

The following procedure is a supplement to other documentation supplied with this equipment and will guide the user in properly wiring the iQpump VTC and motor. It will also show the user how to configure the iQpump VTC for a simplex pump application.

Danger: Improper wiring can and will cause bodily harm as well as damage to the equipment.

When installing the system, be sure to follow good wiring practices and all applicable codes. Ensure that the mounting of the various components are secure and that the environment, such as extreme dampness, poor ventilation, etc. will not cause system degradation.

Please read this cheat sheet and other documentation provided with the iQpump VTC thoroughly before attempting any installation.

Step 1 iQpump VTC Model Identification and Mounting

To make sure you received the correct model, it is essential to verify the iQpump VTC nameplate with your order and make sure the iQpump VTC has the correct rating so it can be used with your motor. Please check the nameplate information as shown in the example below.



- Check that the available power will meet the **input power** requirements.
- Ensure that the **output power** from the iQpump VTC is compatible with the pump motor requirements.
- In the case of systems with more than one iQpump VTC, follow the above procedure for each iQpump VTC and pump motor.

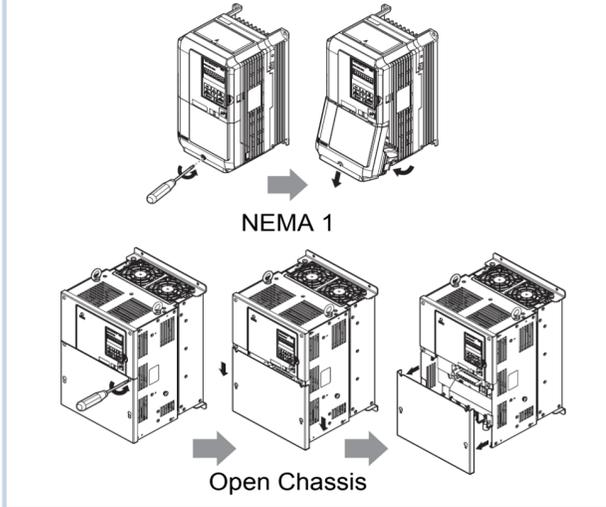
Mounting the iQpump VTC

The mounting of the iQpump VTC is extremely important regarding environment and accessibility. Depending on your system, there are various models available and the mounting dimensions (footprint) may be different. Because the mounting procedure is fairly extensive, it is beyond the scope of this document; the user is referred to the iQpump VTC Technical Manual (Document No. SIEP YAIP1W 01) received with the iQpump VTC, **Section 2.2 Mechanical Installation**. Match the model that you received and follow the procedure described in the manual to ensure a safe and functional installation. In cases where the system has more than one iQpump VTC, refer to the proper clearances required for adequate ventilation. *Please pay particular attention to:*

- The clearances to be maintained around the enclosure for adequate ventilation.
- The environmental specifications such as avoiding excessive dampness, extreme temperatures, chemical exposure, corrosive areas, etc. to avoid damage to the equipment and to maintain safety.

Removing and Attaching the Terminal Cover

Improper removal of the iQpump VTC terminal cover as well as front cover can cause extensive damage to the iQpump VTC. To avoid damage to these items, please pay particular attention to the iQpump VTC Technical Manual, Document No. SIEP YAIP1W 01, **Section 3.5, Removing and Attaching the Terminal Cover**.



Step 2 Connect Motor and Line Power

Fig.1 & 2 below show the electrical connections for the input power and motor terminals for various iQpump VTC models. Select the proper diagram for the model you are installing (see Step 1). **WITH POWER OFF** make the appropriate connections. **Make sure to follow good wiring practices and all applicable codes. Ensure that the equipment is grounded properly as shown.**

DANGER; LETHAL VOLTAGES ARE PRESENT- Before applying power to the iQpump VTC, ensure that the terminal cover is fastened and all wiring connections are secure. After the power has been turned OFF, wait at least five minutes until the charge indicator extinguishes completely before touching any wiring, circuit boards or components.

