



# FireConnect<sup>®</sup>

Remote Monitoring

Installation and Operation Manual

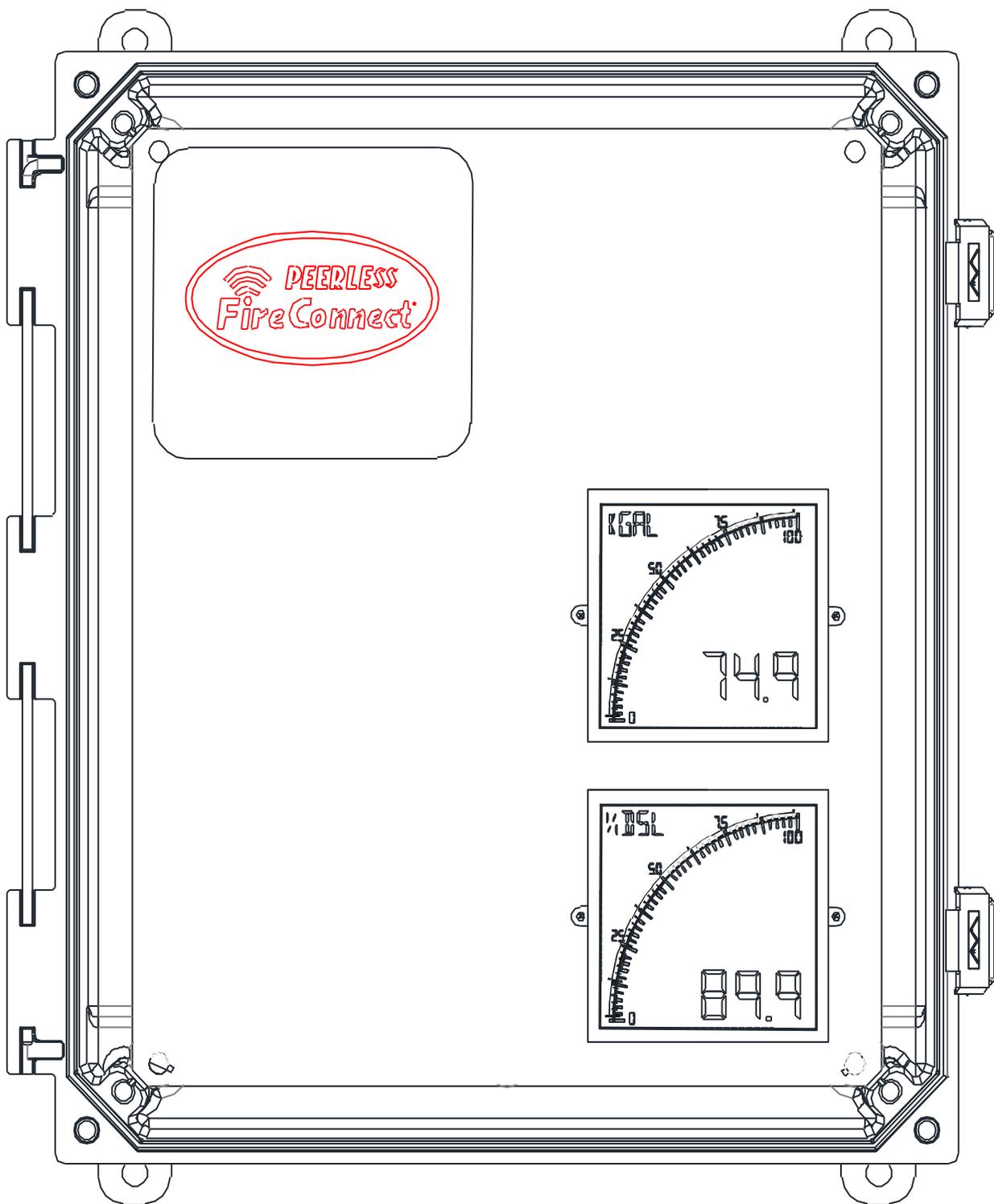
**Another Digital Innovation from the Peerless Pump Company**

2005 Dr. Martin Luther King Jr

Indianapolis, 46202 - U.S.A.

Phone: (+1) (317) 925-9661

[www.peerlesspump.com](http://www.peerlesspump.com)



## Table of Contents

Table of Contents .....	3
<b>Chapter 1 - Symbols Used in This Document.....</b>	<b>6</b>
<b>Chapter 2 - General Information.....</b>	<b>7</b>
<b>2.1 Product Description.....</b>	<b>7</b>
<b>2.2 Warranty.....</b>	<b>7</b>
<b>2.3 Personnel Qualification .....</b>	<b>7</b>
<b>2.4 Warnings.....</b>	<b>7</b>
<b>Chapter 3 – Transportation, Handling, &amp; Storage .....</b>	<b>8</b>
<b>3.1 Receipt and Inspection .....</b>	<b>8</b>
<b>3.2 Storage.....</b>	<b>8</b>
<b>3.2.1 Controlled Storage.....</b>	<b>8</b>
<b>3.2.2 Uncontrolled Storage .....</b>	<b>9</b>
<b>3.2.3 Standard Short-Term Storage.....</b>	<b>9</b>
<b>3.2.4 Long-Term Storage.....</b>	<b>9</b>
<b>3.3 Disposal of Packaging Materials .....</b>	<b>9</b>
<b>Chapter 4 - Identification.....</b>	<b>10</b>
<b>4.1 Identification Tag.....</b>	<b>10</b>
<b>4.1.1 Certifications .....</b>	<b>10</b>
<b>4.2 Model Number Product Key.....</b>	<b>10</b>
<b>Chapter 5 - Equipment Installation.....</b>	<b>11</b>
<b>5.1 Factory Support .....</b>	<b>11</b>
<b>5.2 Inspection .....</b>	<b>11</b>
<b>5.3 Required Tools and Fixtures.....</b>	<b>11</b>
<b>5.4 Location .....</b>	<b>12</b>
<b>5.5 FireConnect® Gateway Controller (FCGC) Install .....</b>	<b>12</b>
<b>5.5.1 Conduit Entrance .....</b>	<b>12</b>
<b>5.5.2 Wiring FireConnect®.....</b>	<b>12</b>
<b>5.5.3 Wiring to Power Supply.....</b>	<b>12</b>
<b>5.5.4 Wiring to Suction Pressure Transducer.....</b>	<b>14</b>
<b>5.5.5 Wiring to Flowmeter – ANALOG.....</b>	<b>14</b>
<b>5.5.6 Installation and Operation of the Flowmeter .....</b>	<b>16</b>
<b>5.6 Wiring to Controller Modbus .....</b>	<b>16</b>
<b>5.7 Speed Sensor .....</b>	<b>16</b>
<b>5.8 External Antenna (required) .....</b>	<b>16</b>
<b>5.9 Pump Room Temperature Sensor .....</b>	<b>16</b>
<b>5.9 Installing the Suction Pressure &amp; Tank Level Transducer.....</b>	<b>18</b>
<b>5.9.1 Tank Level Monitoring .....</b>	<b>18</b>
<b>5.10 Diesel Tank Level Monitoring &amp; Visual Indicator.....</b>	<b>19</b>
<b>5.10.1 Installation of the FireConnect Diesel Fuel Tank Level Sensor.....</b>	<b>19</b>

5.10.2 Diesel Fuel Tank Level Monitoring (Dimensional Analysis).....	20
5.10.3 Diesel Fuel Tank Level Monitoring; <i>Alternate Installation Method</i> .....	21
5.12 Closed Cooling Loop; Tank Return Monitoring.....	21
5.12.1 Closed Cooling Loop; Tank Return Monitoring Installation.....	22
5.12.1.1 Closed Cooling Loop; Tank Return Monitoring Installation (Wiring).....	23
5.13 Digital Temperature Sensor Programming.....	24
5.13.1 Digital Temperature Sensor Display & Menu Navigation.....	24
5.11.2 Digital Temperature Sensor Menu Structure.....	25
5.11.2 Digital Temperature Sensor Menu Setting.....	26
5.12 Battery Backup.....	27
5.12.1 Battery Recommendations.....	27
5.12.2 Battery Location.....	27
5.12.3 Battery Wiring.....	28
5.12.4 Battery Maintenance.....	28
6.0 Setup, Operation, and Shutdown.....	29
6.1 Setup.....	29
6.1.1 Powering On.....	29
6.1.2 Configuring the Flowmeter.....	29
6.1.3 Configuring the Tank Level Display.....	29
6.1.4 Connecting to the Cloud.....	29
6.2 Operation.....	29
6.3 Shutdown.....	30
7.0 Fire & Jockey Pump Controller Compatibility.....	30
7.1 Firetrol.....	30
7.1.1 Fire Pump Controller (Firetrol).....	30
7.1.2 Jockey Pump Controller (Firetrol).....	30
7.2 Tornatech.....	30
7.2.1 Fire Pump Controller (Tornatech).....	30
7.2.2 Jockey Pump Controller (Tornatech).....	31
7.3 Eaton.....	31
7.3.1 Fire Pump Controller (Eaton).....	31
7.3.2 Jockey Pump Controller (Eaton).....	31
7.4 Master Control Systems.....	31
7.4.1 Fire Pump Controller (Master).....	31
7.4.2 Jockey Pump Controller (Master).....	31
7.5 FPC & JPC Modbus Option Codes.....	31
7.5.1 Typical Parts List.....	31
8.0 Typical Parts List.....	32
9.0 Disposal.....	32
10.0 Troubleshooting.....	32

<b>Appendix-I (Drawings)</b> .....	33
<b>Appendix-II</b> .....	39
<b>Greyline TTFM 6.1 Quick Start</b> .....	39
<b>CONNECTIONS; POWER INPUT</b> .....	39
<b>KEYPAD SYSTEM</b> .....	39
<b>ICONS</b> .....	39
<b>MENU STRUCTURE</b> .....	40
<b>MAIN DISPLAY</b> .....	41
<b>MESSAGE ICON</b> .....	41
<b>STATUS</b> .....	41
<b>MENU SELECTIONS</b> .....	42
<b>UNITS/MODE</b> .....	42
<b>SET UP</b> .....	43
<b>CALIBRATION</b> .....	44
<b>SPECIAL FUNCTIONS</b> .....	45
<b>TYPICAL SE16B SENSOR INSTALLATION</b> .....	46
<b>SENSOR MOUNTING LOCATION</b> .....	46
<b>2 OR 4 CROSS INSTALLATION OVERVIEW – SE16B TMK-B1 Kit</b> .....	47
<b>SENSOR MOUNTING/COUPLING RECOMMENDATIONS</b> .....	48
<b>ENCLOSURE INSTALLATION</b> .....	49
<b>FIELD TROUBLESHOOTING</b> .....	49
<b>PIPE CHARTS</b> .....	50
<b>Appendix-III</b> .....	52
<b>Greyline TTFM 6.1 Instruction Manual</b> .....	52
<b>Appendix-IV</b> .....	53
<b>ProSense Digital Temperature Sensor Manual</b> .....	53
<b>Appendix-V</b> .....	54
<b>Commissioning; FCGC w/Firetrol MarkIII &amp; Tornatech V2 Interfaces; Main &amp; Jockey</b> .....	54
<b>Setting up the Main Controller; Mark III/Vizitouch 2.0</b> .....	55
<b>Diesel Specific Controllers</b> .....	56
<b>Setting up the Jockey Controller; Mark III/Vizitouch 2.0</b> .....	57
<b>Peerless Pump Contact Information</b> .....	59

## Chapter 1 - Symbols Used in This Document



- Warning! If these safety instructions are not observed, personal injury may result.



- Warning! If these instructions are not observed, electric shock with consequent risk of serious personal injury or death may occur.

**Caution**

- If these safety instructions are not observed, the result may be a malfunction or damage to the equipment.

**Note**

- These are notes or instructions that make the job easier and ensure safe operation.

## Chapter 2 - General Information

These instructions should be retained for reference regarding future maintenance and operation. Additional copies can be found at [www.PeerlessPump.com](http://www.PeerlessPump.com)

These are general instructions and may not take into account possible local regulations. All installations are subject to local code and regulations, and/or the authority having jurisdiction. The user should ensure such regulations are observed by all parties involved.

Information in this manual is believed to be reliable. In spite of all efforts to provide sound and necessary information, the content of this manual may be insufficient. It is not guaranteed to be complete or accurate in all instances.

### 2.1 Product Description

The FireConnect® system is a Peerless Pump proprietary hardware and software package that provides real-time fire pump system monitoring through cloud networking. FireConnect® collects data from peripherals on-site such as: the controllers for the fire pump and jockey pump, a suction pressure transducer, an externally mounted, transit time flowmeter and other sensors as supplied. It will then communicate that data to the cloud via a cellular connection. The system can be monitored using the Peerless Pump FireConnect® application. Through the application, the user can view real-time fire system information such as: alarm conditions, system pressure, water flow, and event logs.

See Appendix for Piping & Instrumentation Diagram (PI&D) and for a typical electrical wiring connection diagram.

### 2.2 Warranty

This unit is manufactured under a quality management standard as certified and audited by external quality assurance organizations. Genuine parts and accessories have been designed, tested and incorporated into the products to help ensure their continued product quality and performance in use.

Damage or malfunction caused by misuse, abuse or failure to follow these instructions are not covered by warranty.

Any modification of our products or removal of original components may impair the safety of these products and affect their operation.

Standard warranty conditions can be found at [www.Peerless Pump.com](http://www.Peerless Pump.com).

### 2.3 Personnel Qualification

All operations must be carried out by qualified personnel. Please consult the procuring organization for the recommended procedure for connections to equipment not supplied by Peerless Pump Company.

### 2.4 Warnings



- **Warning!**  
***Do not remove or paint over any safety labels. If labels are lost or damaged, contact a Peerless Pump representative for replacement.***



- **Warning!**  
***Never perform maintenance work when the unit is connected to power. Use only qualified electricians for electrical installation and maintenance.***

## Chapter 3 – Transportation, Handling, & Storage

The FireConnect® system has been prepared for shipment at the factory in such a way as to minimize potential damage due to handling and transport.

### Caution

- ***The equipment should not be subjected to excessive forces during the handling or transport.***

### 3.1 Receipt and Inspection

Receiver should report any material shortages or damage to the transport company handling the shipment and to Peerless Pump.

Note any extent of damage or shortage on the freight bill and bill of lading. Failure to note damage may result in a declined warranty.

Take inventory of the shipment upon arrival to ensure the parts received match the list of parts on the order. Failure to report missing parts may result in a void of the warranty.

It is important that all components for the FireConnect® system are identified and properly stored until time of installation. There may be many small parts that are best left in their original shipping container until installation.

Check within all packaging material in order to verify that no parts or instructions are accidentally discarded. **In some shipments, be aware that small boxes containing additional parts may be bound to pump skids.** At the time of installation, match components using their markings to the system they are to be installed on if there is more than one.

### 3.2 Storage

Standard factory packaging and protection is suitable during transit and within covered storage at a jobsite for a short period between delivery and installation/startup. This protection includes preservatives applied at the factory to the components.

The effective protection is two to three months from the date of shipment from the factory. This is dependent on storage conditions and the severity of the environment to which the equipment is exposed as described below. For an international destination, this will vary depending on the seaworthiness of export boxing.

At the time of specification and/or order placement

Peerless Pump should be advised about an extended storage duration that will be excess of two to three months and other than what is described below. This is to ensure special storage protection can be provided for the equipment prior to shipping from the factory.

#### 3.2.1 Controlled Storage

Storage facilities should be maintained at an even temperature of at least 40°F (4.5 °C) above the dew point with relative humidity lower than 50 % with little or no dust. The equipment is to be inspected weekly to ensure that all preservatives are intact, and internals are protected.

### Caution

- ***Protect the equipment from flooding or from harmful chemical vapors.***
- ***Storage should be free from ambient vibration. Excessive vibration can cause bearing damage.***
- ***Precautions should be taken to prevent rodents, snakes, birds, insects, etc. from nesting inside the equipment.***

### **3.2.2 Uncontrolled Storage**

For uncontrolled storage periods of three months or less, the equipment is to be inspected weekly to ensure internals are protected.

Provide a roof or shed shelter to protect from direct exposure to the elements

### **3.2.3 Standard Short-Term Storage**

The FireConnect® system, as shipped, has an effective protection for short-term (two to three months) storage in a covered, dry, and ventilated location as described above at the job site prior to installation.

### **3.2.4 Long-Term Storage**

Long-term storage protection from the factory does not extend the warranty in any manner. Warranty policy is twelve months from startup or eighteen months from time of shipment, whichever occurs first. This warranty is valid only if equipment has been properly handled and stored as per the stated requirements.

Should the equipment be stored or handled improperly, then the warranty becomes invalid and may be reinstated only after a factory representative inspects the equipment prior to startup. Expenses for the representative will be billed in accordance with the latest schedule for the field service engineer.

Any repairs or replacement parts needed will be billed to the customer at prices in effect at time they are shipped.

In addition to having complied with the storage conditions the FireConnect® system, once installed, should be inspected at regular periods, with intervals not to exceed three months.

## **3.3 Disposal of Packaging Materials**

This product or parts of it must be disposed of in an environmentally sound way. For assistance, please contact Peerless Pump when disposing of packaging materials or FireConnect® components.

All electronic waste should be disposed of in a way that aligns with the EPA standards and recommendations.

## Chapter 4 - Identification

### 4.1 Identification Tag

The product or device identification number can be found on the **INSIDE** of the FireConnect Gateway Controller (FCGC) door. This unique number corresponds to the original device configuration and features. Please reference this number when inquiring with the factory, to include any other pertinent information as deemed by the inquiring personnel.

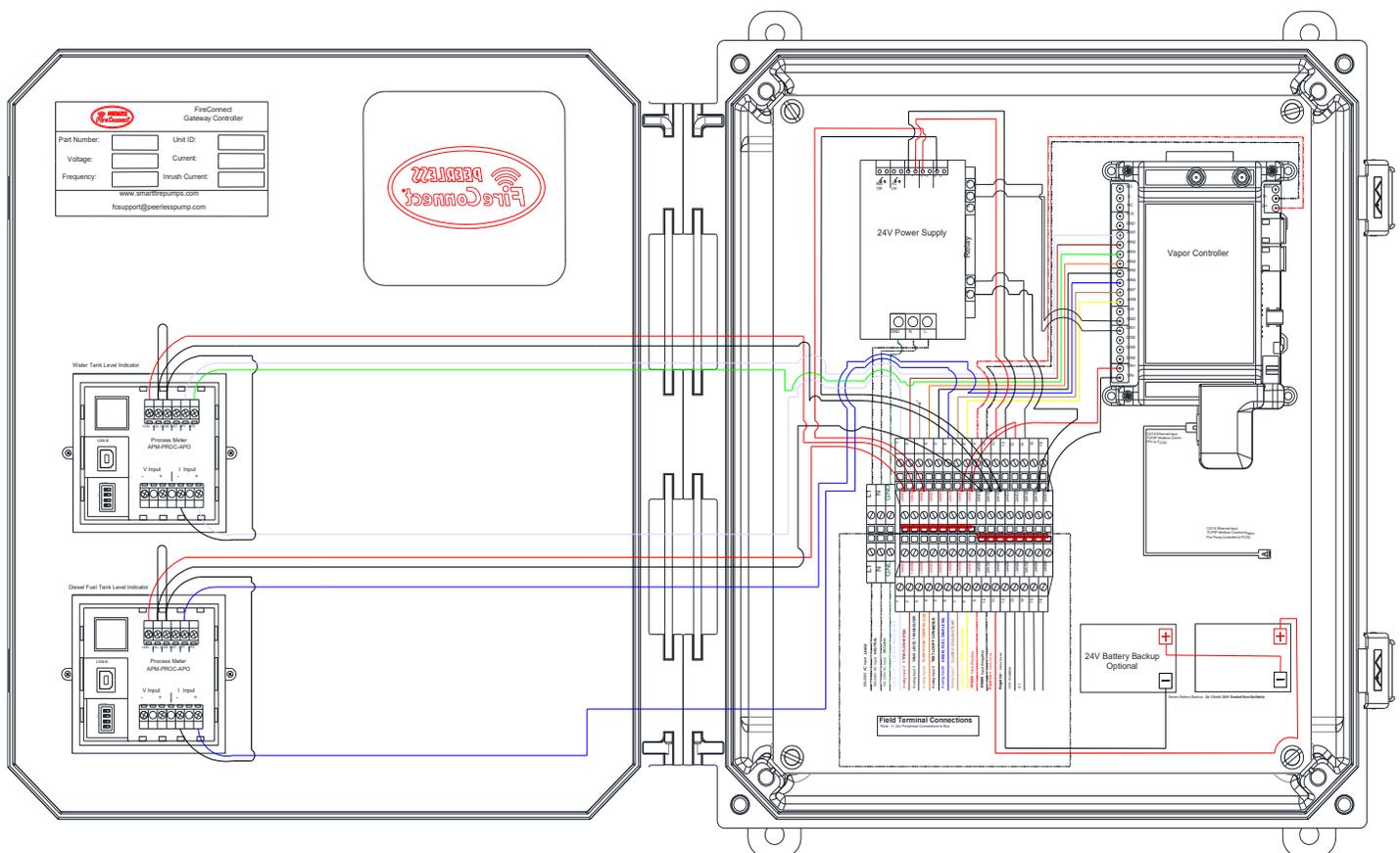
Reference Figure-1 for illustration of product identification number.

#### 4.1.1 Certifications

An optional FireConnect® Gateway Controller (FCGC) is available with the CE certification and is provided with all labeling and identification required by this standard.

### 4.2 Model Number Product Key

*While this feature is currently in development, all product information is available from the FireConnect Sales Team and is to be provided at the time of order placement.*



**Figure 1 - FireConnect Gateway Controller (FCGC) enclosure with identification tag displayed on the inside of the enclosure door**

## Chapter 5 - Equipment Installation

### 5.1 Factory Support

For these customized products, we recommend that a Peerless Pump service engineer supervise installation, commissioning, and startup.

This is to ensure that the equipment is properly installed. In addition, this allows end user personnel the opportunity to review and see implemented, factory recommended instructions.

### 5.2 Inspection

All system parts were carefully inspected before leaving the factory but may have become soiled or damaged in shipping and handling or while in storage awaiting installation. The installer must therefore confirm that all parts are clean and undamaged prior to installation.

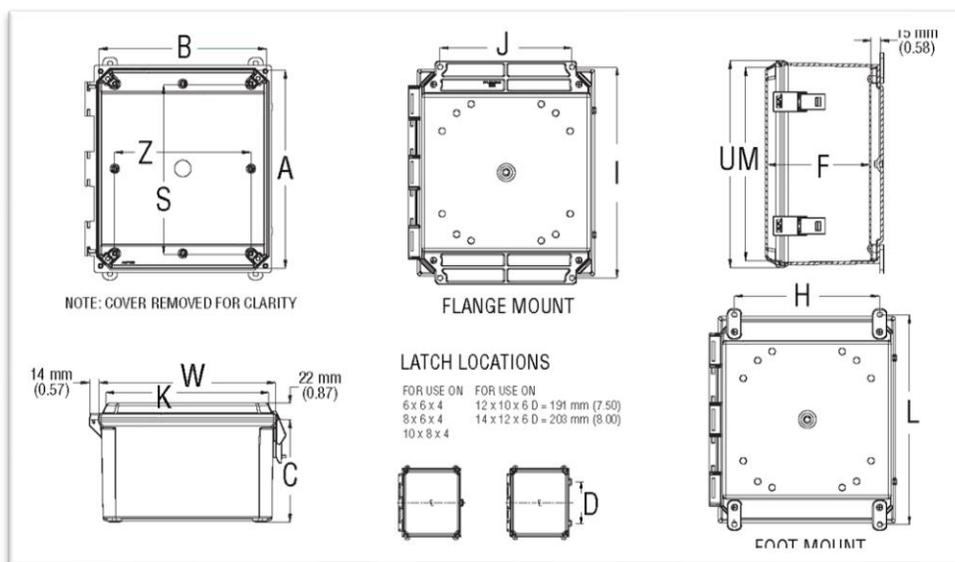
If there is reason to believe the factory wired connections have been damaged in transit, please refer to the factory support team for assistance in tracing the line diagram connections found in Appendix-I

For any and all other damages or discrepancies, please contact the Peerless Pump Company warranty services.

### 5.3 Required Tools and Fixtures

Tools and fixtures for FireConnect® system installation, disassembly and reassembly may include (but not limited to) these items:

- Lifting devices (hoist or straps)
- Screwdriver (slotted and/or Phillips)
- Wire strippers
- Standard pipefitting equipment (for the flowmeter transducer installation)
- Drill motor and bits
- Calibrated measuring tape
- Calipers (for proper spacing of the Greyline TTFM Flowmeter and the ultrasonic sensors)



DIMENSIONS: mm (in)														
BOX SIZE INSIDE DIMENSIONS			USABLE DEPTH	PANEL BOSS CENTERS			FLANGE MOUNT CENTERS		FOOT MOUNT CENTERS		COVER SIZE			
A	B	C	F	S	Z	J	I	H	L	K	M	W	U	
317.5 (12.50")	272.3 (10.72")	150.8 (5.94")	153.8 (6.06")	260.4 (10.25")	N/A	224.0 (8.82")	332.6 (12.70")	224.0 (8.82")	332.6 (12.70")	N/A	N/A	272.3 (10.72")	317.5 (12.50")	

Figure 2 - Enclosure dimensions for the FireConnect Gateway Controller (FCGC)

## 5.4 Location

The FireConnect® system must be installed on a panel stand or wall rigid enough to support the entire weight of the device. The system must be located indoors and protected from environmental exposures such as excessive heat, cold, dust, and water entry. Peerless Pump recommends installing the FCGC on the wall nearest to the main fire pump controller, or in the closest proximity as practicality will allow.

## 5.5 FireConnect® Gateway Controller (FCGC) Install

See **Figure-2.** (FCGC Panel Dimensions) for mounting dimensions and installation space requirements.

### 5.5.1 Conduit Entrance

Conduit entrance can be made either through the top or bottom of the enclosure.

Use appropriate conduit hub that matches the "Enclosure Type" as shown on the controller nameplate. When controllers suitable for outside installation are used, be sure the appropriate weatherproof conduit hub is used and provide a canopy to prevent direct sunlight on the controller.

NOTE: If entering from the top, waterproof hubs are required for all installations.

#### Caution

- **Foreign metallic debris, such as drilling chips, can cause a dangerous and/or damaging electrical fault when the equipment is energized. Be sure to protect all electrical parts from metallic debris during installation.**

### 5.5.2 Wiring FireConnect®

#### Caution

- **In addition to any optional alarms required by specifications, both controllers (main and jockey) must be ordered with Modbus RTU (RS-485) or Modbus TCP/IP option.**

**If the Modbus RTU or TCP/IP option is not already supplied on the controllers, it must be specified at time of ordering/purchase of a new controller in order to operate FireConnect®. Field modification to add one of these options on newer controllers may be possible. Contact Peerless Pump for details.**



- **Warning! Before performing any electrical work, ensure all power supplies have been disconnected.**

### 5.5.3 Wiring to Power Supply

FireConnect® requires a 120/240VAC, 20A, 1PH, 50/60Hz source. Power consumption and usage is dependent upon the options specific to the units designed configuration. Once the conduit has been installed and connections made to the bottom of the FireConnect® Gateway enclosure, the connections to the field terminals can be made as follows:

1. Open the FCGC cover and locate the power supply terminal strip.
2. Terminate incoming power feed to the terminal strip, marked in **Figure-3** as **L – N – G** (Line, Neutral, Ground).
  - a. Reference the Field Terminal Connection diagram found in **Figure-3**

#### Note

- **Enclosure grounding inside the FCGC will be factory installed.**



- **Warning! FireConnect® does not have internal short circuit protection. Thus, it is strongly recommended to utilize a 20-amp fuse/circuit breaker on the external power supply source.**

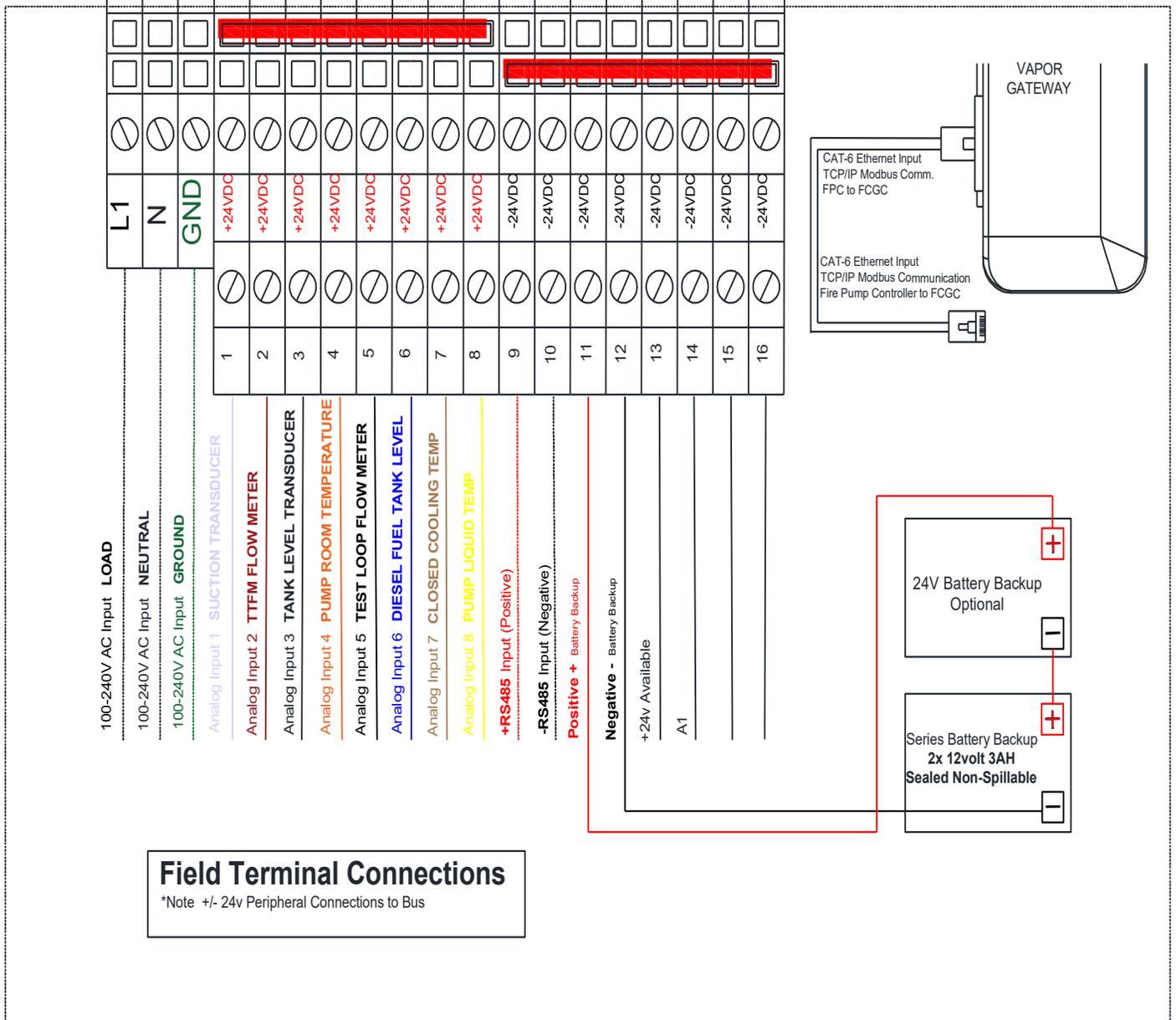


Figure 3 – Field Terminal Connections for the FireConnect Gateway Controller

### 5.5.4 Wiring to Suction Pressure Transducer

FireConnect® requires an external pressure sensor installed in the fire system suction piping. The pressure transducer will be supplied with unit. Refer to Section 5.9 for the recommended transducer location and installation. The contractor must supply 18awg shielded wiring from the transducer to the FCGC.

1. Install 18awg/2c shielded wire with connections to the pressure transducer screw terminals or the two-wire leads and route to the FCGC via approved conduit or by necessary means in compliance with local code or authority having jurisdiction.
2. Make conduit connections to the bottom of the FCGC enclosure as needed, ensuring adequate clearance for all terminations.
3. Feed wire into FCGC through the cable gland on the bottom side of the enclosure.
4. Terminate the negative (-) wire at the screw terminal labeled **Analog Input 1 Suction Transducer**
  - a. Reference **Figure-3**
5. Terminate the positive (+) wire at the screw terminal labeled **+24Volt Bus** to any open terminal (Verify w/Multi Meter)
  - a. Reference **Figure-3**
6. Further instruction for suction pressure and tank level monitoring can be found in Section 5.9

### 5.5.5 Wiring to Flowmeter – ANALOG

In most installations, FireConnect® utilizes a Transit Time Flow Meter (TTFM) requiring two ultrasonic sensors to be mounted on the suction or discharge piping, which ever presents the best suited conditions to meet the installation requirements for straight runs of piping and location. **See Appendix-II for the complete installation and operation manual for the Greyline TTFM Flow Meter.**

Connection of the TTFM display unit to the FCGC will utilize the +24VDC and analog input terminals between the flow meter display unit and the FCGC.

After following the Appendix-II instructions for choosing your location to install the TTFM display unit and setting up the hardware, make the connections for the power supply and analog signal to and from the TTFM & FCGC as follows:

1. Make sure the power is off and all “Lock Out Tag Out” procedures are followed according to site practices.
2. Run all the necessary conduit and connections to and from the bottom of each enclosure, the TTFM and FCGC
3. Run two lengths of 18awg/2c shielded wire, or wire approved by the local authority, from the TTFM to the FCGC
4. Route both sets of shielded wire properly labeled and exposed in the bottom of each enclosure.
5. TTFM Display Unit Enclosure
  - a. Terminate the Positive (+) and Negative (-) leads to their respective terminals in the TTFM enclosure for the power supply.
    - i. Reference **Figure-4**
  - b. Terminate the Analog OUTPUT signal to its respective terminal for the data to be sent to the FCGC controller.
    - i. Reference **Figure-4**
6. FCGC Enclosure
  - a. Terminate the leads for TTFM power supply to their respective polarity along the +/- 24Volt Bus in any open terminal. (Verify Polarity w/Multi Meter)
    - i. Reference **Figure-3**
  - b. Terminate the Analog signal positive to the terminal labeled **Analog Input 2 TTFM FLOW METER** and the negative lead to be grounded anywhere along the **-24Volt Bus** (Verify Polarity w/Multi Meter)
    - i. Reference **Figure-3**

Once these connections are made and verified to be free from errors, power on FCGC to verify the TTFM has been properly connected. With power and communication verified on the TTFM display unit, proceed with the installation and calibration steps found in the **Appendix-II Greyline TTFM Flow Meter Installation and Operation Manual**

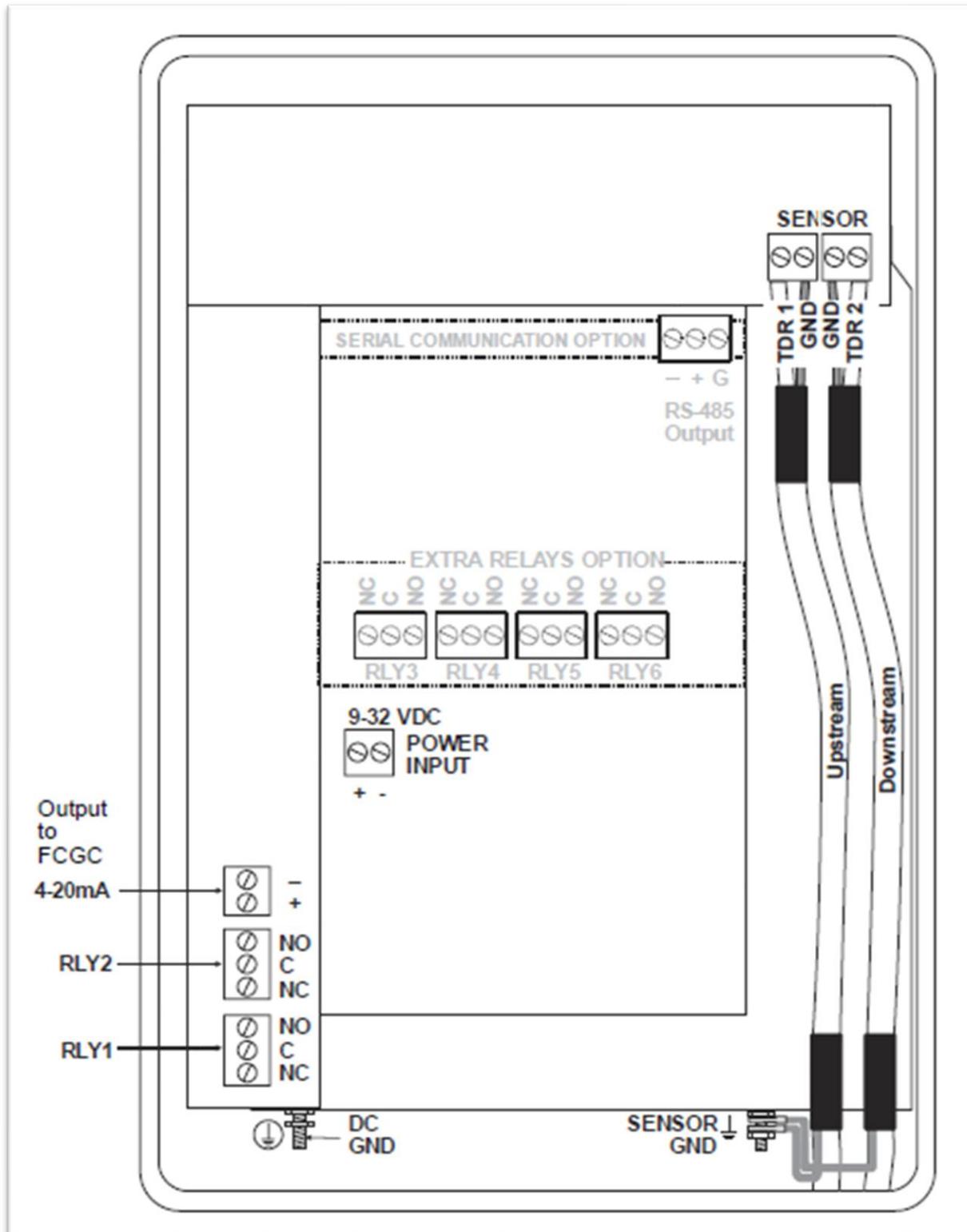


Figure 4 - Greyline Transit Time Flow Meter display unit enclosure with field terminal connections

### 5.5.6 Installation and Operation of the Flowmeter

Please reference **Appendix-II** for the complete Installation and Operations Manual of the Greyline Transit Time Flow Meter (TTFM) to be used in conjunction with the FireConnect Gateway Controller (FCGC), utilizing the +/- 24V power source contained within and the analog signal output from the TTFM wired to the analog input of the FCGC. Reference Figure-7 for optimal TTFM installation location.

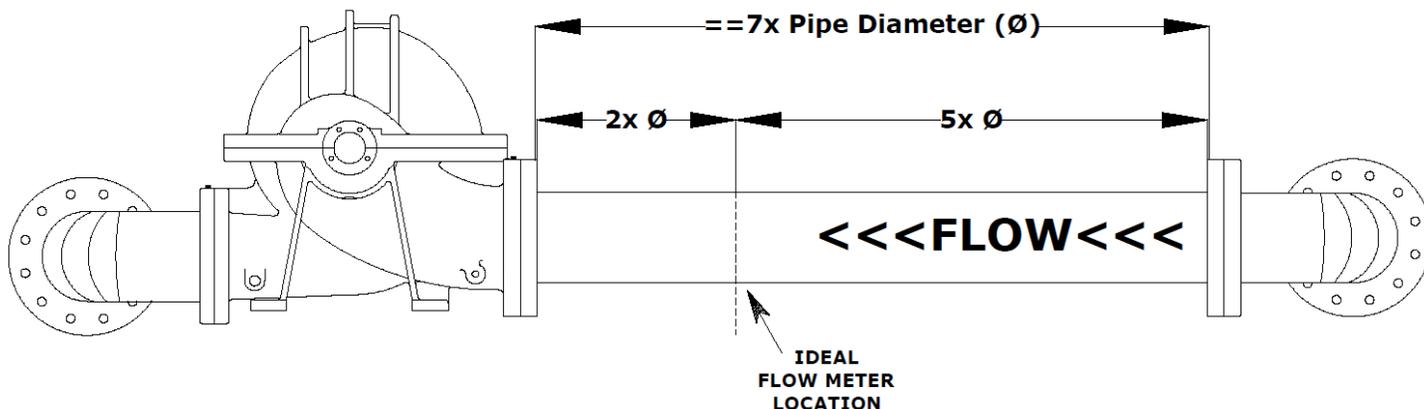


Figure 5 - Recommended location for Flow Meter installations

### 5.6 Wiring to Controller Modbus

FireConnect® requires RS-485 Modbus or TCP/IP connections with the main fire pump controller (hereafter named FPC) and with the jockey maintenance pump controller (if installed, hereafter named JPC). Depending on the brand and model of the fire pump controllers that have been installed, the contractor must supply either CAT 6 cable for TCP/IP or 18awg/2c shielded wiring from the FPC and JPC for Modbus communications between the controllers and the FCGC.

1. All connections to and from the FPC and JPC should be performed by an approved technician in accordance their respective manufacturers.
2. Once the RS485 Modbus lines have been landed inside the FCGC enclosure, connections are as follows:
  - a. The Rx- line coming from the FPC is to be connected to terminal 10, labeled -RS485 Input (Negative)
  - b. The Rx+ line coming from the FPC is to be connected to terminal 9, labeled +RS485 Input (Positive)
  - c. **Please reference Figure-3 Field Termination Diagram**

### 5.7 Speed Sensor

*(This option is currently in development)*

### 5.8 External Antenna (required)

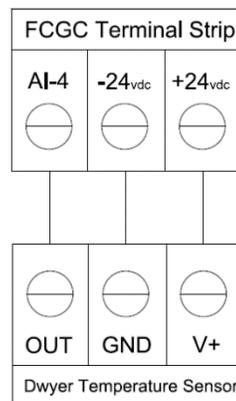
This GPS/cellular external antenna and wiring length can be specified at time of order or can be supplied at time of startup by notifying Peerless Pump prior to startup date.

### 5.9 Pump Room Temperature Sensor

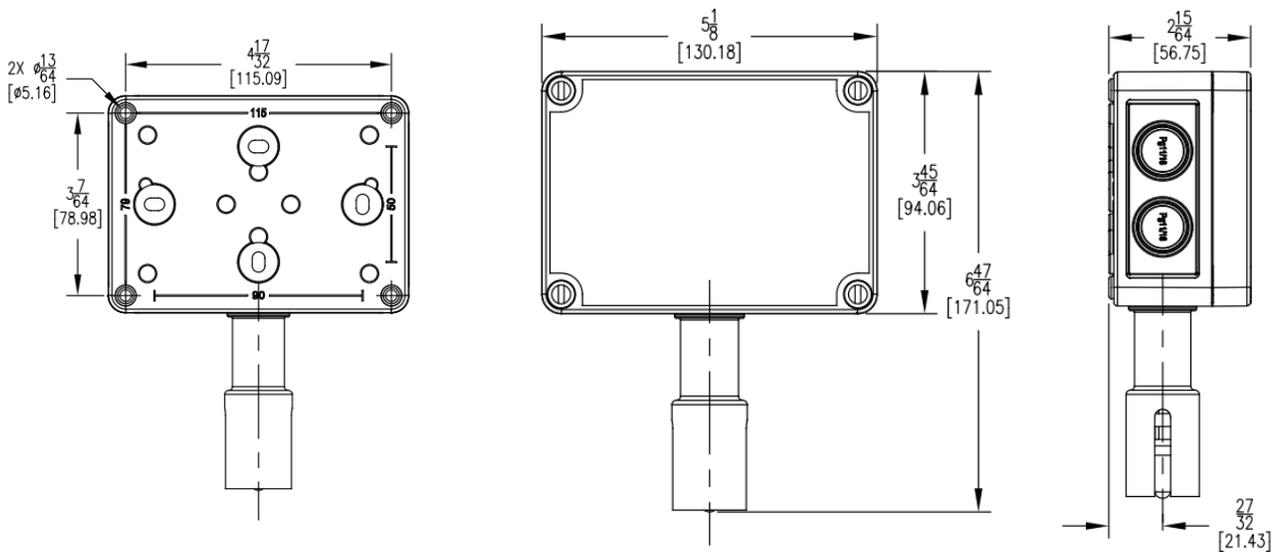
The transmitter should be mounted with the sensor pointing down to prevent water collection in the sensor cavity. The following steps outline the installation and wiring of the unit.

1. Remove the cover plugs from the face of the unit and the top cover.
2. Position the transmitter where it is to be mounted and mark the mounting holes in each corner of the housing.
3. Drill or punch out marked locations from the housing.
4. Place the transmitter box over mounting holes on wall and align. Install wall mount screws (not provided) in mounting holes.

5. Run one length of 18awg/2c shielded wire, or wire approved by the local authority, from the Dwyer temperature sensor to the FCGC from the unit housing using approved conduit connections for penetrations to the enclosure.
  - A positive(24v) connection is made to the **+24VDC supply** found inside of the FCGC terminal block.
    - Connection to the sensing unit will be terminated by connecting to the **Positive (V+)** lead of the temperature sensor.
  - The second wire is connected to **Terminal #4** found inside the FCGC terminal block.
    - Connection to the sensing unit will be terminated by connection to the **Output (OUT)** lead of the temperature sensor.
  - There is **NO** connection to the **Ground (GND)** lead of the temperature sensor.
6. Replace cover and cover plugs on the face of the unit.



**Figure 6 - Dwyer Temperature Sensor Connections**



**Figure 7 - Pump Room Temperature Sensor Dimensions**

## 5.9 Installing the Suction Pressure & Tank Level Transducer

FireConnect® requires an external pressure sensor installed in the fire system suction piping. The pressure transducer will be supplied with unit. Refer to Section 5.5.4 for the transducer wiring details.

Most Peerless Pumps will have a 1/4" NPT hole on one side of the suction flange with an existing plug, analog pressure gauge, or installed pressure transducer, which is also an acceptable place to install a new or additional pressure transducer. This will ultimately be the best location for the installation of a suction pressure transducer, but anywhere in the suction piping with a close proximity to the pump will be acceptable.

**Reference Figure-5**

### 5.9.1 Tank Level Monitoring

Tank level monitoring is provided through the FireConnect user interface via the Incident Command page. The tank level will be updated at a regular frequency while the pump is idle. During a pump run event, tank level will be updated in real time and an estimated "Time to Empty" will be displayed as well based on the calculated flow.

