

motivair

PUMP STATION

INSTALLATION, OPERATION, & MAINTENANCE

INSTRUCTIONS

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Motivair Pump Stations are factory-packaged units that include: close-coupled pump; pump control panel with starters; 15 -gallon horizontal ASME expansion tank, pump isolation valves & flanges; pressure & temperature gauges; and a differential switch to detect pump failure (loss of pressure). Duplex stations include the above items plus: standby pumps; pump discharge check valves; and automatic pump switchover on lead pump failure.

WARNING! THIS EQUIPMENT IS DESIGNED TO BE INSTALLED AND SERVICED ONLY BY SKILLED INDUSTRIAL MAINTENANCE PERSONNEL. ALTHOUGH GUARDS MAY BE PROVIDED, CARE MUST BE TAKEN TO AVOID ENTANGLEMENT IN ANY ROTATING EQUIPMENT. ELECTRICAL SUPPLY FOR THIS EQUIPMENT IS TYPICALLY 460/3/60. ALWAYS DISCONNECT POWER PRIOR TO OPENING CONTROL PANELS. ALWAYS LOCK OUT POWER PRIOR TO PERFORMING SERVICE OR REPAIRS. EXERCISE EXTREME CAUTION WHEN STARTING AND OPERATING THIS EQUIPMENT. FAILURE TO OBSERVE AND FOLLOW PROPER SAFETY PRECAUTIONS CAN RESULT IN SERIOUS INJURY OR DEATH.

FIELD PIPING

The pump station has been pre-piped at the factory to facilitate field installation. The following are recommendations regarding the field installed interconnecting piping required between the components:

All piping should be done in accordance with local codes. To reduce the potential for leaks, use weld or sweat joints where possible. When threaded connections are used, be sure to use Teflon tape or pipe sealant. The water/glycol fluids generally used in these systems allow the use of standard piping materials such as steel, copper, cast iron, and plastic.

Do not use galvanized steel as some glycol solutions may react with zinc to form sludge.

Pipe size is determined by calculating the total system pressure drop... not by using the equipment connection sizes! Equipment connections are sized based on maximum fluid velocities and not on pressure drop; the interconnecting piping must be sized large enough so that the total pressure drop (including all elbows, fittings, valves, etc.) does not exceed the pump pressure capacity. Please consult pump performance curve included with this manual.

All additional valves installed in the piping (for isolation, throttling, etc.) should be the same size as the system piping. In the case of retrofitting a closed loop fluid cooling system into an existing once-through water installation, care must be taken to insure that the existing piping is not fouled from the previous fluid. Chemical cleaning may be necessary to remove accumulated scale and debris prior to closed loop installation.

Individual heat sources should be piped in parallel with a full-size ball valve and temperature gauge installed on the leaving fluid side for flow balancing purposes. All automatic water flow control devices must be removed from all heat sources.

Install automatic or manual venting devices at all piping local high points. Local high points are created when the piping creates a loop where air can be trapped regardless of elevation relative to the rest of the piping system.

FIELD WIRING

The pump stations are individually factory pre-wired to facilitate installation and minimize field labor costs. Field installed power wiring and/or interconnecting wiring must include the following considerations:

The electrical installation should be in accordance with National Electric Code and any local codes and/or regulations. A wiring schematic for each component can be found in its respective control enclosure.

If not specifically included in the purchase order, a disconnect switch (either fused or non-fused) must be provided and installed in the field "by others" for each unit.

Standard units may be supplied pre-wired for either 208-230/3/60 or 460/3/60. Be sure to check unit nameplate(s) to be certain that the supplied power is in agreement with each specific component.

START-UP PREPARATION

Attention to the following items prior to starting the system will save time and trouble during system operation:

Check pumps for proper power phase connection by "bumping" motors. Pumps are marked with a directional arrow for this purpose. Do not run pump motors in reverse direction for any extended period as equipment damage may result. Do not run pumps dry at any time.

