RMI Upgrade

Instructions to upgrade hardware for version 6.00 software – Older Units

Hardware upgrade for version 6.00 software

Introduction

The following detailed instructions explain how to alter the FMonitor to work with the new version 6.00+ software. Operations, programming and installation manuals are included with the upgrade kit that detail actual operation of the FMONITOR with the new software, and the addition of the serial port hardware.

Tools Needed

<   #0 or #1 Phillips screwdriver
<   small needle-nose pliers
<   small-blade screwdriver
<   small diagonal cutter
<   box cutter or similar for cutting PC board traces
<   solder iron
<   Allen wrenches or collet wrench to remove knobs
<   good light and eyeballs

Record Current Settings

The FMONITOR's current nonvolatile ram will no longer be used. You may want to record all your current alarm settings, total tachtime and other values so that they may programmed into the unit after the upgrade. A good place to do this is in Appendix C of the programming manual included with this upgrade kit. Note that the upgrade will use degrees Fahrenheit as its primary unit for temperatures. If you wish to convert your current degrees Celsius settings to Fahrenheit, this can be done now.

$$F^\circ = (C^\circ \times 9/5) + 32$$

Initial Preparation

<   Remove the FMonitor from the mounting tray and bring to your work area.
<   Remove the top and bottom cover.
<   Remove the rear retaining clip (circlip) and then the long retaining screw that goes through the unit by sliding it to the rear out of the front display assembly, lifting the front of the screw so it comes out of the vertical PC board slot (snug) and then sliding it forward out of the rear of the chassis.
<   Remove the two screws attaching the vertical CPU PC board to the chassis and carefully unplug and remove the board being careful not to snag anything on the chassis tabs. Set the board aside for now.
<   If the knobs are the newer collet type with a white cap and indicator line, remove the white cap with a sharp edge tool between the lip of the cap and the knob.
<   Using Allen wrenchs (on older type knobs) or the collet-wrench supplied

with those units using the collet knobs, remove the two knobs.   Observing the position of the large knob pointer will help
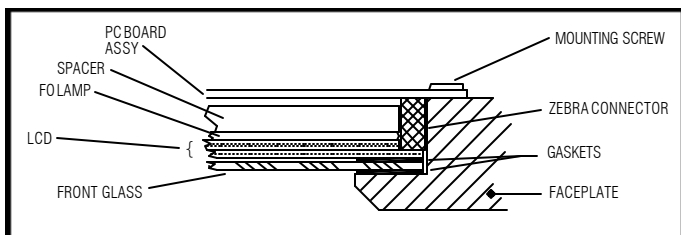
when assembling.

< Remove the four side screws holding the faceplate assembly to the chassis , unplug the display ribbon cable from the main PC board, and remove the faceplate assembly.

Replace Faceplate Assembly Components

Most of the components in the faceplate assembly will be replaced, including the front lens, the liquid crystal display, the backlight and the display driver PC board assembly. The only components we will save for reuse are the two black gaskets and the two rubber connectors that electrically connect the PC board to the LCD.

< Remove the twelve screws holding the display PC board to the faceplate.

< Remove all the faceplate assembly components. You will find that the rubber connectors, called "zebra" in the drawing, between the PC board and the LCD are sticking everything together. Since we need the connectors, just grab at one end and peel the connectors from between the PC board and the LCD.   Save the two black gaskets also.

PC BOARD ASSY — SPACER — FO LAMP — LCD — FRONT GLASS — MOUNTING SCREW — ZEBRA CONNECTOR — GASKETS — FACEPLATE

Refer to the assembly drawing above for the following instructions.

< Install one of the saved black gaskets into the faceplate recess.

< Remove BOTH the protective films from the plastic front window (NOT the GLASS LCD DISPLAY!). The back film is about like Saran Wrap & the front is like white paper. Determine the dull non-glare side, and install with the non-glare side to the front of the μMONITOR.

< Install the remaining saved black gasket.

Before starting the next step, it is important to determine if the LCD display has a protective film on the front of the display. If it is not present, you may be tempted to remove the necessary polarizer film on the front of the display instead of the protective film called out in the next step. We have two different vendors for the display, and even the same vendor does not always use the same type of protective film (color & markings) from batch to batch. Basically, if the front of the LCD is very shiny (nice reflections like clean glass), then it does not have a protective film. If it has a dull finish, has obvious scratches, has small trapped air bubbles or has diagonal lines, then a film is present. A film of any type will come off **EASILY**.

< Locate the LCD display and observe the permanent black lines on the front. The two lines that form a "T" will be above the rotary switch hole when installed. After you have determined the assembly position, remove the protective film from the front of the LCD display if present. It is green in color and usually there are small air bubbles under it - it may be missing. The film will easily peel off, it's stuck down with an electrostatic bond rather than adhesive. Install the display. <   Lo that the two narrow surfaces are clean and install the strips, one on each long side of the display, making sure that the .3 inch side of the connector next to the metal of the faceplate has the insulation side. These strips will provide separate conduction paths for each of the pads on the Display Driver PC board and the matching pad on the Liquid Crystal Display.

< Locate the fiber-optic lamp. It is about 1/16 inch thick, white color, with the light-pipe fibers coming out one end and then making a 180° turn around behind the lamp (the "tail"). All of the individual fibers are then gathered into a round, black, plastic housing behind the lamp. Place the front of the lamp into the faceplate cavity between the rubber connectors. The lamp tail fibers should be on the side above the **[OFF/ON/BAT]** round switch hole and will match up with the end notch on the Display PC board assembly.

< Locate the cardboard spacer(s). There will either be two individual rectangles, or one large rectangle with a hole in the middle. The spacer(s) is used to help hold up the rubber connectors during and after assembly. Refer to the display driver PC board assembly. Note the one component installed on the solder side of the PC board that will face toward the lamp and display after the assembly is in position. Position the hole of the large spacer, or position the two smaller spacers so that the component on the PC board will have clearance, and not be pressing into the back of the cardboard spacer(s).

< Remove from its anti-static bag, and position the Display Driver PC board assembly so that the twelve mounting holes in the PC board line up with the threaded holes in the faceplate. The PC board assembly will set up off the back faceplate surface because of the rubber connectors. Installing the mounting screws will apply the proper amount of squeeze to the rubber connectors. The wire cable from the PC board is positioned toward the push-button holes in the faceplate.

< Start two of the #4-40 x 1/4 pan head screws at diagonal corners to hold the assembly in line. Start the remaining ten screws and turn until they just touch the PC board, then alternately tighten each screw about 1/2 turn until the screws have pulled the PC board assembly flush to the back of the faceplate surface. Make sure that none of the fiber-optic strands will be trapped between the PC board and the faceplate. Snug all screws.

< Hold the LED on the display PC board so it doesn't get its leads strained, and slide the black, plastic housing on the tail of the fiber-optic lamp over the LED on the PC board assembly until it snaps into place.

< This completes the faceplate assembly.

Alter CPU PC Board

Four integrated circuits will be removed from the CPU PC board assembly. For those parts with a socket or socket pins, just use a small screw driver and alternately pry up on each end to work the part out of the socket. For those parts that are soldered onto the PC board, use a small diagonal pliers or toenail clippers to cut the leads off the integrated circuits as you will not be using them again. This is preferable to attempting to unsolder the parts as there is less chance of damaging the PC board. First clip the leads right next to the body of the IC, and after the IC is removed, you can trim the remaining leads closer to the PC board.

One location where you will remove an IC will be used again… the large CPU chip. If this is soldered, you will want to clip the leads next to the body, but not trim them close to the PC board. This makes them easier to remove one-at-a-time. If this is the case, a solder sucker is really called for. Even a cheap hand-type solder sucker is better than trying to get solder out of a through-hole using solder wick.

<   One at a time, remove U15, U19 & U21. U15 should have a white label on the top. If not the part marking should read 2732. U19 should be marked 74C(or HC)373. U21 may be either marked 2444, or be a small PC board assembly.

<   Remove U16, being careful as this is where a new assembly will be used. ONLY IF the part is soldered to the PC board, clip the leads next to the body. Have a friend help by grabbing each cut-off lead and tugging as you heat the lead from the solder side of the PC board. Once all the leads have been removed, use a solder sucker to remove the excess solder remaining in the holes. ONLY IF THERE IS NO OTHER CHOICE in getting the solder out, use a .032 (1/32") drill in a HAND CHUCK to remove the excess solder. Any larger drill or using power will probably drill out the connecting tube between the top and bottom of the PC board.
ONLY IF the IC was soldered in, install and solder the supplied 40 pin socket, positioning the cut-out on the end rail of the socket (indicating front of IC) to match the cut-out on the designator on the PC board.

<   If U16 was plugged into individual socket pins, make sure all the pins are aligned and the same height because the new CPU assembly's stiff pins will not allow misalignment. If any look off line or too high, use a straight dentist pick and solder iron to adjust the socket pins. You can also make a tool using a sewing needle stuck into a small dowel for a handle. Lightly stick the tool into each socket pin and touch the side of the pin with the tip of the solder iron so it heats up and also melts the solder holding it into the PC board. As the solder melts, you can apply a little downward pressure with the tool to make sure it goes all the way to the PC board, and also make sure that it is straight up and down. It helps to put a LITTLE bit of solder on the tip of the iron to help make heat contact with the socket pin. Be careful to not get too close to the top of the socket pin, or the solder will "jump' down into the hole and ruin the socket pin. Spare socket pins are in the kit if you goof.

<   Locate and remove the crystal Y1 (refer to picture below). One end of the bare wire that is supporting the crystal needs to be heated and lifted from its hole. A helping friend is handy. Clip the two leads near the crystal body and then melt the solder while tugging on the leads. Refer back three steps for directions on removing the solder from the holes.

<   Locate and install the crystal from the upgrade kit, marked 11.0592 or 11.05, in the same place and reinstall the hold down strap. Solder both leads and the hold down wire.
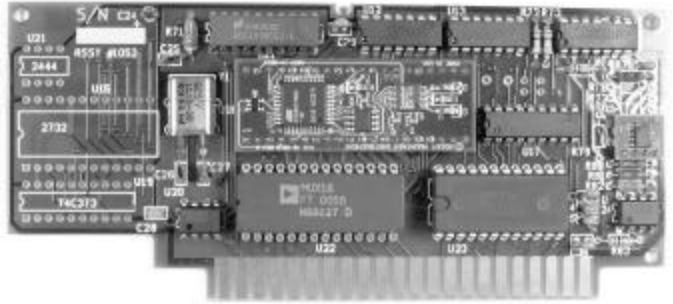
<   Use the .032 drill (1/32"), preferably in a hand-chuck, and drill a hole through the PC board as shown in the picture below. Be exact in the placement of the hole. After just starting the hole, flip the board back and forth to make sure that no traces on the other side of the board will be damaged.

<   Use a sharp tool like an Xacto knife or a box cutter to
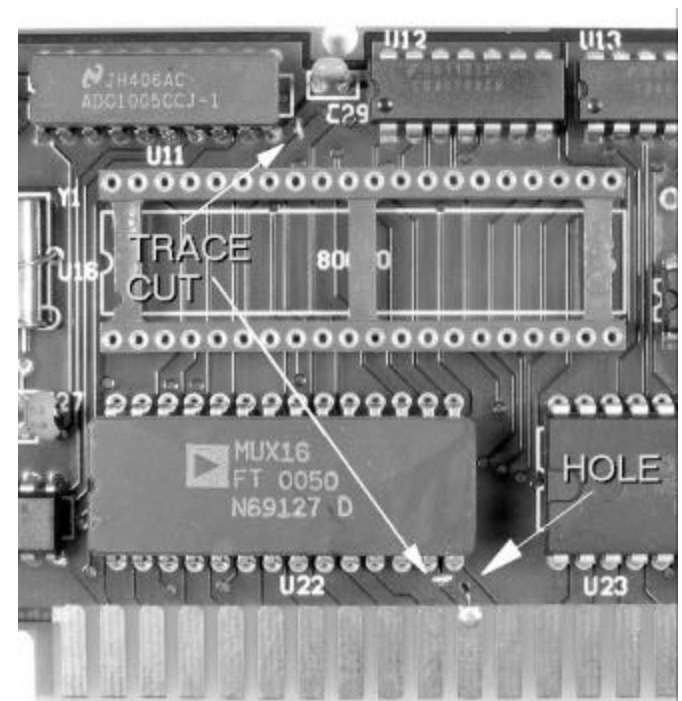
carefully remove a portion of the traces as shown above. A rotary tool will also work. Just be careful not to cut too deep or damage adjacent traces, but be sure that the traces on either side of the cut are no longer joined.

<   Locate the black jumper wire from the upgrade kit. Cut the lead off one end of the wire so the bare lead is about 1/8" long. Bring this end up through the hole and bend the

bare portion flat to the gold tab and solder as shown in the picture above.

<   Turn the PC board over and solder the other end of the black jumper as shown in the picture below. Trim the end.
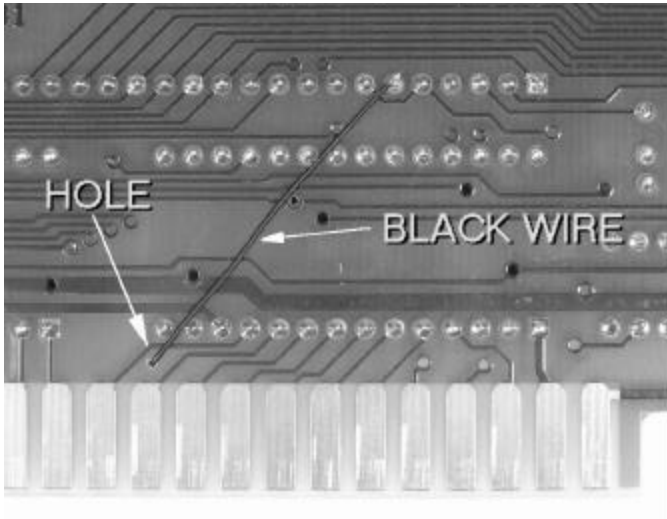
<   Locate and install the new CPU assembly at position U16, oriented as shown in the first picture in this section. Make sure all the leads on the assembly are starting into the socket pins before pressing the assembly down.

Alter Main PC Board

<   Remove the main PC board from the chassis by removing the four screws from the solder side of the board. This will make it easier to make the following changes.

<   On the component side of the PC board, remove the IC at U8, located in the corner of the board and marked X9503. You can unplug, or cut and clip as for other ICs that are not being replaced.

<   **IF!!** there is a resistor instead of a tantalum capacitor installed at R14, clip the wire lead at the top of the resistor so it can be removed in two pieces. Heat the solder on each lead (bottom of board) while tugging on the part/lead from the top of the board to remove. Remove the solder as previously explained. Locate the 2.2**F**FD tantalum capacitor from the upgrade kit and install it WITH THE LONG POSITIVE LEAD into the pad next to the "4" in R14.

<   Repeat the previous instruction for removing R15 and replacing it with the 442K resistor, marked 4423.

        Two jumper wires will be added to the bottom of the main PC board and two traces will be cut. This will route the serial RS232 input and output to the rear connector of the FMONITOR, and disable the power supply for the old EL type backlight. If you used an auxiliary switch or a dimmer to control the FMONITOR's backlight, these will also no longer be useful as all controls are now internal.

<   Use the photo below to locate where the two PC board traces will be cut. Cut the traces as described before.

        The red wire and the capacitor at C45 should already be installed. This jumper powers the manifold pressure sensor.

 If your unit does not have this jumper and capacitor, it either does not have a MAP sensor, or the sensor is of a very old type that uses a different power source. If your unit has one or two HEAVIER wires going horizontal across the board, these may be left.

<   Locate the yellow wire included in the upgrade kit and cut some of the bare wire off on each end to leave about 1/16 inch of bare wire on each end. With a drop of solder on the tip of your iron, tack one end to the round end of the gold edge connector tab shown in the photo. Keep the dab of solder as far as possible away from the edge of the gold tab that plugs into the black connector in the mounting tray.
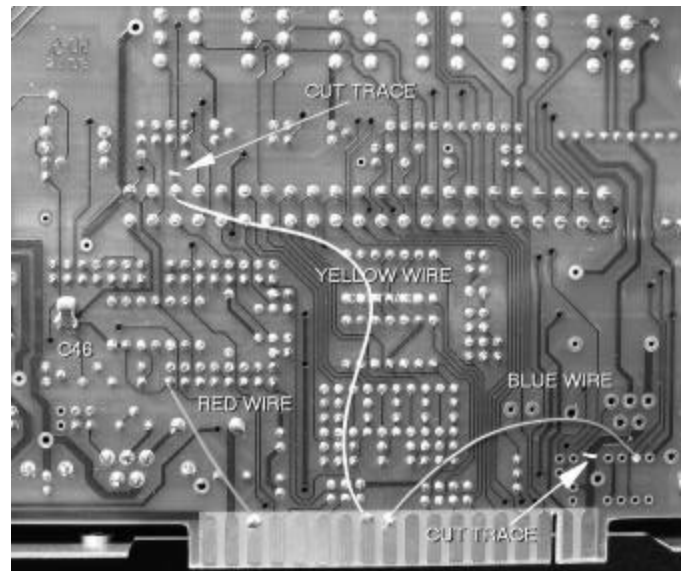
<   Tack the other end of the yellow wire to the solder pad as shown.

<   Locate the blue wire from the upgrade kit and trim back the bare wires as was done with the yellow wire. Tack one end of this wire to the gold edge connector pad as shown in the same manner as the yellow.

<   Solder the other end of the blue wire as shown. This pad is one of the pads from the IC U8 that has been removed.

Reassemble Unit

        Before putting the unit back together, it will be useful to record a few facts about the main PC board for later use in programming the calculation constants. Depending on the age of your unit, and changes that have been made, a different formula other than the default may need to be entered. Record the values of the following (numbers or colors):

        R57 (if present) _____
        R58 _____ or jumper
        R59 _____
        R24 (or R25) _____

R57/58/59 are related to manifold pressure. If you do

not have a sensor installed, these values are not important. Be sure to check on the solder side to see if R58 has been jumpered with a bare wire. Note if that is such.

R24/25 are related to fuel pressure. Some installations have been modified to indicate higher fuel pressures than the normal 0-31 psi. If your setup uses only the standard 0-31 psi range, these values are not important.

See documentation near the end of this update for more details on programming the FMONITOR for these functions.

< Install the main PC board in the chassis with the four screws.

< Plug the display ribbon cable onto the header on the main PC board, slip the assembly over the pushbuttons and rotary switch and anchor with the four flat-head machine screws.

< Plug the CPU PC board assembly into the socket on the main PC board and install the two screws at the top.

< Slide the long retaining screw, at an angle through the rear of the chassis, from inside to outside the chassis. Tilt the screw down into the slot at the top of the CPU PC board assembly and then slide the slotted end into the rear of the display assembly. The retaining clip should still be on the front of the screw. It will hit the back of the display assembly PC board.

< Install the rear retaining clip. Note that the clip has one side with sharp edges and one side with rounded edges. Install with the sharp edge toward the center of the long retaining screw.

< Install the two knobs. Make sure the knob pointers are correct. If you have the bushing type knobs, make sure the bushings are tight so the knobs don't slip.

< Install the top and bottom cover.

This completes the modifications to the unit itself.

Aircraft Changes

The only modification needed on your aircraft is the addition of wiring and connector to support the new RS232 serial port. The new serial input and output connections at the back of the FMONITOR are connected to a phone-jack connector that is installed in the instrument panel. This allows you to easily upgrade the unit's software using a PC or laptop by connecting the supplied serial port cable to that computer and uploading new software obtained via email or downloaded from the RMI website.

In addition, if the fuel-data (or fuel-air-data if a FENCODER is connected) serial information can be fed to a GPS or other system capable of receiving it, the serial port wiring will also need to connect to that equipment. See the new installation manual supplied with this upgrade for details on the RS232 adapter cable and RS232 panel jack.

Formula Programming

If your unit has been modified to expand the fuel

pressure range from 0-31 psi to 0-99 psi, or you have an older manifold pressure sensor, you may have to reprogram the unit's formula constants as detailed in the programming manual supplied with this upgrade. If not, you may skip this whole section. Follow one or both of the below if you have the high fuel pressure modification or an older MAP sensor.

EXPANDED FUEL PSI RANGE

If you are reading this section, you have the 0-99 psi fuel pressure modification.

If R24 or R25 are 22.1K (marked RN55D2212 on the resistor), then use the **VDO 0-10 bar** sensor formula constants listed in the programming manual.

If R24 or R25 are 37.4K (marked RN55D3742 on the resistor), then use these constants: OFF=100, MUL=1, DIV=4 and OFF=0.

MANIFOLD PRESSURE

If you are reading this section, you have a manifold pressure sensor installed.

If R58 is a jumper wire, then you have the latest MAP sensor and should use the default values in the software.

If R58 is not jumpered, and is 2.43k (marked 2431) and R59 is 10.7k (marked 1072), then you should use these constants: OFF=176, MUL=1, DIV=3 and OFF=90.

If R58 is 13.7k (marked 1372) and R59 is 30.1k (marked 3012), and your sensor is powered by the 10 volts coming from pin T, then use these constants: OFF=137, MUL=11, DIV=25 and OFF=0.

Should you have other sensors or resistor combinations, please compile as much information as possible and contact tech support at RMI.

List of Upgrade Materials

1	14-0004	FMONITOR Display PC board assembly
1	14-0013	FMONITOR CPU PC board assembly
1	18-0110	1 x 3/32" Shrink Tubing (install manual)
1	18-0114	1 x 5/16" Shrink/adhesive Tubing (install manual)
1	22-0001	FMONITOR Non-glare Lens
1	22-0003	Display Spacer(s)
2	26-0023	Retaining Ring (spares)
1	28-0142	442K 1% Resistor
1	32-0107	2.2FFD 16v Tantalum Capacitor
1	40-0009	FMONITOR Fiber-optic Backlight
1	42-0007	40-pin IC Socket
10	42-0035	IC Socket Pins (spares)
3	42-0040	Crimp Terminals (install manual)
2	42-0052	RS232 Male Pins (install manual)
2	44-0011	Solder
2	44-0015	Twisted-pair Shielded Wire (install manual)
1	44-0018	3.5mm RS232 Panel Jack (install manual)
1	44-0019	2" Blue WW Wire
1	44-0020	3" Yellow WW Wire
1	44-0021	3.5mm RS232 Phone Plug (install manual)
1	44-0025	1.25" Black WW Wire

1   50-0003   FMONITOR LCD Display
1   54-0006   11.0592MHZ Crystal HC-49U Case
1   62-0005   FMONITOR Installation Manual
1   62-0011   FMONITOR Operations & Programming Man.