# DeviceNet Motor Control Centers (MCCs)

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DeviceNet Motor Control Centers (MCCs)

Table 1 Publications

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<thead>
<tr>
<th>Title</th>
<th>Description</th>
<th>Publication Number</th>
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<tbody>
<tr>
<td>Bulletin 2100 CENTERLINE Motor Control Centers</td>
<td>Brochure</td>
<td>2100-BR002-EN-P*</td>
</tr>
<tr>
<td>Integrated Intelligence within an MCC—IntelliCENTERTM</td>
<td>Brochure</td>
<td>PCP-BR001-EN-P*</td>
</tr>
<tr>
<td>IntelliCENTERTM Software User Guide</td>
<td>User Manual</td>
<td>2100-UM002-EN-P*</td>
</tr>
<tr>
<td>Integrated, Intelligent Motor Control Centers</td>
<td>White Paper</td>
<td>2100-WP001-EN-P*</td>
</tr>
<tr>
<td>Joining and Splicing Vertical Sections</td>
<td>Instructions</td>
<td>2100-IN010-ENP</td>
</tr>
<tr>
<td>DeviceNet Product Overview</td>
<td>System Overview</td>
<td>DN-2.5</td>
</tr>
<tr>
<td>DeviceNet Selection Guide</td>
<td>Selection Guide</td>
<td>DN-4.010-EN-P*</td>
</tr>
<tr>
<td>DeviceNet Cable System</td>
<td>User Manual</td>
<td>DN-6.7.2-MAY99</td>
</tr>
<tr>
<td>KwikLink Radiated Immunity Testing</td>
<td>White Paper</td>
<td>1485-WP001-US-P*</td>
</tr>
<tr>
<td>KwikLink Connection System Brochure</td>
<td>Brochure</td>
<td>1485-CG001-EN-P*</td>
</tr>
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* x is a placeholder for the revision letter of the publication. When referencing and/or ordering via The Automation Bookstore (www.theautomationbookstore.com) always use the latest revision available.

Table 2 Websites

<table>
<thead>
<tr>
<th>Topic</th>
<th>Internet Web Address</th>
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<tr>
<td>IntelliCENTERTM</td>
<td><a href="http://www.ab.com/intellicenter">http://www.ab.com/intellicenter</a></td>
</tr>
<tr>
<td>Motor control centers</td>
<td><a href="http://www.ab.com/mcc">http://www.ab.com/mcc</a></td>
</tr>
<tr>
<td>Ordering publications</td>
<td><a href="http://www.theautomationbookstore.com">http://www.theautomationbookstore.com</a></td>
</tr>
<tr>
<td>DeviceNet (Allen-Bradley)</td>
<td><a href="http://www.ab.com/networks">http://www.ab.com/networks</a></td>
</tr>
<tr>
<td>Electronic data sheets (EDS) files</td>
<td><a href="http://www.ab.com/networks/eds">http://www.ab.com/networks/eds</a></td>
</tr>
<tr>
<td>Open DeviceNet Vendor Association (ODVA)</td>
<td><a href="http://www.odva.org">http://www.odva.org</a></td>
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Table 3 Technical Support

<table>
<thead>
<tr>
<th>Type of support</th>
<th>Access at</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone</td>
<td>440.646.5800</td>
</tr>
<tr>
<td>Fax</td>
<td>414.382.0505</td>
</tr>
<tr>
<td>E-mail</td>
<td><a href="mailto:raictechsupport@ra.rockwell.com">raictechsupport@ra.rockwell.com</a></td>
</tr>
<tr>
<td>Internet website</td>
<td><a href="http://www.ab.com/mcc">http://www.ab.com/mcc</a></td>
</tr>
</tbody>
</table>
Overview

This document describes cable system construction and components associated with a DeviceNet network that is factory installed in Bulletin 2100 CENTERLINE® and IntelliCENTER motor control centers (MCCs).

ATTENTION

Before performing any service or maintenance activities on MCC sections, disconnect all power sources.

DeviceNet

DeviceNet is a low-cost communication link to connect industrial devices (such as limit switches, photoelectric sensors, motor starters, push buttons, variable frequency drives, and operator interfaces) to a network and eliminate time-consuming and costly hardwiring.

DeviceNet is a simple, open networking solution based on the producer/consumer model, the latest in network technology. This technology allows for real-time control, data exchange, configuration capabilities, and collection of data at regular intervals or on demand. The network specifications and protocol are open—managed by the Open DeviceNet Vendor Association (ODVA)—meaning that vendors are not required to purchase hardware, software, or licensing rights to connect devices to a system. This has resulted in over 300 vendors offering DeviceNet products and over a half million installed nodes worldwide.

