H2O Drive™

Constant Pressure Control Panel

For Submersible Well Pumps
User Manual

RD150 / RD300 / RD500 / RD750

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TABLE OF CONTENTS

⚠WARNINGS

Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Failure to follow these precautions could result in serious injury or death. Keep these instructions with warranty after installation. This product must be installed in accordance with National Electrical Code, ANSI/NFPA 70 so as to prevent moisture from entering or accumulating within the controller housing.
See additional specifications on page 3 of this manual.

⚠WARNING

ELECTRICAL SHOCK HAZARD

Disconnect power to the H2O Drive™ Panel and wait 10 minutes before removing any cover.
A qualified service person must install and service this product according to applicable codes and electrical schematics.

- Lethal voltages are still present inside the H2O Drive™ Panel after power is disconnected. Wait 10 minutes to allow internal capacitors to fully discharge before attempting to connect or disconnect wiring or to service this equipment.
- Do not connect incoming power to motor terminals U, V, W. Doing so will result in irreversible damage to the drive.
- Do not connect power to this equipment if it has been damaged or has any missing parts.
- Verify that the incoming voltage supply matches the H2O Drive™ Panel rating before applying power to the unit.
- The H2O Drive™ Panel contains no serviceable parts, do not attempt to repair this equipment.
- The H2O Drive™ Panel must be grounded at the grounding terminal according to N.E.C. Refer to the electrical connections page.
- Do not install in areas with: excessive or conductive dust, corrosive or flammable gas, excessive heat, regular impact shocks or excessive vibration.
- Do not install in areas where ambient temperature exceeds 40°C (104°F).

⚠WARNING

EXPLOSION OR FIRE HAZARD

Do not use this product with flammable liquids. Do not install in hazardous locations as defined by National Electrical Code, ANSI/NFPA 70.

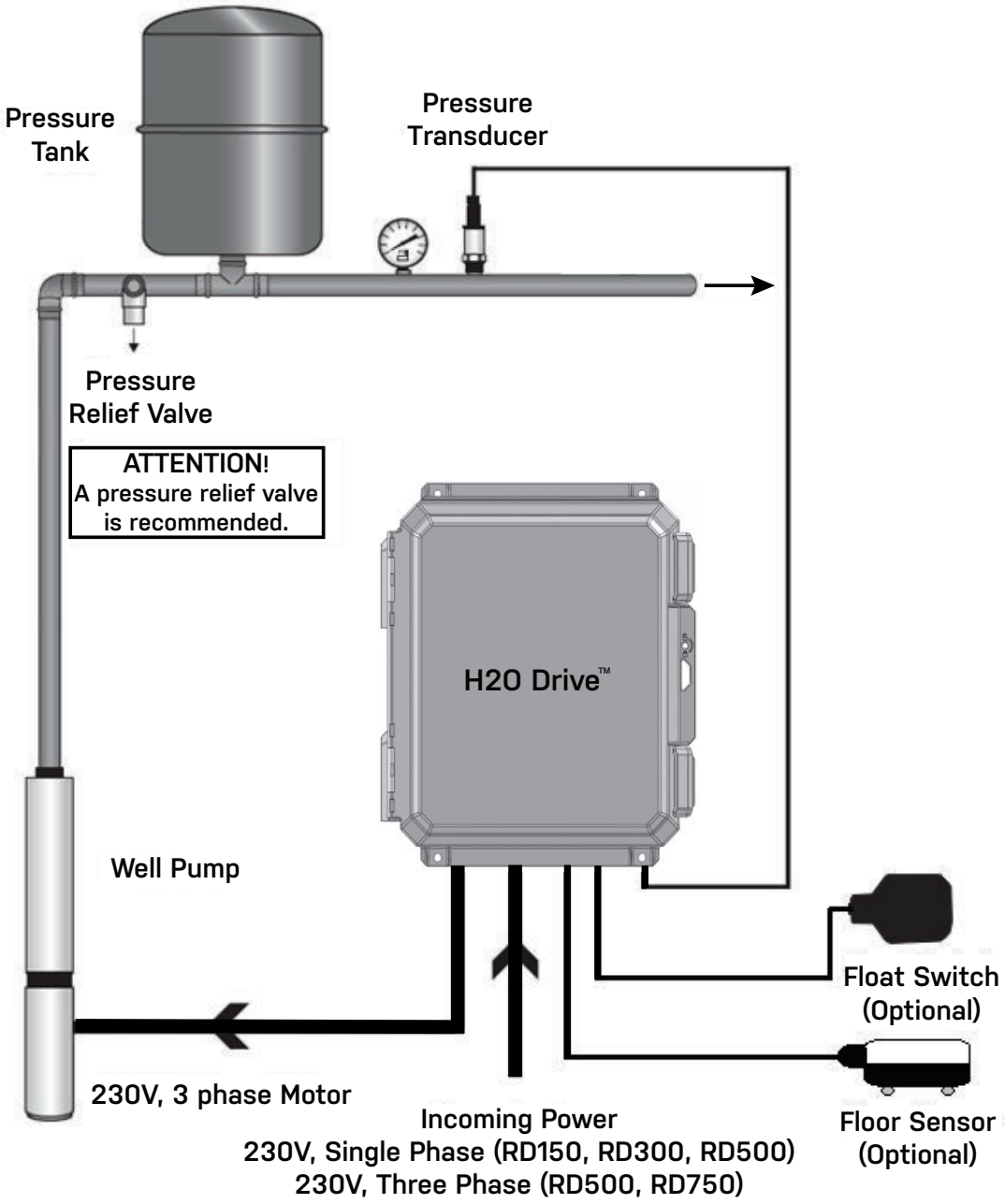
INCLUDED IN THE H2O DRIVE™ PANEL PACKAGE

1. H2O DRIVE™ Panel VFD controller (RD150, RD300, RD500 or RD750)
2. Pressure transducer (0-150 PSI range) 4-20mA output signal.
3. Pressure transducer cable (5m – 16.4 ft)
4. Strain reliefs (x3)
5. User manual

Verify that all components are included and the H2O Drive™ Panel model number is correct.

SYSTEM OVERVIEW

RD150, RD300, RD500 and RD750



INTRODUCTION & SPECIFICATIONS

Congratulations and thank you for your purchase of the H2O Drive™ control panel. This manual explains the features and operations of the controller which was designed to operate one well pump in a pressure control application. The controller automatically controls the operation and speed of the pump based on the signal from the pressure transducer.

GENERAL

- One Variable Frequency Drive well pump pressure controller
- Operates using a 0-150 PSI pressure transducer (4-20mA)
- HMI - Rotary selector for menu navigation and editing settings
- HMI - High-Brightness 2.4" color graphic LCD display, 240X320 pixel resolution

PUMP CONTROL AND PROTECTION

- Pump run indication
- Pump speed (Hz) and Amps (A) indication
- Pump motor overload protection
- High- and low-pressure alarms
- Pump dry run alarm and well recharge timer
- Floor water sensor and low level switch alarm/shutdown

SYSTEM

- Pump run time

ELECTRICAL SPECIFICATIONS

- Input voltage: 240V nominal
  - 200-240V 50Hz/60Hz, single phase for RD150 & RD300
  - 200-240V 50Hz/60Hz, three phase/single phase for RD500
  - 200-240V 50Hz/60Hz, three phase for RD750
- Output 0-240V, three phase, 0-60Hz capable of operating up to 80Hz
  Note: The output voltage cannot exceed the input voltage.

