SPRINT ELECTRIC

Quick Start Guide

PL/X

1 Introduction

This Quick Start Guide is intended as a supplement to the PL/X Product Manual, to allow you to quickly get your PL/X Drive up and running as a basic speed controller in a safe and efficient manner.

For any other application, please refer to the PL/X Product Manual.

2 Important safety notes

Drives and process control systems are a very important part of creating better quality and value in products, but they must be designed, installed and used with great care to ensure everyone's safety. Pay particular attention to all the safety warnings in this section.

Electric shock risk! Electrical devices constitute a safety hazard. It is the responsibility of the user to ensure compliance with any acts or bylaws in force.

Do not attempt to commission the PL/X unless you:

- are qualified, and have the knowledge and skills to use it safely.
- thoroughly understand the operation of the machine on which the PL/X is installed,
- have read and understood this document, and
- are familiar with electrical wiring and safety standards.

Only use qualified personnel to design, construct, operate and maintain your systems.

Make sure that all personnel who use or maintain the equipment are aware of all the hazards that are involved in your equipment and processes.

If you have any doubts about the safety of your system or process, do not proceed without first consulting an expert.

3 Navigating the menus

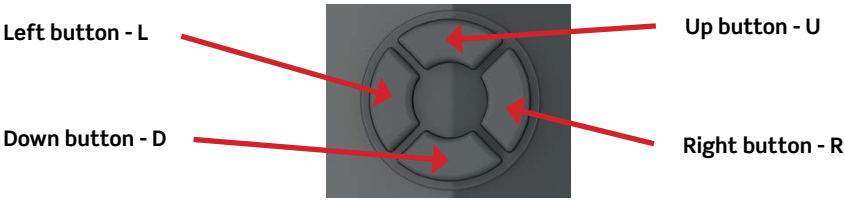


Figure 3-1: Navigation button

Use the buttons on the front of the PL/X to navigate through the setup menus. In this Quick Start Guide, the button sequences are listed next to the display that will be shown when the buttons are pressed correctly.

Button abbreviations:

L	Press the **Left** button once	**R**	Press the **Right** button once
U	Press the **Up** button once	**D**	Press the **Down** button once

U/D Press the **Up** button to increase the value.
Press the **Down** button to decrease the value.

Nx Press the relevant button N times. This applies to all buttons. N specifies the number of times to press the button e.g. for **5xL**, press the **Left** button 5 times.

3.1.1 Diagnostic Summary Screens

The Diagnostic Summary Screens are displayed at power up.

SPD%	Iarm	Ifld	RJSC
0	0	0	0000

↔

SRef	Ilim	-Ilim	Mode
0	150	-150	STOP

Note: When the display is at the top level, it toggles between the Diagnostic Summaries approximately every 5 seconds.

Press the Left key at least 5 times (**5xL**) to return to these screens from any menu level.

3.1.2 Save parameters

To save the settings at any time, go first to the Diagnostic Screens (section 3.1.1), then press the **Right** (**R**) button, **Up** (**U**) button and **Right** (**R**) button to display the Parameter Save screen. This sequence is shown as **R-U-R**:

R-U-R

PARAMETER SAVE 2
UP KEY TO CONTINUE

Press the **Up** (**U**) button to continue.

When the save is finished, press the Left button twice (**2xL**).

4 Installation

4.1.2 Connect the drive

Before starting to connect the drive, make sure that all power is OFF.

Make sure that power and control wiring are routed in separate conduit / cable trays and that wiring meets all applicable national and local electrical regulations.

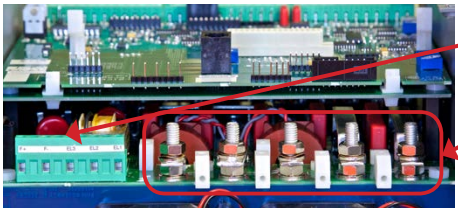
Make sure that the voltages on the EL1/EL2/EL3 terminals are in-phase with the voltages on L1/L2/L3.

For reliable operation, the PL/X must control the main contactor through its CON1 and CON2 terminals.

Drive ratings of 185kW and higher (frame sizes 3, 4 & 5) require an external power connection for the heatsink cooling fan.

Use the following diagrams to connect your drive.

4.1.1 Frame 1

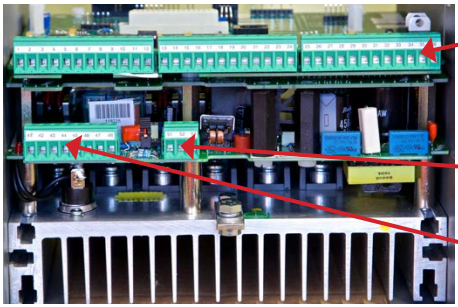


Field (F+ and F-) and EL1, EL2, EL3 supply terminals

Busbar connections for input ac power (L1, L2, L3) and armature (A+ and A-)

Note: These terminals are common for all PL/X models.

Figure 4-1: Top connections - Frame 1



Control terminals 1 - 36

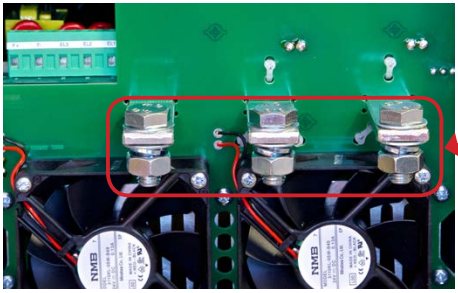
Note: These terminals are common for all PL/X models.

Control power supply (L, N, E):
Terminals 51 (E), 52 (N) and 53 (L)

Terminals 41 - 48 for contactor control and remote armature sensing

Figure 4-2: Bottom connections - Frame 1

4.1.2 Frame 2

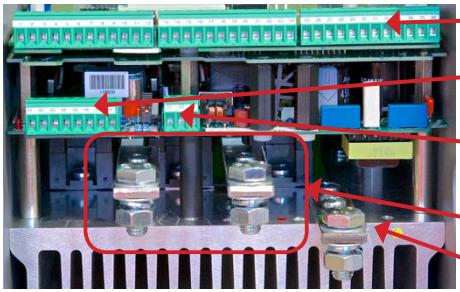


Note: Field (F+ and F-) and EL1, EL2, EL3 supply terminals are as Frame 1

Input ac busbars (L1, L2, L3)

Note: The motor armature connections (A+, A-) are located at the bottom of the unit (Figure 4 4).

Figure 4-3: Top connections - Frame 2



Control terminals 1 – 36

Terminals 41 – 48 for contactor control and remote armature sensing

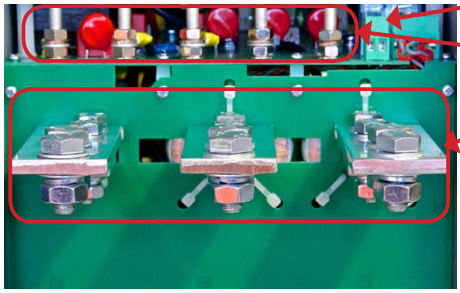
Control power supply (L, N, E): Terminals 51 (E), 52 (N) and 53 (L)

Armature (A+ and A-) terminals

Earth/Ground

Figure 4-4: Bottom connections – Frame 2

4.1.3 Frame 3



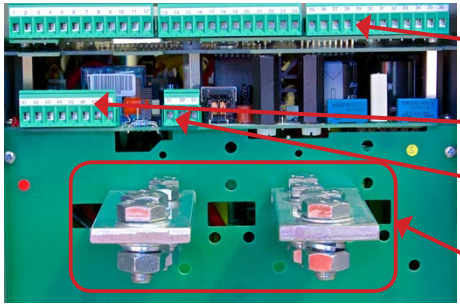
110Vac external fan supply (B1, B2)

Field (F+ and F-) and EL1, EL2, EL3 supply terminals

Input ac busbars (L1, L2, L3)

Note: The motor armature connections (A+, A-) are located at the bottom of the unit (Figure 4 6).

Figure 4-5: Top connections – Frame 3



Control terminals 1 – 36

Terminals 41 – 48 for contactor control and remote armature sensing

Control power supply (L, N, E): Terminals 51 (E), 52 (N) and 53 (L)

Armature (A+ and A-) terminals

Figure 4-6: Bottom connections – Frame 3

4.1.4 Frame 4

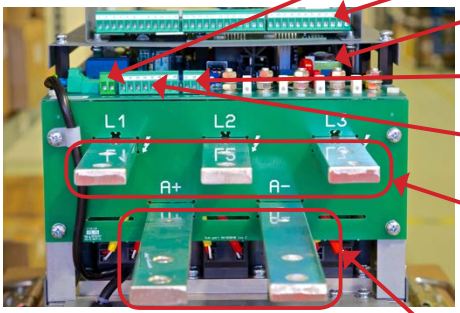


Figure 4-7:
Bottom connections - Frame 4

240Vac external fan supply (B1, B2)

Control terminals 1 - 36

EL1, EL2, EL3 and Field (F+ and F-) supply terminals

Control power supply (L, N, E): terminals 51 (E), 52 (N) and 53 (L)

Terminals 41 - 48 for contactor control and remote armature sensing

Busbar connections for input ac power (L1, L2, L3)

Note: L1, L2, L3 can be located at either top or bottom of the unit, depending on your original purchase requirements.

Armature (A+ and A-) terminals

4.1.5 Frame 5

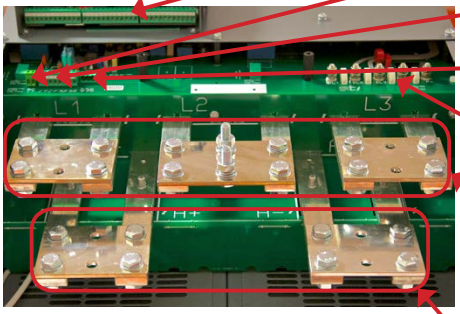


Figure 4-8:
Bottom connections - Frame 5

Control terminals 1 - 36

240Vac external fan supply (B1, B2)

Terminals 41 - 48 for contactor control and remote armature sensing

Control power supply (L, N, E): terminals 51 (E), 52 (N) and 53 (L)

EL1, EL2, EL3 and Field (F+ and F-) supply terminals

Busbar connections for input ac power (L1, L2, L3)

Note: L1, L2, L3 can be located at either top or bottom of the unit, depending on your original purchase requirements.

Armature (A+ and A-) terminals

4.1.6 Wiring diagrams

Power

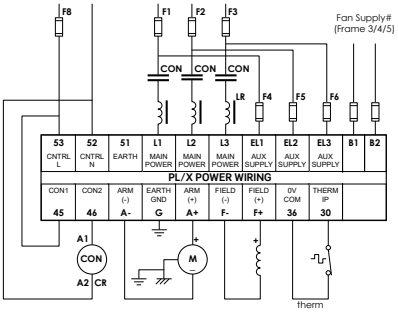


Figure 4-9: Power wiring diagram

Control

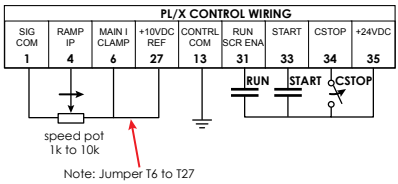


Figure 4-10: Control wiring diagram

Note: See Product Manual for fuse specifications.

The power input terminals are located at the top of the PL/X*, with the power output terminals at the bottom of the PL/X (except for Frame 1 model).

Note: If a thermistor is not fitted to the motor, short together terminals 30 and 36.

** Power input terminals located at top or bottom for frame 4 & 5.*

 # Frame 3 models require a 110Vac fan supply. Frame 4 & 5 models require a 240Vac fan supply.

The control terminals are located at the bottom of the PL/X.

4.1.7 Control terminal functions

Note: All contacts are maintained type.

CSTOP Coast Stop

This must be closed before all other control signals for correct sequencing.

When opened, the drive immediately stops generating armature current and the contactor drops out. The motor coasts to a stop.

RUN Run

Electronic inhibit for all operation modes. May be connected to terminal T35 with a jumper in most applications or preferably an auxiliary normally open contact on the main contactor.

When closed, the drive may generate current. If open, no armature current will be generated.

START Start

When closed the drive's contactor comes in and the motor runs at potentiometer speed setting.

When opened, the drive ramps to zero and the contactor opens after a delay (default 2 secs).

Note: As programmed from the factory, after removal of the START input, the motor field current is present until the field quench delay is completed (default 10 seconds).

4.1.8 Optional feedback devices

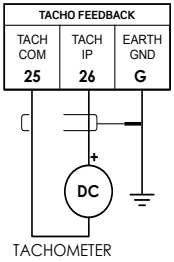


Figure 4-11: DC tachometer

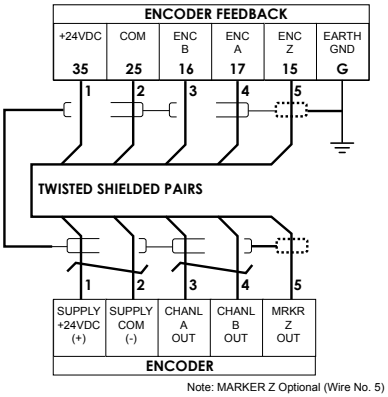


Figure 4-12: Encoder

4.2 Note the supply and motor data

Measure the supply voltage and enter it below.

Make a note of all the other parameters from the motor and feedback device nameplates.

Description	Typical value	Actual value	Units
Supply voltage	480		Vac
Armature volts	500		Vdc
Armature current	35		Adc
Base speed	1750		rpm
Maximum speed	2300		rpm
Field volts	300		Vdc
Field current @ BS	1.35		Adc
Field current @ MS	0.8		Adc
Feedback device:			
DC tachometer	60		V/1000
Encoder	1024		PPR
Encoder volts	5 – 24		Vdc

4.3 Final checks BEFORE applying power

- Recheck all wiring, especially the drive's chassis ground.
- Use a multimeter to check the L1, L2, L3, F+, F-, A+ and A- terminals for short circuits to ground. All readings should be greater than 1MΩ.
  If any resistances are lower than 1MΩ, correct them before you apply power.

4.4 Final checks BEFORE applying power

It is essential that the following steps are performed as written and in the correct sequence.

Apply 110 – 240 Vac control power to terminal T53 (Line) and T52 (Neutral).

4.4.1 Calibrate the drive to the motor

Press the buttons in the specified sequence to set the values recorded in section 4.2:

Note: When U/D is shown, use the Up and Down buttons to change the values.

1.	Rated Armature Current	**R-R-U-R-R-U/D**	2) RATED ARM AMPS 35.0 AMPS
2.	Rated Field Current	**L-D-D-R-U/D**	4) RATED FIELD AMPS 1.35 AMPS
3.	Rated Base Speed	**L-D-R-U/D**	5) BASE RATED RPM 1750 RPM
4.	Required Maximum Speed	**L-D-R-U/D**	6) DESIRED MAX RPM 1750 RPM

Note: The base speed is the same as maximum speed unless field weakening is used to extend the speed range (section 4.11).

Always commission the drive with armature voltage as the speed feedback source even if the motor is fitted with a dc tacho or encoder as this allows the polarity of the feedback to be verified. This ensures that the motor will not run out of control

5.	Rated Armature Volts	**L-9xD-R-U/D**	18) RATED ARM VOLTS 500 VOLTS
6.	Supply Voltage	**L-D-R-U/D**	19) EL1/2/3 RATED AC 460.0 VOLTS

Check the following have not been modified from their factory default settings. If necessary correct the selections to those shown below:

7.	Motor 1/2 Select	**L-D-R-U/D**	20) MOTOR 1/2 SELECT MOTOR 1
8.	Speed Feedback Type	**L-8xU-R-U/D** Then **4xL**	9) SPEED FBK TYPE ARMATURE VOLTS

4.4.2 Feedback calibration

If you do not have a DC tachometer or encoder, skip this section. Save the parameters (section 3.1.2).

1. DC tachometer

For a DC Tachometer, first calibrate the drive to the expected DC voltage for base speed

Base Tacho Voltage = (Base Speed/1000) x Tacho Volts per 1000 RPM

The tacho voltage must not exceed 200 Vdc

R-R-U-R-6xD-R-U/D Then **4xL**	8) MAX TACHO VOLTS 87.50 VOLTS

2. Encoder
PPR

If the encoder is a quadrature type then enable parameter 10 as below. For a pulse and direction type encoder disable the parameter. In both cases set the number of lines.

Note: On PL models only, it is also possible to operate with a pulse-only encoder (no direction signal).

R-R-U-R-8xD-R-R-U/D	10) QUADRATURE ENABLE ENABLED
L-D-R-U/D Then **4xL**	11) ENCODER LINES 1024

4.5 Apply main 3-phase power

4.5.1 Check control terminals

The next checks ensure that the drive contactor is sequenced correctly before the three-phase power is applied.

Note: The value under the letters TRJSC in the display indicates the actual Control Input terminal status

Letter	Terminal	Function
T	30	THM
R	31	RUN
J	32	JOG
S	33	START
C	34	CSTOP

From the Diagnostic Screens, go to the CIP Diagnostic as follows:

R-D-R-4xD-R-D-D-R

164) DOP 123TRJSC CIP
10100000

Leave the **CSTOP** contact of your control wiring open (a 0 is displayed under the C) and close the other control contacts. Check that the digit under the appropriate letter changes as you cycle the contact.

*Note: Generally **1 = ON** and **0 = OFF** (however, for the thermistor T, **0 = 0k** while **1 = Motor Overtemp**).*

When you are satisfied with the operation of the **T**, **R** and **S** control inputs, leave **R** and **S OFF** and check the **C** control input for correct operation.

4.5.2 Apply power

Now apply the main 3-phase power.

4.6 Autotune the PL/X

Before running the motor, the current loop of the drive must be tuned to the motor (parameters 93, 94 and 95).

1. Set RUN and CSTOP high but leave START low. The control inputs should match TRJSC below:

Still from section 4.5.1

Then **4xL**

164) DOP 123TRJSC CIP
10101001

2. Enable the autotune mode

R-R-6xD-R-7xD-R-U

Then **4xL**

92) AUTOTUNE ENABLE
ENABLED

3. Start the drive by energising the Start Input (T33)

R-D-R-4xD-R-D-D-R

Then **4xL**

164) DOP 123TRJSC CIP
10101011

4. The contactor closes and an autotune is performed (it takes 10 – 60 seconds). When complete, the drive's contactor opens.
Turn off the Start Input (T33).

5. Save the parameters. See section 3.1.2.

4.7 Motor rotational checks

Disconnect the motor from the gear box and machine before starting these running checks.

1. Reduce the current limit.
As an added precaution, restrict the available current to the drive by reducing the Current Limit to just enough current to turn the motor (usually 5 to 10%).

R-R-U-R-D-R

3) CURRENT LIMIT (%)
5.00 %

2. Check the speed potentiometer operation. Monitor the Ramp Input to check the operation of the speed potentiometer. Leave the reference at zero after checking for correct operation.

L-L-D-R-5xD-R

Then **4xL**

26) RAMP INPUT
75.14 %

3. Start the drive.
Energise the Start Input (T33) to start the drive. Check the field voltage at the F+ and F- terminals. When the motor is cold, you will measure less than the rated field voltage

4. Confirm the field current matches the nameplate data.

R-D-R-D-D-R-D-D-R

Then **4xL**

145) FLD CUR AMPS MON
1.35 AMPS

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

6. Slowly bring the motor to full speed.
Check the voltage on the A+ and A- terminals as you slowly bring the motor up to full speed.

R-D-R-R-3xD-R

126) ARM VOLTS MON
500.0 VOLTS

4.8 Feedback

If you do not have a DC tachometer or encoder, skip this section and go to section 4.10.

If you are using a tachometer or encoder:

1. Check to ensure the speed reference is positive (+).

3xU

123) TOTAL SPD REF MN
26.50 %

2. Check the sign of the feedback as follows:

DC tachometer: **6xD**

Then **4xL**

129) TACHO VOLTS MON
23.19 VOLTS

If positive (+), skip to step 4.9. If negative (-), stop, power off the drive then swap the tachometer leads on T25 and T26 and recheck

Or Encoder: **2xU**

Then **4xL**

132) ENCODER RPM MON
464 RPM

If positive (+), skip to step 4.9. If negative (-), stop, power off the drive then swap the encoder leads on T16 & T17. Alternatively check & adjust parameter 13.

R-R-U-R-8xD-R-3xD-R-D

Then **5xL**

13) ENCODER SIGN
INVERT

4.9 Switching feedback type

1. Check the sign of the feedback as follows:

DC tachometer: **R-R-U-R-7xD-R-U**

Then **4xL**

9) SPEED FBK TYPE
ANALOG TACHO

If positive (+), skip to step 4.9. If negative (-), stop, power off the drive then swap the tachometer leads on T25 and T26 and recheck

Encoder: **R-R-U-R-7xD-R-2xU**

Then **4xL**

9) SPEED FBK TYPE
ENCODER

2. Start the drive and make sure maximum speed can be obtained, and that the armature voltage does not exceed the nameplate armature voltage

4.10 Increase current limit to rated value

1. Return the Current Limit to 150%.

R-R-U-R-D-R-U

Then **4xL**

3) CURRENT LIMIT (%)
150.00 %

2. Save the parameters (section 3.1.2).

4.11 Set up field weakening

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

1. Stop the drive and enable the field weakening mode.

R-R-7xD-R-4xD-R-R-U

103) FLD WEAK ENABLE
ENABLED

2. Set the minimum field current % to just less than the minimum field current % expected.
Min Field % = (Ifm + Ifb) x 90

L-7xD-R-U/D

Then **5xL**

110) MIN FLD CURRENT
53.33 %

3. Gradually increase the motor speed to maximum, taking care not to exceed the rated armature voltage or maximum speed value noted on the motor nameplate.

4. Save the parameters (section 3.1.2).

The PL/X Digital DC Drive is now successfully commissioned.