CDHD Servo Drive

Quick Start Guide

120/240 VAC and 400/480 VAC

Revision 7.1b

DOC-CDHD-QSG-EN

SERVOTRONIX

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Revision History

Doc. Rev.	Date	Remarks
7.1/a/b	Jan.2015	Fault update. Wiring diagram adjustments. Cover image.
7.0	Dec.2014	Updated for FW 1.15.x. Revised wiring tables/diagrams; added inrush surge warnings; minor corrections
6.0	May 2014	Added CDHD-024/030 400/480 VAC; Added CDHD Power Blocks; Major revisions.
5.7	Jan.2014	Updates and corrections, firmware 1.4.5
5.6	Oct.2013	Updated: ordering info; pin assignments diagrams; controller and machine interface wiring diagrams; EnDat wiring; faults
5.5	Aug. 2013	Updated product photos in wiring diagrams. Minor updates and corrections.
5.4	Mar. 2013	Miscellaneous corrections and updates.
5.3	Dec. 2012	Added and revised faults and warnings.
5.2	Dec. 2012	Added wiring for CDHD-020/CDHD-024 models.
5.0 / 5.1	Nov. 2012	Includes 120/240 VAC and 400/480 VAC models.
4.3	Aug. 2012	Warnings and faults updated.
4.1 / 4.2	Aug. 2012	Pin assignment diagrams updated.
4.0	Aug. 2012	Revision for version 4.1.2.6
3.2	Jan. 2012	Revision 3.2
3.1	Dec.2011	Revision 3.1 (internal release)
3.0	Dec.2011	Supplied connectors removed; additional faults; additional diagrams (internal release).
2.4	Nov.2011	Includes 7 CDHD models; 3 different frames. Sequence of installation steps.
2.3	Sept.2011	Wire gauge. STO interface. Motor Feedback interface. USB driver. screen. System Wiring - Pin Assignment diagram Rev.09
2.2	Sept.2011	System Wiring - Pin Assignment diagram updated (Rev.08) for Controller I/F
2.1	Aug. 2011	Wiring and pinouts updated, diagrams added/revised. Installation Steps 12 and 13 revised. Status/fault codes revised.
2.0	Jun. 2011	

Firmware Revision	Software (GUI) Revision
1.15.xx	1.15.xx

Note: If an earlier firmware revision is installed in your CDHD drive, contact your Account Manager or Technical Support.

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Disclaimer

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Trademarks

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Technical Support

If you need assistance with the installation and configuration of the CDHD drive, contact technical support: tech.support@servotronix.com

Ordering Options

CDHD – 006 2A AP 1 – ST

CDHD Servo Drive – HD Series

Rating	120/240 VAC	
	Cont [A rms]	Peak [A rms]
1D5	1.5	4.5
003	3	9
4D5	4.5	18
006	6	18
008	8	28
010	10	28
013	13	28
020	20	48
024	24	48
	400/480 VAC	
	Cont [A rms]	Peak [A rms]
003	3	9
006	6	18
012	12	24
024	24	72
030	30	90

AC and Controller Input Power Supply	
2A	Input Single Phase 120 L-L VAC +10% -15% 50/60 Hz Input Single Phase 240 L-L VAC +10% -15% 50/60 Hz Input Three Phase 120-240 L-L VAC +10% -15% 50/60 Hz
4D	AC Input Power Supply: - Input Three Phase 400 L-L VAC +10% -15% 50/60 Hz - Input Three Phase 480 L-L VAC +10% -15% 50/60 Hz 24 VDC input for control board power supply

Interface Options	
AP *	Analog Voltage, Pulse Train Ref, RS232
AF *	Analog Voltage, Pulse Train Ref, CANopen, USB, RS232
EC **	EtherCAT, USB, RS232
PB ***	PWM Power Block

* Standard configuration with one analog input
** Standard configuration with two analog inputs
*** PB0 and PWM power block do not have analog input option

Analog Input	
0	Power block
1	One analog input, 16 bit
2	Two analog inputs, 14 bit each

Safe Torque Off (STO) Functional Safety Certified
Excluding: 120/240 020/024 models; 400/480 all models; 4D models

Contents

1 Introduction

CDHD Models

The various models in the CDHD servo drive series are differentiated by means of the communication methods and protocols they use. The following table presents the different models and their distinguishing characteristics.

Table 1-1.CDHD Models - Communication and Protocols

CDHD Model	Physical Layer	Communication Protocol	Programming Language
CDHD (AP)	Analog	±10V	VarCom
	Pulse Train	AB signals	
	Serial	ASCII CDHD commands	
CDHD CAN (AF) A CAN drive, which uses CANopen protocol. (Also referred to as the CDHD CANopen drive.)	Analog	±10V	VarCom
	Pulse Train	AB signals	
	Serial	ASCII CDHD commands	
	CAN	**Communication**: CANopen - all 1000h objects **Manufacturer-Specific**: CANopen - all 2000h objects **Standard Servo-Drive** (Motion): CANopen - all 6000h objects)	VarCom CANopen
CDHD EtherCAT (EC) An EtherCAT drive, which uses CANopen over EtherCAT (CoE) protocol.	Ethernet	**Communication**: EtherCAT **Manufacturer-Specific**: CANopen - all 2000h objects **Standard Servo-Drive** (Motion): CANopen - all 6000h objects)	VarCom CANopen
CDHD Power Block (PB)	PWM signals	PWM signals	PMAC (Delta Tau)

CDHD Documentation

This manual is part of a documentation set. The entire set consists of the following:

- **CDHD Quick Start Guide**. Basic setup and operation of the drive.
- **CDHD User Manual**. Hardware installation, configuration and operation.
- **CDHD VarCom Reference Manual**. Parameters and commands used to program the CDHD.
- **CDHD CANopen for CAN and EtherCAT Reference Manual.** CDHD implementation of CANopen protocol for CAN (AF) and EtherCAT (EC) drives.
- **CDHD Functional Safety Reference Manual**
- **CDHD Technical Training Manual**. For use with CDHD Demo Kit and software for learning to configure, program and operate the CDHD drive.

Safety

Only qualified persons may perform the installation procedures. You do not need to be an expert in motion control to install and operate the drive system. However, you must have a basic understanding of electronics, computers, mechanics, and safety practices.

The CDHD utilizes hazardous voltages.
Be sure the drive is properly grounded.

Before you install the CDHD, review the safety instructions in this manual. The manual is available as a PDF file that can be downloaded from the website.

Failure to follow the safety instructions may result in personal injury or equipment damage.

Required Hardware and Tools

All required hardware and tools are specified in the diagrams in the section *CDHD Wiring and Pin Assignments*.

The connectors and tools that are supplied with the CDHD are also indicated in those diagrams.

In addition, you will need a small slotted screwdriver for setting switches.

To connect the CDHD to the host computer via serial communication, you will need one of the following:

- USB 2.0 A to Mini-B cable (USB interface)
- 4p4c plug and cable (RS232 interface)

To connect the CDHD to the host computer or host PLC via fieldbus, you will need:

- RJ45 cables (CAN interface or EtherCAT)

Required Computer System

The following computer system and software are required:

- 2 GHz CPU
- 1 MB RAM
- 1000 MB available on hard drive (after .net 4 is installed)
- USB or RS232 port for connecting to the drive, according to CDHD model.
- Operating system: Windows XP-SP3, or Windows 7
- Recommended screen resolution for is 1280x800.
  Minimal resolution is1024x768.
- , the graphical software interface for configuring and testing the drive. Download from the website or contact Technical Support.
- **.Net4** (for details, refer to .NET Framework System Requirements). If .NET 4 is not installed on the computer, will guide you through the installation, but will not install it automatically.

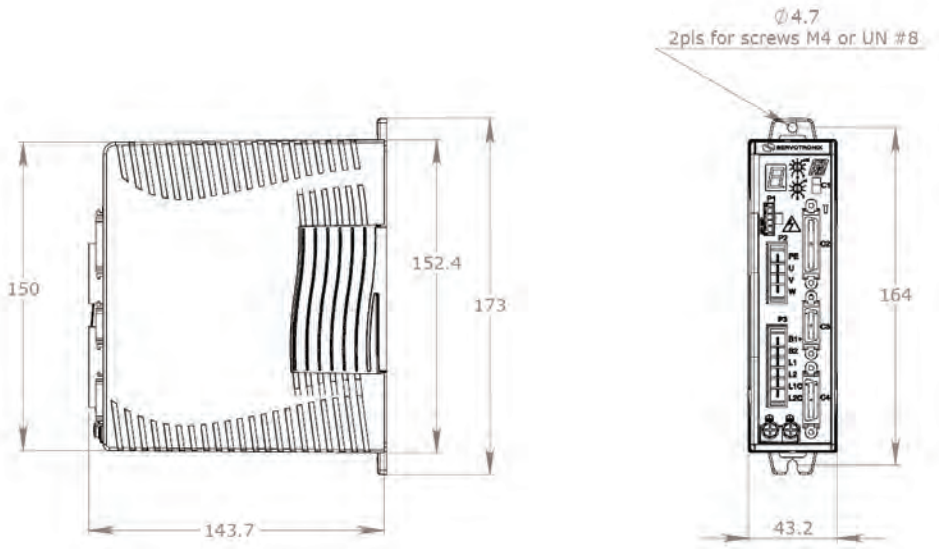
CDHD Installation Procedure

Perform the following steps to install and setup a CDHD system.

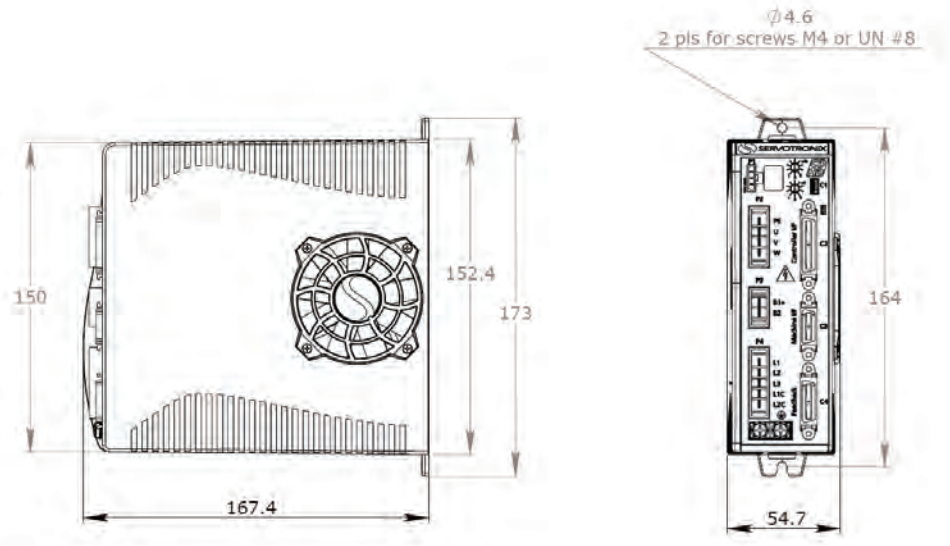
1. Mount the CDHD.
2. Make all electrical connections:
   - Controller I/Os and/or Machine I/Os
   - Motor feedback
   - Fieldbus devices, if required
   - Safe torque off (STO), or bypass using jumpers
   - Motor
   - Regeneration resistor, if required
   - Motor brake, if required
   - AC input voltage
3. Set the drive address using the rotary switches.
4. Connect the drive to the PC.
5. Power up the drive and the PC.
6. Install software.
7. Using , configure and test the drive.

CDHD Dimensions and Mounting

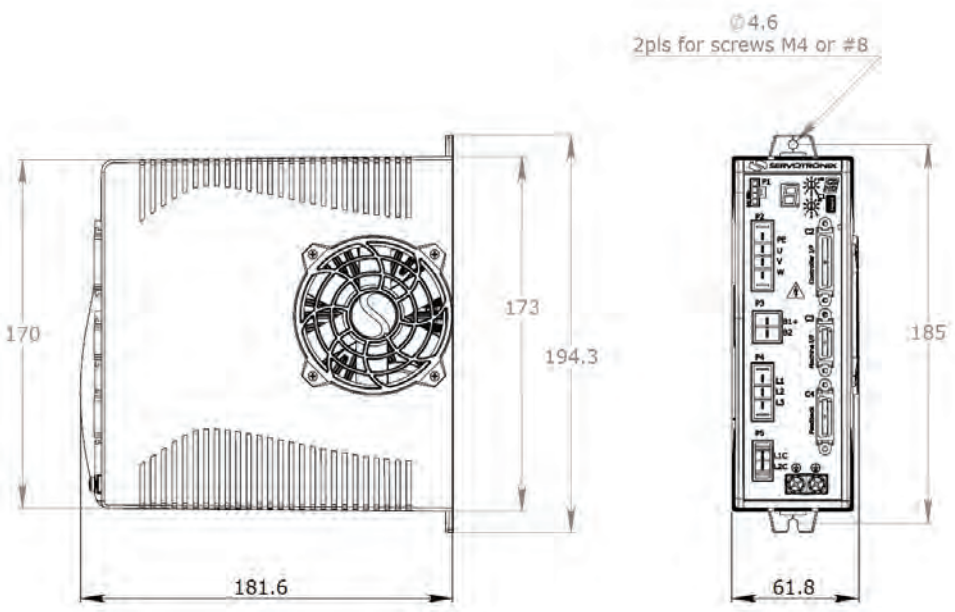
Using the bracket on the back of the CDHD, mount the CDHD on a grounded conductive metal panel.



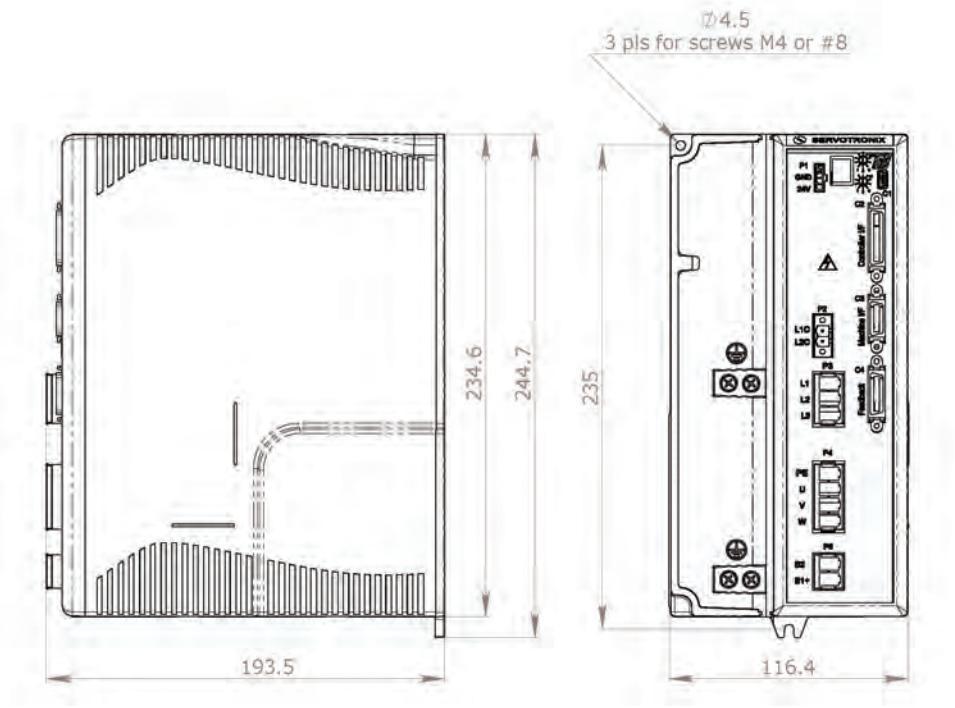
CDHD-1D5/CDHD-003 (120/240 VAC) - Dimensions (mm)
Note: CDHD-003 has fan.



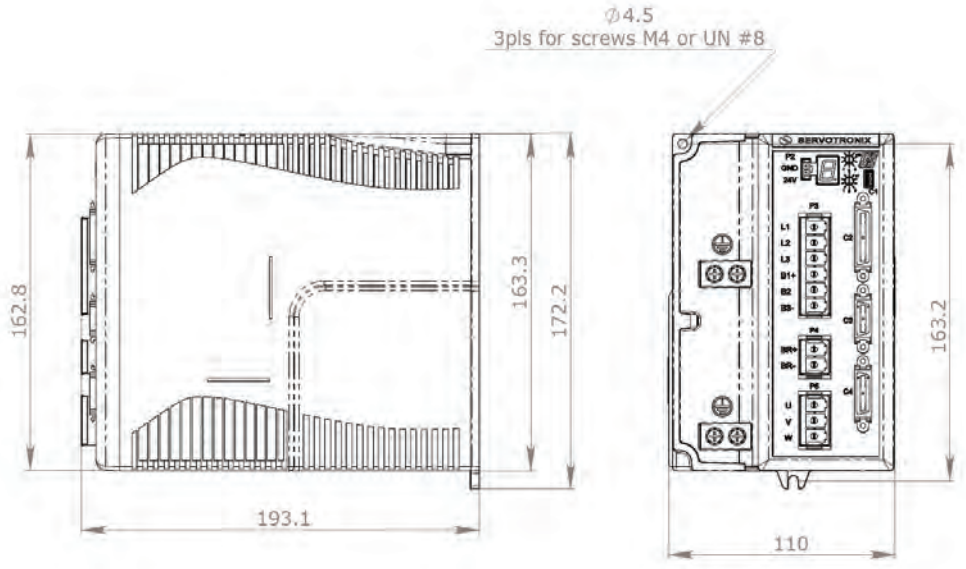
CDHD-4D5/CDHD-006 (120/240 VAC) - Dimensions (mm)



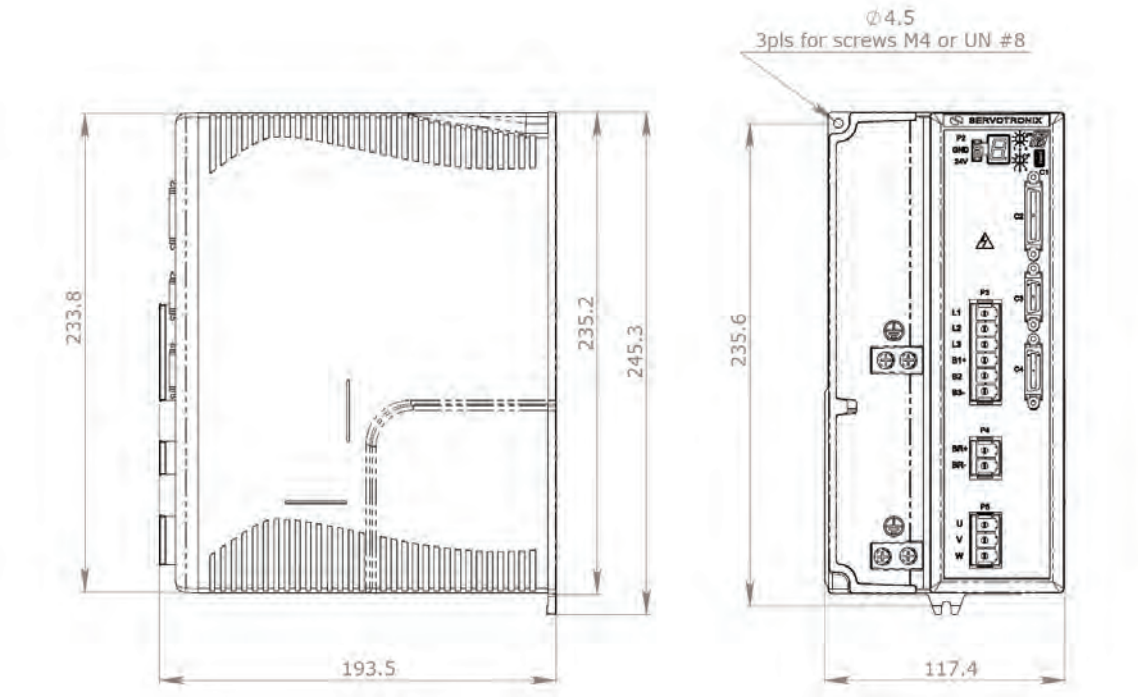
CDHD-008/CDHD-010/CDHD-013 (120/240 VAC) - Dimensions (mm)



CDHD-020/CDHD-024 (120/240 VAC) - Dimensions (mm)



CDHD-003/CDHD-006 (400/480 VAC) - Dimensions (mm)



CDHD-012 (400/480 VAC) - Dimensions (mm)

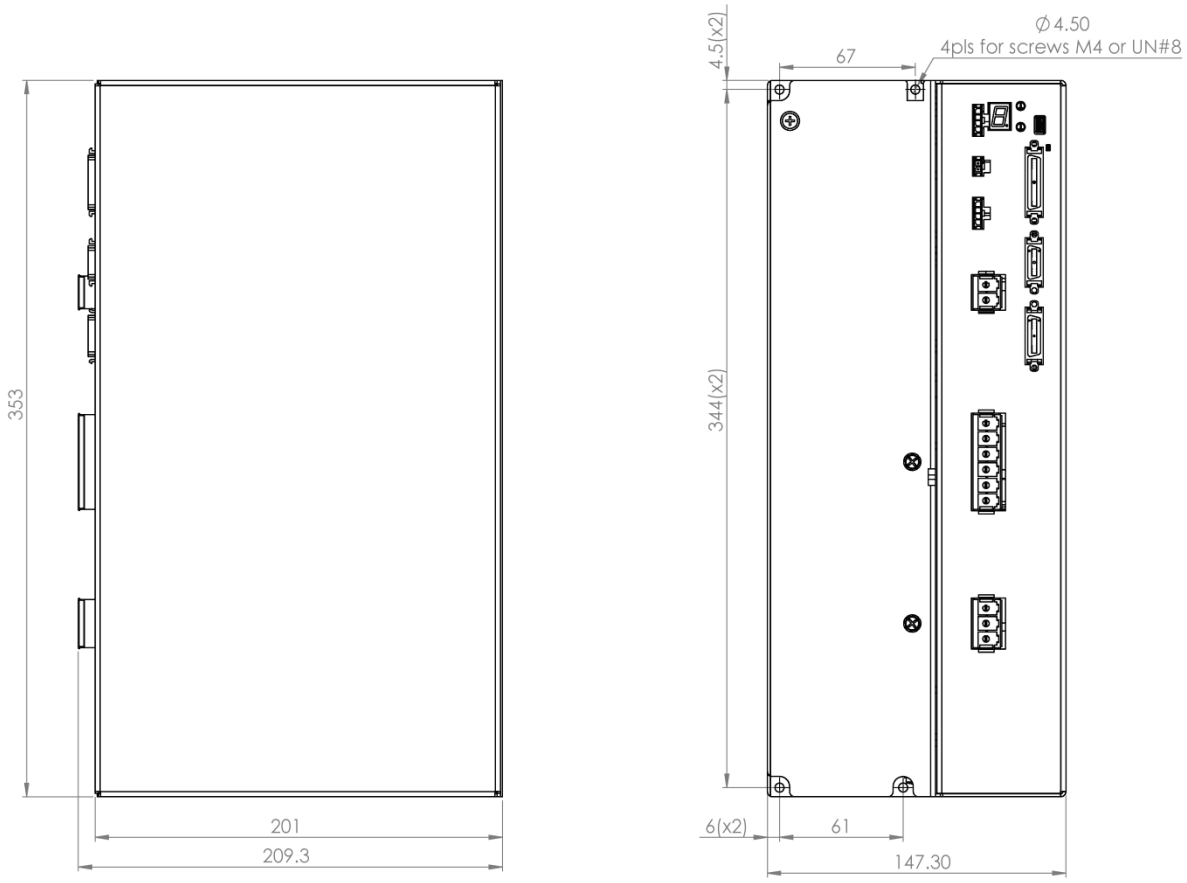
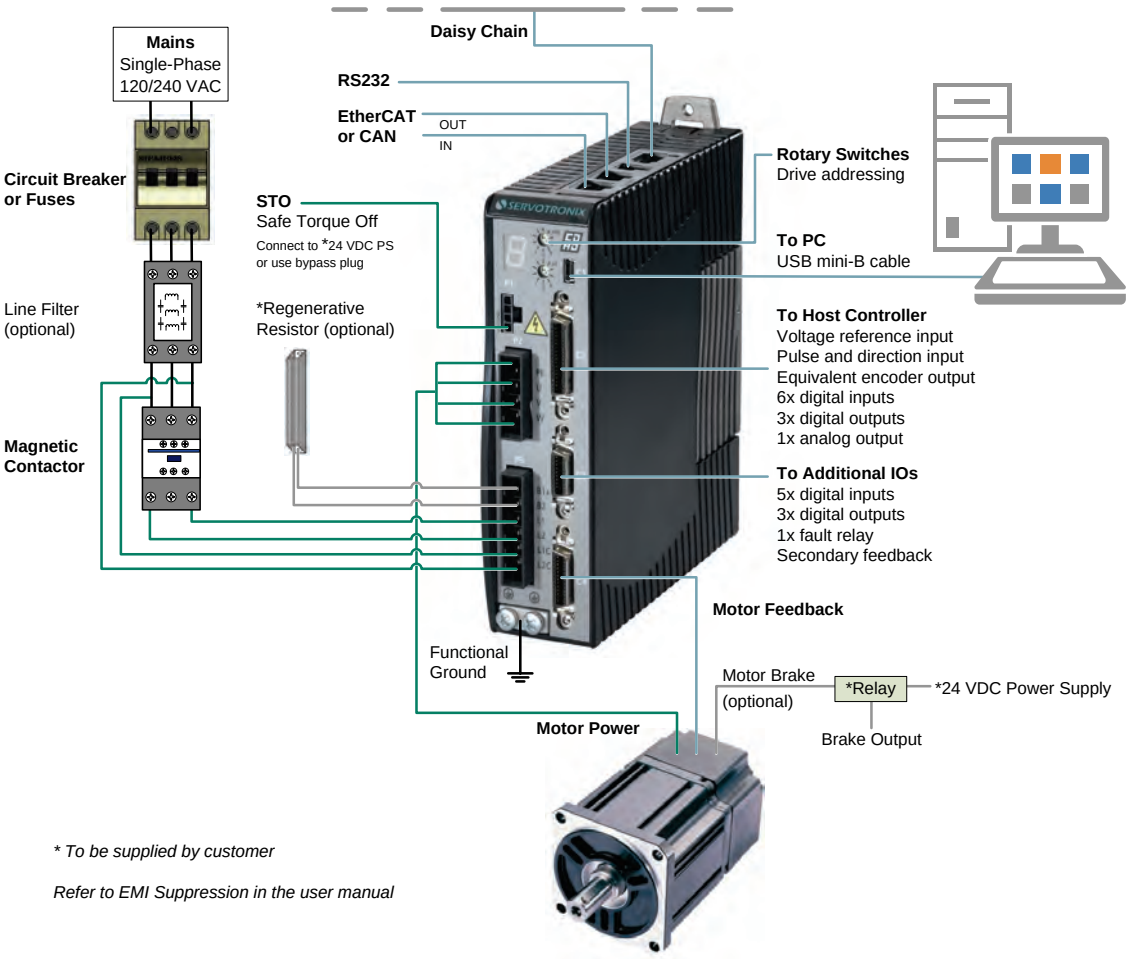


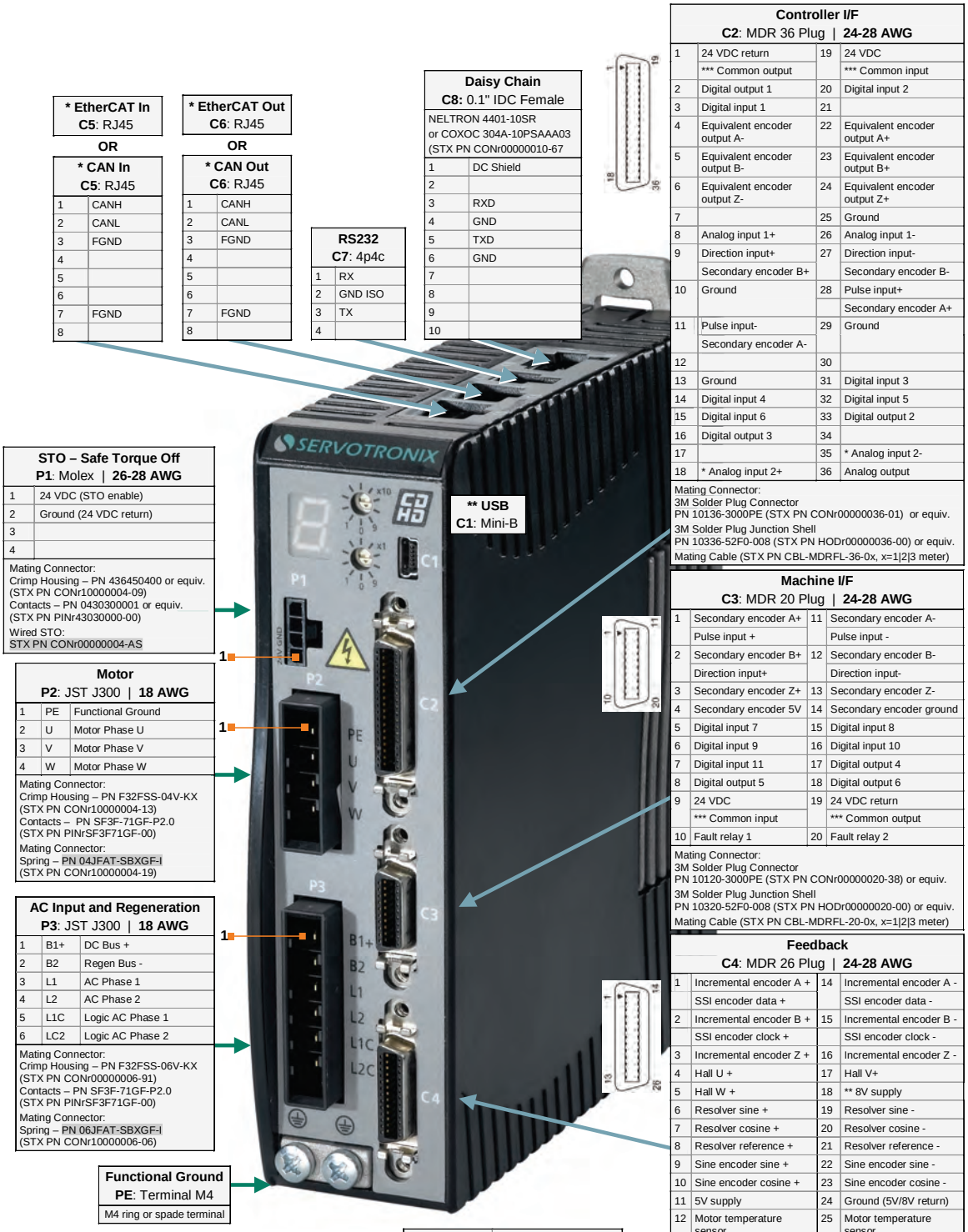
Figure 3-1.CDHD-024/CDHD-030 (400/480 VAC) – Dimensions (mm)

CDHD Wiring and Pin Assignments

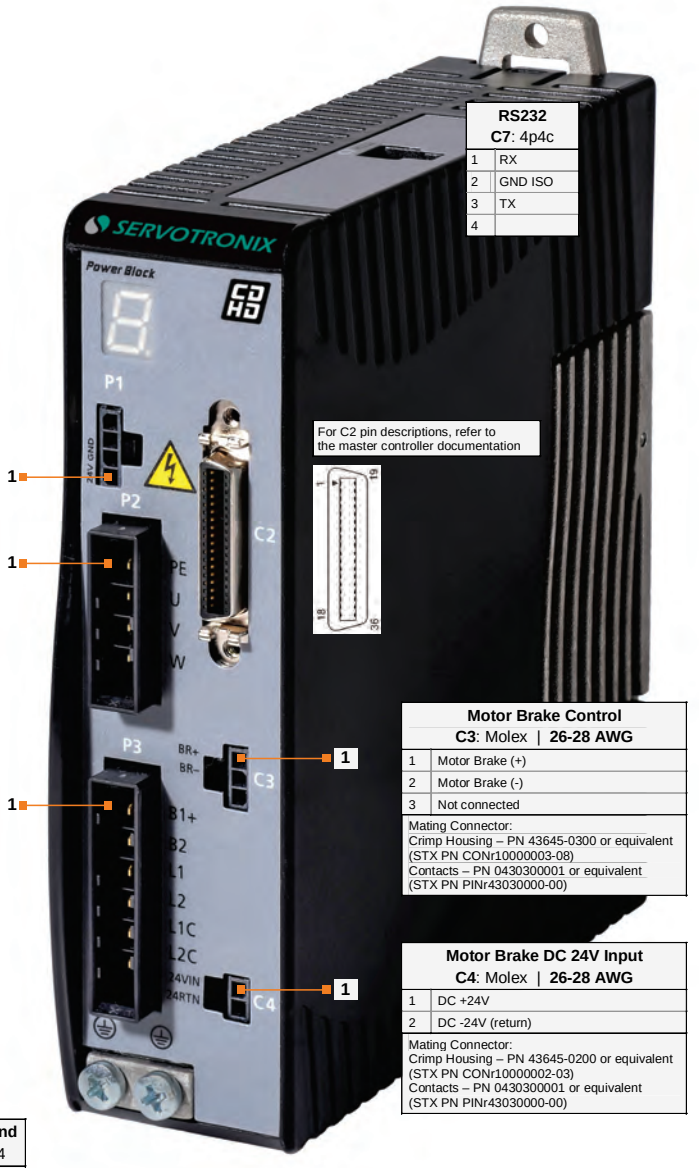
CDHD-1D5/CDHD-003 (120/240 VAC)



Servo System Wiring, 1-Phase – CDHD-1D5/CDHD-003 (120/240 VAC)



Pin Assignments on CDHD-1D5/CDHD-003 – AP/AF/EC Models (120/240 VAC)



STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Motor
P2: JST J300 | **18 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing – PN F32FSS-04V-KX
(STX PN CONr10000004-13)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 04JFAT-SBXGF-I
(STX PN CONr10000004-19)

AC Input and Regeneration
P3: JST J300 | **18 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -
3	L1	AC Phase 1
4	L2	AC Phase 2
5	L1C	Logic AC Phase 1
6	LC2	Logic AC Phase 2

Mating Connector:
Crimp Housing – PN F32FSS-06V-KX
(STX PN CONr00000006-91)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 06JFAT-SBXGF-I
(STX PN CONr10000006-06)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

For C2 pin descriptions, refer to the master controller documentation

Motor Brake Control
C3: Molex | **26-28 AWG**

1	Motor Brake (+)
2	Motor Brake (-)
3	Not connected

Mating Connector:
Crimp Housing – PN 43645-0300 or equivalent
(STX PN CONr10000003-08)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Motor Brake DC 24V Input
C4: Molex | **26-28 AWG**

1	DC +24V
2	DC -24V (return)

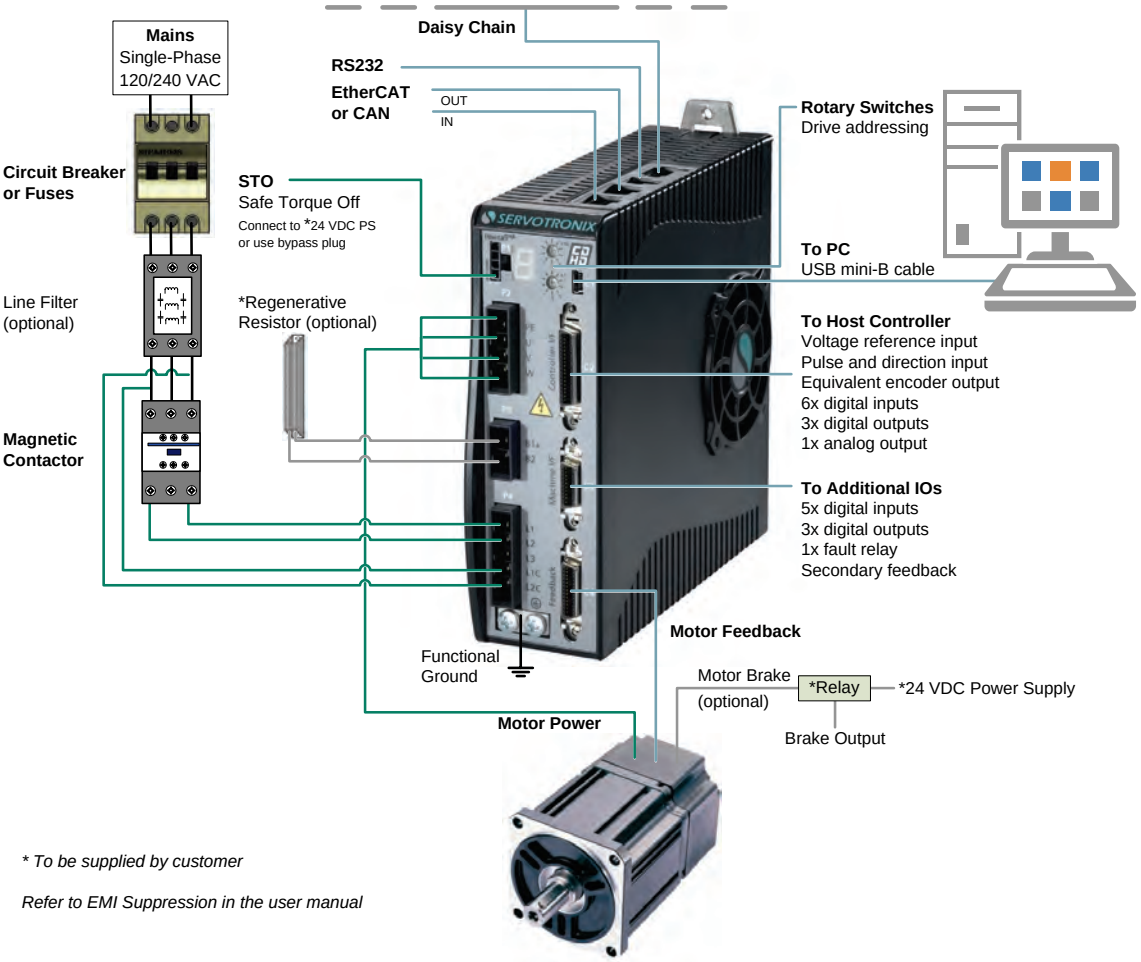
Mating Connector:
Crimp Housing – PN 43645-0200 or equivalent
(STX PN CONr10000002-03)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Crimping tool	Molex 0638190000 (P1, C3, C4) or equivalent
Crimping tool	YRF-1070 (P2, P3, P4)
Extraction tool	EJ-JFAJ3
Key for spring connector	J-FAT-OT

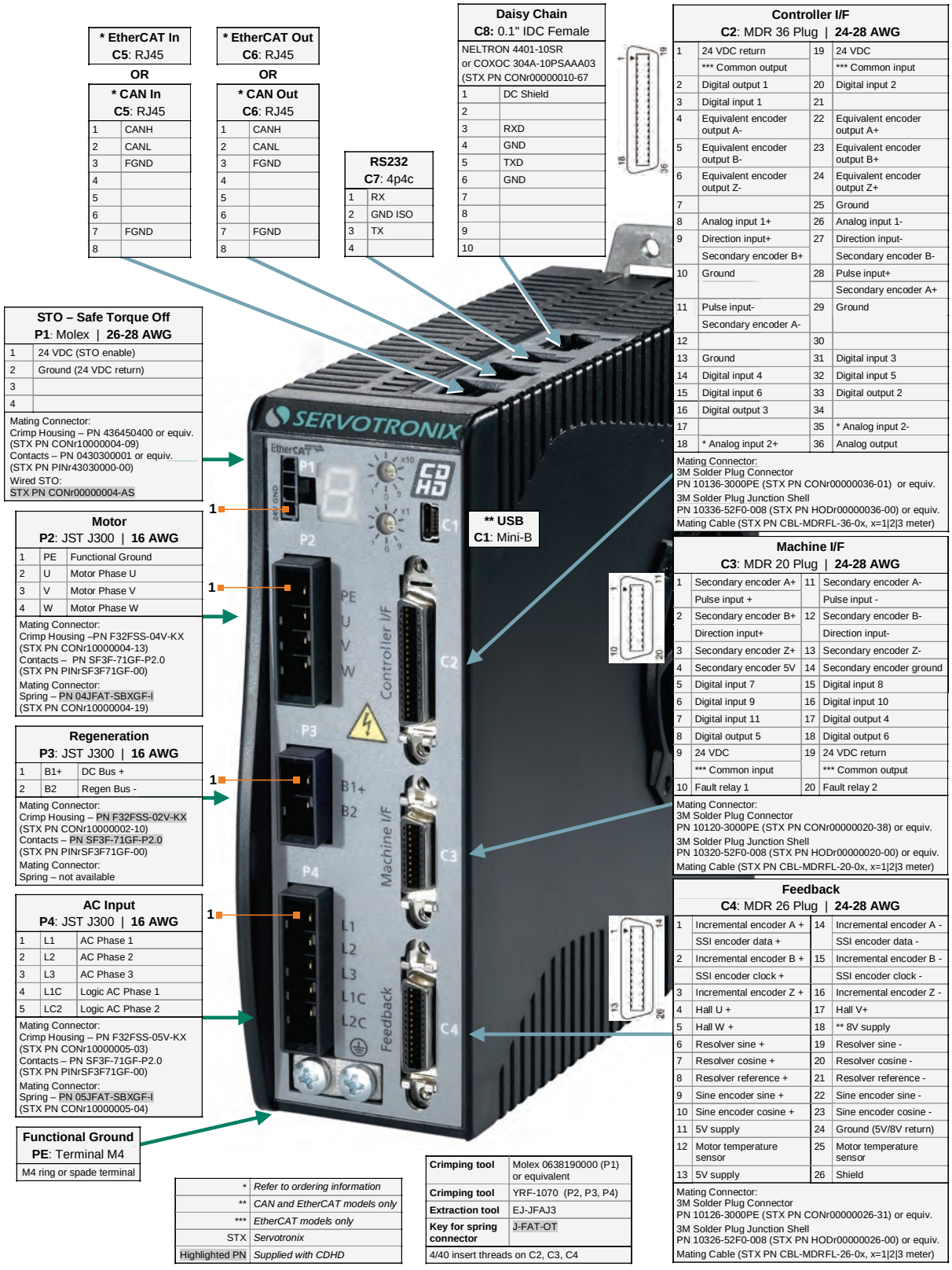
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD-PB*

Pin Assignments on CDHD-1D5/CDHD-003 – Power Block (120/240 VAC)

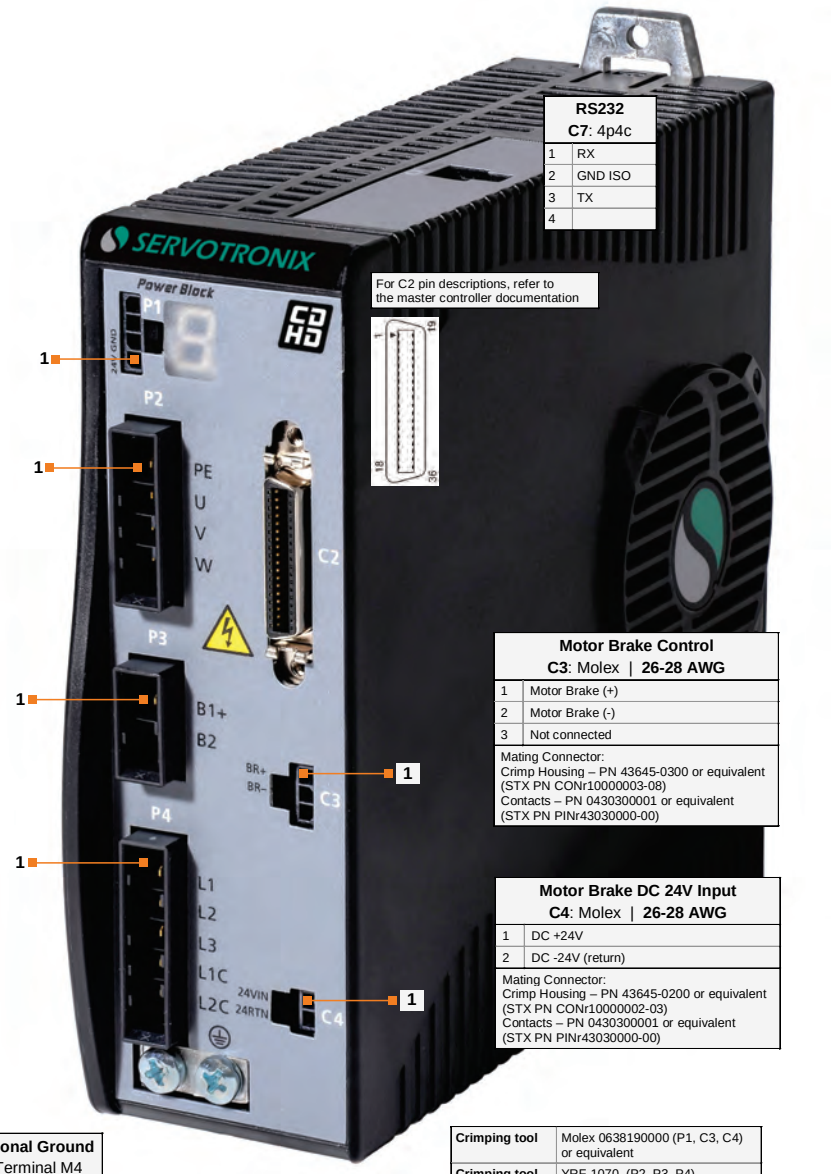
CDHD-4D5/CDHD-006 (120/240 VAC)



Servo System Wiring, 1-Phase – CDHD-4D5/CDHD-006 (120/240 VAC)



Pin Assignments on CDHD-4D5/CDHD-006 – AP/AF/EC Models (120/240 VAC)



STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Motor
P2: JST J300 | **16 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing –PN F32FSS-04V-KX
(STX PN CONr10000004-13)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 04JFAT-SBXGF-I
(STX PN CONr10000004-19)

Regeneration
P3: JST J300 | **16 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
Crimp Housing – PN F32FSS-02V-KX
(STX PN CONr10000002-10)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – not available

AC Input
P4: JST J300 | **16 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	L1C	Logic AC Phase 1
5	LC2	Logic AC Phase 2

Mating Connector:
Crimp Housing – PN F32FSS-05V-KX
(STX PN CONr10000005-03)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)
Mating Connector:
Spring – PN 05JFAT-SBXGF-I
(STX PN CONr10000005-04)

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

For C2 pin descriptions, refer to the master controller documentation

Motor Brake Control
C3: Molex | **26-28 AWG**

1	Motor Brake (+)
2	Motor Brake (-)
3	Not connected

Mating Connector:
Crimp Housing – PN 43645-0300 or equivalent
(STX PN CONr10000003-08)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Motor Brake DC 24V Input
C4: Molex | **26-28 AWG**

1	DC +24V
2	DC -24V (return)

Mating Connector:
Crimp Housing – PN 43645-0200 or equivalent
(STX PN CONr10000002-03)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Functional Ground
PE: Terminal M4

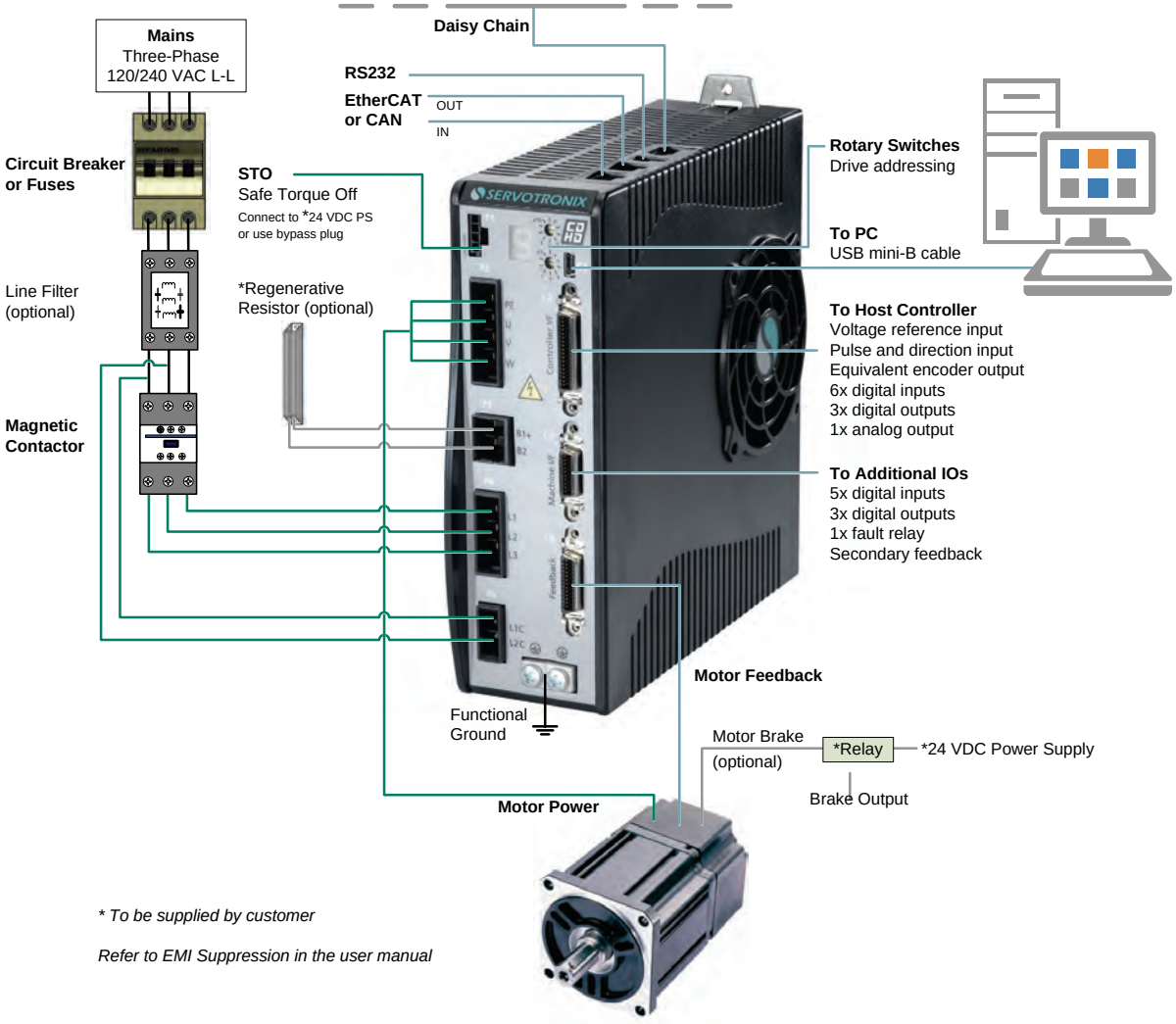
M4 ring or spade terminal

STX	*Servotronix*
Highlighted PN	*Supplied with CDHD-PB*

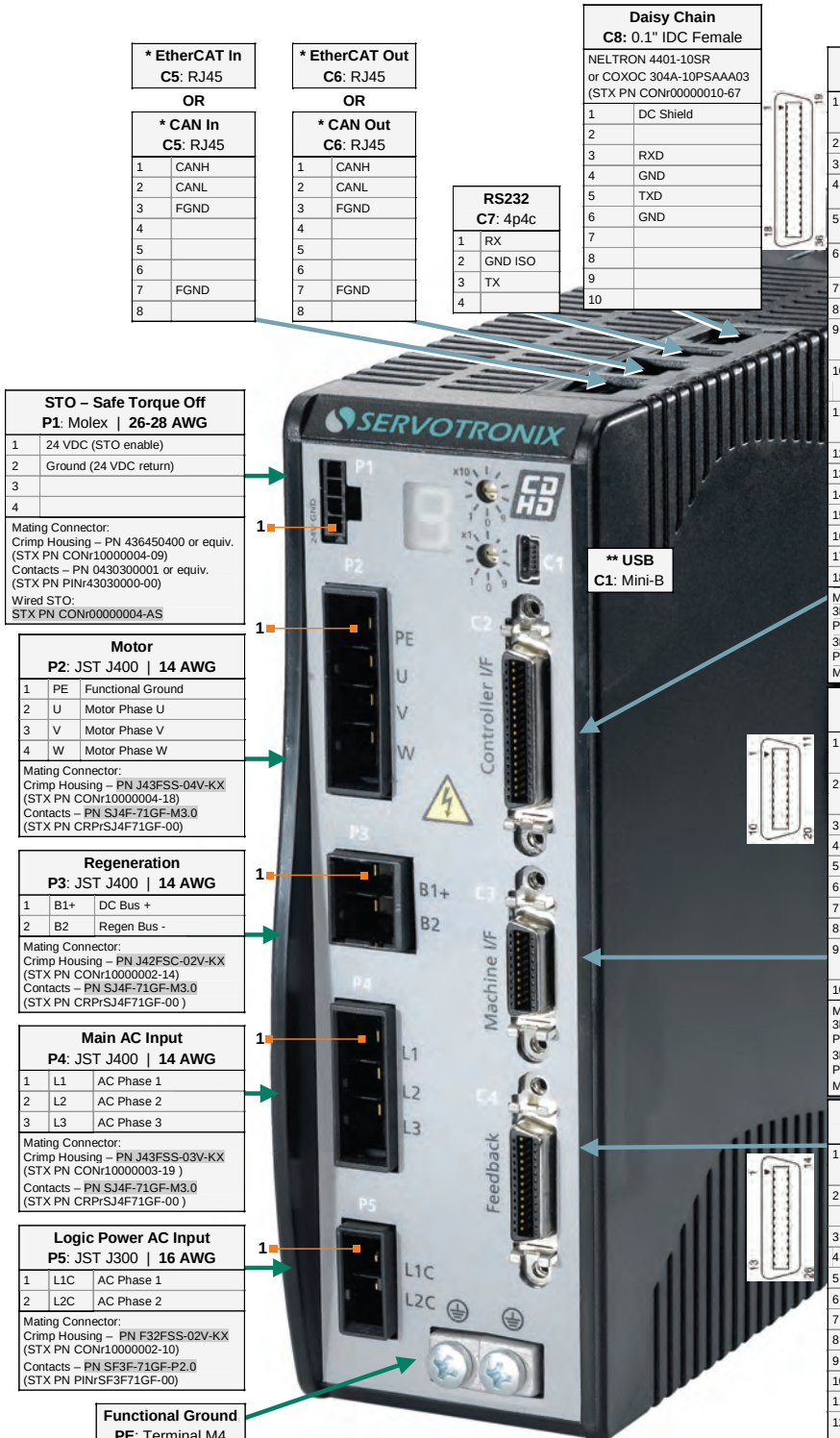
Crimping tool	Molex 0638190000 (P1, C3, C4) or equivalent
Crimping tool	YRF-1070 (P2, P3, P4)
Extraction tool	EJ-JFAJ3
Key for spring connector	J-FAT-OT

Pin Assignments on CDHD-4D5/CDHD-006 – Power Block (120/240 VAC)

CDHD-008/CDHD-010/CDHD-013 (120/240 VAC)



Servo System Wiring, 3-Phase – CDHD-008/CDHD-010/CDHD-013 (120/240 VAC)



*** EtherCAT In**
C5: RJ45
OR
*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45
OR
*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female
NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
3M Solder Plug Connector
PN 10136-3000PE (STX PN CONr00000036-01) or equiv.
3M Solder Plug Junction Shell
PN 10336-52F0-008 (STX PN HODr00000036-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-36-0x, x=1|2|3 meter)

**** USB**
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Motor
P2: JST J400 | **14 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing – PN J43FSS-04V-KX
(STX PN CONr10000004-18)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Regeneration
P3: JST J400 | **14 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
Crimp Housing – PN J42FSC-02V-KX
(STX PN CONr10000002-14)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Main AC Input
P4: JST J400 | **14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
Crimp Housing – PN J43FSS-03V-KX
(STX PN CONr10000003-19)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Logic Power AC Input
P5: JST J300 | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
Crimp Housing – PN F32FSS-02V-KX
(STX PN CONr10000002-10)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)

Functional Ground
PE: Terminal M4
M4 ring or spade terminal

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
3M Solder Plug Connector
PN 10120-3000PE (STX PN CONr00000020-38) or equiv.
3M Solder Plug Junction Shell
PN 10320-52F0-008 (STX PN HODr00000020-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-20-0x, x=1|2|3 meter)

Feedback
C4: MDR 26 Plug | **24-28 AWG**

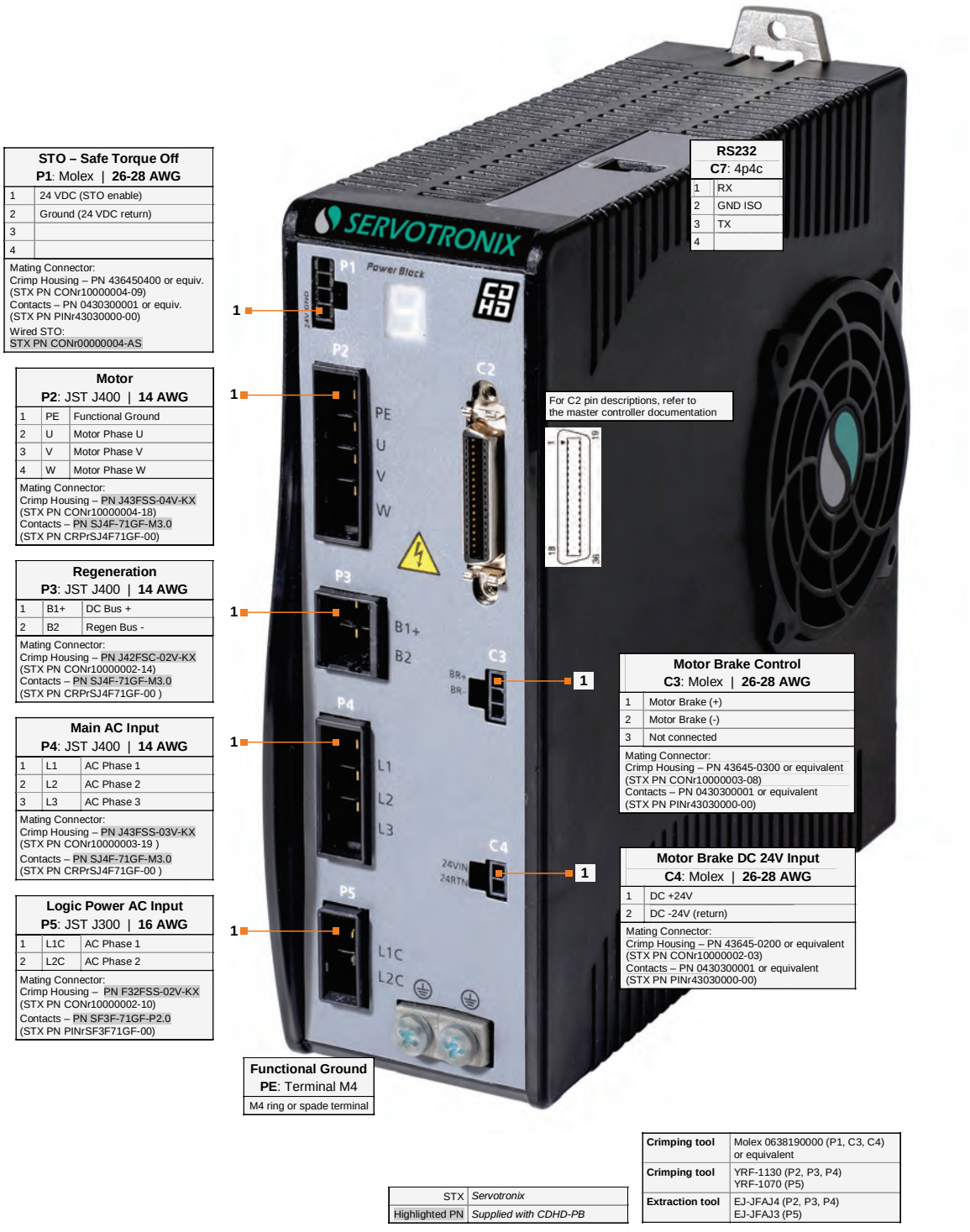
1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
3M Solder Plug Connector
PN 10126-3000PE (STX PN CONr00000026-31) or equiv.
3M Solder Plug Junction Shell
PN 10326-52F0-008 (STX PN HODr00000026-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-26-0x, x=1|2|3 meter)

*	*Refer to ordering information*
**	*CAN and EtherCAT models only*
***	*EtherCAT models only*
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD*

Crimping tool	Molex 0638190000 (P1) or equivalent
Crimping tool	YRF-1130 (P2, P3, P4) YRF-1070 (P5)
Extraction tool	EJ-JFAJ4 (P2, P3, P4) EJ-JFAJ3 (P5)
4/40 insert threads on C2, C3, C4	

Pin Assignments on CDHD-008/CDHD-010/CDHD-013 – AP/AF/EC Models (120/240 VAC)



STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Motor
P2: JST J400 | **14 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
Crimp Housing – PN J43FSS-04V-KX
(STX PN CONr10000004-18)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Regeneration
P3: JST J400 | **14 AWG**

1	B1+	DC Bus +
2	B2	Regen Bus -

Mating Connector:
Crimp Housing – PN J42FSC-02V-KX
(STX PN CONr10000002-14)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Main AC Input
P4: JST J400 | **14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
Crimp Housing – PN J43FSS-03V-KX
(STX PN CONr10000003-19)
Contacts – PN SJ4F-71GF-M3.0
(STX PN CRPrSJ4F71GF-00)

Logic Power AC Input
P5: JST J300 | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
Crimp Housing – PN F32FSS-02V-KX
(STX PN CONr10000002-10)
Contacts – PN SF3F-71GF-P2.0
(STX PN PINrSF3F71GF-00)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Motor Brake Control
C3: Molex | **26-28 AWG**

1	Motor Brake (+)
2	Motor Brake (-)
3	Not connected

Mating Connector:
Crimp Housing – PN 43645-0300 or equivalent
(STX PN CONr10000003-08)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Motor Brake DC 24V Input
C4: Molex | **26-28 AWG**

1	DC +24V
2	DC -24V (return)

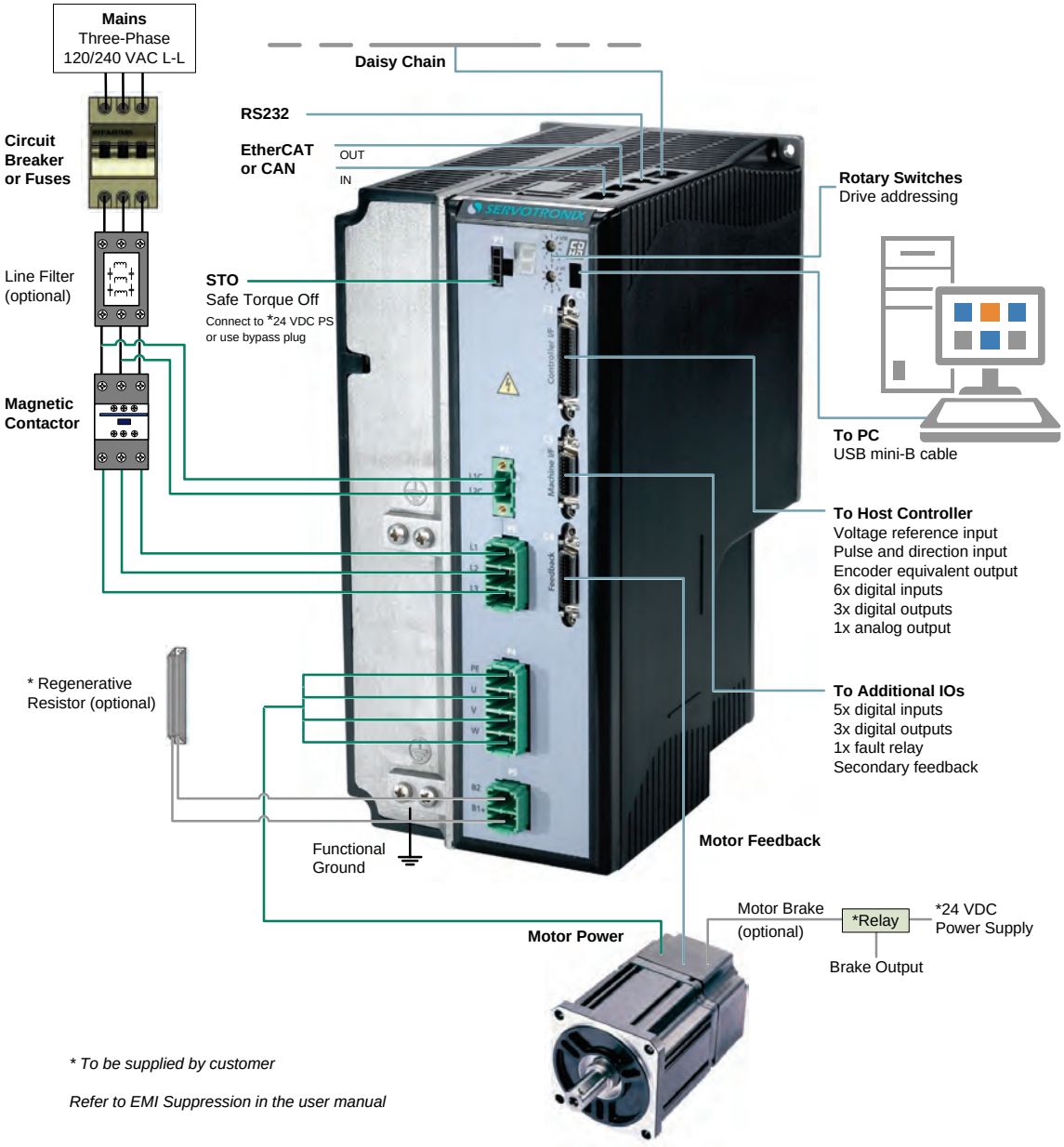
Mating Connector:
Crimp Housing – PN 43645-0200 or equivalent
(STX PN CONr10000002-03)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

STX	*Servotronix*
Highlighted PN	*Supplied with CDHD-PB*

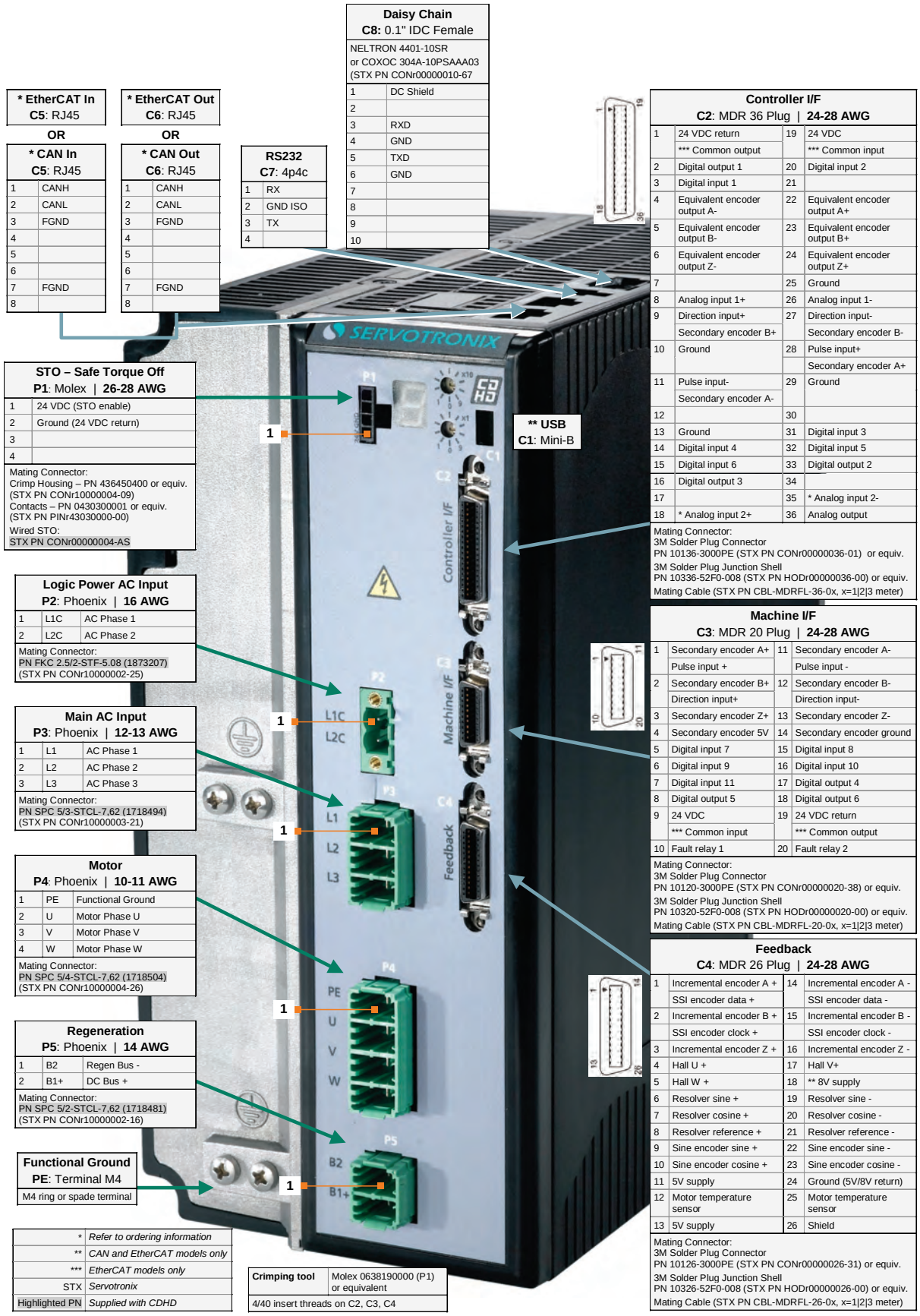
Crimping tool	Molex 0638190000 (P1, C3, C4) or equivalent
Crimping tool	YRF-1130 (P2, P3, P4) YRF-1070 (P5)
Extraction tool	EJ-JFAJ4 (P2, P3, P4) EJ-JFAJ3 (P5)

Pin Assignments on CDHD-008/CDHD-010/CDHD-013 – Power Block (120/240 VAC)

CDHD-020/CDHD-024 (120/240 VAC)



Servo System Wiring, 3-Phase – CDHD-020/CDHD-024 (120/240 VAC)



*** EtherCAT In**
C5: RJ45

OR

*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45

OR

*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
3M Solder Plug Connector
PN 10136-3000PE (STX PN CONr00000036-01) or equiv.
3M Solder Plug Junction Shell
PN 10336-52F0-008 (STX PN HODr00000036-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-36-0x, x=1|2|3 meter)

**** USB**
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Logic Power AC Input
P2: Phoenix | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
PN FKC 2.5/2-STF-5.08 (1873207)
(STX PN CONr10000002-25)

Main AC Input
P3: Phoenix | **12-13 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

Motor
P4: Phoenix | **10-11 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
PN SPC 5/4-STCL-7,62 (1718504)
(STX PN CONr10000004-26)

Regeneration
P5: Phoenix | **14 AWG**

1	B2	Regen Bus -
2	B1+	DC Bus +

Mating Connector:
PN SPC 5/2-STCL-7,62 (1718481)
(STX PN CONr10000002-16)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
3M Solder Plug Connector
PN 10120-3000PE (STX PN CONr00000020-38) or equiv.
3M Solder Plug Junction Shell
PN 10320-52F0-008 (STX PN HODr00000020-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-20-0x, x=1|2|3 meter)

Feedback
C4: MDR 26 Plug | **24-28 AWG**

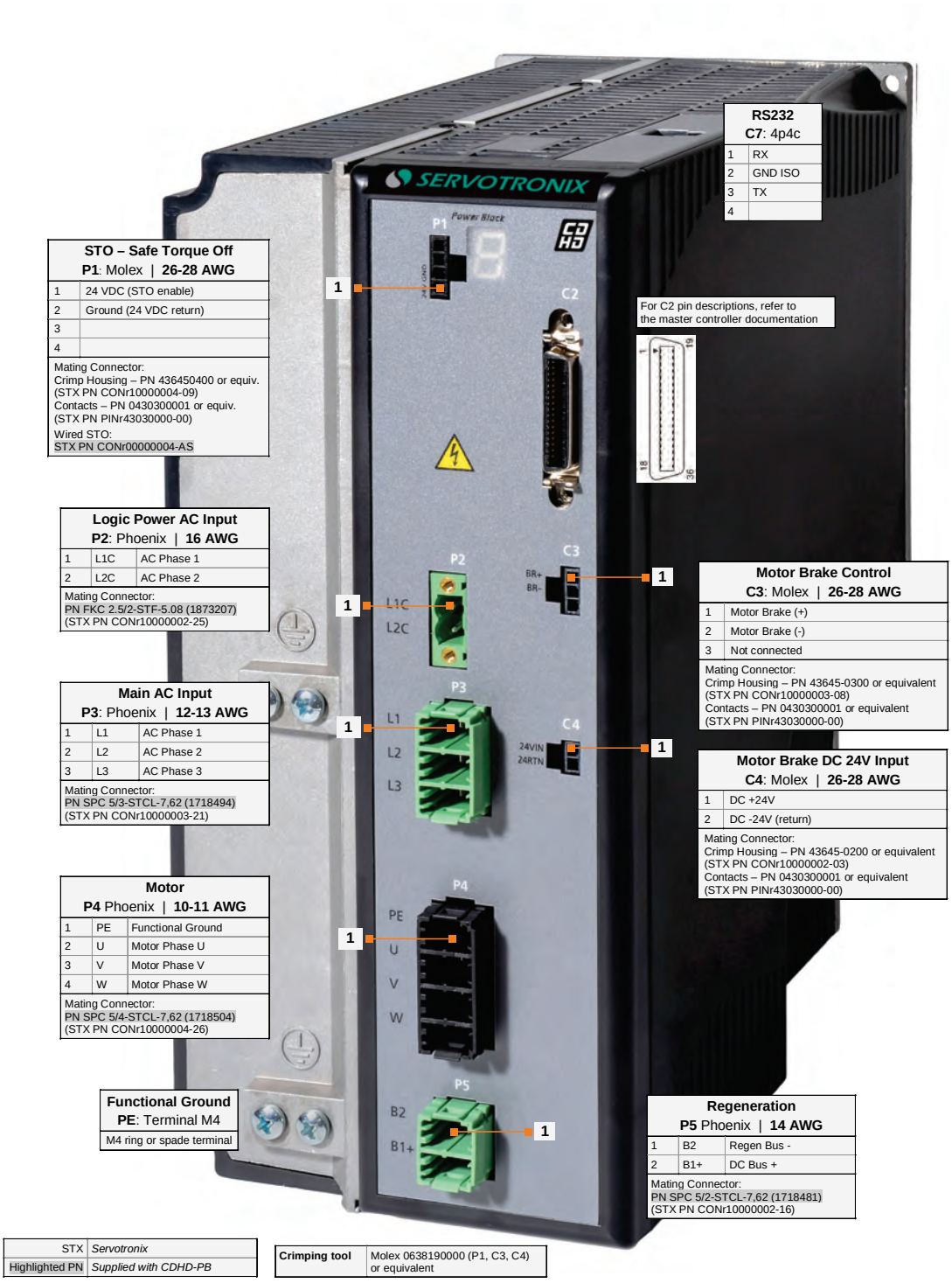
1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
3M Solder Plug Connector
PN 10126-3000PE (STX PN CONr00000026-31) or equiv.
3M Solder Plug Junction Shell
PN 10326-52F0-008 (STX PN HODr00000026-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-26-0x, x=1|2|3 meter)

*	*Refer to ordering information*
**	*CAN and EtherCAT models only*
***	*EtherCAT models only*
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD*

Crimping tool	Molex 0638190000 (P1) or equivalent
4/40 insert threads on C2, C3, C4	

Pin Assignments on CDHD-020/CDHD-024 – AP/AF/EC Models (120/240 VAC)



RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

For C2 pin descriptions, refer to the master controller documentation

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Logic Power AC Input
P2: Phoenix | **16 AWG**

1	L1C	AC Phase 1
2	L2C	AC Phase 2

Mating Connector:
PN FKC 2.5/2-STF-5.08 (1873207)
(STX PN CONr10000002-25)

Main AC Input
P3: Phoenix | **12-13 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

Motor
P4 Phoenix | **10-11 AWG**

1	PE	Functional Ground
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Mating Connector:
PN SPC 5/4-STCL-7,62 (1718504)
(STX PN CONr10000004-26)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor Brake Control
C3: Molex | **26-28 AWG**

1	Motor Brake (+)
2	Motor Brake (-)
3	Not connected

Mating Connector:
Crimp Housing – PN 43645-0300 or equivalent
(STX PN CONr10000003-08)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Motor Brake DC 24V Input
C4: Molex | **26-28 AWG**

1	DC +24V
2	DC -24V (return)

Mating Connector:
Crimp Housing – PN 43645-0200 or equivalent
(STX PN CONr10000002-03)
Contacts – PN 0430300001 or equivalent
(STX PN PINr43030000-00)

Regeneration
P5 Phoenix | **14 AWG**

1	B2	Regen Bus -
2	B1+	DC Bus +

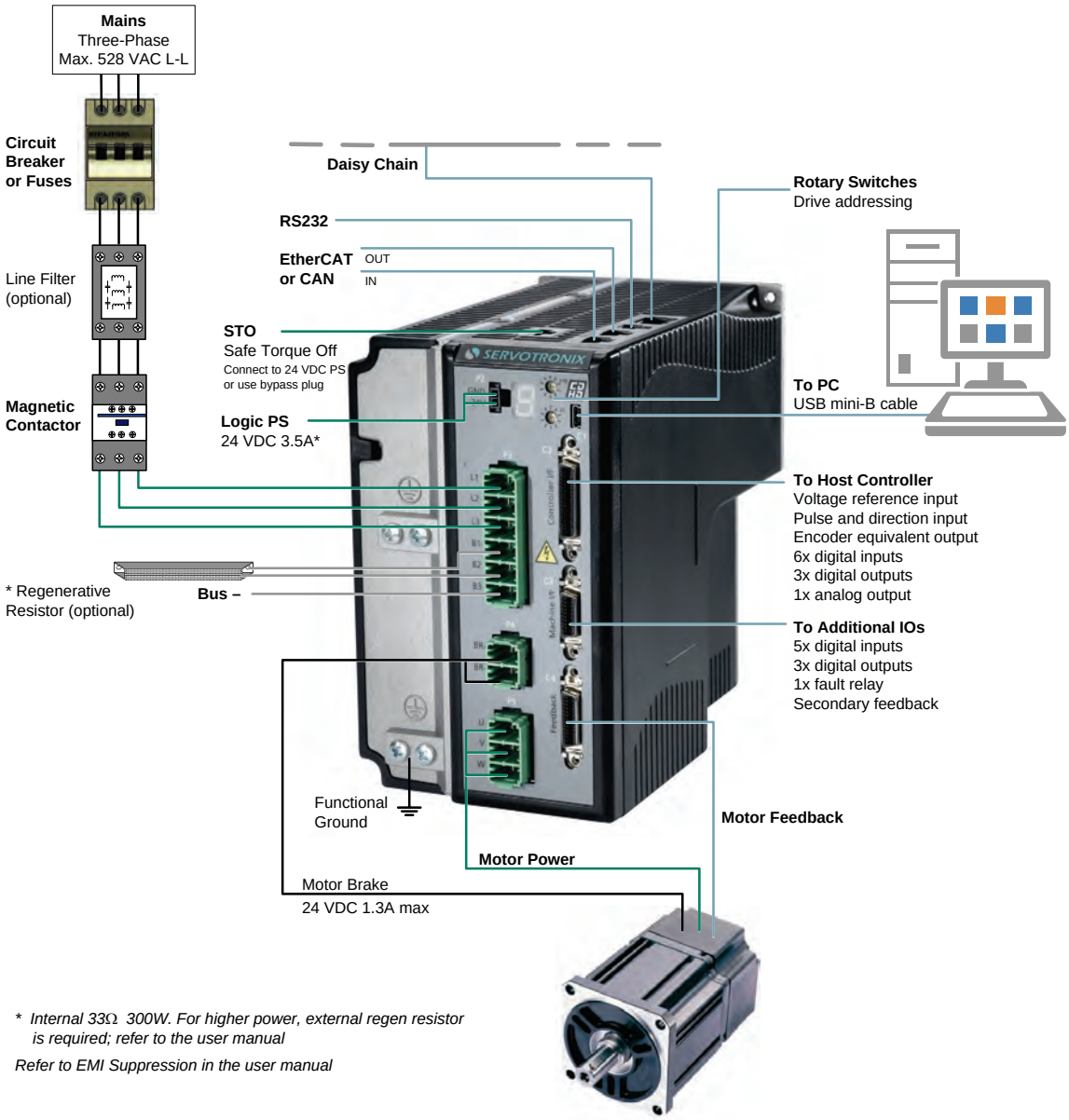
Mating Connector:
PN SPC 5/2-STCL-7,62 (1718481)
(STX PN CONr10000002-16)

STX	*Servotronix*
Highlighted PN	*Supplied with CDHD-PB*

Crimping tool	Molex 0638190000 (P1, C3, C4) or equivalent

Pin Assignments on CDHD-020/CDHD-024 – Power Block (120/240 VAC)

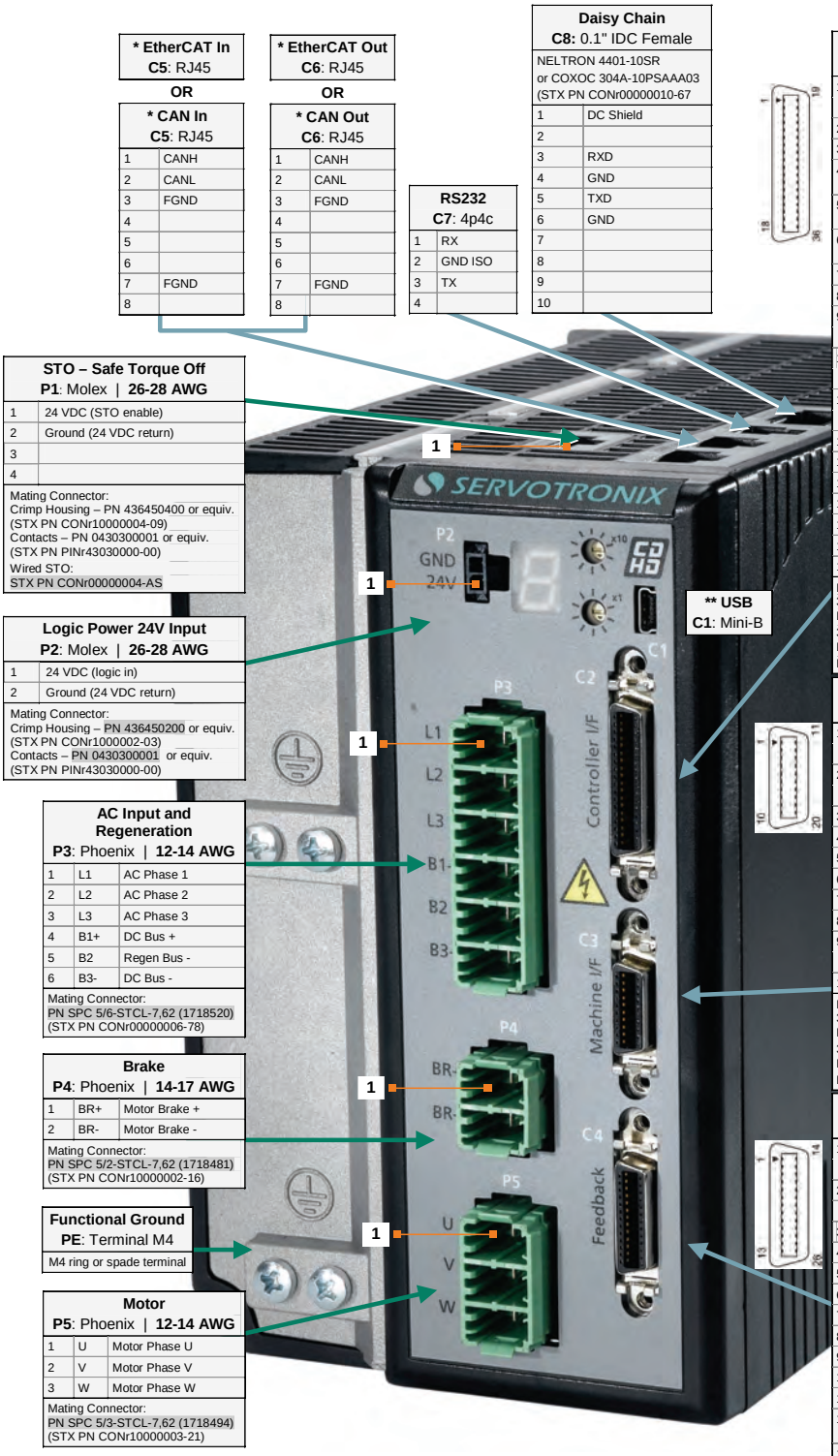
CDHD-003/CDHD-006 (400/480 VAC)



** Internal 33Ω 300W. For higher power, external regen resistor is required; refer to the user manual*

Refer to EMI Suppression in the user manual

Servo System Wiring, 3-Phase – CDHD-003/CDHD-006– AP/AF/EC Models (400/480 VAC)



*** EtherCAT In**
C5: RJ45

OR

*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45

OR

*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
3M Solder Plug Connector
PN 10136-3000PE (STX PN CONr00000036-01) or equiv.
3M Solder Plug Junction Shell
PN 10336-52F0-008 (STX PN HODr00000036-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-36-0x, x=1|2|3 meter)

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Logic Power 24V Input
P2: Molex | **26-28 AWG**

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
Crimp Housing – PN 436450200 or equiv.
(STX PN CONr1000002-03)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)

**** USB**
C1: Mini-B

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
3M Solder Plug Connector
PN 10120-3000PE (STX PN CONr00000020-38) or equiv.
3M Solder Plug Junction Shell
PN 10320-52F0-008 (STX PN HODr00000020-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-20-0x, x=1|2|3 meter)

AC Input and Regeneration
P3: Phoenix | **12-14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
PN SPC 5/6-STCL-7,62 (1718520)
(STX PN CONr00000006-78)

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
3M Solder Plug Connector
PN 10126-3000PE (STX PN CONr00000026-31) or equiv.
3M Solder Plug Junction Shell
PN 10326-52F0-008 (STX PN HODr00000026-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-26-0x, x=1|2|3 meter)

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
PN SPC 5/2-STCL-7,62 (1718481)
(STX PN CONr10000002-16)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor
P5: Phoenix | **12-14 AWG**

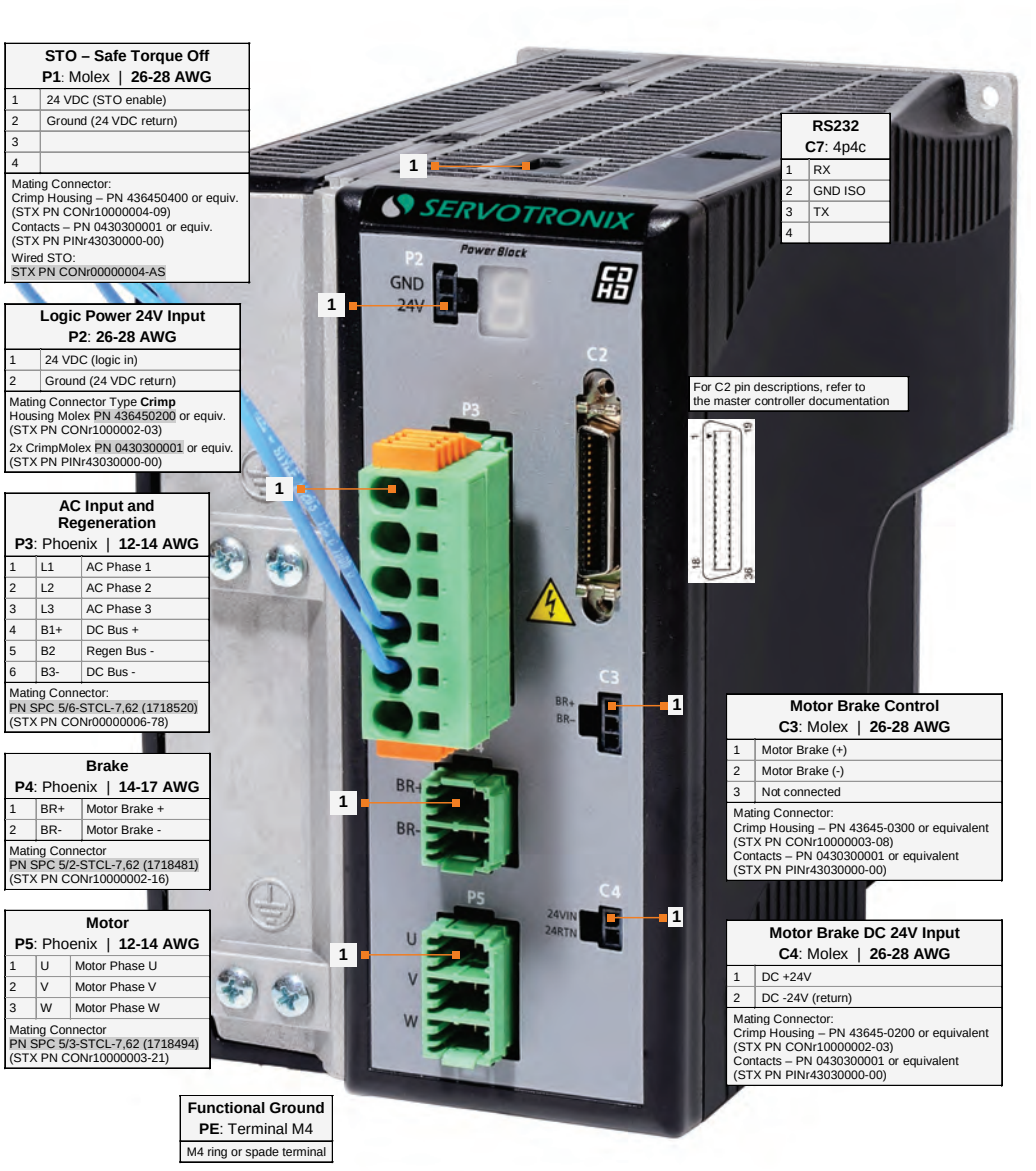
1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

*	*Refer to ordering information*
**	*CAN and EtherCAT models only*
***	*EtherCAT models only*
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD*

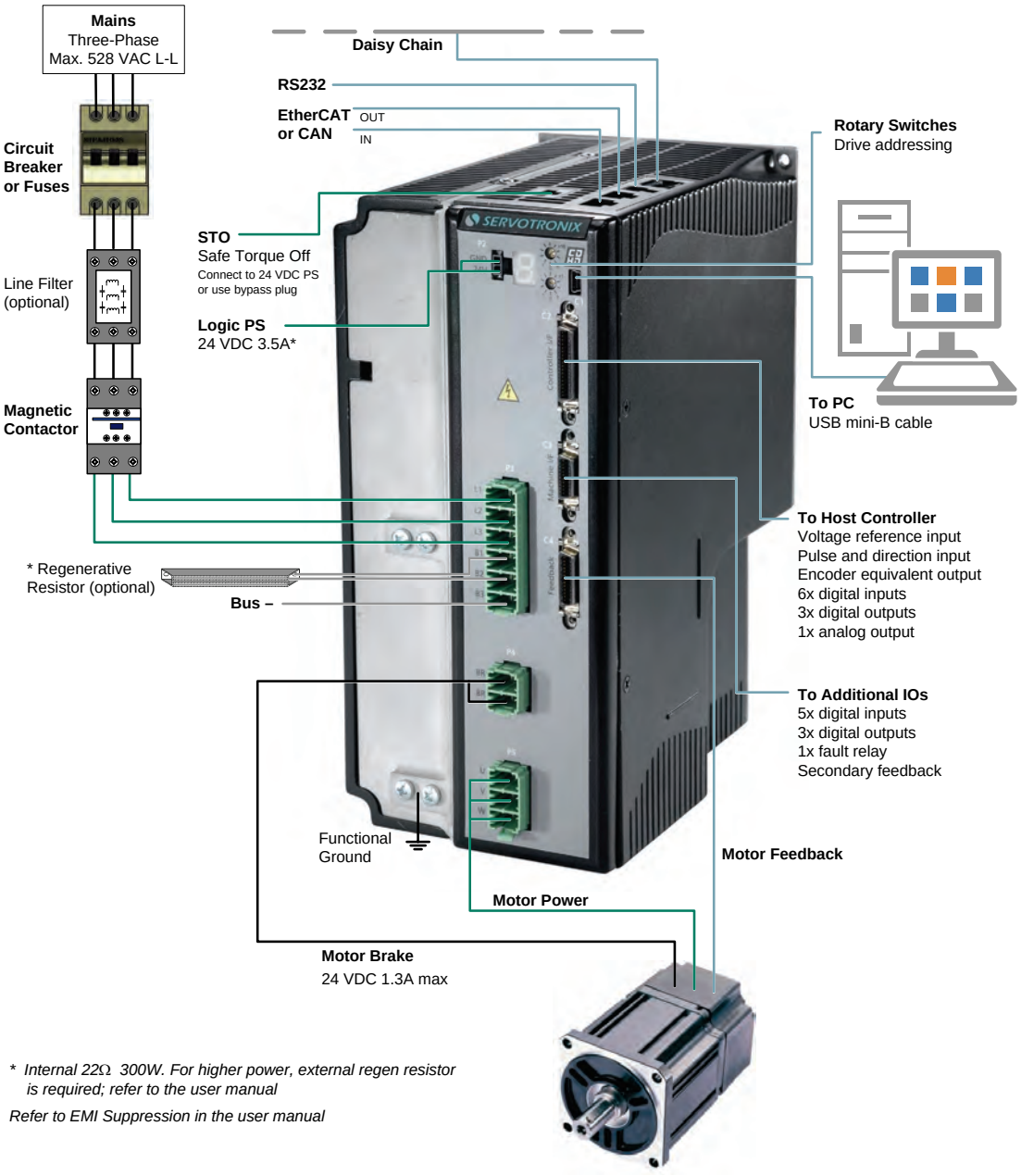
Crimping tool	Molex 0638190000 (P1, P2) or equivalent
4/40 insert threads on C2, C3, C4	

Pin Assignments on CDHD-003/CDHD-006 – AP/AF/EC Models (400/480 VAC)

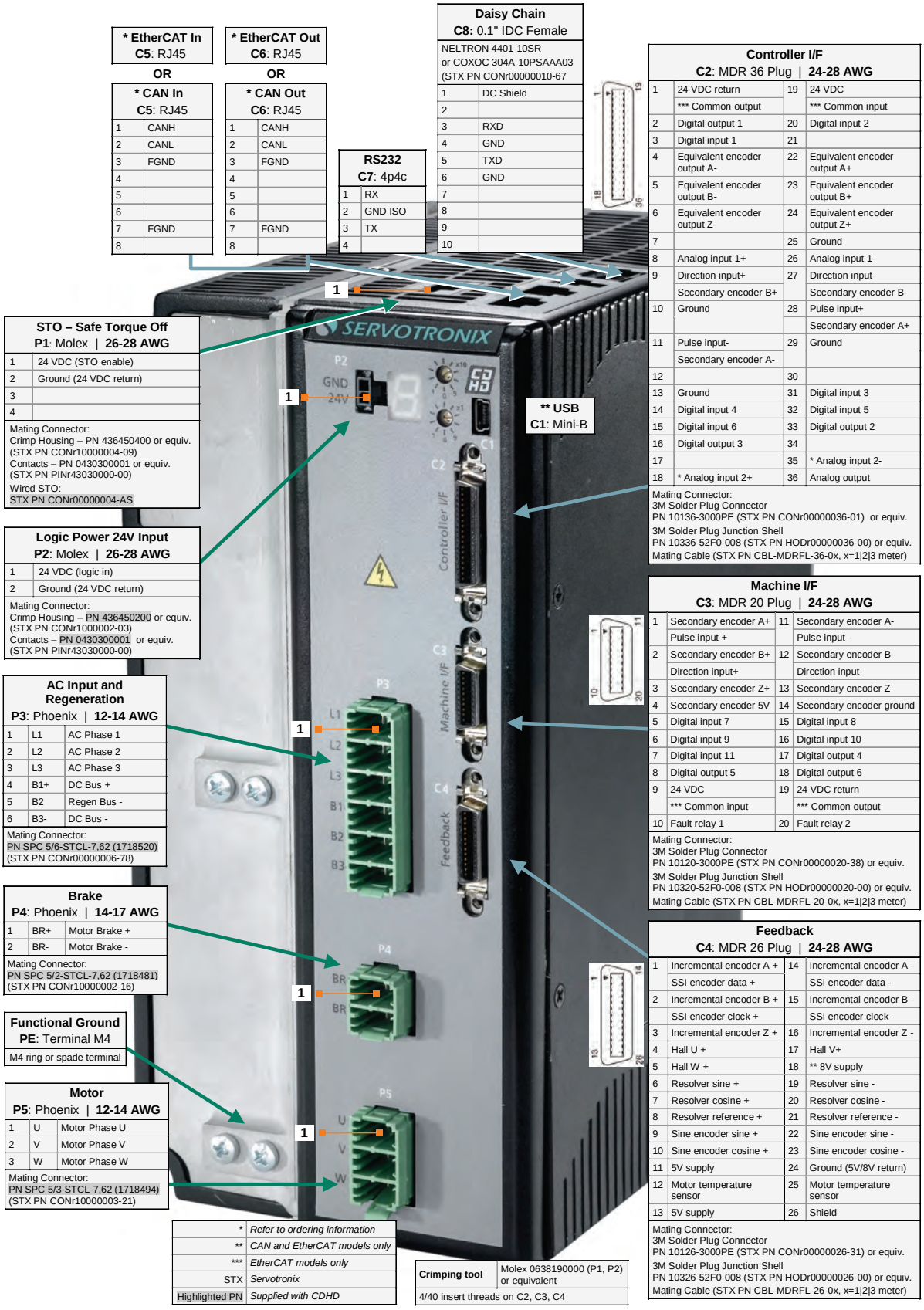


Pin Assignments on CDHD-003/CDHD-006 – Power Block (400/480 VAC)

CDHD-012 (400/480 VAC)



Servo System Wiring, 3-Phase – CDHD-012 (400/480 VAC)



*** EtherCAT In**
C5: RJ45

OR

*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45

OR

*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

**** USB**
C1: Mini-B

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

Logic Power 24V Input
P2: Molex | **26-28 AWG**

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector:
Crimp Housing – PN 436450200 or equiv.
(STX PN CONr1000002-03)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)

AC Input and Regeneration
P3: Phoenix | **12-14 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
PN SPC 5/6-STCL-7,62 (1718520)
(STX PN CONr00000006-78)

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector:
PN SPC 5/2-STCL-7,62 (1718481)
(STX PN CONr10000002-16)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor
P5: Phoenix | **12-14 AWG**

1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
3M Solder Plug Connector
PN 10136-3000PE (STX PN CONr00000036-01) or equiv.
3M Solder Plug Junction Shell
PN 10336-52F0-008 (STX PN HODr00000036-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-36-0x, x=1|2|3 meter)

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
3M Solder Plug Connector
PN 10120-3000PE (STX PN CONr00000020-38) or equiv.
3M Solder Plug Junction Shell
PN 10320-52F0-008 (STX PN HODr00000020-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-20-0x, x=1|2|3 meter)

Feedback
C4: MDR 26 Plug | **24-28 AWG**

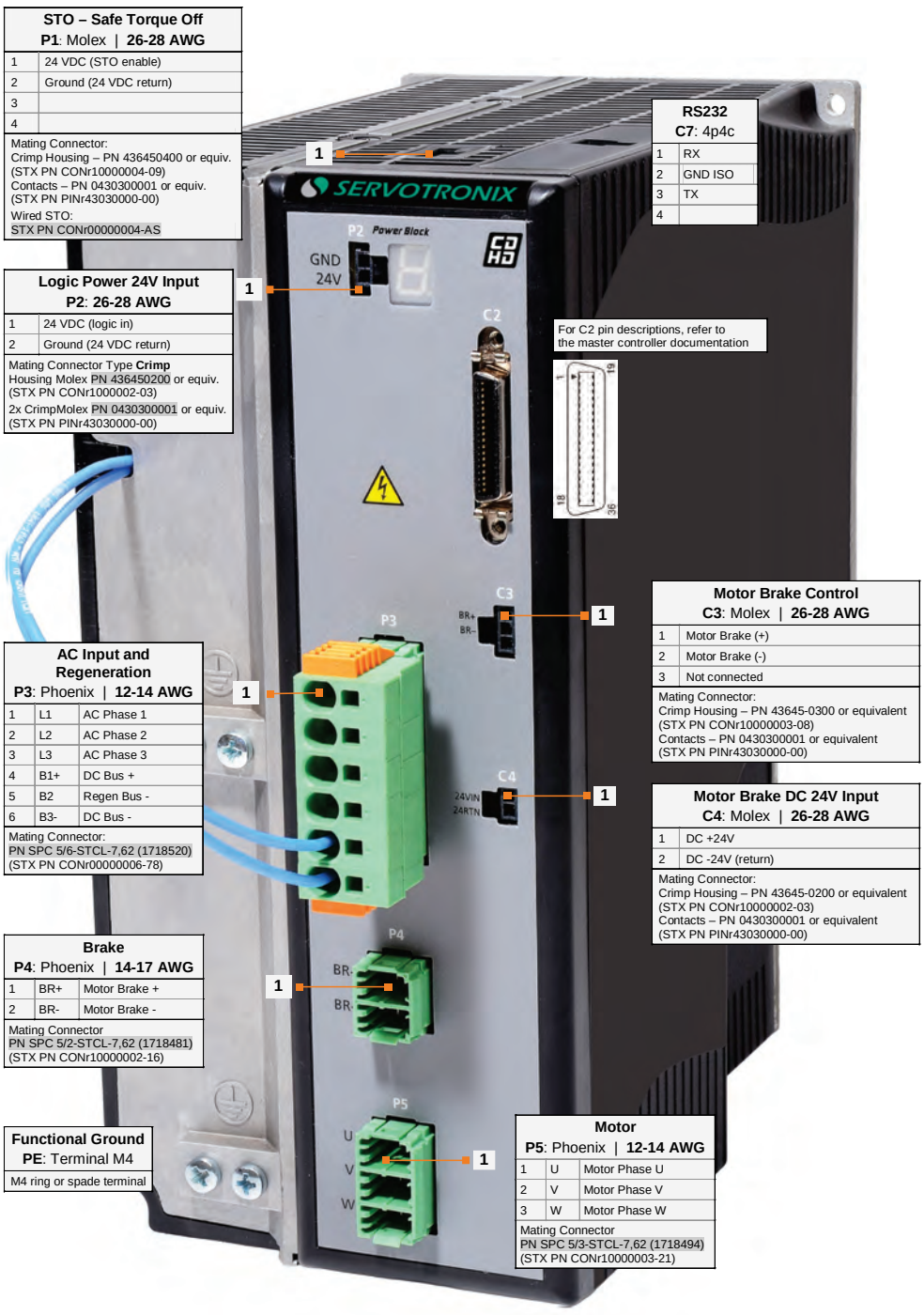
1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
3M Solder Plug Connector
PN 10126-3000PE (STX PN CONr00000026-31) or equiv.
3M Solder Plug Junction Shell
PN 10326-52F0-008 (STX PN HODr00000026-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-26-0x, x=1|2|3 meter)

*	*Refer to ordering information*
**	*CAN and EtherCAT models only*
***	*EtherCAT models only*
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD*

Crimping tool	Molex 0638190000 (P1, P2) or equivalent
4/40 insert threads on C2, C3, C4	

Pin Assignments on CDHD-012 – AP/AF/EC Models (400/480 VAC)

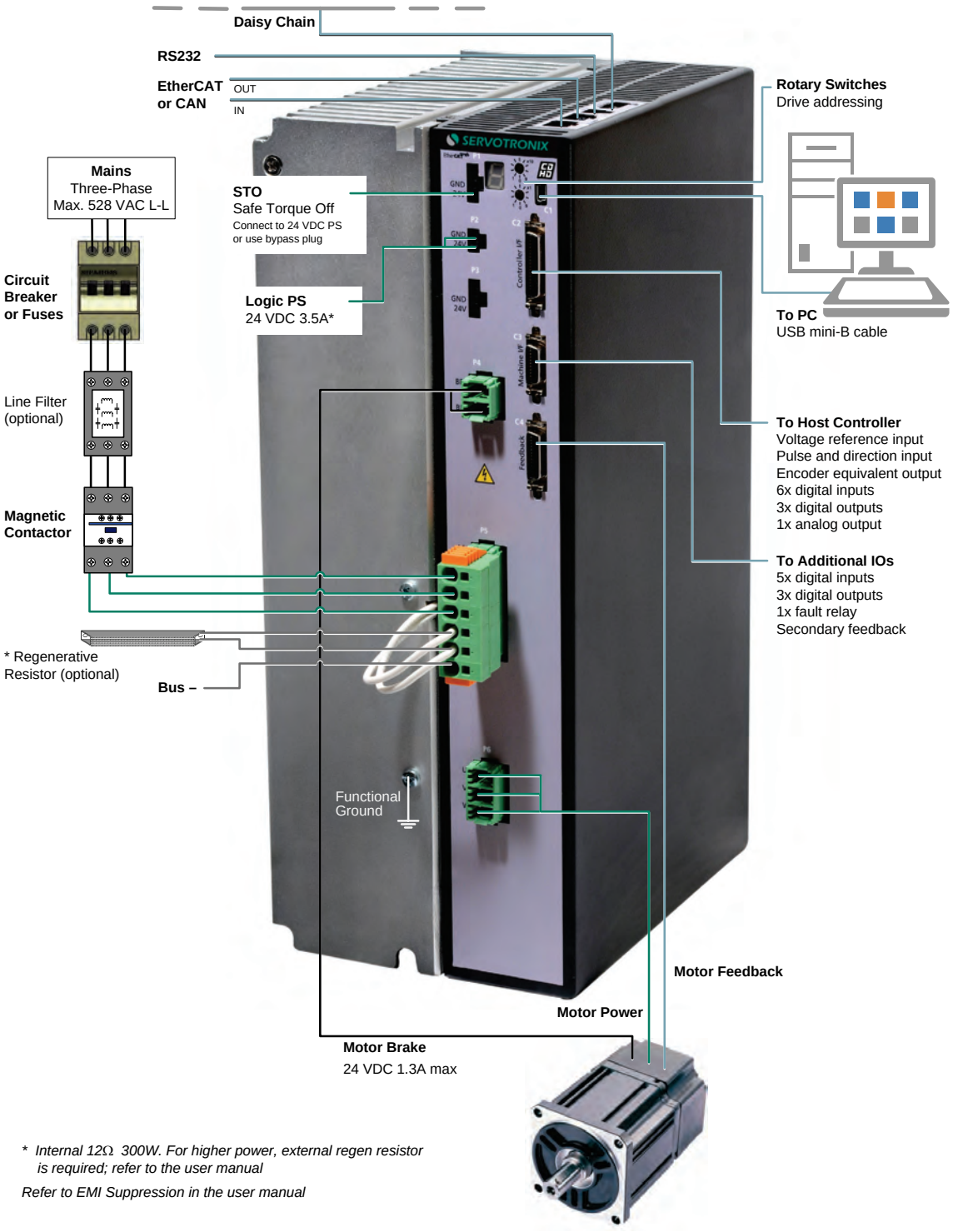


STX	*Servotronix*
Highlighted PN	*Supplied with CDHD-PB*

Crimping tool	Molex 0638190000 (P1, P2, C3, C4) or equivalent

Pin Assignments on CDHD-012 – Power Block (400/480 VAC)

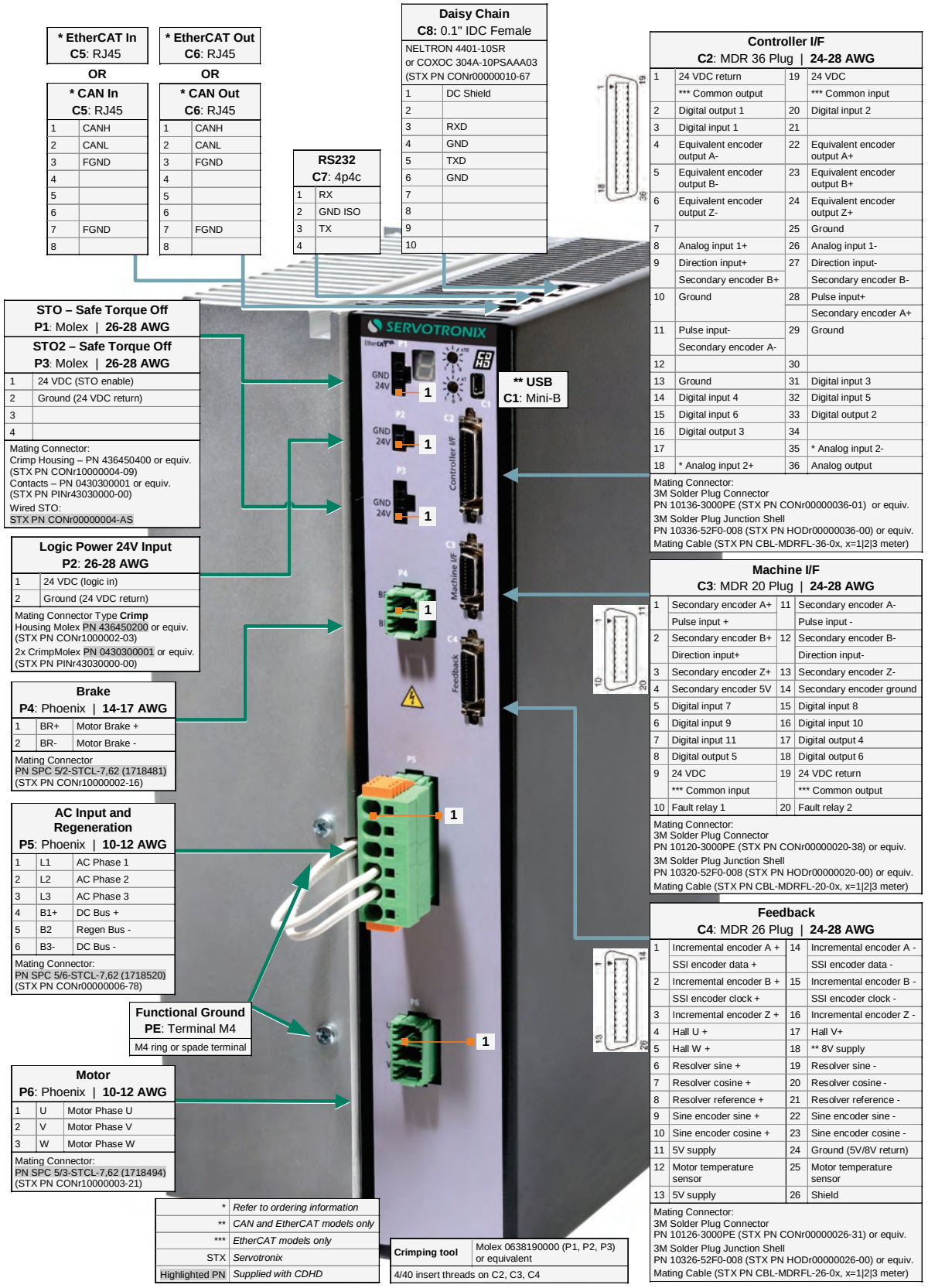
CDHD-024/CDHD-030 (400/480 VAC)



* *Internal 12Ω 300W. For higher power, external regen resistor is required; refer to the user manual*

Refer to EMI Suppression in the user manual

Servo System Wiring, 3-Phase – CDHD-024/CDHD-030 (400/480 VAC)



*** EtherCAT In**
C5: RJ45

OR

*** CAN In**
C5: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

*** EtherCAT Out**
C6: RJ45

OR

*** CAN Out**
C6: RJ45

1	CANH
2	CANL
3	FGND
4	
5	
6	
7	FGND
8	

RS232
C7: 4p4c

1	RX
2	GND ISO
3	TX
4	

Daisy Chain
C8: 0.1" IDC Female

NELTRON 4401-10SR
or COXOC 304A-10PSAAA03
(STX PN CONr00000010-67

1	DC Shield
2	
3	RXD
4	GND
5	TXD
6	GND
7	
8	
9	
10	

Controller I/F
C2: MDR 36 Plug | **24-28 AWG**

1	24 VDC return	19	24 VDC
	*** Common output		*** Common input
2	Digital output 1	20	Digital input 2
3	Digital input 1	21	
4	Equivalent encoder output A-	22	Equivalent encoder output A+
5	Equivalent encoder output B-	23	Equivalent encoder output B+
6	Equivalent encoder output Z-	24	Equivalent encoder output Z+
7		25	Ground
8	Analog input 1+	26	Analog input 1-
9	Direction input+	27	Direction input-
	Secondary encoder B+		Secondary encoder B-
10	Ground	28	Pulse input+
			Secondary encoder A+
11	Pulse input-	29	Ground
	Secondary encoder A-		
12		30	
13	Ground	31	Digital input 3
14	Digital input 4	32	Digital input 5
15	Digital input 6	33	Digital output 2
16	Digital output 3	34	
17		35	* Analog input 2-
18	* Analog input 2+	36	Analog output

Mating Connector:
3M Solder Plug Connector
PN 10136-3000PE (STX PN CONr00000036-01) or equiv.
3M Solder Plug Junction Shell
PN 10336-52F0-008 (STX PN HODr00000036-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-36-0x, x=1|2|3 meter)

STO – Safe Torque Off
P1: Molex | **26-28 AWG**

STO2 – Safe Torque Off
P3: Molex | **26-28 AWG**

1	24 VDC (STO enable)
2	Ground (24 VDC return)
3	
4	

Mating Connector:
Crimp Housing – PN 436450400 or equiv.
(STX PN CONr10000004-09)
Contacts – PN 0430300001 or equiv.
(STX PN PINr43030000-00)
Wired STO:
STX PN CONr00000004-AS

**** USB**
C1: Mini-B

Logic Power 24V Input
P2: 26-28 AWG

1	24 VDC (logic in)
2	Ground (24 VDC return)

Mating Connector Type **Crimp**
Housing Molex PN 436450200 or equiv.
(STX PN CONr1000002-03)
2x CrimpMolex PN 0430300001 or equiv.
(STX PN PINr43030000-00)

Machine I/F
C3: MDR 20 Plug | **24-28 AWG**

1	Secondary encoder A+	11	Secondary encoder A-
	Pulse input +		Pulse input -
2	Secondary encoder B+	12	Secondary encoder B-
	Direction input+		Direction input-
3	Secondary encoder Z+	13	Secondary encoder Z-
4	Secondary encoder 5V	14	Secondary encoder ground
5	Digital input 7	15	Digital input 8
6	Digital input 9	16	Digital input 10
7	Digital input 11	17	Digital output 4
8	Digital output 5	18	Digital output 6
9	24 VDC	19	24 VDC return
	*** Common input		*** Common output
10	Fault relay 1	20	Fault relay 2

Mating Connector:
3M Solder Plug Connector
PN 10120-3000PE (STX PN CONr00000020-38) or equiv.
3M Solder Plug Junction Shell
PN 10320-52F0-008 (STX PN HODr00000020-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-20-0x, x=1|2|3 meter)

Brake
P4: Phoenix | **14-17 AWG**

1	BR+	Motor Brake +
2	BR-	Motor Brake -

Mating Connector
PN SPC 5/2-STCL-7,62 (1718481)
(STX PN CONr10000002-16)

Feedback
C4: MDR 26 Plug | **24-28 AWG**

1	Incremental encoder A +	14	Incremental encoder A -
	SSI encoder data +		SSI encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	SSI encoder clock +		SSI encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Mating Connector:
3M Solder Plug Connector
PN 10126-3000PE (STX PN CONr00000026-31) or equiv.
3M Solder Plug Junction Shell
PN 10326-52F0-008 (STX PN HODr00000026-00) or equiv.
Mating Cable (STX PN CBL-MDRFL-26-0x, x=1|2|3 meter)

AC Input and Regeneration
P5: Phoenix | **10-12 AWG**

1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus -
6	B3-	DC Bus -

Mating Connector:
PN SPC 5/6-STCL-7,62 (1718520)
(STX PN CONr00000006-78)

Functional Ground
PE: Terminal M4

M4 ring or spade terminal

Motor
P6: Phoenix | **10-12 AWG**

1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

Mating Connector:
PN SPC 5/3-STCL-7,62 (1718494)
(STX PN CONr10000003-21)

*	*Refer to ordering information*
**	*CAN and EtherCAT models only*
***	*EtherCAT models only*
STX	*Servotronix*
Highlighted PN	*Supplied with CDHD*

Crimping tool	Molex 0638190000 (P1, P2, P3) or equivalent
4/40 insert threads on C2, C3, C4	

Pin Assignments on CDHD-024/CDHD-030 – AP/AF/EC Models (400/480 VAC)

2 Control Board - AP/AF/EC

Overview

The control board has the same interfaces on all CDHD AP/AF/EC models:

- USB Communication – C1 (*Exception*: AP models do not have a USB port.)
- Controller I/Os – C2
- Machine I/Os – C3
- Motor Feedback – C4
- Fieldbus Devices (optional) – C5 and C6
- RS232 Communication – C7
- Daisy Chain – C8
- Drive Address Rotary Switches

Controller I/Os – C2

Controller I/Os are connected through interface **C2** on all CDHD AP/AF/EC models.

Wire the digital and analog inputs and outputs according to the requirements of your application.

Unused pins must remain unwired.

To preserve isolation of the digital I/Os, connect a 24 VDC source to pin 19. Connect the return of the 24 VDC supply to pin 1, which functions as the ground path for the outputs.

Note: **AP/AF Models:** The 24 VDC supply and return can be connected on either the Controller interface (C2) or the Machine interface (C3), but it is not necessary to connect it on both.

Notes: **EC Models:**

- Common output on the Controller interface (C2) and the Machine interface (C3) are connected internally.
- Common input on the Controller interface (C2) and the Machine interface (C3) are connected internally.
- User can connect outputs as source or sink.
- User can connect inputs as source or sink.
- Refer to the Controller Interface Wiring schematic diagram for **EC Models** below, and the CDHD System Wiring - Pin Assignments diagram for **EC Models** at the end of this manual.

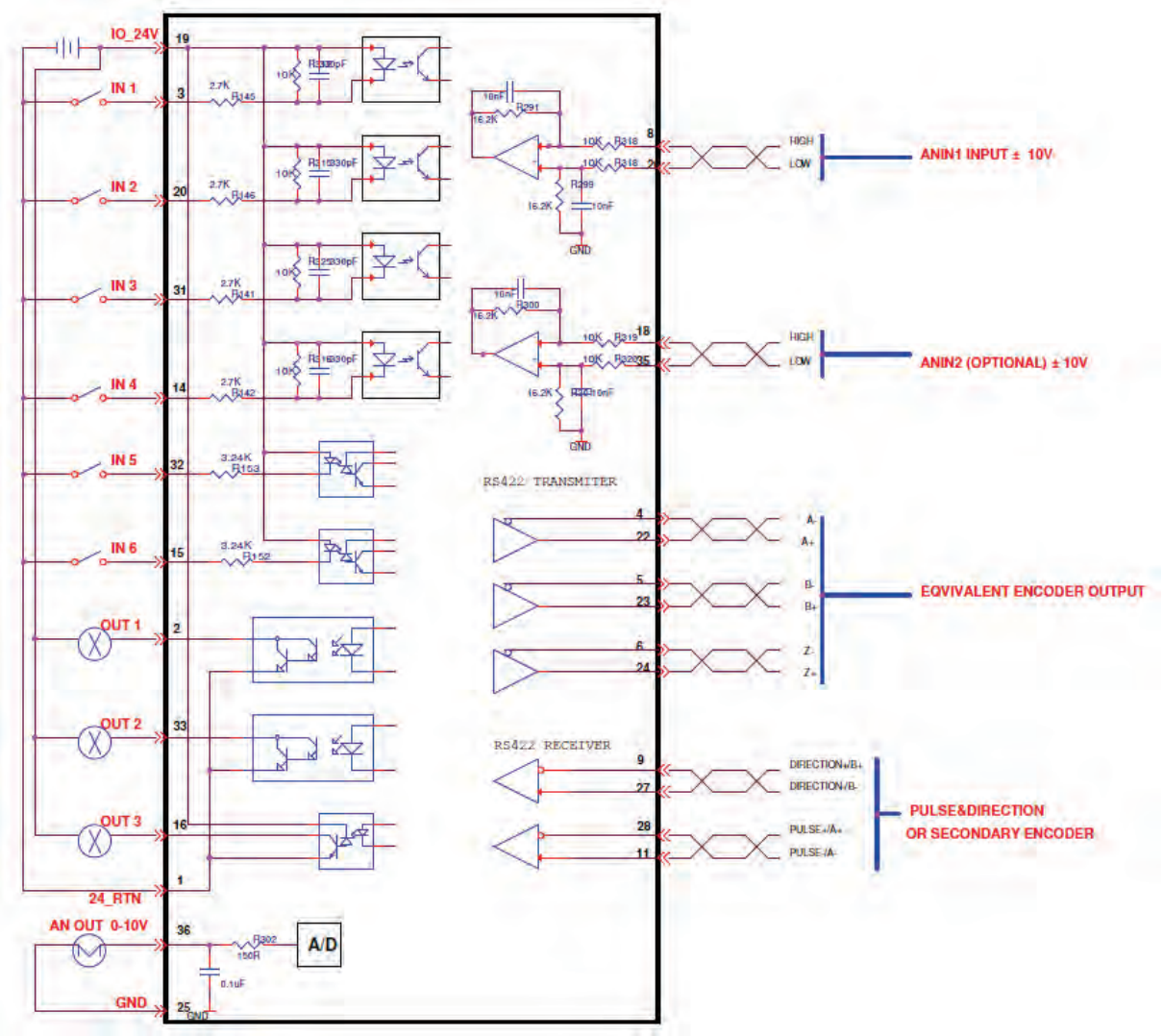
Controller I/O Interface

Pin	Function	Description	Pin	Function	Description
1	24 VDC return	AP/AF Models: Return of the user-supplied 24 VDC	19	24 VDC	AP/AF Models: User supplied 24V, for I/O biasing
	Common output	EC Models		Common input	EC Models
2	Digital output 1	Opto-isolated programmable digital output. Read using OUT1	20	Digital input 2	Opto-isolated programmable digital input. Read using IN2
3	Digital input 1	Opto-isolated programmable digital input. Read using IN1	21		
4	Equivalent encoder output A-	Low side of the equivalent encoder output signal A (RS422)	22	Equivalent encoder output A+	High side of the equivalent encoder output signal A (RS422)
5	Equivalent encoder output B-	Low side of the equivalent encoder output signal B (RS422)	23	Equivalent encoder output B+	High side of the equivalent encoder output signal B (RS422)
6	Equivalent encoder output Z-	Low side of the equivalent encoder output index (RS422)	24	Equivalent encoder output Z+	High side of the equivalent encoder output index (RS422)
7			25	Ground	Digital ground
8	Analog input 1+	High side of the differential analog command input (±10 VDC)	26	Analog input 1-	Low side of the differential analog command input (±10 VDC)
9	Direction input+	High side of the direction signal (RS422), or High side of the down count signal	27	Direction input-	Low side of the direction signal (RS422), or Low side of the down count signal
	Secondary encoder B+	High side of the Secondary encoder input signal B (RS422)		Secondary encoder B-	Low side of the secondary encoder input signal B (RS422)
10	Ground	Digital ground	28	Pulse input+	High side of the pulse signal (RS422), or High side of the master encoder signal A, or High side of the up count signal
				Secondary encoder A+	High side of the secondary encoder input signal A (RS422)

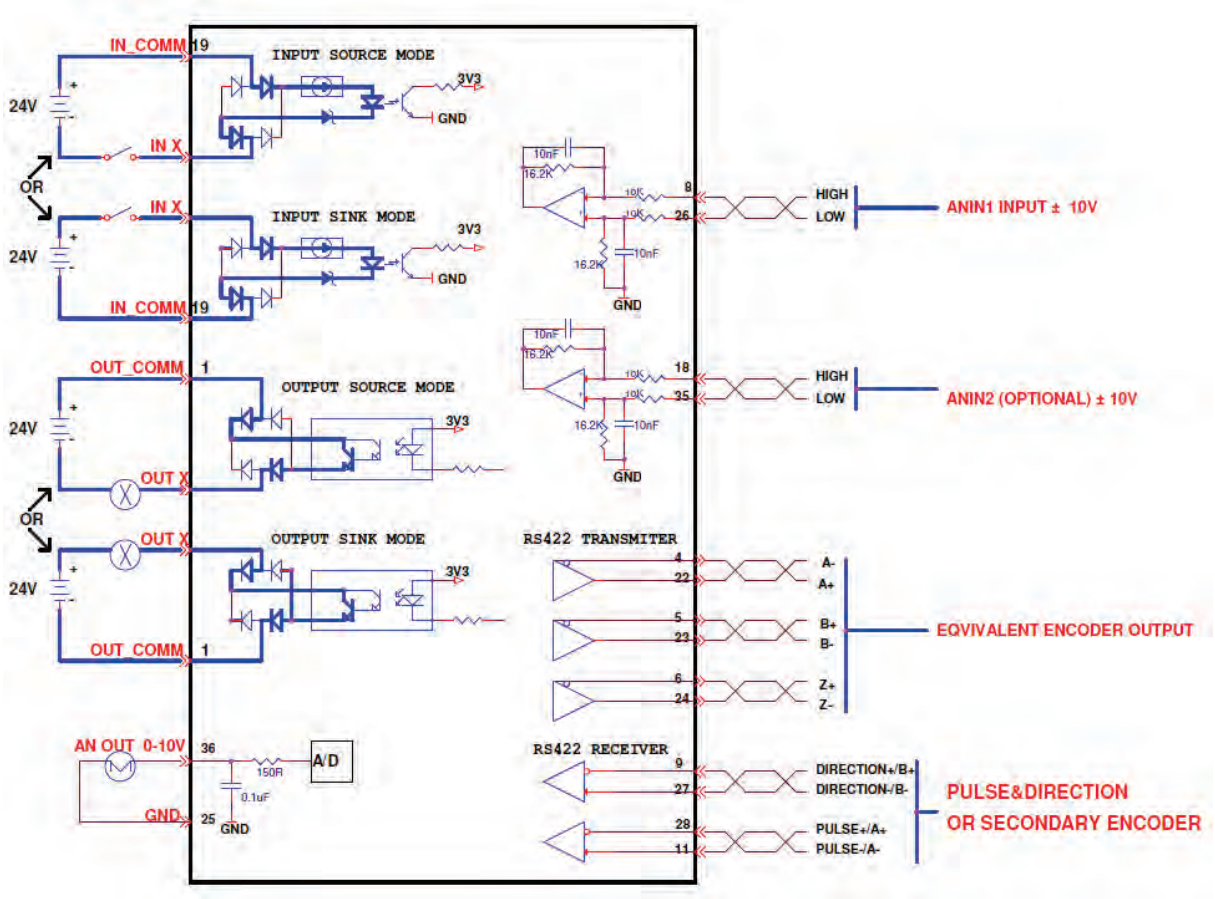
Pin	Function	Description	Pin	Function	Description
11	Pulse input-	Low side of the pulse signal (RS422), or Low side of the master encoder signal A, or Low side of the up count signal	29	Ground	Digital ground
	Secondary encoder A-	Low side of the secondary encoder input signal A (RS422)			
12			30		
13	Ground	Digital ground	31	Digital input 3	Opto-isolated programmable digital input. Read using IN3
14	Digital input 4	Opto-isolated programmable digital input. Read using IN4	32	Digital input 5	Fast opto-isolated programmable digital input. Read using IN5
15	Digital input 6	Fast opto-isolated programmable digital input. Read using IN6	33	Digital output 2	Opto-isolated programmable digital output. Read using OUT2
16	Digital output 3	Fast opto-isolated programmable digital output. Read using OUT3	34		
17			35*	Analog input 2-	Low side of the second differential analog input (±10 VDC)
18*	Analog input 2+	High side of the second differential analog input (±10 VDC)	36	Analog output	Analog output, referenced to digital ground (0-10 VDC)

** Optional, see ordering information*

Controller Interface Wiring



Controller Interface Wiring – AP/AF Models



Controller Interface Wiring – EC Models

Machine I/Os – C3

Machine I/Os are connected through interface **C3** on all CDHD models.

Wire the machine inputs and outputs according to the requirements of your application.

Unused pins must remain unwired.

To preserve isolation of the digital I/Os, connect a 24 VDC source to pin 9. Connect the return of the 24 VDC supply to pin 19, which functions as the ground path for the outputs.

Note: **AP/AF Models:** The 24 VDC supply and return can be connected on either the Controller interface (C2) or the Machine interface (C3), but it is not necessary to connect it to both.

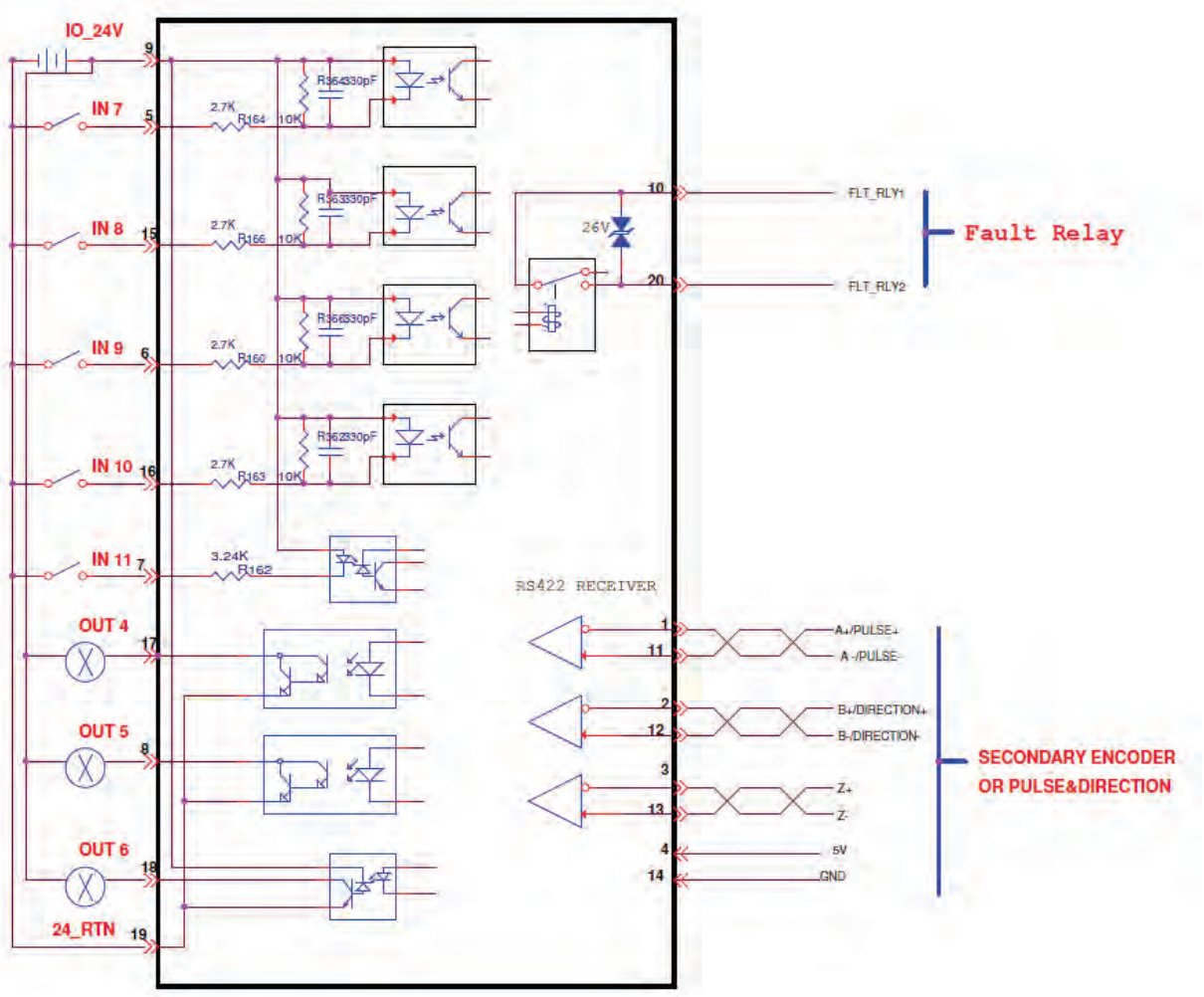
Notes: **EC Models:**

- Common output on the Controller interface (C2) and the Machine interface (C3) are connected internally.
- Common input on the Controller interface (C2) and the Machine interface (C3) are connected internally.
- User can connect outputs as source or sink.
- User can connect inputs as source or sink.
- Refer to the Machine Interface Wiring schematic diagram for **EC Models** below, and the CDHD System Wiring - Pin Assignments diagram for **EC Models** at the end of this manual.

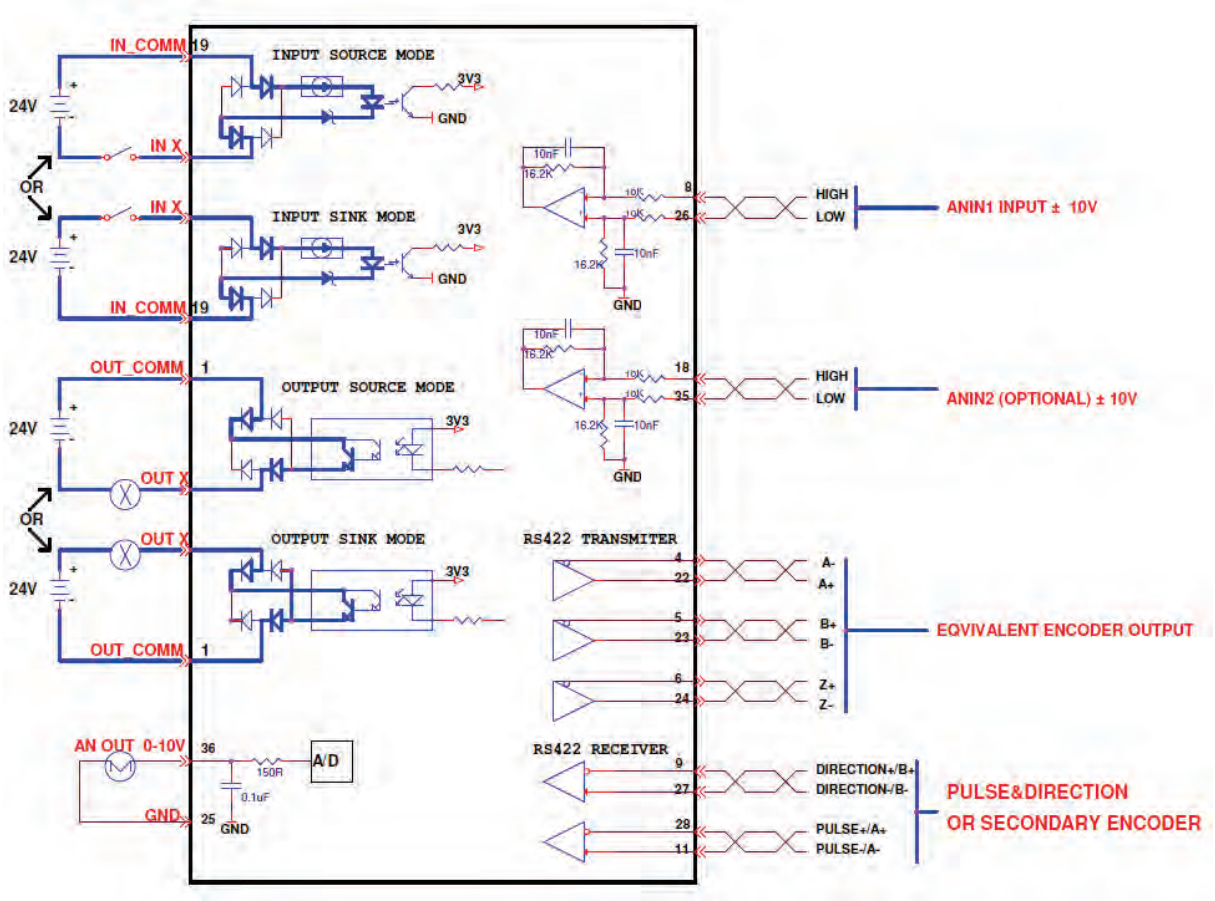
Machine I/O Interface

Pin	Function	Description	Pin	Function	Description
1	Secondary encoder A+	High side of the secondary encoder input signal A (RS422)	11	Secondary encoder A-	Low side of the secondary encoder input signal A (RS422)
	Pulse input+	High side of the pulse signal		Pulse input-	Low side of the pulse signal
2	Secondary encoder B+	High side of the Secondary encoder input signal B (RS422)	12	Secondary encoder B-	Low side of the secondary encoder input signal B (RS422)
	Direction input+	High side of the direction signal		Direction input-	Low side of the direction signal
3	Secondary encoder Z+	High side of the secondary encoder input index (RS422)	13	Secondary encoder Z-	Low side of the secondary encoder input index (RS422)
4	Secondary encoder 5V	5 VDC supply for the secondary encoder	14	Secondary encoder ground	Ground of the 5 VDC supply for the secondary encoder.
5	Digital input 7	Opto-isolated programmable digital input. Read using IN7	15	Digital input 8	Opto-isolated programmable digital input. Read using IN8
6	Digital input 9	Opto-isolated programmable digital input. Read using IN9	16	Digital input 10	Opto-isolated programmable digital input. Read using IN10
7	Digital input 11	Fast opto-isolated programmable digital input. Read using IN11	17	Digital output 4	Opto-isolated programmable digital output. Read using OUT4
8	Digital output 5	Opto-isolated programmable digital output. Read using OUT5	18	Digital output 6	Fast opto-isolated programmable digital output. Read using OUT6
9	24 VDC	AP/AF Models: User supplied 24V, for I/O biasing	19	24 VDC return	AP/AF Models: Return of the user-supplied 24 VDC
	Common input	EC Models		Common output	EC Models
10	Fault relay 1	Terminal 1 of the dry contact fault relay	20	Fault relay 2	Terminal 2 of the dry contact fault relay

Machine Interface Wiring



Machine Interface Wiring – AP/AF Models



Machine Interface Wiring – EC Models

Motor Feedback – C4

Motor Feedback uses interface **C4** on all CDHD models.

