micom
Advanced HF radio solutions

FRN8525
FRN8526
FRN8527

Modem/Vocoder

User Guide

Micom HF-SSB Modem/Vocoder

FRN8525A

FRN8526A

FRN8527A

User Guide

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Chapter 1 Introduction

The Micom Modem/Vocoder unit is a robust, digital voice coder (Vocoder) that uses a standard algorithm adjusted for use over narrowband radios. The unit can be ordered in various configurations to suit the user's specific needs: Vocoder only, Vocoder with AES (Advanced Encryption Standard) encryption, Modem only, Modem with AES encryption, or a combination of Vocoder and modem with or without AES encryption. Refer to Table 1 on page 2 for configuration options and part numbers.

The Micom Modem/Vocoder is compatible with all MICOM HF radios, as well as many other types of HF, VHF, and UHF radios. The unit connects to the radio set through a single 15-pin connector located on its rear panel. Power is supplied via the same connector.

Units that incorporate the Modem come with Micom-Net Email software. This software enables sending and receiving email, including file attachments, directly to other radios over the HF channel, as well as over the internet.

FEATURES

- Vocoder user data rate: 1200 bps (digital voice).
- Email data rate: up to 9000-10000 bps compressed, up to 4800 bps uncompressed.
- Digital voice with improved voice quality over weak or noisy channels, and through interfering signals.
- Simple Push-To-Talk operation.
- Optional voice encryption, using seven (7) operator selectable, AES algorithm keys (see Table 1 for the various encryption options).
- Backwards compatibe with previous Micom Vocoder models (FRN8497, FLN3176, and FLN3177).
- DSP and CPU based hardware, combined with state of the art algorithms, providing a technologically advanced, unified solution for digitized voice and data communications (encryption and data optional).
- All configurations of the Modem/Vocoder can be supplied/adapted for use with different brands of radios. Note that for Micom 3, the Modem/Vocoder is also available as an internal option. For more information, consult with your local distributor.

CONFIGURATION OPTIONS

The various Modem/Vocoder configuration options include:

Table 1: Optional Configurations

Model	Vocoder	4800 bps Data Modem with Micom-Net Email Software	AES encryption option#
FRN8525A	✓		FVN5228
FRN8526A*		✓	FVN5229
FRN8527A	✓	✓	FVN5230

*This model is also referred to as MDM4800.

Encryption is subject to export license.

🖉 **NOTE**

Throughout this guide, unless otherwise specified, references to FRN8525A also include models FRN8526A and FRN8527A.

Chapter 2 Installation

PACKAGE CONTENTS

Before installing, make sure you receive the following components according to the models and encryption options you ordered.

FRN8525A – Vocoder

- External Vocoder (FRN8525A)
- Cable, Vocoder to radio (???????????)
- Hand microphone (FMN1615A)
- Speaker, 8 Ω 5.5" external (HSN4027A)
- User's guide (6886868J01)

FRN8526A – Modem

- External modem (FRN8526A)
- Cable, Vocoder to radio (??????????)
- Cable, modem data (serial) to PC (????????)
- Software, Micom Net 32bit (????????)
- User's guide (6886868J01)

FRN8527A – Vocoder and Modem

- External modem (FRN8527A)
- Cable, Vocoder to radio (???????????)
- Cable, modem data (serial) to PC (????????)
- Software, Micom Net 32bit (?????????)
- Hand microphone (FMN1615A)
- Speaker, 8 Ω 5.5" external (HSN4027A)
- User's guide (6886868J01)

Encryption option FVN5228

- Cable, modem data (serial) to PC (??????????)
- Software, Micom Key Loader (MKL) (????????)

Encryption option FVN5229/FVN5230

- Software, Micom Key Loader (MKL) (??????????)

