

September 2007

**FD100 Diesel Engine Controllers**



**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.

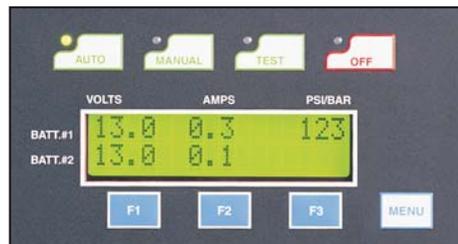
**Printer / Recorder**

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".



**Last 1024 Messages**

The internal microprocessor stores the most recent 1024 messages in its memory. The messages can be printed, viewed on the LCD screen or downloaded to a computer. Each message is time and date stamped. The LCD display acts as a paperless chart recorder.



**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.

**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).

**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 its' 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.



## FD100 Diesel Engine Controllers

### 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.

### 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.

#### 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.

#### 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.

### Alarm LED's

Auto Mode  
Fail to Start  
Low Oil Pressure  
Engine Overspeed  
Engine Run  
Battery Failure  
Charger Failure  
Low Fuel Level  
High Fuel Level  
Fuel Spill  
High Engine Temperature  
Low Pump Room Temperature  
High Reservoir Level  
Low Reservoir Level

#### Charger Fail Output

A single Form C relay output will activate if the charger fails for any reason.

#### 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 Alarm Latching. Options currently supported for the charger include 12 or 24 Volt Lead Acid and NiCad Batteries.

#### Installation / Mounting

Two chargers are direct mounted to the back pan. A separate bracket, which accommodates a single charger board, can be used for retro-fitting previous models.

#### LCD Display

A single line by 16 character LCD display will alternately show:  
Charging Amps; Voltage; Alarms

#### Specifications

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



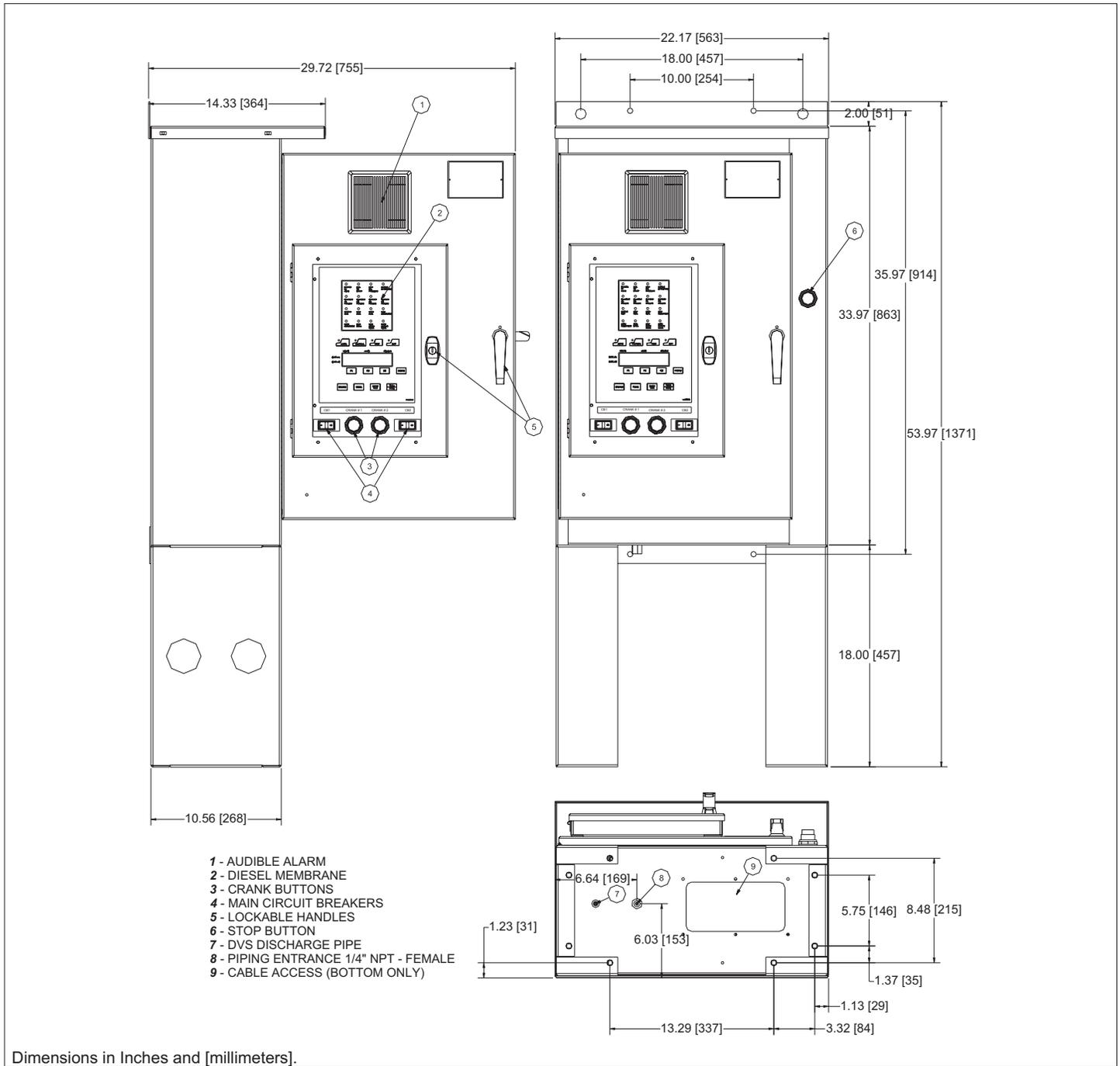
For CE Approved Dimensional drawing - see Page 1-5.

