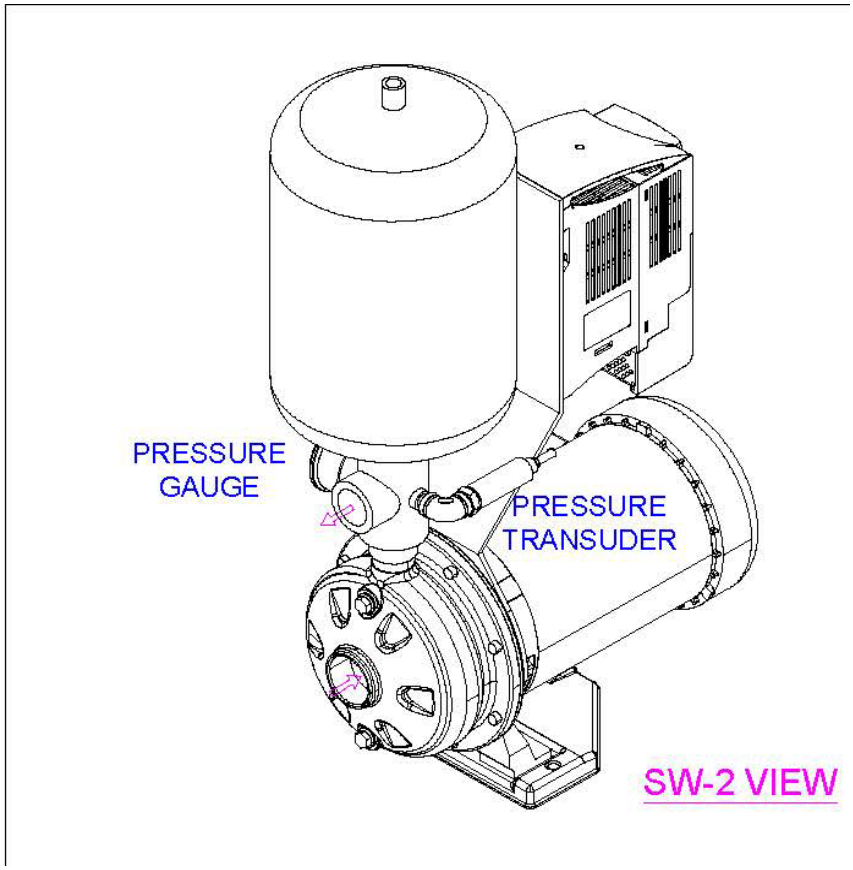
SENCILLO™
SIMPLE.

QUARK ELECTRONIC BOOSTER PUMP

OPERATION AND MAINTENANCE MANUAL



Sencillo Systems
2381 Philmont Avenue #125
Huntingdon Valley PA 19006
P: 610-340-2848
www.sencillosystems.com

SUBJECT DATA

Section	Subject Item
1.	Sequence of Operations and Model Numbers
2.	Drawing
3.	Pump
4.	Bladder Tank
5.	Controller
6	Pressure Transducer

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SECTION 1

Sequence of Operations and Model Numbers

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QUARK
Pressure Maintenance
SEQUENCE OF OPERATION

The ***QUARK*** Variable Speed Packaged Pump System incorporates the following sequence of operations:

BASIC OPERATION – The pump operates continuously at various speeds to maintain the system discharge pressure at a specified pressure (in PSI). The pump increases in speed when the pressure is less than the set point level and slows when the pressure approaches the set point pressure.

The control software uses a Proportional Derivative Integral (PID) Loop Controller to accomplish this control.

When the pressure reaches the set point level, and stays there for a specific amount of time, the pump will slow down and turn off. If, at any time, the pressure drops below the allowable pressure band, the pump turns back on and replenishes the pressure to bring it back to the setpoint value.

Set Point Pressure – The desired level is set on the front of the drive.

Pump Speed – The pump RPM is adjusted up and down by a Variable Frequency Drive (VFD) connected directly to each individual Pump Motor. A Signal from the Level Transducer is constantly being compared to a "System Set-Point" on the Interface Panel. The Pump Drive Controller directs the drive to either speed up or slowdown in order to meet or maintain the System Set-Point Level.

The speed of response, timing of increase and decrease speed, and run time of the drive are all parameters that are set by the startup technician, tuned to maintain smooth operation on the building.

High/Low Level Alarm Dry Contact – The controller includes a single 2 wire relay output that provides a dry contact alarm if the tank level reaches a high or low level. The high and low level is set on the drive. This provides only the activation of a common alarm for either case, and does not include a light or horn.

Pump Fault – If a motor were to fail or a drive fault, the Faulted Pump will be displayed in Red on the Home Screen, the word "Faulted" will appear. The pump will not run until resolved.

Pressure Transducer – the transducer converts the water pressure (measured by means of water pressure measured at the sensor) to a 4-20mA signal and transmits it to the controller for operations.

Form QSO
Dated: 1/4/19
Rev. A

Quark Simplex Variable Speed Pump - Includes centrifugal motor-driven pump with mechanical seal, Variable Speed Pump Controller with No-Flow Shutdown/Auto Restart, pre-wired to the motor, Customer Pressure Selection, Alarms, Pressure Transducer, Discharge 304SS Piping, 2.5" Glycerin-Filled Discharge Pressure gauge, Discharge Ball Valve & Check Valve, 2 gallon 150psi Hydro Tank. Conforms to NSF61 Low Lead Drinking Laws.

GPM	Boost Pressure (PSI)	HP	NPT Suct (in)	NPT Disch (in)	1/230V Model	QTY	3/208-230v Model	QTY	3/480v Model	QTY	Weight (lbs)
30	15	.75	1.25	1	S30-15-1/230		S30-15-3/230		S30-15-3/480		67
	20	.75	1.25	1	S30-20-1/230		S30-20-3/230		S30-20-3/480		67
	25	.75	1.25	1	S30-25-1/230		S30-25-3/230		S30-25-3/480		67
	30	1.5	1.25	1	S30-30-1/230		S30-30-3/230		S30-30-3/480		70
	35	1.5	1.25	1	S30-35-1/230		S30-35-3/230		S30-35-3/480		70
	40	1.5	1.25	1	S30-40-1/230		S30-40-3/230		S30-40-3/480		70
	45	3	1.25	1	S30-45-1/230		S30-45-3/230		S30-45-3/480		91
	50	3	1.25	1	S30-50-1/230		S30-50-3/230		S30-50-3/480		91
	55	3	1.25	1	S30-55-1/230		S30-55-3/230		S30-55-3/480		91
	60	3	1.25	1	S30-60-1/230		S30-60-3/230		S30-60-3/480		90
	70	3	1.25	1	S30-70-1/230		S30-70-3/230		S30-70-3/480		90
40	15	.75	1.25	1	S40-15-1/230		S40-15-3/230		S40-15-3/480		67
	25	1.5	1.25	1	S40-25-1/230		S40-25-3/230		S40-25-3/480		70
	30	1.5	1.25	1	S40-30-1/230		S40-30-3/230		S40-30-3/480		70
	35	1.5	1.25	1	S40-35-1/230		S40-35-3/230		S40-35-3/480		70
	40	3	1.25	1	S40-40-1/230		S40-40-3/230		S40-40-3/480		91
	45	3	1.25	1	S40-45-1/230		S40-45-3/230		S40-45-3/480		91
	50	3	1.25	1	S40-50-1/230		S40-50-3/230		S40-50-3/480		91
	60	3	1.25	1	S40-60-1/230		S40-60-3/230		S40-60-3/480		90
50	25	1.5	1.25	1.5	S50-25-1/230		S50-25-3/230		S50-25-3/480		66
	30	1.5	1.25	1.5	S50-30-1/230		S50-30-3/230		S50-30-3/480		66
	40	3	1.25	1.5	S50-40-1/230		S50-40-3/230		S50-40-3/480		87
	50	3	1.5	1.5	S50-50-1/230		S50-50-3//230		S50-50-3//480		87
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	40	3	1.5	1.5	S60-40-1/230		S60-40-3/230		S60-40-3/480		87
	45	3	1.5	1.5	S60-45-1/230		S60-45-3/230		S60-45-3/480		87
70	15	1.5	1.5	1.5	S70-15-1/230		S70-15-3/230		S70-15-3/480		66
	25	3	1.5	1.5	S70-25-1/230		S70-25-3/230		S70-25-3/480		87
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	35	3	1.5	1.5	S70-35-1/230		S70-35-3/230		S70-35-3/480		87
	40	3	1.5	1.5	S70-40-1/230		S70-40-3/230		S70-40-3/480		87
	45	3	1.5	1.5	S70-45-1/230		S70-45-3/230		S70-45-3/480		87
80	15	1.5	1.5	1.5	S80-15-1/230		S80-15-3/230		S80-15-3/480		66
	20	3	1.5	1.5	S80-20-1/230		S80-20-3/230		S80-20-3/480		87
	35	3	1.5	1.5	S80-35-1/230		S80-35-3/230		S80-35-3/480		87
	40	3	1.5	1.5	S80-40-1/230		S80-40-3/230		S80-40-3/480		87
100	20	3	1.5	1.5	S100-20-1/230		S100-20-3/230		S100-20-3/480		101
	25	3	1.5	1.5	S100-25-1/230		S100-25-3/230		S100-25-3/480		101
	30	3	1.5	1.5	S100-30-1/230		S100-30-3/230		S100-30-3/480		101

NOTES:

Requires flooded suction condition.

This product is designed for clean water, free of debris.

Maximum setpoint and operating pressure is 130 psi.

Unit ships in Box.

Startup service is not required for warranty application.

Bladder Tank MUST be charged to 5 psi below setpoint pressure.

Controls are designed to operate in clean/dry environment. Not suitable for wet or outdoor applications.

SECTION 2

Drawing

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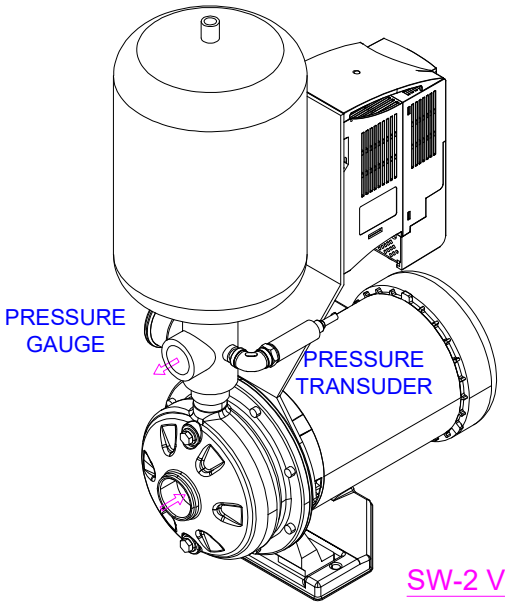
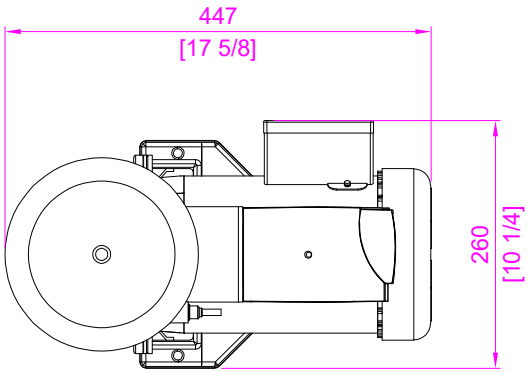
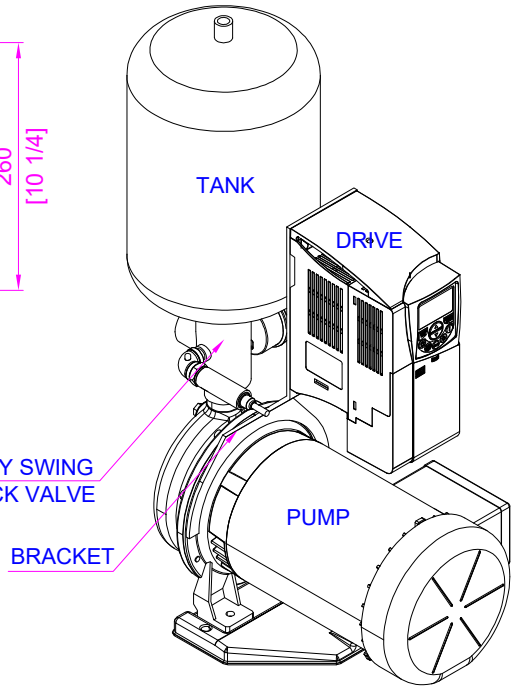


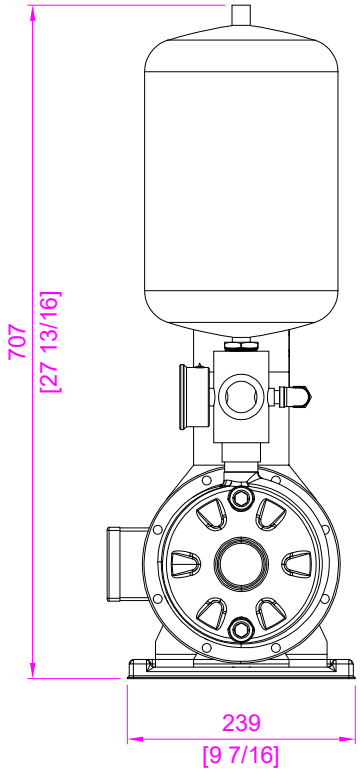
SW-2 VIEW



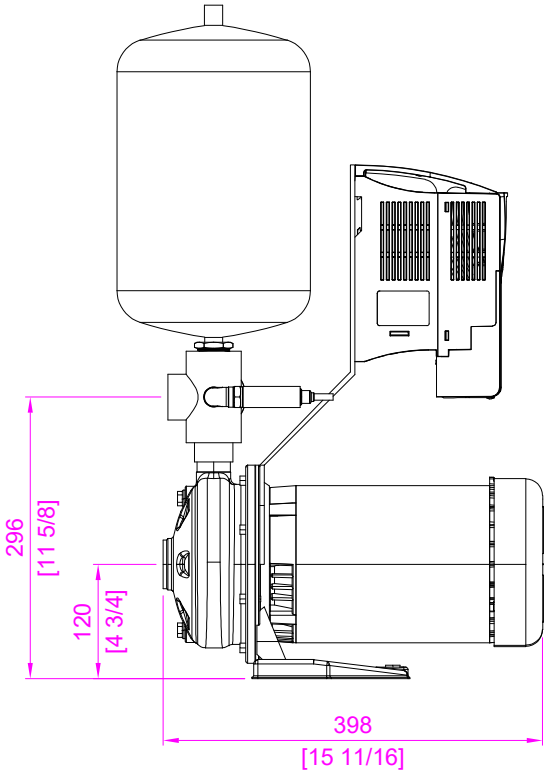
TOP VIEW



SW-1 VIEW



SIDE VIEW



FRONT VIEW

NOTES :

1. PIPE SUPPORTS NOT SHOWN (INSTALLED AS REQUIRED AT ASSEMBLY).

2. TOLERANCES ARE 1/4" UNLESS OTHERWISE NOTED.

3. TOLERANCES FOR CONNECTIONS ARE 1" UNLESS OTHERWISE NOTED.

4. WHEN PREFABRICATING INTERCONNECTING FIELD PIPING,LEAVE AT LEAST ONE FINAL WELD OR JOINT IN EACH PLANE UNTIL MODULE IS INSTALLED ON FOUNDATION.

