MANUAL

LIMITED SERVICE FIRE PUMP CONTROLLER

SERIES M30

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PART I: GENERAL DESCRIPTION

The basic function of the Fire Pump Controller is to start the pump motor to restore pressure in the water main. This may be accomplished by automatically starting the pump motor upon drop in pressure in the water main or from a number of other demand signals. The controller can be started by remote manual means but cannot be stopped remotely. It can be set to stop automatically or require manual stop after an automatic start.

PART II: FUNCTIONS

A. Automatic Starting From:

1. Drop in water line pressure
2. Deluge Valve operation, Option D
3. Loss of remote alarm power, Option P

B. Alarms and Signals:

1. **Remote indication of pump operation**: One (1) set of normally open (N.O.) and normally closed (N.C.) contacts located in the controller operates when the pump is running.
2. **Loss of power to the controller**: One (1) Single Pole Double Throw (SPDT) contact located in the controller operates for loss of power, loss of phase, or low voltage.
3. **Phase reversal of power to controller**: One (1) SPDT contact located in the controller operates for phase reversal of the power to the controller.
4. **Power On pilot light on controller**: This light is on whenever the circuit breaker of the controller is closed indicating that power is available and the controller is set for operation.
5. **Phase reversal pilot light**: This pilot light is on whenever there is a phase reversal of the power to the controller.
6. **Electric Motor Lockout (Option M)**: The electric motor lockout is generally used in conjunction with engine lockout above. If the engine is running due to a power outage, or other reasons, the electric motor can be locked out until the engine is stopped.

C. Sequential Starting (Option S): This optional feature is provided for multiple fire pump installations. This provision times the start of the pump motors by a preset time interval so that all motors do not come on at once.

D. Principle Components of Controller:

1. Circuit breaker
2. Contactor
3. Pressure Switch

The incoming line is connected directly to the circuit breaker. From there power is fed to the contactor. The circuit breaker is normally closed. The contactor is operated either manually or automatically to start the motor.

PART III: INSTALLATION

The Fire Pump Controller has been assembled and wired at the factory with the highest workmanship standards. All wiring and functions have been thoroughly tested to assure correct operation when properly installed. Before operating the controller perform the Initial Installation Startup Procedure, Part IV.

The cubicle should be well grounded according to local standards. Make sure that all applicable external control wires are connected to appropriate terminals as shown in External Hookup drawing. If the controller is supplied with Option "D" Deluge Valve Start, and it is not being used the terminals for this must be jumpered (see External Hookup drawings). Failure to make the proper connections will cause the controller to malfunction. Connection from the contactor to the motor may be done after the test procedure is completed. The contact ratings of the remote alarm signal circuits of the controller are shown in External Hookup drawing. Do not exceed ten (10) amperes, 600 volts on these circuits. After installation has been completed, perform the Initial Installation Start-Up procedure, Part IV before operating the controller.

PART IV: INITIAL INSTALLATION START-UP PROCEDURE

A. **General:** All but the final functional test can be made with the motor disconnected. This will eliminate the need for starting and stopping the motor several times during the test procedure. If the output connections from the contactor to the motor were made on initial installation, disconnect them for the first part of the Initial Installation Start-Up Procedure. Refer to Controller Hookup drawings for nomenclature of all controls. Refer to schematic for location of contacts for remote alarms.

The controls and their functions are follows:

1. **Circuit Breaker**: The circuit breaker is located ahead of the motor contactor. Its function is to protect the line from damage due to a short in the load.

2. **Emergency Start Lever**: This control is used to start the fire pump in case of any malfunction within the control circuits.

3. **Start Button**: This pushbutton starts the pump motor by exciting the contactor coil circuit, thereby connecting the current to the pump motor.

4. **Stop Button**: This pushbutton stops the pump motor by opening the contactor coil circuit, thereby disconnecting the current to the pump motor.

B. **Initial Start-Up:**

1. Close circuit breaker and measure voltage at the line terminals of motor contactor. Voltage should be the same as the incoming line voltage. The Power On pilot light on controller should be on. In addition, the red Phase Reversal pilot light should not be on. If it is, check that all three phases are present and of the correct voltage. If all power is correct, turn the controller circuit breaker OFF, reverse any two of the three phase wires connected to terminals L1, L2, or L3, of the power monitor, then turn circuit breaker back ON. The Phase Reversal pilot light should not be on.

2. Push start button, motor contactor should close. Measure voltage at output of contactor. It should be the same as the incoming line voltage.

3. Push stop button, motor contactor should be open.

4. Drop water pressure at water inlet to controller so pressure switch will close, motor contactor should close. Allow water pressure to return to normal. If controller is set for automatic stop, set running period timer for at least 10 minutes. Motor contactor should open after this time period. If controller is set for manual stop, push stop button, motor contactor should open.

5. For controllers supplied with Option D, repeat Step 4, except momentarily open deluge valve switch instead of dropping pressure to close the pressure switch.

