

Digitair[®] Model 6680

END-OF-TRAIN

REPEATER UNIT

Communication Interface Unit (CIU)-type Enclosure

Installation ■

Operation ■

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This manual provides information on the installation and operation of the DIGITAIR® Model 6680 End-of-Train Repeater Unit. Refer to Service Manual SM 7069 for detailed Shop Maintenance information.

1.1 General Overview And Functional Description

The primary purpose of the DIGITAIR® Repeater Unit is to relay End-of-Train (EOT) telemetry messages from the rear of the train to the front of the train and vice versa (i.e., from the EOT End Unit to the EOT Cab Unit, and vice versa). The Repeater is typically used in areas where radio signals are weak due to surrounding terrain conditions or where there exists RF “dead” spots such as in many train yards. As such, the Repeater should be installed in a strategic location where it will provide maximum radio coverage in the area in which it will be used.

The Repeater is housed in a single “Communication Interface Unit (CIU)”-type enclosure as depicted in Figure 1.1. The unit is powered from an external DC power source via a power cable that plugs into its front panel mounted Host Interface connector. Connection to a UHF ¼ wave antenna is accomplished via the Repeater’s front panel mounted “N”-type RF antenna connector.

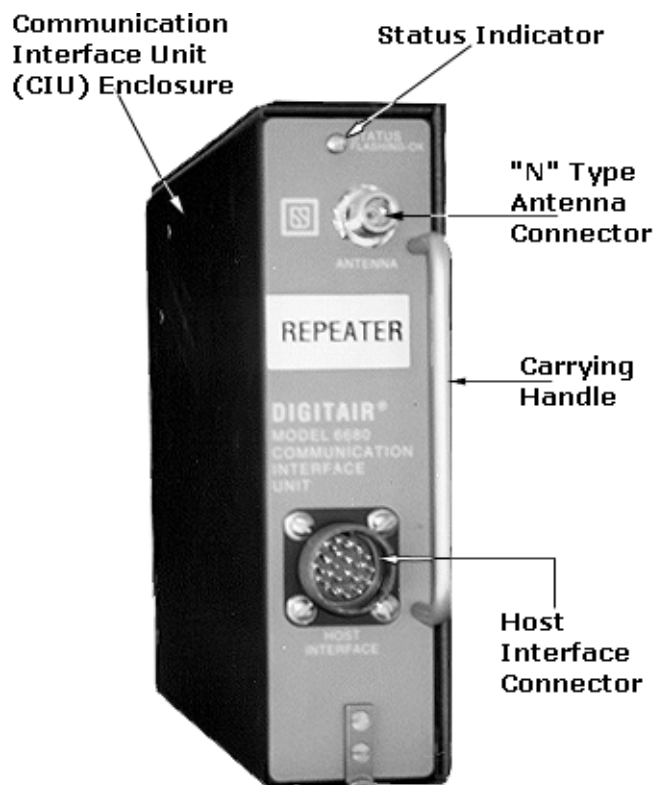


Figure 1.1 - Repeater Unit

1.1.1 Repeater Power-Up

The Repeater has no power switch; it is meant to be operational at all times. The unit is powered on when a DC power source is applied to its Host Interface connector. The unit then indicates that it is operational by continuously flashing its green STATUS indicator.

1.1.2 Repeater Functions and Capabilities

The Repeater hardware is designed using the latest in microcontroller technology, making it an “intelligent” device capable of performing several powerful functions in addition to its main function of relaying EOT messages. These are configurable via a serial connection from the Repeater to a standard PC and include the following:

- Built-in diagnostics;
- Selection of normal 2-Watts transmission or high-power 4-Watts transmission (as required);
- Ability to repeat only normal EOT messages or, by configuration, to repeat special messages types used for other applications;
- Can be programmed to NOT repeat (i.e., block out) up to 4 EOT ID Codes. This helps reduce radio traffic in yards where EOT beacons or test EOTs have been installed;
- Functions can be enabled to prevent multiple repeats of the same EOT message when two or more Repeaters are operating within telemetry range of each other. This is commonly referred to as “ping-pong” prevention.

These and other functions are described in Section 3.0 - Configuration and Diagnostics.

1.2 Repeater Message Protocol Compatibility

The Model 6680 Repeater is compatible with all EOT equipment employing existing protocols such as the American Association of Railroads (AAR) End-of-Train message protocol. It meets or exceeds the guidelines of the AAR, as well as the Federal Railroad Administration (FRA), the Federal Communications Commission (FCC) and Industry Canada (IC) regulations.

