
**Freq Drive Wiring & Setup
APP- 022****General:**

This application note will deal with how to wire and program multiple frequency drives. There are many different drive types being used, but all have similar inputs, outputs and setup parameters. This application will deal with the Allen Bradley Power flex units, but will describe the parameters in a manner that you should be able to translate to your particular drive.

Objective:

Just about every one has a different way of wiring the drives. We would like to standardize the wiring and provide the simplest and cleanest way to wire these drives. Depending if you are running refrigeration or not, there are certain parameters that should be set on all drives and we will go through the complete setup.

Start Contact:

In the past we have always used a start contact from the control panel. Typically this would require a dry contact for each drive, which is a lot of extra wiring and expense. Our new approach will not use a start contact. The XT panel provides a 0-20ma or a 0-10vdc output for the drives. This is an opto isolated output and uses a separate transformer to supply the power. The power for this transformer is supplied by the fan output module. Thus, regardless of what output the panel is calling for on the freq drive, the output will be zero until the fan output is energized on the panel. This is a good safety feature and will allow us to start the drives using the analog signal only.

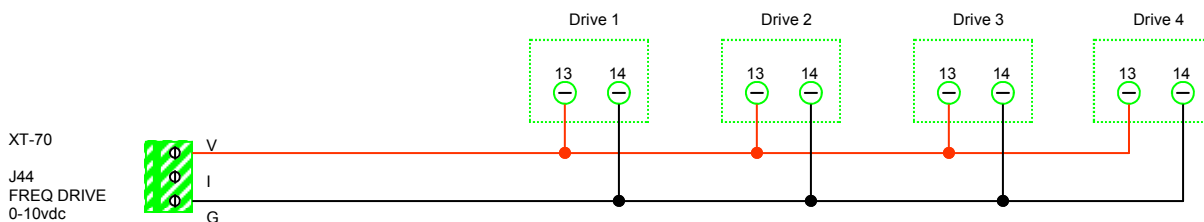
The simplest and best approach is to use the 0-10vdc output and not the 0-20ma. Using the 0-10vdc will allow you to use two wires and parallel all drives.

One of the issues with using a Start contact was that it was dry from the XT panel. The drives require a 24vdc signal to activate the Start circuit. Many schemes were developed using the 24vdc from the drive, but all had issues. If you use the power supply from one drive, all drives would fail if you lost that one drive. To overcome this requires the use of a dry contact for each drive, which really complicates the wiring.

Bottom line, it will require only 2 wires from the panel to control any number of drives. The objective is to use one 4 conductor cable from the panel to the first drive and then daisy chain the 4 conductor in and out of each drive.

It is recommended that you use a red (+) and black (-) conductor for the 0-10vdc signal.

On the AB drives the analog input for the 0-10vdc is terminals 13(+) and 14(-). **Note - you must set dip switch A01 to 10v.** Each manufacture will have jumpers or switches to allow you to select either 0-10vdc or 0-20ma inputs. On the AB we are using Analog input 1 (most drives have more than one analog input). It is recommended to standardize the use of analog input 1 for all drive manufactures.

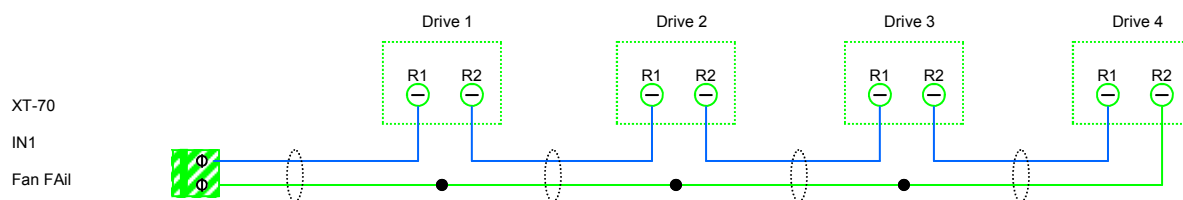


You can hook any number of drives up in this configuration. BTU has some new 4 conductor cable 20 awg that is rated at 600 volts. This cable could be run from the XT to the VFD's in the same wire way as the Power / Motor leads and meet NEC.

Fan Proving:

This application will show how to hook up the fan proving on each drive using one pair of wires. It is recommended that you use the white and green conductors to standardize the fan proving.

