



**INSTALLATION AND MAINTENANCE MANUAL  
FOR FULL SERVICE ELECTRIC FIRE PUMP  
CONTROLLERS  
MODEL FSx**

## GENERAL DESCRIPTION

All 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/manual starting and stopping and for automatic start, controlled by the pressure transducer. 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.

If the fire pump controller is coupled with an automatic transfer switch, this manual should be read together with the appropriate transfer switch manual (9MAN515).

## TYPES OF ELECTRIC FIRE PUMP CONTROLLERS

<b>FIRE PUMP CATALOGUE NUMBER</b>				
MODEL NO. EXAMPLE : FSA - 480 / 20 / 3 / 60				
FSA	480	20	3	60
Model prefix	Voltage	HP rating	Phase	Frequency

### FULL SERVICE CONTROLLERS, ACROSS-THE-LINE STARTER

**MODEL FSA :**

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.

## **FULL SERVICE CONTROLLERS, 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.

### **MODEL FSP : 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.

### **MODEL FSR : 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.

### **MODEL FSS : 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.

### **MODEL FPY : 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.

## **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)

### **WATER PRESSURE CONTROL**

The controller will start automatically on low pressure detection by the pressure transducer, provided the controller was not already manually started. The controller is supplied with the automatic shutdown provision factory defeated (to offer manual shutdown only), the motor can only be stopped by depressing the STOP push-button located on the controller after the pressure is re-established.

If the controller is field converted to automatic shutdown, a running period timer set 10 minutes will automatically shutdown the motor after all starting causes have returned to normal. The motor can also be stopped by depressing the STOP push-button located on the controller after all starting causes have returned to normal.

### **MANUAL ELECTRIC CONTROL AT CONTROLLER**

The controller can be electrically manually started by depressing the START push-button on the controller independently of the pressure transducer and can only be manually stopped by depressing the STOP push-button located on the controller.

### **EMERGENCY-RUN MECHANICAL CONTROL AT CONTROLLER**

The controller may be started with a manual mechanical method by operating the handle labeled EMERGENCY START. This handle provides for an across-the-line starting and non-automatic continuous running operation of the motor. This handle can be latched in the actuated position.

### **MANUAL ELECTRIC CONTROL AT REMOTE STATION**

The controller can be electrically manually started by the momentary closing of a remote contact independently of the pressure transducer and can only be manually stopped by depressing the STOP push-button located on the controller.

### **SEQUENCE STARTING**

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. Sequential start time is selectable (0, 5, 10, 15 sec).

### **FIRE PROTECTION EQUIPMENT CONTROL**

When option A3 is supplied (deluge valve provision), the controller can be started by the opening of a normally closed contact (fail safe circuit) on the fire protection equipment (deluge valve) independent of the pressure transducer. The controller can only be manually stopped by the STOP push-button located on the controller but only after the fire protecting equipment contact has returned to normal.

# STATUS DISPLAY AND ANNUNCIATOR ON CONTROLLER

## STATUS DISPLAY

The first line shows the normal source status. The three line-to-line voltages and the frequency of the normal source are displayed. The last two digits are reserved to write a status symbol. The status symbol "W" indicates the source is in wrong phase sequence. The status symbol "n" indicates the source is not acceptable. This non-acceptability occurs when :  
any line voltage drops below 85%,  
the frequency is too high or too low,  
an unbalance occurs between the three phases,  
the source is in wrong phase sequence.

If the controller is supplied with a TLG transfer switch, the second line is dedicated to the alternate source. If the controller is not supplied with a transfer switch, the second line stays blank.

When shown, the second line has the same functions as the first line. The second line is blank when the generator set is shut down, or when the alternate source is not present.

The third line is dedicated for the motor and trouble status. When no trouble, the three line currents are shown followed by the elapse time meter of the motor. The elapse time meter is expressed in hours and tenths of hours. If trouble occurs the two last digits of the elapse time meter are replaced by a status symbol. The symbol can be :

- P for Pump starting failure (see below)
- O for Overcurrent problem (see below)
- U for Undercurrent (see below)
- T for Transducer problem (see below)
- PTEST to indicate the pump is running because of the weekly exercise test. In this case, the elapse time meter is fully replaced by 'PTEST'
- TTEST to indicate the transfer switch is exercising because of the weekly exercise test. In this case, the elapse time meter is fully replaced by 'TTEST'

The fourth line is dedicated for the pressure system status. The first section shows the cut-

out threshold, the second section shows the cut-in threshold, the third section shows the system pressure.

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

Those values are adjustable on the field by removing the adjustment cover plate with a Philips screwdriver. When removed, it is possible to have access to small multiturn potentiometers. Those potentiometers can be adjusted with small Philips screwdriver. When adjusting, value is changing on the display. The pressure unit (PSI or kPa) can be selected on the field.

## ANNUNCIATOR FOR CONTROLLER WITHOUT TRANSFER SWITCH

### NORMAL POWER

This LED indicates power acceptable on all 3 phases and phase sequence is correct.

### TROUBLE

This LED indicates unexpected situation occurring. This LED is flashing and a flashing symbol appears on the last digit of the third line. To help the user, the trouble legend is written on the display (See troubleshooting hint).

- **P** for pump starting failure. This trouble occurs when the low system pressure is detected but the current did not reach 10% of the nominal current after 20 seconds.
- **O** indicates an over current. This trouble occurs when the current is over 130% of the nominal current for more than 20 seconds.
- **U** indicates an under current. This trouble occurs when the detected current is under 30% of the nominal current for more than 20 seconds.
- **T** indicates a pressure transducer problem. This can occur if :
  - the pressure transducer is not connected (atmospheric pressure)
  - the transducer does not send a correct signal
  - a wire to the transducer is cut.

The last trouble is recorded and displayed. To clear the symbol and the LED, the Reset Push button must be depressed.

#### PHASE REVERSAL

This LED indicates phase reversal of the power source.

#### LOW SYSTEM PRESSURE

This LED indicates the pump demand. It turns on when the pressure drops below the cut in value, and shuts off when the pressure rises over the cut out value.

- If the start is delayed by the sequential start timer, this LED is flashing fast to indicate an immediate start.
- If the controller is set to automatically shut off after the run period timer of 10 minutes, the LED is flashing slowly to indicate that the pressure is satisfied and the pump is running because of this run period timer and it will stop after this delay.

### **ANNUNCIATOR FOR CONTROLLER WITH TRANSFER SWITCH**

#### NORMAL POWER AVAILABLE

This LED indicates normal power acceptable on all 3 phases and phase sequence is correct.

#### NORMAL POSITION

This LED indicates the transfer switch is in normal position and the motor is connected to the normal power.

#### ALTERNATE POWER AVAILABLE

This LED indicates alternate power acceptable on all 3 phases and phase sequence is correct.

#### ALTERNATE POSITION

This LED indicates the transfer switch is in alternate position and the motor is connected to the alternate power.

#### PHASE REVERSAL

This LED indicates phase reversal of the source that the motor is connected to.

#### ISOLATING SWITCH IN OFF POSITION

This LED indicates the isolating switch of the alternate source is in off position.

#### TROUBLE

This LED indicates unexpected situation occurring. This LED is flashing and a flashing symbol appears on the last digit of the third line. To help the user, the trouble legend is written on the display. (See troubleshooting hint)

- **P** for pump starting failure. This trouble occurs when the low system pressure is detected but the current did not reach 10% of the nominal current after 20 seconds.
- **O** indicates an over current. This trouble occurs when the current is over 130% of the nominal current for more than 20 seconds.
- **U** indicates an under current. This trouble occurs when the detected current is under 30% of the nominal current for more than 20 seconds.
- **T** indicates a pressure transducer problem. This can occur if :
  - the pressure transducer is not connected (atmospheric pressure)
  - the transducer does not send a correct signal
  - a wire to the transducer is cut.

The last trouble is recorded and displayed. To clear the symbol and the LED, the Reset Push button must be depressed.

#### LOW SYSTEM PRESSURE

This LED indicates the pump demand. It goes on when the pressure drops below the cut in value, and shuts off when the pressure rises over the cut out value.

- If the start is delayed by the sequential start timer, this LED is flashing fast to indicate an immediate start
- If the controller is set to automatically shut off after the run period timer of 10 minutes, the LED is flashing slowly to indicate that the pressure is satisfied and the pump will stop after this time.

# STANDARD CONTROLLER ALARM CONTACTS FOR REMOTE INDICATION

All alarm contacts are rated for 250V 10A. maximum and are intended to be connected to a separate reliable power source not exceeding 125VAC.

