



## MANUAL FOR MODEL FD4 FIRE PUMP CONTROLLERS

Starting Serial No. "EF"

This manual provides General Information, Installation, Operation, Maintenance and System Set-Up Information for METRON Model FD-4 Engine Driven Fire Pump Controllers.

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## PART I: GENERAL INFORMATION

The basic function of the model FD4 Fire Pump Controller for diesel engine driven fire pumps is to automatically start the engine upon a drop in pressure in the water main, or from a number of other demand signals. This controller provides automatic cycled cranking, alarm and/or alarm shutdown protection for various engine failures. Stopping of the engine after the demand period is over may be either manual or automatic. This controller also includes an automatic weekly test starting feature.

## PART II: FUNCTIONS

Equipment is provided in the Controller to provide the following functions:

- A. Automatic Starting From:
  - a. Drop in water line pressure
  - b. Loss of battery charger output (if enabled)
  - c. Operation of optional remote start switches, such as remote start switch, deluge valve switch, fire alarm switch, etc.
  - d. Weekly test timer
- B. OID – Operator Interface Device - Provided for display of alarm functions, system pressure, battery volts, battery charger amps, alarm conditions, etc. Includes a 4 line by 20 character LCD for display of system messages and programming.
- C. Auto-Off-Manual selector switch.
- D. Automatic Cranking - A microprocessor controlled crank cycle timer provides six (6) fixed crank periods separated by five (5) rest periods each of approximately 15 seconds duration.
- E. Alarms and Signal Lights - Fourteen (14) Standard lights are provided to give visual signals for; **"System Fault"**, **"Battery #1 Healthy"**, **"Battery #2 Healthy"**, **"Charger #1 Failure"**, **"Charger #2 Failure"**, **"AC Power Loss"**, **"Engine Running"**, **"Engine Failed to Start"**, **"Engine Low Oil Pressure"**, **"Engine High Water Temp"**, **"Engine Overspeed"**, **"Low Fuel"**, **"Speed Switch Failure"**, **"Contactor Coil Failure"**, **"ECM Alternate"**, and **"ECM Failure"**. In addition the mode buttons have LED's on the button indicating **"Auto"**, **"Manual"**, **"Test"**, or **"Off"** mode. 12 additional lights, configurable by the factory, are provided for **"Pump Room Alarms"**. An audible alarm horn is mounted on the front of the cubicle for sounding in the event of failure. Terminals are provided for remote failure indication of the following:
  - "Automatic Mode"**
  - "System Fault"**
  - "Engine Running (2 sets)"**
  - "Common Battery Fault"**
- F. A data logger is provided as standard to record system pressure along with numerous alarm conditions and system events. The data can be displayed on the OID or can be downloaded to a PC through the RS485 port provided on the main system board. Data is stored on an SD Memory card. This card contains individual pressure files with each file containing one days worth of pressure data. Each file is of the PressXXX.txt format. Each entry is stamped with the date and time and system pressure at that time. The Events.txt file contains all of the logged events with each event stamped with date and time. The SD memory card can be removed and files transferred directly to a PC using appropriate memory card reader. The controller will continue to operate normally with the SD card removed. There will, however, be a visual and audible alarm when the card is removed. Events and pressure data will continue to be logged while the card is missing. The memory cards should be replaced within 12 hours to ensure that no data is lost.
- G. A weekly test timer is supplied to automatically start the engine any set day of the week, at a set time of day, and a preset run time. See Part IV below for more information and the System Config Screen 106.
- H. **"Stop"** Pushbutton - A pushbutton is provided to stop the engine in Auto at any time provided all starting demands have cleared. This returns the controller to the automatic position. The Auto-Off-Manual selector switch can also be put in the "Off" mode to stop the engine. Any starting commands will not start the engine in the "Off" mode.
- I. Integral Battery Chargers (Option J). There are two separate fully automatic, solid state chargers provided for maintaining full charge on the dual sets of engine batteries. An LED display is provided on each charger to indicate charger AC input voltage is present and DC output voltage is present.

User Preferences Screen 218 and 219 are used to determine when the Charger Failure alarm will activate. When Screen 218 is set to No, the Charger Failure alarm will not be active while the engine is running. Should both chargers fail or switch off due to a high voltage output from the engine alternator, the AC Power Failure lamp may come on. This is normal. It will reset

automatically once the engine stops running and the charger failure alarms reset. When Screen 218 is set to Yes, the Charger Failure alarm will be active at all times when the Mode selector switch is in the Auto or Manual mode. Screen 219 is used to determine the time delay between the failure contacts on the charger closing and the Charger Failure lamp and audible alarm sounding on the controller.

- J. Cabinet - A heavy gauge steel cubicle encloses the controller. The OID, the key operated Auto-Off-Manual (AOM) Selector Switch and manual start pushbuttons are mounted on the outer door. The battery circuit breakers are located inside the cabinet on the main back panel of the unit. A key for the AOM switch is stored in a break-glass housing on the door of the cabinet. An additional key is located inside the cabinet.

### PART III: OPERATION OF THE CONTROLLER

- A. When the controller is the "**Auto**" mode and both circuit breakers are in the "**On**" position, the controller is in standby condition ready to start the engine automatically. A green pilot light above the "**Auto**" button will illuminate in this mode. Also, Battery #1 Fault and Battery #2 Fault lights should be off indicating that battery power is available.

When the water pressure drops below a level which is set in System Config Screen 101, the Controller will actuate the starter motor and the cranking cycle will commence. If the engine starts and runs, cranking will cease and the protective circuits will be operative. If the engine fails to start after six (6) crank periods, cranking will cease, the "**Engine Failed to Start**" light will illuminate, and the alarm horn will sound. The battery alternating circuit alternates batteries on each crank attempt unless one battery is in a discharged state and incapable of cranking the engine. In this instance, the control will lock onto the other battery for the remaining cranking attempts. Dry contacts for remote indication of "**Battery Failure**" are provided.

The panel is wired so that optional remote start switches may be used, such as Deluge Valve, Remote Start pushbutton, Fire Alarm switches, etc. In addition, when "Power Failure Engine Startup" feature is enabled (System Config Screen 111), the Controller will automatically start the engine upon loss of Battery Charger output or AC Power loss, after an adjustable time delay (System Config Screen 112).

While the engine is running, all protective circuits are operative. If the engine stops while running, and there is still an auto start demand, the control will attempt to restart the engine. If the engine fails to start the "**Engine Failed to Start**" light will illuminate and the alarm will sound. If, while the engine is operating, the oil pressure drops below a safe limit, the "**Low Oil Pressure**" light will illuminate immediately. After approximately seven (7) seconds the alarm will sound. Should the engine temperature exceed a safe limit while running, the "**Engine High Water Temp.**" light will illuminate and the alarm will sound indicating engine overheating.

If the controller is in **Auto** and it detects "Oil Pressure" i.e. the Oil Pressure Sensor is open or disconnected during the Standby or pump idle condition, the "**System Failure**" alarm will sound and the Event Log will have an entry indicating "Oil Pressure Switch Failure". Should a demand to run such as low pressure, deluge valve, remote start, etc. exist during this "Oil Pressure Sensor Failure" condition, the controller will try to start engine. If the speed switch detects the engine is running, cranking will cease and the "**Engine Running**" LED will be illuminated. If the Speed Switch does not detect the engine is running, the controller will continue to crank the engine for the full six cycles, then sound the "**Engine Failed to Start**" LED and keep the fuel solenoid on for one hour. At the end of the one hour, the fuel solenoid will open and the engine will stop if it was actually running.

If the controller is in **Auto** and it detects "Engine Running" i.e. Speed Switch is closed during the Standby or pump idle condition, the "**System Failure**" alarm will sound and the Event Log will have an entry indicating "**Speed Switch Failure**" and the "**Speed Switch Failure**" LED will be illuminated.

In case of Overspeed, the engine will be stopped and the "**Engine Overspeed**" light will illuminate and the alarm will sound. The light and alarm will stay on until the Engine Speed Switch and the Controller are manually reset. To manually reset the Controller, turn the controller selector switch to **Off**, then press the Reset button. Then turn the selector switch back to "**Auto**".

The Controller may be configured as either "**Manual**" or "**Automatic**" stop as required (System Config Screen 104). "**Manual**" stop is set as standard. The current status of this setting is visible on the Main System Status Screen where the letter "A" will appear in the upper right hand corner of the screen when set to Automatic Stop and an "M" will appear when set for Manual stop. When Automatic stop is enabled the stop timer is preset at the factory to 30 minutes. Longer time settings can be set in System Config screen 105. When "Automatic Stop" is disabled, the engine will continue to run even though the pressure switch or other remote starting switch returns to its normal position. The engine can be stopped immediately only by pressing the stop button or by turning the Auto-Off-Manual switch to the **Off** position. On engines that do not use the "energize to stop" method (i.e. Caterpillar), the engine may also be stopped by turning the circuit breakers BATT1 and BATT2 to OFF. If set up for "**Automatic**" stop, the engine will be stopped automatically upon restoration to normal of whatever demand switch started

the engine providing it has run at least 30 minutes or longer as set in System Config screen 105. If the demand period was less than the time set on the auto stop timer, the engine will continue to run until the timer times out and then will stop.

- B. When the **"Test"** mode button is pressed for two or more seconds, the engine will be started by causing a drop in water pressure. Failure alarm circuits will be operative in the **"Test"** mode. This method of starting provides a test of the Controller, thereby assuring proper operation when required. The engine will run for the time set in Auto Weekly Test Length Of Run Time (System Config Screen 109) or until the **"Stop"** push button is pressed or the selector switch is turned to **"OFF"**.
- C. The **"Manual"** position of the Auto-Off-Manual switch is for manually starting the engine from either battery. The fuel and water solenoids are energized in this position, and the engine must be cranked by pushing one of the buttons located below the OID. **"Manual Crank 1"** cranks from Battery 1, and **"Manual Crank 2"** cranks from Battery 2. Pressing both buttons will result in cranking from both batteries simultaneously.
- D. When the engine is given a command to stop for any reason, terminal 12 will energize and will remain on for approximately 15 seconds. The controller will not start until terminal 12 is de-energized again.
- E. Periodic Self Testing - The Test Run Timer can be set to give test runs on any day of the week and time of day desired. A timing element is incorporated in the control so that when the engine starts in this manner, it will run for a definite time before it shuts down. See System Config Screens 106 through 109 to set the starting time and length of engine running.
- F. Provision for sequential starting is accomplished by the use of adjustable time delay on pressure drop starting or "Deluge Valve" starting. On Multiple Pump installations these timers are set sequentially and progressively longer in time to prevent more than one (1) pump from starting simultaneously with another pump. Failure of the lead pump to start will not prevent subsequent pumps from starting. The time delay on starting is set in System Config Screen 103.
- G. The "Speed Switch Failure" alarm light is to annunciate that there has been a failure of the Speed Switch on the engine while the engine is running. Should there be a command to start and the Oil Pressure rises to normal levels before the Speed Switch applies power to terminal #2, the "Speed Switch Failure" LED will illuminate and the alarm horn will sound.
- H. The "Contactor Coil Failure" alarm light is to annunciate a loss of continuity to the two engine starting contactors on the engine. There is a low level DC current that is applied to field terminals #9 and #10 to detect continuity in the contactor coils. Should the contactor coil open or fail, the "Contactor Coil Failure" LED will illuminate and the alarm horn will sound. In addition there will be an entry in the Event log to indicate which Contactor coil has failed.
- I. The "Loss of DC Power" lamp is provided to indicate that both batteries have been disconnected or turned off but AC power is still available. The alarm horn will also sound upon the loss of DC Power and can not be silenced.
- J. The "ECM Alternate" and "ECM Failure" alarms apply only to those engines that have electronic fuel control. Should the "Electronic Control Module" Fail the "ECM Failure LED will illuminate and sound the horn. In addition if the Alternate Electronic Control Module is switch over to control the engine, the "ECM Alternate" LED will illuminate and sound the horn.

## **PART IV: INSTALLATION AND TEST PROCEDURE**

### **A. INSTALLATION**

The Fire Pump Controller has been assembled and wired at the factory in accordance with the highest workmanship standards. All circuits and functions have been thoroughly tested to assure correct operation when properly installed. The installer should be completely familiar with the external hookup of the engine junction box to the terminal bar in the Controller. Various engine components must be wired to the proper terminal in the controller using the correct size of stranded wire. An appropriate size wire must be wired from the grounding lug in the controller to earth ground. In most cases, the engine manufacturer furnishes the engines with all accessories installed and wired to the connection box. Therefore, it is only necessary to wire from the engine connection box to like numbered terminals in the Controller. Note proper wire sizes. All wires must be stranded.

