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

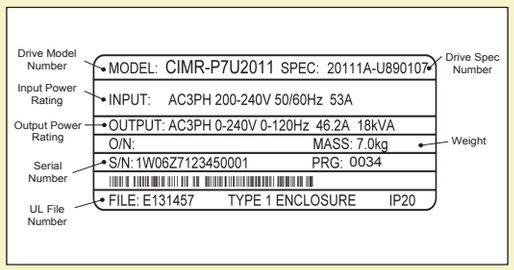
Danger:
Improper wiring can and will cause bodily harm as well as damage to the equipment.

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 thoroughly before attempting any installation.

Step 1 iQpump Model Identification and Mounting

To make sure you received the correct model, it is essential to verify the iQpump nameplate with your order and make sure the iQpump 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 is compatible with the pump motor requirements.
- In the case of systems with more than one iQpump, follow the above procedure for each iQpump and pump motor.

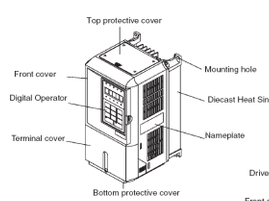
Mounting the iQpump

The mounting of the iQpump 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 User Manual (Document No. TM.iQp.06) received with the iQpump, ***Section 1 Physical 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, refer to the proper clearances required for adequate ventilation. *Please pay particular attention to:*

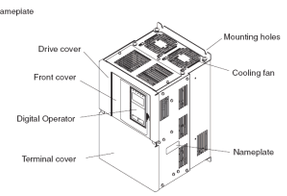
- The clearances to be maintained around the enclosure for adequate ventilation.
- The environmental specifications such as avoiding excessive dampness, extreme temperatures, chemical exposure, corrosive areas, etc. to avoid damage to the equipment and to maintain safety.

Removing and Attaching the Terminal Cover

Improper removal of the iQpump terminal cover as well as front cover can cause extensive damage to the iQpump. To avoid damage to these items, please pay particular attention to the iQpump User Manual, Document No. TM.iQp.06, Section 1.8, **Removing and Attaching the Terminal Cover.**



NEMA 1



Open Chassis

Step 2 Connect Pump Motor and Line Power

Fig.1 & 2 below show the electrical connections for the input power and motor terminals for various iQpump 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, 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.***

WARNING DO NOT CONNECT ANY OF THE FOLLOWING TERMINALS TO EARTH GROUND

B1 B2 - + +1 +2

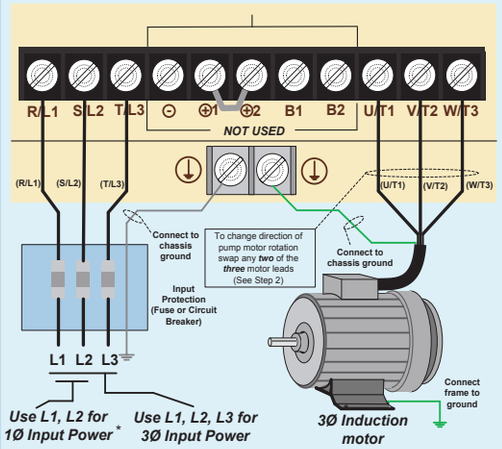


Fig. 1 Input Power and Output Motor Electrical Connections for Models: 20P4 to 2018 and 40P4 to 4018

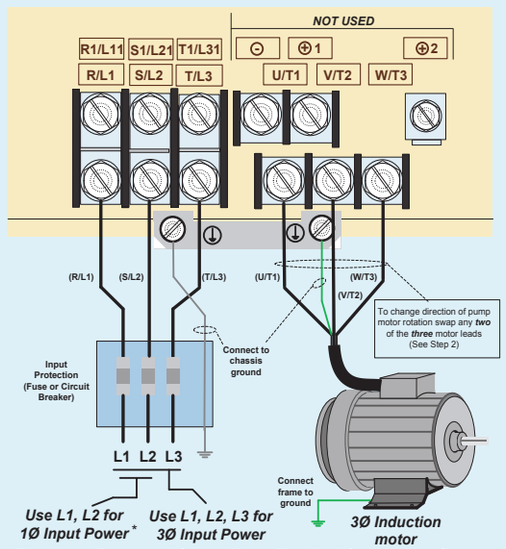


Fig. 2 Input Power and Output Motor Electrical Connections for Models: 2022 & Larger and 4030 & Larger

