USING SureStep™ WITH AutomationDirect PLCs

APPENDIX B

In This Appendix...

Compatible AutomationDirect PLCs and Modules

The following tables show which high-speed pulse-output PLCs and modules can be used with the *Sure*Step Microstepping Motor Drives.

Productivity PLCs/Modules for Use with *Sure*Step Drives	
Productivity Series High Speed Counter I/O Modules	
P3-HSO	Productivity3000 high-speed pulse output module, 1MHz maximum switching frequency, 2-channel, 4 general purpose output points, 5-24 VDC, sinking/sourcing, 6 general purpose input points, external 24 VDC required.
P2-HSO	Productivity2000 high-speed pulse output module, 1MHz maximum switching frequency, 2-channel, 4 general purpose output points, 5-24 VDC, sinking/sourcing, 6 general purpose input points, external 24 VDC required.

BRX Series PLCs/Modules for Use with *Sure*Step Drives	
BRX Series High Speed Counter I/O Modules	
BX-DM1-10ED1-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 6-point, AC/DC, Discrete Output: 4-point, sinking.
BX-DM1-10ED2-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 6-point, AC/DC, Discrete Output: 4-point, sourcing.
BX-DM1E-10ED13-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 6-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 4-point, sinking, Analog Output: 1-channel, current/voltage.
BX-DM1E-10ED23-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 6-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 4-point, sourcing, Analog Output: 1-channel, current/voltage.
BX-DM1-18ED2-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 10-point, AC/DC, Discrete Output: 8-point, sourcing.
BX-DM1-18ED1-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 10-point, AC/DC, Discrete Output: 8-point, sinking.
BX-DM1E-18ED23-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 10-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 8-point, sourcing, Analog Output: 1-channel, current/voltage.
BX-DM1E-18ED13-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 10-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 8-point, sinking, Analog Output: 1-channel, current/voltage.
BX-DM1-18ED2	BRX Do-more PLC, 120-240 VAC required, serial port, microSD card slot, Discrete Input: 10-point, AC/DC, Discrete Output: 8-point, sourcing.
BX-DM1-18ED1	BRX Do-more PLC, 120-240 VAC required, serial port, microSD card slot, Discrete Input: 10-point, AC/DC, Discrete Output: 8-point, sinking.
Table continued next page.	

BRX Series PLCs/Modules for Use with *Sure*Step Drives	
BX-DM1E-18ED23	BRX Do-more PLC, 120-240 VAC required, Ethernet and serial ports, microSD card slot, Discrete Input: 10-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 8-point, sourcing, Analog Output: 1-channel, current/voltage.
BX-DM1E-18ED13	BRX Do-more PLC, 120-240 VAC required, Ethernet and serial ports, microSD card slot, Discrete Input: 10-point, AC/DC, Analog Input: 1-channel, current/voltage, Discrete Output: 8-point, sinking, Analog Output: 1-channel, current/voltage.
BX-DM1-36ED2-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 20-point, AC/DC, Discrete Output: 16-point, sourcing.
BX-DM1-36ED1-D	BRX Do-more PLC, 12-24 VDC required, serial port, microSD card slot, Discrete Input: 20-point, AC/DC, Discrete Output: 16-point, sinking.
BX-DM1E-36ED23-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 20-point, AC/DC, Analog Input: 4-channel, current/voltage, Discrete Output: 16-point, sourcing, Analog Output: 2-channel, current/voltage.
BX-DM1E-36ED13-D	BRX Do-more PLC, 12-24 VDC required, Ethernet and serial ports, microSD card slot, Discrete Input: 20-point, AC/DC, Analog Input: 4-channel, current/voltage, Discrete Output: 16-point, sinking, Analog Output: 2-channel, current/voltage.
BX-DM1-36ED2	BRX Do-more PLC, 120-240 VAC required, serial port, microSD card slot, Discrete Input: 20-point, AC/DC, Discrete Output: 16-point, sourcing.
BX-DM1-36ED1	BRX Do-more PLC, 120-240 VAC required, serial port, microSD card slot, Discrete Input: 20-point, AC/DC, Discrete Output: 16-point, sinking.
BX-DM1E-36ED23	BRX Do-more PLC, 120-240 VAC required, Ethernet and serial ports, microSD card slot, Discrete Input: 20-point, AC/DC, Analog Input: 4-channel, current/voltage, Discrete Output: 16-point, sourcing, Analog Output: 2-channel, current/voltage.
BX-DM1E-36ED13	BRX Do-more PLC, 120-240 VAC required, Ethernet and serial ports, microSD card slot, Discrete Input: 20-point, AC/DC, Analog Input: 4-channel, current/voltage, Discrete Output: 16-point, sinking, Analog Output: 2-channel, current/voltage.
Table continued next page.	