A drain valve is provided to relieve water pressure to the pressure switch, thus closing the pressure switch contacts and starting the engine. This test simulates an actual start demand. Since the Controller operates the drain valve only momentarily, a small amount of water is drained off. The water pressure sensing line to the Controller from the pump must be thoroughly flushed before connection to the Controller in order to remove chips, particles, or other matter, that could enter the plumbing components in the Controller.

Controllers configured with **"Automatic Stop"** enabled may be changed to **"Manual"** stop by disabling this feature in System Config Screen 104. If deluge valve switches are to be used for starting, enable the Deluge Valve Option in Config Screen 121 and connect the remote normally closed switch to terminals 31 and 111.

## B. TEST PROCEDURE

All of the following tests should be made on each unit after installation. If each test is satisfactory, the operator may place the control switch in "Auto" mode and depend upon the panel operating properly when required. Also, any one or all of these tests may be carried out at any time after installation, if so desired. **NOTE: If 115 Volts A.C. is not connected to Controller, the "Charger Failure" lights and "AC Power Loss" light and alarm will be activated and if the Power Failure Start feature (System Config Screen 111) is enabled, the controller will start automatically. The 115VAC must be turned ON to prevent the engine from starting.**

### ENGINE TERMINAL (terminals 1-12) STATUS INDICATOR LIGHTS

Light Emitting Diodes (L.E.D.) lights have been installed on the microprocessor module to indicate the status of each engine terminal. Status indication is given below:

| <u>Terminal Number</u><br><u>(Microprocessor Func #)</u> | <u>L.E.D. (light) "ON" Indication</u>                        |
|--|--|
| 1 (Out 06)   | Power available to fuel and water solenoids                  |
| 2 (In 06)  | Speed switch has operated into engine running mode           |
| 3 (In 07)  | Speed switch has operated into overspeed mode                |
| 4 (In 08)  | Oil Pressure switch contacts closed (Low Oil Pressure)       |
| 5 (In 09)  | Water temperature switch contacts closed (High Engine Temp.) |
| 6 (In 01)  | Battery #1 voltage present                                   |
| 8 (In 02)  | Battery #2 voltage present                                   |
| 9 (Out 02)   | Crank #1 voltage present (while cranking on Battery #1)      |
| 10 (Out 03)  | Crank #2 voltage present (while cranking on Battery #2)      |
| 12 (Out 07)  | Energize to stop voltage present                             |

#### a. BATTERY LOCKOUT TEST:

1. Turn on Battery #1 switch and Battery #2 switch.
2. Press the "Reset" button. Battery #1 and Battery #2 Healthy lights should be on.
3. Turn Battery #1 switch off for a couple of seconds and back on. Battery #1 light should go off and remain off.
4. Press "Reset" button. Battery #1 light should come on.
5. Repeat for Battery #2.

#### b. CRANKING CYCLE TEST: This test simulates a condition where the engine refuses to start.

1. Disconnect Terminal No.1 on Controller panel. **NOTE: Disconnecting Terminal No.1 is for the purpose of removing power from the fuel solenoid so engine will not start. On engines where the fuel solenoid is not used (Caterpillar), or is connected other than through Terminal #1 (Clarke-G.M.), other means must be used to stop fuel flow to the engine to prevent starting.**
2. Press the "Test" mode button to start cranking the engine. Time the crank and rest periods, and count the number of cranks. There should be six (6) crank periods separated by five (5) rest periods each of approximately 15-seconds duration. The "Failed to Start" light should come on and the alarm horn should sound. Status indicator light for Terminal #1 should come on as soon as the "Test" push button is pressed and the pressure drops below the low set point. Indicator lights for terminals 9 and 10 should come on alternately to indicate cranking cycle. (See above)
3. Press the "Stop" push button to stop the engine and properly reconnect all leads.

**NOTE: In order to prevent discharging the starting batteries, this same test can be made without actually cranking the engine by disconnecting the starter cable and observing the action of the starter contactors and/or status indicator lights for terminals 9 and 10.**

#### c. CHECKING STARTING MOTOR RELEASE

1. Press the "Test" mode button. Engine should start promptly and starting motor should release at approximately 1/3 of engine speed. Status indicator light for terminal #2 should come on to indicate speed switch has operated to disconnect cranking and the Engine Running LED should illuminate.

NOTE: A convenient method of determining the exact instant the starter releases is to connect a battery test light or voltmeter across the starter terminals and observe when power is disconnected.

2. Press the "**Stop**" push button to stop the engine.

d. **OIL PRESSURE FAILURE TEST:**

1. Press the "**Test**" mode button to start engine. When the engine is starting and oil pressure is not yet up to full pressure, the "**Engine Low Oil Pressure**" light will illuminate, but the horn will not sound. When pressure builds up, and the switch opens, the light will go out. This feature provides indication that the oil pressure switch contacts are operating in a normal manner.
2. After the engine is running, connect a temporary jumper between terminal #4 and terminal #11.
3. Both the "**Engine Low Oil Pressure**" light and status indicator light for terminal #4 should come on immediately. Wait approximately seven (7) seconds. Alarm horn should sound.
4. Press the "**Stop**" push button to stop the engine and remove jumper between terminal #4 and terminal #11.
5. Wait at least 30 seconds for elements to reset before making any further tests.

e. **WATER TEMPERATURE FAILURE TEST:**

1. Press the "**Test**" push button to start engine.
2. Jumper contacts on water temperature switch on engine.
3. Alarm horn sounds and the "**High Water Temperature**" light on controller illuminates immediately. Status indicator light for terminal #5 should come on with "**High Water Temperature**" light.
4. Press the "**Stop**" push button to stop the engine and remove jumper on water switch.

f. **OVERSPEED FAILURE TEST:**

1. Press the "**Test**" mode button to start engine.
2. Momentarily short the contacts on the engine speed switch, or connect a temporary jumper between terminal #3 and #6 on the controller.
3. The alarm horn sounds and the "**Engine Overspeed**" light will illuminate immediately. Engine comes to a stop. Status indicator lights for terminals #3 and #12 should come on with the "**Engine Overspeed**" light.
4. Remove the jumper from terminals #3 and #6 then turn the selector switch to the **Off** position. Press the "**Reset**" button to reset the "**Overspeed**" alarm. Turn the selector switch back to the **Auto** position.

g. **CONTACTOR COIL FAILURE ALARM TEST:**

1. While the controller is in the "**Auto**" mode disconnect the field wire from terminal 9. Within a few seconds the "**Contactors Coil Failure**" lamp should illuminate and the alarm horn should sound. Reconnect the field wire to terminal 9. The "**Contactors Coil Failure**" lamp should go out and the alarm horn should silence. Repeat for terminal 10.

h. **SPEED SWITCH FAILURE ALARM TEST:**

1. Disconnect the field wire from terminal #2.
2. Press the "**Test**" mode button to start engine.
3. Once the engine starts and oil pressure is detected, the engine should stop cranking and the "**Speed Switch Failure**" light should illuminate and the alarm horn should sound.
4. Press the "**Stop**" push button to stop the engine and reconnect the wire to terminal #2.

i. **AUTOMATIC STARTING TESTS:**

1. Place control in "**Auto**" position.
2. Bleed off pressure in system until pressure drops below the low set point.
3. Engine should start automatically and continue to run after pressure rises above the high set point, if arranged for "**Manual**" stop. If arranged for "**Automatic**" stop, engine will continue to run for time set on Engine Run Timer and then stop.

4. Press the **"Stop"** push button to stop the engine.
  5. Repeat tests for each demand switch such as deluge valve, remote start, etc.
- j. **PERIODIC WEEKLY START TEST:**
1. Pressure must be up and all other demand switches de-activated.
  2. 115 V.A.C. power must be turned on to the panel.
  3. When the current day and time of day matches the settings in System Config screens 107 and 108, the solenoid drain valve will energize and the engine will begin cranking. It will continue to run for the amount of time set.
  4. Should a remote manual start occur or a low pressure condition occur while the pump is running on Weekly Test, the pump will not stop until the Stop pushbutton is pressed or if set for Automatic Stop, the Minimum run timer times out.
  5. The periodic Weekly Test function is factory set to No in Screen 106 due to Factory Mutual standard requirements. Contact the Metron Factory Service department for instructions to turn this function on if this is not a Factory Mutual insured facility.
  6. Should the controller be in the alarm condition for "Oil Pressure Switch Failure" and the weekly test time occurs, the controller will open the solenoid drain valve, initiate the start sequence but then go into the Stop cycle so that the engine never cranks in order to prevent damage to the engine if the sensors are not function correctly. At that time the Oil Pressure Switch should be checked for proper operation and that the wiring to the controller is correct and in good condition.
- k. **SETTING PROGRAM WEEKLY TEST TIME:** System Config screen 106 through 109.
- l. **REMOTE START SWITCH CIRCUITS:** Field wiring terminals are provided on the controller so that optional remote start switches such as Remote Pushbutton Stations, Deluge Valve Switch, Fire Alarm Switches, etc., may be used to start the engine. Two (2) sets of terminals are provided. Terminals #112 and #31 are used for remote manual start push buttons (close to start). Terminals #111 and #31 are used for remote Deluge Valve Switch or other remote automatic start switches (open to start). Upon automatic start from this type of switch, the engine will be stopped either automatically (if set for automatic stop) after the demand switch de-activates and Engine Auto Stop Timer times out, or manually at the Controller. Terminals #111 and #31 must have a jumper installed if a remote Deluge switch is "Enabled" but not to be used. When the controller is shipped from the factory Deluge Valve start is Disabled (System Config screen 121).
- m. **AC POWER FAILURE STARTING:** If this feature has been enabled it can be tested by disconnecting the normal 115 V.A.C. to the Controller. After the preset time delay (which is specified in System Config screen 112), the Controller will commence cranking the engine. The **"Charger #1 Failure"**, **"Charger #2 Failure"**, and **"AC Power Loss"** lamps will illuminate and the alarm will sound without delay.
- n. **NORMAL OPERATION – AUTOMATIC:** Turn the selector switch to the **"Auto"** position. A green **"Automatic Mode"** light will illuminate and the engine will automatically start upon drop in pressure or operation of other start switches. If the Auto Stop Timer is disabled (Manual Stop) the engine must be turned off at the Controller. When the Auto Stop Timer is enabled, upon termination of the demand signal, the engine will run for the length of time left on the Auto Stop Timer and then will stop automatically.
- o. **AN ADJUSTABLE SEQUENTIAL START TIMER IS SUPPLIED FOR MULTIPLE PUMP INSTALLATION:** Normally, the leading pump Controller will not have a delay timer and will commence cranking the engine immediately upon operation of a demand signal (other than Power Failure which is time delayed). The subsequent Controllers will have a time delay which is adjustable from 0 to 999 seconds. Each time delay should be set with progressively longer times on each subsequent pump. The recommended time interval is ten (10) to fifteen (15) seconds. This may be extended or shortened as required by the local authorities having jurisdiction.
- p. **PUMP ROOM ALARMS:** Field terminals may be provided for various inputs from pump room alarms. These alarms include: Low Fuel, Low Pump Room Temperature, Reservoir Low, Reservoir Empty, Low Suction Pressure, Relief Valve Discharge and/or Flow Meter On etc. A maximum of ten (10) pump room alarms are available. The Controller is arranged so that the alarm horn will sound and the light will come on when the alarm sensor contacts close. These pump room alarms can be silenced with the "Silence" push button on the OID if they have been configured as silenceable.

## PART V: ADDITIONAL OPTIONAL FEATURES

- A. **Battery Charger Operation:** The Battery Chargers are mounted in the engine controller, and are factory wired to the controller terminal block from which it obtains its 120 volt, 50-60 Hz. supply voltage, and through which it provides charging current to the batteries. The charging current to the two (2) batteries and the battery voltage is monitored by the controller and displayed on the OID. The charger output is current limited and provides full protection during the engine cranking cycle. The charger input and output are fused for protection in case of a failure of the control circuit or other internal component.

Each battery charger is fully automatic, and will charge the batteries at a rate of up to 10 amperes. As the batteries approach full charge, the current will taper off to a predetermined level at which time the charger automatically switches to the float mode of operation. In the float mode the charger maintains the batteries at the float potential (approximately 12.7 volts for a 12-volt battery or 25.4 volts for the 24-volt battery).

