DUPLEXER
INSTRUCTION MANUAL

MOTOR PROTECTION ELECTRONICS, LLC

DUPLEXER

APPLICATIONS

- Duplex Pumping Stations that Control Liquid Level
- Pump Down (Empty a Tank) or Pump Up (Fill a Tank)
- Where Connection to a SCADA System is Required

FEATURES

- Float or Conductance Probe Level Inputs
- Duplex Alternation
- Level Input Indication
- Pump Call Indication
- High Alarm Indication with Latch Feature
- Power On Indication
- Level Simulation Push-Button
- HOA and Lead Select Switches
- Pump Call and High Level Alarm Relays
- Surge Protected Level Inputs
- Start Up Delay
- Lag Pump Delay
- RS232 Port or Ethernet Port with Modbus Protocol
- SCADA Feature - Pump Run Elapsed Time Meters
- SCADA Feature - Pump Last Run Cycle Time Meters
- SCADA Feature - Pump Start Counters
- Setup and Troubleshooting Features Available using a Separately Supplied Touch Screen Interface Device

SPECIFICATIONS

Input Power:	120 VAC ±10%, 10 VA max
Relay Outputs:	6 A Resistive @ 120 VAC 3.6 A Inductive @ 120 VAC
Agency Approval:	UL 508, CAN/CSA UL FILE #: E101681
Operating Temp:	-20 °C to +60 °C
Storage Temp:	-45 °C to +85 °C
Indicators:	LED
Sensor Output Voltage:	±5 V Square wave
Sensor Output Current:	±0.5 mA max (per sensor)
Color:	White with Blue Lettering
Enclosure Material:	Lexan

ORDERING INFORMATION

Part Number: 010 - 120 - 122 P X

Communication Options:

R = RS232 Port: COM1
E = Ethernet Port: ENET1

TOUCH SCREEN INTERFACE DEVICE

The Touch Screen Interface Device (TSID) is a optional piece of equipment that is used to perform troubleshooting and customization of the DUPLEXER for specific applications. It provides full access to all the setup and diagnostic parameters. It also has a screen designed to demo the SCADA capabilities of the DUPLEXER.

TSID FUNCTIONS

- View Status of Float Switch / Level Probe Inputs
- View Level Input Out of Sequence Data
- Setup of the Following Parameters:
    - Alarm Reset Mode
    - Start Up Delay
    - Lag Pump Delay
    - Pump Up / Down Mode
    - Level Input Sensitivity
    - Remote Control Command Cancel Delay
    - Communication Setup for use in SCADA System
- View and Reset Fault Codes
- Demo SCADA features

TSID COMMUNICATION WITH DUPLEXER

The **Touch Screen Interface Device (TSID)** communicates with the DUPLEXER through its RS232 Serial Port (COM1) or through its Ethernet Port (ENET1).

For the TSID to communicate with the DUPLEXER, the Communication Port (COM1 or ENET1) setup parameters must match the settings on the TSID. The default settings on the DUPLEXER will already match.

However, the DUPLEXER's communication port settings may have been changed to accommodate connection to a SCADA system. In such cases the communication port settings will need to be returned to the default settings.

To temporarily return the DUPLEXER's communication port settings to their default, hold down the pushbutton on the DUPLEXER while cycling power to the DUPLEXER. (On the older model of the DUPLEXER, hold down the pushbutton on the DUPLEXER for 22 seconds.)

When all the work using the TSID is completed, the power to the DUPLEXER must be cycled for any changes to the Communication Setup Parameters to take effect.

The Touch Screen Interface Device (TSID) consists of a seven inch Touch Screen panel made by Automation Direct, housed in a durable carrying case with a power cord and interface cables (RS232 and Ethernet) for connection to the DUPLEXER. It is programmed as a Modbus Master that continually polls the DUPLEXER.

ORDERING INFORMATION

Part Number: TSID

H-O-A TOGGLE SWITCHES

The H-O-A (HAND-OFF-AUTO) toggle switches provide control over the pumps for maintenance or testing purposes. When a pump's H-O-A switch is placed in the "HAND" position the pump will be called to run. When placed in the "Auto" position the respective pump will be turned on and off as needed to maintain the wet well level, based on the level inputs. Placing a pump's H-O-A in the "Off" position disables the pump from operating.

PUMP ON INDICATORS

The Pump ON indicators are turned on when the respective pump call relay is energized, in either "HAND" or "AUTO" mode.

POWER INDICATOR

The DUPLEXER monitors its internal power supply voltage and turns on the "POWER" indicator whenever there is sufficient electrical power for the unit to function. When the "POWER" indicator is off, the power supply voltage is too low for the unit to function. The Duplexer requires at least 100 VAC, but it can ride through a brief brown out.

