Technical Manual

iDEN

900 MHz SRRC EBTS
FOR HARMONY WIRELESS
COMMUNICATION SYSTEMS

68P80802B45-O

09/23/02

MOTOROLA
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RF SUB-SYSTEM

SUPPLMENT TO EBTS SYSTEM MANUAL
6880801E35

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Front Matter

About This Manual

This manual provides the experienced service technician with an overview of the 900 MHz Single Rack, Redundant Controller (SRRC) EBTS for Harmony Wireless Communication Systems.

The EBTS System has three major components:

- ❒ Generation 3 Site Controller (Gen 3 SC)
- ❒ Base Radios (BRs)
- ❒ RF Distribution System (RFDS)

NOTE

This manual supplements the Enhanced Base Transceiver System (EBTS) System Manual, *68P80801E35*.

The information in this manual is current as of the printing date. If changes to this manual occur after the printing date, they will be documented and issued as Schaumburg Manual Revisions (SMRs).

Target Audience

The target audience of this document includes field service technicians responsible for installing, maintaining, and troubleshooting the EBTS.

In keeping with Motorola's field replaceable unit (FRU) philosophy, this manual provides sufficient functional information to the FRU level. Please refer to the appropriate section of this manual for removal and replacement instructions.

Maintenance Philosophy

The EBTS has been designed using a Field Replaceable Unit (FRU) maintenance concept. To minimize system down time, faulty FRUs may be quickly and easily replaced with replacement FRUs. This helps to restore normal system operation quickly.

Due to the high percentage of surface mount components and multi-layer circuit boards, field repair is discouraged. Faulty or suspect FRUs should be returned to the Motorola Customer Support Center for further troubleshooting and repair.

Each FRU has a bar code label attached to its front panel. This label identifies a sequential serial number for the FRU. Log this number whenever contacting the Motorola Customer Support Center. For complete information on ordering replacement FRUs, or instructions on how to return faulty FRUs for repair, contact:

Nippon Motorola LTD. **Tokyo Service Center** **044-366-8860**	**OR**	**Motorola Customer Support Center** **1311 East Algonquin Road** **Schaumburg, Illinois 60196** **(800) 448-3245 or (847) 576-7300**

Technical Support Service

Motorola provides technical support services for installation, optimization, and maintenance of its fixed network equipment. Before calling the Motorola Customer Support Center, please note the following information:

- ❒ Where the system is located.
- ❒ The date the system was put into service.
- ❒ A brief description of problem.
- ❒ Any other unusual circumstances.

General Safety Information

The following general safety precautions must be observed during all phases of operation, service, and repair of the equipment described in this manual. The safety precautions listed below represent warnings of certain dangers of which we are aware. You should follow these warnings and all other safety precautions necessary for the safe operation of the equipment in your operating environment.

Red and follow all warning notices and instructions marked on the product or included in this manual before installing, servicing or operating the equipment. Retain these safety instructions for future reference. Also, all applicable safety procedures, such as Occupational, Safety, and Health Administration (OSHA) requirements, National Electrical Code (NEC) requirements, local code requirements, safe working practices, and good judgement must be used by personnel.

Refer to appropriate section of the product service manual for additional pertinent safety information.

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modifications of equipment.

Identify maintenance actions that require two people to perform the repair. Two people are required when:

- ✓A repair has the risk of injury that would require on person to perform first aid or call for emergency support. An example would be work around high voltage sources. A second person may be required to remove power and call for emergency aid if an accident occurs to the first person.
- ✓Use the National Institute of Occupational Safety and Health (NIOSH) listing equation to determine whether a one or two person lift is required when a system component must be removed and replaced in its rack.

If troubleshooting the equipment while power is applied, be aware of the live circuits.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and all connectors are properly terminated.

All equipment must be properly grounded in accordance with *Motorola Standards and Guidelines for Communication Sites "R56"* (6881089E50) and specified installation instructions for safe operation.

Slots and openings in the cabinet are provided for ventilation. To ensure reliable operation of the product and protect it from overheating, these slots and openings must not be blocked or covered.

Only a qualified technician familiar with similar electronic equipment should service equipment.

Some equipment components can become extremely hot during operation. Turn off all power to the equipment and wait until sufficiently cool before touching.

Human Exposure Compliance

This equipment is designed to generate and radiate radio frequency (RF) energy by means of an external antenna. When terminated into a non-radiating RF load, the base station equipment is certified to comply with Federal Communications Commission (FCC) regulations pertaining to human exposure to RF radiation in accordance with the FCC Rules Part 1 section 1.1310 as published in title 47 code of federal regulations and procedures established in TIA/EIA TSB92, Report on EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines, Compliance to FCC regulations of the final installation should be assessed and take into account site specific characteristics such as type and location of antennas, as well as site accessibility of occupational personnel (controlled environment) and the general public (uncontrolled environment). This equipment should only be installed and maintained by trained technicians. Licensees of the FCC using this equipment are responsible for insuring that its installation and operation comply with FCC regulations Part 1 section 1.1310 as published in title 47 code of federal regulations.

Whether a given installation meets FCC limits for human exposure to radio frequency radiation may depend not only on this equipment but also on whether the "environments" being assessed are being affected by radio frequency fields from other equipment, the effects of which may add to the level of exposure. Accordingly, the overall exposure may be affected by radio frequency generating facilities that exist at the time the licensee's equipment is being installed or even by equipment installed later. Therefore, the effects of any such facilities must be considered in site selection and in determining whether a particular installation meets the FCC requirements.

FCC OET Bulletin 65 provides materials to assist in making determinations if a given facility is compliant with the human exposure to RF radiation limits. Determining the compliance of transmitter sites of various complexities may be accomplished by means of computational methods. For more complex sites direct measurement of power density may be more expedient. Additional information on the topic of electromagnetic exposure is contained in the *Motorola Standards and Guideline for Communications Sites* publication. Persons responsible for installation of this equipment are urged to consult the listed reference material to assist in determining whether a given installation complies with the applicable limits.

In general the following guidelines should be observed when working in or around radio transmitter sites:

- All personnel should have electromagnetic energy awareness training.
- All personnel entering the site must be authorized.
- Obey all posted signs
- Assume all antennas are active
- Before working on antennas, notify owners and disable appropriate transmitters.
- Maintain minimum 3 feet clearance from all antennas.
- Do not stop in front of antennas.

- Use personal RF monitors while working near antennas.
- Never operate transmitters without shields during normal operation.
- Do not operate base station antennas in equipment rooms

For installations outside of the U.S., consult with the applicable governing body and standards for RF energy human exposure requirements and take necessary steps for compliance with local regulations.

References:

TIA/EIA TSB92 “Report on EME Evaluation for RF Cabinet Emissions Under FCC MPE Guidelines”, Global Engineering Documents: http://globl.ihs.com/

FCC OET Bulletin 65 “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”; http://www.fcc.gov/oet/rfsaftey/.

Motorola Standards and Guideline for Communications Sites, Motorola manual 68P81089E50.

IEEE Recommended Practice for the Measure of Potentially Hazardous Electromagnetic Fields-- RF and Microwave, IEEE Std. C95.3-1991, Publication Sales, 445 Hoes Lane, P.O. Box 1331, Piscattaway, NJ 08855-1331

IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, IEEE C95.1-1991, Publication Sales, 445 Hoes Lane. P.O. Box 1331, Piscattaway, NJ 08855-1331

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900 MHz QUAD Single Rack, Redundant Controller

Overview

This section provides technical information for the Single Rack, Redundant Controller 900 MHz QUAD MHz Duplexed EBTS, hereinafter called the SRRC System.

The topics of this section are listed in the following table.

Section	Page	Description
Description	2	Describes the SRRC system
SRRC General Specifications	9	Provides performance specifications for the SRRC system
Site Control Theory Of Operation	13	Provides reference to Gen 3 SC theory of operation and descriptions
RFDS Theory of Operation	14	Provides theory of operation for the 900 MHz QUAD Duplexed RFDS, as used in the SRRC system
Removal/Replacement Procedures	27	Provides instructions for replacing SRRC components
Cabling Information	37	Provides information on how to connect all cabling required for installing and expanding the SRRC system
Base Radio Buildout/ RFDS Expansion	58	Provides instructions on adding additional Base Radios to an existing SRRC system. Provides instructions on expanding the BR capacity of an SRRC system

Description

The SRRC primary cabinet combines the Control Cabinet and RF Cabinet functions in one cabinet. As such, the SRRC consists of a single cabinet (called the SRRC primary cabinet, shown in Figure 1) which contains a 900 MHz QUAD Duplexed RFDS and up to four 900 MHz Multicarrier Base Radios, along with a redundant (dual) Gen 3 SC.

The SRRC system contains an RF Distribution System (functionally consisting of the same RFDS equipment used in a Stand-alone RF Cabinet), and a Controller subsystem (functionally consisting of the same Control Cabinet equipment used in a Stand-alone Control Cabinet). These subsystems are individually discussed below.

RF Distribution System

The SRRC system uses a 900 MHz QUAD Duplexed RFDS, which is a 900 MHz duplexing/hybrid combining and receiver multicoupler system. Duplexers allow a transmit (Tx) and a receive (Rx) path to share a common antenna. Cascaded transmit combiner stages allow several transmit signals to be fed to a single duplexer/antenna. Figure 3 shows the 900 MHz QUAD Duplexed RFDS used within the SRRC system.

The 900 MHz QUAD Duplexed RFDS contains several Field Replaceable Units (FRUs), including:

- An Rx LNA/Multicoupler Tray (Rx Tray), consisting of the following FRUs:
  - Three First Multicoupler/Amplifier (4-Way) assemblies
  - Two Power Supplies
  - Alarm Board
  - Input/Output Interface Board (I/O Board)
- A Triple 2-Way Combiner Deck without Isolators (optional)
- rack space is provided for field installed Tower-Top Amplifier (TTA) interface panel

Multicarrier EBTS Configuration

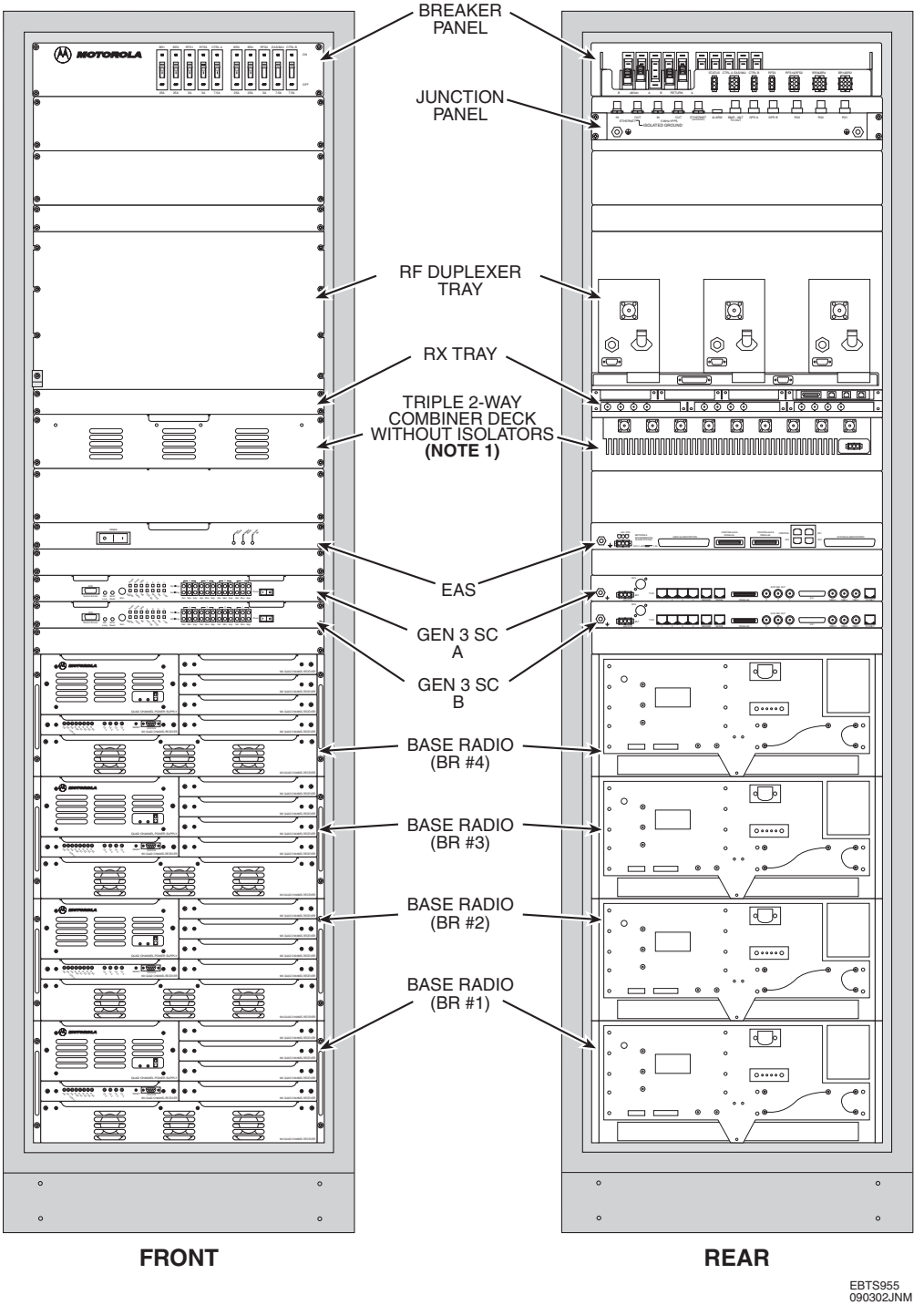
Multicarrier specific racking configurations maximize RF density in a single iDEN RF rack. This new Multicarrier based sites include the Single Rack Redundant Controller (SRRC). The major differences between the Multicarrier optimized racks and its single carrier counterpart are:

- ❒ Multicarrier racks ship with a maximum of four (4) QUAD BRs per sector.
- ❒ Triple 2-way combiners are optional in Multicarrier racking configurations. The Triple 2-way combiners can be purchased as part of the Multicarrier rack if the BRs will be placed on a single antenna.

Multicarrier SRRC

This configuration is the same as the Single Carrier SRRC Rack, except it ships with a maximum of four Multicarrier Base Radios. A triple 2-way combiner without isolators can be purchased as an option or installed as a field expansion when combining two Multicarrier BRs onto a single transmit antenna. Refer to Figure 1.

Description



NOTE 1: FOR QUAD SRRC SITES: TRIPLE 2-WAY COMBINER IS OPTIONAL FOR COMBINING QUAD BASE RADIOS WITH 3 OR FEWER CONFIGURED CARRIERS.