The charger provides a means of monitoring the charger output to sound an alarm in case of loss of charger output. This also provides a means of monitoring the A.C. power since a loss of A.C. power results in a loss of charger output.

**Never disconnect the batteries from the controller while the AC power is on to the controller as this may cause damage to the printed circuit boards.**

In the event that a battery is lost or disconnected the output of the charger will stop (0 volts). This will allow the voltage sensing circuit of the fire pump controller microprocessor to detect a missing battery or open circuit from the battery. This will result in the respective Battery Fault light to illuminate and the alarm horn to sound. Before reconnecting the battery to the controller, turn the AC power off. Then reconnect the battery to the controller and turn the AC power back on to reset the alarm.

Generally, when all conditions are normal, the batteries will come to a full charge prior to the 24 hour period. As batteries begin to charge, the controller OID will indicate a gradual decrease in current flow. When these ammeters indicate a current level of less than 0.5 amps the charger will be in a trickle mode.

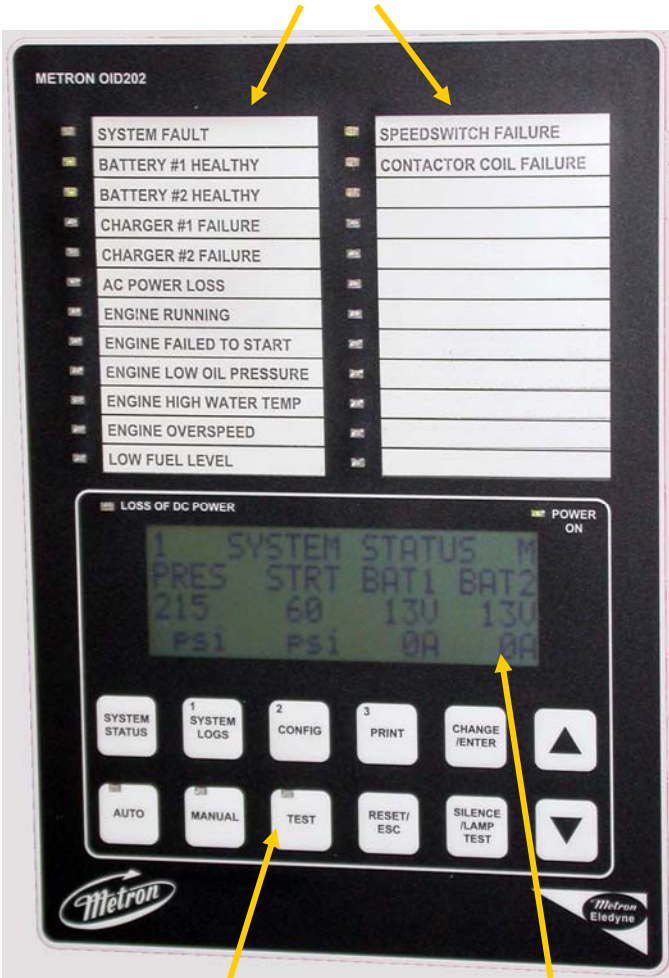
Check batteries daily for a few days after initial installation has been made, and weekly thereafter. Batteries should be checked for overcharging (gassing), or undercharging (low voltage, or low specific gravity of the electrolyte or acid).

**CAUTION:** Under no circumstances should new electrolyte (acid) be added to a battery that has been previously filled. Only distilled water is recommended for maintenance purposes.

## PART VI: OPERATOR INTERFACE DEVICE (OID) USE AND NAVIGATION

The Operator Interface Device (OID) provides visual indication of the alarms, status of system parameters, and an interface to change set points to configure the FD4 to operate appropriately for various installation requirements.

Labeled LED  
Annunciator



Control Type Buttons

Navigation Buttons

### Common Tasks Performed Using The OID

**Silencing Horn:** If a horn is sounding and the alarm is silence able, a quick press of the [SILENCE/LAMP TEST] will silence the horn (less than 1 second press).

**Resetting Alarms:** If the alarm condition has cleared, press and hold the [RESET/ESC] button 2 to 5 seconds to reset alarms. “Engine Failed to Start” and “Engine Overspeed” alarms require the system to be in the OFF mode before a reset is allowed.

**Test Mode:** When controller is in Auto Mode, pressing and holding the [TEST] button for two or more seconds will open the pressure drain solenoid thus dropping the pressure which causes the controller to start the engine. Pressing and releasing the [TEST] button in Manual Mode will illuminate the lamp on the button but has no effect on the starting.

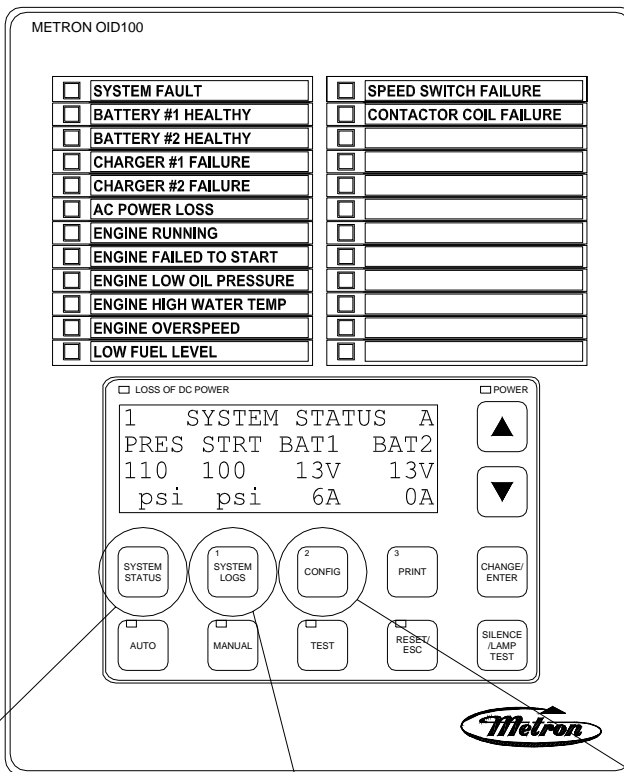
**Lamp Test:** To illuminate and check all the OID LED’s and the horn, press and hold the [SILENCE/LAMP TEST] button 5 or more seconds or until all the lights turn on.

Sample display only. For general reference only.

System Operation and

Digital Display With

## OID Screen Map



```

1 SYSTEM STATUS A
PRES STRT BAT1 BAT2
110 100 13V 13V
psi psi 6A 0A

2 SYSTEM STATUS
Engine Countdown Tmr
0sec Until Start
0min Until Stop

3 SYSTEM STATUS
Engine Countdown Tmr
For AC Power Outage
0min Until Start

4 SYSTEM STATUS
Engine Hrs: 5.3
# Of Starts: 8
Mon02/17/03 17:53:26

5 SYSTEM STATUS
Firmware Ver SV 1.1
Commissioned Date:
11/15/02

6 SYSTEM STATUS
Extended Voltage
BAT 1 27.10 0.00A
BAT 2 27.05 0.00A
    
```

```

SYSTEM LOGS
1) Event Log
2) Pressure Log
    
```

```

1 CONFIG
1) SYSTEM SETPOINTS
2) USER PREFERENCES
3) TECH SCREENS

2 CONFIG
1) ANALOG SIGNALS
2) AUXILLIARY ALARMS
    
```

Continued on next page.

```

# 1 EVENT LOG
System in Off
Mode Occurred
02/16/03 13:15:15
    
```

```

PRESSURE LOG
02/16/03 17:52:45
112 psi
Skip Rate:[EACH ]
    
```

```

# 1 EVENT DETAILS
System in Off
Mode Occurred
02/16/03 13:15:15
    
```

```

PRESSURE LOG
02/16/03 17:52:30
112 psi
Skip Rate:[EACH ]
    
```

```

# 1 EVENT DETAILS
Pressure: 83.2psi
System Auto:Yes
Engine Running:No
    
```

```

PRESSURE LOG
02/16/03 17:52:15
113 psi
Skip Rate:[EACH ]
    
```

```

# 1 EVENT DETAILS
Charger #1 OK:Yes
Charger #2 OK:Yes
Battery #1 OK:Yes
    
```

```

# 1 EVENT DETAILS
Battery #2 OK:Yes
AC Power Avail:Yes
Low Fuel Level:No
    
```

```

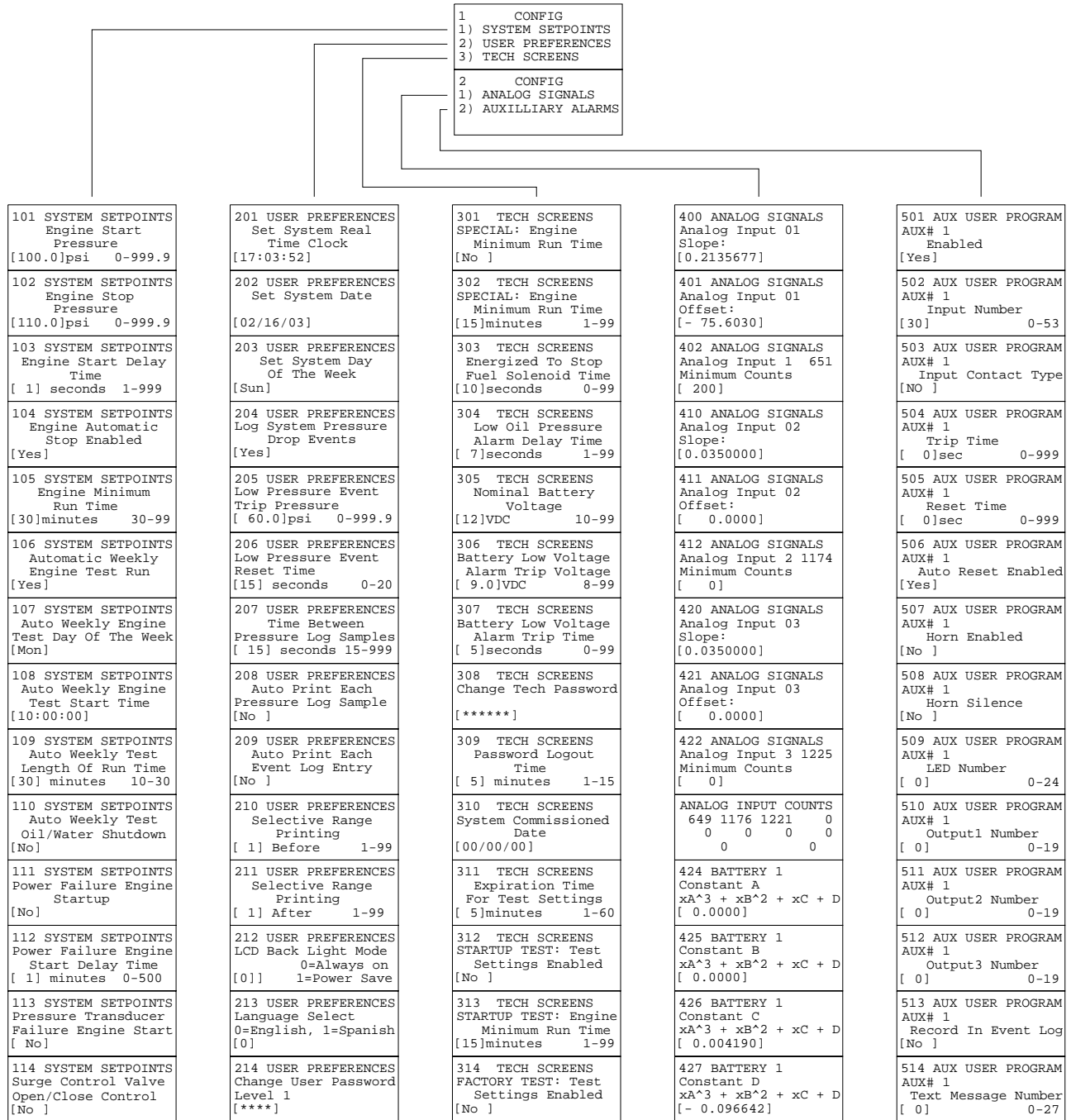
# 2 EVENT LOG
Engine Failed To
Start Alarm Occurred
02/16/03 07:32:15
    
```

```

# 3 EVENT LOG
AC Power Failure
Alarm Cleared
02/16/03 07:09:48
    
```

**OID Screen Map (continued)**

Note: Sample settings shown below. Not to be used to program controller for operation. Consult factory for correct settings for the site conditions.