Simulate system operation with water charge by running pumps. Check system pressures and insure that flow is adequate to all heat sources. Fill the system with an inhibited, industrial-grade ethylene glycol and water solution. Do not use automotive antifreeze as this may contain an incompatible inhibitor that could cause a build-up of sludge. The following chart indicates freeze point protection of various glycol/water concentrations:

<u>PERCENT %</u>	<u>20%</u>	<u>30%</u>	<u>40%</u>	<u>50%</u>	
Minimum Outside Design	+15	-3	-14	-38	Temperature (°F)

In filling the system, **it is important to insure that all air is removed.** Be certain that all valves are open, open all vent connections and, using an external pump, slowly fill with a pre-mixed water/glycol solution via the valve located on the pumping station. This will allow the system to fill with fluid from bottom to top allowing the air to be forced out through vent openings. Close each vent as fluid is observed to be discharging steadily.

Small installations, where all system components are located at the same elevation, can be filled using a stand pipe. Make sure that the stand pipe is higher than any other system component, open vent connections, and again, slowly fill with pre-mixed fluid closing vents as fluid reaches them. Be sure to cap stand pipe prior to starting the circulation pumps.

START-UP

The following start-up procedure should be used when starting the pump station for the first time, and for re-starting after it has been idle for an extended period:

Energize pump station control panel.

Check pump suction and discharge pressure gauges to verify fluid flow. Use a field installed valve in the water supply piping to set the pressure at the level required to achieve the proper flow per the pump curve.

Check visually for fluid leaks.

Verify pump failure alarm by slowly closing pump discharge valve until alarm sounds (on duplex pump stations 2nd pump should start automatically after a short time delay).

Return valve to open position and reset alarm.

OPERATION

The pumping station provides a packaged means of circulating the proper fluid flow rate through the cooling system. It is equipped with an expansion tank to allow the system to allow for changes in the fluid volume associated with changes in temperature. It is also equipped with an air purger and automatic air vent to continuously remove any air that may be entrained in the fluid.

A low flow alarm is included with the pumping station to alert operators of a pump failure. A differential pressure switch is used to detect pump failure. If the pressure differential across the pump(s) falls below a pre-set level, the pump will be de-energized and the visual and audible alarms will be energized. On dual pump stations, the stand-by pump will automatically be energized upon lead pump failure. Pressing the alarm-reset button can momentarily silence the alarm. To silence the alarm, the pump switch must be manually turned off and the "alarm silence" button pushed. For dual pump stations, the standby pump will automatically be energized, but the "alarm silence" button has to be pushed to acknowledge the lead pump failure. Pump isolation valves and pipe unions are included in the station piping to facilitate pump removal.

MAINTENANCE

All motors are permanently lubricated for the life of the equipment. Pumps are direct connected motors to eliminate maintenance associated with belts or other drives. See the attached installation and maintenance manual for the manufacturer's specifics.

Test pump station pressure relief valve periodically to insure proper operation in the event of an elevation in system pressure beyond equipment design parameters.

Test low-pressure alarm periodically by slowly closing lead pump discharge isolation valve until alarm sounds. Opening of the valve and alarm reset should return system to normal operation.

motivair™

Engineered cooling solutions for all applications.™

PUMP STATION PLC MANUAL



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PLC controlled Pump Stations Sequence of Operation.

Motivair pump stations supplied with PLC controls operate to control 1 to 3 individual pumps to maintain a constant flow under steady or variable loads. The PLC monitors the Pump(s) supply and discharge pressure and controls flow by varying the speed of the pump by a VFD to maintain the differential set point. The differential set point is based on the quantity of flow (GPM) necessary for the application process. The control band adjusts the reaction speed and sensitivity to changes in demand. The higher the set point the more flow, the higher the control band the smoother and slower the pumps speed reacts to change.

The Main screen displays the date, time, supply and return pump pressures, operating differential pressure, loop temperature, the 0-10v VFD signal and unit on/off status.

The PLC controls pump rotation based on run hours settable from 1 to 999 hrs and manual switching for maintenance and testing. The PLC monitors differential pressure and set point for loss of flow if the differential falls below 50% of the current set point the PLC will issue a flow warning after the warning time delay expires and switch to the standby pump. If flow is not reestablished within the flow alarm delay time period a flow alarm is triggered. A VFD alarm is triggered on the PLC if a VFD alarm is present. Transducers and temp probe failures will also trigger a PLC alarms. Alarms must be manually cleared by first resolving the cause condition and then pressing the alarm key on the PLC 2 times. All alarm are recorded in the alarm history log and can be accessed through the program menu.