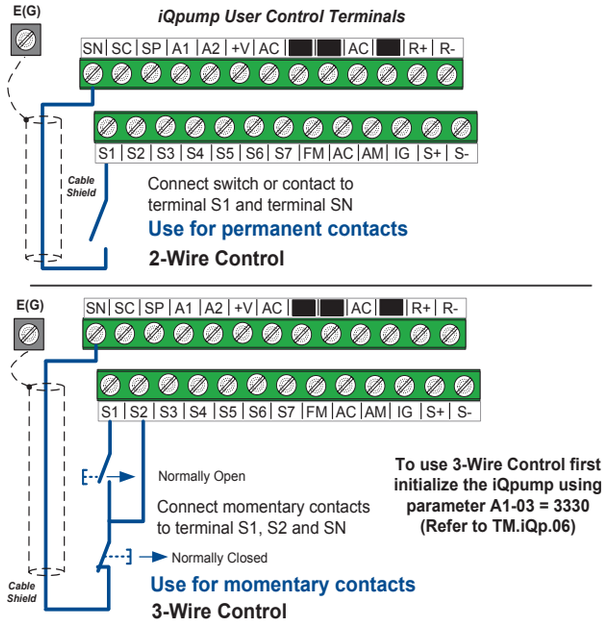
* Make sure the iQpump has been properly sized for single phase input power.

Step 3 Control Wiring

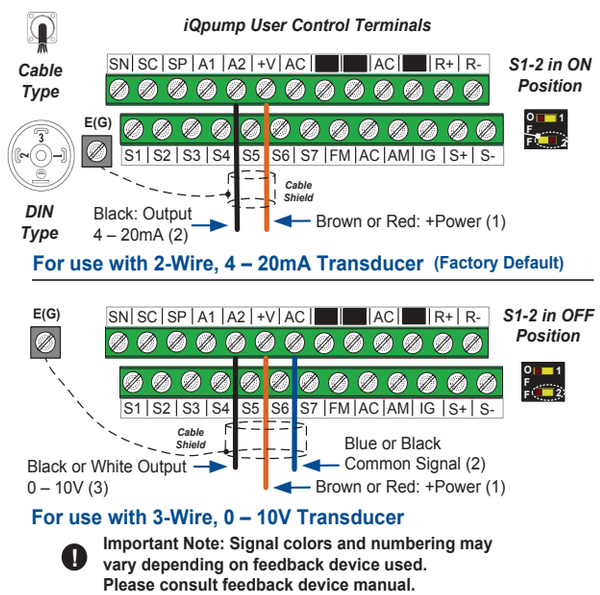
This step shows how to connect control wiring and feedback signal to the iQpump. Before making any control connections, **MAKE SURE POWER TO THE iQpump IS TURNED OFF!** Next remove the terminal cover to gain access to the control terminals. (Step 1.)

SELECT START / STOP CONTROL METHOD

The iQpump 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 using an external switch or contact.



FEEDBACK SIGNAL WIRING (TRANSDUCER)



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

Step 4 Pump Quick Setup

In this step, the iQpump is setup for a simplex pump application using the Pump Quick Setup menu. Apply power to the iQpump after all the electrical connections have been made and the terminal cover has been re-attached. At this point **DO NOT RUN THE MOTOR** the digital operator should be reading as shown below in ***Fig. 3***.

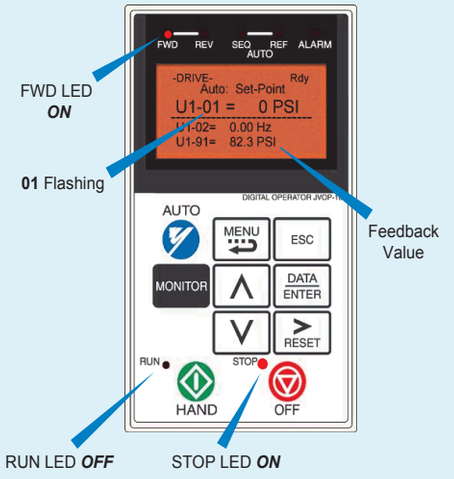
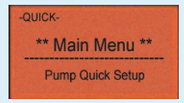
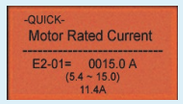


Fig. 3 Digital Operator

Next, push MENU 2 times on the digital operator until the digital operator shows the **Pump Quick Setup** Main Menu.

