

Submersible Pump Quickstart Guide



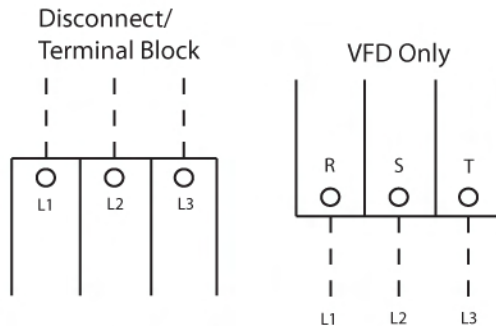
Wiring

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

Note: Do not wire to the "N" terminal, it is NOT a neutral connection.

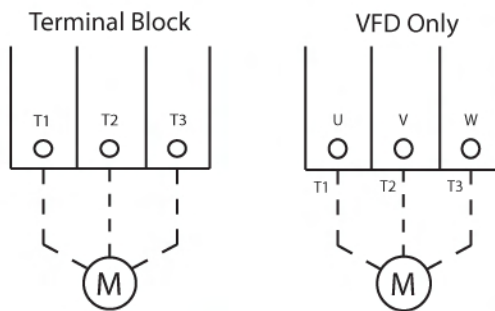
Input:

Verify correct available voltage and wiring to the enclosed VFD pump package. Wire input power to the terminal block labeled L1, L2 & L3 or VFD terminals labeled R, S & T. See Application notes for single phase wiring instructions. Ensure connections are tightened to the proper torque setting.



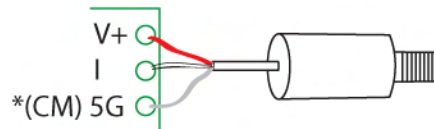
Motor:

Wire motor leads to the terminal block marked T1, T2 & T3 in enclosed VFD packages. Insure all connections are secure and tightened to the proper torque setting.



Transducer:

Wire the pressure transducer's positive wire to the VFD terminal marked V+ and the negative wire to terminal I with the shield wired to 5G for drives 40HP or less and CM on 50HP and above. For pressure transducers provided by Cerus, the RED wire goes to V+ and the WHITE wire goes to I.



*Note: Use "5G" for 7.5-40HP VFDs and "CM" for VFDs over 40HP

Verify that the HOA switch is in the OFF position. Then, power up the drive and you will see this display:

```
DRV ▶ T/K    0.0A
00    STP    0.00Hz
```

If you do not see this screen, press the ESC/SHIFT key until it appears. You are now ready to program your motor settings.

Programming Motor Settings

The following parameters will need to be set to properly adjust the drive to the pump motor. These parameters are in the FU2 group which you can access by pressing the mode key. Make changes by using the PROG key, ESC/SHIFT key, and Arrow keys. Save changes by pressing ENTER.

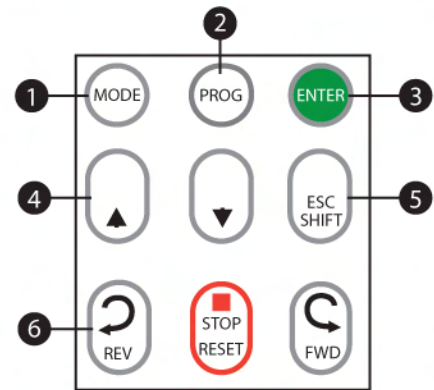
```
FU2 ▶ Motor Select
40    7.5 kW
```

Set the motor size in KW. To calculate HP to KW multiple HP X .75. For example a 10 HP motor is 7.5 KW.

```
FU2 ▶ Rated-Curr
43    11.0A
```

Motor Service Factor Amperes (SFA). This parameter sets the motor service factor amps. If there is no SFA rating on the motor nameplate, put the FLA rating.

Keypad Programming



- 1 **Mode:** Moves you through the five program groups: DRV>FU1>FU2>I/O>APP>DRV
- 2 **Program:** Enters programming mode and allows changes to parameter values
- 3 **Enter:** Saves parameter value and exits programming mode
- 4 **Up & Down:** Cycles through the parameters within each program group and adjusts settings within parameters when in programming mode
- 5 **Esc/Shift:** Moves cursor while in programming mode
- 6 **Rev, Stop/Reset, Fwd:** Allows keypad control of VFD only

System Initial Start Up & Control Settings

Set Point

DRV Cmd. Freq
00 0.00Hz

Find your setpoint below in TABLE 1, which is based on a 0-100PSI transducer, and note the corresponding Hz number. This number will be programmed as your set point. Press ESC/SHIFT to display DRV 00, press the PROG key and the display will now look like the image to the left.

TABLE 1

PSI	40	45	50	55	60	65	70	75	80	85	90	95
Hz	24	27	30	33	36	39	42	45	48	51	54	57

Note: If using a pressure range that is different than 0-100PSI, call factory 1-800-962-3787

DRV ▶ T/K 0.0A
00 STP 0.00Hz

To change the value use the ESC/SHIFT key to move the cursor to the digit you want to change and the up / down arrow keys to change the values. When complete press the ENTER key to save the setting. The screen will now return to the DRV 00 main screen as shown to the left.

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, move HOA switch to the OFF position, disconnect power to the VFD and wait 5 minutes. Swap two motor leads to change rotation. Repeat this step to verify rotation then proceed.

Determine Minimum Demand Frequency

Turn the HOA switch to the AUTO position and run water at various flow rates noting change in frequency at different rates of flow. Operate system at the minimum desired flow rate. Once the system reaches the set point and stabilizes, note the frequency on the display screen and write it in the space below for future reference. This is your minimum demand frequency.

MINIMUM DEMAND FREQUENCY _____ Hz

Return the HOA switch to the OFF position and continue setup.

Minimum Frequency

APP ▶ PID limit-L
11 30.0 Hz

Press the MODE button to get to the APP parameter group and the up arrow to display minimum frequency, APP 11. Change this setting to the minimum demand frequency minus 2Hz. This parameter should never be set for less than 30 Hertz for a submersible motor.

Sleep Mode Delay Time

APP ▶ Sleep Delay
40 20.0 sec

Use the UP arrow to scroll up to APP 40. The sleep delay time is preset for 20 seconds. A higher time setting in this parameter will increase the delay to activate sleep mode.

Sleep Mode Frequency

APP ▶ Sleep Freq
41 31.00 Hz

Use the UP arrow to scroll up to APP 41. Set the sleep frequency to 1 Hz more than the previously determined minimum demand frequency.

Saving Parameters

FU2 ▶ Para. Read
91 --- No ---

Save the VFD parameters into the keypad for use later in the event the drive settings are inadvertently changed. Use the MODE key to change to the FU2 group and the arrow keys to scroll to FU2-91.

Press PROG and change to Yes, then press the ENTER key to save the settings. The setting will change back to NO when the parameters are saved.

Loading Parameters

FU2 ▶ Para. Write
92 --- No ---

To load parameters from the keypad into the drive, use the MODE key to change to the FU2 group and the arrow keys to scroll to FU2-92.

Press PROG and change to Yes and press the ENTER key to save the settings. The setting will change back to No when the parameters are loaded into the drive.

System Validation

Move HOA switch to AUTO position and pressurize system. Run the system under various demands and verify that the drive maintains the pressure setpoint. Run system without demand to ensure drive enters sleep mode, if not, follow the steps in the Trouble Shooting and FAQs section and retest system. While drive is in sleep mode, place demand on the system and verify the drive wakes to maintain pressure.

Special Applications

Single Phase Wiring & Settings

Wire input power to L1 & L3 on the terminal block labeled L1, L2 & L3. All drives must be wired to three phase motors. Ensure all connections are secure and tightened to the proper torque setting.

FU1 ▶ Trip Select
69 101

The Cerus VFD Package is pre programmed for 3-Phase input. To program the VFD for 1-Phase input applications navigate to Parameter FU1-69. Press the PROG key and use the ESC/SHIFT key to move the cursor to the middle digit. Press the DOWN arrow to change the value to 0 and press ENTER to store changes. The screen should look like the example to the left when finished

Underload Trip (Dry Pump Protection)

FU1 ▶ ULTselect
85 Yes

Enable Underload trip protection in FU1-85. Set to Yes to enable.

FU1 ▶ ULTlevel
86 60 %

Set Underload trip level to 60% or the % of No Load Amps to SFA. (No Load Amps / SFA) * 100 = Setting%

FU1 ▶ ULTtime
88 2.0 sec

Set Underload trip time to 2 seconds.

Pre-PID Settings (Pipe Fill)

APP ▶ PrePIDfreq
74 42.00 Hz

Navigate to APP-74. This parameter sets the speed the drive will run to fill an empty pipe. Set this parameter for a speed that exceeds the **Minimum Demand Frequency**. It will run at this frequency for the time delay set in APP-76 or until pressure exceeds the exit level set in APP-75.

APP ▶ PrePIDF/B
75 30.0 %

Pre-PID exit level. Scroll up to APP-75. This sets the feedback level when the drive will switch from PrePID speed to run under normal PID operation. Set to 30% and adjust as necessary.

APP ▶ PrePIDdly
76 30 sec

Pre-PID Delay. Scroll up to APP-76. This sets the time to fill an empty pipe. Set for 30 seconds, test during startup and adjust as necessary.

APP ▶ Pbroken Mode
77 Yes

Broken Pipe. Scroll up to APP-77. This enables a broken pipe trip during initial pipe fill. Set to Yes to enable.

Trouble Shooting and FAQs

Problem: My pump rotation is backwards

Solution: Disconnect power and swap any two phases of the motor leads. This can be done on any terminal on the output side of the VFD.

Problem: Overcurrent 2 fault displays on the VFD

Solution: The most effective solution to eliminate this fault is to install an output reactor or filter in the VFD package. If one is already installed, decreasing the carrier frequency (parameter FU2-48) may also help.

Problem: There is no response to my analog signal (0-10V or 4-20mA). I'm not getting any feedback

Solution: Check parameter DRV-19 by pressing the DOWN arrow from the main start up screen. Values for V1 and/or I should be above 400. If all values are below 400, check sensor wires.

Problem: I run my system and the VFD does not go to sleep

Solution: Increase parameters APP-11 and APP-41 by 0.5Hz each and retest the system. If, after adjustment, the VFD still will not go to sleep, verify that there are no leaks or any demand on the system and re-determine the minimum demand frequency. Adjust minimum frequency, sleep mode delay time, and sleep mode frequency.

Problem: The VFD overshoots the setpoint - how can I prevent this?

Solution: Decreasing the value in parameter APP-07 "PID P-gain" will help prevent overshooting the setpoint. Additionally, increasing the value in parameter APP-08 "PID I-time" slows the VFD's response time.

Problem: The VFD shows HW-diag. What does this mean?

Solution: The HW-diag fault has many meanings – most commonly it indicates an input phase open. Verify the input power source to ensure that three phase power is supplied to the VFD. If the VFD is being used in a phase conversion application, adjust parameter FU1-69 to 101 (see Application Notes). Cycle power to the VFD to reset.

Question: How do I adjust underload trip time?

Answer: Parameter FU1-88 "ULT time" allows adjustment of the underload trip time.

Question: Does DRV-01 (Acceleration Time) and DRV-02 (Deceleration Time) affect the PID mode?

Answer: No, the VFD does not use DRV-01 and DRV-02 while operating in PID mode.

Question: Why is the setpoint in Hz? Also, can it be less than the PID minimum?

Answer: The setpoint is actually a ratio between the sensor range and 0-60Hz. The programmed value = $\frac{\text{Desired Setpoint} \times 60}{\text{Max Range of Sensor}}$
Since it is not an actual output frequency, it does not matter if it is below the PID at minimum speed.

Factory Programmed Parameters

Parameter	Description	Settings
DRV-00	Command Frequency (PID Setpoint)	30 Hz
DRV-01	Acceleration Time	2 Sec
DRV-05	Step Frequency 1 (Hand Mode Speed)	60 Hz
FU1-23	Stop Mode	FREE RUN
FU1-60	ETH Selection (Enables Motor Overload Protection)	YES
FU1-66	Overload Protection (Prevents VFD Overloading)	YES
FU2-20	Power On Start	YES
FU2-21	Start After Reset	YES
FU2-22	Speed Search	1110
FU2-25	Number of Retries After Reset	3
FU2-26	Delay to Retry	60 Sec
FU2-41	Motor Poles	2
FU2-48	Carrier Frequency	2.5 kHz
APP-01	PID Mode Enable	YES
APP-10	PID Max Frequency	60 Hz
APP-49	Sleep Wake Level	4%