| *Direct*LOGIC PLCs/Modules for Use with *Sure*Step Drives [1] |
|---|
| **DL05 PLCs** |
| **D0-05AD** — DL05 CPU, 8 AC in / 6 DC out, 110/220 VAC power supply. Inputs: 8 AC inputs, 90-120 VAC, 2 isolated commons. Outputs: 6 DC outputs, 6-27 VDC current sinking, 1.0 A/pt max, 1 common. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (0.5 A/pt.). |
| **D0-05DD** — DL05 CPU, 8 DC in / 6 DC out, 110/220 VAC power supply. Inputs: 8 DC inputs, 12-24 VDC current sinking/sourcing, 2 isolated commons. Outputs: 6 DC outputs, 6-27 VDC current sinking, 1.0 A/pt max, 1 common. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (0.5 A/pt) (not available when using high-speed inputs). |
| **D0-05DD-D** — DL05 CPU, 8 DC in / 6 DC out, 12/24 VDC power supply. Inputs: 8 DC inputs, 12-24 VDC current sinking/sourcing, 2 isolated commons. Outputs: 6 DC outputs, 6-27 VDC current sinking, 1.0 A/pt max, 1 common. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (0.5 A/pt.) (not available when using high-speed inputs). |
| **DL06 PLCs** |
| **D0-06DD1** — DL06 CPU, 20 DC in / 16 DC out, 110/220 VAC power supply, with 0.3A 24 VDC auxiliary device power supply. Inputs: 20 DC inputs, 12-24 VDC current sinking/sourcing, 5 isolated commons (4 inputs per common). Outputs: 16 DC outputs, 12-24 VDC current sinking, 1.0A/pt max, 4 commons non-isolated (4 points per common). Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 10 kHz (0.5 A/pt) (not available when using high-speed inputs). |
| **D0-06DD2** — DL06 CPU, 20 DC in / 16 DC out, 110/220 VAC power supply, with 0.3A 24 VDC auxiliary device power supply. Inputs: 20 DC inputs, 12-24 VDC current sinking/sourcing, 5 isolated commons (4 inputs per common). Outputs: 16 DC outputs, 12-24 VDC current sourcing 1.0A/pt max, 4 commons non-isolated (4 points per common). Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 10 kHz (0.5 A/pt) (not available when using high-speed inputs). |
| **D0-06DD1-D** — DL06 CPU, 20 DC in / 16 DC out, 12/24 VDC power supply. Inputs: 20 DC inputs, 12-24 VDC current sinking/sourcing, 5 isolated commons (4 inputs per common). Outputs: 16 DC outputs, 12-24 VDC current sinking, 1.0 A/pt max, 4 commons non-isolated (4 pts/common). Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 10 kHz (0.5 A/pt) (not available when using high-speed inputs). |
| **D0-06DD2-D** — DL06 CPU, 20 DC in / 16 DC out, 12/24 VDC power supply. Inputs: 20 DC inputs, 12-24 VDC current sinking/sourcing, 5 isolated commons (4 inputs per common). Outputs: 16 DC outputs, 12-24VDC current sourcing, 1.0A/pt max, 4 commons non-isolated (4 pts/common). Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 10 kHz (0.5 A/pt) (not available when using high-speed inputs). |
| **DL05/DL06 High Speed Counter I/O Module** |
| **H0-CTRIO** — DL05/06 High Speed Counter I/O Interface Module, 4 DC sink/source inputs 9-30 VDC, 2 isolated sink/source DC outputs, 5-30 VDC, 1A per point. Inputs supported: 1 quadrature encoder counters up to 100 kHz, or 2 single channel counters up to 100 kHz, and 2 high speed discrete inputs for Reset, Inhibit, or Capture. Outputs supported: 2 independently configurable high speed discrete outputs or 1 channel pulse output control, 20Hz-25kHz per channel, pulse and direction or CW/CCW pulses. |
| *Table continued next page.* |

