

INSTRUCTION MANUAL
and
DETAILED PRODUCT SPECIFICATION
DUPLEX BACKUP PUMP CONTROL SYSTEM
MODEL NUMBER BPC-2

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1.0 PURPOSE

This document establishes the performance, and design requirements for the Duplex Backup Controller, model BPC-2.

2.0 APPLICABLE DOCUMENTS

None

3.0 REQUIREMENTS

3.1 GENERAL DESCRIPTION

The BPC-2 is a system that automatically controls one or two pumps. It is intended to be the primary pump controller in lift stations and other pump down applications. The controller is designed to use up to five standard float switches. It also has six inputs that are intended for use with the seal leak sensors and/or thermal switches in submersible pumps. All of the inputs are optically isolated and the system includes a built in alternator with selector switch. The controller is a microcomputer-based device with one RS-232 serial port. If this port is connected to a telephone or radio modem the controller will function as both a pump controller and as a remote terminal unit in a SCADA telemetry system. Figure 1 is a front view of the controller.

3.1.1 OPERATION

The BPC-2 uses float switches to sense level. Three floats are used to control the two pumps. The OFF float is positioned at the level below which both pumps are to be off. The LEAD float is set at the level at which the lead pump should come on. The LAG float is set at the level at which both pumps should be on. As the water level in the wet well rises it will reach the LEAD float. When this float closes the lead pump is started. This pump should pump the level down until it reaches the OFF float. When the level is pumped down below the OFF float and it opens then the lead pump is stopped. If the lead pump fails to pump the level down and the level reaches the LAG float then the lag pump is started. With both pumps running the level is pumped down to the OFF float and both pumps are stopped. If the alternator switch on the front of the controller is in the center position then each cycle the lead and lag pump will be swapped so that pump starts and run time is equalized. If the alternator switch is in the 1-2 position then pump 1 will always be the lead pump. If the alternator switch is in the 2-1 position then pump 2 will always be the lead pump. A timer is built into the controller so that both pumps cannot be started at the same time. This insures that at least 8 seconds will elapse between pump starts. This is important after power failures to insure if the level is high in the wet well both pumps are not called at once. The controller has provisions for two alarm floats, a high level alarm and a low level alarm. These floats are optional. If the level is below the LOW float then the low alarm light on the front panel will light, the low alarm relay will close and both pumps will be stopped if they are not already off. If the level is above the HIGH float then the high alarm light on the front panel will light, the high

alarm relay will close and both pumps will be started (8 seconds apart) if they are not on already. All of the floats should be normally open (open if above liquid) type floats. The controller has two pump fail inputs. When these inputs are closed the associated pump will be disabled and the other called in its place. When this condition exists a continuous red error light for that pump will illuminate on the front panel. The controller also has two pump warning inputs which are intended for use on submersible pumps with two stage leak sensors. The warning inputs, when activated, cause the pump error light to blink but do not disable the pump. The error and warning inputs are optional and if not used should be left unconnected. The fail and warning inputs are completely isolated and intended to connect directly to the sensors in the pumps without the need for any sensing relays. The controller can also be ordered in a configuration that is directly compatible with single wire leak and thermal sensors if your pumps are equipped this way. In either case no isolation relays are required. All float and sensor inputs are designed to operate at voltages and currents well below the intrinsically safe limits.

3.3 SPECIFICATIONS

The BPC-2 is a microcomputer-based device that has the following hardware features:

1. Five float switch inputs for the float switch modes.
2. Four error sensor inputs for pump failure.
3. Two warning sensor inputs.
4. Five relays for driving two motor starters, the high alarm lamp, the alarm horn, and the low alarm.
5. 15 indicator light emitting diodes (lamps).
6. An RS-232 serial communications port.
7. A 68HC11 microcomputer.
8. A power supply for system power.
9. One input for a horn mute switch.