DEDICATED I/Os

- Pressure transducer input, 4-20mA, two wire
- 2 Auxiliary alarm inputs (Low level, Floor water sensor) Dry contact only
- 1 alarm relay output (N.O). 230V, 0.3A Max

ENVIRONMENT

- Operating temperature: 14°F to 104°F (-10°C to 40°C)
- Storage temperature -4°F to 131°F (-20°C to 55°C)
- Altitude: Maximum of 3280 ft (1000m) above sea level
- Outdoor rated enclosure (UL Type 3R)

PART NUMBER	MODEL	DESCRIPTION	RATED AMPS[1]	S.F. AMPS[2]	HP	INPUT	OUTPUT	ENCLOSURE DIMENSION	SHIPPING WEIGHT
1076917	RD150	H2O DRIVE - 1.5HP	7.0A	7.3A	0.5/0.75/1.0/1.5	230V, 1PHASE	230V, 3PHASE	14X12X6	16.4 lbs
1076918	RD300	H2O DRIVE - 3.0HP	10.0A	10.9A	2.0/3.0	230V, 1PHASE	230V, 3PHASE	14X12X6	17.4 lbs
1076919	RD500	H2O DRIVE - 5.0HP	15.9A	17.8A	5.0	230V, 1 or 3PHASE[3]	230V, 3PHASE	18X16X10	32.7 lbs
1077249	RD750	H2O DRIVE - 7.5HP	31.8A	31.8A	7.5	230V, 3PHASE	230V, 3PHASE	18X16X10	28.7 lbs

[1] VFD rated Amps. 150% OL for 60 sec., 200% for 0.5 sec (Constant torque - UL listed)
[2] VFD Amps for pumps: 120% for 60 sec. (Variable Torque)
[3] VFD UL rated for 3 phase input

SELECTING THE CORRECT VFD

1. Determine the voltage available on site.
2. Select a pump with the same voltage (motor must be 3 phase).
3. Check pump motor nameplate Service Factor Amps (SFA) for proper VFD sizing.
4. Select a VFD with an output amps rating greater or equal to motor SFA.
5. The motor and VFD must be oversized for operation >60Hz. Consult the pump MFR for sizing.

HYDROPNEUMATIC TANK

To maintain constant pressure and prevent rapid cycling, a hydropneumatic tank (pressure tank) is needed in the system (refer to the minimum capacity of pressure tank table below). The H2O Drive™ Panel may use a pressure tank of a larger capacity than listed in the table.

MINIMUM CAPACITY OF PRESSURE TANK

Flow Rate	Model	Min. Tank Volume
< 12.0 GPM	RD150	2 Gallons
	RD300	4 Gallons
≥ 12.0 GPM	RD150	4 Gallons
	RD300	8 Gallons

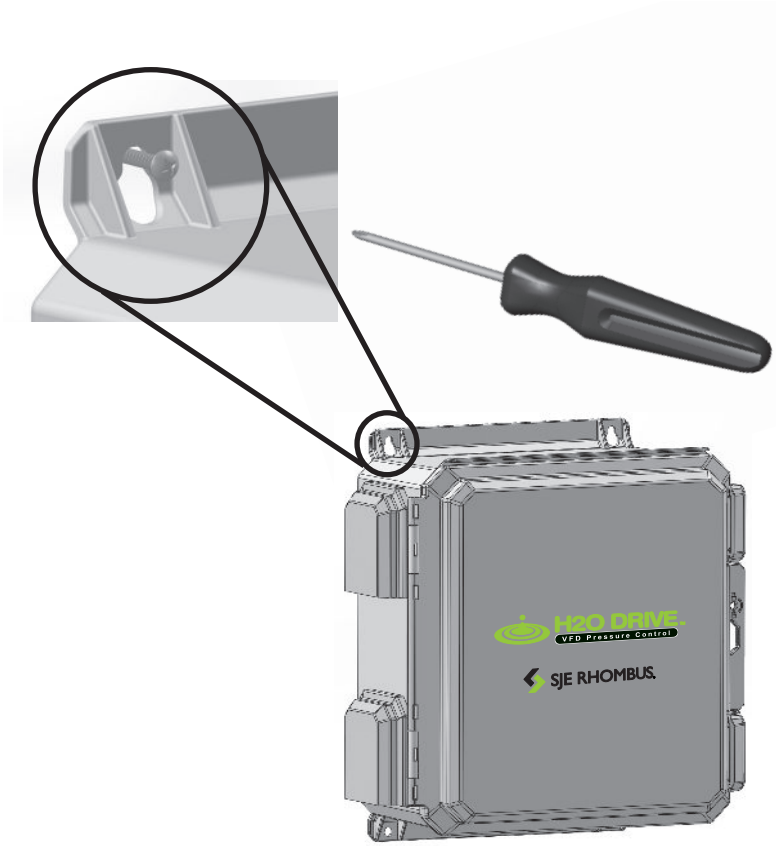
For 5HP & 7.5HP, the minimum tank size should be >20% of the rated flow. For example, a pump designed to deliver up to 100 GPM would require a minimum tank size of 20 gallons.

INITIAL PRESSURE TANK CHARGE PRESSURE

Set Pressure	Pre-charge Pressure
40 PSI	28 PSI
45 PSI	32 PSI
50 PSI	35 PSI
55 PSI	39 PSI
60 PSI	42 PSI
65 PSI	46 PSI
70 PSI	49 PSI
75 PSI	53 PSI

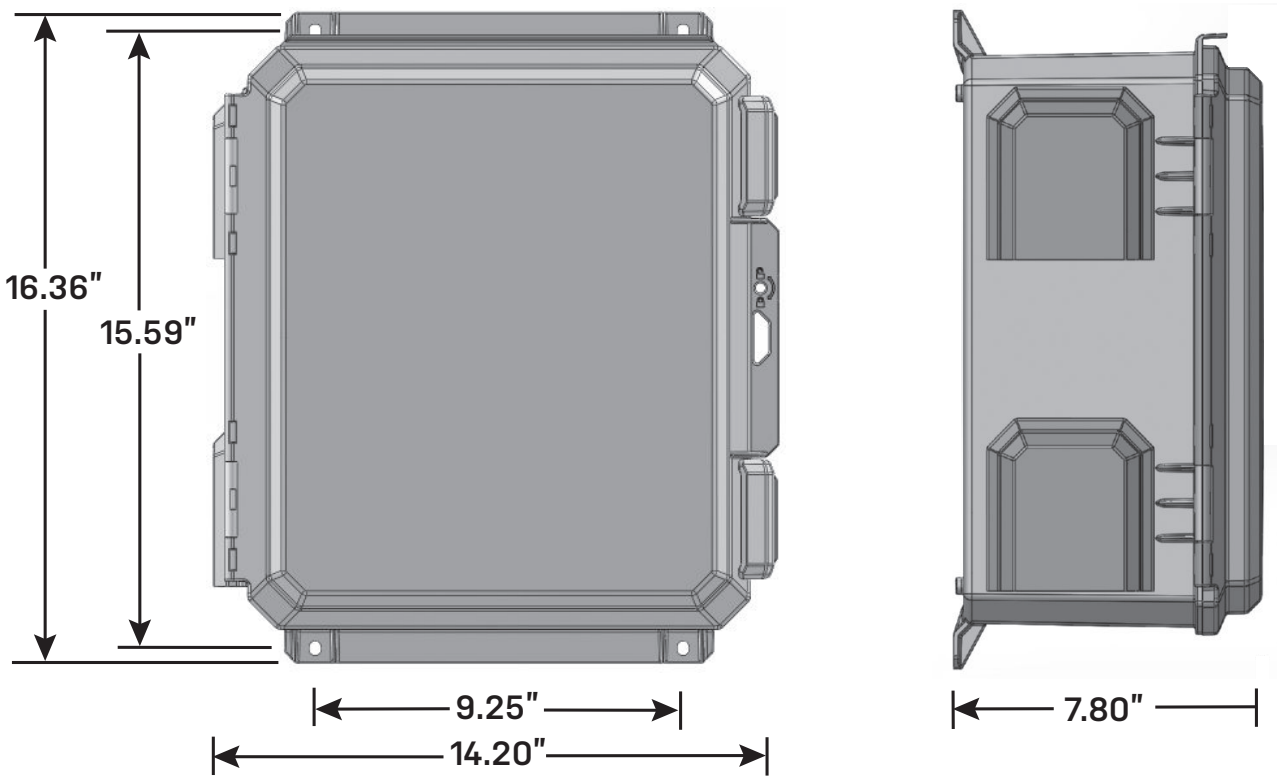
1. Initial charge pressure should be at least 70% of the system pressure.
2. To maintain the optimum pressure level, check the air pressure in the tank regularly.
3. Pre-charge pressure must be set when the tank is empty and vented.