DeviceNet in MCCs

DeviceNet is ideally suited for MCC applications with respect to cost and performance. This document details the applications of DeviceNet in MCCs, including cable system construction and common DeviceNet components.
System Architecture

When designing DeviceNet systems, it is necessary to consider the following factors:

- Total trunk length does not exceed the maximum allowable per network baud rate: 246 feet (75 m) at 500 kbps, 656 feet (200 m) at 250 kbps or 1378 feet (420 m) at 125 kbps
- Cumulative drop length does not exceed the maximum allowable per the network baud rate: 128 feet (39 m) at 500 kbps, 256 feet (78 m) at 250 kbps or 512 feet (156 m) at 125 kbps
- Number of nodes does not exceed 64, with three nodes reserved for scanner (node 00), PC (node 62) and new device (node 63)
- Total power load and distribution points do not exceed 8A
- Individual drop lengths do not exceed 20 feet (6 m)

Designing Cable Systems

**IMPORTANT:** For IntelliCENTER, 500 kbps provides optimum performance, but 250 kbps may be used (125 kbps is not recommended).

- To simplify and MCC design a separate DeviceNet network is recommended for each MCC line-up. See Figure 1.
- The DeviceNet should be bridged to ControlNet or Ethernet in the MCC.

This approach generally allows the network to operate at the maximum speed (500 kbps) and reduces the likelihood of encountering limits for node count, power consumption, and cable lengths. While other architectures can be employed, care must be taken to avoid these limits. See Figure 2.
Figure 1 Recommended System Architecture

ControlNet or Ethernet

Add-on MCC Example
Potential Issues:
• Exceeding trunk line limits
• Exceeding drop line limits
• Exceeding node count limit
• Exceeding power supply limit

Remote PLC Example
Potential Issues:
• Exceeding trunk line limits
**Determining DeviceNet Cable Lengths**

To help determine cable lengths for your application, each MCC is shipped with documentation identifying the trunk and drop length used within the MCC.

**Figure 3 DeviceNet Network Specifications**

<table>
<thead>
<tr>
<th>NETWORK NUMBER:</th>
<th>CURRENT DRAW: 2.115 AMPERES</th>
<th>BTC ( \text{BAUD RATE:} 500\text{kbps} )</th>
<th>CUMULATIVE DROP LENGTH: 40.30 FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL NUMBER OF NODES: 16</td>
<td>CUMULATIVE TRUNK LENGTH: 93.70 FEET</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE** – The cumulative length of the trunk and drop cables determine the maximum baud rate of the DeviceNet system.

- 500kbps if the cumulative trunk length is less than 246 feet (75m) AND the cumulative drop length is less than 128 feet (39m).
- 250kbps if the cumulative trunk length is less than 656 feet (200m) AND the cumulative drop length is less than 256 feet (78m).
- 125kbps if the cumulative trunk length is less than 1378 feet (420m) AND the cumulative drop length is less than 512 feet (156m).

**Number of Devices per Network**

DeviceNet can accommodate 64 nodes, with three nodes reserved for scanner (node 00), PC (node 62) and new device (node 63).

The assume expandability and performance the following guidelines for the initial system should be considered:

- 50 Nodes maximum @ 500 kbps for DeviceNet or IntelliCENTER MCCs
- 50 Nodes maximum @ 250 kbps for DeviceNet MCCs
- 35 Nodes maximum @ 250 for IntelliCENTER MCCs

This approach may necessitate additional DeviceNet scanner modules, but has proven worthwhile in many applications.
MCC Cable System Construction

ATTENTION

Do not apply high voltage to any installed DeviceNet cable system or its connectors. The high voltage will destroy internal capacitors in the connectors.

Three types of media (cable) are used in MCCs for DeviceNet communication:

<table>
<thead>
<tr>
<th>Type</th>
<th>Flat</th>
<th>Round</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Class 1, 600 Volts, 8 Amps</td>
<td>• Class 1, 600 Volts, 8 Amps</td>
<td>• Class 1, 600 Volts, 8 Amps</td>
</tr>
<tr>
<td></td>
<td>• 4 conductor—no shield or bare wire required in Class 1 DeviceNet MCCs</td>
<td>• 4 conductor—no shield or bare wire required in Class 1 DeviceNet MCCs</td>
<td>• 4 Conductor - No shield or bare wire required in Class 1 DeviceNet MCCs</td>
</tr>
<tr>
<td>Use</td>
<td>Trunk lines (and drop lines in series L sections)</td>
<td>Connecting units to DeviceNet ports (unit drop lines)</td>
<td>Trunk line for extending trunk beyond MCC</td>
</tr>
<tr>
<td>Part Number</td>
<td>1485C-P1E75 (75 m spool) 1485C-P1E200 (200 m spool) 1485C-P1E420 (420 m spool)</td>
<td>1485C-P1-B50 (50 m spool)</td>
<td>Belden 7896A</td>
</tr>
</tbody>
</table>

For flat cable specifications, refer to publication 1485-CG001x-EN-P.