### 5.9.2 Dimensional Analysis (Tank Applications)

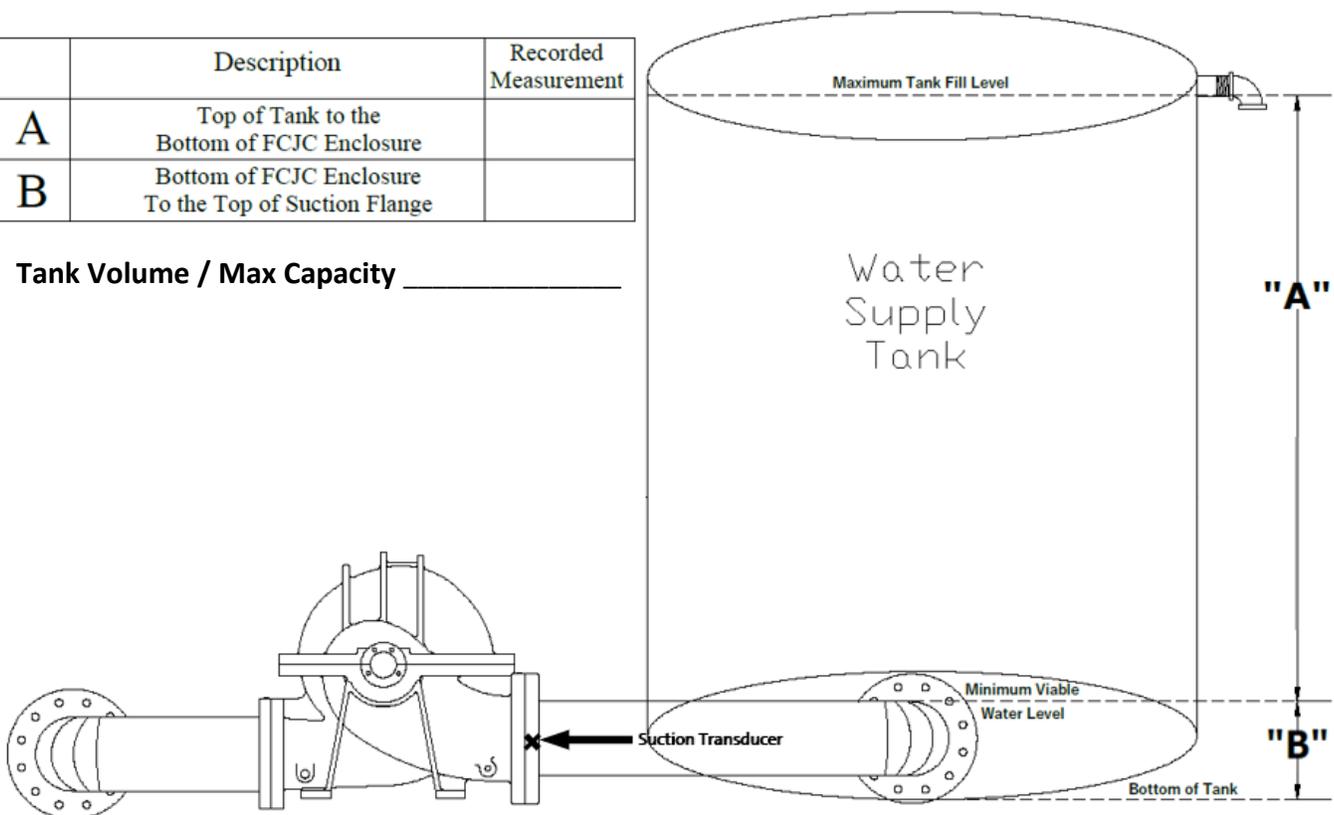
Once the FCGC suction transducer has been installed, critical dimensions will need to be recorded and sent to factory support for optimal programming and scaling. This is required for the Tank Level Remote Monitoring via the FireConnect User Interface and to be sure the level is accurately reflected therein. Please send "A" & "B" dimensions during the commissioning process, as well as the tanks **TOTAL VOLUME** and units of measurement.

**Note**

- Any inaccuracies on critical dimensions will be directly reflected on the accuracy for the Tank Level Remote Monitoring via the FireConnect User Interface.
- All measurements must be recorded as vertical distance with critical respect to earth level

	Description	Recorded Measurement
A	Top of Tank to the Bottom of FCJC Enclosure	
B	Bottom of FCJC Enclosure To the Top of Suction Flange	

Tank Volume / Max Capacity \_\_\_\_\_



## 5.10 Diesel Tank Level Monitoring & Visual Indicator



- **Warning!** If these safety instructions are not observed, personal injury may result. Read entire instruction set prior to beginning the installation process, including the standards provided within NFPA 20 with regard to the assembly and configuration requirements for fuel lines on Diesel Driven Fire Pumps.

### Caution

- If these instructions are not observed, the result could lead to malfunction, damage to the equipment, or violations to the NFPA 20 standards. All of which are to ensure safe and reliable installations for peripheral monitoring.

The Diesel Tank Level Monitoring system is designed to be an integral part of the FireConnect® Gateway Controller. The system includes a Visual Tank Level Display mounted to the FCGC enclosure which will provide visual confirmation of the current tank level. The gauge will be preconfigured at the time of order fulfillment based on the tank size and dimensions provided at the time of order placement.

The Installation of the FireConnect Diesel Fuel Tank Level Monitoring Assembly is to be performed by qualified personnel according to the following procedure and in accordance with the authority having jurisdiction. The customer assumes all responsibility for installation and plumbing connections, acknowledging that deviations from the recommended installation procedure could potentially result in violations to the NFPA 20 standard.

All responsible parties should review NFPA 20, chapter 11 to ensure complete compliance.

Provided in Figure-6 & 7 are two options for installation, both for new construction and retrofitting an existing tank. These options are designed to prevent the need for draining of an existing tank which is filled with fuel. However, if at all possible, the primary design in Figure-6 should be applied for the most accurate readings to be returned by the Diesel Tank Level Monitoring option. Should the method of installation found in Figure-8 be utilized, the “A” dimension should be reported at the time of order, or parameterization will need to be performed at the time of installation.

All sensing units supplied with the Diesel Tank Level Monitoring option are to be ATEX certified in order to ensure intrinsic isolation of the electrical components and meet the appropriate requirements for the specified application.

### 5.10.1 Installation of the FireConnect Diesel Fuel Tank Level Sensor

Prior to installation, review of NFPA 20 Chapter 11 is HIGHLY recommended.

The Peerless FireConnect Diesel Fuel Tank Level Monitoring Assembly is installed on the outlet of the tank where the fuel line connections to the engine are attached. Please note, the path of fuel from the tank to the engine must not be obstructed in any way, contain only one isolation valve, and is to always remain locked open per NFPA requirements. The sensing assembly is designed as a peripheral unit, leaving the path of fuel flow unobstructed and unaltered from the tank to the engine. Please refer to *Figure-6 & 7* for the recommended configuration diagrams.

Contained within Figure-6 is the preferred method of installation but may require the fuel to be drained from the tank if installation is to be performed on an existing system. This installation method is best suited for “New Construction” and should be performed prior to commissioning and filling the tank.

The Tee fitting, to be installed for the sensing configuration, should be of equal diameter to the outlet of the tank and be constructed of NON-galvanized steel or cast iron, along with all other required fittings. The sensing lines must all be horizontally aligned with earth level to the outlet of the tank for accurate measurement. All fittings should be installed with the appropriate PTFE thread sealant.

The orientation of the locked isolation valve can be modified to meet the needs of installation as required by the customer and conditions of the installation environment. The customer assumes all responsibility for the compliance of regulations according to NFPA standards. Reference Figures-6 & 7 for examples of these options and dimensions required.

The wiring and connections for the sensing unit:

Run one length of 18awg/2c shielded wire, or wire approved by the local authority, from the Microsensor transducer provided in the kit to the FCGC using approved conduit connections for penetrations to the enclosure.

- A positive +24v connection is made to the +24v rail found inside the FCGC and is to be connected to the sensing unit by conduit or means approved by the authority having jurisdiction.
  - Refer to device label for color code of wire
- A second wire is connected to the Analog Input #6 and runs alongside the +24v lead and is to be run to the sensing unit by conduit or means approved by the authority having jurisdiction.
  - Refer to device label for color code of wire.

### 5.10.2 Diesel Fuel Tank Level Monitoring (Dimensional Analysis)

- The optional Diesel Fuel Tank Level Monitoring Assembly must be configured in a similar manor to the Tank Level Monitoring found in section 5.7 of this Installation and Operation Manual. Configuration will be programmed prior to shipment if all dimensions are provided at the time of order placement.

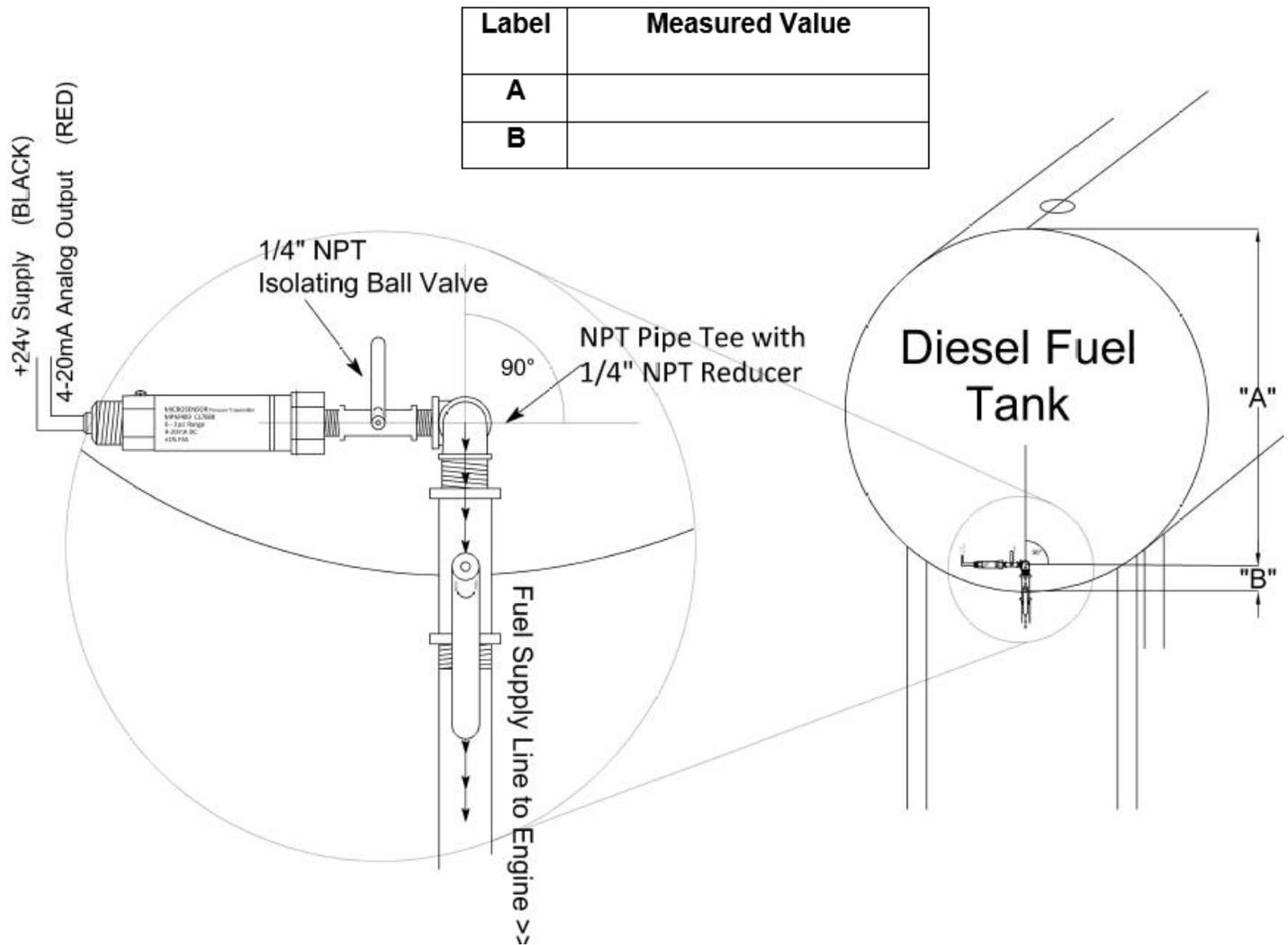


Figure 6 - Diesel Level Monitoring; Factory Preferred Installation Method

If dimensions are not provided at the time of order, field programming may be necessary and will require the dimensions to be provided as shown below in *Figure-7*

Please use the following instruction subset with illustration to determine the dimensions as described. Record all information in the table provided to be communicated with factory support and stored within the enclosure for future reference.

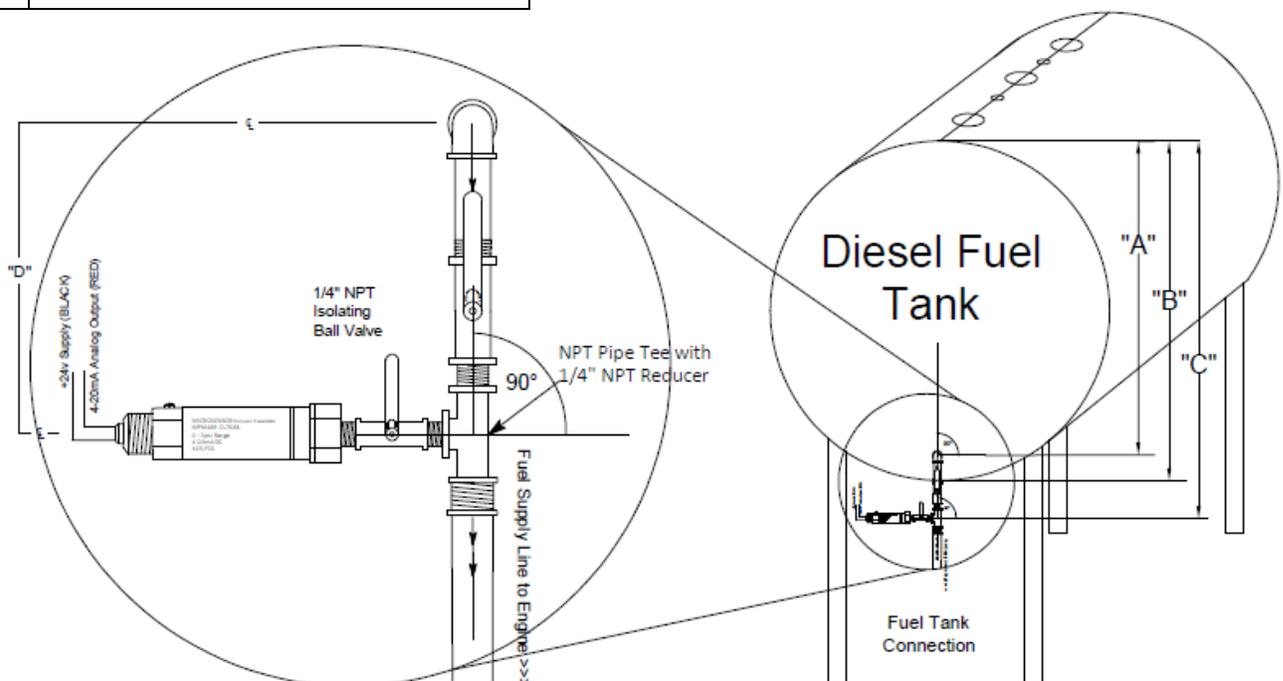
- Record the “**A**” dimension
  - This will be the vertical distance, Centerline of tank, Measuring Outlet to the Top of the Tank
- Record the “**B**” dimension
  - This will be the vertical distance, Centerline of the tank, Measuring Top of the tank to the Bottom

### 5.10.3 Diesel Fuel Tank Level Monitoring; *Alternate Installation Method*

In the event of installation on an existing tank and in order to prevent draining the tank for installation, please use the following instruction subset with illustration to determine the dimensions as described. This method allows the peripheral monitoring transducer to be installed below the isolation valve.

- Record the “**A**” dimension
  - This will be the vertical distance, Centerline of tank, Measuring Outlet to the Top of the Tank
- Record the “**B**” dimension
  - This will be the vertical distance, Centerline of the tank, Measuring Top of the tank to the Bottom
- Record the “**C**” dimension
  - This will be the vertical distance, Centerline of the tank, Measuring Top of the tank to Centerline of the Transducer

Label	Measured Value
<b>A</b>	
<b>B</b>	
<b>C</b>	



**Figure 7 - Diesel Level Monitoring; Alternate Installation Method for Existing Fire Systems (Allows Installation Without Draining Tank)**

## 5.12 Closed Cooling Loop; Tank Return Monitoring

The closed cooling loop with tank return monitoring is an option available for the FireConnect Gateway Controller and allows the FireConnect Gateway User Interface to monitor and capture the amount of water conserved and track the annual savings for positive representation of the environmental impact.



### Caution

- This option is available for installations with a FireConnect Gateway Controller, but it is the customer's responsibility to ensure compatibility with their system's diesel engine manufacturer's specification for minimum required flow through the heat exchanger for proper functionality and required thermal transfer of engine coolant.
- Each installation and purchase of this remote monitoring package will require the customer to consult their respective engine manufacturer for approval of the installation.
  - This is required due to the positive head pressure created by gravity when returning the cooling water to the reservoir.

The customer assumes all liability and risk ensued by the installation of this modification and is responsible for ensuring the engine manufacturer specifications are compliant.

The customer assumes all responsibility for NFPA compliance, or compliance with authority having jurisdiction.

### 5.12.1 Closed Cooling Loop; Tank Return Monitoring Installation

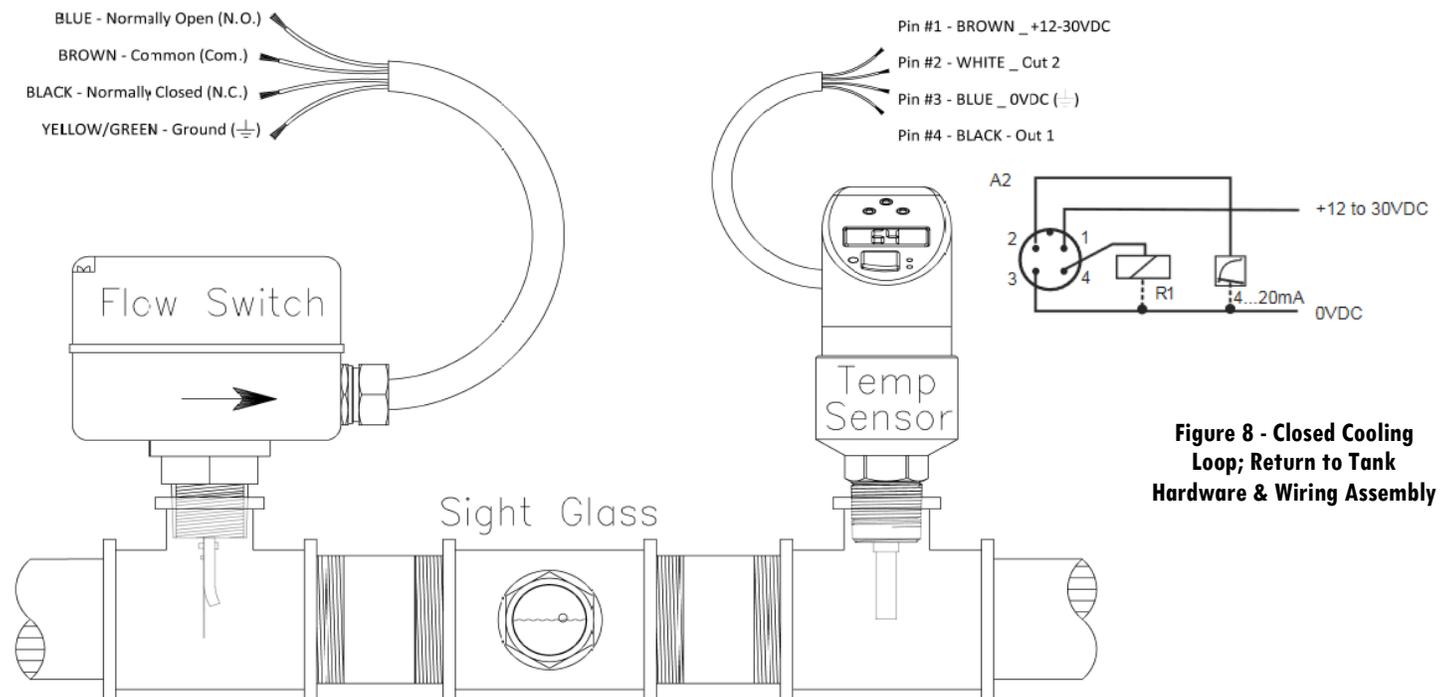
The closed cooling loop return is to be connected to the discharge from the heat exchanger of the diesel engine. The piping must be increased by at least two nominal pipe sizes and will be connected to the assembly provided as part of the monitoring kit. The nominal sizes for components provided will be 2.0" NPT pipe threads and connected as shown in *Figure – 8*.

The Kit assembly will include the following:

- 2x Digital Temperature Sensor
- Discrete Flow Switch
- Sight Glass Indicator

When installing the kit assembly, orientation must be observed with respect to the direction of flow indicated by the markings on the flow switch.

The return line should be routed to the top of tank for factory approved installation, or by best means as deemed necessary and approved by the authority having jurisdiction.



**Figure 8 - Closed Cooling Loop; Return to Tank Hardware & Wiring Assembly**

### 5.12.1.1 Closed Cooling Loop; Tank Return Monitoring Installation (Wiring)

The closed cooling loop return will require termination of the Flow Switch and Temperature Sensor inside the FireConnect Gateway Controller.

The wiring and connections for the Flow Switch unit:

- Run one length of 18awg/2c shielded wire, or wire approved by the local authority, from the discrete Flow Switch transducer provided in the kit to the FCGC using approved conduit connections for penetrations to the enclosure.
- A negative (0v) connection is made to the **GROUND** rail found inside the FCGC
  - Connection to the sensing unit will be terminated by connection to the **Brown – Common (Com)** lead of the flow switch
- The second wire is connected to the **Digital Input #1** Found inside the FCGC
  - Connection to the sensing unit will be terminated by connection to the **BLUE – Normally Open (NO)** lead of the switch now configured as a Normally Open switch.

