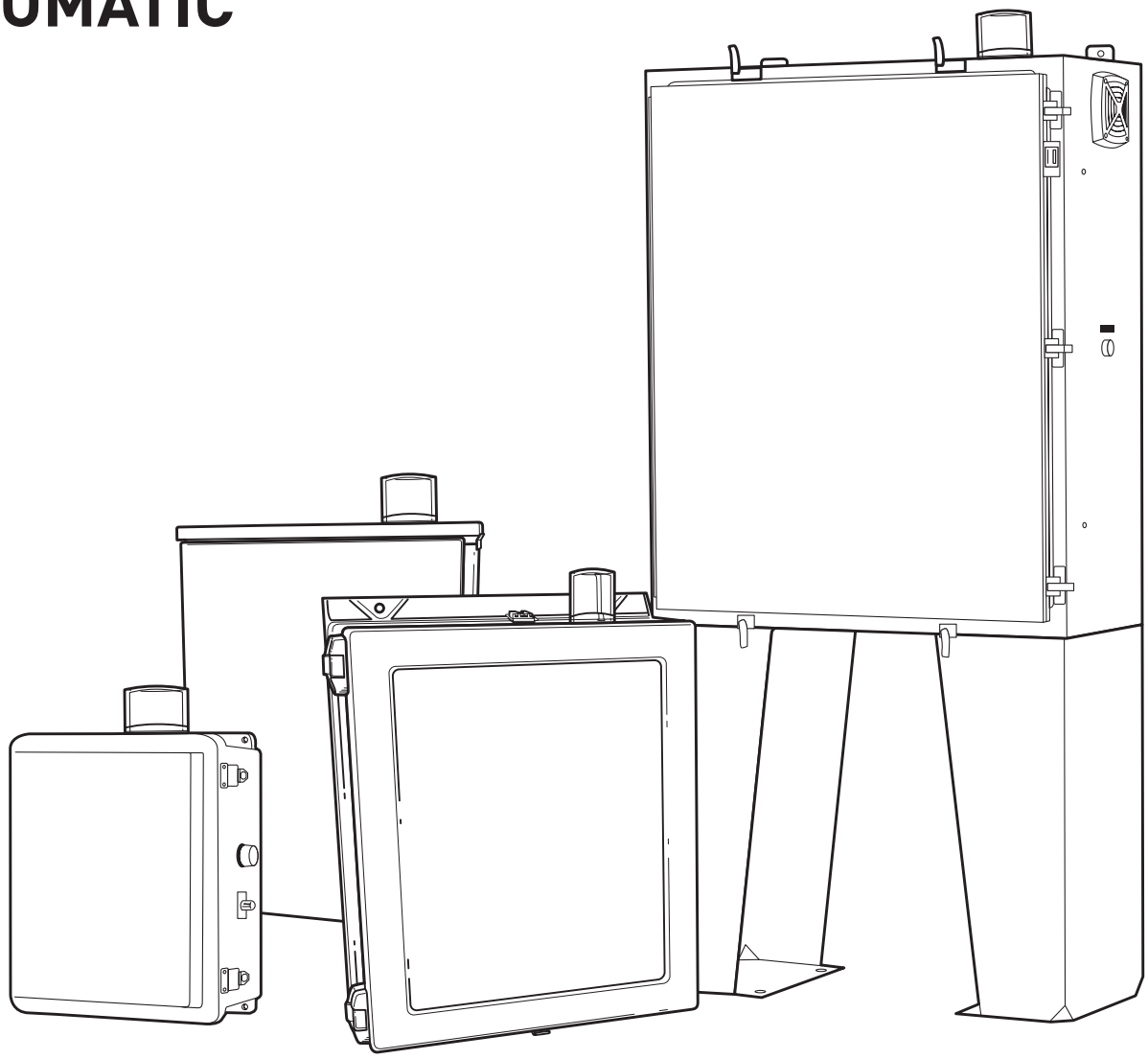
PENTAIR

HYDROMATIC®



NOVUS 4000
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-03-518 | Part # 5625-518-1 | | 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.

