



Cutler-Hammer

Diesel Engine Fire Pump Controllers

Instructions



Table of Contents

1.	INSTALLATION AND MOUNTING	1
2.	ELECTRICAL CONNECTIONS	1
2.1	WIRE SIZES	1
3.	SYSTEM PRESSURE CONNECTION	2
4.	MAIN DISPLAY PANEL	2
4.1	LCD DISPLAY	2
4.2	ANNUNCIATORS	2
4.3	MAIN SWITCH	2
4.4	FUNCTION (F1,F2,F3) AND MENU KEYS	2
4.5	SILENCE AND RESET BUTTON	2
4.6	LAMP TEST BUTTON	2
4.7	TIME/PRINT BUTTON	2
5.	OPERATION OF CONTROLLER	3
5.1	OFF MODE	3
5.2	MANUAL MODE	3
5.3	AUTO MODE	3
5.4	STOP MODES	3
5.5	WEEKLY TEST TIMER	3
5.6	TEST MODE	4
5.7	RUN PERIOD TIMER	4
5.8	SEQUENTIAL START TIMER	4
6.	PROGRAMMING OF THE MAIN CONTROLLER	4
6.1	TO PROGRAM THE CONTROLLER	4
6.2	PROGRAM DESCRIPTIONS	4
6.2.1	<i>Change Date</i>	5
6.2.2	<i>Change Time</i>	5
6.2.3	<i>Weekly Timer</i>	5
6.2.4	<i>Run Period Timer</i>	5
6.2.5	<i>Language</i>	5
6.2.6	<i>Pressure Transmitter</i>	5
6.2.7	<i>Pressure Start Point</i>	5
6.2.8	<i>Pressure Stop Point</i>	5
6.2.9	<i>Low Suction Shutdown</i>	5
6.2.10	<i>Printer Deviation</i>	6
6.2.11	<i>Current Pressure</i>	6
6.2.12	<i>Sequential Start</i>	6
6.2.13	<i>Stop Mode</i>	6
6.2.14	<i>AC Failure Start</i>	6
6.2.15	<i>Print Routine</i>	6
6.2.16	<i>Print Status</i>	6
6.2.17	<i>Select Mode or Press Menu</i>	6
7.	ALARM SIGNALS (ANNUNCIATOR PANEL)	6
7.1	BATTERY FAILURE	6
7.2	CHARGER FAILURE	6
7.3	ENGINE RUN	6
7.4	ENGINE OVERSPEED	6
7.5	FAIL TO START	6
7.6	FUEL SPILL	7
7.7	HIGH ENGINE TEMPERATURE	7
7.8	LOW / HIGH FUEL	7

7.9	LOW OIL PRESSURE	7
7.10	LOW / HIGH RESERVOIR	7
7.11	LOW ROOM TEMPERATURE	7
8.	BATTERY CHARGERS	7
9.	OPERATING TEMPERATURE	9
10.	SYSTEM OVERPRESSURE – PLD	10
11.	ELECTRONIC STARTING ENGINES – ECM	10
12.	INITIAL START UP	11
12.1	AUTOMATIC START TEST	11
12.2	MANUAL START TEST	12
12.3	TEST START TEST	12
12.4	WEEKLY EXERCISER TEST	12
13.	FIELD FAILURE ALARM SIMULATION	13
13.1	CHARGER FAILURE	13
13.2	BATTERY FAILURE	13
13.3	LOW OIL PRESSURE	13
13.4	HIGH ENGINE TEMPERATURE	13
13.5	ENGINE FAIL TO START	13
13.6	ENGINE OVERSPEED	13
13.7	OTHER ALARMS (PUMP ROOM ALARMS)	13
14.	PRINTER – RECORDER INSTRUCTIONS	14
14.1	OPERATING PROCEDURE	14
14.2	SELF TEST FUNCTION	14
14.3	PAPER LOADING	14
14.4	PRINT MODES	15
14.4.1	Auto Print	15
14.4.2	Manual Print	15
14.5	PRINT STATUS	15
14.6	PRINTER DEVIATION	15
14.7	REPLACEMENT PAPER TYPE	16
APPENDIX A	19
APPENDIX B	ANNUNCIATOR ALARMS	20
APPENDIX C	PRINTER ‘EVENT’ MESSAGES	21

Installation & Maintenance Manual for Diesel Engine Fire Pump Controller

In order to familiarize yourself with the FD100 Diesel Controller, please read this instruction manual thoroughly and carefully. Retain the manual for future reference.

1. Installation and Mounting

Carefully unpack the diesel controller and inspect thoroughly.

The controller should be located as close as is practical to the engine it controls and shall be within sight of the diesel engine and batteries, preferably ten feet or less.

The FD100 controller is designed for wall mounting using the mounting brackets on the top and bottom of the unit. The controller is not free-standing and must be bolted securely to a wall.

Refer to the dimension drawing (Figure #3) in this manual for dimensional data.

The enclosure should be mounted with fastening devices capable of supporting 105lbs/48kg.

2. Electrical Connections

All electrical connections should meet national and local electrical codes and standards.

The controller should be located or so protected that it will not be damaged by water escaping from pumps or pump connections. Current carrying parts of controllers shall be a minimum of 12 inches (305 mm) above the floor level.

- Verify all data on the nameplate such as catalog number, polarity of grounding, AC line, battery voltage and system pressure.
- Inspect all electrical connections, components and wiring for any visible damage and correct as necessary. Ensure that all electrical connections are tightened before being energized.
- Refer to the appropriate field connection drawing affixed to the enclosure door, for all wiring information pertaining to the incoming AC power supply, batteries and engine wiring.
- Install necessary conduit using proper methods and tools.
- Terminals 1 through 12, located on the lower terminal block, are for interconnection to the respective terminals on the diesel engine terminal block.

- Incoming AC line voltage is clearly marked L,N and GD (ground) located on the lower terminal block.
- Terminals 16 through 31, located on the lower terminal block, are for interconnection of all remote alarm functions.
**Do not apply an AC voltage to these terminals. Dry contact rating only.*
- Terminals 39 through 134, located on the Relay Board, are for connection of all output relay functions. These terminals are of the pull-apart variety for ease of wiring.
- Input terminals on controller card are rated for 30 VDC.

NOTE: All field connections and AC wiring must be brought into the enclosure through the lower right or bottom right side ONLY (refer to label affixed inside enclosure),

****OTHERWISE WARRANTY IS VOID.****

2.1 Wire Sizes

- For control wiring, use #14 AWG wire for all electrical connections except battery connections.
- For battery connection, terminals **6, 7, 8** and **11**, use the following:

#10 AWG: 0' to 25' (7.62 m)

8 AWG: 25' to 50' (15.2 m)

3. System Pressure Connection

The FD100 is supplied with a Pressure Transmitter or, as an option, a Pressure Switch. The controller is provided with a 1/4" NPT female system pressure connection located on the bottom, external side of the enclosure. The connection should be installed as per NFPA, pamphlet No. 20.

The "TEST" drain connection, located to the left of the system pressure connection, should be piped to a drain or to waste.

NOTE: Water lines to the drain valve and pressure switch must be free from dirt and contamination.

The main controller panel interfaces with either the pressure transmitter or the optional pressure switch. The controller must be programmed for the appropriate device.

Using the standard pressure transmitter, the actual pressure is displayed on the top right hand corner of the LCD display. Precise start and stop pressure set points can be programmed into the controller via the membrane switches. Pressure readings are also displayed on the printer during alarm situations or pressure deviations.

With the Pressure Switch option, the LCD will display "OK" if the pressure is satisfied, and "LOW", if the contacts on the pressure switch change state. The printer will indicate "Low Pressure" on the paper display when the pressure drops below the set point.

4. Main Display Panel

The main display panel located inside the enclosure, behind the breakable glass panel, serves many operator interface functions (refer to Figure #1 for the main display panel layout):

- LCD Display
- Annunciators
- Main Switches
- Ammeter and Voltmeter for Each Battery
- Pressure Indicator
- Programming Functions

4.1 LCD Display

The LCD display located on the bottom of the main display panel indicates both the voltage and current reading of each battery as well as the system pressure, in PSI.

The LCD display is also used while programming the diesel controller.

4.2 Annunciators

The alarm and status indicators are located in the top portion of the main display panel and will illuminate only if the situation occurs.

The indicators are color coded to signify the urgency of the alarm:

GREEN: Normal Running Condition
 RED: Critical Alarm
 YELLOW: Supervisory Alarm

4.3 Main Switch

Four membrane switches labeled AUTO, MANUAL, TEST and OFF, each equipped with an LED indicator, are clearly marked for easy operation of the controller.

4.4 Function (F1,F2,F3) and MENU Keys

There are four membrane switches, F1, F2, F3 and MENU which are dedicated to programming the controller. Refer to section 6 for programming of the controller.

4.5 Silence and Reset Button

Used to silence and/or reset prescribed alarms as per NFPA Pamphlet No. 20.

4.6 Lamp Test Button

When depressed, the LED's will illuminate sequentially, row by row. This function can be utilized at any time during the operation of the diesel controller.

4.7 Time/Print Button

This button toggles between two functions. When initially depressed the LCD display will indicate:

TOP: Actual date and time
BOTTOM: Weekly Test Timer, date and time.
BOTTOM: Quantity of messages stored in memory.
RIGHT

When depressed again, the controller will prompt the user to hold the button for 3 seconds (at which time an audible tone is heard) after which the stored event and alarm messages will be transmitted to the printer. This is only applicable when the 'Print Routine' is set for *Manual Print*, otherwise the data is sent directly to the printer without user intervention. Refer to Section 14. The "Time/Print" key is not functional when the controller is in the OFF mode.

5. Operation of Controller

Before accessing any mode, you must return to the OFF mode.

5.1 OFF Mode

In the OFF position the controller prevents the engine from starting and resets the following alarms:

- Overspeed
- Charger Failure
- Battery Failure
- Fail to Start
- Low Oil Pressure
- High Engine Temperature

The OFF position will silence all alarms.

Three (3) sets of alarm contacts are provided to indicate that the controller is in the “OFF” mode. The contacts are rated for 10 A @ 220 VAC / 32 VDC. Terminals 120 to 128.

5.2 Manual Mode

This position allows the starting of the engines using the manual crank buttons, Crank #1 and Crank #2, located below the main display panel. For added cranking capacity, both Crank buttons can be depressed simultaneously.

