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Standby Exciter Option FW EP1 Exciter Switcher Application Guide

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Standby Exciter Option

Application Guide

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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.

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RF TECHNICAL SERVICES

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Fax: +1 (217) 224-6258

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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.

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SAFETY PRECAUTIONS

PLEASE READ AND OBSERVE ALL SAFETY PRECAUTIONS

ALL PERSONS WHO WORK WITH OR ARE EXPOSED TO POWER TUBES, POWER TRANSISTORS, OR EQUIPMENT 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/cm² per one tenth hour average level has been adopted by several U.S. Government agencies including the Occupational Safety and Health Administration (OSHA) as the standard protection guide for employee work environments. An even stricter standard is recommended by the American National Standards Institute which recommends a 1.0 mW/cm² per one tenth hour average level exposure between 30 Hz and 300 MHz as the standard employee protection guide (ANSI C95.1-1982).

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

HOT SURFACES

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



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1 Overview

This guide contains required information to install, operate, and maintain the FW EP1 exciter level switcher option in any STX HP system.

For STX HP factory rack installations, the FW EP1 will also be installed in the rack.

Table 1 - Specifications

Parameter	Specification
Physical	
Height	1 RU 1.75" (4.4 cm)
Width	19" (48.3 cm) EIA Rack Mount
Depth	15" (38.1 cm) including connectors
Weight	5lbs (2.3 kg) unpacked
Outlet Size	1"x 4", 4in ² (25.8 cm ²), two top of unit, two bottom of unit
Environmental	
Temperature	-10°C to +50°C
Altitude	10,000ft (3048M) maximum
Humidity	95% maximum, non-condensing
AC Input	
Voltage	90 to 264 VAC, Single Phase
Frequency	47-63 Hz
Surge Protection	None: external surge protection required
RF Relay	
Exciter Inputs	Up to 650 W maximum



1.1 Theory of Operation

Setup includes the FW EP1 exciter switcher with two STXe 500 system controller/exciter. For STX HP systems, a Dual Switch Assembly is added to the back of the STX Cabinet to route the STXe 500 GPIO control signals. Refer to Figure 1

The FW EP1 switcher performs two primary functions:

1. Switch exciter drive RF to STX HP cabinet
2. Regulated system controllers' active/standby state.

The switcher is intended to be installed such that primary RF corresponds to the primary controller/exciter BE Interface control wiring. At most, one unit is active at a time, and the RF relay routes exciter RF to match the activated system controller and exciter.

In automatic switching mode, the switcher's logic is rooted in a power detector in the FW EP1. RF samples from both STXe 500 exciters are routed to the power detector which corresponds to the nominal 100W RF drive level outputs of the exciters. If the power of the main exciter dips below the tuned threshold in the FW EP1, the RF relay immediately toggles and the standby system controller is activated. The standby unit remains active, indicated by the switcher's front panel LED, until RF output power level drops below the threshold and is detected. When this occurs the switcher takes a moment to re-arm and then switches back to the primary exciter. To reset the FW EP1 to exciter 1, manually turn the dial to EXCITER 1 and back to AUTOMATIC or mute exciter 2 via remote station interface.

If RF output from both exciters is too low, the switcher will cycle between the two exciters indefinitely. To prevent this state, turn the dial and force the switcher into OFF, EXCITER 1, or EXCITER 2 modes.

In these modes, (OFF, EXCITER 1, or EXCITER 2), the switcher forces the system to the set state implied by the name and no automatic switching occurs. In the exciter 1 mode, the switcher control output remains active for exciter 1 and exciter 2 as standby. In the exciter 2 mode, output logic remains active in exciter 2 and exciter 1 in standby. In the off mode, the switcher logic follows the default position of the RF coax relay which defaults to exciter 1. In the event of an AC power failure the switcher will also default to exciter 1.

In all operation modes, the front panel ALARM LED illuminates when power measurement detects an RF level below the threshold setting.

1.2 System Documents

This document is intended to be a supplement to existing installation guide and operation manual documentation for STX HP transmitters. These documents are shipped with transmitters and can also be found on our website at <http://www.bdcast.com/information-center/> in the guide and manual sections for the product.



