FUELMASTER
ENGINEERED BY syntech

K&K 3-Line-Display Installation Manual for FM*Live*

08/28/2025

FM*Live* Version: 10 .4.0

Document Version: 4.0

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Contents

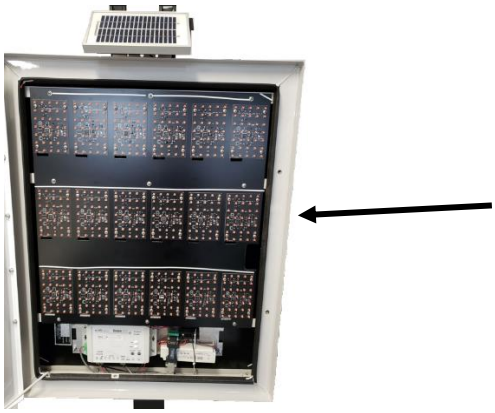
3-Line Display Overview

This K&K 3-Line Display Installation Manual guides the FuelMaster® installer through the installation, configuration and troubleshooting of the **K&K Systems 3-Line Display for FM*Live*** systems.

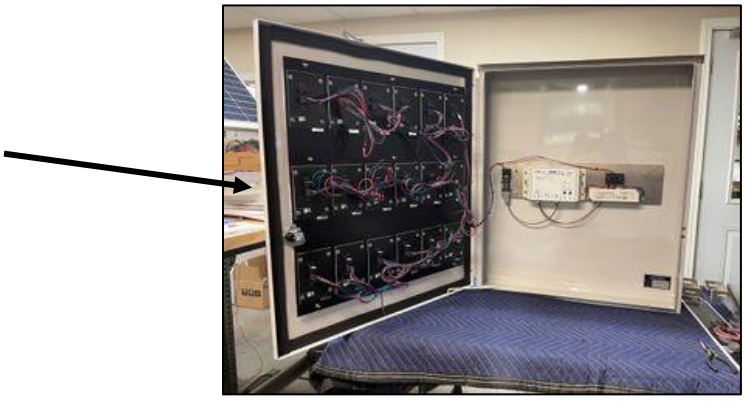
Syntech Kit part ID: 191F0280-10 and 191F0280-20 includes all the necessary components for a complete FM*Live* installation.

3-Line Display Differences

Gen 1 Release – The LED Panel Assembly is secured to the main housing.



Gen 2 Release – The LED Panel Assembly is secured to the door.

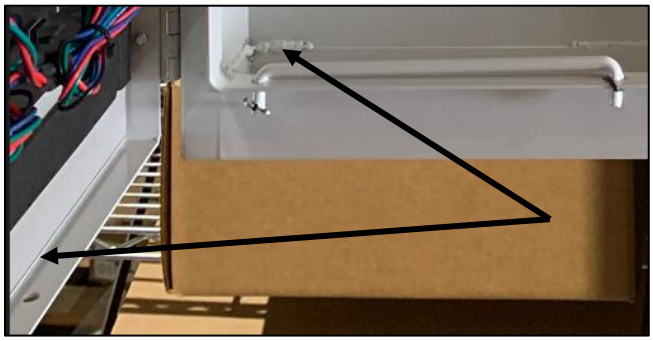


Both production releases are functionally equivalent. The only difference is where the LED Panel Assembly is mounted inside the unit.

Additional Gen 2 Release Changes

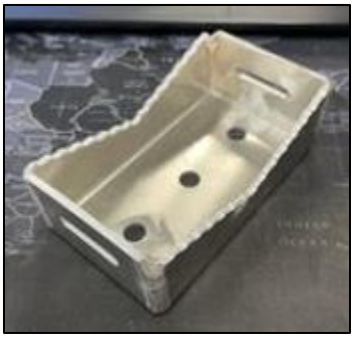
- Changed colored Syntech logo to monochrome Fuelmaster logo.

- The Door Prop Rod holds the door securely open at a 120-degree angle providing plenty of clearance while working inside the display.



- The door is now closed and locked with T-Handle.

- Mounting brackets changed from U-bolt, L-brackets, to 'V' shape bolt-on brackets, since new housing no longer contains the track for mounting with L-Bracket.



3-Line Display Product Identification and Compatibility

Product identification is located inside the unit and affixed to the back of the housing. Important data includes:

- Date of Manufacture
- Model Number
- Serial Number

3-Line Display Compatibility (FM*Live* – Gen 2)

Scenario	Supported	Kit Needed
Adding a K&K 3-Line Display to a New or existing FMU.		191F0280-10
Adding a second K&K 3-Line Display to an existing FMLive FMU		First Kit: 191F0280-10 Second Kit: 191F0280-20

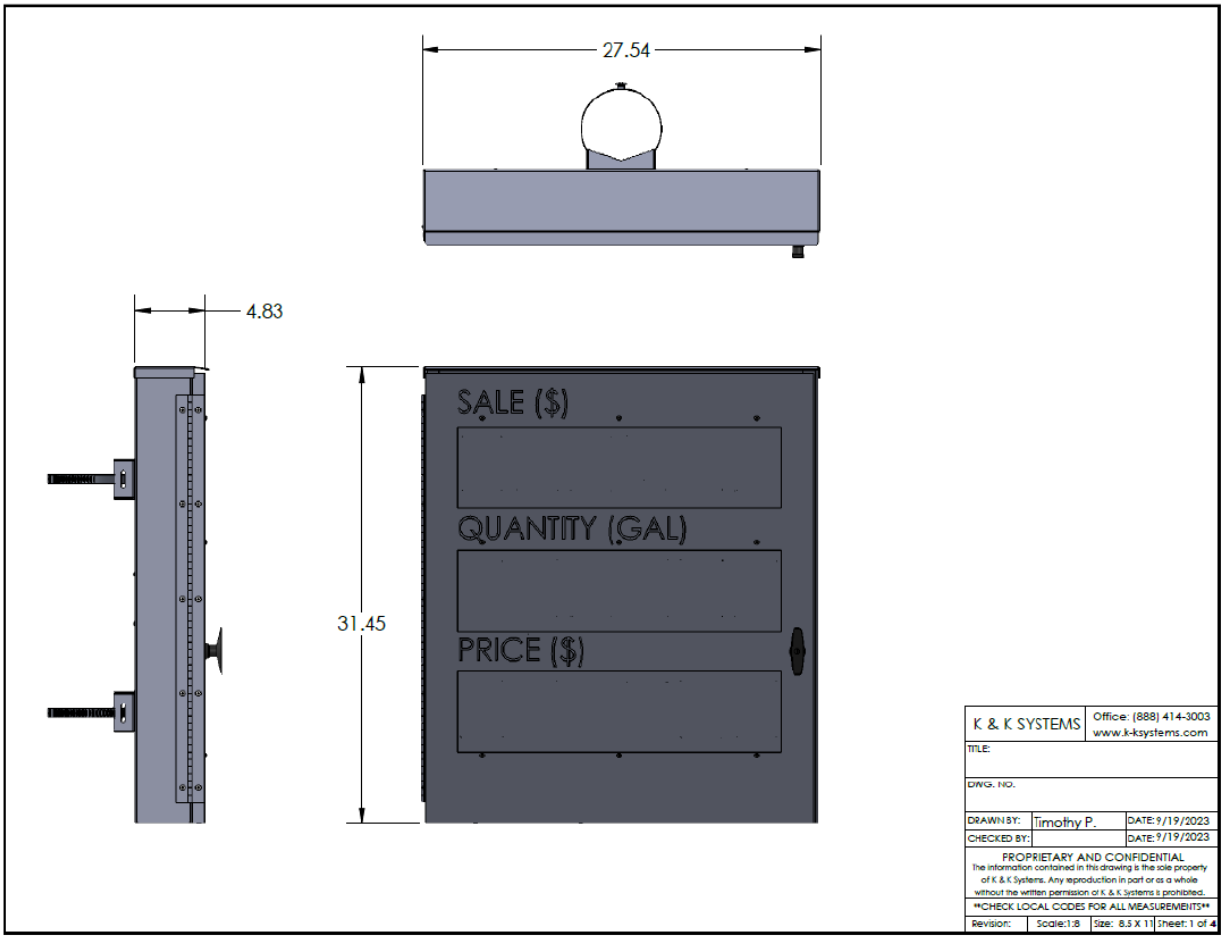
3-Line Display General Details (Gen 2 Release)

Display Dimensions

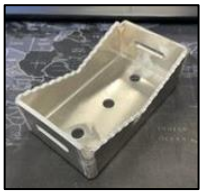
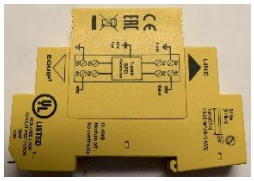
Height: 31.45 inches

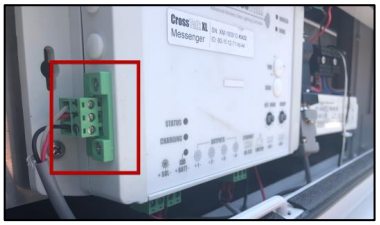
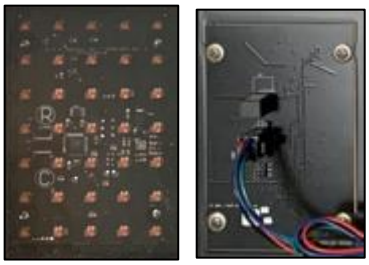
Width: 27.54 inches

Depth: 4.83 inches



Display Components

Part	Image
Solar Panel with Mounting Bracket STS Part ID**:** 266810	
K&K 3-Line Display (Gen 2 Release) FuelMaster logo STS Part ID: 266552	
3-Line Display Mounting Hardware Kit includes V-bracket, hex screws, and stainless-steel adjustable bands. Maximum pole diameter is 6-inches. Longer bands can be purchased at your local hardware store. ▪ Bracket part ID: 267413 ▪ MFR Part ID: MES71261418A ▪ Description: BRACKET, MOUNTING, V-SHAPE, 3LD, K&K, GEN 2 ▪ Hex Screw part ID: 267414	 
Surge Protector, RS232/RS485 STS Part ID: 266734	

USB to RS232 Cable STS Part ID: 191F0224-60	
3-Line Display / CrossTalk Controller Connections ▪ Wire, 3-Conductor, Shielded, 22AWG, 300V (Cable) ▪ STS Part ID: 255114 ▪ 3-Pin Connector ▪ STS Part ID: 265926	**Image n/a** 
LED Panels (Replacement Part) STS Part ID: 267355	

Mounting the 3-Line Display

IMPORTANT	The 3-Line Display will require at least three (3) people to safely mount the display.