Figure 1 ***900 MHz QUAD SRRC System Cabinet with Generation 3 Site Controller***

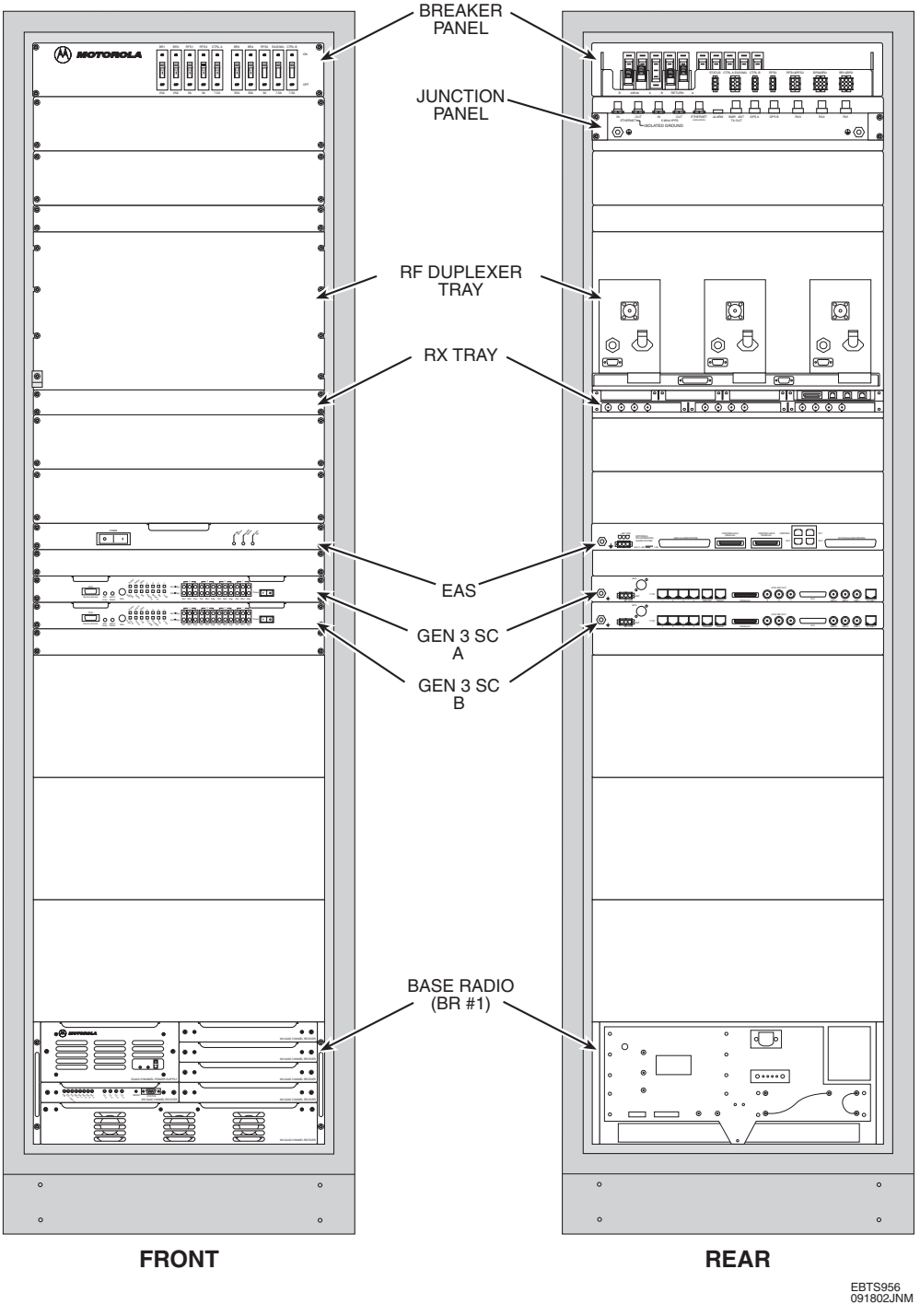


Figure 2 ***Low Capacity Generation 3 Site Controller SRRC System***

The 900 MHz QUAD Duplexed RFDS employs cascaded combining in a modularized, compact design. This modularization, along with a combining scheme based around the modularization, allows expansion with a minimum amount of added components. The cascaded combining along with the compact design allows up to four Base Radios (BRs) in the SRRC cabinet; each standard expansion cabinet contains four BRs. This allows a maximum of 16 channels in a three-branch diversity site.

To eliminate the retrofit of several discrete expansion hardware items, the 900 MHz QUAD Duplexed RFDS uses a combiner deck. The deck provides the various combining and signal conditioning functions normally associated with discrete hybrid coupler and coupler/load assemblies.

The Triple 2-Way Combiner Deck without Isolators (shown in Figure 4) provide a combining and signal conditioning interface between the Duplexers and several Base Radio transmit signals.

The decks utilize a microstrip/groundplane design to facilitate transmission line properties that provide functions such as hybrid combining. Due to the compact, high-density design of the combiner decks, a coldplate and forced-air cooling is used instead of the simple radiational/convective cooling used in the other RFDSs. The coldplate is a casting with integral heat sinks which conducts heat away from the circuitry. Additionally, fans provide concentrated cooling air flow across the assembly. The fans are not thermostatically controlled and operate continuously while power is applied to the cabinet.

An Rx Tray (Figure 5) is used for Rx signal distribution. Corresponding to the three Rx diversity branches, the Rx Tray contains three Multicouplers (MCs). Each MC contains an amplifier/4-way multicoupler that accepts a single Rx signal and provides four outputs. These outputs provide the Rx signal to up to four BRs in the SRRC cabinet.

The Rx Tray also contains a dual-redundant power supply, an I/O board, an alarm diagnostics board, and a power/signal backplane ("midplane" board). The power supplies provide operating power for the Rx Tray receive multicouplers, as well as the combiner deck fans, and the duplexer power monitor assemblies. The I/O board provides a power and alarm interconnect between various RFDS assemblies. The alarm diagnostics board detects and routes RFDS failure status information to the Environmental Alarm System (EAS) via the I/O board alarm interconnect.

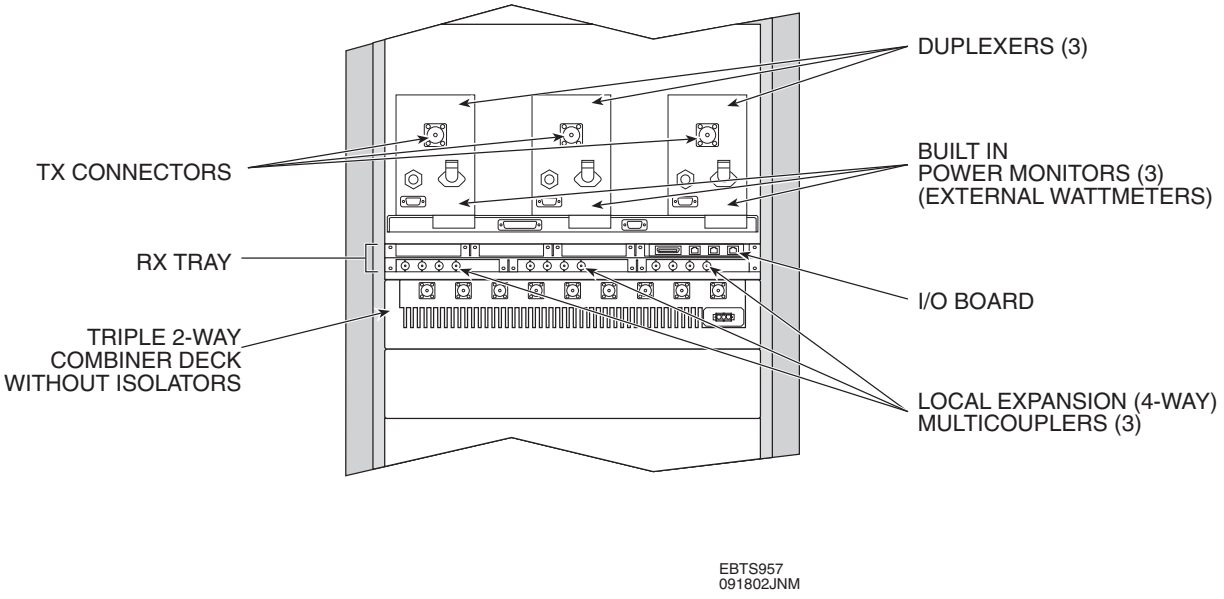


Figure 3 ***900 MHz QUAD Duplexed RF Distribution System***

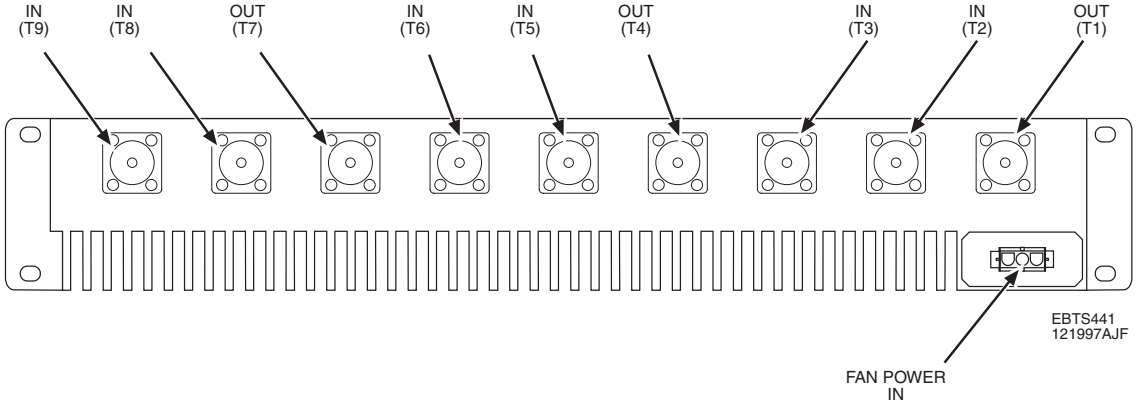


Figure 4 ***Triple 2-Way Combiner Deck***

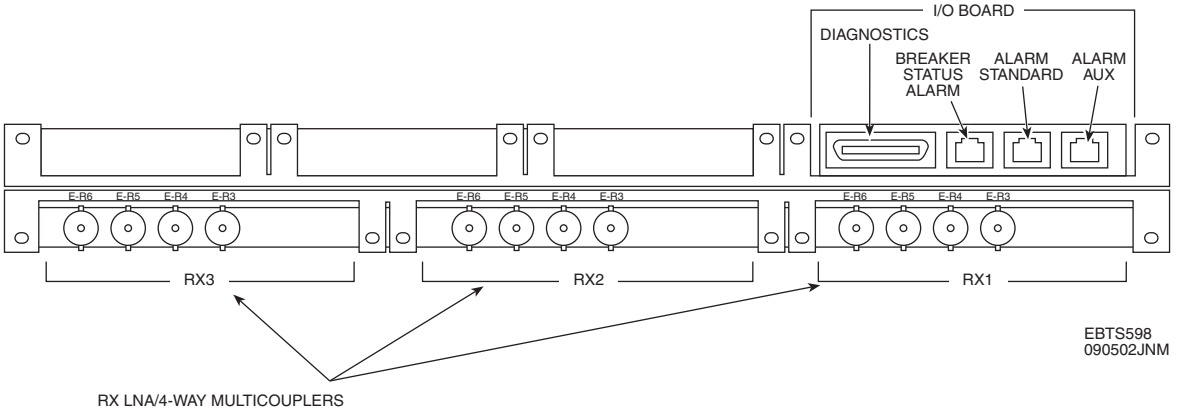


Figure 5 ***Rx Tray***

Controller System

The SRRC system uses the same integrated Generation 3 Site Controller (Gen 3 SC) assemblies as the standard Control Cabinet used in the Stand-alone Control And RF Cabinet system. This system consists of the following:

- ❒ Two Gen 3 SCs (one main, one redundant)
- ❒ Environmental Alarm System (EAS)

The Gen 3 SC provides the interface between the Base Radios and the telco network, as well as providing a common interface point for all system alarms.

Refer to the Gen 3 SC Supplement of this manual for more information on the applicable Controller.

Generation 3 Site Controller
System Manual 68P80801E30

SRRC General Specifications

SRRC RFDS Specifications

900 MHz QUAD Duplexed RFDS General Specifications

Table 1 lists the general specifications for the 900 MHz QUAD Duplexed RFDS.

Table 1 ***900 MHz QUAD Duplexed RFDS General Specifications***

Specification	Value or Range
Rack Space Requirement	9 EIA Rack Units (RU)
Storage Temperature Range	-40˚ to +203˚ F (-40 to +95° C)
Operating Temperature Range	+32˚ to +104˚ F (0 to +40° C)
Cooling (Combiner Decks)	Coldplate with continuous forced-air cooling
Frequency Range: Receive Transmit	 896 to 901 MHz 935 to 940 MHz
Tx - Rx Spacing	39 MHz
Channel Spacing	25 kHz (min.)
Port Impedance	50 Ω (nom.)
Input Supply Voltage; RFDS	-48 VDC (-41 VDC to -65 VDC)
Input Current; RFDS	2.25 A (steady-state max.)
Input Supply Voltage; Fan Array	12 VDC

Table 2 ***900 Quad RFDS Transmit Level Specifications***

Function	Tolerance (typical)		
	PA Out of BR	RF Power at Antenna Port	
		Duplexed (1)	Two Way Hybrid Combined (1)
One Channel Maximum Forward Power	52 watts	>= 32.5 watts	>= 13.5 watts
Two Channel Total Maximum Forward Power	52 watts	>= 32.5 watts	>= 13.5 watts
Three Channel Total Maximum Forward Power	48 watts	>= 30 watts	>= 12.5 watts
Four Channel Total Maximum Forward Power	42 watts	>= 26.5 watts	>= 11.1 watts
All Channel Configurations Total Maximum Reflected Power (when antenna port is 50 ohm terminated)	<= 2 watts	<= 2 watts	<= 2 watts

(1) Measured at the antenna port of the 900 MHz RFDS

Table 3 ***900 Quad RFDS Receiver Level Specifications***

Function	Tolerance
Sensitivity (8%) BER	<= -113.5 dBm
Nominal BER (-80dBm applied level)	<= 0.01% BER
BER at Maximum Signal Level (-31 dBm)	<= 0.1%

Antenna to Receiver Specifications

Table 4 lists the 900 MHz QUAD Duplexed RFDS antenna port-to-receiver port specifications for a single receive branch. Figures 6 through 7 show the typical 900 MHz transmit and receive filter response plots, respectively.

Table 4 ***Duplexer Antenna Port-to-Receiver Port Specifications***

Specification	Value or Range
Gain (896 to 901 MHz):	
T_A = 77° F (25° C) ambient temperature	9.0 ±0.75 dB
-22° <T_A<140° F (-30° <T_A<60° C)	9.0 ±1.10 dB

