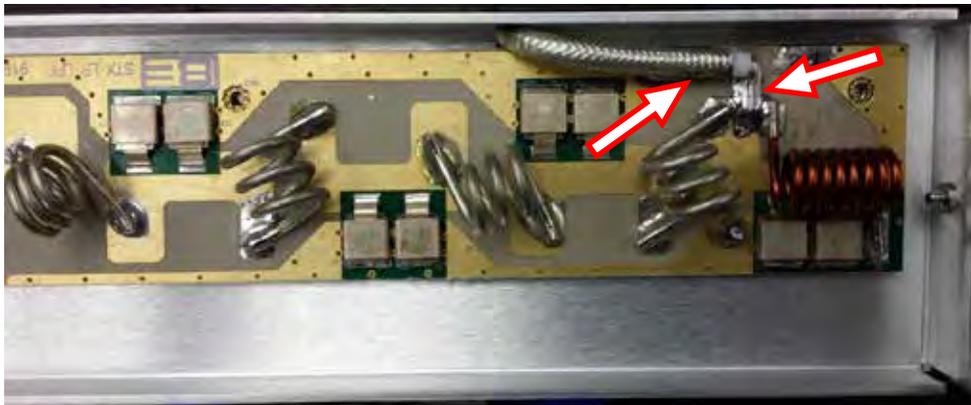


Figure 132 – Low Pass Filter RF Input

15. Set the PA assembly back down and use large soldering irons in the same way to disconnect the final PA pallet output as shown.



Figure 133 – Final PA Pallet RF Output

16. Use a 5/16" nut driver to remove the self-locking nut that secures the low pass filter.



Figure 134 – Low Pass Filter Nut

17. Slide the low pass filter out of the chassis section. If replacing the low pass filter only, the next three steps can be skipped.
18. Use a Phillips screwdriver to remove the three screws that secure the chassis section to the PA heat sink.



Figure 135 – Low Pass Filter Chassis Section Screws

19. Use a 5/16" nut driver to remove the self-locking nut that secures low pass filter chassis section.

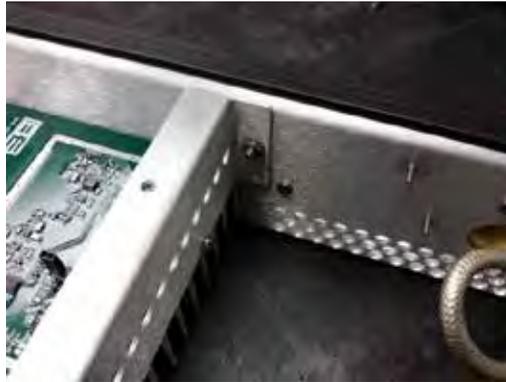


Figure 136 – Low Pass Filter Chassis Nut

20. Use a Phillips screwdriver to remove the screw that holds the end of the low pass filter chassis section.



Figure 137 – Chassis Section Screw

Repeat the previous steps in reverse with the replacement PA module, the replacement low pass filter board assembly, or both.

Performance of the system after the amplifier or low pass filter replacement process has been completed may depend on part to part variations of the amplifier and surrounding circuitry. If there is degradation in performance please contact BE technical services to arrange to ship the system for diagnosis, repair, and re-tuning.

14.16 Front Panel Display



Figure 138 – Front Display Board Assembly

- 919-4207 1 STX CPE Display Board Assembly
- Short Phillips Screwdriver

1. Use a short Phillips screwdriver to remove the two screws securing the board assembly.



Figure 139 – Front Display Screw

2. Disengage the latch on the cable harness and disconnect it from the display board.

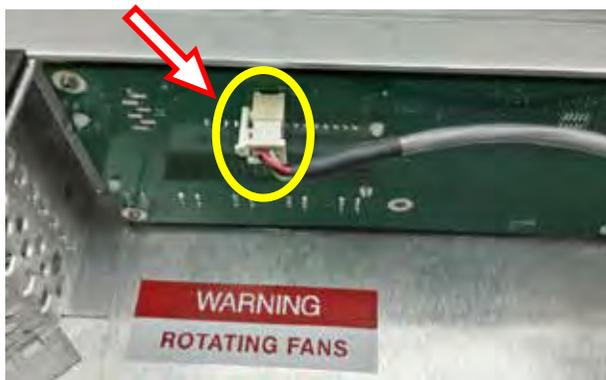


Figure 140 – Front Display Plug

3. Reach in the left of the board and unsnap the two corners.



Figure 141 – Front Display Left Snaps

4. Angle the board out and unsnap the other two corners.



Figure 142 – Front Display Right Snaps

5. Repeat the previous steps in reverse with the replacement front panel display board assembly.

14.17 Extended I/O



Figure 143 – Extended I/O Board

3/16" Nut Driver

1. Unplug the cable harness by pinching the latches and lifting.

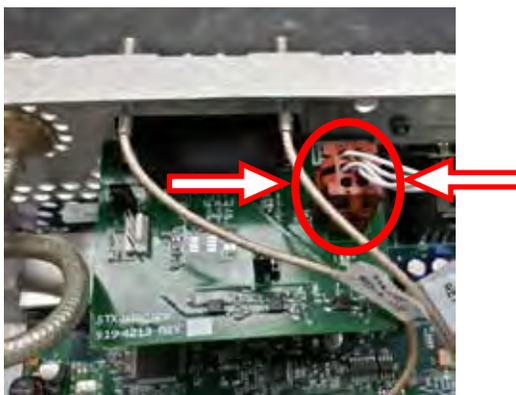


Figure 144 – Extended I/O Cable

2. Use a 3/16" nut driver to remove the jack screws and lock washers.



Figure 145 – Extended I/O Jack Screws

3. Repeat the previous steps in reverse with the replacement Extended I/O board assembly.

14.18 Controller Exciter



Figure 146 – Controller Exciter Board

- 919-4200-100 1 STX Controller Exciter Board Assembly
- Phillips Screwdriver
- 3/16" Nut Driver
- 9/16" wrench (or machine-thinned 9/16" deep-well nut driver)

1. Follow the steps in section 0 to remove the extended I/O board.
2. Use a 3/16" nut driver to unscrew the four D-Subminiature jackscrews and lock washers that secure the GPIO and BE INTERFACE jacks.

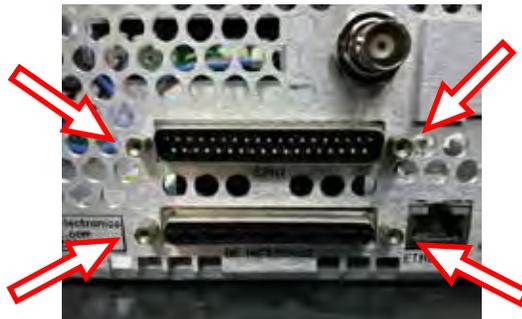


Figure 147 – CPE D-Subminiature Jackscrews

3. Use a Phillips screwdriver to remove the six screws that secure the XLR jacks.

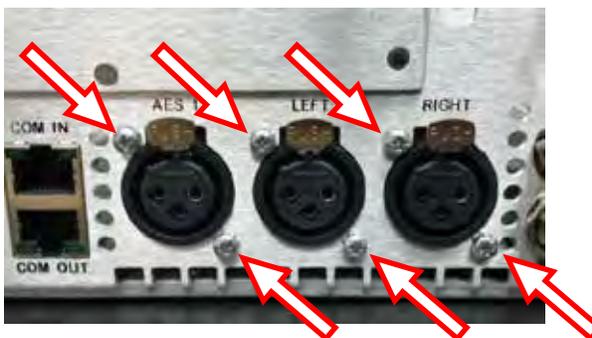


Figure 148 – CPE XLR Screws

4. Use a 9/16" wrench to loosen the six BNC nuts. Space is tightly constrained, and once the nuts are loose they can be removed by hand.



Figure 149 – CPE BNC Nuts

5. Disconnect all cables from the Controller Exciter board. Unseat the cables from the notch in the chassis wall and set them out of the way.