Assumptions

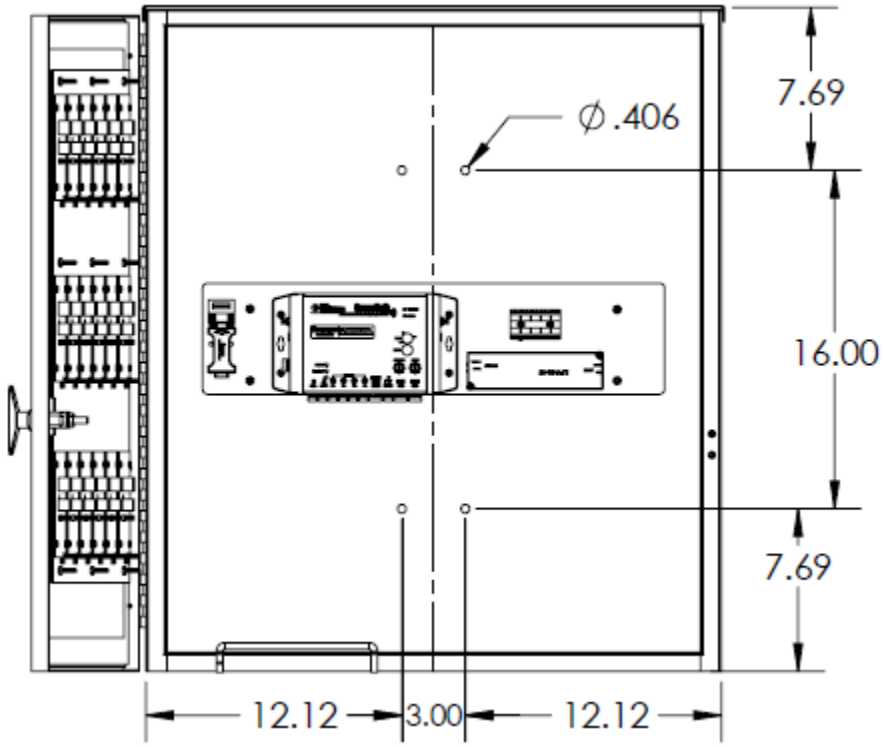
This tutorial assumes:

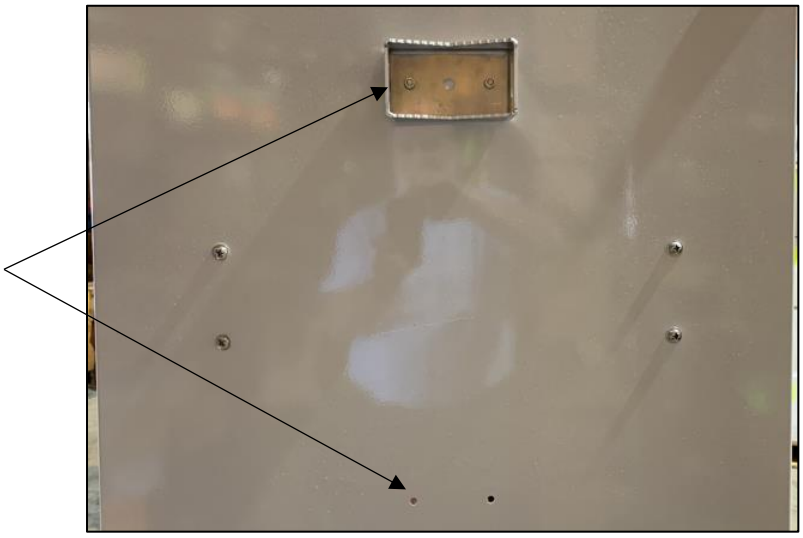
- A K&K 3LD is not currently installed
- You are working with an FM*Live* FMU (FMU-4500 or newer 5000 series)
- The unit is configured to work with FM*Live* 10.5 or newer

Mounting Options

- The 3-Line Display can be mounted to a wall or on a pole.
- Syntech does not offer (stock or sell) a mount, as the display can be attached to a wall or mount.
- Syntech does not stipulate strict guidelines for mounting as factors are different from site to site. Instead, Syntech relies on the knowledge and experience of the distributor/installer performing the installation, and that they will ensure the installation and mounting are completed to code, with safety as the highest priority.

- The back of the enclosure includes two (2) sets of 0.406” diameter drill holes positioned in the location shown below for positioning of the mounting.





The back of the 3-Line Display showing holes and bracket installed.

Mounting Kit Hardware

- The Gen 2 version of the K&K 3-Line Display and comes with the following mounting hardware:
  - Two (2) V-shaped mounting brackets (Syntech part ID: 267413)
  - Two (2) hex screws (part ID: 267414)
  - Two (2) 5-5/8" – 6-1/2" size adjustable stainless steel hex clamp bands.
- The mounting kit hardware is designed to support round and square poles, as well as Unistrut channel.
- The provided stainless-steel adjustable bands can be installed on a pole with a maximum diameter of 6-inches. Longer bands can be obtained at your local hardware store.

Wall Mount Option

- As mentioned above, the back of the 3-Line Display enclosure includes two (2) sets of 0.406" diameter drill holes for mounting, and can accommodate wedge anchors, lag bolts, etc. of that size.
- Care must be taken if the holes are drilled wider than the width provided as electronic components, such as the CrossTalk Controller and power connections, are also located in the housing.
- If you must drill, cover and protect sensitive electronic components. Clean up all metal debris after drilling.

NOTE	As previously mentioned, mounting locations and options vary from site to site. The mounting examples below serve only as guidelines.

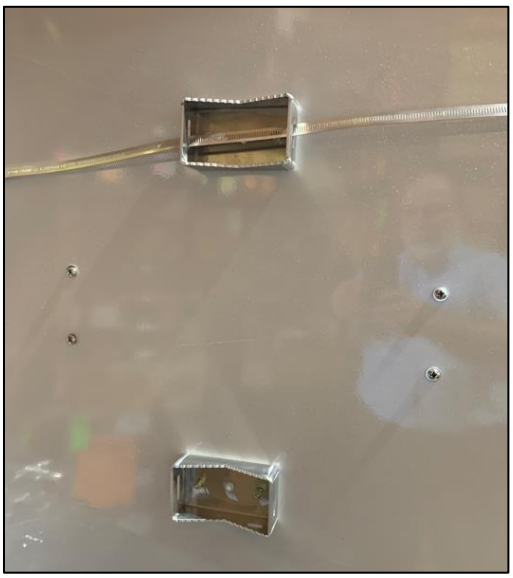
Wall Mount Example

1. Find a mounting location within range of the FMU.
2. Measure and mark the four holes needed to mount 3-Line Display to the wall.
3. If the bolts being used exceed the diameter of the pre-drilled holes, drill out the holes to the required diameter.
4. Secure the 3-Line Display to the wall.
5. Next, refer to section: *Solar Panel Mounting and Connection*.
6. Complete the final mounting steps by ensuring the display is secure.

