



MANUAL FOR MODEL FD4 FIRE PUMP CONTROLLERS

Starting Serial No. "BF"

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 buttons for Auto, Test, Manual and Off. Also features a 4 line by 20 character LCD for display
- C. 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.
- D. Alarms and Signal Lights - Twelve (12) Standard lights are provided to give visual signals for; **"System Fault"**, **"Battery #1 Failure"**, **"Battery #2 Failure"**, **"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"** and **"Low Fuel"**. In addition the mode buttons have LED's on the button indicating **"Auto"**, **"Manual"**, **"Test"**, or **"Off"** mode. 12 additional lights, configurable by the factory, are provided for **"Pump Room Alarms"**. An audible alarm horn is mounted on the front of the cubicle for sounding in the event of failure. Terminals are provided for remote failure indication of the following:
 - "Automatic Mode"**
 - "System Fault"**
 - "Engine Running (2 sets)"**
 - "Common Battery Fault"**
- E. 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 RS232 port provided on the main system board or printed to the internal printer (if supplied).
- F. 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 System Config Screen 106.
- G. **"Stop"** Pushbutton - A pushbutton is provided to stop the engine in Automatic only after starting causes have returned to normal. This returns the controller to the automatic position.
- H. 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 the charger circuit board with a selector switch for reading the charging current and voltage on each charger as standard.
- I. Cabinet - A heavy gauge steel cubicle encloses the controller. The OID, battery circuit breakers, and manual start pushbuttons are mounted behind a break-glass in the door of the cabinet.

PART III: OPERATION OF THE CONTROLLER

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

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

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

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

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, Press the **"Off"** button and the Press the **"Reset"** button on the OID for two seconds.

The Controller may be configured as either **"Manual"** or **"Automatic"** stop as required (System Config Screen 104).

"Manual" stop is set as standard. When Automatic stop is enabled the stop timer is preset at the factory to 30 minutes. Longer time settings can be set in System Config screen 105. When "Automatic Stop" is disabled, the engine will continue to run even though the pressure switch or other remote starting switch returns to its normal position. The engine can be stopped immediately only by pressing the stop button or by pressing the **Off** mode button. 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 **"OFF"** mode button is pressed.
- C. The **"Manual"** mode button 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.

PART IV: INSTALLATION AND TEST PROCEDURE

A. INSTALLATION

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

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

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

B. TEST PROCEDURE

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

ENGINE TERMINAL (terminals 1-12) STATUS INDICATOR LIGHTS

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

<u>Terminal Number</u> <u>(Microprocessor Func #)</u>	<u>L.E.D. (light) "ON" Indication</u>
1 (Out 06)	Power available to fuel and water solenoids
2 (In 06)	Speed switch has operated into engine running mode
3 (In 07)	Speed switch has operated into overspeed mode
4 (In 08)	Oil Pressure switch contacts closed (Low Oil Pressure)
5 (In 09)	Water temperature switch contacts closed (High Engine Temp.)
6 (Ain 02)	Battery #1 voltage present
8 (Ain 03)	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 Failure lights should be off.
3. Turn Battery #1 switch off for a couple of seconds and back on. Battery #1 light should go off and remain off.
4. Press "**Reset**" button. Battery #1 light should come on.
5. Repeat for Battery #2.

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

1. Disconnect Terminal No.1 on Controller panel. **NOTE: Disconnecting Terminal No.1 is for the purpose of removing power from the fuel solenoid so engine will not start. On engines where the fuel solenoid is not used**

(Caterpillar), or is connected other than through Terminal #1 (Clarke-G.M.), other means must be used to stop fuel flow to the engine to prevent starting.

2. Press the **"Test"** mode button to start cranking the engine. Time the crank and rest periods, and count the number of cranks. There should be six (6) crank periods separated by five (5) rest periods each of approximately 15-seconds duration. The **"Failed to Start"** light should come on and the alarm horn should sound. Status indicator light for Terminal #1 should come on as soon as the **"Test"** push button is pressed and the pressure drops below the low set point. Indicator lights for terminals 9 and 10 should come on alternately to indicate cranking cycle. (See above)
3. Press the **"Stop"** push button to stop the engine and properly reconnect all leads.

