Installation & Operation

EDACS®

Orion™ Test Unit

(For Non-Simulcast Applications)

ERICSSON

REVISION HISTORY

Revision	Date	Reason for Change
	Jan 1996	Original Release

NOTICE!

This Manual covers Ericsson and General Electric products manufactured and sold by Ericsson Inc.

NOTICE!

Repairs to this equipment should be made only by an authorized service technician or facility designated by the supplier. Any repairs, alterations or substitution of recommended parts made by the user to this equipment not approved by the manufacturer could void the user's authority to operate the equipment in addition to the manufacturer's warranty.

NOTICE!

TABLE OF CONTENTS

LIST OF FIGURES

SPECIFICATIONS

Mechanical:
- Width ..... 19 in. (483 mm)
- Height ..... 3.5 in. (89 mm)
- Depth ..... 13.25 in. (337 mm)

Environmental:
- Temperature Range (20% Duty Cycle) ..... −30° to +60° C (−22° to +140° F)

Power Requirements:
- Receiver (Squelched) ..... 1.1 Amperes at 13.8 Vdc
- Receiver (Unsquelched) ..... 3.0 Amperes at 13.8 Vdc (15 Watts Output)
- Transmitter (12 Watt Output) ..... 7 Amperes at 13.6 Vdc
- Transmitter (30 Watt Output) ..... 14 Amperes at 13.6 Vdc

INTRODUCTION

This manual covers the Orion TU (Test Unit) for Non-Simulcast applications. The Orion TU is an optional feature of the EDACS Site Controller and is used to test the radio channels at a single EDACS Trunked Site. The TU monitors the outgoing messages on the Control Channel and places test calls under the direction of the Site Controller computer. A test call consists of sending a call request on the Control Channel, receiving a Working Channel assignment, and checking data transmission in both directions on the assigned Working Channel. Any failure of the Control or Working Channel to perform as expected is reported to the Site Controller. The Orion TU can also be used as a service or test radio for maintenance personnel.

Information for installation, operation, and maintenance of the Orion TU is included in this manual. For additional information, see one or more of the following related manuals:

TQ-3374 V12 (or later) - Radio Programming Guide

LBI-38984 - User's Guide, EDACS System Manager

LBI-38985 - Maint. Manual, EDACS Site Controller

LBI-38888 - Operator's Manual, Orion Control Unit

LBI-38992 - Maint. Manual, Orion Control Unit

LBI-38903 - Maint. Manual, Orion VHF Mobile

LBI-39172 - Maint. Manual, Orion VHF Mobile, Dual Bandwidth

LBI-38904 - Maint. Manual, Orion UHF Mobile

LBI-39162 - Maint. Manual, Orion UHF Mobile, Dual Bandwidth

LBI-38902 - Maint. Manual, Orion 800 MHz Mobile

LBI-38906 - Maint. Manual, Orion 900 MHz Mobile

DESCRIPTION

The Orion TU consists of an Orion TU radio, shelf, antenna, power cable, data cable, and programming cable. The Orion TU radio is mounted in the shelf, which is mounted in the Site Controller cabinet directly below the Alarm and Control Unit. The antenna has its own attached cable to connect to the shelf, and a magnetic-base to assist mounting in any convenient location that will give adequate coupling to the site's receive antenna circuit. The power cable connects the shelf to the cabinet's DC power supply, the data cable connects the shelf to the Site Controller computer, and the programming cable connects the shelf to the programming equipment.

The shelf is assembled at the time of installation. A hardware kit and all parts are provided. The assembled shelf contains a fan, RF attenuator, speaker, internal wiring, and an Orion TU radio. The Orion TU radio is equipped with a hand-held microphone, and diagnostic test software (group 22 or higher). The TU feature must be enabled in factory. Customer-specific parameters may be programmed during installation.

EDACS 3 version 12 or later software is required to program the Orion TU radio. This software is not provided as part of the Orion TU. If your system uses MRK or Orion radios, you will already have this software (although it may not be the required version). If you do not have the required version, you will need to get it before installation.

Figure 1 shows the front view of a fully-assembled Orion TU shelf.

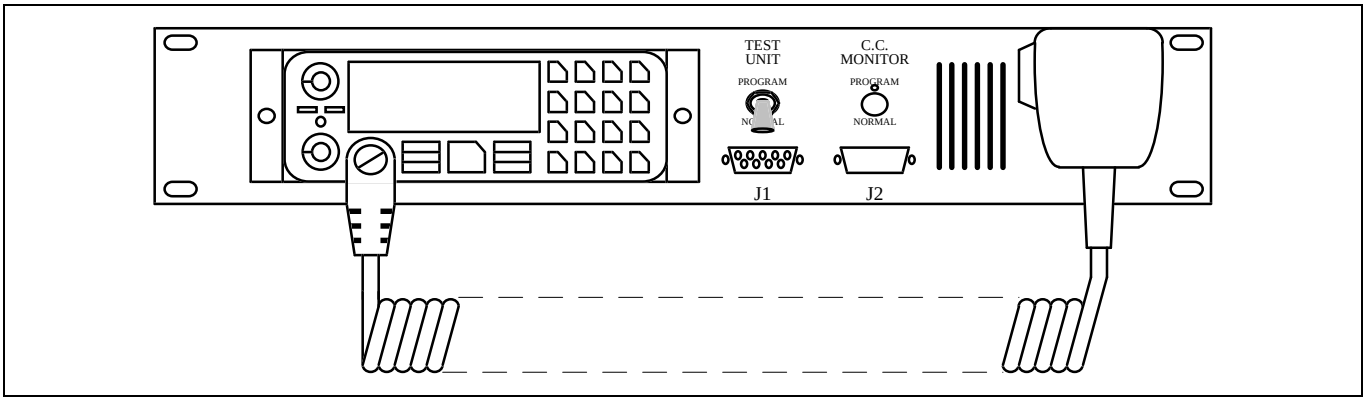


Figure 1 - Front View of Fully-Assembled Orion TU Shelf

INSTALLATION

PREPARATION

❑ Read Instructions: Read the complete installation instructions. This will give you a feel for what has to be done, what you will need to do, and how long it will take.

❑ Check Tools: Make sure you have adequate tools to do the job right. Installation of the Orion TU requires the following tools:

- Small flat-blade screw driver
- Medium flat-blade screw driver
- #1 Phillips screw driver
- T10 Torx screw driver
- T20 Torx screw driver
- 5/16" hex nut driver

❑ Check Orion TU Material: Make sure you have all the Orion TU material on hand for the installation. The Orion TU material is listed in the Parts List near the end of this manual. The part numbers for a few parts will depend upon the model of the Orion TU radio, the model of the DC power supply, and the model of the Site Controller computer.

An Orion TU radio for frequencies below 470 MHz will have only two connectors on its back (TNC and DB-37) and requires a 19B804718P1 Orion TU shelf harness. An Orion TU radio for frequencies above 470 MHz will have a third connector on its back (separate DC power connection) and requires a 19B804719P1 Orion TU shelf harness.

The earlier 19D430272-type DC power supplies have screw-terminal connections in a fuse box and require a 19B804708P1 power cable. The latest 19A149978-type DC power supplies have a high-current plug connection which requires the 19B804708P1 power cable and the existing wiring going to this high-current plug to be modified so they can share the plug.

The latest model Site Controller computer, using modular connectors on its back panel for connection points, requires a 19B804709P1 data cable. Earlier models, using EMULEX or DILOG panels for connection points, require a 19B804731P1 data cable.

❑ Check Programming Material: Make sure you have the following programming cable on hand for the installation (provided with the Orion TU):

- 19B804722P1 Orion TU Programming Cable (Data Interface Module to TU Shelf)

Make sure you have the following additional programming equipment and material on hand for the installation (not provided with the Orion TU):

- TQ3374 version 12 or later EDACS 3 Radio Programming Software and Programming Guide
- IBM PC/XT/AT (or any true compatible) with MS-DOS version 3.0 or later, an available serial port, and 640K Internal RAM
- 19B235027P1 RS-232 Data Cable (PC to Data Interface Module)
- 19D438367G2 Data Interface Module
- 19B800850P2 12 VDC Power Supply for Data Interface Module (120V, 60 Hz operation) or:

  19B800888P1 12 VDC Power Supply for Data Interface Module (230V, 50 Hz operation)

ASSEMBLE NEW TU SHELF

The Orion TU shelf must be assembled before it is mounted in the Site Controller cabinet. The connection of the Orion TU shelf harness to the Orion TU radio is slightly different, depending upon whether the Orion TU radio is for frequencies below or above 470 MHz. An Orion TU radio for frequencies below 470 MHz (VHF, UHF low split, and UHF mid split) has two connections to the Orion TU shelf. An Orion TU radio for frequencies above 470 MHz (UHF high split, 800 MHz, and 900 MHz) has three connections to the Orion TU shelf.

The cable layout for an Orion TU shelf for frequencies below 470 MHz is shown in Figure 2. The cable layout for an Orion TU shelf for frequencies above 470 MHz is shown in Figure 3. An interconnection diagram for each configuration is shown near the end of this manual.

❑ Install Connector on Fan:

- Get the basic Orion TU shelf (sheet metal with fan, microphone hanger, cable clamps, guides, and supports).

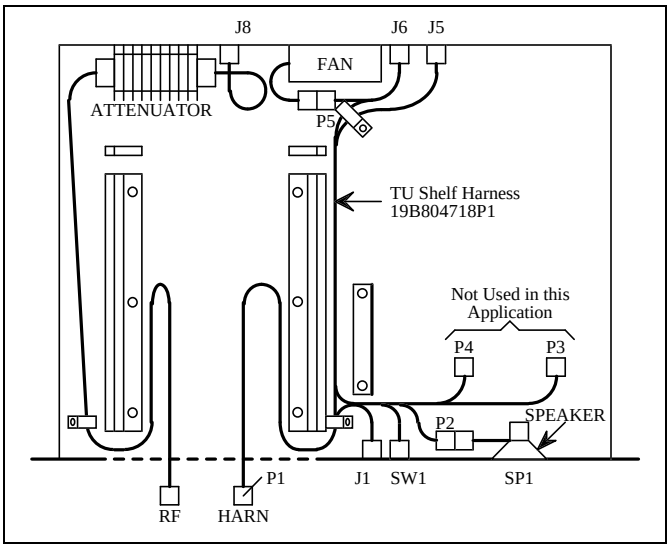


Figure 2 - TU Shelf Cable Layout - Below 470 MHz

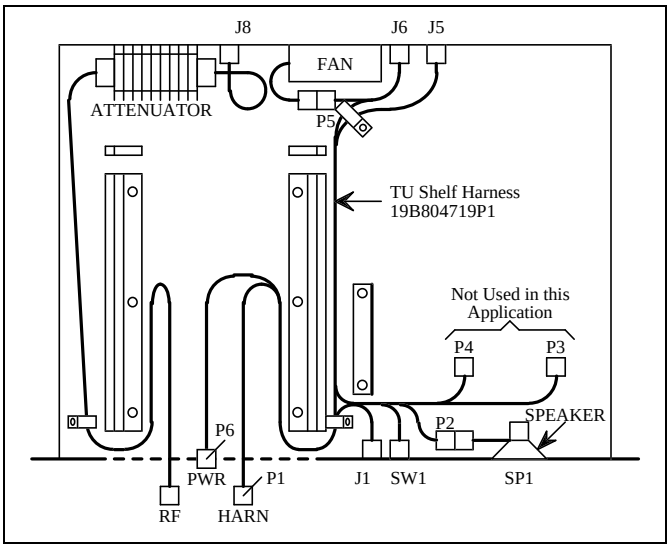


Figure 3 - TU Shelf Cable Layout - Above 470 MHz

- Remove two right-angle brackets about 11" long, two plates about 1 3/4" square, one microphone hanger with keeper (thin spring steel sheet that goes behind hanger), two #6-32 screws, two #6 flat washers, and two #6 lock washers (may be lose or taped in place) from the shelf and save for a later step in the installation.