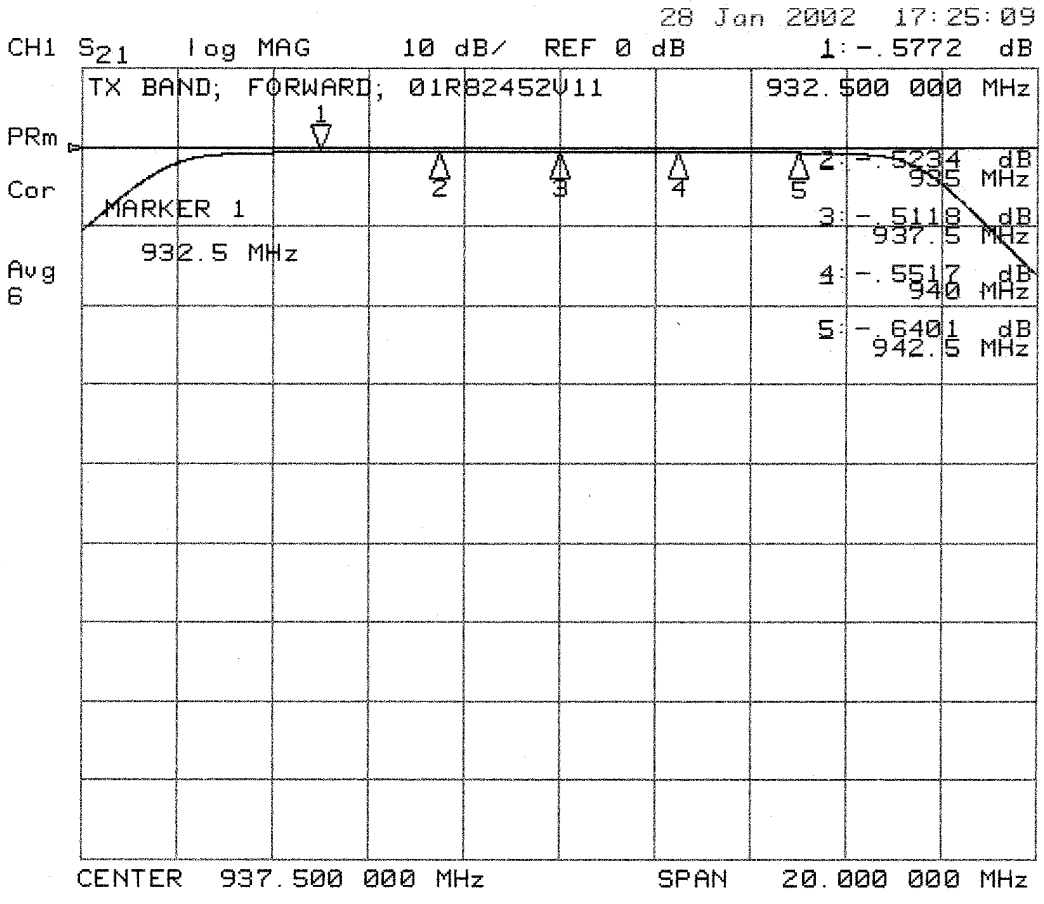


Figure 6 ***Typical 900 MHz TX Duplexer filter response plot***

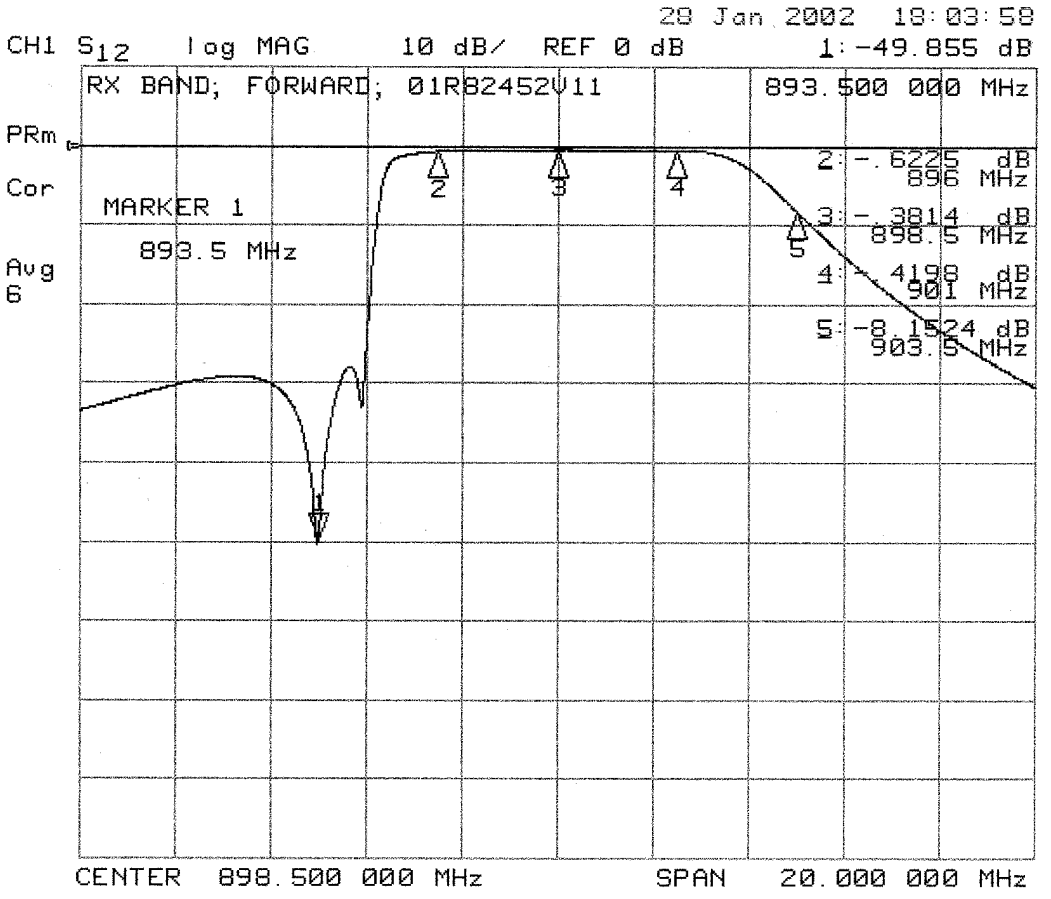


Figure 7 ***Typical 900 MHz RX Duplexer filter response plot***

Transmitter to Antenna Specifications

Table 5 lists the 900 MHz QUAD Duplexed RFDS transmitter port-to-antenna port specifications.

Table 5 ***Duplexer Transmitter Port-to-Antenna Port Specifications***

Specification	Value or Range (dB)	
	No Expansion *	Expansion **
Insertion Loss, 935 to 940 MHz	2.0	5.8
* Excluding hybrid type combiner ** Expansion includes hybrid combiner loss		

Site Control Theory Of Operation

The Gen 3 SC/iSC assigns available frequencies and time slots to the mobiles. It also links the EBTS Base Radios to the T1/E1 lines. Alarm monitoring functions are provided by the Environmental Alarm System (EAS) which mates with the iSC. The SRRC uses a redundant controller arrangement. As such, the SRRC Gen 3 SC/iSC consists of the following:

- ❒ Two Controllers (one main, one redundant) - Standard
- ❒ One Environmental Alarm System (EAS)
- ❒ Option: Controllers Non-Redundant

Refer to the Gen 3 SC supplement to this manual for more information on the Gen 3 SC.

Generation 3 Site Controller
System Manual 68P80801E30

RFDS Theory of Operation

Figure 8 is a block diagram for the 900 MHz QUAD Duplexed RFDS configurations used within the SRRC system.

900 MHz QUAD Duplexed RFDS Baseline Configuration

(See Figure 8.) The baseline configuration consists of a one Base Radio (BR), triple-receive diversity system located in the SRRC primary cabinet. Without additional RFDS assemblies, the SRRC primary cabinet can directly accommodate four Base Radios.

Duplexer Operation

Three Duplexers accommodate three Transmit/Receive (Tx/Rx) antennas, ANT 1 through ANT 3. Each Duplexer is tuned to accept a transmit input (TX IN 1 through TX IN 3) in the 935-940 MHz range.

The respective Rx outputs furnished by the three Duplexers (RX OUT 1 through RX OUT 3) provide triple-diversity Rx signals for individual Base Radio receivers operating in the 896 - 901 MHz range. The RX OUT1 through RX OUT3 signals are applied to the Base Radio receivers through multicouplers, which are discussed later.

Transmit Operation

A Triple 2-Way Combiner Deck without Isolators provides combining of multiple TX signals from the Base Radios. The deck consists of three microstrip/groundplane printed circuits which provide the combining functions.

Base Radio 1 and 3 transmit signals TX1 and TX3 are applied to the first of three sections of the Triple 2-Way Combiner Deck. Each section of the deck combines two Tx inputs onto one line. Tx signals TX1 and TX3 are each combined by a hybrid coupler. The output of the hybrid coupler is then fed to the ANT 1 Duplexer TX input.

Base Radio 2 and 4 transmit signals TX2 and TX4 are similarly applied to the second section of the Triple 2-Way Combiner Deck. The combined TX2/TX4 signal is then fed to the ANT 2 Duplexer TX input.

Duplexers 1 through 3 power monitor signals VPWR1 through VPWR3 must be interfaced with Base Radios 1 through 3, respectively. Therefore, a Tx signal allocation is used for the four Base Radios that maintains the arrangement of duplexers 1 through 3 power monitor signals VPWR1 through VPWR3 interfacing with Base Radios 1 through 3, respectively. As such, a Base Radio 1-3 / 2-4 Tx signal allocation across the three duplexers is utilized (rather than a simple 1-2 / 3-4 distribution). An optional second style of combining can be used to put all 4 Tx signals onto a single Tx antenna. (Power Monitors are discussed in detail later.)

If there is no Triple 2-Way Combiner Deck, Base Radio 1 through 3 can be cable directly to Duplexers 1 through 3.

Receive Operation

Each receive branch of the 900 MHz QUAD Duplexed RFDS uses a Receive Multicoupler assembly consisting of a Low Noise Amplifier and a 4-way multicoupler. The Receive Multicouplers convert a single receive signal into multiple buffered receive signals. All three Rx branches function identically; therefore, only the RX1 is discussed here.

The Receive Multicoupler uses a low-noise amplifier and a four-way splitter to provide RX1 signals to the Main RF Cabinet Base Radios. The splitter takes the RX1 signal from the amp and provides four outputs (ER3 through ER6), which respectively feed the RX1 receivers in Base Radios 1 through 4.

Although the baseline system combines the Tx signals onto only the ANT 1 Duplexer/antenna, the three Tx/Rx antennas (along with the Rx circuitry shown in Figure 8) provide triple-diversity receive for all configurations.

Power Monitoring

A dual-directional coupler is installed on each Duplexer antenna port. The couplers are in-line and provide forward and reflected RF signal samples. These signal samples are fed to power monitors that, in turn, read the forward and reflected power readings from the antenna.

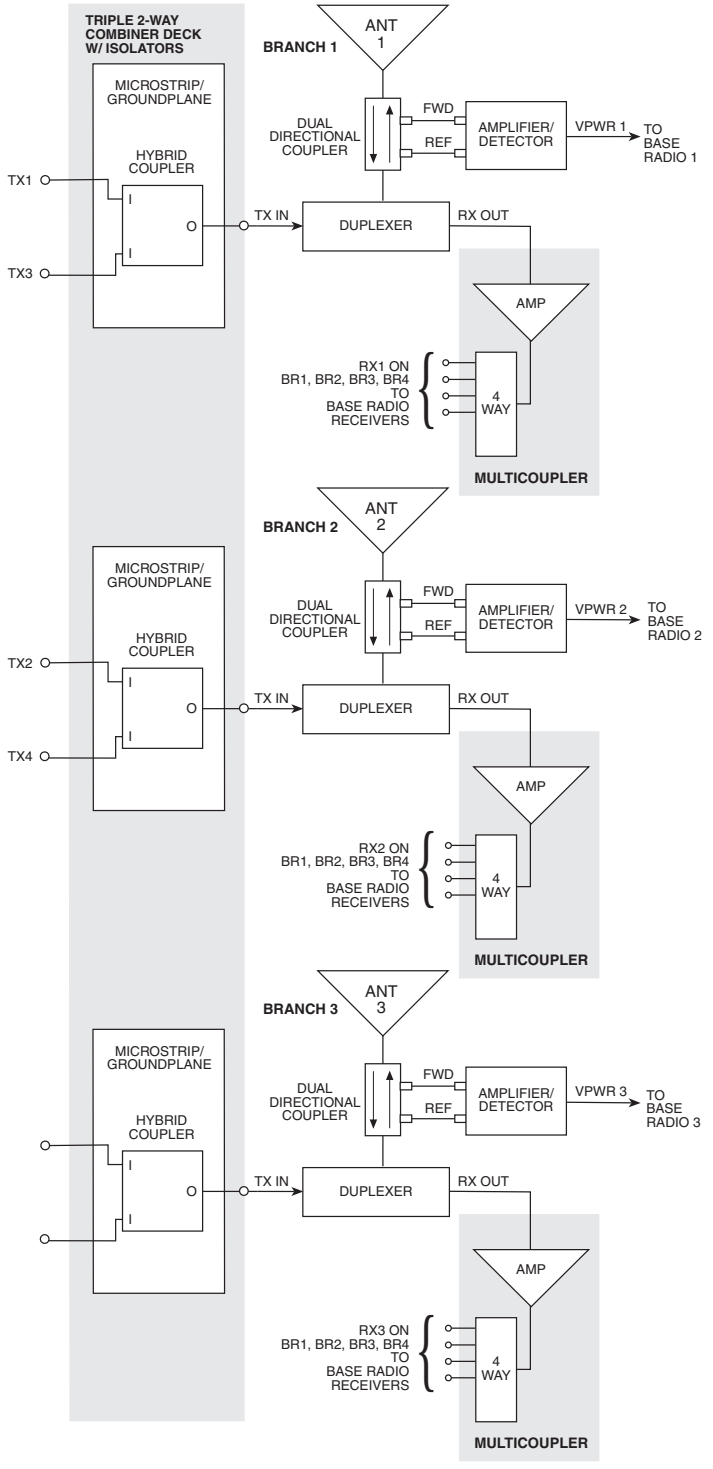


Figure 8 ***900 MHz QUAD SRRC Duplexed RFDS Block Diagram***

The power monitors measure the power readings by converting forward-power signal sample FWD and reflected-power signal sample REF into DC voltages. These DC voltages (VFWD1 through VFWD3, VREF1 through VREF3) are proportional to the forward and reflected power readings. VPWR1 through VPWR3 are sent to Base Radios 1 through 3, respectively, where they are used to determine the forward and reflected power readings. They are also used to calculate the VSWR at a particular antenna port.

NOTE

Depending upon configuration, Base Radios 2 and 3 may not transmit over antennas 2 or 3. These Base Radios are in fact actually monitoring antennas 2 and 3 via the Base Radio 2 VPWR2 interface to duplexer 2, and the Base Radio 3 VPWR3 interface to duplexer 3.

As such, on systems where no transmit signals are applied to duplexer 2 and/or 3, these monitor connections would provide false alarm indications. Therefore, in such cases the power monitor cables connected to the corresponding Base Radio(s) must be disconnected from the Base Radio's ALARM connector.

900 MHz QUAD Duplexed RFDS Alarm Circuit

Two opto-isolator outputs send alarm closure signals to the Environmental Alarm System (EAS): One diagnostic alarm output is provided for both of the power supplies; the other alarm is provided for each of the MC/Amps in the MCs. The alarms operate as normally closed loops. As such, when either (or both) of the power supplies experiences a failure, an alarm is generated. Similarly, when any combination of amplifiers experiences a failure, an alarm is generated. Upon detection of an alarm condition, the respective alarm will open to generate an alarm signal. The alarm signals are routed to the EAS by way of the Alarm output telco connector on the Rx Tray I/O board.

Power Supplies

The RFDS uses two Power Supply boards (power supply A and power supply B) in a dual-redundant arrangement. The Power Supply boards are located in the Rx Tray. The power supplies convert the -48 VDC (hot) site power to +12 VDC and +24 VDC. The +12 VDC is used for the Rx Tray receive multicouplers, and the Tx Combiner fan assemblies. The +24 VDC is used for the Duplexer power monitors and (where applicable) tower top amplifiers.

Each Power Supply board is equipped with green and red LED indicators which indicate when the board is receiving power and properly functioning. The RFS1 and RFS2 circuit breakers on the cabinet breaker panel control the application of -48 VDC power to the A and B Power Supply boards.

Connectors, Pinouts, and Wiring

Power Monitor Wiring Harness

(See Figure 9.) The 900 MHz QUAD Duplexed RFDS contains 25-pin power monitor connector (P4) that interconnects the Power Monitor (sometimes called "external wattmeter") FWD and REF signals to BR1 through BR3.

The 900 MHz QUAD Duplexed RFDS also contains 9-pin monitor power connector (P5) that interconnects the power monitors on each duplexer with DC power from the Rx Tray assembly. The power monitors interconnect with connectors P4 and P5 through duplexer connectors P1 through P3,which respectively connect to the ANT1 through ANT3 duplexers.

Table 6 is a wire-run list that correlates the connections from connectors P4 and P5 to the P1 through P3 duplexer connectors.