The wiring and connections for the Temperature Sensing unit:

- Run one length of 18awg/4c shielded wire, or wire approved by the local authority, from the Digital Temperature Sensor M12 connection lead provided in the kit to the FCGC using approved conduit connection & penetration to the enclosure.
- A negative (0v) connection is made to the **GROUND** rail found inside the FCGC
  - Connection to the temperature sensing unit will be terminated by connection to
    - **Pin #3 – Blue Lead**
- A positive (+24v) connection is made to **Pin #9 or #10** for the +24v DC supply found inside the FCGC
  - Connection to the temperature sensing unit will be terminated by connection to
    - **Pin #1 – Brown Lead**
- The third wire is connected to the **Analog Input #7** found inside the FCGC
  - Connection to the sensing unit will be terminated by connection to
    - **Pin #2 – White Lead**

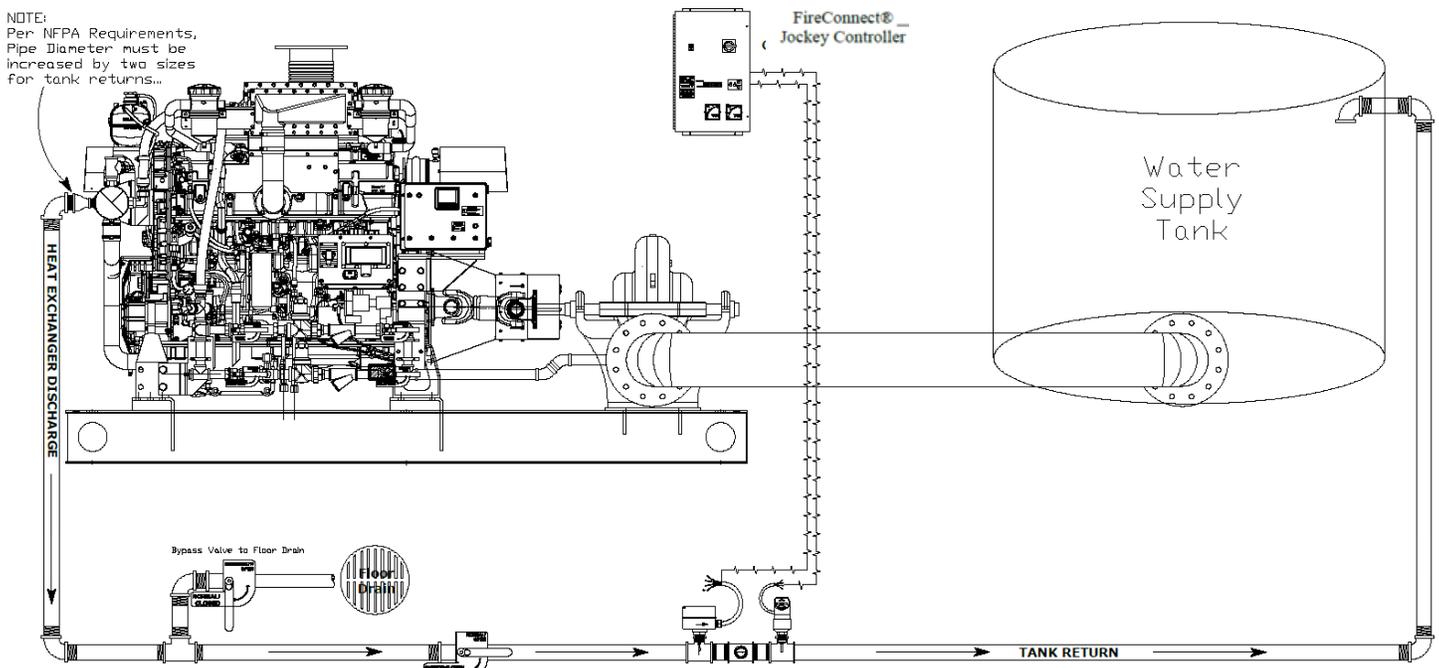


Figure 9 - Closed Cooling Loop; Tank Return Monitoring Hardware Assembly and Overview

## 5.13 Digital Temperature Sensor Programming

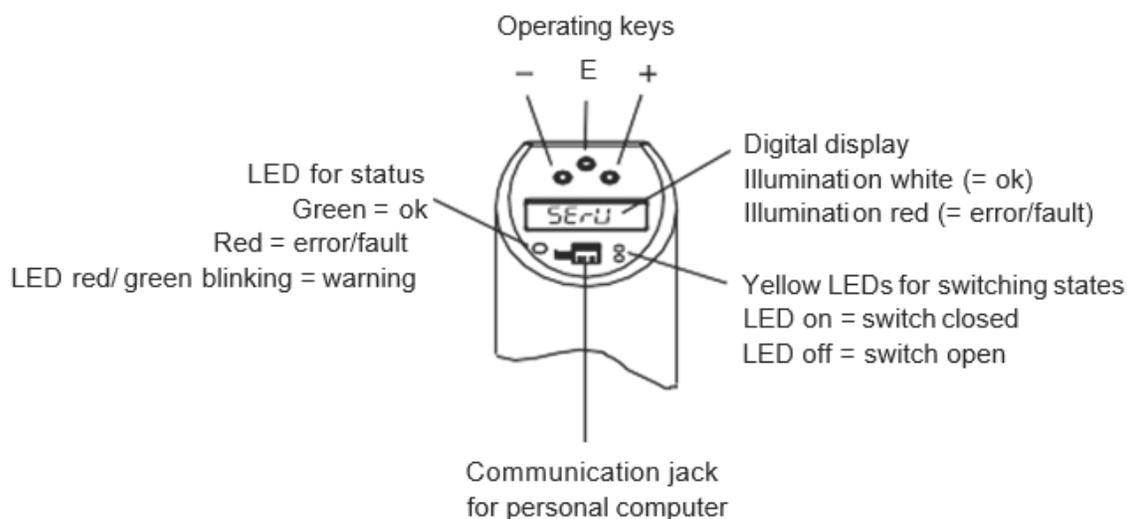
The ProSense ETS Series digital temperature sensor is available as an integral part of the closed cooling loop return monitoring feature and is also available as a standalone instrument for measuring the temperature of liquid being pumped. This device has the ability to be custom programmed for various settings and applications, although the unit should arrive preconfigured for the specific application.

In the event of your preconfigured devices memory becoming compromised during transit or from prolonged periods of storage prior to commissioning, the unit will require configuration.

The wiring diagrams and instructions will utilize **Output-#2** for both the closed cooling return monitoring and the pumped liquid temperature applications. This output will need to be configured as a 4-20mA analog output and a quick start set of instructions are as follows for the basic elements. This basic setup procedure is required for commissioning and compatibility with the FireConnect Gateway Controller and Remote Monitoring user interface. A complete set of the programming instructions are included in the **Appendix-III**

### 5.13.1 Digital Temperature Sensor Display & Menu Navigation

The ProSense ETS Series is programmed and operated by means of three keys (**+**, **-**, **E**) or by using XT-SOFT programming software (see the Programming with XT-SOFT Software section in **Appendix-III**). The digital display and the light emitting diodes (LEDs) support navigation in the operating menu.



The ProSense ETS Series is programmed and operated by means of three keys (**+**, **-**, **E**) and is the most suitable option for field programming and configuration. The following steps outline the

1. Enter the operating menu.
  - Press the **E** key for longer than 3 seconds.
2. Select the "Function group" with the **+** or **-** key.
3. Select the "Function" with the **E** key.
4. Enter or change parameters with the **+** or **-** key. Then return to "Function" with the **E** key.
  - Note: If software locking is enabled, it must be disabled before making entries or changes.
5. Press the **E** key several times to return to the "Function group" - until the appropriate function group is reached again.
6. To exit, press the **E** key for longer **than 3** seconds. If changes were made, see step 7.
7. Query to save data (select "**YES**" or "**NO**" with the **+** or **-** key) - confirm with the **E** key.
  - Changes to the parameter settings only become effective if you choose '**YES**' when asked to save data.

### 5.11.2 Digital Temperature Sensor Menu Structure

The following outline is specific to the FireConnect Gateway Controller in regard to the desired output configuration. Further information is available in Appendix-III for the full functionality.

In *Figure-11* we can see the menu structure and the breakout for selections. All values are acceptable for use as configured by default with exception to **Output-#2** which will need to be configured for a 4-20mA analog signal.

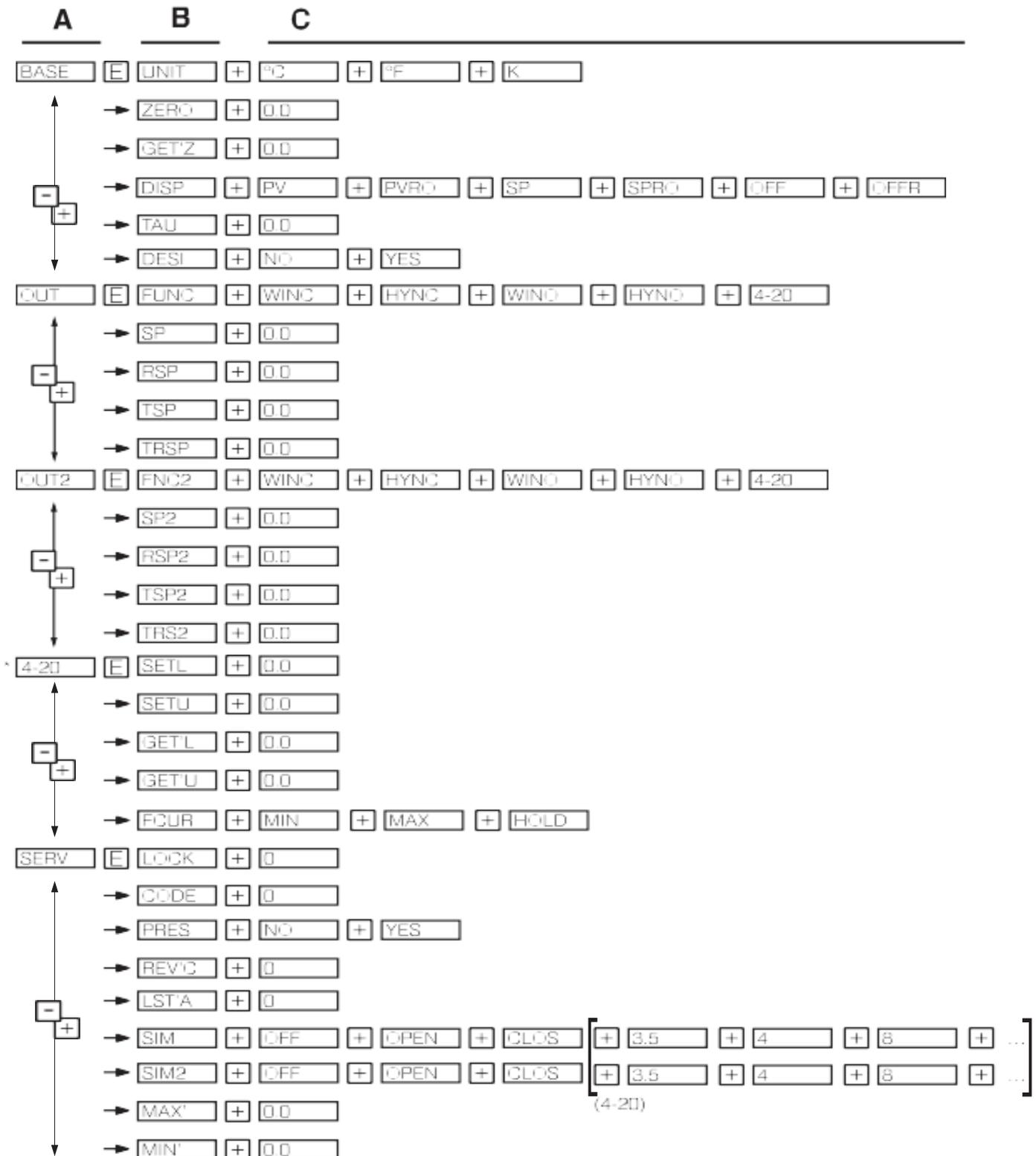


Figure 11 - ProSense Digital Temperature Sensor; Menu Function Tree  
Operating menu: A=function groups, B=functions, C=settings

### 5.11.2 Digital Temperature Sensor Menu Setting

The **Output-#2** will need to be configured as an analog output with a 4-20mA span. Follow the menu structure tree found in *Figure-11* to establish this selection and be sure to commit the changes by selecting the “YES” query.

All other settings do not need to be changed from the default values unless desired by the user. Some of the available options desired by the user may be units of measure for the temperature value (F, C, K) or various display options.

#### Note

- If any other settings or values are changed on the Temperature Sensor, this information will need to be communicated with the FireConnect Support Team in order to properly configure the remote monitoring system and user interface.

Function Group	Function		Settings	Description
BASE	UNIT	Technical unit	°C °F K	Select technical unit: °C, °F, K Factory setting: °F
	ZERO	Configure zero point	0 . 0	Position adjustment: within ±18°F/K (±10°C) of the upper range limit
	GETZ	Accept zero point	0 . 0	No settings possible (not available in XT-SOFT)
	DISP	Display	PV PVRO SP SPRO OFF OFFR	PV: measured value display PVRO: measured value display rotated 180° SP: set switch point display SPRO: set switch point display rotated 180° OFF: display off OFFR: display off rotated 180° Factory setting: measured value PV
	TRU	Damping: display value, output signal	0 . 0	Measured value damping with regard to display value and output: 0 (no damping) or 9 to 40s (in increments of 1 second) Factory setting: 0s
BASE	DES	DESINA	NO YES	PIN assignment of the M12 connector is in accordance with the guidelines of DESINA Factory setting: No
OUT 2 Output 2	FUNC FUNC2	Switching characteristic	WINC HYNC WINO HYNO 4-20	WINC: window/NC contact HYNC: hysteresis/NC contact WINO: window/NO contact HYNO: hysteresis/NO contact 4-20: analog output Factory setting: HYNO

Figure 12 - Digital Temperature Sensor; Menu Functions Specific to the FireConnect System Integration

## 5.12 Battery Backup

Each FireConnect Gateway Controller comes equipped with an internal battery charger for the intended application of a battery backup to the remote monitoring portion of the system. This is intended to prevent a loss of monitoring services in the event of a power failure to the installed site. The system does NOT include batteries, these will need to be furnished by the customer. Reference section 5.12.1 for the types of batteries recommended by the manufacturer.

### 5.12.1 Battery Recommendations

The factory recommended equipment is a sealed lead acid battery designed for backup power supply, preferably with an F1 terminal type for ease of installation. The battery should be approximately 3-5 Amp hours in capacity for extended duration of the remote monitoring in the event of a power failure.

Recommended products:

- SLA12-5F Duracell Ultra 12V 5AH AGM SLA Battery with F1 Terminals
- Interstate Batteries FAS1055 12V 5AH SLA .187 FASTON

### 5.12.2 Battery Location

It is recommended that the batteries be placed in an external enclosure, separate from the internal control components, but in close proximity to the controller.

This is recommended due to inherent risk created by the combination from the arc flash created by the motor contactor and poorly maintained batteries having the potential to excrete volatile gasses.

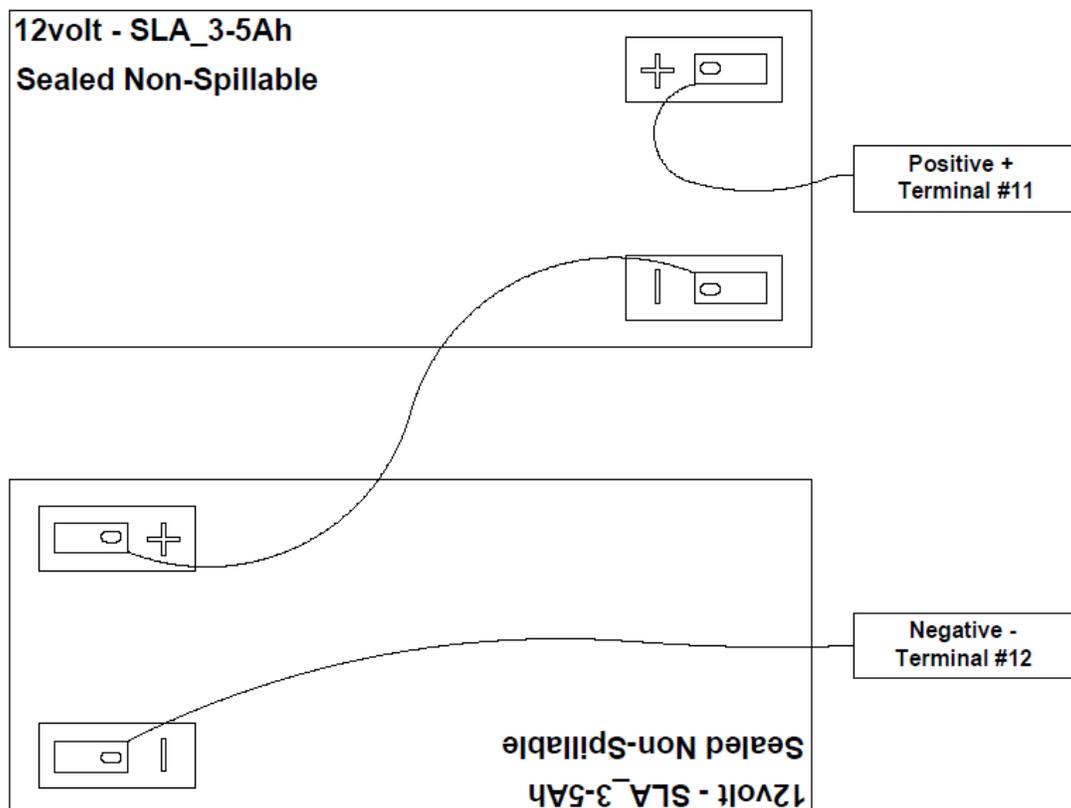


Figure 13 - Remote Monitoring Battery Backup.  
Series Wiring Configuration

### 5.12.3 Battery Wiring

The recommended batteries are a 12v design in nature, therefore two batteries will need to be connected in series for a 24v configuration. Reference *Figure-13* for an illustration of a series connection.

- Run two lengths of 18awg insulated wire, or wire approved by the local authority, from the batteries configured in series to the FCGC using approved conduit connection & penetration to the enclosure.
  - The **Positive +** lead will be connected to **Terminal #11**
  - The **Negative –** lead will be connected to **Terminal #12**

Reference the wiring diagram found in *Appendix-I* for further illustration on the battery backup feature.

### 5.12.4 Battery Maintenance

All battery backup systems require regular maintenance. An annual inspection of the system is recommended, and batteries must be replaced on, or before their expiration date.

## 6.0 Setup, Operation, and Shutdown

### 6.1 Setup

The FireConnect® system startup and commissioning requires interaction between the Peerless Pump sales representative and the FireConnect® startup technician.

The startup technician may visit the installation prior to the formal fire pump startup to ensure FireConnect® components have been installed properly. At this time, powering on of the FireConnect® system may be performed. If a pre-startup visit is not performed, then FireConnect® commissioning will be performed in conjunction with the formal fire pump startup.

#### 6.1.1 Powering On

After equipment installation has successfully been completed per Section 5 instructions, the FireConnect® system is now ready for powering on.



- **Warning**

Before proceeding, check to ensure all electrical connections are properly terminated and secured. Electrical shock, or damage to the components may occur. Always follow lockout tagout procedures whenever possible.

At this point, activate the main power feed. This may be a circuit breaker within the pump room or a main breaker panel. As, there is no manual ON/OFF switch on the FCGC, the system is live as soon as power from the main feed is active. Power ON LED will be lit on the front of the FCGC.

At the point power has been applied, the FCGC will start communicating with the fire pump and jockey controllers (if they have been powered ON), sensors and the cloud network.

The Peerless Pump sales representative or startup technician will then be required to activate the equipment

#### 6.1.2 Configuring the Flowmeter

Please reference **Appendix-II** for the complete Installation and Operations Manual of the Greyline Transit Time Flow Meter (TTFM)

#### 6.1.3 Configuring the Tank Level Display

When this option is selected at the time of order placement, the display will come preconfigured to the unit of volume specified (Gallons or Liters) and incorporated as an integral part of the FireConnect Gateway Controller. The scaling of the display will also be preconfigured at the time of order and will be based on specific dimensions provided at that time, or will have a basic display output with units of pressure if no dimensions were provided.

These dimensions are critical for the proportional scaling to function correctly and will be based on the storage tank dimensions, volumetric capacity, and pressure transducer height. Scaling will be linear, using the force of gravity to calculate the height of the water level above the transducer.

#### 6.1.4 Connecting to the Cloud

FireConnect® begins transmitting to the cloud as soon as it has a live power feed. However, the Peerless Pump sales representative or the start-up technician will be responsible for activating the user's account with the Peerless Pump FireConnect® online application, where the real-time fire pump system data is viewed.

Once the account is activated the principal user(s) will be given login information for the online application.

### 6.2 Operation

Once the Peerless Pump FireConnect® account has been activated, the system is now ready to use. Refer to the online application's manual for FireConnect® operation.

## 6.3 Shutdown

The FireConnect® system does not have a manual on/off switch, so in order to shut it down, the main power feed as described above is disconnected. In the event of a power failure, the FireConnect® system reinitializes itself as soon as power is restored.

## 7.0 Fire & Jockey Pump Controller Compatibility

The FireConnect® system is compatible with a number of Fire Pump Controllers (FPC) and Jockey Pump Controllers (JPC). The built in functionality of the FireConnect® system utilizes the accessible information from these panels in such a way, as to provide Smart Pump Technology with real time monitoring and analytics for existing systems and new installations alike.

Prior to purchasing the FireConnect® system for retrofit applications, contact with our sales team is required determine compatibility with existing systems and retrofitting requirements. Prior to purchase, the customer is required to complete the RFQ Peerless FireConnect® retrofit forms to complete the quote and determine (if any) retrofitting requirements.

### 7.1 Firetrol

The FireConnect® system is currently compatible on some Firetrol legacy controllers with minor retrofitting, as well as current designs of both Fire Pump & Jockey Pump Controllers

#### 7.1.1 Fire Pump Controller (Firetrol)

The FireConnect® system is currently compatible with Firetrol Legacy FPC's known as the Mark II and the Mark IIxg, as well as their latest design, the Mark III.

These legacy controllers, the Mark II and Mark IIxg, may require some retrofitting for compatibility with the Modbus RTU RS485 communication protocol in order to communicate with the FCGC. This retrofitting may involve replacement of the microcontroller, and an update to the operating system firmware. The controller will also require the ZPM option for Modbus RTU.

The latest design FPC's are called the Mark III and utilizes the TCP/IP Modbus communication protocol.

Therefore, legacy controllers Mark II and Mark IIxg will utilize Modbus RS485, and the Mark III will utilize Modbus TCP/IP.

#### 7.1.2 Jockey Pump Controller (Firetrol)

The Firetrol JPC currently in use is considered a legacy unit and utilizes the Modbus RS485 communication protocol and requires option ZPJ for compatibility.

Therefore, legacy controllers will utilize Modbus RS485 for both the main FPC and JPC. As for the Mark III units, the system will utilize TCP/IP for the FPC and RS485 for the JPC.

### 7.2 Tornatech

The FireConnect® system is currently compatible with only the Tornatech Vizeitouch V2 platform. Legacy units known as the Vizeitouch V1 are not compatible.

#### 7.2.1 Fire Pump Controller (Tornatech)

Current design of the main FPC is called the Tornatech Vizeitouch V2 and utilizes the TCP/IP Modbus communication protocol.

## 7.2.2 Jockey Pump Controller (Tornatech)

Current design for the JPC also uses the Vizitouch V2 platform as long as the special FireConnect® option is added and also incorporates a network switch in the JPC. Therefore, Tornatech V2 Modbus is TCP/IP for both the FPC and JPC using the network switch to connect to our FCGC. (**Reference section 7.5 for Modbus Option Codes**)

## 7.3 Eaton

The FireConnect® system is currently compatible with Eaton FPC's and JPC's across the board with no change in their platform to require discretion for cross model compatibility.

### 7.3.1 Fire Pump Controller (Eaton)

The FireConnect® system utilizes Modbus RTU RS485 communication protocols on all Eaton FPC's with the appropriate Modbus options (**Reference section 7.5 for Modbus Option Codes**)

### 7.3.2 Jockey Pump Controller (Eaton)

The FireConnect® system utilizes Modbus RTU RS485 communication protocols on all Eaton JPC's with the appropriate Modbus options (**Reference section 7.5 for Modbus Option Codes**)

## 7.4 Master Control Systems

The Master line of FPC's and JPC's may already be manufactured with the Modbus capability included, or can be retrofitted for compatibility. All potential FireConnect® system retrofit applications and installations should be discussed with a Peerless Pump Sales Manager to verify compatibility.

The subsections listed below and their contents apply only to a majority, each system should be evaluated and confirmed on a case-by-case basis.

### 7.4.1 Fire Pump Controller (Master)

The Master line of FPC's utilize a design with the FPC and JPC already compatible for Modbus communication to one another. Therefore the communication to the FCGC will only require a Modbus TCP/IP communication protocol from the FPC to the FCGC.

