



## **M2115RCU RADIO CONTROLLER OWNER'S MANUAL**



This owner's manual applies to the following specific models:

**AVIATION: M2115RCU-XXX**  
**MARINE: M2115RCU-M**

Mentor Radio produces a family of radio control units, also known as, Pilot Controlled Lighting (PCL), or Pilot Activated Lighting (PAL) systems. This manual covers both aviation and marine band versions for both the 25kHz and 8.33kHz channel spacing. The aviation band version is a VHF radio that operates from 118-137MHz and the marine version is a VHF radio that operates in the frequency range from 155-157MHz.

## **SAFETY**

"Warnings" represent safety issues that if disregarded could cause serious injury or death to people. "Cautions" represent safety concerns that if disregarded could damage equipment or cause personal injury.

### **WARNINGS**

***This unit can be configured for operation from many different power sources. (10 to 30 VDC or 115 VAC or 230 VAC) Depending on the individual installation, dangerous voltages may be present inside the unit's printed circuit board mounting case. It is the user's responsibility to operate the unit safely for a particular installation.***

- 1. High Voltage may be present inside the case when opened.***
- 2. If installed outside, do not operate, test or power up the controller unit in the rain with the NEMA enclosure opened and/or the case cover removed.***
- 3. Maintenance of unit should be performed only by personnel qualified in electrical safety.***
- 4. Disconnect all electrical power prior to removing or performing maintenance on the circuit board or on DIN rail mounted components.***
- 5. Do NOT connect any external circuits rated with voltage higher than 230VAC to relay contacts.***

### **CAUTIONS**

- 1. Do not connect electrical equipment to the controller with power applied.***
- 2. When connecting the computer (PC) to the controller, ensure the power switch is turned off.***
- 3. Do NOT connect any input power other than that identified for the unit.***





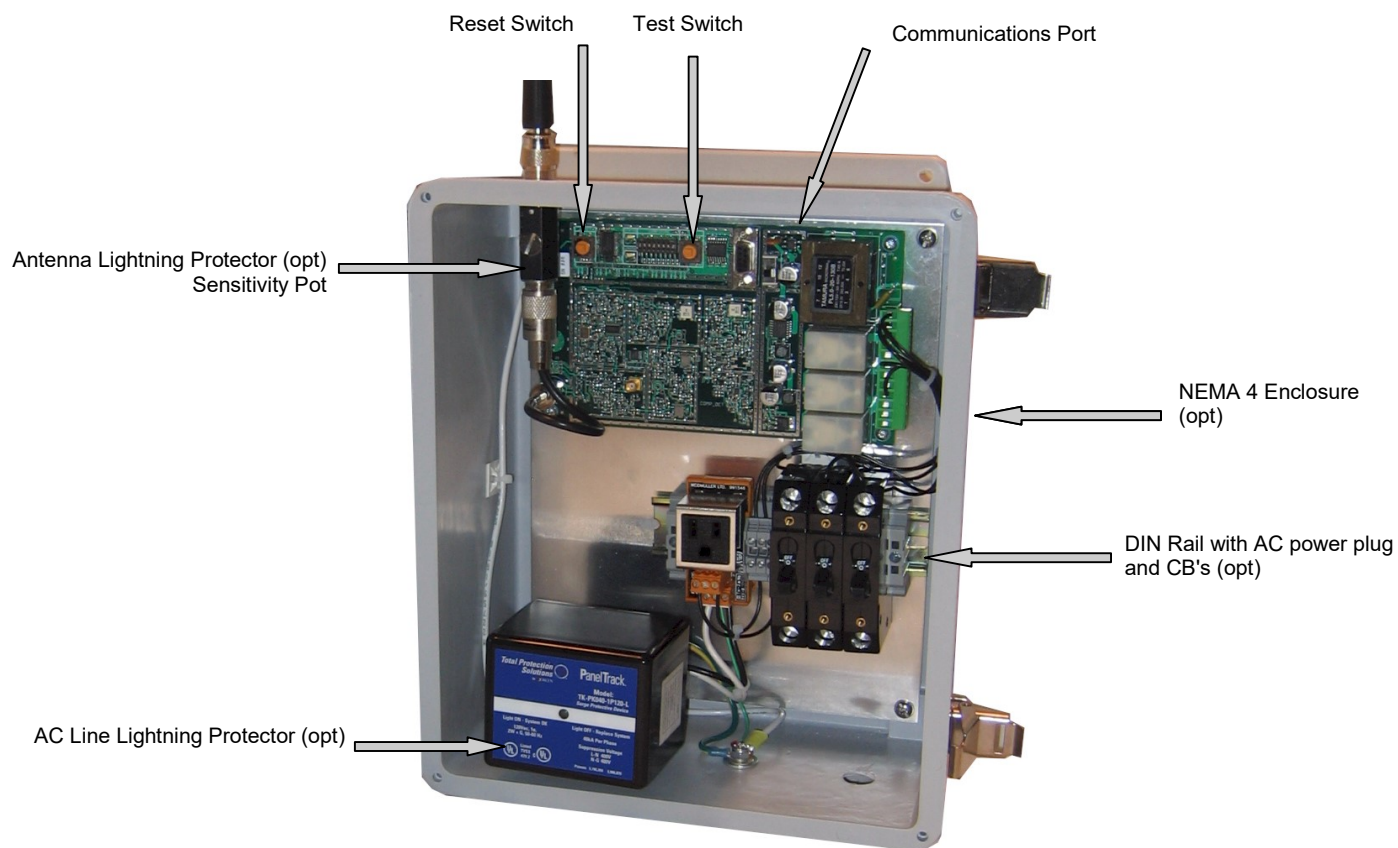
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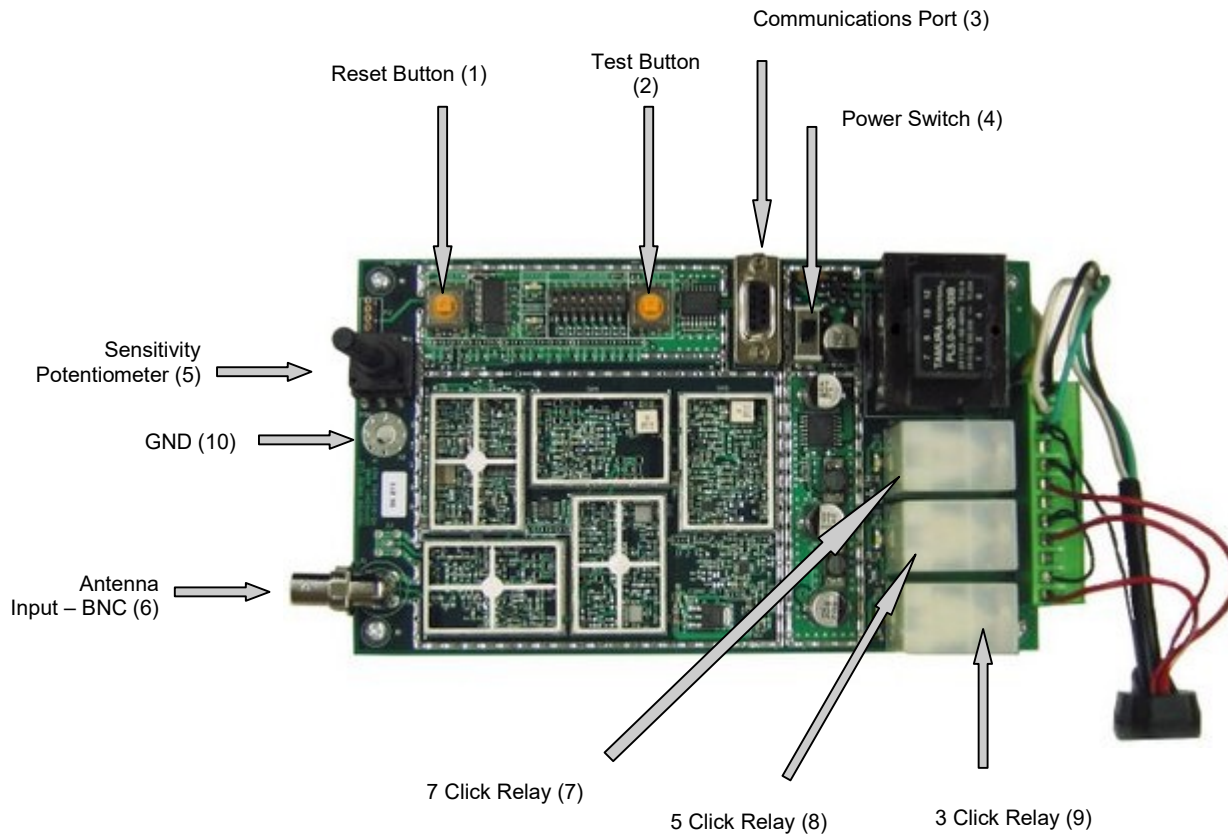