IMPORTANT

It is not recommended to use both Class 1- and Class 2-rated cables within the same DeviceNet system. These two cable types are not compatible because the following properties are different:

- Insulation class
- Overcurrent protection requirements
- Network transmission

Using Class 1- and Class 2-rated cables within the same DeviceNet system can result in application, code, and communication problems.
Series M Sections (May 2001 and later)

The **DeviceNet trunk line assembly** is typically mounted in a channel above the horizontal power bus bars. If a neutral bus is mounted in the upper channel, the trunk line assembly will be mounted below the horizontal power bus bars. The trunk line continues vertically, behind the vertical wireway, joined to the horizontal portion via a DeviceNet connector.

In a standard MCC section, the vertical segment of trunk line has six DeviceNet ports directly connected to it, built into the back of the vertical wireway. Units with communicating devices have a **DeviceNet drop line** from the device, plugged into the ports. Each port is independent, allowing any unit to be plugged in and removed without affecting adjacent units. If a unit with a communicating device occupies a full section, only one DeviceNet port is supplied.

The trunk line terminates with a DeviceNet plug on the left side and a receptacle on the right side. It is accessible from any unattached side of a section by removing the center end cover plate.

**Figure 4 Typical Single MCC Section (Series M)**
Series L Sections (through May 2001)

The DeviceNet trunk line assembly typically is mounted in a channel above the horizontal power bus bars. If a neutral bus is mounted in the upper channel, the trunk line assembly will be mounted below the horizontal power bus bars.

The DeviceNet drop line is located behind the vertical wireway and attaches to the trunk line via a DeviceNet connector. It has six DeviceNet ports directly connected to it, that are built into the back of the vertical wireway. Units with connecting devices have a DeviceNet drop line from the device that plugs into the ports. Each port is independent, allowing any unit to be plugged in and removed without affecting adjacent units. If a communicating device is present in a unit occupying a full section, one DeviceNet port is supplied.

The trunk line terminates with a DeviceNet plug on the leftmost side and a receptacle on the rightmost side of a shipping block. It is accessible from the unattached left and right sides of a shipping block by removing the center end cover plate.

Figure 5 Typical Two-Section Shipping Block (Series L)
Terminating Resistors

Terminating resistors are necessary at the ends of trunk lines to reduce reflections of the communication signals on the network. **The DeviceNet network will operate correctly only when there are exactly two terminating resistors, one at each end of the trunk line.** Terminating resistors must be equal to 121 ohms 1%, 1/4W, metal film (terminating resistor part number 1485A-C2).

MCC line-ups ship with a clear bag containing two (2), five-terminal plug connectors with an installed terminating resistor and a double DeviceNet connector (part number 2100H-DNTR1). The resistors are inserted in the second terminal from each end (connected to the white and blue conductors) of both plugs (See Figure 6).

**Figure 6 Five-terminal Plug Connector, Plug Number 22112-215-01, with jack screws**

The bag is attached to a wireway tie bar, in the vertical wireway of the section that contains documentation (identified by a label on the horizontal wireway cover of this section). The vertical wireway door of this section will also have an identifying label: “**DEVICENET TERMINATING RESISTOR KIT LOCATED BEHIND THIS DOOR**” (See Figure 7). If the section does not contain a vertical wireway, the bag will be attached to a wireway tie bar on the right hand side of the section and the label will be located on the door of the section.

**ATTENTION** Before performing any service or maintenance activities on MCC sections, disconnect all power sources.
Figure 7 DeviceNet Terminating Resistor Kit

Terminating Resistor Kit
Part # 2100H-DNTR1
Installing Terminating Resistors

When the left is one end of the trunk line, install the terminating resistor in the topmost port

When the rightmost section is one end of the trunk line, install the terminating resistor in the bottommost port

When installing terminating resistors, apply the following two rules:

1. Use only two terminating resistors in any network
2. Install terminating resistors at the ends (communication and/or physical) of the trunk line

Incorrect placement of terminating resistors and/or using more than two will cause improper network operation and result in communication losses.

For visibility, accessibility, and safety, the ideal locations for terminating resistors within a DeviceNet MCC are the vertical wireway ports closest to the physical ends of the total trunk line. In a leftmost section, this is the topmost port; in a rightmost section, this is the bottommost port (see example at left). When connecting a DeviceNet MCC to remote equipment, the trunk line may end at a device, such as a PLC card. In these instances, a terminating resistor should be installed in the final connector to that device.