**OID Screen Map (continued)**

|  |
|--|
| 115 SYSTEM SETPOINTS<br>Surge Control Valve<br>Delay Time<br>[ 0 ] seconds 0-999     |
| 116 SYSTEM SETPOINTS<br>Shutdown On Low<br>Intake Pressure/Lvl<br>[No ]              |
| 117 SYSTEM SETPOINTS<br>Shutdown On Low<br>Intake Trip Time<br>[ 20]seconds 0-999    |
| 118 SYSTEM SETPOINTS<br>Low Intake Shutdown<br>Auto Reset<br>[Yes]                   |
| 119 SYSTEM SETPOINTS<br>Low Intake Shutdown<br>Auto Reset Time<br>[ 20]seconds 0-999 |
| 120 SYSTEM SETPOINTS<br>Pressure Switch<br>Engine Start<br>[No ]                     |
| 121 SYSTEM SETPOINTS<br>Deluge Valve<br>Engine Start<br>[Yes]                        |
| 122 SYSTEM SETPOINTS<br>High System Pressure<br>Alarm<br>[175.0]psi 999.9            |

|  |
|--|
| 215 USER PREFERENCES<br>Save Aux alarms<br>to SD memory card<br>[ No]  |
| 216 USER PREFERENCES<br>Load Aux alarms<br>from SD memory card<br>[No] |
| 217 USER PREFERENCES<br>Pressure Units<br>[psi]                        |
| 218 USER PREFERENCES<br>Engine running chrg<br>failure alarm<br>[No]   |
| 219 USER PREFERENCES<br>Charger failure<br>delay time<br>[xxx] 0-999   |
| 220 USER PREFERENCES<br>Modbus address<br>[001] 0-255                  |
| 221 USER PREFERENCES<br>Modbus Enabled<br>(Disables Printer)<br>[Yes]  |
| 222 USER PREFERENCES<br>Modbus/Printer Baud<br>[38400]                 |
| 223 USER PREFERENCES<br>Modbus Parity<br>[Even]                        |

|   |
|---|
| 315 TECH SCREENS<br>FACTORY TEST: Engine<br>Crank Time<br>[15]seconds 1-15      |
| 316 TECH SCREENS<br>FACTORY TEST: Engine<br>Crank Rest Time<br>[15]seconds 1-15 |
| 317 TECH SCREENS<br>Alarm Log 1/10<br>Event Log 1/1569<br>Pr. Log 1/25123       |
| 318 TECH SCREENS<br>Speed switch fail<br>delay time<br>[10]seconds 0-99         |

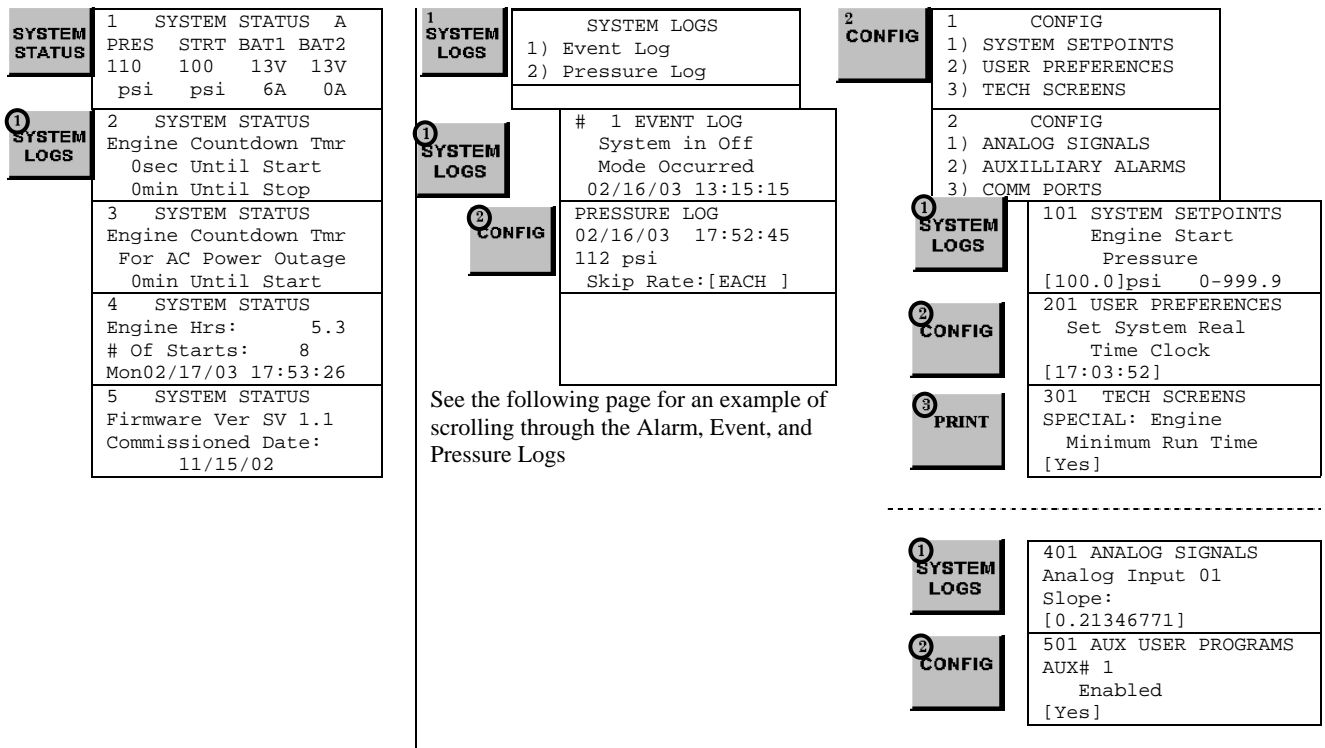
|   |
|---|
| 428 BATTERY 1<br>Volts per count<br>[1.0000000]                       |
| 429 BATTERY 1<br>Minimum Amps<br>[ 1.0]                               |
| 430 BATTERY 2<br>Constant A<br>$xA^3 + xB^2 + xC + D$<br>[ 0.0000]    |
| 431 BATTERY 2<br>Constant B<br>$xA^3 + xB^2 + xC + D$<br>[ 0.0000]    |
| 432 BATTERY 2<br>Constant C<br>$xA^3 + xB^2 + xC + D$<br>[ 0.004190]  |
| 433 BATTERY 2<br>Constant D<br>$xA^3 + xB^2 + xC + D$<br>[- 0.096642] |
| 434 BATTERY 2<br>Volts per count<br>[1.0000000]                       |
| 435 BATTERY 2<br>Minimum Amps<br>[ 1.0]                               |
| 436 USER PREFERENCES<br>Load all settings<br>from SD card<br>[ No]    |
| 437 USER PREFERENCES<br>Save all settings<br>to SD card<br>[ No]      |

The [SYSTEM STATUS], [SYSTEM LOGS], and [CONFIG] buttons navigate the user to the top screen of a column of similarly grouped screens or menus.

**SYSTEM STATUS:** The [SYSTEM STATUS] button can be pressed at any time to return the screen to the home System Status screen #1. System Status screens display the real time information variables about the pump system.

**SYSTEM LOGS:** The [SYSTEM LOGS] button displays the System Logs menu. Once the menu is displayed, buttons with numbers on them can be used to enter the selected data log. See the following page for details on navigating the System Logs.

**CONFIGURATION:** The [CONFIG] button displays the Config menu which groups the different types of set points that configure the system to operate in the desired manner. Use the [UP] and [DOWN] buttons to scroll between the two menu screens. Buttons with numbers on them can be used to enter the selected configuration screen group. See the Configuring the FD4 section for descriptions on the functionality of each set point.



**SYSTEM LOGS:** The FD4 has three separate data logs; 1) alarm log, 2) event log, and 3) pressure log. The alarm log is a subset of the event log and only displays the last ten alarms that have occurred or cleared. The event log records all alarm and system function type events

**1**  
**SYSTEM LOGS**

SYSTEM LOGS  
1) Event Log  
2) Pressure Log

**SYSTEM LOGS:** The [UP] and [DOWN] arrow buttons can be used to scroll through the three data logs. The [CHANGE/ENTER] button enters and exits the alarm/event details in either the Alarm or Event logs. In the Pressure Log the [CHANGE/ENTER] button changes the skip rate used to scroll through the logged pressure readings.

**1**  
**SYSTEM LOGS**

# 1 EVENT LOG  
System in Off  
Mode Occurred  
02/16/03 13:15:15

**CHANGE/ENTER**

# 1 EVENT DETAILS  
System in Off  
Mode Occurred  
02/16/03 13:15:15

# 1 EVENT DETAILS  
Pressure: 83.2psi  
System Auto:Yes  
Engine Running:No

# 1 EVENT DETAILS  
Charger #1 OK:Yes  
Charger #2 OK:Yes  
Battery #1 OK:Yes

# 1 EVENT DETAILS  
Battery #2 OK:Yes  
AC Power Avail:Yes  
Low Fuel Level:NO

# 2 EVENT LOG  
Engine Failed To  
Start Alarm Occurred  
02/16/03 07:32:15

# 3 EVENT LOG  
AC Power Failure  
Alarm Cleared  
02/16/03 07:09:48

**2**  
**CONFIG**

PRESSURE LOG  
02/16/03 17:52:45  
112 psi  
Skip Rate:[EACH ]

PRESSURE LOG  
02/16/03 17:52:30  
112 psi  
Skip Rate:[EACH ]

PRESSURE LOG  
02/16/03 17:52:15  
113 psi  
Skip Rate:[EACH ]

**Printing System Log Data:** The following applies if a PC is connected to the RS485 com ports using a null modem cable. When the [PRINT] button is pressed when looking at data in one of the three logs, a menu for what is to be printed is displayed. Pressing [1] prints just the alarm/event/pressure reading currently being displayed. Pressing [2] prints a range of data before and after the currently displayed alarm/event/pressure reading currently displayed. The range can be changed in the User Preferences setpoints 210 and 211. If you use the RS485 port to download the data, use Microsoft windows Hyperlink program and configure for Baud Rate as 9600, Data bits as 8, Parity as None, Stop Bits as 1 and Flow Control as None. When the print button on the OID is pressed, data will be sent to the PC via the port you have connected to.

```
#1  EVENT LOG
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
```

3  
**PRINT**

```
PRINT OPTIONS
1) PRINT THIS EVENT
2) PRINT EVENT RANGE
   10 BEFORE,10 AFTER
```

**Typical Event/Alarm Log Message Printout**

```
#1  EVENT LOG
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
#2  EVENT LOG
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
```

```
#1  EVENT LOG
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
```

**CHANGE/ENTER**

```
#1  EVENT DETAILS
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
```

3  
**PRINT**

```
PRINT OPTIONS
1) PRINT THIS EVENT
2) PRINT EVENT RANGE
   10 BEFORE,10 AFTER
```

```
#1  EVENT DETAILS
   Pressure:360psi
   System Auto:Yes
   Engine Running:No
```

```
#1  EVENT DETAILS
   Charger #1 OK:Yes
   Charger #2 OK:Yes
   Battery #1 OK:Yes
```

```
#1  EVENT DETAILS
   Battery #2 OK:Yes
   AC Power Avail:Yes
   Fuel Level OK:Yes
```

**Typical Event/Alarm Log Details Printout**

```
#1  EVENT DETAILS
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
   Pressure:360psi
   System Auto:Yes
   Engine Running:No
   Charger #1 OK:Yes
   Charger #2 OK:Yes
   Battery #1 OK:Yes
   Battery #2 OK:Yes
   AC Power Avail:Yes
   Fuel Level OK:Yes

#2  EVENT DETAILS
   AC Power Restored
   Occurred On
   11/16/02 07:32:15
   Pressure:360psi
   System Auto:Yes
   Engine Running:No
   Charger #1 OK:Yes
   Charger #2 OK:Yes
   Battery #1 OK:Yes
   Battery #2 OK:Yes
   AC Power Avail:Yes
   Fuel Level OK:Yes
```

**Typical Pressure Log Printout**

```
PRESSURE LOG
01/01/03 17:52:45
600 psi
Skip Rate:[EACH ]
```

3  
**PRINT**

```
PRINT OPTIONS
1) PRINT THIS ENTRY
2) PRINT ENTRY RANGE
   10 BEFORE,10 AFTER
```

```
PRESSURE LOG
01/01/03 17:52:45
600 psi
01/01/03 17:52:30
```

```

PRESSURE LOG
01/01/03 17:52:30
599 psi
Skip Rate:[EACH ]

```

```

599 psi
01/01/03 17:52:15
599 psi
01/01/03 17:52:00
601 psi

```

**CONFIGURATION SCREENS:** All parameters that control the operation of the controller can be viewed and changed within the Configuration set point screens. Each set point is protected by a user password to prevent unauthorized changes. The system set points are separated into five different group

s.

