Bardac drives

basicPL/X Quick Start

This Quick Start is a supplement to the standard product manuals intended for use as a guide to get your PL/X Drive up and running as a basic speed controller in a safe and efficient manner. For all other applications, refer to the PL/X Product and Applications Manuals.

⚠ Only qualified personnel who thoroughly understand the operation of the machine on which the PL/X is installed and who are familiar with electrical wiring and safety standards should attempt to commission this equipment.

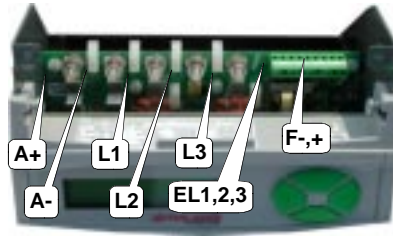### *With ALL Power OFF*

1. Connect up the drive

Hook your drive up according to the following diagrams. Ensure power and control wiring are routed in separate conduit/cable trays and wiring meets applicable national and local electrical codes.
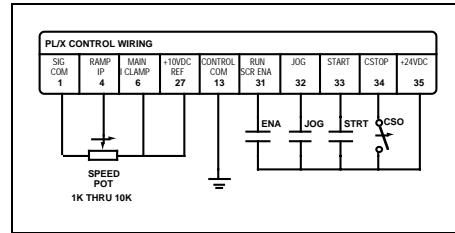
Power Wiring Diagram
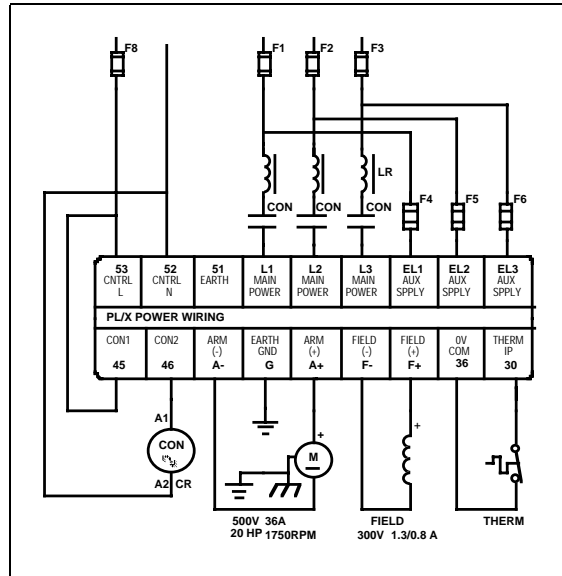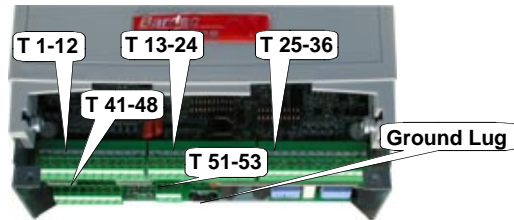

See Product Manual for fuse specifications.

Power Terminals

A+, L1, L3, F-,+
A-, L2, EL1,2,3

Control Wiring Diagram

Control Terminals

T 1-12, T 13-24, T 25-36, T 41-48, T 51-53, Ground Lug

Contact Descriptions (All are maintained-type)

CSO (Coast Stop Override): Must be closed prior to all other control signals for proper sequencing. When opened, the drive immediately stops generating armature current and the contactor drops out. Motor coasts to stop.

ENA (Enable): Electronic inhibit for all modes of operation. When closed, the drive may generate current. If open, no armature current will generated. May be jumpered to Terminal 35 in most applications.

JOG: When closed, the drive's contactor comes in and the motor will run at the Jog Speed 1 setting (Default 5% speed). When opened, the drive ramps to zero and contactor opens after a delay (Default = 2 secs).