3.3.1 FLOAT SWITCH INPUTS

The five float switch inputs are all self powered and optically isolated. The floats are connected between the float common pin (J1 pin 4) and the individual float input. The floats should all be normally open (closed when submerged) type floats. The float switch inputs have the following specifications:

Voltage when open	12.0 Volts DC
Current when closed	1.8 milliamps
Isolation	2500 V rms

3.3.2 ERROR SENSING INPUTS

The four error inputs are self powered and optically isolated. They can be directly connected to the seal leak sensor in a submersible pump or to thermal sensor or both. They have the following specifications:

Voltage when open	12.0 Volts DC
Max current	2.3 milliamps
Isolation	2500 Vrms

3.3.3 WARNING INPUTS

The two warning inputs are identical to the error inputs except that they do not disable the pumps. They are intended for use with submersible pumps that have dual seal leak sensors.

3.3.4 RELAYS

The controller has five relays (pump 1, pump 2, high alarm, high alarm horn, and low alarm) which have the following specifications:

Contact Rating	10 Amps at 125 VAC
Breakdown Voltage	800 Vrms
Life	100,000 cycles minimum at max load 5,000,000 cycles unloaded

3.3.5 SERIAL PORT

The controller has one RS-232 serial port designed for use with either a telephone or radio modem. This permits the controller to function as a remote terminal in a multiple remote telemetry system or SCADA system. Several protocols are available (consult the factory for specific requirements).

3.3.6 POWER SUPPLY

The BPC-2 is designed to run on standard line power. It is fused, surge protected, and transformer isolated. All internal power supplies are regulated. The system has the following input power requirements:

Input Voltage	115 VAC +/- 15% at 60 Hz. +/- 20%
Input Current	0.7 Amps Max
Transient protection	Metal Oxide Varistor

3.3.7 MUTE INPUT

The BPC-2 has one input, which is used to silence the high alarm horn. When it is shorted to ground the high alarm horn relay will be opened to stop the high alarm horn during a high alarm condition. The high alarm light relay will not be affected by this action. When the current high alarm condition is cleared the high alarm horn relay will again be armed so that any new high alarms will sound the horn.

3.4 CONNECTOR PIN DEFINITIONS

All electrical connections to the controller are made through three connectors.

CONNECTOR J1

PIN NO.	FUNCTION
J1- 1	115 Volts A.C. power input
J1- 2	115 Volts A.C. power input
J1- 3	GROUND
J1- 4	FLOAT COMMON
J1- 5	HIGH ALARM HORN RELAY CONTACT
J1- 6	HIGH ALARM HORN RELAY CONTACT
J1- 7	HIGH ALARM LIGHT RELAY CONTACT
J1- 8	HIGH ALARM LIGHT RELAY CONTACT
J1- 9	PUMP 2 RELAY CONTACT
J1- 10	PUMP 2 RELAY CONTACT
J1- 11	PUMP 1 RELAY CONTACT
J1- 12	PUMP 1 RELAY CONTACT
J1- 13	GROUND
J1- 14	LOW ALARM RELAY NORMALLY OPEN CONTACT
J1- 15	LOW ALARM RELAY COMMON CONTACT
J1- 16	LOW ALARM RELAY NORMALLY CLOSED CONTACT

CONNECTOR J2

PIN NO.	FUNCTION
J2-1	PUMP 1 THERMAL SENSOR INPUT
J2-2	HIGH ALARM FLOAT INPUT
J2-3	LAG FLOAT INPUT
J2-4	LEAD FLOAT INPUT
J2-5	OFF FLOAT INPUT
J2-6	LOW ALARM FLOAT INPUT
J2-7	PUMP 1 WARNING INPUT
J2-8	PUMP 2 WARNING INPUT
J2-9	PUMP 1 SEAL LEAK SENSOR INPUT
J2-10	PUMP 2 SEAL LEAK SENSOR INPUT
J2-11	PUMP 2 THERMAL SENSOR INPUT
J2-12	MUTE BUTTON INPUT

CONNECTOR J3

J3-1	NOT USED
J3-2	RS-232 RECEIVED DATA
J3-3	RS-232 TRANSMIT DATA
J3-4	NOT USED
J3-5	GROUND
J3-6	NOT USED
J3-7	REQUEST TO SEND
J3-8	CLEAR TO SEND
J3-9	MODE (USED TO DOWNLOAD NEW PROGRAMS)

