



USER'S GUIDE

VHF COMMUNICATOR, A80276 (PART OF SEAR II ACCESSORY GROUP)

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The equipment covered in this manual has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

DOCUMENT HISTORY

Version	Release Date	Details of Change(s)
A	August 2003	Initial Release
B	August 2005	<ul style="list-style-type: none"> • Page 1, inserted new second paragraph concerning frequency sets and a related note. • Added frequency label to figures 1 (page 2) and 2 (page 3). • Page 2, deleted “eventual” from 2nd sentence of 2nd paragraph. • Page 4, added Warning in 3.4 regarding location of VHF comm. antenna. • Page 6, inserted note about installing ferrite beads on power & Echelon cables, modified command paths in 4.2 • Page 7, removed frequencies from table 2. • Page 8, modified <i>frequency programming</i> paragraph to discuss freq. label and programming. Modified 4.4 by changing “destination” to “hop” in items 1, 2, and 3. • Page 10, modified low temperature range to -22 °F (-30 °C) from -40 °F (-40 °C) and high temp range to +158 °F (+70 °C) from +160 °F (+71 °C). • Added Appendix A on installing ferrite beads.
C	March 2008	<ul style="list-style-type: none"> • Page 4, Para 3.2, Add User Serial Port information. • Page 10, Para 5.4.1, Add General specifications for transceiver. • Page 10, Para 5.4.2, Add Transmitter specifications for transceiver. • Page 11, Para 5.4.3, Add Receiver specifications for transceiver. • Page 11, Para 5.5, Changed max temperature specification from +70° to +65° C. • Pages 12–29, Section 7, Add section on User Serial Port Programming functions.
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		<ul style="list-style-type: none"> • Page 9, Table 3-1, Add Argus information. • Page 11, Para 4.1, Add Argus information. • Page 12, Add Table 4-2. • Page 13, Para 4.1.2., add Master Device. • Page 14, Para 4.1.3, Add Master Device, Para 4.1.5, Add Argus installation information. • Page 25 – 43 Update all screens. • Page 25, Add Table 7-1. • Page 26, Add Table 7-2. • Page 28, Add Table 7-3 • Page 30, Add Table 7-4.
D.1	June 2014	Rebrand for Siemens

NOTES, CAUTIONS, AND WARNINGS

Throughout this manual, notes, cautions, and warnings are frequently used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

WARNING

WARNING

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. WARNINGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

CAUTION

CAUTION

REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN A POTENTIALLY HAZARDOUS SITUATION AND/OR POSSIBLE DAMAGE TO EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

NOTE

NOTE

Generally used to highlight certain information relating to the topic under discussion.

If there are any questions, contact Siemens Industry Inc., Rail Automation Application Engineering.

ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

Static electricity can damage electronic circuitry, particularly low voltage components such as the integrated circuits commonly used throughout the electronics industry. Therefore, procedures have been adopted industry-wide which make it possible to avoid the sometimes invisible damage caused by electrostatic discharge (ESD) during the handling, shipping, and storage of electronic modules and components. Siemens Industry, Inc., Rail Automation has instituted these practices at its manufacturing facility and encourages its customers to adopt them as well to lessen the likelihood of equipment damage in the field due to ESD. Some of the basic protective practices include the following:

- Ground yourself before touching card cages, assemblies, modules, or components.
- Remove power from card cages and assemblies before removing or installing modules.
- Remove circuit boards (modules) from card cages by the ejector lever only. If an ejector lever is not provided, grasp the edge of the circuit board but avoid touching circuit traces or components.
- Handle circuit boards by the edges only.
- Never physically touch circuit board or connector contact fingers or allow these fingers to come in contact with an insulator (e.g., plastic, rubber, etc.).
- When not in use, place circuit boards in approved static-shielding bags, contact fingers first. Remove circuit boards from static-shielding bags by grasping the ejector lever or the edge of the board only. Each bag should include a caution label on the outside indicating static-sensitive contents.
- Cover workbench surfaces used for repair of electronic equipment with static dissipative workbench matting.
- Use integrated circuit extractor/insertor tools designed to remove and install electrostatic-sensitive integrated circuit devices such as PROM's (OK Industries, Inc., Model EX-2 Extractor and Model MOS-40 Insertor (or equivalent) are highly recommended).
- Utilize only anti-static cushioning material in equipment shipping and storage containers.

For information concerning ESD material applications, please contact the Technical Support Staff at 1-800-793-7233. ESD Awareness Classes and additional ESD product information are also available through the Technical Support Staff.

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1.0 VHF COMMUNICATOR – INTRODUCTION

1.1 GENERAL

The VHF Communicator (A80276) adds VHF voice-band communications capabilities to the SEAR II Event Recorder and the Argus Event Recorder. The unit has a built-in 6-Watt VHF radio transceiver operating in the 148 – 174 MHz range, and it communicates with the SEAR II or the Argus over the Echelon network.

Several configurations of the VHF Communicator are available with different sets of preprogrammed frequencies assigned to the eight available channels. The assigned frequencies are identified on a label affixed to the front panel.

NOTE

NOTE

Because new frequency sets are being added all the time, no attempt has been made to list the available frequency sets in this manual. Please contact Siemens Industry, Inc., Rail Automation Customer Service at 800-793-7233 for currently available frequency sets.

The VHF Communicator can send and receive data in the Bell 202 standard using FSK modulation at 1200 baud. Other FSK modulation schemes are supported. It can also send and receive DTMF tones. Additionally, the VHF Communicator can enunciate voice messages over the radio, based on a user-defined vocabulary file (digitized speech) stored in non-volatile memory.

The VHF Communicator expands the suite of communications devices that can be used in the SEAR II and Argus event recording systems. When paired with VHF Communicators, a SEAR II Event Recorder at a grade-crossing location can communicate with other SEAR II units in adjacent locations using a railroad's existing VHF frequency channels. This provides an affordable way for several recorders in the field to communicate with a central office, transferring alarms, event reports and configuration data, without the need for each SEAR II to have a direct link with the office. Data can be propagated from site to site using VHF Communicator links until it reaches a location where a central office communications link is present (for example a modem, ATCS radio, or other gateway device).

The Argus can use the VHF Communicator to send alarm notifications to the central office using an existing VHF voice communications network (see the Data Over Voice System manual Document No. COM-00-07-10).

The DTMF and speech enunciation capabilities of the VHF Communicator allow the SEAR II to be used in expanded applications such as remote crossing warning system start and automation of maintainer assisted tests, which are simplified by the use of DTMF action codes and voice-prompt feedback.



WARNING

THE VHF COMMUNICATOR IS A NON-VITAL SYSTEM AND SHOULD NOT BE USED FOR VITAL APPLICATIONS.

See Figure 1-1 for VHF Communicator and SEAR II interconnections.

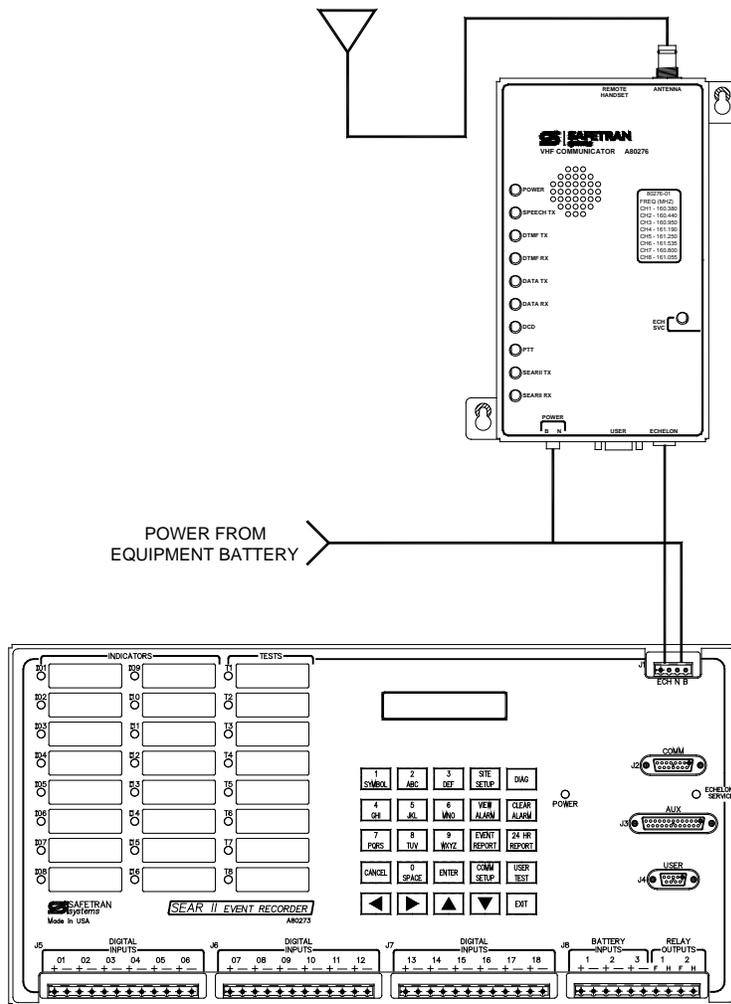


Figure 1-1 VHF Communicator and SEAR II Interconnections

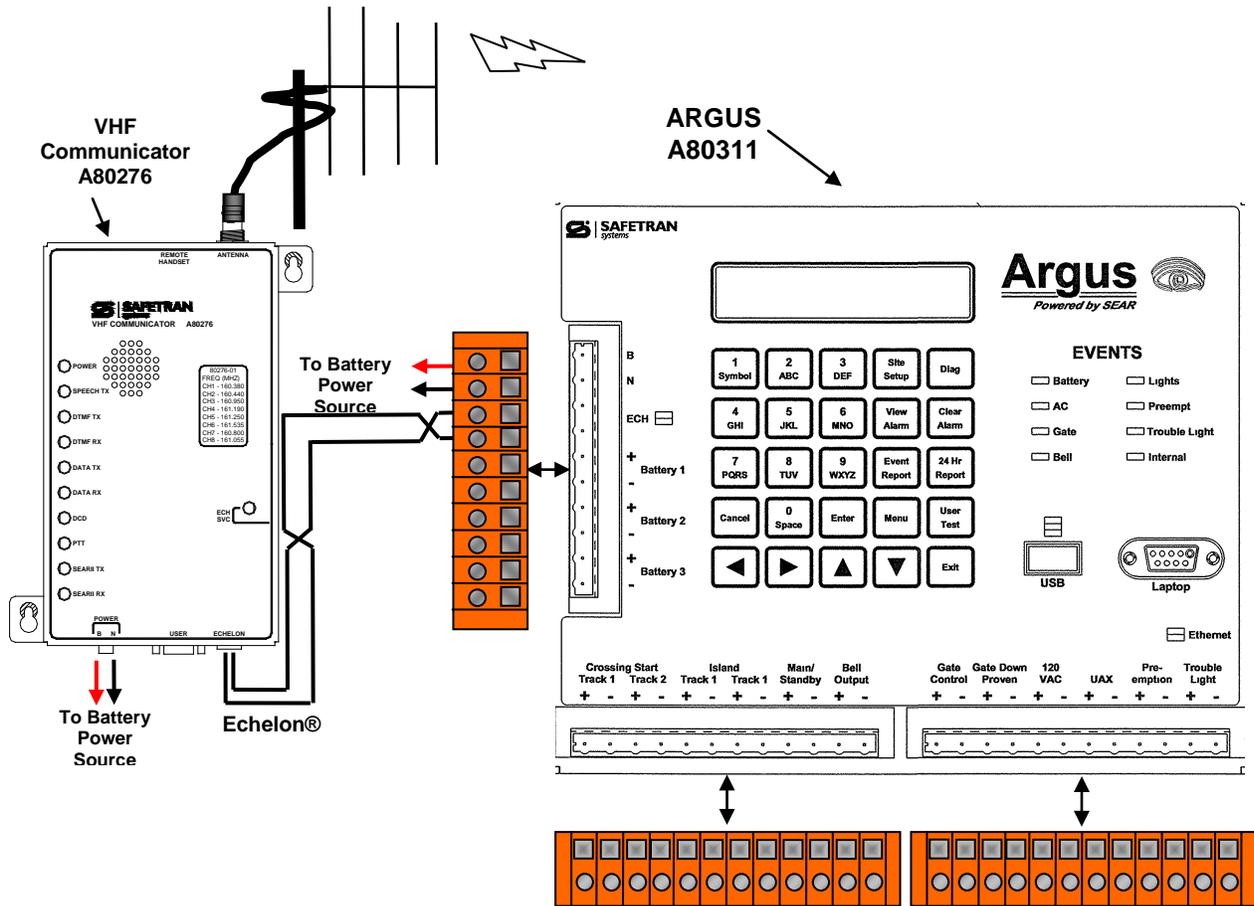


Figure 1-2 VHF Communicator and Argus Interconnections

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2.0 SYSTEM OVERVIEW

In normal operation the VHF Communicator is controlled by the SEAR II or Argus via the Echelon network. The SEAR II or Argus sends data and DTMF digit sequences, to be transmitted over the radio, to the VHF Communicator, which in turn controls all radio related functions. When data and/or DTMF digit sequences are received, the VHF Communicator buffers the information and transfers it to the SEAR II or Argus. Once a vocabulary file has been downloaded into the VHF Communicator, the SEAR II or Argus can send speech enunciation requests consisting of a list of word numbers. The VHF Communicator processes the requests and enunciates the words over the radio in the order requested.

Functional LEDs and an internal speaker provide visual and audible feedback on the operation of the device. A set of jacks for a remote handset (speaker and microphone with push-to-talk feature) is also provided on the VHF Communicator and can be used for voice communication between users located at different sites. This feature can be useful in expediting installation and troubleshooting of VHF Communicator sites. Remote handsets are not provided with the unit, but are readily available at electronics outlets should this feature be desired.

3.0 HARDWARE DESCRIPTION

3.1 GENERAL

The VHF Communicator is equipped with connectors for power supply input, Echelon network, standard serial port, antenna, and remote handset. Unlike most RF communication devices, the VHF Communicator features complete isolation between the internal circuitry, which is referenced to earth-ground via the antenna, and the connectors used for power supply input and communications interfaces (Echelon and serial RS232C.) This allows the VHF Communicator to be directly powered from railroad signal batteries without the need for external isolators for communications interfaces or separate isolated DC-DC converters. See Figure 3-1 for connector designations.



Figure 3-1. VHF Communicator Connector Arrangement

3.2 USER SERIAL PORT

The serial port on the VHF Communicator is used for downloading executive software and vocabulary files into the unit. It is also used to implement a terminal-based user interface that allows full control over the VHF Communicator functionality for testing and diagnostic purposes. The RS232C port is fully isolated and uses a standard DCE pinout on a female DB9 connector. Section 7 details the features of the User Serial Port.

3.3 ECHELON® NETWORK

The standard Echelon port on the VHF Communicator provides for a simple twisted pair connection to the SEAR II. All data, controls, and indications are exchanged between the master device and the VHF Communicator via the Echelon network. The Echelon Service button and LED are used in setting up the VHF Communicator as an Argus or SEAR II slave module on the Echelon network. The Echelon® Configuration Handbook (Siemens Document COM-00-07-09) details the wiring requirements for the Echelon® network.

3.4 ANTENNA CONNECTOR

The antenna connector provided on the VHF Communicator enclosure is a standard female BNC plug. In order to accommodate other popular antenna cabling and connector schemes, the VHF Communicator is supplied with a BNC-male to UHF-female in-line connector adapter.



