

OWNER'S MANUAL



PENTEK®



PENTEK **INTELLIDRIVE®** **CONSTANT PRESSURE CONTROLLER**

Installation / Operation / Parts

Should you the installer or owner be unfamiliar with the correct installation or operation of this type of equipment you should contact the distributor/manufacturer for the correct advice before proceeding with the installation or operation of this product.

Important Safety Instructions

Read the Owner's Manual and related documentation carefully before attempting to install or operate the **PENTEK INTELLIDRIVE™**. Make sure that you have a full knowledge of the equipment, safety information, and instructions before using this product.

Carefully read and follow all safety instructions in this manual and on the VFD.

⚠ This is the safety-alert. When you see this symbol on your VFD or in this manual, look for one of the following signal words and be alert to the potential for personal injury:

⚠ DANGER warns about hazards that will cause serious personal injury, death or major property damage if ignored.

⚠ WARNING warns about hazards that can cause serious personal injury, death or major property damage if ignored.

⚠ CAUTION warns about hazards that will or can cause minor personal injury or property damage if ignored. The word **NOTE** indicates special instructions which are important but not related to hazards.

To avoid serious or fatal personal injury and possible property damage, carefully read and follow the safety instructions.

⚠ WARNING Risk of electrical shock if VFD is connected to the power wiring before hanging the box. Always hang the VFD box before connecting the wires to it.

⚠ WARNING Risk of electrical shock if the VFD is handled or serviced with wet or damp hands. Always make sure your hands are dry before working on the VFD. Perform all operations on the HMI with dry hands.

⚠ WARNING Risk of electrical shock and hand injury. Do not reach into or change the cooling fan while power is on to the VFD.

⚠ WARNING Risk of electrical shock. Do not touch the printed circuit board when power is on to the VFD.

⚠ WARNING Fire hazard if installed with incorrect or inadequate circuit breaker protection. To make sure of protection in the event of an internal fault in the VFD, install the VFD on an independent branch circuit protected by a circuit breaker (see Table 2, Page 6 for circuit breaker sizing), with no other appliances on the circuit.

⚠ CAUTION Risk of burns. The drive can become hot during normal operation. Allow it to cool for 10 minutes after shut-down before handling it to avoid burns.

⚠ CAUTION Risk of electric shock. A means for disconnection from the supply mains, having a contact separation in all poles, must be incorporated in the fixed wiring in accordance with the wiring rules.


⚠ CAUTION Complex equipment. This device is not intended for use by persons (including children) having reduced physical, sensory or mental capabilities, or lack of experience and knowledge.

NOTE: This VFD is classified as Class A EMC/EMI equipment. It is intended for use in an industrial environment. There may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbances.

NOTE: The device must be supplied through a Type A Residual Current Device (RCD) having a rated residual operating current not exceeding 30 mA.

NOTE: To avoid damage to the drive or problems with the drive:

- Connect the output cables to 3-wire submersible motors as described in Output Connections, page 7. Any other order will reverse the motor rotation and may damage the motor.
- Do not modify the equipment.
- Do not use power factor correction capacitors with this VFD; they will damage both the motor and the VFD.
- Do not remove any parts unless instructed to do so in the owner's manual.
- Do not use a magnetic contactor on the VFD for frequent starting/stopping of the VFD.
- Do not install or operate the VFD if it is damaged or parts are missing.
- Before starting a VFD that has been stored for a long time, always inspect it and test operation.
- Do not carry out a megger (insulation resistance) test on the control circuit of the VFD.



⚠ WARNING

Risk of high-voltage electrical shock from EMI/RFI Filter inside Drive. Make all wiring connections, then close and fasten the cover before turning on power to Drive.

DO NOT open the box when power is connected to the Drive.

<p>Before doing any service or maintenance inside the Drive:</p> <ol style="list-style-type: none"> 1. DISCONNECT power. 2. WAIT 5 minutes for retained voltage to discharge. 3. Open box. 	<p>Before connecting or disconnecting any wires inside the Drive:</p> <ol style="list-style-type: none"> 1. DISCONNECT power. 2. WAIT 5 minutes for retained voltage to discharge. 3. Open box.
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⚠ WARNING Risk of high-voltage electrical shock from the EMI/RFI Filter if the front cover of the VFD is open or removed while power is connected to the VFD or the VFD is running. The front cover of the VFD must be closed during operation.

- After allowing at least 5 minutes for the EMI/RFI Filter to discharge and before starting any wiring or inspection procedures, check for residual voltage with a voltage tester.

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⚠ WARNING

EMI/RFI Filter



Risk of electric shock.

Can shock, burn or kill.

- Drive's internal components retain high voltage for up to 5 minutes after input power is disconnected.
- EMI/RFI Filter carries high voltage when pump is running.
- Disconnect power and wait 5 minutes before opening PENTEK INTELLIDRIVE cover.

Owner's Information

PENTEK INTELLIDRIVE Model No. _____

PENTEK INTELLIDRIVE Serial No. _____

Pump Model No. _____

Pump Serial No. _____

Motor Model No. _____

Motor Service Factor Amps _____

Pressure Tank Model No. _____

Pressure Tank Serial No. _____

Dealer/Installer: _____

Installer Phone No. _____

Date of Installation _____

Wire Lengths in (Meters): _____

Circuit Breaker to Drive _____

PENTEK INTELLIDRIVE to Motor _____

Supply Voltage _____

Note to Installer: Record the data listed above for future reference. Give manual to end user or attach to PENTEK INTELLIDRIVE when installation is complete.

Specifications/Ratings

Input Voltage1-Phase 230VAC Nominal (190–265VAC)
 Input Frequency 50/60Hz
 Ambient Temperature Range -20° to 50 °C
 Output Connections 3-Phase, 3-wire, 220V,
 3-Wire/1-Phase
 1-Phase/2-wire
 Max Motor Cable Length.....305m
 Enclosure 3R

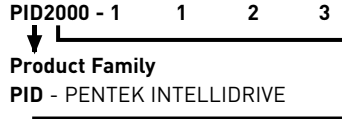
Each carton contains:

- PENTEK INTELLIDRIVE Variable Frequency Drive
- Pressure Transducer
- 3m Pressure Transducer Cable
- Quick Start Guide
- Owner’s Manual

Table 1 - Specifications

Model	Max kW	Input Phase	Motor Operation	Max Amps
PID20	1.5	1	2-wire, 3-wire & 3-phase	13.5

The PENTEK INTELLIDRIVE is specifically designed to operate 4” submersible pumps and 3-phase, 220V above ground pumps in water well and residential booster applications. Each Drive is rated for maximum output amp rating. Any use of Drive outside of intended design parameters will void warranty. If Drive is used with above ground motors not rated for a Variable Frequency Drive, maximize motor life by limiting lead length to 8m. Refer to pump Owners Manual and AS/NZS 3000 for proper wire size.



