Welcome to the DCS800 training module for the DCS800, ABB DC Drives.

If you need help navigating this module, please click the Help button in the top right-hand corner. To view the presenter notes as text, please click the Notes button in the bottom right corner.
This training module covers:

- DriveWindow Light Tool
- Programming opportunities
- Field exciter connection
- Typical DC drives applications
DriveWindow Light is the basic commissioning and service tool for ABB DC and AC drives like DCS800, DCS400, ACS550, ACS350 and many more.

The tool comes on the CD delivered with every DCS800. Also, all needed plug-ins like the Startup Assistant and DWL AP for the DCS800 are delivered on the CD.

DriveWindow Light provides a direct PC to drive communication via serial RS232 communication. It is mainly used for parameter management like setting, storing, loading and comparing.

From DriveWindow Light it is possible to launch the Startup assistant for fast and easy commissioning.

Also, the visualization tool for graphical display of application programs DWL AP can be activated from DriveWindow Light.

To connect DriveWindow Light to a PC either a build-in COM port or an adapter from PCMCIA to COM port is needed. Adapters USB to COM port are very slow. In some cases, they do not work properly. Thus, it is strongly recommended to avoid them.
One of the reasons for the development of the DCS800 was the seek for the same look and feel as ABB AC drives. This increases the acceptance of the DCS800, because the higher the similarity between DC and AC drive the less training customers need to commission and service both types of drives.

The compact and easy to use DCS800 Control Panel is included in the standard scope of delivery and the same hardware is used for ACS550 and ACS350.

DC and AC drives using the same tools. DriveSize for engineering, DriveWindow and DriveWindow Light for commissioning and service, CoDeSys for programming.

Both drive types using the same R-type I/O modules for:

- analog in- and outputs,
- digital in- and outputs,
- encoders and
- resolvers.

For R-type serial communication modules are used for:

- Profibus-DP,
- DeviceNet,
- CANopen,
- ControlNet,
- Modbus (RTU),
- Modbus/TCP and
- Ethernet/IP.

The optical interface board SDCS-COM-8 is used for the same fast communication to ABB overriding control systems lie AC 800M as ABB AC drives.
The Adaptive Program is as well known from AC drives. Each DC drive has 16 function block available for programming and each function block can be changed to one of the 35 functions of the library.

It is also very important to know, that DC drives using similar macros, parameter structures and command words like AC drives. This means, that the changes in the overriding control between DC- and AC drives are kept to a minimum.

To make ordering easy the plus codes for DC- and AC drives are the same.
The basic package can be adapted and upgraded to fit a wide variety of applications.

To communicate with the overriding control several serial communications are available, such as:

- Profibus-DP,
- DeviceNet,
- CANopen,
- ControlNet,
- Modbus (RTU),
- Modbus/TCP and
- Ethernet/IP.

For fast monitoring of up to 2000 different DC- and AC drives the professional commissioning and service tool DriveWindow is used.

The DCS800 provides an internal PLC function with CoDeSys to adapt the drive to demanding applications like cranes and winders.

To archive higher field currents external field exciter, must be used. External field exciters with field currents up to 520 ADC are available.

Additional I/O are available with R-type extension modules.

The optical interface board SDCS-COM-8 is used for connection to the ABB fiber optic world for example for AC 800M, additional I/O, N-type fieldbus modules and DriveWindow.

Isolated I/O replace the standard I/O for more security. The same isolated I/O boards have been used for DCS 500 and DCS 600. This makes an upgrade to DCS800 much easier since only the flat cables coming from the I/O boards must be plugged on the DCS800.

Fast communication between DCS800 drives like master-follower and drive-to-drive communication is
available.
For high power applications using currents over 5200 ADC hard paralleling of drive modules or 12-pulse application is standard for the DCS800.
Each DCS800 has a name plate showing its type- and plus code. With the help of the type code, it is possible to identify the drive module.