Mounting Base (Anchored) or Pole Mount Example

1. Find a mounting location within range of the FMU and determine the height of the installation.
2. Secure the top and bottom brackets to the housing using the bolts and washers provided. Bolts and washers will feed from the inside of the housing, through the housing wall, and into the bracket nutserts.

3. Insert the stainless-steel bands through the slotted openings in the brackets.



4. Install the top band.
   a. With two people holding the display at each end, the third person will place the top band around the pole, join the band together, and tighten the band.
   b. It is quicker to use a powered or cordless drill with the appropriate size nut-driver to quickly tighten the band.
5. Install the bottom band.

Top and bottom bands installed.

6. Next, refer to section: *Solar Panel Mount and Connection*.
7. Complete the final mounting steps by ensuring the display is secure.

Solar Panel Mounting and Connection

Solar Panel

The solar panel is only used for controlling the brightness of the LED's and not for 3-Line Display power. The solar panel automatically controls the LED's brightness depending on ambient conditions such as sunlight intensity and different times of the day and/or weather conditions while maintaining viewing distance requirements.

When it is bright outside the solar panel will make the LED's brighter (increase its luminous intensity) so it can be seen better. When it is dark outside it will dim the LED's (reduce its luminous intensity) for better readability.

Refer to the *Troubleshooting* section for solar panel configuration and testing options.

IMPORTANT	The Solar Panel converts sunlight into usable energy in the form of voltage and current, therefore, the panel should receive a fair amount of direct sunlight throughout the day. If you install the 3-Line Display and Solar Panel under a covering, the energy captured, and the voltage required for proper functionality may be insufficient. For steps on how to test solar panel voltage, refer to the Troubleshooting section, Display Voltage for Solar Panel.

Solar Panel Part ID and Components

Syntech provides a mounting bracket and hardware to mount the solar panel.

Part ID 266810 includes both the solar panel and the bracket.

Solar Panel (Front)

Solar Panel (Rear)

Mounting Bracket

Correct orientation when installed

The solar panel comes with a cable that is nine-feet (9-ft) in length. Mounting is not limited to attachment to the 3-Line Display only but can be any place within range of the cable length that can be mounted securely, in the proper orientation, and receive direct sunlight.

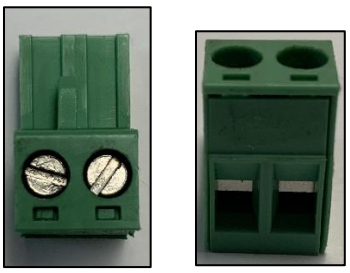
Mounting the Solar Panel

1. Locate the solar panel mounting bracket and ensure the orientation is correct.
2. Align and secure the solar panel to the solar panel mounting bracket with self-tapping screws (1/2").
3. Verify the Solar Panel can be mounted securely and placed in a way so as to receive direct sunlight.

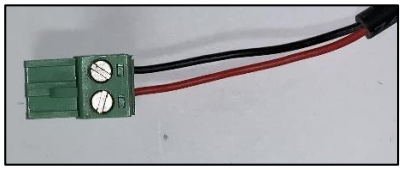
Connecting the Solar Panel to the 3-Line Display

The solar panel contains a 9-foot long two-conductor cable. The two-conductors will attach to the CrossTalk Controller's (+SOL-) connector inside the 3-Line Display.

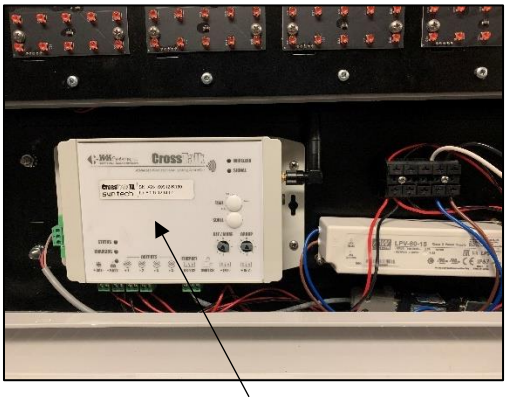
1. Open the door panel of the 3-Line Display. Use the prop rod to hold it open securely.
2. Run the two-conductor cable end from the solar panel through the access panel at the bottom of the 3-Line Display.
3. Locate the 2-pin Terminal Block and turn each screw fully counter-clockwise. The wires will be inserted into each hole.



4. With the terminal block oriented as shown above, insert the red wire (+) on the left and the black wire (-) on the right. Tighten each screw.



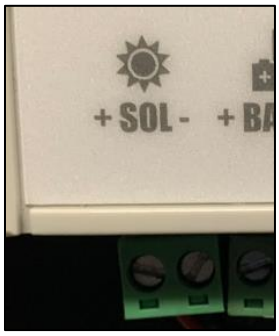
5. Locate the CrossTalk Controller inside the 3-Line Display.



CrossTalk Controller

6. On the bottom left corner locate the (+SOL-) icon. The connector is below the icon.

7. Insert the 2-pin terminal block into the connector. **Note** that the block is keyed to only be inserted one-way into the CrossTalk Controller connector.