Voltage Rating:

1 = 190-265 Volt 1 phase input

Output voltage:

1 = 230v 1 phase output

HP Rating:

Type:
2 = 2.0 HP

Motor

3 = 3-wire

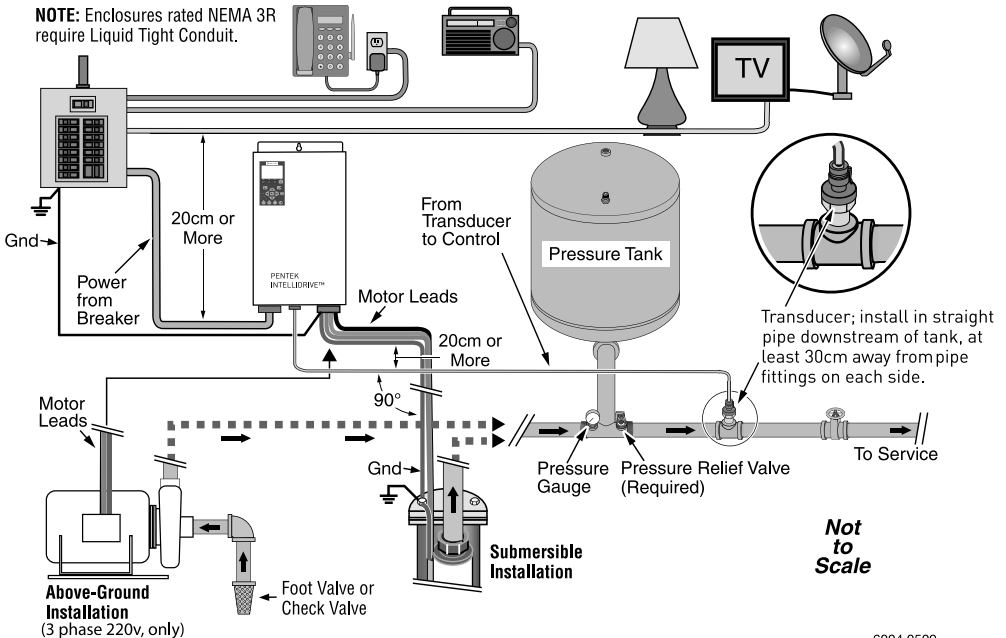


Figure 1 - A typical residential installation layout

Transducer

The PENTEK INTELLIDRIVE uses a 4-20mA, 0-668 kPa pressure transducer to control motor speed (max is 2068 kPa transducer).

The transducer (see Figure 1) senses pressure in the pipe and converts it to an electrical signal. The Drive senses and processes the signal in the PID (Proportional, Integration, Derivative) control. When operating in AUTOSTART mode, the Drive increases and decreases the speed of the pump motor as needed to maintain constant pressure in the piping system.

Keypad

The keypad programs the Drive, monitors the status of the pump, and displays faults if they occur. Each button has a unique function, as described in Figure 2. The LCD display shows a text display of the status of the Drive's operation. Other LEDs light up to indicate when certain buttons are pressed or certain events occur.

Fan

The Drive uses a thermostatically controlled internal fan which operates automatically when necessary to cool the Drive components.

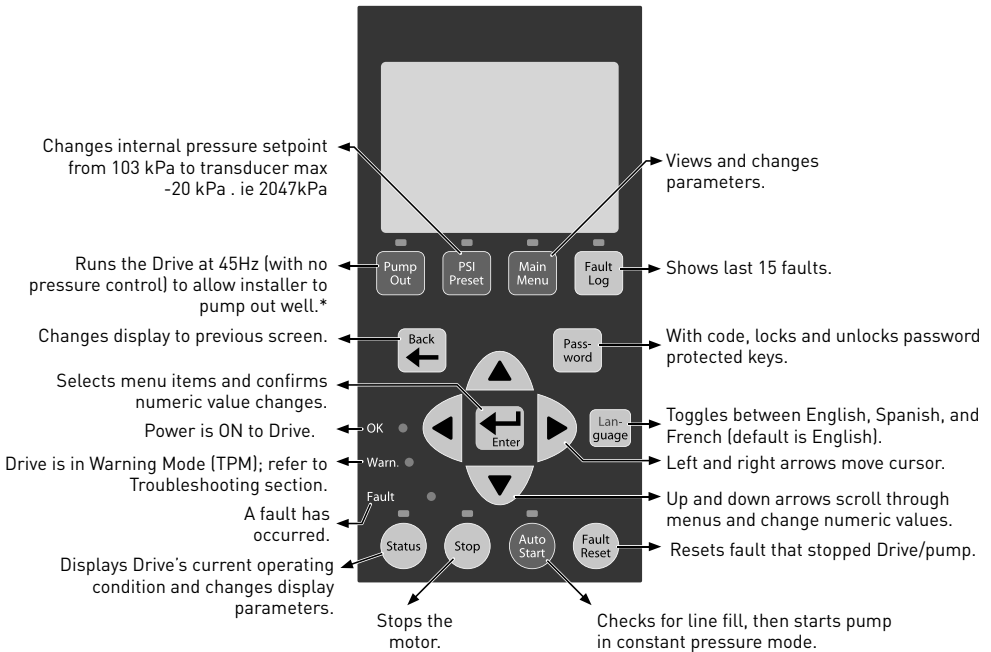


Figure 2 - PENTEK INTELLIDRIVE keypad functions

Table 2 - Circuit breaker and wire sizes

Motor	Drive Model	Volts	Motor HP	Wire Size*		Circuit Breaker**	Generator (kVA)***
				Input	Output		
2-wire	PID20	230	1-1/2	2.5mm ²	2.5mm ²	25 (with RCD, Ref page2)	5.3
3-wire	PID20		1-1/2	2.5mm ²	2.5mm ²	25 (with RCD, Ref page2)	5.3
			2				5.8

* Wiring size will change depending on the length of wire. See Table 3

** With properly-sized circuit breakers, the Drive is protected from short circuit on the input and the output. There is no risk of fire or electrical shock due to a short circuit. The Drive has NEC Class 10 overload protection.

*** Minimum 240V generator size.

NOTICE Information in Table 3 applies ONLY to PENTEK® motors. For other motors, refer to motor manufacturer specifications for wire sizing.

Table 3 - Wire Sizing, Drive to Pentek 3-Wire, 1-Phase Motor, 40°C Ambient, and 5 percent Voltage Drop, 60C and 75C Insulation (copper only).

Motor P/N	Motor Rating			Maximum Cable Length in M					
	Volts	HP	SFA	1.5 mm ²	2.5 mm ²	4.0 mm ²	6 mm ²	10 mm ²	16 mm ²
G43A0010B2	230	1	6.4	64	117	188	280	305	-
G43A0015B2		1 1/2	9.4	43	80	128	190	305	-
G43A0020B2		2	12.4	33	60	95	140	240	305

Mounting the Drive

To mount the Drive as shown in Figure 6, follow this procedure:

1. First, remove the cover by backing out screw at bottom of front cover.
2. Push on backplate with thumbs while pulling the cover toward you with index fingers, creating a gap. See Figures 3 and 4.

