



E-Learning, DC drives

DCS800 Hardware Options, part 1

Size D1 – D4

G560e_b Part 1

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Welcome to the DCS800 Hardware Options training module for ABB DC drives.

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To view the presenter notes as text, please click the Notes button in the bottom right corner.

Objectives

This training module covers:

- Location for plug-in options
- Types of plug-in options
- Fiber optic connection board
- DCS800 Memory Card
- Drive-to-drive connection via DCSLink
- SUB-4 board for low mains voltages
- IOB2 and IOB-3 boards for potential free connection

This training module covers:

- Location for plug-in options
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Location of plug-in options Overview for module sizes D1 to D7



Slot 1

- Usable for all types of R-type modules
- Thus, only slot for fieldbus adapters

Slot 2

- Usable for all types of R-type modules

Slot 3

- Usable for all types of R-type modules
- COM-8x board connection

Slot 4

- Usable for ABB Memory Card

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- The size D1 to D7 modules provide four slots for so called plug-in options. The plug-in options are:
 - R-type fieldbus adapters,
 - R-type I/O extension modules,
 - R-type encoder extension module,
 - R-type resolver extension module,
 - SDCS-COM-8 fiber optic interface board and
 - the SDCS-MEM-8 Memory Card.
- Slot 1 can be used for all types of R-type modules. Thus, this is the only usable slot for fieldbus adapters.
- Slot 2 can be used for all types of R-type modules, except for fieldbus adapters.
- Slot 3 can be used for the SDCS-COM-8 and all types of R-type modules, except for fieldbus adapters.
- Slot 4 can only be used for the SDCS-MEM-8 Memory Card.

Fieldbus adapters For module sizes D1 to D7



- R-type fieldbus adapters provide connectivity to all major automation systems
- R-type fieldbus adapter must be plugged into slot 1
- Fieldbus types currently available are:
 - Profibus (RPBA-01)
 - DeviceNet (RDNA-01)
 - CANopen (RCAN-01)
 - ControlNet (RCNA-01)
 - Modbus/RTU/TCP (RMBA-01)
 - Ethernet/IP (RETA-01)

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- The R-type fieldbus adapters provide connectivity to all major automation systems. A single twisted pair cable avoids large amounts of conventional cabling, thus reducing costs and increasing system reliability.
- The R-type fieldbus adapter must be plugged into slot1.
- the following fieldbus types are currently available:
 - Profibus,
 - DeviceNet,
 - CANopen,
 - ControlNet,
 - Modbus,
 - Modbus/TCP and
 - Ethernet/IP.

I/O extension modules RAIO and RDIO For module sizes D1 to D7



- R-type I/O extension modules provide additional analog and digital I/O
- They can be plugged into slot 1, 2 and 3
- Drive has 4 standard AI's and 2 AO's
 - Extension is possible with 1 or 2 RAIO extension modules
 - Each RAIO features 2 AI's and 2 AO's
- Drive has 8 standard DI's and 8 DO's
 - Extension is possible with 1 to 3 RDIO extension modules
 - Each RDIO features 3 DI's and 2 DO's

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- The R-type I/O extension modules provide additional analog and digital I/O.
- The R-type I/O extension modules can be plugged into slot1, slot2 and slot3.
- The drive has 4 standard analog inputs and 2 standard analog outputs. An extension can be made by using one or two RAIO analog I/O extension modules. Each RAIO features 2 analog inputs and 2 analog outputs. Therefore, the maximum number of analog inputs is 8 and the number of analog outputs is 6.
- The drive has 8 standard digital inputs and 8 standard digital outputs. An extension is possible by means of one or two RDIO digital I/O extension modules. Each RDIO features 3 digital inputs and 2 digital outputs. Thus, the maximum number of digital inputs is 14 and the number of digital outputs is 12.