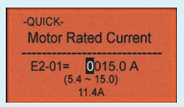


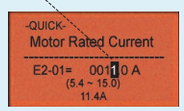
Next press DATA ENTER to start the Pump Quick Setup procedure.



The Pump Quick Start Menu consists of the most important parameters to setup your iQpump for use with your pump system.

Press DATA ENTER to access a parameter, and use RESET to select the digit and use ∧ ∨ to change the parameter value.





Press DATA ENTER to save the value.

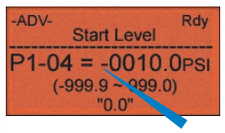
IMPORTANT: Enter service factor amps (SFA) when using an iQpump with a submersible pump motor.

Press ∧ to go to the next parameter to continue the Pump Quick Setup programming. When Quick Setup is completed, press MONITOR to exit the Pump Quick Setup menu and go to operation.

Note: Refer to Step 5 for a Pump Quick Setup Parameter Overview.

Step 5

iQpump Quick Setup Parameter Overview (Simplex)

Parameter	Value	Description	Reference	Comments
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
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)***
d1-01	0	Set-Point 1	Set System Set-Point	**Set to system pressure**
P1-04	0.0 PSI	Start Level	When the iQpump 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 Level has to programmed to a positive value in order for the Start Level to be an absolute value. Example: Start 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 Set-Point** Start Level has to programmed to a negative value in order for the Start Level to be a delta value from the set-point. Example: Start Level P1-04 set to ***–10 PSI*** with a system set-point 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.  Use ∧ ∨ to change the sign.	It is mandatory to program the Start Level in order to use the sleep function. ***(See Illustration 2 and 3)***
P1-06	40.0 Hz	Minimum Pump Frequency	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.
P4-10	0 Disabled	Auto Mode Operator Run Power Down Storage	Stores the run status in the Auto mode when operating from digital operator (b1-02=0). 0: Disabled 1: Enabled	Recommended for use when Start/Stop command is from keypad. ***(See Illustration 6)***
P5-04	1 Enabled	Hand Key Enable / Disable	Enables or disables the Hand Key on the digital operator. 0: Disabled 1: Enabled	Hand Key on keypad. ***(See Illustration 4)***

1 TRANSDUCER / FEEDBACK DEVICE SCALING

P1-03 = 0 0 0 0 0 Feedback Scaling

Feedback Maximum

Decimal Point Position

Examples:

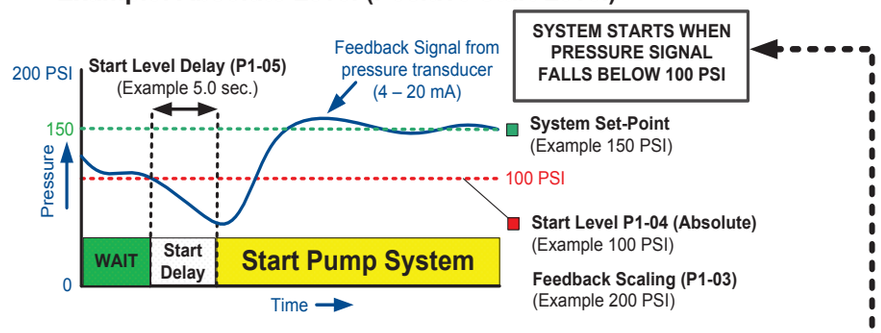
0 – 1000, no decimals, P1-03 = 1000

0 – 300.0, one decimal, P1-03 = 10300

0 – 50.00, two decimals, P1-03 = 25000

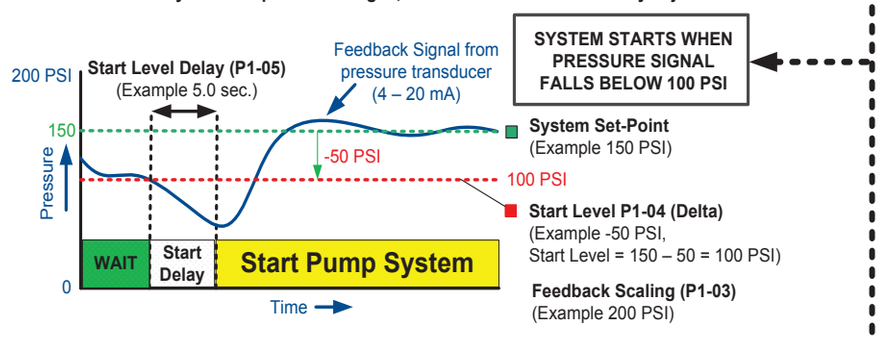
2 START LEVEL

Example: Absolute Level (Positive Start Level)