Pump Introduction

The NOVUS 4000 is a general purpose pump controller designed to control up to 3 pumps, in either pump up or pump down applications. It sequences pumps on and off in response to changes in level, pressure, or flow. The primary sensor input is a 4 to 20 Ma. current loop which can be connected to any sensor that has a 4-20 Ma. output. When used to control level in a tank or well, the input is usually connected to a pressure transducer or ultrasonic transmitter. A loop power supply is provided in the NOVUS 4000.

The NOVUS 4000 can be configured for many applications using its easy to use front panel user interface. Wiring is easy using removable terminal block on the back cover. Field replacement is easy because the terminal blocks unplug from the controller so no wires need to be disconnected.

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.

Pump Features

- 32 character alpha-numeric liquid crystal display for level, status, and setpoint information.
- Alternation selector switch on front panel to turn alternation on and select the lead pump if alternation is off.
- Simple menu structure for easy display and modification of setpoints and setup configuration.
- Built-in elapsed time meters for all pumps. They are nonvolatile and easily examined from the front panel.
- 4 to 20 Ma. main sensor input with loop power supply for easy connection to most transducers and transmitters. Adjustments are provided for both scale and offset.
- Inputs for pump seal leak sensors and pump over temperature sensors with red fail lights for out of specification conditions.
- Fully scalable 4-20 Ma. level output transmitter.
- Built-in single float backup system for pump down applications.
- Three auxiliary inputs which can be pump disable or pump run confirmation inputs for a fail to start test.
- Built-in horn relay with internal and input for external mute button.
- Relay outputs for both high and low level alarms with adjustable setpoints.
- Individually selectable setpoints for up to three pumps.
- All inputs are filtered and transient protected.
- Built-in software, no programming required.
- All inputs operate on low voltage and current.
- Input power is 115V AC, internally fused and transient protected.
- All terminal strips unplug without removing the wires for easy field replacement.

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.

Pump Down Operation

Pump down is used in situations, like wastewater lift stations, where a liquid flows into a tank or well and must be pumped out. A liquid flows in the level in the well rises. The level is continually monitored by the level transmitter which sends a 4-20 Ma. signal to the controller which displays the level on the first line of the display. If the level is below the low alarm setpoint then the low alarm light and relay are activated. If the horn is enabled then it too will be activated. As the level rises above the low alarm setpoint the low alarm condition will be cleared. When the level rises above the lead pump on setpoint the lead pump will be called to run. Which pump is the lead pump is determined by the alternator. The

current lead pump is displayed on the right side of the top line of the display. When the lead pump starts the liquid level should begin to fall as liquid is pumped out of the well. When the level falls to the lead pump off setpoint then the lead pump will be stopped and the alternator sequenced if it is on. If the level continues to rise it will reach the lag pump on setpoint and the lag pump will be called. If the level then falls to the lag pump off setpoint then the lag pump will be turned off. The lag pump will not be called if the total number of pumps setpoint is 1. If the lead and lag pump running do not cause the level to fall then the third pump will be called when the level reaches the lag2 on setpoint and if three pumps are selected for the maximum number of pumps. If the level continues to rise then it will reach the high alarm setpoint and set a high alarm condition. The high alarm light and relay will be activated. If the horn is enabled then it too will be activated until the alarm condition clears or until the mute button is depressed.

Single Float Backup

A single float backup system is provided in pump down mode only. It can be useful if the primary level sensor fails. A single normally open float switch is connected to the float input and suspended in the well at a point above the normal operating levels of the system. In this way the float will be submerged only if level rises above that required to call on all available pumps. The backup system is enabled by setting a backup time (in seconds) in the backup time setpoint of the configuration menu. If this time is zero then the backup system is disabled. If the high float is activated, and backup is enabled, and the pumps are not already calling for all available pumps then the backup mode is initiated. The float light on the front panel is turned on and the lead pump is called to run. At the same time two timers are started, one for 30 sec. and one for 60 sec. If the high float opens (comes out of the liquid) then these two timers are cleared and no further pumps will be called. The lead pump will remain on for the period of time set in the backup time setpoint. If the 30 second timer expires before the high float opens then the lag pump will be called if there are at least 2 pumps. If the 60 second timer expires before the high float opens then the second lag pump will be called if there are three pumps. All pumps will be sequentially turned off after the high float has been open for a period of time equal to the backup timer setpoint. The float light on the front panel will remain on until cleared by the reset/mute button on the panel or the external reset/mute button.