Encoder (RTAC) and resolver (RRIA) modules For module sizes D1 to D7



- R-type encoder or resolver extension module provides one additional input connection for an encoder or resolver
- They can be plugged into slot 1, 2 or 3
- Drive has one standard encoder connection
- Second encoder connection is possible by means of one extension module
 - RTAC for encoder connection
 - They can be used simultaneously
- RRIA extension module provides resolver connection

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- The R-type encoder or resolver extension module provides one additional input connection for an encoder or resolver.
- The R-type encoder or resolver extension module can be plugged into slot1, slot2 or slot3.
- The drive has 1 standard encoder connection. A second encoder connection can be made by using an RTAC extension module. Thus, the maximum of 2 encoders can be connected and used simultaneously.
- Instead of a second encoder connection with an RTAC, one RRIA extension module can be used to provide a resolver connection.

Fiber optic interface board SDCS-COM-8 For module sizes D1 to D7



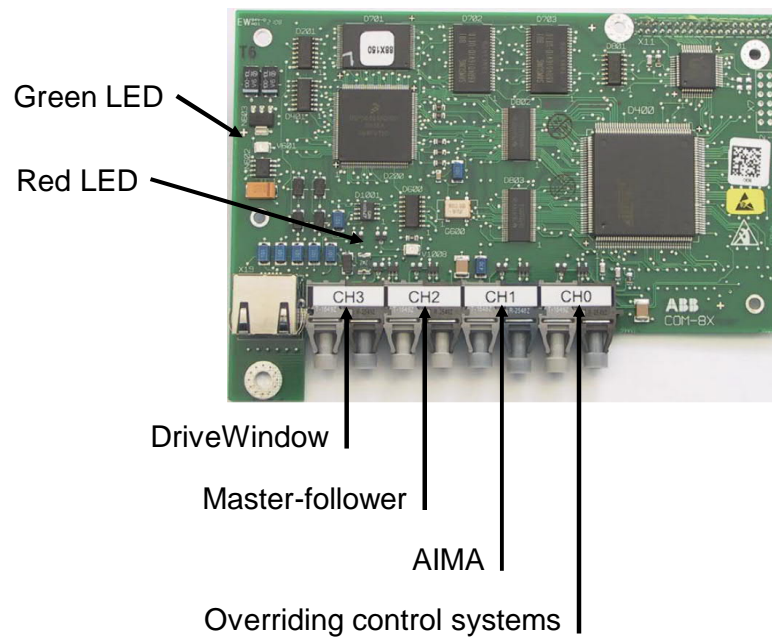
- Fiber optic interface board SDCS-COM-8 provides the interface to ABB fiber optic world
- It must be plugged into slot 3
- SDCS-COM-8 board is equipped with four optical channels for DDCS com.
- There are two different types of fiber optic interface boards available:
 - SDCS-COM-81 (10 MBaud)
 - SDCS-COM-82 (5 MBaud)
- Select the board depending on used communication devices

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- The fiber optic interface board SDCS-COM-8 provides the interface to the ABB fiber optic world.
- The SDCS-COM-8 must be plugged into slot3.
- The SDCS-COM-8 is equipped with four optical channels for DDCS communication:
 - Depending on the optical components used for channel 0 there are two different fiber optic interface boards available.
 - The SDCS-COM-81 is used to communicate with ABB overriding control systems like FCI or AC800 M. For this, 10 MBd optical components are used for channel 0.
 - The SDCS-COM-82 is used to communicate with N-type fieldbus adapters. For this 5 MBd optical components are used for channel 0.
 - Select the communication interface board type depending on the communication devices used.

Fiber optic interface board SDCS-COM-8 Connection diagram



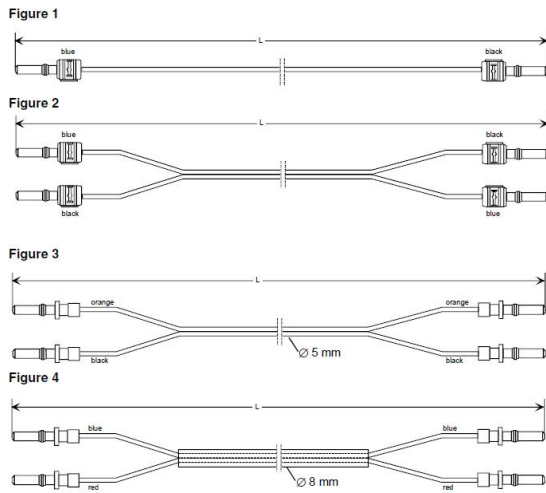
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- Here is the connection diagram for the SDCS-COM-8 board.
- Channel 0 is used for communication to ABB overriding control systems, e.g., AC800.
- Channel 1 is used for communication to the I/O module extension board AIMA.
- Channel 2 is used for the fiber optic master-follower communication with one master and up to 10 followers.
- Channel 3 is used for the fast commissioning and maintenance tool DriveWindow.
- The red LED blinks during the boot procedure. In case of continuous blinking the SDCS-.COM-8 is faulty.
- A continuously green LED shows, that the 5 V power supply is okay.