- Get a two-position connector housing and two male pins from the hardware kit.

- Crimp one pin on the red wire from the fan and insert the pin into position 1 in the connector shell.

- Crimp one pin on the black wire from the fan and insert the pin into position 2 in the connector shell.

❑ Modify and Install Speaker:

- Get a speaker from the hardware kit.

- Cut the existing connector off the wires attached to the speaker, discard the connector, and strip the insulation back about 3/16 inch on each wire.

- Get a two-position connector housing and two male pins from the hardware kit.

- Crimp the pins on the wires attached to the speaker and insert the pins into the connector shell (polarity does not matter).

- Get four #4 flat washers, four #4 external-tooth lock washers, and four #4-40 hex nuts from the hardware kit.

- Fasten the speaker to the inside of the shelf using the #4 hardware. (Place the lock washer between the nut and the flat washer.)

❑ Install TU Shelf Harness:

- Get the 19B804718P1 or 19B804719P1 harness for the shelf.

- Cut the loop of red wire sticking out of the back of the DB-37 connector of the harness.

- Snap the 8-pin modular connector of the harness into the hole in the back of the shelf labeled “J5”.

- Snap the 3-pin power connector of the harness into the hole in the back of the shelf labeled “J6”.

- Plug the fan into the nearest 2-position connector of the harness.

- Fasten the harness with the cable clamp near the fan, route the harness towards the front of the shelf, and fasten the harness with the cable clamp near the front of the shelf.

- Get two M3x10mm Torx-head machine screws, two M3 external-tooth lock washers, and two M3 flat washers from the hardware kit.

- Fasten the DB-9 connector of the harness into the hole in the front of the shelf labeled “J1” using the M3 hardware. (Place the lock washer between the screw head and the flat washer.)

- Remove the keyed washer and nut from the toggle switch of the harness and insert the switch into the hole in the front panel just above the connector labeled “J1”. Then fasten in place using the keyed washer and nut supplied with the switch. Place the keyed washer between the nut and the front of the shelf with the washer’s tab inserted into the small positioning hole just above the main hole.
- Plug the speaker into the nearest 2-position connector of the harness.
- Route the harness around the front of the right-hand support for the Orion TU radio, and then loop the harness between the two supports.

❑ Install RF Attenuator (See Figure 4):

- Get the RF attenuator and two plastic cable ties from the hardware kit.
- Position the attenuator along the back of the shelf near the left-hand corner, with the female end closest to the corner.
- Feed the tip of each cable tie through the hole in the back of the shelf, down around the attenuator, through the hole in the bottom of the shelf, and back up to the starting point.

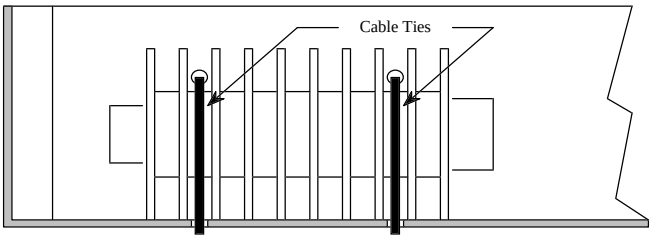


Figure 4 - RF Attenuator Mounting

❑ Install Coaxial Cables:

- Get the 19B804720P1 short (4") coaxial cable.
- Get four #4-40x3/8 machine screws, four #4 external-tooth lock washers, four #4 flat washers, and four #4-40 hex nuts from the hardware kit.
- Position the bulkhead connector of the coaxial cable in the hole in the back of the shelf labeled “J8”. Then fasten in place using the #4 hardware. (Put the screw head and the flat washer on the outside of the shelf.)
- Fasten the other connector of the coaxial cable to the nearest end of the RF attenuator.
- Get the 19B804720P2 long (32") coaxial cable.
- Fasten the Type N connector of the coaxial cable to the RF attenuator.
- Route the coaxial cable forward towards the front of the shelf, through the cable clamp, around the front of the left-hand support for the Orion TU radio, and then loop the cable between the two supports.

❑ Fasten Slides to TU Radio (See Figure 5):

- Get the Orion TU radio.
- Get the two slides (right-angle brackets about 11" long) removed earlier from inside the shelf.
- Get four M4 external-tooth lock washers and four M4x10mm Torx-head machine screws from the hardware kit.
- Fasten the slides to the radio using the M4 hardware.

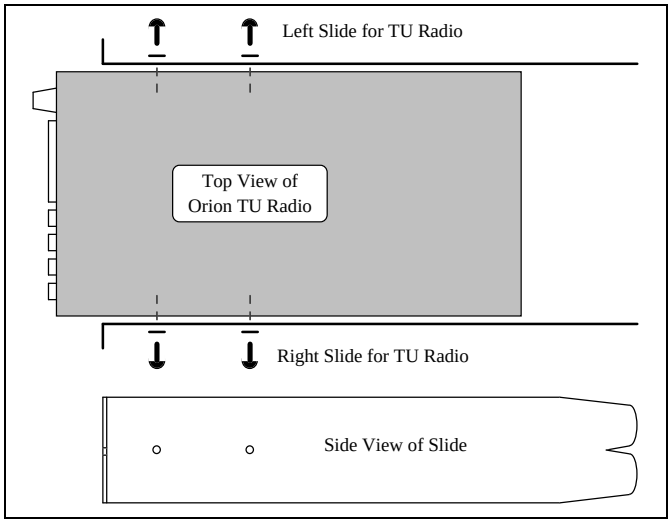


Figure 5 - Slides for Orion TU Radio

❑ Connect TU Radio: Connect the harness and RF cable to the back of the Orion TU radio. An Orion TU radio for frequencies below 470 MHz has two connections to the Orion TU shelf. An Orion TU radio for frequencies below 470 MHz has three connections to the Orion TU shelf.

❑ Install TU Radio:

- Connect the harness and RF cable in the shelf to the back of the Orion TU radio. (There will be two connections to a radio for frequencies below 470 MHz; three connections above 470 MHz.)

- Push the slides tight against the Orion TU radio and insert it into the shelf. Keep the RF cable and harness below the Orion TU radio and between the slides.

- Get two #6-32x3/8 machine screws, two #6 external-tooth lock washers, and two #6 flat washers from the hardware kit.

- Secure the slides to the front of the shelf using the #6 hardware. (Place the lock washer between the screw head and the flat washer.)

❑ Connect Microphone:

- Get microphone hanger, keeper (thin spring steel sheet that goes behind hanger), two #6-32 screws, two #6 flat washers, and two #6 lock washers removed earlier from the shelf.

- Fasten the microphone hanger and keeper to the front of the shelf to the right of the speaker. Place each lock washer between a screw head and a flat washer.

- Get microphone, plug into the connector on the front of the Orion TU radio, and place in the microphone hanger on the front of the shelf.

REMOVE OLD TU SHELF

Skip this step if an old TU shelf is not present in the Site Controller cabinet. However, if an old TU shelf with or without a TU radio is present, it must be removed before the Orion TU shelf can be installed.

❑ Turn Off DC Power Supply: Before removing any equipment from the Site Controller cabinet, turn off the DC Power Supply in the cabinet.

❑ Remove Old Data Link Cable: Remove the cable connecting J2 on the ACU (see Figure 6) to Port 27 on the Site Controller computer (see Figure 7). If connections to the Site Controller computer are through DILOG or EMULEX panels, the cable goes to connector 11B (see Figure 8 or Figure 9) instead of Port 27.

❑ Remove Old TU Harness: Remove the cable connecting J1 on the ACU (see Figure 6) to the TU radio in the old TU shelf and to the main DC power supply in the cabinet.

❑ Disconnect Old TU Antenna: Disconnect the old TU antenna cable from the attenuator at the back of the TU Shelf.

❑ Remove Old TU Shelf: Remove the old TU shelf by removing the four screws holding it to the front mounting rails of the cabinet.

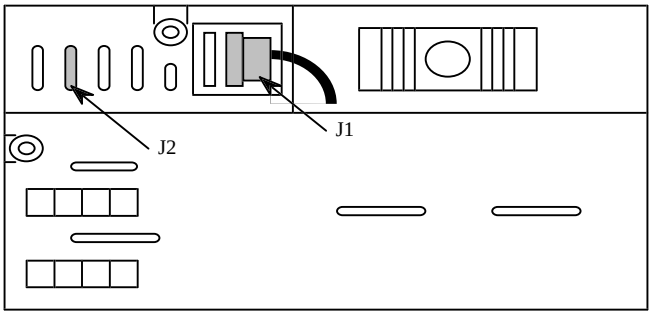


Figure 6 - Back View of ACU

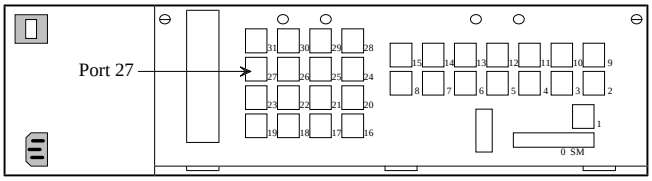


Figure 7 - Back View of Site Controller Computer

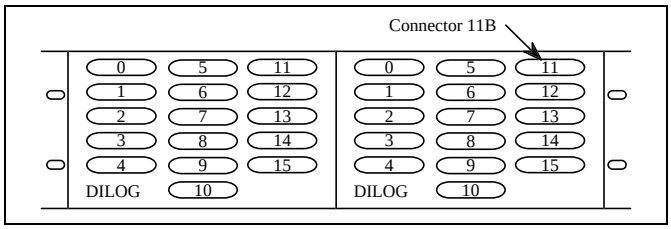


Figure 8 - DILOG Distribution Panels

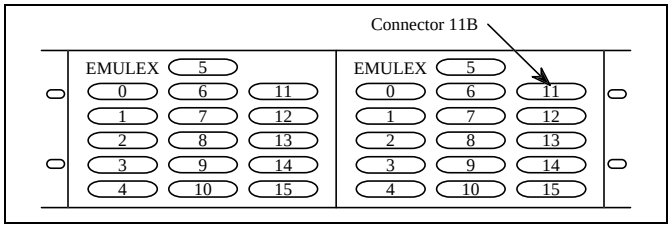


Figure 9 - EMULEX Distribution Panel

INSTALL NEW TU SHELF

❑ Turn Off DC Power Supply: Before adding any equipment to the Site Controller cabinet, turn off the DC Power Supply in the cabinet.