1.3 R.A.I.L. Team and Technical Support

The Rapid Action Information Link (R.A.I.L.) Team is comprised of experienced product and application engineers ready to assist and resolve any technical issues concerning DIGITAIR[®] End-of-Train equipment or any US&S product.

Any questions regarding the contents of this Service Manual should be directed to the R.A.I.L. Team via telephone at 1-800-652-7276 or via Internet e-mail at: railteam@switch.com.



1.4 Repeater Ordering Information

This section provides information on ordering the Model 6680 Repeater and related accessories. Please contact US&S Customer Service at 1-800-652-7276 or your US&S Sales Representative for technical information, pricing and additional sales information.

1.4.1 Repeater Unit and Power Cable

The Repeater is shipped together with a mating power cable per the following US&S part numbers:

1. Repeater Unit with power cable - P/N: N24300101
2. Power Cable Only - P/N: N24306001

1.4.2 Repeater Diagnostic and Configuration Software Disk

The Repeater does not rely on a dedicated external device for system diagnostics or configuration. All of the unit diagnostic tests and configuration functions are included on a Diagnostics Software Disk that runs on a standard DOS-compatible personal computer (PC) which plugs into the Repeater's internal DB-9 style Diagnostic Port.

The Diagnostic Software has been designed to permit easy customization of the Repeater's operation. Most of the variable default values and functions are user-selectable, set by the factory at purchase time, or set by railway technicians via a personal computer. The Diagnostic Software program on the disk is named "**diagunit.exe**" and its use is described in Section 3.0, Configuration and Diagnostics.

The Diagnostic Software Disk can be ordered under the following part numbers:

Description	Part Number
3.5" Diskette	N451232-1264
5.25" Diskette	N451232-1265

Table 1.1 - Diagnostic Software Disk

1.4.3 Repeater Executable Software Disk

The Repeater uses a FLASH-type programmable, non-volatile memory chip to store its application software. This eliminates the need to disassemble the unit and physically replace an EPROM (memory chip) in the event that software upgrades are issued.

The Repeater Executable Software disk allows the user to download software upgrades, when issued, into the Repeater's internal FLASH memory. This disk contains two files, (1) the latest upgrade version of the Repeater executable software, named "**repeat.hex**", and (2) the Cab Unit Flash Loader program, named "**load.exe**". The use of this disk is described in Appendix A.

The Repeater Executable Software disk is available on a 3.5" diskette under US&S Part Number N451232-1637.

1.5 Repeater Major Hardware Assemblies

Figure 1.2 shows the Repeater with its cover removed, exposing its major hardware assemblies and the location of the Diagnostic Connector:

