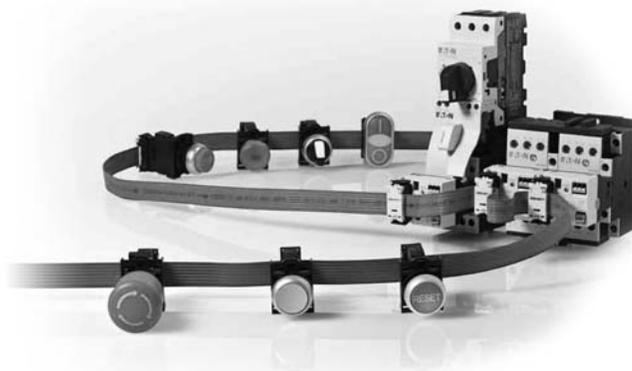


# SmartWire-DT Connectivity



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## General Questions

### 1. What is SmartWire-DT?

SmartWire-DT is control panel wiring replacement system. It uses an eight conductor flat cable to connect common control components together instead of using traditional point to point wiring connections. This flat cable carries the control power for devices and also handles the high level communication and control of the devices. It is a neat, fast, efficient, and safe panel wiring system.

### 2. What does the “DT” stand for in SmartWire-DT?

The DT and the DT mark stands for Device Technology and refers to the fact that SmartWire-DT compatible devices contain an ASIC (Application Specific Integrated Circuit) chip which allows intelligent communication on the SmartWire-DT network.

### 3. How is SmartWire-DT different than other device level networks such as DeviceNet, PROFIBUS-DP, and ASi?

SmartWire-DT is the first system that was intentionally designed to reduce the conventional point-to-point wiring found in control panels so it was designed to attach quickly, easily, and neatly to common control components such as motor starters and pilot devices. Points of difference include:

- The flexible flat cable that can attach easily to motor contactors and pilot devices mounted in a side-by-side configuration
- The number of devices that can be connected to each gateway; up to 99 nodes per gateway
- The ability for the network to connect to devices inside the control panel and to extend to other control panels or pushbutton control stations on the same line
- Automatic node addressing means there are no DIP switches to set to address nodes on the network—it is automatically done with the push of a button and nodes can be reassigned automatically when new nodes are added and/or replaced on the network

### 4. Is SmartWire-DT a proprietary network or an open protocol?

Eaton has invested a significant amount of R&D to develop the SmartWire-DT system—including the communication protocol and ASIC hardware set—and retains the proprietary rights for the system. However, the protocol is open to qualified manufacturers that want to develop SmartWire-DT compatible devices. SmartWire-DT development kits are available for this purpose.

### 5. What is the maximum operating length for SmartWire-DT network and how many nodes can it support?

The SmartWire-DT network can be 2,000 feet or 600 meters long and each gateway can have up to 99 devices connected to it. The actual number of devices that can be connected depends on the type of fieldbus that is being used. On PROFIBUS-DP networks, the SmartWire-DT gateways support 58 nodes but on a CANopen network, the SmartWire-DT gateway supports 99 nodes. If additional nodes are required, then additional gateways can be used.

### 6. The SmartWire-DT system seems to include a lot of parts and components. How do you design a layout and manage all the different components to construct a system?

SmartWire-DT was designed to reduce the wiring, design, and testing effort required for complex control panels while maintaining all the flexibility you need for a variety of control panel requirements. A configuration software program called SWD-Assist is available as a free download, to help you plan the network layout and to ensure that all of the logistics of construction the network are simply addressed. An auto-completion wizard makes it easy to use SWD-Assist and ensures that all the required parts and control power requirements are addressed. It generates the required bill of materials and data files for the gateway modules.

### 7. What is the functional safety rating of SmartWire-DT?

Currently, the SmartWire-DT network is not rated for “functional safety” which means that Emergency Stop switches (E-Stops) still have to be hard-wired to interrupt the 24Vdc control power circuit on the SmartWire-DT cable. The E-Stops can also be connected as a node on the network to monitor its status. The M22 E-Stops can accept a SmartWire-DT module and up to four normally closed (N.C.) contact blocks.

### 8. What are the origins of the SmartWire-DT technology?

The origins of SmartWire-DT are from the Moeller line of products, originally called Darwin Technology. It was developed as a more compact way of connecting multiple sections of a machine, as well as being able to create easier wiring of devices inside of the panel.

### 9. When will SmartWire-DT Ethernet gateway be available for sale?

The SmartWire-DT Ethernet gateway is planned for release in the fourth quarter of 2011 and will be suitable for use with EtherNet/IP and Modbus TCP networks.

### 10. Does Eaton provide training on how to configure SmartWire-DT?

Eaton provides the SmartWire-DT configuration software, called SWD-Assist, as a free download. The MS Windows compatible SWD-Assist allows you to plan and configure your SmartWire-DT network using simple click and drag commands.

### 11. Are there any other device level networks that have the same capability as SmartWire-DT?

When you consider the cost, simplicity, functionality, and ease of use, there is no other network on the market today that is comparable to SmartWire-DT! Remember that SmartWire-DT was specifically designed to eliminate one of the biggest pain points for an OEM or panel builder—the cost, time, and effort involved in conventionally wiring a control cabinet. SmartWire-DT saves time, increases efficiency, and reduces typical errors associated with point-to-point wiring.

## Technical/Application Questions

### 12. What is the speed or polling cycle time of a SmartWire-DT network?

This chart is from the SmartWire-DT system manual. It shows the polling cycle time for SmartWire-DT as a function of number of devices and total data size. It shows that the polling time is mostly dependent on total data size.

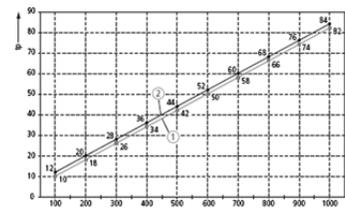


Figure 2: Polling cycle time, dependent on the SMD user data bytes transferred at 125 Kbits  
 $n$  = number of user data bytes  
 $t_p$  = polling cycle time [ms]  
 ① 1 SMD slave with  $n$  user data bytes  
 ② 99 SMD slaves with  $n$  user data bytes

Given that the devices (contactors, I/O modules) have relatively small data sizes (1 to 4 bytes per device), systems under 50 devices probably will not have over 100 bytes of data, meaning the polling time will be 10mS or less.

Now, the total worst case delay from sensor state change to PLC input bit change is the sum of the SmartWire-DT polling cycle time and the fieldbus (PROFIBUS-DP or CANopen) polling cycle. So if the SmartWire-DT polling cycle is 10mS and the PROFIBUS-DP polling cycle is 5ms, worst case delay is 15mS.

Polling time is not dependent on bus length (meters of cable).

**13. How do you connect Emergency Stop pushbuttons in a SmartWire-DT network?**

The emergency stop of motor starters with the SmartWire-DT contactor module DIL-SWD-32 can be accomplished with the interruption of the 24Vdc control voltage at the SmartWire-DT gateway or powerfeed module.

*Safety Category 1*

The emergency stop of motor starters with the SWD contactor module DIL-SWD-32 can be accomplished with the interruption of the 24Vdc control voltage at the SWD gateway or SWD powerfeed module (UAUX). Using the opening contacts of an emergency switch or opening output of a safety relay (e.g. ESR5) to interrupt this control voltage conforms to Safety Category 1 to EN 954-1.

*Safety Category 3*

For an increased safety level of the emergency stop one has to add one group contactor which carries the current of all motor starters. The coil of the group contactor is controlled by the relay output of the safety relay and must also be switched off in the case of an emergency. This provides a redundancy off-switching for the motor starters. In addition to this group contactor one also has to read back the switching status of the contactors in the feedback circuit of the safety relay. Therefore the auxiliary contacts of the motor starter contactors and the group contactor have to be normally closed contacts.

**14. How do you connect sensors, solenoids, or stacklights to SmartWire-DT?**

Using the SmartWire-DT I/O modules you can connect sensors or other input output devices that do not have a dedicated SmartWire-DT module. Up to 8 digital inputs, 4 digital inputs and 4 transistor outputs, or 4 digital inputs and 2 relay outputs are possible on one SmartWire-DT I/O module.

