



**INSTALLATION AND MAINTENANCE MANUAL  
FOR LIMITED SERVICE PUMP CONTROLLERS  
MODEL GPL + GLx**



# 1. GENERAL DESCRIPTION

Model GPL limited service fire pump controller is designed to automatically start an electric driven fire pump upon detection of a pressure drop in the fire protection system. It is intended to control 3-phase squirrel cage induction motors 30 HP or less, 600V or less, where such use is acceptable to the authority having jurisdiction. The controller is arranged for electrical/manual starting and stopping and for automatic start, controlled by the pressure sensor. The combination automatic/non-automatic option provides a

10-minute automatic stop after automatic start but only after all starting causes have returned to normal.

The combination fire pump controller with transfer switch complies with NFPA 20-2007 standard chap 10-8.1 and respects arrangement I according to article 10-8.2.1

The automatic transfer switch is designed to monitor two power sources and connect the fire pump motor to the available source.

# 2. TYPES OF LIMITED SERVICE PUMP CONTROLLERS

FIRE PUMP CATALOGUE NUMBER				
MODEL n° EXAMPLE: GPL - 480 / 20 / 3 / 60				
GPL	480	20	3	60
Model prefix	Voltage	HP rating	Phase	Frequency

# 3. TYPES OF AUTOMATIC TRANSFER SWITCH

TRANSFER SWITCH CATALOGUE NUMBER				
MODEL n° EXAMPLE: GLG - 480 / 20 / 3 / 60				
GLG	480	20	3	60
Model prefix	Voltage	HP rating	Phase	Frequency

## 3.1. MODEL GLG

This model is used when the alternate power source is fed from a generator set having a capacity not exceeding 225 % of the fire pump motor's rated full load current. A contact is provided to start the generator set.

## 3.2. MODEL GLU

This model is used when the alternate power source is fed from a second utility or from a generator set having a capacity exceeding 225 % of the fire pump motor's rated full load current. A contact is provided to start the generator set.

## 4. METHODS OF STARTING / STOPPING

The controllers are available as combination automatic / non-automatic with provision for manual or automatic shutdown (automatic shutdown only possible after automatic start)

### 4.1. METHODS OF STARTING

#### 4.1.1. AUTOMATIC START

The controller will start automatically on low pressure detection by the pressure sensor when pressure drops below cut-in threshold.

#### 4.1.2. MANUAL START

The motor can be started by depressing the START push button whatever the system pressure.

#### 4.1.3. REMOTE START

The motor can be started from a remote location by momentarily opening a contact independent of the pressure control.

#### 4.1.4. EMERGENCY START

The motor can be started manually by using the emergency handle. This handle can be maintained in a closed position.

Important: to avoid damaging the contactor, it is recommended to start the motor in the manor:

- 1) shutdown the main power by using the main disconnect means,
- 2) pull the emergency handle and lock it in closed position,
- 3) turn the power back on by using the main disconnect means.

#### 4.1.5. SEQUENTIAL START

In case of multiple pump application, it may be necessary to delay the starting of each motor in case of water pressure drop to prevent simultaneous starting of all motors.

#### 4.1.6. EXTERNAL SIGNAL START

A connection for a deluge valve is provided; the controller can be started by opening a normally closed contact on the fire protection equipment (deluge valve) independent of the pressure sensor.

When option A4 is supplied (flowmeter), the motor can be started by closing a normally open contact from the flowmeter independent of the pressure sensor. **IMPORTANT: if the pressure does not drop below the cut-in pressure, the pump will stop when the contact will re-open.**

#### 4.1.7. WEEKLY START

The motor can be started (and stopped) automatically at the preprogrammed time.

#### 4.1.8. TEST START

The motor can be started automatically for a running period of 10 minutes by pressing cut-in and cut-out push button simultaneously.

### 4.2. METHODS OF STOPPING.

#### 4.2.1. MANUAL STOP

Manual stop is done by depressing the STOP push button.

The manual stop is possible after a manual start, remote start, or external signal start but starting condition must have disappeared.

The manual stop is also possible after an automatic start but only if pressure is above the cut-out threshold.

#### 4.2.2. AUTOMATIC STOP

The automatic stop is possible only after an automatic start, and this function must be activated. When this function is enabled, the motor is automatically stopped 10 minutes after the restoration of the pressure (above the cut-out threshold).

#### 4.2.3. EMERGENCY STOP

The emergency stop is always possible in any starting conditions and is done by using the main disconnecting means located on the door.

## 5. TRANSFER SWITCH OPERATION SEQUENCE

### 5.1. TRANSFER TO ALTERNATE POWER SOURCE

The Transfer to Alternate Power Source starts automatically when at least one of the following conditions applies:

- Normal Power voltage falls below 85% of nominal voltage,
- Normal Power Phase Reversal is detected,
- Transfer Switch Test push button (located on the front display) is maintained depressed for over 10 seconds.

When an under voltage condition on any phase of the Normal Power source is detected by the sensor the 3 second normal power source outage delay timer starts counting.

If the normal source voltage rises above the sensor dropout setting before the 3 second time delay expires, the transfer sequence is cancelled.

If the Normal Power source voltage is still below the sensor dropout setting (85%) when the time delay expires, the relay is deactivated to start the generator set. At the same time, a voltage and frequency sensor begins monitoring the Alternate Power Source. The sensor will accept the alternate power source only when both voltage and frequency reach pre-set pickup value. An approximate 15 second time span occurs because the engine-driven generator cranks, starts, and runs up to nominal pickup value. For this reason, if the Transfer test switch push button is pressed, it must be held until transfer is initiated.

When the Alternate Power Source is within acceptable limits (above 90% of the nominal voltage), the transfer to alternate power source is initiated.

The transfer switch will remain in the alternate power source position until the normal source is restored. If the test button is used, the transfer switch will remain on

alternate power source until the retransfer to normal delay times out (5 minutes).

### 5.2. RETRANSFER TO NORMAL

Important : the transfer switch stays in alternate position if motor is running. Retransfer sequence is enabled if motor is not running.

The Retransfer to the Normal Power source starts when the voltage sensor detects restoration of the Normal Power Source within acceptable limits. The voltage level must rise above the pre-set pickup value (90%) on all phases before the sensor will accept the normal source.

When the normal source is accepted by the sensor, the retransfer to normal delay timer starts counting (factory set at 5 minutes). This delay can be by-passed by depressing 'bypass time delay' push button. This delay prevents immediate load retransfer to the normal source. The delay insures that the normal source has stabilized before reconnection of Fire Pump Motor. If the normal source voltage falls below the pre-set dropout value before the time delay expires, the timing cycle is reset to zero. If the alternate power source fails during the timing cycle, the load is immediately retransferred to the normal source, if that source is acceptable.

The Automatic Transfer Switch is now feeding the Fire Pump Motor from the Normal Power Source again.

Upon retransfer to the normal source, the 5 minute cooling timer starts counting to keep the engine running for a cool-down period. This delay can be by-passed by depressing 'bypass time delay' push button. After the time delay, the relay is re-activated to shut down the engine-driven generator. All circuits are reset for any future normal source failure.

## 6. FRONT PANEL

### 6.1. GENERALS

The GPL+GLx controller is provided with three electronic boards/displays. Two displays are located on the front membrane of the pump controller, and one display is located on the front membrane of the transfer switch.

On the pump controller, the upper electronic board/display is monitoring connected source parameters (voltage, frequency & current monitoring); the lower electronic board/display is monitoring pressure data's and is recording pressure data's and events.

On the transfer switch, the electronic board/display is monitoring both normal and alternate power sources (voltage and frequency monitoring).

### 6.2. PUMP CONTROLLER - POWER MONITORING BOARD

#### 6.2.1. DISPLAY

This display is a 4 line – 16 character screen.

#### DISPLAY IN 'NORMAL' MODE.

When powered, the electrical display is activated in the "normal" mode.

208	209	210	60
19	21	19	
12.3h	C=	46	
□ □ □ □	□ □ □	!	

The first line shows the three voltages<sup>1</sup> between phases and the frequency of the source the pump controller is connected to. The second line shows the current in each phase.

The third line shows pump run elapse time meter, and pump start count. This third line shows alarm messages when present.

The fourth line is reserved for following indicators :

<sup>1</sup> Display shows only one voltage when powered with single phase power supply.

#### Overcurrent

When the electronic board detects overcurrent (130% of FLA) for more than 20 seconds, the indicator starts flashing. If overcurrent occurred, the indicator remains steady until the RESET push button is depressed.

#### Undercurrent

When the electronic board detects a current that is lower than 30% of FLA for more than 20 seconds, the indicator starts flashing. If undercurrent occurred, the indicator remains steady until the RESET push button is depressed.

#### Overvoltage

When the electronic board detects an overvoltage condition (110% of nominal voltage) for more than 1 second, the indicator starts flashing. If overvoltage occurred, the indicator remains steady until the RESET push button is depressed.

#### Undervoltage

When the electronic board detects an undervoltage condition (85% of nominal voltage) for more than 1 second, the indicator starts flashing. If undervoltage occurred, the indicator remains steady until the RESET push button is depressed.

Note : a power shut down is not considered as an undervoltage condition.

#### Phase unbalance

When the electronic board detects a phase unbalance condition<sup>2</sup> (over 3%) for more than 1 second, the indicator starts flashing. If phase unbalance occurred, the indicator remains steady until the RESET push button is depressed.

#### Phase loss

When the electronic board detects a phase loss condition, for more than 1 second, the

<sup>2</sup> Unbalance is defined as the ratio of maximum deviation from average versus average.