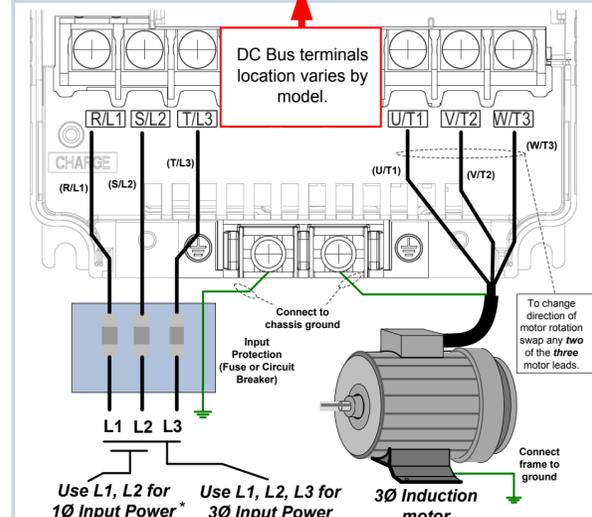
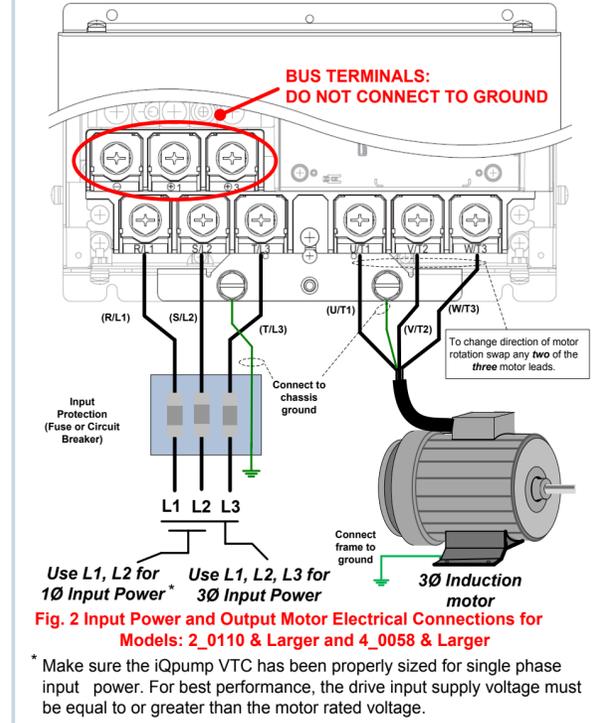


Fig. 1 Input Power and Output Motor Electrical Connections for Models: 2_0004 - 2_0056, 4_0002 - 4_0044 and 5_0003 - 50011



* Make sure the iQpump VTC has been properly sized for single phase input power. For best performance, the drive input supply voltage must be equal to or greater than the motor rated voltage.

Step 3 Real-time Clock Setup

This step shows how to setup the iQpump VTC real-time clock for first use.

Note: If clock is not set the drive can still be programmed and operated, but ALM light will flash every 30s and showing **Clock Not Set** message.

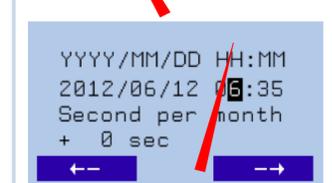
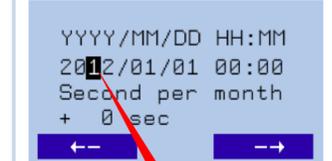
Power up the drive and set the real-time Clock. The real-time Clock setup screen will appear at first power up.

Press **F2** to set the clock.

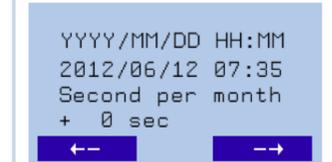
Note: After the real-time clock is set the real-time clock setup screen will not show again unless parameter o4-17 is set to "Set".



Real-time Clock Setup Screen



Use **F1** to move cursor to the left and **F2** to move cursor to the right. Use **↑** and **↓** to adjust. When date and time are set press **ENTER** to save.



Example: Jun 12th 2012, 7:35am

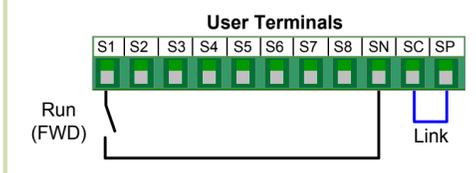
Note: Do NOT adjust sec per month.

Step 4 Selecting Start/Stop and Speed Method

This step shows how to connect control wiring and feedback signal to the iQpump VTC. Before making any control connections **MAKE SURE POWER TO THE iQpump VTC IS TURNED OFF!** Next remove the terminal cover to gain access to the control terminals. (Step 1.)

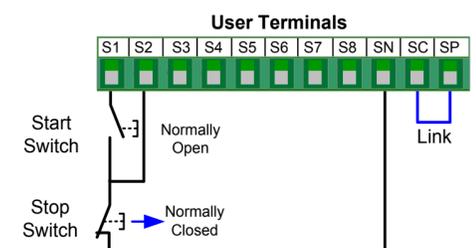
SELECT START / STOP CONTROL METHOD b1-02

The iQpump VTC is **DEFAULT SETUP TO START/STOP FROM THE KEYPAD** (digital operator). If this is the preferred start/stop method then continue to the feedback signal connection section. Please refer to the wiring diagram below to start/stop the iQpump VTC using an external switch or contact.



Wiring Diagram: 2-Wire Control Use for maintained contacts

Note: 3rd row of terminal board is shown here.