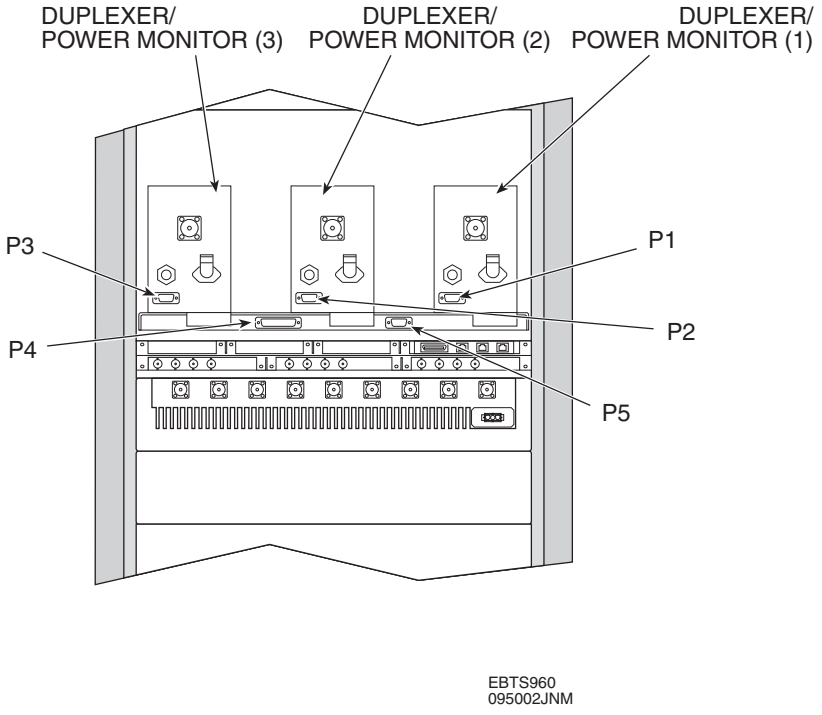


Figure 9 ***900 MHz QUAD SRRC RFDS Alarm/Monitor Connections***

Table 6 ***900 MHz QUAD Duplexed RFDS Alarm/Monitor Harness Wire Run List***

From	To	Function
P4-1	—	no connection
P4-2	—	no connection
P4-3	—	no connection
P4-4	P1-3	GND
P4-5	P1-5	ANT A (antenna 1) FWD power monitor
P4-6	P1-1	Antenna A REF power monitor
P4-7	P2-3	GND
P4-8	P2-5	ANT B (antenna 2) FWD power monitor
P4-9	P2-1	ANT B (antenna 2) REF power monitor
P4-10	P3-3	GND
P4-11	P3-5	ANT C (antenna 3) FWD power monitor
P4-12	P3-1	ANT C (antenna 3) REF power monitor
P4-13	—	no connection
P4-14	—	no connection
P4-15	—	no connection
P4-16	—	no connection
P4-17	—	no connection
P4-18	P1-4	GND (power monitor return)
P4-19	P2-4	GND (power monitor return)
P4-20	P3-4	GND (power monitor return)
P4-21	—	no connection
P4-22	—	no connection
P4-23	—	no connection
P4-24	—	no connection
P4-25	—	no connection
P5-1	P1-2	+24 VDC (monitor 1)
P5-2	P1-7	GND (monitor 1)
P5-3	P1-9	no connection
P5-4	P2-2	+24 VDC (monitor 2)
P5-5	P2-7	GND (monitor 2)
P5-6	P2-9	no connection
P5-7	P3-2	+24 VDC (monitor 3)
P5-8	P3-7	GND (monitor 3)
P5-9	P3-9	no connection

I/O Board Alarm Output Cabling

Two versions of the I/O Board currently exist: CTF6220A and CTF6220B. The two versions are functionally identical, but do use different pinouts for the RJ-45 ALARM STANDARD connector that connects the cabinet alarms to the EAS.

Version CTF6220B eliminates the need for an extra, second cable to be connected between the I/O Board and the EAS. Figure 10 shows the cabling for both versions.

NOTE

The CTF6220A and CTF6220B I/O boards are totally interchangeable. However, appropriate cabling must be used for the version being used (as shown in Figure 10). If cabling does not correspond to version, false alarms will result.

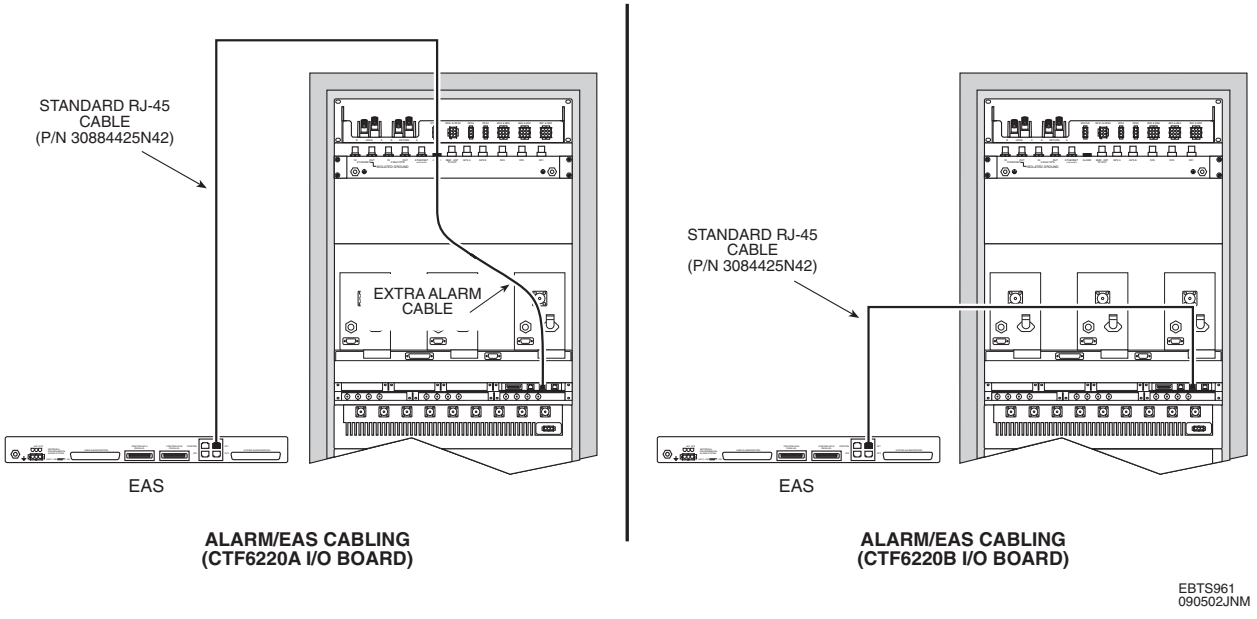


Figure 10 ***I/O Board Alarm-to-EAS Cabling (I/O Board CTF6220A and CTF6220B)***

I/O Board Rear Panel Connector Pinouts

The I/O Board rear panel connectors provide the cabinet alarm interface to the I/O board and a diagnostics connector. (Figure 5 shows and identifies the connectors.) The connectors are as follows:

- **Diagnostics** – 36-pin SCSI-style connector (reserved for future use)
- **Breaker Status (Alarm Expansion)** – RJ-45 connector receives breaker status from breaker panel. (Also has reserved function of receiving external alarm signals.)
- **Alarm Standard** – RJ-45 connector sends cabinet alarm status to the EAS.
- **Alarm Auxiliary** – RJ-45 connector sends additional, auxiliary alarm signals (reserved).

Table 7 lists the rear panel connector pinouts for I/O Board CTF6220A. Table 8 lists the connector pinout for I/O Board CTF6220B.

Table 7 ***I/O Board Rear Panel Connector Pinouts (I/O Board CTF6220A)***

Pin	Function/Connector			
	Diagnostics	**Breaker Status Alarm**	**Alarm Standard**	**Alarm Auxiliary**
1	1st MC #2 Alarm	Breaker	Breaker Alarm	PS Alarm Expansion
2	1st MC #3 Alarm	Breaker return	Breaker Alarm return	PS Alarm Expansion return
3	Exp MC #1 Alarm	RFDS MC Alarm	RFDS Multicoupler Alarm	1st MC Alarm
4	Exp MC #2 Alarm	RFDS TTA Alarm	RFDS TTA Alarm	Expansion MC Alarm
5	Exp MC #3 Alarm	RFDS PS Alarm	RFDS Power Supply Alarm	Fan Alarm
6	MC Alarm Expansion	RFDS MC Alarm return	RFDS Multicoupler Alarm return	1st MC Alarm return
7	TTA #1 Alarm	RFDS TTA Alarm return	RFDS TTA Alarm return	Expansion MC Alarm return
8	TTA #2 Alarm	RFDS PS Alarm return	RFDS Power Supply Alarm return	Fan Alarm return

Table 7 ***I/O Board Rear Panel Connector Pinouts (I/O Board CTF6220A) (Continued)***

Pin	Function/Connector			
	Diagnostics	**Breaker Status Alarm**	**Alarm Standard**	**Alarm Auxiliary**
9	TTA #3 Alarm			
10	TTA Alarm Expansion			
11	Fans #1 Alarm			
12	Fans #2 Alarm			
13	PS#1 +12VDC Alarm			
14	PS#1 +24VDC Alarm			
15	PS#2 +12VDC Alarm			
16	PS#2 +24VDC Alarm			
17	PS Alarm Expansion			
18	N/C			
19	1st MC #1 Alarm			
20	GND			
21	GND			
22	GND			
23	GND			
24	GND			
25	N/C			
26	N/C			
27	+24 VDC			
28	+24 VDC			
29	+24 VDC			
30	+24 VDC			
31	N/C			
32	N/C			
33	+12 VDC			
34	+12 VDC			
35	+12 VDC			
36	+12 VDC			

Table 8 ***I/O Board Rear Panel Connector Pinouts (I/O Board CTF6220B)***

Pin	Function/Connector			
	Diagnostics	**Breaker Status Alarm**	**Alarm Standard**	**Alarm Auxiliary**
1	1st MC #2 Alarm	Breaker	RFDS Power Supply Alarm return	Fan Alarm return
2	1st MC #3 Alarm	Breaker return	RFDS TTA Alarm return	Expansion MC Alarm return
3	Exp MC #1 Alarm	RFDS MC Alarm	RFDS Multicoupler Alarm return	1st MC Alarm return
4	Exp MC #2 Alarm	RFDS TTA Alarm	RFDS Power Supply Alarm	Fan Alarm
5	Exp MC #3 Alarm	RFDS PS Alarm	RFDS TTA Alarm	Expansion MC Alarm
6	MC Alarm Expansion	RFDS MC Alarm return	RFDS Multicoupler Alarm	1st MC Alarm
7	TTA #1 Alarm	RFDS TTA Alarm return	Breaker Alarm return	PS Alarm Expansion return
8	TTA #2 Alarm	RFDS PS Alarm return	Breaker Alarm	PS Alarm Expansion
9	TTA #3 Alarm			
10	TTA Alarm Expansion			
11	Fans #1 Alarm			
12	Fans #2 Alarm			
13	PS#1 +12VDC Alarm			
14	PS#1 +24VDC Alarm			
15	PS#2 +12VDC Alarm			
16	PS#2 +24VDC Alarm			
17	PS Alarm Expansion			
18	N/C			
19	1st MC #1 Alarm			
20	GND			
21	GND			
22	GND			
23	GND			
24	GND			
25	N/C			

Table 8 ***I/O Board Rear Panel Connector Pinouts (I/O Board CTF6220B) (Continued)***

Pin	Function/Connector			
	Diagnostics	Breaker Status Alarm	Alarm Standard	Alarm Auxiliary
26	N/C			
27	+24 VDC			
28	+24 VDC			
29	+24 VDC			
30	+24 VDC			
31	N/C			
32	N/C			
33	+12 VDC			
34	+12 VDC			
35	+12 VDC			
36	+12 VDC			

I/O Board Power Connectors

The I/O Board power connectors provide the I/O board power interface from the cabinet breaker panel -48 VDC power feed to the RFDS and combiner deck fans. (The I/O Board power connectors are mounted on the printed circuit board surface and are identified in Figure 18.) The connectors are as follows:

- **-48 VDC input** – 8-pin Mate-N-Lok header connector P1008. Receives -48 VDC feed from RFS1 & RFS2 connector on the breaker panel.
- **Fan Power output** – 8-pin Mate-N-Lok header connector P1007. Sends +12 VDC to the combiner deck fans.
- **RFDS Power output (power monitor interface)** – Mate-N-Lok header connector which terminates to 9-pin submini-D connector P5 (located on the duplexer shelf). Refer to Table 6 for pinout and signal functions.
- **TTA Power output/Alarm input** – 16-pin Mini Mate-N-Lok header connector P1006. Only used on systems with TTA interface. Sends +24 VDC to TTA Alarm Tray. Receives alarm signals from TTA Alarm Tray.

Table 9 lists the power connector pinouts for all versions of the I/O Board.

Table 9 ***I/O Board Power Connector Pinouts***

Pin		Function/Connector	
	TTA Power/Alarm Interface P1006	**-48 VDC Input P1008**	**Fan Power P1007**
1	TTA #1 +24 VDC	-48 VDC (‘A’ side)	N/C
2	TTA #1 GND	Return (‘A’ side)	Return (‘A’ side)
3	TTA #1 alarm enable	N/C	Alarm enable (‘A’ side)
4	TTA #1 alarm	N/C	+12 VDC (‘A’ side)
5	TTA #1 alarm return	-48 VDC (‘B’ side)	N/C
6	TTA #2 +24 VDC	Return (‘B’ side)	Return (‘B’ side)
7	TTA #2 GND	N/C	Alarm enable (‘B’ side)
8	TTA #2 alarm enable	N/C	+12 VDC (‘B’ side)
9	TTA #2 alarm		
10	TTA #2 alarm return		
11	TTA #3 +24 VDC		
12	TTA #3 GND		
13	TTA #3 alarm enable		
14	TTA #3 alarm		
15	TTA #3 alarm return		
16	N/C		

Removal/Replacement Procedures

Replacement of Gen 3 SC FRUs

Instructions for replacing the Gen 3 SC FRUs are provided in the Gen 3 SC Supplement to this manual.

Generation 3 Site Controller
System Manual 68P80801E30

Replacement of RFDS FRUs

Instructions are provided below for replacing FRUs within the 900 MHz QUAD Duplexed RFDS. Figure 1 identifies the 900 MHz QUAD Duplexed RFDS assemblies and FRUs. Figure 11 identifies the Rx Tray assemblies and attaching hardware.
Replace suspected FRUs with known non-defective FRUs to restore the RFDS to proper operation.

CAUTION

The RFDS contains static-sensitive modules. Take precautionary measures to prevent static discharge damage when servicing the RFDS.

(4-Way) Multicoupler Board Replacement Procedure

Perform the following steps to replace a 4-Way Multicoupler Board.