LEAD SELECT TOGGLE SWITCH

For normal automatic alternation of the pumps set the Lead Select toggle switch to the "AUTO" position. In cases where one of the two pumps is not available for service or has maintenance issues, the other pump may be selected as lead by setting the Lead Select toggle switch to either "1" or "2" .

HIGH LEVEL ALARM

High Alarm & Relay

The indicator labeled "HIGH ALARM" is turned on whenever the ALARM input is closed or covered. The ALARM relay contact will also be closed. As soon as the ALARM input is opened or uncovered the HIGH ALARM indicator will be turned off and the ALARM relay contact will open. This indicator and the ALARM relay does not latch on and is not effected by the alarm latch/reset feature discussed below.

Level Status - Alarm

The indicator under "LEVEL STATUS" labeled "ALARM" is turned on whenever the ALARM input is closed or covered. It is part of the column of indicators that provides level indication. The alarm indication will remain latched on to provide a record of the condition, provided the Alarm Reset Mode is set for manual reset. If in the Manual Reset mode and if no longer in a High Level Alarm condition, pressing the pushbutton on the DUPLEXER will reset the latched ALARM.

Alarm Reset Mode

The **Alarm Reset Mode** may be changed using the **Touch Screen Interface Device**.

Parameter	Register Address	Default Value	Setting Definitions
Alarm Reset Mode	40019	1	1 = Manual Reset (by Pressing the Pushbutton) 2 = Auto Reset (when no longer at Alarm Level)

Remote Alarm Reset

While in the "Manual Reset" mode, the latched "ALARM" indication may be reset remotely through SCADA by momentarily setting Modbus Coil 7 (Modbus Register 40001 Bit 6).

PUMP DELAYS

Start Up Delay

Whenever electrical power is lost and then restored, immediate pump operation is prevented by the Start Up Delay which must first expire before a pump may be called to run.

Lag Pump Delay

Any time one of the pumps is called to run, the Lag Pump Delay must first expire before the other pump may be called to run.

The **Pump Delay** settings may be changed using the **Touch Screen Interface Device**.

Parameter	Register Address	Default Value	Setting Definitions
Start Up Delay	40021	10 seconds	Range: 10 - 100 seconds Sets the delay before the first pump may be started after a power outage.
Lag Pump Delay	40017	5 seconds	Range: 1 - 100 seconds Sets the delay before a second pump may be started after the first pump is started.

LEVEL SIMULATION

Entering the Level Simulation Mode

To enter the Level Simulation mode press and hold the pushbutton, on the front of the unit, for three seconds or until one or more of the level indicators are turned on.

Increasing the Simulated Level

To increase the simulated level, hold the pushbutton until the desired level is indicated on the level status indicators. There is a three second delay between levels. With the H-O-A's in the "Auto" position, the pumps will be called to run as the level is increased to the Lead and Lag levels.

Decreasing the Simulated Level

To decrease the simulated level, release the pushbutton. The level will decrease by one level every three seconds.

Exiting the Level Simulation Mode

To exit the Level Simulation mode, release the pushbutton and wait until all the level indicators are turned off. Three seconds after the last level indicator is turned off, the unit exits the Level Simulation mode.

PUMP UP / DOWN MODE

The controller may be used in either a Pump Down (empty a tank) or Pump Up (fill a tank) level control application. The level inputs may be connected to either four float switches, four single point conductance probes, or selected points on a ten point conductance probe.

Where float switches are used, the float switch contacts must be the Normally Open type that close as the liquid level rises to cover or tilt the float switch.

Where a conductance probe is used, care must be taken to ensure that liquid is grounded and that the Level Input Sensitivity setting is correct for the liquid being controlled. See the section in this manual on the "Level Inputs".

Note: When operated in the Pump Up mode, the Off, Lead, and Lag level status indicators will turn on as the level drops below the respective level input points.

The **Pump Up / Down Mode** may be changed using the **Touch Screen Interface Device**.

Parameter	Register Address	Default Value	Setting Definitions
Pump Up / Down Mode	40016	1	1 = Pump Down (Empty a Tank) 2 = Pump Up (Fill a Tank)

LEVEL INPUTS

The Off, Lead, Lag, and Alarm level inputs allow the DUPLEXER to determine the level of the liquid in the wet well. The inputs may be connected to either four float switches, four single point conductance probes, or four selected points on a ten point conductance probe.

