MANUAL FOR MODEL FD4 FIRE PUMP CONTROLLERS

Starting Serial No. "FF"

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", "Pump On Demand", "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**.** 8 additional lights, configurable by the factory, can be 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. In addition the **"Pump on Demand"** light will illuminate. 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 fuel solenoid will stay on for one hour however. This is to allow the engine to continue to run in the event the failed to start condition was due to a faulty speed switch signal from the engine. 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, External Pressure , These start switches will also cause the **"Pump on Demand"** light to illuminate.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 after a seven (7) second time delay and the alarm will sound indicating engine overheating.

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 with a maximum setting of 60 minutes possible. 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 "Pump On Demand" alarm light is provided to indicate that there is a command to start and run the additive pump controller. This includes a low pressure condition, deluge valve start signal etc. The alarm light will clear when the start condition has been cleared such as the water pressure in the system rises above the high set point set in screen 102.

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:

Terminal Number (Microprocessor Func #)	**L.E.D. (light) "ON" Indication**
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.

Note: On Electronic Engines with electronic oil pressure sensors, the oil pressure light may not illuminate while the engine is cranking. The low oil pressure test should be performed on these engines with the engine running as described below.

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 will illuminate after approximately 7 seconds. 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 **"Contactor Coil Failure"** lamp should illuminate and the alarm horn should sound. Reconnect the field wire to terminal 9. The **"Contactor Coil Failure"** lamp should go out and the alarm horn should silence. Repeat for terminal 10.

h. **AUTOMATIC STARTING TESTS:**

1. Place control in **"Auto"** position.
2. Bleed off pressure in system until pressure drops below the low set point. The **"Pump on Demand"** light should come on.
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.

i. **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.

j. **SETTING PROGRAM WEEKLY TEST TIME:** System Config screen 106 through 109.

k. **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).

l. **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.

m. **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.

n. **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.

o. **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 (8) 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.

p. **FOAM PUMP OPTION:** An optional feature to operate an external pressure dump valve can be provided for Foam Pump Service if required. Screen 318 is set to approximately 10-15 seconds to operate a dry contact which can be used to operate the Dump Valve solenoid. This contact will close when a demand for the pump to run is received such as low pressure, deluge valve, remote start, weekly test start etc. Once the engine is running, the timing circuit will start and keep the contact close for the length of time set in screen 318. Then it will open and de-energize the dump valve allowing the pump to develop full pressure. In addition, if the controller is not activated by a pressure start, the pressure transducer can be deactivated through screen 319. This will also remove the pressure display from the main status screen of the OID. The controller can only then be activated by a remote start such as deluge valve or remote start contacts. This a factory settable option only and must be ordered with the controller before it ships from the factory.

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.

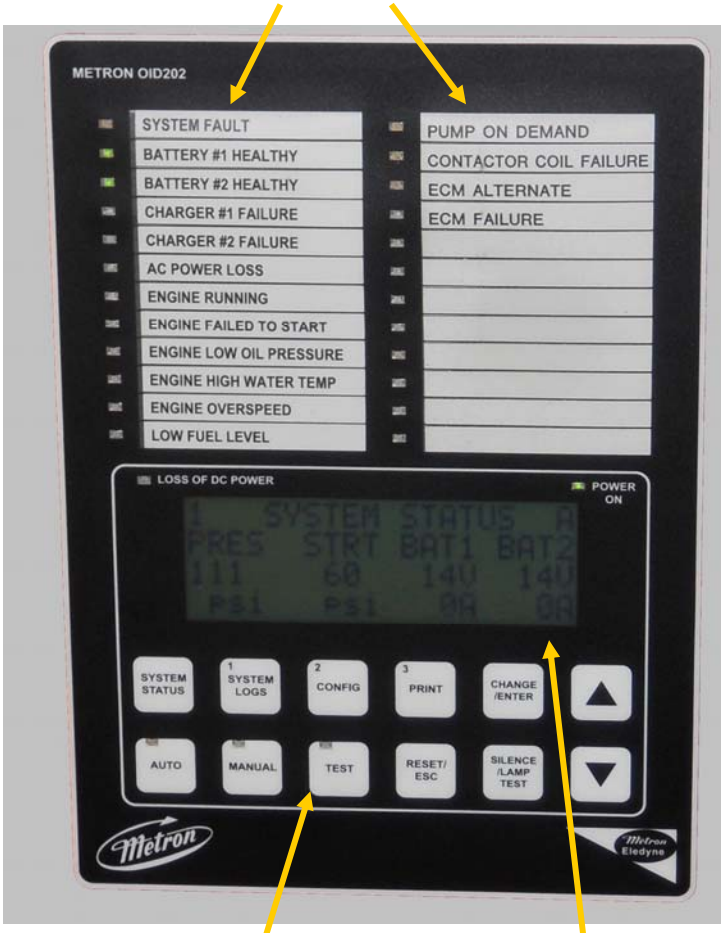
Check batteries daily for a few days after initial installation has been made, and weekly thereafter. Batteries should be checked for overcharging (gassing), or undercharging (low voltage, or low specific gravity of the electrolyte or acid.

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



System Operation and Control Type Buttons

Digital Display With 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).