*Direct*LOGIC PLCs/Modules for Use with *Sure*Step Drives [1] (continued)	
DL105 PLCs	
F1-130AD	DL130 CPU, 10 AC in / 8 DC out, 110/220 VAC power supply. Inputs: 10 AC inputs, 80-132 VAC, 3 isolated commons. Outputs: 8 DC outputs, 5-30 VDC current sinking, 0.5A/pt max, 3 internally connected commons. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (@ 0.25 A/pt max).
F1-130DD	DL130 CPU, 10 DC in / 8 DC out, 110/220 VAC power supply. Inputs: 10 DC inputs, 12-24 VDC current sinking/sourcing, 3 isolated commons. Outputs: 8 DC outputs, 5-30 VDC current sinking, 0.5 A/pt max, 3 internally connected commons. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (@ 0.25 A/pt max) (not available when using high-speed inputs).
F1-130DD-D	DL130 CPU, 10 DC in / 8 DC out, 12/24 VDC power supply. Inputs: 10 DC inputs, 12-24 VDC current sinking/sourcing, 3 isolated commons. Outputs: 8 DC outputs, 5-30 VDC current sinking, 0.5 A/pt max, 3 internally connected commons. Two outputs are configurable for independent CW/CCW pulse train output or step and direction pulse output up to 7kHz (@ 0.25 A/pt max) (not available when using high-speed inputs).
DL205 and Do-More High Speed Counter I/O Modules	
H2-CTRIO2	DL205 High Speed Counter I/O Interface Module, 8 DC sink/source inputs 9-30 VDC, 4 isolated sink/source DC outputs, 5-30 VDC, 1A per point. Inputs supported: 2 quadrature encoder counters up to 100 kHz, or 4 single channel counters up to 100 kHz, and 4 high speed discrete inputs for Reset, Inhibit, or Capture. Outputs supported: 4 independently configurable high speed discrete outputs or 2 channels pulse output control, 20 Hz - 25 kHz per channel, pulse and direction or CW/CCW pulses.
D2-CTRINT	Counter Interface Module, 4 isolated DC inputs, 1 pulse train output (CW) or 2 pulse train outputs (CW/CCW) with DC input restrictions, accepts two up-counters when used with D2-240 or D2-250(-1) (one only with D2-230), or one up/down counter. (not available when using high-speed inputs).
Terminator I/O High Speed Counter I/O Module	
T1H-CTRIO	Terminator I/O High Speed Counter I/O Interface Module, 8 DC sink/source inputs 9-30 VDC, 4 isolated sink/source DC outputs, 5-30 VDC, 1A per point. Inputs supported: 2 quadrature encoder counters up to 100 kHz, or 4 single channel counters up to 100 kHz, and 4 high speed discrete inputs for Reset, Inhibit, or Capture. Outputs supported: 4 independently configurable high speed discrete outputs or 2 channels pulse output control, 20 Hz - 25 kHz per channel, pulse and direction or CW/CCW pulses. (Use with T1K-16B or T1K-16B-1 terminal base.)
DL405 High Speed Counter I/O Module	
H4-CTRIO	DL405 High Speed Counter I/O Interface Module, 8 DC sink/source inputs 9-30 VDC, 4 isolated sink/source DC outputs, 5-30 VDC, 1A per point. Inputs supported: 2 quadrature encoder counters up to 100 kHz, or 4 single channel counters up to 100 kHz, and 4 high speed discrete inputs for Reset, Inhibit, or Capture. Outputs supported: 4 independently configurable high speed discrete outputs or 2 channels pulse output control, 20 Hz - 25 kHz per channel, pulse and direction or CW/CCW pulses.