Removal

(See Figure 11.) Remove 4-Way Multicoupler Board as follows:

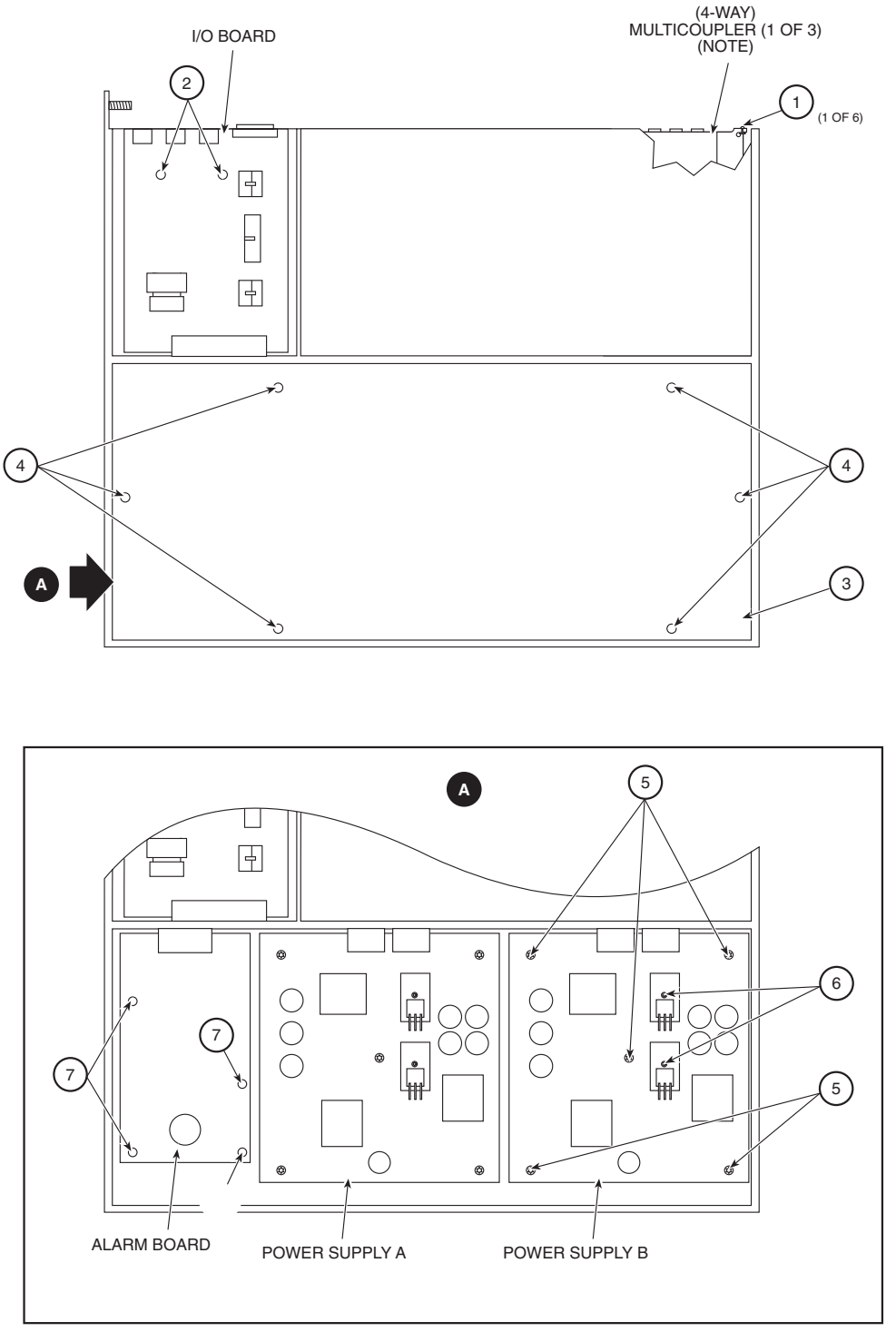
1. Tag and remove all BNC connections at the **R1** through **R4** BNC connectors on the 4-Way Multicoupler Board.
2. Remove two M3.5 TORX screws (1, Figure 11) which secure board assembly to Rx Tray chassis (one screw on each side of board). Save screws for reuse.
3. Partially draw board assembly out of Rx Tray until blindmate connector at front of board is disengaged.
4. Remove board from slot enough to gain access to input port SMA cable termination on top of board. Disconnect SMA cable from board connector.
5. Remove board fully from Rx Tray slot.

Installation

(See Figure 11.) Install 4-Way Multicoupler Board as follows:

1. Align 4-Way Multicoupler Board with Rx Tray board slot. Partially slide board into slot enough to allow Rx input SMA cable to mate with SMA connector on top of board.
2. Connect SMA cable to SMA connector on top of board. Using a breaking-type 5/16" torque wrench, torque the SMA connector to 5 in-lb.
3. Carefully slide board fully into slot, making certain blindmate connection at front of board is fully mated to Rx Tray chassis midplane connector.
4. Install two M3.5 TORX screws (1, Figure 11), one on each side of assembly, (saved during removal) which secure board assembly to Rx Tray chassis.
5. Connect cabling to the **R1** through **R4** BNC connectors on the 4-Way Multicoupler Board as tagged during removal.

   If adding the 4-Way Multicoupler Board, perform the required cabling in accordance with the Cabling Information subsection of this section.



NOTE: THREE (4-WAY) MULTICOUPLERS ARE LOCATED ON UNDERSIDE OF RX TRAY.

EBTS962
090502JNM

Figure 11 ***Rx Tray FRU/Assembly Replacement***

I/O Board Replacement Procedure

NOTE

During I/O Board replacement, the site will be inoperative due to loss of alarm and certain power functions. When followed as written, this procedure keeps the amount of downtime to a minimum.

Motorola recommends performing this procedure during off-peak periods.

NOTE

To prevent alarm reports while the replacement procedure is performed, the site should be taken down via the Operations and Maintenance Center (OMC).

Removal

(See Figure 11.) Remove I/O Board as follows:

1. Remove four M3.5 TORX screws which secure Rx Tray chassis to front panel. (Do not remove the four M6 TORX screws which secure front panel to equipment cabinet.) Save screws for reuse.
2. From rear of cabinet, carefully slide Rx Tray chassis from cabinet enough to access two M3.5 TORX screws (2, Figure 11) that secure I/O Board to Rx Tray chassis.
3. Remove two M3.5 TORX screws that secure I/O Board to Rx Tray chassis. Save screws for reuse.
4. Slide I/O Board away from Rx Tray midplane until connector at front of board is disengaged.
5. With board still connected to RJ45 alarm and Mate-N-Lok power connectors, tag wiring connections. Position board aside with all connections intact.

Installation

(See Figure 11.) Install I/O Board as follows:

6. Disconnect connection on board being replaced. Connect harness to replacement I/O Board noting tagged position.
7. Place new I/O Board in mounting position.

8. Align connector at front of board with mating connector on Rx Tray chassis midplane. Gently slide board toward front of Rx Tray chassis until connectors are fully mated.

9. Secure board using two M3.5 TORX screws (2, Figure 11) saved during removal.

10. Carefully slide Rx Tray chassis toward front panel until chassis is flush with front panel. Make certain no wiring is pinched between Rx Tray chassis and front panel.

11. Start four M3.5 TORX screws that secure Rx Tray chassis to Rx Tray front panel. Tighten all four screws evenly.

12. Reactivate site via OMC.

Power Supply Board Replacement Procedure

The Rx Tray Power Supply boards are located in the Rx Tray as shown in Figure 11. Because two Power Supply boards are used in a redundant arrangement, a defective power supply board can be replaced without taking the system out of operation.

CAUTION

The Power Supply Board opposite the board being replaced will remain energized during this procedure. When replacing board, use care to prevent accidental contact of tools with components and/or surfaces of energized board. Failure to do so may result in damage to equipment.

Removal

(See Figure 11.) Perform the following steps to determine and replace a defective Power Supply board.

1. Remove the four M6 TORX screws which secure the Rx Tray front panel to the Equipment Cabinet mounting rails. Save screws for reuse.

2. From front of cabinet, gradually slide the Rx Tray from cabinet enough to gain access to cover (3, Figure 11).

3. Remove six M3.5 TORX screws (4) that secure cover to Rx Tray chassis (save screws for reuse.) Remove cover.

4. Determine which Power Supply board has failed by observing the green and red LED indicators on each board. (On properly functioning supply, green LED is lit and red LED is off.)

5. Noting the Power Supply board that has failed, on Breaker Panel turn off power for the defective power supply as follows:

Power Supply Board	Breaker Panel Circuit Breaker
A (left board as viewed from front)	RFS1
B (right board as viewed from front)	RFS2

6. On failed board, remove five M3.5 TORX screws (5) that secure board to Rx Tray chassis. Save screws for reuse.

7. Remove two M3 TORX screws (6) that secure board, along with D120 and D122 TO-220 devices, to Rx Tray chassis.

NOTE

Check if TO-220 devices use plastic insulator collars with each screw. If collars are used, save screws and collars for reuse. Plastic insulating collars and insulator pads are not needed when replacing newer-version power supply using plastic-encased TO-220 devices.

8. Slide board towards front of Rx Tray chassis until connector at rear of board disengages mating connector on Rx Tray chassis midplane. Remove board from chassis.

Installation

(See Figure 11.) Install Power Supply Board as follows:

1. Place Power Supply Board in mounting position on Rx Tray chassis floor.
2. Align connector at rear of board with mating connector on Rx Tray chassis midplane. Gently slide board toward rear of chassis until connectors are fully mated.
3. Start (but do not tighten) five M3.5 TORX screws (5, Figure 11) that secure board to Rx Tray chassis.

CAUTION

If the TO-220 devices on replacement Power Supply Board in the following step have **metal tabs**, plastic insulator collar and insulator pad must be used with retaining screws. If the TO-220 devices on the replacement power supply are **plastic encased** (encapsulated TO-220), collars are not used.

Failing to use insulator collars on metal-tab device will result in damage to the replacement power supply.

4. Note the TO-220 devices (D120 and D122) on the board, each secured by a screw (6) in the device mounting tabs. If devices have a metal mounting tab, make certain that a plastic insulator collar (saved during removal) is properly installed in each mounting tab on TO-220 devices, D120 and D122.
5. Start (but do not tighten) two M3 TORX screws (6) that secure board, along with D120 and D122 TO-220 devices, to Rx Tray chassis.
6. Tighten five screws (5) and two screws (6) evenly.
7. Apply power to board being replaced by resetting appropriate breaker on Breaker Panel. Verify proper operation by observing green LED indicator on board.
8. Place cover (3) in mounting position, making certain any adjacent wiring is not pinched under cover.
9. Secure cover using six M3.5 TORX screws (4).
10. Carefully slide Rx Tray fully into cabinet.
11. Secure the Rx Tray to the Equipment Cabinet mounting rails using four M6 TORX screws. Tighten the screws to 40 in-lb (4.5 Nm).

Alarm Board Replacement Procedure

Perform the following steps to replace an Alarm Board.

NOTE

The site will be inoperative during the Alarm Board replacement (loss of alarm functions). When followed as written, this procedure keeps the amount of downtime to a minimum.

Motorola recommends performing this procedure during non-peak periods.

NOTE

To prevent alarm reports while the replacement procedure is performed, the site should be taken down via the Operations and Maintenance Center (OMC).

Removal

(See Figure 11.) Remove Alarm Board as follows:

1. Remove the four M6 TORX screws which secure the Rx Tray front panel to the Equipment Cabinet mounting rails. Save screws for reuse.
2. From front of cabinet, gradually slide the Rx Tray from cabinet enough to gain access to cover (3, Figure 11).
3. Remove six M3.5 TORX screws (4) that secure cover to Rx Tray chassis (save screws for reuse.) Remove cover.
4. Remove four M3.5 TORX screws (7) that secure Alarm Board to Rx Tray chassis. Save screws for reuse.
5. Using the finger hole in the Alarm Board, place finger in hole and pull board forward until connector at rear of board disengages mating connector on Rx Tray chassis midplane. Remove board from chassis.

Installation

(See Figure 11.) Install Alarm Board as follows:

1. Place Alarm Board in mounting position on Rx Tray chassis floor.
2. Align connector at rear of board with mating connector on Rx Tray chassis midplane.

3. Using finger hole in board, gently slide board toward rear of Rx Tray chassis until connector is fully mated.
4. Secure board using four M3.5 TORX screws (7, Figure 11) saved during removal.
5. Place cover (3) in mounting position, making certain any adjacent wiring is not pinched under cover.
6. Secure cover using six M3.5 TORX screws (4) saved during removal.
7. Carefully slide Rx Tray fully into cabinet.
8. Secure the Rx Tray to the Equipment Cabinet mounting rails using four M6 TORX screws. Tighten the screws to 40 in-lb (4.5 Nm).
9. Reactivate site via OMC.

Combiner Deck Replacement Procedure

The following procedure applies to all types of combiner decks. Perform the following steps to replace a Combiner Deck.

⚠ CAUTION

Combiner deck surfaces are hot. Allow combiner deck to cool before proceeding to prevent injury.

⚠ CAUTION

RF Energy hazard. Be sure the **dekey** command sequence (see Set the transmit power to 40 watts. Dekey the BR in the Software Commands section for details.) has been issued to all base radios that connect with the combiner deck. This will prevent injury or damage to equipment while disconnecting or connecting transmit cabling.

NOTE

During Combiner Deck replacement the site will be inoperative.

Removal

Remove Combiner Deck as follows:

1. Make certain the **dekey** command sequence (see Set the transmit power to desired power. Key the BR in the Software Commands section for details) has been issued to all base radios that connect to the Combiner Deck being removed.
2. At rear of Combiner Deck, disconnect Mate-N-Lok fan power connector.
3. Tag and disconnect N-connector RF cables from Combiner Deck rear panel connectors.
4. Remove the four M6 TORX screws which secure the Combiner Deck front panel to the Equipment Cabinet mounting rails. Save screws for reuse.
5. While supporting the Combiner Deck, carefully remove the Combiner Deck from the Equipment Cabinet by sliding it from the front of cabinet.

Installation

Install Combiner Deck as follows:

1. While supporting the Combiner Deck, carefully lift and slide the Combiner Deck into the pre-installed side rails in the Equipment Cabinet mounting position.

   (If adding a Combiner Deck, see Cabling Information subsection for Combiner Deck mounting locations.)
2. Secure the Combiner Deck to the Equipment Cabinet mounting rails using four M6 TORX screws. Tighten the screws to 40 in-lb (4.5 Nm).
3. Connect cabling to the Combiner Deck rear panel connectors as tagged during removal.

   If adding the Combiner Deck, perform the required cabling in accordance with the Cabling Information subsection of this section.
4. Reactivate system as follows:
   - On an up-and-running system which was deactivated with a **dekey** command sequence (see Set the transmit power to desired power. Key the BR in the Software Commands section for details), reset the Base Radio Controller on Base Radios where the command was issued.
   - On a system that was completely shut down, perform activation in accordance with the System Testing section of this manual.

Cabling Information

The illustrations and corresponding tables within this section identify cabling part numbers and point-to-point connections. The illustrations show the location and connections of the cables. Each cable is identified by an index number. The corresponding tables identify the point-to-point connection, function, and part number of the cables. Connections appearing in **bold** are labeled accordingly on the equipment.

The cabling diagrams included in this section are listed in the following table.

Duplexer-To-Rx Tray Cabling

NOTE

Duplexer-to-Rx Tray cabling is factory configured. This information is provided as a reference when adding multicoupler boards or performing maintenance.

Duplexer-to-Rx Tray cabling routes the Rx output from the Duplexers to the 4-way multicouplers in the SRRC cabinet Rx Tray. Table 10 identifies and Figure 12 shows the Duplexer cabling and connecting points.

Table 10 ***Duplexer-To-Rx Tray Cabling***

Index	Part Number	From	To	Notes
1	3012028G17	Duplexer Rx output port (see detail A in Fig. Figures 12 and 12)	Input port on 4-Way Multicoupler Board (see detail B in Fig. Figures 12 and 12)	

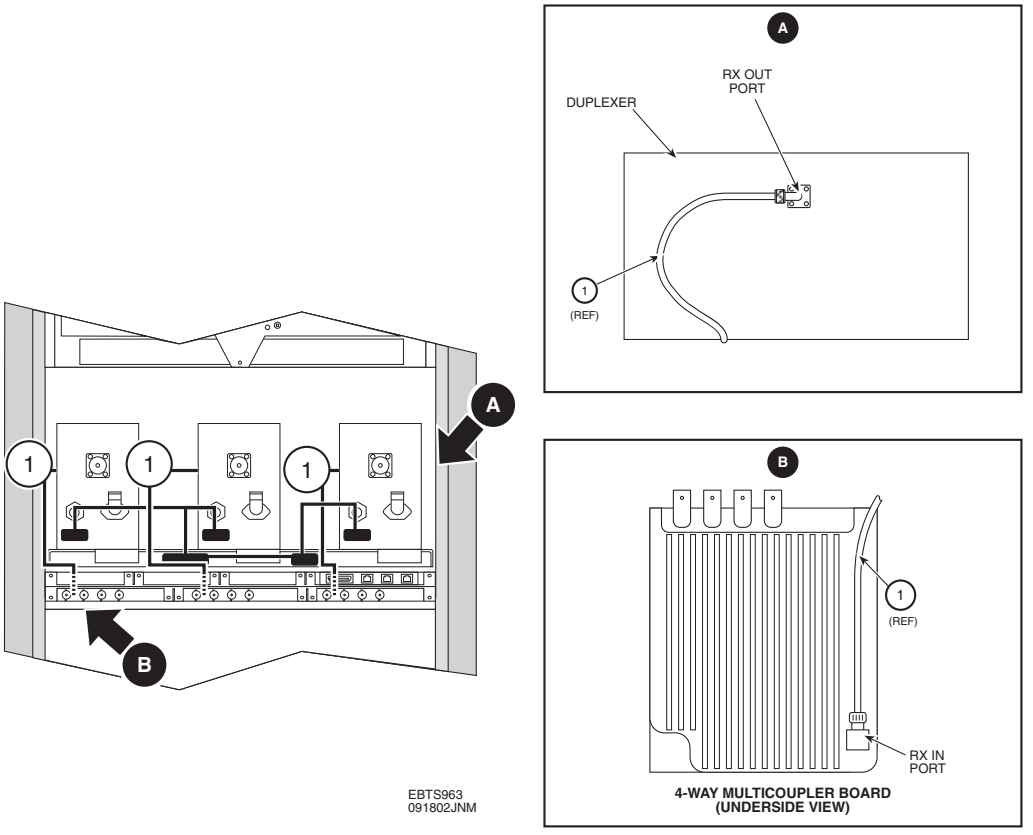


Figure 12 ***Duplexer-To-Rx Tray Cabling (SRRC Cabinet)***

Receiver Cabling

Receiver cabling refers to the cabling within the cabinet(s) from the Rx Tray to the Base Radios, and intercabinet receive cabling for expansion systems.