❑ Install Shelf:

- Get four Tinnerman clips and four sheet metal screws from the hardware kit.
- Fasten the TU shelf to the front rails of the cabinet just below the Alarm and Control Unit using the Tinnerman clips and sheet metal screws.

❑ Install Back Supports (see Figure 10):

- Get the two back supports (plates about 1 3/4" square) removed earlier from inside the shelf.
- Get four Tinnerman clips and four sheet metal screws from the hardware kit.
- Fasten the back supports to the back rails of the cabinet using the Tinnerman clips and sheet metal screws.
- Get two #10-32x1/2 machine screws, two #10 external-tooth lock washers, and two #10 flat washers from the hardware kit.
- Fasten the back supports to the back of the Orion TU shelf using the #10 hardware. (Place the lock washer between the screw head and the flat washer.)

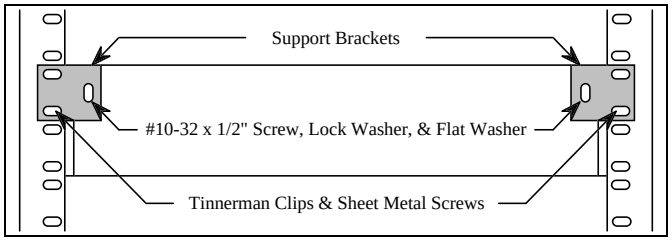


Figure 10 - Back Supports for Orion TU Shelf

CABLE CONNECTIONS

External cable connections to the Orion TU shelf are the same for all frequencies. However, connections to older models of the Site Controller computer and the DC power supply will be different than for the latest models. Cable connections between the TU Shelf and the latest models of the Site Controller computer and the DC power supply are shown in Figure 11. Cable connections between the TU Shelf and the older models of the Site Controller computer and the DC power supply are shown in Figure 12.

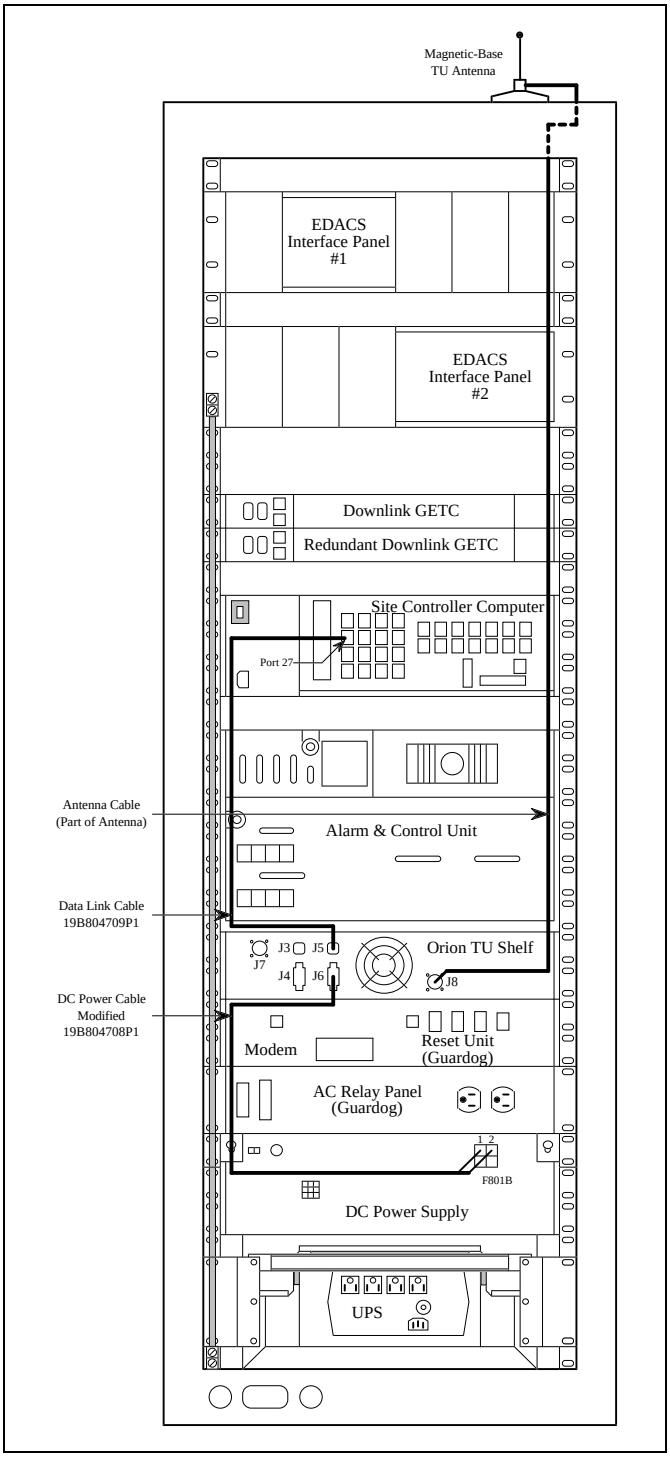


Figure 11 - Cabinet Connections to Latest Equipment

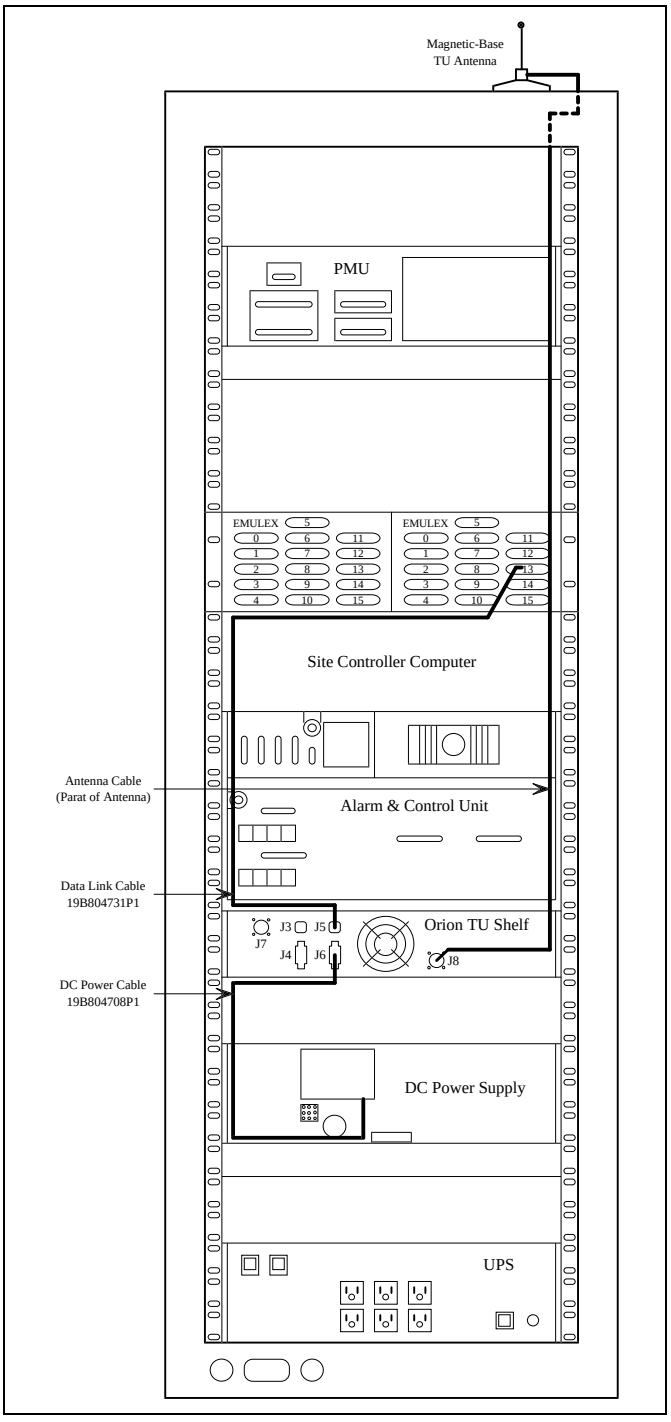


Figure 12 - Cabinet Connections to Older Equipment

❑ Install TU Antenna: If no TU antenna was previously installed, place the antenna on top of the Site Controller cabinet (or other location) and route the cable down into the cabinet through the hole used by other cables. Then run the TU antenna cable down the right rear rail of the cabinet to the Orion TU shelf.

❑ Connect TU Antenna Cable: Connect the cable from the TU antenna to J8 on the back of the Orion TU shelf.

❑ Install DC Power Cable: Connect a 19B804708P1 DC power cable from J6 on the back of the Orion TU shelf to the DC power supply. The connection to the DC power supply will depend upon the model of the DC power supply. Use whichever of the following two procedures applies:

- 19A149978P1 or -P2 DC power supply - Identified by the large high-current connector plugged into F801B on the back of the DC power supply.
  - Cut the spade terminals off the 19B804708P1 power cable and strip back the insulation 1/4 inch.
  - Unplug the connector from F801B on the back of the DC power supply, remove any existing wires with their pins attached (see Figure 13), cut off the used pins, and strip back the insulation 1/4 inch.
  - Find two new pins in the hardware kit.
  - Twist the red wire from the 19B804708P1 power cable together with all existing red wires removed from the connector, insert together in one new pin, crimp, and insert into pin position 1 in the connector.
  - Twist the black wire from the 19B804708P1 power cable together with all existing black wires removed from the connector, insert together in one new pin, crimp, and insert into pin position 2 in the connector.
  - Plug the connector back into F801B on the back of the DC power supply.
- 19D430272P1 or -P2 DC power supply - Identified by the black plastic fuse box on its back panel.
  - Remove the fuse box cover from the DC power supply (see Figure 14).
  - Connect the spade lug on the red lead of the cable to terminal 2
  - Connect the spade lug on the black lead of the cable to terminal G10.
  - Re-attach the fuse box cover to the DC power supply.

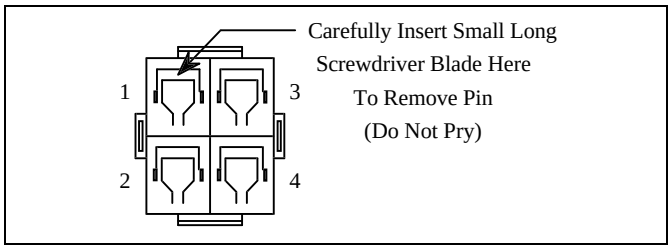


Figure 13 - Pin Removal from High-Current Plug

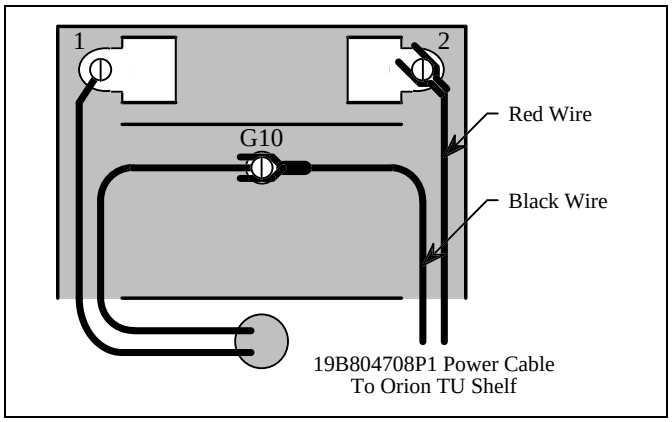


Figure 14 - Fuse Box on Older Power Supply

❑ Install Data Link Cable: Connect a data link cable from J5 on the back of the Orion TU shelf to the Site Controller computer. The cable used will depend upon the model of the Site Controller computer. Use whichever of the following two cables applies:

- For connection to the latest 19A149302P9 Site Controller (identified by the modular connectors on its back panel), use a 19B804709P1 data link cable and connect to Port 27 on the Site Controller (see Figure 7).

- For connection to an earlier 19A149302P1 through -P8 Site Controller (identified by the DILOG or EMULEX panels), use a 19B804731P1 data link cable and connect to connector 11B on the DILOG or EMULEX panels (see Figure 8 or Figure 9).

❑ Turn On DC Power Supply: Turn on the DC Power Supply in the cabinet and check to see that all equipment appears to be working normally.

❑ Power Up TU: Turn on the Orion TU radio by rotating the Power On-Off Volume knob clockwise (top left corner of radio). Make sure that "TEST UNIT" is displayed on the Orion TU radio before proceeding.

PROGRAMMING

The Orion TU radio is enabled as a TU in the factory (you cannot substitute a regular Orion radio). However, some parameters in the Orion TU personality must still be customized for the specific system where it is to be used. Even though some of these parameters may have been set correctly in the factory, you must check certain parameters to be sure. The procedure given here describes reading the personality shipped in the Orion TU radio to the programming equipment, modifying this personality with the programming equipment, saving the modified personality in the programming equipment for future reference, and writing the modified personality back into the Orion TU radio.

❑ Load Programming Software into PC: Load the EDACS 3 Radios (Version 12 or later) programming software into the PC as follows:

- Turn on the PC and wait for it to complete its initialization routine.

- When the **C:\>_** or **D:\>_** command prompt is shown on the PC monitor, insert the EDACS 3 Radios Program Disk #1 (Version 12 or later) into the PC's A (or B) drive, type "A:" (or "B:"), press the **Enter** key, type "INSTALL", and press the **Enter** key again.

- The **Radio Programming Software Installation Procedure** screen will appear. In the highlighted **Target Drive** field, type in the letter of the PC's hard disk (usually C or D) and press the **F1** (Begin) function key.

- The PC will read the Program Disk, create a GE directory in the root directory of the hard disk, and load the programming files into this GE directory. The PC will prompt you to insert Program Disk #2 when needed. Remove the Program Disk #1, insert Program Disk #2, and press the **F1** (Begin) function key to continue the installation. The PC will prompt you when the installation is complete. Press the **Enter** key and remove Program Disk #2. If your PC's hard disk is the C drive, type "C:" and press the **Enter** key. The **C:\GE\EDACS\BIN>_** command prompt should now be shown on the PC monitor. Type in "CD\" and press the **Enter** key to return to the **C:\>_** or **D:\>_** command prompt.

❑ Connect Programming Equipment: Connect the radio programming equipment to the Orion TU shelf as shown in Figure 15.

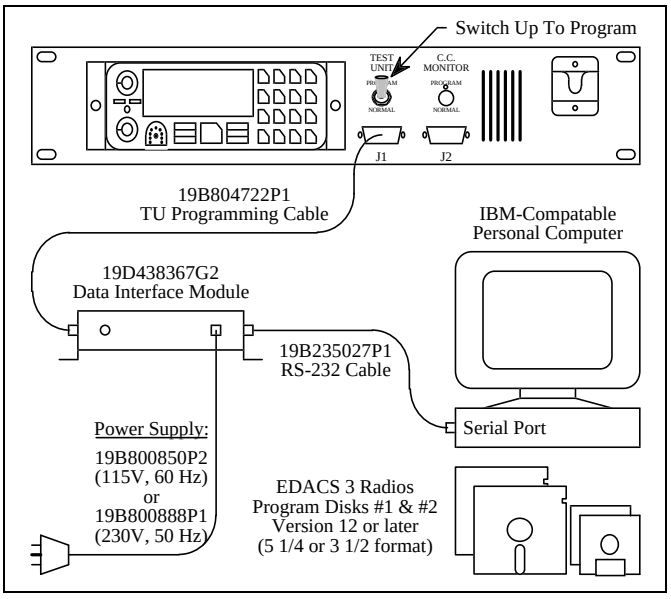


Figure 15 - Programming Setup

❑ Switch TU to Program: Move the switch on the front panel of the Orion TU shelf (labeled "TEST UNIT") to the up position (labeled "PROGRAM").

❑ Program TU Personality: Program the personality of the Orion TU radio as follows:

- Run EDACS3 Programming File - With the DOS command prompt (C:\ or D:\) displayed on the PC monitor, type "CD\GE" and press the **Enter** key (to go to the directory named GE where the EDACS3 programming file is located). Then type "EDACS3" and press the **Enter** key (to run the EDACS3 programming file). You will know that the EDACS3 programming file is running when you see the introductory copyright screen briefly, followed by the **Current Personality** screen on the PC monitor.

- Evoke Orion TU Programming Mode - Turn the Orion TU radio off for one second and then back on again, using upper left knob on radio. (Ignore the DSP ERR message that is briefly displayed on the TU radio each time it is turned on.) Make sure that **PC PROG** is displayed on the Orion TU Radio. If not, check to make sure that the programming equipment is connected as shown in Figure 15, and that the switch on the front of the Orion TU shelf is in the up (programming) position. Then, start this step over.

- Read Personality from TU - Using the **Current Personality** screen as the starting point, use the following procedure to read the personality from the Orion TU to the programming equipment:

  - Press the **F6** (Read) function key to bring up the **Read Radio** window (see Figure 16).

  - In the **Selected Filename** field, type in a filename for this TU personality (when finished this filename will be shown as a personality in the **Current Personality** screen).

  - Press the **F1** (Yes) function key to read the TU personality into the PC.

  - When complete, press the **Enter** key and check that the new filename is shown in the **Current Personality** screen.

- Customize TU Personality - Using the **Current Personality** screen as the starting point, use the following procedure to modify the personality read from the Orion TU, save the modified personality in the programming equipment for future reference, and write the modified personality back into the Orion TU radio:

  - Highlight the name given to the personality read from the TU.

  - Press the **F2** (Change) function key to bring up the **Change/Edit File** window (check to be sure that the name given to the personality read from the TU is shown in the window).

  - Press the **F1** (Yes) function key to go to the **Radio Personality** screen (see Figure 17). (Ignore any warning about the number of agencies defined.)

  - Press the **F7** (Option) function key to go to the **Radio Options** screen.

  - Press the **F8** (More) function key 3 times to see more feature keys.

  - Press the **F2** (DGNTST) function key to go to the **Radio Diagnostics Options** screen (see Figure 18).

  - Select **Enable** in the **Diagnostics Test Mode:** field using the **Tab** key.