The engine can be stopped by the ‘Local Stop’ pushbutton or by placing the controller in the OFF mode. The engine will automatically stop in the case of an OVERSPEED condition.

All alarms, except for “FAIL TO START”, are active in the MANUAL mode.

CAUTION: Only depress Crank #1 or Crank #2 pushbuttons with controller in the ‘MANUAL’ mode.

Do not depress the crank pushbuttons in any other mode or while engine is running. Doing so can result in serious damage to the engine.

Three (3) sets of alarm contacts are provided to indicate that the controller is in the “MANUAL” mode. The contacts are rated for 10 A @ 220 VAC / 32 VDC. Terminals 63 to 71.

5.3 AUTO Mode

Placing the controller in the AUTO mode illuminates the “SWITCH IN AUTO” annunciator. The controller is now ready to start the engine in an emergency situation.

A drop in pressure, ‘Remote Start’ signal, a signal from the ‘Deluge Valve’ or Weekly Test Timer will initiate the “attempt to start” cycle. This cycle consists of 6 crank periods of 15 seconds duration separated by 5 rest periods of 15 seconds duration. Battery 1 and Battery 2 are alternated for each crank cycle. In the event that one battery is inoperative or missing, the controller will lock-in on the remaining battery during the cranking sequence. Once the engine is running, the controller will stop all further cranking.

5.4 Stop Modes

The Stop Mode is programmable for either ‘Manual Stop’ or ‘Auto Stop’ (see Figure #2). Note that the engine can be stopped at any time by placing the controller in the OFF position or automatically in case of an OVERSPEED condition.

Manual Stop Mode: the engine will continue to run until the ‘Local Stop’ or ‘Remote Stop’ pushbutton is depressed, providing all starting causes have been eliminated.

NOTE: When the controller starts in this mode there is a 15 second time delay in which the ‘Local Stop’ pushbutton will have no effect.

Auto Stop Mode: the engine will continue to run until the running period timer (RPT) has timed out (factory set at 30 minutes) and all starting causes have been eliminated.

5.5 Weekly Test Timer

Each diesel controller is equipped with a **Weekly Test Timer**, 24 hour clock, to automatically exercise the engine once a week. The controller initiates the starting sequence by opening the drain valve resulting in a simulated system pressure loss. The drain valve is automatically closed once the controller receives an “ENGINE RUN” signal. The engine will continue to run for a minimum of 30 minutes or for the duration of the RPT setting, whichever is greater. “Weekly Test Started” will be indicated on the hard copy printout.

In the event that the engine is inoperative at the time the Weekly Test is to be initiated, the Weekly Test will commence immediately after the engine is put in service. This ensures that the engine is exercised at least once a week for the time specified as per NFPA Pamphlet No. 20.

In order to protect the engine, during the Weekly Test sequence, an OVERSPEED condition, LOW OIL PRESSURE or HIGH ENGINE TEMP alarm will automatically shutdown the engine.

5.6 TEST Mode

Placing the controller in the TEST position initiates a starting sequence by opening the drain valve resulting in a pressure loss. The controller will start the engine in the automatic mode.

The TEST sequence can be terminated by putting the controller in the OFF mode, otherwise the STOP mode prevails as programmed.

All alarms are active in the test mode. In order to protect the engine, in the test mode, an OVERSPEED condition, LOW OIL PRESSURE or HIGH ENGINE TEMP alarm will automatically shutdown the engine.

5.7 Run Period Timer

The Run Period Timer (RPT) performs the automatic stopping function in a Fire Pump Controller after a start initiated by the pressure transmitter during automatic operation.

The purpose of the RPT is to ensure that the engine is not subjected to frequent starts in response to the pressure. Refer to Section 6 for programming of the RPT.

5.8 Sequential Start Timer

The Sequential Start Timer is standard in all diesel fire pump controllers.

“The controller for each unit of multiple pump units operating in parallel shall incorporate a sequential timing device to prevent any one motor from starting simultaneously with any other motor. If water requirements call for more than one pumping unit to operate, the units shall start at intervals of 5 to 10 seconds. Failure of a leading motor to start shall not prevent subsequent pumping units from starting” – NFPA, Pamphlet 20, Chapter 7.

The sequential start timer (SST) delays the starting of a fire pump in response to the pressure switch. It does not delay a pushbutton or emergency handle start.

With a SST in each controller, any pump may be selected as the lead pump by appropriate setting of the timers. If the lead pump restores the pressure in less than the time delays applied to the lag pumps, then the lag pumps will not start.

In addition, the provision of a sequential start timer, set to a few seconds delay, will prevent the lead pump controller from responding to momentary hydraulic transient pressure loss which would otherwise start the fire pump unnecessarily.

The SST can be programmed from 0 – 300 seconds. Typically, each pump should be delayed

by 10 seconds from the pump ahead of it. If hydraulic transients are a problem, all timers can be adjusted for a few seconds extra time delay.

6. Programming of the Main Controller

>> *The controller is programmable <<
in the ‘OFF’ mode only*

The LCD display will prompt the programmer with data and allow the operator to modify the program using a combination of the MENU key and three function keys; **F1**, **F2** and **F3**. The displayed parameter value indicates the present setting of the controller. Located above the F1, F2 & F3 keys are designated symbols and/or words describing their function. The function keys are used to increase, decrease or accept preset values.

While programming, a Function key or the MENU key must be depressed within a 60 second time period, otherwise the controller will return to the initial prompt.

6.1 To Program The Controller

Place the controller in the ‘OFF’ mode and depress the MENU key, followed by the **F3** key. Figure #2 illustrates the sequence in which the operator is prompted for each parameter. To move to the next parameter, press the MENU key. Note that moving from one parameter to the next does not affect the value of the parameter currently displayed.

F1 and F2 are used to change the value while F3 is used to enter the value into memory or accept the present value and proceed to the next parameter.

For example, if the parameter displayed is “CHANGE DATE”, press the MENU key three (3) times to access the “RUN PERIOD TIMER” parameter and press F3 to change the time. F1 increases the count, F2 decreases the count and F3 enters the selected value into memory and proceeds to the next parameter.

PROGRAMMABLE RANGES

Run Period Timer:	1-60 mins
Pressure (Start/Stop):	1-500 PSI
Pressure Deviation:	1-100 PSI
AC Failure Delay:	0-300 sec
Sequential Start Timer:	0-300 sec
Low Suction Shutdown	YES or NO

6.2 Program Descriptions

Refer to Appendix A attached .

6.2.1 Change Date

Factory set, however, this parameter allows the user to set the current date.

6.2.2 Change Time

Factory set, however, this parameter allows the user to set the current time.

6.2.3 Weekly Timer

This function allows the user to set the controller to automatically start and stop the engine once per week. Select the day and time (24-hour clock) for the engine to run. Once selected, choose the run time desired, in minutes. **The engine will now start once per week as programmed. The engine will run for a minimum of 30 minutes or for the duration of the RPT setting, whichever is greater.**

You can view the status of the Weekly Test date by depressing the TIME/PRINT button twice.

6.2.4 Run Period Timer

To activate the RPT, the STOP MODE function must be 'Set for Automatic' (see below in this section). When the engine is started in response to the pressure switch, it will continue to run for the duration of the RPT, in minutes. Once timed out, if no further starting causes prevail, the engine will automatically stop.

If the engine is started manually the RPT has no affect and the engine must be stopped manually.

If the STOP MODE function is 'Set for Manual', the RPT does not affect the operation of the controller and becomes inoperative.

The timing range for the RPT is: 1-60 mins

NOTE: that the RPT timer must be reset to thirty (30) minutes when the controller is placed in service.

6.2.5 Language

The language can be selected for either English, Spanish or French.

6.2.6 Pressure Transmitter

When selected as YES, the controller will start based on the signal from the pressure transmitter.

When selected as NO, the engine will start when the controller detects a contact closure between terminals 31+11.

For both starting conditions above, the Sequential Start Timer is activated when selected.

6.2.7 Pressure Start Point

The value programmed determines at what pressure the controller will initiate a start command to the engine.

The pressure range is: 1-500 PSI
Factory default: 1 PSI

6.2.8 Pressure Stop Point

The value programmed determines at what pressure the system must reach before the controller will STOP the engine, either manually via the STOP pushbutton or automatically via the RPT timer. If the actual pressure does not exceed the STOP pressure value, the engine will continue to run.

The pressure range is: 1-500 PSI
Factory default: 100 PSI

6.2.9 Low Suction Shutdown

This function monitors a contact closure between terminals 29+11. If shutdown is disabled, the LCD display will show low suction and the engine will continue to run.

If shutdown is enabled, to prevent the controller from responding to momentary hydraulic transient pressure loss (which would otherwise shut down the engine unnecessarily), a time delay must be programmed to ensure a steady state.

The shutdown time delay is selectable between 0 - 30 seconds. Upon detecting a steady state contact closure, the engine will turn off.

The reset mode of the engine is user selectable. For AUTOMATIC reset, a time delay between 0 - 30 seconds is selected, after which the controller observes the input for a true signal, and if true, will not allow the engine to restart. If false, the controller will function as normal and respond to a start signal.

If MANUAL reset is selected, the RESET pushbutton must be depressed to reset the controller. If the situation continues to exist, the controller will not restart the engine and the alarm will reappear.

The LCD display will indicate 'Low Suction Shutdown' in both situations.

NOTE: NFPA 20, Section 2-9.9, specifically prohibits the installation of any device in the suction piping that will restrict starting or stopping of the fire pump. Eaton Corporation assumes no liability when this function is used.

6.2.10 Printer Deviation

This value determines how often to print system pressure fluctuations as programmed by the user. In effect, it performs as a chart recorder.

For example, if 10 PSI is programmed, each time the system pressure fluctuates by 10 PSI, up or down, the actual pressure is recorded in memory and printed, tagged with a date and time. This method avoids continual, time-based printing of unnecessary pressure values.

6.2.11 Current Pressure

Allows the user to view the actual pressure during programming of the Diesel Controller.

6.2.12 Sequential Start

This parameter allows programming of a start delay after a start request. To bypass the start delay, set the parameter to zero.

The programmable range is:0-300 sec

6.2.13 Stop Mode

If 'Set for Manual', once started, the engine MUST be stopped manually by depressing the STOP pushbutton located on the flange, regardless of the starting cause. If 'Set for Auto', the RPT becomes operative.

