



INSTALLATION AND MAINTENANCE MANUAL FOR
DIESEL ENGINE FIRE PUMP CONTROLLER
AUTOMATIC CONTROLLER
GPD

1. INTRODUCTION

Diesel engine fire pump controllers are designed to automatically start a diesel engine driven fire pump upon detection of a pressure drop in the fire protection system. A Diesel Engine fire Pump Controller provides automatic & manual starting and stopping. Automatic start is controlled by a pressure transducer or by remote automatic devices as deluge valve. Manual

start is controlled by remote manual button or by controller push button. The automatic shutdown option provides a 30-minutes automatic stop after automatic start once all starting causes have returned to normal. The diesel engine fire pump controller includes two battery chargers to maintain engine batteries continuously charged.

2. TYPES OF DIESEL ENGINE FIRE PUMP CONTROLLERS

FIRE PUMP CATALOGUE NUMBER					
MODEL NO. EXAMPLE : GPD – N – 12 – F – BCE10-110					
GPD	N	12	F	BCE10	110
Model prefix	Type of ground	Battery voltage	Type of cabinet	Type of Battery charger	Incoming voltage
GPD	N : Negative ground	12 : 12V	F : Floor mounted (with 18" feet)		110: 110/120V 50/60Hz
	P : Positive ground	24 : 24V	W : Wall mounted		220: 208/240V 50/60Hz
			B : Base mounted (transducer on the side)		

3. INSTALLATION

This diesel controller is UL listed, FM certified and CSA approved. The controller is built in accordance with the latest edition of the National Fire Protection Association standard for the Installation of Centrifugal Fire Pumps,

NFPA No.20 (Centrifugal Fire Pumps 2010 Edition). The controller is intended to be installed in accordance to NFPA 20-2010 and

In USA	National Electrical Code NFPA 70
In Canada	Canadian Electrical Code, Part 1
Others *	Local Electrical Codes *

* Only American and Canadian applicable codes have been considered during the design of the controllers and the selection of components.

4. LOCATION

The controller shall be located as close as practical to the motor it controls and shall be within sight of the motor.

The controller shall be so located or so protected that it will not be damaged by water escaping from pump or pump connections. Current carrying parts of controller shall be not less than 12 in. (305 mm) above the floor level.

Working clearances around controller shall comply with NFPA 70, National Electrical Code, Article 110 or C22.1, Canadian Electrical Code, Article 26.302 or other local codes.

The controller is suitable for use in locations subject to a moderate degree of moisture, such as a damp basement. The pump room ambient temperature shall be between 41°F (5°C) and 122°F (40°C).

The standard controller enclosure is rated NEMA 2 (IP41). It is the installer's responsibility to insure that either the standard enclosure meets the ambient conditions or that an enclosure with an appropriate rating has been provided.

Controllers must be installed inside a building, and they are not designed for outside environment. The paint color may change if controller is exposed to ultraviolet rays during long period of time.

5. MOUNTING

The diesel engine fire pump controller shall be mounted in a substantial manner on a single incombustible supporting structure.

Wall mounted controller shall be attached to the structure or wall using all four (4) mounting ears provided on the controller with hardware designed to support the weight of the controller at a height not less than 12 in. (305 mm) above floor level.

Floor mounted controller shall be attached to the floor using all holes provided on the mounting feet with hardware designed to support the weight of the controller. The mounting feet provide the necessary 12 in. (305 mm) clearance for current carrying parts. A concrete slab is recommended to avoid water accumulation at the controller's feet.

6. CONNECTIONS

6.1 WATER CONNECTIONS

The controller must be connected to the pipe system according to NFPA20-2010, and also to a drain pipe. The water connections are on the bottom of the controller. The connection to the system pressure is a ¼ NPT, an adapter for ½ tubing is provided. The connection to the drain is a tapered connection for plastic tubing. It is necessary to connect the drain to waste connection. Large amount of water may be evacuated.

6.2 ELECTRICAL WIRING AND CONNECTIONS

6.2.1 ELECTRICAL WIRING

The electrical wiring between the power source and the diesel engine fire pump controller shall meet the NFPA 20-2010, Chapter 12.5.2.5 and 12.6.4, NFPA 70 National Electrical Code Article 695 or C22.1 Canadian Electrical Code, Section 32-200 or other local codes.

6.2.2 ELECTRICAL CONNECTIONS

A licensed electrician must supervise the electrical connections.

Only watertight hub fittings shall be used when entering the cabinet to preserve the NEMA rating of the cabinet. The installer is responsible for adequate protection of diesel engine fire pump controller components against

metallic debris or drilling chips. Failure to do so may cause injuries to personnel, damage the controller and subsequently void warranty.

6.2.3 SIZING

Wiring between controller and engine (terminals 1,2,3,4,5,9,10,12,301,302) must be stranded #14AWG as minimum.

For battery wiring (terminals 6, 8 and 11), stranded #12 AWG (or 10 AWG with a fork terminal) wire must be used when distance between controller and batteries is less than 25'/7.6m. For distance between 26'/7.9m to 50'/15.2m, two stranded #12 AWG (or 10 AWG with fork terminal) wires must be used in parallel.

For distance over 50'/15.2m, two stranded #12 AWG (or 10 AWG with fork terminal) wires must be used in parallel, a ancillary stranded #14AWG must be connected directly to the battery to sense the battery voltage – contact factory in this particular case. Power supply wiring must be stranded #14 AWG as minimum.

Incoming power supply terminals are sized for #16 to #6 AWG wire.

6.2.4 INCOMING POWER CONNECTIONS

Diesel engine fire pump controller shall be powered by a dedicated source protected by a fuse or circuit

breaker. Verify the label on the cabinet to select the correct protection.

6.3 TERMINAL STRIP DESCRIPTION

Refer to terminal diagram affixed inside the controller before connecting any terminals.

6.3.1 INCOMING POWER TERMINALS

The power terminals are located on the bottom right and labeled L–N.

The ground terminal is located beside the power terminals.

6.3.2 DIESEL ENGINE CONNECTION

The controller must be connected to the diesel engine control panel. The wiring in between diesel controller and diesel engine control panel must be stranded, not less than #16 AWG and not greater than #6 AWG – refer to 6.2.3 for correct sizing. It is recommended to use fork terminal on this terminal to insure perfect electrical connection.

