Broadcast Electronics
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STX 20
20 kW
FM Transmitter
Technical Manual

597-4015
Revision A
Feb 5 2019

STX 20 20kW Transmitter
Technical Manual

Broadcast Electronics Product Warranty (Two-Year Limited)

Broadcast Electronics hereby warrants all new products manufactured by Broadcast Electronics against any defects in material or workmanship at the time of delivery thereof, or that develop under normal use within a period of two (2) years from the date of shipment.

Broadcast Electronics reserves the right to repair equipment under warranty with new or refurbished equipment or parts. Broadcast Electronics' sole responsibility, with respect to any equipment or parts not conforming to this warranty, is to replace or repair such equipment upon the return thereof F.O.B. to Broadcast Electronics' factory in Quincy, Illinois, U.S.A. In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement.

This warranty shall exclude the following products, component parts and/or assemblies:

(a) Transmitter power output tubes shall only carry the original manufacturers' or suppliers' standard warranty in effect on their original shipment date.

(b) All computers, computer peripherals, cables, hard disk drives, etc., shall only carry the manufacturers' or suppliers' standard warranty in effect on their original shipment date.

(c) "Components", defined as separate and individual parts (e.g. transistors, integrated circuits, capacitors, resistors, inductors, fans, etc.), resold by Broadcast Electronics from another manufacturer or supplier, shall only carry a 90-day warranty, effective the date of shipment. Any such "Components" being returned for warranty claim must be (1) returned in their original packaging and (2) must be in new, unused condition. Broadcast Electronics is unable to process or resolve component defects or performance concerns on components that have been soldered, installed, wired or in any way altered from their new condition.

(d) "Resale Equipment", defined as equipment purchased from another manufacturer or supplier, then resold by Broadcast Electronics, shall only carry such manufacturer's or suppliers' standard warranty in effect as of the original shipment date. All warranty claims against any and all "resale equipment" sold by Broadcast Electronics must be filed directly with the original equipment manufacturer. Broadcast Electronics is unable to process or resolve equipment defects or performance concerns on products or services not manufactured by Broadcast Electronics.

This warranty shall not extend to claims resulting from any acts of God, terrorism, war, defects or failures caused by Purchaser or user abuse or misuse, operator error, or unauthorized attempts to repair or alter the equipment in any way.

Under no circumstances shall Broadcast Electronics be responsible for indirect, incidental or consequential damages, including, but not limited to transportation costs, non-authorized repair or service costs, downtime costs, costs for substituting equipment or loss of anticipated profits or revenue incurred by Purchaser, whether based in contract, tort or for negligence or breach of statutory duty or otherwise. The terms of the foregoing warranty shall be null and void if the equipment has been altered or repaired without specific written authorization from Broadcast Electronics, or if not installed according to Broadcast Electronics' instruction manuals, including, but not limited to, the absence of proper grounding, surge (TVSS) protection on the AC circuit panel or proper lightning protection/grounding on all output circuits, or if equipment is operated under environmental conditions or circumstances other than those specifically described in Broadcast Electronics' product literature or instruction manual which accompany the equipment. The warranty shall be voided if the product or subassembly is equipped with a tamper seal and that tamper seal is broken. Broadcast Electronics shall not be liable for any expense of any nature whatsoever incurred

this warranty. If the equipment is described as “used” equipment, it is sold as is and where is and no warranty applies unless authorized in writing.

EXCEPT AS SET FORTH HEREIN, AS TO TITLE AND AS SPECIFICALLY REQUIRED BY LAW, THERE ARE NO OTHER WARRANTIES, OR ANY AFFIRMATIONS OF FACT OR PROMISES BY BROADCAST ELECTRONICS, WITH REFERENCE TO THE EQUIPMENT, OR TO MERCHANTABILITY, FITNESS FOR A PARTICULAR APPLICATION, SIGNAL COVERAGE, INFRINGEMENT, OR OTHERWISE, WHICH EXTEND BEYOND THE DESCRIPTION OF THE EQUIPMENT

ON THE FACE HEREOF.

IMPORTANT INFORMATION

EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carriers' agent will present a receipt for your signature. Do not sign it until you have:

1) Inspected the containers for visible signs of damage and 2) Counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Claims for loss or damage will not be honored without proper notification of inspection by the carrier.

RF PRODUCT TECHNICAL ASSISTANCE, REPAIR SERVICE, PARTS -

Technical assistance is available from Broadcast Electronics by letter, prepaid telephone or E-mail. Do not return any merchandise without first contacting Broadcast Electronics and receiving prior written approval and a Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to the circumstances and reasons when requesting return of merchandise. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured, and well protected. If proper shipping materials are not available, contact the RF Technical Services department for a shipping container. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. All returned merchandise must be sent freight prepaid and properly insured by the customer

Emergency and warranty replacement parts may be ordered from the following address. Be sure to include the equipment model number, serial number, part description, and part number. Non-emergency replacement parts may be ordered directly from the Broadcast Electronics stock room (see next page.)

RF TECHNICAL SERVICES

Telephone: +1 (217) 224-9617
E-Mail: rfservice@bdcast.com
Fax: +1 (217) 224-6258

FACILITY CONTACTS

Broadcast Electronics, - Quincy Facility
4100 N. 24th St. P.O. BOX 3606
Quincy, Illinois 62305
Telephone: +1 (217) 224-9600
Fax: +1 (217) 224-6258
General E-Mail: bdcast@bdcast.com
Web Site: www.bdcast.com

PARTS

Telephone: +1 (217) 224-9617
E-Mail: parts@bdcast.com

RETURN, REPAIR, AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to circumstances and reasons when requesting return of merchandise. All returned merchandise must be sent freight prepaid and properly insured by the customer.

MODIFICATIONS

Broadcast Electronics, reserves the right to modify the design and specifications of the equipment in this manual without notice. Any modifications shall not adversely affect performance of the equipment so modified.

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/cm^2 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/cm^2 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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Tables

1 Overview

The STX HP FM transmitter series is designed to provide a cost effective solution for the FM broadcast market. The STX HP is frequency agile and the STX 20 provides power levels from 2 kW to 20 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 maunal is set up information for 20kW system with the STXe500 exciter being used for RF drive and control of the high power operation of the STX 20. The manual also includes maintenance, and service information for the STXe500, 10kW power block cabinets and the STX20 cabinet.

1.1 Instructions

Use this document for the installation and technical resource for STX 20 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.

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

1.4 STX 20 Technical Specifications

Table 1 – Specifications: STX 20 & Exciter

STX 20 RF SPECS

Output Power:

Range: 9 kW to 20 kW

Efficiency:

70% or greater typical @ 20 kW (AC to RF)

VSWR:

Rated power into 1.5:1 maximum, capable of operating into higher VSWR with automatic power reduction, open and short circuit protected at all phase angles

Impedance:

50 Ohm

Frequency:

Range: 87.5 MHz to 108 MHz, tuned to specific operating frequency, exciter programmable in 10 kHz steps

Stability: ±300 Hz, 0° to 50° C

Regulatory:

Meets IEC 215 safety requirements, CE, IC, FCC

Modulation:

Type:

Direct frequency modulation of carrier frequency

Capabilities:

Greater than ±350 kHz

STXe 500 Exciter Audio Specifications

GENERAL

RF Power Output:

25-550W

Output Impedance:

50 ohms nominal

VSWR:

Rated power into 1.5:1 VSWR. Open and short circuit protected at all phase angles

Frequency Range:

87.5MHz to 108MHz; 10kHz increments

Frequency Stability:

Internal TCXO: +/-100Hz factory calibration, +/-4ppm agin/temp, -10 degrees C to +50 degrees C; External Input: +/- accuracy of reference source

Audio Inputs:

AES, L&R analog, Unbalanced composite, SCA audio inputs, RDS input

Modulation Type:

Direct-to-channel digitally generated FM (no analog up-conversion); FM only

Modulation Capability:
Up to 300kHz

Asynchronous AM S/N Ratio:
75dB below rated power reference carrier with 100% AM modulation at 400Hz, with no FM modulation present.

Synchronous AM S/N Ratio:
60dB below rated power reference carrier with 100% AM modulation at 400Hz, with FM modulation +/- 75kHz at 400Hz

Spurious and Harmonic:
85dB or better typical, low pass filter standard

AC Input:
90 to 264VAC; 47-63Hz

Power Factor:
0.99 typical at 110VAC, 0.95 typical at 220VAC

AC Inputs Testing:
Tested to EN 301 489-1, including Voltage Dips and Dropouts (Section 9.7B), Voltage Surges (Section 9.8), and conducted immunity and conducted radiation

Regulatory:
FCC; IC; CE; BETS-6; IEC 215 Safety

Operational Modes:
Stereo, mono (L+R), L only, R only

STEREO

Connector Types:
AES: Wire – XLR
L&R: XLR

Input Level:
AES:
- 2 dBfs for 100% modulation; 16-24 bits (32, 44.1, 48 or 96 kHz typical rates for AES/EBU devices)

L&R:
+10 dBm for 100% modulation into 600 ohms

Impedance:
AES:
110 ohm balanced

L&R:
600 ohms or 10 k selectable; balanced

Amplitude Response:
AES:
±0.25 dB, 20 Hz to 15 kHz

L&R:
±0.25 dB, 20 Hz to 15 kHz

THD + Noise:

AES:

0.03 or better @400Hz measured 10 Hz-22Khz, 75 uS deemphasis

L&R:

0.005 typical @400Hz, measured 10 Hz-22Khz, 75 uS deemphasis

S/N Ratio:

AES:

95dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth,A-weighted filter
100dB typical below 100% modulation @ 400 Hz,

10Hz-22Khz bandwidth, CCIR-468 filter

L&R:

86dB or better below 100% modulation @ 400Hz, 10 Hz-22Khz bandwidth, unweighted

Analog:

93dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth,A-weighted filter 98dB typical below 100% modulation @ 400 Hz,

10Hz-22Khz bandwidth, CCIR-468 filter

S/N Ratio

Stereo::

80dB or better below 100% modulation @ 400Hz, unweighted

Stereo Separation::

70dB or better, 20HZ to 15kHz

AES:

80 dB, 20 Hz to 15 kHz

L&R:

70 dB, 20 Hz to 15 kHz

Pilot Stability:

±0.3 Hz, 0º C to +50º C

Audio Overshoot::

150% peak deviation max.

Composite Performance:

Connector Type:

BNC Unbalanced: BNC

Input Level:

3.5 V p-p for 100% modulation into 10 kOhms

Impedance:

Balanced: 10 kOhm or 50 ohm selectable, Unbalanced: 10 kOhm

Amplitude Response:

±0.03 dB 20 Hz to 53 kHz; 0.1 dB 53 kHz to 99 kHz

Phase Response:

±0.1º from linear phase; 53 kHz to 100 kHz

THD + Noise:
0.005% or less @ 400Hz, 10-22Khz bandwith, 75 us deemphasis

Intermod Dist:
SMPTE: 0.01% or less (60/7000 Hz, 1:1 ratio) DIM-B: 0.005% typical (14Khz)

FM S/N Radio:
88 dB below 100% modulation @ 400 Hz, 10Hz-22Khz bandwidth, unweighted

FM S/N Ratio:
95dB typical below 100% modulation @ 400Hz, 10Hz-22Khz bandwidth, A-weighted filter

FM S/N Ratio:
100dB typical below100% modulation @ 400 Hz, 10Hz-22Khz bandwidth, CCIR-468 filter

SCA/SCA2/RDS:

Impedance:
10k ohms unbalanced

Amplitude Response:
+/- 0.1dB; 53Hz to 100kHz

19kHz Output:
19kHz synchronization clock for external RBDS/RDS operation 1V pp into high impedance

STXe500 MECHANICAL & PHYSICAL

Height:
3.5 inches (2 RU)

Width:
19" EIA rack mountable

Depth:
21 inches

Weight:
25lbs. unpacked

STX20 MECHANICAL & PHYSICAL

Height:
68” (172.7 cm)

Width::
44.75” (113.7 cm)

Depth::
30” (76.2 cm)

Weight::
1050lbs (476.3 kg) unpacked

RF Output Connector:
3 1/8" EIA Rigid Coax Clamp

ENVIRONMENTAL

Temperature Range:
0 degrees C to +50 degrees C

Altitude:
7500 ft. (2286 M) @ 50 Hz; 10,000 ft. (3048 M) @ 60 Hz

Humidity:
0-95% Non-Condensing

ELECTRICAL

AC Input Voltage:
196-252 VAC, DELTA (or 340-435 VAC 4 WIRE WYE), 50/60 Hz three phase, single phase input power optional

AC Power Consumption:
Typical at 20,000 W RF Power Output; 28,964 W

Power Factor:
0.98 at 230 VAC

ALL SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

1.5 Default Operation

Every STX 20 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 – 20 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
    - Off
    - -12.0 dB input gain
22. SCA2
    - Off
    - -12.0 dB input gain
23. RDS – Off, -12.0 dB input gain
    - Off
    - -12.0 dB input gain
24. Real Time Clock – shipped with Quincy, IL time, factory reset does not affect this
    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.

25. Controller Ethernet
    - DHCP - Disabled
    - I.P. – 10.2.4.110
    - Subnet Mask – 255.255.0.0
    - Gateway – 10.2.1.1

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

2 Preparing to Install

2.1 Verify Contents of Shipment

The STX 20 is disassembled to some level for packaging and shipping. The amount of disassembly may vary depending on shipping carrier used and final destination, international vs domestic. For most domestic ground carriers such as UPS, with a 150lbs weight limit, the following is a typical packing check list for basic STX 20 system.

2.1.1 20kW Systems - Basic

☐ 909-2003-206T			STX 20 20kW, 220V, 3PH, DELTA
☐ 909-2003-226T			STX 20 20kW, 220V, Single Phase
☐ 909-2003-386T			STX 20 20kW, 220V, 3PH, WYE
☐ Box,		2	959-0000 PA Modules
☐ Box,		2	959-0000 PA Modules
☐ Box,		2	959-0000 PA Modules
☐ Box,		2	959-0000 PA Modules
☐ Box,		7	540-5205 PA Power Supplies
☐ Box,		7	540-5205 PA Power Supplies
☐ Box		1	540-5205 STXe 500 Exciter
☐ Book 597-4015		1	STX 20 20kW, Technical Manual
☐ Bag 979-6320		1	STX HP 10kW Install Kit
☐ 400-0208		1	Strip, Quiet Shield
☐ 949-4130		1	Exciter Activation Stub (STXe500)
☐ 418-0283		1	37PIN D-SUB FEMALE SOLDERPOT
☐ 417-0284		1	37PIN D-SUB SHELL
☐ 418-1550-010		4	10PIN CONNECTOR, PLUG
☐ 471-6302		1	AIR DAM, PA POWER SUPPLY

2.1.2 20kW Systems – Alternates and Options

1. The basic 20kW transmitter does not include the external reject load. If purchased with the transmitter, the reject load would be a separate box, pallet or container
2. If purchased, the EP1 Switcher Option with a second STXe500 would have this exciter removed also for shipment. The EP1 unit would remain in the STX 20 cabinet.
3. If purchased, the option for an 8th PA Power Supply in each of the 10kW power blocks would be boxed with the other 7 PA Supplies for the basic systems or left in the cabinet on rack installation options

2.1.3 Additional Items Sold Separately Requiring Separate Packing

☐ 20kW or larger full power test load
☐ Rigid or Semi-Rigid coax and connectors. (1-5/8" or 3-1/8")
☐ 3-1/8" Coax Switch for Main/Alt transmitter operation.
☐ AC power mains connection wire and main breaker
☐ Remote station interface controller
☐ Networking equipment and cable(s)

2.2 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

2.3 Estimated Time for Installation

Installation and initial setup should take between 4- 6 hours for sites that already have AC service, RF output system and Program & HD equipment in place. This time includes placement of the STX 20, but does not include removal of an existing transmitter.

If other equipment is needed to be installed and/or set up other than the STX 20, addition time will be required.

3 Installation and Initial Setup

This section covers installation for a basic, STX 20kW transmitter. Other systems purchased may include optional equipment or RF systems. Some of these installation steps may not apply for these optional purchases and may have other documents to augment the installation.

Review Section 5, Rear Assemblies to indenify components and assemblies and their locations. Depending on the type of packaging for shipment, some equipment and cabling have been removed with will need to be reinstalled. Use the following information to identify any the cabling that may have been disconnected for shipping and equipment removal.

3.1 Control Communications

1. Locate Etherrnet cable 846-4010, item 1 in Figure 1. This connects the STXe500 Ethernet port connector and the #2 port in the Ethernet Switch mounted on side of the master power block.

2. Locate cable 846-4005 , item 2 in Figure 1. This plugs into COM IN on the master power block and the COM OUT connector on the STXe 500.

3. Item 3. This cable is harnessed on the master power block cabinet and connects to the #1 port on the Ethernet Switch to front of the STX 20.

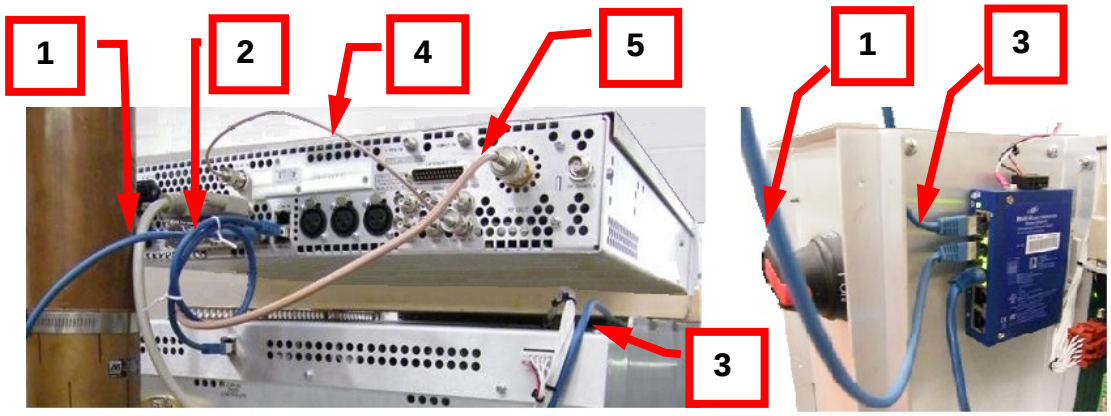


Figure 1 – RF Coax, Comm & Ethernet Cables

3.2 Exciter PA RF Drive

4. Locate coax cable 949-4163, item 4 in Figure 1. This jumpers the STXe500 EXC RF OUT to the PA RF IN connector on back of the STXe500.

5. The STX 20 RF Drive Coax Cable , item 5 in Figure 1. This RF cable connects RF Out of STXe500 to the RF Input Port on the 2-Way Power Divider mounted on the center channel of the STX20 cabinet. Refer to Section 5, item 5.5.

3.3 BE-Interface Activation Stub

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

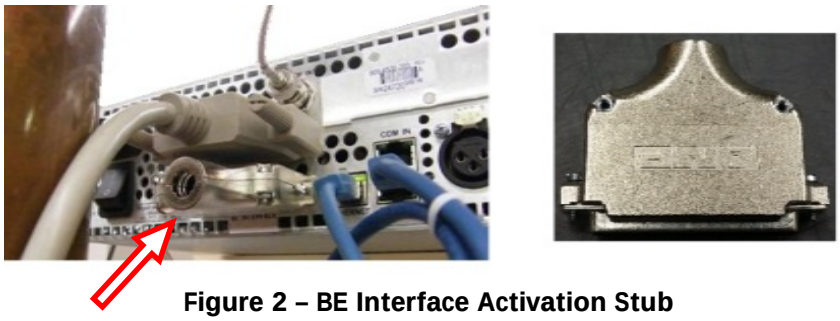


Figure 2 – BE Interface Activation Stub

NOTE: There are system options that utilize this input such as the EP1 switcher and the 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.

3.4 Customer Interface Board & GPIO Cable

The STX20 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 3 or with a failsafe relay as part of the remote control system wiring.

STX20 remote control installation requires Active Low/Ground Logic. Refer to Table 2 in Section 5.3.5 for terminal details for connections to the Customer Interface Bd.

A GPIO Cable is installed in the STX20 to connect the Customer Interface Bd to the back of the STXe500. However if the 10kW power blocks are removed for shipping, locate and install the GPIO Cable as shown in the arrows in Figure 3.

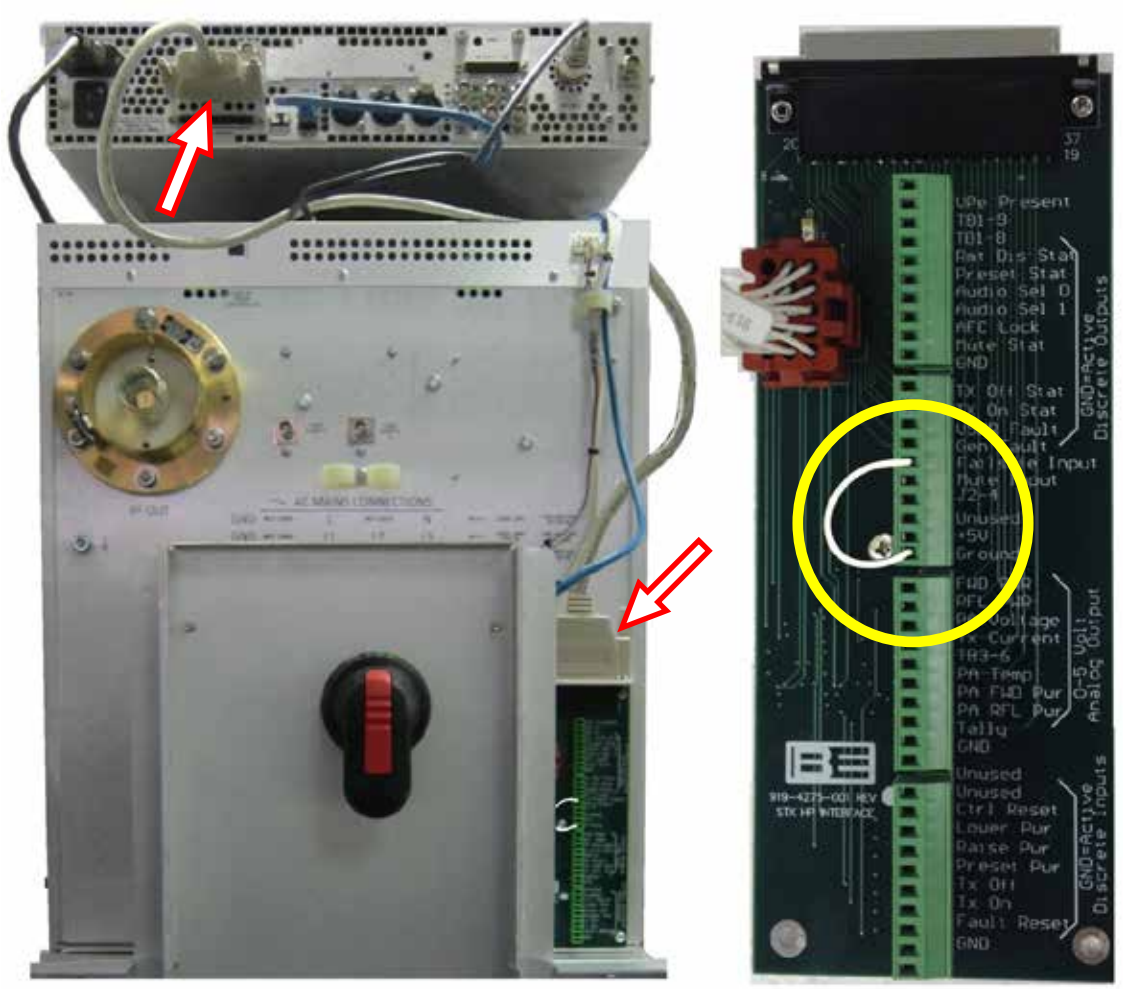


Figure 3 - Customer Interface Board

3.5 Transmitter Antenna RF Out

The STX 20 antenna RF output is 3-1/8". A second output is for combiner reject load and this is 1-5/8". Both outputs are unflanged coax.

1. Loosen the hose clamps that ships with the flanges and attached coax components. When installing any elbow, ensure that the female inner conductor is aligned with the male inner connector to avoid splitting male connector.

2. Connect the external reject load with 1-5/8" coax and components.

3. Connect the 3-1/8" coax and compenents to the sites' RF system, test load & antenna.

3.6 AC Power Service and Installation

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.

In a three phase power service, the transmitter must be connected to a closed delta or wye. Refer to these configurations diagramed in Figure 5. 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.

1. Use 1 AWG THHN or equivilent for providing 3 phase power to the STX 20. Multiconductor cable may also be used provided it complies with local electric codes.

2. Use a 3/16" Allen Key for the Main AC Terminal connections in Figure 4

Figure 4 – STX 20 Main AC Terminal Block

3. When stripping back the cable jacket, be sure to leave enough of the jacket so as not to expose any of the wire conductor outside of the safety cover through holes

DO NOT INSTALL ANY STX HP PRODUCT WITH OUT USING THESE SAFETY COVERS.

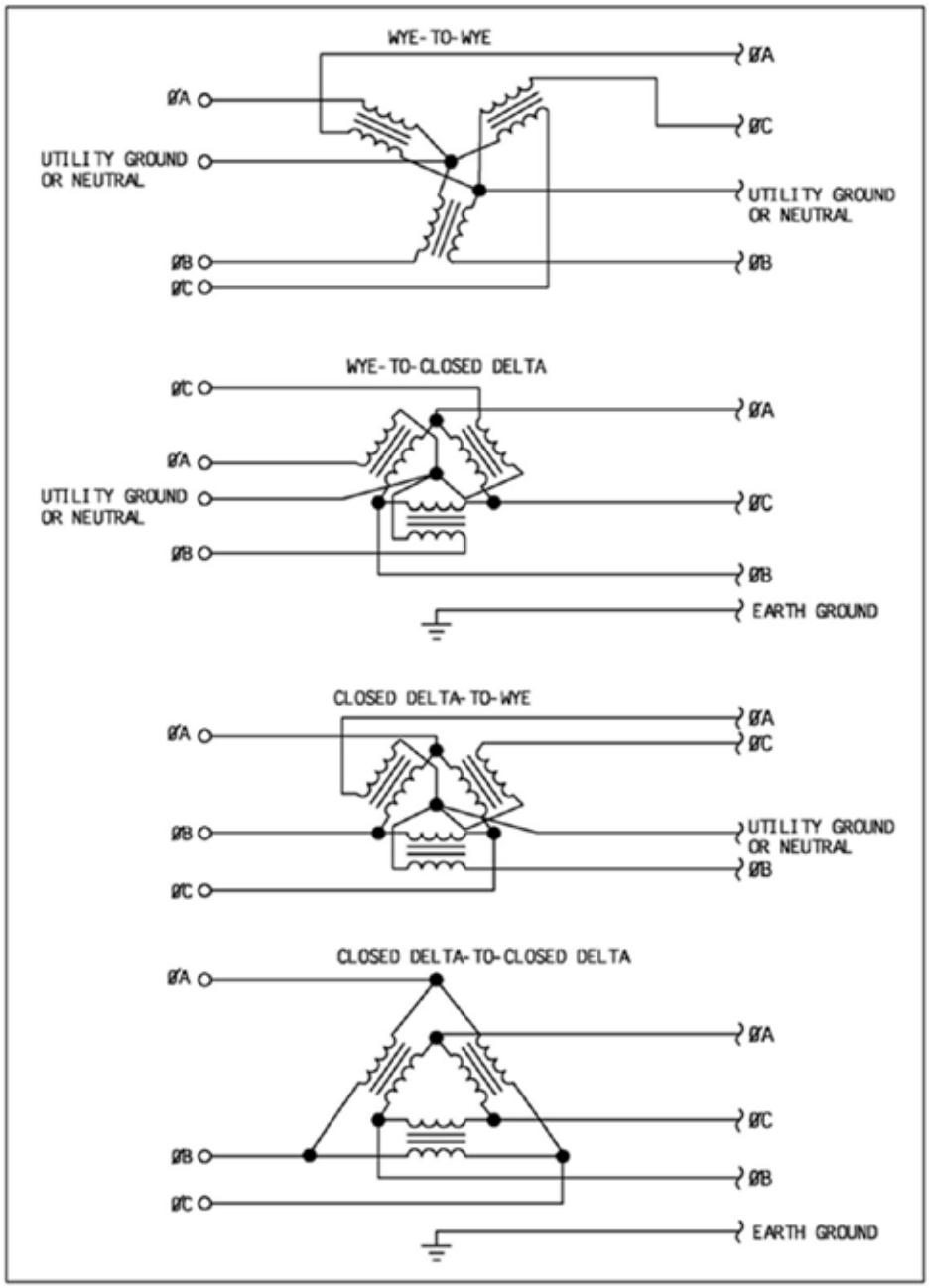


Figure 5 - Three Phase AC Main Configurations

3.7 10kW Power Blocks - AC Distribution & Servicing

Each STX 20KW has two 10kW Power Blocks. The power blocks are already wired to the main AC terminal. Each power block uses a circuit breaker with disconnect handle to provide a seperate AC disconnect . Refer to Figure 6. The circuit breaker is mounted on the rear of the power block and is housed in its own enclosure to provide AC power to the various DC supplies used in the cabinet. In addition, an IEC-320 AC receptacle is providing for AC power to STXe500 exciter and other ancillary equipment used in the STX 20.