**15. Can you connect analog inputs and outputs to SmartWire-DT?**

Yes, analog modules (12 bit resolution) will be available in the third quarter 2011 for 0-10V, 4-20mA, and temperature signals.

**16. What function does the flat cable serve?**

The flat cable allows for easy connection to all devices on a SmartWire-DT network, as well as provides control power to devices and control logic. The flat cable also provides easy connections, without splicing, cutting or terminations to device lugs.

**17. What is the insulation voltage rating of the flat cable?**

The flat cable is 600V rated and can be placed in the same wiring duct carrying power cables rated at 480V or 600V.

**18. What is the voltage of the SmartWire-DT system?**

SmartWire-DT uses 15Vdc for the powering all the nodes (including the pilot device LEDs) and the communication protocol. In addition, SmartWire-DT also transports 24Vdc power for the contactor coils. The 15Vdc is generated by the gateway and powerfeed modules from a separate 24Vdc power supply.

**19. Is SmartWire-DT fed through a power supply?**

Yes, it is supplied by a 24Vdc power supply into the gateway which then distributes power through the flat cable to each SmartWire-DT connected device.

**20. Does SmartWire-DT require a PLC to operate?**

Yes. A PLC or main controller is required with a SmartWire-DT network. The PLC or controller must be able to support a fieldbus master or input/output (I/O) scanner card. In addition, Eaton has PLC and OI solutions that can direct connect to SmartWire-DT gateway module!

**21. Does SmartWire-DT operate on AC, DC, or both?**

SmartWire-DT is DC operated and requires a 24Vdc power supply. SmartWire-DT transports 24Vdc to power the contactor coils and generates 15Vdc for data communications and the other SmartWire-DT nodes.

**22. Why does SmartWire-DT have both flat and round cables?**

The round cable is used for connecting SmartWire-DT devices that are outside the control panel such as pushbutton control stations or another control panel and is suitable for making UL Type 4 or IP67 type connections. The flat cable was designed to be flexible for use inside the enclosure to easily connect motor control components on the panel and/or door-mounted pilot devices.

**23. What is the bend radius of the SmartWire-DT flat cable?**

The bend radius of the flat cable is 5 cm.

**24. Is it necessary to run separate control power wiring with the SmartWire-DT system?**

No, the eight conductor SmartWire-DT cables also carry control power to energize 24Vdc contactor or relay coils.

**25. What is the difference between powerfeed module 1 and powerfeed module 2?**

The SmartWire-DT powerfeed 1 module is an additional 24Vdc power feed module that controls a separate 24Vdc control circuit on the SmartWire-DT system while maintaining a continuous 15Vdc power and communications on the network. The powerfeed module 2 provides the 24Vdc like module 1, as well as provides additional 15Vdc power for the other devices. Module 2 is also used when many devices are connected or when large networks are utilized.

**Standards & Certification Questions****26. What certifications does SmartWire-DT have?**

SmartWire-DT is UL, CSA, and CE certified.

**27. What is the UL file number for SmartWire-DT?**

UL File No. E29184.

**28. What is the CSA file number for SmartWire-DT?**

CSA File No. 2324643 and CSA Class No. 3211-07.

**Network Questions****29. Can SmartWire-DT work with any PLC?**

No, SmartWire-DT can only work with PLCs that have a fieldbus polling master communications.

**30. Can SmartWire-DT be used with a third party PLC?**

Yes, SmartWire-DT can communicate with third party PLCs that support fieldbus networks and as long as they support the communication protocols that SmartWire-DT supports with a fieldbus scanner card.

**31. Which Eaton products can be connected directly to SmartWire-DT?**

The XTCE contactors size B and C frames and M22 pilot devices (excluding the potentiometers) have SmartWire-DT modules that can be directly connected to a SmartWire-DT network. Other modules that are planned include a contactor module that connects to the XTPE electronic manual motor protector, a DS7 soft starter module, and a MMax variable frequency drive module.