H2O DRIVE™ PANEL INSTALLATION & MOUNTING

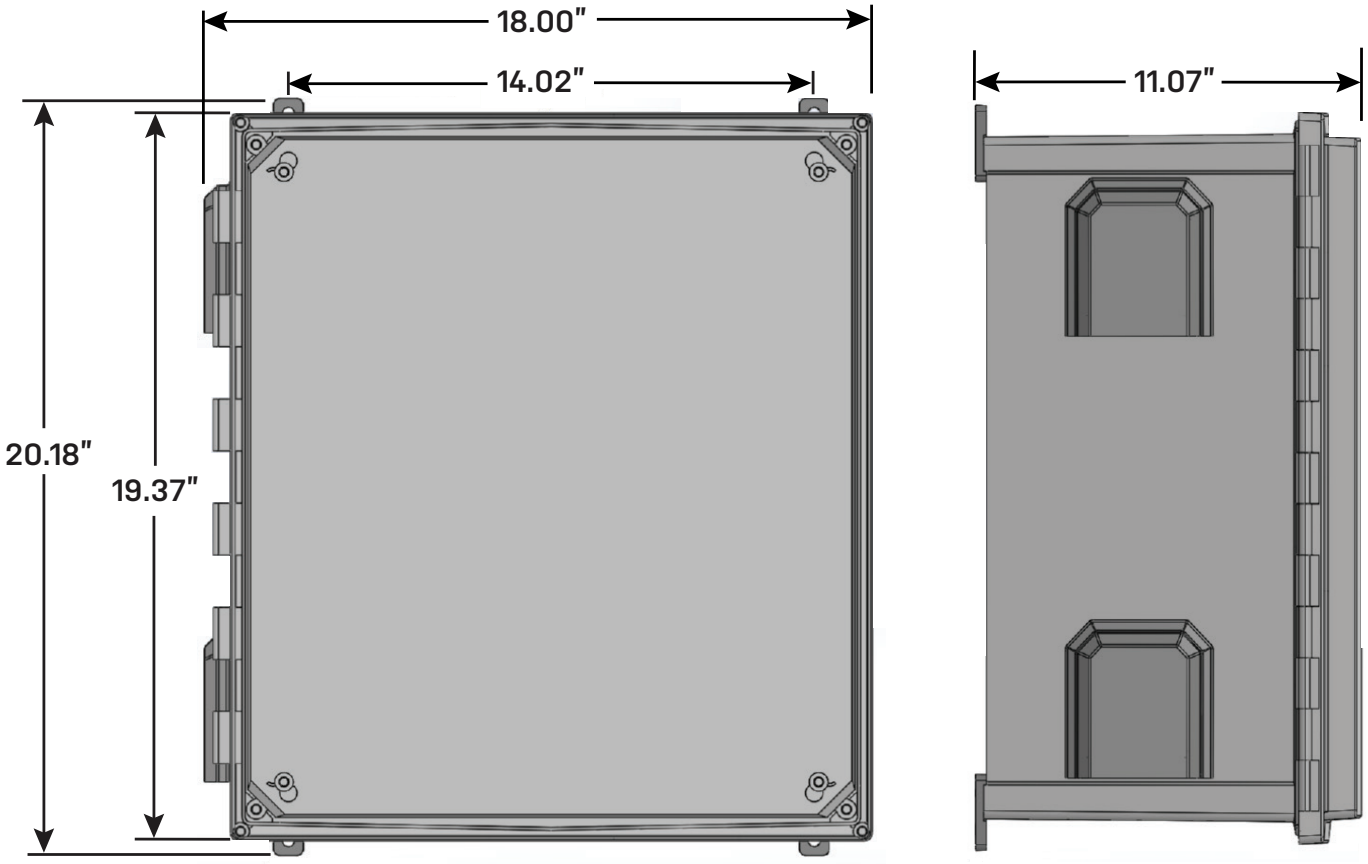


1. The H2O Drive™ Panel is designed for outdoor installations.
2. The control panel can be wall or post mounted.
3. Mount vertically using four (4) screws.
4. Avoid locations with direct sunlight exposure.
5. Locate near the well head, keeping the motor cable as short as possible.
6. Liquid tight conduits required for outdoor installations.

RD150 & RD300 DIMENSIONS

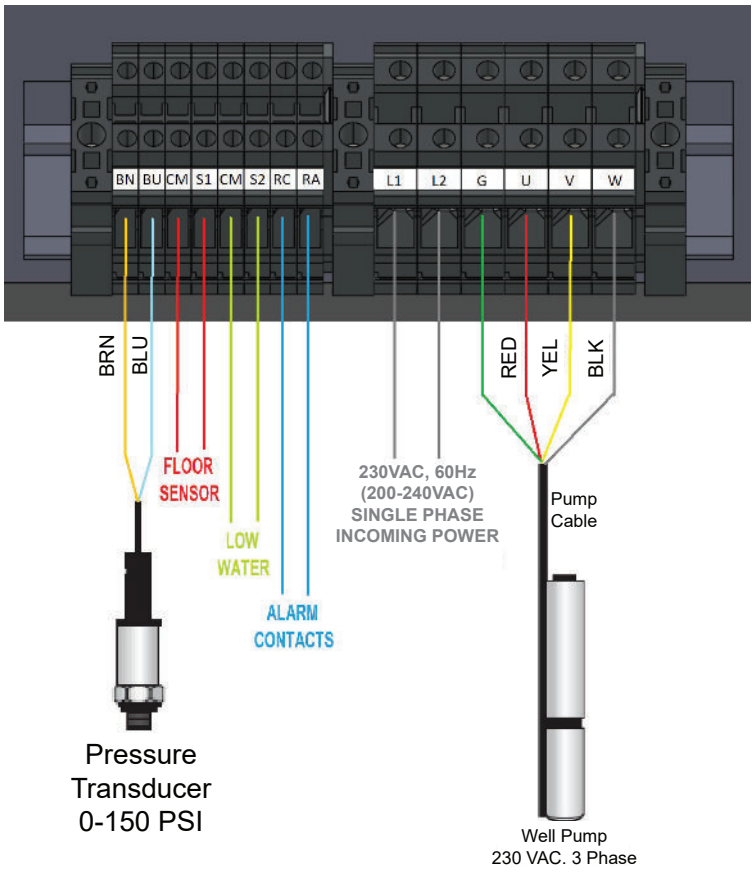


RD500 & RD750 DIMENSIONS



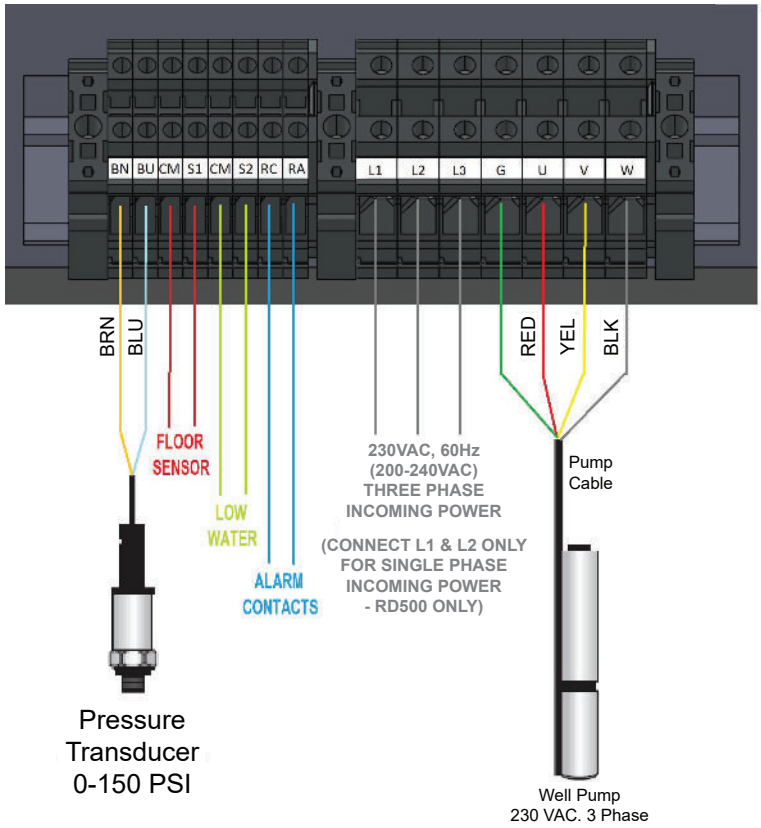
Electrical Connections Diagram

RD150 & RD300



Electrical Connections Diagram

RD500 & RD750



TERMINAL CONNECTIONS

Symbol	Function
BN	(BROWN) 24 VDC Pressure Transducer power
BU	(BLUE) 4-20mA signal from Pressure Transducer
CM, S1	CM = Signal Common. S1 = Floor Sensor Input (Dry Contact Only)
CM, S2	CM = Signal Common. S2 = Low Water Input (Dry Contact Only)
RC, RA	Alarm Relay Output. 230VAC 0.3A max, 30VDC 0.3A max
L1, L2	Incoming Power (RD150, RD300)
L1, L2, L3	Incoming Power (RD500, RD750)
G	Motor Ground
U, V, W	Pump Motor Connection

SURGE PROTECTIVE DEVICE (SPD)

A Surge Protective Device (SPD/lightning arrestor) will reduce problems resulting from power surges and lightning; however, 100% protection is not achievable. The SPD must be connected to the input power terminals. Do not connect the SPD to the pump motor output terminals of the H2O Drive™ Panel.