The terminals are numbered according to the standard:

- 1: FS : fuel solenoid valve (energized to start)
- 2: ER : engine run contact
- 3: OS : engine over speed contact
- 4: OP : engine oil pressure contact
- 5: WT : engine coolant thermostat contact
- 6: B1 : battery #1 positive
- 8: B2 : battery #2 positive
- 9: C1 : start contactor #1
- 10: C2 : start contactor #2
- 11: GND : engine ground
- 12: ST : stop fuel solenoid valve (ETS - energized to stop) – Important see note.
- 301 : ECM selector in alternate position
- 302 : fuel injection malfunction

Note : the #12 signal is Energized to Stop. The signal is always present except if the Jumper “CUT FOR TEMP ETS” is cut. If this jumper is cut, the #12 is energized for a period of time (adjustable by the potentiometer from 3 to 30 min. After that time, the #12 is de-energized.

6.3.3 FIELD CONNECTIONS

The diesel controller is provided with provision inputs that suits most of general installations. These inputs are located on terminal strips J4 and J18. The connection must be FREE of voltage – the connection must be a DRY contact only.

6.3.3.1 LOW FUEL FLOAT SWITCH

One lead of the float switch contact must be connected to the terminal 24 lfl (low fuel level). The second lead

of the float switch contact must be connected to the bottom terminal (common), or directly to the ground. Note : NFPA 20-2007 requires float switch to be activated at the two-thirds of tank capacity.

Note : Float switch contact must closes when low level is detected.

6.3.3.2 DELUGE VALVE

One lead of the deluge valve NC contact must be connected to terminal 25 dv (deluge valve), the second lead must be connected to the bottom terminal (common), or directly to the ground. **It is very important to cut the jumper 19 on the board in order to enable the function.**

6.3.3.3 WATER RESERVOIR LOW

One lead of the float switch contact must be connected to the terminal 26 wl (water level). The second lead of the float switch contact must be connected to the bottom terminal (common), or directly to the ground. A 20 second delay (non adjustable) is introduced to avoid flickering because of float instability.

6.3.3.4 WATER RESERVOIR EMPTY

One lead of the float switch contact must be connected to the terminal 27 we (water reservoir empty). The second lead of the float switch contact must be connected to the bottom terminal (common), or directly to the ground. A 20 second delay (non adjustable) is introduced to avoid flickering because of float instability.

6.3.3.5 LOW PUMP ROOM TEMPERATURE

One lead of the temperature switch contact must be connected to the terminal 28 rt^o (temperature). The second lead of the temperature switch contact must be connected to the bottom terminal (common), or directly to the ground.

6.3.3.6 HIGH FUEL LEVEL

One lead of the float switch contact must be connected to the terminal 29 hfl (high fuel level). The second lead of the float switch contact must be connected to the bottom terminal (common), or directly to the ground. **It is very important to cut the jumper J20 on the board in order to enable the function.**

6.3.3.7 LOW SUCTION PRESSURE

One lead of the pressure switch contact must be connected to the terminal 30 ls (low suction). The second lead of the pressure switch contact must be connected to the bottom terminal (common), or directly to the ground.

6.3.3.8 LOCKOUT SIGNAL

One lead of the lockout signal contact must be connected to the terminal 31 loc (lockout). The second lead of the lockout signal contact must be connected to

the bottom terminal (common), or directly to the ground.

6.3.3.9 REMOTE START

The remote start dry contact must be wired on the J18 1V+ and J18 2 Start contact terminals. By opening this contact, the controller will start the engine. To enable the remote start signal, the factory installed jumper must be removed.

6.3.4 ALARM CONTACTS

Contacts 11-12 and 21-22 are normally closed, contacts 11-14 and 21-24 are normally open.

6.3.4.1 MAIN SWITCH IN MANUAL OR IN OFF POSITION

This contact is connected to terminals strip J5. Terminals Y1–Y2 closes to signal that the main switch is in Manual or in Off position.

6.3.4.2 MAIN SWITCH IN AUTO POSITION

This contact is connected to terminal strip J5. Terminals Y3–Y4 closes to signal that the main switch is in Auto position.

6.3.4.3 ENGINE TROUBLE

DPDT contacts are connected to terminals strip J10.

6.3.4.4 ENGINE RUN

DPDT contacts are connected to terminals strip J11.

6.3.4.5 PUMP ROOM ALARM

DPDT contacts are connected to terminals strip J12.

6.3.4.6 CONTROLLER TROUBLE

DPDT contacts are connected to terminals strip J13 Important : this relay is normally energized when controller is in normal condition. The relay is deenergized when controller trouble is detected.

6.3.4.7 OUTPUT #1

DPDT contacts are connected to terminals strip J14. The contact functionality is programmed at factory. Verify the electrical diagram attached in the controller to know the functionality of this output.

6.3.4.8 OUTPUT # 2

DPDT contacts are connected to terminals strip J15. The contact functionality is programmed at factory. Verify the electrical diagram attached in the controller to know the functionality of this output.

7. CIRCUIT PROTECTION

CB1 protects battery charger 1 transformer.
CB2 protects battery charger 2 transformer.
CB3 protects control circuit from battery 1.
CB4 protects control circuit from battery 2.

If CB1 and CB2 are both left to off position, the led “AC power ON” goes off.
If CB3 and CB4 are both left to off position, the message “no DC power” appears on the screen.

8. CONTROLLER SEQUENCE OF OPERATION

8.1 GENERAL

The controller can be set as automatic controller or be set as a non-automatic controller. As automatic controller, a symbol “A” appears on the right side of the screen. In this configuration, the manual start signals and automatic start signals are enabled.

As non-automatic controller, a symbol “N” appears on the right side of the screen. In this configuration, only manual start signals are enabled to start engine.

8.1.1 AUTOMATIC START SIGNAL

The automatic start signals are either a drop of system pressure below cut in set point, remote start signal from automatic device as deluge valve, automatic weekly test.

8.1.2 MANUAL START SIGNAL

Manual start signals are coming from human action as use of the crank push buttons, as use of remote start signal from remote push button, or action on the run test push button.

8.2 MAIN SWITCH

The main switch is located on the controller door. It is behind a breakable and pad lockable cover.

8.2.1 MAIN SWITCH IN OFF POSITION

This position shuts off the engine and prevents engine from starting. It also resets all alarm conditions if any. In this position, there is no message on the screen excepted “low fuel level” and “ECM position”.

8.2.2 MAIN SWITCH IN MANUAL POSITION

This position provides for manual engine start by energizing the start fuel solenoid valve. Depressing the Crank #1 push button provides manual start with battery #1, depressing the Crank #2 push button provides manual start with battery #2.

By depressing both push buttons simultaneously, the batteries #1 and #2 are used in parallel to start the engine.

‘Fail to start’ and ‘Fail when running’ alarm signals are not operational in this position.

An ‘Overspeed’ condition will stop the engine and will sound the buzzer.

