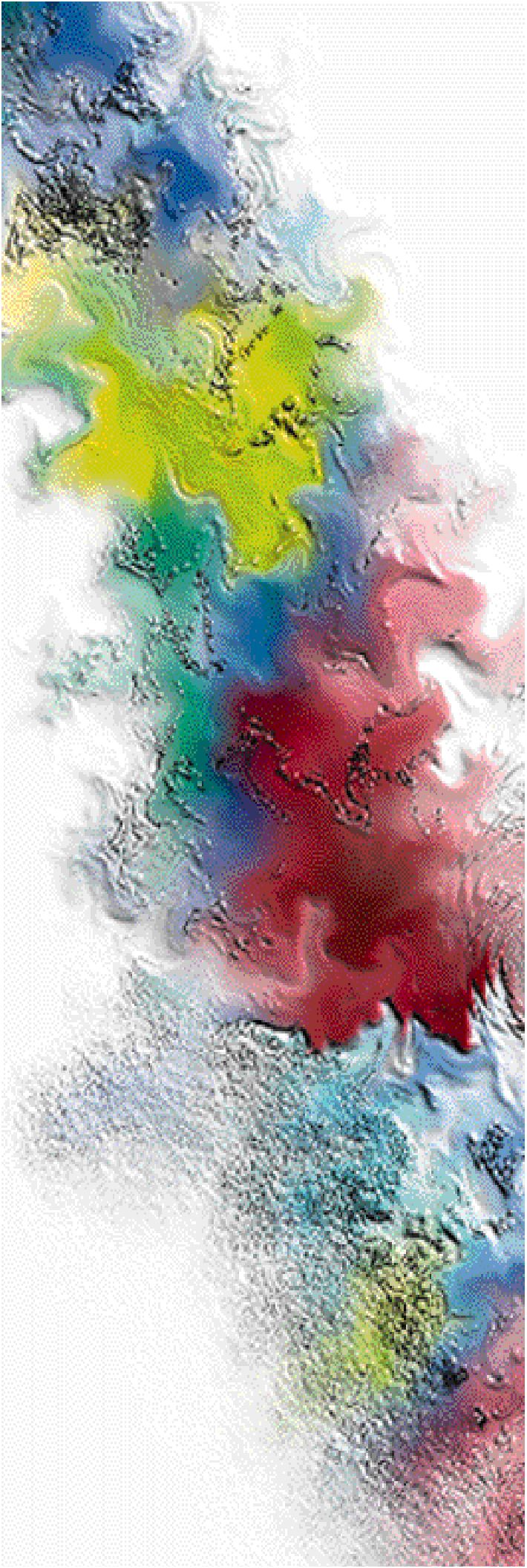

RF-Baton!™ Transmitter Controller

for the RF-O!™ Paging Station

Installation and Operation

Series: Wireless Messaging System

System Version: Two-Way 3.0
Software Version: 1.5.6

Issue Date: November 1998
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MOTOROLA

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5401 North Beach St., MS E112
Fort Worth, TX 76137-2794

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(817) 245-4663
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Read Instructions: Read all the safety instructions before operating the equipment. Retain these safety instructions for future reference. Specialized procedures and instructions are required and must be followed. Also, all applicable safety procedures, such as Occupational, Safety, and Health Administration (OSHA) requirements, National Electric Code Requirements, local code requirements, safe working practices, and good judgement must be used by personnel.

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- Equipment damage–

This safety admonition applies to an operating or maintenance procedure, practice or condition which, if not strictly observed, could result in damage to the equipment or database.

- Personal injury or injury that may result in death–

This safety admonition applies to an operating or maintenance procedure, practice or condition which, if not strictly observed, could result in serious personal injury or death.

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Motorola is not responsible for static damage to equipment not sold under the Motorola logo.

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PSG Limited Equipment Warranty for U.S. And Canadian Markets

General Terms

1. Motorola Paging Systems Group (PSG) manufactured infrastructure equipment is warranted to be free from defects in material and workmanship to the original purchaser only as set forth herein.

2. This Warranty covers only that equipment identified in paragraph 1 that is used in the manner and for the purpose intended.

3. This Warranty specifically excludes any and all software products from any source. PSG software products are the subject of the PSG Software Maintenance Program, addressed separately.

4. This Warranty shall commence 30 days after the date of shipment of the PSG infrastructure equipment.

5. The term of Warranty for all PSG infrastructure equipment, except for AlphaMate® 250 paging entry terminal products, is one (1) year parts and labor. The term of Warranty for AlphaMate 250 paging entry terminals is one (1) year parts and 120 days labor in Motorola PSG-authorized service centers. In-field labor for warranty claims (excluding AlphaMate 250 products) will be provided by Motorola PSG-authorized service centers during normal business hours.

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6871080

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   b. Storage not conforming to the Shipping, Receiving, and Installation section of the applicable Motorola Equipment Manual;

   c. Environmental characteristics not conforming to the applicable Motorola Equipment Manual;

   d. Nonconformance with the Equipment Operating Instructions in the applicable Motorola Equipment Manual;

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   f. Cosmetic damages;

   g. Damages caused by external electrical stress;

   h. Lightning;

   i. Accidental damage;

   j. Negligence, neglect, mishandling, abuse or misuse;

   k. Force Majeure; and

   l. Damage caused by Shipper(s).

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b. The Return Authorization Number must be shown on the label attached to each returned item. A description of the fault must accompany each returned item. The returned item must be properly packed, and the insurance and shipping charges prepaid;

c. Motorola shall either repair or replace the returned item. The replacement item may be new or refurbished. When refurbished, it shall be equivalent to new in operation. When a returned item is replaced by Motorola, the returned item shall become the property of Motorola;

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c. The Customer shall return defective items to Motorola within thirty (30) days from the date of shipment of the Advance Replacement Parts; failing which, Motorola shall bill and the Customer shall pay the full current list price of the Advance Replacement Parts.

10. To secure payment of the list price of Advance Replacement Parts if the defective items are not returned to Motorola, the Customer hereby grants to Motorola a purchase money security interest in any Advance Replacement Parts.

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    b. Within thirty (30) days of written demand by Motorola, fails to pay (1) any charge for Advance Replacement Parts supplied under this Warranty, if the Customer has not timely returned the defective items, or (2) any other amount that may be due.

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16. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THIS WARRANTY, EVEN IF MOTOROLA HAS BEEN ADVISED OF THE POSSIBILITY THEREOF, INCLUDING, WITHOUT LIMITATION, LOST PROFITS AND REVENUES, FAILURE TO REALIZE EXPECTED SAVINGS, LOST DATA OR ANY CLAIMS AGAINST THE CUSTOMER BY A THIRD PARTY.

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1. Motorola Paging Systems Group (PSG) manufactured infrastructure equipment is warranted to be free from defects in material and workmanship to the original purchaser only as set forth herein.

2. This Warranty covers only that equipment identified in paragraph 1 that is used in the manner and for the purpose intended.

3. This Warranty specifically excludes any and all software products from any source. PSG software products are the subject of the PSG Software Maintenance Program, addressed separately.

4. This Warranty shall commence 30 days after the date of shipment of the PSG infrastructure equipment.

5. The term of Warranty for all PSG infrastructure equipment is one (1) year parts and labor.

Limitations And Qualifications of Warranty

6. LIMITATION—THE REMEDY UNDER THIS WARRANTY IS LIMITED TO MOTOROLA'S REPAIR OR REPLACEMENT OF DEFECTIVE EQUIPMENT. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES OR CONDITIONS, EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

7. This Warranty does not cover, nor include a remedy for, damages, defects or failure caused by:
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   c. Environmental characteristics not conforming to the applicable Motorola Equipment Manual;
   d. Nonconformance with the Equipment Operating Instructions in the applicable Motorola Equipment Manual;
   e. External causes including, without limitation, use in conjunction with incompatible equipment, unless such use was with or under Motorola's prior written consent;
   f. Cosmetic damages;
   g. Damages caused by external electrical stress;
   h. Lightning;
   i. Accidental damage;

j. Negligence, neglect, mishandling, abuse, or misuse;

k. Force Majeure; and

l. Damage caused by Shipper(s).

Return of Equipment

8. If an item of PSG infrastructure equipment malfunctions or fails in normal use within the Warranty Period:

   a. The Customer shall promptly notify the nearest Motorola Area Customer Care Center (CCC) of the problem and provide the serial number of the defective item. Motorola shall then, at its option, either resolve the problem over the telephone or issue a Return Authorization Number to the Customer. The Customer shall, at its cost, ship the item to the Motorola Area CCC location designated at the time the Return Authorization Number is issued;

   b. The Return Authorization Number must be shown on the label attached to each returned item. A description of the fault must accompany each returned item. The returned item must be properly packed, and the insurance and shipping charges prepaid;

   c. Motorola shall either repair or replace the returned item. The replacement item may be new or refurbished. When refurbished, it shall be equivalent to new in operation. When a returned item is replaced by Motorola, the returned item shall become the property of Motorola;

   d. Subject to all the terms of this Warranty, part availability and the clearance of Customs, Motorola shall complete the repair or exchange of Motorola-manufactured equipment returned under Warranty within fifteen (15) working days of receipt of the equipment;

   e. Motorola shall, at its cost, ship the repaired or replaced item to the Customer. If the Customer has requested Express Shipping, the Customer shall pay Motorola an expedite fee; and

   f. Equipment which is repaired or replaced by Motorola shall be free of defects in material and workmanship for the remainder of the original Warranty, or for 90 days from the date of repair or replacement, whichever is longer. All other terms of this Warranty shall apply to such repairs or replacements.

Advance Replacements

9. During the Warranty Period:
   a. At the Customer's request and for the Customer's convenience, Motorola may supply the Customer with Advance Replacement Parts (parts furnished in advance of Motorola's receipt of defective items). Motorola's provision of such parts will be contingent on part availability and on the Customer's maintaining a satisfactory credit standing with Motorola.
   b. Motorola shall ship the Advance Replacement Parts requested by the Customer within 48 hours of Motorola determining that such service is appropriate, if stock is available at the Motorola service location. If stock is not available, Motorola will make reasonable efforts to locate and provide it to the Customer within ten (10) working days.
   c. The Customer shall return defective items to the Motorola Area Customer Care Center within thirty (30) days from the date of shipment of the Advance Replacement Parts; failing which, Motorola shall bill and the Customer shall pay the full current list price of the Advance Replacement Parts.

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Default and Termination

13. Motorola shall have the right to immediately terminate this Warranty, and to suspend its performance under this Warranty, upon notification to the Customer if the Customer:
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    b. Within thirty (30) days of written demand by Motorola, fails to pay (1) any charge for Advance Replacement Parts supplied under this Warranty, if the Customer has not timely returned the defective items, or (2) any other amount that may be due.

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Introduction

About This Manual

This manual provides instructions for the installation and operation of the RF-Baton!™ (RF-B!™) transmitter controller in the RF-Orchestra!™ (RF-O!™) paging station cabinet. The RF-B! transmitter controller is an infrastructure component of the Wireless Messaging System (WMS).

This manual is intended for persons with a technical background in digital and analog circuits, and a general knowledge of messaging systems operation.

The chapters contained within this document are designed to provide important information on installation and operation in the following format:

- Chapter 1, "Introduction", provides a brief introduction to this document, describes the software application keyboard conventions used in this manual, and lists other relevant documents.
- Chapter 2, "System Description", provides an overview of the Wireless Messaging System, and a description of the RF-Baton! (RF-B!) transmitter controller including descriptions and block diagrams of the equipment modules, the specifications and electrical requirements.
- Chapter 3, "Preinstallation", provides information to consider before installing the RF-B! transmitter controller.
- Chapter 4, "Installation", provides a list of required tools and equipment needed to successfully install the RF-B! transmitter controller, hardware installation instructions, power-up procedures, configuration instructions and indications, software download procedures, and an operational checkout.
- Chapter 5, "Operation", describes how to use the service terminal with the Friendly Integrated Paging System (FIPS), how to access the logs, how to access and use the test modes, and how to reset the RF-B! transmitter controller.
- Chapter 6, "Maintenance", provides information on troubleshooting the RF-B! transmitter controller, GPS diagnostics, instructions for replacing defective Field Replaceable Units (FRUs), remote software download procedures, local software download procedures, and parameter database updating procedures.

- Appendix A, "Abbreviations and Acronyms", lists the abbreviations and acronyms used in this manual.
- Appendix B, "Connector Pinouts", provides information on connector pinouts.
- Appendix C, "FIPS Action Commands and Parameter IDs", provides a summary of action, read, and write commands.
- Appendix D, "Alarms and Error Messages", lists and describes the alarms and error messages.
- Appendix E, "Traces", lists and describes the traces available to the operator.

Keyboard Conventions

This section describes the software application keyboard conventions used in this manual (see Table 1-1):

Table 1-1: Keyboard Conventions Used in This Manual

Convention	Description
System input	Text that you must type into the system and screen options appear in bold Helvetica text. Example: **partition**
Keys	Single keyboard keys used during input appear bold and in carets. Examples: **<Enter>**, **<F2>**, **<Esc>** When one key is to be pressed and held while another key is pressed, the key names appear bold, in carets, and joined by a plus sign. Examples: **<Esc+2>**, **<Ctrl+Y>**
Keyboard labeling	Keyboard labeling varies. For example, **<Enter>**, <**Return**>, or <**Enter/Return**> may indicate the key used for information entry. These procedures use **<Enter>** to represent the various labelling. Unless otherwise noted, the sequence is: **Item <Enter>**. Also, **<Control>** or **<Ctrl>** may indicate the control key. These procedures use **<Ctrl>**.
Variables	Variables that you must type into the system are set inside vertical brackets **[ ]**. However, you do not type the brackets. Examples: **[Latitude]**, **[177.12.77.34]**
System output	System responses to commands appear as Helvetica text. Example: COMMAND SUCCESSFUL
Function Keys	If you are using a Sun™ system, and the instruction state to press **<F2>**,press the function key **<F2>**. If you are using a VT100 terminal, you must press **<Esc>** and the number key, not the function key. For example, if the instruction says “press **<F2>**”, the VT100 equivalent is to press **<Esc +2>** (the number key) simultaneously.
Highlight	To highlight or select an option, use the arrow keys to position the cursor on the option and press **<Enter>**. To continue, you must press **<F2>**.

Related Publications

The related Motorola publications include:

- *Choreographer! Network Manager Concepts Description*, Motorola Part No. 6880492G08
- *Choreographer!™ Network Manager Installation and Operation*, Motorola Part No. 6880492G07
- *GT/UT Oncore User's Guide*; included as part of Motorola GPS evaluation kit (Model number VPEVAL0002, GTEVAL0001, or UTEVAL0001)
- *Quality Standards Fixed Network Equipment - Installation Manual R56*, Motorola Part No. 6881089E50
- *RF-Conductor!™ Controller Hardware Installation*, Motorola Part No. 6880494G50
- *RF-Conductor!™ Controller Installation*, Motorola Part No. 6880494G53
- *RF-Baton! Transmitter Controller Control Module*, Motorola Part No. 6880497G24
- *RF-Baton! Transmitter Controller Reference Module*, Motorola Part No. 6880497G22
- *RF-Orchestra! Paging Station Installation and Operation*, Motorola Part No. *6880493G02*
- *RF-0rchestra! Paging Station 6-Hour Battery*, Motorola Part No. 6880497G23
- *RF-0rchestra!™ Paging Station DC-DC Converter Module*, Motorola Part No. 6880495G24

Other related publications include:

- *FCC Emission Requirements, Part 15*
- *ETSI 300.279*
- *TIA-603*

System Description

The Wireless Messaging System Overview

The WMS, the Motorola two-way advanced messaging solution, is part of the FLEX™ family of protocols. FLEX is the high-speed messaging protocol that is now the standard protocol in the one-way messaging industry. The ReFLEX™ messaging protocol includes a reverse channel to support two-way messaging. The InFLEXion™ system is a higher speed and more robust two-way voice and data messaging protocol.

With small, lightweight, low-power subscriber communicators, ReFLEX- and InFLEXion-based services offer many advantages:

- High transmission speeds, up to 6400 bits per second (bps) for more than 600,000 numeric communicators per channel
- High resistance to signal fading
- Two-way messaging including ReFLEX messaging protocol (text messaging), InFLEXion messaging protocol (voice messaging), message receipt acknowledgment, and message retransmission
- Alters speed to match the system daily traffic pattern
- Extended communicator battery life

The Wireless Messaging System consists of the following systems (see Figure 2-1):

- The Wireless Message Gateway (WMG™) -Administrator!
- The RF-Conductor!™ (RF-C!™) controller
- The Choreographer!™ network manager
- The RF-B! transmitter controller
- The RF-Orchestra!™ (RF-O!™) paging station
- The RF-Audience!™ (RF-A!™) receiver
- Communicators

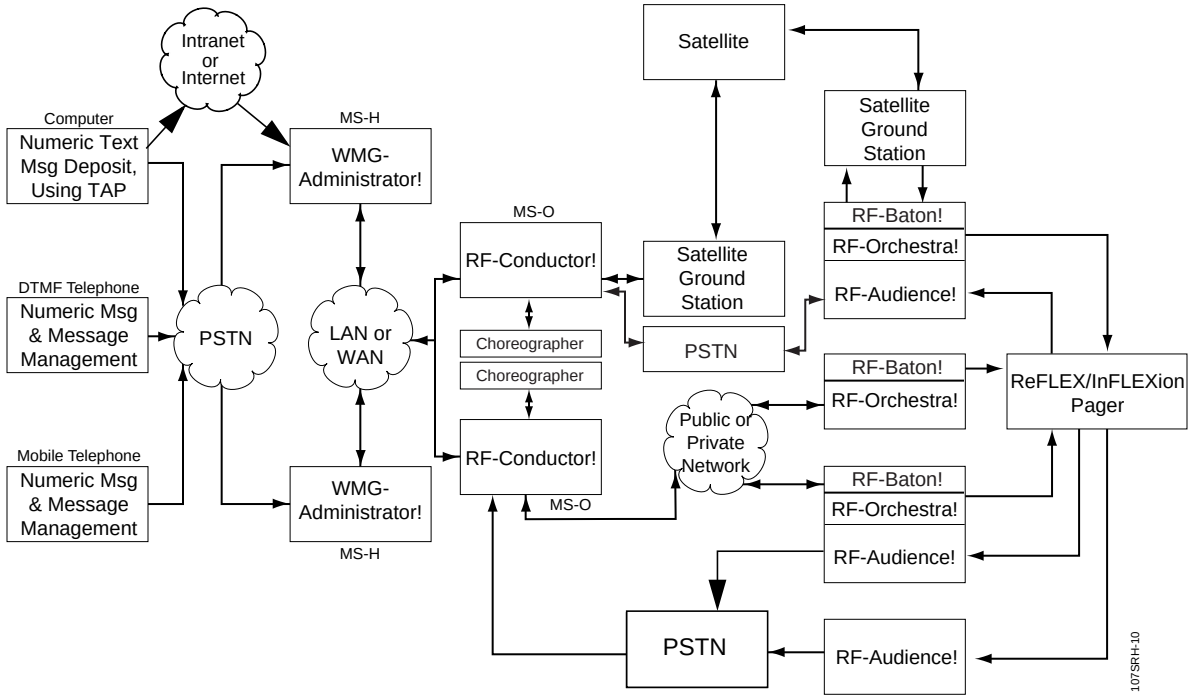


Figure 2-1: The Wireless Messaging System Block Diagram

The WMG-Administrator!

The WMG-Administrator! is a two-way messaging switch, corresponding to a traditional messaging terminal. This switch, the clearinghouse for all messages in The Wireless Messaging System, provides a wide range of messaging and administrative services. Callers access the system over the Public Switched Telephone Network (PSTN) or the Internet. The system accepts any of the following inputs:

- Ordinary and Integrated Services Digital Network (ISDN) lines
- Trunks with signaling for each channel signaling or SS7 common-channel signaling
- T1 and E1 spans

Each WMG-Administrator! connects to other products in the Wireless Messaging System through a network of land lines, and satellite links, or both.

The RF-C! Controller

The RF-C! controller is the messaging system controller for the transmitters and receivers in a region. The RF-C! controller routes voice and text messages from the WMG-Administrator! to the appropriate transmitters through the transmitter controllers and returns responses from the RF-A! receivers to the WMG-Administrator!.

The Choreographer! Network Manager

The Choreographer! network manager is a software interface for voice and data communications used in the paging infrastructure. The interface manages and configures network devices.

The RF-B! Transmitter Controller

The RF-B! transmitter controller provides an interface between the RF-C! Controller and the RF-O! transmitter. The RF-B! transmitter controller also provides synchronization timing for the transmitter using a Global Positioning System (GPS) receiver.

The RF-O! Paging Station

The RF-O! paging station is a linear transmitter for voice and data messaging that supports up to two InFLEXion subchannels and three ReFLEX channels. The RF-O! paging station converts data received from the RF-B! transmitter controller into modulated radio frequency (RF) energy for transmission to the communicators.

RF-A! Receivers

The RF-A! receivers return messages transmitted by the subscriber communicators. RF-A! receivers funnel their outputs through a multiplexer that provides a single link back to the RF-C! controller. RF-A! receivers can be stand-alone or co-located with a transmitter.

Communicators

Communicators are miniature radios that accept messages from the paging station. ReFLEX protocol communicators receive numeric or alphanumeric messages. InFLEXion communicators receive voice messages. Both ReFLEX and InFLEXion communicators provide return acknowledgments when the message is accurately received and when the subscriber accesses the message. Depending upon the communicator, certain ReFLEX communicators, and in the future InFLEXion, communicators are capable of initiating a return message.

Note: Communicators are also known by different names, depending on the particular region [for example, Personal Messaging Units (PMUs), Personal Communications Devices (PCDs), Pagers, or Subscriber Units].

ReFLEX and InFLEXion Messaging Protocol Overview

The delivery of advanced messaging is augmented by a family of new Motorola over-the-air (OTA) message protocols. The ReFLEX messaging protocol provides two-way text messaging, and the InFLEXion messaging protocol provides two-way voice and data messaging. Two-way messaging, using the ReFLEX and InFLEXion protocols, provides guaranteed message delivery because a received message is acknowledged by the communicator. If a message is not acknowledged after a transmission, the system retransmits the message intermittently until it is received.

The primary difference between the ReFLEX and InFLEXion protocols is in the outbound (transmitter to communicator) signal path. ReFLEX is strictly a data messaging protocol, whereas the InFLEXion protocol supports voice messaging. The protocols are identical with respect to the inbound (communicator to receiver) signal path.

ReFLEX Messaging Protocol

Key features of the ReFLEX messaging protocol are the ability of the system to guarantee delivery of a data message and the ability of the subscriber to reply to the message. These functions create the closed-loop performance that makes advanced messaging a quantum leap in wireless communications.

Message Response

The ReFLEX system enables the subscriber to originate a message and offers the subscriber two ways to respond to a received message:

- After receiving a message, the subscriber selects a response from a subscriber-specific list. This list has up to 120 pre-established, subscriber-specific messages stored in the communicator and in the terminal. To optimize air time, only the selected message index identifier is sent back to the terminal, which then sends the associated message.
- The subscriber selects a response from a list the sender imbedded into the message. After selection, the subscriber can return the response to the system where the sender can access and review it.

Reviewing Responses

The system provides the following two ways for the message sender to review the response:

- Call Query—The message sender can call back to the system at a later time and use the transaction ID to retrieve the response.
- Auto MESSAGE—If the message sender is also a subscriber in the system, the system can be instructed to send the response directly to the message sender's communicator.

Originating a Message

To originate a message, the subscriber selects the individual or group from a list of up-to-32 addresses stored in the communicator. Then, from a 64-message subset list of the subscriber's 120-message master list, the subscriber selects a message and instructs the system to send it to the selected address.

InFLEXion Messaging Protocol Features

The InFLEXion messaging protocol system provides for local frequency re-use based on subchannel frequencies in the 50 kHz channel bandwidth. Up-to-seven subchannels are available in a 50 kHz bandwidth for the InFLEXion messaging protocol, and the system is configured with a cellular-like design. Individual transmitter sites can be active and broadcasting on a given subchannel, while an adjacent transmitter is active and broadcasting on a different subchannel. Properly spaced transmitters can be operating on the same frequency, transmitting different messages at the same time.

In addition to registration and acknowledgment, InFLEXion voice messaging has support for virtual storage. Although the communicator can store several minutes of voice messages, when the memory becomes full, the communicator instructs the system to hold messages in the terminal. The terminal acts as a buffer until space becomes available in the communicator. When communicator memory becomes available, the queued messages are forwarded to the communicator.

The InFLEXion voice technology has other benefits:

- The caller voice message stores directly in the terminal where the voice message forwards to the subscriber communicator. This operation reduces the operational costs normally associated with alphanumeric messaging.
- The actual voice of the caller conveys the message urgency. Voice messaging provides a higher level of communication than numeric or alphanumeric messaging.

- In many cases, a voice message does not require a return call because more detail can be conveyed in a voice message.
- Language independence is achieved because the message flows from the caller to the subscriber, thus negating the need for translation.

All the benefits of the InFLEXion system provide a greatly increased capacity for voice messaging when compared to conventional voice paging.

RF-B! Transmitter Controller Functional Description

The following paragraphs describe the operation of the RF-B! transmitter controller at a functional level. This information gives the service technician a basic understanding of the functions performed by the transmitter controller to facilitate maintenance and troubleshooting to the field replaceable unit (FRU) level.

The RF-B! transmitter controller decodes incoming messaging data from the RF-C! controller and converts the data to transmitter-compatible protocols. The decoded messaging information is sent to the transmitter for transmission to the communicators.

The RF-B! transmitter controller performs the following functions (see Figure 2-2):

- Secondary voice processing
- InFLEXion and ReFLEX message processing
- Remote software download processing
- Software download transfers to the transmitter
- Transmitter operation and remote diagnostic monitoring
- Synchronization to GPS time needed for simulcast and FLEX systems

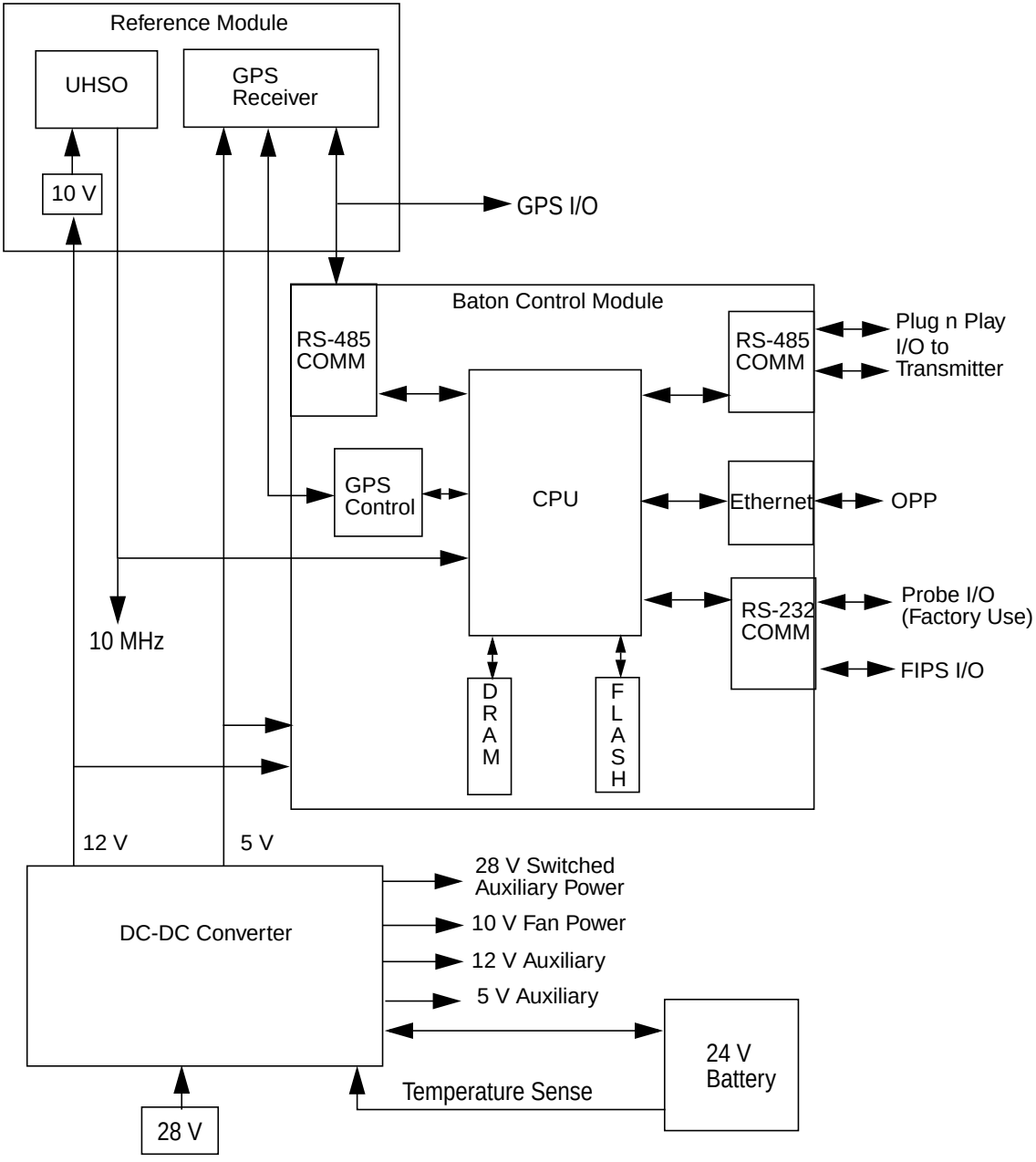


Figure 2-2: RF-B! Transmitter Controller Block Diagram

Chassis

The RF-B! transmitter controller chassis is a 19-in. (48.26 cm) rack mount module that is two Electronics Industries Association (EIA) rack units (RU) high (3.5 in. or 8.89 cm) (see Figure 2-3).

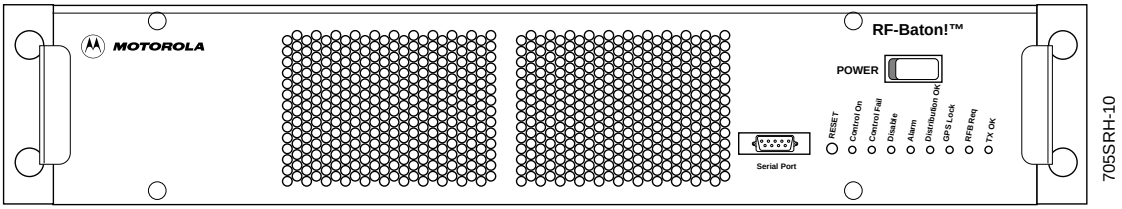


Figure 2-3: RF-Baton! Transmitter Controller (Front View)

The chassis consists of a metal housing, a detachable faceplate, and a backplane with input / output (I / O) connectors. The chassis contains three internal modules (see Figure 2-4).

- Baton Control Module (BCM)
- Reference Module with Global Positioning System (GPS) option
- DC-DC Converter

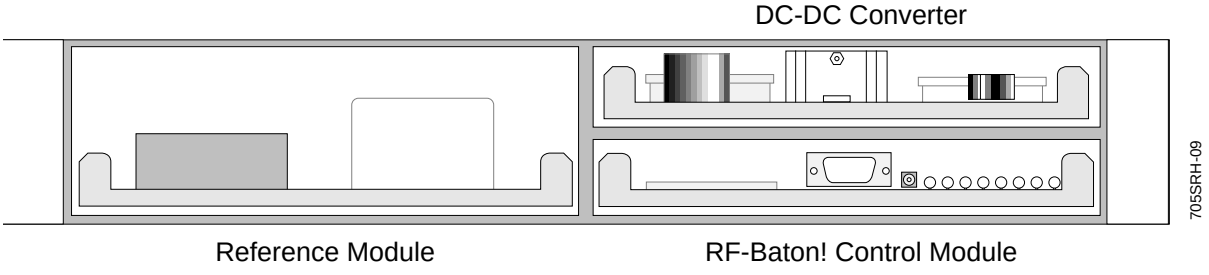


Figure 2-4: RF-B! Transmitter Controller With Faceplate Removed

The Baton Control Module

The BCM controls all functions of the RF-B! transmitter controller. The BCM is primarily responsible for receiving, processing, scheduling, and sending outbound messages to the transmitter. While handling the outbound messages, the BCM also maintains GPS tracking, monitors simulcast capability, monitors transmitter status, and provides a user interface.

Outbound Message Control and Processing

The BCM is the primary controller between the RF-C! controller and the paging transmitter. The BCM accepts messaging data inputs from the RF-C! controller through the ethernet auxiliary unit interface (AUI) input / output (I / O) connector on the backplane.

The BCM decodes and converts the messaging data into transmitter-compatible protocols. The host processor unwraps the message contents from the communications protocol and processes them. The BCM provides secondary voice processing, calculates launch time and queues the message for transmission. Once a message launch time has arrived, the processed message data and appropriate control data are supplied to the transmitter through the plug-n-play (PnP) interface.

The outbound message dataflow processing occurs in four steps (see Figure 2-5).

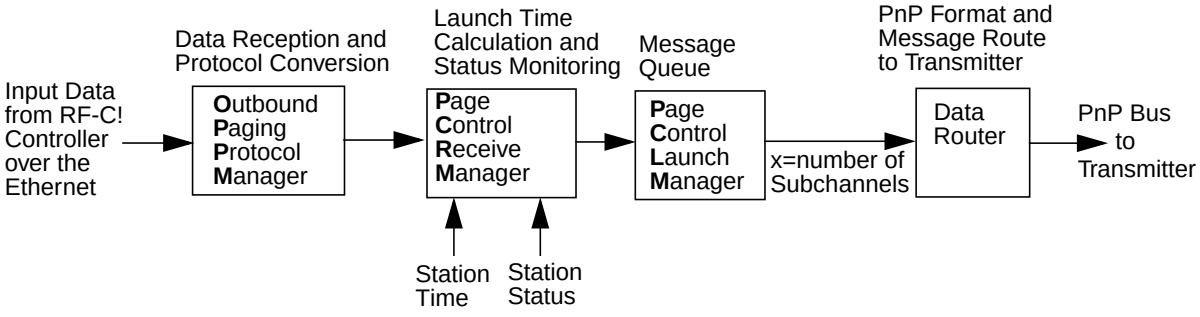


Figure 2-5: BCM Outbound Message Dataflow

- The Outbound Paging Protocol Manager (OPPM) receives the messaging data from the RF-C! controller over the ethernet and converts the data into compatible protocols.

- The Page Control Receive Manager (PCRM) receives message data from the OPPM, calculates the exact message launch time, and queues the message for transmission. The calculated launch time is based on the launch time received from the RF-C! controller as well as transmitter and transmitter controller characteristics. The PCRM also monitors station paging status, and is responsible for enabling and disabling paging based on station status.
- The Page Control Launch Manager (PCLM) directs the message data to the proper data router based on the transmission subchannel. The PCLM depends on the launch time calculated by the PCRM.
- The data router (DRT1) converts the message data specified by the PCLM into the PnP format and outputs the data to the transmitter through the PnP interface. There is a separate data router for each transmission subchannel on the system.

GPS Tracking and Simulcast

The BCM acquires and maintains GPS lock from the GPS receiver during normal operation in order to provide optimum simulcast capabilities. GPS lock is required because the RF-B! transmitter controller time is synchronized with GPS time to maintain a common timebase across multiple paging stations, which allows simulcast capability. If the GPS lock is lost, the RF-B! transmitter controller uses the timing from the UHSO to continue simulcast operation for up-to-96 minutes while attempting to reestablish the GPS lock.

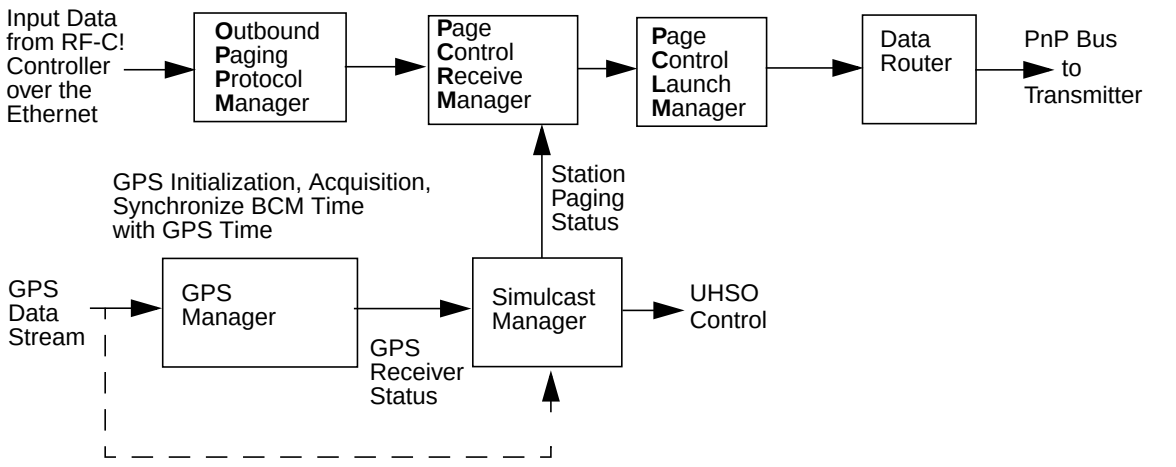


Figure 2-6: GPS and Simulcast Interaction with Outbound Message Dataflow

- The GPS Manager initializes the GPS receiver, and acquires and monitors GPS lock. The GPS Manager synchronizes RF-B! transmitter controller time with GPS time and re-acquires GPS lock when necessary.
- The Simulcast Manger monitors and maintains simulcast capability. While the RF-B! transmitter controller has GPS lock, the Simulcast Manager monitors the GPS signal and steers the UHSO reference to maintain optimal simulcast conditions. While there is no GPS lock, the Simulcast Manager allows the RF-B! transmitter controller to continue paging using an internal reference for up-to-96 minutes while monitoring for GPS re-acquisition. If GPS is not re-acquired by the GPS Manager, the Simulcast Manager disables paging.

RF-B! Transmitter Controller Hardware Monitoring

The BCM constantly monitors all RF-B! transmitter controller hardware components including UHSO reference and internal reference status.

Transmitter Monitoring

The BCM accepts remote software downloads and transfers software downloads to the transmitter. The BCM also monitors the transmitter for proper operational status using the PnP TX_OK signal and forwards alarms reported by the transmitter to the Choreographer! network manager.

User Interface

The BCM provides configuration and status information in two ways:

- The first is through a Local Maintenance Serial Interface using the Friendly Interface Protocol System (FIPS), which communicates with the BCM using the front panel serial port.
- The second is through the Choreographer! network device manager, which communicates with the BCM over the WAN.

Depending upon the request, the user interface interacts with many different facets of the BCM, including, but not limited to, each of the BCM functions previously described.

Reference Module with GPS Receiver Option

The Reference Module includes the Ultra High Stability Oscillator (UHSO) and the optional Motorola OncoreVP GPS receiver (see Figure 2-7).

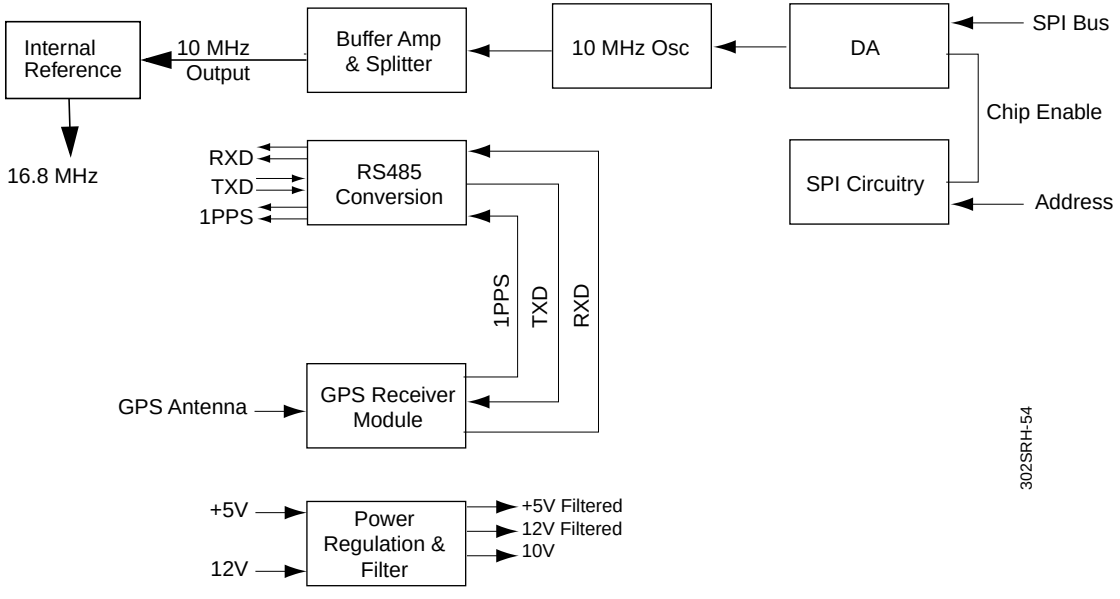


Figure 2-7: RF-B! Reference Module Block Diagram

UHSO

The 16.8-MHz timing clock is synchronized to a 10-MHz reference provided by a UHSO on the reference module. This same reference is used by the transmitter to synchronize the Internal transmit clocks. Using GPS 1PPS as a reference, the host processor sends a UHSO adjustment value through the SPI Interface to maintain the accuracy of the 10-MHz reference.

GPS Receiver

The optional GPS receiver, also located on the reference module, detects signals from the U.S. Department of Defense NAV STAR GPS satellites. The GPS receiver uses these signals to supply timing information and a 1PPS signal to the transmitter and any co-located RF-A! receivers.

DC-DC Converter Module

The DC-DC converter module accepts a +28 Vdc input, steps the voltage down to +12 Vdc and +5 Vdc for the BCM and reference modules, and +10 Vdc for the fans. The DC-DC converter also provides external +5 Vdc, +12 Vdc, and switched +28 Vdc outputs. If an optional battery revert and charger is installed, the RF-B! transmitter controller remains fully operational for 6 hours during power outages. Figure 2-8 shows a block diagram of the DC-DC converter module.

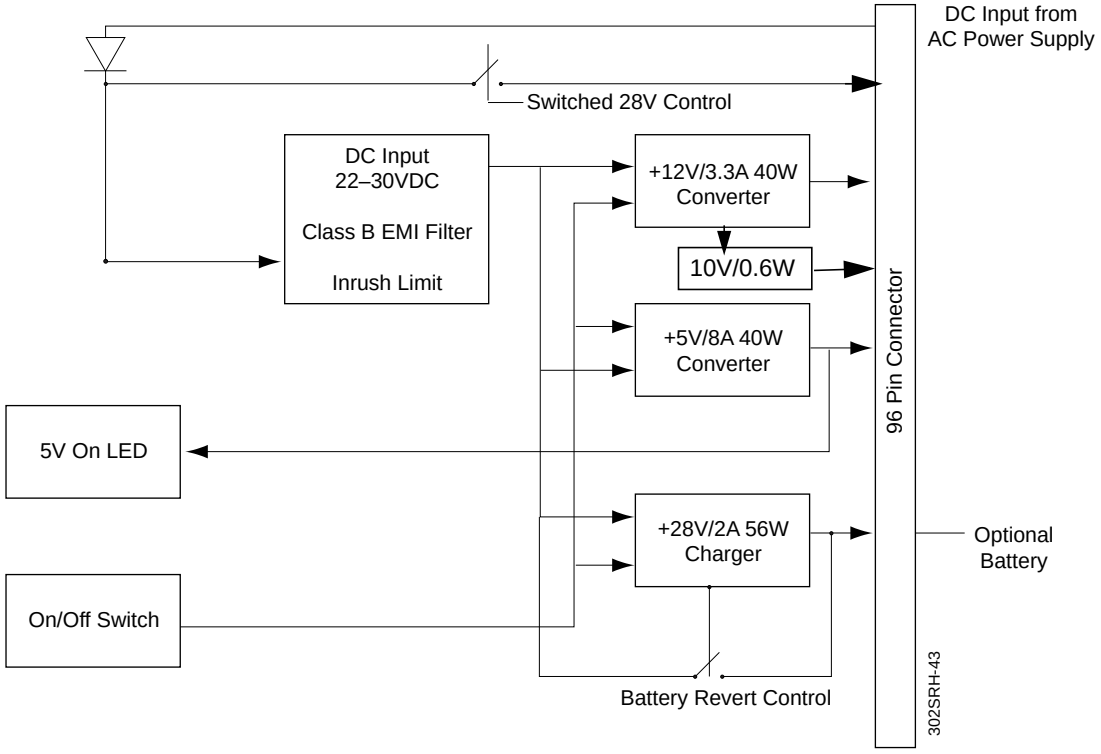


Figure 2-8: DC-DC Converter Module Block Diagram

RF-B! Transmitter Controller Front Panel

The RF-B! transmitter controller front panel contains a power switch, a reset switch, eight light-emitting diodes (LEDs) (seven LEDs controlled by the RF-B! transmitter controller and one LED controlled by the transmitter), and a serial port for communication. Figure 2-9 shows the location of these controls.

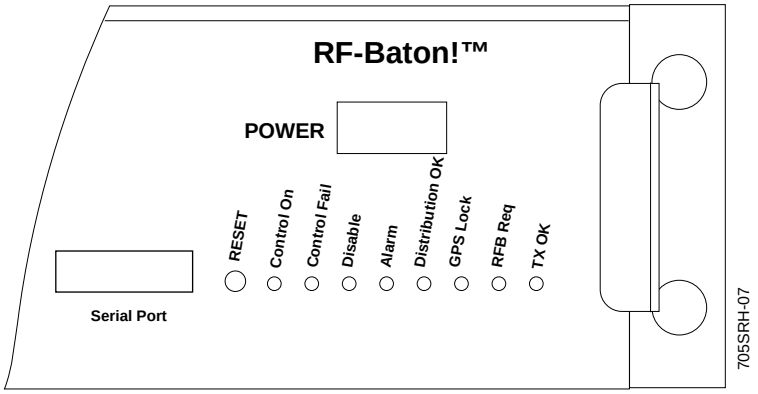


Figure 2-9: RF-Baton! Transmitter Controller Controls and LEDs

Table 2-1 explains the controls and their functions. Table 2-2 lists the eight LEDs located on the front panel, along with a description of the status indicated by each LED.

Table 2-1: RF-B! Transmitter Controller Controls

Control	Function
POWER	Switches power to the RF-B! transmitter controller
RESET	Resets RF-B! transmitter controller operation

Table 2-2: RF-B! Transmitter Controller Indicators

LED	Function	Color
Control On	ON after successful completion of reset sequence	Green
Control Fail	ON when a normal RF-B! control module failure is detected in the reset sequence	Red
Disable	ON when normal messaging activity is disabled	Red
Alarm	ON after a station alarm is detected	Red
Distribution OK	Not used	Not used
GPS Lock	ON when satellite receiver lock is established	Green
RFB Req	Not used	Not used
TX OK	On when transmitter connected is ready to receive data (Note: Controlled by transmitter only)	Green

External Connections

The following paragraphs explain the RF-B! transmitter controller external connections.

Serial Port

The RF-B! transmitter controller serial port is located on the front panel for obtaining station parameter and diagnostic information using a service terminal. The serial port uses RS-232 signaling through a DB-9 female connector (see Figure 2-10). Appendix B, "Connector Pinouts" provides pin-out information for this connector.

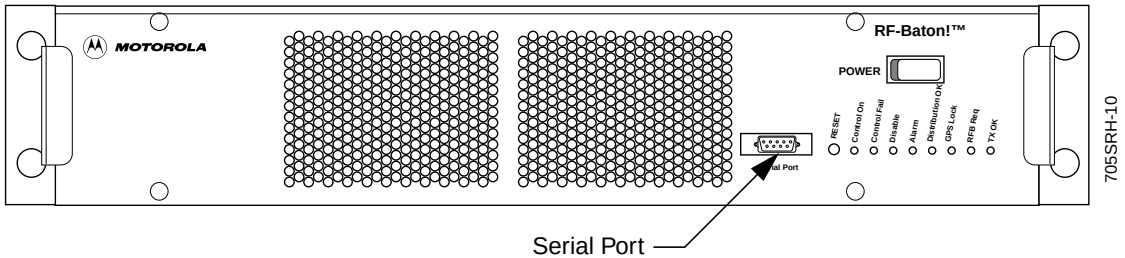


Figure 2-10: RF-Baton! Transmitter Controller (Front View)

Backplane Connectors

The RF-B! transmitter controller has 22 backplane connectors, providing the connections necessary for interfacing to the transmitter and distribution network (see Figure 2-11 and Table 2-3). Appendix B, "Connector Pinouts" provides pin-out information for each connector.

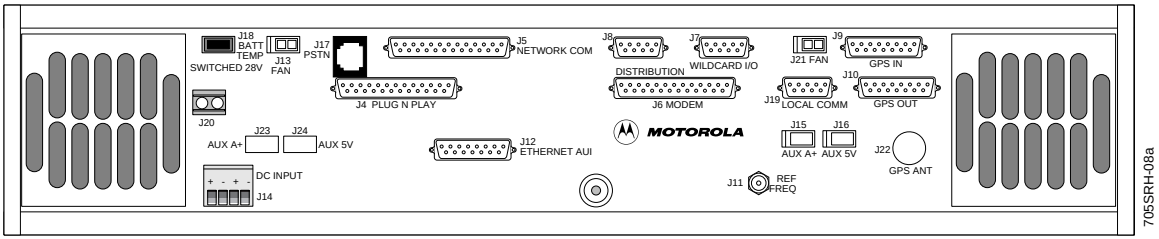


Figure 2-11: RF-B! Transmitter Controller Backplane

Table 2-3: RF-B! Transmitter Controller Backplane Connectors—J1 through J22 (Sheet 1 of 2)

Connector.	Name	Description
J1	Internal	DC-DC Converter backplane connector
J2	Internal	Baton Control Module backplane connector
J3	Internal	Reference Module backplane connector
J4	PLUG-N-PLAY	Industry standard interface between the transmitter and the transmitter controller
J5	NETWORK COMM	Not used
J6	MODEM	Not used
J7	WILDCARD I/O	Not used
J8	DISTRIBUTION	Reserved
J9	GPS IN	Remote GPS receiver signal interface using RS-485
J10	GPS OUT	GPS signal timing distribution using RS-485
J11	REF FREQ (Coaxial)	10-MHz source at 50 ohm impedance
J12	ETHERNET AUI	Standard AUI interface for Ethernet 10 Base 2
J13 and J21	FAN	RF-B! chassis fan connection with filtering

Table 2-3: RF-B! Transmitter Controller Backplane Connectors—J1 through J22 (Sheet 2 of 2)

Connector.	Name	Description
J14	BATT	+28 Vdc input and optional battery revert connection for batteries
J15	AUX 5V	Auxiliary +5 Vdc source
J16	AUX A+	Auxiliary +12 Vdc source
J17	PSTN	Optional internal public switch telephone network connection
J18	BATT TEMP	Input from battery temperature sensor with the optional battery installed
J19	AIPS PORT	Development use only
J20	SWITCHED 28V	Auxiliary +28 Vdc source controlled by the BCM—used for external GPS receiver power
J22	GPS ANT (Coaxial)	RF signal input from antenna using SMA connector. Note: Center conductor has +5 Vdc applied when the optional GPS receiver is installed in the RF-B! transmitter controller.

RF-Baton! Transmitter Controller Specifications

The RF-B! transmitter controller conforms to explicit mechanical, electrical, and environmental specifications. The following sections discuss these specifications in detail.

Mechanical Specifications

The RF-B! transmitter controller is mechanically designed around specific parameters (see Table 2-4). This design provides easy access to modules and interconnect points. The RF-B! transmitter controller mounts in the same cabinet as the transmitter.

Table 2-4: RF-B! Transmitter Controller Mechanical Specifications

Parameter	Specification
Standard mounting configuration	19 in. (48.26 cm) EIA cabinet
Width	19 in. (48.26 cm)
Height	2 rack units (3.5 in. or 8.89 cm)
Depth	15 in. (38.1 cm)
Weight	30 lb (13.64 kg)

Electrical Specifications

The RF-B! transmitter controller operates within specific electrical parameters (see Table 2-5).

Table 2-5: RF-B! Transmitter Controller Electrical Specifications

Parameter	Specification
Input voltage	+28 Vdc + or – 4Vdc
Input power	200 W max.
Input DC voltage ripple	50 mV p-p
FCC emission requirements	Part 15
Lightning protection	NA
Electrostatic discharge (ESD)	In accordance with ETSI 300.279

Environmental Specifications

The RF-B! transmitter controller requires special environmental conditions for proper operation and system longevity (see Table 2-6).

Table 2-6: Environmental Specifications

Parameter	Specification
Operating Temperature	– 22 ˚F to 140 ˚F (–30 ˚C to +60 ˚C) per TIA-603
Operating Humidity	0% to 95% relative at 122 ˚F (50 ˚C) per TIA-603
Dust	Airborne particles must not exceed 90 µg/m^3
Vibration	TIA/EIA 603

Operating Specifications

The following chart shows RF-B! transmitter controller operating specifications (see Table 2-7):

Table 2-7: RF-B! Transmitter Controller Operating Specifications (Sheet 1 of 2)

Parameter	Specification or Value
Host Processor	Motorola 68EN360 running at 25 MHz
DSP	Quad Motorola DSP56166 or DSP 56167 at 66 MHz
Memory	2 M x 32 bit DRAM on 72 pin SIMM dual 512 k x 32 bit FLASH on 80 pin SIMM 32 k x 8 bit EEPROM socketed
Channel Capacity	1 to 4 subchannels of InFLEXion messaging protocol 3 subchannels of ReFLEX messaging protocol
Frame Time Synchronization	GPS
Frequency Stability	5 ppb
Network Support	Ethernet AUI Optional 10Base2 transceiver available
Diagnostics	Front panel FIPS using EIA-232 (3-wire connection)

Table 2-7: RF-B! Transmitter Controller Operating Specifications (Sheet 2 of 2)

Parameter	Specification or Value
Alarms	System alarms supported using SNMP
Visual Indicators	8 front panel LEDs and 1 LED on the back of the BCM
Software Download	Supported through front panel and network
Timing Source	Internal—Motorola format External—Trimble® format
Transmitter Interface	Plug-n-Play standard—2.0 MB/s

Preinstallation

Site Considerations

Because the RF-B! transmitter controller is typically installed into an existing cabinet, ensure that the site has been prepared appropriately. To verify that proper site considerations and recommendations are being followed, refer to the Motorola *Quality Standards - Fixed Network Equipment (FNE) Installation Manual R56* (Motorola Part No. 6881089E50), your specific transmitter Installation and Operation manual, and local site documentation.

Environmental Considerations

Extreme temperatures can cause permanent damage and reduce the life span of electronic equipment. In addition, extreme temperature swings occurring over a short period of time can significantly affect the paging station simulcast capabilities.

To combat temperature problems, Motorola recommends a thermostatically controlled Heating, Ventilation, Air-Conditioning (HVAC) system. The HVAC system should be capable of automatically switching between heating and cooling modes in response to the thermostat. Wire each HVAC system to a delayed circuit to prevent both HVAC systems from starting simultaneously. Choose controls that never allow both systems to operate simultaneously.

Maintain relative humidity within the site at less than 95 percent at +50 ˚C (+122 ˚F), non-condensing. For equipment operating in an area that is not environmentally controlled, the airborne particle level must not exceed 90 $\mu g / m^3$.

Antenna Considerations

If the RF-B! transmitter controller contains an optional Global Positioning System (GPS) receiver, the receiver must locate and track at least four satellites during initial power-up. After power-up, the receiver tracks three satellite to maintain the timing signal. Because this timing is critical for maintaining system synchronization, carefully evaluate any proposed GPS antenna locations before installation to ensure an adequate lock can be obtained from the proposed site. Ensure that the GPS antenna has a clear view of the sky.

GPS Evaluation Kit

The Motorola GPS evaluation kit (Model No. VPEVAL0002, GTEVAL0001, or UTEVAL0001) provides a means of evaluating potential site and antenna mounting locations before site acceptance and construction begin.

The evaluation kit includes the hardware and software programs and instructions necessary for collecting site evaluation data. Use the kit to collect the following necessary data:

- Number of visible satellites
- Signal strength of tracked satellites
- Number of satellites being tracked
- Dilution of Precision (DOP) type (position or horizontal)

To order this kit, contact the Motorola Position & Navigation Systems Business that is listed in the Foreword of this manual, or contact your Motorola representative.

The following paragraphs explain some of the procedures used to collect GPS data.

GPS Tracking Criteria

The GPS receiver must have a Position Dilution of Precision (PDOP) of less than 10 to successfully initialize. A PDOP greater than 10 can delay start-up. To minimize delay, a PDOP of greater than 10 for more than 30 minutes is not recommended.

Large PDOP values typically occur when tracking less than four satellites. Once operating with the receiver keyed, a PDOP of greater than 10 does not affect the site performance as long at least three satellites are being tracked.

The GPS receiver must be able to achieve the following performance requirements:

- Track a minimum of four satellites for GPS receiver initialization that occurs after any loss of power to the GPS receiver or any time the GPS almanac is cleared.

Note: Loss of power to the BCM does not imply loss of power to the GPS receiver.

- Maintain track on at least three satellites after GPS receiver initialization is complete.
- Not lose tracking of satellites for more than 96 minutes.

Proper GPS antenna installation is essential for obtaining optimal performance of the paging station. When GPS antennas are improperly installed, and subsequent frequent and long loss of GPS satellite tracking occurs, the simulcast capability of the station is greatly diminished and longer system down-time can result.

GPS Antenna Requirements

The GPS antenna must be mounted with an unrestricted aerial view of within 10 degrees of the horizon in all directions and high enough to clear the peak of any site roof.

For systems in the northern hemisphere, the GPS antennas must be mounted to provide a clear view of the southern sky. For systems in the southern hemisphere, GPS antennas must be mounted to provide a clear view of the northern sky.

Adjacent structures, such as trees or buildings, can obstruct signals. The GPS antenna must be mounted clear of all obstructions to provide a clear path. Other adjacent antenna towers at the RF site that protrude into the required view have a minimal effect on GPS satellite reception and are not considered obstructions.

Maintain a distance of at least 38 dB ($32.2 + 20\log f_{(MHz)} + 20\log D_{(10/5\text{-}80)} = 37.3$ dB) of path loss (from a 1-Watt isotropic radiator) from any other antenna to prevent jamming the GPS receiver signal.

Long runs of single-braided, shielded cable can subject the GPS receiver to jamming interference. Use solid copper, outer conductor coaxial cable between the GPS antenna and receiver.

Use a coaxial cable with specifications that satisfy the system gain requirements for the GPS receiver, at a frequency of 1575.42 MHz (GPS-L1), to connect the GPS antenna to the GPS receiver's GPS input.

The maximum allowable cable loss between the GPS antenna and the RF-B! transmitter controller is 6 dB. The maximum cable loss includes additional considerations, such as line-of-sight loss and minimum satellite power during satellite acquisition. The total line-of-sight loss (7 dB) includes foliage loss (for example, low density tree tops, 6 dB) and ice loss (1 dB).

Only one GPS receiver may power the GPS antenna; all other ports to other receivers must be DC-blocked to prevent damage.

Antenna Requirements

Use antenna lines with silver-plated connectors (male and female) to reduce interference (intermodulation) problems. For example, mate a male connector with a silver-plated center pin to a female connector with a silver-plated outer conductor.

Mark all antenna feed lines appropriately to ensure connections to the proper locations. Use colored, vinyl marking tape designed for outdoor purposes to mark the antenna feed lines.

Terminate all antenna feed lines with a suitable surge arrestor within 12 in. (30.48 cm) inside the entry window. Connect each arrestor to the master ground bar located below the entry plate.

Grounding

The RF-B! transmitter controller connects to the main cabinet ground through the cabinet chassis rail (see Figure 3-1). The screws that secure the RF-B! transmitter controller to the rails, along with contact between the RF-B! transmitter controller chassis and the cabinet rails, provide the physical connection between the RF-B! transmitter controller and the grounding path.

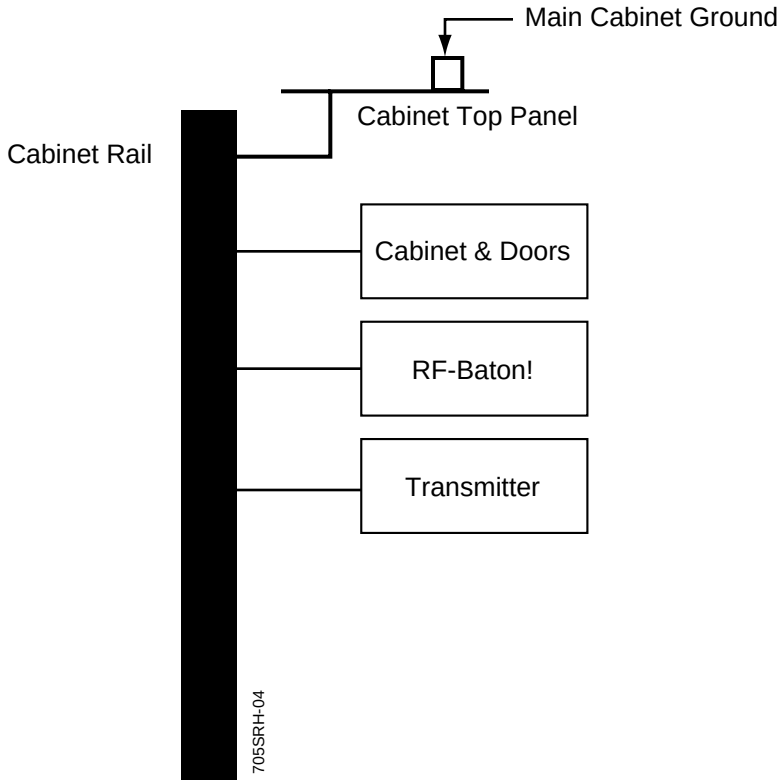


Figure 3-1: RF-B! Transmitter Controller Chassis Ground Equipment

Equipment Inspection

Generally, the factory packs all equipment, including the RF-B! transmitter controller with all modules intact and mounted into a cabinet. Inspect all equipment while it is still on the delivery truck.

Note: If obvious damage occurred to the shipping containers before unpacking, reject any damaged materials and equipment. Report any damaged or short equipment issues to your shipping company and Motorola representative.

To prevent ESD damage, wear an antistatic wrist or foot strap, and observe the guidelines for safe handling of electrostatic-sensitive devices and equipment.

Inspect the RF-B! transmitter controller, and other equipment, if applicable, for the following conditions upon delivery:

- Loose or damaged equipment
- Dents, scratches, or other damage to the side of any chassis
- Cabinet wiring out of place
- Physical damage to external controls or connectors of modules and boards
- Acknowledgment of all equipment listed on the packing list

If any equipment is damaged, immediately contact the shipping company, then your Motorola representative.

Installation

Installation Overview

The following installation procedures must be performed only by certified technicians. If this is your first time to install this type of equipment, completely read Chapter 3, "Preinstallation", and this chapter before beginning the procedure. If you are not familiar with site preparation, grounding techniques, and lightning protection. Motorola recommends the *Quality Standards Fixed Network Equipment Installation Manual (R56),* Motorola Part No. 6881089E50.

Before performing the installation procedures, prepare the site with all associated antennas, phone lines, and other related site equipment (see Chapter 3, "Preinstallation").

Required Tools and Equipment

The following tables list the tools and test equipment required for installation. The model numbers listed are recommended, but equivalent tools and equipment made by other manufacturers are acceptable. Motorola recommends using various shades of colored, vinyl tape for wire identification.

Note: Select tools and equipment that have insulated grips and handles. This insulation helps prevent potential injury resulting from electrical shock.

Recommended Tools

Table 4-1 lists the recommended tools for installation. These tools are not included as part of the RF-Baton! (RF-B!) transmitter controller shipment and must be procured locally.

Table 4-1: Recommended Tools for Installation

Tool	Model or Type	Manufacturer	Description
Torque Wrench	Adjustable from 1 to 10 in.-lb	Locally procured	Torque wrench handle for RF connections
1-1/4 in. Crows Foot Adapter	Snap-On, GFC40A	Snap-On	Torque wrench adapter for Andrew type 7/16 DIN connectors
1-1/16 in. Crows Foot Adapter	Snap-On, GFC34A	Snap-On	Torque wrench adapter for Huber-Suhner type 7/16 DIN connectors
TORX® Driver Set	T-15 and T-30 bits	Locally procured	Tightening connections
Screwdriver	Flatblade; 1/16 in.	Locally procured	Tightening connections
Wrench	Open End, 3/8 in.	Locally procured	Tightening connections

Recommended Test Equipment

Table 4-2 lists the recommended test equipment for installation. This equipment is not included as part of the RF-B! transmitter controller shipment and must be procured before installation. All model numbers are Motorola part numbers unless otherwise noted.

Table 4-2: Recommended Test Equipment for Installation

Test Equipment	Model or Type	Manufacturer	Description
Communication Software	Terminal emulation program (Procomm Plus™ or equivalent)	Locally procured (DataStorm)	Host communication
Service Terminal—Personal Computer (PC) with hard drive optional	Locally procured	Locally procured	Runs communication software; provides interface to system
Global Positioning System (GPS) Evaluation Kit	VPEVAL0002	Motorola	Evaluate GPS
DB-9 to DB-9 straight-through cable with null modem adapter	No specific model recommended	Locally procured	Communications

Hardware Installation

Typically, the RF-B! transmitter controller is installed by the factory in the same cabinet as the transmitter. This section provides information related to installing a separately shipped RF-B! transmitter controller into a cabinet.

The information provided in this section is for the installation and cabling of the RF-B! transmitter controller with the Motorola RF-O! paging station and the Motorola OncoreVP GPS receiver. The RF-B! transmitter controller can, however, also be used with different transmitters and GPS receivers, which may change the cabling layout. For these specific cabling variations, refer to your local site documentation.

RF-B! Transmitter Controller Installation

This section covers the installation and hookup of the RF-B! transmitter controller with a Motorola RF-Orchestra! (RF-O!) paging station.

Before installing the RF-B! transmitter controller into a cabinet, consider the position of the RF-B! transmitter controller to the RF-O! transmitter. Ensure the RF-B! transmitter controller is installed as close to the RF-O! as possible. Figure 4-1 shows the typical installation of the RF-B! transmitter controller with the RF-O!.

Note: The space needed for the RF-B! transmitter controller is two EIA rack units (3.5 in. or 8.89 cm) high.

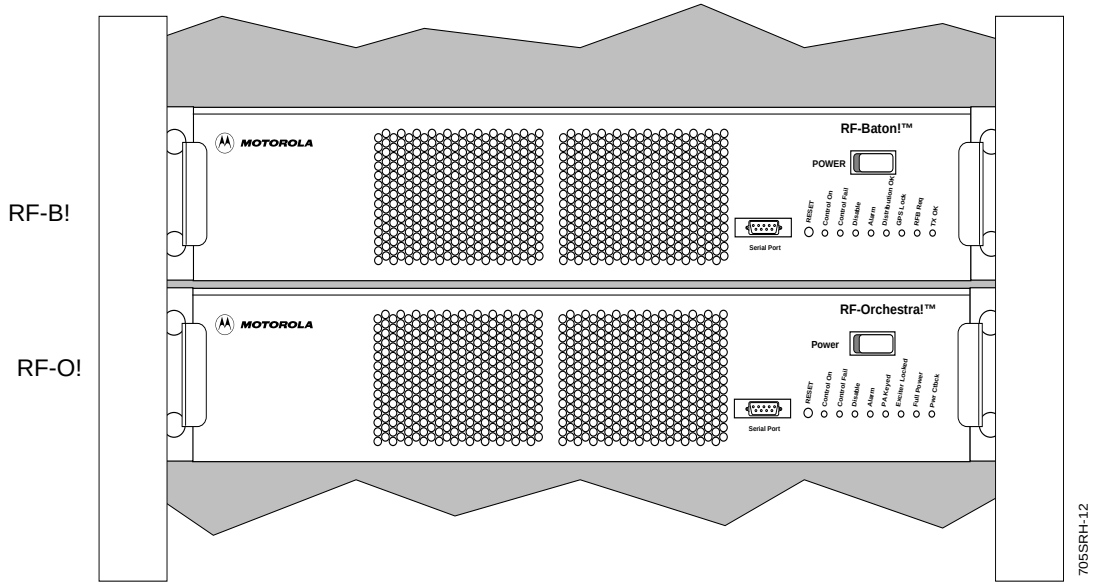


Figure 4-1: RF-B! Transmitter Controller and RF-O! Transmitter Installation Configuration

Tool

The following tool is required:

- TORX driver with T-30 bit

RF-B! Transmitter Controller Installation Procedure

Perform the following steps to install the RF-B! transmitter controller into a typical EIA standard 19-inch (48.26 cm) panel width cabinet.

Note: Perform Step 1 if the cabinet door does not open at least 90 degrees. Otherwise, go to Step 2.

1. Remove the front and rear cabinet doors (see, Chapter 6, "Maintenance", paragraph, "Doors Removal")

2. Select an appropriate place within the cabinet for installation of the RF-B! transmitter controller.

3. Unpack the RF-B! transmitter controller and the four T30 TORX screws.

4. Slide the RF-B! transmitter controller into the appropriate slot.

5. Align the RF-B! transmitter controller mounting holes with the cabinet mounting holes and install the four T-30 TORX screws (see Figure 4-2).

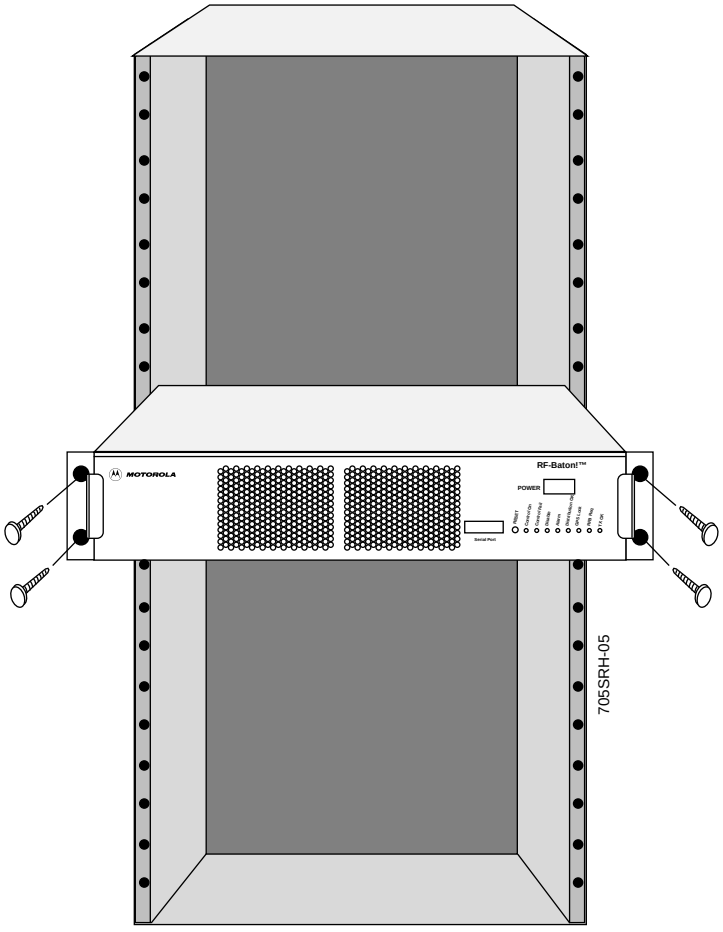


Figure 4-2: Installing the RF-B! Transmitter Controller into an EIA Standard 19-Inch (48.26 cm) Width Motorola Cabinet

RF-Baton! Transmitter Controller Cabling

After installing the RF-B! transmitter controller, make the connections to the GPS antenna, RF-O! backplane, and ground. Figure 4-3 shows the RF-B! transmitter controller connections. Table 4-3 lists the connections and the type of cabling for each connection.

Note: The RF-B! transmitter controller can be used with other transmitters. For any other cabling variations, refer to your local site documentation.

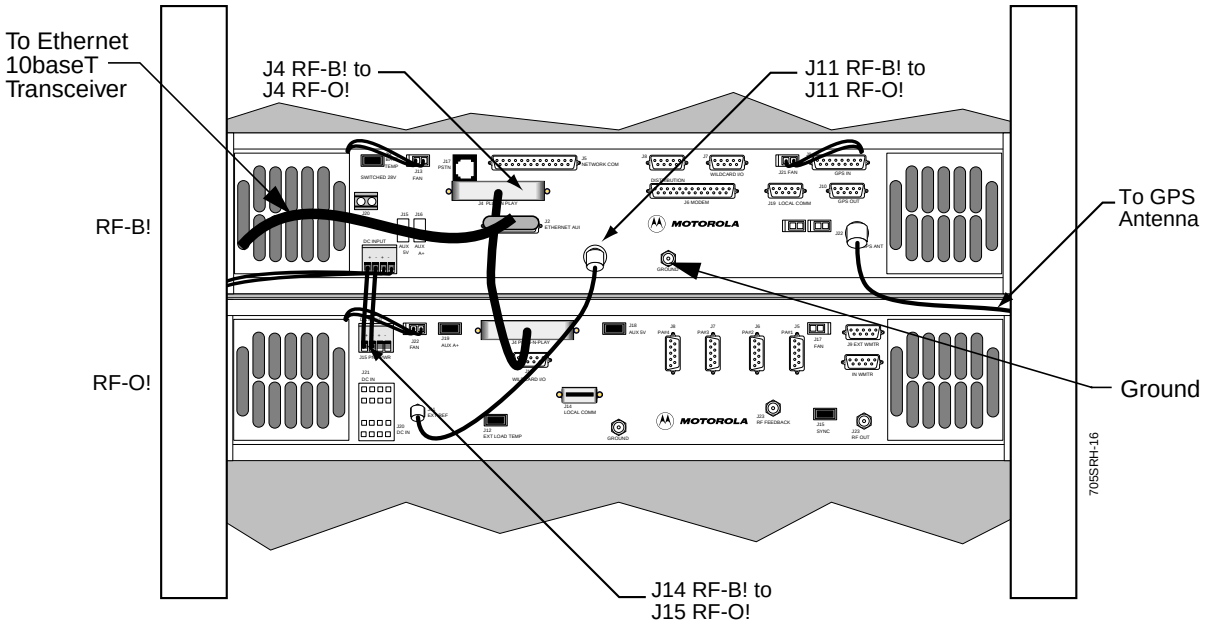


Figure 4-3: RF-B! Transmitter Controller Cabling (Rear View)

Tools

The following tools are required:

- 3/8 in. open end wrench
- 5/16 in. torque wrench
- 1/16 in. flat-blade screwdriver

Table 4-3: RF-B! Transmitter Controller Cabling Connections

RF-B! Transmitter Controller	RF-O! Transmitter	Motorola Part No.	Description
J4	J4	3080508R03	Plug-n-Play (PnP) Cable: DB25-to-DB25
J6	NA	3082750X01	Modem cable: DB25 Female
J9	NA	3086130G01 and 3086130G02	External GPS Input: DB25 Female
J11	J11	0112004Z03	Frequency Reference: BNC-to-BNC
J12	NA	3080508R04	Ethernet AUI: DB15 Female
J14	J15	3080609R09	DC Power Cable: +28 Vdc
J18		3080610R02	Battery Temperature: 3 PIN
J22	NA	3080571S01	Input from GPS antenna: 50 Ohm coaxial cable
GND	NA	3082000X02	Ground wire: 16 AWG

Note: Appendix B lists the connector pinouts.

1. From the rear of the cabinet, open the cabinet door to access the backplane.

2. Connect the GPS antenna cable (Motorola part number 3080571S01) to the GPS ANT connector (J22) on the RF-B! transmitter controller and the other end to the GPS connector on the cabinet input panel.

   Use a 3/8 in. open-end, back-up wrench and a 5/16 in. torque wrench calibrated to 6 in./lb to secure the connectors.

3. Connect the PnP cable (Motorola part number 3080508R03) to the PLUG N PLAY connector (J4) on the RF-B! transmitter controller and the PLUG N PLAY connector (J4) on the RF-O! transmitter.

   Use a flat-blade screwdriver to secure the connectors.

4. Connect the 10 MHz reference cable (Motorola part number 0112004Z03) to the REF FREQ connector (J11) on the RF-B! transmitter controller and the EXT REF connector (J11) on the RF-O! transmitter.

Use a 3/8 in. open-end, back-up wrench and a 5/16 in. torque wrench calibrated to 6 in./lb to secure the connectors.

5. Connect the 15 pin ethernet adapter (Motorola part number 3080508R04) to the ETHERNET AUI connector (J12) on the RF-B! transmitter controller and the other end to the ethernet 10baseT transceiver on the cabinet input panel.

   Use a flat-blade screwdriver to secure the connectors.

6. Attach the ground cable (Motorola Part Number 3082000X02) to the ground stud under the Motorola logo using the M5 lock nut and the other end to the cabinet.

   Use a 5/16 in. torque wrench calibrated to 6 in./lb to secure the nut.

7. Connect the DC power cable to the PRI PWR connector (J15) on the RF-O! transmitter and the DC INPUT connector (J14) on the RF-B! transmitter controller.

Powering Up the System

After all external connections have been made to the RF-B! transmitter controller, the station is ready for operation.

Perform the following procedure to verify proper operation of the RF-O! paging station and RF-B! transmitter controller during power up.

1. Place the main AC power distribution unit circuit breaker in the ON position (see Figure 4-4).

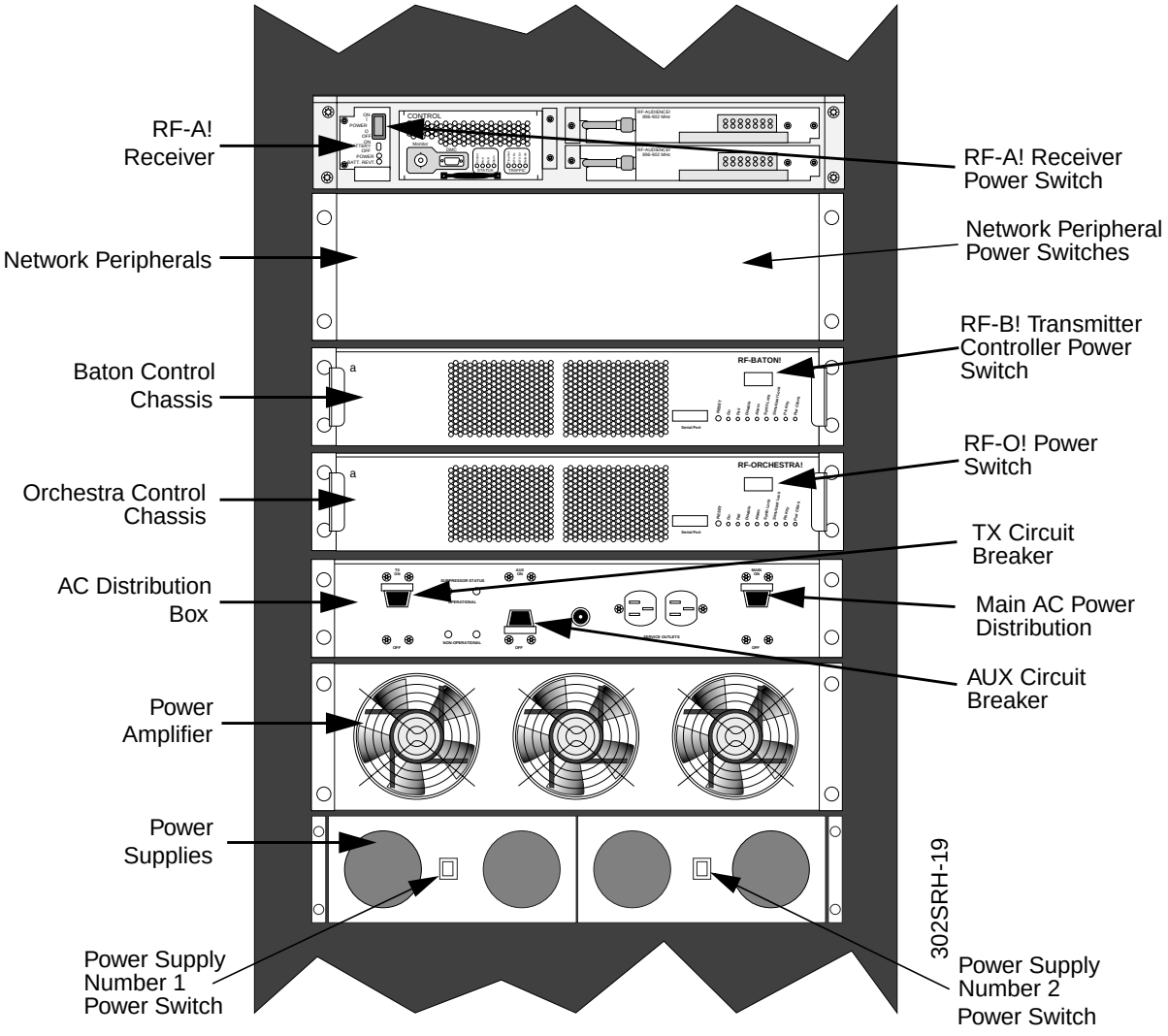


Figure 4-4: RF-O! Paging Station Power Switches

2. Place the TX and AUX circuit breakers in the ON position.

Note: The green light-emitting diode (LED) on the AC power distribution unit indicates the surge suppression is functional.

3. Place the AC Power Supply module Power switch in the ON position.

   Repeat for all power supply modules (up to four).

Note: Any AC power in the ON position sources power to the RF-O! transmitter and RF-B! transmitter controller chassis.

4. Place the RF-O! transmitter POWER switch in the ON (|) position.
   - All RF-O! transmitter LEDs light briefly during power up.
   - ON and Alarm are the only RF-O! transmitter LEDs lit after power-up self tests are complete.

5. Place the RF-B! transmitter controller POWER switch to the on position (|).
   - All seven RF-B! transmitter controller LEDs light briefly during power up (see Figure 4-5).
   - All seven RF-B! transmitter controller LEDs turn off for 1 second.
   - All LEDs reflect normal operational conditions within 25 minutes (see Table 4-4).
   - Control On and Alarm are the only RF-B! transmitter controller LEDs still lit after power-up self tests are complete.

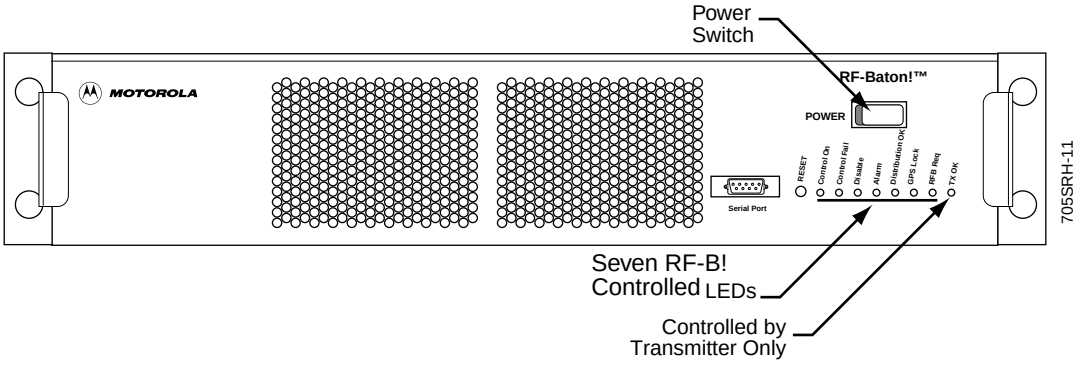


Figure 4-5: RF-B! Transmitter Controller (Front View)

Table 4-4: Normal RF-B! Transmitter Controller LED Conditions

LED	Function	Normal Condition
Control On	On after successful completion of reset sequence	ON
Control Fail	On when a normal Baton control module failure is detected in the reset sequence	OFF
Disable	On when normal messaging activity is disabled	OFF
Alarm	On after station alarm is detected	OFF
Distribution OK	Not used	Not used
GPS Lock	On when satellite receiver locks on at least 3 satellites	ON
RFB Req	Not used	Not used
TX OK	On when transmitter is connected and ready to receive data (Note: Controlled by transmitter only.)	ON

6. Turn on network peripherals (refer to the appropriate vendor manuals).

7. Release the front cover of the RF-Audience! (RF-A!) receiver and place the POWER switch in the ON (|) position.

   Repeat for all co-located receivers.

8. Upon Initial installation, ensure the RF-O! paging station is continuously powered up and uninterrupted for at least 60 minutes to allow the GPS receiver time to determine the site location, build the GPS almanac, and lock on to the appropriate satellites.
   - The Exciter Lock LED on the RF-O! transmitter lights within 15 minutes.
   - The GPS LOCK LED on the RF-B! transmitter controller lights within 25 minutes.

When the Exciter Lock LED on the RF-O! transmitter and the GPS Lock LED on the RF-B! transmitter controller light, the station is ready for paging. Subsequent resets of the RF-B! transmitter controller do not require as long to initialize if the station has not been moved.

General Operational Setup and First Time Use

The factory installs all software necessary for operating the RF-B! transmitter controller. There are, however, site specific setups that are necessary before the RF-B! transmitter controller is ready to perform paging operation. The following sections provide detailed procedures for all site specific setups.

All setup procedures use a service terminal using the Friendly Integrated Paging System (FIPS) protocol to interface with the RF-B! transmitter controller. If unfamiliar with this interface, reference Chapter 5, "Operation", paragraph, "Service Terminal" for a detailed FIPS tutorial.

The setup procedures are broken down into the following parts:

- Networking
- Transmitter interface, RF-B! setup
- GPS value recording

Networking Setup

This procedure configures the RF-B! transmitter controller site specific networking parameters for normal operation with an ethernet input. Refer to the site network plan for the information required to complete this procedure. Record the site specific values of the networking information in Table 4-5.

Table 4-5: Site-Specific Network Parameter Checklist

Parameter	Related FIPS Command	Value
OPP UDP Port	r or w 55	See the network site plan.
RF-B! IP Address	r or w 705	
Subnet Mask	r or w 706	
Default Gateway Address	r or w 708	
SNMP Network Manager Address	r or w 500, 501,502, 503, 504	
TFTP Server IP Address	a 301	

1. Start a FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

2. Verify the User Datagram Protocol (UDP) port number of the Outbound Paging Protocol (OPP) connection. Type:

   r 55 <Enter>

   The system responds:

   RR 55 xxxxx (see the site network plan for the value of xxxxx)

   If the system responds with any value other than xxxxx, type:

   w 55 [xxxxx] <Enter> (see the site network plan for the value of xxxxx)

3. Set the RF-B! Internet Protocol (IP) address according to the site network plan. Type:

   w 705 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

4. Set the RF-B! Subnet mask according to the site network plan

   w 706 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

Note: 0x indicates that the number is hexadecimal.

5. Set the default gateway address according to the site network plan. Type:

   w 708 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

6. Set the network address for each of the Simple Network Management Protocol (SNMP) network managers (up to five). Type:

   w 500 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

   w 501 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

   w 502 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

   w 503 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

   w 504 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

7. Set the Trivial File Transfer Protocol (TFTP) server IP address according to the network plan. Type:

   a 301 xxx.xxx.xxx.xxx <Enter> where xxx=0–255 decimal

If your site is part of a multicast group, see Chapter 6, "Maintenance",paragraph, "Assigning an RF-B! Transmitter Controller to a Multicast Group".

The network parameters are set.

RF-B! Transmitter Controller Specific Setup

In addition to the networking parameters set in the preceding procedure, there are also RF-B! transmitter controller specific parameters that must be set upon installation. A table of the necessary information is provided below. Record the site specific values in Table 4-6.

Table 4-6: Site-Specific RF-B! Transmitter Controller Parameter Checklist

Parameter	Related FIPS Command	Value
Transmitter Color Code Value	r or w 704	
Baton Control Module (BCM) Identifier Number	r or w 155	

1. Start a FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

2. Set the transmitter color code value. Type:

   w 704 [value] <Enter> where value= 0–65535 decimal

3. Set the BCM serial number. Type:

   w 155 [identifier number] <Enter> where serial number is 8 alphanumeric characters

The RF-B! transmitter controller site specific parameters are set.

OncoreVP GPS Value Recording

The RF-B! transmitter controller performs auto-configuration of the OncoreVP GPS receiver. Record the GPS values after obtaining GPS lock in Table 4-7. This information can help to speed up the recovery process if you lose GPS lock or have to replace an RF-B! transmitter controller or any of the field replaceable units (FRUs).

Table 4-7: RF-B! Transmitter Controller Oncore GPS Data

Command	Record	Address
r 194	**GPS Station Latitude**	
r 195	**GPS Station Longitude**	
r 196	**GPS Station Height**	
r 800	**UHSO Warp Value**	

1. Start a FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

2. To confirm the auto-configuration of the RF-B! transmitter controller, type:

   a 212 <Enter>

   The system responds:

```
RA  212

COPYRIGHT 1991-1996 MOTOROLA INC.
SFTW P/N # 98-P36830P
SOFTWARE VER # 8
SOFTWARE REV # 8
SOFTWARE DATE  06 Aug 1996
MODEL #    B3121P1115
HDWR P/N # _
SERIAL #   SSG0190511
MANUFACTUR DATE 6L25
OPTIONS LIST    IB
```

Operational Checkout

Because the RF-B! transmitter controller operates in conjunction with the associated transmitter, a complete operational check of the RF-B! transmitter controller includes the transmitter. The following steps provide operational checkout procedures for the RF-B! transmitter controller. Refer to the appropriate documentation with your paging station for interconnection details.

Operational checkout for the RF-B! transmitter controller consists of procedures for:

- GPS operation
- Messaging data path

Equipment

The following equipment is required to checkout the RF-B! transmitter controller:

- Service terminal with communications software
- DB-9 to DB-9 straight-through cable with null modem adapter

GPS Operation Checkout Procedure

This procedure verifies the operational performance of the BCM with regards to GPS. This procedure does not require, but may be run with, messaging data being received by the BCM from the ethernet input.

Note: The example trace outputs provided with this procedure are for the Motorola OncoreVP GPS receiver. If another GPS receiver is being used, the output may differ slightly.

Perform the following procedure to checkout the GPS function of the RF-B! transmitter controller:

1. Perform a power-on reset of the RF-B! transmitter controller (see Chapter 5, "Operation", paragraph, "Power-on Reset").

2. Start a FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

3. Enable the GPS initialization trace. Type:

   a 192 GPSC 8 <Enter>

   The system responds:

   RA 192

   The BCM outputs GPS initialization data for approximately 15 minutes. Here is an example of the initialization data:

```
GPS STATE VERIFY_SOFTWARE_REVISION
GPS software version 8 revision 8
GPS STATE EXECUTE_SELF_TEST
GPS STATE SET_POS_FIX_TYPE
GPS STATE SET_FIX_MODE
GPS STATE SET_APPLICATION_TYPE
GPS STATE SET_LATITUDE
GPS STATE SET_LONGITUDE
GPS STATE SET_HEIGHT
GPS STATE SET_SATELLITE_MASK_ANGLE
GPS STATE SET_1PPS_CABLE_DELAY_OPTION
GPS STATE DISABLE_POSITION_HOLD_OPTION
GPS STATE WAIT_FOR_3D_LOCK*
GPS STATE WAIT_FOR_POSITION_CONVERGE*
GPS STATE SOLVE_FOR_LOCATION*
GPS STATE SET_FINAL_SATELLITE_MASK_ANGLE
GPS STATE SET_POSITION_HOLD_STGPS STATE
GPS STATE INIT_COMPLETE
```

Note: Lines marked with an asterisk (*) will occur many times.

4. Verify the front panel GPS lock LED lights shortly after the trace displays INIT COMPLETE.

5. Check the GPS receiver status for a value of 0x8. Type:

   a 208 <Enter>

   The system responds:

   RA 208

   # visible satellites = 8, # tracked satellites = 8 receiver status = 0x8
   ID=1 Mode=8 SS=41 Status=0xa8
   ID=14 Mode=8 SS=43 Status=0xa8
   ID=15 Mode=8 SS=43 Status=0xa0
   ID=21 Mode=8 SS=36 Status=0xa8
   ID=22 Mode=8 SS=35 Status=0xa8
   ID=25 Mode=8 SS=63 Status=0xa8

Note: This command displays the receiver status as well as satellite information. Only six satellites are displayed despite the number of visoble or tracked satellites.

For a further explanation of the output of this action command, refer to the FIPS action command table in Appendix C.

6. Wait one minute, then check the simulcast status by enabling the trace. Type:

   a 192 SASM 32 <Enter>

   The system responds:

   RA 192

   State: 4, pps_occured: 1, pps_within_window: 1

7. The RF-B! transmitter controller must be in State 4. If the RF-B! transmitter controller is in state 1, 2, or 3, wait 30 to 60 seconds and repeat Step 6.

The GPS operation checkout is complete.

Paging Data Path Checkout Procedure

This procedure verifies the operational paging performance of the RF-B! transmitter controller. This procedure has two prerequisites:

- GPS lock

- Operational Motorola RF-O! paging station ready to transmit

1. Ensure that the GPS is locked (see paragraph, "GPS Operation Checkout Procedure").

2. Ensure that the RF-O! paging station is ready to transmit (reference *RF-Orchestra! Paging Station Installation and Operation*, Motorola Part No. 6880493G02*).*

3. Start a FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

Setting the RF-B! Transmitter Controller in Test Mode, Generation of AM Input Message Data

To checkout the RF-B! transmitter controller data path, message data must be available. This procedure should be run while receiving valid message data from the RF-Conductor! (RF-C!) controller but can also be run using the BCM to generate message data. If RF-C! controller data is available, skip Step 5 through Step 7 and go to Step 8.

4. Clear the Logs.

   a. Type: **a 103 <Enter>**

   The system responds:

   RA 103

Note: Two standard alarms are logged upon RF-B! transmitter controller reset. Clearing the alarm log also clears the front panel ALARM LED.

   b. Type: **a 111 <Enter>**

   The system responds:

   RA 111

   c. Type: **a 113 <Enter>**

   The system responds:

   RA 113

5. Set the subchannel offsets. Type

   a 195 1 2 3 1 <Enter>

6. Set the center frequency. Type:

   a 196 1 <Enter>

7. Begin the AM message data generation. Type:

   a 176 0 8 0 0 0 1 10 5 1 <Enter>

Note: For a detailed description of all the parameters used to set up and initiate the test message generation, see Chapter 5, "Operation", paragraph, "Test Data Mode".

Verifying the Paging Operation of the RF-B! Transmitter Controller

The following steps verify that the RF-B! transmitter controller is sending data and keying the transmitter.

8. Verify that the front panel TX_OK LED (green) is On.

   This indicates that the transmitter is ready to accept data from the RF-B! transmitter controller. If the TX_OK LED is not lit, begin troubleshooting the transmitter.

9. If using the RF-C! controller for input message data, verify the RF-C! controller to RF-B! transmitter controller connection using the Outbound Paging Protocol Manager (OPPM) trace. Type:

   a 192 OPPM 4 <Enter>

Note: This trace has no meaning if using the RF-B! transmitter controller test modes to generate test message data. If you are using test modes, skip to Step 11.

The system responds:

```
RA 192

=====================================================
PdmData { } = PilotOnly
Time   { } =  42 : 22 : 6150000
PdmApdu { } =
     rfChannelIndex = 0
     subchannel = 2

=====================================================
PdmData { } = InflexionSqm
Time   { } =  42 : 22 : 6350000
PdmApdu { } =
     rfChannelIndex = 0
     subchannel = 2

=====================================================
PdmData { } = InflexionAdpcm24
Time   { } =  42 : 22 : 7250000
PdmApdu { } =
     rfChannelIndex = 0
     subchannel = 2
          SideBandMode = 0 (0 = lower, 1 = upper)
=====================================================
```

Note: The exact output of this trace depends on the input data. The presence of this trace verifies the RF-C! controller to RF-B! transmitter controller connection

10. Disable the OPPM trace. Type:

    a 193 OPPM 4 <Enter>

    The system responds:

    RA 193

    The trace stops

11. Verify that the RF-B! transmitter controller has enabled paging. Type:

    a 192 PCRM 2 <Enter>

    The system responds:

    RA 192

    The trace begins. If using the RF-C! controller to generate input data and paging is enabled, the following message is displayed:

    Paging is Enabled!

Note: *When paging is enabled, the RF-B! transmitter controller has recognized that:*
a) The TX_OK line is set.
b) The Simulcast Manager is in a simulcast operational state.
c) Paging has not been disabled by the user (using FIPS).

If using the RF-B! transmitter controller generated test messages, the following message is displayed:

In test mode!

12. Disable the Page Control Receive Manager (PCRM) trace. Type:

    a 193 PCRM 2 <Enter>

    The system responds:

    RA 193

    The trace stops.

13. Verify the RF-B! transmitter controller is sending data to the transmitter over the PnP connection. Type:

    a 192 DRT1 1 <Enter>

    The system responds:

    RA 192

    DRTR1: inc=185 delta=185 mod=0 id=832854C

Note: The presence of the trace is proof. The actual trace content may change according to your system setup.

14. Disable the PnP data router trace. Type:

    a 193 DRT1 1 <Enter>

    The system responds:

    RA 193

    The trace stops.

15. Finally, verify that the RF-B! transmitter controller is keying the transmitter. Verify the PA Keyed LED (fourth LED from the right) on the RF-O! transmitter is On (see Figure 4-6).

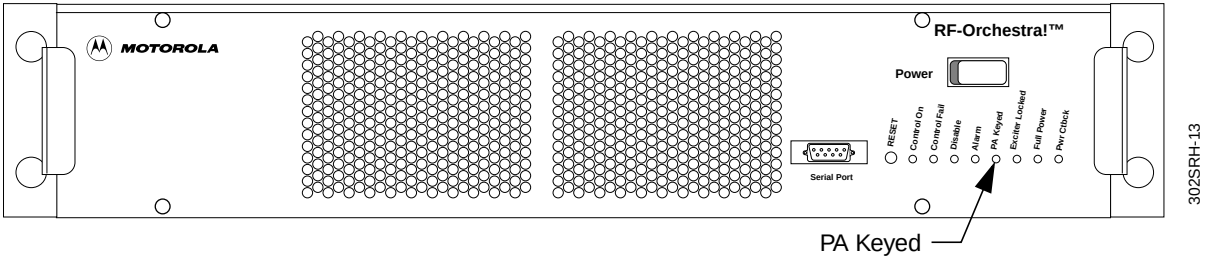


Figure 4-6: RF-O! transmitter Front Panel

16. If using the RF-B! transmitter controller to generate test data, disable the test messages and dekey the transmitter. Type:

    a 177 <Enter>

17. Re-check the RF-B! transmitter controller paging status using the PCRM trace. Type:

    a 192 PCRM 2 <Enter>

    The system responds:

    RA 192

    The trace begins. The following output appears:

    Paging is Enabled!

18. Clear the Logs.

    a. Type: **a 103 <Enter>**

    The system responds:

    RA 103

Note: Two standard alarms are logged upon RF-B! transmitter controller reset. Clearing the alarm log also clears the front panel ALARM LED.

    b. Type: **a 111 <Enter>**

    The system responds:

    RA 111

    c. Type: **a 113 <Enter>**

    The system responds:

    RA 113

19. Verify the following LEDs on the RF-B! transmitter controller are lit:
    - Control ON (green)
    - Distribution OK (green)
    - GPS Lock (green)
    - RF-B REQ (green)
    - TX_OK (green)

The RF-B! transmitter controller operation checkout is complete.

Operation

Interfacing with the RF-B! Transmitter Controller

You can interface with the RF-B! transmitter controller using the Choreographer! network manager or a service terminal. Both provide similar interface functionality to the RF-B! transmitter controller, though the user interface is different.

Choreographer! Network Manager

The Choreographer! network manager is a software interface for voice and data communications, used in the paging infrastructure. The interface manages and configures network devices, including the RF-Audience! (RF-A!), RF-B!, and RF-Orchestra! (RF-O!) at each station. For a complete description of how to use the Choreographer! network manager to interface with the RF-B! transmitter controller, refer to *Choreographer!™ Network Manager Installation and Operation* manual, Motorola Part No. 6880492G07.

Service Terminal

The service terminal is usually an IBM®–compatible personal computer (PC) running a compatible communications software program. Procomm Plus® is the recommended communications software program; however, an equivalent program may be used. The service terminal connects to the serial port on the RF-B! transmitter controller front panel (see Figure 5-1). For convenience, use an RS-232 cable at least 10-ft (3.05 m) long with a DB9 connector.

The service terminal provides a command line interface with the RF-B! to access all station parameters and functions using the Friendly Integrated Paging System (FIPS) protocol. The FIPS interface is used throughout this manual for RF-B! installation, operation and troubleshooting.

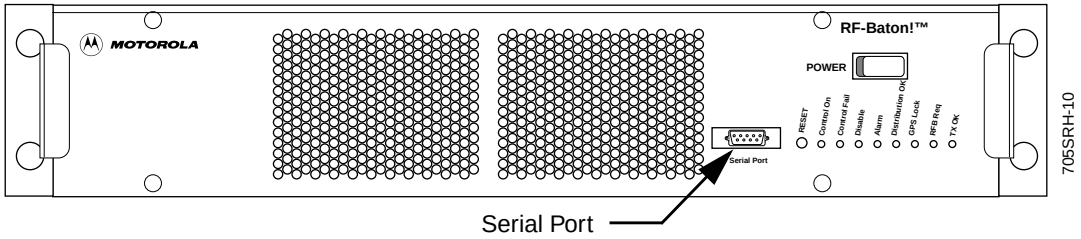


Figure 5-1: RF-B! Transmitter Controller (Front View)

Service Terminal Setup

Perform the following steps to connect the service terminal for communications:

1. Connect the service terminal to the RF-B! transmitter controller serial port connector using an RS-232 cable with a DB-9 connector and a null modem adapter. (See Figure 5-1).

Note: The RF-B! transmitter controller serial port connector is configured as Data Terminal Equipment (DTE). A null modem adapter must be used for the service terminal to interface with the serial port connector.

2. Switch on the service terminal.

3. Set the flow control to none.

4. Set the service terminal to the parameters listed below (see Table 5-1).

Table 5-1: Service Terminal Interface Parameters

Description	Setting
Baud rate	9600 (Default Value)
Parity rate	None
Data bits	8
Stop bits	1
Emulation	VT100

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

5. Type: **<Enter>**

   The service terminal displays:

   ENTER PROTOCOL:

6. Type: **FIPS <Enter>**

   The service terminal displays:

   ENTER PASSWORD:

Note: The default password set at the factory is 6000.

7. Type: **[password] <Enter>**

   The service terminal displays:

   RFB FIPS:

You are now connected to FIPS and ready to perform action, read, and write commands.

FIPS Commands

FIPS commands are used to control the RF-B! transmitter controller. Commands are broken down into three categories:

- Action commands
- Read parameter command
- Write parameter command

Table 5-2 shows the FIPS command syntax.

Table 5-2: Commands Table (Sheet 1 of 2)

Command[1]	Designator	Description
Action Command **a XXX YYY <Enter>**	a [2] XXX YYY **<Enter>**	An action command The numerical value of action parameter An action argument Pressing the **<Enter>** key performs an action

Table 5-2: Commands Table (Sheet 2 of 2)

Command[1]	Designator	Description
Parameter Read **r XXX <Enter>**	r XXX **<Enter>**	Read from memory command Numerical value of parameter to be read Pressing the **<Enter>** key performs an action
Parameter Write: **w XXX YYY <Enter>**	w XXX YYY **<Enter>**	Write to memory command The numerical value of a parameter to be changed Argument to be written Pressing the **<Enter>** key performs an action

1. Some action commands may not need any argument and some write commands may use more than one argument.

2. May be upper or lower case.

Action Commands

In general, an action command causes the RF-B! transmitter controller to change operating modes or interact with an external entity. An action command can write one or more parameters to the internal Baton Control Module (BCM) memory or performs a series of functions. The action command appears in the following format:

a [command #] [parameter or list] <Enter>

This is an example of an action command. The following action command interfaces with the Global Positioning System (GPS) receiver and returns the GPS status to the user.

RFB FIPS: **a 208 <Enter>**
RFB FIPS: RA 208
visible satellites = 10, # tracked satellites = 8 receiver status = 0x8

ID=1 Mode=8 SS=55 Status=0xa8
ID=25 Mode=8 SS=49 Status=0xa8
ID=29 Mode=8 SS=52 Status=0xa8
ID=8 Mode=8 SS=57 Status=0xa8
ID=5 Mode=8 SS=21 Status=0xa8
ID=30 Mode=8 SS=18 Status=0xa8

Appendix C lists the RF-B! action commands.

Read Parameter Command

A read command returns a parameter value as stored in internal RF-B! transmitter controller nonvolatile memory. The read command appears in the following format:

r [parameter #] <Enter>

For example, to read the active bank software version:

RFB FIPS: **r 148 <Enter>**
RFB FIPS: RA 148 1.5.2

Appendix C lists the RF-B! read commands.

Write Parameter Command

A write command writes a single parameter value to the internal RF-B! transmitter controller nonvolatile memory. The write command appears in the following format:

w [parameter #] [parameter] <Enter>

For example, as used in the Installation chapter, to set the transmitter color code,

RFB FIPS: **w 704 1[value]**
RFB FIPS: RW <value>

Appendix C lists the RF-B! write commands.

Note: In a few cases, a write command behaves like an action command in the sense that the write command causes the RF-B! transmitter controller to change operating modes.

Customizing FIPS

The following procedures customize your FIPS sessions for a specific RF-B! transmitter controller.

Changing the FIPS Password

To enter a terminal session using FIPS, you must enter a password. The factory default FIPS password is **6000** but may be changed for greater security. Access the password through FIPS parameter 707. For example; to change the password to baton, type:

w 707 baton <Enter>

The system responds:

RFB FIPS: RW 707 baton

Note: Resetting the parameter database resets the FIPS password to the factory default.

Changing the FIPS Inactivity Time-out

If a period of time elapses without activity at the FIPS port, the RF-B! transmitter controller FIPS session times out and requires the user to re-enter a password. These actions do not affect paging operation.

The factory default FIPS inactivity time-out is 300 seconds. You access the inactivity time-out through FIPS parameter 136. For example; to change the inactivity time-out to 1800 seconds (30 minutes), type:

w 136 1800 <Enter>

The system responds

RFB FIPS: RW 136 1800

Note: Resetting the parameter database resets the FIPS inactivity timeout to the factory default.

Changing the Serial Port Baud Rate

You access the FIPS serial port connect baud rate through FIPS parameter 139. The factory default value of this parameter is 9600 bits per second (bps). For example; to change the baud rate of the serial connection to 4800 bps, type:

w 139 3 <Enter> (The input baud rate parameter comes from Table 5-3.)

The system responds:

RFB FIPS: RW 139 3

Table 5-3: Serial Port Baud Rate Parameters

Baud Rate Parameter	Baud Rate
1	1200 bps
2	2400 bps
3	4800 bps
4	9600 bps
5	19.2 kbps
6	38 kbps
7	57 kbps
8	115 kbps

Note: Be sure to change the baud rate of the terminal emulation program to correspond with the FIPS baud rate

Configuration

This section contains RF-B! transmitter controller FIPS commands that allow you to check the software and network configurations.

Software Configuration

The following commands provide access to the RF-B! transmitter controller software configuration. The FLASH Single In-line Memory Module (SIMM) located on the BCM contains two separate memory banks where RF-B! transmitter controller software can reside. Only one bank, however, can be active at a time.

Active Software Bank

To determine which of the software banks is currently active, type:

r 901 <Enter>

The systems responds:

RFB FIPS: RR 901 <bank>

If bank = 1, Bank A is active. If bank = 2, Bank B is active.

The software version in the active bank can be determined by reading FIPS parameter 148. For example; if the RF-B! transmitter controller is running software version 1.5.4, and you type:

r 148 <Enter>

The system responds:

RFB FIPS: RR 148 1.5.4

Dormant Software Bank

Likewise, the software version resident in the dormant bank can be determined by reading FIPS parameter 152. For example; if the dormant software bank contains software version 1.4.4, and you type:

r 152 <Enter>

The system responds:

RFB FIPS: RR 152 1.4.4

Current MIB Version

For network management purposes, the Management Information Base (MIB) of the active software version can be determined by reading FIPS parameter 154. For example; type:

r 154 <Enter>

The system responds:

RFB FIPS: RR 154 4 (Where the MIB version is 4.)

Network Configuration

The necessary initial network configuration of the RF-B! transmitter controller is detailed in Chapter 4, "Installation", paragraph, "Networking Setup". The site-specific parameters set during the installation procedure are necessary for proper message operation.

This section contains an overview and description of the FIPS availability of the network configuration parameters of the RF-B! transmitter controller.

Table 5-4: Network Configuration Parameters

Parameter	FIPS Parameter ID	Description
UDP Port	55	The transport layer port number used for Outbound Paging Protocol (OPP) message data.
SNMP IP	500-504	The Internet Protocol (IP) addresses for up to five independent network managers.
Color Code	704	InFLEXion protocol transmitter color code located in outbound control information. Each transmitter color code is unique.
Local IP	705	The IP address for the RF-B! transmitter controller. This is unique for each RF-B! transmitter controller on the network.
Subnet Mask	706	The subnet mask of the physical subnetwork that the RF-B! transmitter controller is connected to.
Gateway IP	708	The IP address of the router that connects to the RF-B! transmitter controller.

These parameters are all read or write, but they should only be set upon initial installation or network reconfiguration.

IP addresses are specified in Decimal Dot Notation (DDN). For example; to read the local IP address of the RF-B! transmitter controller, type:

r 705 <Enter>

The system responds:

RFB FIPS: Network IP Address: 192.183.23.1

In this example, the RF-B! transmitter controller IP address in DDN is 192.183.23.1.

Reset and Initialization

The RF-B! transmitter controller operation has three different types of resets. This section explains the differences between the available reset types. Motorola encourages a thorough understanding of each reset type to minimize the station down time when a reset is necessary.

The available reset types are:

- Power-on reset
- Hard reset
- Software reset

Power-on Reset

The power-on reset is the most thorough reset available. This reset occurs when power to the RF-B! transmitter controller is interrupted. A power-on reset returns the RF-B! transmitter controller microprocessor, external interfaces, the Ultra-High Stability Oscillator (UHSO), and GPS receiver to initial default conditions. Upon power-on reset, the following actions are performed:

- RF-B! transmitter controller control software boot
- Network initialization
- FIPS initialization
- Complete GPS receiver and simulcast initialization

After the RF-B! transmitter controller software boot, network initialization, and FIPS initialization are complete, the FIPS banner appears on the service terminal screen (if connected).

```
>>>>>>>        MOTOROLA RF-BATON!        <<<<<<<
>>>>>>>  WIRELESS MESSAGING SYSTEM (WMS)  <<<<<<<
>>>>>>>  (c) Copyright 1998 Motorola, Inc.  <<<<<<<
>>>>>>>        All Rights Reserved.        <<<<<<<

>>>>>>>  DEFAULT PARAMETER VALUES NOT LOADED  <<<<<<<
```

At this point in the power-on reset cycle, FIPS communication with the RF-B! transmitter controller is available.

A complete power-on reset takes approximately 15 to 20 minutes, the majority of the time performing GPS acquisition and lock. After the GPS receiver has acquired lock, the front panel GPS lock LED lights and simulcast initialization completes the reset cycle.

Simulcast initialization takes approximately one minute to complete after the front panel GPS lock LED lights. During the final simulcast initialization, the RF-B! transmitter controller system time is synchronized to GPS time. At the completion of a power-on reset, the RF-B! transmitter controller is ready to page.

A power-on reset clears the alarm, error, and software logs. All information contained in these logs regarding previous operation is lost.

If the hardware dual in-line package (DIP) switch #2 ON switch SW600 is enabled during reset, the software parameter database reinitializes to default values during software boot (see Chapter 6, "Maintenance", paragraph, "Resetting the Parameter Database").

Hard Reset

A hard reset of the RF-B! transmitter controller occurs when the reset button on the front of the RF-B! transmitter controller is pressed. Pressing the RF-B! transmitter controller reset button causes the following actions to occur:

- RF-B! transmitter controller control software boot
- Network initialization
- FIPS initialization
- GPS initialization check and simulcast initialization

A hard reset of the RF-B! transmitter controller differs from a power-on reset only in the handling of GPS initialization. After a hard reset has occurred, the RF-B! transmitter controller control software checks the operational status of the GPS receiver to determine if a complete acquisition and lock is necessary.

During a typical hard reset, a complete GPS receiver initialization is not necessary. In such a case, the front panel GPS lock light-emitting diode (LED) lights, and the simulcast initialization completes the reset cycle. The entire reset cycle takes approximately one and one-half minutes.

If the GPS receiver initialization is necessary, the reset cycle takes the same amount of time as a power-on reset.

Software reset

A software reset of the RF-B! transmitter controller is commanded using the FIPS interface. A software reset is functionally equivalent to a hard reset and causes the following actions to occur:

- RF-B! transmitter controller control software boot
- Network initialization
- FIPS initialization
- GPS initialization check and Simulcast initialization
- Station and software logs are maintained

The FIPS software reset command is **a 117**.

Note: Given the significant time differences required by the power-on reset and the hard or software reset, Motorola recommends that you use the power-on reset only when necessary.

Operation Modes

The RF-B! transmitter controller has three operation modes:

- Normal paging mode
- Trace mode
- Test-data mode

Note: The trace mode, and test-data mode are test modes that can interfere with normal transmitter operation. These modes are for advanced diagnostics only and may require assistance from a Motorola service representative.

Normal Paging Mode

This is the normal and default mode of operation for the RF-B! transmitter controller. Upon any type of reset, the RF-B! transmitter controller control software returns to paging mode after GPS and Simulcast initialization. While operating in this mode, all RF-B! transmitter controller functions are available, and input message data is transferred to the transmitter.

Paging with GPS

During normal paging operation, the RF-B! transmitter controller simulcast manager monitors GPS lock. While operating with GPS lock, the station time is synchronized with GPS time.

Paging with FREERUN

The RF-B! transmitter controller can temporarily operate in FREERUN, a condition when the simulcast manager has lost GPS lock. During this time, the RF-B! transmitter controller simulcast manager maintains normal paging operation while attempting to reacquire GPS lock. If GPS lock is reacquired within the FREERUN time-out value, the RF-B! transmitter controller simulcast exits FREERUN and continues operation with GPS. If GPS lock is not reacquired, paging operation is disabled until GPS lock is re-acquired.

Note: The FREERUN timeout value is programmable. The factory default is 96 minutes.

Trace Mode

The trace mode is ordinarily used to verify operation or debug the station by echoing data from various test points in the system to the FIPS display.

Note: Notify the control center before initiating a trace. Some trace modes affect station performance and can cause loss of distribution data due to extra processing delays.

To start a trace, perform the following steps:

1. Establish a FIPS session (see paragraph, "Service Terminal").

2. To start the trace, type:

   a 192 [task name] [flag] <Enter>

   The trace starts immediately.

   For example, to start the Outbound Paging Protocol Manager (OPPM) trace and monitor input message data the **a 192** command appears as follows:

   a 192 OPPM 4 <Enter>

3. After a trace is no longer needed, issue the following FIPS command to end that trace:

   a 193 [task name] [flag] <Enter>

   The trace stops immediately.

   For example, to disable the OPPM trace, type

   a 193 OPPM 4 <Enter>

Note: The options must be entered in exactly the same way as when issuing the FIPS action command 192 or the trace will not stop.

For further details on the 192 and 193 action commands, see the FIPS action command description in Chapter 6, "Maintenance", paragraph, "Data Path Diagnostics", and Appendix C. A description and example of each available trace is provided in Appendix E.

Test Data Mode

Test data transmission Mode is usually used to test the RF path and performance of the connected transmitter. While in this mode, the RF-B! transmitter controller generates test data which is transmitted to the transmitter. The contents of the test message data is determined by the user.

Before initiating a test mode, ensure that the transmitter is connected properly and the distribution network has been disconnected.

To set up and execute a test transmission, perform the following steps:

1. Establish a FIPS session (see paragraph, "Service Terminal").

2. Set the transmission frequency to 1 of 16 possible values. Type:

   a 196 [frequency index] <Enter> (where frequency index = 0–15)

   The frequency index in the **a 196** command directly corresponds to parameters maintained on the transmitter. To be precise, the transmitter parameter 2000 contains the center frequency for frequency index = 1, and subsequently transmitter parameter 2015 contains the center frequency for frequency index = 15.

   Refer to *RF-Orchestra! Paging Station Installation and Operation*, Motorola Part No. *6880493G02* for more information on determining and setting the center frequency.

   For further information on the 195 and 196 action commands, refer to the FIPS action command description in Appendix C.

3. Set the offset of each subchannel relative to the center frequency. Type:

   a 195 [offset_1 offset_2 offset_3 offset_4] <Enter>

   where **offset_n** = frequency offset for subchannel 1–4.

   The offsets set in the **a 195** command are from the center frequency set in Step 2. Each offset value ranges from 0–15 according to Table 5-5.

Table 5-5: Subchannel Offset

Offset	Offset Index	Frequency
0	0	0 kHz
1	1	6.25 kHz
2	2	12.5 kHz
3	3	18.75 kHz
4	4	25.0 kHz (not supported)
5	5	31.25 kHz (not supported)
6	6	37.5 kHz (not supported)
7	7	43.75 kHz (not supported)
8	Reserved	Reserved
9	–7	–43.75 kHz (not supported)
10	–5	–37.5 kHz (not supported)
11	–5	–31.25 kHz (not supported)
12	–4	–25.0 kHz (not supported)
13	–3	–18.75 kHz
14	–2	–12.5 kHz
15	–1	–6.25 kHz

Starting an AM Test Mode

1. Start the AM test. Type:

   a 176 [mod pat_1 pat_2 pat_3 pat_4 repetition rate] <Enter>

   where:

   – **mod** = 1 for amplitude modulation (AM)

   – **pat_1**, **pat_2**, **pat_3**, and **pat_4** are the AM subchannel pattern indexes chosen from Table 5-6

   – **repetition rate** = 0–128 frames

   The test transmission starts immediately. The AM test mode keys the transmitter.

Table 5-6: AM Subchannel Pattern Indexes

Pattern Index	Pattern
0	Disabled
2	Random AM
4	Random AM with 1 sideband of training
5	Random AM with 2 sidebands of training

For more details on supported test transmission options, see the description of FIPS action command 176 in Appendix C.

Note: Ensure that the distribution network is reconnected when the test is complete, so normal processing can resume.

2. When the test is complete, disable the test mode. Type:

   a 177 <Enter>

   The test transmission ends immediately, and normal processing resumes.

Starting an FM Test Mode

1. Start the test. Type:

   a 176 [mod pat_1 pat_2 pat_3 pat_4 repetition_rate blocks bit_rate fsk] <Enter>

   where:

   – **mod** = 0 for frequency modulation (FM)

– **pat_1**, **pat_2**, **pat_3**, and **pat_4** are the FM subchannel patterns chosen from Table 5-7
– **repetition_rate** ranges from 0–128 frames
– the number of data **blocks** per frame ranges from 0–11
– data **bit_rate** is chosen from Table 5-8
– **fsk** is chosen from Table 5-9:

The test transmission starts immediately. The FM test mode keys the transmitter.

Table 5-7: FM Subchannel Patterns

Pattern Index	Pattern
0	Disabled
1	A Pattern
2	B Pattern
3	C Pattern
4	D Pattern
5	Big comma
6	Little comma
7	Staircase
8	Random

Table 5-8: Data Bit Rate Index

Bit Rate Index	Bit Rate
2	1600 bps
4	3200 bps
5	6400 bps

Note: The 1600 bps bit rate is only available with 2-level FSK

Table 5-9: FM FSK Index

FSK Index	FSK Level
0	2-level
1	4- level

For more details on supported test transmission options, see the description of FIPS action command 176 in Appendix C.

Note: Ensure that the distribution network is reconnected when the test is complete, so normal processing can resume.

2. When the test is complete, disable the test mode. Type.

   a 177 <Enter>

   The test transmission ends immediately, and normal processing resumes.

Note: The test modes provided for checking-out and troubleshooting a messaging station with no distribution network connection is available.

GPS Receiver FIPS Commands

The GPS receiver provides timing signals to the RF-B! transmitter controller which are critical for proper operation. The RF-B! transmitter controller requires a regular timestamp and one pulse per second (1 PPS) timing signal from the GPS receiver.

The available FIPS commands that interact with the GPS receiver can be separated into three groups. Each group contains commands which provide valuable information regarding the GPS receiver. They are:

- GPS configuration—receiver configuration data
- GPS values —including time, date, position, and dilution of position (DOP)
- GPS status—receiver health and GPS satellite status

OncoreVP GPS Configuration

Table 5-10 details the configuration of the OncoreVP GPS receiver. The GPS Config column contains the action command used; the Response Column shows a typical response to the action command; and the Description column details the configuration. The GPS configuration can not be altered by the user.

Table 5-10: OncoreVP GPS Receiver Configuration

GPS Config	Response	Description
xDOP **a 203**	RA 203 xDOP Type = PDOP	The type of DOP used by the GPS receiver. Chosen from **G**eometric, **P**osition, **H**orizontal, **V**ertical, and **T**ime
Height Reference **a 205**	RA 205 GPS ellipsoid height reference	Chosen reference height above chosen ellipsoid or above mean sea level.
Position Reference **a 206**	RA 206 position reference: N-IN-VIEW	Choose to calculate position using Best-4 or all visible satellites (N-IN-VIEW)
Application Type **a 207**	RA 207 application type: static	Used to optimize satellite search. Chosen from Air, Handheld, Land, Marine and Static.
Position Hold **a 213**	RA 213 Position-Hold: ENABLED	Used for optimization. Enabled or disabled.

GPS Values

Use the following procedures to access GPS values.

GPS Time and Date

Use the following FIPS action commands to acquire the current GPS time and date.

1. To get the current GPS time, type:

   a 215 <Enter>

   The system responds

   RFB FIPS: RA 215 Time 21:18:01

Note: The returned time is displayed in Greenwich Mean Time (GMT).

2. To get the current GPS date, type:

   a 214 <Enter>

   The system responds

   RFB FIPS: RA 214 Date: 10/28/1998

As long as the RF-B! transmitter controller is operating with GPS, the GPS time and date are also the system time and date.

GPS Positional Data

These action commands request and display the positional data held by the GPS receiver. As is done in Figure 4, paragraph, "OncoreVP GPS Value Recording", it is valuable to have the GPS receiver positional data recorded in order to speed GPS acquisition if the RF-B! needs to be replaced.

1. To get the current receiver latitude, type:

   a 200 <Enter>

   The system responds

   Latitude: +118232934 msec,

   32 degrees, 50 minutes, 32 seconds

2. To get the current receiver longitude, type:

   a 201 <Enter>

   The system responds

   Longitude -350255243 msec,

   -97 degrees, 17 minutes, 35 seconds

3. To get the current receiver height, type:

   a 202 <Enter>

   The system responds

   RFB FIPS: RA 202 Height +0021568 cm (ellipsoid) +0024020 cm (msl)

xDOP Value

The GPS lock acquired by the receiver is more stable with a lower xDOP value. In fact, in order to acquire GPS lock, the xDOP value must be less than 10. To check the receiver xDOP value, type:

a 204 <Enter>

The system responds:

RFB FIPS: RA 204 xDOP Value: 0.0

GPS Health and Status

Use the following FIPS commands to determine the GPS receiver health and tracking status.

GPS Receiver Status

To request the GPS receiver status, type:

a 208 <Enter>

The system responds:

```
RFB FIPS: RA  208
# visible satellites = 7, # tracked satellites = 7receiver status = 0x8
ID=19 Mode=8 SS=25 Status=0xa8
ID=14 Mode=8 SS=79 Status=0xa8
ID=16 Mode=8 SS=77 Status=0xa8
ID=22 Mode=8 SS=74 Status=0xa8
ID=18 Mode=8 SS=64 Status=0xa8
ID=3 Mode=8 SS=35 Status=0xa8
```

This status report shows the number of visible and tracked satellites in the GPS constellation, the receiver status, and the satellite information of up to six satellites. It is possible that a satellite that has information displayed is visible but is not one of the tracked satellites.

The receiver and satellite status words can be decoded using the FIPS action command table in Appendix C.

Satellite Status

The following action command displays a summary of the GPS constellation showing the number of visible satellites (up to 12), the Doppler frequency, location and health of each. Type:

a 209 <Enter>

the system responds:

```
RFB FIPS: RA  209
ID=3 Doppler=2256 ELE=30 AZI=125 HEALTH=0
ID=14 Doppler=-2724 ELE=40 AZI=209 HEALTH=0
ID=16 Doppler=-402 ELE=45 AZI=269 HEALTH=0
ID=18 Doppler=2870 ELE=35 AZI=316 HEALTH=0
ID=19 Doppler=2261 ELE=20 AZI=280 HEALTH=0
ID=22 Doppler=-2224 ELE=53 AZI=46 HEALTH=0
ID=31 Doppler=3385 ELE=15 AZI=163 HEALTH=0
```

For this message, the Doppler frequency is in Hertz, the elevation and azimuth are in degrees, and the satellite health is shown in Table 5-11:

Table 5-11: Satellite Health

Health	Description
0	Healthy and not removed
1	Healthy and not removed
2	Unhealthy and not removed
3	Unhealthy and removed

GPS Almanac Status

The following GIPS action command displays information corresponding to the currently used satellite almanac.

To view the almanac status, type:

a 211 <Enter>

and the system responds

```
RFB FIPS: RA  211
RAM:    valid
        week:   213
        time:   123
        #avail: 27
        SVID:   0x77f7f3ff
ROM:    valid
        week:   213
        time:   123
        #avail: 27
        SVID:   0x77f7f3ff
```

The GPS receiver updates the almanac periodically. This status message displays the status of the currently used almanac, located in Random Access Memory (RAM) as well as the almanac stored in Read Only Memory (ROM).

Alarm and Error Logs

The RF-B! transmitter controller software allows access to the station alarm and error logs. This information is useful when investigating a station performance issue or during routine maintenance cycles. The RF-B! transmitter controller provides three logs:

- Station Alarm Log—station alarms since last reset
- Station Error Log—station error history; operational errors
- Software Error Log—software debug log; no operational errors

Appendix D contains a complete list of logged alarms and errors along with their severity.

Alarm Log

The alarm log contains the alarms logged since the last reset or alarm log clear. The alarm log is useful in determining the current operational status of the RF-B! transmitter controller. To read the current station alarms, perform the following steps:

1. Establish a FIPS session (see paragraph, "Service Terminal").

2. Read all alarms. Type:

   a 99 <Enter>

   The service terminal lists the active alarms.

3. Clear all alarms. Type:

   a 103 <Enter>

   The station alarm LED on the front panel should no longer be lit.

The Alarm log is not maintained during any reset.

Station Error Log

The station error log contains the station operational errors logged during operation. This log can be used to determine an operational history of the RF-B! transmitter controller. To read the station error log, perform the following steps:

1. Establish a FIPS session (see paragraph, "Service Terminal").

2. Read the station error log. Type:

   a 104 <Enter>

   The service terminal lists the recorded station errors.

   Each log entry line contains the following information:

   <Type><Action><Error Code><Caller><Line Num><Timestamp><Occurrences>

   Table 5-12 describes the log entries.

Table 5-12: Station Error Log Entries

Entry	Description
Type	Helps to determine which subsystem within the module is responsible for the error condition. The type can take on values such as NVM, DSP, STATION_ERROR, GPS, and so forth.
Action	Tells what action the error logging mechanism took when the error occurred. The action can be either RESET_STATION or LOG_ERROR (nonfatal, error was logged, but station was not reset.)
Error Code	Identifies individual errors. The tables in this Appendix D contain descriptions of each of the possible error codes.
Caller	Identifies the software source code module that logged the error. Used for software debugging.
Line Num	Identifies the physical line number of the calling software source code module from where the error was logged. Used for software debugging.
Timestamp	Marks the GPS time when the latest occurrence of the error was logged. If GPS time is not known at the time the error is logged, the Timestamp contains the current value of the onboard clock, which starts timing from 1996/04/02.12:00:00 upon reset.
Occurrences	Gives the number of times the current combination of Type, Action, Error Code, Caller, and Line Num have occurred since the log was last cleared. Note that different callers can log the same error code, in which case separate log entries are made.

3. To clear the station error log, type:

   a 111 <Enter>

   Clears the station error log.

The station error log is maintained during hard and software resets.

Software Log

This log is used primarily for development debugging purposes and does not contain any operational errors. To read the current software log, perform the following steps:

1. Establish a FIPS session (see paragraph, "Service Terminal").

2. Read all alarms. Type:

   a 110 <Enter>

   Lists the current software log.

Note: The software log does not contain any operational errors.

3. Clear the log. Type:

   a 113 <Enter>

The software log is maintained during a hard and software reset.

Log Initialization

This section shows the initial condition of the station alarm and station error logs after a power-on reset. Since neither log is maintained through a power-on reset, these logs show the alarms and error messages that are logged during a normal RF-B! transmitter controller initialization.

Initial Alarm Log

The following is the alarm log during GPS receiver initialization. Paging is disabled until the GPS and simulcast initialization are complete.

ALARM	STATUS	COUNT	DESCRIPTION
arst	AL	001	Alarm occurred on Reset
pgds	AL	001	Paging is disabled

Once the GPS and simulcast initialization is complete, paging is enabled. This is shown by the STATUS of the “Paging is disabled” alarm changing to “OK”

ALARM	STATUS	COUNT	DESCRIPTION
arst	AL	001	Alarm occurred on Reset
pgds	OK	001	Paging is disabled

AL = the alarm is in effect

OK = the alarm is cleared (not in effect)

The initial alarm log should be cleared after GPS initialization is complete, using the FIPS a 103 action command, so that the front panel ALARM LED is an indicator of when new operational alarms are logged.

Initial Station Error Log

The following station error log entries are made during RF-B! transmitter controller initialization:

RFB FIPS: <STATION_ERROR> <LOG_ERROR> <S_PAGING_IS_DISABLED> <PAGE_CONTROL_RECEIVE_MANAGER> <2834> <1996/04/02.12:00:22> <1>

RFB FIPS: <STATION_ERROR> <LOG_ERROR> <E_FLUSH_PDM_LIST> <PAGE_CONTROL_LAUNCH_MANAGER> <387> <1996/04/02.12:00:22> <1>

RFB FIPS: <STATION_ERROR> <LOG_ERROR> <S_RSR_POWER_UP_RESET> <ROOT> <570> <1996/04/02.12:00:01> <1>

The initial station error log should be cleared after GPS initialization is complete, using the FIPS **a 111** action command.

Maintenance

Troubleshooting

The service technician performs troubleshooting whenever a failure occurs during normal operation that cannot be resolved by the RF-Conductor! (RF-C!) controller.

This troubleshooting section is a guide to isolating failures to a FRU level. Replace the suspected FRU with a working FRU and contact the local Motorola Service Center for repair. After replacing the FRU, perform the RF-Baton! (RF-B!) transmitter controller power-up checkout procedure to verify that the failure clears (see Chapter 4, "Installation", paragraph, "Powering Up the System").

Front Panel Indications

Table 6-1 provides information about front panel indications, possible failures, and corrective actions. The index lists several possible failures and corresponding corrective actions for some indications. If a failure is isolated to a FRU, replace the defective module with a working unit and contact the Motorola Paging One-Call-Support Center for repair.

Table 6-1: Control Module Troubleshooting Chart (Sheet 1 of 2)

Indication	Possible Failure	Corrective Action
POWER LED not lit	+28 Vdc input power not present	Check input power source and all power connections.
	+14 Vdc or +5.1 Vdc output not present	Replace DC-DC converter.
Control On LED not lit	No input power	Verify power supply module power switch is in the ON position
	Control module did not complete power-up sequence	Press Reset. If Control ON LED is still not lit, replace control module.
Control Fail LED lit	Control module failure has been detected	Replace control module
Disable LED lit	GPS receiver not locked; transmitter not connected or failed	Check if GPS receiver is locked, check transmitter cables

Table 6-1: Control Module Troubleshooting Chart (Sheet 2 of 2)

Indication	Possible Failure	Corrective Action
Alarm LED lit	Station alarm has been detected	Interrogate error log, alarm log, or both
Distribution OK LED lit	Not used	
GPS LED not lit (more than 1 hr.)	No GPS; GPS in test mode; GPS antenna blocked, bad location, or both	Reset control module, unblock GPS antenna, check antenna location (see, paragraph, "GPS Diagnostics").
RFB Req LED not lit	Not used	Not used
TX OK LED not lit	Transmitter not hooked up	Connect transmitter to RF-B! transmitter controller
	Bad transmitter cable	Replace transmitter to RF-B! transmitter controller cable.
	Improper transmitter configuration.	Refer to *RF-Orchestra! Paging Station Installation and Operation*, Motorola Part No. 6880493G02.
RF-B! fails to complete power-up reset	Bad DRAM or Flash SIMM	See paragraph, "Bad DRAM or Flash SIMM".
RF-B! not keying transmitter	RF-B! data path problem Networking or RF-C! disconnect RF-B! to RF-O! miscommunication RF-O! paging not enabled RF-B! paging not enabled RF-B! or RF-O! PnP error	See paragraph, "Data Path Diagnostics".

RF-B! Transmitter Controller Status

Use the following steps to check the status of the RF-B! transmitter controller using the service terminal interface.

1. Connect your Friendly Integrated Paging System (FIPS) terminal to the Serial port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: The alarm and error logs provide detailed diagnostic information.

2. To display the alarms that have been generated. Type:

   a 99 <Enter>

   The terminal displays the alarms that have been generated since the last reset. The alarms are described in Appendix D.

3. Alarms are normally logged to the Choreographer! network manager using Simple Network Management Protocol (SNMP). If the alarms are not being displayed on the Choreographer! network manager, check the value of the Choreographer! network manager Internet Protocol (IP) address programmed into the RF-B! transmitter controller. At the FIPS terminal type:

   r 500 <Enter>

   The terminal displays the Choreographer! network manager IP address.

4. To correct an invalid IP address, type:

   w 500 [xxx.xxx.xxx.xxx] <Enter> (where xxx.xxx.xxx.xxx is the Choreographer! network manager IP address)

5. Verify the state of the RF-B! transmitter controller paging mode. Type:

   r 99 <Enter>

   The terminal displays the paging mode: (0=Enabled, 1=Disabled).

6. If the paging mode is disabled, enable paging. Type:

   w 99 0 <Enter>

7. List the Errors that have been logged. Type:

   a 104 <Enter>

   The terminal displays the error messages that have been generated since the last reset. Error messages are described in Appendix D.

8. Compare the message launch times against the pSOS system time using the input paging data QUEUE trace command. Type:

   a 192 PCRM 4 <Enter>

   The terminal displays the QUEUE trace.

9. Stop the input paging data QUEUE trace. Type:

   a 193 PCRM 4 <Enter>

10. Stop the trace. Type:

    a 193 PCRM 4 <Enter>

    The trace stops and the terminal displays:

    RFB FIPS: RA 193

Bad DRAM or Flash SIMM

The RF-B! transmitter controller will not complete a reset if the Dynamic Random Access Memory (DRAM) OR Flash Single In-line Memory Module (SIMM) or the software programmed into it are defective.

Always observe antistatic precautions when handling memory modules or printed circuit boards or other Wireless Messaging System (WMS) components.

1. Set the RF-B! transmitter controller power switch to OFF (O).

2. Remove the front panel (see paragraph, "Faceplate Removal").

3. Slide the Baton Control Module (BCM) board out to gain access to the SIMM (see Figure 6-1 and Figure 6-2).

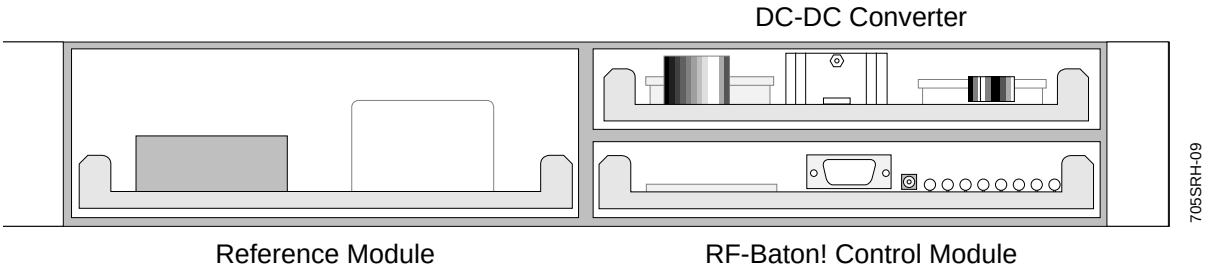


Figure 6-1: RF-B! Transmitter Controller Front Panel (Cover Removed)

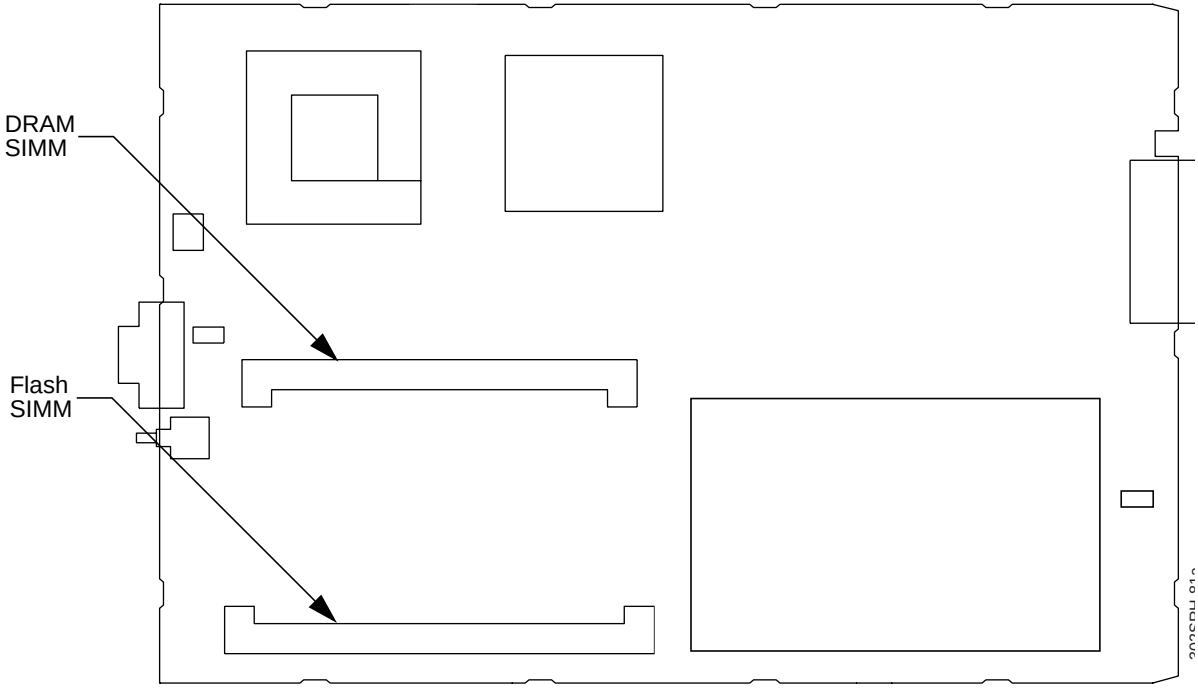


Figure 6-2: BCM Component Layout—SIMM Locations

4. Check the SIMM part numbers to ensure they are the right parts.

5. Make sure the SIMMs are well seated in their connectors.

6. If the problem persists, install a new BCM (see paragraph, "Baton Control Module").

No 1PPS Synchronization and the GPS Lock Light Is On

To detect this problem check the error log for errors that indicate one-pulse-per-second (1 PPS) synchronization problems. Type:

a 104 <Enter>

The terminal displays the error log.

The errors that indicate a 1 PPS synchronization problem are:

- <E_TX_OK_DOWN>
- <E_HIGH_STABILITY_REFERENCE_FAILURE>
- <E_XILINX_DOWNLOAD_FAILURE>

TX_OK_DOWN

The RF-O! transmitter indicates when it has a not ready to page status. If the RF-O! transmitter Disable light on the RF-O! transmitter front panel is lit, make sure the Plug & Play cable from the Plug & Play connector (J4) on the RF-B! transmitter controller to the PnP Interface connector (J17) on the RF-O! transmitter is properly connected

If this does not correct the problem, continue with the following paragraphs.

HIGH_STABILITY_REFERENCE_FAILURE

To correct a HIGH_STABILITY_REFERENCE_FAILURE, perform the following procedure:

1. Clear the error log. Type:

   a 111 <Enter>

2. Set the RF-B! transmitter controller power switch to Off (O).

3. Remove the faceplate (see paragraph, "Faceplate Removal").

4. Reseat the BCM and Reference module into the backplane to ensure they are inserted properly.

   Slide the boards out one or two inches and then carefully push them into the backplane connectors.

5. Install the faceplate (see paragraph, "Faceplate Installation").

6. Set the RF-B! transmitter controller power switch to On (|).

7. View the error log. Type:

   a 104 <Enter>

   If the <E_HIGH_STABILITY_REFERENCE_FAILURE> is in the log, the 10 MHz reference signal is missing.

8. Check the 10 MHz coaxial cable for loose or broken connectors.

   If the cable is bad, replace the cable.

9. If the cable is good, replace the reference module.

10. If the reference module is good, replace the DC-DC converter.

XILINX_DOWNLOAD_FAILURE

To correct a XILINX_DOWNLOAD_FAILURE, perform the following procedure:

1. Clear the error log. Type:

   a 111 <Enter>

2. Reset the RF-B! transmitter controller. Type:

   a 117 <Enter>

3. After the RF-B! transmitter controller completes the reset, view the error log. Type:

   a 104 <Enter>

   If the error <E_XILINX_DOWNLOAD_FAILURE> is still in the error log, replace the BCM.

Data Path Diagnostics

This section details the diagnostics available to troubleshoot the message data path through the RF-B! transmitter controller. The procedure gives an in depth view of the RF-B! transmitter controller message data handling and a detailed view of the RF-B! transmitter controller operation, which is especially useful if the transmitter is not keying.

You need a strong understanding of the overall paging system, especially the RF-B! transmitter controller, before using the Data Path diagnostics. Chapter 2, "System Description", paragraph, "The Wireless Messaging System Overview" provides a paging system overview, while Chapter 2, "System Description", paragraph, "The Baton Control Module" contains a detailed functional description of the RF-B! transmitter controller. You also need a strong understanding of FIPS protocol and the use of the service terminal for troubleshooting.

The Data Path diagnostics are formatted to provide information from the RF-B! transmitter controller perspective as to why the transmitter is not keying. Individual sections of this procedure are also useful for troubleshooting other problems.

Verify the RF-B! Transmitter Controller Network Connection

Perform the following procedure to verify that the RF-C! controller and RF-B! transmitter controller are communicating with each other:

1. Check the network connection by pinging the RF-B! transmitter controller from the RF-C! controller. Type

   ping [RF-B! transmitter controller IP address] <Enter>

   The terminal displays the address.

2. If the ping is not returned, check the following parameters against the values listed on the site network plan:
   a. Check the Universal Datagram Protocol (UDP) Port number. Type:
      r 55 <Enter>
   b. Check the IP address. Type:
      r 705 <Enter>
   c. Check the Subnet mask. Type:
      r 706 <Enter>

d. Check the Gateway address. Type:
r 708 <Enter>

3. If any of the above parameters do not match the site network plan, write the value using the corresponding FIPS **write** command and reboot the RF-B! transmitter controller.

4. If all of the above parameters match the site network plan, there are a number of router problems that will cause a disconnect, resulting in no data being transmitted to the RF-B! transmitter controller:
   - Return Internet Protocol (RIP) is turned off on the external ethernet port.
   - Address Resolution Protocol (ARP) tables are corrupted.
   - Channel Service Unit-Data Service Unit (CSU-DSU) is not working [should say 56K on the Liquid Crystal Display(LCD) CSU-DSU screen].
   - Frame Relay permanent virtual circuit (PVC) is not set up.
   - Cables or cable connections are bad.

   Consult the router documentation for further explanation of the above. You may have to reload the router configuration and reset the RF-B! transmitter controller to force correction of the ARP tables. Do as much as possible to check the telco connections before travelling to visit the site.

Verify RF-B! Transmitter Controller Receipt of Message Data

This section determines if the Outbound Paging Protocol Manager (OPPM) is receiving and processing input messages.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. Verify the RF-B! transmitter controller is receiving data from the network. Type:

   a 192 OPPM 4 <Enter>

   The terminal displays the OPPM trace.

   If there is no data scrolling across the screen (trace output) disable the network packet trace and go to Step 5.

3. Verify that the rfChannelIndex, and subchannel are correct. These values are set in the RF-C! controller configuration.

   The following is a typical example of a Sync and SCI pattern:

```
PdmData { } = InflexionSynch
Time    { } =  10 : 58 : 1250000
PdmApdu { } =
        rfChannelIndex = 0
        subchannel = 2
        ====================================================
PdmData { } = ReflexOpp
Time    { } =  11 : 0 : 0
PdmApdu { } =
        rfChannelIndex = 0
        subchannel = 2
        ====================================================
PdmData { } = InflexionSynch
Time    { } =  11 : 1 : 8750000
PdmApdu { } =
        rfChannelIndex = 0
        subchannel = 2
        ====================================================
PdmData { } = InflexionSynch
Time    { } =  11 : 3 : 7500000
PdmApdu { } =
        rfChannelIndex = 0
        subchannel = 2
```

Table 6-2 shows the Paging Data Message (PDM) data types for the OPPM packet trace.

Table 6-2: PDM Data Types for the OPPM Packet Trace

PdmData Type	Modulation Mode	Description
InflexionSynch	Frequency Modulation (FM)	90 ms packet
ReflexOpp	FM	1.875 second data packet
PilotOnly	Amplitude Modulation (AM)	20 ms, packet.
InflexionSqm	AM	1-3 patterns, 30 ms each packet
InflexionAdpcm24	AM	May occur many times in a single AM packet, but must occur in pairs (SideBandMode =0,1)

4. Go to paragraph, "Verify RF-B! Transmitter Controller Paging Is Enabled".

5. Stop the network packet trace. Type:

   a 193 OPPM 4 <Enter>

   The trace stops and the terminal displays:

   RFB FIPS: RA 193

   If there is no trace output for the OPPM 4 network packet trace continue with Step 6 through Step 8.

6. Enable the ethernet statistics trace. Type:

   a 192 OPPM 1 <Enter>

   This trace displays the ethernet statistics correlating to the input data.

7. Verify that the ethernet packets are not being rejected

.

```
==================================================
    OPPM: Rcvd 10312 bytes

    # PACKETS DISCARDED: 0
    # ERROR PACKETS RECVD: 1
    # PACKETS DISCARDED DUE TO UNKNOWN PROTOCOL: 0
    # UNICAST PACKETS RECVD: 2424
    # MULTIICAST PACKETS RECVD: 401 255

    ==================================================
    OPPM: Rcvd 64 bytes

    # PACKETS DISCARDED: 0
    # ERROR PACKETS RECVD: 1
    # PACKETS DISCARDED DUE TO UNKNOWN PROTOCOL: 0
    # UNICAST PACKETS RECVD: 2432
    # MULTIICAST PACKETS RECVD: 401

    ==================================================
```

If the number of discarded packets is close or equal to the number of received packets, the problem is in the ethernet. Refer to the site networking documentation to troubleshoot the RF-C! controller to RF-B! transmitter controller network connection.

If the number of discarded packets is equal to zero and the OPPM 4 trace was blank, the problem is in the RF-C! controller. Refer to *RF-Conductor!™ Controller Hardware Installation*, Motorola Part No. 6880494G50 or *RF-Conductor!™ Controller Installation*, Motorola Part No. 6880494G53 to troubleshoot the problem. Be sure to check the RF-B! transmitter controller IP address and port number resident in the RF-C! controller.

8. Stop the ethernet statistics trace. Type:

a 193 OPPM 1 <Enter>

The trace stops and the terminal displays:

RFB FIPS: RA 193

Verify RF-B! Transmitter Controller Paging Is Enabled

Since the OPP manager is processing input message data (verified in the previous section), verify that the RF-B! transmitter controller has enabled paging. There are three conditions which must be satisfied in order for paging to be enabled. They are:

- The user has not manually disabled paging through FIPS.
- The Simulcast manager is in a paging state.
- The system hardware manager has not detected an error.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. Verify that paging is enabled. Type:

   a 192 PCRM 2 <Enter>

   The trace displays the paging status of the RF-B! transmitter controller. For example:

   Paging is Enabled!

3. Stop the trace. Type:

   a 193 PCRM 2 <Enter>

   The trace stops and the terminal displays:

   RFB FIPS: RA 193

4. If paging is enabled, go to paragraph, "Verify Launch Time Calculation and Processing". If paging is disabled, proceed with Step 5.

5. Verify that paging has not been disabled through FIPS, the 99 parameter is equal to zero. Type:

   r 99 <Enter>

   The system responds:

   RFB FIPS: RR 99 0

6. If the 99 parameter is set to 1 (paging is disabled), type:

   w 99 0 <Enter>

7. Verify that paging is enabled. Type:

   a 192 PCRM 2 <Enter>

   The trace displays the paging status of the RF-B! transmitter controller. For example:

   Paging is Enabled!

8. Verify that the Simulcast Manager has is in a paging enabled state. Type:

   a 192 SASM 32 <Enter>

   The trace displays the simulcast state and the 1 PPS status. For example:

   RFB FIPS: State: 4, pps_occured: 1, pps_within_window: 1

   State 4 and state 5 are paging enabled states for the simulcast manager. If the returned state is not 4 or 5, the problem is in the Global Positioning System (GPS). Refer to paragraph, "GPS Diagnostics".

9. Stop the trace. Type:

   a 193 SASM 32 <Enter>

   The trace stops.

10. If the simulcast manager is in a paging enabled state, check the station error log for System Hardware Manager reports. Type:

    a 104 <Enter>

    a. Replace the reference module if the error log has the following errors:
       - 10 MHz reference
       - 16 MHz reference
       - Pendulum

    b. Check the transmitter if the following error is in the error log:
       - TX_OK

Verify Launch Time Calculation and Processing

The RF-B! does not process the input message data correctly if there is a time discrepancy between the RF-B! transmitter controller and the RF-C! controller, or between the RF-B! transmitter controller and the transmitter.

The RF-B! does not process message data that is received from the RF-C! controller too late or too early. If the network delay is too short, the RF-B! transmitter controller does not have enough work-ahead time to launch the page. If the network delay is too long, the RF-B! transmitter controller input buffers overflow. The RF-B! transmitter controller can buffer up to 64 packets of each kind of packet or up to 60 seconds of data running at full load if only a single channel is running.

In addition, the RF-B! transmitter controller uses values received from the transmitter to determine the time for the data to be received by the transmitter. The transmitter will not key if there is a problem here.

This procedure checks both interfaces for time discrepancy.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. Determine if the RF-B! transmitter controller and RF-C! controller have a time discrepancy using the Page Control Receive manager (PCRM) trace on the RF-B! transmitter controller. Type:

   a 192 PCRM 4 <Enter>

   The terminal displays the PCRM 4 trace.

```
PDM type: 16
                Seq number: 1
 Launch minute: 8  Launch second: 11  Launch ticks: 36

Calc Launch minute: 8  Calc Launch second: 11  Calc Launch ticks: 28
 pSOS minute:       8  pSOS second:       5  pSOS ticks:       50
 Queue minute:      38  Queue second:      11  Queue ticks:      36
```

3. Disable the launch time trace. Type:

   a 193 PCRM 4 <Enter>

   The trace stops and the terminal displays:

   RFB FIPS: RA 193

4. Observe the data trace to ensure that the Launch time is always greater than the pSOS time. This checks the RF-B! transmitter controller and the RF-C! controller time synchronization.

   Typically, the launch time is 6 seconds later than pSOS time and must be a minimum of 2 seconds. Both the RF-C! controller and the RF-B! transmitter controller must be GPS synchronized.

   If the pSOS time is greater than the Launch time, troubleshoot the RF-C! controller to make sure the RF-C! is sending the message data to the RF-B! transmitter controller early enough (refer to *RF-Conductor!™ Controller Hardware Installation*, Motorola Part No. 6880494G50 or *RF-Conductor!™ Controller Installation*, Motorola Part No. 6880494G53).

5. View the error log to determine if any of the following network time errors are present. Type:

   a 104 <Enter>

   The terminal displays the error messages. (see Appendix D).

   – E_LATE_LAUNCH_TIME (caused by too little network delay)
   – E_UNMATCHED_ACTIVE_SUBCHANL_LAUNCH_TIME
   – E_DUPLICATE_MDP_FRAMES

   These errors are indications of network problems.

Note: 1 tick = 10 ms.

6. Observe the difference between the Launch ticks and the Calc Launch ticks to check the RF-B! transmitter controller and transmitter time synchronization.

   The Launch ticks represent the actual launch time of the message by the transmitter. The Calc Launch ticks represent the time the transmitter must receive the data to launch at the proper launch time. The difference between the Launch ticks and Calc Launch ticks is dependent upon parameters received by the RF-B! transmitter controller from the transmitter on startup.

The two values are the Workahead Time (FIPS parameter 602) and the Workahead Window Width (FIPS parameter 603). The difference between the Launch ticks and Calc Launch ticks should be:

Tick delta = round up{ [(Workahead Window / 2) + Workahead Time] / 10}

If the actual delta is less than the expected delta, check the transmitter values which get reported to the RF-B! transmitter controller.

Network time errors are caused when the RF-C! controller schedules simultaneous transmissions on the same subchannel. This can happen when the RF-C! controller makes a positive time change correction causing data to overlap.

Verify Proper Control Message Output

Verify the control commands generated by the RF-B! transmitter controller. The primary concern for this procedure is that the proper protocol format is recognized.

For ReFLEX paging systems, there are few control commands necessary, while the InFLEXion protocol requires many control commands to be transmitted.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. Enable the Page Control Launch Manager (PCLM) command trace. Type:

   a 192 PCLM 1 <Enter>

   The terminal displays the PCLM 1 trace.

   a. If the system is a ReFLEX system, the paging batches are expected to be continuous with relatively far fewer control commands than an InFLEXion system. For example:

```
==batch is contiguous
No freq chng
offset freq & mod type match

==batch is contiguous
No freq chng
offset freq & mod type match
```

b. If the system an InFLEXion system, the paging batches have more interleaved control commands. For example:

```
==batch is contiguous
No freq chng
offset freq & mod type match

==paging just enabled OR batch NOT contiguous
new ctl cmd -
[0]:2625a0
[1]:0
[2]:80000001

==paging just enabled OR batch NOT contiguous
new ctl cmd -
[0]:37b1d0
[1]:0
[2]:80000002
```

If the protocol format is suspect, verify the RF-C! controller protocol (reference *RF-Conductor!™ Controller Hardware Installation*, Motorola Part No. 6880494G50 or *RF-Conductor!™ Controller Installation*, Motorola Part No. 6880494G53).

3. Stop the trace. Type:

a 193 PCLM 1 <Enter>

The trace stops and the terminal displays:

```
RFB FIPS: RA 193
```

Verify Data to Transmitter

The final step in the data path through the RF-B! transmitter controller is the data router. This procedure checks the data router to verify the proper transfer of data to the transmitter.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. Enable the Data Router (DRT1) output trace

   a 192 DRT1 1 <Enter>

   The terminal displays the DRT1 1 trace.

   DRTR1: inc=152 delta=152 mod=0 id=82EE54C
   DRTR1: inc=9 delta=9 mod=0 id=825C54C
   DRTR1: inc=2 delta=2 mod=0 id=827A54C
   DRTR1: inc=9 delta=9 mod=0 id=8247B4C
   DRTR1: inc=2 delta=2 mod=0 id=827C54C
   DRTR1: inc=9 delta=9 mod=0 id=825A74C

   Verify that the inc value and the delta value are identical to the values shown in this trace example. If the values are not identical with those shown, call one-call support.

Note: If this occurs, no user servicable solution exists. The problem is a Plug n Play (PnP) problem.

3. Stop the trace. Type:

   a 193 DRT1 1 <Enter>

   The trace stops and the terminal displays:

   RFB FIPS: RA 193

GPS Diagnostics

The RF-O! paging station can use a Motorola or an external GPS receiver. The Motorola GPS receiver mounts on the reference module board next to the BCM (see Figure 6-1). The external receiver mounts in the antenna and sends RS-422 signals to the RF-B! transmitter controller. The RF-B! transmitter controller controls the GPS receiver functions and receives GPS timing from the receiver.

This section provides information for the Motorola GPS receiver. The FIPS display screens for the Trimble GPS receiver differ from those for the Motorola GPS receiver.

1. Connect your FIPS terminal to the FIPS Serial Port on the front panel of the RF-B! transmitter controller and log into the FIPS session (see Chapter 5, "Operation", paragraph, "Service Terminal").

2. To display the Trimble GPS receiver signal strength in signal to noise ratios (SNR), type:

   a 209 <Enter>

   The terminal displays the Trimble SNRs.

   If the RF-B! transmitter controller GPS Lock front panel indicator is off, the GPS receiver has been disabled or has not received signals from enough satellites.

3. To display the error log, type:

   a 104 <Enter>

4. Check the error log for the following errors:
   - <S_GPS_IS_DISABLED>
   - <E_GPS_SELF_TEST_FAILED>
   - <E_GPS_NOT_TRACKING_SATELLITES>
   - <E_SASM_FREERUN_TIMEOUT>

S_GPS_IS_DISABLED

If the <S_GPS_IS_DISABLED> error is in the error log, perform the following procedure:

1. Verify that GPS synchronization has not been user disabled Type:

   r 930 <Enter>

   If the 930 parameter is set to 0, GPS synchronization is enabled. If the 930 parameter is set to 1, GPS synchronization has been disabled.

2. If disabled, enable GPS synchronization. Type:

   w 930 0 <Enter>

   This causes the GPS receiver to reinitialize as if a power-on reset has occurred.

   If the RF-B! transmitter controller **GPS Lock** front panel indicator does not light within 30 minutes, the GPS receiver is unable to receive signals from enough satellites.

3. Enable the GPS initialization trace. Type:

   a 192 GPSC 8 <Enter>

4. Check the error log for the <E_GPS_NOT_TRACKING_SATELLITES>.

   If <E_GPS_NOT_TRACKING_SATELLITES> is present, go to paragraph, "<E_GPS_NOT_TRACKING_SATELLITES>".

   This type of problem may be caused by RF cabling, GPS antenna defects, interfering signals, or an obstruction to the GPS antenna.

<E_GPS_SELF_TEST_FAILED>

This procedure is only valid for the Motorola OncoreVP GPS receiver. Trimble does not support self-test features.

1. Perform a self test on the GPS receiver. Type:

   a 218 <Enter>

   Below is an example of a FIPS: a 218 command that passed:

```
RESULTS:
CHANNEL 1 CORRELATION TEST: PASSED
CHANNEL 2 CORRELATION TEST: PASSED
CHANNEL 3 CORRELATION TEST: PASSED
CHANNEL 4 CORRELATION TEST: PASSED
CHANNEL 5 CORRELATION TEST: PASSED
CHANNEL 6 CORRELATION TEST: PASSED
1 KHz PRESENCE: PASSED
ROM LSByte CHECKSUM: PASSED
ROM MSByte CHECKSUM: PASSED
RAM LSByte: PASSED
RAM MSByte: PASSED
EEPROM: PASSED
DCXO SPI COMM: PASSED
RTC COMM & TIME: PASSED
```

2. Read the station error log. Type:

   a 104 <Enter>

   If the error <E_GPS_SELF_TEST_FAILED> is in the error log, replace the GPS receiver. (see paragraph, "Reference Module")

3. Reset the RF-B! transmitter controller. Type:

   a 117 <Enter>

Note: *You must reset the RF-B! transmitter controller after the test is complete to restore the normal operating mode. The GPS receiver must perform a complete reinitialization before the RF-B! transmitter controller enables paging.*

<E_GPS_NOT_TRACKING_SATELLITES>

If the GPS receiver temporarily loses satellite tracking, the RF-B! transmitter controller operates in a FREERUN mode. During a loss of satellite tracking, the error log is updated with the error message <E_GPS_NOT_TRACKING_SATELLITES> and is indicated by a Simulcast Manager state 5.

1. Start the SASM trace. Type:

   a 192 SASM 32 <Enter>

   Verify the Simulcast state.

   State:0-3: pps_occured: 1, pps_within_window: 1: SIMULCAST INITIALIZATION

   State: 4, pps_occured: 1, pps_within_window: 1 : PAGING WITH GPS

   State: 5, pps_occured: 1, pps_within_window: 1 : FREERUN

2. Turn off the SASM trace. Type:

   a 193 SASM 32 <Enter>

In the FREERUN mode the timing accuracy for the station depends on the accuracy of the reference oscillator. The reference oscillator can maintain simulcast accuracy for 96 minutes. After 96 minutes, the station is disabled from paging until satellite tracking resumes. While paging is disabled, the error log is updated with the error messages <S_PAGING_DISABLED> and <E_SASM_FREERUN_TIMEOUT>. To get more information about the GPS receiver status and why GPS tracking was lost, perform the following steps:

3. Request the GPS receiver status:

   a 208 <Enter>

   The terminal displays:

```
# visible satellites = 8, # tracked satellites = 6 receiver status = 0x8
ID=3 Mode=8 SS=34 Status=0xa8
ID=16 Mode=0 SS=102 Status=0x0
ID=18 Mode=8 SS=50 Status=0xa8
ID=19 Mode=8 SS=32 Status=0xa8
ID=22 Mode=5 SS=22 Status=0x20
ID=27 Mode=0 SS=102 Status=0x0
```

- Visible Satellites—the number of visible satellites is recorded in the Motorola GPS receiver almanac and is the maximum number of satellite signals that the GPS receiver expects to receive at any one time. If the GPS almanac is bad, the visible satellites value is reported as NA.
- Tracked Satellites—this value is the number of satellite signals currently being received. The tracked satellites value is a subset of the visible satellites value and should always be less than or equal to the visible satellites value. At least four satellites must be reported in Mode=8 to initialize the GPS receiver. At least three satellites must be reported to maintain GPS lock and operate in the Simulcast manager State 4.
- Receiver Status—should always be 8 after GPS initialization.
- Signal Strength—the Trimble GPS receiver requires a minimum SNR of 4 decibels (dB). If the signal strength is poor, check the GPS antenna connections and ensure that the antenna has a clear view of the horizon. Performance can also be affected by radio frequency (RF) interference at 1.575 GHz.

  For further information regarding the **a 208** command output, see the action command description table in Appendix C.

4. Request the almanac status. Type:

a 211 <Enter>

The following trace is an example output from the **a 211** command if the almanac is valid:

```
RAM:    valid
        week:   211
        time:   123
        #avail: 26
        SVID:   0x77d7f3ff
ROM:    valid
        week:   211
        time:   123
        #avail: 26
        SVID:   0x77d7f3ff
```

The following trace is an example output from the **a 211** command if the almanac is not valid:

```
RAM:    invalid
        week: -------
        time: -------
        #avail: -------
        SVID: -------
ROM:    invalid
        week:   -------
        time: -------
        #avail: -------
SVID: -------
```

The Motorola GPS receiver automatically corrects a bad almanac if it can acquire satellite signal(s). Nominal acquisition time for a Motorola GPS receiver with a blank almanac is 15 minutes in addition to the regular GPS initialization time (15 minutes).

In addition to the **a 211** command, the validity of the almanac can also be determined from the **a 208** command output. If the receiver status value is odd (that is. the least significant bit is set), the almanac is not valid and is being rebuilt. A notification the almanac is being rebuilt is printed in addition to the almanac status.

The Trimble GPS receiver almanac information can not be displayed using the **a 211** command.

<E_SASM_FREERUN_TIMEOUT>

The RF-B! transmitter controller is configurable and can operate for 96 continuous minutes without GPS lock. After the 96 minutes have expired, the <E_SASM_FREERUN_TIMEOUT> error is logged in the station error log and the simulcast manager returns to state zero. If GPS lock is regained after the RF-B! transmitter controller has timed out, the simulcast manager reinitializes and enables paging when complete.

The occurrence of the <E_SASM_FREERUN_TIMEOUT> error can indicate GPS receiver problems external to the RF-B! transmitter controller. Examine the GPS antenna installation (see Chapter 3, "Preinstallation", paragraph, "Antenna Considerations" and reference the *GT/UT Oncore User's Guide).*

Removal and Installation

Replace faulty FRUs with good FRUs to restore the RF-B! transmitter controller to proper operation. The following procedures provide FRU removal and installation instructions.

The RF-B! transmitter controller contains static-sensitive modules. When servicing the equipment, you must take precautionary steps to prevent damage to the modules from static discharge.

Do not force RF-B! transmitter controller modules into their slots. Connector damage can occur if the modules are not carefully inserted.

Cabinet Doors

Perform the following procedures to remove and install the transmitter cabinet front or rear door.

Doors Removal

Motorola recommends that two persons perform this procedure.

Note: One person supports the door while the other person detaches the hinges from the brackets.

1. Open the cabinet door.

2. On the bottom left of the door, compress the spring-loaded hinge pins until the hinge pins clear the hinge bracket (see Figure 6-3).

   Lock the pins in place.

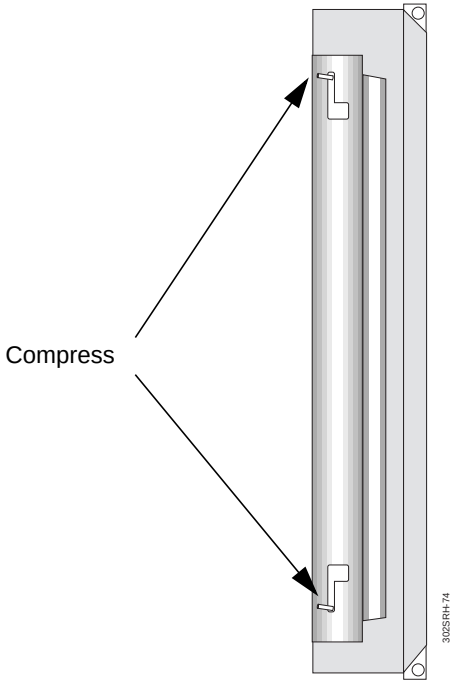


Figure 6-3: Hinge Located on RF-O! Paging Station Cabinet Door

3. Repeat Step 2 for the hinges located in the middle and top of the door.

4. Lift the door out and set aside.

Doors Installation

1. Lift the door and align the hinge pins with the hinge brackets located on the left side of the main transmitter cabinet.

2. Release the hinge pins compressed in paragraph, "Doors Removal", Step 2 and Step 3.

RF-B! Transmitter Controller

Perform the following procedures to remove and install the RF-B! transmitter controller in the RF-O! paging station.

Tools

#30 TORX driver

Transmitter Controller Removal

Perform the following steps to remove the RF-B! transmitter controller.

Note: Perform Step 1 if the door does not open at least 90 degrees.

1. Remove the front door (see paragraph, "Doors Removal".)

2. Set the RF-B! transmitter controller POWER switch to OFF (O) (see Figure 6-4).

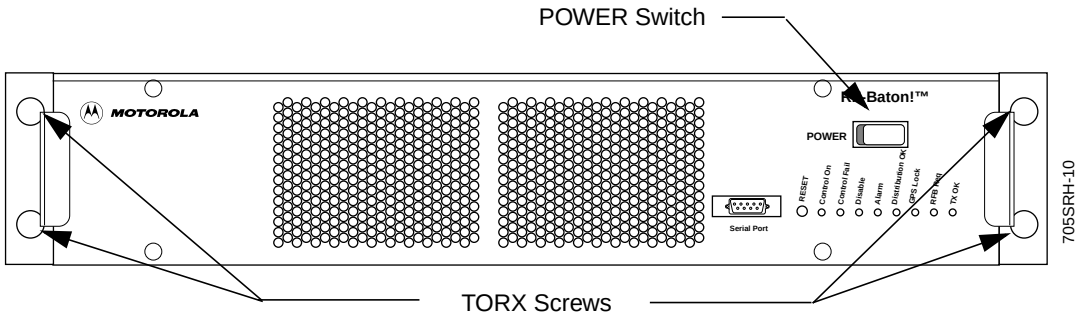


Figure 6-4: RF-B! Transmitter Controller Front Panel

3. Power down any other equipment connected to the RF-B! transmitter controller.

4. From the back of the cabinet, label and disconnect the cables attached to the RF-B! transmitter controller.

5. From the front of the cabinet, remove and retain the four #30 TORX screws securing the RF-B! transmitter controller chassis to the cabinet (see Figure 6-4).

6. Slide the RF-B! transmitter controller chassis gently forward, and remove carefully.

Transmitter Controller Installation

Perform the following steps to install the RF-B! transmitter controller.

1. Slide the new RF-B! transmitter controller chassis into the front of the transmitter cabinet.

2. Secure the RF-B! transmitter controller chassis to the cabinet using the four TORX screws removed in paragraph, "Transmitter Controller Removal", Step 5.

3. From the back of the cabinet, connect the cables disconnected in paragraph, "Transmitter Controller Removal", Step 4.

4. From the front of the cabinet, set the RF-B! transmitter controller POWER switch to ON (|) (see Figure 6-4).

5. Switch on any other equipment connected to the RF-B! transmitter controller.

6. If necessary, install the front cabinet door (see paragraph, "Doors Installation".)

RF-B! Transmitter Controller Faceplate

Perform the following procedures to remove and install the RF-B! transmitter controller faceplate.

Tools

#15 TORX driver

Faceplate Removal

Perform the following steps to remove the RF-B! transmitter controller faceplate.

1. Set the RF-B! transmitter controller POWER switch to OFF (O) (see Figure 6-5).

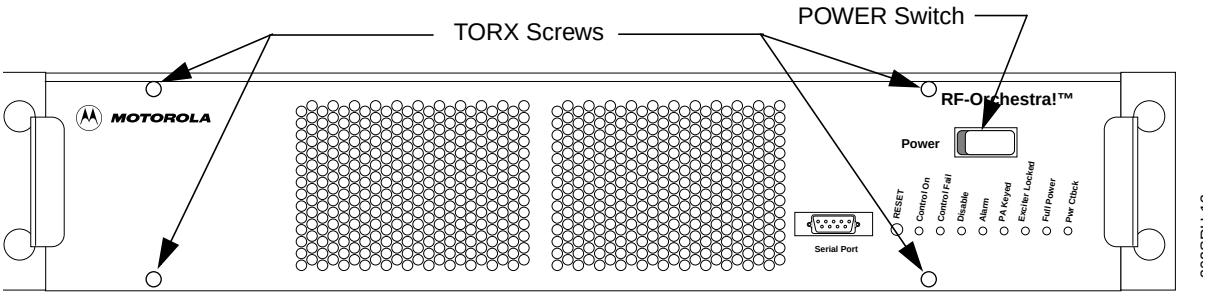


Figure 6-5: RF-B! Transmitter Controller Front Panel

2. Remove the four #15 TORX screws holding the faceplate to the front of the RF-B! transmitter controller (see Figure 6-5).

3. Remove the faceplate.

Faceplate Installation

Perform the following steps to install the RF-B! transmitter controller faceplate.

1. Line up all LEDs and switches properly and secure the faceplate to the front of the RF-B! transmitter controller, using the four TORX screws removed in paragraph, "Faceplate Removal", Step 2.

2. Set the RF-B! transmitter controller POWER switch to ON (|) (see Figure 6-5).

DC-DC Converter

Perform the following procedures to remove and install the DC-DC Converter.

DC-DC Converter Removal

Perform the following steps to remove the DC-DC Converter.

1. Remove the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Removal").

2. Unplug the DC-DC Converter from the RF-B! transmitter controller chassis (see Figure 6-6).

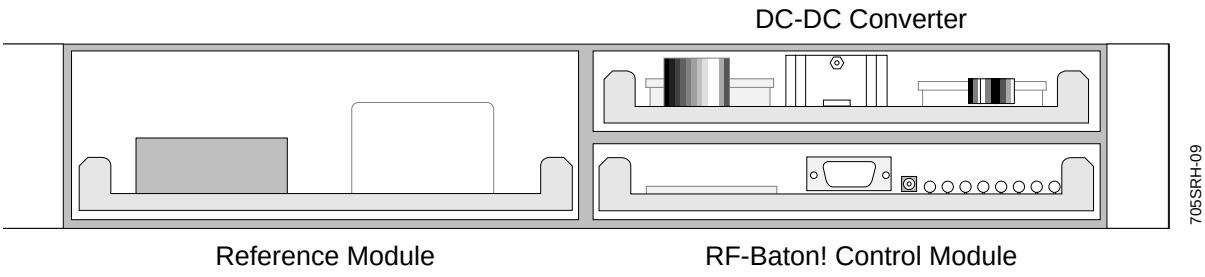


Figure 6-6: RF-B! Transmitter Controller (Front Panel Removed)

3. Gently pull the DC-DC Converter straight out and set aside.

DC-DC Converter Installation

Perform the following steps to install the DC-DC Converter.

1. Gently place the DC-DC Converter into the DC-DC Converter slot in the RF-B! transmitter controller chassis, firmly seating the board card-edge connectors into the backplane.

2. Install the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Installation").

Baton Control Module

Perform the following procedures to remove and install the Baton Control Module (BCM).

BCM Removal

Perform the following steps to remove the BCM.

1. Remove the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Removal").
2. Unplug the BCM from the RF-B! transmitter controller chassis (see Figure 6-6).
3. Gently pull the BCM straight out and set aside.

BCM Installation

Perform the following steps to install the BCM.

1. Gently place the new BCM into its slot in the RF-B! transmitter controller chassis, firmly seating the board card-edge connectors into the backplane (see Figure 6-6).
2. Install the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Installation").

Reference Module

Perform the following procedures to remove and install the reference module.

Reference Module Removal

Perform the following steps to remove the reference module.

1. Remove the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Removal").
2. Unplug the reference module from the RF-B! transmitter controller chassis (see Figure 6-6).
3. Gently pull the reference module straight out and set aside.

Reference Module Installation

Perform the following steps to install the reference module.

1. Gently place the new reference module into its slot in the RF-B! transmitter controller chassis, firmly seating the board card-edge connectors into the backplane.

2. Install the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Installation").

6-Hour Battery

Perform the following procedures to remove and install the 6-hour battery.

Tools

The following tools are required:

- Small flat-blade screwdriver
- Wire cutters (to cut the wire tie)
- TORX driver with #30 bit

6-Hour Battery Removal

Perform the following steps to remove the 6-hour battery:

1. From the front of the cabinet, set the RF-B! transmitter controller POWER switch to OFF (O) (see Figure 6-7).

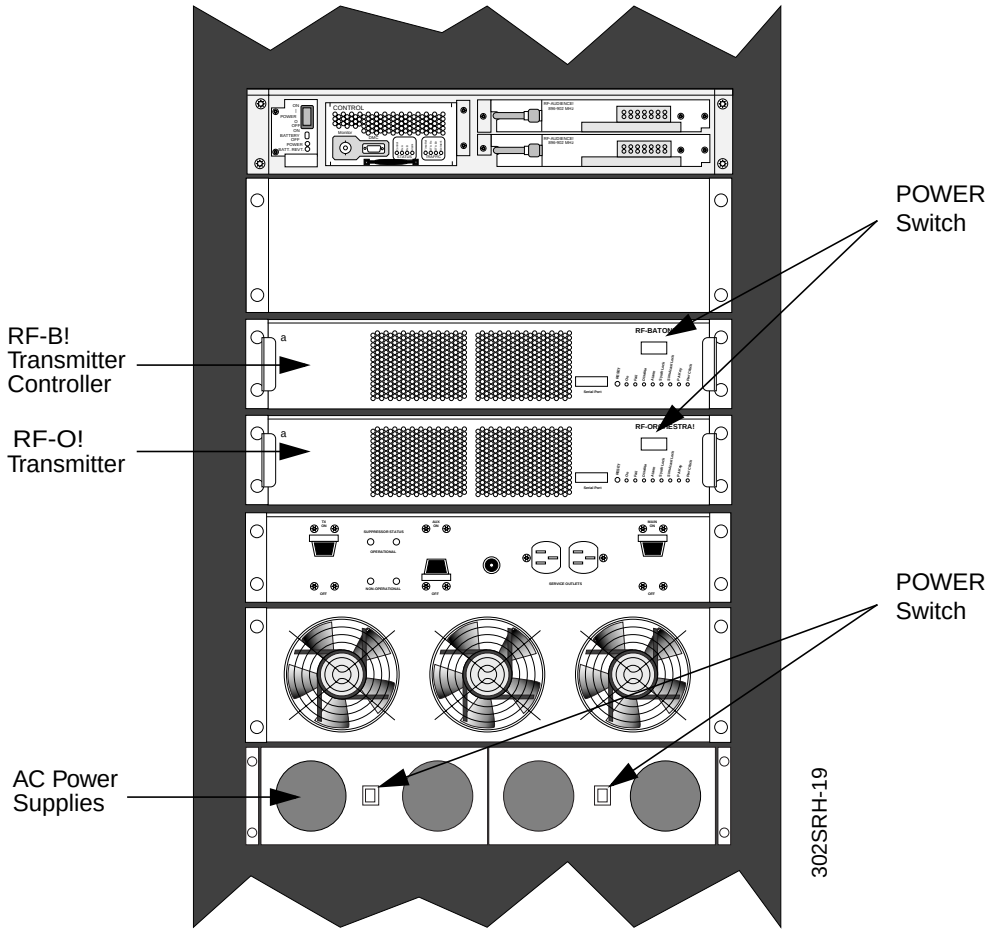


Figure 6-7: RF-O! Paging Station Power Switches

2. Set the RF-O! transmitter POWER switch to OFF (O) (see Figure 6-7).

3. Set the AC power supply switches to OFF (O) (see Figure 6-7).

Note: Perform Step 4 if the cabinet door does not open at least 90 degrees. Otherwise, go to Step 5.

4. Remove the rear cabinet door (see paragraph, "Doors Removal").

5. Loosen the two screws securing the connector to J14 on the baton control chassis (BCC) back panel (see Figure 6-8).

   Disconnect the connector.

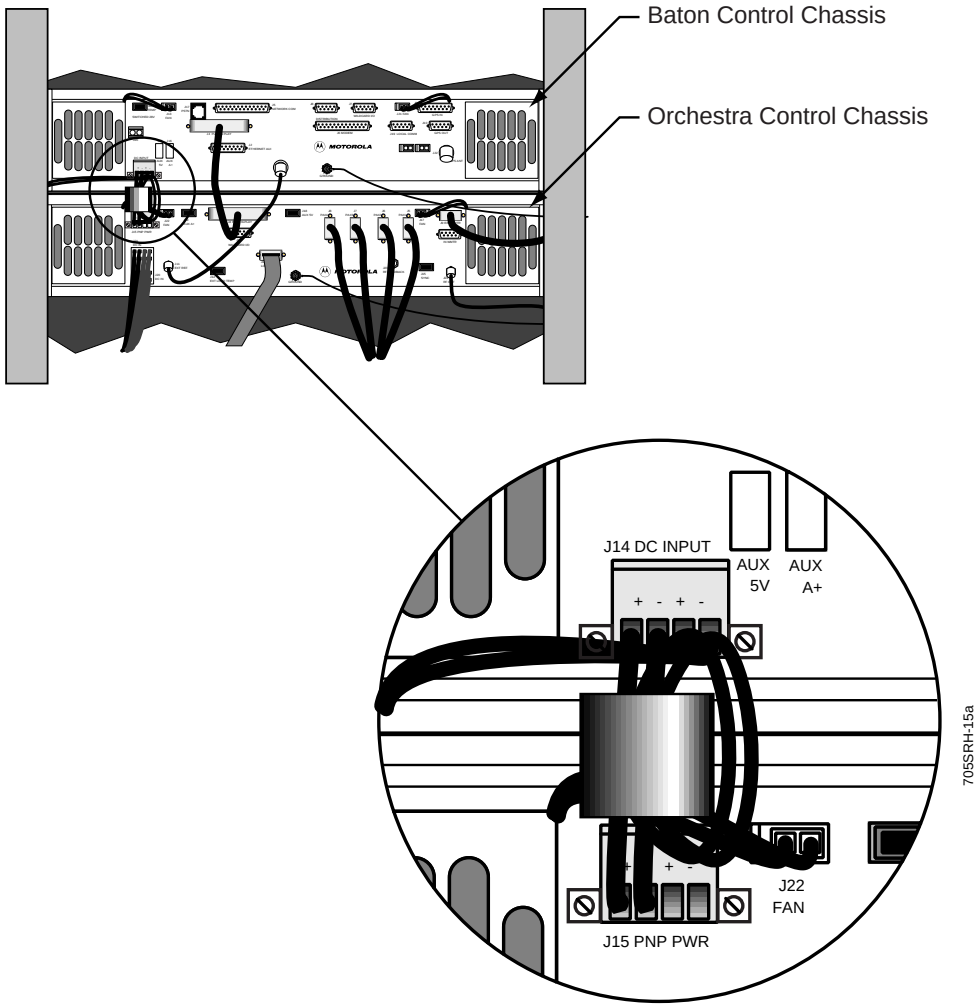


Figure 6-8: Rear View of BCC and OCC

6. Loosen the two screws securing the connector to J15 on the orchestra control chassis (OCC) back panel (see Figure 6-8).

   Disconnect the connector.

7. Remove the wire tie that secures the wires to the chassis (see Figure 6-9).

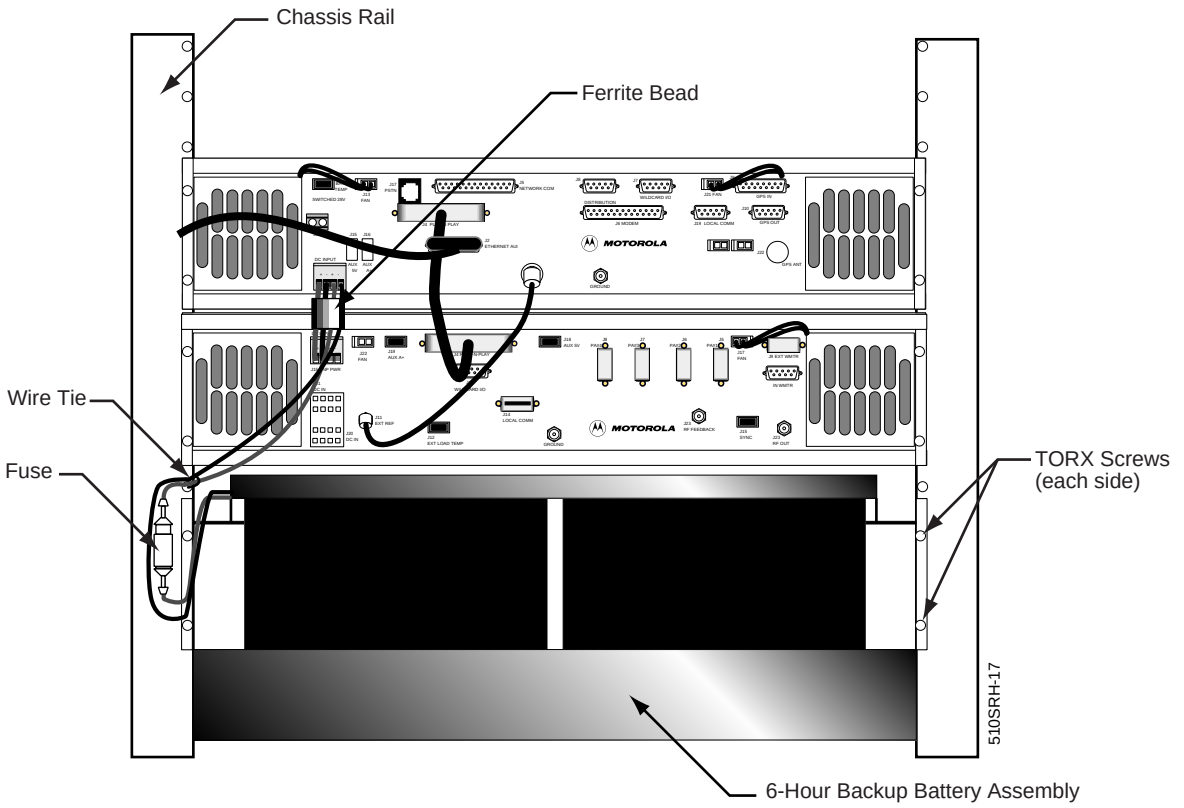


Figure 6-9: 6-Hour Battery Assembly (Installed)

DANGER

The 6-hour battery assembly weighs 40 pounds. One person must support the battery assembly while the other person removes the screws to prevent injury to personnel, damage to the equipment, or both.

8. While supporting the battery assembly, remove and save the four #30 TORX screws and remove the battery assembly (see Figure 6-9).

6-Hour Battery Installation

Perform the following steps to install the 6-hour battery assembly:

1. From the back of the cabinet, position the 6-hour battery assembly with the wires on the left side.

2. Align the bracket holes on the battery assembly with the chassis holes and install the four screws removed in paragraph, "6-Hour Battery Removal", Step 8 (see Figure 6-9).

3. Connect the connector with two wires to J15 on the OCC and tighten the screws (see Figure 6-8).

4. Connect the connector with four wires to J14 on the BCC and tighten the screws.

5. Anchor the wires to the chassis rail using a wire tie (see Figure 6-9).

6. Install the fuse).

7. If necessary, install the rear cabinet door (see paragraph, "Doors Installation").

8. From the front of the cabinet, set the AC power supply power switches to ON (|) (see Figure 6-7).

9. Set the RF-O! transmitter POWER switch to ON (|) (see Figure 6-7).

10. Set the RF-B! transmitter controller POWER switch to ON (|).

11. Check system operation (see Chapter 4, "Installation", paragraph, "Operational Checkout").

Assigning an RF-B! Transmitter Controller to a Multicast Group

Each RF-B! transmitter controller must have an individual (unicast) IP address to process the traffic. In addition, each RF-B! transmitter controller can be part of up-to 16 multicast groups. This means that the RF-B! can have 1 unicast and up-to 16 multicast IP addresses for a total of 17 IP addresses. (The multicast address is a Class D IP address.) The RF-B! transmitter controller joins a multicast group and registers with the routers using Internet Group Management Protocol (IGMP). A group can consist of any number of RF-B! transmitter controllers.

Multicasting allows an RF-C! controller to send one packet for each group rather than having to send individual packets to each RF-B! transmitter controller. This reduces the amount of traffic the controller and network have to handle.The network then routes the packets to the members of the group. The router queries the RF-B! transmitter controllers for group membership on a regular basis (usually once a minute), and the transmitter controllers respond with the group identifiers (IDs).

Multicast Direct Write Mode

Perform the following steps to put the multicast address directly into the active address table:

1. Establish a FIPS session at the paging station (see Chapter 5, "Operation", paragraph, "Service Terminal") or a Management Information Base (MIB) session at the RF-C! controller (refer to *RF-Conductor!™ Controller Administration* manual, Motorola part number 6880494G54).

2. Check the contents of the active address table to ensure that you do not write over an existing address. Type:

   a 60 a i <Enter> (where i = 1–16)

   The terminal displays the contents of the index location in the active address table.

3. Check the contents of the configuration address table to ensure that you do not write over an existing address. Type:

   a 60 c i <Enter> (where i = 1–16)

   The terminal displays the contents of the index location in the configuration address table.

4. Go to direct write mode. Type:

   w 347 1 <Enter>

5. Enter the index number and group IP address. Type:

   a 61 i [group IP address] <Enter> (where i = 1–16)

   The address is written to the i index location in the configuration and active address tables.

6. Repeat Step 5 as required to assign the RF-B! to additional groups.

Multicast Gated Write Mode

Perform the following steps to put a group of multicast IP addresses into the active table:

1. Establish a FIPS session at the paging station (see Chapter 5, "Operation", paragraph, "Service Terminal") or a MIB session at the RF-C! controller (refer to *RF-Conductor!™ Controller Administration* manual, Motorola part number 6880494G54).

2. Check the contents of the configuration address table to ensure that you do not write over an existing address. Type:

   a 60 c i <Enter> (where i = 1–16)

   The terminal displays the contents of the index location in the configuration address table.

3. Go to the gated write mode. Type:

   w 347 0 <Enter>

4. Type: **a 61 i [group IP address] <Enter>** (where i = 1–16)

   The address is written to the configuration table.

5. Repeat Step 2 through Step 4 as required to assign this RF-B! to additional groups.

6. Check the contents of the active address table to ensure that you do not write over an existing address. Type:

   a 60 a i <Enter> (where i = 1–16)

   The terminal displays the contents of the index location in the active address table.

When you write the contents of the configuration address table to the active address table, the contents of the entire active address table are replaced. If you want to keep an address that is in the active address file, you must put the address in the configuration address file before you write to the active address file.

7. To write the contents of the configuration table to the active address table, type:

   w 346 1 <Enter>

   The contents of the configuration table are written to the active address table.

Deleting an RF-B! Transmitter Controller from a Multicast Group

Perform the following steps to remove an RF-B! transmitter controller from a group:

1. Establish a FIPS session at the paging station (see Chapter 5, "Operation", paragraph, "Service Terminal") or a MIB session at the RF-C! controller (refer to *RF-Conductor!™ Controller Administration* manual, Motorola part number 6880494G54).

2. Check the contents of the active address table. Type:

   a 60 a i <Enter> (where i = 1–16)

   The terminal displays the contents of the index location in the active address table.

3. Type: **a 61 i 0.0.0.0 <Enter>** (where i is the index number of the group address you are removing)

   The group address in index location i is deactivated.

Remote Software Download from Choreographer! Network Manager

Refer to *Choreographer! Network Manager Concepts Description*, Motorola Part No. 6880492G08 and *Choreographer!™ Network Manager Installation and Operation*, Motorola Part No. 6880492G07 for the procedures to download software to the RF-B! transmitter controller dormant flash bank using the Choreographer! network manager. The RF-B! transmitter controller continues to pass paging traffic during the download. Paging operation is disrupted temporarily during the cutover to the new software. This disruption is equivalent to the time the RF-B! transmitter controller takes to reset and achieve GPS synchronization (approximately 5–10 minutes).

Local Software Download Using the Front Panel

The Local Software Download is executed using the FIPS interface and a Trivial File Transfer Protocol (TFTP) server. The Local Software Download procedure loads a new software image to the Dormant Flash Bank. The RF-B! transmitter controller continues to pass paging traffic while the download is underway. Paging operation is disrupted temporarily when the cutover of the new software is performed. This disruption is equivalent to the time the RF-B! transmitter controller takes to reset and achieve GPS synchronization—approximately 5-10 minutes.

Equipment

The following equipment is required to perform a local software download.

- PC or workstation running a VT100 terminal emulator program (Procomm Plus)
- Serial cable with null-modem
- TFTP Server with UNIX formatted RF-B! transmitter controller S-Record File

Setup

Assure that the S-Record File is loaded on the TFTP Server in the /tftpboot directory (this is the directory that the RF-B! transmitter controller attempts to access for the S-Record).

Local Software Download Procedure

Perform the following steps to perform the local software download:

1. Connect the service terminal to the RF-B! transmitter controller (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

2. At the FIPS prompt, type:

   A 300 <Enter>

   The following information should appear on the display:

FIPS:	
Current tftp parameter configuration:	
TFTP server IP address:	<tftp server IP address>
remote file name	: rfb1
Commands to proceed further:	
a 310	to start download to RFB
a 312	to switch over to dormant banK
a 301 xx.xx.xx.xx	to set TFTP Server IP address
a 302 file name	to set TFTP download file
	NOTE: 8 characters MAXimum

3. Enter the correct file name of the S-record to be downloaded. Type:

   A 302 [filename] <Enter> (where **[filename]** is the S-record file stored in the `/tftpboot` directory of the TFTP server)

4. Change the IP address to the correct IP Address of the TFTP Server. Type:

   A 301 [xxx.xx.xxx.xx] <Enter> (where xxx... is the IP address of the TFTP server)

5. Start the download. Type:

   A 310 <Enter>

   The second light-emitting diode (LED) from the right (RFB Req LED) flashes to indicate the file is being programmed into the FLASH memory.

   The download time is approximately 5 minutes.

   When the RFB Req LED stops flashing, wait 30 seconds before going to Step 6.

6. The new software is now loaded into the dormant FLASH bank. To switch it to the active bank,type:

   A 312 <Enter>

   The RF-B! transmitter controller should reboot. The second LED from the left (Control On) lights indicating the cutover is complete.

7. Verify the active software version. Type:

   R 148 <Enter> (Read Active Flash bank)

   The RF-B! returns the active software version.

8. Check the dormant FLASH bank. Type:

   R 152 <Enter> (Read Dormant Flash bank})

   The RF-B! returns the dormant software version.

Note: See paragraph, "Parameter Database Updating" to determine whether any updates to the parameter database are necessary.

Parameter Database Updating

The parameter database information is stored on an Electrically Erasable Programmable Read Only Memory (EEPROM) (SK900) on the BCM. Occasionally, new parameters are added to support a new feature of the RF-B! transmitter controller software. Efforts are made to keep backwards compatibility with older software versions to avoid the need to reprogram the parameter database whenever the software is upgraded. In certain cases, you may also need to manually initialize new parameters (using FIPS) without resetting the entire database.

In certain instances initializing the parameter database becomes necessary. See paragraph, "Initializing New Parameters" to decide if any new parameters need to be manually initialized using FIPS. Check the software release notes to determine if a hard reset is required.

Resetting the Parameter Database

Reset the parameter database after software upgrades.

Perform the following procedure to reset the parameter database:

1. Set the RF-B! transmitter controller Power switch to OFF (O) (see Figure 6-10).

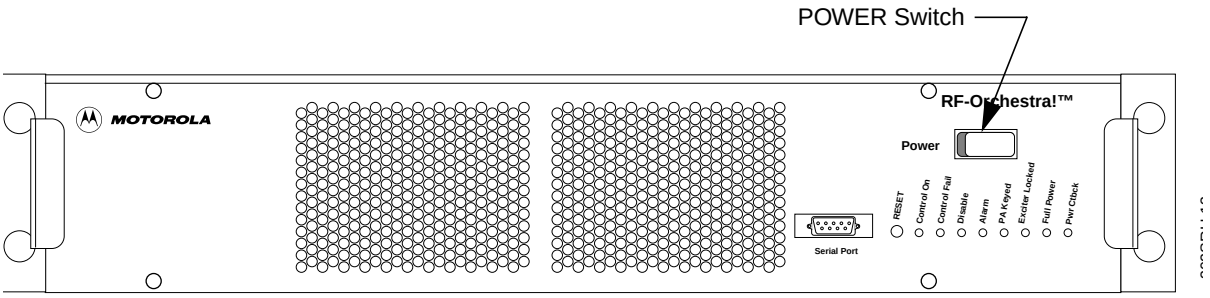


Figure 6-10: RF-B! Transmitter Controller Front Panel

2. Remove the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Removal").

3. Gently pull the BCM straight out (see Figure 6-11).

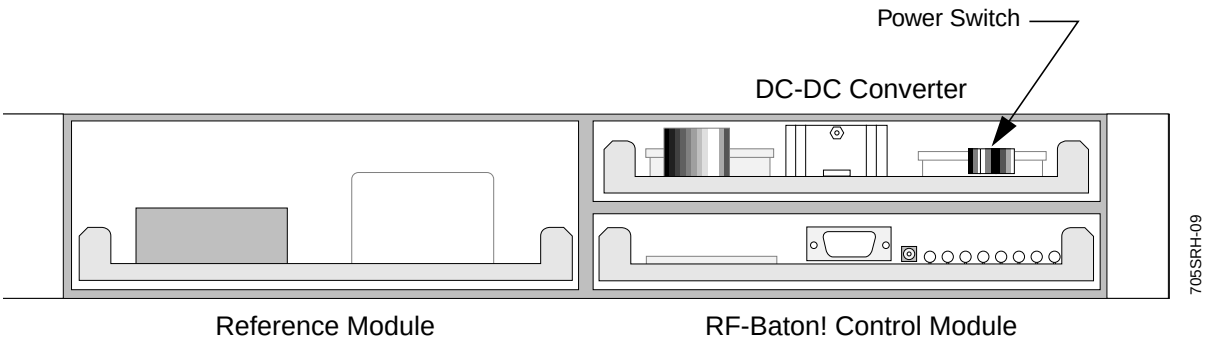


Figure 6-11: RF-B! Transmitter Controller (Front Panel Removed)

4. Set Switch 2 of Dual In-line Package (DIP) switch SW600 to ON (see Figure 6-12).

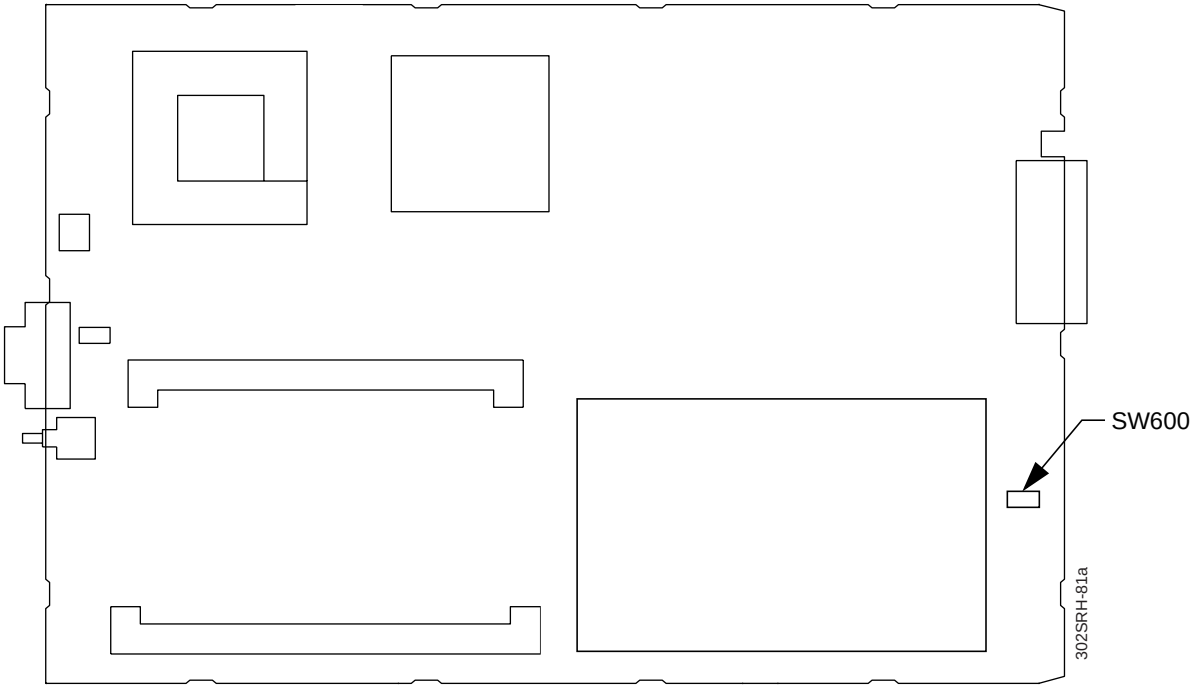


Figure 6-12: BCM Component Layout—DIP Switch S2 (SW600) Location

5. Gently place the BCM into the slot in the RF-B! transmitter controller chassis, firmly seating the board card-edge connectors into the backplane (see Figure 6-11).

6. Set the RF-B! transmitter controller POWER switch to ON (|).

7. Allow the board to completely boot up (the FIPS prompt appears).

8. After the boot up, set the RF-B! transmitter controller POWER switch to OFF (O).

9. Gently pull the BCM straight out.

10. Set Switch 2 of DIP SW600 to OFF (see Figure 6-12).

11. Gently place the BCM into the slot in the RF-B! transmitter controller chassis, firmly seating the board card-edge connectors into the backplane (see Figure 6-11).

12. Install the RF-B! transmitter controller faceplate (see paragraph, "Faceplate Installation").

13. Set the RF-B! transmitter controller POWER switch to ON (|).

Note: The RF-B! transmitter controller networking parameters that were initialized during the installation procedure are maintained during a parameter database update. All other parameters are reset to a default condition, including software download parameters.

The parameter database is set.

Initializing New Parameters

If you did not reset the Parameter Database and you are upgrading from RFB 1.1.0 or earlier RF-B! transmitter controller software, you must perform the following procedure:

1. Connect a service terminal to the RF-B! transmitter controller (see Chapter 5, "Operation", paragraph, "Service Terminal").

Note: Keyboard conventions were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions".)

2. Set the maintenance path (RF-O! transmitter and RF-B! transmitter controller) to 9600 baud. Type:

   w 213 4 <Enter>

Note: This parameter was added in revision 1.2.0.

Abbreviations and Acronyms

Table A-1 lists the abbreviations and acronyms used in this document.

Table A-1: Abbreviations List (Sheet 1 of 5)

Abbreviation or Acronym	Definition
A	Ampere(s)
ac or AC	Alternating Current
AGC	Automatic Gain Control
AM	Amplitude Modulation
ARP	Address Resolution Protocol
ASCII	American Standard Code for Information Interchange
ASR	Asynchronous Service Request
Async	Asynchronous
AUI	Auxiliary Unit Interface
aux	auxiliary
AWG	American Wire Gauge
BATT	Battery
BCC	Baton Control Chassis
BCM	Baton Control Module
bps	bits per second
˚C	Degrees Celsius
cm	Centimeters
CPU	Central Processing Unit
CSU/DSU	Channel Service Unit/Data Service Unit
DA	Digital to Analog

Table A-1: Abbreviations List (Sheet 2 of 5)

Abbreviation or Acronym	Definition
dB	Decibel
DC or dc	Direct Current
DC-DC	Direct Current to Direct Current
DDN	Decimal Dot Notation
DIP	Dual In-line Package
DOP	Dilution of Precision
DRAM	Dynamic Random Access Memory
DRT	Data Router
DSP	Digital Signal Processor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi-frequency
DUART	Dual Universal Asynchronous Receiver Transmitter
EEPROM	Electrically Erasable Programmable Read-Only Memory
EIA	Electronics Industries Association
˚F	Degrees Fahrenheit
FCC	Federal Communications Commission
FIPS	Friendly Interface Protocol System
FM	Frequency modulation
FNE	Fixed Network Equipment
FPGA	Field Programmable Gate Array
FRU	Field Replaceable Unit
FSK	Frequency Shift Keying
ft	Foot
GMT	Greenwich Mean Time
GPS	Global Positioning System

Table A-1: Abbreviations List (Sheet 3 of 5)

Abbreviation or Acronym	Definition
HSO	High Stability Oscillator
HVAC	Heating, Ventilation, Air Conditioning
Hz	Hertz
ID	Identifier
IGMP	Internet Group Management Protocol
I/O	Input/Output
in.	Inch
IP	Internet Protocol
ISDN	Integrated Services Digital Network
kbps	Kilobits per second
kHz	KiloHertz
LAN	Local Area Network
lb	Pound
LCD	Liquid Crystal Display
LED	Light-Emitting Diode
m	Meter
mA	Milliampere
Mb/s or Mbps	Megabits per second
MHz	MegaHertz
μg/m^3	Micrograms per cubic meter
MIB	Management Information Based
mm	Millimeter
μs	Microsecond
ms	Millisecond
msb	Most significant bit

Table A-1: Abbreviations List (Sheet 4 of 5)

Abbreviation or Acronym	Definition
mV	Millivolts
NA or na	Not applicable
ns	Nanosecond
OCC	Orchestra Control Chassis
OCM	Orchestra Control Module
OPP	Outbound Paging Protocol
OPPM	Outbound Paging Protocol Manager
Osc	Oscillator
PC	Personal Computer
PCD	Personal Communications Device
PCLM	Page Control Launch Manager
PCRM	Page Control Receive Manager
PDM	Paging Data Message
PDOP	Position Dilution of Precision
PMU	Personal Messaging Unit
p-p	peak to peak
PnP	Plug-n-Play
ppb	parts per billion
PPP	Point-to-Point Protocol
PPS	Pulse Per Second
PSTN	Public Switched Telephone Network
PVC	Permanent Virtual Circuit
RAM	Random Access Memory
Ref	Reference
RF	Radio Frequency

Table A-1: Abbreviations List (Sheet 5 of 5)

Abbreviation or Acronym	Definition
RF-A!	RF-Audience!
RF-B!	RF-Baton!
RF-C!	RF-Conductor!
RF-O!	RF-Orchestra!
RIP	Return Internet Protocol
ROM	Read Only Memory
RU	Rack Unit
Rx	Receive
SIMM	Single In-line Memory Module
SNMP	Simple Network Management Protocol
SNR	Signal to Noise Ratio
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
Sync	Synchronous
TAP	Telocator Alphanumeric Protocol
TEMP	Temperature
TFTP	Trivial File Transfer Protocol
Tx	Transmit
UDP	User Datagram Protocol
UHSO	Ultra-High Stability Oscillator
Vdc	Volts - direct current
WAN	Wide Area Network
W	Watt
WMG	Wireless Messaging Gateway
WMS	Wireless Messaging Service

Connector Pinouts

Serial Port

The RF-B! transmitter controller serial port, located on the front panel, is used for obtaining station parameter and diagnostic information through a service terminal. The serial port uses RS-232 signaling through a DB-9 female connector. Table B-1 provides the pinout information for the Serial Port.

Note: The Console port requires the data carrier detect (DCD) pin to detect that a serial cable is connected. Ensure that your serial interface and cable properly provide DCD.

Table B-1: Console Port Connector

Pin	Signal
1	DCD
2	RXD
3	TXD
4	DTR
5	GND
6	Not used
7	Not used
8	Not used
9	Not used

Backplane Connectors

The RF-B! transmitter controller has 22 backplane connectors, providing the connections necessary for interfacing to the transmitter and distribution network (see Figure B-1 and Table B-2 through Table B-10).

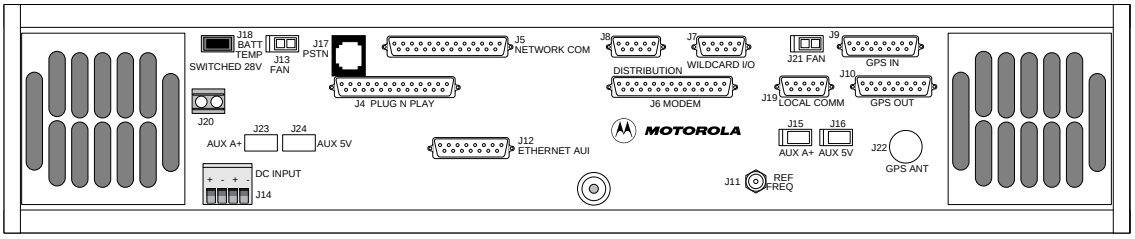


Figure B-1: RF-B! Transmitter Controller Back Panel

Table B-2: RF-B! Transmitter Controller Backplane Connectors—J1 through J22 (Sheet 1 of 2)

Connector	Name	Description
J1	Internal	DC-DC converter module backplane connector
J2	Internal	BCM backplane connector
J3	Internal	Reference module backplane connector
J4	Plug-n-Play	Transmitter interface protocol standard
J5	NETWORK COMM	High-speed RS-232 port
J6	MODEM	External modem interface with RS-232
J7	WILDCARD I/O	External circuit input/output interface
J8	DISTRIBUTION	Reserved
J9	GPS IN	Remote GPS receiver signal interface using RS-485
J10	GPS OUT	GPS signal timing distribution using RS-485
J11	REF FREQ (Coaxial)	10-MHz source at 50-ohm impedance
J12	ETHERNET AUI	Standard ethernet auxiliary unit interface (AUI) for ethernet distribution network
J13 and J21	FAN	RF-B! chassis fan connection with filtering

Table B-2: RF-B! Transmitter Controller Backplane Connectors—J1 through J22 (Sheet 2 of 2)

Connector	Name	Description
J14	BATT	+28-Vdc input and optional battery revert connection for batteries
J15	AUX 5V	+5-Vdc source limited to 50-mA maximum current
J16	AUX A+	+12-Vdc source limited to 50-mA maximum current
J17	PSTN	Optional internal public switch telephone network connection
J18	BATT TEMP	Input from battery temperature sensor with the optional battery installed
J19	LOCAL COMM PORT	Maintenance use only; ASCII interface protocol system (AIPS)
J20	SWITCHED 28 V	Auxiliary +28-Vdc source controlled by RF-B! control module with 800-mA maximum current
J22	GPS ANT (Coaxial)	Radio Frequency (RF) signal input from antenna using SMA connector. *Note: The inner conductor has +5 V applied when the optional GPS receiver is installed in the RF-B! transmitter controller.*

Table B-3: DC-DC Converter Backplane Pinouts—J1 (Sheet 1 of 2)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
A1	28V	**B1**	28V	**C1**	28V	**D1**	28V
A2	28V	**B2**	28V	**C2**	28V	**D2**	28V
A3	28V	**B3**	28V	**C3**	GND	**D3**	GND
A4	GND	**B4**	GND	**C4**	GND	**D4**	GND
A5	GND	**B5**	GND	**C5**	GND	**D5**	GND
A6	5V	**B6**	5V	**C6**	5V	**D6**	5V
A7	5V	**B7**	5V	**C7**	5V	**D7**	5V
A8	GND	**B8**	GND	**C8**	GND	**D8**	GND
A9	GND	**B9**	GND	**C9**	GND	**D9**	GND
A10	A+	**B10**	A+	**C10**	GND	**D10**	GND
A11	FAN A+	**B11**	FAN A+	**C11**		**D11**	
A12	BATTERY -	**B12**	BATTERY -	**C12**	BATTERY -	**D12**	BATTERY -

Table B-3: DC-DC Converter Backplane Pinouts—J1 (Sheet 2 of 2)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
A13	BATTERY -	**B13**	BATTERY -	**C13**	BATTERY -	**D13**	BATTERY -
A14	BATTERY -	**B14**	BATTERY -	**C14**	BATTERY +	**D14**	BATTERY +
A15	BATTERY +	**B15**	BATTERY +	**C15**	BATTERY +	**D15**	BATTERY +
A16	BATTERY +	**B16**	BATTERY +	**C16**	BATTERY +	**D16**	BATTERY +
A17	SWITCHED 28V	**B17**	SWITCHED 28V	**C17**	SWITCHED 28V	**D17**	SWITCHED 28V
A18	GND	**B18**	GND	**C18**	GND	**D18**	GND
A19	SWITCHED 28 CNTRL	**B19**	BATT REVERT ALARM	**C19**	THERMISTOR TEMP +	**D19**	THERMISTOR TEMP -
A20	GND	**B20**	GND	**C20**	GND	**D20**	OPEN
A21	RXD	**B21**	TXD	**C21**	DSR	**D21**	DCD
A22	DTR	**B22**	CTS	**C22**	RTS	**D22**	RI
A23	OPEN	**B23**	OPEN	**C23**	OPEN	**D23**	OPEN
A24	TIP	**B24**	OPEN	**C24**	OPEN	**D24**	RING

Table B-4: Baton Control Module (BCM) Backplane Pinouts—J2 (Sheet 1 of 2)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
A1	10 MHz_REF	**B1**	GND	**C1**	ARX+	**D1**	ARX-
A2	GND	**B2**	GND	**C2**	ATX+	**D2**	ATX-
A3	ACX+	**B3**	ACX-	**C3**	RFCREQ	**D3**	TXOK
A4	1PPS_RS485+	**B4**	1PPS_RS485-	**C4**	RFCMAINTB	**D4**	RFCMAINTA
A5	TX_RS485+	**B5**	TX_RS485-	**C5**	TXMAINTB	**D5**	TXMAINTA
A6	RX_RS485+	**B6**	RX_RS485-	**C6**	PTFRAMEB	**D6**	PTFRAMEA
A7	CABLE_SENSE	**B7**	ALT_RESET*	**C7**	PDATAB	**D7**	PTDATAA
A8	X_TXD	**B8**	X_RXD	**C8**	PTCLOCKB	**D8**	PTCLOCKA
A9	GND	**B9**	GND	**C9**	MARKB	**D9**	MARKA
A10	AUX_IN2	**B10**	AUX_OUT1	**C10**	GND	**D10**	GND

Table B-4: Baton Control Module (BCM) Backplane Pinouts—J2 (Sheet 2 of 2)

Pin	Function	Pin	Function	Pin	Function	Pin	Function
A11	AUX_OUT2	**B11**	AUX_IN1	**C11**	NTWK_TX_CLK	**D11**	NTWK_TXD
A12	DIST_RCLK	**B12**	DIST_DCD	**C12**	NTWK_RX_CLK	**D12**	NTWK_RXD
A13	DIST_RXD	**B13**	DIST_TCLK	**C13**	GND	**D13**	NTWK_RTS
A14	GND	**B14**	DIST_TXD	**C14**	NTWK_DTR	**D14**	NTWK_CTS
A15	SPI_A2	**B15**	REFMOD_SEL	**C15**	NTWK_DSR	**D15**	NTWK_RI
A16	SPI_A0	**B16**	SPI_A1	**C16**	NTWK_DCD	**D16**	NTWK_TXCE
A17	SPI_MOSI	**B17**	SPI_CLK	**C17**	BATT_REVERT_ALARM	**D17**	SWITCHED 28 CNTRL
A18	SPI_MISO	**B18**	GND	**C18**	TCLK	**D18**	TXD
A19	5V	**B19**	5V	**C19**	RCLK	**D19**	RXD
A20	5V	**B20**	5V	**C20**	DTR	**D20**	RTS
A21	5	**B21**	5V	**C21**	DSR	**D21**	CTS
A22	A+	**B22**	5V	**C22**	DCD	**D22**	RI
A23	GND	**B23**	GND	**C23**	GND	**D23**	GND
A24	GND	**B24**	GND	**C24**	GND	**D24**	GND

Table B-5: Reference Module with GPS Receiver Backplane Pinouts

Pin	Function	Pin	Function	Pin		Pin	Function
A1	A+	**B1**	A+	**C1**	GND	**D1**	GND
A2	5V	**B2**	5V	**C2**	GND	**D2**	GND
A3	5V	**B3**	5V	**C3**	GND	**D3**	GND
A4	OPEN	**B4**	OPEN	**C4**	OPEN	**D4**	OPEN
A5	OPEN	**B5**	OPEN	**C5**	OPEN	**D5**	OPEN
A6	RX_RS485-	**B6**	OPEN	**C6**	OPEN	**D6**	OPEN
A7	RX_RS485+	**B7**	OPEN	**C7**	OPEN	**D7**	OPEN
A8	TX_RS485-	**B8**	OPEN	**C8**	OPEN	**D8**	OPEN

Table B-5: Reference Module with GPS Receiver Backplane Pinouts

Pin	Function	Pin	Function	Pin		Pin	Function
A9	TX_RS485+	**B9**	OPEN	**C9**	OPEN	**D9**	OPEN
A10	1PPS_RS485-	**B10**	OPEN	**C10**	OPEN	**D10**	OPEN
A11	1PPS_RS485+	**B11**	OPEN	**C11**	OPEN	**D11**	OPEN
A12	GND	**B12**	OPEN	**C12**	OPEN	**D12**	OPEN
A13	GND	**B13**	OPEN	**C13**	OPEN	**D13**	OPEN
A14	SPI_MISO	**B14**	SPI_CLK	**C14**	OPEN	**D14**	OPEN
A14	SPI_MOSI	**B15**	SPI_A0	**C15**	OPEN	**D15**	OPEN
A16	SPI_A1	**B16**	SPI_A2	**C16**	OPEN	**D16**	OPEN
A17	REFMOD_SEL	**B17**	CABLE SENSE	**C17**	OPEN	**D17**	OPEN
A18	ALT_RESET*	**B18**	OPEN	**C18**	OPEN	**D18**	OPEN
A19	OPEN	**B19**	OPEN	**C19**	OPEN	**D19**	OPEN
A20	OPEN	**B20**	OPEN	**C20**	OPEN	**D20**	OPEN
A21	OPEN	**B21**	OPEN	**C21**	OPEN	**D21**	OPEN
A22	GND	**B22**	GND	**C22**	GND	**D22**	GND
A23	GND	**B23**	GND	**C23**	GND	**D23**	GND
A24	GND	**B24**	10MHz_REF	**C24**	GND	**D24**	GND

Table B-6: Miscellaneous Connectors—J4 through J6 (Sheet 1 of 2)

Pin	J4 Plug-N-Play	J5 Network Comm Port	J6 Ext Modem Interface
1	GND	GND	GND
2	EXTERNAL KEY	NTWK_TXD	TXD
3	TX DATA	NTWK_RXD	RXD
4	WIDE or NARROW DEV	NTWK_RTS	RTS
5	SPARE 1	NTWK_CTS	CTS
6	OPEN	NTWK_DSR	DSR

Table B-6: Miscellaneous Connectors—J4 through J6 (Sheet 2 of 2)

Pin	J4 Plug-N-Play	J5 Network Comm Port	J6 Ext Modem Interface
7	GND	GND	GND
8	OPEN	NTWK_DCD	DCD
9	POWER AMP FAIL	OPEN	OPEN
10	SYNTH OUT OF LOCK	OPEN	OPEN
11	EXCITER FAIL	OPEN	OPEN
12	LOW FWD POWER	OPEN	OPEN
13	OPEN	OPEN	OPEN
14	OPEN	OPEN	OPEN
15	TX BAUD CLOCK	NTWK_TX_CLK	TCLK
16	TX DATA CLOCK	OPEN	OPEN
17	OPEN	NTWK_RX_CLK	RCLK
18	OPEN	OPEN	OPEN
19	OPEN	OPEN	OPEN
20	OPEN	NTWK_DTR	DTR
21	OPEN	OPEN	OPEN
22	HIGH REFL POWER	NTWK_RI	RI
23	AC POWER FAIL	OPEN	OPEN
24	COOLING FAN FAIL	NTWK_TXCE	OPEN
25	SYS TIMER ALARM	OPEN	OPEN

Table B-7: Miscellaneous Connectors—J7 through J10

Pin	J7 Wildcard I/O	J8 Distribution Port	J9 Ext GPS Input	J10 Ext GPS Output
1	GND	GND	RX_RS485+	RX_RS485+
2	5 V	DIST_TXD	RX_RS485-	RX_RS485-
3	A+	DIST_RXD	TX_RS485+	TX_RS485+
4	GND	GND	TX_RS485-	TX_RS485-
5	CHANNEL BIT 0	DIST_DCD	1PPS_RS485+	1PPS_RS485+
6	CHANNEL BIT 1	GND	1PPS_RS485-	1PPS_RS485-
7	CHANNEL BIT 2	DIST_TXCLK	OPEN	OPEN
8	ANT RELAY MODE	DIST_RXCLK	OPEN	OPEN
9	GND	GND	A+	OPEN
10			GND	OPEN
11			OPEN	OPEN
12			OPEN	OPEN
13			CABLE SENSE	CABLE SENSE
14			GND	GND
15			GND	GND

Table B-8: Miscellaneous Connectors—J11 through J14 (Sheet 1 of 2)

Pin	J11 Ref Freq I/O	J12 Ethernet AUI	J13 DC Fan Power	J14 DC Power
1	10 MHz_REF	GND	FAN A+	28 V
2	GND	ACX+	FAN GND	GND
3	GND	ATX+		BATTERY +
4	GND	GND		BATTERY -
5	GND	ARX+		
6		GND		

Table B-8: Miscellaneous Connectors—J11 through J14 (Sheet 2 of 2)

Pin	J11 Ref Freq I/O	J12 Ethernet AUI	J13 DC Fan Power	J14 DC Power
7		OPEN		
8		GND		
9		ACX-		
10		ATX-		
11		GND		
12		ARX-		
13		A+		
14		GND		
15		OPEN		

Table B-9: Miscellaneous Connectors—J15 through J19

Pin	J15 AUX 5 V	J16 AUX A+	J17 PSTN Phoneline	J18 BATT Temp	J19 Local Comm Port
1	5 V	A+		THERMISTOR TEMP +	OPEN
2	OPEN	OPEN	OPEN	OPEN	X_RXD
3	GND	GND	TIP	THERMISTOR TEMP -	X_TXD
4			RING		OPEN
5			OPEN		GND
6					OPEN
7					OPEN
8					OPEN
9					OPEN

Table B-10: Miscellaneous Connectors—J20, J21, J23, J24

PIN	J20 Switched 28 V	J21 DC Fan Power	J23 AUX A+ DC Power	J24 AUX 5 V DC Power
1	SWITCHED 28 V	FAN A+	A+	5 V
2	GND	FAN GND	GND	GND

FIPS Action Commands and Parameter IDs

This appendix summarizes the Friendly Integrated Paging System (FIPS) action, read, and write commands for the RF-Baton! (RF-B!) transmitter controller that is used with the RF-Orchestra! (RF-O!) paging station. Table C-1 summarizes the action commands. Table C-2 summarizes the read and write commands.

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
16	GPS Pass Thru Command	Send command to GPS receiver.	a 16 [GPS command]	GPS receiver reacts to commands.
17	GPS Pass Thru Mode Start	Put BCM into mode where GPS commands can be directly sent to GPS receiver.	a 17	None
18	GPS Pass Thru Mode End	Remove BCM from mode where GPS commands can be directly sent to GPS receiver.	a 18	None
60	Read OPP Multicast Table	Reads the contents of the OPP Multicast Configuration & Active Tables	a 60 a i (*Read Active Table*) a 60 c i (*Read Config Table*) i=1..16 for a specific index into the table or i=? for the contents of the entire table	Multicast IP Address(es) from the Configuration or Active Tables.
61	Configure a Multicast IP Address	Adds a Multicast IP address to the OPP Multicast Configuration Table. If the “Group Write Mode” (FIPS param 347) is set to ‘1’ (Direct Write Mode) the IP address gets updated to the Active Table as well.	a 61 i [*Multicast IP Address*] i=1..16 is the index into the Configuration Table where the IP Address is to be added	Successful update or invalid IP Address assertion.
99	Read All Alarms	Display all alarms in alarm log.	a 99	All alarms which have become active since last clear-alarm-log command are displayed. Format matches error log. Supported alarms are listed in this document. Full set of alarms is listed in MPD.
103	Clear All Alarms	Clear all alarms in alarm log.	a 103	None. Re-reading alarm log will return no alarms.
104	Read Error Log	Display all errors in error log.	a 104	All errors which have become active since last clear-error-log command are displayed. Errors are defined by software developers to indicate failures related to hardware or system problems. Error format is: error -type, module in which error was detected, line number in module, time of last occurrence, number of occurrences.

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
110	Read Software Error Log	Display all errors in software error log.	a 110	All software errors, which have become active since last clear-sware-error-log command, are displayed. Software errors are defined by software developers to indicate failures which are software specific. Error format is: error -type, module in which error was detected, line number in module, number of occurrences.
111	Clear Error Log	Clear all errors in error log.	a 111	None. Re-reading error log will return no errors.
113	Clear Software Error Log	Clear all errors in software error log.	a 113	None. Re-reading software error log will return no errors.
117	Reset Station	Initiate “warm” reset of station.	a 117	BCM goes through reset cycle (best indicated by LED sequence).
120	Read bus error Log	Display all errors in bus error log	a 120	All errors which have become active since last clear-bus error-log command are displayed.
121	Clear Bus error Log	Clear all errors in bus error log	a 121	None. Re-reading bus error log will return no errors
140	Test ADPCM Training (*Version 1.2.1+*)	Test training on various DSPs	a 140 x (where x is 0,1,2,3)	Requests training on one of the 4 DSPs (0,1, 2, or 3). The first byte of the returned message will display 00 if training request was successful Used for Development Testing Only.
141	Enable or Disable ADPCM Training (*Version 1.2.1+*)	Enables or Disables ADPCM Training	a 141 x (x=0, disables training, x=1, enables training)	This command enables and disables training for testing purposes. Training is enabled by default after power-up reset. If training is disabled, it will be re-enabled after a reset, or after the “enable” command is sent. Used for Development Testing Only.

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
176	Transmit Test Data Start	Initiate transmission of canned data to the OCM.	a 176 m p1 p2 p3 p4 r d s f m = modulation type 0 = FM 1 = AM; p1 = subchan 1 pattern p2 = subchan 2 pattern p3 = subchan 3 pattern p4 = subchan 4 pattern For AM 0 = disabled 2 = random AM data 4 = Random or 1 sideband training 5 = Random or 2 sidebands training For FM 0 = disabled 1 = A Pattern 2 = B Pattern 3 = C Pattern 4 = D pattern 5 = Big comma 6 = Little comma 7 = Staircase 8 = random; r = repetition rate 0 - 128 frames; d = # of data blocks per frame (NA for AM) 1- 11; s = bit rate of data (NA for AM) 5 = 6400 bps 4 = 3200 bps 2 = 1600 bps-2 lvl fsk only f = FSK, 1 = 4-level 0 = 2-level	BCM stops transmission of normal paging traffic and begins sending data across the Plug-n-Play interface. Station begins transmitting data based on arguments passed to “a 176”.

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
177	Transmit Test Data Stop	Stop transmission of canned data to the OCM.	a 177	BCM stops sending data across the Plug-n-Play interface. Station stops transmitting data. *NOTE: Transmission of data may immediately begin due to PDMs arriving at the network interface; that is, normal paging traffic.*
192	Start Debug Trace	Initiate trace to be displayed using FIPS.	a 192 [TASK] [FLAG] TASK = pSOS Task Name GPSC, SASM	FIPS terminal begins displaying information captured by software. a 192 GPSC 8: Monitor GPS initialization a 192 PCRM 4: Monitor PDMs information a 192 SASM 34: Monitor Sync and Simulcast
193	Stop Debug Trace	Stop the trace using FIPS	FLAG = Trace to disable	a 193 GPSC 8 a 193 PCRM 4
194	Probe Mode	Puts RF-B! transmitter controller back into Probe mode. This will cause the RF-B! to cease normal operation	a 194	Probe should come up on probe port.
195	Set Subchannel Offsets	Set the offset of the subchannels relative to the center frequency.	a 195 o1 o2 o3 o4 o1 = subchannel offset 1 o2 = subchannel offset 2 o3 = subchannel offset 3 o4 = subchannel offset 4 Range 1-16	
196	Set Tx Frequencies	Set center frequency to one of 16 possible values.	a 196 f f = 1 - 16	
198	Set or Reset OCM Parameters Writable Flag	Set or reset the OCM Parameters Writable Flag on the RF-O! over the PnP Maintenance Path.	a 198 Y (Set) a 198 N (Reset)	Successful or Failed assertion.
200	GPS Report Latitude	Report current latitude in ms.	a 200	Motorola: Latitude: xxx ms Trimble: Latitude: xx radians, xx ms

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
201	GPS Report Longitude	Report current longitude in ms.	a 201	Motorola: Longitude: xxx ms Trimble: Longitude: xx radians, xx ms
202	GPS Report Height	Report current height in ms.	a 202	Motorola: Height: xxx cm (ellipsoid), xx cm (msl) Trimble: Height: xx meters, xx cm
203	GPS Report xDOP Types		a 203	Motorola: xDOP Type= ???? Trimble: Trimble supports.....
204	GPS Report xDOP Values		a 204	Motorola: xDOP Value: xxx Trimble: PDOP mask= xxxx
205	GPS Report Height Reference		a 205	Motorola: ?????? Reference Trimble: Height Reference: ???????
206	GPS Report Position Reference		a 206	Motorola: Position Reference: ?????????? Trimble: Position Reference: ??????????
207	GPS Report Application Type		a 207	Motorola: Application Reference: ??????????? Trimble: Application Type: ????????????

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
208	GPS Report Position Status	Report time, position, velocity, geometry, satellite visibility and tracking status.	a 208	MOTOROLA GPS: **Almanac**: Data transmitted by GPS satellites which include orbit information on all the satellites. Visible Satellites: Satellites listed in the almanac - range 0..12 **Tracked Satellites:** - range 0..8 for an 8 Channel receiver Satellites that are good enough to be used by the GPS receiver to compute a position fix, which is latitude, longitude, height, time. Note that we are talking channel-6 language, so we can only show up to 6 channels in the FIPS command. ***Note:*** *If the almanac is bad, we may have an occasion where the number of visible satellites is 0, but number of tracked satellites is 3. This means that there is not enough info about the satellites in the almanac, and the receiver will then at random pick some satellites and tries to track those. This may or may not result in a position fix, or "tracking". If the almanac is OK, the number of tracked satellites is a subset of the number of visible satellites.* Receiver Status: There are 8 bits: bit 7 (msb): Position propagate mode bit 6 : Poor geometry (DOP > 20) bit 5 : 3D fix bit 4 : 2D fix bit 3: : Acquiring satellites or position hold bit 2 : Differential bit 1 : Insufficient visible satellites (<3) bit 0 : Bad Almanac

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
208 cont'd	GPS Report Position Status			**ID**: Satellite ID - range from 0 .. 37 **Mode**: Channel tracking mode - range from 0 ..8 0 - Code search 1 - Code acquire 2 - AGC set 3 - Freq acquire 4 - Bit sync detected 5 - Message sync detected 6 - Satellite time avail 7 - Ephemeris acquire 8 - Avail for position fix **SS**: Signal Strength - range from 0 .. 255 A good signal strength is between 80..140. If Channel mode is 0, signal strength is meaningless. **Channel Status**: There are 8 bits: bit 7 (msb): Using for position fix bit 6 : Satellite momentum alert flag set bit 5 : Satellite anti spoof flag set bit 4 : Satellite unhealthy bit 3: : Satellite inaccurate (>16 meters) bit 2,bit 1: Spare TRIMBLE GPS: # tracked Satellites Health of GPS Receiver:
209	GPS Report Satellite Status		a 209	Motorola: Status and Health Trimble: # of Visible Satellite List
210	GPS Report xDOP Status		a 210	Motorola: N-IN-View or Best-4 Trimble: Mode: # Satellite
211	GPS Report Almanac Status		a 211	Motorola: Almanac Status Trimble: Almanac Status NOT Supported
212	GPS Report Receiver ID		a 212	Motorola: COPYRIGHT 1991-1995 Motorola Inc. Trimble: Trimble Navigation - Pathfinder Basic
213	GPS Report Position Hold		a 213	Motorola: Position-Hold:????????? Trimble: Position Hold Not Supported

Table C-1: FIPS Action Commands

Action	Name	Description	Usage	Response
214	GPS Report Date		a 214	Date: mm/dd/yyyy
215	GPS Report Time		a 215	Time: HH:MM:SS
218	GPS_PERFORM_ SELF_TEST		a 218	Motorola: Results: Trimble: Not Supported
300	Display TFTP Configuration	Displays the TFTP parameters configurations	a 300	Current TFTP parameter configuration: TFTP server IP address: 199.4.70.10 remote file name : test.fil Commands to proceed further: a 310 to start download to RFB a 312 to switch over to dormant bank a 301 xx.xx.xx.xx to set TFTP Server IP address a 302 file name to set TFTP download file *NOTE: 8 characters maximum*
301	Set TFTP IP Address	Sets the TFTP server IP address	a 301 xx.xx.xx.xx	MUST BE SET AT INSTALLATION.
302	Set TFTP File Name	Sets the download file name for TFTP server. *NOTE: 8 character name maximum*	a 302 [filename]	
310	Start RFB Remote Software Download	Starts the remote download to the RF-B! transmitter controller	a 310	LED starts to flash during the burning of the flash.
311	Start RFO Remote Software Download	Starts the remote download to the RF-O! paging station	a 311	None
312	Flash Bank Switch	Switch to the dormant Flash bank	a 312	None

Table C-2: Supported Parameters

Param ID	Name	Description	Usage	Range	Default
50	FIPS Port Number	Reads or sets the remote FIPS Port Number	r 50 w 50 [value]	0 - 65535	20000
55	OPP Port Number	Reads or sets the UDP Port Number	r 55 w 55 [value]	0 - 65535	12000
99	Paging Access Disabled	Parameter to show paging enabled or disabled: 1= Disabled, 0 = Enabled	r 99 w 99 [value]	“0”= Enabled “1” = Disabled	None
136	FIPS time-out	FIPS inactivity time-out value in seconds	r 136 w 136 [value]	60 - 3600	300
148	Active Bank Software Version	Reads the active bank software version	r 148	?	?
139	FPSP Baud rate	Reads or sets FIPS serial port connection baud rate	r 139 w 139 [value]	1200 = 1 2400 = 2 4800 = 3 9600 = 4 19.2K = 5 38K = 6 57K = 7 115K = 8	9600 = 4
140	GPS Baud rate	Reads or sets GPS baud rate	r 140 w 140 [value]	1200 = 1 2400 = 2 4800 = 3 9600 = 4 19.2K = 5 38K = 6 57K = 7 115K = 8	9600 = 4
152	Dormant Bank Software Version	Reads the dormant bank software version	r 152	?	?
154	MIB version	Reads the current MIB version number	r 154	?	None

Table C-2: Supported Parameters

Param ID	Name	Description	Usage	Range	Default
155	Hardware Serial Number	Storage string for serial number	r 155 w 155 [value]	?	None
185	Pendulum Warp Value	Programmable Pendulum Warp ***WARNING: This parameter intended for Lab and Development use only!***	r 185 w 185 [value]	0 - 215	110
194	GPS Latitude	Parameter used to set a predetermined latitude value for use by the GPS receiver.	r 194 w 194 [value]	–324000000 324000000	118234479
195	GPS Longitude	Parameter used to set a predetermined longitude value for use by the GPS receiver.	r 195 w 195 [value]	–648000000 648000000	-350254697
196	GPS Height	Parameter used to set a predetermined height value for use by the GPS receiver.	r 196 w 196 [value]	–100000 1800000	20533
198	GPS 1 PPS Cable Delay	Parameter used to offset the 1 PPS pulse to compensate for antenna cable delay.	r 198 w 198 [value]	0 - 999,999 (ns)	0
213	MPIF Baud Rate	Reads or sets maintenance path baud rate	r 213 w 213 [value]	1200 = 1, 2400 = 2, 4800 = 3, 9600 = 4, 19.2K = 5, 38K = 6, 57K = 7, 115K = 8,	9600 = 4

Table C-2: Supported Parameters

Param ID	Name	Description	Usage	Range	Default
346	OPP Multicast Group Commit Flag	Reads or Sets the OPP Multicast Group Commit Flag. If “Group Write Mode” (FIPS Parameter 347) is set to ‘1’ (Direct Write Mode), setting this flag has no effect. If “Group Write Mode” is set to ‘0’ (Gated Write Mode), setting this flag updates the contents of the *entire* OPP Multicast Configuration Table to the Active Table.	r 346 (Read) w 346 1 (Group Commit)		0
347	OPP Multicast Group Write Mode	Reads or Sets the OPP Multicast Group Write Mode.	r 347 (Read) w 347 [mode]	0 = Gated Write Mode 1 = Direct Write Mode	0
430	Dormant download status	Software download status of the dormant bank	r 430	0 = fail 1 = pass	0 = fail
500	SNMP Address0	Network address of SNMP manager 0.	r 500 w 500 [xxx.xxx.xxx.xxx]		0
501	SNMP Address1	Network address of SNMP manager 1.	r 501 w 501 [xxx.xxx.xxx.xxx]		0
502	SNMP Address2	Network address of SNMP manager 2.	r 502 w 502 [xxx.xxx.xxx.xxx]		0
503	SNMP Address3	Network address of SNMP manager 3.	r 503 w 503 [xxx.xxx.xxx.xxx]		0
504	SNMP Address4	Network address of SNMP manager 4.	r 504 w 504 [xxx.xxx.xxx.xxx]		0
600	Frequency Change Delay	Reads frequency change delay PnP value, should not be overwritten	r 600	0 -999999	0
601	Key up Delay	Reads transmitter key up delay PnP value, should not be overwritten	r 601	0 - 999999	0

Table C-2: Supported Parameters

Param ID	Name	Description	Usage	Range	Default
602	Workahead Time	Reads Minimum workahead time PnP value, should not be overwritten	r 602	0 - 999999	30000
603	Workahead Window Width	Reads Workahead Window Width *PnP value should not be overwritten*.	r 603	0 - 999999	50000
703	Paging Protocol Supported	Parameter to determine which protocol will be decoded in the RF-B! transmitter controller.	r 703 w 703 [value]	1 = OPP 2 = CNET (CNET not supported)	1 = OPP
704	Transmitter Color Code	Parameter used to set InFLEXion protocol “transmitter color code” in outbound control information.	r 704 w 704 [value]	0 - 65535	21845
705	Network IP Address	Parameter used to set IP address of RF-B! transmitter controller.	r 705 w 705 [x.x.x.x]	where each x = 0 - 255	0.0.0.0
706	Sub-Network Mask	Parameter used to set IP sub-network mask of RF-B! transmitter controller.	r 706 w 706 [x.x.x.x]	where each x = 0 - $FF	0.0.0.0
707	User Password	Password used to access FIPS	r 707 w 707 [value]	[string]	6000
708	Gateway Address	Default gateway address	r 708 w 708 [x.x.x.x]	where each x = 0 - 255	0.0.0.0
800	UHSO Steering	Value used to steer the UHSO frequency - higher values result in lower frequencies.	r 800 w 800 [value]	0 - 4095	2047
801	FREERUN timeout	Length of time in minutes that RF-B! transmitter controller will remain in FREERUN state before shutdown.	r 801 w 801 [value]	15 -200	96
901	Active FLASH Bank	Active Software FLASH	r 901	1 = Bank A 2 = Bank B	1 = Bank A

Table C-2: Supported Parameters

Param ID	Name	Description	Usage	Range	Default
930	GPS Access Disabled	Parameter used to enable or disable GPS synchronization.	r 930 w 930 [value]	0 = Enabled 1 = Disabled, when Disabled, the BCM will inhibit paging.	0 = Enabled

Alarms and Error Messages

This appendix presents the error messages and alarms for the RF-Baton! (RF-B!) transmitter controller (see Table D-1 through Table D-7).

Table D-1 through Table D-3 list and describe the error codes that appear in the station error log (**a 104**). Table D-4 through Table D-6 list and describe the error codes that appear in the software event log (**a 110**). Table D-7 lists and describes the alarms. Once an error message is generated, the associated alarm severity is modified by using the Friendly Interface Protocol System (FIPS) action command, **a 200 ?**.

The tables are in alphabetical order by the Error Code column. Match the description below with the message that appears in the log. Any modifications to the defaults listed below will survive a station reset.

Table D-1: Station Errors (Sheet 1 of 2)

Error Code	Description
E_DUPLICATE_MDP_FRAMES	Duplicate frame detected in paging queue
E_EARLY_LAUNCH_TIME	Single message data purged. The launch time is too far ahead of the current time. Not enough RF-B! transmitter controller memory.
E_FLUSH_PDM_LIST	All message data purged. Data queues are flushed upon the Baton Control Module (BCM) disabling paging.
E_HIGH_STABILITY_REFERENCE_FAILURE	The station lost contact with the Ultra High Stability Oscillator (UHSO).
E_LATE_LAUNCH_TIME	Single message data purged. The necessary processing time and current time exceeded the launch time.
E_MISSING_AM_SIDEBAND	One of the two sidebands of AM data was missing from a message batch scheduled to be routed to the transmitter.
E_NO_DSP_AVAILABLE	BCM ran out of available subchannels to transmit the data on.
E_OPP_VERSION_NOT_SUPPORTED	Unsupported OPP version.
E_PAGING_PROTOCOL_NOT_SUPPORTED	Unsupported paging protocol.

Table D-1: Station Errors (Sheet 2 of 2)

Error Code	Description
E_PENDULUM_NOT_LOCKED	The pendulum has fallen out of phase lock with the 10 MHz. This could be due to the absence of a 10-MHz reference, incorrect programming, failure of the RF-O! paging station synthesizer, incorrect programming, or failure of the pendulum.
E_PENDULUM_REFERENCE_FAILURE	The pendulum clock is no longer detectable by the host microprocessor.
E_PLACE_BATCH_ON_PAGING_QUEUE	Frame not added to paging queue.
E_PULSE_OUTSIDE_WIN_PAGING	1 PPS pulse occurred outside designated window.
E_SASM_FREERUN_TIMEOUT	Global Positioning System (GPS) lock not re-acquired during simulcast FREERUN. Paging is disabled until GPS lock is re-acquired.
E_SUB_CHANNEL_DELETED	AM subchannel message data was invalid.
E_TX_OK_DOWN	TX_OK signal has been disabled by the transmitter.
E_UNABLE_TO_DETERMINE_SYS_CONFIG	Unknown station controller type
E_UNMATCHED_ACTIVE_SUBCHNL_LAUNCH_TIME	Launch time of pending message batch did not correspond with the end time of current message batch on a unique subchannel.
E_XILINX_DOWNLOAD_FAILURE	An error occurred while attempting to download a program to the Field Programmable Gate Array (FPGA).

Table D-2: Digital Signal Processor (DSP) Errors

Error Code	Description
E_DSP_BOOTSTRAP_TIMEOUT_ERROR	Unsuccessful attempt in downloading bootstrap code to the DSP.
E_DSP_OUTPUT_BUFFER_FULL	Only valid during a training request. Training request made, but there were no DSP message buffers available to receive the training request.
E_DSP_STARTUP_FAILURE	An attempt to download code to one of the DSPs failed.
E_DSP_TIMEOUT_ERROR	Unsuccessful attempt to download main application code to the DSP.
E_DSP_TIMEOUT_ON_OUTPUT	The DSP did not respond to a Host request within a designated time-out period.

Table D-3: GPS Errors

Error Code	Description
E_GPS_BAD_COMMAND	Bad command received from GPS receiver.
E_BUFFER_LENGTH_EXCEEDED	GPS message size has exceeded buffer size.
E_CORRUPTED_GPS_COMMAND_TABLE	GPS command table has been corrupted.
E_GPS_BAD_PACKET_LENGTH	Requested Trimble GPS packet was incorrect size.
E_GPS_NO_RESPONSE	GPS receiver does not respond to a Host command within designated time period
E_GPS_NOT_TRACKING_SATELLITES	GPS lost satellite tracking after initialization.
E_GPS_SELF_TEST_FAILURE	Self test on GPS receiver failed.
E_GPS_UNSTUFF_PACKET_FAIL	Trimble GPS report packet is invalid.

Table D-4: Operating System Errors (Sheet 1 of 4)

Error Code	Description
E_ACTIVE	Cannot start—already active.
E_BADTMID	Invalid timer identifier (ID) specified.
E_BUFADDR	Cannot Retbuf—incorrect buffer start address.
E_BUFFREE	Cannot Retbuf—buffer already free.
E_BUFINUSE	Cannot Delete—one or more buffers in use.
E_BUFSIZE	Cannot Create—buffer size not a power of 2 or less than 4.
E_DELFS	Cannot Delete—error from While.
E_DELLC	Cannot Delete—error from Preppy.
E_DELNS	Cannot Delete—error from PNA.
E_FOPEN	Cannot Delete—files open.
E_ILLDATE	Date input out of range.
E_ILLTICKS	Ticks input out of range.
E_ILLTIME	Time of day input out of range.

Table D-4: Operating System Errors (Sheet 2 of 4)

Error Code	Description
E_IODN	Illegal device major number.
E_IOOP	Illegal input/output (I/O) operation number.
E_LALIGN	LADDR not on section boundary.
E_MAPPED	Section already mapped
E_MATQDEL	Informative—at time of deletion messages were pending.
E_NACTIVE	Cannot restart—never started.
E_NOASR	Cannot send—task has no valid Asynchronous Service Request (ASR).
E_NOBUF	Cannot getbuf—no free buffers available.
E_NODENO	Illegal node number.
E_NODR	No driver provided.
E_NOEVS	No wanted events were pending.
E_NOMGB	Cannot create or send—no more message buffers.
E_NOMSG	Cannot receive—no pending message.
E_NOQCB	Cannot create—no more QCBs.
E_NOSCB	Cannot create—no more SCBs.
E_NOSECT	No section available
E_NOSEG	Cannot getseg—not enough memory.
E_NOSEM	Cannot acquire—semaphore not available.
E_NOSTK	Cannot create—no stack space.
E_NOTCB	Cannot create—out of tabs.
E_NOTIME	Time of day has not been set.
E_NOTIMERS	No timers left.
E_NOTINASR	Cannot return—not in ASR.
E_NOTINRN	Cannot getseg—segment does not belong to the region.
E_NOTSUSP	Cannot resume—not suspended.

Table D-4: Operating System Errors (Sheet 3 of 4)

Error Code	Description
E_OBJDEL	Object has been deleted.
E_OBJID	Illegal or Invalid object ID.
E_OBJNF	Object not found.
E_OBJTFULL	Object table full.
E_OBJTYPE	Incorrect object type.
E_PALIGN	PADDR not page-aligned.
E_PRIOR	Cannot create—priority out of range.
E_PTADDR	Cannot create—start address not on long word or MMU boundary.
E_QFULL	Cannot send—message queue full.
E_QKILLD	Cannot receive—queue deleted while waiting.
E_REGNUM	Illegal task register number.
E_RNADDR	Cannot create—start address not on long word or MMU page.
E_RNKILLD	Cannot getseg—region deleted while waiting.
E_RSTFS	Informative only. Files may be corrupted on restart.
E_SEGADDR	Cannot getseg—incorrect segment start address.
E_SEGFREE	Cannot retseg—segment already free.
E_SEGINUSE	Cannot delete—one or more segment in use.
E_SETPRI	Cannot change priority—new priority.
E_SKILLD	Cannot acquire—semaphore deleted while waiting.
E_SSFN	Illegal system service function number.
E_SUPER	Cannot affect supervisor map.
E_SUSP	Cannot suspend—already suspended.
E_SWITCH	Illegal more switch.
E_TATQDEL	Informative—at time of deletion tasks were waiting.
E_TATRNDEL	Informative—tasks were waiting at deletion.

Table D-4: Operating System Errors (Sheet 4 of 4)

Error Code	Description
E_TATSDEL	Informative—at time of deletion tasks were waiting.
E_TIMEOUT	Task timed out waiting for resource.
E_TINYPT	Cannot create—length too small for necessary PTCB.
E_TINYRN	Cannot create—region length too small for required RNCB.
E_TINYSTK	Cannot create—stack too small.
E_TINYUNIT	Cannot create—length too large for given unit size.
E_TMNOTSET	Cannot cancel—timer not set.
E_TOOBIG	Cannot getseg—requested size is too big.
E_TOOLATE	Time request too late—time already past.
E_TOOLONG	length greater than section.
E_TOOMUCH	Copy too long—past section end.
E_UNIMPL	Unemployments system service.
E_UNITSIZE	Cannot create—unit size not power of 2 or less than 4.
E_UNMAPPED	Logical address is not mapped.
E_ZERO	Cannot getseg—requested size is zero.
E_ZEROMAP	Zero memory to be mapped.

Table D-5: Software Errors (Sheet 1 of 2)

Error Code	Description
E_BAD_IMAGE_CRC	An application remote software download attempt failed.
E_BAD_XILINX_PARAMETER	Invalid Xilinx type used.
E_CANNOT_FLUSH_QUEUE	Failed attempt to flush message queue because maximum number of messages expected was received.
E_DETERMINE_OBJECT_ID_NOT_FOUND	An unrecognized system ID value was used.
E_ILLEGAL_IPS_COMMAND	An unrecognized FIPS action command was received.

Table D-5: Software Errors (Sheet 2 of 2)

Error Code	Description
E_ILLEGAL_PARAMETER_WRITE	FIPS user attempted to write to a value that is application read only.
E_ILLEGAL_PORT_NUMBER	An attempt to access an illegal output port has been made.
E_NOT_ENOUGH_MEMORY	There was not enough memory to dynamically allocate a buffer.
E_PARAMETER_MANAGER_BAD_STATUS	Parameter manager status problem.
E_PARAMETER_WRITE_OUT_OF_RANGE	UHSO alignment parameters are invalid.
E_PASSED_PARAMETER_OUT_OF_RANGE	A FIPS parameter was out of range.
E_PORT_ACCESS_FAILURE	The GPS ASR has been started without a valid Dual Universal Asynchronous Receiver Transmitter (DUART) port having been assigned and allocated.
E_SNMP_DECODE_FAILURE	Failed decode of received Simple Network Management Protocol (SNMP) packet.
E_SNMP_SETUP_MIB_FAIL	SNMP Management Information Base (MIB) initialization failed.
E_SRAM_READ_FAULT	Attempt to read from static random access memory (SRAM) failed.
E_SRAM_WRITE_FAULT	Attempt to write to SRAM failed.
E_SWITCH_DEFAULT	The value passed to a conditional switch statement did not match any of the tested values.
E_UNABLE_TO_START_TASKS	An attempt to start one of the station tasks has failed.
E_UNEXPECTED_ELSE	The code took an undesired branch in a conditional statement.
E_UNEXPECTED_IPS_COMMAND	An unrecognized UHSO alignment command was received.
E_UNEXPECTED_OPCODE	A command passed to a task was not recognized by that task.
E_UNEXPECTED_TERMINATION	Expecting UHSO warm-up timer to go off, but instead, wrong timer name is passed.
E_VARIABLE_OUT_OF_RANGE	Variable passed to a routine was outside its allowed limits.

Table D-6: OPP Errors

Error Code	Description
E_ADD_MEMBERSHIP_FAILED	Multicast membership add failed.
E_DROP_MEMBERSHIP_FAILED	Multicast membership drop failed.
E_OPP_ASN1_DECODE	Error in decoding a User Datagram Protocol (UDP) packet.
E_OPP_ASN1_INIT	Initialization of the ASN.1 decoder fails.
E_OPP_BIND	Error in binding the UDP socket to an address or port number.
E_OPP_INVALID_PARAMETER_ID	Invalid parameter ID returned on update.
E_OPP_IOCTL	The UDP link has an I/O error.
E_OPP_PSDOWN	The UDP link is inactive and can not be used.
E_OPP_RECVFROM	Error in receiving a UDP packet from the socket.
E_OPP_SELECT	Error waiting for input on UDP socket.
E_OPP_SOCKET	Error in creating UDP socket.

Table D-7: Alarms (Sheet 1 of 2)

Reported In			
Error Log	SW Log	Error Code	Description
✓		RSR_DOUBLE_FAULT_MON_RESET	Issued upon internal bus error
✓		RSR_EXTERNAL_TOTAL_SYSTEM_RESET	Issued upon hard reset (front panel reset button)
✓		RSR_LOSS_OF_CLOCK_RESET	Issued upon failure of central processing Unit (CPU) clock
✓		RSR_POWER_UP_RESET	Issued upon power-on reset.
✓		RSR_SOFT_RESET_PIN_RESET	Internal only, soft reset.
✓		RSR_SOFTWARE_RESET	Issued upon software reset (FIPS: a 117)
✓		RSR_SOFTWARE_WATCHDOG_RESET	Issued upon reset caused by watchdog timer expiration

Table D-7: Alarms (Sheet 2 of 2)

Reported In			
Error Log	SW Log	Error Code	Description
✓		S_GPS_IS_DISABLED	Issued when GPS access is disabled through FIPS by the user. GPS is disabled through parameter 99 in the parameter database.
	✓	S_GPS_RESOLVED_LOCATION	Issued upon successful initialization of the GPS receiver.
✓		S_PAGING_IS_DISABLED	Caused by distribution link failure, high stability reference failure, GPS receiver out of lock, GPS receiver failure, TX_OK line fail. *NOTE: TX_OK line is asserted by the Orchestra Control Module (OCM), until one of the following occurs on the OCM: synthesizer out of lock, SASM failure, or module reset.*

Traces

Table E-1 describes the developer implemented traces available for the RF-Baton! (RF-B!) transmitter controller. Use the following syntax to enable traces:

a 192 [TASK] [FLAG]

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
ATR1	0x00000001	1	**Training Request Trace**—details training parameters found in the associated PDM & the resulting response from the DSP.	ATRN: TRAINING REQUEST. lgth=0030 bytes. Data= 94DB B369 ATRN: REQUEST Training ID: 8146084 ATRN: RESPONSE Training ID: 814608 ATRN: Coeff Lgth=0066 (words) coeffs= 0012 04E0 04B6
ATR1	0x00000002	2	**Training Response Trace**—more verbose format of the training parameters. Good trace if running continuously because of verbose output.	ATRN: REQUEST Training ID: 8146084 ATRN: Training Resp Received.
ATR1	0x00000004	4	**Verbose Training I/O Trace**—full details of the training parameters requested in the PDM and the resulting response from the DSP. This trace should be used sparingly in a continuous mode because of high overhead in outputting the data. Good for snapshots of specific training PDMs.	ATRN: Training Data (30 bytes) 94,DB,B3,69,6F,C7,B9,2C,25,BA,AE,38,FF,9B,89,BE,7C,F3,7E,D9, D9,7E,F4,E6,89,13,29,56,AC,3E ATRN: REQUEST Training ID: 8148084 ATRN: Training Resp Received. ATRN: RESPONSE Training ID: 8148084 ATRN: Training Coefficients (132 bytes) 00,12,04,E0,04,B6,00,BF,06,BC,07,6F,04,47,05,52,00,00,00,00, 00,00,00,00,00,00,00,00,00,00,00,07,4E,00,00,9C,00,00,40,00, 80,00,00,08,58,00,81,60,00,08,50,00,01,44,00,07,52,00,80,A6, 00,07,5A,00,00,B4,00,07,56,00,00,57,00,05,60,00,00,18,00,00, FF,E2,00,15,FF,FD,00,11,00,26,00,02,FF,E5,20,00,00,12,00,2A, 00,57,00,63,00,10,15,98,0B,A4,00,00,3E,20,00,00,28,8C,1C,31, 00,00,00,00,00,80,00,00,00,01,00,9C
ATR1	0x00000008	8	**Verbose Training Input Trace**—full details of the requested parameters in the PDM.	Contains request portion of verbose trace.
ATR1	0x00000010	16	**Verbose Training Output Trace**—Full details of the resulting response from the DSP.	Contains response portion of verbose trace.
DRT1	0x00000001	1	**DRTR Task Output Trace**—details the output metrics of the PnP bus data in terms of how many PnP increments were sent and how much time it took. Also, details which RF-O! paging station modulator gets the data.	DRTR1: inc=9 delta=9 mod=0 id=812BC04 | | | | |-- pSOS Buffer ID | | | |--- RFO Modulator (0 - 3) | | |--- Time taken to send data (X10ms) | |--- # PnP increments transmitted |--- Which DRTR task sent data (DRT1, 2, 3, 4) Each DRTR task represents a 'subchannel' of data

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
DRT1	0x00000002	2	**DRTR Task CPU Pin Trace**—toggles CPU port pins PA 2 and PA 3 for scope debugging. For development only. No use to the customer.	No output
GPSC	0x00000001	1	**GPS Task Timestamp Trace**—valid during GPS initialization and during normal GPS operation (while paging). At initialization time (1), shows the timestamping logic execution. During normal operation (2), shows each time pSOS is set to GPS time.	psos = 16: 1:15: 49 1. GRCM: First time thru, forcing psos time to gps ... 2. Set pSOS time to GPS time - gps = 16: 1:15: 50 - 49
GPSC	0x00000004	4	**GPS Task Queue Message Trace**—shows GPS message pSOS ID. Used for internal development only. No use to the customer.	grcm q_msg= 129 grcm q_msg= 129
GPSC	0x00000008	8	**GPS Task Initialization State Trace**—details the GPS state machine operation by state machine name. The GPS is not completely initialized until the GPS STATE INIT_COMPLETE is reached.	GPS STATE VERIFY_SOFTWARE_REVISION GPS software version 8 revision 4 GPS STATE EXECUTE_SELF_TEST GPS STATE SET_POS_FIX_TYPE GPS STATE SET_FIX_MODE GPS STATE SET_APPLICATION_TYPE GPS STATE SET_LATITUDE GPS STATE SET_LONGITUDE GPS STATE SET_HEIGHT GPS STATE SET_SATELLITE_MASK_ANGLE GPS STATE SET_1PPS_CABLE_DELAY_OPTION GPS STATE DISABLE_POSITION_HOLD_OPTION GPS STATE DISABLE_ALTITUDE_HOLD_OPTION GPS STATE WAIT_FOR_3D_LOCK ... GPS STATE WAIT_FOR_POSITION_CONVERGE ... GPS STATE SOLVE_FOR_LOCATION ... GPS STATE SET_FINAL_SATELLITE_MASK_ANGLE GPS STATE SET_POSITION_HOLD_STAGE GPS STATE INIT_COMPLETE

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
GPSC	0x00000080	128	**Gps Set Defaults Command**—sets the GPS receiver to factory defaults. *NOTE:* *1. Factory defaults is NOT a valid Paging mode. That is, if defaults are set, a **Power OFF Reset** must be done to re-establish paging capable parameters. The next GPS acquisition will take a long time because the GPS almanacs must be rebuilt.* *2. This command only applies to Motorola GPS receivers.*	. . . GPS STATE SOLVE_FOR_LOCATION GPS STATE SOLVE_FOR_LOCATION GPS STATE SET_FINAL_SATELLITE_MASK_ANGLE GPS STATE SET_POSITION_HOLD_STAGE GPS STATE INIT_COMPLETE Initializing GPS Receiver
GPSC	0x00000010 (16 dec)	16	**GPS Task Location Trace**—displays the latitude, longitude, and height parameters after GPS lock has occurred.	nv_lat 118234087 nv_lon -350254784 nv_hgt 28758 rt_lat 23646800 rt_lon -70050951 rt_hgt 5802
GPSC	0x00001000	4096	**GPS Task Re-Init Command**—from the POSITION HOLD state, if this flag is set, the GPS state machine re-initializes itself back to the first state of the state machine. For development use only. No use to the customer.	. . . GPS STATE SOLVE_FOR_LOCATION GPS STATE SOLVE_FOR_LOCATION GPS STATE SOLVE_FOR_LOCATION GPS STATE SET_FINAL_SATELLITE_MASK_ANGLE GPS STATE SET_POSITION_HOLD_STAGETM 6:50 GPS STATE START_OF_INIT GPS STATE VERIFY_SOFTWARE_REVISION GPS software version 8 revision 4 GPS STATE EXECUTE_SELF_TEST GPS STATE SET_POS_FIX_TYPE GPS STATE SET_FIX_MODE . .

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
GPSC	0x00002000	8192	**Recursive Location Trace**—from the SET FINAL MASK ANGLE state, if this flag is set, the GPS state machine re-initializes itself back to the SET FIX MODE state of the state machine. For development use only. No use to the customer.	. . . GPS STATE SOLVE_FOR_LOCATION GPS STATE SOLVE_FOR_LOCATION nv_lat 118232466 nv_lon -350254178 nv_hgt 22955 rt_lat 118232466 rt_lon -350254178TM 11:59 GPS STATE SET_FIX_MODE GPS STATE SET_APPLICATION_TYPE GPS STATE SET_LATITUDE GPS STATE SET_LONGITUDE GPS STATE SET_HEIGHT . .
MPIF	0x00000010	16	**Maint Path Task Trace—**write trace *NOTE:* *This feature will be redesigned post version 1.4.4 and is subject to being updated.*	
MPIF	0x00000001	1	**Maint Path Task Trace—**events received trace *NOTE: This feature will be redesigned post version 1.4.4 and is subject to being updated.*	MP Event Returned: Event: 18 Alarm: O String: Paging Disabled Alarm
MPIF	0x00000002	2	**Maint Path Task Trace—**values received trace *NOTE: This feature will be redesigned post version 1.4.4 and is subject to being updated.*	MPM: No new events or changed values. MPM: Get NEXT event or value command.
OPPM	0x00000001	1	**OPP Manager Task Ethernet Statistics Trace**—details ethernet metrics as each PDM is received by the RF-B! transmitter controller. UNICAST packets are PDMs directed at a specific RF-B! IP. MULTICAST packets are PDMs that are broadcast to all RF-B!s.	OPPM: Rcvd 63 bytes # PACKETS DISCARDED: 0 # ERROR PACKETS RECVD: 0 # PACKETS DISCARDED DUE TO UNKNOWN PROTOCOL: 0 # UNICAST PACKETS RECVD: 3747 # MULTIICAST PACKETS RECVD: 1497

Table E-1: Traces

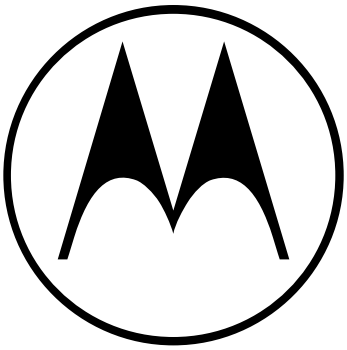
TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
OPPM	0x00000002	2	**OPP Manager Task PDM Trace**—verbosely displays the contents of each PDM successfully received by the RF-B!. *NOTE: Paging Enable does NOT have to be in effect for this trace to run. That is, the ethernet front end is always operational, regardless of the state of paging.* *This trace should be used sparingly on a continuous basis because of the added overhead in outputting the data.*	PdmData { } = ReflexOpp Time { } = 36 : 15 : 0 PdmApdu { } = rfChannelIndex = 0 subchannel = 0 ReflexOpp { } = Speed = 6400 Fsk = fsk4 PadBlocks = 10 DigEncoding = longWordWithBch Fiw{} = cycle:9, frame:8, global:0, fr type:3, ch type:1 BIW #1 = end biw:6, end addr:6, co:0, mis:0 Additional BIW: CRC Additional BIW: Zone ID Additional BIW: Base Frame Mgmnt 2 Additional BIW: Rev Chnl Info Additional BIW: SQC
OPPM	0x00000004	4	**OPP Manager Task PDM Trace**—quickly displays the contents of each PDM successfully received by the RF-B!. *NOTE: Paging Enable does NOT have to be in effect for this trace to run. That is, the ethernet front end is always operational, regardless of the state of paging.* *This trace can be used on a continuous basis to verify PDM content.*	PdmData { } = ReflexOpp Time { } = 34 : 15 : 0 PdmApdu { } = rfChannelIndex = 0 subchannel = 0
OPPM	0x00000008	8	**OPP Manager Task Output Disable Command**—this command disables the output of the OPP manager, thus the rest of the paging control tasks do not execute. This cmd can be used in conjunction with OPPM 4 to look at PDM data without transmitting it over the air.	No output
OPPM	0x00000010	16	**Print pNA Message Block Usage**	

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
PCLM	0x00000001	1	**PCLM Task PnP Control Command Trace**—displays the PnP control command logic and the contents of the 3 pieces of data [0, 1, 2] sent.	==paging just enabled OR batch NOT contiguous new ctl cmd - [0]:5f5e10 - next PDM launch time in 10s of microseconds [1]:0 [2]:80000001 | | | | | - defines modulation mode for each | subchannel. 1 = FM, 2 = AM. Ch 1 = LSB | -- always '8'
PCLM	0x00000004	4	**PCLM Task Logic Trace**—displays key PCLM logic algorithms. For development use only. No use to the customer.	No output
PCLM	0x00000002	2	**PCLM Task Link List Delay Trace**—displays the time until the next frame launch. Data is calculated from the time difference between the present frame and the next one on the linked list. Time is X10ms	Calc'd launch dly:186 ex: 186 X 10ms = 1860ms = 1.86 seconds
PCLM	0x00000008	8	**Print Logic Trace?**	
PCRM	0x00000002	2	**PCRM Task Status Trace**—paging status trace - Notifies the user of the paging Enable or Disable status of the Baton! Executes each time a PDM is successfully received.	Paging is Disabled!
PCRM	0x00000004	4	**PCRM Task Launch Trace**—displays three components associated with a PDM launch time: 1. Launch [min, sec, ticks]—the absolute launch time for the frame. 2. Calc Launch [min, sec, ticks]— the RF-B! launch time which is calcuLated as the absolute launch time—PnP Work Ahead Window time. The WAW time is defined as Parameter 602 + 603 (in 10s microseconds) 3. pSOS [min, sec, ticks] - the system time (GPS relative) at which this trace executes. PDM Type & Seq number are generated by the Controller and are used for internal development mostly.	PDM type: 6 Seq number: 7 Launch minute: 7 Launch second: 43 Launch ticks: 12 Calc Launch minute: 7 Calc Launch second: 43 Calc Launch ticks: 4 pSOS minute: 7 pSOS second: 40 pSOS ticks: 32 Queue minute: 37 Queue second: 43 Queue ticks:12

Table E-1: Traces

TASK	MASK	FLAG (dec)	DESCRIPTION	EXAMPLE OUTPUT
SASM	0x00000002	2	**SASM Task UHSO Steer Trace**—displays the new steering value sent to the UHSO. This value is derived from a closed loop control system that has two parts: 1. Fine—high resolution adjustment (that is, small increments) 2. Coarse—large adjustments (if needed)	FIPS:Alignment - New Steering Val Coarse-- 1907:
SASM	0x00000008	8	**SASM Task Tracking Trace**—displays the fact that SASM has been notified by GPS that it is tracking satellites.	GPS SATELLITE TRACKING
SASM	0x00000020	32	**SASM Task State Machine Trace**—displays the SASM state machine. STATES are: 1 - Acquire (paging disable) 2 - Validate (paging disable) 3 - Warm Up (paging disable) 4 - Paging enable 5 - Free Run (paging enable) pps_occurred—1 = good; 0 = bad Means the 1 PPS actually occurred. pps_within_window —1 = good; 0 = bad. Means the 1 PPS was within the launch window as defined by parameter 902: 0 = NA 1 = 0.480 µs 2 = 0.950 µs 3 = 1.900 µs 4 = 3.810 µs 5 = 7.600 µs *NOTE: The* RF-B! *should always be set for 7.600* µs	FIPS: State: 4, pps_occurred: 1, pps_within_window: 1
SASM	0x00000040	64	**Drop Out Trace**	



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