INSTALLATION AND MAINTENANCE MANUAL FOR ELECTRIC FIRE PUMP CONTROLLERS WITH AUTOMATIC TRANSFER SWITCH

MODEL GPx + GPG or GPU

1. GENERAL DESCRIPTION

Model GPx electric fire pump controllers are 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 and is arranged for electrical or 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

2. TYPES OF ELECTRIC FIRE PUMP CONTROLLERS

FIRE PUMP CATALOGUE NUMBER				
MODEL n° EXAMPLE: GPA - 208 / 50 / 3 / 60				
GPA	208	50	3	60
Model prefix	Voltage	HP rating	Phase	Frequency

2.1. ACROSS-THE-LINE STARTER

2.1.1. MODEL GPA:

This model is intended to be used where the local utility or the capacity of the power source permits across-the-line starting.
Full voltage is applied to the motor as soon as the controller receives a start command

2.2. REDUCED VOLTAGE STARTER

These models are intended to be used where the local utility or the capacity of the power source does not permit full voltage starting.
In all the reduced voltage models, the manual “EMERGENCY RUN” device will initiate across-the-line starting.

2.2.1. MODEL GPP: PART WINDING STARTER

This model requires the use of a motor with two separate windings and 6 power conductors between the controller and the motor.
Upon a start command, the first winding is connected to the line immediately. The second winding is connected to the line after a very short time delay.

2.2.2. MODEL GPR: AUTOTRANSFORMER STARTER

This model does not require a multi-connection motor. It only requires 3 conductors between the controller and the motor.
Upon a start command, an autotransformer is utilized to supply reduced voltage to the motor. After a time delay, the autotransformer is shunted out and the motor is connected to full voltage by a closed transition switching sequence.

2.2.3. MODEL GPS: SOLID STATE STARTER

This model does not require a multi-connection motor. It only requires 3 conductors between the controller and the motor.
Upon a start command, a solid-state starter is utilized to supply a step less ramp-up voltage to the motor until the motor reaches its full speed. At that time, a fully horsepower rated by-pass contactor is energized connecting the motor directly to

full voltage and eliminating all heat loss within the solid-state starter.
This controller also features a soft motor stopping mode.

2.2.4. MODEL GPV: ACCELERATION RESISTOR STARTER

This model does not require a multi-connection motor. It only requires 3 conductors between the controller and the motor.
Upon a start command, a set of acceleration resistors in each phase is utilized to supply a reduced voltage to the motor. After a time delay, the resistors are shunted out and the motor is connected to full voltage by a closed transition switching sequence.

2.2.5. MODEL GPW: WYE-DELTA CLOSED TRANSITION STARTER

This model requires a multi-connection motor and 6 conductors between the controller and the motor.
Upon a start command, the motor is connected to the line in the wye connection. After a time delay, the motor is reconnected to the line in the Delta configuration applying full voltage to the motor windings by a closed transition switching sequence.
The power source does not « see » any open circuit during the transition from wye to delta.

2.2.6. MODEL GPY: WYE-DELTA OPEN TRANSITION STARTER

This type of starter requires a multi-connection motor and 6 conductors between the controller and the motor.
Upon a start command, the motor is connected to the line in the Wye connection. After a time delay, the motor is reconnected to the line in the Delta configuration applying full voltage to the motor windings. This controller is of the open transition type. The motor is disconnected from the line during the transition from start (wye) to run (delta) mode.

3. TYPES OF AUTOMATIC TRANSFER SWITCH

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

3.1. MODEL GPG

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 GPU

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. The controller must be in automatic mode.

4.1.2. MANUAL START

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

4.1.3. REMOTE MANUAL START

The motor can be started from a remote location by momentarily opening/closing a contact of a manual push button.

4.1.4. REMOTE AUTOMATIC START

The motor can be started from a remote location by momentarily opening/closing a contact connected to an automatic device. The controller must be in automatic mode.

4.1.5. 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.

4.1.6. 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.

4.1.7. 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.

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 controller with transfer switch 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).

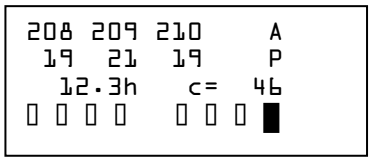
6.2. PUMP CONTROLLER - POWER MONITORING BOARD

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.



The first line shows the three voltages between phases of the source the pump controller is connected to.
The last digit of the first line indicates the controller mode of operation (A: automatic controller, N: Non-automatic controller)

The second line shows the current in each phase.
The last digit of the second line indicates the controller mode (P : pressure actuated controller; N:non pressure actuated controller)

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:
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 5 seconds, 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[1] (over 3.5%) for more than 1 second, the indicator starts flashing. If phase unbalance occurred, the indicator

[1] 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 x 9 / 459 = 1.96 %

Reference: NEMA Standards MG 1 – 14.35.

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 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
Input : 00001000
Output :10000000
OV: 250 Gnd:5.1A
```

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.