**2  
CONFIG**

```

1      CONFIG
1) SYSTEM SETPOINTS
2) USER PREFERENCES
3) TECH SCREENS

2      CONFIG
1) ANALOG SIGNALS
2) AUXILLIARY ALARMS

```

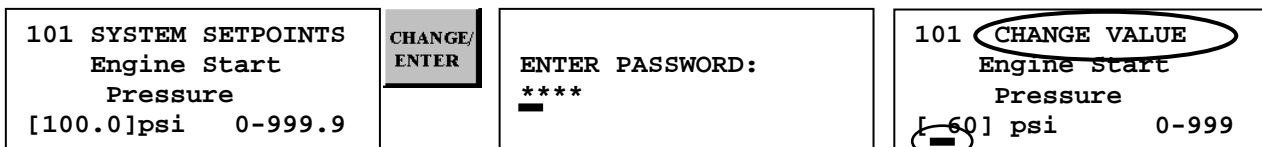
- 1) SYSTEM SETPOINTS (Level 1 password): These setpoints adjust the conditions for starting and stopping the engine.
- 2) USER PREFERENCES (Level 1 password): These setpoints adjust settings not related to engine operation.
- 3) TECH SCREENS (Level 2 password): These setpoints are for factory/technician purposes only and are used to fine tune special systems.
- 1) ANALOG SIGNALS (Level 2 password): These setpoints calibrate the analog pressure and battery volt readings.
- 2) AUXILLIARY ALARMS (Level 2 password): These 12 user programs are used to setup any auxiliary signals that need to be monitored.

### Changing Values:

- 1) Navigate to the configuration set point screen that contains the value that needs to be changed.
- 2) Press [CHANGE/ENTER]. If a password has not been entered for a while, the “ENTER PASSWORD” screen will be displayed. Use the [1] [2] and [3] buttons to enter the appropriate password.
- 3) Once the correct password level has been attained, the “CHANGE VALUE” screen for the value to be changed will be displayed. An underscore cursor will appear beneath the first digit on the entry.

Use [UP] or [DOWN] arrow buttons to scroll the value of the digit with the cursor. Press [CHANGE/ENTER] to accept each digit's entry. The cursor will move to the right so the next digit can be changed. Pressing [SILENCE/RESET/ESC] or the [SYSTEM STATUS] button will exit change mode without changing the original value.

### Example of how to change a setpoint value:



Press the [1], [2], or [3] keys to enter the password. The default user password is 1111. This can be changed by the user in screen 214.

Press the [UP] and [DOWN] arrow keys to change each digit at the cursor, press [CHANGE/ENTER] to accept the digit and move the cursor to the right. Press [SILENCE/RESET/ESC] to escape the change value screen and to keep the original value.

**Printing Configuration Setpoints:** The following applies if a PC is connected to the RS485 com port using a null modem cable. When the [PRINT] button is pressed while looking at a configuration setpoint screen, a menu for what is to be printed is displayed. Pressing [1] prints just the set point screen currently being displayed. Pressing [2] prints all the set points in the section of set points currently displayed. Pressing [3] prints all the set point screens of all five set point sections.

NOTE: when printing all set points, only Aux#01 User Programs 501 through 515 will be printed. To print any of the remaining eleven aux alarm settings, press [PRINT] when inside the appropriate Aux alarm and select [2] for “2) PRINT 500 SETPTS.” The 501 through 515 Aux User Programs for that aux alarm will be printed.

```
101 SYSTEM SETPOINTS
    Engine Start
    Pressure
[ 60] psi      0-999
```

3  
**PRINT**

```
PRINT OPTIONS
1) PRINT THIS SETPT
2) PRINT 100 SETPTS
3) PRINT ALL SETPTS
```

**Typical Configuration Setpoint Printout**

```
101 SYSTEM SETPOINTS
    Engine Start
    Pressure
[ 60] psi      0-999

102 SYSTEM SETPOINTS
    Engine Stop
    Pressure
[ 90] psi      0-999

103 SYSTEM SETPOINTS
    Engine Start Delay
    Time
[ 10] seconds  0-999
    "          "
    "          "
    "          "

509 AUX USER PROGRAMS
Aux Alarm #01
2nd Control Output
[ 0]           12-25

510 AUX USER PROGRAMS
Aux Alarm #01
3rd Control Output
[ 0]           12-25
```

**PART VII: SYSTEM SET POINT DEFINITIONS**

Note: Sample settings shown below. Not to be used to program controller for operation. Consult factory for correct settings for the site conditions.

**Configure System Setpoints**

101 SYSTEM SETPOINTS  
Engine Start  
Pressure  
[ 60] psi 0-999

If system pressure is at or below this setting the engine will start if the system is in Auto mode. The Start pressure should never be set higher than the stop pressure. There should be about a 5 psi difference between the start and stop pressure settings.

102 SYSTEM SETPOINTS  
Engine Stop  
Pressure  
[ 90] psi 0-999

If system pressure is at or above this setting and the engine is running in Auto mode, the engine can be stopped using the stop pushbutton or can automatically stop if auto stop is enabled in setting 104.

103 SYSTEM SETPOINTS  
Engine Start Delay  
Time  
[ 10] seconds 1-999

This time setting delays the start of the engine in Auto mode when a low pressure condition or deluge valve start signal is received. This setting is normally used for multiple pump installations where sequencing of pump starting is desired.

104 SYSTEM SETPOINTS  
Engine Automatic  
Stop Enabled  
[No]

When enabled, the engine will stop automatically after all starting demands have been satisfied. The timer set in 105 below must also time out before the engine will stop. Factory default is NO.

105 SYSTEM SETPOINTS  
Engine Minimum  
Run Time  
[30]minutes 1-99

The minimum run time that the engine must run before stopping automatically. Must be set to at least 30 minutes per NFPA 20. Only active if 104 above is set to Enabled.

106 SYSTEM SETPOINTS  
Automatic Weekly  
Engine Test Run  
[No]

When set to "Yes" and the controller is in Auto mode, the controller will start the engine and run for a preset time and then automatically stop. The day of the week and time the engine would start once a week are set in set points 107 and 108 below. Requires the Tech password to change. Contact Metron Factory.

107 SYSTEM SETPOINTS  
Auto Weekly Engine  
Test Day Of The Week  
[Tue]

The day of the week that the automatic weekly test start will begin.

108 SYSTEM SETPOINTS  
Auto Weekly Engine  
Test Start Time  
[10:00:00]

The time of day the automatic weekly test start will begin.

109 SYSTEM SETPOINTS  
Auto Weekly Test  
Length Of Run Time  
[30] minutes 1-99

The length of time the engine will run when started on automatic weekly test. Must be set for a minimum of 30 minutes per NFPA 20.

110 SYSTEM SETPOINTS  
Auto Weekly Test  
Oil/Water Shutdown  
[Yes]

When this feature is enabled, the engine will stop on Low Oil pressure or High Engine Water Temperature during the weekly test run. If some other auto start demand occurs, the controller will restart the engine.

111 SYSTEM SETPOINTS  
Power Failure Engine  
Startup  
[Yes]

When this feature is enabled the engine will start if the AC power to the controller fails. The time delay set in 112 below is used to override momentary outages.

112 SYSTEM SETPOINTS  
Power Failure Engine  
Start Delay Time  
[ 1 ] minutes 0-500

When set point 111 above is enabled, set this timer for the length of time desired to sense a loss of AC power and override any momentary outages.

113 SYSTEM SETPOINTS  
Pressure Transducer  
Failure Engine Start  
[Yes]

When this feature is enabled, the controller will start the engine if a faulty pressure transducer is detected, i.e. loss of output from the transducer or max voltage sensed from the transducer indicating it has shorted.

114 SYSTEM SETPOINTS  
Surge Control Valve  
Open/Close Control  
[Yes]

Setting Reserved For Factory Configurations

115 SYSTEM SETPOINTS  
Surge Control Valve  
Delay Time  
[ 15 ] seconds 0-999

Setting Reserved For Factory Configurations

116 SYSTEM SETPOINTS  
Shutdown On Low  
Intake Pressure/Lvl  
[No ]

Low Suction Shutdown – If this feature is enabled and a separate suction pressure switch is connected to the controller, the engine will not start or it will stop if already running, if there is a low suction pressure condition.

117 SYSTEM SETPOINTS  
Shutdown On Low  
Intake Trip Time  
[ 0 ]seconds 0-999

Set this timer for the desired time to override momentary dips in suction pressure before a shutdown will occur.

118 SYSTEM SETPOINTS  
Low Intake Shutdown  
Auto Reset  
[ No]

If enabled, once the low intake pressure condition has cleared and remained clear for the set point 119 reset amount of time, the low intake alarm will clear itself.

119 SYSTEM SETPOINTS  
Low Intake Shutdown  
Auto Reset Time  
[ 0 ]seconds 0-999

Amount of time that low intake pressure condition needs to be clear before an automatic reset of a low intake alarm can occur if enabled in set point 118.

120 SYSTEM SETPOINTS  
Pressure Switch  
Engine Start  
[No ]

If enabled this setting activates the logic to monitor an optional pressure switch dry contact closure (ie normally open contact that closes to start engine) that will start the engine on a low pressure condition if system is in Auto mode.

121 SYSTEM SETPOINTS  
Deluge Valve  
Engine Start  
[No ]

If enabled this setting activates the logic to monitor an optional deluge valve dry contact opening (ie normally closed contact that opens to start engine) that will start the engine if system is in Auto mode.

122 SYSTEM SETPOINTS  
High System Pressure  
Alarm  
[100.0]psi 0-999.9

This setting determines the pressure at which the High System Pressure variable will be turned on. This is used primarily for variable speed engine applications. It can be used to illuminate a lamp and activate remote dry contacts.

## Configure User Preferences

201 USER PREFERENCES  
Set System Real  
Time Clock  
[17:03:52]

Set the current FD4 clock (24 hour clock).

202 USER PREFERENCES  
Set System Date  
[12/31/99]

Set the current FD4 date.

203 USER PREFERENCES  
Set System Day  
Of The Week  
[Monday ]

Set the local day of the week.

204 USER PREFERENCES  
Log System Pressure  
Drop Events  
[No ]

When this feature is enabled, the controller will log the current system pressure in the event log when system pressure has dropped below the set pressure value. Typically set to "No" as not to needlessly fill up the event log.

205 USER PREFERENCES  
Low Pressure Event  
Trip Pressure  
[ 0.0]psi 0-999

The desired pressure that will cause a log of system pressure in addition to the normal periodic logging of system pressure.

206 USER PREFERENCES  
Low Pressure Event  
Reset Time  
[ 5] seconds 0-20

The amount of time the pressure must be above the pressure setting in screen 205 before the Pressure Drop Event is logged as being cleared.

207 USER PREFERENCES  
Time Between  
Pressure Log Samples  
[ 15] seconds 15-999

The frequency at which system pressure is automatically logged. Normally set to 15 seconds. Lower values will increase the number of logged pressures and fill up the memory in a shorter period of time.

208 USER PREFERENCES  
Auto Print Each  
Pressure Log Sample  
[No ]

When set to Yes, each pressure log entry will be printed as it occurs. This should be set to No to save printer paper and wear on the printer.

209 USER PREFERENCES  
Auto Print Each  
Event Log Entry  
[No ]

When set to Yes, each event log entry will be printed as it occurs. This should be set to No to save printer paper and wear on the printer.

210 USER PREFERENCES  
Selective Range  
Printing  
[ 1] Before 1-99

This setting will determine the start point of print range of the pressure, alarm, or event log based on which log entry is currently being viewed.

211 USER PREFERENCES  
Selective Range  
Printing  
[ 1] After 1-99

This setting will determine the stop point of print range of the pressure, alarm, or event log based on which log entry is currently being viewed.

212 USER PREFERENCES  
LCD Back Light Mode  
0=Always on  
[0] 1=Power Save

Set to Always on or to Power Save if it is desired to have the backlight automatically shut off when no buttons have been pressed for a preset period of time. This should only be done if battery power is limited and AC power is not on.