MOTOR CABLE

MAXIMUM MOTOR CABLE LENGTHS

Cable type:
4 conductor (3W + GND) shielded cable is recommended for optimum operation and noise suppression. Unshielded cable can be used if ran in metal conduit. Do not use flat cable. Do not use 3 separate/untwisted conductors. Do not use cables without a ground conductor.

Motor Cable sizing:
Select the motor cable from the table below.

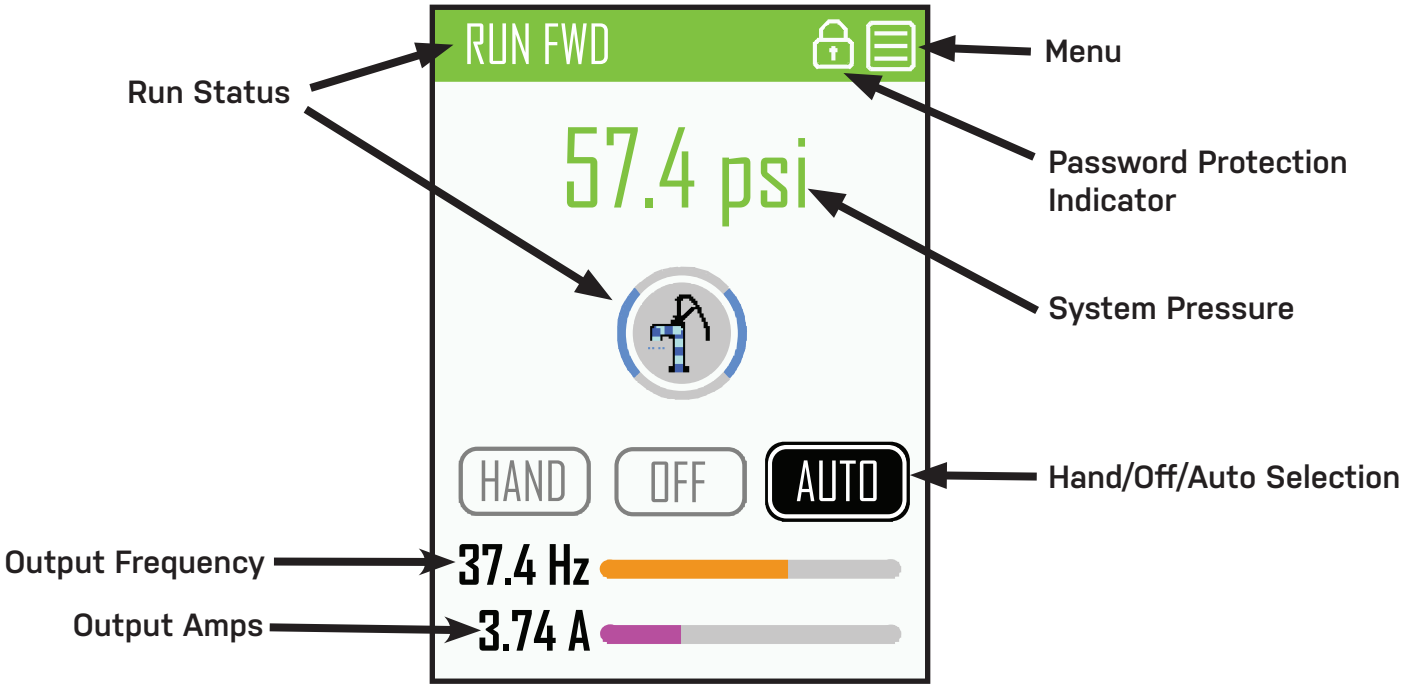
	Motor		Incoming Power		Motor Cable Length (75C)[1] (Feet)			
MODEL	HP	SFA[2]	AWG	CB	14 AWG	12 AWG	10AWG	8AWG
RD150	1/2HP	2.9A	14	15A	800			
	3/4HP	3.9A	14	15A	650			
	1.0HP	4.7A	12	15A	550			
	1.5HP	6.1A	12	25A	410	650		
RD300	2.0HP	8.1A	10	25A	320	500	800	
	3.0HP	10.1A	10	30A	240	380	600	
RD500	5.0HP	17.5A	6	50A	140	230	350	550
RD750	7.5HP	26.4A	6	60A[3]		150	250	400

[1]Cable length is measured from H2O Drive™ Panel to the motor.
[2]Data is based on 230V motor, 3 phase operating at 60Hz Max. Check motor name plate.
[3]Requires 3 phase input power and 3-pole Circuit Breaker (MCCB).
For cable lengths greater than 800 ft., please contact factory.
Do not use flat cable. Use round cable with twisted conductors (3 wire + ground).
75C Insulation - AWG Copper Wire only. Do not use aluminum conductors.
Use shielded cable or run cable in metal conduit to reduce Radio Frequency Interference (RFI).
The motor must only be grounded in the control panel. Do not also ground at the well head or disconnect.

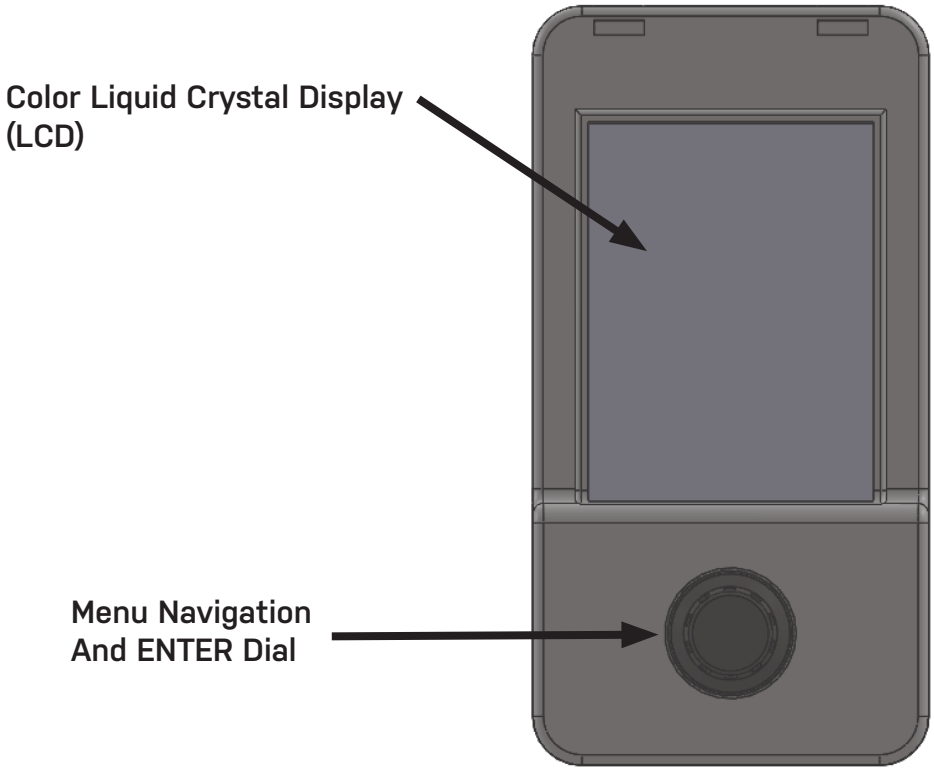
PROGRAMMING

HMI MAIN SCREEN

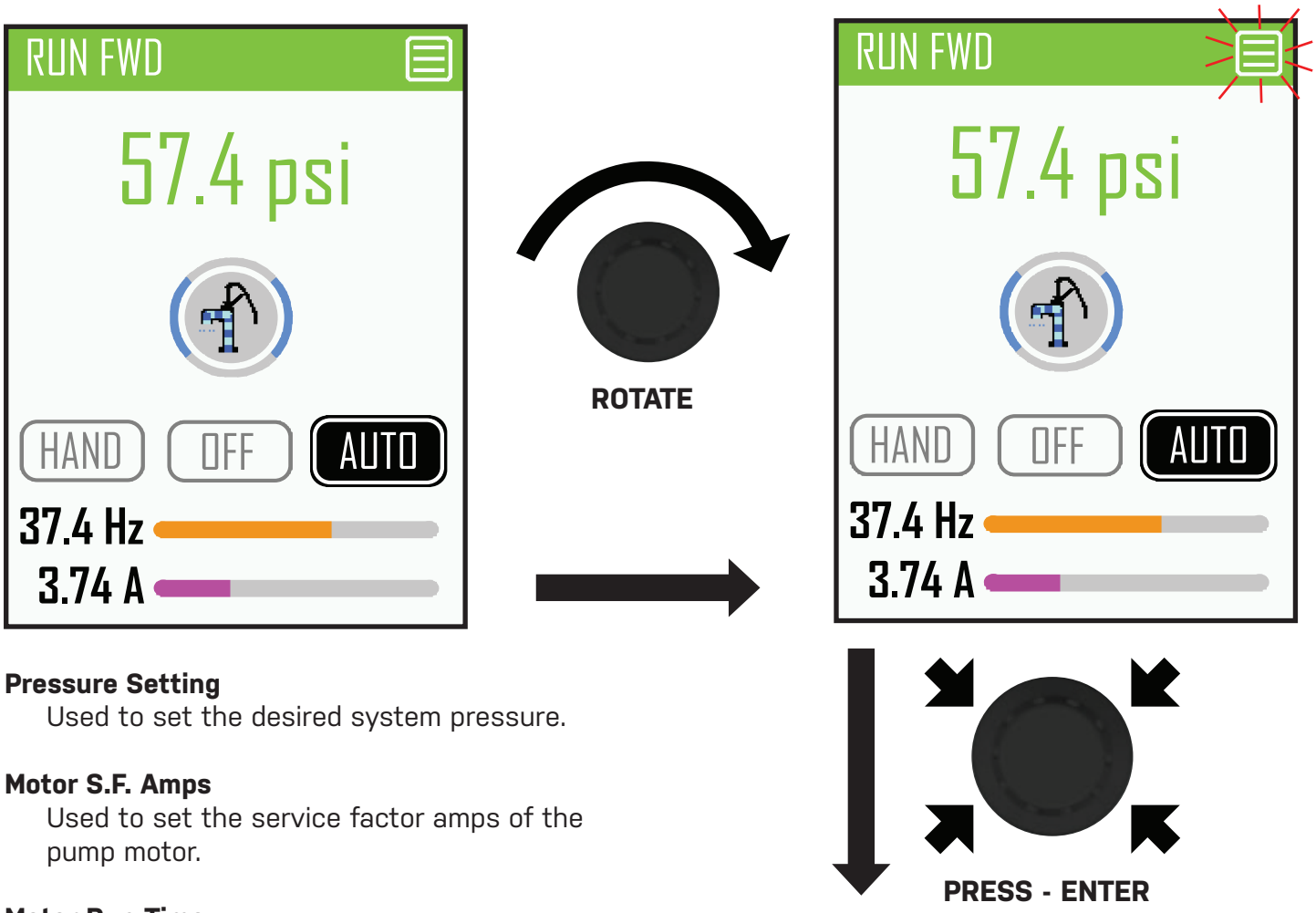
The main screen shows an overview of the system status including any active alarms.



USER INTERFACE



MAIN MENU



Pressure Setting
Used to set the desired system pressure.

Motor S.F. Amps
Used to set the service factor amps of the pump motor.

Motor Run Time
View the accumulated run time of the pump.

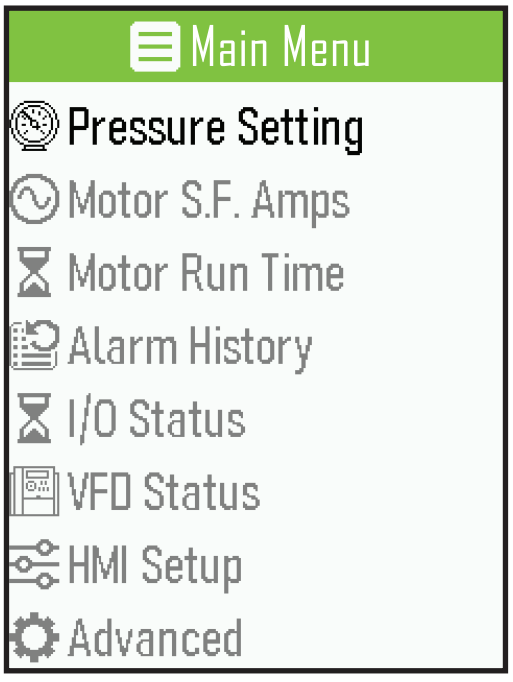
Alarm History
View the history of the last 10 stored faults.

I/O Status
View the status of the H2O Drive's analog input, digital inputs, and alarm relay output.

VFD Status
View the H2O Drive's status. This includes output voltage, output current, output frequency, output power, and DC bus voltage.

HMI Setup
Used to configure the display's color theme, as well as set up the password protection.

Advanced
Used to set advanced functions.



Setting	Min.	Max.	Units	Default	Description
Enter Password	00-00	99-99		00-00	Only displays if a password is required.
Pressure Setting	0	Transducer Range	PSI	60	Enter the target pressure to maintain
Motor S.F. Amps	1.80	7.50	A	5.90	RD150 default set for: 1.5HP, 230V, 60Hz, 5.9 SFA
	2.50	11.00		10.90	RD300 default set for: 3.0HP, 230V, 60Hz, 10.9 SFA
	8.00	17.80		17.80	RD500 default set for: 5.0HP, 230V, 60Hz, 17.8 SFA
	8.00	31.80		26.40	RD750 default set for: 7.5HP, 230V, 60Hz, 26.4 SFA
HMI Setup Menu					
Color Theme	Blue/Dark, Green/Dark			Green/Dark	The color palette used for the display.
Password Setup	00-00	99-99		00-00	Will not display if the user has not yet entered the correct password. 00-00 will disable password protection.
Advanced Menu					
Start Pressure Diff.	0	Set Pressure -1	PSI	5	Pressure drop before starting the pump (Wake up).
High Pressure Alarm	0	Transducer Range	PSI	80	Will automatically be set 20 PSI above Pressure Setting during Quick Start.
Low Pressure Alarm	0	Set Pressure -1	PSI	15	
Low Pressure Delay Time	0	999	sec	30	
Dry Run Amps	0.00	Motor S.F. Amps	A	0.00	0.00A = Dry Run Disabled
Dry Run Delay Time	0	999	sec	20	
Dry Run Reset Mode	Auto-Reset	Manual-Reset		Auto-Reset	
Dry Run Recharge Time	0.1	9.9	hr	1.0	
Motor Voltage	200.0	240.0	V	230.0	Motor nameplate Voltage. Cannot be greater than the measured incoming voltage to the control panel.
Sleep Frequency	0.00	Max Frequency	Hz	35.00	Frequency at low flow. Timer will start when Hz < Sleep Hz.
Sleep Time	0.0	3600.0	sec	10.0	Delay before stopping the pump in sleep mode (no flow).
Min. Frequency	20.00	Max Frequency	Hz	30.00	Lowest Hz the pump is allowed to Run before Stopping in sleep mode.
Max. Frequency	35.00	80.00	Hz	60.00	Highest Hz the pump is allowed to Run when Pressure < Set Pressure. Do not set >60Hz without consulting with the pump manufacturer and sizing the motor/VFD correctly.
1st Accel	0.0	300.0	sec	2.0	Initial acceleration on pump start.
1st Decel	0.0	300.0	sec	2.0	
Accel/Decel 2	0.0	300.0	sec	2.0	
Accel 2 Switchover Hz	0.00	60.00	Hz	30.00	
PID - Proportional	0.1%	500.0%	%	35.0%	Expert users only.
PID - Integral	0.1	100.0	sec	1.0	Expert users only.
Transducer Range	1	300	PSI	150	Match the pressure transducer range.
Transducer Offset	-10.0	10.0	PSI	0.0	Used to adjust the pressure transducer reading higher or lower.
HAND Run Time	0	999	min	5	The timer will stop the pump when operating in Manual. 0 = no timeout (Continuously Run at Manual Hz)
HAND Speed	30.00	Max. Frequency	Hz	45.00	
Carrier Frequency	0.7	10	kHz	2	

PARAMETER DESCRIPTIONS

BASIC SETTINGS

- **Enter Password**
  If password protection has been enabled in the Password Setup menu, the user must enter the correct password to be allowed to change any settings. Once entered correctly, the settings are "unlocked" and may be edited. After no inputs from the user for 5 minutes, these settings will become "locked" until the correct password is entered once again.
- **Pressure Setting**
  Pressure Setting is the target pressure to be maintained at the pump discharge. It cannot exceed the maximum range of the pressure transducer.
- **Motor S.F. Amps**
  The VFD's electronic overload will signal an overload fault and protect the motor from damage in the event of an overload condition. Set the Motor S.F. Amps setting to the motor nameplate Service Factor Amps (SFA) for submersible pumps.

HMI SETUP

- **Color Theme**
  This adjusts the colors used in the HMI display screens.
- **Password Setup**
  When a password is set up, the user will only be able to view settings on the HMI but cannot change them, unless they first enter the correct password in the Enter Password menu. Set Password Setup to any 4-digit password 00-01 through 99-99 to enable this password protection. **Be sure this is a password you will remember, or write the password down in a secure location for your future reference.** Set Password Setup to 00-00 to disable password protection. Note: When password protection is enabled, this setting will not be accessible until the user enters the correct password in the Enter Password setting.

ADVANCED SETTINGS

- **Start Pressure Diff.**
  The Start Pressure Diff. is the amount of pressure drop from the Pressure Setting, at which the VFD will wake from sleep and run to maintain the system pressure. The pump will start if the pressure drops below the Pressure Setting minus the Start Pressure Diff. Example: If the Pressure Setting is 40 PSI and the Start Pressure Diff. is 5 PSI, the pump will start when the pressure drops below 35 PSI.
- **High Pressure Alarm**
  Set the High Pressure Alarm setting to the pressure at which the VFD output will shut off due to high system pressure. There is a 2 second delay before the VFD will activate the High Pressure Alarm. If system pressure drops below the High Pressure alarm setting for 10 seconds, the high pressure alarm will automatically reset and normal operation of the VFD will resume.
- **Low Pressure Alarm**
  The Low Pressure Alarm will activate when both of the following conditions persist for the amount of time defined in Low Pressure Delay Time:
  1) The pump is running at Max. Frequency.
  2) The measured pressure is below the Low Pressure Alarm setting.
  This alarm will stop the pump, and must be manually reset. Set Low Pressure Alarm to "0" to disable the alarm.

- **Low Pressure Delay Time**
  Delay before stopping the pump on Low Pressure Alarm (default 20 sec).
- **Dry Run Amps**
  The Dry Run Amps alarm will activate when all three of the following conditions persist for the amount of time defined in Dry Run Delay Time:
  1) The pump is running at Max. Frequency.
  2) The measured pressure is below the Pressure setting.
  3) The pump current is below the Dry Run Amps setting.

  This alarm will stop the pump, and can be reset manually or automatically, depending on the Dry Run Reset Mode setting. While the above three conditions are true, a Dry Run warning will display on screen showing a timer counting down to the Dry Run Alarm trip. Set Dry Run Amps to 0.00 to disable Dry Run detection.
- **Dry Run Delay Time**
  Delay before stopping the pump on a Dry Run Alarm.
- **Dry Run Reset Mode**
  If Dry Run Reset Mode is set to Auto Reset, once a Dry Run Alarm is active, a countdown timer will begin according to the Dry Run Recharge Time setting. After that timer reaches zero, the Dry Run alarm will be cleared, and the pump will be allowed to run again. If Dry Run Reset Mode is set to Manual Reset, then the user must reset a Dry Run Alarm manually through the main screen.
- **Dry Run Recharge Time**
  Delay before automatically re-starting the pump after a Dry Run Alarm.
- **Motor Voltage**
  Set the Motor Voltage setting to the voltage rating found on the motor nameplate. This value must not exceed the voltage of the incoming power.
- **Sleep Frequency**
  Set the Sleep Frequency to the frequency at which the pump no longer builds pressure when operating at or near the Set Pressure. The VFD will enter the "sleep" mode when the output frequency of the VFD drops below the Sleep Frequency for a period of time (Sleep Time).
- **Sleep Time**
  Set the Sleep Time to the amount of time that the VFD will wait before entering "Sleep"mode after the output frequency drops below the Sleep Frequency. Note: If the system cycles on and off too frequently, try the following: increase the Sleep Time, lower the Sleep Frequency, or increase the Start Pressure Diff. A combination of changes of all three settings may be necessary. If the VFD does not enter "Sleep" mode when there is no flow of water in the system, the Sleep Frequency must be increased.
- **Min. Frequency**
  The Min Frequency should be set to the minimum output frequency that the pump should be allowed to run. Contact your pump manufacturer to obtain the pump safe operation ranges.
- **Max. Frequency**
  The Max Frequency should be set to the maximum output frequency that the pump should be allowed to run. Contact your pump and motor manufacturer for motor selection and operation above 60 Hz.
- **1st Accel.**
  Set the 1st Accel. time to the rate at which the output frequency will accelerate from 0Hz to the Accel 2 Switchover Frequency. This time is based on the time the VFD would take to accelerate from 0Hz to 60Hz. Example: If the pump is required to accelerate from stop to 30Hz in 1 second the 1st Accel. time should be set to 2 seconds.

- **1st Decel.**
  Set the 1st Decel. time to the rate at which the output frequency will decelerate from the Accel 2 Switchover Frequency to a stop. This rate is based on the time the VFD would take to decelerate from 60Hz to 0Hz. Example: If the pump is required to decelerate from 30Hz to a stop in 4 seconds the 1st Decel. time should be set to 8 seconds.
- **Accel/Decel 2**
  Set the Accel/Decel 2 time to the rate at which the output frequency will change as the VFD is operating above the Accel 2 Switchover Frequency. This time is based on the time the VFD would take the accelerate or decelerate between 0Hz to 60Hz.
- **Accel 2 Switchover Hz**
  The Accel 2 Switchover Hz frequency should be set to the frequency at which the acceleration and deceleration rates change. This is typically used on submersible type pumps, where the manufacturer requires a fast acceleration from a stop to 30Hz for proper thrust bearing operation.
- **PID - Proportional**
  The PID - Proportional term is intended to be adjusted by advanced users only.
  The PID Proportional term is used to adjust the reaction of the output frequency to changes in the system pressure. Decreasing the PID - Proportional term will allow the VFD to make larger corrections to the output frequency with differences between the Set Pressure and actual system pressure. Increasing the PID - Proportional term will allow the VFD to make smaller corrections to the output frequency with differences between the Pressure Setting and actual system pressure.
- **PID - Integral**
  The PID - Integral term is intended to be adjusted by advanced users only. The PID - Integral term is used to adjust how quickly the output frequency reacts to changes in the system pressure. Decreasing the PID Integral term will allow the VFD to make quicker corrections to the output frequency with differences between the Pressure Setting and actual system pressure. Increasing the PID Integral term will allow the VFD to make slower corrections to the output frequency with differences between the Pressure Setting and actual system pressure.
- **Transducer Range**
  If using a different transducer other than supplied, set the Transducer Range to the full span rating of the pressure transducer. The Pressure Setting and Start Pressure Diff. values must also be updated after changing the Transducer Range, as these values are automatically scaled based on the Transducer Max Range.
- **Transducer Offset**
  The measured pressure can be adjusted up or down as desired to adjust to any small offset errors that may be present. For example, if there are other pressure gauges in the system more accurate than the VFD's 4-20mA sensor. Adjust the Transducer Offset value to a positive or negative value as needed until the displayed pressure shows the desired reading. This positive or negavite value will be added to all pressure readings.
- **HAND Run Time**
  When in HAND, the pump will run at the HAND Speed for the number of minutes set in HAND Run Time if the user does not switch back to OFF or AUTO before that. The pump will stop when the HAND Run Time is done, at which point the controller will switch back to OFF mode. Set to 0 minutes to disable this protective function, allowing the pump to run in HAND mode indefinitely.
- **HAND Speed**
  This is the constant speed at which the pump will run while it is in HAND mode.
- **Carrier Frequency**
  This is the PWM switching frequency for the VFD inverter output.

- **Factory Reset**
  This will reset all user settings and VFD parameters to their factory default values. The user must select "Confirm" when prompted "Are You Sure?" for the factory reset to be performed.

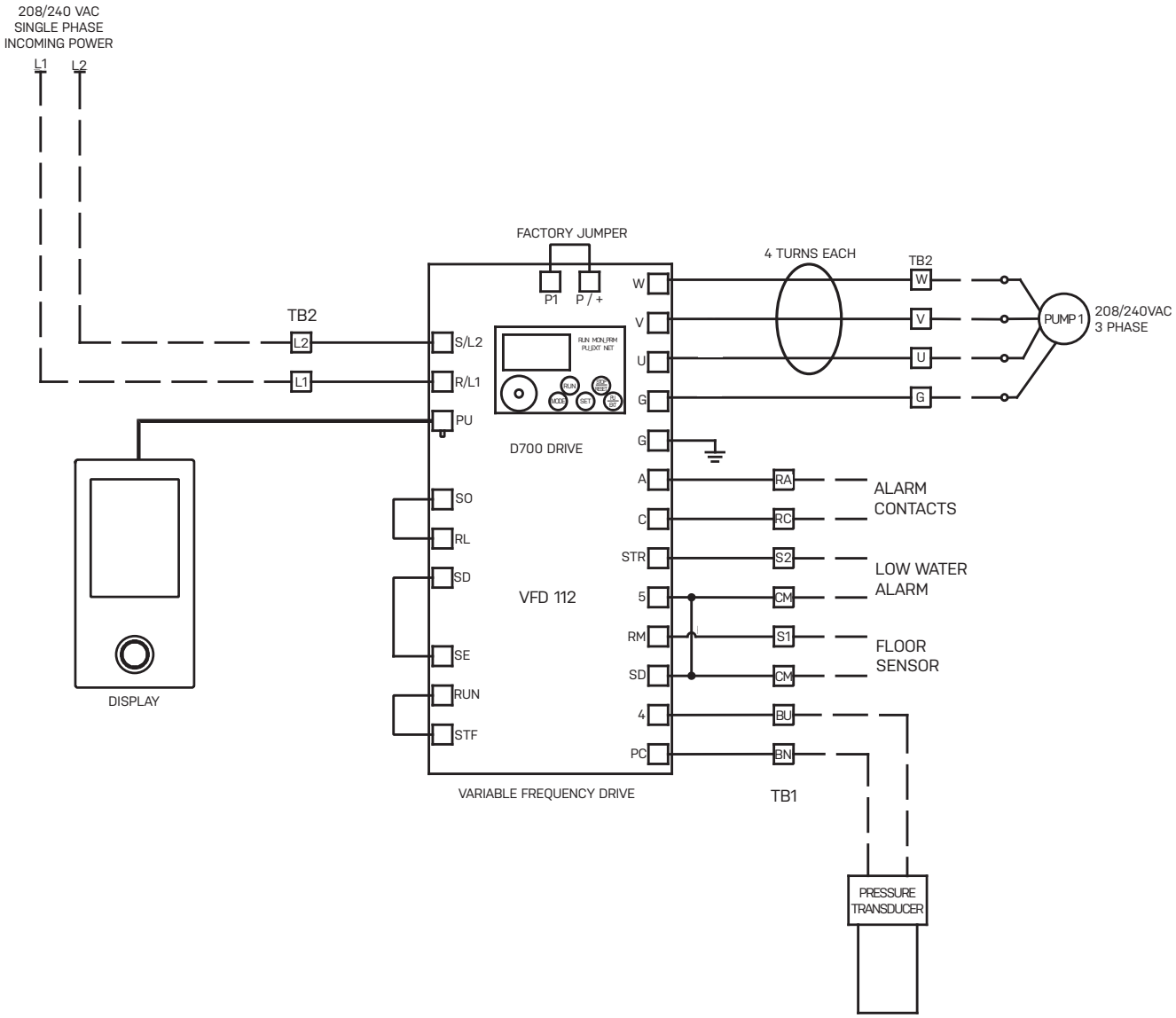
TUNING & TROUBLESHOOTING GUIDE

- **Testing & tuning the system:**
  To optimize the system, it is necessary to test run the pump and record the following parameters: Pressure, Hz, & Amps. All are visible on the main screen of the display. Adjustments can then be made to optimize the system performance.
- **Pressure Overshoot:**
  Open multiple valves (faucets). Check to see if the pressure drops and the pump starts. Ensure that the pump starts when pressure drops below the setpoint – differential.
  As the pump starts and ramps up, leave the valves open and ensure the pressure increases rapidly and reach the set pressure. Record the Amp reading when the pump is running at full speed (60Hz). It is not uncommon for the pressure to overshoot the setpoint by 2~8 PSI. If the overshoot is excessive (causing a high-pressure alarm), check the following (in order of importance. Only go to the next step after completing the first one. Do not go to the next step if the previous one fixes the problem. Do not change multiple parameters at the same time)
  1) Check sizing and pre-charge of the pressure tank (Hydropneumatic tank)
  2) Reduce the PID integral term. (From 1.0 to 0.8 sec)
  3) Decrease the Max Frequency by 3Hz and try again
- **Dry Run:**
  The pump will shut down when running at full speed (60Hz) and is not able to meet the set pressure and has low amps. Record the Amp reading during normal pumping conditions and set the "Dry Run Amps" at 20% under this value. If the well is low producing, it is possible to set a Recharge timer. The Dry Run alarm will automatically reset at the end of the Recharge timer and the pump will run again.
- **Excessive cycling:**
  If the pump is cycling too often, check the following:
  Sleep Frequency: Lower by 2Hz and try again.
- **Not shutting off:**
  If the pump does not shut off when there is no flow (all valves closed), check the following:
  Raise the Sleep Frequency 3Hz above the frequency observed when running at no flow.
  Check sizing and pre-charge of the pressure tank (Hydropneumatic tank).