SRRC Cabinet Receiver Cabling

Table 11 lists receiver cabling information and Figure 13 shows the receiver cabling connections for the SRRC primary cabinet.

Table 11 ***Receiver Cabling (SRRC Primary Cabinet)***

Index	Part Number	From	To
1	3013943C38	**E-R3** connector on 4-Way Multicoupler Board	RX connectors on BR1
2	3013943C38	**E-R4** connector on 4-Way Multicoupler Board	RX connectors on BR2
3	3013943C38	**E-R5** connector on 4-Way Multicoupler Board	RX connectors on BR3
4	3013943C38	**E-R6** connector on 4-Way Multicoupler Board	RX connectors on BR4 (NOTE)

NOTES:

1. BR4 is expansion BR. Baseline system is equipped with BR1.

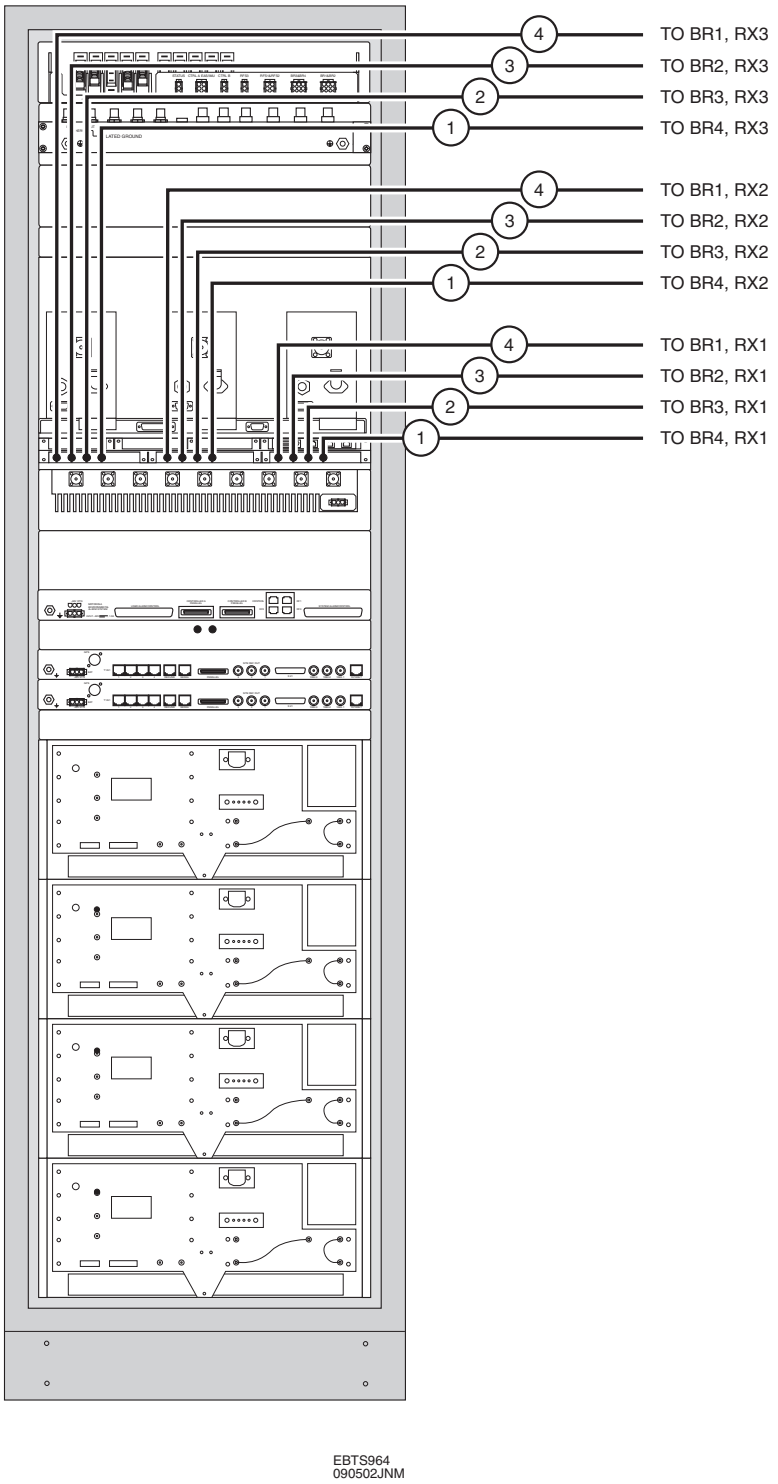


Figure 13 ***Receiver Cabling (SRRC Primary Cabinet)***

Chassis Grounding

Chassis grounding refers to the ground cable connections between the equipment modules within the equipment cabinet and the cabinet frame. Chassis grounds help prevent interference and damage to equipment in the event of a lightning strike.

Information for the SRRC cabinet is provided below.

SRRC Cabinet Ground Connections

Table 12 identifies and Figure 14 shows the SRRC cabinet ground cabling.

Table 12 ***Ground Straps (SRRC Primary Cabinet)***

Index	Part Number	From	To
1	3082000X04	Ground Bus Bar	**GROUND** stud on Base Radio 1
2	3082000X04	Ground Bus Bar	**GROUND** stud on Base Radio 2 (NOTE)
3	3082000X04	Ground Bus Bar	**GROUND** stud on Base Radio 3 (NOTE)
4	308200X04	Ground Bus Bar	**GROUND** stud on Base Radio 4 (NOTE)
5	3082000X12	Ground Bus Bar	**GROUND** stud on Gen 3 SC B/iSC B
6	3082000X12	Ground Bus Bar	**GROUND** stud on Gen 3 SC A/iSC A
7	3082000X12	Ground Bus Bar	**GROUND** stud on EAS
8	3082000X12	Ground Bus Bar	**GROUND** stud on Triple 2-Way
9	3082000X12	Ground Bus Bar	Ground stud on Rx Tray
10	3082000X05	Ground stud on junction panel	ground stud on Antenna 1 Duplexer
11	3082000X05	Ground stud on junction panel	ground stud on Antenna 2 Duplexer
12	3082000X05	Ground stud on junction panel	ground stud on Antenna 3 Duplexer

NOTES:

1. BR2, BR3, and BR4 are expansion BRs. Baseline system is equipped with BR1.

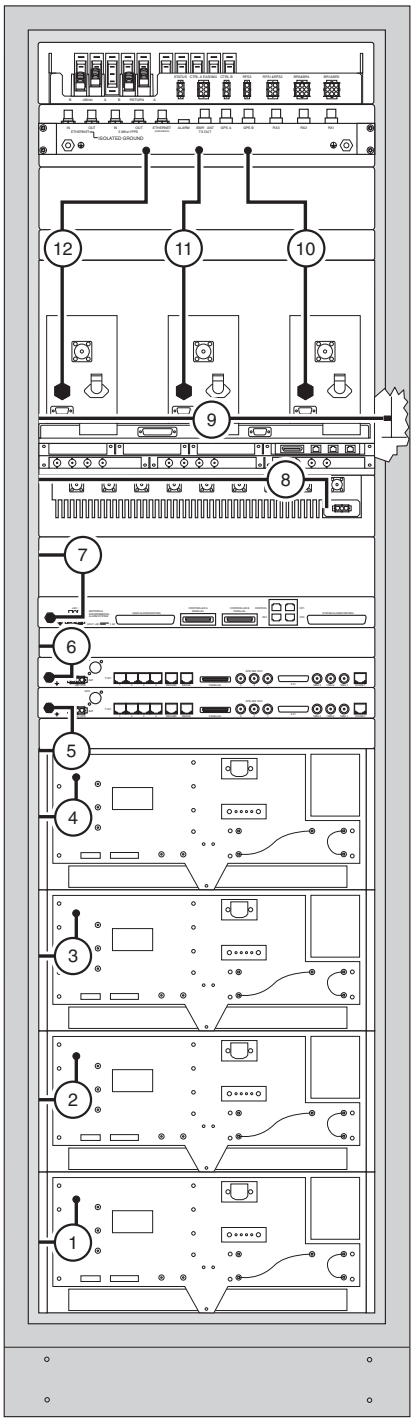


Figure 14 ***Chassis Grounding Diagram (SRRC Cabinet)***

5 MHz/1 PPS Cabling

5 MHz/1 PPS cabling routes the time frequency reference signal between the Junction Panel and each Base Radio.

Information for both the SRRC primary cabinet and expansion cabinets is respectively provided below.

SRRC Cabinet 5MHz/1PPS Cabling

Table 13 identifies and Figure 15 shows the 5 MHz/1 PPS cabling for the SRRC cabinet.

Table 13 ***5 MHz/1 PPS Cabling (SRRC Cabinet)***

Index	Part Number	From	To
1	0909906D01	—	**5 MHz/1 PPS OUT 1, OUT 2** and **OUT 3** connectors on Junction Panel (50Ω termination) (NOTE 3)
2	3082363Y08	Underside of **5 MHZ/1 PPS OUT** connector on Junction Panel	BNC T-adapter on Base Radio 1
3	3013943N19	BNC T-adapter on Base Radio 1	BNC T-adapter on Base Radio 2 (NOTE 5) BNC T-adapter on Base Radio 3 (NOTE 5) BNC T-adapter on Base Radio 4 (NOTE 5)
4	3013943N22	T-adapter on Base Radio 4	BNC Y-adapter on Gen3 SC A **OUT 1** connector
5	3013943N05	BNC Y-adapter on Gen3 SC A, **OUT 1**, **OUT 2**, and **OUT 3** connectors	BNC **OUT 1, OUT 2** and **OUT 3** connectors on Gen 3 SC B
6	5882669Y01	—	BNC **OUT 1, OUT 2** and **OUT 3** connectors on Gen 3 SC A (BNC Y-adapter)
7	3082363Y03	Underside of **5 MHz/1 PPS OUT 3** connector on Junction Panel	BNC Y-adapter on Gen 3 SC A **OUT 3** connector
8	3082363Y03	Underside of **5 MHz/1 PPS OUT 2** connector on Junction Panel	BNC Y-adapter on Gen 3 SC A **OUT 2** connector
9	3013942P34	Underside of **GPS A** connector on Junction Panel	**GPS** connector on Gen3 SC A
10	3013942P34	Underside of **GPS B** connector on Junction Panel	**GPS** connector on Gen3 SC B

NOTES:

1. Cables are connected between BNC T-adapters (P/N 0909907D01), which are connected to the appropriate BR connector.
2. Cabinet is equipped with cables (index no. 4) and T-adapters for connection to four BRs regardless of BR complement. Unused T-adapters are left unconnected.
3. 50Ω termination required only if Expansion RF Cabinet(s) is not used.
4. If installation uses more than 15 BRs, index terminations are not used. Instead, use **OUT 1**, **OUT 2** and **OUT 3** connections, as described in “5 MHz/1 PPS Interconnections” (Installation section of this manual).
5. BR2, BR3, and BR4 are expansion BRs. Baseline system is equipped with BR1.

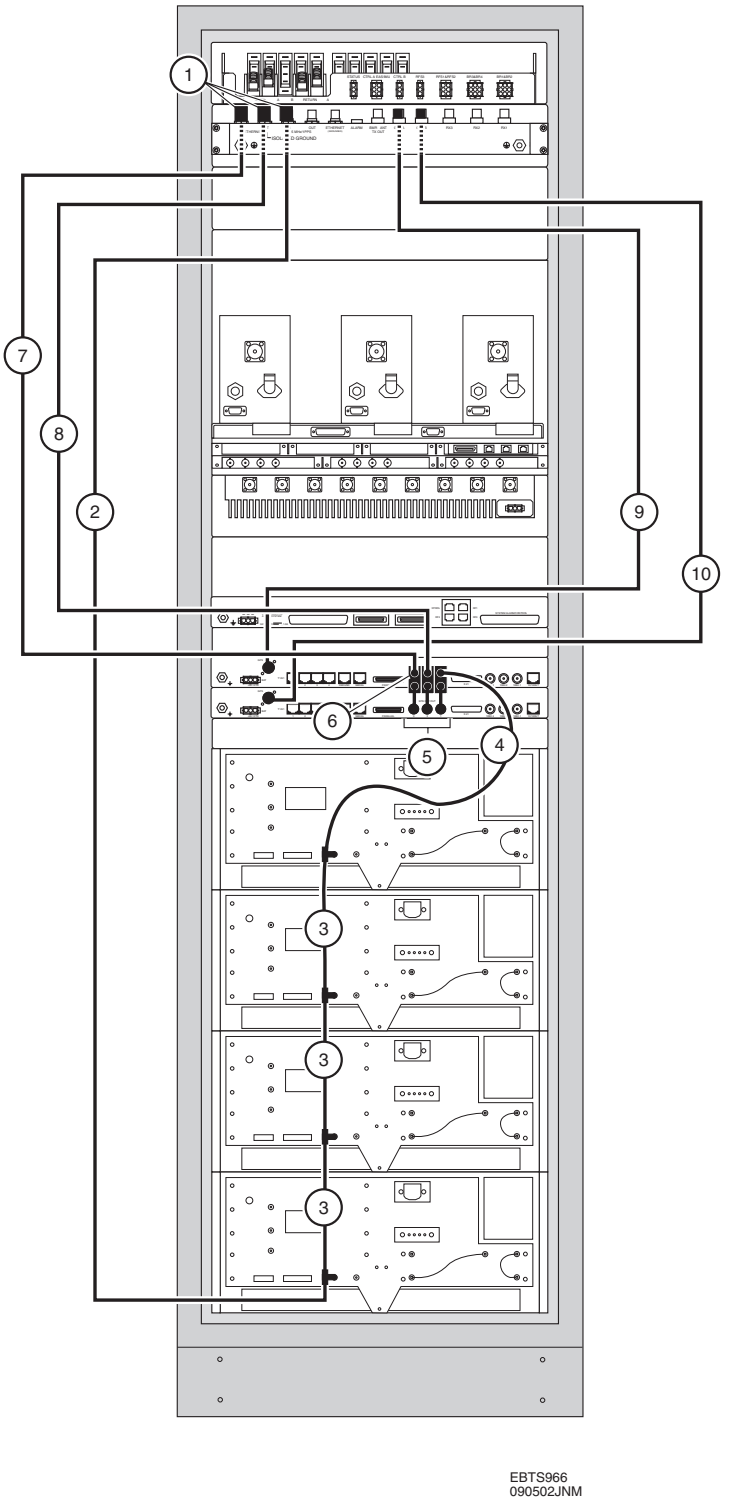


Figure 15 ***5 MHz/1 PPS Cabling (SRRC Cabinet)***

Ethernet Cabling

Ethernet cabling routes the Ethernet network between the Junction Panel and each Base Radio.

Information for both the SRRC primary cabinet and expansion cabinets is respectively provided below.

SRRC Cabinet Ethernet Cabling

Table 14 identifies and Figure 16 shows the Ethernet cabling for the SRRC cabinet.