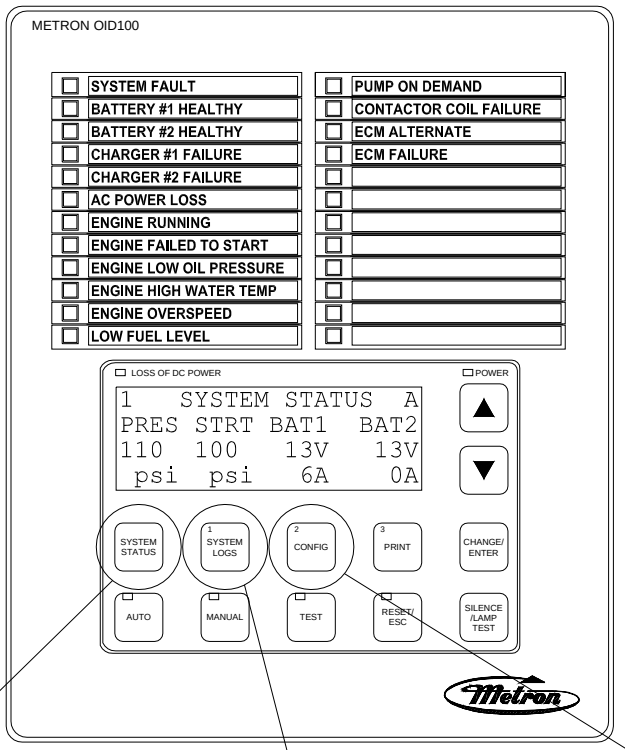
Resetting Alarms: If the alarm condition has cleared, press and hold the [RESET/ESC] button 2 to 5 seconds to reset alarms. "Engine Failed to Start" and "Engine Overspeed" alarms require the system to be in the OFF mode before a reset is allowed.

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.

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
Mon06/16/10 17:53:26

5 SYSTEM STATUS
Firmware Ver SV 4.59
Commissioned Date:
06/15/10

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 EVENT LOG
System in Off
Mode Occurred
06/16/10 13:15:15

1 EVENT DETAILS
System in Off
Mode Occurred
06/16/10 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
06/16/10 07:32:15

3 EVENT LOG
AC Power Failure
Alarm Cleared
06/16/10 07:09:48

PRESSURE LOG
06/16/10 17:52:45
112 psi
Skip Rate:[EACH]

PRESSURE LOG
06/16/10 17:52:30
112 psi
Skip Rate:[EACH]

PRESSURE LOG
06/16/10 17:52:15
113 psi
Skip Rate:[EACH]

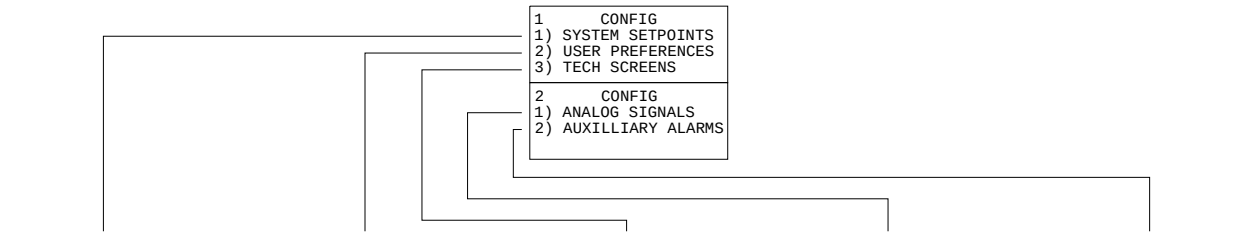
1 CONFIG
1) SYSTEM SETPOINTS
2) USER PREFERENCES
3) TECH SCREENS

2 CONFIG
1) ANALOG SIGNALS
2) AUXILLIARY ALARMS

Continued on next page.

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.



101 SYSTEM SETPOINTS Engine Start Pressure [100.0]psi 0-999.9
102 SYSTEM SETPOINTS Engine Stop Pressure [110.0]psi 0-999.9
103 SYSTEM SETPOINTS Engine Start Delay Time [1] seconds 1-999
104 SYSTEM SETPOINTS Engine Automatic Stop Enabled [Yes]
105 SYSTEM SETPOINTS Engine Minimum Run Time [30]minutes 30-60
106 SYSTEM SETPOINTS Automatic Weekly Engine Test Run [Yes]
107 SYSTEM SETPOINTS Auto Weekly Engine Test Day Of The Week [Mon]
108 SYSTEM SETPOINTS Auto Weekly Engine Test Start Time [10:00:00]
109 SYSTEM SETPOINTS Auto Weekly Test Length Of Run Time [30] minutes 10-30
110 SYSTEM SETPOINTS Auto Weekly Test Oil/Water Shutdown [No]
111 SYSTEM SETPOINTS Power Failure Engine Startup [No]
112 SYSTEM SETPOINTS Power Failure Engine Start Delay Time [1] minutes 0-500
113 SYSTEM SETPOINTS Pressure Transducer Failure Engine Start [Yes]
114 SYSTEM SETPOINTS Surge Control Valve Open/Close Control [No]
115 SYSTEM SETPOINTS Surge Control Valve Delay Time [0] seconds 0-999

201 USER PREFERENCES Set System Real Time Clock [17:03:52]
202 USER PREFERENCES Set System Date [02/16/03]
203 USER PREFERENCES Set System Day Of The Week [Sun]
204 USER PREFERENCES Log System Pressure Drop Events [Yes]
205 USER PREFERENCES Low Pressure Event Trip Pressure [60.0]psi 0-999.9
206 USER PREFERENCES Low Pressure Event Reset Time [15] seconds 0-20
207 USER PREFERENCES Time Between Pressure Log Samples [15] seconds 15-999
208 USER PREFERENCES Auto Print Each Pressure Log Sample [No]
209 USER PREFERENCES Auto Print Each Event Log Entry [No]
210 USER PREFERENCES Selective Range Printing [1] Before 1-99
211 USER PREFERENCES Selective Range Printing [1] After 1-99
212 USER PREFERENCES LCD Back Light Mode 0=Always on [0]] 1=Power Save
213 USER PREFERENCES Language Select 0=English, 1=Spanish [0]
214 USER PREFERENCES Change User Password Level 1 [****]
215 USER PREFERENCES Save ALL settings to SD memory card [No]

301 TECH SCREENS SPECIAL: Engine Minimum Run Time [No]
302 TECH SCREENS SPECIAL: Engine Minimum Run Time [15]minutes 1-99
303 TECH SCREENS Energized To Stop Fuel Solenoid Time [10]seconds 0-99
304 TECH SCREENS Low Oil Pressure Alarm Delay Time [7]seconds 1-99
305 TECH SCREENS Nominal Battery Voltage [12]VDC 10-99
306 TECH SCREENS Battery Low Voltage Alarm Trip Voltage [9.0]VDC 8-99
307 TECH SCREENS Battery Low Voltage Alarm Trip Time [5]seconds 0-99
308 TECH SCREENS Change Tech Password [******]
309 TECH SCREENS Password Logout Time [5] minutes 1-15
310 TECH SCREENS System Commissioned Date [00/00/00]
311 TECH SCREENS Expiration Time For Test Settings [5]minutes 1-60
312 TECH SCREENS STARTUP TEST: Test Settings Enabled [No]
313 TECH SCREENS STARTUP TEST: Engine Minimum Run Time [15]minutes 1-99
314 TECH SCREENS FACTORY TEST: Test Settings Enabled [No]
315 TECH SCREENS FACTORY TEST: Engine Crank Time [15]seconds 1-15

400 ANALOG SIGNALS Analog Input 01 Slope: [0.2135677]
401 ANALOG SIGNALS Analog Input 01 Offset: [- 75.6030]
402 ANALOG SIGNALS Analog Input 1 651 Minimum Counts [200]
410 ANALOG SIGNALS Analog Input 02 Slope: [0.0350000]
411 ANALOG SIGNALS Analog Input 02 Offset: [0.0000]
412 ANALOG SIGNALS Analog Input 2 1174 Minimum Counts [0]
420 ANALOG SIGNALS Analog Input 03 Slope: [0.0350000]
421 ANALOG SIGNALS Analog Input 03 Offset: [0.0000]
422 ANALOG SIGNALS Analog Input 3 1225 Minimum Counts [0]
ANALOG INPUT COUNTS 649 1176 1221 0 0 0 0 0 0 0
424 BATTERY 1 Constant A xA^3 + xB^2 + xC + D [0.0000]
425 BATTERY 1 Constant B xA^3 + xB^2 + xC + D [0.0000]
426 BATTERY 1 Constant C xA^3 + xB^2 + xC + D [0.004190]
427 BATTERY 1 Constant D xA^3 + xB^2 + xC + D [- 0.096642]
428 BATTERY 1 Volts per count [1.0000000]

501 AUX SETPOINTS Aux User Program #1 Enabled [Yes]
502 AUX SETPOINTS Aux User Program #1 Input Number [30] 0-62
503 AUX SETPOINTS Aux User Program #1 Input Contact Type [NO]
504 AUX SETPOINTS Aux User Program #1 Trip Time [0]sec 0-999
505 AUX SETPOINTS Aux User Program #1 Reset Time [0]sec 0-999
506 AUX SETPOINTS Aux User Program #1 Auto Reset Enabled [Yes]
507 AUX SETPOINTS Aux User Program #1 Horn Enabled [No]
508 AUX SETPOINTS Aux User Program #1 Horn Silence [No]
509 AUX SETPOINTS Aux User Program #1 LED Number [0] 0-24
510 AUX SETPOINTS Aux User Program #1 Output1 Number [0] 0-19
511 AUX SETPOINTS Aux User Program #1 Output2 Number [0] 0-19
512 AUX SETPOINTS Aux User Program #1 Output3 Number [0] 0-19
513 AUX SETPOINTS Aux User Program #1 Record In Event Log [No]
514 AUX SETPOINTS Aux User Program #1 Text Message Number [0] 0-32
515 AUX SETPOINTS Aux User Program #1 Engine Run Dependent [0] 0-32

OID Screen Map (continued)

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

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

```
118 SYSTEM SETPOINTS
Low Intake Shutdown
     Auto Reset
[Yes]
```

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

```
120 SYSTEM SETPOINTS
  Pressure Switch
   Engine Start
[No ]
```

```
121 SYSTEM SETPOINTS
    Deluge Valve
    Engine Start
[Yes]
```

```
122 SYSTEM SETPOINTS
High System Pressure
      Alarm
[175.0]psi     999.9
```

```
123 SYSTEM SETPOINTS
  Engine Lockout
     Latched
[No]
```

```
216 USER PREFERENCES
Load ALL settings
from SD memory card
[No]
```

```
217 USER PREFERENCES
Pressure Units

[psi]
```

```
218 USER PREFERENCES
Engine running chrg
failure alarm
[No]
```

```
219 USER PREFERENCES
Charger failure
delay time
[xxx]          0-999
```

```
220 USER PREFERENCES
Modbus address

[001]          0-255
```

```
221 USER PREFERENCES
Modbus Enabled
(Disables Printer)
[Yes]
```

```
222 USER PREFERENCES
Modbus/Printer Baud

[38400]
```

```
223 USER PREFERENCES
Modbus Parity

[Even]
```

```
316  TECH SCREENS
FACTORY TEST: Engine
   Crank Rest Time
[15]seconds     1-15
```

```
317  TECH SCREENS
Alarm Log    1/10
Event Log    1/1569
Pr. Log      1/25123
```

```
318  TECH SCREENS
     Dump Valve
     time delay
[10]seconds    0-999
```

```
319  TECH SCREENS
Pressure
Transducer
[Yes]
```

```
320  TECH SCREENS
Weekly Test Start
Due lamp ONLY
[No]
```

```
321  TECH SCREENS

      UNUSED
```

```
322  TECH SCREENS

      UNUSED
```

```
323  TECH SCREENS

      UNUSED
```

```
324  TECH SCREENS
Mode Select
0=US, 1=EU
[US]
```

```
429 BATTERY 1
Minimum Amps

[     1.0]
```

```
430 BATTERY 2
Constant A
xA^3 + xB^2 + xC + D
[ 0.0000]
```

```
431 BATTERY 2
Constant B
xA^3 + xB^2 + xC + D
[ 0.0000]
```

```
432 BATTERY 2
Constant C
xA^3 + xB^2 + xC + D
[ 0.004190]
```

```
433 BATTERY 2
Constant D
xA^3 + xB^2 + xC + D
[- 0.096642]
```

```
434 BATTERY 2
Volts per count

[1.0000000]
```

