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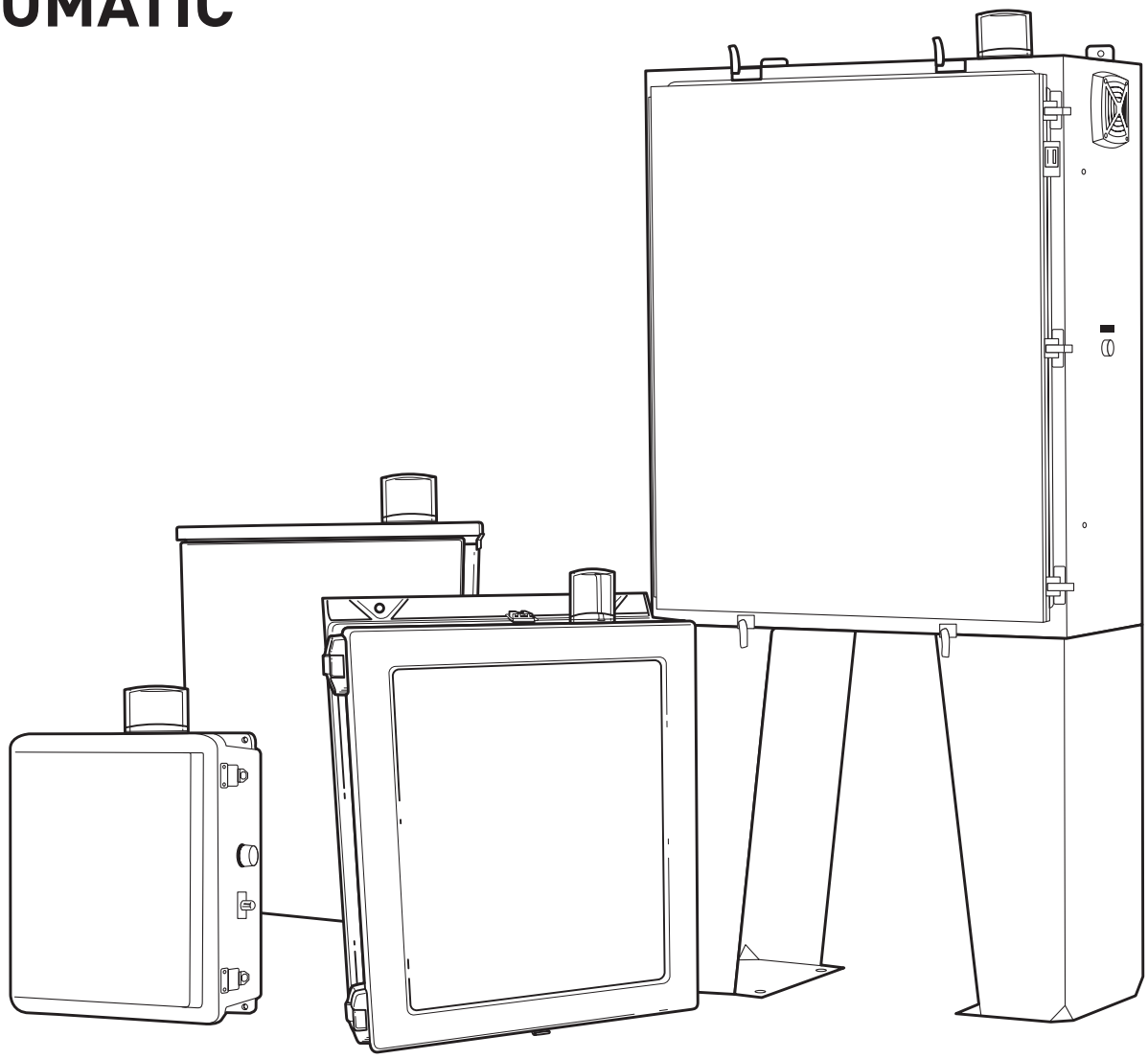


NOVUS 3000
STANDARD ELECTRICAL CONTROLS

INSTALLATION AND SERVICE MANUAL

NOTE! To the installer: Please make sure you provide this manual to the owner of the equipment or to the responsible party who maintains the system.