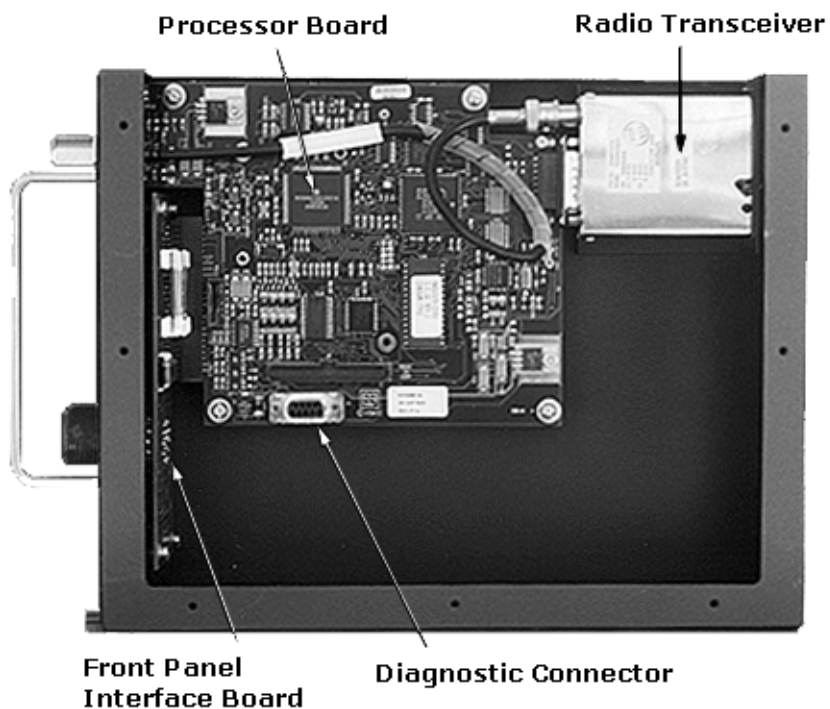


Figure 1.2 - Repeater Hardware Assemblies


1.6 Repeater Specifications

Parameter	Specification
Physical:	
Overall Dimensions	H = 9.25", W = 2.50", D = 11.60"
Weight	4 lbs.
Environmental:	
Operating Temperature Range	-30°C to +50°C
Storage Temperature Range	-55°C to 100°C
Humidity	95% non-condensing at 40°C, 96-hour exposure
Power Requirements:	
DC Power	12 VDC to 15 VDC @ 2A
Radio Transceiver:	
Radio Frequencies:	
Front-to-Rear Messages	452.9375 Mhz
Rear-to-Front Messages	457.9375 Mhz
	(Other frequencies available at customer request)
Transmit Power	2-Watts (standard) or 4-Watts (requires 15 VDC)
Transmit Frequency Stability	5 PPM
Emission	16K0F2D
Deviation (at 1200 Hz)	3.3 KHz
Receive Sensitivity (-12 dB SINAD)	0.45 uV (max)
Receive Frequency Stability	10 PPM (max)
Selectivity	60 dB (min)
Intermodulation Immunity	60 dB (min)
Spurious Rejection	55 dB (min)
Image Rejection	50 dB (min)
PC Diagnostic Interface:	
Asynchronous Serial Data Rate	9600 Baud, 1 Stop Bit, 8 Data Bits
Voltage Level	EIA RS-232C

Table 1.2 - Repeater Specifications

This section describes the installation of the Repeater and how to connect power and a UHF antenna to the unit. Configuration and verification of proper operation after power-up are also discussed.

2.1 Items Required for Installation and Configuration

Items required to install the Repeater include the following:

- Repeater Unit (CIU-type enclosure)
- Power Cable (either supplied with the Repeater or available separately)
- Diagnostic Software Disk

Items to be supplied by user include:

- Power Supply (12 VDC nominal for 2-Watt operation, 15-VDC nominal for 4-Watt operation)
- ¼ Wave UHF Antenna terminated with an N-type RF connector
- Grounding and Lightning protection (as required)
- Mounting hardware (as appropriate for the particular installation location)
- PC serial communications cable, DB-9 type, straight-through, male-to-female connectors.

2.2 Model 6680 Repeater Unit Packaging Issues

The Model 6680 Repeater Enclosure was designed to operate as an Head-of-Train Device (HOTD) Communication Interface Unit (CIU) and, as such, is packaged in an LSI-compliant HOTD CIU enclosure. For background purposes, the HOTD CIU operates as an EOT Front End Unit and is meant to be rack-mounted in a locomotive that is equipped with an Integrated Cab. As such, the package does not incorporate mounting tabs.

2.3 Repeater Unit Installation

The Repeater must be installed indoors or in a wayside hut or bungalow, where it will be protected from wet weather conditions. Securely mount the Repeater in an available location, such as an empty equipment rack shelf, using appropriate mounting hardware dependent on the location chosen. It is recommended that the Repeater be installed so that its cover can be removed for easy access to the internal Diagnostic Connector and for adjustments.

2.4 Power Supply Installation and Connections

The power supply, which is furnished by the user, should be installed using the same care and techniques as those described for the Repeater. The power cable, which is provided, is approximately 6 feet in length.

The power cable is supplied with a connector pre-mounted on one end, the other end is unterminated. Plug the power cable connector into the Repeater's host interface connector. Only two pins on the host interface connector are used. Pin assignments and lead color codes are as shown in Table 2.0.

CAUTION

Non-standard cables, or those supplied by the railroad, may employ different color codes than those used by US&S. Refer to the connector pin assignments in this manual or consult US&S Customer Service at 1-800-652-7276 for further technical assistance, if required.

Cut the unterminated end of the cable to the desired length. Strip and install whatever spade lug, tab, or other contact is required for the power supply.

Pin	Conductor	Power Cable Connector (MS3106A-20-29S)
D	Red	Power Supply Positive (+ 12 VDC or +15 VDC)
J	Black	Power Supply Ground

Note: Other Pins Not Used for Repeater Application

Table 2.0 - Repeater Power Connections

2.4.1 Repeater Transmit Power Level and Related Power Supply Requirements

The Repeater can be configured to operate at a standard 2-Watt transmit power level or at an increased high power transmit level of 4-Watts (refer to Section 3.0 for configuration information). The power supply requirements for the two levels are as follows:

Transmit Power Level	Power Supply Requirements
2-Watts	+12 VDC @ 2 Amps
4-Watts	+15 VDC @ 2 Amps

Table 2.1 - Repeater Transmit Power Levels

NOTE

Special FCC Licensing may be required if 2 watts Effective Radiated Power (ERP) is exceeded. Consult FCC Part 90 Rules and Regulations.

