

# **MASTER**

## **DIESEL FIRE PUMP CONTROLLER**

**Model - DEC**

**Innovation – G4**



**Instructional Startup Video**

## **INSTRUCTION MANUAL**

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**IMPORTANT SAFETY INFORMATION**



**WARNING - DANGER OF LETHAL ELECTRICAL SHOCK AND ARC FLASH HAZARD - USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE) IN ACCORDANCE WITH NFPA 70E.**

**WARNING - BATTERY EXPLOSION HAZARD. DISCONNECT AC POWER AND ALL LOADS BEFORE CONNECTING OR DISCONNECTING BATTERY LEADS AT OR NEAR THE BATTERY.**

**WARNING - THIS EQUIPMENT MUST ONLY BE SERVICED BY QUALIFIED ELECTRICAL PERSONNEL.**

**GENERAL DESCRIPTION AND APPLICATION**

MASTER Diesel Engine Fire Pump Controllers meet all of the requirements of NFPA-20, *Standard for the Installation of Stationary Fire Pumps for Fire Protection*. They are designed to automatically start a diesel driven fire pump in the event of a fire.

DEC Series controllers enhance the standard G4 innovation with the following:

- NEMA type 12, dusttight enclosure
- 5.7 inch color display
- Ethernet with Modbus TCP protocol
- Programmable Option Chassis included as standard equipment
- Conformal coating on all printed circuit boards
- Lightning guarantee
- 5 year warranty

**MODEL NUMBER CONSTRUCTION**

<u>Model</u>	-	<u>Voltage and Ground</u>	-	<u>AC Input</u>	-	<u>Modifications</u>
DEC		12N, 24N 12P, 24P		115, 230		XG4 (See table below)

G4 Innovation – Modification Code Table

- FC - Foam Controller
- 3R - NEMA type 3R, rain tight enclosure
- 4 - NEMA type 4, water tight enclosure
- 4XB - NEMA type 4X, 304 stainless steel water tight enclosure
- 4XC - NEMA type 4X, 316 stainless steel water tight enclosure
- 8E - CE declaration for European Community
- 15 - 300 PSI, 316 SS pressure transducer, test valve, and wet parts
- 15A - 300 PSI, 300 series SS pressure transducer, test valve, and wet parts
- 16A - 500 PSI, pressure transducer, test valve, and wet parts
- 19 - Space heater
- 20 - Space heater with thermostat
- 20A - Space heater with humidistat
- 48E - Email Notification through Ethernet
- 48J - External remote alarm connection box
- 32 - Low pump room temperature switch
- 83LT - Low suction transducer and wet parts externally mounted

G4 Standard Functions

- Pressure Start
- Remote Start
- Deluge Start
- Manual, Non-automatic Operation (Remote, Deluge, or Manual Start only)
- Sequence Delay
- High Zone Delay

- Minimum Run Timer
- Auto Weekly or Monthly Testing
- Pressure Drop Start button
- Audible Alarm with silence.
- Transducer Testing
- Remote Alarm Contact Testing
- Low Discharge Pressure alarm
- Overpressure alarm
- Pump Demand/On Demand contacts
- Conversion between PSI and BAR
- Motor run audible alarm
- Lockout (when authorized by AHJ)

## **STANDARD PRODUCT SPECIFICATIONS**

Fire Protection Approvals – UL listed to ANSI/UL 218, FM approved to standard 1321/1323.

Fire Protection Standards – Complies with NFPA 20, IEC62091.

Voltage Rating – Controllers are designed for or it's rated voltage, -15% and +10%.

Voltmeter and Ammeter Display Accuracy – The display accuracy is designed for +/- 2% of rated voltage and current.

### Automatic Dual Rate, Mode Switching, Battery Charger

Voltage settings:

Lead Acid Batteries	
High Voltage alarm	2.60 v/cel
Equalize	2.34 v/cell
Float	2.20 v/cell
Low Voltage Alarm	2.13 v/cell

Voltage Regulation – 0.2%

Temperature Stability – 0.08%/C

Low Voltage Shutdown – 4.0 volts

Battery Failure – The battery failure alarm is set to 67% of the nominal system voltage

Remote Contacts – On the CU, control unit, the voltage free contacts are rated for 2 amps (resistive) at 30 vdc, or 1 amp (resistive) at 125 vac.

Remote Contacts – On the POC, Programmable Option Chassis, the voltage free contacts are rated for 6 amps (resistive) at 30 vdc, 6 amps (resistive) at 250 vac. They also carry UL pilot duty ratings R300 and B300.

Pressure Rating – Standard controllers are rated for 300 PSI (20.7 BAR). Higher ratings are available. The display accuracy is designed for +/- 2% of rated pressure. Note: If the system pressure exceeds the rated pressure by 4%, a XDCR/DVS Fault will occur and start the engine.

Plumbing – Standard controllers are provided with brass fittings. Other materials are available.

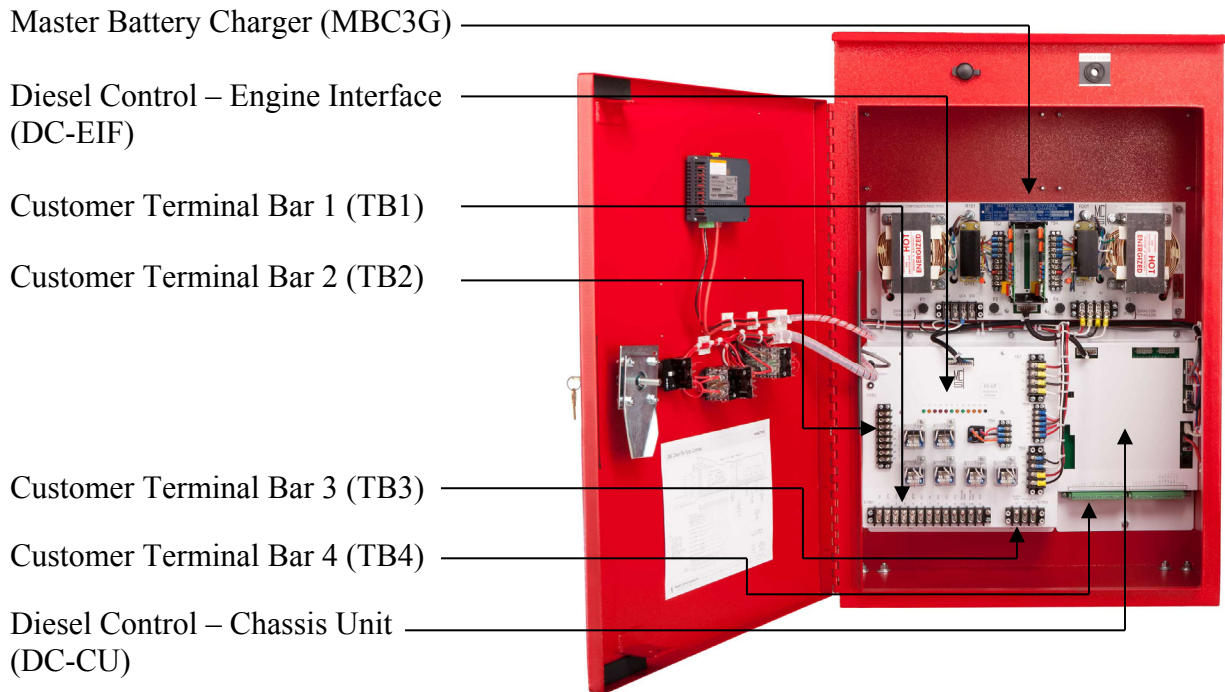
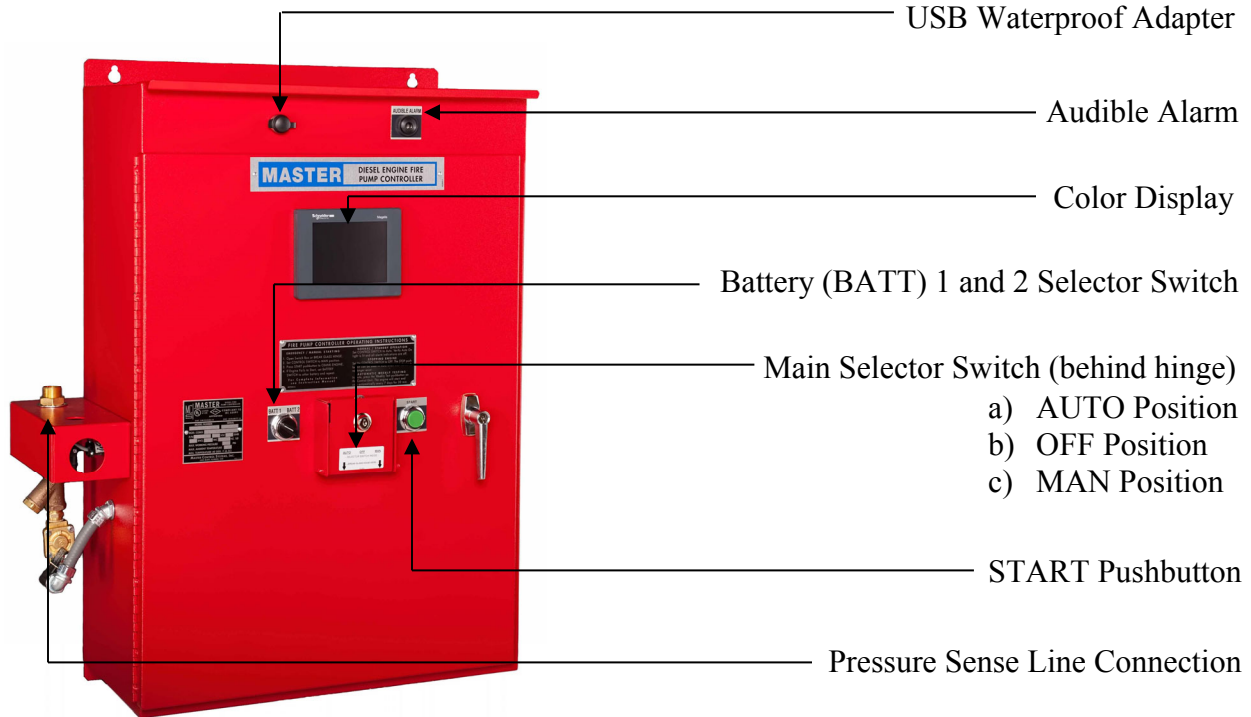
Enclosure – Standard controllers are rated for NEMA type 12 or IP-54. Other enclosures are available.

Ambient Temperature – Rated for operation in a 50C ambient provided the input and output cable has a temperature rating of 105C. For a 40C ambient, the temperature rating of the cable can be reduced to 90C. No direct sunlight is allowed on the enclosure.

Electromagnetic Compatibility – Tested to comply with EN 61000-6-2 for immunity and EN 61000-6-4 for emissions.

**ANNOTATED CONTROLLER ILLUSTRATION**

DEC - G4 Series Controller



## ATTACHING MAIN SELECTOR SWITCH HINGE

### INSTALLING THE HINGE -

1. Slide the glass rod into the hinge by pushing the ends of the rod together until it fits cleanly, as shown below in Picture A. The hinge should now be ready to be installed (Picture B).

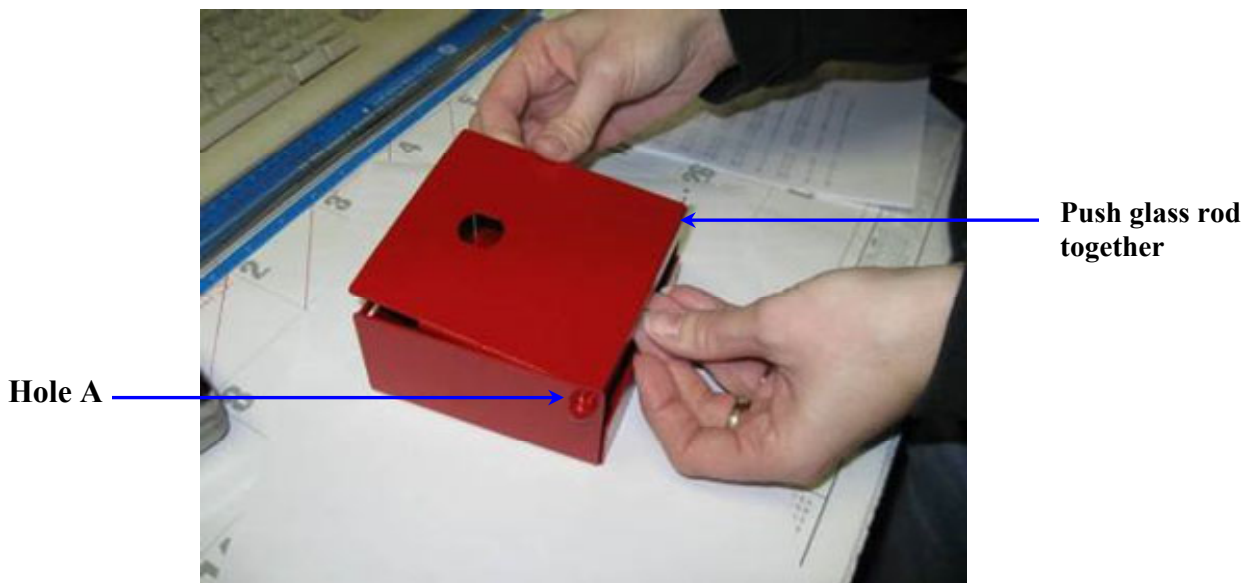


Picture A



Picture B

2. Turn the hinge over and place one end into Hole A first, then push the other end of the rod together allowing the glass rod to contract and fit cleanly in both holes.



Picture C



## **INSTALLATION**

The fire pump controller and all of its wiring and plumbing should be installed in accordance with the requirements given below and the external wiring diagram(s) near the end of this manual. It should also be installed in accordance with the requirements of NFPA-20, *Standard for the Installation of Stationary Fire Pumps for Fire Protection*, and the requirements of NFPA-70, article 695, the *National Electric Code*, as well as any local requirements.

**LOCATION** - Controllers should be located as close as practical to the engines they control. Preferably, this is within 25 feet. It should also be located within sight of the engine and in an area free from dripping and spraying water.

**RATINGS** - Check that the battery voltage and grounding agree with the controller nameplate voltages and grounding before beginning installation.

**MOUNTING** - Controllers should be securely mounted and bolted to noncombustible surface or structure. These controllers are designed for wall mounting or for floor mounting when additional mounting legs or a based cabinet is used. When installed on a common base with the pump and engine, use adequate bracing and suitable vibration dampers to keep vibration to a minimum.

**CONDUIT ENTRANCE** - Conduit entrance can be made either through the top or bottom of the enclosure.

**CAUTION** - **FOREIGN METALLIC DEBRIS, SUCH AS DRILLING CHIPS, CAN CAUSE A DANGEROUS AND/OR DAMAGING ELECTRICAL FAULT WHEN THE EQUIPMENT IS ENERGIZED. BE SURE TO PROTECT ALL ELECTRICAL PARTS FROM METALLIC DEBRIS DURING INSTALLATION.**

Use appropriate conduit hub that matches the "Enclosure Type" as shown on the controller nameplate. When controllers suitable for outside installation are used, be sure the appropriate weatherproof conduit hub is used and provide a sun roof to prevent direct sunlight on the controller.

NOTE: If entering from the top, waterproof hubs are required for all installations to match the minimum "Enclosure Type".

## CONNECTIONS

**CAUTION - BEFORE MAKING FINAL CONNECTIONS TO THE BATTERIES AND BEFORE ENERGIZING THE AC POWER CIRCUIT, BE SURE THE MAIN SELECTOR SWITCH IS SET TO THE OFF POSITION.**

PIPING CONNECTIONS - A 1/2 inch nominal pressure sense line, typically made of brass, rigid copper or 300 series stainless steel, shall be connected to the incoming bulkhead connector located on the controller. The pressure sense line shall have two 3/32" orifices installed between the fire protection system and the bulkhead fitting. Secure this sense line as needed to prevent vibration or damage. For further installation details, consult NFPA-20 or refer to the Piping Diagram drawing located in the drawing section of this manual.

WIRING TO THE ENGINE (see the following tables)

Wire terminals 1 through 12 on TB1 of the DC-EIF chassis to the corresponding numbers on the engine terminal bar in the engine junction box. Always use flexible stranded copper wire that is not affected by water, oil, or engine heat. Terminal 7 should only be connected with engines that only use a 20 amp alternator and rely on the controller to provide Control Battery to the engine circuits.

### AC INPUT CONNECTIONS

Wire terminals 15, 16 and 17 on TB3 of the DC-EIF chassis to the AC power branch circuit at the controller nameplate voltage and frequency. Chassis grounding is terminated on terminal 15. Do not exceed ampere limits shown on the External Wiring Diagram.

REMOTE ALARM CONNECTIONS - See the contact rating limitations on the wiring diagram.

1. Pump Running Signal - Terminals numbered 23, 24, and 25 on TB2 of the DC-EIF chassis provide a form "C" set of contacts which transfer when the engine is running. Contacts on terminals 23 and 24 close in the alarm state, while contacts on terminals 24 and 25 open in the alarm state.
2. Pump Running Signal (second set) - Terminals numbered 26, 27, and 28 on TB2 of the DC-EIF chassis provide a form "C" set of contacts which transfer when the engine is running. Contacts on terminals 23 and 24 close in the alarm state, while contacts on terminals 24 and 25 open in the alarm state.
3. Pump Running Signal (third set) - Terminals numbered 35, 36, and 37 on TB4A of the DC-CU chassis provide a form "C" set of contacts which transfer when the engine is running. Contacts on terminals 35 and 36 close in the alarm state, while contacts on terminals 36 and 37 open in the alarm state.
4. System Trouble Signal - Terminals numbered 38, 39, and 40 on TB4A of the DC-CU chassis provide a form "C" set of contacts which transfer when a System Trouble occurs.

Contacts on terminals 38 and 39 close in the alarm state, while contacts on terminals 39 and 40 open in the alarm state.

5. Auto Off Signal - Terminals numbered 41, 42, and 43 on TB4A of the DC-CU chassis provide a form "C" set of contacts which transfer when the control Switch is Off . Contacts on terminals 41 and 42 close in the alarm state, while contacts on terminals 42 and 43 open in the alarm state.
6. Pump House Trouble signal - Terminals numbered 44, 45, and 46 on TB4A of the DC-CU chassis provide a form "C" set of contacts which transfer when the a Pump House Trouble alarm occurs. Contacts on terminals 44 and 45 close in the alarm state, while contacts on terminals 45 and 46 open in the alarm state.

Programmable Option Chassis (included as standard equipment) – 8 input signals and 8 output relays. Output relays (Aux Relay #1 through #8) provide form C contacts. They can be programmed for any of the following functions:

- Auto Off
- Battery 1 Failure
- Battery 2 Failure
- Charger Failure
- Failure to Start
- High Water
- Interstitial Space Liquid Intrusion
- Lockout
- Low Discharge Pressure
- Low Fuel Level
- Low Oil
- Low Suction Pressure
- Low Zone Start or On Demand
- Overspeed
- Overpressure
- PHT1 – PHT7 – Pump House Trouble inputs
- Pump Running
- SC1 or SC 2 Failure
- Transducer Failure
- 301 – Electronic Control Module Switch (ECMS)
- 302 – Fuel Injection Malfunction (FIM)
- 303 – Electronic Control Module Warning (ECMW)
- 304 – Electronic Control Module Failure (ECMF)
- 310 – High Raw Water Temperature (HRT)
- 311 – Low Raw Water Flow (LRF)
- 312 – Low Engine Temperature (LET)

#### REMOTE INPUTS

1. Deluge Valve Start – Wire a normally closed remote contact between terminals 31 and 32 on TB4A of the Control Unit. Contacts open to start. See Circuit Wiring Table below.

2. Remote Start – Wire a normally closed remote contact between terminals 31 and 33 on TB4A of the Control Unit. Contacts open to start. See Circuit Wiring Table below.
3. Lockout – Wire a normally open remote contact between terminals 31 and 34 on TB4A of the Control Unit. Contacts open to start. See Circuit Wiring Table below.

