



MSK Modem Product Manual

Part No. 255362B*

DATE 5/21/07



IMPORTANT NOTICE

Thank you for choosing Federal Signal products!

Please complete an online registration of your product by visiting our website www.federalwarningsystems.com. Click on the “Register Product” tab.

Our registered customers will receive discounts on future upgrades and choose to receive Federal Signal product information, updates, and special offers on additional products.

PLEASE THOROUGHLY READ THE FOLLOWING SAFETY NOTICES.

Federal Signal reserves the right to make changes to devices and specifications detailed in the manual at any time in order to improve reliability, function or design. The information in this book has been carefully checked and is believed to be accurate; however, no responsibility is assumed for any inaccuracies.

SAFETY NOTICES

The health and safety of others depends on your safe installation, service and operation of our products. It is important to read, understand and follow all instructions shipped with this product. Contact Federal Warning System's Customer Care Center at: <http://www.federalwarningsystems.com> or 1-800-524-3021 for further information or to obtain additional copies of product literature.

Important safety instructions and precautions you should follow are listed below:

PLANNING

- If suitable control and status monitoring equipment is not selected, or the installation site for the equipment is not selected properly, or the equipment is not installed properly, it may not be able to perform its intended functions. Please read all information in this manual before planning and installing the control system.
- The control system may be used to remotely and automatically control equipment that may be dangerous to personnel near the equipment while in operation. To prevent injury, carefully plan site locations, post warnings and restrict access to dangerous areas. Whenever possible, disconnect all control system power, including batteries, before working near the equipment being controlled.

INSTALLATION & SERVICE

- Electrocutation or severe personal injury can occur when performing various installation and service functions such as making electrical connections, drilling holes, or lifting equipment. Experienced electricians should perform installation in accordance with national, state and any other electrical codes having jurisdiction. All work should be performed under the direction of the installation or service crew safety foreman.
- After installation or service, test the system to confirm that it is operating properly. Test the system regularly to confirm that it continues to operate as intended.
- If future service personnel do not have these warnings and all other instructions shipped with the equipment to refer to, the siren system may not provide the intended audible warning and service personnel may be exposed to death, permanent hearing loss, or other bodily injury. File these instructions in a safe place and refer to them periodically. Give a copy of these instructions to new recruits and trainees. Also, give a copy to anyone who is going to service or repair the sirens. For additional copies, call the Federal Warning Systems Customer Care Center at 800-524-3021 or write to them at 2645 Federal Signal Drive, University Park, IL 60466.

OPERATION

- Failure to understand the capabilities and limitations of your control system could result in serious injuries to persons affected by the use of this control system. Carefully read and thoroughly understand all safety notices in this manual and all operations-related items in all instruction manuals shipped with equipment. Thoroughly discuss all contingency plans to be used in case of an unforeseen equipment failure.

Limited Warranty

*The Signal Division, **Federal Signal Corporation**, warrants each new product to be free from defects in material and workmanship, under normal use and service, for a period of two years on parts replacement and one year on labor from the date of delivery to the first user-purchaser*

During this warranty period, the obligation of Federal is limited to repairing or replacing, as Federal may elect, any part or parts of such product which after examination by Federal discloses to be defective in material and/or workmanship.

Federal will provide warranty for any unit which is delivered, transported prepaid, to the Federal factory or designated authorized warranty service center for examination and such examination reveals a defect in material and/or workmanship.

This warranty does not cover travel expenses, the cost of specialized equipment for gaining access to the product, or labor charges for removal and re-installation of the product. The Federal Signal Corporation warranty shall not apply to components or accessories that have a separate warranty by the original manufacturer, such as, but not limited to, batteries.

This warranty does not extend to any unit which has been subjected to abuse, misuse, improper installation or which has been inadequately maintained, nor to units which have problems related to service or modification at any facility other than Federal factory or authorized warranty service centers. Moreover, Federal shall have no liability with respect to defects arising in Products through any cause other than ordinary use (such as, for example, accident, fire, lightning, water damage, or other remaining acts of god).

THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL FEDERAL BE LIABLE FOR ANY LOSS OF PROFITS OR ANY INDIRECT OR CONSEQUENTIAL DAMAGES ARISING OUT OF ANY SUCH DEFECT IN MATERIAL WORKMANSHIP.



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Federal Warning Systems

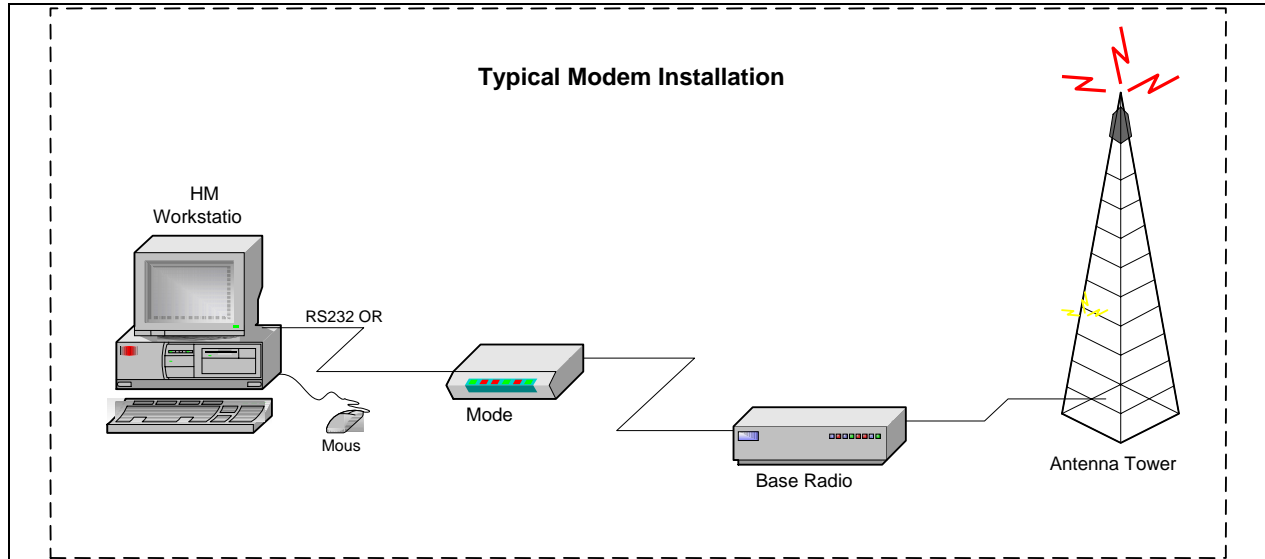
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SECTION 1 General Description

1.0 Introduction



The illustration above shows a typical configuration of the MSK RF Modem at an HMI workstation with communications link to RTU's (Remote Terminal Units). The RF modem provides an interface between the HMI (Human Machine Interface) workstation computer and the communications network. The RF modem has a universal transceiver interface, providing 1200 or 2400-baud communications over a wide range of wireless base-station types or to landlines for wire-line control. Indicator lights allow the user to monitor the modem communications and an internal monitor speaker allows the user to hear incoming and outgoing data packets. A built-in receive level indicator allows for easy adjustment during initial setup.

1.1 Features Summary

- Universal transceiver interface connects to a wide range of transceiver types
- Power, communications status, as well as receive level indicators
- Integral speaker for field service monitoring of communications
- Easy installation and alignment
- 1200 or 2400 baud communications
- Integral 600-Ohm interface for transceiver interface or wire-line control
- Integral local RS232 port for local control, configuration and diagnostics
- USB – Universal Serial Bus allows connection between devices