```
  Phase Reversal
    Simulation

      8 Seconds
```

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. POWER AVAILABLE 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.

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 ± 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 right.

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 last digit of the second line indicates if the automatic shutdown feature is enabled (A) or disabled (M).

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 simulates a pressure drop in the system to start the pump for a run period time of 10 minutes.

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. ALARM BELL

The conditions that trigger the alarm bell are:

- Pressure below 5 psi
- Pressure at maximum pressure
- Cut-in and cut-out set at 0 psi – 0bar
- Pressure monitoring board in programming mode.

It is possible to permanently silence the alarm bell by moving the dipswitches BUZZER E/D (located on the relay board) to the D position (disabled).

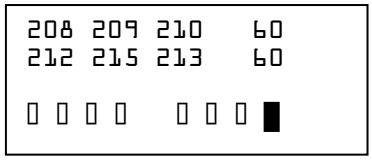
6.5. TRANSFER SWITCH - SOURCE MONITORING BOARD

6.5.1. 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.



The first line shows the three voltages between phases and the frequency of the normal source.
The second line shows the three voltages between phases and the frequency of the alternate source.
The third line shows status messages when present.

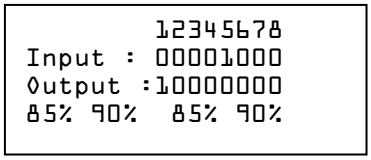
The fourth line is reserved for following indicators:

Normal source available
This indicator lights up (black square) 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 the symbol "R" if the normal source is in wrong phase rotation.
Alternate source available
This indicator lights up (black square) 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 the symbol "R" if the amternate source is in wrong phase rotation.

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 5 min).

DISPLAY IN 'STATUS' MODE

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



By pressing the RESET push button longer than 5 seconds, the display will switch in the 'status' mode. The second line indicates all status of the eight inputs. As the third line shows status of the eight outputs.
The fourth line shows the settings of the normal and alternate source (pick-up and drop out).

The display will switch back to the normal display mode after 1 minute, or when the reset push button is depressed.

6.5.2. 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 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;
- This push button is also used to have acces to the status mode by depressing it for than 5 seconds.

6.5.3. TRANSFER SWITCH TEST PUSH BUTTON

The transfer switch test push button, located to the left of 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.

6.6. ALARM BELL

The alarm bell located on the door of 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 not in ON position, the audible alarm will start again.

7. ALARM CONTACTS

The following alarm contacts are available on all controllers:

- motor run
- power available (loss of phase)
- phase reversal
- pump room alarm
- motor trouble
- Control 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 alarm contacts are available in option:

- weekly test (option C4)
- low suction (option C5)
- low discharge (option C6)
- low temperature (option C7)
- low level (option C10)
- high motor temperature(option C11)
- high vibration (option C12)
- ground fault (option C13)
- pump on demand/automatic start (option C14)
- pump fail to start (option C15)
- control voltage healthy (option C16)
- flow meter open (option C17)
- high water level (option C18)

8. INSTALLATION

The GPx electric fire 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 fire 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 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 brackets 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 for the pressure sensor is 1/2" NPT. The pressure sensor connection is located on the side of the controller.
The pump start - stop pressure sensor shall be connected to the system as per NFPA 20-2007, Chapter 10-5.2.1.6 (b) and (c) and figure A-10-5.2.1 (a) and (b).

11.2. ELECTRICAL CONNECTIONS

11.2.1. ELECTRICAL WIRING

The electrical wiring between the power source and the fire 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 fire 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 varies depending on the model of starter:

- 3-wires plus ground sized at 125% of full load current for models GPA, GPR, GPS, and GPV.
- 6-wires plus ground sized at 125% of 50% of the motor full load current for GPP model.
- 6-wires plus ground sized at 125% of 58% of the motor full load current for: GPY and GPW models.

11.2.2. 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 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.

11.2.3. INCOMING POWER CONNECTIONS

Incoming normal power is to be connected to terminals identified L1-L2 and L3 located on the disconnecting means IS. If the controller is supplied with a transfer switch, incoming alternate power is to be connected to terminals identified AL1-AL2-AL3 located on the disconnecting means AIS (transfer switch side).
The electronic board is phase sensitive, thus the incoming power leads must be connected in the correct phase order.

11.2.4. MOTOR CONNECTIONS

Motor connections are connected to terminals identified by:

- T1-T2 and T3 located on main contactor (1M) for models GPA, GPR, GPS and GPV
- T1-T2 and T3 located on contactor (1M) and T7-T8 and T9 located on contactor (2M) for model GPP:
- T1-T2 and T3 located on contactor (1M) and T6-T4 and T5 located on contactor (2M) for models GPY and GPW.

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.

11.2.5. 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.)

Except when mentioned, all contacts are DPDT and located on the relay board.

Contacts are rated for 8A, 250VAC.

The following contacts are available from the top to the bottom of the board.

LOSS OF PHASE

Identified TB3 'Power Available'; the NO contacts TB3-11/14, 21/24 (held in closed position when power is available) will open and the NC contacts TB3-11/12, 21/22 (held in open position when power is available) will close to signal loss of any phase or power.

PHASE REVERSAL

Identified TB4 'Phase Reversal'; the NO contacts TB4-11/14, 21/24 will close and the NC contacts TB4-11/12, 21/22 will open to signal phase reversal.

PUMP ROOM ALARM

Identified TB5 'Pump Room Alarm'; the NO contacts TB5-11/14, 21/24 will close and the NC contacts TB5-11/12, 21/22 will open to signal pump room alarm condition (Overvoltage or Undervoltage or phase unbalance). This relay may be also activated by external signal if so programmed.

MOTOR TROUBLE

Identified TB6 'Motor Trouble'; the NO contacts TB6-11/14, 21/24 will close and the NC contacts TB6-11/12, 21/22 will open to signal a motor trouble (overcurrent or undercurrent or fail to start or ground fault (optional)). This relay may be also activated by external signal if so programmed.

WEEKLY TEST

Identified TB7 'Weekly Test'; the NO contacts TB7-11/14, 21/24 will close and the NC contacts TB7-11/12, 21/22 will open to signal motor is running because of exercise weekly test.

CONTROL READY

Identified TB8 'Ctrl Ready'. Only one form C contact is available. This relay is energized in normal condition. The NO contact TB8-11/14 (held in closed position when controller is ready) will open and the NC contact TB8-11/12 (held in open position when controller is ready) will close to signal the pressure board is set for pressure actuated controller and is functioning. Note that this relay will open when pressure control board is in programming mode.

MOTOR RUN

Located on the bottom left of the relay board, and identified TB1. Two SPST contacts are available. The NC contact (TB1-11/12) will open and the NO contact (TB1-23/24) will close to signal motor running.

INTERLOCK (OPTION A7)

Relay CR34: 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 signal interlock to remote equipment.

EXTRA MOTOR RUN ALARM CONTACTS (OPTION C1)

The NO contact is connected to terminals 93-94 and will close to signal motor run.

The NC contact is connected to terminals 95-96 and will open to signal motor run.

LOW SUCTION (OPTION C5)

Relay CR18: 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.

LOW DISCHARGE (OPTION C6)

Relay CR19: 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 discharge pressure condition.

