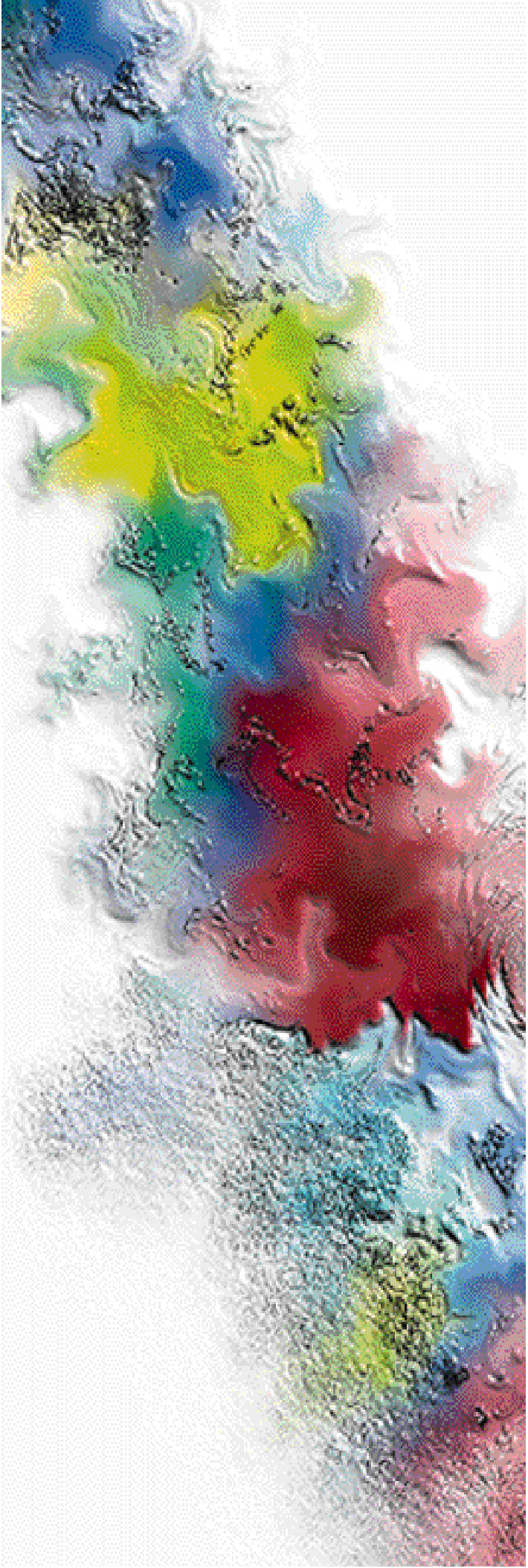

RF-Conductor™ Controller

Models 3100 and 3110

Hardware Installation

Series: Wireless Messaging System

System Version: WMS Two-Way 3.0,
One-Way 1.07, 1.08
Software Version: 3.7

Issue Date: January 1999

6880494G50-B

MOTOROLA

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MOTOROLA

Foreword

General Information

The information in this manual has been reviewed for accuracy. However, no responsibility is assumed for inaccuracies. Motorola® reserves the right to make changes to any products discussed herein. The information in this document is subject to change without notice. Motorola assumes no liability for hardware or software damage or loss of data because of errors or omissions in this manual. Motorola does not assume any liability arising from the application or use of any products or circuits described herein. Neither does Motorola convey any license under its patents or right of others.

Refer questions concerning the contents of this manual or requests for related circuit board information to the following location:

Motorola, Inc.
Paging Systems Group
Multimedia Publications Department
5401 North Beach St., MS E230-A
Fort Worth, TX 76137-2794

or telephone: **(817) 245-2823**

To access on-line electronic information (BBS) for service notices and the latest software releases, call the Paging One-Call-Support™ Center. To request additional manuals or parts, please contact the Motorola Americas Parts Division:

telephone: **(800) 422-4210**
facsimile: **(847) 538-8198**

To request a part number, contact the Parts Identification Group:

telephone: **(847) 538-0021**

For Motorola Infrastructure and communicator test equipment, contact the Motorola Test Equipment Center:

telephone: **(800) 505-8378**

Global Service Organization

Motorola provides Infrastructure and communicator technical support through authorized or company-owned Service Centers. Motorola also provides service for communicators on a contract basis. For contract service information, please contact your local Motorola representative or the Paging One-Call-Support Center:

Motorola, Inc.
Paging One-Call-Support Center
5401 North Beach St., MS E112
Fort Worth, TX 76137-2794

telephone: **(800) 520-7243** or
(817) 245-4663
facsimile: **(817) 245-2141**
electronic mail: **FOCSC1@mot.com** (to have Technical Support contact you)

Service Training

Motorola, through its Advanced Messaging Technical Training Group in Fort Worth, Texas, offers courses on communicators, messaging switches, transmitters, and receivers. These courses are taught on the site or at a customer's location.

Students learn to install, configure, and maintain Motorola messaging systems. The classrooms at Motorola are equipped to ensure hands-on experience in practical lab exercises.

Training courses range from a basic introduction to communicators and messaging systems to customized classes on specific systems and large system applications.

To obtain a course catalog or scheduling information:

telephone: **(817) 245-2184 or**
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facsimile: **(817) 245-2177**
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Trademarks contained herein are the acknowledged property of their respective owners.

Important Safety Information

The installation, maintenance, and / or operation of this equipment may present potentially unsafe conditions, including, but not limited to, electrical shock, improper voltage to components, and improper operation that can cause personal injury, death or damage to property.

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.

Heed Admonitions: Adhere to all warnings on the equipment and in the operating instructions. Follow all operating and use instructions. Two safety admonitions are used in this instruction manual to indicate:

- 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.

Mounting: Mount the equipment only as recommended by the manufacturer. Situate the equipment away from heat sources such as radiators, heat registers, stoves, or other equipment (including amplifiers) that produces heat.

Power Sources and Grounding: Connect the equipment to the type of power source described in the installation instructions or as marked on the equipment. Take precautions to avoid defeating the grounding or polarization provisions of the equipment. Disconnect the power to the equipment by a circuit breaker when left unused for long periods of time.

Cleaning: Clean the outside of the equipment by using only a damp cloth. Do not immerse the equipment in any type of liquid, including water. Do not use liquid cleaners or aerosol cleaners. Dirt or other foreign matter should not be allowed to accumulate in the interior of the enclosure.

Damage Requiring Service: Do not attempt to perform service functions that are not described in the operating instructions. All other servicing should be referred to qualified service personnel.

Telephone Line Installation: All telephone line connections to the equipment should be accomplished with the telephone lines disconnected from the network interface.

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

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.

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:

   a. The equipment or any part of it NOT having been installed, modified, adapted, repaired, maintained, transported or relocated in accordance with Motorola technical specifications and instructions;

   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;

   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 Motorola Paging One-Call-Support™ Center at 1-800-520-PAGE (7243) as to the problem and provide the serial number of the defective item. Motorola shall, 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 Paging One-Call-Support Center 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 and to part availability, Motorola shall complete the repair or exchange of Motorola-manufactured equipment returned under Warranty within ten (10) 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 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.

Telephone Technical Assistance

11. During the Warranty Period, Motorola will provide the Customer with over-the-telephone technical fault analysis free of labor charges. The Customer may call the Paging One-Call-Support Center at 1-800-520-PAGE (7243) for assistance. For warranty calls in excess of 15 per location per month or for non-warranty calls, Motorola shall charge the Customer per Motorola's then-current labor rates.

Excluded Equipment

12. The following equipment is excluded from this Warranty and is covered instead by the Original Equipment Manufacturer's Warranty:
    a. Equipment which is not an integral part of a basic system configuration and which is not manufactured by Motorola, such as batteries and satellite dish LNBs;
    b. Peripheral equipment such as printers, modems, data loggers, video display terminals, and lightning and surge protectors; and
    c. Equipment which is not listed in Motorola's Price Book.

Force Majeure

13. Motorola shall not be responsible for failure to discharge its obligations under this Warranty due to delays by suppliers, material shortages; strikes, lockouts or other labor disputes; disturbances, government regulations, floods, lightning, fires, wars, accidents, acts of God, and any other causes beyond Motorola's reasonable control.

Default and Termination

14. 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:
    a. Assigns or transfers the Customer's rights or obligations under this Warranty without the prior written consent of Motorola; or
    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.

15. Notwithstanding any such termination of the Warranty to the Customer, the Customer shall remain responsible for all amounts then due.

Limitation of Liability

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.

PSG Limited Equipment Warranty for Non-U.S. and Non-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 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:

   a. The equipment or any part of it NOT having been installed, modified, adapted, repaired, maintained, transported or relocated in accordance with Motorola technical specifications and instructions;

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;

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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Excluded Equipment

11. The following equipment is excluded from this Warranty and is covered instead by the Original Equipment Manufacturer's Warranty:
    a. Equipment which is not an integral part of a basic system configuration and which is not manufactured by Motorola, such as batteries and satellite dish LNBs;
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    c. Equipment which is not listed in Motorola's Price Book.

Force Majeure

12. Motorola shall not be responsible for failure to discharge its obligations under this Warranty due to delays by suppliers, material shortages; strikes, lockouts or other labor disputes; disturbances, government regulations, floods, lightning, fires, wars, accidents, acts of God, and any other causes beyond Motorola's reasonable control.

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:
    a. Assigns or transfers the Customer's rights or obligations under this Warranty without the prior written consent of Motorola; or
    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.

14. Notwithstanding any such termination of the Warranty to the Customer, the Customer shall remain responsible for all amounts then due.

Limitation of Liability

15. 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.

Contents

Figures

Tables

Introduction

About This Manual

This manual is designed as a guide to successfully install the RF-C! controller. The manual is intended for persons with a technical background in digital and analog circuits, and a general knowledge of paging systems operation. This manual contains the following chapters:

- Chapter 1: Introduction—This chapter describes the purpose of this manual and lists the chapters and their functions, and related publications.
- Chapter 2: System Description—This chapter provides an overview of the RF-C! controller, a description of the RF-C! controller components, descriptions of equipment indicators (Light Emitting Diodes[LEDs]), and switch information.
- Chapter 3: Site Requirements—This chapter discusses site planning and includes the following considerations:
  - equipment specifications
  - environmental requirements
  - electrical requirements
  - grounding requirements
- Chapter 4: Cabinet Installation—This chapter describes RF-C! controller hardware installation and cabling information.
- Chapter 5: Power Up and Initial Indications Nonredundant—This chapter describes the power up procedure and the LED indications of a properly installed and operating system.
- Chapter 6: Troubleshooting—This chapter describes the historical and real-time statistics and whether they are viewed through Choreographer!™ software interface.
- Appendix A: Acronyms—This appendix defines the acronyms and special terms used in this book.

Keyboard Conventions

The software application keyboard conventions used in this manual are described (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 says “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**>.
Space	When entering commands, a caret (**^**) indicates a blank space. Example: **cd^/home**

Related Publications

Related Motorola publications include:

- *RF-Conductor!™ Controller Software Installation and Operation*, Motorola Part No. 6880494G51
- *Choreographer!™ Network Manager Installation and Operation*, Motorola Part No. 6880492G07
- *RF-Conductor!™ Controller Hardware Installation*, Motorola Part No. 6880494G52 for VME-based hardware systems, or 6880494G50 for hardware systems based on the Ultra™ computer
- *Quality Standards-Fixed Network Equipment (FNE) Installation Manual (R56)*, Motorola Part No. 6881089E50
- *CRD-5500 SCSI RAID Users' Manual (included with the RAID controller)*
- *CRD-5500 Redundant Controller Kit* (included with the RAID controller)
- *WMG-A/RF-C! and C! Grounding Requirements*, FSB#085-0001
- *Minimum Design Loads in Buildings and Other Structures*

System Description

The RF-C! controller performs the following tasks in the Wireless Messaging System (WMS):

- Controlling message traffic
- Receiving messaging data from a messaging input device, such as a Wireless Message Gateway™ (WMG™) messaging switch (MS)
- Routing messaging data to the appropriate transmitter
- Relaying data received from receivers and receiver concentrators back to a messaging terminal, such as a WMG, if appropriate
- Batching and scheduling of ReFLEX™, InFLEXion™, FLEX™, and POCSAG messaging protocols
- Performing all one- and two-way functions such as subscriber location, message retry, acknowledgments, and unit registration

The RF-C! controller system chassis contains the following Ultra™ components:

- 167-MHz UltraSPARC™ microprocessor (with the option to add another 167-MHz microprocessor)
- 128 MB of random access memory (RAM) per processor board, expandable to 2 gigabytes (GB)
- Two serial ports (with the option to add up to 80 serial ports by using the terminal server within the system)
- 2-GB internal fast / wide small computer system interface (SCSI) hard disk drive
- 4-GB / 8-GB compressed digital audio tape (DAT) drive
- 12 / 20X compact disk read-only memory (CD-ROM) drive

The RF-C! controller has the following features:

- Global Positioning System (GPS) satellite reference
- Power supplies available in –48-Vdc, 115-Vac, and 230-Vac configurations
- High capacity input and output ports
- Rapid event monitoring
- Proprietary outbound paging protocol (OPP) for communicating with the RF-Baton!™ (RF-B!™) controller
- Proprietary inbound paging protocol (IPP) for inbound, two-way traffic
- ReFLEX, InFLEXion, FLEX, and POCSAG messaging support

Associated with the RF-C! controller is the Choreographer!™ network manager, a visual controller that manages a series of system tasks and transmitter / receiver alarm reporting.

The RF-C! controller front and back views of nonredundant and redundant (with redundant array of independent disk (RAID) drives) are provided (see Figure 2-1 and Figure 2-2). Individual major components are identified in the model (see paragraph, "System Architecture").

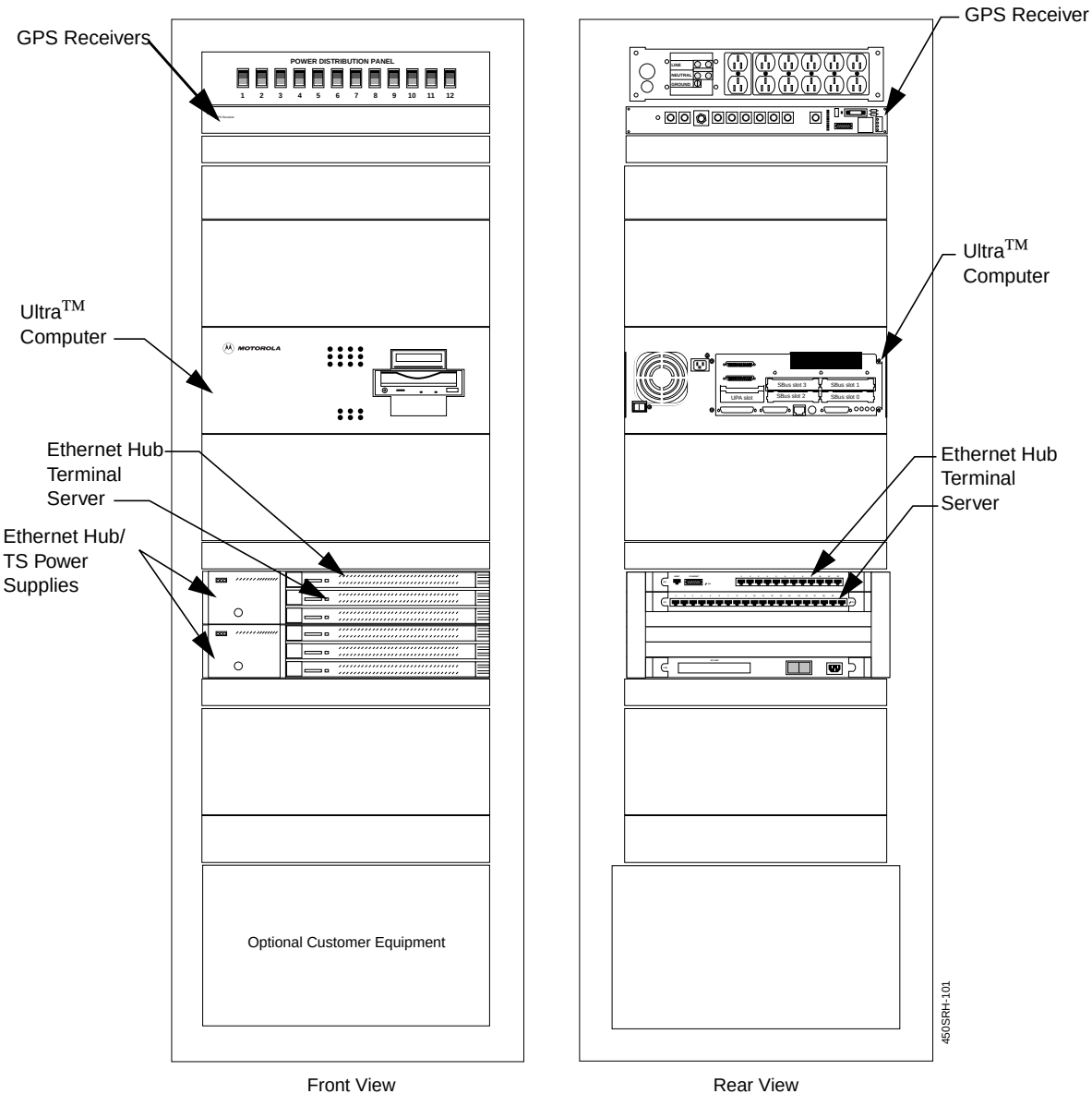


Figure 2-1: Nonredundant AC-Powered RF-C! Controller

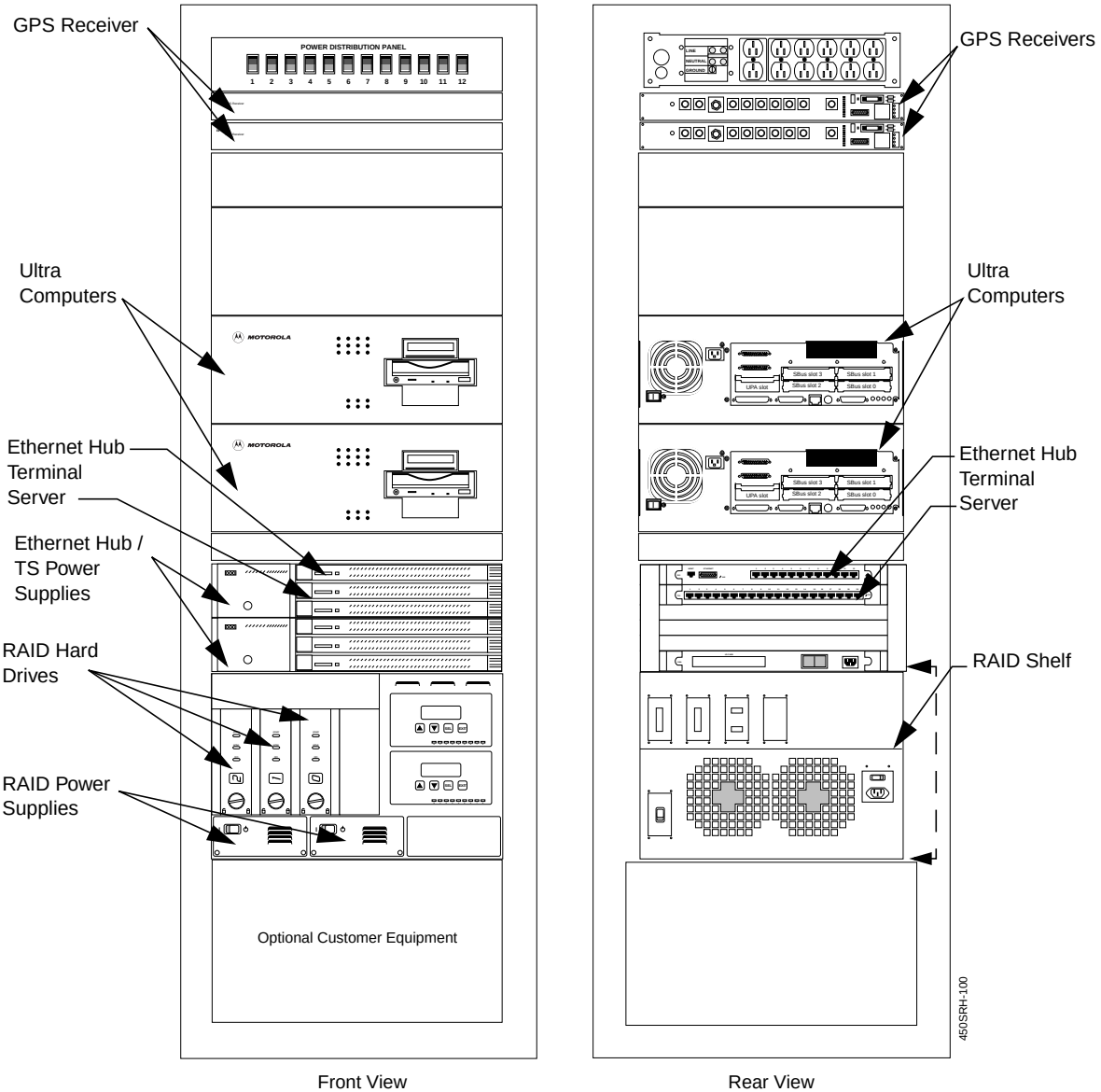


Figure 2-2: Redundant AC-Powered RF-C! Controller with RAID

System Architecture

RF-C! controller cabinets are configured differently depending on the model ordered. Depending on the configuration, the RF-C! controller cabinet may contain the following devices:

- Ultra chassis
  - UltraSPARC microprocessor printed circuit board (PCB)
  - CPU modules
  - Four port Ethernet card
  - Fast / wide SCSI card (redundant only)
  - 2-GB internal SCSI hard disk drive
  - 4mm DDS-2 (or greater) drive
  - CD-ROM drive
  - Power supply
  - DC converter
- Peripheral devices
  - GPS receiver
  - Ethernet hub
  - Terminal server
  - RAID hard drives
  - RAID power supplies
  - Power distribution unit

Ultra Computer

The primary component of the RF-C! controller system is the Ultra computer. The computer is available with single or dual 167-MHz UltraSPARC microprocessor modules and 128-MB RAM (expandable to 2-GB RAM). Two separate computers provide redundancy in the RF-C! controller system.

The computer is available in three configurations:

- M200—one 167-MHz microprocessor, 128 MB RAM
- M500—two 167-MHz microprocessors, 128MB RAM
- M1000—two 167-MHz microprocessors, 256 MB RAM

The computer supports the following features:

- 16 single in-line memory module (SIMM) memory slots, for a maximum of 2 GB RAM (using 128-MB SIMMs)
- High-speed 576-bit wide memory bus
- Four SBus slots
- One on-board autosensing 10/100baseT, fast Ethernet
- Four 10baseT Ethernet ports on one SBus expansion card
- Fast/wide SCSI interface
- Two RS-232C/RS-423 panel serial ports (DB25)
- One parallel port (DB25) compatible with Centronics™
- Internal 12/20X CD-ROM drive
- Internal 4/8-GB DDS-2 (or greater) drive
- Internal 2-GB 3.5 X 1, Fast/Wide SCSI drive with an additional slot for a second internal drive

The Ultra computer has three front panel indicators (see Figure 2-3):

- Power LED—Green when the Ultra CP has power. The power LED will briefly be red as the Ultra CP powers up.
- Status LED—Solid green when the Ultra CP is booted and functioning properly. The status LED is red immediately after power is applied to the Ultra CP, and flickers green while the Ultra CP boots.
- SCSI LED—Flickers green when there is SCSI activity. The SCSI LED indicates heavy SCSI activity with a solid green color.

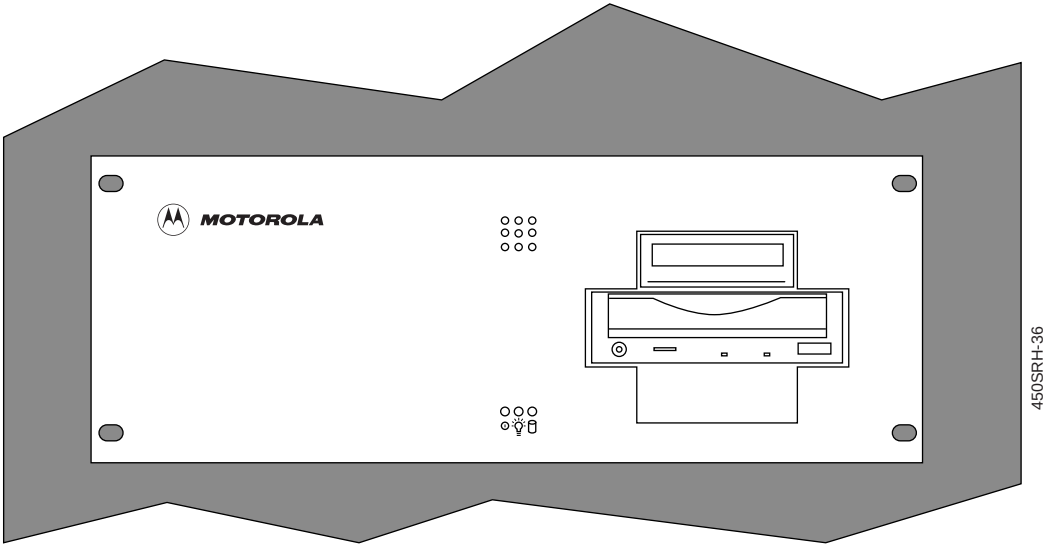


Figure 2-3: Ultra Computer Front View

Hard Drive

The RF-C! controller uses a 2-GB internal SCSI hard drive for storing files, databases, and configuration information.

DAT Drive

The RF-C! controller uses a 4-mm DAT drive for backup storage of databases, statistics files, and software updates. The front panel display contains two light-emitting diodes (LED) and the tape load slot (see Table 2-1).

Table 2-1: Ultra DAT Front Panel Features

Item	Description
Tape light	LED that indicates status of tape: - Slow flashing green: tape is being loaded or unloaded, or self-test is in progress at start up - Steady green: tape is loaded and ready to access - Fast flashing green: tape is being accessed with a read or write operation
Clean/attention light	LED that indicates the following conditions: - Slow flashing amber: tape head needs cleaning or the cartridge is near end of useful life - Steady amber: hard fault, self-test at start-up failed

Clean the DAT drive after every eight hours of use. Use a Sony® DG5CL computer grade cleaning cartridge (or equivalent) and follow the manufacturer's instructions.

CD-ROM Drive

The RF-C! controller uses a 12/20X-speed CD-ROM drive for operating system updates and for rebooting the operating system if the hard disk drive database is corrupted. The front panel display contains two buttons, two LEDs, and several other controls (see Table 2-2).

Table 2-2: Ultra CD-ROM Front Panel Features (Sheet 1 of 2)

Item	Description
Eject button	Button to eject CD-ROM tray. When operating, push once during play to stop, push twice to eject tray.
Play button	Button to begin CD-ROM play mode. When already operating, push once to skip, push and hold to fast forward through CD-ROM.
ON/BUSY indicator	LED that indicates the following conditions: — Steady amber: power is on — Flashing amber: disc is inserted and being accessed — No indication: power is off

Table 2-2: Ultra CD-ROM Front Panel Features (Sheet 2 of 2)

Item	Description
DISC indicator	LED that is green when power is on and a disc is inserted. LED is off if no disc is inserted
Volume control	Slide control for headphone jack volume
Headphone jack	Stereo mini-jack for headphones or powered speakers
Emergency eject hole	For emergency ejection of disc when Eject button does not work. Insert emergency eject stick, paper clip, or other thin, rigid object to eject disc tray

Power Supply

The power supply provides +3.0 V, +3.3 V, +5.0 V, and +12.0 V/-12.0 V to the Ultra printed circuit board (PCB).

Peripheral Devices

The RF-C! controller uses several peripheral devices for ensuring proper throughput of paging information:

- GPS receiver
- Ethernet hub
- Optional terminal server
- RAID hard drive
- Optional video display terminals (VDTs), screen dump printers, and logging printers

GPS Receiver

The GPS receiver is a rack-mounted unit that is one rack unit high and can be installed in the same cabinet as the RF-C! controller cabinet. A redundant RF-C! controller configuration contains two GPS receivers with two separate antennas.

The GPS receiver performs GPS synchronization. The GPS receiver provides RS-232 signaling and GPS time reference. All connections are made from the rear of the unit.

The GPS receiver gets power from the Ultra chassis using a power cable.

Ethernet Hub

The ethernet hub provides interconnectivity for the multiple subnets used by the RF-C! controller.

All data connections are in the rear of the unit. Status indicators on the front of the unit display power, network, and active port connections.

Terminal Server

The terminal server accepts asynchronous serial data inputs through RS-232 inputs (RJ-45 connections) and provides either AUI or 10Base-T output.

All connections are in the rear of the RF-C! controller cabinet. Status indicators on the front of the unit display power, network, and active port connections.

RAID Hard Drive

The RAID drive houses sensitive data for RF-C! controllers in a redundant configuration. Access to the RAID is controlled through high availability software where the active Ultra computer has read / write access and the secondary Ultra computer has read-only access.

Video Display Terminals, X Terminal, Screen Dump Printers, and Logging Printers

Remote VDTs may be connected to the RF-C! controller to the unit terminal server. The X terminal connects to the RF-C! controller through the terminal server or the ethernet hub. Network printers connect to the RF-C! controller using an ethernet connection.

Site Requirements

Site Considerations

This section provides a brief overview of site planning considerations and basic system specifications. A pre-installation site review and evaluation helps prevent potential equipment installation problems.

Motorola recommends the minimum requirements discussed in the following sections when selecting a site.

Basic Site Requirements

A suitable site must meet the following requirements:

- Site should contain enough space that all equipment is out of direct light.
- Site must be able to resist extreme weather conditions.
- Site should comply with the requirements of the American National Standards building Code Requirements for *Minimum Design Loads in Buildings and Other Structures* and / or other such building code requirements enforced in your local area.

Floor Space

The RF-C! controller cabinet requires a floor space 23.31 inches (59.2cm) wide by 30.15 inches (76.6cm) deep, plus two feet front and rear. The RF-C! controller footprint is illustrated (see Figure 3-1).

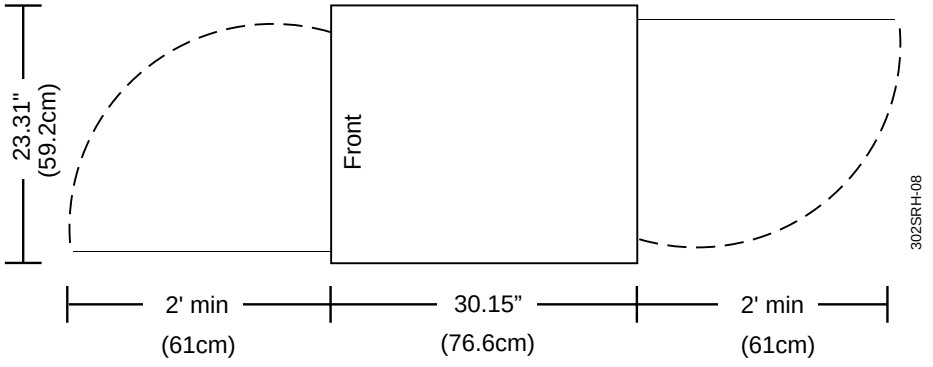


Figure 3-1: Equipment Cabinet Footprint

At least two feet of free space are required in front of and behind the cabinet. This space provides access to the cabinet as well as airflow into and out of the equipment during operation. However, the National Electric Code (NEC) requires a 36-inch clearance for electrical service access to all fuse panels, breaker panels, and so forth. All doors to the equipment must be able to open at least 90 degrees.

Flooring

The floor must be level to within 0.125 inches and able to support the weight of the equipment. The RF-C! controller weighs 400 to 500 lb. depending on the configuration, resulting in a floor loading of 82 to 103 lb / ft^2.

Ceilings

The minimum ceiling height is 8.5 feet above a finished floor. This space is required for the height of the cabinet and cable access to the top of the cabinet.

The ceiling structure should be able to support a cable tray assembly for routing the intercabinet cabling and other site cabling. If required, cables may be run under a raised floor.

Seismic Requirements

Sites that are in seismic activity areas may require additional bracing of the equipment cabinets. This manual does not contain specific procedures related to seismic bracing. Refer to site requirements and local building codes for further information on installation in seismically active areas. The cabinet is equipped with locking casters as a standard feature.

Mechanical Specifications

The RF-C! controller mechanical design enables installation of boards and other peripheral devices into the cabinet (see Table 3-1 and Table 3-2).

Table 3-1: RF-C! Controller Mechanical Specifications

Item	Description
Cabinet: **Physical dimensions**	Height: 71.25 in. (180.98 cm) Width: 23.21 in. (59.23 cm) Depth: 30.15 in. (76.58 cm), without doors, 31.42” (80.15 cm)
Total weight (with Ultra chassis, GPS receivers, power distribution unit, and ethernet hub units)	400 lb (181 kg) nominal
Ultra chassis: **Physical dimensions**	Height: 7.0 in. (17.78 cm) Width: 19 in. (48.26 cm) Depth: 20.6 in. (52.4 cm) (each cabinet may hold up to two Ultra chassis)
Ultra peripherals	One CD-ROM and one DAT drive standard
Mounting	Standard 19-inch (48.26 cm) chassis with Electronics Industries Association (EIA) flange

Table 3-2: Peripheral Device Mechanical Specifications

Item	Description
GPS receivers (Quantity of up to 2)	Height: 1.75 in. (4.445 cm)
0- to 80-port ethernet server (Quantity of 1)	Height: 7.0 in. (17.78 cm)

Electrical Requirements

This section provides a brief overview of the electrical requirements and specifications.

Wiring

All electrical wiring for the site must meet the requirements of the NEC and / or other applicable local codes.

Conductors

All conductors must be made of copper.

Grounding Requirements

While many methods of grounding are available, Motorola recommends the single point method where each cabinet has its own ground. Always use a green wire of American Wire Gauge (AWG) #6 or larger as the bus. Refer to the Motorola *Quality Standards-Fixed Network Equipment (FNE) Installation Manual (R56)* and field service bulletin, *FSB#085-0001, WMG-A/RF-C! and C! Grounding Requirements* for grounding requirements.

Electrical Specifications

The unique architecture of the RF-C! controller requires special electrical considerations (see Table 3-3).

This equipment should be powered by an uninterruptable power supply (UPS).

Table 3-3: Electrical Specifications

Item	Description
Input voltage	–48 Vdc ±10% or 115/230 Vac, dependent upon model
Total power consumption	1300 watts maximum
Power protection	Over-current and over-voltage protection
Line regulation	All output voltages regulated to ± 5%
Surge protection	Circuitry is provided to limit initial peak inrush current
Ripple and noise	1% peak-to-peak or 100 mV, whichever is greater (50-MHz bandwidth)
Remote sensing	Circuitry compensates for 500 mV of total line drop open sense lead protection
Overload protection	All outputs are protected against overloads and shorts

Environmental Considerations

This section provides a brief overview of the environmental considerations.

The RF-C! controller requires special environmental conditions for proper operation and system longevity (see Table 3-4).

Table 3-4: Environmental Considerations

Environmental Element	Requirements
Heating/ventilation/ air-conditioning (HVAC)	1) Must maintain the desired environment to meet the equipment heat dissipation values 2) Must be capable of automatically switching between the heating and cooling modes in response to the thermostat 3) Must ensure that both modes never operate simultaneously
Air flow	Intake from left side, exhaust from right side of the Ultra computer (when looking at front of RF-C! controller cabinet). The airflow for other components is from front to back.
Operating temperature	50˚F to 95˚F (10˚C to 35˚C)
Transport and storage temperature	–22˚F to 140˚F (–30˚C to 60˚C)
Operating relative humidity	20% to 80% (non-condensing)
Storage relative humidity	5% to 95% (noncondensing)
Air cleanliness	Airborne particles level must not exceed 90 mg/m3

Cabinet Installation

Unpacking the Equipment

The RF-C! controller is shipped pre-assembled. Equipment used with the RF-C! controller is shipped already installed in accordance with customer requirements and specifications. Unpack any equipment shipped separately according to the documentation supplied with the equipment.

Use the following procedure to unpack the RF-C! controller:

1. Before opening the carton, inspect the outside for holes or damage.

   Report any damage to the shipping agency.

The RF-C! controller weighs 400 to 500 lb (182 to 227 Kg) depending on the configuration. At least two people should unpack the RF-C! controller. Failure to get assistance or the use of improper lifting techniques may result in physical injury and/or damage to the equipment.

2. Uncrate the RF-C! controller.

3. Inspect the equipment for damage.

   Report any damage to the shipping agency.

4. Inventory all equipment and verify that you have received everything on the shipping list.

Installing the Cabinet

This section contains instructions for installing the RF-C! controller and is intended for use by personnel responsible for such installation.

Tools

Standard hand tools are required for cabinet installation:

- Phillips™ screwdriver
- Straight-blade screwdriver
- TORX® driver—T30
- Side cutters
- Pliers
- Wrenches
- Level

Test Equipment

The following test equipment is recommended:

- Volt-Ohmmeter / digital voltmeter (VOM / DVM)
- Local area network (LAN) tester
- Terminal emulation software (for example, Procomm™, Crosstalk®, or HyperTerminal™).

Parts

The following parts are required for cabinet installation:

- Wire ties
- 3/8 in. by 7/8 in. (0.95 cm by 2.22 cm) bolt
- Two flat washers
- Two star washers
- 3/8 in. hex nut

Alternatively, the following parts may be used for cabinet installation:

- One TT6.0 - 1.0 mm by 10 mm self-tapping screw
- One star washer
- Input power cable, 10 to 12 AWG (Supplied by the customer).

Installation Procedure

Perform the following steps to install the RF-C! controller:

The RF-C! controller weighs 400 to 500 lb (182 to 227 Kg) depending on the configuration. At least two people should move the RF-C! controller. Failure to get assistance or the use of improper lifting techniques may result in physical injury and/or damage to the equipment.

1. Roll the RF-C! controller cabinet into position on the built-in casters.

Note: Leveling the cabinet requires two people, one person at the front of the cabinet and one at the rear.

2. Level the cabinet to within 1/8 inch.
   a. Lower the cabinet feet to support the cabinet.
   b. Using a carpenter's level or equivalent, level the cabinet front to back and then side to side.
   c. Once the cabinet is level, secure the feet in place using the lock nuts located on the feet.

Note: Refer to the Motorola Quality Standards-Fixed Network Equipment (FNE) Installation Manual (R56) and field service bulletin, FSB#085-0001, WMG-A/RF-C! and C! Grounding Requirements for additional site and equipment grounding requirements.

When viewed from the rear, the left rear vertical rail is the common ground.

3. Attach the site ground wire to the cabinet ground terminal.
   a. Route the facility ground wire through the top or bottom of the cabinet. The ground wire should be a #6 AWG copper wire with a 3/8-in. (0.95 cm) connector or equivalent.
   b. Connect the ground wire to the cabinet frame (rear, left rail) using a 3/8 in. by 7/8 in. (0.95 cm by 2.22 cm) bolt, two star washers, and a 3/8 in. (.95 cm) hex nut. The components should be in the following order: bolt, ground wire, star washer, frame, star washer, and hex nut. Tighten the hex nut to ensure that the star washers penetrate the surface of the equipment frame. Alternatively, a TT6.0 - 1.0 mm by 10 mm screw and star washer may be used. The components should be attached in the following order: screw, ground wire, star washer, and frame.
   c. Using a VOM/DVM, check the resistance between the ground wire and the frame. The resistance must be less than 1 ohm.

4. Attach the facility power cables to the power distribution unit (PDU).

Note: The facility power cables are customer supplied. Use a qualified technician to install this cable.

5. Attach the global positioning system (GPS) antenna to the GPS receiver.

Note: The GPS antenna is customer supplied. Use a qualified technician to install this antenna.

Major Component Installation

The RF-C! controller comes fully assembled. To replace a major component, perform the applicable replacement procedure (see Chapter 7, "Board and Module Replacement").

Software Installation

The UNIX® software is installed at the factory. If the software becomes corrupted or changes are made after the cabinet installation, perform the software installation procedures. See the *RF-Conductor! Controller Software Installation Manual*, document 6880494G51 for information.

Cabling

This section provides an overview of how to connect internal cabinet devices to one another and how to interface the RF-C! controller cabinet to the external equipment and data sources. The cables required to connect the elements of a typical RF-C! controller are listed (see Table 4-1). The figures that show typical hookup configurations of various RF-C! controller elements are provided (see Table 4-2). Your cabling needs may differ from this typical application. Refer to your local site documentation for information on site-specific cabling variations.

Table 4-1: Typical Internal Cabinet Cabling (Sheet 1 of 3)

Cable Label	Cable Type	Part Number	Connect From	Connect To
1	CBL 7.5 FT IEC320 PWR ST	3080654R03	PRIME Ultra computer	Port 1 on PDU
1	RFC chassis DC PWR	3086618G01	PRIME Ultra computer	Port 1 on PDU
2	CBL 7.5 FT IEC320 PWR ST	3080654R03	RDNDT Ultra computer	Port 2 on PDU
2	RFC chassis DC PWR	3086618G01	RDNDT Ultra computer	Port 2 on PDU
3	ethernet hub chassis PWR CBL (AC)	3080654R03	AC port on ethernet hub	Port 3 on PDU

Table 4-1: Typical Internal Cabinet Cabling (Sheet 2 of 3)

Cable Label	Cable Type	Part Number	Connect From	Connect To
3	ethernet hub chassis PWR CBL (DC)	3080559F01	Upper PWR supply on ethernet hub	Port 3 on PDU
4	ethernet hub chassis PWR CBL (DC)	3080559F01	Lower PWR supply on ethernet hub	Port 4 on PDU
5	RAID AC PWR CBL	3080654R03	AC RAID	Port 5 on PDU
5	RAID DC PWR CBL	3080560F02	DC RAID	Port 5 on PDU
6	RAID DC PWR CBL	3080560F02	DC RAID	Port 6 on PDU
7	CBL GPS PWR	3080572P02	PRIME, Ultra computer	P16 port on PRIME GPS
8	CBL GPS PWR	3080572P02	RDNDT, Ultra computer	P16 port on RDNDT GPS
9	CBL RS232 RJ48-RJ48	5880567S04 3080548S01	PRIME Ultra computer, serial port A	Port 1 on 20-port terminal server
10	CBL RS232 RJ48-RJ48	5880567S04 3080548S01	RDNDT Ultra computer, serial port A	Port 2 on 20-port terminal server
11	CBL RS232 RJ48—RJ48	3080548501 5880551S02	COM PORT A on RAID (upper port)	Port 3 on 20-port terminal server
12	CBL RS232 RJ48—RJ48	3080548501 5880551S02	COM PORT B on RAID (lower port)	Port 4 on 20-port terminal server
13	CBL RS232 RJ48—RJ48	5880567S01 3080548S01 5880550S01	PRIME Ultra computer, serial port B	COM PORT on PRIME GPS
14	CBL RS232 RJ48—RJ48	5880567S01 3080548S01 5880550S01	RDNDT Ultra computer, serial port B	COM PORT on RDNDT GPS
15	CBL 10/100Base-T 7 FT	3080533F29	PRIME Ultra computer, port qe0	Port 7 on 12-port Ethernet hub
16	CBL 10/100Base-T 7 FT	3080533F29	RDNDT Ultra computer, port qe0	Port 8 on 12-port Ethernet hub
17	CBL 10/100Base-T 7 FT	3080533F29	PRIME Ultra computer, port qe1	Port 10 on 12-port Ethernet hub

Table 4-1: Typical Internal Cabinet Cabling (Sheet 3 of 3)

Cable Label	Cable Type	Part Number	Connect From	Connect To
18	CBL 10/100Base-T 7 FT	3080533F29	RDNDT Ultra computer, port qe1	Port 11 on 12-port Ethernet hub
19	CBL 10/100Base-T 7 FT	3080533F29	PRIME Ultra computer, 10/100 Base-T port hme0	Port 2 on 12-port Ethernet hub
20	CBL 10/100Base-T 7 FT	3080533F29	PRIME Ultra computer, 10/100 Base-T port hme0	Port 3 on 12-port Ethernet hub
21	CBL external SCSI	3080580F01	PRIME RAID SCSI port (right port)	Ultra Prime SCSI Controller Computer
22	CBL external SCSI	3080580F01	RDNDT RAID SCSI port (left port)	Ultra RDNDT SCSI Controller Computer

Table 4-2: Typical Hookup Configurations for RF-C! Controller

Item	Figure Number
AC power panel	Figure 4-1
DC power panel	Figure 4-2
GPS receiver, back view	Figure 4-3
Ethernet hub	Figure 4-4
Ultra computer	Figure 4-5

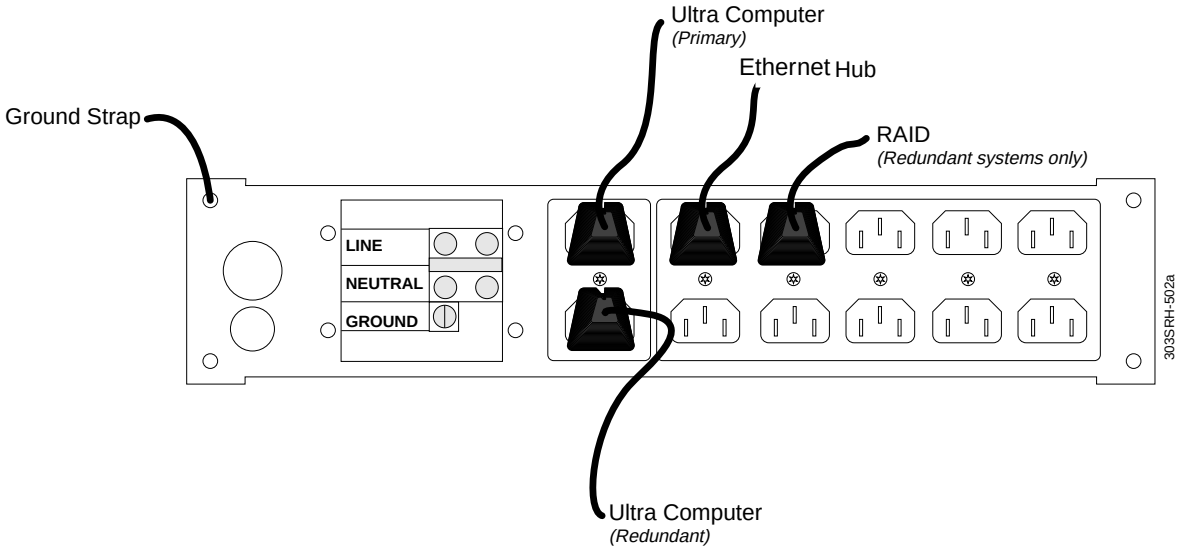


Figure 4-1: AC Power Panel, Typical Connections for RF-C! Controller

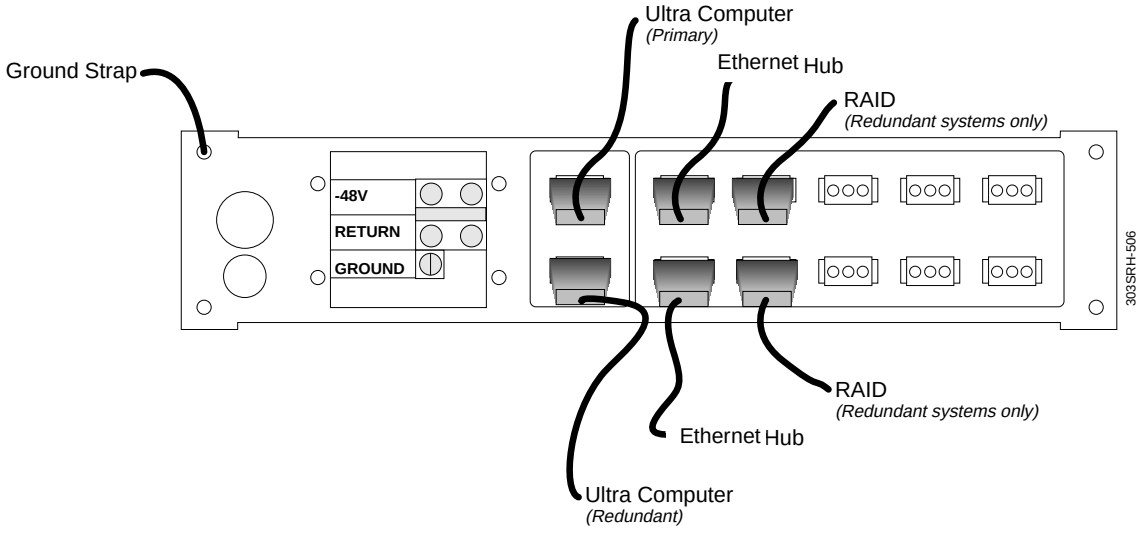
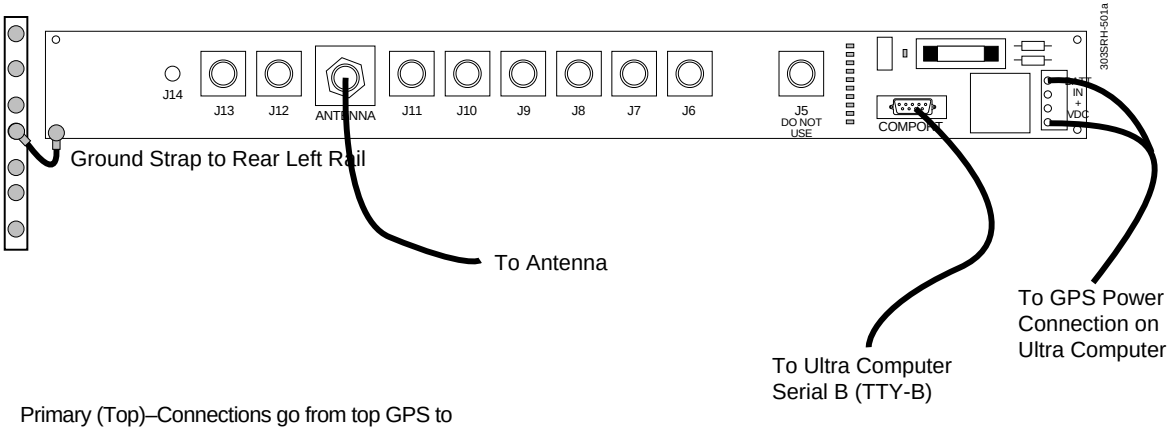


Figure 4-2: DC Power Panel, Typical Connections for RF-C! Controller



Primary (Top)–Connections go from top GPS to connections on top Ultra Computer chassis

Redundant (Bottom)–Connections go from lower GPS to connections on bottom Ultra Computer chassis

Figure 4-3: GPS Receiver, Back View, Typical Connections for RF-C! Controller

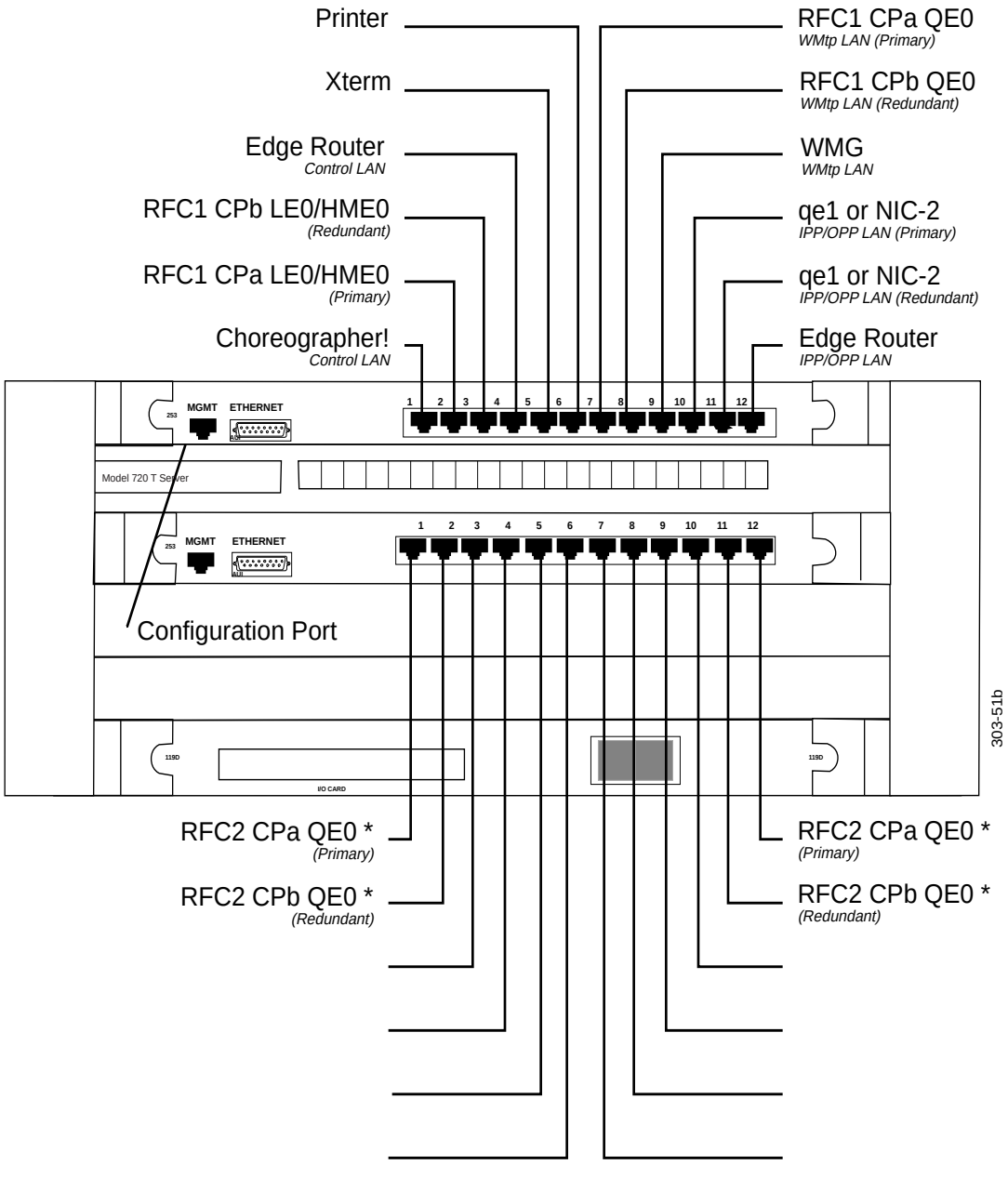


Figure 4-4: Ethernet Hub—Typical Connections

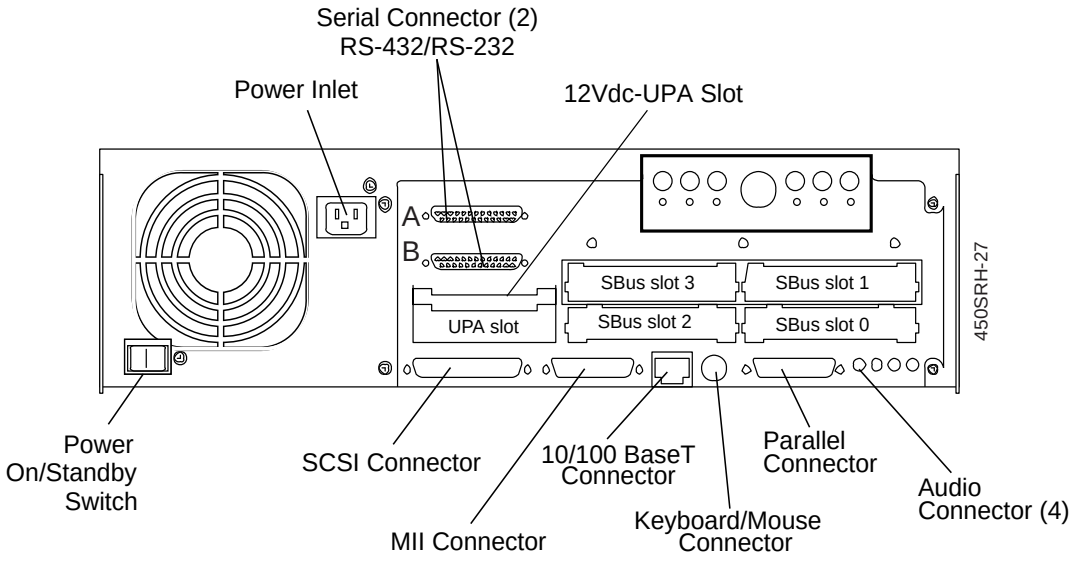


Figure 4-5: Ultra Computer AC Power Hookup Configuration

Power Up and Initial Indications Nonredundant

Power-Up Procedure

Use the following procedure to power up the RF-Conductor! (RF-C!) controller:

1. Turn on the appropriate switches on the Power Distribution Unit (PDU) panel. These switches are located on the front of the PDU (see Figure 5-1). Switches set depend on the RF-C! controller configuration as indicated in Table 5-1.

Table 5-1: PDU Switches for Power Up

Power Source	Nonredundant/ Redundant	PDU Switches
AC	Nonredundant	1, 3
DC	Nonredundant	1,3,4
AC	Redundant	1,2,3,5
DC	Redundant	1,2,3,4,5,6

2. If this is a redundant system, apply power to the RAID. Press the two power switches at the bottom front of the RAID.

Note: It is very important that the RAID be turned on before powering any other RF-C! controller components.

3. Apply power to the Ultra computer. The power switch is at the bottom left corner of the rear of the computer. If you have a redundant system, power on the prime Ultra computer first, then the secondary Ultra. Each Ultra computer will go into a self-test mode that lasts 1 to 2 minutes.

   The power and status LEDs on the Ultra front panel should turn on.

4. Apply power to the ethernet hub.

   The power supply LED turns on. The ethernet hub goes into the self-test mode. The self-test takes 1 to 2 minutes.

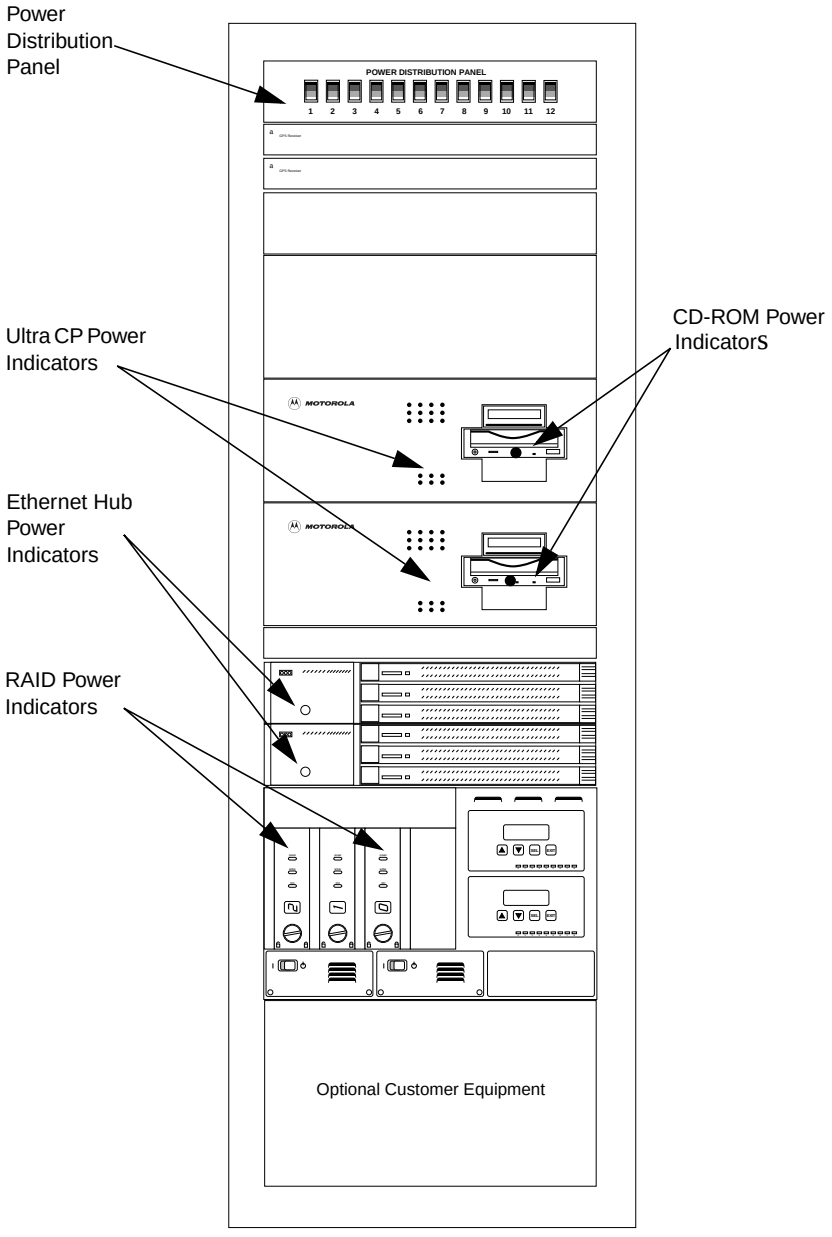


Figure 5-1: Example Redundant RF-C! Controller Power Indicators

Ultra Controls and Indicators

This section describes the typical indications of a properly installed and operating Ultra computer. The Ultra front panel LEDs are listed (see Table 5-2). The status of controls and indicators on customer-added items vary according to the particular installation.

Table 5-2: Ultra Computer Front Panel Features

Item	Description
DAT drive: Tape light	LED that indicates status of tape: - Slow flashing green: tape is being loaded or unloaded, or self-test is in progress at start up - Steady green: tape is loaded and ready to access - Fast flashing green: tape is being accessed with a read or write operation
Clean/attention light	LED that indicates the following conditions: - Slow flashing amber: tape head needs cleaning or the cartridge is near end of useful life - Steady amber: hard fault, self-test at start-up failed
CD-ROM drive: ON/BUSY indicator	LED that indicates the following conditions: — Steady amber: power is on — Flashing amber: disc is inserted and being accessed — No indication: power is off
DISC indicator	LED is green when power is on and a disc is inserted. LED is off if no disc is inserted
Front Panel LEDs	Power LED—Green when the Ultra CP has power. The power LED will briefly go red as the Ultra CP powers up. Status LED—Solid green when the Ultra CP is booted and functioning properly. The status LED is red immediately after power is applied to the Ultra CP, and flickers green while the Ultra CP boots. SCSI LED—Flickers green when there is SCSI activity. The SCSI LED indicates heavy SCSI activity with a solid green color.

Troubleshooting

Test Equipment and Software Requirements

The following test equipment and software are required:

- IBM® personal computer (PC) or equivalent
- Data tape
- Compact disk (CD)
- DB-9 IBM AT® serial port female-to-female cable, P / N 3080503G01 (included with setup)
- Terminal server to DB-25 cable (included with setup)

Performing the tests in this chapter will take the RF-C! controller offline and paging will stop.

Test Procedures for the RF-C! Controller System

The following paragraphs and illustrations show how to run the software-controlled operational tests. These tests are independent, and may be performed in any order.

Use the following procedures to test the RF-C! controller system:

- Test equipment setup
- Test and operation of the primary Ultra computer power supply
- Test and operation of the secondary Ultra computer power supply
- Small computer system interface (SCSI) device testing
- Test and operation for the Ultra printed circuit board (PCB)
- Test and operation of the Global Positioning System (GPS) receiver
- Ethernet hub test
- Terminal server test

Test Equipment Setup

Perform the following procedure to set up the test equipment.

The software application keyboard conventions used in this chapter were previously described (see Chapter 1, "Introduction", paragraph, "Keyboard Conventions", Table 1-1).

Note: Before performing these test procedures, perform the procedures in RF-Conductor! Controller Software Installation, number 6880494G51.

Shut down the UNIX operating system in the proper manner.

1. At the UNIX prompt, type:

   sync <Return>

2. At the UNIX prompt, type:

   shutdown^-y^-i0^-g0 <Enter>

   The UNIX system stops operation.

3. Connect a terminal to the serial port TTYA on the rear of the primary Ultra computer (see Figure 6-1).

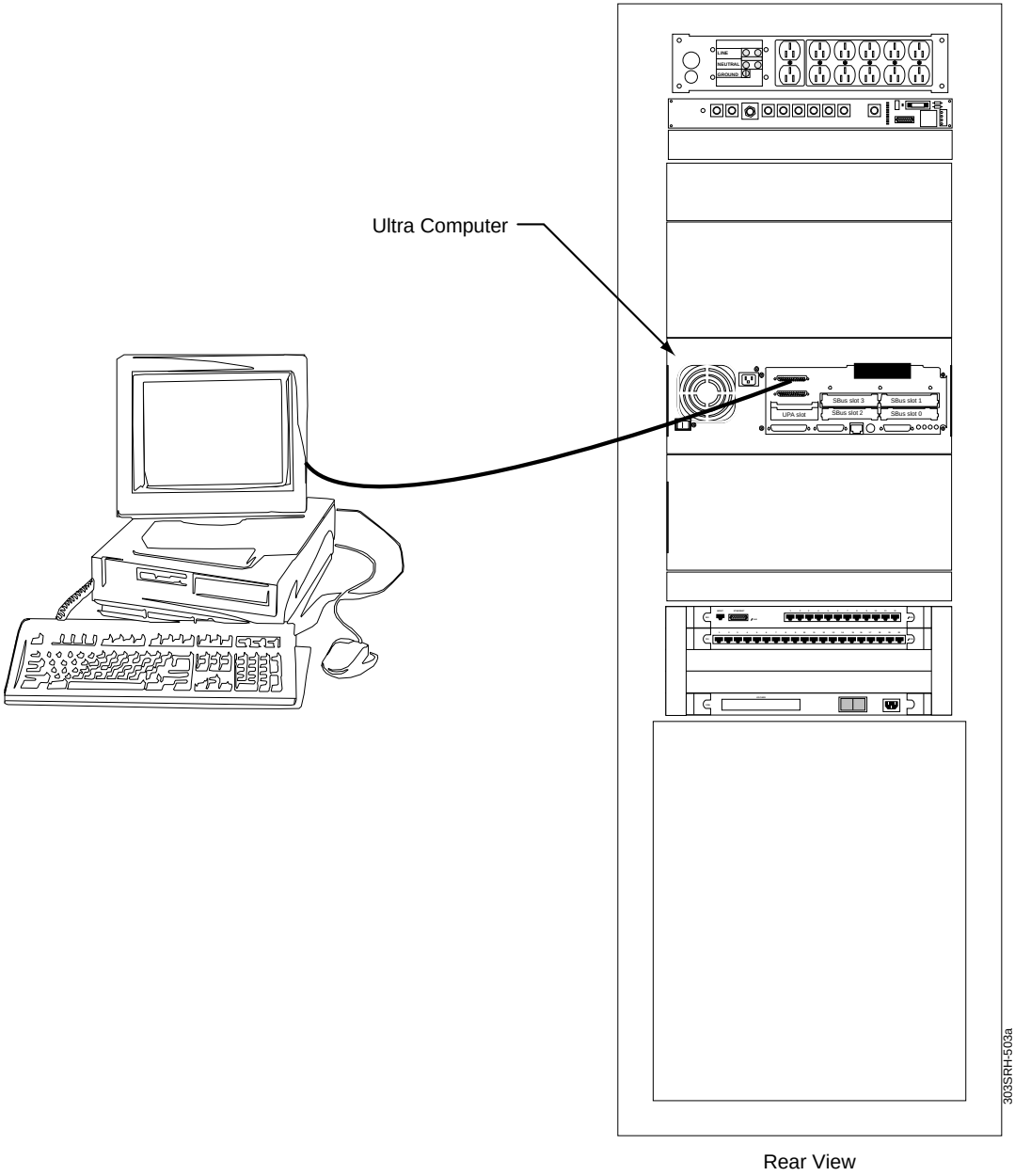


Figure 6-1: Test Equipment Setup

The Ultra computer has a standard female DB-25 connector that is configured for XON / XOFF software flow control. This configuration only uses pins 2, 3, and 7. Use a null modem cable with a DB-25 connector on one end and a connector suitable to the serial port of your terminal on the other end.

4. Press **<Enter>** on the terminal keyboard.

   An ok prompt appears on the terminal screen.

5. Set the terminal communications port. Type:

   setenv^ttya-mode^9600,8,n,1,s <Enter>

SCSI Device Testing

Perform the following procedure to verify that each SCSI device is configured properly.

1. If there is no terminal attached, attach a VT100, a dumb terminal, a PC with terminal software, or a Sun workstation to the serial port A of the Ultra computer.

2. Power up the RF-C! controller.

   During system boot, the system label Initializing Memory appears. Send a **break** from the terminal. The system prompt ok appears.

3. At the ok prompt, type the following command:

   ok **reset-all <Enter>**

   The reset command restarts the boot process. During the reboot, the system label memory test appears. Send a **break** from the terminal. The system prompt ok appears.

4. At the ok prompt, type the following command:

   ok **probe-scsi-all <Enter>**

5. The following system message appears:

   This command may hang the system if a Stop-A or halt command
   has been executed. Please type reset-all to reset the system
   before executing the command.
   Do you wish to continue? (y/n)

6. Type **y <Enter>**

7. Verify the settings in Table 6-1.

Table 6-1: SCSI Device Configuration

SCSI Device	SCSI Controller ID	SCSI ID or Target
2-GB hard disk drive	esp	0
4-mm digital audio tape (DAT) Drive	esp	4
Compact disk read-only memory (CD-ROM) drive	esp	6
RAID (for redundant systems only)	isp	0

8. Test each SCSI device by typing the commands for each of the installed devices (see Table 6-2).

Note: For the CD-ROM drive test, a CD must be inserted into the CD-ROM drive. For the DAT drive test, a blank tape must be inserted in the DAT drive for the test to finish successfully.

Failure to use a blank tape will result in the contents of that tape being destroyed.

Table 6-2: Installed Device Test Commands

Device to Test	Command to Type
2-GB hard disk drive	Test disk
4-mm DAT drive	Test tape
CD-ROM drive	Test CD-ROM
Additional SCSI devices	Test alias, use command **devalias** to find the device alias

Test and Operation for the Ultra Computer

If the system under test is so equipped, you may run diagnostics test on Ultra SPARC CPU. To verify the diagnostic software is installed on your system, execute the following command at the UNIX prompt:

pkginfo SUNWvts

If the SUN Validation and Test Suite software is installed, the system should respond with the following information:

Application SUNWvts Sun Validation & Test Suite

Perform the following procedure to test and operate the Ultra SPARC central processing unit (CPU) board for the A side and the B side as required. Ensure that the unit under test is in the backup mode and not the prime mode before running SUNWvts.

1. Verify that the VT100 cable is connected to the primary Ultra computer Serial A (TTYA) port, located on the back of the Ultra computer (see Figure 6-1).

2. Start the test. At the UNIX prompt, type:

   root <Enter>

Note: In Step 3, type your RF-C! controller system password. The factory default password is motorola.

3. Type:

   [password] <Enter>

Note: You must be logged in as **root** *to run SunVTS. SunVTS needs to write the log and error files, owned by the root directory, to the /*var/opt/SUNWvts/logs *directory.*

4. Insert a write enabled data tape into the DAT drive.

5. Insert a CD into the CD-ROM drive before beginning the CPU test (any UNIX-based CD except the Solaris™ operating system CD).

6. From the VT100 console, change the Term to the vt100 mode. Type:

   TERM=vt100; export TERM <Enter>

7. Go to diagnostic subdirectory by typing the following UNIX line command:

   > cd /opt/SUNWvts/bin <Return>

8. Run the diagnostic by typing:

   > ./sunvts <Return>

   The graphical user interface (GUI) window appears.

Note: Use the arrow keys (←, ↑, →, ↓ to select fields within the window.
Use the **<Tab>** *key to move within a window.*
Deselect an option by pressing the **<spacebar>**.
Select a field by pressing **<Return>**.

9. Select the **Test_Mode** field.

10. Select the **On_Line** option.

11. Select the **Intervention** option.

12. Select the **Enable** option.

13. Select the **Network** field, and press **<Return>** to open the next window.

14. Deselect **qe1** by pressing the **<spacebar>**.

Note: If system is nonredundant, deselect **qe0** *and* **hme0**, *as well.*

15. Press **<Esc>** to return to the main menu.

16. Select **Reset**.

17. Select **Start**.

    Observe the System Status window during test. The test takes approximately five minutes. The test is complete when **System Status** shows idle. Verify that the output reads:

    Total error: 0

    or

    System Passes: 1

18. To exit SUNvts, select **Quit**.

19. Select the **Quit UI and Kernel** option.

20. Push **Eject** to remove tape media from DAT tape drive.

21. At the command line, type **eject** to remove CD-ROM from CD-ROM drive.

Ethernet Hub/Terminal Server Test

Perform the following procedures to test the ethernet hub / terminal server.

Overview

Testing the ethernet hub / server terminal server is performed in three parts.

- Part 1 tests the hub by sending a ping to all ethernet hub ports that have an associated internet protocol (IP) address. Ping is used to send an ICMP diagnostic packet to the destination you specify, and is a pass or fail test. If the destination responds to the diagnostic packet, then the RF-C! controller system displays the message: alive. If the destination does not respond, then the message No response or answer from [destination_name] is displayed on the console.
- Part 2 tests the ethernet hub terminal server by telnetting to the correct terminal server ports 1 through 20.

Note: In redundant RF-C! controller systems, port 1 is system A (primary) of the RF-C! controller and port 2 is system B (redundant) of the RF-C! controller.

Part 1: Ethernet Hub Server Port(s) Test

This section describes the test procedure for the ethernet connections within the RF-C! controller system. This test can be done manually by entering ping UNIX commands at the VT100 terminal.

1. Verify the Ethernet matrix link combinations (see Table 6-3).

Note: The ping tests included are for example only to show test capabilities. Depending upon your installation, you will have different network names, addresses, and configurations. See the /etc/hosts file on your system.

Table 6-3: Ping Verify Table

Log in as	Verify the link to	Default IP Address	UNIX Command (Type)
Host name	mfgrfc1a	199.4.77.20	ping mfgrfc1a
	mfgrfc1b	199.4.77.21	ping mfgrfc1b
	mfgrtr1a	xxx.xx.xx.xx	ping mfgrtr1a
	rfcaipp	177.11.77.13	ping rfcaipp
	rfcbipp	177.11.77.14	ping rfcbipp
	rtrlipp	xxx.xx.xx.xx	ping rtrlipp
	rfclsr1	177.12.77.10	ping rfclsr1
	rfcncd1	177.12.77.18	ping rfcncd1
	rfcchor1	177.12.77.12	ping rfcchor1
	rfcactl	177.12.77.13	ping rfcactl
	rfcbctl	177.12.77.14	ping rfcbctl
	rtr1ctl	xxx.xx.xx.xx	ping rtr1ctl
	rfcxhb1a	177.12.77.16	ping rfcxhb1a
	rfcxts1a	177.12.77.17	ping rfcxts1a

2. From the VT100 terminal, type:

   cd <Enter>

3. Verify the link. Type:

   ping^mfgrfc1a <Enter>

   A system response of alive indicates the Pass Test condition.

   A system response of No answer from destination or unknown host indicates the Fail Test condition.

4. Verify the link. Type:

   ping^mfgrfc1b <Enter>

   A system response of alive indicates the Pass Test condition.

A system response of No answer from destination or unknown host indicates the Fail Test condition.

Note: The following test (ping mfgrtr1a) may not be available.

5. Verify the link. Type:

   ping^mfgrtr1a <Enter>

   A system response of alive indicates the Pass Test condition.

   A system response of No answer from destination or unknown host indicates the Fail Test condition.

6. Verify the link. Type:

   ping^rfcaipp <Enter>

   A system response of alive indicates the Pass Test condition.

   A system response of No answer from destination or unknown host indicates the Fail Test condition.

7. Verify the link. Type:

   ping^rfcbipp <Enter>

   A system response of alive indicates the Pass Test condition.

   A system response of No answer from destination or unknown host indicates the Fail Test condition.

Note: The following test (ping rtrlipp) may not be available.

8. Verify the link. Type:

   ping^rtrlipp <Enter>

   A system response of alive indicates the Pass Test condition.

   A system response of No answer from destination or unknown host indicates the Fail Test condition.

9. Verify the link. Type:

   ping^rfclsr1 <Enter>

   A system response of alive indicates the Pass Test condition.

A system response of No answer from destination or unknown host indicates the Fail Test condition.

Note: The following test (ping rfcncd1) may not be available.

10. Verify the link. Type:

    ping^rfcncd1 <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

Note: The following test (ping rfcchor1) may not be available.

11. Verify the link. Type:

    ping^rfcchor1 <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

12. Verify the link. Type:

    ping^rfcactl <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

13. Verify the link. Type:

    ping^rfcbctl <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

Note: The following test (ping rtr1ctl) may not be available.

14. Verify the link. Type:

    ping^rtr1ctl <Enter>

A system response of alive indicates the Pass Test condition.

A system response of No answer from destination or unknown host indicates the Fail Test condition.

15. Verify the link. Type:

    ping^rfcxhb1a <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

16. Verify the link. Type:

    ping^rfcxts1a <Enter>

    A system response of alive indicates the Pass Test condition.

    A system response of No answer from destination or unknown host indicates the Fail Test condition.

You have completed manual testing of the ethernet connections.

Part 2: Terminal Server Port(s) Test

To begin testing the terminal server, ensure the RJ-45 cables are connected into port 1 and port 2 on the 20-port strip labeled as **723** on the rear of the ethernet hub 20-port terminal server. The cables should be labeled as **A** and **B**. The cable that is labeled **A** should go into port 1 and is for the primary system of the RF-C! controller. The cable that is labeled **B** should be connected to port 2 and is for the redundant system of the RF-C! controller. Presently, only two ports are used. (A nonredundant RF-C! controller will have a cable for port 1 only).

The back of the terminal server has 20 ports (labeled 1 through 20). The ports relate to the software port numbers:

- port1 = 2001
- port2 = 2002
- port3 = 2003
- port4 = 2004
- port5 = 2005
- port11 = 2011
- port12 = 2012
- port13 = 2013
- port14 = 2014
- port15 = 2015

- port6 = 2006
- port7 = 2007
- port8 = 2008
- port9 = 2009
- port10 = 2010
- port16 = 2016
- port17 = 2017
- port18 = 2018
- port19 = 2019
- port20 = 2020

To begin the terminal server ports test, perform the following procedure:

Test port 1 on the ethernet hub terminal server.

1. At the UNIX prompt #, type:

   tty <Enter>

   The system responds: /dev/console

2. At the UNIX prompt #, type:

   telnet^rfcxts1a^2001 <Enter>

   The system responds: Trying xxx.xx.xx.xx

   The system responds: Escape Character is '^]', hold down on <Ctrl> and <]> simultaneously

3. Press **<Enter>** until the mfgrfc1a login prompt appears.

4. To stop, press:

   <Ctrl+]>

   The system responds: telnet>

5. Type:

   quit <Enter>

   The system responds: Connection closed

Note: Step 6 through Step 10 test port 2 on the ethernet hub terminal server.

6. At the UNIX prompt#, type:

   tty <Enter>

   The system responds: /dev/console

7. At the UNIX prompt #, type:

   telnet^rfcxts1a^2002 <Enter>

   The system responds: Trying xxx.xx.xx.xx

   The system responds: Escape Character is '^]', hold down on **<Ctrl>** and **<]>** simultaneously

8. Press **<Enter>** until the mfgrfc1a login prompt appears.

9. To stop, press:

   <Ctrl+]>

   The system responds: telnet>

10. Type:

    quit <Enter>

    The system responds: Connection closed

Note: Step 11 and Step 12 test ports 3 through 20 on the ethernet hub terminal server.

11. Move the cable that is attached to port 1 of the ethernet hub terminal server to port 3.

12. Repeat Step 6 through Step 10 for ports 3 through 20.
    a. Run each port test using the number corresponding to the particular port being tested (2003, 2004, 2005, and so on).
    b. After completing the tests on each port through port 20, return cable A to port 1.

Note: Nonredundant systems will have a cable in port 1 only. Therefore, in addition to performing tests on ports 3 through 20, also run the test sequence on port 2 using the cable available.

Network Printer Test

This tests the network printer. To test the printer configuration, perform the following procedure:

1. At the UNIX prompt #, type:

   lp^-d rfclsr1_1^/etc/inet/protocols <Enter>

2. Verify that you get a printout of the protocols (see Figure 6-2).

   If the system printed the text: Pass Test.

   If the system failed to print the text: Fail Test.

```
#ident  "@(#)protocols  1.2    90/02/03 SMI"  /* SVr4.0 1.1  */
#
#Internet (IP) protocols
#
ip          0       IP          #internet protocol, pseudo protocol number
icmp        1       ICMP        #internet control message protocol
ggp         3       GGP         #gateway-gateway protocol
tcp         6       TCP         #transmission control protocol
egp         8       EGP         #exterior gateway protocol
pup         12      PUP         #PARC universal packet protocol
udp         17      UDP         #user datagram protocol
hmp         20      HMP         #host monitoring protocol
xns-idp     22      XNS-IDP     #Xerox NS IDP
rdp         27      RDP         #"reliable datagram" protocol
```

Figure 6-2: Product of Printer Configuration

To test printing a PostScript file, perform the following procedure:

1. At the UNIX prompt #, type:

   lp^-d^rfclsr1_1 /usr/openwin/share/images/PostScript/tiger.ps <Enter>

2. Verify that an image of a tiger is printed.

   A printout of an image of a tiger indicates the Pass Test condition.

   No printout of an image of a tiger indicates the Fail test condition.

The printer test is complete.

The RF-C! controller testing is complete.

Acronyms

Table A-1 lists acronyms and special terms used in this document.

Table A-1: Acronyms and Terms (Sheet 1 of 4)

Term	Definition
AC	Alternating Current
Assy	Assembly
AUI	Auxiliary Unit Interface
AWG	American Wire Gauge
BIOS	Basic Input/Output System
C	Celsius
CBL	Cable
CD	Compact Disk
CD-ROM	Compact Disk Read-Only Memory
cm	Centimeter
CP	Central Processor
CPU	Central Processing Unit
DAT	Digital Audio Tape
DC	Direct Current
DIP	Dual In-line Pin
DOS	Disk Operating System
DVM	Digital Voltmeter
EEPROM	Electronically Erasable Programmable Read-Only Memory
EIA	Electronics Industries Association
EPROM	Erasable Programmable Read-Only Memory

Table A-1: Acronyms and Terms (Sheet 2 of 4)

Term	Definition
ESD	Electrostatic Discharge
F	Fahrenheit
FIFO	First In, First Out
FNE	Fixed Network Equipment
ft	Feet
GB	Gigabyte
GND	Ground
GPIO	General Purpose Input/Output
GPS	Global Positioning System
HA	High Availability
HVAC	Heating/Ventilation Air Conditioning
ID	Identification
in.	Inch
IO	Input/Output
IP	Internet Protocol
IPP	Inbound Paging Protocol
IRQ	Interrupt Request
K	Kilo (1,000)
kB	Kilobyte
KBD	Keyboard
kg	Kilogram
LAN	Local Area Network
lb	Pound
LED	Light-Emitting Diode
LSB	Least Significant Bit

Table A-1: Acronyms and Terms (Sheet 3 of 4)

Term	Definition
MB	Megabyte
MHz	Megahertz
mm	Millimeter
MS	Messaging Switch
MSB	Most Significant Bit
mV	Millivolt
N/A	Not Applicable
NEC	National Electrical Code
NIU	Network Interface Unit
NVRAM	Non-Volatile Random Access Memory
OPP	Outbound Paging Protocol
OSC	Oscillator
PC	Personal Computer
PCD	Personal Communicator Device
PDU	Power Distribution Unit
PLL	Phase-Locked Loop
pps	Pulse Per Second
PROM	Programmable Read Only Memory
PWR	Power
RAID	Redundant Array of Independent Disks Redundant Array of Inexpensive Disks
RAM	Random Access Memory
RDNDT	Redundant
ROM	Read Only Memory
RTC	Real Time Clock
SCD	SPARC Compliant Definition

Table A-1: Acronyms and Terms (Sheet 4 of 4)

Term	Definition
SCSI	Small Computer System Interface
s	Second
SRAM	Static Random Access Memory
TAR	Tape Archive
TNPP	Telocator Network Paging Protocol
µg/m^3	Micrograms per cubic meter
UPS	Uninterruptable Power Supply
URS	Universal Redundancy Switch
Vac	Volts Alternating Current
VCO	Voltage Controlled Oscillator
VCXO	Voltage Controlled Crystal Oscillator
Vdc	Volts Direct Current
VDT	Video Display Terminal
VME	Versa Module Eurocard
VOM	Volt-Ohmmeter
W	Watt
WMG	Wireless Message Gateway
Xmit	Transmit
Xoff	Transfer Off
Xon	Transfer On