**Product Description**

The FD100 Diesel Engine Controller is designed to control and monitor 12 or 24 volt, diesel fire pump engines. All models are listed by UL and ULC, and approved by Factory Mutual and CSA, as well as meeting or exceeding the requirements of NFPA 20 and NFPA 70.

**Product Features**

**Microprocessor Control**

EATON Cutler-Hammer FD100 Diesel Engine Fire Pump Controllers are microprocessor based. All events surrounding the operation of the controller are stored within the memory, thus giving the ability to diagnose and troubleshoot problems based on an actual history of events. Events are time and date stamped.

A main display unit provides a read-out of parameters such as current pressure, volts and amps and will display error messages as well as provide alarm indication. A status report is available which can be printed locally. The status reports provide a record of the state of the controller as it was left after commissioning.

**Pressure Transmitter: 0.5 - 5.5V**

Each diesel engine controller is equipped with a plug-in style, 0.5 to 5.5 volt pressure transmitter.

**Run Period Timer**

The run period timer is built into the FD100 microprocessor and can be accessed via the membrane / keypad. It is programmable from 0-60 minutes and should be reset to thirty (30) minutes when the controller is placed in service.

**Printer / Recorder**

The industrial grade thermal printer is housed in a rugged steel enclosure within the controller. The on/off switch, feed and reset buttons are front accessible. A bi-color status LED is also visible on the front of the printer. Green indicates - “Printer Operational” while yellow indicates - “Out of Paper”.

**Engine Crank Cycle**

Upon detecting a drop in system pressure, the microprocessor sends a start signal to the engine, initiating its’ crank cycle. The crank cycle consists of six periods of 15 second duration, separated by five rest periods of 15 second duration alternating on each set of batteries. If the engine does not start within this cycle, an audible and visible “Fail to Start” alarm is activated. Should voltage of either battery fall below 67% of normal during the crank cycle, a “Battery Failure” alarm will be activated and the FD100 will alter the cranking sequence by continuing the process with the remaining “good” battery. The crank cycle terminates when the engine starts. The FD100 continues to monitor the batteries and engine for conditions such as: water temperature, oil pressure and speed (RPM).

**Common Alarm Relay**

The FD100 controller has a common alarm relay which energizes whenever there are any alarm conditions present. This relay is energized under normal conditions and has LED status indication.

**Additional Output Relays**

Two additional output relays labeled Future #1 and Future #2, can be user programmed to operate for ten (10) different functions. Programming is done in the FD100 menu using the membrane / keypad.

**Alarm Relay Ratings**

All alarm relays are rated at 10 Amps, 220VAC 1/3HP resistive load only.

**NEMA 2 Enclosures**

All FD100 controllers come standard with NEMA 2 enclosures unless otherwise ordered. Available options include: NEMA 3R, 4, 4X, 12.

**AC Power Failure**

The FD100 microprocessor retains a record in it’s memory whenever AC power is applied / restored to the controller. The LCD display indicates the message “AC Power OK”.

**Weekly Test Timer**

Each diesel controller is equipped with a Weekly Test Timer, 24 hour clock, to automatically exercise the engine once a week for the time specified as per NFPA Pamphlet No. 20.

**Relay Board**

The FD100 Relay Board is clearly labeled with pull-apart terminal blocks for ease of wiring and connections. All relays are labeled with full description as well as corresponding three letter designation as indicated on the wiring diagram.

A visual LED indicates the energized state of the relay. All plug-in relays are identical 3PDT, allowing complete interchangeability. All terminal numbers are indicated on both the stationary and moveable portion of the terminal blocks. Pump Room Trouble and Engine Trouble common alarm relays are standard.
Battery Chargers

Product Features

Alarm & Status Indication
The display panel is equipped with sixteen indication LED’s which indicate various functions and operations of the controller. They are colour keyed to the urgency of the indication. Green indicates normal running conditions, Yellow indicates supervisory alarms and Red indicates critical alarms.

LCD Display / Function Panel
The 2 line liquid crystal display allows viewing of all programming parameters in addition to battery and pressure information without opening the front door of the controller. Messages can also be downloaded to a laptop computer via the communications port located on the top of the main microprocessor board.

Battery Chargers

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.

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.

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). In this mode, the battery will come to 100% charge. At the same time, any additional load on the battery system will draw its current from the charger so that the battery will not discharge due to these additional loads. This charging technique insures that the battery will not be overcharged.

AC Input Fuse Protection
The AC Supply is protected by a 6 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.

RS232 Port
This port is currently not active. It is reserved for use with the Diesel Plus controller.