STRT (Start): When closed, the drive's contactor comes in and the motor will run at potentiometer speed setting. When opened, the drive ramps to zero and contactor opens after a delay (Default = 2 secs).
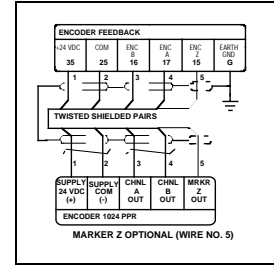
In all cases after removal of the control input, the motor field current will be present until the field quench delay is completed (Default = 10 secs).

Optional Feedback Devices
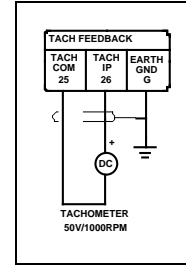
DC Tachometer   *Encoder*

2. Get the supply and motor nameplate data

Description	Typical	Actual	Units
Supply Voltage (**VL**)	480		VAC
Armature Volts (**VA**)	500		VDC
Armature Current (**IA**)	35		ADC
Base Speed (**BS**)	1750		RPM
Maximum Speed (**MS**)	2300		RPM
Field Volts (**VF**)	300		VDC
Field Current @ BS (**IFb**)	1.35		ADC
Field Current @ MS (**IFm**)	0.8		ADC
Feedback Device			
DC Tachometer (**TV**)	50		V/1000
Encoder (**PPR**)	1024		PPR
Supply Volts (**EV**)	5 - 24		VDC

Final Power OFF Checks

Recheck all your wiring, especially the drive's chassis ground. Also, use your multimeter to check the **L1, L2, L3, F+**, **F-**, **A+**, and **A-** Terminals for short circuits to ground. All readings should be greater than 1 MΩ. Correct any low resistances prior to applying power.

It is essential to perform all of the following steps in their entirety and in the proper sequence! If in doubt, call 1-410-604-3400.

Power ON Checks

1. **Apply Control Power and Calibrate**

Apply 100-240 VAC control power to T53 (Line) and T52 (Neutral).

2. **Calibrate the Drive to the Motor**

From the Entry Menu, the green keys are used to set up the drive. The required key sequences are displayed to the left of each parameter to be modified. When executed correctly, the display on the drive should match the one shown.

Abbreviations used for keystrokes:

L,R,U,D = Press the specified button **EXACTLY** once.

8xU = Press the **Up** button **8** times.

U/D = Use the **Up** button to increase the value, use the **Down** button to decrease the value.

At power up, the Entry Menu is displayed. By pressing the Left key at least 5 times, you will return you to the Entry Menu from any menu level.

5xL
```
PRESS RIGHT KEY FOR
ENTRY MENU   LEVEL 1
```

From the Entry Menu, press the keys in the below sequence to set the rated armature current from the nameplate data.

R,R,U,R,R – U/D
```
2)RATED ARM AMPS
    35.0  AMPS
```
IA

Use the up and down keys to change the values.

Now, to move to the rated field current:

L,D,D,R – U/D
```
4)RATED FIELD AMPS
    1.35  AMPS
```
IFb

Repeat these steps for the following:

L,D,R - U/D
```
5)BASE RATED RPM
    1750  RPM
```
BS

L,D,R - U/D
```
6)DESIRED MAX RPM
    1750  RPM
```
BS

L,9xD,R - U/D
```
18)RATED ARM VOLTS
    500.0  VOLTS
```
VA

L,D,R - U/D
```
19)EL1/2/3 RATED AC
    460.0  VOLTS
```
VL

Also check the following to ensure they have not been modified from the factory default settings:

L,D,R - U/D
```
20)MOTOR 1,2 SELECT
    MOTOR 1
```

L,8xU,R - U/D
```
9)SPEED FBK TYPE
   ARMATURE VOLTS
```
Then 4xL

Although the drive regulates field current by default, set the field voltage clamp as a percentage of AC supply volts.

$$FV \% = (FV \div VL) \times 100$$

R,R,7xD,R,D,R – U/D
```
100)FIELD VOLTS OP %
    65.00  %
```
Then 4xL

FV%

Feedback calibration

If you do not have a DC tachometer or encoder, skip this section and go to Step 3 .