### 7.4.2 Jockey Pump Controller (Master)

The Master line of JPC's encountered in the field will typically be prewired for communication to the FPC and should require no additional connections for communication with the FCGC when configured correctly.

This configuration would have been specified at the time of order by the Sales Representative upon submittal of the "RFQ Peerless FireConnect® Retrofit" form used to specify controller options required for communication to the FCGC.

## 7.5 FPC & JPC Modbus Option Codes

The below is list of option codes for FPC's and JPC's

Required FCGC Modbus Option Adder by Brand:	Firetrol	Tornatech	Eaton	Master
Electric Controller FC Option Code	Y99	ELE-OPTD26H	COM	82H
Diesel Controller FC Option Code	Y99	DIE-OPTD32H	COM	82H
Jockey Controller FC Option Code	ZPJ	JOC-OPTV514A	COM	None Req'd

### 7.5.1 Typical Parts List

The step-by-step instructions for integrating the FCGC with the most common controller configurations, based on both manufacturer and model design can be found in **Appendix-V**.

For controllers models and manufacturers not listed, please contact [FCSupport@peerlesspump.com](mailto:FCSupport@peerlesspump.com)

## 8.0 Typical Parts List

*(This feature is currently in development)*

*(Please refer to the factory for replacement components)*

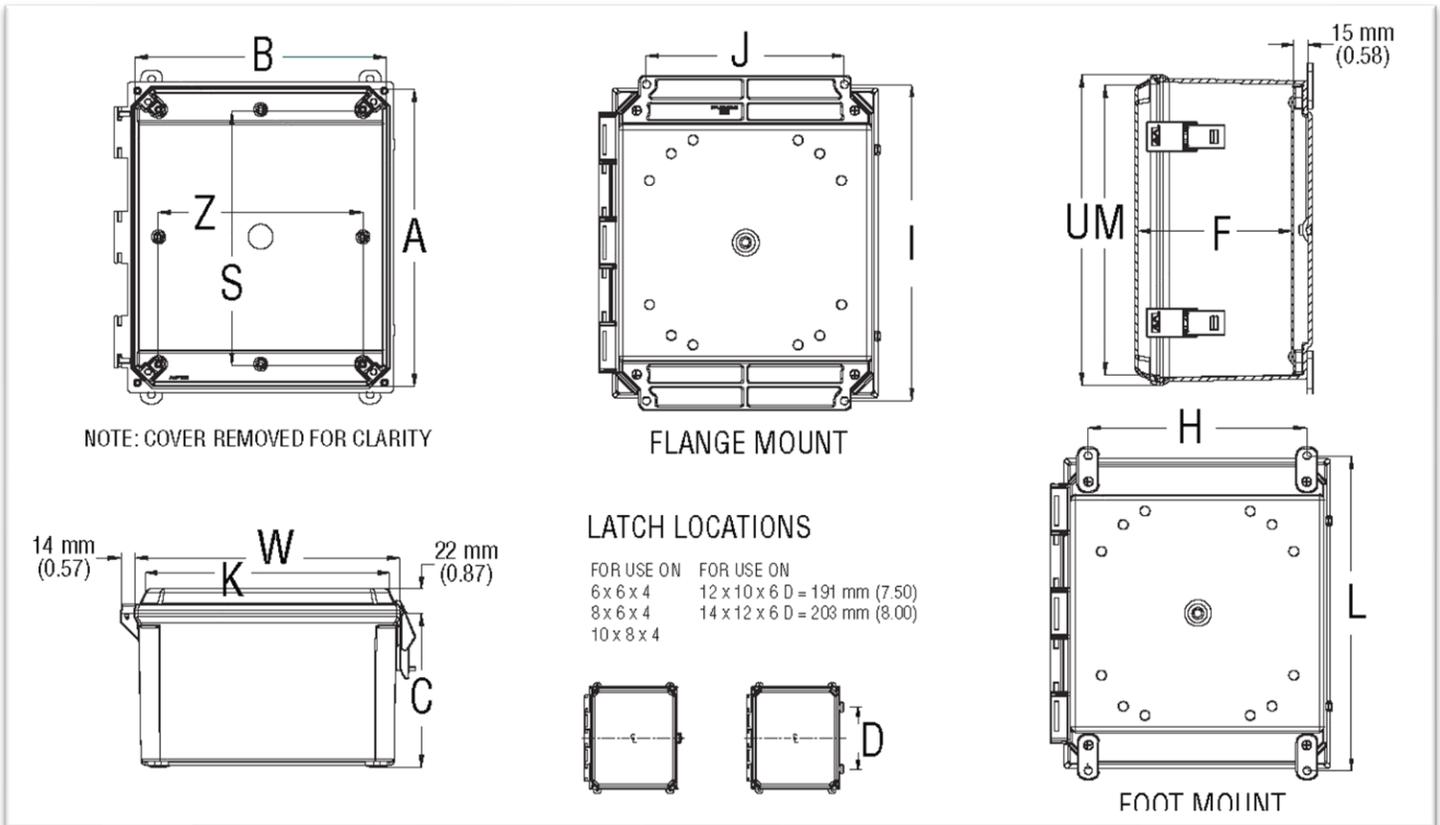
## 9.0 Disposal

This product or parts of it must be disposed of in an environmentally sound way. For assistance, please contact Peerless Pump when disposing of packaging materials or FireConnect® components.

## 10.0 Troubleshooting

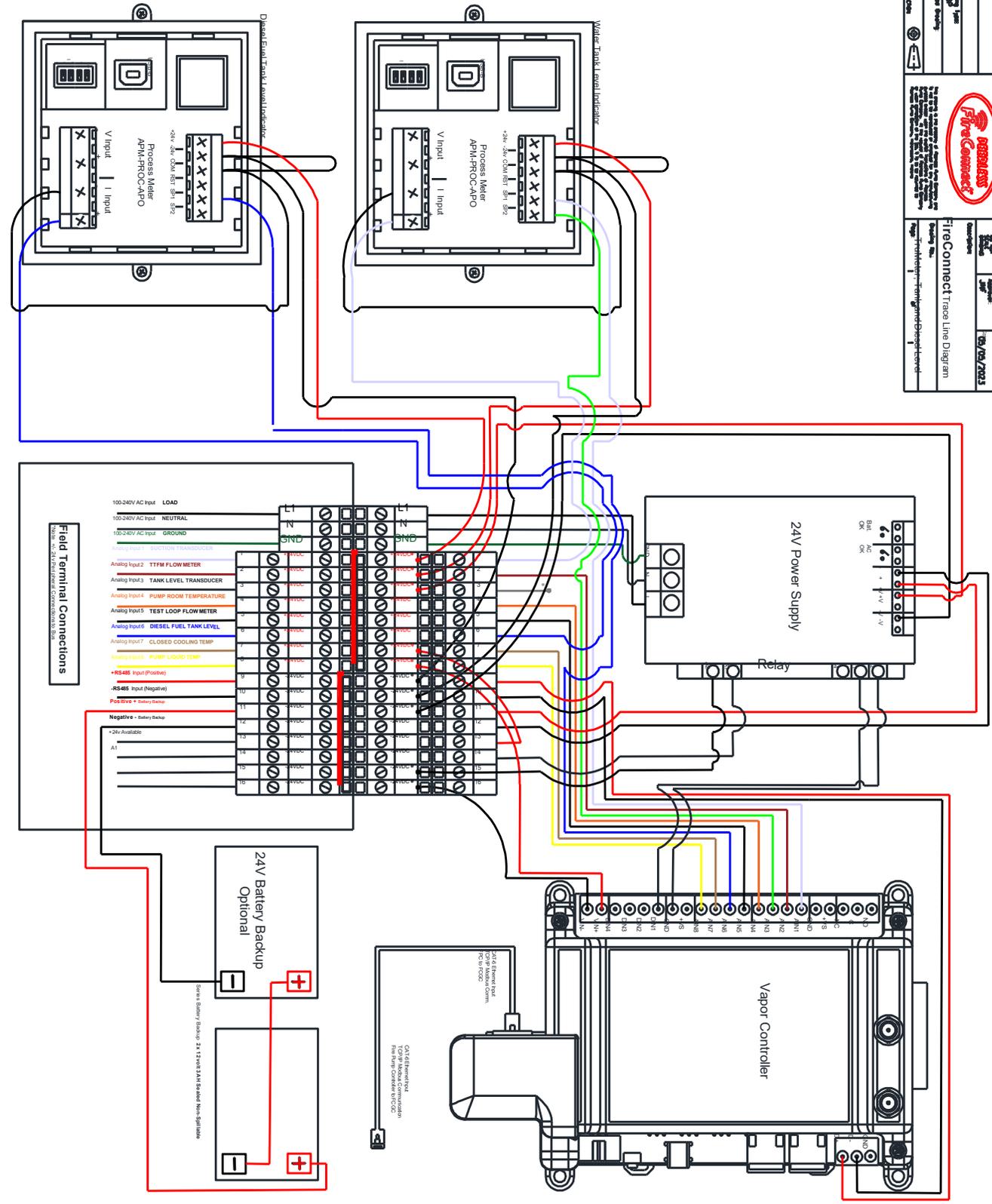
<b>Fault</b>	<b>Cause</b>	<b>Remedy</b>
1. No power to FireConnect® Gateway Controller	a) Power feed to main breaker disconnected b) Power feed to FCGC disconnected	<ul style="list-style-type: none"> <li>• Check main breaker status</li> <li>• Check all wiring terminals and terminal blocks, ensuring they are secure</li> </ul>
2. No connectivity to Peerless Pump FireConnect® app	a) Poor cellular connection b) Antenna is disconnected or poorly connected c) Incorrect wiring connections or settings between FPC, JPC, & FCGC d) The Peerless Pump FireConnect® app is down for maintenance	<ul style="list-style-type: none"> <li>• If connection is consistently poor, upgrading to the external antenna is required</li> <li>• Check internal antenna connection in FireConnect® to ensure it is secure</li> <li>• Check all connections and settings as noted in these instructions or contact a Peerless Pump sales representative, or installing technician for assistance</li> <li>• Contact a Peerless Pump sales representative or the installing technician for assistance</li> </ul>
4. Flowmeter 0% Signal Strength	a) The placement of the ultrasonic sensors is not correct or the setting for pipe type is not correct	<ul style="list-style-type: none"> <li>• Check the spacing of the sensors and the pipe material settings, including thickness and all other applicable variables</li> </ul>
<b><i>Additional content is in development</i></b>		

Appendix-I (Drawings)



DIMENSIONS: mm (in)														
BOX SIZE INSIDE DIMENSIONS			USABLE DEPTH	PANEL BOSS CENTERS			FLANGE MOUNT CENTERS		FOOT MOUNT CENTERS		COVER SIZE			
A	B	C	F	S	Z	J	I	H	L	K	M	W	U	
317.5 (12.50")	272.3 (10.72")	150.8 (5.94")	153.8 (6.06")	260.4 (10.25")	N/A	224.0 (8.82")	332.6 (12.70")	224.0 (8.82")	332.6 (12.70")	N/A	N/A	272.3 (10.72")	317.5 (12.50")	

Printed Name:	Revision:	Date:
Drawn by:	Checked by:	03/04/2013
Approved by:	03/05/2013	
		
<b>FireConnect Trace Line Diagram</b>		
The information on this diagram is for reference only. It is not intended to be used as a substitute for the actual equipment or the manufacturer's instructions.		



**Field Terminal Connections**

100-240V AC Input LOAD

100-240V AC Input NEUTRAL

100-240V AC Input GROUND

Analog Input 1 SUCTION TRANSDUCER

Analog Input 2 TTFM FLOW METER

Analog Input 3 TANK LEVEL TRANSDUCER

Analog Input 4 PUMP ROOM TEMPERATURE

Analog Input 5 TEST LOOP FLOW METER

Analog Input 6 DESEL FUEL TANK LEVEL

Analog Input 7 CLOSED COOLING TEMP

Analog Input 8 PUMP LIQUID TEMP

+RS-485 Input (Positive)

-RS-485 Input (Negative)

Pos + Battery Backup

Negative - Battery Backup

+24V Available

A1

24V Battery Backup  
Optional

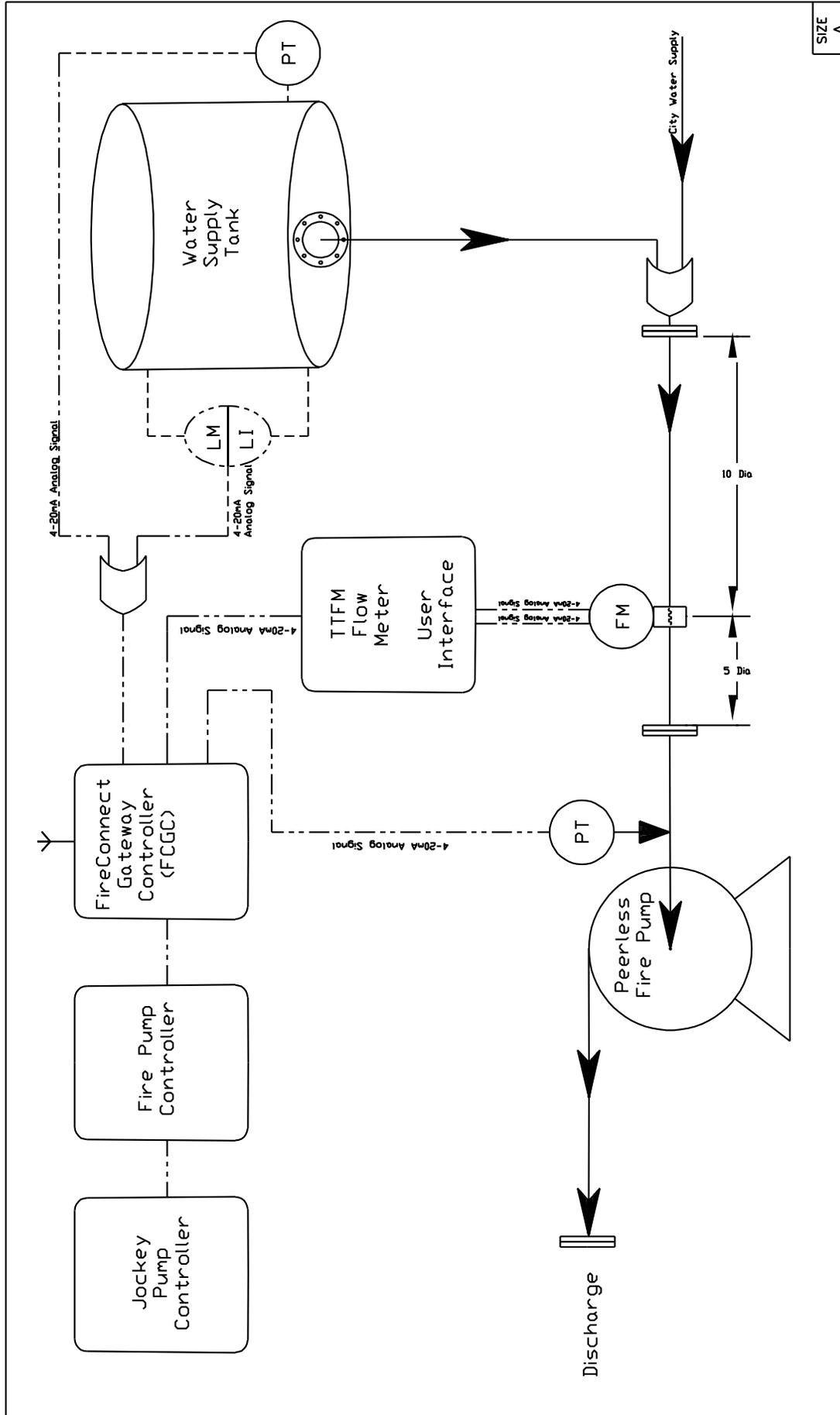
Series Battery Backup 24V 12Vx8 3.2Ah Non-Spillable

24V AC Input  
24V Input  
0V Input

24V AC Input  
24V Input  
0V Input

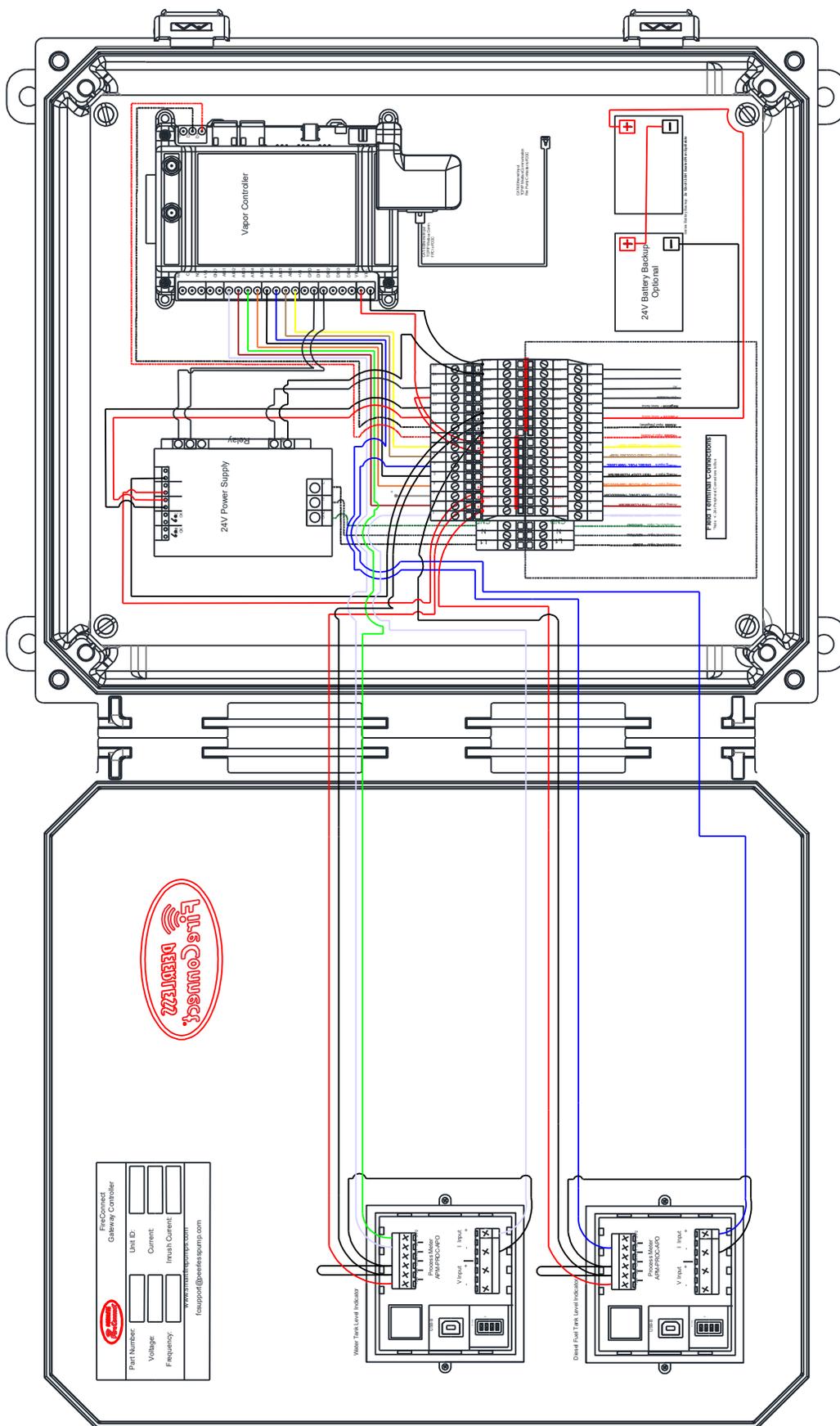
24V AC  
24V  
0V

24V AC  
24V  
0V



Scale: None		Drawer: JNF	Date: 05/16/2021
DO NOT SCALE DRAWING		Approver: JNF	Date: 05/16/2021
Description: P&ID FireConnect Peerless Pump Company			
Drawing No.: _____			
Page: 1 of 1			
<p>This drawing is the property of Peerless Pump Company and shall be returned to Peerless Pump Company upon completion of the job. It is to be returned to Peerless Pump Company, Indianapolis, Indiana.</p>			
Basic Material No.:			
Dimension of basic material:			
Type of basic material:			
XXXXX	XXXX-XX-XX	Drawing Type: P&ID	
Chg Number	Date Int.	Related Drawings:	
		THIRD ANGLE PROJECTION	

UNLESS OTHERWISE SPECIFIED,  
 ALL BOLT HOLES  $\varnothing$  .030 A/B  
 WELDS TO BE WATERTIGHT REMOVE SHARP EDGES  
 ALL DIMENSIONS ARE IN INCHES.  
 DECIMALS : ANGLES : FINISH :  
 X.X ± 0.1 X.XX ± 0.03 X.XXX ± 0.005  
 X.XX ± 0.03 125/ Ra



<b>FireConnect</b>	
Gateway Controller	
Part Number:	Unit ID:
Voltage:	Current:
Frequency:	Inrush Current:
www.fireconnect.com fcsupport@fireconnect.com	

Blank Material No.:	Blank Material No.:	Blank Material No.:	Blank Material No.:
Dimension of basic material:			
Type of basic material:			
Qty note	Date Int.	Design Type	Revised Drawing
		APPD	PRODUCTION



**FireConnect Trace Line Diagram**

Application: Tank and Diesel Level

Page: 1 of 1

Drawn: JNF  
Date: 05/05/2023

Checked: JNF  
Date: 05/05/2023

Approved: JNF

Project: Tank and Diesel Level

FireConnect

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**Customer assumes responsibility for assembly and maintaining NFPA compliance**

**11.4.4.2**

"Fuel piping shall not be galvanized steel or copper"

**11.4.4.2.1**

"Where black steel pipe is used for fuel piping, the fittings shall be steel or malleable iron fittings"

**11.4.4.5.2**

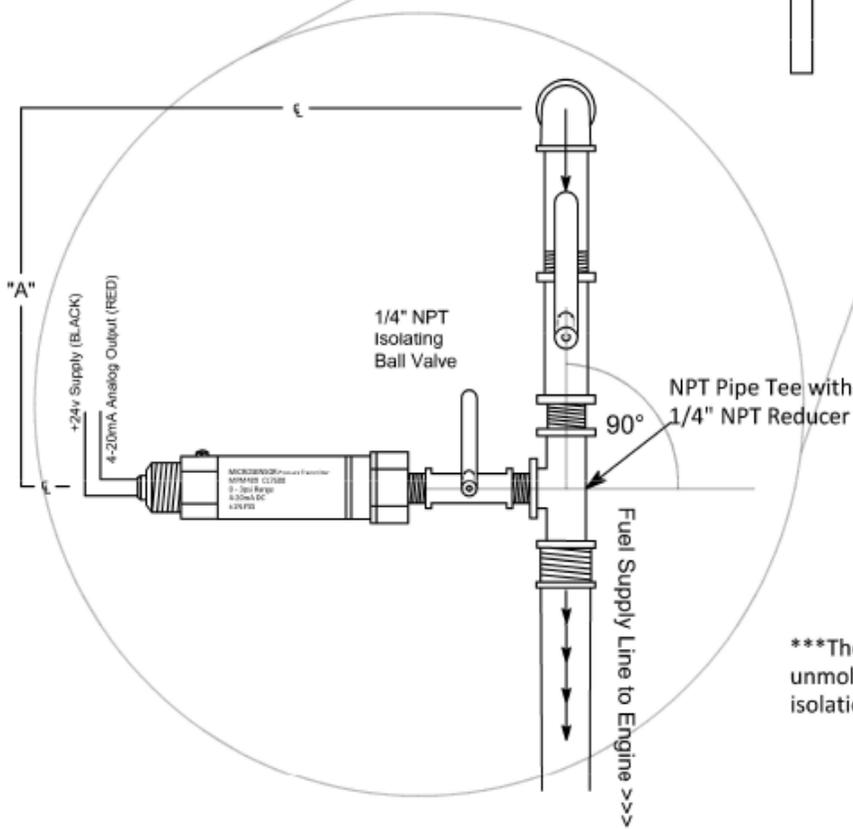
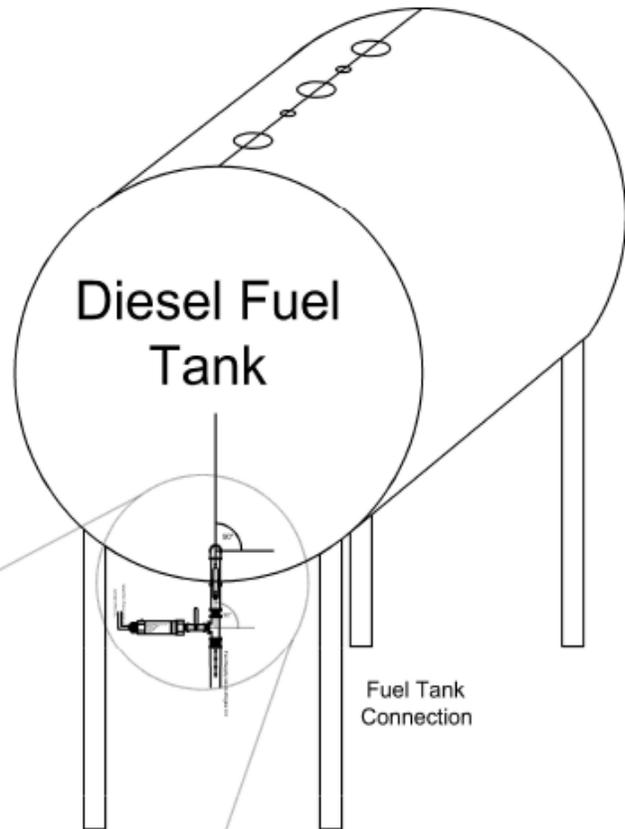
"No other valve than a manual locked open valve shall be put in the fuel line from the fuel tank to the engine except as provided as part of the listed engine"

**11.4.4.5.1**

"The valve shall be locked in the open position"

Transducer is to be installed 90° perpendicular to the centerline of the tank, horizontally parallel to the tank axis.