6.2.14 AC Failure Start

If 'Enabled', the controller will automatically start upon the loss of AC power. There will be a non-adjustable delay of 30 seconds before the AC failure is detected. An additional delay can be set if desired. Time range is between 0 & 300 seconds. If 'disabled' AC power failure will have no affect on the starting of the engine.

6.2.15 Print Routine

If selected for Auto, the messages will print immediately without any user intervention.

If selected for Manual, the messages will be stored in the controller's memory and will print once the TIME/PRINT key is pushed and held for 3 seconds.

To avoid paper build up inside the enclosure, it is recommended that the print mode be selected as 'MANUAL' during normal operation of the controller.

6.2.16 Print Status

If selected as 'NO', a Status report will not print when exiting the programming menu. If selected as 'YES', after exiting the program mode, and pressing the Time/Print button for 3 seconds, the programmed parameters and selected controller

readings will be printed. This is most helpful during and after commissioning of the Fire Pump Controller. A sample status printout is shown in section 14.

6.2.17 Select Mode or Press Menu

If programming of the unit is complete pressing the mode keys will put the controller back into operation.

7. Alarm Signals (Annunciator Panel)

Each FD100 Diesel Controller is equipped with all the alarms as shown in Appendix A. Unused alarms can be activated at any time. Refer to the schematic supplied with the FD100 for alarm connections.

Refer to Appendix A: "Annunciator Alarms" affixed inside the enclosure, which describes each alarm, method of resetting, associated terminal reference number, common trouble alarm and print out. Section 14 describes the "Print Mode".

7.1 Battery Failure

There are two annunciators on the alarm panel for, "Battery #1 Failure" and "Battery #2 Failure". The alarm is activated during the cranking cycle when the controller detects a weak or discharged battery, i.e. 67% of rated voltage, or less, or whenever a battery cable is disconnected.

7.2 Charger Failure

There are two annunciators on the alarm panel for, "Charger #1 Failure" and "Charger #2 Failure". The alarm is activated when the supply power to the charger is lost or when the charger malfunctions (alarm contacts are fed into the controller from the charging unit). The engine continues to run. To avoid nuisance power failures, a 20 second delay is built in to the charger failure alarm actuation circuit.

7.3 Engine Run

This annunciator illuminates when the controller receives a running signal from the diesel engine.

7.4 Engine Overspeed

An "Engine Overspeed" alarm will shutdown the engine regardless of the start condition – *in all modes*. The signal is sent from the engine to the controller.

7.5 Fail To Start

After 6 cranking attempts, three attempts per battery, the "Fail To Start" annunciator will

illuminate. Attention to the diesel and its associated equipment is required immediately.

7.6 Fuel Spill

Indicates that the relief valve has been manually opened. This will cause a start of the engine once the pressure drops below the set value.

7.7 High Engine Temperature

Indicates that the coolant temperature in the water jackets is extremely hot. The over temperature switch on the engine signals the controller. The engine continues to run in the AUTO and MANUAL modes. In the "TEST" mode and during the weekly test cycle the engine will shutdown.

7.8 Low / High Fuel

(When Fuel Level Switch Wired)

Indicates that the engine fuel supply is low / high. The engine continues to run.

7.9 Low Oil Pressure

The controller has an inherent delay to bypass the low oil pressure alarm during engine start up. After the delay, should the engine receive a 'Low Oil Pressure' signal, the controller will initiate an alarm. The engine will continue to run in the 'AUTO' and 'MANUAL' mode. In the 'TEST' mode and during the weekly test cycle this alarm will automatically shutdown the engine. This situation will result in serious engine damage if kept running.

7.10 Low / High Reservoir

Indicates that the water reservoir level is low / high. (Signal supplied by others)

7.11 Low Room Temperature

(When Thermostat Installed)

Should a "Low Room Temperature" alarm occur the engine will continue to run.

1 Software versions before V2.91 have a Relief Valve Discharge alarm instead of the Fuel spill alarm.

2 Software versions prior to V2.91 have an audible alarm for Low / High Fuel which followed the input signal from the fuel tank.

8. Battery Chargers

Battery chargers are independent chargers producing a maximum of 10 amps each at full rate. Each battery charger is fully electronic and will protect itself by shutting down during a continued short circuit.

The maximum current draw that the chargers will draw when operating at 100% charging rate is:

12 Volt System	24 Volt System
1.6 amps - 120V	3.2 amps - 120V
0.8 amps - 240V	1.6 amps - 240V

Three Step Charge

The battery chargers incorporate a three step charge to guarantee the fastest charge times while optimizing battery life.

The three steps are referred to as Bulk mode, Overcharge Mode and Float mode.

Bulk

In Bulk mode, a current of 10 Amps is delivered into the battery until the voltage reaches 2.4 Volts per cell for Lead Acid Batteries. (14.4 Volts for a 12 Volt battery). At this point, the battery has recovered approximately 90% of its capacity.

When the charger senses this state, it switches to the Overcharge mode.

The battery charger LCD display will indicate "BULK" while in this mode.

The bulk mode charging may take up to 24 hours depending on the battery capacity and the level to which it was discharged.

Overcharge

In the Overcharge mode, the voltage on the battery is held at 14.4 Volts and the current into the battery declines. This mode is maintained until the current into the battery declines to 1.5 Amps. At this moment, the battery is approximately 99% charged and the charger will change to Float Mode.

The battery charger LCD display will indicate "OVER" as well as the battery voltage and the delivered current.

The overcharge mode charging may take up to 12 hours depending on the battery capacity and the level to which it was discharged.

Float

In Float Mode, the charger maintains the battery voltage at 2.23 Volts per cell for a lead acid battery (13.4 Volts for a 12 Volt battery). Once Bulk and Overcharge modes are completed, the charger will maintain the battery charge in Float mode by regulating to 13.3V. If the charger cannot maintain the battery capacity while in Float mode, the charger will begin a new charging sequence by entering Bulk mode.

The battery charger LCD display will indicate "FLT" as well as the battery voltage and the delivered current.

Charger Failure Alarm

A single Form C relay output will activate if the charger fails during a charge cycle due to any of the following conditions:

Maximum battery charger output voltage has been exceeded.¹

Battery charger output voltage is greater than the maximum battery voltage threshold.¹

Battery charger output voltage is less than the minimum battery voltage threshold.¹

Battery charger output voltage is greater than the battery charge mode maximum voltage threshold.²

Battery charger output voltage is less than the battery charge mode minimum voltage threshold.²

Loss of AC power.

The Charger Failure Alarm relay is normally energized and utilizes the Normally Open contact to signal the alarm condition. When there is a failure, the relay de-energizes.

Dead Cell Alarm

A single Form C relay output will activate if the battery fails during a charge cycle due to any of the following conditions:

Battery charger output current is greater than the maximum battery current threshold.¹

Battery charger output current is greater than the battery charge mode maximum current threshold.²

Battery charger output current is less than the battery charge mode minimum current threshold.²

Loss of AC power.

The Dead Cell Alarm relay is normally energized and utilizes the Normally Open contact to signal the alarm condition. When there is a failure, the relay de-energizes.

Note: The Dead Cell Alarm relay is not provided and must be ordered separately.

Charger Shut Down

The charger will automatically shut down if there is no load connected to the output or if there is a short on the load side of the charger. In addition,

1 - Refer to Appendix A: Table 1

2 - Refer to Appendix A: Table 2

the charger will not operate if a battery is connected incorrectly or if the wrong voltage of battery is connected.

AC Input Fuse Protection

The AC Supply is protected by a 5 amp fuse which will blow in case of a breakdown of the charger. This fuse will not blow as a result of overloading of the charger since the electronics will shutdown the charger in this event before the fuse blows.

LCD Display

A 1 line by 16 character LCD display on the front of each charger will alternately show:

Charging Amps; Voltage; Alarms

As well, error messages will be displayed according to the conditions that exist.

"NO BATTERY" is displayed if no battery is attached to the charger.

"BATTERY ERROR" is displayed if a battery is connected to the charger but the voltage is not within the minimum and maximum thresholds for the selected battery type.

"ERROR, RECOVERING" is displayed if the maximum battery charger output voltage (31.4V) has been exceeded.

"VOLTAGE ERROR" is displayed if a charging test fails during a charge cycle due to any of the following conditions:

Battery charger output voltage is greater than the maximum battery voltage threshold.¹

Battery charger output voltage is less than the minimum battery voltage threshold.¹

Battery charger output voltage is greater than the battery charge mode maximum voltage threshold.²

Battery charger output voltage is less than the battery charge mode minimum voltage threshold.²

"TEMPERATURE ERROR" is displayed if a temperature error is detected.

Temperature errors:

Internal temperature is greater than the maximum ambient temperature.

External temperature is greater than the maximum battery temperature. If the external temperature probe is not connected (terminal P2) the internal temperature is used in its place.

Note: The ambient and battery maximum temperature threshold are both 60°C.

“CURRENT ERROR” is displayed if a battery test has failed during a charge cycle due to any of the following conditions:

Battery charger output current is greater than the maximum battery current threshold.¹

Battery charger output current is greater than the battery charge mode maximum current threshold.

Battery charger output current is less than the battery charge mode minimum current threshold.

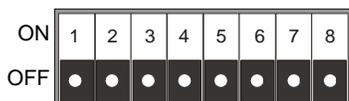
Charger Setup: Lead Acid / Ni Cad

DIP switches on the charger can be used to select a number of options including battery type and voltage as well as Forced Charging. Options currently supported for the charger include 12 or 24 Volt Lead Acid and NiCad Batteries.

Lead Acid

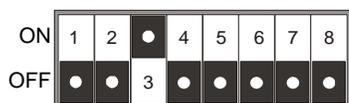
To select 12Volt battery charge cycle with Lead Acid batteries set all DIP switches to the OFF position.

12 Volt Lead Acid



To select 24Volt battery charger cycle with Lead Acid batteries, set DIP switch 3 to the ON position and all other DIP switches to the OFF position.

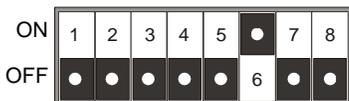
24 Volt Lead Acid



NiCad

To select 12Volt battery charger with NiCad batteries, set DIP switch 6 to the ON position and all other DIP switches to the OFF position.

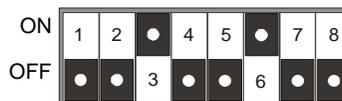
12 Volt - NiCad



To select 24Volt battery charger cycle with NiCad batteries, set DIP switches 3 and 6 to the ON

position and all other DIP switches to the OFF position.

24 Volt - NiCad



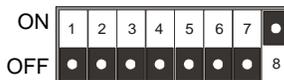
Forced Charging

There is provision for the battery chargers to provide a forced charge to the batteries.

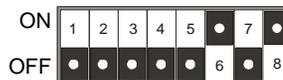
The Forced Charge function will only activate immediately after applying power to the charger with DIP Switch 8 in the ON position and a battery connected.

When the charger is in the forced charge mode, it will attempt to recover a battery by delivering 10 amps. If the battery does not reach the minimum battery voltage (8 volts for a 12 volt system; 18 volts for a 24 volt system) within 5 minutes, the recovery attempt will terminate. Once the battery reaches it's minimum battery voltage, the normal charge sequence will commence. Forced charging will only occur once per battery charger power cycle.

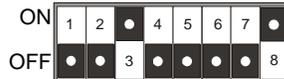
12 Volt Lead Acid



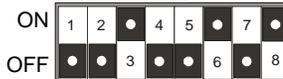
12 Volt - NiCad



24 Volt Lead Acid



24 Volt - NiCad



Installation / Mounting

Two chargers are direct mounted to the back pan.

A retrofit kit consisting of a retrofit mounting plate, single battery charger and wire connection terminals is available for retro-fitting previous models. Refer to the Renewal Parts List PL05805008K.

Specifications

- Voltage Input: 90 - 240VAC - Auto detect
- Voltage Output: 12 - 24VDC-DIP switch selectable
- Hertz: Operates on 50 / 60Hz
- Operating Temperature: 0 to 55 degrees C

9. Operating Temperature

The operating temperature range of the FD100 is: -20°C to 55°C.

1 - Refer to Appendix A: Table 1
2 - Refer to Appendix A: Table 2

10. System Overpressure – PLD

All FD100 diesel engine controllers conform to NFPA - Section 12.4.1.3 (8) - System overpressure for engines equipped with pressure limiting controls. Separate visible and audible indicators will activate once the pressure reaches 115 percent of total rated head (pressure).

When the PLD option is requested, a visible alarm light and an additional pressure switch are added to the controller. The diesel controller horn will sound if system overpressure is present.

11. Electronic Starting Engines – ECM

The FD100 diesel engine fire pump controllers are compatible with NFPA20 - Section 12.4.1.3 for engines with ECM (Electronic Control Module) controls.

Separate visible indicators and audible alarms are provided for the conditions - ECM Selector Switch in Alternate and Fuel Injection Malfunction.

When the ECM option is requested, two pilot lights and relay contacts are added to the controller in order to meet the requirements.

The FD100 terminal strip will be provided with two additional terminals as follows:

Terminal Number 301 - ECM Selector Switch in Alternate

Terminal Number 302 - Fuel Injection Malfunction

12. Initial Start Up

1. Ensure that circuit breakers CB1 and CB2 are in the OFF (0) position.
2. Ensure that AC power is supplied to terminals L and N, and GD is grounded.
3. Connect engine batteries to the controller, terminals 6,8 and 11. If batteries are connected in wrong polarity the battery voltage will read zero.

Note that terminals 6A and 8A are for factory use only and NOT for external connections.

4. Turn circuit breakers CB1 and CB2 ON (“1” position).
5. Turn printer ON after CB1 and/or CB2 have been turned ON.
6. Pressure (start) is factory preset at 1 PSI.
7. Place the controller in the ‘OFF’ mode by depressing the “OFF” button.
8. Ensure that the Diesel is programmed to user’s specifications. Refer to section 6 in this manual. Refer to STATUS printout for factory set parameters.

12.1 Automatic Start Test

Test printer while in Auto mode as per Section 14 of manual. _____

Depress the “AUTO” button. _____

LED on “AUTO” button will light and Annunciator “Switch in Auto” will illuminate. _____

Ensure that water pressure is available and the LCD display on the Display Panel is reading the system pressure, in PSI. _____

Decrease water pressure. Controller will begin its cranking cycle. _____

Should the engine fail to start after 6 crank and rest cycles, the audible alarm will sound and the “Fail To Start” annunciator will illuminate. Depress “OFF” button to silence alarm. _____

When engine starts, “Engine Run” annunciator illuminates. _____

Increase water pressure above programmed STOP point. Press the stop pushbutton on the enclosure. If the pressure is satisfied, the engine will stop. _____

OR _____

If STOP mode is programmed for “Auto-Stop”, engine will stop after Run Period Timer times out and pressure is satisfied. RPT is programmed by the user, factory set at 30 minutes. _____

If Sequential Timer is > 0 seconds, automatic start will be delayed by the number of seconds programmed. _____

If AC Power Failure is ENABLED, automatic start will be delayed by the number of seconds programmed upon a power failure. _____

12.2 Manual Start Test

Depress the “Manual” button. The LED on the button will illuminate. _____

Fuel Solenoid relay will change state. _____

Press Crank No.1 pushbutton. Engine cranks and starts, “Engine Run” annunciator illuminates. _____

Press “OFF” button. Wait for engine to stop. Push “Manual” button then press Crank No.2 pushbutton. Engine cranks and starts, “Engine Run” annunciator illuminates. _____

Press “OFF” button. Engine will stop. _____

12.3 Test Start Test

Depress the “Test” button. LED on button will illuminate. _____

Drain Valve Solenoid will energize and reduce pressure. Controller will start engine automatically. “Engine Run” annunciator illuminates. _____

Press “OFF” button. Engine will stop. _____

NOTE: *Engine will stop if Low Oil Pressure, High Water Temp or Overspeed alarms are detected.*

12.4 Weekly Exerciser Test

Depress “OFF” button. _____

To test the Weekly Exerciser, preprogram the controller to initiate the test at a time suitable to the user. _____

Depress “AUTO” button. _____

At programmed time and date the drain valve solenoid will open. When the pressure drops below the start PSI value, engine will start, “Engine Run” annunciator will illuminate, and drain valve solenoid will close. _____

Press “OFF” button. Engine will stop. _____

Reprogram Weekly Exerciser for normal operation. _____

NOTE: *Engine will stop if Low Oil Pressure, High Water Temp or Overspeed alarms are detected.*

13. Field Failure Alarm Simulation

Ensure that CB1 and/or CB2 are in the *ON* position prior to applying power to the printer (refer to nameplate above printer).

Ensure that both CB1 and CB2 are in the *ON* position and that there is AC power to the chargers. Place the controller in either the *AUTO* or *MANUAL* mode.

NOTE: – For all engine alarms, the Engine Trouble Alarm relay will energize.
– Do not put an AC voltage on these contacts.

13.1 Charger Failure

Remove AC power to the diesel controller panel. After a delay of 30 seconds, the alarm will sound and both Charger #1 Failure and Charger #2 Failure indicating LED's will display. Or, jumper 11 & 22, 11 & 23; [*11 is Battery (negative)*].

After test, reapply AC power to continue testing of other alarms. To reset alarm go to *OFF* mode and then back into *AUTO* or *MANUAL* mode.

13.2 Battery Failure

Turn *OFF* CB1. Alarm will sound and Battery Failure #1 will indicate in the display.

To reset alarm go to *OFF* mode and then back into *AUTO* or *MANUAL* mode.

Turn *ON* CB1 and turn CB2 *OFF*. Alarm will sound and Battery Failure #2 will indicate in the display. Reset alarms as per above.

NOTE: Do not turn off both CB1 and CB2 simultaneously. Otherwise power will be lost to the controller card.

NOTE: For the following tests, while controller is in the *AUTO* or *MANUAL* mode, place a JUMPER between terminal 2 & 11. This will give an *ENGINE RUN* signal to the controller. Or, you can run the engine.

NOTE: There is an inherent 15 second delay for detecting alarms after an *ENGINE RUN* signal.

13.3 Low Oil Pressure

Jumper 4 & 11. Alarm will sound and indicate on the display. To silence alarm, controller must be in the *OFF* mode. *If the engine is wired to the panel and the engine itself is NOT running, the LOW OIL PRESSURE alarm will automatically alarm after the 15 second delay, with terminals 2 and 11 jumpered.*

13.4 High Engine Temperature

Jumper 5 & 11. Alarm will sound and indicate on display. To silence alarm, controller must be in the *OFF* mode. *Note that the LOW OIL PRESSURE*

alarm will also indicate if terminal 4 is wired from the engine to the panel and the engine is not physically running.

13.5 Engine Fail to Start

(*ALL ENGINES EXCEPT CATERPILLAR*)

1. Disconnect field wires #9 & #10 on Fire Pump Controller & initiate automatic start (Place controller in *TEST* mode). Note that actual engine will not crank thus reducing wear and tear on its starters and batteries.

Caterpillar Engines: Install a wire jumper between terminals 1 & 12 and initiate automatic start.

2. Allow pressure to drop and begin cranking sequence.
3. Wait 180 seconds to allow for 3 cranks per battery (15 seconds cranking, 15 seconds rest, 6 times).
4. Alarm will sound and *Fail To Start* indicator will display. To silence alarm, place controller in the *OFF* mode.

13.6 Engine Overspeed

Mechanically close speed switch relay on the diesel engine or jumper 3 & 11. Alarm will sound, *Engine Overspeed* indicator will display, and the *fuel stop* relay will energize.

To silence alarm, place controller in the *OFF* mode.

13.7 Other Alarms (Pump Room Alarms)

To test pump room alarms, such as Low Fuel, Low Room Temp etc., place a jumper between terminal 11 and the corresponding alarm terminal input.

NOTE: The Pump Room Trouble relay will also activate.

14. Printer – Recorder Instructions

The microprocessor-controlled printer is supplied as standard with all Diesel Fire Pump Controllers. Mounted inside the enclosure the printer-recorder provides a hard copy status report of all alarms, events, voltage, system pressure, weekly test timer and programmed parameters of the controller. Each alarm printout is stamped with the time and date that can be used as a trouble-shooting tool to determine start-up causes and exact times of all events.



14.1 Operating Procedure

The printer-recorder is shipped from the factory with two rolls of paper.

Caution must be taken while inside the controller to avoid electrical shocks.

The functions of operating controls are as follows:

Control	Function
L.E.D.	Indicates 'power on' when green and 'paper out' when orange.
Switch	Power off in down position. Power on in up position.
Latch	To secure main body of the printer to mounting enclosure.

14.2 Self Test Function

To activate self-test feature, press and hold the feed button then turn the power on. To stop the self-test before the end of the message, power down the printer.

14.3 Paper Loading

Remove printer chassis from enclosure by turning the latch counter clockwise. Pull out chassis until it stops.

Install the paper spindle into a new roll of thermal paper. Position the roll of paper so that it will feed from the top, then place the roll and spindle into the paper support brackets, making certain that the paper is level. It is recommended that square and clean cut edge is used for entry of paper into the printer mechanism – scissor cut preferred.

To load paper, turn on the power. Now feed the cut edge of the paper into the guide until the paper stops. Press feed button, paper will advance as long as button is held. Feed paper until lead edge lines up with paper cutter.

At this time it is recommended that a self-test be performed to ensure that the paper is installed correctly, (thermal side up) and that it is feeding properly.

In the event of a paper jam condition do not force the paper into the unit, or try to pry the paper out of the unit, this may damage the thermal print mechanism. Disconnect primary power and interface cable before servicing the unit. Carefully remove paper with a set of tweezers, or a small pair of needle nose pliers. If the paper cannot be cleared, remove the face plate by removing the five Philips head screws and nuts holding the face plate. This will allow access to the printer mechanism. Once paper is cleared from the mechanism, re-assemble the unit. At this time, re-load paper.

NOTE: Do not remove jumpers inside of printer

14.4 Print Modes

While in the MENU mode, the 'PRINT ROUTINE' can be set up for either 'Auto' or 'Manual'.

14.4.1 Auto Print

Messages will print directly to the printer as the event or alarm occurs.

DO NOT LEAVE IN THIS MODE

14.4.2 Manual Print

The event and alarm messages are stored in memory until the 'Time/Print' key is depressed, at which time all stored data is printed. The controller will store up to 1024 messages on a First In-First Out basis. To print the stored data hold the 'Time/Print' key for 3 seconds or more. *DO NOT REMOVE POWER FROM PRINTER UNTIL ALL MESSAGES ARE PRINTED, OTHERWISE INFORMATION WILL BE LOST.*

14.5 Print Status

When programmed as YES, the printer will print the "STATUS" of the controller upon exiting the program mode and *only* after selecting AUTO, MANUAL or TEST mode on the main switch.

14.6 Printer Deviation

Is used to determine how often to print system pressure fluctuations, in PSI, as programmed by the user.

For example, if 10 PSI is programmed, each time the system pressure varies by 10 PSI or greater, the actual pressure, date and time will be printed on the printout display (if a Mercoid Pressure Switch is supplied this parameter has no effect).

The programming of the print mode is detailed in Section 6.

"STATUS" Printout

```
*****
S T A T U S   rev4.4
SO 16E5612 CO 103558
 10/20/00, 08:29:23
Weekly Test Time is
  MONDAY 07:05
AC Failure   DISABLED
Print Mode in MANUAL
Stop Mode in AUTO
SST Setting = 000SEC
RPT Setting = 30 MIN
Start Point =001PSI
Stop Point  =110PSI
Pressure    =119PSI
Low Suction Shutdwn:
  Disabled
Charger #1  = 00.2 A
Charger #2  = 00.3 A
Battery #1  = 13.0 U
Battery #2  = 12.9 U
*****
```

Alarm & Message Printout

```
05/26/99, 07:26:01
Pressure = 172 PSI
  **AUTO**

05/26/99, 07:26:18
Pressure = 182 PSI
  **AUTO**

05/26/98, 07:37:51
Low Fuel
  **AUTO**

05/26/98, 07:38:12
Low Room Temp
  **AUTO**

05/26/98, 07:38:22
Battery #2 Failure
  **AUTO**

05/26/98, 07:40:11
Remote Start Request
  **AUTO**

05/26/98, 07:40:11
Fuel Solenoid Open
  **AUTO**

05/26/98, 07:40:11
Cranking Battery #1
  **AUTO**

05/26/98, 07:40:25
Engine Run
  **AUTO**
```

14.7 Replacement Paper Type

The printer-recorder uses a thermographic printing paper on a 2-3/4" diameter roll which is 2-1/4" wide and having a plastic core with a 7/16" hole. Suitable paper is available at most office-supply stores. See list below depicting the office supply stores and their respective catalog number for the paper.

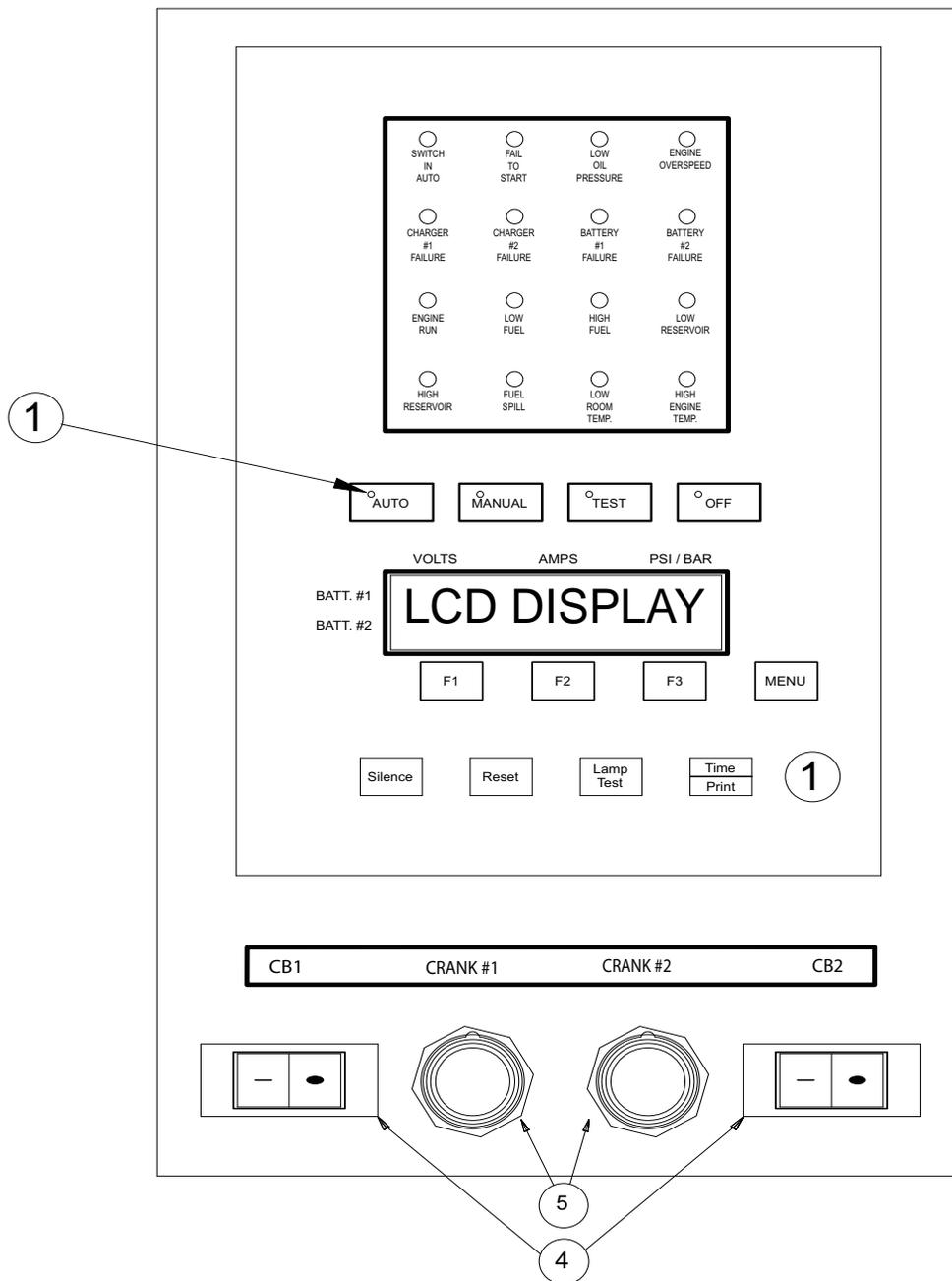
NOTE: If the end of the paper roll is taped, extra caution must be taken when the colored stripe appears – indicating the paper is running out. At this point turn the printer off and replace the roll. Note that one or two messages may be lost as a result.

NON-TAPED ENDED ROLLS

WILSONS: LAB CR722

TAPED ENDED ROLLS

STAPLES: 14485
GRAND & TOY: 7767000
OFFICE DEPOT: 302-232



NOTES:

1. LED'S ARE LIT TO INDICATE WHICH MODE THE CONTROLLER IS IN.
2. CONNECT BOTH BATTERIES FIRST THEN CLOSE BOTH BREAKERS.
3. TIME/PRINT TOGGLES BETWEEN TWO FUNCTIONS. WHEN IN PRINT FUNCTION TAKE INSTRUCTION FROM LCD DISPLAY. (HOLD BUTTON FOR AT LEAST 3 SEC. THEN PRINTER WILL PRINT ANY AVAILABLE INFORMATION
4. FOR DETAIL AND SET UP REFER TO OPERATING MANUAL
5. TO MANUALLY START THE DIESEL, DEPRESS THE "OFF" MODE SWITCH THEN THE MAUAL MODE SWITCH. PRESS CRANK #1 OR CRANK #2 OR BOTH TILL DIESEL IS STARTED.

FIGURE #1

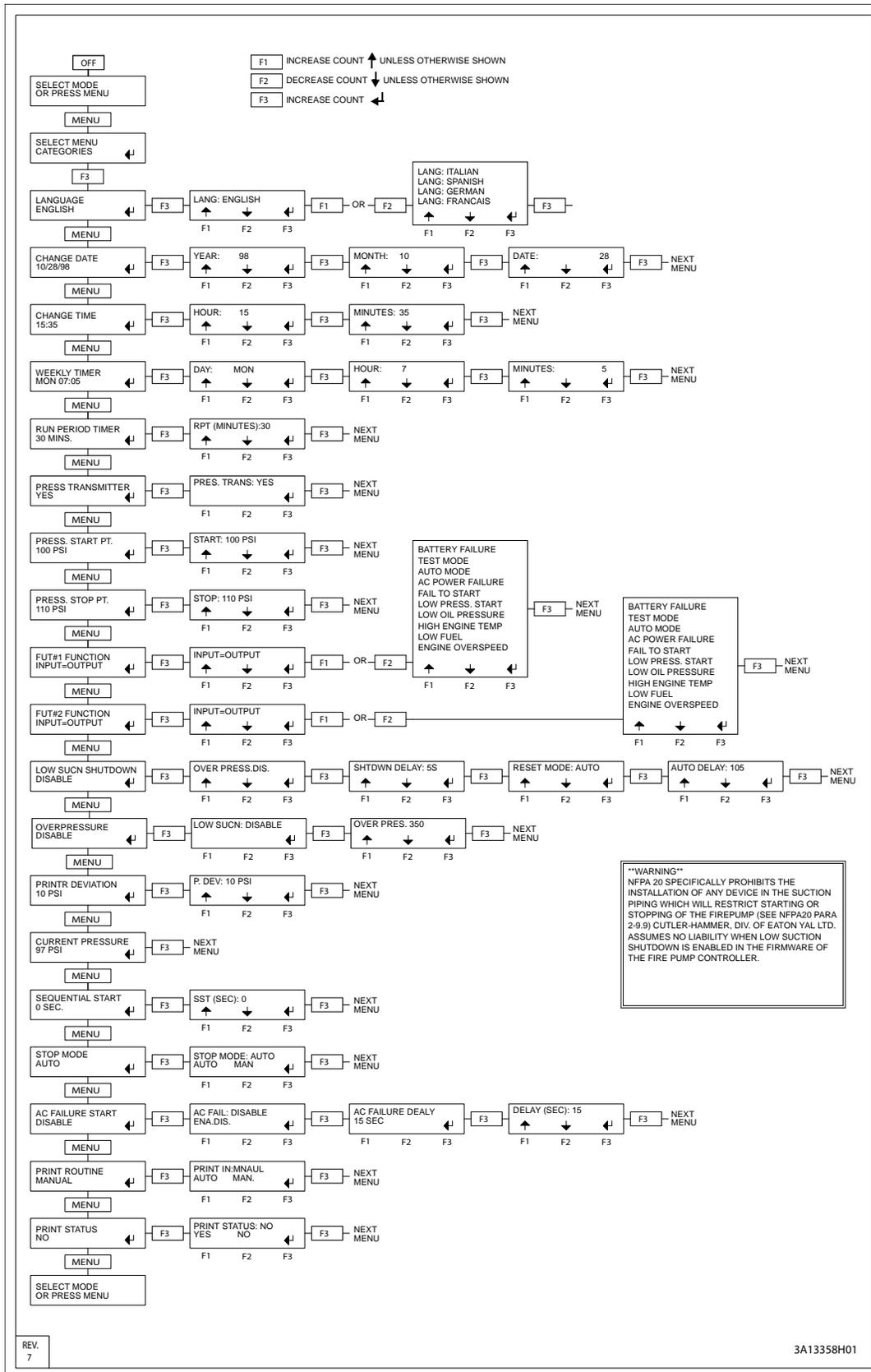


FIGURE #2

APPENDIX A:

Table 1:

Threshold	12V Battery			24V Battery		
	Min.	Typ.	Max	Min.	Typ.	Max
Charger Output Voltage			31.4 V			31.4 V
Charger Output Current			11 A			11 A
Battery Voltage	8.0V		18.0V	18.0 V		31.4 V
Ambient Temperature			60°C			60°C

Table 2:

Threshold	12V Battery						24V Battery					
	Bulk		Overcharge		Float		Bulk		Overcharge		Float	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Charger Output Voltage		14.4 V		14.4 V	12.4V	14.4 V		28.8V		28.8V	25.8	27.8V
Charger Output Current	9.0A	10.0 A		10.0 A		2.0 A	9.0A	10.0 A		10.0 A		2.0 A

APPENDIX B: ANNUNCIATOR ALARMS

Alarm	Terminal Ref. No.	Audible Alarm Silenced By :	Annunciator * Reset By:	Common Trouble Alarm			Alarm ** Print Out
				Type	Relay #	Reset By:	
Battery #1 / #2 Failure	N/A	Placing Controller in the "OFF" Mode	Pressing RESET On Controller Panel	Pump Room	PRT	Pressing RESET On Controller Panel	MM/DD/YR, HH/MM/SS Battery #X Failure **mode**
Charger #1 / #2 Failure	22 / 23	Placing Controller in the "OFF" Mode	Pressing RESET On Controller Panel	Pump Room	PRT	Pressing RESET On Controller Panel	MM/DD/YR, HH/MM/SS Charger #X Failure **mode**
Engine Overspeed	3	Placing Controller in the "OFF" Mode	Placing Controller in the "OFF" Mode, Resetting Speed Switch on Diesel	Engine	ETA	Placing Controller in the "OFF" Mode	MM/DD/YR, HH/MM/SS Engine Overspeed **mode**
Fail To Start	N/A	Placing Controller in the "OFF" Mode	Placing Controller in the "OFF" Mode	Engine	ETA	Placing Controller in the "OFF" Mode	MM/DD/YR, HH/MM/SS Fail To Start **mode**
Fuel Spill	20	Pressing SILENCE On Controller Panel	Pressing RESET On Controller Panel	Pump Room	PRT	Eliminate Problem and Press RESET	MM/DD/YR, HH/MM/SS Fuel Spill **mode**
High Engine Temperature	5	Placing Controller in the "OFF" Mode	Placing Controller in the "OFF" Mode	Engine	ETA	Placing Controller in the "OFF" Mode	MM/DD/YR, HH/MM/SS High Engine Temp **mode**
Low Fuel Or High Fuel	16 17	Pressing SILENCE On Controller Panel	Placing Controller in the "OFF" Mode	Pump Room	PRT	Eliminate Problem	MM/DD/YR, HH/MM/SS Low (or High) Fuel **mode**
Low Oil Pressure	4	Placing Controller in the "OFF" Mode	Placing Controller in the "OFF" Mode	Engine	ETA	Placing Controller in the "OFF" Mode	MM/DD/YR, HH/MM/SS Low Oil Pressure **mode**
Low Reservoir Or High Reservoir	18 19	Pressing SILENCE On Controller Panel	Pressing RESET On Controller Panel	Pump Room	PRT	Eliminate Problem and Press RESET	MM/DD/YR, HH/MM/SS Low (or High) Reservoir **mode**
Low Room Temperature	21	Pressing SILENCE On Controller Panel	Pressing RESET On Controller Panel	Pump Room	PRT	Pressing RESET On Controller Panel	MM/DD/YR, HH/MM/SS Low Room Temp **mode**

* Alarms are not resettable if condition continues to exist.

** Mode ** refers to Main Switch Mode - AUTO, MANUAL, TEST

PAGE 2 OF 3

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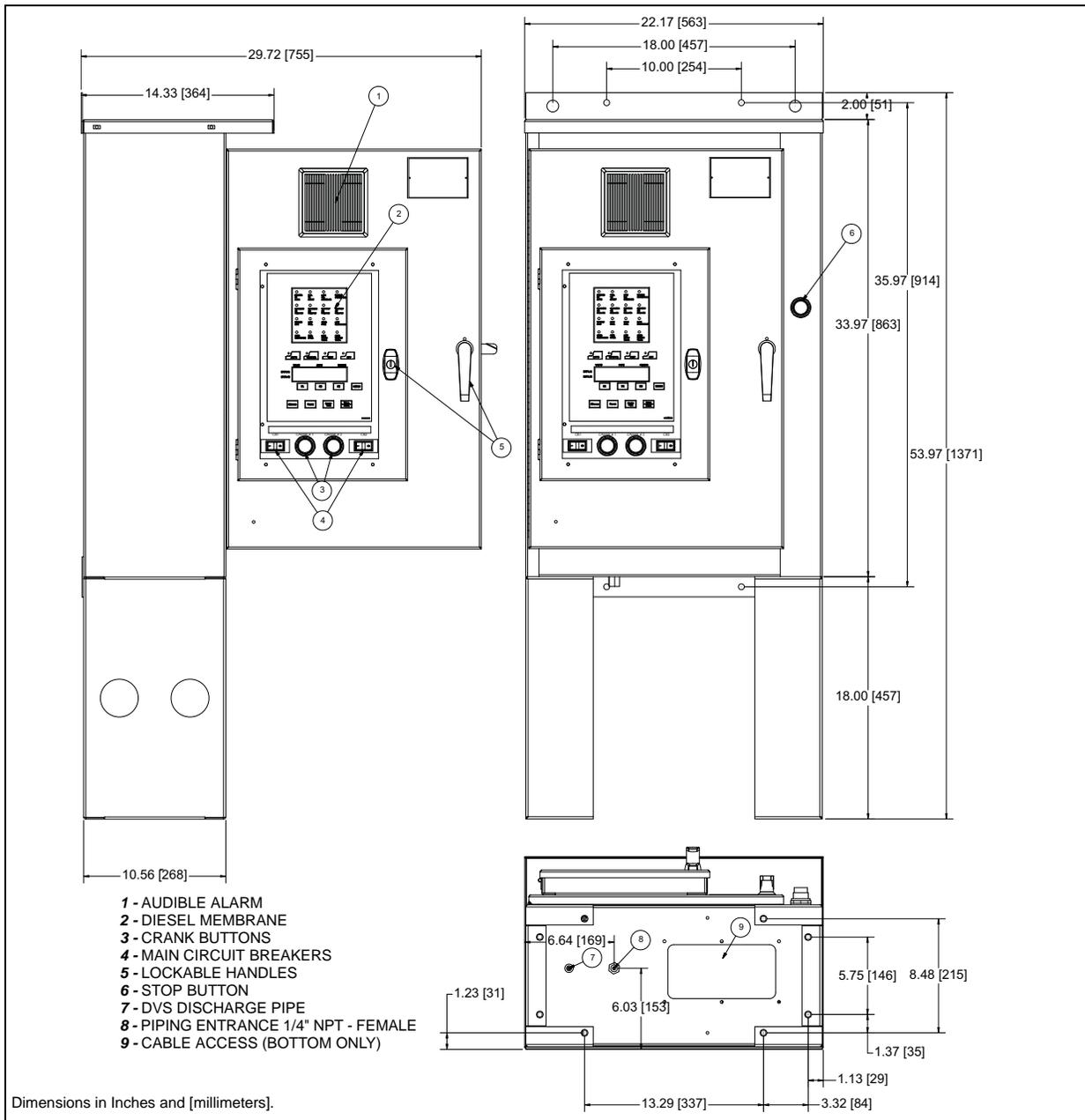
APPENDIX C: PRINTER 'EVENT' MESSAGES

Message	Description of Message	Message ** Print Out
Cranking Battery #1 or #2	Indicates which battery the controller is cranking during an "attempt to start" cycle. This message will not print in the manual mode.	MM/DD/YR, HH/MM/SS Cranking Battery #X **mode**
Drain Valve Opened	In the "TEST" mode or when initiating the weekly test timer this message prints to indicate the actual time that the drain valve has opened.	MM/DD/YR, HH/MM/SS Drain Valve Opened **mode**
Deluge Valve Open	Indicates that the engine was requested to start due to the Deluge Valve being activated.	MM/DD/YR, HH/MM/SS Deluge Valve Open **mode**
Engine Run	Prints after the controller receives an "Engine Run" signal from the diesel engine.	MM/DD/YR, HH/MM/SS Engine Run **mode**
Engine Stopped	Prints after the diesel engine has stopped as indicated by the "Engine Run" contacts.	MM/DD/YR, HH/MM/SS Engine Stopped **mode**
Fuel Solenoid Closed	Any time the fuel solenoid is de-activated, after a manual stop for example, this message will print.	MM/DD/YR, HH/MM/SS Fuel Solenoid Close **mode**
Fuel Solenoid Open	Any time the fuel solenoid is activated, prior to cranking for example, this message will print.	MM/DD/YR, HH/MM/SS Fuel Solenoid Open **mode**
Low Pressure	This message is printed when the controller is called upon to start the diesel engine as a result of low system pressure.	MM/DD/YR, HH/MM/SS Low Pressure **mode**
Manual Stop Request	Indicates that the Local STOP pushbutton has been depressed to initiate an engine shutdown.	MM/DD/YR, HH/MM/SS Manual Stop Request **mode**
Pressure = XXX PSI	Pressure reading will print if the deviation in pressure exceeds the amount, in PSI, as programmed in to the controller by the user.	MM/DD/YR, HH/MM/SS Pressure = XXXPSI **mode**
* Pressure Start	Future #2 relay will energize once the pressure is less than the programmed Pressure Start Point and the engine starts. Can be enabled or disabled.	MM/DD/YR, HH/MM/SS Pressure Start **mode**
Remote Start Request	Indicates that the engine was called upon to start due to someone pressing the "Remote Start" pushbutton.	MM/DD/YR, HH/MM/SS Remote Start Request **mode**
RPT Time Out	After the Weekly Test Timer or Running Period Timer expires (if STOP Mode is programmed for Auto) this message will print.	MM/DD/YR, HH/MM/SS RPT Timed Out **mode**
Weekly Test Started	This is the actual time that the Weekly Test Timer is called upon to start. The engine will continue to run for 30 minutes after the time indicated.	MM/DD/YR, HH/MM/SS Weekly Test Started **mode**

** Not Available on software versions V2.91 or earlier*

*** Mode ** refers to Main Switch Mode - AUTO, MANUAL, TEST*

Dimensions
Standard Enclosure - Type NEMA 2, 12



Approx. Weight Lbs. (Kg)
105 (48)



NOTES:
 1. All enclosures finished in FirePump red.
 2. Cable entrance bottom only.
 3. Standard enclosure type NEMA 2, 12
 4. Enclosure made from #14 gauge(0.75) HR. Steel.

FIGURE #3

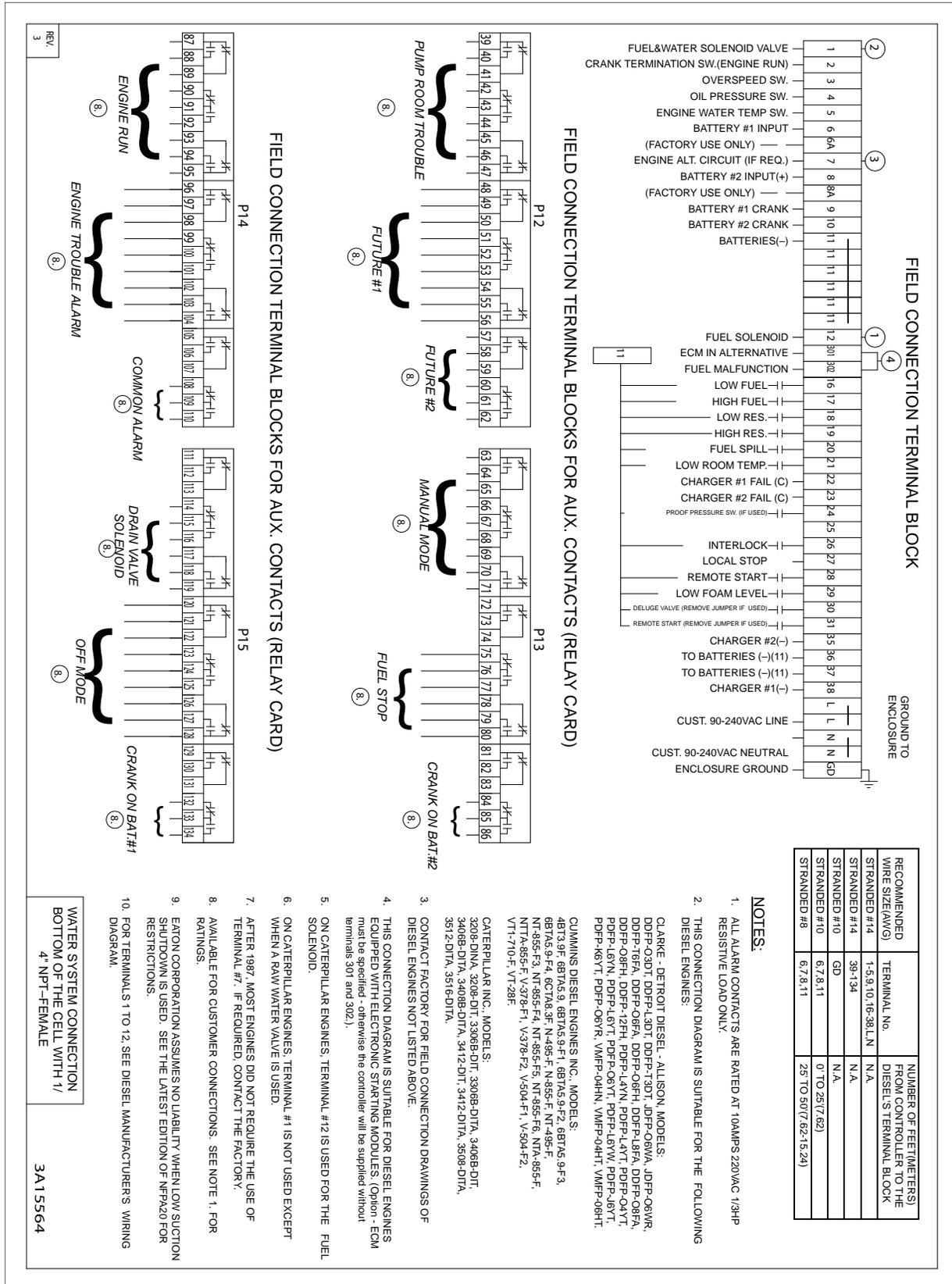


FIGURE #4

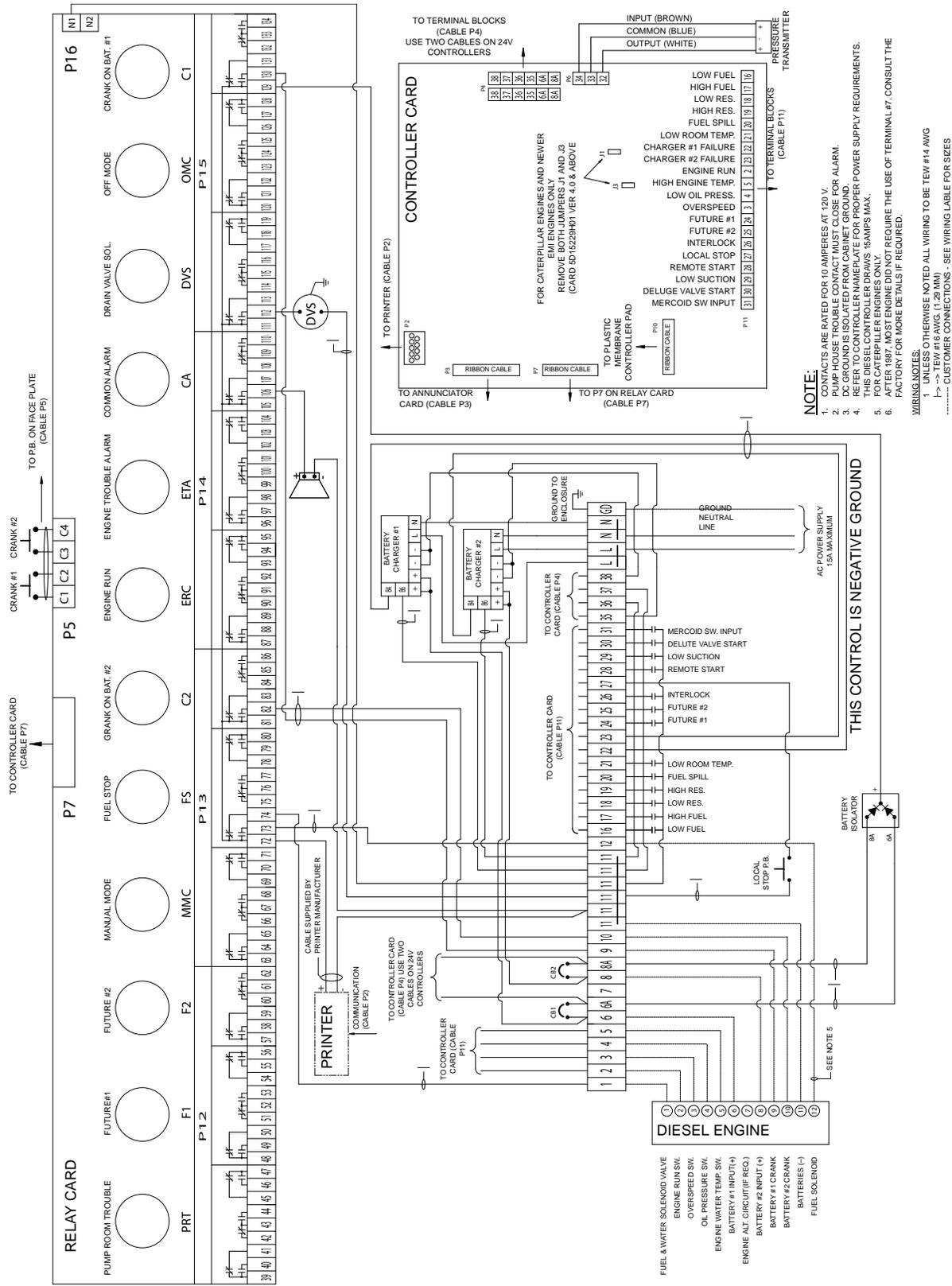


FIGURE #5

Diesel Commissioning List

Read Completely Before Proceeding With Start Up

Sign-Off	
	<i>Physical Inspection</i>
	Inspect for Enclosure Damage Inspect for Component Damage within Enclosure Controller Free of Debris (Inside and Outside Controller) All Packing Material is Removed from Controller (i.e.- behind pressure switch) All Components are Secure within Enclosure All Moving Parts are Allowed to Move Freely <ul style="list-style-type: none"> -Push Buttons -Door Handles -Roller Breakers (CB1 & CB2) -Outer Door
	<i>Wiring Inspection</i>
	Ensure that circuit breakers CB1 and CB2 are in the OFF (0) position. Inspect all Wiring to and from Controller <ul style="list-style-type: none"> -All field connections and incoming wiring must be brought into the enclosure through the bottom right side ONLY Compare rating nameplates on controller and engine. All Electrical Connections are tight All Wiring to and from Controller is Correct <ul style="list-style-type: none"> -Field Connections (Remote Starters, Fuel Level Switch, etc) -Engine Connections: (Terminal #) <ul style="list-style-type: none"> #1 - Fuel & Water Solenoid Valve #2 - Engine Run Sw. #3 - Overspeed Sw. #4 - Oil Pressure Sw. #5 - Engine Water Temp. Sw. #6 - Battery #1 Input (+) <i>(If connected to the wrong polarity the battery voltage will read 0)</i> #7 - Engine Alt. Circuit (If Required) #8 - Battery #2 Input (+) <i>(If connected to the wrong polarity the battery voltage will read 0)</i> #9 - Battery #1 Crank #10 - Battery #2 Crank #11 - Batteries (-) #12 - Fuel Solenoid (Caterpillar engines only) <p><i>* Ensure battery wire is sized per the following Chart: (Terminals 6, 8 and 11)</i></p> <ul style="list-style-type: none"> <i>#10 AWG: 0' to 25' (7.62 m)</i> <i>#8 AWG: 25' to 50' (15.2 m)</i> <p>Note: Ensure that the negative ground (Terminal #11) is making a good connection in the controller, engine control box, on the engine block and at the batteries.</p>

	<i>Immediately Before Initial Start-Up</i>
	<p>Check Pressure Transmitter Connections</p> <ul style="list-style-type: none"> -Ensure Sensing Line is connected to pump discharge -Check for leaks from Pressure Transmitter to incoming sensing line. <p>If using a Caterpillar engine remove jumpers J1 & J3 from the controller board.</p> <p>Ensure that AC power is supplied to terminals L and N, and GD is grounded to earth.</p> <p>Ensure battery chargers are set to the AUTO Mode</p> <p>Ensure printer is in the 'OFF' position</p>
	<i>Diesel Configuration Checklist</i>
	<p>Turn circuit breakers CB1 & CB2 ON ("I" Position)</p> <p>Turn printer ON after CB1 and/or CB2 have been turned ON</p> <p>Place the controller in the 'OFF' mode by depressing the "OFF" button</p> <p>Enter the diesel programming menu, a flowchart is provided on the Diesel door and in the instruction manual</p> <p>Change Date & Time</p> <p>Set Weekly Run Timer - This cannot be set for less than 30 minutes</p> <p>Set Run Period Timer</p> <p>Set Pressure Start Point</p> <p>Set Pressure Stop Point</p> <p>Set Pressure Deviation (Default value is 10 PSI)</p> <p>Set Sequential Start Timer (If required)</p> <p>Set Stop Mode to either Manual or Automatic</p> <p>Enable/Disable AC Failure Start</p> <p>Set Print Routine to Automatic (This will be set back to manual when testing is finished)</p> <p>Set "Print Status Report" to YES.</p>
	<i>Operational Check</i>
	<p>Press "Lamp Test" Button on the Diesel display board to make sure all lights are operational</p> <hr/> <p>Note: To switch between modes the controller must be switched into the 'OFF' mode first.</p> <hr/> <p>Automatic Start Test</p> <p>Place the controller in the 'AUTO' mode by depressing the "AUTO" button</p> <ul style="list-style-type: none"> - Annunciator "Switch in Auto" will illuminate <p>Decrease the water pressure to below the controller 'Start Point'</p> <ul style="list-style-type: none"> - The controller will begin its cranking cycle - When the engine starts "Engine Run" will illuminate <p>Increase the water pressure to above the controller 'Stop Point'</p> <p>Press the Stop pushbutton on the enclosure</p> <hr/> <p>Note: The stop pushbutton will not work when the controller is programmed for auto stop on controllers with firmware Version 4.4 and lower. Controllers with version 4.6 or higher will stop regardless of what stop mode is programmed providing the pressure stop point has been reached and a 15 second fixed time delay has elapsed.</p>

Manual Start Test

Place the controller in the 'MANUAL' mode by depressing the "MANUAL" button

- Fuel Solenoid relay will change state

Press the 'Crank #1' pushbutton

- The controller will attempt to crank off Battery #1
- When the engine starts "Engine Run" will illuminate

Press the "OFF" button to stop the engine

Once the engine stops, press the "MANUAL" button to return to 'MANUAL' mode

Press the 'Crank #2' pushbutton

- The controller will attempt to crank off Battery #2
- When the engine starts "Engine Run" will illuminate

Press the "OFF" button to stop the engine

Test Start Test

Place the controller in the 'TEST' mode by depressing the "TEST" button

- Drain Valve Solenoid will energize and reduce pressure
- controller will start automatically
- When the engine starts "Engine Run" will illuminate

Press the "OFF" button to stop the engine

Weekly Exerciser Test

Program the Weekly Timer to a time suitable to run the test

Place the controller in the 'AUTO' mode by depressing the "AUTO" button

- At the programmed date and time the drain valve solenoid will open and the pressure will drop
- The engine will run for a minimum of 30 minutes or for the duration of the RPT setting, whichever is greater

Reprogram the Weekly Timer for normal operation

Controller Function Tests*Overspeed*

Place the controller in the 'AUTO' mode by depressing the "AUTO" button (Optional)

- Start the controller either by jumpering remote start (Terminal #11 & #28) or by dropping the pressure
- Press the 75% verify button on the speed switch in the engine control box, the engine should stop and the controller should give an overspeed alarm

Press the "OFF" button to reset the alarms

Low Oil Pressure / High Engine Temp

Place the controller in the 'AUTO' mode by depressing the "AUTO" button

- Start the controller either by jumpering remote start (Terminal #11 & #28) or by dropping the pressure
- Place a jumper between Terminals #4 & #11, the 'Low Oil Pressure' light should illuminate
- Place a jumper between Terminals #5 & #11, the 'High Engine Temperature' light should illuminate

Press the "OFF" button to stop the engine

Battery #1 Failure / Battery #2 Failure

Place the controller in the 'MANUAL' mode by depressing the "MANUAL" button

- Disconnect one of the leads going to battery #1
- 'Battery #1 Failure' should illuminate after 3 minutes
- Reconnect Battery #1

Press the "OFF" button to reset the alarms

Place the controller in the 'MANUAL' mode by depressing the "MANUAL" button

- Disconnect one of the leads going to battery #2
- 'Battery #2 Failure' should illuminate after 3 minutes
- Reconnect Battery #2

Press the "OFF" button to reset the alarms

Charger #1 Failure / Charger #2 Failure

Place the controller in the 'MANUAL' mode by depressing the "MANUAL" button

- Disconnect AC power going to the controller
- 'Charger #1 Failure' and 'Charger #2 Failure' should illuminate after 3 minutes
- Reconnect AC power

Press the "OFF" button to reset the alarms

Fail to Start

Place the controller in the 'AUTO' mode by depressing the "AUTO" button

- Disconnect leads #9 & #10 going to the controller
- Start the controller either by jumpering remote start (Terminal #11 & #28) or by dropping the pressure
- After the controller goes through its cranking cycles 'Fail to Start' should illuminate
- Reconnect #9 & #10

Press the "OFF" button to reset the alarms

Optional Alarms

Place the controller in the 'MANUAL' mode by depressing the "MANUAL" button

Test Alarm Conditions with a Jumper Between Terminal #11 and ... (If condition is used)

- #16 - Low Fuel
- #17 - High Fuel
- #18 - Low Reservoir
- #19 - High Reservoir
- #20 - Fuel Spill
- #21 - Low Room Temperature
- #25 - Future #2
- #24 - Future #2
- #25 - Interlock (with jumper in engine should never start)
- #29 - Low Suction

Note: To clear the above alarms, press the "OFF" button

Starting Conditions

Test Starting Conditions with a Jumper Between Terminal #11 and ...

#28 - Remote Start (The engine will start)

#30 - Deluge Valve Start (The engine will start)

#31 - Mercoird Switch Input (The engine will start)

Note: *To stop the engine, press the "OFF" button*

Diesel Configuration Checklist

Confirm all settings below...

Date & Time

Weekly Run Timer

Run Period Timer

Pressure Start Point

Pressure Stop Point

Low Pressure Alarm

Pressure Deviation

Sequential Start Timer (If required)

Enable/Disable Manual Stop as per requirements

Enable/Disable AC Failure Start (If Required)

Print Routine (When finished at site set to 'Manual')

Set "Print Status Report" to YES.

Note: Press and hold the 'F3' button for 3 seconds in order to print a status report on controllers with firmware version 4.6 or higher.

Before Leaving Site

Test printer by printing Status Report - and keep for your records.

Dump all printer messages contained in the memory.

(Hit time/print button for 3 seconds while printing - hold the reset button on printer until memory is cleared).

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