If the power block cabinets are removed for shipment or servicing, refer to steps 1 though 6.

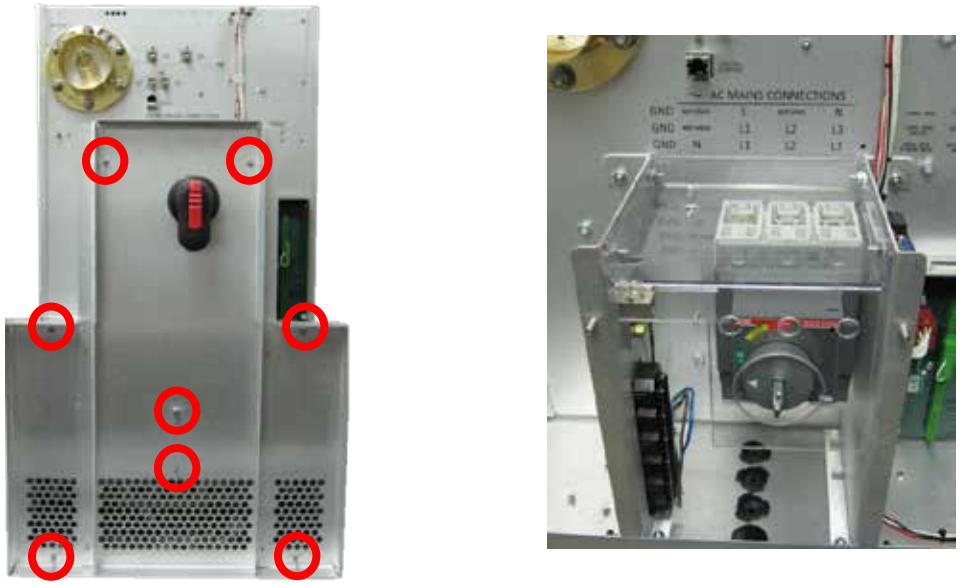


Figure 6 - Power Block AC Wiring

If a power block cabinet is removed for shipping or servicing, use the AC connection information that is silkscreened on the back above the breaker enclosure in Figure 6.

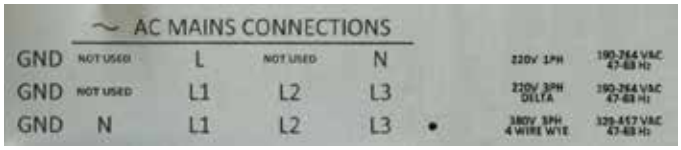


Figure 7 – Power Block AC Input Silkscreen

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

1. The power block Handle will remain attached to Rear Access Panel and is required to be in the OFF position to remove the Rear Access Panel of a power block

2. Remove the 8 nuts circled on rear panel in Figure 6 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 Figures 8 & 9.

Figure 8 – Tool Access for AC Connections

4. The safety ground connection requires a 3/16" Allen key. Refer to Figure 8

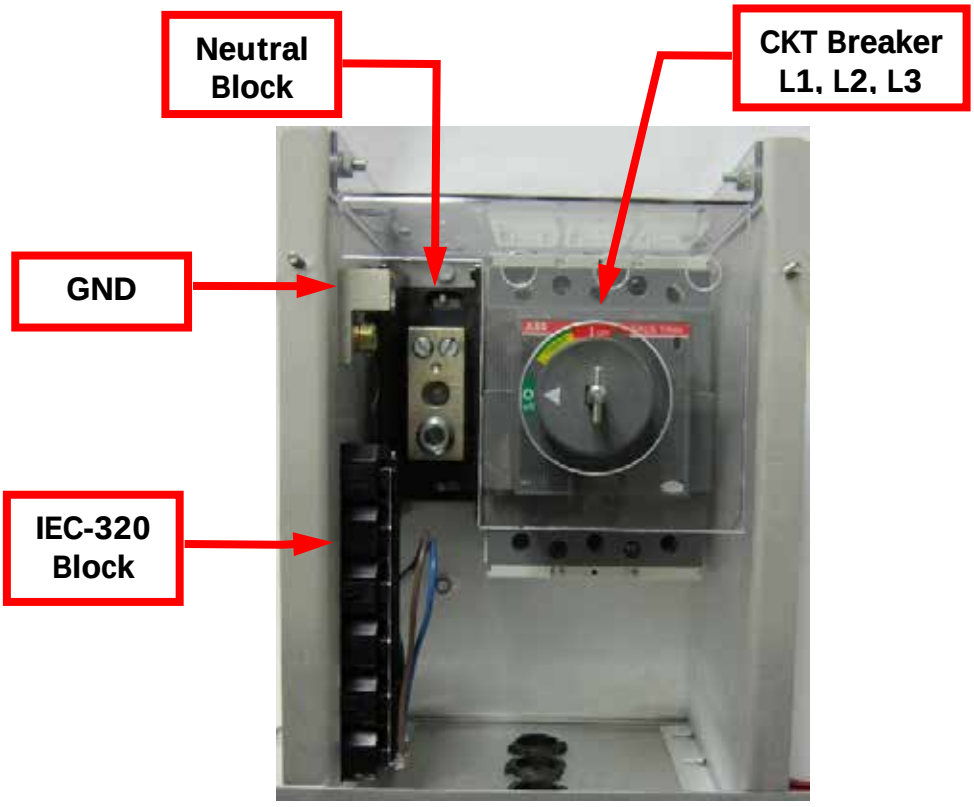


Figure 9 – Power Block AC Components

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 7.

6. Connect the STXe500 AC input to the IEC-320 block with the provided cord.

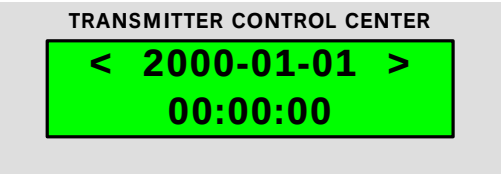
3.8 Turn on AC

1. Insure the power block AC Breaker Handles are in the “ON” position.
2. Turn on the main AC power from the sites disconnect panel.
3. Turn on the power switch in the rear of the STXe500 if not already on.

3.9 Set Time and Date

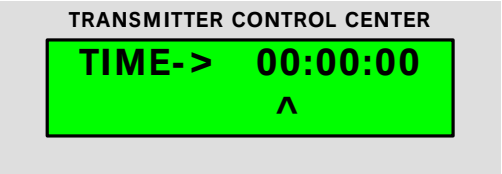
The internal real time clock holds the current time and date for use in the event log. This is a rudimentary device that supports 24-hour format and does not adjust for daylight saving. If installing during summer in a daylight saving region, following standard non-daylight time is recommended instead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



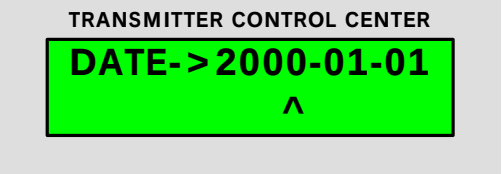
2. Press up or down to select the time editing screen.

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.



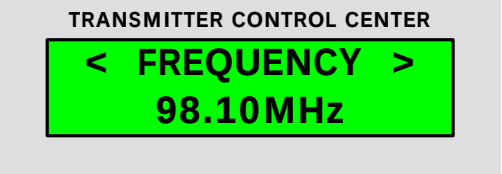
7. Press enter when finished editing for the setting to take effect in the system, save, and keep time.

3.10 Frequency

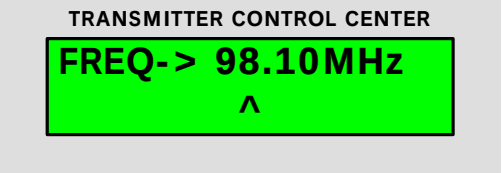
The STX 20 system is built around frequency agile exciter and PA hardware. The frequency can be changed directly from the front panel of the STXe 500. No hardware modifications or tuning procedure are required when the carrier frequency is changed.

If the STX 20 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.

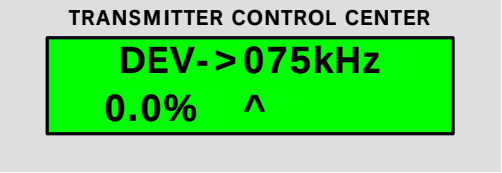
3.11 100% peak modulation

The STX 20 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.

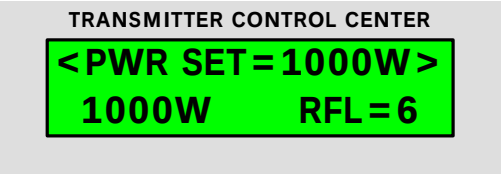
3. Press left or right to move the cursor between frequency digits. Press up or down on each digit to increment or decrement the number. This change takes effect immediately in the system without saving the setting to allow for active tuning.



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

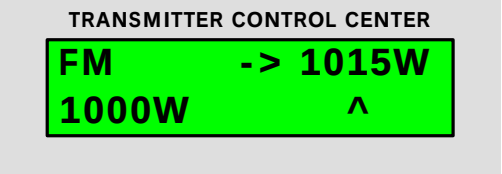
3.12 Power set point

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.

3.13 Primary Audio Source

The STX 20 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.

3.13.1 AES

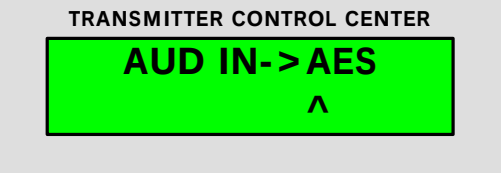
The STXe supports standard AES audio as well as 192 kHz Composite over AES. The 192 kHz Composite over AES operates with various brand name systems including Wheatstone, Omnia and Orban audio processors.

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

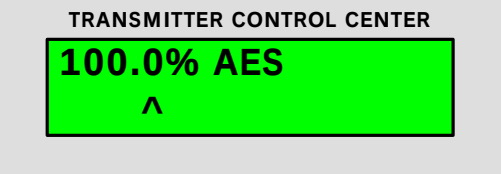
1. Connect an XLR cable from the desired AES audio source.

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.

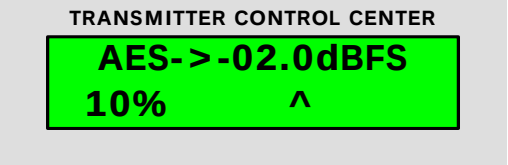
7. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.

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%.



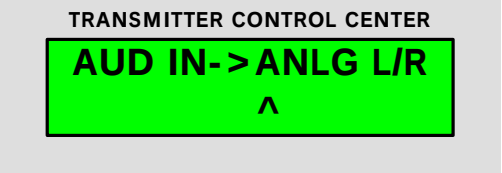
11. Press enter when finished editing to exit the sub-menu.

3.13.2 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.

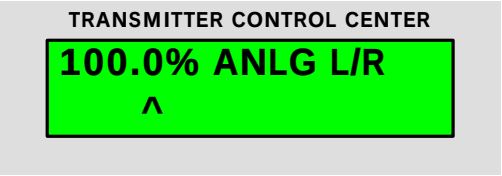
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO INPUT menu. Press enter to continue.

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.



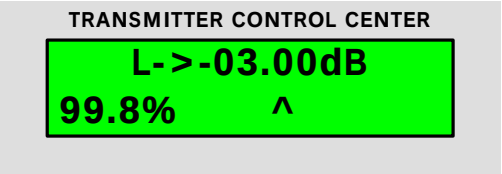
5. Press enter when finished editing for the setting to take effect in the system and save.

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.

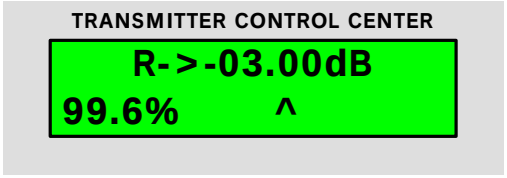
8. The display will show the current peak modulation attributable to the Left input. The level can be adjusted by changing the associated gain/attenuation. This has a range of -96.0 dB to +22.0 dB in 0.25 dB steps. Press left or right to move the cursor.

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.

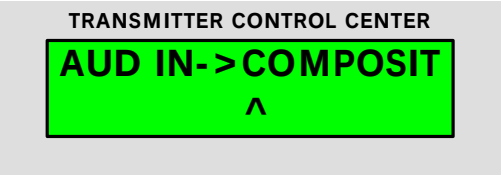


3.13.3 Composite

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.

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

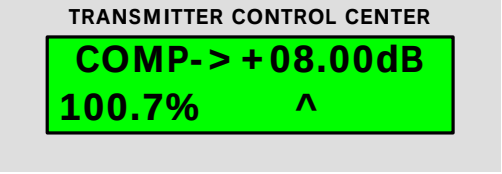


4. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.

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

6. 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%.

7. 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

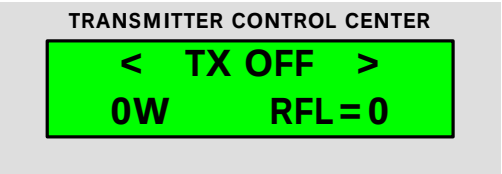


8. Press enter when finished editing to save the L calibration setting.

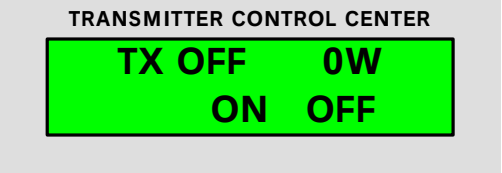
3.14 Turn RF Transmission On

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.

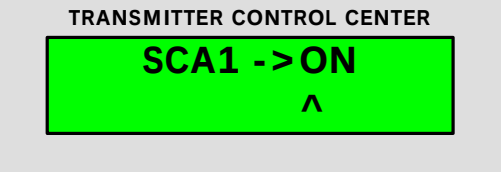
The setup of these audio input sources all follow the same pattern as one another Repeat these steps below to utilize any of these inputs.

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.

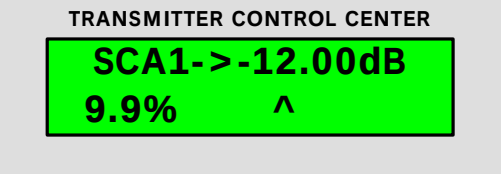
7. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the AUDIO LEVEL menu. Press enter to continue.

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

9. 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%.

10. 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.

11. 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.

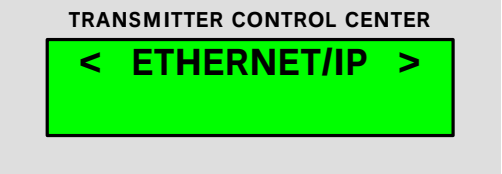
Consult your network manager or internet service provider to ensure that the correct IP settings are used.

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.

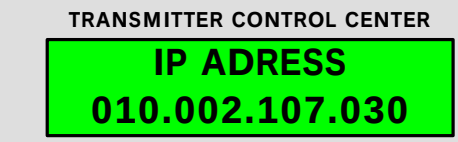
1. From the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the ETHERNET/IP menu. Press enter to continue.

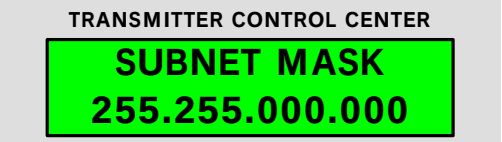


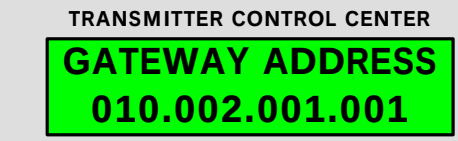
2. Press up or down to select the port to be set up. CONTROLLER is the ETHERNET port on the STX. Exgine is the ETHERNET DATA port on the optional VPeXG system. VPe is the ETHERNET VPE port on the optional VPeXG system. Press enter to continue.

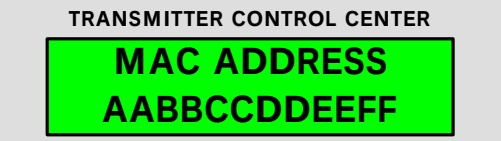
3. Press up or down to select the IP parameter to be observed or changed. Press enter to continue.

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.

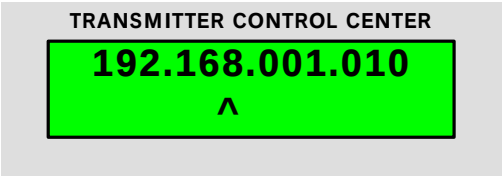








5. Press left or right to move the cursor to any of the 12 digits. Press up or down to increment or decrement the number. Press enter when finished making the setting change.



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.

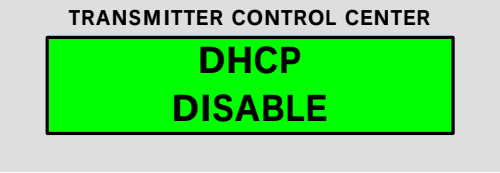
Use either this dynamic host control setup or static IP setup.

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.

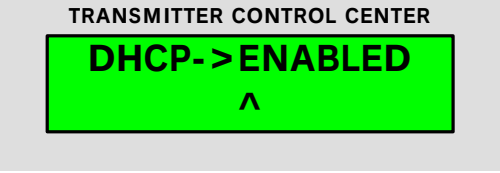
2. Press up or down to navigate to the ETHERNET/IP CONTROLLER. Press enter to continue.

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.

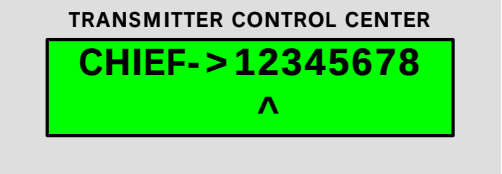
4.3 Password

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.



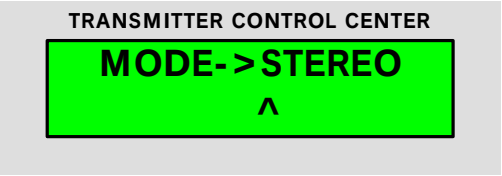
4. Press enter when finished editing for the password to take effect in the system.

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.

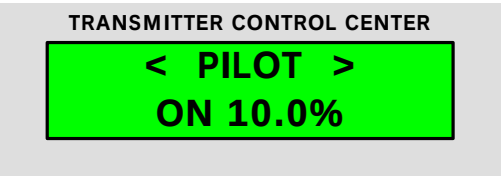
2. Press up or down to select STEREO.



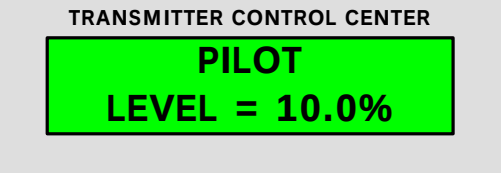
3. Press enter for the selected mono/stereo mode to save and take effect in the system.

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.

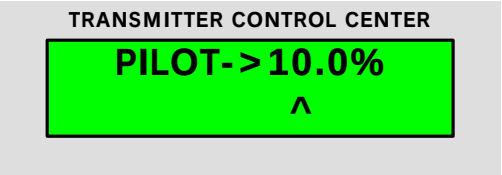
5. To change the injection of the 19kHz stereo pilot: from the main screen on the transmitter control center on the front panel of the main assembly, press up or down to navigate to the PILOT menu. Press enter to continue.



6. Press up or down to select LEVEL.



7. 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.



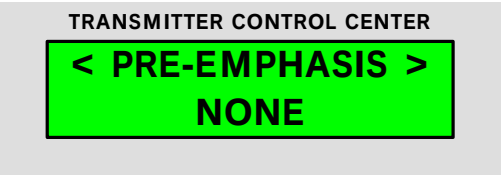
8. Press enter for the pilot level to save and take effect in the system.

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.

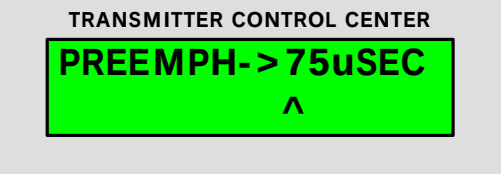
4.5 Pre-Emphasis

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 μS.

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 pre-emphasis menu. Press enter to continue.



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

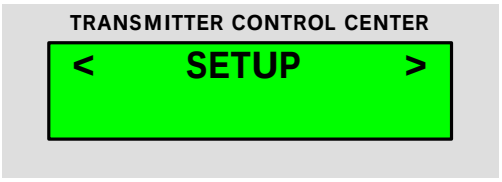


3. Press enter for the filter change to save and take effect in the system.

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.

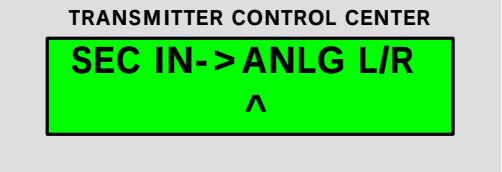
1. From the main screen on the transmitter control center on the front panel of the main



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 3.13.

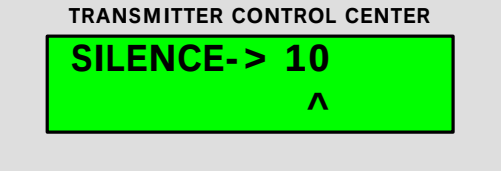


4. Press enter when finished with selection for the secondary audio source to take effect in the system.

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 STX20 Rear Assemblies & Connections

The reference designators in Figure 9 below refers to sub-section numbers in the following pages. For example, location or equipment pointed out by box 1 in this figure, will have description and details provided in section 5.1. Box 2 corresponds to section 5.2 and so forth.

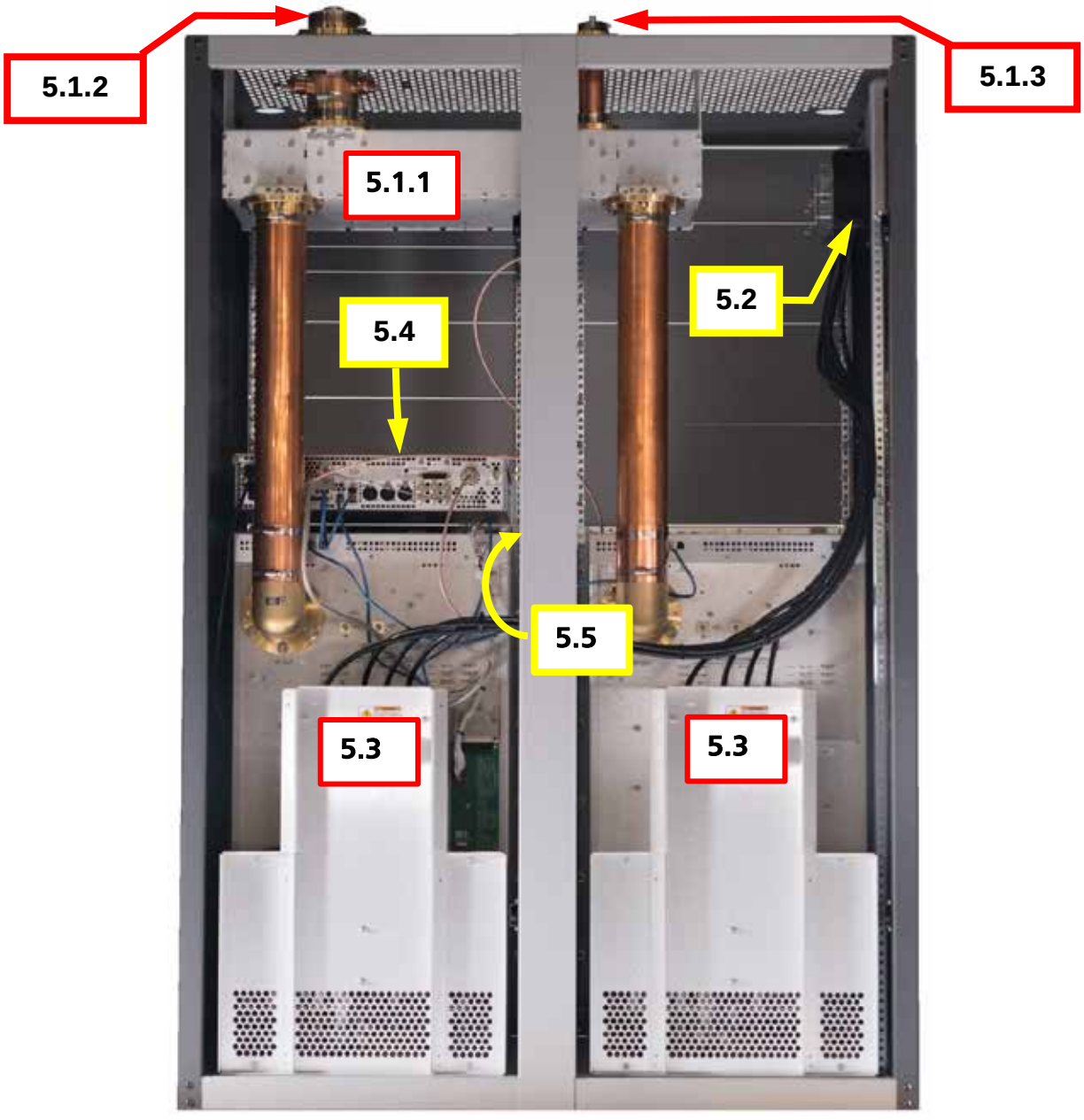


Figure 10 – STX20 Rear Assemblies

5.1 20kW Combiner and Connection Ports

5.1.1 90 Degree Hybid Combiner

The STX 20 uses a broadb and hybrid combiner that requires a 90 degree offset for the 10 + 10 combining. The 90 phase shift is provided by the power divider, item 5 in this section.

5.1.2 20KW Output Port

The antenna output port is a 3-1/8" unflanged connection.

5.1.3 Combiner Reject Port

The combiner requires a 5kW reject load. The 1-5/8" unflanged output port is provided for this requirement.

5.2 STX 20 AC Power Terminal Block

Three phase power is connected to his location. The electical cabling on the load side of the terminal block is provided which routes power to the two the 10kW power blocks.

Figure 11 shows a typical Delta wiring with GND connected at T-4.

For a WYE service, Neutral would be connected to T-4

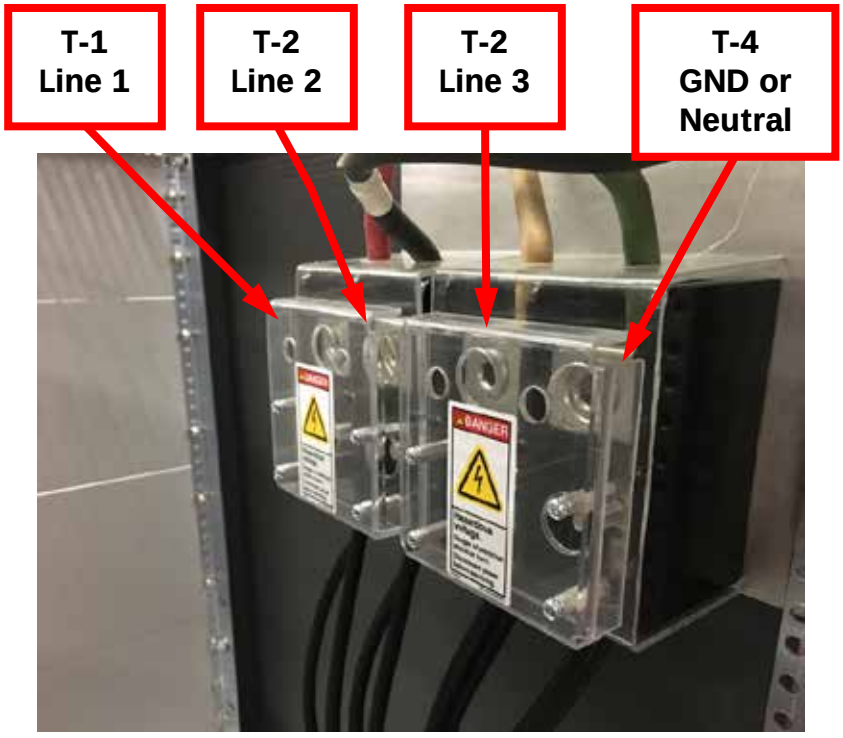


Figure 11 – STX 20 AC Input Terminal Block

5.3 10KW Power Block Assemblies

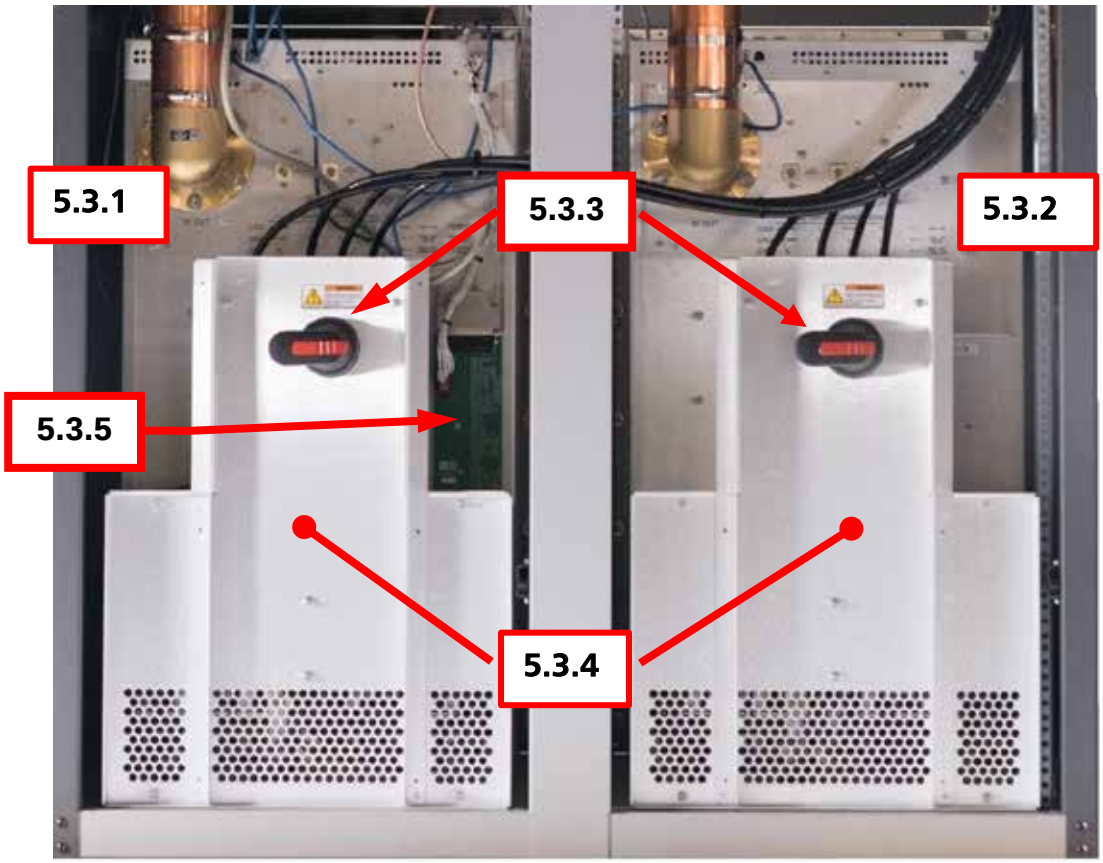


Figure 12 – 10kW Power Block Rear

5.3.1 10kW Master Power Block Cabinet

PA cabinet enclosure to house 10kW subassemblies.

5.3.2 10kW Slave Power Block Cabinet

5.3.3 Power Block AC Disconnect Switches

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

5.3.4 Power Block Rear Access Panels

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

5.3.5 Customer Interface Board

The STX 20 Customer Interface Bd is for any discreet wiring for the site's control and monitoring system.

Table 2 defines the connections for the four terminal strips, TB1, TB2, TB3 & TB4., Each terminal is a 10 pin header with TB1 at the top of board just underneath the GPIO connector J2. Table 2 will be sequence matched from top to bottom. Use the screw type connectors, BE p/n 418-1550-010, provided in the installation kit. The connectors handle wire sizes 16 – 26 AWG,

Figure 13 - Customer Interface Board

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.
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.

Pin	Direction	Name	Description
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

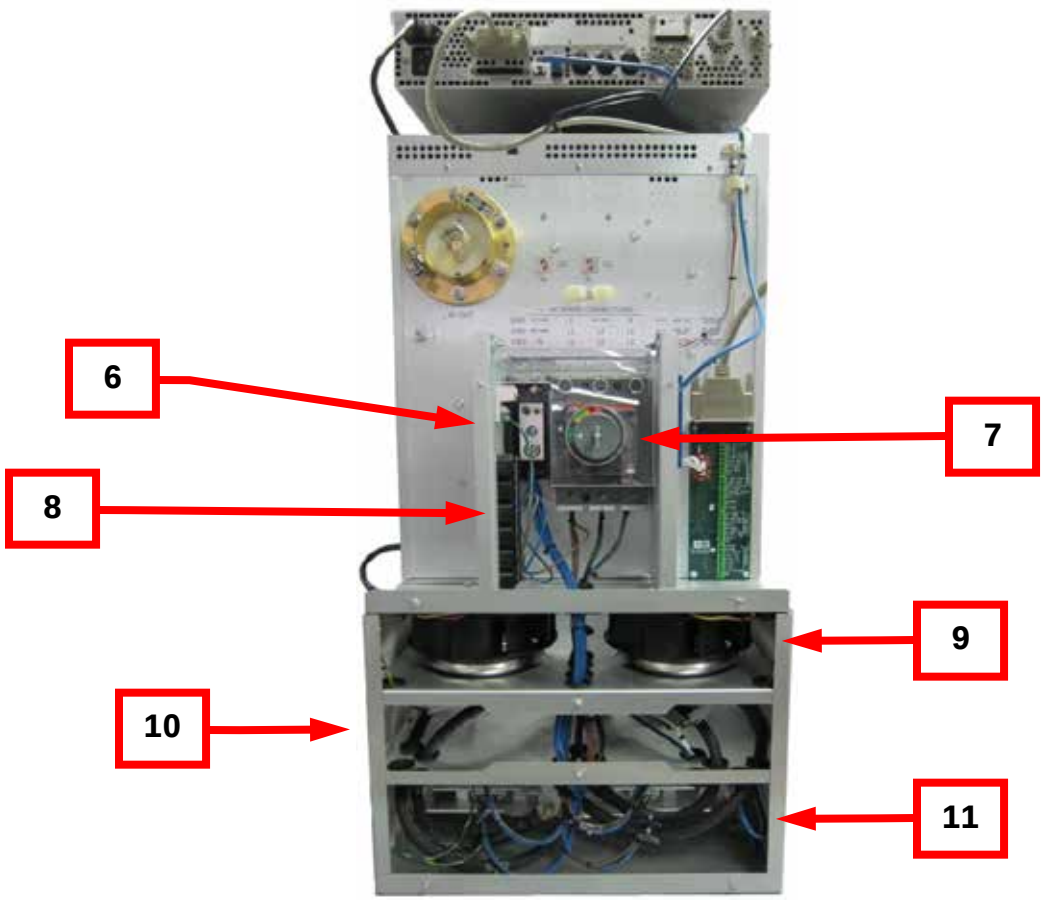


Figure 14 – 10kW Power Block w Rear Panel Removed

5.3.6 AC Input Enclosure

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

5.3.7 Disconnect Circuit Breaker

3-pole circuit breaker.

5.3.8 IEC-320 AC Receptacle Block

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

5.3.9 PA Cooling Fan Enclosure

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

5.3.10 DC Power Supplies Rear Access

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

5.3.11 PA Power Supply Mother Bd Rear Access

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

5.4 STXe 500 Rear Panel Connections

In addition as being the exciter for the STX20 transmitter system, the STXe500 provides the overall transmitter system control and RF IPA drive for power block 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 5.4.1

The reference designators Figure 14 refer to sub-section numbers. For example, Flag 1 corresponds to details in section 5.4.1, Flag 2 corresponds to section 5.4.2, etc.

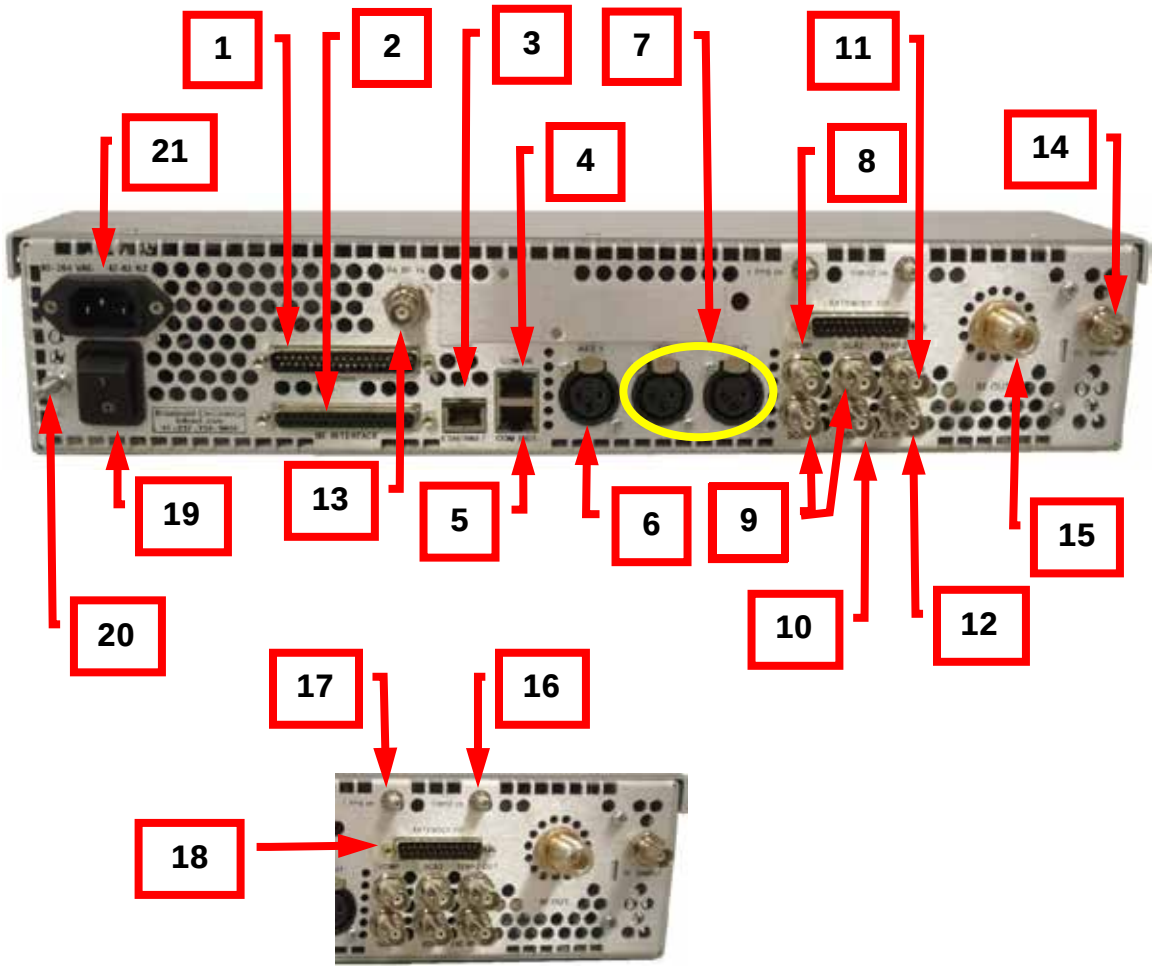


Figure 15 – STXe 500 Rear Panel

5.4.1 STXe 500 GPIO Connection

The GPIO connection in the rear of the STXe500 is cabled to the Customer Interface Bd to route the site's I/O requirments to the control system in the STXe500. If the STXe500 is removed or the GPIO cable is removed, the unmute/failsafe will need to be grounded at the 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 16 – 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.

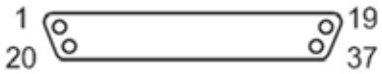


Figure 17 - Standard D-Sub 37 Numbering

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

5.4.2 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

5.4.3 Ethernet

Ethernet is provided on a standard 10/100 Mbps RJ45 connector. On an STX 20 system, connection is made via the Ethernet switch on the Master Power Block 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 on the front of the STX 20.

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.

5.4.4 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.

5.4.5 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 STX 20 configuration, this must connect to the COM IN on the STX 20 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 STX 20 cabinet when used in conjunction with the STX EP 1 Switcher.

5.4.6 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 ksps.

5.4.7 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.

5.4.8 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.

5.4.9 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.

5.4.10 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.

5.4.11 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.

5.4.12 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.

5.4.13 PA RF IN

Power Amplifier RF Input BNC connector. This is connected to the EXC RF OUT on basic STX 20 systems for FM operation. In a Digital system, it is connected to the optional VPe/XG. (e.g. HD radio or Digital Radio Mondiale).

5.4.14 RF Sample

Power amplifier RF sample connector. This BNC carries a coupled RF signal from the STXe500 PA amplifier which is the IPA in STX 20 system..

Nominally generates about 19 dBm at about 10KW output power of the STX 20. This not a calibrated output, but may be used for troubleshooting or general instrumentation.

5.4.15 RF OUT

Power Amplifier RF output connector. This Type N connector provides the IPA drive power to the STX 20 cabinet. The RF coax cable from the STX 20 connects to this RF output

5.4.16 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.

5.4.17 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.

5.4.18 Extended I/O

This interface on the STXe500 is used with legacy Broadcast Electronics transmitters and not used in the STX 20 system.

5.4.19 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.

5.4.20 Ground

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

5.4.21 AC Input

The AC power input is the IEC320 C13 connector for use with C14 plug and cable provided for STX 20 system.

5.5 RF Drive 2-Way Splitter Assembly

The RF output of the STXe500 is routed to the 2-Way power divider. The STXe500 RF outpur is split into two equal levels with a 90 phase shift between to the two RF outputs of the 2-Way Splitter Assy. The 90 degree phase shift is required for 10 +10 combining of the two10kW Power Block RF outputs.

6 Front Assemblies and Features

The STX 20 transmitter 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.

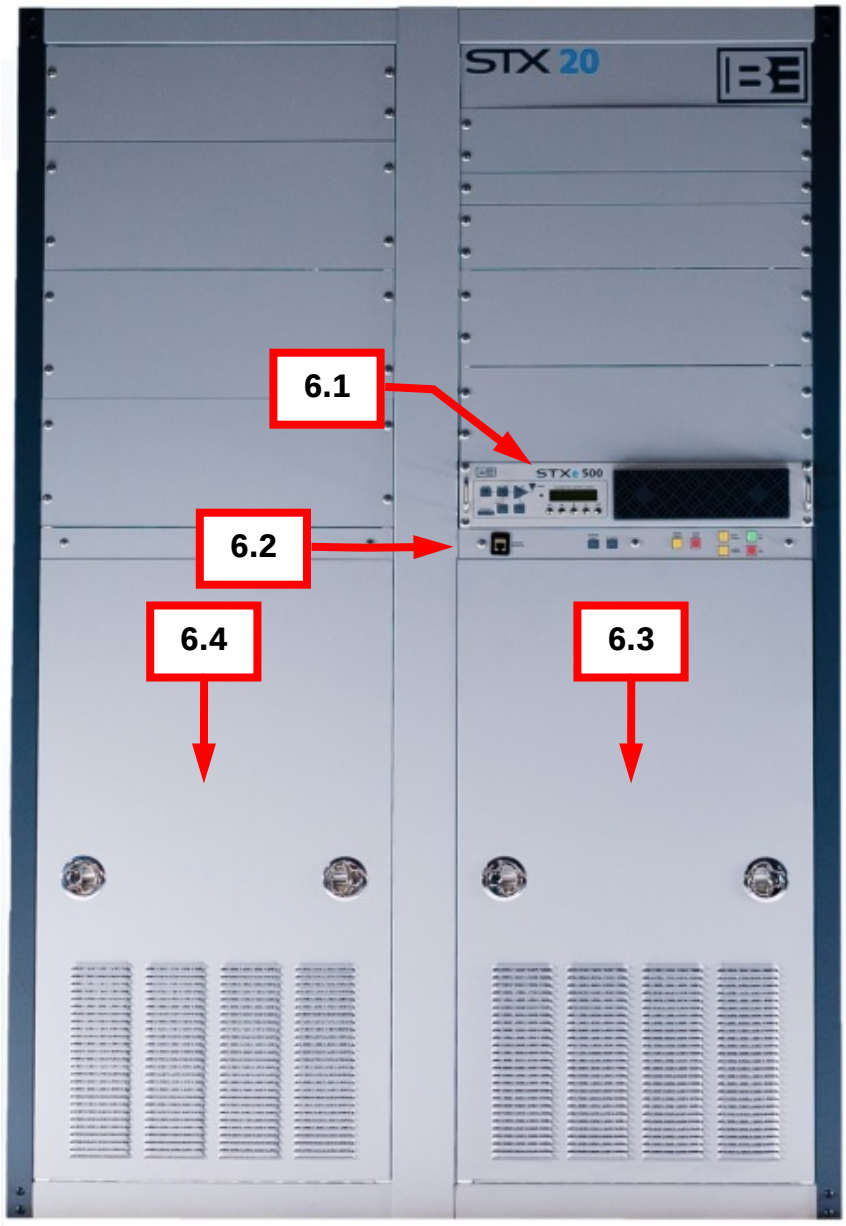


Figure 18 – STX 20 Front Views

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.

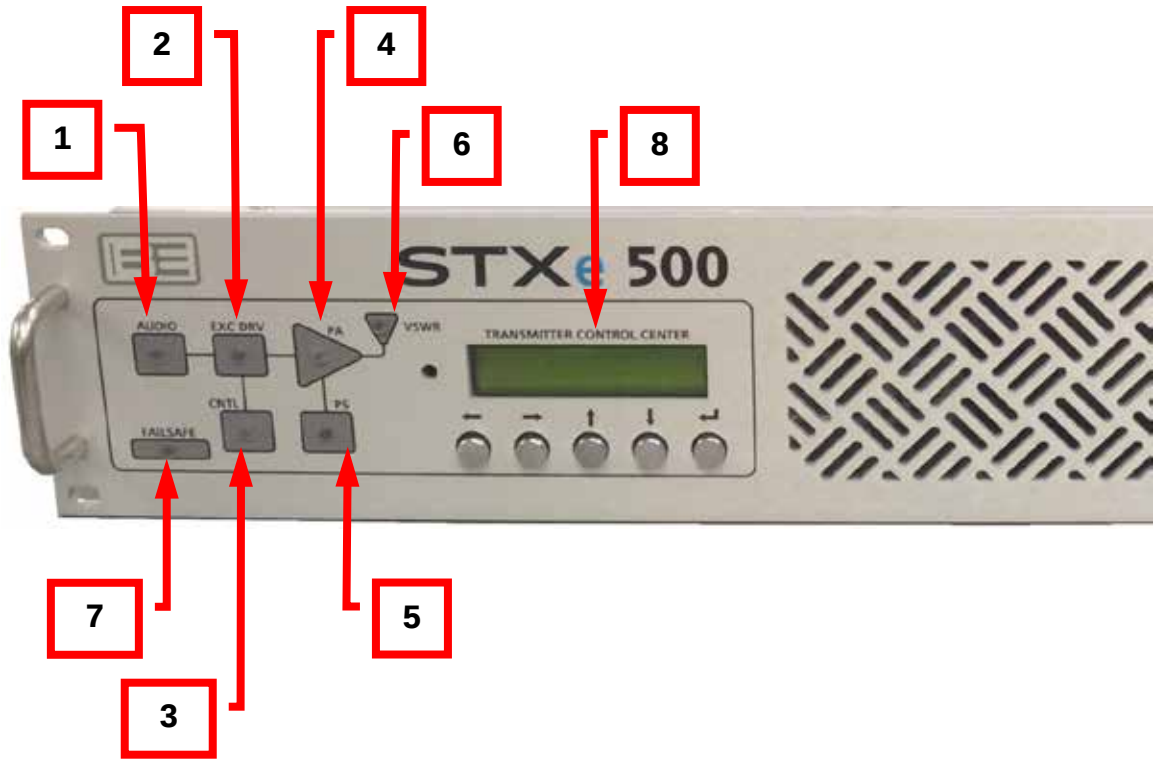


Figure 19 – STXe 500 Front Panel

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

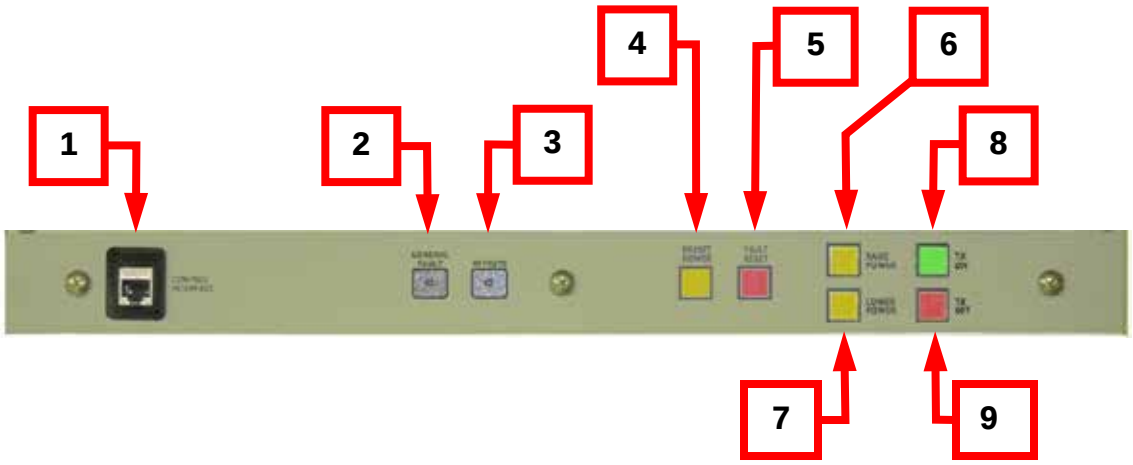


Figure 20 – Transmitter Control Panel

6.2.1 CONTROL INTERFACE

Provides a front RJ45's local access point for STX 20 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 20 transmitter power.

6.2.7 LOWER POWER

Lowers STX 20 transmitter power

6.2.8 TX ON

Turns on RF output in the STX 20

6.2.9 TX OFF

Turns off the RF output in the STX 20

6.3 10kW Power Block – Master

Figure 21 - 10kW Power Blocks – Front

6.4 10kW Power Block – Slave

The Master and Slave power block cabinets are identical with each cabinet housing four PA Modules, seven PA Power Supplies, plus dual power supplies for Motherboard power requirements and seperated supplies for the cabinet cooling fans.

The cabinet also provides the 1RU mounting location for the STX20 Front Panel Control Assy which is mounted on the Master power Block cabinet.

7 Theory of Operation

Refer to the system block diagram, Figure 21 and Figure 22at the end of this section.

The main assemblies that make up the STX 20 FM transmitter systems are as follow; the STXe 500 exciter/control platform, two 10kW power blocks, a 2-way power divider and a 2-way Combiner. RF output directional couplers and RF sampling, plus the necessary interconnect cabling completes the system.

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 RF drive output of the STXe500 is routed to the 2-way power divider. The drive level is split and feed to each 10kW power block. The 2-way divider also provides a 90 degree phase shift that is requred when the power block outputs are combined in the 2-way hybrid combiner for the 10 +10 power combining.

Each 10kW power block includes control interfaces to provide interfacing between the STXe 500 for control and monitoring of the STX 20 transmitter systems. These control interfaces communicate through controller area network CAN communications.

The STX 20 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 two10kW power blocks. Wit the exeption of the Customer Interface Bd and the STX 20 Front Control Panel being mounted on one of the power block cabinets, the two power blocks are identical 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 20 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 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 the power block's 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.

Each power block has two identical PA power supply mother board and tray assemblies to house and control the power supplies used to create a 10kW PA DC supply buss. Each PS mother board tray assembly houses up to 4 power supplies plus the 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 power supply is self-regulated and protected. 7 power supplies are use for a 10kW power block for total of 14 in the STX 20 transmitter systems. An optional, 8th power supply can be purchased for each power block for additional redundancy.

AC mains power is connected to the main terminal block of the rear of the STX 20 cabinet. The power is cabled into each power block's AC distribution enclosure . From this enclosure, the AC power is distributed to the PS mother boards and other DC power supplies within the power block cabinet and AC outlet to power the STXe 500.

The 10kW power block 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.

STX 20 – BLOCK DIAGRAM

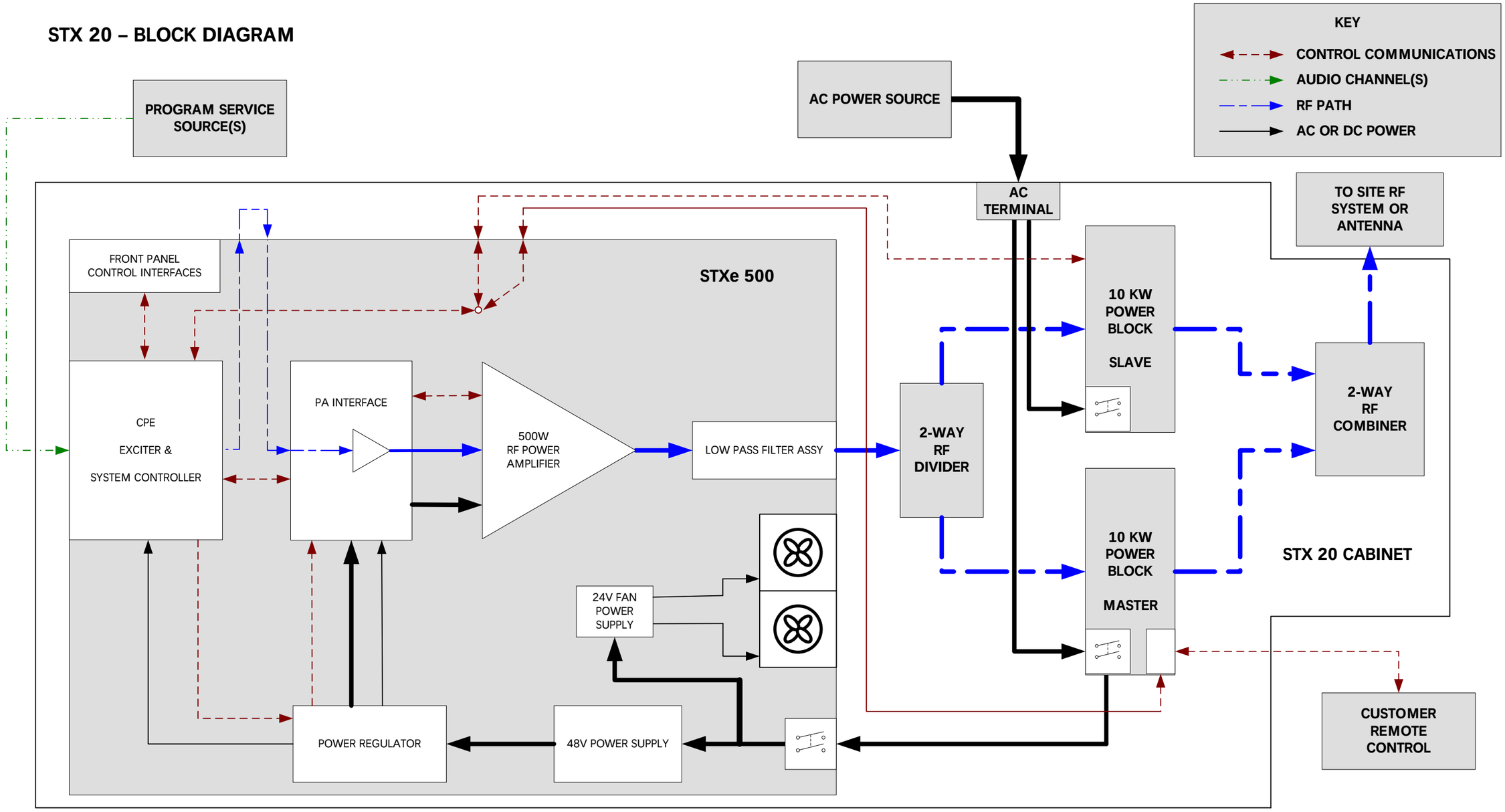


Figure 22 - STX 20 System Block Diagram

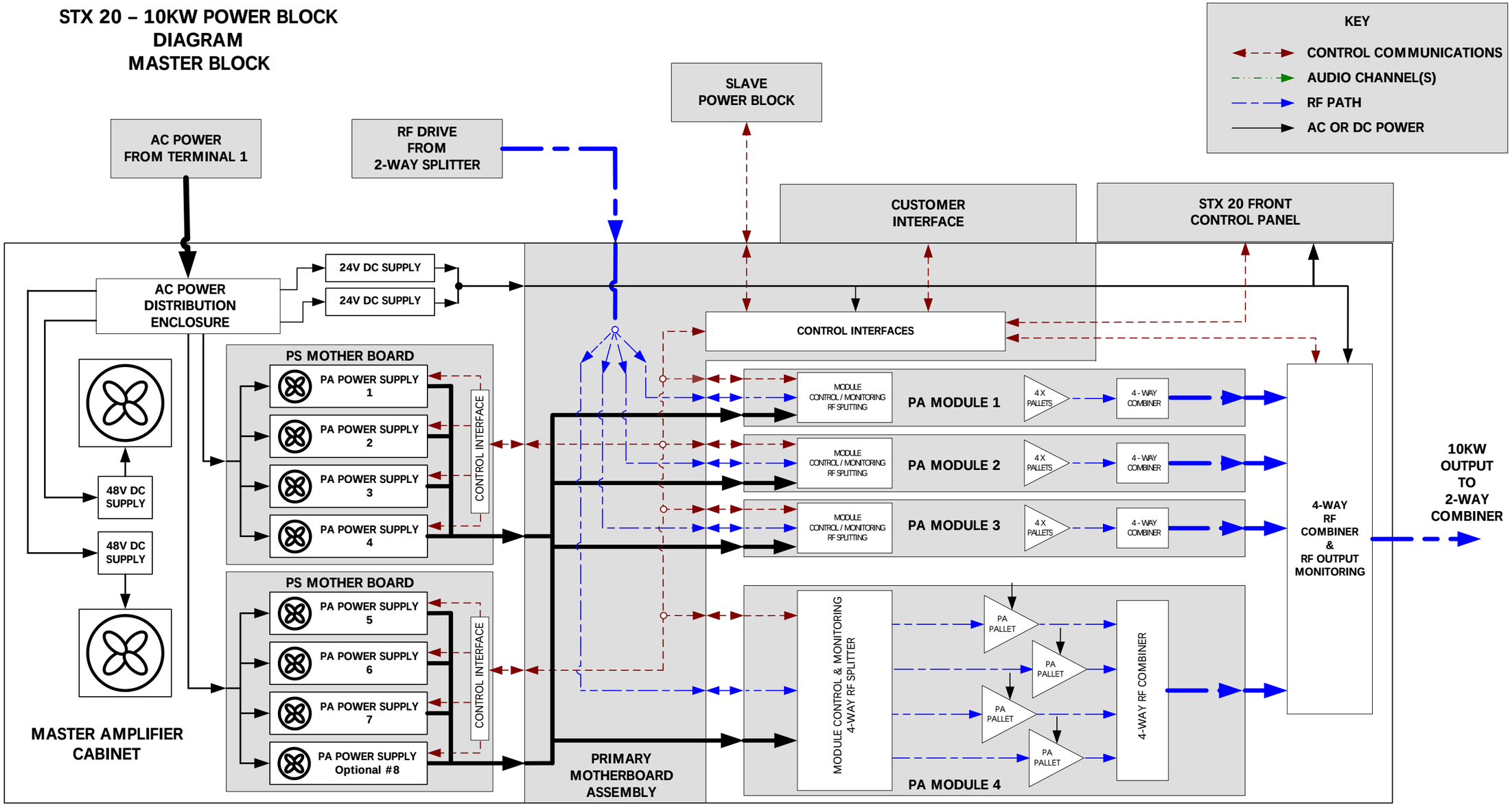


Figure 23 – 10kW Power Block Diagram

8 STXe 500 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.

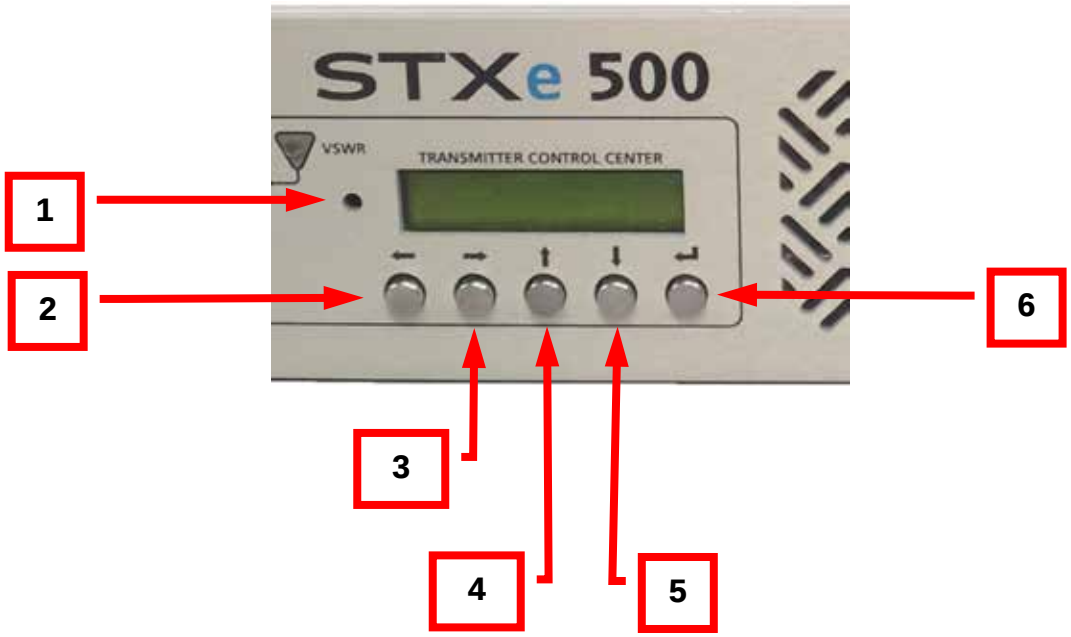


Figure 24 – Transmitter Control Center

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.

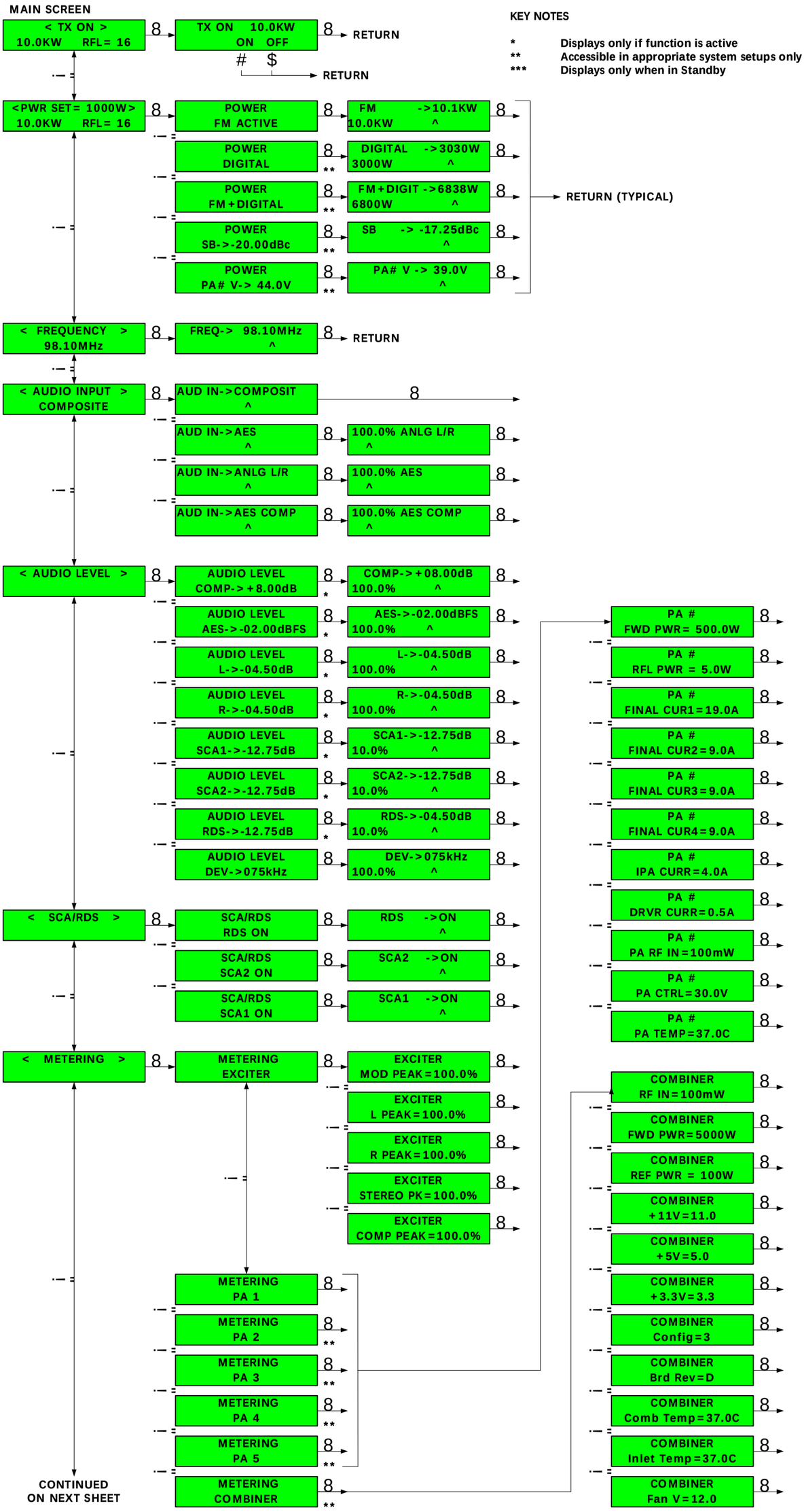


Figure 25 – Transmitter Control Center Menus Sheet 1

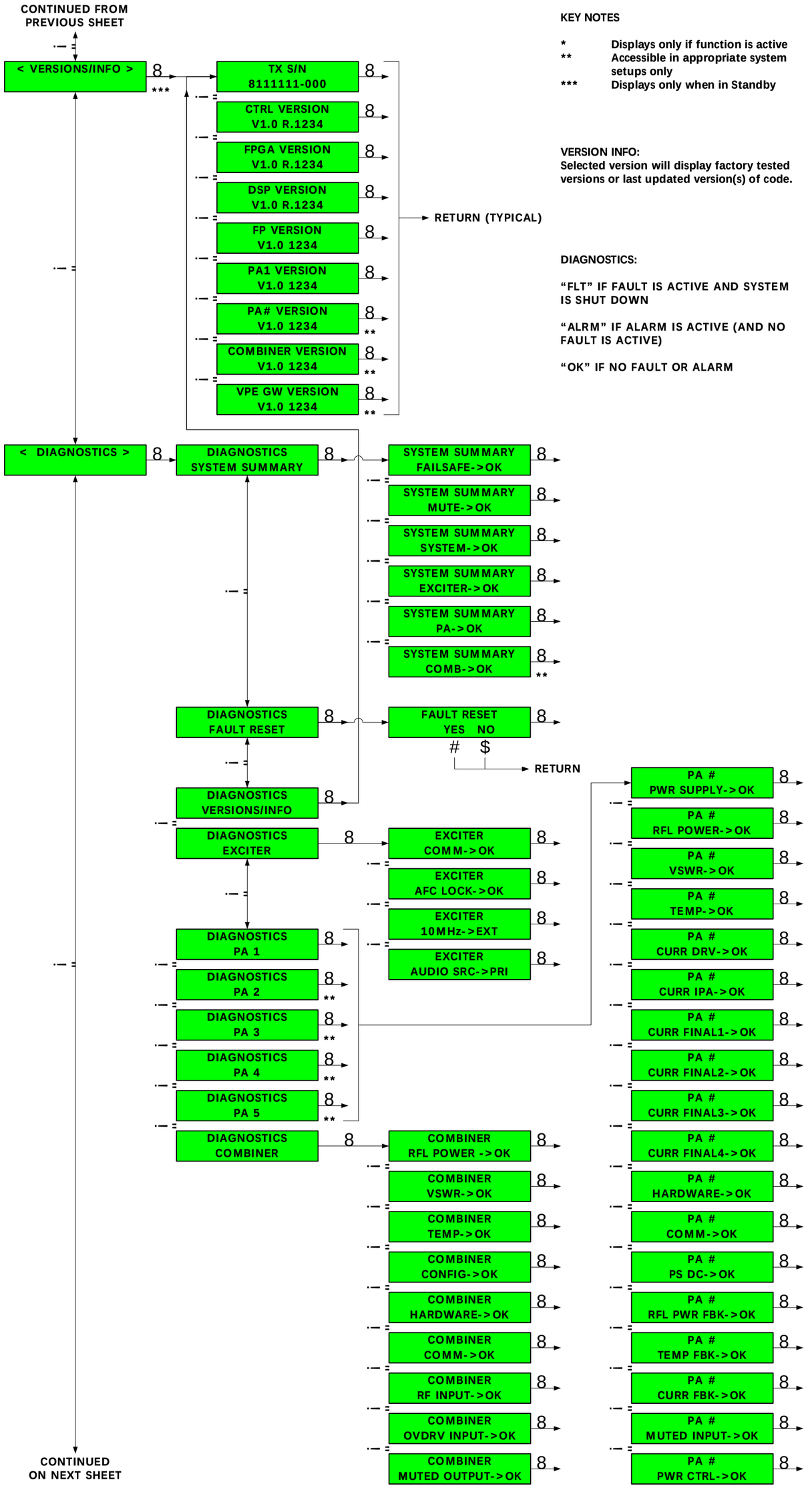
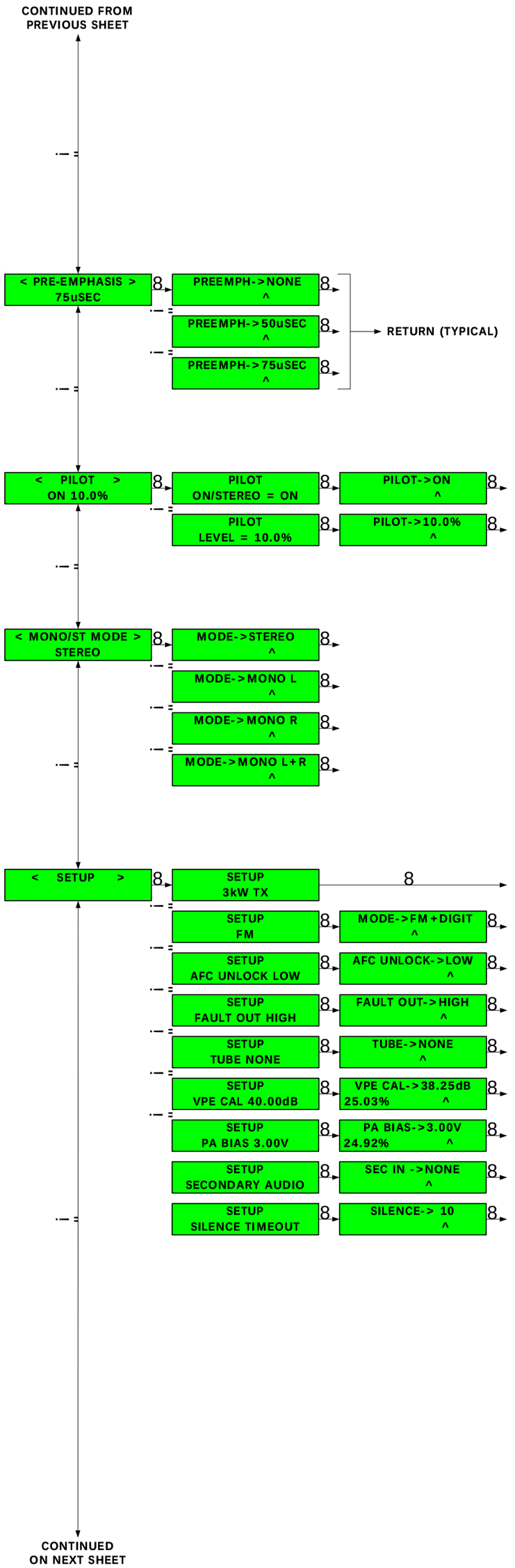


Figure 26 – Transmitter Control Center Menus Sheet 2



KEY NOTES

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

Figure 27 – Transmitter Control Center Menus Sheet 3

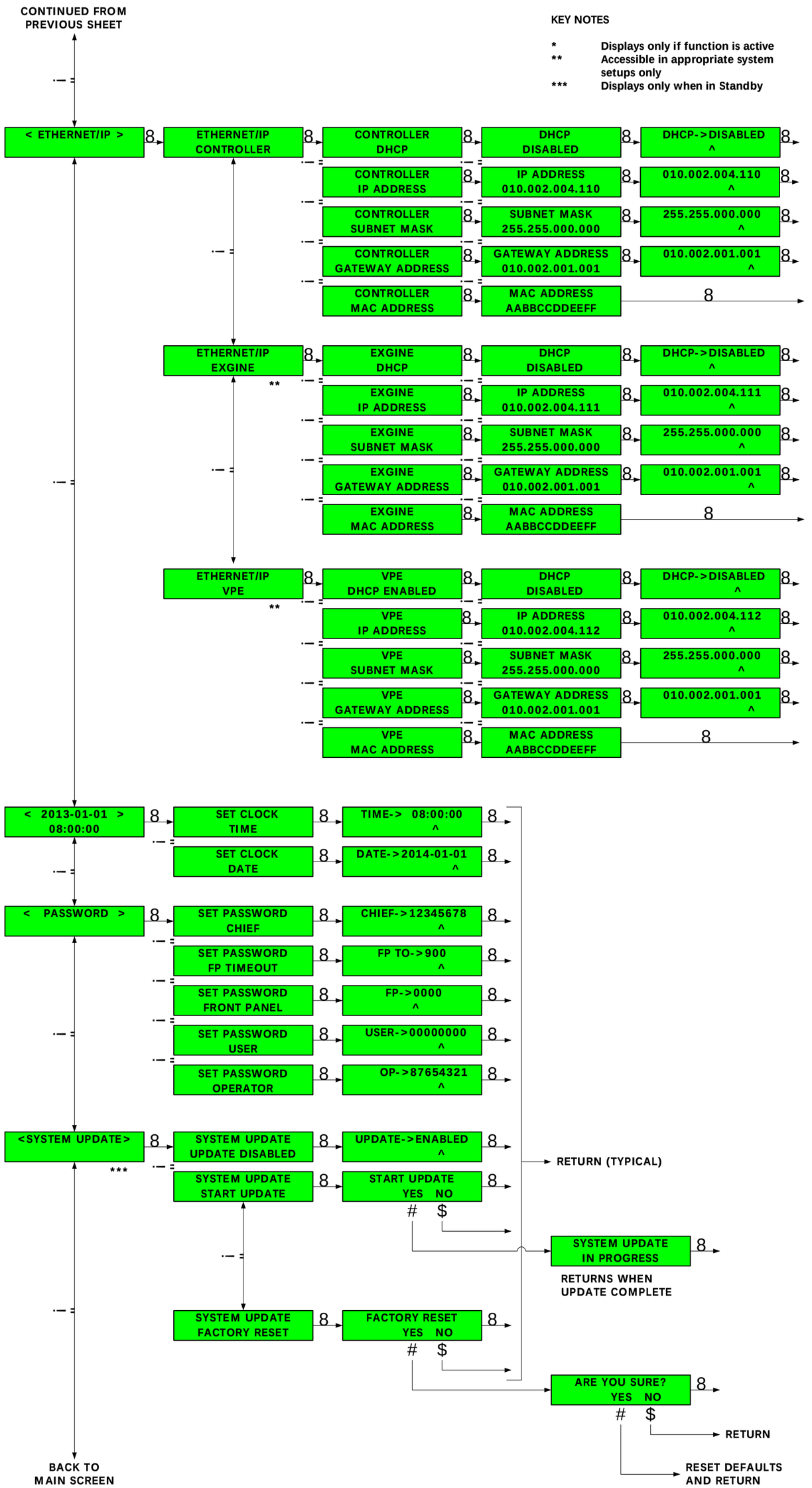


Figure 28 – Transmitter Control Center Menus Sheet 4

9 Basic Web Page

The STX 20 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.

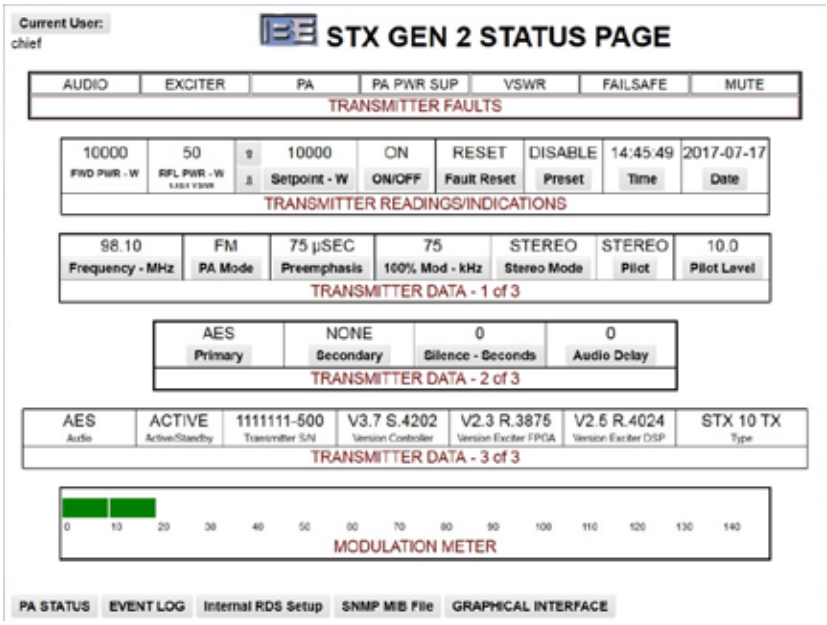


Figure 29 – Web Interface Main Page

The basic settings and monitoring fields in the system are shown in Figure 28. To switch the active users,such as" Chief" or "Operator", click the "Current User" link in the upper left of the screen. To access additonal status and monitoring information, click on "PA STATUS" or "EVENT LOG" links respectively. These views can be seen in Figure 29 and Figure 30

Posting settings to the exciter that have the text description in bold, requires an appropriate login profle. 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 29. 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.

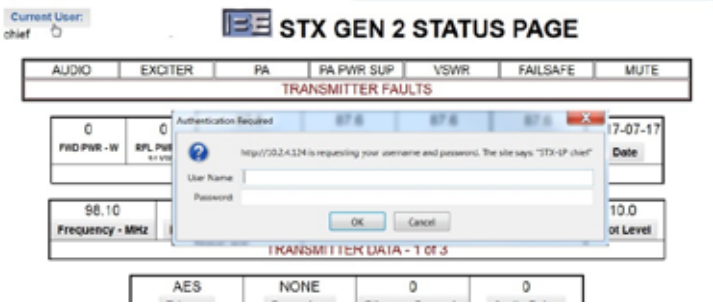


Figure 30 – Web Interface Authentication

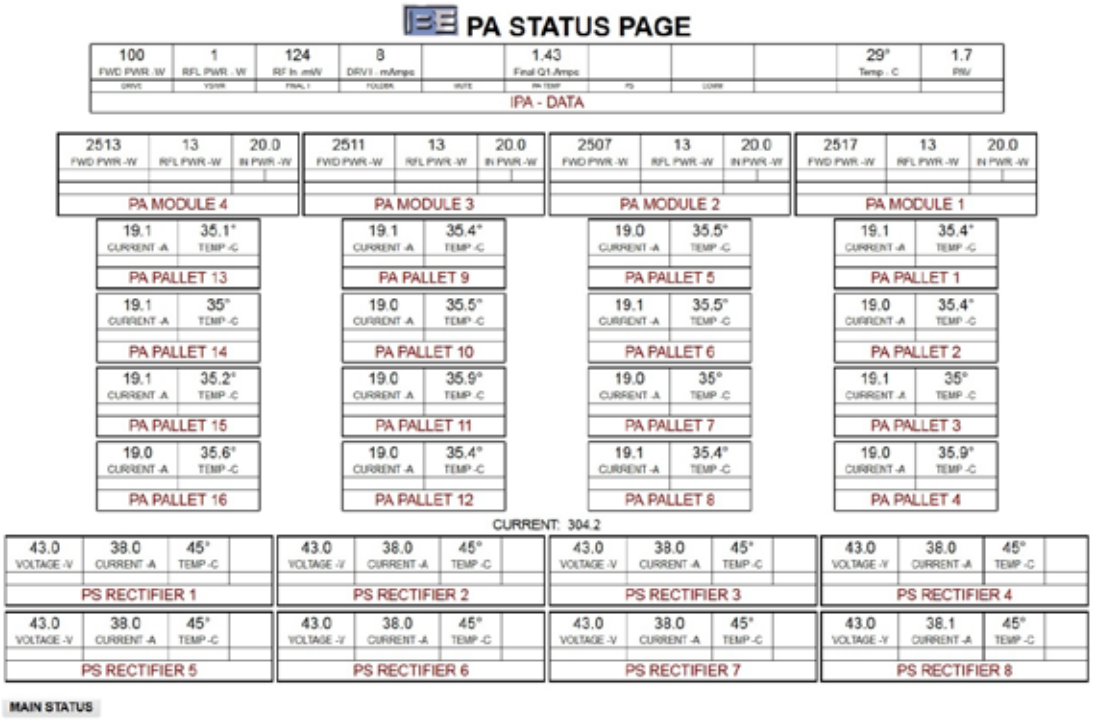


Figure 31 – Web Interface PA Status Page

Figure 32 – 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 32. This will then display the RDS Setup Page, Figure 33.

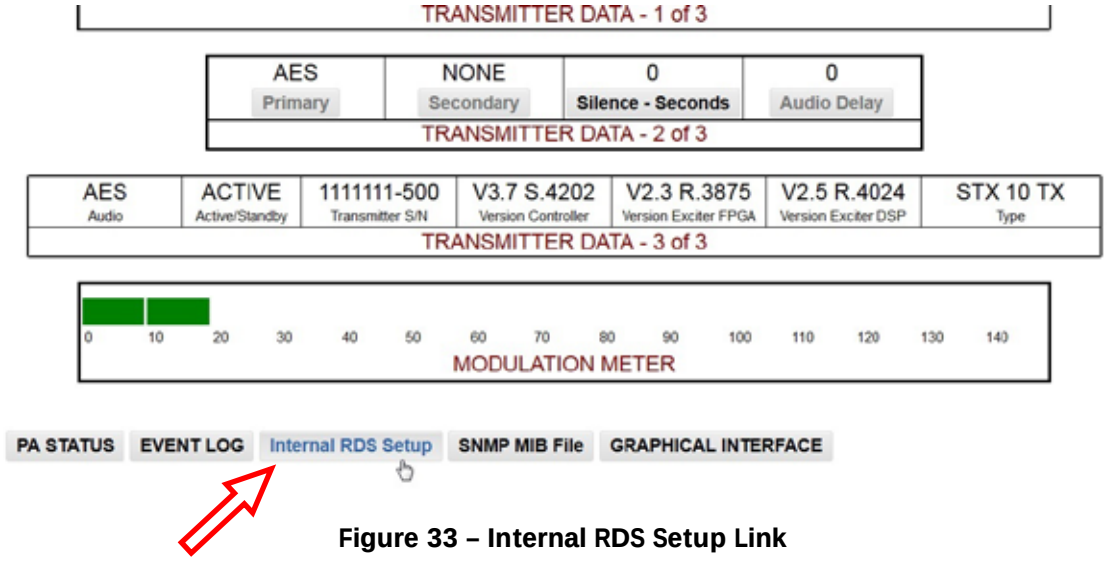


Figure 33 – Internal RDS Setup Link

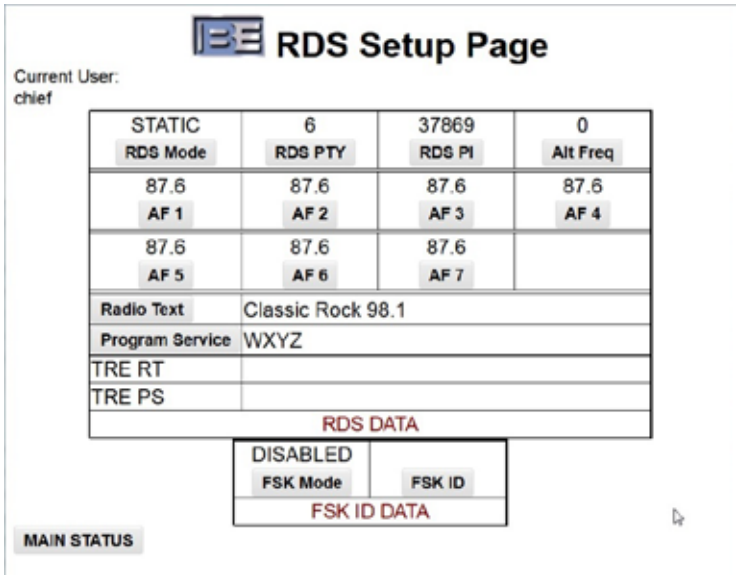
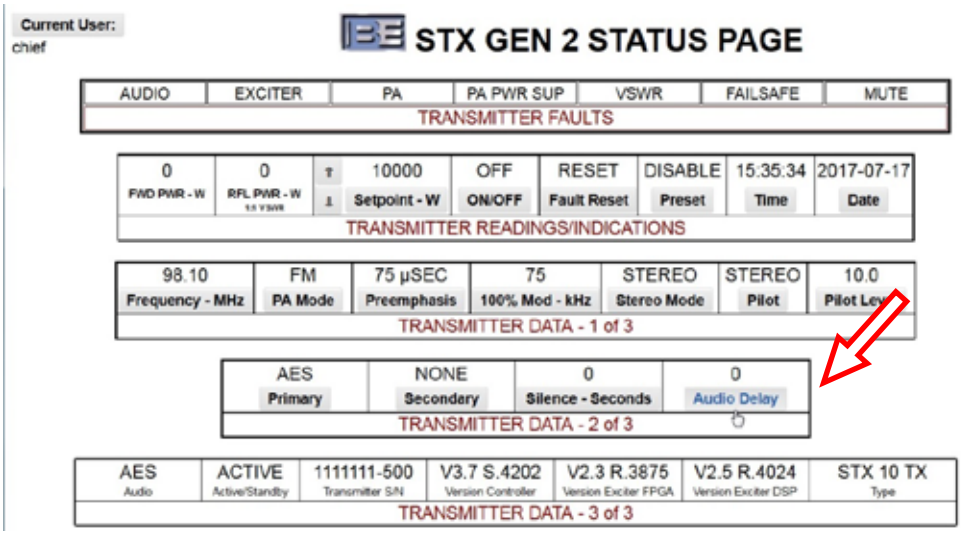


Figure 34 – RDS Setup Page

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 .



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.

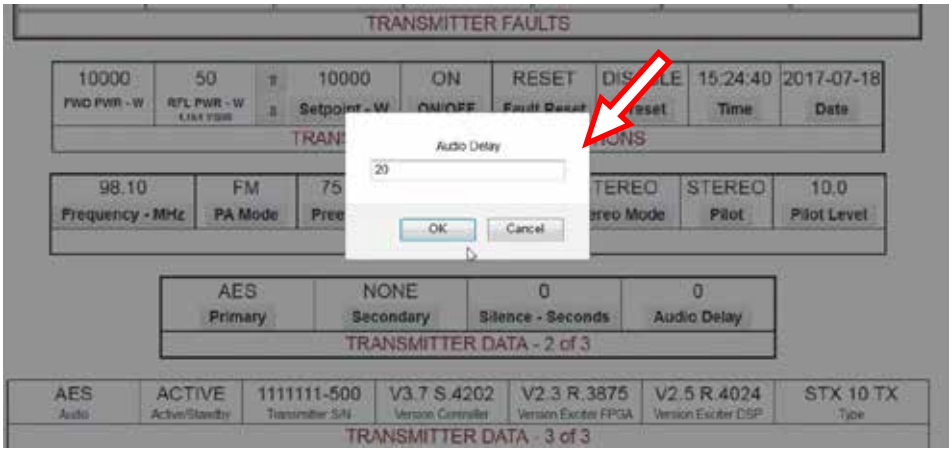


Figure 35 – Audio Delay Web Interface

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.

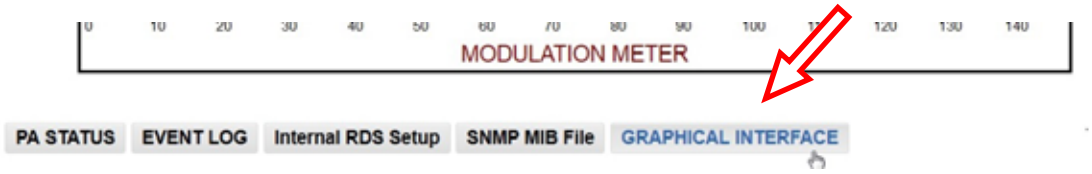
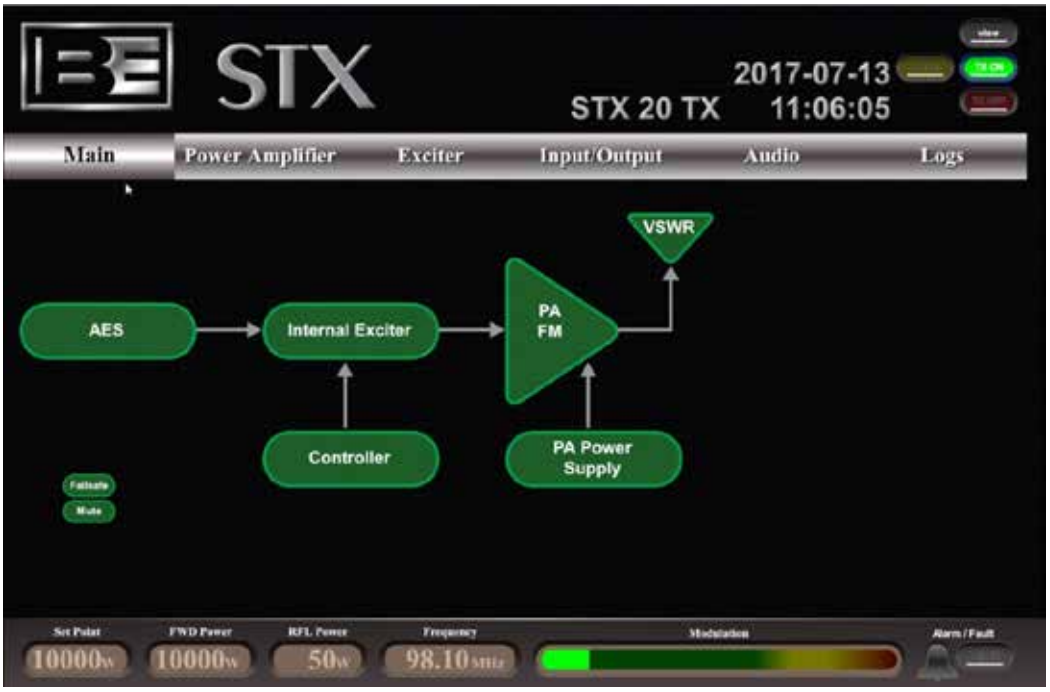


Figure 36 - Link from Basic Web Page to GUI Main Page



Refer to Fig 36. While navigating the screen pages, buttons that are 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 37 - 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 37A. The previous screen being displayed will change to that in Figure 37B. Move cursor into the desired profile. In this example “Chief” is being selected.

Figure 38 – 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 39 – Password and Log In Windows

Figure 40 – 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 41 – Navigation Bar

10.2.1 Features & Items Always Displayed.

The Navigation Bar as well the Features and Items in Figure 41 are displayed in all screens

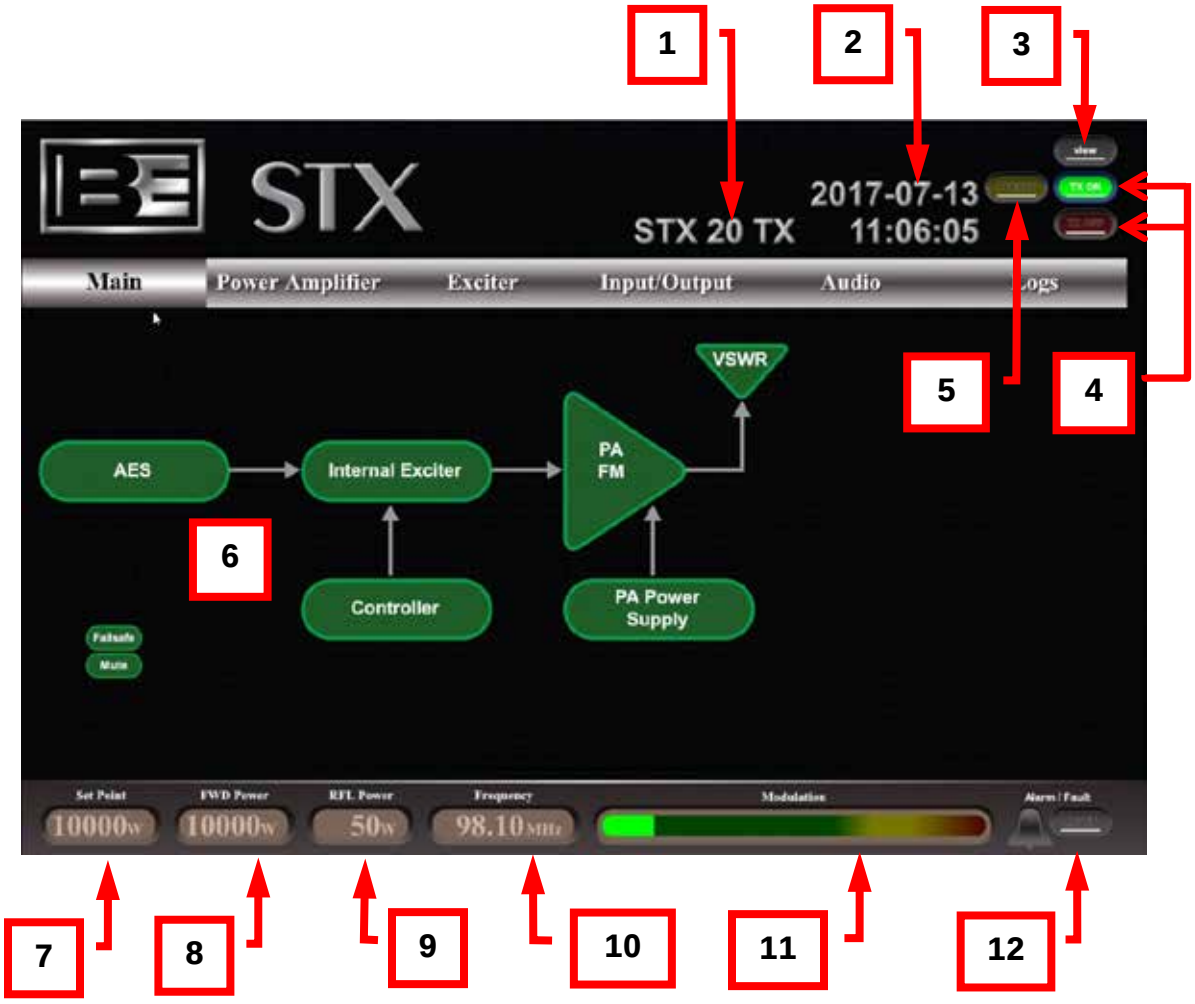


Figure 42 – Main Page

.

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 20kW 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.

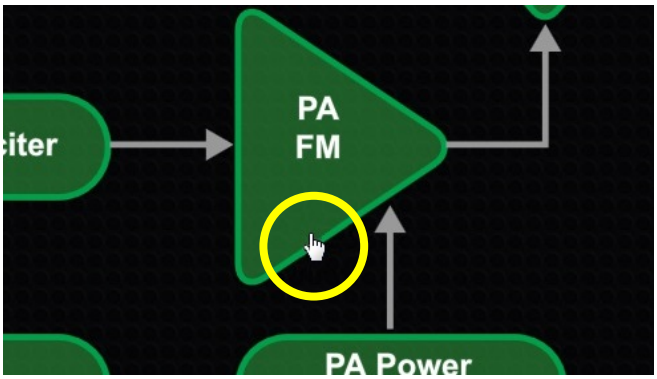


Figure 43 – Block Diagram for Navigation

10.3 Power Amplifier

The Power Amplifier Page contains five colums of detailed information of PA Module Assemblies used in an STX20 high power system. The IPA Data in column 1 is for the amplifer 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 44 – 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 44. The display can be toggled to either mode with proper login profile

Figure 45 – RFL Power vs VSWR Feature

10.3.1 IPA Data Features, Column 1

Figure 45 and Table 6 detail the information provided in the first column on PA Amplifier Page

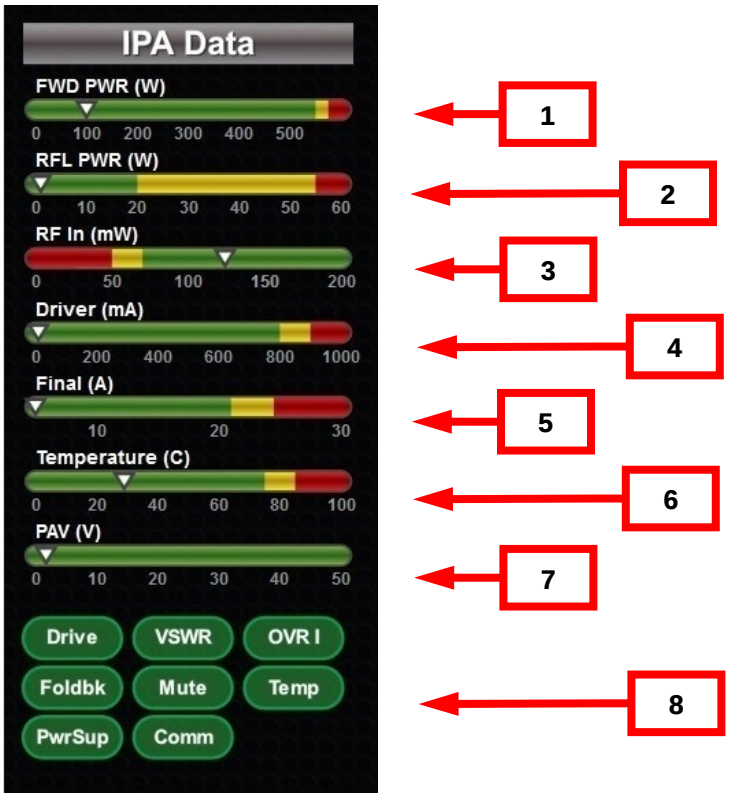


Figure 46 - IPA Data Column Features

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

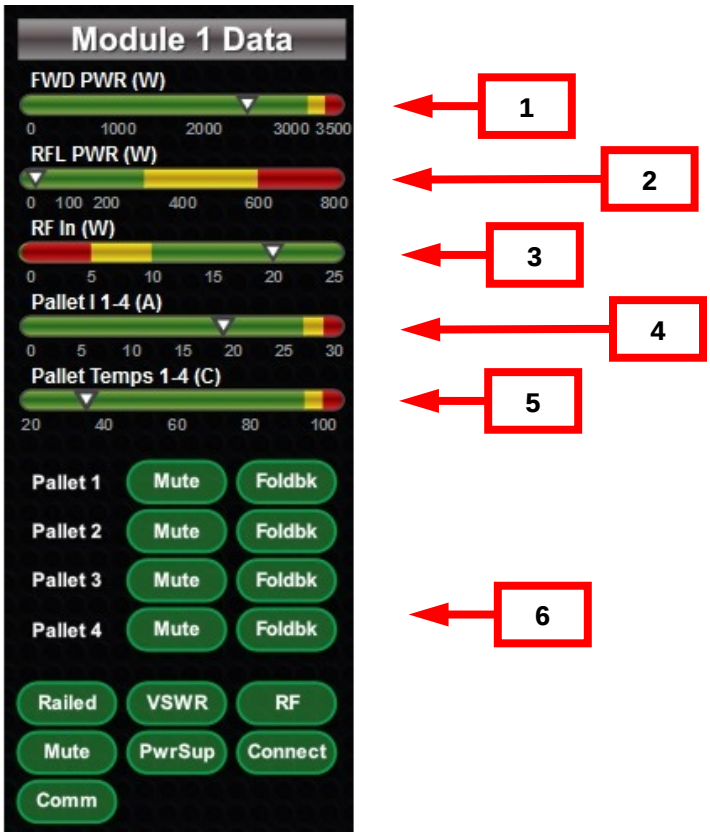


Figure 47 – PA Module Data Column Features

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 each 10kW power block cabinet. Figure 47 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 48 – 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 49 – Navigation Links to PA Power Supply

10.4.1 PA Power Supply Features

Figure 49 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 50 – 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

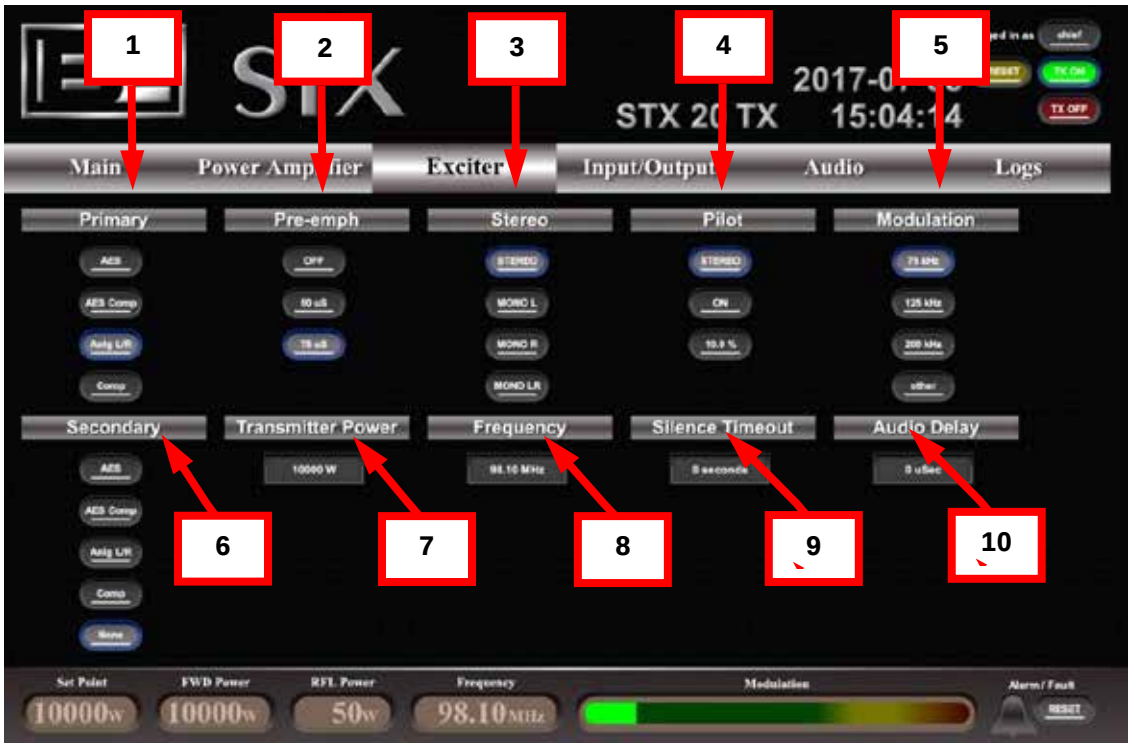


Figure 51 – Exciter Page

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 52 – 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 5.3.5 for more details and descriptions of the STX 20 system Input/Output.

10.7 Audio

Figure 53 – 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 54 – 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 20 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 then click "Save link as…". 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.

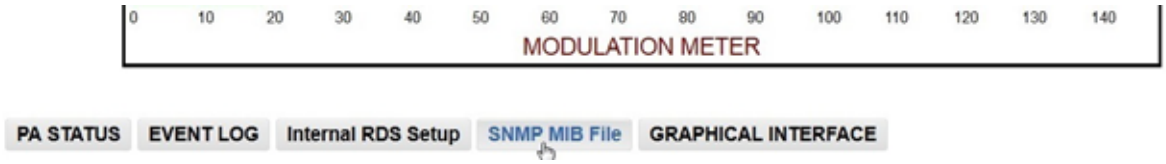


Figure 55 – MIB Download

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 delimitating '+' 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 …38118.2.2.2.0, the object for system forward power.

12 Backup Control Modes

The STX 20 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 20 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 20 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 3.3 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 STX20 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 provides PA diagonstic and fault data for both the IPA and the RF Amplifier Modules. Examples shown in Figures 55 and 56 explain various fault and status conditions

Figure 56 – VSWR Fault Example

In Figure 55, a failure is simulated to exibit 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 amplifer including the IPA so it will not display any faults or status changes in this example.

Table 12 – PA Diagnostics Details

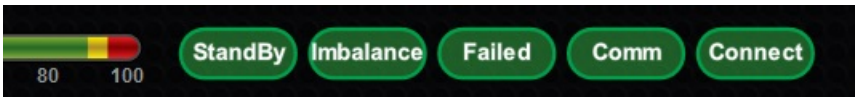
Fault/Alarm	Description
RF Power Supply Fault PwrSup	This fault activates when a power source failure is detected.
VSWR Fault VSWR	This fault activates when the measured reflected power is greater than the maximum reflected power/VSWR rating of the system or individual amplifier at any power level.
Temperature 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 56, 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 57 – 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 STX 20 Maintenace

Most of the maintenace information for STX 20 cabinet is covered by the STXe500 and the 10kW power blocks, Sections 15 and 16. Replacement part and assembly numbers are detailed in these two sections

14.1 CPE Flashcode Update in STX 20 Sub-Assemblies

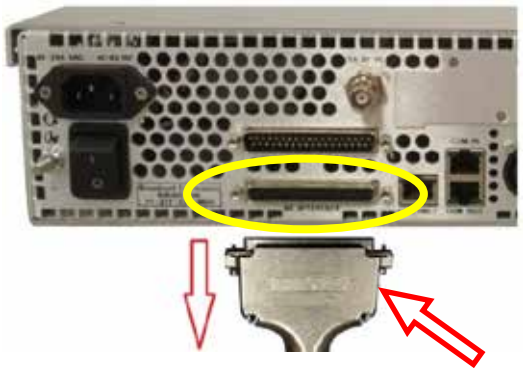
The CPE in the STXe500 controls the transmitter system by communicating with other sub-assemblies in the STX 20. Some of these sub assemblies have their own firmware. When ever any of these sub-assemblies or modules having firmware is replaced, a flash code from the CPE should be preformed to ensure 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 10KW Combiner with 1-5/8" Output
  - ☐ 919-4241 PA Cabinet Controller PCB Assembly
- ☐ 959-4230-111 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

14.2 Flashcode Instructions

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

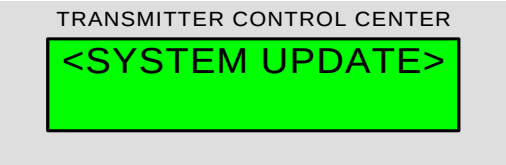


Remove Activation Stub attached to the BE INTERFACE connector.

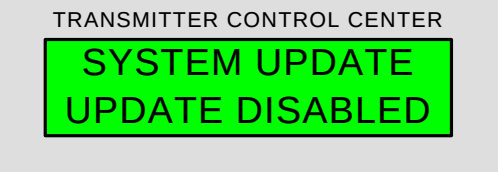
Figure 58 – Remove BE Activation Stub

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

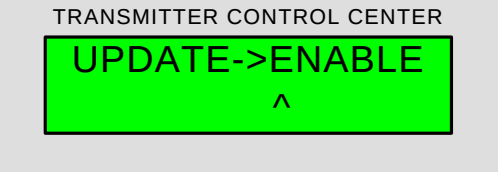
3. Navigate to the < SYSTEM UPDATE > menu using the up arrow h .



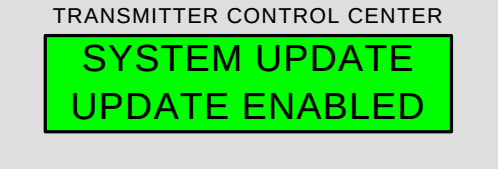
4. Depress 8 . to enter the SYSTEM UPDATE screen which will display UPDATE DISABLED



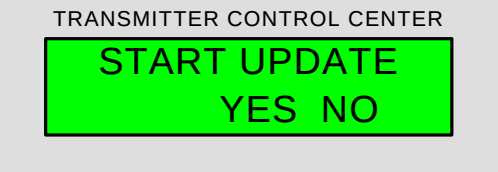
5. Depress 8 . to enter the UPDATE -> DISABLED /ENABLE screen. Depress the i or h buttons to toggle between DISABLED and ENABLED.



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

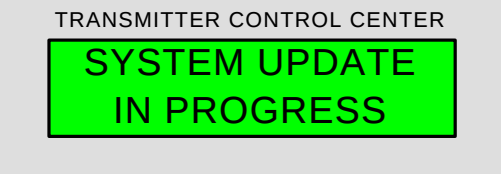


7. Depress the down arrow i to the < SYSTEM UPDATE / START UPDATE > screen and depress 8 . to get to the START UPDATE confirmation screen

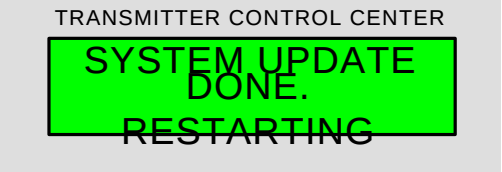


8. Press the up arrow h to confirm YES. The CPE update will start.

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 STXe500 Maintenance

15.1 Clean Air Filters

STXe 500 comes standard with air filters that are front accessible for servicing without having to remover 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 59 – 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.

15.2 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.

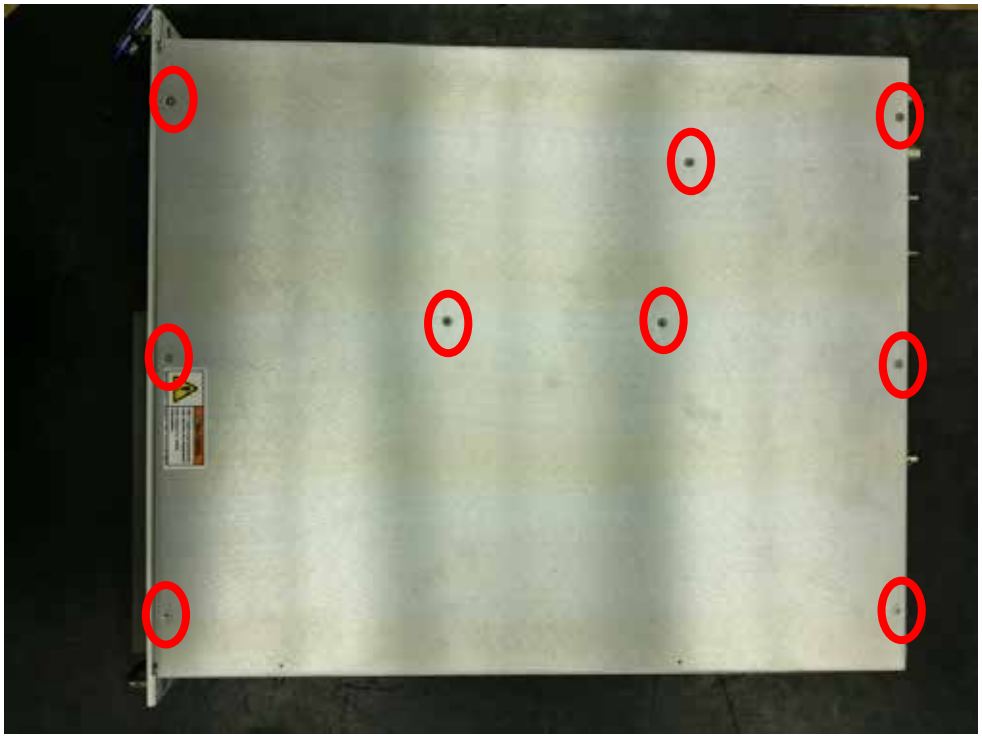


Figure 60 – Top Cover

15.3 STXe 500 Main Power Supply

Figure 61 – 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 62 – STXe 500 Main PS Wires

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

Figure 63 – STXe 500 Main PS Chassis Screws

3. Loosen the internal thumb screws by hand.

Figure 64 – STXe 500 Main PS Internal Thumb Screws

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

Figure 65 – STXe 500 Main PS Extraction

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

Figure 66 – STXe 500 Main PS Chassis Section

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

15.4 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 67 – 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.

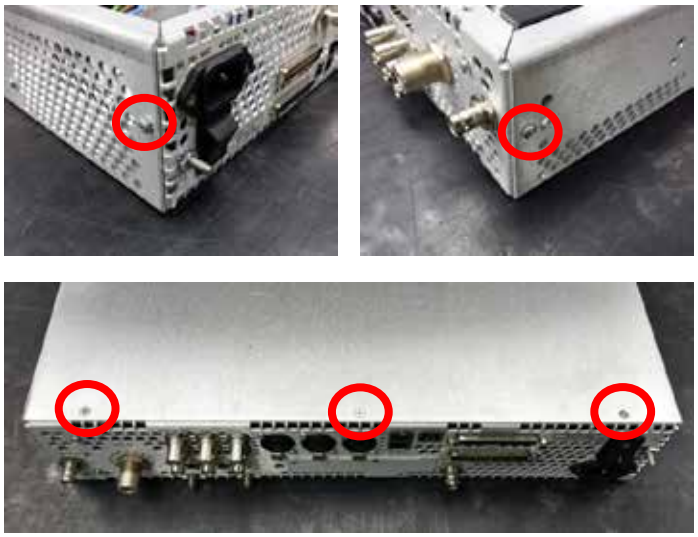


Figure 68 – Back Panel Screws

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

Figure 69 – N-Type Connector Nut

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

Figure 70 – BNC Connector Nut

4. Remove the CPE screw and unsnap the corners.

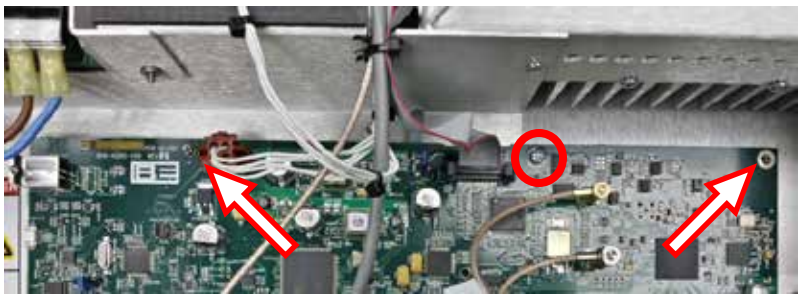


Figure 71 – CPE Screws and Snaps

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

Figure 72 – Displaced Back Panel Assembly

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

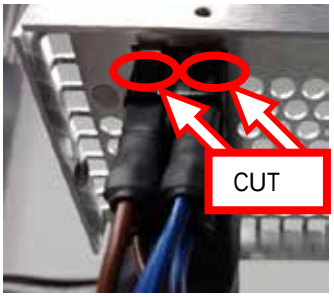


Figure 73 – AC Switch Tabs

7. 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 74 – AC Switch Wires

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

15.5 AC Input and EMI Filter

Figure 75 – 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.

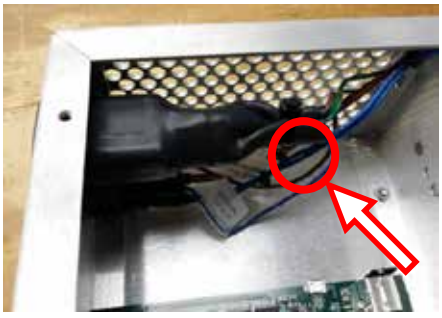


Figure 76 – AC Cable Tie

2. Cut the shrink wrap.

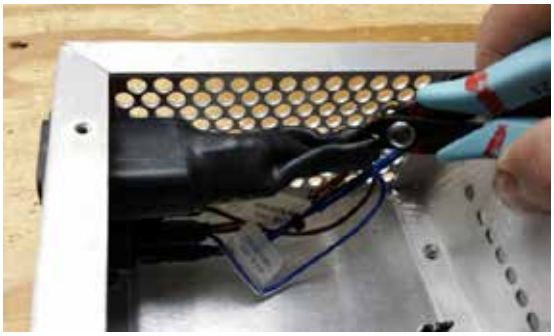


Figure 77 – Cut Shrink Wrap

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

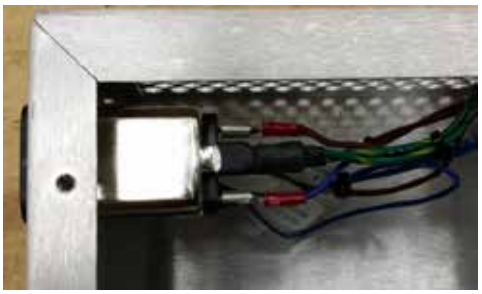


Figure 78 – AC Studs

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

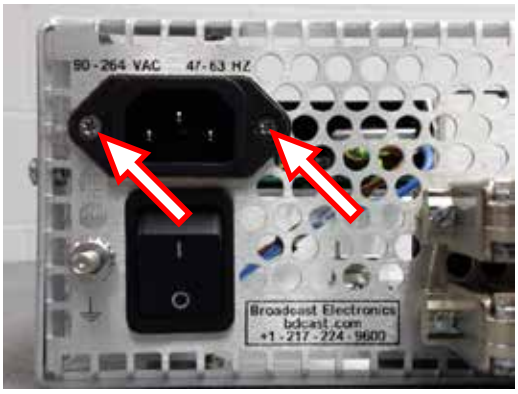


Figure 79 – AC Input Screws

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

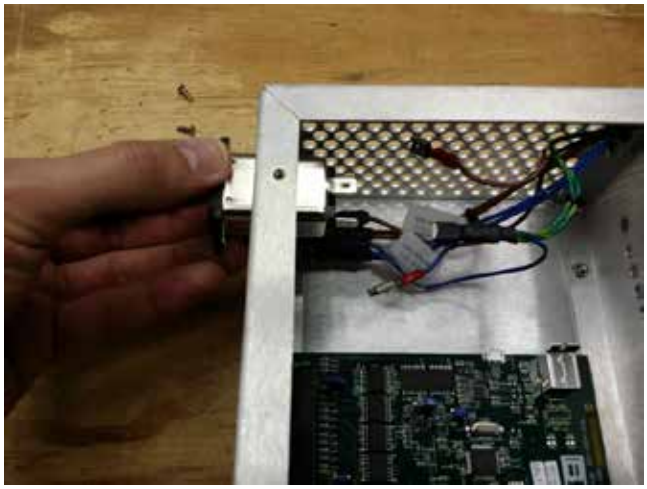


Figure 80 – AC Input Assembly Removal

6. 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.

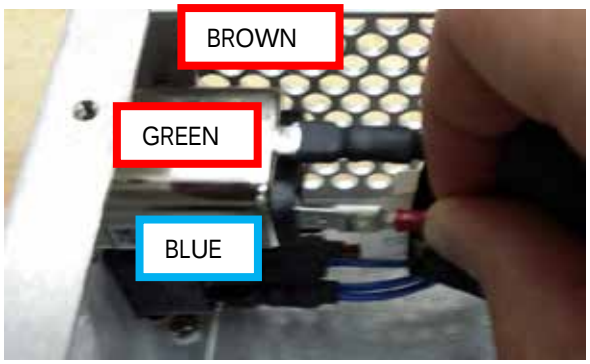


Figure 81 - Internal AC Connections

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

Figure 82 – Shrink Wrap

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

15.6 Fan Power Supply

Figure 83 – 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.

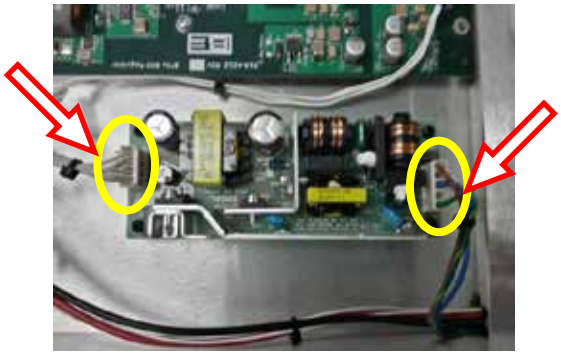


Figure 84 – Fan Power Supply Connectors

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

Figure 85 – Fan PS Screws

3. Carefully lift the power supply out of the chassis.

Figure 86 – Fan PS Extraction

4. 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.

15.7 Fan

Figure 87 – Fan

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

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

Figure 88 – Fan Assembly Extraction

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

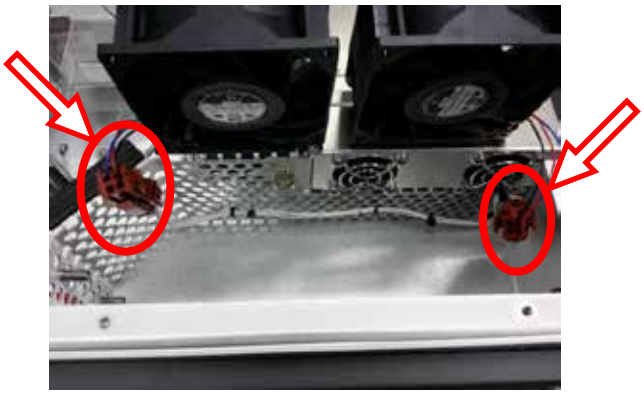


Figure 89 – Fan Connectors

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

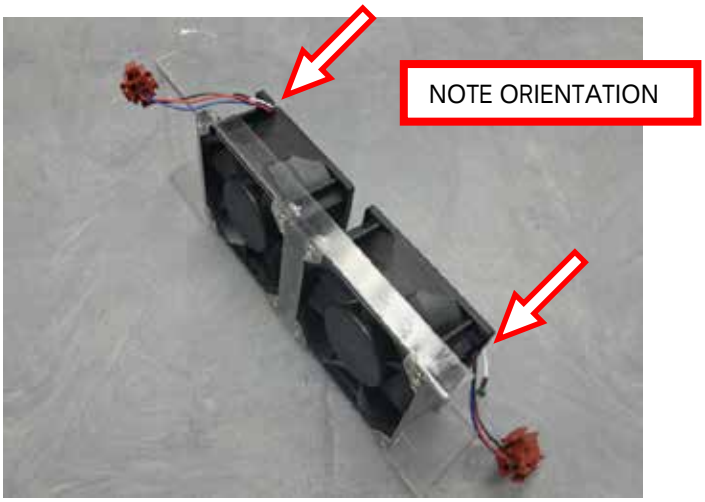


Figure 90 – Fan Orientations

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

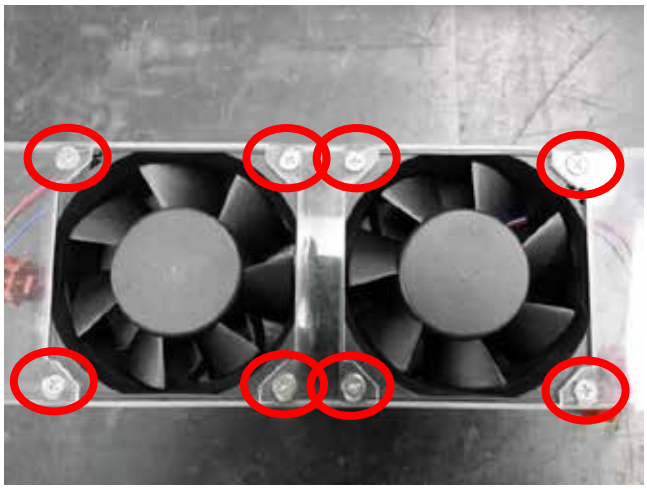


Figure 91 – Fan Screws

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.

15.8 Fuse – DC Regulator

Figure 92 – 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 93 – Main PS Chassis Screws

2. Loosen the internal thumb screws by hand.

Figure 94 – 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 95 – 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.

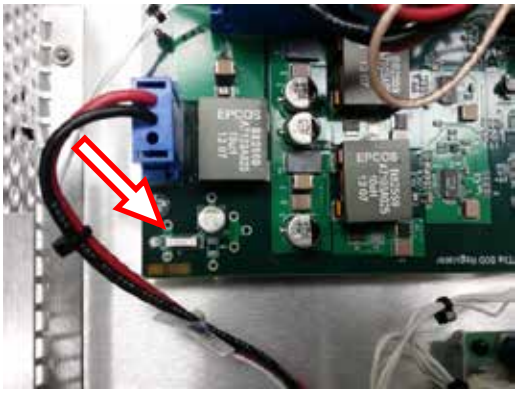


Figure 96 – DC Regulator Fuse Location

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.

15.9 DC Regulator

Figure 97 – 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.

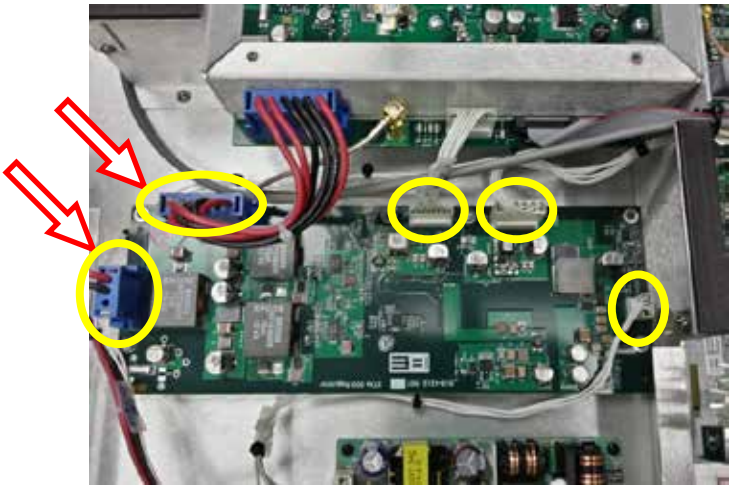


Figure 98 – DC Regulator Cables

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

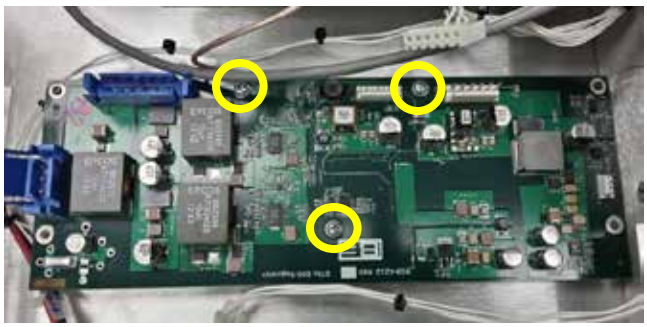


Figure 99 – DC Regulator Screws

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

Figure 100 – DC Regulator Snaps

4. Lift the board out of the chassis.

Figure 101 – DC Regulator Extraction

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

15.10 Fuse – Low Voltage

Figure 102 – 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 103 – 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.

15.11 Fuse – Driver Power Amplifier

Figure 104 – 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.

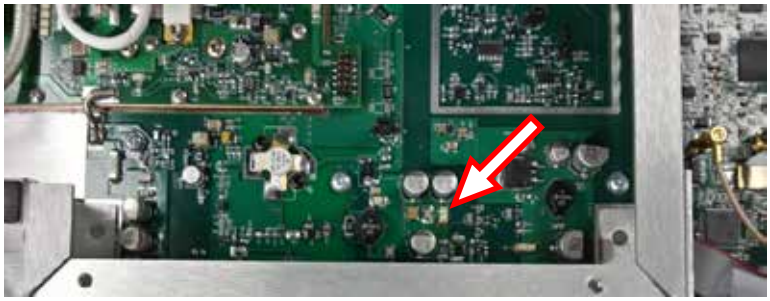


Figure 105 – Driver Fuse Location

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.

15.12 Fuse – Final Power Amplifier

Figure 106 – 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 107 – 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.

15.13 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 108 – 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 109 – Driver Amp Location

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

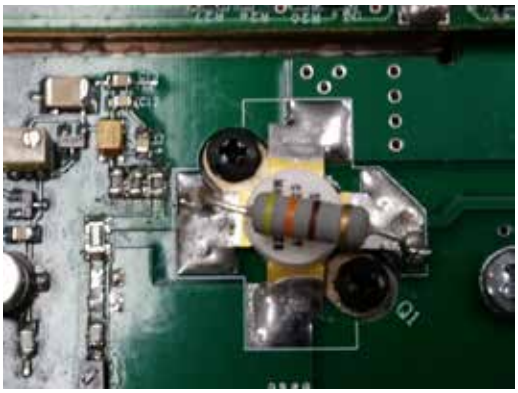


Figure 110 – Driver RC Parts

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 111 – 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.

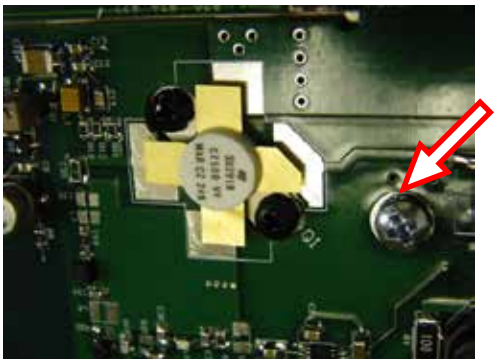


Figure 112 – Driver Placement

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.

15.14 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 113 – Final PA Input Inductor

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

Figure 114 – Final PA Output Coaxial Cables

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

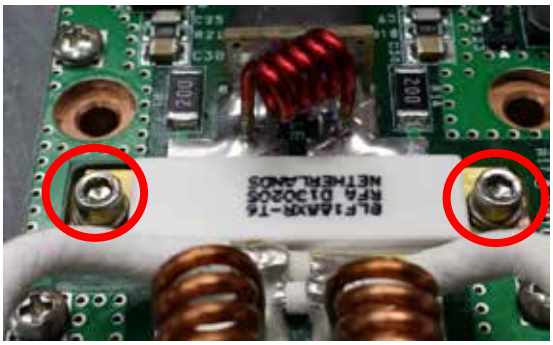


Figure 115 – Final PA Mounting Screws and Washers

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.

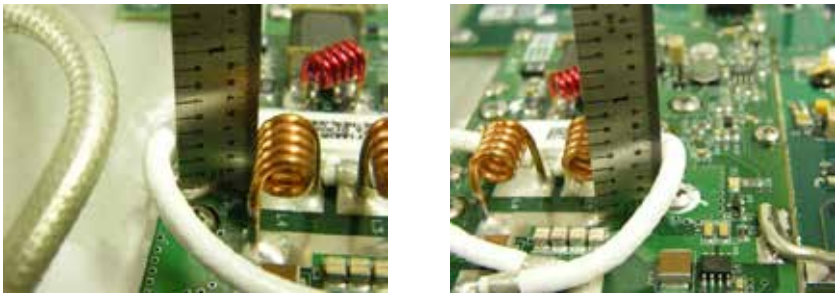


Figure 116 – Final PA Coaxial Cable Heights

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 117 – 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.

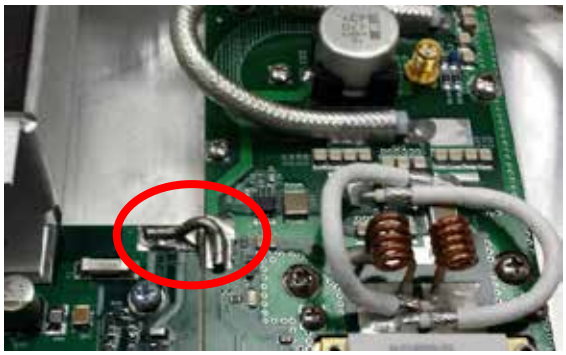


Figure 118 – Pallet DC Input

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

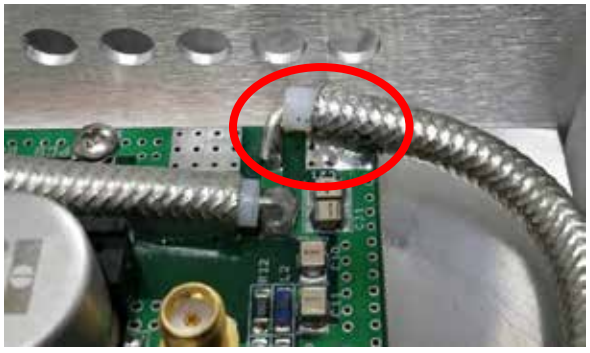


Figure 119 – Final RF Output

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.

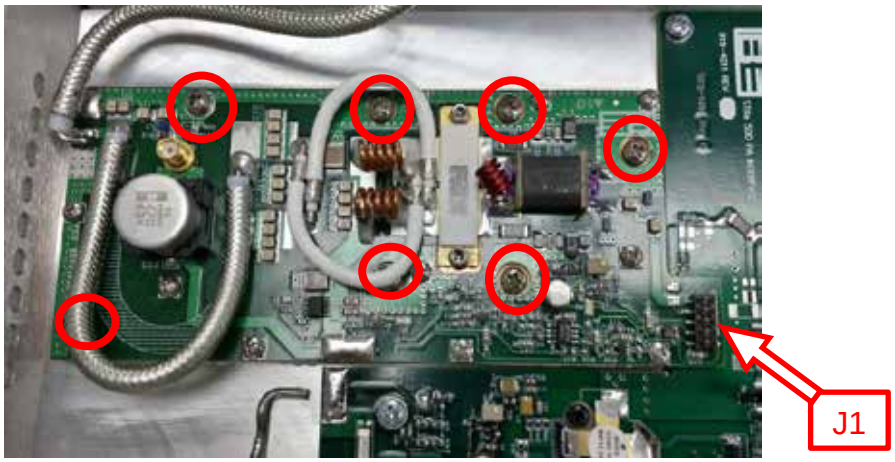


Figure 120 – Pallet Screws

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 121 – 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" +/-0.030" from the highest point to the circuit board surface. Bend the output coax such that it is 0.80" +/-0.030" from the highest point to the circuit board surface.

Figure 122 – Pallet Coaxial Cable Heights

15.15 Power Amplifier and Low Pass Filter Assembly

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

Figure 123 – Power Amplifier Assembly

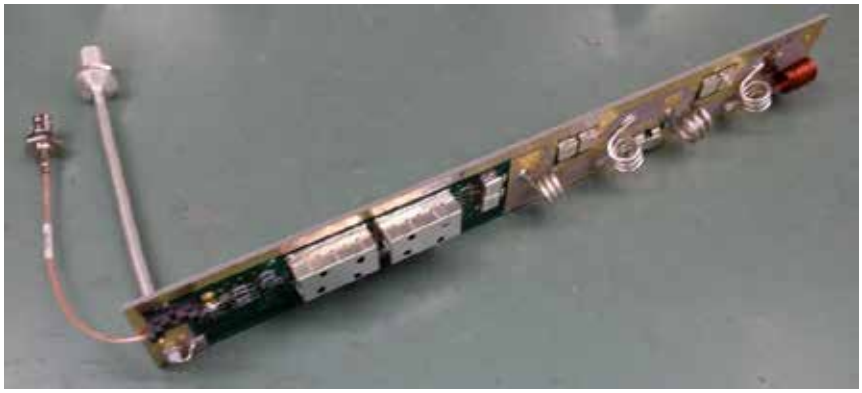


Figure 124 – Low Pass Filter Circuit Board Assembly

☐ 959-4500-100	1	500W PA Assembly
And/Or		
☐ 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.

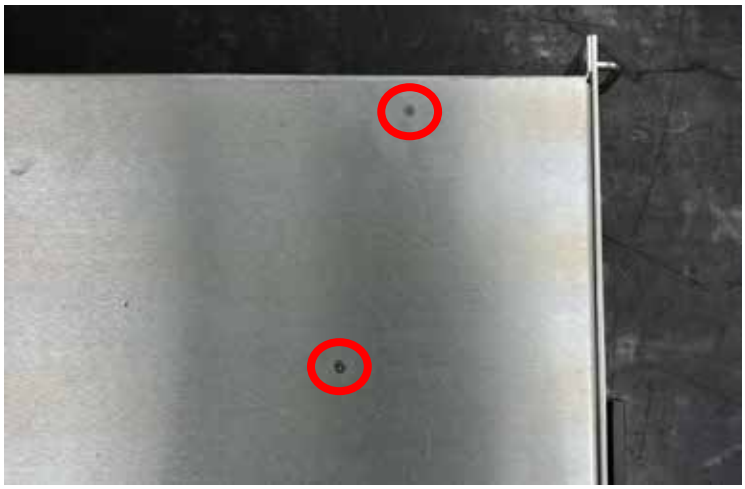


Figure 125 – Bottom PA Screws

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

Figure 126 – 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.

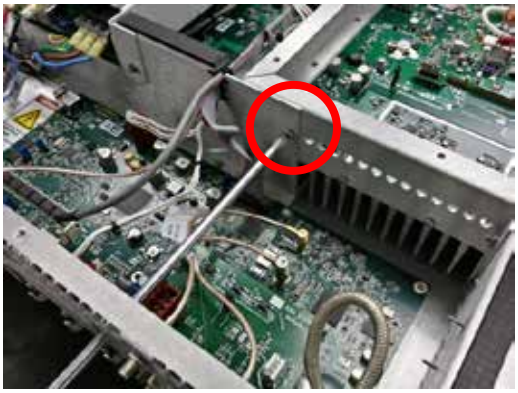


Figure 127 – Front PA Screw

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

Figure 128 – RF OUT Nut

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

Figure 129 – RF Sample Nut

6. Disconnect all cables from the PA assembly.

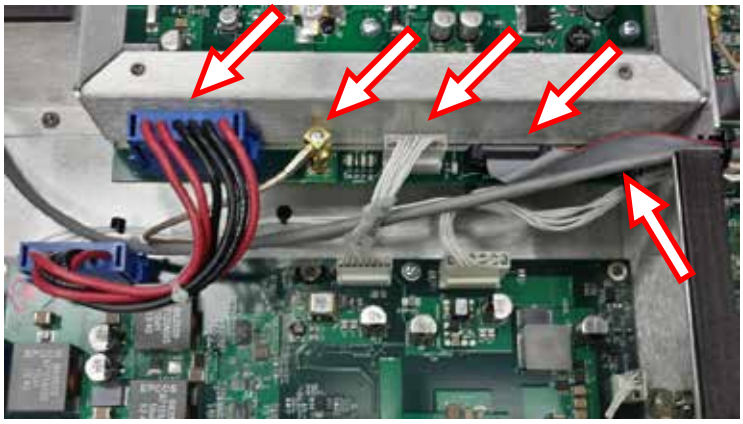


Figure 130 – PA Assembly Cables

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 131 – CPE Screw and Snap

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

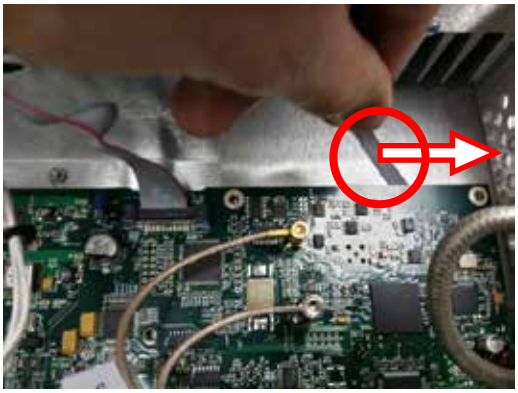


Figure 132 – Low Pass Filter Ribbon

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 133 – Low Pass Filter Screws

12. Disconnect the ribbon cable from the board assembly.

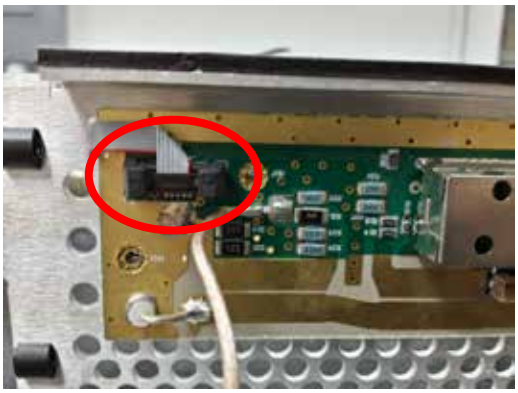


Figure 134 – Low Pass Filter Ribbon

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

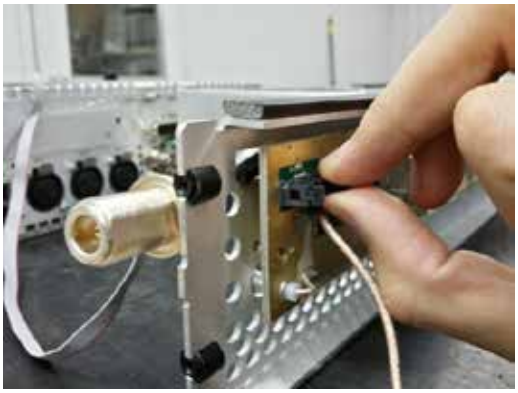


Figure 135 – Low Pass Filter Ribbon Extraction

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 136 – 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.

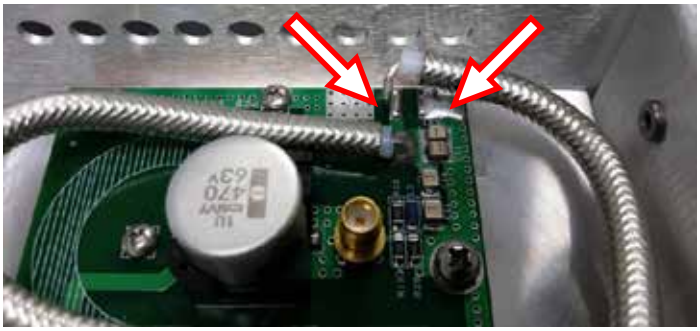


Figure 137 – Final PA Pallet RF Output

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

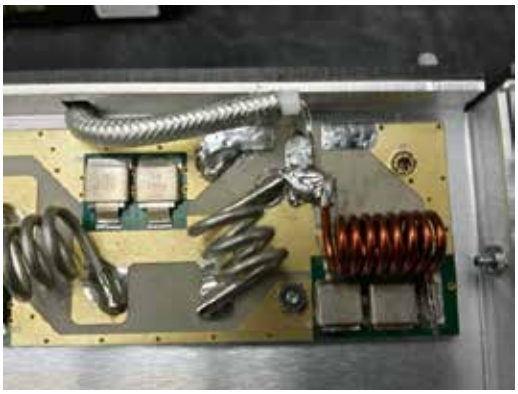


Figure 138 – Low Pass Filter Nut

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.

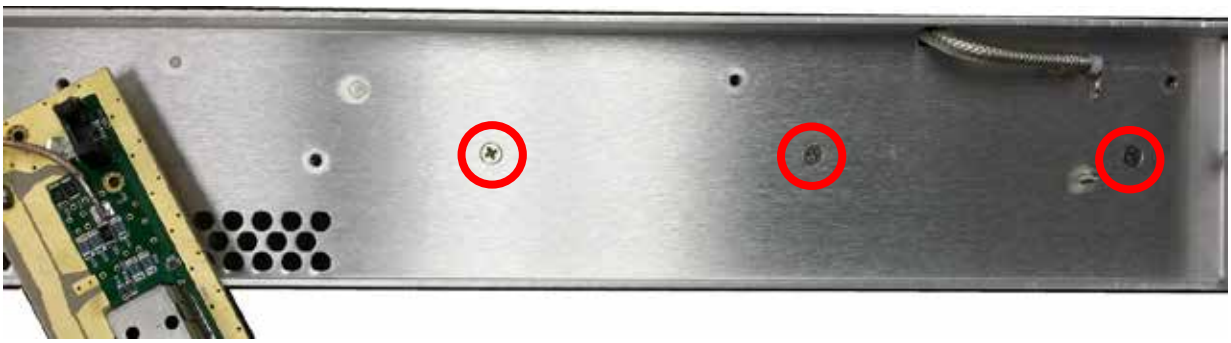


Figure 139 – Low Pass Filter Chassis Section Screws

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

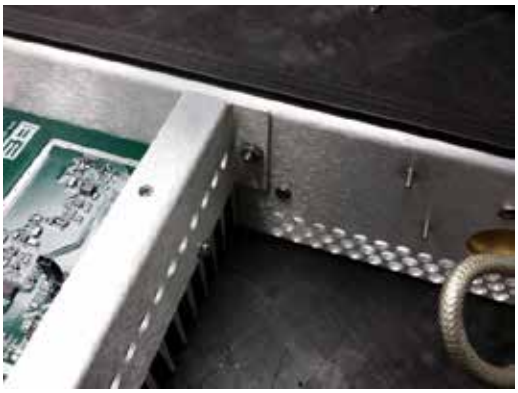


Figure 140 – Low Pass Filter Chassis Nut

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

Figure 141 – 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.

15.16 Front Panel Display

Figure 142 – 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 143 – Front Display Screw

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

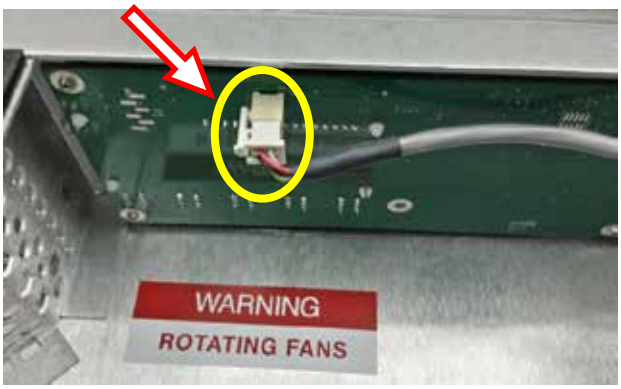


Figure 144 – Front Display Plug

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

Figure 145 – Front Display Left Snaps

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

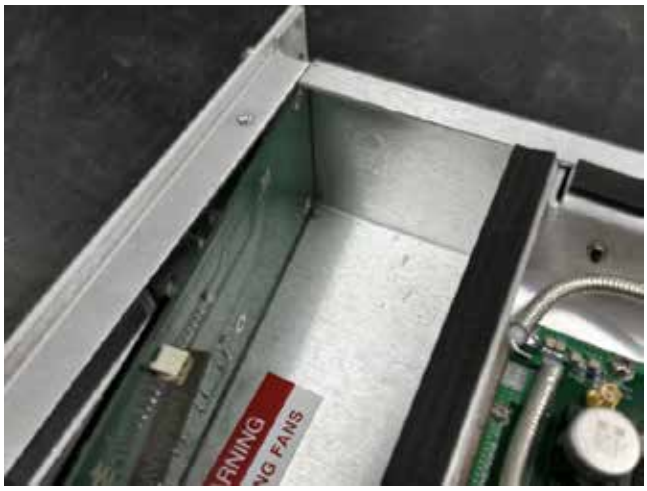


Figure 146 – Front Display Right Snaps

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

15.17 Extended I/O

Figure 147 – Extended I/O Board

☐ 3/16” Nut Driver

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

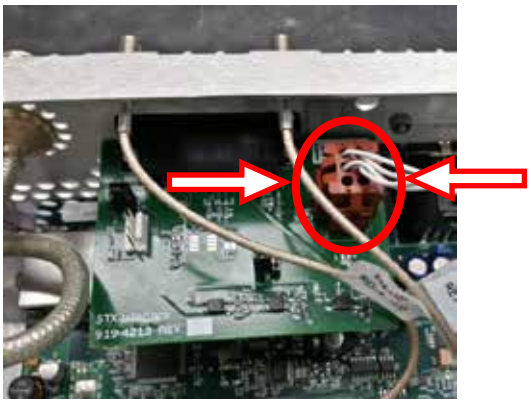


Figure 148 – Extended I/O Cable

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

Figure 149 – Extended I/O Jack Screws

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

15.18 Controller Exciter

Figure 150 – 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.

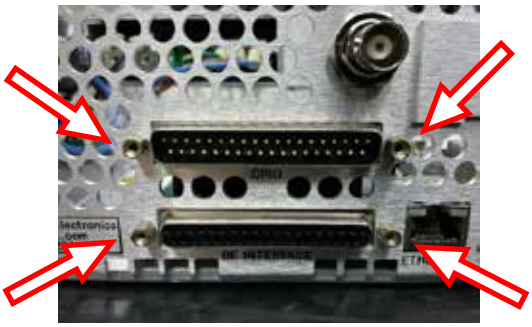


Figure 151 – CPE D-Subminiature Jackscrews

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

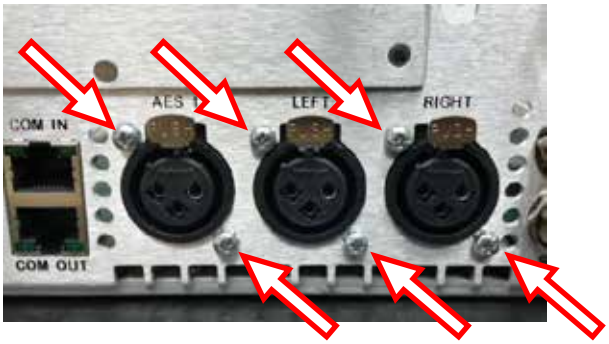


Figure 152 – CPE XLR Screws

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.

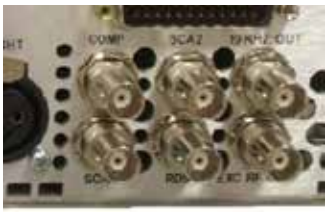


Figure 153 – CPE BNC Nuts

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.

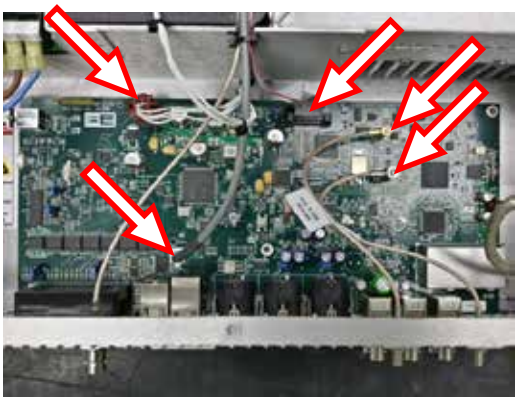


Figure 154 – CPE Cables

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 155 – Main PS AC Wiring

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

Figure 156 – CPE Screw

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

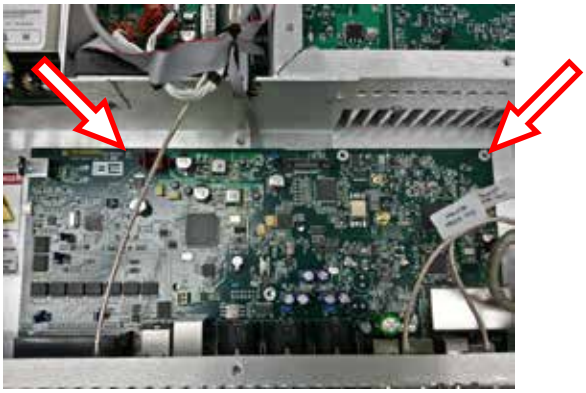


Figure 157 – CPE Snaps

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

Figure 158 – 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 159 – Board Extraction

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

16 10kW Power Block Maintenance

16.1 Front and Rear Access

Some of the STX HP modules and sub assemblies such as the PA Power Supplies which are accessable behind the Front Access Panel may be serviced without truning the TX off or removing AC power from the cabinet. Howerver, with the Front Panel removed, the normal air flow for cooling will be disrupted.and the PA temperture 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 Disconnnect 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.

16.2 HP Air Filter

The air filter is front accessable 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 recommend 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 160 – 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.

16.3 PA & Power Supply Enclosures

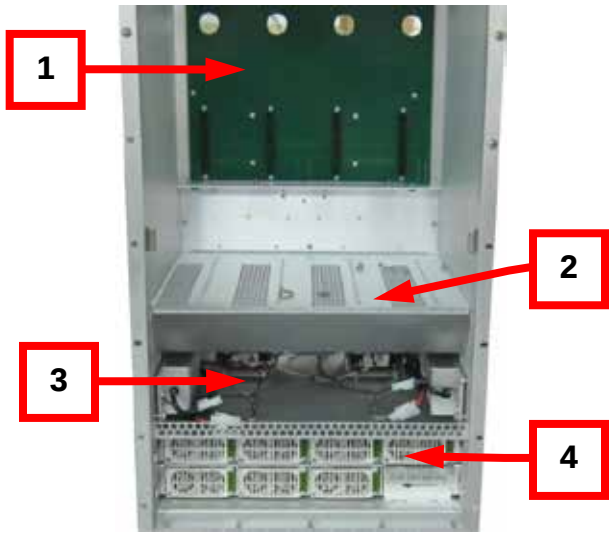


Figure 161 – 10kW Front Cabinet Compartments

16.3.1 PA Module Enclosure

The 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..

16.3.2 PA Module Air Plenum

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

16.3.3 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.

16.3.4 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 plugable.

Figure 162 – Plower Block with Rear Access Panel Removed

16.4 PA Power Supplies

The STX 20 comes with a standard configuration of seven supplies in each 10kW HP Cabinet,for total of 14 power supplies. The STX 20 can maintain full power with six of seven operating power supplies temporarily to allow replacement of a power supply.

Figure 163 – PA Power Supply

☐ 540-5205 52V 2725W Power Supply

1. To remove a power supply, push on the clip circled in Figure 160 to allow you to swing out the hinged fan cover. This will unlatch the supply out of it's mother board connector and allowing you to pull the supply the remainder of the way out of it's module position.

Figure 164 – 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.

16.5 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 161. Only the Mounting Plate and hardware shown in Figure 163 is reused.

Figure 165 – Fan Power Supply Assembly

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

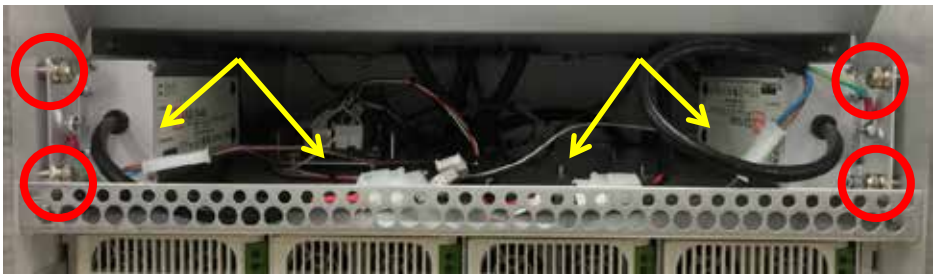
1. Unplug the two connectors for the power supply that needs to be replaced
2. While holding onto the supply, loosen the two thumb screws to release the Mounting Plate from the wall of the cabinet. The plate is slotted on the other end and PS assembly will pull forward and out.
3. 

Figure 166 – Fan & MB Power Supply Enclosure

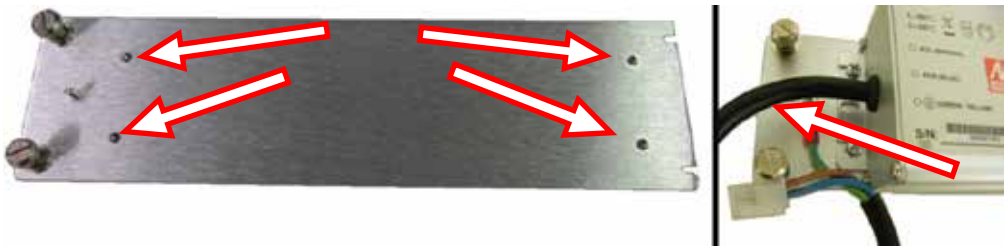
4. 

Figure 167 – FAN PS & Mounting Plate

5. Remove the existing supply and replace with the four 6-32 mounting screws . Secure the AC safety GND lug with the 6-32 nut.
6. 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.

16.6 Control Power Supply

The 24 & 12 VDC supply requiremnts needed for various control and interface assemblies is provided by this +24/+12VDC Dual Power Supply as shown in Figure 164.

Figure 168 – 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..

7. 

Figure 169 – 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 166.

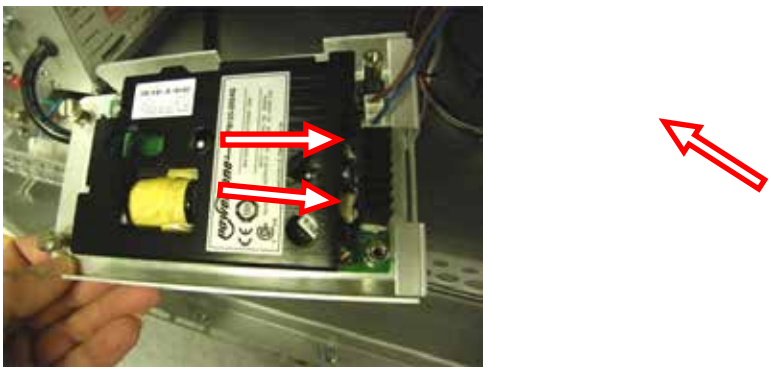
8. 

Figure 170 – PS Connector Locations

3. Install the replacement PS in the reverse order.

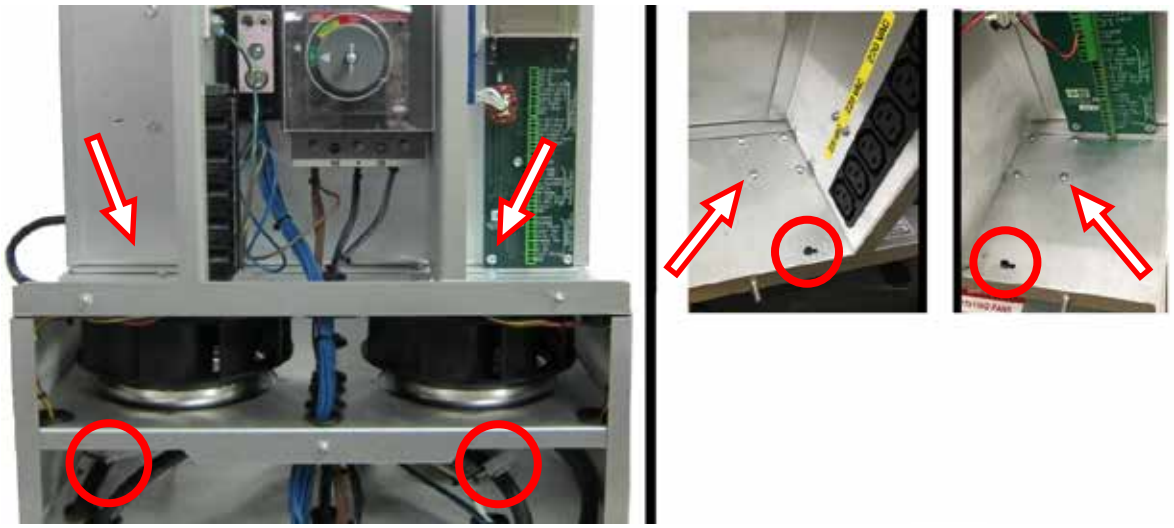
16.7 PA Cooling Fans

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

Figure 171 – 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.



A B

Figure 172 – 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 though the clearance hole to remove the fan.

4. Install the new fan in the reverse order .

16.8 STX HP PA Module

Each of the four PA Modules are secured into the STX cabinet with two retaining brackets located in Figure 169.

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

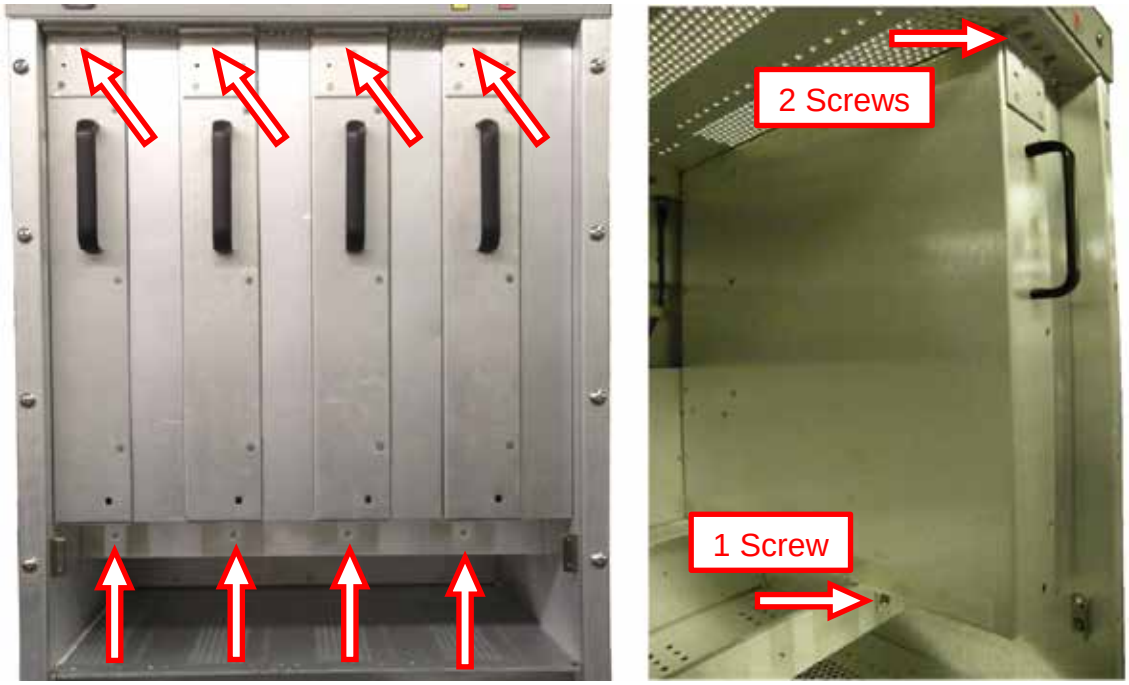


Figure 173 – PA Module Retaining Brackets

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 14.1 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

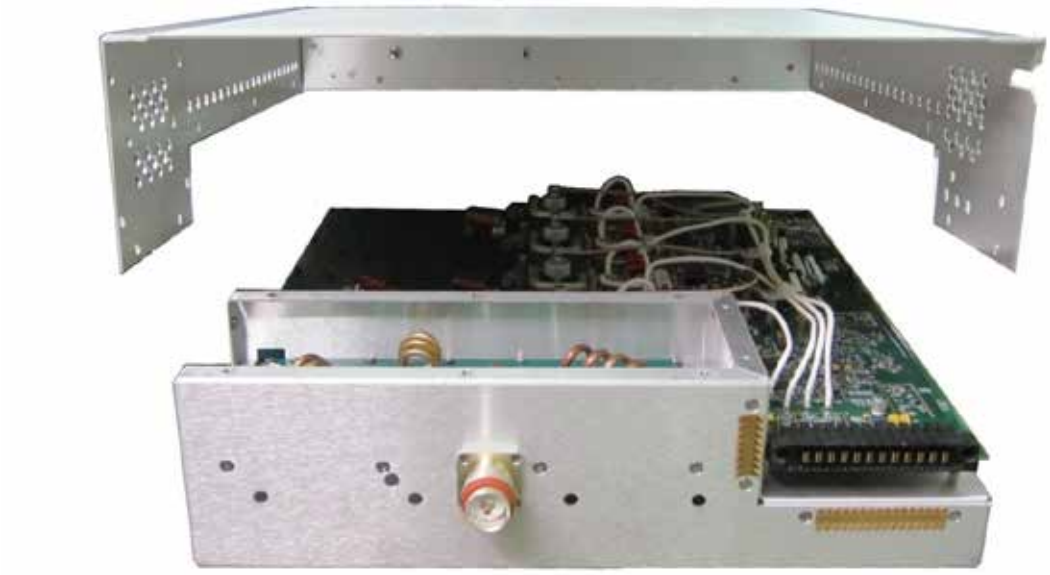


Figure 174 – PA Module Cover Removal

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 171

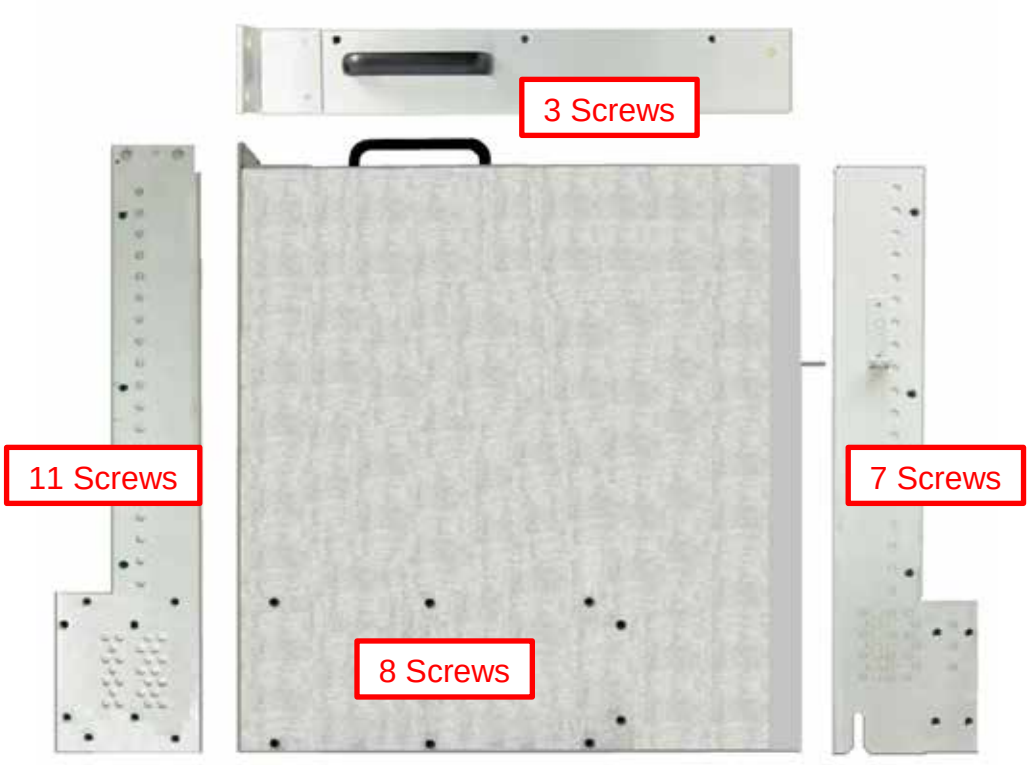


Figure 175 – Screw Locations –PA Module Cover

The major subassemblies, PWB's and componets of the PA Module are shown identified in Figure 172 below

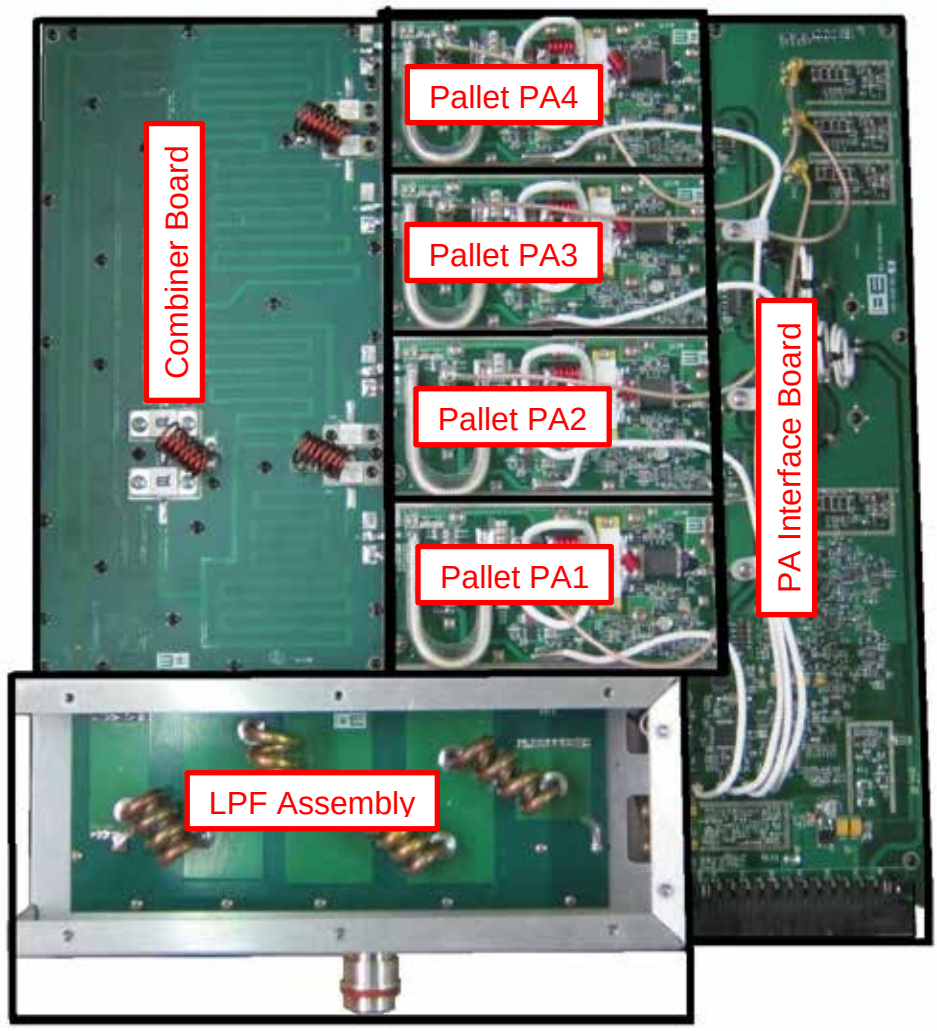
3. 

Figure 176 – PWB an Subassemblies of PA Module

- Pallet PA Assembly. The PA Module consists of (4) identical PA Pallets.
- Combiner Board. The RF out of the 4 pallert assy's are combinered on this assembly.
- Low Pass Filter. The LPF Assembly attenuates unwanted emmisions 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 distributuion 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.

.

4.

16.9 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 in used for control and I/O circuits on the PA Interface Bd plus +5VDC is fused with a 2A suface 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 173 and Figure 174 .

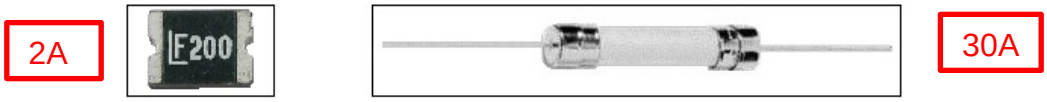


Figure 177 – 30A Fuse, PA Module

- ☐ 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.

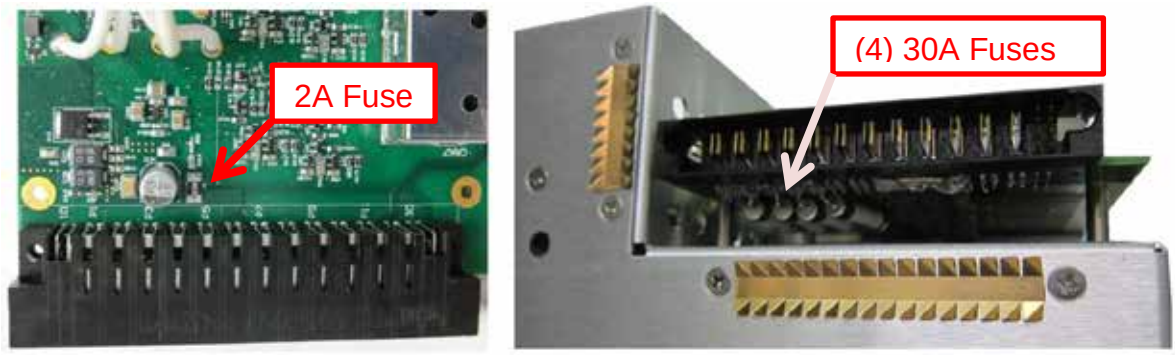


Figure 178 – Fuses at I/O Connector

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 175 .

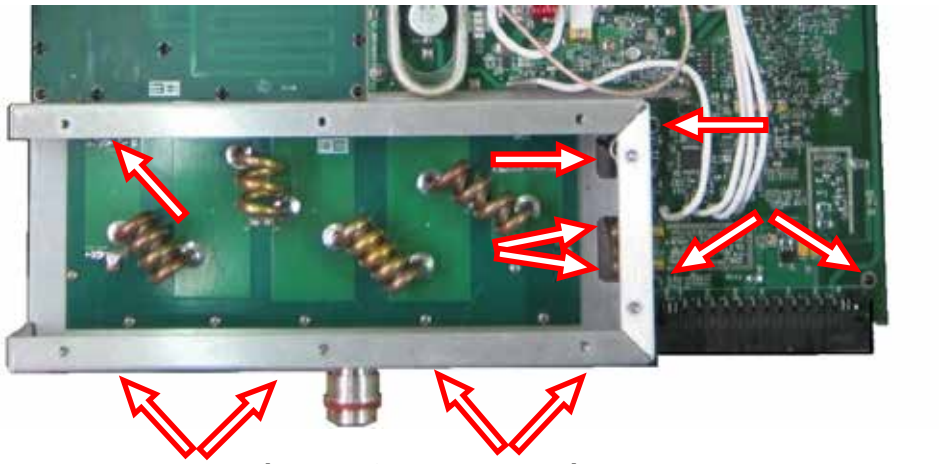


Figure 179 – LPF Connection Areas

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

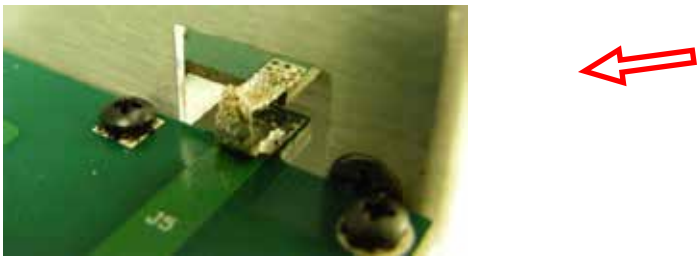
3. 

Figure 180 – LPF RF Input

4. On the LPF, disconnect the Directional Coupler Cabling consisting of two RF coax connectors and the 2 wire plug shown in Figure 177

5. 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.

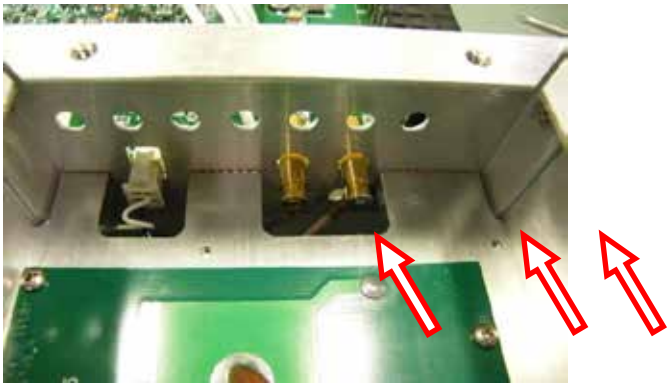
6. 

Figure 181 – LPF Directional Coupler Connectors

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

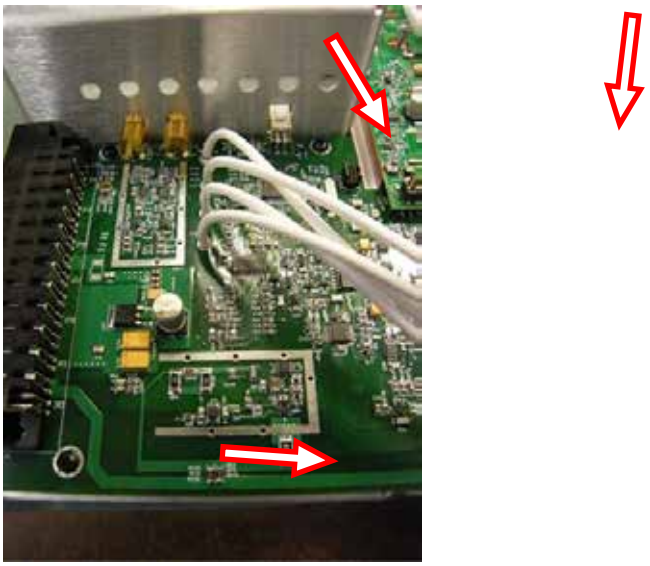
8. 

Figure 182 – LPF Screw Locations on PA Interface Board

9. Remove the four screws that fasten the LPF Assembly to the Heat Sink Assembly shown in Figure 180 via the access holes shown in Figure 179. Note, use the upper access hole on left side of RF output connector to remove that heat sink screw.

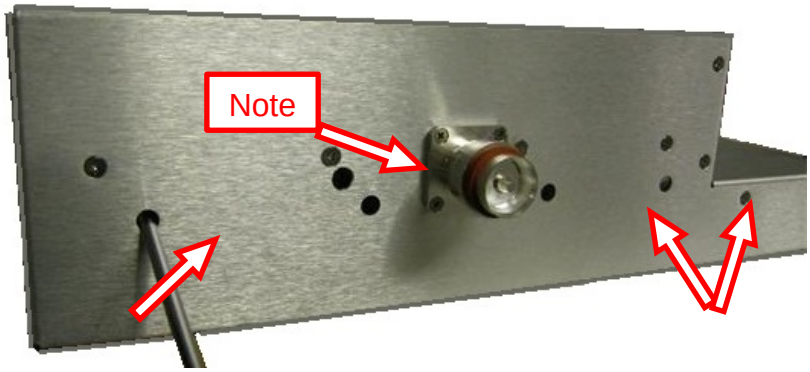
10. 

Figure 183 – LPF Access Hole Locations

11. 

Figure 184 – LPF / Heat Sink Mounting Screws

12. 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 181 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.

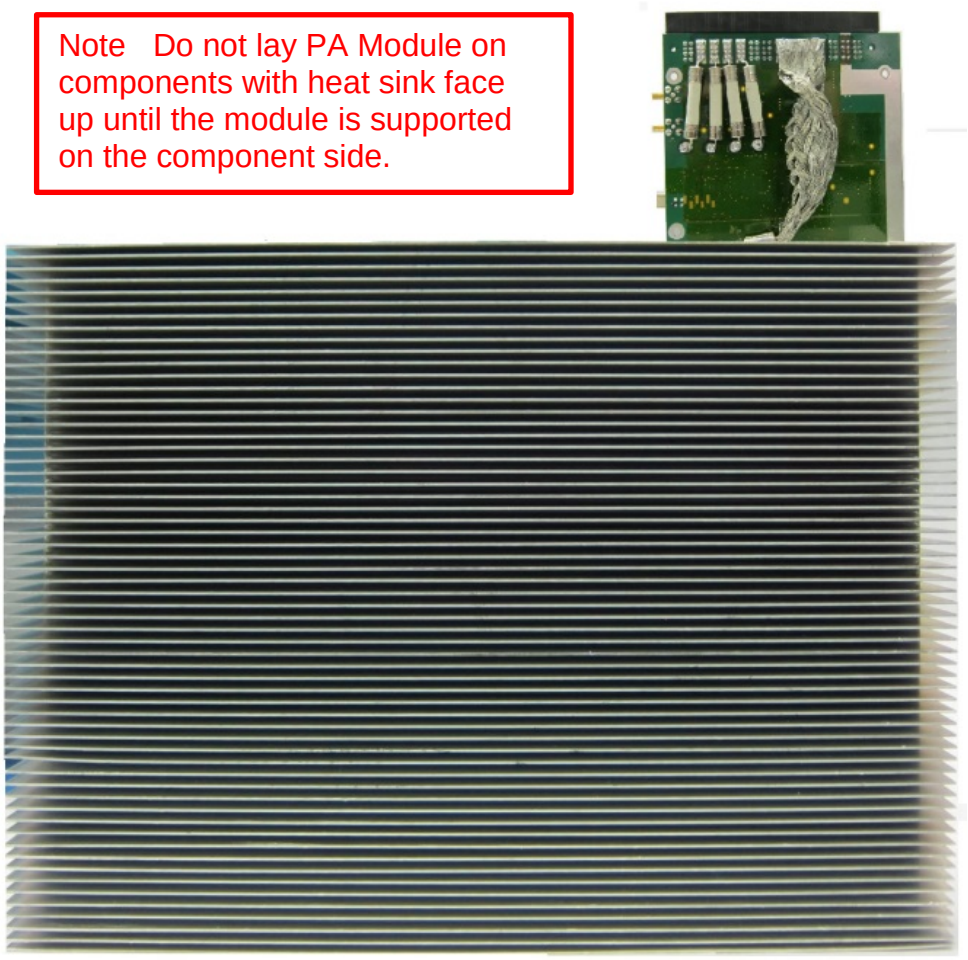
13. 

Figure 185 – LPF Removed from PA Module

14. 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)

15. Unsolder the leads of the failed fuse(s) from the board and remove fuse.

16. Clip and bend leads of the replacement fuse(s) to match the mounting and solder fuse(s) in place.

17. Turn module over and lay heat sink on bench.

18. Remove cover and begin steps of putting LPF Assy back on module.

19. 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

20. 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 186 – Captive Phillips Screw Method

21. Once all screws are in position, tighten to fit, but careful not over tighten screws on the PA Interface Bd to avoid PWB damage.

22. Plug the Directional Coupler cables back into their respective connectors on the PA Interface Bd. Refer to Figure.

23. Position and and solder the RF input braid back onto the LPF PWB. Refer to Figure 176

24. 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.

16.10 Pallet PA Assembly

Figure 187 – 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.

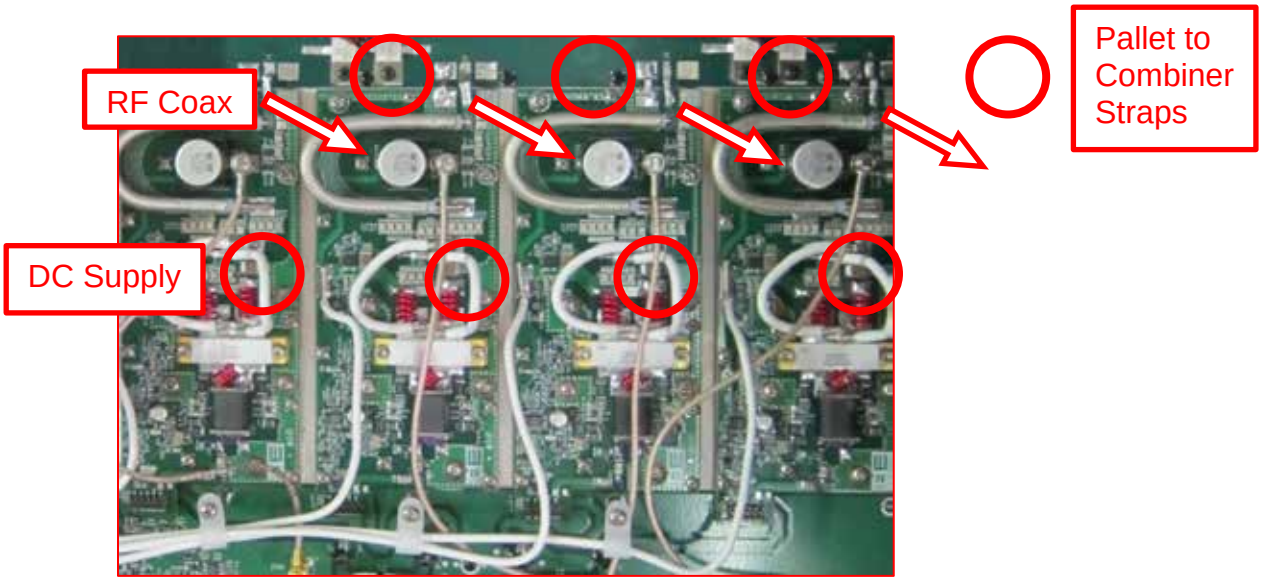


Figure 188 – Pallet Solder & Coax Cable Locations

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

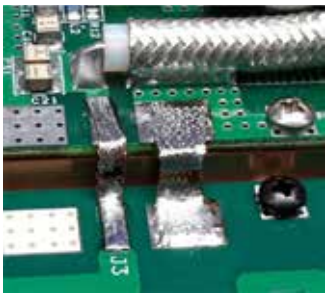


Figure 189 – Pallet RF Output

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 186

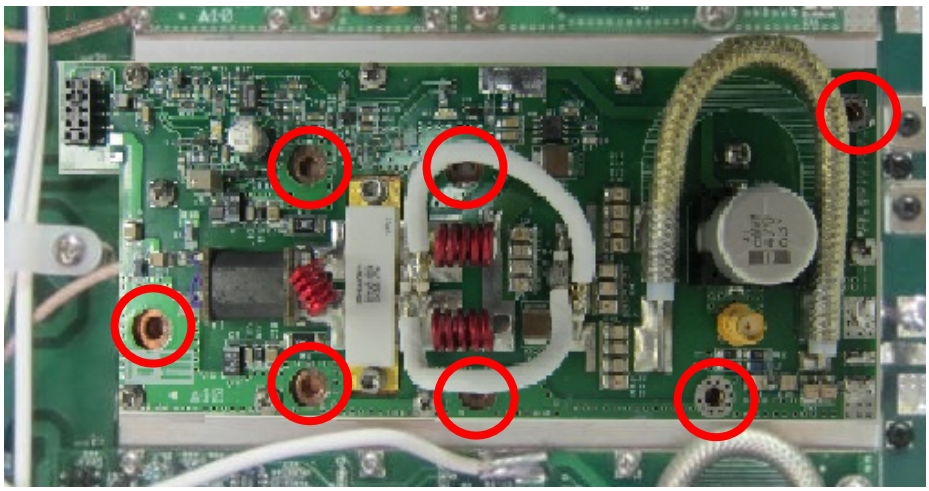


Figure 190 – Pallet Screws

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

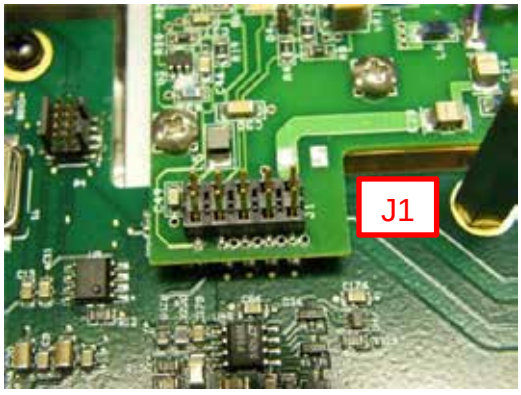


Figure 191 – Pallet / PA Interface J1 Connector

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 192 – 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.

16.11 Combiner Reject Resistors

Figure 193 – 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.

Resitors locations on PA Module Pallet Combiner

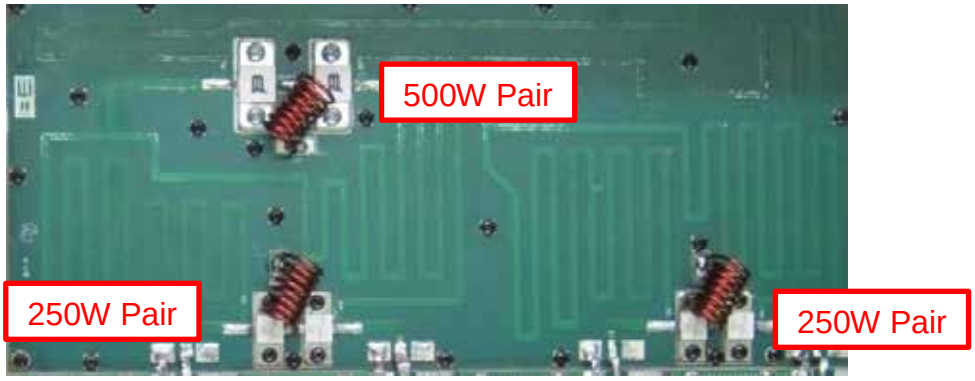


Figure 194 – PA Module Combiner Board

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

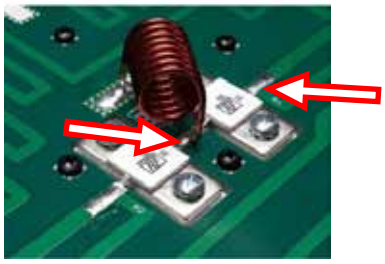


Figure 195 – Resistor and Coil Combination

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.

16.12 Front Control Panel and RJ45 Control Interface

Figure 196 – Front Control Panel Complete

When the 3 mounting screws are removed in Figure 192, and the 1RU silk screened panel is removed, only the RJ45 connector is attached to the 1RU silk screened panel, Figure 193.

Figure 197 – Front Control Panel – 1RU Silk Screened Panel

Figure 195 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 made from the back and it may be necessary to remove the Exciter to improve access for servicing this area.

Figure 198 – STX HP Front with 1RU Silkscreened Panel Removed

Figure 199 – Front Panel Control Printed Circuit Board

16.12.1 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.

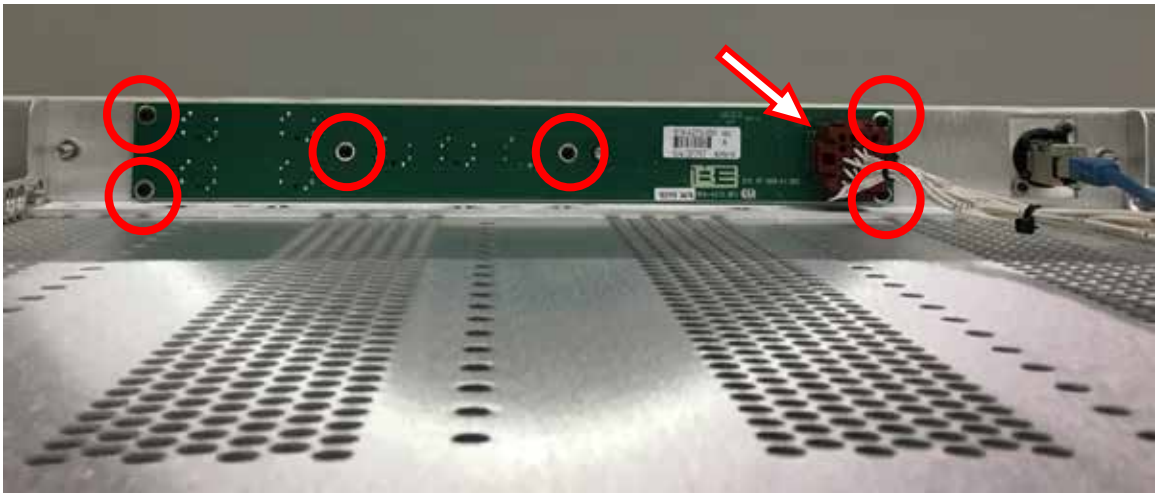


Figure 200 – Front Control Panel Rear View & Mounting Screws

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.

16.12.2 - RJ45 Connector Removal

1. The RJ45 connector can be service from front by removing the 3 screws identified in Figure 192, if the CAT5E cable is loosen from the rear.
2.
3. Cut Tywaps in harness along top of cabinet and along the back as identified in Figure 197B.

4. Loosen CAT5E cable just enough to disconnect cable from the RJ45 connector in Figure 197A.

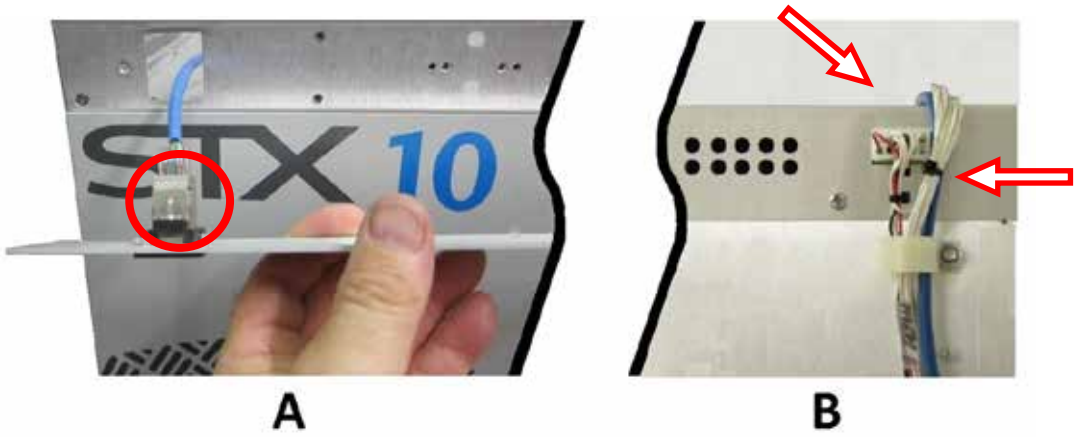


Figure 201 - Loosen CAT5E cable from harness in rear of cabinet

5. Remove the two Phillips screws and captive nuts to replace the RJ45 connector

6. Repeat the previous steps in reverse order to put panel back on cabinet.

16.13 AC Power Compartment

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

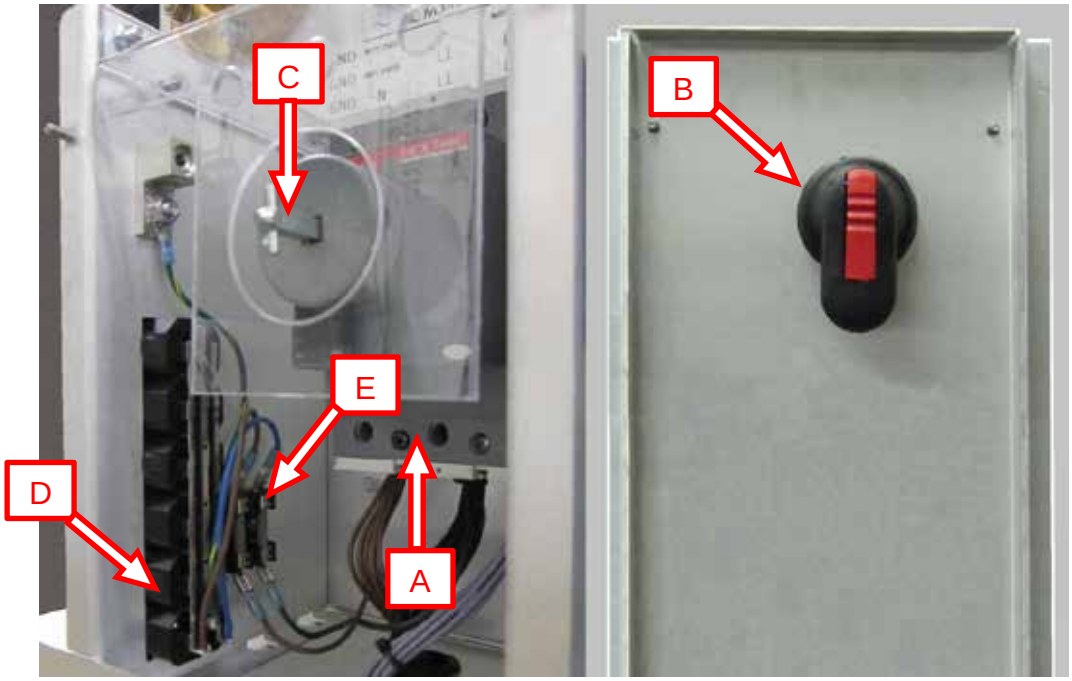


Figure 202 - AC Compartment

☐ A-341-0106	1	Circuit Breaker, 80A, T3N080TW
Or….		
☐ A-341-0107	1	Circuit Breaker, 125A, T3N125TW
☐ B-486-5500-100	1	Handle
☐ C-486-5500-600	1	Handle Shaft
☐ D-417-6121-251	1	IEC 320 Receptacle Block
☐ E-330-2000	2	Fuse, 20A 250V

☐ Straight Blade Screwdriver
☐ Phillips Screwdriver

16.13.1 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 198, 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 199B and remove breaker

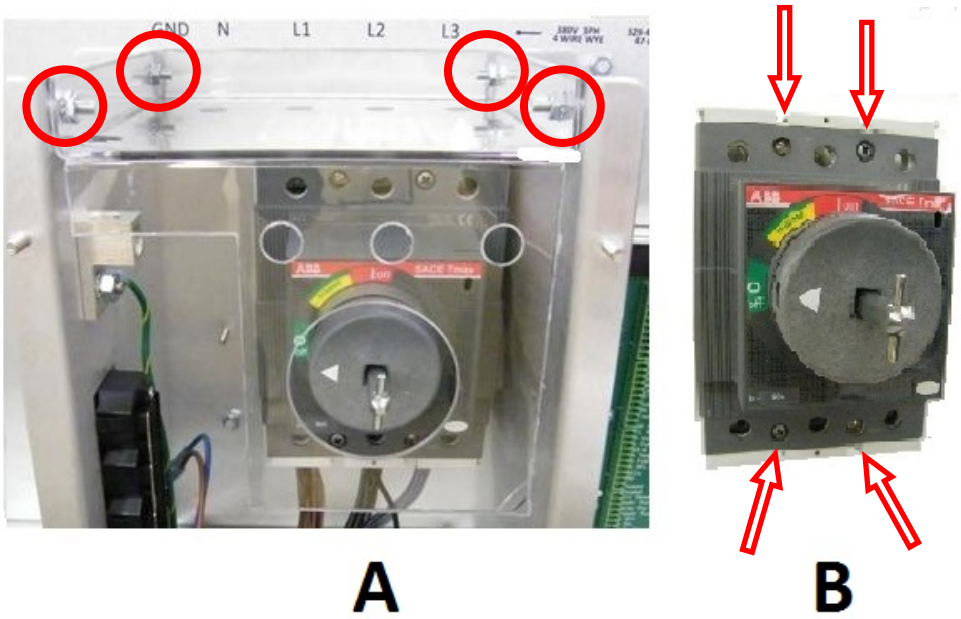


Figure 203 - Circuit Breaker

5. Replace new breaker in reverse order.

16.13.2 Circuit Breaker Handle Alignment

In the event the Circuit Breaker Handle is removed from the Rear Access Panel, Figure 200 below shows the correct position to reinstall the Handle to line up with the Shaft mounted on the Breaker.

Figure 204 – Handle Alignment