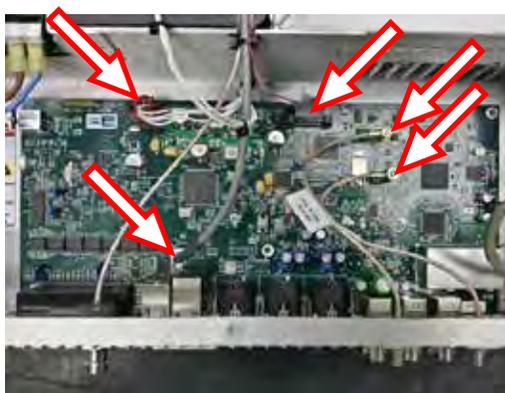


Figure 150 – CPE Cables

6. Pop the polycarbonate cover and use a Phillips screwdriver to loosen and slide the AC wiring off of the main power supply. This allows clearance during board extraction.



Figure 151 – Main PS AC Wiring

7. Use a Phillips screwdriver to remove the screw securing the board.



Figure 152 – CPE Screw

8. Gently lift the board next to each of the two snaps and free the board.



Figure 153 – CPE Snaps

9. Slide the coaxial cable forward in the harness to allow required clearance.



Figure 154 – Coaxial Cable Displacement

10. Angle the back of the board up and slide the connectors back until the XLR latches contact the chassis as shown. Gently tuck the latches under to free the board.



Figure 155 – Board Extraction

11. Repeat the previous steps in reverse with the replacement Controller Exciter board assembly

15 Maintenance STX 10 HP Cabinet

15.1 Front and Rear Access

Some of the STX HP modules and sub assemblies such as the PA Power Supplies which are accessible behind the Front Access Panel may be serviced without turning the TX off or removing AC power from the cabinet. However, with the Front Panel removed, the normal air flow for cooling will be disrupted and the PA temperature sensing will fold back the TX power output and therefore this practice is not recommended or at least to be kept to a minimum of time to prevent fold back or over temperature conditions in cabinet.

The parts and sub assemblies that are accessed from the rear will require the removal of the Rear Access Panel. This will require turning the STX-HP off and the Rear Access Panel AC Breaker Disconnect switched to the OFF position to remove the Rear Cover. If the Breaker itself needs service, it will be necessary to disconnect all AC power to the STX HP Cabinet.

15.2 HP Air Filter

The air filter is front accessible for servicing without having to remove power from the transmitter. The filter is washable but must be dry before returning to service. Therefore it is recommended to have a spare ready to install to minimize replacement time

407-6300 Foil-X Air Filter

1. Remove the Front Cover to access the air filter located in the lower rear of the Front Cover



Figure 156 – STX HP Air Filter

2. The Filter will swing out along the bottom for removal. Replace filter with the air flow arrow pointing to the inside and place the front cover back on the cabinet.

15.3 CPE Flashcode Update in Replacement Sub-Assemblies

The CPE in the STXe500 controls the transmitter system by communicating with other sub-assemblies in the STXe500 and STX HP Cabinet. Some of these sub assemblies such as the PA Modules In STX HP Cabinet have their own firmware. When ever any of these sub-assemblies or modules having firmware is replaced, a flash code from the CPE should be preformed to ensure the replacement module will have matching firmware with the remaining subassemblies.

Listed below are the assemblies that contain this firmware and their lower level PCB assembly that if either is replaced, will need to preform the CPE Flashcode Update.

- 959-0000 STX HP PA Module Assembly
 - 959-4250 PA Module Interface PCB Assembly

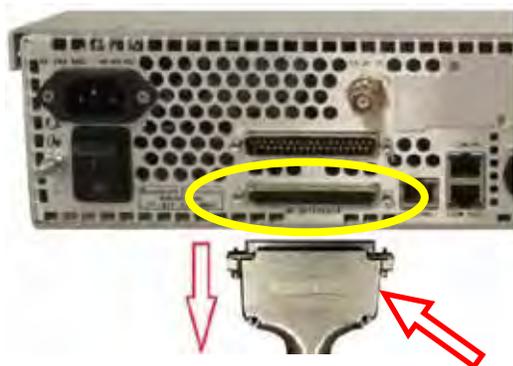
- 959-4230-110 STX 10KW Combiner with 1-5/8" Output
 - 919-4241 PA Cabinet Controller PCB Assembly

- 959-4230-111 STX 10KW Combiner with 3-1/8" Output
 - 919-4241 PA Cabinet Controller PCB Assembly

- 959-6300 PA Power Supply Tray Assembly
 - 919-4266 PA PS Motherboard PCB Assembly

15.3.1 CPE Flashcode Update Instructions

1. Put CPE system in Standby, by removing the BE Activation Stub from the back of the STXe500.



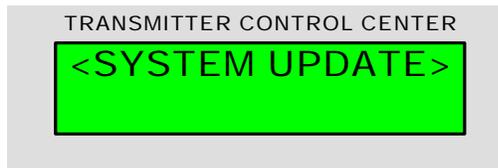
Remove Activation Stub attached to the BE INTERFACE connector.

Figure 157 – Remove BE Activation Stub

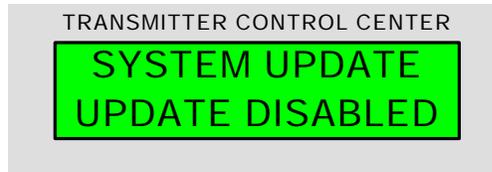
2. The front screen will show that the unit is in <STANDBY>.



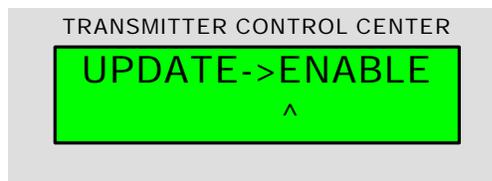
3. Navigate to the < SYSTEM UPDATE > menu using the up arrow **h** .



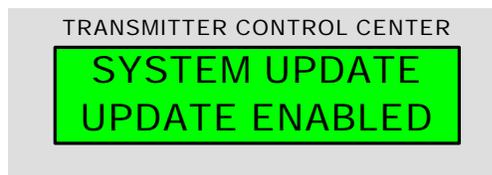
4. Depress **8** . to enter the SYSTEM UPDATE screen which will display UPDATE DISABLED



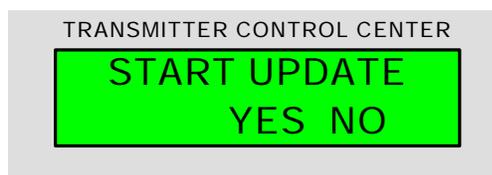
5. Depress **8** . to enter the UPDATE -> DISABLED /ENABLE screen. Depress the **i** or **h** buttons to toggle between DISABLED and ENABLED.



6. Select ENABLED and then depress the **8** . to exit and return to the <SYSTEM UPDATE> screen.



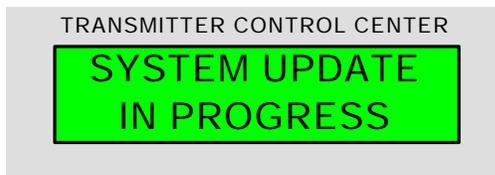
7. Depress the down arrow **i** to the < SYSTEM UPDATE / START UPDATE > screen and depress **8** . to get to the START UPDATE confirmation screen



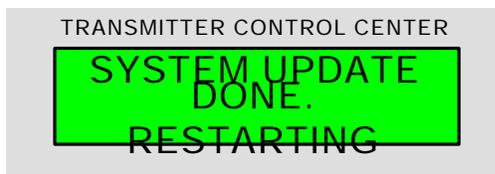
8. Press the up arrow **h** to confirm YES. The CPE update will start.



9. The CPE Image will update the other modules firmware and the screen will change to SYSTEM UPDATE and will display IN PROGRESS.



10. After the update is completed, the SYSTEM UPDATE screen will change and display DONE RESTARTING .



11. The CPE will return to the standby mode and the screen will display <Standby>.



12. The CPE flash code update is now complete and the CPE system can be taken out of Standby by plugging the BE INTERFACE CONNECTOR back into position.

15.4 PA Power Supply

The STX 10 comes with a standard configuration of seven supplies, and can maintain full power with six operating power supplies temporarily to allow replacement of a power supply.



Figure 158 – PA Power Supply

□ 540-5205 52V 2725W Power Supply

1. To remove a power supply, push on the clip circled in Figure 159 to allow you to swing out the hinged fan cover. This will unlatch the supply out of its mother board connector and allowing you to pull the supply the remainder of the way out of its module position.



Figure 159 – Power Supply Latch

2. Replace the power supply using the fan cover to seat and latch the supply back into the mother board connector. Note, the power supply will not seat if the cover is clipped shut.