**32. How is device addressing done on the SmartWire-DT network?**

SmartWire-DT assigns node addresses automatically when the auto-config button on the gateway is invoked. There are no DIP switches to be set on the modules nor do modules have to be programmed separately. SmartWire-DT makes it easy to connect. If a module has to be replaced, the auto-config addressing process will find and address the new node without any reprogramming.

**33. Is it possible to address a SmartWire-DT node manually?**

No, with SmartWire-DT, device addressing is done automatically when the auto-config button is pressed on the gateway.

**34. How many nodes are available per SmartWire-DT network?**

Up to 99 nodes can be connected to each SmartWire-DT CANopen gateway and 58 nodes can be connected to PROFIBUS-DP gateways. The Ethernet gateway will support 99 nodes.

**35. Why is the number of nodes on a PROFIBUS-DP gateway limited to 58 nodes instead of 99 nodes like the other gateways?**

The limitation comes from the maximum number of parameter bytes of a PROFIBUS-DP node—235 bytes. Each SmartWire-DT node requires 4 bytes. Therefore the maximum number of SmartWire-DT nodes that can be connected to a PROFIBUS-DP gateway is 58 (235 divided by 4).

**36. Is SmartWire-DT “plug and play?”**

The SmartWire-DT communication network needs to be addressed using the gateway auto-config button and some programming is required to provide instruction to the devices for their operation.

**37. Is DeviceNet a planned communication protocol for SmartWire-DT?**

Currently there are no plans to associate SmartWire-DT with DeviceNet, but if there is a need it would be considered.

**Installation Questions**

**38. Are special tools required to use SmartWire-DT?**

There are two special crimping tools required for the SmartWire-DT flat cable. One is used to crimp the flat plugs at each end of the cable and the other is used to crimp the device plugs along the cable.



Flat Plug Crimper Tool



Device Plug Crimp Tool

Eaton Corporation  
Electrical Sector  
1111 Superior Ave.  
Cleveland, OH 44114  
United States  
877-ETN-CARE (877-386-2273)  
Eaton.com

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**39. How do you cut the flat cable?**

The flat cable has eight AWG 24 wires and can be cut easily using a pair of industrial scissors or an edge utility cutter (see photo).



Edge Utility Cutter Tool

**40. Does it matter how the flat cable is connected to the device plugs or the gateway?**

Yes, it is critical that the correct polarity and direction of the flat cable is followed during installation. The flat cable has a black strip on one side of the flat cable to indicate the 15Vdc supply voltage line and the front of the cable has black arrows to indicate the direction of the cable. Both the black strip and black arrow on the cable match the arrow direction and +15Vdc marking on the device plug.

**41. What space requirements are necessary to include SmartWire-DT in an existing panel?**

When converting or adding SmartWire-DT to a panel, space is required for the modules that connect to the top of the contactors, roughly 1" (25mm). The SmartWire-DT gateway and powerfeed modules require 1-3/8" width of DIN rail.

**42. How can you tell that your components have a secure connection to the SmartWire-DT and that they have been properly addressed on the network?**

When nodes are properly connected and addressed on the SmartWire-DT network, the indicator LEDs will be a solid green (no flashing).

**43. Can a SmartWire-DT connector be removed from the cabling after it has been crimped in place?**

No. Device plugs may not be removed once they have been crimped to the flat cable. When a SmartWire-DT device plug is crimped to the flat cable, the insulated displacement connections pierce through the insulation and one of the wires is hole-punched open to identify the node position on the network. Therefore, the device plugs should not be removed once crimped on the flat cable. If the device plug is not in the desired location and/or if it was installed backwards or upside down, it can be left in place and defeated with the use of SWD4-SEL8-10 device plug jumper.

**44. How are the powerfeed modules in the SmartWire-DT system applied?**

The SmartWire-DT powerfeed modules are put in line with other components in the SmartWire-DT network. They are used for different tasks; module 1 is used to add extra 24Vdc power to provide additional power to multiple contactors with large draws. Module 2 is used to accomplish the same task as module 1 however; it also adds the 15Vdc power needed by the SmartWire-DT network to support large connection bases, or large runs of the SmartWire-DT network.

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