Pump Sequence Timers

In both pump up and pump down modes there are two timers which prevent more than one pump from turning on or off at the same time. These timers prevent excess power loads when pumps are turning on and some hydraulic problems (water hammer) when pumps are being turned off.

Time At Setpoint

The NOVUS 4000 has a feature that prevents any pumps from being turned on or off until a setpoint condition has been satisfied for a minimum time. This minimum time is the TIME AT SP setpoint in the setup menu and can be set from 0 to 31 seconds. As an example, assume this setpoint is set for 8 seconds, and we have a pump down system (lift station). Then, the water level in the tank must exceed the lead on setpoint continuously for 8 seconds before the lead pump will be called. There is not much need for this in most lift stations as the level changes slowly, but this feature can be very useful in water pressure (pump up) systems where the pressure may swing wildly for several seconds after a pump is turned off or on. If this time is set longer than the pressure takes to settle, then no further pump calls will happen until the new pressure has stabilized.

Fail To Start Test

The NOVUS 4000 has an optional fail to start test. This optional test is controlled by the START TEST time in the setup menu. If this time is zero then this test is disabled. If the start test is enabled then the AUX/DIS inputs for each pump must be connected through a dry contact to ground. These contacts must close and short the AUX/DIS input to ground when the pump is running. The auxiliary contact on the starter or a switch on the check valve arm can be used. If the start test is disabled (time=0) then these inputs are pump disable inputs.

For example, assume that the test is enabled with a START TEST time of 15 seconds. When a pump is called a timer is started for that pump. If the timer reaches 15 seconds and the AUX/DIS input for that pump has not been shorted to ground then a fail to start test failure is set for that pump. The pump is then disabled and the next available pump is called in its place. This failure condition is displayed on the front panel and will remain active until reset by either a reset button or reset input. The high level alarm will also reset this condition. This is to make sure that a broken or misadjusted check valve switch does not cause an overflow.

Pump Up Operation

Pump up mode is used in situations, like water distribution, where the pumps must maintain a pressure or fill a tank (like a water tower). For the purposes of this description assume we have three pumps which will be used to maintain the level in a water tank. The level is sensed by a pressure transmitter mounted in the base of the tank and all three pumps send water to the tank.

As water is dispensed from the tank the level drops. If the level drops far enough to reach the lead on setpoint then the lead pump is called to run. This should cause the level to rise until the lead off setpoint is reached and the pump is shut down. If the alternator is on then the lead pump will be sequenced to the next available pump. If the level continues to fall then the lag on setpoint will be reached and the lag pump will be called. As in pump down operation each pump has separate on and off setpoints and there are setpoints for high and low alarm. Unlike pump down the pump up mode does not have a float backup system.

Pump Alternation

The NOVUS 4000 has an automatic alternation system which can be used to cause a different pump to be used each pump cycle. This is useful to equalize pump wear. When the alternator is off the lead pump can be selected and that pump will always be called first. The alternator on the NOVUS 4000 is controlled by a toggle switch on the front panel. When the switch is in the up position the alternator is on and the lead pump will be changed each cycle. When the switch handle is in the center position the alternator is off and the lead pump is selected by pushing the handle down. The handle has a spring return from the down position. Each time the handle is pushed down the lead pump will be incremented to the next available pump. The current lead pump is displayed on the right side of the first line of the display (LP=2).

For systems with two pumps, alternation, if on, simply swaps lead pump duty between the two pump each pump cycle. If there are three pumps, alternation can be either of two options. In normal alternation of each pump cycle the next available pump is selected as lead so that if all pumps are available then each will be lead every third time. The other option is jockey pump. In this type of system pump 1 is a small pump and pumps 2 and 3 are large. The small pump (pump 1) is always the lead pump and the other two pumps alternate. When either of the two large pumps is on the small one is turned off. This is useful in systems where demand can be low at some times and large at others.

