



# Instruction Sheet

## 1915e ECM Circulator

302-388

SUPERSEDES: March 5, 2019

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Plant ID No. 001-5016



# 1900e<sup>TM</sup> series

ECM HIGH-EFFICIENCY CIRCULATOR

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## Limited Warranty Statement

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# Section 1. Installation and Operation



**Warning:** Installation and use of this product requires experience and knowledge of this or similar products. Persons with reduced physical, mental or sensory capabilities must not use this product, unless properly instructed and supervised. Children must not be allowed to play with this product.

**Avertissement:** l'installation et l'utilisation de ce produit exigent une expérience et des connaissances de ce produit ou de produits semblables. Une personne aux capacités physiques, mentales ou sensorielles réduites ne doit pas utiliser ce produit, à moins d'être correctement instruite et supervisée. On ne doit pas laisser les enfants jouer avec ce produit.



**Warning:** Use supply wires suitable for 90°C.

**AVERTISSEMENT:** Employer des fils d'alimentation adéquats pour 90°C.



**Warning:** Misconnection or overload of electrical or signal connections could cause pump to shut-down or cause permanent damage.

**AVERTISSEMENT:** Toute erreur de raccordement ou surcharge des connexions électriques ou de signalisation peut entraîner un arrêt de la pompe ou des dommages permanents.



**Warning:** Do not operate pump without the electrical cover securely attached.

**AVERTISSEMENT:** Ne pas actionner la pompe si le couvercle électrique n'est pas correctement fixé.



**Warning:** Pump motor, electronics enclosure and condensate drain openings should not be thermally insulated as it could interfere with cooling and condensate drainage.

**AVERTISSEMENT:** Le moteur de pompe, l'enceinte électronique et les ouvertures de drainage de condensat doivent être thermiquement isolés car il peut y avoir interférence avec l'évacuation de condensat et de liquide de refroidissement.

## Introduction

This manual is broken down into two sections and describes the installation, operation and control module for 1900e series pumps. Section 1 describes the installation and operation features. Section 2 describes the control module and its functions.

## 1 - General Information Uses

The 1900e series circulating pumps are available in 2 versions. The cast iron version is used for the transfer of liquid media within a closed-loop hot-water heating or air-conditioning hydronic system. The stainless steel version is used in potable DHW systems or where NSF/ANSI 61-G & 372 compliance is required.

Both the cast iron and stainless steel versions are designed as single or parallel main/standby operation variable-speed pumps, where the speed is regulated by an on-board electronic device.

## 2 - Safety

These instructions should be studied carefully before installing or operating the pump. They are meant to help you with installation, use and maintenance and to increase your safety. Installation should be performed with regards to local or national standards. Only qualified personnel should maintain and service these products. Failure to comply with safety precautions could cause personal injury or machinery damage.



**Warning:** Do not use in swimming pool or spa areas. Pump has not been investigated for these applications.

**AVERTISSEMENT:** Ne pas utiliser dans une piscine ou un spa. La pompe n'a pas été étudiée pour ces applications.



**Warning:** To avoid electrical shock, disconnect the power supply to the circulator and the main electrical unit. Follow all local electrical and plumbing codes.

**AVERTISSEMENT:** Pour éviter tout choc électrique, débranchez l'alimentation électrique vers le circulateur et l'unité électrique principale. Respectez tous les codes de plomberie et électriques locaux.



**Warning:** Hot surfaces can cause burns. The motor can also reach temperatures that could cause injury.

**AVERTISSEMENT:** Les surfaces chaudes peuvent provoquer des brûlures. Le moteur peut également atteindre des températures qui peuvent entraîner des blessures.



**Warning:** The addition of petroleum based fluids or certain chemical additives to systems using TACO equipment voids the warranty.

**AVERTISSEMENT:** L'ajout de liquides à base de pétrole ou de certains additifs chimiques à des systèmes utilisant un équipement TACO annule la garantie.

## 3 - Pump Description

The high efficiency, electronically commutated, close coupled 1900e series pumps consist of two main parts; the centrifugal pump and the electronic control. The hydraulic section is sealed from the motor assembly by a mechanical seal. 1900e series pumps are powered by an electronically commutated permanent magnet motor (ECM) which does not consume energy to magnetize the rotor, providing superior energy efficiency.

The ECM motor is run by an on-board frequency converter. The converter estimates current flow and head from the motor load and speed. With this information the self-sensing ECM pump constantly calculates pump head and flow and adapts motor speed to the appropriate flow for the selected curve.

### 3.1 - Features

- 10 easy to set modes to match system requirements.
  - 4 - Constant Pressure modes.
  - 3 - Constant Speed modes.
  - 1 - Proportional Pressure mode.
  - 1 - 0-10v mode.
  - 1 - 2-pump operation mode.
- ECM performance equivalent to the versatile 1900 & 1600 series pumps.
- Fully rotational User Interface (UI) to accommodate any pump position.
- Led Status monitors Pump On (solid green), Pump in Standby (flashing green) and Error (flashing red error code - see section 22.1)
- Mechanically sealed for easy maintenance.

## 4 - Use

All 1900e series pumps equipped with a cast iron casing are intended for circulation of solid-free fluid in pressurized, hot and chilled hydronic systems. All 1900e series pumps equipped with a stainless steel casing are intended for DHW and potable water applications and are NSF Commercial Hot (180°F water) rated and suitable for sanitizing applications.