Item # H-03-519 | Part # 5625-519-1 | | 11/02/12

General Information

Thank you for purchasing your Hydromatic® Novus Control Panel. To help ensure years of trouble-free operation, please read the following manual carefully.

Before Operation:

Read the following instructions carefully. Reasonable care and safe methods should be practiced. Check local codes and requirements before installation.

Attention:

This manual contains important information for the safe use of this product. Read this manual completely before using this product and refer to it often for continued safe product use. DO NOT THROW AWAY OR LOSE THIS MANUAL. Keep it in a safe place so that you may refer to it often.

CALIFORNIA PROPOSITION 65 WARNING:

⚠WARNING This product and related accessories contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Introduction

The model NOVUS 3000 is a float switch based dual pump controller intended primarily for wastewater lift stations and other pump-down applications. It has inputs for five normally open float switches and sensor inputs for the seal fail and temperature fail sensors normally found in submersible pumps. The controller has indicator lamps and test push button switches on each of the float inputs as well as an indicator that will illuminate if the floats do not close in the correct order. The controller has built-in alternation and a three position switch to select automatic alternation or to select between pump 1 and pump 2 if alternation is off. The controller has disable inputs for each of the pumps. The controller has built-in support for an alarm horn with inputs for an external mute button and also a mute button on the controller front panel. There are two alarm outputs, one for the high alarm and one for the low alarm. These output relays can be set up to cycle on and off during an alarm to support a blinking panel alarm light. The controller has five output relays. Two are for the two pumps, one each for the high and low level alarms, and one to drive the horn. The controller has indicator lights and external relay drivers for the following conditions: floats out of order, seal fail for pumps 1 and 2, temperature fail for pumps 1 and 2, and pump disabled for pumps 1 and 2.

Unpacking Panel:

Remove panel from carton. When unpacking unit, check for concealed damage. Claims for damage must be made at the receiving end through the delivery carrier. Damage cannot be processed from the factory.

Power Supply

WARNING: Do not attempt to wire this control box unless you have a good working knowledge of electricity and are familiar with the state and local codes. If you are in doubt about anything, contact a qualified electrician.

Do not attempt to operate this unit on any other voltage or power distribution other than for which it was originally designed (check nameplate). **Failure to comply with this will result in the immediate cancellation of all warranties and claims.**

It is advisable to put the panel on its own circuit using a circuit breaker adequately sized to protect the pump(s). Check state and local codes for the correct wire size and circuit protection to use. The wire should be sized large enough to handle the full load current of the pump(s) you are operating and any voltage drop that might occur due to long service runs.

Run power supply lines to the control box and secure (knockouts are not supplied in this box). Select a convenient location on the bottom to enter the box with the power supply. Cut a hole with a chassis punch. Caution should be taken not to get metal chips in the components while cutting hole. After the hole is cut, any metal particles must be removed from the box. Failure to do so may result in premature component failure.

Connect incoming power to the terminal blocks labeled L1, L2, L3, and all necessary ground wires to the ground lug at the bottom of the box. The ground lug should be fastened to a good driven earth ground by one of the methods described in the National Electric Code. NEC does not permit using ground as a current-carrying conductor, therefore a neutral must be provided for 115 volt 1 phase, 208 volt 1 phase, 230 volt 1 phase, or 208 volt 3 phase systems.

WARNING: Before handling these pumps and controls,

always disconnect the power first. Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

Electrical Connections:

The contractor must conform to the latest requirements of the National Electrical Code. All conduit and cables shall be in accordance with NEC Code NFPA #70. To maintain UL and CSA ENCL rating, use the same type UL and CSA weatherproof conduit hubs when connecting to this enclosure. Prior to conducting any installation, repair or service with regard to the control panel, refer to the schematic appropriate for that panel. The schematic will provide guidance with regard to the terminal block connections.

CAUTION: A nonmetallic enclosure does not provide grounding conduit connections. Use grounding bushing and jumper wires.