Pump Startup

When the NOVUS 4000 is first powered up it executes an internal self test. During this test many internal functions are checked and the displays are sequenced. The system is controlled by an internal microcomputer which is monitored by a watchdog timer system which will restart the system in the unlikely event that the program fails to execute properly. After the self test is complete several timers are started which prevent any relay outputs from activating until all of the system inputs have had a chance to settle and all of the input filtering has resolved to their proper values.

Front Panel Indicators & Controls

Figure 1 is a view of the front panel of the NOVUS 4000. It includes eight LED lamps, a 32 character LCD display, 5 push buttons, one toggle switch and one adjustment knob. They have the following functions:

1. **PUMP 1 THRU PUMP 3 LAMPS**

   These three green LED lamps indicate which pump is currently being called.

2. **OFF LAMP**

   This green lamp indicates that no pumps are currently called to run.

3. **HIGH LAMP**

   This red lamp signals that the level is above the high setpoint.

4. **LOW LAMP**

   This red lamp signals that the level is below the low setpoint.

5. **FLOATS LAMP**

   This red lamp will be on if the system has had a float backup cycle since the last reset or power up.

6. **XDUCER LAMP**

   This red lamp signals that the main level sensor input is outside of its normal range of 4 to 20 milliamps. This means that either the transducer or the NOVUS 4000 input has failed.

7. **ALT SWITCH**

   The alternate switch will turn alternation on when up and off when in the center position. When it is pushed down the lead pump will be sequenced to the next available pump. The current lead pump is indicated on the first line of the display.

8. **MENU BUTTON**

   This button is depressed and held for 10 seconds to enter the setpoint menu.

9. **UP / YES BUTTON**

   This button has several functions depending on the mode of the controller.

   When the controller is in normal mode (not in one of the menus) this button causes the bottom line of the display to sequence between pump status and the three elapsed time meters. After 15 seconds the bottom line of the display always reverts to pump status in normal mode.

   When the controller is in one of the two menus this button is used to increment the current parameter being adjusted or to tell the system to save the new value.

10. **DN / NO BUTTON**

    This button has several functions depending on the mode of the controller.

    When the controller is in normal mode (not in one of the menus) this button caused the bottom line of the display to sequence between the pump status and the three elapsed time meters.

    When the controller is in one of the two menus this button is used to decrement the current parameter being adjusted or to tell the system not to save the new value.

11. **MUTE / RESET BUTTON**

    This button will reset any current latched up alarms such as temp fail or on floats. It will also silence the horn if an alarm is currently active.

12. **TEST / ADJUST BUTTON AND KNOB**

    The function of these two operators depends on the mode of the controller.

    When the controller is in the normal (not menus) mode these operators are used to test the system. When the TEST button is depressed and held the ADJUST knob will be the level for the system. As you turn the knob up and down the level will go up and down. This will call on pumps and make alarms just as if the level was coming from the transducer. The controller will switch back to the transducer 8 seconds after the button is released.

    When the controller is in one of the menus these operators are used to change the value of the setpoint or parameter. Depressing and holding the ADJUST button will cause the knob value to be placed in the current parameter or setpoint. This can be used along with the up and down buttons to easily adjust all of the setpoints.

13. **32 CHARACTER DISPLAY**

    This alpha-numeric display has two lines of 16 characters each. The first line always displays the current level in feet and the current lead pump. The second line depends on the mode of the controller.

    In normal mode this line displays pump status or the elapsed time meters. Pressing the up or down buttons will sequence through the three elapsed time meters. After 15 seconds this line will revert to pump status. When pump status is displayed the display will read ALL PUMPS OK if there are no pump faults. If there are pump faults such as temperature failures or seal failures they will be displayed one at a time every 2 seconds.

    In either of the two menus the second line of the display shows the parameter being adjusted and its current value.