## Component Layout

(Includes optional items)



## Controls Layout





## **Basic Features**

- **Channel Spacing:** 25kHz or 8.333 kHz
- **Synthesized Tuning** - Customer programmable. Utilizing a standard DB-9 serial cable (included) use your PC to program the operating frequency using custom PC software. Password authentication required to change operating frequency for increased security and to prevent inadvertent changes.
- **Indicator lights** - Colored LED's light up to display relay activation. A STATUS LED flashes once per second to indicate normal operation. A WINDOW LED turns on to indicate a mic click has been detected and the unit is waiting for more clicks. Relays can only be energized with the WINDOW LED is on.
- **Relays reactivate after power restoration** – Automatically energizes those relays that were energized prior to the moment power was lost. If the power is restored the timeout period is reset to a full timeout period.
- **Operates from wide range of power sources** – The controller can operate with any power from 10VDC, 12VDC, 24VDC, 30VDC, 115VAC, or 230VAC. Conversion from DC to AC power sources requires sending the unit back to the factory for re-configuration. Remote locations may find it convenient to power the unit from a solar panel with a battery back-up to simplify remote installations.
- **Test Button** - Test relays and controller circuits without radio inputs.
- **Reset Button** - De-energize relays before timeout expiration.
- **8 Different Time Out Values** - No timeouts, 10 seconds, 5, 10, 15, 30, 45 & 60 minutes. Available in 8 and 12 hour timeouts intervals upon special request.
- **Optional Weatherproof Enclosure** - Unit fits into a 12"x6" fiberglass enclosure with built-in mounting capability.
- **Optional Lightning Protection** - Available for both AC line input and antenna input.
- **Power Status** - Indication built into the STATUS LED.
- **Receiver Sensitivity Adjustment** - Potentiometer adjustment allows setting receiver sensitivity within the range of about 1 uV to more than 10,000 uV.





## **Theory of Operation**

The M2115RCU radio control unit consists of a radio receiver and a microprocessor-based decoder/controller assembly. The receiver detects microphone “clicks”—short radio transmissions when a user presses the push-to-talk (PTT) switch on an external VHF radio. The decoder operates relays according to the patterns of clicks. The receiver is based on the model M15 receiver/transmitter. Except for the oscillator circuit, the transmitter circuits are not installed; the oscillator is used to generate a test signal to check operation of the receiver and decoder/controller assembly.

The receiver is a frequency synthesized dual conversion super heterodyne. It contains two mosfet dual-gate mixers. The first local oscillator is frequency synthesized and operates at 400 mHz above the channel frequency. The second local oscillator operates at 455kHz. The filtered output of the receiver’s diode detector is connected to the input of the decoder/controller board where it is digitized. The click detection and relay control logic is performed by the embedded microcontroller. The microcontroller software determines if the signal is a valid radio click. If a valid click is received the controller opens a window for the configured time interval to allow more clicks to be received. The controller responds to 3, 5 or 7 pulses within the “window” time and energizes up to three relays. The relay contacts are connected to the terminal strip on the decoder/controller board for controlling lights or other external electrical equipment. For protection, relay contact connections from the decoder/controller to external load circuits may optionally pass through three 5-ampere fuses or circuit breakers.

The optional antenna lightning protector includes a replaceable gas discharge tube. The AC line lightning protector also includes an LED which is normally illuminated indicating that the line protector is operating properly. This LED will remain on even when the unit is turned off.

## **General System Operation**

In order for a pilot to turn on the runway lights, he first sets his radio to the channel frequency used by the airport radio control unit (M2115RCU). He then briefly presses and releases his push-to-talk (PTT) microphone switch to produce a sequence of short “clicks”. The first microphone “click” starts the “window” timer, after which the operator has either 3 or 5 seconds to complete the desired sequence; either 3, 5 or 7 clicks. On the first click, the microprocessor turns on the “WINDOW” LED, starts a timer and waits for more pulses. Once the “WINDOW” timer expires, the “WINDOW” LED is turned off and the received pulse count is reset. During the time the window is open, any additional clicks are received, and the response of the unit is governed by the selection of the various dip switch settings. If three pulses are received, the 3-click relay is energized. On the 5th pulse, the 5-click relay is energized, and on the 7th pulse the 7-click relay is energized. All energized relays remain energized for the configured timeout period. At the end of this timeout period, all relays deactivate.





During any time-out period, another series of microphone clicks may be transmitted, decoded and the corresponding relays are energized provided the relay “deactivate disable dip switch” (switch 5) is not enabled. The configuration of the following sections define how the unit will perform.

## **Dipswitch Configuration Options**

To aid in the configuration, there is a visual aid in the PC software included to allow viewing the switches that are set and the interpretation of their behavior. The testing of this behavior can be performed from either the controller or the PC.

### **Timeout Period (Dipswitch 1, 2, and 3)**

The following chart determines the switch settings for the corresponding time out period.

<b>Timeout Period</b>	<b>SW 1</b>	<b>SW 2</b>	<b>SW 3</b>
No Timeout	ON	ON	ON
10 Second	OFF	ON	ON
5 Minute	ON	OFF	ON
10 Minute	OFF	OFF	ON
15 Minute	ON	ON	OFF
30 Minute	OFF	ON	OFF
45 Minute	ON	OFF	OFF
60 Minute	OFF	OFF	OFF

### **Window Time (Dipswitch 4)**

**Off - 5 Second Window**  
**On - 3 Second Window**

### **Relay Deactivate Disable (Dipswitch 5)**

**Off – Normal Operation**  
**On – Enable Function**

With this feature enabled the only way to de-energize energized relays is at the end of the timeout period.