LOW TEMPERATURE (OPTION C7)

Relay CR20: 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 temperature condition

LOW LEVEL (OPTION C10)

Relay CR21: 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 level condition

HITH MOTOR TEMPERATURE (OPTION C11)

Relay CR22: 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 high motor temperature condition

HIGH VIBRATION (OPTION C12)

Relay CR23: 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 high vibration condition

GROUND FAULT (OPTION C13)

Relay CR24: 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 ground fault detection.

PUMP ON DEMAND (OPTION C14)

Relay CR25: 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 pump on demand condition.

FAIL TO START (OPTION C15)

Relay CR26: 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 fail to start condition - no current under an automatic start.

CONTROL VOLTAGE HEALTHY (OPTION C16)

Relay CR27: 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 when control voltage is healthy.

FLOW METER OPEN (OPTION C17)

Relay CR39: 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 flow meter open condition.

HIGH WATER LEVEL (OPTION C18)

Relay CR40: 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 high water level condition.

LOCK OUT SIGNAL (OPTION A6)

Three terminals (107-108-109) are installed on a terminal strip. The contact 107-108 will close and the contact 108-109 will open to signal that the fire pump controller is locked out (will not start in automatic mode).

PERMANENT LOAD SHEDDING (OPTION E1 AND E3)

Relay CR31: 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 when the pump is running while the connected power source is the alternate source.

TEMPORARY LOAD SHEDDING (OPTION E2 AND E3)

Relay CR32: 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 temporary shed external load (adjustment of TR4 is required)

11.2.6. CONNECTION TO EXTERNAL DEVICE

REMOTE MANUAL START SIGNAL

Each electric fire pump controller has provision for connection to a manual remote start station (manually operated). This

remote start contact can be normally open or normally closed. Normally open contact must be connected to TB10-1/2 and the factory installed jumper must stay in place. Normally closed contact must be connected to TB10-2/3 instead of the factory installed jumper. Change of state of this contact will initiate a manual start of the pump.
Note : the sequential start timer is not enabled when starting is initiate by remote device.

REMOTE AUTOMATIC START SIGNAL

Each electric fire pump controller has provision for connection to a remote automatic starting device (automatically operated). This remote start contact can be normally open or normally closed. Normally open contact must be connected to TB10-4/5 and the factory installed jumper must stay in place. Normally closed contact must be connected to TB10-5/6 instead of the factory installed jumper. Change of state of this contact will initiate an automatic start of the pump.
Note : important to activate this function, the factory installed jumper between TB10-7/8 must be removed.
Note : the sequential start timer is not enabled when starting is initiate by remote device.

LOCK OUT SIGNAL (OPTION A6)

To respect the NFPA 20-2007 art 10.5.2.6, two sets of terminals are added on the terminal strip (104-106 and 3-110).

If the interlocked equipments are in the same pump room and wiring is mechanically protected, the terminals 3-110 can be used to connect a NO contact. When this NO contact is open, the fire pump controller is enabled. If this NO contact is closed, the controller is locked out and will not start with a pressure drop (automatic start). The motor can always be manually started by START push button.

If the interlocked equipments are not in the same pump room or are in the same pump room but wiring is not mechanically protected, the terminal **3-110 can not be used**; the terminal 104-106 must be used to connect a remote control voltage from the other equipment. Very important, verify that control voltage from other equipment and control relay CR10 are compatible. When voltage will be present between terminals (104-106), the controller is locked out and will not start with a pressure drop (automatic start). The motor can always be manually started by START push button.

CONCENTRATE FOAM PUMP (OPTION A8)

Three terminals identified 'FOAM PUMP' are enabled with this option. This foam pump contact can be normally open or normally closed. Normally open contact must be connected to TB10-10/11 and the factory installed jumper must stay in place. Normally closed contact must be connected to TB10-9/11 instead of the factory installed jumper. Change of state of this contact will initiate a start of the pump.
The pressure sensing within the fire pump controller is omitted.

The sequential start timer is so programmed is enabled with this starting signal.

LOW ZONE (OPTION A9)

To respect the NFPA 20-2007 art 10.5.2.6, the interconnected controllers must be installed in the same pump room and wiring between them must be mechanically protected. If not the OPTION A9A must be used.

Red terminals 31-16 must be connected to the NO contact from the upper level equipment. Closing this contact will initiate a start command.

Red terminals 15-15A must be connected to the upper level equipment to allow upper equipment starting.

MEDIUM ZONE (OPTION A10)

To respect the NFPA 20-2007 art 10.5.2.6, the interconnected controllers must be installed in the same pump room and wiring between them must be mechanically protected. If not the OPTION A10A must be used.

Red terminals 31L-16L must be connected to the NO contact from the upper level equipment. Closing this contact will initiate a start command of high controller.

Red terminals 15L-15AL must be connected to the upper level equipment to allow upper equipment starting.

Blue terminals 31H-16H is the starting command to the lower equipment. Command closure will initiate a lower equipment start.

Blue terminals 15AH-151H must be connected to the NO contact signaling the lower equipment running. Closure of this contact will enable the medium zone controller to start.

HIGH ZONE (OPTION A11)

To respect the NFPA 20-2007 art 10.5.2.6, the interconnected controllers must be installed in the same pump room and wiring between them must be mechanically protected. If not the OPTION A11A must be used.

Blue terminals 31-16 is the starting command to the lower equipment. Command closure will initiate a lower equipment start.

Blue terminals 15A-151 must be connected to the NO contact signaling the lower equipment running. Closure of this contact will enable the high zone controller to start.

LOW SUCTION PRESSURE SWITCH (OPTION B7)

Refer to label inside controller for connection details.

LOW DISCHARGE PRESSURE SWITCH (OPTION B9)

Refer to label inside controller for connection details.

LOW AMBIANT TEMPERATURE THERMOSTAT (OPTION B10)

Refer to label inside controller for connection details.

LOW WATER LEVEL FLOAT (OPTION B18)

Refer to label inside controller for connection details.

MOTOR HIGH TEMPERATURE (OPTION B19)

Two terminals 89-90 are installed on the terminal strip and must be connected to the motor temperature sensor. The wiring between terminals and sensor must be shielded.

HIGH VIBRATION SENSOR (OPTION B20)

Refer to label inside controller for connection details.

FLOW METER (OPTION B23)

Refer to label inside controller for connection details.

HIGH WATER LEVEL FLOAT (OPTION B24)

Refer to label inside controller for connection details.

12. PRESSURE BOARD PROGRAMMING

12.1. GENERALS

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

When a menu is accessed, the alarm bell will be sounding if the dipswitches BUZZER E/D are in the E position (Enabled). During commissioning, the alarm can be silenced by moving them to D position.

After completing the start up, it is important to verify that the dipswitches BUZZER E/D are in the E position.

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:

Date/time and weekly test
↓
Unit
↓
Timer
↓
Pressure differential (expert only)
↓
Sensor Calibration (expert only)
↓
Memory purge (expert only)
↓
Maximum pressure (expert only)
↓
Low system pressure setting (expert only)
↓
High system pressure setting (expert only)
↓
Print mode
↓
Pressure log
↓
Event log
↓
I/O status
↓

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.[2]

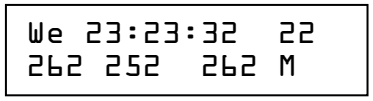
When the EPSR is in normal mode, the following screen is:

```
We 23:23:32   E
262  252  262 M
```

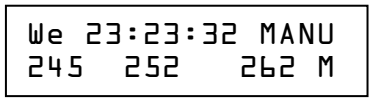
The last digit on the first line is E or D.
When letter E appears: a weekly test is programmed and pump will start at specific time.
When letter D appears: the weekly test is disabled.

[2] 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)

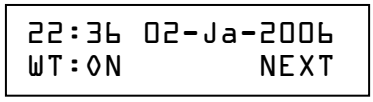


If the word 'MANU' appears on the right, the system is waiting for a manual stop.



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.

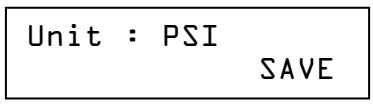


On the first line, the user can adjust the time and the date
On the second line, the user can enable the weekly test (WT:ON), or disable the weekly test (WT:OFF).
If weekly test is enabled, the NEXT function will open a second window.

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

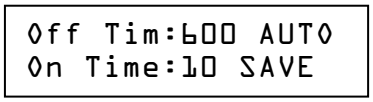
In this menu, the user can modify the unit of the displayed pressure.



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.



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

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 at the expiration of this timer. The ON timer starts counting when pressure drops below cut in threshold. The ON timer resets to its initial value when pressure reaches cut-out threshold.
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 S8-2 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 ± 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 S8-2 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. The 'Cut Out" push button must be depressed 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. The 'Cut Out' push button must be depressed to record this value. A "✱" appears in front of Read.
3. The cursor must be moved to 'NEXT' and the 'Cut Out' push button must be depressed.
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.

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 S8-2 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 S8-2 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 S8-2 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 S8-2 on).

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

In this menu, the expert user can change the high system pressure threshold. If the system pressure raises above 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 min :200 NEXT
```

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

```
X : 15 min
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 inputs

```
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.