Temperature Monitoring
Internal Temperature Sensor
To achieve optimal performance of the charger and to insure that the batteries are not overcharged, each charger is equipped with an internal temperature sensor which provides an ambient temperature indication. The charging parameters are altered based on the temperature readings, to provide optimal charging results.

Additionally, for temperatures outside of the charging temperatures recommended by the battery manufacturers, the charger will activate an alarm.

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

Specifications
Voltage Input: 90 - 240VAC - Auto detect
Voltage Output: 12 - 24VDC - DIP switch selectable
Hertz: Operates on 50 / 60Hz

Standards & Certification
The FD100 Diesel Engine Fire Pump Controllers meet or exceed the requirements of Underwriters Laboratories, Underwriters Laboratories Canada, Factory Mutual, the Canadian Standards Association, New York City building code, are built to NFPA 20 standards and meet CE mark requirements.

For CE Approved Dimensional drawing - see Page 1-5.

For more information visit: www.chfire.com
Dimensions

* Standard Enclosure - Type NEMA 3R (*4, 4X)*

**NOTES:**
1. All enclosures finished in FirePump red.
2. Cable Entrance bottom only.
3. Standard Enclosure type NEMA 3R.
4. Enclosure made from #14 Gauge (0.75) HR Steel.

* NEMA 4, 4X enclosures are supplied:
Without wall mounting holes.
With 1/4 Turn latches instead of 3 point handle.

Approx. Weight

<table>
<thead>
<tr>
<th>Lbs. (Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>105 (48)</td>
</tr>
</tbody>
</table>

For more information visit: www.chfire.com
Main Display

- LED lit to indicate which mode the controller is in.
- Connect both batteries first, then close both breakers.
- 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.
- For detailed and set up refer to operating manual.
- To manually start the diesel, depress the "OFF" mode switch then the manual mode switch. Press crank #1 or crank #2 or both till diesel is started.

For more information visit: www.chfire.com
Field Connections

**NOTES:**
1. ALL ALARM CONTACTS ARE RATED AT 10AMPS 220VAC 1/3HP RESISTIVE LOAD ONLY.
2. THIS CONNECTION DIAGRAM IS SUITABLE FOR THE FOLLOWING DIESEL MANUFACTURERS:
   - CLARKE-ON DIESEL INC.
   - CUMMINS DIESEL ENGINES INC.
   - CATERPILLAR DIESEL ENGINES INC.
   - NATIONAL DIESEL CORPORATION
3. CONTACT FACTORY FOR FIELD CONNECTION DRAWINGS OF DIESEL ENGINES NOT LISTED ABOVE.
4. FOR TERMINALS 1–12 SEE DIESEL MANUFACTURES WIRING DIAGRAM.
5. ON CATERPILLAR ENGINES ONLY TERMINAL #12 IS USED FOR THE FUEL SOLENOID.
6. ON CATERPILLAR ENGINES TERMINAL #1 IS NOT USED EXCEPT WHEN A RAW WATER VALVE IS USED.
7. AFTER 1987 MOST ENGINES DID NOT REQUIRE THE USE OF TERMINAL #7 (ALT. CIRCUIT)

**Recommended Wire Size (AWG)**

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>Terminal No.</th>
<th>Number of Feet (Meters) From Controller to the Diesel's Terminal Block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stranded #14 (1.63 MM)</td>
<td>1–5, 9, 10, 16–38, L, N</td>
<td>N.A.</td>
</tr>
<tr>
<td>Stranded #14 (1.63 MM)</td>
<td>39–134</td>
<td>N.A.</td>
</tr>
<tr>
<td>Stranded #10 (2.50 MM)</td>
<td>GO</td>
<td>N.A.</td>
</tr>
<tr>
<td>Stranded #10 (2.50 MM)</td>
<td>6, 7, 8, 11</td>
<td>0' TO 25'(7.62)</td>
</tr>
<tr>
<td>Stranded #10 (2.50 MM)</td>
<td>6, 7, 8, 11</td>
<td>25' TO 50'(7.62–15.24)</td>
</tr>
</tbody>
</table>
Fire Pump Controllers

Features

FD100 Diesel Engine Fire Pump Controllers

October 2007

Typical Specifications

1. Approvals
   A. The Fire Pump Controller shall meet the require-
      ments of the latest edition of NFPA 20 as well as
      meeting CE mark requirements. It shall be listed
      by [Underwriters Laboratories (UL)] [Underwriters
      Laboratories of Canada (ULC)] and approved by
      [Factory Mutual Research (FM)] [Canadian Stan-
      dards Association (CSA)] [New York Department
      of Buildings (NYSB)] for fire pump service.
   B. The controller shall be [12 volt / 24 volt] negative
      ground, for use with Diesel Engine, Model manu-
      factured by _____________.