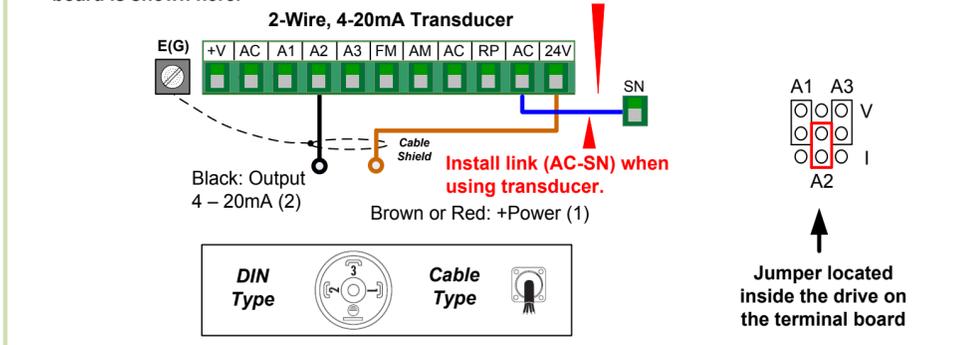


Wiring Diagram: 3-Wire Control Use for momentary contacts

To use 3-Wire Control first Initialize the iQpump using parameter A1-03 = 3330 (Refer to the Quick Start Guide TOEP YAIP1W 01)

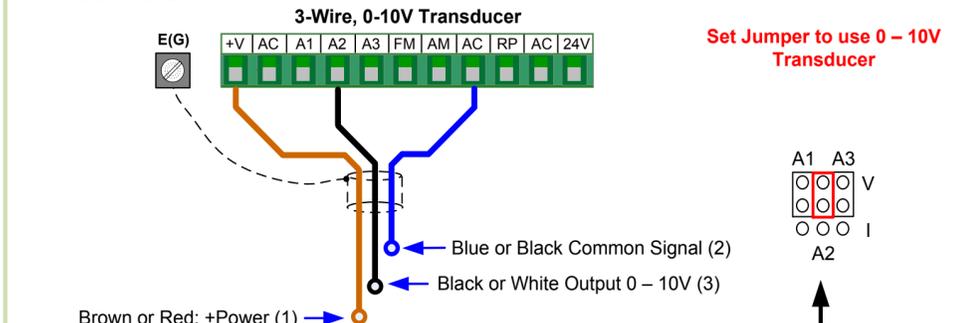
FEEDBACK SIGNAL WIRING (TRANSDUCER)

Note: 2nd row of terminal board is shown here.



For use with 2-Wire, 4 – 20mA Transducer (Factory Default)

Note: 2nd row of terminal board is shown here.



For use with 3-Wire, 0 – 10V Transducer

Important Note: Signal colors and numbering may vary depending on feedback device used, please consult feedback device manual.

NOTE: It is beyond the scope of this document to program the iQpump VTC drive for network communication control. Please refer to the iQpump VTC Technical Manual, (Document No. SIEP YAIP1W 01) for this selection.

Step 5 Changing Parameters and Monitoring the iQpump VTC

This step shows how to access and modify an iQpump VTC parameter as well as how to monitor iQpump VTC signals such as output frequency and motor current.

Make sure all protective covers have been re-attached and power is turned on. **DO NOT RUN THE MOTOR.**

Access Parameter Menu and Change Parameter Value

Press **V** two times until the digital operator shows the parameter menu.



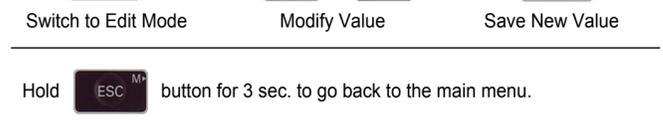
2X **V** → **ENTER** → **RESET** Select Digit



2X **V** → **ENTER** → **RESET** Select Digit



Inc./Dec. Selection → Go to Next Digit → Inc./Dec. Selection



Switch to Edit Mode → Modify Value → Save New Value

Hold **ESC** button for 3 sec. to go back to the main menu.

Monitor Motor Frequency and Motor Current

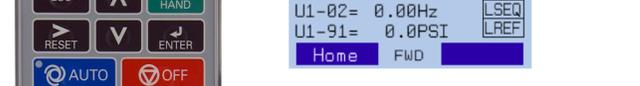
iQpump VTC Digital Operator power-up state

Output Frequency and Transducer Feedback can be monitored simultaneously. Use **F1** and **F2** to select monitor signals.

Press **ESC** and **↑** simultaneously shows the monitor menu.

Press **ENTER** to access monitor menu.

Use **↑** and **↓** to select monitor.



Please refer to the iQpump Quick Start Manual, (Document No. TOEP YAIP1W 01) on how to access other drive monitors.

Step 6 Application Setup

This step shows how to configure the iQpump VTC for a dedicated pump application.

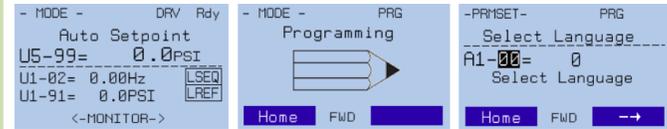
Make sure all protective covers have been re-attached and power is turned on. **DO NOT RUN THE MOTOR.**

Available iQpump Application Macro's:

- 6008 Constant Pressure Mode (PSI)
 - 6009 Pump Down Level Mode (Ft)
 - 6010 Geothermal Mode
 - 6011 VTC Pressure Control Mode ← Default**
 - 7770 General Purpose Mode
- The factory default is setup for VTC Pressure Control Mode, only change if application different.*

Select Application

Press **V** two times until the digital operator shows the parameter menu.



2X **V** → **ENTER** → 3X **RESET** Select Digit



Inc./Dec. Selection → Switch to Edit Mode → Select Application

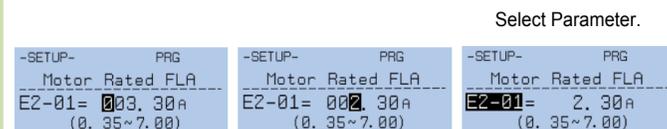
Press **ENTER** to select.

Enter Application Parameters

Hold **ESC** button for 3 sec. to go back to the main menu.



3X **V** → **ENTER** → **↑** and **↓** Select Parameter.



Switch to Edit Mode → Modify Value → Save New Value

Go Back to Main Menu

Hold **ESC** button for 3 sec. to go back to the main menu.

Step 7 iQpump VTC Quick Setup Parameter Overview (Simplex) VTC Pressure Control Mode

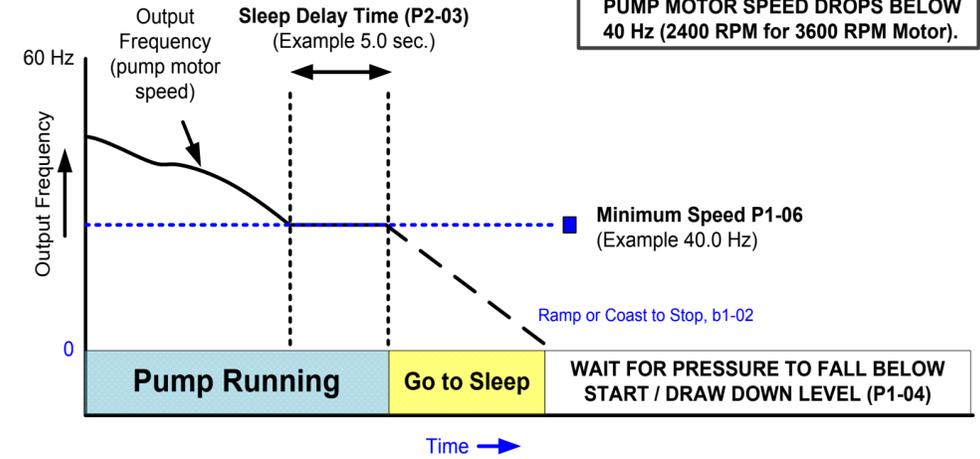
Parameter	Value	Description	Reference	Comments
A1-06	Dependent on Initialization Mode	Application Selected	Displays selected applications, see Step 6.	Read-only cannot be modified
E2-01	Drive Size Dependent	Motor Rated Current	Set to the motor nameplate full load amps.	For submersible motors use service factor amps (SFA).
E2-04	2	Number of Motor Poles	Number of motor poles is used to show the correct motor RPM on the display Enter '4' for an 1800 RPM motor and '2' for a 3600 RPM motor.	Confirm number of poles 2 Pole Motor = 3600 RPM 4 Pole Motor = 1800 RPM 6 Pole Motor = 1200 RPM 8 Pole Motor = 900 RPM
b1-02	0 (Keypad)	Run Command Selection	Selects how the pump system is started: 0: Operator - "Auto", "Hand" and "Off" keys on digital operator, 1: Terminals - Contact Closure on Terminal S1	See Step 3. for wiring for terminal control.
C1-01	15.0 sec.	Accel. Time 1	Time it takes to accelerate the pump motor from zero to maximum speed.	Adjusted depending on system performance
C1-02	15.0 sec.	Decel. Time 1	Time it takes to decelerate the pump motor from maximum speed to zero.	Adjusted depending on system performance
P1-03	145	Feedback Device Scaling	System Scaling: Enter feedback device maximum: Example: Enter 200 for pressure transducer with a maximum of 200 PSI at 20mA.	Confirm feedback device scaling. (See Illustration 1)
Q1-01	0	Setpoint 1	Set System Setpoint	Set to system pressure
P1-04	0.0 PSI	Start / Drawn Down Level	When the iQpump VTC is turned On and the feedback signal level (transducer) falls below this level, the pump system will start after the time specified in P1-05 (default 1 sec). Programming the Start Level as an Absolute Value. Start / Draw Down Level has to programmed to a positive value in order for the Start / Draw Down Level to be an absolute value. Example: Start / Draw Down Level P1-04 set to 50 PSI and delay time P1-05 set to 5 sec. Pump system will start when the pressure drops below 50 PSI for 5 sec. Programming the Start Level as a Delta Level from the System Setpoint Start / Draw Down Level has to programmed to a negative value in order for the Start Level to be a delta value from the setpoint. Example: Start / Draw Down Level P1-04 set to -10 PSI with a system setpoint of 50 PSI and a delay time P1-05 set to 5 sec. Pump system will start when the pressure drops below 40 PSI (50 - 10) for 5 sec.	It is mandatory to program the Start / Draw Down Level in order to use the sleep function. (See Illustration 2 and 3)
P1-06	40.0 Hz	Minimum Pump Speed	Minimum speed (Hz) the pump motor has to operate at. Example: Base pump motor speed is 3600 RPM, minimum speed is 2400 RPM. Set minimum pump frequency to 40.0 Hz. (2400 ÷ 3600 x 60 Hz = 40 Hz)	Minimum pump frequency should be set to a value where the pump enters a no-flow condition.