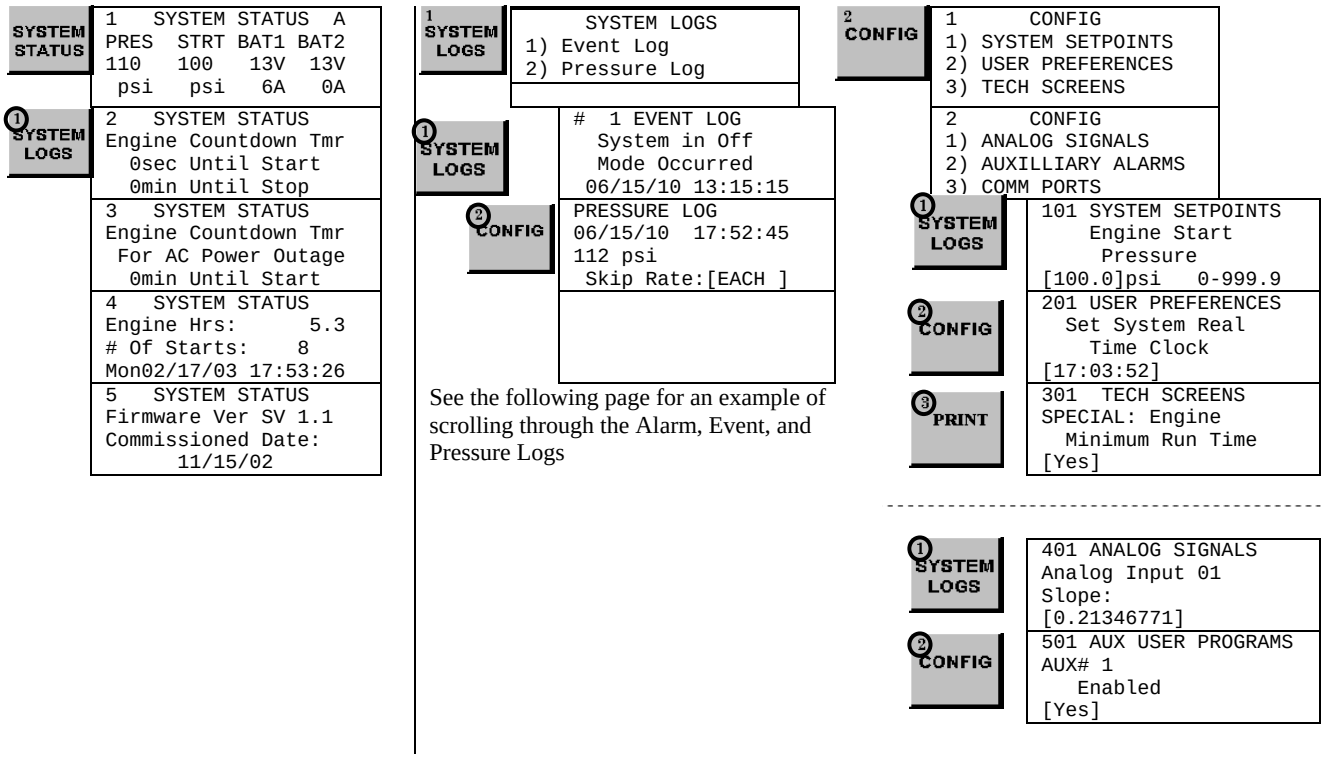
```
435 BATTERY 2
Minimum Amps

[     1.0]
```

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.



See the following page for an example of scrolling through the Alarm, Event, and Pressure Logs

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

```
    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 EVENT LOG
   System in Off
   Mode Occurred
 06/15/10 13:15:15
```

```
#   1 EVENT DETAILS
   System in Off
   Mode Occurred
 06/15/10 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
 06/15/10 07:32:15
```

```
#   3 EVENT LOG
   AC Power Failure
    Alarm Cleared
 06/15/10 07:09:48
```

```
    PRESSURE LOG
06/15/10  17:52:45
112 psi
 Skip Rate:[EACH  ]
```

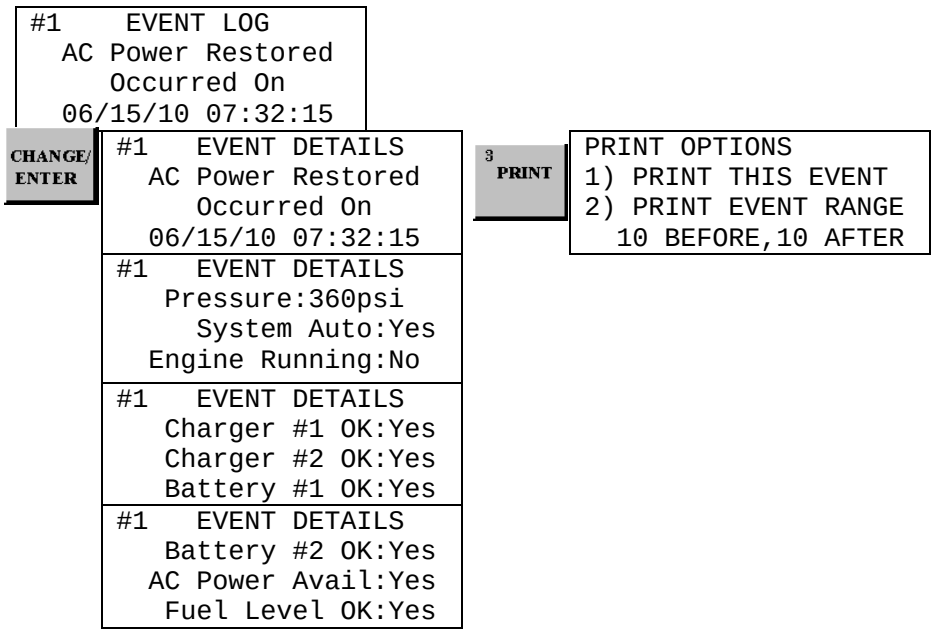
```
    PRESSURE LOG
06/15/10  17:52:30
112 psi
 Skip Rate:[EACH  ]
```

```
    PRESSURE LOG
06/15/10  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.

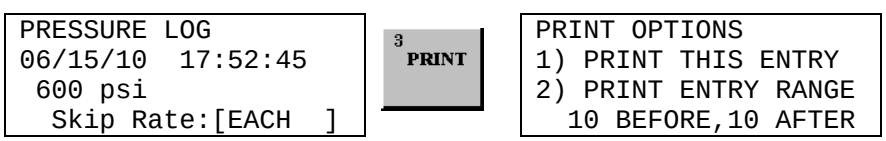
Typical Event/Alarm Log Message Printout