Setpoint Menu

The setpoint menu is used to examine and change the on and off setpoints for the pumps and the high and low alarm setpoints. The menu in entered and updated using the following procedure:

1. Depress the MENU button and hold it until the first setpoint appears on the bottom line of the display. This will take about 10 seconds.
2. The display should say LEAD ON = XX.X FT. where XX.X is the current value for the lead pump on setpoint.
3. If you wish to change this value then use the UP or DOWN buttons or you can hold the ADJUST button down and turn the ADJUST knob until the value is correct. After the value is correct then depress the MENU/NEXT button to go to the next setpoint.
4. If you have changed the value then the displays will ask SAVE? (Y/N). If you wish to save the new value then press UP/YES if not then press DOWN/NO. The display should change to the next setpoint.
5. The display should say LEAD OFF = XX.X FT. where XX.X is the current lead off setpoint. Repeat steps 3 and 4 above to make any changes you need to this setpoint.
6. This process should be repeated until all of the setpoints have been examined and changed or until no further changes are required. Once all setpoints have been done the screen will return to normal mode or you can, at any time, hit the MUTE/RESET button and return to normal mode.

If the system is set up for 2 pumps then the setpoints for the lag2 pump will be skipped in the menu. If the system is set up for only 1 pump then the setpoints for both lag pumps will be skipped.

The setpoints are stored in electrically erasable programmable memory EEPROM which will not lose its contents when powered down. This is done every time the operator answers YES to the SAVE? (Y/N) prompt.

Configuration Menu

This menu is used to configure the NOVUS 4000 controller for its application. This is normally only done once (when the panel is built or at startup) and would not be required again unless the configuration changed. This menu is entered using the following procedure:

1. Depress the UP and DOWN buttons at the same time and hold them until the first setting is displayed on the bottom line of the display. This will take about 10 seconds.
2. The display should say MAX LEVEL XX.X FT where XX.X is the current value. This parameter is the level when the level transmitter is at 20 Ma. (full scale). For example, if the transducer is a 10 psig submersible pressure transducer then 10 psi is 23.1 feet so adjust this value to 23.1.
3. If no change to this setting is required then press the MENU/NEXT button. To change this value we use the same procedure that we used on the setpoint menu. Use the UP or DOWN buttons or depress the ADJUST button while turning the ADJUST knob. After you have the value required depress the MENU/NEXT button to go to the next parameter.
4. If the parameter has changed then the display will ask SAVE? (Y/N). If the value is correct then press the UP/YES button to save it, or press the DOWN/NO button to continue without saving the new setting.
5. The display should say OFFSET XX.X where XX.X is the current value. This parameter is the level when the level transmitter is at 4 Ma. For example, if the transmitter is a submersible pressure transducer mounted 6 inches off the floor of the wet well then this setting should be 00.5 ft. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.
6. The display should say HOW MANY PUMPS X where X is the current max number of pumps. If this is a duplex station set this to 2. If it is a triplex station then use 3. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.
7. The display should say START DELAY XXXS where XXX is the current delay between pump starts. This parameter is the minimum time between starting one pump and then starting another. It is set in seconds from 0 to 255. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.
8. The display should say STOP DELAY XXXS where XXX is the current delay between pump stops. This parameter is the minimum time between stopping one pump and then stopping another. It is set in seconds from 0 to 127. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.
9. The display should say TIME AT SP XXXS where XXX is

the current setpoint time. This parameter is the minimum time a setpoint condition must be continually met for the required action to take place (for example, starting a pump). It is set in seconds from 0 to 31. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

10. The display should say PUMP UP/PUMP DN XX where XX is the current setting. This parameter determines the overall pump mode of the controller. If you have a lift station then set it to DN. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

11. The display should say BACKUP TIME XXXS where XXX is the current float backup time. This parameter is the time period after the high float comes out of the water that the pumps will remain on. To disable the float backup system set this to 000. It is set in seconds from 0 to 255. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

12. The display should say START TEST XXXS where XXX is the current start test delay time. This parameter is the maximum time delay between a pump being called and the confirming pump run signal (on the AUX/DIS input). To disable the fail to start test set this to 000. It is set in seconds from 0 to 63. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

13. The display should say SEAL XXX YYY. This parameter is used to set up the mode of the seal fail inputs. Use the UP and DOWN buttons to select between the options available. The options are:

SEAL NORM AUTO R – In this mode the seal fail input is set to cause a failure if the resistance to ground is less than 2000 ohms and the alarm will auto reset if the alarm condition clears.

