Wireless Solutions for Advancing Communications

M2115 OWNERS MANUAL

Model M2115

Airport Ground Support Radio

VHF Voice Radio Frequency Band: (118.025-136.975 MHz)

This document supports the following models:

M2115M	Mobile Receiver/Transmitter - 10 Watt
M2115B	Base Station Receiver/Transmitter - 10 Watt

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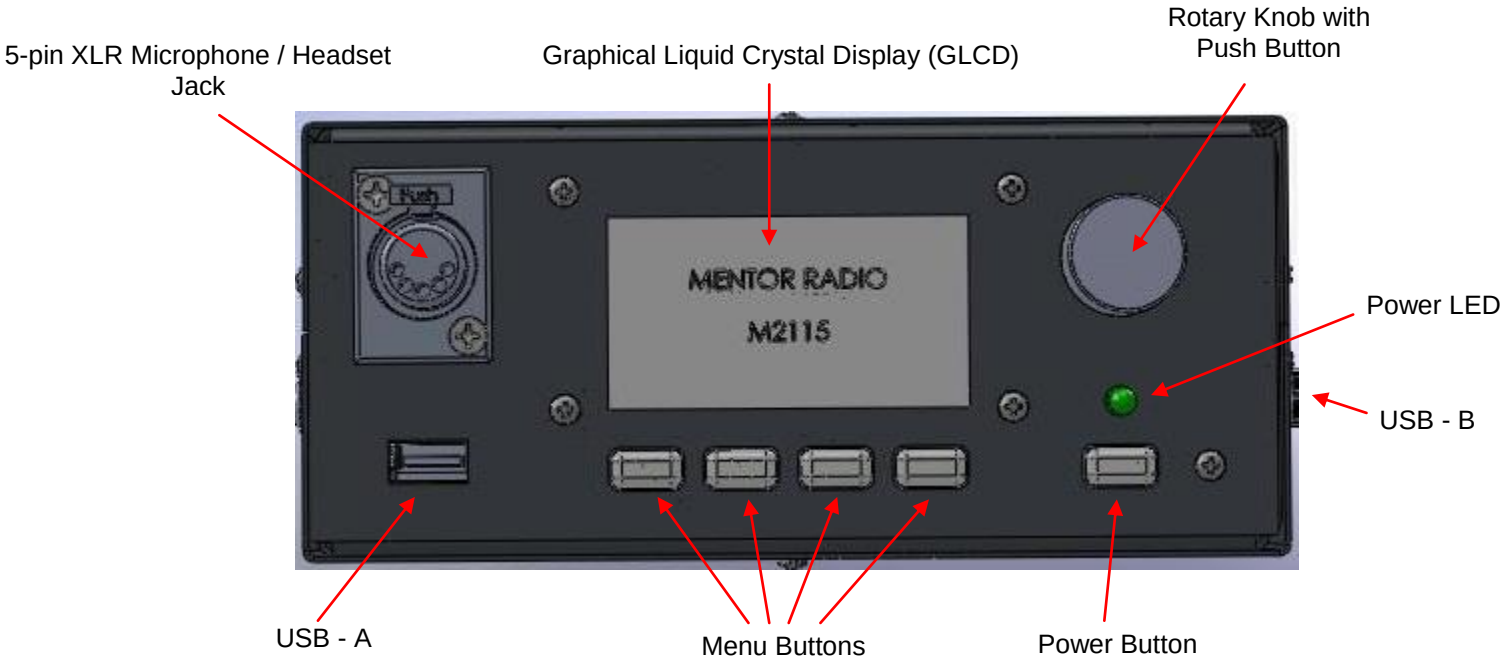
Safety Notice [1]

The following safety precautions are meant to prevent personal injury and damage to the equipment.

1.) Do not connect the unit to any voltage source other than to the source provided/recommended for the unit. Verify correct polarity of the mobile unit power leads during installation.
2.) Do not operate the unit within the vicinity of lightning.
3.) Under normal conditions, **DO NOT TRANSMIT WHEN THE VSWR ENUNCIATOR IS DISPLAYED. OVERRIDING THE TRANSMITTER'S AUTOMATIC SHUTDOWN IS FOR EMERGENCY USE ONLY AND WILL VOID THE WARRANTY IF DAMAGE OCCURS AS A RESULT.**
4.) Do not operate the unit when wet.
5.) Do not operate the unit if there is an indication of a malfunction (i.e. LCD shows abnormal indications).
6.) Do not perform internal maintenance on the unit. Only qualified technicians should perform maintenance on this product.

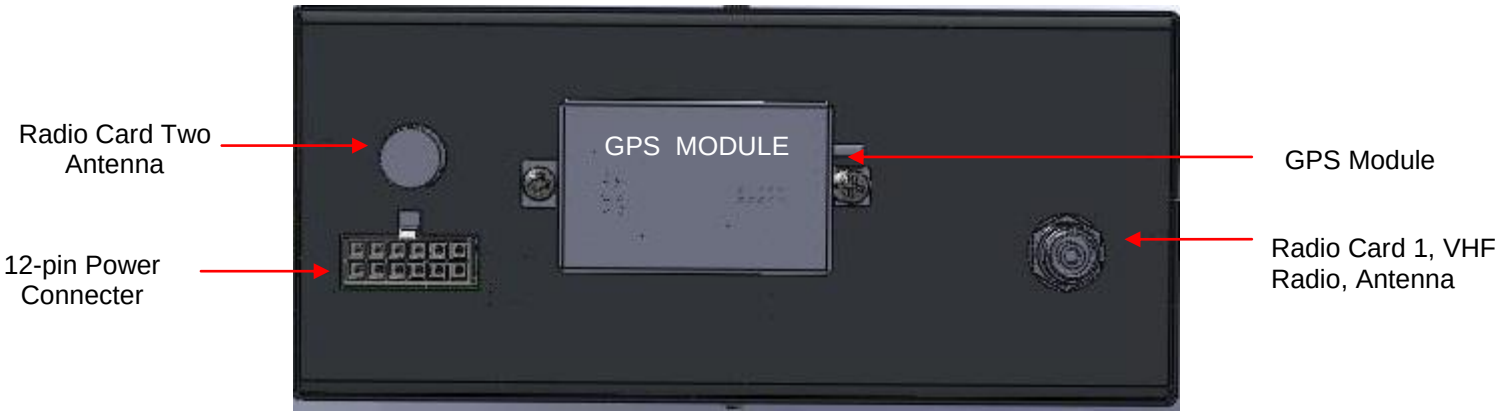
Mechanical Diagrams [2]

Front Panel Diagram [2.1]



The front panel controls allow a user to program, operate, and monitor the state of the M2115 radio. The radio comes with a noise canceling handheld microphone that plugs into the Microphone/Headset Jack. A headset may also be used for high noise environments. See Front Panel Control for descriptions of how the front panel controls operate and Screen Control for specific screen functionality.

Rear Panel Diagram [2.2]



See Rear Panel for specific component functionality.

Introduction [3]

Mentor Radio Model M2115 refers to a family of fully frequency synthesized transceiver radios. Model M2115M refers to the vehicle mounted mobile version of the transceiver, while models M2115B and M2115B refer to the 10W watt base station version. Both the mobile and base station radios use the same core radio. However, there are several differences between them, which are as follows:

1.) Input power required: The M2115M requires 12-14 VDC, whereas the M2115B version operates off of an AC power source (115 VAC or 230 VAC).
2.) Microphone signals: The 500 ohm audio output signal is factory configurable. For mobiles, it is connected to the microphone jack for headset use. On the base unit, it may be connected to the rear panel for remote control connections.
3.) Remote interface: All base radios have remote control capability. The 12-pin rear power plug includes discrete signals for connecting to a variety of remote controls. 5 signal lines (F1 through F5 are available to allow remote frequency selection. Any one of up to 16 channels may be selected.

On all base station units, a rocker style power switch on the rear of the base power supply unit controls the AC input power to the unit. A built-in fuse provides circuit overload protection and spare fuse is included in the power plug. The unit is provisioned with a D-shaped AC power plug to allow low cost international power cords to be connected to local AC power.

Physical Component Descriptions [4]

Radio Cards [4.1]

A M2115 may contain one or two radio cards, while the radio system's main controller is housed only on the VHF voice radio card operating in the 118.025 MHz – 136.975 MHz VHF band. Therefore, all M2115's must have this radio card installed. Expanded functionality may be given to the radio by adding a second radio card. Each radio will have its own separate antenna connector on the rear panel which allows for simultaneous dual band operation.

The second radio card may operate in one of several bands planned for integration into the M2115 unit. The first radio card to be introduced will be a UHF FM LMR radio operating in the 450-470MHz band for voice and low speed data. As technology progresses, radios in different frequency bands offering diverse functionality will be developed and made available for the second card slot.

USB-A and USB-B Ports [4.2]

There are two USB ports available for connecting various devices to the M2115 mobile and base units. There is a USB-A style connector on the front panel of the radio that will allow the connection of a flash memory stick to either read/write configuration information, save audio in a base station application, or save GPS data when used in a mobile application. There is also a USB-B style connector on the right side of the radio that allows an M2115 to connect to a PC. A user may configure an M2115 remotely through the use of a PC program. Configuration information is either entered into a simple-to-use graphical interface, or is read in from a file that contains configuration information downloaded to a PC from an M2115. Once the information is loaded into the graphical interface, the user may then load the configuration information into the M2115 over the USB-B port. This makes configuring the radio quick and easy as no front panel operation is needed to program the M2115. Another use of the USB-B port is for when two radio boards are installed in the M2115. When used in tandem with an LMR radio PC application data may be sent over the UHF radio link to the base station for Business-to-Business (B2B) applications. Live ("real time") GPS data may also be sent to a dispatcher for vehicle tracking purposes (e.g.: optimal resource scheduling, etc…). The LMR and GPS applications are future implementations.

Rear Panel [4.3]

The rear panel includes a 12-pin power connector, two TNC style antenna connectors for radio cards 1 and 2, and an optional GPS module. The radio includes a cover plate for the GPS interface when the GPS module is not in use. The 12-pin power connecter may also have wires for an external power amplifier, remote frequency control, external microphone input, and/or external speaker output for base stations. If an external power amplifier is used, the number of frequencies made available by remote selection goes from a maximum of 16 to a maximum of 7 channels as the power amplifier uses two of the remote frequency selection lines. The 12-pin power connector implements functions that are dependent on the type of M2115. The available options are as follows:

Mobile and Base Station Radios**:**

- External speaker wire
- 12V-14V DC Power Supply

Base Station (BS) Radios (only)**:**

- External RF Power Amplifier Monitoring wires (25W and 50W BS's)
- Remote Frequency Selection, Remote PTT, and Microphone Input wires

Global Positioning System (GPS) [4.4]

Note: The GPS unit is a future option.
The Global Positioning System (GPS) is a satellite based system that allows an M2115 to know it's location with an error in horizontal distance of only 10.5 meters. The GPS module updates its position once every second and main controller polls this data and uses it for reporting the position of the radio. Some users may want to know where their vehicles are in real time (resource scheduling applications), while others may want to review their vehicles' locations periodically. Depending on whether the radio is a mobile, base station, or dual card radio determines what implementation may be used with any given M2115. Mentor Radio's live tracking system requires using the UHF LMR radio to send location data in real time. Users with less stringent time requirements may have the radio set up to access the data by manually extracting it with a flash memory stick (sold separately). The radio may store up to a week's worth of GPS information. The GPS module is sold separately from an M2115, and customers may install it themselves (See Installation).

Receiver [4.5]

The M2115 receiver is a dual conversion super heterodyne with frequency synthesized local oscillators. The first local oscillator (LO1) is 400 MHz above the carrier frequency and the second local oscillator (LO2) is set to 800 MHz. The process for receiving a signal is as follows:

- The received signal is mixed with LO1 where only the ~400 MHz mixing product is kept. All other frequencies including those from other channels are filtered out except for the adjacent channels. The resulting signal will henceforth be called MIX1.
- LO2 is divided by two inside an IQ modulator and mixed with MIX1 to yield two different signals. These two signals are the I and Q baseband components of the received RF signal. All other unwanted frequencies from adjacent channels are filtered out during this process.
- The I and Q baseband signals go through separate analog-to-digital conversions (ADC) inside a Digital Signal Processor (DSP) and the voice/data is then fully demodulated inside the DSP.
    - If the radio card is a VHF/UHF voice radio, then the DSP passes the voice information to the radio's main microcontroller. The voice audio is then sent to the local speaker and/or to an external speaker by way of filtered ~9-bit pulse-width modulation (PWM). The audio level may be adjusted from the front panel, and may even be shut off completely if desired. The squelch level and channel frequency may also be adjusted from the front panel.
    - If the radio card is a UHF data radio, then the data may sent to a PC over the USB-B port and/or saved to a flash memory stick.

While receiving, the radio cannot be transmitting as well. Since transmit supersedes receive, pressing the PTT will cause any signal that is being received on the current channel to be cut off from being sent to the M2115's speaker(s). By default, the radio is in receive mode and will send audio to the speaker at all times when not in transmit mode so long as the squelch level is set to 0%. Setting the squelch level above 0% will always cut out noise being sent to the speaker when there is no audio being received. Each saved channel has its own squelch setting, so make sure to set each channel to the squelch level desired. To see how to adjust the squelch level to get rid of noise or unwanted distant signals, see Screen Control.

Transmitter [4.6]

General Operation [4.6.1]
There are multiple power output levels for the transmitter, where each channel has a unique power setting. There are 0W, 1W, 5W, and 10W output power settings that may be set using the front panel for the M2115M. For the 25W and 50W base stations, the power setting selection changes accordingly but still implements different settings. The 0W setting disables the transmitter and so the M2115 functions as a receive-only device in this case. When the microphone push-to-talk switch is pressed from the remote controller or front panel the microprocessor detects it, shuts down the receiver, and then enters transmit mode. It does not matter what screen on the display a user is on in order to go into transmit mode, but the user will have the message "TRANSMIT" appear on the upper left side of the screen if on the main screen. Also note that all front panel operations are disabled when in transmit mode.

Hot Microphone Detection [4.6.2]
There is a hot-microphone automatic shut down function that kicks in after 30 seconds of continuous transmitter on time which is useful for when a user has accidentally has the PTT in a pressed state while they are not present.

Base Station PTT Operation [4.6.3]
For base station radios, the audio input that is used depends on which PTT is pressed when a remote interface is installed. The remote audio input is used when the remote PTT is pressed, and the local audio input is used when the local PTT is pressed. If the PTT is pressed from the remote controller AFTER the PTT has been pressed from the local controller, the PTT from the remote controller is ignored by the main processor. Any audio put on the remote controller audio line is also ignored. If the remote controller's PTT was pressed first, the same procedure holds true.

High Voltage Standing Wave Ratio (VSWR) Detection [4.6.4]
While in transmit mode, the M2115's transmitter output is applied to forward and reverse power detector circuits. This allows the radio to keep the power output stable while transmitting. The radio card's processor can also detect if the PA breaks or prevent the PA from breaking by shutting it off when the reflected power voltage reads too high (VSWR) when transmitting. The front panel display shows "VSWR" when on the main screen when a high reflected power is detected to let the user know that the transmitter has been turned off due to high VSWR. A user may disable this feature altogether, although it is not recommended (see VSWR).

AM Modulation Control [4.6.5]
For voice radio's, the AM modulation index can be as high as 95% and will never go over 100% due to processor monitoring and control while under normal operation. All radios in this family are capable of operating at 100% duty cycle.

Front Panel Control [4.7]

Overview [4.7.1]
The M2115 front panel control consists of a power on/off momentary button, a power status LED, four menu buttons, an optical rotary encoder with built in push button, a USB-A port, a USB-B port, a graphical liquid crystal display (GLCD), and a locking microphone/headset jack. Each M2115 radio includes a handheld noise canceling microphone with a heavy duty 5-pin XLR locking connector.

5-Pin XLR Locking Microphone/Headset Connector [4.7.2]
The M2115 can be configured to operate with a headset using a headset adapter which may be purchased through Mentor Radio. A Bluetooth adapter which is also sold through Mentor Radio may be connected to this plug and allows a user to use nearly any off-the-shelf Bluetooth headset on the market. The adapter comes with a wireless PTT so that the user needs to buy only the Bluetooth headset from a third-party vendor.

Power Control Button [4.7.3]

The power for the M2115 is controlled by a front panel momentary power on-off button. This is the button that is directly underneath the green LED on the front panel. Pressing the power on-off button while the radio is off will turn the radio on which will be apparent by the illumination of the green LED. Of course, the radio must have a power supply connected or nothing will happen. Also, if the radio turns off instantly, then the button was not held down long enough. To turn the radio off, it is highly recommended to only use the method that uses power on-off button. This is done by holding the power on-off button down for about 3 seconds while the radio is in receive mode. The green LED will turn off to indicate the main processor is trying to shut the radio down. The radio will only fully turn off after the button is released. If the radio is non-responsive to the button press, then the radio may need to be shut down by turning the power supply off. This method should only be used if absolutely necessary as configuration data may be lost.

Menu Buttons [4.7.4]

Pressing a menu button changes either some value on the screen or changes what screen a user is viewing entirely. Menu buttons are referred to menu buttons 1-4, going from left to right when looking at the front panel head on (see the front panel diagram for visuals). Text above each button describes what each button will do on any given screen, while the high VSWR override functionality is accessible from every screen and only requires that a user is not in transmit mode to change the state.

Rotary Knob [4.7.5]

The rotary knob serves several purposes on some screens and none on others. Most uses are for increasing or decreasing the value of a selected field on a screen, but that is not all it is used for. When there is a screen that includes an “Enter” and/or “Exit” menu option, users may press the rotary knob once for “Enter” and twice for “Exit”. Each screen uses the rotary knob differently. See the individual screens for rotary knob functionality in its entirety.

Internal Speaker [4.7.6]

A 2”x2” speaker is mounted on the bottom panel on the M2115M for mobile applications. A 3.5”x2” speaker is mounted on the front panel of the power supply for base station units. The M2115B also includes an interface for a variety of remote control connections.

VSWR [5]

VSWR is an acronym for Voltage Standing Wave Ratio. VSWR is a measure of the ability of the transmitter to radiate RF power through the antenna and into open space compared to the signal that is reflected back into the transmitter. The more reflected power that does not leave the antenna, the higher the chance that there is excess energy may damage the transmitter components. Therefore, it is very important to shut down the transmitter when there is a high reflected power to help prevent damage to the transmitter.

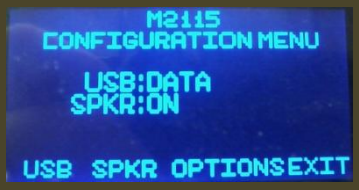
Under normal operating conditions, the transmitter is shut down when a high VSWR is read. Recognizing that there are times in the aviation industry where communications capability may be the difference of life and death, Mentor Radio has provided the ability to override the high VSWR transmitter shut down function of the M2115. To disable the high VSWR transmitter shut down function, a user needs only to hold down menu buttons 1 and 3 for around 3 seconds while the radio is powered up and in receive mode. Realize that if the PA blows up when VSWR control is overridden, then any warranty is instantly void. To re-enable the high VSWR control function hold down buttons 1 and 3 for another 3 seconds. It does not matter what screen that a user is on to enable or disable the override, but the main screen shows that the control is disabled by displaying “OV” on the upper left of the screen. When a high VSWR is encountered, a user should cut the power to the radio and inspect/ repair the transmission line as soon as possible.

Screen Control [6]

The table below describes what each function menu does for each individual screen. Note that rotating the rotary knob in the clockwise direction will increase the value of field that has focus, and rotating the rotary knob in the counter clockwise direction will decrease the value of the field on the screen that has focus.

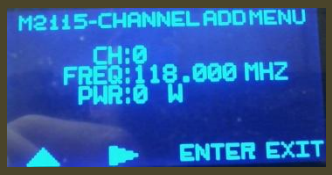
Screen Name	Actions	Screen Shot
Main	**Button 1:** Opens the Channel Select screen. **Button 2:** Opens the Basic Settings screen. **Button 3:** Opens the Configuration Main screen. **Button 4:** Open the Reset screen. **Rotary Knob Rotate:** Increases and decreases **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
Channel Select	**Description:** While toggling through channels radio is tuned to the current channel displayed on the screen. However, the change is not permanent. If the user exits the screen, the channel that the radio was tuned to before entering this screen is restored. **Button 1:** Toggles through channels in the up direction. **Button 2:** Toggles through channels in the down direction. **Button 3:** If the channel shown on the screen is different from the channel that the radio is currently tuned to, then the radio is tuned to the channel currently shown on the screen. When the screen is exited, the selected channel will remain the current channel. **Button 4:** Opens the Main screen. **Rotary Knob Rotate:** Clockwise goes up through the channels and counter clockwise goes down. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
Basic Settings	**Button 1:** Opens the Power Adjust screen. **Button 2:** Opens the Squelch Adjust screen. **Button 3:** Opens the Backlight Adjust screen. **Button 4:** Opens the Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	

Squelch Adjust	**Description:** The value that is displayed when the screen is first loaded is the current channel's squelch level. If the screen is exited before button 3 is pressed, the last saved squelch value is what the current channel has and not the value that is shown on the screen (unless the two values are in fact identical). **Button 1:** Increases the squelch value by 5% each press, up to a maximum value of 100% for the channel that the radio is currently tuned to. **Button 2:** Decreases the squelch value by 5% to a minimum value of 0% for the channel that the radio is currently tuned to. **Button 3:** Saves the currently selected squelch value as the current channels squelch value. **Button 4:** Opens the Basic Settings screen. **Rotary Knob Rotate:** Increases and decreases the squelch value in 5% intervals. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
Backlight Adjust	**Description:** The backlight intensity changes as the value shown on the screen changes, but unless button 3 is pressed before exiting the backlight intensity will revert back to the last saved value. **Button 1:** Increases the backlight value in 4% intervals up to a maximum of 100%. **Button 2:** Decreases the backlight value in 4% intervals down to a minimum of 0%. **Button 3:** Saves the backlight value that is currently displayed. **Button 4:** Opens the Basic Settings screen. **Rotary Knob Rotate:** Increases and decreases the backlight value in 4% increments. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	

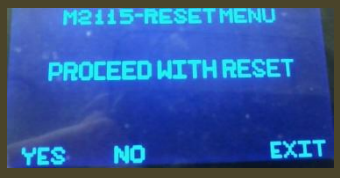
Power Adjust	**Description:** Allows a user to alter the transmit output power for the currently selected channel. Unless button 3 is pressed before exiting, the transmit output power will revert back to the last saved value. **Button 1:** Increases the current transmit output power. The interval and maximum value are dependent on the model of M2115. **Button 2:** Decreases the current transmit output power. The interval and minimum value are dependent on the model of M2115. **Button 3:** Save the value for the transmit output power as the power value on the screen. **Button 4:** Opens the Basic Settings screen. **Rotary Knob Rotate:** Increases and decreases the power value. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
Configuration Main	**Button 1:** Opens the USB screen. **Button 2:** Opens the Speaker screen. **Button 3:** If there are users entered into the system, then the Log In screen is opened. Otherwise, the Channel and user Configuration Main screen is opened. **Button 4:** Opens the Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
USB	**Button 1:** DO NOT USE. This screen will not exist as it is soon. **Button 2:** DO NOT USE. This screen will not exist as it is soon. **Button 3:** Nothing **Button 4:** Opens Configuration Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
Speaker	**Button 1:** The radio will send received audio signals to connected radio speakers. **Button 2:** The radio will not send received audio signals to connected radio speakers. **Button 3:** Nothing **Button 4:** Opens Configuration Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	

Channel and User Configuration Main	**Button 1:** Opens Add or Delete Channel screen. **Button 2:** Opens Channel Edit screen **Button 3:** Opens Add Channel screen. **Button 4:** Opens Configuration Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
Add or Delete Channel	**Button 1:** Opens Add Channel screen. **Button 2:** Opens Delete Channel screen. **Button 3:** Nothing **Button 4:** Opens Channel and User Configuration Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
Delete Channel	**Button 1:** Goes through currently saved channels in the up direction. **Button 2:** Goes through currently saved channels in the down direction. **Button 3:** Deletes the currently selected channel. **Button 4:** Opens the Add or Delete Channel screen. **Rotary Knob Rotate:** Go up and down through the currently saved channels. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	

Edit Channel	**Description:** There are two different focus groups for this screen. The first group is the line marked “CH” and the second includes the “FREQ” and “PWR” lines. Enter and Exit control which group the user is navigating. The current field that is field in the group that has focus will be blinking at a rate of one second. **Button 1:** If in group 1, does nothing. If in group 2, selects between the “FREQ” and “PWR” fields. No matter what the position was in the “FREQ” field, the position will always start at the 100 MHz place holder. **Button 2:** If in group 1, does nothing. If in group 2, the position in “FREQ” is moved to the right one place holder. When at the 0.001 MHz place holder, the position wraps around to the 100 MHz place holder. **Button 3:** When in group 1, changes the focus to group 2 and places the curser to the 100 MHz place holder position in the “FREQ” field. When in group 2, the information displayed on the screen is saved for the current channel displayed on the screen. **Button 4:** When in group 1, opens Channel and User Configuration Main screen. When in group 2, sets focus to group 1. **Rotary Knob Rotate:** When in group 1, selects the channel whose frequency and/or transmit power output is desired to be altered. When in group 2, increases and decreases the value of the currently selected field. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	

Add Channel	**Description:** The cursor that indicates what field is being modified on the screen is indicated by blinking at a rate of one second. Before a new channel will be saved, the user must make sure that a channel number is selected. The frequency and power fields can be unaltered and a new frequency can still be saved. A message saying that the channel has been saved will notify the user of a proper save. **Button 1:** Changes the focus of cursor to the field directly above the current field. If the cursor is on "CH", the cursor will move to "PWR". **Button 2:** Does nothing when the "CH" and "PWR" fields are selected. When the "FREQ" field is selected, the frequency position moves to the right one place holder. When at 0.001 MHz, the curser moves to the 100 MHz position holder. **Button 3:** Saves the current channel information on the screen if there are no errors, and resets all three fields. Fields are not reset if there is an error. **Button 4:** Opens the Add or Delete Channel screen. **Rotary Knob Rotate:** Increases and decreases the value in the selected field at the cursor position. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
User Main	**Button 1:** Opens the Edit User screen. **Button 2:** Opens the Add User screen. **Button 3:** Opens the Delete User screen. **Button 4:** Opens the Channel and User Configuration Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	

Edit User	**Description:** There are two different focus groups for this screen. The first group is the line marked "USERID" and the second includes the "PASSWORD" and "ACCESSLVL" lines. Enter and Exit control which group the user is navigating. The current field that is field in the group that has focus will be blinking at a rate of one second. If a user name is desired to be changed, the user must be re-added. **Button 1:** If in group 1, does nothing. If in group 2, selects between the "PASSWORD" and "ACCESSLVL" fields. No matter what the position was of the cursor in the "PASSWORD" field, the position will always start at the far left place holder. **Button 2:** If in group 1, does nothing. If in group 2, the position in "PASSWORD" is moved to the right one place holder. When at the 10 place holders out, the position wraps around to the far left place holder. **Button 3:** When in group 1, the focus changes to group 2 and places the curser to the far left place holder in the "PASSWORD" field. When in group 2, the information displayed on the screen is saved for the current user displayed on the screen and the focus shifts back to group 1. **Button 4:** When in group 1, opens User Main screen. When in group 2, focus is set to group 1. **Rotary Knob Rotate:** Increases and decreases the value in the selected field at the cursor position. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
Add User	**Description:** A blinking cursor indicates what data the user is currently manipulating. **Button 1:** Changes the cursor focus to the field that is directly above the current field. If the current field is "USERID", then the field changes to "ACCESSLVL". **Button 2:** When "PASSWORD" or "USERID" fields have focus, the cursor moves one place holder to the right. If the cursor is at the last place holder, then the cursor moves to the far left place holder in the selected field. **Button 3:** If a "USERID" and "ACCESSLVL" are set, the user is saved and all of the fields are cleared. Otherwise, an error message pops up on the screen. **Button 4:** Opens the User Main screen. **Rotary Knob Rotate:** Increases and decreases the value in the selected field at the cursor position. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	

Delete User	**Button 1:** Shuffles through users in the up direction. **Button 2:** Shuffles through users in the down direction. **Button 3:** Deletes the currently selected user. **Button 4:** Opens the User Main screen. **Rotary Knob Rotate:** Shuffles through users in the up and down direction. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	
Reset	**Button 1:** Opens Reset Confirm screen, where the squelch value for the currently selected channel will be reset to factory default. **Button 2:** Opens Reset Confirm screen, where the backlight intensity value will be reset to factory default. **Button 3:** Opens Reset Confirm screen, where the radio is reset to factory default settings and all channel and user information is deleted. If users are in the system, the Log In screen is opened instead or Reset Confirm. **Button 4:** Opens the Main screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	
Reset Confirm	**Button 1:** Resets whichever option brought the user to this screen. **Button 2:** Opens the Reset screen. **Button 3:** Nothing **Button 4:** Opens the Reset screen. **Rotary Knob Rotate:** Nothing **Rotary Knob 1 Press:** Nothing **Rotary Knob 2 Presses:** Nothing	

Log In	**Description:** A blinking cursor indicates what data the user is currently manipulating. **Button 1:** Changes the cursor focus to the field that is directly above the current field. If the current field is "USER ID", then the field changes to "PASSWORD". **Button 2:** The cursor moves one place holder to the right in the selected field. If the cursor is at the last place holder, then the cursor moves to the far left place holder in the selected field. **Button 3:** Opens the security protected screen that the user tried getting to prior to the Log In screen being shown. **Button 4:** Opens the screen that was displayed directly before this one. **Rotary Knob Rotate:** Increases and decreases the value in the selected field at the cursor position. **Rotary Knob 1 Press:** Performs the same function as button 3. **Rotary Knob 2 Presses:** Performs the same function as button 4.	

Installation [5]

Notice [5.1]

The first consideration for installation is to choose a suitable location. For both mobile and base installations, installation of the M2115 radio requires connecting the radio to a suitable antenna and a suitable power source.

NOTICE: For geographic locations where lightning is prevalent, Mentor Radio recommends installing a lightning protector on the antenna coax. If used as a base station radio, another lightning protector on the AC line is recommended.

M2115M [5.2]

The M2115M is intended to be installed into a vehicle. A suitable location should be selected to allow viewing of the GLCD and access to the front panel controls. A mounting bracket is provided that will allow mounting the M2115M under the dash or on any flat surface. The bracket may be installed above or below the radio. Mobile antennas are available in two versions; a thru-hole type and a magnetic mount type. Installing a thru-hole requires drilling a hole in the vehicle or mounting on a hood or roof of a vehicle. Magnetic mount antennas require routing the coax through the vehicle door where water may leak in or where the coax may be pinched. This may shorten the life of the antenna. Therefore, it is recommended to use a magnetic mount antenna for short term applications where the antenna may be removed and a thru-hole type for a permanently mounted antenna. Install the antenna and connect to the antenna connector on the rear panel. Some antennas for aviation band frequencies come with a UHF connector. In this case, a UHF to TNC adapter may be used to connect the antenna to the radio.

The M2115M includes a built in speaker. However, an external speaker may be used with or instead of the internal speaker. If an external speaker is to be used, install 18 AWG wires to the power plug as follows: Green wire to pin 12 (Speaker audio out signal) and a black wire to pin 2 (GND). A power cable is available which includes a 6 foot speaker cable. External speakers and cables sold separately.

Verify that the vehicle power is no greater than 14VDC. Connect the power cable to the vehicle power or battery (Red to “+”, Black to “-”). Connect the 12-pin connector to the rear of the M2115M radio.

M2115B [5.3]

The M2115B can rest on a shelf or a desk. Since this unit contains a cooling fan, when located on a desk or shelf do not place equipment, papers, magazines, etc. where they would restrict air flow through the left and right side vent ports thereby reducing its cooling.

Install a suitable power cord for local power used. A line replaceable fuse is inside power plug. To remove the fuse, the cord must be removed first which is done with lightly prying pressure. The exposed fuse is the operating fuse and a spare fuse is located inside the fuse holder tray.

The antenna connector is a TNC style connector. If the antenna coax does not mate with this type, adapters are available from Mentor Radio or from many electronic distributors. Connections for remote operation, when needed, are made via the 25 pin connector (type DB25) on the rear of the cabinet.

The antenna should be either a wideband type (118-137 MHz) or a narrow band type tuned to single channel or a very narrow range of frequencies. If a 3 or 6 dB gain antenna is used, communications range can be increased, because gain antennas effectively increase both receiver sensitivity and transmitter power. Care should be taken using gain antennas as many specify gain in a specific direction only. A directional antenna may reduce range in other directions in order to increase gain in a single direction. Depending upon your application, this may be acceptable. Low loss coaxial cable is also recommended, especially if the cable length exceeds 30 feet (10 meters).

Plug the included microphone into the microphone jack on the front panel of the M2115. Be sure the plug is pushed all the way into the jack before turning the radio on.

If remote operation is to be used, refer to the remote section in this manual. This information is provided for planning and installing remote controls to work with the M2115B.

Global Positioning System (GPS) Module [5.4]

** To install the GPS module a #2 Philips Head screwdriver is required

1.) Remove the rear panel GPS module cover plate by unscrewing the two screws that hold the plate on.
2.) Press the GPS module connector onto the mating connector on the rear panel. Press firmly to ensure the connector is fully seated.
3.) Install cover plate over module and fasten the two screws removed from step 1.
4.) Install GPS antenna in a suitable location. Route antenna cable to radio. Connect to the GPS module mating connector (SMA style connector). NOTE: the GPS antenna must be exposed to the sky although placing it on a dashboard may be acceptable. For optimal sky view an externally mounted antenna is better. Review user requirements before deciding on antenna installation location.
5.) To enable the GPS feature of the radio, see the screen controls. ** This feature is not currently available.

Remote Control [5.5]

Planning [5.5.1]

As a general guide and for basic system design planning purposes, the following may help you in your equipment requirement and selection process. Review Figure 1 for a summary of the pros and cons of each system.

REMOTE	BENEFITS	DOWNSIDE
Local Extension Control:	• **Less expensive controllers**	• Distance limited (<1K ft) • Hard to add controllers • Requires special expensive cable between each controller and radio. • NO remote frequency selection • Requires tools and technical skill to connect wires to a terminal board.
Tone Remote Control:	• **Not distance limited** • **Easy to add controllers** • **Uses low cost phone wire to connect between adapter and radios.** • **Allows remote frequency selection** • **No tools required to install units.**	• More expensive controllers • Requires a tone remote adapter

Figure 1 - Comparison between Remote Control Systems

Installation [5.5.2]

The M2115B provides the connections necessary at the rear panel 12-pin power plug. This plug contains all the connections needed for connecting various types of remote controllers to allow remote users to operate the M2115B base station radio.

Each basic remote control type requires a different adapter cable to connect between the radio and the controllers. There are four basic styles of controllers available for connecting to the M2115B, which are:

1. Telephone Style handset
2. Desktop Style with a Pedestal Style Desktop microphone
3. Hands Free Voice Operated Transmit (vox) box
4. Dispatch style controller with a Gooseneck microphone

Each of these 4 styles is available for both the local extension and tone remote controllers. Further, it is also possible to interface the M2115B to a dispatch console. Most consoles allow the interfacing many different types of radios and so make sure the M2115B is configured as an analog radio.

Figure 2 shows the functions of the remote connector pins.

M2115 PIN	DB-25 PIN	FUNCTION	COLOR
10	**1**	**Mic PTT**	**Gray**
8	**2**	**Mic Audio**	**Violet**
2	**3**	**Ground**	**Black**
	4	**Ground**	**Black**
	5	**Ground**	**Black**
	6	**Ground**	**Black**
12	**7**	**4 Ohm RCVR out**	**Green**
	8	**4 ohm RCVR out**	**Green**
3	**9**	**500/600 Ohm RCVR out**	**Green**
9	**25**	**+12 VDC Switched**	**Yellow**
7		**F1**	
1	**NA – Pwr Amp**	**F2**	
4	**NA – Pwr Amp**	**F3**	
5		**F4**	
6		**F5**	
1	**NA – No Pwr Amp**	**FWD PWR DET**	
4	**NA – No Pwr Amp**	**REV PWR DET**	

Figure 2 - M2115 Power Plug / Remote Cable (DB-25 plug)

25 pin D-subminiature type connector cable.

Connections to the mating connector may use #22 gauge wire. Note that there are four ground terminals and two terminals for the 4 ohm receiver audio output. The ground terminals may be used as needed for various remote connections; in some circumstances it may be desirable to “double-up”, using two ground pins in parallel (Each pin is rated for 1 ampere). The 4 ohm audio receiver outputs can be used with one 4 ohm or two 8 ohm external speakers. The +14 VDC is available to operate external remote control equipment. The 500/600 ohm receiver audio output can be used for remote stations or for a tape recorder output. Its level is factory adjusted to 0 dBm (0.77 v rms) but may be adjusted internally for any level from -7 to +10 dBm by a trimmer potentiometer on the printed circuit board inside the M2115.

The remote microphone audio input should be in the range -10 to -16dBm (0.3 to 0.15 V RMS). If this voltage is too high the modulation may be distorted when transmitting—that is, the voice transmissions may not sound as clear.

User Security Notice [6]

Mentor Radio has incorporated security into the M2115M and M2115B to help prevent inadvertent frequency changes that may result in unauthorized emissions. However, the M2115M and M2115B may be programmed without enabling security. Operating the M2115 radio without enabling security allows faster configuration changes but cannot help prevent unauthorized users from making inadvertent frequency changes that may potentially result in transmissions on unauthorized frequencies. It is up to the licensee or responsible person to determine if security is required for the M2115 radio. If more than one user is to operate the radio, Mentor Radio recommends that security be enabled.

Enabling security requires adding at least one user to the radio. Once one or more users are entered into the configuration, no changes to the configuration are allowed until a user "logs in". A prompt requests that a user enter his/her user identification (displayed on the LCD as USERID) and password.

RF Exposure Affirmative Statement [7]

The M2115M and M2115B are restricted to occupational/controller use to satisfy FCC RF Exposure Limits. Use only authorized accessories and antennas. The use of non-authorized accessories or antennas may exceed FCC RF Exposure Limits.

Maintenance [8]

No routine maintenance is necessary, other than to remove accumulated dust. If the equipment is accidentally impacted or dropped, operation should be fully checked and an internal inspection made for loose or broken parts.

Servicing and Repair [9]

Should the M2115 require servicing, return it to us with a description of the problem. SERVICE SHOULD ONLY BE ATTEMPTED BY TECHNICIANS EXPERIENCED WITH THIS TYPE OF EQUIPMENT AND WHO HAVE AVAILABLE THE APPROPRIATE TEST EQUIPMENT.

Trouble Shooting and User Repair Guide [10]

In the event of a malfunction the following information may help isolate the malfunction to a line replaceable component.

1.) Unit will not turn on after pressing the power button.
- For a mobile installation check that the power connections are secure and verify the polarity is correct.
- For a base unit, verify that the fuse has not blown. A spare fuse is inside the fuse holder tray.

2.) LCD is hard to read in day light.
- Adjust the backlight setting to a more suitable level for your existing lighting condition. See screen.

3.) Radio has continuous noise when in receive mode.
- Adjust squelch level. Increase level until the noise stops. This is the point of maximum sensitivity squelched. It will be necessary to set this level for each operating channel.
- You may need to adjust to a lower setting if you are trying to receive very weak signals.

4.) The receiver volume level is set to low.
- In normal operate mode the volume may be adjusted by rotating the front panel rotary knob while on the main screen.

5.) The unit tries to transmit then stops and the VSWR enunciator illuminates on the LCD.
- This is an indication that there is a malfunction in the transmission line (coax cable) or antenna. If this happens a qualified technician should check the cabling and antenna installation for the problem.

6.) The base unit is connected to a tone remote adapter, and remote operations fail to operate the radio properly.
- Try disconnecting the remote control and operate the M2115 locally. If the unit operates properly, replace the tone remote adapter.

7.) The wrong frequency appears on the main menu screen for a previously programmed channel.
- This is an indication that there may have been an inadvertent change in the configuration of the radio. If security is not enabled, enable it by adding a user. After security is enabled, only a user with a password can gain access to change configuration data. It is also possible that there was a firmware malfunction that the configuration needs to be reloaded.

8.) The volume is different from when the unit was last turned off.
- This is because the unit was not turned off from the front panel on-off button.

Licensing [11]

In the United States, all aviation band transmitters must be licensed by the Federal Communications Commission (FCC). Applications for base stations are filed on FCC form 406.

Model	Enter these FCC ID's on application	Transmitter Output
M2115M	QQTM2115	10 W
M2115B	QQTM2115	10 W

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Mentor Radio, LLC could void the user's authority to operate the equipment and voids the manufacturer's warranty.

With each new M2115B, there are instructions included on how to complete form 406 online at the FCC Internet web site (Drawing. 1100958).

The radio equipment you have purchased requires FCC licensing. This was formerly done by completing and mailing FCC Form 406. This has been replaced by electronic online filing via the Universal Licensing System (ULS). The Internet address for this is www.wireless.fcc.gov/uls. This site provides instructions for the application, as well as online forms to complete and transmit electronically, as well as instructions for payment of filing fees.

In the past, Mentor Radio provided information required by Form 406 for its specific models. This information may still be needed when you make the online application, and is provided below for your assistance. The Mentor Radio Model identification is not the same as the FCC Identification. The first table below gives the FCC Identification and the transmitter power for Mentor models.

For all Mentor Radio transmitters enter "6K00A3E" for "emission and bandwidth" ("0" is a numerical zero, not the letter following "N").

You may be asked for a "Class of Station". The second table below can help you select your Class. You must apply for a frequency that the FCC permits for your selected Class. Some of the permissible frequencies are listed below. For a complete listing of available frequencies, consult the FCC rules, Part 87.173 (available online at www./wireless.fcc.gov/rules).

Class of Station	FCC Code	MR Models	Typical Use	Frequencies Available
Aeronautical Advisory	FAU	M2115B	Unicom	No tower: 122.700, 122.800 Tower on field: 122.950 Heliport: 123.050, 123.075
Aeronautical Multi-com	MFL	M2115B	Air/Ground	Coordination 122.850, 122.900, 123.100
Search & Rescue	SAR	M2115B		123.100
Aviation Support	FAS	M2115B	Flight Schools, Soaring	123.300, 123.500, 121.950
Aero. Utility Mobile	MOU	M2115M	Airport vehicles Gnd. Cont. & tower freqs	
Aeronautical Enroute	FA	M2115B	ARINC, Corp.	128.825 to 132.000
Flight Test	FAT	M2115B	Manufacturers	123.200, 123.225
Control Tower	FAC	M2115B	numerous	118.000-136.975

Limited Warranty [11]

Your Mentor Radio Division equipment is warranted to the original consumer purchaser only, for one full year, to be free from defects in materials and workmanship under normal use. This warranty does not include damage to the product resulting from accident or misuse. This warranty will not be effective unless you submit a Warranty Registration online at http://www.mentorradio.com.

If the equipment should become defective within the warranty period, we will elect to repair or replace it, without charge, if returned, postage prepaid, to the address shown below. We are not liable for defects or damages caused by the use of unauthorized replacement parts and/or service.

ALL IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITTNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO ONE YEAR. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

MENTOR RADIO, LLC., BECAUSE OF LACK OF CONTROL OVER THE CONDITIONS OF USE OF THIS EQUIPMENT, IS NOT LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. ANY RECOVERY MAY NOT BE GREATER THAN THE PURCHASE PRICE PAID FOR THE EQUIPMENT. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.