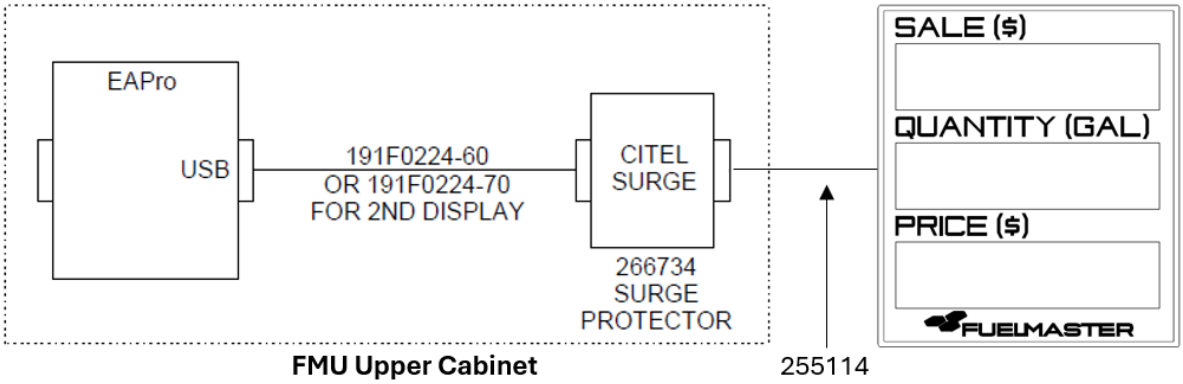


The solar panel is now connected to the 3-Line Display.

FMU to 3-Line Display Connections Overview

Connecting the FMU to the 3-Line Display is a two-phase process:

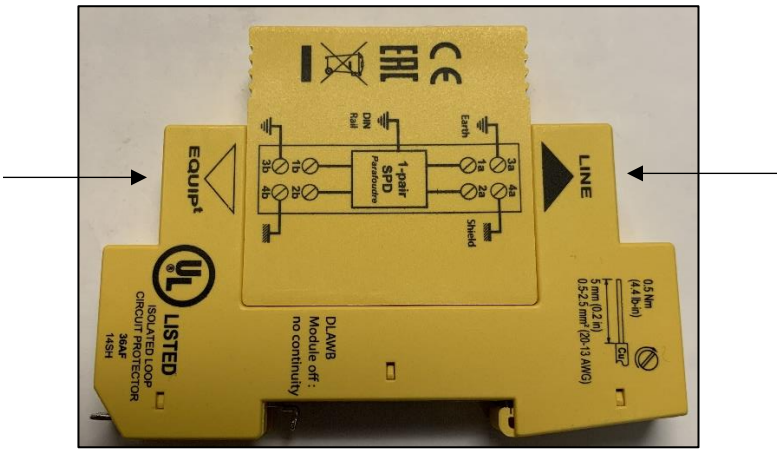
1. Installation and connection of the FMU Upper Cabinet components.
    a. Install the EAPro Board and Citel Surge Protection Device (SPD).
    b. Connect the EAPro Board to the Citel SPD 'EQUIPt' side.
2. Connect the Citel SPD 'LINE' side to the 3-Line Display.



Citel Surge Protection Device (SPD) Overview

The Citel Surge Protection Device (SPD) is installed between the FMU and the 3-Line Display.

- The EQUIPt of the SPD side connects to the FMU.
- The LINE side connects to the 3-Line Display.



EQUIPt side **LINE side**

- Connection details are noted in the installation sections below.

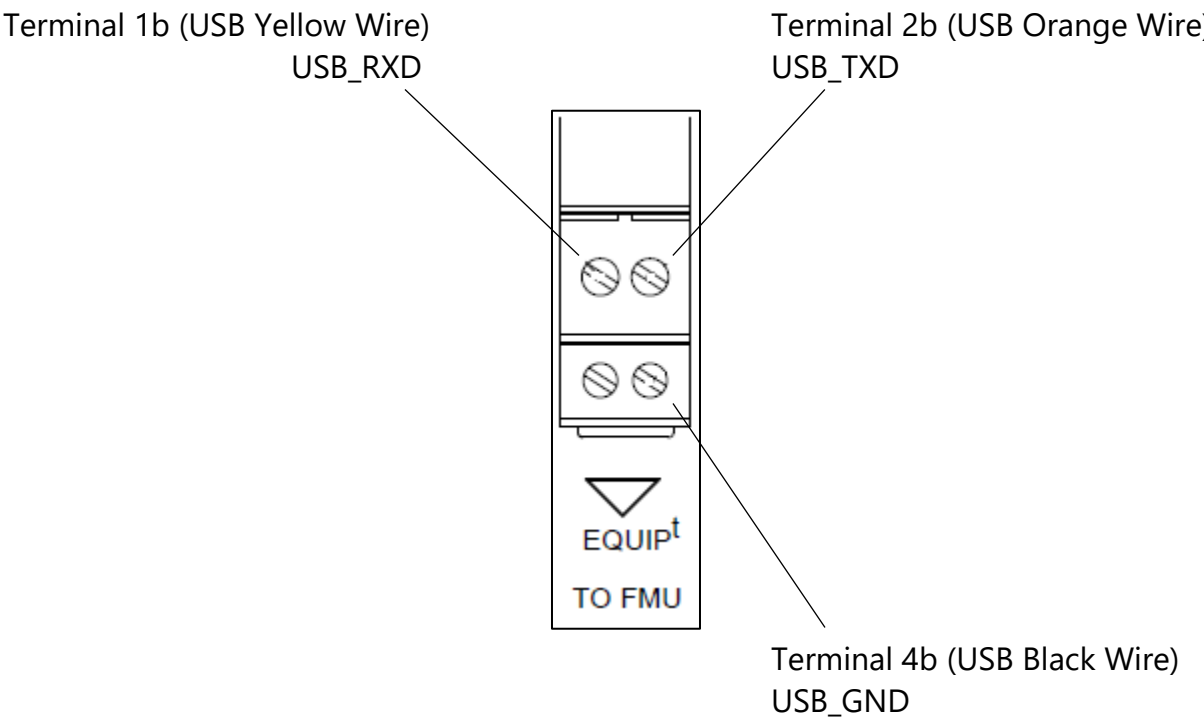
FMU Upper Cabinet Connections

NOTE	This section covers wiring the FMU-EAPro to the Citel SPD.