Example: With voltages of 460, 467, and 450, the average is 459, the maximum deviation from the average is 9, and the Percent Unbalance =  $100 \times 9 / 459 = 1.96 \%$

Reference: NEMA Standards MG 1 – 14.35.

indicator is steady ON. This indicator is automatically reset when power is restored.

**Fail to start**

Under any start conditions (provided main contactor energized), if the current remains below 5% for more than 20 seconds, the indicator starts flashing. If fail to start condition occurred, the indicator remains steady until the RESET push button is depressed.

**Motor Run:**

When the main contactor closes, the RUN indicator appears. This indicator is automatically reset when main contactor re-open.

**DISPLAY IN 'STATUS' MODE**

Sometimes it is convenient for maintenance personnel to show all input and output status.

12345678
<b>Input : 00001000</b>
<b>Output : 10000000</b>
<b>OV: 250 Gnd: 5. 1A</b>

By pressing the RESET push button longer than 5 seconds, the display will switch in the 'status' mode.

The three top lines indicate status of the eight inputs and outputs.

The fourth line shows maximum voltage (OV) that has been applied to the controller and the ground fault threshold (GND).

The maximum voltage (OV) value cannot be reset. The ground fault detection is optional.

The display will switch back to the normal display mode after 10 minutes, or when the reset push button is depressed.

	Input	Output
1	Alarm 1	Power Available
2	Alarm 2	Phase Reversal
3	Alarm 3	Pump Room Relay
4	Alarm 4	Motor Alarm Relay
5	Motor run	Lock Rotor (shunt trip)
6	Alarm 5	Alarm A
7	DIP ABC-CBA	Alarm B
8	Reset PB	Alarm C

**DISPLAY IN 'SIMULATION' MODE**

By pressing the RESET push button longer than 10 seconds, the display will switch in

the phase reversal simulation mode. A message will appear on the screen to inform that the controller is in phase reversal simulation. During this simulation, the phase reversal alarm relay and phase reversal pilot light will be energized.

<p><b>Phase Reversal Simulation</b></p> <p><b>8 Seconds</b></p>
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**6.2.2.'RESET' PUSH BUTTON**

This button is used to reset indicator, when indicator is steady. When depressed continuously for more than 5 seconds, the screen shows input/output status. When depressed continuously for more than 10 seconds, a 10 second phase reversal simulation is performed.

**6.2.3.NORMAL POWER LIGHT**

This LED indicates power acceptable on all 3 phases and phase sequence is correct. The power is acceptable if the voltage is greater than 85% of nominal voltage.

**6.2.4.PHASE REVERSAL LIGHT**

This LED indicates phase reversal of the power source.<sup>3</sup>

<sup>3</sup> Only for 3 phases power supply.

### **6.3. PUMP CONTROLLER - PRESSURE MONITORING BOARD**

#### **6.3.1.DISPLAY**

This display is a 2 line – 16 character screen.

The top line shows day and time, or various status messages.

The day and time are always shown. If a message must be shown, the screen is scrolling successively at an interval of  $\pm 1$  second.

The last digit indicates if the weekly test is enabled (E) or disabled (D).

If a timer count-down (on timer & off timer) is activated, the remaining time is shown on the right (replacing weekly test status digit). If manual stop is required to stop the pump (automatic stop function not enabled), the word "MANU" appears on the left.

The second line is dedicated for the pressure system status.

The first group of digits shows the cut-out threshold, the second group of digits shows the cut-in threshold, the third group shows the actual system pressure.

The pressure can be displayed in PSI or bar. The unit is shown on the display – P for PSI, B for bar.

Note :

1psi = 6.894 kPa = 0.068 bar

1kPa = 0.010 bar = 0.145 psi

1bar = 100 kPa = 14.503 psi

#### **6.3.2.PUMP DEMAND LIGHT**

'Pump demand' light indicates an automatic start condition. It is activated when the pressure drops below the cut-in pressure. It is deactivated either when the run period timer expired (if the function is enabled), or either when the stop push button is depressed. The stop push button is enabled only if the actual system pressure is above cut-out threshold.

The message 'Pump on demand' appears on the first line when stop push button is disabled.

#### **6.3.3.WEEKLY TEST LIGHT**

Weekly test light indicates that the system is in operation due to a weekly test. The weekly test is programmable. Note : the

weekly light is also energized during manual test.

#### **6.3.4.CUT-OUT AND CUT-IN PUSHBUTTONS.**

Those push buttons are used to adjust the cut-in and cut-out threshold. A quick action on the push button will increase value by one (1). A longer action will increase value by ten (10). The value only increases from minimum to maximum, and when maximum is reached, the value return to the minimum value. **The cut-in and cut-out can be adjusted only when 'Lock-Unlock » dipswitch is in 'Unlock' position.** (See 15.2)

The cut-in and cut-out push buttons are also use to move cursor and change values in programming mode.

If the cut-in and cut-out push buttons are depressed simultaneously, the system simulate a pressure drop in the system to start the pump for a run period time of 10 minutes.

With board version 040122SWP01-11 and above, it is possible to avoid nuisance starting when adjusting pressure threshold by depressing STOP push button while Lock-Unlock dipswitch is in 'Unlock' position.

#### **6.3.5.PRINT PUSHBUTTON.**

The 'print' is used to print the last seven day résumé and the pressure data's. The 'print' is used only if a printer is mounted.

#### **6.3.6.USB COMMUNICATION PORT.**

The USB communication port is used to connect a laptop with USB cable. From the laptop using HyperTerminal provided with Windows, the user has access to pressure data's, historic of the events, actual settings.

## 6.4. TRANSFER SWITCH - SOURCE MONITORING BOARD

### 6.4.1. DISPLAY

This display is a 4 line – 16 character screen.

#### DISPLAY IN 'NORMAL' MODE.

When powered, the electrical display is activated in the “normal” mode.

208	209	210	60
212	215	213	60
□	□	□	□
□	□	□	!

The first line shows the three voltages<sup>4</sup> between phases and the frequency of the normal source.

The second line shows the three voltages<sup>5</sup> between phases and the frequency of the alternate source.

The third line shows status messages when present.

The fourth line is reserved for following indicators:

#### Normal source available

This indicator lights up when normal voltage/frequency reaches 90% of nominal voltage/frequency.

This indicator disappears when normal voltage/frequency drops below 85% of nominal voltage/frequency.

The indicator shows a symbol “R” if the normal source sequence is wrong - phase reversal.

#### Alternate source available

This indicator lights up when alternate voltage/frequency reaches 90% of nominal voltage/frequency.

This indicator disappears when alternate voltage/frequency drops below 85% of nominal voltage/frequency.

The indicator shows a symbol “R” if the alternate source sequence is wrong - phase reversal.

#### Normal Position

This indicator is present when pump contactor is connected to normal power.

#### Alternate position

This indicator is present when pump contactor is connected to alternate power.

#### Transfer in progress

This indicator is present when pump contactor is connected to alternate power and the transfer to normal source will occur shortly.

#### Retransfer in progress

This indicator is present when pump contactor is connected to normal power and the transfer to alternate source will occur shortly.

#### Generator start signal

This indicator is present when the signal is given to the generator to start.

#### Cooling time

This indicator is present when the generator set is running for the cooling time (set at 10 min).

#### DISPLAY IN 'STATUS' MODE

Sometimes it is convenient for maintenance personnel to show all input and output status.

	12345678
Input :	00001000
Output :	10000000
85% 90%	85% 90%

By pressing the RESET push button longer than 5 seconds, the display will switch in the ‘status’ mode.

The second line indicates status of the eight inputs.

As the third line indicates status of the eight outputs.

The fourth line indicates the settings of the normal and alternate source (pick-up and drop out).

The display will switch back to the normal display mode after 10 minute, or when the reset push button is depressed.

#### 6.4.2. PUSH BUTTON

This push button has different functionalities.

- When all conditions are normal and a retransfer is in progress, the push button is used as ‘bypass time delay’ to force

<sup>4</sup> Display shows only one voltage when powered with single phase power supply.

<sup>5</sup> Display shows only one voltage when powered with single phase power supply.

the transfer switch to move to normal position.

- When all conditions are normal and the generator set is running for the cooling time, the push button is used to bypass this cooling time and force the generator set to stop.
- When alarm message is present, the push button is used to clear the message.
- When buzzer is sounding because alternate isolating switch is in off position, the push button is used to momentarily silence the buzzer (15 minutes).
- When the PB is depressed more than 5 seconds, the screen change mode to show status of inputs and outputs, as well as validation threshold of sources.

#### **6.4.3. TRANSFER SWITCH TEST PUSH BUTTON**

The transfer switch test push button, located on the enclosure door, is used to simulate a normal power failure by disconnecting one phase. If this button is depressed more than 3 seconds, the generator starts. To activate the transfer switch, this push button must be depressed until the transfer switch is initiated.

#### **6.5. AUDIBLE ALARM**

The alarm bell located on the controller is sounding when the isolating switch is in OFF position. During start-up, this audible alarm can be silenced for a period of 15 minutes by depressing the 'silence' push-button. If after 15 minutes, the alternate source isolating switch is still in OFF position, the audible alarm will start again.

## 7. ALARM CONTACTS

The following alarm contacts are available in the pump controller:

- motor run
- power available (loss of phase)
- phase reversal
- pump room alarm
- motor trouble
- EPSR ready

The following alarm contacts are available in the transfer switch compartment

- transfer switch in normal position
- transfer switch in alternate position
- alternate isolating switch in off position

The following optional alarm contacts are available in the pump controller :

- weekly test (option C4)
- low suction (option C5)

## 8. INSTALLATION

The GPL limited service pump controller is listed cULus, CSA, FM and is intended to be installed in accordance with the Standard of the National Fire Protection Association for

the Installation of Centrifugal Fire Pumps, NFPA n°20-2007 (Centrifugal Fire Pumps) 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.

