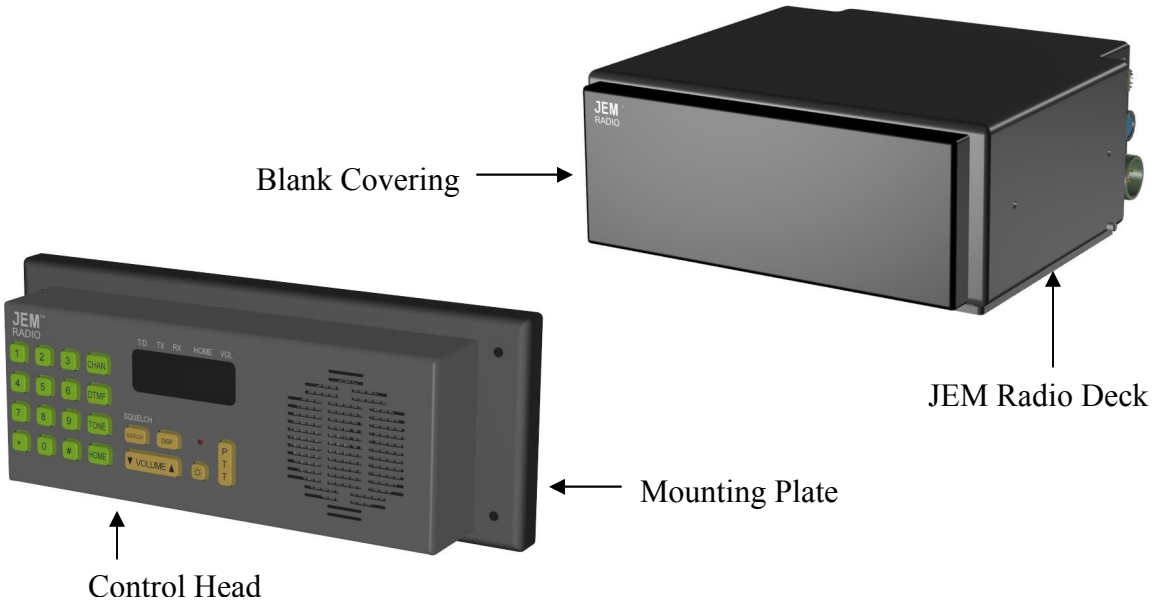
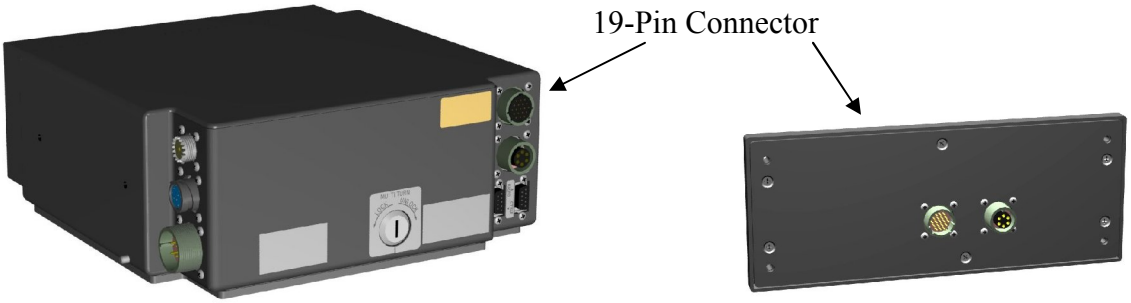
User Guide

This **JEM Radio** is based around a 6.25 KHz digital radio with all the form, fit and function of the AAR requirements. This clean cab radio (JEM Radio) is designed to function as a one or two piece. The one piece JEM Radio is pictured above.

To make the JEM Radio into a two-piece radio, the control head is removed from the front of the deck and a blank installed in its place. The control head is inserted onto a remote mounting plate and installed into the standard AAR opening in the locomotive throttle stand. The deck may be mounted under the floor. A data/power cable is routed from a 19-pin connector on the back of the deck to the 19-pin connector on the back of the remote control head. The JEM Radio is then operated as before.



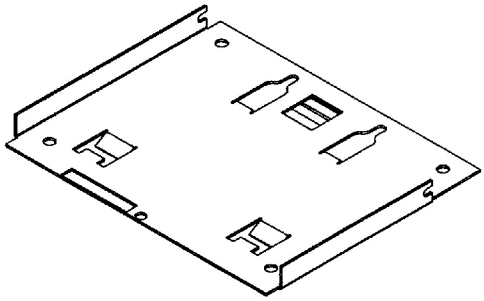
(719) 574-5541 JEM Communications, Inc. (402) 334-2923

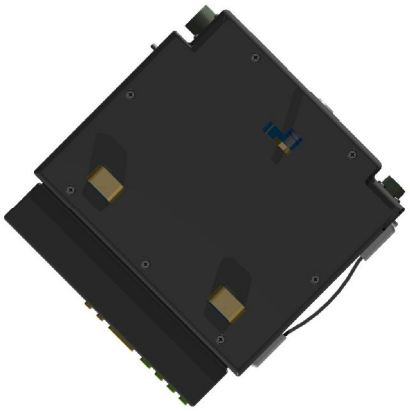


JEM Radio Rear:
19-Pin Connector Upper Right

Control Head Mounting Plate:
19-Pin Connector Left

The Remote Control Head has threaded holes in each corner of the mounting plate that meet up with the recommended AAR mounting holes. The mounting screws are inserted from outside the enclosure to secure the Remote Control Head in place.





JEM-BRKT

An AAR JEM-BRKT radio mounting plate for the JEM Radio may also be ordered from JEM Communications, Inc. This mounting plate may be installed in the throttle stand, under the floor or wherever needed.

It is important to also note at this point that the carrying handle for the JEM Radio may be installed on either side of the radio. With the JEM Radio in the upright position and facing the control head the handle is on the left side in the above views. Mounting holes are also on the right side of the case to install the handle.

Following is a list of the functions on the **JEM Radio**:

Channel Entry: 

The JEM Radio has the capability of Digital (6.25 KHz), Narrow (12.5 KHz) and Wide (25 KHz) channel pairs. The digital channels are selected by hitting the CHAN 

button and entering 6 digits (first 3 digits for TX and then 3 digits for RX). Those channel numbers are from 302 to 487. Valid narrow channel numbers are also three (3) digits to include (001 – 097) and (104 – 196). For example, narrow band channel 084 is the same frequency as wide band channel 84 and narrow band channel 184 selects the frequency between channels 084 and 085. A wide band channel is selected by hitting the CHAN button and entering 4 digits (first 2 digits for TX and then 2 digits for RX). After entering 4 digits, the radio will wait approximately 3 seconds before accepting the entry as a complete wide band channel pair. Or the CHAN button can be hit immediately after entering the four (4) digits and the JEM Radio will go to those two wide band channels without delay. Valid wide band channels in the US include (05 – 97). Every wide band channel has the equivalent narrow band channel frequency. It is INVALID to enter a mixed combination of digital, narrow and wide band TX/RX pair. The TX and RX channels must both be in the same band. Check the AAR Frequency Numbering Plan to see the frequency for each transmit or receive channel.

Volume: 

The volume of the front panel speaker is selectable between 1 and 20. Press and hold the VOLUME rocker switch 

to the right to increase or to the left to decrease the volume. A tone will sound each time the volume changes to indicate loudness. The volume button can be held down to quickly change values. The JEM Radio Config Tool may be used to set a minimum value the radio is allowed to go down to.

DTMF Tones: 

	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

DTMF digits can be sent by hitting the number keys as well as the '#' and '*' key. The number keys will not send DTMF tones when in the channel or tone selection mode. Sequenced DTMF tones can be sent by first hitting the DTMF 

button and then hitting the number keys in succession to select a number sequence. The T/D field of the VF display will change to D and the first number selected. Each following number pressed will send the corresponding DTMF tone but the display will not change. The duration of the transmitted digit is set with the core radio programming software.

Single Tones: 

Single tones can be sent by first hitting the TONE  button and then hitting a number key to select a predefined signal tone frequency. The T/D field of the VF display will change to T and the number to show the keypad selection. The keypad buttons *, 0 and # are invalid selections. Each successive tone must be preceded by the TONE button. The table to the right is a typical example of the number buttons vs each tone. The frequency of each tone may be set as desired in the core radio programming software.

Button	Tone (Hz)
1	900
2	1478
3	1748
4	1800
5	1900
6	2200
7	2400
8	2600
9	2800

Home Numbers: 

Think of **Home Numbers** like a speed dial number on your phone. 1 thru 500 Home Numbers may be set up in the JEM Radio with the JEM Radio Config Tool software. Home numbers are selected by hitting the HOME  key and then hitting the one (1), two (2) or three (3) number keys to select a predefined TX, RX pair. The currently selected home number will be displayed in the Home area of the VF display. When the Home Numbers are configured for one radio, then that configuration may be saved as a file to be written into other 6.25 KHz capable JEM Radios.

For single digit home numbers you may simply hit the HOME  key and corresponding number for the desired TX, RX pair, wait 3-4 seconds and the JEM Radio will set it up. For a double digit home channel the same applies; hit the HOME  key and then the corresponding double digit number for the desired TX, RX pair, wait 3-4 seconds for the JEM Radio to respond. To not have to wait for the 3-4 seconds delay, simply hit the Home key again after entering the single or double digits. The currently selected single, double or triple digit home number will be displayed in the Home area of the VF display.

Revert to Last TX-RX Channel Pair:

For those roads that operate with two (2) primary TX-RX channel pairs the **'Revert to Last TX-RX Channel Pair'** key sequence may be very desirable. First set up the two channel pairs. Example: [CHAN] 7272 [CHAN] would set up the 1st channel pair that could be considered a road channel. Next enter [CHAN] 4809 [CHAN] for the 2nd channel pair as a dispatcher channel. While in dispatcher channel the operator may hit the HOME  key and then # key. The JEM Radio will Revert to the road channel TX-RX pair of 72 72. While in the road channel the operator may now hit the HOME  key and then the # key and the JEM Radio will Revert to the dispatcher channel TX-RX pair of 48 09. And then hit HOME  key and # key to revert back to the road channel. Etc.

Brightness Control: 

The brightness of the VF display can be set to 4 intensities by pushing the brightness button  . The keypad is constantly backlit as long as power is supplied to the radio. Depressing the button  for more than three (3) seconds displays the software version in the radio deck and the control head.

TX, BSY Indication:

A TX or BSY will appear in the lower right of the VF display to indicate radio status. TX indicates the radio is transmitting. BSY indicates the radio is receiving a transmission or that the control head is busy setting up the core radio.

PTT: 

The PTT button 

is pressed to transmit voice messages via the front panel microphone.

Squelch: 

The SQUELCH button 

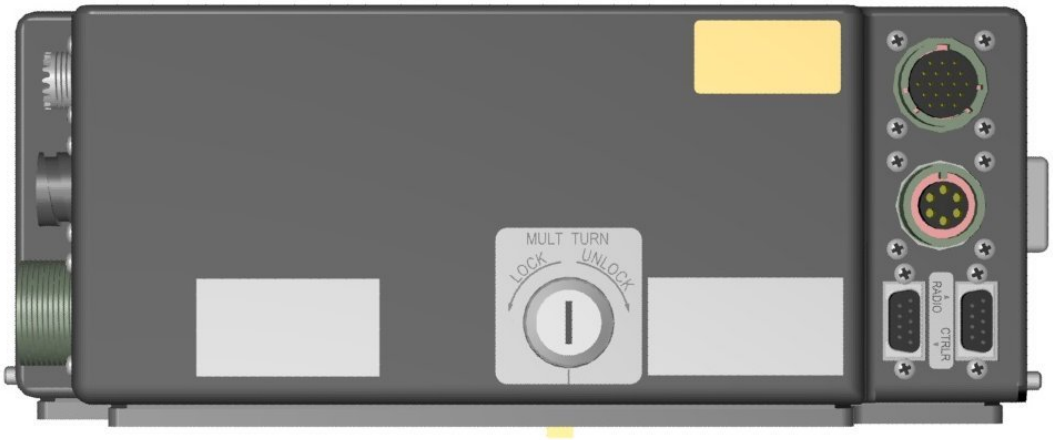
is used to adjust the receive sensitivity of the JEM Radio. Pushing SQUELCH will change the setting from ‘0’ to ‘9’ and around again. A setting of ‘0’ means the radio is wide open and any signal on the receive channel will be heard while a setting of ‘9’ means a stronger signal needs to be received before it is heard. A squelch setting of ‘4’ is the recommended initial setting. Depending on the other radio you are communicating with and other radio traffic in the area, you will need to adjust the squelch up or down to achieve the desired communication without having to listen to a lot of unnecessary radio traffic. Respectively, if you are not receiving any radio communication, you will need to adjust the squelch down until you are starting to hear voice traffic.

ANI Option:

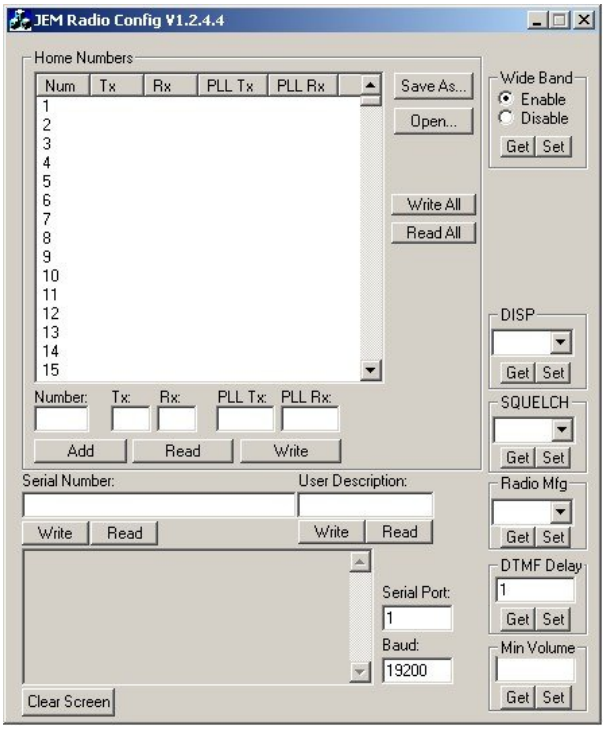
The JEM Radio has an ANI option available. It can be optioned and programmed to operate in FleetSync®, GE Star® or MDC-1200® modes. The ID range has been extended for the MDC-1200® to DEEE and for the GE Star® to 16,383. This option provides an Automatic Numeric Identification (ANI) of a specific radio transmitter each time the microphone press-to-talk (PTT) switch is activated.

JEM Radio Programming:

On the rear of the JEM Radio are two (2) DB-9 connectors. One DB-9 is to set up the parameters in the control head and the other is for the core (Icom or Kenwood) radio. The connector for the control head is toward the inside and the connector for the radio is to the outside as pictured below. The COM Port settings are 19.2 kbps, 8 bits, none & 1.



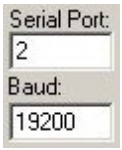
JEM Radio Config Software:



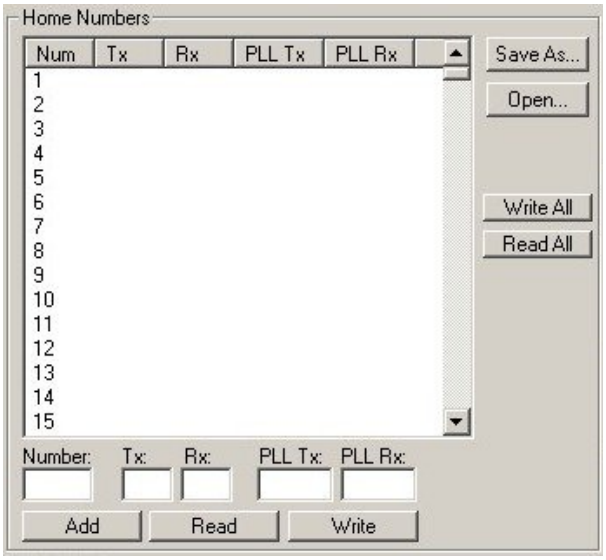
JEM Radio Config is a Windows based software package to configure the parameters in the JEM Radio control head. To the right is a screen shot of the programming software window. This software communicates to the JEM Radio control head via the DB-9 connector on the rear of the radio deck. The DB-9 is towards the inside of the radio.

With this configuration software the user will be able to disable the manual selection of wide band channels for the JEM Radio, produce a list of home numbers or program the radio from a file previously saved, enter a unique serial number, enable the DISP button, set if squelch is adjustable from the front panel, select which core radio is being utilized, set the minimum delay time between DTMF digits being sent, program a minimum audio volume to be allowed and setting a COM port number & baud rate.

The **Serial Port** is the number of the COM port used on the PC loaded with the JEM Radio Config software. The baud rate set in the JEM Radio is 19.2 kHz.



In the upper right of the screen is a **Wide Band Enabled** or **Disabled** selection. When the time comes that the JEM Radio will not be allowed to operate in a 25 KHz band, **'Disabled'** must be selected and the **'Set'** button activated. This will not allow any user to set a wide band channel. The only channels allowed will be the three (3) digit narrow (12.5 KHz) or digital band (6.25 KHz) values. The **'Get'** button will display what is set in the JEM Radio.



Home Numbers are like speed dial numbers in your telephone. Up to 500 Home Numbers are programmable in the JEM Radio. The first 100 may include PLL Tones to be programmed with each Tx and Rx AAR frequency. This JEM Config Tool allows each railroad to produce their own HOME Numbers list.

To produce the first Home Numbers list, a home number is entered in the **'Number'** box, the AAR **Tx** & **Rx** numbers entered in their respective boxes and click the **'Add'** button. You can see the Num, Tx & Rx values in the chart above. The slide bar at the right of the chart allows you to scroll through the Home Numbers. When you add a PLL tone frequency to the Home Numbers it will also be displayed in the chart. Once a list is produced you may **'Save As'** a file name of your choice. When a Home Numbers list has been saved in a file, then you may **'Open'** that file to be programmed into the next JEM Radio. The **'Write All'** button will write all values in this window into the JEM Radio. Correspondingly the **'Read All'** button will read all of the values from the JEM Radio and display them in this window.

When a JEM Radio is connected to the computer you will be able to **'Read'** what values are programmed into a specific Home Number of that radio or to **'Write'** values into a specific Home Number in the radio. See the AAR Frequency Plan to correlate an AAR number to a specific frequency.

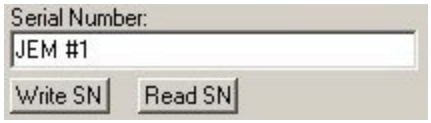
The **'DISP'** is provided for those roads that desire to use a dispatcher button. See explanation of **'Revert to Last TX-RX Channel Pair'** key sequence for an alternative method.

The **'SQUELCH'** button can be set to **'NONE'** if a road desires to set a specific squelch value in the core radio and not allow users on the locomotive to adjust squelch. Or **'SQLCH'** may be selected for normal operation of the squelch function with an analog radio.

The **'Radio Mfg'** selector tells the JEM Radio deck which core radio is installed. The selection is **'Set'** either Icom or Kenwood as of the present design. And you can **'Get'** the value from the JEM Radio.

A '**DTMF Delay'** parameter is **'Set'** to control the time between DTMF digits. The actual length of the DTMF digit is programmed in each individual core radio (ICOM or Kenwood). The **'DTMF Delay'** value needs to be at least 400 msec longer that the length of the DTMF digit in the core radio. If the core radio was programmed to send a digit for 300 msec, then the value in the box needs to be 7 for 700 msec (300 + 400 = 700). Each individual number correlates to 100 msec (6=600 msec; 8=800msec; etc.). The DTMF digits are manually entered from the keypad on the JEM Radio. You may also **'Get'** this value.

A **'Min Volume'** value may be programmed in the JEM Radio. Should the Comm Shop of a road deem it necessary to **'Set'** how low the audio volume can go on a JEM Radio, this can be done here. Example: a 5 in the box will allow the user to reduce the volume of the radio only down to a value of 5. So the range would then be 5 to 20. **'Get'** will read that value.



You may **'Write SN'** a unique **Serial Number** in the JEM Radio. 32 alphanumeric characters may be entered in this box. This is intended for future applications when a road provides a communications link to the locomotive to determine the identification number of the JEM Radio being utilized or to be manually entered with the Config Tool to provide a unique serial number for inventory purposes. You may **'Read SN'** this value from the JEM radio.

You may **'Write'** a twelve (12) character **User Description** for this JEM Radio. In the event you have a variety of JEM Radios in your system you will be able to differentiate them with this User Description. The description could be '6.25 Icom' or '6.25 Kenwood'. When the JEM Radio is powered on this will be displayed in the second line of the radio display. Additionally, when the brightness button is held down for 3 seconds the second line shows the radio deck and control head S/W version numbers and then the user description. **'Read'** will retrieve this description from the JEM Radio.

JEM RADIO Cable Connectors

Accessories Connector (12-Pin)

Pin	Signal	Description
A	Remote Mic	Remote microphone audio input
B	Mic Ground	Remote microphone ground
C	Remote PTT	Input signal for remote transmit activation
D	PTT Return	PTT reference (common)
E	Remote Audio	Low level audio output
F	+ 13.6 Vdc	Low power (1Amp max)
H	Audio Return	Remote audio common
J	13.6 Vdc Return	13.6 Vdc common (chassis)
K	#	Do Not Use
L	#	Do Not Use
M	External Speaker	Remote speaker
N	External Speaker	Remote speaker return

Remote Control Head Connector (19-Pin)

Pin	Signal	Pin	Signal
A	Audio Out	M	Speaker -
E	GND	N	Speaker +
F	Hook 1	S	RXF 232
J	Vcc	T	TXF 232
K	Vcc	U	PTT 1
L	Mic Audio 3	V	Mic Panel

Power Connector (4-Pin)

Pin	Signal	Description
*A	+74 Vdc	Primary isolated input voltage
B	-13.6 Vdc	Radio common (chassis)
*C	-74 Vdc	Primary isolated input voltage
D	+13.6 Vdc	Regulated radio voltage input

* Only one supply voltage can be used at a time.

Rear Handset Connector (6-Pin)

Pin	Signal	Description
A	Mic Audio	Modulation input from handset microphone
B	Mic Gnd	Mic Audio return (common with radio chassis)
C	PTT	Push-To-Talk input
D	PTT Gnd	PTT return path (common with radio chassis)
E	Receive Audio	Audio input to receiver element in handset
F	Hook Switch	Optional input connected to the handset cradle switch

JEM Communications, Inc. Warranty Policy

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. ALL WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

It is the Policy of JEM Communications to warranty the JEM Radio for a period of three years from the date of shipment. This warranty covers defects in factory material and workmanship only. JEM will not be responsible for defects caused by abuse, acts of God or other reasons beyond our control.

The responsibility of JEM under this Warranty will be to repair or replace at no cost to the customer any JEM Radio returned to JEM. JEM will not be responsible for any other costs associated with defective material unless specifically agreed to in writing.

The coverage under this Warranty for the JEM Radio only extends to JEM Radios that are purchased by the different railroads and/or railways. Any defects caused by customer supplied materials and/or products are not covered.

For JEM Radio Warranty and/or Repair: Call JEM Communications, Inc. at 402-334-2923 or 719-574-5541 for an RMA Number

Ship to: JEM Communications Repair Facility
1555 Paonia Street
Colorado Springs, CO 80915