The PLC contains a BMS set-up screen to select protocols and baud rate. UOM screen to select degrees C or F. Probe calibration screen, Date and time set screen, alarm time delay screen, pump set-up screen, etc... The "Enable Exercise" parameter will enable a pump to rotate for 30 sec every 7 days if pump station is shut down for long terms.

A password is required to enter all set up screens except "Pump Rotation" set up screen. The program button will open a menu to 1. System on/off 2. Client settings 3. Manufacture settings.

When the PLC is switched on the lead pump will operate to maintain the differential set point.

Default values:

Differential set Point:	25 psi
Control Band:	20 psi
PI Time Band:	20 sec
Pump rotation:	Timed
Rotation Time:	24 hr.
No of Pumps:	2 or as built
No. of flow warnings	1
Enable exercise	off
Flow delay at start:	60 sec
Flow delay Run:	45 sec
Warning stop time:	20 sec
Lead pump off delay:	0 sec

HMI Screen Navigation



The Human Machine Interface (HMI) is a 6 button Remote panel mount display screen. The 6 buttons on left and right sides as follows:



“Alarm “ – press to view current alarm & clear alarms



“Program” – press to enter the programming menu screen



“Escape” – press to go back one screen or one space



“Down arrow” – press to scroll down or lower a setting



“Up arrow” – press to scroll up or raise a setting



“Enter” – press to navigate to changeable parameters and to confirm changes

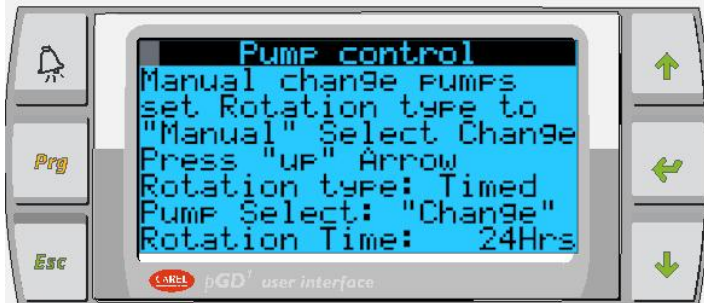
The HMI screens are a scrolling menu style the up and down arrows will scroll through all available screens in a sub menu i.e. press alarm and scroll through all active alarms.

This is the main screen or “Home Screen”



The home screen is displayed when you press the ESC key or after a few minutes of inactivity. The home screen displays all the pressure readings of the Pump Station.

Pressing the DOWN ARROW key will scroll to the next available screen.



The next screen shown by pressing the DOWN ARROW key contains the MANUAL PUMP CHANGE Instructions and the TIMED pump rotation hours setting. Note: See Page 13 for more info on rotation.



Press the PROGRAM key for access to the programming menu. The programming menu contains three sub menus as shown use the UP & DOWN ARROW keys to highlight your selection then press the ENTER key to confirm your selection.

Switching the unit On and Off



Pressing the ENTER key on the previous screen enters the "On/Off Unit" screen as shown. Pressing ENTER key will highlight any changeable settings on the screen. Press ENTER key to highlight "SWITCH OFF" then press the UP or DOWN ARROW key to change to "SWITCH ON" Press ENTER key to confirm your selection. The Pump Station is now on.



Press the PROGRAM key to go to the programming menus as shown above scroll down and Highlight “Client Settings” press ENTER key to confirm. The next screen will be the “User Password “ screen. Press ENTER to highlight the first digit and use the UP ARROW to change the number. (Default PW=1234) Press ENTER to confirm and move to the second digit and scroll UP ARROW to insert “2-3-4” Press ENTER



The Client/User programming submenus contain all the Set-point/alarm setting screens accessed by scrolling with the UP/DOWN ARROW keys. The first screen (shown) is the pump set-point screen. Press ENTER to highlight the parameter to change and use the UP/DOWN ARROW to change setting then press ENTER to confirm change.



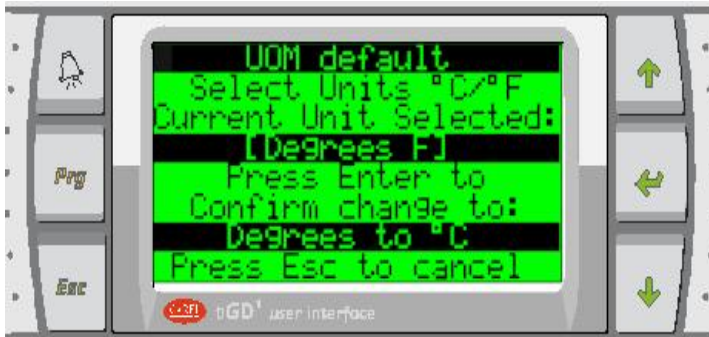
Other screens available in the submenu are the Date/Time setting screen.



The BMS setup screen is also available to set the desired communications protocol and stating address.



The following screens shown here are accessible through the “Manufacturer Setup” and should not need to be accessed unless a specific change requirement is necessary. Contact Motivair for access and more information if changes in this menu section are required.



Unit of Measure screen.



Default reboot screen.



Pressing the ALARM key will display the screen shown if no alarms are present. Press ENTER to view the alarm log history.



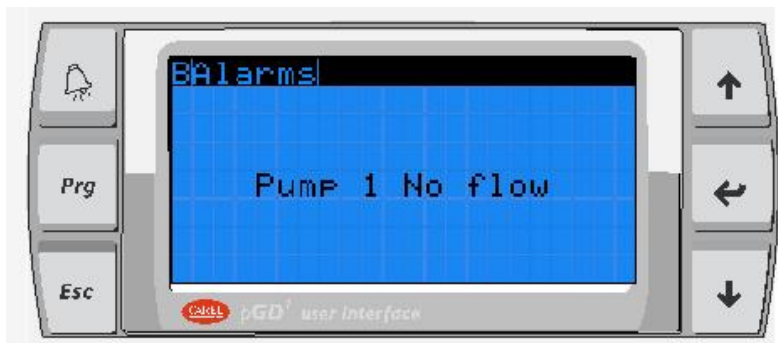
The screen shown is displayed if an alarm is present and active. Press the ALARM key once to display the actual alarm press the ALARM key 2 x to clear non active alarms.



Pressing the ALARM key once displays the active alarm.



Flow warning screen



Flow alarm screen

Program Revision 1.4 Pump rotation supplement



PS pump rotation “timed” – Timed by hours from 1-999 hrs. is actual pump run time. In most cases this is actual calendar time as the pump is rarely turned off. However if the pump is stopped or the controller is stopped for maintenance the hr. counter stops counting until run is resumed. This means 24 = 1day is true but can be off by any hours the unit is stopped – this is actual pump run hours.

The run hours can also be reduced from 0-2 hrs. by a power down of the controller; this is due to memory recording intervals.



The “Weekly” rotation option was added to the program for applications where the exact day and time of rotation would always occur every week. This weekly rotation is not dependent on pump hours or power off situations. The Day of the week and the hour and minute are settable to provide a predictable changeover rotation point.



To manually switch the current lead running pump set type to “Manual” and press the up or down arrow to switch between the pumps.

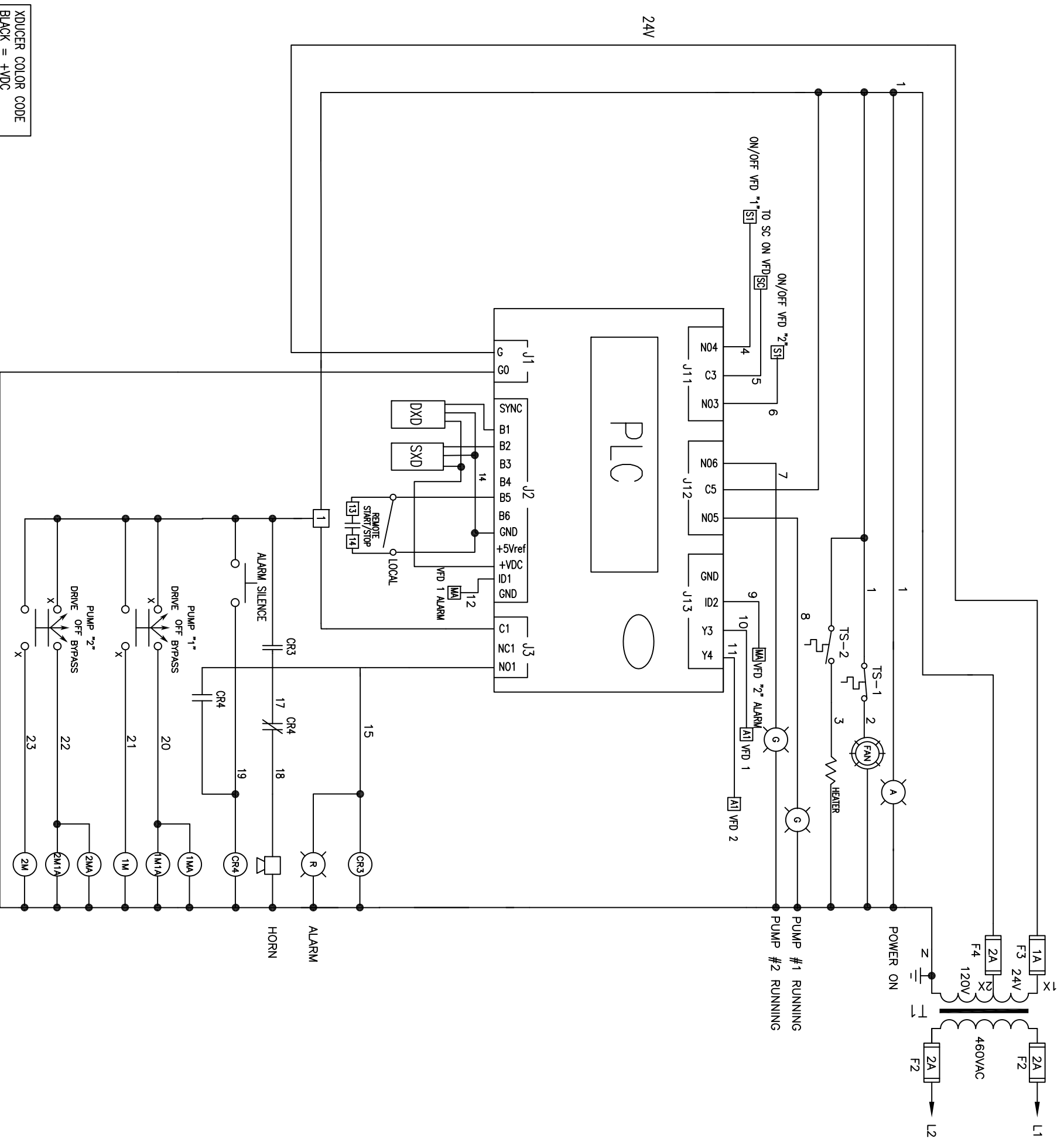
Factory Service & Support:

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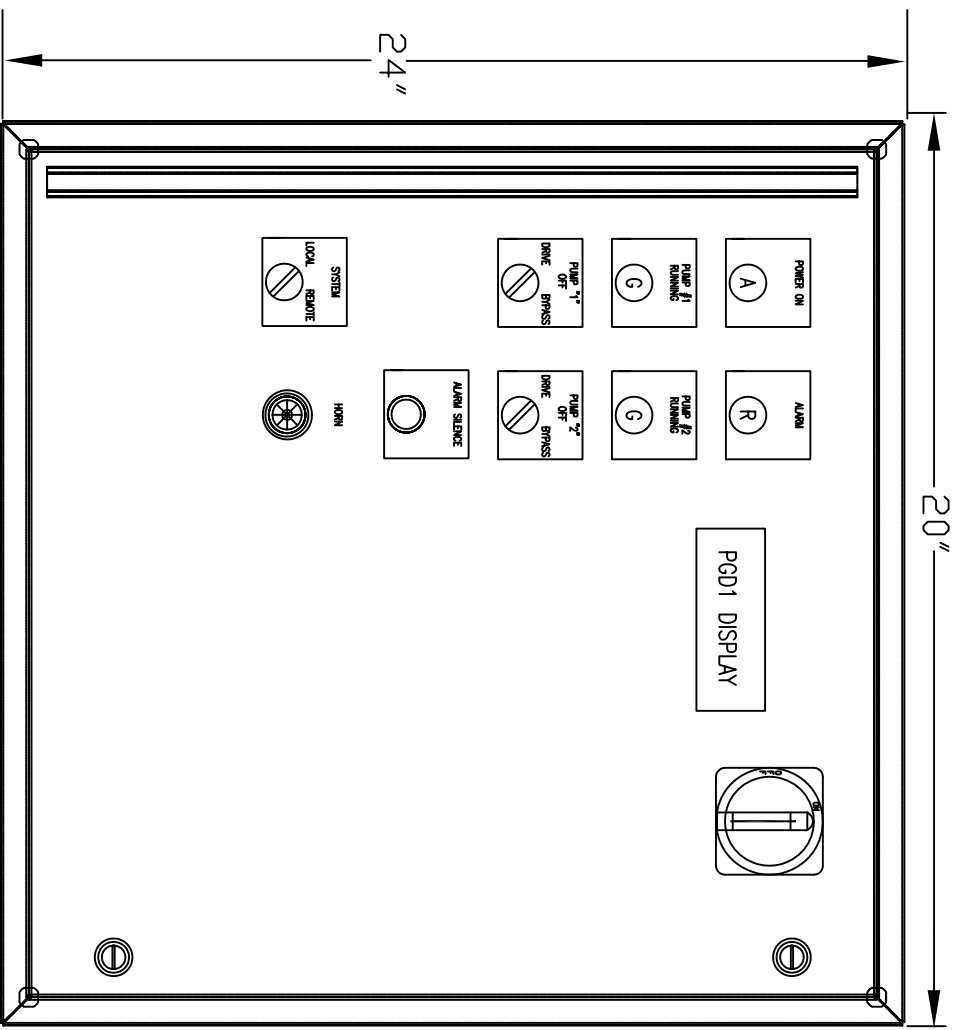
This product is covered by Motivair's Limited Product Warranty. A copy of this warranty is available by calling the factory number listed above.

**Additional information on this product may be found at
www.motivaircorp.com**

NOTES:



XDUCER COLOR CODE
 BLACK = +VDC
 WHITE = B1 +B2
 GREEN = GND
 SXD = SUCTION B2
 DXD = DISCHARGE B1



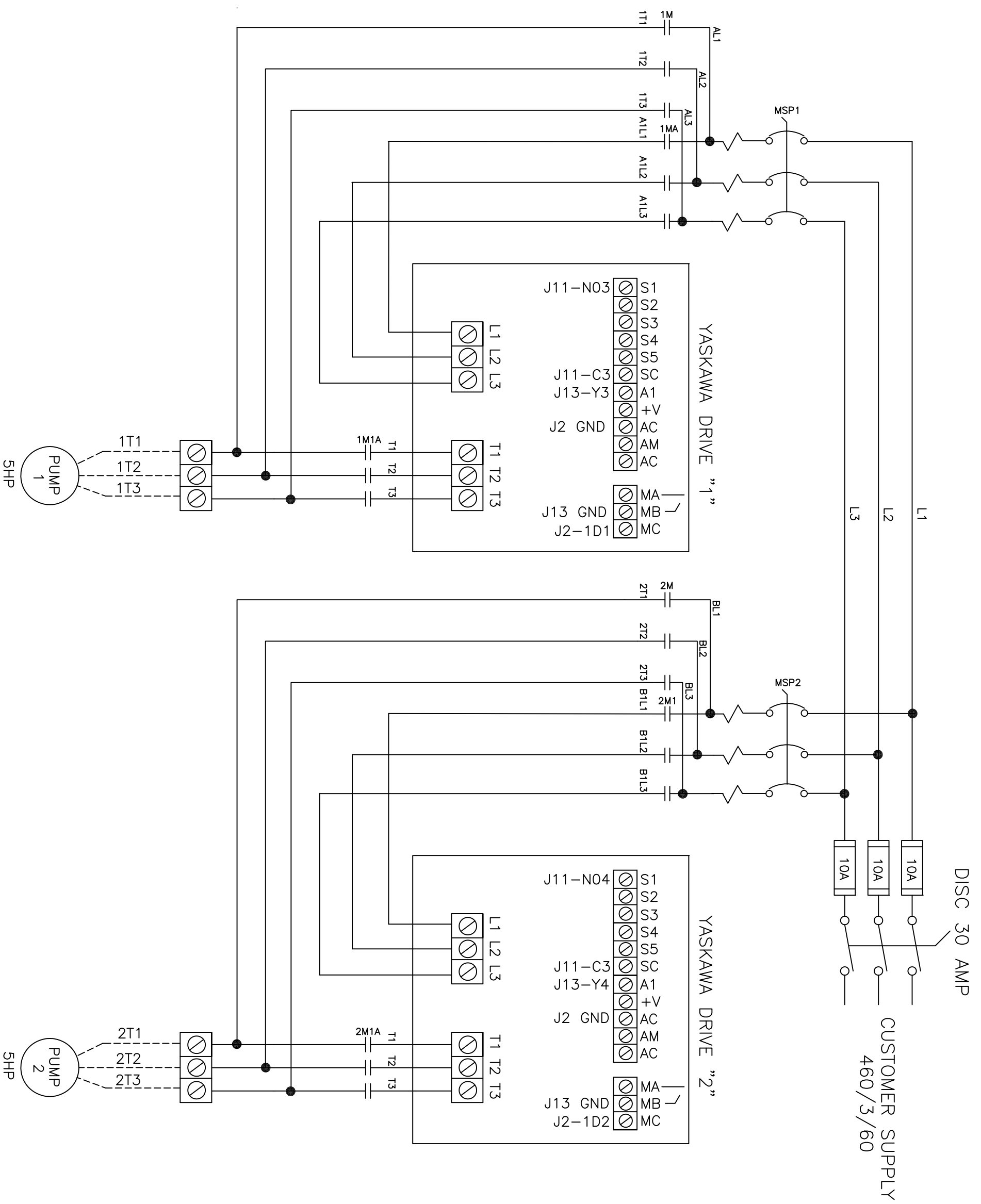
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P0# 13937
 MOTIVAIRWO #32149

DESCRIPTION 5 HP 460/3/60V DUPLEX
 VFD PUMPING STATION

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DATE	REV. 2	C.G.A. JOB	DRAWING NUMBER
1/28/14		13188	131209D



NOTES
 1) INDICATES TERMINAL BLOCKS.
 2) USE COPPER WIRE ONLY

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BMS Supervisor Parameters Pump Stations

Analog variables

BMS Address	Description	Default	UOM	Min	Max	Direction	Variable name	ModBus Reg
10	Calibrate B1 Supply pressure probe	0	PSI	-99.9	99.9	R/W	Calibrate_B1	40011
11	Calibrate B3 Fluid temp probe	0	°C/°F	-9.9	9.9	R/W	Calibrate_B3	40012
12	Calibrate B2 Return pressure probe	0	PSI	-99.9	99.9	R/W	Calibrate_B2	40013
19	Fluid outlet temp (supply)	0	°C/°F	-99.9	99.9	R	HXS_Out	40020
32	Pump Pressure Supply	0	PSI	-999.9	1000	R	Pressure_Supply	40033
33	Pump Pressure Return	0	PSI	-999.9	1000	R	Pressure_Return	40034
34	B1 transducer low range limit	0	PSI	0	1000	R/W	B1_xducer_low_Limit	40035
35	B1 transducer High range limit	0	PSI	0	1000	R/W	B1_xducer_High_Limit	40036
36	B2 transducer low range limit	0	PSI	0	1000	R/W	B2_xducer_low_Limit	40037
37	Pump differential pressure output	0	PSI	0	99.9	R	Pump_DeltaP	40038
38	Delta P Control set point	0	PSI	-99.9	99.9	R/W	SetPt_Pump_VFD	40039
39	Control band VFD	0	PSI	0	99.9	R/W	Setpt_VFDControlBand	40040
40	VFD output 0-10v	0	V	-99.9	99.9	R	VFD_Out10v	40041
42	B2 transducer High range limit	0	PSI	0	1000	R/W	B2_xducer_High_Limit	40043

Integer variables

BMS Address	Description	Default	UOM	Min	Max	Direction	Variable name	TCP/IP*
21	Flow alarm delay start	45	s	1	999	R/W	Delay_Startup_Flow_Alarm	40150 45023
22	Flow alarm delay run	10	s	1	999	R/W	Delay_Run_Flow_Alarm_1	40151 45024
23	Rotation time	24	Hrs	1	999	R/W	Rot_Time_hh_1	40152 45025
24	Number of pumps	2	---	1	2	R/W	N_Pumps	40153 45026
30	Clock Day	---	---	1	31	R	BMS_Day	40159 45032
31	Clock Month	---	---	1	12	R	BMS_Month	40160 45033
32	Clock Year	---	---	0	99	R	BMS_Year	40161 45034
33	Clock Hour	---	---	0	23	R	BMS_Hour	40162 45035
34	Clock Minute	---	---	0	59	R	BMS_Minute	40163 45036
35	Pump A Run Hours Hi Integer	---	---	0	999	R	P1_Hrs_H	40164 45037
36	Pump A Run Hours Lo Integer	---	---	0	999	R	P1_Hrs_L	40165 45038
37	Pump B Run Hours Hi Integer	---	---	0	999	R	P2_Hrs_H	40166 45039
38	Pump B Run Hours Lo Integer	---	---	0	999	R	P2_Hrs_L	40167 45040

Digital variables

BMS Address	Description	Default	UOM	Min	Max	Direction	Variable name	ModBus Reg
16	On-Off unit state (0: Off; 1: On)	0	---	0	1	R	Sys_On	10017
20	Alarm Reset by BMS	0	---	0	1	R/W	Reset_Alarm_BMS	10021
22	General alarm output	0	---	0	1	R	General_Alarm	10023
23	Clock board alarm	0	---	0	1	R	AI_Clock	10024
28	Alarm B3 Probe	0	---	0	1	R	AI_Probe_3	10029
39	B1 Pressure Probe alarm	0	---	0	1	R	B1_Probe_alarm	10040
40	B2 Pressure Probe alarm	0	---	0	1	R	B2_Probe_alarm	10041
41	Alarm VFD A	0	---	0	1	R	VFD_A_Alarm	10042
42	Alarm VFD B	0	---	0	1	R/W	VFD_B_Alarm	10043
43	Low Flow Pump A warning	0	---	0	1	R	Warning_Pump1_1	10044
44	Low flow Pump B warning	0	---	0	1	R	Warning_Pump2_1	10045
45	Manual pump select	1	---	0	1	R/W	Pump_select	10046
46	Enable VFD A alarm	0	---	0	1	R/W	VFD_A_Alm_Enable	10047
47	Enable VFD B alarm	0	---	0	1	R/W	VFD_B_Alm_Enable	10048
49	Digital input On-Off	0	---	0	1	R/W	Dig_In_OnOff	10050
50	Pump A Status	0	---	0	1	R	Pump_A_Status	10051
51	Pump B Status	0	---	0	1	R	Pump_B_Status	10052
55	On-Off by BMS	0	---	0	1	R/W	Superv_OnOff	10056
56	Low Flow Pump A alarm	0	---	0	1	R	Alarm_Pump1_1	10057
57	Low flow Pump B alarm	0	---	0	1	R	Alarm_Pump2_1	10058
58	Hrs counter reset pump A	0	---	0	1	R/W	Reset_A	10059
59	Hrs counter reset pump B	0	---	0	1	R/W	Reset_B	10060

* Note on TCP/IP: Integer registers are reallocated to 45003 and above with PcoWeb interfaces 1.5 version. The older Version 1.4 or below subtract 1 from the register address i.e. 45023 -1 = 45022