The DUPLEXER sends a ±5V square wave signal to each of the float switches or probe electrodes and monitors the signals. For applications that use float switches, the common side of all the float switches is connected to ground. In applications that use a conductance probe (Level Probe), the liquid must be grounded. When a float switch is closed or liquid covers one of the probe electrodes, the square wave signal is partially or fully diverted to ground, and the respective input's Level Input Status Value changes from a high number to a lower number. The Level Input Status Value associated with the input is then compared to the Level Input Sensitivity setting. When the input's Level Input Status Value is determined to be below the Level Input Sensitivity setting, the input is considered to be closed or covered.

Float Switch Applications

Where float switches are used, the float switch contacts must be the Normally Open type that close as the liquid level rises to cover or tilt the float switch. This type float switch is required for both the Pump Down (empty a tank) mode, and for the Pump Up (fill a tank) mode. When the DUPLEXER is operated in the Pump Up mode, the state of the Off, Lead, and Lag inputs is inverted by the logic inside the DUPLEXER, allowing the use of the Normally Open type float switch.

Conductance Probe Applications

For applications that use a conductance probe, the liquid in the wet well must contain ions which allow the water to conduct electrical current. Sewage contains a lot of ions and is a very good conductor of electricity. However, clean water has a low number of ions, and can be difficult to detect. Using a conductance probe to detect storm water is not recommended. While storm water may start out with enough ions to detect, it usually become more difficult to detect the longer it rains, as the run off becomes cleaner.

Grounding The Liquid

When used with a conductance probe the liquid in the wet well must have an electrical connection to the control panel ground. Where a submersible pump is present, the grounded housing of the pump is sufficient. In the absence of any other path to ground, a single point probe, or the bottom electrode of a ten point probe, may be placed low in the wet well and connected to the control panel ground.

Level Input Sensitivity

The **Level Input Sensitivity** may be changed using the **Touch Screen Interface Device**.

Parameter	Register Address	Default Value	Recommended Setting
Level Input Sensitivity	40018	100	Float Switch 100 Typical Sewage (Conductance Probe) 100 Light Sewage (Conductance Probe) 150

Note: The Level Inputs, when connected to a Level Probe, read sewage very effectively but will not reliably read storm water or well water.

REMOTE PUMP CONTROL

Disable Pumps

The pumps may be disabled through the SCADA system by setting Modbus Coil 1 or 2 (Register 40001 Bits 0 or 1).

To return a pump to normal control clear Modbus Coil 1 or 2 (Register 40001 Bits 0 or 1).

Force On Pumps

The pumps may be forced on through the SCADA system by setting Modbus Coil 3 or 4 (Register 40001 Bits 2 or 3).

To return a pump to normal control clear Modbus Coil 3 or 4 (Register 40001 Bits 2 or 3).

Remote Control Command Cancel Delay

If communication with the SCADA system is lost while the pumps are being controlled remotely, the remote control commands will be automatically canceled upon the expiration of the Remote Control Command Cancel Delay. Momentarily turning off the electrical power to the controller will also cancel the remote control commands.

The Remote Control Command Cancel Delay may be changed using the Touch Screen Interface Device. See Page 11.

FORCE PUMP ALTERNATION

An operator may remotely force alternation of the pumps through SCADA by momentarily setting Modbus Coil 25 (Register 40002, Bit 8). For the feature to work the LEAD SELECT toggle switch on the DUPLEXER must be set to "AUTO".

CURRENT LEAD PUMP POSITION

The number of the pump that is currently the "Lead Pump" may be viewed through SCADA from Modbus Register 40054.

ELAPSED TIME METERS

The **Elapsed Time Meters** keep track of how many hours the pumps have run since the last time the meters were reset. They may be read through the SCADA system at Modbus Registers 40006 - 40007. The values read from these Registers are intended for use in comparing the pump run time of one pump with the run time of the other pump, for the purpose of checking for uneven run times, not for pump warranty purposes. (Uneven run times is an indication of a maintenance problem with one of the pumps.) Periodically the comparison of run times should be made and the Registers should be reset to zero. The data is stored in non-volatile memory so that the data is not lost during a power outage. To reset one of the ETMs to zero, momentarily set Modbus Coils 5 - 6 (Register 40001 Bits 4 - 5). The Elapsed Time Meter registers have a range of 0.0 - 6553.5 hours, where the decimal point must be inserted by the HMI.

LAST RUN CYCLE TIME METERS

The **Last Run Cycle Time Meters** keep track of how long a pump ran during its last run cycle. The data may be read from Modbus Registers 40008 - 40009. The data is stored in non-volatile memory so that the data is not lost during a power outage. To reset the meters to zero, momentarily set Modbus Coils 9 - 10 (Register 40001 Bits 8 - 9).