### **Mutually Exclusive Configuration (Dipswitch 6 Off)**

This mode is programmed to allow only one of the relays to be energized at any one time. For example, as before, the first click starts the configured “Window” timer. (3 seconds or 5 seconds). If 3 clicks are received before the “Window” timer is expired this causes the 5-click and 7-click relays to drop out. On a fifth click, the second relay will pull-in again, and on a seventh click the third relay will pull-in again. In this way, a pilot can change the lighting or which loads are controlled, if desired, without waiting for the end of the time-out period. A new time-out period will begin at the end of the 5 second window.

### **Mutually Exclusive Disabled Configuration (Dipswitch 6 On)**

This is the normal operating mode. This allows the relays to all be energized during the timeout period. When each new sequence of clicks is received the corresponding number of relays energizes without de-energizing any other relays. For example, the 3-click relay stays energized upon the receipt of the 5<sup>th</sup> new click at which time the 5-click relay energizes.

### **Click-Off Function Configuration (Dipswitch 7 On, 8 Off)**

### **5 Click-Off Enabled Configuration (Dipswitch 7 Off, 8 Off)**

This configuration is primarily suited for customers who only want to turn one set of lights or equipment on and off. The normal configuration will not allow the user to manually de-energize the relays once the timeout period is started. This 5 click off option allows that. If only the 3-click relay is installed to control one item, the user can turn on the equipment with 3 clicks and turn off the equipment by clicking 5 times.

### **7 Click-Off Enabled Configuration (Dipswitch 7 Off, 8 On)**

This is the same configuration as the 5 click-off, except that it allows the use of 2 different relays to be controlled and allow the pilot to manually turn off both with 7 clicks. .

## **Installation**

Depending on which model M2115RCU you purchased, installation can vary. To protect your investment, we recommend lightning protection for all models installed outdoors. The following considerations apply to every M2115RCU model.





**Choose a proper site\*:** The M2115RCU may be installed either indoors or outdoors. Considerations about antenna placement, power input availability and relay connection requirements should be taken into consideration when selecting a suitable installation location. (\*Note: See installation instructions for each model listed for individual recommendations.)

**NOTE:** When the M2115RCU is mounted outside, a location should be selected so that the antenna is not “shadowed” by buildings or other obstructions in the direction from which aircraft may approach. For maximum radio range, mount the antenna as high as practical. For outdoor operation use, a optional NEMA enclosure is required. Application of a waterproof sealant over external coaxial connectors is recommended along with all electrical wires connecting between the internal relays and external equipment.

**Configuration:** This step is only required if the unit is not configured at the factory or if changing the configuration dip switches is required. Connecting a PC to the enclosed DB-9 serial communications port will allow the user to change the operating frequency. NOTE: only authorized persons are allowed to change the operating frequency in the computer program. Access to this functionality is password protected. The PC software also allows the user to test the new dip switch settings before physically changing the switches on the radio control unit. Once the relay performance is verified the new switch settings are to be made permanent, click the button “Get Physical Dip Switch Settings.”(NOTE: 8.333Hz channel spacing requires 2 software programs to set the functionality; one for setting the frequency and the other to set the performance “dip switch” settings.) Both are included on the CD that is included with each unit.

**Testing:** After configuration, test the controller using the “Test” button in the PC board.

## Installation for each model M2115RCU is as follows:

### M2115RCU-BNC

1. Choose a location where:
  - No metal or other conductive particles could come in contact with the printed circuit board of the M2115RCU-BNC radio control unit.
  - No fluids could splash onto printed circuit board of the M2115RCU-BNC.
  - Unit will not be exposed to severe temperature changes. (near furnaces or air conditioners)
2. Connect relay and power wires to green connector. If unit is configured for AC power, connect your power ground to the plate ground stud.
3. Connect antenna to printed circuit board BNC RF connector using adapter (included).



## **M2115RCU-ALC**

Aluminum case with external terminal boards on the rear and an antenna input BNC connector on the front.

1. Remove the four case screws and mount the case to an appropriate mounting fixture so that the unit is secure before connecting wires.
  2. Connect control relay wires to 9 terminal strip as follows.
    - Pin 1 : K1-NO
    - Pin 2 : K1-C
    - Pin 3 : K1-NC
    - Pin 4 : K2-NO
    - Pin 5 : K2-C
    - Pin 6 : K2-NC
    - Pin 7 : K3-NO
    - Pin 8 : K3-C
    - Pin 9 : K3-NC
  3. Connect power wires to 3 pin terminal strip. If connecting M2115RCU-ALC to 10-30VDC
    - Pin 1 : DC + (pos)
    - Pin 2 : DC - (minus)
    - Pin 3 : GND (earth ground)
- If connecting M2115RCU-ALC to 115VAC
- Pin 1 : AC-Line
  - Pin 2 : AC-N
  - Pin 3 : AC-GND
4. Connect antenna to printed circuit board BNC RF connector using adapter (included).



## **M2115RCU-STC**

1. Install case to appropriate mounting fixture.
2. Install control relay and power wires through the NEMA case and attach to green PCB mating connector as follows.
  - Pin 1: K1-NO
  - Pin 2: K1--C
  - Pin 3: K1-NC
  - Pin 4: K2-NO
  - Pin 5: K2-C
  - Pin 6: K2-NC
  - Pin 7: K3-NO
  - Pin 8: K3-C
  - Pin 9: K3-NC
  - Pin 11: AC-N (for a DC configuration connect to –DC).
  - Pin 12: AC Line (for DC configuration connect to +DC).
3. Connect power input ground to enclosure ground terminal board.
4. Install antenna to exterior UHF feed thru connector on NEMA enclosure.

## **M2115RCU-FGC**

1. Installation procedure is the same as M2115RCU-STC. (See above procedure).

## **Connections**

**Antenna Connector:** Standard UHF coaxial antenna.

### ***Power and Control:***

The electrical connections for power and control are normally made via two 7/8" holes in the enclosure. Wiring may be connected through conduits, or as required by local electrical codes. The contacts of the relays on the decoder assembly are rated for 5 amperes at 120 VAC or 2.5A at 240VAC.

Follow manufacturer's installation instructions to install antenna. Depending on the model of M2115RCU purchased, an adapter may be necessary. If the antenna provides a UHF style connector, it will be necessary to install a UHF female to BNC male adapter in order to connect the antenna coax to the M2115RCU antenna input connector. Each radio controller comes with a coaxial cable (6") with a BNC connector that attaches to the controller's electrical board on one end and a UHF connector on the other end.





When the M2115RCU is mounted outside, a location should be selected so that the antenna is not “shadowed” by buildings or other obstructions in the direction from which aircraft may approach. For maximum radio range, mount the antenna as high as practical. For outdoor operation, use of an optional NEMA enclosure is required. Application of a waterproof sealant over external coaxial connectors is recommended along with all electrical wires connecting between the internal relays and external equipment.

## **Testing, Programming and Adjustments**

### **Testing**

Testing consists of operating the unit such that the control relays energize and de-energize to verify that equipment connected to the relays are operating correctly. Testing the relays consists of either actual energizing of the physical relays or performing a simulated energizing of the relays to test logic and timing. To test the actual energizing of the relays, the test may be performed with or without the aid of a PC or radio. In order to test the receiver portion of the controller any aviation band transceiver may be used to produce the necessary microphone clicks. Customers may also test the physical energizing of the relays and the controller/decoder's ability to energize the relays by performing a test by pushing a test button installed on the front panel. The reset button cancels remaining timeout interval and de-energize all relays.

Connecting a PC to the M2115RCU and running “test” using the M2115RCU-PC windows based program allows users the ability to run tests from the controller. Further, the operating frequency may be read directly from the controller and viewed on the PC to verify the correct operating frequency. (NOTE: Please use correct programming software (25kHz or 8333kHz channel spacing) to verify the correct operating frequency. Use the 25kHz programming software to verify the functionality of the dip switch.)





**Testing using radio:**

Press the microphone button 3, 5 & 7 times each to verify relays energize and de-energize according to dip switch configuration settings. (Allow time for window LED to extinguish before starting next series of clicks.)

**Testing using Test button on M2115RCU:**

1. Verify that the STATUS LED on the Controller PCB assembly is on and blinks at a rate of once per second.
2. Press test button 3, 5 & 7 times each to verify relays energize and de-energize according to dip switch configuration settings. (Allow time for window LED to extinguish before starting next series of clicks)

**Testing using M2115RCU-PC program:**

1. Connect PC communications port cable.
2. Connect the software using the following section procedure "Programming" steps 1-6 and "Configuration" step 10. Select "Test From PTT on Controller" as "Test Target".
3. Click PC Test button 3, 5 & 7 times each to verify relays energize and de-energize according to dip switch configuration settings. (Allow time for window LED to extinguish before starting next series of clicks)

Simulated Testing using M2115RCU-PC program may be performed the same as testing using M2115RCU-PC program above except select "Test from Computer" as "Test Target".



## Programming

The programming procedure is required to change the operating frequency. Once set this should not need to be changed, but may be viewed to ensure correct programming of the operating frequency. The configuration procedure is available to aid customers when changes to the dip switch settings are desired or needed.

**For programming, simulated testing and adjustments, the enclosure door must be opened. WARNING. Since the enclosure may contain 120 VAC or higher power present on exposed terminals, the following should be done only by persons trained in safety precautions for these conditions.**

1. Gain access to the M2115RCU Communications Port connector. (See Component Layout diagram - page 5)
2. Connect serial cable between computer and controller. Ensure that the controller power is off before connecting the cable.
3. Run M2115RCU-PC software.
4. Set the communications port to the correct serial port. If this is the first time the M2115RCU-PC software is run or the serial cable is connected to a different physical port that the last time it was run, click Communications Port Select, and then click on the corresponding port for the physical connection to the controller serial cable. If the M2115RCU-PC software was previously run and the same port is currently being used, this step is unnecessary.

### **Software Connection to M2115RCU**

1. From M2115RCU-PC main screen click Configuration Connect.
2. To initiate communications with the controller press and hold the controller "Test" button before turning on the controller power switch. After turning on the power switch, release the "Test" button. The M2115RCU-PC menu configuration should change from gray to black (enabled) to indicate that you are connected to the PC. **NOTE:** it is normal for the RCU to not blink the STATUS LED when connected to a PC.

### **Changing the Frequency (25 KhZ Channel Spacing)**

1. Click M2115RCU-PC Configuration | Sign In. If this is the first time the software is used, "Sign In" will be disabled. Go to Configuration | Create New Password to create a password. This password is used to authenticate the user to allow changing the operating frequency. If a password did not exist before, and it was created with "Create New Password", pass step 8 because the user is now signed in. If a password already existed, click Sign In.





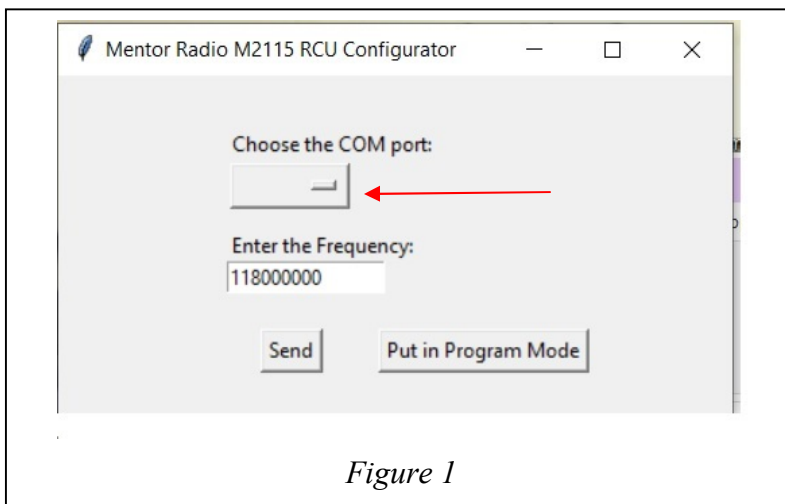
2. Click "View/Set Frequency". Enter the appropriate operating frequency. Click the "Save Frequency" button to write the frequency to the controller. NOTE: The frequency can only be changed after the user is "signed in".

### ***Changing the Frequency (8.333 KhZ Channel Spacing)***

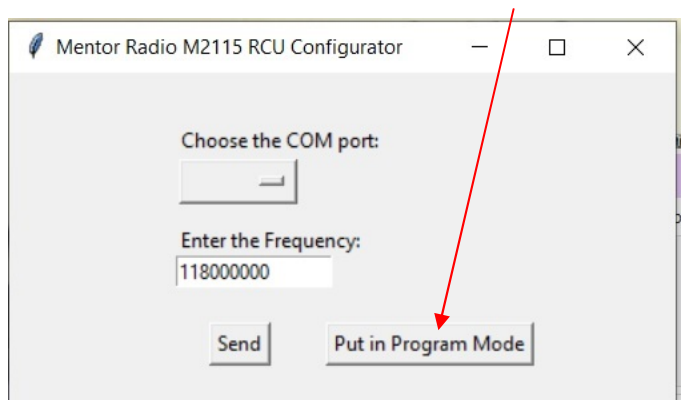
The software is a self-contained executable file that can be run from any directory in a computer storage system. (NOTE: the software will program any Mentor Radio RCU frequency and not only 8333Hz versions.)

Make sure that the "COM" port is installed on the computer before running the programming software. The program scans for COM ports upon running, but will not detect them if they are installed after the program starts.

1. Turn on the M2115RCU while holding down the "test button," this is the same as the other software for 25 kHz.
2. Connect the serial cable to the DB9 connector on the M2115RCU.
3. Run the executable file. The following dialog box should appear. (Figure 1)
4. Click on the pull down box under the "Choose the COM port:" label.
5. Choose the COM port that will be connected to the RCU.

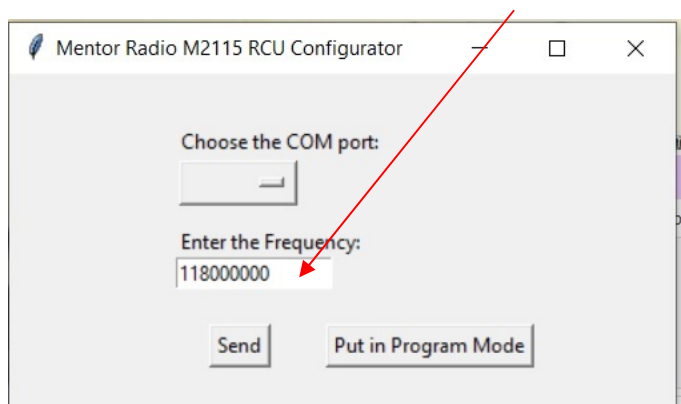


6. Press the “Put in Program Mode” button. (Figure 2)



*Figure 2*

7. Enter the desired frequency in the Frequency box. Frequency must be entered in Hz format. There should be 9 digits for each frequency. (Figure 3)



*Figure 3*

8. Press the "Send" button. (Figure 4)

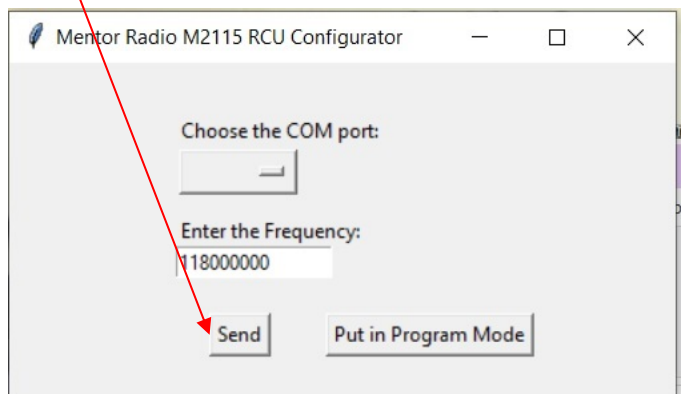


Figure 4

The M2115RCU will change frequency right after the "Send" button is pressed. Multiple frequencies can be entered, but only the last one entered before the M2115RCU is turned off will be remembered.

9. Turn the power to the M2115RCU off. The frequency is now programmed.

The table below, figure 5, shows all the frequencies that are allowable in the range of between every 100 kHz in the total frequency range of 118MHz to 137MHz.

**Frequencies available between 'Kilohertz'**

08333	16667	25000
33333	41667	50000
58333	66667	75000
83333	91667	

Figure 5

The frequency that can be entered takes the format of: 1XXX + one number in table.  
For example, a valid frequency would be 124583333. Where 1245 is the 1XXX part and the 8333 Hz is a frequency in the table.

## **Configuration**

This section describes how the software may aid the customer in selecting the physical dipswitch settings to ensure the controller is operating as expected. This procedure may be used with the 25 kHz software whether the controller is connected to the PC or not. Using the software without the controller allows the user to test a new dipswitch setting without actually affecting the actual controller relays or stressing the connected control circuits. If the user wishes to test new configuration settings without connecting to the RCU, simply perform step 3, disregarding steps 1-2, and steps 4-9.

1. Click under Configuration "Run Tests". Then click the tab "Current Settings". Then select the settings that you want to be tested (See "DIPSWITCH CONFIGURATION OPTIONS" for the description of these settings). To select where to test from, select the "Test Target" menu option. To enter the test, click on the "Enter Test Mode" button. If testing from the computer, press the "Test" button in the program. If testing from the controller, press the "Test" button on the controller. In both cases, operation reflecting the "Current Settings" will be seen on both the controller and PC. If the "Current Config" is desired as the normal controller configuration, click on the "Dipswitch Visual" tab. Use the image of the "Current Dipswitch" as a guide and set the controller dip switches.
2. Verify your switch settings by clicking the "Press to get your Physical Configuration" button on the dipswitch visual tab. The display for the physical dipswitch should change to reflect the new dipswitch settings. The images between the Physical and Current Dipswitch settings should be in agreement. You can also confirm the physical switch settings by clicking the "Physical Dipswitch Config" tab. The settings should agree with your desired settings from the "Current Config" tab.
3. Click "Back" and then "Exit" to shut down M2115RCU-PC program.
4. Turn off the controller.
5. Disconnect serial cable.

**NOTE:** If the user wishes to test the controller using actual radio clicks, it is necessary to disconnect the M2115RCU-PC software. To disconnect the software, click back, but do not click "Exit" on the main screen. Click "Communications Disconnect". The STATUS LED should blink. The controller is now operating normally

After the complete M2115RCU is installed, it is essential that daytime tests be conducted to confirm that the system operates as expected. Results from these tests may require adjusting the sensitivity potentiometer to achieve desired performance.

## **Adjustment**

Setting the Sensitivity Potentiometer (5) requires no tools. To adjust the sensitivity potentiometer, (5), simply turn the shaft of the potentiometer (5) counter-clockwise (CCW) to increase sensitivity and clockwise (CW) to decrease sensitivity.

## **Periodic Maintenance**

Periodic maintenance/inspection is recommended. Customer may determine appropriate time interval for their installation. Check the following items:

1. Remove accumulated dust, dirt, and moisture from inside of the enclosure.
2. Inspect all electrical connections and wires. All connections should be secure and free from corrosion.
3. Test per section "Testing" (page 12)
4. If AC line lightning protection is installed: Verify that the LED on the AC Line protector is ON. **CAUTION:** Failure to routinely inspect for and correct this condition may result in damage to the unit in the event of a lightning strike. If at the time of inspection the green LED is blinking four times per second rather than the normal once per second, the microprocessor's "watchdog" feature has detected an error in its operation, but has corrected the problem. If it blinks sixteen times per second the error was caused by a power "brown out"; that is, the 120 VAC line voltage at some time has fallen below the 98-132 v operating range. **NOTE:** these fast blinking rates are intended to alert users to a past problem that has been self corrected, not that there is an existing problem. These problems may have been of such short duration that they were not noticed. The blinking LED may be reset to once per second either by pressing the small reset switch button near the LED, or by moving the on-off slide switch briefly to off, then back on.

## **Spurious Operations**

Occasional spurious (unexpected) operations are nearly inevitable. Usually the spurious operations are not caused by a defect in this equipment. For airport lighting, some possible causes of these “spurs” include:

1. An aircraft intending to operate lights at another airport accidentally transmits on the wrong frequency, or both airports use the same frequency for light control.
2. Two aircraft transmit simultaneously on the channel with transmitters whose frequencies differ by less than 20 Hz (causing a low frequency heterodyne)
3. An aircraft transmits with a defective transmitter, microphone, cables, or antenna system (“cuts in and out” or “breaks up”). Certain lightning static patterns from in-range electrical storms. If pilots feel that the operating range is greater than necessary and that spurious operations are troublesome and may be caused by distant aircraft, the sensitivity of the receiver can be reduced. (See the section on Adjustment). It may be necessary to experiment with several settings before finding the best one for a particular installation. Microphone clicks must be at least 1/20 second long to register. If the sequence of clicks is too slow, the 5 second window may expire before the last click is counted. The pilot should make certain his radio is tuned to the correct frequency and should be aware that the range of operation is dependent on altitude. In some installations, the range will be less for aircraft approaching from some directions, due to multi-path reflections of the radio signal or to shadowing from hills and buildings.

## Troubleshooting

1. **Problem:** Pilot cannot turn on runway lights from the air. Pilot can turn on lights when aircraft is on the ground.  
**Solution:** Adjust sensitivity potentiometer.
2. **Problem:** Unit Inoperative.
  - a. Is Status LED blinking?  
**Yes:** Test without computer (See instructions below).
    1. Pass: Test with radio. (See step 3) (
    2. Failed – No Relay activation after 3-5 and 7 clicks, but, relay LED's operate normally.  
**Solution:** Replace Relay. Check relay wiring.
    3. Failed – no Window LED when test button pressed. Test with computer (See instructions below). If still fails, return unit for repair.  
**No:** check power, if power ok, return unit for repair.
3. **Problem:** Unit Tests OK with or without computer, fails with radio.  
**Solution:** Adjust sensitivity pot by increasing sensitivity. If unit still fails, send in repair for radio.
4. **Problem:** Relays de-energize before expected timeout.  
**Solution:** Connect computer, click Get Physical Dipswitch Settings. Compare displayed timeout to expected timeout values. Is timeout correct? If yes: Run test from computer and observe timeout box. Change Dipswitch settings for expected timeout or return unit for repair.
5. **Problem:** Unit will not connect to PC.  
**Solution:** Make sure to set M2115RCU-PC software communications port to correct communications port number before connecting. Press and hold Test button when turning power switch on the M2115RCU unit.
6. **Problem:** Cannot change operating frequency.  
**Solution:** computer communications cable must be connected to controller communications port connector. M2115RCU-PC software must be running on PC and connected to controller. User must be logged in to M2115RCU. Only authorized users may change operating frequency.
7. **Problem:** Relays energize without radio mic clicks or test button presses.  
**Solution:** Adjust Sensitivity potentiometer clockwise (CW) to decrease sensitivity.



**Items 8 and 9 are for installations that have lightning protection installed.**

8. **Problem:** Potential lightning strike.  
**Solution:** If there is a lightning strike on the antenna. Replace the gas discharge tube and inspect all wires, ground wire, coax and antenna for damage.
9. **Problem:** Potential lightning strike on power source.  
**Solution:** If there is a lightning strike on the power line and the LED on the AC Line Lightning protector is not illuminated, replace the AC line lightning protector.

**WARNING:** This equipment contains internal voltages that can cause injury or death. Tests should be performed only by personnel trained in electrical safety.

The objective of troubleshooting is to identify a defective component so that it can be replaced. The PCB is the only field-replaceable component. If the unit does not respond to aircraft signals, start by testing the unit with the cover removed.

Testing may be performed without the PC connected to the controller to determine the general health of the unit.

**Testing without computer** (Periodically test the controller system to ensure the unit is performing optimally).

1. Remove enclosure cover.
2. Observe the behavior of the LED indicators located on the printed circuit board assembly. If the red "Status" LED is blinking, then the decoder assembly is turned on, power is properly applied to the unit and the assembly is operating normally.
3. Press 'Test' button on controller 3 times. On the 1<sup>st</sup> press the 'Window' LED should light, with the 3 click relay LED lighting on the 3<sup>rd</sup> pressing. Depending on the anticipated behavior from the configuration settings, press the button the appropriate number of times to energize the 5 click and 7 click relays if they are present.
4. Wait the appropriate length of time for the configured timeout period and watch the corresponding relay LED to make sure that the LED goes out when the timeout period has expired.
5. If all tests pass, close cover.
6. Test complete.
7. If the status LED is operating normally but the red "window" LED does not turn on when the controller "Test" button is pressed or any other problem occurs during the previous test, it will be necessary to connect the computer to the controller to continue testing.

To establish that contacts on a relay are not operating correctly, observe the associated LED (red, green, yellow). If the LED lights up, but the controlled lights do not respond, connect a jumper across the relay contacts. If the lights *do* respond as expected, the relay may be defective. Note that in many installations there will be another external relay between the decoder relay and the lights.

### **Testing With Computer**

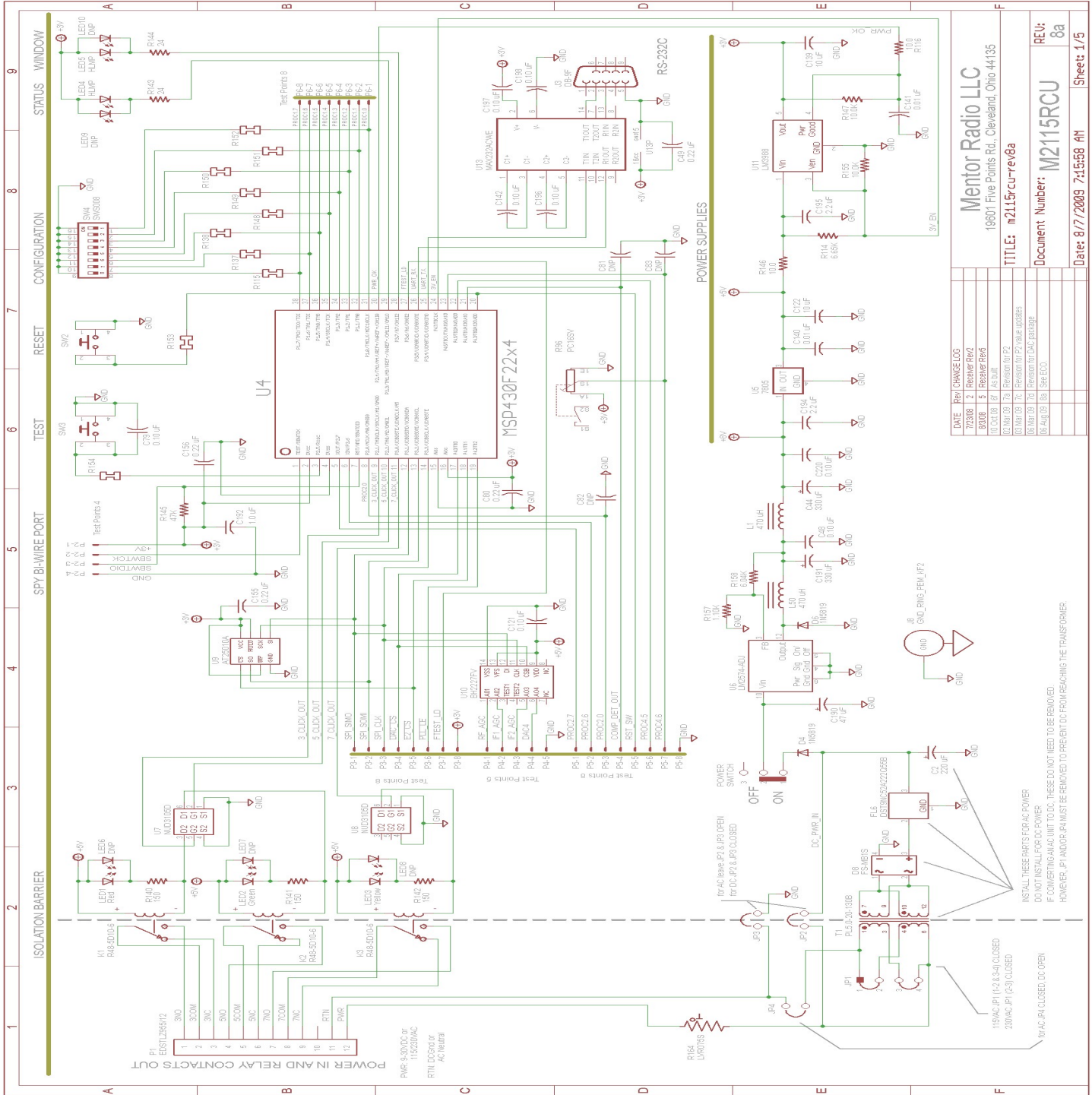
1. Remove enclosure cover
2. Connect the serial cable between PC and controller.
3. Select connect from main menu.
4. Press Test button and turn on controller. PC menu Configuration should turn from gray to black to indicate active menu.
5. Select "Configuration" | "Run Tests". (Ctrl-T)
6. Select where you want to run the test from on the PC Unit Configuration screen.

#### ***If from PC:***

- a. Click "Enter Test Mode"
- b. Click "Test" button 3, 5, & 7 clicks to test response on both computer and controller. The controller should respond with the window and relay led's activating at the corresponding clicks.

#### ***If from controller:***

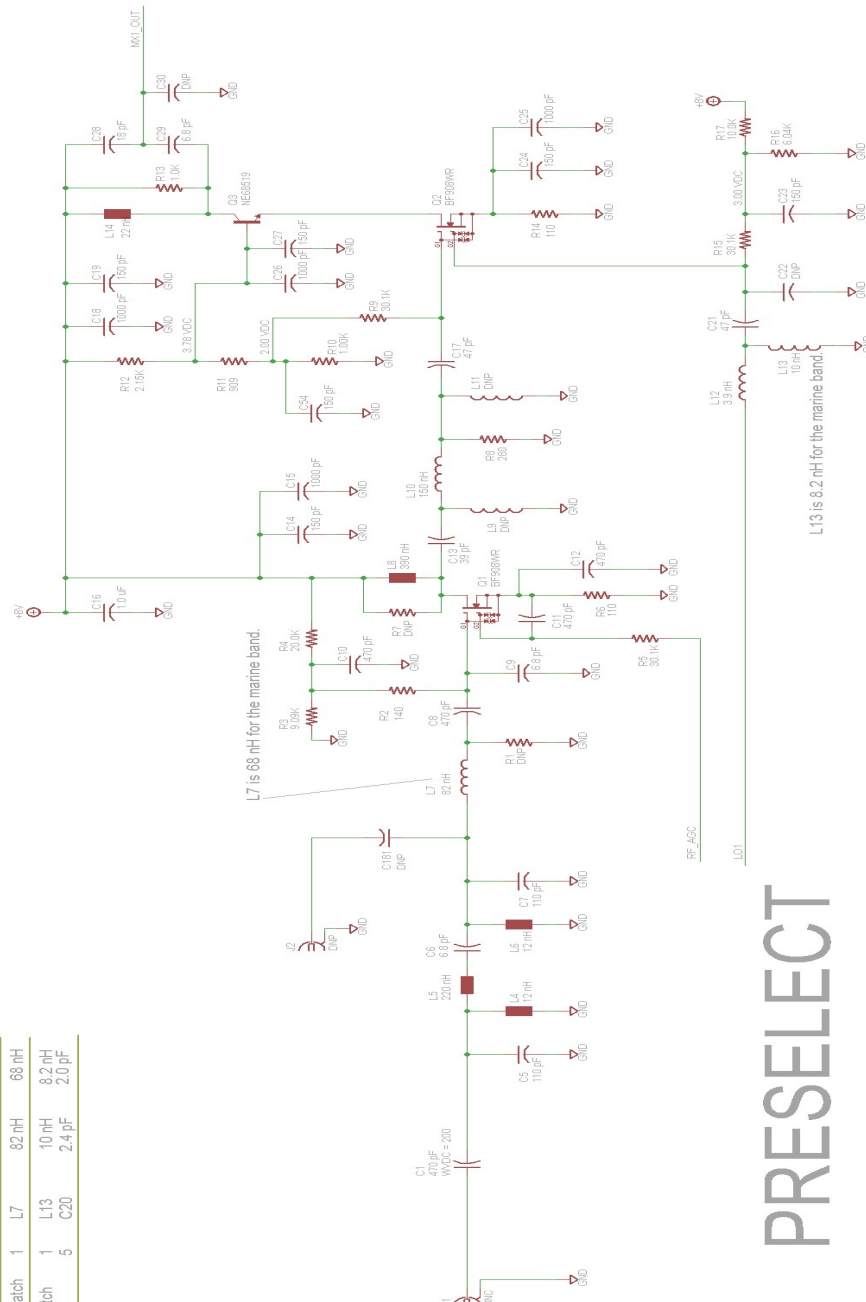
- a. Press the "Test" button on the controller.
  - b. Observe the window and relay LEDs activate on the controller and the computer.
7. Select Click to Quit from PC screen to end testing.
  8. Turn off controller power.
  9. Disconnect serial cable from controller.
  10. Turn power back on controller. Verify status LED is flashing once per second.
  11. Press controller "Test" button at least 3 times to energize at least the 3 click relay.
  12. Turn controller power off. Wait at least 3 seconds and turn power back on. Controller relay should reactivate.
  13. At the end of the configured timeout period the relay should deactivate.
  14. Test complete



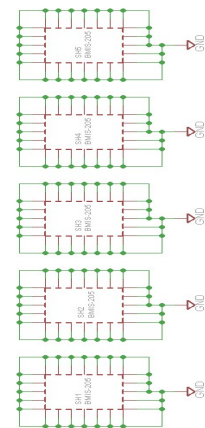
# VGA/MX1

## Band Differences

Circuit	Sheet	Ref'Des	Aeronautical	Maine
Preselector	1	C5, C7	110 pF	91 pF
		C6	0.5 pF	4.7 pF
		L4, L6	12 nH	8.7 nH
		L5	220 nH	200 nH
		L7	82 nH	68 nH
VGA1 / MX1 Match	1	L7	82 nH	68 nH
LO1 / MX1 Match	1	L13	10 nH	8.2 nH
	5	C20	2.4 pF	2.0 pF



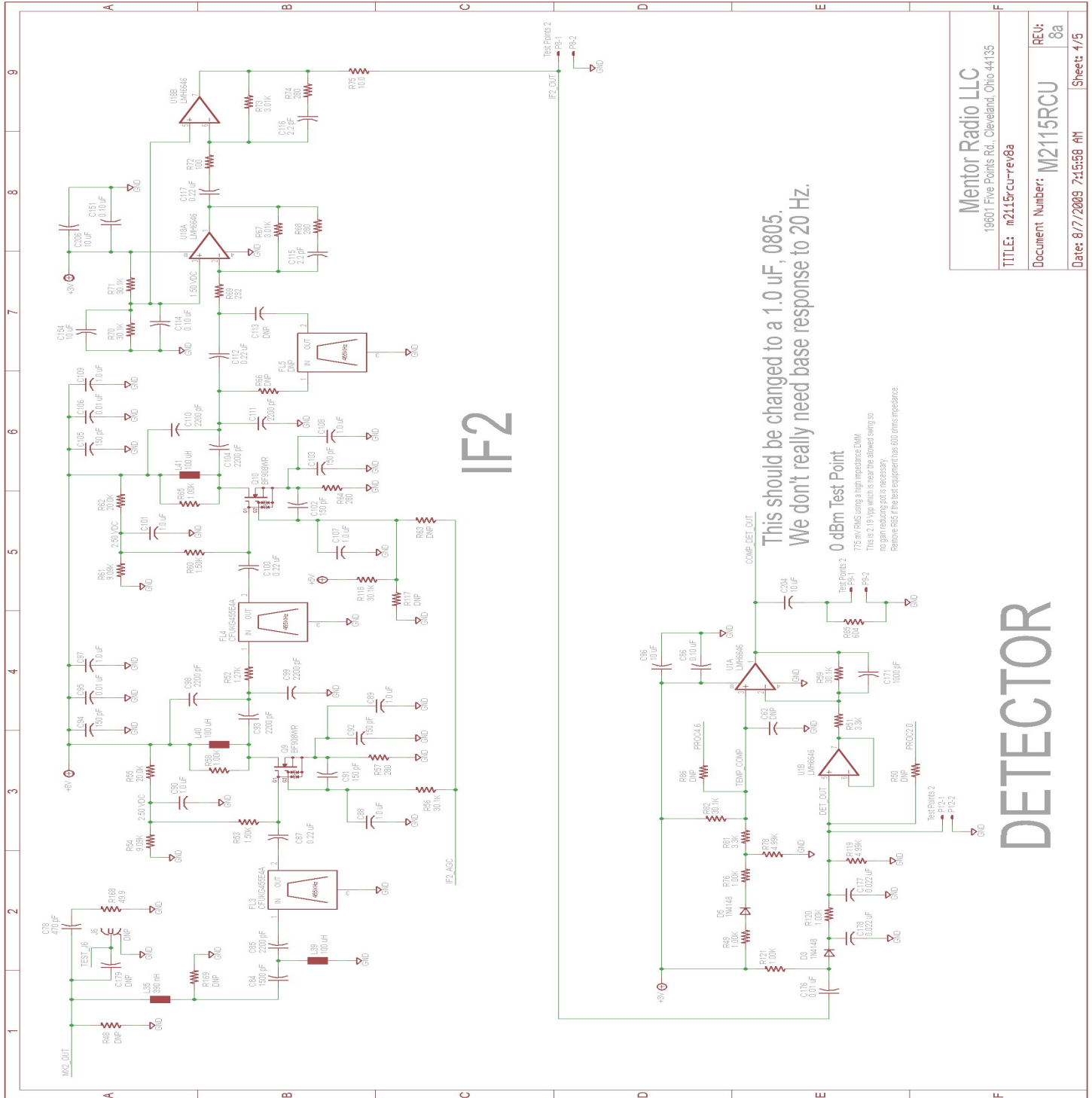
## PRESELECT



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Document Number: M2115RCU	Sheet: 2/5
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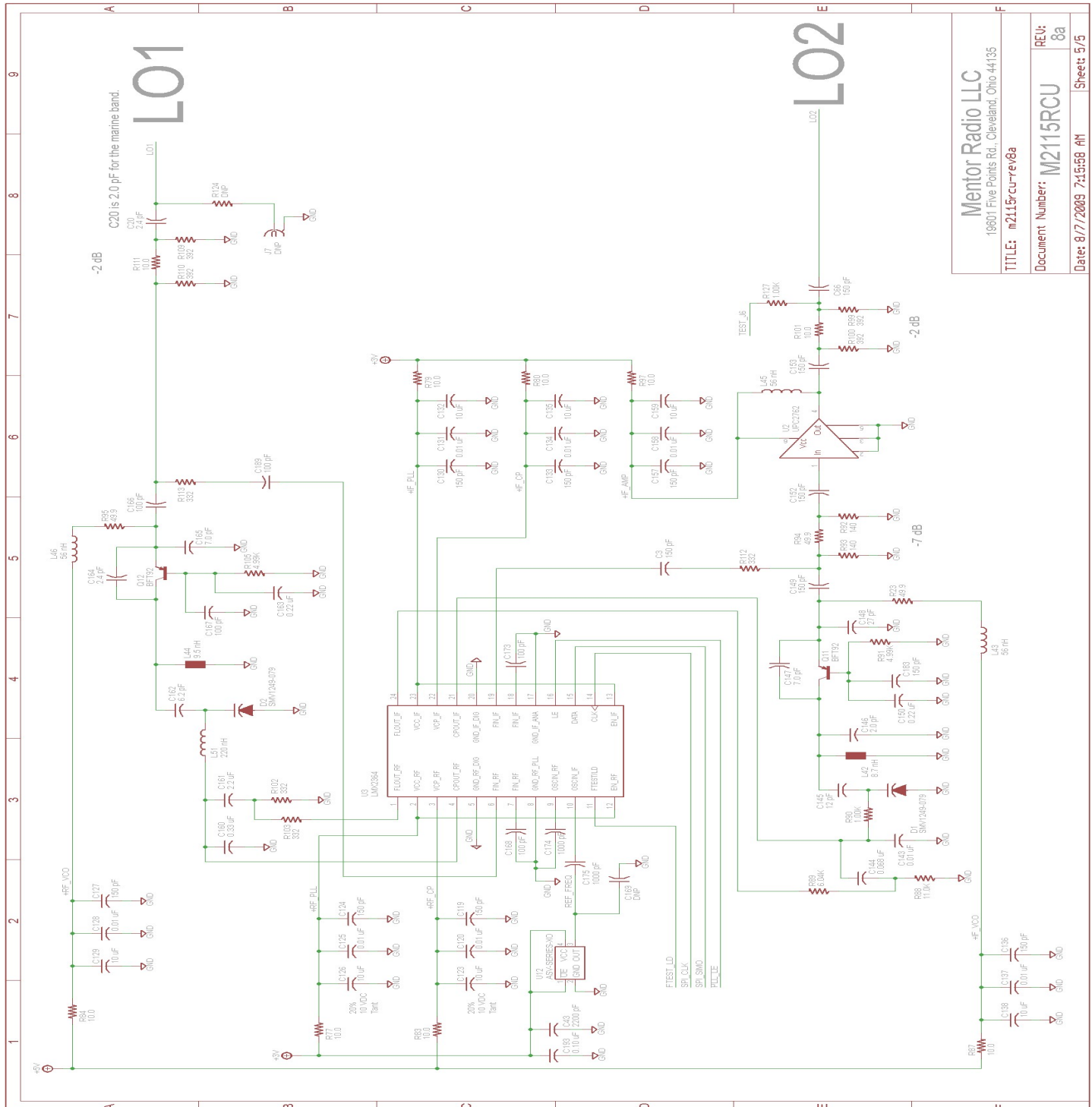


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### **Optional Accessories**

1. Enclosure/ Case
  - a) NEMA 4 (outdoor use)
  - b) Fiberglass enclosure
  - c) Steel enclosure
  - d) Aluminum case (no DIM rail, no lightning protector, indoor use only)
2. Antenna lightning protector
3. AC line lightning protector
4. DIN rail mounted components
5. AC power plug
6. Control relay in-line fuses
7. Control relay in-line circuit breakers





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## **LIMITED WARRANTY**

Your Mentor Radio 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.

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 FITNESS 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.***

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



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