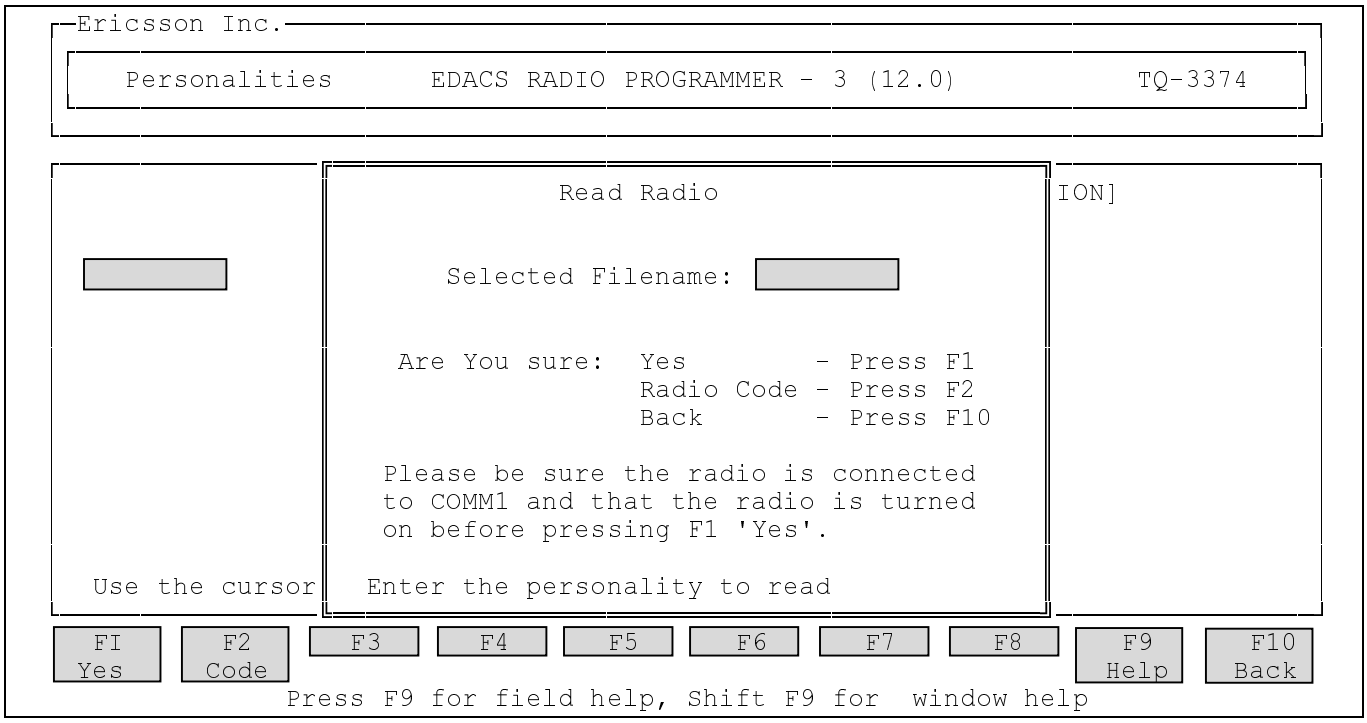


Figure 16 - Read Radio Window

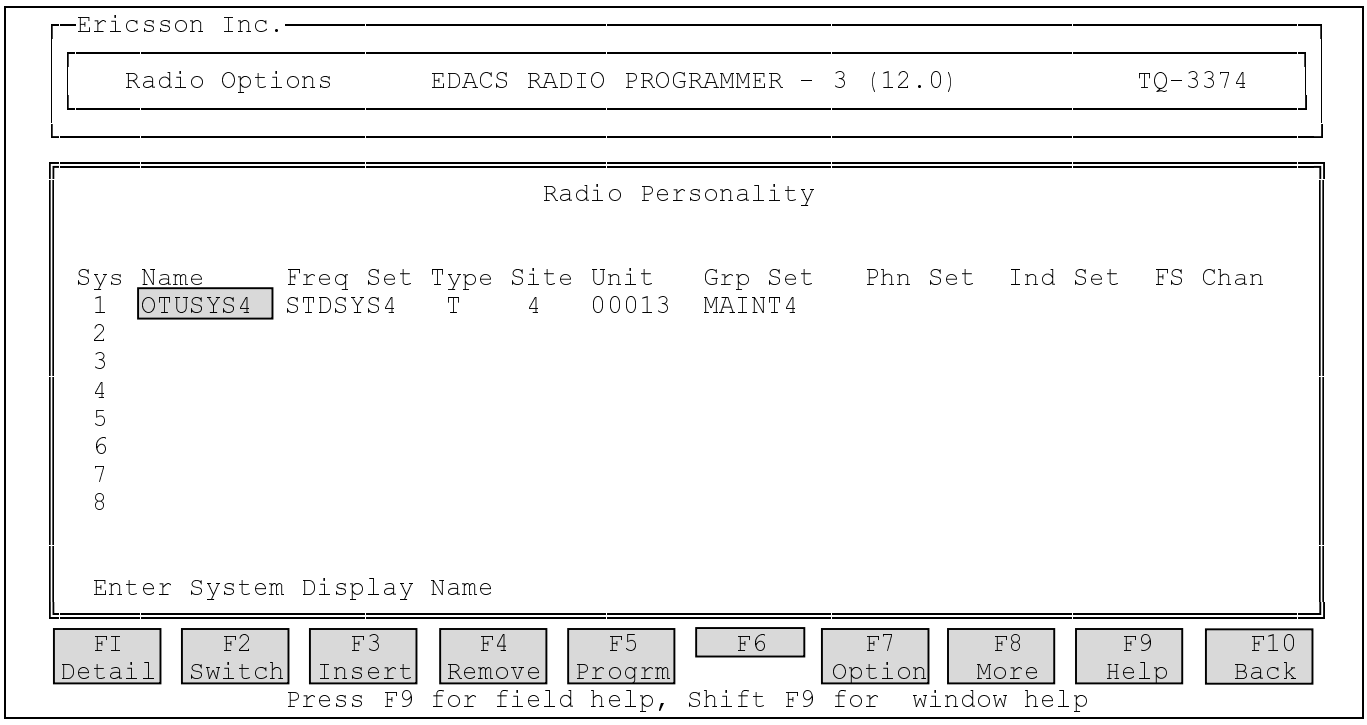


Figure 17 - Radio Personality Screen

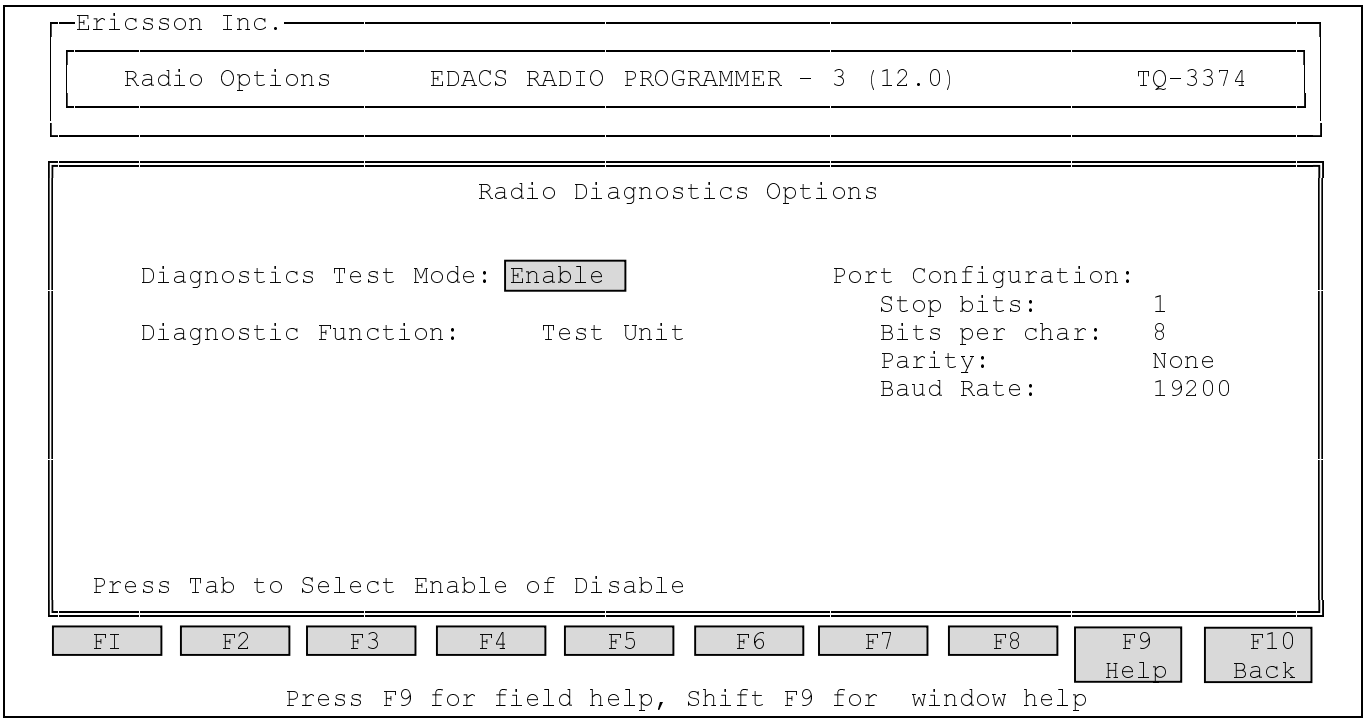


Figure 18 - Radio Diagnostics Options Screen

- Press the down arrow key to move the cursor to the **Diagnostic Function:** field.
- Select **Test Unit** in the **Diagnostic Function:** field using the **Tab** key.
- Press the **F10** (Back) function key to go back to the **Radio Options** screen.
- Press the **F10** (Back) function key to go back to the **Radio Personality** screen.
- Press the **F8** (More) feature key to see more feature keys.
- Press the **F3** (Freq) function key to go to the **Currently Defined Frequency Sets** screen.
- Press the **F3** (NewTrk) function key to go to the **Trunked Frequency Set** screen.
- Press the **F7** (Option) function key to go to the **Trunked Set Options** window (see Figure 19).
- Press the down arrow key to move the cursor to the **Bandwidth Options:** field.
- Select **25** or **12.5** in the **Bandwidth Options:** field using the **Tab** key.
- Press the **F10** (Back) function key to go back to the **Trunked Frequency Set** screen (see Figure 20).