Step 7

iQpump VTC Factory Defaults Overview (only adjust settings based on your application)

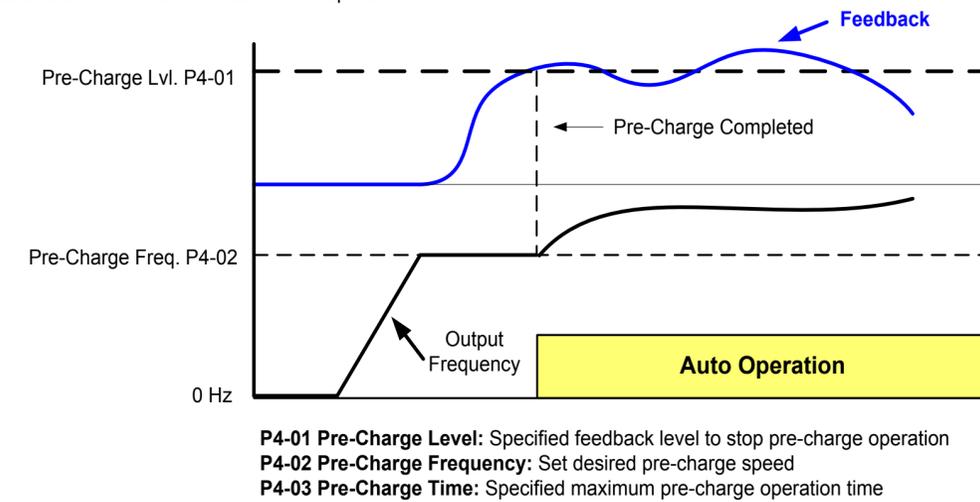
Parameter	Value	Description	Reference	Comments
P1-08	0.0 PSI	Low Feedback Level		The iQpump VTC will display a "Low Feedback (LFB)" alarm when the feedback level falls below the programmed level. The alarm will turn off when the feedback level rises above the programmed Low Feedback Level plus the Hysteresis Level (P1-14). A value of 0 disables this function. This function is only active during running while operating in the auto mode.
P1-09	5 sec.	Low Feedback Level Fault Delay Time		The iQpump VTC will display a "Low Feedback/Water (LFB/LW)" fault when the feedback level falls below the programmed level for a time specified in P1-09. The iQpump VTC will coast to a stop when a fault occurs. A value of 0 disables this function. This function is only active during running while operating in the auto mode
P1-11	155 PSI	High Feedback Level		The iQpump VTC will display a "High Feedback Level (HFB)" alarm when the feedback level rises above the programmed level. The alarm will turn off when the feedback level falls below the programmed High Feedback Level minus the Hysteresis Level (P1-14). This function is active during running in the hand mode
P1-12	2 sec.	High Feedback Level Fault Delay Time		The iQpump VTC will initiate a "High Feedback Fault (HFB)" when the feedback level rises above the programmed level for a time specified in P1-12. The iQpump VTC will coast to a stop when a fault occurs. This function is active during running in all operation modes.
P2-02	0.0 Hz	Sleep Level		When the selected signal level (P2-01) falls below the sleep level (P2-02) the system will stop and go to sleep. Example: Sleep level at 35 Hz indicates (2100 ÷ 3600 x 60 Hz = 35 Hz) that the pump system will stop running when the pump motor speed is smaller or equal to 2100 RPM for a the sleep delay time specified (P2-03).
P2-03	15 sec.	Sleep Delay Time		Time it takes before the pump system goes to sleep when the selected signal level (P2-01) falls below the specified sleep level (P2-02).
P4-01	0.0 PSI	Pre-Charge Level		Sets the release level of iQpump VTC while running at the pre-charge frequency (P4-02). The iQpump VTC will stop when one of the following conditions occurs: Feedback signal rises above P4-01 level, pre-charge timer P4-03 expires, or low water digital input is deactivated (H1-XX = 85). The pre-charge function can only be activated while in a stop condition. The function is enabled by setting P4-03 to a value greater than 0. When the function is activated, the iQpump VTC operator display indicates a "Pre-charge" alarm. Note: This function is only active in the stopped mode. Thrust Mode: The pre-charge level is used when the thrust mode is active for the feedback check. The thrust mode is deactivated when the feedback exceeds the programmed level in P4-01. A value of 0 disables the thrust mode feedback check function.
P4-02	0.0 Hz	Pre-Charge Frequency		Sets the frequency reference used when the pre-charge function is active.
P4-03	0.0 min.	Pre-Charge Time		Sets the maximum allowed pre-charge time. A value of 0 disables this function.