DC Tachometer Calibration

For a tachometer, initially calibrate the drive for the expected DC voltage at base speed.

$$TVb = (BS \div 1000) \times TV$$

⚠ **Caution: TVb** must not exceed 200 VDC.

R,R,U,R,6xD,R – U/D

| 8)ANALOG TACHO VOLTS |
| 87.50 VOLTS |

Then 4xL

TVb

Encoder Calibration

Ensure quadrature is enabled and enter the PPR.

R,R,U,R,8xD,R,R – U/D

| 10)QUADRATURE ENABLE |
| ENABLED |

L,D,R – U/D

| 11)ENCODER LINES |
| 1024 |

Then 4xL

PPR

3. Save Parameters

To save your work thus far, from the Entry Menu:

R,U,R

| PARAMETER SAVE   2 |
| UP KEY TO CONTINUE |

U

| PARAMETER SAVE   2 |
| SAVING |

When done

| PARAMETER SAVE   2 |
| FINISHED |

Then 2xL

4. Check Control Terminals

The next few checks are to ensure the drive contactor is sequenced properly prior to applying three phase power. The value under the letters **TRJSC** in the display indicate the actual Control Input (**CIP**) terminal status.

Letter	Terminal	Contact
Thermistor	30	THERM
Run	31	ENA
Jog	32	JOG
Start	33	STRT
Coast Stop	34	CSO

From the Entry Menu, go to the CIP Diagnostic.

R,D,R,4xD,R,D,D,R

| 164)DOP 123TRJSC CIP |
| 10100000 |

Then 4xL

Leaving the **CSO** contact of your control wiring open (a **0** under the **C**), close the other control contacts. Check to see if the digit under the appropriate letter changes as you cycle of the contact. Generally, **1** = **ON** while **0** = **OFF** (for the thermistor T, 0 = OK while 1 = Motor Overtemp).

Once satisfied with the operation of the **T**,**R**,**J**, and **S** control inputs, leave **R**,**J**, and **S OFF** and check the **C** control input for proper operation.

5. Apply Main Three Phase Power

6. Autotune the PL/X

Prior to running the motor, the current loop of the drive must be tuned to the motor and cabling.

a) Ensure the drive is in a normal stop condition. The CIP's should match **TRJSC** below:

R,D,R,4xD,R,D,D,R

| 164)DOP 123TRJSC CIP |
| 10101001 |

Then 4xL

b) Enable the autotune mode.

R,R,6xD,R,7xD,R – U

| 92)AUTOTUNE ENABLE |
| ENABLED |

Then 4xL

c) Start the drive and the contactor will close.

R,D,R,4xD,R,D,D,R

| 164)DOP 123TRJSC CIP |
| 10101011 |

Then 4xL

The autotune will generally take from 10 to 60 seconds. When complete, the drive's contactor will automatically open. Turn off the Start input.

Now, **SAVE PARAMETERS** as described in step 3.

7. Motor Rotational Checks

Ideally, you would like to perform these running checks with the motor disconnected from the gear box and machine.

As an additional precaution, limit the available current to the drive by reducing the Current Clamp Scaler to just enough current to turn the motor (usually 5 to 10%).

R,R,6xD,R,R – D

| 81)CUR CLAMP SCALER |
| 5.00 % |

Check operation of the speed potentiometer by monitoring the Ramp Input.

L,L,6xU,R,5xD,R,R

| 26)RAMP INPUT |
| 75.14 % |

Then 4xL

Leave the reference at zero after checking for proper operation.

Start the drive by energizing T33. Check the field voltage at the **F+** and **F-**. When the motor is cold, you will measure somewhat less than the rated field voltage (approximately 240 VDC for a 300 VDC rated field).

Confirm the field current matches the **IFb** nameplate data.