## **MOTOR RUNNING CONDITION**

A normally open and a normally closed contact of the run contactor (1R) is provided. Rated for 10 A., 240 VAC.

The normally open contact is connected to terminals 5 and 6 and will close to signal motor run.

The normally closed contact is connected to terminals 7 and 8 and will open to signal motor run.

## **LOSS OF ANY PHASE OR POWER AT LINE TERMINALS OF MOTOR CONTACTOR**

DPDT contacts of the Phase Loss relay (CR6) are provided. Rated for 10A., 250V.

The normally open contacts (held in closed position when power is available) are located on the relay socket itself (terminals 11-14 & 21-24) and will open to signal loss of power.

The normally closed contacts (held in open position when power is available) are located on the relay socket itself (terminals 11-12 & 21-22) and will close to signal loss of any phase or power.

## **PHASE REVERSAL**

DPDT contacts of the Phase Reversal relay (CR8) are provided. Rated for 10A, 250V.

The normally open contacts are located on the relay socket itself (terminals 11-14 & 21-24) and will close to signal phase reversal.

The normally closed contacts are located on the relay socket itself (terminals 11-12 & 21-22) and will open to signal phase reversal.

## **TROUBLE**

DPDT contacts of the Trouble relay (CR7) are provided. Rated for 10A, 250V.

The normally open contacts (held in closed position when power is available) are located on the relay socket itself (terminals 11-14 & 21-24) and will open when trouble is present.

The normally closed contacts (held in open position when power is available) are located on the relay socket itself (terminals 11-12 & 21-22) and will close when trouble is present.

The Trouble relay is activated only when trouble is occurring. It does not have the same function as the 'Trouble' LED. The 'Trouble' LED memorizes the trouble and the LED goes off when RESET pushbutton is activated. Instead, the Trouble relay is activated only when trouble is present, it does not need to be reset.

# INSTALLATION

The FSx series fire pump controller is ULc listed and CSA approved. The controller is built in accordance with the Standard of the National Fire Protection Association for the Installation of Centrifugal Fire Pumps, NFPA No.20 (Centrifugal Fire Pumps 2001 Edition). The controller is intended to be installed in accordance to NFPA 20-2001 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.

## LOCATION

Controller shall be located as close as practical to the motor they control and shall be within sight of the motor.

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

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

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 3. 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.

## 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 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.

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. Mounting feet provide the necessary 12 in. (305 mm) clearance for current carrying parts.

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

# CONNECTIONS

## WATER CONNECTIONS

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

The pump start - stop pressure transducer (PT1) shall be connected to the system as per NFPA 20, Chapter 7-5.2.1 (b) and (c) and figure A-7-5.2.1 (a) and (b).

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

## ELECTRICAL WIRING AND CONNECTIONS

### ELECTRICAL WIRING

The electrical wiring between the power source and the fire pump controller shall meet the NFPA 20, Chapter 6-3, 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 :
  - Model FSA : Full Service Full Voltage / Across-The-Line Starter
  - Model FSR : Full Service Reduced Voltage / Autotransformer Starter
  - Model FSS : Full Service Reduced Voltage / Solid State Starter
- 6-wires plus ground sized at 125% of 50% of the motor full load current for :
  - Model FPP : Full Service Reduced Voltage / Part Winding Starter

- 6-wires plus ground sized at 125% of 58% of the motor full load current for :
  - Model FPY : Full Service Reduced Voltage / Wye-Delta Open Circuit Starter

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

**Fire pump controllers without an automatic transfer switch are not intended to be connected to an emergency power source, such a connection will not meet NFPA20 requirements. It is the responsibility of the installer to obtain proper waiver from the authority having jurisdiction to deviate from the NFPA20 standard.**

## **ELECTRICAL CONNECTIONS**

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.

## **INCOMING POWER CONNECTIONS**

Incoming power connections on the controller are suitable to accept copper wire sized at minimum 125% of full load motor current with an insulation not less than 60°C. (Refer to terminal diagram for terminal sizes.) Minimum bending space is provided in accordance with wire size for wires entering the cabinet from the wall opposite to the terminals.

Incoming power is to be connected to terminals identified L1-L2 and L3 located on the isolating switch (IS).

## **MOTOR CONNECTIONS**

Motor connections on the controller are suitable to accept copper wire sized at minimum ampacity with an insulation not less than 60°C. (Refer to terminal diagram for terminal sizes.) Minimum bending space is provided in accordance with wire size for wires entering the cabinet from the wall opposite to the terminals. Motor connections are connected to terminals identified by :

- T1-T2 and T3 located on contactor (1R) for
  - Model FSA : Full Service Full Voltage Across-The-Line Starter
  - Model FSR : Full Service Reduced Voltage / Autotransformer Starter
  - Model FSS : Full Service Reduced Voltage / Solid State Starter
  
- T1-T2 and T3 located on contactor (1M) and T7-T8 and T9 located on contactor (2M) for
  - Model FPP : Full Service Reduced Voltage / Part Winding Starter

- T1-T2 and T3 located on contactor (1M) and T6-T4 and T5 located on contactor (2M) for
  - Model FPY : Full Service Reduced Voltage / Wye-Delta Open Circuit Starter

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.

## **ALARM CONNECTIONS FOR REMOTE INDICATIONS**

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.)

## **STANDARD ALARM CONTACT**

The three following sets of alarm contacts are available in each electric fire pump controller to meet NFPA 20, Chapter 7-4.7. These alarm circuits shall be powered by a separate reliable supervised power source not exceeding 125 V.

### **MOTOR RUNNING CONDITION**

A normally open and a normally closed contact of the Run contactor is provided. Rated for 10 A., 240 VAC.

The normally open contact is connected to terminals 5 and 6 and will close to signal motor run.

The normally closed contact is connected to terminals 7 and 8 and will open to signal motor run.

### LOSS OF ANY PHASE OR POWER AT LINE TERMINALS OF MOTOR CONTACTOR

DPDT contacts of the Phase Loss relay (CR6) are provided. Rated for 10A., 250V. The normally open contacts (held in closed position when power is available) are located on the relay socket itself (terminals 11-14 & 21-24) and will open to signal loss of power. The normally closed contacts (held in open position when power is available) are located on the relay socket itself (terminals 11-12 & 21-22) and will close to signal loss of any phase or power.

### PHASE REVERSAL

DPDT contacts of the Phase Reversal relay (CR8) are provided. Rated for 10A, 250V. The normally open contacts are located on the relay socket itself (terminals 11-14 & 21-24) and will close to signal phase reversal. The normally closed contacts are located on the relay socket itself (terminals 11-12 & 21-22) and will open to signal phase reversal.

### TROUBLE

DPDT contacts of the Trouble relay (CR7) are provided. Rated for 10A, 250V. The normally open contacts (held in closed position when power is available) are located on the relay socket itself (terminals 11-14 & 21-24) and will open when trouble is present. The normally closed contacts (held in open position when power is available) are located on the relay socket itself (terminals 11-12 & 21-22) and will close when trouble is present. The Trouble relay is activated only when trouble is occurring. It does not have the same function as the 'Trouble' LED. The 'Trouble' LED memorizes the trouble and the LED goes off when RESET pushbutton is activated. Instead, the Trouble relay is activated only when trouble is present, it does not need to be reset.

### OPTIONAL ALARM CONTACTS

The following optional sets of alarm contacts are available for the electric fire pump controllers. These optional alarm circuits shall be powered by a separate reliable supervised power source not exceeding 125 V. If the optional alarm contacts are supplied, the field connections terminals will be located on the main terminal strip.

### FIRE PUMP CONTROLLER LOCK OUT ALARM CONTACTS (OPTION NO. A6)

A SPDT contact of control relay (CR14) is provided for the lock out condition alarm signal. Rated for 10 A., 240 VAC.

The normally open contact is connected to terminals 108 and 109 and will close in case of a remote lock out signal.

The normally closed contact is connected to terminals 109 and 110 and will open in case of a remote lock out signal.

### INTERLOCK ALARM CONTACTS (OPTION NO. A7)

A DPDT contact of control relay (CR15) is provided for the remote interlock circuit. Rated for 10 A., 240 VAC.

The normally open contact is located on the relay socket itself (terminals 11-12 & 21-22) and will close to signal interlock to remote equipment.

The normally closed contact is located on the relay socket itself (terminals 11-14 & 21-24) and will open to signal interlock to remote equipment.

### EXTRA MOTOR RUN ALARM CONTACTS (OPTION NO. C1)

One additional normally open and one normally closed alarm contact are provided for the motor running condition. Rated for 10 A., 240 VAC.

The normally open contact is connected to terminals 85 and 86 and will close to signal motor run.