WARNING

THE VHF COMMUNICATOR HOUSES A RADIO TRANSMITTER THAT OUTPUTS RF ENERGY THROUGH A CONNECTED ANTENNA. DO NOT MOUNT THE ANTENNA DIRECTLY ON THE VHF COMMUNICATOR INSIDE OF THE BUNGALOW OR EQUIPMENT ENCLOSURE. RADIATED ENERGY COULD INTERFERE WITH THE OPERATION OF VITAL EQUIPMENT IN CLOSE PROXIMITY. ALWAYS MOUNT THE ANTENNA OUTSIDE OF THE BUNGALOW OR EQUIPMENT ENCLOSURE.

3.5 REMOTE HANDSET

A standard remote microphone / speaker handset may be used with the VHF Communicator for voice communication between two units. Though it may be a seldom-used feature under normal operation, it can be of assistance when troubleshooting sites during installation or maintenance. The connectors provided on the unit's enclosure follow the industry-standard arrangement of two tip/ring jacks spaced 0.4" apart, one being 2.5mm in diameter for the microphone/push-to-talk switch combination, and the other 3.5mm in diameter for the speaker connection.

3.6 AUDIO AND VISUAL INDICATORS

As a way to monitor the progress of radio communications, the VHF Communicator has a built-in speaker that outputs the audio signals going to and coming from the radio. Along with the function indication LEDs on the front panel of the unit, the speaker allows the user to quickly assess the operational status of the VHF Communicator.

3.7 CONNECTOR AND INDICATOR DETAILS

Refer to Table 3-1 for a detailed description of the VHF Communicator's connectors, indicators, and interfaces.

Table 3-1 VHF Communicator Connectors and Indicators

CONNECTOR, INDICATOR, OR DEVICE	PIN # / INDICATION	FUNCTION	NOTES
J1 Mass-terminated 2-pin terminal block	1	B – Battery input to the VHFC – positive terminal	Power supply input. Use 16 gauge or heavier wire.
	2	N – Battery input to the VHFC – negative terminal.	
J2 DB9 connector for serial communications (USER port)	2	TXD – Transmit data (output from VHFC)	RS232C communications interface for unit setup and diagnostic operation
	3	RXD – Receive data (input to the VHFC)	
	5	GND – Isolated serial port common	
	7	CTS – Clear-to-Send (input to the VHFC)	
J3 Mass-terminated 2-pin terminal block	1	ECH A – Echelon network twisted pair connection A	Echelon network connector – connections are polarity-independent
	2	ECH B – Echelon network twisted pair connection B	
J4 ANTENNA JACK	–	BNC connector for 50-ohm external antenna	–
J5 REMOTE HANDSET	SPK Jack	3.5mm standard jack for external speaker	Accepts 8-ohm, 0.2-watt speaker
	MIC/PTT Jack	2.5mm standard jack for external microphone/push-to-talk switch combo	Accepts standard electric condenser microphones with integral push-to-talk switch
POWER LED	GREEN	ON when power is applied to the VHFC.	–
SPEECH TX	RED	ON when VHFC is enunciating speech messages over the radio	–

Table 3-1 VHF Communicator Connectors and Indicators – Continued

CONNECTOR, INDICATOR, OR DEVICE	PIN # / INDICATION	FUNCTION	NOTES
DTMF TX	RED	ON when the VHFC is transmitting DTMF tone sequences over the radio	–
DTMF RX	RED	ON when the VHFC is receiving DTMF tone sequences over the radio	–
DATA TX	RED	ON when the VHFC is transmitting data over the radio	–
DATA RX	RED	ON when the VHFC is receiving data over the radio	–
DCD	RED	ON when the VHFC detects a carrier signal on the radio	–
PTT	RED	ON when the VHFC transmits a carrier signal over the radio	–
SEAR II TX	RED	ON when the VHFC is transmitting data to the SEAR II or Argus	–
SEAR II RX	RED	ON when the VHFC is receiving data from the SEAR II or Argus	–
ECH SVC LED	YELLOW	ON when the VHFC is being installed as an Echelon slave to the SEAR II	–
ECH SVC BUTTON	–	Press to install the VHFC on the SEAR II Echelon network	Module installation instructions can be found in the Argus or SEAR II manuals

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4.0 INSTALLATION

4.1 GENERAL

The VHF Communicator can be mounted on a shelf, a wall, or a backboard. Two mounting tabs are provided for mounting screws and the unit may be attached vertically or horizontally. The Echelon connection between the VHF Communicator and the Argus or SEAR II should be implemented with twisted pair cable. The unit can be powered from any available battery and will accept voltages in the (9-30) VDC range. The Echelon® Configuration Handbook (Siemens Document COM-00-07-09) details the wiring requirements for the Echelon® network.

NOTE

NOTE

In order to reduce radiated electromagnetic interference from the VHF Communicator power and Echelon cables, a clamp-on ferrite bead filter must be installed on each cable before placing the unit in operation. Please refer to Appendix A in this manual for instructions on installing the ferrite beads.

The VHF Communicator software can be configured from either a computer terminal running a terminal emulation program such as HyperTerminal, or by the SEAR II keypad and display (LUI), or by the Argus keypad and display. Refer to the Argus and SEAR II manuals for detailed configuration procedures.

On a SEAR II System:

To access the configuration settings in computer **terminal mode**, select:

Main Menu > Configuration > Modules > Change Module > (select VHF Module at prompt) > Edit Settings

To access the configuration settings using the keypad of the **LUI**, select:

Main Menu > Configuration > Modules > Change Module > (select VHF Module at prompt) > Edit Settings

On an Argus System:

To access the configuration settings in computer **terminal mode**, select:

Main Menu > Change Settings > Modules > Module Type > (enter VHF Module name) > Edit Settings

To access the configuration settings using the keypad of the **LUI**, select:

Main Menu > Change Settings > Modules > Add Modules > Slot #XX - Module Type (select VHF Module at prompt) > Edit Data.

Refer to Table 4-1 when adding a VHF communicator to the SEAR II module configuration.

Table 4-1. VHF Communicator / SEAR II Configurable Settings

SETTING	POSSIBLE VALUES	DEFAULT VALUE	DESCRIPTION
Rx Type	Framed, Stream, or DTMF only	Framed	Determines method the VHF Communicator will use to packetize the incoming data. See descriptions of types below. In DTMF only mode, no data will be received.
STX List	0 – FF (hex) for each of 5 values	F5 F9 FB F1 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the start of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.
ETX List	0 – FF (hex) for each of 5 values	F6 00 00 00 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the end of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.
Data/DTMF Chan	1 – 8	1	Specifies the channel of the radio that will be used to send and receive data packets and DTMF tones.
Voice Chan	1 – 8	1	Specifies the channel of the radio that will be used to transmit digitized speech.

Refer to Table 4-2 when adding a VHF communicator to the Argus module configuration.

Table 4-2 VHF Communicator / Argus Configurable Settings

SETTING	POSSIBLE VALUES	DEFAULT VALUE	DESCRIPTION
Name		VHF-1	Name of radio.
RX Type	Framed, Stream, or DTMF only	Framed	Determines method the VHF Communicator will use to packetize the incoming data. See descriptions of types below. In DTMF only mode, no data will be received.
STX List	0 – FF (hex) for each of 5 values	F9 F5 FB F1 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the start of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.
ETX List	0 – FF (hex) for each of 5 values	F6 00 00 00 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the end of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.

SETTING	POSSIBLE VALUES	DEFAULT VALUE	DESCRIPTION
Data/DTMF Channel	1 – 8	3	Specifies the channel of the radio that will be used to send and receive data packets and DTMF tones.
Voice Channel	1 – 8	3	Specifies the channel of the radio that will be used to transmit digitized speech.
Tone Length	10-9999	250	The amount of time the VHF Communicator will hold transmitting an individual DTMF tone.
Tone Space	10-9999	250	The amount of time to wait between transmissions of DTMF tones when a sequence of DTMF tones are being transmitted.
Key-up Delay		200	
Key-down Delay		250	
FSK TX Mode	V23 1200bps V23 75bps Bell202 1200bps Bell202 150bps	150 bps	The modulation scheme used to encode data transmitted on the RF audio channel. By default, the setting is Bell202 150bps.
FSK RX Mode	V23 1200bps V23 75bps Bell202 1200bps Bell202 150bps	150 bps	The modulation scheme used to decode data received on the RF audio channel. By default, the setting is Bell202 150bps.

4.1.1 Framed Reception (Rx Type = Framed)

In this mode of operation, the VHF Communicator compares each incoming byte to the non-zero bytes of the STX List. If there is a match with an STX byte, that character is placed at the start of the accumulation buffer and incoming bytes are added. As the bytes are added, the VHF Communicator scans them for a match to the non-zero bytes of the ETX list. If a match is made, the ETX character is added to the buffer and the buffer is sent to the Master Device as a received data packet. If another STX character is received while scanning for the ETX character, the accumulated data is thrown out and the process starts again. If the ETX character does not arrive before the maximum size of the buffer is reached, the data is thrown out and the process starts again.

4.1.2 Stream Reception (Rx Type = Stream)

In this mode of operation, the VHF Communicator begins buffering received data when carrier detect (DCD) goes active. It continues to buffer data while carrier detect is active. When DCD goes inactive, the buffered data is sent to the Master Device. If the buffer fills up before DCD goes inactive, the full buffer is sent to the Master Device and the process continues.

4.1.3 Frequency Programming

The VHF Communicator module does not support the programming of the channel frequencies through the Master Device interface. The frequencies preprogrammed into the eight channels at the factory are listed on a label affixed to the VHF Communicator front panel.

4.1.4 Network Installation

To install the VHF communicator on the SEAR II network, follow the procedure specified for Installing Modules in the SEAR II manual. The module must have been configured with the desired settings before network installation. After the VHF Communicator is installed into the network, testing of the communication link to nearby sites is recommended.

4.1.5 Argus Installation

Additional parameters and settings can be adjusted when installing a VHF Communicator for use by an Argus system. See the Argus manual for a description of the presented options.

4.2 TESTING THE COMMUNICATION LINK ON THE SEAR II FRONT PANEL

Before testing the communication link, the COMM SETUP for the unit must have been performed. The COMM SETUP sets the ATCS address of the unit, ATCS address of the office, the unit's primary destination address, the unit's first backup destination address, and the unit's second backup destination address. It also sets the type of communication link and the port settings. The VHF Communicator data communication protocol is backwards-compatible with DEMA, a third party legacy product used on some railroads.

From the `Diag/Monitor` menu of the Local User Interface, select **Field Comm**.

The keys operate as follows:

- Send a test packet to the primary hop address. This option is not available for unit configured as a Collector.

- Send a test packet to the first backup hop address. This option is not available for unit configured as a Collector.

- Send a test packet to the second backup hop address. This option is not available for unit configured as a Collector.

- Send a test packet to any field ATCS address (7 . RRR . LLL . GGG . SS . DD).

- Send a test packet to any office ATCS address (2 . RRR . NN . DDDD).

- Send a test packet to any DEMA address

After a test packet goes out you should see the following on the local display:

```
TX:TEST PKT,X,Y  
RX:TEST ACK,W,Z
```

X = Group number or DEMA address of the destination of the outgoing message.

Y = Group number or DEMA address of the receiver of the outgoing message.

W = Group number or DEMA address of the originator address of the message.

Z = Group number or DEMA address of the sender of the message.

For the test packet, X should equal W, and Y should equal Z.

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5.0 SPECIFICATIONS

5.1 POWER SUPPLY

Input Range:	9-30 VDC
Input Current:	6A Max (radio transmitter ON), 0.8A Max (radio transmitter OFF) 16 gauge or heavier wire
Isolation:	2000 VRMS, 60 Hz, 60 Sec to chassis

5.2 ECHELON® LONTALK™ INTERFACE

Data Transfer Rate:	1.25 Mbps
Transmission Medium:	Level 4 (NEMA) twisted pair cable, shielded or unshielded, wire size #22 AWG (0.65mm) or #24 AWG (0.5mm) Category 5 cable.
Topology:	Bus (direct daisy chain), <u>no stubs or Routers.</u>
Number of Nodes:	No more than 8 (including any terminations used) in any 16-meter (53 feet) length of transmission cable, 16 maximum total per network segment.
Termination:	One termination required on each end of the network. Use Safetran A80078 external termination if the end module does not provide an on-board termination option.
Network Length:	53 feet (16m) recommended maximum, 430 feet (130m) absolute maximum per network segment (with certain restrictions).



CAUTION

DUE TO THE NATURE OF THE ECHELON® LAN INTERFACE, ALL DEVICES CONNECTED TO THE LAN SHOULD BE CONTAINED ENTIRELY WITHIN THE SAME SIGNAL CASE OR BUNGALOW.

NOTE**NOTE**

The Echelon® Configuration Handbook (Siemens Rail Automation Document COM-00-07-09) details the wiring requirements for the Echelon® network.

5.3 SERIAL INTERFACE

RS232C DB9-Female connector, DCE Pinout

Isolation: 2000 VRMS, 60 Hz, 60 Sec to chassis

5.4 RADIO TRANSCEIVER**5.4.1 General**

FCC Identifier:	AIERIT12-150
Number of channels:	8
TX/RX Spacing (w/in frequency range):	26 MHz max
Mode of Operation:	Simplex or Half Duplex
Channel Increment (Synthesizer step size):	2.5 kHz
Emissions Bandwidth:	
Narrow Mode:	11 kHz
Wide Mode:	16 kHz
Frequency Stability (-30° to +65° C):	1.5ppm

5.4.2 Transmitter

Frequency Range:	VHF 148 to 174 MHz
Operating Bandwidth:	26 MHz
Output Power:	6 Watts max.
Duty Cycle:	5 to 100% depending on power and temperature
RF Load Impedance:	50 ohms
Audio Distortion:	≤5% Max
Modulation Frequency Response:	(+1/-3 dB ref 1 KHz)
At MIC IN (ref pre-emphasis curve):	50 Hz-2500 Hz
At AUX IN (w/o pre-emphasis):	50 Hz-2700 Hz
Transmitter Attack Time:	≤15 ms
Spurious and Harmonics:	≤-20 dBm
FM Hum and Noise:	
12.5 kHz channel operation:	≥40 dB
25 kHz channel operation:	≥45 dB
Transmit Current Drain:	≤2.4 A

5.4.3 Receiver

Operating Bandwidth:	26 MHz
Sensitivity (12 SINAD w/de-emphasis) :	≤0.28 μ V
RF Input Impedance:	50 ohms
Adjacent Channel Selectivity	
+/- 12.5 kHz w/narrow IF:	≥60 dB
+/- 25 kHz w/wide IF:	≥70 dB
Spurious Image Rejection:	≥70 dB
Intermodulation Rejection:	≥70 dB
FM Hum and Noise:	
12.5 kHz channel operation:	≥40 dB
25 kHz channel operation:	≥45 dB
Conducted Spurious:	≤-57 dBm
Receive Attack Time:	≤15 ms
Noise Squelch Attack Time:	≤13 ms
RSSI Squelch Attack Time:	≤5 ms
Audio Distortion:	≤5%
Audio Response at AUX OUT:	
12.5 kHz channel operation:	100 Hz to 3.5 kHz
25 kHz channel operation:	100 Hz to 5 kHz
Receive Current Drain:	≤80 mA

5.5 ENVIRONMENTAL

Temperature: -22 °F to +149 °F (-30 °C to +65 °C)

5.6 DIMENSIONS

Case Size: 8.68" H x 5.25" W x 4.00" D
(not including connector protrusions or mounting tabs)

Weight: 4 pounds

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6.0 MAINTENANCE

6.1 GENERAL

There is no routine maintenance required on this piece of equipment.