Wire the motor feedback interface according to the type of feedback device to be used in your application. Refer to the guidelines following the pinout table below.

Pins 1, 2, 14 and 15 have dual functionality.

Pin 25 for the motor temperature sensor is connected internally in the drive to CDHD ground.

Unused pins must remain unwired.

Notes about serial communication encoders, such as Tamagawa and Nikon:

Serial encoder data is bidirectional.

Serial encoder clock is only output.

The low-voltage indication comes directly from the encoder, and the drive has not means to verify battery voltage.

Motor Feedback Interface

Pin	Function	Pin	Function
1	Incremental encoder A +	14	Incremental encoder A -
	Serial encoder data +		Serial encoder data -
2	Incremental encoder B +	15	Incremental encoder B -
	Serial encoder clock +		Serial encoder clock -
3	Incremental encoder Z +	16	Incremental encoder Z -
4	Hall U +	17	Hall V+
5	Hall W +	18	**AF/EC Models:** 8V supply
6	Resolver sine +	19	Resolver sine -
7	Resolver cosine +	20	Resolver cosine -
8	Resolver reference +	21	Resolver reference -
9	Sine encoder sine +	22	Sine encoder sine -
10	Sine encoder cosine +	23	Sine encoder cosine -
11	5V supply	24	Ground (5V/8V return)
12	Motor temperature sensor	25	Motor temperature sensor
13	5V supply	26	Shield

Feedback Wiring Guidelines

The following tables present suggestions for the most common feedback variations. If you need additional information or your motor feedback does not match any one of the following, contact technical support.

The tables present the wiring pin layout. Use the **User Motor Pin#** column in these tables to record the pin numbers of your specific motor for future reference.

Notes for Wiring Tables

A If the motor does not support a temperature sensor, do not connect pins 12 and 25.

B The motor temperature is available on the serial data; there is no need for pins 12 and 25.

C Halls are single-ended signals. To use differential Hall signals, refer to the relevant wiring tables.

D Incremental encoders with Hall sensors and index pulse.
A, B and Z signals use the same wiring as Hall sensors U, V, and W.
On power up, feedback briefly sends Hall readings, and then continuously sends the A, B and Z signals.

E On every power up, the phase find procedure must be executed.

F Encoder backup battery is external to the CDHD drive. Voltage must be more than 3.6 VDC. Suggested battery is lithium 3.6V, 1000mAh.
Use the backup battery recommended by the encoder manufacturer.

G To use differential Halls with A quad B and index, connect the Halls to the Machine interface as follows:
Hall U+ to Machine I/F pin 1, Hall U- to Machine I/F pin 11.
Hall V+ to Machine I/F pin 2, Hall V- to Machine I/F pin 12.
Hall W+ to Machine I/F pin 3, Hall W- to Machine I/F pin 13.
Connect the encoder A, B, I, and power supply to the Motor Feedback connector.

H An 8V option is available only for CDHD AF and EC models.

Use the **Motor Setup** procedure and the **Feedback** screens to define motor feedback type, resolution, and other parameters.

1. Feedback Wiring – Resolver

Pin #	Twisted Pair	User Motor Pin#	Signal Description
6	Twisted Pair		Resolver Sine +
19			Resolver Sine -
7	Twisted Pair		Resolver Cosine +
20			Resolver Cosine -
8	Twisted Pair		Resolver Reference +
21			Resolver Reference -
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
24	Ground		Optional: Internal shield of each twisted pair (sine, cosine, reference)
26			Cable Shield

Note: **A**

2. Feedback Wiring - Incremental Encoder A Quad B, Index Pulse and Halls

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Incremental Encoder A+
14			Incremental Encoder A-
2	Twisted Pair		Incremental Encoder B+
15			Incremental Encoder B-
3	Twisted Pair		Incremental Encoder Z+
16			Incremental Encoder Z-
4			Hall U
17			Hall V
5			Hall W
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Notes: **A, C**

3. Feedback Wiring – Single-Ended Halls Only

Pin #	Twisted Pair	User Motor Pin#	Signal Description
4			Hall U
17			Hall V
5			Hall W
11			+5 VDC
24			0 VDC
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
26			Shield

Notes: **A, C**

4. Feedback Wiring - Incremental Encoder A Quad B, Index Pulse and Differential Halls

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Incremental Encoder A+
14			Incremental Encoder A-
2	Twisted Pair		Incremental Encoder B+
15			Incremental Encoder B-
9			Hall U+
22			Hall U-
10			Hall V+
23			Hall V-
3			Hall W+
16			Hall W-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Notes: **A, G**

5. Feedback Wiring –Differential Halls Only

Pin #	Twisted Pair	User Motor Pin#	Signal Description
9			Hall U+
22			Hall U-
10			Hall V+
23			Hall V-
3			Hall W+
16			Hall W-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Notes: **A**

6. Feedback Wiring - Incremental Tamagawa

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Incremental Encoder A+ / Hall U+
14			Incremental Encoder A- / Hall U-
2	Twisted Pair		Incremental Encoder B+ / Hall V+
15			Incremental Encoder B- / Hall V-
3	Twisted Pair		Incremental Encoder Z+ / Hall W+
16			Incremental Encoder Z- / Hall W-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Notes: **A, D**

7. Feedback Wiring - Sine Encoder

Pin #	Twisted Pair	User Motor Pin#	Signal Description
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Notes: **A, E**

8. Feedback Wiring - Sine Encoder with Halls

Pin #	Twisted Pair	User Motor Pin#	Signal Description
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
4			Hall U
17			Hall V
5			Hall W
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

9. Feedback Wiring – Sine Encoder with Index

Pin #	Twisted Pair	User Motor Pin#	Signal Description
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
3	Twisted Pair		Sine Encoder Z+
16			Sine Encoder Z-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

10. Feedback Wiring – Sine Encoder with Index and Halls

Pin #	Twisted Pair	User Motor Pin#	Signal Description
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
3	Twisted Pair		Sine Encoder Z+
16			Sine Encoder Z-
4			Hall U
17			Hall V
5			Hall W
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

11. Feedback Wiring – Sick 5V (Hiperface Protocol and Sine Signal)

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

12. Feedback Wiring - Sick 8V (Hiperface Protocol and Sine Signal)

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
18			+8 VDC
24			0 VDC
26			Shield

Note: **A**

13. Feedback Wiring – Heidenhain (EnDat 2.x Communication Only)

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
2	Twisted Pair		Serial Clock +
15			Serial Clock -
12	Twisted Pair		Motor Temperature Sensor
25			Motor Temperature Sensor
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

14. Feedback Wiring – Heidenhain (EnDat 2.x with Sine/Cosine)

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
2	Twisted Pair		Serial Clock +
15			Serial Clock -
9	Twisted Pair		Sine Encoder Sine+
22			Sine Encoder Sine-
10	Twisted Pair		Sine Encoder Cosine+
23			Sine Encoder Cosine-
11			+5 VDC
24			0 VDC
26			Shield

Note: **A**

15. Feedback Wiring - Single Turn: Nikon 17-bit Single Turn | Incremental Tamagawa 17-bit Single Turn

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
11			+5 VDC
24			0 VDC
26			Shield

Notes: **B**

16. Feedback Wiring - Multi-turn: Nikon 17-bit Multi-turn | Tamagawa 17-bit Multi-turn | Sankyo Multi-turn

Pin #	Twisted Pair	User Motor Pin#	Signal Description
1	Twisted Pair		Serial Data +
14			Serial Data -
11			+5 VDC
24			0 VDC
26			Shield
			Battery Voltage
			Battery Ground

Notes: **B, F**

Fieldbus Devices – C5 and C6

All CDHD models have the same RJ45 connectors.

Interfaces **C5** and **C6** are RJ45 ports that serve as transmitter (Tx) and receiver (Rx) for drives operating on CAN or EtherCAT networks.

Refer to the CDHD *CANopen for CAN and EtherCAT Drives Reference Manua*l for details on installation, configuration and operation of drives being used on CAN and EtherCAT networks.

Host Computer – C1, C7

On all CDHD models the drive can be connected to the host computer through either one of the following interfaces:

- **USB port**. The interface is labeled **C1** on all CDHD models (*Exception*: AP models do not have a USB port.)
  Use a USB 2.0 A to Mini-B cable.
- **RS232 port**. The interface is labeled **C7** on all CDHD models.
  Use a 4p4c plug.

RS232 Interface – 4P4C

Pin	Pin Label	Function
1	RX	Receive
2	GND ISO	Ground
3	TX	Transmit
4		Unused

Daisy Chain – C8

The CDHD can be addressed and controlled on a daisy-chained RS-232 line.

In a daisy-chain RS-232 configuration, all drives must be daisy-chained through the **C8** connector. Each drive must have a unique address to enable its identification on the network.

A daisy-chained drive can be assigned an address from 1 to 99 by setting the rotary switches on the drive. When configuring a daisy-chain, address 0 cannot be used.

Daisy Chain Interface

Pin	Function
1	DC Shield
2	Unused
3	RXD
4	GND
5	TXD
6	GND
7-10	Unused

Drive Address Switches

On all CDHD models, two rotary switches are used to set the drive address for both CAN and serial communication. Use a small slotted screwdriver or similar tool to set the switches.

Each switch has 10 positions:

- The upper switch positions are set as tens: 10, 20, 30 … 90
- The lower switch positions are set as ones: 0, 1, 2 … 9

Each drive on the network must have a unique address.

Note: If two or more drives are connected to the network, address 0 cannot be used. A single drive may have the address 0.

3 Control Board – Power Block

The control board has the same interfaces on all CDHD power blocks (both 120/240 VAC and 400/480 VAC):

- Controller I/Os – C2
- Motor Brake Control – C3
- Motor Brake 24 VDC Input – C4
- RS232 Communication – C7

Controller I/Os

The interface is labeled **C2** on all CDHD power blocks.

For C2 pin descriptions, refer to the master controller documentation.

Wire the controller inputs and outputs according to the requirements of your application. Unused pins must remain unwired.

Motor Brake Control

The interface is labeled **C3** on all CDHD power blocks.

Motor Brake Interface

Pin	Pin Label	Function
1	BR+	Motor Brake (+)
2	BR-	Motor Brake (-)
3		Not connected

Motor Brake 24 VDC Input

The interface is labeled **C4** on all CDHD power blocks.

Motor Brake 24 VDC Interface

Pin	Pin Label	Function
1	24VIN	+24V DC
2	24RTN	-24V DC

RS232 Communication

The interface is labeled **C7** on all CDHD power blocks. Use a 4p4c plug.

RS232 Interface

Pin	Pin Label	Function
1	**RX**	Receive
2	**GND ISO**	Ground
3	**TX**	Transmit
4		Unused

4 Power Board 120/240 VAC

Overview

On most CDHD 120/240 VAC models, the power board has the following interfaces:

- STO – P1
- Motor – P2 (P4 on CDHD-020/024)
- Regeneration Resistor – P3 (P5 on CDHD-020/024)
- AC Input Voltage – P3, P4 (P2, P3 on CDHD-020/024)

Make sure the main voltage rating matches the drive specification. Applying incorrect voltage may cause drive failure.

Do not apply power until all hardware connections are complete.

Safe Torque Off (STO) – P1

STO uses interface **P1** on all CDHD 120/240 VAC models.

Safe torque off (STO) is a safety function that prevents the drive from delivering power to the motor, which can generate torque.

STO Enable and STO Return must be connected to enable CDHD operation. The STO Enable signal voltage must be 24 VDC.

Note: If the application does not require STO control, jumper pin 4 to pin 1, and pin 3 to pin 2, to bypass the STO.

STO Interface

Pin	Pin Label	Function
1	24V	STO Enable
2	GND	STO Return
3		24V Return, provided by the drive for use with emergency stop circuit
4		24V Supply, provided by the drive for use with emergency stop circuit

Motor – P2

Motor uses interface **P2** on all CDHD 120/240 models.

Exception: **Motor** uses **P4** on CDHD-020/024.

Motor Interface

Pin	Pin Label	Function
1	PE	Protective ground (motor housing)
2	U	Motor Phase U
3	V	Motor Phase V
4	W	Motor Phase W

Regeneration Resistor – P3

Regen uses interface **P3** on all CDHD 120/240 VAC models.

Exception: **Regen** uses **P5** CDHD-020/024.

Note: On models CDHD-1D5 and CDHD-003, **Regen** and **AC Input Voltage** are combined on one connector.

If the application requires a regeneration (regen) resistor, connect the regen resistor between terminals B1+ and B2.

Regen Interface

CDHD-1D5, CDHD-003 CDHD-4D5, CDHD-006 CDHD-008, CDHD-010 CDHD-013	Pin	Pin Label	Function
P3	1	**B1+**	DC bus +
	2	**B2**	Regen bus -
CDHD-020, CDHD-024	**Pin**	**Pin Label**	**Function**
P5	1	**B2**	Regen bus -
	2	**B1+**	DC bus +

AC Input – P3, P4, P5

The AC Input interfaces and connectors vary among CDHD 120/240 VAC models.

- CDHD-1D5 and CDHD-003: One connector for bus power and logic power uses interface **P3**.
- CDHD-4D5 and CDHD-006: One connector for bus power and logic power uses interface **P4**.
- CDHD-008, CDHD-010 andCDHD-013: Two connectors – a connector for bus power uses interface **P4**, and another connector for logic power uses interface **P5**.
- CDHD -020/024: Two connectors – a connector for bus power uses interface **P3**, and another connector for logic power uses interface **P2**.

Make the following connections:

1. Connect the AC input voltage ground wire to the PE terminal, located on the CDHD front panel. Use an M4 ring or spade terminal.
2. Connect L1, L2 and L3 (for bus power):
   - If the main voltage is from a single-phase source, connect line and neutral to L1 and L2.
   - If the main voltage is from a three-phase source, connect the phases to L1, L2 and L3.
3. Connect L1C and L2C (for logic power):
   - If the main voltage is from a single-phase source, connect line and neutral to L1C and L2C.
   - If the main voltage is from a three-phase source, connect any two phases to L1C and L2C.

Prevent inrush surge:

Bus Power (L1-L2-L3): After switching Bus Power On, wait 1 minute before switching On again, regardless of time in Off state.

Logic Power (L1C-L2C): After switching Logic Power Off, wait 1 minute before switching On again.

Note: On models CDHD-1D5 and CDHD-003, **Regen** and **AC Input Voltage** are combined on one connector.

CDHD-1D5 CDHD-003	**Pin**	**Pin Label**	**Function**
P3	3	L1	AC Phase 1
	4	L2	AC Phase 2
	5	L1C	Logic AC Phase 1
	6	LC2	Logic AC Neutral
CDHD-4D5 CDHD-006	**Pin**	**Pin Label**	**Function**
P4	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
	4	L1C	Logic AC Phase 1
	5	LC2	Logic AC Neutral
CDHD-008 CDHD-010 CDHD-013	**Pin**	**Pin Label**	**Function**
P4	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
P5	1	L1C	Logic AC Phase 1
	2	LC2	Logic AC Neutral
CDHD-020 CDHD-024	**Pin**	**Pin Label**	**Function**
P3	1	L1	AC Phase 1
	2	L2	AC Phase 2
	3	L3	AC Phase 3
P2	1	L1C	Logic AC Phase 1
	2	LC2	Logic AC Neutral

5 Power Board 400/480 VAC

Overview

On all CDHD 400/480 VAC models, the power board has the following interfaces:

- STO – P1
- Logic Power 24 VDC – P2
- AC Input and Regeneration – P3
- Brake – P4
- Motor – P5

Make sure the main voltage rating matches the drive specification. Applying incorrect voltage may cause drive failure.

Do not apply power until all hardware connections are complete.

Safe Torque Off (STO) – P1

STO uses interface **P1** on all CDHD 400/480 VAC models.

CDHD-24 and CDHD-30, 400/480 VAC models, also have a second STO interface, **P3**.

Safe torque off (STO) is a safety function that prevents the drive from delivering power to the motor, which can generate torque.

STO Enable and STO Return must be connected to enable CDHD operation. The STO Enable signal voltage must be 24 VDC.

Note: If the application does not require STO control, jumper pin 4 to pin 1, and pin 3 to pin 2, to bypass the STO.

STO Interface

Pin	Pin Label	Function
1	24V	STO Enable
2	GND	24 VDC Return
3		
4		

Logic Power 24V Input – P2

Logic Power 24V uses interface **P2** on all CDHD 400/480 VAC models.

This interface is used to connect an external power supply (24V 3.15A max.) that provides the logic voltage to the control board and to the motor brake circuit.

Prevent inrush surge:

Logic Power (L1C-L2C): After switching Logic Power Off, wait 1 minute before switching On again.

Logic Power 24V Interface

Pin	Pin Label	Function
1	24V	Logic In
2	GND	24 VDC Return

AC Input and Regeneration Resistor – P3

On the CDHD 400/480 VAC models, **AC Input** and **Regen Resistor** are combined on one connector, and use the following interfaces:

- **P3** on CDHD-003/CDHD-006/CDHD-012
- **P5** on CDHD-024/CDHD-030

1. Connect the AC input voltage ground wire to the PE terminal, located on the CDHD front panel. Use an M4 ring or spade terminal.
2. Connect L1, L2 and L3 (for bus power)
3. If the application requires a regeneration (regen) resistor, connect the regen resistor between terminals B1+ and B2.

Prevent inrush surge:

Bus Power (L1-L2-L3): After switching Bus Power On, wait 1 minute before switching On again, regardless of time in Off state.

AC Input and Regeneration Resistor Interface

Pin	Pin Label	Function
1	L1	AC Phase 1
2	L2	AC Phase 2
3	L3	AC Phase 3
4	B1+	DC Bus +
5	B2	Regen Bus
6	B3-	DC Bus -

Brake – P4

Brake uses interface **P4** on all CDHD 400/480 VAC models.

This is the power output for the electric motor brake system.

Brake Interface

Pin	Pin Label	Function
1	BR+	Motor Brake +
2	BR-	Motor Brake -

Motor – P5

Motor uses interface **P5** on all 400/480 VAC models:

Motor Interface

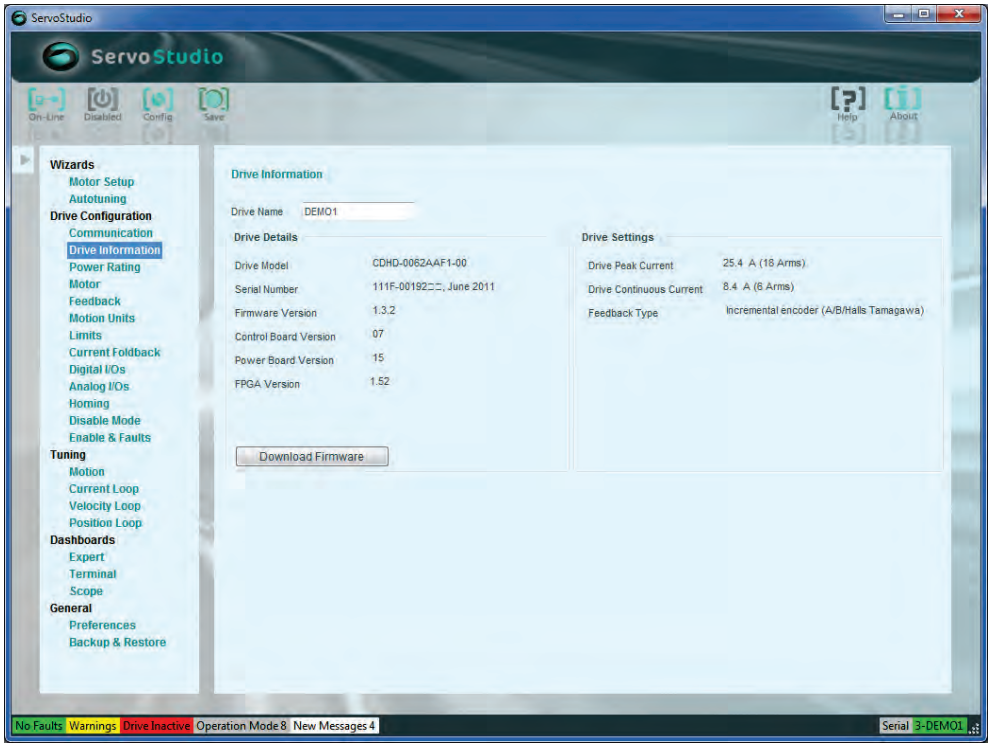
Pin	Pin Label	Function
1	U	Motor Phase U
2	V	Motor Phase V
3	W	Motor Phase W

6 Software

Installation

Use software to configure the drive for your application.