- DCS800 is the product series.
- The type shows the kind of product. For example, S0 is a converter module.
- The bridge type indicates if the drive has a single bridge and thus is non-regenerative or if a double bridge is used and the drive is regenerative.
- This animation shows a single bridge with six thyristors.
- This animation shows a double bridge with 12 anti parallel thyristors.
- The rated armature current of the drive. In this example it is 680 ADC.
The rated mains or AC voltage of the drive. In this example it is between 230 and 400 VAC.

Power connection of the drive only valid for sizes D7. These modules can have a left or right-side busbar connection.

The list of plus codes of the drive.
The plus codes describe the plug-in options for the DCS800.

Plug-ins which are also used for AC drives have the same plus code for DC and AC. For example, the R-type Profibus module has the plus code +K454.

The plus code represents a modification of the drive module itself. E.g., to plug-in a RAIO-01 into the module is +L500.

An external field exciter modification of the drive module itself and thus has to be ordered by means of its ID code.
Each DCS800 has a name plate. With the help of the name plate, it is possible to identify the drive module. U1 is the rated mains or AC voltage of the drive. I1 is rated input current. I2 is the rated armature current. IF (I F) is the rated field current. This shows the drives rated cooling fan voltage. The list of plus codes of the drive. Serial number showing production year and production week.
The standard I/O are all included on the SDCS-CON-4 and come with connection for an analog tacho, inputs for a pulse encoder, 4 analog inputs, 3 analog outputs, 8 digital inputs, 7 digital outputs plus one additional digital output with a relay to control the main contactor. It is also possible to connect a PTC for motor temperature supervision.

The DCS800 has the same terminal layout as DCS 500 or DCS 600 for easy upgrading.

To increase the available amount of I/O it is possible to connect two additional analog I/O modules and two additional digital I/O modules.

The maximal amount of analog I/O with two RAIO modules is 8 analog inputs and 7 analog outputs.
- Analog inputs 1 to 4 are standard,
- analog inputs 5 and 6 are on the first RAIO and
- analog inputs 7 and 8 are on the second RAIO. They are only usable for motor temperature supervision.
- Analog outputs 1 and 2 are standard,
- analog outputs 3 and 4 are on the first RAIO and
- Analog outputs 5 and 6 are on the second RAIO. They are only usable for motor temperature supervision.
- Analog output 7 is standard, and fix connected to actual current measurement directly over the burden resistor.

The maximal amount of digital I/O with two RDIO modules is 14 digital inputs and 12 digital outputs.
Digital inputs 1 to 8 are standard,
digital inputs 9 to 11 are on the first RAIO and
digital inputs 12 to 14 are on the second RAIO.

Digital outputs 1 to 8 are standard,
digital outputs 9 and 10 are on the first RAIO and
digital outputs 11 and 12 are on the second RAIO.

It is possible to connect encoder either via SDCS-CON-4 as standard or via an RTAC module. This module provides also the possibility to connect two encoders at the same time.

To connect a resolver, use an RRIA module.

Isolated I/O replace the standard I/O for more security. The same isolated I/O boards - SDCS-IOB-2 and SDCS-IOB-3 - have been used for DCS 500 and DCS 600. This makes an upgrade to DCS800 much easier since only the flat cables coming from the I/O boards must be plugged on the DCS800.
The compact and easy to use DCS800 Control Panel is included in the standard scope of delivery. The actual values are shown in physical units or percent depending on the displayed signal. The DCS800 Control Panel is multilingual and uses for example English, French, German, Italian and Spanish. The key with the question mark displays context sensitive help, for example in case of faults and alarms. The Startup Assistant and the Adaptive Program can be accessed by the DCS800 Control Panel.

DriveWindow Light is the basic commissioning and service tool for ABB DC and AC drives. From DriveWindow Light it is possible to launch the Startup assistant for fast and easy commissioning and the visualization tool for graphical display of application programs. The tool comes for free on the CD delivered with every DCS800.

For fast monitoring of up to 2000 different DC- and AC drives the professional commissioning and service tool DriveWindow is used. The connection to the drives is done via SDCS-COM-8 and a fiber optic network with possible distances of 200 meters between nodes.