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7.0 USER SERIAL PORT PROGRAMMING

7.1 GENERAL

The User Serial Port on the VHF Communicator allows full control over the VHF Communicator functionality for testing and diagnostic purposes and is used for downloading executive software and vocabulary files into the unit using a PC with HyperTerminal. Factory default of the VHF Communicator communications port is:

9600 baud, No Parity, 8 Bits, 1 stop-bit, No flow control.

Type <CTRL + L> to start the session.

7.2 MAIN MENU

The Main Menu screen as shown in Figure 7-1, enables the User to navigate through the features of the VHF Communicator.

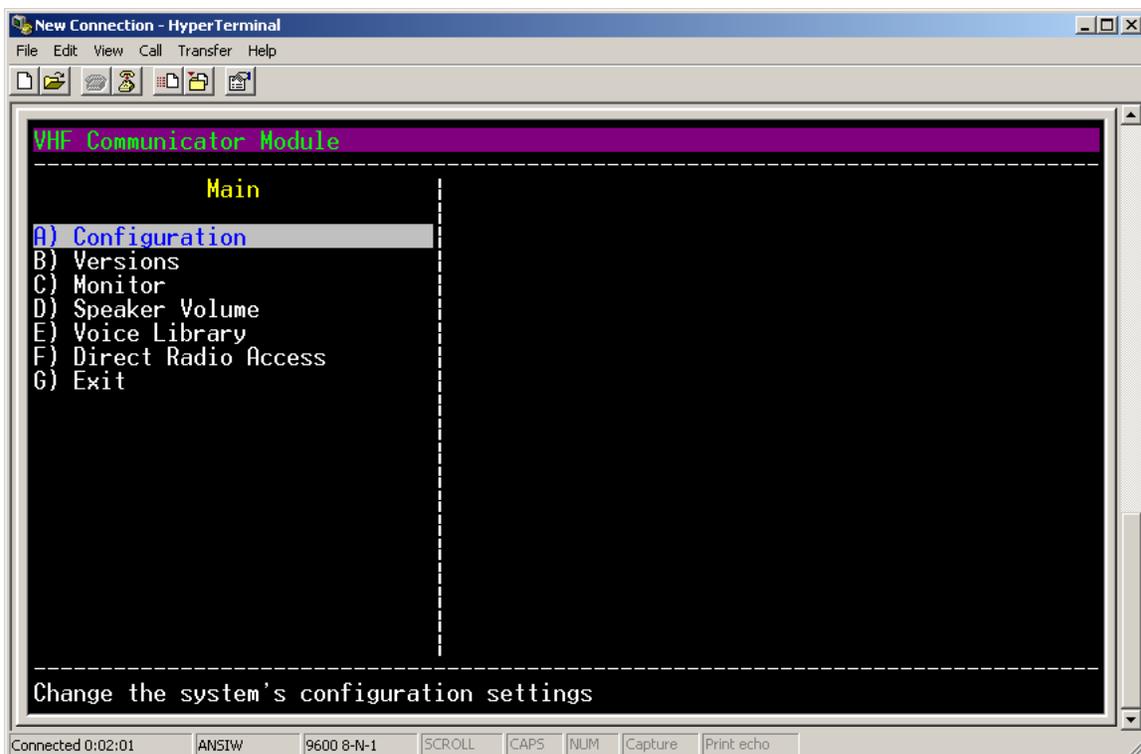


Figure 7-1 Main Menu

7.2.1 Configuration Menu

The Configuration Menu is shown in Figure 7-2.

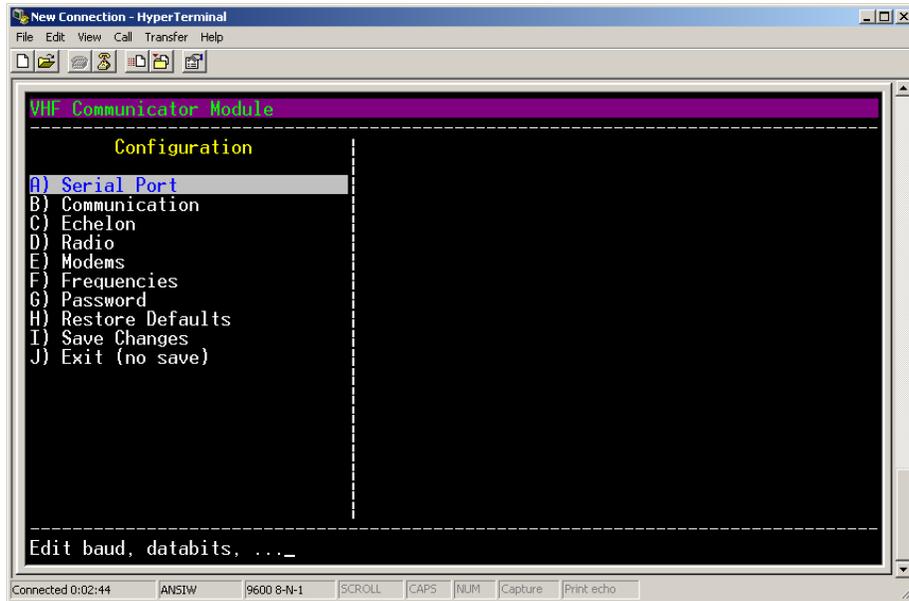


Figure 7-2 Configuration Menu

7.2.1.1 Serial Port Menu

The serial port parameters are configured in this menu as shown in Figure 7-3.

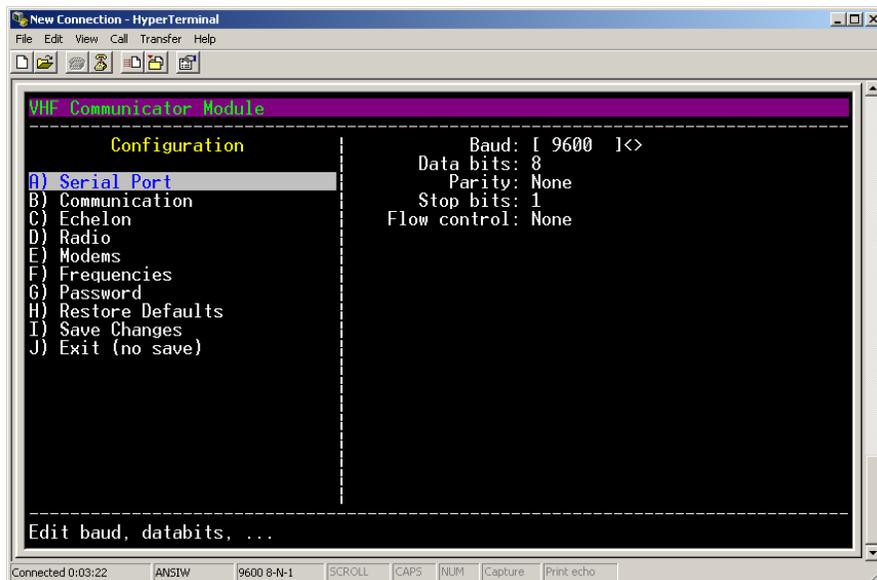


Figure 7-3 Serial Port Menu

Table 7-1 below details the Serial Port Options.

Table 7-1 Serial Port Settings

Setting	Units	Range/Option	Default Value	Description
Baud Rate		600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600	9600	Sets the Serial Port Baud rate.
Data Bits		7, 8	8	Sets Data Bits
Parity		None, Odd, Even	None	Set Parity
Stop Bits		1, 2	1	Sets Stop Bit
Flow Control		None, Hardware	None	Sets Flow Control

7.2.1.2 Communication Menu

The screen in Figure 7-4 displays the communications configuration parameters. Default settings are available in Section 4, Table 2.

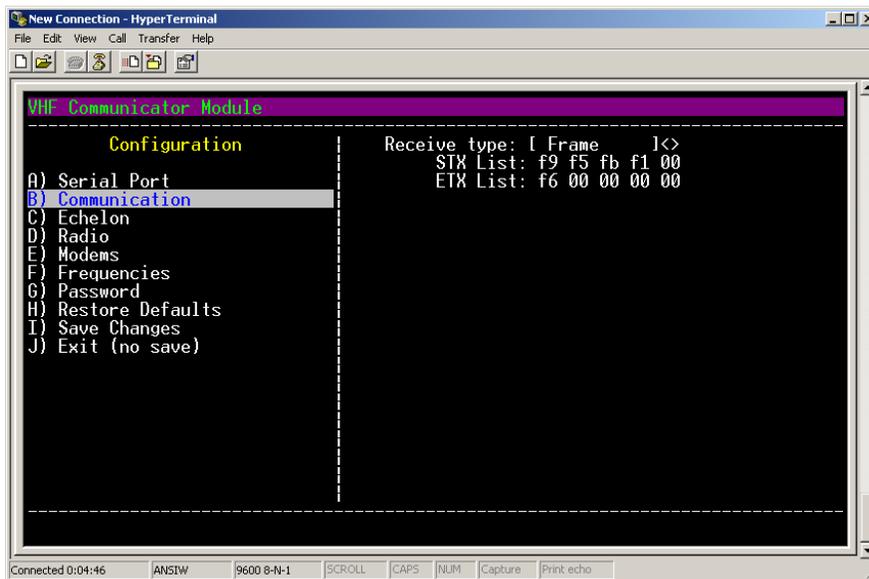


Figure 7-4 Communications Menu

Table 7-2 below details the Communications Settings.

Table 7-2 Communication Settings

SETTING	POSSIBLE VALUES	DEFAULT VALUE	DESCRIPTION
Name		VHF-1	Name of radio.
RX Type	Framed, Stream, or DTMF only	Framed	Determines method the VHF Communicator will use to packetize the incoming data. See descriptions of types below. In DTMF only mode, no data will be received.
STX List	0 – FF (hex) for each of 5 values	F9 F5 FB F1 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the start of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.
ETX List	0 – FF (hex) for each of 5 values	F6 00 00 00 00	This setting is only applicable if Rx Type is set to Framed. List of up to 5 possible byte values that can represent the end of a valid frame of data. An entry with a value of zero is not used. See Framed Reception below.

7.2.1.3 Echelon Menu

The Echelon Menu shown in Figure 7-5 enables setting the node for the VHF Communicator.

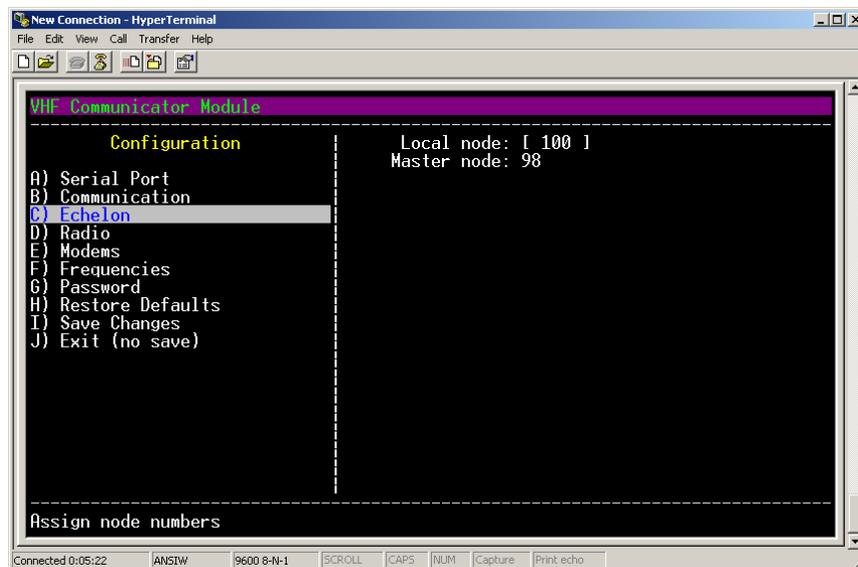


Figure 7-5 Echelon Menu

7.2.1.4 Radio Menu

The screen in Figure 7-6 displays the settings for radio and modem transmit and receive protocols.

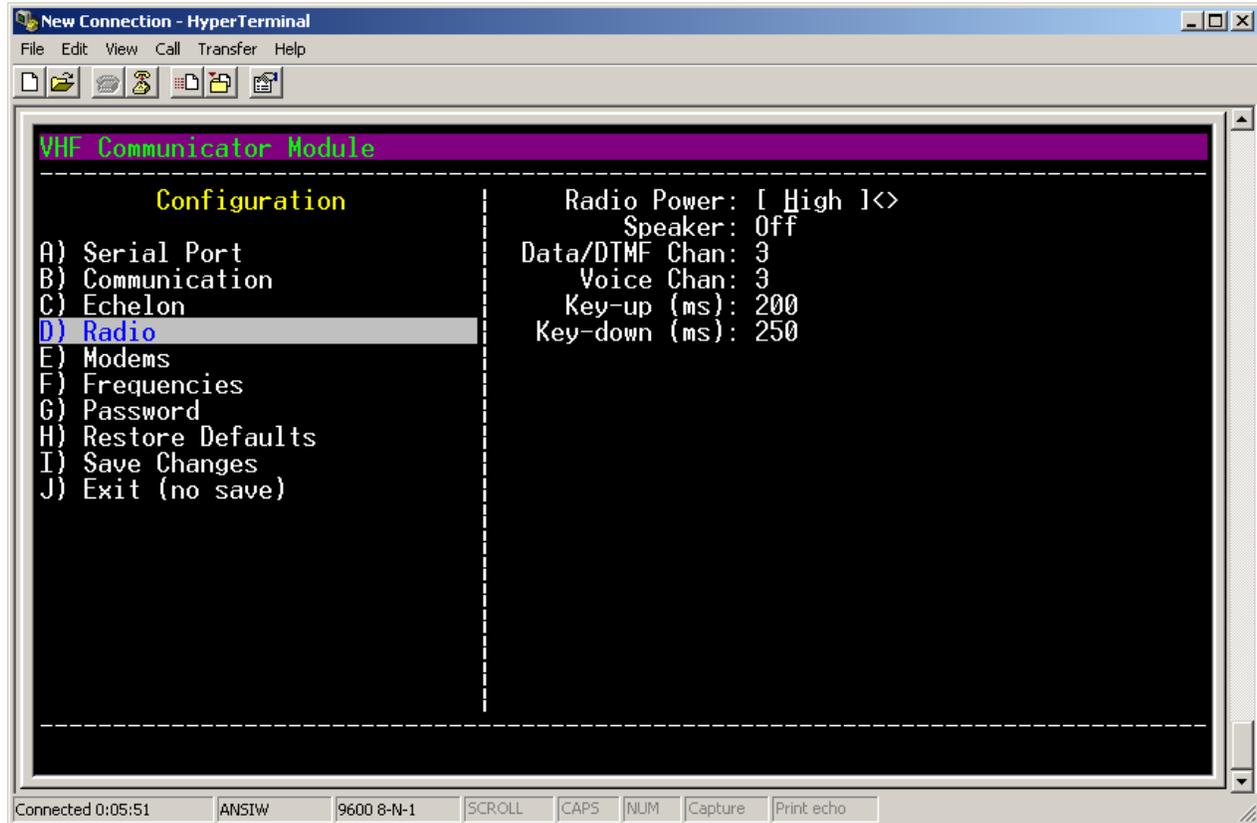


Figure 7-6 Radio Menu

Table 7-3 describes the Radio Menu options available on the VHF Communicator. Similar menus are available on the SEAR II and Argus units and can be transferred to the VHF Communicator. Transferring from the SEAR II or Argus will overwrite any settings made directly on the VHF Communicator.

Table 7-3 Radio Menu Options

Setting	Units	Range/Options	Default Value	Description
Radio Power	N/A	High or Low	High	Sets the power level of the internal radio module. On high power, the internal radio transmits at approximately 6W. At low power, it transmits at approximately 3W.
Speaker	N/A	Off or On	Off	If the speaker option is set to "On", the received and transmitted information can be heard on the VHF Communicators speaker output.
Data/DTMF Channel	N/A	1 – 8	1	The selected channel, of the 8 available, used to send and receive data and DTMF tones on.
Voice Channel	N/A	1 – 8	1	The selected channel, of the 8 available, used when speaking words from the voice library over the air.
Key-up time	milliseconds	10 - 5000	200	The amount of time between when PTT is asserted to active the carrier before data, DTMF tones, or speech is sent on carrier.
Key-down time	milliseconds	10 – 5000	250	The amount of time after data, DTMF tones, or speech has completed being transmitted before PTT is removed to release the carrier.

7.2.1.5 Modem Menu

The screen in Figure 7-7 displays the setting for the FSK modem. Internally, the VHF Communicator has two modem chips, one for DTMF encoding and decoding and one for data encoding and decoding. Each chip has options to adjust levels and modes.

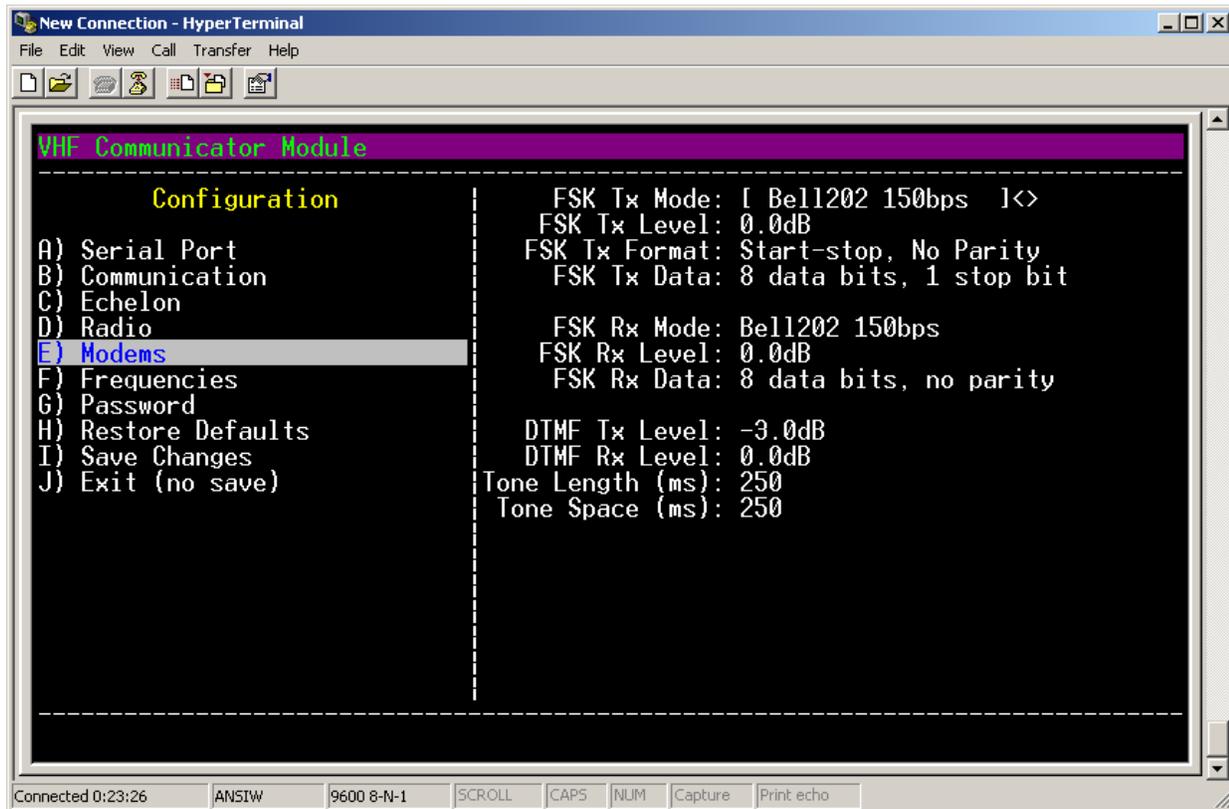


Figure 7-7 Modem Menu

Table 7-4 describes “Modem Menu” options. There are menu screens available on the Argus and SEAR II to program some of these settings and transfer them to the VHF Communicator. The SEAR II or Argus settings will overwrite any settings you may make directly on the VHF Communicator. However, only the mode settings, tone length, and tone space are configurable on the Argus or SEAR II. The remaining settings will not be overwritten.

Table 7-4 Modem Menu Settings

Setting	Units	Range/Options	Default Value	Description
FSK TX Mode	N/A	V23 1200bps V23 75bps Bell202 1200bps Bell202 150bps	Bell202 1200bps	The modulation scheme used to encode data transmitted on the RF audio channel. By default, the setting is “Bell202 1200bps”. However, for the Data Over Voice system, the Argus will set the TX mode to “Bell202 150bps”.
FSK TX Level	dB	-10.5dB -9.0dB -7.5dB -6.0dB -4.5dB -3.0dB -1.5dB 0.0dB	0.0dB	A signal level adjustment to the TX audio signal out of the data modem chip, before it is processed by the internal radio.
FSK TX Format	N/A	Start-stop, Odd Parity Start-stop, Even Parity Start-stop, No Parity	Start-stop, No Parity	The data byte format to use for the data when transmitted over the air, similar to RS-232 serial byte format.

Table 7-4 Modem Menu Settings (Continued)

Setting	Units	Range/Options	Default Value	Description
FSK TX Data	N/A	5 data bits, 1 stop bit 5 data bits, 2 stop bits 6 data bits, 1 stop bit 6 data bits, 2 stop bits 7 data bits, 1 stop bit 7 data bits, 2 stop bits 8 data bits, 1 stop bit 8 data bits, 2 stop bits	8 data bits, 1 stop bit	The number of data bits and the stop bits to use for the data byte format when transmitted over the air, similar to RS-232 serial byte format.
FSK RX Mode	N/A	V23 1200bps V23 75bps Bell202 1200bps Bell202 150bps	Bell202 1200bps	The modulation scheme used to decode data received on the RF audio channel. By default, the setting is "Bell202 1200bps". However, for the Data Over Voice system, the Argus will set the RX mode to "Bell202 150bps".
FSK RX Level	dB	-10.5dB -9.0dB -7.5dB -6.0dB -4.5dB -3.0dB -1.5dB 0.0dB	0.0dB	A signal level adjustment to the RX audio signal into the data modem chip, after being processed by the internal radio.

Table 7-4 Modem Menu Settings (Continued)

Setting	Units	Range/Options	Default Value	Description
FSK RX Data	N/A	5 data bits, no parity 5 data bits, parity 6 data bits, no parity 6 data bits, parity 7 data bits, no parity 7 data bits, parity 8 data bits, no parity 8 data bits, parity	8 data bits, no parity	The data byte format to use for the data when received over the air, similar to RS-232 serial byte format.
DTMF TX Level	dB	-10.5dB -9.0dB -7.5dB -6.0dB -4.5dB -3.0dB -1.5dB 0.0dB	-3.0dB	A signal level adjustment to the TX audio signal out of the DTMF modem chip, before being processed by the internal radio.
DTMF RX Level	dB	-10.5dB -9.0dB -7.5dB -6.0dB -4.5dB -3.0dB -1.5dB 0.0dB	0.0dB	A signal level adjustment to the RX audio signal into the DTMF modem chip, after being processed by the internal radio.

Table 7-4 Modem Menu Settings (Continued)

Setting	Units	Range/Options	Default Value	Description
Tone Length	milliseconds	10 – 9999	250	The amount of time the VHF Communicator will hold transmitting an individual DTMF tone.
Tone Space	milliseconds	10 - 9999	250	The amount of time to wait between transmissions of DTMF tones when a sequence of DTMF tones is being transmitted.

7.2.1.6 Frequencies Menu

The VHF Communicator module does not support the programming of the channel frequencies. The frequencies are preprogrammed into the eight channels at the factory and are listed on a label affixed to the VHF Communicator front panel.

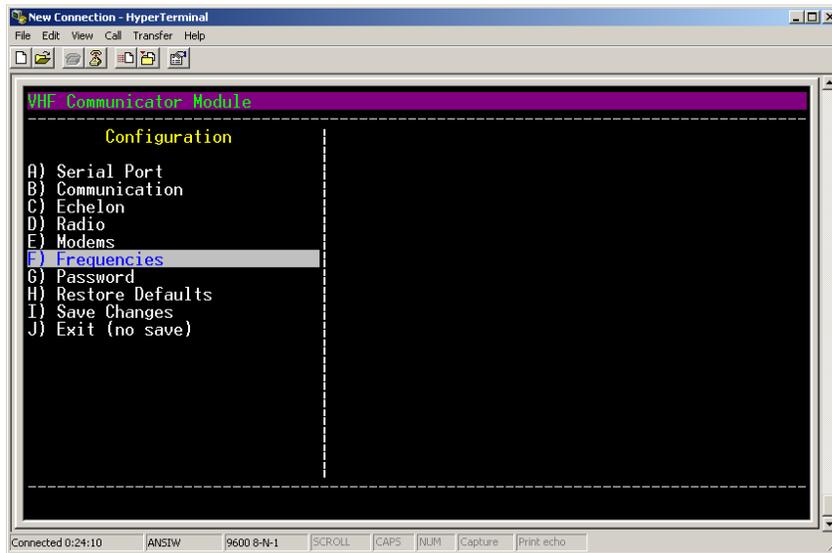


Figure 7-8 Frequencies Menu

7.2.1.7 Password Menu

A Password Menu is provided to establish a minimal level security access as shown in Figure 7-9

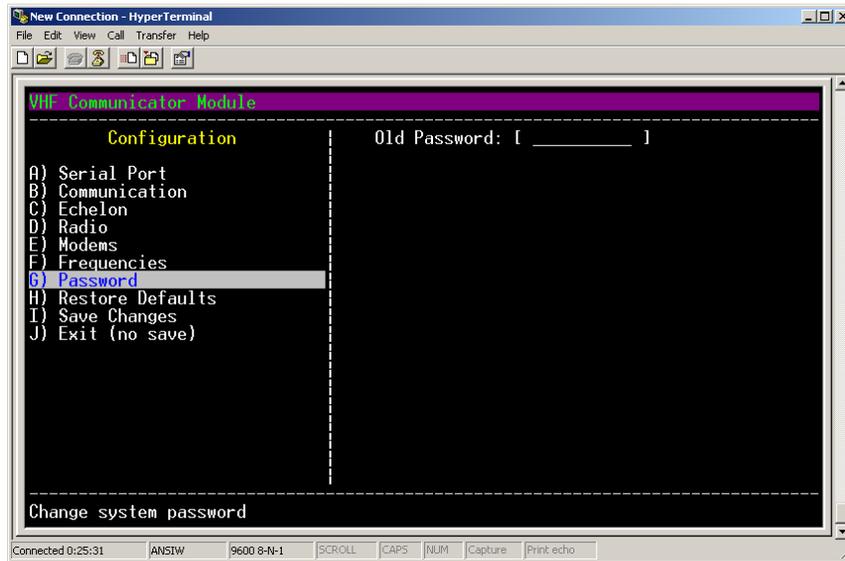


Figure 7-9 Password Menu

7.2.1.8 Restore Defaults Menu

The screen in Figure 7-10 provides a means to restore default parameters.

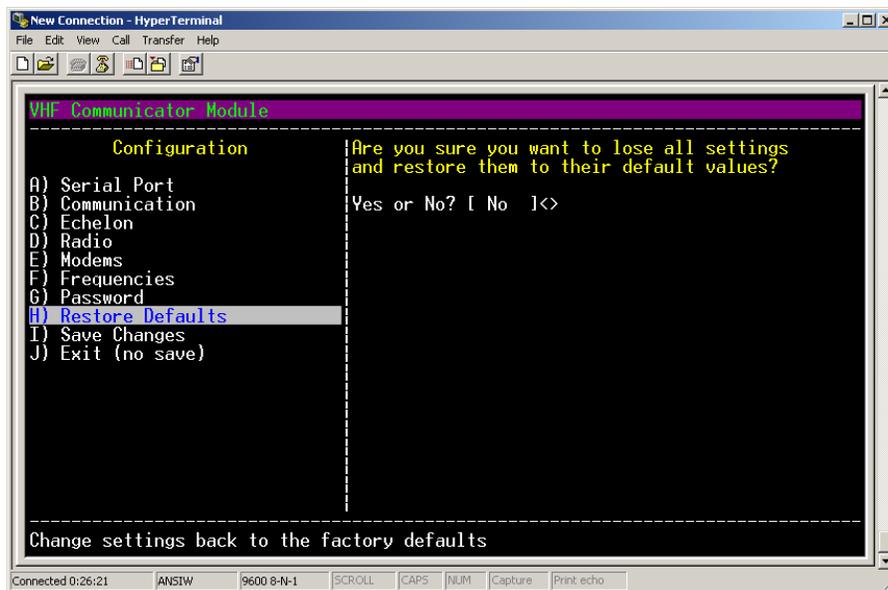


Figure 7-10 Restore Defaults Menu

7.2.1.9 Save Changes Menu

Changes made in any of the configuration menus must be saved using the Save Changes menu as shown in Figure 7-11.

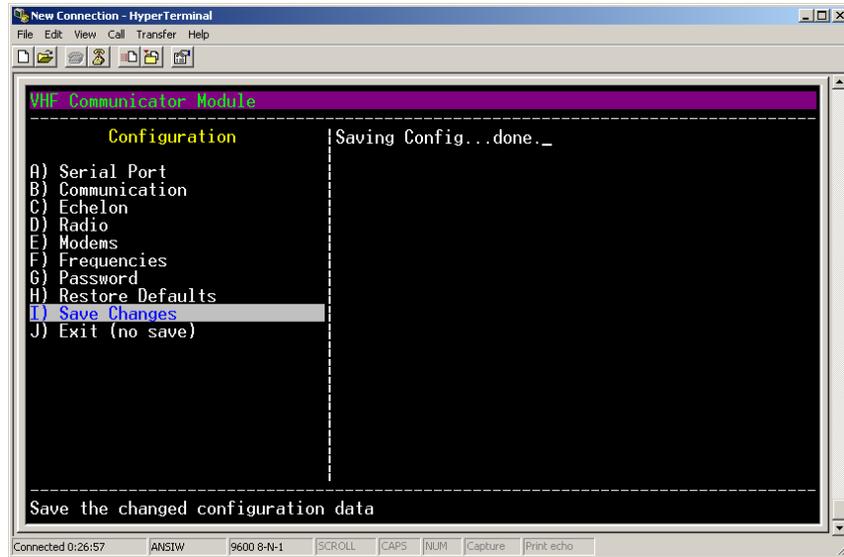


Figure 7-11 Save Changes Menu

7.2.1.10 Exit Configuration Menu

To exit the configuration menu and return to the main menu select EXIT and press enter. If changes were not saved using the Save Changes entry, all changes will be lost.

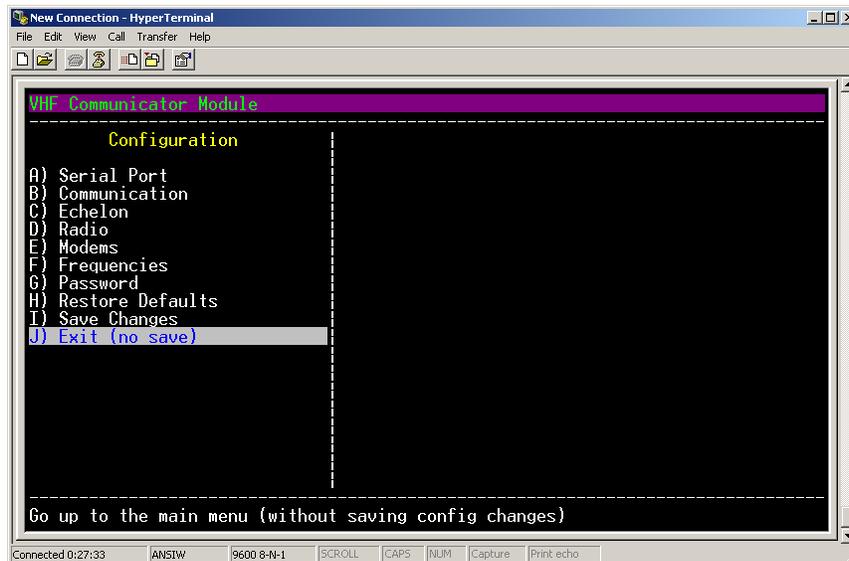


Figure 7-12 Exit Configuration Menu

7.2.2 Versions Menu

The Versions Menu displays the version of the Executive Software installed.

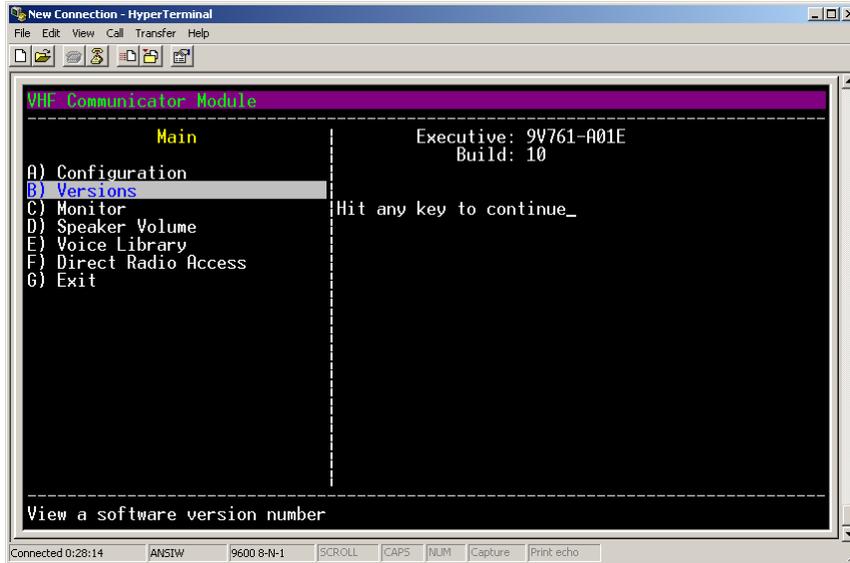


Figure 7-13 Versions Menu

7.2.3 Monitor Menu

The Monitor Menu provides entries for setting the speaker volume and test data, DTMF, and Vocabulary Words. The monitor screen serves as a test/debug tool for originating and received activity.

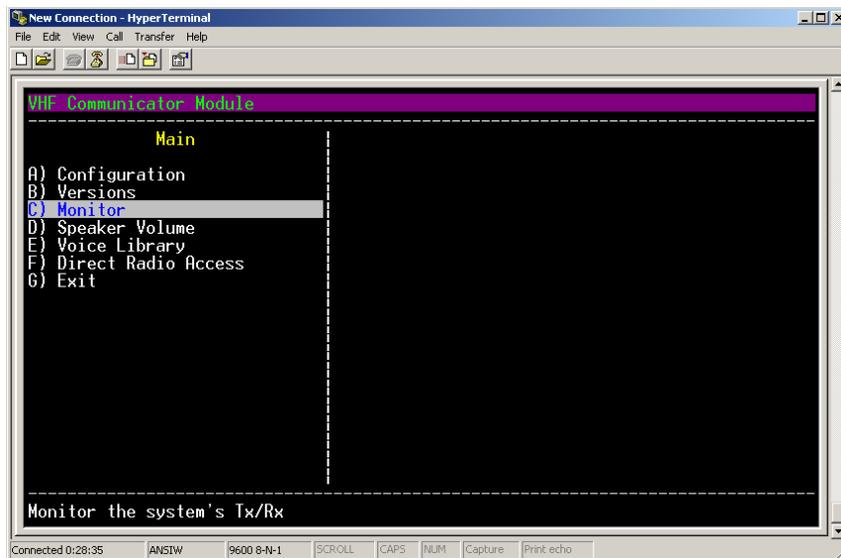


Figure 7-14 Monitor Menu

7.2.4 Monitor Sub-Menu Selections

The Menu displayed in Figure 7-15 displays the Sub-menu selections. Pressing any key will enable the monitoring mode. In the Monitor Mode, information transmitted and information received is displayed on the screen.

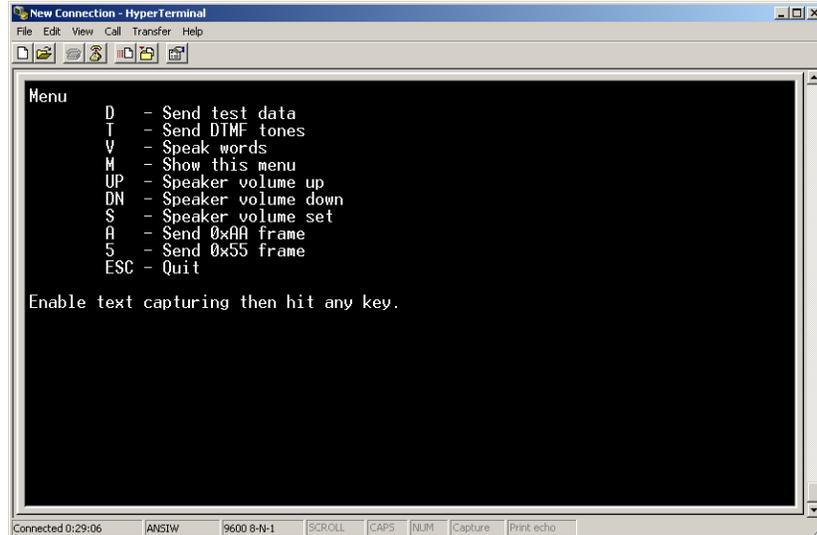


Figure 7-15 Monitor Sub-Menu Selections

7.2.4.1 D – Send Test Data

The “D” key will send a test data packet.

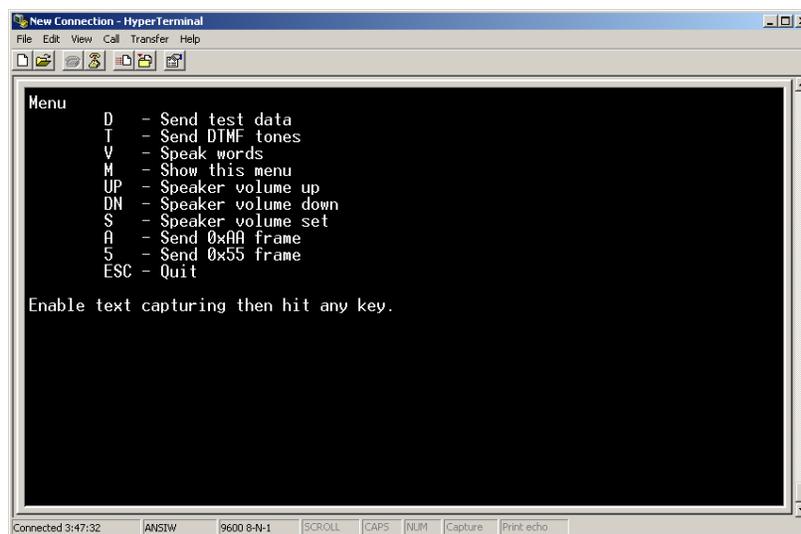


Figure 7-16 Send Test Data – Screen 1

Pressing the “D” key will activate the sequence and transmit a data packet. The packet can be heard through the VHF Communicator speaker. A log is printed out as shown in Figure 7-17 for both sent data as well as received data from other VHF Communicators. Press **ESC** to return to the Main Menu.

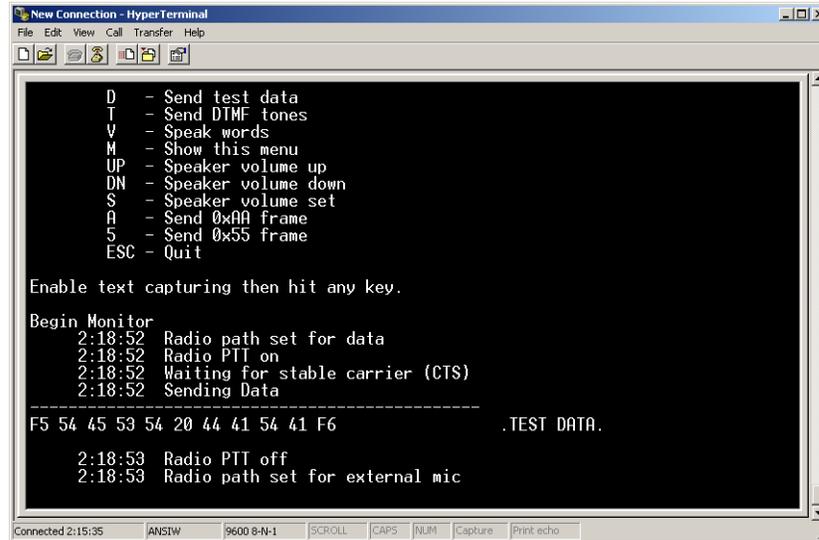


Figure 7-17 Send Test Data – Screen 2

7.2.4.2 T – Send DTMF Tones

The “T” key will send DTMF tones. Pressing the “T” key will bring up a dialog requesting user input for the desired DTMF tones to be sent. As shown in Figure 7-18.

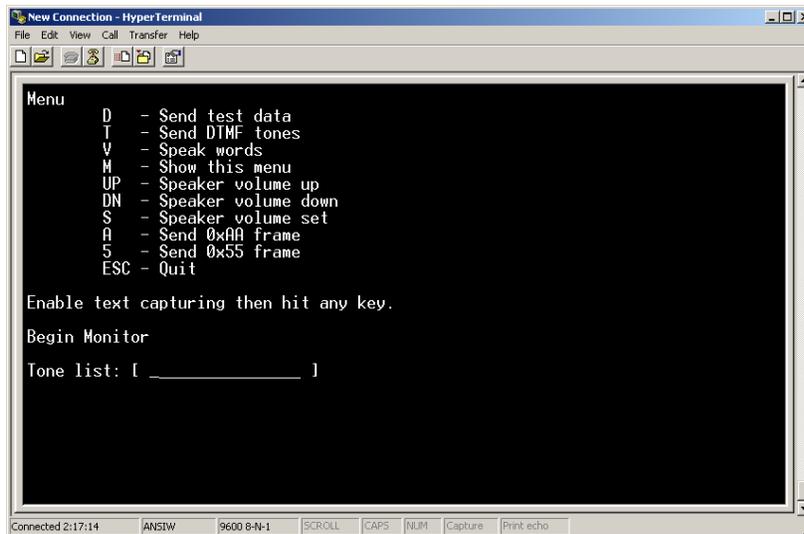


Figure 7-18 Send DTMF Tones – Screen 1

Enter the desired tone numbers as shown in Figure 7-19 and press **enter**.

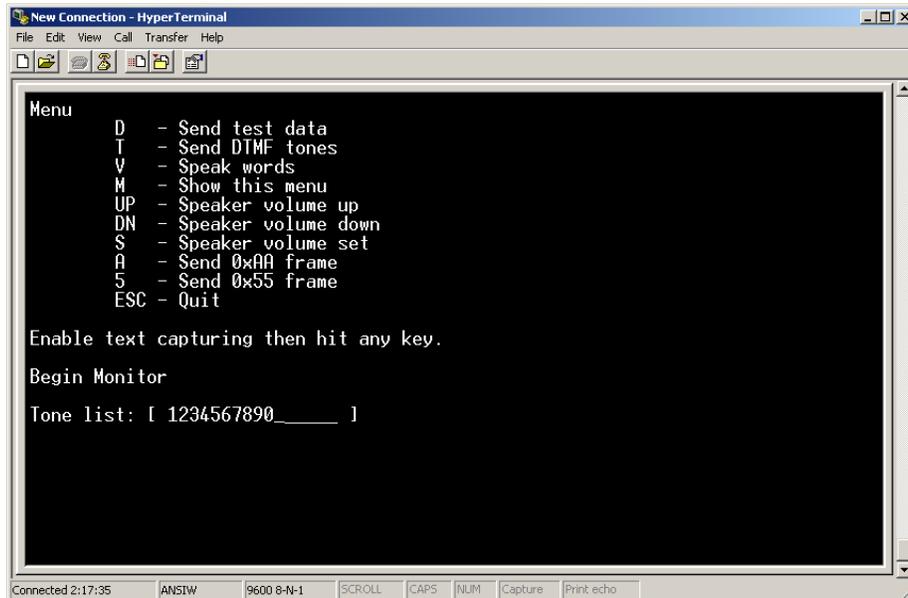


Figure 7-19 Send DTMF Tones – Screen 2

The DTMF tones selected will be sent. Confirmation of the transmission is displayed as shown in Figure 7-20. DTMF tones from other VHF Communicators will be printed as received. Press **ESC** to return to the Main Menu.

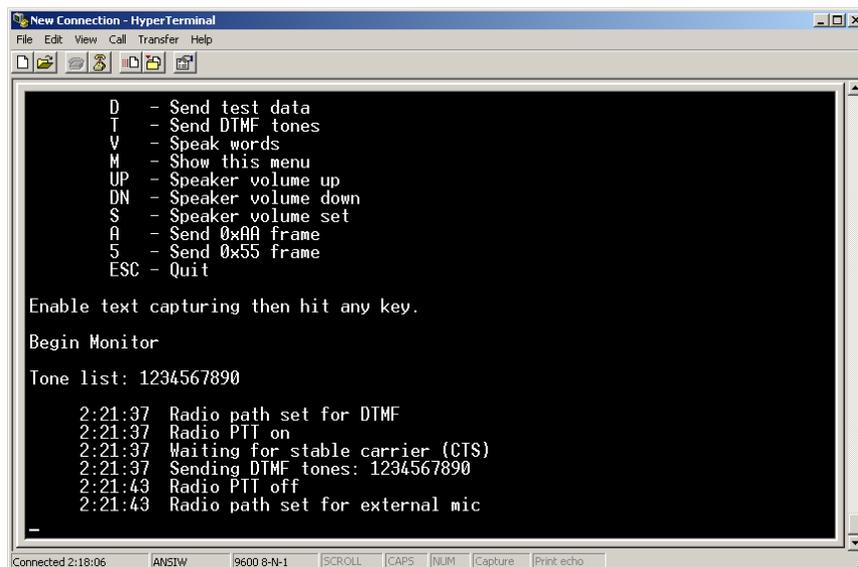


Figure 7-20 Send DTMF Tones – Screen 3

7.2.4.3 V – Speak Words

Pressing the “V” key will bring up the **Speak Words** dialog as shown in Figure 7-21.

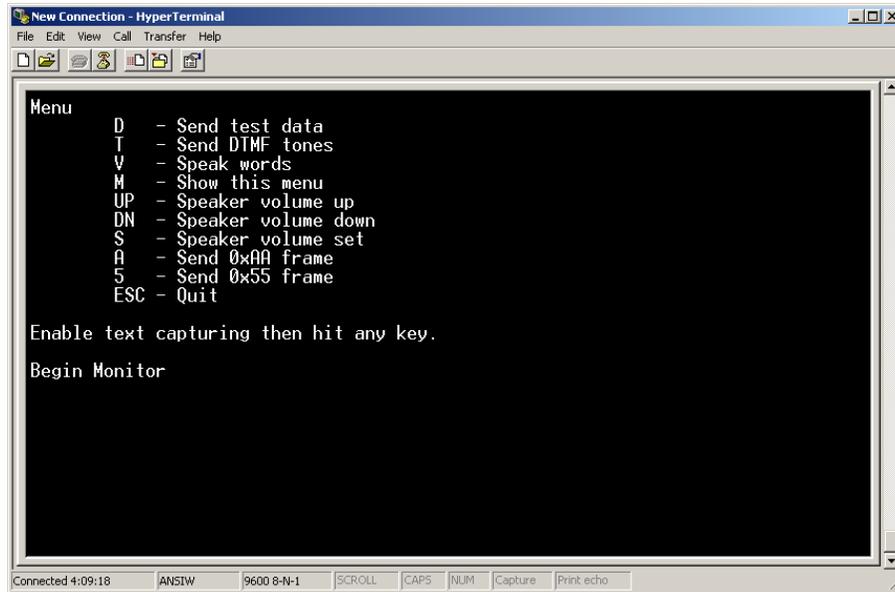


Figure 7-21 Speak Words – Screen 1

Enter the number of the first word desired and press **enter**.

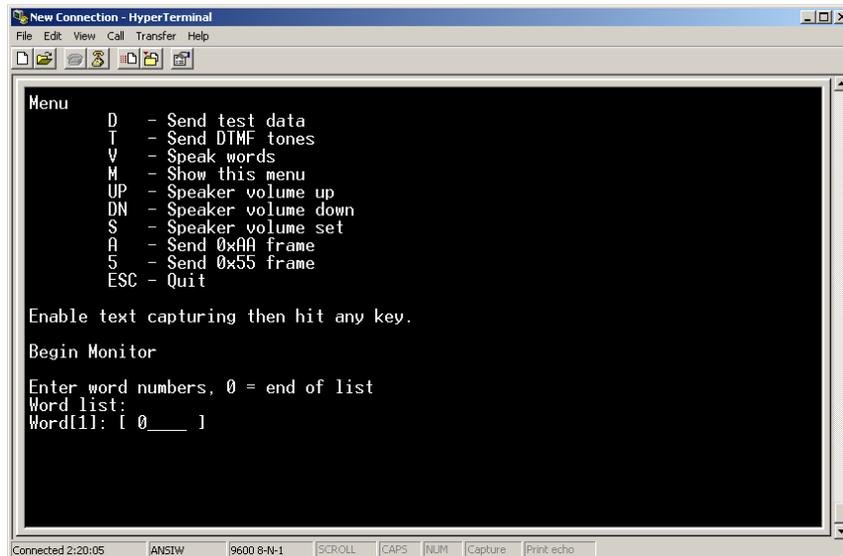


Figure 7-22 Speak Words – Screen 2

Enter the number of any additional words desired and press **enter**. Enter a “0” to indicate the end of the list as shown in Figure 7-23.

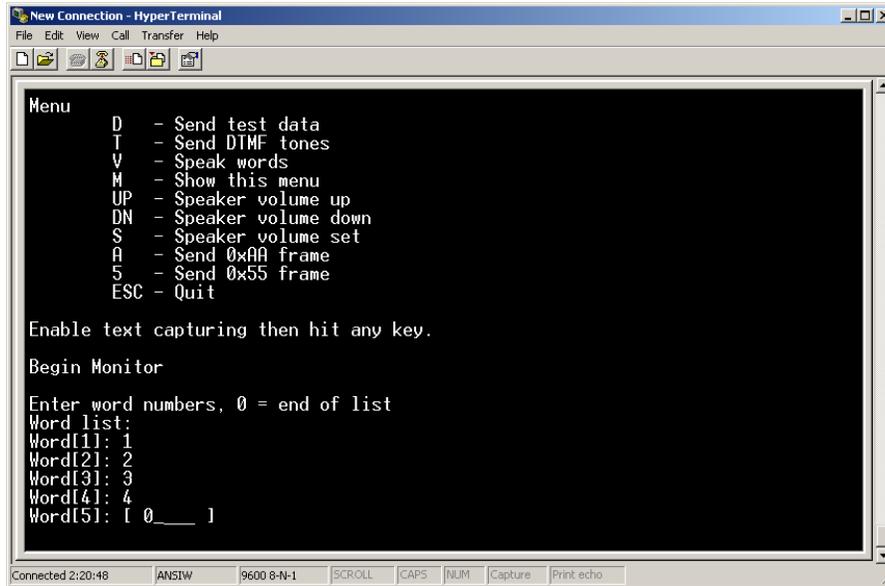


Figure 7-23 Speak Words – Screen 3

Press **enter** to start the transmission. The word sequence will be transmitted and also be heard through the VHF Communicator speaker. A log of the sequence will be printed on the screen as shown in Figure 7-24. Press **ESC** to return to the Main Menu.

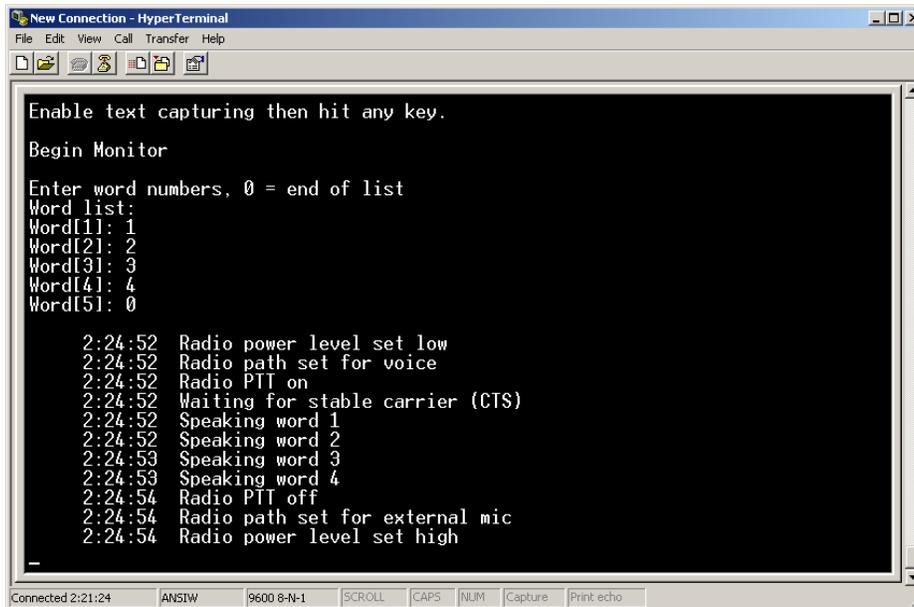


Figure 7-24 Speak Words – Screen 4

7.2.4.4 Show Monitor Menu

Pressing the “M” key will display the Monitor menu as shown in Figure 7-25.

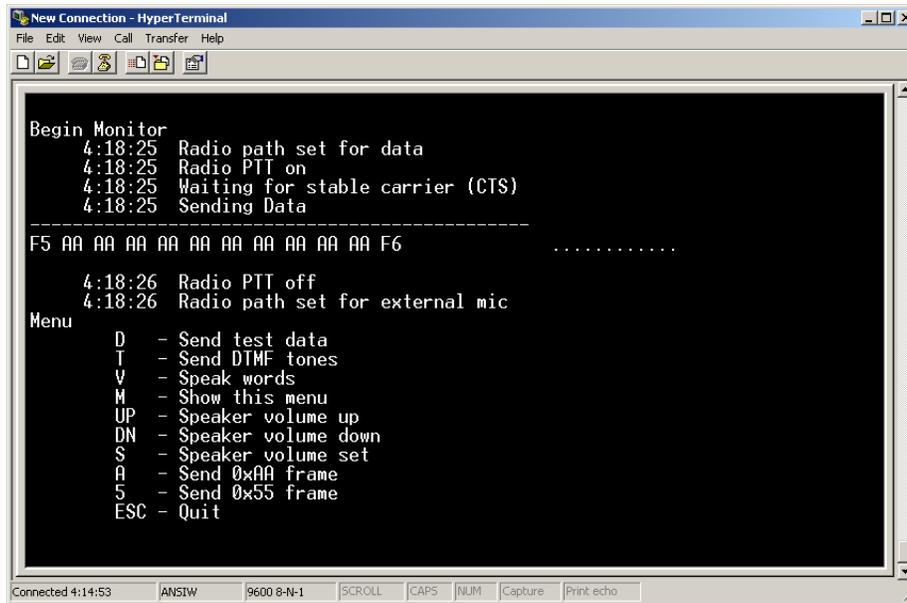
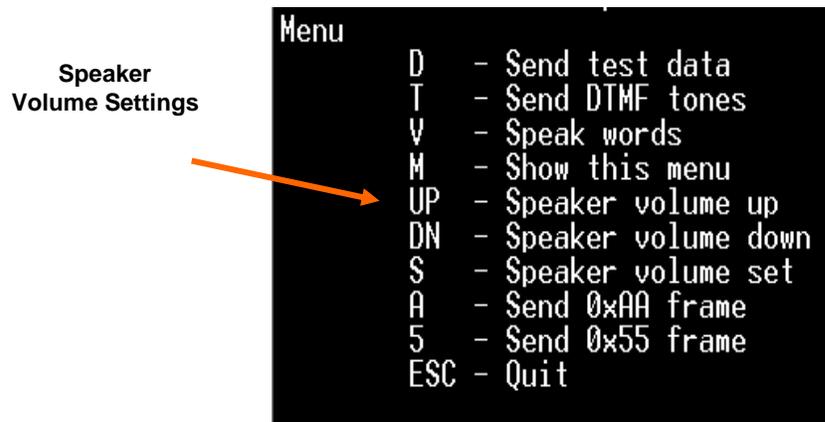


Figure 7-25 Show Monitor Menu

7.2.4.5 Speaker Volume Settings – Monitor Menu

Speaker volume settings can be adjusted in the Monitor sub-menu using the **arrow up**, **arrow down**, and “S” keys. These controls are convenient when sending or receiving test streams by not having to leave the Monitor Menu and switch to the Speaker Volume Menu. Duplicate commands are available in the **Speaker Volume** section of the **Main Menu**.



7.2.5 Speaker Volume

The VHF Communicator speaker volume can be adjusted and set using the Speaker Volume Menu as shown in Figure 7-26 . Pressing the **Up Arrow** will increase the speaker volume. Repeating the **Up Arrow** commands will increase the volume another increment. In the same manner, pressing the **Down Arrow** will decrease the speaker volume one increment. When the desired volume is achieved, press the “**S**” key to save the setting. Press **ESC** to return to the Main Menu.

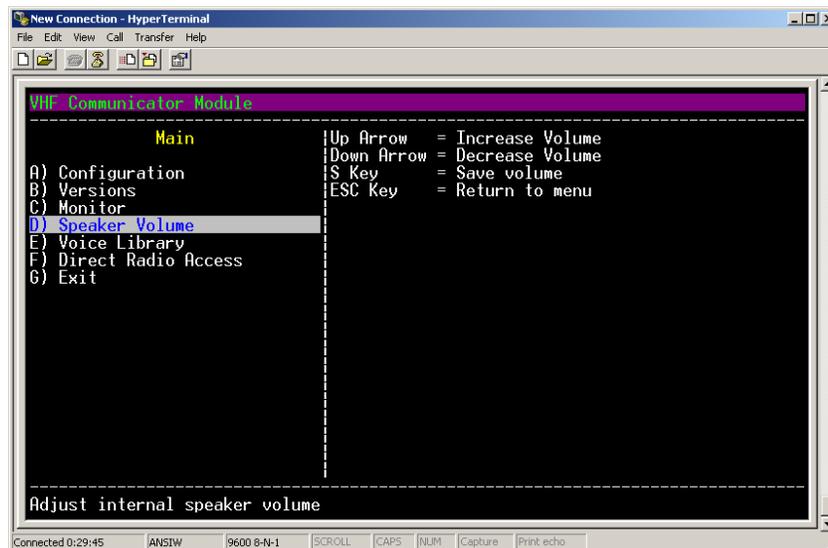


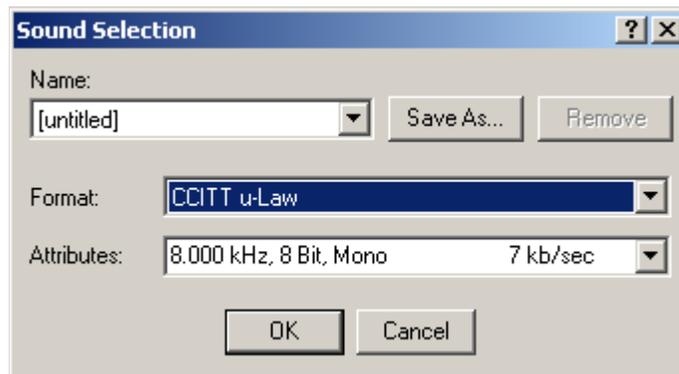
Figure 7-26 Speaker Volume Settings

7.2.6 Voice Library

VHF Communicator vocabulary files are collections of individual audio files, one for each word or phrase in the library, that have been archived into a single file using a zipping utility. The resulting vocabulary file can then be downloaded into the VHF Communicator via the User Serial Port. The Library is recorded using the Sound Recorder utility found in Windows. Any equivalent sound recording program may be used as well.



Individual words and phrases recorded with the Sound Recorder utility must be saved in the **CCITT u-Law** format, with **8 kHz, 8-bit, Mono** attributes.



The file must be named according to the following convention:

File name = nnn_word name.wav

nnn = The position in the word file. (e.g. 001 – 999)

word name = a descriptive name for the recorded word.

.wav = the file extension, indicating the type of audio file.

For example, if the voice library is to contain three words to form the sentence “System is normal”, the individual files would be:

001_system.wav

002_is.wav

003_normal.wav

In this case the word “system” is the first word in the library. The second and third words are “is” and “normal”, respectively. Once all the words and phrases have been recorded and saved in the CCITT u-Law wav format, a single archival file must be created using a zipping utility such as WinZip. It is important that the zipping operation be done without compression. An example file name would be “example_library.zip”. Once the archiving process is complete the file is ready for downloading to the VHF Communicator.

Selecting “E” on the Main Menu, as shown in Figure 7-27 will bring up the sub-menu for management and deployment of the Voice Library as displayed in Figure 7-28.

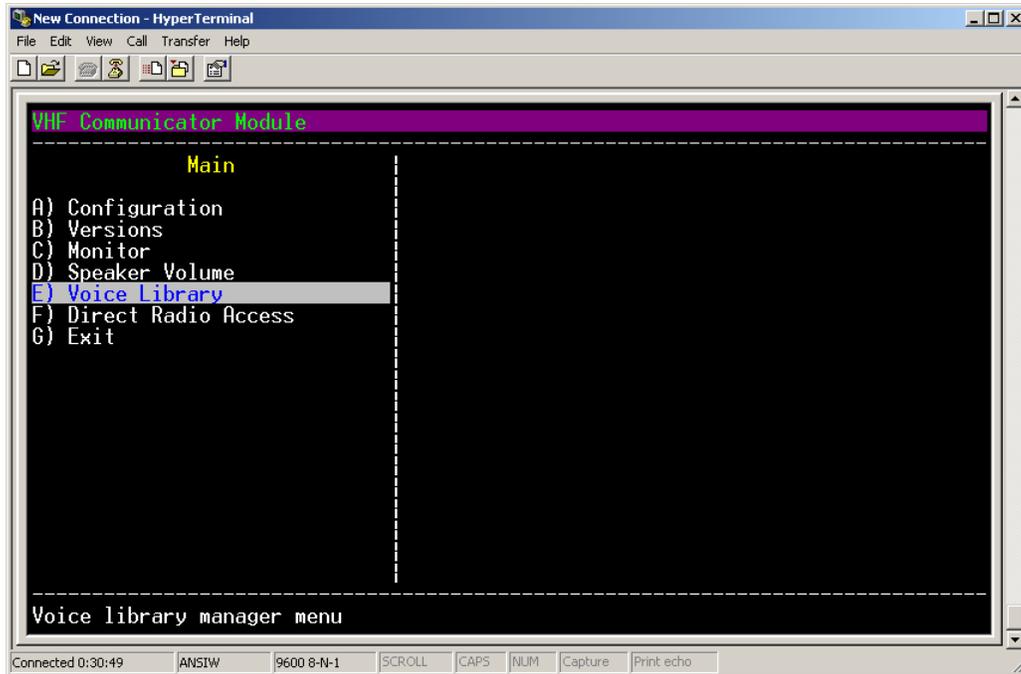


Figure 7-27 Voice Library

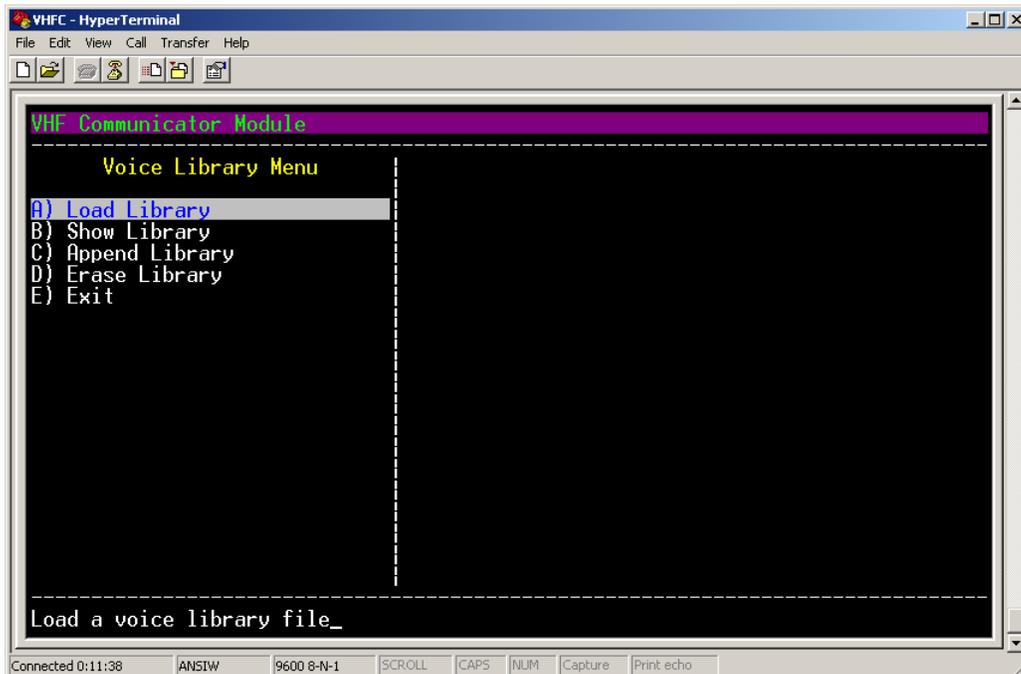


Figure 7-28 Voice Library Menu

7.2.6.1 Load Library

To download a voice library into the VHF Communicator, enter “**A**” to bring up the **Load Library** screen shown in Figure 7-29. Note existing files will be erased in this process. To add files to an existing Library, the **Append Library** function will be used.

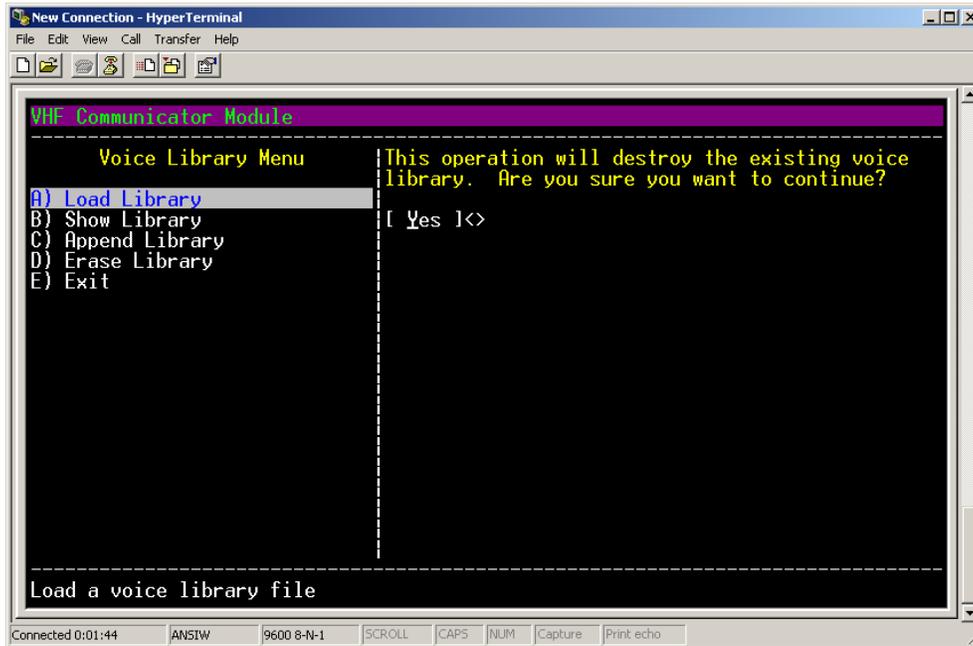


Figure 7-29 Load Library

Using the arrow keys select **YES** to proceed. The screen in Figure 7-30 will come up. To download the zip file, use the **TRANSFER** drop menu in HyperTerminal and select **SEND FILE**.

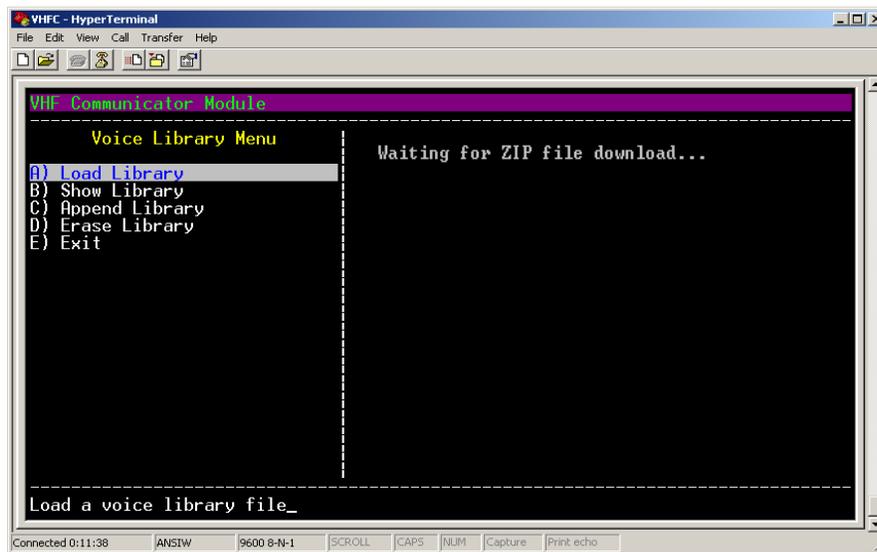


Figure 7-30 Loading Library

The download pop-up menu will appear as shown in Figure 7-31. Locate the desired file, and set the Protocol to **Zmodem with Crash Recovery**. Press the **SEND** button to download the file.

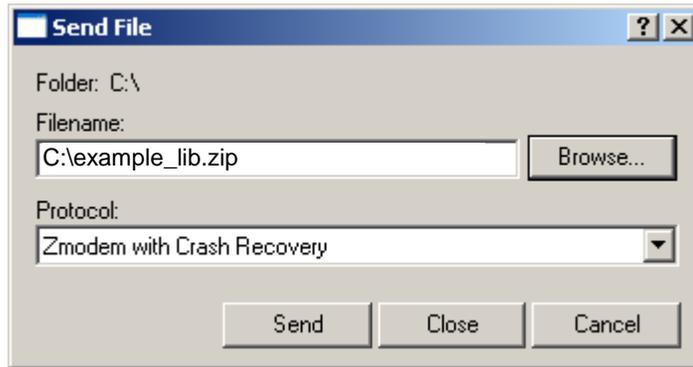


Figure 7-31 Send File Screen

A download status pop-up screen will appear displaying the download progress as shown in Figure 7-32. When the download is completed verify the files are present using the **Show Library** function.

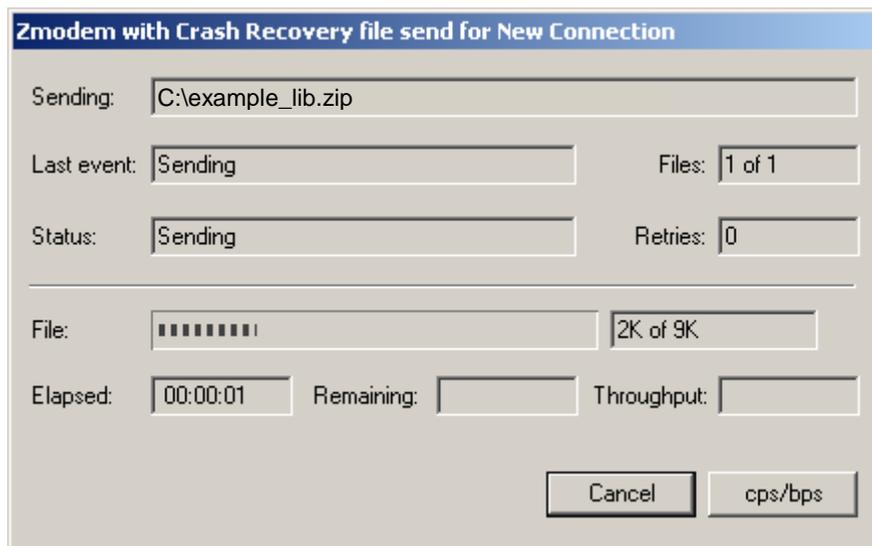


Figure 7-32 Download Progress Screen

7.2.6.2 Show Library

To view the Voice Library enter “**B**” and press enter. The **Show Library** menu screen will appear as shown in Figure 7-33.

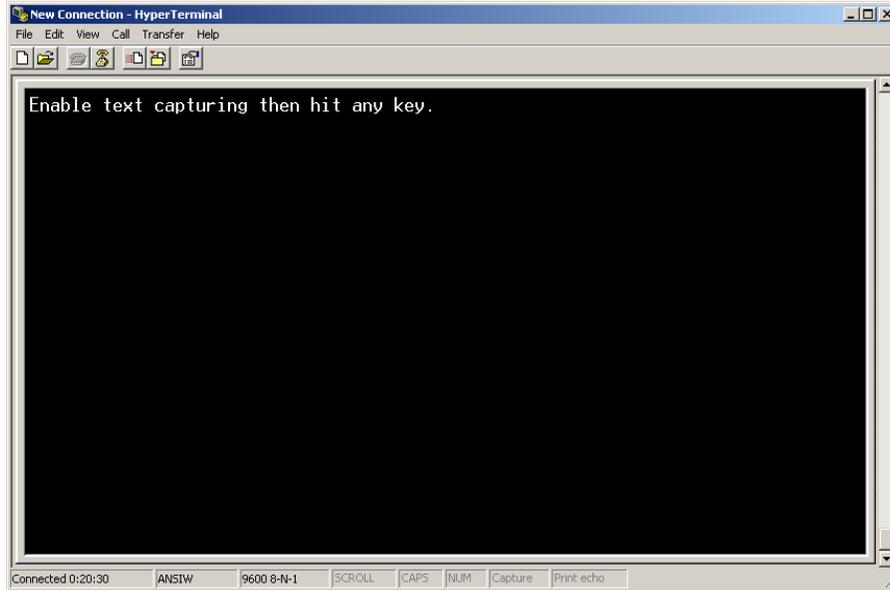


Figure 7-33 Show Library – Screen 1

Hit any key and a list of stored files will appear as displayed in Figure 7-34. Hit any key to return to the Voice Library Menu.

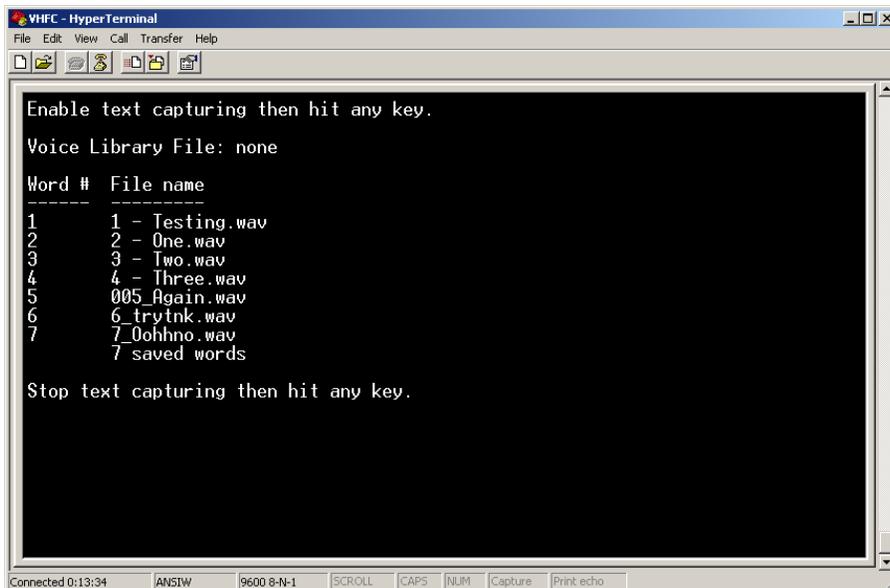


Figure 7-34 Show Library – Screen 2

7.2.6.3 Append Library

The **Append Library** function enables the user to add words and phrases to the existing library. Select the **Append Library** function as shown in Figure 7-35.

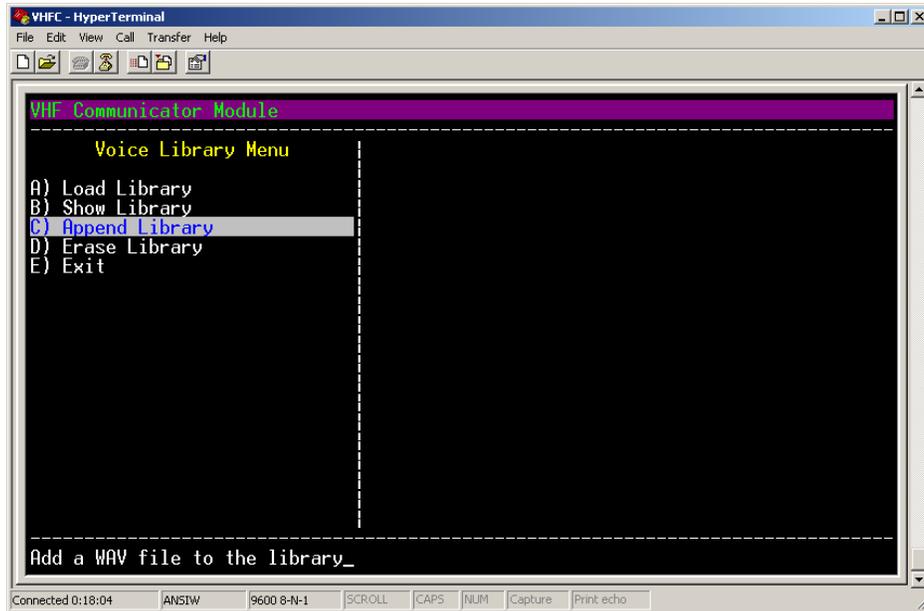


Figure 7-35 Append Library – Screen 1

A dialog will appear indicating the program is ready to accept a new file as displayed in Figure 7-36. Using the HyperTerminal **TRANSFER** drop-menu, select **SEND FILE**.

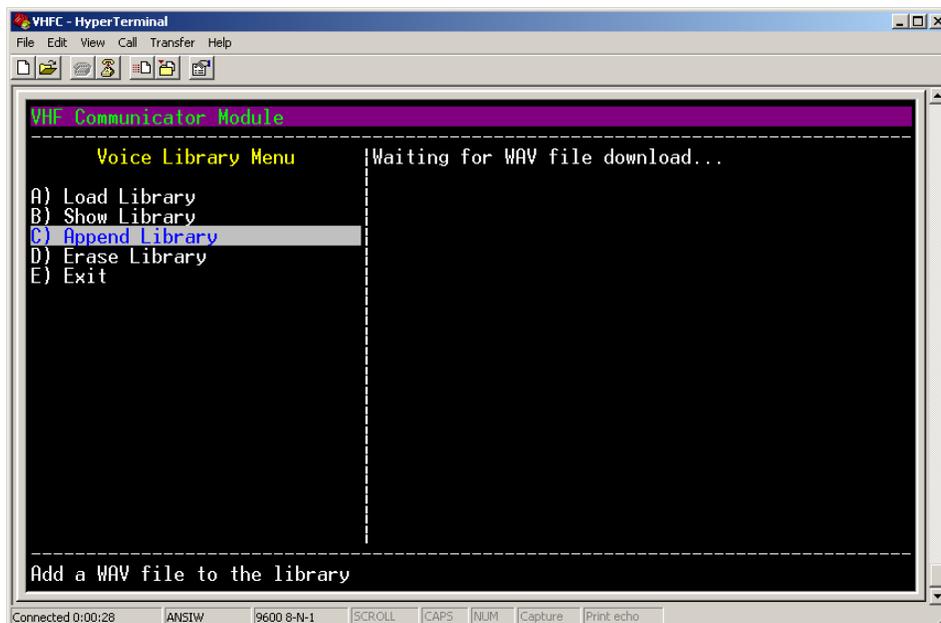


Figure 7-36 Append Library – Screen 2

The download pop-up menu will appear as shown in Figure 7-37. Locate the desired file, and set the Protocol to **Zmodem with Crash Recovery**. Press the **SEND** button to download the file.

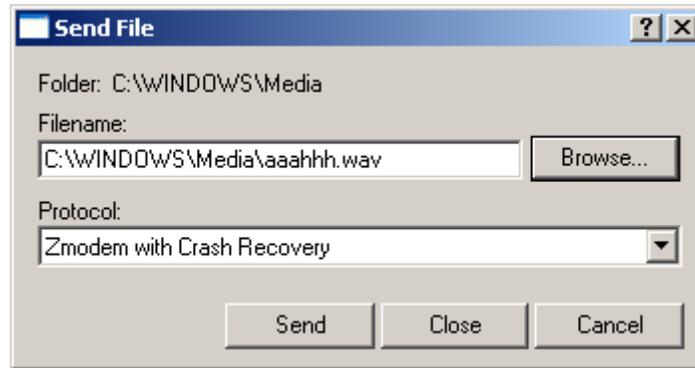


Figure 7-37 Append Library Send File Screen

A download status pop-up screen will appear displaying the download progress as shown in Figure 7-38. When the download is completed verify the files are present using the **Show Library** function.

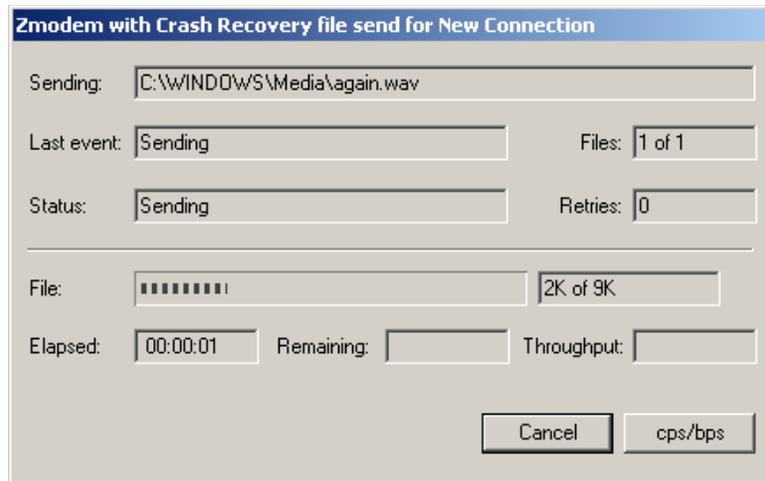


Figure 7-38 Append Library – Download Status

7.2.6.4 Erase Library

To remove the Library, select **D – Erase Library** as shown in Figure 7-39. Use the **arrow keys** to select **Yes** or **No** to continue. Note that erased files cannot be recovered. Select “**E**” to exit and return to the Main Menu.

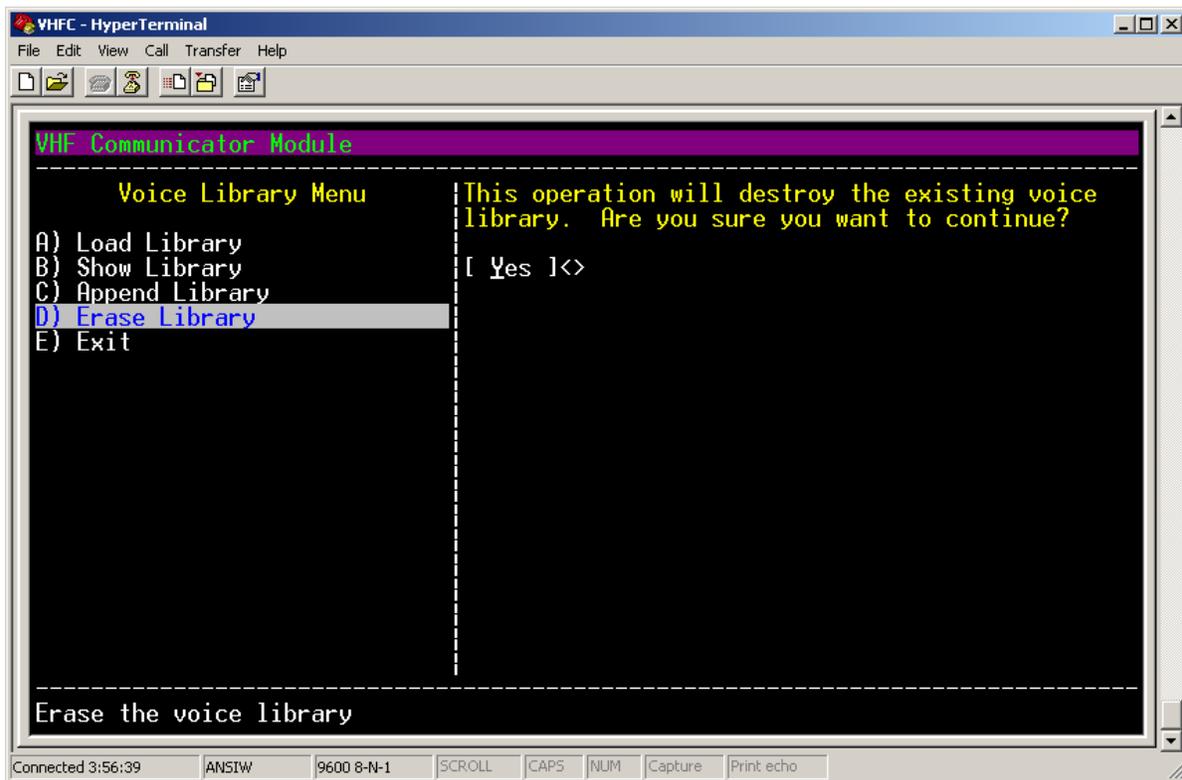


Figure 7-39 Erase Library

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8.0 TROUBLESHOOTING

8.1 GENERAL

While it is possible to give an outline of troubleshooting techniques, it is impossible to cover every combination of problems that may occur in the system. Therefore, the methods described below have been prepared as an outline for checking the system.

Table 8-1. Troubleshooting Chart

Problem	Possible Causes	Check or Try
Green Power LED not illuminated	No power to the VHFC	Check power supply input
Red Speech TX LED not illuminated	No speech messages being enunciated from the VHFC over the radio	Check s/w configuration
Red DTMF TX LED not illuminated	No DTMF tone sequences being transmitted from the VHFC over the radio	Check s/w configuration
Red DTMF RX LED not illuminated	No DTMF tone sequences being received from the VHFC over the radio	Check s/w configuration
Red DATA TX LED not illuminated	No data is being transmitted from the VHFC over the radio	Check s/w configuration
Red DATA RX LED not illuminated	No data is being received from the VHFC over the radio	Check s/w configuration
Red DCD LED not illuminated	No carrier signal is being detected from the VHFC on the radio	Check s/w configuration
Red PTT LED not illuminated	No carrier signal is being transmitted from the VHFC on the radio	Check s/w configuration
Red SEAR II TX LED not illuminated	No data is being transmitted from the VHFC to the SEAR II	Check s/w configuration
Red SEAR II RX LED not illuminated	No data is being received from the SEAR II to the VHFC	Check s/w configuration

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A.0 APPENDIX A - INSTALLING FERRITE BEADS ON VHF COMMUNICATOR CABLES

A.1 PURPOSE

In order to reduce radiated electromagnetic interference from the VHF Communicator power and Echelon cables, clamp-on ferrite bead filters must be installed as explained below.

A.2 CABLES AFFECTED

VHF Communicator power and Echelon cables:

Wire Specifications	Cable Description
14 or 16 AWG stranded, insulated wire. Twisted-pair recommended, but not required.	Power Cable
Level 4 #22 AWG (0.65mm) twisted pair or Category 5 #24 AWG (0.5mm) twisted pair. The Echelon® Configuration Handbook (Siemens Document COM-00-07-09) details the wiring requirements for the Echelon® network.	Echelon Cable

A.3 MATERIALS REQUIRED

The following item is required to modify the power and Echelon cables:

Description	Part Number	Quantity
Clamp-on EMI Filter (Ferrite)	Z590-00016-0000	2 (1 per cable)

A.4 CABLE MODIFICATION INSTRUCTIONS

Perform the following procedure to install the clamp-on EMI filter on the power cable:

Step 1. Open the clamp-on EMI filter as shown in Figure 1.



Figure 1. Clamp-on EMI Filter (open)

Step 2. Place the open EMI filter under the cable approximately one inch from the 2-pin power connector.

Step 3. Wrap the loose end of the cable around the outer surface of the filter and back through the center of the filter two times (totaling three runs inside the filter – see Figure 2), then snap the filter closed (see Figure 3).

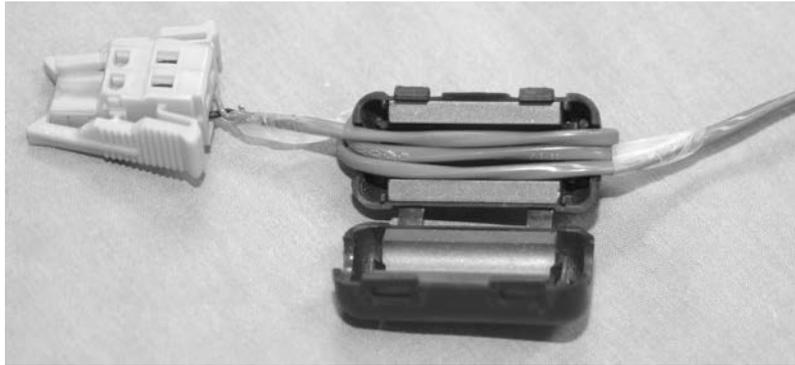


Figure 2. EMI Filter Installation (showing wire loops)

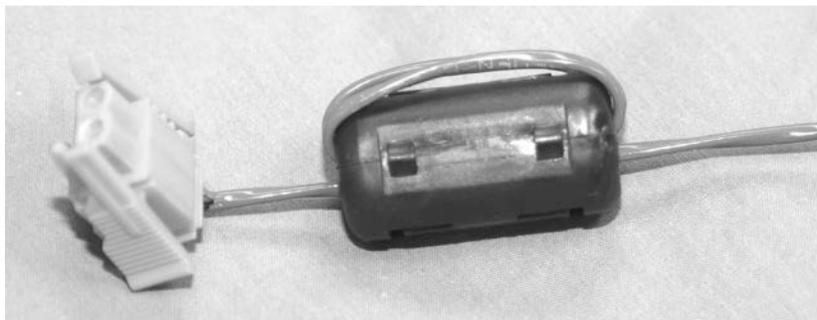


Figure 3. EMI Filter Installed

Perform the following procedure to install the clamp-on EMI filter on the Echelon cable:

Step 1. Open the clamp-on EMI filter as shown in Figure 1.

Step 2. Place the open EMI filter under the cable approximately one inch from the 2-pin Echelon connector.

Step 3. Wrap the loose end of the cable around the outer surface of the filter and back through the center of the filter one time (totaling two runs inside the filter), then snap the filter closed.

NOTES

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