FRONT AND REAR PANELS

Figure 1 displays the front panel of the Modem/Vocoder.
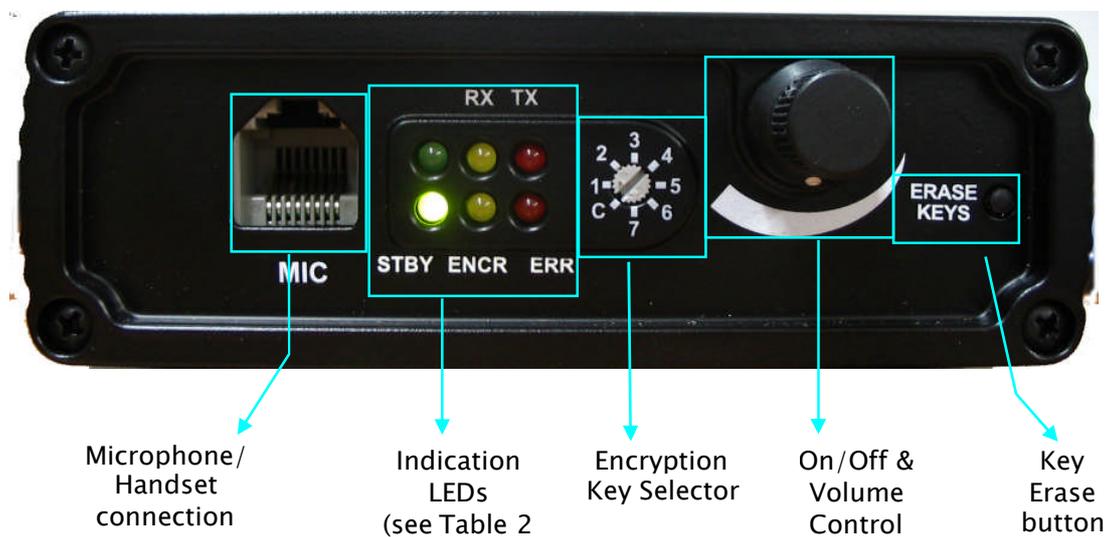
Figure 1: Modem/Vocoder Front Panel

Figure 2 displays the rear panel of the Modem/Vocoder.

15-pin radio connection port (see Appendix B for pin-outs)

RS232 Serial Port with RJ-11 connector (see Appendix C for pin-outs)

External Speaker connection
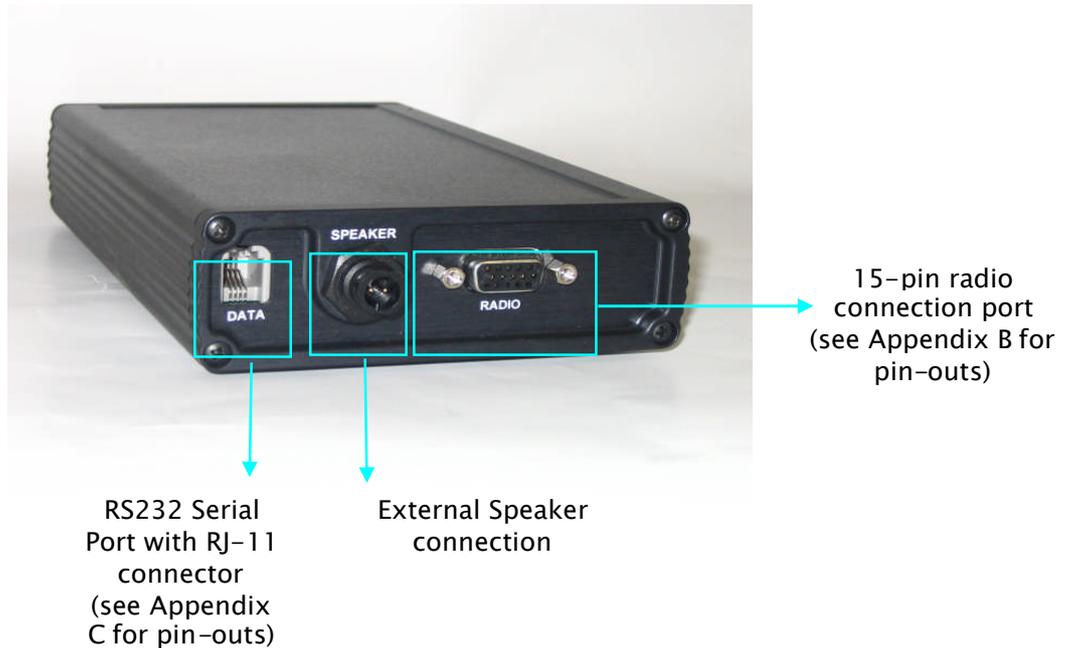
Figure 2: Modem/Vocoder Rear Panel

INSTALLING THE MODEM/VOCODER

When installing the Modem/Vocoder, see Figure 1 and Figure 2 on page 4 for the location of the various connectors.

To install the Moder/Vocoder:

1. Connect the Radio-Vocoder cable to the Vocoder and the radio, as follows (see Figure 3):

   ▪ Connect the 15pin connector of the Radio-Vocoder cable to the rear panel RADIO port.

   ▪ Connect the 25pin connector of the Radio-Vocoder cable to the transceiver accessory connector.

🖉 **NOTE**

When using the Micom 2E/3 radios without the 19" rack mount conversion options (G160, G638, etc.) or Junction Box (FLN2271), use the 44pin-to-25pin plug adaptor (FLN8276A), which must be ordered separately.

15pin
(male)
connector

Rack mounted
Micom 2E/3 / other
radios:
25pin (female)

Micom 2E/3:
25pin/44pin plug
adaptor (FLN8276)
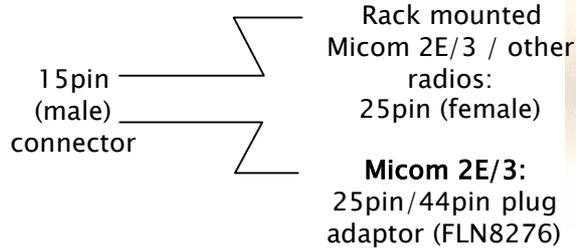
Figure 3: Connecting the Radio-Vocoder Cable

2. Attach the external speaker to the connector labeled SPEAKER located on the rear panel.

3. Attach the Microphone to the connector labeled MIC located on the front panel.

4. Set the transceiver's Microphone Side tone to ON/YES (refer to the radio manufacturer's owner's manual).

5. For data modem application or key loading, make sure a PC is connected via the supplied serial cable to the DATA port.
Refer to *Operating in Data Modem Mode* on page 10 for a full description of Data Modem mode.
Refer to *Operating in Encryption Mode* on page 8 for a full description of the encryption option.

The Vocoder is now ready for operation.

Chapter 3 Operation

TURNING ON THE UNIT

6. Turn the volume switch clockwise. A clicking sound is heard and the lower left STBY LED is lit.

Figure 4: Standby Mode

7. A self test is performed. All LEDs except STBY should blink for 1 second.

The Vocoder is now in standby and waiting communications.

For information on how to operate in encryption mode, refer to *Operating in Encryption Mode* on page 8.

For information on how to operate in modem data mode, refer to *Operating in Data Modem Mode* on page 10.

FRONT PANEL INDICATORS

The front panel includes six LEDs that indicate the operational status of the Vocoder.
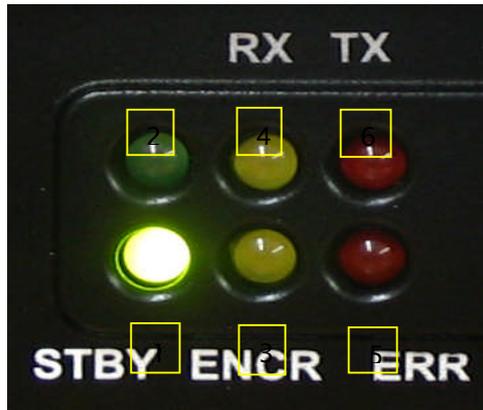
Figure 5: Front Panel LEDs

Table 2: Front Panel LEDs Indications

LED No.	Designation	Color	Description
1	STBY	Green	Vocoder is ready for use
2	(Blank)	Green	Reserved for future use
3	ENCR (optional)	Yellow	Encryption indicator (see Encryption Mode Indications on page 9)
4	RX	Yellow	Data/Voice is being received
5	ERR	Red	Receive error detected
6	TX	Red	Data/Voice is being transmitted

OPERATING IN ENCRYPTION MODE

Introduction to Encryption Mode

The Advanced Encryption Standard (AES) is a new Federal Information Processing Standard (FIPS-197), chosen by National Institute of Standards and Technology (NIST). AES specifies a cryptographic algorithm for use by U.S. Governmental organizations in order to protect sensitive but unclassified information.

The AES algorithm is an a-symmetric block cipher that can encrypt (encipher) and decrypt (decipher) information. It is capable of using 128, 192, and 256-bit cryptographic keys to encrypt and decrypt data in blocks of 128 bits.

For each given message, the encryption key is chosen at random from among an enormous number of keys. Like other private key cryptographic methods, both the sender and the receiver must know and use the same private key.

Enabling Encryption and Switching Keys

To enable Encryption mode, use a small flat blade screwdriver to turn the Key Selector switch so that the arrow is not pointed to C (Clear mode) but to the required key number. To change encryption keys (1–7), use the screwdriver to turn the switch so the arrow is pointed to the requested key number.

Encryption Mode Indications

Figure 6: Encryption Mode Indications

The front panel LEDs indicate encryption status, as follows:

- *Encryption enabled*: when encryption mode is enabled, the ENCR LED is constantly on.

- *Transmission*: during transmission, the TX and ENCR LEDs are both on. A low volume beep emitted every 3 seconds indicates that the transmission is being encrypted.

  - Reception:

    - When the RX and ENCR LEDs are both on, an encrypted transmission is being received.

    - When the RX LED is on but the ENCR LED is blinking:

    - If voice is heard: although encryption is enabled on the receiver side, the recieved transmission was not encrypted (received in clear format).

    - If no voice: the received transmission was encrypted with a different key than the one used by the receiver, and therefore could not be decrypted.

Key Loading via MKL Setup

To load the keys via MKL (Micom Key Loader):

- Connect the RS232 cable RJ-11 connector to the Vocoder DATA port on the rear panel (see Figure 2).

  - Connect the RS232 cable to a PC with the MKL application installed.

    For MKL operation see the MKL application help.

Key Erasing

To erase all keys from memory, turn the Key Selector to Clear mode (C) and press in the ERASE KEYS button for 3 seconds.

OPERATING IN DATA MODEM MODE

Introduction to Data Modem Mode

The FRN8526A/FRN8527A is a 4800bps (uncoded) rated modem fully compliant with
MIL-STD-188-110B section 5.3.2, and STANAG 4539 annex B sections 2,3, using automatic baud rate selection and error correction.

Enabling Data Modem Mode

To enable Data Modem mode:

8. Make sure the Modem/Vocoder is turned on and the STBY LED is on.

9. Run the required PC application (Micom Net) according to the application guide or help file.

Data Modem Mode Indications

- When a link is established and the modem sends and receives data, the TX/RX LEDs are alternatively lit.

- When Channel quality degrades, the ERR LED lights up. A longer duration between subsequent lighting of the ERR LED signifies better channel quality.

Appendix A Technical Specifications

	FRN 8525 Vocoder Digital Audio Quality Enhancer + FVN5228 AES* Encryption	FRN 8526 4800bps MODEM with Email/Internet gateway + FVN5229 AES* Encryption	FRN 8527 Integrated 4800bps Modem with Email/Internet gateway and Vocoder. + FVN5230 voice and data AES* encryption	
			FRN 8525 Vocoder operation mode	Data Modem operation mode
General:				
Waveform	MIL–STD–188–110B section 5.3.2 STANAG 4539 annex B sections 2,3	MIL–STD–188–110B section 5.3.2 STANAG 4539 annex B sections 2,3	MIL–STD–188–110B section 5.3.2 STANAG 4539 annex B sections 2,3	MIL–STD–188–110B section 5.3.2 STANAG 4539 annex B sections 2,3
User Data–Rates Without compression	Coded 1200bps (voice)	Coded: 75–2400 bps (Automatic Baud rate selection) Uncoded: up to 4800bps	Coded 1200bps (voice)	Coded: 75–2400 bps (Automatic Baud rate selection) Uncoded: up to 4800bps
Immunity to multi–ray multipath	5 fading–rays tested (over standard performance)	5 fading–rays tested (over standard performance)	5 fading–rays tested (over standard performance)	5 fading–rays tested (over standard performance)
Power	+10 to +18VDC @ 1A maximum	+10 to +18VDC @ 1A maximum	+10 to +18VDC @ 1A maximum	+10 to +18VDC @ 1A maximum
Interfaces:				
Control	RS232 Asynchronous	RS232 Asynchronous	RS232 Asynchronous	RS232 Asynchronous
Data	NA	RS232 Asynchronous	NA	RS232 Asynchronous
Input Audio	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)
Output Audio	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)	Nominal 0 dBm (600 Ohm, balanced)
Input/Output connectors	Microphone/ Handset (front); External Speaker (rear)	Microphone/ Handset (front); External Speaker (rear)	Microphone/ Handset (front); External Speaker (rear)	Microphone/ Handset (front); External Speaker (rear)
I/O Connectors:				
Radio Port	15–pin D–type female connector for RX audio, TX audio, PTT	15–pin D–type female connector for RX audio, TX audio, PTT	15–pin D–type female connector for RX audio, TX audio, PTT	15–pin D–type female connector for RX audio, TX audio, PTT
Data Port	Serial RS–232 control port. RJ–11 connector	Serial RS–232 control port. RJ–11 connector	Serial RS–232 control port. RJ–11 connector	Serial RS–232 control port. RJ–11 connector

	FRN 8525 Vocoder Digital Audio Quality Enhancer + FVN5228 AES* Encryption	FRN 8526 4800bps MODEM with Email/Internet gateway + FVN5229 AES* Encryption	FRN 8527 Integrated 4800bps Modem with Email/Internet gateway and Vocoder. + FVN5230 voice and data AES* encryption	
			FRN 8525 Vocoder operation mode	Data Modem operation mode
Microphone	RJ45 connector	NA	RJ45 connector	NA
Speaker	5W / 8 Ohm	NA	5W / 8 Ohm	NA
Environment:				
Temperature	−30 to + 60℃	−30 to + 60℃	−30 to + 60℃	−30 to + 60℃
Humidity	95% @ + 50℃	95% @ + 50℃	95% @ + 50℃	95% @ + 50℃
Storage	−40℃ to +85℃	−40℃ to +85℃	−40℃ to +85℃	−40℃ to +85℃

* Encryption is subject to export license

Appendix B Vocoder Radio Port Pinouts

Pin	Function	Comments
1	Rx audio Base Band input from radio, + wire	0 dBm, 600 Ω
2	Rx audio Base Band input from radio, – wire	0 dBm, 600 Ω
3	TX audio output to radio, + wire	0 dBm 600 Ω
4	TX audio output to radio, – wire	0 dBm, 600 Ω
6	PTT output to radio	5V, maximum 100 mA 0V – Active PTT
7,8	Supply voltage input	13.8 VDC, 1A
9,10	Ground	

RADIO CABLE SCHEMATICS

HF SSB Radio

TO POWER SUPPLY
(13.8 VDC, 1A)

+   -

1	2	3	4	6	7	8	9	10
RX BB+	RX BB-	TX BB+	TX BB	PTT	13.8 VDC	13.8 VDC	GND	GND
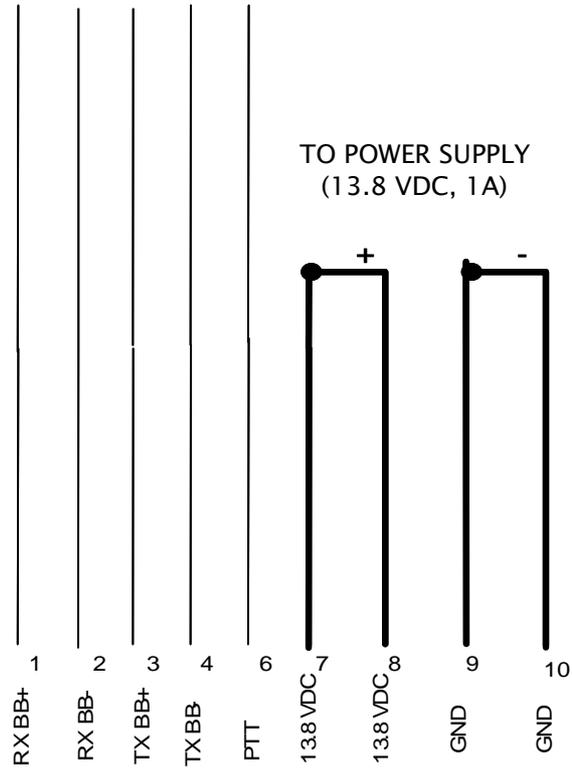
VOCODER

Appendix C Serial Port Pinouts

Vocoder Serial Com port (DATA)   PC Serial RS232 Com
                                    Port

Pin	Function
4	GND
3	TX output (RS232 levels)
1	RX input (RS232 levels)

Pin	Function
5	GND
2	RX input (RS232 levels)
3	TX output (RS232 levels)