Fiber optic cables

Overview about different types



Optical component type [MBd]	Transmission speed [MBit/s]	Cable type	Cable length [m]
5	1	POF	0.5, ..., 15
	2 or 4	POF	0.5, ..., 10
10	1, 2, or 4	POF	0.5, ..., 30
		HCS®	30, ..., 200

POF = Plastic Optical Fiber
HCS = Hard Clad Silica (glass)

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- Fiber optic cables are used for the SDCS-COM-8 and its DDCS communication. They are available in different types and lengths.
- Figure 1 shows a plastic optical fiber single cable.
- Figure 2 shows a plastic optical fiber double cable.
- Figure 3 shows a hard clad silica double cable without a plastic jacket.
- Figure 4 shows a hard clad silica double cable with a plastic jacket.
- The length of the cables varies depending on the optical component type and the transmission speed.

Memory Card SDCS-MEM-8

Enter application programming area



- Memory Card SDCS-MEM-8 is used to store the application program written by using the Control Builder DCS800
- It must be plugged into slot 4
- Control Builder DCS800 is a user-friendly tool based on the standard tool CoDeSys (3-S software company)
- Ready-made applications are available stored on the Memory Card for
 - Winder applications
 - Crane applications

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- The SDCS-MEM-8 Memory Card is used to store the application program written by using the Control Builder DCS800.
- The Memory Card must be plugged into slot4.
- The ControlBuilder DCS800 is a user-friendly tool based on the standard tool CoDeSys. With the ControlBuilder DCS800, application programs can be developed with functions like winders, decentralized controls, etc. directly in the drive.
- Ready-made applications for winder and crane applications are available stored on the Memory Card.

DCSLink board SDCS-DSL-4 Hardware location



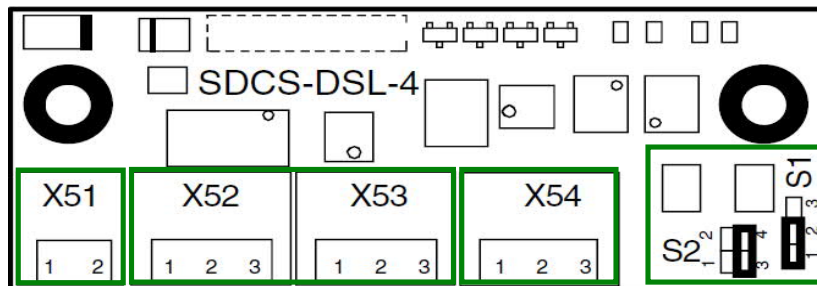
- The SDCS-DSL-4 board provides the connection to the DCSLink.
- It must be plugged into connector X8 of the SDCS-CON-4 board
- DCSLink provides the interface for the following functions:
 - External field exciter connection
 - Master-Follower connection
 - 12-pulse-communication
 - Drive-to-drive communication






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- The SDCS-DSL-4 board provides the connection to the DCSLink.
- The SDCS-DSL-4 is plugged into connector X8 of the SDCS-CON-4 board and thus provides the DCSLink interface to field exciters, master-follower, 12-pulse communication and drive-to-drive communication at the same time.