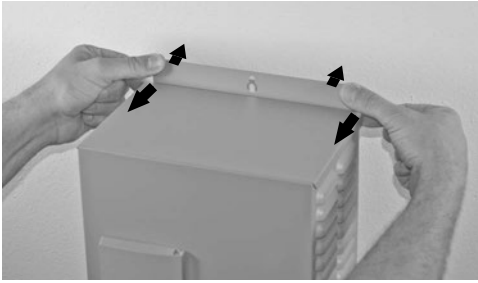


Figure 3 - Separate cover and backplate

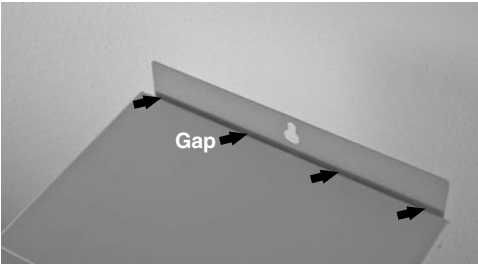


Figure 4 - Gap between cover and backplate

3. Pull bottom of cover towards you; lift up on cover and remove. See Figure 5.



Figure 5 - Pull out bottom of cover

4. With the cover removed, permanently mount the Drive using the top slotted hole, plus either the three bottom holes (for flat surface mounting) or the center bottom hole (for attaching to a post or stud). See Figure 6.

5. Ensure the Drive's ventilation holes are not blocked and there is enough space around it to allow free air flow (minimum 75mm clearance on top, bottom, and sides). See Figure 6. Once the Drive is mounted, electrical wiring can be connected.

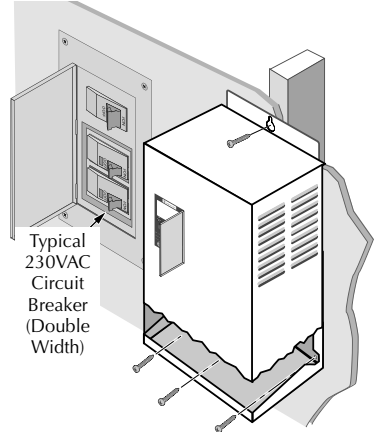


Figure 6 - Attaching Drive to wall

6. To reattach the Drive cover, hook the top of it on backplate (be sure to leave a gap). Lower bottom of cover into place. Push cover evenly against backplate, eliminating the gap. See Figure 7.

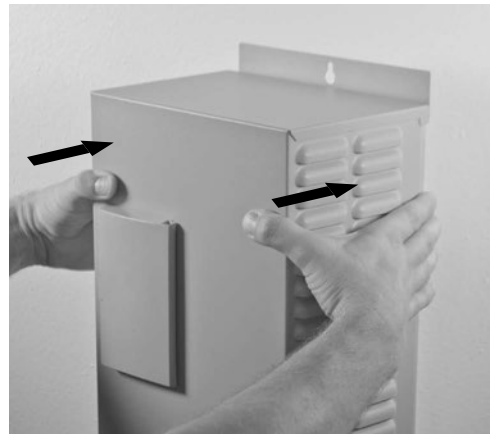


Figure 7 - Re-attaching Drive cover

7. Replace screw at bottom of front cover.

Wiring

To allow for ease of wiring, the enclosure wiring area is free of electronics other than the terminals. Conduit holes and knockouts are located so that the wire can be fed straight through to the connectors, with minimal bending. The terminals accept 1.5mm²-16mm² wire.

For wire sizing refer to table 3, page 6.

NOTICE For convenience in wiring, the input and motor terminals unplug from the box. Pull them down to remove them for ease of access, as shown in Figure 8.

Verify that the terminal connectors are completely seated when you replace them. It is best practice to connect all output wires (larger wire gauge) first, then all input wires.

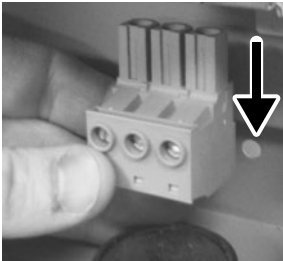


Figure 8 - Pull input and motor terminals down to remove, making wiring easier.

Pump Connections

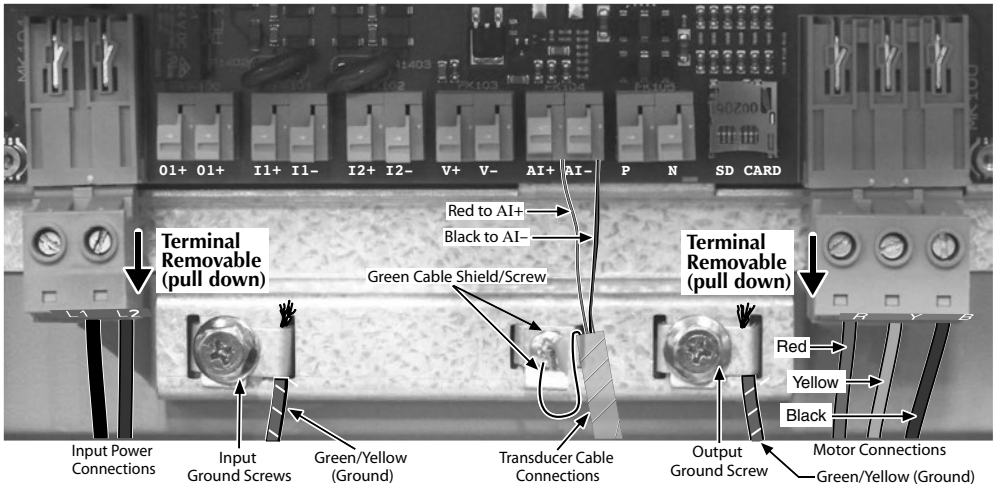
If the PENTEK INTELLIDRIVE is used with above ground motors not rated for Variable Frequency Drive use, maximize motor life by limiting lead length to 8.0m.

The output of the Drive is single phase (2-wire or 3-wire) or 3-phase, depending on motor selection during startup.

The output power terminals (motor wire connections) are located on the lower right side of the Drive and are labeled R (Red), Y (Yellow), and B (Black). See Tables 3.

Feed the motor cable through the 20mm conduit hole on the bottom right side and into the appropriate terminals. If the wire is large enough to require a larger conduit hole, remove the 3.2cm knockout and use the appropriate conduit connections. Attach the motor ground wire to the grounding screw, located to the upper right of the terminal block. Attach the motor power wires to the terminals as shown in Figure 9.

NOTICE Drive does not sense motor temperature and will not protect motor from over heating.