EAPro and Citel SPD EQUIPt-side Connections

1. Turn off the FMU power.
2. Open the door unit head door.
3. Plug the USB end of the USB to RS-232 cable (p/n 191F0224-60) into an available USB port on the EAPro inside of the unit head.
4. Locate the other end of the USB to RS-232 cable (no connector). This end will be wired into the 'EQUIPt' side of the Citel SPD.
    a. Connect the Yellow conductor to the 1b terminal.
    b. Connect the Orange conductor to the 2b terminal.
    c. Connect the Black conductor to the 4b terminal.

Cable (191F0224-60 / 70) from FMU-EAPro to:



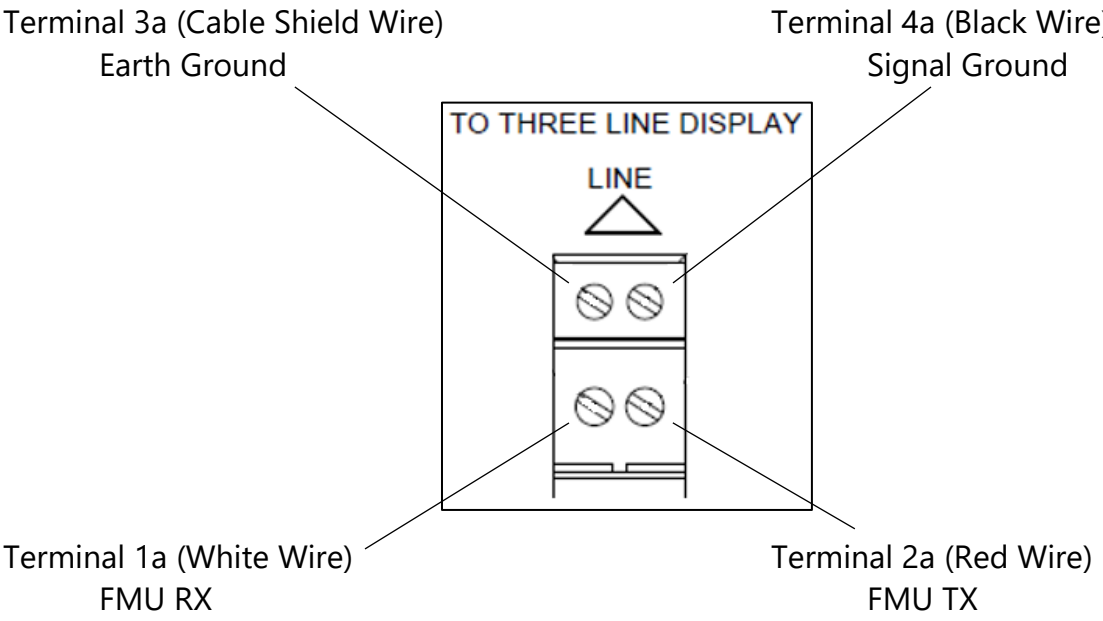
(Ref Drawing: 191F0280 Rev D)

Citel Surge Protection Device LINE-side Connections

NOTE	This section covers wiring the Citel SPD LINE-side to the 3-Line Display. The length of the 3-conductor cable shipped with the 3-Line Display kit is 75ft. Installers can cut the cable to their desired length depending on how far the 3LD is from the unit.

Connect the pigtail end of the 3-Line Display serial cable (STS# 255114) to the LINE side of the Citel SPD.

1. Connect the White wire to terminal 1a.
2. Connect the Red wire to terminal 2a.
3. Connect the cable shield to terminal 3a.
4. Connect the Black wire to the terminal 4a.



NOTE	For additional information regarding the Citel Surge Protection Device (SPD), refer to product bulletin **PB-261: Installation of the RS-232 Citel Surge Protection Device.**

3-Line Display/Crosstalk Controller

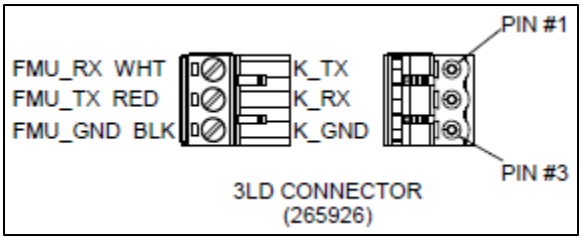
3-Pin Connector

Connect the 3-pin connector side of the three-conductor cable into the CrossTalk Controller inside of the 3LD housing. The wire order is:

1. Connect the White wire to PIN 1 (FMU_Receive (RX)_WHT)

a. Connects with the 3-Line Display CrossTalk Controller transmit (TX) pin.

2. Connect the Red wire to Pin 2 (FMU_Transmit (TX)_RED)
   b. Connects with the 3-Line Display CrossTalk Controller receive (RX) pin.
3. Connect the Black wire to Pin 3 (FMU_Signal Ground (GND)_BLK
   c. Connects with the 3-Line Display CrossTalk Controller signal ground (GND) pin.



Ref Drawing: 191F0280_Rev D (2023-11-03)

CrossTalk Controller showing 3-pin Connector Installed

FMU and 3-Line Display Power On

Power the display using an input power source of 100-240 VAC 50-60 Hz.

1. Power on the FMU.
2. Power on the 3-Line Display.
3. Proceed to the Troubleshooting steps below to ensure everything is functional.