The normally closed contact is connected to terminals 87 and 88 and will open to signal motor run.

### WEEKLY EXERCISE CYCLE ALARM CONTACTS (OPTION NO. C4)

A DPDT contact of control relay (CR28) is provided to indicate weekly test is running. Rated for 10 A., 240 VAC.

The normally open contact is located on the relay socket itself (terminals 11-12 & 21-22) and will close to signal weekly test is running.

The normally closed contact is located on the relay socket itself (terminals 11-14 & 21-24) and will open to signal weekly test is running.

### LOW SUCTION ALARM CONTACTS (OPTION NO. C5)

The pressure switch contact is connected to terminals 103-128 and must close when pressure drops below set point.

DPDT alarm contacts of the control relay CR22 are provided for the low suction condition.

The normally open contacts are located on the relay socket itself (terminals 11-12 & 21-22) and will close in case of low suction condition.

The normally closed contacts are located on the relay socket itself (terminals 11-14 & 21-24) and will open in case of low suction condition.

### LOW DISCHARGE ALARM CONTACTS (OPTION NO. C6)

DPDT alarm contacts of the control relay CR23 are provided for the low discharge condition.

The normally open contact is located on the relay socket itself (terminals 11-12 & 21-22) and will close if the discharge pressure drops below 80% of the cut in value (adjustable on the front display - see PRS99 programming instruction).

The normally closed contact located on the relay socket itself (terminals 11-14 & 21-24) and will open if the discharge pressure drops below 80% of the cut in value (adjustable on the front display - see PRS99 programming instruction).

### LOW LEVEL ALARM CONTACTS (OPTION NO. C10)

The float switch is connected to terminals 103-132. The float switch contact must close in low level condition.

DPDT alarm contacts of the control relay CR25 are provided for the low level condition.

The normally open contact is located on the relay socket itself (terminals 11-12 & 21-22) and will close on low level condition.

The normally closed contact is located on the relay socket itself (terminals 11-14 & 21-24) will open on low level condition.

### STANDARD FIELD DEVICES PROVISION

#### REMOTE START SIGNAL CONNECTION

Each electric fire pump controller has provision for connection to a manual remote start station (remote start contact). This remote start contact shall be normally open and connected to

terminals 3 and 4 on the main terminal strip. Contact closure will start the pump motor. Pump motor can only be stopped by the STOP push button on the controller.

### OPTIONAL FIELD DEVICE CONNECTION PROVISION

The following optional field devices may need to be connected to the fire pump controller. If the optional field device connections are ordered, the connection terminals will be located on the main terminal strip.

#### DELUGE VALVE PROVISION (OPTION NO. A3)

Two additional control terminals 3 and 101 are installed on the main terminal strip for the connection of a deluge valve or other fire protection equipment control contacts supplied by others. See NFPA 20, Chapter 7-5.2.2., '*Non pressure switch-actuated automatic fire pump controllers shall commence its starting sequence by the automatic opening of a remote contact.*'

#### FLOW SWITCH PROVISION (OPTION NO. A4)

Two additional control terminals 13 and 14 are installed on the main terminal strip for the connection of a flow switch contact supplied by others. The flow switch contact shall be normally open and shall close on water flow detection to initiate pump motor start.

#### FIRE PUMP CONTROLLER LOCK OUT SIGNAL FROM REMOTE EQUIPMENT (OPTION NO. A6)

Two additional control terminals are installed on the main terminal strip. The remote lock out signal (consisting of an AC or DC source of power from the equipment initializing the lock out) is connected to terminals 105 and 106. Lockout signal voltage must be the same as indicated next to terminals

#### INTERLOCK PROVISION TO REMOTE EQUIPMENT (OPTION NO. A7)

Two additional control terminals are installed on the main terminal strip. The interlock output signal (consisting of 120 VAC signal to the equipment to be interlocked) is connected to terminals 1 and 113.

LOW SUCTION PRESSURE SWITCH AS  
COMPLEMENT (OPTION NO. B7 AND/OR  
C5)

If options B7 (pilot light) and/or C5 (alarm contact) are supplied on the fire pump controller and Option D1 (low suction pressure switch) has not been requested, it is necessary to connect a remote installed pressure switch to terminals 103-128. This pressure switch contact shall close on pressure drop at the low-pressure value selected on the pressure switch.

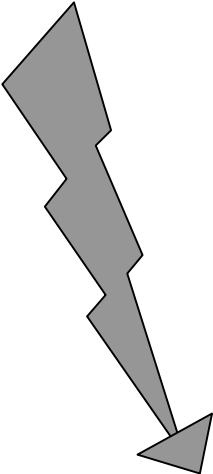
LOW LEVEL ALARM CONTACT (OPTION  
NO. C10)

The float switch supplied by others must be connected to terminals 103-132. The float switch contact must close in low-level condition.

AQUASTAT AND SOLENOID CIRCUIT  
(OPTION NO. D16)

Three terminals 103-126-1 are installed on the terminal strip. The aquastat must be connected between terminals 103-126 and the 120VAC solenoid must be connected between terminals 126-1.

# 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>

**ONLY QUALIFIED PERSONNEL SHOULD WORK ON OR AROUND THIS EQUIPMENT.**

## VERIFICATIONS

### 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. (See Electrical Wiring and Connections for reference.)

### 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. (See Water Connections for reference.)

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

**IMPORTANT :** If the fire pump controller is coupled with an automatic transfer switch, it is important to read both installation and maintenance manuals before proceeding with the following fire pump start-up.

It is necessary to proceed with the fire pump start-up before proceeding with the transfer switch start-up. At any time, the transfer switch isolating switch (or circuit breaker) must stay in OFF position during the fire pump start-up.

# SETTINGS

		Required	N/A															
	<p><b><u>DIPSWITCH</u></b></p>																	
	<p>The Dipswitch S2 is located on the middle top of the electronic board. Select the appropriate dipswitch for the setting that needs to be changed. Use a small screwdriver or a pencil to change the position of the dipswitch. The factory setting is shown in figure 1.</p> <div style="text-align: center;"> </div> <p style="text-align: center;">Figure 1</p> <p><b><u>PHASE REVERSAL(PH REV)</u></b></p> <p>The S2-1 dip switch is used to change the reference phase sequence (see Start Up - Check wrong phase rotation signal).</p> <p><b><u>RUN PERIOD TIMER (RPT)</u></b></p> <p>The S2-2 dip switch is set to the left for manual shutdown only. The S2-2 dip switch is set to the right if an automatic stop is required (see NFPA 20 §7-5.4 and accepted by authority having jurisdiction).</p> <p><b><u>SEQUENTIAL START TIMER (SEQ TIMER)</u></b></p> <p>On a multiple pump application, this timer must be field set as determined by the controller position in the pumping sequence of operation.</p> <p>Lead fire pump controller sequential start timer shall be set at 0 sec.</p> <p>Second and consecutive fire pump controller sequential start timers shall be set at 5 to 10 second intervals.</p> <p>Refer to the table for the value of the sequential start timer</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>S2-3</th> <th>S2-4</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>Left</td> <td>Left</td> <td>0 sec</td> </tr> <tr> <td>Right</td> <td>Left</td> <td>5 sec</td> </tr> <tr> <td>Left</td> <td>Right</td> <td>10 sec</td> </tr> <tr> <td>Right</td> <td>Right</td> <td>15 sec</td> </tr> </tbody> </table> <p><b><u>TEST (TEST)</u></b></p> <p>This Dip switch (S2-5) is used by factory and must be set to the left.</p>	S2-3	S2-4	Time	Left	Left	0 sec	Right	Left	5 sec	Left	Right	10 sec	Right	Right	15 sec		
S2-3	S2-4	Time																
Left	Left	0 sec																
Right	Left	5 sec																
Left	Right	10 sec																
Right	Right	15 sec																

	<p><b><u>PRESSURE UNIT (PR UNIT)</u></b></p> <p>The S2-6 dipswitch is set to the right if PSI is required as pressure unit.</p> <p>The S2-6 dipswitch is set to the left if kPa (kilo Pascal) is required as pressure unit.</p> <p><b><u>SERIAL (SERIAL)</u></b></p> <p>The S2-7 and S2-8 dipswitches are used by factory. S2-7 must be set to the left, S2-8 must be set to the right.</p>		
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	<p><b><u>TIMERS</u></b></p>	Required	N/A
<p><b><u>DANGER.</u></b></p> <p>Hazardous voltage is present in the enclosure and will cause severe personal injury or cause death.</p>	<p><b><u>TIMER TR1-TR2 SETTING</u></b></p> <p>Model FSS controller is equipped with two timers (TR1, TR2).</p> <p>TR1 timer is used to by pass the soft starter after its voltage ramp. This timer is factory sealed at 20 sec. Any change on this adjustment can cause damage of the controller and subsequently void warranty</p> <p>TR2 timer is used to delay a fail safe relay on the power up, this timer is factory set at 1 sec. This adjustment is factory sealed at 1 sec. Any change on this adjustment can cause damage of the controller and subsequently void warranty.</p>		