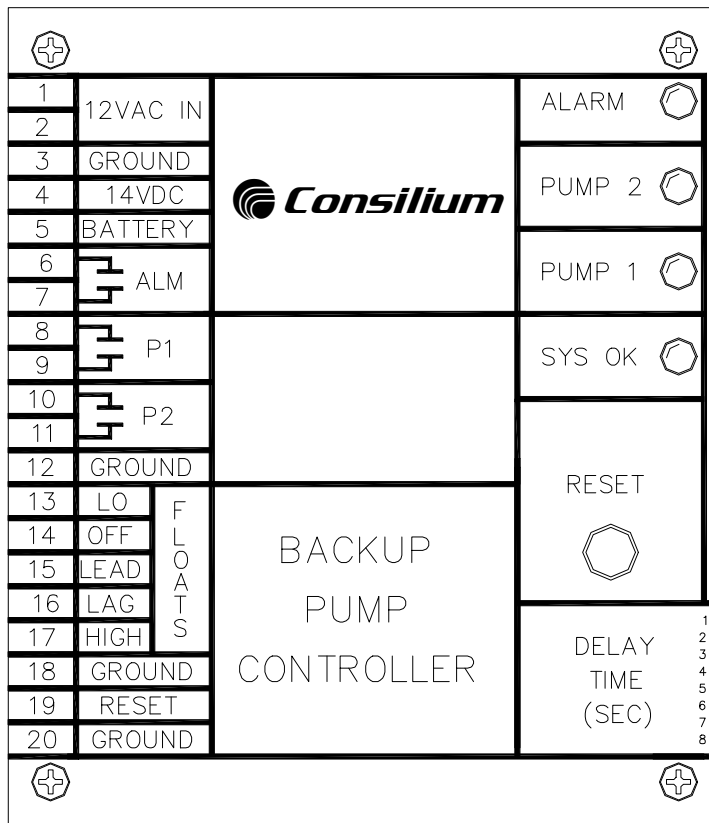


Figure 1

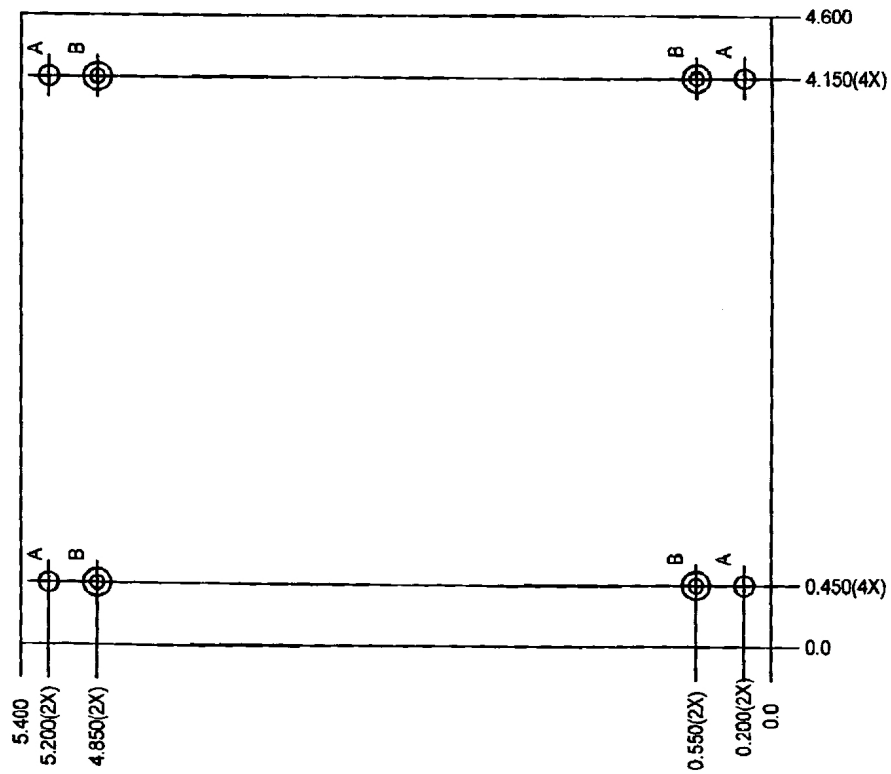