All other alarm signals are operational (buzzer and message) but have no influence on the engine operation.

The engine can be stopped either by depressing the STOP push-button located on the controller or by setting the main switch in OFF position.

8.2.3 MAIN SWITCH IN AUTO POSITION

On AUTO position, any starting condition will initiate the automatic engine cranking cycle. The cranking cycle consists of energizing the fuel solenoid valve (wire #1)/de-energizing stop solenoid (wire #12) and cranking the engine for 15 seconds and then rest for 15 seconds, this sequence is repeated six (6) times. If the engine fails to start, then the controller will indicate an "Engine fail to start" alarm. The battery changeover is made automatically but if one battery is inoperative, missing or weak, the cranking sequence locks out on the remaining battery.

Note : if both batteries are declared weak, the next cranking cycle will be initiated with both batteries.

8.2.3.1 WATER PRESSURE CONTROL

The water pressure control is enabled only when cut-in and cut-out setpoints are set at any value other than 0psi.

The engine will automatically start when the pressure transducer detects a drop of pressure; provided that the engine was not already started and the controller is not locked out by any other equipment.

The engine starting sequence due to water pressure control can be delayed using the sequential start timer. All engine alarm signals are operational but do not prevent the engine to run, except for the overspeed signal that immediately stops the engine.

If lockout signal appears when engine is running or during cranking sequence under water pressure control, the engine is stopped waiting the lockout signal to disappear in order to restart.

Manual shutdown

The controller is supplied with the automatic shutdown provision factory defeated (to offer manual shutdown only). The engine can be stopped by depressing the STOP push-button located on the controller after the pressure is re-established (above the cut out pressure adjustment).

The engine can also be stopped by setting the main switch in OFF position.

Automatic shutdown

If the controller is field converted to automatic shutdown, a running period timer (factory set at 30 minutes) will automatically shutdown the motor after all starting causes have returned to normal. The engine can also be stopped by depressing the STOP push-button located on the controller provided all starting causes have returned to normal and system pressure is above the cut out pressure adjustment.

The engine can also be stopped by setting the main switch in OFF position.

8.2.3.2 AUTOMATIC REMOTE CONTROL

When automatic remote equipment (as deluge valve) is connected, the controller can be started by the opening of a normally closed contact (fail safe circuit) on this equipment independent of the pressure transducer.

The engine can be manually stopped by the STOP push-button located on the controller but only after the fire protecting equipment contact has returned to normal (provided that the system pressure is above the cut out pressure adjustment).

All engine alarm signals are operational but do not prevent the engine to run, except for the Overspeed signal that immediately stops the engine.

Starting sequence due to automatic remote control signal can be delayed with the sequential start timer (see 11.1.4)

The engine can also be stopped by setting the main switch in OFF position or by depressing the stop push button provided the automatic remote signal is vanished.

If lockout signal appears when engine is running or during cranking sequence under automatic remote control, the engine is stopped waiting the lockout signal to disappear in order to restart.

8.2.3.3 MANUAL REMOTE CONTROL

The engine can be started by the momentary opening of a manual remote contact independent of any automatic system. The engine can be manually stopped by depressing the STOP push-button located on the controller (provided that the system pressure is above the cut out pressure adjustment). All engine alarm signals are operational but do not prevent the engine to run, except for the Overspeed signal that immediately stops the engine.

Starting sequence due to manual remote control signal can be delayed by setting DIP Switch S5-4 and with the adjustment of sequential start timer (see 11.1.4).

The engine can also be stopped by setting the main switch in OFF position or by depressing the stop push button provided the manual remote control signal is vanished.

The lockout signal is disabled under manual remote control, the engine continues to run or crank whatever is the lockout signal.

8.2.3.4 WEEKLY TEST

The controller can be set for a weekly test. When the weekly test is enabled, at the programmed start time, the two way solenoid valve opens to drain water provoking a pressure drop in the system. The engine will start allowing the system pressure to rise. It will stop at the programmed stop time or after the run period timer whichever is the shortest. The Stop push button is enabled and if depressed will also stop the engine before expiration of the weekly test (provided that the system pressure is above the cut out pressure adjustment).

All alarm signals are operative.

Low oil pressure, high temperature, overspeed conditions will immediately stop the engine to prevent damage.

The engine can also be stopped by setting the main switch in OFF position.

If lockout signal appears when engine is running or during cranking sequence under weekly test, the engine is stopped waiting the lockout signal to disappear in order to restart.

Important : when the solenoid valve is activated, water is draining out of the system. (see Overpressure Adjustment 11.3.4 to adjust the draining timer from 0 to 255 seconds).

- If the system pressure drops below cut-in threshold, the solenoid valve is de-energized and the starting sequence is initiated.
- If the system pressure does drop by 5 PSI or more but does not drop below cut-in threshold at the expiration of draining timer (maximum 255 seconds), the message "Warn:Cutin not reach" appears on the screen and the starting sequence is initiated.
- If the system pressure did not change significantly (less than 5 psi) at the expiration of draining timer (maximum 255 seconds), the message "TestFail:Default Sol" appears on the screen and the starting sequence is NOT initiated.

8.2.3.5 RUN TEST

Depressing the 'run test' push button located on the front panel, the two way solenoid valve opens to drain water provoking a pressure drop in the system. . The engine will start allowing the system pressure to rise. The engine will then stop automatically after the run period timer or when the stop push button is depressed.

All alarm signals are operative.

Low oil pressure, high temperature, overspeed conditions will immediately stop the engine to prevent damage.

The engine can also be stopped by setting the main switch in OFF position.If lockout signal appears when engine is running or during cranking sequence under run test, the engine is stopped waiting the lockout signal to disappear in order to restart.

Important : when the solenoid valve is activated, water is draining out of the system. (see Overpressure Adjustment 11.3.4 to adjust the draining timer from 0 to 255 seconds).

- If the system pressure drops below cut-in threshold, the solenoid valve is de-energized and the starting sequence is initiated.
- If the system pressure does drop by 5 PSI or more but does not drop below cut-in threshold at the expiration of draining timer (maximum 255 seconds), the message "Warn:Cutin not reach" appears on the screen and the starting sequence is initiated.
- If the system pressure did not change significantly (less than 5 psi) at the expiration of draining timer (maximum 255 seconds), the message "TestFail:Default Sol" appears on the screen and the starting sequence is NOT initiated.

8.2.3.6 AC FAILURE START

This feature is field programmable (factory defeated). The engine will start automatically if the AC power source is absent for more than the preset time. The engine will immediately stop when AC power is reestablished.

The engine can also be stopped by setting the main switch in OFF position.

If lockout signal appears when engine is running or during cranking sequence under AC failure start, the engine is stopped waiting the lockout signal to disappear in order to restart.

8.3 OPERATOR EQUIPMENT

8.3.1 MAIN SELECTOR SWITCH

The main switch is located on the controller door. It is behind a breakable and pad-lockable cover.

8.3.2 STOP PUSH BUTTON

The red stop push button can be used to stop the engine.

When the main switch is in automatic position, the stop push button will stop the engine provided system pressure is above the cut out value and all starting causes have returned to normal.

When in manual mode, the stop push button must be pressed and held for the engine to stop. If the stop push button is not held for a sufficient time, enough fuel may remain in the hose so that the engine continues to run.

8.3.3 CRANK #1- CRANK#2 PUSH BUTTONS

Those push buttons can be used only when the main switch is in the hand position. They are used to manually crank the engine using battery #1 or #2, or both if both push buttons are activated simultaneously.

9. STATUS DISPLAY AND ANNUNCIATOR ON CONTROLLER

9.1 STATUS DISPLAY

The top line shows the #1 battery,#1 battery charger status and controller mode

12.6	9.8	Bulk	A
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The first group of digits indicates the battery voltage.

The second group of digits indicates the current delivered by the charger to the battery.

The third group of digits indicates the charger status.

- "Bulk" indicates that the charger is delivering the maximum current for fast recovering of the battery charge
- "Over" indicates that the charger is in overcharge mode to maximize the battery charge
- "Float" indicates that the charger is maintaining the voltage of the battery
- "AC Fail" indicated that the charger is not connected to power source
- "no ans" indicates that the charger has lost the communication with the main electronic board

The last digit "N" or "A" indicates the controller mode of operating.

- "N" indicates that the controller is set for a manual (non-automatic) controller. The engine starts only on manual starting signal.
- "A" indicates that the controller is set for a automatic) controller. The engine starts either on pressure drop, on automatic starting signal or on manual starting signal.

The second line shows the #2 battery,#2 battery charger status, and shutdown mode.

See above for battery and battery charger indications.

The last digit "M" or "A" indicates the shutdown mode :

- "M" indicates manual shutdown. The engine stops only by using the stop pushbutton or the main selector switch.
- "A" indicates automatic shutdown. The engine stops automatically at the expiration of the shutdown timer.

The third line shows the controller date and time or various alarm messages. The date (D/M/Y) and the time are always shown except when one or more alarms are present. When more than one alarm are detected, the line will scroll the different messages.

The available messages are the following:

- "Crank 1/6 Batt#1 10s" indicates at which state is the cranking cycle and the timer count down.
- "Low System Pressure" indicates that the system pressure is lower than 85% (this value can be adjusted at factory only) of the cut in pressure value for more than 1 second.
- "Remote Start" indicates that the engine has been started by activation (opening) of the External start contact.

- "Remote – Pump Demand" indicates that the remote signal is still present (open) and it is impossible to stop the engine with Stop push button.
- "Automatic Start" indicates that the engine has been started by detection of a pressure drop (under cut in value).
- "Auto Start – Pump Demand" indicates that the pressure is still below the cut-out threshold and it is impossible to stop the engine with Stop push button.
- "Deluge Valve" indicates that the engine has been started by activation (opening) of the deluge valve field contact.
- "Deluge valve – Pump Demand" indicates that the Deluge Valve signal is still present (open) and it is impossible to stop the engine with the Stop push button.
- "AC Power Failure" indicates that the controller is powered only by batteries
- "RPT mm:ss" indicates the remaining time before automatic shutdown (see 11.1.3)
- "Seq. Start Time:ss" indicated the remaining time before start sequence (see 11.1.4)
- "Default solenoid" indicates that the solenoid valve has been activated but the pressure drop has not been detected,
- "Low Fuel Level " indicates that the low fuel float contact is closed for more than 1 second
- "Water Reservoir Low" indicates that the water reservoir low contact is closed for more than 10 seconds
- "Water Reservoir Empty" indicates that the water reservoir empty contact is closed for more than 10 seconds
- "Low Pump Room Temp" indicates that the low pump room thermostat contact is closed
- "High Fuel Level" indicates that the high fuel float contact is open for more than 0.5 second
- "Low Suction Pressure" indicates that the low suction pressure switch contact is closed for more than 3 seconds
- "Weekly Test mm:ss" indicates the remaining time before the end of the weekly test. This feature requests a correct setting of the weekly test (see 11.3.2)
- "Lockout Signal" indicates that the controller is locked by other equipment and will not start automatically.
- "AC Failure Start mm:ss" indicates the remaining time before automatic start in case of detection of loss of power supply. This feature must be programmed (see 11.3.5).
- "System overpressure" indicates that the system pressure is above the preset value (see overpressure 11.3.4).
- "Altern. ECM pos." indicates that ECM selector switch is in alternate ECM position.

- "Fuel injection malfunction" indicates a malfunction of the fuel injection system.
- "loss of continuity 1" indicates that the continuity on the wire #9 has been interrupted.
- "loss of continuity 2" indicates that the continuity on the wire #10 has been interrupted.
- "No DC power" indicates that the controller is powered up only by AC power. The controller is not operational.
- "Warn:Cutin not reach" indicates that the pressure did not drop significantly during activation of solenoid valve. It dropped by 5 PSI or more, but did not reach the Cut-In value.
- "TestFail:Default Sol" indicates that the pressure has not changed during activation of solenoid valve. The test failed.

The fourth line is dedicated for the pressure system status.

O:124 I:100 P:135psi

The first group of digits shows the cut-out threshold.

The second group shows the cut-in threshold.

The third group shows the actual system pressure.

- 'O' means cut-Out which is the value where the pump has to stop after run period timer,
- 'I' means cut-In which is the value where the pump has to start.

9.2 ANNUNCIATOR PANEL

Sixteen indicators give the status of the controller and the engine. The indicators with (★) activate the alarm bell and must be reset by switching the main selector to the OFF position. The indicator with (§) activates the alarm bell and is auto resettable.

The indicators are lit up in the following conditions :

- "AC Power On" : (green) indicates that the controller is connected to an external AC power source.
- "Main switch in Auto" : (green) indicates that the controller main switch is in auto position.
- "Battery #1 Failure" (★) indicates that either one of the following conditions occurred
 - Battery #1 voltage drops below 50% of nominal battery voltage
 - Battery #1 does not reach appropriate voltage after 24 hours with 10Amp charging current
 - Battery #1 is connected in reverse polarity
 - Battery #1 is disconnected
- "Battery #2 Failure" (★) is same as Battery #1 Failure applied to battery #2
- "Charger #1 Failure" (★) indicates that either one of the following conditions occurred :
 - The Electronics board detects an internal fault.
 - The average current value reaches 15A.