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**FD100 Diesel Engine Controllers**

**Dimensions**

**Standard Enclosure - Type NEMA 2, 12**



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

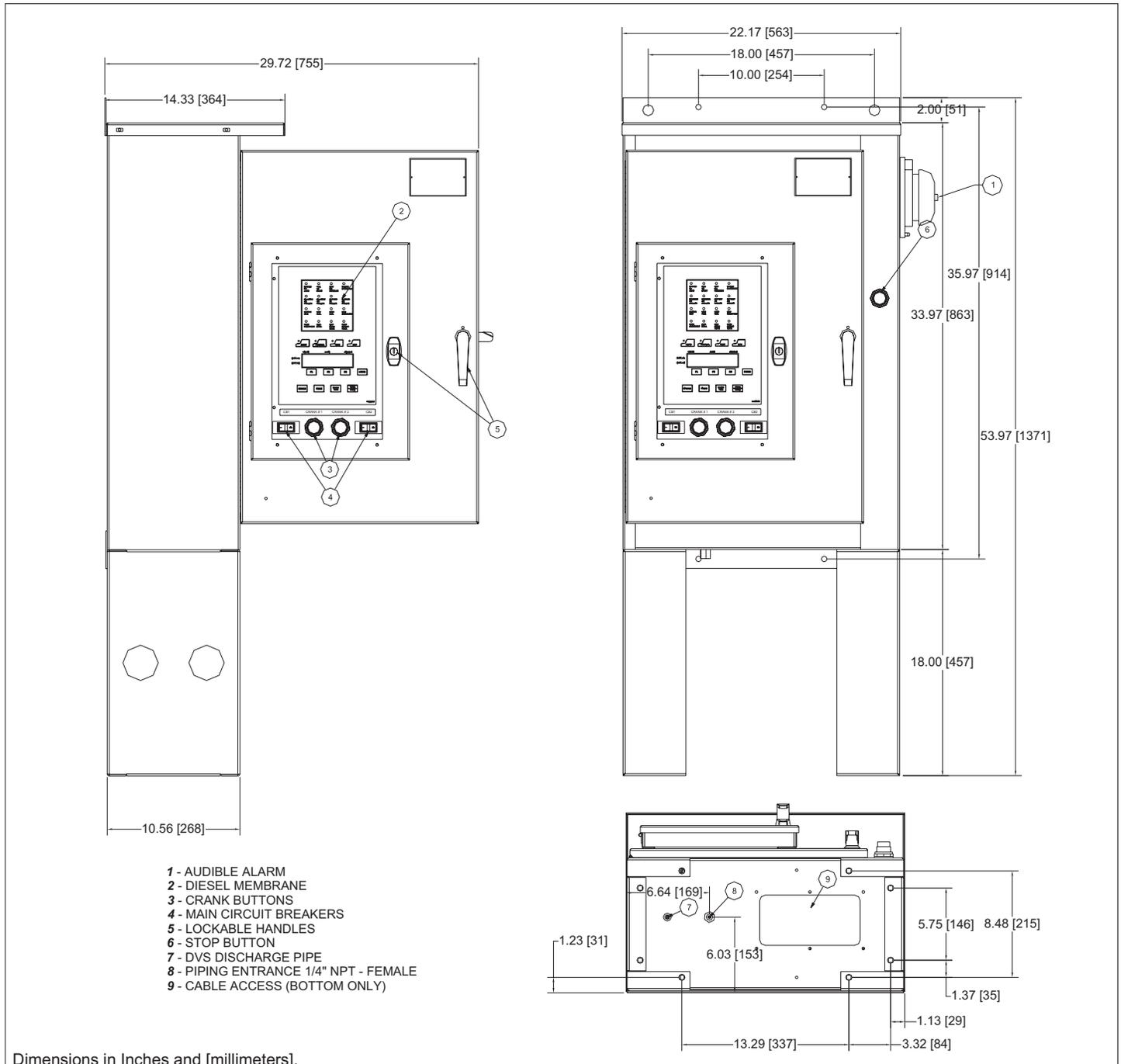


- NOTES:  
 1. All enclosures finished in FirePump red.  
 2. Cable Entrance bottom only.  
 3. Standard Enclosure type NEMA 2, 12  
 4. Enclosure made from #14 Gauge (0.75) HR Steel.

**FD100 Diesel Engine Controllers**

**Dimensions**

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



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

- 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.