	<p><b><u>PRESSURE TRANSDUCERS / PRESSURE SWITCHES</u></b></p>	Required	N/A
<p><b><u>DANGER.</u></b></p> <p>Hazardous voltage is present in the enclosure and will cause severe personal injury or cause death</p>	<p><b><u>PRESSURE TRANSDUCER PT1</u></b></p> <p>FSx controllers are supplied with a 0-300 psig pressure transducer. The adjustment of the cut-in (pump start threshold) and cut-out (pump stop threshold) pressure must be set when power is available. This adjustment is set during initial start up.</p> <p><b><u>PRESSURE SWITCH PS2</u></b></p> <p>If the controller is equipped with option D1 (Low suction pressure switch) a pressure switch (4-150 PSIG) is supplied. The pressure switch cut-in (low suction pressure alarm) and cut-out (low suction pressure alarm reset) must be set to suit the exact installation requirements. Refer to form (9FOR167) for detailed instructions.</p>		

## ACTUAL START-UP

	<p><b><u>CHECK MOTOR ROTATION</u></b></p>		
<p><b>DANGER.</b> Hazardous voltage is present in the enclosure and will cause severe personal injury or cause death.</p> <p>Only experienced licensed electricians should perform start up. Only qualified personnel should work on or around this equipment.</p>	<ul style="list-style-type: none"> <li>◆ Turn circuit breaker handle to the ON position. <ul style="list-style-type: none"> <li>• 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.</li> <li>• To avoid the motor to start, the cut in and cut out adjustment must be set to zero (the controller is shipped from the factory with this setting)</li> </ul> </li> <li>◆ Turn the circuit breaker handle to the OFF position as soon as motor starts to stop motor.</li> <li>◆ Check the motor rotation. <ul style="list-style-type: none"> <li>• If the motor rotation is correct, no further adjustment is required, move to the next section.</li> </ul> </li> <li>◆ Correct the motor rotation. <ul style="list-style-type: none"> <li>• 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.</li> </ul> <p><u>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.</u></p> </li> <li>◆ Turn circuit breaker handle to the ON position.</li> <li>◆ Check the motor rotation once more.</li> </ul>		
	<p><b><u>CHECK WRONG PHASE ROTATION INDICATION</u></b></p>		
	<ul style="list-style-type: none"> <li>◆ Turn circuit breaker handle to the ON position. <ul style="list-style-type: none"> <li>• If the display does not show a 'W' symbol on the right side of the first line, feeders are in the right phase sequence. No further adjustment is required, move to the next section.</li> <li>• If the display shows a 'W' symbol on the right side of the first line, feeders and electronic module do not have the same sequence and the electronic needs to be adjusted. <ul style="list-style-type: none"> <li>- Turn circuit breaker handle to the OFF position.</li> <li>- Open control panel door.</li> <li>- Locate the S2 dipswitch on the middle top of the electronic board.</li> <li>- With a small screwdriver or pencil, change S2-1 (Ph rev) dipswitch from left to right.</li> <li>- Close controller panel door.</li> <li>- Turn circuit breaker to the ON position.</li> </ul> </li> </ul> </li> </ul> <p>Verify that display does not show 'W' symbol on the first line. No further adjustment is required.</p>		

## INITIAL START-UP

	<b><u>INITIAL START-UP</u></b>		
<p>Only experienced licensed electricians should perform start up. Only qualified personnel should work on or around this equipment.</p>	<ul style="list-style-type: none"> <li>◆ To avoid the motor to start, the cut in and cut out adjustment must be set to zero (the controller is shipped from the factory with this setting)</li> <li>◆ Turn the circuit breaker handle to the ON position.               <ul style="list-style-type: none"> <li>- If the system pressure is above the cut in pressure setting (pressurized system), the motor will not start.</li> <li>- If the system pressure is under cut out pressure setting (under-pressurized system), the motor starts automatically to build up pressure.</li> </ul> </li> <li>◆ Adjust the cut in and cut out setting               <ul style="list-style-type: none"> <li>- See PRS99 Programming instructions for detailed instructions</li> <li>- Loosen the cover plate on the front display</li> <li>- First, adjust the cut out threshold to the desired value, then adjust the cut in threshold to the desired value.</li> </ul> <p style="margin-left: 40px;"><u>Note</u> : the cut in threshold must be lower than the cut out threshold otherwise the line is flashing and the system will not work properly.</p> <p style="margin-left: 40px;"><u>Note</u> : the operator must assure that the pump cut out setting (pump stop) is lower than the maximum output pressure of the fire pump, otherwise the controller will never stop.</p> </li> <li>◆ Once pressure is above the cut out setting, press the STOP pushbutton to stop the motor. The system is ready for further tests.</li> </ul>		

## MANUAL START TEST

	<b><u>START FROM START PUSHBUTTON PB1</u></b>		
	<ul style="list-style-type: none"> <li>◆ 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.)</li> <li>◆ Measure and record on the Start-up report form (9TES200) the current drawn by the motor on phase 1, 2 and 3 under no load condition and full load condition.</li> <li>◆ Press STOP pushbutton on the controller, pump motor will stop.</li> </ul>		

	<b><u>START FROM EMERGENCY START HANDLE</u></b>		
	<ul style="list-style-type: none"> <li>◆ Pull the EMERGENCY START handle and turn it to its ON position, the pump 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).</li> <li>◆ Press STOP pushbutton on the controller, pump motor will not stop.</li> <li>◆ Put EMERGENCY START handle back to OFF position</li> <li>◆ Press STOP pushbutton on the controller, pump motor will stop.</li> </ul>		
	<b><u>START FROM REMOTE START STATION</u></b>		
	<ul style="list-style-type: none"> <li>◆ If the remote start circuit consists of a momentary pushbutton or contact : <ul style="list-style-type: none"> <li>• Press the remote START pushbutton or initiate closure of the remote start contact, the pump motor will start regardless of the system pressure and continues to run. (No possibility of automatic stop.)</li> <li>• Press STOP pushbutton on the controller, pump motor will stop.</li> </ul> </li> <li>◆ If the remote start circuit consists of a maintained contact : <ul style="list-style-type: none"> <li>• Initiate closure of the remote start contact, the pump motor will start regardless of the system pressure and continues to run. (No possibility of automatic stop.)</li> <li>• Initiate opening of the remote contact. (No possibility of automatic or manual stop if contact remains closed unless the circuit breaker is turned off.)</li> <li>• Press STOP pushbutton on the controller, pump motor will stop.</li> </ul> </li> </ul>		
	<b><u>START FROM FIRE EQUIPMENT CONTROL (DELUGE VALVE) (OPTION NO. A3)</u></b>		
	<ul style="list-style-type: none"> <li>◆ 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. (No possibility of automatic or manual stop if contact remains opened unless the circuit breaker is turned off.)</li> <li>◆ Press the STOP pushbutton, the pump motor will stop.</li> </ul>		

# AUTOMATIC START TEST

	<p><b><u>WATER PRESSURE CONTROL</u></b></p>		
<p><b><u>DANGER.</u></b> Hazardous voltage is present in the enclosure and will cause severe personal injury or cause death.</p> <p>Only experienced licensed electricians should perform start up. Only qualified personnel should work on or around this equipment.</p>	<p><b><u>MANUAL SHUTDOWN MODE</u></b></p> <ul style="list-style-type: none"> <li>◆ Verify that the control panel is set for manual stop (the controller is factory set for manual shutdown).             <ul style="list-style-type: none"> <li>– Turn the circuit breaker handle to OFF position, and open the main door,</li> <li>– Locate the S2-2 (RPT) dipswitch on the middle top of the electronic board</li> <li>– Verify that S2-2 (RPT) is set to the left</li> <li>– Close the main door, and turn the circuit breaker handle to ON position.</li> </ul> </li> <li>◆ Simulate a pressure drop in the system by draining water off the pressure sensing line.</li> <li>◆ The pressure transducer automatically starts the pump motor when the pressure falls below the cut-in setting (the Low System Pressure LED goes on)</li> <li>◆ Verify that the pump motor starts at the desired pressure. If not, loosen cover plate and adjust cut in and cut out threshold (Refer PRS99 programming instructions for details).</li> <li>◆ Let the pump build up pressure. The Low System Pressure LED extinguishes when the pressure reaches the cut out setting. Press the STOP pushbutton. If the Low System Pressure LED does not extinguish, the pressure cutout setting needs to be readjusted to a lower value. (Refer PRS99 programming instructions for details).</li> </ul> <p><b><u>AUTOMATIC SHUTDOWN MODE</u></b></p> <p>NFPA20 §7-5.4 :'<i>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</i>'</p> <ul style="list-style-type: none"> <li>◆ Set the controller for automatic shutdown.             <ul style="list-style-type: none"> <li>– Turn the circuit breaker handle to OFF position, and open the main door,</li> <li>– Locate the S2-2 (RPT) dipswitch on the middle top of the electronic board</li> <li>– Switch S2-2 (RPT) to the right</li> <li>– Turn the circuit breaker handle to ON position, and close the main door.</li> </ul> </li> <li>◆ Simulate a pressure drop in the system by draining water off the pressure sensing line. The pressure transducer automatically starts the pump motor when the pressure</li> </ul>		