PUMP START COUNTERS

The **Pump Start Counters** keep track of how many pump starts have occurred since the last time the counters were reset. The data may be read from Modbus Registers 40010 - 40011. The data is stored in non-volatile memory so that it is not lost during a power outage. To reset the counters to zero, momentarily set Modbus Coils 11 - 12 (Register 40001 Bits 10 - 11).

OUT-OF-SEQUENCE - Pump Operation - Pump Down Mode

In the Pump Down Mode the Out-Of-Sequence logic detects when an input fails to close in the correct order and provides the modified pump operation described below:

Out-Of-Sequence Condition	Pump Operation
OFF INPUT - Out-Of-Sequence **Lead** and **Lag** Inputs Close Before the **Off**.	Turns on 1st pump when the **Lead** and **Lag** inputs close. Turns on 2nd pump when **High** input closes.
LEAD INPUT - Out-Of-Sequence **Off** and **Lag** Inputs Close Before the **Lead**.	Turns on 1st pump when the **Off** and **Lag** inputs close. Turns on 2nd pump when **High** input closes.
LAG INPUT - Out-Of-Sequence **Off**, **Lead**, and **High** Inputs Close Before the **Lag**.	Turns on 1st pump when the **Off** and **Lead** inputs close. Turns on 2nd pump when **High** input closes.
OFF and LEAD INPUTS - Out-Of-Sequence **Lag** and **High** Inputs Close Before the **Off** and **Lead**.	Turns on both pumps when the **Lag** and the **High** inputs close.
OFF and LAG INPUTS - Out-Of-Sequence **Lead** and **High** Inputs Close Before the **Off** and **Lag**.	Turns on both pumps when the **Lead** and the **High** inputs close.
LEAD and LAG INPUTS - Out-Of-Sequence **Off** and **High** Inputs Close Before the **Lead** and **Lag**.	Turns on both pumps when the **Off** and the **High** inputs close.
HIGH INPUT - Out-Of-Sequence **High** Input fails to Open Before **Off, Lead** & **Lag** Inputs Open. (High Input Always Closed.)	Turns on both pumps when either the **Off**, **Lead** or **Lag** inputs close.

OUT OF SEQUENCE - Pump Operation - Pump Up Mode

In the Pump Up Mode the Out-Of-Sequence logic detects when an input fails to Open in the correct order and provides the modified pump operation described below:

Out-Of-Sequence Condition	Pump Operation
HIGH INPUT - Out-Of-Sequence **High** Input fails to Open Before **Off, Lead** and **Lag** Inputs Open. (High Input Always Closed.)	The **High** level input operates as a redundant Off. If it fails to open as the level drops, it will prevent pump operation until the **Off, Lead** and **Lag** inputs all open, then both pumps will be turned on.
OFF INPUT - Out-Of-Sequence **Lead** Input Open Before the **Off**.	Turns on both pumps when the **Lead** and **Lag** inputs open.
LEAD INPUT - Out-Of-Sequence **Off** and **Lag** Inputs Open Before the **Lead**.	Turns on both pumps when the **Off** and **Lag** inputs open.

Note: When both pumps are called to run the **Lag Pump Delay** is active to prevent both pumps from coming on at the same time.

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OUT-OF-SEQUENCE - Trouble Shooting

Currently Out-Of-Sequence

When Level Inputs are currently out of sequence, the "Currently Out-Of-Sequence" data is placed into Modbus Coils 65-68 (Register 40005 Bits 0-3). It may be viewed using the **Touch Screen Interface Device**.

Latched Out-Of-Sequence

When Level Inputs are Out-Of-Sequence the fault data is copied and latched so that later an operator may view which inputs were previously Out-Of-Sequence. The "Latched Out-Of-Sequence" data is placed into Modbus Coils 69-72 (Register 40005 Bits 4-7). The "Latched Out-Of-Sequence" data is stored in non-volatile memory and may be read even if power to the unit had been interrupted. It may be viewed using the **Touch Screen Interface Device**. The data may be erased by pressing the "Fault Reset" button on the Touch Screen Interface Device, which momentarily sets the "Fault Code - Reset" Modbus Coil 8 (Register 40001, Bit 7).

Whenever there is an input with a "Latched Out-Of-Sequence" condition "Fault Code" 11, 12, 13 or 14 will also be present as the "Fault Code", Modbus Register 40004.

FAULT CODES

Fault Code

When a fault condition currently exists, a **Fault Code (FLC)** is generated and placed into Modbus Register 40004. It may be viewed using the **Touch Screen Interface Device**.