3 SLEEP MODE (Example)



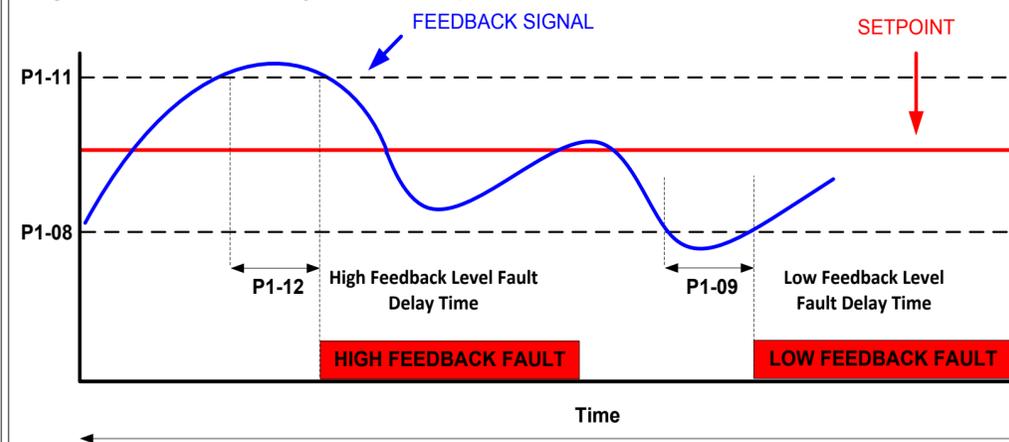
4 PRE-CHARGE OPERATION

This function is used when the pump system needs to be pre-charged before normal operation. Upon start the iQpump VTC will run at a fixed speed for a specified time or until the feedback signal reaches a programmed level after which it will switch to auto mode operation.



5 LOW/HIGH FEEDBACK LEVEL DETECTION

iQpump VTC continuously monitors the system feedback signal. To display a 'Low Feedback' fault set the low feedback level parameter P1-08 to the minimum feedback level allowed for your system and to display a 'High Feedback' fault set the high feedback level parameter P1-11 to the maximum feedback level allowed.

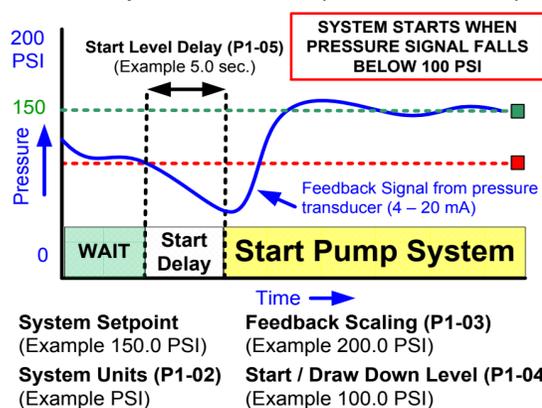


1 SYSTEM FEEDBACK UNIT / FEEDBACK DEVICE SCALING
P1-02 Feedback Unit

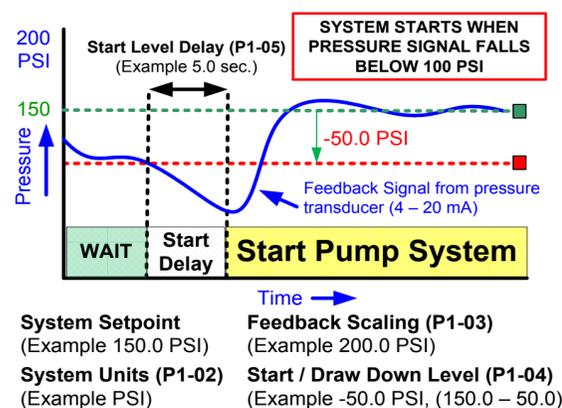
- 0: Inch of Water
- 1: PSI
- 2: GPM
- 3: Degrees Fahrenheit
- 4: CFM
- 5: CMH
- 6: Liters / Hr
- 7: Liters/Sec
- 8: Bar
- 9: Pascal
- 10: Degrees Celsius
- 11: Meter
- 12: Feet
- 13: Liters per Minute
- 14: cm per Minute
- 15: Inch Hg
- 25: No Unit

P1-03 = 200.0 PSI Feedback Scaling
Feedback Maximum

2 START / DRAW DOWN LEVEL
Example: Absolute Level (Positive Start Level)



START / DRAW DOWN LEVEL
Example: Delta Level (Negative Start Level)



Step 8 Pump Rotation and Feedback Signal Check

In this step the motor is checked for proper direction and operation. This test is to be performed solely from the digital operator. Apply power to the iQpump VTC after all the electrical connections have been made and protective covers have been re-attached. At this point, **DO NOT RUN THE MOTOR**, the Digital Operator should display as shown in **Fig. 3**.