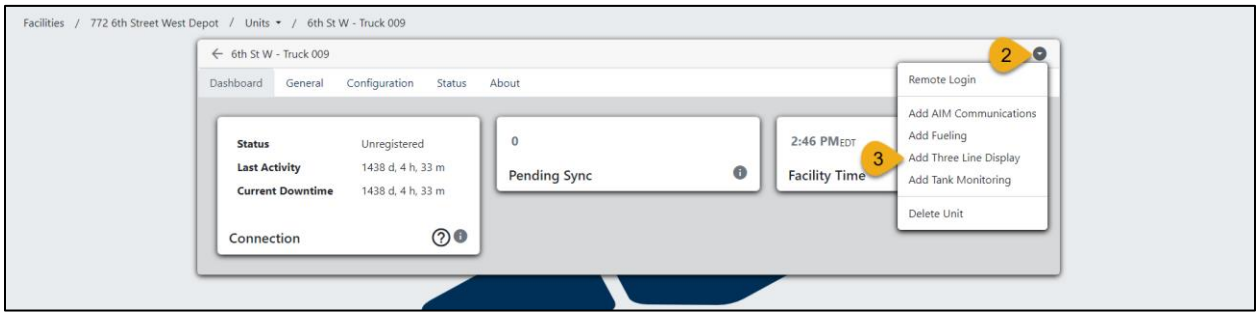
Configure 3-Line Display in FM*Live*

Assumptions

This tutorial assumes:

- You have installed a 3LD and connected it to your FMU
- Your Organization has been configured
- You have created a Unit in FM*Live*
- You have added Fueling capability to the Unit
- You have configured fueling positions for the Unit
- You are a Facility Manager

1. Navigate to the unit where you would like to add a 3LD.
2. Select the **dropdown** at the top right corner of the Unit Dashboard.



3. Select **Add Three Line Display**. The Three Line Display configuration model will display.
4. Select the Wired K&K for the **Display Type** field.

5. Populate the following fields:

Wired K&K 3LD

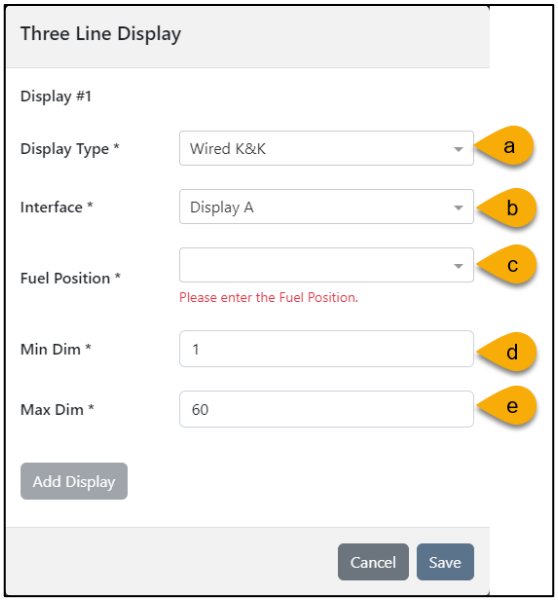
d. **Display Type**: the brand of the three-line display you are configuring

e. **Interface**: the serial device the 3LD will use to communicate with our FMU

f. **Fuel Position**: the fueling positions authorized to display on the 3LD; users may select more than one fueling position to show on the display

g. **Min Dim:** the minimum value for how dim (or weak) the LEDs will display on the 3-Line Display, based on voltage coming from the solar panel

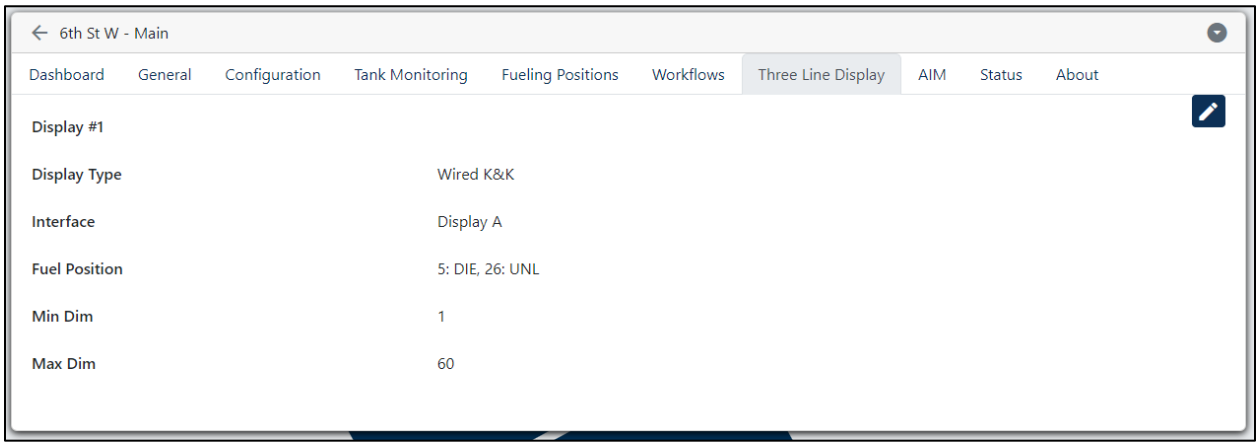
h. **Max Dim:** the maximum value for how bright (or intense) the LEDs will display on the 3-Line Display, based on voltage coming from the solar panel



NOTE	Users can add up to two 3-Line Display's to be controlled by a single unit. To add a second 3-Line Display, select **Add Display** and repeat steps 4 and 5.

WARNING	If two K&K devices are being used at one FMU, one must use Display A for the Interface fields, and the other must use Display B. Programmed FTDI USB-to-serial cables are used to uniquely identify our serial devices. Two different cables are needed since we will support up to two 3LD devices for one unit. **Misconfiguring serial cables will result in the 3LD not working.**

6. Select **Save**. The *Three Line Display* tab will display on the unit configuration.



TIP	If any questions arise, contact Syntech Systems, Inc.'s Customer Satisfaction Center (CSC) at 1-800-888-9136, ext. 2, or email support@myfuelmaster.com.