5. TOTAL WEIGHT : .....LBS (APPROX.)

SENCILLO SYSTEMS
966 ARGYLE RD
WARRINGTON, PA 18976
TEL: (610) 340-2848

PROJECT NUMBER :

PROJECT NAME:

PROJECT ADDRESS:

CUSTOMER CONNECTIONS :
WATER INLET :
WATER OUTLET :

PUMP DATA:
MODEL : ACDU200530T3C
SUCTION :
DISCHARGE :
HP :

REV.	DATE	DESCRIPTION
00	16/02	FIRST ISSUE

REVISIONS

DRAWING TITLE :

QUARK 2.0
GA DRAWING

DESIGNER :	DRAFTER :	CHECKED BY:
JC	JL	TH

DATE : 16/02/2025

SCALE : AS NOTED

DRAWING NUMBER :
S-XXXX-100

SECTION 3

PUMP

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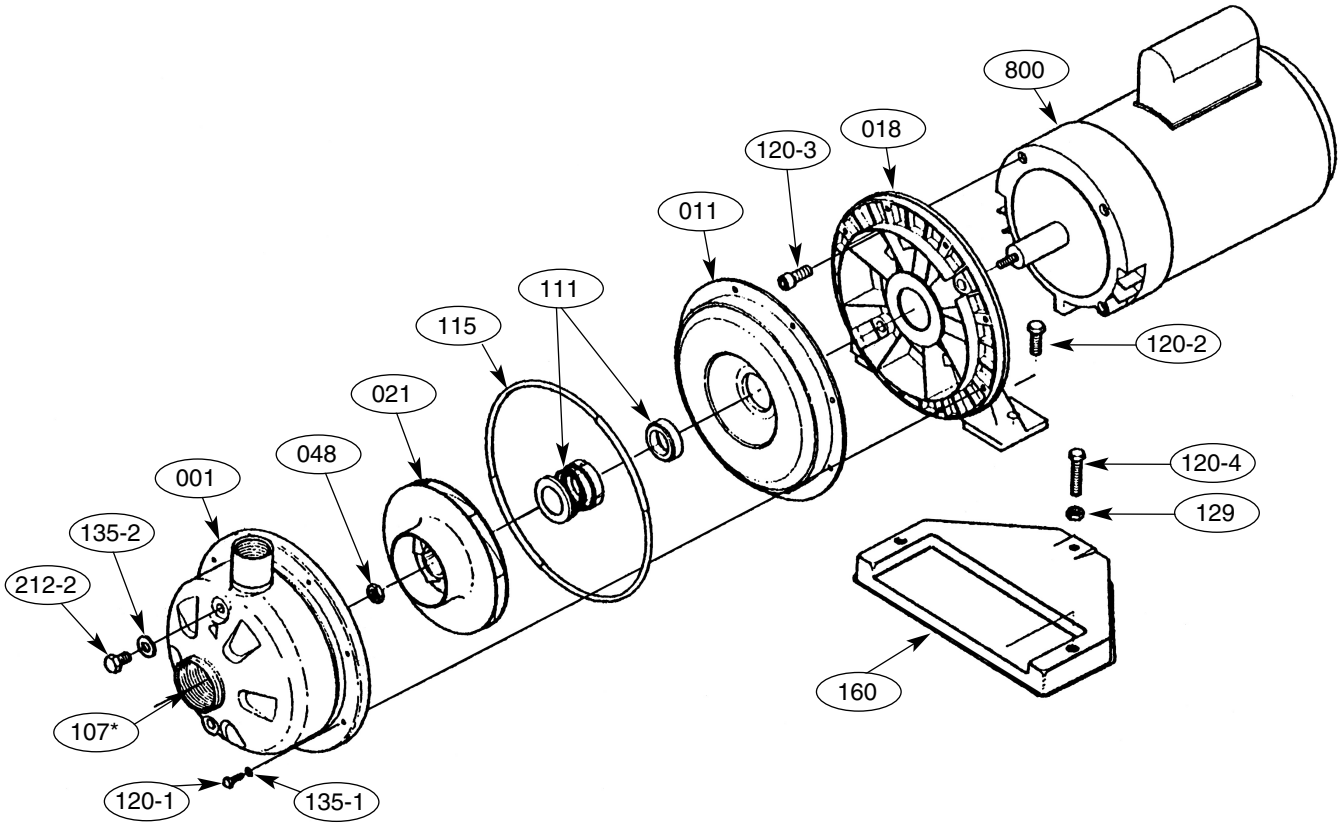
Model CDU **EBARA Stainless Steel Centrifugal Pumps**

Sectional View



Part No.	Part Name	Material	No. for 1 Unit
001	Casing	304L Stainless	1
011	Casing cover	304L Stainless	1
018	Bracket	Aluminum	1
021	Impeller	304L Stainless	1
048	Impeller nut	304L Stainless	1
107*	Casing ring (*CDU 70 series only)	Viton	1
111	Mechanical seal	—	1
115	O-Ring	Viton	1
120-1	Bolt	304L Stainless	8
120-2	Bolt	304L Stainless	2
120-3	Bolt	304L Stainless	4
120-4	Bolt	304L Stainless	1
129	Nut	304L Stainless	1
135-1	Washer	304L Stainless	8
135-2	Washer	Aluminum	2
160	Base	Steel	1
212-2	Plug	304L Stainless	2
800	Motor	—	1

Models:

CDU*

CDX

2CDU*

2CDX

Instruction and Operation Manual

NSF

Certified to NSF/ANSI 61, ANNEX G

* NSF/ANSI 61 Annex G listed models: CDU, 2CDU

EBARA

EBARA Standard Pump

EBARA Pumps Americas Corporation

Contents

NOTE: *Only products bearing the NSF Mark on the product, product packaging, and/or documentation shipped with the product are Certified.*

⚠ WARNING

IMPORTANT SAFETY INSTRUCTIONS
Rules for Safe Installation and Operation

1. Read these rules and instructions carefully. Failure to follow them could cause serious bodily injury and/or property damage.
2. Check your local codes before installing. You must comply with their rules
3. For maximum safety, this product should be connected to a grounded circuit equipped with a ground fault interrupter device.
4. Before installing this product, have the electrical circuit checked by an electrician to make sure it is properly grounded.
5. Before installing or servicing your pump, BE CERTAIN pump power source is disconnected.
6. Make sure the line voltage and frequency of the electrical current supply agrees with the motor wiring. If motor is dual voltage type, BE SURE it is wired correctly for your power supply.
7. Complete pump and piping system MUST be protected against below freezing temperature. Failure to do so could cause severe damage and void the warranty.
8. Avoid system pressures that may exceed one and a half times the operating point selected from the pump performance curve.
9. Do not run your pump dry. If it is, there will be damage to the pump seal.

General Description

CDU, 2CDU, CDX, 2CDX model pumps may be used for the pumping of clean water and other fluids compatible with 304 stainless steel. These pumps are not to be used for handling dirty water or water with suspended solids, water containing acids, or corrosive liquids, seawater, and flammable or dangerous liquids. Please see pump specifications for fluid temperature ranges. These pumps are not designed to run without water.

2CDU/2CDXU model pumps and CDU/CDXU model pumps are similar in function and construction. The differences between the models include:

- single impeller vs. twin impeller
- flow rate
- heads
- weight
- dimensions.

Please see the technical specifications in this manual for more detailed descriptions.

Rules for Safe Installation and Operation

PACKAGE CONTENTS

1. Be sure all parts have been furnished and that nothing has been damaged in shipment.
2. The catalog lists all parts included with package. A packing list packed with pump, also lists contents.
3. OPEN PACKAGES AND MAKE THIS CHECK BEFORE GOING TO JOBSITE.

PIPING – Pipes must line up and not be forced into position by unions. Piping should be independently supported near the pump so that no strain will be placed on the pump casing. Where any noise is objectionable, pump should be insulated from the piping with rubber connections. Always keep pipe size as large as possible and use a minimum of fittings to reduce friction losses.

SUCTION PIPING – Suction pipe should be direct and as short as possible. It should be at least one size larger than suction inlet tapping and should have a minimum of elbows and fittings (5 to 6 pipe diameters of straight pipe before inlet is recommended). The piping should be laid out so that it slopes upward to pump without dips or high points so that air pockets are eliminated. The highest point in the suction piping should be the pump inlet except where liquid flows to the pump inlet under pressure.

The suction pipe must be tight and free of air leaks or pump will not operate properly.

DISCHARGE PIPING – Discharge piping should never be smaller than pump tapping and should preferably be one size larger. A gate valve should always be installed in discharge line for throttling if capacity is not correct. To protect the pump from water hammer and to prevent backflow, a check valve should be installed in the discharge line between the pump and gate valve.

ELECTRICAL CONNECTIONS – Be sure motor wiring is connected for voltage being used. Unit should be connected to a separate circuit. A fused disconnect switch or circuit breaker must be used in this circuit. Wire of sufficient size should be used to keep voltage drop to a maximum of 5%.

Single phase motors have built-in overload protection. Flexible metallic conduit should be used to protect the motor leads.

PRIMING – The pump must be primed before starting. The pump casing and suction piping must be filled with water before starting motor. Remove vent plug in top of casing while pouring in priming water. A hand pump or ejector can be used for priming when desired. When water is poured into pump to prime, remove all air before starting motor.

STARTING – When the pump is up to operating speed, open the discharge valve to obtain desired capacity or pressure. **WARNING! DO NOT ALLOW THE PUMP TO RUN WITH THE DISCHARGE VALVE TIGHTLY CLOSED. IF THE PUMP RUNS FOR AN EXTENDED PERIOD OF TIME WITHOUT LIQUID BEING DISCHARGED, THE LIQUID IN THE PUMP CASE CAN GET EXTREMELY HOT CAUSING SEVERE DAMAGE TO THE PUMP AND POSSIBLY CAUSE INJURY TO PEOPLE.**

ROTATION – All single phase motors are single rotation and leave factory with proper rotation. Three phase motors should be checked to ensure proper rotation

FREEZING – Care should be taken to prevent the pump from freezing during cold weather. It may be necessary, when there is any possibility of this, to drain the pump casing when not in operation. Drain by removing the pipe plug in the bottom of the casing.

ROTARY SEAL – PRO STEEL pumps are fitted only with rotary seal. This seal is recommended for LIQUIDS free from abrasives.

LOCATION OF UNIT – The pump should be installed as near to the liquid source as is practical so that the static suction head (vertical distance from the center line of the pump to water level) is maximized, and so that a short, direct suction pipe may be used. The capacity of a centrifugal pump is reduced when the unit is operated under a high suction lift. The piping should be as free from turns and bends as possible, as elbows and fittings greatly increase friction loss. Place the unit so that it is readily accessible for service and maintenance and on a solid foundation, which provides a rigid and vibration-free support. Protect the pump against flooding and excess moisture.

