PowerXL Series Redundant Drive Application

Introduction

The Power XL Series drive is capable of operating in a redundant drive scheme when using any given refrence. This system will utilize two drives with one drive as the Master drive and a secondary drive as a backup or redundant drive. This scheme will use the RS485 communication bus to communicate between the two drives. If the master/lead drive would happen to fail due to a fault or a motor interlock is removed, the secondary/redundant drive will be brought in and allow the system to keep running. Additional isolation can be built into the scheme to provide the ability to physically replace a drive if one has failed while allowing the other drive to operate the system. This system could include multiple drives running a single motor or multiple drives running their own motor for redundancy.

System Configurations

The system eample setup for this redundant drive application will include two adjustable frequency drives of the same or different rating, appropriate input protection, input isolation contactor connect devices, output contactors, and a single motor. The output of both drives will be wired into two output contactors and combined to feed to the motor. This setup will allow for either drive to supply power to the motor. By adding disconnects before each drive, a failed drive can be replaced while having the backup drive continue to operate the system. This typical setup is detailed in Figure 1 below.

In most cases, this redundant drive setup will be used with two drives and a single motor as described above. However, the system could also be set up to utilize two drives each wired to its own motor. This system would utilize the same components as described above, except the output contactors would be wired to the respective motors and not combined to the same motor. This alternative setup is shown in Figure 2 below. This configuration provides redundancy for the drives as well as the motors.

For both system configurations, the output contactors for the master drive and backup drive will be tied to the Run relay output on the respective drives. This will set the drive software as the interlock. When the master drive is running and sees a fault, the motor interlock contactor will drop out. When this occurs, the system will check if the backup drive is able to run the motor. If it is able, the backup drive will close its Run relay thus closing the output contactor.

All main controls, inputs and outputs should be wired to both drives. This will allow either drive to properly operate the system if it becomes the active drive. Further details on the wiring and setup are given in the following sections.