Make the Following Electrical Connections:

a. **Connect the pump leads to the control panel.** ***If pump is single phase and the panel has start capacitor, start relay and run capacitor, it is critical that the pump leads be connected properly. The White, Black, and Red pump leads must be connected to the appropriate terminals as directed by the panel schematic and the label on the back panel below the terminals.***

b. Connect the pump heat sensor and seal failure leads (if available on the pump) to the appropriate terminal blocks in the control panel.

c. Connect all the float control leads or 4-20mA leads to the appropriate panel terminals. Contractor must be very careful in locating the floats at the proper elevations. The maximum distance from the control panel to the floats is the lesser of l00 feet, or the maximum distance recommended for the pump.

d. Before connecting power to the control panel, make sure all control switches (e.g. H-O-A switch) and protective devices (e.g. breakers) are in the Off position. Now connect power to the terminal block or the circuit breaker as directed by the schematic.

e. Control panel must be grounded properly per NEC and/or local codes. To facilitate this, a ground lug is provided on the control panel.

Operation

The NOVUS 3000 uses five normally open float switches for level sensing. When the tank is empty all of the floats are open. The lowest float is the low alarm float. If it is not used the low float input should be shorted with a jumper. When the tank is empty the controller will be in the low alarm condition. On rising water, when the level is high enough to close the low float switch then the low alarm will go off. As the level rises the off float will close and then the lead float will close. When this happens the pump controller will call for the lead pump. Which pump is the lead, will be determined by the alternator. If the alternator is set for pump 1, then pump 1 will be called. If the alternator is set for pump 2, then it will be called. If the alternator is set in the on position, then for each pump cycle the lead pump will change. If one of the pumps has an existing leak failure, then the other pump will be called as the lead. If any pump has existing temperature failure or is disabled, then that pump will not be called. If the lead pump lowers the water level far enough to open both the lead and off floats, then the lead pump will be turned off and the lead pump changed if alternation is on. If the water level continues to rise and closes the lag pump, then the lag pump will be called. If the level drops enough to open the lag, lead, and off floats, then the two pumps will be turned off. When both pumps are turned off there is a 4 second delay between the first and second pump turning off. If the water level continues to rise and closes the high alarm float, then the high alarm condition will be set. This will cause the high alarm relay and light to come on. This alarm condition will clear when the level is low enough to open the high float. Any time a pump is started an internal timer is started which will prevent the other pump from starting for a period of time which is selected by one of the option switches on the bottom of the controller. This time can be either 6 or 12 seconds. The controller has three pairs of inputs for setting pump related alarms or faults.

Start-up Operation

1. Check junction box for moisture. Moisture may cause chattering of relays/contactors.
2. **If pump is single phase with start capacitor, start relay and run capacitor in panel. Check that pump White,**

Black, and Red power wires are connected to panel correctly.

3. **WARNING!** ***Live voltage can kill!*** Check incoming power voltage to make sure that it is correct for panel and pump model.
4. Energize control panel. (Turn on power to panel.)
5. Check overload relay and verify reset mode (if overload is supplied).
6. **WARNING!** ***Live voltage can kill!*** Check voltage to the panel and at secondary of control transformer using a voltmeter. If no transformer is supplied, check voltage at the circuit breakers.
7. With H-O-A switch in hand, check discharge to verify the pump is running. Check for flow. On three phase power, check to see if each pump has proper rotation. Wrong rotation will give low flow.
8. Check full load current with amp probe and compare it with the nameplate rating. On three phase pumps, check all three phases. On single phase pumps, check black pump lead.
9. Check operation of start relay, if supplied on single phase panels, per procedure in Item #7 of Maintenance Instructions.
10. With H-O-A switch in Auto, check float operation and response to control panel to the float operation. For sequence of operation, refer to design specification.
11. Make sure H-O-A switch is left in the Auto position after start-up is completed.

Pump Start-Up:

Refer to pump Installation and Service Manual.

Pump Maintenance

WARNING: Before handling these pumps and controls, always disconnect the power first. Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

The maintenance schedule will vary with operating and environmental conditions. It will also vary with the specific type of control supplied. The list herein is a guide only.

1. Exercise breaker through one cycle. Be careful not to overexercise as the breaker is not a switching device. *Excessive operations tend to affect the trip curve of the breaker.*
2. Check contactors and relays for excessive humming. This can be accomplished by turning pumps on and off in the Hand mode with the H-O-A switch.
3. Check pump run light(s) by running pump(s) in Hand mode. Check bulb(s) in any other light(s).
4. *With the power off*, check continuity of all control fuses.
5. Check voltage at primary and secondary of control transformer.
6. Check the pump full load amps.
7. For 1 phase panels with start circuit, about 5 seconds after the pump starts check the voltage from terminal 1 to terminal 2 on the start relay to be sure that the relay has operated. The voltage from terminal 1 to terminal 2 on the start relay must exceed 10 VAC. For some pumps the voltage may exceed 400 VAC. If after 5 seconds the voltage from terminal 1 to terminal 2 on the start relay does not exceed 10 VAC, stop the pump as the start capacitor may be damaged in about 15 seconds.

   If the start relay is not operating, check the pump and the system voltage to be sure that they match. Check the power wiring to ensure that the pump is connected properly. Start the pump once more and check that the voltage from the terminal for the black wire to the white wire is within system tolerance. Call for help if you cannot resolve the problem.
8. Check junction boxes for moisture. Moisture may cause chattering of relays and contactors.
9. Check for moisture inside control panel enclosure. Moisture can cause damage to electrical components. Check door gasket for proper seal.
10. Check labels to verify they have not been damaged.
11. Lubricate enclosure hinges.
12. Pull floats and check for proper operation and ensure there is no foreign buildup on them.

Spare Parts List:

The following is a list of recommended spare parts. However, conditions of service vary significantly and a general list may not in its entirety be applicable to a given installation. The user should exercise judgment in defining specific requirements based on this guide.

1. Fuses for control transformer primary and secondary. (If required)
2. Contactor.
3. Bulbs for any light requiring a bulb.
4. Control transformer. (If required)
5. Alternator relay. (If required)

Float Controls

Optional: The LOW WATER / REDUNDANT OFF float should be installed just above where the pump begins to ingest air normally; this is about the top of the volute.

The OFF float should be installed about halfway down the pump. If a LOW WATER / REDUNDANT OFF float is used, then the off float should be installed a minimum of 4 inches above the LOW WATER / REDUNDANT OFF float.

Install the ON / LEAD floats a minimum of 4 inches above the OFF float. If additional volume is to be pumped on each cycle or if the pump running time for each cycle needs to be increased, then increase the distance from the ON / LEAD float to the OFF float as needed.

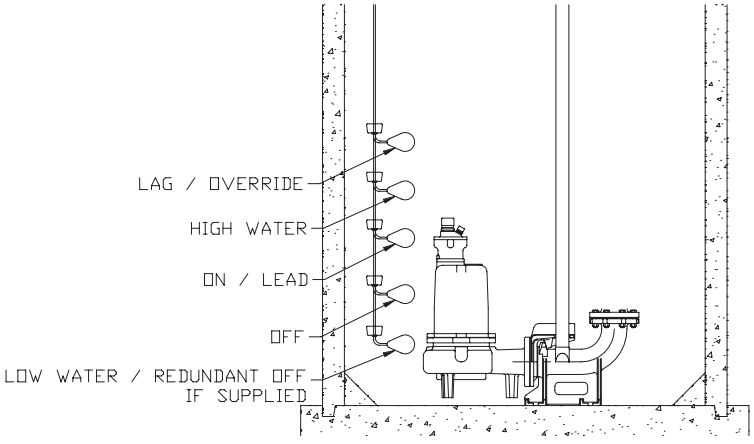
Install the HIGH WATER float 4 inches above the ON / LEAD float.

For duplex systems install the LAG / OVERRIDE float 4 inches above the HIGH WATER float.

On duplex systems where both pumps have to run on a daily basis to keep up with the incoming flow, then the HIGH WATER and the LAG / OVERRIDE float position should be reversed.

Seal Fail Inputs

Each pump has an input for the seal fail (moisture) sensor commonly found in submersible pumps. The controller measures the resistance of the sensor. In normal operation the seal fail condition is set if the resistance is less than 2000 ohms. One of the option switches can be used to change this to set the alarm if the resistance is greater than 2000 ohms. If a seal fail alarm is set, then that pump is demoted to lag pump and its seal fail lamp and output are activated. The seal fail does not disable the pump.



Temperature Fail Inputs

Each pump has an input for the temperature fail sensor often found in pumps. This sensor should be shorted if the pump is good. If the pump overheats, then this sensor will open. The sensor is connected to ground and to the sensor input for that pump. If the pump controller detects an open condition in the sensor, then the temperature fail lamp and output are activated. The temperature fail condition will disable the pump. The controller can be set using an option switch on the bottom of the controller to latch up the temperature fail condition. If this option is selected, then once a temperature fail condition is detected the fault will not clear until the fault condition is cleared and the reset push button is pushed (or external reset input is closed). If this option is not selected, then the fault will clear when the sensor in the pump closes again.

Disable / Pump Running Inputs

Each pump has an input which has two possible functions. If the fail to start test is not activated by an option switch on the bottom of the controller, these inputs are pump disabled. Under this condition, if this input is shorted to ground, then that pump will be disabled. If the fail to start test is activated these inputs are pump running inputs and should be shorted to ground whenever the pump is running.

Fail To Start Test

If the fail to start test is activated (using the option switches on the bottom of the controller), then the follow sequence is used each time a pump is called:

1. When a pump is called a timer is started.
2. After a start-up time has expired (set by switch 6), the pump running input is checked. If the pump is not running at the end of the time, then a pump fail to start condition is set and the pump is disabled. The pump will remain disabled until the reset button is pushed or until the external reset input is activated.

Alarm Relay Outputs

The controller has two relays for level alarm. Option switch 5 can be used to cause these relays to cycle on and off. This is useful to provide blinking on the external alarm lights.

Auxiliary Relay

There is one relay that can have either of two functions selected by option switch 4:

1. If the horn option is selected, then this relay can be used to drive an external horn or bell. Whenever either a high or low alarm condition starts, the relay is activated (closed). If the alarm condition is cleared, then the relay is also cleared. If the reset button is pushed or the external reset/mute input is activated, then the horn relay is cleared. If the horn is muted, then it will not reactivate until the alarm condition is cleared and another starts.
2. If the common alarm option is selected, then this relay will be activated when any of the following conditions exist:
   - High alarm
   - Low alarm
   - Pump temperature failure
   - Pump disabled by fail to start test

This common alarm condition can be used to drive an alarm light, telephone dialer, or telemetry system.

Option Switches

There are six switches on the back of the controller which select several different options.

SW1 – When this switch is set, the fail to start test is enabled.

SW2 – When this switch is set, the temperature fail condition is latched up until reset.

SW3 – When this switch is set, the seal fail input is inverted (open is fault).

SW4 – When this switch is set, the aux relay is the common alarm. If it is not set, then the aux relay is the horn output.

SW5 – When this switch is set, the low and high alarm relays will cycle, causing a lamp blink.

SW6 – When this switch is set, the time between pump starts and the delay for the fail to start test is 12 seconds instead of 6 seconds.

Fault Outputs

There are seven fault lamps with corresponding driver outputs. They are used to display the following fault conditions:

1. Floats out of order
2. Pump 1 seal fail
3. Pump 2 seal fail
4. Pump 1 temperature fail
5. Pump 2 temperature fail
6. Pump 1 disabled
7. Pump 2 disabled

Each of these has a corresponding relay drive output. These outputs are designed to drive the coil of a 12VDC relay external to the controller. A source of 12VDC is also provided. To use these outputs, one side of the relay coil is connected to 12VDC and the other coil connection is connected to the driver output.

Specifications

Float and Sensor Inputs

There are five float inputs; two seal fail sensor inputs, two temperature fail inputs, and two disable inputs. They use current limiting resistors, filter capacitors and Zener diodes for transient protection. They also have both hardware and software filters on these inputs to improve immunity from noise. They have the following specifications:

Short Circuit Current less than 2 Ma.

Open Circuit Voltage 5.0 VDC

Mute / Reset Input

The mute / reset input is intended for use with a momentary push button switch mounted on the dead front or on the side of the enclosure. It has the following specifications:

Short Circuit Current less than 2 Ma.

Open Circuit Voltage 5.0 VDC

Relay Outputs

There are five relays which are used for pumps and alarms. All of them except the low alarm relay are form A (SPST) relays. The low alarm is a form C (SPDT) relay. They have the following specifications:

Maximum current at 120 VAC, 7 amps with a resistive load

Maximum voltage 140 VAC

Power Inputs

The controller is designed to run on 120 VAC control power. It is internally fused at 1 amp and transient protected with a MOV transient protector. It uses transformer isolation and internal current limited voltage regulators. It has the following specifications:

Input Voltage 120 VAC ± 10% 50 to 70 Hz.

Maximum Current 0.4 amps

Operating and Storage Temperature Range

Operating Temperature –10° C to 60° C

0% to 95% relative humidity, non-condensing

Storage Temperature –20° C to 65° C

0% to 95% relative humidity, non-condensing

Fault Driver Outputs

The controller has seven open drain FET driver outputs for driving external relays, lights, telephone dialers, or remote terminal units. The outputs short to ground when activated and have the following specifications:

Maximum voltage +12VDC

Minimum voltage 0.0 VDC

Maximum continuous sink current +0.4 amps

Maximum on resistance 2 ohms

Pump Troubleshooting

WARNING: Before handling these pumps and controls, always disconnect the power first. Do not smoke or use sparkable electrical devices or flames in a septic (gaseous) or possible septic sump.

1. **Pump does not run in Hand position.**
   a. Check pump circuit breaker and control fuse for tripping or blown condition.
   b. Check incoming power voltage and control circuit voltage.
   c. Check overload relay to see if it is tripped. Reset relay if tripped and check pump current with ammmeter.
   d. With the power off, check motor heat sensor continuity.
   e. Check wiring of pump to control panel. It should agree with the schematic.
   f. Check contactor coil resistance.
2. **Pump does not run in Auto position.**
   a. Check items (a.) through (f.) per Item #1 above.
   b. Floats may be miswired to control panel. Check float type (N.O. or N.C.) and hook up by referring to the schematic. If the start and stop floats are hooked in reverse, pump will short cycle and will not pump the level down.
      1. Is water level in the system high enough to activate the floats?
      2. If there is enough water in the system (with the power turned off), mark and disconnect the off and on floats. Next, install jumper wires in the terminal blocks for off and on floats. Turn power back on, put H-O-A switch in Auto and see if pump runs.
      3. If pump runs with jumper, problem is with floats. Remove jumpers and troubleshoot floats with ohmmeter.
      4. If pump does not run in Auto mode with jumpers, check Auto circuit wiring in panel.
3. **Pump runs, but run light does not energize.**
   a. Remove light and check with an ohmmeter.
   b. Check run light wiring.

Pump Troubleshooting

4. Pump runs but does not pump down the wet well.

a. On three phase only, pump rotation may be wrong. Wiring of pump to control panel may be reverse sequenced.

b. Impeller may be dragging in volute due to solids. High amperage draw would identify this.

c. Refer to the pump manual for other possibilities such as closed discharge gate valve, etc.

5. Severe humming/chattering of contactors and control relays.

a. There may be low voltage. Check voltage at primary and secondary of control transformer using a voltmeter. This low voltage condition may cause severe chattering and burnout of contactors and relays.

b. Contactor may have dust around magnet of coil structure. Dry or clean as required.

c. Check voltage to the control panel. Contactors require a minimum of 85% of full voltage to pull in without chatter. If the problem is a recurring one, measure voltage with recorder on a 24 hour basis.

d. Make sure the floats are located away from any turbulence.

e. Dry out the junction box (if furnished); moisture in the junction box may cause relays to energize intermittently.

6. Short cycling pump.

a. Check float controls.

7. Run light stays on.

a. Selector switch may be in the Hand position.