DCSLink board SDCS-DSL-4 Hardware connection



Supply		Remarks	Jumper coding	
24 V	≤200 mA	24 V grounded supply for FEX425 internal and DCF803-0035 field exciter units; short circuit protected 250 mA	S1 Bus termination	
				120 Ohm
				* no termination, park position
			S2 Ground termination	
				0 Ohm (direct) ground termination
				200 kOhm R-C ground termination
				* no termination, park position
			* default value	

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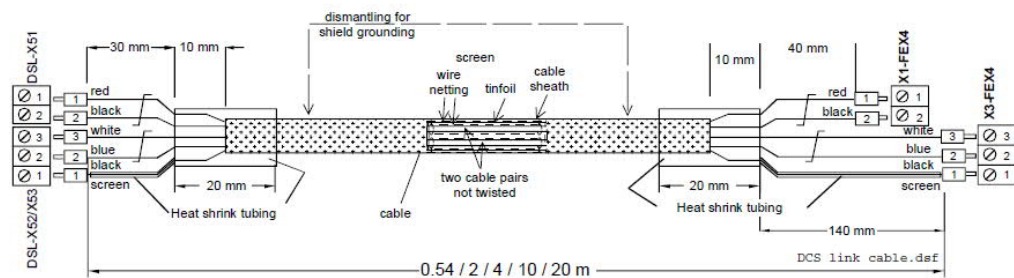


- Connector X51 supplies 24 volts DC for field exciters of type FEX-425-Int DCF803-0016 and DCF803-0035. The supply is short circuit protected and supplies a maximum current of 250 milliamps.
- Connectors X52 and X53 provide the DCSLink. Both connectors are connected in parallel, thus, it is possible to connect two cables to separate plugs.
- Connector X54 is currently not used.
- Jumper S1 sets the bus termination, as the bus termination is mandatory at the two physical ends of the bus.
- Jumper S2 sets the ground termination. The ground can be terminated directly or via an R-C network.

DCSLink cable

Overview type and length

DCSLink cable



- DCSLink usually uses a shielded twisted pair cable which contains CANbus Low and CANbus High signals
- It contains also 2 wires for the 24 VDC supply of external field exciters
- The cable is available from ABB in different lengths from 0.54 m up to 20 m

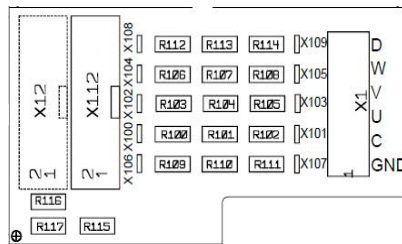
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- The DCSLink usually uses a shielded twisted pair cable and contains CANbus low and CANbus high signals.
- It also contains 2 wires for the 24 volts DC supply of external field exciters.
- The cable is available from ABB in different lengths from 0.54 meters up to 20 meters.

Interface board SDCS-SUB-4

The board for low mains voltage



chain RC...RD [MOhm]	Setting 97.03	Size
appr. 1.17	117 V	D1...D4

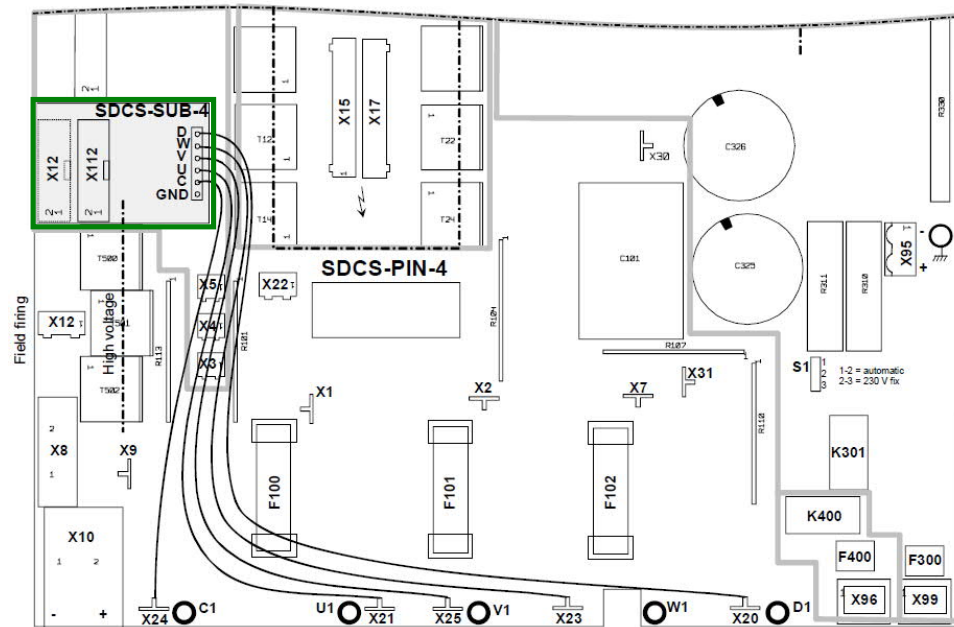
- Size D1 to D4 modules can work with mains voltages of 200 VAC up to 525 VAC
- Mains voltages below 100 VAC must be adapted by SDCS-SUB-4 board to get improved mains synchronization and DC voltage measurement
- When using the SDCS-SUB-4 board, voltage scaling in the software must be changed (97.03 == 117 V)
- Then the working range is possible up to 200 VAC
- Order the SDCS-SUB-4 board by means of plus code S186