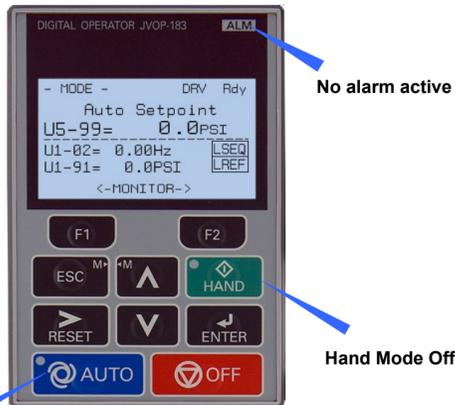
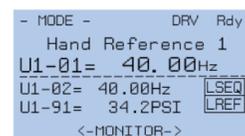


Fig. 3: Digital Operator

Motor Rotation Test

Next, push **HAND** on the Digital Operator; the display should read



and the **HAND** LED should be **ON**.

The motor should now be operating at in the correct direction of pump.

Push **OFF** on the Digital Operator; the display should read as in Fig. 3.

Press **ENTER** to access Hand Speed. Use **↑** **↓** **RESET** to change Hand Speed value. Press **ENTER** to save value.

If the direction is not correct, then power down the iQpump VTC and

Follow Instructions below.

! DANGER

After the power has been turned OFF, wait at least five minutes until the charge indicator extinguishes completely before touching any wiring, circuit boards or components.



Use precaution, and refer to **Fig.1 or 2**, swap any **two** of the **three** output leads to the motor (U/T1, V/T2 and W/T3). After the wiring change, repeat **Step 8** and recheck motor direction.

Digital Operator turned off.

FEEDBACK SIGNAL CHECK

Verify feedback on display (show keypad) matches mechanical pressure gauge.



Refer to parameter P1-02 and P1-03, if the feedback device scaling or system units are incorrect.

FEEDBACK SIGNAL LEVEL

Step 9 Auto Mode Operation

AUTO MODE

The iQpump VTC can be operated in AUTO mode when the following actions have been performed:

- All parameters are programmed
- Motor direction has been checked
- Auto Mode: Reference source selected in parameter b1-01 (See step 3)
- Auto Mode: Run source selected in parameter b1-02 (See Step 3)

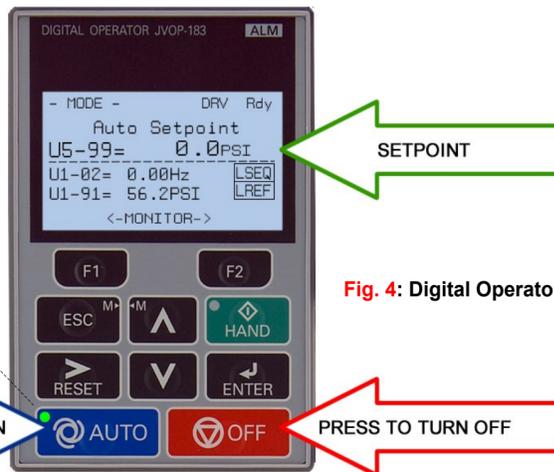


Fig. 4: Digital Operator

PRESS AUTO BUTTON

PRESS TO TURN OFF

Press the **AUTO** button to put the iQpump VTC into AUTO mode.

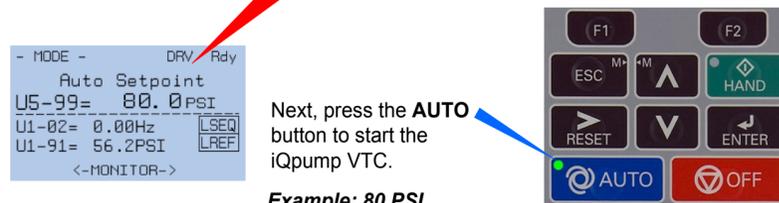
In AUTO mode the iQpump VTC is capable of starting or stopping based on the Run Source Selection setting parameter b1-02. (See Step 3 Select Start/Stop Control Method) The setpoint used in AUTO mode is based on the Reference Source Selection setting parameter b1-01. (See Step 3 Select Speed Method)

SET SYSTEM SETPOINT

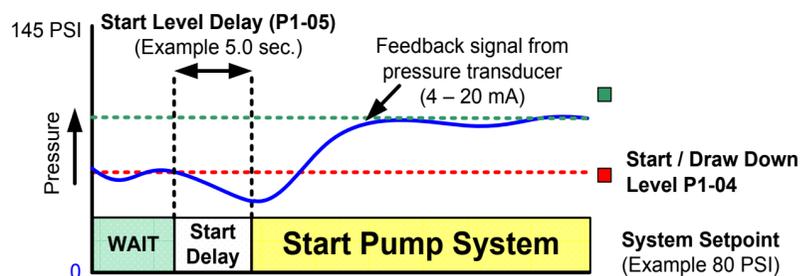
Next, press **ENTER** to access or modify the system setpoint that was entered using parameter Q1-01 System Setpoint in the iQpump Quick Setup Menu

Use **RESET** to select the digit and **↑** **↓** to change the system setpoint.