Each of the different manufactures of freq drives supply up to 4 relay outputs. We will use one of the relays to provide a closure whenever the drive is running. On the AB drives we will use Relay output 1. Terminals R1 and R2 are the normally open contacts for relay output 1.



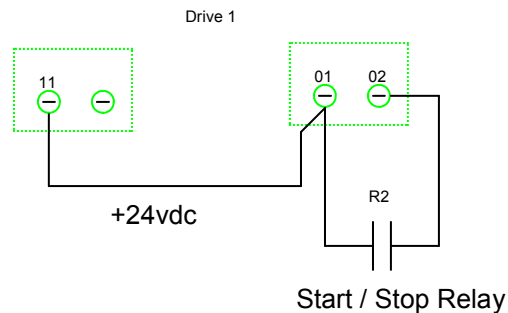
T055 is the AB parameter for relay output 1. Set T055 = 2. This will cause relay output1 to energize anytime that the drive is running. You should have a similar setting on all the other manufactures. Any fault or alarm will shut the drive off and output 1 will de-energize.

Start / Stop Input:

All VFD manufactures have inputs that you can use a Stop / Start switch on. The key to making this work is to use a second VFD output relay for the Stop / Start switch. The relay will be programmed to pickup when the 0-10vdc signal is above 15%.

On the AB drives, terminal 01 is the Stop input and 02 is the Start / Run FWD input. To wire a start / stop switch, you would wire as shown below.

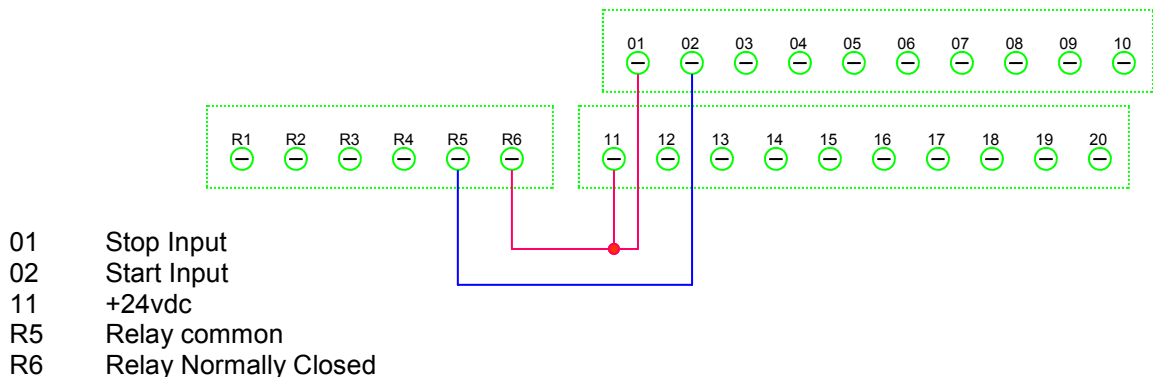
When the relay R2 energizes, the drive will start. When it drops out, the drive will stop.



Relay Output 2 Setup:

Each VFD manufacturer will have a list of settings that will control Relay Output 2. For AB the parameter is T060 Relay Out2 Set. A setting of 11 is the Analog Input Loss. A loss of the Analog 0-10vdc signal will cause Relay Output 2 to energize. A loss of signal is described as less than 1vdc.

Note - when the analog input signal is 1 vdc or greater, then the Relay Output 2 will be de-energized, thus we need to use the normally closed contact for the R2 start signal. The normally closed contact for Relay Output 2 on the AB is R5 & R6. Each drive would be wired as shown below.



Soft Start and Stop:

All drive manufactures have an Acceleration Time and a Deceleration Time. These two parameters should be set to 60 seconds. This will allow a gradual ramp up and ramp down during starting and stopping. If you are running Refrigeration you may want to set the Deceleration to 120 seconds to allow the evaporator to be cleared of any liquid.

DC Brake Time @ Start:

This parameter will apply the brake to stop the fan from spinning before starting the fans.

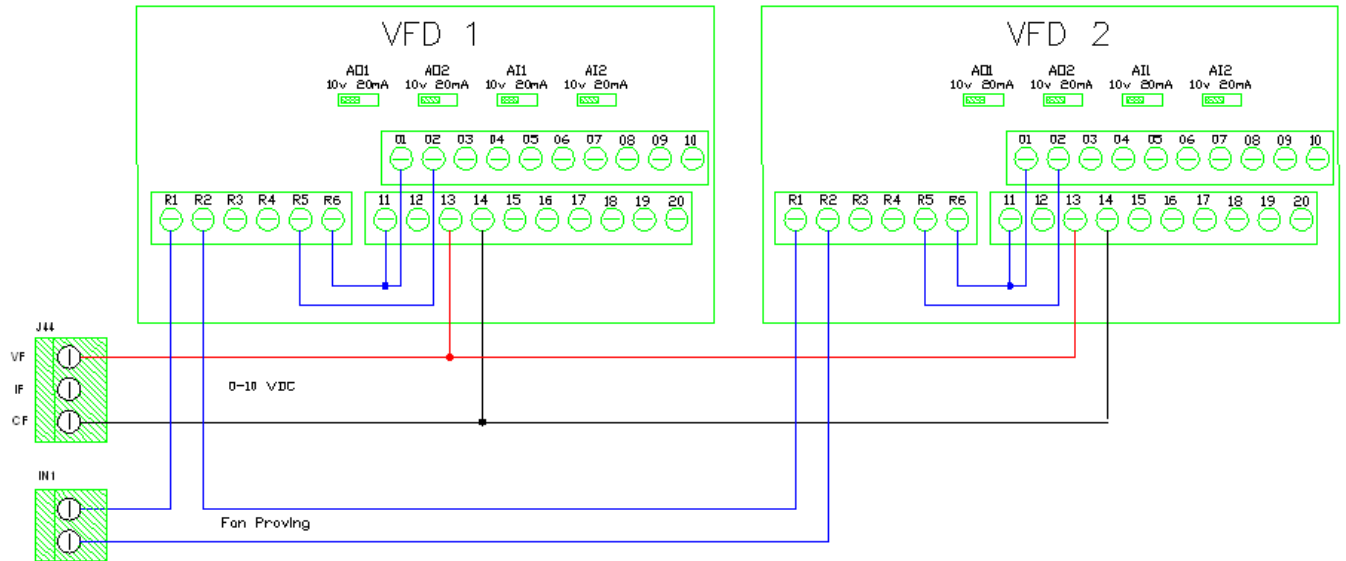
AB Setup Parameters:

Power Flex 400 Parameters			
Parameter	Function	Setting	Note
P 34	Min Freq	0	
P 35	MaxFreq	60	UNLESS Fans are oversized for system, then set to MaxDesign hz
P 36	Start Source	2	2 wire start signal
P 37	Stop Mode	0	Ramp, CF
P 38	Speed Reference	2	From Analog input 1 if 0-10v or 4-20mA is used
		0	From Keypad if no signal from Control Panel
P 39	Accel Time	60	
P 40	Decel Time	60	With No Refrig
		120	With Refrig
P 42	Auto Mode	0	No Function
T 55	Relay Output 1	2	Motor Running - de-energizes relay when motor is not running, used for fan proving circuit
T 60	Relay Output 2	11	Analog Input loss - de-energizes relay when analog input drops below 15%, used to start/stop VFD w/ Analog input
T 69	Analog input selection	0	If 0-20mA is used for speed control
		1	If 4-20mA is used for speed control
		2	If 0-10v is used for speed control
A163	Auto Restart tries	3	
A164	Auto Restart Delay	10	
A165	Start at power up	1	Enabled
A168	PWM Frequency	2	
A174	Maximum Voltage	See Note	Set to Maximum system voltage
A175	Slip Hertz @ FLA	0	0 disables slip compensation, VFD disregards RPM/hz matching
A177	DC Brake Level	See Note	Set to VFD Continuous Amps less 2 Amp. (Example, If Cont Amps is 33, set to 31.)
A178	DC Brk Time@Strt	20	Applies DC brake at start up for 20 sec to ensure fan is stopped before it tries to start
A179	Current Limit 1	See Note	Set to VFD Continuous Amps less 0.5 Amps. (Example, If Cont Amps is 33, set to 32.5.)
A200	Motor NP FLA	See Note	Set to Motor Name Plate Full Load Amps

All other parameters are set to default settings.

Complete Wiring Diagram for 2 Drive AB System:

VFD Wiring For Analog Input Start/Stop



All other parameters are set to default settings.