**Configure User Preferences  
(continued)**

|   |
|---|
| 213 USER PREFERENCES<br>Language Select<br>0=English 1=Spanish<br>[English]               |
| 214 USER PREFERENCES<br>Change User Password<br>Level 1<br>[****]                         |
| 215 USER PREFERENCES<br>Save Aux Alarms<br>to SD card<br>[No]                             |
| 216 USER PREFERENCES<br>Load Aux Alarms<br>from SD card<br>[No]                           |
| 217 USER PREFERENCES<br>Pressure Units<br><br>[psi]                                       |
| 218 USER PREFERENCES<br>Engine running chrg<br>failure alarm<br>[ No]                     |
| 219 USER PREFERENCES<br>Charger failure<br>delay time<br>[ 5]sec                    0-999 |
| 220 USER PREFERENCES<br>Modbus Address<br><br>[001]                    0-255              |
| 221 USER PREFERENCES<br>Modbus Enabled<br>(Disables Printer)<br>[ No]                     |
| 222 USER PREFERENCES<br>Modbus/Printer Baud<br><br>[ 9600]                                |
| 223 USER PREFERENCES<br>Modbus Parity<br><br>[None]                                       |

Set to English or Spanish

Used to set the password necessary to access the System config screens.

Used to save auxiliary alarm configuration parameters to the SD card

Used to load auxiliary alarm configuration parameters from the SD card

Used to select between psi, bar and kg/cm2 as the display of pressure

Used to select whether the charger failure alarm will be active while the engine is running or not.

Used to select the time delay before the controller will signal an alarm on the charger failure after the contacts close on the battery charger.

Sets the Modbus Address when turned on via screen 221

Turns on the Modbus protocol via the RS485 and turns off the ASCII text output for the printer.

Baud Rate for the Modbus or Printer, depending on which is selected in screen 221

Parity setting for the Modbus, either Even or Odd

## PART VIII: ALARM AND EVENT LOG MESSAGES

The following lists all the possible messages that can be recorded within either the alarm or event logs.

|   |   |
|---|---|
| Battery1 Low Voltage<br>Alarm Occurred/<br>Alarm Cleared        | Battery1 voltage is/was less than the Battery Low Voltage trip voltage set in set point #306  |
| Battery1 Disconnectd<br>Alarm Occurred/<br>Alarm Cleared        | Battery1 wiring has been disconnected and/or BAT1 switch is in the OFF position   |
| Battery1 Switch off<br>Alarm Occurred/<br>Alarm Cleared         | Battery1 wiring has been disconnected and/or BAT1 switch is in the OFF position   |
| Battery2 Low Voltage<br>Alarm Occurred/<br>Alarm Cleared        | Battery2 voltage is/was less than the Battery Low Voltage trip voltage set in set point #306  |
| Battery2 Disconnectd<br>Alarm Occurred/<br>Alarm Cleared        | Battery2 wiring has been disconnected and/or BAT2 switch is in the OFF position   |
| Battery2 Switch off<br>Alarm Occurred/<br>Alarm Cleared         | Battery2 wiring has been disconnected and/or BAT2 switch is in the OFF position   |
| Charger 1 Fault<br>Alarm Occurred/<br>Alarm Cleared             | Charger 1 fault contacts are/were in a fault state. Causes could be disconnected battery, wrong battery voltage, AC power loss, etc.  |
| Charger 2 Fault<br>Alarm Occurred/<br>Alarm Cleared             | Charger 2 fault contacts are/were in a fault state. Causes could be disconnected battery, wrong battery voltage, AC power loss, etc.  |
| AC Power Failure<br>Alarm Occurred/<br>Alarm Cleared            | AC Power Failure declared when both battery chargers are in a fault condition at the same time.   |
| Engine Overspeed<br>Alarm Occurred/<br>Alarm Cleared            | An overspeed signal was detected coming from the engine. FD4 controller must be put in OFF mode to reset this alarm.  |
| Engine Failed to<br>Start Alarm Occurred<br>Start Alarm Cleared | FD4 controller attempted to start engine in Auto mode but the engine failed to start (ie a engine run signal was never received). FD4 controller must be put in OFF mode to reset this alarm.   |
| Engine Quit<br>Alarm Occurred/<br>Alarm Cleared                 | FD4 controller lost the engine run signal from the engine while it was running in Auto mode. This could be a bad wire connection or a problem on the engine that shut the engine down other than an overspeed or failed to start condition. |
| Low Oil Pressure<br>Alarm Occurred/<br>Alarm Cleared            | A low oil pressure signal was received from the engine while the engine was running for at least the amount of seconds set in setpoint #304.  |
| High Water Temp<br>Alarm Occurred/<br>Alarm Cleared             | A high engine coolant water temperature signal was received from the engine while it was running.   |
| Pressure Transducer<br>Alarm Occurred/<br>Alarm Cleared         | The pressure signal from the pressure transducer has fallen outside normal operating range potentially indicating a problem with the transducer or its wiring.  |
| Low Fuel Level<br>Alarm Occurred/<br>Alarm Cleared              | A low fuel signal has been received for at least 3 seconds.   |
| Stop pushbutton<br>Pressed in                                   | An operator pressed the Stop pushbutton.  |
| Engine<br>Started / running<br>Stopped                          | Engine was started or stopped in either Auto or Manual mode.  |
| Engine Lockout Sig<br>Occurred<br>Cleared                       | A remote engine lockout signal was received or cleared.   |
| Remote Start Sig<br>Occurred<br>Cleared                         | A remote start signal was received or cleared.  |
| System in Auto<br>Mode Occurred                                 | System was placed in Auto mode.   |
| System in Off<br>Mode Occurred                                  | System was placed in Off mode.  |
| System in Manual<br>Mode Occurred                               | System was placed in Manual mode.   |
| Auto Test Start<br>Occurred                                     | An automatic engine test sequence was started while in Auto mode by either the weekly program clock function or a user pressing the [TEST] button for 2 or more seconds   |
| Alarm Reset Button  | A user did an alarm reset by pressing and holding the [SILENCE/RESET/ESC] button  |

|  |  |
|--|--|
| Occurred   | for 2 to 5 seconds.  |
| Low Pressure Start<br>Occurred<br>Cleared                    | A low pressure start was attempted because of a low pressure reading from the transducer or optional pressure switch while in Auto mode.   |
| Low Press Condition<br>Occurred<br>Cleared                   | System pressure dropped below the start pressure or the optional pressure switch indicates a low pressure condition. This can be logged in all modes of operation.   |
| Deluge Start<br>Occurred<br>Cleared                          | A deluge start signal was received while in Auto mode.   |
| Controller Reboot<br>Occurred                                | DC power was restored to the FD4 microprocessor.   |
| Pressure Drop<br>Occurred<br>Cleared                         | If setpoint #204 is set to yes, this event gets recorded when the system pressure drops below the setting in setpoint #205.  |
| Low Intake Pressure<br>Shutdown Occurred<br>Shutdown Cleared | If the low intake shutdown option is enabled in setpoint #116, a low suction signal will stop the engine.  |
| Auxiliary Alarm<br>Occurred<br>Cleared                       | Indicates one of the aux alarms occurred as programmed in the user programs and was set to record in the event or alarm log but the text message assigned was 0. See Aux Alarm Text List Messages below for possible auxiliary alarm messages. |

#### Aux Alarm Text List Messages

- 0 Auxiliary Alarm
- 1 High Fuel Level
- 2 Fuel Spill
- 3 Fuel Tank Rupture
- 4 Low Pump Room Temp
- 5 Reservoir Low
- 6 Reservoir Empty
- 7 Reservoir High
- 8 Flow Meter On
- 9 Relief Valve Open
- 10 Low Suction Pressure
- 11 High Engine Oil Temp
- 12 Low Jacket Water Flw
- 13 Low Jacket Water Lvl
- 14 Low Hydraulic Press
- 15 Low Firewater Press
- 16 Air Damper Closed
- 17 Air Damper Open
- 18 Low Purge Pressure
- 19 Low Gear Oil Press
- 20 Low Coolant Level
- 21 High Gear Oil Temp
- 22 High Vibration
- 23 Low Fuel Pressure
- 24 Pump On Demand
- 25 High Exhaust Temp
- 26 High Fuel Temp
- 28 ECM Alternate
- 29 ECM Failure
- 30 High System Pressure

#### List of possible internal variables used as inputs for aux alarm user programs.

- 30 Low Oil Pressure
- 31 General Battery Fault
- 32 Engine Quit Alarm
- 33 Pressure Transducer Fault
- 34 Low Intake Shutdown Alarm
- 35 Pump On Demand, Fire Condition
- 36 System Fault
- 37 Auto Mode
- 38 Manual Mode
- 39 Off Mode
- 40 Overspeed
- 41 Failed to Start
- 42 High Water Temp
- 43 AC Power Failure
- 44 Batt 1 Failure
- 45 Batt 2 Failure
- 46 Charger 1 Failure
- 47 Charger 2 Failure
- 48 General Charger Failure
- 49 Low Fuel Level
- 50 Pressure Drop Event
- 51 High System Pressure
- 52 Low Pressure
- 53 Speed Switch Failure
- 54 Contactor Coil Failure
- 55 Test Mode
- 56 Hi Zone/Low Zone Mode

### SD CARD FILE FORMAT.

The controller is equipped with an SD (Secure Digital) memory card on the motherboard to store the Pressure log, Event log, Operators Manual in PDF format, Auxiliary Alarm configuration information and the controller drawings in PDF format. The SD card is located on the right hand edge of the motherboard and is removed by pressing in on the right edge of the card to release from the card holder. When the SD card is removed, data is still being recorded on temporary flash memory on the motherboard. Once the card is replaced, the stored data will be written back to the SD Card. When the SD card is removed, the LCD display will indicate that the card is missing and that it should be replaced. If the card is not replaced within approximately 1 minute, the alarm will sound and the System Fault LED will come on. Once the SD card is replaced, the System Fault LED will go out but the Alarm Silence button must be pressed to silence the alarm horn. The data stored on the SD card is in standard ASCII text format and can be read by a computer equipped with an appropriate SD card reader. These are readily available at any electronics store. The data on the SD card is in the following format:

#### **PressXXX.txt file**

Data is stored in a standard comma delimited file as follows:

07/27/07, 11:07:52, 060  
Date Time Pressure

Each file starting with "Press" contains one days worth of pressure data.

#### **Events.txt file**

Data is stored in a standard comma delimited file as follows:

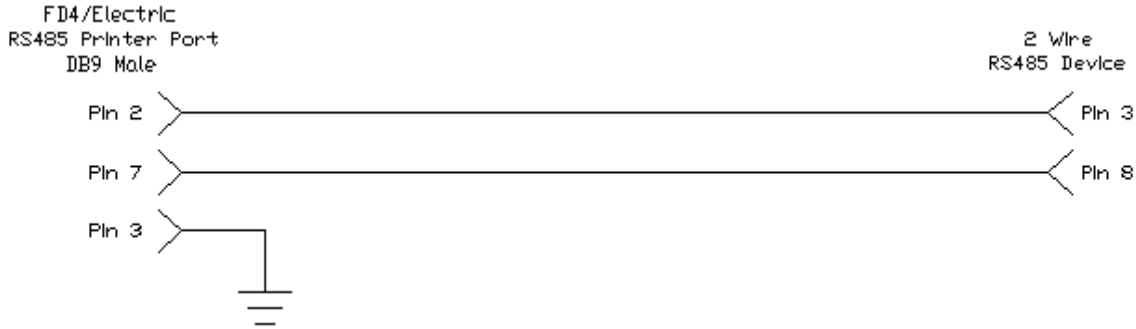
07/27/07 ,11:09:26 ,Battery2 Low Voltage, Alarm Cleared ,060 cont.....  
Date Time Event Action Pressure

1, 0, 0, 0, 1, 1, 000  
Auto mode, Engine running, Charger 1 Fault, Charger 2 fault, Battery 1 OK, Battery 2 OK, Event Txt

## Appendix A

### **RS485 Port Usage For Serial Modbus RTU protocol:**

The Modbus option on the fire pump controller boards can be enabled by disabling the printer option to the onboard RS485 port. All communications to this port will be in a 2 wire RS485 format. 255 controllers can communicate on a single network. The pinout cabling required for connection to the port is as follows. It is necessary to apply a terminating resistor to both ends of the network. Note-Only 50 Modbus registers can be polled at time from the controller. I/O servers must be set up accordingly.



### **Modbus Setup From Controller Interface:**

From the 200 series user preference configuration screens the Modbus setting can be access from screens 220 through 223. Screen 220 is used to set the Modbus address 1-255. All Modbus devices on a network must have a unique address.

Screen 221 is used to enable/disable the Modbus option. If ‘Yes’ is selected the Modbus will be enabled and the RS485 port can no longer be used as a printer port.

Screen 222 is used to set the baud rate for the RS485 port. The baud rates possible are 2400, 4800, 9600, 19200, and 38400 bits/second. Note that the baud rate setting is for the RS485 port in general and applies for Modbus and printer usage.

Screen 223 is used to set the Modbus parity. Valid selections are ‘Even’, ‘Odd’, and ‘None’. This setting must match the parity setting of all other Modbus devices on the network.

### **Modbus Register Usage Description:**

The historical event and pressure logs, and real time clock can be accessed and controlled through the Modbus registers listed below.

Register 40001 is a write to controller only register where commands can be entered to accomplish the following as seen in figure 1.1. Depending on the Modbus I/O server used, either the individual bits in register 40001 can be toggled or integer values can be written. Either way, the controller automatically zeros register 40001 after a valid command is received.

| Description                                     | Modbus Registers | Usage Notes For Read/Write Registers   |
|---|------------------|--|
| Set Real Time Clock                             | 040001:0         | Bit 0 Of Modbus Register 040001 - Must Write a 1 Into Register 040001 To Set Clock   |
| Remote Start Diesel Engine                      | 040001:1         | Bit 1 Of Modbus Register 040001 - Must Write a 2 Into Register 040001 To Start Engine                                      |
|   | 040001:2         |  |
| Increment Event Historical Log Data             | 040001:3         | Bit 3 Of Modbus Register 040001 - Must Write an 8 Into Register 040001 To Increment Event Historical Log Pointer           |
| Decrement Event Historical Log Data             | 040001:4         | Bit 4 Of Modbus Register 040001 - Must Write a 16 Into Register 040001 To Decrement Event Historical Log Pointer           |
| Increment PSI Historical Log Data               | 040001:5         | Bit 5 Of Modbus Register 040001 - Must Write a 32 Into Register 040001 To Increment PSI Historical Log Pointer             |
| Decrement PSI Historical Log Data               | 040001:6         | Bit 6 Of Modbus Register 040001 - Must Write a 64 Into Register 040001 To Decrement PSI Historical Log Pointer             |
| Set Historical Event Log To Most Current Record | 040001:7         | Bit 7 Of Modbus Register 040001 - Must Write a 128 Into Register 040001 To Set Event Historical Log To Most Current Record |
| Set Historical PSI Log To Most Current Record   | 040001:8         | Bit 8 Of Modbus Register 040001 - Must Write a 256 Into Register 040001 To Set PSI Historical Log To Most Current Record   |

Figure 1.1

### **Real Time Event Monitoring:**

All events listed below in figure 1.2 are real time and can be viewed in Modbus register 40002. Figure 1.2 depicts the 16 bit breakdown and cross reference. This is not to be confused with the historical event log.

| Description                      | Modbus Registers | Usage Notes For Read/Write Registers   |
|----------------------------------|------------------|--|
| Bit 0 'Switch In Auto'           | 040002:0         | Bit 0 Of Modbus Register 040002 - Indicates The 'Switch In Auto' Event         |
| Bit 1 'System Fault'             | 040002:1         | Bit 1 Of Modbus Register 040002 - Indicates The 'System Fault' Event           |
| Bit 2 'Engine Running'           | 040002:2         | Bit 2 Of Modbus Register 040002 - Indicates The 'Engine Running' Event         |
| Bit 3 'Battery Fault'            | 040002:3         | Bit 3 Of Modbus Register 040002 - Indicates The 'Batter Fault' Event           |
| Bit 4 'Charger Failure'          | 040002:4         | Bit 4 Of Modbus Register 040002 - Indicates The 'Charger Failure' Event        |
| Bit 5 'Failed To Start'          | 040002:5         | Bit 5 Of Modbus Register 040002 - Indicates The 'Failed To Start' Event        |
| Bit 6 'AC Power Failure'         | 040002:6         | Bit 6 Of Modbus Register 040002 - Indicates The 'AC Power Failure' Event       |
| Bit 7 'Low Oil Pressure'         | 040002:7         | Bit 7 Of Modbus Register 040002 - Indicates The 'Low Oil Pressure' Event       |
| Bit 8 'High Water Temperature'   | 040002:8         | Bit 8 Of Modbus Register 040002 - Indicates The 'High Water Temperature' Event |
| Bit 9 'Low Fuel Level'           | 040002:9         | Bit 9 Of Modbus Register 040002 - Indicates The 'Low Fuel Level' Event         |
| Bit 10 'Pump On Demand'          | 040002:10        | Bit 10 Of Modbus Register 040002 - Indicates The 'Pump On Demand' Event        |
| Bit 11 'Engine Overspeed'        | 040002:11        | Bit 11 Of Modbus Register 040002 - Indicates The 'Engine Overspeed' Event      |
| Bit 12                           | 040002:12        | Bit 12 Of Modbus Register 040002 - Not Used                                    |
| Bit 13 'Low Discharge Pressure'  | 040002:13        | Bit 13 Of Modbus Register 040002 - Indicates A 'Low Discharge Pressure' Event  |
| Bit 14 'Engine Fuel Solenoid On' | 040002:14        | Bit 14 Of Modbus Register 040002 - Indicates A 'Engine Fuel Solenoid On' Event |
| Bit 15 'High Discharge Pressure' | 040002:15        | Bit 15 Of Modbus Register 040002 - Indicates A 'High Discharge Pressure' Event |

Figure 1.2

### Setting And Reading The Real Time Clock Through Modbus:

Modbus registers 40003 through 40009 are real time clock read registers as seen in figure 1.3. To set the clock current values must be entered into registers 40011 through 40017. Any of these registers left to zero will result in an incorrect clock setting. Once desired clock date and time values are entered bit 0 of register 40001 must be toggled for the controller to accept the values. This can be done by setting bit 0 high or writing a 1 to register 40001. The controller will then accept the new values.

| Description                     | Modbus Registers | Usage Notes For Read/Write Registers   |
|---------------------------------|------------------|--|
| Real Time Clock Month           | 040003           | PLC Read Real Time Clock Month 1-12  |
| Real Time Clock Day             | 040004           | PLC Read Real Time Clock Day 1-31  |
| Real Time Clock Year            | 040005           | PLC Read Real Time Clock Year 00-99  |
| Real Time Clock Hour            | 040006           | PLC Read Real Time Clock Hour 1-24   |
| Real Time Clock Minute          | 040007           | PLC Read Real Time Clock Minute 0-59   |
| Real Time Clock Second          | 040008           | PLC Read Real Time Clock Seconds 0-59  |
| Real Time Clock Day Of Week     | 040009           | PLC Read Real Time Clock Day Of Week 0-6 "Sunday = 0"  |
|                                 |                  | **Must Have All Fields Filled To Set PLC Clock, Null Fields Will Write 0's To The Clock**                                |
|                                 |                  | **Once Desired Clock Values Are Entered, Toggling Bit 0 Of Modbus Register 040001 Or PLC Address \9001.0 Will Set Clock* |
| Real Time Clock Set Month       | 040011           | PLC Set Real Time Clock Month 1-12   |
| Real Time Clock Set Day         | 040012           | PLC Set Real Time Clock Day 1-31   |
| Real Time Clock Set Year        | 040013           | PLC Set Real Time Clock Year 00-99 "Cannot Enter 2006, Must Enter 06"  |
| Real Time Clock Set Hour        | 040014           | PLC Set Real Time Clock Hour 1-24  |
| Real Time Clock Set Minute      | 040015           | PLC Set Real Time Clock Minute 0-59  |
| Real Time Clock Set Second      | 040016           | PLC Set Real Time Clock Second 0-59  |
| Real Time Clock Set Day Of Week | 040017           | PLC Set Real Time Clock Day Of Week 0-6 "Sunday = 0"   |

Figure 1.3

### Most Current And Historical Alarms and Events:

The most recent event or alarm date time stamped can be viewed from Modbus registers 40019 through 40025. Register 40019 contains a number representing the most current alarm or event and if it is an occurring or clearing event. The meaning of this number can be cross referenced from figures 1.6 through 1.9. Date and time for the event or alarm are viewed in registers 40020 through 40025. See figure 1.4 for register interpretation.

| Description                | Modbus Registers | Usage Notes For Read Only Registers                  |
|----------------------------|------------------|--|
| Most Current Event Number  | 040019           | Most Current Event That Happened 1-169 (Index Below) |
| Most Current Event Month   | 040020           | Most Current Event Month 1-12                        |
| Most Current Event Day     | 040021           | Most Current Event Day 1-31                          |
| Most Current Event Year    | 040022           | Most Current Event Year 00-99                        |
| Most Current Event Hours   | 040023           | Most Current Event Hours 1-24                        |
| Most Current Event Minutes | 040024           | Most Current Event Minutes 0-59                      |
| Most Current Event Seconds | 040025           | Most Current Event Seconds 0-59                      |

Figure 1.4

The historical events and alarms can be viewed from Modbus registers 40026 through 40033. Here it is possible to scroll through the entire log and set the log pointer to the most current record. Register 40026 contains a number representing the actual log number entry location in the controller. Register 40027 contains a number representing the event or alarm that can be indexed using figures 1.6 through 1.9. Registers 40028 through 40033 show the date and time stamp information for the log record being pointed to.

To maneuver through the log:

Toggling bit 3 or writing an 8 to register 40001 will increment the log by one entry.

Toggling bit 4 or writing a 16 to register 40001 will decrement the log by one entry.  
 Toggling bit 7 or writing a 128 to register 40001 will set the log to view the most current log entry.

It is recommended to set the log to the most current entry before scrolling. Upon doing this the historical log should show the same data from registers in Figure 1.4. When scrolling, it is possible to move forward and backward through roughly a full weeks worth of data.

| Description                        | Modbus Registers | Usage Notes For Read Only Registers                          |
|------------------------------------|------------------|--|
| Event Historical Log Index         | 040026           | Event Historical Log Index Value For Record Being Pointed To |
| Event Historical Log Event Number  | 040027           | Event Historical Log Event That Occurred 1-21                |
| Event Historical Log Event Month   | 040028           | Event Historical Log Month Event Occurred 1-12               |
| Event Historical Log Event Day     | 040029           | Event Historical Log Day Event Occurred 1-31                 |
| Event Historical Log Event Year    | 040030           | Event Historical Log Year Event Occurred 00-99               |
| Event Historical Log Event Hours   | 040031           | Event Historical log Hour Event Occurred 1-24                |
| Event Historical Log Event Minutes | 040032           | Event Historical Log Minute Event Occurred 0-59              |
| Event Historical Log Event Seconds | 040033           | Event Historical Log Second Event Occurred 0-59              |

Figure 1.5

| Event/Alarm Description                | Event Index # |
|--|---------------|
| Battery 1 Low Voltage Alarm Occurred   | 0             |
| Battery 1 Low Voltage Alarm Cleared    | 1             |
| Battery 1 Disconnect Alarm Occurred    | 2             |
| Battery 1 Disconnect Alarm Cleared     | 3             |
| Battery 1 Switch Off Alarm Occurred    | 4             |
| Battery 1 Switch Off Alarm Cleared     | 5             |
| Battery 2 Low Voltage Alarm Occurred   | 6             |
| Battery 2 Low Voltage Alarm Cleared    | 7             |
| Battery 2 Disconnect Alarm Occurred    | 8             |
| Battery 2 Disconnect Alarm Cleared     | 9             |
| Battery 2 Switch Off Alarm Occurred    | 10            |
| Battery 2 Switch Off Alarm Cleared     | 11            |
| Charger 1 Fault Alarm Occurred         | 12            |
| Charger 1 Fault Alarm Cleared          | 13            |
| Charger 2 Fault Alarm Occurred         | 14            |
| Charger 2 Fault Alarm Cleared          | 15            |
| AC Power Failure Alarm Occurred        | 16            |
| AC Power Failure Alarm Cleared         | 17            |
| Engine Overspeed Alarm Occurred        | 18            |
| Engine Overspeed Alarm Cleared         | 19            |
| Engine Failed To Start Alarm Occurred  | 20            |
| Engine Failed To Start Alarm Cleared   | 21            |
| Engine Quit Alarm Occurred             | 22            |
| Engine Quit Alarm Cleared              | 23            |
| Low Oil Pressure Alarm Occurred        | 24            |
| Low Oil Pressure Alarm Cleared         | 25            |
| High Water Temperature Alarm Occurred  | 26            |
| High Water Temperature Alarm Cleared   | 27            |
| Pressure Transducer Alarm Occurred     | 28            |
| Pressure Transducer Alarm Cleared      | 29            |
| Low Fuel Leve Alarm Occurred           | 30            |
| Low Fuel Leve Alarm Cleared            | 31            |
| Battery 1 Switch Signal Event Occurred | 32            |
| Battery 1 Switch Signal Event Cleared  | 33            |
| Battery 2 Switch Signal Event Occurred | 34            |
| Battery 2 Switch Signal Event Cleared  | 35            |
| Battery 1 Fault Contact Occurred       | 36            |
| Battery 1 Fault Contact Cleared        | 37            |
| Battery 2 Fault Contact Occurred       | 38            |
| Battery 2 Fault Contact Cleared        | 39            |
| Stop Pushbutton Pressed Event          | 40            |
| Stop Pushbutton Released Event         | 41            |

Figure 1.6

| Event/Alarm Description                | Event Index # |
|--|---------------|
| Engine Started/Running Event           | 42            |
| Engine Stopped Event                   | 43            |
| Engine Overspeed Signal Occurred       | 44            |
| Engine Overspeed Signal Cleared        | 45            |
| Low Oil Pressure Signal Occurred       | 46            |
| Low Oil Pressure Signal Cleared        | 47            |
| High Water Temperature Signal Occurred | 48            |
| High Water Temperature Signal Cleared  | 49            |
| Engine Lockout Signal Occurred         | 50            |
| Engine Lockout Signal Cleared          | 51            |
| Deluge Signal Occurred                 | 52            |
| Deluge Signal Cleared                  | 53            |
| Remote Start Signal Occurred           | 54            |
| Remote Start Signal Cleared            | 55            |
| Low Fuel Level Signal Occurred         | 56            |
| Low Fuel Level Signal Cleared          | 57            |
| Pressure Switch Signal Occurred        | 58            |
| Pressure Switch Signal Cleared         | 59            |
| Aux 2 Message Occurred                 | 60            |
| Aux 2 Message Cleared                  | 61            |
| Aux 3 Message Occurred                 | 62            |
| Aux 3 Message Cleared                  | 63            |
| Aux 4 Message Occurred                 | 64            |
| Aux 4 Message Cleared                  | 65            |
| Aux 5 Message Occurred                 | 66            |
| Aux 5 Message Cleared                  | 67            |
| Aux 6 Message Occurred                 | 68            |
| Aux 6 Message Cleared                  | 69            |
| Aux 7 Message Occurred                 | 70            |
| Aux 7 Message Cleared                  | 71            |
| Aux 8 Message Occurred                 | 72            |
| Aux 8 Message Cleared                  | 73            |
| Aux 9 Message Occurred                 | 74            |
| Aux 9 Message Cleared                  | 75            |
| Aux 10 Message Occurred                | 76            |
| Aux 10 Message Cleared                 | 77            |
| Mode Change Signal Occurred            | 78            |
| Mode Change Signal Cleared             | 79            |
| System In Auto Event Occurred          | 80            |
| System In Auto Event Cleared           | 81            |
| System In Off Event Occurred           | 82            |
| System In Off Event Cleared            | 83            |
| System In Manual Event Occurred        | 84            |
| System In Manual Event Cleared         | 85            |

Figure 1.7

| Event/Alarm Description                     | Event Index # |
|---|---------------|
| Auto Test Start Event Occurred              | 86            |
| Auto Test Start Event Cleared               | 87            |
| Alarm Reset Button Pressed Event Occurred   | 88            |
| Alarm Reset Button Pressed Event Cleared    | 89            |
| Low Pressure Start Event Occurred           | 90            |
| Low Pressure Start Event Cleared            | 91            |
| Low Pressure Condition Event Occurred       | 92            |
| Low Pressure Condition Event Cleared        | 93            |
| Deluge Start Event Occurred                 | 94            |
| Deluge Start Event Cleared                  | 95            |
| Memory Card Missing Event Occurred          | 96            |
| Memory Card Missing Event Cleared           | 97            |
| Controller Reboot Event Occurred            | 98            |
| Controller Reboot Event Cleared             | 99            |
| Pressure Drop Event Occurred                | 100           |
| Pressure Drop Event Cleared                 | 101           |
| N/A   | 102           |
| N/A   | 103           |
| N/A   | 104           |
| N/A   | 105           |
| Low Intake Pressure Shutdown Event Occurred | 106           |
| Low Intake Pressure Shutdown Event Cleared  | 107           |
| Auxiliary Alarm Occurred                    | 108           |
| Auxiliary Alarm Cleared                     | 109           |
| High Fuel Level Alarm Occurred              | 110           |
| High Fuel Level Alarm Cleared               | 111           |
| Fuel Spill Alarm Occurred                   | 112           |
| Fuel Spill Alarm Cleared                    | 113           |
| Fuel Tank Rupture Alarm Occurred            | 114           |
| Fuel Tank Rupture Alarm Cleared             | 115           |
| Low Pump Room Temperature Alarm Occurred    | 116           |
| Low Pump Room Temperature Alarm Cleared     | 117           |
| Reservoir Low Alarm Occurred                | 118           |
| Reservoir Low Alarm Cleared                 | 119           |
| Reservoir Empty Alarm Occurred              | 120           |
| Reservoir Empty Alarm Cleared               | 121           |
| Reservoir High Alarm Occurred               | 122           |
| Reservoir High Alarm Cleared                | 123           |
| Flow Meter On Alarm Occurred                | 124           |
| Flow Meter On Alarm Cleared                 | 125           |
| Relief Valve Open Alarm Occurred            | 126           |
| Relief Valve Open Alarm Cleared             | 127           |
| Low Suction Pressure Alarm Occurred         | 128           |
| Low Suction Pressure Alarm Cleared          | 129           |

Figure 1.8

| Event/Alarm Description                    | Event Index # |
|--|---------------|
| High Engine Oil Temperature Alarm Occurred | 130           |
| High Engine Oil Temperature Alarm Cleared  | 131           |
| Low Jacket Water Flow Alarm Occurred       | 132           |
| Low Jacket Water Flow Alarm Cleared        | 133           |
| Low Jacket Water Level Alarm Occurred      | 134           |
| Low Jacket Water Level Alarm Cleared       | 135           |
| Low Hydraulic Pressure Alarm Occurred      | 136           |
| Low Hydraulic Pressure Alarm Cleared       | 137           |
| Low Firewater Pressure Alarm Occurred      | 138           |
| Low Firewater Pressure Alarm Cleared       | 139           |
| Air Damper Closed Alarm Occurred           | 140           |
| Air Damper Closed Alarm Cleared            | 141           |
| Air Damper Open Alarm Occurred             | 142           |
| Air Damper Open Alarm Cleared              | 143           |
| Low Purge Pressure Alarm Occurred          | 144           |
| Low Purge Pressure Alarm Cleared           | 145           |
| Low Gear Oil Pressure Alarm Occurred       | 146           |
| Low Gear Oil Pressure Alarm Cleared        | 147           |
| Low Coolant Level Alarm Occurred           | 148           |
| Low Coolant Level Alarm Cleared            | 149           |
| High Gear Oil Temperature Alarm Occurred   | 150           |
| High Gear Oil Temperature Alarm Cleared    | 151           |
| High Vibration Alarm Occurred              | 152           |
| High Vibration Alarm Cleared               | 153           |
| Low Fuel Pressure Alarm Occurred           | 154           |
| Low Fuel Pressure Alarm Cleared            | 155           |
| Pump On Demand Alarm Occurred              | 156           |
| Pump On Demand Alarm Cleared               | 157           |
| High Exhaust Temperature Alarm Occurred    | 158           |
| High Exhaust Temperature Alarm Cleared     | 159           |
| High Fuel Temperature Alarm Occurred       | 160           |
| High Fuel Temperature Alarm Cleared        | 161           |
| Pump Room Door Ajar Alarm Occurred         | 162           |
| Pump Room Door Ajar Alarm Cleared          | 163           |
| ECM Alternate Alarm Occurred               | 164           |
| ECM Alternate Alarm Cleared                | 165           |
| ECM Failure Occurred                       | 166           |
| ECM Failure Cleared                        | 167           |
| High System Pressure Alarm Occurred        | 168           |
| High System Pressure Alarm Cleared         | 169           |

Figure 1.9

**Most Current And Historical Pressure Readings:**

The most recent system pressure with date time stamp can be viewed from Modbus registers 40034 through 40040. Register 40034 contains a number representing the most current pressure read by the controller. The value is scaled and should match the pressure displayed on the main status screen on the controller OID. Date and time stamp for the pressure reading is viewed in registers 40035 through 40040. See figure 1.10 for register interpretation. The pressure log must be set up to log on an interval for these pressure readings to be logged.

| Description               | Modbus Registers | Usage Notes For Read Only Registers          |
|---------------------------|------------------|--|
| Most Current PSI Pressure | 040034           | Most Current PSI 0-300 PSI (Real Time Value) |
| Most Current PSI Day      | 040035           | Most Current PSI Month 1-12                  |
| Most Current PSI Month    | 040036           | Most Current PSI Day 1-31                    |
| Most Current PSI Year     | 040037           | Most Current PSI Year 00-99                  |
| Most Current PSI Hours    | 040038           | Most Current PSI Hours 1-24                  |
| Most Current PSI Minutes  | 040039           | Most Current PSI Minutes 0-59                |
| Most Current PSI Seconds  | 040040           | Most Current PSI Seconds 0-59                |

Figure 1.10

The historical pressure readings can be viewed from Modbus registers 40041 through 40048. Here it is possible to scroll through the entire log and set the log pointer to the most current record. Register 40041 contains a number representing the actual log number entry location in the controller. Register 40042 contains a number representing the logged pressure reading. Registers 40043 through 40048 show the date and time stamp information for the log record being pointed to.

To maneuver through the log:

Toggling bit 5 or writing a 32 to register 40001 will increment the log by one entry.

Toggling bit 6 or writing a 64 to register 40001 will decrement the log by one entry.

Toggling bit 8 or writing a 256 to register 40001 will set the log to view the most current log entry.

It is recommended to set the log to the most current entry before scrolling. Upon doing this the historical log should show the same data from registers in Figure 1.10. When scrolling, it is possible to move forward and backward through roughly a full weeks worth of data.

| <i>Description</i>          | <i>Modbus Registers</i> | <i>Usage Notes For Read Only Registers</i>                 |
|-----------------------------|-------------------------|--|
| PSI Historical Log Index    | 040041                  | PSI Historical Log Index Value For Record Being Pointed To |
| PSI Historical Log Pressure | 040042                  | PSI Historical Log PSI That Occurred 0-300 PSI             |
| PSI Historical Log Day      | 040043                  | PSI Historical Log Day PSI Occurred 1-12                   |
| PSI Historical Log Month    | 040044                  | PSI Historical Log Month PSI Occurred 1-31                 |
| PSI Historical Log Year     | 040045                  | PSI Historical Log Year PSI Occurred 00-99                 |
| PSI Historical Log Hours    | 040046                  | PSI Historical Log Hour PSI Occurred 1-24                  |
| PSI Historical Log Minutes  | 040047                  | PSI Historical Log Minute PSI Occurred 0-59                |
| PSI Historical Log Seconds  | 040048                  | PSI Historical Log Second PSI Occurred 0-59                |

Figure 1.11

**Miscellaneous Floating Point Readings:**

Battery amperage and voltage along with engine run hours and system pressure can all be read from the controller Real or Floating Point registers. These are Modbus registers 40186 through 40196. These registers will be double word and a separate poll definition must be used. No more than 50 registers can be pulled at a time. All available floating point registers are shown in Figure 1.12 and do not require scaling.

| <i>Description</i>        | <i>Modbus Registers</i> | <i>Usage Notes For Read Only Registers</i>           |
|---------------------------|-------------------------|--|
| Battery 1 Volts Reading   | 040186                  | Battery 1 Volts Floating Point Value                 |
| Battery 2 Volts Reading   | 040188                  | Battery 2 Volts Floating Point Value                 |
| Battery 1 Amps Reading    | 040190                  | Battery 1 Amps Floating Point Value                  |
| Battery 2 Amps Reading    | 040192                  | Battery 2 Amps Floating Point Value                  |
| Engine Run Hours          | 040194                  | Engine Run Hours Floating Point Value                |
| Most Current PSI Pressure | 040196                  | Most Current Pressure 0-300 PSI Floating Point Value |

Figure 1.12