*Submersible Motor: 3-Ph/3-W. 1-Ph., follow colors as above.
 Submersible Motor: 1-Ph./2-W., connect to Y and B, any order.
 Above-ground Motors: L1 to R, L2 to Y, L3 to B; verify rotation.*

Figure 9 - Basic Wiring Connections for Startup

Pressure Tank Recommendations

Minimum tank size is 8 litres. Use a pre-charged pressure tank with Drive, as shown in Table 6. The tank size must equal at least 20 percent of the pump’s rated flow in litres per minute (LPM), but cannot be less than 8 litre capacity. For example, a pump rated at 30 LPM would require a tank of 8 litres capacity or larger. A pump rated at 200 LPM would require a 40 litre tank or larger. Tanks larger than 40 litre can be used, but may require adjustment of *Wake Delay* parameter.

Table 7 - Control Pressure Set Point and Tank Pre-Charge Pressure Values (PSI).

Pressure Point Setting (kPa)	Precharge Pressure (kPa)	Pressure Point Setting (kPa)	Precharge Pressure (kPa)
170	120	440	310
205	145	480	340
240	170	510	360
270	190	545	380
310	220	580	410
350	245	610	430
375	265	650	455
414 (Default)	290	-	-

NOTICE Set pressure tank’s pre-charge to 70 percent of the system operating pressure. When using an external set point as well as an internal set point, pre-charge tank to 70 percent of the lower setpoint of the two. Some applications may require a different percentage when determining the setpoint.

Transducer Connections

A 0-668 kPa 4-20 mA transducer is provided with Drive. Install the transducer downstream of tank, as shown in Figure 1. Install transducer in a tee in a straight section of pipe with at least 30cm of straight pipe on each side of the tee (i.e., all fittings must be at least 30cm away from transducer).

Feed transducer cable through the open 13mm conduit hole on bottom of the Drive enclosure. As shown in Figure 9, connect the red wire of the transducer cable to AI+, connect black wire to AI-, and connect the green cable shield to the metal cable shield screw.

To connect the transducer wires:

1. Strip wire 13mm
2. Push spring terminal up with finger or slotted screwdriver
3. Insert wires from bottom
4. Release spring terminal

Input Power Connections

The input power terminals are located on the lower left side and are marked L1 and L2 (see Figure 9). There is a ground screw for the input ground wire to the right of the connector (torque to 1.5 Nm). Feed wire through the 20mm conduit hole on the bottom left side and into appropriate terminals. If wire is large enough to require a larger conduit hole, remove the 3.2cm knockout and use appropriate conduit connections.

To determine the correct wire sizes for installation, see Table 3.

NOTICE The PENTEKINTELLIDRIVE only accepts 230V single phase input power. If incoming power does not match this, have a qualified electrician alter supply voltage to 230V/1Ph before connecting it to the Drive.

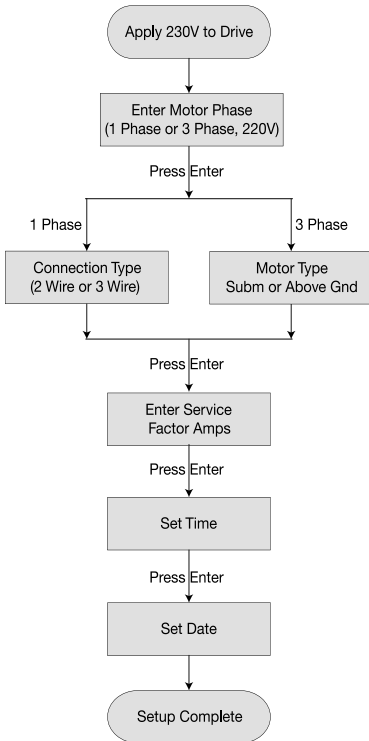
Initial Startup and Programming Procedures

Ensure that the cover is installed before operating the PENTEK INTELLIDRIVE.

Most installations will only require the initial startup settings. However, the installer may need to set additional parameters. Information about accessing all parameters, explanations of their functions, and procedures for changing parameter values, will be found later in this section.

1. **Program the Drive:** Apply power to the PENTEK INTELLIDRIVE. *Setup Guide* will appear in the display. Follow keypress sequence shown in Figure 10.

NOTICE If *Setup Guide* does not appear, refer to *Drive Reset Procedure*, Figure 20.



Service Factor Amps

To maximize pump performance, be sure to enter the correct Service Factor Amps (SF Amps) in the PENTEK INTELLIDRIVE.

- Entering SF Amps **higher** than the motor rating lets the Drive supply more amps to the motor than the motor is designed for and may allow the motor to overheat (see Table 8).
- Entering SF Amps **lower** than the motor rating limits the output amps to less than the motor is designed for and will reduce the performance of the pump.
- For any 1-Phase 3-Wire motor, the correct Service Factor Amp rating for the Drive is Cap Start/Cap Run amps (see Table 8). This may not match the motor nameplate, which (for a Single Phase, 3-Wire motor) will generally be Cap Start/ Induction Run Amps.
- For any 3-Phase, 220V or 1 Phase, 2-Wire motor, use the motor nameplate Service Factor Amp rating.

NOTICE PENTEK® submersible motors may differ from motors of the same horsepower from other manufacturers. **For 1-Phase, 3-Wire motors from all other submersible motor manufacturers, enter the motor manufacturer's CS/CR service factor amps for your motor.** For 3-Phase, 220V or 2-Wire 1-Phase motors, use the motor nameplate amp value. Also see *Retro Fit Applications*.

Figure 10 - Drive Setup Guide.

23. **Pump out well** (if necessary):

Direct pump's discharge to appropriate location not connected to system and press **Pump Out**. The pump will run at 45 Hz.

Run the Drive in this mode until the well discharge runs clear, then press **STOP** button to stop Drive.

▲ WARNING Risk of explosion. In **Pump Out** mode, pump runs at a constant speed, which can cause very high pressure if flow is restricted.

4. **Verify installation:** Make sure that the system has properly-sized, pressure-relief valve and pressure tank.

Make sure pressure tank's precharge is correct. (See Table 7).

Make sure pump discharge is connected to system.

5. **System Start:**

- A. Open valves at the ends of lines so that air will escape during pressurization.
- B. Press **Auto Start**; close valves at the ends of lines after all air has escaped.
- C. The system goes into **Constant Pressure Operation** as soon as the transducer registers the **Dry Run Sensitivity** parameter (default is 68 kPa). If system pressure does not reach that kPa value within 3 minutes, the Drive will stop. Press **Auto Start again** to restart line fill. If longer priming or line fill time is required, adjust **Fill Time** parameter. (See Table 9).

Changing a Parameter Value

This procedure works for ANY parameter.

- A. Press **MAIN MENU** button.
- B. Follow the keypress sequence shown in Figure 12:

A shorthand way to remember this is:

- Press **ENTER** to change a value
- Press **ENTER** again to save it
- If new value is not saved, any screen change will result in the loss of the new value.

Table 9 lists all available commands and parameters for the PENTEK INTELLIDRIVE.

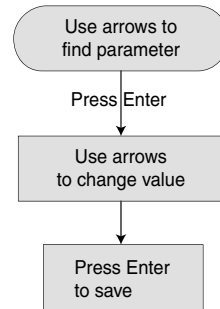


Figure 12 - Changing parameter value.

Keypad Lock - Password

The password locks or unlocks the blue buttons on keypad. All PENTEK INTELLIDRIVE units are shipped from factory with the default password 7777. It can be changed to any other 1 to 4 digit number. To reset password to a unique password for unit, unlock keypad (see below) and follow the keypress sequence shown in Figure 8 to make the change.

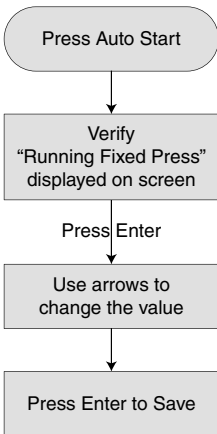
If installer does not press the password button, then the keypad will automatically lock 60 minutes after the Drive is powered up. The time out period is adjustable (see Table 9).

To unlock keypad press **Password**, use directional arrows to select numeric code and press **ENTER**.

NOTICE For more detailed information on keypad functions, see Figure 2.

Pump Out Operation

Press **Pump Out**. The Drive will start pump in a constant speed mode (default 45 Hz). The pump will run until **STOP** or **Auto Start** are pushed.



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Figure 13 - Change PSI Setpoint while running pump.

Setting the Pressure

NOTICE Default pressure setting is 414 kPa. If this value is changed, adjust tank pressure accordingly (see Table 7).

There are three ways to change the pressure setpoint:

- **While running the pump**

Follow keypress sequence shown in Figure 13 to make desired change. This parameter allows either *Internal* or *External Setpoint* to be changed, depending on which one is referenced at the time the change is made.

- **Via the PSI Preset**

Follow keypress sequence shown in Figure 14 to make desired change.

- **Via the Main Menu** (Main Menu/Settings/Set point/Internal Setpoint)

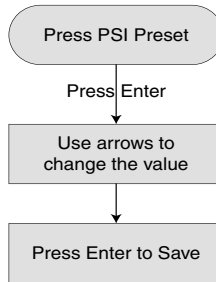


Figure 14 - Change PSI Setpoint using PSI Preset.

Table 9 lists all available commands and parameters for the PENTEK INTELLIDRIVE.

Table 9 - Main Menu and Parameters

Menu Settings	Parameter	Unit of Measure	Value			Description
			Default	Min.	Max.	
Time/Date	Hour Format	Hours	12Hr	12Hr	24Hr	Selects 12 or 24 hour time scale.
	Time	mm:ss	1:00 AM	1	24	Sets current time. Used for time stamp in fault log.
	Date	MM/DD/YYYY	1/1/12	-	-	Sets current date. Used for date stamp in fault log.
PID Control	Proportional Gain	-	2500	0	10000	Sets the PID controller gain. Used in conjunction with all <i>PID Control</i> parameters to control how fast or slow the Drive reacts to pressure changes.
	Integration Time	Milliseconds	500 ms	20 ms	65000 ms	Sets the PID controller integration time. Used in conjunction with all <i>PID Control</i> parameters to control how fast or slow Drive reacts to pressure changes.
	Derivation Time	Milliseconds	60 ms	0 ms	10000 ms	Sets PID controller derivation time. Used in conjunction with all <i>PID Control</i> parameters to control how fast or slow Drive reacts to pressure changes.
	Derivative Limit	-	120	0	2000	Sets derivative filter time constant for PID controller.
Sleep	Boost Differential	kPa	21 kPa	21 kPa	69 kPa	First part of <i>Boost Process</i> . Pressure boost that happens before it goes to <i>Wake Delay</i> .
	Boost Delay	MM:SS	1 Min	30 Sec	5 Min	The time Drive takes to start <i>Boost Process</i> after system has stabilized.
	Wake Up Differential	kPa	34 kPa	34 kPa	103 kPa	Pressure amount below setpoint that wakes up Drive.
	Wake Delay	MM:SS	15 Sec	3 Sec	2 Min	Second part of the <i>Boost Process</i> . The time it takes to ramp down pressure during the <i>Boost Process</i> .
Password	Password Time Out	HrHr:mm	1 Hr	1 Min	6 Hr	Amount of time it takes to lock keypad (after last button is pressed).
	Password	-	7777	0000	9999	Password used to unlock keypad.

Table 9 (continued)

Menu Settings	Parameter	Unit of Measure	Value			Description
			Default	Min	Max	
Setpoints	Internal Setpoint	kPa	414 kPa	103 kPa	668 kPa (Max Sensor Value minus 30 kPa)	Main pressure setpoint used. Sets main system operational pressure. This parameter is accessed here, through PSI Preset button, or by pressing Enter button while in Constant Pressure operation.
	External Setpoint	kPa	276 kPa	103 kPa	Max Sensor Value minus 20 kPa.	Second pressure setpoint. When another pressure setting is desired other than Internal Setpoint. Additional programming needed in I/O section. Requires an external switch or timer to wired to I1 or I2 terminals. It is only active when there is voltage present I1 terminals [see Figure 11]
Sub Menu	Parameter	Unit of Measure	Default	Max	Min	Description
Motor	Motor Phase	-	1	3	1	Selects phase of motor to be operated. An additional sub menu will appear, based on phase selection, to select proper motor type.
	Connection Type	-	3 wire	3 wire	2 wire	Wire type for 1 phase motor operation only. Can only access by first setting Motor Phase parameter to 1 Phase.
	Motor Type	-	Subm	Subm	Above Gnd	Motor type for 3 phase, 220V, motor operation only. Can only access by first setting Motor Phase parameter to 3 Phase.
	Service Factor Amps	A	00.0 A	00.0 A	Per drive and motor	Service factor amps (max. load) of motor the Drive is operating. Sets maximum allowed amps at output of Drive. See Table 7 for values.
	Min Frequency	Hz	30 Hz	30 Hz	1 below Max Hz	Minimum frequency (speed) motor will run.
	Max Frequency	Hz	50 Hz	1 above Min Hz	Hz	Maximum frequency (speed) motor will run.
Sensor	Max Sensor Value	kPa	689 kPa	2068 kPa	68 kPa	Maximum pressure value of transducer sensor used with Drive. Only change if different transducer is used with Drive, other than 689 kPa max scale.