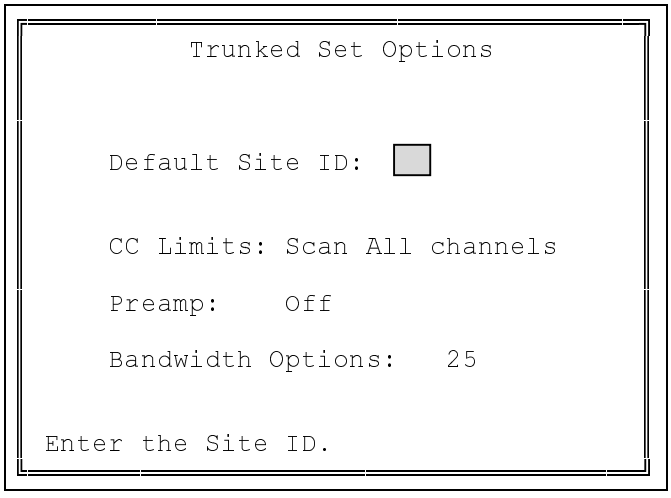


Figure 19 - Trunked Set Options Window

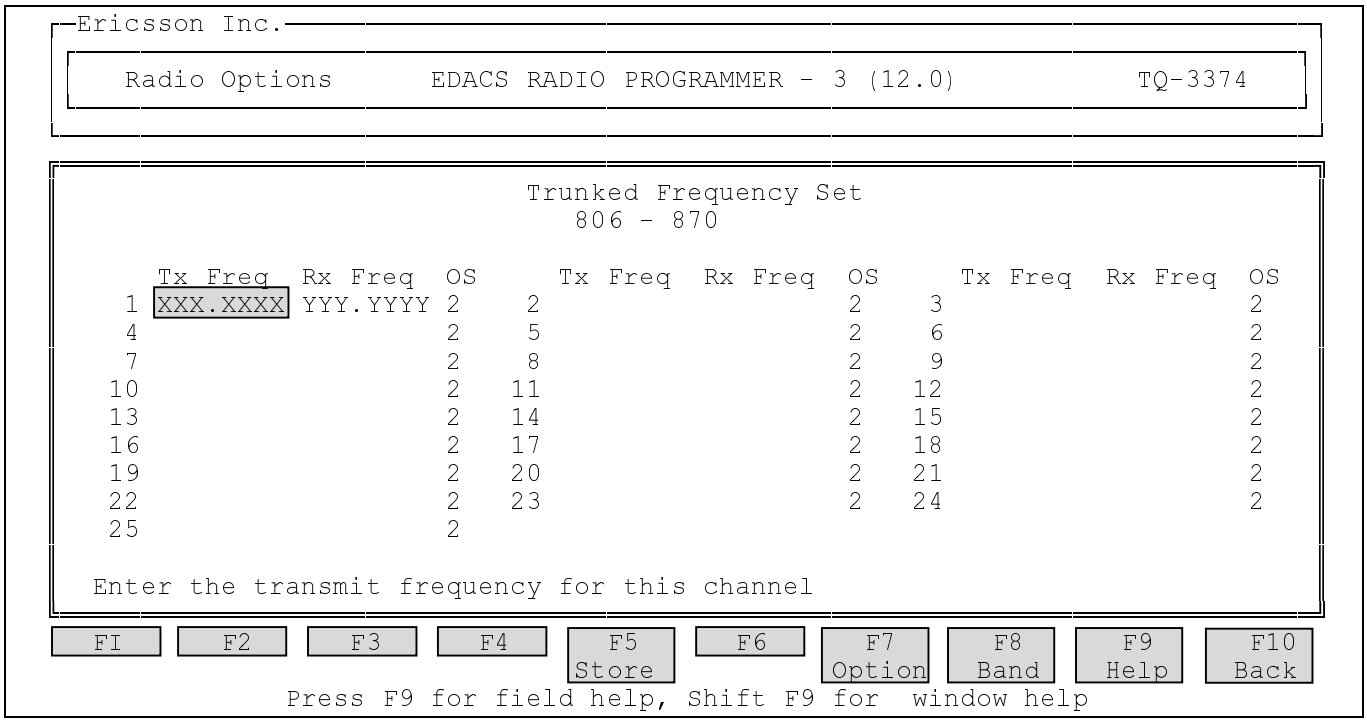


Figure 20 - Trunked Frequency Set Screen

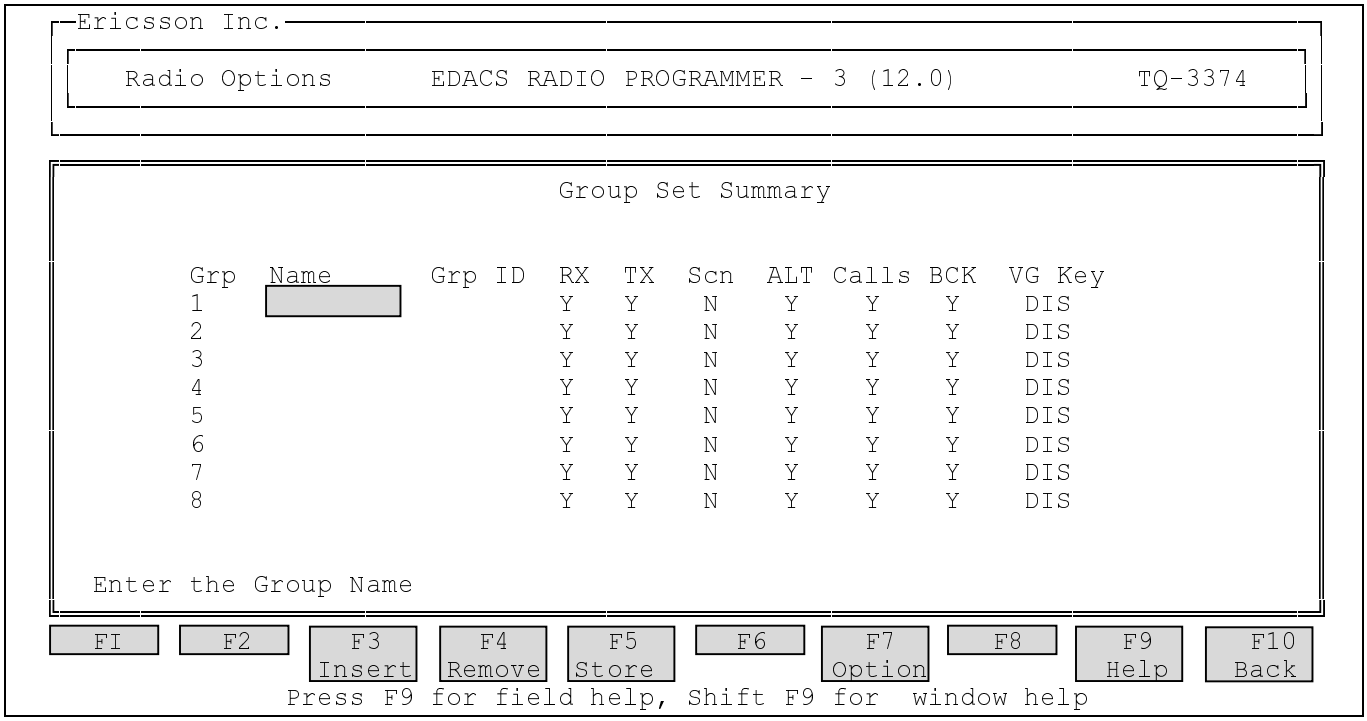


Figure 21 - Group Set Summary Screen

- Type in the transmit frequency for each equipped channel (in MHz: XXX.XXXX) in the **Tx Freq** columns using the **Tab** and arrow keys. (Remember that the transmit frequencies for mobiles are the receive frequencies marked on the EDACS repeaters.)
- Press the **F10** (Back) function key to go to the **Save File** window.
- In the **File to be saved:** field, type in a filename for this frequency set (when finished this filename will be shown as a frequency set in the **Currently Defined Frequency Sets** screen).
- Press the **F1** (Yes) function key to save the frequency set file and go back to the **Currently Defined Frequency Sets** screen.
- Check to be sure that the filename for the new frequency set is shown in the **Currently Defined Frequency Sets** screen.
- Press the **F10** (Back) function key to go back to the **Radio Personality** screen.
- Press the **F4** (Group) function key to go to the **Currently Defined Group Sets** screen.
- Press the **F4** (New) function key to go to the **Group Set Summary** screen (see Figure 21).
- Type in the group names and group IDs, using the **Tab** and arrow keys to move the cursor between fields (no name is necessary in the **Name** column, but it may be useful).
- Press the **F10** (Back) function key to bring up the **Save File** window.
- In the **File to be saved:** field, type in a filename for this group set (when finished this filename will be shown as a group set in the **Currently Defined Group Sets** screen).
- Press the **F1** (Yes) function key to save the group set file and go back to the **Currently Defined Group Sets** screen.
- Check to be sure that the filename for the new group set is shown in the **Currently Defined Group Sets** screen.
- Press the **F10** (Back) function key to go back to the **Radio Personality** screen.
- In the **Name** column, type in the name of the system where the TU is installed.
- In the **Freq Set** column, type in the name used for the frequency set.
- In the **Site** column, type in the site number where the TU is installed.
- In the **Unit** column, type in any LID that is not currently in use. (LID will be used by TU in the service radio mode when making a call request on the Control Channel.)
- In the **Grp Set** column, type in the name used for the group set.
- Press the **F10** (Back) function key to go to the **Save File** window.
- In the **File to be saved:** field, type in a filename for the modified Orion TU personality (when finished this filename will be shown as a personality in the **Current Personality** screen).
- Press the **F1** (Yes) function key to save the modified Orion TU personality and go back to the **Current Personality** screen.
- Check to be sure that the filename for the modified Orion TU personality is highlighted in the **Current Personality** screen.
- Press the **F5** (Program) function key to program the Orion TU radio with the modified Orion TU personality.
- When programming is complete, press the **F10** (Back) function key to go back to the DOS command prompt (make sure you see the DOS command prompt displayed on the PC monitor before proceeding).

❑ Switch TU to Normal: Move the switch on the front panel of the Orion TU shelf (labeled “Test Unit”) to the down position (labeled “Normal”).

❑ Disconnect Programming Equipment: Disconnect the programming equipment from the Orion TU shelf.

SITE DATABASE

Three TU parameters are configurable in the site database by the System Manager. These parameters need to be checked and may need to be changed for the desired operation.

❑ Go to Site Test Parameters Panel: Go to the Site Test Parameters panel to see the current configuration of the three TU parameters.

- Select Menu Item 10 to get to the External Device Definition screen.
- In the Selected Device panel, enter the site number (or site name) in the Device Number field (or the Device Name field) where the TU is installed.
- Press the Next key three times to get to the Site Test Parameters panel (3:4).

❑ Check Test Unit Enabled Parameter: The Test Unit Enabled parameter determines if the TU is enabled or disabled. The character Y (default) in the field enables the TU; the character N disables it. Enter the desired character in the field, or (if already OK) go on to the next parameter.

❑ Check Local Test Unit Parameter: The Local Test Unit parameter is used to indicate if the TU is locally located with the Site Controller computer, or remotely located (such as at a remote transmitter site in a Simulcast system). The field contains the two words: Local and Remote. The selection is shown in bold type (default = Local). Use the left or right arrow key to make the desired selection, or (if already OK) go on to the next parameter.

❑ Check Background Test Call Interval Parameter: The Background Test Call Interval parameter is used to set the time interval (in minutes) between test calls on Working Channels. The field may contain any number from 0 to 1440 (default = 5). Entering a 0 in this field disables Background Test Calls, but the TU will continue to monitor the Control Channel and make Recovery Test Calls on failed Working Channels. Enter the desired number, or (if already OK) go on.

❑ Save TU Parameter Changes to Database: After you have completed all the changes you wish to make to the TU parameters, press the Do key to save your changes in the database.

❑ Transfer TU Parameter Changes to Site: When you press the Do key to save changes to the site database in the System Manager, these changes are not automatically sent to the site. Whenever a Site Controller computer is reset or powered on, it will request that the System Manager download the latest database for that site, including the latest TU parameter changes. However, this is not the way to get TU parameter changes to the site. The following procedure allows a system administrator to send the TU parameter changes without disrupting the site:

- Select Menu Item 22 to look at the Site Reconfiguration screen.
- In the Selected Site panel, enter the Site Number or Site Name for the site to be sent the TU data.
- Press the Next key three times to get to the Site Test Parameters panel (3:5).
- In the Site Test Parameters panel (3:5), change the character in the rows between the Database box and the Site box from N to Y for each TU parameter you wish to send to the site and press the Do key.
- Press the F6 function key to return to the Main Menu.
- Press the F7 function key to exit from the System Manager.

OPERATION

USER CALL MODE

To switch to the User Call Mode, press the OPT and CLR keys simultaneously (see Figure 22). The display will show system and group name. Group calls can then be made using the normal procedure for an Orion mobile. To return to the Test Unit Mode, again press the OPT and CLR keys simultaneously.

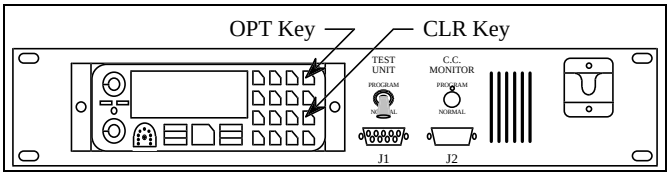


Figure 22 - Location of OPT and CLR Keys

TEST UNIT MODE

Overview

In the Test Unit Mode, the Orion Test Unit (TU) receives all its instructions from, and reports the results of the channel tests, directly to the Site Controller computer through a single serial data link. During normal operation, the TU operates in one of the following states:

- Power-Up
- Set-Up
- Monitor
- Test Call

Power-Up

The TU enters the Power-Up state when power is first applied or after receiving the Reset message from the Site Controller computer. In the Power-Up state the TU sets all switching circuits to a predetermined state and performs self-diagnostic checks. When these checks are completed, the TU sends a Status Response message to the Site Controller computer and waits for a Status Request message in return. If a Status Request message is not received within 10 seconds, the TU again sends a Status Response message and again waits for a Status Request message in return. This continues until a Status Request message is received by the TU.

Set-Up

The TU enters the Set-Up state after sending either of the following messages to the Site Controller computer:

- Status Response (while in the Initialization state)
- CC Fail

Monitor

The TU enters the Monitor state when it receives the Monitor Control Channel message from the Site Controller computer, or after completing a test call. Upon entering this state, the TU sets its receiver to the local transmit frequency of the Control Channel (given in the Monitor Control Channel message) and begins monitoring the locally-transmitted Control Channel messages.

