MOTOROLA
Land Mobile Products Sector

iDEN™

810-825 MHz receive and 855-870 MHz transmit
Enhanced Base Transceiver System

SYSTEM MANUAL

68P80800F45-O

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About This Manual

Purpose

The purpose of this manual is to describe those aspects of the Australian (810-825 MHz receive and 855-870 MHz transmit) Enhanced Base Transceiver System (EBTS) that differ from the standard EBTS.

Target Audience

This manual is intended for use by technicians experienced with similar types of equipment. In keeping with the philosophy of Field Replaceable Units (FRUs), this manual contains functional information sufficient to allow service personnel to identify faulty modules and replace them with known good FRUs.

Related Manuals

This manual is intended to supplement the following related manuals:

- ❒ iDEN EBTS System Manual (68P81099E10)
- ❒ integrated Site Controller System Manual (68P81098E05)

Error and Concern Reporting

Any errors or concerns about this manual or its contents should be reported via the survey form provided at the beginning of this manual. Please be sure to add your name and phone number so we can follow-up with you.

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System Description

Overview

This section provides technical information for the 810-825 MHz receive and 855-870 MHz transmit Enhanced Base Transceiver System, hereinafter called the EBTS. Only the unique items for the EBTS are described in this section of the manual.

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

Section	Page	Description
Base Radio Performance Specifications	4	Provides general specifications
RFDS Description	5	Describes the GEN4 810-825 MHz receive and 855-870 MHz transmit Duplexed RFDS

NOTE

Refer to the standard iDEN EBTS manual (68P81099E10) for other general system description details.

Base Radio Performance Specifications

General specifications for the Base Radio are listed in Table 1.

Table 1 ***Base Radio General Specifications***

Specification	Value or Range
Dimensions: Height Width Depth	 5 EIA Rack Units (RU) 19″ (482.6 mm) 16.75″ (425 mm)
Operating Temperature Range	32 ˚ to 104 ˚ F (0° to +40° C)
Storage Temperature Range	-22 ˚ to +140˚ F (-30° to 60° C)
Frequency Range: Receive Transmit	 810 to 825 MHz 855 to 870 MHz
Tx - Rx Spacing	45 MHz
Channel Spacing	25 kHz (min.)
Frequency Generation	Synthesized
Digital Modulation	M-16QAM
Power Supply Inputs:	-48 Vdc (-42 to -60 Vdc)
Diversity Branches	Up to 3

NOTE

Please refer to the standard iDEN EBTS manual (68P81099E10) for the other specifications.

RFDS Description

The EBTS provides radio communication links between the land network and the mobile subscriber units in the integrated Dispatch Enhanced Network (iDEN) system.

RF Distribution System (RFDS)

The 810-825 MHz receive and 855-870 MHz transmit GEN 4 Duplexed RFDS is an 800 MHz duplexing/hybrid combining and receiver multicoupler system. Duplexers allow a transmit (Tx) and a receive (Rx) path to share a common antenna. Cascaded combiner stages allow several transmit signals to be fed to a single duplexer/antenna.

Although similar in function to the earlier 0182020V06 duplexed RFDS, the GEN 4 Duplexed RFDS employs cascaded combining in a modularized, compact design. This allows expansion with a minimum amount of added components. The cascaded combining along with the compact design allows up to six Base Radios (BRs) per RF cabinet. This allows a maximum of 18 channels in a three-branch diversity site. (A 24-channel three-branch diversity site is obtained using a fourth, transmit-only antenna and six additional BRs.)

Table 2 lists the general specifications for the 810-825 MHz Duplexed RFDS (0182452V08).

Table 2 ***810-825 MHz Duplexed RFDS General Specifications***

Specification	Value or Range
Rack Space Requirement	6 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	 810 to 825 MHz 855 to 870 MHz
Tx - Rx Spacing	45 MHz
Channel Spacing	25 kHz (min.)
Port Impedance	50 Ω (nom.)
Input Supply Voltage; RFDS	-42 Vdc to -60 Vdc (-48 Vdc nom.)
Input Current; RFDS	2.25 A (steady-state max.)
Input Supply Voltage; Fan Array	12 Vdc

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RF Distribution System

Overview

This section provides technical information for the 810-825 MHz receive and 855-870 MHz transmit GEN 4 Duplexed RFDS. Only the unique items for the RFDS are described in this section of the manual.

NOTE

Refer to the standard iDEN EBTS manual (68P81099E10) for other RFDS description details.

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

Section	Page	Description
RFDS Theory of Operation	8	Describes the transmit and receive path of the GEN 4 Duplexed RFDS
Duplexer Removal/ Replacement Procedures	9	Provides instructions for replacing the Duplexer of the GEN 4 Duplexed RFDS
Field Retrofit of DC Injector Installation	12	Provides instructions for field installation to retrofit the DC Injector.

RFDS Theory of Operation

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 855-870 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 810-825 MHz range. The RX OUT 1 through RX OUT 3 signals are applied to the Base Radio receivers through multicouplers.

Transmit Operation

A Dual 3-Way Combiner Deck provides combining and isolation of multiple TX signals from the Base Radios. The deck consists of two microstrip/groundplane printed circuits which provide filtering and combining functions. The circuit cards also contain discrete isolator devices.

Harmonic filters are used in each Tx signal path to prevent undesired intermodulation products due to simultaneous Tx signals.

Receive Operation

Each receive branch of the GEN 4 Duplexed RFDS uses a First Multicoupler (First MC) and a local Expansion MC. Both splitters each use a Multicoupler/Amplifier (MC/Amp) which converts a single receive signal into multiple buffered receive signals. All three Rx branches function identically.

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.

NOTE

Refer to the standard iDEN EBTS manual (68P81099E10) for the detailed theory of operation.

Removal/Replacement Procedures

Duplexer Removal Procedure

The following procedure should be used to remove a faulty duplexer from the RF Distribution System of a 810-825 MHz receive / 855-870 MHz transmit EBTS.

1. Disconnect 9-pin D-sub connector from front of V08 duplexer to be replaced.
2. Disconnect antenna cable from antenna port on duplexer.
3. Disconnect cable from Tx IN port on duplexer.
4. Remove nut that secures ground cable to the Ground stud on the duplexer. Disconnect cable and position aside. Save the nut fore reuse.
5. On front of the duplexer tray, remove two TORX™ screws that secure the duplexer at its front (see Figure 1). Save screws for reuse.

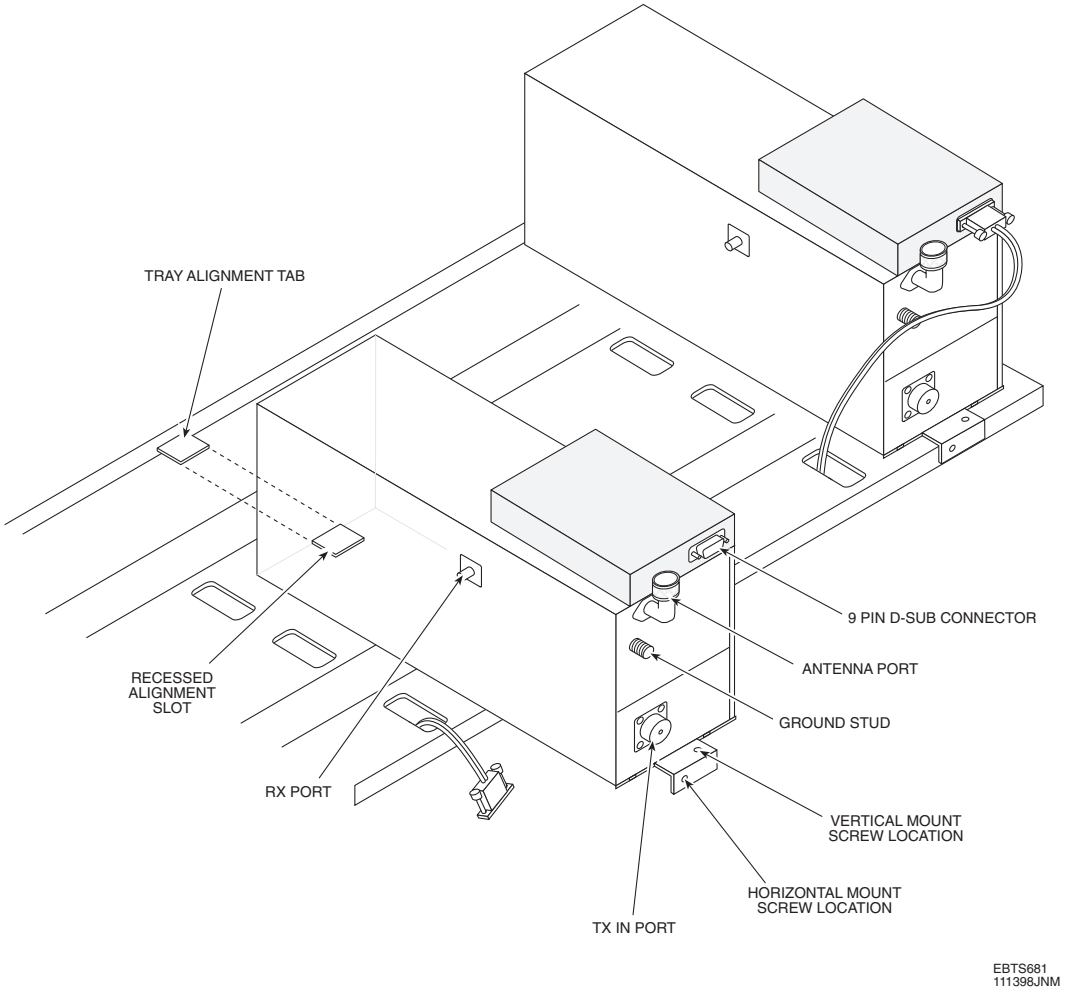

Figure 1 ***Duplexer Removal and Replacement***

6. Draw the duplexer away from the tray far enough to access the Rx port on the side of duplexer.

7. Disconnect cable from Rx port.

8. Remove duplexer from tray.

Duplexer Replacement Procedure

Use the following procedure to install a known-good duplexer in the RF Distribution System of a 810-825 MHz receive / 855-870 MHz transmit EBTS.

1. Place replacement V08 duplexer onto the tray.
2. Connect cable to Rx port.
3. Assure full engagement of the duplexer (via rear slot) with tray alignment tab.
4. Follow securing and cable attachment procedures in reverse order from step 5 of Duplexer Removal Procedure.

Field Retrofit of DC Injector Installation

The DC injectors allow the Duplexed TTA +24 V operating power to be fed to the Duplexed TTA LNAs via the Tx/Rx coaxial feed cable. A DC injector must be installed at the antenna port of each duplexer.

Install DC injectors as follows:

1. On Antenna 1 duplexer antenna port, disconnect antenna cable (refer to Figure 2).
2. On Antenna 1 duplexer, remove hex nut that secures ground cable to duplexer. Disconnect cable and position aside.
3. Place DC injector mounting bracket over duplexer ground stud.
4. Place ground cable over stud. Start (but do not tighten) hex nut that secures ground cable, along with bracket.

CAUTION

To ensure proper operation, in the next step take special care to properly orient the DC injector.

5. Orient DC injector such that port labeled "PROTECTED" is facing duplexer port. Connect PROTECTED port on DC injector to duplexer port.
6. Align mounting holes in bracket with mounting holes on DC injector. Secure DC injector to bracket using two M4 screws.
7. Fully tighten ground cable hex nut.
8. Connect the antenna cable to DC injector port labeled "SURGE".
9. Connect plug-end of the DC injector wiring harness to the TTA Power/Alarm interface card (use the left-side connector labeled, "to DC Injector").
10. Repeat steps 1 through 9 for antenna branch 2 and branch 3.
11. Perform cabling in accordance with "Duplexed TTA Cabling", which is contained in the description of the 800 MHz GEN 4 Duplexed RF Distribution System found in the iDEN EBTS System Manual (68P81099E10).
12. Reactivate the site via OMC.
13. Perform the Duplexed TTA Receive Branch Equalization procedure, located in the 800 MHz GEN 4 Duplexed RF Distribution System section of the iDEN EBTS System Manual (68P81099E10).

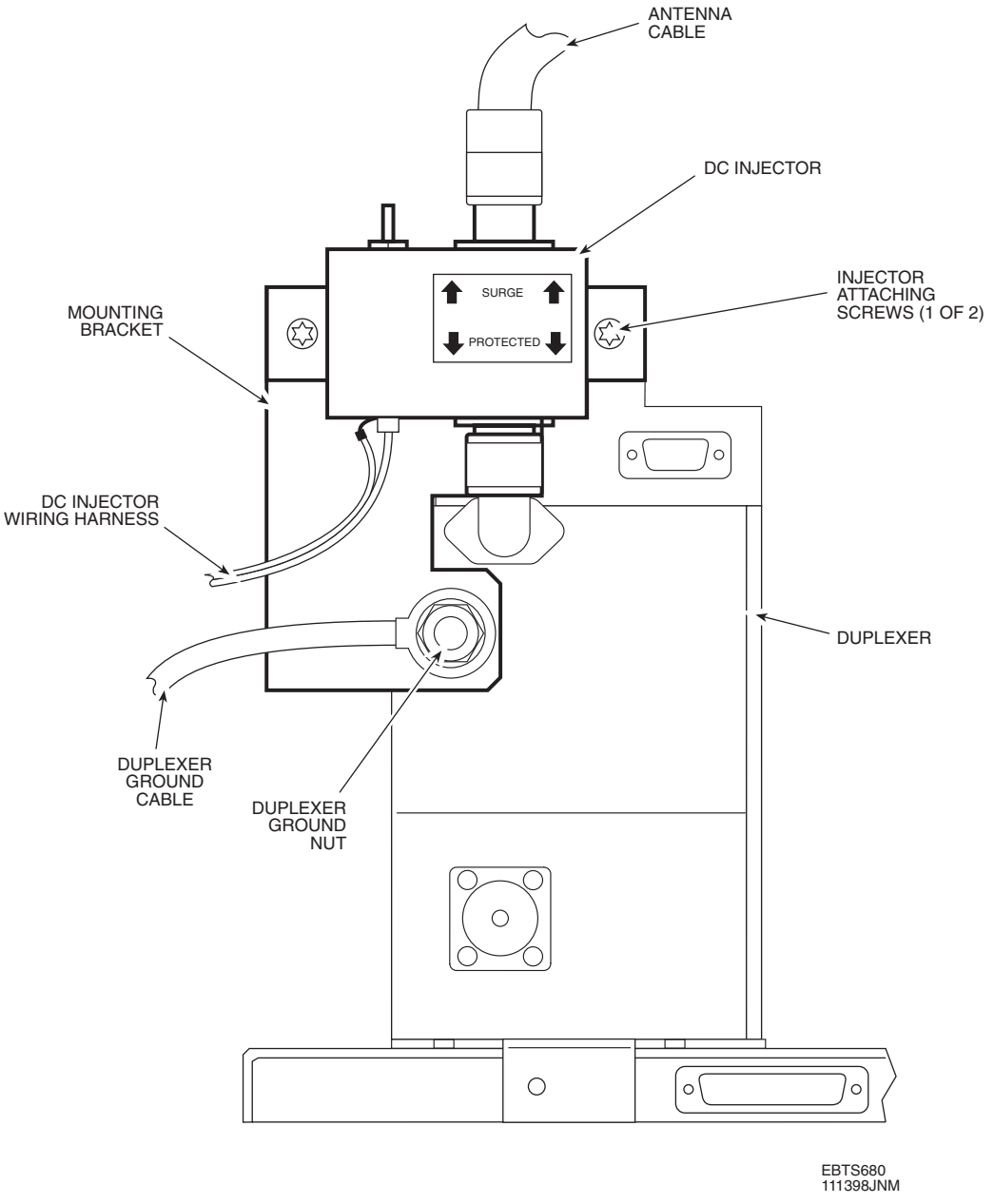

Figure 2 ***DC Injector Installation***

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