The "A" dimension will be required for proper scaling, accurate to 0.5 Inches or 1.0 Centimeters



\*\*\*The path of fuel flow must remain unobstructed and unmolested, the locked open valve is the only means of isolation between the tank and the engine\*\*\*

Basic Material No.: INSTALLATION OPTION #2	
Dimension of basic material: ..	
Type of basic material:	
	Drawing Type: SHOP
	Related Drawing: ..
Chg note	Date Int.
	THIRD ANGLE PROJECTION



3009 Dr. Martin Luther King Jr Street  
INDIANAPOLIS, IN 46202  
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Scale: None	Drawn: JNF	Date: 07/01/2021
DO NOT SCALE DRAWING	Approver: JNF	Date: 07/01/2021
Description: <b>FireConnect</b> Fuel Tank Level Monitoring Assembly		
Drawing No.: Front View Orientation (MicroSensor)		
Page:	1	of 1

**Customer assumes responsibility for assembly and maintaining NFPA compliance**

**11.4.4.2**

"Fuel piping shall not be galvanized steel or copper"

**11.4.4.2.1**

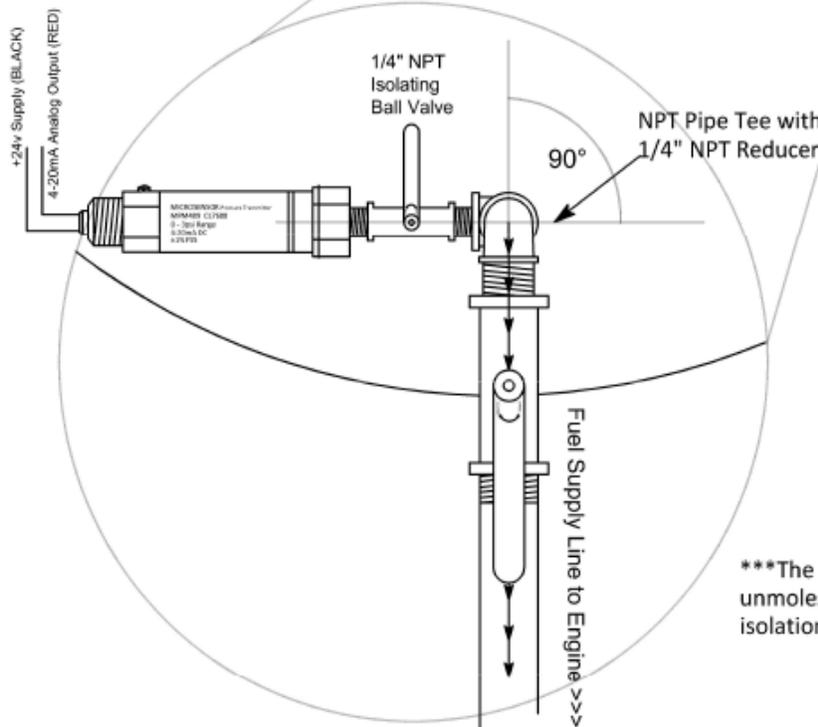
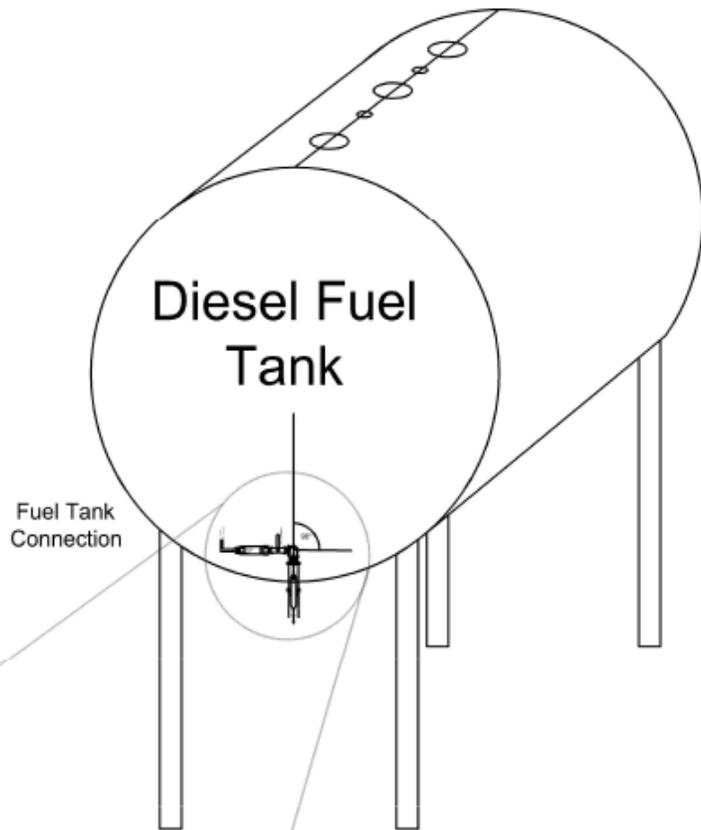
"Where black steel pipe is used for fuel piping, the fittings shall be steel or malleable iron fittings"

**11.4.4.5.2**

"No other valve than a manual locked open valve shall be put in the fuel line from the fuel tank to the engine except as provided as part of the listed engine"

**11.4.4.5.1**

"The valve shall be locked in the open position"



Transducer is to be installed 90° perpendicular to the centerline of the tank, horizontally parallel to the tank outlet for proper fuel level readings

\*\*\*The path of fuel flow must remain unobstructed and unmolesed, the locked open valve is the only means of isolation between the tank and the engine\*\*\*

Basic Material No.:		Drawing Type:	
Dimension of basic material:		SHOP	
Type of basic material:		Related Drawing:	
Chg note	Date Int.	THIRD ANGLE PROJECTION	



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 INDIANAPOLIS, IN 46202  
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Scale:	None	Drawn:	JNF	Date:	07/01/2021
DO NOT SCALE DRAWING		Approver:	JNF	Date:	07/01/2021
Description:					
<b>FireConnect</b>					
Fuel Tank Level Monitoring Assembly					
Drawing No.: Front View Orientation (MicroSensor)					
Page:	1	of	1		

## Appendix-II

### Greyline TTFM 6.1 Quick Start

The following “Quick Start” installation and operation manual is an adaptation from the original and can be referenced in Appendix III should further details be required during the installation and commissioning of the FireConnect® Gateway Controller system . All “Quick Start” instructions are specific for the application of the Greyline TTFM 6.1 flow meter to be used in the FireConnect® Gateway Controller system.

### CONNECTIONS; POWER INPUT

The FireConnect® system utilizes the optional DC input model and requires 9-32 VDC/10 Watts as our standard configuration. Connect to + and – terminals as **referenced in section 5.5.1.3**.

An option is available for standard supply at 100-240V 50/60Hz upon request when ordering the FireConnect® system.



- Warning! If these instructions are not observed, electric shock with consequent risk of serious personal injury or death may occur.

### KEYPAD SYSTEM

The diagram found in the next section shows the TTFM 6.1 menu system. Arrows show four directions to leave a menu box. Press a corresponding keypad arrow to move to the next item in the direction shown. Move the cursor (highlighted) under numerals and increase/decrease numerals with the ▲ and ▼ keys.

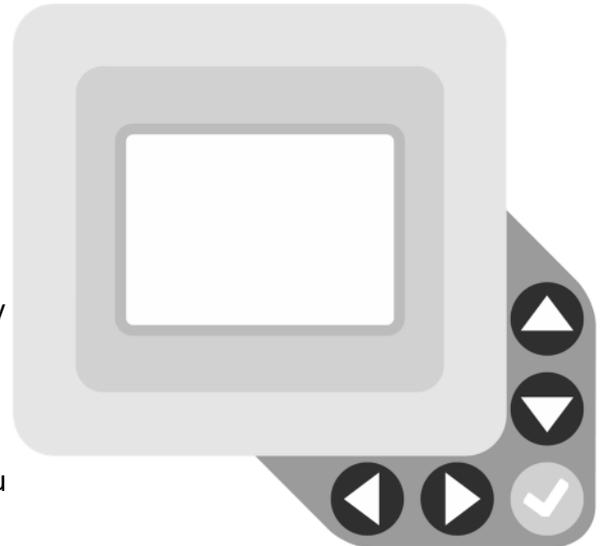


Figure 14 - Greyline TTFM 6.1 Display and Panel

To store calibration values permanently (even through power interruptions), press the ✓ button.

### ICONS



- Message waiting. Press ▲ from main page to view.



- Data logging off.



- Data logging on.



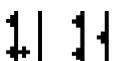
- USB file downloading.



- File download completed.



- Download Error.



- TTFM Echo OK.

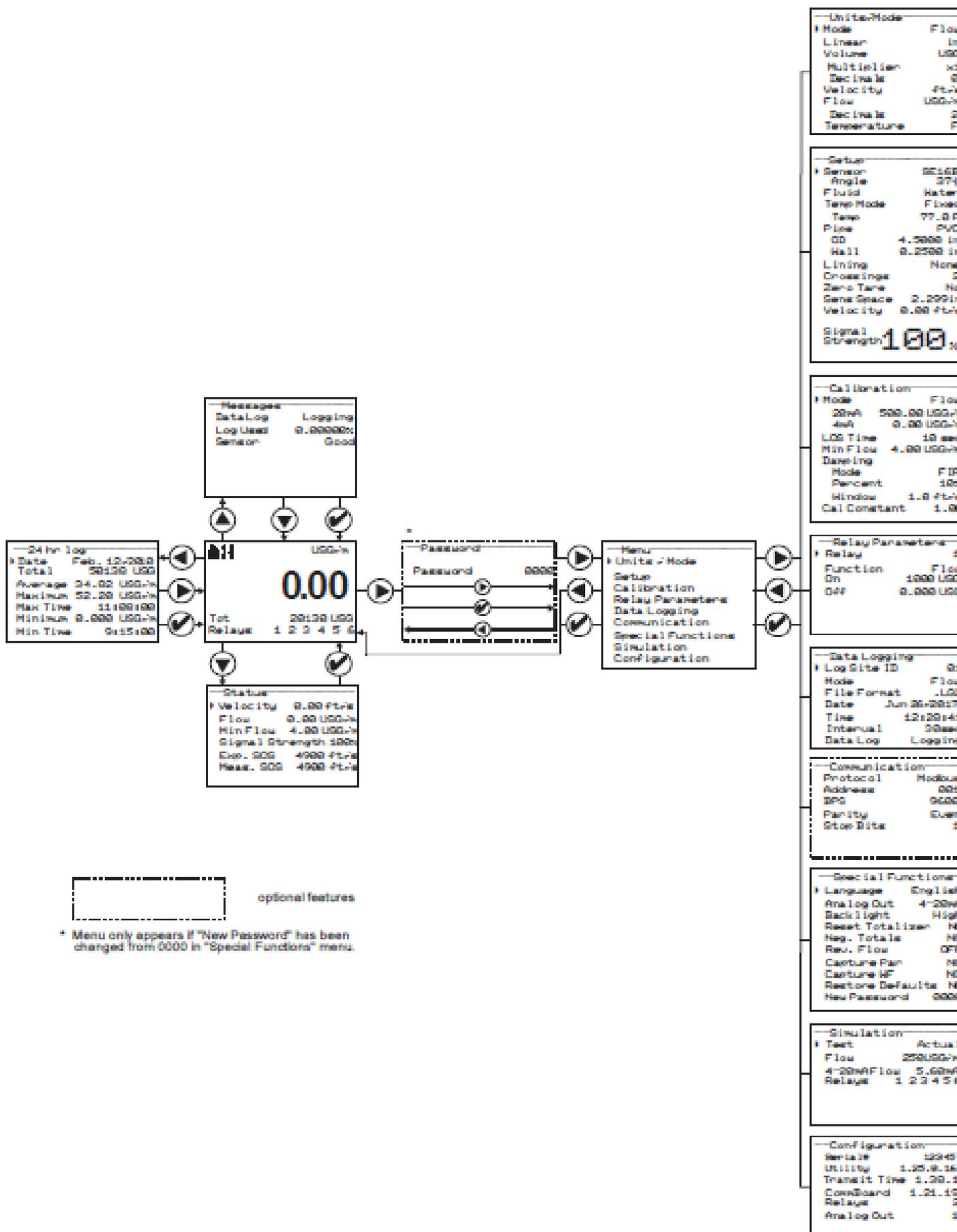


- TTFM - Low Signal / No Echo, Empty Pipe or high Aeration.



- TTFM - No Sensors Attached / Wrong Settings

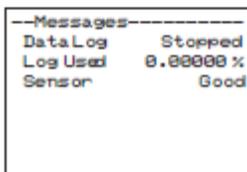
# MENU STRUCTURE





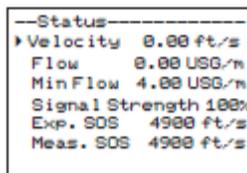
## MAIN DISPLAY

The Main Display shows the units selected from the Units/Mode menu, flow rate or velocity rate being measured, totalizer, totalizer multiplier, and relay states. The TTFM 6.1 will go to this display after start-up.



## MESSAGE ICON

Press ▲ from the Main Display to view status of the data logger and error/warning messages provided by the instrument. The Message Icon will appear on the Main Display if error messages are being generated by the instrument. Press ✓ to return to the Main Display.



## STATUS

Press ▼ from the Main Display to view Status of the measurement. Press ✓ to return to the Main Display.

- **Velocity**

Displays flow velocity in ft/s or m/s, selected in the Units/Mode menu.

- **Flow**

Displays flow rate in units selected in the Units/Mode menu. A list of flow rate units is provided in the Units/Mode section of the manual.

- **Min Flow**

Displays a read-only value for the minimum flow cutoff, in units which match the Flow selection. Measured flow rates below the Min Flow will result in the displayed flow rate on the LCD display to be 0.0. This parameter is used to suppress electrical noise at zero flow conditions, and it is typically set to the flow rate equivalent of 0.1 ft/sec in the programmed pipe size. The Min Flow can be adjusted in the Calibration menu.

- **Signal Strength**

Displays magnitude of signal being received by the ultrasonic sensors. 100% is the ideal signal strength. Signal strengths less than 100% could indicate poor pipe conditions (corrosion), highly aerated water, or programmed setup parameters which don't closely match field conditions. Consideration should be made to use 1-cross installation method in such cases, if not already using it.

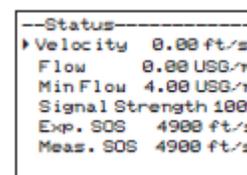
- **Exp. SOS**

Displays the expected fluid speed of sound measurement, in units that match the Velocity. The expected speed of sound is based on the pipe, fluid, and temperature selection in the Setup menu.

- **Meas. SOS**

Displays the measured fluid speed of sound, in units that match Exp. SOS. The meter calculates this value based on the time it takes for the signal to arrive from one transducer to another. Large differences between expected and measured speed of sound (> 10%) typically indicate an error in the setup of the instrument. Verify the following are correct in the Setup menu and with the physical installation of the transducers:

- Pipe Material
- Pipe OD
- Pipe Wall Thickness
- Liner Type
- Liner Thickness
- Fluid Type
- Fluid Temperature
- Crossings
- Separation Distance



## MENU SELECTIONS

The Menu selections page is used to navigate to specific menus which are described in more detail on the following pages.

Press ▲ or ▼ to navigate to different menus, and ▶ to enter the selected menu.

```

--Menu-----
▶ Units / Mode
  Setup
  Calibration
  Relay Parameters
  Data Logging
  Communication
  Special Functions
  Simulation
  Configuration
  
```

## UNITS/MODE

### Mode

Press the ▶ and then the ▲ or ▼ to select Flow or Velocity. Flow mode displays the flow rate in engineering units (e.g. gpm, litres/sec, etc.) Press the ✓ to store your selection then the ▼ to the next menu item.

### Linear

Press the ▶ key and then the ▲ or ▼ to select your units of measurement. The Linear units define what units the pipe dimensions and sensor spacing will be displayed in. Typically inches or mm is selected. Press the ✓ to store your selection then the ▼ to the next menu item.

```

--Units/Mode-----
▶ Mode           Flow
  Linear         in
  Volume         USG
  Multiplier     x1
  Decimals      0
  Velocity       ft/s
  Flow           USG/m
  Decimals      2
  Temperature    F
  
```

### Volume

Press the ▶ and then the ▲ or ▼ to select units for volume. Note: "bbl" denotes US oil barrels. Press the ✓ to store your selection then the ▼ to the next menu item.

### Multiplier

Press the ▶ and then the ▲ or ▼ to select the totalizer multiplier. Multipliers are used when resolution down to single digit is not required, or when you don't want to convert from gallons to thousands of gallons, as an example. Press ✓ to store your selection then ▼ to the next menu item.

### Decimals (Volume)

Press the ▶ and then the ▲ or ▼ to select the number of decimal points to be present on the totalizer display on the LCD screen. Default = 0. Options = 0, 1, 2. Press the ✓ to store your selection then the ▼ to the next menu item.

### Velocity

Press the ▶ and then the ▲ or ▼ to select the engineering units for flow velocity and sonic velocity of the fluid. Press ✓ to store your selection then ▼ to the next menu item.

### Flow

Press the ▶ and then the ▲ or ▼ to select the engineering units for flow rate. Press ✓ to store your selection then ▼ to the next menu item.

### Decimals (Flow)

Press the ▶ and then the ▲ or ▼ to select the number of decimal points to be present on the flow rate display on the LCD screen. Default = 2. Options = 0, 1, 2. Press the ✓ to store your selection then the ▼ to the next menu item.

### Temperature

Press the ▶ and then the ▲ or ▼ to select units for temperature. Press the ✓ to store your selection then the ▲ to go back to another menu item, or ◀ to exit back to the Menu Selection screen.

## SET UP

Press ▼ or ▲ to position cursor at Setup, and ▶ to enter. Use ▼ or ▲ to position cursor before each menu item and ▶ to enter. When settings are completed press ✓ to store and ✓ again to return to the Main Menu.

### Sensor Select

Choose SE16A, SE16B, or SE16C, depending on transducers connected to TTFM 6.1.

### Angle

For SE16B only, select angle which matches the transducer pair connected to the TTFM. Options: 35, 37, 39, and 41. Angle is determined by the part number on the SE16-B transducer label. For SE16A and SE16C, Angle should be 37.

### Part Number on SE16-B Label

- SE16-B-35
  - Corresponding Transducer Angle 35
- SE16-B-37
  - Corresponding Transducer Angle 37
- SE16-B-39
  - Corresponding Transducer Angle 39
- SE16-B-41
  - Corresponding Transducer Angle 41

### Fluid

Select fluid type.

### Vel@25C

When Fluid = Other, enter the fluid velocity at 25C from table or other reference. Engineering units may be m/s or ft/s depending on Units menu programming.

### dV/C

When Fluid = Other, Enter fluid velocity adjustment factor over change in temperature in units of m/s or ft/s per °C.

### Temp Mode

Choose Fixed.

### Temp

Enter fluid operating temperature in displayed engineering units.

### Pipe

Select pipe material.

### Pipe Vel

When Pipe = Other, enter pipe material speed of sound (consult factory).

### OD

Highlight the digits and then ▲ or ▼ to change the numbers and decimal point. Pipe OD should be entered as the exact outside diameter of the pipe where the sensor is mounted. Refer to the Pipe Charts Appendix in this manual for outside diameter of common pipe types and sizes.

### Wall

Enter pipe wall thickness. Pipe wall thickness should be entered as the exact wall thickness of the pipe where the sensor is mounted. Refer to the Pipe Charts Appendix in this manual for wall thicknesses of common pipe types and sizes.

### Lining

Select liner material

### Vel

When Lining = Other, enter speed of sound of liner (consult factory).

-----Setup-----	
▶ Sensor	SE16B
Angle	37
Fluid	Water
Temp Mode	Fixed
Temp	77.8 F
Pipe	PVC
OD	4.5888 in
Wall	0.2588 in
Lining	None
Crossings	2
Zero Tare	No
Sens Space	2.299 in
Velocity	8.88 ft/s
Signal Strength	100%

**Thick**

When Lining  $\neq$  None, enter liner thickness.

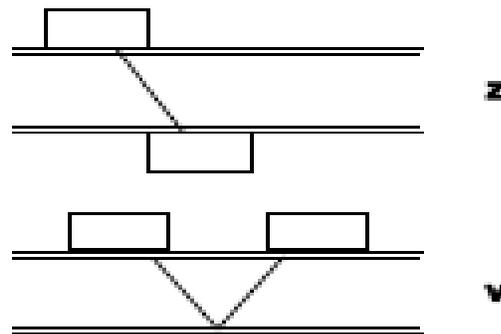
**Crossings**

Crossings 1 = Z mounting

Crossings 2 = V mounting

\*These are the only two approved methods for the FireConnect® System

Older pipes are often degraded or scaled on the inside. These conditions can hinder the ability to receive a strong signal when Crossings = 4 or 2. We suggest starting with Crossings = 2 or 1, respectively, in these cases.

**Zero Tare**

Used to calibrate zero-flow measured by the TTFM 6.1 in process. Flow in the pipe should be confirmed as 0 before enabling, or significant errors in flow accuracy could occur.

Set Calibration/Damping to 0%, and under no flow conditions and with a full pipe, select Yes to force readings to zero.

