

# Pump Quickstart Guide



## Wiring

Warning: Input, Output and Control wiring must be in separate conduits

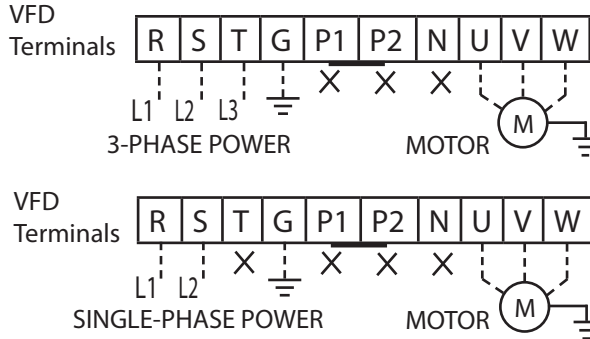
Note: **Do not** wire any wire to the DC bus "P1", "P2" & "N" terminals.

### VFD Only

Verify correct input voltage and wiring to the VFD power and motor terminals. Connect 3-phase input power wires to VFD terminals R, S & T or single-phase power wires to VFD terminals R & S.

Connect 3-phase motor wires to VFD terminals U, V & W.

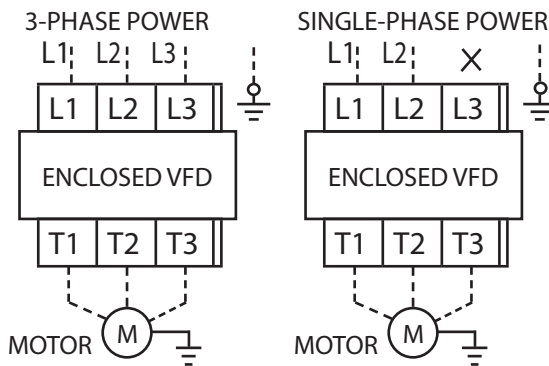
Connect power source ground wire and motor ground wire to VFD ground terminal.



### Enclosed VFD

Verify correct input voltage and wiring to enclosed VFD panel power and motor terminals. Connect 3-phase input power wires to enclosure or disconnect terminals L1, L2 & L3 or single-phase power wires to terminals L1 & L2.

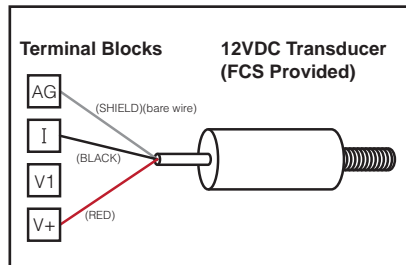
Connect 3-phase motor wires to enclosure terminals T1, T2 & T3. Connect power source ground wire and motor ground wire to enclosure ground terminal.



**Control Wiring:** The start dry contact should be wired to VFD terminals CM and M7 or 1 and 2 in enclosed VFD panel. If jumper is installed on start terminals, VFD will run when power turned on.

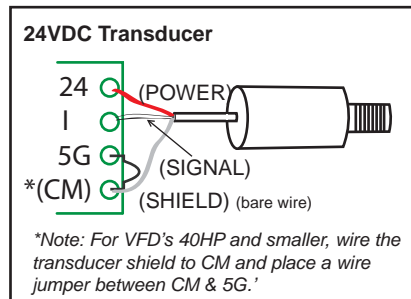
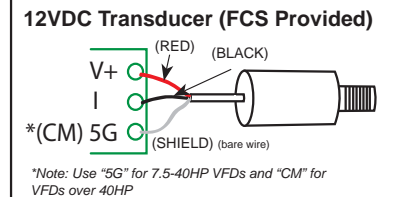
### Transducer:

**Enclosed Drive Instructions:**  
(terminals mounted on back panel)



Notes:  
1) Put shrink tube or electrical tape on bare shield wire to prevent short circuit of any VFD terminals.  
2) Wiring may vary for non-FCS provided transducers

### Stand Alone Drive Instructions:



### Main Display:

DRV ▶ T/K 0.0A  
00L STP 0.00Hz

**DRV** - Current parameter group. (SET, DRV, FG1, FG2, I/O, APP, EXT & COM)

**00L** - Shows the current parameter number within a current group. An 'L' will appear when VFD is switched to Local control mode by either LOC/REM key or digital input.

**T** - Shows source for VFD start/stop operation (T = Remote, K = Keypad, O = Communication Protocol).

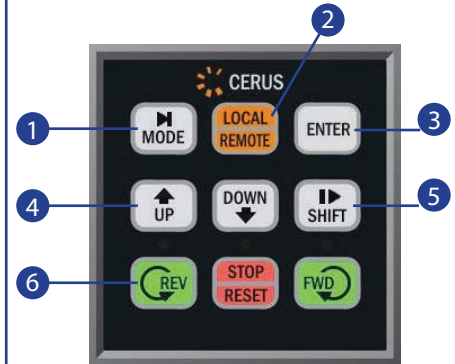
**K** - Shows source for VFD frequency command (K= Keypad, V= 0-10VDC, I= 4-20mA, O= Communication)

**0.0A** - Shows the actual motor current

**STP** - Shows the current status of the VFD (STP = Stop, FWD = Forward, REV = Reverse)

**0.00Hz** - Shows frequency reference or PID set-point in VFD stop mode and actual VFD output frequency in VFD run mode.

## Keypad Programming



- 1 Mode:** Use to cycle through parameter groups: SET>DRV>FG1>FG2>....
- 2 Loc/Rem:** Toggles between Local and Remote operation
- 3 Enter:** Use to enter programming mode of any parameter as well to submit a change. A flashing cursor will appear when VFD is in programming mode.
- 4 Up & Down:** Use to cycle through parameters of the current group. Use to adjust parameters when in programming mode.
- 5 Shift:** Use to cycle backwards through parameter groups. When in programming mode, use to shift cursor to the right (one position per press).
- 6 Rev, Stop/Reset & Fwd:** Use to Start and Stop VFD Forward or Reverse in Local mode. Use Stop to reset VFD fault.

**Transducer verification** – From main DRV-00 screen go to DRV-98 by pressing Down key . The reading is in 4-20mA range and it should match to transducer output current. If reading is less than 4mA, verify transducer wiring and voltage on V+ and 24 terminals.

**Transducer placement:** Placing the transducer too close to the pump discharge may cause oscillations and improper operation of the VFD.

Note: If two transducers are used for redundancy, refer to VFD manual for details.



**WARNING:** Submersible pumps can develop very high pressure in some situations. Always use a properly selected and installed pressure relief valve to prevent damage and injury from over-pressurization of pipes and tanks. Installation of cut-off pressure switch is recommended.

# System Initial Start Up & Control Settings

The majority of drive setups can be accomplished by going through only one group; the setup [SET] group. This group was designed to have start-up specific parameters to make start-up easy. Navigate to the SETUP group [SET] by pressing the SHIFT button once from the main screen. Your display will show SET in the upper left hand corner of the display.

## Parameter Programming Description

- 1) Press [MODE] or [SHIFT] key until the desired parameter group is displayed.
- 2) Press UP [▲] or DOWN [▼] keys to scroll to the desired parameter. If you know the desired parameter number, you can set its number in the first parameter #00 “Jump code” of any parameter group (except SET and DRV groups) and after pressing [ENTER] key display will show that parameter.
- 3) Press [ENTER] key to enter the programming mode, which is indicated by a flashing cursor. Some parameters cannot be changed during VFD run or fault modes. Refer to the manual to check if desired parameter can be programmed during run.
- 4) For selectable parameters press [▲] or [▼] keys to change parameter selection.  
When programming a numerical value, the value will be changed from maximum to minimum by pressing UP or DOWN key. In order to change any digit in a numeric value, use the SHIFT key to move the flashing cursor to that digit and UP or DOWN keys to adjust the selected digit.
- 5) Press [▲] or [▼] keys to change the digit in numerical parameter value.
- 6) Press [ENTER] key to finish programming for this parameter. The flashing cursor disappears.

## Verify Basic Settings

SET ▶ App. Select 00      None	<b>APPLICATION SELECTION:</b> Select either Submersible or Circulating pump to load preset programming. Refer to the parameter table at the end of this quick-start for presets.
SET ▶ Input Phase 01      3-Phase	<b>INPUT POWER # OF PHASES:</b> Default is 3-Phase. Select 1-Phase for single-phase to three-phase conversion application which will change a motor HP rating setting to 50% of the VFD rating.
SET ▶ Motor HP 02      7.5 HP	<b>RATED MOTOR HP:</b> Put the motor horsepower rating from the motor nameplate.
SET ▶ Motor FLA 03      2.2 A	<b>RATED MOTOR CURRENT:</b> Put the motor FLA (full load amps) rating from the motor nameplate.
SET ▶ F/B Unit Max 25      100.0 PSI	<b>PRESSURE TRANSDUCER RANGE:</b> The SET-25 default is for a 0-100PSI transducer. Program the maximum range of your pressure transducer. E.g. Program a value of 250PSI for a 250PSI transducer.
SET ▶ PID SetPoint 26      50.0 PSI	<b>PRESSURE SET-POINT:</b> Set SET-26 to desired pressure (psi) that VFD needs to maintain. The default is 50PSI and can be changed to any number within pressure transducer range. The pressure Set-point can be changed in DRV-00 parameter in remote mode too (in local mode it shows Hz).