1. Install on the host computer.
2. When installation is complete, start .



Power Up

1. After completing the hardware connections, turn on power to the drive.
2. The first time the drive is connected to the host computer on the USB port, Windows detects the device and displays a **Found New Hardware** wizard.

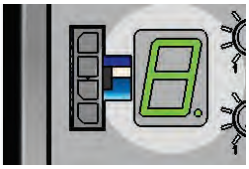
   Browse to and select the **Drivers** folder. The path will vary, depending on the computer's operating system and the location selected for software installation; for example:

   - \Program Files (x86)\ \\Drivers
   - \Program Files\ \\Drivers

   The wizard will automatically select and install the driver file.

3. Look at the 7-segment display on the CDHD front panel.

   Upon initial power up, the status display shows a flashing **e**, indicating that drive parameters are not yet configured. This fault will be cleared once the drive is configured.



   The digital display provides various indications of drive operation, such as operation modes, drive enable status, and fault conditions.

For more information, refer to the section *Drive Status*.

Drive Configuration

1. In , select the **Setup Wizard** option from the navigation menu.
2. Follow the prompts to configure the CDHD for your particular motor and application.

Note: The wizard performs a basic drive configuration. For more advanced configuration options and procedures, refer to the user manual.

7 Drive Status

The 7-segment display provides various indications of drive status, such as operation modes, drive enable status, and fault conditions.

In general, the display uses the following conventions:

- **Decimal point** – Indicates the drive's Enable/Disable status; if displayed, the drive is enabled.
- **Steadily lit digit** – Indicates the operation mode (OPMODE) currently in effect.
- **Steadily lit letter** – Indicates a warning.
- **Flashing** – Indicates a fault.
- **Sequential display of letters and digits** – Indicates a fault, with some exceptions:
  - **A t 1** indicates motor phasing (MOTORSETUP) is in progress.
  - **L1, L2, L3, L4** indicate the state of software and hardware limit switches.
  - **S1** is a warning.
  - A digit flashing at half-second intervals during encoder initialization, indicates the operation mode (OPMODE) currently in effect.

In the event of concurrent faults, only one fault code is displayed on the 7-segment display. The display shows the code of the fault with the highest priority.

Normal Operation Codes

After the drive is configured and ready for operation, the display shows a steadily lit single digit, indicating the operation mode.

Display	Name	Description	Drive Enabled	Drive Disabled
.		Drive enabled		
0	OPMODE 0	Serial velocity control mode		
1	OPMODE 1	Analog velocity control mode		
2	OPMODE 2	Serial current control mode		
3	OPMODE 3	Analog current control mode		
4	OPMODE 4	Master/slave gearing control mode		

Display	Name	Description	Drive Enabled	Drive Disabled
8	OPMODE 8	Position control mode		
E	Ember Mode	Drive is in Ember mode; firmware is being downloaded to the drive.		

Warning and Fault Codes

The following table will help you interpret the warning and fault codes, and respond appropriately.

- **Display** is the code that appears on the drive's 7-segment display.
- **Light** distinguishes between a steadily lit character (for warnings) and a flashing character (for faults).
- **Type** specifies a warning or a fault.
- **Name** is the text message displayed in .

Display	Light	Type	Name	Description	Action Required
≡	Flash	Fault	Watchdog Fault	Generally occurs due to an unforeseen circumstance. The drive is inoperable until power is cycled.	Contact technical support.
_	Flash	Fault	Realtime Overload Fault	CPU has exceeded its computational limit. Realtime execution takes longer than 31.25 µs.	Contact technical support.
_	Steady	Warning	Realtime Overload Warning	Drive has detected that CPU is close to its computational limit.	
-1		Fault	Not Configured	Drive configuration required.	Set drive parameters and execute CONFIG.
-5		Fault	Motor Setup Failed	Motor Setup procedure failed (MOTORSETUPST will show the reason)	Check phase and motor wiring. Make sure to choose the correct feedback type, and follow the hints in MOTORSETUPST.
8.			Hardware Ember Switch Activated	All segments light up when the Hardware Ember switch is pressed, which sets the drive to serial communication Boot-Up Mode.	
A4		Fault	CAN Supply Fault	A problem with the internal voltage supply for the CAN bus.	The drive probably needs repair. Contact technical support.
b	Flash	Fault	Drive Locked	Security code and key do not match. Fatal fault; drive cannot be operated.	Contact technical support.
b	Steady	Warning	Tamagawa Battery Low-Voltage	Battery voltage is nearing fault level. Relevant only for Tamagawa encoder.	Prepare to replace battery soon.
b1		Fault	PLL (phase-locked loop) Synchronization Failed	Controller synchronization signal is missing or not stable. The fault is detected only when synchronization is enabled by SYNCSOURCE command.	Check if controller provide synchronization signal. Check the cable connection and wiring.

Display	Light	Type	Name	Description	Action Required
C1		Fault	CAN Heartbeat Lost	Drive detected disconnection between CAN master and drive.	Reconnect master and slave, and power cycle the drive.
e	Flash	Fault	Parameter Memory Checksum Failure	The non-volatile memory used to store drive parameters is empty or the data is corrupted. May occur during power off if SAVE operation has not completed.	Reconfigure the drive, or download the parameter set, and save the parameters. If problem persists, contact technical support.
E	Flash	Fault	Failure Writing to Flash Memory	An internal problem accessing the flash memory. Fatal fault; drive cannot be operated.	Contact technical support.
e101		Fault	FPGA Config Fail	The code for the FPGA did not load. Fatal fault; drive cannot be operated.	Contact technical support.
e105		Fault	Self Test Fail	The power-up self test failed. Fatal fault; drive cannot be operated.	Contact technical support.
e106		Fault	Control EEPROM Fault	A problem accessing the EEPROM on the control board. Fatal fault; drive cannot be operated.	Contact technical support.
e107		Fault	Power EEPROM Fault	A problem accessing the EEPROM on the power board. Fatal fault; drive cannot be operated.	Contact technical support.
e108		Fault	Vbus Measure Circuit Fail	A failure occurred in the circuit that measures bus voltage.	Reset faults. If the fault persists, the drive probably needs repair. Contact technical support.
e109		Fault	Current-Sensors Offset Out-of-Range	The calculated offsets for the current sensors are out of range.	Reset faults. If the fault persists, the drive probably needs repair. Contact technical support.
e120		Fault	FPGA Version Mismatch	FPGA version does not match the firmware version	Update either the FPGA version or drive version
e121		Fault	Internal Error	Internal error due to an endless while loop or a numerical issue	Contact technical support.
e123		Fault	Motor Plate Read Failed	Motor type nameplate data cannot be read.	Reconnect the feedback device. Make sure the motor type nameplate data is present.
e124		Fault	SAVE and Power Cycle Required	Parameter was changed, and requires SAVE and power cycle to take effect.	SAVE and then cycle power to the drive.
e125		Fault	Fieldbus Version Mismatch	EtherCAT - the Microblaze version does not match the version specified by drive.	Make sure the correct version has been downloaded to the drive.
e126		Fault	ESI Version Mismatch	EtherCAT - the ESI version does not match the version specified by drive.	Make sure the correct version has been downloaded to the drive.
e127		Fault	Output Over-Current Detected	Over-current detected on one of the digital outputs. This fault disables the drive.	Verify correct wiring of the digital outputs. Make sure the output circuit is not shorted.

Display	Light	Type	Name	Description	Action Required
F	Steady	Warning	Foldback	Drive fold current dropped below the drive fold current warning threshold (MIFOLDWTHRESH). Or, motor fold current dropped below the motor fold current warning threshold (IFOLDWTHRESH).	Check the drive-motor sizing. This warning can occur if the drive or the motor is under-sized (under-powered) for the application.
F1		Fault	Drive Foldback	Drive fold current dropped below the drive fold current fault threshold (MIFOLDFTHRESH).	Check motor-drive sizing. This fault can occur if the drive is under-sized (under-powered) for the application. Check that the commutation angle is correct (i.e., commutation is balanced). Check MIFOLDFTHRESH and MIFOLDWTHRESH values
F2		Fault	Motor Foldback	Motor fold current dropped below the motor fold current fault threshold. (IFOLDFTHRESH).	Check the drive-motor sizing. This fault can occur if the motor is under-sized (under-powered) for the application. Check IFOLDFTHRESH and IFOLDWTHRESH values.
F2H		Fault	Pulse Train Frequency Too High	The external pulse train frequency has exceeded the maximum specified input frequency.	Reduce the frequency of the gearing pulses commanded from the controller.
F3		Fault	Stall Fault	A stall fault occurred because the motor was in a stalled state for too long; that is, [I > MICONT] and [I > 0.9 ILIM] and [V < STALLVEL] for [time > STALLTIME].	Remove the stall condition, and take care to prevent stall conditions.
Fb1		Fault	Fieldbus – Target position exceeds velocity limit	A target position command from controller was rejected because it would cause the motor to exceed the velocity limit.	Enable the drive and send valid position commands.
Fb3		Fault	EtherCAT – Cable disconnected	The connection between controller and drive was removed.	Reestablish the connection between controller and drive.
Fb4		Fault	Fieldbus Target Command Lost	The fieldbus controller has not sent a target command in 3 consecutive instances.	Clear the fault and allow the controller to send new commands.
Fb7		Fault	CAN is in Bus-Off State	The drive has disconnected from the CAN bus due to communication errors, and is no longer sending/receiving communication packets.	Check CAN cabling and verify the CAN network is functioning properly.
Fb8		Fault	EtherCAT Packet Loss	EtherCAT packets have been lost.	Make sure the EtherCAT master (controller) sends the packets within the time defined (by the master).
Fb9		Fault	Fieldbus - Drive Active but not in Operational State	Drive was enabled and in an operational state upon receiving a command to move to a lower state of communication.	Make sure the controller does not switch to a lower state of communication while the drive is enabled.

Display	Light	Type	Name	Description	Action Required
H	Flash	Fault	Motor Over-Temperature	Either the motor has overheated, or the drive is not set up correctly for the motor temperature sensor.	Check that the drive is configured properly (using THERMODE, THERMTYPE, THERMTHRESH and THERMTIME), and that the motor temperature sensor is properly connected to the drive if needed. If the drive is configured and wired properly, check whether the motor is under-sized for the application.
H	Steady	Warning	Motor Over-Temperature	Motor is overheated.	
J	Flash	Fault	Velocity Over-Speed Exceeded	Actual velocity exceeded 1.2 times the velocity limit. The velocity limit is set using VLIM.	Check that VLIM is set to match the application requirements. Using velocity loop tuning, check for excessive overshoot.
J1		Fault	Exceeded Maximum Position Error	The position error (PE) has exceeded the position error limit (PEMAX)	Change drive tuning to improve position tracking, or increase PEMAX to allow a greater position error.
J2		Fault	Exceeded Maximum Velocity Error	The velocity error (VE) has exceeded the velocity error limit (VEMAX)	Change drive tuning to improve velocity tracking, or increase VEMAX to allow a greater velocity error.
J3		Fault	Excessive PE Value	The position error (PE) has reached the software numerical limit.	Check tuning.
J4		Fault	Motor Runaway Condition Detected	The motor moves in negative direction although the commanded current is positive. Commutation is incorrect. (Algebraic signs of actual current, acceleration and velocity do not match.)	Correct MPHASE setting. Activate and improve the phase find process.
J5		Fault	Secondary Feedback Position Mismatch	Position deviation between motor and load is too great.	Increase SFBPETHRESH, SFBPETIME, SFBPEMAX, or improve position tuning.
L1		Warning	Hardware positive limit switch is open	Positive hardware limit switch is activated.	
L2		Warning	Hardware negative limit switch is open	Negative hardware limit switch is activated.	
L3		Warning	Hardware positive and negative limit switches are open	Positive and negative hardware limit switches are both activated.	
L4		Warning	Software positive limit switch is tripped	Positive software limit switch is activated. PFB > POSLIMPOS and POSLIMMODE = 1	
L5		Warning	Software negative limit switch is tripped	Negative software limit switch is activated. PFB < POSLIMNEG and POSLIMMODE = 1	
L6		Warning	Software limit switches are tripped	Positive and negative software limit switches are activated. PFB > POSLIMPOS and PFB < POSLIMNEG and POSLIMMODE = 1	

Display	Light	Type	Name	Description	Action Required
n	Flash	Fault	STO Fault	The STO signal is not connected when drive enabled.	Check that the STO connector (P1) is wired correctly.
n	Steady	Warning	STO	The STO signal is not connected when drive disabled.	Check that the STO connector (P1) is wired correctly.
n1		Fault	Regen Over-Current	The preset current limit for regen current has been exceeded.	Increase the value of the regen resistor.
n3		Fault	Emergency Stop Issued	The input defined as emergency stop has been activated.	Turn off the specific input.
n41		Fault	Power Brake Open Load	Open load on the power brake output	Make sure the power brake load cables are connected properly and are not damaged.
n42		Fault	Power Brake Short	Short circuit on the power brake output	Replace the power brake (the motor).
n43		Fault	Invalid Gain Table Data	The condition LMJRGT1 < LMJRGT2 <LMJRGT3 has not been met.	Modify and correct the gain tables.
n45		Fault	Power Brake Fault	A fault occurred on the power brake.	Replace the motor brake.
o	Flash	Fault	Over-Voltage	The bus voltage exceeded the maximum value.	Check whether a regen resistor is required for the application.
o	Steady	Warning	Bus AC Supply Line Disconnected	At least one phase of the main power for the bus supply is not connected.	
o15		Fault	Plus 15V Out of Range	The internal +15 V supply is out of range.	The drive probably needs repair. Contact technical support.
o-15		Fault	Minus 15V Out of Range	The internal -15 V supply is out of range.	The drive probably needs repair. Contact technical support.
o5		Fault	5V Out of Range	5V is low or powering off.	May occur during power off. If occurs otherwise, contact technical support.
o6		Fault	Logic AC Power Failure	The main power for the logic supply is off.	No action required. This is a normal response when logic power is turned off.
o7		Fault	Bus AC Supply Line Disconnect	At least one phase of the main power for the bus supply is not connected.	Check the connection of the bus AC supply. Make sure the supply is on.
o8		Fault	Regen Resistor Overload	The regen resistor load exceeds its allowed power.	Check whether the regen resistor properties are suited to the application.
P		Fault	Over-Current	Over-current at the drive output has been detected. The drive allows this fault to occur up to 3 times in succession. After 3 faults, the drive forces a delay of 1 minute before it can be reenabled.	Check for a short circuit on the motor connection. Check for excessive overshoot in the current loop.
P2		Fault	Unstable Current Loop	An unexpected high current overshoot has been detected	Check and modify current controller settings.

Display	Light	Type	Name	Description	Action Required
r	Steady	Warning	Offset and/or Gain Adjustment Values Detected After SININIT	Significant offset and/or gain adjustment values were detected after SININIT. The values that trigger this warning are half the value of those used to declare a fault. Although the system may continue to function, these values indicate the existence of a problem, which may worsen over time.	Check the encoder and associated hardware. These values suggest some degradation in either electronics (e.g., encoder, drive) or wiring (e.g., increased wire resistance, increased leakage between wires). The problem must be analyzed and repaired.
r10		Fault	Sine Feedback Communication Fail	Communication problem between the drive and the EnDat encoder.	Check that the data and clock signals to the EnDat encoder are connected properly. The cable must be shielded.
r14		Fault	Sine Encoder Quadrature Fault	Mismatch between calculated and actual encoder quadrature information.	Check the feedback device wiring. Check that the correct encoder type (MENCTYPE) is selected.
r15		Fault	Sin/Cos Calibration Invalid	The sine/cosine calibration parameters are out of range. This fault is related to resolver and sine encoder feedback.	Re-execute the sine/cosine calibration process.
r16		Fault	Feedback 5V Over-Current	The current supplied by the drive on the 5V primary encoder supply has exceeded the preset current limit. The drive allows this fault to occur up to 3 times in succession. After 3 faults, the drive forces a delay of 1 minute before it can be reenabled.	The CDHD can source a maximum current of 250 mA to the primary encoder. Check for a short-circuit at the encoder. Check if the encoder is drawing more than the current limit.
r17		Fault	Secondary Feedback Index Break	Secondary encoder index line not connected.	Check whether the drive is configured for working with the index signal on the secondary encoder, and check if the index signal is connected.
r18		Fault	Secondary Feedback A/B Line Break	One of the secondary feedback signals is not connected.	Check that all signals from the secondary encoder are properly connected to the drive.
r19		Fault	Secondary Feedback 5V Over-Current	The preset current limit for current supplied by the drive on the 5 V secondary encoder supply has been exceeded.	The CDHD can source a maximum current of 250 mA to the secondary encoder. Check for a short-circuit at the encoder. Check if the encoder is drawing more than the current limit.
r20		Fault	Feedback Communication Error	Communication with the feedback device did not initialize correctly.	Check that the feedback device is wired correctly. Check that the correct encoder type (MENCTYPE) is selected.
r21		Fault	Nikon Encoder Operational Fault	Communication with the Nikon MAR-A40A feedback device did not initialize correctly.	Check that the feedback device is wired correctly. Check that the correct encoder type (MENCTYPE) is selected.

Display	Light	Type	Name	Description	Action Required
r23		Fault	Phase Find Failed	Commutation initialization has failed. This fault occurs in systems that do not have commutation information (e.g., Hall signals) in the motor feedback device.	Check whether the motor feedback type and the phase-finding parameters are set correctly for the application.
r24		Fault	Tamagawa Init Failed	The initialization process with the Tamagawa feedback device has failed.	Check that the wiring to the encoder is correct.
r25		Fault	Pulse & Direction Input Line Break	One of the Pulse & Direction signals is not connected.	Check that all signals to the P&D inputs are properly connected to the drive.
r26		Fault	Tamagawa Abs Operational Fault	Several faults are indicated by the feedback device and include one or more of the following: battery low/error, over-speed, counting error, multi-turn error	Check the battery voltage and feedback wiring. Make sure the motor did not move at a high velocity during encoder initialization.
r27		Fault	Motor Phases Disconnected	One of the motor phases is disconnected. The current of one of the motor phases is effectively zero for more than 160 electrical degrees while the current command is greater than 100.	Check the wiring of the motor phases.
r28		Fault	Resolver Initialization Failed	The drive could not detect the proper gain setting or sampling point for the sine/cosine signals.	Check resolver wiring and gain value.
r29		Fault	Absolute Encoder Battery Low-Voltage	An error bit indicating a battery problem was detected in data from the drive.	Replace battery, then reset drive. If battery is replaced while drive is on, position information is retained.
r34		Fault	PFB Off Checksum Invalid	The calculated checksum of the PFB backup data does not match the expected checksum.	If required by the application, home the machine.
r35		Fault	PFB Off Data Mismatch	Multi-turn data of the PFB cannot be restored due to axis movement.	If required by the application, home the machine.
r36		Fault	No PFB Off Data	PFB backup memory is empty.	If required by the application, home the machine.
r37		Fault	Encoder Phase Error	In normal incremental encoder operation, quadrature inputs A and B are 90 degrees out of phase. The phase error occurs when edge transition is detected simultaneously on the A and B signals.	Set MENCAQBFILT to 0 to remove the filter on A and B signals. If problem persists, it may be due to a faulty encoder.
r38		Fault	Differential Halls Line Break	Line break in differential Hall sensors.	Make sure HALLSTYPE matches the Hall sensors in use (single-ended or differential). Check whether all signals from the differential Hall sensors are properly connected to the drive.

Display	Light	Type	Name	Description	Action Required
r39		Fault	AqB Commutation Fault	Loss of commutation/encoder counts for AqB encoder. The index signal serves as a reference position for detecting loss of commutation/pulses. The AqB encoder counter is compared at different index positions. Between index position captures the count must be exactly MENCRESx4 (or 0 counts if moved back to same index location).	If a fault occurs shortly after motion begins, check MENCRES settings. If a fault occurs after some time it is likely due to EMI noise. Improve the installation. Make sure ground is connected. Make sure shield is connected on feedback and motor cables.
r4		Fault	A/B Line Break	One of the primary feedback signals is not connected. This fault occurs in incremental encoder, resolver and sine encoder feedback types.	Check whether all signals from the primary feedback device are properly connected to the drive.
r40		Fault	ServoSense Encoder Fault	The drive has detected an internal fault on the ServoSense encoder through communication.	Use command SRVSNSINFO to identify the fault.
r41		Fault	Sankyo Absolute Encoder Fault	One or more faults are indicated by the feedback device, including: battery low or error, over-speed, counting error, multi-turn error.	Check the battery voltage and feedback wiring. Make sure the motor did not move at a high velocity during encoder initialization.
r5		Fault	Index Line Break	Encoder index line is not connected.	Check that the drive is configured for working with the index signal (using MENCTYPE), and check if the index signal is connected.
r6		Fault	Invalid Halls	The drive has detected either 000 or 111 state on the Hall feedback signals.	Check that the Hall signals are all properly connected. While turning the motor, read the Halls state (using HALLS) to see which signal is not connected. If the feedback type is Tamagawa, check that the feedback wiring is correct
r8		Fault	A/B Out of Range	Feedback analog signal is out of range. This fault is related to resolver and sine encoder feedback. The drive checks that the amplitudes of the sine and cosine signals are correct, based on the calculation sin2 + cos2 = 1	Check the amplitudes of the sine and cosine signals.
r9		Fault	Encoder Simul Frequency Too High	The computed equivalent encoder output frequency exceeds the upper limit for this signal, which is 4 MHz.	Check the parameters used for setting up the equivalent encoder output. If using a sine encoder, check the ENCOUTRES parameter settings.
S1		Warning	Cannot Use SFBTYPE 1 with Analog OPMODE	Cannot use the specified type of secondary feedback with analog operation modes (i.e., OPMODE 1, OPMODE 3)	
t	Steady	Warning	Over-Temperature	The temperature on the power board and/or on the control board and/or the power module (IPM) has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.

Display	Light	Type	Name	Description	Action Required
t1		Fault	Power Stage Over-Temperature	The temperature on the power board has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t2		Fault	Power Module Over-Temperature	The temperature inside the integrated power module has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t3		Fault	Control Board Over-Temperature	The temperature on the control board has exceeded the preset limit.	Check if the ambient temperature exceeds the drive specification. Otherwise contact technical support.
t4		Fault	Temperature Sensor Failure	Temperature sensor malfunction.	Cycle power. If problem persists, contact technical support.
u	Flash	Fault	Under-Voltage	The bus voltage is below the minimum value.	Check that the main AC voltage supply is connected to the drive and is switched on. The under-voltage limit can be read with the UVTHRESH command.
u	Steady	Warning	Under-Voltage	The bus voltage is below the minimum value.	Check that the main AC voltage supply is connected to the drive and is switched on. Verify that the setting of UVMODE is correct.

CDHD Servo Drive

Quick Start Guide

DOC-CDHD-QSG-EN Rev. 7.1b

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