Troubleshooting

Users can troubleshoot their 3LD following installation as long as they have access to the supervisor menu or the special function menu on the FMU.

Users with access to the supervisor menu will have the option to:

- View the current solar voltage coming from the solar panel
- Test the solar voltage changes
- Test the performance of the 3LD LEDs
- Change the brightness of the 3LD LEDs
- Reset brightness to default values for the 3LD LEDs

Assumptions

The tutorials below assume:

- A K&K 3LD is currently installed
- The unit must be registered
- You have added the configuration for a 3LD to your unit in FM*Live*
- You have a supervisor key to access the supervisor menu on the FMU
- You have navigated to the Diagnostics section of the supervisor or special function menu

View Current Solar Voltage

7. Select '**3 = 3LD**'.
   - The user will be taken to the 3LD Management Menu.
8. Select '**S=SOLAR**'.
   - The current voltage of the solar panel will display. This value is periodically updated about once per second.

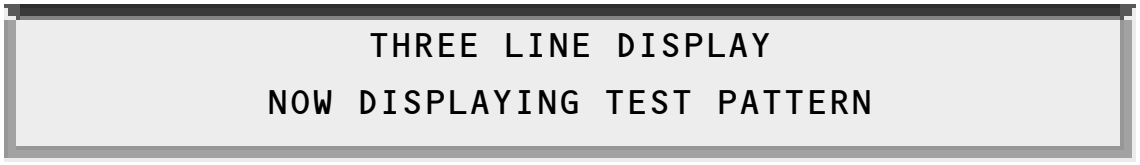
Verify Solar Voltage Changes

1. Select '**3 = 3LD**'.
2. Select '**S=SOLAR**'.

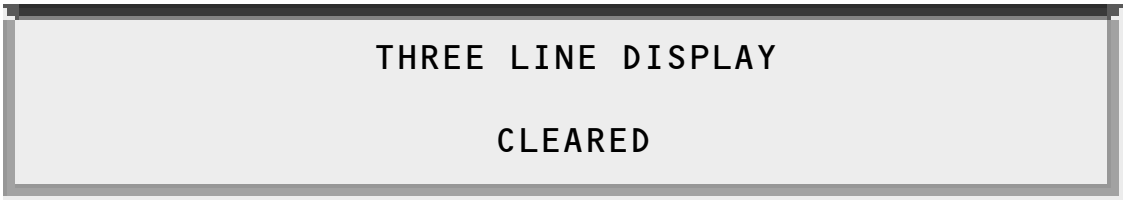
TIP	You can cover the solar panel to verify the solar voltage decreases or shine a flashlight on the solar panel to verify the solar voltage increases.

Test Performance of LEDs

1. Select '**T = TEST**'.
   - The following message will display on the front panel:



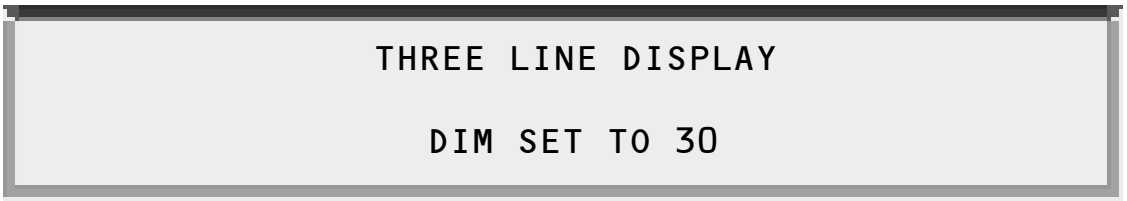
   - The 3LD will show the letters A – R on the display, then all LEDs will light up.
2. Navigate back to the 3LD section of the Diagnostics Menu.
3. Select '**C=CLEAR**'.
   - The 3LD will clear the test pattern. The following message will display on the front panel:



Change LED Brightness

1. Select '**D = DIM TEST**'.
   - The user will be prompted to enter a value ranging from 1 (most dim) to 200 (to most bright).

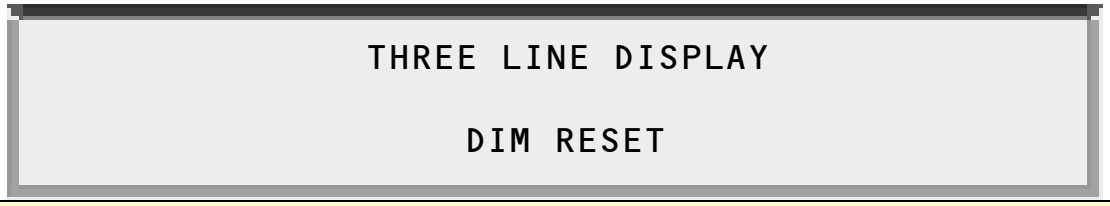
2. Enter the value you want to set the LED DIM Level (aka brightness) to.
   - The following message should display on the front panel:



TIP	Syntech recommends that the minimum DIM be 1 and the maximum DIM be 60. The higher the value, the brighter the LEDs will display.

Reset LED Brightness

1. Select '**R= DIM RESET**'.
   - The following message should display on the front panel:



NOTE	Running this command will revert the DIM values to the recommended default values.

Document Revision History

Version	Date	Description
1.0	**8/24/2023**	**Initial publication.**
2.0	**9/6/2023**	Update Part Numbers for 3-Pin Connector/Conduit Cable and USB to RS232 Cable. **Verified Wiring steps for 3LD and Citel SPD.**
3.0	10/10/2023	**Added Part Number for LED Panels to 3LD Components.**
3.1	05-15-2024	Major revisions now cover pages 1 thru 22
4.0	08/28/2025	Updated to fit styling standards.