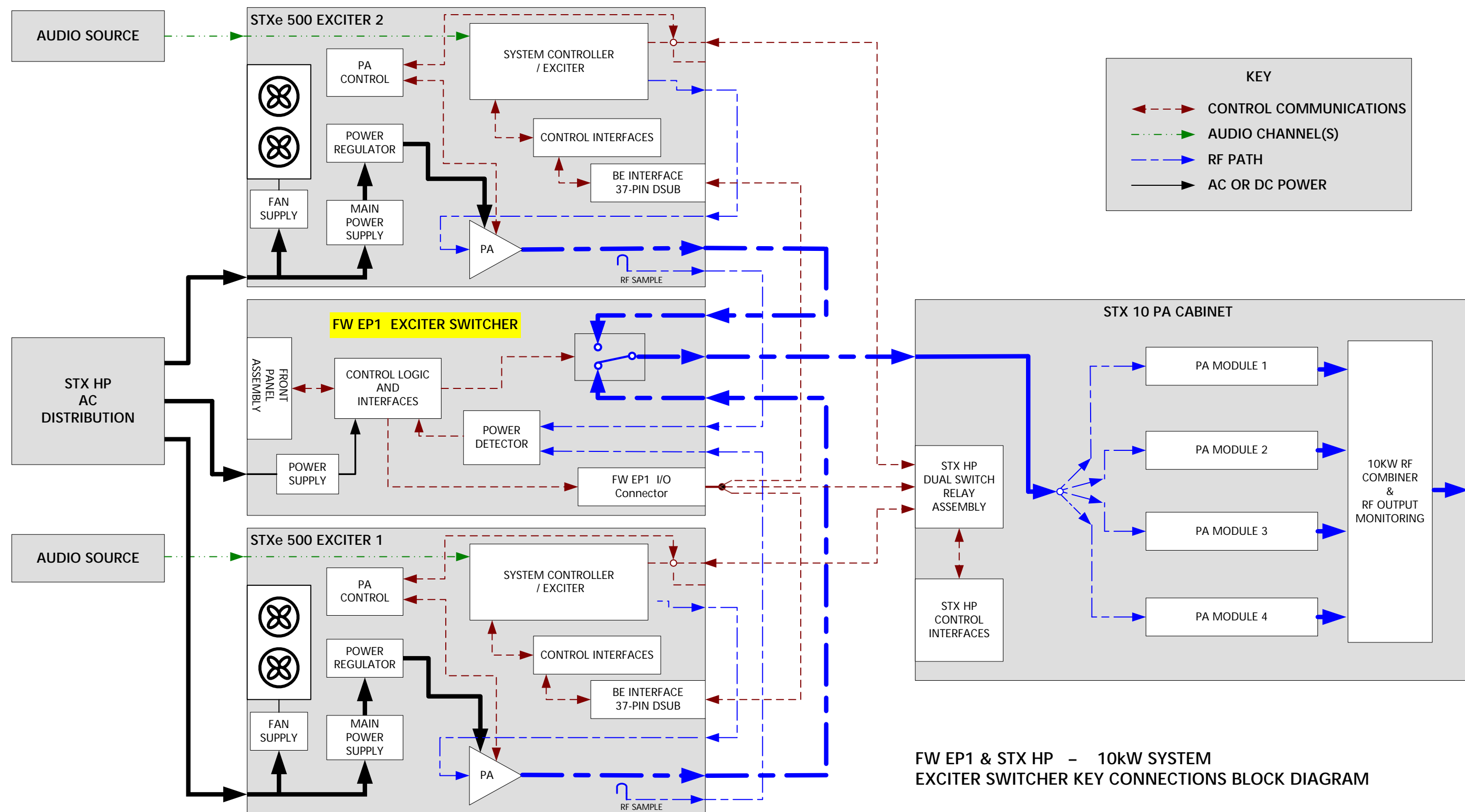


Figure 1 – 10kW System With Exciter Switcher

2 FW EP1 Front Panel Features

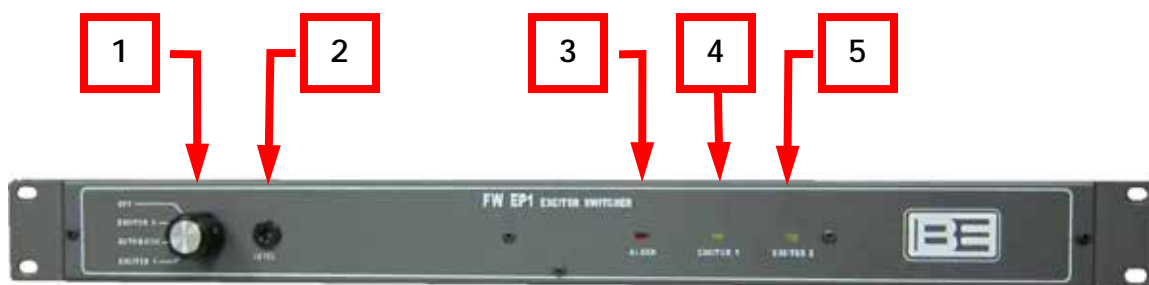


Figure 2 – FW EP1 Front Panel Features

2.1 CONTROL KNOB:

1. OFF – Takes switcher out of AUTOMATIC mode and defaults to exciter 1 active and exciter 2 standby.
2. EXCITER 2 – Activates exciter 2 only. RF out is statically routed from Exciter 2.
3. AUTOMATIC – Activates exciter 1 until exciter RF power is below the tuned threshold. Exciter 2 then remains active until RF power is below the tuned threshold. If neither exciter has high enough RF power, the switcher continuously cycles between the two.
4. EXCITER 1 – activates exciter 1 only. RF out is statically routed from Exciter 1.

2.2 LEVEL

This adjustment controls the level of the rectified RF sample of the active exciter. The signal feeds the comparator circuit for the trip threshold for Exciter & Alarm LEDs ,and RF mute, RF coax switch control signals.

2.3 ALARM

Red LED illuminates when the RF output of the FW EP1 has RF below the RF power threshold tuned by the LEVEL adjustment. Also illuminates red if the FW EP1 system is running in automatic mode and has switched to exciter 2 due to a detected power loss.

2.4 EXCITER 1

Orange LED illuminates when Exciter 1 is currently active and the RF relay routes EXCITER 1 RF IN to RF OUT.