	<p>falls below the cut-in setting (the Low System Pressure let up).</p> <ul style="list-style-type: none"> <li>◆ Verify that the pump motor starts at the desired pressure. If not, loosen cover plate and adjust cut in and cut out threshold (Refer PRS99 programming instructions for details).</li> <li>◆ Let the pump build up pressure. The Low System Pressure LED starts flashing when the pressure reaches the cut out setting.</li> <li>◆ 10 minutes after the pressure has reached the cut out setting, the pump motor will automatically stop, and the Low System Pressure LED extinguishes.</li> </ul> <p>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.</p> <p><b><u>WEEKLY AUTOMATIC EXERCISE CYCLES</u></b></p> <p><b><u>IMPORTANT</u></b> : it is the responsibility of the operator to be sure that his system accepts unsupervised test. Certain pumping system needs water flow in the system otherwise the pump can be damaged by overheating.</p> <p>Refer to the PRS99 programming instructions to set the weekly test</p> <ul style="list-style-type: none"> <li>◆ Program a new short start-stop pump test cycle.</li> <li>◆ At the beginning of the new test cycle, the pump motor will start and run continuously. The text 'PTEST' appears in the end of the third line of the main display.</li> <li>◆ At the end of the test cycle, the pump motor will stop automatically.</li> </ul> <p>Reprogram the PRS99 to the desired exercising schedule.</p> <p><b><u>FLOW SWITCH PUMP START (OPTION NO. A4)</u></b></p> <p>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.</p> <ul style="list-style-type: none"> <li>◆ Verify that the motor starts when a water flow is detected.</li> </ul> <p>(NOTE : No possibility of automatic or manual stop if the flow switch contact remains closed unless the circuit breaker is turned off.)</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> <li>• If the controller is set for manual shut down only, press the STOP pushbutton, the pump motor will stop if water flow has subsided.</li> </ul>	
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## LOCK OUT AND INTERLOCK PROVISION TEST

	<b><u>LOCK OUT PROVISION FROM OTHER EQUIPMENT (OPTION NO. A6)</u></b>	Required	N/A
	<p>Lock out is only effective on automatic start signals</p> <ul style="list-style-type: none"> <li>◆ Energize the lock out signal on the remote equipment.</li> <li>◆ The lock out pilot light PL1 is energized.</li> <li>◆ Simulate all the available manual start sequences : start push button on the controller, emergency start handle, remote start, start from the fire equipment control (deluge valve).               <ul style="list-style-type: none"> <li>• The pump motor should start in any of these conditions.</li> </ul> </li> <li>◆ Simulate all the available automatic start sequences : water pressure control, flow switch, weekly exerciser.               <ul style="list-style-type: none"> <li>• The pump motor should not start in any of these conditions.</li> </ul> </li> <li>◆ De-energize the lock out signal on the remote equipment.               <ul style="list-style-type: none"> <li>• The lock out pilot light PL1 is de-energized.</li> </ul> </li> <li>◆ Simulate all the available automatic start sequences : water pressure control, flow switch water pressure control, weekly exerciser.               <ul style="list-style-type: none"> <li>• The pump motor should start in any of these conditions</li> </ul> </li> </ul>		
	<b><u>INTERLOCK PROVISION TO OTHER EQUIPMENT (OPTION NO. A7)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Create the interlock condition on the controller. (May vary based on the sequence of operation.)               <ul style="list-style-type: none"> <li>• The interlock pilot light PL2 is energized.</li> </ul> </li> <li>◆ Verify that the interlocked equipment is not operational.</li> <li>◆ De-activate the interlock condition on the controller.               <ul style="list-style-type: none"> <li>• The interlock pilot light PL2 is de-energized.</li> </ul> </li> <li>◆ Verify that the interlocked equipment is operational.</li> </ul>		

# TEST ALARM CONDITIONS

	<b><u>PHASE LOSS ALARM CONDITION</u></b>		
	<ul style="list-style-type: none"> <li>◆ Simulate a power failure by switching the circuit breaker handle to OFF position.             <ul style="list-style-type: none"> <li>• Verify the control relay CR6 is de-energized, the normally open contacts 11-14, 21-24 are opened, and the normally closed contacts 11-12, 21-22 are closed</li> </ul> </li>   <li>◆ Restore the power by switching the circuit breaker back on             <ul style="list-style-type: none"> <li>• Verify the control relay CR6 is energized, the normally open contacts 11-14, 21-24 are closed, and the normally closed contacts 11-12, 21-22 are opened.</li> </ul> </li> </ul>		
	<b><u>TROUBLE ALARM CONDITION</u></b>		
	<ul style="list-style-type: none"> <li>◆ Simulate trouble condition by draining all water from pressure sensing line.             <ul style="list-style-type: none"> <li>• Verify pressure drops to atmospheric pressure (below 5 psi), a 'T' symbol is flashing on the third line on the display.</li> <li>• Verify the control relay CR7 is de-energized, the normally open contacts 11-14, 21-24 are opened, and the normally closed contacts 11-12, 21-22 are closed</li> </ul> </li>   <li>◆ Restore the pressure in the pressure sensing line.             <ul style="list-style-type: none"> <li>• Clear the flashing symbol by pressing the RESET push button</li> <li>• Verify the control relay CR7 is energized, the normally open contacts 11-14, 21-24 are closed, and the normally closed contacts 11-12, 21-22 are opened.</li> </ul> </li> </ul>		
	<b><u>PUMP RUN ALARM CONDITION</u></b>		
	<ul style="list-style-type: none"> <li>◆ Start the pump by pressing the START pushbutton.             <ul style="list-style-type: none"> <li>• The contact between terminals 5-6 closes, the contact between terminals 7-8 opens when pump is running.</li> <li>• If option B6 is installed, the pilot light PL3 "Run" is energized.</li> </ul> </li>   <li>◆ Stop the pump by pressing the STOP pushbutton.             <ul style="list-style-type: none"> <li>• The contact between terminals 5-6 opens, the contact between terminals 7-8 closes when pump is at rest.</li> <li>• If option B6 is installed, the pilot light PL3 "Run" is de-energized.</li> </ul> </li> </ul>		

	<p><b><u>LOW SUCTION ALARM CONDITION(OPTION NO. B7 AND/OR C5)</u></b></p>		
	<ul style="list-style-type: none"> <li>◆ Simulate a drop of pressure on the suction pipe by closing the pressure sensing line and draining water. <ul style="list-style-type: none"> <li>• If Option no. B7 is installed, the pilot light PL4 "Low Suction" is energized.</li> <li>• If Option no. C5 is installed, the control relay CR22 is energized, the normally open contacts 11-14, 21-24 close, and the normally closed contacts 11-12, 21-22 open</li> </ul> </li> <li>◆ Restore the suction pressure to normal. <ul style="list-style-type: none"> <li>• The pilot light PL4 "Low Suction" and the control relay CR22 are de-energized.</li> </ul> </li> </ul>		
	<p><b><u>WEEKLY TEST ALARM CONDITION (OPTION N°C4)</u></b></p>		
	<p><b><u>IMPORTANT : it is the responsibility of the operator to be sure that his system accepts unsupervised test. Certain pumping system needs water flow in the system otherwise the pump can be damaged by overheating.</u></b></p> <ul style="list-style-type: none"> <li>◆ Program a new short start-stop test cycle to simulate a weekly test condition. Refer to the PRS99 programming instructions to set the weekly test. <ul style="list-style-type: none"> <li>• When weekly test is processing, 'PTEST4 appears on the third line of the display.</li> <li>• If option C4 is installed, the control relay CR28 is energized, the normally open contacts 11-14, 21-24 close, and the normally closed contacts 11-12, 21-22 open</li> </ul> </li> <li>◆ At the end of the test cycle, 'PTEST' disappears and the control relay CR28 is de-energized.</li> </ul>		
	<p><b><u>LOW DISCHARGE ALARM CONDITION (OPTION NO. B9 AND/OR C6)</u></b></p>		
	<ul style="list-style-type: none"> <li>◆ Low discharge condition occurs when the discharge pressure is below 80% of the cut-in pressure value. <p style="margin-left: 40px;">For example, if the cut in pressure (shown on the display) is 150 psi, the alarm is activated when the pressure is below 120psi.</p> </li> <li>◆ Simulate a drop of pressure on the discharge pipe by draining water on the pressure sensing line. <ul style="list-style-type: none"> <li>• If Option no. B9 is installed, the pilot light PL6 "Low Discharge" is energized.</li> <li>• If Option no. C6 is installed, the control relay CR23 is energized, the normally open contacts 11-14, 21-24 close, and the normally closed contacts 11-12, 21-22 open.</li> </ul> </li> </ul>		