(1)   Any DirectLOGIC PLC capable of RS-232 ASCII communication can write serial commands to the SureStep *Advanced* Microstepping Drives (STP-DRV-4850 & -80100). These PLCs include DL 05, 06, 250-1, 260, 350, and 450/454. However, we strongly recommend using DL06 or DL260 PLCs for serial commands due to their more advanced ASCII instruction set which includes PRINTV and VPRINT commands.

Typical Connections to a Productivity PLC

The following wiring diagrams show typical connections between any SureStep Drive or Integrated motor/drive and a Productivity P3-HSO or P2-HSO (wiring is identical). All SureStep drives can be wired for Line Driver signals (preferred for noise immunity) or Open Collector. Refer to the Productivity User Manual for detailed programming instructions when using the HSO module.

### Line Driver/Differential Wiring (preferred)
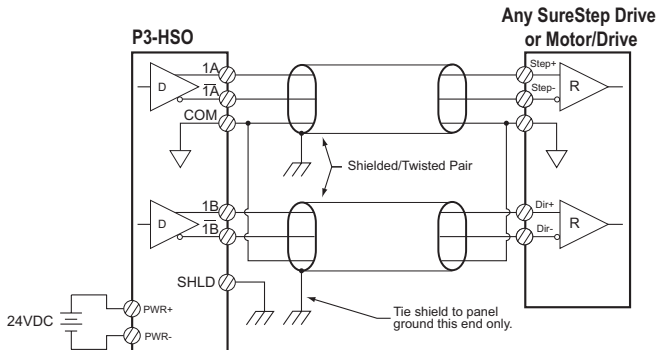
Open Collector/Single-ended wiring
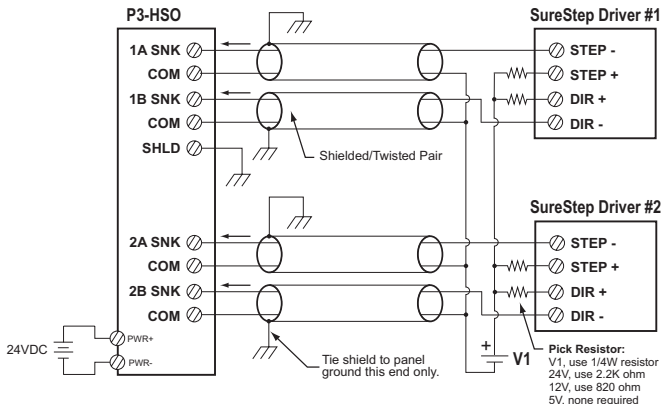
A voltage dropping resistor is only needed if the PLC cannot generate 5VDC high speed pulses and the drive can only accept 5VDC pulses. These resistor values result in a 10mA signal [Amps = Volts/(internal drive R + external R)]. Other values can be used, but ensure that [5mA < signal current < 15mA]. See the individual drive chapters for more information.
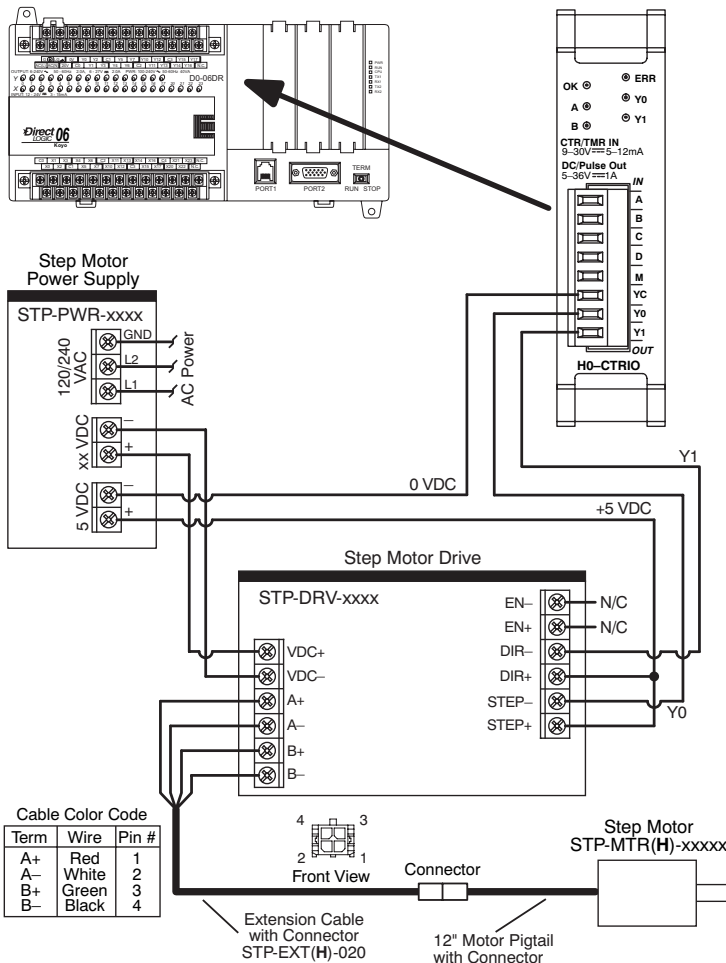
Typical Connections to a DL05 PLC

The following wiring diagram shows typical connections between the *Sure*Step Stepping System components and a *Direct*LOGIC DL05 PLC. Refer to the DL05 Micro PLC User Manual, p/n D0-USER-M, High-Speed Input and Pulse Output Features chapter, for detailed programming instructions when using the PLC for the Mode 30: Pulse Output function.
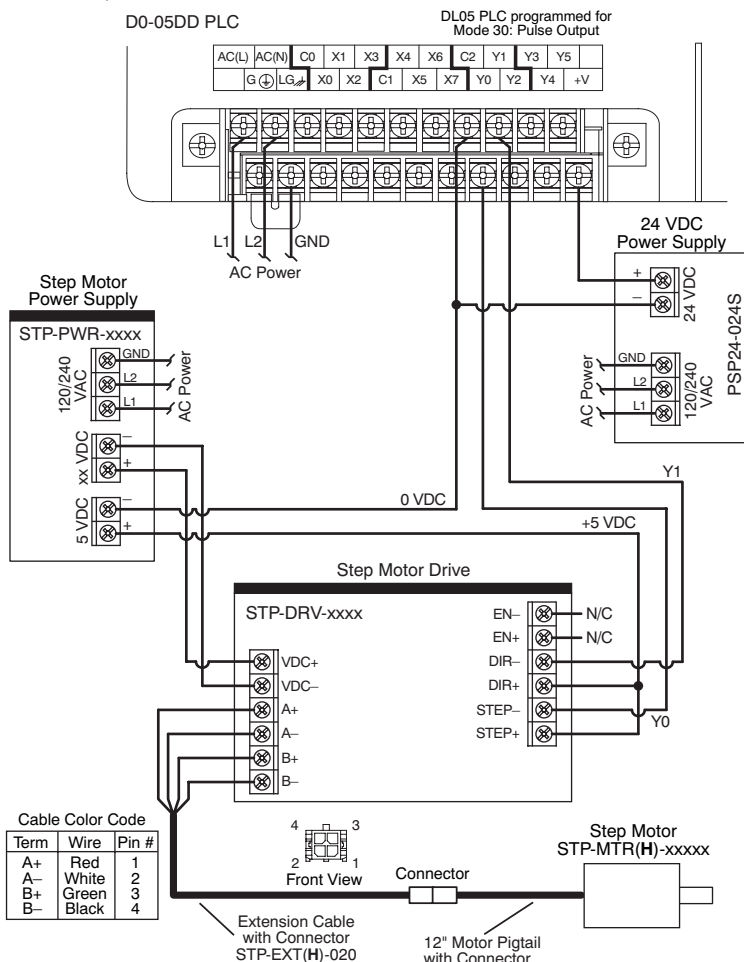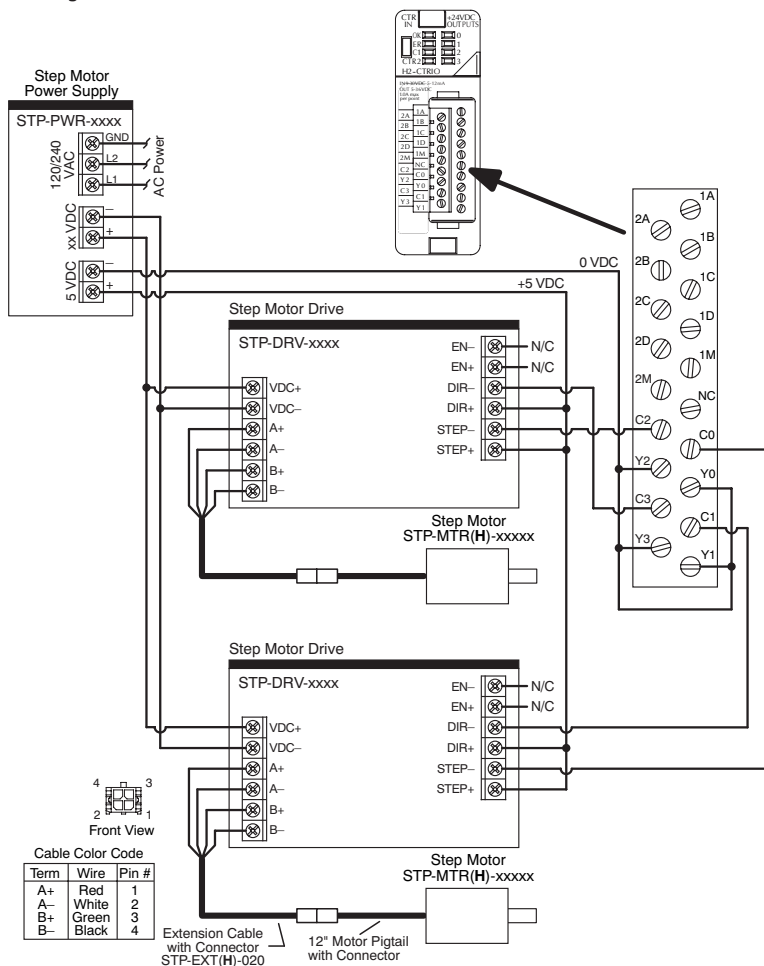
Typical Connections to an H0-CTRIO