Table 9 (continued)

Menu or Sub Menu	Parameter	Unit of Measure	Value			Description
			Default	Min	Max	
Ex Runtime	Excessive Runtime Detection	-	Enabled	Disabled	Enabled	Enables or disables Excessive Runtime Detection.
	Excessive Runtime Hours	Hours	24	1	100	Number of hours Drive can run before it faults on Excessive Runtime.
Dry Run	Auto Restart Delay	Minutes	10 Min	3 Min	60 Min	Time Drive waits to restart pump when Dry Run is detected.
	Number of Resets	-	3	0	5	Number of tries Drive attempts to restart pump when Dry Run condition is detected.
	Detection Time	M:SS	15 Sec	5 Sec	10 Min	Time the Drive takes to recognize Dry Run condition.
	Sensitivity	kPa	68 kPA	0	2068 kPa	Pressure value that Dry Run condition is detected at. Dry Run fault will occur if this pressure cannot be met within Detection Time window. Lower pressure = less sensitivity.
	Fill Time	M:SS	1 M	15 S	10 M	Time allowed to fill (prime) pipes during Auto Line Fill process. Relates to Dry Run Sensitivity value. [Time starts after 55 Hz is reached].
I/O	Digital Input 1	-	Unused	-	-	Selects operation of Drive when terminal I1 is used. Select between Unused, Run Enabled, Ext Fault, and Setpoint. The Drive will respond to selected command when voltage is present at I1 terminal.
	Digital Input 2					
	Relay Output	-	Unused	-	-	Selects the operation of Drive when terminal O1 is used. Select between Unused, Run, and Fault. The Drive closes the Relay when Run or Fault is selected.
Over Press	Over Pressure	kPa	552 kPa	103 kPa	2047 kPa	Sets Over Pressure Warning value. Change if higher than 552 kPa system pressure is needed.
No Ground	No Ground Detection	-	Enabled	Disabled	Enabled	Selects whether Ground Detection parameter is Enabled or Disabled. If Disabled is selected, it will revert back to Enabled after 72 hours. Warning LED will flash entire time it is Disabled.
Reset	Factory Reset	-	No	No	Yes	Resets all parameters to factory defaults. Displays Setup Guide after it is complete. Software version displayed here. Does not clear fault log.
SW Update	Software Update	-	Disabled	Disabled	Enabled	Used to update software, if necessary.

The I/O terminals are located in the center of the wiring compartment, as shown previously in Figure 9.

The Digital Input connections (**I1** and **I2**) are used to control the Drive based on the state of an external device, such as a flow switch, moisture sensor, alternator, or other device.

Programming is needed to activate any of these functions [see Table 9].

The Output Relay (**O1**) is used to control an external device based on two states of Drive; either Running the pump or Faulted.

Programming is needed to activate any of these functions [see Table 9].

Cable Installation

Three 13mm conduit knockouts are provided on the bottom of the Drive enclosure for the I/O wires.

Break out the closest 13mm knockout and route the wires through. Use a cord grip to prevent the wire from rubbing and causing a short.

NOTICE Never run low voltage I/O wire through the same conduit hole as the 230V input wires or motor wires.

To connect the external wires to the terminals:

1. Strip wire 13mm
2. Push spring terminal up with finger or slotted screwdriver
3. Insert wires from bottom
4. Release spring terminal

Connection Examples

Figures 15-18 show various connection schemes for typical applications. Table 10 describes each I/O terminal, including purpose and rating.

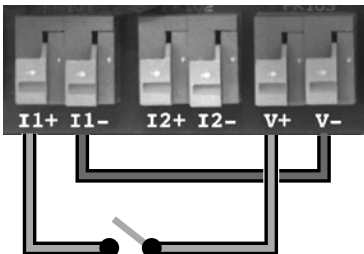


Figure 15 - Example Input with internal 24 volt supply

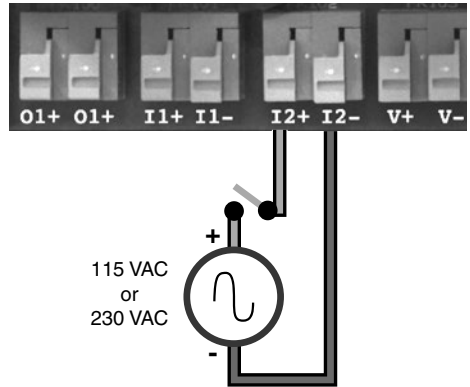


Figure 16 - Example external Input with external supply

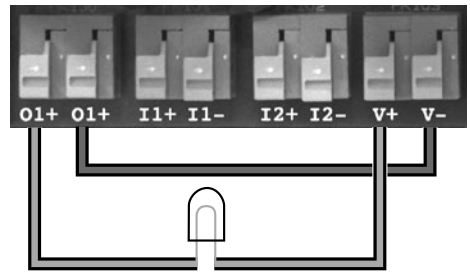


Figure 17 - Example Output relay with internal 24 volt supply

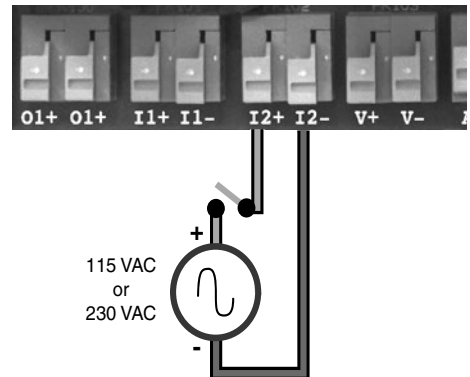


Figure 18 - Example Output with external supply

Table 10 - I/O Function, Connections, Ratings

Label	Function	Connection	Rating
AI+	Positive connection for transducer	Red transducer wire	24 Volt (supplied)
AI-	Negative connection for transducer	Black transducer wire	
V+	Positive side of 24 volt power supply. Used to power external devices.	Positive side of 24V external device, i.e., flow switch, moisture sensor, alternator, etc. Need to complete the circuit with V-. See Figures 15 and 17.	40mA maximum output
V-	Negative side of 24 volt power supply. Used to power external devices.	Typically to I1-, I2-, or O1-. Used with a flow switch, moisture sensor, alternator, etc. Need to complete the circuit with V+. See Figures 15 and 17.	
I1+	Positive (dry contacts) connection of <i>Digital Input 1</i> . Connect when using an external device to control Drive.	From an external device i.e., flow switch, moisture sensor, alternator, etc. Requires complete circuit connection with I1-. See Figures 15 and 16.	Accepts 24VDC and up to 230VAC
I1-	Negative (dry contacts) connection of <i>Digital Input 1</i> . Connect when using an external device to control Drive.	Can be from V- or from the negative side of an external power supply. Requires complete circuit connection with I1+. See Figures 15 and 16.	
I2+	Positive (dry contacts) connection of <i>Digital Input 2</i> . Connect when using an external device to control Drive.	From an external device, i.e., flow switch, moisture sensor, alternator, etc. Requires complete circuit connection with I2-. See Figures 15 and 16.	
I2-	Negative (dry contacts) connection of <i>Digital Input 2</i> . Connect when using an external device to control Drive.	Can be from V- or from the negative side of an external power supply. Requires complete circuit connection with I2+. See Figures 15 and 16.	
O1+	Output relay (dry contacts) connection. Programmed to close when pump is Running or Faulted .	Positive wires of an external device. See Figures 17 and 18.	Accepts up to 5 Amps at 24VDC and 8 Amps at up to 230VAC
O1+	Output relay (dry contacts) connection. Programmed to close when pump is Running or Faulted .	Positive wires of an external device. See Figures 17 and 18.	
P	Positive connection of an RS-485 communication device (see Figure 15).	Positive wire from RS-485 device.	Per RS-485 Standard
N	Negative connection of an RS-485 communication device (see Figure 15).	Negative wire from RS-485 device.	