SECTION 2 SPECIFICATIONS

2.0 Electrical

Input Voltage	10-15VDC
Current Draw	<100mA

2.1 Serial & I2C Ports

Serial Port Protocol	RS232C 1200,N,8,1 / 2400,N,8,1
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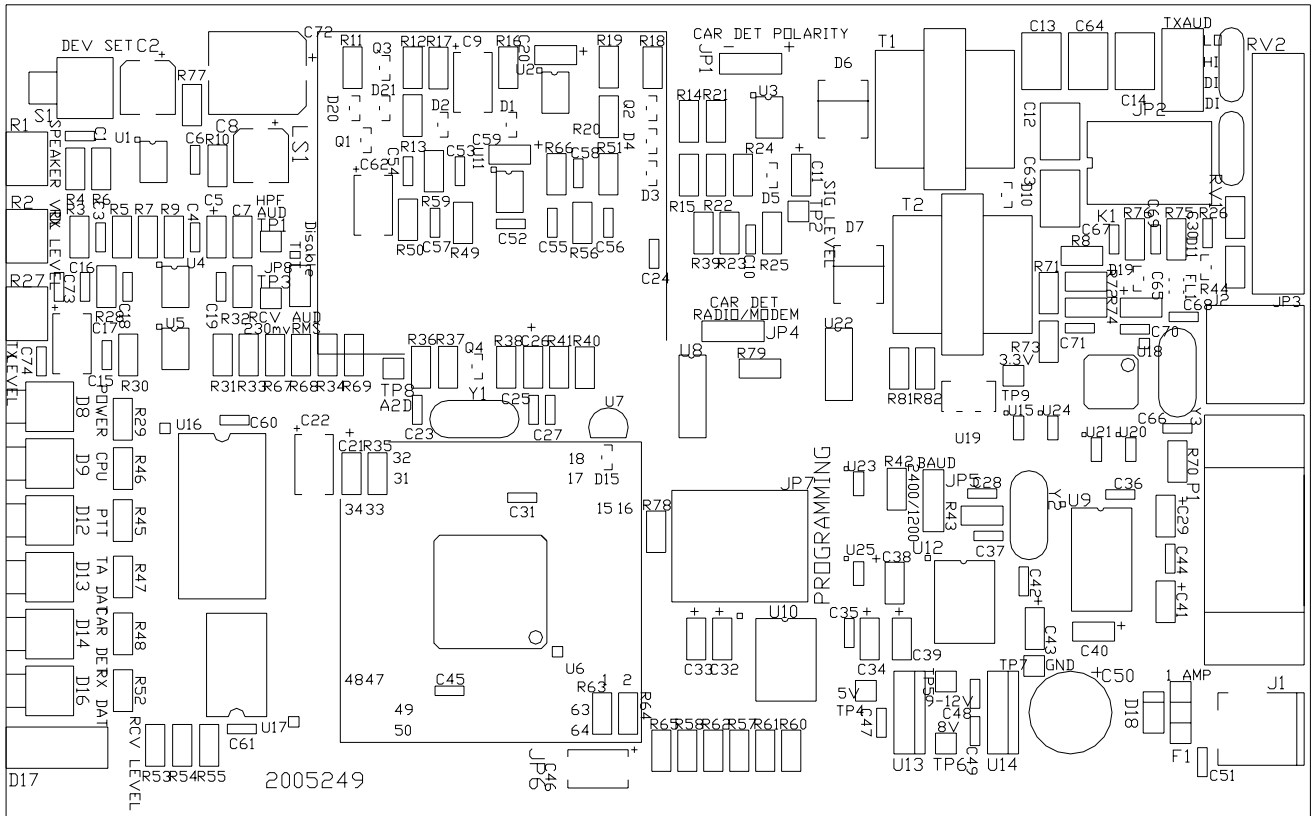
2.2 Radio Modem

Decode Sensitivity	18 dB SINAD
Communications	1200 or 2400-baud MSK
Modem Tones	1200/1800 for 1200 baud 1200/2400 for 2400 baud

2.3 Transceiver Interface & 600 Ohm ports

RX Audio Input Level	40 to 1200 mVRMS, (-25dB to +3.8dB) Set to make 230 mVRMS at TP3
Protection	MOV and Transorb surge protection
Impedance	600 Ohms
TX Audio Output Level	10 to 775 mVRMS, (-37dB to 0dB) Into 600 Ohms, w/ Low Z output 30 to 1500 mVRMS Into 10k Ohms, w/ High Z output
Protection	MOV and Transorb surge protection
Impedance	600 Ohms or 10k Ohms
PTT Relay Output	1 Amp @ 30VDC, 0.3 Amps @ 120VAC
Carrier Detect Input	< 80k Ohms between JP3 pins 1 & 2, or < 1.75VDC relative to JP3 pin 1 for active state.

2.4 Connectors Indicators and Controls



Component Locations

Connectors:

J1 10-15VDC Power Input – pin size 0.08, Center of plug = (+)

JP1 Carrier Detect Polarity

Jumper pins 1 & 2 for active Low
 Jumper pins 2 & 3 for active High

JP2 Transmit Audio Output Impedance

Jumper pins 1 & 2 for 10K Ohms output impedance
 Jumper pins 2 & 3 for 600 Ohms output impedance

JP3 Transceiver Interface Connector

- 1 - Ground reference for carrier detect input
- 2 - Carrier detect input
- 3 - Normally Open contact of PTT relay output
- 4 - Common of PTT relay output
- 5 - One side of balanced 600 Ohm receive audio input
- 6 - Other side of balanced 600 Ohm receive audio input
- 7 - One side of balanced 600 Ohm or 10K Ohm transmit audio output
- 8 - Other side of balanced 600 Ohm or 10K Ohm transmit audio output

JP4 Carrier Detect Source Selector

- Jumper pins 1 & 2 for modem carrier detect
- Jumper pins 2 & 3 for radio carrier detect

JP5 Baud rate selector

- Jumper pins 1 & 2 for 2400 Baud, Jumper pins 2 & 3 for 1200 Baud
- (Note: The Federal Commander Digital System only supports 1200 Baud)

JP6 JTAG Emulation port (Factory use only)

JP7 FLASH Programming Port (Used to update the modem operating system)

- 1 – Not Used
- 2 - TX Data, standard RS232 levels
- 3 - RX Data, standard RS232 levels
- 4 - Ground
- 5 - Serial Clock input for FLASH programming, standard RS232 levels
- 6 - Processor ResetNot line, used in programming FLASH, 10k pull-up

P1 RS232 Serial Port

- 1 - DCD, Radio carrier detect to PC
- 2 - Radio receive data to PC, standard RS232 levels, 1200 Baud,N,8,1
- 3 - Radio transmit data from PC, standard RS232 levels, 1200 Baud,N,8,1
- 4 - DTR, Radio PTT from PC
- 5 - Ground, 0.5 amps max current capacity
- 6,7,8,9 – Not Used

Indicators:

- D8 - Power indicator, green
- D9 - CPU Heartbeat indicator, green
- D12 - Transmit, radio PTT indicator, red
- D13 - Transmit data indicator, red
- D14 - Receive carrier detect indicator, yellow
- D16 - Receive data indicator, yellow
- D17 - Bar-graph display, Receive level indicator, yellow,
 - No segments lit = < 50mVRMS
 - 1st segment = 50 to 175mVRMS
 - 1st & 2nd segments = 175 to 300mVRMS
 - 1st, 2nd & 3rd segments = > 300mVRMS

Controls:

- S1 Transmit deviation set, push to cause radio to transmit 1200Hz modem tone.
- R2 Receive audio level; Set to turn on the 1st two segments of D17.
- R27 Transmit audio level; Set to make proper deviation.
(Typically 3.5 - 4 kHz for 25 kHz bandwidth channels and 1.75 – 2 kHz for 12.5 kHz bandwidth channels).

2.5 Environmental

Operating Temperature	-30° C - +65° C
Humidity	0-95% Non-Condensing

2.6 Physical

Size	1.32" height, 4.18" width, 6.54" length
Shipping Weight	2 Lbs.

SECTION 3

Installation and Calibration

3.0 Installation

A. Computer Connection

The modem connects to the computer via an RS232 port (DB9 female connector) on the rear panel of the modem. A standard 9 pin serial cable should be used (FS part number 1751190A). Do not use a null modem cable. The modem will automatically convert all RS232 data to an MSK encoded audio source that can be used with radio and landline communications systems.

Place the modem on a stable level surface away from moisture and electrical interference. The modem should be within six feet from the computer and the radio or wire-line interface. Distances up to 30 feet can be used if a longer serial cable is provided. A short haul modem should be used between the computer and the modem if the serial connection is over 30 feet.

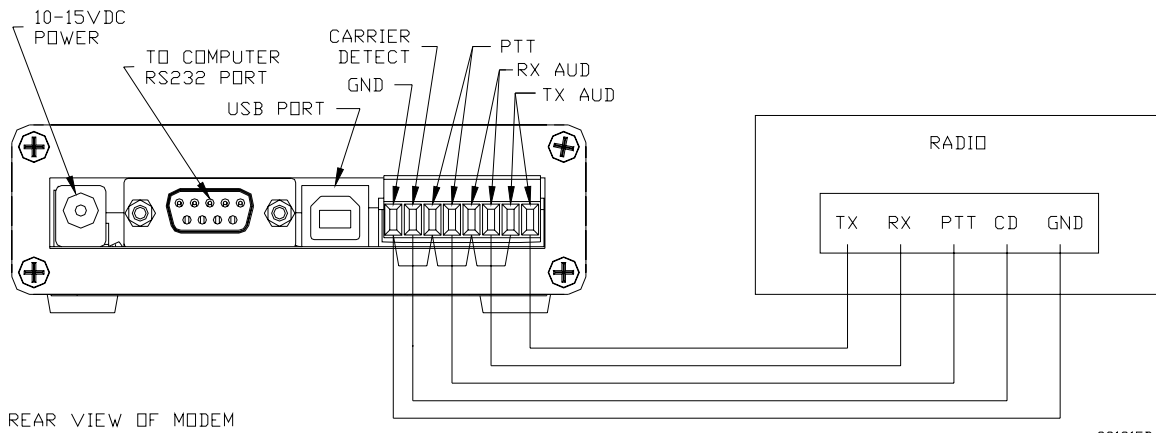
B. Radio or Landline Connections

The output of the modem is brought out of the rear panel of the modem using an 8-pin connector that accepts bare wire 26-18 AWG. The pin designations for the connector are listed below.

JP3, 8-Pin Transceiver Interface Connector

- 1 - Ground reference for carrier detect input
- 2 - Carrier detect input
- 3 - Normally Open contact of PTT relay output
- 4 - Common of PTT relay output
- 5 - One side of balanced 600 Ohm receive audio input
- 6 - Other side of balanced 600 Ohm receive audio input
- 7 - One side of balanced 600 Ohm or 10K Ohm transmit audio output
- 8 - Other side of balanced 600 Ohm or 10K Ohm transmit audio output

The modem should be placed as close as possible to the radio or wire-line interface. Twisted/shielded cable should be used if the wire run must exceed 6 feet. When the modem is connected to a single ended audio system as is found with many radios, one end of the 600 ohm transmit and receive audio lines must be tied together as shown below.



C. Power Connection

Power is supplied to the modem at the circular power plug on the rear of the modem. This input requires a DC power source between 10 and 15VDC. The center pin is + and the outside pin is ground.

D. Baud Rate Configuration

The standard baud rate is set to 1200 Baud by jumpering pins 2 and 3 of JP5 on the modem board (inside the housing). The 1200 Baud rate is compatible with the Federal Commander Digital Control Systems. The modem can be configured to transmit at 2400 baud by jumpering pins 1 and 2 of JP5 for use in 2400-baud systems.

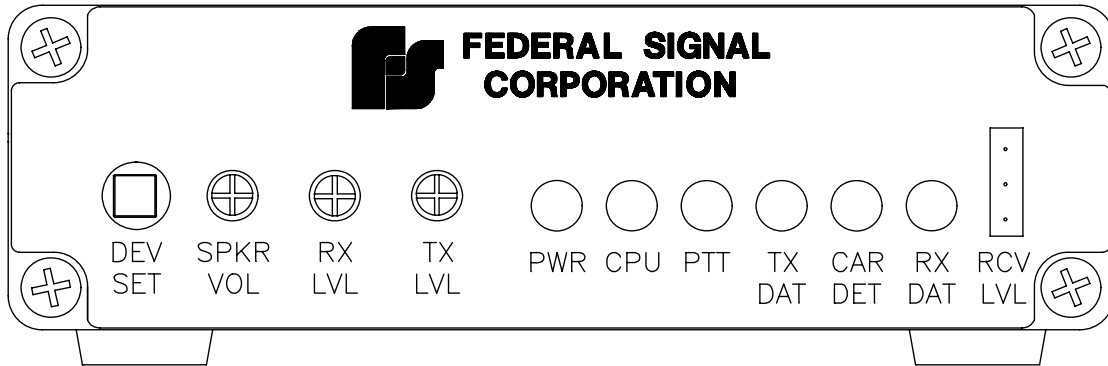
E. Carrier Detect Polarity

The standard configuration for carrier detect is set with JP1 pins 1 and 2 jumpered together. In this configuration, carrier will be detected when the CD input goes low or pulls to ground. If the carrier detect signal goes high (above 2 VDC) when carrier is present, jumper pins 2 and 3 of JP1 on the modem board.

F. Transmit Audio Output Impedance

The standard configuration for transmit impedance is set for 600 ohms. If the circuit requires a high impedance output, jumper pins 1 and 2 of JP2 on the modem board to select a 10k ohm output impedance.

3.1 Calibration



291313A

Refer to the front panel drawing of the modem above for reference during calibration.

A. Receive Audio Level Adjustment

The receive audio level is adjusted using the “RX LVL” potentiometer located on the front panel of the modem. Adjust this pot until the bottom two LEDs on the “RCV Level” indicator remain on and the top LED is off when the modem is receiving a signal. This signal may be easily generated by sending a calibration tone from an RTU. Short JP18 on the RTU board to send a calibration tone.

B. Transmit Audio Level Adjustment

The transmit audio level is adjusted using the “TX LVL” potentiometer located on the front panel of the modem. Press the “DEV SET” button on the front panel of the modem to generate a modem tone. Adjust the TX LVL pot until the desired output level is obtained at the audio output connector. If a radio transceiver is used, adjust the output for 3.5 – 4kHz deviation for a 25kHz spaced radio system. If a 12.5kHz bandwidth radio channel is used, adjust the deviation to 1.75 – 2kHz deviation. (Note that the “Front Porch” or PTT time before sending data is fixed at 500ms. when using the Commander Digital System.)

C. Speaker Volume Adjustment

The modem’s speaker volume is adjusted via the “SPKR VOL” located on the front panel of the modem. Press the DEV SET button and adjust this pot until the desired audio level is obtained from the modem’s speaker.

3.2 Testing

Verify that all LEDs are operating correctly on the modem. The power LED should remain on when power is applied to the modem and the CPU LED should be blinking. The TX DAT LED and the PTT LED should turn on when the DEV SET button is pressed. The CAR DET and RX DAT LED should turn on when the modem is receiving data.

Poll a Remote Terminal Unit from the control point and verify the RTU responds to the poll correctly. Repeat this polling sequence at least 10 times sequentially and verify that communications are consistent.

SECTION 4 Maintenance

4.0 Daily Testing

Daily testing should be done to ensure that the communications system is operating properly. A system wide poll of all RTU's in the system is an easy way to confirm that the system is communicating properly. Communications failures should be investigated and corrected to ensure the system continues to perform as expected.

4.1 Semi-Annual Calibration

The calibration procedure above should be performed semi-annually to verify that the communications system remains in calibration.

4.2 Updating the Operating System

The modems operating system software is contained in non-volatile FLASH memory. The operating system is programmed at the factory. If special circumstances require a change to the operating system, contact Federal Signal Customer Service at:
Phone: (800) 524-3021 Fax: (708) 534-4865.

Required Equipment:

- Six (6) conductor telephone cable
- Programming adaptor board (FS Part no. 2005204)
- RTU Programming Software
- Modem Operating System Update (HEX File)

Programming Procedure

CAUTION: This procedure should only be performed by a qualified service technician using appropriate ESD protection to prevent damage to the modem.

Remove the modem board from the modem enclosure. Attach the programming adaptor board to the computer's DB9 serial port. Plug the 6 conductor cable into the adaptor in the "FLASH" position and connect the other end to JP7 of the modem board. Launch the RTU Programming software and click the "UPDATE" button. Select the updated Modem hex file and open. When the screen reads "With the unit powered ON Plug in the FLASH Programming Cable", click "OK". After programming, test the modem for proper operation before placing back into service.