## 9. LOCATION

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

Controller shall be so located or so protected that it will not be damaged by water escaping from pump or pump connections.

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.

Controller shall be 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 (50°C).

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

Controllers shall be located in a building; they are not designed for outside location. The paint color may change if controller is exposed to ultraviolet rays during long period of time.

## 10. MOUNTING

### 10.1. WALL MOUNTING

The limited service pump controller shall be mounted in a substantial manner on a single noncombustible 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. above floor level.

### 10.2. FLOOR MOUNTING

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. A concrete slab is recommended to avoid water accumulation on the controller's feet.

# 11. CONNECTIONS

## 11.1. WATER CONNECTIONS

The threaded connection of the pressure sensor (1/4" NPT. F.) is flush with the bottom of the enclosure. See dimensions drawing for exact location. If the enclosure is base mounted, the pressure sensor connection is located on the side of the controller.

The pressure sensor (PT1) shall be connected to the system as per NFPA 20-2007, figure A-10-5.2.1 (a) and (b).

The optional low suction pressure switch (PS2) shall be connected to the suction side of the system following standard practice.

## 11.2. ELECTRICAL CONNECTIONS

### 11.2.1. TRANSFER SWITCH OVERCURRENT PROTECTIVE DEVICE

The overcurrent protective device on the alternate power source shall meet the NFPA 20-2007; chapter 9-6.5 :*"Where protective devices are installed in the on-site power source circuits at the generator, such devices shall allow instantaneous pickup of the full pump room load."*

#### IMPORTANT

**An external overcurrent protective device shall be installed to protect the alternate power source wiring from a generator set. The alternate power side of the automatic transfer switch does not have any overcurrent protective device. Only an alternate power isolating switch (not a protective device) is provided within GLU transfer switch.**

### 11.2.2. ELECTRICAL WIRING

The electrical wiring between the power source and the limited service pump controller shall meet the NFPA 20-2007, Chapter 9-3, NFPA 70 National Electrical Code Article 695 or C22.1 Canadian Electrical Code, Section 32-200 or other local codes. Electrical wiring shall be typically sized to carry at least 125% of the full load current of the fire pump motor.

Incoming power terminals on the controller are suitable to accept wire based on that selection with insulation not less than 60°C. (Refer to terminal diagram for terminal sizes.)

The electrical wiring between the limited service pump controller and the pump motor shall be in rigid, intermediate, or liquid tight flexible metal conduit or Type MI cable and meet the requirements of NFPA 70 National Electrical Code or C22.1 Canadian Electrical Code or other local codes.

The number of conductors required is 3-wires<sup>6</sup> plus ground sized at 125% of full load current.

### 11.2.3. ENCLOSURE DRILLING

The dimension drawings show the area suitable for incoming power and motor connections. No other location shall be used. 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 limited service 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.

### 11.2.4. INCOMING POWER CONNECTIONS

Normal power is to be connected to terminals identified L1-L2 and L3 located on the disconnecting means (CB).

Alternate power from second source or from generator set is to be connected to terminals identified E1 E2 and E3 located on the disconnecting means (ACB or AIS).

**Important : the electronic board is phase sensitive, thus the incoming power leads must be connected in the correct phase order.**

<sup>6</sup> 2 wires plus ground for single phase.

### **11.2.5. MOTOR CONNECTIONS**

Motor connections are connected to terminals identified by T1-T2 and T3 located on main contactor (1M).

It is the responsibility of the installer to obtain connection information on the motor and to assure that the motor is connected as per motor manufacturer recommendations.

Failure to do so may cause injuries to personnel, damage the motor and/or the controller and subsequently void warranty on both items.

### **11.2.6. ALARM CONTACT CONNECTION**

Since these alarm connections are derived from control relays or motor contactor auxiliary contacts located inside a metallic enclosure with wiring that can pick up induction from the line voltage, an induced voltage can be present at the terminal connections. It is the responsibility of the alarm contractor to evaluate the potential danger for their equipment. A remote alarm panel Type APE with interface relays may be required if induced voltages cause problems to electronic equipment.

(NOTE: This induction problem is more likely to occur in 600 V. models.)

#### **Contacts located on the fire pump section.**

Except low suction contacts, all contacts are located on the relay board and clearly identified by C (common), NO (Normally Open) and NC (normally closed).

Contacts are rated for 8A, 250VAC.

From the top to the bottom:

#### **MOTOR RUN**

Identify by 'RUN NC' or 'RUN NO'.  
The NC contact will open to signal motor running. The NO contact will close to signal motor running.

#### **LOSS OF PHASE**

Identify by 'Pow. Av.'.  
The NO contacts (held in closed position when power is available) will open and the NC contacts (held in open position when power is available) will close to signal loss of any phase or power.

#### **PHASE REVERSAL**

Identify by 'Ph. Rev.'.  
The NO contacts will close and the NC contacts will open to signal phase reversal.

#### **PUMP ROOM ALARM**

Identify by 'Room Al.'.  
The NO contacts will close and the NC contacts will open to signal a pump room alarm (Overvoltage or Undervoltage or phase unbalance). This relay may be activated by external command (optional : see affixed drawing on door ).

#### **MOTOR TROUBLE**

Identify by 'Motor Tr.'.  
The NO contacts will close and the NC contacts will open to signal a motor trouble (overcurrent or undercurrent or fail to start or ground fault (optional)). This relay may be activated by external command (optional : see affixed drawing on door ).

#### **WEEKLY TEST (OPTION C4)**

Identify by 'Weekly T.'.  
The NO contacts will close and the NC contacts will open to signal the motor is running because of exercise weekly test or a run test.

#### **EPSR READY**

Identify by 'EPSR Ready'.  
The NO contacts (held in closed position when power is available) will open and the NC contacts (held in open position when power is available) will close to signal the EPSR (pressure board) is ready and functioning.

#### **LOW SUCTION (OPTION C5)**

Relay AR10: this relay is added on a terminal strip. The NO contacts (11-12 and 21-22) will close; the NC contacts (11-14 and 21-24) will open in case of low suction condition.

#### **PERMANENT LOAD SHEDDING CONTACT (OPTION E1)**

Relay AR11: this relay is added on a terminal strip. The NO contacts (11-12 and 21-22) will close; the NC contacts (11-14 and 21-24) will open to shed external load. Shedding is done when pump demand while the transfer switch is connected to the alternate source.

### Contacts located on the transfer switch section.

All contacts in the transfer switch section are located on a terminal strip. Except when mentioned, contacts are rated for 10A, 250 VAC

### ALTERNATE POWER ISOLATING SWITCH IN OFF POSITION

The contact connected to terminals 91-92 opens when Alternate Power Isolating Switch is in OFF position.

### TRANSFER SWITCH IN NORMAL POSITION

When transfer switch is in normal position (The load is connected to the normal power), the contact connected to terminals 95-94 is closed, the contact connected to terminals 93-94 is open.

### TRANSFER SWITCH IN ALTERNATE POSITION

When transfer switch is in alternate position (The load is connected to the alternate power), the contact connected to terminals 97-98 is closed, the contact connected to terminals 96-97 is open.

### GENERATOR START SIGNAL

A normally open contact G1-G2 is provided to start the generator set. The contact is rated 6A., 24Vdc.

The terminals are blue and are located on the terminal strip. The contact will close to start the generator set.

This contact is interlocked with the Alternate Power Isolating Switch (AIS) to avoid starting signal when the Alternate Power Isolating Switch is in off position.

## **11.2.7. CONNECTION TO EXTERNAL DEVICE**

### REMOTE START SIGNAL

Each limited service pump controller has provision for connection to a manual remote start station (remote start contact). This remote start contact shall be normally closed

and connected to terminals identify by 'Remote St NC' on the relay board located on the fire pump section. Contact opening will start the pump motor.

### DELUGE VALVE

Two terminals identify 'Deluge NC' are installed for the connection of normally closed contact from a deluge valve or other fire protection equipment control. Opening this contact will initiate a pump start.

**IMPORTANT : the jumper IJ1 located close from the terminal must be cut to enable the function.**

### FLOW SWITCH (OPTION A4)

Two terminals identify 'flow switch' are installed on the relay board for the connection of a NO contact from external flow switch. Closure of this contact will initiate pump motor start.

**IMPORTANT: if pressure does not drop below cut-in threshold, the pump will stop at the contact re-opening.**

### CONCENTRATE FOAM PUMP (OPTION A8)

Three terminals identify 'FOAM PUMP NC, NO, C' are installed for connection of the remote fire alarm contacts. The common must be connected to C terminal, the normally open contact must be connected to NO, and the normally closed contact must be connected to NC.

The pump starts on NO contact closure or NC contact opening.

The pressure sensing within the fire pump controller is omitted.

Note : Pump room alarm and motor trouble event are no more recorded when this option is provided.

### LOW SUCTION PRESSURE SWITCH (OPTIONS B7)

The low suction pressure switch must be connected to terminal identify 'AI N°1' (or to terminals #100-101 if option C5 is provided). The pressure switch contact shall close on pressure drop.