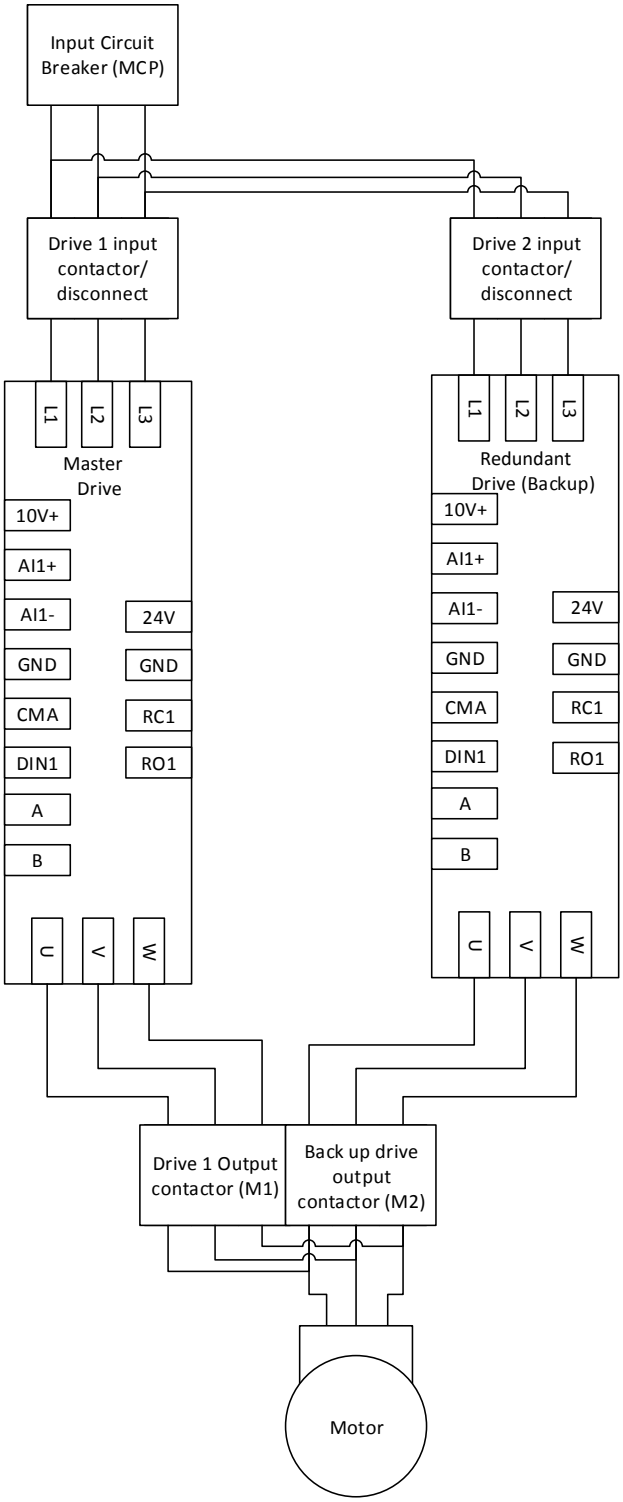


Figure 1: Redundant Drive Configuration with 2 Drives Controlling 1 Motor

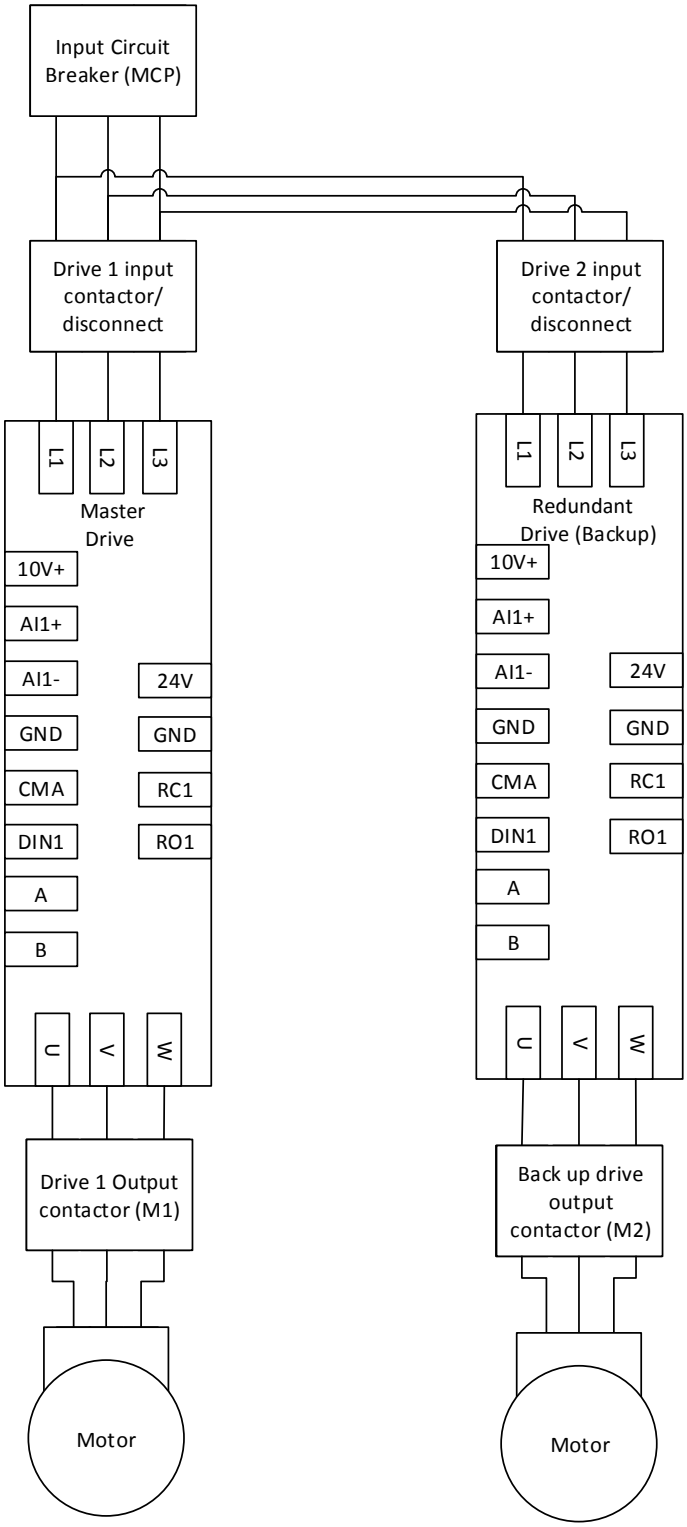


Figure 2: Redundant Drive Configuration with 2 Drives Controlling 2 Motors

Sample Control Schemes

Figures 3 – 5 below show basic control scheme layouts for three different types of transducer setups. The figures show the wiring of the analog signals, start commands, and the RS-485 communication bus between each drive. With this setup, the backup drive will always be capable of becoming the active drive in the event of a drive failure.