	<ul style="list-style-type: none"> <li>◆ Restore the suction pressure to normal. <ul style="list-style-type: none"> <li>• The pilot light PL6 "Low Discharge" and the control relay CR23 are de-energized.</li> </ul> </li> </ul>		
	<b><u>MANUAL START ALARM CONDITION (OPTION NO. B12)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Activate manual start sequence (START pushbutton, remote start contact). <ul style="list-style-type: none"> <li>• The PL10 'Manual Start' pilot light is energized when manual start sequence is activate.</li> </ul> </li> </ul>		
	<b><u>EMERGENCY START ALARM CONDITION (OPTION NO. B13)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Activate emergency start handle. <ul style="list-style-type: none"> <li>• The PL11 'Emergency Start' pilot light is energized when emergency start sequence is activate.</li> </ul> </li> </ul>		
	<b><u>AUTOMATIC START ALARM CONDITION (OPTION NO. B14)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Simulate an automatic start sequence because of a pressure drop by draining the water off the pressure sensing line or by adjusting the cut-in and cut-out pressure threshold. <ul style="list-style-type: none"> <li>• The PL12 'Automatic Start' pilot light is energized when automatic start sequence is activate.</li> </ul> </li> </ul>		
	<b><u>DELUGE VALVE OPEN ALARM CONDITION (OPTION NO. B16)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Open the deluge valve contact. <ul style="list-style-type: none"> <li>• The pilot light PL13 "Deluge Valve Open" is energized when the deluge valve contact is open.</li> </ul> </li> </ul>		
	<b><u>LOW LEVEL ALARM CONDITION (OPTION NO B18 AND/OR C10)</u></b>		
	<ul style="list-style-type: none"> <li>◆ Simulate a low level alarm by lifting the float switch above liquid level <ul style="list-style-type: none"> <li>• If Option no. B18 is installed, the pilot light PL14 "Low Level" is energized.</li> <li>• If Option no. C10 is installed, the control relay CR25 is energized, the normally open contacts 11-14, 21-24 close, and the normally closed contacts 11-12, 21-22 open.</li> </ul> </li> <li>◆ Release the float switch.</li> </ul>		

# PRS99 PROGRAMMING INSTRUCTIONS

## HOW TO READ THE DISPLAY

	L1-L2	L2-L3	L3-L1		
Power	600	598	599	60	V / Hz
Current / TT	126	128	129	2.4	Amps / Hr
Pressure	O:22!	I:205	P:219PSI		

### TOP LINE

The top line displays normal power supply data.

Voltage	Voltage	Voltage	Frequency	Statu:
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The first group displays the voltage between phase L1 and phase L2.

The second group displays the voltage between Phase L2 and L3.

The third group displays the voltage between Phase L3 and L1.

The fourth group displays the frequency of the source (in Hz).

The fifth group displays the status of the normal power supply :

“Wn” indicates power supply is in

Wrong phase (i.e. phase reversal)

“n” indicates power supply is not available, which includes:

- voltage has dropped to less than 85%
- frequency is too high or too low
- there is an unbalance between the three phases

### SECOND LINE

The second line is dedicated for the alternate source. It stays blank when the controller is

supplied without transfer switch or if the voltage of the second source is not present. It has the same readout of the top line (See above).

### THIRD LINE

The third line displays the electric motor status :

Amps	Amps	Amps	TT.T
------	------	------	------

The first group displays the current of phase L1. The second group displays the current of phase L2.

The third group displays the current of phase L3. The fourth group displays the elapsed motor run time in hours and tenths of hours (e.g. 12.4)

### FOURTH LINE

The fourth line displays the system pressure status :

O:xxx	I:xxx	P:xxx PSI
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The first group “O:xxx” displays the fire pump cut-out pressure setting (the pump stop pressure) The second group “I:xxx” displays the fire pump cut-in pressure setting (the pump start pressure) The third group “P:xxxPSI” displays the pressure sensed by the transducer (the pressure in the main to the sprinkler/standpipe system). This pressure can be shown in psi or kPa (kilo Pascal)

## HOW TO ADJUST THE CUT IN / CUT OUT PRESSURE

The pressure settings must be entered in the field, after installation, field wiring and pressure connection to the transducer have been completed.

The aluminum cover plate located between the annunciator panel and the three white push-buttons covers two small multi-turn potentiometers. With a small Philips screwdriver, loosen the plate securing screws and flip the plate counterclockwise so that it hangs from the left securing screw. Insert the small

screwdriver into the hole to reach the potentiometer. The same small Philips screwdriver may be used to make the adjustments. The left potentiometer dial sets the desired cut-out pressure. The right potentiometer dial sets the desired cut-in pressure. Turn the dial carefully, until the desired readings appear on the fourth line of the display. Return the aluminum cover plate to its normal position and tighten the securing screws.

If the cut-in pressure has been set higher than the

cut-out pressure, display line flashes on and off, to signal an improper setting. Re-set the settings to ensure that the cut-out pressure setting is higher than the cut-in pressure setting.

If the cut in value and the cut out value are set to zero, the pump can only start in manual mode (with start and stop push button).

## **WHAT IS THE FLASHING SYMBOL ON THE SECOND LINE**

The flashing symbol alerts the operator that a trouble occurred on the controller. The most recent flashing letter symbol is retained on the display and recorded. To clear the letter symbol from the display, after the fault has been corrected, press the RESET push button.

Flashing Symbol P indicates the pump did not run although there was a pump demand. It occurs when the Low System Pressure LED is lit and the motor did not absorb any current.

Flashing Symbol O indicates the pump absorbed an abnormally high current. It occurs when the power supply current (amps) is more than 130% of nominal.

Flashing Symbol U indicates the pump absorbed an abnormally low current. It occurs when the power supply current (amps) is less than 30% of nominal.

Flashing Symbol T indicates a pressure transducer problem. It occurs to indicate either the pressure transducer is not connected (is sensing less than 5 psi) or the pressure transducer is transmitting a signal that is out of the factory range setting or a wire to the pressure transducer is cut.

See troubleshooting hint to verify if the system is correct.

## **WHY 'LOW SYSTEM PRESSURE' LED IS FLASHING**

'Low System Pressure' LED is flashing to indicate that a timer is counting. It can happen in the starting sequence because of the sequential

start timer, or in the stopping sequence because of the running period timer of 10 minutes (See Manual/Automatic shutdown).

## **HOW TO ADJUST THE DATE AND TIME**

To adjust date, time, weekly test, the PRS99 must be set in setup mode. To enter in the setup mode, press and hold the "Print" button until normal default display is replaced by set-up menu display.

Release the "Print" push-button. The set-up menu display is:

Day	Date	Year	Hr:Min
Compatible system : N			
WT	START	STOP	
Day	Hr:Min	Hr:Min	OFF

Scroll through the menu set-up system by repeated pressing and releasing of the PRINT button.

Change the value of the setting displayed by repeated pressing and releasing of the RESET button.

Utilizing these functions, set the present day, date, year and time.

Finally, press and hold PRINT push-button until set-up menu display is replaced by normal display to store all changes or modifications. If above step does not occur within 60 seconds, the display will revert to the default normal mode. Any changes or modifications will not be saved.