2.5 Antenna Installation

The antenna should be a ¼-wave UHF-type unit with the required cable length terminated in an N-style RF connector. Connection to the Repeater simply involves plugging the “N” connector into the Repeater’s front panel mounted antenna connector. The user must provide adequate grounding and proper lightning protection for the Repeater.



2.6 Repeater Power-Up and Operational Verification

With the Repeater fully installed, apply power to the unit. Observe that the green STATUS indicator on the Repeater's front panel begins to flash and continues to flash indefinitely. This indicates that the Repeater software is running and that the processor board is operational.

The Repeater is now ready for use.

As an additional measure, if available, use an RF Communication Monitor to verify that the Repeater is transmitting front-to-rear and rear-to-front EOT messages at the frequencies stated in Section 1.6 - Repeater Specifications.

2.6.1 Repeater Configuration

If required, the user can configure the Repeater at this time. To configure the Repeater, remove its cover and follow the instructions provided in Section 3.0 - Configuration and Diagnostics.

2.6.2 Basic Troubleshooting and Fuse Replacement

If the Repeater does not operate as described above, check the following:

1. Unplug the power cable connector from the Repeater. Confirm proper pin assignments according to Section 2.4 and verify that correct DC voltage appears on the pins as listed in Table 2.0.
2. Remove the Repeater's cover and check the fuses. Replace the fuse(s) as required per Table 2.2.

Fuse Designation	Function of Fuse	Fuse Rating
F1	Radio Module	2-Amp, 250 Volt (2-Watt Operation)
		3-Amp, 250 Volt (4-Watt Operation)
F2	Electronics	2-Amp, 250 Volt

Table 2.2 - Fuse Functions and Ratings

If the unit still does not operate properly, it will require more detailed troubleshooting per Service Manual SM 7069 - Shop Maintenance, or must be sent out for repair.

The Repeater incorporates a diagnostic port, which is used to access the built-in configuration and diagnostic functions. This port is comprised of a DB-9 type RS-232/C serial connector and is located on the processor board (J6) inside the Repeater's enclosure. The port connects to a DOS-compatible PC via a standard straight-through, 9-pin male-to-female serial computer cable. The female connector type will be determined by the port on your PC. Straight-through male-to-female cables are commercially available.

3.1 Digitair[®] Diagnostic Software

Digitair[®] Diagnostic Software running on a PC provides a full set of menu-driven configuration and diagnostic functions. The diagnostic software is a single program named "**diagunit.exe**" supplied on a floppy disk. The software can be ordered under US&S part number N451232-1264 (3.5" disk) or N451232-1265 (5.25" disk).

NOTE

This manual provides some examples of the diagnostic functions and provides detailed information on Repeater configuration. Refer to Service Manual SM 7069 (Shop Maintenance) for detailed diagnostic information and procedures.

3.2 Running the Diagnostic Software

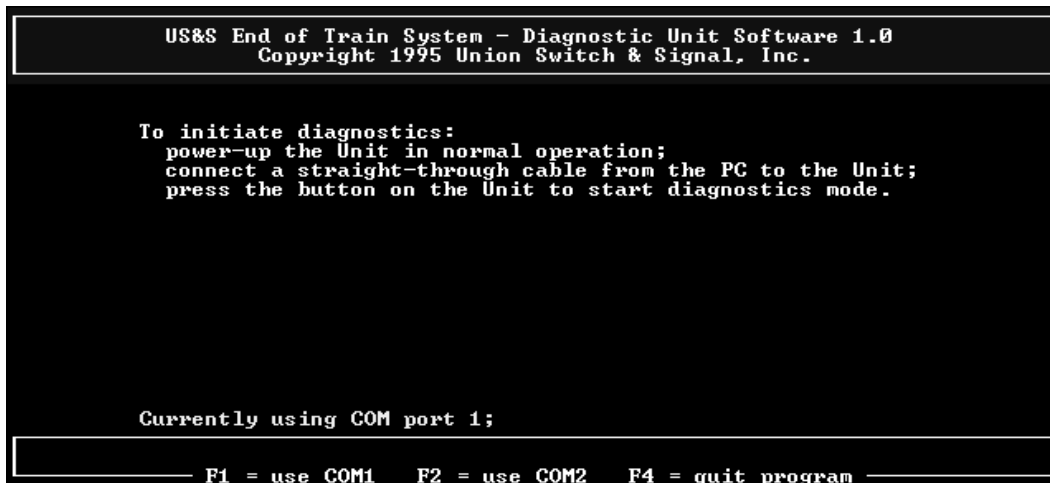
To run the diagnostic software, perform the following:

1. To gain access to the diagnostic port, remove the Repeater's cover.

CAUTION

The Repeater contains static-sensitive components. Always observe proper ESD handling procedures; otherwise, equipment damage may result.

2. With the diagnostic PC powered-on, execute the diagnostic software from the floppy disk (or from the PC's hard disk if it has been copied there) by typing "**diagunit**" followed by <Enter>.
3. The following Diagnostic Start-Up Screen will appear as shown. The program name and version appear at the top of the screen. The box at the bottom of the screen displays any prompts for user input. The last line shows applicable PC function keys.

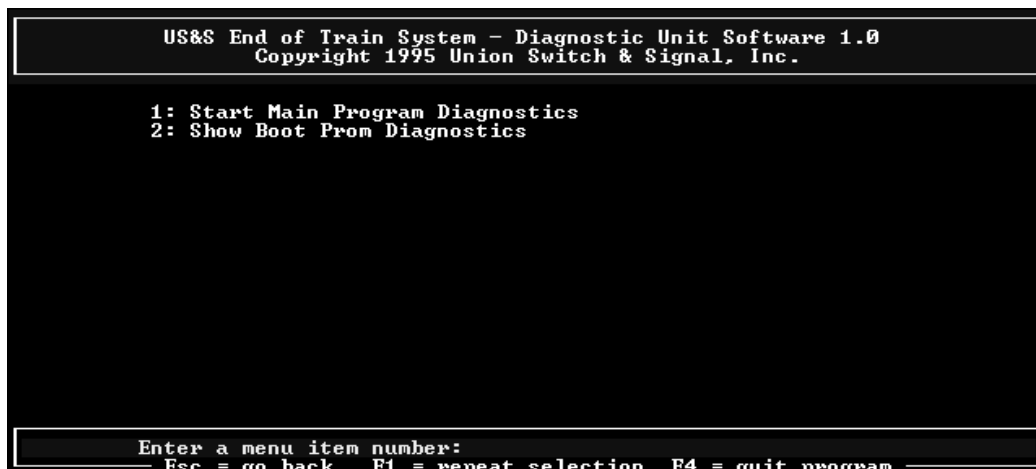


4. Connect the serial computer cable between the diagnostic PC and the Repeater's Diagnostic Port connector.

NOTE

The Repeater's Diagnostic Port is permanently set for 9600 baud, 8-data bits, 1-stop bit and no parity. The Diagnostic Software sets the PC's serial port to these same values; therefore, no configuration should be required.

5. The Diagnostic Software defaults to PC serial port COM1. If use of COM2 is required, press <F2> to use COM2. Press <F1> to return to COM1.
6. Note that the Repeater has no switches or buttons. To proceed, power-up the Repeater.
7. The diagnostic PC will then display the Initial Diagnostic screen as follows:



8. To quit the program at any time, press <F4>. The program will prompt with "Really quit? [Y, N]:". If "Y" is selected, the program will terminate. If "N" is selected, the program will continue.

9. To access the primary diagnostic/configuration screen, type “1” (Start Main Program Diagnostics) and press <Enter>. The following screen will appear.

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Start Main Program Diagnostics:
Proceeding to run program in flash.
Press 'Esc' to get to the new main menu.