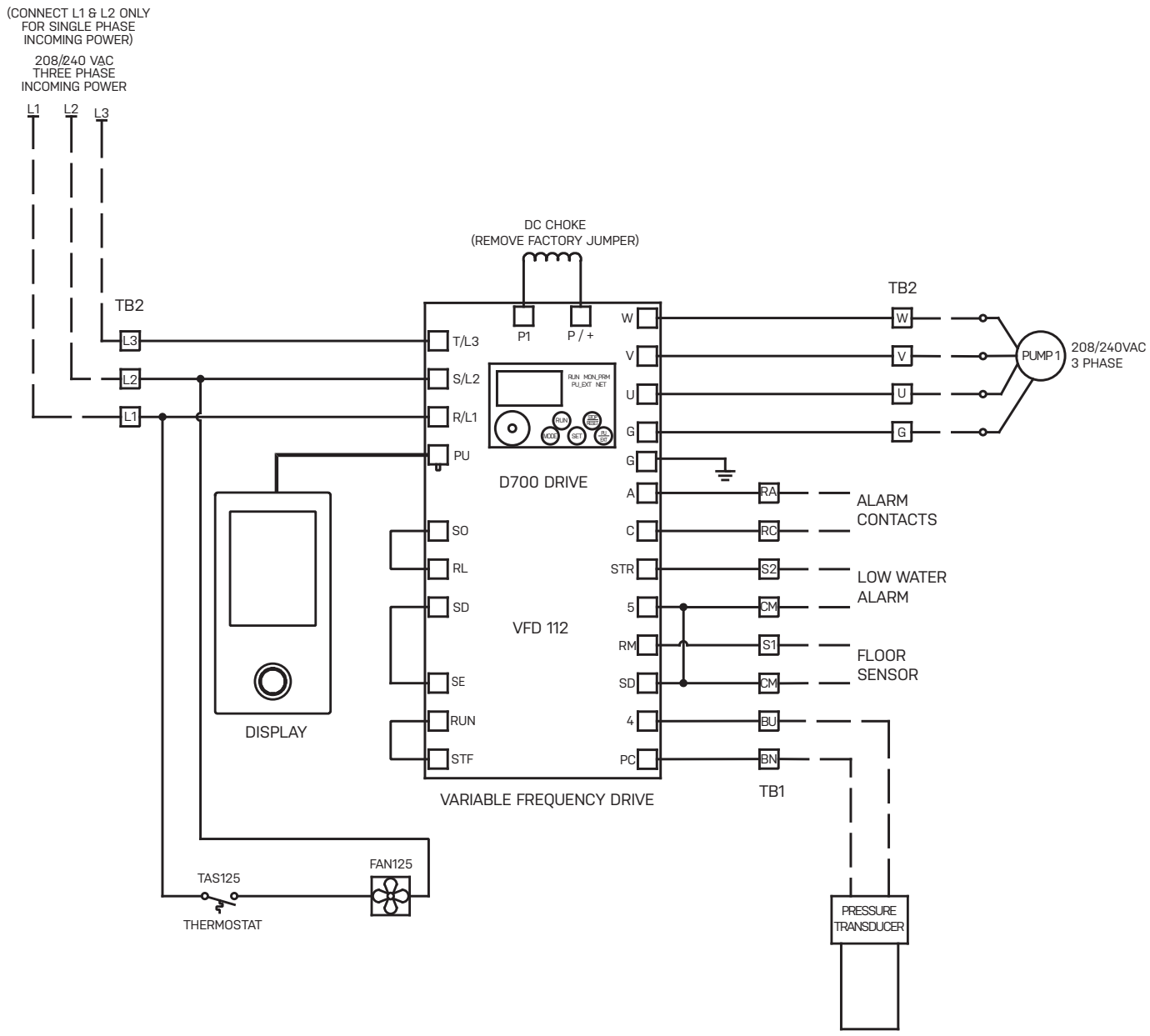
ERROR MESSAGES

	MAIN DISPLAY MESSAGE	DESCRIPTION OF FAULT ALARM
SYSTEM FAULTS	HMI Communication Lost	Loss of communications between VFD and display
	Pressure Sensor Failure	Pressure transducer fault (Analog input <3.7mA or >20.7mA)
	High Pressure Alarm	Pressure > High Pressure Alarm setpoint
	Low Pressure Alarm	Pressure < Low Pressure Alarm setpoint
	Floor Sensor Alarm	Floor Sensor digital input is active, VFD is shut down.
	Low Water Alarm	Low Water digital input is active, VFD is shut down.
	DRY RUN (Flashing)	Pump Amps low / VFD full speed / pressure under setpoint--Impending shut down (timer counting down)
	DRY RUN	Run Dry Fault (Auto-Reset timer counting down or Manual Reset required).
VFD FAULTS		
	Over-current During Accel	E. OC1 Overcurrent Trip During Acceleration
	Over-current (Const Speed)	E. OC2 Overcurrent Trip During Constant Speed
	Over-current During Decel	E. OC3 Overcurrent Trip During Deceleration
	Over-voltage 1	E. OV1 Regenerative Overvoltage
	Over-voltage 2	E. OV2 Regenerative Overvoltage
	Over-voltage 3	E. OV3 Regenerative Overvoltage Trip
	VFD Overload Trip	E. THT Inverter Overload Trip
	Motor Overload Trip	E. THM Motor Overload Trip
	VFD Overheat	E. FIN Overheat
	Stall Prevention	E. OLT Stall Prevention
	Ground Fault	E. GF Output Side Earth (ground)
	Output Phase Loss	E. LF Output Phase Loss
	Inrush Current Limit	E. IOH Inrush Current Limit Circuit
	Invalid Analog Input	E. AIE Analog Input Fault
	VFD EEPROM Fault	E. PE Parameter Storage Device Fault
	Fault Retry Exceeded	E. RET Retry Count Excess
	VFD CPU Fault	E. 5/E CPU fault
	Output Amps Detection	E. CDO Output Current Detection Value Exceeded
	VFD CPU Fault	E. CPU VFD CPU Fault
	Input Phase Loss	E. ILF Input Phase Loss
	Brake Transistor Alarm	E. BE Break Transistor Alarm Detection
	External Thermal Overload	E. OHT External Thermal Relay Operation
	External Thermistor Trip	E. PTC Thermistor Operation
	Disconnected PU	E. PUE PU Disconnection
	Safety Circuit Fault	E. SAF Safety Circuit Fault

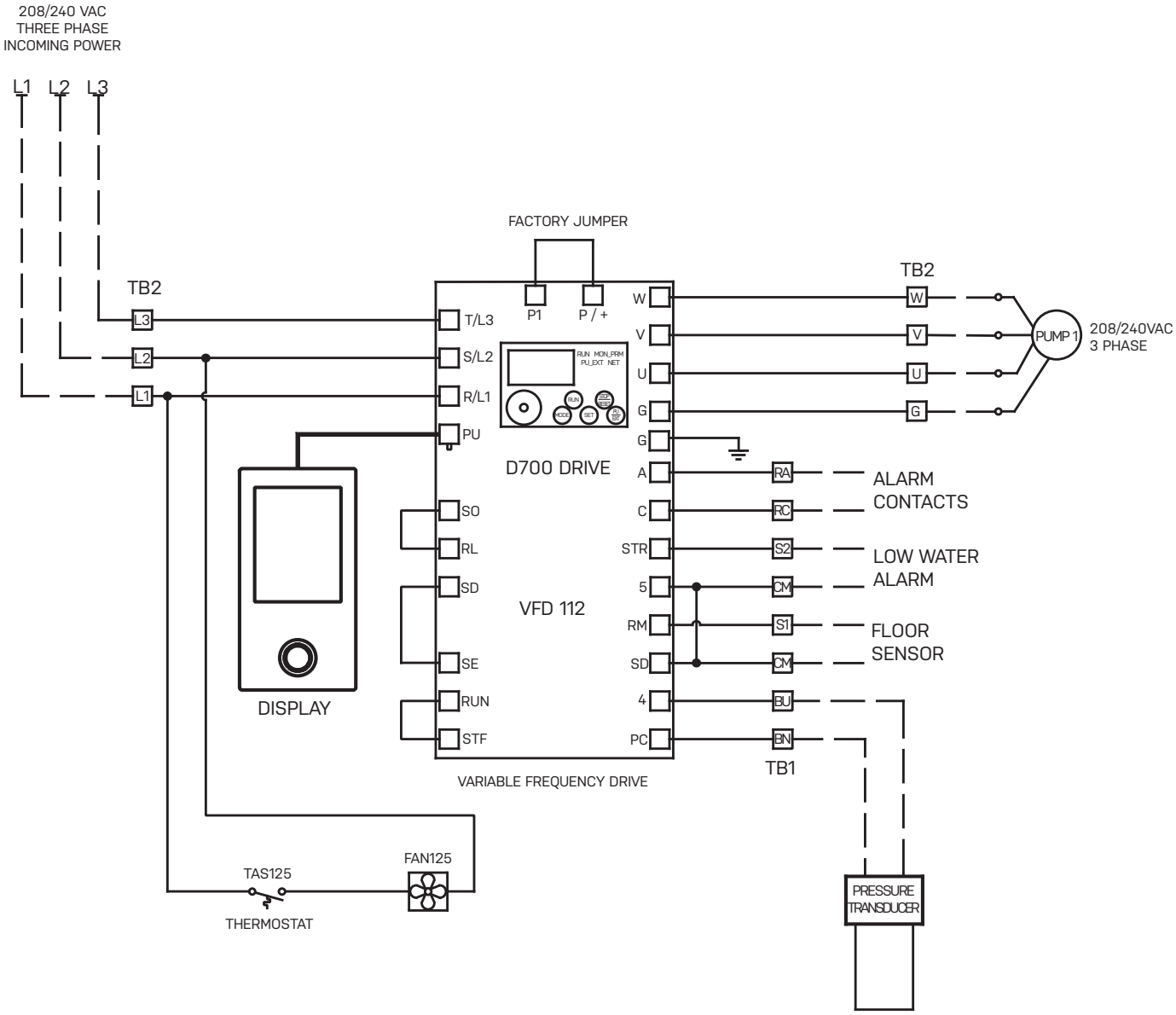
RD150 & RD300 SCHEMATIC



RD500 SCHEMATIC



RD750 SCHEMATIC



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