Last Fault Code

The **Last Fault Code (LFC)** is a record of the **Fault Code** condition that was detected. It is stored in non-volatile memory and may be read even if power to the unit had been interrupted. It is placed into Modbus Register 40051. It may be viewed and reset using the **Touch Screen Interface Device**.

Fault Code Table

Fault Code	Description of Condition
0	Normal
Communication Faults	
1	The UART detected an Overrun Error reading incoming message.
2	The UART detected a Parity Error reading the incoming message.
3	The UART detected a Framing Error or Parity Error reading the incoming message.
4	Incoming message failed Checksum Test.
5	Incoming message Length Error. Maximum Allowed: 80 Bytes
6	Incoming message with Function Code No. 15 - Byte Count Limit Exceeded. Maximum Allowed: 13 Bytes
7	Incoming message with Function Code No. 15 - Coil Quantity Exceeds what is Allowed by Byte Count.
8	Incoming message with Function Code No. 16 - Byte Count Limit Exceeded. Maximum Allowed: 70 Bytes
Level Input Faults	
11	Level Input - Off Latched Out-Of-Sequence
12	Level Input - Lead Latched Out-Of-Sequence
13	Level Input - Lag Latched Out-Of-Sequence
14	Level Input - Alarm Latched Out-Of-Sequence

COMMUNICATION PORT

The DUPLEXER may be ordered with either an RS232 Serial Port (COM1) or an Ethernet Port (ENET1), but not both.

Either COM1 or ENET1 may be used to connected to a SCADA system or to the TSID.

The **RS232 Serial Port - COM1** uses the Modbus RTU protocol.

The **Ethernet Port - ENET1** uses the Modbus TCP protocol.

The DUPLEXER's Communication Port (COM1 or ENET1) operates as a Modbus Slave, where all communication is initiated by the connected device, which must be a Modbus Master.

MODBUS FUNCTIONS SUPPORTED

Function Code	Function Description	Notes
01	Read Coil Status	
02	Read Input Status	
03	Read Holding Registers	
04	Read Input Registers	
05	Force Single Coil	
06	Preset Single Register	
08	Diagnostics - Sub-function 00 (Return Query Data)	
15	Force Multiple Coils	Limited to 104 Coils
16	Preset Multiple Registers	Limited to 1 Register

TSID COMMUNICATION WITH DUPLEXER

The **Touch Screen Interface Device (TSID)** communicates with the DUPLEXER through its RS232 Serial Port (COM1) or through its Ethernet Port (ENET1).

For the TSID to communicate with the DUPLEXER, the Communication Port (COM1 or ENET1) setup parameters must match the settings on the TSID. The default settings on the DUPLEXER will already match.

If the DUPLEXER's communication port settings have been changed to accommodate connection to a SCADA system, the communication port settings will need to be temporarily returned to their default settings.

To temporarily return the DUPLEXER's communication port settings to their default settings, hold down the pushbutton on the DUPLEXER while cycling power to the DUPLEXER. (On the older model of the DUPLEXER, hold down the pushbutton on the DUPLEXER for 22 seconds.)

When all the work using the TSID is completed, the power to the DUPLEXER must be cycled for any changes to the Communication Setup parameters to take effect.

REGISTER ACCESS MODE

The Register Access Mode feature (when set on Read Only) prevents malicious attempts to remotely control the pumps, or change setup parameter values. Unless needed, the Register Access Mode should be left on Read & Write.

The Register Access Mode parameter may be setup using the **Touch Screen Interface Device**:

Parameter	Register Address	Default Value	Setting Definitions
Register Access Mode	40020	1	1 = Read & Write 2 = Read Only

NOTE: If the Register Access Mode is changed to "Read Only" the DUPLEXER will continue to allow changes to parameter values until the next cycling of the power and then the change will take effect.

To temporarily change the DUPLEXER's Register Access Mode to Read & Write, hold down the pushbutton on the DUPLEXER while cycling power to the DUPLEXER. (On the older model of the DUPLEXER, hold down the pushbutton on the DUPLEXER for 22 seconds.)

REMOTE CONTROL COMMAND CANCEL DELAY

If communication with the SCADA system is lost while the pumps are being controlled remotely, the remote control commands will be automatically canceled upon the expiration of the Remote Control Command Cancel Delay. Momentarily turning off the electrical power to the DUPLEXER will also cancel the remote control commands.

The **Remote Control Command Cancel Delay** may be changed using the **Touch Screen Interface Device**.

Parameter	Register Address	Default Value	Setting Definition
Remote Control Command Cancel Delay	40027	1 minute	Delay Range: 1 - 255 minutes Delays the canceling of Remote Control Commands upon loss of communication. Note: To Prevent Remote Control Commands from being canceled - Set On: 0

RS232 SERIAL PORT - COM1

The RS232 Serial Port COM1 operates using the Modbus RTU protocol. The serial port may be used to communicate with the Touch Screen Interface Device, or it may be used to connect to a SCADA system.

The Serial Port COM1 must be setup to communicate with the device it is connected to. The Baud Rate, Parity Mode and Stop Bits parameter values of the two devices must be set to match. Also, the Slave Address must be set to a number that is associated with the lift station.

The following parameters may be setup using the **Touch Screen Interface Device**:

Parameter	Register Address	Default Value	Setting Definitions
Slave Address	40022	1	Range: 1 - 247
Baud Rate	40023	4	2 = 2400 bps 3 = 4800 bps 4 = 9600 bps
Parity Mode	40024	0	0 = No Parity 1 = Odd Parity 2 = Even Parity
Stop Bits	40025	2	1 = 1 Stop Bit 2 = 2 Stop Bits (The 2nd Stop Bit is available only when No Parity is selected)

Note:
The RS232 Serial Port (COM1) logic reads the setup values upon power up. Any changes to the above settings require that the power to be cycled before the new values are used.

COM1

11
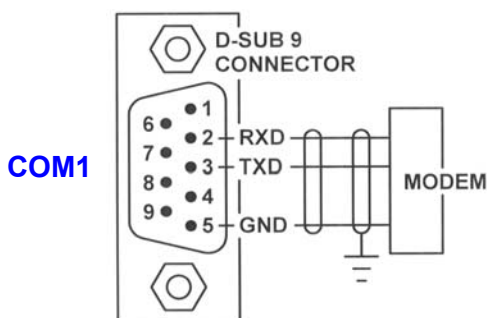
ETHERNET PORT - ENET1

Description

The Ethernet Port has the following features:
- Protocol Supported: Modbus TCP
- IEEE 802.3 Compliant
- Auto-negotiation of Communication Speed: 10 or 100 Mbps
- Auto-negotiation of Duplex Mode: Half or Full Duplex
- Link, and Active status LED indicators

ENET1

LED Indicator	OFF	ON
LINK (Green)	Not Linked	Linked
ACTIVE (Yellow)	Idle	Active Communication
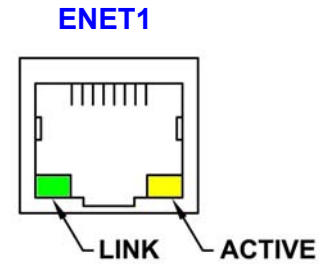
Parameter	Default Value	Register Address	Parameter Definitions
Ethernet Port ENET1 Setup			
Protocol	2	40200	2 = Modbus TCP
IP Address	192 . 168 . 80 . 12	40204-40201	Range: 0 - 255 Identifier for the device on an IP network.
Subnet Mask	255 . 255 . 255 . 0	40226-40223	Range: 0 - 255 Range of IP addresses that can be Directly connected in the network.
Default Gateway	192 . 168 . 80 . 1	40230-40227	Range: 0 - 255 A node on the network that serves as an entrance to another network when no direct connection exists.
Port Number	502	40232	Range: 1 - 65,535
Ethernet Port ENET1 MAC Address			
MAC Address	0 : 80 : 194 : 219 : XXX : XXX	40222-40217	Unique number that identifies each field device. It is set at the factory, and should not be changed.

Note**:**
The Ethernet Port (ENET1) logic reads the setup values upon power up. Any changes to the above settings require that the power to be cycled before the new values are used.

SCADA REGISTERS

SCADA Register Address: 40001

Description of Register Contents (Where a Modbus Coil is represented by a Bit in a Register)

Coil	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Description					Pump 2 Start Counter Reset	Pump 1 Start Counter Reset	Pump 2 Last Run Cycle Time Reset	Pump 1 Last Run Cycle Time Reset	Fault Code - Reset	Level Status - Alarm - Reset	Pump 2 ETM - Reset	Pump 1 ETM - Reset	Pump 2 Remote Control Force Pump On	Pump 1 Remote Control Force Pump On	Pump 2 Remote Control Disable Pump Operation	Pump 1 Remote Control Disable Pump Operation
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

SCADA Register Address: 40002

Coil	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
Description								Force Pump Alternation	Fault Code Register Has Non-zero Fault Code	Level Status - Alarm Latched On	Pump 2 - Called	Pump 1 - Called	Level Status - Alarm	Level Status - Lag	Level Status - Lead	Level Status - Off
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