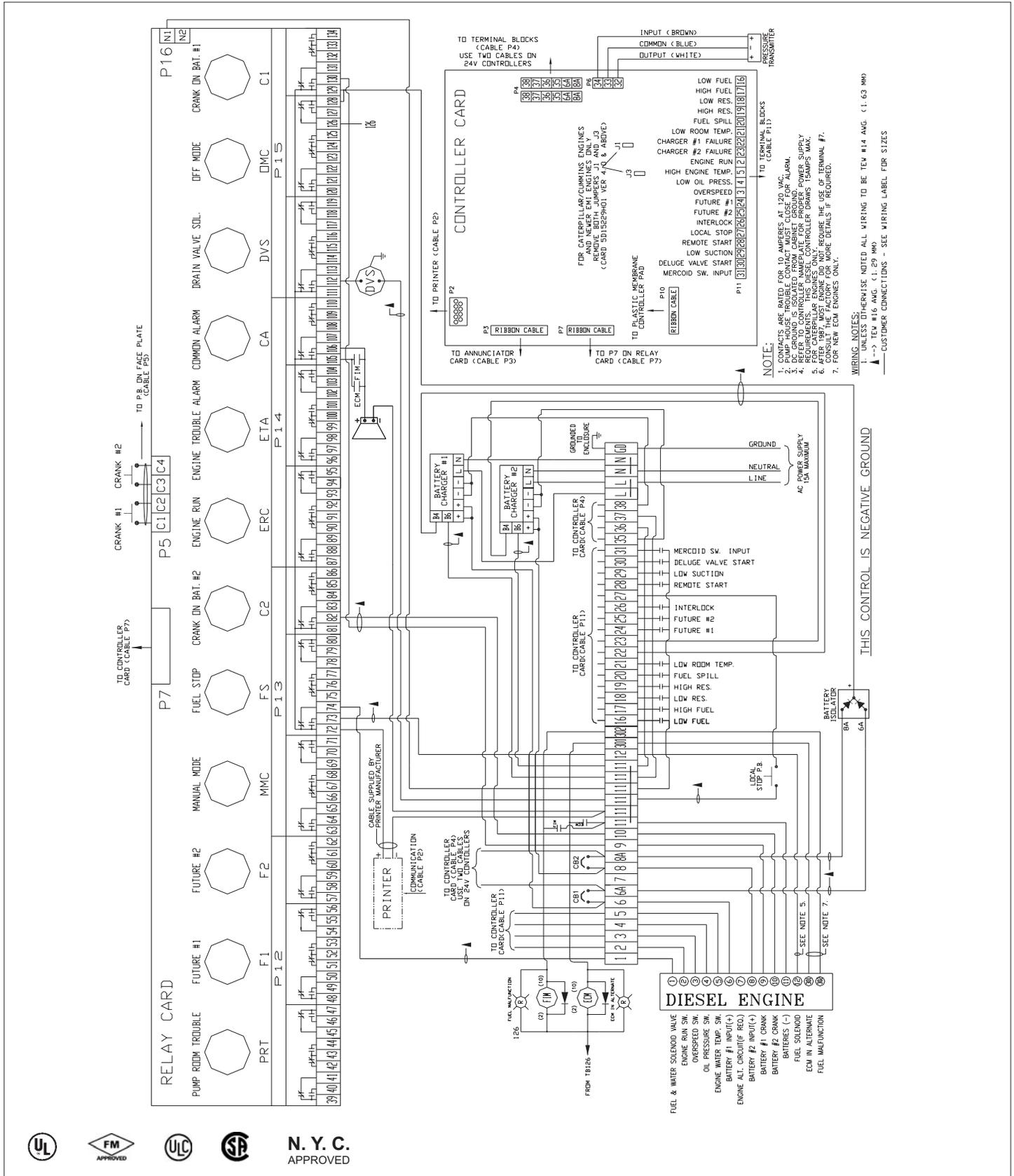




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FD100 Diesel Engine Controllers

Electrical Wiring Schematic
FD100 - Electronic Starting Engines



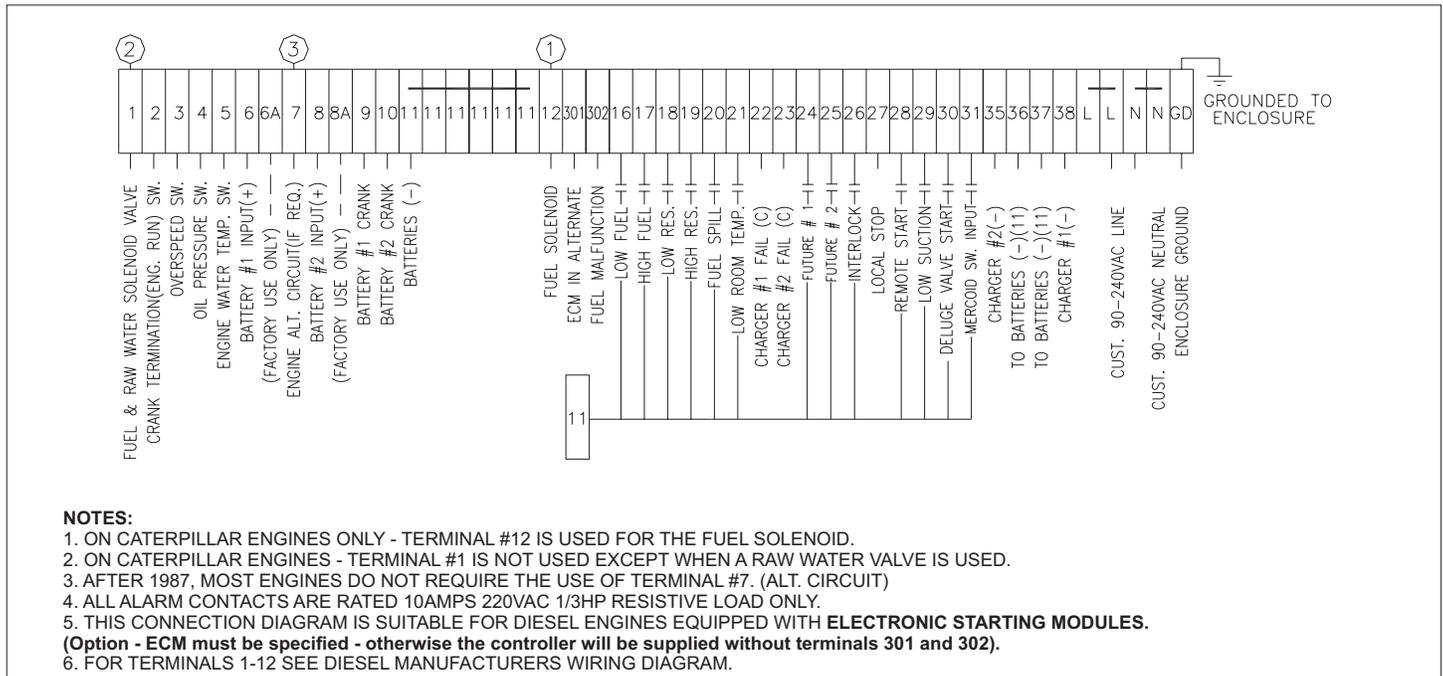
- NOTE:
1. CONTACTS ARE RATED FOR 10 AMPERES AT 120 VAC.
2. COMMON IS ISOLATED FROM CABINET GROUND.
3. DC GROUND IS ISOLATED FROM CABINET GROUND.
4. REFER TO CONTROLLER MANUFACTURER FOR POWER SUPPLY REQUIREMENTS.
5. FOR CATERPILLAR ENGINES ONLY - REQUIRE THE USE OF TERMINAL #7.
6. CONSULT THE FACTORY FOR MORE DETAILS IF REQUIRED.
7. FOR NEW ECM ENGINES ONLY.
WIRING NOTES:
UNLESS OTHERWISE NOTED ALL WIRING TO BE TEW #14 AWG (1.63 MM)
--> TEW #16 AWG (1.29 MM)
-- CUSTOMER CONNECTIONS - SEE WIRING LABEL FOR SIZES

UL FM APPROVED ULC CSA N. Y. C. APPROVED

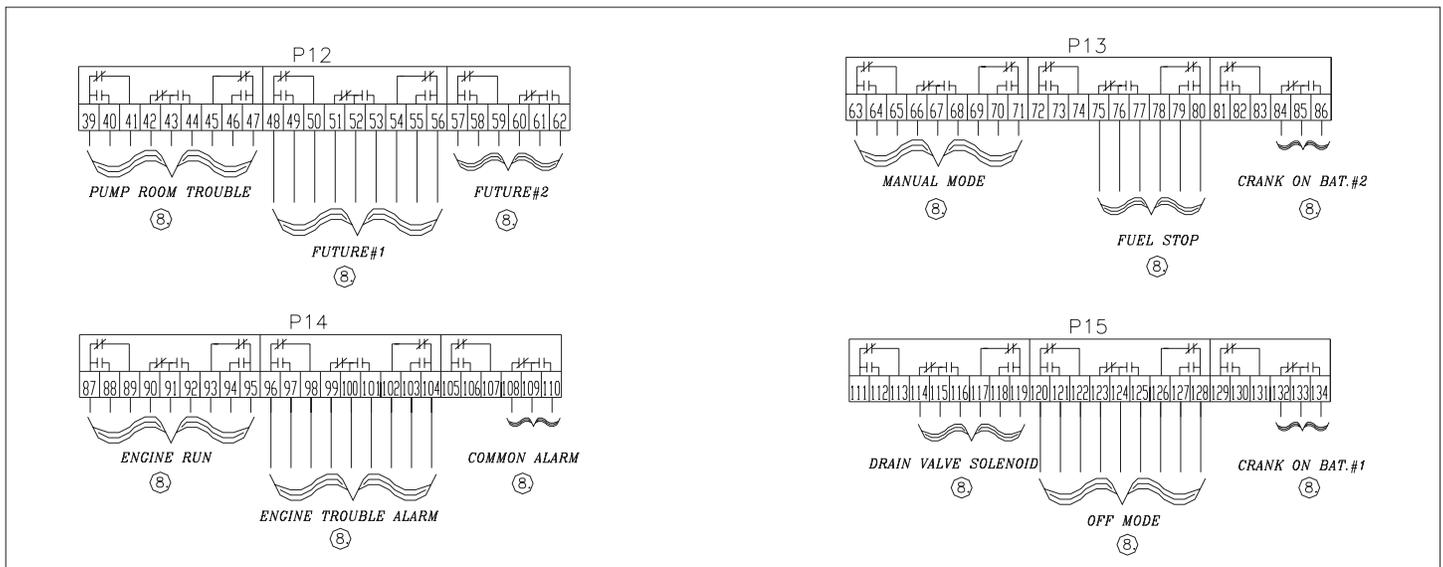
**FD100 Diesel Engine Controllers**

**Field Connections**

**Main Terminal Block**



**Relay Card Terminal Blocks**



**Technical Data and Specifications**

**Line Terminals (Incoming Cables)**

Recommended Wire Size	Terminal Number	Distance
Stranded # 14 (1.63 mm)	1-5, 9, 10, 16-38, L, N	N. A.
Stranded # 14 (1.63 mm)	39 - 134	N. A.
Stranded # 10 (2.59 mm)	Ground	N. A.
Stranded # 10 (2.59 mm)	6, 7, 8, 11	0 feet to 25 feet (7.62m)
Stranded # 8 (3.26 mm)	6, 7, 8, 11	25 feet to 50 feet (7.62 - 15.24m)

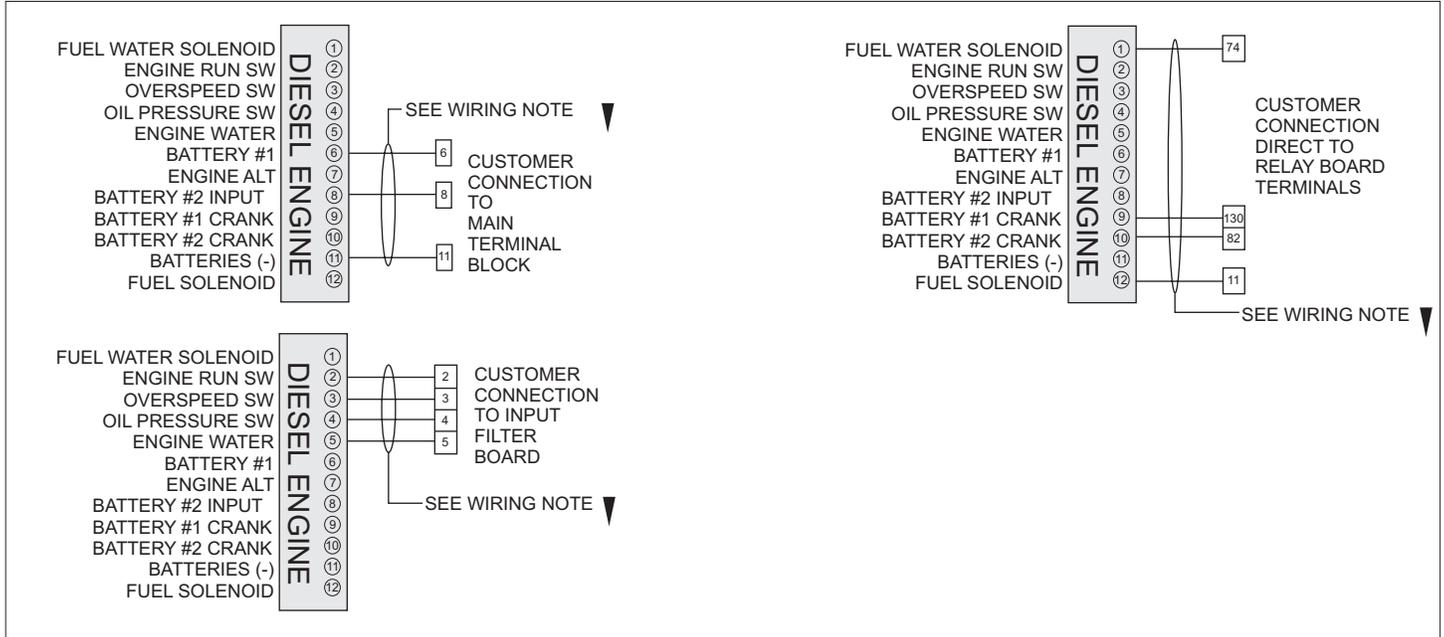
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**FD100 Diesel Engine Controllers**

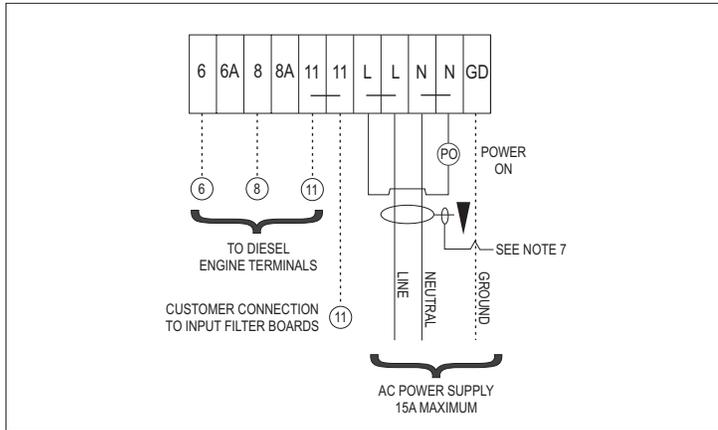
**Field Connections**

**FD110 Diesel Engine Controller Catalog Numbering System**

**DIESEL ENGINE TERMINAL BLOCK**



**MAIN TERMINAL BLOCK**



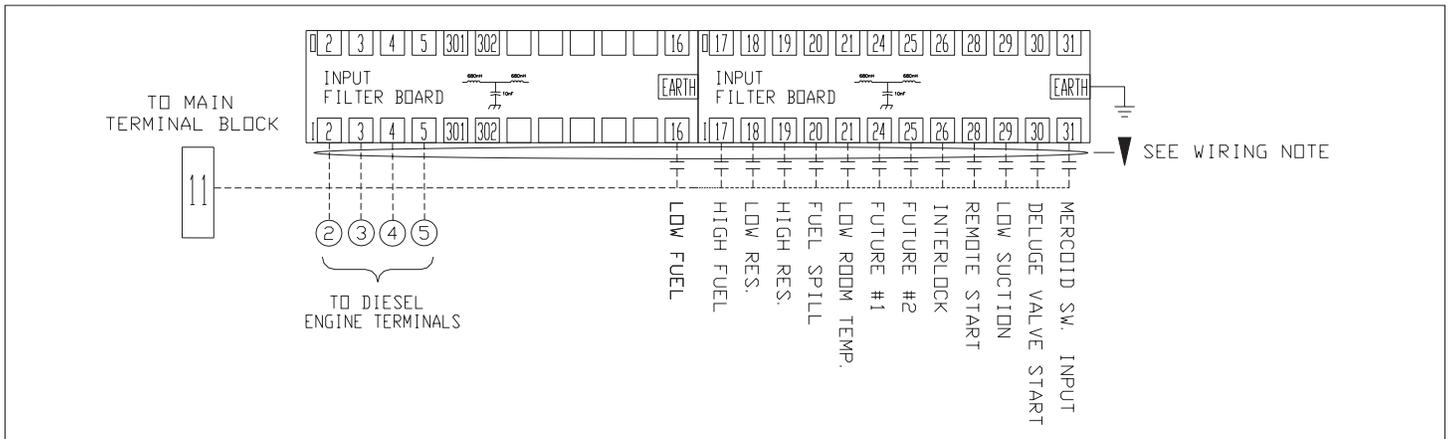
**NOTE:**

1. CONTACTS ARE RATED FOR 10 AMPERES AT 120 VAC.
2. PUMP HOUSE TROUBLE CONTACT MUST CLOSE FOR ALARM.
3. DC GROUND IS ISOLATED FROM CABINET GROUND.
4. REFER TO CONTROLLER NAMEPLATE FOR PROPER POWER SUPPLY REQUIREMENTS. THIS DIESEL CONTROLLER DRAWS 15AMPS MAX.
5. FOR CATERPILLAR ENGINES ONLY.
6. AFTER 1987, MOST ENGINE DID NOT REQUIRE THE USE OF TERMINAL #7. CONSULT THE FACTORY FOR MORE DETAILS IF REQUIRED.
7. RUN L & N TWO TURNS THROUGH FERRITE FILTER BLOCK.

**WIRING NOTES:**

1. UNLESS OTHERWISE NOTED ALL WIRING TO BE TEW #14 AWG. (1.63 MM)
- ▲ --> TEW #16 AWG. (1.29 MM)
- ▼ --> CUSTOMER TO INSTALL FERRITES (K1 -NF-130-A(N)BK2) AT POINT OF CABLE ENTRY
- CUSTOMER CONNECTIONS - SEE WIRING LABEL FOR SIZES

**INPUT FILTER BOARD**



**FD100 Diesel Engine Controllers**

**Catalog Number Selection**

**FD100 Diesel Engine Controller Catalog Numbering System**