8. Nuisance tripping of overload on motor starters or circuit breakers.

a. Check pump amp draw with amp probe and compare to nameplate amps on pump.

b. The impeller may be locked up due to excessive debris or solids.

c. Possible motor failure (fault in windings).

d. Pump may be miswired to terminal block.

e. Voltage and current unbalance. Three phase only. Voltage unbalance on three phase power sources can cause motor current to become unbalanced and excessive heating will result. Tripping of the overload protectors and premature motor failures can be expected if the current unbalance exceeds five percent.

$$\text{Percent Current Unbalance} = \frac{\text{Maximum Current Difference from Average Current}}{\text{Average Current}} \times 100$$

To determine if motor current unbalance is a function of the motor or the power supply:

1. Label the leads and the terminals 1, 2, and 3 respectively.
2. Record the amperage for each lead.
3. Move each lead to the next terminal (1 to 2, 2 to 3, 3 to 1).
4. Again read the amperage of each lead.
5. Move each lead to the next terminal (1 to 3, 2 to 1, 3 to 2).
6. Again read the amperage of each lead.
7. If the unbalance moves with the motor leads, the unbalance is caused by the motor. If the unbalance remains with the terminals, the unbalance is in the power supply.
8. If the current unbalance exceeds five percent, nuisance tripping or excessive heating will result.
9. Connect leads for the lowest percent of current unbalance.

f. Connections and start components. Single phase only.

1. *Disconnect all power from the panel before making these checks.*
2. Motor winding resistance readings.

a. Disconnect all three motor leads from panel terminal blocks.

b. Using a volt-ohmmeter, with the scale set on RX1, measure the resistance between the leads with the chart.

Winding	Typical Motor Leads	Resistance Reading
Main	Black to White	Lowest
Start	Black to Red	Next Lowest (Middle)
Both	White to Red	Highest (Main & Start)

3. Capacitor check.

   a. Make sure the capacitor is discharged. Use extreme caution as a spark might occur.

   b. Disconnect the capacitor leads and connect an analog-type volt-ohmmeter to the capacitor terminals.

   c. Set the meter on the RX1,000 scale to check the start capacitor. Set the meter on the RX10,000 scale to check the run capacitor.

   d. The meter should indicate low ohms when it is first connected, but as the capacitor becomes charged (by the meter), it will return to a reading of infinity (open circuit).

4. Start relay check.

   a. Check the coil resistance It should be 3,000 to 15,000 ohms.

   b. Install a clamp on amp meter around the start winding lead.

   c. Set the amp meter scale to at least 2 times the pump motor full load current.

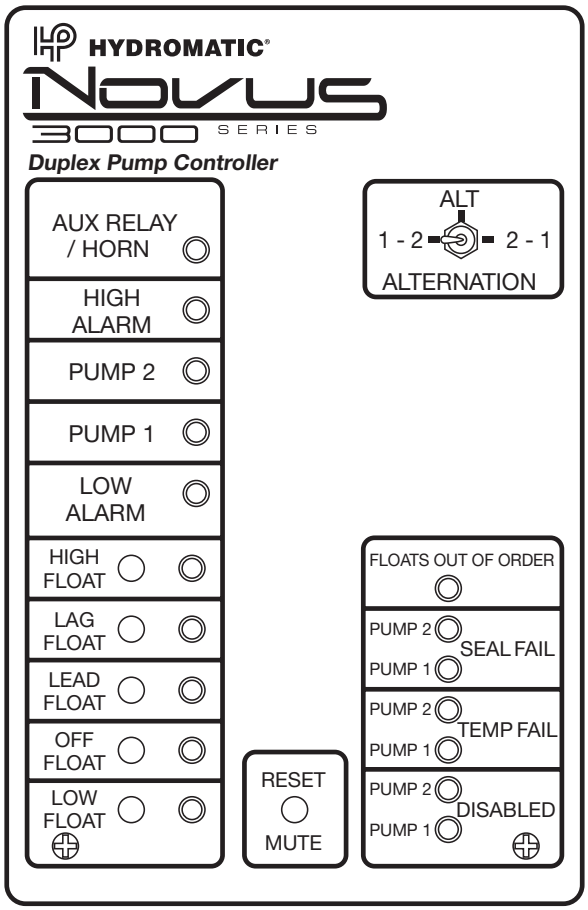
   d. Place the H-O-A switch in the Hand position to start the pump.

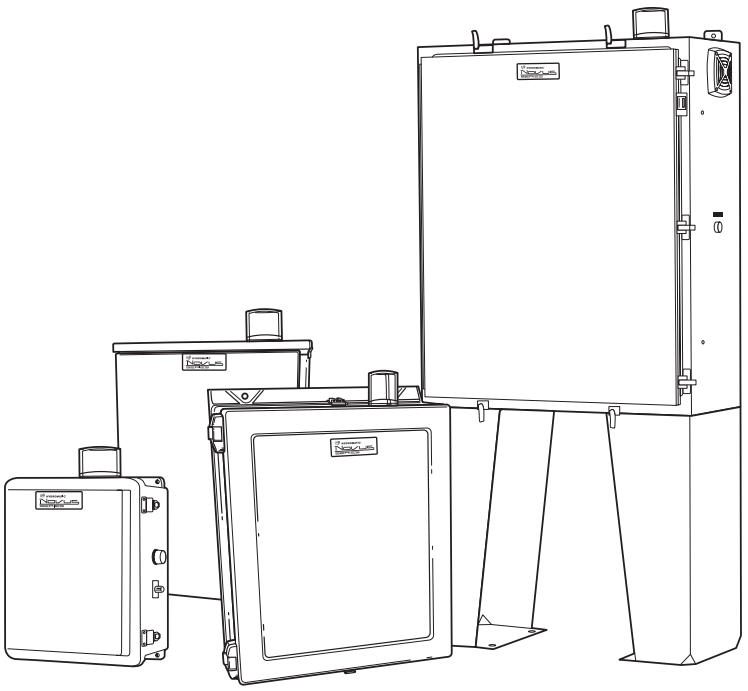
   e. The meter should read approximately 2 times full load current during starting.

   f. After the motor has started (within one second) the current should drop to a value much less than full load current.

5. Motor voltage check:

Component	Typical Motor Lead	Mode	Voltage Reading
Main Winding	Black to White	Start	Line Voltage
Main Winding	Black to White	Run	Line Voltage
Start Winding	Black to Red	Start	Line Voltage
Start Winding	Black to Red	Run	120% Line Voltage





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STANDARD LIMITED WARRANTY

Pentair Hydromatic® warrants its products against defects in material and workmanship for a period of 12 months from the date of shipment from Pentair Hydromatic or 18 months from the manufacturing date, whichever occurs first – provided that such products are used in compliance with the requirements of the Pentair Hydromatic catalog and technical manuals for use in pumping raw sewage, municipal wastewater or similar, abrasive-free, noncorrosive liquids.

During the warranty period and subject to the conditions set forth, Pentair Hydromatic, at its discretion, will repair or replace to the original user, the parts that prove defective in materials and workmanship. Pentair Hydromatic reserves the right to change or improve its products or any portions thereof without being obligated to provide such a change or improvement for prior sold and/or shipped units.

Start-up reports and electrical schematics may be required to support warranty claims. Submit at the time of start up through the Pentair Hydromatic website: http://forms.pentairliterature.com/startupform/startupform.asp?type=h. Warranty is effective only if Pentair Hydromatic authorized control panels are used. All seal fail and heat sensing devices must be hooked up, functional and monitored or this warranty will be void. Pentair Hydromatic will cover only the lower seal and labor thereof for all dual seal pumps. Under no circumstance will Pentair Hydromatic be responsible for the cost of field labor, travel expenses, rented equipment, removal/reinstallation costs or freight expenses to and from the factory or an authorized Pentair Hydromatic service facility.

This limited warranty will not apply: (a) to defects or malfunctions resulting from failure to properly install, operate or maintain the unit in accordance with the printed instructions provided; (b) to failures resulting from abuse, accident or negligence; (c) to normal maintenance services and parts used in connection with such service; (d) to units that are not installed in accordance with applicable local codes, ordinances and good trade practices; (e) if the unit is moved from its original installation location; (f) if unit is used for purposes other than for what it is designed and manufactured; (g) to any unit that has been repaired or altered by anyone other than Pentair Hydromatic or an authorized Pentair Hydromatic service provider; (h) to any unit that has been repaired using non factory specified/ OEM parts.

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