If Safe Torque Off (STO) is used, the inputs can be run in parallel to each drive or individually. If the backup drive's STO is connected individually from the Master drive and a fault is triggered, it can be sent back to the Master drive to stop the system.

If multiple motors are used, it would be advised to use Motor interlocks to be sure the motor is OK to run prior to operating. In the case where a single motor is used, the interlock would be disabled or fed back to both drives. When the motor interlock is used, it will not allow the system to run with a single motor.

The last drive in the network should have the RS485 Termination resistor enabled on the control board. This resistor identifies the last device on the communication network.

Please see the figures and associated notes on the following pages.

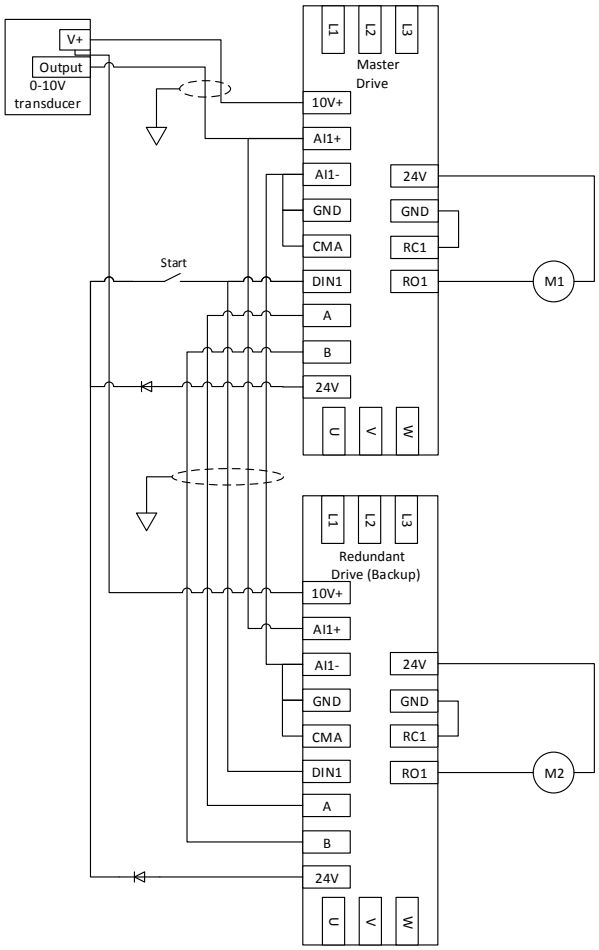
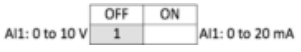
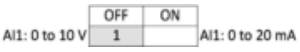
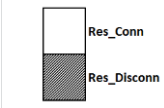
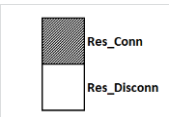


Figure 3: Control scheme with 10V supply and 0-10V transducer

For the control scheme in Figure 3, please note the following:

- The 10V+/24V+ supplies along with Grounds for each drive should be connected together. When connecting multiple power supplies together, it is advised to use a feedback diode to prevent power supplies back feeding on themselves.
- The Run commands need to be wired into each drive.