Esc = go back  F1 = repeat  F4 = quit program
```

Press <Esc> to proceed to the Main Menu. Also observe that the Repeater’s green “STATUS” light begins to flash, indicating that the main application program is now running.

3.3 Main Menu

To select one of the submenus associated with **Diagnostic Items** or **Configuration Items**, type the desired menu item and press <Enter>.

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

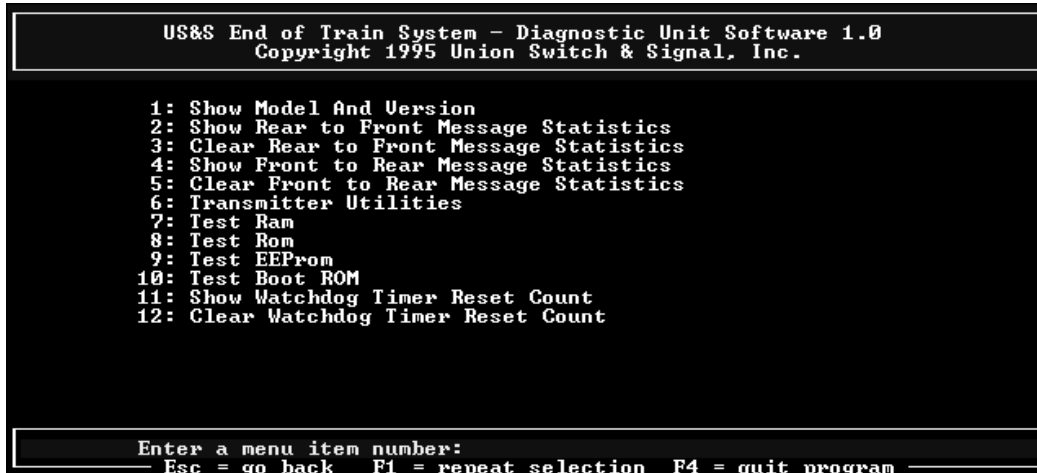
1: Diagnostic Items
2: Configuration Items

Enter a menu item number:
Esc = go back  F1 = repeat selection  F4 = quit program
```



3.4 Diagnostic Items

This Diagnostic Items Menu displays selections that may show information about, or perform a diagnostic test on, specific elements of the Repeater.



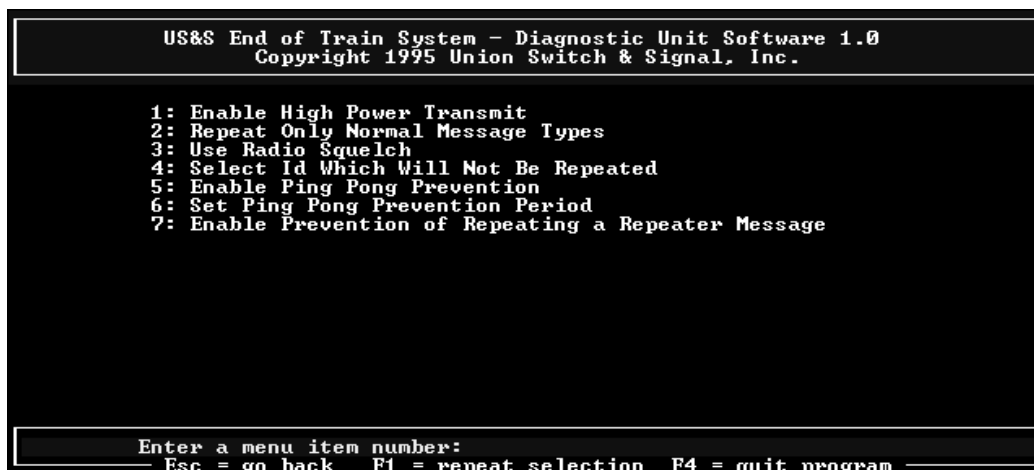
Select a diagnostic test from this menu by typing in a menu item number followed by <Enter>. To return to the Main Menu, press <Esc>.

NOTE

The use of the Diagnostic Items is beyond the scope of this manual. Each Diagnostic Item is described in detail in the Repeater Shop Maintenance Manual, SM 7069.

3.5 Configuration Items Menu

The Configuration Items Menu displays selections that allow Repeater functions to be enabled or disabled and also allows customization of certain functions. This section describes the purpose and use of each menu item as shown below in the Main Configuration Menu:



To select an item from this menu, type in a menu item number and press <Enter>. To return to the Main Menu, press <Esc>.



3.5.1 Enable High Power Transmit

The Repeater normally transmits repeated EOT messages at 2-Watts RF power; however, it has the capability to transmit at a 4-Watt power level if required by the railroad. To select the transmit power level, type in “1” (Enable High Power Transmit) and press <Enter>. The following screen shows the currently selected setting:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Enable High Power Transmit:
Current value is OFF <0>