- Battery Charger is desynchronized with the AC source for more than 5min.
- The current stay less than 0.5A in Bulk mode.
- The charger #1 is not connected to the AC source although the charger #2 is connected to the AC source.

- "Charger #2 Failure" (★) is same as Charger #1 Failure applied to charger#2
- "Engine Low Oil Pressure" (★) indicates that the engine oil pressure contact has opened when the motor was running. This detects an abnormal pressure in the diesel engine oil pressure circuit. Note that the oil pressure must be reached no later than 8 seconds after the engine run signal input.
- "Engine High Temperature" (★) indicates that the engine high temperature contact has opened when the motor was running. This detects an abnormal temperature of the diesel engine coolant liquid.
- "Engine Overspeed" (★) indicates that the engine overspeed switch contact has closed
- "Engine run" indicates that the engine run contact is closed. This detects a running condition of the motor
- "Engine Fail to Start" (★) indicates that the starting sequence of six successive cranking period has been performed, but a closed engine run contact has not been detected
- "Fail When Running" (★) indicates that an open engine run contact has been detected even though the diesel engine controller demands a continuous running condition.
- "Pump Room Alarm" (§) indicates either low suction condition, low fuel level condition, water reservoir low condition, water reservoir empty condition, low pump room temperature condition, high fuel level condition, AC power failure condition, or external signal (see option schematic inside controller).
- "Deluge Valve / Remote Start" indicates the engine has started because of a deluge valve signal or a remote start signal.
- "Weekly Test" indicates that the weekly test is in progress
- "Controller Trouble" (★) indicates either a battery #1 failure, a battery #2 failure a charger #1 failure a charger #2 failure .

9.3 PUSH BUTTONS

Several push buttons are mounted on the front membrane.

The "Cut Out" push button is used to adjust the pressure threshold to stop the diesel engine. This push button is enabled when the adjustment lock dipswitch is correctly set.

The “Cut In” push button is used to adjust the pressure threshold to start the diesel engine. This push button is enabled when the adjustment lock dipswitch is correctly set.

The “Lamp Test/Silence” push button has two functions. First, it is used to test the display LED’s and the audible alarm. When activated, the left column lights up for 1 second, then the right column for 1 second, then the alarm bell for 1 second. Secondly, it is used to silence the ‘pump room’ alarm, the ‘fail when running’ alarm, the ECM in alternate mode alarm, the charger failure alarms and the default solenoid alarm.

The “Run Test” push button is used to release the pressure on the pressure transducer to simulate a drop of pressure if set for automatic mode; or directly to start the engine if set for manual mode.

The “Print” push button is used to print a resume of the last fifteen-day events as well as the last seven-day pressure data.

The “Paper Feed” push button is used to feed paper through the printer slot in order to avoid tearing the printout.

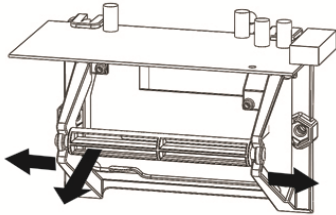
10. PRINTER

10.1 GENERALS

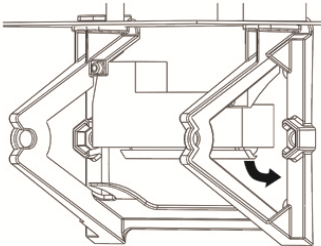
The printer works on demand only. However, in order to prevent a paper drum deformation, the paper drum is activated automatically at regular intervals.

10.2 PAPER REPLACEMENT

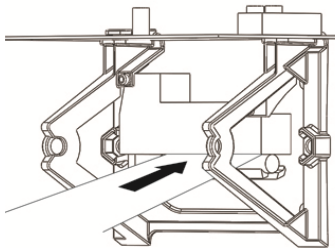
The printer is a thermal type. The paper must be thermal paper and be correctly oriented. The following operations must be followed to replace the paper :



Carefully pull the sides out in order to extract empty paper roll.

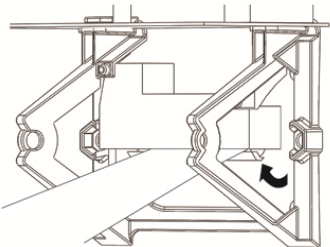


On the bottom of the printer, slide down the roll cover in order to have access to the paper slot.



Insert the thermal paper into the slot. Important, the thermal side must be the top side.

Note . to validate the thermal side, scratch the paper with your finger nail. The thermal side is marked by finger nail scratches.

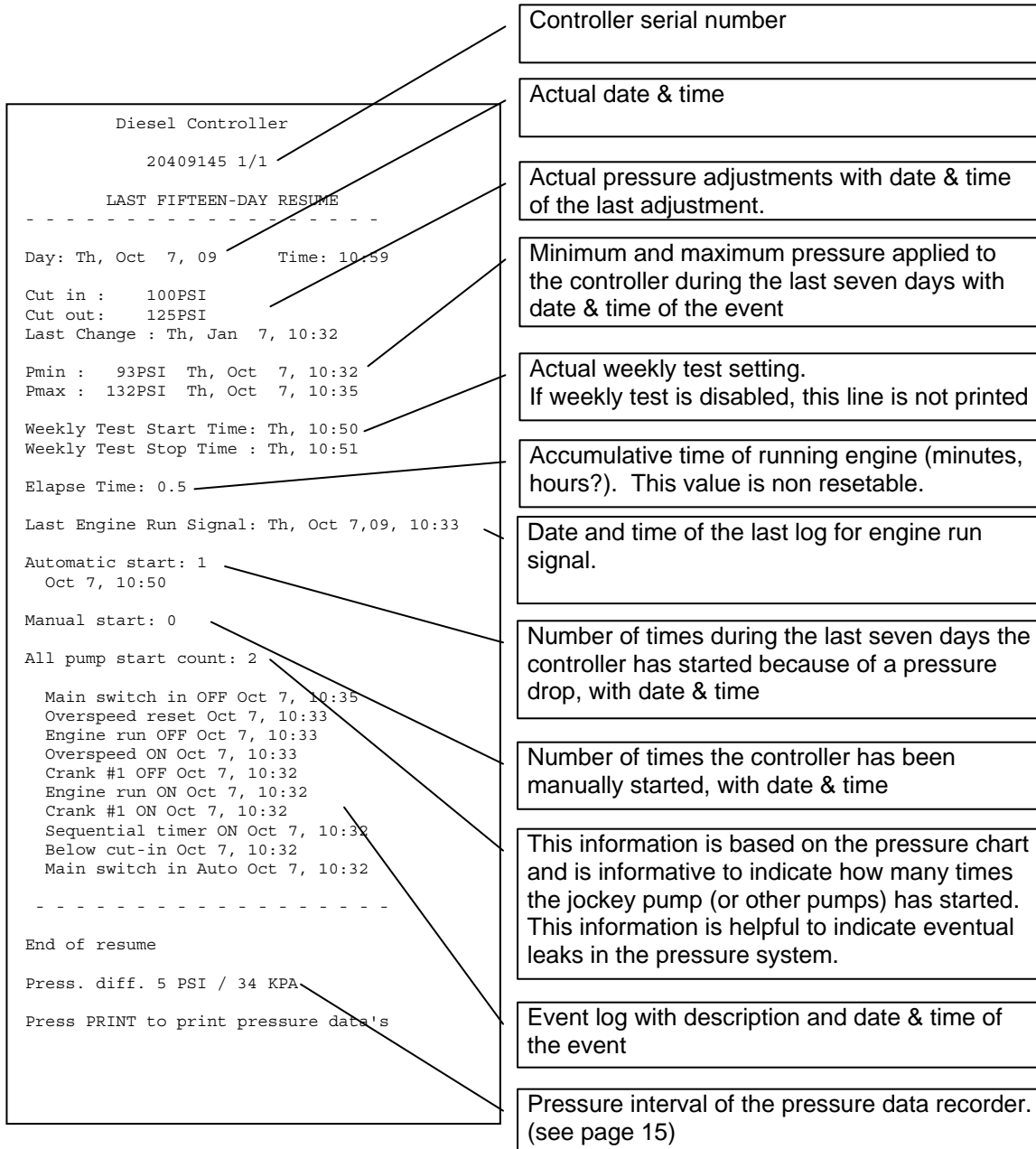


Reclose the roll cover to squeeze the paper.
Place the paper roll on its support.

10.3 PRINTOUT DESCRIPTION

10.3.1 LAST FIFTEEN DAY RESUME.

When 'Print' push button is momentarily depressed, the thermal printer starts to print the last fifteen day resume as follows.



10.3.2 PRESSURE DATA'S

The pressure data is printed when the 'Print' push button is depressed in the 15 seconds following the end of the last fifteen day résumé printout.

The pressure data's can be either printed as a succession of pressure values or as a graph.

10.3.2.1 TEXT MODE

By selecting Text mode, the printout will be a successive pressure values with date & time.

Depending on the pressure variation in the pressure system and the pressure interval (see 11.1.6), this printout can be very long.

Printout starts by earliest data.

"End of pressure data's" indicates the end of the printout.

```
Press PRINT to print pressure data's

Pressure unit is : PSI
124 Oct 7, 10:35
Pump stop Oct 7, 10:35
127 Oct 7, 10:35
132 Oct 7, 10:35
125 Oct 7, 10:35
112 Oct 7, 10:35
Pump start Oct 7, 10:35
93 Oct 7, 10:32
Auto start Oct 7, 10:32
102 Oct 7, 10:00
104 Oct 7, 9:00
105 Oct 7, 8:00
109 Oct 7, 7:00
112 Oct 7, 6:00
116 Oct 7, 5:00
122 Oct 7, 4:28
123 Oct 7, 4:00
125 Oct 7, 3:00
127 Oct 7, 2:00
127 Oct 7, 1:00
128 Oct 6, 24:00
127 Oct 6, 23:00

End of pressure data's
```

Pressure value, month & date, time in hh:mm

10.3.2.2 GRAPHIC MODE

By selecting Graphic mode, the printout will be a continuous graph that represents the pressure versus the time. The Y axis (vertical axis) is the pressure. The minimum and maximum can be adjusted to enlarge the variation (see printing mode 11.3.3). The X axis (horizontal axis) is the time, and it can be selected for 1 hour or ¼ hour. A grid (horizontal line) axis can be added to facilitate the graph reading. In this graph printout, there is no pressure value added on the graph.

11. SET UP

11.1 DIP SWITCH CONFIGURATION

To have access to the dip switch, the door must be open. Two dip switches are located on the side of the electronic board mounted on the door. Dip switch S5 is on the top, Dip switch S10 is on the bottom. The factory settings are as follow :

S5

ON OFF

<input type="checkbox"/>	<input checked="" type="checkbox"/>	S5-4 remote start seq. timer
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S5-3 for factory only
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S5-2 for factory only
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S5-1 for factory only

S10

ON OFF

<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-8 test for factory use
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-7 pressure interval
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-6 pressure interval
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-5 pressure unit
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-4 sequential start timer
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-3 sequential start timer
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-2 run period timer
<input type="checkbox"/>	<input checked="" type="checkbox"/>	S10-1 pressure adjust. lock

11.1.1 REMOTE START SEQUENTIAL TIMER S5-4

When S5-4 is ON, the engine will start the cranking sequence after the ON timer as programmed when the remote start signal is activated (opening of the contact)

11.1.2 PRESSURE ADJUSTMENT S10-1

When S10-1 is On, the pressure adjustment push buttons are enabled. When S10-1 is Off, the adjustment of the pressure cut-in and cut-out are not permitted.

11.1.3 RUN PERIOD TIMER S10-2

When S10-2 is On, the controller is set for automatic stop. The engine will stop after the minimum run period timer (factory set at 30 minutes). When S10-2 Off, the controller is set for manual stop, engine will stop only by depressing the stop push button provided the pressure is above cut out, and remote start signal is not present.

11.1.4 SEQUENTIAL START TIMER S10-3&4

The controller delays the engine start cycle by 5 seconds, 10 seconds or adjustable time (factory set at 15 seconds) upon a water pressure drop detection, a deluge valve detection. All other starting causes activate the engine immediately. To modify the delay, the dip switch must be set according to the following table:

DIP	ON	OFF	Time
S10-4 OFF S10-3 OFF	<input type="checkbox"/>	<input checked="" type="checkbox"/>	0 second
S10-4 ON S10-3 OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	5 seconds
S10-4 OFF S10-3 ON	<input type="checkbox"/>	<input checked="" type="checkbox"/>	10 seconds
S10-4 ON S10-3 ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Programmable time (15 seconds by default)

11.1.5 PRESSURE UNIT S10-5

The pressure can be displayed in bar or in psi (pound per square inch). When On, the pressure unit is bar. When Off, the pressure unit is psi.

11.1.6 PRESSURE INTERVAL S10-6&7

The pressure data is recorded each time the pressure varies more than the pressure interval. The pressure interval can be adjusted to 1 psi, 2 psi, 5 psi or 10 psi. Note : 1 psi = 6.895kPa = 0.06895 bar. To modify the pressure interval, set the dip switch according to the following table :

DIPSWITCHES	ON	OFF	PSI interval
S10-7 OFF S10-6 OFF	<input type="checkbox"/>	<input checked="" type="checkbox"/>	5 psi 0.35bar
S10-7 ON S10-6 OFF	<input checked="" type="checkbox"/>	<input type="checkbox"/>	10 psi 0.7bar
S10-7 OFF S10-6 ON	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1 psi 0.07bar
S10-7 ON S10-6 ON	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	2 psi 0.14bar

11.1.7 TEST MODE S10-8

This dipswitch is reserved for factory use. It must remains always on OFF position.

11.2 PRESSURE ADJUSTMENT

When main selector switch is in automatic position, if the system pressure drops below the cut-in pressure value, the controller initiates a pump starting sequence. When the system pressure reaches the cut-out value, the engine will stop when the stop push button is activated or will be stopped automatically if adjusted for an automatic stop.

It is important to adjust the cut out value first. This adjustment must be set below the maximum pressure of the pump otherwise the engine will never stop. The cut in value must be adjusted at the system pressure.

Before adjusting the pressure set points, the adjustment dip switch (S10-1) must be ON to enable the function.

A quick push on the push button will increase value by one (1) unit. A long push will increase value by ten (10) units. The value only increases from minimum to maximum, and when the maximum is reached, the value return to the minimum value.

It is important to re-set the dip switch S10-1 to OFF to prevent unauthorized changes.

11.3 FIELD ADJUSTEMENT MENU'S

11.3.1 GENERALS

Seven (7) menu's give access to several parameters for field adjustment.

To have access to menu's, the Print Push button must be depressed for several seconds and MAINTAINED until the **desired** menu appears.

The first menu window opens after six (6) seconds, a Run Test push button action will give access to next menu. When the desired menu is on the screen, Print push button can be released.

To select value to change, press the "Print" push button.

To modify the value, press the 'Run Test" push button.

To save the modification and return to the "normal" display mode, select SAVE using the 'Print' push button and validate using the 'Run Test' push button.

To exit the menu without saving modification, select 'Exit' using the 'Print' push button and validate using the 'Run Test' push button

If no push button is depressed for 30 seconds, the modification is not saved and the screen will return to normal mode.

11.3.2 CLOCK & WEEKLY TEST ADJUSTMENT

In this menu, the display shows :

```
Su Apr 17, 09 17 :05
Weekly Test : Y
We 15:32 16:00 EXIT
Start Stop SAVE
```

- on the first line: the controller date and time,

- on the second line : the weekly test activation (Y (yes) or N (no)),
- on the third line : the day of the week when the weekly test will be performed, the start time and the stop time.

All of these parameters can be adjusted. Note that during weekly test, the stop time may be overridden by the run period timer.

According NFPA20, the engine must run at least 30 minutes every week.

11.3.3 PRINTING MODE

In this menu, the type of printout can be selected.

```
Mode : Text
Ymax: 400 Ymin:000
X: 1Hour Grid:0
SAVE EXIT
```

If Text is selected, the printout will be successive lines of pressure values.

If Graph is selected, the printout will be a series' of small lines representative to the pressure. The scaling of the Y axis (pressure) can be adjusted by entering the Y max and Y min values. The scaling of the X axis (time) can be adjusted by selection between one hour or 15 minutes.

Up to 5 dot lines (grid) can be added to have a better graph reading.

11.3.4 OVERPRESSURE ADJUSTMENT

Controllers connected to engines equipped with pressure limiting control must indicate when the pressure is over 115 percent of total rated head pressure (NFPA20-2007,12.4.1.4(4))

```
System Overpressure
0250 psi
Solenoid Valve 255s
SAVE EXIT
```

In this menu, the maximum overpressure value can be entered in PSI or bar (depending of the selected unit). If system pressure exceeds this value, the 'engine trouble' alarm relay, the 'engine trouble' LED are triggered. The second value is the Solenoid Valve timer. It can be set from 0 to 255 seconds. This timer is the maximum time allowed with the solenoid valve open during a weekly test or a manual Run test.

11.3.5 TIMERS

In this menu, three different timers can be adjusted :

```
Sequent. Time:15Sec
Run Per. Time:00Min
AC Fail Start: No M
SAVE EXIT
```

11.3.5.1 SEQUENTIAL START TIMER

This timer can be adjusted from 0 to 60 seconds and is factory set at 15 seconds.

This sequential start timer delays the engine start sequence with the set time. This timer is enabled under automatic start sequence if dipswitch S10-3&S10-4 are in ON position. This timer is also enabled under manual remote start if dipswitch S5-4 is in ON position.

11.3.5.2 RUN PERIOD TIMER

The engine shutdown will occur after Run Period Timer is expired if the S10-2 Dip switch is ON.

Note : this timer is reset if pressure drops below cut out pressure.

The Run Period Timer can be adjusted from 0 to 60 minutes, and is factory set at 30 minutes.

11.3.5.3 AC FAIL START

If programmed, the engine will start automatically under an AC failure. The AC fail Start timer can be adjusted from 0 to 255 minutes (note : if 0 is selected, 'NO' appears on the screen that disables the function) The time starts discounting when AC source is lost, at the expiration the engine starts. The controller is shipped with this function disabled (NO).

11.3.6 PRESSURE SENSOR CALIBRATION

The pressure sensor is calibrated at factory before shipping, and it is not necessary to proceed any further calibration.

If a pressure sensor calibration is needed due to a pressure sensor replacement, it is very important to calibrate the unit with a high accurate gauge.

A high accurate reference gauge must be connected to the system where it is representative to the pressure applied to the sensor.

In this menu, the screen shows:

```
CUR PRESSURE 0154psi
PRESS1: 0000*READ
PRESS2: 0200 READ
NEXT EXIT
```

The calibration is done in three steps :

- 1) A low pressure must be applied to the system; the readout of the reference gauge must be entered in the menu after 'PRESS1'. Then, the cursor must be moved to READ. The 'Run Test' must be depressed to record this value. A "*" appears on the screen to indicate that this value is entered.
- 2) A high pressure must be applied to the system; the readout of the reference gauge must be entered in the menu after 'PRESS2'. Then, the cursor must be moved to READ. The 'Run Test' push button must be depressed to record this value. A "*" appears at the right.
- 3) The cursor must be moved to 'NEXT' and the 'Run Test' push button must be depressed. A second window opens that gives the old values and the new values of gain and offset. Cursor must be move to SAVE or EXIT. Note: the new value can be adjusted manually if needed. The next screen shows the resulting coefficient calculated by the pressure sensor calibration, allowing to compare them with the previous ones. It is possible to save the new calibration, or reject it by selecting Exit.

```
          OLD    NEW
GAIN:    24910  24910
OFFSET:   0052  0052
          SAVE   EXIT
```

11.3.7 WEAK BATTERY VOLTAGE

In this menu, the threshold to declare a weak battery can be adjusted between 0,0 volt and 24,0 volts. By default, the value is adjusted to 6.0 Volts.

```
WEAK BATTERY VOLTAGE
      6.0 V
SAVE          EXIT
```

11.3.8 MEMORY PURGE

In this menu, the pressure data or the event memory can be erased individually.

```
MEMORY PURGE
Event Memory :PURGE
Pressure Data :PURGE
EXIT
```

The cursor must be moved to the respective "PURGE". The "Run Test" must be depressed for purging respective data's.

12. BATTERY CHARGER

Each battery charger is equipped with its own individual power transformer, and circuit breakers.

The battery charger has a RS485 communication port to send data' to the main electronic board.

The battery charger #1 is powered by the XTR1 transformer protected by the CB1 circuit breaker.

The battery charger #2 is powered by the XTR2 transformer protected by the CB2 circuit breaker. .

NOTE : When operating in bulk mode, the power transformer reaches a very high temperature. **This temperature rise is normal.**

Battery chargers are equipped with indicators :

- "Logic power " indicates electronic board is powered up. This indicator must always be on or flashing.
- "Bulk" indicates battery charger is in bulk mode. In this mode, the charger delivers its maximum rated current to the battery.
- "Overcharge" indicates battery charger is maintaining a constant voltage and regulating the delivered current in order to increase the gravity of the battery electrolyte.
- "Floating" indicates battery is fully charged and the battery charger is delivering the minimum current to maintain the battery charge.
- "Charger Failure" indicates a charger malfunction. This occurs when the microprocessor detects an internal fault, or when the average current

value reaches 15A, or when the Battery Charger is desynchronized with the AC source for more than 5 minutes or when the current stays less than 0.5 amp in bulk or in overcharge mode. To reset this status, the small 'Reset' push button located on the top right corner of the battery charger must be depressed

- "Battery Failure" indicates a battery problem. This occurs when the battery voltage drops below 50% of the nominal battery voltage, or when battery does not reach the appropriate voltage after 24 hours in bulk mode, or when the battery is disconnected or connected in reverse polarity. The battery replacement is probably needed.

- "AC Present" indicates that the power transformer is feeding the battery charger. When the AC source is not available, the LED's are flashing at regular intervals, the backlight of the main electronic board shuts down to save energy.

The reset push button, located on the top right of the board, is used to restart the charger and to clear internal fault.

IMPORTANT : the fuse, located on the board, is a SLO-BLO 3AG-32VDC-20A model. It is very important to replace the fuse by the exact fuse model.

13. RELAY FUNCTION

13.1 GENERAL

The alarm relays are located on the main I/O board, and on the I/O optional board if controller is so equipped. Each relay is DPDT model and rated for 8A-250Vac. Contacts 11-12 and 21-22 are normally closed, contacts 11-14 and 21-24 are normally open.

13.2 RELAY DESCRIPTION

13.2.1 ENGINE TROUBLE RELAY

The engine trouble relay **is set** if one of the following conditions occurs :

- Low oil pressure
- Engine high temperature
- Engine fail to start after 6 cranking cycles
- Overspeed
- Fail when running
- System overpressure
- ECM in alternate position
- FIM Fuel injection malfunction
- No DC power
- Battery failure
- Other function if factory programmed

The engine trouble relay can only be reset by switching the main switch to the OFF position.

13.2.2 ENGINE RUN RELAY

The engine run relay is energized when the motor is running.

13.2.3 PUMP ROOM ALARM RELAY

The pump room alarm relay is energized if one of the following conditions is present :

- Low suction (signal must be maintained more than 3 seconds)
- Low fuel level (signal must be maintained more than 1 second)
- Water reservoir low (signal must be maintained more than 10 seconds)
- Water reservoir empty (signal must be maintained more than 10 seconds)
- Low pump room temperature
- High fuel level
- AC failure ("AC power on" is not present)

Other function if factory programmed

If none of those conditions are present, the pump room alarm relay is reset automatically.

13.2.4 CONTROLLER TROUBLE RELAY

The controller trouble relay is energized when all conditions are normal. This fail safe relay de-energizes and **is maintained de-energized** if any of the following conditions occurs :

- Battery #1 failure
- Battery #2 failure
- Charger #1 failure
- Charger #2 failure
- Pressure line failure
- No DC power
- Solenoid default

The controller trouble relay can only be reset by switching the main switch to the OFF position.

14. ALARM BELL

The alarm bell is activated under default condition. There are two types of defaults.

14.1 **“TYPE 1” DEFAULTS**

“Type 1” defaults are related to the engine and the controller. Those defaults are considered as major defaults. When a “type 1” default occurs, the alarm bell starts ringing. The only way to silence is to set the main switch onto OFF position.

“Type 1” defaults are :

- Engine Overspeed
- Engine Low oil pressure
- Engine High temperature
- Fail to start
- Battery #1 failure
- Battery #2 failure
- System overpressure
- Fuel Injection malfunction
- No DC power

Note : other external conditions may trigger type 1 default depending of the factory settings – verify drawings affixed inside the cabinet

14.2 **“TYPE 2” DEFAULTS**

“Type 2” defaults are related to accessories and are considered as various defaults. When a “type 2”

default occurs, the alarm bell starts ringing. The bell can be silenced by depressing the “Lamp test / silence” push button.

When silenced, the alarm bell restarts ringing if a new default occurs or if the alarm conditions remain unchanged after 24 hours.

The alarm bell automatically stops ringing if all “type 2” defaults are vanished.

“Type 2” defaults are :

- Pressure line failure
- Low suction pressure
- Water reservoir low
- Water reservoir empty
- Low fuel level
- High fuel level
- Low pump room temperature
- Fail when running
- Charger #1 failure
- Charger #2 failure
- ECM in alternate position
- No AC power

Note : other external conditions may trigger type 2 default depending of the factory settings – verify drawings affixed inside the cabinet

15. EVENT AND PRESSURE DATA RETRIEVING

The controller records events of the last fifteen days and pressure data's of the last seven days. The information is accessible by using the printer.

When provided with a printer, the events and the pressure data can be obtained by depressing the “Print” push button.

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