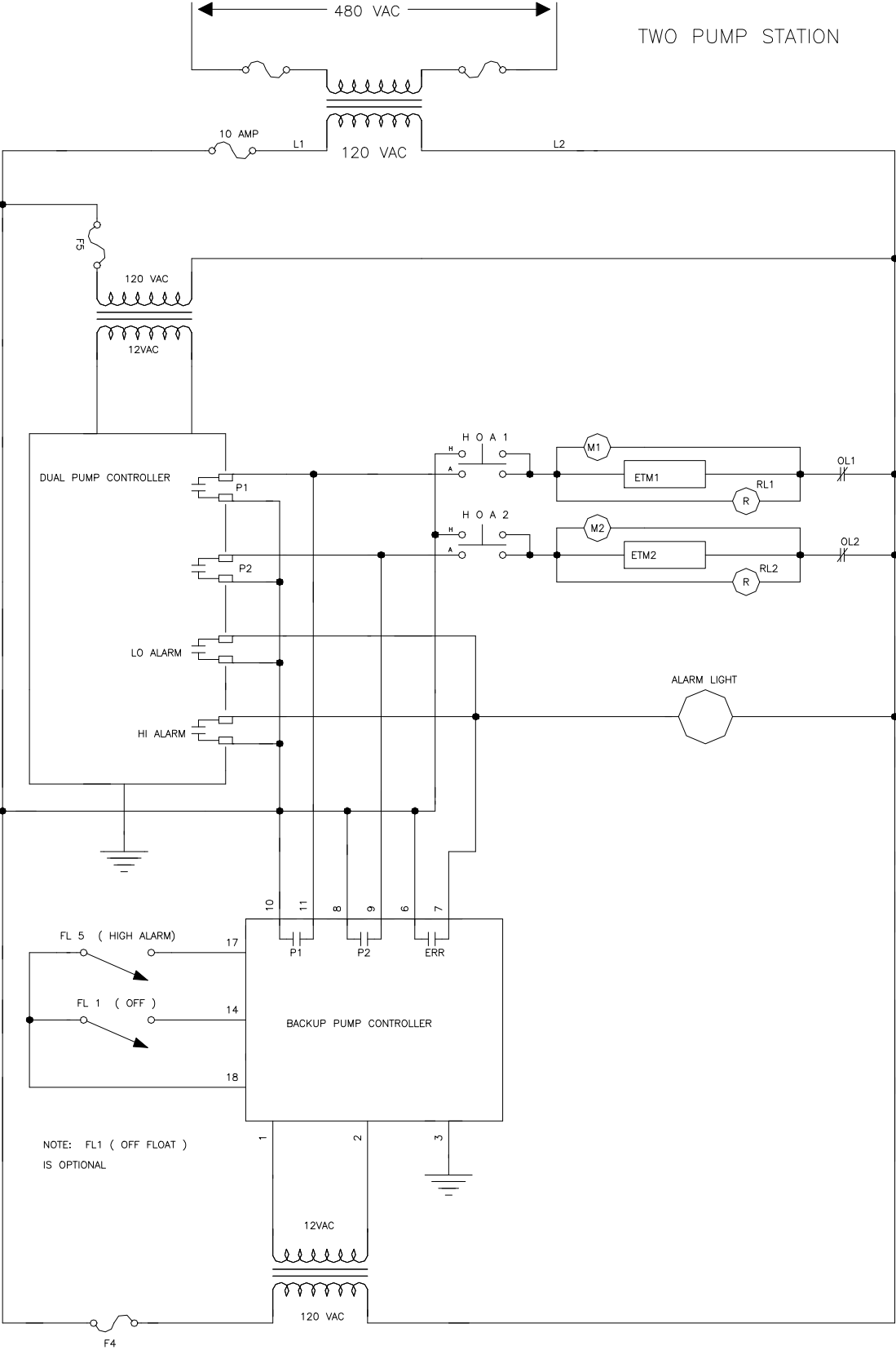


Figure 2

TWO PUMP STATION



NOTE: FL 1 (OFF FLOAT)
IS OPTIONAL