SCADA Register Address: 40005

Coil	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65
Description									Level Input - Alarm Latched Out of Sequence	Level Input - Lag Latched Out of Sequence	Level Input - Lead Latched Out of Sequence	Level Input - Off Latched Out of Sequence	Level Input - Alarm Currently Out of Sequence	Level Input - Lag Currently Out of Sequence	Level Input - Lead Currently Out of Sequence	Level Input - Off Currently Out of Sequence
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

SCADA REGISTERS

SCADA Register Address	Description of SCADA Data Registers
40004	Fault Code (FLC)
40051	Last Fault Code (LFC)
40006	Pump 1 Elapsed Time Meter (hours and 1/10 hours) Range: 0.0 - 6553.5 hours
40007	Pump 2 Elapsed Time Meter (hours and 1/10 hours) Range: 0.0 - 6553.5 hours
40008	Pump 1 Last Run Cycle Time (minutes and 1/10 minutes) Range: 0.0 - 6553.5 minutes
40009	Pump 2 Last Run Cycle Time (minutes and 1/10 minutes) Range: 0.0 - 6553.5 minutes
40010	Pump 1 Start Counter (Number of Pump Starts) Range: 0 - 65535 Starts
40011	Pump 2 Start Counter (Number of Pump Starts) Range: 0 - 65535 Starts
40040	Ethernet Board - Operating Program Revision Number
40041	Control Board - Operating Program Revision Number
40042	Power Supply Voltage (Volts and 1/10 Volts) Normal Range: 14.4V - 20.4V
40043	Off - Level Input - Analog Status Normal Range: Uncovered: 240 - 255 Covered: 52 - 70
40044	Lead - Level Input - Analog Status Normal Range: Uncovered: 240 - 255 Covered: 52 - 70
40045	Lag - Level Input - Analog Status Normal Range: Uncovered: 240 - 255 Covered: 52 - 70
40046	Alarm - Level Input - Analog Status Normal Range: Uncovered: 240 - 255 Covered: 52 - 70
40054	Current Lead Pump Position

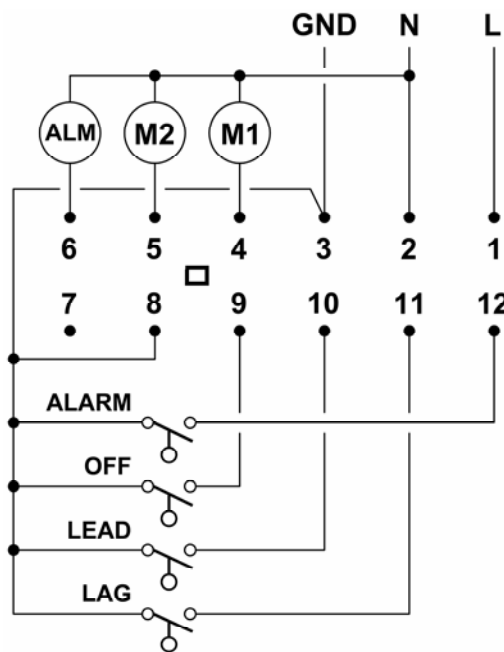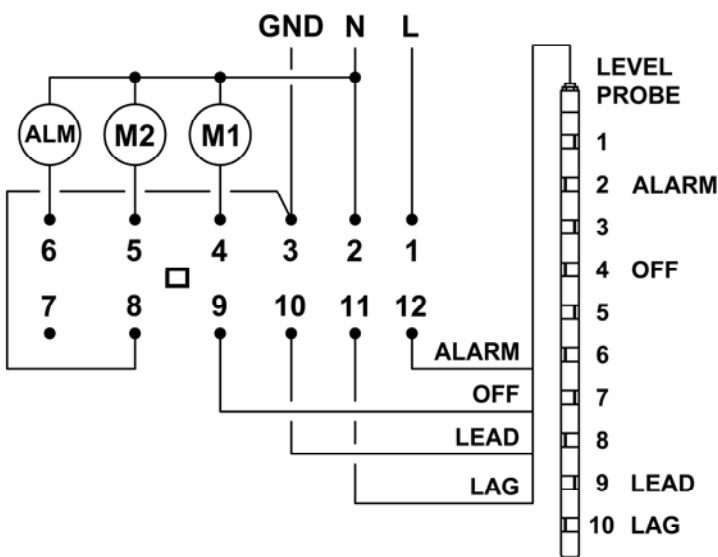# CONNECTION DIAGRAMS