15.5 Fan Power Supply

The Fan PS supplied from BE comes with connectors attached to the AC input cable on the left of and DC output cable on the right of Figure 160. Only the Mounting Plate and hardware shown in Figure 162 is reused.



Figure 160 – Fan Power Supply Assembly

- 540-0150-001 48V Power Supply with Connectors
- Straight Blade Screwdriver.

1. Unplug the two connectors for the power supply that needs to be replaced
2. While holding onto the supply, loosen the two thumb screws to release the Mounting Plate from the wall of the cabinet. The plate is slotted on the other end and PS assembly will pull forward and out.

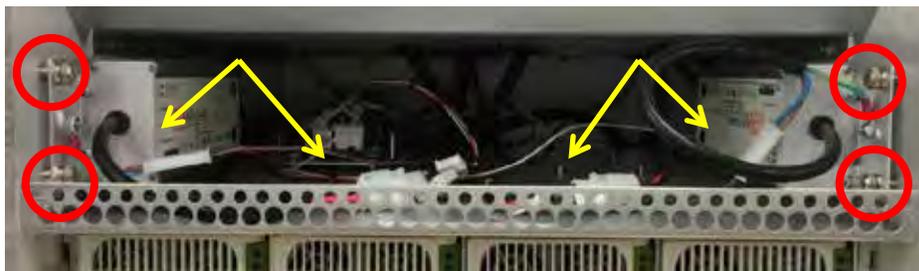


Figure 161 – Fan & MB Power Supply Enclosure

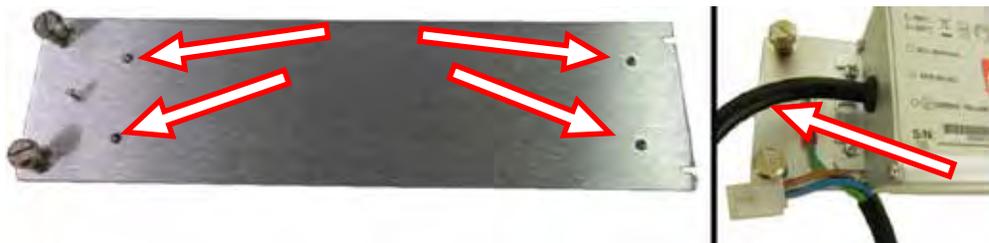


Figure 162 – FAN PS & Mounting Plate

3. Remove the existing supply and replace with the four 6-32 mounting screws . Secure the AC safety GND lug with the 6-32 nut.
4. Position the Fan PS Assembly back in cabinet and tighten thumb screws. Plug the AC input cable and DC output cable into their respective connectors.

15.6 Control Power Supply

The 24 & 12 VDC supply requirements needed for various control and interface assemblies is provided by this +24/+12VDC Dual Power Supply as shown in Figure 163.



Figure 163 – 24/12+VDC Power Supply

- 959-2024 Power Supply with Mounting. 24V/12V
- Straight Blade Screwdriver.

1. All STX HP cabinets have this supply located in the Left and Rear of the Fan & Control PS Enclosure as shown in Figure 164. An optional second supply is available and its location is in the opposite Right/ Rear of the Enclosure..

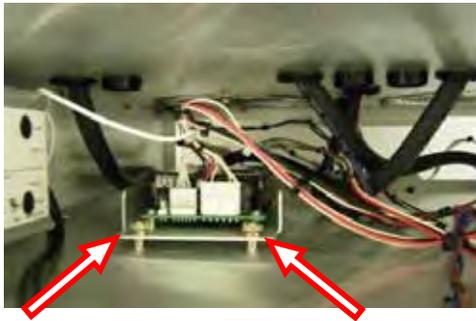


Figure 164 – 24/12V+VDC PS Location & Mounting

2. Loosen the two thumb screws shown in Figure 164, and pull the supply assembly forward to unplug the wire harness connectors located in Figure 165.



Figure 165 – PS Connector Locations

3. Install the replacement PS in the reverse order.

15.7 PA Cooling Fans

Two centrifugal fans provide cooling for the four PA modules, plus flushing air for other parts of the cabinet.



Figure 166 – Fan, 48VDC

- 380-6363-001 2 Centrifugal Fan with Connector
- .402-0000 2 Ty-Wrap
- Diagonal Cutters
- Phillips Screwdriver .

1. Unplug the fan cable connector circled in Figure-A for either the left or right fan needing replacement.

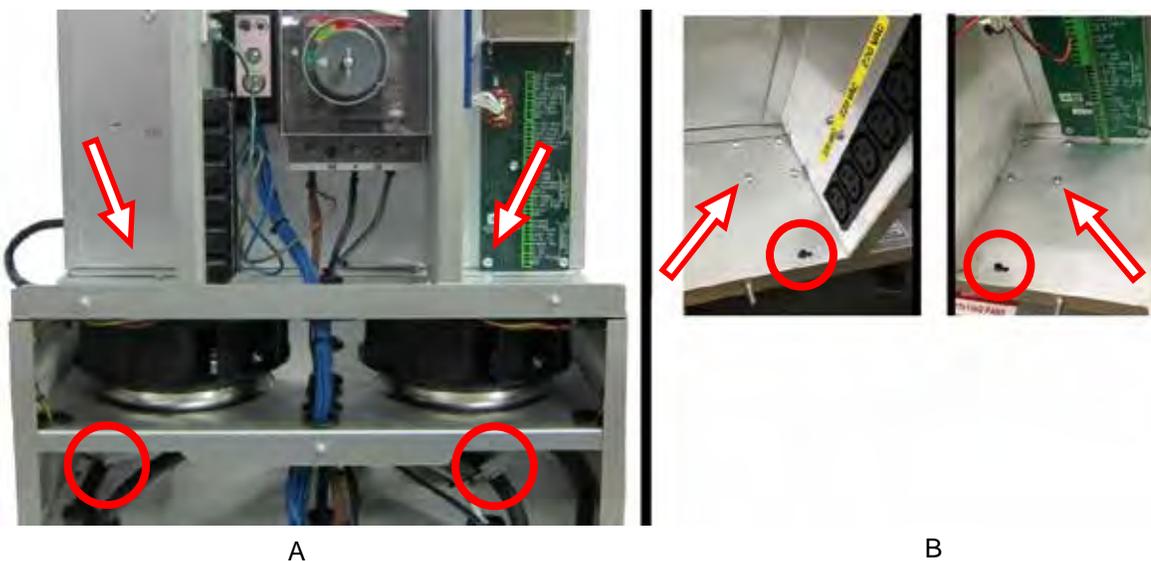


Figure 167 – Fan Enclosure and Mounting

2. Cut the Ty-Wrap that holds the fan cable in place circled in Figure B, for the fan that needs to be replaced.
3. Each fan is held in place by four 4M 7X8 screws located by the arrows shown in Figure 166 A & B. Remove the screws for the fan needing replacement and then pull the fan cable through the clearance hole to remove the fan.
4. Install the new fan in the reverse order .

15.8 STX HP PA Module

Each of the four PA Modules are secured into the STX cabinet with two retaining brackets located in Figure 168.

- 959-0000 STX HP PA Module Assembly
- Phillips Screwdriver.

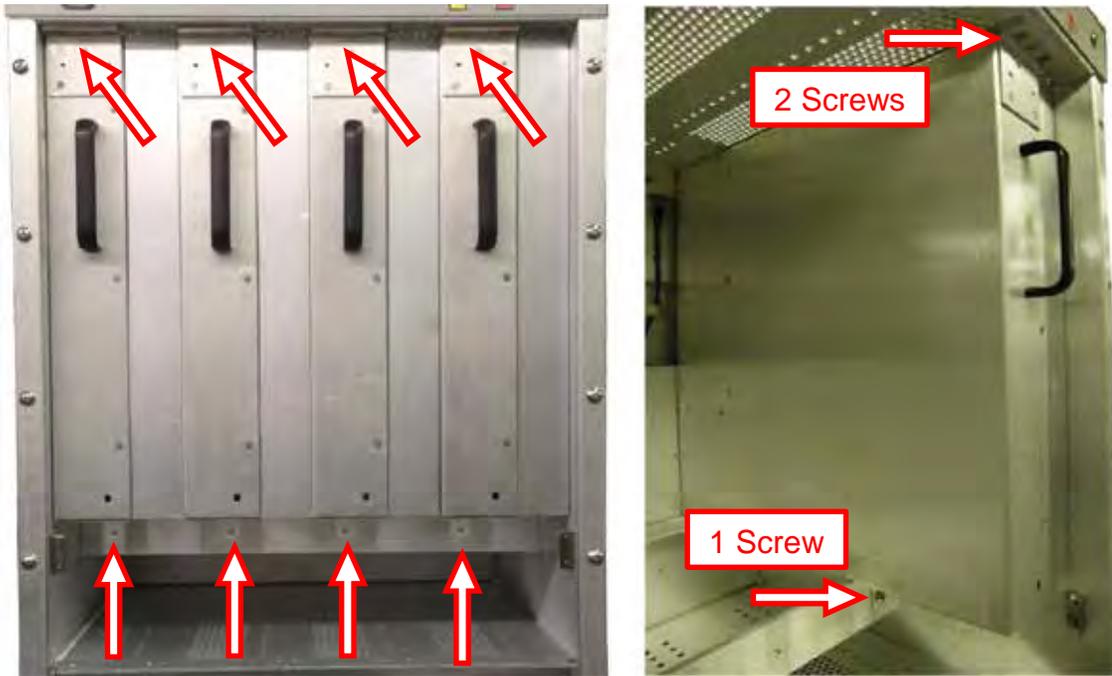


Figure 168 – PA Module Retaining Brackets

1. To replace or remove a complete PA Module, remove the two screws from the top bracket and the single screw from the lower bracket .
2. Pull PA Module straight out while using your other hand to hold module from underneath
3. Inspect all the connectors, RF, DC supply and control, for any damage on both the PA Module and the mating locations on the PA Motherboard before putting a replacement module back in the cabinet.
4. Replace the PA Module in reverse order
5. If a replacement PA Module is installed, preform the CPE flash update as detailed in Section 15.3 to ensure the module's firmware matches the other PA Modules

1. To inspect or service other parts within the PA Module, the cover must be removed as shown in Figure 169



Figure 169 – PA Module Cover Removal

2. Remove the 6/32 Flat Head screws from the cover's top, front, left and right sides. Screws are located at the dark holes on each side in the Figure 170

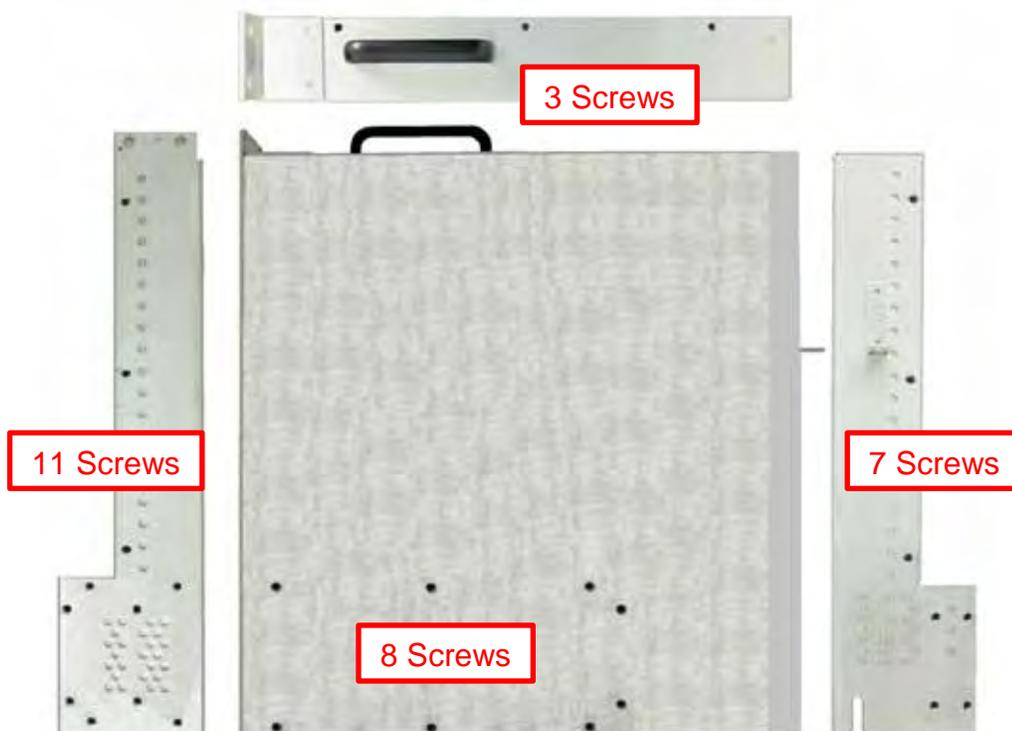


Figure 170 – Screw Locations –PA Module Cover

The major subassemblies, PWB's and componets of the PA Module are shown identified in Figure 171 below

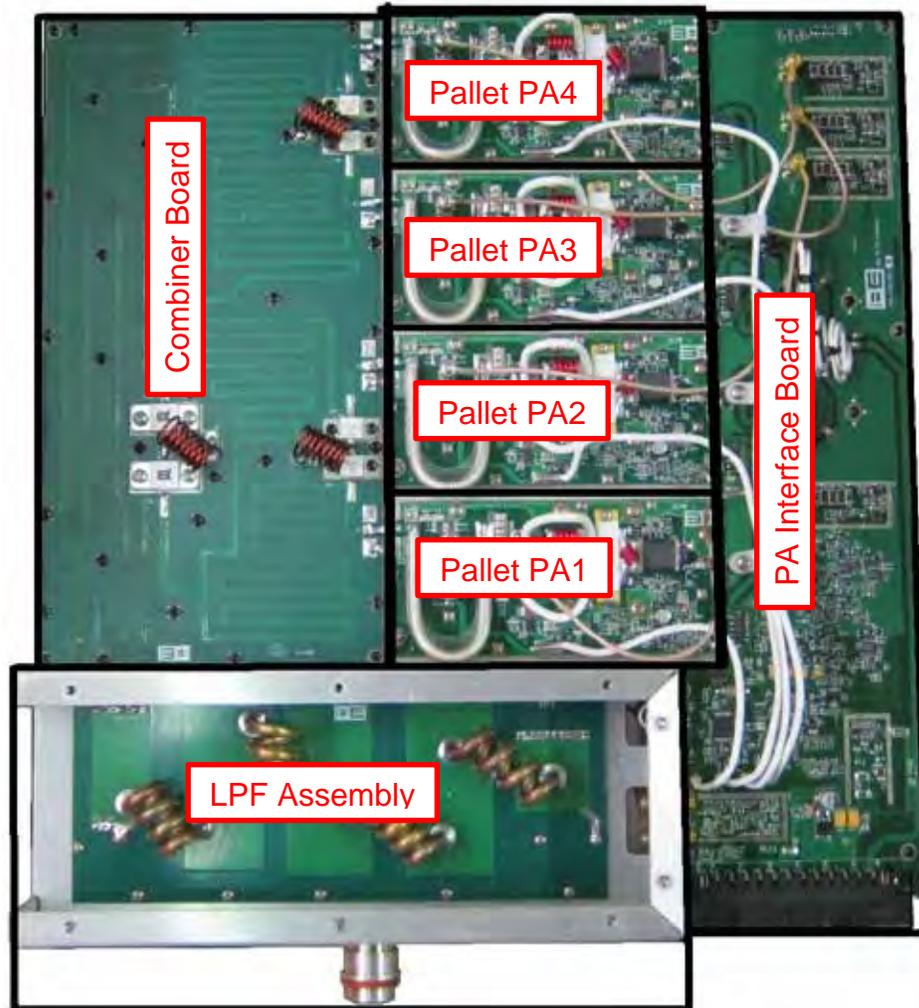


Figure 171 – PWB and Subassemblies of PA Module

- Pallet PA Assembly. The PA Module consists of (4) identical PA Pallets.
- Combiner Board. The RF out of the 4 pallet assy's are combined on this assembly.
- Low Pass Filter. The LPF Assembly attenuates unwanted emissions of RF out from the Combiner Bd. The RF is then routed to a Directional Coupler Bd mounted on the underside of LPF Assy to provide PA Module RF output metering.
- PA Interface Board. This multifunction PWB assembly provides the following:
 1. DC power distribution to PA Pallets,
 2. 4-way RF drive distribution to the PA Pallets
 3. PA Module control, monitoring and I/O to the STX HP system.
-

15.9 PA Module Fuses & LPF Removal

DC supply voltages enter the PA Module at the I/O connector of the PA Interface Bd and are fused at that location. +5VDC is used for control and I/O circuits on the PA Interface Bd plus +5VDC is fused with a 2A surface mount PTC fuse.