## Verify Rotation

Move HOA switch to AUTO position and the VFD will begin to run the motor. Check the output flow and verify proper rotation. If rotation is incorrect, stop the VFD, turn the VFD power off and wait 5 minutes. Swap two motor leads to change rotation.

## Advanced Control Features

**These parameters are set to optimal and safe default settings for the Submersible Pump application and can be changed in the field to fit application requirements. You may need to adjust some parameters to provide better control for your system.**

### - Pre-PID Settings (Pipe Fill Mode)

Pre-PID is designed for pump systems with long pipes that require filling pipe at every start. Upon PrePID time delay expiration or when system pressure (PSI) exceeds the PrePID Exit Level, the VFD will switch to PID control and maintain a system pressure at pressure set-point.

Note: SET-36 is set to 0.0Hz (Pre-PID is disabled by default) and can be enabled by changing SET-36 frequency.

SET ▶ PrePID freq 36      42.00 Hz	<b>PRE-PID FREQUENCY:</b> Navigate to SET-36 and put VFD frequency at which drive will run to fill an empty pipe. Set this parameter for frequency above PID Low Frequency Limit and VFD will run to fill the pipe system for the time delay set in SET-37 or until pressure exceeds the exit level set in SET-38. Default setting is 0.0 Hz.
SET ▶ PrePID dly 37      30 sec	<b>PRE-PID STOP DELAY:</b> This sets the time to fill an empty pipe. Test how much time it takes to fill an empty pipe during startup and adjust as necessary. Default setting is 180 sec.
SET ▶ PrePID Exit 38      25.0 PSI	<b>PRE-PID EXIT LEVEL:</b> PSI level above which the VFD will switch to PID control mode to maintain a system pressure at set-point. Default setting is 25 PSI.

## - Broken Pipe Trip

Broken Pipe will stop VFD operation if a broken pipe is detected while running in PID control mode to protect from flooding the field. For trip specifics, please refer to the installation & operation manual

SET ▶ Pbroken Mode  
40 Yes

**BROKEN PIPE MODE:** Set to YES to enable, NO to disable. Default setting is NO. If the following three parameters are met simultaneously, VFD will trip on a broken pipe fault.

SET ▶ PbrokenFreq  
41 59.00 Hz

1) If drive is running over the speed indicated in SET 41,

SET ▶ PbrokenDly  
42 30 sec

2) If drive is running longer than time indicated in SET 42,

SET ▶ Pbroken F/B  
43 50

3) If the pressure is below PSI indicated in SET 43.

## - UnderLevel Protection (Dry Well)

Underlevel trip (known as dry well protection) is designed to trip the VFD when the pump motor current draw is less than SET-78 for SET-77 time delay when VFD output frequency is above SET-76. For submersible pumps it is typically 65-70% and for centrifugal pumps 30-35%. For the correct adjustment check with motor manufacturer.

SET ▶ Level Detect  
74 Under Level

**LEVEL DETECTION:** Change SET-74 to NO to disable. Default setting is UnderLevel.

SET ▶ LDT Level  
78 0.0 A

**UNDERLOAD AMPERAGE:** Adjust SET-78 to 65-70% of SET-03 (FLA) for submersible and 30-35% for centrifugal pump. Default setting is 0.0 A.

SET ▶ LDT Fill Time  
81 60.0 min

**WELL FILL TIME:** If parameter SET-80=YES, SET-81 fill time setting should be sufficient to fill the well before VFD attempting to start again. Default setting is 60.0 min. If VFD trips again on Under Level fault during restart attempt, the SET-81 value will be doubled for next restart.

## - Setting Sleep Mode

Sleep mode will stop the VFD in no-demand condition when system pressure is slightly above SET-26 set-point and output frequency is below SET-32 Sleep mode frequency setting for SET-33 Sleep mode delay time. The most critical step is to determine and set a correct SET-27 PID Frequency Low Limit.

### Determine No-Demand Frequency and PID Frequency Low Limit

SET ▶ PID Limit-L  
27 30.00 Hz

**PID LIMIT LOW:** Turn the HOA switch to Auto position and run system with No demand. When system pressure is at pressure set-point and frequency is stabilized, add 1Hz to this frequency and set it in SET-27. If system pressure is above pressure set-point, the first of three conditions for activation of the Sleep mode is met. For Flat curve pumps Minimum frequency is typically 53-54Hz.

SET ▶ Sleep Freq  
32 35.00 Hz

**SLEEP MODE FREQUENCY:** Set this parameter to [SET-27]+0.5Hz. If VFD frequency is below SET-32, the second condition for activation of the Sleep mode is met.

SET ▶ Sleep Delay  
33 20 Sec

**SLEEP MODE DELAY TIME:** The SET-33 is a delay time to activate Sleep Mode when other two conditions are met. If any of two above conditions is off, the Sleep Delay Timer will be reset.

SET ▶ WakeUp Level  
35 2%

**WAKE-UP LEVEL:** The SET-35 is a percentage of SET-25 pressure transducer range. The VFD will wake-up if system pressure is less than wake-up pressure that can be calculated  $[\text{SET-26}] - ([\text{SET-25}] * [\text{SET-35}] / 100)$ . For 100PSI transducer the SET-35 value equals to PSI (2% would be 2PSI).

**Sleep Boost Mode:** When pump system is ready to go into Sleep mode, it can increase a system pressure by some PSI to prevent short cycling at low demand changes.

SET ▶ Sleep Boost  
34 3.0 PSI

**SLEEP BOOST:** The VFD will boost the system pressure by the programmed in SET-34 value before going to sleep. Default is 3PSI for submersible and 2PSI for Centrifugal pumps. Program a value of 0PSI to disable this feature.

SET ▶ Boost Timer  
47 10 sec

**SLEEP BOOST TIMER:** When VFD is ready for sleep mode it will increase pressure set-point by Sleep Boost value. When Set-point is met or Sleep Boost Timer SET-47 expires, VFD will activate sleep mode.

**Pipe Leak protection:** Refer to VFD manual for detailed description on Dual Demand and Pipe Leak features.

**Pump Speed Limit by Well Water Level:** Refer to VFD manual for details. Requires well level transducer.

## System Validation

1. Switch HOA in the AUTO position with low demand and run VFD for one minute after the system is at pressure set-point. The VFD should maintain a set-point and not go into sleep mode.
2. Close demand completely and VFD should drop frequency to minimum and after delay time it should boost system pressure (if boost is enabled) and go to sleep mode.
3. Open low demand and VFD should wake up after pressure drops below the wake-up pressure.
4. Run VFD with different demand levels to check if control is stable.

### - Saving Parameters

Saving parameters to the keypad is recommended after the start-up is performed and you are satisfied with pump system operation. If the programming is changed later and your VFD is no longer operating the way you intended it to, you can always load your previously saved parameters from the keypad. Additionally, the programmed keypad can be used to copy same parameter settings to another VFD.

FG2 ▶ Para.Read  
91 Yes

**SAVE PARAMETERS TO KEYPAD:** Change FG2-91 to YES to save parameters to the keypad. After pressing ENTER key, this parameter will go back to NO after saving is done (approximately one minute).

FG2 ▶ Para.Write  
92 Yes

**LOAD PARAMETERS FROM KEYPAD:** Change FG2-92 to YES to load parameters from the keypad. After pressing ENTER key, this parameter will go back to NO after loading is done (approximately one minute).

## Factory Programmed Parameters

Function	Parameter	Description	Submersible	Circulating
Setup	SET-04	Motor RPM	3600 rpm	1800 rpm
	SET-11	VFD acceleration time	2 sec	20 sec
	SET-12	VFD deceleration time	2 sec	30 sec
	SET-16	Stop mode	Coast	Decel
	SET-20	PID Operation	YES	YES
	SET-21	PID Feedback Signal	I (4-20mA)	I (4-20mA)
	SET-22	Feedback unit	PSI	PSI
	SET-25	Transducer Range	100 PSI	100 PSI
	SET-26 & DRV-00	Pressure Set-Point	50 PSI	50 PSI
	SET-27	PID low limit frequency	30hz	30hz
Sleep Mode	SET-32	Sleep Frequency	35hz	35hz
	SET-33	Sleep mode delay time	10 sec	20 sec
	SET-34	Sleep mode boost value	3 PSI	2 PSI
	SET-35	Sleep mode wake-up level	8%	2%
	SET-47	Sleep Boost Timer	10 sec	10 sec
Pipe Fill	SET-36	Pre-PID frequency	0.0 Hz (disabled)	0.0 Hz (disabled)
	SET-37	Pre-PID delay time	180 sec	60 sec
	SET-38	PrePID exit level	25 PSI	25 PSI
Broken Pipe	SET-40	Broken pipe enable	NO	NO
	SET-41	Broken pipe frequency	59Hz	59Hz
	SET-42	Broken pipe delay time	30 sec	30 sec
	SET-43	Broken pipe feedback level	35PSI	25 PSI
	SET-74	Level detection enable	Under Level	NO
Underload	SET-75	Level detection source	Current (underload)	Current (underload)
	SET-76	Level detection frequency	59.0 Hz	59.0 Hz
	SET-77	Level detection delay time	1 sec	1 sec
	SET-78	LDT Level	0.0A	0.0A
	SET-80	Level detection trip enable	YES	YES
	SET-81	Well fill time	60min	0 min