Possible values are:
0: OFF
1: ON

Enter a new value:
Esc = go back    F4 = quit program
```

The factory default setting is typically “0” for the 2-Watt power level.

To enable high power transmit at 4-Watts, type in the menu item number and press <Enter>. To return to the Main Configuration Menu, press <Esc>.

NOTE (4-Watt Operation)

Operation at 4-Watts requires that the Repeater be powered from a 15 VDC source. It may also require that the user apply for special licensing with the FCC to operate in excess of 2-watts Effective Radiated Power.



3.5.2 Repeat Only Normal Message Types

The Repeater is typically used to relay standard AAR-type EOT messages. The Repeater also can be used to repeat non-AAR defined messages, such as those transmitted by US&S' Wayside Communication Unit (WCU). To select the type of message to be repeated, type in "2" (Repeat Only Normal Message Type) and press <Enter>. The following screen shows the currently selected setting:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Repeat Only Normal Message Types:
Current value is TRUE <1>

Possible values are:
0: FALSE
1: TRUE

Enter a new value:
Esc = go back  F4 = quit program
```

To change the operational mode, type in the menu item number and press <Enter>. To return to the Main Configuration Menu, press <Esc>.

3.5.3 Use Radio Squelch

The Repeater can use its transceiver squelch level in conjunction with the Carrier Detect signal to detect the presence of an EOT message. It also can operate without squelch by "hunting" for the message sync bits that precede every message. Operating the Repeater without squelch improves reception of weak radio signals when operating the unit in extreme cold temperatures.

To enable or disable the use of radio squelch, type in "3" (Use Radio Squelch) and press <Enter>. The following screen shows the currently selected setting:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Use Radio Squelch:
Current value is TRUE <1>

Possible values are:
0: FALSE
1: TRUE

Enter a new value:
Esc = go back  F4 = quit program
```

To change the operational mode, type in the desired menu item number and press <Enter>. To return to the Main Configuration Menu, press <Esc>.



3.5.4 Select ID That Will Not Be Repeated

The Repeater can be programmed with up to four EOT ID Codes that will not be repeated (i.e., blocked out). This helps reduce yard radio traffic by allowing the user to block out Test EOTs, beacons or similar equipment often used in yards. It is desirable not to re-broadcast messages transmitted by these devices via the Repeater.

To select the ID Code of the message not to be repeated, type in “4” (**Select ID Which Will Not Be Repeated**) and press <Enter>. The following screen shows the options to either select and/or clear each of the four ID Codes.

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

1: Select First ID Which Will Not Be Repeated
2: Clear First ID Selection
3: Select Second ID Which Will Not Be Repeated
4: Clear Second ID Selection
5: Select Third ID Which Will Not Be Repeated
6: Clear Third ID Selection
7: Select Fourth ID Which Will Not Be Repeated
8: Clear Fourth ID Selection

Enter a menu item number:
Esc = go back  F1 = repeat selection  F4 = quit program
```

To enter an ID Code or clear out a code that has already been stored, type in the corresponding menu item number and press <Enter>. Clearing a code sets it to “00000” (note this is also the default factory setting for all four ID Codes).

Note that the valid range of ID Codes is “00000” through “99999”.

The screen below shows an example of ID Code “05000” entered for the first ID Code NOT to be repeated.

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Select First ID Which Will Not Be Repeated:
Current value is 05000

Enter a new value:
Esc = go back  F4 = quit program
```

Press <Esc> to return to the Select ID screen. Press <Esc> a second time to return to the Main Configuration Menu.



3.5.5 Enable Ping-Pong Prevention

When two or more EOT repeaters are within telemetry range, the possibility exists for multiple repeats of the message back and forth from one repeater to another. This is referred to as “Ping-Ponging” and can jam up the EOT radio frequencies, thereby interfering with the Arming process or with Communications Link Tests. To enable or disable the use of Ping-Pong Prevention, type in “5” (Enable Ping-Pong Prevention) and press <Enter>. The following screen shows the currently selected setting:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Enable Ping Pong Prevention:
Current value is TRUE (1)

Possible values are:
0: FALSE
1: TRUE

Enter a new value:
Esc = go back    F4 = quit program
```

The factory default setting is “True” (enabled) and is the recommended setting. To change the operational mode, type in the desired menu item number and press <Enter>. To return to the Main Configuration Menu, press <Esc>.

3.5.6 Set Ping-Pong Prevention Period

The Repeater accomplishes Ping-Pong Prevention by looking at each message received and discarding identical messages. The Ping-Pong Prevention Period is the duration of time that the Repeater will discard identical messages. To set the Ping-Pong Prevention Period, type in “6” (Set Ping-Pong Prevention Period) and press <Enter>. The following screen shows the current value in seconds:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Set Ping Pong Prevention Period:
Current value is 3 seconds

Enter a new value:
Esc = go back    F4 = quit program
```

The factory default value is 3 seconds. To change the prevention period, type in the desired value and press <Enter>. To return to the Main Configuration Menu, press <Esc>.

3.5.7 Enable Prevention of Repeating a Repeater Message

US&S Repeaters append a special “repeater signature” to each message relayed. As such, US&S Repeaters can identify a message repeated by another US&S Repeater. This function, when enabled, prevents “Ping-Ponging” between US&S Repeaters. To enable this function, type in “7” (Enable Prevention of Repeating a Repeater Message) and press <Enter>. The following screen shows the current setting:

```
US&S End of Train System - Diagnostic Unit Software 1.0
Copyright 1995 Union Switch & Signal, Inc.

Enable Prevention of Repeating a Repeater Message:
Current value is TRUE (1)

Possible values are:
0: FALSE
1: TRUE

Enter a new value:
Esc = go back  F4 = quit program
```

The factory default setting is “**True**” (enabled) and is the recommended setting. To change the operational mode, type in the desired menu item number and press <Enter>. To return to the Main Configuration Menu, press <Esc>.

A.1 Repeater Software Upgrades

The Repeater uses a FLASH-type programmable non-volatile memory chip as opposed to an EPROM chip to store its application software. This eliminates the need to disassemble the unit and physically replace the EPROM in the event that software upgrades are issued.

Software upgrades are supplied by US&S on a Repeater Executable Software Disk containing two files: (1) the latest upgrade version of the Repeater executable software named “**repeat.hex**” and (2) the Flash Loader program named “**load.exe**”. This is a 3.5” disk and is available under US&S Part Number N451232-1637.

Software upgrades are downloaded into the Repeater’s Flash memory from a PC connected to the unit’s internal DIAG connector via the same 9-pin “D” type serial cable used for performing diagnostics. The download function is performed by running the Flash Loader Software as detailed in the following sections.

A.2 Flash Loader Program

The Flash Loader program is named “**load.exe**” and runs on a DOS-compatible PC.

Although this program may be run from the floppy disk drive, it is preferable to copy it to a directory on the PC’s hard drive. The new upgrade version of “**repeat.hex**” must reside on the same floppy disk or hard drive directory containing “**load.exe**”.

A.3 Using “load.exe”

At the PC DOS prompt, the command syntax for “**load.exe**” can be viewed by typing in **load** followed by <Enter>. The PC will display the command structure as follows:

Cab Unit Flash Loader (Rev 1) Thu Jul 18 16:11:41 EDT 1996
Usage:
load -<serial port> <filename> [-r]
where
-<serial port> is -COM1 or -COM2
<filename> is the executable to be loaded in Motorola Exormax format.
-r means run the program after loading (optional)
Use a straight-through cable from the PC to the Unit.

Therefore, the typical command line, depending on the PC serial port being used, will be:

load -COM1 repeat.hex -r <Enter> if PC serial port 1 is being used;
or
load -COM2 repeat.hex -r <Enter> if PC serial port 2 is being used.



APPENDIX A

A.4 Procedure for Downloading Repeater Software Upgrades

To download Repeater software upgrades, perform the following:

1. On the PC, copy the new Upgrade Version of the file “**repeat.hex**” to the floppy disk or hard drive directory containing the Flash Loader Software “**load.exe**”.
2. Turn OFF power to the Repeater.
3. Remove the Repeater’s cover and connect one end of the serial cable to the Repeater’s DIAG (DB-9) connector and the other end to the PC’s serial port (either COM1 or COM2).
4. Turn ON power to the Repeater.
5. On the PC, type the load command for the Flash Loader as follows:

load -COM1 repeat.hex -r <Enter> if PC serial port 1 is being used.

or

load -COM2 repeat.hex -r <Enter> if PC serial port 2 is being used.

The PC will display the progress of the download process as follows:

Cab Unit Flash Loader (Rev 1) Thu Jul 18 16:11:41 EDT 1996

Press a key at any time to quit this program.

Initiating target diagnostics:

Cab Unit Boot Prom (REV 1) Thu Jul 18 9:37:47 EDT 1996

ROM test PASSED

RAM test PASSED

Erasing flash ... done.

Writing to flash ... #### records downloaded.

6. Upon completion of the download, the Repeater will begin running the new upgrade software in the normal fashion just as it does on standard power-up. The green STATUS indicator mounted on the Repeater’s front panel should be flashing, indicating that the new upgrade program is operating correctly.
7. Unplug the serial cable from the Repeater and reinstall its cover. The Repeater is now ready for operation.