Parameter/Setting	Main Drive Setting	Backup Drive Setting
P2.1 – AI1 Mode	0-10V	0-10V
P2.2 – AI1 Signal Range	0-100%	0-100%
Jumper		
RS485 Terminating Resistor		

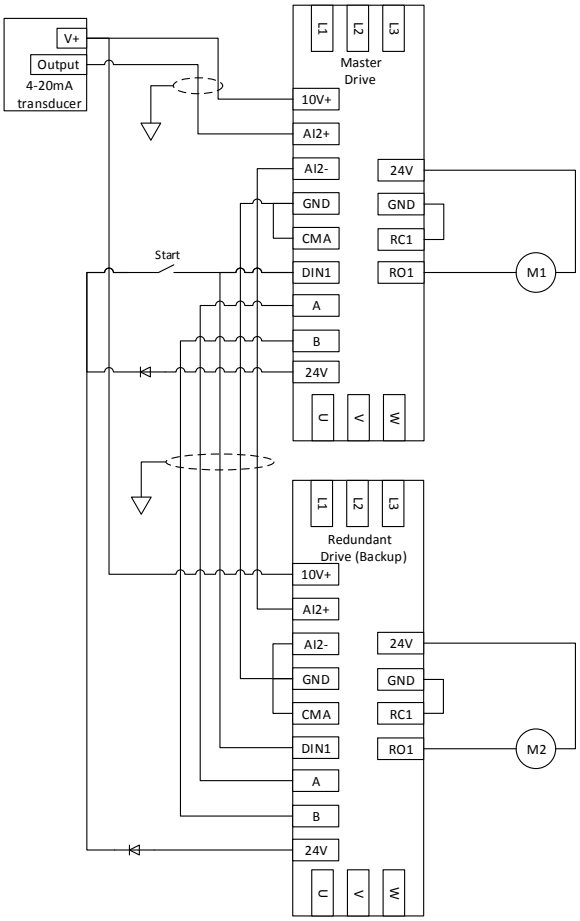
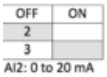
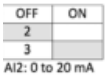
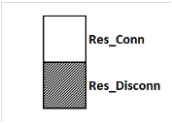
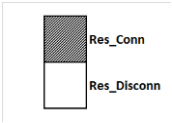


Figure 4: Control Scheme with 10V supply and 4-20mA Transducer

For the control scheme in Figure 4, please note the following:

- The 10V+/24V+ supplies along with Grounds for each drive should be connected. When connecting multiple power supplies together, it is advised to use a feedback diode to prevent power supplies back feeding on themselves.
- The Run commands need to be wired into each drive.

Parameter/Setting	Main Drive Setting	Backup Drive Setting
P2.11 – AI2 Mode	0-20mA	0-20mA
P2.12 – AI2 Signal Range	20-100%	20-100%
Jumper		
RS485 Terminating Resistor		

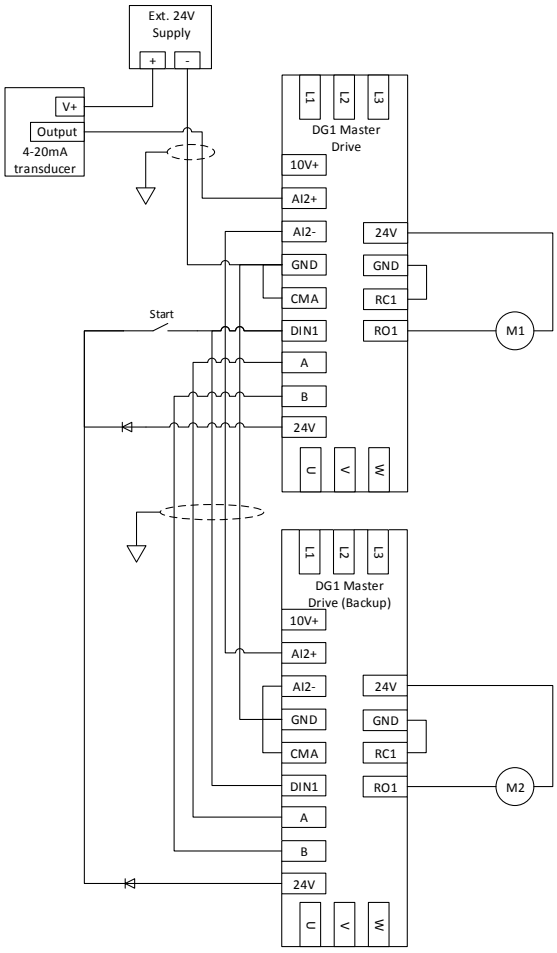
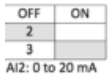
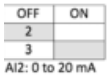
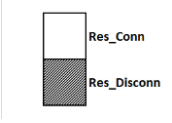
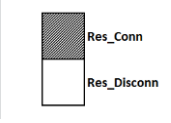


Figure 5: Control Scheme with External Supply and a 4-20mA transducer

For the control scheme in Figure 5, please note the following:

- The 24V+ supplies along with Grounds for each drive should be connected. When connecting multiple power supplies together, it is advised to use a feedback diode to prevent power supplies back feeding on themselves.
- The Run commands need to be wired into each drive.