Distribution of the PA Supply Voltage for the individual PA Pallets is provided by four 30A fuses mounted on the underside of the PA Interface Board. Refer to Figure 172 and Figure 173 .

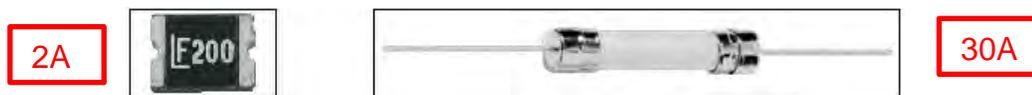


Figure 172 – 30A Fuse, PA Module

- 330-1812-002 1 2A Surface Mount, PTC Resettable Fuse
- 334-0030-001 4 30A Axial Lead Fuse
- Digital multi-meter with Ohm metering
- Tweezers
- Phillips Screwdriver.
- Soldering Iron(s)
- Solder
- Solder Wick and/or De-Soldering Tool.

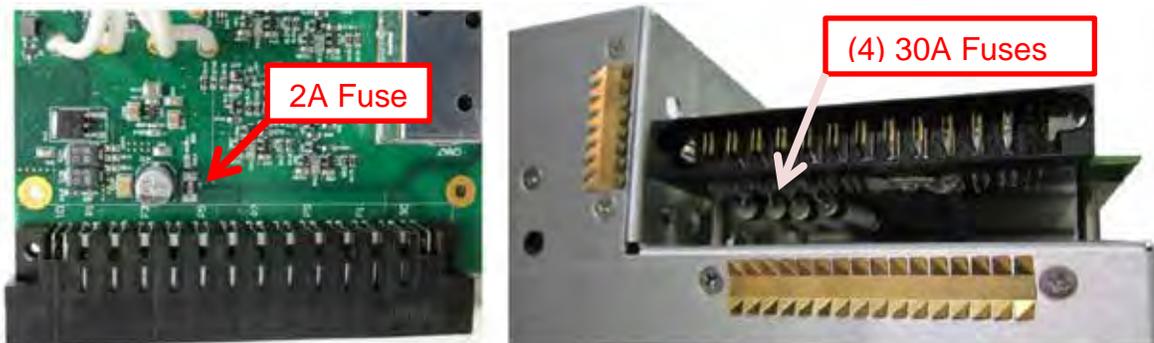


Figure 173 – Fuses at I/O Connector

Other voltages that are needed in the PA Module are created on the PA Interface Bd and distributed to other sub-assemblies such a PA Bias voltage for the PA Pallets.

1. To change the 2A fuse, use solder wick to remove the solder from the F1 location on the top side of the PA Interface Bd.
2. Remove fuse with tweezers and replace with new fuse.
3. Solder the new fuse in place being careful not to bridge any solder on adjacent pads.

To replace any of the 30A PA Pallet Fuses on the underside of the PA Interface Board, the LPF Assembly will need to be removed.

1. The electrical and mechanical connection locations are shown in Figure 174 .

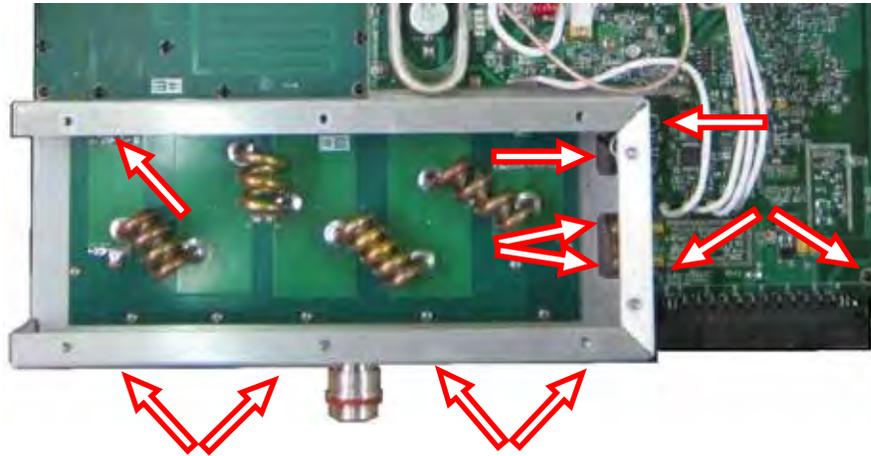


Figure 174 – LPF Connection Areas

2. Unsolder the RF input braid while bending the braid up and off of the LPF.

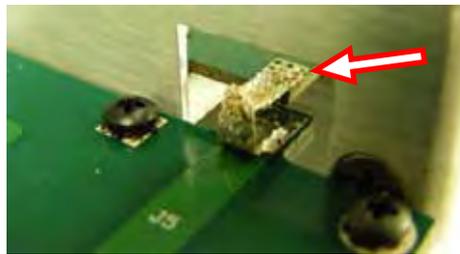


Figure 175 – LPF RF Input

3. On the LPF, disconnect the Directional Coupler Cabling consisting of two RF coax connectors and the 2 wire plug shown in Figure 176
4. Tape each connector end to keep them from falling back into clearance hole in the LPF. Note and mark which coax cable is FWD & REV.

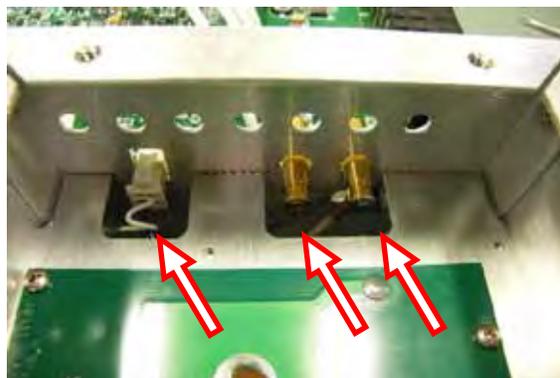


Figure 176 – LPF Directional Coupler Connectors

5. Remove the three screws from the PA Interface Board shown in

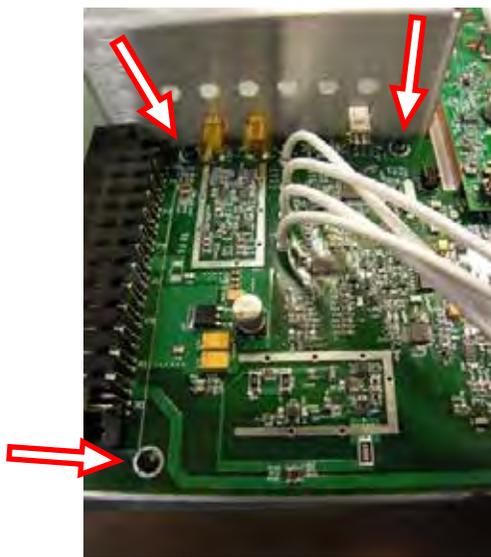


Figure 177 – LPF Screw Locations on PA Interface Board

6. Remove the four screws that fasten the LPF Assembly to the Heat Sink Assembly shown in Figure 179 via the access holes shown in Figure 178. Note, use the upper access hole on left side of RF output connector to remove that heat sink screw.

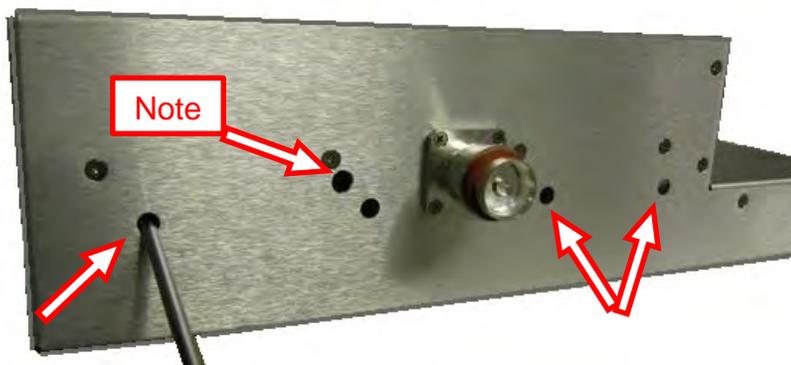


Figure 178 – LPF Access Hole Locations



Figure 179 – LPF / Heat Sink Mounting Screws

7. Pull the PA Module & Heat Sink Assy up and away from LPF Assy to expose the underside of the PA Interface Board as shown in Figure 180 with Heat Sink Assy on edge.

Note Do not lay PA Module on components with heat sink face up until the module is supported on the component side.

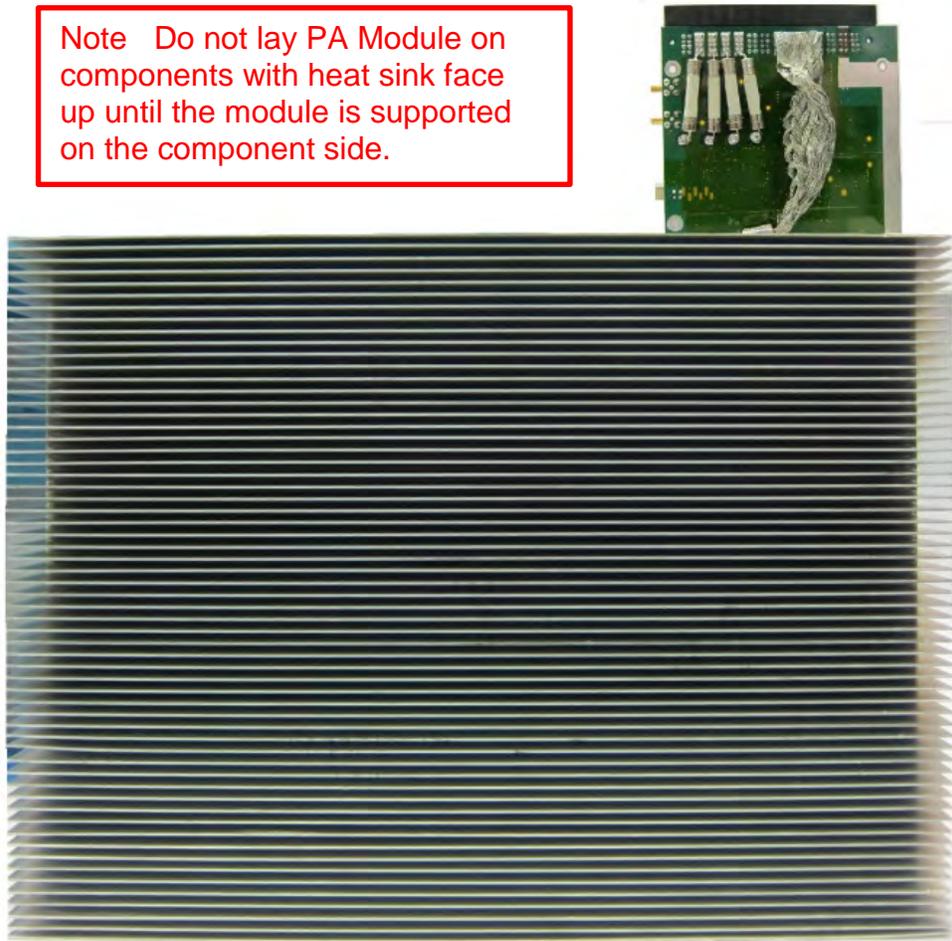


Figure 180 – LPF Removed from PA Module

8. To prevent component damage and/or cable displacement, put the module cover back on with at least two screws inserted on 3 sides of heat sink assembly. You can now lay the PA module with heat sink face up to service the underside of PA Interface Bd and unsolder fuse(s)
9. Unsolder the leads of the failed fuse(s) from the board and remove fuse.
10. Clip and bend leads of the replacement fuse(s) to match the mounting and solder fuse(s) in place.
11. Turn module over and lay heat sink on bench.
12. Remove cover and begin steps of putting LPF Assy back on module.
13. Place the LPF Assy into position against the heat sink assy and put all mounting screws removed in steps 4 & 5, back in. Keep all screws loose until all seven screws are in their positions and

14. A method is needed to hold the screws captive to replace the four heat sink screws removed in step 5. A good method to hold a screw captive on the screw driver tip is use a small amount of wax such as a soft candlestick or wax crayon.



Figure 181 – Captive Phillips Screw Method

15. Once all screws are in position, tighten to fit, but careful not over tighten screws on the PA Interface Bd to avoid PWB damage.
16. Plug the Directional Coupler cables back into their respective connectors on the PA Interface Bd. Refer to Figure.
17. Position and and solder the RF input braid back onto the LPF PWB. Refer to Figure 175
18. If no further servicing is needed such as PA Pallet replacement, proceed to the module put cover back on. Put all screws back in cover in order to maintain RF and EMI performance.

15.10 Pallet PA Assembly



Figure 182 – Pallet PA Assembly

- 959-4500 1 Pallet PA Assembly
- (11 lb-in) Torque Phillips Screwdriver
- Digital multi-meter with Ohm metering
- Tweezers
- Soldering Iron(s)
- Solder
- 700-0028-004 Thermal Compound
- 1" Form Brush.
- Solder Wick and/or De-Soldering Tool.

Each Pallet has 3 soldering locations. One is the DC supply voltage wire routed from the 30 amp fuse location. The others are the two braided straps that bridge the RF output of the Pallet to the Combiner PWB.

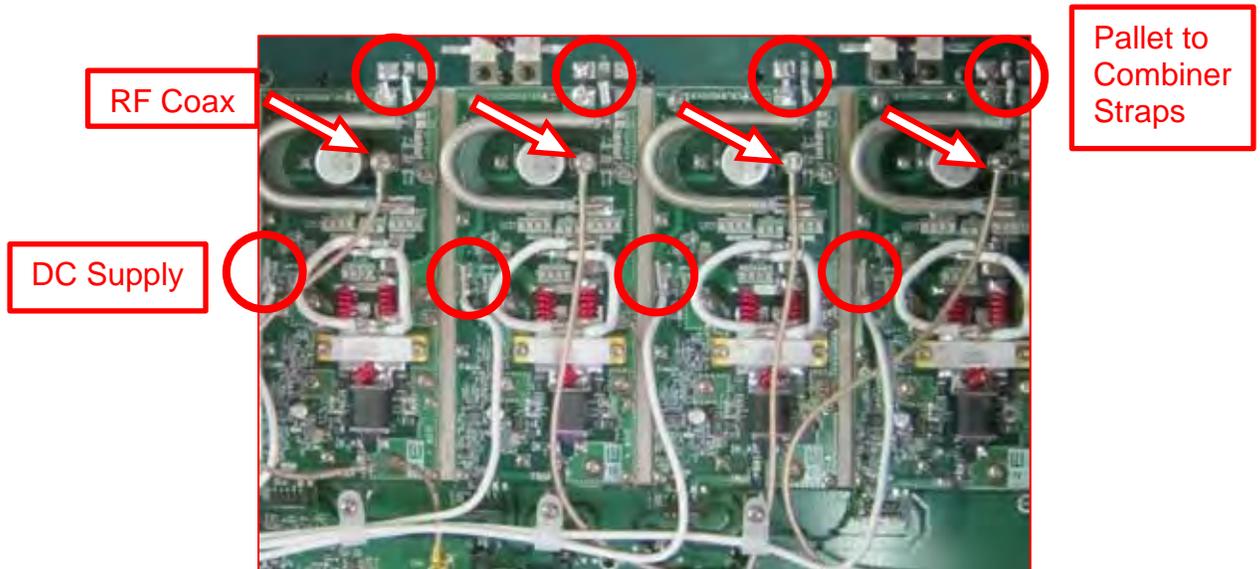


Figure 183 – Pallet Solder & Coax Cable Locations

1. Identify the failed Pallet and remove the RF coax cable at the arrowed location of the damage Pallet and position it out of the way.
2. Unsolder the supply wire from the Pallet and position out of the way

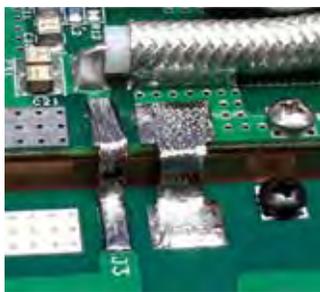


Figure 184 – Pallet RF Output

3. Unsolder the two braids on the Pallet side. If the braid is too stiff to bend up and away from Pallet then remove braid.
4. Remove only the 7 pallet screws that hold the Pallet to the module heatsink shown at the locations in Figure 185

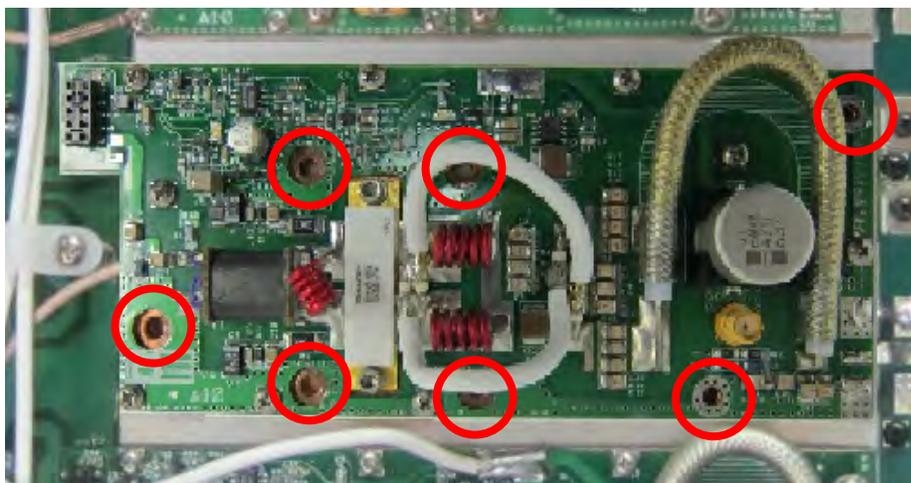


Figure 185 – Pallet Screws

5. Carefully lift the Pallet straight up from heat sink disengaging the J1 connector out from the pins attached to the PA Interface Board.

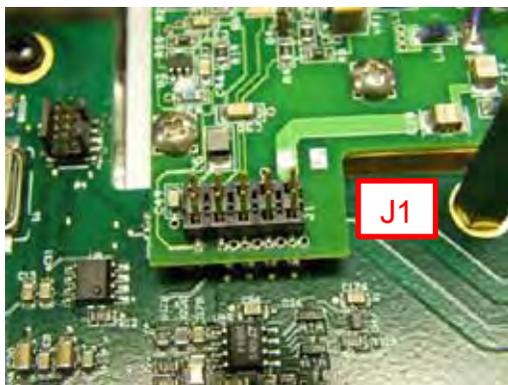


Figure 186 – Pallet / PA Interface J1 Connector

6. Clean the surface area of the aluminum heat sink where the Pallet was.
7. Using a foam bush, apply a thin and even layer of thermal compound to the copper surface of the Pallet Heat Spreader. Make sure both surfaces are free of any debris.



Figure 187 – Pallet Copper Heat Spreader

8. Carefully place the new Pallet on the aluminum heat sink while aligning the pin connections into the J1 on the PA Interface Board
9. Put the 7 screws back in Pallet and torque to 11 lbs.
10. Replace the remaining connections removed in steps 1, 2 & 3.
11. Replace cover using all screws removed to insure RF and EMI integrity.

15.11 Combiner Reject Resistors



Figure 188 – PA Combiner Resistors

- 131-0050-250 4 50 Ohm 250W, Flanged
- 131-0050-500 2 50 Ohm 500W, Flanged
- Digital multi-meter with Ohm metering
- Tweezers
- Soldering Iron(s)
- Solder and Thermal Compound
- Solder Wick and/or De-Soldering Tool.

Resistors locations on PA Module Pallet Combiner

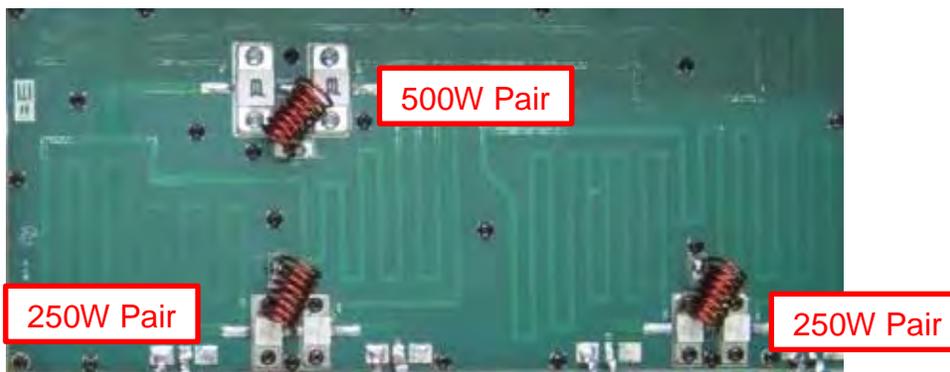


Figure 189 – PA Module Combiner Board

1. Remove the mounting screws of the resistor(s) that is to be replaced.

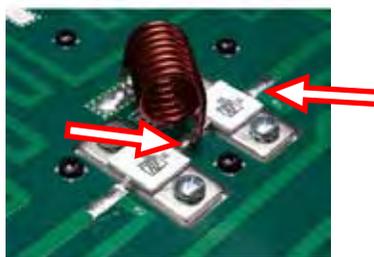


Figure 190 – Resistor and Coil Combination

2. Unsolder resistor leads and remove resistor. If coil needs to be lifted up slightly, do not distort coil windings.
3. Put thermal compound on resistor and fasten place. Torque to 11 lbs.
4. Solder resistor leads and coil end in place.

15.12 Front Control Panel and RJ45 Control Interface



Figure 191 – Front Control Panel Complete

When the 3 mounting screws are removed in Figure 191, and the 1RU silk screened panel is removed, only the RJ45 connector is attached to the 1RU silk screened panel, Figure 192.



Figure 192 – Front Control Panel – 1RU Silk Screened Panel

Figure 194 is the Front Panel Control Printer PCB and it is mounted to a folded lip that is part of the STX HP cabinet. Removal of the Board for servicing will have to be made from the back and it may be necessary to remove the Exciter to improve access for servicing this area.



Figure 193 – STX HP Front with 1RU Silkscreened Panel Removed



Figure 194 – Front Panel Control Printed Circuit Board

15.12.1 Replaceable Parts

- 471-6302 1 RJ45 Panel Mount Connector

 - 919-4270-001 1 Front Panel Control PCB
- Or components on 919-4270-001:
- 340-0139 3 Switch, Pushbutton, Illuminated, Yellow
 - 340-0140 1 Switch, Pushbutton, Illuminated, Green
 - 340-0143 2 Switch, Pushbutton, Illuminated, Red
 - Phillips Screwdriver
 - Tweezers
 - Soldering Iron & Solder
 - Solder Wick and/or De-Soldering Tool.

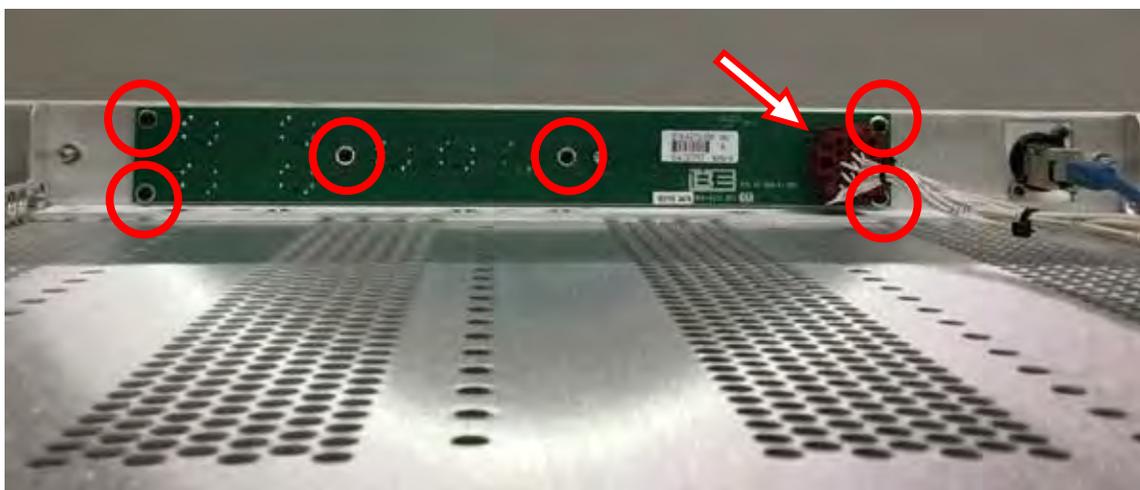


Figure 195 – Front Control Panel Rear View & Mounting Screws

1. Remove the the 20 Pin Plug from the Front Control Board.
2. Remove the six mounting screws and remove the Board.
3. Unsolder the defective switch and clear our the through holes on the printed board.
4. Place new switch in board and solder in place.
5. Place board back on folded lip of the STX cabinet top panel with the six screws and reinsert the 20 pin plug.

15.12.2 - RJ45 Connector Removal

1. The RJ45 connector can be service from front by removing the 3 screws identified in Figure 191, if the CAT5E cable is loosen from the rear.
2. Cut Tywaps in harness along top of cabinet and along the back as identified in Figure 196B.
3. Loosen CAT5E cable just enough to disconnect cable from the RJ45 connector in Figure 196A.

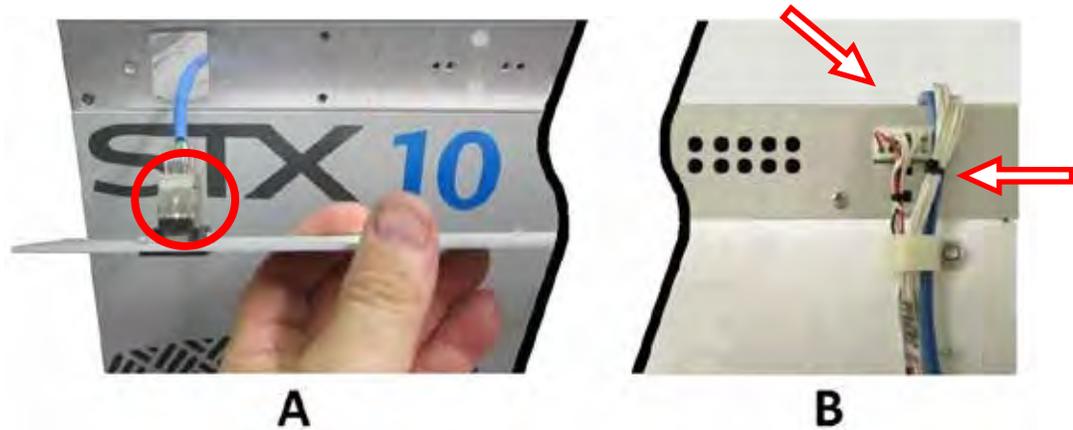


Figure 196 - Loosen CAT5E cable from harness in rear of cabinet

4. Remove the two Phillips screws and captive nuts to replace the RJ45 connector
5. Repeat the previous steps in reverse order to put panel back on cabinet.

15.13 AC Power Compartment

Replaceable part in the AC Compartment are the Circuit Breaker, Handle, Handle Shaft, IEC320 receptacle block & 20A Fuses.

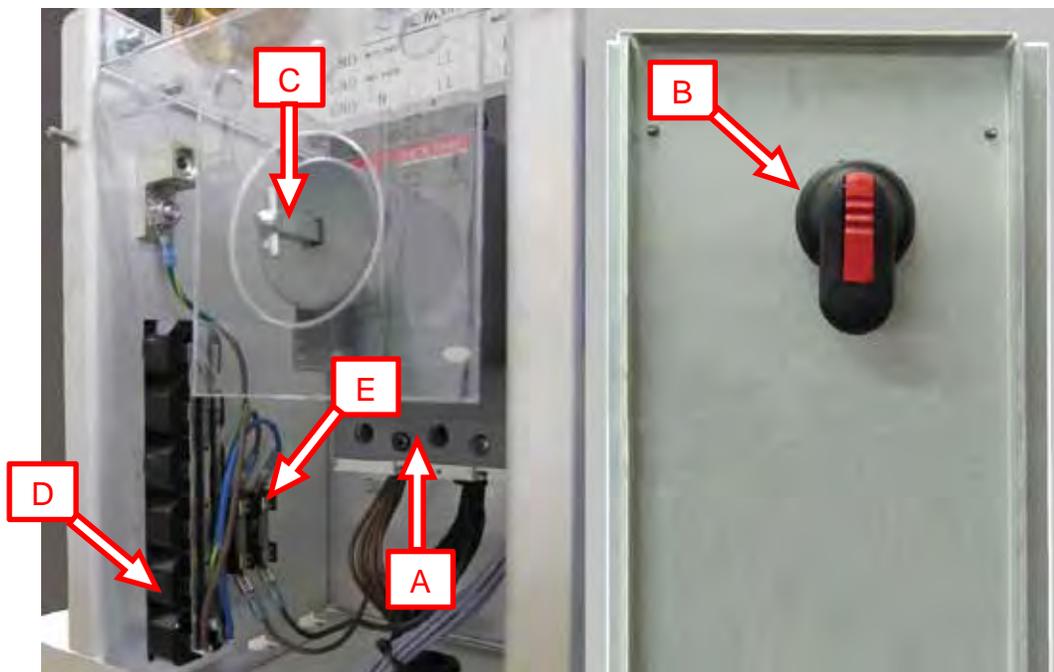


Figure 197 - AC Compartment

<input type="checkbox"/> A-341-0106	1	Circuit Breaker, 80A, T3N080TW
Or....		
<input type="checkbox"/> A-341-0107	1	Circuit Breaker, 125A, T3N125TW
<input type="checkbox"/> B-486-5500-100	1	Handle
<input type="checkbox"/> C-486-5500-600	1	Handle Shaft
<input type="checkbox"/> D-417-6121-251	1	IEC 320 Receptacle Block
<input type="checkbox"/> E-330-2000	2	Fuse, 20A 250V

- Straight Blade Screwdriver
- Phillips Screwdriver

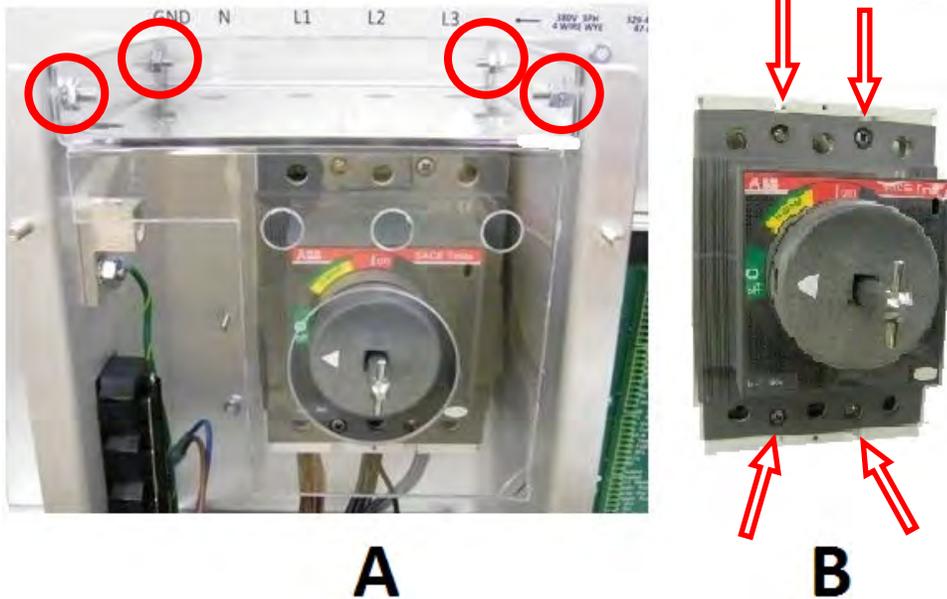
15.13.1 Circuit Breaker



ENSURE ac power input IS completely DISCONNECTED From STX Cabinet BEFORE servicing an of the AC Compartment components

1. Turn Handle to OFF which is the vertical position as shown in Figure 197, and remove Rear Access Panel.
2. Remove the Line and Load wiring from circuit breaker terminals with the straight blade screwdriver.

3. Remove four Phillips screws and captive nuts circled in Figure A to remove the clear shield from top of the AC Compartment
4. Remove the four Phillips screws located in Figure 198B and remove breaker



A
B
Figure 198 - Circuit Breaker

5. Replace new breaker in reverse order.

15.13.2 Circuit Breaker Handle Alignment

In the event the Circuit Breaker Handle is removed from the Rear Access Panel, Figure 199 below shows the correct position to reinstall the Handle to line up with the Shaft mounted on the Breaker.



Figure 199 - Handle Alignment