2.5 EXCITER 2

Orange LED illuminates when Exciter 2 is currently active and the RF relay routes EXCITER 2 RF IN to RF OUT.

3 FW EP1 Rear Panel Connections

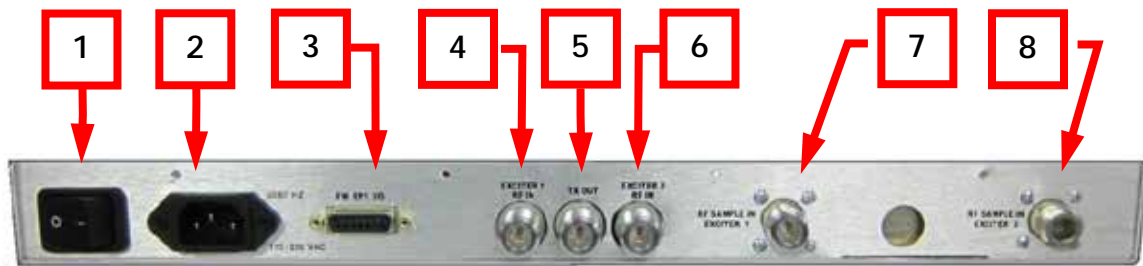


Figure 3 – FW EP1 Rear Panel Features

3.1 AC Switch

Turns the AC power on or off to the FW EP1's power supply.

3.2 AC Power IN

Standard 50/60 Hz 115-230 VAC power input.

3.3 FW EP1 I/O

15-pin D-subminiature. This connection acts as a machine interface for inputs and outputs between the FW EP1 and the STX HP system. Use with the provided cable harness.

3.4 EXCITER 2 RF IN

Type N, 100W nominal RF input from exciter 2.

3.5 RF OUTPUT

Type N RF output routed from exciter 1 or exciter 2 inputs via internal RF relay. See Theory of Operation for conditions that determine the relay position.

3.6 EXCITER 1 RF IN

Type N, 100W nominal RF input from exciter 1.

3.7 EXCITER 1 RF SAMPLE INPUT

RF sample from Exciter 1 is routed to this connector.

3.8 EXCITER 2 RF SAMPLE INPUT

RF sample from Exciter 2 is routed to this connector.

4 STX HP Dual Switch Relay Assembly

The Dual Switch Relay Board and Cover are included with the FW EP1 Option. This assembly routes the GPIO signals from active STXe 500 exciter to the STX HP Cabinet. It is mounted in the upper left rear of the STX HP cabinet above the Interface Board.

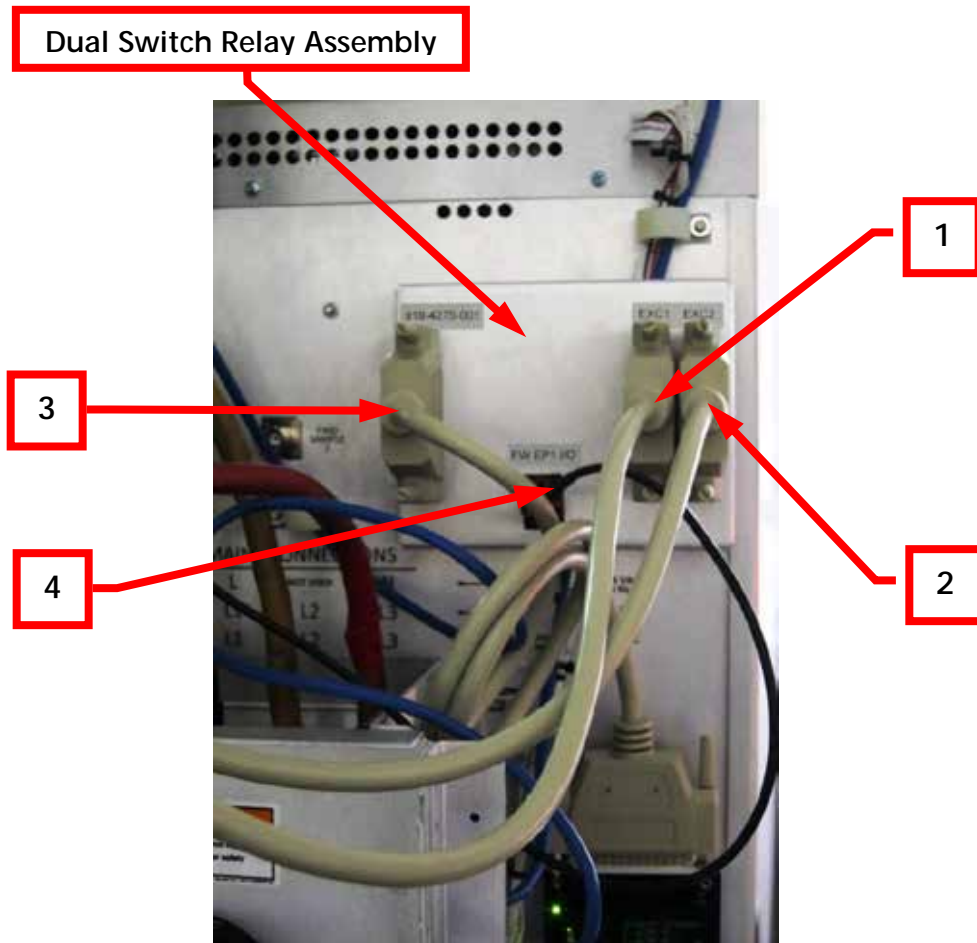


Figure 4 – Dual Switch Relay Assy Cable Connections

- 4.1 GPIO cable from Exciter 1
- 4.2 GPIO cable from Exciter 2
- 4.3 GPIO cable from Dual Switch Relay output to STX HP Interface
- 4.4 Control cable from FW EP1 I/O.

5 FW EP1 Installation

5.1 Preparing to Install

5.1.1 Verify Contents of Shipment

- ☐ 909-4167-100 FW EP1 Exciter Switcher Unit
- ☐ 909-4167 FW EP1 Exciter Switcher Option/Cable Kit

5.1.2 Tools and Materials

Tools listed in STX HP installation are adequate and include:

- ☐ Small flat blade screwdriver (about 5/32" blade or smaller)
- ☐ Large Phillips screwdriver

5.1.3 Estimated Time for Installation

Time added to the STX HP installation should be approximately 10 minutes.

5.2 Rack Mounting

The FW EP1 occupies one standard rack unit. Simply use the provided screws (and clips if needed) to secure all four corners of the front panel.

5.3 AC Power

Plug the provided AC power cable to a standard 50-60 Hz 115-230 VAC service outlet.

5.4 Exciter RF Cables

If installing with 10kW, connect the 100W RF out of the FW EP1 to STX 10 RF In.

Connect the RF out from the first main exciter unit to the 100W RF IN EXCITER 1 on the FW EP1.

Connect the RF out from the second exciter unit to the 100W RF IN EXCITER 2 on the FW EP1

Connect the RF sample out from the first main exciter unit to the EXCITER 1 RF SAMPLE INPUT on the FW EP1

Connect the RF sample out from the second exciter unit to the EXCITER 2 RF SAMPLE INPUT on the FW EP1



5.5 Control Cable

Connect the D-sub 15 pin connector to the FW EP1 I/O connector on the back panel of the FW EP1. Secure the two screws with a small flat screwdriver as shown in Figure 5 – FW EP1 I/O Connector.

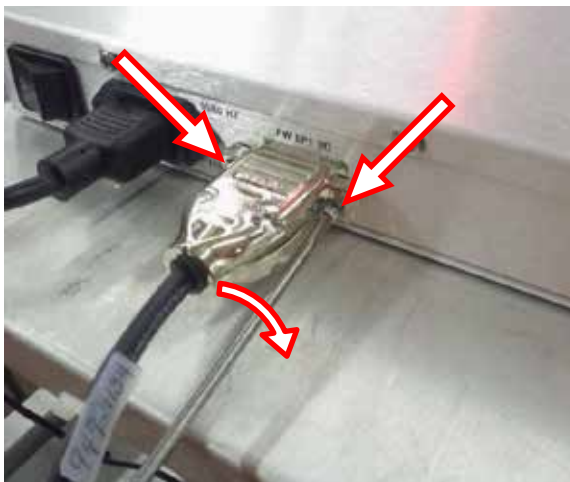


Figure 5 – FW EP1 I/O Connector

This cable fans out in to 3 connection points in the system as follows:

Connect the D-sub 37-pin connector labeled EX1 to the first main exciter's BE Interface connector. Ensure that this unit corresponds to the RF drive used with RF IN EXCITER 1 and the RF sample used with the EXCITER 1 RF SAMPLE INPUT.

Connect the D-sub 37-pin connector labeled EX2 to the second exciter's BE Interface connector. Ensure that this unit corresponds to the RF drive used with RF IN EXCITER 2 and the RF sample used with the EXCITER 2 RF SAMPLE INPUT.

Connect the push in snap connector to the Dual Switch Assembly on STX HP cabinet. Refer to section 4.4

5.6 Initial Turn on

Note: FW EP1 is intended to switch exciters on the complete or near total RF output failure of an exciter. The trip threshold is typically be set for an exciter output power reduction of more than 70%. This will prevent unwanted switching of the exciters in the event of an STX PA module or Power Supply failure(s).

1. Flip the AC power switch to turn on the FW EP1.
2. Select an active exciter by turning the knob to the EXCITER 1 or EXCITER 2 position
3. Turn the transmitter on.
4. Ensure the mute alarm is deactivated. If necessary, reduce LEVEL by turning counterclockwise as needed to deactivate the mute alarm.

5. Lower the transmitter power output by removing 3 of the 7 STX PA Power Supplies, (remove 4 if equipped with 8 PA Power Supplies). Turn the Level adjustment with a small flat screwdriver clockwise to raise the threshold at which the Alarm LED lights. Back the level off slightly to extinguish the Alarm LED
6. Return transmitter power output to normal operating level and then repeat step 5 on the other exciter:
7. Return transmitter power output to normal and with RF still on, turn the control dial to AUTOMATIC to arm the system



AVOID TURNING TRANSMITTER RF OFF WHEN THE FW EP1 IS IN AUTOMATIC SWITCHING MODE



6 Troubleshooting

6.1 Remote Re-arming in AUTOMATIC Mode

As discussed in the Theory of Operation section, remote switching back to exciter 1 can be accomplished remotely by temporarily activating the Mute Input with TB2-6 to ground on the STX HP Interface Board.

Typically, diagnostics of exciters is required followed by manually switching the FW EP1 out of and then back into automatic mode.



AVOID TURNING RF OFF WITH THE FW EP1 IN AUTOMATIC SWITCHING MODE

6.2 Remote RF ON/OFF in AUTOMATIC Mode

If a transmitter RF OFF command is issued, an FW EP1 system in automatic mode will switch between two muted exciters indefinitely. If left in this state, the RF relay will eventually wear out and fail rendering the FW EP1 inoperable. This should be avoided.

RF ON/OFF commands can be issued through either active or standby system controllers. Simply issue an RF on command in either system controller. If the wrong unit is active after the RF on command is issued, repeat the process in section 6.1 to set the system back to exciter 1 again.

7 Maintenance

7.1 FW EP1 Exciter Switcher – Major Parts

- | | | |
|----|--------------|--|
| 1. | 919-4209 | PCB Assy, FW LP1/EP1 Logic & Switching Board |
| 2. | 800-296A-001 | FW EP1 I/O Board |
| 3. | 919-4208 | PCB Assy, FW LP1/EP1 Exciter Relay Board |
| 4. | 340-0202-002 | Coax Switch Assy |
| 5. | 339-0006 | 10A AC Receptacle / RFI Filter |
| 6. | 349-0020 | Rocker Switch, DPST, 20A |
| 7. | 540-1205 | Power Supply |
| 8. | 919-4276 | PCB Assy, STX-HP Dual Switch Relay Board |

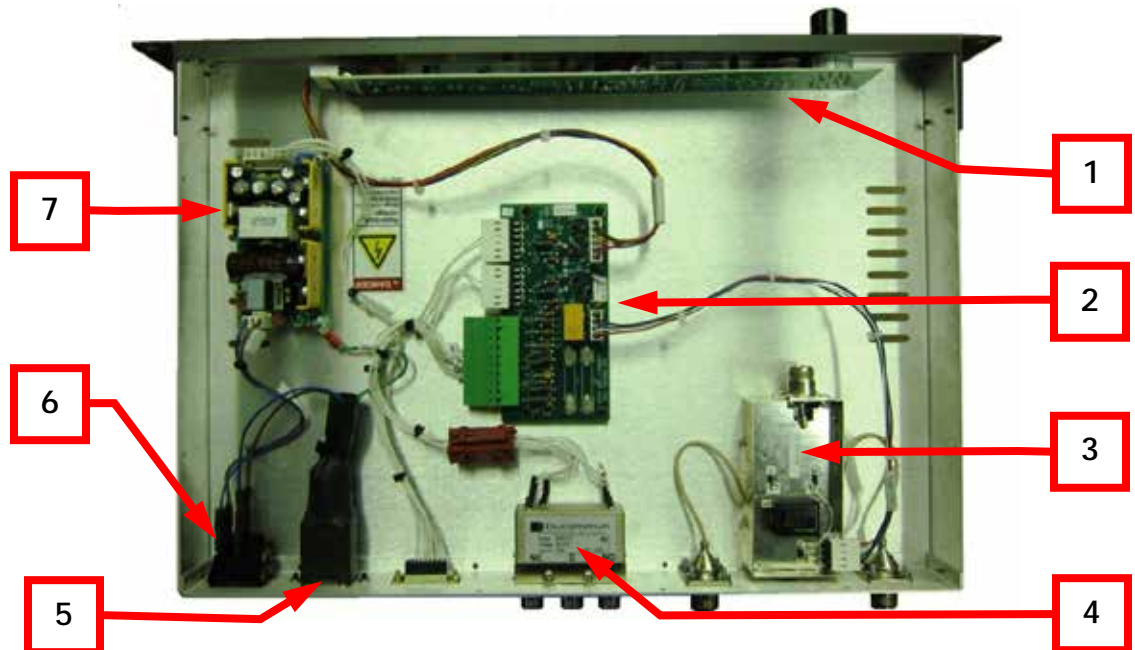


Figure 6 – FW EP1 Exciter Switcher Part Locations

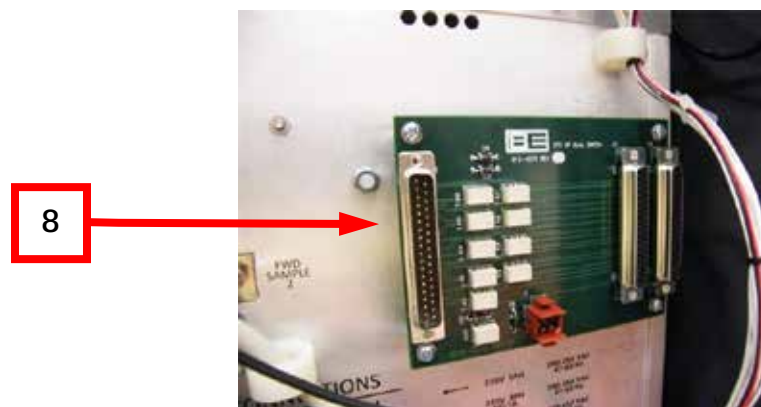


Figure 7 – STX HP Dual Switch Relay Board