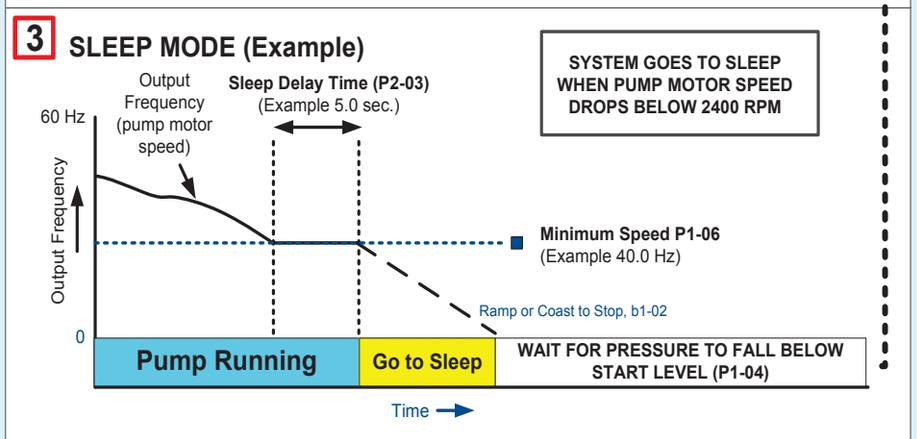


Example: Delta Level (Negative Start Level)

Note: When System Set-point is changed, the start level is automatically adjusted.



3 SLEEP MODE (Example)



Step 5

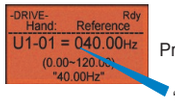
iQpump Factory Defaults Overview (only adjust settings based on your application)

Parameter	Value	Description	Reference	Comments
b5-03	3.0 sec.	PI Integral Time	Decrease integral time to make iQpump more responsive.	***Caution:*** can cause instability if value is too low.
b5-12	2 (Fault)	PI Feedback Reference Missing Detection Selection	Select what to do when the feedback device (transducer) fails or gets disconnected. 0: Disabled, continue running no message is displayed 1: Alarm, show warning on the keypad when the feedback device fails or is disconnected 2: Fault, stop pump system when the feedback fails or is disconnected	**NOTE:** Disable parameter b5-12 if no transducer is installed.
b5-14	2.0 sec.	PI Feedback Loss Detection Time	Delay time before iQpump shows alarm or fault when feedback device has failed or is disconnected. Example: 2.0 sec., iQpump displays alarm or fault 2 sec. after the device has failed or is disconnected.	
C1-01	20.0 sec.	Acceleration Time 1	Time it takes to accelerate the pump motor from zero to maximum speed.	Adjusted depending on system performance
C1-02	10.0 sec.	Deceleration Time 1	Time it takes to decelerate the pump motor from maximum speed to zero.	
L5-01	5	Number of Restart Attempts	Determines the number of times iQpump will perform an automatic restart on the faults listed in the comments column. iQpump System Protection Faults that can be setup to restart are Low Level Feedback, High Level Feedback, Transducer Loss, Not Maintaining Set-point, Loss of Prime, Pump Over Cycle. Refer to parameters P4-07 and P4-08. The number of restart attempts is set by L5-01.	• Overcurrent • Ground Fault • Output Phase Loss • Input Phase Loss • iQpump Overload • Motor Overload • Overtorque • DC Bus Fuse Blown • DC Bus Undervoltage • DC Bus Overvoltage • Overheat
L5-03	20 sec.	Maximum Restart Time After Fault	If the restart fails (or is not attempted due to a continuing fault condition) iQpump waits the Maximum Restart Time After Fault, before attempting another restart.	
P1-06	40.0 Hz	Minimum Pump Frequency	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)	P1-06 should be set to the level where the pump can produce the minimum pressure even at zero flow.
P2-03	5 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)	Adjust according to system requirements.
P4-05	30.0 Hz	Thrust Bearing Frequency	Sets the frequency reference used when the thrust bearing function is active. A value of 0 disables this function.	Primarily used for submersible pumps. Program P4-05 = 0.0 Hz to disable function when iQpump is used with a centrifugal pump.
P4-11	0.2 Min	Utility Start Delay	When utility power is restored and P4-10 is enabled (1), iQpump waits the time specified in P4-11 before auto operation becomes active.	Note: Only active when P4-10 is enabled (1) and operation (start/stop) is from the digital operator.

4 HAND MODE OPERATION

Hand Speed from the Keypad/Digital Operator (Default)
Press the HAND KEY on the digital operator to run the system in Hand Mode.

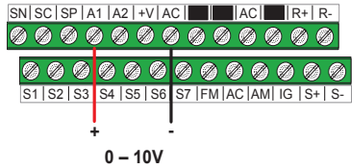
Hand Mode speed can be adjusted by pressing DATA ENTER, use RESET to move the cursor and ∧ ∨ to adjust the hand speed reference.

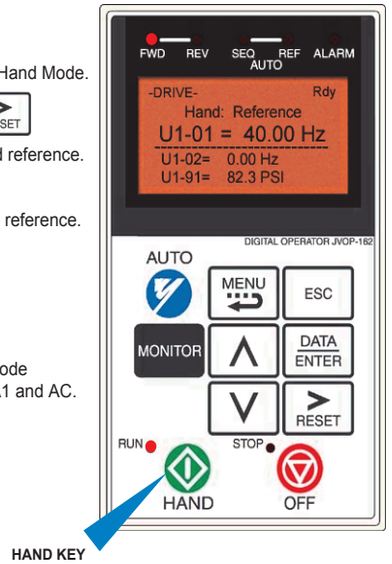


Press DATA ENTER to save new active hand speed reference.

'0' Blinking

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 A1 and AC.



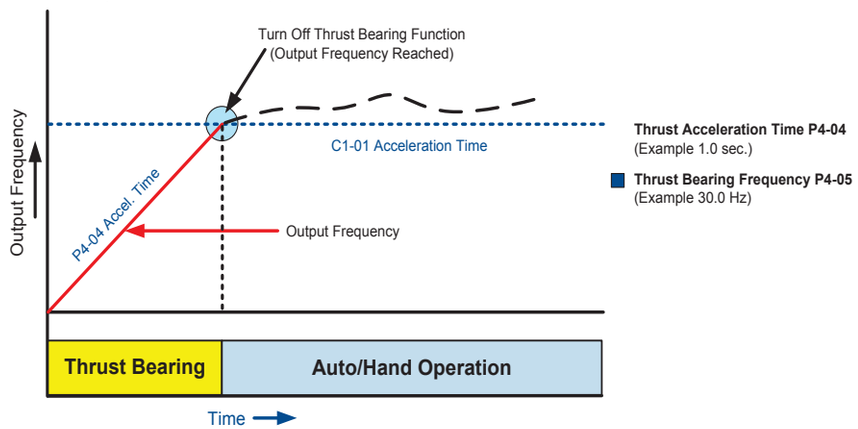


Note: Hand Key can be disabled with parameter P5-04

5 THRUST BEARING - SUBMERSIBLE MOTORS (e.g. Franklin)

Note: Thrust Bearing Function is Enabled by Default

When **using** a submersible motor in combination with iQpump, it is recommended to use the **Thrust Bearing** function to prevent excess motor wear. To enable this function, enter the minimum motor frequency in parameter P4-05. Example: Minimum motor speed 1800 RPM, 1800 RPM ÷ 3600 RPM x 60.0 Hz = **30.0 Hz**



6 AUTO OPERATION – POWER DOWN STORAGE

Allows iQpump to automatically start after power failure when operated from keypad / digital operator. This function is recommended for use when operating the iQpump in remote / unmanned areas.

When the iQpump is powered down while running, an internal run command will automatically be initiated upon power-up.

Step 6 Pump Rotation and Feedback Signal Check

When Pump Quick Setup is completed, press MONITOR to exit the Pump Quick Setup menu and go to operation.

In this step the pump motor is checked for proper direction and operation. This test is to be performed solely from the digital operator. Apply power to the iQpump after all the electrical connections have been made and the terminal cover has been reattached. At this point, **DO NOT RUN THE MOTOR**, the digital operator should display as shown below in ***Fig. 5***.

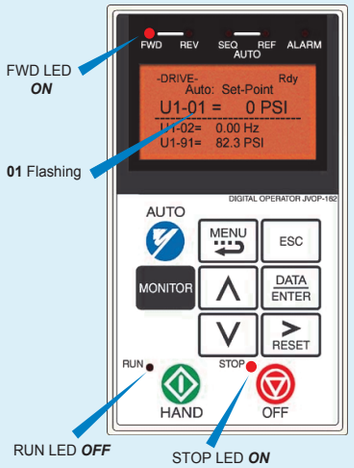


Fig. 5 Digital Operator

Next, push HAND on the digital operator; the display should read



Hand reference speed can be adjusted by pressing DATA ENTER, use RESET to move cursor and ∧ ∨ to adjust the value. Press DATA ENTER to save changes.

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

RUN ● LED should be ***ON***.

Push OFF on the digital operator; the display should read as in Fig. 3.

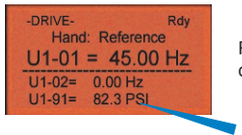
If the direction is not correct, then power down the iQpump.

DANGER, ***LETHAL VOLTAGES ARE PRESENT- Before applying power to the iQpump, 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.***

Using Safety precaution, and referring to ***Fig.1 or 2,*** swap any ***two*** of the ***three*** output leads to the pump motor (U/T1, V/T2 and W/T3). After the wiring change repeat ***Step 6*** and recheck motor direction.

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.

Step 7 Auto Mode Operation

iQpump can be operated in automatic mode when the following actions have been performed:

- All parameters are programmed
- Pump motor direction has been checked
- Feedback signal has been checked

At this point, **DO NOT RUN THE MOTOR**, the digital operator should display as shown below in ***Fig. 6***.

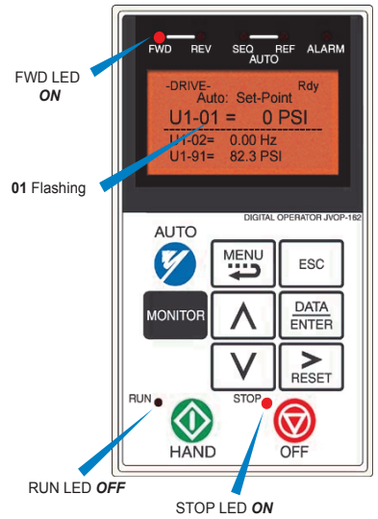


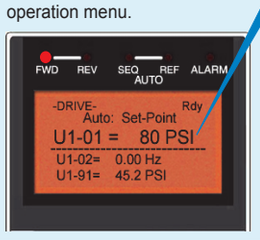
Fig. 6 Digital Operator

SET SYSTEM SET-POINT

Next, press DATA ENTER to access or modify the system set-point that was entered using parameter d1-01 System Set-point in the Pump Quick Setup Menu

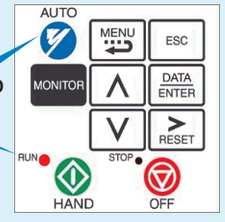
Use RESET to select the digit and ∧ ∨ to change the system set-point.

Next press DATA ENTER to store set-point and press MONITOR to return to the main operation menu.

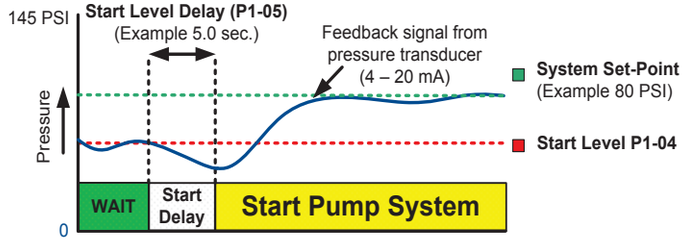


Example: 80 PSI

Next, press the **AUTO** button to start the iQpump.



iQpump 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 2 of 4 for additional information on the Start Level Function.

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 User Manual (Document No. TM.iQp.06) 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: Set-point 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.

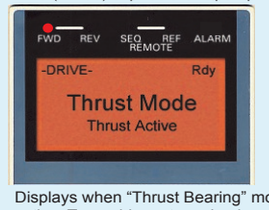
TYPICAL DISPLAY MESSAGES



Displays when the iQpump is about to start. The feedback level has fallen below the Start Level (P1-04) and the start delay timer is active. Once the Start Level Delay Time (P1-05) expires the iQpump will start.



Displays when the iQpump is in “sleep” mode or when the iQpump is waiting for the feedback level to drop below the Start Level (P1-04).



Displays when “Thrust Bearing” mode is active. To enable, enter value in parameter P4-05



The feedback level has risen above P1-09 level for the time specified in P1-10. High feedback fault is active in Hand Mode, Auto Mode, Pre-Charge and Thrust Mode when the iQpump is running.

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