R,D,R,D,D,R,D,D,R

| 145)FLD CUR AMPS MON |
| 1.35 AMPS |

Then 4xL

Increase the potentiometer setting until the motor is turning slowly. Check motor rotation. If backwards, stop, turn off **ALL** power to the drive, and swap the field leads (**F+**, **F-**). Recheck after changes.

Now, slowly bring the motor up to full speed while checking the voltage on the **A+** and **A-** terminals.

R,D,R,R,3xD,R

| 126)ARM VOLTS MON |
| 500.0 VOLTS |

If you have neither a tachometer nor encoder, skip to Step 9. If using a tachometer or encoder, check to ensure the speed reference is positive (**+**).

3xU

| 123)TOTAL SPD REF MN |
| 26.50 % |

Then, check the sign of the feedback.

Tachometer Feedback

6xD

| 129)TACHO VOLTS MON |
| -23.19 VOLTS |

Then 4xL

If positive (**+**), skip to Step 8. If negative (**-**), stop, power off the drive, then swap the tachometer leads on T25 and T26 and recheck.

Encoder Feedback

2xU

| 132)ENCODER RPM MON |
| -464 RPM |

Then 4xL

If positive (**+**), skip to Step 8. If negative (**-**), stop the drive and invert the encoder sign.

R,R,U,R,8xD,R,3xD,R,D

| 13)ENCODER SIGN |
| INVERT |

4xL

8. Switching Feedback Type

Select the appropriate feedback.

Tachometer Feedback

R,R,U,R,7xD,R – U

| 9)SPEED FBK TYPE |
| ANALOG TACHO |

Then 4xL

Encoder Feedback

R,R,U,R,7xD,R – 2xU

| 9)SPEED FBK TYPE |
| ENCODER |

Then 4xL

Again, start the drive and ensure maximum speed can be obtained and the armature voltage does not exceed the nameplate **VA**.

9. Increase the Current Clamp to Rated Value

At this point, the Current Clamp Scaler may be returned to 150%.

R,R,6xD,R,R – U

| 81)CUR CLAMP SCALER |
| 150.00 % |

Then 4xL

Now, **SAVE PARAMETERS** as described in Step 3.

10. Adjusting the Speed Calibration

Gradually, increase your potentiometer to the maximum position and then adjust the final speed of the motor.

Depending on the final feedback type, different parameters are used to adjust the final speed calibration. These parameters may be adjusted while the drive is running.

Armature Voltage

R,R,U,R,5xU,R – U

| 16)ARM VOLTS TRIM |
| 1.0000 |

Then 4xL

Increase this value to reduce the armature voltage. If voltage is low, stop and readjust **PIN 18 - Rated Arm Volts** from Step 2.

Tachometer Feedback

R,R,U,R,4xU,R – U

| 17)ANALOG TACHO TRIM |
| 1.0000 |

Then 4xL

Increase this value to reduce the motor speed. If speed is too slow, stop and readjust **PIN 8 - Analog Tacho Volts** from Step 2.

Encoder Feedback

R,R,U,R,4xD,R – U/D

| 6)DESIRED MAX RPM |
| 1750 RPM |

Then 4xL

Change this value to achieve the desired motor speed.

Again, **SAVE PARAMETERS**.

11. Setting Up Field Weakening

While using either tachometer or encoder feedback, field weakening may be enabled for a motor which supports an extended speed range.

a) First, stop the drive and enable the field weakening mode.

R,R,7xD,R,4xD,R,R – U

| 103)FLD WEAK ENABLE |
| ENABLED |

b) Next, set the minimum field expected less 10% margin for error.

Min Field % = (Ifm ÷ Ifb) x 90

L,7xD,R – U/D

| 110)MIN FLD CURRENT |
| 53.33 % |

Then 4xL

Finally, adjust the maximum speed as described in Step 8. Do **not** exceed the **MS** value noted on the motor nameplate.

Again, **SAVE PARAMETERS**.

Congratulations, you have successfully commissioned your Bardac PL/X Digital DC Drive.

If you have any questions or do not understand a portion of this Quick Start Manual, please contact us: