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STX LP Generation II
1 kW, 2 kW, 3 kW, 5 kW
FM Transmitters
Installation and Maintenance Guide

597-4101-200
Revision B
May 31, 2013

STX LP Generation II - 1 kW, 2 kW, 3 kW, 5 kW FM Transmitters
Installation and Maintenance Guide

Broadcast Electronics Product Warranty (Two-Year Limited)

BE hereby warrants all new products manufactured by BE 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.

BE reserves the right to repair equipment under warranty with new or refurbished equipment or parts. BE's 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 BE's 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 BE 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. BE 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 new their new condition.

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

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 BE 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 BE, or if not installed according to BE's 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 BE's 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. BE shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of BE. The warranty provided herein shall terminate at the end of the period set forth above. This warranty extends only to the original Purchaser and is not transferable. There are no third party beneficiaries of any of the provisions of

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 BE, 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. 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. Do not mail the equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact the RF Technical Services Department for a Return Authorization.

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 at the number shown below.

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
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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 WHICH 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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1 Overview

The STX LP FM transmitter series is designed to provide a low power cost effective solution for the FM broadcast market. The STX LP is available in 4 models providing power levels from 250 W to 5 kW.

This guide provides installation and maintenance information for STX LP Generation II transmitters. Photographs in this document typically show the STX LP Generation II combined systems in an optional 19" EIA 21RU sold-separately rack and a 2RU power distribution panel sold-separately option. Racks sized at 21, 35, or 42 RU are available for purchase and installation through Broadcast Electronics. It is highly recommended that customers specify and purchase one of these sold-separately racks for factory setup of new transmitters.

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

IP network interfacing features are optional. Network cables and hardware depend on the desired networking setup and are relatively common.

For details in operation, please see the STX LP Generation II FM Transmitter Operation Manual. A copy can be found in the binder containing this manual that is shipped with all transmitters. For electronic copies of any technical documentation please visit http://www.bdcast.com/information-center/ and follow navigation on the left side of the page – authorized login is required for download of technical documents.

Order for experienced quick installation:
See section 4 Installation and Initial Setup for detailed directions of all of these steps. If your transmitter system has been assembled in the factory, please go to step 5.

1. Install the transmitter in a rack – not required but highly recommended
2. Ensure AC is disconnected from service and connect distribution to all assemblies
3. RF coaxial cabling
4. Control communications bus cabling
5. Antenna/load
6. Remote Station Interface Failsafe and BE Interface (activation stub or exciter switcher)
7. AC power service to AC distribution
8. Turn on AC power to all units
9. Set Ethernet/IP network settings and connect Ethernet to local networking
10. Set time and date
11. Connect and set up all program services
12. Set the output power level of the transmitter
13. Turn RF transmission on

Figure 1 – STX LP Generation II – 1kW

Figure 2 – STX LP Generation II – 2kW

Figure 3 – STX LP Generation II – 3kW

Figure 4 – STX LP Generation II – 5kW

Table 1 - Optional Equipment

PART NUM	DESCRIPTION
979-4103	FW LP1 and Exciter Switcher Kit for 1kW STX LP Gen II
979-4103-100	FW LP1 and Exciter Switcher Kit for 2, 3, and 5kW STX LP Gen II

Table 2 - Specifications

Parameter	Specification
Physical	
1 kW Model -	
Height	3 RU 5.25" (13.4 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	26" (66.1 cm) including connectors
Weight	40lbs (18.2 kg) unpacked
Outlet Size	50 in^2 (493 cm^2), rear of unit
2 kW Model -	
Height	10 RU 17.5" (44.5 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	26" (66.1 cm) including connectors
Weight	130lbs (59.0 kg) unpacked
Total Outlet Size	125 in2 (1065 cm2), rear of unit
3 kW Model -	
Height	13 RU 22.75" (57.8 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	26" (66.1 cm) including connectors
Weight	170lbs (77.1 kg) unpacked
Total Outlet Size	175 in^2 (1419 cm^2), rear of unit
5 kW Model -	
Height	19 RU 33.25" (84.5 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	26" (66.1 cm) including connectors
Weight	250lbs (113.4 kg) unpacked
Total Outlet Size	275 in^2 (2129 cm^2), rear of unit
Environmental	
Temperature	-10°C to +50°C
Altitude	10,000ft (3048M) maximum
Humidity	95% maximum, non-condensing
1 kW Model	
Air Capacity	200 CFM (5.7 m^3/Min)
Heat Dissipation	750 W at Rated Output
BTU	2560 BTU/H at Rated Output
2 kW Model	
Air Capacity	600 CFM (17.0 m^3/Min)
Heat Dissipation	1550 W at Rated Output

BTU	5295 BTU/H at Rated Output
3 kW Model	
Air Capacity	800 CFM (22.7 m^3/Min)
Heat Dissipation	2300 W at Rated Output
BTU	7850 BTU/H at Rated Output
5 kW Model	
Air Capacity	1200 CFM (34.0 m^3/Min)
Heat Dissipation	3800 W at Rated Output
BTU	13000 BTU/H at Rated Output
AC Input	
Frequency	47-63 Hz
Power Factor	≥0.98
Surge Protection	Not included – External surge protection required
1 kW Model	
Power Consumption	1.75 kW (calculated) at Rated Output
Voltage	180 to 260 V AC Split Phase
Power	Requires 20 Amps Max
Current Draw	16 Amps Max
2 kW Model	
Power Consumption	3.5 kW (calculated) at Rated Output
Single Phase -	
Voltage	180 to 260 VAC Split Phase
Power	Disconnect Size 40 Amps
Current Draw	32 Amps Max
3 kW Model	
Power Consumption	5.3 kW (calculated) at Rated Output
Single Phase	
Voltage	180 to 260 VAC Split Phase
Power	Disconnect Size 60 Amps
Current Draw	48 Amps Max
Three Phase	
Voltage	180 to 260VAC Delta or 311 to 449VAC Wye
Power	Disconnect Size 30 Amps
Current Draw	28 Amps Max
5 kW Model	
Power Consumption	8.8 kW (calculated) at Rated Output
Single Phase -	
Voltage	180 to 260 VAC Split Phase
Power	Disconnect Size 100 Amps
Current Draw	80 Amps Max
Three Phase -	
Voltage	180 to 260VAC Delta or 311 to 449VAC Wye
Power	Disconnect Size 60 Amps
Current Draw	47 Amps Max

RF Output

Power Accuracy	+/-5% of Total Output Power Setting
Impedance	50 Ohms nominal
VSWR	Rated Power into 1.5:1 VSWR
Asynchronous AM SNR	Better than -65 dB (typical -70dB) referenced to average peak-to-peak carrier amplitude. 75 uSec de-emphasis
Synchronous AM SNR	Better than -53 dBr (typical -60dB) referenced to average peak-to-peak carrier amplitude. 75 kHz deviation @ 400 Hz

1 kW Model

FM Only Power	250-1100W
FM+Digital* Power	175-770W
Digital Only* Power	75-330W
Power Control Precision	1W
Efficiency	65% or greater AC to RF
RF Output Connector	Type N, Female

2 kW Model

FM Only Power	500-2200W
FM+Digital* Power	350-1540W
Digital Only* Power	150-660W
Power Control Precision	2W
Efficiency	57% or greater AC to RF
RF Output Connector	1 5/8" Rigid Coax Clamp, Male Inner, 50 Ohm

3 kW Model

FM Only Power	750-3300W
FM+Digital* Power	525-2310W
Digital Only* Power	225-990W
Power Control Precision	3W
Efficiency	57% or greater AC to RF
RF Output Connector	1 5/8" Rigid Coax Clamp, Male Inner, 50 Ohm

5 kW Model

FM Only Power	1250-5500W
FM+Digital* Power	875-3850W
Digital Only* Power	375-1650W
Power Control Precision	5W
Efficiency	57% or greater AC to RF
RF Output Connector	1 5/8" Rigid Coax Clamp, Male Inner, 50 Ohm

Frequency

Range	87.5MHz to 108MHz; 10kHz increments
Stability	+/-150 Hz, -10°C to +50°C

Modulation

Type	Direct-to-Channel; FM, FM+Digital (OFDM), All Digital
Capability	450 kHz

RF Harmonics Suppression	Meets all FCC/DOC requirements and CCIR recommendations
Composite Input	
Connector	BNC, un-balanced
Impedance	10k ohms
Level	3.5V p-p for 75 kHz modulation
Amplitude Response	+/-0.03 dB 30 Hz to 53 kHz; +/-0.25 dB 53 kHz to 100 kHz
SNR	-80dBr; reference 3.5V p-p at 400 Hz
THD + Noise	0.05%; 30 Hz to 100 kHz
IMD	0.01%, SMPTE (60 Hz:7 kHz, 1:1 amplitude ratio)
SCA1 & 2 Inputs	
Connectors(2)	BNC, un-balanced
Impedance	10k ohms
Level	3.5V p-p for 10% injection level
Response	+/-0.5dB; 53 kHz to 100 kHz
RDS Input	
Connector	BNC, un-balanced
Impedance	10k ohms
Level	3.5V p-p for 10% injection level
Response	+/-0.5 dB; 53 kHz to 100 kHz
AES Input	
Connector	XLR Female
Impedance	110 Ohms, balanced
Level	-2 dBFS for 100% modulation
Amplitude Response	+/-0.25 dB; 30 Hz to 15 kHz
SNR	75 dB below 100% modulation @ 400 Hz
THD + Noise	0.025%
Stereo Separation	-74dB 30 Hz to 15 kHz
Pre-emphasis	None, 50 uSec, 75 uSec selectable
Modes	Mono L, Mono R, Mono L+R, Stereo
Analog L/R	
Connectors	XLR Female
Impedance	600 Ohms or 10kOhms, selectable, balanced
Level	3.5Vpp for 100% modulation into 10kOhms
Amplitude Response	+/-0.25dB; 30 Hz to 15 kHz
SNR	75 dB below 100% modulation @ 400 Hz
IMD	0.1% or better
THD + Noise	0.1% or better
Stereo Separation	-70dB 30 Hz to 15kHz
Pre-emphasis	None, 50 usec, 75 usec selectable
Modes	Mono L, Mono R, Mono L+R, Stereo

Pilot Output	
Stability	+/-0.3 Hz, 0°C to +50°C
Connector	BNC un-balanced
Level	+/- 5% 1V p-p into high impedance
10 MHz Input	
Connector	SMA un-balanced
Level	1 to 3 V p-p, nominal 2.8 V p-p (13 dBm)
1 Pulse Per Second Input	
Connector	SMA un-balanced
Level	5V TTL Rising Edge
Regulatory	
FCC/DOC/CE/IEC 215 Safety	Meets or exceeds FCC/DOC/CE and IEC 215 requirements

* Digital Radio Signal Generator Required

2 Preparing to Install

2.1 Verify Contents of Shipment

Note for 2, 3, and 5kW systems with the backup system controller and exciter option: substitute one main assembly for one add-on assembly in the checklist below.

1 kW Systems

- ☐ 909-4103-001 STX LP Generation II Main Assembly
- ☐ 979-4120 1kW STX LP Generation II Installation Kit
- ☐ 979-4110 STX LP Generation II Manual Binder

2 kW Systems

- ☐ 909-4103-001 STX LP Generation II Main Assembly
- ☐ 959-4113 STX LP Generation II Add-on Assembly
- ☐ 979-4220 2kW STX LP Generation II Installation Kit
- ☐ 979-4110 STX LP Generation II Manual Binder

3 kW Systems

- ☐ 909-4103-001 STX LP Generation II Main Assembly
- ☐ Qty:2 959-4113 STX LP Generation II Add-on Assembly
- ☐ 979-4320 3kW STX LP Generation II Installation Kit
- ☐ 979-4110 STX LP Generation II Manual Binder

5 kW Systems

- ☐ 909-4103-001 STX LP Generation II Main Assembly
- ☐ Qty:4 959-4113 STX LP Generation II Add-on Assembly
- ☐ 959-4501-200 5kW STX LP Generation II Combiner Assembly
- ☐ 979-4520 5kW STX LP Generation II Installation Kit
- ☐ 979-4110 STX LP Generation II Manual Binder

2.2 Items Sold Separately or Not Supplied

- ☐ Optional standby system controller and exciter kit with switcher and cables
- ☐ 19" EIA rack with rear support rails
- ☐ AC power main service connection with main breaker
- ☐ Remote station interface controller and solderable wiring for desired connections
- ☐ Networking cable(s) and switch(s) for Ethernet connectivity

2.3 Tools and Materials

- ☐ Small flat blade screwdriver (about 5/32" blade or smaller)
- ☐ Large flat blade screwdriver (or 5/16" socket driver)
- ☐ Small Phillips screwdriver
- ☐ Large Phillips screwdriver
- ☐ Tie-wraps

AC Power Distribution

- ☐ 3/16" Allen Wrench

Remote Station Interface Connections

- ☐ Control wiring (wire strippers) per desired installation
- ☐ Soldering iron and solder

2.4 Estimated Time for Installation

A first time installer with the simplest system setup may take about one hour from unpacking to RF power-on.

3 Rear Panel Connections

Before assembling the system, please take some time to familiarize yourself with all of the connectivity features included in STX LP Generation II Systems.

3.1 Main Assembly Features

For STX LP 1kW models, the STX LP main assembly is used as a standalone transmitter. In STX LP 2kW, 3kW, and STX LP 5kW models, the STX LP 1kW assembly is used as the system control and audio interface center. This assembly's rear panel connections and features are detailed below.

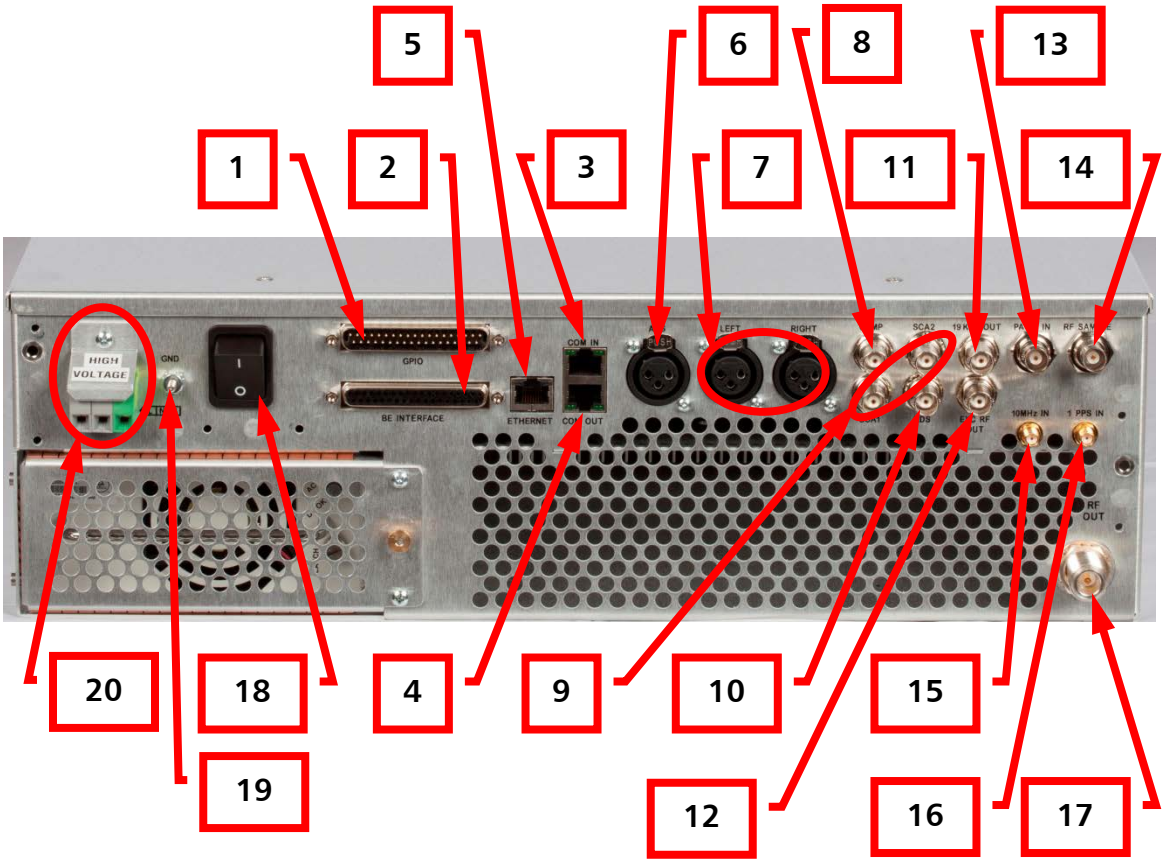


Figure 5 – Main Assembly Rear Panel

3.1.1 GPIO

General purpose input/output connector. This D-Sub 37 male connector is used in remote station interface control and other machine interfacing. Pin descriptions are below in Table 3. Note that "low" logic refers to a connection to logic ground pins 12 or 19. "High" logic is a connection to +5V supplied by pin 32. Active edge refers to a transition from the inactive state to the active state. For example, active low would be a momentary transition from the high state to the low state, and the implication is that no action is performed on the transition back to high. A momentary pulse such as this should be approximately 100ms in duration to ensure capture of the event.

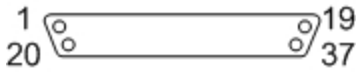


Figure 6 - Standard D-Sub 37 Connector Numbering

Table 3 – GPIO Pins

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
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	FM Only Mode	FM Only mode is selected on an active low edge.
12	Input	Ground	Isolated ground to be used for remote input connections.
13	Input	FM+Dig Mode	FM + Digital mode is selected on an active low edge.
14	Input	Dig Only Mode	Digital Only mode is selected on an active low edge.
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 (via pin 18). Varies linearly from 0 = 0A to 5 V = 50A.
17	Output	Selected PA Temperature	DC voltage for heat sink temperature reading in a PA module. Varies linearly from 0V = 0 degrees C to 5V = 100 degrees C.
18	Input	PA Module Select	Controls which PA is being monitored (this applies to pins in this table prefixed with "Selected PA"). If more than one PA is present, each active low edge cycles through selections. The end of the selectable PAs is referenced by all outputs being set to ~0V. This input does nothing in 1kW systems.
19	N/A	Ground	Isolated ground intended to be used for safe remote

Pin	Direction	Name	Description
			input logic connections on this interface. Jumper J9 allows this to be wired to a system-wide chassis ground. Pin 37 provides an alternate place to connect to this circuitry.
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 1.5:1
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	Selected PA Forward Power	DC voltage for PA forward output power. Varies linearly from 0V = 0W to 5V = 1250 W.
30	Output	Selected PA Reflected Power	DC voltage for PA reflected output power. Varies linearly from 0V = 0W to 5V = 100 W.
31	Input	Reserved	Reserved
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	Selected PA Voltage	DC voltage representing the variable RF power supply. Linear from 0V = 0V to 5V = 50 V.
35	Output	Reserved	Reserved
36	Output	Reserved	Reserved
37	N/A	Ground	Chassis ground connection.

3.1.2 BE INTERFACE

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
22	N/A	Ground	Chassis Ground
23	Input	Multiple CPE Control	Tie to ground for systems with standby exciter option.
Other		Reserved	Reserved

3.1.3 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 Cat 5 cable must be connected from COM OUT on the primary unit to this input on the standby unit.

Note that this input is not typically used in 1kW configurations.

3.1.4 COM OUT

System communications bus output. This RJ45 jack is used to wire the communications bus to the rest of the system. For main/backup systems, this connects to the standby unit. The second main assembly in a 2kW system setup connects to the combiner. For all other configurations, this must connect to the next add-on PA in the chain.

Note that this output is not typically used in 1kW configurations.

3.1.5 ETHERNET

Standard 10/100 Mbps RJ45 IP network communications input/output. Connect to a local area network switch and/or to a gateway for access through the internet. This interface automatically negotiates hardware interfacing, and a crossover cable is not required. Direct connections to a PC or other network controller can be made with either a crossover or straight Ethernet cable.

IP-based interfaces such as the built-in website and SNMP require this to be connected and the network configured through the transmitter control center. There is no explicit cap on the number of connections that can be made to the network controller; however an excessive number of connections will cause a decrease in performance in any of these IP interfaces.

3.1.6 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 are 32, 44.1, 48, and 96k.

3.1.7 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.

A hardware jumper allows the input to be switched to 600 Ohm impedance.

3.1.8 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.

3.1.9 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.

3.1.10 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.

3.1.11 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.

3.1.12 EXC RF OUT

Internal exciter RF output connector. This BNC connector outputs the internally generated exciter power level RF signal. For 1kW systems this should be jumped to PA RF IN using a coaxial connector. For all other system types this should be connected to the RF SPLT IN on the combiner module.

3.1.13 PA RF IN

Power Amplifier RF Input connector. For 1kW systems this is cabled from EXC RF OUT. For combined systems, this should be connected to one of the splitter RF outputs on the combiner module designated A, B, C, D, or E using phase matched cables.

3.1.14 RF SAMPLE

Power amplifier RF sample connector. This BNC carries a coupled RF signal from the module's PA. This is intended to be used in 1kW systems in optional monitoring of RF output.

Nominally generates about 19 dBm at about 1kW PA output power. The output level scales with total output power of the PA module.

3.1.15 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.

3.1.16 1 PPS IN

One pulse per second connector. This BNC input 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 GPS receiver modules or digital radio signal generators is recommended.

3.1.17 RF OUT

Power Amplifier RF output connector. This N-connector output carries the amplified RF output at an absolute maximum (FM-only) forward power level of 1250 W. For 1kW system setups, connect this output to a 50 Ohm antenna. In combined systems this should be connected to a COMBINER RF IN designated by J1, J2, J3, J4, or J5 on the combiner module using phase matched cables.

3.1.18 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.

3.1.19 Ground

Ground bolt that can be used to locally connect chassis ground to source connections or any other device that may generate ground loop noise.

3.1.20 AC Input

The AC power input terminal block provides a direct connection for split-phase service. Conductors must be in proper order. From left to right these are Line, Line/Neutral, and Ground.

3.2 Add-on PA Assembly Features

Add-on power amplifier modules are used to simply add 1kW more nominal power amplification to STX systems. These must be used in concert with an appropriately sized combiner module in order to generate rated total output power for 2kW, 3kW, and 5kW systems.

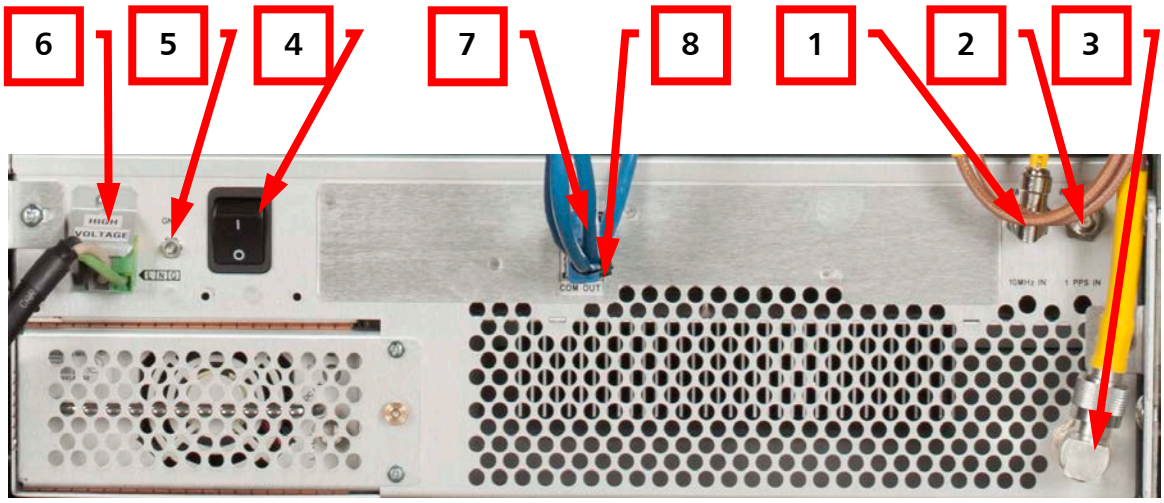


Figure 7 – Add-on Assembly Rear Panel

3.2.1 PA RF IN

Power Amplifier RF Input connector. This should be connected to one of the splitter RF outputs on the combiner module designated A, B, C, D, or E using phase matched cables.

3.2.2 RF SAMPLE

Power amplifier RF sample connector. This BNC carries a coupled RF signal from the module's PA and provides an optional method for monitoring RF output. Nominally generates about 19 dBm at about 1kW PA output power. The output level varies proportionally with total output power of the PA module.

3.2.3 RF OUT

Power Amplifier RF output connector. This N-connector output carries the amplified RF output at an absolute maximum (FM-only) forward power level of 1250 W. This should be connected to a COMBINER RF IN designated by J1, J2, J3, J4, or J5 on the combiner module using phase matched cables.

3.2.4 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.

3.2.5 Ground

Ground bolt that can be used to locally connect chassis ground to source connections or any other device that may generate ground loop noise.

3.2.6 AC Input

The AC power input terminal block provides a direct connection for split-phase service. Conductors must be in proper order. From left to right these are Line, Line/Neutral, and Ground.

3.2.7 COM IN

System communications bus input. This RJ45 input must be connected from COM OUT on the previous unit in the chain. This could either be a main assembly or a previous add-on assembly.

3.2.8 COM OUT

System communications bus output. This RJ45 jack is used to wire the communications bus to the rest of the system. This must connect to either the next add-on PA in the chain or the combiner when observing the last add-on unit in the communications bus chain.

3.3 Combiner Assembly Features

Combiner modules are required for 2kW, 3kW, and 5kW system total output power levels. A balanced amount of amplified power at all 1kW nominal power inputs is required to achieve rated power levels. Modules themselves cannot be modified to increase power capacity and must be exchanged in full for any upgrade applications.

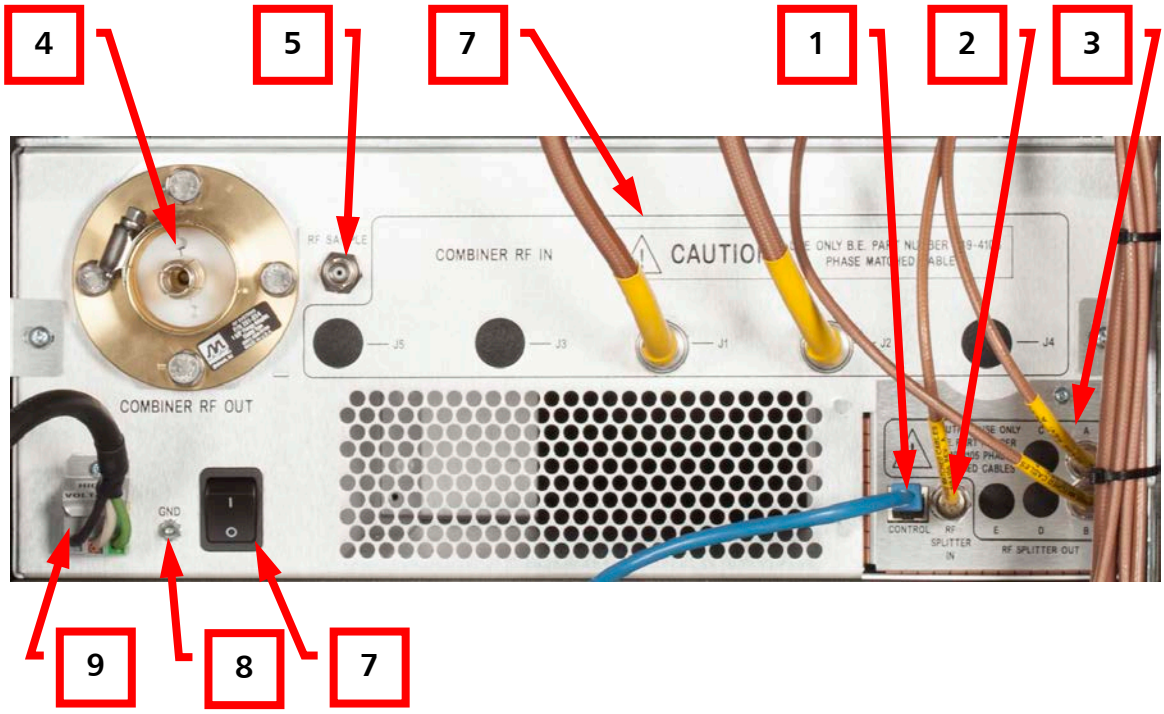


Figure 8 – Combiner Assembly Rear Panel

3.3.1 CONTROL

Control communication connection. This RJ45 jack must be connected to the communications output on last PA in the control communications bus chain for the bus to function correctly.

3.3.2 RF SPLITTER IN

RF splitter input connector. This BNC connector should be connected to the exciter level RF source that is intended to be used in the system.

3.3.3 RF SPLITTER OUT

RF splitter output connectors A, B, C, D, and E. These BNC connectors output exciter level RF that is essentially equivalent to the signal connected to the RF splitter input. Note that 2kW and 3kW systems will only have 2 or 3 of these connectors respectively, and the extra holes have covers.

3.3.4 COMBINER RF OUT

System RF output connector. This output, typically a 1 5/8" hard coax flange, is for connection to transmission and antenna systems.

3.3.5 RF SAMPLE

Combiner RF output sample connector. This BNC carries a coupled RF signal from the combiner module and provides an optional method for monitoring RF output. Nominally generates about 19 dBm at about 1kW PA output power. The output level varies proportionally with total output power of the system.

3.3.6 COMBINER RF IN

Combiner RF input connectors J1, J2, J3, J4, and J5. These N-connectors connect to the outputs of all of the power amplifiers in the system using phase matched cables. Note that 2kW and 3kW systems will only have 2 or 3 of these connectors respectively, and the extra spaces have covers.

3.3.7 Power Switch

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

3.3.8 Ground

Ground bolt that can be used to locally connect chassis ground to source connections or any other device that may generate ground loop noise.

3.3.9 AC Input

The AC power input terminal block provides a direct connection for split-phase service. Conductors must be in proper order. From left to right these are Line, Line/Neutral, and Ground.

4 Installation and Initial Setup

Information in this section is intended to be used in the setup of a standard STX Generation II transmitter package in any system size – 1kW, 2kW, 3kW, and 5kW. Some alternate methods for changing user settings are available through other interfaces beside front panel LCD menus. Please see the Operation Manual for user interface usage details.

4.1 Rack Mounting

Rack mounting is highly recommended for safe and stable operation. Racks can be purchased through Broadcast Electronics to allow quick and easy final installation at the transmission site. If your transmitter has already been assembled in a rack, please skip to section 4.5 Antenna/Load.

Many different 19" EIA rack products exist, however the STX LP Generation II requires a four-post rack and a path for exhaust air to exit the back of the transmitter. Other considerations should include paths for transmission line out to the antenna or load, AC power into the unit, and any control and communications cabling for remote station control or Ethernet. The installation kit includes screws and clips for normal non-threaded rails. There are also sets of screws for threaded front rail rack installations. Unused screw sets can be discarded.

The vertical location of the transmitter is recommended and pictured towards the bottom of the rack for a safe weight distribution. Placing the transmitter at the top of the rack creates a top-heavy and potentially hazardous setup. Lighter systems such as audio processing, studio, or other equipment should be placed towards the top where they contribute less to high centers of gravity and are more easily accessible for a standing technician.

If power distribution breaker panel is used, start with the bottom PA assembly positioned over the 3rd rack unit from the bottom. In this case, prop up the back of the unit while fastening the front panel to relieve stress until rear supports are attached.

1. On the front mounting rails, locate the desired set of three rack units – 9 screw holes in total. Place a clip at the bottom hole on the top rack unit and place a clip at the top hole of the bottom rack unit. Refer to Figure 9 to the right.

2. Set the assembly in place and insert screws. Drive screws enough to give good vertical support and allow movement; do not tighten completely.

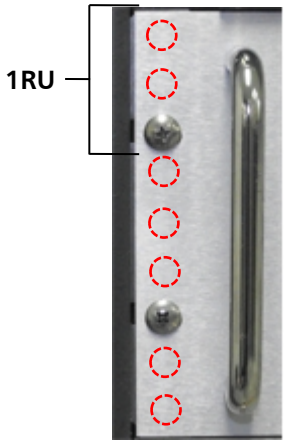


Figure 9 – Front Mounting Screws

3. On the back left rail, locate the set of three rack units occupied by the assembly. Place the top clip one RU above the top assembly RU in the middle screw hole. Place the second clip in the top screw hole of the middle assembly RU. Refer to Figure 10.

4. On the back right rail, locate the set of three rack units occupied by the assembly. Place one clip in the middle hole of the top RU and one in the top hole of the bottom RU. Refer to Figure 11.

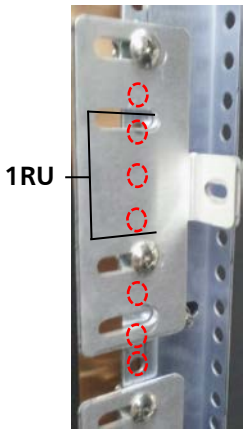


Figure 10 – Left Rear Support Mounting

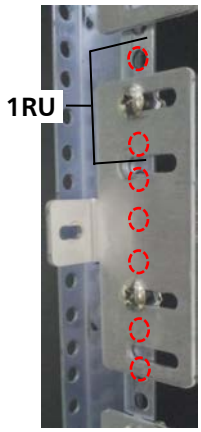


Figure 11 – Right Rear Support Mounting

5. Arrange main/add-on rear support brackets such that the screw holes line up with the top slot and insert screws. As with the front panel screws, drive screws enough to give good vertical support and still allow movement.

6. Insert 10-32 sim screws in the rear bracket and fully tighten it to the nut embedded in the back of the assembly's chassis. Tighten fully.

7. Fully tighten all screws in the rear and front support rails.

8. Repeat steps 1-7 above for all main and add-on assemblies.

9. Follow step 1 above for the combiner assembly, and simply note that there are two empty RU between the screws rather than the one RU on the main and add-on assemblies.

10. Use a similar process for mounting both of the combiner back rail supports: Locate the four rack units occupied by the assembly. Place clips In the bottom screw holes of the top RUs, and place clips in the bottom hold of the RU 2nd from bottom. Refer to Figure 12 for the left and right rear mounting.

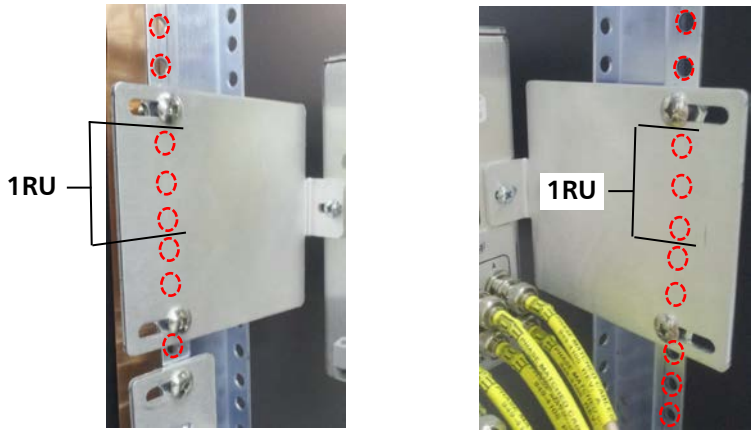


Figure 12 – Combiner Left and Right Rear Support Mounting

4.2 AC Distribution

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

Repeat steps 1. and 2. for all assemblies in the system.

1. Securely connect black line conductor to the terminal block labeled L, connect white line conductor to N (L), and connect green conductor to G. Refer to the left of Figure 13.

2. Connect the AC terminal safety cover with a normal Phillips screwdriver. Refer to the right of Figure 13.

Figure 13 – AC Power Block

4.3 RF Coaxial Cabling

1kW transmitters simply require a BNC coaxial connection between exciter RF output and power amplifier RF input. This short cable is shipped with all 1kW systems.

Combined systems require three stages of RF coaxial connections:

1. Connect EXC RF OUT on the main assembly to RF SPLITTER IN on the combiner assembly.

2. Using phase matched BNC cables, connect RF SPLITTER OUT jacks to PA RF IN on all main and add-on assemblies in the system

3. Using phase matched N-Connector cables, connect RF OUT on all main and add-on assemblies to COMBINER RF IN jacks on the combiner assembly.

4.4 Control Communications Bus

The control communications chain bus must be connected in a specific way for the communications to function. The numbering scheme for PAs is also determined by the order that they are connected in this chain, and skipping a PA that was previously connected results in a shift in all PAs that are further down the chain.

1. Using a 1’ CAT5 cable, connect COM OUT to COM IN on the assembly below.

2. Repeat step 1. for all main and add-on assemblies to the bottom of the stack.

3. Using 3’ CAT5 cable, connect COM OUT on the bottom unit to CONTROL on the combiner assembly.

4.5 Antenna/Load

1kW systems simply connect to the antenna or other load via N-connector and coaxial transmission cabling.

2, 3, and 5kW systems COMBINER RF OUT requires 1 5/8" hard coax plumbing. Loosen the hose clamp that ships attached to the flange. Ensure that the inner conductor is aligned with the male inner connector on the transmitter and slide the piping into place. Tighten the hose clamp and verify a good mechanical connection between the flange and pipe.

4.6 Remote Station Interface and BE Interface

For standard single exciter installations, connect the supplied connector stub to the BE Interface. Secure the connector with its built in screws using a small flat screwdriver. For standby system control and exciter option setups, do the same to each of the system controller and exciter connectors using the provided switcher cable harness.

An asserted failsafe connection is required for any level of RF transmission. The intended use of this feature is a failsafe chain through all safety-critical transmission components such as the antenna/load. Such devices should break the failsafe circuit in the event of a failure or unsafe condition.

Standby setups require separate wiring to each GPIO remote station interface. Outputs must be wired and monitored individually. Inputs are simple pull-up resistors that are intended to be grounded for assertion, thus wiring the same numbered input pin on each system controller to one control relay is acceptable.

1. Wire a failsafe control circuit through safety relays in external transmission system equipment. If no such devices exist, substitute a short control wire for this step.

2. Solder one end of the failsafe circuit to pin 2 on 37-pin D-Sub solder cup connector.

3. Solder the opposing end of the failsafe circuit to a ground pin on the 37-pin D-Sub solder cup connector, such as pin 19. See 3.1.1 GPIO for alternative ground wiring pins.

4. Solder all other remote interfacing pins to external remote station interface equipment as desired, refer to 3.1.1 GPIO.

5. Enclose the D-Sub connector and wires with the provided shell and fasten the halves together securely with a small flat screwdriver.

6. Attach the fabricated cable harness to the GPIO input on the main assembly and secure the connector to the jack with the screws on the shell using a small flat screwdriver.

4.7 AC Power Service

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

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.

For constraints on the types of AC service that must be connected to the transmitter, please consult the AC Input section in the system specifications. The STX LP Generation II 1kW and 2kW systems require split-phase service. 3kW and 5kW transmitters can operate when serviced by split-phase, three phase closed delta, or three phase wye AC power – be sure to inform the sales representative which AC configuration is desired.

4.7.1 Single Phase

For 1kW systems, simply connect Line, Line/Neutral, and Ground to the AC Input terminal block. 2, 3, and 5kW systems require conductors to be connected to the proper terminal on the AC power distribution breaker panel.

1. Connect Line conductor to terminal block labeled L
2. Connect Line for ~120V configurations, Neutral for ~220V configurations conductor to terminal block labeled N
3. Connect Neutral/Ground to terminal block labeled G
4. Connect an earth ground strap to the earth ground terminal.

4.7.2 Three Phase

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

Proper power service can be identified by transformers: three transformers with one winding each or one transformer with three windings. Invalid service configurations use two transformers. Refer to Figure 13 and Figure 14 for acceptable main power service configurations.

Delta configurations:

1. Connect Phase A conductor to first terminal block labeled L
2. Connect Phase B conductor to second terminal block labeled L
3. Connect Phase C conductor to third terminal block labeled L
4. Connect an earth ground strap to the earth ground terminal.

Wye configurations:

5. Connect Phase A conductor to first terminal block labeled L
6. Connect Phase B conductor to second terminal block labeled L
7. Connect Phase C conductor to third terminal block labeled L
8. Connect Neutral conductor to terminal block labeled N
9. Connect an earth ground strap to the earth ground terminal.

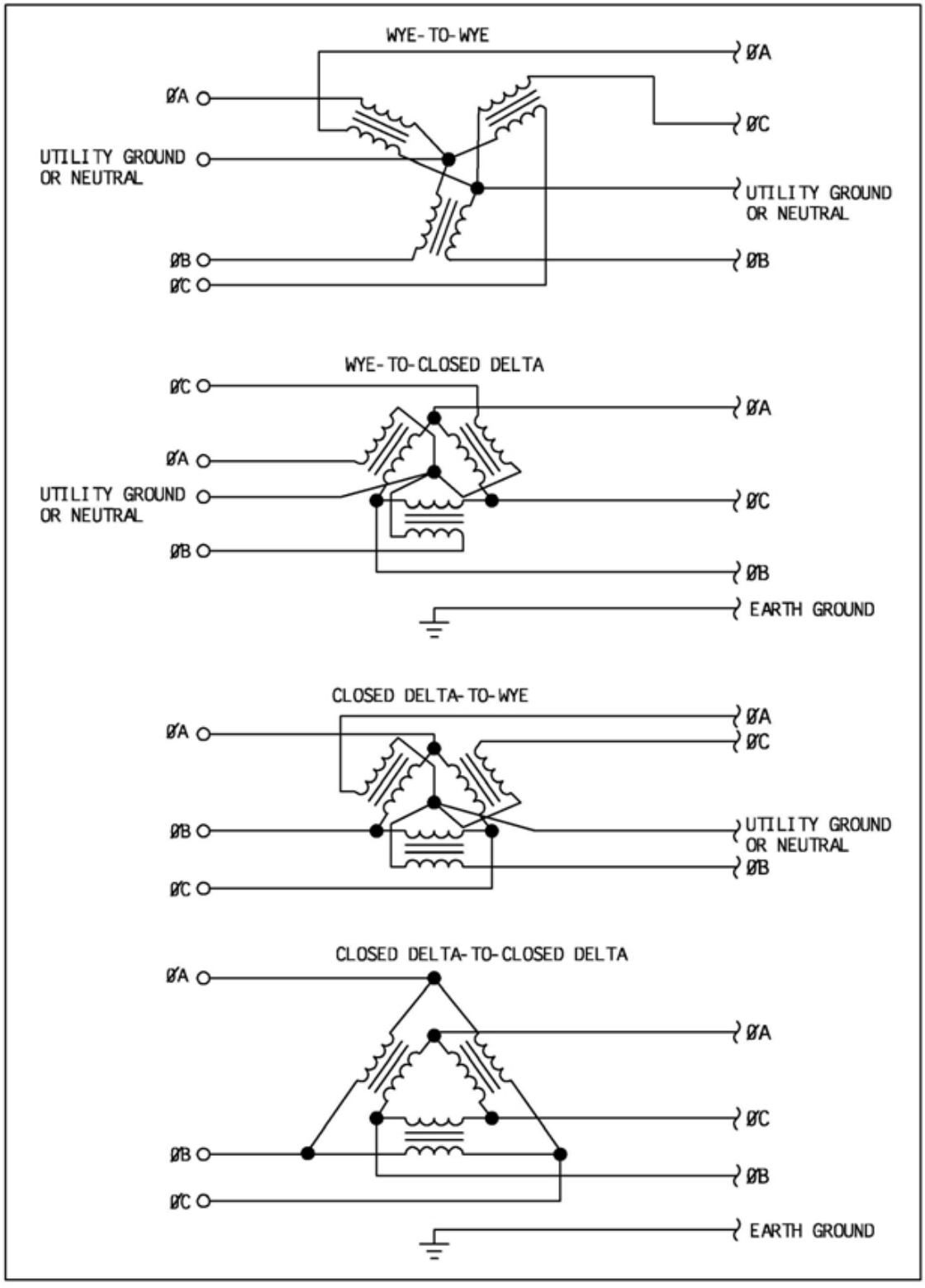
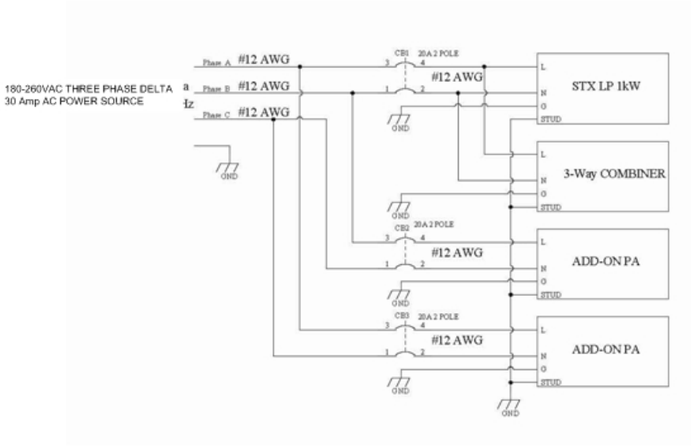
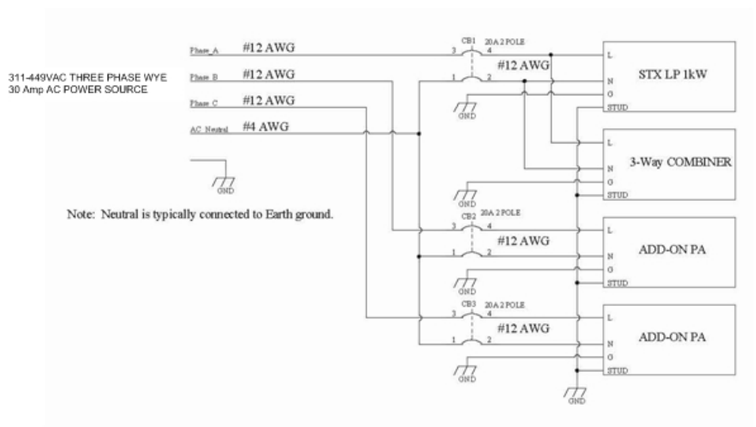


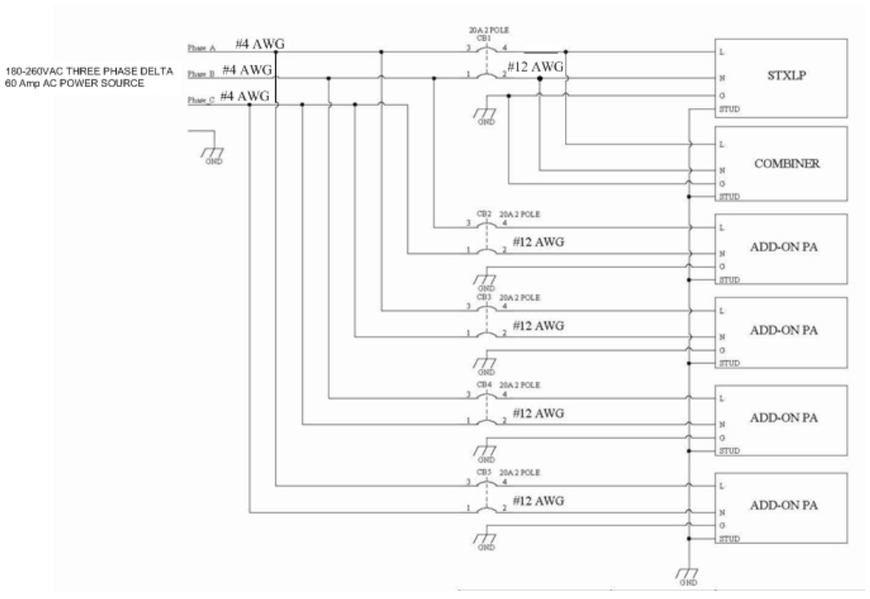
Figure 14 – Three Phase AC Main Configurations



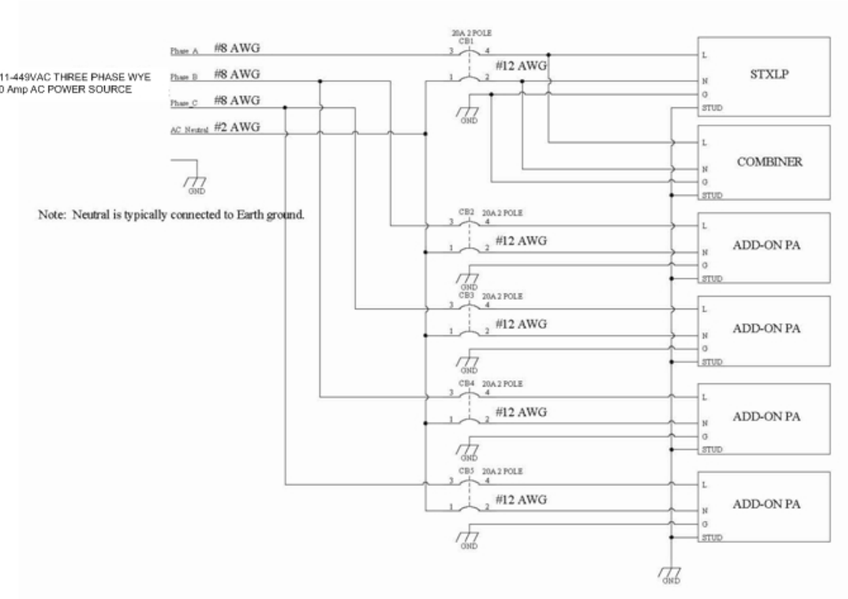
STXLP 3KW THREE PHASE DELTA



STXLP 3KW THREE PHASE WYE



STXLP 5KW THREE PHASE DELTA



STXLP 5KW THREE PHASE WYE

NOTES –
FOR PROPER FUSE/CIRCUIT BREAKER SIZE, ALWAYS
CONSULT LOCAL AND NATIONAL ELECTRIC CODES.

Figure 15 - Three Phase Power Distribution Schematic

4.8 Turn on AC

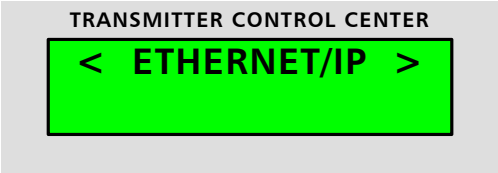
1. Unlock AC main breaker on the service line and turn the switch to the on position.
2. Turn on all circuit breakers one at a time.
3. Flip the Power Switch to the on position on all units.

4.9 Ethernet/IP Network

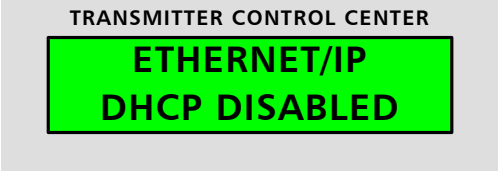
IP network features are entirely optional. System setup sections below contain procedures based on the LCD interface on the front panel of the main assembly, but there is alternative user interfacing for control of all of these setup parameters in both the web and SNMP interfaces. If utilization of these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

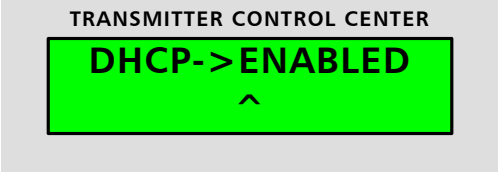
4.9.1 Dynamic Host Control

1. Connect an Ethernet cable to networking equipment (such as a switch or gateway).



2. Using the transmitter control center on the front panel of the main assembly, navigate to the ETHERNET/IP menu.

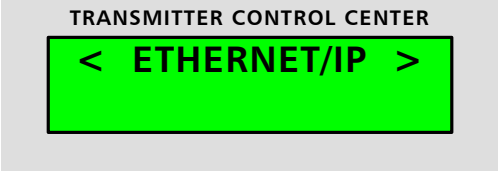




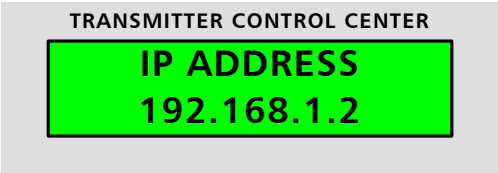
3. Set DHCP to ENABLED (see below for static IP settings).

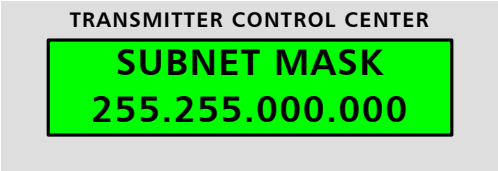
4.9.2 Static IP

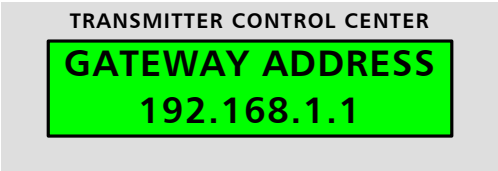
1. Connect an Ethernet cable to networking equipment (such as a switch or gateway).



2. Using the transmitter control center on the front panel of the main assembly, navigate to the ETHERNET/IP menu.



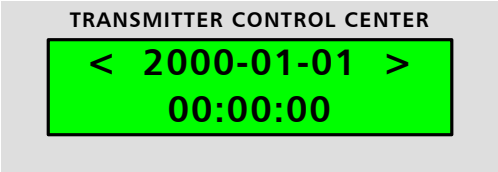




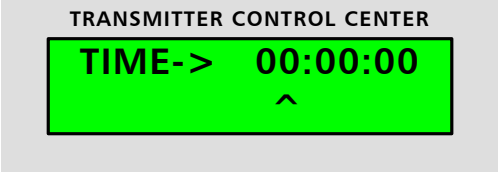
3. With DHCP disabled, set the IP Address, Subnet Mask, and Gateway address. These settings should be set appropriately to match the local network setup. Consult your network manager or internet service provider to ensure that the correct settings are used.

4.10 Set Time and Date

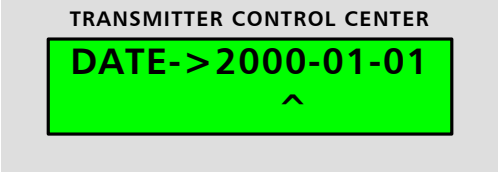
The internal real time clock holds the current time and date for use in the event log. This is a rudimentary device that supports 24-hour format and does not adjust for daylight saving. If installing during summer in a daylight saving region, following standard non-daylight time is recommended instead.



1. Using the transmitter control center on the front panel of the main assembly, navigate to the Date and Time menu.



2. Navigate to the time editing screen and set the local (24 hour non-daylight saving) time.



3. Navigate to the date editing screen and set the current date.

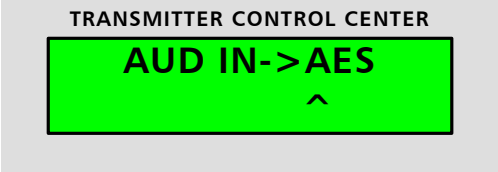
4.11 Program Services

The STX provides built-in injection of one primary audio source – AES, Composite, or Analog L/R.

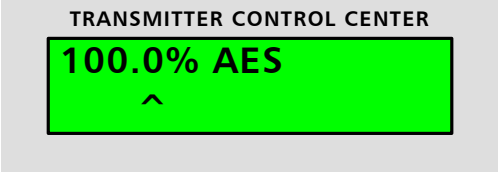
4.11.1 AES

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

2. Navigate to the audio input screen.



3. Select AES as the primary audio source and return.



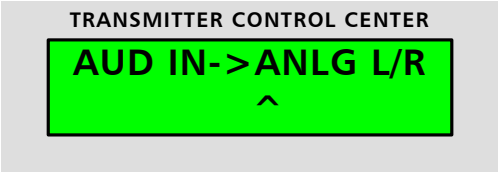
4. Set the stereo injection reduction (to allocate injection budget for secondary services). Leave this at 100% if there are no secondary services. Return when finished adjusting.

Note that -2 dBFS is the 100% reference level for AES stereo.

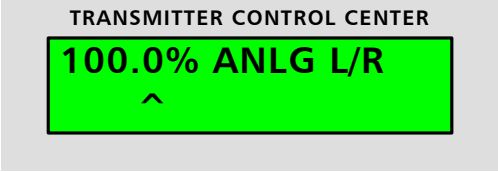
4.11.2 Analog L/R

1. Connect XLR cables from the desired Analog Left and Right audio source. Activate the source with reference tones for level calibration.

2. Navigate to the audio input menu.

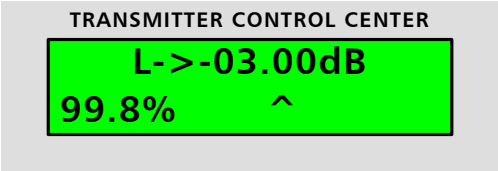


3. Select analog L/R as the primary audio source.

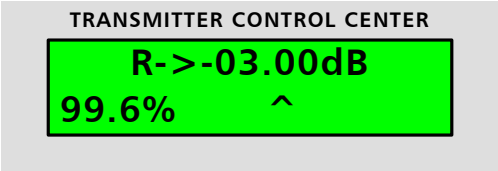


4. Set the stereo injection reduction (to allocate injection budget for secondary services). Leave this at 100% if there are no secondary services. Return when finished adjusting.

5. Enter the audio level menu.



6. Select L and adjust until the displayed left channel peak hold is 100% within a few percent.



7. Repeat step 6 for R.

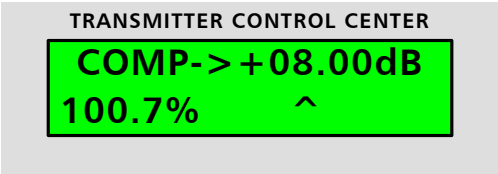
4.11.3 Composite

1. Connect a BNC cable from the desired unbalanced composite audio source. Activate the source with reference tones for level calibration.

2. Navigate to the audio input menu.

3. Select composite as the primary audio source.

4. Navigate to the audio level menu.

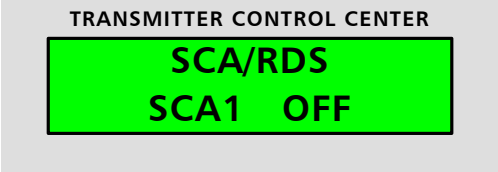


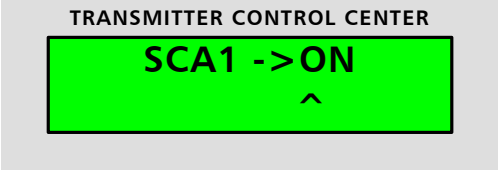
5. Select comp and adjust until the displayed composite peak hold is approximately 100%. Note that enabled SCA1, SCA2, and RDS input signals also contribute to this composite peak hold value. These sources should be turned off for this calibration.

Secondary audio input sources SCA1, SCA2, and RDS all follow the same pattern. 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 reference level for calibration.

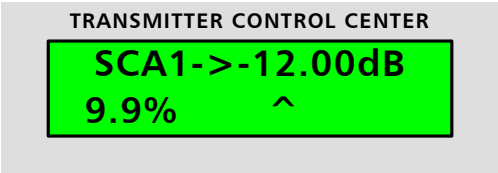
2. Navigate to the SCA/RDS menu.





3. Select the desired SCA/RDS input and change the setting to ON.

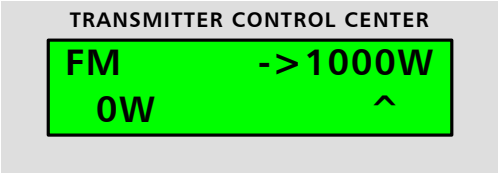
4. Navigate to the audio level menu.



5. Select the desired input and 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. These sources should be turned off for calibration of each individual channel.

4.12 Output Power Level

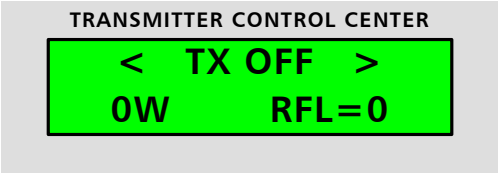
1. On the front panel of the main assembly, navigate to PWR SET and select the active mode power.



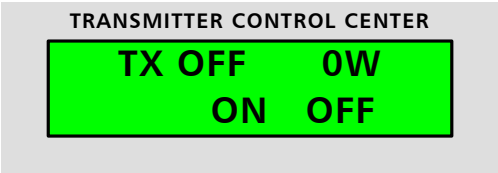
2. Adjust this setpoint using the left, right, up, and down buttons to set the desired total forward output power and return. Note that settings above the maximum or below the minimum are not allowed.

4.13 RF Transmission Turn-On

If all the previous sections have been completed, the system should be ready for operation. Additional options and features can be enabled. See the operation manual for details.



1. Return to the main screen on the front panel display press the return button.



2. Press the button corresponding to the “ON” display to power up the transmitter.

5 Maintenance

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

5.1 Main Power Supply Replacement

1. Using a Philips screwdriver, remove the screws securing the power supply cover plate and remove the plate by swinging it out.

2. Insert a Philips screwdriver into the exposed holes and loosen the screws enough to allow the retaining bracket to slide.

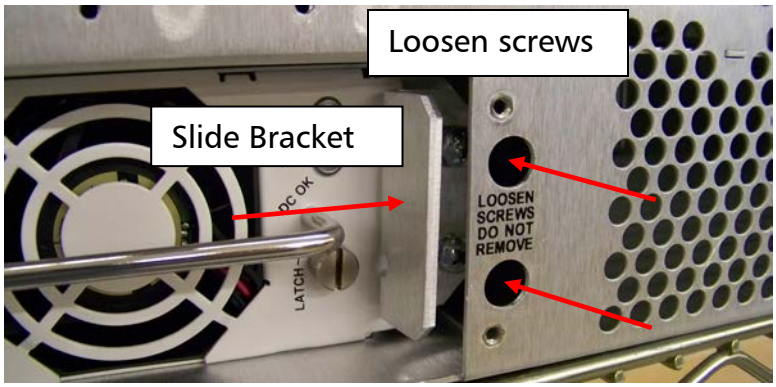


Figure 16 – Power Supply Retaining Bracket

3. Unlatch the power supply by rotating the latch knob counterclockwise.

4. Carefully pull the power supply by the handle until it slides out of the chassis.

5. Insert the new power supply, slide it all the way in, and firmly push to engage the power supply with its blind mate connector.

6. Ensure full connection by rotating the locking knob clockwise to engage the latch.

7. Slide the retaining bracket in front of the flange and tighten the screws.

8. Replace the cover and secure it with screws.

5.2 Low Voltage Power Supply Replacement

Low voltage power supplies produce DC that is +/-12V or less. These power supplies run low power PA stages, fans, and logic boards. Main assemblies have three of these power supplies each, add-on assemblies have two each, and combiner assemblies have two each. All of these low voltage power supplies have identical footprints, but their functions are all very different.

MIXING UP POWER SUPPLIES WILL RENDER THE AFFECTED SYSTEM INOPERABLE AND MAY CAUSE DAMAGE TO INTERNAL COMPONENTS. CAREFULLY IDENTIFY THE POWER SUPPLY THAT NEEDS TO BE REPLACED.

To replace any of these power supplies:

1. Use a Phillips screwdriver to remove the assembly top cover.
2. Disconnect AC and DC cable harnesses.
3. Remove the two corner screws.
4. Lift up carefully to disengage the snaps in the other two corners.
5. Note the orientation of the replacement supply so that the two AC pins are facing the AC harness. Snap the power supply into place.
6. Secure the power supply with screws to ensure proper grounding and safety in any future shipping.
7. Reconnect both cable harnesses.

5.3 Combiner Fan Replacement

1. Use a Phillips screwdriver to remove the combiner assembly top cover.
2. Disconnect the fan's cabling by disengaging the latch.
3. Cut any tie-wraps that secure the fan to the internal section of the chassis.
4. Carefully disengage the fan harness by twisting the end and sliding it through the slot.
5. Lift the fan out of the chassis.
6. Lower the replacement fan assembly into place.
7. Secure the fan with the harness for safety in any future shipping.
8. Further secure the fan to the chassis with tie-wraps to ensure good air flow.
9. Connect the fan's cable harness to the appropriate jack on the pcb.

5.4 Main/Add-on Fan Sub-Assembly Replacement

1. Use a Phillips screwdriver to remove the main/add-on assembly top cover.
2. Disconnect the fan's cable harness.
3. Cut the tie-wrap that ties the fan assembly to the chassis.
4. Lift the assembly out of the unit.

5. Insert the new fan assembly by lining up the edges in the mounting channels and gently lowering it into the chassis.

6. Tie-wrap the assembly to the chassis for future safe shipment.

7. Connect the cable harness.

8. Replace the main cover.

5.5 Front Panel Board Replacement

1. Repeat steps 1 through 4 in section 5.4 Main/Add-on Fan Sub-Assembly Replacement to provide space for removal of this board.

2. Use a flat blade screwdriver to disengage the latch on the cable harness connected to the board.

3. Use a flat blade screwdriver to gently pry the board from its snap mounts and pull the board from the chassis.

4. Gently snap on the new front panel board ensuring that all snaps are completely engaged.

5. Connect the cable harness

6. Repeat the remaining steps in section 5.4 Main/Add-on Fan Sub-Assembly Replacement to restore the fan assembly to its original state.

5.6 Power Amplifier

Tasks in this section require removal and replacement of both the top cover and the secondary power amplifier cover. Follow these steps to access power amplifier components:

1. Use a Phillips screwdriver to remove the top cover of the main/add-on assembly in which the PA is located.

2. Use the same Phillips screwdriver to loosen all PA cover screws. Lift the cover until the top of the lid reaches the top of the chassis. Carefully swing the lid up to clear the screw standoffs from running into the low pass filter coils and slide the lid out.

When tasks in this section are complete, simply execute these steps in reverse to return the system to a safe operating state.

5.6.1 PA Assembly Replacement

If a power amplifier board must be replaced, BE will tune and ship a PA assembly palate. On this palate is a board with all amplifiers components soldered and a combiner board with resistors soldered in. Adequate soldering irons are required to complete step 3. If you do not have adequate soldering irons, do not attempt this task.

1. Disconnect the main power cabling by disengaging the latches on the connector.
2. Disconnect the low voltage power cable by pulling up on the connector without yanking the cable – use a tool to get sufficient grip if necessary.

3. Use two large soldering irons to heat both sides of the conductors between the power amplifier's combiner circuit board and the low pass filter circuit board. Slide the conductors one at a time onto the low pass filter enough to clear the combiner board.
4. Unscrew the SMA connector to disconnect the exciter drive cable.
5. Detach the small ribbon cable connecting to the low pass filter.
6. Detach the ribbon cable connecting to the front panel board.
7. Detach the ribbon cable connecting to the controller.
8. Remove all screws securing the power amplifier board and the splitter board.
9. Lift both boards off of the heat sink and wipe any excess thermal compound that remains.
10. Remove all screws from the replacement boards to separate them from the palate.
11. Lightly and carefully apply a coating of thermal compound to the underside of power transistors and high power resistors.
12. Carefully lift both boards and place them on the heat sink. Note that this must be accurate the first time to ensure correct application of thermal compound between critical components and the heat sink.
13. Repeat steps 8 through 1 in reverse - tighten IPA and final transistor screws to 6 in-lb.

5.6.2 Final Amplifier Transistor Replacement

THIS TASK REQUIRES LIVE OPERATION AND TUNING OF A POWER AMPLIFIER MODULE WITH PROTECTIVE COVERING REMOVED. USE EXTREME CAUTION WHEN OPERATING ANY HIGH POWER TRANSMISSION DEVICE IN THIS MANNER.

THESE POWER AMPLIFIERS HAVE SPECIALIZED LEAD BENDING AND TRIMMING FOR THIS APPLICATION. PARTS SHOULD BE ACQUIRED THROUGH BE TO ENSURE PROPER SELECTION.

Adequate soldering irons are required to complete step 3. If you do not have adequate soldering irons, do not attempt this task.

1. Identify the final stage amplifier to be removed – Q1 is Final 1, etc.
2. Remove the two screws securing the transistor to the heat sink.
3. Use soldering irons to lift the (smaller) gate leads.
4. Use soldering irons again to lift both the (larger) output leads and remove the transistor.
5. User solder wick to remove all solder from these locations on the board.
6. Wipe to remove excess thermal compound.
7. Lightly and carefully apply an even coat of thermal compound to the bottom of the new transistor.
8. Place the transistor in its spot and secure it with screws. Tighten to 6 in-lb.
9. Solder all leads using silver-based high temperature solder.
10. Remove jumper P5, P6, P9, or P10 depending on which final is being worked on.
11. Power on the system and navigate the front panel interface to METERING -> PA# (where # is for the PA being operated) -> Final # (where # is the final transistor being replaced).
12. Adjust R137 with a potentiometer turner until 0.8 Amps is reached.
13. Power off the system and replace the jumper removed in step 10.

5.6.3 Low-Pass Filter Assembly Replacement

Adequate soldering irons are required to complete step 1. If you do not have adequate soldering irons, do not attempt this task.

1. Use two large soldering irons to heat both sides of the conductors between the power amplifier's combiner circuit board and the low pass filter circuit board. Slide the conductors one at a time onto the combiner circuit board enough to clear the low pass filter.
2. Disconnect the ribbon cable connecting low pass filter to the power amplifier circuit board.
3. Use a 3/4" wrench to loosen and remove the nut securing the N-connector to the back panel.
4. Use a 5/8" wrench to loosen and remove the nut securing the BNC RF Sample jack. Set the sample cable and BNC to the side.
5. Use a Phillips screwdriver; Start by removing the screw at the front of the chassis and work your way to the back to remove all screws securing the low pass filter to the heat sink.
6. Carefully swing the board up, pivot slightly to avoid the chassis, and slide out the coax and N-connector.
7. Repeat all of these steps in reverse to install the replacement.

5.7 Splitter Replacement

1. Disconnect communication, exciter drive in, and splitter RF out cables from the splitter.
2. Use a Phillips screwdriver to remove the two screws securing the splitter board.
3. Slide the board out and disconnect the ribbon cable.
4. Repeat all these steps in reverse to install the replacement. When sliding the replacement into place be mindful of the horizontal standoffs that create a channel for the board.

5.8 Add-on PA Controller Replacement

1. Use a Phillips screwdriver to remove the main/add-on assembly top cover.
2. Disconnect the ribbon cable.
3. Use a Phillips screwdriver to remove the single screw holding the board to the chassis.
4. Gently disengage the snaps and carefully swing the board up to remove it from the chassis.
5. Repeat all of these steps in reverse to install the replacement.

5.9 System Controller and Exciter Replacement

1. Use a Phillips screwdriver to remove the top cover of the main assembly.
2. Disengage the latch on the power cable harness and disconnect it from the board.
3. Disengage the latch on the front panel harness and disconnect it from the board.

4. Disconnect the ribbon cable.

5. Unscrew the 10 MHz SMA cable and disconnect it.

6. Gently pull the 1PPS SMB cable and disconnect it. Do not yank the cable – use a set of pliers for sufficient grip on the cable end if necessary.

7. Disconnect all cabling from the back panel jacks.

8. Use a 3/16" nut driver to remove the four D-Sub connector screws.

9. Use a Phillips screwdriver to remove the screws on the XLR connectors – 2 per connector.

10. Use a 9/16" wrench to remove all six nuts from the BNC connectors.

11. Use a Phillips screwdriver to remove the single screw holding the board to the chassis.

12. Disengage both snaps by reaching under both sides of the rear of the board and gently lifting up.

13. Swing the board up and slide it out of the back panels. Be mindful of the XLR jack latches – they will typically catch on the chassis.

14. Repeat all of these steps in reverse to install the replacement.