Next press **ENTER** to store setpoint and press **F1** to return to the main operation menu.



iQpump VTC automatically starts in Auto Mode when the feedback signal level falls below the programmed level in parameter P1-04 for the specified time in P1-05.



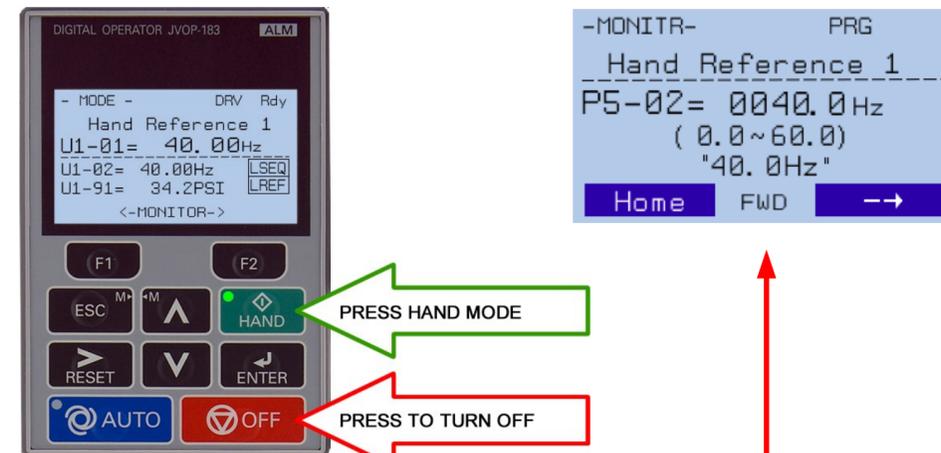
Refer to Illustration 2 on Page 3 of 4 for additional information on the Start Level Function.

Step 10 Hand Mode Operation

HAND MODE

The iQpump VTC can be operated in HAND mode when the following actions have been performed:

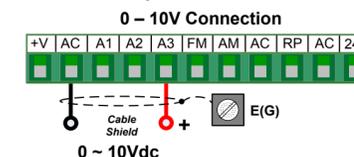
- All parameters are programmed
- Motor direction has been checked



Press **ENTER** to access Hand Speed. Use **↑** **↓** **RESET** to change Hand Speed value. Press **ENTER** to save value.

Hand Speed from Analog Input (0 - 10V)

Set parameter P5-01 'Hand Mode Ref.' to '0' to adjust the hand mode reference from an external 0 - 10V signal connected to terminal A3 and AC.



Sleep and Anti-No-Flow (ANF) Detection (P2-23, P2-24, P2-25)

NOTE: Before adjusting Anti-No-Flow operation ensure your system is regulating satisfactory while operating under normal running conditions.

If stable continue to Step 1 to verify no-flow/sleep operation. If unstable turn off the Anti-No-Flow function (P2-23 = 0.00%) and adjust the PI control parameters b5-02 and b5-03 to stabilize pump system. Refer to iQpump Quick Start Guide (Document No.TOEP YAIP1W 01) for additional information. Once the system is stable, re-enable the Anti-No-Flow function by setting P2-23 to 0.40% and continue to Step 1 to verify no-flow/sleep operation.

Step 1: Verify system holds pressure by creating a no-flow situation (e.g. close off discharge valve).

Step 2: Press OFF button on the digital operator, wait 1 min. until system stabilizes and verify system pressure feedback U1-91. If the pressure drops more than 3 PSI (U1-91) adjust P2-25 to the actual delta pressure drop plus 1 PSI.

Example: Setpoint is 80 PSI, pressure feedback U1-91 shows 76 PSI, P2-25 should be 4 + 1 or 5 PSI.

Note: This value should always be more than your start level (P1-04). If not, the system pressure is not holding and this needs to be corrected, or the pump system will continue to cycle on and off.

Step 3: Run system in normal automatic operation with flow. Next check monitor U1-99 "ANF Timer" and verify that the value is incrementing and resetting back to zero continuously. If the value holds at 10 sec. (P2-24) increase P2-24 "Anti-No-Flow Detection Time" by increments of 5 sec. Repeat Step 3 each time P2-24 is adjusted.

Step 4: Create a no-flow situation (e.g. close discharge valve) and monitor that U1-99 "ANF Timer" increments and holds at P2-24 time (value set in Step 3). Once the Anti-No-Flow timer expires the speed will reduce gradually until it reaches minimum pump speed (P1-06) where it will hold for 5 sec. (P2-03) before going to sleep.

Step 5: Run system in normal automatic operation and verify sleep and wake-up operation until system performs satisfactory.