## 5 - Pumped Fluids

In hot and chilled hydronic systems, use water or water/glycol mixtures only. Water/glycol mixtures must be HVAC-system compatible and should have no more than 50% concentration of glycol. The fluid shall not consist of aggressive or explosive additives, mixtures of mineral oils or solid or fibrous particles. The pump should not be used for pumping flammable, explosive fluids, or in an explosive environment.



**Warning:** The majority of mechanical seal failures are due to poor media (fluid) quality in the system. To maximize seal life, media quality must be maintained in the system, and TDS (Total Dissolved Solids)/TSS (Total Suspended Solids) should not exceed 500ppm with standard carbon/Silicon-Carbide seals. The use of inhibitor based glycols is acceptable, but additional inhibitors should not be added. Always follow the glycol manufacturer's specification for system preparation and water quality. Treatment with silicates should not be used. Failure to maintain media quality will void the standard Taco warranty.

**AVERTISSEMENT:** La plupart des défaillances des garnitures mécaniques sont dues à une mauvaise qualité de caloporteur. Pour prolonger la durée des joints, on doit maintenir la qualité du fluide dans le système et les solides dissouts totaux (SDT)/matières en suspension totales (MES) ne doivent pas dépasser 500 ppm avec des joints standard en carbone/carbure de silicium. L'utilisation de glycols/inhibiteurs combinés est acceptable, mais on ne doit y ajouter aucun inhibiteur supplémentaire. Suivez toujours les spécifications du fabricant du glycol pour la préparation du système et la qualité du fluide. On ne doit pas utiliser de traitement aux silicates. Ne pas maintenir la qualité du fluide annulera la garantie standard de Taco.

## 6 - Pump Installation

The 1900e series pump is protected with a double box during shipping. It can be lifted from the box by the heat sink.



**Warning:** Pump may be heavy. Provide yourself help if needed.

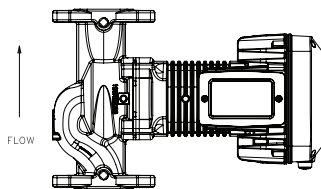
**AVERTISSEMENT:** La pompe est lourde. Veuillez à demander de l'aide si nécessaire.

It is recommended that the 1900e series pumps be installed with at least 5 to 10 pipe diameters of straight pipe on the inlet and outlet of the pump. Use all nuts and bolts to attach companion flanges to the pump flanges.

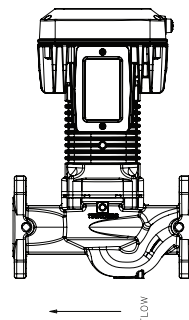
The 1915e uses a mechanical seal. To ensure reliability of the seal, a minimum continuous safe flow rate of 9 gpm at full load (15% of BEP flow) is recommended. Ensure flange bolts are adequately torqued.

The 1900e series model pumps can be installed with the motor shaft in the horizontal position or the vertical position with the control module facing up (see Figure 1). The cover can be rotated independent of the pump to adjust orientation of the User Interface – the cable glands should never be pointed upward to mitigate water ingress. The desired conduit box orientation can be achieved by rotating the motor housing on the pump casing.

### Preferred Installation Positions



### Acceptable Installation Positions



### UNAUTHORIZED Installation Positions

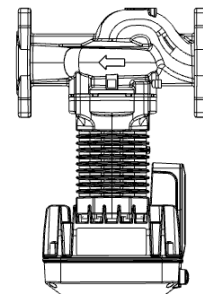


Figure 1.

Desired pump orientation can be achieved by rotating the pump casing. The pump is mounted to the volute with four screws. By removing those the head can be turned. See detailed Motor Rotation Procedure 7 below.

**Caution:** When reassembling, care should be taken to avoid damaging the o-ring and insuring a good seal.

Flange Bolt Size	FLANGE DIMENSIONS			
Model (Flange Size)	Bolt Hole Diameter	Flange Thickness	Minimum Bolt Size	Qty.
1915e (1 1/2")	0.672	0.688	5/8" x 2 1/4"	2

Cast Iron Flange Kit	1600-031RP
Stainless Steel Flange Kit	198-3084RP

## PERMITTED AMBIENT AND MEDIA TEMPERATURE

Ambient Temperature [°F]	Fluid Temperature	
	Min. [°F]	Max. [°F]
Up to 75	36	230
85	36	212
95	36	203
105	36	175

Ambient Temperature [°C]	Fluid Temperature	
	Min. [°C]	Max. [°C]
Up to 25	2	110
30	2	100
35	2	90
40	2	80

**Attention!** Operation outside recommended conditions may shorten pump lifetime and void the warranty.

## 7 - Motor Rotation Procedure

**Caution:** If system is filled and pressurized, shut off valves before and after the 1900e series pump. Allow to cool if system fluid is hot.

**Notice!** It is recommended to always change the orientation of the motor before installing pump in piping.

**Attention!** Installing pumps in UNAUTHORIZED positions may result in voiding the warranty.

**Tools Required:**

- 3/16" ball-end hex wrench
- 1/4" or 3/8" flat tip screw driver

- With the motor in a vertical position, use the 3/16" ball-end hex wrench to loosen and remove the 4 body bolts.
- Using a flat tip screwdriver if necessary, gently pry the motor away from the pump housing. The motor is now ready to be rotated.
- Rotate the motor so that the conduit box is in the desired position.
 

**Note:** The Control Panel UI is designed so that it can be rotated separately. (see Section 8 Control Panel UI Rotation Procedure)
- Reinstall the motor assembly to the pump housing being sure not to damage the seal and the impeller is inserted into the wear ring of the casing.
- Insert the bolts and tighten in a crisscross pattern.

**8 - Control Panel UI Rotation Procedure**

- Disconnect and lockout the electrical supply to the pump.
- Remove the 4 screws securing the Control Panel UI to the Control Box.
- Gently remove the Control Panel UI away from the Control Box.
 


**Note:** The control panel is connected to the High Voltage Power Unit by a ribbon cable. The cable is long enough to accommodate rotation without disconnecting the cable from the UI.
- Rotate the Control Panel UI to the position desired.
- Insert the screws and tighten in a crisscross pattern.

**9 - Seal Replacement**

Mechanical Seal Options	Seal Kit Number*
Standard Seal Carbon/Silicon-Carbide/EPDM	198-3079RP
NSF Compatible Seal Carbon/Silicon-Carbide/Viton	198-3080RP
Impeller Assembly, Standard Seal Carbon/Silicon-Carbide/EPDM	198-3249RP
Impeller Assembly, NSF Compatible Seal Carbon/Silicon-Carbide/Viton	198-3250RP

\* Includes Gaskets (Casing, Flange and Drive Casing).

- Disconnect and lockout the electrical supply to the pump.
- Remove the conduit box cover and disconnect the electrical connections to the pump.
- Relieve the system pressure, reduce the system temperature to ambient and drain the water from body.
- Close isolation valves on suction and discharge sides of the pump. If valves are not present, the system may need to be drained.
- Remove flange nuts/bolts and the pump from the piping.
- Loosen and remove the four body bolts that attach the motor assembly to the pump body. Carefully remove the motor and control assembly from the pump body.
- Remove the User Interface (UI) cover from the motor/heat sink assembly exposing the slotted pump shaft access port through the center of the High Voltage Power Module.
- Disconnect the ribbon cable from the UI panel.



**Caution:** Do NOT remove the High Voltage Power Module. Removal of the High Voltage Power Unit will void the manufacturer's warranty and may pose the **Risk of Electric Shock**.

- Place the motor assembly in a horizontal position with the impeller and slotted shaft end easily accessible.
- The impeller is fastened to the shaft using a **REVERSE** (Left-Handed) thread. To remove the impeller, carefully place the flat end of a screwdriver into the slotted shaft end. While holding the rotor/shaft in place with the screwdriver, turn the impeller clockwise using your free hand to remove the impeller from the shaft and gain access to the mechanical seal.

**NOTE:** The impeller is made from a polymeric material, use caution not to crack or otherwise damage the impeller.

- Remove the complete seal assembly from the shaft.
- Remove the seal face plate by gently prying it away from the housing.
- Remove the old seal seat and cup from the seal face plate.
- Thoroughly clean the impeller shaft before installing the new seal.
- Lubricate the new cup with soapy water and install new parts in the face plate recess.
- Replace the face plate to its original position. Carefully tap the face plate evenly into the recess in the motor housing assembly.
- For DHW applications, lubricate the impeller shaft with soapy water, for all other applications use the lubricant supplied with the seal kit.
 

**NOTE:** Do NOT install the new seal on a dry impeller shaft or damage to the seal may result.

**NOTE:** Do NOT use any other oil or grease.
- Slide the new carbon seal and spring assembly onto the shaft until it contacts the seal seat.
- While holding the shaft in place as used in the impeller removal steps, thread the impeller onto the shaft in a counter-clockwise direction until it stops. Check to make sure the impeller/shaft assembly will rotate. If the impeller does not spin freely, contact Taco Technical Support at 1 (401) 942-8000.
- Reconnect the ribbon cable from the High Voltage Power Module to the UI panel.
- Clean the gasket surfaces between the pump casing and Impeller/Motor assembly. Using the new gasket provided with the seal kit, reassemble the Impeller/Motor assembly to the casing and secure with the four body bolts. Use caution not to pinch the body gasket or leaks may result. Tighten the four bolts evenly in a crisscross pattern to 70 in-lb. of torque.
- Reinstall the pump into the system using the new flange gaskets supplied with the seal kit if required. Be sure that the arrow on the casing is pointing in the right direction of flow.
- Reconnect the electrical wiring. Do not turn on the electrical supply to the pump until all "Start-Up" steps are complete.
- Follow procedure outlined under **START-UP** section.

**10 - System Start-Up**

- The pump must always be filled with system fluid and the system vented as the pump uses a mechanical seal which requires fluid lubrication.
- Partially unscrew the highest point 1/8" NPT drain plug in the pump casing until only water trickles from the screw threads. Retighten the drain plug as needed to seal the system.
- The motor stator openings and stator housing should not be insulated. The thermal insulation may prevent motor cooling and prohibit condensate from escaping from the motor housing when used in high humidity environments where the fluid temperature is below the motor temperature.
- Prior to pump start-up, closed heating and cooling systems should be thoroughly cleaned and drained.
- Open isolation valves and refill system with clean water. Check for any leaks.
- Vent all air from system at an air vent located at a high point in the system and at the highest point 1/8" NPT casing drain plug.
- Start the pump and check for proper operation.
 

**NOTE:** Pump casing includes three 1/8" NPT drain plugs to evacuate air from the mechanical seal chamber prior to operation.

**11 - Electrical Connections**

- Connection of the pump must comply with local electrical codes and be carried out by qualified personnel. When connecting the pump, the following must be considered:
- Local or national electrical code requirements supersede Taco's specification.
- Install an electrical disconnect to comply with national electrical code.
- Connection of the power supply electrical cable must be done in a manner that ensures it does not contact the motor housing and volute of the device, due to potential high temperatures of both.
- The pump has built-in over current protection, temperature protection, and basic overvoltage protection. It does not require additional overload protection devices unless required by local electrical codes. Power supply cabling should be capable of carrying rated power and be properly fused. Grounding connection is essential for safety and should be connected first. System piping should be grounded separately.
- Connect the black wire of the pump to the "Hot/ Live" wire of the system. Typically black, or red wire if no black wire is present. When no black



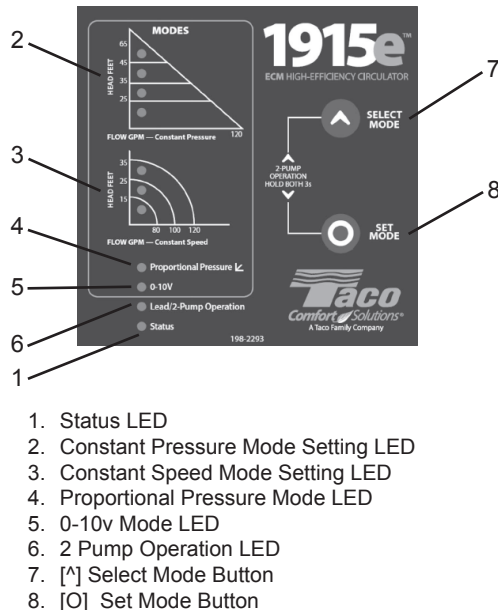


wire is present, a red wire is a secondary live wire found in some 220/1 circuits. Connect the white wire of the pump to the white or gray neutral wire of the system. The installation green ground wire is connected to the grounding terminal inside the pump electrical box. See fig 2 noted to the left.

Figure 2  
Electrical opening: 1/2" 14 MPSM standard thread

## 12 - Setup and Operation

### 12.1 - Control (UI) Panel Layout



### 12.2 - Switching the Pump On and Off

When the pump is powered for the first time, it operates with the factory default setting in Constant Pressure mode equal to 45ft of head.

The pump requires dry contact to run and comes with a jumper across the ENABLE INPUT (J4) contacts found on the Control Panel UI. The pump will run when connected to a power source when the jumper is connected. Turning the pump on/off remotely is accomplished by accessing the ENABLE INPUT (J4) contacts on the UI control board located under the UI and connecting the contacts to an external relay. Access is gained by removing the 4 screws located in each of the UI panel's four corners.

## 13 - Pump Functions

### [^] Select Mode Button

Short press: **Change Mode**

- Scrolling through operational modes upwards. Current operational mode LED blinking. To accept the new mode press the Set Mode button.

### [O] Set Mode Button

Short press: **Confirm Selection**

- To confirm the mode currently selected. Selected operational mode LED solid.

**NOTE:** Pump returns to previous operational mode if Set Mode is not pressed.

### Long Press – LOCKOUT

- Pressing and holding the [O] Set Mode Button for 10 seconds activates or deactivates pump LOCKOUT. In LOCKOUT, the currently selected mode is active only. No changes can be made while in LOCKOUT. LOCKOUT activation or deactivation is acknowledged by all LED's blinking on and off once, and returns to display current operating mode.

### [^] Select Mode Button + [O] Set Mode Button

Long press (3 seconds): **2 Pump Operation**

- To select or deselect 2 pump (lead/lag) operation.

## 13.1 - Pump Modes, 0-10Vdc and Parallel Pump Operation

The pump can operate in 9 different modes. Set the pump in the most appropriate mode depending on the system where the pump operates.

The pump modes are:

**Constant Pressure:** 4 settings - 65ft, 45ft, 35ft, 25ft (Changes impeller speed to maintain pressure as flow increases)

- The pump maintains the selected pressure from 0 flow to maximum power. At maximum power the pressure begins to drop with increasing flow.

**Constant Speed:** 3 settings - 35ft, 25ft, 15ft (Maintains speed at selected head at 0 flow)

- In Constant Speed mode the impeller speed is maintained through the entire range of flow.

**Automatic Mode:** 1 setting (Proportional Pressure - increases impeller speed to increase differential head as flow increases)

- In automatic mode the pump sets the operating pressure depending on the system resistance.
- The parameters are preset and cannot be changed.

### 0 – 10Vdc:

- In this mode, all automatic curves are deactivated for full control via an external signal. A dry contact from the external source is used to activate or deactivate the pump. Pump speed is controlled via a 0-10V DC signal. Loss of the 0-10V DC signal defaults pump to 50% of full speed. The 0-10Vdc output signal is a linear relationship between speed and Vdc regardless of the selected mode. 0 Vdc is minimum speed, 10 Vdc is maximum speed, 5 Vdc is medium speed etc.
- 0-10Vdc operation is unavailable in 2 pump mode.

To switch between modes (except 2-Pump Operation) depress the [^] **Select Mode** button for 1 second. The selected mode LED will begin blinking. Continue pressing the [^] **Select Mode** button to scroll through the available modes indicated by the mode's blinking LED. Press the [O] **Set Mode** button to accept the desired operating mode.

### 2-Pump Operation: 1 setting

- This option is selected when 2 pump alternation is desired.
- Pumps will alternate run-time every 24 hours (not adjustable).
- In this mode the lead pump will control the operation of the lag pump.
  - Set both pumps to the same Mode
  - Turn main power off to both pumps
  - Connect Primary Pump "P1" relay output common and NO to "P2" Enable Input (see 21.1 - Connection Examples Parallel Pump Operation). NOTE: Remove factory installed jumper from "P2" Enable Input
  - Connect "P2" 0 – 10Vdc Output to "P1" 0-10Vdc Input, positive to positive and negative to negative
  - NOTE: Between pumps standard 18ga unshielded communication wire is sufficient

To activate or deactivate 2-Pump Operation, press the [^] **Select Mode** button + [O] **Set Mode** button together and hold for 3 seconds. The 2-Pump Operation LED will light indicating 2-Pump Operation activation. The LED will go out upon deactivation. Only the master pump should be set to 2-pump operation.

## 14 - Specification

### 14.1 - Application

- Maximum Operating Pressure: 175 PSI (12 bar)
- Water Temperature Range: 36° – 230°F (2.2° – 110°C)
- Ambient Operation Temperature Range: 32° – 104°F (0° – 40°C)
- Relative Humidity: Max. 95%
- Central heating application is designed for closed loop heating and cooling systems pumping water or a water/glycol mixture.
- DHW application is designed for open loop potable water systems.

#### Rated NSF/ANSI 61-G & 372 Commercial Hot (180 °F)

- NPSHr - Minimum static inlet pressure at pump suction to avoid cavitation and mechanical seal damage:

Fluid Temperatures	PSI / bar
112°F (50°C)	7.3 / 0.5
176°F (80°C)	11.6 / 0.8
230°F (110°C)	20.3 / 1.4

### 14.2 - For indoor use only - employer uniquement a l'interieur.

## 15 - Electrical Ratings

Pump Ratings	1 phase, 200-240V, 47-63Hz
Power Consumption (HP)	0.027-0.75 HP
Power Consumption (W)	20-650W
Rated Current (1 phase, 230V)	0.25-3.8A
Relay Output	30 VDC Max. Load up to 2A
	24VAC Max. Load up to 3A
Analog Input	Input Voltage: 0-10V, 10mA
	Output Voltage: 0-10V, 10mA

**Note:** Supply voltages below 230V may result in performance reduction at low flow.

## 16 - Standards, Protection and Connection

- Insulation: Class H (180 °C)
- Enclosure: Type 2
- Integrated Motor Protection (Electronically Protected)
- Continuous Duty
- UL778
- CAN/CSAC22.2#108, #100, #107.1, EMC (89/366EEC):EN61000
- Flange Connections: 2-bolt

**Note:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

## 17 - Materials of Construction

- Casing *HVAC application:* Ductile Iron, Cathaphoresis Coated  
*DHW application:* Stainless Steel
- Impeller PPS
- Shaft Stainless Steel
- Bearing Sealed for Life Ball Bearings, 6002 Series

# Section 2. Controller Operation

## 18 - Features

This section describes the controller features for 1900e series of pumps. The controller is used for various remote control applications, including:

- Remote on/off
- Analog 0 - 10 V voltage control
- Status relay feedback

There are several possible connection configurations. Not all functions can be used simultaneously.

- on/off + 0 - 10 V + relay output

## 19 - Specifications

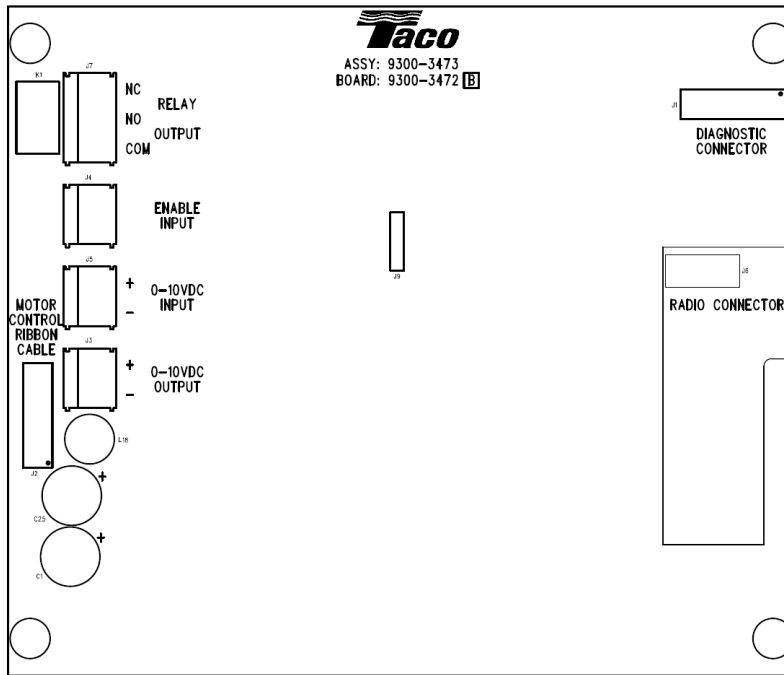
Tables to the right provide an overview of Controller specifications. For details, please refer to appropriate sections of this manual.

General Data		
Ambient Humidity	< 95% relative, non-condensing	Also see appropriate pump data for other ambient specifications.

Analog Signals		
Input Voltage Range	0 to 10V dc	When used as input. 10 mA max. drive required.
Output Voltage Range	0 to 10V dc	When used as output. 10 mA max. load allowed.
Input Resistance	~3 kΩ	

Relay Specifications	
Connection Type	Terminal Block
Rating	24V AC, 3A
	30V DC, 2A

## 20 - Controller Layout



Terminal Designation	Description
RELAY OUTPUT	Used to enable alarm output, Relay is closed during normal operation and open during alarm. Used to enable slave pump when in 2 pump operation. The primary pump relay is used to turn on/off the slave pump through the slave enable input.
ENABLE INPUT	Jumper must be connected for pump to run. (DEFAULT CONFIGURATION) Use with external dry contact relay for remote on/off
0 - 10V DC Input	Used to receive speed control from an external control. Used to receive input from Slave pump when in 2 pump operation to verify operation.
0 - 10V DC Output	Used to send signal to Master in 2 pump operation Used to provide analog feedback to an external controller
MOTOR CONTROLLER RIBBON CABLE	Connects High Voltage Power Module to UI. If the cable becomes disconnected, reconnect to "MOTOR CONTROL RIBBON CABLE" connector.

## 21 - Connection Considerations

- All cables connected must be heat-resistant to at least +185 °F.
- All cables connected must be installed in accordance with The National Electric Code NFPA 79 / EN 60204-1.
- All wires to the communications module must be connected to the terminals or cut. No loose wiring permitted.



**Warning:** Voltages over 24V AC/DC are possible on NO, C, NC Terminals.  
Cable outer layer must not be stripped longer than 0.59 inches.

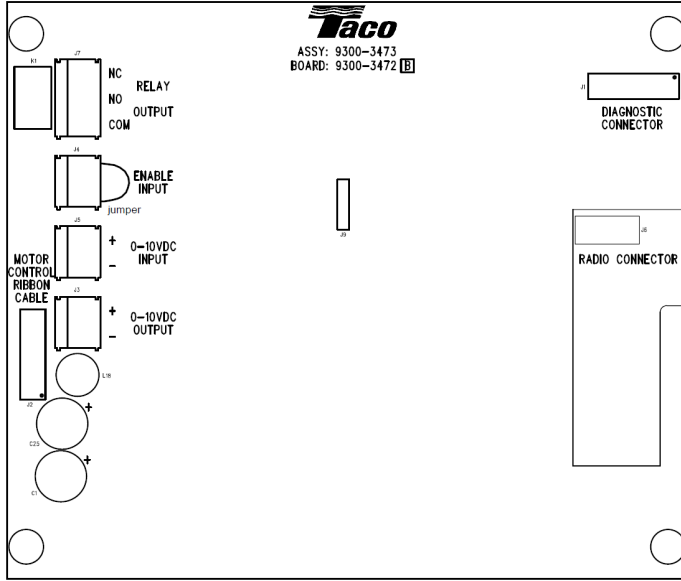


**Warning:** Before performing any work on the module, make sure that the pump and module electricity supply has been switched off and that it cannot be accidentally switched on.

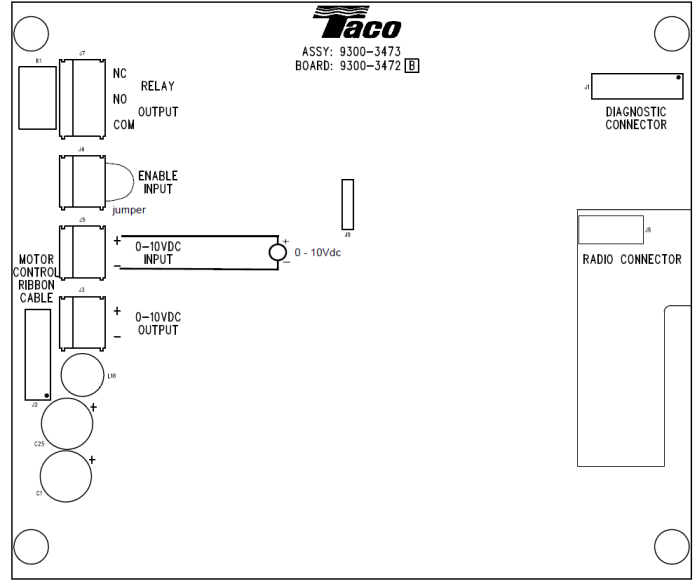


## 21.1 - Connection Examples

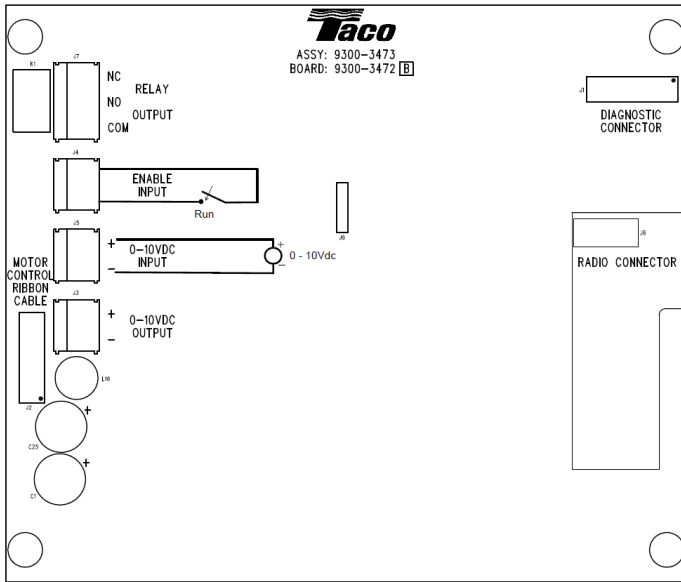
DEFAULT (FACTORY) Configuration



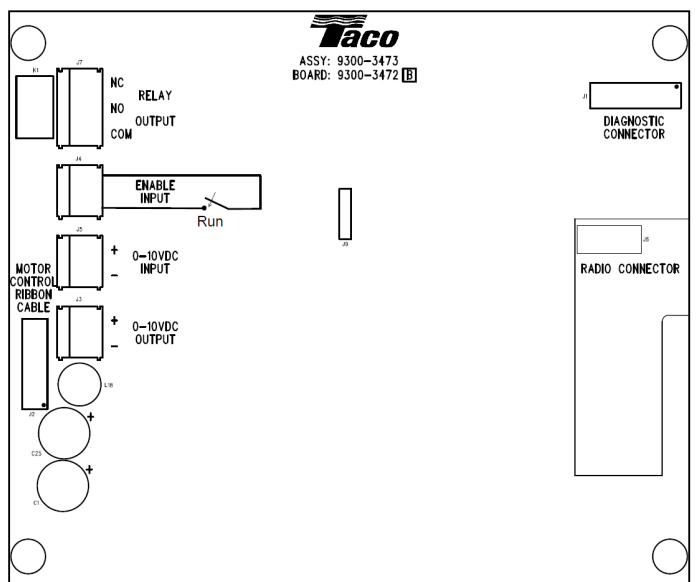
REMOTE START - Analog Control 1



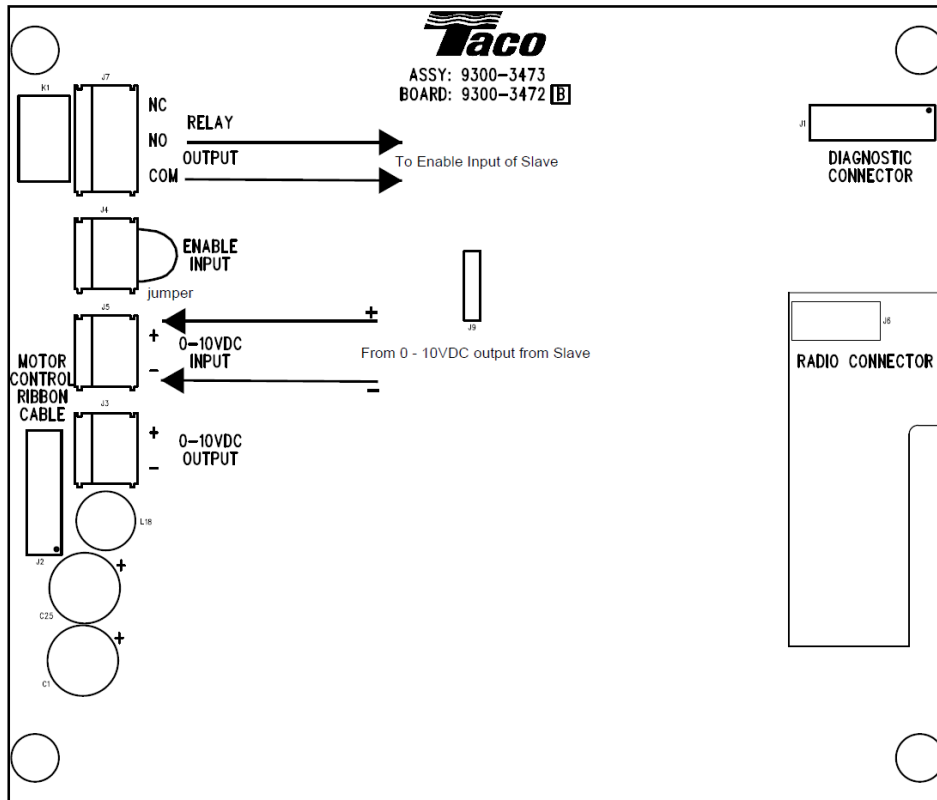
REMOTE START - Analog Control 2



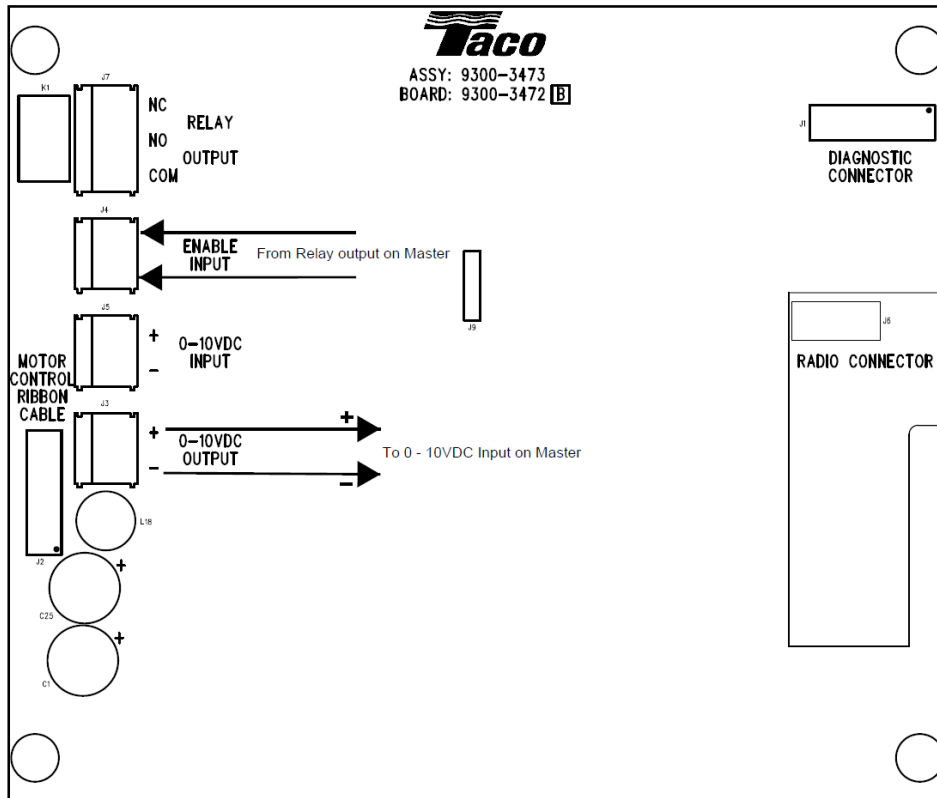
REMOTE START - Analog Control 3



2-PUMP OPERATION - Lead Pump

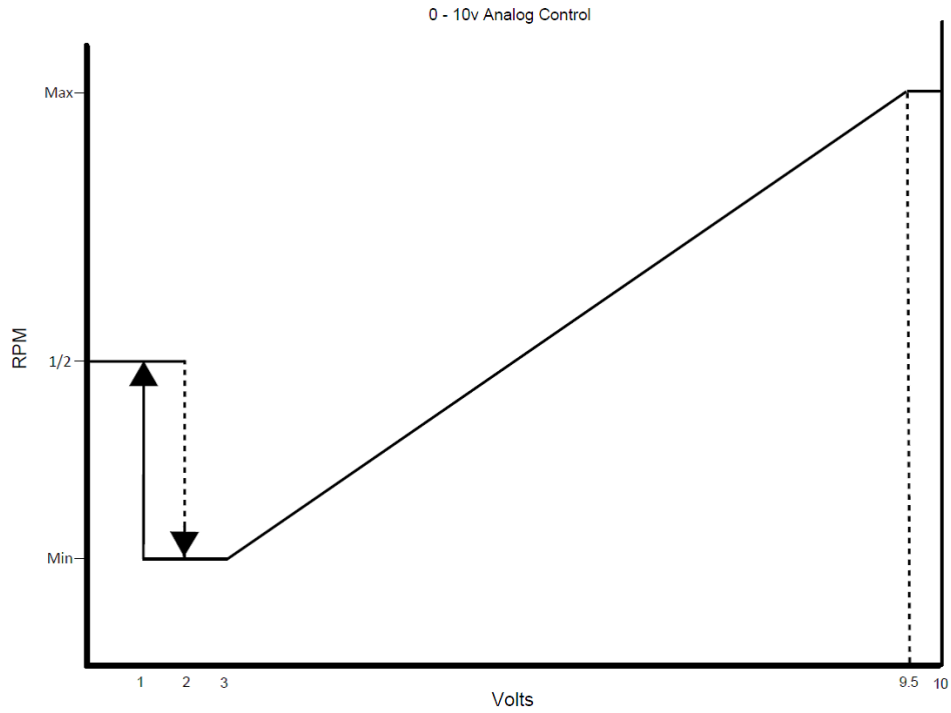


2-PUMP OPERATION - Lag Pump



Analog Control Curve

RUN Voltage	MAX Voltage	Function
> 1 V	< 3 V	Pump at minimum speed.
= 0 V	< 2 V	Pump is at 1/2 speed.
> 3 V	3 to 10 V	Speed is proportional to voltage regulation.



## 22 - Fault Finding

### 22.1 - Error Codes

The pump Status LED will flash red during errors and overload conditions.

The sequence of the flash is determined by the type of the error per the following table.

Error Code (blinks in 1/2 second intervals)	Description	Probable Cause(s)
1 blink	Locked Rotor	Impeller is unable to turn - debris in system
2 blinks	Over Current	High Motor Load
3 blinks	Over Temperature	Motor might be faulty or viscous medium is present. High Motor Load, Water Temperature too hot, Pump running dry.
4 blinks	Over Voltage	Line voltage is too high.
5 blinks	Under Voltage	Line voltage is too low for proper operation.
6 blinks	Communication Fault	
7 blinks	Motor Temperature Fault	Control temperature near maximum limit. Control reduces rpm to reduce heat.
8 blinks	Staging Fault	

## LIMITED WARRANTY STATEMENT

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Taco, Inc. will repair or replace without charge (at the company's option) any commercial pump product or part which is proven defective under normal use within one (1) year from the date code.

Seals provided on commercial pumps are not covered by this warranty.

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subject to misuse, misapplication, the addition of petroleum-based fluids or certain chemical additives to the systems, or other abuse, will not be covered by this warranty.

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Taco reserves the right to provide replacement products and parts which

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