Table 14 ***Ethernet Cabling (SRRC Primary Cabinet)***

Index	Part Number	From	To
1	0909906D01	—	**ETHERNET 10B2-1, 10B2-2, and 10B2-3** connectors on Junction Panel (50 Ω Termination) (NOTE 3)
2	3082363Y08	Underside of **ETHERNET OUT** on Junction Panel	BNC T-adapter on Base Radio 1
3	3013943N19	BNC T-adapter on Base Radio 1	BNC T-adapter on Base Radio 2 (NOTE 4) BNC T-adapter on Base Radio 3 (NOTE 4) BNC T-adapter on Base Radio 4 (NOTE 4)
4	3013943N22	T-adapter on Base Radio 4	BNC Y-adapter on Gen3 SC B, **10 B2-1** connector
5	3013943N19	BNC Y-adapter on Gen3 SC A, **10B2-1, 10B2-2**, and **10B2-3** connectors	BNC Y-adapter on **10B2-1, 10B2-2, and 10B2-3** connectors on Gen 3 SC B
6	3082363Y03	Underside of **10B2-2** connector on Junction Panel	Gen3 SC A, **10B2-2** connector
7	3082363Y03	Underside of **10B2-3** connector on Junction Panel	Gen3 SC A, **10B2-3** connector

NOTES:

1. Cables are connected between BNC T-adapters (P/N 0909907D01), which are connected to the appropriate BR connector.
2. Cabinet is equipped with cables (index no. 4) and T-adapters for connection to four BRs regardless of BR complement. Unused T-adapters are left unconnected.
4. BR2, BR3, and BR4 are expansion BRs. Baseline system is equipped with BR1.

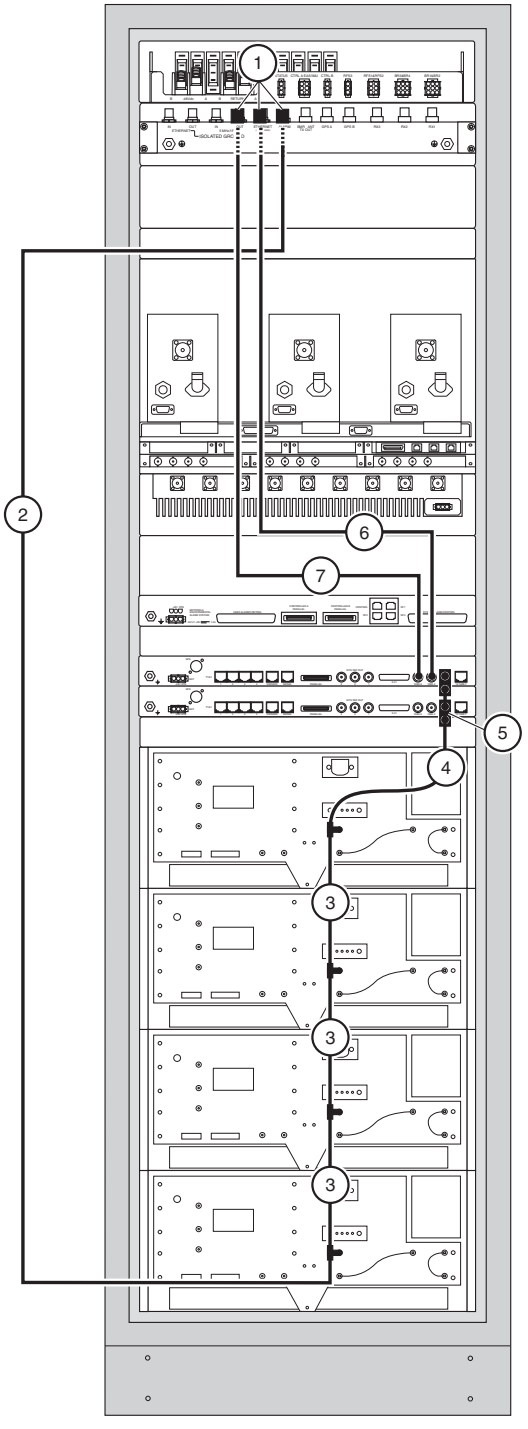


Figure 16 ***Ethernet Cabling (SRRC Primary Cabinet)***

Gen 3 SC/EAS Interconnections

Gen 3 SC/EAS interconnections refer to the SRRC primary cabinet system redundancy connections between Gen 3 SC A and Gen 3 SC B, and the connections between the Gen 3 SC and the EAS.

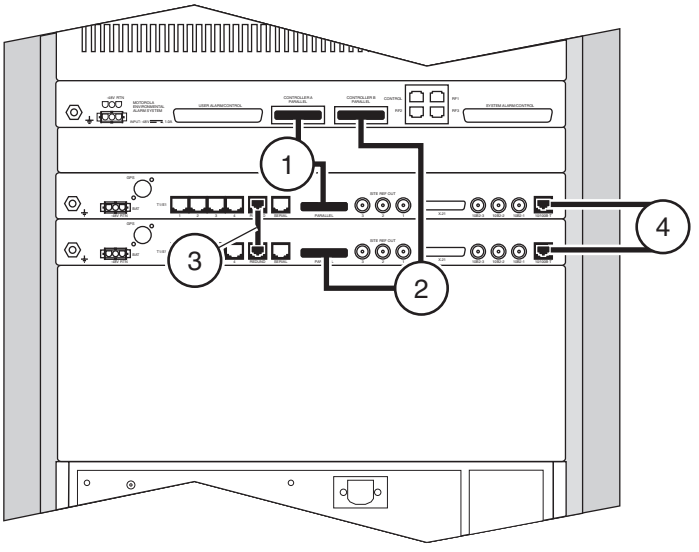
Table 15 identifies and Figure 17 shows the Gen 3 SC-to-EAS.

Table 15 ***Gen 3 SC/EAS Interconnections***

Index	Part Number	From	To
1	3083499X01	**CONTROLLER A PARALLEL** connector on EAS	**PARALLEL** connector on Gen 3 SC A Transient Protection (S/P) card.
2	3083499X01	**CONTROLLER B PARALLEL** connector on EAS	**PARALLEL** connector on Gen 3 SC B Transient Protection (S/P) card.
3	3084225N24	**REDUND** connector on Gen 3 SC A	**REDUND** connector on Gen 3 SC B
4	3082505Y12	**10/100 B-T Connector** on Gen 3 SC A	**10/100 B-T Connector** on Gen 3 SC B

NOTES:

1. Refer to Gen 3 SC Supplement to this manual, 68P880801E30, for Gen 3 SC-to-network cabling.
2. Refer to Gen 3 SC Supplement to this manual, 68P880801E30, for EAS USER ALARM connections.



EBTS531
082802JNM

Figure 17 ***Gen 3 SC/EAS Interconnections***

DC Power Cabling

DC power connections refer to power cabling between the Equipment Cabinet Power Distribution Panel and the modules within the cabinet.

Information for both the SRRC primary cabinet and expansion cabinets is respectively provided below.

SRRC Primary Cabinet DC Power Cabling

Table 16 identifies and Figure 18 shows the DC power connections for the SRRC primary cabinet.

Table 16 ***DC Power Cabling (SRRC Primary Cabinet)***

Index	Part Number	From	To	Notes
1	3082050X02	**BR1&BR2** connector on Power Distribution Panel	**DC POWER** connector on Base Radio 1 and 2 (NOTE 2)	Y-cable assembly
2	3082050X01	**BR3&BR4** connector on Power Distribution Panel	**DC POWER** connector on Base Radio 3 and 4 (NOTE 2)	Y-cable assembly
3	3082129X04	**RFS1&RFS2** connectors on Power Distribution Panel	**–48 VDC** Mate-N-Lok input connector on Rx Tray I/O board	See detail A in Fig. Figures 18 and 18
4	3082129X02	**FAN POWER** output Mate-N-Lok connector on Rx Tray I/O board	Mate-N-Lok input connector on Combiner Deck	Y-cable assembly see detail A in Fig. Figures 18 and 18
5	3082056X03	RFDS power output Mate-N-Lok connector on Rx Tray I/O board	9-pin submini D connector (P5) on RFDS duplexer shelf	See detail A in Fig. Figures 18 and 18
6	3083609X01	**CTRL A** connector on Power Distribution Panel	• **BATTERY** connector on EAS • **BATTERY** connector on Gen 3 SC/iSC A	Y-cable assembly
7	3082082X02	**CTRL B** connector on Power Distribution Panel	**BATTERY** connector on Gen 3 SC/iSC B	

NOTES:

1. Cabinet is equipped with full 4-BR power cabling.
2. BR2, BR3, and BR4 are expansion BRs. Baseline system is equipped with BR1.

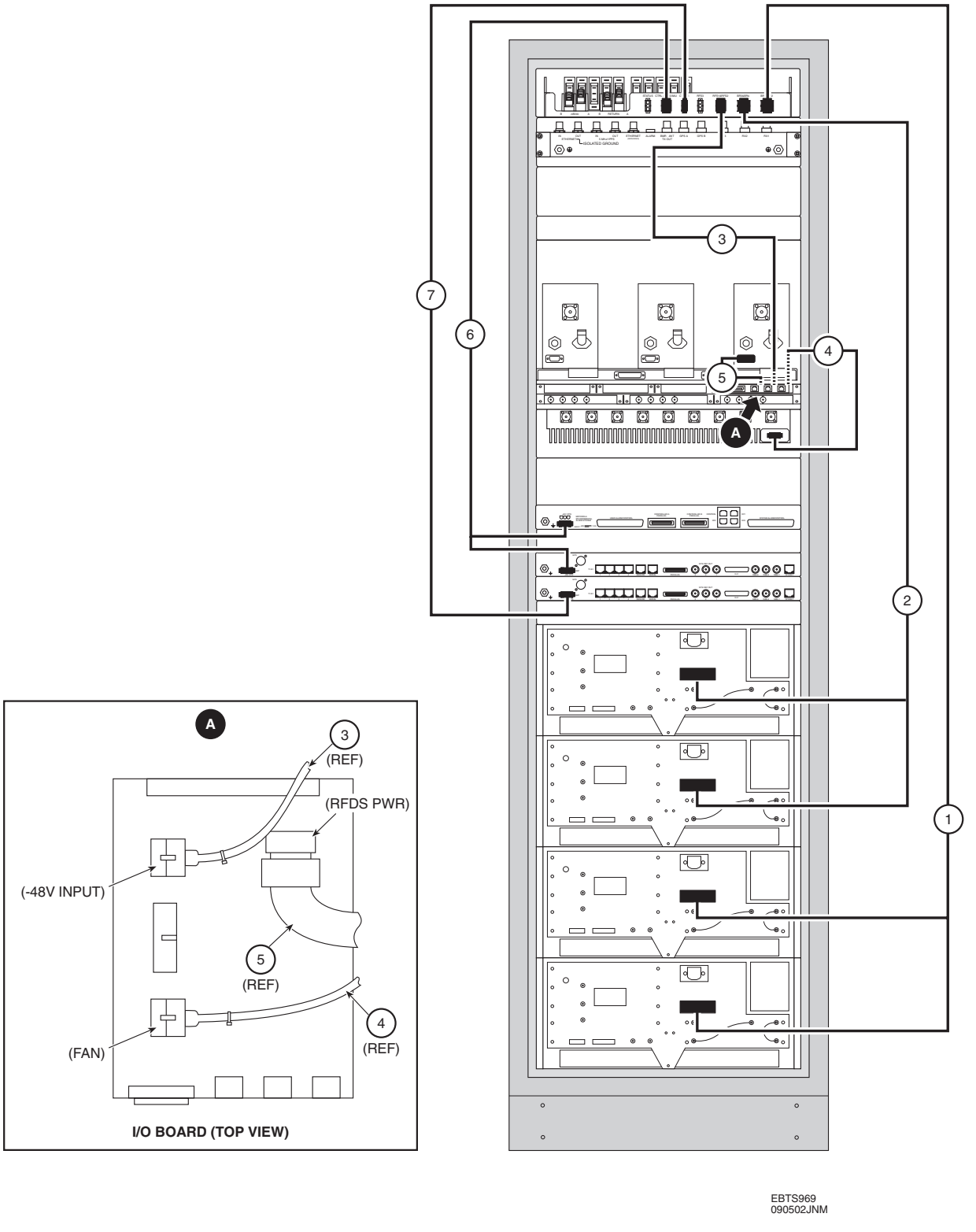


Figure 18 ***DC Power Cabling (SRRC Cabinet)***

Alarm/Power Monitor Harness Connections

The cabinet alarm connections use a multi-connector wiring harness assembly that provides for daisy-chain connection of the various modules.

NOTE

I/O Board alarm-to-EAS cabling varies with I/O Board version. Refer to "I/O Board Alarm Output Cabling" and Figure 10 earlier in this section for details.

SRRC Cabinet Alarm/Power Monitor Harness Connections

Table 17 identifies and Figure 19 shows the harness connecting points for the SRRC primary cabinet.

Table 17 ***Alarm/Power Monitor Harness Connections (SRRC Primary Cabinet)***

Index	Part Number	From	To
1	3082053X05	25-pin submini-D connector (P4) on RFDS duplexer shelf	Power monitor multi-connector harness. From top-to-bottom, connects to: • 25-pin **ALARM** connector on Base Radio 3 • 25-pin **ALARM** connector on Base Radio 2 • 25-pin **ALARM** connector on Base Radio 1
2	3082733X02	—	Shorting plug. Connects to **CONTROL** connector on EAS. **CAUTION: If shorting plug is not used, false alarms will result.**
3	3084225N02	RJ45 STANDARD alarm connector on I/O board	**RF#1** connector on EAS
4	3082129X03	**STATUS** connector on breaker panel	RJ45 EXPANSION alarm input connector on I/O board

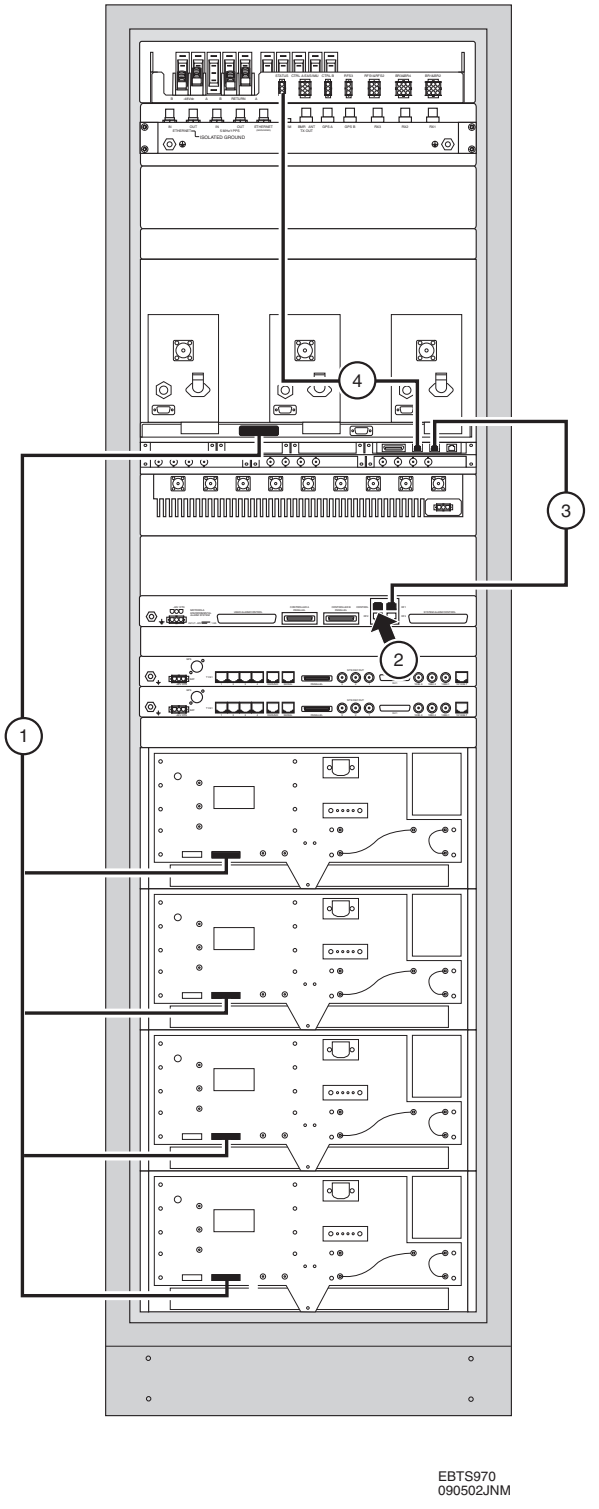


Figure 19 ***Alarm/Power Monitor Harness Connections (SRRC Cabinet)***

Transmit Power Out Cabling

NOTE

Refer to Receiver Cabling for receive expansion cabling information.

Transmit power output cabling routes the Base Radio RF output to the transmit inputs on the RFDS.

Cabling information is provided below in accordance with the expansion level break points utilized in the SRRC system.

900 MHz QUAD SRRC Transmit Cabling

Table 18, Table 19, and Table 20 identifies and Figure 20, Figure 21, and Figure 22 shows the baseline 1-3 BR SRRC Tx cabling. This cabling is also the basis for all system expansion, as well.

Table 18 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration without Combiner***

Index	Part Number	From	To
1	0112004K14	**PA OUT** connector on BR 1	Duplexer 1 Tx input port
2	0112004K14	**PA OUT** connector on BR 2	Duplexer 2 Tx input port
3	0112004K14	**PA OUT** connector on BR 3	Duplexer 3 Tx input port

Table 19 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration with 2-Way Combiner 2 Branch***

Index	Part Number	From	To
1	0112004K14	**PA OUT** connector on BR 1	Triple 2-Way Combiner Deck **T2** (IN) port
2	0112004K14	**PA OUT** connector on BR 2	Triple 2-Way Combiner Deck **T5** (IN) port
3	0112004K14	**PA OUT** connector on BR 3	Triple 2-Way Combiner Deck **T3** (IN) port
4	0112004K10	**PA OUT** connector on BR 4	Triple 2-Way Combiner Deck **T6** (IN) port
5	0112004B03	**T1** (OUT) port on Triple 2-Way Combiner Deck	Duplexer 1 Tx input port
6	0112004B03	**T4** (OUT) port on Triple 2-Way Combiner Deck	Duplexer 2 Tx input port

Table 20 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration 4-Way Combiner 1 Branch***

Index	Part Number	From	To
1	0112004K14	**PA OUT** connector on BR 1	Triple 2-Way Combiner Deck **T2** (IN) port
2	0112004K14	**PA OUT** connector on BR 2	Triple 2-Way Combiner Deck **T5** (IN) port
3	0112004K14	**PA OUT** connector on BR 3	Triple 2-Way Combiner Deck **T3** (IN) port
4	0112004K10	**PA OUT** connector on BR 4	Triple 2-Way Combiner Deck **T6** (IN) port
5	0112004B03	**T1** (OUT) port on Triple 2-Way Combiner Deck	Triple 2-Way Combiner Deck **T8** (IN) port
6	0112004B03	**T4** (OUT) port on Triple 2-Way Combiner Deck	Triple 2-Way Combiner Deck **T9** (IN) port
7	0112004B03	**T7** (OUT) port on Triple 2-Way Combiner Deck	Duplexer 1 Tx input port

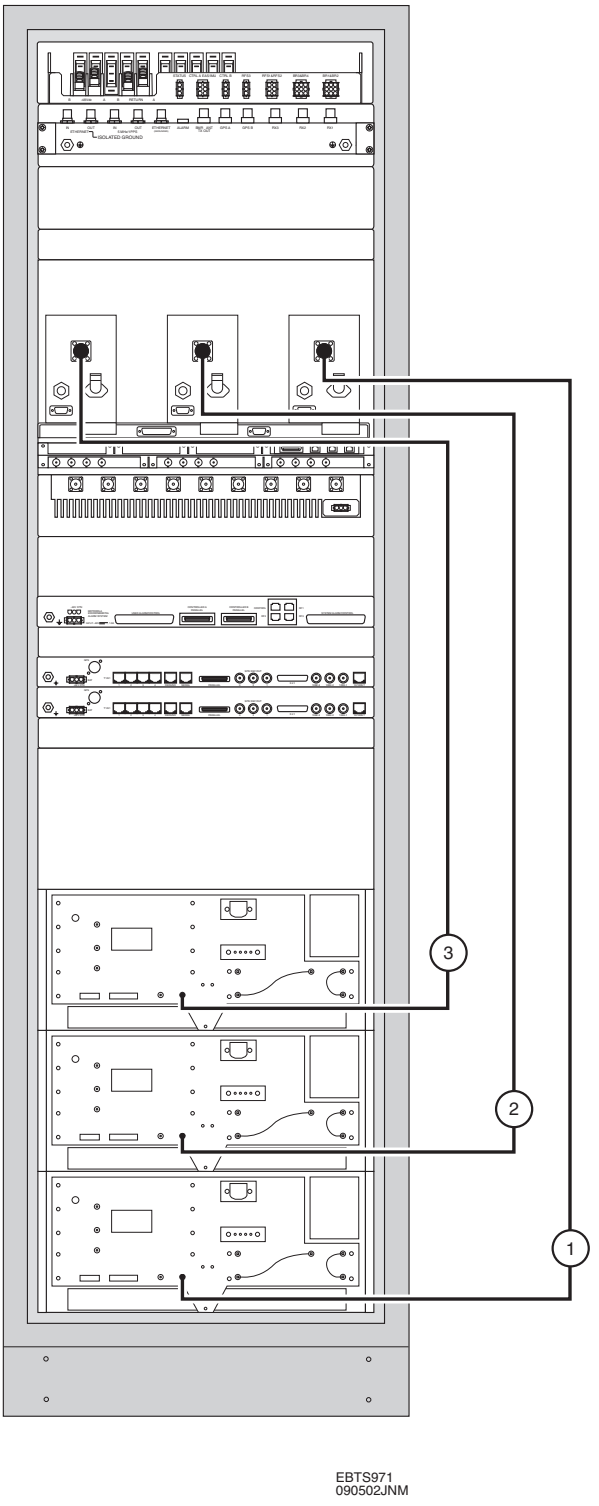


Figure 20 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration without Combiner***

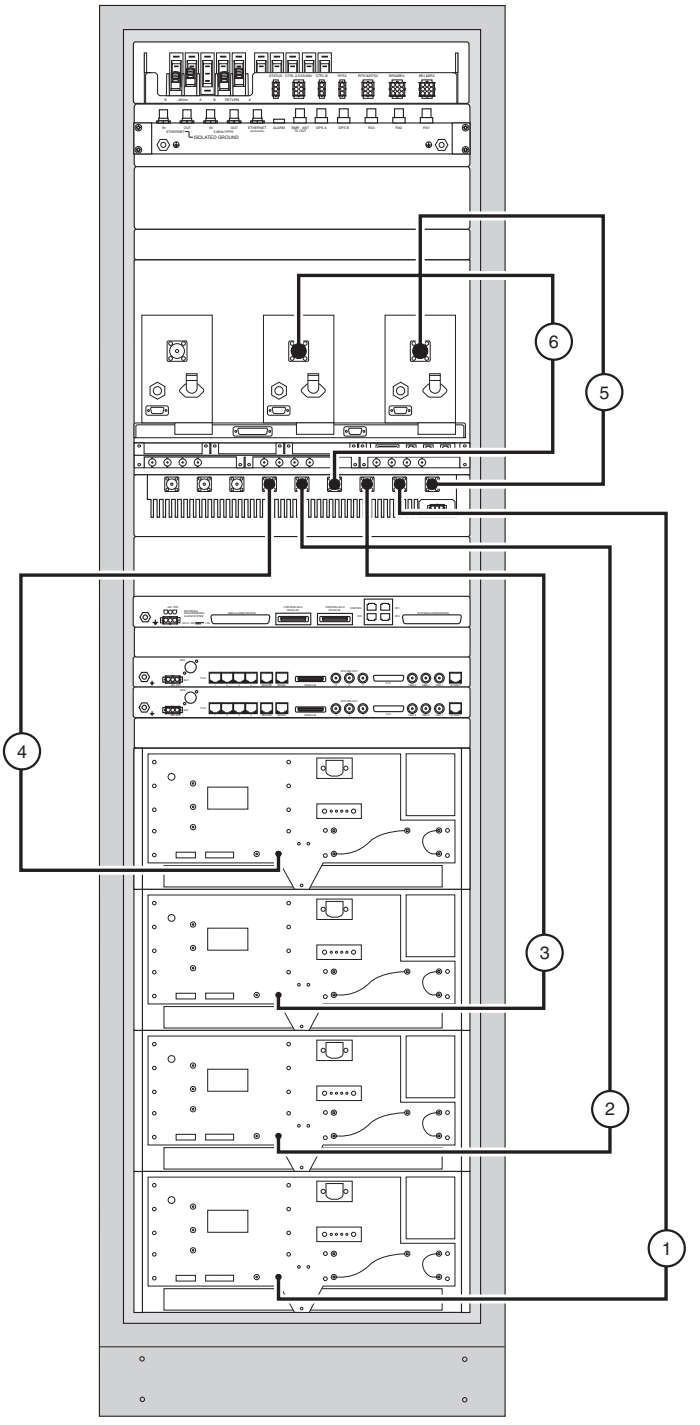


Figure 21 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration with 2-Way Combiner 2 Branch***

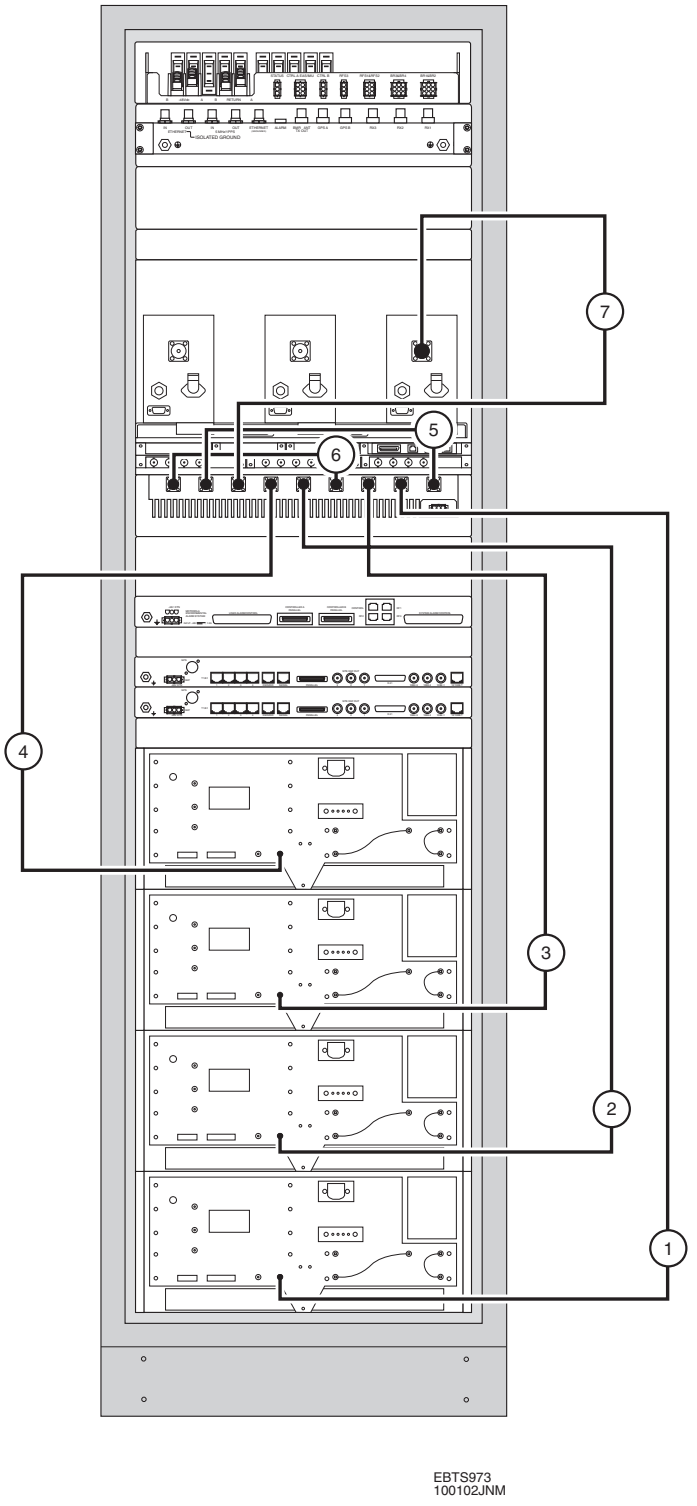


Figure 22 ***Transmit Power Out Cabling, 900 MHz QUAD SRRC Configuration 4-Way Combiner 1 Branch***

Base Radio Buildout/RFDS Expansion

Buildout General Information

"Base Radio Buildout" refers to adding more base radios to an existing EBTS. After a certain number of Base Radios are added to a system, RFDS expansion is required to accommodate the total Base Radio complement.

IPL software is added with each BR that is ordered. The system software must be modified for each additional BR.

NOTE

The following procedures and references specify procedures required in installing hardware and cabling only.

Complete the installation by performing system reprogramming (as applicable) in accordance with the "Software Commands" and "System Testing" sections of this manual.

An 900 MHz SRRC site can be built-out to a maximum of four BRs installed in the SRRC cabinet.

Buildout Procedures

Depending on the existing number of Base Radios in a system, and the build out configuration being performed, various build out steps need to be taken. Table 21 lists the steps (or provides reference to procedures) in installing the various modules. Table 21 also lists the additional modules required in performing various levels of build out.

Installing Hardware

Using Table 21, install required hardware and perform cabling as follows:

1. Noting the existing configuration of the system, and the intended buildout configuration, note the expansion level ("Buildout Level" column) required to bring the system to the desired buildout level.

   The "Buildout Level" column correspondingly lists the SRRC configuration that accommodates a given number of BRs.

2. Noting the range of Expansion Levels required in accomplishing the buildout, note any additional equipment required in the "Equipment" column.

3. Perform the steps listed in the "Installation" column.

Example on using the buildout table are provided below.

When a baseline system containing one BR is expanded to four BRs (with all four BRs to be in the 900 MHz QUAD SRRC, the procedures required in performing the buildout are:

❒ "4 BR" buildout instructions.

The following equipment will be installed during the buildout procedure:

❒ Fourth BR in the SRRC primary cabinet

❒ One Triple 2-Way Combiner Deck in the SRRC primary cabinet

Table 21 ***SRRC Buildout Instructions***

Buildout Level (RFDS Configuration)	Expansion Equipment Required	Installation Instructions	
		Procedure/Reference	Page
Up to 3 BRs (Baseline)	No additional equipment required	1. Install Base Radio(s) in accordance with "Base Radio/Base Radio FRU Replacement" (Base Radio section of this manual). 2. Perform the following cabling in accordance with "Cabling Information" subsection. • Receiver Cabling • Chassis Grounding • Ethernet Cabling • DC Power Cabling • Transmit Power Out Cabling	— 37
(BR Expansion)	Triple 2-Way Combiner Deck (CLN1351)	**NOTE:** 4-BR expansion procedure in its entirety as specified below. (Refer to "Theory of Operation" subsection for more information.) 1. If not currently installed, add Base Radios 1 through 3 in SRRC cabinet as described in "Up to 3 BRs" buildout instructions above. 2. On ANT 1 through ANT 3 Duplexers, disconnect existing cabling between Duplexers and BRs. 3. Install Triple 2-Way Combiner Deck in accordance with "Combiner Deck Replacement Procedure". 4. In SRRC cabinet, perform cabling between Combiner Decks, Duplexers, and BRs in accordance with "Transmit Power Out Cabling". 5. Perform Rx expansion cabling in accordance with "Receiver Cabling". 6. Reconfigure power monitor harness connection to ALARM connector on Base Radios in accordance with "SRRC Cabinet Alarm/Power Monitor Harness Connections". (See NOTE in table regarding Base Radio ALARM connections versus duplexers used.)	— — 35 53 40 51

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