The following diagrams illustrate some common equipment configurations and the correct placement of the terminating resistors. The number of sections shown is arbitrary and for illustration purposes only. Drawings are not to scale.

If you have questions about installing terminating resistors in your MCC, contact technical support.

**IMPORTANT** The portion of the MCC trunk line that is to the left of the leftmost terminating resistor and to the right of the rightmost terminating resistor is considered drop cable and must be included in the total drop cable calculations.

**Figure 8 Terminating Resistor (plug) installed in vertical wireway port**
Figure 9 DeviceNet scanner remote from MCC - One DeviceNet network

Figure 10 DeviceNet scanner installed in the first full section; no other units in that section - One DeviceNet Network
Figure 11 DeviceNet scanner installed in a middle section in a plug-in unit - One DeviceNet network

Figure 12 DeviceNet scanner installed in a middle section in a plug-in unit - Two DeviceNet networks

Do not splice trunk lines between two separate DeviceNet networks.
Figure 13 DeviceNet scanner remote from MCC - Two DeviceNet networks

Do not splice trunk lines between two separate DeviceNet networks.
To minimize the impact of DeviceNet trunk length limitations, it is recommended that each MCC have an independent DeviceNet network. Accordingly, the following two architectures shown must be used with caution.

**Figure 14 DeviceNet scanner remote from MCCs - One DeviceNet network; divided MCC line-up**
Adding a Motor Control Center Unit to a DeviceNet System

General

Use this section to add Bulletin 2100 and 2400 units to a DeviceNet MCC. Each DeviceNet component is factory wired within the unit and has a communication cable that plugs into the device on one end and generally into a vertical wireway DeviceNet port on the other end.
Procedure

ATTENTION Before performing any service or maintenance activities on MCC units or sections, disconnect all power sources.

For a CENTERLINE MCC with a Class 1 DeviceNet cabling system:

1. Determine the proper length of patch cable by measuring from the DeviceNet device in the unit to the DeviceNet port in the vertical wireway.

   NOTE: Cable can be made as short as is practical, since excessive drop lengths can lower data transmission rates. Refer to DeviceNet Selection Guide, publication DNET-SG001x-EN-P, for specific design parameters.

2. Cut the cable to the desired length by removing material from the end of the cable that has no connector plug. Strip the cable and attach the separate five-terminal plug connector. The wire is color coded for simplified wiring.

3. Plug the one connector into the DeviceNet component in the unit. Plug the other plug connector into the DeviceNet port in the vertical wireway. Torque the screws on both connectors to 5 lb.-in. (0.55 Nm).

4. If there is a need to plug in more devices than available DeviceNet ports in the vertical wireway double. DeviceNet connector (Catalog Number: 1485P-PIJ5-UU5 or Part Number 42122-304-51). This allows two devices to be plugged into one port.

Figure 16 Connecting the unit DeviceNet cable to the DeviceNet port in the back of the vertical wireway
Software Update

After installing or relocating units in an IntelliCENTER MCC, the user must update the IntelliCENTER software by following these directions.

Adding Additional Data Disk(s)

Insert the new data disk into the computer’s CD-ROM drive. The CD contains an auto-install program that will guide the user through the installation. The user will be prompted to choose the directory into which the new data disk will be installed. The installation program will suggest the directory into which the original software was installed. It is recommended that the new data disk be installed into the same directory.

Moving IntelliCENTER Units

Moving IntelliCENTER Units Within the same MCC Lineup

After changing the location of a unit in the IntelliCENTER (physically moving the unit in the actual MCC lineup) the new unit location must be entered into the Spreadsheet View of the IntelliCENTER software. To make the change in the IntelliCENTER software, open the Spreadsheet View by selecting Spreadsheet - from the View menu or by 'clicking' on the Spreadsheet View icon.

In the Spreadsheet view 'click' in the Vertical Section cell (if the Vertical Section column is not shown see Adding and Removing Columns) and change the Section Number by simply typing over the existing section number. Next, click in the Unit Location cell (if the Unit Location column is not shown see
Adding and Removing Columns) and choose the new location from the drop-down list.

After the above selections are completed 'click' the Apply button to save the change in the software.

The original unit location, network, node number and baud rate is labeled on each device. See Figure 17.

**Moving IntelliCENTER units to a different MCC lineup**

After moving an IntelliCENTER unit to a different lineup (physically moving the unit from one IntelliCENTER MCC to another) the unit location must be reflected in the IntelliCENTER software. This is done by entered into the Spreadsheet View of the IntelliCENTER in which the unit was moved from. Open the Spreadsheet View by selecting Spreadsheet - from the View menu or by 'clicking' on the Spreadsheet View icon.
In the Spreadsheet view 'right click' in the Spreadsheet View and select Move Unit to Another Lineup from the Edit menu.

Fill in the appropriate information and then 'click' the OK. In the Spreadsheet View 'click' the Apply button to save the change in the software. This change will automatically add the new information (unit) to the database (lineup) where the unit was moved.

The original unit location, network, node number and baud rate is labeled on each device. See Figure 17.

**Figure 17 DeviceNet Label**
Splicing DeviceNet Communication Cables in Motor Control Centers

General

This section describes the recommended procedure for splicing DeviceNet communication cables (trunk lines) in MCCs. It must be used in conjunction with publication 2100-IN010x-EN-P, Joining and Splicing Vertical Sections. Cable can be spliced to the leftmost or rightmost section of an MCC lineup. Photos show splicing to a rightmost section.

Procedure

1. Join the sections, following steps 1 through 7 on pages 1 and 2 of publication 2100-IN010x-EN-P. To access splice connections, remove the red bus cover through the vertical wireway opening.

2. Splice the horizontal bus, following steps 1 through 4 on pages 10 through 11 of publication 2100-IN010x-EN-P. Do not replace covers or plates at this time.

3. To splice DeviceNet trunk lines between separate sections, connect the linking plug from the right section into the left section linking receptacle. Torque connector screws to 5 lb.-in. (0.6 Nm).

4. When joining new sections to an existing MCC, remove the terminating resistor from the original final section (the one to which new sections were just spliced). Install the terminating resistor according to the information supplied in the sections “Terminating Resistors” and “Installing Terminating Resistors” beginning on page 9.

Following the rules and guidelines required in The Planning and Installation Manual for DeviceNet, make certain that terminating resistors (equal to 121 ohms 1%, 1/4W, metal film and supplied in the first and last sections of the MCC lineup) are plugged in at the far left and far right ends of the DeviceNet trunk line.

5. Follow step 5 on page 11 of publication 2100-IN010x-EN-P.

6. When new sections are added, always do the following design calculations:
   - Check the total number of nodes. See System Architecture. If the number of nodes exceeds the guidelines, add a network.
   - Recalculate the total power consumption. If it exceeds 8 A, add a power supply.
   - Verify the cumulative trunk length. See System Architecture.
   - Verify the cumulative drop length. See System Architecture.
**DeviceNet Motor Control Centers (MCCs)**

**Figure 18 MCC Section (Series M)**

Typical single MCC section (Series M)

- Linking Plug
- DeviceNet Trunk line
- Linking Receptacle
- 3-phase horizontal power bus

**Figure 19 MCC Section (Series L)**

Typical Single MCC Section (Series L)

- Linking Plug
- DeviceNet Trunk line
- Linking Receptacle
- 3-phase horizontal power bus

**Front view of DeviceNet splice (Series M)**

**Front view of DeviceNet splice (Series L)**
Connecting DeviceNet to Equipment Remote from the MCC Sections

General

This section describes the recommended procedure for connecting DeviceNet communication cables (trunk lines) in CENTERLINE and IntelliCENTER, Series L and M MCC sections, to equipment remote from the MCC sections.

The DeviceNet connection will be to the end of the trunk line in the MCC section nearest to the equipment. This effectively makes the connecting cable an extension of the trunk line. Refer to the DeviceNet Cable System Planning and Installation Manual, DN-6.7.2-MAY99, for length restrictions and associated effects on data transmission rates.

Procedure

Class II DeviceNet cable is NOT recommended for extending the trunk. Obtain approved DeviceNet cable long enough to connect between the MCC section and equipment. The Belden Class I shielded round trunk cable, Belden 7896A, is strongly recommended. When using this cable use trunk length limits for the flat cable. Refer to DeviceNet publications such as DN-6.7.2-MAY99 for details about attaching connectors to cables. To strip flat cable, make a shallow cut on each flat surface and edge. Flex the cable jacket to complete the break, then pull the jacket free from the wires. Strip away approximately 1/4 inch (6.35 mm) insulation from each of the four conductors.

1. Determine the safest and most convenient place to access the DeviceNet cable terminating point in the remote equipment. Drill the necessary cabinet or cover plate opening. Terminate the MCC end of the cable at the bottommost wireway port of the rightmost section or at the topmost wireway port of the leftmost section. Remove the terminating resistor plug from the wireway port, and save it for correct installation when all DeviceNet connections are complete.

2. If the termination is to another DeviceNet cable, proceed to step 3. If the termination is at a DeviceNet module (ControlNet to DeviceNet Linking device [CN2DN] or modules for 1771, SLC 500, or ControlLogix PLCs), plug the cable connector into the module connector. Torque connector screws to 5 lb.-in. (0.6 Nm). If this connection is the termination of the DeviceNet cable (end of the trunk line), remove the resistor from the terminating resistor plug (from step 1). Insert the resistor into the open row of terminals on the ten-terminal plug connector to terminate the white and blue conductors (second hole from each end).
3. If the termination is to another DeviceNet cable, remove the terminating resistor from the other cable (if one is present). Insert the new cable connector into the existing cable connector. Torque connector screws to 5 lb.-in. (0.6 Nm).

4. Following the rules and guidelines required in The Planning and Installation Manual for DeviceNet, make certain that terminating resistors (equal to 121 ohms 1%, 1/4W, metal film and supplied in the first and last sections of the MCC line-up) are plugged in at the far left and far right ends of the DeviceNet trunk line.

5. For connecting other equipment not referenced above, please consult Rockwell Automation technical support.
When wiring between field devices and input points in the MCC, care should be given to maintaining separation between control and power wiring. For more information, refer to publication 1770-4.1, *Industrial Automation Wiring and Grounding Guidelines*, specifically the section of raceway layout considerations.
DeviceNet Power Supply

The DeviceNet cable system requires a 24Vdc power source to operate. The power supply must:

- Meet NEC Class 1 requirements as outlined in Article 725
- Be DeviceNet compatible as specified in the ODVA requirements

Power supplies that do not satisfy both points listed above can result in damage to the DeviceNet signal and components, as well as failure to comply with NEC, local codes, and inspection.

A power supply unit that meets all DeviceNet requirements can be supplied with the MCC—catalog number 2100-DPS—(consult your local Rockwell Automation salesperson or Allen-Bradley distributor). It is available in three configurations: with circuit breaker or fusible disconnect and 500 VA control transformer (NOTE: transformer is provided in a separate unit); or with no disconnecting means, requiring a separate 110–120 V source. A cable connects the output of the power supply to a DeviceNet port in the back of the vertical wireway. The cable is already connected when the power supply unit ships installed in the MCC.

Remote power supplies should meet the following requirements (refer to DN-6.7.2-MAY99 for additional information):

- Rated 24 Vdc (±1%)
- Rise time of less than 250 milliseconds to within 5% of its rated output voltage
- Current limit protection
- Sized correctly to provide each device with its required power—each device typically requires 90–165 mA
- Derated for temperature using the manufacturer's guidelines

Connecting Power Supplies—Remote or in the MCC Line-Up

Connecting power supplies according to these guidelines will minimize voltage drops in the DeviceNet system and ensure proper supply voltage to system devices. Refer to the DeviceNet Cable System Planning and Installation Manual, DN-6.7.2-MAY99, for detailed connecting instructions.

Series M Sections

For line-ups with more than eight sections, connect the power supply to the DeviceNet system within one section, either way, of the middle of the line-up.
For line-ups with eight or fewer sections, connect the power supply to the DeviceNet system where it is convenient (no location restrictions).

**Series L Sections**

Connect the power supply to the DeviceNet system where it is convenient (no location restrictions).

**Network Grounding at the Power Supply**

The DeviceNet cable must be grounded at only one location. The ideal choice is at the power supply. Ground the power supply and 24 Vdc common (black wire) using #8 AWG wire.

**Best Grounding Practice**

- If the power supply comes installed in the MCC, the black 24 Vdc common terminal is grounded within the unit. To improve the grounding, use #8 AWG green wire and ground the black 24Vdc common terminal to a very stable ground external to the MCC (or to an optional TE ground inside the MCC).
- If the power supply is external, the same grounding recommendations apply.

**Connecting Two Power Supplies**

An additional 24 Vdc Class 1 power supply must be installed for MCC line-ups with more than 17 sections. When using two supplies, the red conductor between the power supplies must be broken. Locate a linking connector between sections and disconnect the red conductor (See Figure 21).

Ground only ONE of the two power supplies.
Position each power supply to ensure that it feeds a maximum of eight sections to the left or right (refer to the sample line-up below).

MCC line-ups with more than 17 sections could exceed the 75 meters (246 feet) trunk length limit to support 500 kbps communications. When the trunk length exceeds this limit, 250 kbps communications should be specified.
Start-Up and Training Aids

IntelliCENTER MCC Design, Start-Up and Training Course

Course Description

This course provides the concepts, knowledge and tools necessary to design, specify, install, troubleshoot, and use an IntelliCENTER MCC or DeviceNet MCC.

Content

- Basics of communication and Rockwell Automation networks
- Control and communication architecture overview with sample architecture problems solved in class (selecting networks, network devices, network speeds, etc.)
- DeviceNet MCC structure, units and wiring technical details for both low voltage and medium voltage MCCs
- Demonstration of software associated with DeviceNet MCCs (RSLinx and RSNetworkx for DeviceNet)
- Necessary steps for a successful start-up including installing EDS files
- Maintenance issues, such as adding MCC units to IntelliCENTER MCCs, replacement of DeviceNet devices and recommended tools
- Optional Third day focuses on network configuration, mapping of scanners, and PLC programming in a DeviceNet MCC system, including hands-on exercises with a ControlLogix system

Who Should Attend

This course is intended for control engineers, electrical technicians and system integrators who will be involved in designing, installing and using IntelliCENTER/DeviceNet MCCs.

Prerequisites

Familiarity with Windows and PLC programming
Topical Outline

- Basics of digital communication
- Overview of Rockwell Automation communication architecture
- Basics of DeviceNet
- RSLinx and RSNetworkx for DeviceNet introduction
- DeviceNet wiring rules
- Receiving and installing DeviceNet MCC sections
- IntelliCENTER software configuration
- Installing and registering EDS files
- Adding MCC units to IntelliCENTER MCCs
- Replacement of DeviceNet devices
- Hands-on IntelliCENTER lab
- Support resources
- Mapping scanners - introduction, examples, hands-on (Optional - Third Day)
- Programming PLCs connected to DeviceNet - introduction, examples, hands-on with a ControlLogix system (Optional - Third Day)

Course Dates and Prices

Refer to www.ab.com/intellicenter

Field Support Kit for DeviceNet MCCs

The Allen-Bradley DeviceNet and IntelliCENTER MCCs provide users with a DeviceNet network that is wired, commissioned and tested, resulting in a true plug-and-play integrated solution. As with any control system, through a successful installation requires the proper tools. This kit includes an assortment of DeviceNet-related components that will prove helpful for:

- Starting up a DeviceNet system
- Commission DeviceNet nodes (setting baud rate and node number)
- Testing DeviceNet devices
- Training on DeviceNet
The kit includes a mini network, a DeviceNet configurator tool and assorted components.

<table>
<thead>
<tr>
<th>Mini Network</th>
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<tbody>
<tr>
<td>• Trunk line with three DeviceNet ports and terminating resistors</td>
</tr>
<tr>
<td>• 10 foot patch cable</td>
</tr>
<tr>
<td>• 1.5 foot patch cable</td>
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<tr>
<td>• 24 Vdc power supply</td>
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<table>
<thead>
<tr>
<th>DeviceNet Configurator Tool</th>
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</thead>
<tbody>
<tr>
<td>• DeviceNet Handheld Configurator (193-PCT)</td>
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<tr>
<td>• Configurator Cable (2707-NC13)</td>
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</table>

<table>
<thead>
<tr>
<th>Assorted Components for DeviceNet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• (5) Terminating Resistors</td>
</tr>
<tr>
<td>• (10) 5-Terminal Plug Connectors</td>
</tr>
<tr>
<td>• (5) 10-Terminal Plug Connectors</td>
</tr>
<tr>
<td>• (2) 5-Terminal Male Connectors</td>
</tr>
<tr>
<td>• 10 foot Round Class 1 DeviceNet Cable</td>
</tr>
<tr>
<td>• Narrow-tip Screwdriver for DeviceNet Connectors</td>
</tr>
<tr>
<td>• DeviceNet Y-Header</td>
</tr>
</tbody>
</table>
Applications

Standalone Configurator Tool

Mini-network wall plug power supply (with male connector)

1.5 ft. patch cable (with connectors)

E3 Electronic Overload Relay (not included)

Y-Header (Splitter)

Configurator cable

DeviceNet Configurator, Internal terminator resistor programmed "IN"

DeviceNet Device (not included)

Connecting to a DeviceNet MCC

10 ft. patch cable (with connectors)

Laptop computer with 1784-PCD DeviceNet card and cable (not included)

10 terminal plug with terminating resistor plugged into port

Mini network
The following items are suggested for IntelliCENTER and DeviceNet MCC installation and maintenance:

- Field Support kit for DeviceNet MCCs, 2100H-DFSK1
- Hand tools—high-quality side-cutter, needle nose pliers, wire stripper
- Short length of Class 1, 8 A round adapter cable with five-terminal receptacle on each end
- Ten foot (3 m) personal computer (PC) cable with five-terminal plug on each end—part number 2100H-ICPC120
- Digital multi-meter—Fluke 79 or equivalent
- ODVA DeviceNet monitor — order form available at http://www.ab.com/intellicenter/instructions or contact product support
- Laptop personal computer with the following software:
  - RS Networx for DeviceNet
  - RS Linx
  - ControlFlash update software
  - RS Logix 5 for PLC/5
  - RS Logix 500 for SLC and MicroLogix
  - RS Logix 5000 for ControlLogix
  - IntelliCENTER software

Training Cases

For the ultimate in-house training - 2 styles of IntelliCENTER training cases are available

2-Unit Training Case
- Starter with E3 electronic overload relay
- Starter with DeviceNet Starter Auxiliary
- Motor
- Load

1-Unit Training Case
- Starter with E3 electronic overload relay
- Load for each phase
System Design Installation Checklist

When installing a DeviceNet MCC, use the following checklist before applying power to the network:

- Number of nodes does not exceed 64, with three nodes reserved for scanner (node 00), PC (node 62), and new device (node 63)
- Individual drop lengths do not exceed 20 feet (6 m)
- Cumulative drop length does not exceed the desired network baud rate limit: 128 feet (39 m) at 500 kbps, 256 feet (78 m) at 250 kbps or 512 feet (156 m) at 125 kbps
- Total trunk length does not exceed the maximum allowable per the network baud rate: 246 feet (75 m) at 500 kbps, 656 feet (200 m) at 250 kbps, or 1378 feet (420 m) at 125 kbps

NOTE: For IntelliCENTER, 500 kbps provides optimum performance, but 250 kbps may be used (125 kbps is not recommended).

- Verify that all devices are programmed to the same baud rate. Autobaud can be used for each device. The scanner will then set the baud rate for the entire system
- Verify that terminating resistors are in place at the trunk line terminations and measure for proper resistors (121 ohms, 1/4 W, 1%, metal film)
- Verify that the power supply for the system is 24 Vdc
- Total power load and distribution points do not exceed 8 A
- The system has one, and only one, earth ground for the V-
- There is an earth ground connection
- All connections are inspected for loose wires, opens, and shorts

DeviceNet Software Installation Checklist

The following general steps, along with references for more information, are provided to assist with the DeviceNet software installation process.

1. Install the communication card in your personal computer.
2. Load the Windows hardware drivers for the communication card.
3. Load RSNetworx™ for DeviceNet and RSLinx software.
4. Configure the RSLinx driver.
   - Within the RSWho function, make sure no unrecognized devices (i.e., “?” symbols) appear for any devices. If an unrecognized device appears, load the Electronic Data Sheet (EDS) file. See the “How to Find Electronic Data Sheets (EDS)” section below for further details.
5. Use RSNetworx for DeviceNet to program and configure devices (e.g., full load current, acceleration rate, etc.).

Do not download to a device before uploading from that device. Otherwise, the node and baud rates will be overwritten, requiring each device to be individually manually reprogrammed.

Make sure to set communication-loss behavior for each device.

6. Use RSNetworx for DeviceNet to program the DeviceNet scanner.

RSNetworx for DeviceNet can also be used to change baud rates and node numbers, but remember that the devices are normally pre-programmed at the factory.

7. Write the PLC program.

8. If IntelliCENTER software is provided, load per the IntelliCENTER Software User Guide (publication 2100-UM002-EN-P).

**How to Find Electronic Data Sheets (EDS)**

**Background**

After installing IntelliCENTER software, an Electronic Data Sheet (EDS) file must be registered for each unique device in the MCC. This section details how to perform that task.
Definition of EDS Files

EDS files are simple text files used by network configuration tools—such as DeviceNetManager™, RSNetworx, and IntelliCENTER software—to help identify products and easily commission them on a network. EDS files describe a product’s device type, product revision, and configurable parameters on a DeviceNet or ControlNet network.

Necessary EDS Files

For IntelliCENTER MCCs the data CD contains a directory (<cdrom>:\EDS) of all EDS files necessary for the devices in your IntelliCENTER. The EDS files will be automatically registered by the installation program.

For IntelliCENTER and DeviceNet MCCs, a separated “EDS file” CD is provided. This CD contains EDS files for all DeviceNet products found in MCCs.

Installing EDS Files

The EDS files are installed with a program from Rockwell Software that is also on the IntelliCENTER data CD (in the same directory as the EDS files). This program is called “RSHWare.exe.”

To install the EDS files:

1. Run the program RSHWare.exe.
2. Click Add/Remove.
3. Select Register an EDS file. Click Next.
4. Select Register a directory of EDS files.
5. Browse to the EDS directory on the data CD.
6. Click Next.
7. The Installer will display the test results. Click Next to continue.
8. The Installer will allow you to change the graphic image for each device. Click Next to continue.
9. The Installer will display the final task summary. Click Next to continue.
10. Click Finish when completed.

Finding EDS Files for Other Devices

EDS files can be obtained at http://www.ab.com/networks/eds.
Notes: