

Installation and Use of Next Generation Three Line Display (3LD)

(Syntech Part Number 263386)

There are significant differences between this Next Generation 3LD and the previous model covered in Product Bulletin 221:

- Pricing is picked up from the FMU and no longer must be loaded into the display with a laptop.
- Any one of up to 8 products and unit prices configured in FMU may be displayed.
- LED light intensity is programmable with a laptop connection to FMU; there may be one higher setting for daylight and a less intense setting for night time. Display is visible in direct sunlight.
- Programming of display is only necessary if firmware must be updated.

PULSE FILTERING does not affect the Next Generation 3LD. It may be turned on or off.

When an electronic dispenser is used with the 3LD, there can be up to a 10 second delay between disconnecting the hose and final updates to the display. The delay is variable but does resolve to the correct quantity and total cost. This delay does not occur with mechanical pumps.

Description

FuelMaster is offering a remote 3-line display (3LD) for retail fueling operations. This 3LD (see Figure 1) displays the unit price (\$\$\$), the quantity pumped as it is being pumped (VOL), and the running cost of the unit price times the quantity pumped [TOT(\$)]. This information is displayed in three-inch-high red characters on a black background visible at well over 100 feet. The transaction information from the previous transaction remains displayed until a new transaction is started or until the display is rebooted.

This Next Generation 3LD is not dependent upon pulse inputs, individual hose connections, or reset signals. It will display transaction information the FMU collects, for up to 8 hoses, 8 different products, and 8 different unit prices. User programming is not necessary except for a rare upgrade of display firmware. The 3LD is initially tested and programmed by Syntech before shipment, then is dependent upon FMU inputs for all future use. User preferences for daytime and night time LED light intensity may be programmed into the FMU with a laptop connection while configuring the FMU. See **Programming the Display** in this bulletin.

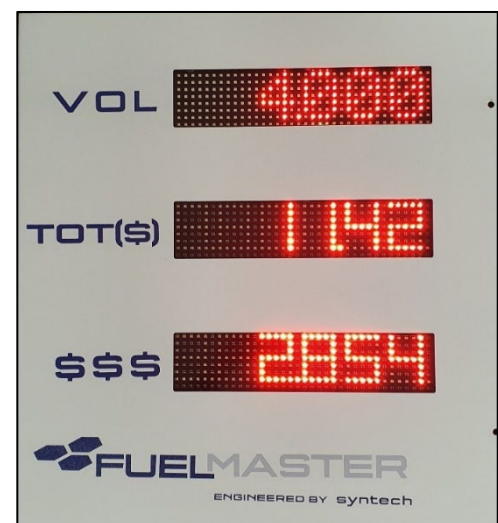


Figure 1

Kit Parts

The parts that make up the standard 941B0280 3-Line Display Kit are illustrated below with part numbers. See Figure 2.

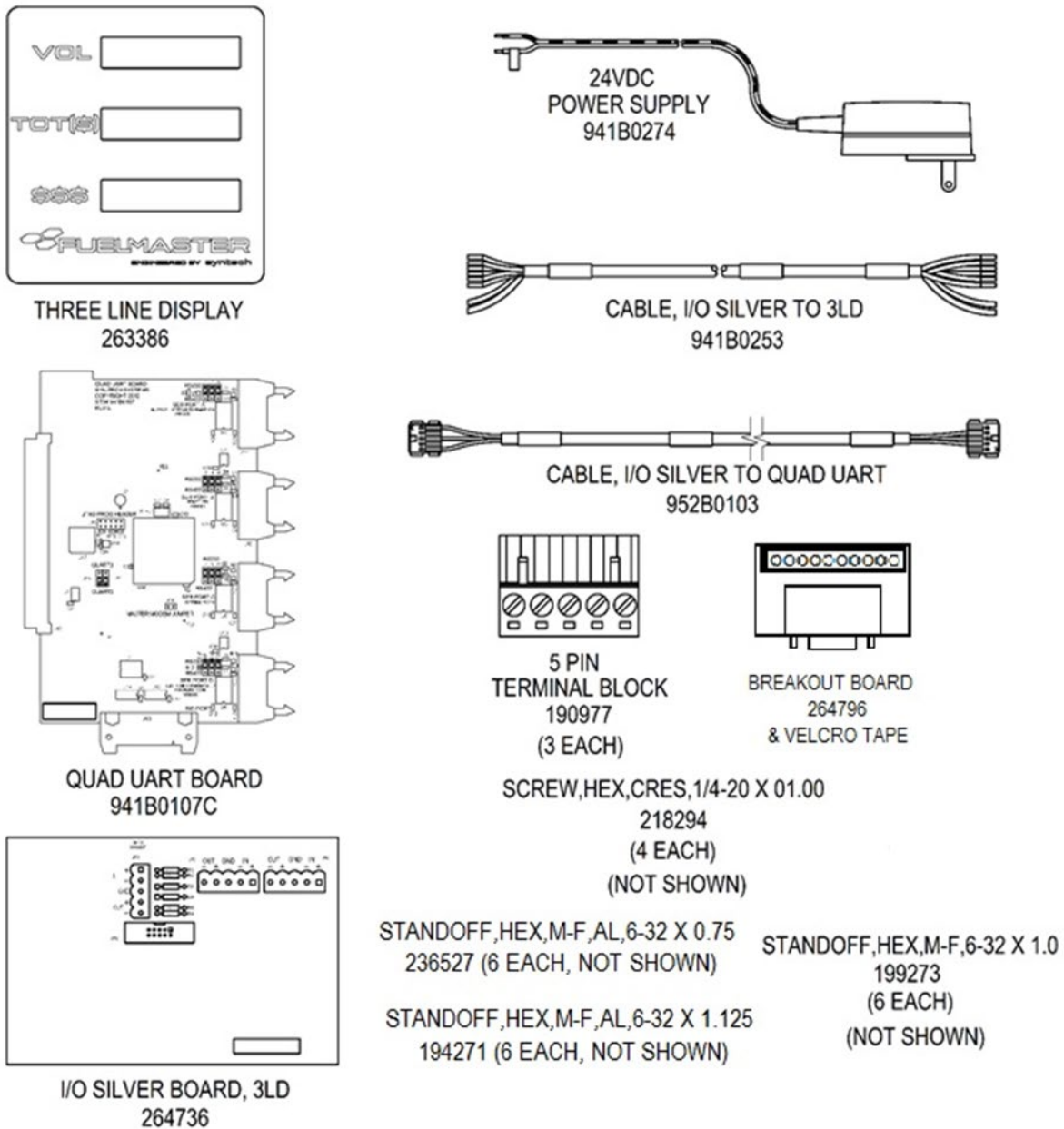


Figure 2

CAUTION

The Flash Loader must be installed with FMU power off, oriented A to A, and B to B, and the jumper in the top two pins. More details in Product Bulletin 198.

NOTE

Important! When performing an FMU firmware upgrade, follow the guidance of Product Bulletin 218, Screenshots for FMU Firmware Updates/Recovery. Screenshots of the FMU configuration are taken before the upgrade, then the FMU is initialized to clear memory of the old firmware. The screenshots can then be used to reconfigure the FMU to the customer's preferences with the new firmware. If this is a new installation, and a firmware upgrade is not being performed, disregard this note, at this time.

Upgrade FMU Firmware and FuelMaster Software

Version 3.91 or later FMU firmware and version 5.8.3.0 or later FuelMaster software must be installed for compatibility with the 3LD. If already installed, disregard this procedure.

The FMU firmware is provided on a Flash Loader (Syntech part number 234362C). See Figure 3. The firmware is updated by turning FMU power off, inserting the Flash Loader into the DEBUG MEMORY socket of the FMU mainboard (being sure to align A to A, and B to B), and turning power back on. When prompted the firmware transfer is complete, turn off FMU power, and remove the Flash Loader. The firmware update is complete.

Version 5.8.3.0 or later FuelMaster software is available in two versions: server.exe and client.exe. Server.exe has Sequel server software included. Client.exe is for customers who already have Sequel server software and don't need to add it. It is best to follow the instructions for installation provided with the software.

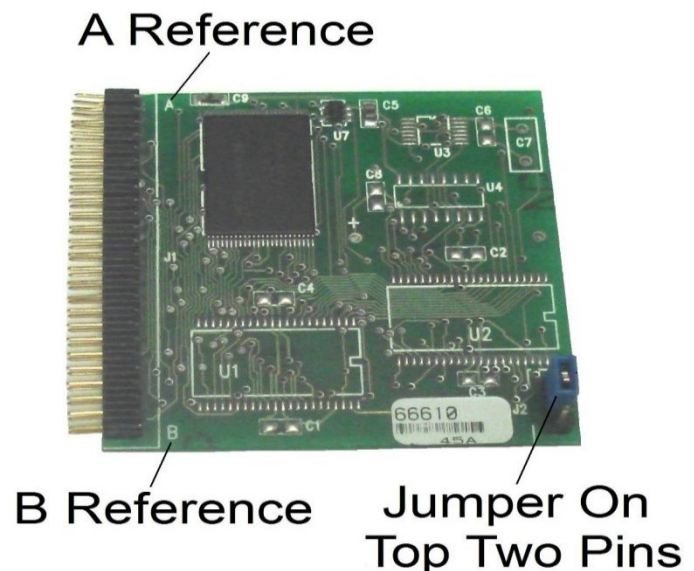


Figure 3

Mount the Display

The display has four ¼-20 x 1-inch hex head stainless screws and washers on the back panel for mounting. The hex screws are installed near the four corners of the display back panel as depicted in Figure 4. The display weighs 45-50 lbs so the mount point needs to be sturdy. The FMU is not a mount platform. Unistrut is a good material for this type of mount.

It is not advisable to extend the FMU interfacing cable beyond its 75-foot length. It may be shortened, but it should not be lengthened. The interfacing cable is pre-connected to the 3LD Internal Junction Box and stowed inside the display.

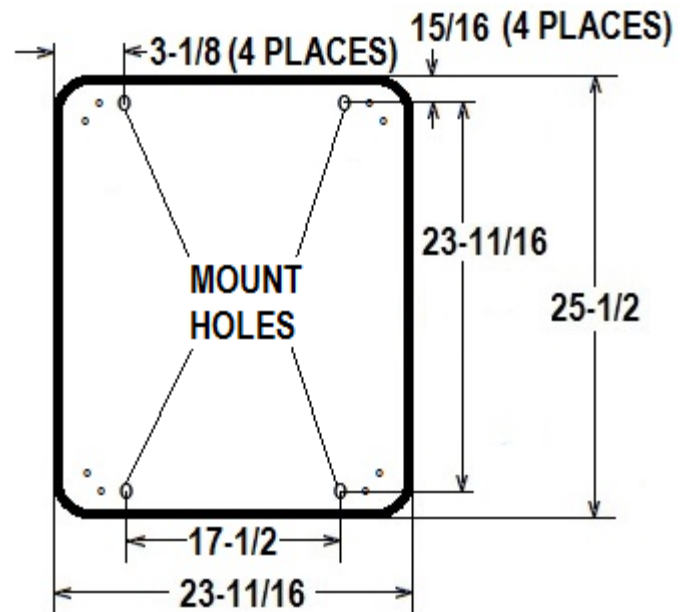


Figure 4

If the display will be used with flammable fueling equipment, it must be mounted outside the Class I Div 1 or 2 hazardous area. In most cases that is 18 inches from the fuel dispenser, and over 18 inches above grade (ground) level. The area 18 inches above grade level extends 20 feet from the flammable fuel dispenser(s). Conduit approved for use in Class I Div 1 or 2 hazardous areas must be used if the wiring enters into a Class I hazardous location. If the conduit does not enter the Class I location, it is still required, but does not need to be approved for use in Class I locations. Liquidtight flexible nonmetallic conduit is acceptable above Class I locations.

At the bottom of the display is a hole provided to accept a ½ inch NPT conduit fitting. It is not threaded. A fitting with a locknut will be necessary. The display front panel must be removed to install the conduit fitting. Four Philips head screws secure the front panel to the display. Be sure to run the display cable through the conduit as the conduit is installed. Connections in the FMU will be made to an I/O Silver Board mounted on standoffs over the Pedestal I/O Board.

Install FMU Components

The Quad UART (QUART) Board, I/O Silver Board, 24VDC Power Supply, and Quad UART to I/O Silver Board connecting cable must be installed in the FMU. Perform the following:

NOTE FMU firmware version 3.91 or later, and FuelMaster software version 5.8.3.0 or later, are required to support the interface of the 3LD.

1. Remove FMU power at the breaker panel.
2. Unlock and open the FMU upper cabinet and pedestal doors.
3. Loosen the four screws for each panel, and remove the upper and lower electrical access panels in the FMU pedestal.

4. Verify a conduit is installed from the FMU to the display, and the display cable is routed from the display to the FMU.
5. Install the Quad UART Board:
 - a. Verify jumpers (3 each) are installed in the upper RS232 positions of **J1**, **J2**, and **J5** on the Quad UART Board next to **SER PORT A**.
 - b. Verify jumpers (2 each) are installed in the **QUART2** positions of the Quad UART Board.
 - c. Verify the **MASTER MODEM JUMPER** is removed from the Quad UART Board.
 - d. On the main board over the expansion slots, loosen the two hold-down bracket screws and raise the hold-down bracket.
 - e. Insert the Quad UART Board in an unused expansion slot on the main board.
 - f. Lower the hold-down bracket over the Quad UART Board and any other expansion boards, and tighten the bracket screws.
6. Install the I/O Silver Board. The 3LD may be installed and used in conjunction with other components utilizing an I/O Silver Board such as the Electronic Dispenser Interface and Tank Monitor Interface. The breakout board is stowed on Velcro, and may be detached from the Velcro for troubleshooting or upgrading the display firmware.

NOTE

When one I/O Silver Board is installed, one-inch standoffs are used to support it. When two I/O Silver Boards are to be installed, the one-inch standoffs are removed, $\frac{3}{4}$ inch standoffs are installed for the lower board, and 1-1/8 inch standoffs are installed for the top board.

7. If no other I/O Silver Board is installed:
 - a. Remove the six 6-32 screws located near the top and bottom of **TB1**, **TB2**, and **TB3** on the Pedestal I/O Board.
 - b. Install the six 199273 one inch standoffs in the screw holes near the top and bottom of **TB1**, **TB2**, and **TB3**.
 - c. Align the I/O Silver Board provided with the install kit over the standoffs, and reinstall the six 6-32 screws to secure the I/O Silver Board to the standoffs. There are several holes through the I/O Silver Board, but only six that align with the six standoffs.
 - d. Plug the three 5-pin terminal blocks into **JP5**, **JP6**, and **JP11** of the I/O Silver Board.

NOTE

Standoffs are measured in the hex area, only. See Figure 5.

8. If another I/O Silver Board is installed, a second I/O Silver Board must be installed over the existing I/O Silver Board:
 - a. Remove the six 6-32 screws securing the I/O Silver Board to standoffs, and move the I/O Silver Board aside.

b. Unthread and remove the six one-inch standoffs installed near the top and bottom of **TB1**, **TB2**, and **TB3**.

c. In their place, install the six $\frac{3}{4}$ inch standoffs (Syntech part number 236527).

d. Position the I/O Silver Board over the $\frac{3}{4}$ inch standoffs and thread the 1-1/8 inch standoffs (Syntech part number 194271) through the holes in the I/O Silver Board into the $\frac{3}{4}$ inch standoffs. Be sure all connections into the lower I/O Silver Board are complete. There will not be room to make connections after the second I/O Silver Board is installed.

e. Position the new I/O Silver Board over the screw holes in the 1-1/8 inch standoffs, and reinsert the six 6-32 screws through the I/O Silver Board into the 1-1/8 inch standoffs.

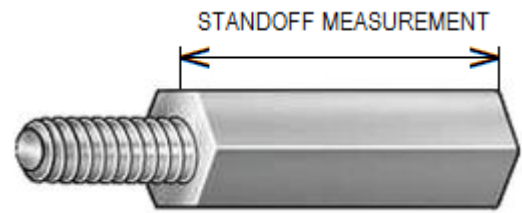


Figure 5

CAUTION The 952B0103 Quad UART to I/O Silver Board Cable can be installed incorrectly and result in damage to FMU components. The cable is labeled with TO FMU QUAD UART BOARD and TO I/O SILVER BOARD next to the appropriate connector. Be sure to make the connections accordingly.

9. Connect the 952B0103 cable **TO FMU QUAD UART BOARD** connector to **SERIAL PORT A** of the Quad UART Board.

10. Connect the 952B0103 cable **TO I/O SILVER BOARD** connector to **JP12** of the I/O Silver Board.

11. Plug the three 5-pin terminal blocks into **JP5**, **JP6**, and **JP11** of the I/O Silver Board.

12. Plug the 24VDC Power Supply into the receptacle of the 178802A power cable in the FMU upper cabinet, and route the two DC power wires through the thru-hole between the upper cabinet and pedestal.

13. The FMU components are installed. Do not reapply power. Go to **Wire the Display** to complete the wiring.

Wire the Display

The display may now be connected to the new FMU components as shown in Figure 6.

NOTE If the receptacle of the 178802A power cable is being used for other purposes, another receptacle must be provided. Another receptacle may be wired into the incoming AC power wires for the FMU. If connected after the FMU power switch, power may be removed by turning off the FMU power switch. The loose leads from the display cable may not be long enough to reach all connection points in the FMU pedestal. It may be necessary to cut back more cable insulation before proceeding.

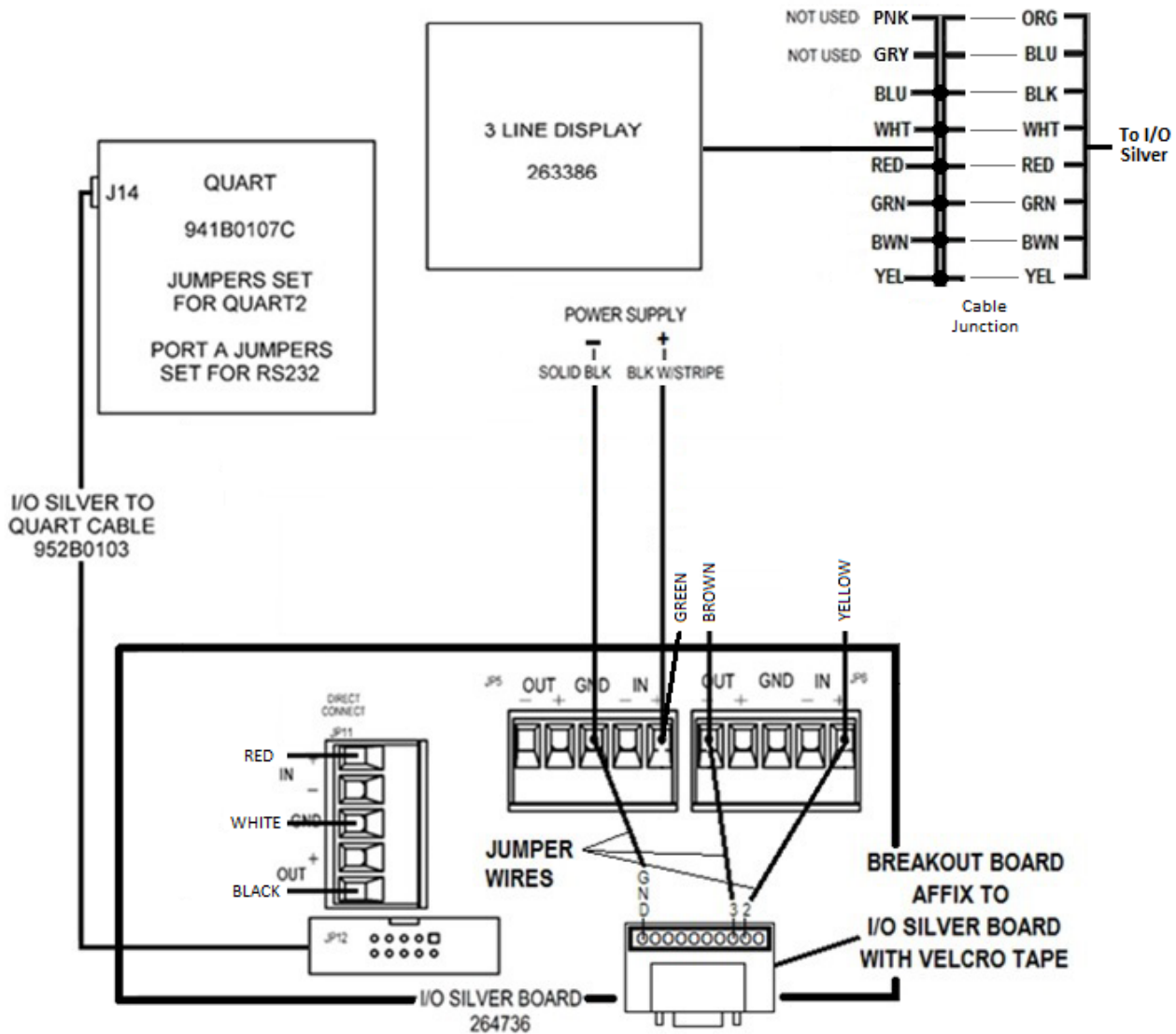


Figure 6

Perform the following:

1. Plug the 24VDC Power Supply into the receptacle of the 178802A power cable in the FMU upper cabinet, and route the two DC power wires through the thru-hole between the upper cabinet and pedestal.
2. Route the display cable into the pedestal. The blue and orange wires will not be connected to anything and may be bent back and taped.
3. See Figure 6. Perform the following using the 264736 I/O Silver Board provided with the install kit (the 264796 breakout board is preinstalled by Syntech and has wires into some of the same positions called out below):

NOTE If two wires of different wire gauge sizes are inserted into the same connector position, it is best to twist them together before installation. A smaller wire may not be captured by the connector.

- a. The power supply hot wire has a label on it, **POSITIVE (+)**. Twist it together with the display cable green wire and connect both into **JP5, IN+**.
- b. Connect the power supply ground wire into **JP5, GND**, with the breakout board GND wire.
- c. Connect the display cable yellow wire to **JP6, IN+**, with the breakout board yellow wire.
- d. Connect the display cable brown wire to **JP6, OUT-**, with the breakout board brown wire.
- e. Connect the display cable black wire to **JP11, OUT-**.
- f. Connect the display cable white wire to **JP11, GND**.
- g. Connect the display cable red wire to **JP11, IN+**. Wiring is complete.

Powering the Display

NOTE Upon initial boot up, no data will appear in the center segment (TOT\$) of the three-line display as no transactions have been made.

1. Apply FMU power. When the FMU power switch is turned on, the display will initialize:
 - a. Each of the three displays will self-test by flashing decimal points along with six sets of numbers 9 down to 0 (example: **99999.9, 8888.88, 777.777**, etc.). The decimal will change position with each set of numbers.
 - b. The firmware is pre-loaded in each display (example: **EVT1.65**). The top display is the controller for the unit.
 - c. Upon power up, the displays should read: **FT L1** on top, **FT L2** in middle, and **FT L3** on bottom.
 - d. Before the display is enabled, the bottom line will display **0.000**. After the display is enabled (in **Configuring the Display**), **0.000** will display on the top line, and **0.00** will display on the middle line.
2. If the display initialized correctly, close the display faceplate.

3. Close and lock the FMU pedestal door.
4. Go to **Configuring the Display**.

Configuring the Display

Configuring is necessary to enable the display through the FMU and to set the light intensity and start times of the LEDs. Make a laptop connection to the FMU in accordance with Product Bulletin 111. When a connection to the FMU is established, enter command **E1**. The following **3-Line Display Menu** will appear with default values shown:

3-Line Display Menu:

1. Display Enabled (Requires Reboot, Disables Bluetooth)	: DISABLED
2. Daytime Intensity (%)	: 100
3. Nighttime Intensity (%)	: 50
4. Daytime Start Time	: 07:00:00
5. Nighttime Start Time	: 20:00:00
6. RESTORE DEFAULT VALUES	

Select Operation (ESC Exits):

1. At the cursor next to **Select Operation (ESC Exits)**: enter **1** to enable the display. **DISABLED** will change to **ENABLED**. The display will not be enabled until the FMU is rebooted (power off, then on). Initially, when enabled, the bottom line of the display will display **0.000**. After a few seconds, the top line will display **0.000**, and the middle line will display **0.00**. If not enabled, the top and middle display lines will not display.

NOTE

LED light intensity can be adjusted for daytime or nighttime operation. Daytime typically requires brighter lighting to defeat the brightness of sunlight. Much less intensity will be required for nighttime use. It might be wise to use the default values until you have the opportunity to observe the intensity. LED light intensity setting changes (for intensity % and start times) will change after 5 minutes, or when a new transaction is started.

2. To change Daytime Intensity (%):, at the cursor next to Select Operation (ESC Exits): enter 2. The prompt Enter a Number (1-101):__ will appear. Enter the desired intensity percentage at the cursor, and press Enter. The intensity change will show in the menu. Go to step 6 if no other changes are necessary.
3. To change Nighttime Intensity (%):, at the cursor next to Select Operation (ESC Exits): enter 2. The prompt Enter a Number (1-101):__ will appear. Enter the desired intensity percentage at the cursor, and press Enter. The intensity change will show in the menu. Go to step 6 if no other changes are necessary.
4. Daytime Start Time is the time when the LED intensity changes from nighttime to daytime intensity. To change Daytime Start Time, at the cursor next to Select Operation (ESC Exits): enter 4 for the operation. A prompt ENTER TIME: ____:____:____ will appear. Enter hours:minutes:seconds for a 24-hour clock, and press Enter. The time change will show in the menu. Go to step 6 if no other changes are necessary.

5. Nighttime Start Time is the time when the LED intensity changes from daytime to nighttime intensity. To change Nighttime Start Time, at the cursor next to Select Operation (ESC Exits): enter 5 for the operation. A prompt ENTER TIME: ____:____:____ will appear. Enter hours:minutes:seconds for a 24-hour clock, and press Enter. The time change will show in the menu. Go to step 6 if no other changes are necessary.
6. When all desired changes have been made, the prompt Configuration has changed. Do you want to save? (Y, N) will appear. Press Y to save changes. Pressing N will remove changes.

Price/Sale/Receipt Options

This is optional and not necessary for display operation. These options will provide 1) pricing on the FMU LCD at the end of the transaction which matches pricing on the 3LD, and 2) unit pricing for all hoses configured in the FMU.

These options must be enabled with a laptop connection in accordance with Product Bulletin 111. The first option will show pricing to the fueling customer. When enabled, the unit price of the product being pumped from each hose may be displayed by depressing “A” on the FMU keypad. The first depression will show the unit price for the first hose. Subsequent depressions will show the unit price for each additional hose configured in the FMU.

FMU transaction pricing may be displayed on the FMU LCD and compared to display pricing. After a transaction is run, the hose number, total sale price, and total sale quantity may be displayed on the FMU display. Existing fuel sites may already have some of these options turned on. It is a Weights & Measures requirement at self-service retail stations to display the sale at the end of the transaction. The 3LD permits the fueling customer to observe the sale while at the end of a long fueling hose.

Perform the following, as desired:

1. Connect a laptop to the FMU in accordance with Product Bulletin 111.
2. To show pump pricing before a transaction is started:
 - a. Type a **59** command and press **Enter**. A display similar to the following should appear:

CURRENT SYSTEM OPTIONS (MENU 1) CONFIGURATION

A. SYSTEM INPUT TYPE: VMN - VEH. KEY

B. CUSTOM SYSTEM OPTION: DISABLED

C. ENTERED VEHICLE IDs ARE: ALPHANUMERIC

D. SEMI MANUAL MODE: DISABLED

E. REAL GATE TXN: DISABLED

F. POWER FAIL CHECK: ENABLED

G. ENTERED USER IDs ARE: ALPHANUMERIC

H. FURNACE LOGGING: DISABLED

I. USING OLD PROKEES: DISABLED

J. SHOW PROKEE/SMARTCARD ID: DISABLED

K. CONFIRM PROKEE/SMARTCARD ID: DISABLED

L. DISPLAY PUMP PRICING: DISABLED

M. EIU PROKEE/SMARTCARD WHICH KEYS: NO KEYS!!!

N. TWO RELAYS PER PUMP: DISABLED

O. AUTO ACTIVATE SINGLE PUMP: DISABLED

P. MODEM CONNECT UPPER SPEED LIMIT: MAXIMUM

Q. RESTORE DEFAULT VALUES

USAGE - <LETTER>=CHANGE VALUE, <ESC>=EXIT

- b. Depress **L**. The display should reset to:

L. DISPLAY PUMP PRICING: ENABLED.

- c. Press **Esc** to exit. A display similar to the following should appear:

CONFIGURATION HAS CHANGED!

WOULD YOU LIKE TO SAVE IT? (Y/N)

- d. Press **Y** to save the configuration change. The following prompt will appear:

SAVING SYSTEM CONFIGURATION...

CONFIGURATION RECORDED.

- e. To show pump pricing, press **A** on the FMU keypad. A display similar to the following should appear (the price shown is an example):

CURRENT PRICES: (PUMP #1) A=NEXT, D=EXIT

UNLEADED: \$ 2.489 PER GL

3. To show hose number, total quantity, and total cost at the end of a transaction:

- a. Type a **7D** (or **7d**) command, and press **Enter**. A display similar to the following should appear:

Weights & Measures: Display Last TX Configuration

Command Interface: 7D, ARG1, #ARG2

ARG1 - Display Last TX: 0 Disable, 1 Enable

ARG2 - Timeout in Seconds (Optional: Default=300, 0=Indefinitely)

Current Configuration

Display Last Transaction: Disabled

NOTE The 3LD will display the last transaction until a new transaction is started, or until the 3LD is rebooted.

- b. **ARG** = argument. To enable the display of the last transaction, **7D, 1** must be entered (**7D,0** would disable the display). Weights & Measures requires the transaction information to be displayed for 5 minutes, or until the next transaction is started. If the default 5 minutes (300 seconds) is desired, do not perform the second argument. Enter only **7D, 1**. If a continuous display of the previous transaction is desired, enter **7D,1,0**. (Whatever setting is made, if a new transaction is started, the display will clear and process the new transaction.) A display similar to the following should appear:

CONFIGURATION HAS CHANGED!

WOULD YOU LIKE TO SAVE IT? (Y/N)

- c. Press **Y** to save the configuration changes. The configuration changes will be recorded and a display similar to the following should appear:

SAVING SYSTEM CONFIGURATION...

CONFIGURATION RECORDED.

- d. Type a **5b** command, and press **Enter**. A display similar to the following should appear:

CURRENT RECEIPT PRINTER CONFIGURATION

A. RECEIPT PRINTER: DISABLED

B. RCPTS PRINT ON PWR UP: DISABLED

C. RECEIPT ALWAYS: DISABLED

D. RECEIPT PRINTER TYPE: PEDESTAL

E. PEDESTAL RCPT PAPER CUT: FULL

F. RECEIPT PRINTER BAUDRATE: 2400

G. PRINT DOLLAR FOR FLEET RECEIPTS: DISABLED

H. PRINT DUPLICATE RECEIPTS: DISABLED

I. PRINT RECEIPT DATE/TIME STAMP: ENABLED

J. PRINT MASTER PRODUCT DESCRIPTION: DISABLED

K. PRINT RECEIPTS FOR AIM: DISABLED

L. PROMPT FOR AIM RECEIPTS: DISABLED

M. ALLOW \$0.00 FOR PROKEE PRICING: ENABLED

N. RESTORE DEFAULT VALUES

USAGE - <LETTER>=CHANGE VALUE, <ESC>=EXIT

5/16/2016	<ul style="list-style-type: none"> ● Added breakout board and ¾ inch and 1-1/8 inch standoffs to list of kit parts. ● removed Ordering the 3LD Installation Kit. No info needed for other I/O Silver Boards. ● Upgrade FMU Firmware and FuelMaster Software, added to cover installation of compatible FMU firmware and FuelMaster software, if required. ● Removed figure for I/O Silver Board Applications. A new, compatible I/O Silver Board is being shipped with every application. ● Removed step 6b. No longer necessary to use existing I/O Silver Board. ● changed wiring diagram Figure 6 to show installation of breakout board. ● Figure 7 removed. No longer applicable. ● Added Troubleshooting and Figure 7 to cover wiring of displays into internal junction box.
6/3/2016	<p>Added: When an electronic dispenser is used with the 3LD, there can be up to a 10 second delay between disconnecting the hose and final updates to the display. The delay is variable but does resolve to the correct quantity and total cost. This delay does not occur with mechanical pumps.</p>
6/27/2016	<p>Added NOTE near top of page: Important! When performing an FMU firmware upgrade, it is important to follow the guidance of Product Bulletin 218, Screenshots for FMU Firmware Updates/Recovery. Screenshots of the FMU configuration are taken before the upgrade, then the FMU is initialized to clear memory of the old firmware. The screenshots can then be used to reconfigure the FMU to the customer's preferences with the new firmware. If this is a new installation, and a firmware upgrade is not being performed, disregard this note, at this time.</p>
11/13/2019	<ul style="list-style-type: none"> ● Added new image of 3-Line Display (Figure 1). ● Added new image for Kit Parts (Figure 2). ● Clarified that compatible FMU Firmware version is 3.91 <i>or later</i> and FuelMaster Software is 5.8.3 <i>or later</i>. ● Added Figure 6 Wiring Diagram. ● Edited, styled, re-formatted, and branded document.
11/26/2019	<p>Modified wiring schematic (Figure 6) Power Supply wiring.</p>
12/3/2019	<p>Modified wiring schematic (Figure 6) and subsequent steps to note that pink and gray wires will not be used and that the Black wire connecting to OUT is Blue.</p>
12/10/2019	<p>Added Note to Powering the Display sections: "Upon initial boot up, no data will appear in the center segment (TOT\$) of the three-line display as no transactions have been made."</p>
1/13/2020	<p>Modified wiring schematic (Figure 6) colored wiring.</p> <p>Modified step 2 of Wire the Display - "The blue and orange wires will not be..."</p> <p>Modified step 3e of Wire the Display - "Connect the display cable black wire to..."</p>
2/14/2020	<p>Modified wiring schematic (Figure 6) colored wiring.</p>