SEAL NORM LATCH – In this mode the seal fail input is set to cause a failure if the resistance to ground is less than 2000 ohms and the alarm will latch up and must be cleared by the MUTE/RESET button.

SEAL INVR AUTO R – In this mode the seal fail input is set to cause a failure if the resistance to ground is greater than 2000 ohms and the alarm will auto reset if the alarm condition clears.

SEAL INVR LATCH – In this mode the seal fail input is set to cause a failure if the resistance to ground is greater than 2000 ohms and the alarm will latch up and must be cleared by the MUTE/RESET button.

Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

14. The display should say TEMP XXX YYY. This parameter is used to set up the mode of the temperature fail inputs. Use the UP and DOWN buttons to select between the options available. The options are:

TEMP NORM AUTO R – In this mode the temp fail input is set to cause a failure if not shorted to ground and the alarm will auto reset if the alarm condition clears.

TEMP NORM LATCH – In this mode the temp fail input is set to cause a failure if not shorted to ground and the alarm will latch up and must be cleared by the MUTE/RESET button.

TEMP INVR AUTO R – In this mode the temp fail input is set to cause a failure if shorted to ground and the alarm will auto reset if the alarm condition clears.

TEMP INVR LATCH – In this mode the temp fail input is set to cause a failure if shorted to ground and the alarm will latch up and must be cleared by the MUTE/RESET button.

Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

15. The display should say AUX R XXX. This parameter is used to set up the function of the auxiliary relay output. Use the UP and DOWN buttons to select between the options available. The options are:

HORN – The aux relay is for an audible alarm (horn).

SEAL – The aux relay will close if there is a seal fail condition on any pump.

TEMP – The aux relay will close if there is a temperature fail condition on any pump.

SEAL TEMP – The aux relay will close if there is a seal fail or a temperature fail condition on any pump.

Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

16. The display should say ALTERNATE XX where XX is the current setting. This parameter determines what type of alternation will be used. If the controller is set for 1 or 2 pumps then this parameter is not used. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter. The options are:

    NORMAL – The controller will use normal sequential alternation (1-2-3, 2-3-1, 3-1-2).

    1 JOCK – The controller will use single jockey pump alternation. Pump 1 is lead, the other two pumps alternate and pump 1 is turned off if pump 2 or 3 is on.

17. The display should say MAX ON AT ONCE X where X is the current max number of pumps that can be on at the same time. This would normally be set to the number of pumps the station has unless some factor (such as available power) prevents proper operation with all pumps running at the same time. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

18. The display should say A OUT LOW XX.X FT. where XX.X is the level at which the analog output signal is at its minimum or 4 Ma. This parameter and the next one set up the proportional scaling of the analog output of the NOVUS 4000. Use the procedure in steps 3 and 4 above to make any changes and go to the next parameter.

19. The display should say A OUT HI XX.X FT. where XX.X is the level at which the analog output signal is at its maximum or 20 Ma. Use the procedure in steps 3 and 4 above to make any changes and depress the MENU/NEXT button which will complete setup and return you to the main display.

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.

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)

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.

Pump Specifications

General specifications:

Size: H = 5.9", W = 7.2", D = 3.5'

Weight: 1.8 lbs.

Operating Temperature:
–20 C to +70 C

Storage Temperature:
–30 C to +80 C

Input Power: 120 +/- 10%
50–60 Hz. 0.3 amp max.

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.

A. Pump does not run in Hand position.

1. Check pump circuit breaker and control fuse for tripping or blown condition.
2. Check incoming power voltage and control circuit voltage.
3. Check overload relay to see if it is tripped. Reset relay if tripped and check pump current with ammeter.
4. With the power off, check motor heat sensor continuity.
5. Check wiring of pump to control panel. It should agree with the schematic.
6. Check contactor coil resistance.

