

SECTION UC-615
PUMP CONTROLLER

PART 1 - GENERAL

1.01 SCOPE OF WORK

The Contractor shall furnish and install a pump controller in the control panel, including all electrical materials specified herein or required for a complete installation.

1.02 RELATED SECTION

Section UC-600 - Pump Station Electrical Material
Section UC-610 - Pump Station Control Panel

1.03 QUALITY ASSURANCE

- A. All electrical materials and equipment shall be new, of recent domestic manufacture, and approved by the Underwriters' Laboratories, Inc. Material or equipment damaged in the course of installation or test shall be replaced or repaired, at the Contractor's sole expense, in a manner meeting with the approval of the Engineer (ie the Chief, Engineering Division, MD-WASD or his representative). Further, said repairs or replacement shall be performed by personnel qualified such that the UL approval will not be lost. The Contractor shall provide satisfactory evidence of these qualifications to the MD-WASD prior to the work being performed.
- B. All electrical material and installation shall comply with the codes and standards listed in Section UC-600

1.04 SUBMITTALS

The Contractor shall provide all submittals in accordance with Section UC-600

PART 2 - PRODUCTS

2.01 PUMP CONTROLLER

Pump controller shall be microprocessor-based pump controller with level transducer. It shall measure the depth of water in the wet well and operate the pumps based on selected setup values.

A. PUMP CONTROLLER

- 1. The controller shall control up to four pumps to perform liquid level control. The device must be capable of controlling any mix of constant speed and variable

speed pumps. The controller shall be capable of alternating the pumps, and shall provide lag pump delays and high and low level alarms.

2. The controller shall be standard “off the shelf” equipment with published literature and fully tested hardware and operating program. The controller shall be field configurable from the front of the unit, and require no special tools or software to set-up or operate.
3. The controller shall be a microprocessor-based device and not require a battery to maintain the operating program. All set-up values shall be stored in non-volatile memory.
4. A numerical level display shall be provided on the front of the unit. The display shall have a 3 digit, 7 segment LED display and show levels in feet and tenths of feet.
5. The controller shall not require an external power supply or any external I/O modules to be a fully functioning unit. An analog input (4-20mA) with zero and span adjustments shall be provided for the wet-well level input.
6. Relay outputs shall be provided as standard for high and low level alarms and for the control of up to four pumps. Up to four isolated analog outputs (4-20mA) shall be available as an option, for VFD speed control when needed. Up to four isolated analog inputs (4-20mA) inputs shall also be available as an option, for use when needed as telemetry inputs.
7. All electrical connections, for power or I/O, shall be by quick-disconnect, phoenix style connectors.
8. The controller shall have a minimum of 18 discrete inputs. The inputs shall be transient protected and be programmable for the following functions:
 - a. Pump disable with HOA in OFF, or pump fault
 - b. External Alternator Selector Switch
 - c. All pump disable – for connection to Phase Monitor
 - d. Limit number of pumps, called to run, while on emergency power
 - e. Alternation by External Time Clock
 - f. Call pump last – for connection to VFD/Bypass logic
 - g. Pump disable upon low level – for connection to low level float switch
 - h. Float switch backup
9. Troubleshooting features shall include a fault indicator on the front of the unit and retrievable fault codes.
10. Status of the discrete inputs shall be viewable from the front of the unit.
11. A level simulation feature shall be available from the front of the unit. The controller shall automatically return to monitoring the wet well level after sixty seconds if left in the simulation mode.