**Sens pace**

After sensor, angle, fluid, and pipe material are defined, this displays the calculated sensor spacing. Also called the separation distance. The sensors will be set to this dimension when installed on the pipe, as described later in this manual.

**Velocity**

Displays the measured velocity after the sensors have been connected at the specified separation distance.

**Signal Strength**

Displays magnitude of signal being received by the ultrasonic sensor. Should be 100% under ideal operating conditions. Signal strengths less than 100% do not indicate that the meter is not reliable, however, the meter may be more susceptible to complete signal loss should process conditions like entrapped air worsen. When signal strength is less than 100%, consideration should be made to using 1- cross mounting method if this is not the current mounting mode.

**CALIBRATION**

Press  $\blacktriangledown$  or  $\blacktriangle$  to position cursor at Calibration menu, and  $\blacktriangleright$  to enter. Use  $\blacktriangledown$  or

$\blacktriangle$  to position cursor before each menu item and  $\blacktriangleright$  to enter. When settings are completed press  $\checkmark$  to store and  $\checkmark$  again to return to the Main Menu.

**Mode**

Displays the Mode which was selected in the Units/Mode menu. This is read-only.

**20mA**

Press  $\blacktriangleright$  then  $\blacktriangledown$  or  $\blacktriangle$  to change the numbers and decimal point position. Use this menu to set the corresponding flow rate that will be represented by 20mA analog output. If maximum flow is unknown, enter an estimated flow rate and observe actual flow to determine the correct maximum value. Any velocity or flow rate up to +40 ft/sec (12.0 m/sec) may be selected.

**4mA**

Press  $\blacktriangleright$  then  $\blacktriangledown$  or  $\blacktriangle$  to set the flow rate corresponding to 4mA analog output. This setting may be left at zero or can be raised to any value less than the 20mA setting, or lowered to any velocity or corresponding flow rate down to -40 ft/sec (-12 m/sec).

**LOS Time**

Use LOS Time to suppress intermittent loss of signal.

Example: systems with high concentrations of undissolved gasses will cause fluctuations in signal strength when the gasses move past the ultrasonic signal. If a complete loss of signal is experienced, the TTFM 6.1 will hold the last valid reading for the duration of the LOS Time. If the signal strength returns before the LOS Time is expired, because the ultrasonic signal is no longer being impeded, the meter will return to normal operation automatically. If signal strength does not return after the LOS Time has expired, then the meter will report zero flow on the LCD display and outputs and produce a Low Signal alarm. Default LOS Time is 30 seconds, and the value can be set between 0 and 99 seconds.

**Min Flow**

Flow rates below this setting will be displayed as zero flow.

Default flow rate is ~ 0.1 ft/sec for the pipe size programmed in the Setup menu.

**Damping**

Mode Choose between OFF, FIR (Default), or LOW PASS.

When measured flows are outside the Window of the running average, the FIR filter will reduce the damping average so that a fast response can be made to the sudden change in flow rate.

The LOW PASS filter will ignore measured flow rates outside the Window, while holding the running average, until there are enough data points outside the Window to cause a step- response to the new measured value.

While measured flows are within the Window of the running average, both the FIR and LOW PASS filter behave the same.

**Percent**

Higher percentages increase the number of measurements which are averaged together to produce a stable flow reading. Higher percentages also increase the time it takes for the meter to make a step-response to the measured flow rate outside the Window in the LOW PASS Mode.

**Window**

Defines the Window around the running average, in units of Velocity set in the Units/Mode menu. Measurements made inside the Window are added to the running average, and measurements outside the Window effect the response of the meter as described in the Mode section.

**Cal Constant**

Calibration constant defined when the TTFM was calibrated at the factory.

**Press ✓ to return to Menu Selections and Save Adjusted Settings.**

**SPECIAL FUNCTIONS**

Press ▼ or ▲ to position cursor at Special Functions, and ▶ to enter. Use ▼ or

▲ to position cursor before each menu item and ▶ to enter. When settings are completed press ✓ to store and ✓ again to return to the Main Menu.

**Language**

Select English, French or Spanish

**Analog Out**

Select 4-20mA mode for the analog output.

**Backlight**

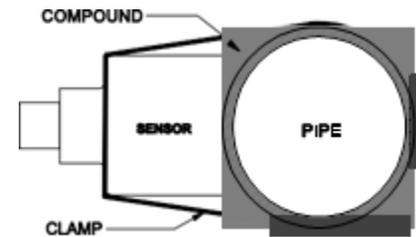
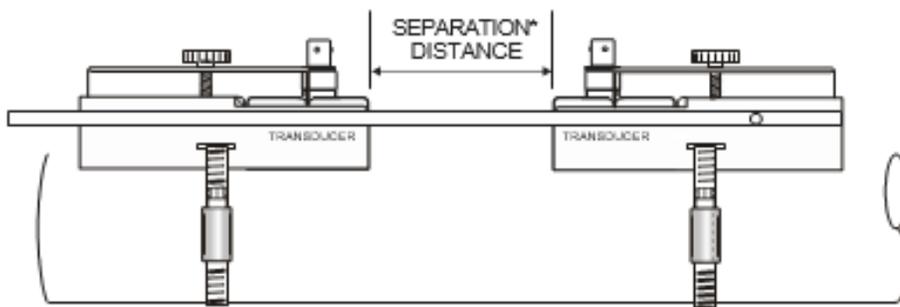
Select High, Medium or Low for continuous backlight brightness.

Select Key Hi/Lo for high backlight lasting 1 minute after a keypress, and then Lo backlight until a key is pressed again.

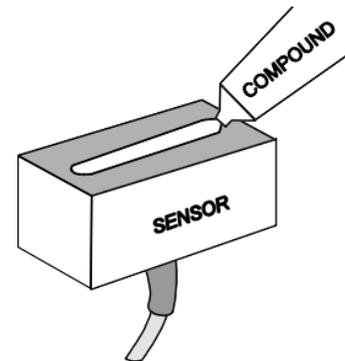
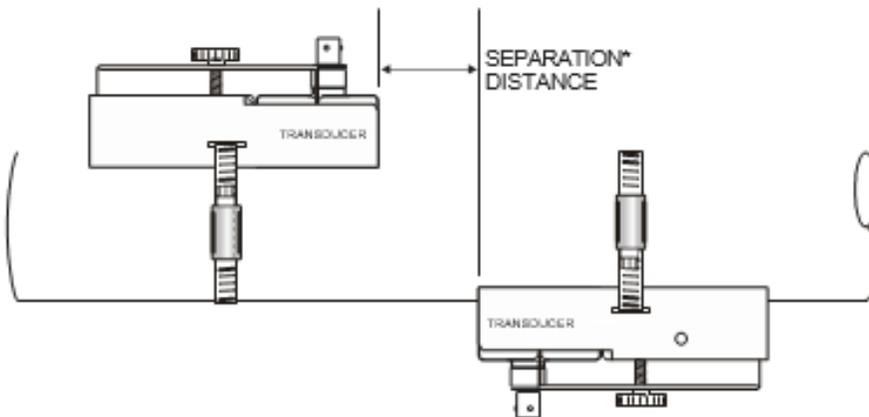
Select Key High, Med or Low for backlight lasting 1 minute after a keypress and then backlight off until a key is pressed again.

## TYPICAL SE16B SENSOR INSTALLATION

2 Cross Separation Distance



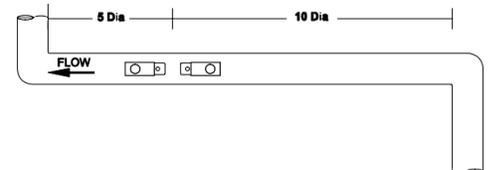
1 Cross Separation Distance



\* Shown in 'Setup' menu after sensor, fluid and pipe parameters are entered.

TMK-B1 transducer mounting kit shown. Sensor spacing method is consistent with TMK-B21 and TMK-B22 kits, but the brackets will be different.

Arrows on top of transducers should be pointed towards each other.



## SENSOR MOUNTING LOCATION

The position of the sensor is one of the most important considerations for accurate flow measurement. The same location guidelines apply to Transit Time as most other flow meter technologies.

**VERTICAL OR HORIZONTAL PIPE** - Vertical pipe runs are acceptable, and the transducers can be mounted in any orientation around the pipe. Downward flow should be avoided in case the pipe becomes partially filled or aerated. On Horizontal pipes and liquids with high concentrations of gas or solids, the sensors should be mounted on the side (1 to 5 o'clock positions) to avoid concentrations of gas at the top of the pipe, or solids at the bottom.

**STRAIGHT RUN REQUIREMENTS** – For best results, the transducers must be installed on a straight run of pipe, free of bends, tees, valves, transitions, insertion probes and obstructions of any kind. For most installations, ten straight unobstructed pipe diameters upstream and five diameters downstream of the transducers is the minimum recommended distance for proper operation. Additional considerations are outlined below.

- Do not, if possible, install the transducers downstream from a throttling valve, a mixing tank, the discharge of a positive displacement pump or any other equipment that could possibly aerate the liquid. The best location will be as free as possible from flow disturbances, vibration, sources of heat, noise, or radiated energy.
- Avoid mounting the transducers on a section of pipe with any external scale. Remove all scale, rust, loose paint, etc., from the location prior to mounting the transducers. A sanding block is included with every meter to facilitate proper pipe preparation.
- Do not mount the transducers on a surface aberration (pipe seam, etc.).
- Do not mount transducers from different ultrasonic flow meters on the same pipe.

- Do not run the transducer triaxial cables in common bundles with cables from other instrumentation. You can run these cables through a common conduit ONLY if they originate at the same flow meter.
- Never mount transducers under water.

**IMPORTANT NOTE:** In some cases, longer straight runs may be necessary where the transducers are placed downstream from devices which cause unusual flow profile disruptions or swirl. For example: modulating valves, or two elbows in close proximity and out of plane.

### SEPARATION DISTANCE (Sensor Spacing Distance)

Separation distance is automatically calculated by the TTFM 6.1 based on parameters entered in the Setup menu. Sens Space is a parameter where this distance is given and is located in the Setup menu. Document this value for the following transducer installation procedure.

## 2 OR 4 CROSS INSTALLATION OVERVIEW – SE16B TMK-B1 Kit

1. Prep the pipe, removing paint and coating in the area the sensor is to be placed, and mind the installation location requirements. Clean the location where the sensor is to be mounted on the opposite side of the pipe after we've marked where it will be installed. Picture below shows a very clean ductile iron pipe which did not require much cleaning. The outside paint is very well bonded and did not need to be removed:
2. Install the stainless-steel mounting brackets on the pipe. Position them at approximately the correct separation distance. Exact measurement is not required at this time. Tip: Use a 5/16" nut driver to tighten the hose clamps.
3. Use alignment bar to ensure the brackets are parallel. Completion of steps 2 & 3 is shown below.



4. Mark the position of the permanent bracket on the pipe. This is the bracket that will not be adjusted and will be used as the reference for the separation distance and alignment. It is your choice which bracket is permanent. With a marker, mark the bracket position by placing the mark directly in front of the stainless side-rail.
5. Measure the separation distance from the mark you created in step 4 and create a new mark on the pipe at the separation distance. It may be useful to mark your tape measure (included with every meter) at the separation distance point before marking the pipe. The marked pipe is shown below.



6. Move the non-permanent bracket to position at the mark you created at step 5 and tighten it completely. Apply coupling compound to the transducers and install them in the brackets.

#### Tips for installing transducers:

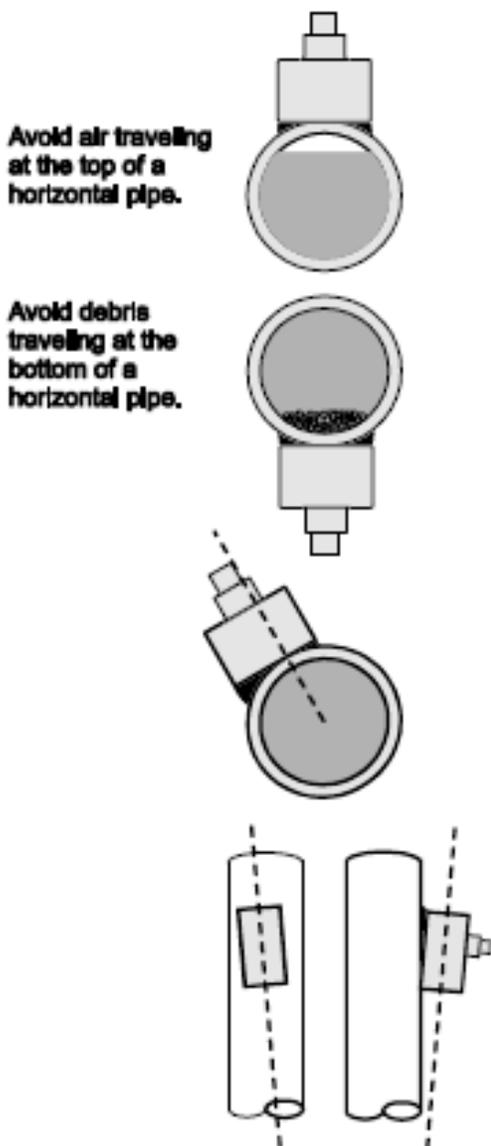
- a. Be sure the red knob on the brackets are loosened completely
- b. Put the transducer into the bracket by ensuring the bottom of the transducer and the couplant does not touch the pipe as you slide it in. (Hover)
- c. With the transducer hovering, tighten the red knob on the bracket until tight. The transducer will be level with the surface of the pipe, and no couplant will have moved.
- d. (pictures of proper coupling application and finished installation on the next page)

7. Coupling compound only: If you need to make fine adjustments ( $\pm 0.25''$ ) to the spacing at this point, you may do so by loosening the hose clamps slightly and sliding the brackets while the transducers are installed inside them. Tighten hose clamps when done.

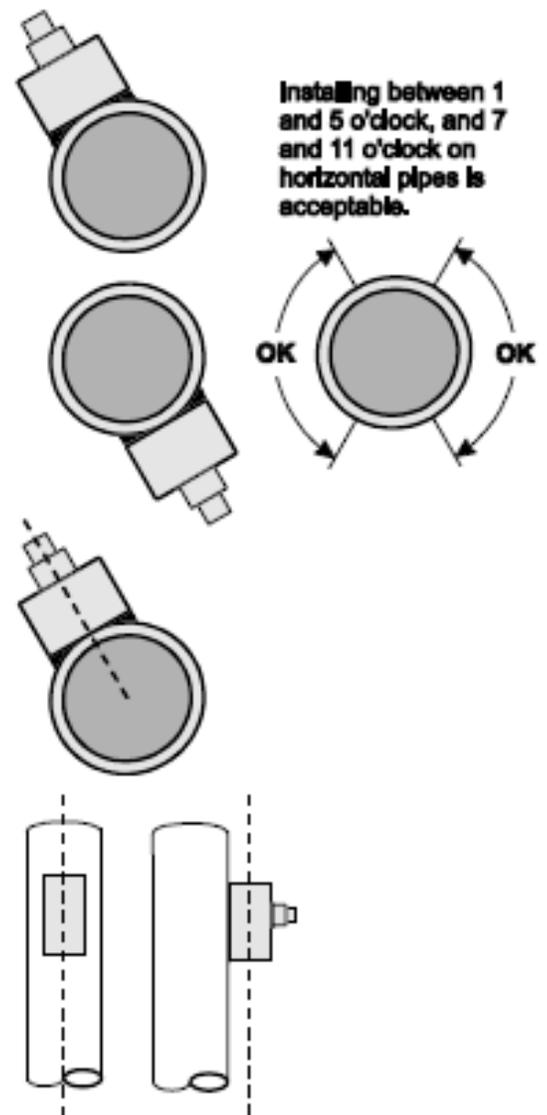


## SENSOR MOUNTING/COUPLING RECOMMENDATIONS

### BAD



### GOOD



## ENCLOSURE INSTALLATION

Locate the enclosure within 25 ft (7.6 m) of the sensors (up to 100 ft - 30 m optional). The enclosure can be wall mounted with the four mounting screws (included) or panel mounted with Option PM Panel Mount kit from Pulsar Measurement. Avoid mounting the enclosure in direct sunlight to protect the electronics from damage due to overheating and condensate. In high humidity atmospheres, or where temperatures fall below freezing, Option TH Enclosure Heater and Thermostat is recommended. **IMPORTANT:** Seal conduit entries to prevent moisture from entering enclosure.

### NEMA4X (IP66) WITH CLEAR COVER

1. Open hinged enclosure cover.
2. Insert #12 screws (supplied) through the four enclosure mounting holes to secure the enclosure to the wall or mounting stand.

Additional conduit holes can be cut in the bottom of the enclosure when required. Use a hole saw or Greenlee-type hole cutter to cut the required holes.

**IMPORTANT: DO NOT make conduit/wiring entries into the top or sides of the enclosure.**

**Note:** This non-metallic enclosure does not automatically provide grounding between conduit connections. Grounding must be provided as part of the installation. Ground in accordance with the requirements of the National Electrical Code. System grounding is provided by connecting grounding wires from all conduit entries to the steel mounting plate or another point which provides continuity.

## CLEANING

Cleaning is not required as a part of normal maintenance.

## FIELD TROUBLESHOOTING

### POSSIBLE CAUSES:

### CORRECTIVE ACTION:

#### METER READING WHEN THERE IS NO FLOW?

Erratic measurement (set damping to 0% to check) due to electrical noise or poor signal quality.

- Set Calibration / Damping to 0% with zero flow use Setup / Tare function.
- Ensure all Flowmeter wiring is in METAL conduit and sensor shield is properly connected to Ground.
- Ensure correct power input Ground connection (<1 ohm resistance).
- Ensure 4-20mA Shield connected to Instrument Ground stud.
- Adjust Calibration / Min Flow setting.
- Contact Pulsar Measurement for further assistance.
- Follow Drive manufacturers wiring and Grounding instructions
- Relocate Flowmeter electronics, Sensor and wiring away from VSD

Variable Speed Drive interference

#### METER READING LOWER THAN EXPECTED?

Calibration Error

- Review calibration menu. Pipe dimensions and fluid selection/fluid velocity.

Lower flow rate than expected

- Investigate pump/valves. Compare velocity with alternate instrument.

Erratic measurement (set damping to 0% to check) due to electrical noise or poor signal quality.

- Ensure all Flowmeter wiring is in METAL conduit and sensor shield is properly grounded.
- Ensure correct power input Ground connection (<1 ohm resistance).
- Ensure 4-20mA Shield connected to Instrument Ground stud.
- Contact Pulsar Measurement for further assistance.

#### NO ECHO INDICATION Icon: No Echo

Improper Installation

- Check Setup menu to ensure pipe material, size, thickness, liner type, thickness, fluid type, and fluid temperature and configured properly. Check transducer mounting method and spacing matches Setup menu values.

Sensors not mounted to Pipe or mounted improperly

- Apply coupling compound and mount sensors to pipe with proper sensor spacing.

Empty pipe or partially filled

- Pipe must be fluid filled and acoustically transparent in order to obtain echoes.

Coupling compound washed out, or sensor loose on pipe.

- Remount sensor
- Use Super Lube® Silicone Compound

OPEN/SHORT SENSOR ICON	<ul style="list-style-type: none"> <li>No sensors attached</li> <li>Short in transducer, or in triax transducer cable. Follow Sensor Connections steps</li> </ul>
Sensor Connections	<ul style="list-style-type: none"> <li>Check sensor connections at TTFM and at sensor junction box.</li> <li>Note: Refer to Sensor Cable Resistance Test to test final connections.</li> </ul>

**METER READING HIGHER THAN EXPECTED?**

Calibration Error	<ul style="list-style-type: none"> <li>Review calibration menu. Pipe dimensions and fluid selection/fluid velocity.</li> </ul>
Higher flow rate than expected	<ul style="list-style-type: none"> <li>Investigate pump/valves. Compare velocity with alternate instrument.</li> </ul>
Erratic measurement (set damping to 0% to check) due to electrical noise or poor signal quality.	<ul style="list-style-type: none"> <li>Ensure all Flowmeter wiring is in METAL conduit and sensor shield is properly grounded.</li> <li>Ensure correct power input Ground connection (&lt;1 ohm resistance).</li> <li>Ensure 4-20mA Shield connected to Instrument Ground stud.</li> <li>Contact Pulsar Measurement for further assistance.</li> </ul>
High viscosity fluid	<ul style="list-style-type: none"> <li>Laminar flow profile due to high viscosity fluid requires an adjustment to Cal Const.</li> </ul>

**PIPE CHARTS**

Note: Not all pipe types allowed in programming have charts below. Pipe dimensions will need to be acquired from pipe markings or the pipe manufacturer in such cases.