2. Ratings
   A. The Controller shall have a low altitude rating of –
      3500 to –1001 meters, a standard rating of –1000
      to +2000 meters, and a high rating of +2001 to
      +4000 meters.

3. Construction
   A. All internal components shall be front mounted
      and wired for ease of inspection and mainte-
      nance. All relays shall be of the plug-in type, in-
      dentical, and complete with visual indication to
      show that the relays are energized. The controller
      shall include an LCD display to indicate battery
      voltage and amperes as well as system pressure,
      in PSI or Bars.
   B. The controller shall have twin battery chargers
      meeting NFPA 20 requirements. The battery
      chargers shall have reverse polarity protection/indica-
      tion and be capable of recharging a com-
      pletely discharged battery within 24 hours. The
      chargers shall auto detect the input voltage of ei-
      ther 120VAC or 220VAC and shall be able to be
      programmed for either 12VDC or 24VDC output.

4. Pressure Transmitter
   A. A plug-in, 0.5-5.5volt, solid state pressure trans-
      mitter shall be installed with a bulkhead fitting in
      the enclosure bottom so that all plumbing con-
      nections are made external to the controller. The
      controller piping and pressure system shall be
      rated for operation in system pressures up to 600
      PSI (42.25 kg/cm²) within +/- 1.5% accuracy.

5. Enclosure
   A. The controller shall be housed in a NEMA Type 2
      (IEC IP11) drip-proof, powder baked finish, free-
      standing enclosure with wall mounting brackets.

6. Printer / Recorder
   A. The controller shall be equipped with a line
      printer-recorder, capable of operation between 8-
      30VDC, that will produce hard copy reports of
      system STATUS; including time, date, weekly
      test time, AC Power Failure status, print and stop
      mode status, sequential start time, RPT setting,
      system pressure setpoints, charger amperes and
      battery voltage plus pump running status reports
      and alarm data. The controller shall have the ca-
      pability of storing 1024 events for furtherance to
      the line printer-recorder.

7. Microprocessor Control
   A. The following parameters shall be programmable
      and included as standard:
      1. START and STOP PSI points
      2. STOP MODE: Manual or Auto
      3. RUN PERIOD TIMER: 0-60 min
      4. AC POWER FAILURE: Enable or Disable
      5. SEQUENTIAL START TIMER: 0-300 sec.
      6. WEEKLY TEST TIMER
      7. PRINT MODE: Manual or Auto
      8. PRINTER DEVIATION: 1-99 PSI
      9. LANGUAGE: English/French/Spanish
   B. The following visual and audible alarms shall be
      provided:
      SWITCH IN AUTO      FAIL TO START
      LOW OIL PRESSURE    ENGINE RUN
      ENGINE OVERSPEED   LOW FUEL
      HIGH ENGINE TEMP.   HIGH FUEL
      BATTERY #1 FAILURE  CHGR #1 FAILURE
      BATTERY #2 FAILURE  CHGR #2 FAILURE
      HIGH RESERVOIR     LOW RESERVOIR
      LOW ROOM TEMP.     FUEL SPILL
   C. The above shall be color coded to signify the ur-
     gency of the alarms:
      1. GREEN: Normal Running Conditions
      2. RED: Critical Alarms
      3. YELLOW: Supervisory Alarms

8. Output Relays
   A. Three (3) sets of alarm contacts (Form-C) rated
      at 10A, 220VAC/32VDC, shall be provided for
      remote indication of:
      1. MANUAL MODE
      2. ENGINE RUN
      3. OFF MODE
      4. PUMP ROOM TROUBLE
      5. ENGINE TROUBLE
   B. Two (2) ‘FUTURE’ relays, each containing three
      sets of alarm contacts (Form-C) shall (each) be
      factory set to indicate one of the following, as per
      customer requirements:
      1. AUTO MODE
      2. FAIL TO START
      3. TEST MODE
      4. ENGINE OVERSPEED
      5. PRESSURE START
      6. LOW OIL PRESSURE
      7. HIGH ENGINE TEMP.
      8. AC POWER FAILURE

9. Manufacturer
   A. The controller shall be microprocessor based as
      manufactured by Eaton’s Cutler-Hammer busi-
      ness unit.

For more information visit: www.chfire.com

PS05805003K/E