B. Pump does not run in Auto position.

1. Is water level in the system high enough to activate the control?

C. Pump runs, but run light does not energize.

1. Remove light and check with an ohmmeter.
2. Check run light wiring.

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

1. On three phase only, pump rotation may be wrong. Wiring of pump to control panel may be reverse sequenced.
2. Impeller may be dragging in volute due to solids. High amperage draw would identify this.
3. Refer to the pump manual for other possibilities such as closed discharge gate valve, etc.

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

1. 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.
2. Contactor may have dust around magnet of coil structure. Dry or clean as required.
3. 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.
4. Make sure the transducer is located away from any turbulence.
5. Dry out the junction box (if furnished); moisture in the junction box may cause relays to energize intermittently.

F. Run light stays on.

1. Selector switch may be in the Hand position.

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

1. Check pump amp draw with amp probe and compare to nameplate amps on pump.
2. The impeller may be locked up due to excessive debris or solids.
3. Possible motor failure (fault in windings).
4. Pump may be miswired to terminal block.
5. 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:

a. Label the leads and the terminals 1, 2, and 3 respectively.

b. Record the amperage for each lead.

c. Move each lead to the next terminal (1 to 2, 2 to 3, 3 to 1).

d. Again read the amperage of each lead.

e. Move each lead to the next terminal (1 to 3, 2 to 1, 3 to 2).

f. Again read the amperage of each lead.

g. 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.

h. If the current unbalance exceeds five percent, nuisance tripping or excessive heating will result.

i. Connect leads for the lowest percent of current unbalance.

6. Connections and start components. Single phase only.

a. *Disconnect all power from the panel before making these checks.*

b. Motor winding resistance readings.

- Disconnect all three motor leads from panel terminal blocks.
- 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)

c. Capacitor check.

- Make sure the capacitor is discharged. Use extreme caution as a spark might occur.
- Disconnect the capacitor leads and connect an analog-type volt-ohmmeter to the capacitor terminals.
- 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.
- 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).

d. Start relay check.

- Check coil resistance. It should be 3,000 to 15,000 ohms.
- Install a clamp on amp meter around the start winding lead.
- Set the amp meter scale to at least 2 times the pump motor full load current.
- Place the H-O-A switch in the Hand position to start the pump.
- The meter should read approximately 2 times full load current during starting.
- After the motor has started (within one second) the current should drop to a value much less than full load current.

e. 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

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

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.

Warranty Exclusions: PENTAIR HYDROMATIC MAKES NO EXPRESS OR IMPLIED WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. PENTAIR HYDROMATIC SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR ANY PARTICULAR PURPOSE.

Liability Limitation: IN NO EVENT SHALL PENTAIR HYDROMATIC BE LIABLE OR RESPONSIBLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES RESULTING FROM OR RELATED IN ANY MANNER TO ANY PENTAIR HYDROMATIC PRODUCT OR PARTS THEREOF. PERSONAL INJURY AND/OR PROPERTY DAMAGE MAY RESULT FROM IMPROPER INSTALLATION. PENTAIR HYDROMATIC DISCLAIMS ALL LIABILITY, INCLUDING LIABILITY UNDER THIS WARRANTY, FOR IMPROPER INSTALLATION. PENTAIR HYDROMATIC RECOMMENDS INSTALLATION BY PROFESSIONALS.

Some states do not permit some or all of the above warranty limitations or the exclusion or limitation of incidental or consequential damages and therefore such limitations may not apply to you. No warranties or representations at any time made by any representatives of Pentair Hydromatic shall vary or expand the provision hereof.

PENTAIR

HYDROMATIC®

740 EAST 9TH STREET
ASHLAND, OHIO, USA 44805
419-289-1144

490 PINEBUSH ROAD, UNIT #4
CAMBRIDGE, ONTARIO, CANADA N1T 0A5
800-363-PUMP

WWW.HYDROMATIC.COM

Warranty Rev. 12/13