6. Turn circuit breaker off.

7. Connect output from contactor to pump motor.

8. Close circuit breaker

9. Push start button, motor should start. Check for proper rotation of the motor.

10. Push stop button, motor should stop.

PART V: OPERATION OF CONTROLLER

After the installation and test procedures are completed, the controller is ready for normal operation. The circuit breaker should be closed. For controllers set for automatic stop, set the running period timer for at least 10 minutes. Emergency manual operation is provided in case of failure of control circuitry. This lever is manually moved to the "On" position and must be manually latched in the "ON" position or it will return to "Off" when released. The lever should be moved from the "Off" position to the "On" position in as quickly a motion as possible to prevent burning the contacts. The circuit breaker should be tripped to disconnect circuit before releasing emergency lever. This lever is for emergency use only. A mechanical interlock switch is connected to the emergency lever to operate the contactor electrically when all circuitry is functioning properly. This is provided to prevent inadvertent slow closing of contactor and burning of contacts.

PART VI: SEQUENCE OF OPERATION

A. **Introduction:** The explanation of the sequence of operation will start with the assumption that the controller has been properly installed, all external connections have been made and the circuit breaker is closed. In other words, the controller is operational. The Power On pilot light should be on. All wiring on the primary side of the transformer 1CPT will be referred to as the primary circuit. All wiring on the secondary side of the transformer 1CPT will be referred to as the secondary circuit.

B. **Manual Operation:** For manual operation there is a start button switch on the controller and terminals for an optional remote start switch located elsewhere. These switches have normally open contacts which close to energize 1CR. 1CR locks in on its own N.O. contact and stays energized until the stop button is depressed. A second set of N.O. contacts of 1CR energizes the coil of 2CR. The N.O. contact of 2CR in the primary circuit closes the circuit to the motor contactor 1MC to start the motor.

To stop the controller manually, the stop pushbutton is depressed. This breaks the circuit to the coils of 2CR and 1CR and they are de-energized. At the same time the N.O. contact of 2CR in the primary circuit opens and de-energizes the motor contactor and stops the motor.

C. **Automatic Operation / (Pressure Switch):** On drop of water pressure the N.O. contact in the pressure switch closes energizing the coil of 2CR. 2CR locks in on its N.O. contact in the secondary circuit. At the same time the N.O. contact in the primary circuit energizes the motor contactor to start the motor. In controllers with sequential starting, 3TR is energized by the pressure switch starting its timing cycle and at the end of the time period , a N.O. contact of 3TR closes energizing 2CR. A N.O. contact of 2CR in the primary circuit closes and energizes the motor contactor as above.

On controllers set for automatic stop, a running period timer, 1TR is used to keep the motor running for a preset time period regardless of whether the contact of the pressure switch has opened. This is accomplished by keeping 2CR locked in through the N.C. contacts of the timer until the timer times out and these contacts open.

On controller set for manual only stop a jumper is installed in parallel with the N.C. contacts of 1TR, thus 2CR is held in the energized state. The controller must be stopped with the manual stop pushbutton switch which breaks the circuit to 2CR. The N.O. 2CR contact in the primary circuit opens and stops the motor.

D. **Automatic Operation / (Deluge Valve-Option D):** The deluge valve switch is a N.C. switch. When it opens 7CR is de-energized. The N.C. contacts of 7CR in the automatic circuit close and energize 2CR. The remaining sequence to start and stop the motor is the same as automatic operation with the pressure switch closing.

E. **Remote / Pump Running Signal:** One (1) N.O. and one (1) N.C. contact is available for remote indication that the pump is running.

F. **Remote / Loss of Power, Loss of Phase, Low Voltage:** One (1) SPDT contact is available for remote indication of loss of line power, loss of phase, or low voltage.

G. **Remote / Phase Reversal:** One (1) SPDT contact is available for remote indication of phase reversal of the incoming power to the controller.

H. **Engine Lockout/ (Option E):** A N.O. auxiliary contact on the motor contactor is provided to prevent an engine type controller from starting if the electric motor is running. Circuitry for this is provided in engine controllers supplied with Option 'E'.

I. **Electric Motor Lockout / (Option M):** Terminals are available to connect to an external switch to lockout the electric motor. This may be necessary when the engine is running, low suction cutoff, etc. The external switch will close to energize 9CR. A N.C. contact of 9CR will break the circuit to 2CR and stop the motor. With the Electric Motor Lockout feature energized, it is still possible to start the motor manually.

J. **Power Failure Start / (Option P):** On loss of reliable source of 120VAC, relay 8CR will be de-energized. The N.C. contact of 8CR will close and start the electric motor in the same manner as for drop in water pressure described above.

K. **Sequential Start / (Option S):** The sequential start timer, 3TR, provides a time delay between the pressure switch contacts closing and the motor contactor closing. Timer 3TR is energized by the N.O. contacts of the pressure switch. When 3TR times out a set of N.O. contacts close and energize 2CR to start the motor.

PART VII: NOMENCLATURE

2CR	Control Relay
5CR	Transformer Secondary Power Available Relay (Option D, J, or P)
7CR	Deluge Start Relay (Option D)
8CR	Power Failure Start Relay (Option P)
9CR	Motor Lockout Relay (Option M)
1TR	Run Period Timer
3TR	Sequential Start Timer (Option S)
1MC	Motor Contactor
1MCA	Motor Contactor Auxiliary Contacts
1CS	Stop Switch
2CS	Start Switch
1PL	Power ON Pilot Light
2PL	Phase Reversal Pilot Light
1CB	Circuit Breaker
1PS	Pressure Switch
1CPT	Control Power Transformer
1PM	Power Monitor
1PR	Phase Loss Relay
2PR	Phase Reversal Relay