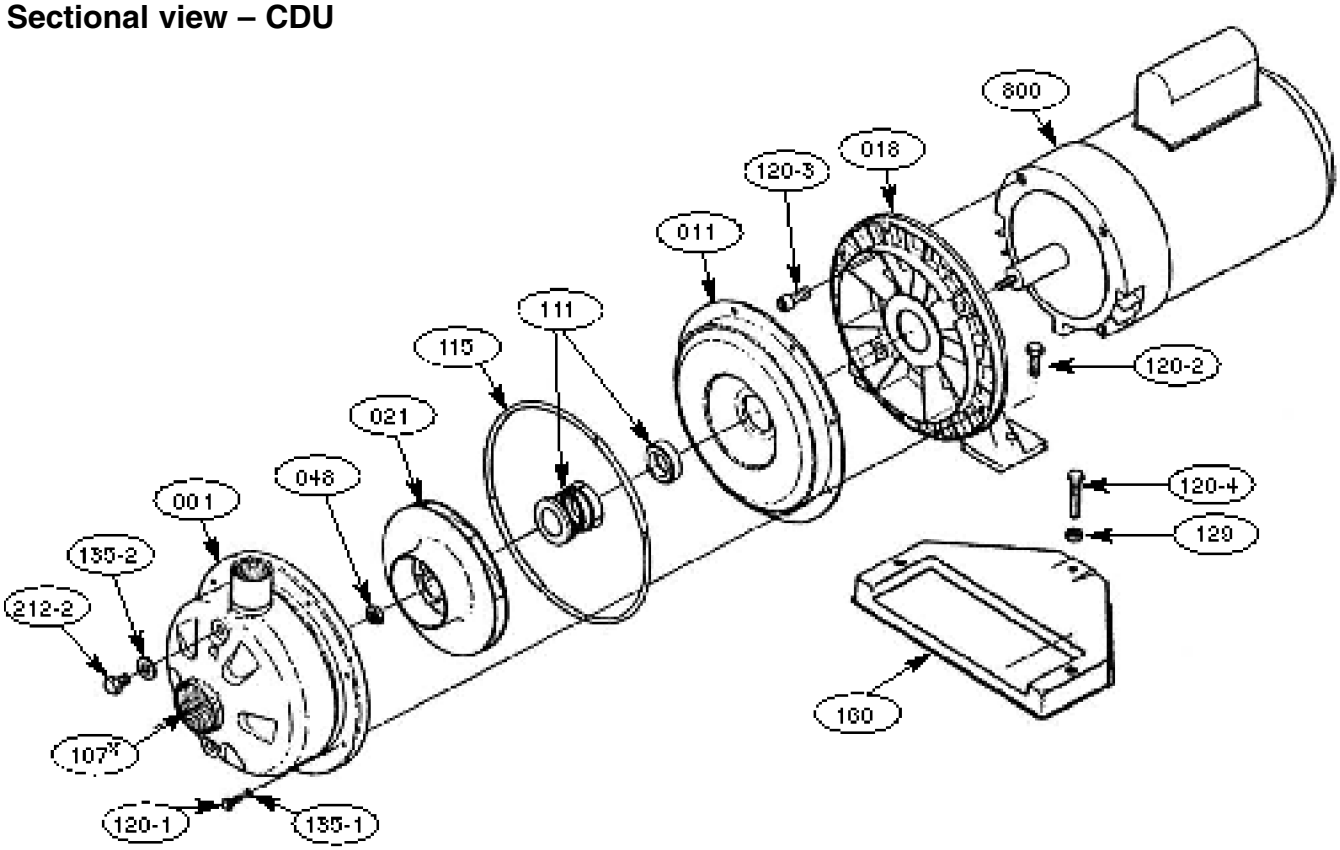
Specifications – CDU

	Standard	Optional
Size		
Suction	CDU70 – 1¼" NPT thread CDU120 – 1¼" NPT thread CDU200 – 1½" NPT thread	
Discharge	1" NPT thread	
Range of HP	½ HP to 3 HP	
Range of Performance		
Capacity	5.5 to 95 GPM at 3450 RPM	
Head	26 to 144 feet at 3450 RPM	
Liquid handled		
Type of liquid	Water	
Temperature	212 F (100 C)	Max. 250 F (121 C) with optional high temperature seal
Max. working pressure	125 PSI (9 Bar)	
Materials		
Casing	304L Stainless Steel	
Impeller (closed type)	304L Stainless Steel	
Shaft	Stainless Steel	
Bracket	Aluminum	
Shaft Seal	Mechanical Seal – Type 21	High temperature version Mild chemical version
Direction of Rotation	Clockwise when viewed from motor end	
Motor		
Type	NEMA 56J Frame	
Speed	60 Hz, 3450 RPM (2 poles)	60Hz, 1725 RPM (4 poles)
Single Phase	TEFC – ½ HP to 3 HP	
	ODP – ½ HP to 3 HP, 115/230V	Explosion proof – consult factory
Three Phase	TEFC – ½ HP to 3 HP	Washdown duty – consult factory
	ODP – ½ HP to 3 HP, 208-230/460V	
Bearing	Ball Bearing	
Motor Protection	Built-in overload protection (single phase)	

Specifications – 2CDU

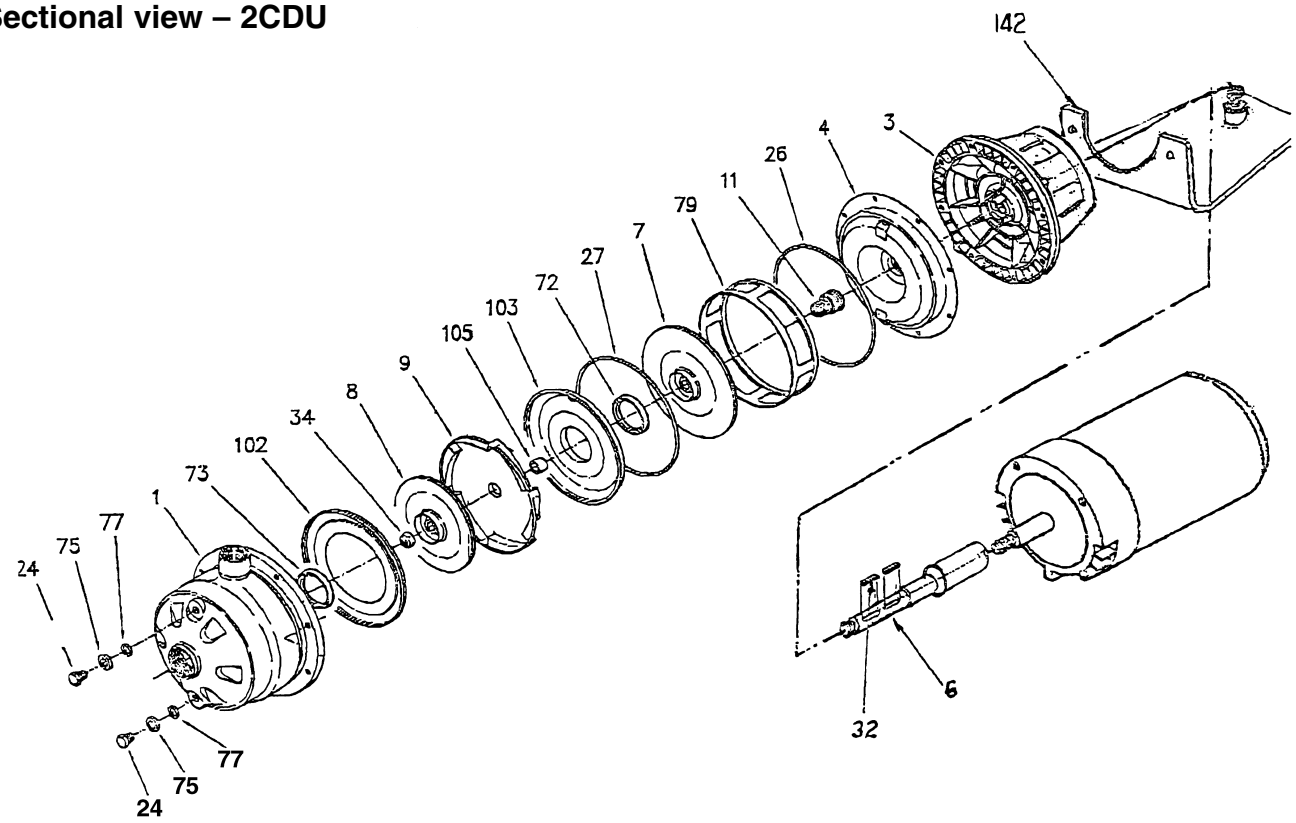
	Standard	Optional
Size		
Suction	2CDU70 – 1¼" NPT Thread 2CDU120 – 1¼" NPT Thread 2CDU200 – 1½" NPT Thread	
Discharge	1" NPT Thread	
Range of HP	2 HP to 5 HP	
Range of Performance		
Capacity	5.5 to 66 GPM at 3600 RPM	
Head	98 to 245 feet at 3600 RPM	
Liquid handled		
Type of liquid	Clean water	
Temperature	Maximum: 212 F (100 C)	Maximum: 250 F (121 C) with optional high temperature seal
Working pressure	Maximum: 125 PSI (9 Bar)	
Materials		
Casing	304L Stainless Steel	
Impeller (closed type)	304L Stainless Steel	
Shaft	304L Stainless Steel	
Bracket	Cast iron	
Shaft Seal	Mechanical Seal – Type 21	High temperature version Mild chemical version
Direction of Rotation	Clockwise when viewed from motor end	
Motor		
Type	NEMA 56J Frame	
Speed	60 Hz, 3450 RPM (2 poles)	
Single Phase	TEFC – 2 HP to 5 HP	
	ODP – 2 HP to 3 HP, 115/230V	Explosion proof – consult factory
Three Phase	TEFC – 2 HP to 5 HP	Washdown duty – consult factory
	ODP – 2 HP to 3 HP, 208-230/460V	
Motor Protection	Built-in overload protection (single phase)	
Bearing	Ball Bearing	

Sectional view – CDU



Part No.	Part Name	Material	No. for 1 Unit
001	Casing	304L Stainless	1
011	Casing cover	304L Stainless	1
018	Bracket	Aluminum	1
021	Impeller	304L Stainless	1
048	Impeller nut	304L Stainless	1
107*	Casing ring (*CDU 70 series only)	Viton	1
111	Mechanical seal	—	1
115	O-Ring	Viton	1
120-1	Bolt	304L Stainless	8
120-2	Bolt	304L Stainless	2
120-3	Bolt	304L Stainless	4
120-4	Bolt	304L Stainless	1
129	Nut	304L Stainless	1
135-1	Washer	304L Stainless	8
135-2	Washer	304L Stainless	2
160	Base	Steel	1
212-2	Plug	304L Stainless	2
800	Motor	—	1

Sectional view – 2CDU



Location No.	Part Name	Material	No. for 1 Unit
001	Casing	304 Stainless	1
003	Motor bracket	Cast Aluminum	1
004	Casing cover	304 Stainless	1
006	Shaft extension	304 Stainless	1
007	Impeller	304 Stainless	1
008	Impeller	304 Stainless	1
009	Diffuser	304 Stainless	1
011	Mechanical Seal Type 21	Carbon/Ceramic	1
024	Priming plug/Drain plug	304 Stainless	2
026	O-Ring	Viton	1
027	O-Ring	Viton	1
032	Key	Stainless	2
034	Impeller nut	304 Stainless/Nylon	1
072	Casing ring	Viton	2
073	Casing ring	Viton	1
075	Washer	304 Stainless	2
077	O-ring	Viton	2
079	Spacer diffuser	304 Stainless	1
102	Suction cover	304 Stainless	1
103	Conveyor cover	304 Stainless	1
105	Sleeve	304 Stainless	1
142	Base	Steel	1

Mounting Instructions

Mounting the Assembly

Do not operate the pump unless the assembly is securely and properly mounted.

Misalignment of the motor/pump assembly or not having the assembly reasonably level may cause pump vibration, noisy operation, fluid leaks, or air leaks and air locks in the suction pipe.

1. Place the motor/pump assembly in its intended operating position.

2. Level the pump through the centerline of the motor/pump assembly suction port.

⚠ WARNING

Initial Operation

Make certain the motor is not connected to a power source until the motor is properly assembled and mounted. Serious personal injury or damage to the motor/pump assembly could occur if the motor is activated improperly.

Only certified electricians should make electrical connections.

1. Prime the pump by adding fluid to the volute case through the top plug.To properly prime the pump, venting may be required.

2. Check the nameplate on the motor to determine the correct wiring procedure for your intended power source and if the motor is single or three phase. Connect the motor to a power source by following the wiring procedure on the motor's nameplate.

Note:

a. Single phase motors are typically dual voltage. In some cases, three phase motors are tri-voltage. Check the nameplate and follow the proper wiring procedure for the voltage you are using. Improperly wiring the motor could result in damage to the motor.

b. Three phase motors require a control box. Install overload protection to help prevent motor damage.

c. Depending on the wiring, three phase motors may start in reverse. Interchange any two power leads to change the starting direction and pump rotation.

- Always follow correct operating procedures.
- Always disconnect the motor/pump assembly from all power sources before servicing the pump or motor.
- Periodically check all power connections, bolts, screws, and the motor's mounting.
- Failure to properly follow assembly and operating instructions could result in damage to the pump and motor.
- Failure to properly install the impeller and impeller nut could result in damage to the pump and could cause serious personal injury.

Maintenance

Service
Keep ventilation openings clear of extraneous objects which may hinder free flow of air thru motor. Motor bearings are lubricated during manufacture. Additional lubrication is not required during their normal lifetime.

⚠ CAUTION

Draining
The pump and piping should always be protected against freezing temperatures. If there is any danger of freezing, the unit should be drained. To drain the pump, remove the drain plug at the bottom of the volute, and remove the priming plug to vent the pump. Drain all piping.

Disassembly Instructions – CDU, CDX, 2CDU, 2CDX

All pumping parts can be removed from case without disturbing the piping.

⚠ WARNING

POWER SUPPLY – Open the power supply switch contacts and remove fuses. Disconnect the electrical wiring from the motor.

VOLUTE CASE
(a) Drain pump case by removing drain plugs.
(b) Remove the bolts securing volute case to pump bracket.
(c) Pry volute case from casing cover with a screwdriver.

IMPELLER
CDU – Hold the motor shaft with a screwdriver in the shaft end slot. Remove the impeller nut. Grasp and turn the impeller counterclockwise (as viewed from pump end).
CDX, 2CDX, 2CDU – Hold the motor shaft with a screwdriver in the shaft end slot. Use a wrench to remove the impeller nut. Slide impellers from the shaft.

SEAL
(a) Remove the rotating part of the seal by pulling it off the shaft.
(b) The stationary seat can be pressed from the casing cover.

CHECK LIST FOR EXAMINATION OF PUMP PARTS
IMPELLER - Replace the impeller if any vane is broken, excessive erosion shows, or if labyrinth surfaces are worn. Impeller nut should be replaced if damaged.

MECHANICAL SEAL - Seal face, O-ring and sealing members should be free of burrs and dirt. Complete seal assembly should be replaced if not in perfect condition.

SHAFT- Shaft surface under seal must be clean, smooth and without any grooves. It should be replaced if necessary.

VOLUTE AND SEAL PLATE LABYRINTH SURFACES (Wear Rings)- If worn, replace the necessary part. If furnished with pressed in wear rings, only the rings need be replaced.

NOTE
If replacement parts are ordered, please furnish the following information to your EBARA distributor:
1. Reference Numbers
2. Description of Pump Part
3. EBARA Model Number and Serial Number on the Nameplate.

CDU/CDX Assembly Instructions

Position the pump on its end with the shaft up. The work surface should be level, capable of supporting the motor.

> **⚠ WARNING**
>
> Make certain the motor is not connected to a power source. Do not install or assemble the pump on a motor connected to a power source. Serious injury could occur if the motor activates during pump assembly.

Assembling the Pump

1. Position the motor bracket on the motor with the mounting feet toward the motor. Cross-tighten bolts to factory recommended torque of 6 ft. lbs.

2. Using finger pressure only, firmly press the stationary seal seat into the casing cover. Press the seat until it evenly bottoms out in the seat cavity.

3. Be careful not to damage the stationary seal.
   a. Position the casing cover over the the motor shaft.
   b. Align the casing cover holes with the motor bracket holes.
   c. Firmly press the casing cover into position. (Casing cover may need to be tapped into place by using a rubber mallet.)

4. Ensure all seals have good contact.
   a. Carefully press the rotating seal assembly onto the motor shaft. Ensure the face of the seal assembly has solid, square contact with the stationary seal seat.
   b. The seal retainer must seal against the motor shaft.
   c. Position the seal spring and seal washer. CDX pumps do not require seal spring washers.

5. Failure to properly install the impeller and the impeller nut could result in the impeller spinning off the shaft in three phase applications (when the motor may start in reverse rotation).
   For CDU pumps:
   a. While holding the seal spring in place, thread the impeller clockwise onto the motor shaft.
   b. Use a screwdriver to hold the motor shaft stationary. Turn the impeller on the shaft until it spins down and bottoms out. Make certain that the impeller is firmly bottomed and sealed.
   c. Install the impeller nut onto the shaft in the same manner as the impeller was installed. Make certain the impeller nut is firmly sealed against the impeller. Apply lock tite to the impeller nut before installing.
   For CDX pumps:
   a. Position key in keyway on shaft
   b. Slide impeller onto shaft
   c. Tighten impeller nut.

6. Position the Viton O-ring over the casing cover. Do not cut nick or damage the O-ring during installation.

7. The discharge can be positioned in the direction desired.
   a. Position the pump volute casing over the casing cover.
   b. Rotate the discharge to the desired direction.
   c. Align the bolt holes and secure the case to the casing cover with lock washers and cap screws.
   d. Cross tighten the bolts to 3.4 lbs (factory recommended torque). Overtightening may result in stripping of the motor bracket threads.

8. Position the mounting base on the pump and secure with cap screws.

9. Place the bolt and lock nut on the back of the mounting base. Adjust the bolt height to support the motor and tighten the lock nut to secure the bolt height.

10. Rotate the impeller to ensure proper alignment.

Assembly Instructions – Models 2CDU, 2CDX

For 2CDX start with step # 3.

1. Apply thread locker to the shaft extension. Thread shaft extension on to the motor shaft. Tighten to 10Nm (7.5 ftlb).
2. Attach motor bracket to the motor cross tightening the bolts. 8 Nm (6 ftlbs)
3. Install stationary seal in the casing cover. Press the seal until it evenly bottoms out in the seat cavity.
4. Carefully press the casing cover onto the motor bracket. Be sure to align the casing cover bolt-holes with the bolt-holes in the motor bracket.
5. Carefully press the rotating seal assembly onto the motor shaft. Ensure that the face of the seal assembly has solid, square contact with the stationary seat. Position the seal spring and spring washer. (2CDX pumps do not require a seal spring washer.)
6. Install the casing cover o-ring. Do not nick or cut the o-ring.
7. Install key in the location to accept the delivery side impeller. Reference the parts list to ensure the proper part number impeller is in the proper position.
8. Install sleeve and key for the suction side impeller.
9. Install diffuser spacer. Be sure to align the diffuser spacer notch with the casing cover spigot.
10. Install the o-ring on the conveyor cover.
11. Assemble the conveyor cover being sure to align the casing cover notch with the diffuser spacer spigot.
12. Install the diffuser.
13. Slide the suction side impeller onto the shaft into its proper position. Reference the parts list to ensure the proper part number impeller is in the proper position.
14. Install the suction cover.
15. Thread the self locking nut onto the shaft and tighten

For 2CDU, go to step 16.A For 2CDX, go to step 16.

16. Place casing onto the assembly, aligning the holes of the casing with the holes of the casing cover and the motor bracket. Thread the casing bolts and crass tighten to 8 Nm (6ft lbs) Go to step 19.
17. Place casing onto the assembly aligning the holes of the casing with the holes of the casing cover and motor bracket. Thread the M6x 16 bolts into the upper side holes. Thread the M6 X 30 bolts in the lower side holes. Cross tighten the casing bolts to 8Nm (6 ftlbs)
18. Fit the base onto the bolts protruding from the lower side holes. Using lock washers and nuts secure the base to the assembly.
19. Install nut and screw in the jack screw position in the base. Set the pump on a horizontal surface and loosen jack screw until it comes in contact with the bottom of the motor.
20. Rotate pump shaft to ensure proper alignment of assembly. Pump shaft should rotate with out rubbing if assembly is installation is correct.

Troubleshooting

TROUBLE	POSSIBLE CAUSE	TROUBLESHOOTING
Pump does not run.	Faulty connection of power supply circuit.	Check power supply circuit.
	Wrong wiring of control circuit.	Correct control circuit.
	Bound shaft	Remove cause of obstruction.
	Mechanical seal faces stuck together	Release seal by turning shaft.
	Faulty motor	Repair or replace motor.
	Damage to bearing	Repair or replace any damaged bearing.
Pump does not pump water. Inadequate quantity.	Considerable voltage drop.	Check incoming power.
	Rotation direction reversed.	Correct rotation direction.
	Lack of priming.	Re-prime the pump.
	High discharge head.	Re-examine the plan.
	Large piping loss.	Re-examine the plan.
	Clogged foot valve.	Clear foot valve suction.
	Leakage from suction piping.	Check and repair suction piping.
	Too high suction lift.	Re-install as per instructions.
	Low water level.	Foot valve in ample immersion.
Overcurrent	Considerable fluctuation of power supply voltage.	Check incoming power.
	Considerable voltage drop.	Check incoming power.
	Low head and overflow rate.	Throttle flow rate at outlet.
	Damaged bearing.	Replace any damaged bearing.
Pump vibrates, excessive operating noise	Beyond rated capacity.	Reduce flow rate.
	Below minimum flow.	Consult distributor
	Improper piping.	Secure piping again.
	Damaged bearing.	Replace any damaged bearing.
	Foreign matter clogging cooling fan.	Remove foreign matter.
Pressurizing application. Pump starts and soon stops	Too limited pressure switch setting.	Replace pressure switch to wider range. Check and repair leaks.
Pump does not stop	Leakage in system.	Reduce max pressure setting to the lower in pressure switch.
	Too high pressure setting.	

MAINTENANCE:

The pump does not require special maintenance.

The following rules must be observed for safe operation:

If the pump is not going to be used for a long period, the pump should be drained of water and flushed with clean water.

Where the pump is exposed to freezing temperatures, it should always be left drained when not in use.

*All specifications subject to change without notice.

Complete enclosed Registration Card and return to Ebara Pumps Americas Corporation.

EBARA PUMPS AMERICAS CORPORATION
ROCK HILL, SOUTH CAROLINA
COMMERCIAL PUMP / PRODUCTS LIMITED WARRANTY
(EXCEPT MODEL OPTIMA SUMP PUMPS)

Ebara Pumps Americas Corporation (EPAC) warrants to the original purchaser only ("Customer") that the EPAC Commercial Pump/Product ("Pump") will be free of defects in workmanship and material for a period of twelve (12) months from the date of installation or eighteen (18) months from the date of shipment by EPAC, whichever comes first, provided that notification of any such defect is promptly given in writing to EPAC. Customer may be required at EPAC's request to verify that it is the Customer of the Pump and that the Pump was installed and operated in accordance with EPAC's instructions.

EPAC's sole obligation under this warranty will be to repair or replace with a new or reconditioned Pump, such Pump as has failed or has been found to be defective during the warranty period, or at EPAC's sole option, to refund to the customer an equitable part of the purchase price. In no event shall EPAC's cost responsibility exceed the initial purchase price paid by the Customer for the Pump.

EPAC shall be liable only for the cost of the Pump, or the cost of repair or replacement of any defective Pump. Customer shall be responsible for labor, cost of removal and installation at Customer's premises, transportation and insurance costs to EPAC and any other incidental costs.

This warranty is void and does not apply if damage is caused by improper installation, improper maintenance, accident, alteration, abuse, misuse or if the Pump has been disassembled prior to warranty evaluation without written authorization from EPAC.

Warranty service and information for return procedures will be provided by EPAC upon receipt of written notice describing the defect or problem to:

Ebara Pumps Americas Corporation
Warranty/Claims
1651 Cedar Line Drive
Rock Hill, SC 29730
803-327-5005 Phone
803-327-5097 Fax

THE FOREGOING WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY ON THIS PUMP, AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE DISCLAIMED AND EXCLUDED FROM THE TERMS OF THIS WARRANTY. EPAC'S SOLE OBLIGATION IN CASE OF ANY DEFECT WILL BE TO PROVIDE THE WARRANTY SERVICE SPECIFIED ABOVE THE FOREGOING IS CUSTOMER'S SOLE AND EXCLUSIVE REMEDY, WHETHER IN CONTRACT, TORT OR OTHERWISE AND EPAC SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES OF ANY KIND WHATSOEVER.

SECTION 4

BLADDER TANK

SENCILLO™

SIMPLE.

WELL-X-TROL®

150 PSIG Working Pressure

Construction

Shell	High Strength Steel
Diaphragm	Heavy Duty Butyl
Liner	Antimicrobial
System Connection	Stainless Steel
Finish	Tuf-Kote™ HG Blue
Water Circulator	Turbulator™
Air Valve	Projection Welded
Factory Precharge	38 PSIG (2.6 bar)

Performance

Maximum Operating Temperature	200°F (93°C)
Maximum Working Pressure	150 PSIG (10.3 bar)
Maximum Relief Valve Setting	125 PSIG (8.6 bar)
Warranty	7 Year

CERTIFIED TO NSF/ANSI 61

MADE IN USA

LOW-LEAD

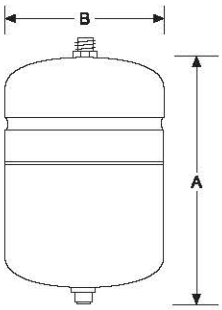
ANTIMICROBIAL PROTECTION

TURBULATOR

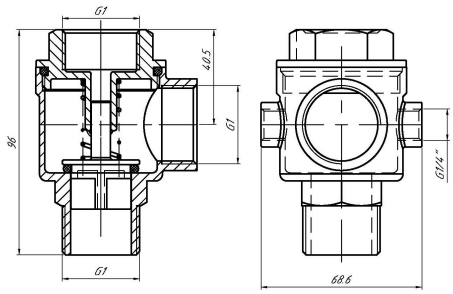
MC 4400 (01/17)

In-Line Models

Model Number	Tank Volume		Max. Acceptance Factor	A Tank Height		B Tank Diameter		System Connection (NPTM)	Shipping Weight	
	Gal	Lit		In	mm	In	mm	In	Lbs	Kg
WX-101	2.0	8	0.45	13	330	8	203	¾	5	2



5 PORT POPPET CHECK VALVE
- 304 stainless steel construction
- BUNA N elastomers
-NPT elastomer seat



Variable Speed Drive

CFW500 - variable speed drive					
Power supply (V)		Model	Frame size	Output current (A)	HP
Single-phase	230	CFW500 A 01P6 S2 NB20	A	1.6	1
		CFW500 A 02P6 S2 NB20		2.6	1
		CFW500 A 04P3 S2 NB20		4.3	1.5
		CFW500 A 07P0 S2 NB20		7	2
Single-phase	230	CFW500 B 07P3 S2 DB20	B	7.3	2
		CFW500 B 10P0 S2 DB20		10	3
Single-phase or three-phase	230	CFW500 A 01P6 B2 NB20	A	1.6	1
		CFW500 A 02P6 B2 NB20		2.6	1
		CFW500 A 04P3 B2 NB20		4.3	1.5
		CFW500 B 07P3 B2 DB20	B	7.3	2
		CFW500 B 10P0 B2 DB20		10	3
Three-phase	230	CFW500 A 07P0 T2 NB20	A	7	2
		CFW500 A 09P6 T2 NB20		9.6	3
Three-phase	380-480	CFW500 A 01P0 T4 NB20	A	1	1
		CFW500 A 01P6 T4 NB20		1.6	1
		CFW500 A 02P6 T4 NB20		2.6	2
		CFW500 A 04P3 T4 NB20		4.3	3
		CFW500 A 06P1 T4 NB20		6.1	3

WELL-X-TROL®

RESIDENTIAL PRE-PRESSURIZED WELL TANKS
INSTALLATION & OPERATION INSTRUCTIONS

Models WX-101 through WX-350

NOTE: Inspect for shipping damage and notify freight carrier or store where purchased immediately if damage is present. To avoid risk of personal injury and property damage, if the product appears to be malfunctioning or shows signs of corrosion, call a licensed professional immediately. Current copies of the Product manual can be viewed at www.amtrol.com. Use proper safety equipment when installing.

THIS IS THE SAFETY ALERT SYMBOL. IT IS USED TO ALERT YOU TO POTENTIAL PERSONAL INJURY AND OTHER HAZARDS. OBEY ALL SAFETY MESSAGES THAT FOLLOW THIS SYMBOL TO REDUCE THE RISK OF PERSONAL INJURY AS WELL AS PROPERTY DAMAGE.

⚠WARNING **READ CAREFULLY THE PRODUCT INSTALLATION & OPERATION INSTRUCTIONS. FAILURE TO FOLLOW THE INSTRUCTIONS AND WARNINGS IN THE MANUAL MAY RESULT IN SERIOUS OR FATAL INJURY AND/OR PROPERTY DAMAGE, AND WILL VOID THE PRODUCT WARRANTY. THIS PRODUCT MUST BE INSTALLED BY A LICENSED PROFESSIONAL. FOLLOW ALL APPLICABLE LOCAL AND STATE CODES AND REGULATIONS. IN THE ABSENCE OF SUCH CODES, FOLLOW THE CURRENT EDITIONS OF THE NATIONAL PLUMBING CODE AND NATIONAL ELECTRIC CODE, AS APPLICABLE. EXPLOSION OR RUPTURE HAZARD. THE WELL TANK MUST BE OPERATED SO THAT THE PRESSURE DOES NOT EXCEED THE MAXIMUM WORKING PRESSURE.**

⚠WARNING **EXPLOSION HAZARD.** Failure to follow the instructions in the product manual can cause a rupture or explosion; possibly causing serious or fatal injury, leaking or flooding and/or property damage.