Remote/Deluge Start or Lockout Circuit Wiring Table

<u>Wire Size</u>	<u>Wire Resistance Ohm/1,000 Ft.</u>	<u>12 vdc (50 Ohms)</u>	<u>24 vdc (250 Ohm)</u>
#12 AWG	1.588	15,700 Ft.	78,500 Ft.
#14	2.525	9,900	49,000
#16	4.016	6,200	31,000
#18	6.385	3,900	19,500
#20	10.15	2,500	12,500
#22	16.14	1,500	7,500
#24	25.67	940	4,700
#26	40.18	620	3,100

NOTE: Resistance and number of splices and contacts in circuit must be taken into consideration. A single splice may exceed the total resistance of 1,000 Ft. or more of wire.

4. Pump House Trouble – Wire a normally open remote contact for each trouble signal to the following terminals on TB4B of the DC-CU chassis:
  - Terminal 47 to 63 for Pump House Trouble 1
  - Terminal 48 to 63 for Pump House Trouble 2
  - Terminal 49 to 63 for Pump House Trouble 3
  - Terminal 50 to 63 for Pump House Trouble 4
  - Terminal 51 to 63 for Pump House Trouble 5
  - Terminal 52 to 63 for Pump House Trouble 6
  - Terminal 53 to 63 for Pump House Trouble 7

Contacts close to alarm. Typically, these alarms are: Pump Room Temp Low, Reservoir Level Low, Reservoir Empty, Fuel Spill, Leak Detection, Relief Valve Open, or Flow Meter Open,

NOTE: The Pump House Trouble alarm names can be customized in the field. See the Advance Setup section of this manual.

5. Interstitial Space Liquid Intrusion – Wire a normally open remote contact for Interstitial Space Liquid Intrusion between terminals 54 and 64 on TB4B of the DC-CU chassis.
6. Low Fuel Level – Wire a normally open remote contact for Low Fuel Level between terminals 55 and 64 on TB4B of the DC-CU chassis.
7. Electronic Engine Alarms – Wire the normally open remote contact from the electronic engine to the following terminals on TB4B of the DC-CU chassis:
  - Terminal 301 to 64 for Electronic Control Module Switch (ECMS)
  - Terminal 302 to 64 for Fuel Injection Malfunction (FIM)
  - Terminal 303 to 64 for Electronic Control Module Warning (ECMW)
  - Terminal 304 to 64 for Electronic Control Module Failure (ECMF)
  - Terminal 310 to 64 for High Raw Water Temperature (HRT)
  - Terminal 311 to 64 for Low Raw Water Flow (LRF)
  - Terminal 312 to 64 for Low Engine Temperature (LET)

**Main Engine to Controller Wiring Table**

**WARNING - BATTERY EXPLOSION HAZARD. DISCONNECT AC POWER AND ALL LOADS BEFORE CONNECTING OR DISCONNECTING BATTERY LEADS AT OR NEAR THE BATTERY.**

DC-EIF Terminal	Minimum Wire Size – AWG (mm <sup>2</sup> )		Max Amps	Function
	25' Max. Run	50' Max Run		
TB1-1	#14 (2.1)	#14 (2.1)	10A	Fuel / Water
TB1-2	#16 (1.3)	#16 (1.3)	1A	Crank Terminate
TB1-3	#16 (1.3)	#16 (1.3)	1A	OVS
TB1-4	#16 (1.3)	#16 (1.3)	1A	LOP
TB1-5	#16 (1.3)	#16 (1.3)	1A	HWT
TB1-6 (for 10 amp charger)	#12 (3.3)	1 #10 or 2 #12 (1x 5.3 or 2x 3.3)	20A	BAT1
TB1-7 (if used)	#12 (3.3)	#12 (3.3)	20A	CB
TB1-8 (for 10 amp charger)	#12 (3.3)	1 #10 or 2 #12 (1 x 5.3 or 2x 3.3)	20A	BAT2
TB1-9	#14 (2.1)	#14 (2.1)	10A	CRK1
TB1-10	#14 (2.1)	#14 (2.1)	10A	CRK2
TB1-11A	#10 or 2 #12 (1x 5.3 or 2x 3.3)	1 #8 or 2 #10 (1x 8.4 or 2x 5.3)	20A	Ground
TB1-11B (if used)	#10 or 2 #12 (1x 5.3 or 2x 3.3)	1 #8 or 2 #10 (1x 8.4 or 2x 5.3)	20A	Ground
TB1-12 (if used)	#14 (2.1)	#14 (2.1)	10A	SDS

**A.C. Wiring Connections**

DC-EIF Terminal	Minimum Wire Size – AWG (mm <sup>2</sup> )		Max Amps	Function
	25' Max Run	50' Max Run		
TB3-15	#14 (2.1)	#14 (2.1)	n/a	Cabinet Ground
TB3-16	#14 (2.1)	#14 (2.1)	12A	A.C. Line
TB3-17	#14 (2.1)	#14 (2.1)	12A	A.C. Neutral (Note 1)

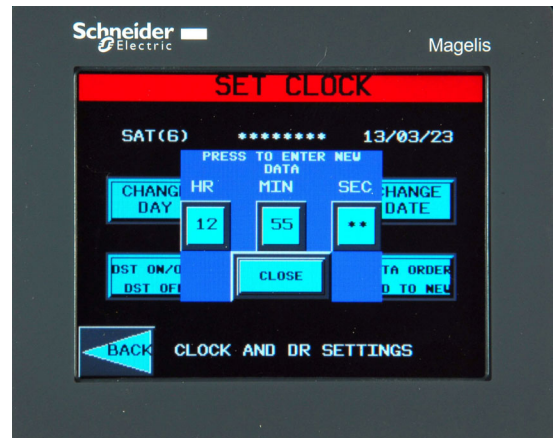
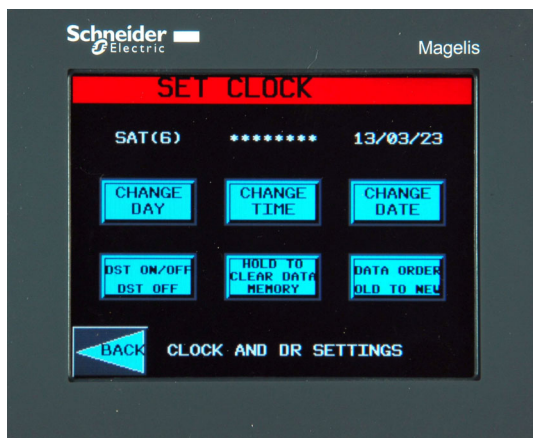
NOTE 1: This connection is also Line (hot) for 230/240 Vac @ 60 Hz.

## INITIAL POWER UP

When turning on your controller for the first time, your G4 touch screen will automatically turn on. You will immediately be prompted to set the current date and time as follows:

1. Press CHANGE DAY to correspond with today’s date, with 1 representing Monday.
2. Press CHANGE TIME to access options to set the hour, minute and second. From here, change the hour to match a 24-hour clock, and the minute and second accordingly.
3. Press CLOSE when you are satisfied with the time.

NOTE: In some cases, a password is required to begin. If the Login screen appears, the Service Level password is required to continue. Contact the factory for further information.



After the time and date are set, press BACK to proceed to page 1 of the SETUP ASSISTANT.



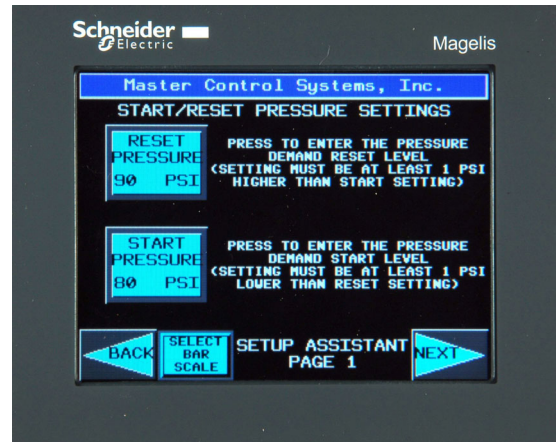
### SETUP ASSISTANT

The Setup Assistance helps you to setup all the basic settings on the controller. It allows you to set the Start/Reset pressures, set the display for PSI or BAR, enable Deluge/Remote Start, enable the Minimum Run Timer, set the Sequence starting delay, set the accelerate time, and enable the Auto Test Timer.

Note: After the Initial Power Up, you will need to Login to access the Setup Assistant. See Logging In for further information.

Note: All settings are automatically updated once entered.

Page 1 allows you to setup the Start Pressure. Simply press the START PRESSURE button and enter the value desired. The Reset pressure will automatically set itself to 10 PSI (0.69 BAR).

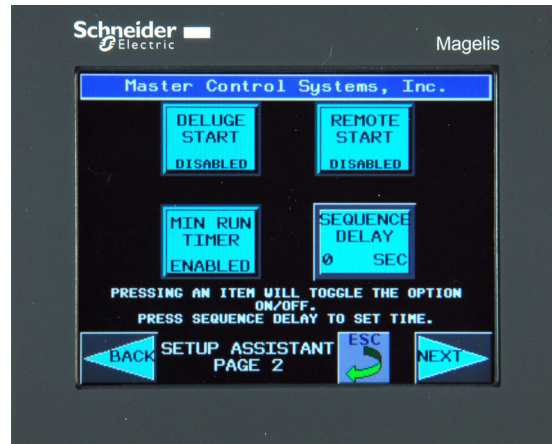


If you need to adjust your Reset Pressure Setting separately, simply push the RESET PRESSURE button, and set it accordingly.

Note: On initial power up, both the Start and Reset pressure settings will be zero. This prevents the controller from start on low pressure until the Start and Reset pressures are set.

Press NEXT to continue to page 2 of the SETUP ASSISTANT, where you will find all your options and settings, including DELUGE START, REMOTE START, MIN RUN TIMER, and SEQUENCE DELAY.





### Deluge Start

The Deluge Start function will allow a maintained contact from a Deluge Valve to call for a start, if enabled. To use this function, you must wire a normally closed contact to the controller that opens when the Deluge Valve trips. It follows all the function of a pressure start and delays according to the sequence time delay.

To enable the Deluge Start from the screen, simply toggle the DELUGE START button to enable or disable as dictated by your needs.

### Remote Start

The Remote Start function will allow a remote manual pushbutton to call for a start, if enabled. To use this function, you must wire a normally closed contact to the controller that opens when the Remote Start button is pressed. It immediately causes a start and *bypasses* sequence time delay.

To enable the Remote Start from the screen, simply toggle the REMOTE START button to enable or disable as dictated by your needs.

### Minimum Run

When enabled, the Minimum Run option will run the motor for at least 1800 seconds. If there is no demand after that time, the pump will shut off immediately – however if there is demand, the pump will continue running until the demand is reset. Typically, this occurs when the pressure recovers to a point above the Reset Pressure setting.

To enable the Minimum Run Timer, toggle the MIN RUN TIMER button to enable or disable as dictated by your needs.

### Sequence Start

This function is used to start multiple pumps in sequence. For example, if you have 3 pumps, and you want a 5 second delay between each one starting, you would set the controllers as follows:

- Controller 1: 0 seconds
- Controller 2: 5 seconds
- Controller 3: 10 seconds

To enable the sequence start time delay, press the SEQUENCE DELAY button and input the amount of time you desire the pump to be delayed. Press ENTER and your entry will automatically be updated.

Press NEXT to continue to page 3 of the Setup Assistant, where you may set the weekly or monthly test time. In addition you can enable or disable the Remote Comm (HMI v3.??? or higher).

### How to Set the Weekly or Monthly Test



To enable, press the AUTO TEST ENABLE button. Then select either the monthly or weekly test, and enter the time you would like the test to automatically occur.

To set the WEEKLY TEST, enter the following:

1. The day, 1-7 with 1 representing Monday
2. The hour, in accordance with a 24 hour clock.
3. The minute, 0-59

For example, if you would like to set the weekly test to **Tuesday at 9:00 am**, you would enter the following:

**Day: 2      Hour: 9      Minute: 00**

To set the MONTHLY TEST you must enter the following:

1. A week 1-4, with 1 representing the first week of the month
2. A day, 1-7 with 1 representing Monday
3. The hour, in accordance with a 24 hour clock.
4. The minute 0-59.

Alternatively, if you would like to set the monthly test to the **2<sup>nd</sup> Tuesday of each month at 9:00 am**, you would enter the following:

**Week: 2      Day: 2      Hour: 9      Minute: 00**

NOTE: All adjustments are automatically updated as soon as they are entered.

### **Remote Communications**

This feature is disabled when shipped. Contact Master Control Systems to enable this feature.

To enable Remote Ethernet TCP/IP access, press the ENABLE REMOTE COMM button. This will enable the Ethernet port for outside communications with the use of the Vijeo Design Air App. Typically, set up routable IP address and use a Virtual Private Network to access the controller. The controller IP address is set under Setup/Advanced/Display/Offline. See your IT professional for more details.

Remote access requires and additional password to connect. The default password is:

Username: REMOTE

Password: REMOTE

After remote access is granted, enter the User or Service passwords as needed.

**CAUTION – ENABLING THE REMOTE CONNECTION WILL ALLOW LOCAL NETWORK AND INTERNET USERS ACCESS TO YOUR SYSTEM SETTINGS. THE FACTORY DEFAULT REMOTE ACCESS PASSWORD SHOULD BE CHANGED SO THAT ONLY AUTHORIZED PERSONNEL CAN CONNECT.**

## LOGGING IN

To change settings on your G4 interface, you must first login with the associated username and password. Unless changed, the factory default username and password is as follows:

Login Factory Defaults:

Username: USER

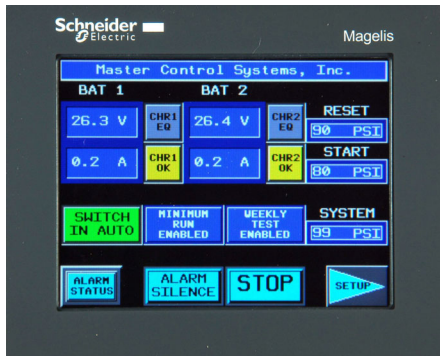
Password: USER

Or

Username: SERVICE

Password: SERVICE

To login from the Main Menu, press SETUP to access the Setting screen. Press LOGIN and then the blank space next to User Name and Password and enter the appropriate information. Once entered, press LOGIN (shown as the lock and key icon). Then press PREV (shown as the reverse arrow icon) to go back to the Setting screen. Now press SETUP ASSISTANT, ADVANCED SETUP, or SERVICE INFORMATION, ADVANCED SETUP, or SERVICE INFORMATION. You are now logged in until any screen is idle for more than 10 minutes.



Main Menu



Setup



Login



Entering Information

## **MENU FUNCTIONS**

### **Functions on Main Menu**

**ALARM STATUS:** When an alarm occurs, the screen will jump to the appropriate alarm screen to display the active alarm. Once the Audible Alarm is silenced, the BACK button can be used to return to the main screen, but if the alarm is still active, the button will change to ACTIVE ALARM and be flashing red. Press the button to go back to the alarm screen. If a Pump House Trouble alarm or Additional Engine alarm exist, the appropriate button will be flashing as well. Press either of these to see the alarm.

**ALARM SILENCE:** Silences the Audible Alarm for the active alarm. If the alarm is Low Oil Pressure, High Water Temperature, Overspeed, Failure to Start, or High Raw Water Temperature, the Audible Alarm will resound in 4 hours. For all other alarms, it will resound in 24 hours.

**STOP Button:** When the engine is running and all starting demands have been reset, the STOP button on the main screen will stop the engine. If any demands are still present, the engine will not stop when the STOP button is pressed.

**SETUP Button:** This button takes you to the SETTINGS screen. From here you can access the Setup Assistant, Advanced Setup, Service Information, PRESSURE DROP TEST button, Alarm Test button, and Setting Summary button.

### **Functions on Alarm Status Menu**

**LOW OIL PRESSURE Alarm:** If low lube oil exists for over 10 seconds while the engine is running, the Low Oil Pressure light will illuminate, the Audible Alarm will sound and the remote System Trouble alarm contacts will transfer. The engine will continue to run and not shutdown unless the engine was started by the Auto Test function or a Pressure Drop Test. If the engine does shutdown during the Auto Test function or a Pressure Drop Test and the system pressure is below the Start setting, the engine will restart and continue to run under the low oil pressure condition.

**HIGH WATER TEMPERATURE Alarm:** If high cooling water temperature exists while the engine is running, the High Water Temperature light will illuminate, the Audible Alarm will sound, and the remote System Trouble alarm contacts will transfer. The engine will continue to run and not shutdown unless the engine was started by the Auto Test function or a Pressure Drop Test. If the engine does shutdown during the Auto Test function or a Pressure Drop Test and the system pressure is below the Start setting, the engine will restart and continue to run under the high water condition.

**BATTERY FAILURE Alarm:** If the voltage of either battery drops below about 2/3rds of its nominal rating for more than one or two seconds, the Battery Failure 1 or Battery Failure 2 light will illuminate, the Audible Alarm will sound, and the System Trouble alarm contacts will

transfer. After battery failure has been corrected, press Battery Fail Reset button or turn the Main Selector Switch to OFF then back to AUTO to reset the alarm.

OVERSPEED Alarm: If the engine Overspeed Switch trips, terminal 1 is de-energized to shutdown the engine immediately, the Overspeed Light will illuminate, the Audible Alarm will sound, and the remote System Trouble alarm contacts will transfer.

The Overspeed alarm and shutdown can not be reset until the speed switch on the engine is reset. Once reset, turn the Main Selector Switch to OFF and back to AUTO to reset the controller.

FAILURE TO START Alarm: If the engine does not start after 15 seconds, cranking will stop and rest for 15 seconds and then continue to crank and rest for a total of 6 crank attempts. If the engine has not started by this time, all further cranking will discontinue, the Failure to Start light will illuminate, the Audible Alarm will sound, and the remote System Trouble alarm contacts will transfer. To reset, place the control switch in the OFF position.

NOTE: Terminal 1 will remain energized after the Failure to Start occurs to allow the engine to continue running upon a failed speed switch.

STARTING CONTACTOR Alarm: In the AUTO position, when either of the Starting Contactor coils are open circuit, the Starting Contactor Failure alarm light will illuminate, the Audible Alarm will sound, and the System Trouble alarm contacts will transfer. The banner across the screen will indicate which contactor coil is open.

CHARGER FAILURE Alarm: Upon loss of AC Power to the controller or a mal-function of either battery charger, the Charger Failure light will illuminate and the remote System Trouble alarm contacts will transfer.

NOTE: The Audible Alarm does not actuate on this alarm to avoid additional battery drain.

PUMP TROUBLE STATUS Button: This button takes you to the Pump House Trouble alarm screen. When a Pump House Trouble alarm contact closes, the appropriate indicating light illuminates, the Audible Alarm sounds, and the Pump House Trouble alarm contacts transfer.

ADDITIONAL ENGINE STATUS Button: This button takes you to the Additional Engine alarm screen. When an additional engine alarm contact closes, the appropriate indicating light illuminates, the Audible Alarm sounds, and the System Trouble alarm contacts transfer.

These alarms are Interstitial Space Liquid Intrusion (54), Low Fuel Level (55), ECM Switch (301), Fuel Injection Failure (302), ECM Warning (303), ECM Failure (304), High Raw Water Temperature (310), Low Raw Flow (311), and Low Engine Temperature (312).

Note: The High Raw Water Temperature alarm (HRT) on terminal 310 will also shutdown the engine if it was started by the Auto Test function or a Pressure Drop Test. If the engine does shutdown during the Auto Test function or a Pressure Drop Test and the system pressure is below the Start setting, the engine will restart and continue to run under the high water condition.



## **Functions on Settings Menu**

**SETUP ASSISTANT:** See the Initial Setup Section in this manual. Requires User Level password. See Logging In section for more information.

**ADVANCED SETUP:** This button takes you to the Advanced Setup screen where you can setup all controller functions. This requires User/Service Level password. See the Advance Setup section in this manual for further details.

**SERVICE INFO:** This button takes you to the Service Information screen where you may find your local service contact information, pump information, change password, and Annual Notification banner settings

**PUMP INFO (HMI v2.9 and higher)**

**DATA SCREENS** - 0%, 25%, 50%, 75%, 100%, 125%, 150% data point buttons.

**SAVE DATA** - When any of the flow buttons are pressed, a new screen will appear.

Press **SAVE DATA**, enter service password, press **SAVE DATA** again to automatically enter all voltages, currents, the discharge pressure, and the suction pressure (when Mod. 83LT is provided). Press **ENTER FLOW** and **ENTER SPEED** buttons to manually enter GPM and RPM. Press **BACK** for the next flow point.

**COMPARE DATA** – Press to compare Present to Previous or Present to Acceptance.

**TOGGLE GRAPH** – Switches between Present, Previous, and Acceptance net pump curves.

**NEXT**

**SAVE TO HISTORY AND CLEAR ALL DATA** – Saves Present data to Previous data and clears Present data. Press before entering new data from the next test. Must first press **HISTORY PROTECTION OFF** (Advanced Setup/Service Menu).

**SECURE PRESENT DATA** – Press to prevent changes in present data.

**CHART FULL SCALE** – Set maximum pressure on graph.

**SAVE ACCEPTANCE TEST** – Press to Present data as also initial Acceptance Test data.

**ENTER PW** – Enter the Service Level password and press **RESET SERV MESSAGE** to change or reset the Annual Test Due banner. Enter the number of days until the next test. This is reset by again pressing **RESET SERV MESSAGE** and entering a new day count or 999.

Note: If the Annual Test Banner is set for 999, it will disable the banner.

**PRESSURE DROP TEST Button:** Pressing the **PRESSURE DROP TEST** button opens the drain valve solenoid to initiate the motor starting sequence by a pressure drop. This button should be used for routine starting. This mode of operation brings into use all of the automatic cranking, running, and safety shutdown circuits.

**ALARM TEST Button:** This button takes you to the Alarm Test screen where you can transfer every remote contact by function. Contacts automatically transfer back to normal if the screen is not touched in 5 minutes.

**SETTING SUMMARY:** See the Setting Summary section in this manual for further details.

## **ADVANCED SETUP**

The Advance Setting Screen allows setting and enabling a multitude of advanced features. Below is a listing of all the features available through this screen:

Advanced Setup Screen (login under USER/USER)

### System Settings Screen

- Start Pressure – enter pressure
- Reset Pressure – enter pressure
- PSI or BAR scale – press to toggle
- Minimum Run Timer – press to enable or disable
- Auto Test Button – See Setup Assistant for further details

### Timer Settings Screen

- Sequence Delay – enter time
- High Zone Delay – enter time

### Option Settings Screen

Option Enables - Page 1

#### Auxiliary Alarm Relay Setup

- Relay Number – press to set or change
- Name - press to set or change
- Select Function - press to continue
- Functions desired – press to select (also see next screen)
- Note: Multiple functions can be selected (except for Auto Off)

#### Pump Trouble Alarm Setup

- Input Number – press set or change
- Name - press to set or change
- Deluge Start – press to enable or disable
- Remote Start – press to enable or disable
- Pump Lockout – press to enable or disable (note: not allowed per NFPA 20)
- Motor Run Audible – press to enable or disable

Option Enables - Page 2

#### Low Suction Pressure Setup (Suction transducer provided with Mod. Code 83LT)

- Low Suction – press to enable or disable
- Low Suction Trip Pressure – enter pressure
- Low Suction Alarm Delay – enter time
- Low Suction Reset Pressure – enter pressure
- Low Suction Shutdown – press to enable or disable
- Note: not allowed per NFPA 20
- Low Suction Shutdown Delay – enter time
- Low Suction Shutdown Delay Reset – enter time

#### Low Discharge Pressure Setup

- Low Discharge – press to enable or disable
- Low Discharge Alarm Pressure – enter pressure



- Low Discharge Alarm Reset Pressure – enter pressure
- Low Discharge Alarm Delay – enter time
- System Overpressure Setup
  - System Overpressure Alarm – press to enable or disable
  - System Overpressure Alarm Pressure – enter pressure
  - System Overpressure Alarm Reset Pressure – enter pressure
  - System Overpressure Alarm Delay – enter pressure
- Manual Start Only – press to enable or disable
- On Demand Signal – press for immediate or delayed
- AC Failure Start Setup
  - AC Failure Start – press to enable or disable
  - AC Failure Start Delay – enter time

DR/Clock Settings Screen

- Change Day – press to enter day of the week 1 through 7 (Monday is day 1)
- Change Time – press to enter hour, minute, second
- Change Date – press to enter Year, Month, Day
- Daylight Savings Time On/Off – press to enable or disable
- Hold to Clear Data Memory – press and hold to delete all history
- Data Order New to Old or Old to New – press to toggle

Service - If logged in under SERVICE/SERVICE, the Service button is enabled.

Test Run – Reduces the minimum run time from 30 minutes to 3 minutes until the screen times out or Logout is pressed.

Analog Cal

- System Pressure
- Suction Pressure (if Mod. 83LT provided)
- To V/A Cal
  - Line Voltages L1-L2, L2-L3, L3-L1
  - Next
  - Line Currents L1, L2, L3

Next

- Aux #1 Analog Input
- Aux #2 Analog Input
- Enable Aux Analog
- Disable PhaseSmart
- Clear Runtime/Start count
- Check Last Operation

**CAUTION – IMPROPER CHANGES TO THE ANALOG SIGNAL CALIBRATION CAN CAUSE ERRONEOUS READINGS AND DISABLE THE FIRE PUMP FROM OPERATING AS INTENDED.**

## SETTING SUMMARY

To check current system settings from the Main Menu, press SETUP, then SETTING SUMMARY. Log-in is not required to view the following system settings:

### Setting Summary Screen

#### Summary Page 1

Reset Pressure	Deluge Start	Pump Lockout
Start Pressure	Remote Start	Minimum Run
Runtime Hours	Manual Start Count	Auto Start Count

#### Summary Page 2

Auto Test Week	Sequence Time
Auto Test Day	High Zone Time
Auto Test Time	AC Failure Start Time

#### Summary Page 3 – Low Suction Alarm and Shutdown

Trip Pressure	Trip Delay	Shutdown Delay
Reset Pressure		Shutdown Reset Delay

#### Summary Page 4 – Low Discharge Pressure Alarm

Low Disch Trip Pressure	Low Disch Alarm Delay	LowDisch Reset Press
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#### Summary Page 5

Over Pressure Trip	Over Press Alarm Delay	Over Pressure Reset
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#### Summary Page 6

System Voltage	Xducer Test	Xducer Test Setting
Serial Number		Manufactured Date
DR version		VI version
HMI version	Jockey Summary	CTL version

#### Jockey Controller Summary

Start Pressure	Reset Pressure	Overpressure
Minimum Run	Restart	24 Hr Over Cycle
Run Hours	Mode	Starts/24 Hr
		Total Starts

## **START-UP PROCEDURE**

The following procedure is designed to verify basic operation and all field input and output connections between the controller and engine. It is recommended for each new installation and the annual fire pump test.

**CAUTION - BEFORE STARTING “ENERGIZE TO STOP” ENGINES, VERIFY THAT BATTERY VOLTAGE IS PRESENT AT TERMINAL 12 WHEN THE MAIN SELECTOR SWITCH IS IN THE OFF POSITION. IF NOT, CONTACT FACTORY BEFORE STARTING ENGINE.**

### I. Manual Starting

- A. Place Main Selector Switch in the MANUAL position.
- B. Place the Battery Selector Switch in the BAT1 position.
- C. Press START Pushbutton and release when engine starts.
- D. Turn control switch to OFF position to stop engine.
- E. Place Battery Selector Switch in the BAT2 position.
- F. Press START Pushbutton and release when engine starts.
- G. Turn control switch to OFF position to stop engine.

NOTE: Observe battery voltage while cranking. If voltage drops below 75% of nominal, it may be an indication of impending battery failure.

### II. Cranking Cycle Test

This test simulates a condition when the engine refuses to start as covered in the preceding "OPERATION OF PANEL" sequence.

- A. Contact the engine manufacture to determine how to disable the engine fuel circuit and disable the engine from starting accordingly.
- B. Place the Main Selector Switch in the AUTO position. Push the PRESSURE DROP TEST button on Setting menu. The Drain Valve Solenoid will open to create a Pressure Drop and initiate cranking of the engine. Verify the engine cranks six times, the audible alarm sounds, the Failure to Start light illuminates, and the System Trouble alarm contacts transfer.
- C. Return Main Selector Switch to the OFF position.

NOTE: Drain Valve Solenoid will continue to dump water until control switch is placed in OFF position.

### III. Checking Starting Motor Release

- A. Place Main Selector Switch in the MANUAL position and press the START pushbutton. Verify the engine start promptly and the terminal 2 LED goes On.
- B. Return switch to OFF position to stop engine.
- C. Place the Main Selector Switch in the AUTO positions and press the PRESSURE DROP TEST button on Setting menu of the display. The engine should start and

run. Verify that either the terminal 9 or 10 LED momentarily goes On and the terminal 2 LED goes On and stays On.

D. Return the switch to OFF position to stop engine.

IV. Oil Pressure Failure Test

A. Contact the engine manufacture to determine how to simulate the low oil circuit.  
B. Place Main Selector Switch in the AUTO position and press the PRESSURE DROP TEST button on the Setting menu of the display to drop the pressure and start the engine.

C. Simulate the Low Oil condition as recommended by the engine manufacture.

D. After 10 seconds, verify the engine shuts down, the audible alarm sounds, the Low Oil pressure signal light illuminates, and the System Trouble alarm contacts transfer.

E. Return the switch to OFF position to stop engine.

**CAUTION - IF THE ENGINE IS STARTED BY A PRESSURE DROP OR OTHER FIRE PROTECTION STARTING DEMAND, THE ENGINE WILL NOT SHUTDOWN.**

V. High Water Temperature Test

A. Contact the engine manufacture to determine how to simulate the High Water temperature circuit.

B. Place Main Selector Switch in the AUTO position and press the PRESSURE DROP TEST button on the Setting menu of the display to drop the pressure and start the engine.

C. Simulate the High Water condition as recommended by the engine manufacture.

D. Verify the engine immediately shuts down, the audible alarm sounds, the High Water signal light illuminates, and the System Trouble alarm contacts transfer.

E. Return the switch to OFF position to stop engine.

**CAUTION - IF THE ENGINE IS STARTED BY A PRESSURE DROP OR OTHER FIRE PROTECTION STARTING DEMAND, THE ENGINE WILL NOT SHUTDOWN.**

VI. Overspeed Test

A. Place Main Selector Switch in the AUTO position and press the PRESSURE DROP TEST button on the Setting menu of the display to start the engine.

B. Operate the Overspeed test switch on the engine mounted control panel. Verify the engine shuts down, the audible alarm sounds, the overspeed signal light illuminates, and the System Trouble alarm contacts transfer.

C. Reset Speed Switch on the Engine.

D. Turn switch to OFF position to reset.

VII. AC Failure Alarm Test

A. Place Main Selector Switch in the AUTO position.

B. Open the 115 or 230 Vac circuit breaker supplying power to the controller.

- C. Verify the A.C. Charger Failure light illuminates and the System Trouble alarm contacts transfer.
- D. Reconnect 115 or 230 Vac

NOTE: The audible alarm will not energize and the display will blank if the battery voltage is less than the Charger Failure settings.

VIII. Battery and Battery Charger Test

- A. Place Main Selector Switch in MANUAL position.
- B. Verify the voltage reading on the display is present and adequate for battery #1
- C. Verify the voltage reading on the display is present and adequate for battery #2
- D. Place the Battery Selector Switch in the BAT 1 position.
- E. Press the START pushbutton. While the engine is cranking, verify the output current reading on the display for battery #1 is approximately 10 amps.
- F. Place the Battery Selector Switch in the BAT 2 position.
- G. Press the START pushbutton. While the engine is cranking, verify the output current reading on the display for battery #2 is approximately 10 amps.
- H. Turn switch to OFF or depress STOP pushbutton to stop engine.

IX. Pressure Starting Test

- A. Place Main Selector Switch in the AUTO position.
- B. Connect a calibrated pressure gauge to the system and verify the system pressure shown on the gauge is equal to the pressure shown on the display.
- C. Slowly open the drain to lower the pressure in system until a pressure start occurs.
- D. Verify the engine starts automatically at the Start Pressure.
- E. After the engine has started, close the drain.
- F. Verify the engine continues to run after the pressure has been restored to normal.
- G. Turn switch to OFF or depress STOP pushbutton to stop engine.

X. Deluge Starting Test (if used)

- A. Place Main Selector Switch in AUTO position.
- B. Operate the deluge valve.
- C. Verify the engine starts and runs automatically.
- D. Turn switch to OFF or depress STOP pushbutton to stop engine.

XI. Remote Starting Test (if used)

- A. Place Main Selector Switch in AUTO position.
- B. Momentarily press the remote start pushbutton.
- C. Verify the engine starts and runs automatically.
- D. Turn switch to OFF or depress STOP pushbutton to stop engine.

XII. Pump House Trouble Alarm Test (If used)

- A. Place Main Selector switch in AUTO position.
- B. Operate each of the Pump House Trouble signal devices connected to terminals 47 through 54 and verify the audible alarm sounds, the appropriate signal light illuminates, and the Pump House Trouble alarm contacts transfer.

- C. Return the switch to OFF position.
- XIII. Electronic Engine Alarms (if used)
- A. Contact the engine manufacture to identify how to simulate each of the Electronic Engine alarms.
  - B. Place Main Selector switch in AUTO position.
  - C. Simulate each engine alarm on terminals 301, 302, 303, 304, 310, 311, 312 and verify the audible alarm sounds, the appropriate signal light illuminates, and the System Trouble alarm contacts transfer.
  - D. Return the switch to OFF position.
- IX. Other Engine Alarms
- A. Place Main Selector switch in AUTO position.
  - B. Simulate a Interstitial Space Liquid Intrusion on terminals 53 to 64 and a Low Fuel Level condition on terminals 55 to 64. Verify the audible alarm sounds, the appropriate signal light illuminates, and the System Trouble alarm contacts transfer.
  - C. Return the switch to OFF position.
- X. Energizing the Controller for Stand-by Operation
- A. Pressurize the system using the Jockey Pump.
  - B. Verify the Start setting of the jockey pump is higher than the Start setting of the fire pump. This is to avoid starting the fire pump while in standby.
  - C. Open the pump discharge valve and any other valves required for proper operation.
  - D. Verify the fire pump does not start.  
Place the Main Selector switch in Auto position.
  - E. Operate the Pressure Drop Test button to drop system pressure and start the engine. Also, verify Deluge Valve Start and Remote Start, if used.
  - F. Check for a pressure start.
  - G. Use the Stop button on the Main Menu to stop the fire pump and leave it in service.

## **OPERATING INSTRUCTIONS**

OFF Position on the Main Selector Switch: This position prevents the engine from starting and stops the engine in all operational modes, if running. It is also used to reset the controller.

BAT Position Switch: Placing the Battery Selector Switch in BAT1 or BAT2 selects which battery is used during cranking in the MANUAL Position.

START Pushbutton: When the Main Selector Switch is in the MANUAL position, pressing the START Pushbutton engages the starter motor on the engine. Releasing the START Pushbutton disengages the starter motor.

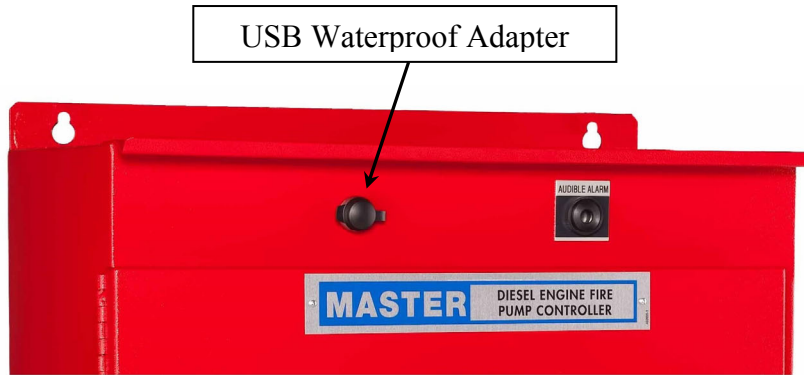
MANUAL Position on the Main Selector Switch: This position on the Main Selector Switch is for manual starting of the engine through the START Pushbutton. To crank on battery 1, place the Battery Selector Switch to BAT 1 and push the START Pushbutton. To crank on battery 2, place the Battery Selector Switch to BAT 2 and again push the START Pushbutton. It bypasses all automatic circuitry.

NOTE: All alarm circuits are active in manual positions.

AUTO Position on the Main Selector Switch: This position is the normal operating position and automatically starts the engine any time a fire demand occurs.

## DOWNLOADING HISTORY

To download data from the data recorder (DR), open the waterproof cap and slide a USB memory stick into the socket. A banner on the main screen will show “USB Active”. When complete, the banner will show “USB Ok”. When Ok, simply remove the memory stick.



To read the data from the USB, simply plug in the USB into any computer and open the CSV file with any spreadsheet program.

For older DR versions, the file name for the captured data has the following format:

YYMDDHMM

- YY – Last 2 digits of the year
- M - A through L = January through December
- DD - 1 through 31 = date
- H - A through X = Hour in 24 hour format
- MM - 0 through 59 = Minute

For the later DR versions, a screen will pop up showing the USB status, a SAVE HISTORY button and a SAVE SYSTEM button. Press either button to select the data desired. The USB status will show Active when downloading data. Once complete, the USB status will show OK. The other SAVE button can then be pressed. If neither button is pressed within 10 seconds, the HISTORY file will automatically be downloaded. The file name format is as follows:

SNxxxxxx\_HIST\_yyyymmdd\_hhmmss, or SNxxxxxx\_SYST\_yyyymmdd\_hhmmss

- SN – always the beginning of the filename
- xxxxxx – controller serial number
- HIST or SYST – History or System data file
- yyyy – Year data was downloaded
- mm – Month data was downloaded
- dd – Day data was downloaded
- hh – Hour data was downloaded
- mm – Minute data was downloaded
- ss – Second data was downloaded



## MAINTENANCE



**WARNING - DANGER OF LETHAL ELECTRICAL SHOCK AND ARC FLASH HAZARD - USE APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT (PPE) IN ACCORDANCE WITH NFPA 70E.**

**WARNING - BATTERY EXPLOSION HAZARD. DISCONNECT AC POWER AND ALL LOADS BEFORE CONNECTING OR DISCONNECTING BATTERY LEADS AT OR NEAR THE BATTERY.**

**WARNING - THIS EQUIPMENT MUST ONLY BE SERVICED BY QUALIFIED ELECTRICAL PERSONNEL.**

On a weekly or monthly basis with the door(s) closed and latched, perform a test of the controller by pressing the Pressure Drop Test button on the Setup menu and verify proper operation. In addition to the pressure drop test, remote starting or deluge valve starting should also be tested if used.

On an annual basis, perform Startup Procedure previously outlined in this manual should be performed.

During the annual testing, qualified electrical personnel should inspect the inside of the controller and check:

- All control wires for tightness
- That all connectors are seated and latched
- For any indication of water marks on any of the components. Replace every component that has water marks on it.
- For any indication that the wire insulation is cracking.

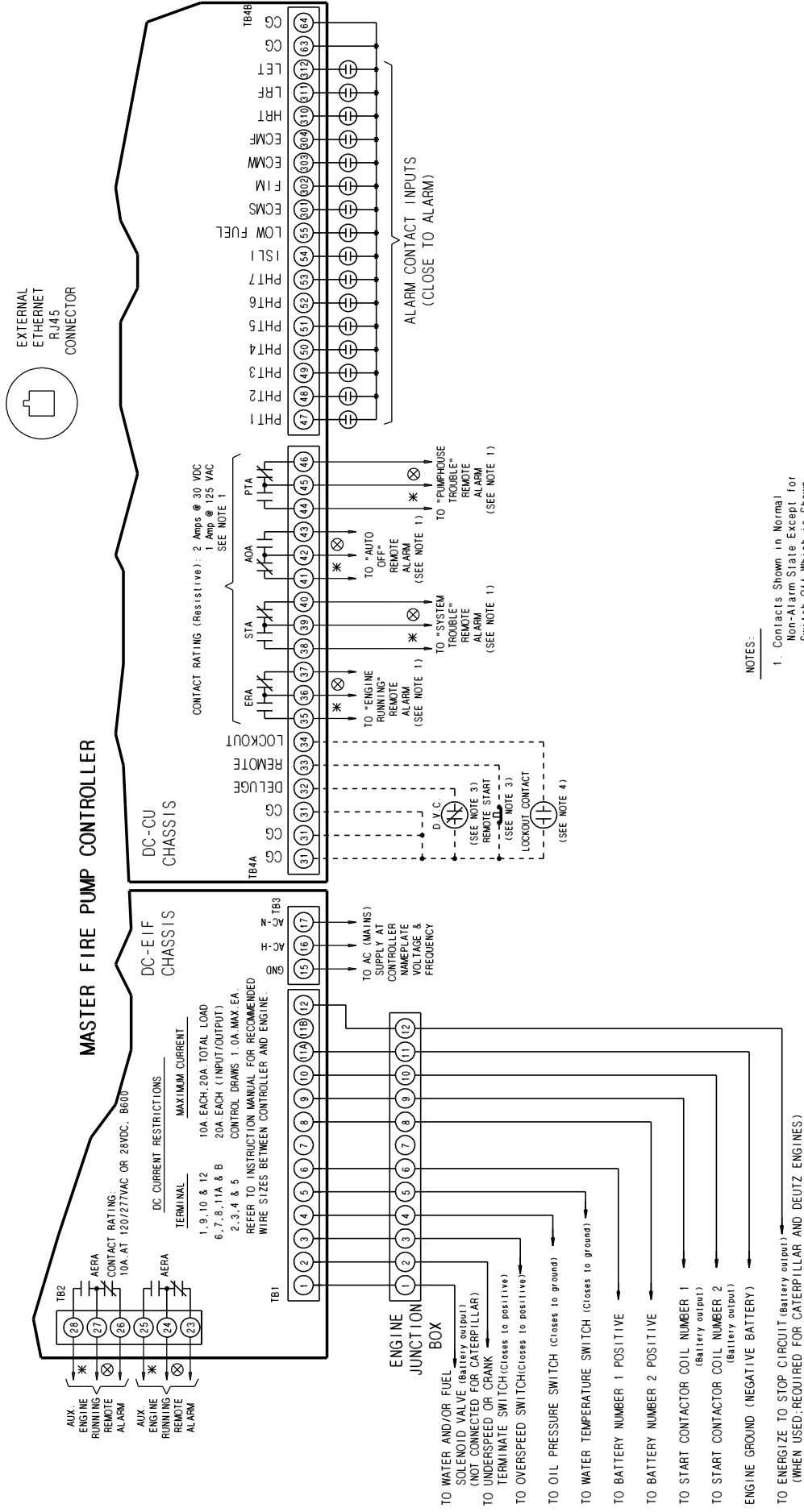
If any operation of the controller does not function correctly, or the inspection reveals any of the above problems, contact Master Control Systems, Inc. for factory authorized service agent recommendations.

**REPLACEMENT PARTS LIST**

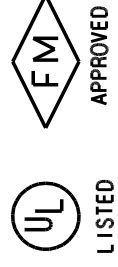
**DEC Fire Pump Controllers**

<b>DESIGNATION</b>	<b>DESCRIPTION</b>	<b>MCS PART NUMBER</b>
<b><i>Complete Chassis Assemblies</i></b>		
EIF	Engine Interface Chassis, 12N, with Relays	649257
EIF	Engine Interface Chassis, 24N, with Relays	649258
DEC-CU	Control Unit Chassis, 12	650262
DEC-CU	Control Unit Chassis, 24	650267
MBC3G	MBC3G-12-10-LA Built-in Battery Charger	6534**
MBC3G	MBC3G-24-10-LA Built-in Battery Charger	6535**
<b><i>Door Mounted Color Display</i></b>		
HMI	5.7” Color Display (Human Machine Interface)	653271
<b><i>Cabinet Mounted Control Components</i></b>		
USB	USB Waterproof Adapter with Cap	402785/402749
TRANSDUCER	Transducer, 1-6 vdc, 300 PSI	306772
DVS	Drain Valve Solenoid, 12 Vdc	306400
DVS	Drain Valve Solenoid, 24 Vdc	306401
ALARM	Audible Alarm – Buzzer	402630
Lockbox	Control Switch Lockbox Assembly	649360
<b><i>Internally Mounted Components</i></b>		
RK2, 9, 10, 12	DPDT 12 VDC Control Relay	800421
RK16, 18	3PDT 12 VDC Control Relay	800431
RK2, 9, 10, 12	DPDT 24 VDC Control Relay	800422
RK16, 18	3PDT 24 VDC Control Relay	800432
Diode Bridge	Energize to Stop Diode Bridge Assembly	649540
<b><i>Battery Charger Components</i></b>		
REG E	Regulator “E”, Regulator Board Assembly	649642
REG E	Regulator “E”, Regulator Board Assembly	649652
SCR	SCR Assembly	600032
F1, F3	AC Fuses, 6 ¼ ASB – 3AG	201530
F2, F4	DC Fuses, 30 A – 3AG	201537

NOTE: When ordering replacement parts, you must supply the Serial Number and Model Number of the Controller in which parts are to be used.

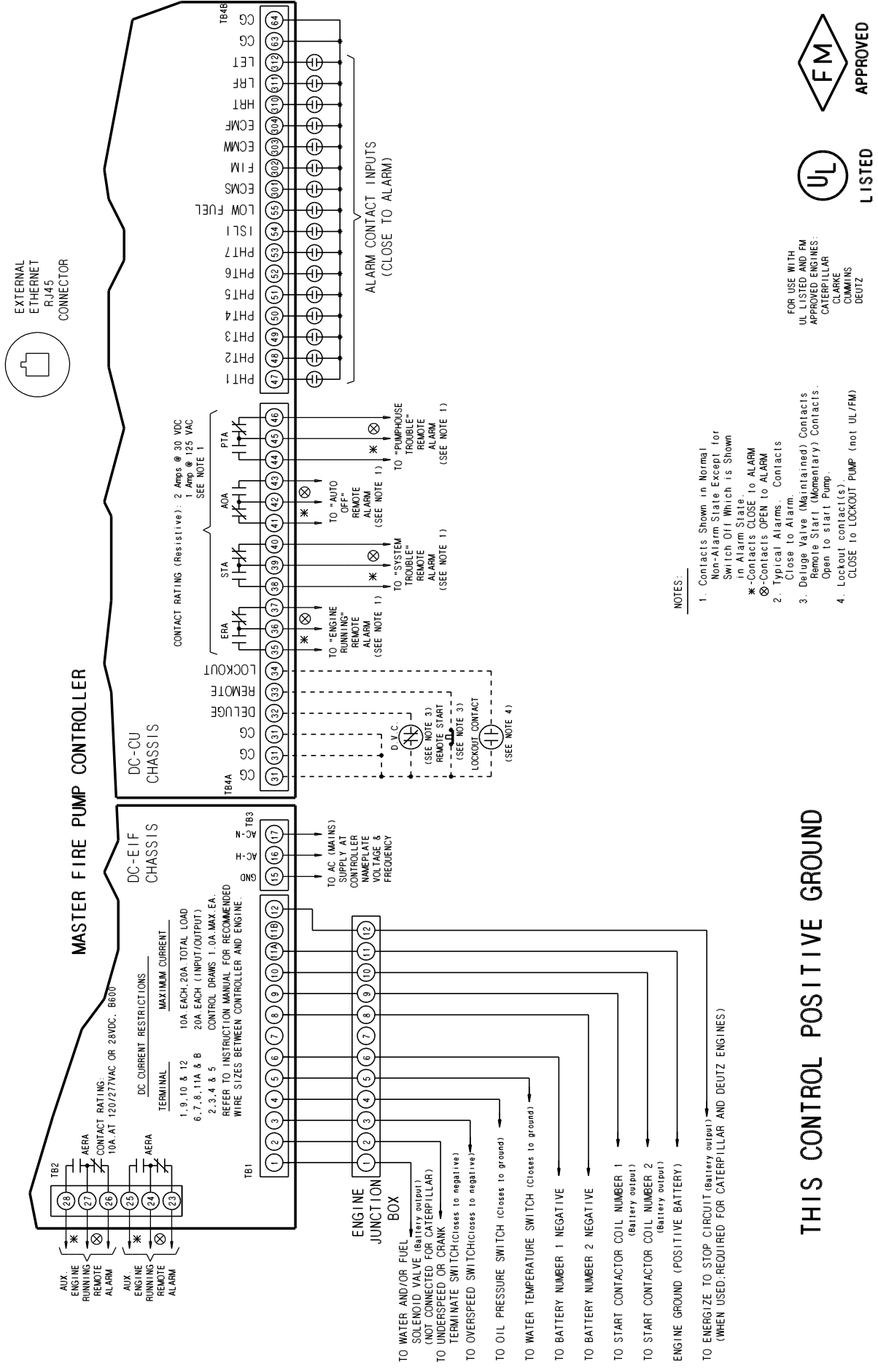


**THIS CONTROL NEGATIVE GROUND**

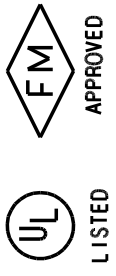


# DEC Diesel Fire Pump Controller

# MASTER



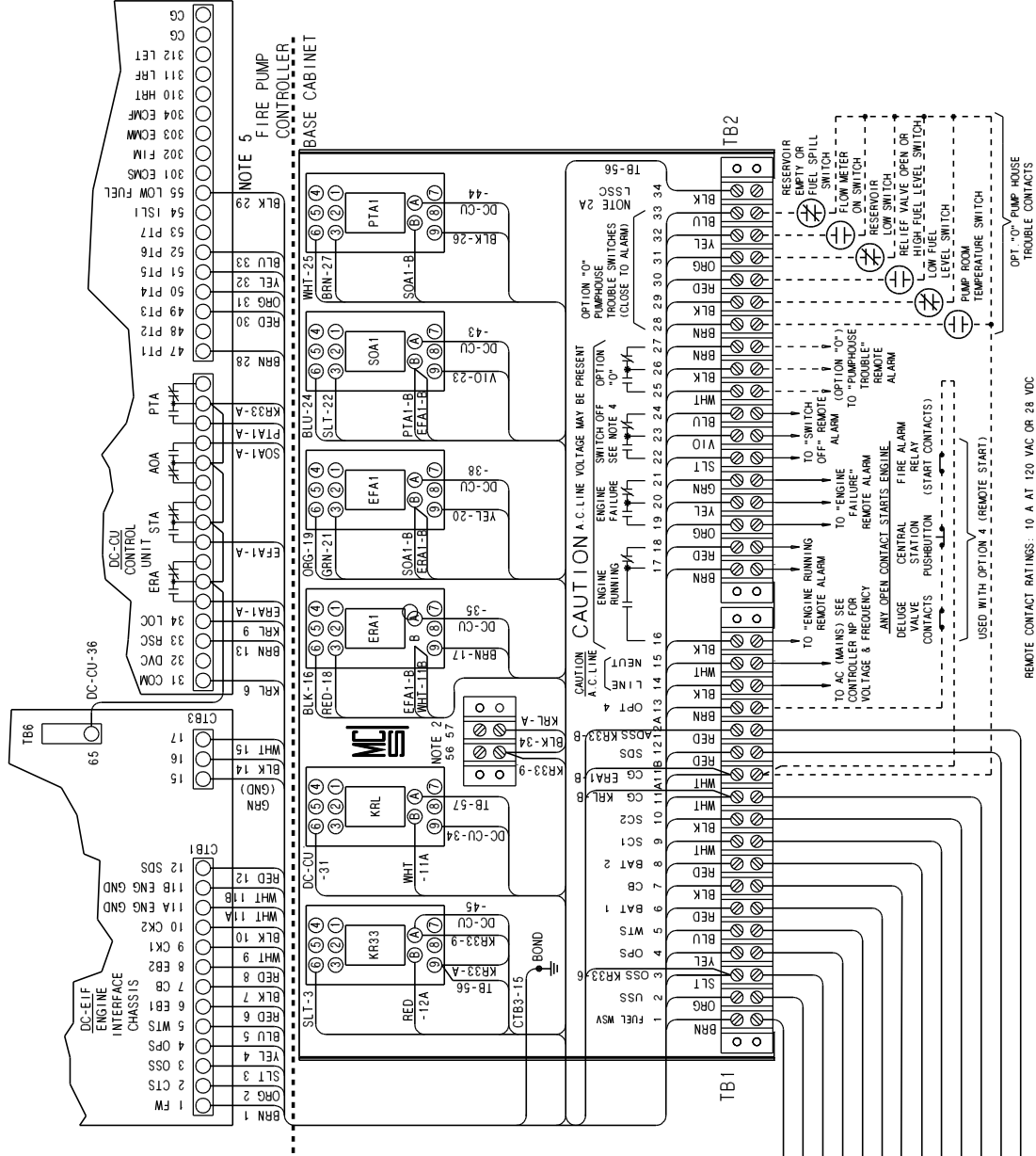
**THIS CONTROL POSITIVE GROUND**



# DEC Diesel Fire Pump Controller

# MASTER

- NOTE 1) BEFORE WIRING, VERIFY IF TERMINAL 12 IS USED FOR ENERGIZE TO STOP (BATTERY OUTPUT) OR AIR DAMPER (CONTACTS TO GROUND). FOR ENERGIZE TO STOP, USE TERMINAL 12. FOR AIR DAMPER USE TERMINAL 12A.
- NOTE 2) SHUTDOWN TERMINALS 56 & 57 USE N.O. CONTACTS. ON LSSC CONTROLLERS, SWAP TERMINALS BETWEEN 10 & 11 (N.C. CONTACTS) TO TERMINALS 9 & 10 (N.O. CONTACTS).
- NOTE 2A) FOR USE WITH LSSC CONTROLLERS, DISCONNECT WIRE ON TERMINAL 33 (DMC CONTROLLERS HAVE LOCKOUT LED). PROVIDES CONSTANT BEST BATTERY.
- NOTE 3) FOR G.M. "V8" ENGINES SERIES 7084-7010 AND 7083-7005, ALSO FOR G.M. "INLINE" ENGINES SERIES 1034-7110, 1044-7110 AND 1064-7110.
- NOTE 4) SWITCH OFF ALARM CONTACTS ARE SHOWN IN NORMAL ENERGIZED STATE NON-ALARM
- NOTE 5) CONTROLLERS SHIPPED PRIOR TO 11/5/2014 HAD LOW FUEL WIRED TO PT2(48)

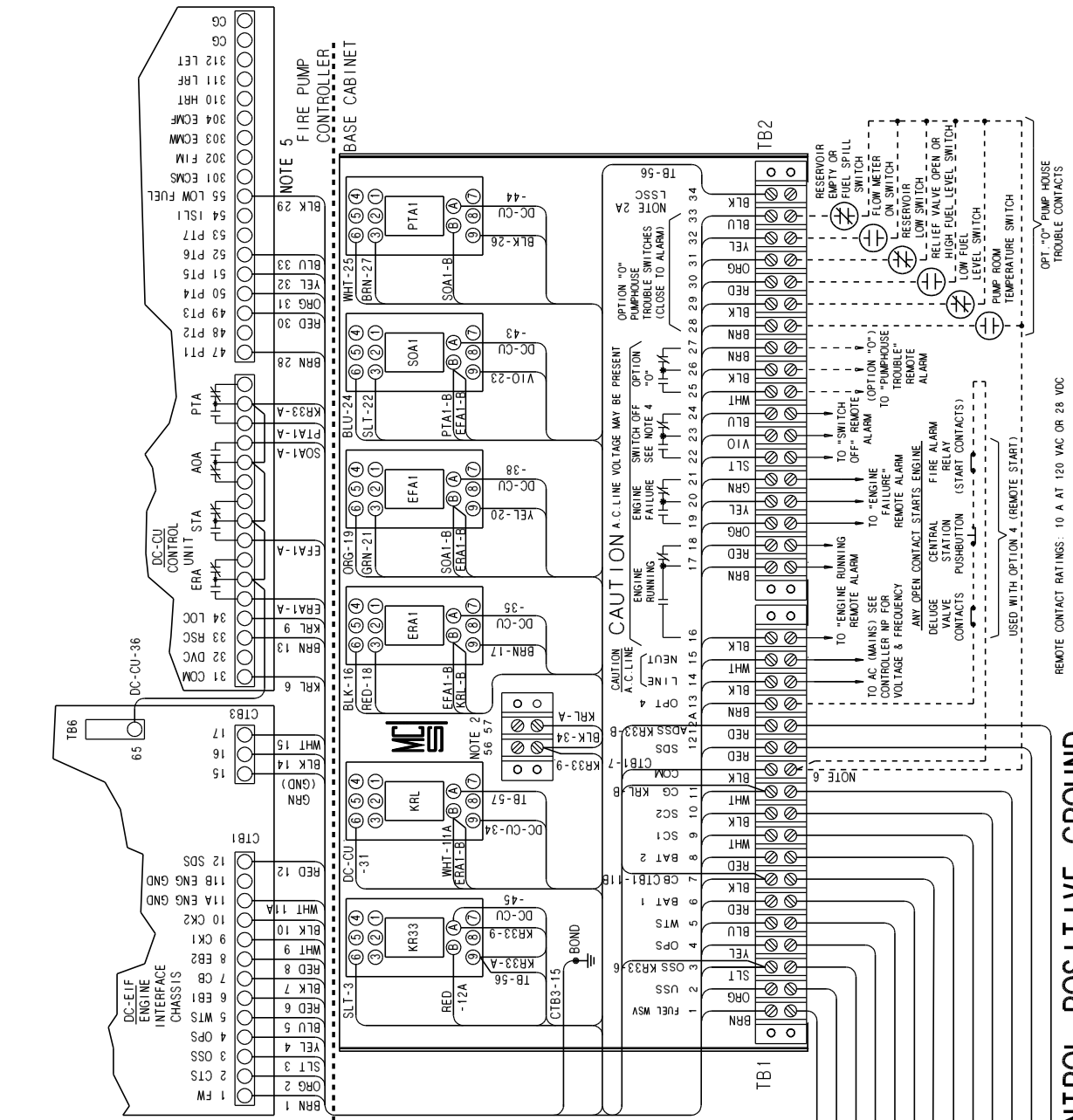


**THIS CONTROL NEGATIVE GROUND**

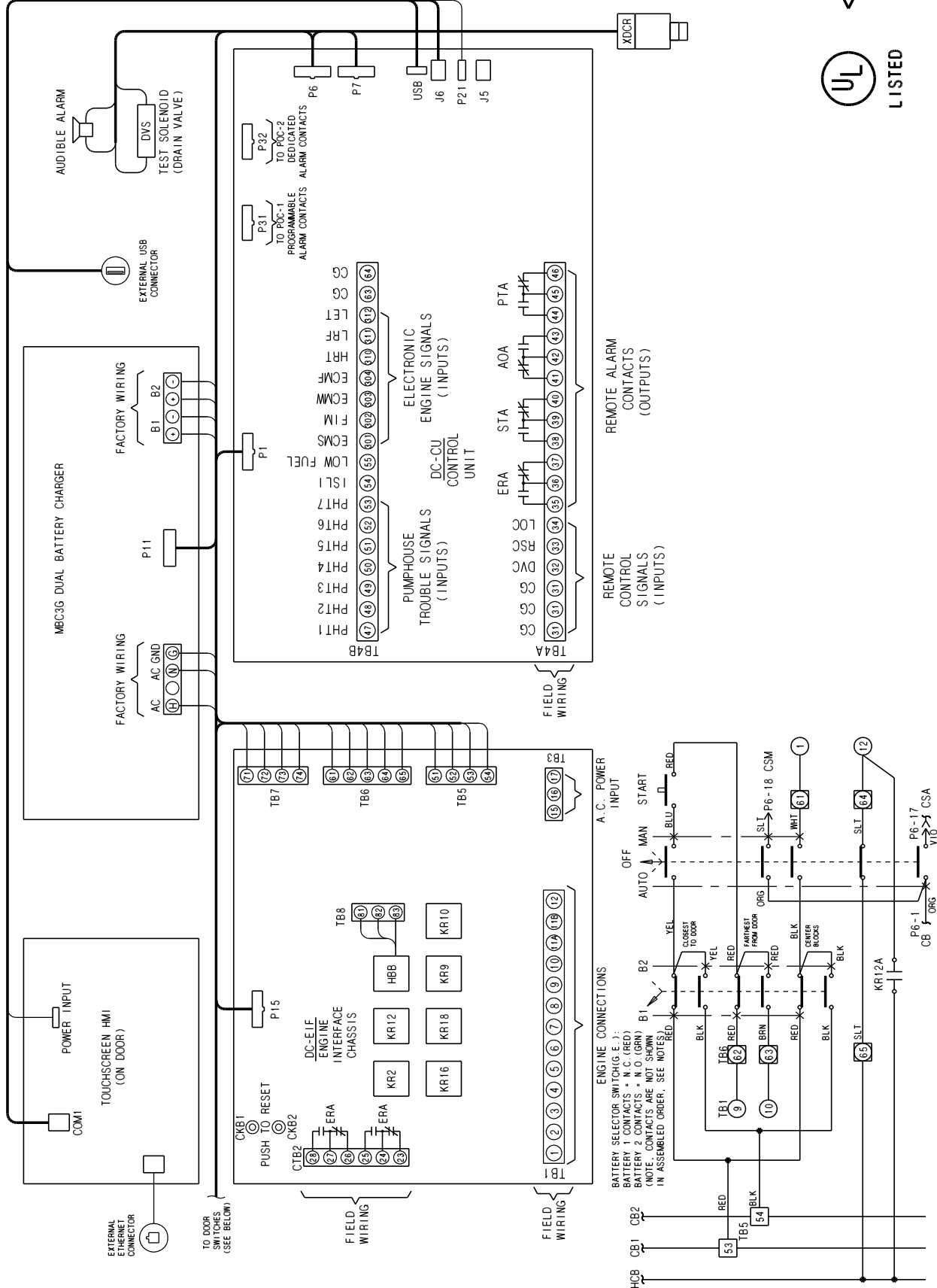
- TO WATER AND/OR FUEL SOLENOID VALVE (battery output)
- TO UNDERSPED OR CRANK TERMINATE SWITCH (closes to battery)
- TO OVERSPED SWITCH (closes to battery)
- TO OIL PRESSURE SWITCH (closes to ground)
- TO WATER TEMPERATURE SWITCH (closes to ground)
- TO BATTERY NUMBER 1 POSITIVE
- TO CONTROL BATTERY POSITIVE
- TO BATTERY NUMBER 2 POSITIVE
- TO START CONTACTOR COIL NUMBER 1 (battery output)
- TO START CONTACTOR COIL NUMBER 2 (battery output)
- TO ENGINE GROUND (NEGATIVE BATTERY)
- TO ENERGIZE TO STOP SOLENOID ENGINES (CAUTION-SEE NOTE 1) (battery output)
- TO AIR DAMPER SWITCH ON G.M. ENGINES ON NOTE 3 (CAUTION-SEE NOTE 1) (closes to ground)

- NOTE 1) BEFORE WIRING, VERIFY IF TERMINAL 12 IS USED FOR ENERGIZE TO STOP (BATTERY OUTPUT) OR AIR DAMPER (CONTACTS TO GROUND). FOR ENERGIZE TO STOP USE TERMINAL 12. FOR AIR DAMPER USE TERMINAL 12A.
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- NOTE 4) SWITCH OFF ALARM CONTACTS ARE SHOWN IN NORMAL ENERGIZED STATE NON-ALARM
- NOTE 5) CONTROLLERS SHIPPED PRIOR TO 11/5/2014 HAD LOW FUEL WIRED TO PT2(48)
- NOTE 6) 'COM' TERMINAL IS FOR CONTROL INPUTS ONLY. USE AS COMMON FOR OPT '4' AND/OR OPT '0' INPUTS ONLY. DO NOT CONNECT TO ENGINE GROUND.

- TO WATER AND/OR FUEL SOLENOID VALVE (Battery Output)
- TO UNDERSPEED OR CRANK TERMINATE SWITCH (Closes to battery)
- TO OVERSPEED SWITCH (Closes to battery)
- TO OIL PRESSURE SWITCH (Closes to ground)
- TO WATER TEMPERATURE SWITCH (Closes to ground)
- TO BATTERY NUMBER 1 NEGATIVE
- TO CONTROL BATTERY NEGATIVE
- TO BATTERY NUMBER 2 NEGATIVE
- TO START CONTACTOR COIL NUMBER 1 (Battery Output)
- TO START CONTACTOR COIL NUMBER 2 (Battery Output)
- TO ENGINE GROUND (POSITIVE BATTERY)
- TO ENERGIZE TO STOP SOLENOID ENGINES (CAUTION-SEE NOTE 1) (Battery Output)
- TO AIR DAMPER SWITCH ON G.M. ENGINES ON NOTE 3 (CAUTION-SEE NOTE 1) (Closes to ground)



**THIS CONTROL POSITIVE GROUND**



LISTED

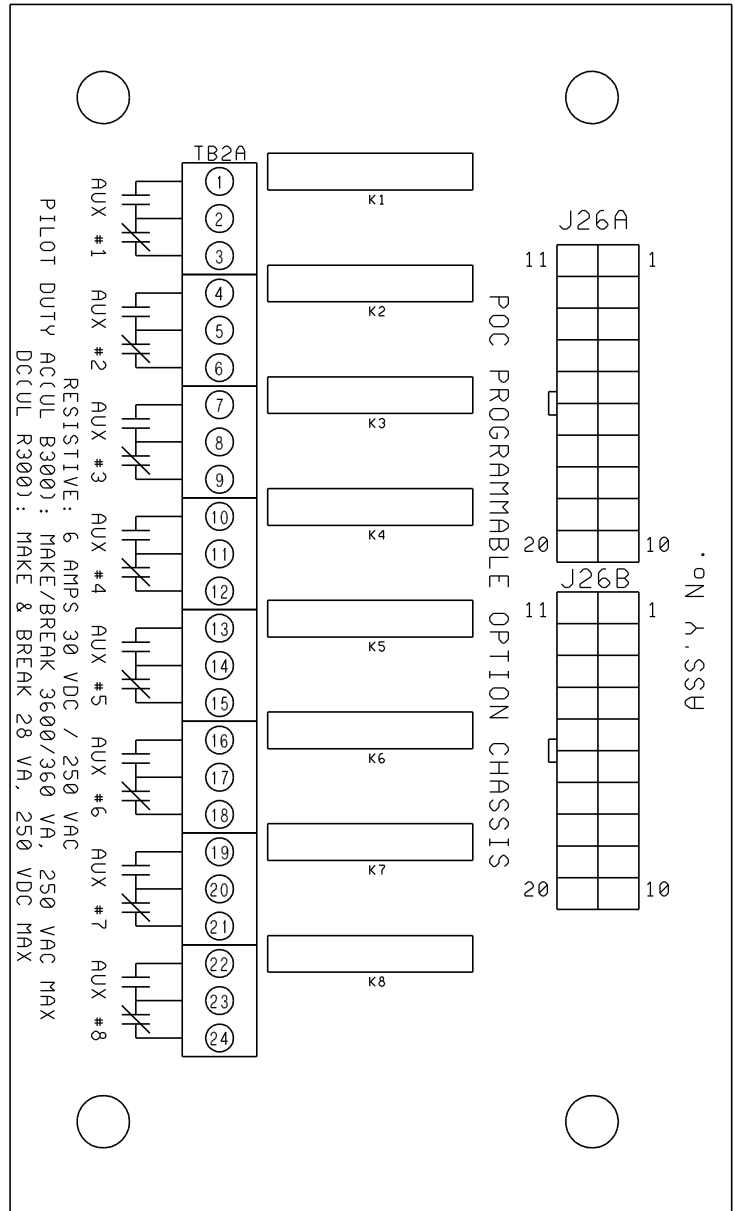


APPROVED



AUX ALARM CONTACTS  
PROGRAM ALARM FUNCTION  
VIA HMI TOUCH SCREEN ON DOOR

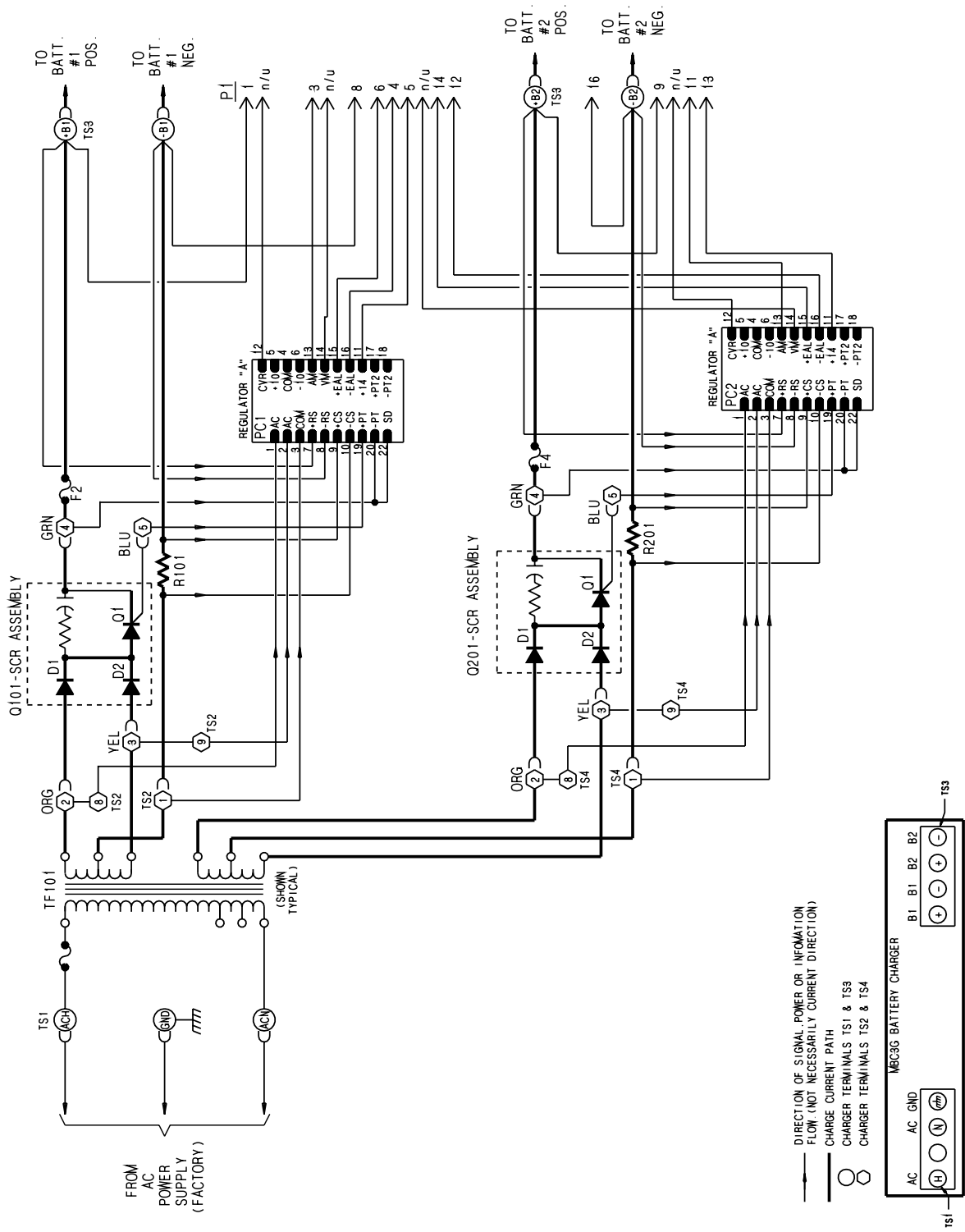
FIELD ALARM RELAY DEFINITIONS
AUX 1
AUX 2
AUX 3
AUX 4
AUX 5
AUX 6
AUX 7
AUX 8





# DEC Battery Charger Schematic

**MASTER**

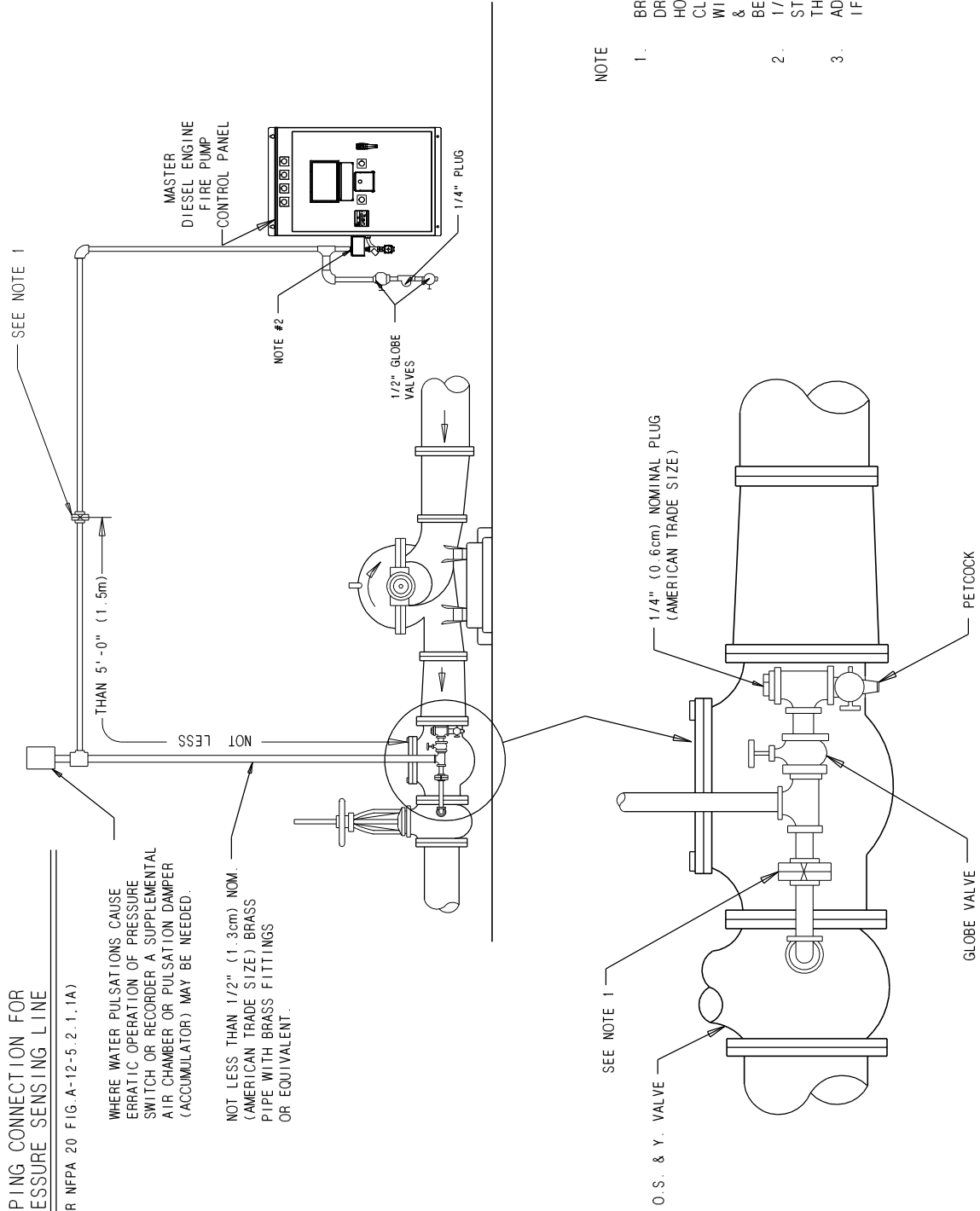




PIPING CONNECTION FOR  
PRESSURE SENSING LINE  
(PER NFPA 20 FIG. A-12-5.2.1.1A)

WHERE WATER PULSATIONS CAUSE  
ERRATIC OPERATION OF PRESSURE  
SWITCH OR RECORDER A SUPPLEMENTAL  
AIR CHAMBER OR PULSATION DAMPER  
(ACCUMULATOR) MAY BE NEEDED.

NOT LESS THAN 1/2" (1.3cm) NOM.  
(AMERICAN TRADE SIZE) BRASS  
PIPE WITH BRASS FITTINGS  
OR EQUIVALENT.



NOTE

1. BRONZE CHECK VALVES, CLAPPER DRILLED WITH 3/32" (.24 mm) HOLE, EXCEPT WHERE WATER IS CLEAN GROUND FACE UNIONS WITH NON-CORROSIVE DIAPHRAM & 3/32" (.24 mm) ORIFICE MAY BE USED.
2. 1/2" (1.3cm) NOMINAL AMERICAN STANDARD TAPER FEMALE PIPE THREAD INLET & OUTLET ADDITIONAL PLUMBING REQUIRED IF MOD. 83LT PROVIDED
- 3.

# DEC Controller Modbus Register Definitions

**MASTER**

SERIAL NUMBER: \_\_\_\_\_

IP ADDRESS – FACTORY DEFAULT: 192.168.1.10  
ALL VARIABLES ARE UNSIGNED INTEGERS

## ANALOG INPUTS

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>DATA FORMAT</i>
40001	Battery #1 volts	xx.x
40002	Battery #2 volts	xx.x
40003	UNUSED	
40004	Battery #1 amps	xx.x
40005	Battery #2 amps	xx.x
40006	UNUSED	
40007	System Pressure	PSI xxx or BAR xx.xx
40008	Suction Pressure	PSI xxx or BAR xx.xx
40009	UNUSED	
40010	Aux. Input #1 User defined	xxx
40011	Aux. Input #2 User defined	xxx

## DIGITAL INPUTS

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>ALARM ON STATE</i>
40012	Alarm Register #1	
bit-0	Minimum Run Delay Timing	High
bit-1	Power Fail Start Delay Timing	High
bit-2	High Zone Delay Timing	High
bit-3	Sequence Delay Timing	High
bit-4	Engine Running	High
bit-5	High Water Temp Alarm	High
bit-6	Low Suction Alarm	High
bit-7	Low Suction Shutdown Active	High
bit-8	System Over Pressure Alarm	High
bit-9	Overspeed Alarm	High
bit-10	Weekly Test Demand Active	High
bit-11	Failure to Start Alarm	High
bit-12	Lockout Active	High
bit-13	Crank on Battery #1	High
bit-14	Crank on Battery #2	High
bit-15	Resting	High
40013	Alarm Register #2	
bit-0	Pressure Start Demand	High
bit-1	Remote Start Demand	High
bit-2	Deluge Start Demand	High
bit-3	Weekly Test Start Demand	High
bit-4	Start Contactor #1 Fail	High
bit-5	Start Contactor #2 Fail	High
bit-6	Audible Alarm	High
bit-7	Weekly/Monthly Test Setup Error	High
bit-8	Minimum Run Timed Out	High
bit-9	Pump Demand	High
bit-10	Control Switch in Auto	High
bit-11	Control Switch in Manual	High
bit-12	Pressure Transducer Fault	High

**DIGITAL INPUTS**

<i>REGISTER</i>	<i>DESCRIPTION</i>	<i>ALARM ON STATE</i>
bit-13	Pressure Transducer Test OK	High
bit-14	AC Power Fail Start	High
bit-15	Low Discharge Pressure Alarm	High
40014	Alarm Register #3	
bit-0	Battery #1 Failure Alarm	High
bit-1	Battery #2 Failure Alarm	High
bit-2	Pump Trouble Group Alarm	High
bit-3	System Trouble #1 Alarm	High
bit-4	AC Power Fail Alarm	High
bit-5	Battery #1 Over Voltage Alarm	High
bit-6	Battery #2 Over Voltage Alarm	High
bit-7	Term 301, ECMS	High
bit-8	Term 302, FIM	High
bit-9	Term 303, ECMW	High
bit-10	Term 304, ECMF	High
bit-11	Term 310, RWHIT	High
bit-12	Term 311, CRWCLS	High
bit-13	Term 312, LET	High
bit-14	Low Oil Pressure Alarm	High
bit-15	Low Fuel Level	High
40015	Alarm Register #4	
bit-0	Pump Trouble #1 Input	High
bit-1	Pump Trouble #2 Input	High
bit-2	Pump Trouble #3 Input	High
bit-3	Pump Trouble #4 Input	High
bit-4	Pump Trouble #5 Input	High
bit-5	Pump Trouble #6 Input	High
bit-6	Pump Trouble #7 Input	High
bit-7	ISLI	High
bit-8	Battery #1 in Equalize	High
bit-9	Battery #2 in Equalize	High
bit-10	Battery #1 OK	High
bit-11	Battery #2 OK	High
bit-12	Charger #1 Fail Alarm	High
bit-13	Charger #2 Fail Alarm	High
bit-14	System Trouble #2 Alarm	High
bit-15	UNUSED	

**OTHER INFO**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>DATA FORMAT</i>
40016	Start Count	xxxxx
40017	Run Time Hours	xxxxx.x
40018	Hours since last run	xxx.x
40019	Hours since last DVS test	xxx.x

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>		<i>DATA FORMAT</i>
	<b>PRESENT DATA</b>		
40030	0%	Date of Test – Day 1 thru 31	xx
40031	25%	Date of Test – Day 1 thru 31	xx
40032	50%	Date of Test - Day 1 thru 31	xx
40033	75%	Date of Test – Day 1 thru 31	xx
40034	100%	Date of Test – Day 1 thru 31	xx
40035	125%	Date of Test – Day 1 thru 31	xx
40036	150%	Date of Test – Day 1 thru 31	xx
	<b>PREVIOUS DATA</b>		
40037	0%	Date of Test – Day 1 thru 31	xx
40038	25%	Date of Test – Day 1 thru 31	xx
40039	50%	Date of Test - Day 1 thru 31	xx
40040	75%	Date of Test – Day 1 thru 31	xx
40041	100%	Date of Test – Day 1 thru 31	xx
40042	125%	Date of Test – Day 1 thru 31	xx
40043	150%	Date of Test – Day 1 thru 31	xx
	<b>ACCEPTANCE DATA</b>		
40044	0%	Date of Test – Day 1 thru 31	xx
40045	25%	Date of Test – Day 1 thru 31	xx
40046	50%	Date of Test - Day 1 thru 31	xx
40047	75%	Date of Test – Day 1 thru 31	xx
40048	100%	Date of Test – Day 1 thru 31	xx
40049	125%	Date of Test – Day 1 thru 31	xx
40050	150%	Date of Test – Day 1 thru 31	xx
	<b>PRESENT FLOW</b>		
40051	0%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40052	25%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40053	50%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40054	75%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40055	100%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40056	125%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40057	150%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
	<b>PREVIOUS FLOW</b>		
40058	0%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40059	25%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40060	50%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40061	75%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40062	100%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40063	125%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40064	150%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
	<b>ACCEPTANCE FLOW</b>		
40065	0%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40066	25%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40067	50%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40068	75%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40069	100%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40070	125%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx
40071	150%	Flow – GPM/LPM	GPM xxxxx or LPM xxxx

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>		<i>DATA FORMAT</i>
<b>PRESENT DATA</b>			
40072	0%	Amps – BAT 1	XX.X
40073	25%	Amps – BAT 1	XX.X
40074	50%	Amps – BAT 1	XX.X
40075	75%	Amps – BAT 1	XX.X
40076	100%	Amps – BAT 1	XX.X
40077	125%	Amps – BAT 1	XX.X
40078	150%	Amps – BAT 1	XX.X
<b>PREVIOUS DATA</b>			
40079	0%	Amps – BAT 1	XX.X
40080	25%	Amps – BAT 1	XX.X
40081	50%	Amps – BAT 1	XX.X
40082	75%	Amps – BAT 1	XX.X
40083	100%	Amps – BAT 1	XX.X
40084	125%	Amps – BAT 1	XX.X
40085	150%	Amps – BAT 1	XX.X
<b>ACCEPTANCE DATA</b>			
40086	0%	Amps – BAT 1	XX.X
40087	25%	Amps – BAT 1	XX.X
40088	50%	Amps – BAT 1	XX.X
40089	75%	Amps – BAT 1	XX.X
40090	100%	Amps – BAT 1	XX.X
40091	125%	Amps – BAT 1	XX.X
40092	150%	Amps – BAT 1	XX.X
<b>PRESENT DATA</b>			
40093	0%	Amps – BAT 2	XX.X
40094	25%	Amps – BAT 2	XX.X
40095	50%	Amps – BAT 2	XX.X
40096	75%	Amps – BAT 2	XX.X
40097	100%	Amps – BAT 2	XX.X
40098	125%	Amps – BAT 2	XX.X
40099	150%	Amps – BAT 2	XX.X
<b>PREVIOUS DATA</b>			
40100	0%	Amps – BAT 2	XX.X
40101	25%	Amps – BAT 2	XX.X
40102	50%	Amps – BAT 2	XX.X
40103	75%	Amps – BAT 2	XX.X
40104	100%	Amps – BAT 2	XX.X
40105	125%	Amps – BAT 2	XX.X
40106	150%	Amps – BAT 2	XX.X
<b>ACCEPTANCE DATA</b>			
40107	0%	Amps – BAT 2	XX.X
40108	25%	Amps – BAT 2	XX.X
40109	50%	Amps – BAT 2	XX.X
40110	75%	Amps – BAT 2	XX.X
40111	100%	Amps – BAT 2	XX.X
40112	125%	Amps – BAT 2	XX.X
40113	150%	Amps – BAT 2	XX.X

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>DATA FORMAT</i>
<b>PRESENT DATA</b>		
40114	UNUSED	
40115	UNUSED	
40116	UNUSED	
40117	UNUSED	
40118	UNUSED	
40119	UNUSED	
40120	UNUSED	
<b>PREVIOUS DATA</b>		
40121	UNUSED	
40122	UNUSED	
40123	UNUSED	
40124	UNUSED	
40125	UNUSED	
40126	UNUSED	
40127		
<b>ACCEPTANCE DATA</b>		
40128	UNUSED	
40129	UNUSED	
40130	UNUSED	
40131	UNUSED	
40132	UNUSED	
40133	UNUSED	
40134	UNUSED	
<b>PRESENT DATA</b>		
40135	0% Month 1 thru 12	Xx
40136	25% Month 1 thru 12	Xx
40137	50% Month 1 thru 12	Xx
40138	75% Month 1 thru 12	Xx
40139	100% Month 1 thru 12	Xx
40140	125% Month 1 thru 12	Xx
40141	150% Month 1 thru 12	Xx
<b>PREVIOUS DATA</b>		
40142	0% Month 1 thru 12	Xx
40143	25% Month 1 thru 12	Xx
40144	50% Month 1 thru 12	Xx
40145	75% Month 1 thru 12	Xx
40146	100% Month 1 thru 12	Xx
40147	125% Month 1 thru 12	Xx
40148	150% Month 1 thru 12	Xx
<b>ACCEPTANCE DATA</b>		
40149	0% Month 1 thru 12	Xx
40150	25% Month 1 thru 12	Xx
40151	50% Month 1 thru 12	Xx
40152	75% Month 1 thru 12	Xx
40153	100% Month 1 thru 12	Xx
40154	125% Month 1 thru 12	Xx
40155	150% Month 1 thru 12	Xx



**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>		<i>DATA FORMAT</i>
<b>PRESENT DATA</b>			
40156	0%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40157	25%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40158	50%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40159	75%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40160	100%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40161	125%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40162	150%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
<b>PREVIOUS DATA</b>			
40163	0%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40164	25%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40165	50%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40166	75%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40167	100%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40168	125%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40169	150%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
<b>ACCEPTANCE DATA</b>			
40170	0%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40171	25%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40172	50%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40173	75%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40174	100%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40175	125%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
40176	150%	Curve Data PSI/BAR (SYS - SUCT)	PSI xxx or BAR xx.xx
<b>PRESENT DATA</b>			
40177	0%	RPM	xxxx
40178	25%	RPM	xxxx
40179	50%	RPM	xxxx
40180	75%	RPM	xxxx
40181	100%	RPM	xxxx
40182	125%	RPM	xxxx
40183	150%	RPM	xxxx
<b>PREVIOUS DATA</b>			
40184	0%	RPM	xxxx
40185	25%	RPM	xxxx
40186	50%	RPM	xxxx
40187	75%	RPM	xxxx
40188	100%	RPM	xxxx
40189	125%	RPM	xxxx
40190	150%	RPM	xxxx
<b>ACCEPTANCE DATA</b>			
40191	0%	RPM	xxxx
40192	25%	RPM	xxxx
40193	50%	RPM	xxxx
40194	75%	RPM	xxxx
40195	100%	RPM	xxxx
40196	125%	RPM	xxxx
40197	150%	RPM	xxxx

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>			<i>DATA FORMAT</i>
<b>PRESENT DATA</b>				
40198	0%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40199	25%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40200	50%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40201	75%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40202	100%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40203	125%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40204	150%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
<b>PREVIOUS DATA</b>				
40205	0%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40206	25%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40207	50%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40208	75%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40209	100%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40210	125%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40211	150%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
<b>ACCEPTANCE DATA</b>				
40212	0%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40213	25%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40214	50%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40215	75%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40216	100%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40217	125%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
40218	150%	Suction	PSI/BAR	PSI xxx or BAR xx.xx
<b>PRESENT DATA</b>				
40219	0%	System	PSI/BAR	PSI xxx or BAR xx.xx
40220	25%	System	PSI/BAR	PSI xxx or BAR xx.xx
40221	50%	System	PSI/BAR	PSI xxx or BAR xx.xx
40222	75%	System	PSI/BAR	PSI xxx or BAR xx.xx
40223	100%	System	PSI/BAR	PSI xxx or BAR xx.xx
40224	125%	System	PSI/BAR	PSI xxx or BAR xx.xx
40225	150%	System	PSI/BAR	PSI xxx or BAR xx.xx
<b>PREVIOUS DATA</b>				
40226	0%	System	PSI/BAR	PSI xxx or BAR xx.xx
40227	25%	System	PSI/BAR	PSI xxx or BAR xx.xx
40228	50%	System	PSI/BAR	PSI xxx or BAR xx.xx
40229	75%	System	PSI/BAR	PSI xxx or BAR xx.xx
40230	100%	System	PSI/BAR	PSI xxx or BAR xx.xx
40231	125%	System	PSI/BAR	PSI xxx or BAR xx.xx
40232	150%	System	PSI/BAR	PSI xxx or BAR xx.xx
<b>ACCEPTANCE DATA</b>				
40233	0%	System	PSI/BAR	PSI xxx or BAR xx.xx
40234	25%	System	PSI/BAR	PSI xxx or BAR xx.xx
40235	50%	System	PSI/BAR	PSI xxx or BAR xx.xx
40236	75%	System	PSI/BAR	PSI xxx or BAR xx.xx
40237	100%	System	PSI/BAR	PSI xxx or BAR xx.xx
40238	125%	System	PSI/BAR	PSI xxx or BAR xx.xx
40239	150%	System	PSI/BAR	PSI xxx or BAR xx.xx

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>		<i>DATA FORMAT</i>
<b>PRESENT DATA</b>			
40240	0%	Volts BAT 1	XX.X
40241	25%	Volts BAT 1	XX.X
40242	50%	Volts BAT 1	XX.X
40243	75%	Volts BAT 1	XX.X
40244	100%	Volts BAT 1	XX.X
40245	125%	Volts BAT 1	XX.X
40246	150%	Volts BAT 1	XX.X
<b>PREVIOUS DATA</b>			
40247	0%	Volts BAT 1	XX.X
40248	25%	Volts BAT 1	XX.X
40249	50%	Volts BAT 1	XX.X
40250	75%	Volts BAT 1	XX.X
40251	100%	Volts BAT 1	XX.X
40252	125%	Volts BAT 1	XX.X
40253	150%	Volts BAT 1	XX.X
<b>ACCEPTANCE DATA</b>			
40254	0%	Volts BAT 1	XX.X
40255	25%	Volts BAT 1	XX.X
40256	50%	Volts BAT 1	XX.X
40257	75%	Volts BAT 1	XX.X
40258	100%	Volts BAT 1	XX.X
40259	125%	Volts BAT 1	XX.X
40260	150%	Volts BAT 1	XX.X
<b>PRESENT DATA</b>			
40261	0%	Volts BAT 2	XX.X
40262	25%	Volts BAT 2	XX.X
40263	50%	Volts BAT 2	XX.X
40264	75%	Volts BAT 2	XX.X
40265	100%	Volts BAT 2	XX.X
40266	125%	Volts BAT 2	XX.X
40267	150%	Volts BAT 2	XX.X
<b>PREVIOUS DATA</b>			
40268	0%	Volts BAT 2	XX.X
40269	25%	Volts BAT 2	XX.X
40270	50%	Volts BAT 2	XX.X
40271	75%	Volts BAT 2	XX.X
40272	100%	Volts BAT 2	XX.X
40273	125%	Volts BAT 2	XX.X
40274	150%	Volts BAT 2	XX.X
<b>ACCEPTANCE DATA</b>			
40275	0%	Volts BAT 2	XX.X
40276	25%	Volts BAT 2	XX.X
40277	50%	Volts BAT 2	XX.X
40278	75%	Volts BAT 2	XX.X
40279	100%	Volts BAT 2	XX.X
40280	125%	Volts BAT 2	XX.X
40281	150%	Volts BAT 2	XX.X

**PUMP CURVE DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>DATA FORMAT</i>
<b>PRESENT DATA</b>		
40282	UNUSED	
40283	UNUSED	
40284	UNUSED	
40285	UNUSED	
40286	UNUSED	
40287	UNUSED	
40288	UNUSED	
<b>PREVIOUS DATA</b>		
40289	UNUSED	
40290	UNUSED	
40291	UNUSED	
40292	UNUSED	
40293	UNUSED	
40294	UNUSED	
40295	UNUSED	
<b>ACCEPTANCE DATA</b>		
40296	UNUSED	
40297	UNUSED	
40298	UNUSED	
40299	UNUSED	
40300	UNUSED	
40301	UNUSED	
40302		
<b>PRESENT DATA</b>		
40303	0% Year (4-digit)	XXXX
40304	25% Year (4-digit)	XXXX
40305	50% Year (4-digit)	XXXX
40306	75% Year (4-digit)	XXXX
40307	100% Year (4-digit)	XXXX
40308	125% Year (4-digit)	XXXX
40309	150% Year (4-digit)	XXXX
<b>PREVIOUS DATA</b>		
40310	0% Year (4-digit)	XXXX
40311	25% Year (4-digit)	XXXX
40312	50% Year (4-digit)	XXXX
40313	75% Year (4-digit)	XXXX
40314	100% Year (4-digit)	XXXX
40315	125% Year (4-digit)	XXXX
40316	150% Year (4-digit)	XXXX
<b>ACCEPTANCE DATA</b>		
40317	0% Year (4-digit)	XXXX
40318	25% Year (4-digit)	XXXX
40319	50% Year (4-digit)	XXXX
40320	75% Year (4-digit)	XXXX
40321	100% Year (4-digit)	XXXX
40322	125% Year (4-digit)	XXXX
40323	150% Year (4-digit)	XXXX

**JOCKEY PUMP DATA**

<i>MODBUS REGISTER</i>	<i>DESCRIPTION</i>	<i>DATA FORMAT</i>
40198	Software Version	xx.x
40199	Start, PSI/BAR, no decimal places/two decimal places	PSI xxx or BAR xx.xx
40200	Stop, PSI/BAR, no decimal places/two decimal places	PSI xxx or BAR xx.xx
40201	Restart	SEC xxx
40202	Min Run	SEC xxx
40203	Start Limit	xxx
40204-5	Run Hours, UNSIGNED DOUBLE INTEGER, TWO DECIMAL PLACES	HOURS xxxxx.xx
40206-7	Total Starts, UNSIGNED DOUBLE INTEGER, NO DECIMAL PLACES	xxxxxxx
40208	Starts Last 24HR	xxx
40209	Alarm Resister:	<b>ALARM ON STATE</b>
bit-0	0=PSI, 1=BAR	High
bit-1	Sequence Timing	High
bit-2	Auto	High
bit-3	Manual	High
bit-4	Secure Mode	High
bit-5	Running	High
bit-6	Remote Start	High
bit-7	Min Run Timing	High
bit-8	Fail to Start	High
bit-9	Excess Starts	High
bit-10	Trouble	High
40210	Overpressure, PSI/BAR, no decimal places/two decimal places	PSI xxx or BAR xx.xx

## DIESEL OPTION AND MODIFICATION DRAWINGS

***NOTE:** The following drawings are applicable to controllers with model numbers which indicate that they are equipped with the following. See controller nameplate for complete model number.*

<b>MODIFICATION</b>	<b>DESCRIPTION</b>	<b>DRAWING</b>
X (FOLLOWED BY)		
POC (Opt. 7)	Option 7 Programmable Option Chassis	22811
19	Strip Heater	22830
20	Strip Heater w/Thermostat	22830
20A	Strip Heater w/Humidistat	22830

### **ACCESSORIES**

4817	Low Fuel Level Switch	4817
4817L	Low Fuel Level Switch – Long Rod	4817L
6288	High Fuel Level Switch	6288

Operating Instructions for Model 4817 and 4817L Low Fuel Level Switches and 6288 High Fuel Switches

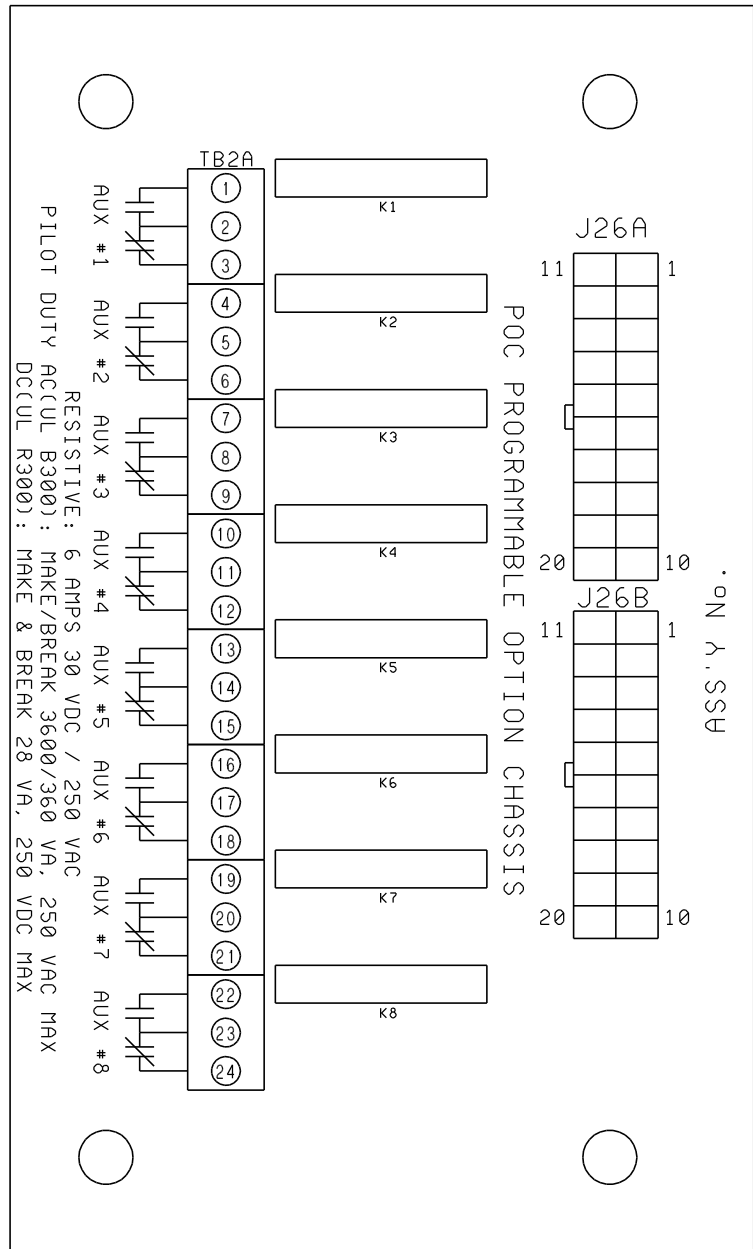
Long and Short Rod Fuel Switches (US Measurements)

Long and Short Rod Fuel Switches (Metric Measurements)

Long and Short Rod Fuel Switches for Oval Tank – Float Settings (US and Metric)

AUX ALARM CONTACT DEFINITIONS FIXED WHEN CONNECTED TO DC-CU P32 (SEE TABLE BELOW)

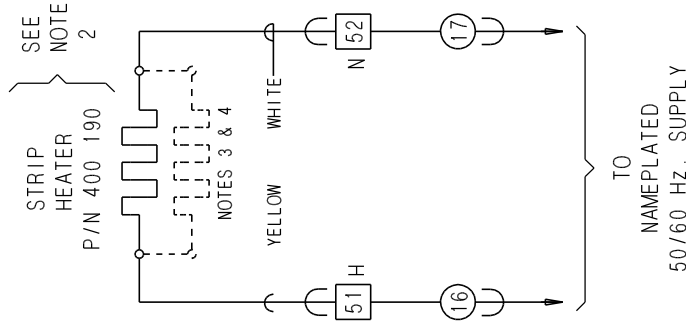
FIELD ALARM RELAY DEFINITIONS	
AUX 1	BATTERY #1 FAILURE
AUX 2	AC FAILURE
AUX 3	BATTERY #2 FAILURE
AUX 4	LOW OIL PRESSURE
AUX 5	SWITCH OFF
AUX 6	HIGH WATER TEMP
AUX 7	FAILURE TO START
AUX 8	ENGINE OVER SPEED



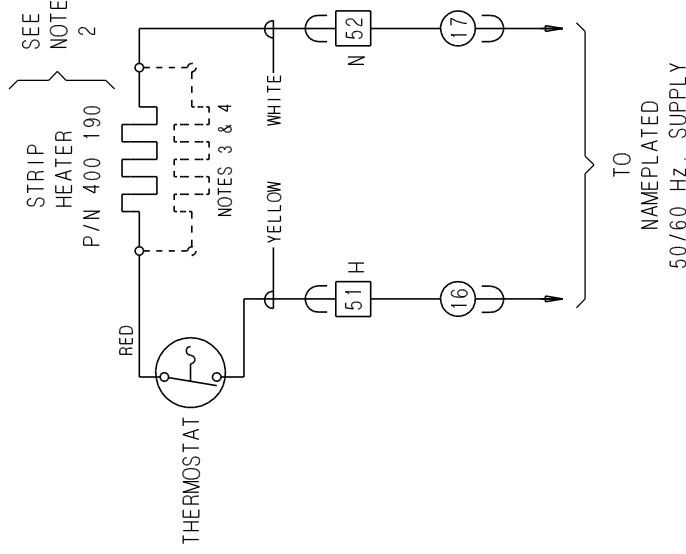
# DEC Diesel Fire Pump Controller Mod. 19, 20 or 20A

# MASTER

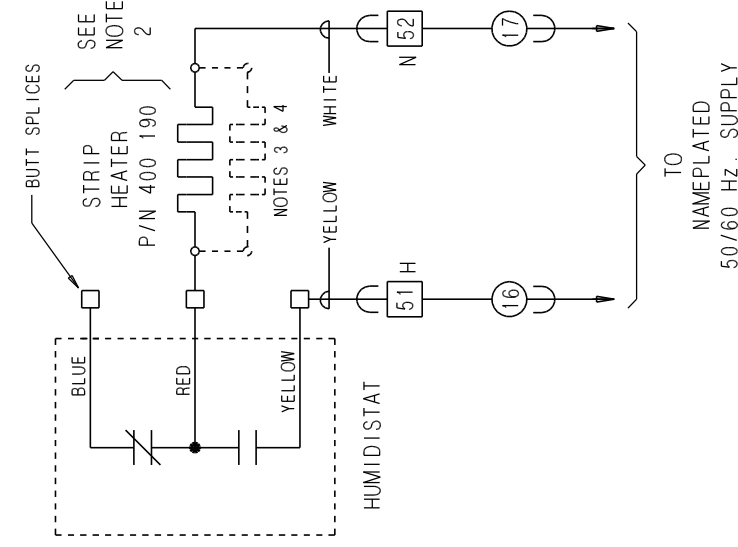
MOD. 19-  
STRIP HEATER



MOD. 20- HEATER  
& THERMOSTAT



MOD. 20A-HEATER  
& HUMIDISTAT



NOTES:

1. SEE ENGINE CONTROLLER SCHEMATIC DIAGRAM FOR CONTROLLER DETAILS.
2. STRIP HEATERS RATED 150 WATTS AT 230 V.A.C. FACTORY CONNECTED IN CONTROLLER TO INTERNAL 115 V.A.C. SOURCE TO YIELD 37.5 WATTS.
3. FOR 220 THRU 240 VAC CONTROLLERS, TWO STRIP HEATERS ARE FACTORY WIRED IN SERIES WHICH YIELDS 75 WATTS.
4. WHEN A BASE CABINET IS SUPPLIED, AN ADDITIONAL HEATER(S) IS MOUNTED INSIDE.



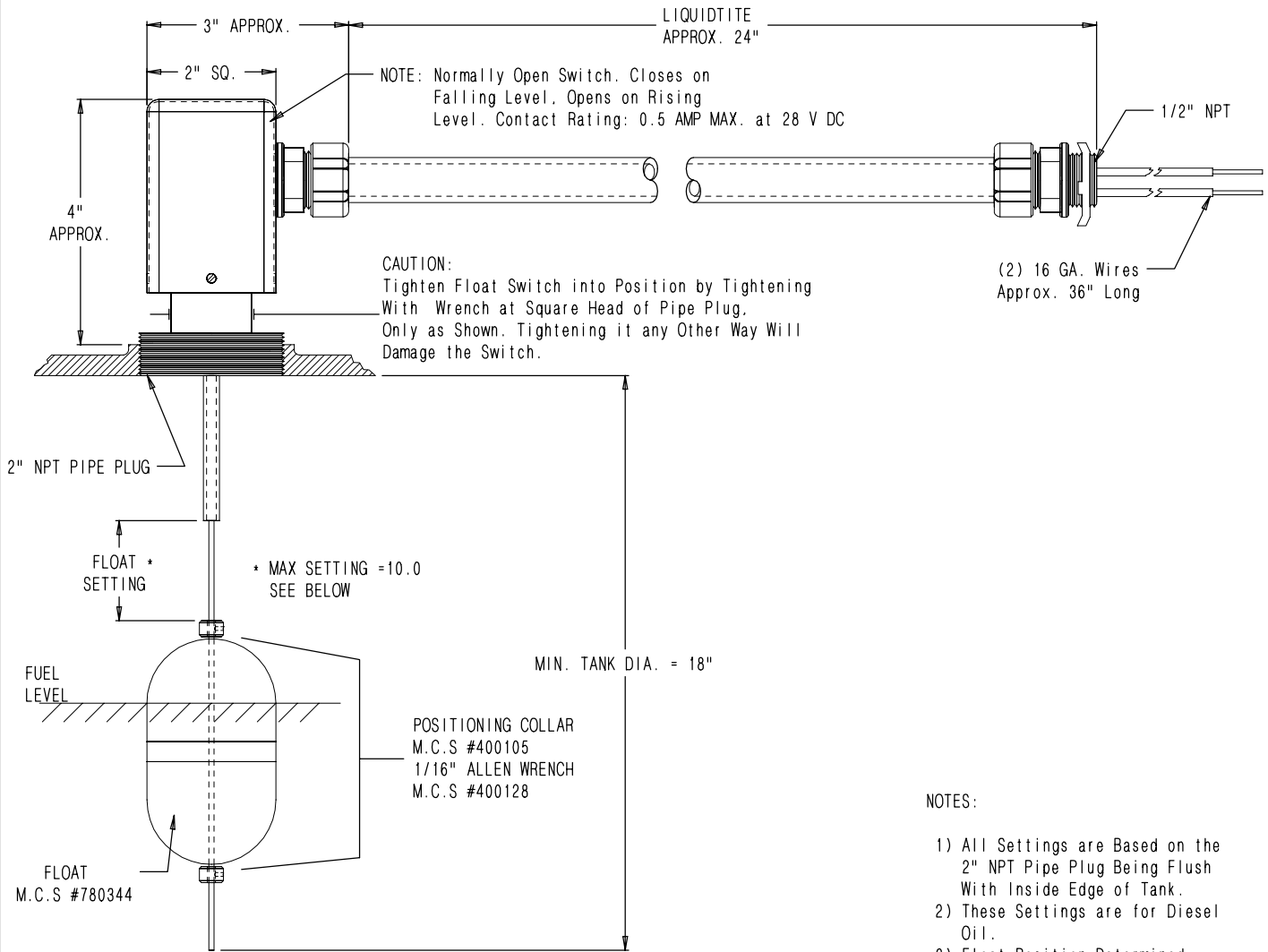
**Master Control Systems Inc.**  
LAKE BLUFF, ILLINOIS U.S.A.

WIRING DIAGRAM-MOD. 19, 20 OR 20A HEATER WITH OR WITHOUT  
THERMOSTAT OR HUMIDISTAT IN DEC SERIES CONTROLLERS - G4

Date 6 June 2012  
Drawing 22830  
Issue 1

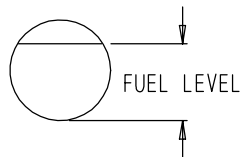
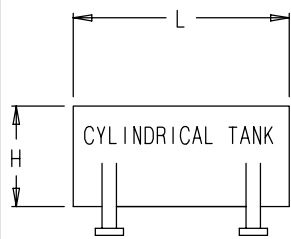


ISSUE	SUMMARY		
11	PER ECN 1775	FE	16 MAR. 98
12	Add Float Level/ECN 2532	BSH	21 JUL. 04



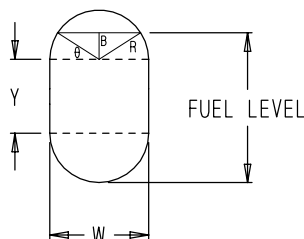
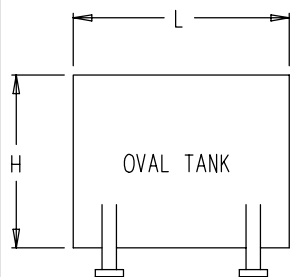
NOTES:

- 1) All Settings are Based on the 2" NPT Pipe Plug Being Flush With Inside Edge of Tank.
- 2) These Settings are for Diesel Oil.
- 3) Float Position Determined With Float Rod Fully Extended.



CYLINDRICAL TANK FLOAT SETTING FORMULAS

80% Fuel Level = 0.746 x Tank Dia.  
 Float Level = 0.254 x (Tank Dia.) - 3.25" in Fuel (Retracted)  
 Float Setting = 0.254 x (Tank Dia.) - 4.25" in Air (extended)



OVAL TANK FLOAT SETTING FORMULAS

$$\left( (H - W) W \right) + \left[ \pi \left( \frac{W}{2} \right)^2 \right] 0.2 = \frac{\pi R^2 \theta}{360} - \frac{R^2 \sin \theta}{2}$$

SOLVE FOR  $\theta$

$$B = R \cos \left( \frac{\theta}{2} \right)$$

80% FUEL LEVEL =  $\frac{W}{2} + Y + B$   
 FUEL LEVEL = H - FUEL LEVEL - 3.25"  
 FLOAT SETTING = H - FUEL LEVEL - 4.25"

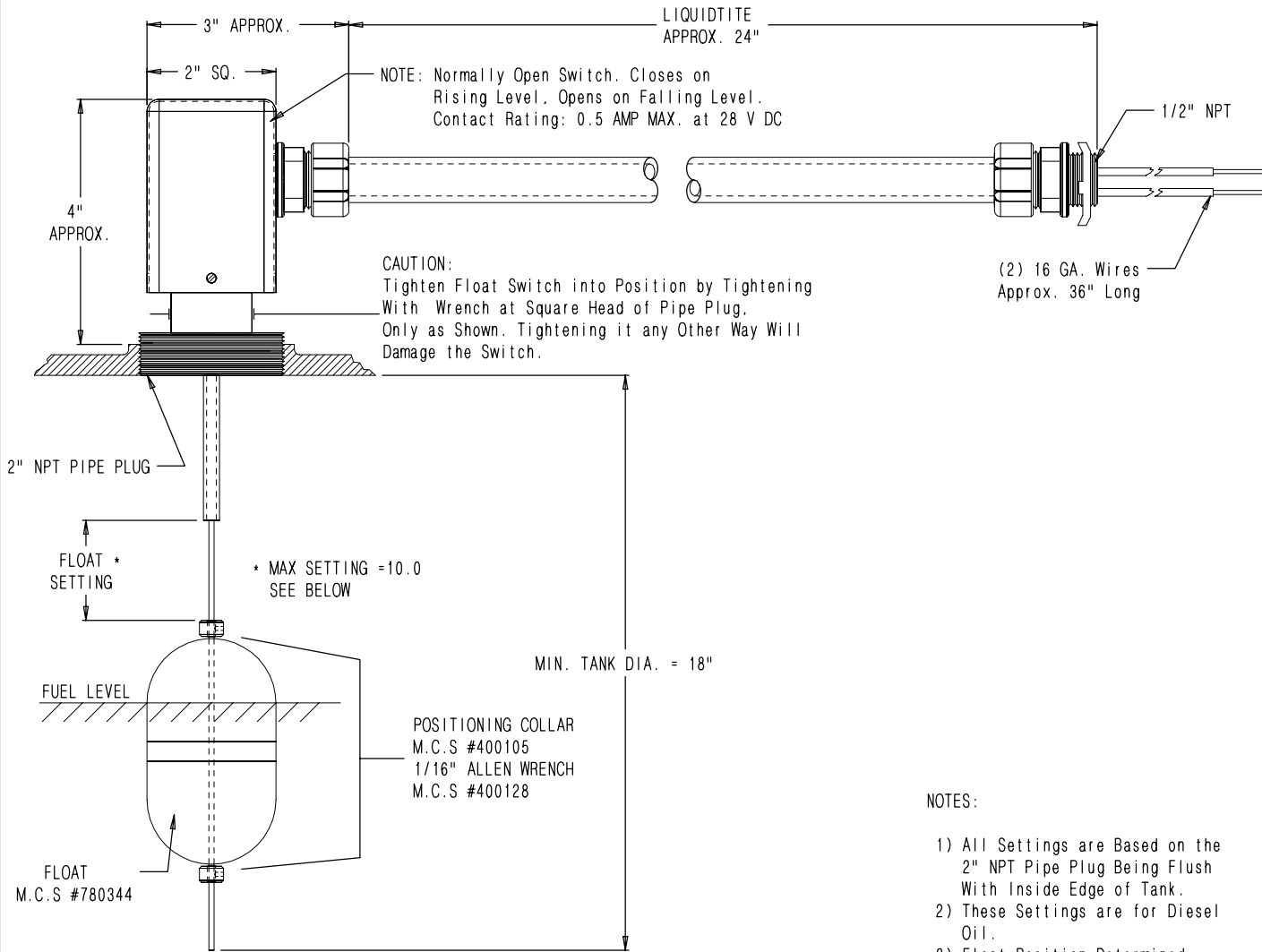
SCALE 3/8" = 1"

LOW FUEL SWITCH MODEL 4817 (SHORT ROD) INSTALLATION DETAILS	
MC MASTER CONTROL SYSTEMS INC. LAKE BLUFF, ILLINOIS U.S.A.	
USED ON	RE-PLOT 21 JUL. 04
DRN. FE	DES.
APP.	DATE 9 SEP. 74
DWG. 4817	ISS. 12 SHEET 1 OF 1

\*For Float Settings See: 4817 - 6288\_Fuel\_Switch\_Settings.WP1

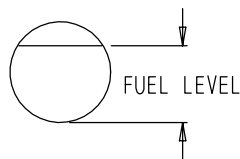
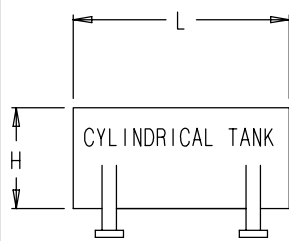


ISSUE	SUMMARY
6	Corrected Dwg/ECN-2057. JEM 25 May 00
7	Add Float Level/ECN 2532 BSH 21 JUL. 04



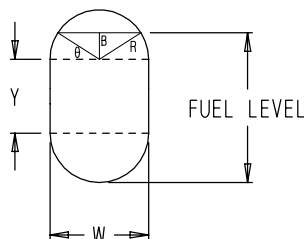
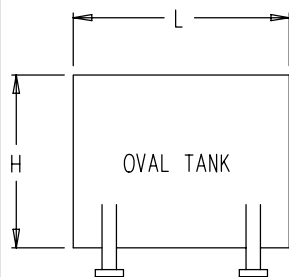
NOTES:

- 1) All Settings are Based on the 2" NPT Pipe Plug Being Flush With Inside Edge of Tank.
- 2) These Settings are for Diesel Oil.
- 3) Float Position Determined With Float Rod Fully Extended.



CYLINDRICAL TANK FLOAT SETTING FORMULAS

80% Fuel Level = 0.746 x Tank Dia.  
 Float Level = 0.254 x (Tank Dia.) - 3.25" in Fuel (Retracted)  
 Float Setting = 0.254 x (Tank Dia.) - 4.25" in Air (extended)



OVAL TANK FLOAT SETTING FORMULAS

$$\left( [(H - W)W] + \left[ \pi \left( \frac{W}{2} \right)^2 \right] \right) 0.2 = \frac{\pi R^2 \theta}{360} - \frac{R^2 \sin \theta}{2}$$

SOLVE FOR  $\theta$

$$B = R \cos \left( \frac{\theta}{2} \right)$$

80% FUEL LEVEL =  $\frac{W}{2} + Y + B$   
 FUEL LEVEL = H - FUEL LEVEL - 3.25"  
 FLOAT SETTING = H - FUEL LEVEL - 4.25"

SCALE 3/8" = 1"

HIGH FUEL SWITCH MODEL 6288 INSTALLATION DETAILS	
MC MASTER CONTROL SYSTEMS INC. LAKE BLUFF, ILLINOIS U.S.A.	
USED ON	RE-PLOT 21 JUL. 04
DRN. FE	DES.
APP.	DATE 22 NOV. 77
DWG. 6288	ISS. 7 SHEET 1 OF 1

\*For Float Settings See: 4817 - 6288\_Fuel\_Switch\_Settings.WP1

## **Operating Instructions**

### **Models 4817 -and- 4817L Low Fuel Switches**

**- and -**

### **6288 High Fuel Switch**

**Installation:** The switch is to be installed in a 2" nominal thread tank opening. The switch is to be tightened by the flats located between the threads and the switch body. **Do not wrench or torque the switch body.** The wiring is terminated in 3/8" seal-tight flexible conduit which is terminated with a 1/2" nominal male threaded conduit fitting. The maximum current rating of the switch is 1/2 Amp. at 28 V.A.C. See drawing for float setting and installation details.

**Low Fuel Switch Sequence:** The Model 4817 and 4817L N.C. Low Fuel Switch consists of a "Form A" reed capsule, an actuating magnet and, a ferrous magnet shunt. When the float is **down** (low fuel) the magnet shunt is lowered out of the magnet field which causes the reed switch to close. This represents the alarm condition. When the float is **up** the magnet shunt bypasses the magnet field away from the reed switch causing it to be open. This is the "normal" non-alarm state.

**High Fuel Switch Sequence:** The Model 6288 N.O. Low Fuel Switch consists of a "Form A" reed capsule, an actuating magnet and, a ferrous magnet shunt. When the float is **up** (high fuel) the magnet shunt is raised out of the magnet field which causes the reed switch to close. This represents the alarm condition. When the float is **down** the magnet shunt bypasses the magnet field away from the reed switch causing it to open. This is the "normal" non-alarm state.

**Adjustment:** Drawing 4817, 4817L & 6288 shows float adjustment data for various sizes of tanks. Low Fuel Alarm is normally considered to be at levels below 80% full.

### **Replacement Parts List**

<b><u>Model and Drawing No.</u></b>	<b><u>M.C.S. Part No.</u></b>	<b><u>Description</u></b>
4817	B800372	Complete Normally Closed <u>Low Fuel Switch</u> - Short Rod
4817L	B801111	Complete Normally Closed <u>Low Fuel Switch</u> - Long Rod
6288	B800018	Complete Normally Open <u>High Fuel Switch</u> - Short Rod

Master Control Systems, Inc.  
910 North Shore Drive  
P.O. Box 276  
Lake Bluff, IL 60044 U.S.A.  
Phone: 847/295-1010 Fax: 847/295-0704

**Long -and- Short Rod Fuel Switches  
Float Settings (Inches) for Cylindrical Tanks (U.S. Units)**

Round Tank Dia.	50%		60%		75%		80%		85%		90%		95%	
	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting
18	9.000	4.750	10.420	3.375	12.636	1.125	13.427	--	14.266	--	15.183	--	16.248	--
19	9.500	5.250	10.998	3.750	13.338	1.375	14.173	--	15.059	--	16.027	--	17.151	--
20	10.000	5.750	11.577	4.125	14.040	1.750	14.919	--	15.851	--	16.870	--	18.054	--
21	10.500	6.250	12.156	4.625	14.742	2.000	15.664	1.125	16.644	--	17.714	--	18.957	--
22	11.000	6.750	12.735	5.000	15.444	2.250	16.410	1.375	17.436	--	18.557	--	19.859	--
23	11.500	7.250	13.314	5.375	16.146	2.625	17.156	1.625	18.229	--	19.401	--	20.762	--
24	12.000	7.750	13.893	5.875	16.848	2.875	17.902	1.875	19.022	--	20.245	--	21.665	--
25	12.500	8.250	14.472	6.250	17.550	3.250	18.648	2.125	19.814	--	21.088	--	22.567	--
26	13.000	8.750	15.051	6.750	18.252	3.500	19.394	2.375	20.607	1.125	21.932	--	23.470	--
27	13.500	9.250	15.629	7.125	18.954	3.750	20.140	2.625	21.399	1.375	22.775	--	24.373	--
28	14.000	9.750	16.208	7.500	19.656	4.125	20.886	2.875	22.192	1.500	23.619	--	25.275	--
29	14.500	10.250	16.787	8.000	20.358	4.375	21.632	3.125	22.984	1.750	24.462	--	26.178	--
30	15.000	10.750	17.366	8.375	21.060	4.750	22.378	3.375	23.777	2.000	25.306	--	27.081	--
31	15.500	11.250	17.945	8.750	21.762	5.000	23.124	3.625	24.570	2.125	26.149	--	27.983	--
32	16.000	11.750	18.524	9.250	22.464	5.250	23.870	3.875	25.362	2.375	26.993	--	28.886	--
33	16.500	12.250	19.103	9.625	23.166	5.625	24.616	4.125	26.155	2.625	27.836	--	29.789	--
34	17.000	12.750	19.682	10.000	23.868	5.875	25.362	4.375	26.947	2.750	28.680	--	30.692	--
35	17.500	13.250	20.260	10.375	24.570	6.125	26.107	4.625	27.740	3.000	29.523	1.125	31.594	--
36	18.000	13.750	20.839	10.750	25.272	6.500	26.853	4.875	28.532	3.250	30.367	1.250	32.497	--
37	18.500	14.250	21.418	11.125	25.974	6.750	27.599	5.125	29.325	3.375	31.210	1.500	33.400	--
38	19.000	14.750	21.997	11.500	26.676	7.125	28.345	5.375	30.118	3.625	32.054	1.750	34.302	--
39	19.500	15.250	22.576	11.875	27.378	7.375	29.091	5.625	30.910	3.875	32.897	1.875	35.205	--
40	20.000	15.750	23.155	12.250	28.080	7.625	29.837	5.875	31.703	4.000	33.741	2.000	36.108	--
41	20.500	16.250	23.734	12.625	28.782	8.000	30.583	6.125	32.495	4.250	34.584	2.125	37.010	--
42	21.000	16.750	24.312	13.000	29.484	8.250	31.329	6.375	33.288	4.500	35.428	2.375	37.913	--
43	21.500	17.250	24.891	13.375	30.185	8.625	32.075	6.625	34.080	4.750	36.271	2.500	38.816	--
44	22.000	17.750	25.470	13.750	30.887	8.875	32.821	6.875	34.873	4.875	37.115	2.625	39.718	--
45	22.500	18.250	26.049	14.125	31.589	9.125	33.567	7.125	35.666	5.125	37.958	2.750	40.621	--
46	23.000	18.750	26.628	14.500	32.291	9.500	34.313	7.375	36.458	5.250	38.802	3.000	41.524	--
47	23.500	19.250	27.207	14.875	32.993	9.750	35.059	7.625	37.251	5.500	39.646	3.125	42.427	--
48	24.000	19.750	27.786	15.250	33.695	10.000	35.804	8.000	38.043	5.750	40.489	3.250	43.329	--
49	24.500	--	28.365	15.625	34.397	10.250	36.550	8.250	38.836	6.000	41.333	3.375	44.232	--
50	25.000	--	28.943	16.000	35.099	10.500	37.296	8.500	39.628	6.125	42.176	3.500	45.135	--
51	25.500	--	29.522	16.375	35.801	10.750	38.042	8.750	40.421	6.375	43.020	3.625	46.037	--
52	26.000	--	30.101	16.750	36.503	11.000	38.788	9.000	41.213	6.500	43.863	3.750	46.940	--
53	26.500	--	30.680	17.125	37.205	11.250	39.534	9.250	42.006	6.750	44.707	4.000	47.843	--
54	27.000	--	31.259	17.500	37.907	11.500	40.280	9.500	42.799	7.000	45.550	4.250	48.745	1.000
55	27.500	--	31.838	18.250	38.609	11.750	41.026	9.750	43.591	7.125	46.394	4.375	49.648	1.125
56	28.000	--	32.417	18.625	39.311	12.000	41.772	10.000	44.384	7.375	47.237	4.500	50.551	1.250
57	8.500	--	32.995	19.000	40.013	12.250	42.518	10.250	45.176	7.625	48.081	4.625	51.453	1.375
58	29.000	--	33.574	--	40.715	12.375	43.264	10.500	45.969	7.750	48.924	4.875	52.356	1.500
59	29.500	--	34.153	--	41.417	12.625	44.010	10.750	46.761	8.000	49.768	5.000	53.259	1.500
60	30.000	--	34.732	--	42.119	12.875	44.756	11.000	47.554	8.250	50.611	5.125	54.162	1.62

NOTE: 4) Use LONG ROD (two float) Model 4817L or Model 6288L for all Settings shown in **bold italics**.

## Long -and- Short Rod Fuel Switches

### Float Settings (Centimeters) for Cylindrical Tanks (Metric Units)

Round Tank Dia.	50%		60%		75%		80%		85%		90%		95%	
	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting	Fuel Height	Float Setting
45.7	22.9	12.1	26.5	8.6	32.1	2.9	34.1	--	36.2	--	38.6	--	41.3	--
48.3	24.1	13.3	27.9	9.5	33.9	3.5	36.0	--	38.2	--	40.7	--	43.6	--
50.8	25.4	14.6	29.4	10.5	35.7	4.4	37.9	--	40.3	--	42.9	--	45.9	--
53.3	26.7	15.9	30.9	11.7	37.4	5.1	39.8	2.9	42.3	2.9	45.0	--	8.1	--
55.9	27.9	17.1	32.3	12.7	39.2	5.7	41.7	3.5	44.3	3.5	47.1	--	50.4	--
58.4	29.2	18.4	33.8	13.7	41.0	6.7	43.6	4.1	46.3	4.1	49.3	--	52.7	--
61.0	30.5	19.7	35.3	14.9	42.8	7.3	45.5	4.8	48.3	--	51.4	--	55.0	--
63.5	31.8	21.0	36.8	15.9	44.6	8.3	47.4	5.4	50.3	--	53.6	--	57.3	--
66.0	33.0	22.2	38.2	17.1	46.4	8.9	49.3	6.0	52.3	2.9	55.7	--	59.6	--
68.6	34.3	23.5	39.7	18.1	48.1	9.5	51.2	6.7	54.4	3.5	57.8	--	61.9	--
71.1	35.6	24.8	41.2	19.1	49.9	10.5	53.1	7.3	56.4	3.8	60.0	--	64.2	--
73.7	36.8	24.1	42.6	20.3	51.7	11.1	54.9	7.9	58.4	4.4	62.1	--	66.5	--
76.2	38.1	25.4	44.1	21.3	53.5	12.7	56.8	8.6	60.4	5.1	64.3	--	68.8	--
78.7	39.4	26.7	45.6	22.2	55.36	12.7	58.7	9.2	62.4	5.4	66.4	--	71.1	--
81.3	40.6	27.9	47.1	23.5	57.1	13.3	60.6	9.8	64.4	6.0	68.6	--	73.4	--
83.8	41.9	29.2	48.5	24.4	58.8	14.3	62.5	10.5	66.4	6.7	70.7	--	75.7	--
86.4	43.2	30.5	50.0	23.8	60.6	14.9	64.4	11.1	68.4	7.0	72.8	--	78.0	--
88.9	44.5	31.8	51.5	24.8	62.4	15.6	66.3	11.7	70.5	7.6	75.0	--	80.2	--
91.4	45.7	33.0	52.9	26.0	64.2	16.5	68.2	12.4	72.5	8.3	77.1	--	82.5	--
94.0	47.0	34.3	54.4	27.0	66.0	17.1	70.1	13.0	74.5	8.6	79.3	--	84.8	--
96.5	48.3	35.6	55.9	27.9	67.8	18.7	72.0	13.7	76.5	9.2	81.4	--	87.1	--
99.1	49.5	36.8	57.3	29.2	69.5	18.7	73.8	14.3	78.5	9.8	83.6	--	89.4	--
101.6	50.8	38.1	58.8	30.2	71.3	19.4	75.8	14.9	80.5	10.2	85.7	--	91.7	--
104.1	52.1	39.4	60.3	31.4	73.1	20.3	77.7	15.6	82.5	10.8	87.8	--	94.0	--
106.7	53.3	40.6	61.8	32.4	74.9	21.9	79.6	16.2	84.6	11.4	90.0	--	96.3	--
109.2	54.6	41.9	63.2	33.3	76.7	21.9	81.5	16.8	86.6	11.7	92.1	--	98.6	--
111.8	55.9	43.2	64.7	34.6	78.5	22.5	83.4	17.5	88.6	12.4	94.3	--	100.9	--
114.3	57.2	44.5	66.2	35.6	80.2	23.2	85.3	18.1	90.6	13.0	96.4	--	103.2	--
116.8	58.4	45.7	67.6	36.5	82.0	24.1	87.2	18.7	92.6	13.3	98.6	--	105.5	--
119.4	59.7	47.0	69.1	37.8	83.8	24.8	89.0	19.7	94.6	14.0	100.7	--	107.8	--
121.9	61.0	48.3	70.6	38.7	85.6	23.8	90.9	20.3	96.6	14.6	102.8	--	110.1	--
124.5	62.2	--	72.0	39.7	87.4	24.4	92.8	21.0	98.6	14.9	105.0	--	112.3	--
127.0	63.5	--	73.5	41.0	89.2	25.4	94.7	21.6	100.7	15.6	107.1	--	114.6	--
129.5	64.8	--	75.0	41.9	90.9	26.0	96.6	22.2	102.7	16.2	109.3	--	116.9	--
132.1	66.0	--	76.5	43.2	92.7	26.7	98.5	22.9	104.7	16.5	111.4	--	119.2	--
134.6	67.3	--	77.9	44.1	94.5	27.6	100.4	23.5	106.7	17.1	113.6	--	121.5	--
137.2	68.6	--	79.4	45.1	96.3	28.3	102.3	24.1	108.7	17.8	115.7	--	123.8	2.5
139.7	69.9	--	80.9	46.4	98.1	29.2	104.2	24.8	110.7	18.1	117.8	--	126.1	2.9
142.2	71.1	--	82.3	47.3	99.9	29.8	106.1	25.4	112.7	18.7	120.0	--	128.4	3.2
144.8	72.4	--	83.8	48.3	101.6	30.5	108.0	24.1	114.7	19.4	122.1	--	130.7	3.2
147.3	73.7	--	85.3	--	103.4	31.4	109.9	24.8	116.8	19.7	124.3	--	133.0	3.5
149.9	74.9	--	86.7	--	105.2	32.1	111.8	25.4	118.8	20.3	126.4	--	135.3	3.8
152.4	76.2	--	88.2	--	107.0	32.7	113.7	26.0	120.8	21.0	128.6	--	137.6	4.1

NOTE: 4) Use LONG ROD (two float) Model 4817L or Model 6288L for all Settings shown in **bold italics**.

## Long -and- Short Rod Fuel Switches

### Oval Tank Settings Float Settings (Inches)

Height	50%			60%			75%			80%			90%		
	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting
36.000	18.000	18.000	13.000	21.260	14.740	9.750	26.140	9.860	5.625	20.770	8.230	4.000	29.243	6.757	2.500
42.000	21.000	21.000	16.000	24.640	17.360	12.375	29.443	12.557	8.250	30.181	11.819	7.625	31.763	10.237	6.000
44.250	22.130	22.130	17.125	25.970	18.280	13.250	31.146	13.104	8.875	31.919	12.331	8.125	33.590	10.660	6.375
45.000	22.500	22.500	17.500	26.510	18.490	13.500	32.520	12.480	8.250	33.901	11.099	6.875	35.584	9.416	5.125
50.000	25.000	25.000	20.000	29.440	20.560	15.625	36.110	13.890	9.625	37.453	12.547	8.250	39.395	10.605	6.375

### Oval Tank -- Float Settings (Centimeters)

Height	50%			60%			75%			80%			90%		
	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting	Fuel Height	Air Height	Float Setting
91.4	45.7	45.7	33.0	54.0	37.4	24.8	66.4	25.0	14.3	52.8	20.9	10.2	74.3	17.2	6.4
106.7	53.3	53.3	40.6	62.3	44.1	31.4	74.8	31.9	21.0	76.7	30.0	19.4	80.7	26.0	15.2
111.8	53.7	53.7	43.5	66.0	46.4	34.0	79.1	33.3	22.5	81.1	31.3	20.6	85.3	20.1	16.2
114.3	57.2	57.2	44.5	67.3	47.0	34.3	82.6	31.7	21.0	86.1	28.2	17.6	90.4	23.9	13.0
127.0	63.5	63.5	50.8	74.8	52.2	39.7	91.7	35.3	24.4	95.1	31.9	21.0	100.1	26.9	16.2

**Notes:**

- 1) Reference N.F.P.A. Standard NFPA-20 A-2-18.
- 2) Typical Low Fuel Level Switch (4817) Settings are 50% thru 80%.
- 3) Typical High Fuel Level Switch (6288) Settings are 80% thru 95%.
- 4) Use LONG ROD (two float) Model 4817L or Model 6288L for all Settings shown in **bold italics**.
- 5) Fuel Height values are Height of Fuel above Tank Bottom (for reference only).  
 Air Height values are the distance from the Fuel Level to the top of the Tank (for reference only).  
 Float Setting is the distance from the top of the Float (or Top Float on Long Rod Fuel Switches) to the bottom of the Float Rod Guide Tube, with the Float (Rod) Extended (Down).
- 6) Float Setting values are calculated for Diesel Fuel.
- 7) Refer to Drawing 4817 for Short Rod (Single Float) Low Fuel Switch Dimensions.
- 8) Refer to Drawing 4817L for Long Rod (Two Float) Low Fuel Switch Dimensions.
- 9) Refer to Drawing 6288 for High Fuel Switch Dimensions.
- 10) Refer to Drawing 6288 for High Fuel Switch Dimensions.

NOTE: 4) Use LONG ROD (two float) Model 4817L or Model 6288L for all Settings shown in **bold italics**.



**Master Control Systems, Inc.  
5 Year Limited**

# Warranty

**Master Control Systems, Inc. guarantees the products listed below against defects in material and workmanship for a period of 5 years from date of invoice in accordance with the following repair or replacement coverage.**

Parts and labor — 2 Years

Parts — 5 Years

**Products Covered**

ECA, ECP, ECR, ECO, ECY, ECS, ECT, ECAT, ECPT, ECRT, ECOT, ECYT, ECST, ECTT, ECVA, ECVR, ECVS, ECVAT, ECVRT, ECVST, DEC

The manufacturer is not responsible for damage to equipment through improper installation or attempts to operate under conditions for which it is not designed. The Manufacturer assumes no responsibility and accepts no charges for repairs which are not authorized by the Manufacturer, even if the controls are proved to be defective. This guarantee is limited to repair and replacement at place of manufacture or by authorized Representatives of Master Control Systems, Inc. Under no circumstances does the Manufacturer guarantee apparatus or equipment not of its product offering. The Manufacturer's total liability under this warranty is for the repair or replacement of products which are proved to be defective. Under no circumstances shall the Manufacturer be liable for any other damages or losses.



**MASTER**  
The Intelligent Choice





**Master Control Systems, Inc.  
5K Lightning Protection**

# **GUARANTEE**

**In addition to our 5 year limited warranty, Master Control Systems, Inc. guarantees the products listed below against damage from any transient voltage surge, including those caused by lightning, for a period of 5 years from date of invoice or a maximum of \$5,000 in accordance with the following repair or replacement coverage.**

Parts and labor — 2 Years

Parts — 5 Years

**Products Covered**

ECA, ECP, ECR, ECO, ECY, ECS, ECT, ECAT, ECPT, ECRT, ECOT, ECYT, ECST, ECTT, ECVA, ECVR, ECVS, ECVAT, ECVRT, ECVST, DEC

The manufacturer is not responsible for damage to equipment through improper installation or attempts to operate under conditions for which it is not designed. The Manufacturer assumes no responsibility and accepts no charges for repairs which are not authorized by the Manufacturer, even if the controls are proved to be damaged by a transient voltage surge. This guarantee is limited to repair and replacement at place of manufacture or by authorized Representatives of Master Control Systems, Inc. Under no circumstances does the Manufacturer guarantee apparatus or equipment not of its product offering. The Manufacturer's total liability under this warranty is for the repair or replacement of products up to \$5,000 which are proved to be damaged due to transient voltage surges. Under no circumstances shall the Manufacturer be liable for any other damages or losses.



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