Monitoring the locally-transmitted Control Channel messages is the primary function of the TU, and consists of the following tasks:

- Obtaining synchronization with the outbound Control Channel data frames.
- Decoding the outbound Control Channel data.

When the TU is unable to complete any one or more of these tasks, it sends the CC Fail message to the Site Controller computer and returns to the Set-Up state. When the Site Controller computer receives the CC Fail message, it logs the failure of the present Control Channel, takes the present Control Channel out of service, allocates a new Control Channel, and sends a CC Monitor message with the new Control Channel number to the TU. When the TU receives the new CC Monitor message, it returns to the Monitor state, sets its receiver to the local transmit frequency of the new Control Channel, and resumes monitoring the locally-transmitted Control Channel messages.

Test Call

The TU enters the Test Call state when it receives a Testcall State message from the Site Controller computer. Upon entering this state, the TU simulates a user placing a call on the system, checks the channel-request sequence, and checks high and low speed data transmission in both directions.

A failure at any step in the sequence causes the TU to send an unsuccessful Call Results message to the Site Controller computer and return to the Set-Up state to wait

for further instructions. When the Site Controller computer receives the unsuccessful Call Results message from the TU, it logs the failure and fails the Working Channel.

A normal (successful) sequence contains the following steps:

1. The TU receives a Testcall State message from the Site Controller computer.

2. The TU sends a request for an individual call and waits to receive a Working Channel assignment. (The TU uses a Logical ID of 0 for both the caller and callee.)

3. The TU receives a Working Channel assignment and sets its receiver and transmitter to the corresponding frequencies of the assigned Working Channel.

4. The TU receives a high-speed-data channel confirmation signal from the Working Channel.

5. The TU sends a high-speed-data key message followed by low-speed data to the Working Channel.

6. The Working Channel detects the high-speed-data key message and low-speed data from the TU.

7. The TU stops sending low-speed data to the Working Channel.

8. When the Working Channel stops receiving the low-speed data from the TU, it transmits low-speed data for the remaining 2-second hang-time interval.

9. The TU checks for low-speed data, sends a Call Results message to the Site Controller computer, and returns to the Monitor state to resume monitoring the locally-transmitted Control Channel messages.

If the number of channels failed by any means (as a percentage of the total number of defined channels at the site) reaches the Channel Fault Tolerance Threshold specified in the Site Controller computer's personality (default is 50 %), the Site Controller computer will disable the piece of equipment responsible for identifying most of the failures under the assumption that it is falsely failing channels. If the TU is failed by this mechanism, all channels failed by the TU (both before and after the TU itself was failed) must subsequently be tested OK before the TU itself will be unfailed.

During the time when the TU is failed by this mechanism, the Site Controller computer assigns Working Channels regardless of whether they have been failed by the TU or not, and continues to instruct the TU to place test calls on all Working Channels.

NOTE

For Site Controller software Prior to G7

Any channel failed by the TU (after the TU itself has been failed by the Site Controller computer) will not show up on the Alarm Screen of the System Manager. The Site Controller computer still keeps track of any additional channels failed by the TU, and all failed channels (those showing an alarm and those not) must be tested OK by the TU before the TU itself is unfailed by the Site Controller computer. If no channels are shown with TU alarms but the TU itself shows an alarm, some channel (not showing an alarm) may not yet have been tested OK by the TU.

MAINTENANCE

Maintenance information, for the standard features of the Orion mobile radio, is described in the standard Orion maintenance manuals listed in the Introduction of this manual. The Test Unit (TU) application software, installed in the Orion test radio, can be checked by simulating commands from the Site Controller computer and monitoring the response messages from the TU.

COMMUNICATIONS PROTOCOL

Communications between the TU and the Site Controller computer is through an asynchronous serial data link using RS-232C levels. When monitoring or simulating messages from the Site Controller computer with a protocol analyzer, set the message protocol as follows:

- Baud Rate = 19,200
- Start Bit = 1
- Data Bits = 8
- Parity Bit = None
- Stop Bit = 1
- Flow Control = None

BENCH TEST

Test Equipment Required

The following equipment (or equivalent) is required to bench test the Orion test radio:

- 12 VDC Power Supply
- RF load, 50 ohms
- Triplett VOM, Model 630-PL, Type 5
- HP 4953A or HP 4951C Protocol Analyzer, or computer with software to allow generation and reception of hexadecimal command strings

Test Setup

Before the Orion test radio can be bench tested, it must have all the correct software installed (see the section on programming), and must be completely functional (refer to the Orion mobile radio maintenance manual).

1. Connect the 12 VDC power supply to the Orion test radio, using a 15A fast-blowing fuse. Connect to J1002 for the higher-frequency test radio or J1003 (pins 32 -37) for the lower-frequency test radio.
2. Connect a 50 ohm RF load to the Orion test radio.
3. Connect the protocol analyzer to J1003 on the Orion test radio (TXD to pin 2, RXD to pin 3, and GND to pin 7).

Test Procedure

Turn on the DC power supply and verify that the voltage is 13.2 +/- 0.6 Vdc. Turn on the Orion TU radio.

Power-Up: Have the protocol analyzer send a Reset message <AA FD 02> and verify that the TU responds with a Status Response message <AA 91 00 00 EE> indicating that it is now in the Power-Up state.

Set-Up: Have the protocol analyzer send a Status Request message <AA 07 F8> and verify that the TU responds with a Status Response message <AA 91 02 00 EC> indicating that it is now in the Set-Up state.

Monitor: Have the protocol analyzer send a CC Monitor message <AA 08 01 01 00 00 00 00 00 F7> and verify that the TU responds with a CC Fail message <AA 94 ff 01 pb> (where ff is 20 or 40 or 80 and pb is the Parity byte) indicating that it is now in the Monitor state.

Test Call: Testing the operation of the TU in the Test Call state is not possible with this test setup. However, after the Orion TU radio is installed in the Orion TU shelf and connected to the Site Controller computer, the protocol analyzer may be inserted between the Orion TU shelf and the Site Controller computer to see the Testcall State message <AA 10 --> coming to the TU, followed by the Call Results message <AA 92 -- -- --> leaving the TU. The presence of these messages indicates that it is in the Test Call state.

IN-SYSTEM TESTS

Each of these tests simulates an abnormal condition that the TU is designed to detect. Check to see that the TU operates as described for each test - not only after the simulated failure is introduced, but also after the simulated failure is removed.

To speed up these tests, temporarily set the Background Test Call Interval to 1 minute using the Site Reconfiguration screen (menu selection 22) of the System Manager. Note the present value so you can set the Background Test Call Interval back to this value when the tests are over.

Simulated Control Channel Failure

High-Speed Data: The following test simulates a high-speed data failure on the Control Channel by forcing the Control Channel GETC not to send high-speed data:

- Identify the Control Channel GETC by finding the one that has L6 and L7 (last two LEDs on right) lit continuously.
- Pull the GETC shelf out and remove jumper J60.
- Observe that the TU fails this channel, takes it out of service, and selects a new Control Channel (look at the Site Monitor screen (menu selection 32) of the System Manager).
- Replace jumper J60 and push the GETC shelf in.
- Observe that a test call is placed on the original Control Channel and it is returned to service (look at the Site Monitor screen (menu selection 32) of the System Manager).

Simulated Working Channel Failures

High-Speed Data: The following test simulates a high-speed data failure on the Working Channel by forcing a Working Channel GETC not to send high-speed data:

- Identify a Working Channel GETC by finding one that does not have L6 (LED 2nd from right) lit continuously.
- Pull the GETC shelf out and remove jumper J60.
- Observe that the TU fails this channel and takes it out of service (look at the Site Monitor screen (menu selection 32) of the System Manager).
- Replace jumper J60 and push the GETC shelf in.
- Observe that a test call is placed on this channel and it is returned to service (look at the Site Monitor screen (menu selection 32) of the System Manager).

Low-Speed Data: The following test simulates a low-speed data failure on a Working Channel by forcing the Working Channel GETC not to send low-speed data:

- Identify a Working Channel GETC by finding one that does not have L6 (LED 2nd from right) lit continuously.
- Pull the GETC shelf out and move jumper J17 from pins 1 & 2 to pins 2 &3.
- Observe that the TU fails this channel and takes it out of service (look at the Site Monitor screen (menu selection 32) of the System Manager).
- Move jumper J17 back to pins 1 &2 and push the GETC shelf in.
- Observe that a test call is placed on this channel and it is returned to service (look at the Site Monitor screen (menu selection 32) of the System Manager).

Channel Frequency: The following test simulates a Working Channel set to the wrong channel frequency:

- Identify a Working Channel GETC by finding one that does not have L6 (LED 2nd from right) lit continuously.
- Pull the GETC shelf out and record the positions of DIP switches S1-1 through S1-7 and S2-1 through S2-4. Then change the DIP switch settings to a combination not used by the system.
- Observe that the TU fails this channel and takes it out of service (look at the Site Monitor screen (menu selection 32) of the System Manager).
- Return the DIP switches to their original positions and push the GETC shelf in.
- Observe that a test call is placed on this channel and it is returned to service (look at the Site Monitor screen (menu selection 32) of the System Manager).
- Return the Background Test Call Interval to its former value.

GLOSSARY

ACU.....The Alarm and Control Unit is an EDACS Site Controller option that reports alarms from user-supplied alarm sensors, and controls relays that operate user-supplied devices.

Control Channel.....A Control Channel is any allowed radio channel (only one at a time) at an EDACS Trunked Site that is used for call requests and Working Channel assignments for trunked calls.

EDACS.....EDACS, short for Enhanced Digital Access Communications System, is a registered trademark of Ericsson Inc. It is used by Ericsson to describe specific communications systems and their specific equipment which meet or exceed the needs of the Public Service, Industrial, Commercial, and Utility markets world-wide.

EDACS Trunked Site .....An EDACS Trunked Site is a location having three or more EDACS Repeaters operating together under the direction of a Site Controller computer or the Control Channel GETC.

MRK.....MRK, a trade mark of Ericsson Inc., is the name of a line of mobile radios.

Orion.....Orion, a trade mark of Ericsson Inc., is the name of a line of mobile radios.

TU.....The Test Unit (TU) is an EDACS Site Controller option that provides a means of testing the radio channels for an EDACS Trunked Site by placing test calls on the Working Channels (under the direction of the Site Controller computer), and monitoring the outgoing messages on the Control Channel.

Working Channel.....A Working Channel is any radio channel at an EDACS Trunked Site that is available or in use to carry trunked calls.