Pump Down (Empty A Tank)
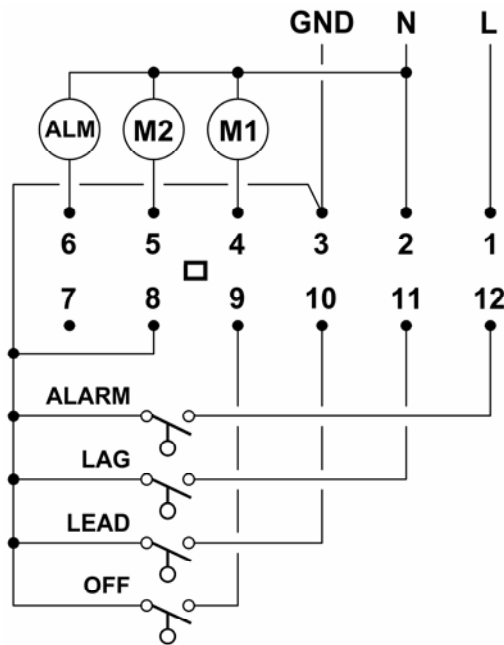
Float Switch Inputs
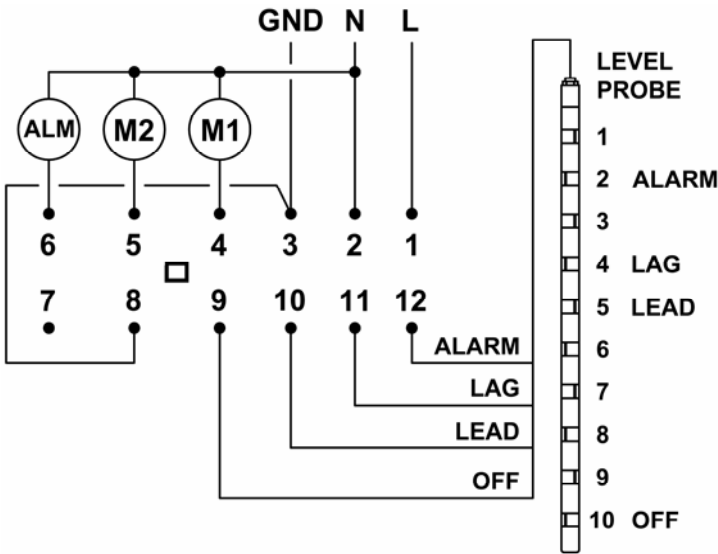
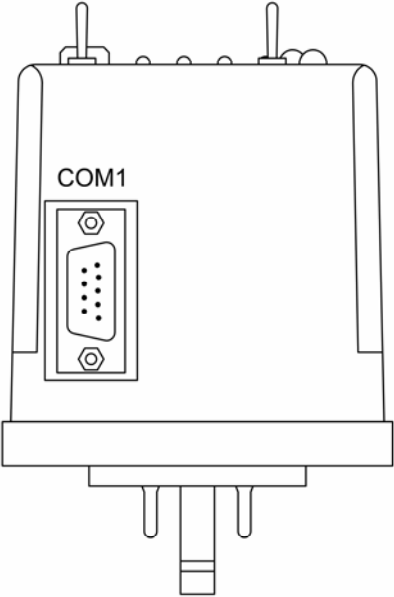**Level Probe Input**
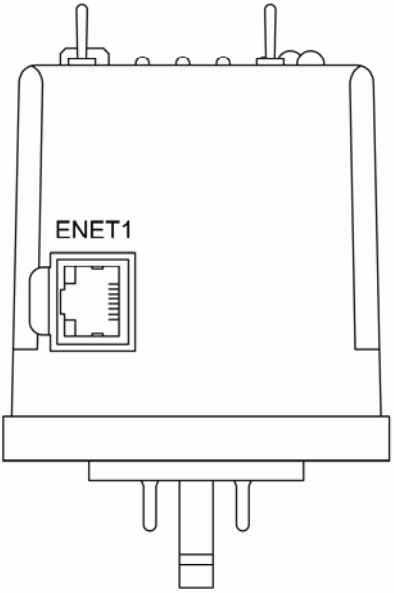
Pump Up (Fill A Tank)

Float Switch Inputs

Level Probe Input

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ENCLOSURE MECHANICAL LAYOUT

Front View

ON   HIGH ALARM   LEVEL STATUS   ON

H - 0 - A PUMP 1

POWER

ALARM
LAG
LEAD
OFF

H - 0 - A PUMP 2

DUPLEX CONTROLLER

ALARM RESET
PUSH & HOLD TO SIMULATE LEVEL

LEAD SELECT

AUTO
1   2

COM1

Right Side View
With Serial Port

Side View

3.60"

3.10"

ENET1

Right Side View
With Ethernet Port

Bottom View

2.85"

3.60"

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