13.3.1. CONNECTION TO EPSR

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

13.3.2. COMMUNICATING

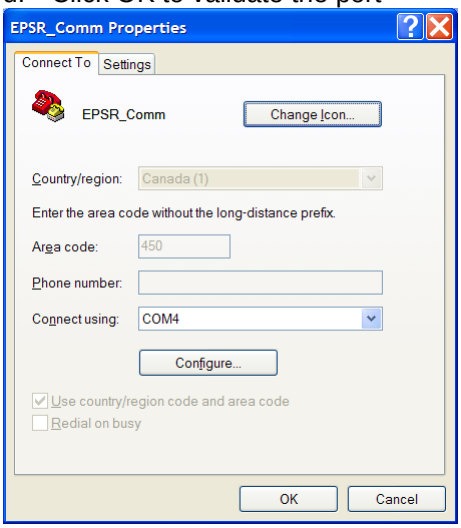
To communicate with the EPSR, communication software is required. The latest versions of Windows ™ come standard with Hyper Terminal software.

a. Select from the Windows™ Toolbar:Start – all Program – Accessories - (Communication) – HyperTerminal or Start - all program - EPSR - EPSR comm. ht
b. 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*
c. If your Hyper Terminal software has already been configured to communicate with an EPSR, select this configuration.

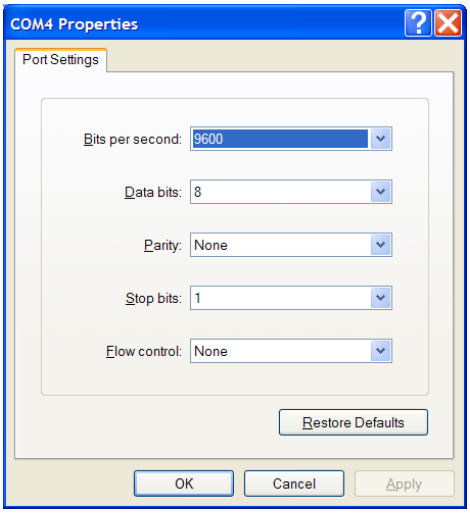
13.3.3. COMMUNICATION CONFIGURATION

To be able to communicate with the EPSR, the communication parameters between the Fire Pump Controller and laptop computer must be identical.

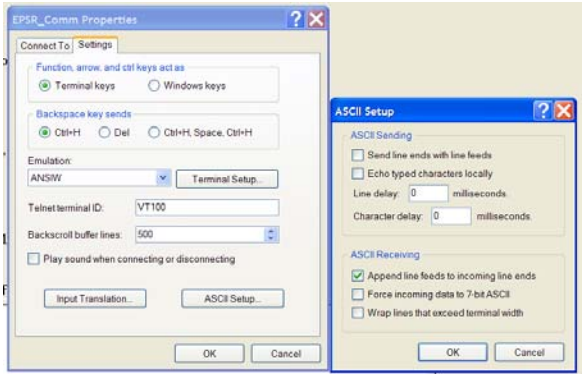
a. In the « New Connection » window, enter a connection name. Ex:"EPSR"
b. Click on « OK » to validate.
c. The «Connect to» window will open and in the connect using box, the USB com port must be entered. (See "verification of USB port)
d. Click OK to validate the port



e. A new window opens to select the communication parameters



f. Verify the following Port settings: bits per second: 9600 - data bits: 8 - parity: none - stop bits: 1 - flow control: none
g. On the Settings windows, verify the following selection 'Terminal Keys' - Ctrl+H' - 'ANSW'- 'VT100' - '500'.

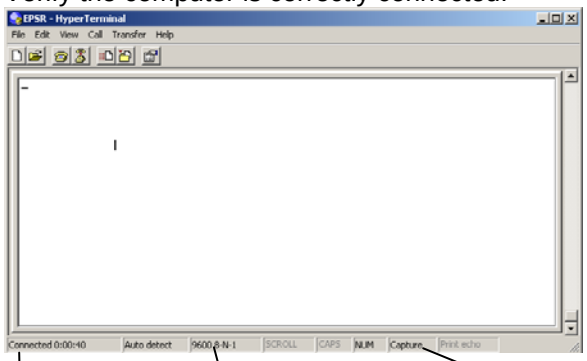


h. Click 'ASCII Setup and verify only 'Append line feeds to incoming line ends' is checked.
i. Press "OK" to validate.

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:

a. Select Transfer – Capture Text –
b. 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'.
c. It is good practice to save the data with a name incorporating the date. Ex: my documents\20061024.txt (for October 24, 2006)
d. click « Start » to begin capturing. At that moment, all new incoming text will be saved in the destination.
e. Click "transfer-capture text-stop" to stop saving incoming text. New coming text will not be saved.

On the computer keyboard,
hit the "1" key to get pressure value of both analog inputs, or
hit the "2" key to download pressure data's of last 7 days , or
hit the "3" key to download resume of last 15 days events, or
hit the "4" key to get EPSR settings.

13.3.5. CLOSING HYPER TERMINAL SESSION

Once the data has been downloaded, the communication can be disconnected.

a. Click on File, select Exit
b. 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, Excel, and 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 seven days resume of the pressure events.

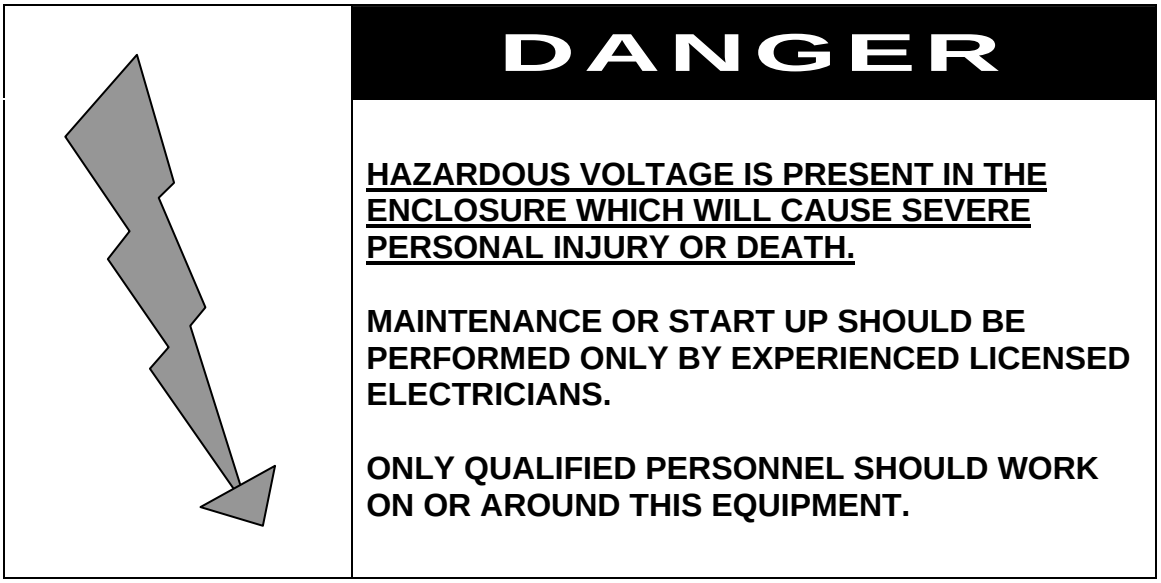
EPSR	
LAST SEVEN-DAY RESUME ----------	
Day : Tu, Mar 23, 04 Time : 14:25	Date and time of the printout
Cut in : 32 psi Cut out : 49 psi	Adjusted thresholds
Last Change : 23 Mar 2004, 12:53	Last time when thresholds have been adjusted
Pmin : 22 psi Tu, Mar 12, 13:52 Pmax : 250 psi Tu, mar 23, 14:01	Minimum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

Soft version :040122SWP01-05 End of resume Press Print to print pressure data's	Software version of the EPSR

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, 12:54:52 93 Mar 23, 12:24:24 104 Mar 23, 12:12:36	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



DANGER

HAZARDOUS VOLTAGE IS PRESENT IN THE ENCLOSURE WHICH WILL CAUSE SEVERE PERSONAL INJURY OR DEATH.

MAINTENANCE OR START UP SHOULD BE PERFORMED ONLY BY EXPERIENCED LICENSED ELECTRICIANS.

ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT.

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.

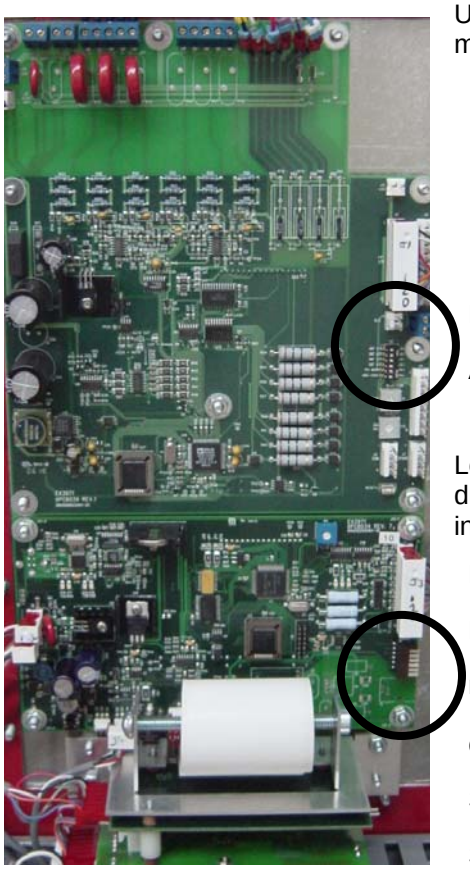
WARNING

Water lines must be flushed before connecting pressure switch or pressure transducer. Failure to do so will void warranty.

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	□□	Do not change (set at factory)
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.

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.

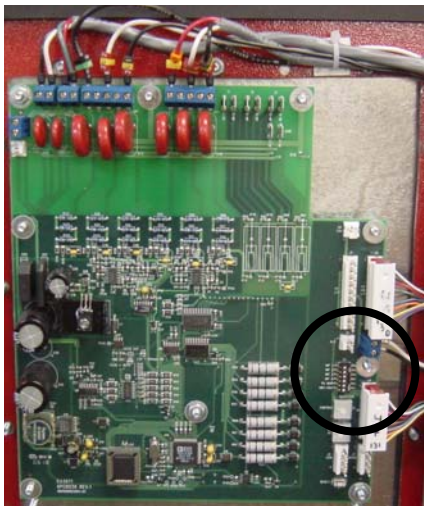
It is important to re–set the dip switch to "LOCK" position to prevent unauthorized changes

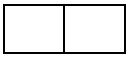
It is possible to avoid nuisance starting by depressing the stop push button.

It is important to remove Jumper J3 on TB10-7/8 to set the automatic mode.

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		Do not change
Inp 2		Do not change
Inp 3		Do not change
Inp 4		Do not change
Ph mon		Factory set - do not change
ABC - CBA		Phase reversal reference

15.3. FIRE PUMP SECTION - VERIFICATION

IMPORTANT : During the fire pump side start–up, the transfer switch door must be kept closed, the isolating switch of the alternate source must be kept all the time in OFF position and secured with a padlock.

When powered up, the transfer switch will automatically switch into normal position and remains in this position. The alarm bell will sound to indicate the isolating switch of the alternate source is in off position. This audible alarm can be silenced for 15 minutes by using the silence push button.

15.3.1. MOTOR ROTATION VERIFICATION

- Turn 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 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 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 red LED ‘phase reversal’ is off and the ‘Normal Source’ indicator on the transfert switch side is a black square, feeders are in the right phase sequence. No further adjustment is required, move to the next section.
  - If the red LED ‘phase reversal’ is on and the ‘Normal Source’ indicator on the transfert switch side is the symbol ‘R’, 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 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 red LED ‘phase reversal’ is off and the ‘Normal Source’ indicator on the transfert switch side is a black square.

15.4. FIRE PUMP CONTROLLER - INITIAL START UP AND FUNCTIONALITY TEST

15.4.1. INITIAL START UP

- Verify that the factory installed jumper between TB10-7/8 is in place to avoid automatic start at power-up.
- Turn the circuit breaker handle to the ON position.
- Verify that the letter N (non automatic controller) appears on the upper display top line.

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 !!!! CAREFUL !!!!

- **Slowly** pull the EMERGENCY START handle until a resistance is felt. The pump motor must start before this 'resistance point'. **VERY 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 MANUAL START STATION

- If a remote start circuit is connected to the controller
  - Press the remote START pushbutton motor will start regardless of the system pressure and continues to run. (No possibility of automatic stop.)
  - Press STOP pushbutton on the controller, pump motor will stop.

15.4.5. START FROM FIRE EQUIPMENT CONTROL

- Verify the equipment is correctly connected to TB10. Verify the factory installed jumper between TB10-7/8 is **removed** to enable automatic start. The letter A (automatic controller) must appear on the upper display top line.
- Initiate opening/closing of the contact, the pump motor will start regardless of the system pressure and continues to run.
- Initiate reverse signal - closure/opening of the contact.
- Press the STOP pushbutton, the pump motor will stop.

15.4.6. WATER PRESSURE CONTROL

- **Verify the factory installed jumper between TB10-7/8 is removed to enable automatic start.**

MANUAL SHUTDOWN MODE

- Verify that the EPSR board is programmed for manual stop. The letter M (manual shutdown) must appear on the lower display second line. (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 wording 'PUMP ON DEMAND' disappears and 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. The letter A (automatic shutdown) must appear on the lower display second line. (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 (factory set at 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 1st line.

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 exercise cycle

- Program weekly test as described in 12.2.
- Verify letter 'E' (weekly exercise enabled) appears on the lower display top line.
- At the beginning of the new test cycle, the pump motor will start and the light 'Weekly test' goes on
- At the end of the test cycle, the pump motor will stop automatically; light 'weekly test' shuts down.
- Reprogram the time clock to the desired exercising schedule.

Or

- Cancel automatic exercise cycle - Verify letter 'D' (weekly exercise disabled) appears on the lower display top line.

Manual exercise cycle.

- Press simultaneously both pressure adjustment push buttons. The pump starts for a 10 minute period. The light 'Weekly test' goes on
- At the expiration of the timer, the pump motor will stop automatically; light 'weekly test' shuts down.

- Note : Manuel stop with stop push button is possible before the end of the test cycle.
- Note : Exercise cycle is cancelled if pressure drops below cut-in threshold
- Note: remaining time before stop is shown on the screen (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/or 'RUN NO' is reacting properly.

15.5.3. PHASE REVERSAL

- 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 or for the new models, only remove the safety pin.
    - 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 or for the new models, the safety pin.
  - **Zenith model**
    - Remove the handle stick. (all models except 150 amp)
    - Insert the hancle 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.

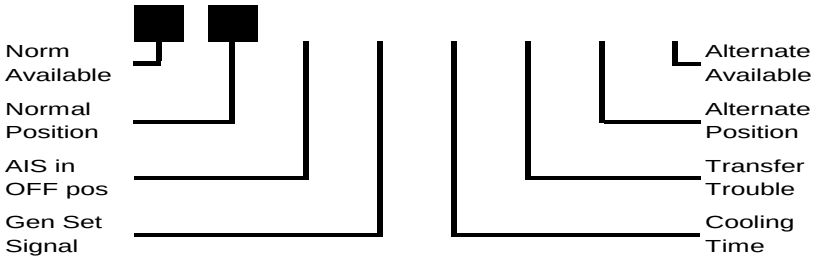
15.6.2. CHECK GENERATOR STARTING AND TRANSFER

VERY IMPORTANT: Verify on both electronic boards that the ABC-CBA dip switches have the same settings. IF NOT RESTART PROCEDURE AT 15.3.1

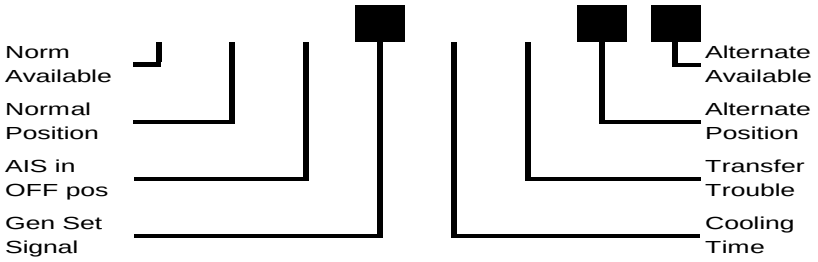
- Verify that Normal Power Circuit Breaker and Alternate Power Isolating Switch are both in OFF position.
- Move the overcurrent protective device (previously locked) on the Alternate feeder line onto the ON position
- Verify that the connection for the control circuit between the generator set and the 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.

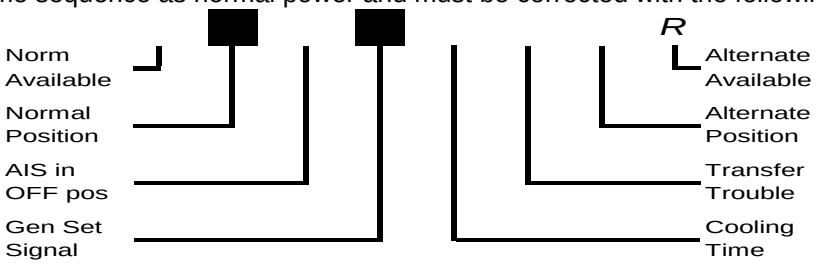
♦ Wait 15 seconds and move the Alternate Power Isolating Switch AIS onto the ON position.
- Verify indicators :



♦ 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:



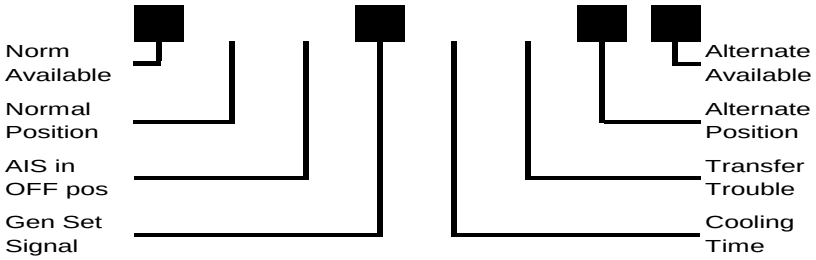
❖ Move the Alternate Power Isolating Switch and Normal Power Circuit Breaker onto the OFF position
❖ Move the Alternate Power source overcurrent protective device (circuit breaker or fusible disconnect) as previously located onto the OFF position
❖ Secure it in off position with a padlock. Work on power 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.

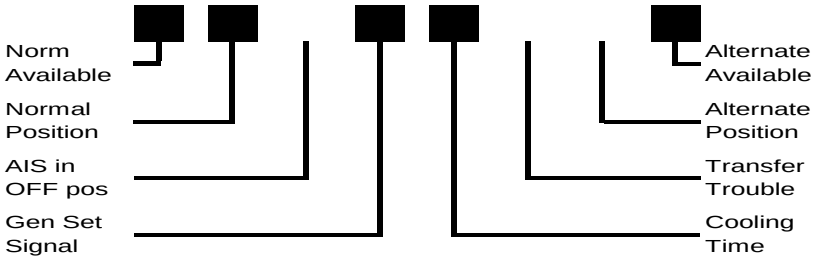
15.6.3. CHECK GENERATOR STOPPING AND RETRANSFER

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



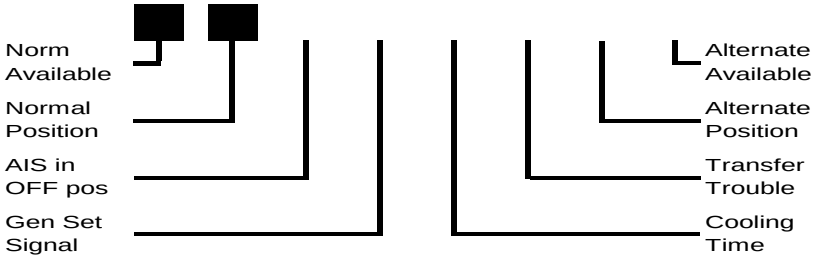
- ♦ After 5 minutes, transfer switch moves to normal source, and 'Cooling time' indicator appears.

  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.

17.1. VISUAL INSPECTION	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.		

17.2. OPERATIONAL INSPECTION	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.)		

Table of content

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