```
#1    EVENT LOG
  AC Power Restored
     Occurred On
  06/15/10 07:32:15
#2    EVENT LOG
  AC Power Restored
     Occurred On
  06/15/10 07:32:15
```



Typical Event/Alarm Log Details Printout

```
#1   EVENT DETAILS
  AC Power Restored
     Occurred On
  06/15/10 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
  06/15/10 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
06/15/10  17:52:45
  600 psi
06/15/10  17:52:30
```

```
PRESSURE LOG
06/15/10  17:52:30
 599 psi
  Skip Rate:[EACH  ]
```

```
  599 psi
06/15/10  17:52:15
  599 psi
06/15/10  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.

```
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.

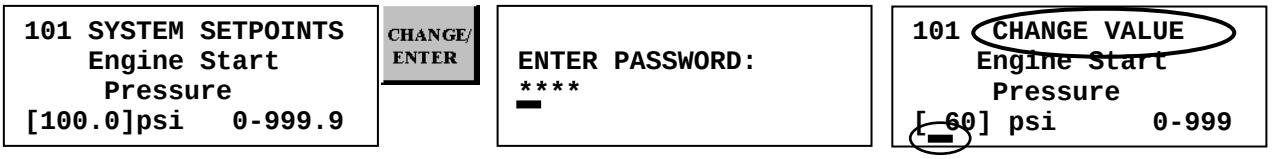
1) ANALOG SIGNALS (Level 2 password): These setpoints calibrate the analog pressure and battery volt readings.
2) AUXILLIARY ALARMS (Level 2 password): These 12 user programs are used to setup any auxiliary signals that need to be monitored.

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:

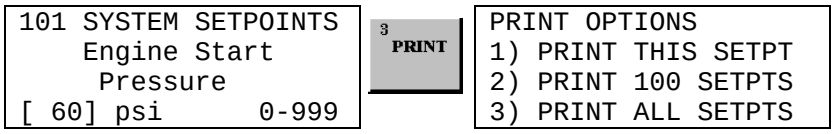


Press the [1], [2], or [3] keys to enter the password. The default user password is 1111. This can be changed by the user in screen 214.

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.



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     30-60
```

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
[Yes]
```

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 Not Used	Setting Reserved For Factory Configurations
115 SYSTEM SETPOINTS Not Used	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.

```
123 SYSTEM SETPOINTS
    Engine Lockout
      Latched
[No]
```

This setting determines if only a momentary input to the Engine Lockout input is required to stop the engine after an automatic stop, or prevent it starting automatically. Can only be activated at the factory by Metron.

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.

Configure User Preferences **(continued)**

```
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.

```
213 USER PREFERENCES
Language Select
0=English  1=Spanish
[English]
```

Set to English or Spanish

```
214 USER PREFERENCES
Change User Password
Level 1
[****]
```

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

```
215 USER PREFERENCES
Save All Settings
to SD card
[No]
```

Used to save auxiliary alarm configuration parameters to the SD card

```
216 USER PREFERENCES
Load All Settings
from SD card
[No]
```

Used to load auxiliary alarm configuration parameters from the SD card

```
217 USER PREFERENCES
Pressure Units

[psi]
```

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

```
218 USER PREFERENCES
Engine running chrg
failure alarm
[ No]
```

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

```
219 USER PREFERENCES
Charger failure
delay time
[  5]sec            0-999
```

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.

```
220 USER PREFERENCES
Modbus Address

[001]               0-255
```

Sets the Modbus Address when turned on via screen 221

```
221 USER PREFERENCES
Modbus Enabled
 (Disables Printer)
[ No]
```

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

```
222 USER PREFERENCES
Modbus/Printer Baud

[ 9600]
```

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

```
223 USER PREFERENCES
Modbus Parity

[None]
```

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 Alarm Occurred/ Alarm Cleared	Battery1 voltage is/was less than the Battery Low Voltage trip voltage set in set point #306
Battery1 Disconnectd Alarm Occurred/ Alarm Cleared	Battery1 wiring has been disconnected and/or BAT1 switch is in the OFF position
Battery1 Switch off Alarm Occurred/ Alarm Cleared	Battery1 wiring has been disconnected and/or BAT1 switch is in the OFF position
Battery2 Low Voltage Alarm Occurred/ Alarm Cleared	Battery2 voltage is/was less than the Battery Low Voltage trip voltage set in set point #306
Battery2 Disconnectd Alarm Occurred/ Alarm Cleared	Battery2 wiring has been disconnected and/or BAT2 switch is in the OFF position
Battery2 Switch off Alarm Occurred/ Alarm Cleared	Battery2 wiring has been disconnected and/or BAT2 switch is in the OFF position
Charger 1 Fault Alarm Occurred/ 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 Alarm Occurred/ 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 Alarm Occurred/ Alarm Cleared	AC Power Failure declared when both battery chargers are in a fault condition at the same time.
Engine Overspeed Alarm Occurred/ 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 Start Alarm Occurred 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 Alarm Occurred/ 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 Alarm Occurred/ 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 Alarm Occurred/ Alarm Cleared	A high engine coolant water temperature signal was received from the engine while it was running.
Pressure Transducer Alarm Occurred/ 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 Alarm Occurred/ Alarm Cleared	A low fuel signal has been received for at least 3 seconds.
Stop pushbutton Pressed in	An operator pressed the Stop pushbutton.
Engine Started / running Stopped	Engine was started or stopped in either Auto or Manual mode.
Engine Lockout Sig Occurred Cleared	A remote engine lockout signal was received or cleared.
Remote Start Sig Occurred Cleared	A remote start signal was received or cleared.
System in Auto Mode Occurred	System was placed in Auto mode.
System in Off Mode Occurred	System was placed in Off mode.
System in Manual Mode Occurred	System was placed in Manual mode.
Auto Test Start 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 Occurred	A user did an alarm reset by pressing and holding the [SILENCE/RESET/ESC] button for 2 to 5 seconds.

Low Pressure Start Occurred 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 Occurred 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 Occurred Cleared	A deluge start signal was received while in Auto mode.
Controller Reboot Occurred	DC power was restored to the FD4 microprocessor.
Pressure Drop Occurred 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 Shutdown Occurred Shutdown Cleared	If the low intake shutdown option is enabled in setpoint #116, a low suction signal will stop the engine.
Auxiliary Alarm Occurred 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	Alternator Fault
19	Low Gear Oil Press
20	Low Coolant Level
21	High Gear Oil Temp
22	Start Motor Fault
23	Low Fuel Pressure
24	Pump On Demand
25	High Exhaust Temp
26	High Fuel Temp
27	Pump Room Ajar
28	ECM Alternate
29	ECM Failure
30	High System Pressure
31	Dump Valve
32	User Alarm Text

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	Engine Auto Available
54	Contactor Coil Failure
55	Test Mode
56	Hi Zone/Low Zone Mode
57	Contactor Coil 1 Failure
58	Contactor Coil 2 Failure
59	Engine running
60	Weekly Test Due
61	Dump Valve
62	Engine Lockout Latched

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 is 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 an 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

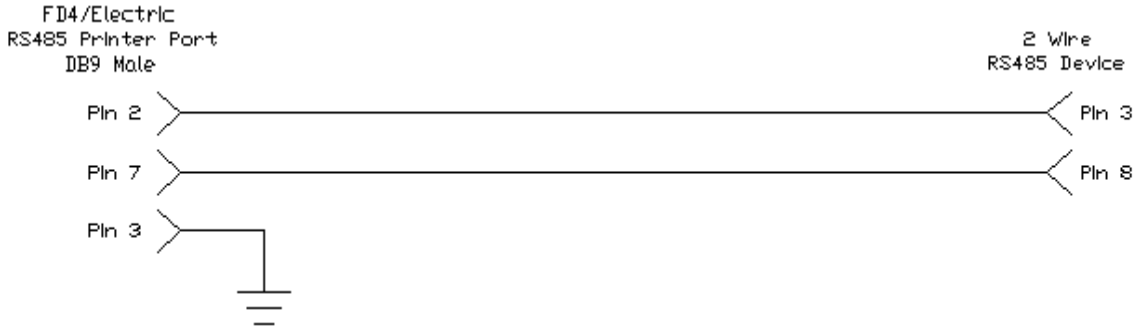
Data is stored in a standard comma delimited file as follows:

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

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 Only 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 'Engine Quit'	040002:12	Bit 12 Of Modbus Register 040002 - Indicates The 'Engine Quit' Event
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
		All Data In Modbus Register 40002 Is Real Time

Description	Modbus Registers	Usage Notes For Read Only Registers
Bit 0 'Pressure Transducer Fault'	040003:0	Bit 0 Of Modbus Register 040003 - Indicates the 'Pressure Transducer Fault' Event
Bit 1 'Low Intake'	040003:1	Bit 1 Of Modbus Register 040003 - Indicates The 'Low Intake' Event
Bit 2 'Switch in Manual'	040003:2	Bit 2 Of Modbus Register 040003 - Indicates The 'Switch in Manual' Event
Bit 3 'Switch in Off'	040003:3	Bit 3 Of Modbus Register 040003 - Indicates 'Switch in Off' Event
Bit 4 'Battery 1 Failure'	040003:4	Bit 4 Of Modbus Register 040003 - Indicates The 'Battery 1 Failure' Event
Bit 5 'Battery 2 Failure'	040003:5	Bit 5 Of Modbus Register 040003 - Indicates The 'Battery 2 Failure' Event
Bit 6 'Charger 1 Failure'	040003:6	Bit 6 Of Modbus Register 040003 - Indicates The 'Charger 1 Failure' Event
Bit 7 'Charger 2 Failure'	040003:7	Bit 7 Of Modbus Register 040003 - Indicates The 'Charger 2 Failure' Event
Bit 8 'Pressure Drop'	040003:8	Bit 8 Of Modbus Register 040003 - Indicates The 'Pressure Drop' Event
Bit 9 'Engine Auto Available'	040003:9	Bit 9 Of Modbus Register 040003 - Indicates The 'Engine Auto Start Available' Event
Bit 10 'Contactor Coil Failure'	040003:10	Bit 10 Of Modbus Register 040003 - Indicates The 'Common Contactor Coil Failure' Event
Bit 11 'Test Running'	040003:11	Bit 11 Of Modbus Register 040003 - Indicates The 'Engine Running in Test Mode' Event
Bit 12 'Hi/Low Zone'	040003:12	Bit 12 Of Modbus Register 040003 - Indicates The 'High/Low Zone Event
Bit 13 'Contactor Coil 1 Failure'	040003:13	Bit 13 Of Modbus Register 040003 - Indicates A 'Contactor Coil Failure 1' Event
Bit 14 'Contactor Coil 2 Failure'	040003:14	Bit 14 Of Modbus Register 040003 - Indicates A 'Contactor Coil 2 Failure' Event
Bit 15 'Weekly Test Due'	040003:15	Bit 15 Of Modbus Register 040003 - Indicates A 'Weekly Test Due' Event
		All Data In Modbus Register 40003 Is Real Time

Description	Modbus Registers	Usage Notes For Read Only Registers
Bit 0 'Dump Valve'	040004:0	Bit 0 Of Modbus Register 040004 - Indicates 'Dump Valve On' Event
Bit 1 'Engine Lockout'	040004:1	Bit 1 Of Modbus Register 040004 - Indicates 'Latched Engine Lockout' Event
Bit 2 'Stop Push button'	040004:2	Bit 2 Of Modbus Register 040004 - Indicates 'Stop push button pressed' Event
Bit 3 'SD Card Missing'	040004:3	Bit 3 Of Modbus Register 040004 - Indicates ' SD Card Missing' Event
Bit 4 'Reset button'	040004:4	Bit 4 Of Modbus Register 040004 - Indicates 'Reset push button pressed' Event
Bit 5 NOT USED	040004:5	Bit 5 Of Modbus Register 040004 - NOT USED
Bit 6 'OID LED 15'	040004:6	Bit 6 Of Modbus Register 040004 - Indicates 'OID Lamp 15 on'
Bit 7 'OID LED 16'	040004:7	Bit 7 Of Modbus Register 040004 - Indicates 'OID Lamp 16 on'
Bit 8 'OID LED 17'	040004:8	Bit 8 Of Modbus Register 040004 - Indicates 'OID Lamp 17 on'
Bit 9 'OID LED 18'	040004:9	Bit 9 Of Modbus Register 040004 - Indicates 'OID Lamp 18 on'
Bit 10 'OID LED 19'	040004:10	Bit 10 Of Modbus Register 040004 - Indicates 'OID Lamp 19 on'
Bit 11 'OID LED 20'	040004:11	Bit 11 Of Modbus Register 040004 - Indicates 'OID Lamp 20 on'
Bit 12 'OID LED 21'	040004:12	Bit 12 Of Modbus Register 040004 - Indicates 'OID Lamp 21 on'
Bit 13 'OID LED 22'	040004:13	Bit 13 Of Modbus Register 040004 - Indicates 'OID Lamp 22 on'
Bit 14 'OID LED 23'	040004:14	Bit 14 Of Modbus Register 040004 - Indicates 'OID Lamp 23 on'
Bit 15 'OID LED 24'	040004:15	Bit 15 Of Modbus Register 040004 - Indicates 'OID Lamp 24 on'
		All Data In Modbus Register 40004 Is Real Time

Description	Modbus Registers	Usage Notes For Read Only Registers
Bit 0 'R1'	040005:0	Bit 0 Of Modbus Register 040005 - Indicates 'Relay 1 On'
Bit 1 'R2'	040005:1	Bit 1 Of Modbus Register 040005 - Indicates 'Relay 2 On'
Bit 2 'R3'	040005:2	Bit 2 Of Modbus Register 040005 - Indicates 'Relay 3 On'
Bit 3 'R4'	040005:3	Bit 3 Of Modbus Register 040005 - Indicates 'Relay 4 On' - Horn
Bit 4 'R5'	040005:4	Bit 4 Of Modbus Register 040005 - Indicates ' Relay 5 On' - Drain Solenoid
Bit 5 'R6'	040005:5	Bit 5 Of Modbus Register 040005 - Indicates 'Relay 6 On' - Engine Fuel Solenoid
Bit 6 'R7'	040005:6	Bit 6 Of Modbus Register 040005 - Indicates 'Relay 7 On' - Engine Stop Solenoid
Bit 7 'R8'	040005:7	Bit 7 Of Modbus Register 040005 - Indicates 'Relay 8 On'
Bit 8 'R9'	040005:8	Bit 8 Of Modbus Register 040005 - Indicates 'Relay 9 On' - System Fault
Bit 9 'R10'	040005:9	Bit 9 Of Modbus Register 040005 - Indicates 'Relay 10 On' - Engine Running
Bit 10 'R11'	040005:10	Bit 10 Of Modbus Register 040005 - Indicates 'Relay 11 On'
Bit 11 'R12'	040005:11	Bit 11 Of Modbus Register 040005 - Indicates 'Relay 12 On'
Bit 12 'R13'	040005:12	Bit 12 Of Modbus Register 040005 - Indicates 'Relay 13 On'
Bit 13 'R14'	040005:13	Bit 13 Of Modbus Register 040005 - Indicates 'Relay 14 On'
Bit 14 'R15'	040005:14	Bit 14 Of Modbus Register 040005 - Indicates 'Relay 15 On'
Bit 15 'R16'	040005:15	Bit 15 Of Modbus Register 040005 - Indicates 'Relay 16 On'
		All Data In Modbus Register 040005 Is Real Time

Description	Modbus Registers	Usage Notes For Read Only Registers
Bit 0 'R17'	040006:0	Bit 0 Of Modbus Register 040006 - Indicates 'Relay 17 On'
Bit 1 'R18'	040006:1	Bit 1 Of Modbus Register 040006 - Indicates 'Relay 18 On'
Bit 2 'R19'	040006:2	Bit 2 Of Modbus Register 040006 - Indicates 'Relay 19 On'
Bit 3 'R20'	040006:3	Bit 3 Of Modbus Register 040006 - Indicates 'Relay 20 On'
Bit 4 'R21'	040006:4	Bit 4 Of Modbus Register 040006 - Indicates ' Relay 21 On'
Bit 5 'R22'	040006:5	Bit 5 Of Modbus Register 040006 - Indicates 'Relay 22 On'
Bit 6 'R23'	040006:6	Bit 6 Of Modbus Register 040006 - Indicates 'Relay 23 On'
Bit 7 'R24'	040006:7	Bit 7 Of Modbus Register 040006 - Indicates 'Relay 24 On'
Bit 8	040006:8	Bit 8 Of Modbus Register 040006 - NOT USED
Bit 9	040006:9	Bit 9 Of Modbus Register 040006 - NOT USED
Bit 10	040006:10	Bit 10 Of Modbus Register 040006 - NOT USED
Bit 11	040006:11	Bit 11 Of Modbus Register 040006 - NOT USED
Bit 12	040006:12	Bit 12 Of Modbus Register 040006 - NOT USED
Bit 13	040006:13	Bit 13 Of Modbus Register 040006 - NOT USED
Bit 14	040006:14	Bit 14 Of Modbus Register 040006 - NOT USED
Bit 15	040006:15	Bit 15 Of Modbus Register 040006 - NOT USED
		All Data In Modbus Register 040006 Is Real Time

Figure 1.2

Setting And Reading The Real Time Clock Through Modbus:

Modbus registers 40007 through 400013 are real time clock read registers as seen in figure 1.3. To set the clock current values must be entered into registers 40014 through 40020. 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 Only Registers*
Real Time Clock Month	040007	PLC Read Real Time Clock Month 1-12
Real Time Clock Day	040008	PLC Read Real Time Clock Day 1-31
Real Time Clock Year	040009	PLC Read Real Time Clock Year 00-99
Real Time Clock Hour	040010	PLC Read Real Time Clock Hour 1-24
Real Time Clock Minute	040011	PLC Read Real Time Clock Minute 0-59
Real Time Clock Second	040012	PLC Read Real Time Clock Seconds 0-59
Real Time Clock Day Of Week	040013	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 040001Or PLC Address V9001.0 Will Set Clock
Real Time Clock Set Month	040014	PLC Set Real Time Clock Month 1-12
Real Time Clock Set Day	040015	PLC Set Real Time Clock Day 1-31
Real Time Clock Set Year	040016	PLC Set Real Time Clock Year 00-99 "Cannot Enter 2006, Must Enter 06"
Real Time Clock Set Hour	040017	PLC Set Real Time Clock Hour 1-24
Real Time Clock Set Minute	040018	PLC Set Real Time Clock Minute 0-59
Real Time Clock Set Second	040019	PLC Set Real Time Clock Second 0-59
Real Time Clock Set Day Of Week	040020	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 40021 through 40027. Register 40021 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 40022 through 40027. See figure 1.4 for register interpretation.

Description	*Modbus Registers*	*Usage Notes For Read Only Registers*
Most Current Event Number	040021	Most Current Event That Happened 1-175 (Index Below)
Most Current Event Month	040022	Most Current Event Month 1-12
Most Current Event Day	040023	Most Current Event Day 1-31
Most Current Event Year	040024	Most Current Event Year 00-99
Most Current Event Hours	040025	Most Current Event Hours 1-24
Most Current Event Minutes	040026	Most Current Event Minutes 0-59
Most Current Event Seconds	040027	Most Current Event Seconds 0-59

Figure 1.4

The historical events and alarms can be viewed from Modbus registers 40028 through 40035. Here it is possible to scroll through the entire log and set the log pointer to the most current record. Register 40028 contains a number representing the actual log number entry location in the controller. Register 40029 contains a number representing the event or alarm that can be indexed using figures 1.6 through 1.9. Registers 40030 through 40035 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	040028	Event Historical Log Index Value For Record Being Pointed To
Event Historical Log Event Number	040029	Event Historical Log Event That Occurred 1-21
Event Historical Log Event Month	040030	Event Historical Log Month Event Occured 1-12
Event Historical Log Event Day	040031	Event Historical Log Day Event Occured 1-31
Event Historical Log Event Year	040032	Event Historical Log Year Event Occurred 00-99
Event Historical Log Event Hours	040033	Event Historical log Hour Event Occurred 1-24
Event Historical Log Event Minutes	040034	Event Historical Log Minute Event Occurred 0-59
Event Historical Log Event Seconds	040035	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
Coil 1 Failure Occurred	76
Coil 1 Failure Cleared	77
Coil 2 Failure Occurred	78
Coil 2 Failure 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
Dump Valve Occurred	170
Dump Valve Cleared	171
User Alarm Text Occurred	172
User Alarm Text Cleared	173
Stop Pressure Fault Occurred	174
Stop Pressure Fault Cleared	175

Figure 1.9

Most Current And Historical Pressure Readings:

The most recent system pressure with date time stamp can be viewed from Modbus registers 40036 through 40042. Register 40036 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 40037 through 40042. 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	040036	Most Current PSI 0-300 PSI (Real Time Value)
Most Current PSI Month	040037	Most Current PSI Month 1-12
Most Current PSI Day	040038	Most Current PSI Day 1 31
Most Current PSI Year	040039	Most Current PSI Year 00-99
Most Current PSI Hours	040040	Most Current PSI Hours 1-24
Most Current PSI Minutes	040041	Most Current PSI Minutes 0-59
Most Current PSI Seconds	040042	Most Current PSI Seconds 0-59

Figure 1.10

The historical pressure readings can be viewed from Modbus registers 40043 through 40050. Here it is possible to scroll through the entire log and set the log pointer to the most current record. Register 40043 contains a number representing the actual log number entry location in the controller. Register 40044 contains a number representing the logged pressure reading. Registers 40045 through 40050 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 1.11. 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***
PSI Historical Log Index	040043	PSI Historical Log Index Value For Record Being Pointed To
PSI Historical Log Pressure	040044	PSI Historical Log PSI That Occurred 0-300 PSI
PSI Historical Log Month	040045	PSI Historical Log Month PSI Occured 1-12
PSI Historical Log Day	040046	PSI Historical Log Day PSI Occured 1-31
PSI Historical Log Year	040047	PSI Historical Log Year PSI Occurred 00-99
PSI Historical Log Hours	040048	PSI Historical Log Hour PSI Occurred 1-24
PSI Historical Log Minutes	040049	PSI Historical Log Minute PSI Occurred 0-59
PSI Historical Log Seconds	040050	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.

Description	***Modbus Registers***	***Usage Notes For Read Only Registers***
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 Floationg Point Value
Most Current PSI Pressure	040196	Most Current Pressure 0-300 PSI Floating Point Value

Figure 1.12