The following wiring diagram shows typical connections between the *Sure*Step Stepping System components and a *Direct*LOGIC H0-CTRIO High Speed Counter I/O Interface Module installed in either a DL05 or DL06 PLC option slot. Refer to the CTRIO High-Speed Counter Module User Manual, p/n Hx-CTRIO-M, for detailed programming instructions when using the H0-CTRIO module.

Step Motor Power Supply

STP-PWR-xxxx

Step Motor Drive

STP-DRV-xxxx

Cable Color Code

Term	Wire	Pin #
A+	Red	1
A–	White	2
B+	Green	3
B–	Black	4

Front View

Connector

Step Motor STP-MTR(H)-xxxxx

Extension Cable with Connector STP-EXT(H)-020

12" Motor Pigtail with Connector

Typical Connections – Multiple Drives/Motors

The following wiring diagram shows typical connections between the *Sure*Step Stepping System components and a *Direct*LOGIC H2-CTRIO(2) High Speed Counter I/O Interface Module installed in a DL205 PLC. Refer to the CTRIO High-Speed Counter Module User Manual, p/n Hx-CTRIO-M, for detailed programming instructions when using the H2-CTRIO module.
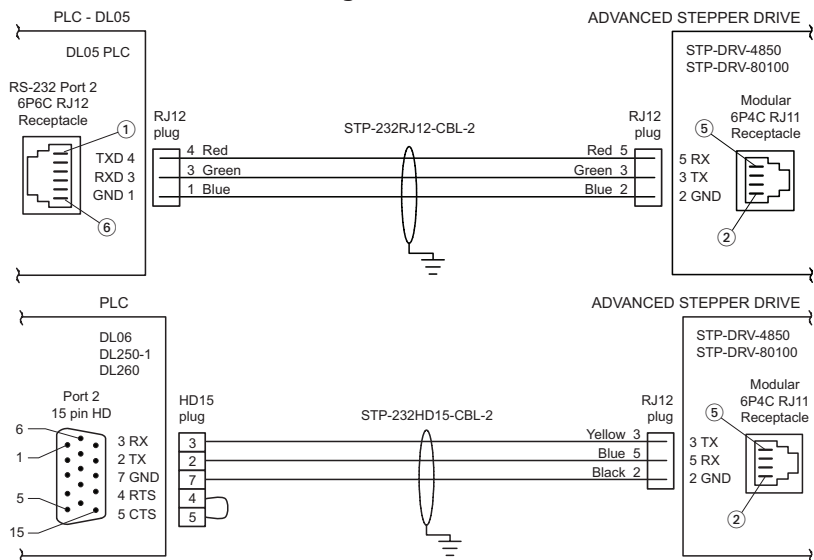
Typical *Direct*LOGIC PLC RS-232
Serial Connections to an Advanced SureStep Drive