## 12. PRESSURE BOARD PROGRAMMING

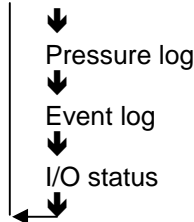
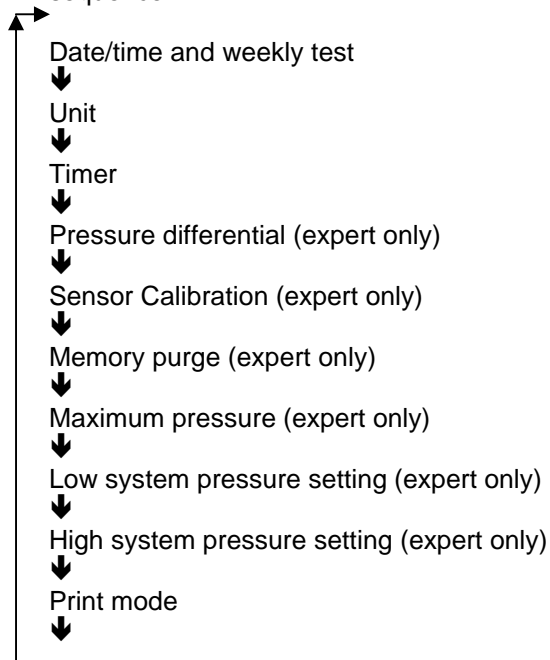
### 12.1. GENERALS

The EPSR (pressure board) can be programmed by entering in different menus.

In each mode, the pushbuttons have same functionality:

- Cut-in push button moves the cursor to its next position.
- Cut-out push button increases the selected value, or activate the selected function (Save, Next, Purge,...)

Some menus are reserved for technician. To have access to those specific menus, the dipswitch S8-2 (expert) must be activated. The standard menus are in the following sequence :



To have access to the first menu, the Cut-in pushbutton must be depressed more than 5 seconds.

To access the subsequent menus, press and hold the cut-in button for more than 5 seconds. When the first (date & time) menu appears (5 sec.), and whilst maintaining the cut-in button, press the cut-out button to scroll to the next menu. When the menu desired appears, release both push-buttons.

If no key is hit for more than 30 seconds, the EPSR returns to normal screen and the changes are not saved.<sup>7</sup>

When the EPSR is in normal mode, the following screen is :

<b>We 23: 23: 32 E</b>
<b>245 252 262 P</b>

The last digit on the first line is E or D. When letter E appears: a weekly test is programmed and pump will start at specific time.

When letter D appears: the weekly test is disabled.

<sup>7</sup> Except sensor calibration

If the On timer (sequential start timer) or if the Off timer (run period timer) is counting, the remaining time is displayed on the top right. (22 seconds remaining in the next figure)

```
We 23: 23: 32  22
246  252  262 P
```

If the word 'MANU' appears on the left, the system is waiting for a manual stop.

```
We 23: 23: 32  MANU
245  252  262 P
```

## 12.2. DATE/TIME AND WEEKLY TEST MENU

In this menu, the user can modify the time and the date, as well as programming the weekly test.

```
22: 36 02- Ja- 2006
WT: ON          NEXT
```

On the first line, the user can adjust the time and the date

On the second line, the user can enable the weekly test (WT:ON), or disable the weekly test (WT:OFF).

If weekly test is enabled, the NEXT function will open a second window.

```
STOP START Mo
05: 35 05: 30 SAVE
```

On the first line, the user can program the weekday of the test.

On the second line, the user can program the stop time and the start time of the test.

## 12.3. UNITS

In this menu, the user can modify the unit of the displayed pressure.

```
Uni t : PSI
SAVE
```

The pressure can be displayed in PSI (pound per square inch) or bar.

## 12.4. TIMERS

In this menu, the user can program the EPSR timers.

```
Off Ti m: 600 AUTO
On Ti me: 10 SAVE
```

In this example, the off timer is programmed as auto stop after 600 second and the on timer is programmed for 10 seconds.

### 12.4.1. OFF TIMER – RUN PERIOD TIMER

The first line is dedicated for Off timer.

With this timer, the user can program the EPSR for a manual shutdown (MANU) or automatic shutdown (AUTO) after a certain time.

The delay is programmed in seconds (0 to 999).

If the timer is programmed for manual shutdown (MANU), the shutdown occurs only by activating the stop push button. The timer value has no impact in this mode.

If the timer is programmed for automatic shutdown (AUTO), the shutdown occurs automatically after the timer has expired.

Note : the timer starts counting when pressure is above cut-out threshold, and is automatically reset at its initial value if pressure drops below cut-out threshold.

Note: when Off timer is programmed, the remaining time before shutdown is displayed on the top right of the normal screen.

### 12.4.2. ON TIMER–SEQUENTIAL START TIMER

The second line is dedicated for the ON timer. With this timer, the user can program a delay before starting the pump. The delay is expressed in seconds (0 to 99). The pump starts if the pressure stays below cut in threshold longer than the programmed on time delay.

Note: when On timer is programmed, the remaining time before start is displayed on the top right of the normal screen.

## 12.5. PRESSURE DATA'S INTERVAL

This menu is accessible for expert only (dipswitch S1-2 on).

In this expert menu, the expert user can define the interval between two pressure data's. (1-2-5-10 psi or 0.07-0.14-0.35-0.69 bar).

**Press Difference**  
**5PSI                      SAVE**

The pressure value is scanned every  $\pm 0.1$  seconds. If the difference between the actual pressure value and the last memorized pressure value is greater than the interval, the actual value is memorized. This value becomes the last memorized value for the next scan.

Note: the pressure is also memorized at the top of the hour.

## 12.6. CALIBRATION OF THE PRESSURE SENSOR

This menu is accessible for expert only (dipswitch S1-2 on).

In this expert menu, the expert user can calibrate the pressure sensor on the site.

**LO: 0023\*ReadEXIT**  
**HI : 0500 ReadNEXT**

If the EPSR is supplied with a pressure sensor, the EPSR has been calibrated at factory.

Important : this expert menu does not disappear automatically. The user must hit the EXIT or the SAVE box to return to normal screen.

The following procedure must be followed to perform the calibration.

**IMPORTANT : a high accurate reference gauge must be connected to the system where it is representative to the pressure applied to the sensor.**

1. A low pressure must be applied to the system; the readout of the

reference gauge must be entered in the menu after 'Lo' and the cursor must be moved to 'READ'. Validate to record this value. A "\*" appears in front of 'READ'.

2. A high pressure must be applied to the system; the readout of the reference gauge must be entered in the menu after 'Hi' and the cursor must be moved to 'READ'. Validate to record this value. A "\*" appears in front of 'READ'.
3. Move the cursor to 'Next' and validate
4. A second window appears that give the result of the calibration (OFFSET and GAIN value).

**Offset: 437 EXIT**  
**Gain: 15425 SAVE**

5. The cursor can directly be moved to SAVE, then validate;

When saving is executed, a message 'new calibration successful' appears for two seconds.

If the Exit is selected, a message 'Exit without changes' appears for two seconds.

In each screen, there is a possibility to exit this menu without modifying values.

Note : the largest is the difference between the low and high pressures, better is the calibration.

If the calibration does not give satisfaction, the procedure can be repeated.

## 12.7. MEMORY PURGE

This menu is accessible for expert only (dipswitch S1-2 on).

**Memory Purge**  
**EXIT                      PURGE**

In this menu, the expert user can erase the pressure data's memory.

A message 'Memory Purging - Reset when compl' appears on the display. This message disappears when purge is completed.

**VERY IMPORTANT : The controller must be shut down when purge is completed.**

## **12.8. MAXIMUM PRESSURE**

This menu is accessible for expert only (dipswitch S1-2 on).

```
Maximum Pressure
300 PSI          SAVE
```

In this menu, the expert user can change the maximum pressure of the cut-out threshold. If the system pressure reaches 125% of maximum pressure, the EPSR ready relay will be reset and the message « Pressure failure - Print to reset » will appear on the screen and an event will be memorized.

## **12.9. LOW SYSTEM PRESSURE**

This menu is accessible for expert only (dipswitch S1-2 on).

```
Low System Press
000 PSI          SAVE
```

In this menu, the expert user can change the low system pressure threshold. If the system pressure drops below this value, a message will appear on the screen and an event will be memorized.

## **12.10. HIGH SYSTEM PRESSURE**

This menu is accessible for expert only (dipswitch S1-2 on).

```
High System Pres
300 PSI          SAVE
```

In this menu, the expert user can change the high system pressure threshold. If the system pressure reaches this value, a message will appear on the screen and an event will be memorized.

## **12.11. PRINT MODE**

In this menu the user can select how the pressure data's will be print (if a printer is installed)

```
Print Mode: TEXT
SAVE
```

The print mode can be set as TEXT or as GRAPH.

If set as text, each pressure record is printed on a separate line as follows :

```
Pressure unit is PSI
83 Mar 23, 12:54
93 Mar 23, 12:24
104 Mar 23, 12:12
```

The first group is the pressure value expressed in the selected unit. The second group is the date and time of the record.

If set as graph, the pressure record is printed as a bargraph.

```
Print Mode: GRAPH
NEXT
```

When graph is selected, a second window can be open to select the axis value.

The Y axis is the pressure axis.

```
Y max : 300
Y mi n : 200 NEXT
```

The X axis is the time axis. The selection is 1h or 1/4h.

```
X : 15 mi n
Grid : 2          SAVE
```

The grid can be set between 0 and 4. If set, grid line will be drawn to help reading the pressure.

Note : the graph is practical only if pressure is very stable.

## **12.12. PRESSURE LOG**

In this menu, the user can view pressure log on the screen.

## Pressure Log

First line shows date/month and time,  
second line shows pressure value.

```
03-mar 12:36:18
125
```

An action on the cut-in push button moves to  
the next log.

An action on the cut-out push button moves  
to the previous log.

IMPORTANT : to exit this menu, either no  
pushbutton must be depressed for more  
than 30 seconds, or the cut-in push button  
must be pressed for more than 10 seconds.

### 12.13. EVENT LOG

In this menu, the user can view event log on  
the screen.

## Event Log

First line shows date/month and time,  
second line shows event.

```
03-mar 12:27:03
Pump start
```

An action on the cut-in push button moves to  
the next log.

An action on the cut-out push button moves  
to the previous log.

IMPORTANT : to exit this menu, either no  
pushbutton must be depressed for more  
than 30 seconds, or the cut-in push button  
must be pressed for more than 10 seconds.

### 12.14. I/O STATUS

In this menu, the user can view the status of  
input and output, as well as analog outputs

```
In: 1. 345 Out: 6. 8
A: 2A5Ah B: 36B4h
```

First line shows which inputs and output are  
activated. The input or output is activated if  
the number is shown.

Input :

- 1 :pump room alarm
- 2 :motor trouble
- 3 :motor run
- 4 :stop push button
- 5 :dip switch (cw/wo solenoid)

Output

- 6 :weekly test
- 7 :EPSR ready
- 8 :pump demand

The second line shows the hexadecimal  
value of the analog input 1 (0..5V) and input  
2 (0..100mV).

## 13. USB PORT

### 13.1. GENERALS

The controller can be connected to a USB port.  
The EPSR driver can be easily downloaded from the TornaTech web site.

### 13.2. VERIFICATION OF USB PORT

It is important to correctly set the computer to retrieve data's from the controller.  
On the 'control panel', click « System ». Select « Hardware », click « Device manager » :  
Verify that there are two communication ports for 'EPSR USB Serial port'. If not the installation of the driver has not been set correctly and must be redone.  
Remind which communication port is used for the EPSR USB Serial port.

### 13.3. RETRIEVING DATA'S

All information is retrieved via HyperTerminal software that is provided with all Windows © version.  
To start HyperTerminal, either select « START » « all programs » « accessories » « communication » « HyperTerminal », either or select « START » « all programs » « EPSR » « EPSR com ht »

#### 13.3.1. CONNECTION TO EPSR

Laptop communication  
Connect your laptop computer communication port to the EPSR USB port.

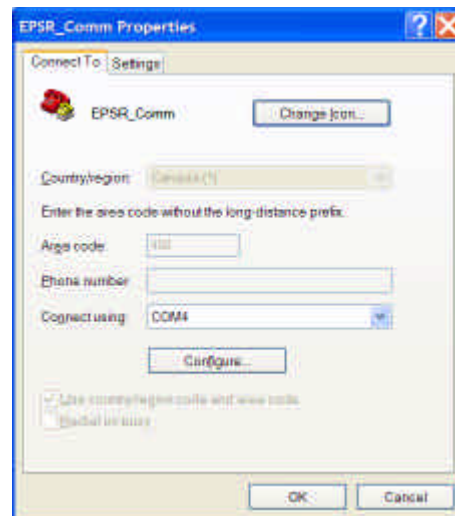
#### 13.3.2. OPENING HYPER TERMINAL

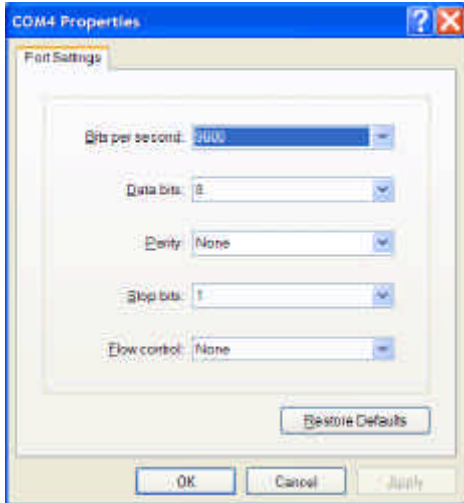
To communicate with the EPSR, communication software is required. The latest versions of Windows™ come standard with Hyper Terminal software.  
Select from the Windows™ Toolbar : Start – all Program – Accessories - (Communication) – Hyper Terminal or Start - all program - EPSR - EPSR comm ht  
If Hyper Terminal software has not been previously configured, double click on hypertrm.exe. *Note : This procedure might not be available on certain versions of software*

If your Hyper Terminal software has already been configured to communicate with an EPSR, select this configuration.  
To access a previously configured communication, click “file – open” and select the file.

#### 13.3.3. COMMUNICATION CONFIGURATION

To be able to communicate with the EPSR, the communication parameters between the Fire Pump Controller and laptop computer must be identical.  
In the « New Connection » window, enter a connection name. Ex : "EPSR"  
Click on « OK » to validate  
The «Connect to» window will open and in the connect using box, the USB com port must be entered . (See “verification of USB port)

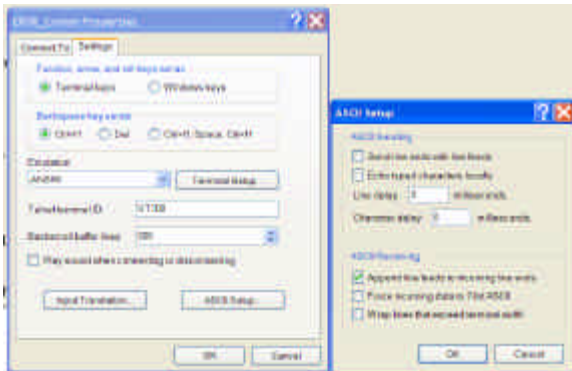




Click 'configure' and verify the following Port settings : bits per second: 9600 - data bits: 8 - parity: none - stop bits: 1 - flow control: none

Click « OK » to validate

On the Settings windows, verify the following



selection 'Terminal Keys' - Ctrl+H' - 'ANSW' - 'VT100' - '500'.

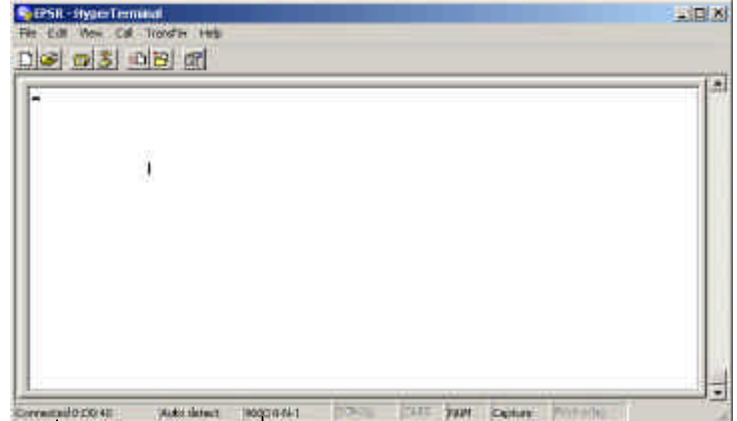
Click 'ASCII Setup and verify only 'Append line feeds to incoming line ends' is checked.

Press "OK" to validate.

### 13.3.4. DOWNLOADING DATA'S

Important, in this step, the data's will appear on the screen. If those information's need to be saved, the Capture text must be active.

Verify the computer is correctly connected :



Connected and timer is counting. If "disconnected", select "Call - call"

9600-8-N-1  
If different, restart a new communication and adjust "COM" properties. (Port settings)

If highlighted, the data's will be stored in the selected file. Note: if the .txt file is not empty, the new data's will be stored at the end of the text.

If not highlighted, it will not be possible to save downloaded data's

To enable Capture, click "transfer-capture text - enter file name - start".

To capture text (save information as .txt file), the word Capture on the bottom must be highlighted.

To highlight Capture : select Transfer - Capture Text -

A window will open to select the destination file. With the help of the Browse function, enter the name of the destination file. The file name must be ended by '.txt' .

It is good practice to save the data with a name incorporating the date. Ex : my documents\20061024.txt ( for October 24,2006)

Click « Start » to begin capturing. At that moment, all new incoming text will be saved in the destination.

Click "transfer-capture text-stop" to stop saving incoming text.

On the computer keyboard,  
hit the "1" key to get pressure value of  
sensor 1 (not used with TornaTech  
controller), or  
hit the "2" key to get pressure value of  
sensor 2, or  
hit the "3" key to download pressure data's,  
or  
hit the "4" key to download last seven day  
resume with events

#### **13.3.5. CLOSING HYPER TERMINAL SESSION**

Once the data has been downloaded, the  
communication can be disconnected.  
Click on File, select Exit  
Click on « YES » to disconnect

#### **13.3.6. READING AND PRINTING OF THE DATA**

The downloaded data's are saved in the  
destination file. This file is as .TXT type that  
can be red by "Notepad", "Word", "Lotus"  
and "Excel" and other software's.  
Upon opening this file, for it to show in the  
file list, the ".TXT" file type needs to be  
selected.  
The data can be saved and printed using  
Word, Excell, Notepad.....

## **14. PRINTER**

If the EPSR is connected to the TornaTech  
thermal printer, the pressure data's can be  
printed.

A first hit of the 'Print' key will activate the  
printer.  
The printing starts by a seven days resume  
of the pressure events.

<u>EPSR</u>	
LAST SEVEN-DAY RESUME	
-----	
Day : Tu, Mar 23, 04 Time : 14:25	Date and time of the printout
Cut in : 32 psi	Adjusted thresholds
Cut out : 49 psi	
Last Change : 23 Mar 2004, 12:53	Last time when thresholds have been adjusted
Pmin : 22 psi Tu, Mar 12, 13:52	Minimum and Maximum pressure during the last seven days.
Pmax : 250 psi Tu, mar 23, 14:01	
Weekly Test :	Weekly test status.
Enabled	
Weekly Test Start Time : Mo, 8:30	Settings are shown only if weekly test is enabled
Weekly Test Stop Time : Mo, 8:31	
Pump Demand : 2	Number of time the pump demand relay has been activated
Manu Off Mar 23, 23:18:44	Date and time when remote stop has been activated
On Mar 23, 23:07:12	Date and time when pump demand relay has been activated
Auto Off Mar 21, 12:06:06	Date and time when pump demand relay has been de-energized
On Mar 21, 11:30:24	Date and time when pump demand relay has been activated
Weekly test : 1	Number of time the weekly test relay has been activated
Manu Off Mar 17, 8:31:00	Indicates Manu is remote stop has been activated
On Mar 17, 8:30:00	
Power failure : 1	Number of time power failures occurs
<u>POWER ON MAR, 22, 10:12:55</u>	Date and time of power-up
Power Off Mar, 22, 10:00:55	Date and time of shutdown
System failure : 1	Number of time system failure occurs
Off Mar 17, 7:31:00	
On Mar 17, 6:35:00	
Settings	Actual settings of the EPSR
Press. Diff. 5 psi / 34 kPa	
On Timer : 5	= Sequential start timer
Off Timer : 12	= Run period timer
Offset : 421	
Gain : 12234	
Calibrated : jun 22 2006, 12:53	Last time when the calibration has been performed
Adjustment : locked	Dipswitch S8-1 status
Soft version :040122SWP01-01	Software version of the EPSR
End of resume	
Press Print to print pressure data's	

A second hit of the 'print' key within the 15 seconds of the end of the printing will activate the printer. The second printout is the pressure data's. Depending of the

printout settings, the printout is a successive list of pressure data's (Text mode) or a continuous curve (Graph mode)

Pressure unit is PSI

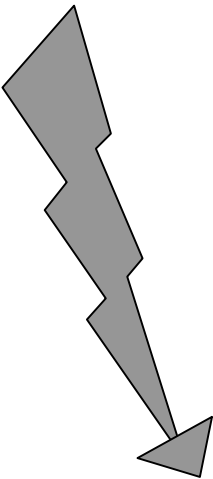
83 Mar 23, 12:54

93 Mar 23, 12:24

104 Mar 23, 12:12

Pressure can be shown is kPa or PSI depending of EPSR settings  
Pressure value in PSI (or kPa), Month, day, time.

## 15. START-UP AND TEST PROCEDURES

	<b>DANGER</b>
	<b><u>HAZARDOUS VOLTAGE IS PRESENT IN THE ENCLOSURE WHICH WILL CAUSE SEVERE PERSONAL INJURY OR DEATH.</u></b>
	<b>MAINTENANCE OR START UP SHOULD BE PERFORMED ONLY BY EXPERIENCED LICENSED ELECTRICIANS.</b>
	<b>ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT.</b>

### 15.1. VERIFICATIONS

#### 15.1.1. ELECTRICAL INSTALLATION

A representative for the electrical contractor responsible for the installation shall be available on-site to assist during the verification of the following points and the actual start-up.

All electrical label ratings meet incoming power voltage and frequency as well as motor voltage, HP and frequency.

All electrical connections in controller are tight. Retighten if necessary.

All electrical connections are properly completed and power is available.

#### 15.1.2. PIPING INSTALLATION

A representative for the sprinkler contractor responsible for the installation shall be available on-site to assist during the verification of the following points and the actual start-up.

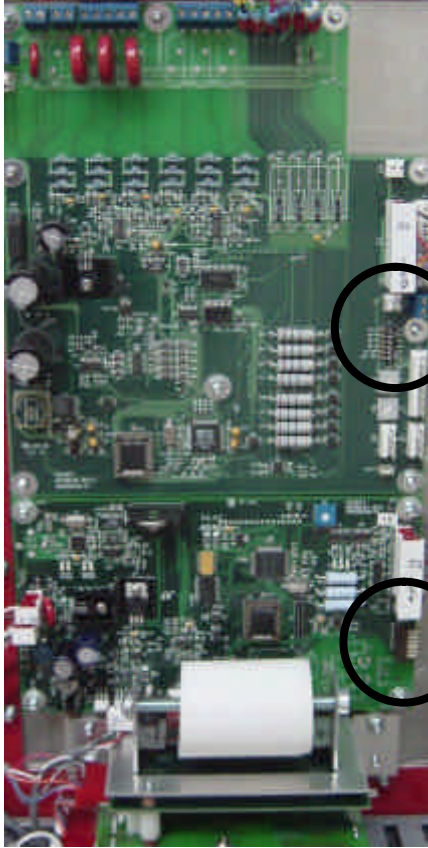
All water connections are properly completed; water is available and free of dirt and/or contamination.

NOTE: Standard controllers have pressure sensor rated for fresh water only. If other conditions exist, make sure that the controller pressure sensor is compatible.

## 15.2. SETTINGS

### 15.2.1. DIPSWITCH - FIRE PUMP SECTION

Two dipswitches must be correctly set.



Upper board : the dipswitch is factory set and the only switch that must be adjusted if necessary is the ABC-CBA switch.

Inp 1		Do not change
Inp 2		Do not change
Inp 3		Do not change
Inp 4		Do not change
Ph mon		Do not change
ABC - CBA		Phase reversal reference

Lower board : the 'lock-unlock' and 'Norm-Exp' switches will be used during set up. Other switches are factory adjusted and must remain in their position.

Lock-Unlock		Cut-in & cut out adjustment
Norm-Exp		Selection of menu
mV - 0..5V		Selection of pressure input
cw/wo valve		Do not change (set at factory)
Spare		Do not change
Spare		Do not change

### 15.2.2. PRESSURE ADJUSTMENT

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 pump will stop when the stop push button is activated or will be stopped automatically if adjusted for an automatic stop (see 12.4.1).

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 (Lock-Unlock) must be set to UNLOCK to enable the function.

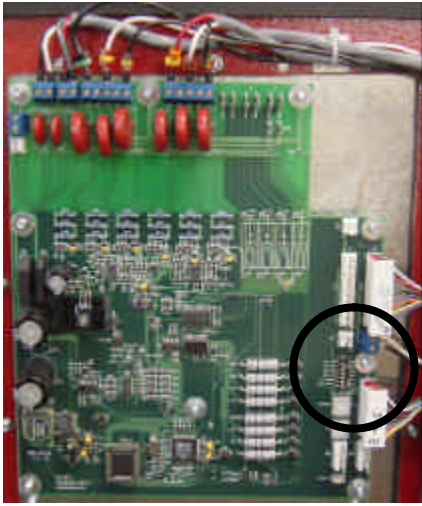
A quick push on the push button will increase value by one (1) unit. A long push will increase value by ten (10) units. The value only increases from minimum to maximum, and when the maximum is reached, the value return to the minimum value.

It is important to re-set the dip switch to "LOCK" position to prevent unauthorized changes.

It is possible to avoid nuisance starting by depressing the stop push button while dipswitch is in UNLOCK position.

### 15.2.3. DIPSWITCH - TRANSFER SWITCH SECTION

The dipswitch is factory set and the only switch that must be adjusted if necessary is the ABC-CBA switch.



Inp 1	<input checked="" type="checkbox"/>	Do not change
Inp 2	<input checked="" type="checkbox"/>	Do not change
Inp 3	<input checked="" type="checkbox"/>	Do not change
Inp 4	<input checked="" type="checkbox"/>	Do not change
Ph mon	<input type="checkbox"/>	Factory set - do not change
ABC - CBA	<input checked="" type="checkbox"/>	Phase reversal reference

### 15.3. PUMP CONTROL SECTION - VERIFICATION

**IMPORTANT** During the first start up, the door of the transfer switch section must be closed, the main disconnning means of the transfer switch section must be open and secure with a padlock.

When the controller section will be powered up, the transfer switch will move automatically to normal position and remains in this position. The audible alarm will be sounding - the transfer switch section switch is opened. There is a possibility of turning this audible alarm off by depressing the 'silence' push button.

#### 15.3.1. MOTOR ROTATION VERIFICATION

- ◆ Turn normal power circuit breaker handle to the ON position.
    - If the system pressure is above the cut out pressure setting (pressurized system), the motor will not start right away.
    - If motor does not start, press the START pushbutton.
  - ◆ Turn the normal power circuit breaker handle to the OFF position as soon as motor starts to stop the motor.
  - ◆ Check the motor rotation.
    - If the motor rotation is correct, no further adjustment is required, move to the next section.
  - ◆ Correct the motor rotation.
    - Motor rotation can be changed by reversing any two motor wires either at the motor junction box or on the motor connection terminals inside the controller. **In both cases, the operator shall assure that the power is disconnected before proceeding.** Special care shall be taken when the motor connections consist in more than three wires; in this case it is necessary to reverse connections on all the motor winding connections.
- NOTE: Under no circumstances shall the internal wiring of the controller be tampered with. Failure to comply will void warranty, may cause injuries and damage the controller. Only the wires directly feeding the motor can be reversed.
- ◆ Turn normal power circuit breaker handle to the ON position.
  - ◆ Check the motor rotation once more.

#### 15.3.2. PHASE REVERSAL INDICATION VERIFICATION

- ◆ Turn circuit breaker handle to the ON position.
    - If the normal power phase reversal red LED is off, feeders are in the right phase sequence. No further adjustment is required, move to the next section.
    - If the normal power phase reversal red LED is on, feeders and electronic module do not have the same sequence and the electronic board needs to be adjusted.
      - Turn circuit breaker handle to the OFF position.
      - Open control panel door.
      - Locate the dipswitch « ABC-CBA » on the upper board.
      - With a small screwdriver or pencil, change « ABC-CBA » dipswitch from left to right.
        - **If a transfer switch is supplied with the controller**
        - **Open transfer switch door.**
        - **Locate the dipswitch « ABC-CBA » on the upper board.**
        - **Change « ABC-CBA » dipswitch from left to right.**
        - **Both ABC-CBA dipswitches must have the same adjustment.**
      - Close controller panel door.
      - Turn circuit breaker to the ON position.
- Verify that normal power phase reversal red LED is off.

## **15.4. PUMP CONTROL SECTION - INITIAL START UP AND FUNCTIONALITY TEST**

### **15.4.1. INITIAL START UP**

- ◆ Turn the circuit breaker handle to the ON position.
  - If the system pressure is above the cut in pressure setting (pressurized system), the motor will not start.
  - If the system pressure is under cut in pressure setting (under-pressurized system), the motor starts automatically to build up pressure.
- ◆ When the pressure is restored, the motor can be stopped using the STOP push button. The controller is ready for further tests.

### **15.4.2. START FROM START PUSHBUTTON**

- ◆ Press the START pushbutton on the controller, pump motor will start regardless of the system pressure and continues to run. (No possibility of automatic stop.)
- ◆ Measure and record the current drawn by the motor on phase 1, 2 and 3 under no load condition and full load condition.
- ◆ Press STOP pushbutton on the controller, pump motor will stop.

### **15.4.3. START FROM EMERGENCY START HANDLE    **!!!! CARREFULL !!!!****

- ◆ **Slowly** lift the EMERGENCY START handle until a resistance is felt. The pump motor must start before this 'resistance point'. **Important : if motor does not start before resistance point, do not active and call manufacturer.**
- ◆ The motor will always start in full voltage regardless of the system pressure and continues to run (no possibility of automatic stop even when the handle is released to its OFF position).
- ◆ Put EMERGENCY START handle back to OFF position
- ◆ Press STOP pushbutton on the controller, pump motor will stop.

### **15.4.4. START FROM REMOTE START STATION**

- ◆ If a remote start circuit is connected to the controller
  - Press the remote START pushbutton on the remote station or initiate temporary opening of the remote start contact, the pump motor will start regardless of the system pressure and continues to run.
  - Press STOP pushbutton on the controller, pump motor will stop.

### **15.4.5. START FROM FIRE EQUIPMENT CONTROL (DELUGE VALVE) (OPTION A3)**

- ◆ Initiate opening of the contact, the pump motor will start regardless of the system pressure and continues to run. (No possibility of automatic stop.)
- ◆ Initiate closure of the contact.
- ◆ Press the STOP pushbutton, the pump motor will stop.

## 15.4.6. WATER PRESSURE CONTROL

### MANUAL SHUTDOWN MODE

- ◆ Verify that the EPSR board is set for manual stop (see 12.4.1)
- ◆ Simulate a pressure drop in the system by draining water off the pressure sensing line.
- ◆ The pressure sensor automatically starts the pump motor when the pressure falls below the cut-in setting.
- ◆ Verify that the pump motor starts at the desired pressure. If not, readjust the cut-in start pressure.
  - Turn the circuit breaker handle to OFF position, and open the main door,
  - Set dipswitch 'Lock-Unlock' to 'Unlock' position
  - Close the main door, and turn the circuit breaker handle to ON position.
  - Adjust the settings using cut-in and cut-out push button.
  - After modification, reset dipswitch in 'Lock' position.
- ◆ When the pump has started and the pressure is below the cut-out threshold, the wording 'PUMP ON DEMAND' is shown on the screen. STOP pushbutton is disabled until pressure is restored.
- ◆ When the pressure is over the cut-out threshold, the word 'MANU' is shown on the first line; press the STOP pushbutton to stop the pump.

### AUTOMATIC SHUTDOWN MODE

NFPA20-2007 §10-5.4 (b) :'. . . automatic shutdown shall not be permitted where the pump constitutes the sole supply of a fire sprinkler or standpipe system or where the authority having jurisdiction has required manual shutdown'

- ◆ Verify that the EPSR board is set for automatic shutdown (see 12.4.1)
- ◆ Simulate a pressure drop in the system by draining water off the pressure sensing line. The pressure sensor automatically starts the pump motor when the pressure falls below the cut-in setting .
- ◆ Verify that the pump motor starts at the desired pressure. If not, refer to above for readjustment
- ◆ Let the pump build up pressure.
- ◆ 10 minutes after the pressure has reached the cut out setting, the pump motor will automatically stop. Note remaining time before shutdown appears on the screen.

Note: the 10 minute run period timer is reset if the system pressure drops below cut in value. It is recommended to adjust cut out value 20 psi below maximum pump pressure.

The pump motor can be stopped before the expiration of the run period delay by pressing the STOP push button if the pressure is higher than the cut out setting

## 15.4.7. FLOW SWITCH PUMP START (OPTION A4)

The flow switch automatically starts the pump motor as soon as the flow exceeds the setting on the flow switch. Usually this condition will be detected faster than a pressure drop.

- ◆ Verify that the motor starts when a water flow is detected (closing signal from flow switch)  
(NOTE: No possibility of automatic or manual stop if the flow switch contact remains closed unless the circuit breaker is turned off.)
  - If the motor has started because of flow switch and the controller did not detect a pressure drop, the motor will stop when flow switch contact will open.

- If the motor has started because of flow switch and the controller did detect a pressure drop,
  - If the controller is set for automatic stop, the pump motor stops when water flow has subsided and after the run period time has expired.
  - In the automatic mode, pressing the STOP pushbutton can stop the pump motor if the water flow has subsided before the run period time has expired.
  - If the controller is set for manual shut down only, press the STOP pushbutton, the pump motor will stop if water flow has subsided.

#### **15.4.8. WEEKLY AUTOMATIC EXERCISE CYCLE**

**IMPORTANT: It is the responsibility of the operator to be sure that the system accepts unsupervised test. Certain pumping systems need water flow in the system otherwise the pump can be damaged by overheating.**

##### Automatic weekly test

- Program weekly test as described in 12.2.
- Verify letter 'E' appears on the screen.
- At the beginning of the new test cycle, the pump motor will start, and 'weekly test' LED is on.
- At the end of the test cycle, the pump motor will stop automatically , and 'weekly test' LED goes off.
- Reprogram the time clock to the desired exercising schedule.

##### Manual weekly test

- Press simultaneously both pressure adjustment push button. The pump starts automacally for a 10 minutes run period timer. 'weekly test' LED is on.
- At the end of the test cycle, the pump motor will stop automatically , and 'weekly test' LED goes off.

Note : a manual stop is possible before expiration of timer by depressing STOP push button.

Note : if the pressure drops below cut-in, it abolishes the weekly test.

Note : remaining time before motor stop is shown on the screen (expressed in seconds)

## **15.5. ALARM TEST**

### **15.5.1. PHASE LOSS**

- ◆ Simulate a power failure by switching the circuit breaker handle to OFF position.
  - Verify the circuit connected to the terminals 'Pow Av' is reacting properly.

### **15.5.2. PUMP RUN**

- ◆ Start the pump by pressing the START pushbutton.
  - Verify the circuit connected to the terminals 'RUN NC' and 'RUN NO' is reacting properly.

### **15.5.3. PHASE REVERSAL** (not for single phase controller)

- ◆ Simulate a phase reversal by maintaining the RESET pushbutton for more than 10 seconds in order to start phase reversal simulation.
  - Verify the circuit connected to the terminals "Ph. Rev.' is reacting properly.

**15.5.4. WEEKLY TEST (OPTION C4)**

- ◆ Start the pump by programming the weekly test
  - Verify the circuit connected to the terminals 'Weekly T.' is reacting properly.

**15.5.5. LOW SUCTION (OPTION C5)**

- ◆ Simulate a drop of pressure on the suction pipe by draining water on the pressure sensing line.
  - Verify if the circuit connected to the AR10 relay base is reacting properly.

## 15.6. TRANSFER SWITCH SECTION - VERIFICATION

**IMPORTANT :** A protective device must be installed on the power line with model GPG since the units have no overcurrent or short circuit protective device on the Alternate Power side. Without this protection, the fire pump motor, the transfer switch and the wiring are not short circuit and overcurrent protected.

### 15.6.1. INSTALLATION AND MECHANICAL CHECK

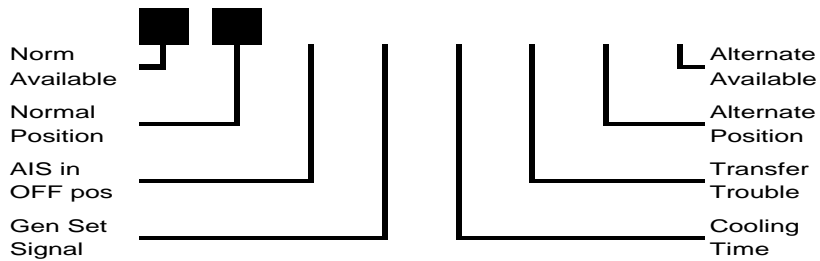
- ◆ Locate the overcurrent protective device (circuit breaker or fuse disconnect) on the alternate power source, which is upstream of the transfer switch.
- ◆ Switch OFF this breaker or fusible disconnect and secure it in OFF position with a padlock.
- ◆ Switch OFF the Alternate Power Isolating Switch AIS on the Transfer Switch.
- ◆ Switch OFF the Normal Power Circuit Breaker located on the Fire Pump.
- ◆ Open both doors and verify with a tester that no voltage is present up stream from the Alternate Power Isolating Switch AIS.
- ◆ Verify with a tester that no voltage is present downstream from the Normal Power Circuit Breaker.
- ◆ Proceed to the manual transfer switch test as described below :
  - **TornaTech model**
    - Unscrew the red/orange knob and remove the pin screw.
    - Move the handle to manually operate the transfer switch. The switch should operate smoothly without binding. If it does not, check for shipping damage or construction debris.
    - Return the transfer switch to the original position, and replace the pin screw.
  - **Zenith model**
    - Remove the handle stick. (all models except 150 amp)
    - Insert the handle stick on the rotation point.
    - Move transfer switch from normal to alternate, and back to normal position. The switch should operate smoothly without binding. If it does not, check for shipping damage or construction debris.
    - Return the transfer switch to the original position, and replace the handle stick.

### 15.6.2. CHECK GENERATOR STARTING AND TRANSFER

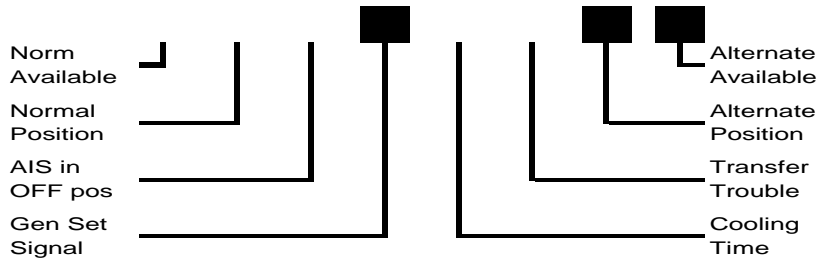
**VERY IMPORTANT:** Verify on both electronic boards that the ABC-CBA dip switches have the same settings. **IF NOT RESTART PROCEDURE AT Error!** Reference source not found.

- ◆ Verify that Normal Power Circuit Breaker and Alternate Power Isolating Switch are both in OFF position.
- ◆ Move the overcurrent protective device (previously locked) on the Alternate feeder line onto the ON position
- ◆ Verify that the connection for the control circuit between the generator set and the transfer switch is correctly done.
  - On the transfer switch terminals strip, the control wires must be connected to G1-G2 (blue terminals)
  - On the generator set, the control wires must be connected to the specific terminals.
- ◆ Close and lock both doors.
- ◆ Move Normal Power Circuit Breaker into the ON position
  - The alarm bell start sounding, press 'SILENCE' push button to stop sounding.
- ◆ Wait 15 seconds and move the Alternate Power Isolating Switch AIS onto the ON position.

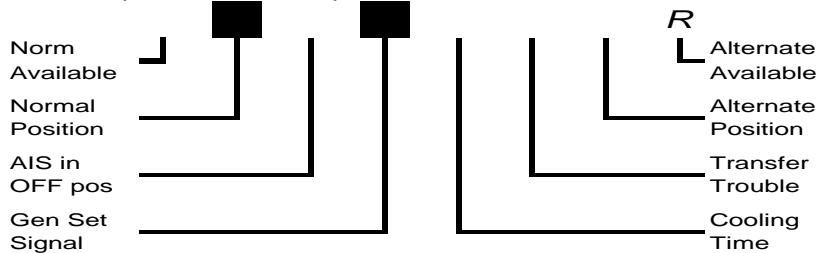
- Verify indicators :



- ◆ Press continuously the 'transfer switch test' yellow push button and the following sequence occurs:
  - Normal available indicator shuts down;
  - After 3 seconds, the generator set signal indicator appears, generator set receives a run signal and should start;
  - The alternate available indicator turns on when voltage and frequency reach pickup value;
    - If the alternate available indicator is a black square, the transfer switch moves to alternate position and alternate position indicator appears. Then release 'Transfer switch test' push button.



- If the alternate available indicator is a letter 'R', the alternate source is not connected in the same sequence as normal power and must be corrected with the following sequence:



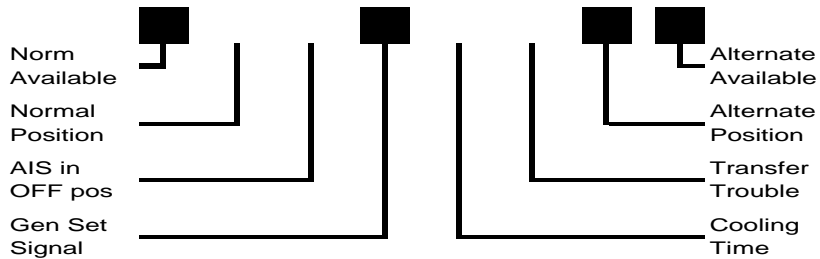
- ❖ Move the Alternate Power Isolating Switch and Normal Power Circuit Breaker onto the OFF position
- ❖ Move the Alternate Power source overcurrent protective device (circuit breaker or fusible disconnect) as previously located onto the OFF position
- ❖ Secure it in off position with a padlock. Work on power wires will be done.
- ❖ Open Transfer switch compartment door.
- ❖ Verify with a tester that the power on the line side of the Alternate Power Isolating Switch is disconnected before proceeding.
- ❖ Swap any two alternate power source feeder wires on the line side of the Alternate Power Isolating Switch to change phase sequence and close compartment door.
- ❖ Note: under no circumstances shall the internal wiring of the controller

be tampered with. Failure to comply will void warranty, may cause injuries and damage the transfer switch. Only the wires on the line side of the Alternate Power Isolating Switch can be reversed.

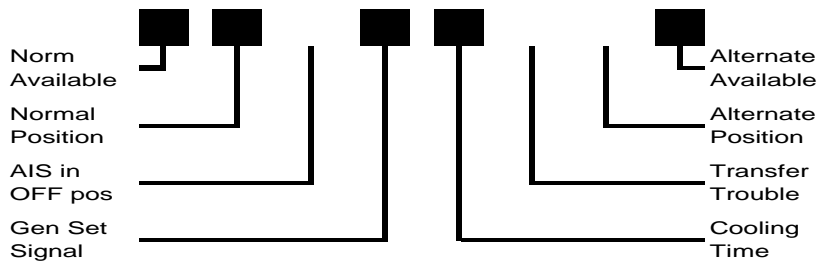
- ❖ Move the Alternate Power source overcurrent protective device as previously locked onto the ON position.
- ❖ Restart the procedure at the beginning.

### 15.6.3. CHECK GENERATOR STOPPING AND RETRANSFER

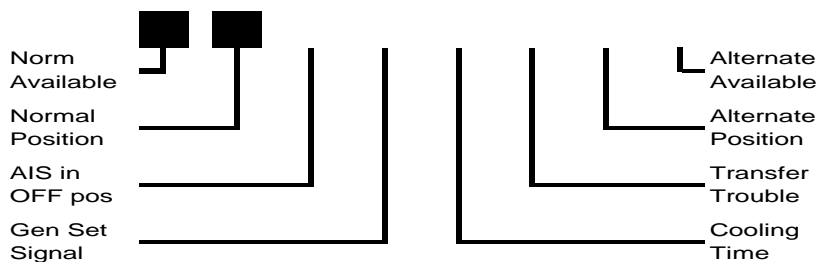
- ◆ When the 'transfer switch test' push button is released the normal available indicator appears.



- ◆ After 5 minutes, transfer switch moves to normal source, and 'Cooling time' indicator appears.  
 Note: to bypass the 5 minutes delay, press 'Bypass time delay' push button.  
 Note: the retransfer sequence to normal power is disabled if pump is running.



- ◆ After the cooling time (5 minutes), the generator set signal is OFF and the engine stops.  
 Note: to stop the engine before the expiration of the cooling time, press 'bypass time delay' push button.  
 Note : some engine has their own cooling time, so the engine will stop after the expiration of the two cooling timers



## **16. FIRE PUMP TROUBLESHOOTING HINTS**

The following troubleshooting hints are intended to solve common field problems by qualified and authorized personnel only. This list is not exhaustive. If the problem is not solved with the following hints, please do not hesitate to contact factory.

**IMPORTANT: Re-tighten all connections (terminals – relays sockets screws – etc.) before doing any troubleshooting.**

## 17. PREVENTIVE MAINTENANCE AND TEST

Fire pump controllers are an important part of your fire protection system. They require a minimum preventive maintenance but must be periodically inspected and their operation simulated to assure constant performance.

**NOTE: Only qualified and authorized personnel must do this maintenance.**

<b>17.1. <u>VISUAL INSPECTION</u></b>	OK	N/D
Inspect cleanliness of controller.		
Remove any object from the top of controller.		
Dust and clean the controller.		
Inspect controller for any evidence of corrosion outside.		
Inspect controller for any evidence of corrosion inside.		
Check for leaks in pressure sensor and piping.		
Inspect door for proper alignment and function of door locks		
Inspect circuit breaker handle for proper operation		
Inspect circuit breaker handle for interlock with door		
Inspect emergency start handle operation		
Verify operation of limit switch on emergency start handle		
Inspect tightness of all connections		
Inspect tightness of all terminal jumpers		
Inspect controller grounding		
Inspect harness mechanical attachment		
Inspect relays, contactors, and timers for any evidence of damage.		
Inspect motor contactor power contacts.		
Inspect tightness of all mounting nuts and screws.		
<b>17.2. <u>OPERATIONAL INSPECTION</u></b>	OK	N/D
Simulate a phase reversal and check indication and remote alarm.		
Check motor rotation.		
Start from start push button		
Start from emergency start handle.		
Start from remote start station. (If connected.)		
Start from weekly test		
Start from water pressure control.		
Start from flow switch. (Option n° A4.)		
Verify low suction alarm condition. (Option n° B7 and/or C5.)		

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TornaTech Inc  
7075 Place Robert Joncas  
Unit 132  
Saint Laurent, Qc, H4M 2Z2  
Canada

Tel : +1 514 334 0523  
Fax : +1 514 334 5448  
[www.tornatech.com](http://www.tornatech.com)