## **HOW TO SET A WEEKLY PUMP TEST**

**It is the responsibility of the operator to be sure that his system accepts unsupervised test. Certain pumping system needs water flow in the system otherwise the pump can be damaged by overheating. Weekly test can be performed only with 'compatible system'.**

Enter in the setup mode, by pressing and holding the "Print" push-button until normal default display is replaced by set-up menu display. Scroll through the menu set-up system by repeated pressing and releasing of the PRINT button.

Change the value of the setting displayed by repeated pressing and releasing of the RESET button.

Utilizing these functions, set the 'compatible system' from N (no) to Y (yes) only if the system accepts unsupervisory pump test. Set 'WT' (weekly pump test) and modify the day, the start time and the stop time of the pump test. To enable or disable the test, set the test to ON (test will be active) or to OFF (test will be inactive) Finally, press and hold "Print" button until set-up menu display is replaced by normal display to store all changes.

If above step does not occur within 60 seconds, the display will revert to the default normal mode. Any changes or modifications will not be saved.

## **HOW TO SET A TRANSFER SWITCH TEST**

**This setting is available only if the controller is supply with a transfer switch.**

**It is the responsibility of the operator to be sure that his system accepts unsupervisory test. Weekly test can be performed only with 'compatible system'.**

Enter in the setup mode, by pressing and holding the "Print" button until normal default display is replaced by set-up menu display.

Scroll through the menu set-up system by repeated pressing and releasing of the PRINT push-button.

Change the value of the setting displayed by repeated pressing and releasing of the RESET push-button.

Utilizing these functions set the 'compatible system' from N (no) to Y (yes) only if the system

accepts unsupervisory test. Set 'TT' (transfer switch test) and modify the day, the start time and the stop time of the transfer switch test. To enable or disable the test, set the test to ON (test will be active) or to OFF (test will be inactive) Finally, press and hold "Print" button until set-up menu display is replaced by normal display to store all changes.

If above step does not occur within 60 seconds, the display will revert to the default normal mode. Any changes or modification will not be saved.

When exercising, the controller closes a contact to start the stand-by diesel generator and initiate the power transfer. The stand-by diesel generator minimum run timer will shut the engine down 5 minutes after the stop time.

## **HOW TO PRINT REPORTS**

Be sure that paper is in the printer. The PAPER FEED push-button allows the paper roll motor to advance the paper.

The PRINT button activates the printer mounted below the trouble legend. No reports can be printed, unless this button is pushed. Two reports may be obtained (printed).

A seven-day record of the controller activity with one press of the PRINT button.

To obtain a read-out of all pressure fluctuations for the previous seven days, press the PRINT button a second time, within 60 seconds. The report will print until all data accumulated is shown. The complete print-out could require a

lot of paper. To conserve paper consumption, a stop feature is provided during this function: if, while the printing is in progress, PRINT is pressed, the printing will stop after few seconds. (Note, the printer has to send all its memory before stopping, this can last 10 seconds, do not press the PRINT button twice otherwise the printing will continue). If a continuation of the printing operation is desired, pressing PRINT will initiate a resumption of the printing from point where it was stopped. There is a 15 minute time window, factory programmed, for this print resumption feature. This is particularly useful when it is observed that the paper roll is about to

run out before the report is finished. The printing can be paused, as described, the paper

roll replaced, and then resumed on the paper fed from the new paper roll.

### **HOW TO REPLACE THE PAPER**

To replace the paper, the operator must open the main door. **Only authorized and qualified personnel can perform opening the main door.**

**Danger, hazardous voltage is present in the enclosure and will cause severe personal injury or cause death.**

Cut the power of the alternate source if present, then cut the power of the normal source and open the main door.

Remove the empty roll by removing the screw, set a new paper roll.

Cut the paper end at a 45° angle. Introduce and force paper in the printer slot until the paper appears throughout the front slot. Close the main door, restore the power and advance the paper by pressing paper feed. Realign the paper is necessary.

### **HOW TO REPLACE THE RIBBON**

The ribbon has a small area where it is marked 'pull'. Remove the actual ribbon by pulling carefully the ribbon with finger. Advance the paper several inches, place the paper in the

ribbon and fix the new ribbon by pressing it carefully. Verify the ink tape is correctly in place.

### **HOW TO AVOID AUTOMATIC START**

During start up it is probably necessary to disable automatic start. The automatic start is

disable when the cut in and the cut out threshold are set to zero.

### **HOW TO RETRIEVE PRESSURE DATA'S FROM RS232 PORT**

#### **1. Connection between laptop computer and Tornatech Fire Pump Controller**

- a. Verify that your laptop computer has a RS232/DB9 communication port
- b. Connect your laptop computer communication port to the Tornatech Fire Pump Controller using a DB9 male/female cable.

- b. If your Hyper Terminal software has not been configured, double click on hypertrm.exe. *Note : This procedure might not be available on certain versions of this software*
- c. If your Hyper Terminal software has already been configured to communicate with a Fire Pump Controller, select this configuration and go to step 4. (In case you are experiencing problems, go to step 7)

#### **2. Opening the Hyper Terminal**

*To communicate with the Fire Pump Controller, communication software is required. The latest versions of Windows come standard with Hyper Terminal software.*

- a. Select from the Windows Toolbar : Start – Program – Accessories- (Communication) – Hyper Terminal

### 3. Communication Configuration

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

- a. In the « New Connection » window, enter a connection name.  
Ex : "Tornatech Controller"
- b. Click on « OK » to validate
- c. The «Connect to» window will open and a communication port must be chosen. (Usually Com 1)
- d. Click on « OK » to validate
- e. The "port setting" window will open for the selection of the communication parameters
- f. Select : bits per second: 9600 - data bits: 8 - parity: none - stop bits: 1 - flow control: hardware
- g. Click « OK » to validate

### 4. Capturing the Information

In this step, the data contained in the Fire Pump Controller will be copied to a file in your laptop computer

- a. Select Transfer – Capture Text –
- b. A window will open so that you can select a file. With the help of the Browse function, enter the name of the file that you will designate to receive the data.
- c. It is good practice to save the data with a name incorporating the date.  
Ex : my documents\021024.txt ( for October 24,2002)  
(In case you are experiencing problems, go to step 7)
- d. If the « Select Capture File » window is open, click on « Open » (available on certain HyperTerminal version only)
- e. Click on « Start » to begin capturing, or downloading, the controller's data

*Note : The data will not start downloading to your laptop computer until the « Print » button is pressed on the Fire Pump Controller display.*

*The data required for the creation of the pressure graph are both the 7-day résumé and the pressure readings. To obtain the 7-day résumé, the "Print" button must be pressed once. To obtain the pressure readings, the "Print" button must be pressed once again within 60 seconds of the first time it was pressure for the 7-day résumé. This data will be saved in the file chosen in step 4C*

- f. If the data that appears on your screen is not legible, please go to step 7d for the troubleshooting information on data transmission problems.

### 5. Closing the Hyper Terminal Session

Once the data has downloaded, the HyperTerminal session can be disconnected.

- a. Click on File, select Exit
- b. Click on « YES » to disconnect

*Note : Upon closing the session, the Hyper Terminal software will ask if you want to save the session ( see step 3a ).*

*If you want to save the session, the data will be saved and an icon will appear the next time the Hyper Terminal will be open.*

*If you decide not to save the session, step 3 will have to be repeated the next time the Hyper Terminal software is opened*

### 6. Reading and Printing of the Data

The downloaded data is saved in the file created in step 3a. This file is a .TXT file that can be read 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.....

## 7. Troubleshooting

- a. Communication icon does not appear (step 2C)
- In certain versions of Hyper Terminal, the icon is hidden because the program has never been used. You must go to the end of the menu to have the icon appear.*

- b. In step 4c, an error message appears indicating that the file cannot be found.

*In certain versions of Hyper Terminal, an empty .TXT file must be created so that it can be designated as the destination file*

While keeping the HyperTerminal session open, open Word. Select File -Save As and create the destination file for the downloaded data to be saved into (Ex : 021024). Important : this file must be a .TXT file only.

- c. When the file is opened in Word, Excel, or any other software, the saved document does not appear in the file list.

The saved file is a .TXT file. Make sure the correct file type (.TXT or \*.\* ) is chosen

- d. In the destination file, the data is not formatted and the text is illegible.

*In the save file, the data is not formatted because the*

*communication parameters are not adequate.*

In Hyper Terminal, click on File – Properties – Settings – ASCII Setup and verify ASCII receiving. Append line feeds to incoming line ends : ON; Force incoming data to 7-bit ASCII : OFF; Wrap lines that exceed terminal width : ON

- e. No data appears on the laptop computer screen when the "Print" button is pressed

Press the "Print" button firmly for approximately 1 second.

Communication has not been established. Select Call-Call and verify if the "connected" status appears at the bottom left of the screen.