RS-485 Communications

RS-485 is a US-based telecommunications standard for binary serial communications between devices. It is the protocol, or set of specifications, that needs to be followed to allow devices that implement the standard to speak to each other. A fully compliant RS-485 port is included in the PENTEK INTELLIDRIVE system to permit serial connections among more than two devices on an RS-485 compliant network. Figure 19 shows two-wire connection to the Drive.

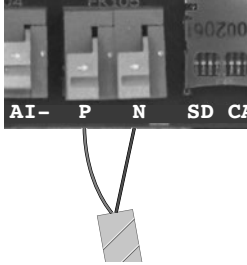


Figure 19 - Example RS-485 Connection

Lightning/Surge Protection

Lightning arrestors or other surge suppressing devices can be used with this product. MOV (Metal Oxide Varistor), SOV (Silicon Oxide Varistor).

Accessories

Part Description	Qty	Part Number
Alternating Control Panel	1	VFD-ALT
Moisture Sensor	1	VFD-WS
Surge Protection Kits	1	VFD-SGA
300 PSI Transducer	1	U17-2000
Flow Switch	1	U17-1999

Retrofit Applications

When retrofitting an installation with the PENTEK INTELLIDRIVE, most of the preceding text can be applied. The recommended Service Factor Amps for non-PENTEK motors please refer to the manufacturer literature.

NOTICE The PENTEK INTELLIDRIVE will not operate Franklin Electric 2-wire motors.

Repair Parts

Part Description	Qty	Part Number
Input Terminal Block Connector	1	PID-CON2
Output Terminal Block Connector	1	PID-CON3
Cooling Fan	1	PID-FAN-R
Pressure Transducer	1	U17-1561-R
3m/10' Transducer Cable	1	U18-1593
8m/25' Transducer Cable*	1	U18-1594
15m/50' Transducer Cable*	1	U18-1595
30m/100' Transducer Cable*	1	U18-1596
45/150' Transducer Cable*	1	U18-1597
61m/200' Transducer Cable*	1	U18-1598
Keypad	1	PID-HMI-R

* Purchase Separately

Fault	Possible Causes	Solution
Over Current	Shorted output	Check for any shorts in motor cables.
	Locked rotor	Check for debris in pump.
	Damaged wire insulation	Check motor wire insulation with a megger.
Over Voltage	Internal Drive short	With power to Drive off, measure outputs with ohmmeter to detect short.
	Power cycling on and off	Check for a generator or switching on input line.
	High line voltage	Measure incoming line voltage to Drive; should be between 190V and 265V.
Under Voltage	Low line voltage	
	Temporary loss of power	Check for local power outage.
	Excessive load current	Check motor is correctly sized for the application.
	Loss of a motor phase	Check correct voltage is present on all motor leads.
	Power was removed from Drive	Check correct voltage is present on all input lines.
Cannot Start Motor	Exceeding Service Factor Amps	Check Service Factor Amps entered are correct.
		Check pump and motor are correct.
	No Service Factor Amps value entered	Check Service Factor Amps entered and are correct.
	There is an open (connection) in motor wires	Check resistance of all motor wires is correct.
Dry Run	Operation at open discharge	May need to reduce Dry Run Sensitivity pressure or apply back pressure on transducer.
	Drive cannot read transducer signal	Check linearity of transducer, as it may be damaged. See Troubleshooting Guide for more information.
	Possible leak	Check for pipe break or large leak.
	Dry running pump	Check water level in well.
Ground Fault	Ground wire shorted to motor phase	Check the ground wire for short to motor phase wire or check insulation integrity with a megger.
	Long motor cable length	If motor cable length is more than 305m a reactor or filter may be needed to limit capacitance between motor wires.
System Not Grounded	Ungrounded Drive	Ground Detect parameter can be disabled, but will reactivate after 72 hours.
	Unbalanced or three phase incoming voltage.	Line to line voltage must be twice line to ground voltage. You cannot use two legs from three phase power.

Fault	Possible Causes	Solution
Open Transducer	Intermittent connection	Check all transducer wires are securely connected or for damaged cable insulation.
	Open Connection	Check for proper wiring of all transducer wires and verify cable connector securely attached to transducer.
	Drive cannot read transducer signal	Check electrical system for ground loops or no ground connection.
	Transducer wires crossed	Check red is in AI+ and black is in AI-.
	Possible failed transducer	Check linearity of transducer; see Troubleshooting Guide for more information.
Shorted Transducer	Short in transducer wires	Check for shorted transducer wire or damaged insulation.
	Possible failed transducer	Check linearity of transducer; see Troubleshooting Guide for more information.
Over Temperature	Excessive heating in drive	Check ambient temperature is not above 50°C (122°F).
		Check for inoperable or unobstructed fan.
		Check vents are not obstructed.
Excessive Runtime	Leak detected	Check for leaks in pipe system.
	Application calls for long run times	Extend Excessive Runtime Hours limitation.
		Disable Excessive Runtime Fault.
Internal Fault	Internal voltages are out of range	Drive will auto reset and attempt to clear fault. Fault Reset can be pressed to clear fault as well. Then try to operate pump. If fault continues Drive may need replacement.
Hardware Fault	Internal hardware failure	Fault Reset can be pressed to clear fault. Then try to operate pump. If fault continues Drive may need replacement.
External Fault	The external device detected fault condition and closed the I1 or I2 input	Check external device.
Low Amps	Under-sized pump	Increase Minimum Speed to 35 Hz.
	Low current draw from pump	
	Thermal protector open in motor (3 wire)	Wait 20 minutes then restart pump.
	Missing motor phase	Check all motor connections at the Drive.
Warning	Possible Causes	Solution
Warning LED flashing	Ungrounded Drive, with ground detection parameter disabled (will operate for 72 hours and then fault).	Verify ground wire is connected on both incoming voltage side and motor side of Drive.
		With the power disconnected, use an ohmmeter to verify which pipe the Drive's transducer is connected to. Also verify that the input ground wire is at the same potential, e.g., has approximately the same ohm reading.
		Verify the input ground is connected all the way back to electrical panel.
Jam Warning	Debris in pump stopping motor from turning (locked rotor).	Drive tries to free debris in pump by reversing or pulsing motor.
Over Pressure Warning	Pressure rising above Over Pressure setting.	Drive stops and waits 1 minute, then checks that pressure is below the Setpoint pressure. Below it restarts, if not checks again in another minute. Can increase over-pressure value.

* For additional Troubleshooting information, please visit www.sta-rite.com/resources/images/16455.pdf for a downloadable guide.

Drive Reset Procedure

Follow the keypress sequence shown below to test the Drive.

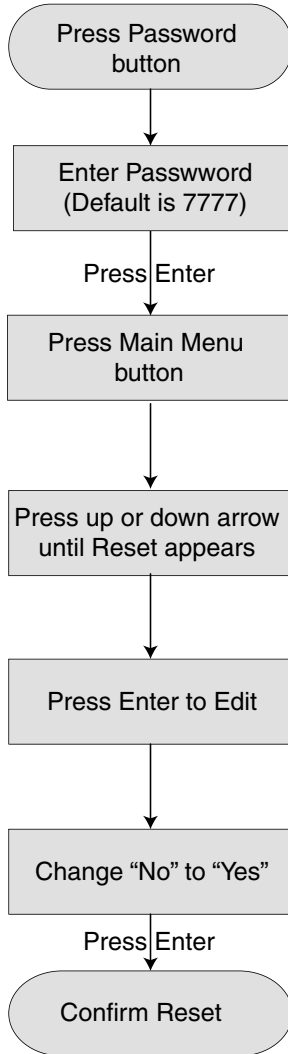


Figure 20 - Drive Reset Procedure

NOTICE In a domestic environment, this product may cause radio interference which may require supplementary mitigation measures.

ADDENDUM - INSTALLATION FOR ELECTROMAGNETIC COMPATIBILITY (EMC)



Overview

The Pentek Intellidrive is a Variable Frequency Drive (VFD). As with all VFD's, this device may cause electromagnetic interference if it is not installed correctly. Following these instructions will ensure that this device will comply with the relevant Australian EMC standards.

These instructions should be read in conjunction with the Pentek Intellidrive Installation Manual, as supplied with the device.

Enclosure

The Pentek Intellidrive shall be installed in an EMC shielded enclosure. The EMC enclosure shall be rated for use from 0 up to 1GHz and shall have a rated attenuation of at least 35dB at 1GHz. Pentair Australia recommends the Hoffman® CSD24248LG- EMC enclosure.



Enclosure Installation

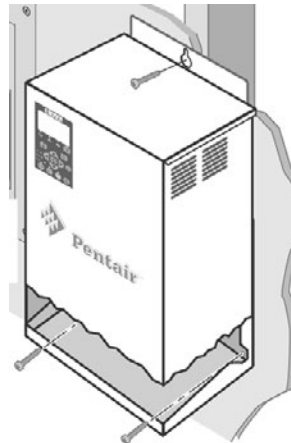
1. Open the enclosure door and remove the mounting panel.
2. Line-up the Intellidrive on the desired location on the mounting panel. Take care to allow enough room for easy access to wiring points on the Intellidrive.

Note: The enclosure may also be used to house other electrical components. All wiring must be completed by a qualified electrician in accordance with the Wiring Rules (AS/NZS 3000).

3. To mount the drive, mark the location of the top keyhole on the mounting panel. Drill a hole in the mounting panel at this mark. Drive a bolt into the mounting panel and hang the Intellidrive on it.
4. Remove the screw on the bottom of the front cover on the Intellidrive and lift the cover off. Mark the locations of the bottom two mounting holes. Drill holes for the bottom two mounting holes and mount the drive using bolts / screws in all holes.

Note: Use serrated washers on mounting bolts / screws to cut through paint and provide a low resistance earth connection.

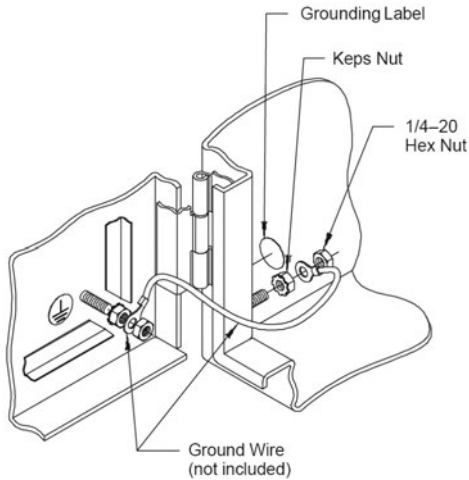
5. Return the mounting panel and Intellidrive to the enclosure and bolt securely in place.



Earthing

Note: All earth wiring shall be installed as per the Wiring Rules (AS/NZS 3000).

Connect an earth strap between the enclosure and the enclosure door to ensure a low resistance earth connection. The earth strap shall be of sufficient wire diameter to handle the total load of all devices connected to the enclosure and in accordance with the Wiring Rules.



The enclosure shall be earthed via the mains earth connection or directly via a ground stake, where the wire run is long, in accordance with the Wiring Rules.

Motor Cable

The cable used to connect from the Intellidrive to the submersible pump motor shall be a shielded cable. The shielded cable section shall run for the above ground length between the Intellidrive and the bore.

The shielded cable shall enter the enclosure, housing the Intellidrive, via a shielded cable gland. Select a shielded gland of suitable size for the shielded cable used.

Note: The mains supply cable does not need to be shielded.

1. Use a hole saw or large drill bit to make a hole for the shielded cable gland, in the enclosure wall, at the desired location for cable entry.
2. Insert the shielded cable gland into the hole and tighten the nut. Ensure the nut is tight enough to cut through the enclosure paint.

3. Remove the cable sheathing, from the end of the cable, to expose the shielding. Remove a sufficient amount to ensure the shielding will be in contact with the cable gland and also to allow enough length of cable to connect to the Intellidrive.
4. Tighten the gland nut.



⚠ Warning

This is a Class A product. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

⚠ Warning

Risk of high-voltage electric shock from EMI/RFI filter inside drive. Before connecting or disconnecting any wires inside the drive, turn off power to the drive and WAIT 5 MINUTES for retained voltage to discharge.

⚠ Warning

Make all wiring connections, then close and fasten the cover before turning on power to the drive. Do not open the box when power is connected to the drive.

⚠ Warning

The Intellidrive must be installed by a qualified electrician and must be installed in accordance with the Wiring Rules (AS/NZS 3000).

IMPORTANT

Please attach your sales invoice/docket here as proof of purchase should warranty service be required. Please do not return Warranty Form to Pentair Australia - please retain for your records.

Purchased From

Purchase Date..... Serial No..... Model No.....



Head Office

Pentair AU/NZ: 1-21 Monash Drive,
Dandenong South, VIC 3175

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Fax : 1800 006 688
National dealer locator: Phone : 1800 664 266

Email: au.sales@pentair.com
Web: www.pentair.com.au

New Zealand

National customer service: Phone : 0800 654 112
Fax : 0800 806 642
National dealer locator: Phone : 0800 664 269

Email: nz.sales@pentair.com
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