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- Size D1 to D4 modules can work with mains voltages from 200 volts AC up to 525 volts AC, because the line voltage and DC voltage measurement on the SDCS-PIN-4 is conducted by means of high ohmic resistors.
- Mains voltages below 100 volts AC must be adapted by using smaller resistances and thus rescaling of the voltage measurement channels is necessary. Such rescaling provides improved mains synchronization and DC measurement resolution at small voltages.
- When using the SDCS-SUB-4 board, voltage scaling in the software must be changed. The default setting is 1.17 Megaohms for 117 volts.
- With this setting the working range is up to 200 volts AC.
- Order the SDCS-SUB-4 board by means of plus code S186.

Interface board SDCS-SUB-4 Hardware location



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- The upgrade kit with the SDCS-SUB-4 also contains the SDCS-SUB-4 and all cables to be connected to the SDCS-PIN-4.
- Remove the flat cable from connector X12 on the SDCS-PIN-4.
- Plug the SDCS-SUB-4 into connector X12 on the SDCS-PIN-4 and connect the cables with connectors X20, X21, X23, X24 and X25.
- Re-connect the flat cable to connector X112 on the SDCS-SUB-4.

Isolated inputs and outputs IOB-2x and IOB-3 board



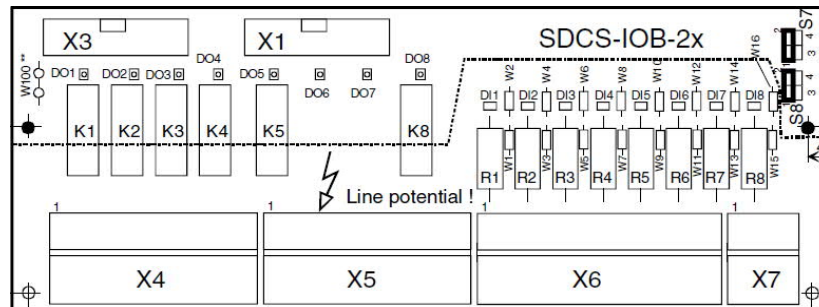
- In some cases isolated inputs and outputs are required in a drive system to connect any device potential free
- DCS800 provides the IOB-2 and the IOB-3 board
- These boards are located outside of the drive
- IOB-3 board provides analog I/O's as well as encoder or tacho connection
- IOB-2 board provides digital I/O's

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- In some cases, isolated inputs and outputs are required in the drive system to connect any device potential free.
- For such cases the DCS800 provides the IOB-2 and the IOB-3 board which can be connected to the controller board CON-4.
- These boards are located outside of the drive and will typically be mounted in a drive cabinet.
- The IOB-3 board provides analog inputs and outputs as well as encoder or tacho connection.
- The IOB-2 board provides digital inputs and outputs

SDCS-IOB-2 Digital I/O board



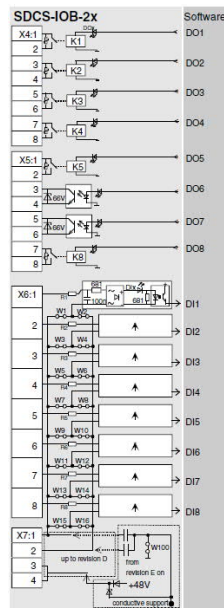
- The digital I/O board IOB-2 substitutes the standard I/O's on the CON-4 board
- Connectors X1 and X3 are used to connect IOB-2 with the CON-4 board via flat cable
 - SDCS-IOB-21 is suitable for voltages up to 48 VDC
 - SDCS-IOB-22 is suitable for voltages up to 115 VAC
 - SDCS-IOB-23 is suitable for voltages up to 230 VAC

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- The digital I/O board IOB-2 substitutes the standard digital inputs and standard digital outputs on the SDCS-CON-4. This means the digital I/O on the SDCS-CON-4 are no longer available.
- Connectors X1 and X3 are used to connect the SDCS-IOB-2 with the SDCS-CON-4 via flat cable.
- Depending on the site of resistors R1 to R8 the digital inputs can take different voltages. Three different voltage levels are available:
 - The SDCS-IOB-21 is suitable for voltages up to 48 VDC.
 - The SDCS-IOB-22 is suitable for voltages up to 115 VAC.
 - The SDCS-IOB-23 is suitable for voltages up to 230 VAC.

SDCS-IOB-2 Connection diagram



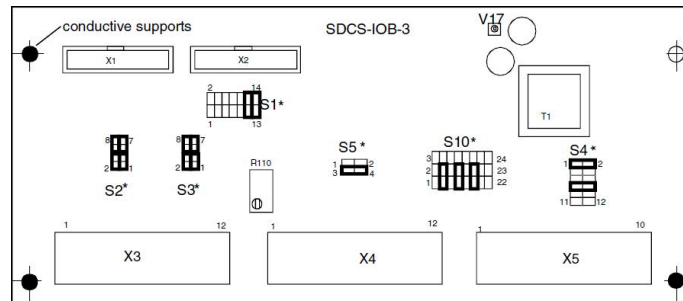
- Connectors X4 and X5 provide the digital outputs (DO1...DO8)
 - Relay contacts (DO1 - DO5 & DO8)
 - Optocoupler contacts (DO6 & DO7)
- Active outputs will be displayed by LED
- Connector X6 provides the digital inputs
 - All inputs are filtered and galvanically isolated by optocouplers
- Connector X7 provides connection to the internal 48 VDC power supply

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- On this slide the connection diagram for the IOB-2 board will be explained.
- Connectors X4 and X5 provide the digital outputs DO1 to DO8.
 - The relay contacts are DO1 to DO5 as well as DO8. The contact can take up to 250 VAC or up to 24 VDC with a maximum current of 3 amps.
 - Digital outputs 6 and 7 are potential isolated by optocouplers. The optocouplers switching capacity is 50 mA with an external voltage of up to 24 VDC.
- If a digital output is active, its LED lights up.
- Connector X6 provides the digital inputs. All digital inputs are filtered and galvanically isolated by means of optocouplers.
- Connector X7 provides connection to the internal 48 VDC power supply with up to 50 mA of current. This power supply is not galvanically isolated from the DCS electronics and is only available on the SDCS-IOB-21.

SDCS-IOB-3 Analog I/O board



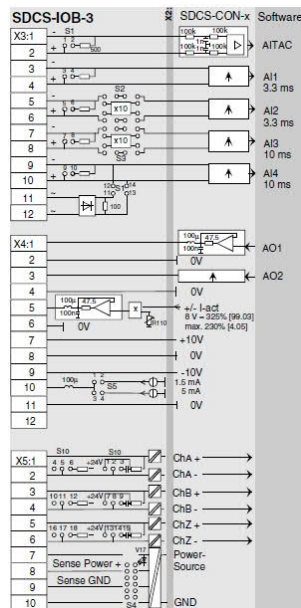
- The analog I/O board IOB-3 substitutes the standard I/O's on the CON-4 board
- Connector X1 and X2 are used to connect the IOB-3 with the CON-4 board via flat cable
- To mount the IOB-3 board use a specially designed card holder including finger protection and screen clamps

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- The analog I/O board SDCS-IOB-3 substitutes the standard analog inputs, standard analog outputs and standard encoder input on the SDCS-CON-4. This means the analog I/O and the encoder input on the SDCS-CON-4 are no longer available.
- Connector X1 and X2 are used to connect the SDCS-IOB-3 with the SDCS-CON-4 via flat cable.
- To mount the SDCS-IOB-3, use a specially designed card holder including finger protection and screen clamps.