Parameter	First Drive Setting	Backup/Last Drive Setting
P2.11 – AI2 Mode	0-20mA	0-20mA
P2.12 – AI2 Signal Range	20-100%	20-100%
Jumper		
RS485 Terminating Resistor		

Parameters

The table below shows the setup parameters for the PowerXL DG1.

Panel Code	Parameter	Default	Range	Modbus ID	Description
P17.2.1	Redundant Drive Enable	0	0-1	2476	0 = Disable 1 = Enable
P17.2.2	Drive ID	0	0-5	2278	Each drive in redundant drive system has to have a unique, and non-zero number. If a drive has a zero ID, it will be regard as isolated single drive. And for redundant drive system, the lower number drive has higher priority to com-pete for master.
P17.2.3	Redundant Run Time Enable	0	0-1	2477	0 = Disable 1 = Enable The run time counter will start counting only if this parameter is enabled.
P17.2.4	Redundant Run Time Reset	0	0-1	2478	0 = Not Reset 1 = Reset One-time parameter, when to “1” it will clear the run time counter.
P17.2.5	Redundant Run Time Limit	0.0 h	0.0-300000.0	2479	If drive run time is over this limit, its network status will be “Need Alternation”. Limit equals 0 means run time counter disabled.

The table below shows the setup parameters for the PowerXL DH1.

Panel Code	Parameter	Default	Range	Modbus ID	Description
P10.2.1	Redundant Drive Enable	0	0-1	2476	0 = Disable 1 = Enable
P10.2.2	Drive ID	0	0-5	2278	Each drive in redundant drive system has to have a unique, and non-zero number. If a drive has a zero ID, it will be regard as isolated single drive. And for redundant drive system, the lower number drive has higher priority to com-pete for master.
P10.2.3	Redundant Run Time Enable	0	0-1	2477	0 = Disable 1 = Enable The run time counter will start counting only if this parameter is enabled.
P10.2.4	Redundant Run Time Reset	0	0-1	2478	0 = Not Reset 1 = Reset One-time parameter, when to “1” it will clear the run time counter.
P10.2.5	Redundant Run Time Limit	0.0 h	0.0-300000.0	2479	If drive run time is over this limit, its network status will be “Need Alternation”. Limit equals 0 means run time counter disabled.

Installation Settings

The steps below detail the process for setting up the redundant drive system on the PowerXL Series Drive.

1. Make all hardwire connections between the two drives.
   a. Terminal A/B for RS485 – connect the two drives together.
   b. Power Supply – connect the two drives with feedback diodes if using both drives supplies (with ext. supply this is not required) to prevent back feeding on individual Master devices.
   c. GND – connect the Control GND terminals on both drives to keep a common control level.
   d. Digital Inputs – connect any desired Digital inputs to both drives.
   e. Analog Inputs – connect analog signals to both drives.
   f. Safe Torque Off (STO) – connect to the STO terminals on both drives in parrallel.
2. Go through the Start Up wizard to set up the motor parameters and control places.
3. Set up any additional control functions required.
4. Set up any Redundant Drive settings, use tables above showing parameters.
5. Once set, copy the parameters to the keypad to back up the parameters for both drives.
6. With the drives connected, the Master drive should see the additional drive and the setup is done. The system can now be started.

Note: When the keypad is used as the start location you need to hit start on both drives before system will operate in system.

Additional Help

In the US or Canada: please contact the Technical Resource Center at 1-877-ETN-CARE or 1-877-386-2273 option 2, option 6.

All other supporting documentation is located on the Eaton web site at www.eaton.com/Drives

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