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

c. **CHECKING STARTING MOTOR RELEASE**

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

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

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

d. **OIL PRESSURE FAILURE TEST:**

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

e. **WATER TEMPERATURE FAILURE TEST:**

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

f. **OVERSPEED FAILURE TEST:**

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

g. **AUTOMATIC STARTING TESTS:**

1. Place control in **"Auto"** position.
2. Bleed off pressure in system until pressure drops below the low set point.

3. Engine should start automatically and continue to run after pressure rises above the high set point, if arranged for **"Manual"** stop. If arranged for **"Automatic"** stop, engine will continue to run for time set on Engine Run Timer and then stop.
 4. Press the **"Stop"** push button to stop the engine.
 5. Repeat tests for each demand switch such as deluge valve, remote start, etc.
- h. **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
- i. **SETTING PROGRAM WEEKLY TEST TIME:** System Config screen 106 through 109.
- j. **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).
- k. **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.
- l. **NORMAL OPERATION – AUTOMATIC:** Press **"Auto"** mode button on OID. 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.
- m. **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.
- n. **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 twelve (12) pump room alarms is available. The Controller is arranged so that the alarm horn will sound and the light will come on when the alarm sensor contacts close. These pump room alarms can be silenced with the "Silence" push button on the OID if they have been configured as silenceable.

PART V: ADDITIONAL OPTIONAL FEATURES

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

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

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

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. The battery must be connected to the controller to reset the alarm.

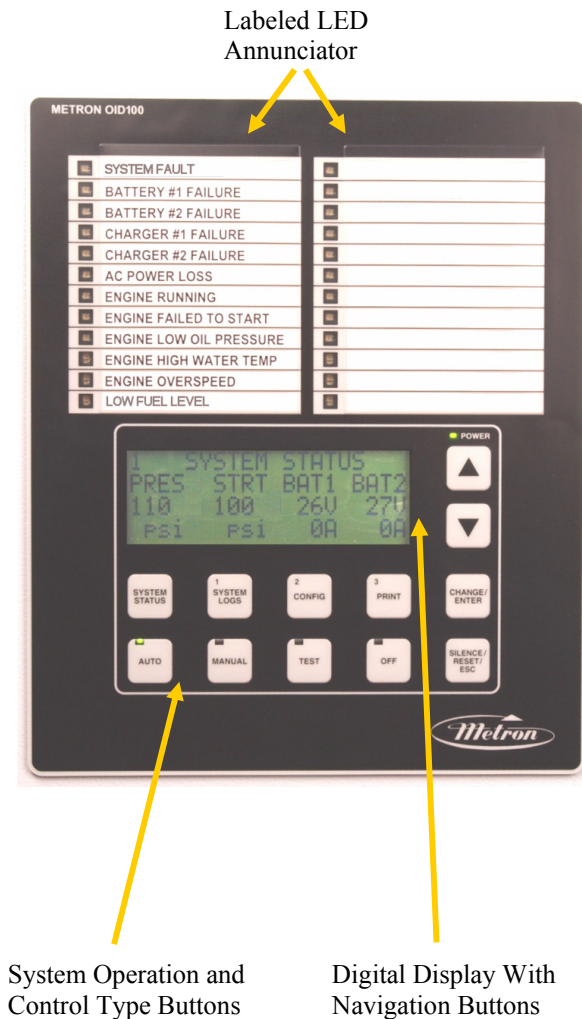
Generally, when all conditions are normal, the batteries will come to a full charge prior to the 24 hour period. As batteries begin to charge, the controller OID will indicate a gradual decrease in current flow. When these ammeters indicate a current level of less than 0.5 amps the charger will be in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



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/RESET/ESC] will silence the horn (less than 1 second press).

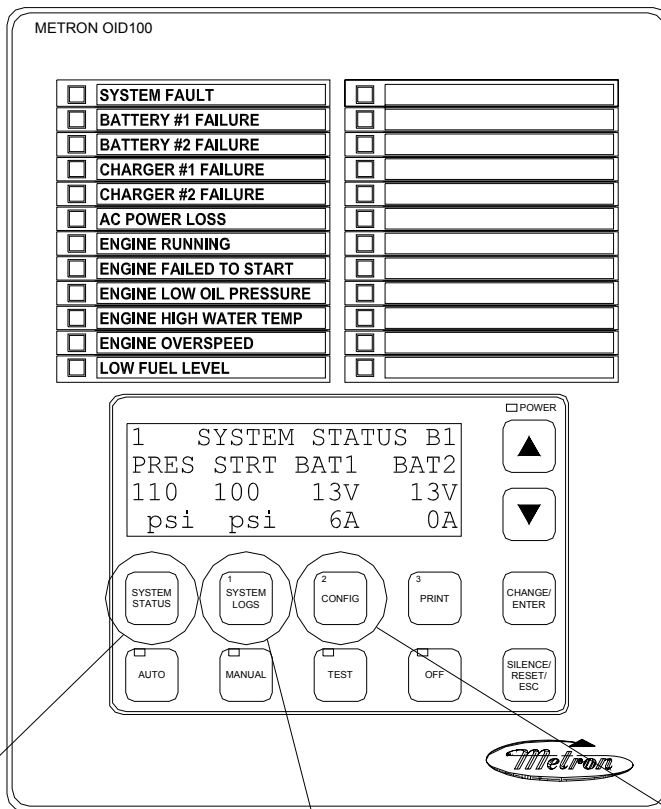
Resetting Alarms: If the alarm condition has cleared, press and hold the [SILENCE/RESET/ESC] button 2 to 5 seconds to reset alarms. “Engine Failed to Start” and “Engine Overspeed” alarms require the system to be in the OFF mode before a reset is allowed.

Operating Mode Change: The operational mode that the controller is in can be changed by pressing the [AUTO] [MANUAL] or [OFF] buttons. An LED will illuminate on the appropriate button indicating the mode of operation the controller is in.

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 directly controls the opening and closing of the drain solenoid. The engine will not automatically start when in Manual Mode.

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

OID Screen Map



1 SYSTEM STATUS B1
PRES STRT BAT1 BAT2
110 100 13V 13V
psi psi 6A 0A

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

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

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

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

SYSTEM LOGS
1) Alarm Log
2) Event Log
3) Pressure Log

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

2 CONFIG
1) ANALOG SIGNALS
2) AUXILLIARY ALARMS

1 ALARM LOG
Engine Failed To
Start Alarm Occurred
02/16/03 07:32:15

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

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

1 ALARM DETAILS
Engine Failed To
Start Alarm Occurred
02/16/03 07:32:15

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

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

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

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

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

1 ALARM DETAILS
Charger #1 OK:No
Charger #2 OK:Yes
Battery #1 OK:No

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

1 ALARM DETAILS
Battery #2 OK:Yes
AC Power Avail:Yes
Low fuel level:No

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

2 ALARM LOG
AC Power Failure
Alarm Cleared
02/16/03 07:09:48

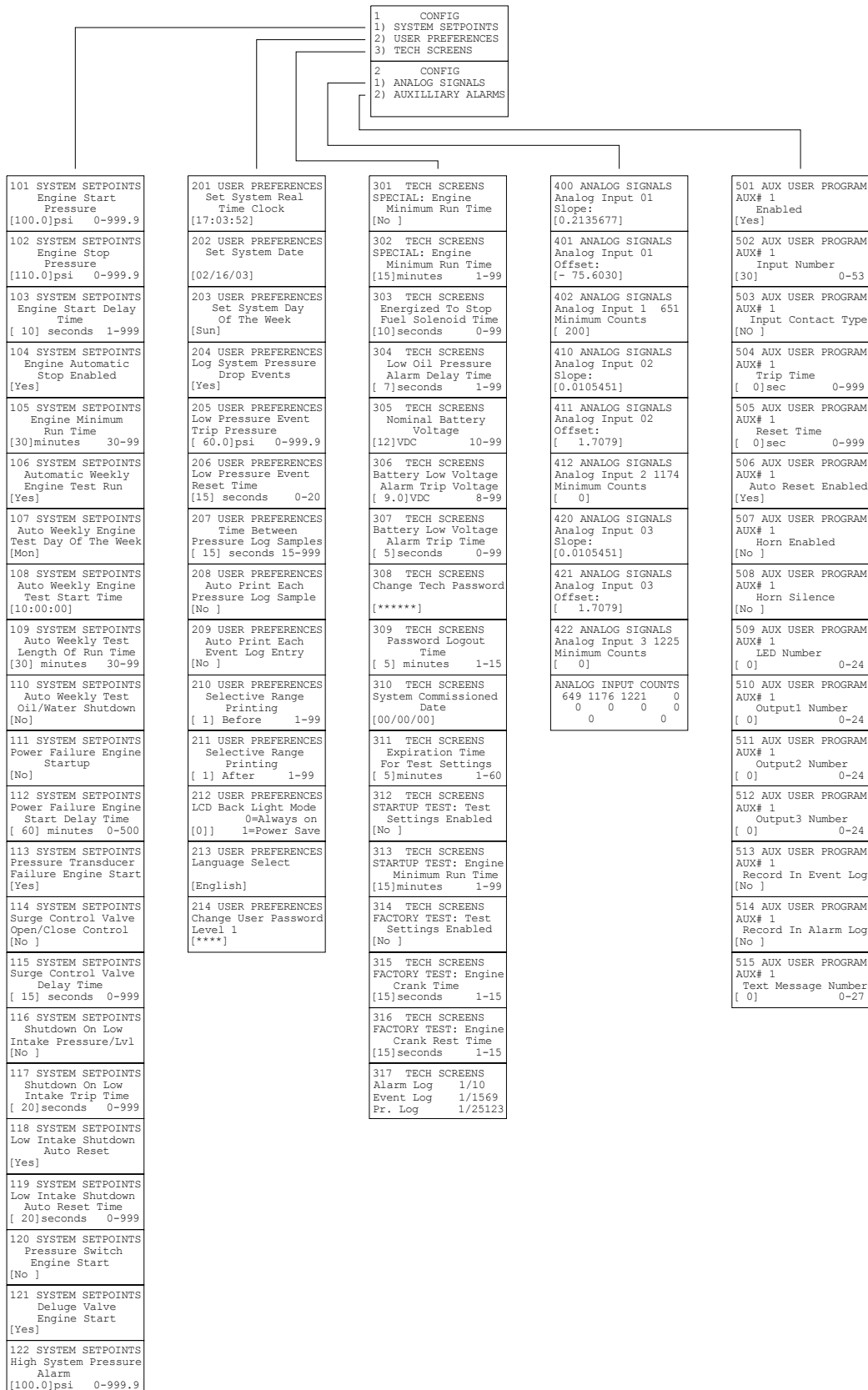
2 EVENT LOG
Engine Failed To
Start Alarm Occurred
02/16/03 07:32:15

3 ALARM LOG
AC Power Failure
Alarm Occurred
02/16/03 06:49:03

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

Continued on next page.

OID Screen Map (continued)

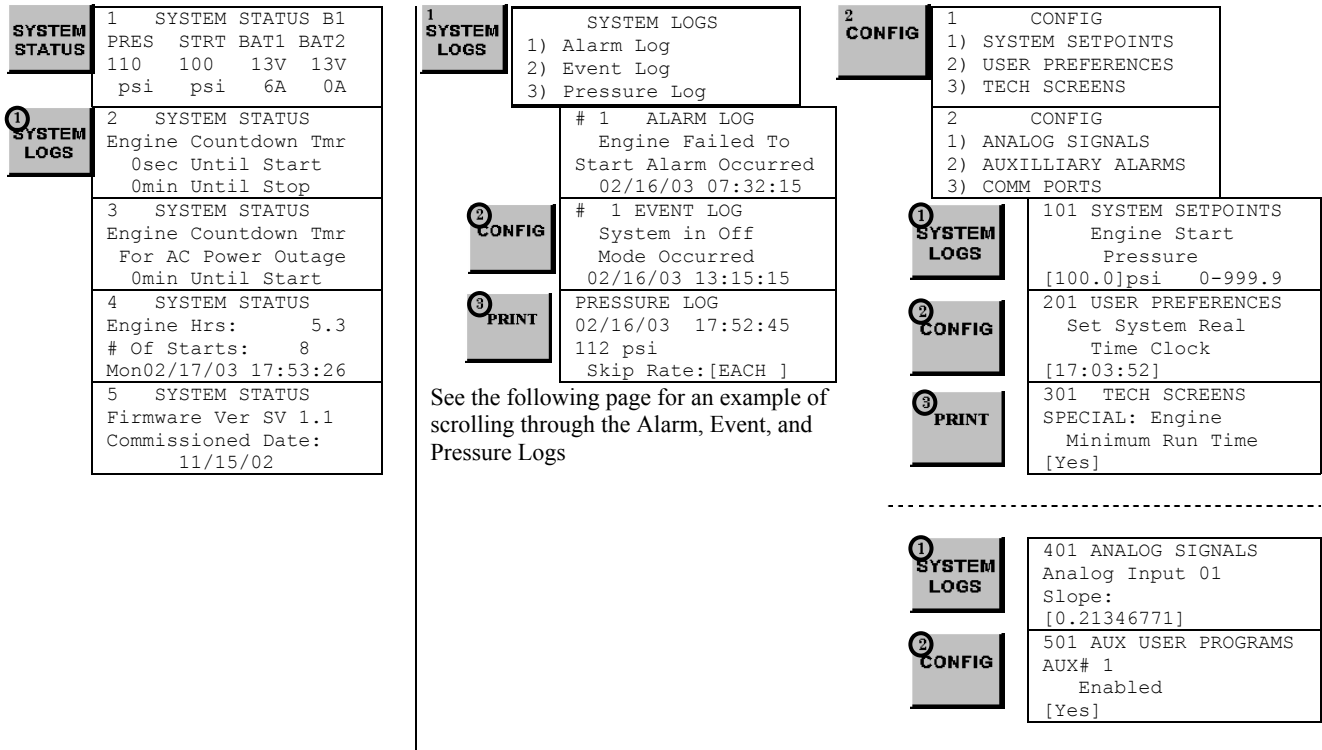


The [SYSTEM STATUS], [SYSTEM LOGS], and [CONFIG] buttons navigate the user to the top screen of a column of similarly grouped screens or menus.

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

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

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



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

1 SYSTEM LOGS

SYSTEM LOGS
 1) Alarm Log
 2) Event Log
 3) Pressure Log

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

1 SYSTEM LOGS

1 ALARM LOG
 Engine Failed To Start Alarm Occurred
 02/16/03 07:32:15

CHANGE/ENTER

1 ALARM DETAILS
 Engine Failed To Start Alarm Occurred
 02/16/03 07:32:15

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

1 ALARM DETAILS
 Charger #1 OK:No
 Charger #2 OK:Yes
 Battery #1 OK:No

1 ALARM DETAILS
 Battery #2 OK:Yes
 AC Power Avail:Yes
 Low fuel level:NO

2 CONFIG

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

CHANGE/ENTER

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

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

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

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

3 PRINT

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

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

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

2 ALARM LOG
 AC Power Failure Alarm Cleared
 02/16/03 07:09:48

3 ALARM LOG
 AC Power Failure Alarm Occurred
 02/16/03 06:49:03

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

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

Printing System Log Data: The following applies if a printer has been installed or a PC is connected to the RS232 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. To download the Log Data using the USB port, log onto Metron's web site at www.metroninc.com and click on the Fire Pump Controller link. Then click on the "Click Here to Download Metron's USB application" link. Install this onto your PC. If you use the RS232 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
    11/16/02 07:32:15
```

3 PRINT

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

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

Typical Event/Alarm Log Details Printout

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

CHANGE/ENTER

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

3 PRINT

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

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

Typical Pressure Log Printout

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

3 PRINT

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

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

```

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

```

```

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

```

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

s.

**2
CONFIG**

```

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

2      CONFIG
1) ANALOG SIGNALS
2) AUXILLIARY ALARMS

```

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

Changing Values:

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

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

Example of how to change a setpoint value:

101 SYSTEM SETPOINTS
Engine Start
Pressure
[100.0]psi 0-999.9

CHANGE/
ENTER

ENTER PASSWORD:

█

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.

101 CHANGE VALUE
Engine Start
Pressure
[60] psi 0-999

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 printer has been installed or a PC is connected to the RS232 com port using a null modem cable. When the [PRINT] button is pressed while looking at a configuration setpoint screen, a menu for what is to be printed is displayed. Pressing [1] prints just the set point screen currently being displayed. Pressing [2] prints all the set points in the section of set points currently displayed. Pressing [3] prints all the set point screens of all five set point sections.

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

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

3
PRINT

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

Typical Configuration Setpoint Printout

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

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

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

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

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

PART VII: SYSTEM SET POINT DEFINITIONS

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.

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 [Yes]

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.

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

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

106 SYSTEM SETPOINTS Automatic Weekly Engine Test Run [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.

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

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
[60] seconds 0-999

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

113 SYSTEM SETPOINTS
Pressure Transducer
Failure Engine Start
[Yes]

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

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

Setting Reserved For Factory Configurations

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

Setting Reserved For Factory Configurations

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

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

117 SYSTEM SETPOINTS
Shutdown On Low
Intake Trip Time
[20]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
[Yes]

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
[20]seconds 0-999

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

120 SYSTEM SETPOINTS
Pressure Switch
Engine Start
[No]

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

121 SYSTEM SETPOINTS
Deluge Valve
Engine Start
[No]

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

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

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

Configure User Preferences

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

Set the current FD4 clock (24 hour clock).

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

Set the current FD4 date.

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

Set the local day of the week.

204 USER PREFERENCES
Log System Pressure
Drop Events
[No]

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**Configure User Preferences
(continued)**

213 USER PREFERENCES
Language Select

[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.

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 Low Purge Pressure
- 19 Low Gear Oil Press
- 20 Low Coolant Level
- 21 High Gear Oil Temp
- 22 High Vibration
- 23 Low Fuel Pressure
- 24 Pump On Demand
- 25 High Exhaust Temp
- 26 High Fuel Temp
- 27 Pump Room Door Ajar
- 28 ECM Alternate
- 29 ECM Failure
- 30 High System Pressure

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

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

APPENDIX 1 - PRINTER OPERATION

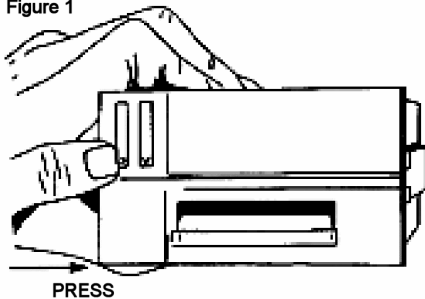
Operator Information

There are two buttons on the front panel of the printer. One button operates the front door latch, the other controls the paper feed.

Door Latch:

With the printer mounted in data mode attitude (paper emerging downwards) so that the two control buttons are at upper left, to open the front door of the printer, press the door latch (the outermost of the two buttons) sideways towards the other button, using thumb or forefinger (see Figure 1). This will release the latch and the door can be swung outwards to expose the paper roll.

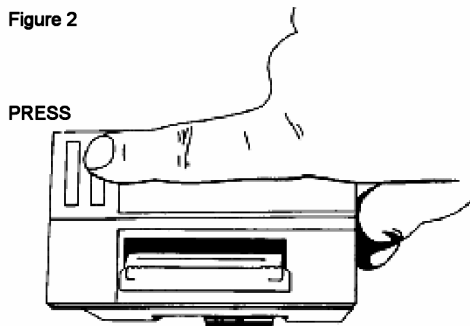
Figure 1



Paper Feed Button.

With the printer in data mode attitude press the top part of the innermost button to activate paper feed (see Figure 2). This will continue for as long as the button is held down.

Figure 2

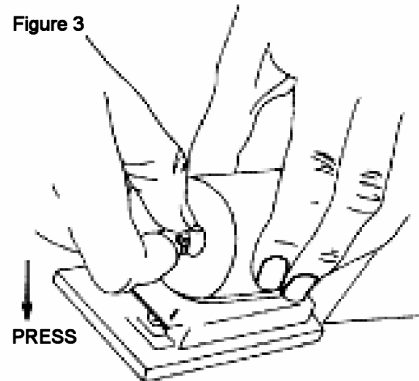


Paper Roll Replacement:

Open the printer door as described above and swing the door open to expose the paper roll. If any paper remains in the printer, tear the end off against the paper tear bar and carefully pull the remaining paper backwards, from the rear of the mechanism mounting chassis, until the free end emerges. Press the paper roll retaining button inwards using the thumb and forefinger

(see figure 3) and remove the empty roll. Take a new roll of paper, and separate the end from the rest of the roll. Remove any damaged or gummed part of the paper, and cut the free end squarely with a pair of scissors or a knife, leaving a clean straight edge to present to the printer mechanism.

Figure 3



Thread the new roll past the retention button onto the spindle with the paper unspooling in an anticlockwise direction when viewed from the open end. (See Figure 4). Press the paper feed actuator arm (at upper left in data mode) until the mechanism grips the paper and pulls it through to the front of the printer. (See Figure 5).

Figure 4

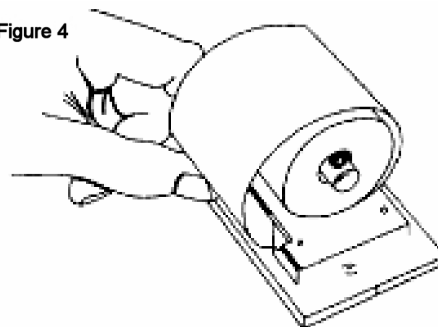


Figure 5



Turn the paper roll so that any loose turns are wound snugly against the roll. Close the printer door.

More paper may now be fed through by pressing the paper feed button on the front panel. (See Figure 2).

Ribbon Cartridge Replacement:

Tear off any paper emerging from the printer. Open the printer door by pressing the door latch inwards.

Place forefinger against the lower edge of the mechanism mounting chassis and thumb against the base of the door (see Figure 6).

Carefully press the door and chassis in vertically opposite directions until the catch is released. Do not pull the door and chassis apart without first releasing the catch.

Swing the chassis back, leaving the door fully

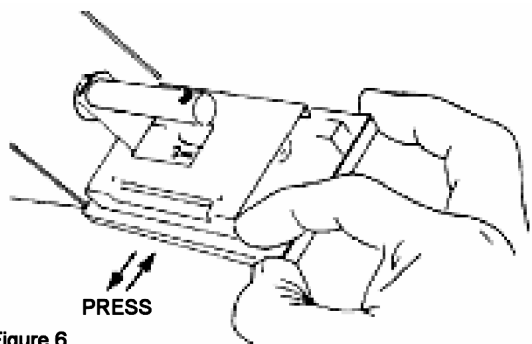


Figure 6

open. This will expose the printer mechanism and ink ribbon cartridge.

Press down on the end of the ink ribbon cartridge marked 'PUSH' (see Figure 7) and carefully remove the used cartridge.

Fit a replacement cartridge, ensuring that the paper lies between the ribbon and the steel printer platen.

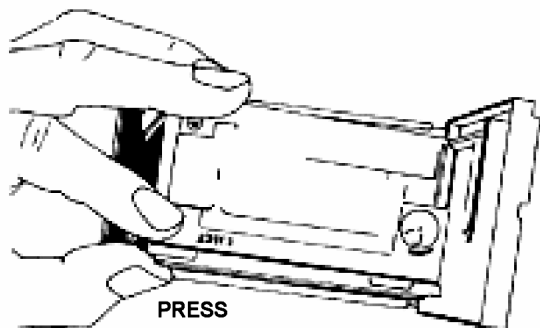
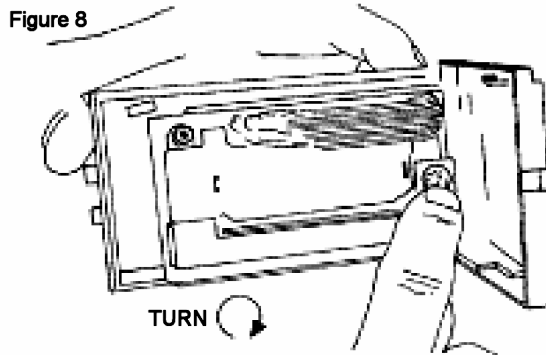


Figure 7

Check that the ribbon cartridge spindle is correctly seated over the printer ribbon drive shaft, and snap the cartridge into place. Ensure that the ribbon is taut and parallel to the paper.

If necessary tighten the ribbon by turning the faceted disc clockwise using fingernail (see Figure 8).



If there is some paper protruding from the front of the printer mechanism, ensure that it will pass clearly through the guide channel and past the tear bar before snapping the chassis shut against the back of the door.

Turn the paper roll by hand so that any loose turns are wound snugly against the roll. Close the door and check that the paper flows freely, using the paper feed button.

For paper and printer ribbon refills, contact the Metron Inc. factory.