SDCS-IOB-3 Connection diagram



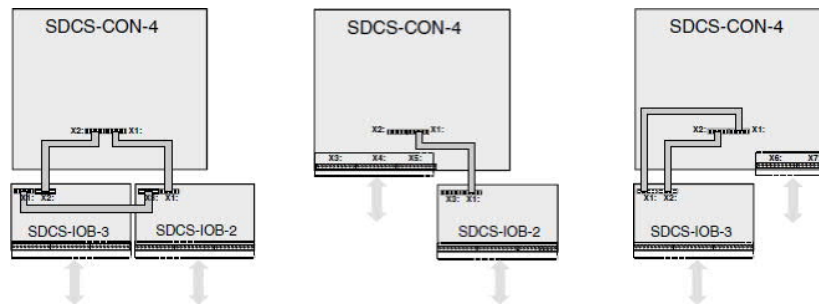
- Connector X3 provides analog encoder connection as well as analog input connection (AI1 to AI4)
- Scaling and adaptations are done via jumpers on the IOB-3 board
- Connector X4 provides analog output connection for
 - AO1, AO2 and actual motor current
 - Voltage source +/- 10 VDC
 - Current source for 1.5 or 5 mA
- Connector X5 provides encoder connection for single ended and differential encoders

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- On this slide the connection diagram of the SDCS-IOB-3 board will be explained.
- Connector X3 provides analog encoder connection as well as analog input connection for analog input 1 to analog input 4.
- Scaling and adaptations are done via jumpers on the IOB-3 board.
- Connector X4 provides analog output connection for:
 - Analog output 1 and 2 and actual motor current. This output is used to connect an oscilloscope for measurements.
 - Voltage source plus-minus 10 volts DC. This is typically used to connect potentiometers to give speed reference to an analog input.
 - Current source with 1.5 Milliamps to 5 Milliamps. This is typically used to supply PTC's especially PT100 temperature sensors to measure motor temperature.
- Connector X5 provides an encoder connection for single ended and differential encoders.

SDCS-IOB-2 and SDCS-IOB-3 Flat cable connections



- There are three ways of connecting the SDCS-IOB-2 and SDCS-IOB-3 boards with the SDCS-CON-4 board
- SDCS-IOB-2 and SDCS-IOB-3 board are connected in a ring configuration with the SDCS-CON-4 board
- SDCS-IOB-2 board is directly connected to CON-4
- SDCS-IOB-3 board is connected in a ring configuration

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- Depending on the configuration, different cable connections have to be utilized.
- In principle there are three ways of connecting the SDCS-IOB-2 and the SDCS-IOB-3 boards with the SDCS-CON-4 board. The cable length is a maximum of 1.7 m when using size D1 to D4 converters and unscreened cables. With screened cables, the maximum length is 4 meters. Note that cable length between IOB-2 and IOB-3 is a maximum of 0.5 meters because of EMC reasons.
 - The SDCS-IOB-2 and SDCS-IOB-3 boards are connected in a ring configuration with the SDCS-CON-4 board. Note that connectors at the CON-4 cannot be used.
 - The SDCS-IOB-2 board as single device is only directly connected with the SDCS-CON-4 board. In this case connectors X3, X4 and X5 can be used.
 - The SDCS-IOB-3 board as single device is only directly connected with the SDCS-CON-4 board in a ring configuration. In this case connectors X6 and X7 can be used.

Summary

Key points of this module are:

- Location for plug-in options
- Types of plug-in options
- Fiber optic connection board
- DCS800 Memory Card
- Drive-to-drive connection via DCSLink
- SUB-4 board for low mains voltages
- IOB2 and IOB-3 boards for potential free connection

Key points of this module are:

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Additional information

- DCS800 Hardware Manual (3ADW000194)

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