Communication is not in capture mode. Select Transfer-Capture Text - select the appropriate file. Verify if the "Capture" status appears at the bottom right of the screen.

- f. The data is downloaded on the screen but the destination file remains empty.

Communication is not in capture mode. Select Transfer-Capture Text - select the appropriate file. Verify if the "Capture" status appears at the bottom right of the screen.

# 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.

1. Fire pump refuses to start in all starting modes.
  - Check if the circuit breaker handle is in the ON position. If the handle is in OFF position, move it to the ON position. If in Trip position, have an electrician verify the controller and motor connection for possible short circuit before resetting.
  - Check if line power on all phases is available to the controller.
  - Check if pump motor is properly connected.
2. Fire pump refuses to start in all starting modes except with emergency handle locked in On position.
  - Check if internal jumper IJ-5, IJ-6, IJ-7 are securely in place. (Some Internal jumpers may be removed according of the option)
  - Check the main control transformer XR1 feeding the control section.
  - Check the master start relay CR5.
  - Check the motor starter power components (contactors, autotransformer, resistors, ...).
3. Fire pump refuses to start on a drop of system pressure.
  - Check if the system pressure transducer PT1 is piped properly and if water is available and exempt of dirt.
  - Check if a change in the pressure sensing line modifies the system pressure value on the display.
  - Check if the cut in and cut out pressure threshold are adjusted properly.
  - Check the auto start relay CR1.
  - Check if internal jumpers IJ-3, IJ-4 are securely in place if required. (Refer to option list).
  - Sequential start timer may be adjusted and the pump starts after the sequential start delay (See setting section).
  - If option no. A6, lock out provision is provided, (IJ-4 factory removed) check relay CR14 and lock out signal.
  - If any of option no. E1, E2 or E3, load-shedding provision is provided, (IJ-3 factory removed) check timer TR8.
4. Fire pump refuses to start with start push button or remote start signal.
  - Check if internal jumper IJ-1 is securely in place. (Internal jumper IJ-1 is factory removed on model FPS).
  - Check manual start relay CR3.
  - Check if remote start signal is properly connected to terminals 3 and 4. (Remote contact should close to start the pump).
5. Fire pump starts in all modes but refuses to stay ON after being started with the emergency handle.
  - Check limit switch LS1 on emergency handle.
  - Check emergency start relay CR5.
6. Fire pump motor refuses to ramp up on solid state model FPS.
  - Check solid-state starter settings and functions.
7. Fire pump refuses to start on weekly exercise test.
  - Check if the PRS99 Display is programmed correctly, and test is enabled.
8. Fire pump refuses to start upon a signal from the deluge valve. (Option no. A3.).
  - Check if deluge valve signal is properly connected to terminals 3 and 101. (Contact should open to start the pump).
  - Check deluge valve relays CR12 and CR13.
9. Fire pump refuses to start on signal from flow switch. (Option no. A4).
  - Check flow switch contact (contact should close upon flow detection between terminals 13 and 14).
10. Fire pump refuses to lock out upon a signal from remote equipment. (Option no. A6.).
  - Check if pump motor operation is not due to a manual start command.
  - Check lock out signal at terminals 105-106 (verify if voltage is compatible with controller).
  - Check fuse FU2.
  - Check lock out relay CR14.

- Check if internal jumper IJ-4 has been removed and replaced by a normally closed contact of relay CR14.
11. Circuit breaker trips when motor starts :
    - Verify the motor connection and motor for any short circuits or grounds.
    - Check compatibility of controller with motor (voltage, HP, frequency).
    - Check if a lock rotor condition exists.
    - On some motors, the magnetizing current may be higher than the circuit breaker magnetic trip setting (usually set around 13 times the motor full load current). Contact factory for possibility of adjustment.
    - Check magnetic trip adjustment on circuit breaker and compare to name plate on the controller.
  12. Fire pump motor starts immediately when circuit breaker is turned on and does not stop when stop push button is activated.
    - Check if system pressure is not below cut out pressure threshold (fourth line on the display).
    - Check if cut in threshold is not adjusted above cut out threshold (display is flashing).
    - Check if emergency handle is not locked in ON position.
    - Check if remote start signal is not calling for the pump motor to run.
    - Check if the weekly test is not calling for the pump motor to run.
    - Check if the deluge valve is not calling for the pump motor to run. (Option no. A3).
    - Check if the flow switch is not calling for the pump motor to run. (Option no. A4).
  13. Fire pump motor starts automatically on pressure drop but refuses to stop when system pressure is restored.
    - Check cut out pressure threshold. If it is adjusted to a pressure higher than the pump capacity, it will never reset and therefore will prevent the pump to stop.
    - Check if system is set for manual shut down only (run period timer is activated - 'Low System Pressure' LED flashes on run period timer cycle).
  14. Display is blank and does not show any data.
    - Check if the circuit breaker handle is in the ON position. If the handle is in OFF position, move it to the ON position. If in Trip position, have an electrician verify the controller and motor connection for possible short circuit before resetting.
  - Check if line power on phase L1-L2 is available to the controller.
  - Check left connector on the display electronic board well connected.
  - Check XR2 transformer.
  15. Display shows 'Wn' symbol on the first line
    - Verify if the sequence of the incoming power has not been changed since the first start up.
    - If motor has the wrong rotation, follow instructions under Actual start-up, check motor rotation.
    - If motor has the right rotation, follow instructions under Actual start-up, check wrong phase rotation indication.
  16. Display shows 'n' Symbol on the first line.
    - Check if incoming power is above 90% of the nominal voltage.
    - Check if the frequency is above 95% of the nominal frequency.
    - Check if incoming power is not unbalanced.
  17. Display has a "P" flashing symbol on the third line
    - The pump did not start on a pressure drop.
    - Verify if a lockout signal avoid the pump to start.
    - If pumps are in line, verify the electrical connection between controllers.
    - If pumps are in line, verify if the starting delay is bellow 18 sec.
    - Verify the motor is correctly connected to the controller.
    - Verify the motor horse power is compatible with the controller.
    - Refer to PRS99 programming instructions.
  18. Display has a "O" flashing symbol on the third line
    - The motor consumption is abnormally high.
    - Verify the motor horse power is compatible with the controller.
    - Verify if the pump size is compatible with the motor size.
    - Verify if the pump turns freely.
    - Refer to PRS99 programming instructions.

19. Display has a "U" flashing symbol on the third line
  - The motor consumption is abnormally low.
  - Verify if the motor size is compatible with the controller.
  - Verify if the pump size is compatible with the motor size.
  - Verify if the pump is not running under or over its curve.
  - Verify if the pump is mechanically connected to the motor.
  - Refer to PRS99 programming instructions.
20. Display has a "T" flashing symbol on the third line
  - Verify if the pressure of the system is above 5psi.
  - Verify the electrical connection between the pressure transducer and the electronic board.
- Refer to PRS99 programming instructions.
21. Display shows 'PTEST' and the pump is running
  - The pump is actually running because of the weekly test.
  - Refer to PRS99 programming instructions.
22. Display has the fourth line flashing
  - Adjust the pressure cut-in threshold below pressure cut-out threshold.
23. Printer is running but the paper does not get out
  - Verify if the paper roll is not empty.
  - Verify if the paper is not jammed.
24. Printing is blank or unreadable
  - Verify if the ribbon is correctly set.
  - Verify if the ribbon is not dry, replace if necessary.

# 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 : : Qualified and authorized personnel only must do this maintenance.**

<b>VISUAL INSPECTION</b>	OK	N/A
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 transducer 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 shunt trip installation		
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>OPERATIONAL INSPECTION</b>	<b>OK</b>	<b>N/A</b>
Check wrong phase rotation indication.		
Check motor rotation.		
Start from start push button		
Start from emergency start handle.		
Start from remote start station. (If connected.)		
Start from weekly test by programming the PRS99 display if authorized		
Start from fire equipment control (deluge valve). (Option no. A3.)		
Start from water pressure control.		
Verify sequential start.		
Start from flow switch. (Option no. A4.)		
Verify lock out provision from other equipment. (Option no. A6.)		
Verify interlock provision to other equipment. (Option no. A7.)		
Verify low suction alarm condition. (Option no. B7 and/or C5.)		
Verify low discharge alarm condition. (Option no. B9 and/or C6.)		
Verify low reservoir level alarm condition. (Option no. B18 and/or C10.)		
Verify permanent load shedding signal. (Option no. E1.)		
Verify temporary load shedding signal. (Option no. E2.)		
Verify permanent & temporary load shedding signal. (Option no. E3.)		

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