Note:
It is possible to connect DriveWindow and DriveWindow Light at the same time. This is for example very helpful when using the DWL AP and DriveWindow to speed up the debugging of the program.
To communicate with the overriding control via serial communication following R-type fieldbus modules are available:

- Profibus-DP,
- DeviceNet,
- CANopen,
- ControlNet,
- Modbus (RTU),
- Modbus/TCP, and
- Ethernet/IP.

For serial communication modules slot 1 has to be used.

N-type fieldbus modules can be connected via SDCS-COM-8.

DDCS communication to overriding control systems from ABB like AC 800M are possible via SDCS-COM-8.
Remote diagnostics for fast an inexpensive service becomes more and more important. The DCS800 provides several different possibilities.

ABB’s professional commissioning and service tool DriveWindow can also be used for remote diagnostics via its build-in OPC server and Ethernet. For this the DriveWindow PC on site is used and connected to the Ethernet. Another DriveWindow PC in a remote location connects via OPC and Ethernet and the user is able to use the full capability of the professional tool to find and solve the problem.

By means of the NETA-01 it is possible to supervise up to 9 drives via Ethernet and an internet browser. It is possible to see, change and save parameters, to read the drive’s fault logger and to upload a saved data logger file. Each NETA module has its own homepage on the internet.

In very remote areas without Ethernet connection and no phone line it is possible to use a Tixi modem with build-in mobile phone. In case of a fault or alarm a service engineer is informed by means of a text message. The modem can also be called from a PC, then parameters can be manipulated, and the fault logger can be read with DriveWindow Light. Only a point to point or single drive connection is possible.
The DCSLink is a multi purpose communication link for the DCS800 based on the SDCS-DSL-4 board and a simple screened twisted pair cable.

One type of connection is used for communication to field exciters, for master-follower communication, drive-to-drive communication and 12-pulse communication. This slide gives an overview of the different communication types.

The DCSLink is used for an armature converter controlling an external field exciter.

To get a 12-pulse system a second armature converter is added and simply connected with the first armature converter via DCSLink.

Now another 12-pulse system is added and connected via DCSLink, and a master follower operation is possible.

Since the DCSLink is a bus system using twisted pair cables a bus termination is mandatory at its two physical ends.

This example shows the capability of the DCSLink. With one type of hardware and a simple cable connection 3 different kinds of communications can be done at once.
This slide shows an overview of all field exciters and where they are used.

OnBoard field exciter are used in converters sizes D1 to D4 with an incoming voltage of up to 525 VAC. The maximum field current is depending on the cooling and thus depending on the module size. For converters with incoming voltages of 600 VAC external field exciters with their own supply voltage have to be used.

The converter size D5 has an internal field exciter including field fuses. The internal field exciter is not internally connected and needs an additional supply with line chokes and field contactor.

The converters sizes D6 and D7 have no internal field exciter due to cooling reasons. Thus, only external field exciters can be connected.

All DCS800 converters can be connected to the external field exciters via the DCSLink.
This slide gives an overview of all external field exciters offered by ABB.

The external field exciters DCF803-0016 and DCF803-0035 have following features:

- The output current for the DCF803-0016 is 5 to 16 ADC or 0.3 to 5 ADC depending on the used output connection.
- The output current for the DCF803-0035 is 5 to 35 ADC or 0.3 to 5 ADC depending on the used output connection.
- The maximum supply voltage is 500 VAC with an auto transformer it is 600 VAC.
- Either all three phases or only a single phase can be connected. For single phase connection an additional auto transformer is needed to adapt the incoming voltage to the field voltage.
- Both field exciters are half controlled. A half controlled bridge consists of three thyristors and three diodes. So no negative voltage is possible and the field exciter can only work in the first quadrant. Thus both field exciters are 1-Q.

The external field exciters DCF503B0050 or DCF803-0050 and DCF803-0060 have following features:

- The output current for the DCF503B0050 and DCF803-0050 is 0.3 to 50 ADC.
- The output current for the DCF803-0060 is 0.3 to 60 ADC.
- The maximum supply voltage is 500 VAC with an auto transformer it is 690 VAC.
- Only a single phase can be connected. Thus an additional auto transformer is needed to adapt the incoming voltage to the field voltage.
- Both field exciters are half controlled. Thus they are 1-Q.

The external field exciters DCF504B0050 or DCF804-0050 and DCF804-0060 have following features:

- The output current for the DCF504B0050 and DCF804-0050 is 0.3 to 50 ADC.
- The output current for the DCF804-0060 is 0.3 to 60 ADC.
- The maximum supply voltage is 500 VAC with an auto transformer it is 690 VAC.
- Only a single phase can be connected. Thus an additional auto transformer is needed to adapt the incoming voltage to the field voltage.
- Both field exciters have two fully controlled anti parallel bridges. So it is possible to supply field current and field voltage in both directions and operation in all 4 quadrants is possible. Thus both field exciters are 4-Q.

For very high field currents up to 520 it is possible to use a standard DCS800 armature converter. This converter easily becomes an external field exciter by simply changing a couple of parameters. It can also be configured by parameters to become a stand alone field exciter.

- The output current runs from 20 to 520 ADC. Higher currents are possible on request.
- The maximum supply voltage is 525 VAC.
- All three phases need to be connected. Thus no additional auto transformer is mandatory.
- The standard converters come with either one fully controlled bridge - this is 2-Q - or two fully controlled anti parallel bridges - this is 4-Q.

<table>
<thead>
<tr>
<th>Type designation</th>
<th>Current range</th>
<th>Max. supply voltage</th>
<th>Type of field exciter</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCF803-0016</td>
<td>5 - 16 / 35 A or 0.3 - 5 A</td>
<td>500 VAC / 600 VAC</td>
<td>1-Q (single phase or 3-phase)</td>
</tr>
<tr>
<td>DCF803-0035</td>
<td>0.3 - 5 A</td>
<td>500 VAC / 690 VAC</td>
<td>1-Q (single phase)</td>
</tr>
<tr>
<td>DCF803-0050</td>
<td>0.3 - 50 A</td>
<td>500 VAC / 690 VAC</td>
<td>1-Q (single phase)</td>
</tr>
<tr>
<td>DCF803-0060</td>
<td>0.3 - 60 A</td>
<td>500 VAC / 690 VAC</td>
<td>1-Q (single phase)</td>
</tr>
<tr>
<td>DCC800-50x</td>
<td>20 - 520 A, higher currents on request</td>
<td>525 VAC, 3-phase</td>
<td>1-Q (single phase)</td>
</tr>
</tbody>
</table>

*with auto transformer **forthcoming
- Standard DCS800 converter modules used as field exciters need additional overvoltage protection called DCF505 or DCF506.
The DCS800 provides an internal PLC function called ControlBuilder DCS800 using CoDeSys to adapt the drive to demanding applications like cranes and winders.

The firmware of the DCS800 and the application program are separate from each other.

The used programming tool CoDeSys is a proven third-party tool based on the standard IEC 61131. CoDeSys is made by a company called 3S. The tool is available free of charge from the internet (www.3s-software.com). It is a proven programming tool not only used by ABB (AC 500, AC 31) but also by companies like Bosch, Lenze and many more.

The standard IEC 61131 asks for a set of internationally predefined programming languages like

- Structured text,
- Instruction list,
- Sequential function chart,
- Ladder diagram and
- Function block diagram.

All these programming languages are available in CoDeSys.

The binary file is saved on the ABB Memory Card. It is also possible to save the source code on the Memory Card and protect it by a password if desired.
The application program can only work with the ABB Memory Card SDCS-MEM-8 inserted into slot 4 of the SDCS-CON-4 board, because at every power-up the binary file needs to be loaded into the RAM of the drive.
The DCS800 can be used in a wide range of industrial applications.
This slide shows a small selection of industrial areas where the DCS800 can be used in motoric applications.
The DCS800 can be used in a wide range of industrial applications. This slide shows a small selection of industrial areas where the DCS800 can be used in non-motoric applications.

- Arc furnace / plasma torch
- Battery chargers
- Electrolysis
- Galvanic
- Heating (resistive load)
- Magnets
Key points of this module are:

- DriveWindow Light Tool
- Programming opportunities
- Field exciter connection
- Typical DC drives applications
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