⚠WARNING Use only with a potable water system. Do not operate in a setting with freezing temperatures or where the temperature can exceed 130°F and do not exceed the maximum working pressure specified for this Product in the Manual. Mount vertically only.

⚠WARNING **Chlorine & Aggressive Water:** The water quality can significantly influence the life of this Product. You should test for corrosive elements, acidity, total solids and other relevant contaminants, including chlorine and treat your water appropriately to insure satisfactory performance and prevent premature failure.

⚠WARNING This Product, like most Products under pressure, may over time corrode, weaken and burst or explode, causing serious or fatal injury, leaking or flooding and/or property damage. To minimize risk, a licensed professional must install and periodically inspect and service the Product. A drip pan connected to an adequate drain must be installed if leaking or flooding could cause property damage. Do not locate in an area where leakage of the tank or connections could cause property damage to the area adjacent to the appliance or to lower floors of the structure.

⚠WARNING **EXPLOSION OR RUPTURE HAZARD** A relief valve must be installed to prevent pressure in excess of local code requirement or maximum working pressure designated in the Product Manual, whichever is less. Do not expose Product to freezing temperatures or temperatures in excess of 130°F. Do not adjust the pre-charge or re-pressurize this Product except for any adjustments required at the time of initial installation, especially if Product is corroded, damaged or has diminished integrity. Adjustments to pre-charge must be done at ambient temperature only. Failure to properly size the Product or follow these instructions may result in excessive strain on the system, lead to Product failure, serious or fatal personal injury, leakage and/or property damage.

⚠WARNING This product can expose you to chemicals including lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY
IMPORTANT GENERAL SAFETY INFORMATION - ADDITIONAL SPECIFIC SAFETY ALERTS APPEAR IN THE FOLLOWING INSTRUCTIONS.

⚠ WARNING **DANGER! EXPLOSION HAZARD.** WHEN THE WELL TANK HAS BEEN IN SERVICE AND A CHANGE TO A HIGHER PRE-CHARGE PRESSURE IS NECESSARY DUE TO A REQUIRED CHANGE IN THE PRESSURE SWITCH SETTING, FAILURE TO FOLLOW INSTRUCTIONS BELOW CAN CAUSE A RUPTURE OR EXPLOSION, POSSIBLY CAUSING SERIOUS OR FATAL PERSONAL INJURY, AND/OR PROPERTY DAMAGE.

- DO NOT ADJUST OR ADD PRESSURE IF THERE HAS BEEN A LOSS OF AIR.
- DO NOT ADJUST THE PRE-CHARGE PRESSURE IF THERE IS VISIBLE EXTERIOR CORROSION.
- DO NOT ADJUST THE PRE-CHARGE PRESSURE IF THERE HAS BEEN A REDUCTION OF THE PUMP CYCLE TIME OR THE PRE-CHARGE PRESSURE COMPARED TO ITS INITIAL SETTING. THIS IS BECAUSE REDUCTION IN PUMP CYCLE TIME CAN RESULT FROM LOSS OF TANK AIR PRESSURE WHICH IN TURN CAN MEAN THERE MAY BE INTERNAL CORROSION AND ANY RE-PRESSURIZATION OR ADDITIONAL PRESSURE COULD RESULT IN RUPTURE OR EXPLOSION.

⚠ WARNING **MAXIMUM WORKING PRESSURE.** Every Well-X-Trol is tested to 150 psig, the maximum working pressure for the Well-X-Trol line. Should pressures exceed 150 psig, proper selection and sizing of an ASME Well-X-Trol should be made.

⚠ WARNING **RELIEF VALVE REQUIRED.** A relief valve should be installed which is set to open at excessive pressures (125 psig or more). This will protect the Well-X-Trol and other system components should the pressure switch malfunction and fail to shut the pump off. The relief valve should be installed at the connection of the Well-X-Trol to the system piping and have a discharge equal to the pump's capacity at 125 psig.

⚠ CAUTION AS IN ALL PLUMBING PRODUCTS AND WATER STORAGE VESSELS, BACTERIA CAN GROW IN YOUR WELL TANK, ESPECIALLY DURING TIMES OF NON-USE. CONSULT YOUR LOCAL PLUMBING OFFICIAL REGARDING ANY STEPS YOU MAY WISH TO TAKE TO SAFELY DISINFECT YOUR HOME'S PLUMBING SYSTEM.

⚠ WARNING A water test must be taken before installation of any water treatment equipment.

⚠ WARNING **DANGER! EXPLOSION HAZARD.** IF YOU ADJUST THE PRE-CHARGE PRESSURE OR ADD PRESSURE TO A TANK THAT IS CORRODED OR DAMAGED OR WITH DIMINISHED INTEGRITY, THE TANK CAN BURST OR EXPLODE, POSSIBLY CAUSING SERIOUS OR FATAL PERSONAL INJURY AND/OR PROPERTY DAMAGE.

- ONLY ADJUST THE PRE-CHARGE AS DESCRIBED IN THIS MANUAL WHEN THE TANK IS NEW OR WHEN THE INTEGRITY OF THE TANK AND LACK OF INTERNAL OR EXTERNAL CORROSION IS CONFIRMED.
- ONLY LICENSED PROFESSIONALS SHOULD CHECK, ADJUST OR RE-CHARGE THE PRE-CHARGE OF TANKS.

⚠ WARNING For your safety, the information in this manual must be followed to minimize the risk of electric shock, property damage or personal injury.

- Properly ground to conform with all governing codes and ordinances.

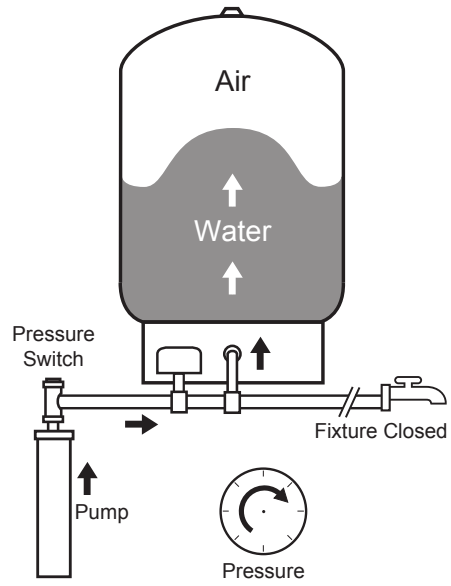
⚠ WARNING Do not install in direct sunlight. Excessive sun heat may cause distortion or other damage to non-metallic parts.

⚠ WARNING Use only lead-free solder and flux for all sweat-solder connections, as required by state and federal codes.

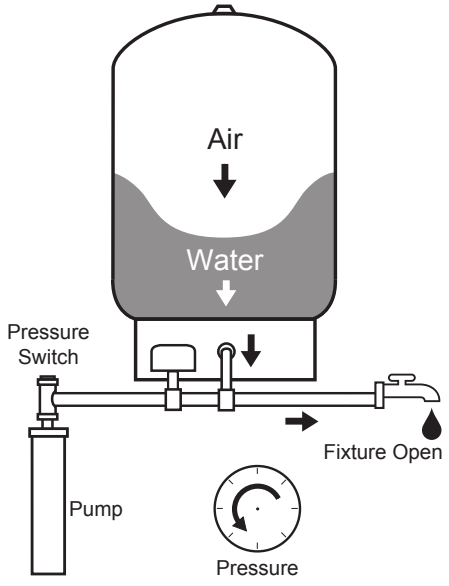
⚠ WARNING **ELECTROCUTION AND EXPLOSION HAZARD.** Before work is performed on the tank, turn off the power to the pump and release all water pressure in the tank and pumping system.

How a Well Tank Works

1. As the pump fills the tank with water, the air above the diaphragm is compressed. This increases the pressure in the tank and causes the pressure switch to turn off the pump.



2. When water is used, it is drawn from the tank and the pressure inside the tank decreases. The reduced pressure starts the pump and refills the tank.

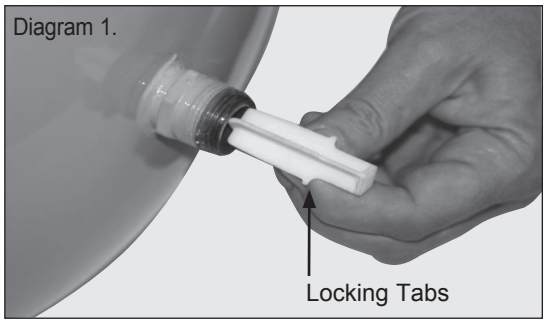


The amount of water delivered between pump cycles is called drawdown. The larger the well tank, the greater the drawdown capacity, the less the pump needs to run. This saves energy and money, and extends pump life. Larger tank sizes also increase the water storage volume to provide more consistent water pressure.

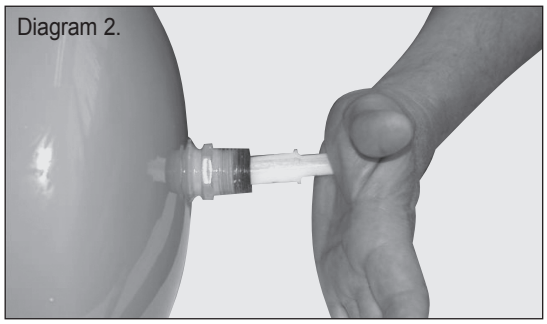
Installation of In-Line Turbulator™

The In-Line Turbulator water circulation device is designed to circulate the water stored in your diaphragm well tank.

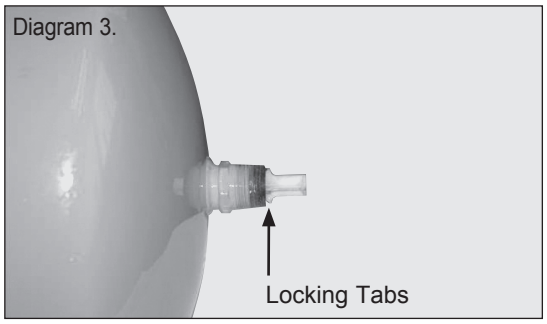
1. Inspect the In-Line Turbulator for any damage that may have occurred during shipping. Insert the In-Line Turbulator (Diagram 1) into the system connection of the expansion tank. The Turbulator can only be inserted with the butt end out as the locking tabs prevent it from being installed backwards.



2. Palm press the In-Line Turbulator (Diagram 2) until the unit locking tabs butt up against the system connection.



3. Your diaphragm well tank is now ready to be installed (Diagram 3).



Installation
System Connection

In-line Models:
WX-101 through WX-103: ¾" NPTM
WX-104 and WX-200: 1" NPTM

Vertical Stand Models:
WX-201 through WX-203: 1" NPTF
WX-205 through WX-350: 1¼" NPTF

Horizontal Models:
WX-102PS through WX-110PS: ¾" NPTM
WX-200PS, WX-202PS and WX-202H: 1" NPTM

Underground Models:
WX-200UG and WX-202UG: 1" NPTF
WX-250UG and WX-251UG: 1¼" NPTF

Pre Installation

The surface on which the Well-X-Trol is installed should be capable of supporting its operating weight (including the weight of water). The Well-X-Trol should be installed as close as possible to the pressure switch. This will reduce the adverse effects of added friction loss and differences in elevation between Well-X-Trol and/or water supply main and switch.

Adjacent to pump: This is the location chosen most often. The Well-X-Trol tank can be used whether pumps are above or below the surface. In either case, it protects the pump by reducing surge, dampening pressure spikes, offering a point of pressure control, and providing minimum run time. This location also permits all equipment to be placed in an area that's both serviceable and secure.

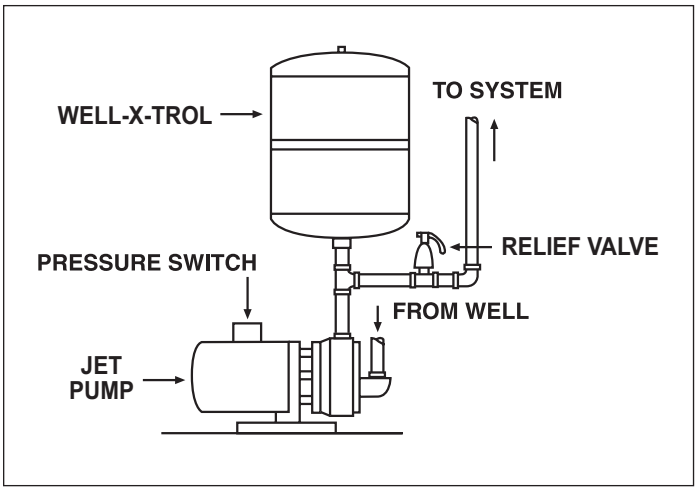
At the end of long pipe runs: The Well-X-Trol tank can be positioned at the end of a long run of pipe so it can provide rapid system response and adequate protection. When this location is chosen, the pressure switch should either be relocated with the Well-X-Trol tank or the setting should be adjusted to compensate for any line pressure drop.

⚠WARNING DO NOT LOCATE IN AN AREA WHERE LEAKAGE OF THE TANK OR CONNECTIONS COULD CAUSE PROPERTY DAMAGE TO THE AREA ADJACENT TO THE APPLIANCE OR TO LOWER FLOORS.

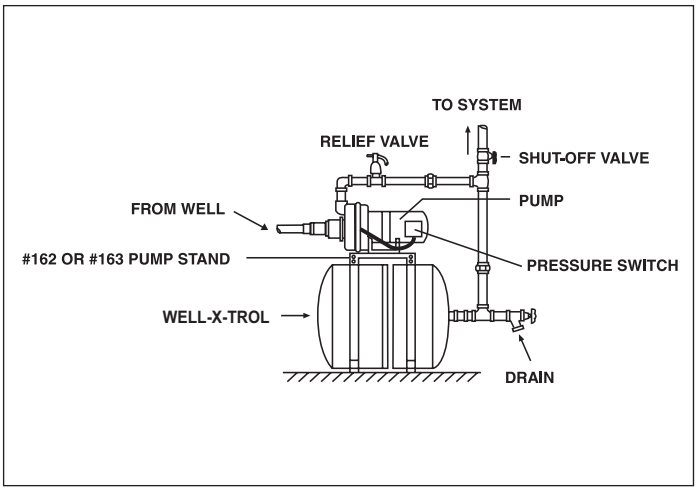
1. Remove protective air valve cap.
2. Check pre-charge pressure.
3. Release or add air as necessary to set the pre-charge pressure 2 psig below the pressure switch pump cut-in setting. (Example, 38 psig precharge for a 40/60 pressure.)
4. Replace protective air valve cap.

Suggested Piping Diagrams

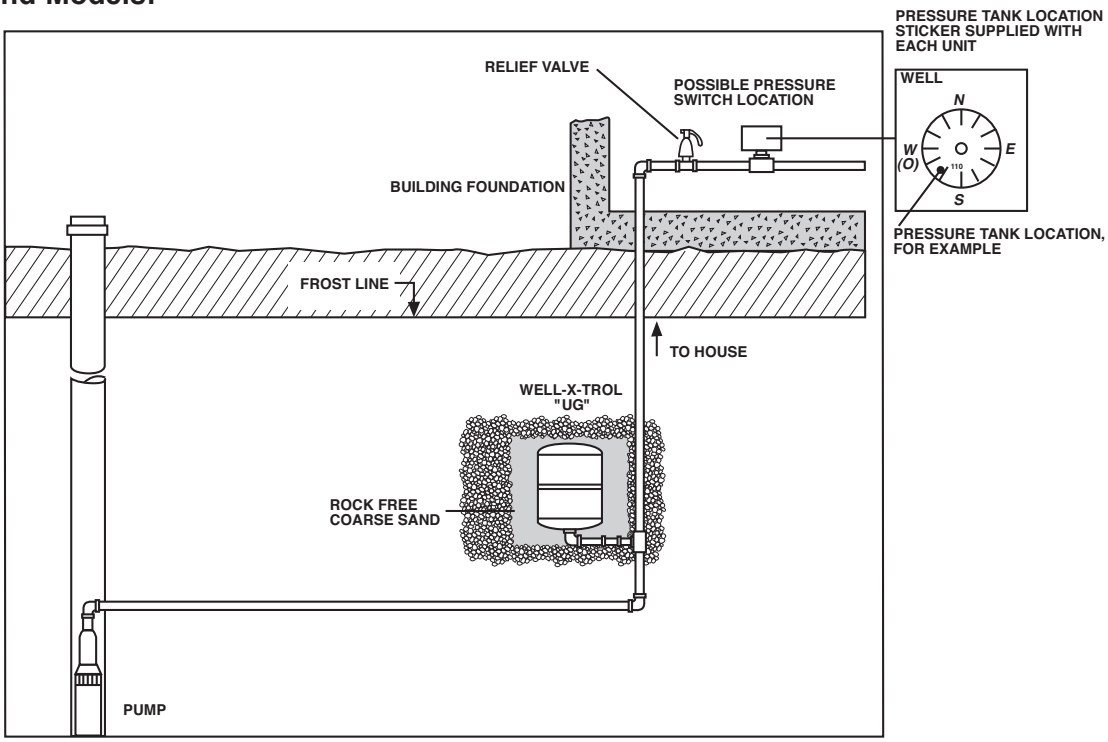
In-line Models:



Horizontal Models:



Underground Models:



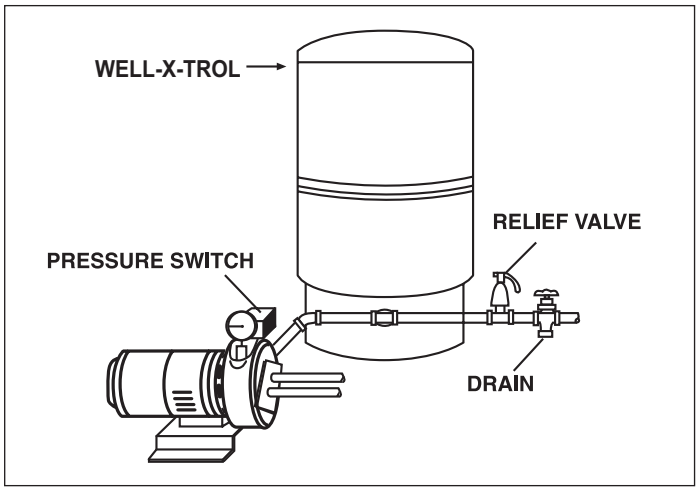
All Well-X-Trol Underground Tanks are designed for direct burial and must be installed **in the vertical position only**. To eliminate danger of freezing, tank should be buried below the frost line.

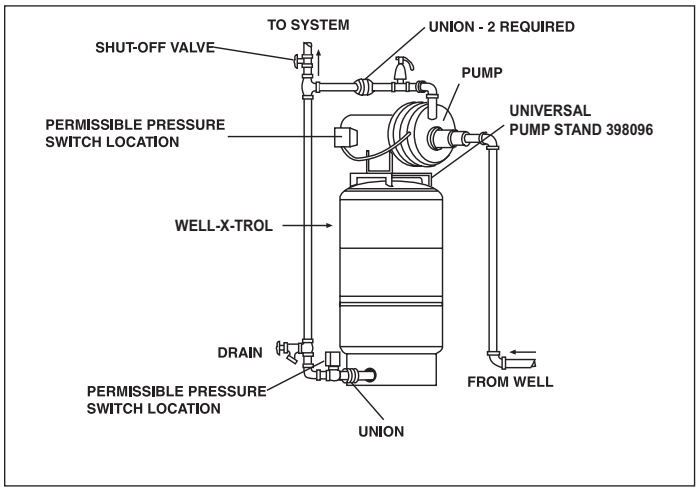
The following steps should be taken when installing a Well-X-Trol Underground Tank:

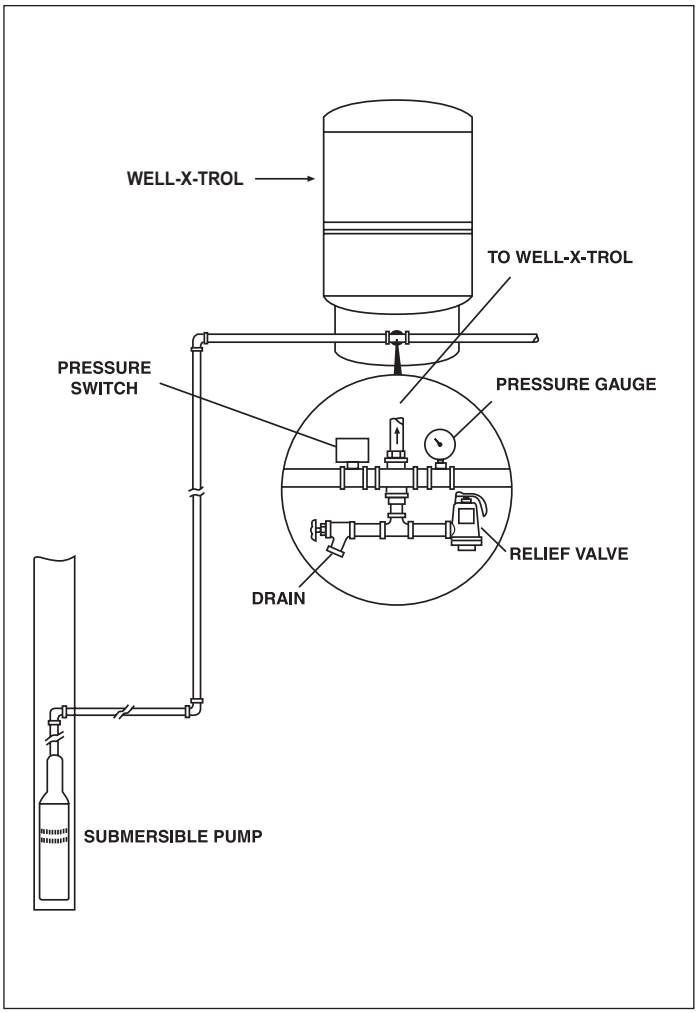
1. Make sure that the tank will be buried below the frost line and above the water table.
2. Remove plastic bag and check tank precharge. Factory precharge is 38 psig. Replace air stem cap securely. Follow adjusting precharge procedure.
3. Important: Install tank on firm **rock-free earth**.
4. The water lines from the pump to the tank and switch location should be the same size to prevent switch cycling.
5. Check the system for performance and inspect for leaks.
6. Important: Backfill hole with sand. Firmly tamp fill to prevent settling. Failure to do so will shorten tank life.
7. Fill out pressure tank location sticker and affix to power panel or other visible surface so tank can be easily located at a later time.

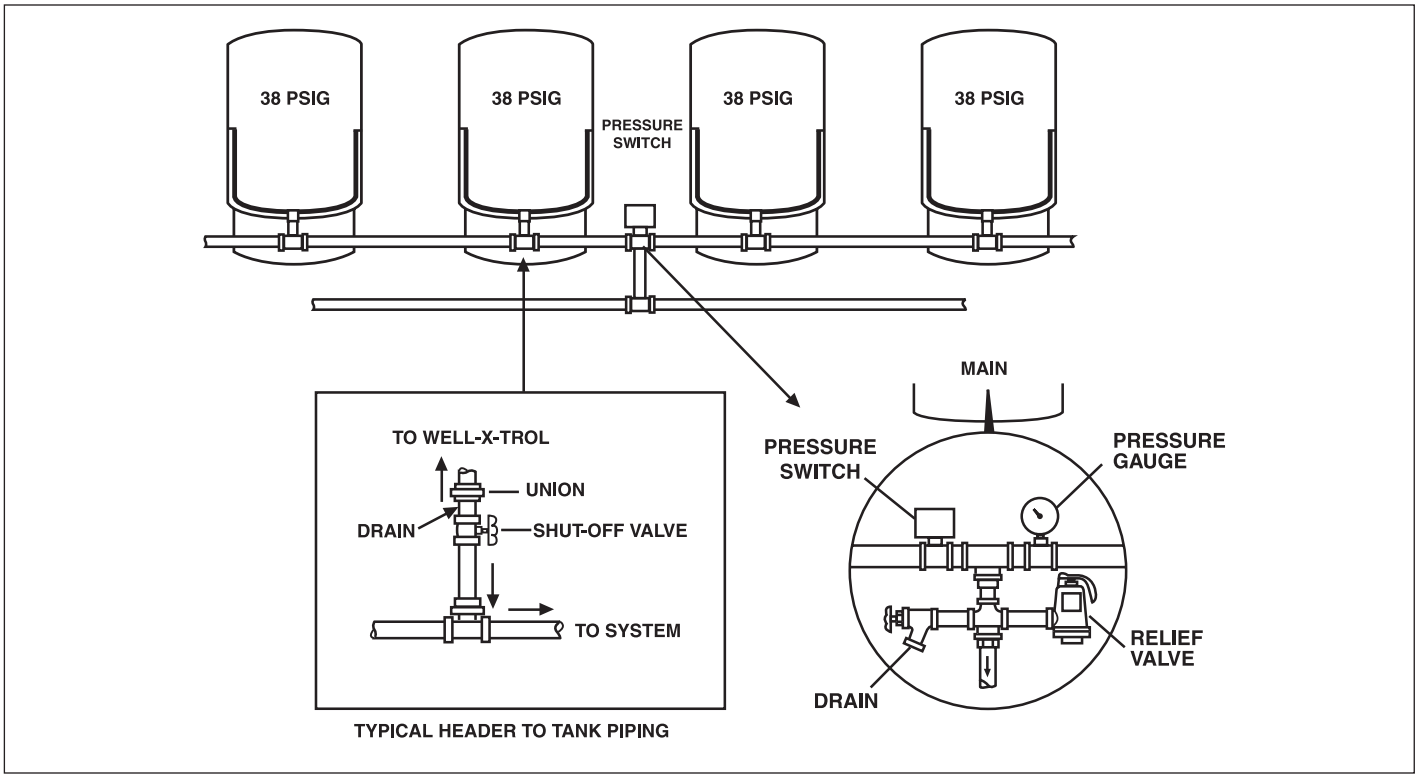
Suggested Piping Diagrams (cont.)

Vertical Models:









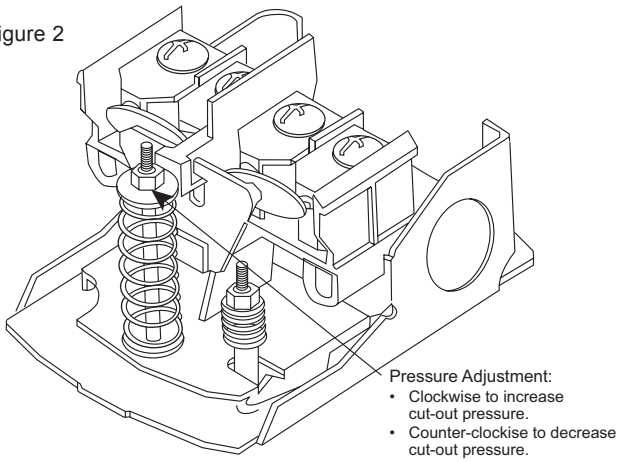
TYPICAL HEADER TO TANK PIPING

Start Up

Fine Tuning Procedures

1. Restore power and pressurize system until pump cuts off.
2. Open one or more fixtures to reduce pressure and initiate a pump cycle.
3. Check operation. Make adjustments only when the tank is empty of water and the system is off.

Figure 2



Adjusting Precharge After Installation

Step 1. Drain tank of all water. Check precharge pressure in the Well-X-Trol Tank.

Step 2. Release or add air as necessary to set the precharge pressure 2 psig below the pressure switch pump cut-in setting.

Maintenance

A licensed professional should check the complete system, including the Well-X-Trol, yearly and more frequently as the system ages.

Warranty

WX Models: Seven (7) Year Limited Warranty

Visit www.amtrol.com for complete warranty details and to register the serial number of your well tank.

WORTHINGTON INDUSTRIES

1400 Division Road, West Warwick, RI USA 02893
T: 800.426.8765 **www.amtrol.com**

Antimicrobial Turbulator LOW-LEAD NSF/ANSI 61 NAF COMPLIANT national ground water association WATER SYSTEMS COUNCIL MADE IN USA

Part #: 9015-868 MC10185 (06/19)

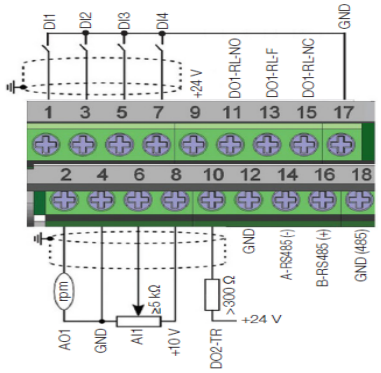
SECTION 5

CONTROLLER

SENCILLO™

SIMPLE.

CFW500



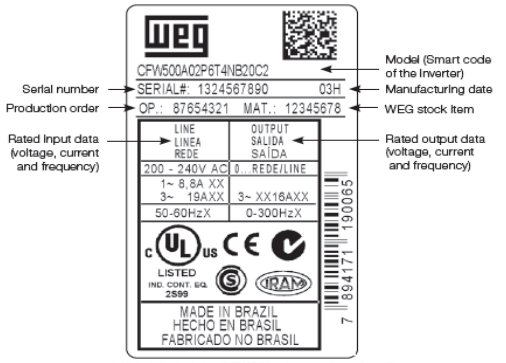
	Connector	Description (*)
Top connection	1	DI1 Digital input 1
	3	DI2 Digital input 2 (*)
	5	DI3 Digital input 3
	7	DI4 Digital input 4
	9	+24 V Power supply +24 Vdc
	11	DO1-RL-NO Digital output 1 (NO contact of relay 1)
	13	DO1-RL-C Digital output 1 (Common point of relay 1)
	15	DO1-RL-NC Digital output 1 (NC contact of relay 1)
	17	GND Reference 0 V
Bottom connection	2	AO1 Analog output 1
	4	GND Reference 0 V
	6	AI1 Analog input 1
	8	+10 V Reference +10 Vdc for potentiometer
	10	DO2-TR Digital output 2 (transistor)
	12	GND Reference 0 V
	14	RS485 - A RS485 (terminal A)
	16	RS485 - B RS485 (terminal B)
	18	GND (485) GND (RS485)

(*) The digital input 2 (DI2) can also be used as input in frequency (FI). For further details refer to the programming manual of the CFW500.

Table 2.1: Nomenclature of the inverters CFW500

	Product and Series	Identification of the Model: Frame Size	Rated Current	No of Phases	Rated Voltage	Brake (*)	Protection Rate (*)	Conducted Emission Level (*)	Safety Functions	Disconnecting Switch	Hardware Version	Special Software Version	Generation
Eg.:	CFW500	A	02P6	T	4	NB	20	C2	--	--	---	--	--
Available options	CFW500	See Table 2.2 on page 9							Blank = without safety functions	Blank = without disconnecting switch		Blank = standard	Blank = Generation 1
		NB = without dynamic braking							Y2 = with safety functions (S1O and SS1-t, as per IEC/EN 61800-5-2)	DS = with disconnecting switch		Sx = special software	
		DB = with dynamic braking									Blank = standard plug-in module		G2 = Generation 2
		20 = IP20									H00 = without plug-in		
		66 = IP66											
		N1 = cabinet Nema1 (type 1 as per UL) (protection rate according to standard IEC IP20)						Blank = it does not meet the levels of standards for conducted emission					
								C2 or C3 = as per category 2 (C2) or 3 (C3) of IEC/EN 61800-3, with internal RFI filter					

(*) The available options for each model are in Table 2.2 on page 9.



a) Side label of the CFW500 - frame sizes A to E

PARAM: all parameters.
READ: reading parameters only.
MODIF: parameters modified in relation to the default only.
BASIC: parameters for basic application.
MOTOR: parameters related to the control of the motor.
I/O: parameters related to digital and analog inputs and outputs.
NET: parameters related to the communication networks.
HMI: parameters to configure the HMI.
HVAC: parameters related to HVAC application.
STARTUP: parameters for oriented Start-up.

Main Parameters	
Oreinted Startup	
P0000	Access Parameters
P0100	Acceleration Time
P0101	Deceleration Time
P0133	Min Speed
P0134	Max Speed
P0200	Password
P0201	Language
P0202	Type of control (V/f), (VVW)
P0204	Load/ Save Parameters
P0205	Main Display
P0206	Secondary Display
P0209	Main Display Eng Unit
P0220	LOC/REM Selection
P0221	Loc Reference Sel
P0222	Rem Reference Sel
P0224	Loc Run/Stop
P0227	Rem Run/Stop
P0229	Stop Mode Selection
P0231	AI1 Signal Function
P0236	AI2 Signal Function
P0263	DI1 Function
P0264	DI2 Function
P0265	DI3 Function
P0266	DI4 Function
P0296	Line Rate Voltage
P0298	Application
P0320	Fly Start/ Ride Through
P0398	Motor Service Factor
P0400	Motor Rated Voltage
P0401	Motor Rated Current
P0402	Motor Rated Speed
P0403	Motor Rated Frequency
P0404	Motor Rated Power
P0406	Motor Ventillation
P0407	Motor Rated Power Factor
P0501	Ref Eng. Unit

CFW500 PID SET UP		
P0203	PID Enable Via AI1	1
P0205	Main Display (Proc. Var.)	40
P0206	Secondary Display (setpoint)	41
P0207	Bar Graph (Motor Speed)	2
P0208	Reference Scale fatocr	600
P0209	Reference Eng. Units	0
P0213	Bar Scale Full	600
P0210	Reference indication form	1
P0220	LOC/ Rem Source	1
P0222	Remote Reference HMI	0
P0536	P0525 Automacti Setting	1
P0227	Remotr Run/ Stop (DIx)	1
P0263	Run/stop (DI1)	1
P0265	PID auto/Mau (DI3)	22
P0266	Deneral Enable (DI4)	2
P0527	PID Controller Action	0
P0528	Var Proc. Indiucation scale	User
P0529	Var Proc. Indiucation form	User
P0217	Sleep Mode Frequency	User
P0218	Sleep Mode Time	User
P0535	Wake Up band	User
	Wake Up Mode Time	User
P0520	PID Proportional Gain	User
P0521	PID Integral I Gain	User
P0522	PID Derivative Gain	User

Magnitude	Gains: Proportional P0520	Integral P0521	Differential P0522
Pressure in pneumatic system	1.000	0.430	0.000
Flow in pneumatic system	1.000	0.370	0.000
Pressure in hydraulic system	1.000	0.430	0.000
Flow in hydraulic system	1.000	0.370	0.000
Temperature	2.000	0.040	0.000
Level	1.000	Read the next note	0.000

4 HMI (KEYPAD) AND BASIC PROGRAMMING

4.1 USE OF THE HMI TO OPERATE THE INVERTER

Quark Drive HMI BUTTONS

Through the HMI, it is possible to command the inverter, visualize and adjust all of its parameters. The HMI presents two operating modes: monitoring and setting. The functions of the keys and the fields of the display active on the HMI vary according to the operating mode. The setting mode is composed of three levels.

BACK BUTTON

- When in the setting mode, level 1: press this key to return to the monitoring mode.
- When in the setting mode, level 2: press this key to return to level 2 of the setting mode.
- When in the setting mode, level 3: press this key to cancel the new value (new value is not saved) and return to level 2 of the setting mode.

ENTER BUTTON

- When in the monitoring mode: press this key to enter the setting mode.
- When in the setting mode, level 1: press this key to select the desired parameter group – it shows the parameter group selected.
- When in the setting mode, level 2: press this key to show the parameter – it shows the content of the parameter in order to change the content.
- When in the setting mode, level 3: press this key to save the new content of the parameter – it returns to level 2 of the setting mode.

INCREASE ARROW

- When in the monitoring mode: press this key to increase the speed.
- When in the setting mode, level 1: press this key to go to the previous group.
- When in the setting mode, level 2: press this key to go to the next parameter.
- When in the setting mode, level 3: press this key to increase the content of the parameter.

DECREASE ARROW

- When in the monitoring mode: press this key to decrease the speed.
- When in the setting mode, level 1: press this key to go to the next group.
- When in the setting mode, level 2: press this key to go to the previous parameter.
- When in the setting mode, level 3: press this key to decrease the content of the parameter.

Press this key to accelerate the motor within the time determined by the acceleration ramp.
Active when: P0224 = 0 in LOC or P0227 = 0 in REM

Press this key to define the motor rotation direction.
Active when:
P0223 = 2 or 3 in LOC and/or P0226 = 2 or 3 in REM

Press this key to decelerate the motor within the time determined by the deceleration ramp.
Active when:
P0224 = 0 in LOC or P0227 = 0 in REM

Press this key to commute between LOCAL and REMOTE mode.
Active when:
P0220 = 2 or 3

Press this key to accelerate the motor up to the speed set in P0122 within the time determined by the acceleration ramp. The motor speed is kept while the key is pressed. When the key is released, the motor decelerates within the time determined by the deceleration ramp, until it stops.
This function is active when all the conditions below are met:
1. Turn/Stop = Stop;
2. Enable general = Active.;
3. P0225 = 1 in LOC and/or P0228 = 1 in REM.

Figure 4.1: *HMI Keys*

4.2 INDICATIONS ON THE HMI DISPLAY

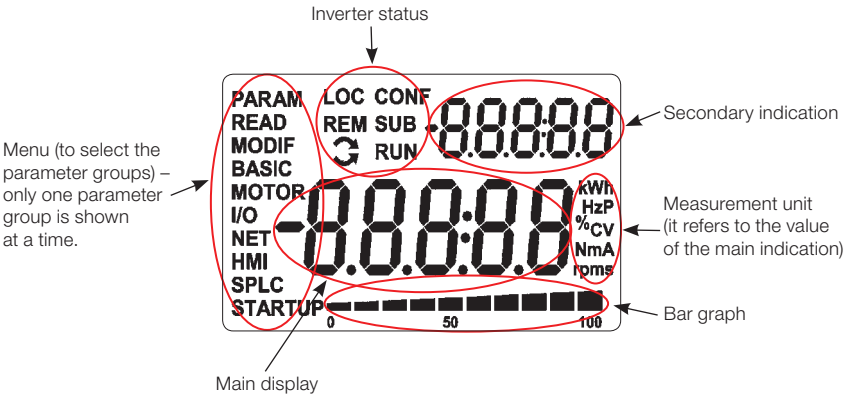


Figure 4.2: *Display fields*

Parameter groups available in the field Menu:
- **PARAM:** all parameters.
- **READ:** reading parameters only.
- **MODIF:** parameters modified in relation to the default only.
- **BASIC:** parameters for basic application.
- **MOTOR:** parameters related to the control of the motor.
- **I/O:** parameters related to digital and analog inputs and outputs.
- **NET:** parameters related to the communication networks.
- **HMI:** parameters to configure the HMI.
- **SPLC:** parameters related to SoftPLC.
- **STARTUP:** parameters for oriented Start-up.

Status of the inverter:
- **LOC:** command source or local references.
- **REM:** command source or remote references.
- ↻ **:** rotation direction by means of arrows.
- **CONF:** configuration error.
- **SUB:** undervoltage.
- **RUN:** execution.

4.3 OPERATING MODES OF THE HMI

Changing a Parameter on the Quark System Drive

The monitoring mode allows the user to view up to three variables on the main display, secondary display and bar graph. Such fields of the display are defined in figure 4.2.

The setting mode is composed of three levels: Level 1 allows the user to select the Menu items to direct the browsing of the parameters. Level 2 allows browsing the parameters of the group selected by level 1. Level 3, in turn, allows the modification of the parameter selected in Level 2. At the end of this level, the modified value is saved or not if the key ENTER or ESC is pressed, respectively.

Figure 4.3 illustrates the basic browsing of the operating modes of the HMI.

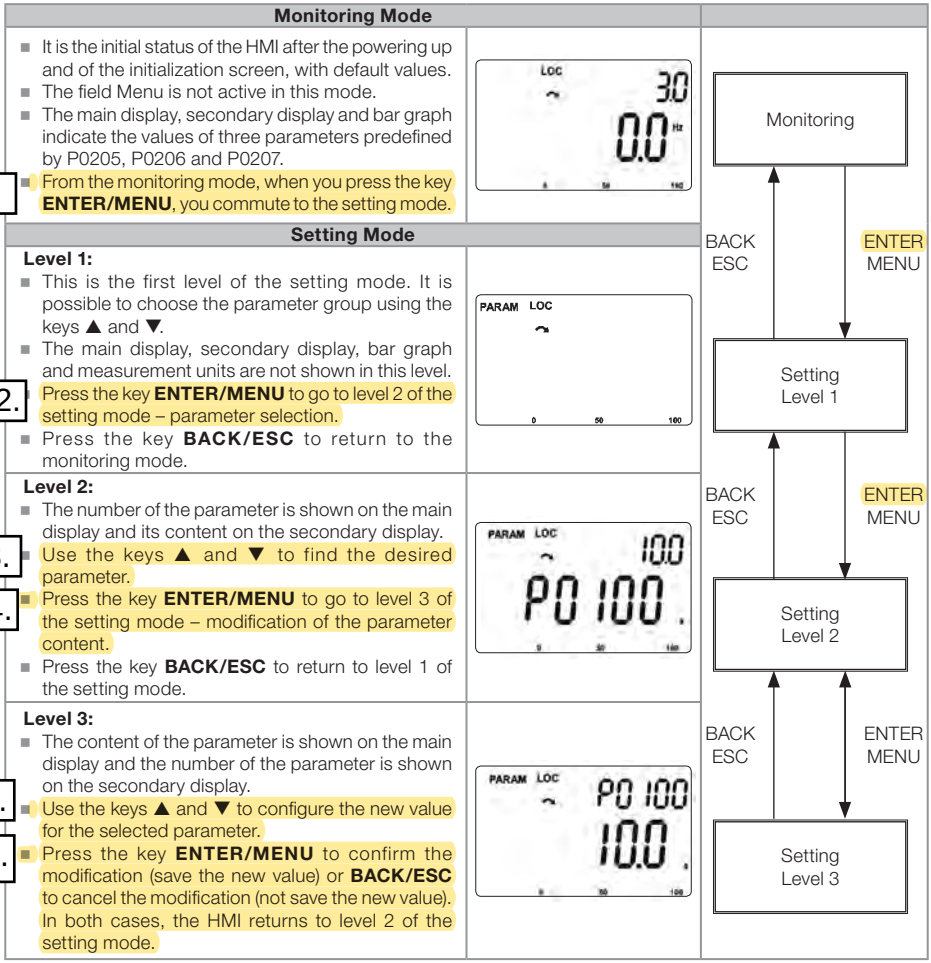


Figure 4.3: *Operating modes of the HMI*

Fault / Alarm	Description	Possible Causes
F0033 Self-tuning Fault	Stator resistance setting fault P0409.	■ Stator resistance value in P0409 does not comply with the inverter power. ■ Motor connection error; turn off the power supply and check the motor terminal box and the connections with the motor terminals. ■ Motor power too low or too high in relation to the inverter.
F0048 Overload on the IGBTs	Overload fault on the power pack with IGBTs (3 s in 1.5xI_{nom}).	■ Inverter output overcurrent (>2xI_{nom}).
F0051 IGBTs Overtemperature	Overtemperature fault measured on the temperature sensor of the power pack.	■ High ambient temperature around the inverter (>50 °C (>122 °F)) and high output current. ■ Blocked or defective fan. ■ Heatsink is too dirty, preventing the air flow.
F0068 Motor Overtemperature (dedicated input)	Overtemperature fault measured on the motor temperature sensor (Triple PTC) via dedicated circuitry in the power scheme.	■ Overload on the motor shaft. ■ Load cycle is too high (high number of starts and stops per minute). ■ High ambient temperature around the motor. ■ Poor contact or short circuit (3 k9 < RPTC < 0 k1). ■ Motor thermistor not installed. ■ Motor shaft is stuck.
F0070 Overcurrent/Short-circuit	Overcurrent or short-circuit on the output, DC Link or braking resistor.	■ Short-circuit between two motor phases. ■ Short-circuit of the rheostatic braking resistor connecting cables. ■ IGBTs module in short-circuit or damaged. ■ Start with too short acceleration ramp. ■ Start with motor spinning without the Flying Start function.
F0072 Motor Overload	Motor overload fault (60 s in 1.5xInom).	■ P0156, P0157 and P0158 setting is too low in relation to the motor operating current. ■ Overload on the motor shaft.
F0074 Ground Fault	Ground overcurrent fault. **Note:** This failure may be disabled by setting P0343 = 0.	■ Short-circuit to the ground in one or more output phases. ■ Motor cable capacitance too high, causing current peaks in the output.
F0076 Motor Connection Error	This fault indicates the motor presents phase loss, imbalanced phase current or is disconnected.	■ Motor wiring or connection error. ■ Loss of motor connection with the drive or broken wire.
F0078 Motor Overtemperature	Overtemperature fault measured on the motor temperature sensor (Triple PTC) via analog input AIx or digital input DIx.	■ Overload on the motor shaft. ■ Load cycle is too high (high number of starts and stops per minute). ■ High ambient temperature around the motor. ■ Poor contact or short-circuit (3k9 < RPTC < 0k1). ■ Motor thermistor not installed. ■ Motor shaft is stuck.
F0079 Encoder Signal Fault	Failure of absence of encoder signals.	■ Wiring between encoder and the accessory interface encoder interrupted. ■ Defective encoder.
F0080 CPU Fault (Watchdog)	Fault related to the supervision algorithm of the inverter main CPU.	■ Electric noise. ■ Inverter firmware fault.
F0084 Auto-diagnosis Fault	Fault related to the automatic identification algorithm of the inverter hardware and plug-in module.	■ Poor contact in the connection between the main control and the power pack. ■ Hardware not compatible with the firmware version. ■ Defect on the internal circuits of the inverter.
F0085 Plug-in Module Will not Start	Failure in the initialization of the plug-in module.	■ Defect on the plug-in module. ■ Poor contact on the connections of the plug-in module to the inverter. ■ Plug-in module without firmware.
F0091 External Fault	External fault via DIx ("No External Fault" in P026x).	■ Wiring on DI1 to DI8 inputs are open or have poor contact.
F0150 Motor Overspeed	Overspeed fault. It is activated when the real speed exceeds the value of P0134 x (100 % + P0132) for more than 20 ms.	■ Wrong settings of P0161 and/or P0162. ■ Problem with the hoist-type load.
F0151 Incomp. Main Sw Version	Main firmware version is different from the plug-in firmware version.	■ Blank memory on plug-in module (1st power-up). ■ Data backup fault during power-down.
F0169 Speed Error too High	Difference between Speed Reference and Effective Speed greater than the setting in P0360 for longer than P0361.	■ Inverter in Torque Current Limitation for too long.

Fault / Alarm	Description	Possible Causes
F0179 Fan Low Speed	Internal fan with speed (P0036) under 2/3 of rated fan speed.	■ Internal fan failure.
F0182 Pulse Feedback Fault	Pulse feedback circuit fault of the output voltage. **Note:** it may be turned off in P0397.	■ Hardware identification fault; compare P0295 and P0296 to the inverter identification label. ■ Inverter internal pulse feedback circuit fault.
F0228 Telegram Reception Timeout	Indicates fault in the serial communication. It indicates the equipment stopped receiving valid serial telegrams for a period longer than the setting in P0314.	■ Pulse feedback input circuit fault. ■ Check network installation, broken cable or fault/poor contact on the connections with the network, grounding. ■ Ensure the master always sends telegrams to the equipment in a time shorter than the setting in P0314. ■ Disable this function in P0314.
F0233 No Supply on CAN Interface	This failure indicates that the CAN interface has no supply between pins 1 and 5 of the connector.	■ Measure if there is voltage within the allowed range between the pins 1 and 5 of the CAN interface connector. ■ Check if the supply cables are not misconnected or inverted. ■ Check for contact problems on the cable or connector of the CAN interface.
F0234 Bus Off	Bus off error detected on the CAN interface.	■ Check for short-circuit on the CAN circuit transmission cable. ■ Check if the cables are not misconnected or inverted. ■ Check if all the network devices use the same baud rate. ■ Check if the termination resistors are with correct values and have been installed only at the end of the main bus. ■ Check if the CAN network was properly installed.
F0235 Node Guarding/ Heartbeat	CANopen communication error control detected communication error using the guarding mechanism.	■ Check the times set on the master and on the slave to exchange messages. In order to prevent problems due to transmission delays and time counting, it is recommended that the values set for error detection by the slave be multiples of the times set for message exchange on the master. ■ Check if the master is sending the guarding telegrams in the time set. ■ Check the problems in the communications that may cause missing telegrams or transmission delays.
F0236 Idle Master	Fault indicates that the DeviceNet network master is in Idle mode.	■ Set the switch that controls the master operation for Run or the corresponding bit on the configuration word of the master software. If further information is needed, refer to the documentation of the master used.
F0237 DeviceNet Connection Timeout	Fault that indicates that one or more DeviceNet connections timed out.	■ Check the network master status. ■ Check network installation, broken cable or fault/poor contact on the connections with the network.
F0238 Profibus DP Interface in Clear Mode	It indicates that the inverter received the command from the Profibus DP network master to go into clear mode.	■ Check the network master status, ensuring it is in the run mode.
F0239 Profibus DP Interface Offline	It indicates interruption in the communication between the Profibus DP network master and the inverter. The Profibus DP communication interface went into offline status.	■ Check if the network master is correctly configured and operating properly. ■ Check for short-circuit or poor contact on the communication cables. ■ Check if the cables are not misconnected or inverted. ■ Check if the termination resistors with the right value were installed only at the end of the main bus. ■ Check the network installation in general – cabling, grounding.
F0240 Profibus DP Module Access Fault	It indicates fault in the access to the Profibus DP communication module data.	■ Check if the Profibus DP module is correctly fitted. ■ Hardware errors due to improper handling or installation of the accessory, for instance, may cause this fault. If possible, carry out tests by replacing the communication accessory.
F0700 Remote HMI Communication Fault	No communication with remote HMI, but there is speed command or reference for this source.	■ Check if the communication interface with the HMI is properly configured in parameter P0312. ■ HMI cable disconnected.
F0701 Remote HMI Communication Fault	No communication with the remote HMI; however, there is command or frequency reference for this source.	■ Check that the HMI communication interface is properly configured in parameter P0312. ■ HMI cable disconnected.
F0709 SPLC Application Stopped	SoftPLC application not running.	■ SoftPLC application stopped (P1001 = 0 and P1000 = 3). ■ SoftPLC state presents incompatible application with the CFW500 firmware version.
F0710 Size of the SoftPLC Application	The size of the SoftPLC user's program exceeded the maximum memory capacity.	■ The total size of the user's program is 8 Kilobytes for V/f scalar control (P0202 = 0) or VVW control (P0202 = 5). However, for vector control, such memory size is reduced to 7 Kilobytes.

Fault / Alarm	Description	Possible Causes
F0711 Fault on SoftPLC Application	Fault found in SoftPLC user's program.	■ SoftPLC user's program stored on flash memory is corrupted. ■ Timeout during execution of SoftPLC scan cycle.
F0761 Low Level of the Process Variable of the Main PID Controller	Fault that indicates the process variation of the main PID controller has a low value.	■ Parameter P1030 is programmed for 2 and the value of the process variation of the main PID controller remained below the value programmed in P1031 for the time programmed in P1032.
F0763 High Level in the Process Variable of the Main PID Controller	Fault that indicates the process variation of the main PID controller has a high value.	■ Parameter P1030 is programmed for 2 and the value of the process variation of the main PID controller remained above the value programmed in P1033 for the time programmed in P1034.
F0767 Dry Pump Detected	Fault that indicates the dry pump condition was detected for the pump driven by the CFW500 frequency inverter.	■ Parameter P1042 is programmed for 2 and the pump driven by the CFW500 frequency inverter is running with speed above the speed programmed in P1043 and the motor torque remained below the value programmed in P1044 for the time programmed in P1045.
F0769 Broken Belt Detected	Fault that indicates the broken belt condition was detected for the motor driven by the CFW500 frequency inverter.	■ Parameter P1046 is programmed for 2 and the motor driven by the CFW500 frequency inverter is running with speed above the speed programmed in P1047 and the motor torque remained below the value programmed in P1048 for the time programmed in P1049.
F0771 Filter Maintenance	Fault that indicates the need of replacing the system filter.	■ Parameter P1050 is programmed for 2 and the operation time of the motor driven by the CFW500 frequency inverter shown in P1052 is above the value programmed in P1051.
F0773 HVAC Plug-in Module not Detected	Indicates to the user that the plug-in module HVAC was not detected.	■ Plug-in Module installed does not match the plug-in module for specific function HVAC.
F0787 Low Level of the Process Variable of the External PID Controller	Fault that indicates the feedback of the external PID controller has a low value.	■ Parameter P1075 is programmed for 2 and the value of the process variation of the external PID controller remained below the value programmed in P1076 for the time programmed in P1077.
F0789 High Level of the Process Variable of the External PID Controller	Fault that indicates the feedback of the external PID controller has a high value.	■ Parameter P1075 is programmed for 2 and the value of the process variation of the external PID controller remained above the value programmed in P1078 for the time programmed in P1079.

SECTION 6

PRESSURE TRANSDUCER

SENCILLO™

SIMPLE.

DISCHARGE PRESSURE TRANSDUCER

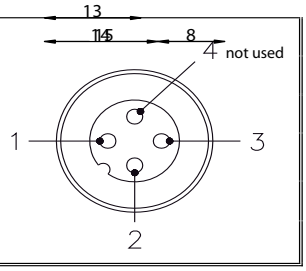
SPECIFICATIONS

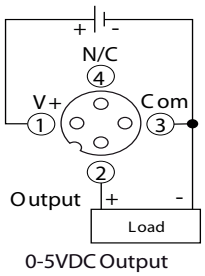
Input	
Supply Voltage	12-36 VDC
Pressure Range	0 to 10,000 psi
Proof Pressure	2 x full scale
Burst Pressure	3 x full scale
Fatigue Life	More than 4 million cycles
Performance	
Accuracy	0.4% full scale, BFSL
Stability	0.2% full scale
Compensated Temperatures	-10 to 75 ° C (14 to 167 ° F)
Operating Temperatures	-20 to 80 ° C (-4 to 176 ° F)
Zero and Span Offset Tolerance	1.5%
Current Consumption	Approx 3mA for voltage output, 22mA for current output (4-20mA)
Mechanical Configuration	
Pressure Port	1/4 NPT (standard) *
Electrical Connection	M12 (standard), 9.4 mini DIN *
Ingress Rating	IP67 when used with T-Direct TDM12 cable
Housing	316 stainless steel
Diaphragm Material	316 SS <1400 psi, 17-4 >1400 psi, all wetted parts are SS, no internal Orings
Approvals	CE
For best performance use shielded cables	
Mating cable assemblies sold separately	

DISCHARGE UNIT RANGE: 0-150 PSI

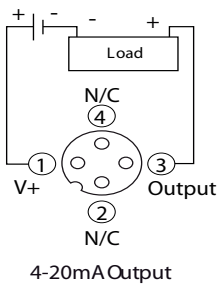
ELECTRICAL CONNECTIONS

Signal	Function	Color	Pin
0-5V	Supply V +	Brown	1
	Output +	White	2
	Com	Blue	3
4-20mA	Supply V +	Brown	1
	Output	Blue	3





0-5VDC Output



4-20mA Output

SENCILLO™
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Manufacturer's Statement of Warranty

Sencillo Systems, hereafter referred to as the manufacturer, warrants this product against defect in workmanship, materials, and equipment for a period of one year from the date of purchase not to exceed 12 months from the date of delivery.

The manufacturer shall repair or replace, by its determination, all defective parts, and/or correct any defects in workmanship or materials. This is a PARTS ONLY warranty. All costs to replace defective parts including travel, tools, labor and other expenses are not covered by this warranty.

Exclusions:

- Damages caused by improper lifting, rigging, or handling of the equipment.
- Damage due to misuse, neglect or service by other than a Sencillo Systems authorized technician during the warranty period.
- Damage caused by flooding, windstorms, lightning strikes, fires, wars, or any acts of God.
- Any damages caused by the installation, or services, by other than a duly licensed professional plumbing, mechanical or utility contractor.
- Any damages caused by use or for any other application other than designated.

SENCILLO SYSTEMS

_____

Authorized Signature

Shipment Date: _____

Warranty Expiration Date: _____

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