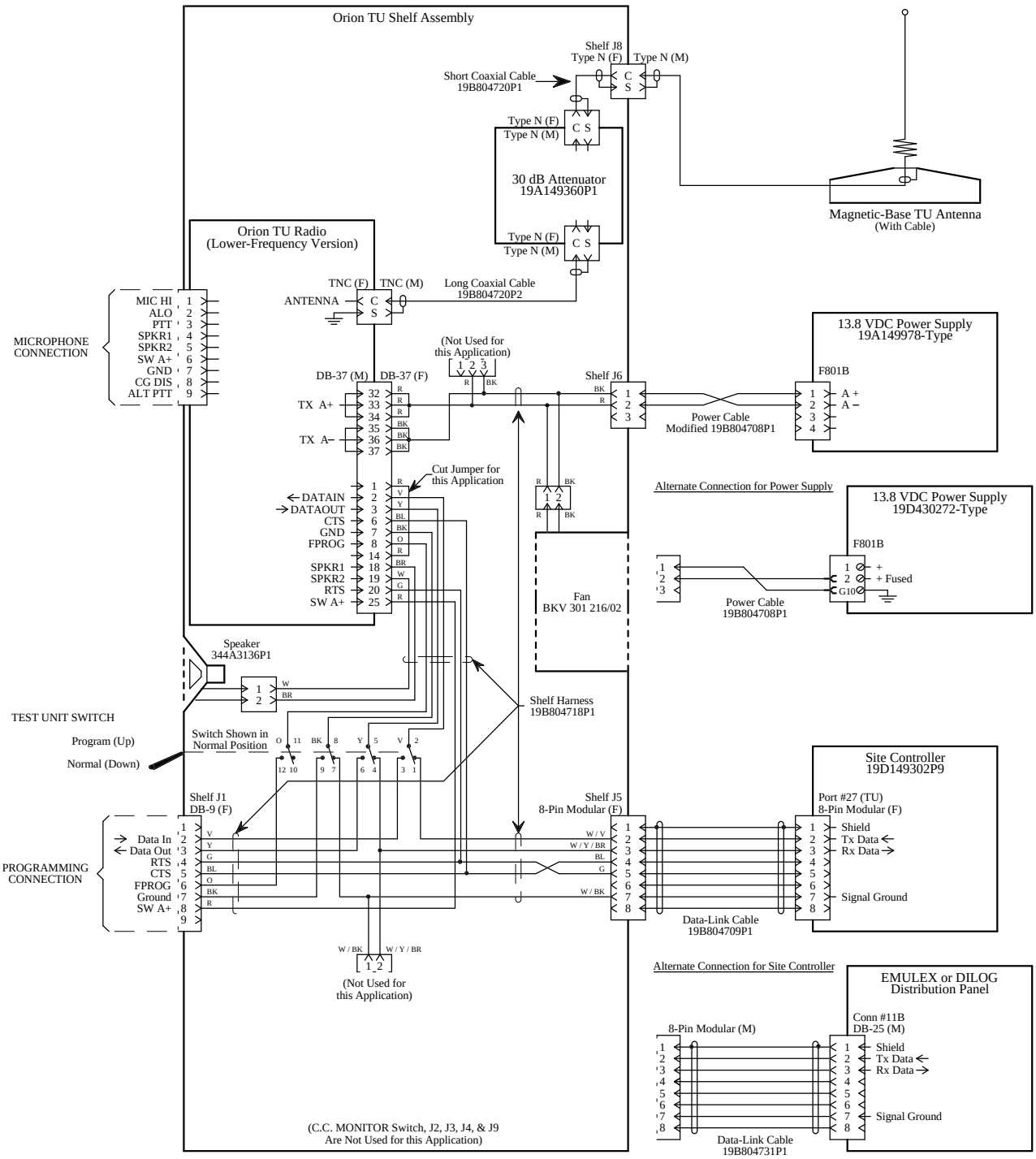
PARTS LIST

Parts for the Orion TU radio are listed in its own manual (see listing in introduction). Parts for the Orion TU (other than the radio) are listed here.

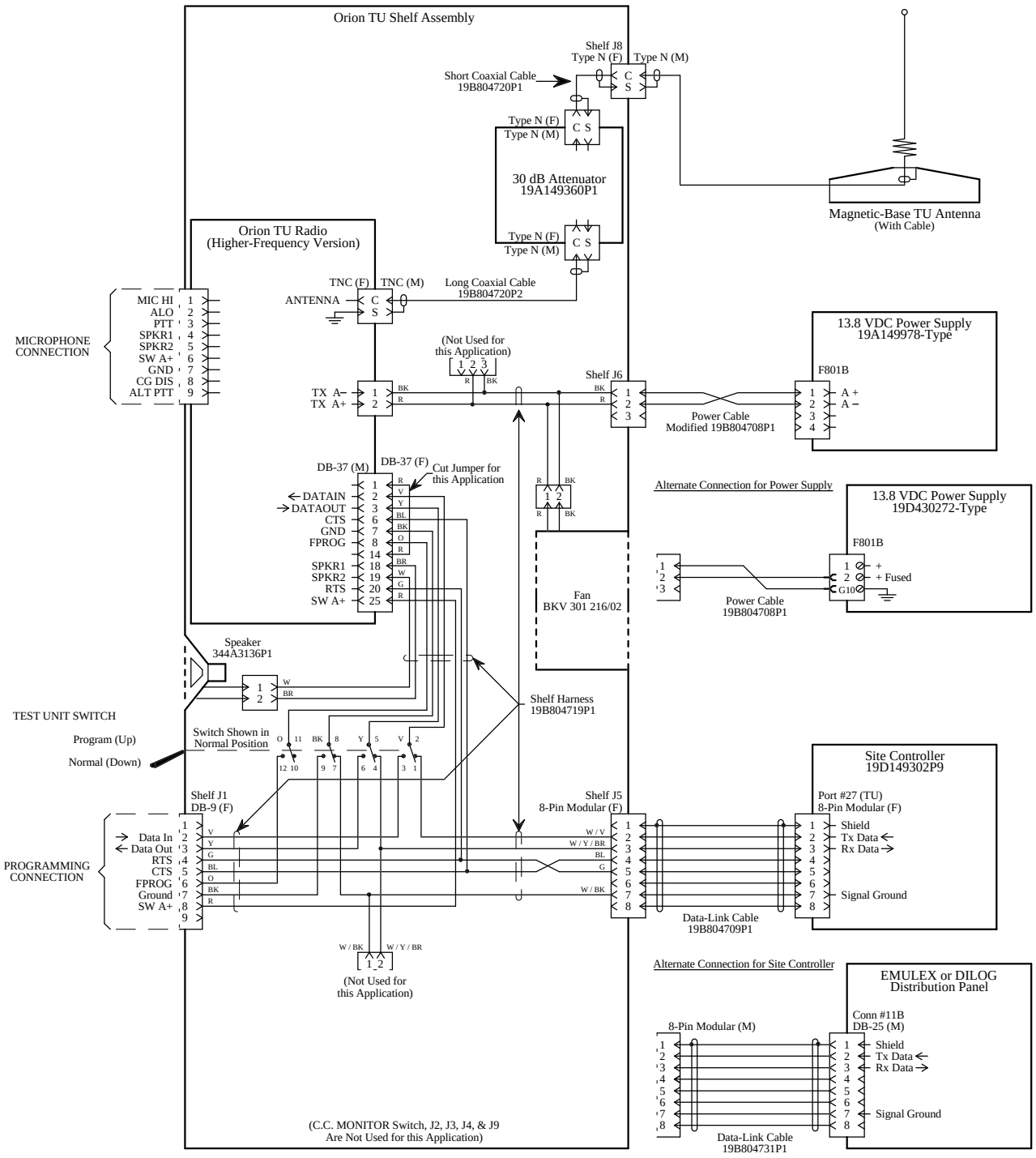
Orion Test Unit

PART NO.	DESCRIPTION
	ANTENNA
Request	TU Antenna, Magnetic-Base with Cable
	EXTERNAL CABLES
19B904708P1	Power Cable, Orion TU shelf to earlier DC power supply (modify for latest DC power supply)
19B804709P1	Data Cable, Orion TU shelf to latest Site Controller computer with modular connectors on back
19B804731P1	Data Cable, Orion TU shelf to earlier Site Controller computer through EMULEX or DIALOG panel
19B804722P1	Programming Cable, Orion TU shelf to Data Interface Module

PART NO.	DESCRIPTION
	BASIC ORION TU SHELF
193D1072P1	Basic Shelf (sheet metal parts with fan, slides for radio, & support brackets)
BKV 301 216/02	Fan, 12 VDC, w/o connector (part of basic shelf)
105 8567/1	Fan Guard (part of basic shelf)
344A4678P1	Hanger, Microphone (part of basic shelf)
	ADDITIONS TO BASIC ORION TU SHELF
Request	Orion TU Radio
344A4528P55	Microphone, Handheld (part of Orion TU Radio)
350A1694G1	Hardware Kit
344A3136P1	Speaker, 8 Ohms, 2 Watts (part of hardware kit)
19B804718P1	Harness, Orion TU Radio to Orion TU shelf (lower frequency version only)
19B804719P1	Harness, Orion TU Radio to Orion TU shelf (higher frequency version only)
19A149360P1	RF Attenuator, 50 Ohms, 20 Watts, 30 dB
19B804720P1	4” Coaxial Cable, attenuator to Orion TU shelf
19B804720P2	32” Coaxial Cable, Orion TU Radio to attenuator



Orion TU Interconnection Diagram
Lower-Frequency TU



Orion TU Interconnection Diagram
Higher-Frequency TU

INSTALLATION CHECKLIST

These steps parallel the main headings in the Installation section of this manual. This list is intended only as a review - to make sure you haven't skipped a step - not as a substitute for the Installation section. For details, see the heading that applies.

❑ Preparation (See Page 6)	❑ Read Instructions. ❑ Check Tools. ❑ Check Orion TU Material. ❑ Check Programming Material.
❑ Assemble New TU Shelf (See Page 6)	❑ Install Connector on Fan. ❑ Modify and Install Speaker. ❑ Install Harness. ❑ Install RF Attenuator. ❑ Install Coaxial Cables. ❑ Fasten Slides to TU Radio. ❑ Install TU Radio in Shelf. ❑ Connect Microphone.
❑ Remove Old TU Shelf (See Page 9) (skip if no old TU shelf is present)	❑ Turn Off DC Power Supply. ❑ Remove Old Data Link Cable. ❑ Remove Old TU Harness. ❑ Disconnect Old TU Antenna. ❑ Remove Old TU Shelf.
❑ Install New TU Shelf (See Page 10)	❑ Turn Off DC Power Supply. ❑ Install Shelf. ❑ Install Back Supports.
❑ Cable Connections (See Page 10)	❑ Install TU Antenna (if not already). ❑ Connect TU Antenna Cable. ❑ Install Power Cable. ❑ Install Data Link Cable. ❑ Turn On DC Power Supply. ❑ Power Up Orion TU.
❑ Programming (See Page 12)	❑ Load Programming Software into PC. ❑ Connect Programming Equipment. ❑ Switch TU to Program. ❑ Program TU Personality. ❑ Switch TU to Normal. ❑ Disconnect Programming Equipment.
❑ Site Database (See Page 18)	❑ Check Test Unit Enabled Parameter. ❑ Check Local Test Unit Parameter. ❑ Check Background Test Call Interval Parameter. ❑ Save TU Parameter Changes to Database. ❑ Transfer TU Parameter Changes to Site.

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