12. Menu selectable First-On/First-Off or First-On/Last-Off alternation sequences shall be available.
13. Menu selectable alternation modes shall include:
 - a. Standard Alternation
 - b. Jockey pump (Pump 1 stays on when other pumps turn on)
 - c. Jockey Pump (Pump 1 turns off when other pumps turn on)
 - d. Split alternation (Pumps 1&2, Pumps 3&4)
 - e. Fixed sequence (Pump 1 always lead)
 - f. Stepped on/off (Only one pump runs at a time)
14. Pump disable discrete inputs shall cause the alternator to skip over disabled pumps.
15. The controller shall remember which pump was in the lead position during a power outage.
16. The pump On/Off levels, high level alarm, low level alarm setup, and VFD speed values shall be viewable and changeable from a remote location.
17. For VFD operation, the controller shall have menu selectable parameters to form a linear wet-well level versus pump speed curve. This pump speed curve shall include the parameters VFD Minimum Speed, Level at Minimum Speed, and Level at 100% speed.
18. Typical operation for Controller operating on VFD shall be:
 - a. As the level rises to a PUMP ON LEVEL, a Pump/VFD is called for, and ramps up to 100% speed as the level increases. As additional pumps are called for, they are started and ramped to 100 % speed. As the level decreases below the 100 % speed point, the speed of the VFD(s) is ramped down. When the level drops to a PUMP OFF LEVEL, the pump/VFD is turned off.
 - b. The controller shall contain inputs for Bypass logic. These inputs shall cause the controller to favor pumps with operational VFDs over pumps that have a VFDs in the Bypass Mode.
19. The station controller unit shall be designed to operate on 120 VAC $\pm$ 10% input power.
20. The controller shall be security code protected.
21. The system shall be designed to detect failures in the system that would prevent proper operation. Detection of this system failure shall give a visual alarm, energize a dry contact alarm relay for remote indication and automatically switch to a float switches backup system.

B. LEVEL TRANSDUCER

1. The level transducer shall sense and measure the liquid level in the wet well based on the hydrostatic pressure of the liquid above the submerged sensor diaphragm.
2. The level transducer shall provide an output signal directly proportional to the sensed level over the calibrated range of the sensing element.
3. The level transducer housing shall be fabricated of PVC with a 2.5" diameter Teflon diaphragm that provides strong chemical resistance and electrical isolation.
4. Silicone oil shall be used as a hydraulic fill.
5. The sensor shall be mounted using its signal cable and have ¾" NPT pipe threading for the pipe mounting.
6. The internal air pressure of the sensor assembly shall be relieved to atmospheric pressure through a sealed breather system.

C. BACKUP LEVEL FLOAT SYSTEM

1. The controller's intrinsically safe float switch inputs shall be designed to allow safe handling of float switches by Pump Station personnel. The ISD Controller shall be UL913 Listed as an Intrinsically Safe device.
2. The controller shall be designed to simplify control panel construction by incorporating four intrinsically safe relays, an alternator, a lag pump delay timer, two HOA switches, a push-to-test switch, and a lead/lag/auto select switch into the unit.
3. All electrical connections shall be quick disconnect, phoenix style connectors. The controller shall contain the following indicators:
 - a. Power-on
 - b. Level
 - c. Output.
 - d. High-Level
 - e. Float Out-of-Sequence.
4. The Push-to Test push-button (which internally closes the Off and the Lead float inputs), shall allow the operator to test the automatic pump call function of the unit, as well as the related pump control circuitry.
5. The Float Switch out-of-sequence logic shall give an indication that the float switches are not opening or closing as they should. This logic shall also compensate for float switch failure conditions, and allow for continued pump operation. The float out-of-sequence indicator shall be turned off by either a return to normal float sequencing, or by resetting the control power.
6. The controller shall provide a delay for the lead pump immediately following a power interruption. The controller shall be available in three mounting variations – Din-rail, panel mount, and surface mount.

2.02 MANUFACTURERS

- A. Motor Protection Electronics, Inc. model SC2000, Multitrode Co. model Multismart 3 or approved equal.
- B. The level transducer shall be manufactured by Contegra Inc., Inc. Model SLX 130 or approved equal.

- C. The Backup float system shall be manufactured by Motor Protection Electronics, Inc. Model ISD or approved equal.
- D. Float Switches shall be Mini Float SM NO as manufactured by Anchor Scientific or approved equal.

PART 3 - EXECUTION

(Not Used)

END OF SECTION