**Carbon Steel & PVC Pipe**

Pipe Size	Pipe O.D.	Schedule Standard		Extra Heavy		Dbl. Extra Heavy		Schedule 10		Schedule 20		Schedule 30		Schedule 40		Schedule 80	
		I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL
½	0.840	0.622	0.109											0.622	0.109	0.546	0.147
¾	1.050	0.824	0.113											0.824	0.113	0.742	0.154
1	1.315	1.049	0.133											1.049	0.133	0.957	0.175
1 ¼	1.660	1.380	0.140											1.380	0.140	1.278	0.191
1 ½	1.900	1.900	0.145											1.900	0.145	1.500	0.200
2	2.375	2.067	.154	1.939	.218	1.503	.436							2.067	.154	1.939	0.218
2 ½	2.875	2.469	.203	2.323	.276	1.771	.552							2.469	.203	2.323	0.276
3	3.500	3.068	.216	2.900	.300	2.300	.600							3.068	.216	2.900	0.300
3 ½	4.000	3.548	.226	3.364	.318	2.728	.636							3.548	.226	3.364	0.318
4	4.500	4.026	.237	3.826	.337	3.152	.674							4.026	.237	3.826	0.337
5	5.563	5.047	.258	4.813	.375	4.063	.750							5.047	.258	4.813	0.375
6	6.625	6.065	.280	5.761	.432	4.897	.864							6.065	.280	5.761	0.432
8	8.625	7.981	.322	7.625	.500	6.875	.875			8.125	.250	8.071	.277	7.981	.322	7.625	0.500
10	10.750	10.020	.365	9.750	.500	8.750	1.000			10.250	.250	10.136	.307	10.020	.365	9.564	0.593
12	12.750	12.000	.375	11.750	.500	10.750	1.000			12.250	.250	12.090	.330	11.938	.406	11.376	0.687
14	14.000	13.250	.375	13.000	.500			13.500	.250	13.376	.312	13.250	.375	13.124	.438	12.500	0.750
16	16.000	15.250	.375	15.000	.500			15.500	.250	15.376	.312	15.250	.375	15.000	.500	14.314	0.843
18	18.000	17.250	.375	17.000	.500			17.500	.250	17.376	.312	17.124	.438	16.876	.562	16.126	0.937
20	20.000	19.250	.375	19.000	.500			19.500	.250	19.250	.375	19.000	.500	18.814	.593	17.938	1.031
22	22.000	21.250	.375	21.000	.500			21.500	.250	21.250	.375	21.000	.500				
24	24.000	23.250	.375	23.000	.500			23.500	.250	23.250	.375	22.876	.562	22.626	.687	21.564	1.218
26	26.000	25.250	.375	25.000	.500			25.376	.312	25.000	.500						
28	28.000	27.250	.375	27.000	.500			27.376	.312	27.000	.500	26.750	.625				
30	30.000	29.250	.375	29.000	.500			29.376	.312	29.000	.500	28.750	.625				
32	32.000	31.250	.375	31.000	.500			31.376	.312	31.000	.500	30.750	.625				
34	34.000	33.250	.375	33.000	.500			33.376	.312	33.000	.500	32.750	.625				
36	36.000	35.250	.375	35.000	.500			35.376	.312	35.000	.500	34.750	.625				
42	42.000	41.250	.375	41.000	.500					41.000	.500	40.750	.625				

## Ductile Iron Pipe – Standard Classes

Size INCH	OUTSIDE DIA. INCH	Class S0		Class S1		Class S2		Class S3		Class S4		Class S5		Class S6		CEMENT LINING	
		WALL	I.D.	**STD	**DOUBLE												
																THICKNESS	THICKNESS
3	3.96			0.25	3.46	0.28	3.40	0.31	3.34	0.34	3.28	0.37	3.22	0.41	3.14	.125	.250
4	4.80			0.26	4.28	0.29	4.22	0.32	4.16	0.35	4.10	0.38	4.04	0.44	3.93		
6	6.90	0.25	6.40	0.28	6.34	0.31	6.28	0.34	6.22	0.37	6.16	0.40	6.10	0.43	6.04		
8	9.05	0.27	8.51	0.30	8.45	0.33	8.39	0.36	8.33	0.39	8.27	0.42	8.21	0.45	8.15		
10	11.10	0.39	10.32	0.32	10.46	0.35	10.40	0.38	10.34	0.41	10.28	0.44	10.22	0.47	10.16		
12	13.20	0.31	12.58	0.34	12.52	0.37	12.46	0.40	12.40	0.43	12.34	0.46	12.28	0.49	12.22		
14	15.30	0.33	14.64	0.36	14.58	0.39	14.52	0.42	14.46	0.45	14.40	0.48	14.34	0.51	14.28	.1875	.375
16	17.40	0.34	16.72	0.37	16.66	0.40	16.60	0.43	16.54	0.46	16.48	0.49	16.42	0.52	16.36		
18	19.50	0.35	18.80	0.38	18.74	0.41	18.68	0.44	18.62	0.47	18.56	0.50	18.50	0.53	18.44		
20	21.60	0.36	20.88	0.39	20.82	0.42	20.76	0.45	20.70	0.48	20.64	0.51	20.58	0.54	20.52		
24	25.80	0.38	25.04	0.41	24.98	0.44	24.92	0.47	24.86	0.50	24.80	0.53	24.74	0.56	24.68		
30	32.00	0.39	31.22	0.43	31.14	0.47	31.06	0.51	30.98	0.55	30.90	0.59	30.82	0.63	30.74		
36	38.30	0.43	37.44	0.48	37.34	0.62	37.06	0.58	37.14	0.63	37.04	0.68	36.94	0.73	36.84		
42	44.50	0.47	43.56	0.53	43.44	0.59	43.32	0.65	43.20	0.71	43.08	0.77	42.96	0.83	42.84		
48	50.80	0.51	49.78	0.58	49.64	0.65	49.50	0.72	49.36	0.79	49.22	0.86	49.08	0.93	48.94		
54	57.10	0.57	55.96	0.65	55.80	0.73	55.64	0.81	55.48	0.89	55.32	0.97	55.16	1.05	55.00		

\*\*REDUCE I.D. BY DIMENSION SHOWN

## Cast Iron Pipe - ASA Standard

Pipe Size	Pipe O.D.	Class 60		Class 100		Class 150		Class 200		Class 260		Class 300		Class 360	
		WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.	WALL	I.D.
3	3.96	0.32	3.32	0.32	3.32	0.32	3.32	0.32	3.32	0.32	3.32	0.32	3.32	0.32	3.32
4	4.80	0.35	4.10	0.35	4.10	0.35	4.10	0.35	4.10	0.35	4.10	0.35	4.10	0.35	4.10
6	6.90	0.38	6.14	0.38	6.14	0.38	6.14	0.38	6.14	0.38	6.14	0.38	6.14	0.38	6.14
8	9.05	0.41	8.23	0.41	8.23	0.41	8.23	0.41	8.23	0.41	8.23	0.41	8.23	0.41	8.23
10	11.10	0.44	10.22	0.44	10.22	0.44	10.22	0.44	10.22	0.44	10.22	0.48	10.14	0.52	10.06
12	13.20	0.48	12.24	0.48	12.24	0.48	12.24	0.48	12.24	0.48	12.24	0.52	12.16	0.56	12.08
14	15.30	0.48	14.34	0.51	14.28	0.51	14.28	0.55	14.20	0.59	14.12	0.59	14.12	0.64	14.02
16	17.40	0.54	16.32	0.54	16.32	0.54	16.32	0.58	16.24	0.63	16.14	0.68	16.04	0.68	16.04
18	19.50	0.54	18.42	0.58	18.34	0.58	18.34	0.63	18.24	0.68	18.14	0.73	18.04	0.79	17.92
20	21.60	0.57	20.46	0.62	20.36	0.62	20.36	0.67	20.26	0.72	20.16	0.78	20.04	0.84	19.92
24	25.80	0.63	24.54	0.68	24.44	0.73	24.34	0.79	24.22	0.79	24.22	0.85	24.10	0.92	23.96

## Cast Iron Pipe - AWWA Standard

Pipe Size	Class A 100 Ft. 43 P8IG			Class B 200 Ft. 88 P8IG			Class C 300 Ft. 130 P8IG			Class D 400 Ft. 173 P8IG		
	O.D.	WALL	I.D.	O.D.	WALL	I.D.	O.D.	WALL	I.D.	O.D.	WALL	I.D.
3	3.80	0.39	3.02	3.96	0.42	3.12	3.96	0.45	3.06	3.96	0.48	3.00
4	4.80	0.42	3.96	5.00	0.45	4.10	5.00	0.48	4.04	5.00	0.52	3.96
6	6.90	0.44	6.02	7.10	0.48	6.14	7.10	0.51	6.08	7.10	0.55	6.00
8	9.05	0.46	8.13	9.05	0.51	8.03	9.30	0.56	8.18	9.30	0.60	8.10
10	11.10	0.50	10.10	11.10	0.57	9.96	11.40	0.62	10.16	11.40	0.68	10.04
12	13.20	0.54	12.12	13.20	0.62	11.96	13.50	0.68	12.14	13.50	0.75	12.00
14	15.30	0.57	14.16	15.30	0.66	13.98	15.65	0.74	14.17	15.65	0.82	14.01
16	17.40	0.60	16.20	17.40	0.70	16.00	17.80	0.80	16.20	17.80	0.89	16.02
18	19.50	0.64	18.22	19.50	0.75	18.00	19.92	0.87	18.18	19.92	0.96	18.00
20	21.60	0.67	20.26	21.60	0.80	20.00	22.06	0.92	20.22	22.06	1.03	20.00
24	25.80	0.76	24.28	25.80	0.89	24.02	26.32	1.04	24.22	26.32	1.16	24.00
30	31.74	0.88	29.98	32.00	1.03	29.94	32.40	1.20	30.00	32.74	1.37	30.00
36	37.96	0.99	35.98	38.30	1.15	36.00	38.70	1.36	39.98	39.16	1.58	36.00
42	44.20	1.10	42.00	44.50	1.28	41.94	45.10	1.54	42.02	45.58	1.78	42.02
48	50.50	1.26	47.98	50.80	1.42	47.96	51.40	1.71	47.98	51.98	1.96	48.06
54	56.66	1.35	53.96	57.10	1.55	54.00	57.80	1.90	54.00	58.40	2.23	53.94
60	62.80	1.39	60.02	63.40	1.67	60.06	64.20	2.00	60.20	64.82	2.38	60.06
72	75.34	1.62	72.10	76.00	1.95	72.10	76.88	2.39	72.10			
84	87.54	1.72	84.10	88.54	2.22	84.10						

## Appendix-III

### Greyline TTFM 6.1 Instruction Manual

The following contents is property of the Pulsar Measurement Company, and to be used only in accordance with the installation of the Greyline TTFM 6.1 Flowmeter.

Double click anywhere in the image to open the Greyline Instruction Manual PDF document, use the URL address below, or simply use the QR code.

<https://drive.google.com/file/d/1lhYuSSvoXdL3TBe9o9MUFqyvMI823W1a/view?usp=sharing>



## Appendix-IV ProSense Digital Temperature Sensor Manual

The following contents is property of the Automation Direct, and to be used only in accordance with the installation of the ProSense ETS Series Digital Temperature Sensors and intended for application as an integral component to the FireConnect line of products.

Utilize the QR Code for access to the complete installation manual provided by Automation Direct if further information is required.

<https://drive.google.com/file/d/14Q2UB9nc5awxXJs8RvBd7oF9XqXs9gVL/view?usp=sharing>



## Appendix-V

### Commissioning; FCGC w/Firetrol MarkIII & Tornatech V2 Interfaces; Main & Jockey

For this configuration, we will be focusing on the communication and network parameters for the **FireConnect Gateway Controller** when paired with the interfaces for the **Firetrol Mark III** or **Tornatech Vizitouch 2.0**, paired in combination as both the **Main Fire Pump Controller** and **Jockey Pump Controller**, in both the **Diesel** and **Electric** main controller formats.

Some of these communication settings will be configured from the factory if ordered with the correct option, but it is important and should be common practice to verify each and every parameter is entered correctly.

The Key Action Items and Parameters for this configuration are as follows for the **Main Fire Pump Controller**:

1. Main Controller IP Settings:
  - a. IP Address- **192.168.003.198**
  - b. Subnet Mask- **255.255.255.000**
  - c. Default Gateway **192.168.003.198**
2. Check  the **Manual Addressing** field in the network configuration settings while entering the IP Addresses
  - a. If equipped, remove the check from the box  labeled **Wireless Networking**
3. Verify Ethernet Connection from the **Main** to the **Jockey** Controller network switch.

The Key Action Items and Parameters for this configuration are as follows for the **Jockey Pump Controller**:

1. Jockey Controller IP Settings:
  - a. IP Address- **192.168.003.199**
  - b. Subnet Mask- **255.255.255.000**
  - c. Default Gateway **192.168.003.199**
2. Check  the **Manual Addressing** field in the network configuration settings while entering the IP Addresses
  - a. If equipped, remove the check from the box  labeled **Wireless Networking**
3. Verify Ethernet Connection from the **Main** to the **Jockey** Controller network switch.
4. Verify Ethernet Connection from the **Jockey** to the **FireConnect Gateway Controller**.



## Setting up the Main Controller; Mark III/Vizitouch 2.0

To enter or change these controller settings, this will require a Level-2 access code from the respective controller manufacturer, Firetrol or Tornatech. Please stop now and contact the manufacturer to obtain the correct password. For Firetrol controllers, email [fieldservices@firetrol.com](mailto:fieldservices@firetrol.com) to obtain a password, or contact Tornatech directly at <https://www.tornatech.com/contact/>.

Once you have the password, tap on the  icon from the home screen to access the password entry screen. Once you have entered the password, the icon will appear green and unlocked  allowing you to navigate to and modify the network parameters.

### **Menu Path- Settings > Advanced > Network Config**

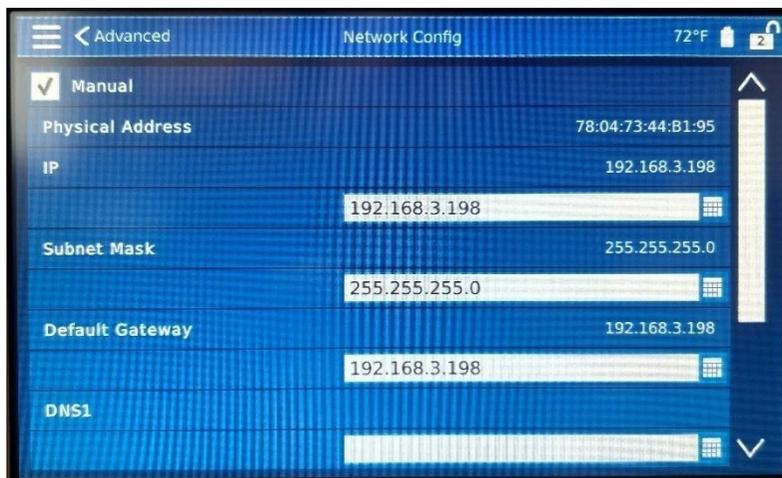
Be sure to check  the **Manual Addressing** field in the network configuration settings while entering the IP Addresses. If equipped, remove the check from the box  labeled **Wireless Networking**.

After indicating your selection for the Manual Address field, enter the following three addresses in their respective location on the screen:

**IP Address- 192.168.003.198**

**Subnet Mask- 255.255.255.000**

**Default Gateway 192.168.003.198**



Next, we will need to verify connection from the Jockey to the Main Fire Pump Controller. This is done by ethernet cable connection and can be connected at two locations on the Main Controller.

The connection to the FireConnect Jockey Controller is covered in the next section. Power cycling the controllers after completing all action items is required!

**Option-1** – Connection to the outside of the main controller via an ethernet cable on equipped models.

**Option-2** – Connect directly to the back of the HMI panel interface for an internal conduit connection.

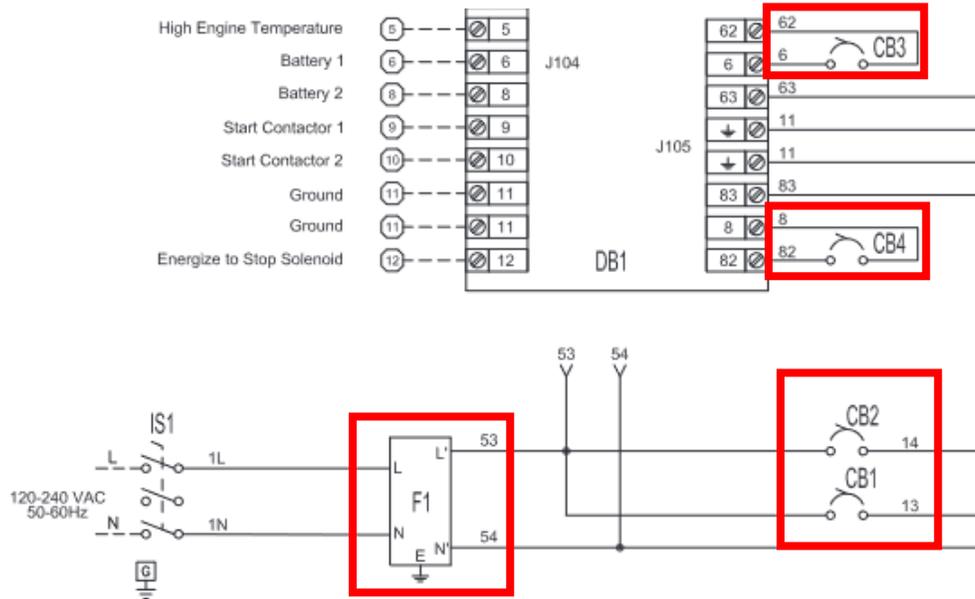
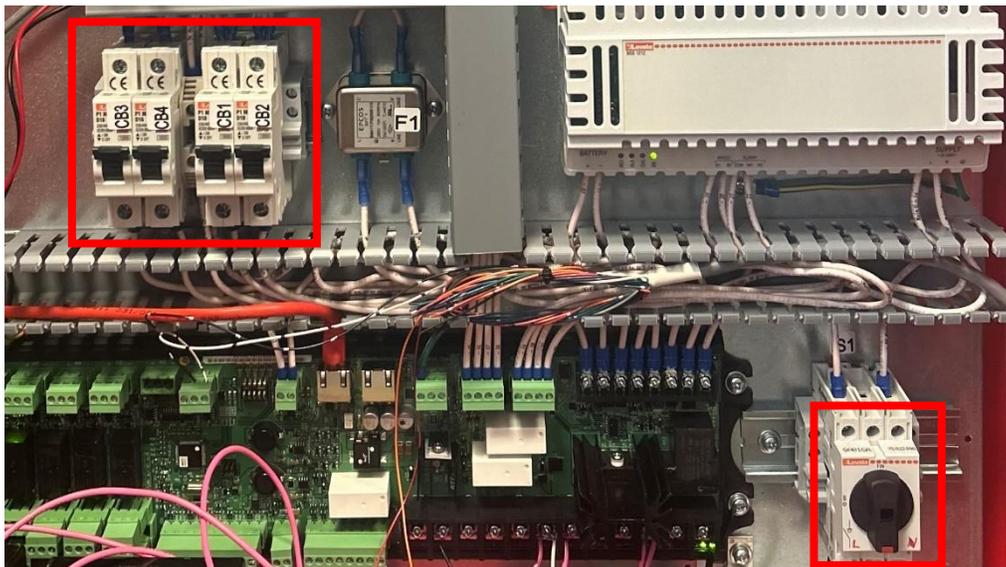


## Diesel Specific Controllers

It is important to note, Diesel Controllers will require the circuit to be broken from the 12-24VDC engine batteries to the HMI panel in order to perform a proper ON/OFF/ON Power Cycle. This is because the panel interface operates on the 12-24VDC source voltage supplied by the batteries.

This action can be performed by cycling off all the Circuit Breakers, typically labeled CB1-CB4, in addition to the Isolation Switch, typically labeled IS1m. This completely disconnects the circuit between the batteries, the chargers, and all terminal connections inside the controller.

All Breakers and Isolation Switches should be located and verified according to the respective manufacturer's installation and operation manuals, and in combination with the controller schematic. Sample images from the controller and schematics have been provided but are subject to change based on model and options.



## Setting up the Jockey Controller; Mark III/Vizitouch 2.0

To enter or change these controller settings, this will require a Level-2 access code from the respective controller manufacturer, Firetrol or Tornatech. Please stop now and contact the manufacturer to obtain the correct password. For Firetrol controllers, email [fieldservices@firetrol.com](mailto:fieldservices@firetrol.com) to obtain a password, or contact Tornatech directly at <https://www.tornatech.com/contact/>.

Once you have the password, tap on the  icon from the home screen to access the password entry screen. Once you have entered the password, the icon will appear green and unlocked  allowing you to navigate to and modify the network parameters.

### Menu Path- Settings > Advanced > Network Config

Be sure to check  the **Manual Addressing** field in the network configuration settings while entering the IP Addresses. If equipped, remove the check from the box  labeled **Wireless Networking**.

After indicating your selection for the Manual Address field, enter the following three addresses in their respective location on the screen:

**IP Address-** 192.168.003.199  
**Subnet Mask-** 255.255.255.000  
**Default Gateway** 192.168.003.199



Next, we will need to verify connection from the Jockey to the Main Fire Pump Controller. This is done by ethernet cable connection and can be connected at two locations on the Jockey Controller, similar to the Main Controller.

The major difference between these branded **Main** and **Jockey Controllers** is the **Network Switch/Hub**, located in the **Jockey Controller**. This is not a default option or component, and these controllers will require having been ordered with the specific option for Network Communications.

These controllers all have the programming by default, hardware can be purchased for retrofitting if required.

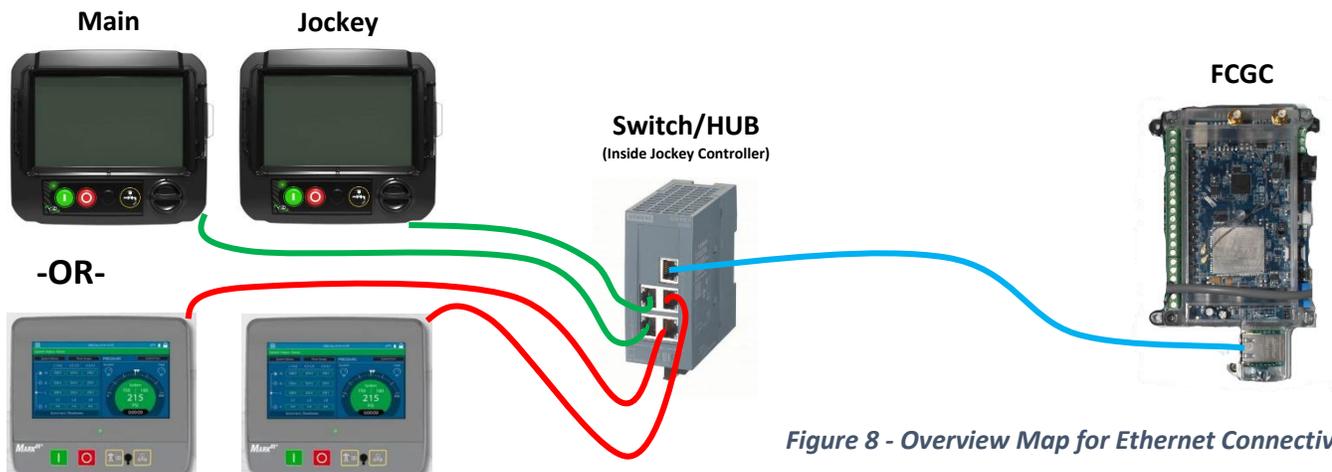


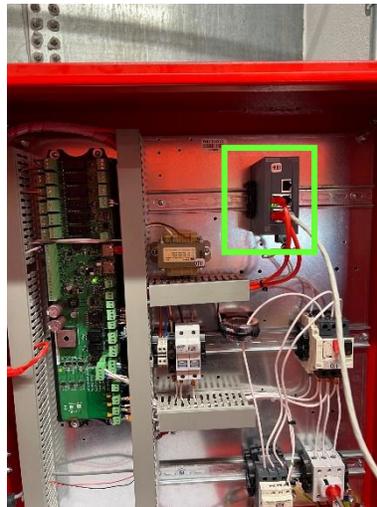
Figure 8 - Overview Map for Ethernet Connectivity

The connectivity map pictured above is how the overall ethernet structure should appear when viewed as a whole. The images below are from actual controllers with FireConnect integration. Please note, controller models may vary in design. However, the key components will remain the same

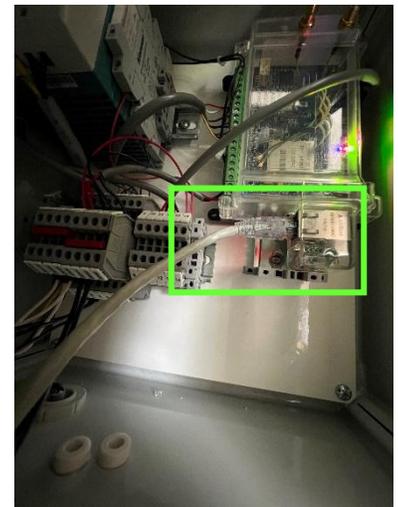
**Main Fire Pump Controller**



**Jockey Pump Controller**



**FireConnect Gateway Controller**



These units can be configured in either manor, using the exterior ethernet port, or removing the connecting wire, and connecting directly into the back of the interface for a sealed conduit connection. The ports used on the **switch**, or **HUB1** as seen in the images above, are not of importance. Any one of them can be used for any of the controllers. What is important, is they are all three, the Main, the Jockey, and the FireConnect, all connected to the **HUB/Switch**.

Once the connection layout has been confirmed correct and the IP addresses have been entered correctly on both controllers (don't forget to check  the **Manual Addressing** field while entering the addresses and if equipped, remove the check from the box  labeled **Wireless Networking**.), you can now power cycle all three systems. The **Main Fire Pump Controller**, the **Jockey Controller**, and the **FireConnect Gateway Controller** are the three systems to **Power Cycle**.

To properly **Power Cycle** a system, this involves disconnecting the power to the interface for approximately 60-seconds. When the unit is powered back on, all system and networking changes we have just applied will be forced into action. (See special Diesel Main Controller section above for **Power Cycling** methods)

## Peerless Pump Contact Information



### Peerless Pump Company

2005 Dr. Martin Luther King Jr

Indianapolis, 46202 - U.S.A.

Phone: (+1) (317) 925-9661

[www.peerlesspump.com](http://www.peerlesspump.com)