The following wiring diagrams show typical serial connections between a *Sure*Step Advanced Microstepping Drive and a *Direct*LOGIC PLC capable of RS-232 ASCII communication. Refer to the particular PLC user manual for instructions for writing ASCII serial commands.

Serial Connection Using Automation Direct Cables
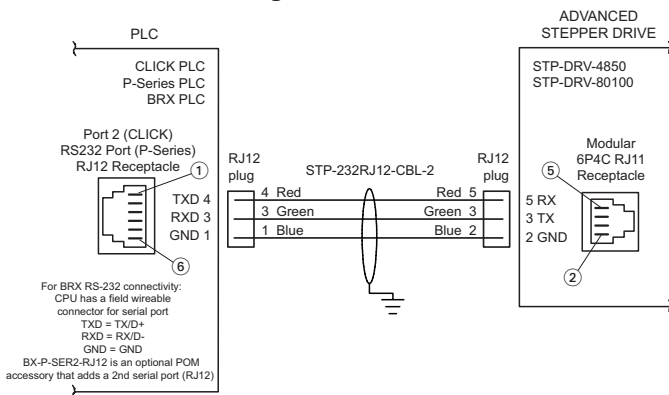

Serial Connection Using Custom Cables

Use Belden 9841 or equivalent cable, and wire according to the Automation Direct cable diagrams shown above (including RTS/CTS jumper for DL06, DL250-1, and DL260).

Typical CLICK, P-Series, & BRX PLC RS-232 Serial Connections to an Advanced SureStep Drive

The following wiring diagrams show typical serial connections between a *Sure*Step Advanced Microstepping Drive and a CLICK, BRX, or P1/P2/P3 PLC capable of RS-232 ASCII communication. Refer to the particular PLC user manual for instructions for writing ASCII serial commands.

### Serial Connection Using Automation Direct Cables

Serial Connection Using Custom Cables

Use Belden 9841 or equivalent cable, and wire according to the Automation Direct STP-232RJ12-CBL-2 diagram shown above.

Typical RS-485 Connections to Integrated Motor/Drives

Most AutomationDirect PLCs support 2-wire RS-485 serial communication (3 wires on the connector: Transmit (+), Receive (-), and Ground). For 2-wire communication, the integrated motor/drive must have its Tx+ and Rx+ connected; and Tx- and Rx-connected.

- The drive's Tx+/Rx+ signal should be connected to the "+" connection of the PLC's RS-485 port.
- The drive's Tx-/Rx- signal should be connected to the "-" connection of the PLC's RS-485 port.
- The drive's RS-485 ground terminal should be connected to the PLC's serial port ground terminal.

RS-485 2-wire System
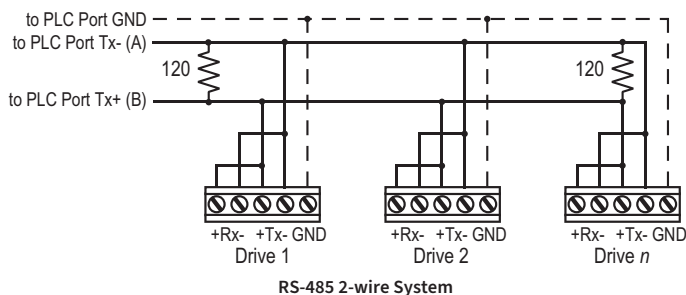
Terminal Connections per PLC			
Drive Connection	CLICK	P-Series	BRX
Tx+, Rx+	+	+	TX/D+
Tx-, Rx-	–	–	RX/D-
GND	LG	G	GND