Extron

ECM DIO8 eBUS Digital I/O Control Module • Setup Guide

The Extron ECM DIO8 is a compact digital I/O module for Extron eBUS®-enabled control systems. The module connects to an IPCP Pro control processor and provides an interface with a variety of I/O devices, including sensors, and contact closure buttons. The ECM DIO8 provides eight digital I/O ports that can be configured or programmed by Extron software. There is also a 24 VDC (100 mA maximum) output to provide power to a sensor.

The module connects to the Extron IPCP Pro control processor or other eBUS devices using a single cable that carries both power and communication. Extron recommends the STP20-2 or STP20P-2 cable.

The ECM DIO8 mounts inside a US 1-gang, Flex55, EU, or MK enclosure. It can also be mounted on any flat surface, using the provided dual-lock fastener.
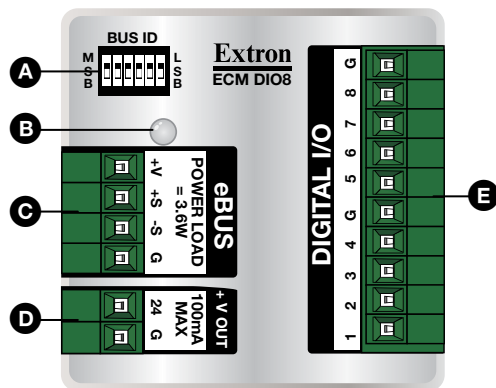
Front Panel Features

Figure 1. Front Panel Features of ECM DIO8

Ⓐ **BUS ID DIP Switches** — Up to eight eBUS devices can be connected to one control processor. Each eBUS device connected to the same IPCP Pro control processor must have a unique BUS ID, which is set using BUS ID DIP switches (see **Step 2 — BUS ID setup** on page 6).

Ⓑ **Status LED** — The ECM DIO8 has a three-color LED (red, amber, and green) that provides diagnostic information about the connection, communication, and power status of the module (see **Step 5 — Testing and Troubleshooting the System** on page 12).

Ⓒ **eBUS Port** — This four-pole captive screw connector provides power to the ECM DIO8 and also provides communication between the ECM DIO8 and a control processor and other eBUS devices.

Ⓓ **Voltage Output** — This two-pole captive screw connector can provide 24 VDC to a sensor (100 mA maximum output current).

Ⓔ **Digital I/O Ports** — This 10-pole captive screw connector provides an interface for up to eight digital I/O devices, with two ground connections.

Overview

The following sections describe:

Digital I/O Uses

The ECM DIO8 has eight digital I/O ports, which can be connected to sensors or contact closure buttons. Each port supports either digital inputs or digital outputs, which is selectable by software (see the *Global Configurator Plus and Professional Help File* or the *Global Scripter Help File*).

Digital input

Digital inputs allow the eBUS system to monitor devices including push buttons, switches, motion sensors, moisture sensors, or tally feedback output.

Dry contact — The digital input is triggered by an external switch or relay and ground. The internal pull-up resistor should be enabled by software.

- **GCP/GS State On** (logic state **Low**) — Externally shorted to ground.
- **GCP/GS State Off** (logic state **High**) — Open, +5 VDC from pull-up resistor.
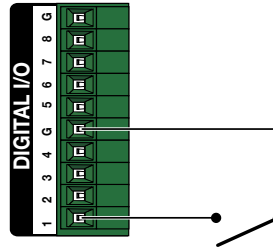

Figure 2. **Digital Input — Dry Contact**

Voltage detection — The digital input is triggered by an external switch or relay that has a voltage supplied. The internal pull-up resistor should be disabled by software.

- **GCP/GS State On** (logic state **Low**) — Voltage ≤ 2 VDC
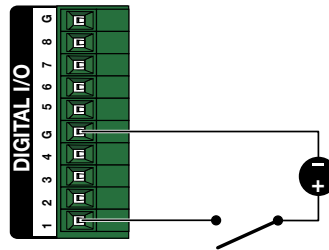- **GCP/GS State Off** (logic state **High**) — Voltage > 2.8 VDC (24 VDC, max)

Figure 3. **Digital Input — Voltage Detection**

Digital output with Pull-up

Driving a Relay Coil — Digital outputs can be used to power LEDs, incandescent lights, or other devices that accept a TTL signal. They can also be used with the Extron IPA RLY 4 to control projector lifts, motorized screens, or light switches.

The internal pull-up resistor should be enabled by software.

- **Port Off** (logic state **High**) — Relay switch closed, +5 VDC from pull-up resistor
- **Port On** (logic state **Low**) — Relay switch open

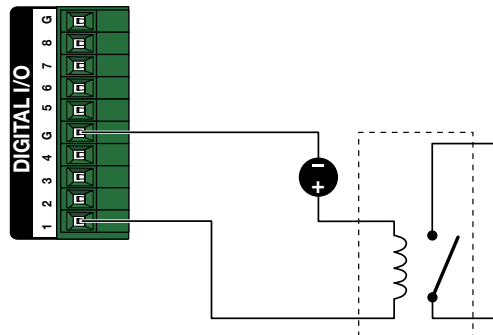**Figure 4.** **Digital Output with Pull-up — Driving a Relay Coil**

Voltage Switch — The internal pull-up resistor should be disabled by software.

- **Port Off** (logic state **Low**) — Voltage switch open
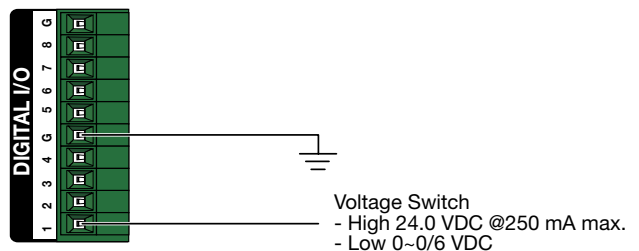- **Port On** (logic state **High**) — Voltage switch closed

Voltage Switch
- High 24.0 VDC @250 mA max.
- Low 0~0/6 VDC

Figure 5. **Digital Output — Voltage Switch**

Before You Start

Downloading Software

You can use Global Configurator Plus and Professional to configure the system or Global Scripter to program the eBUS system (see the appropriate help file for information about using the software).

To download the software:

1. Go to **www.extron.com**.
2. Click `Download` (see figure 6, ❶).
3. Click `Software` (❷).
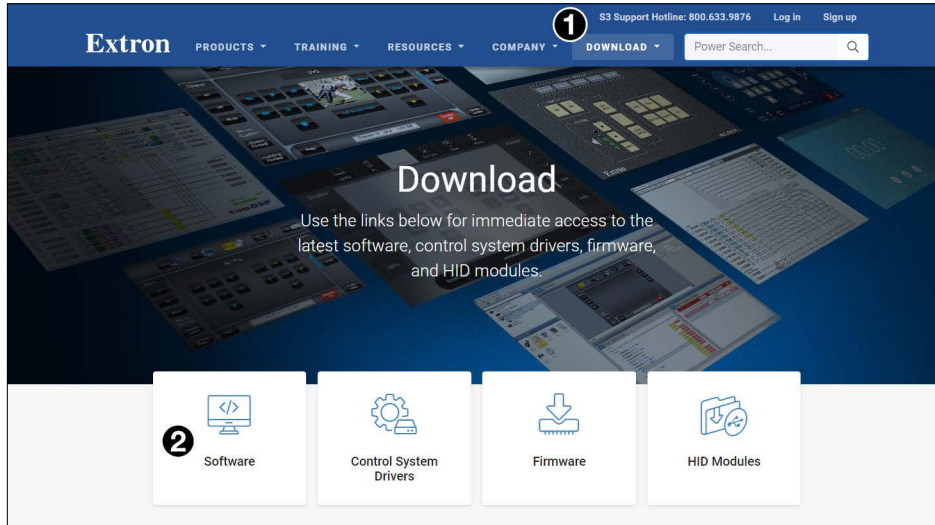
Figure 6. Downloading Software

The `Download Center Software` page opens:
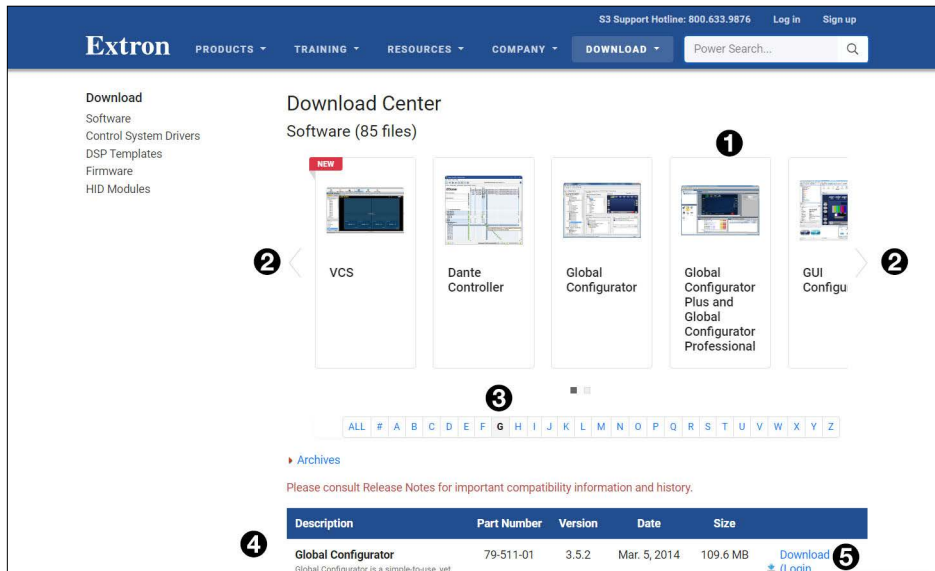
Figure 7. Download Center Software Page

4. If the software appears at the top of the page, click on the product (see figure 7, ❶), which takes you to the product page on the Extron website. This provides further information about the product. Click `Download` and follow the on-screen instructions to download the software.

5. If you do not see the product, use the **<** or **>** arrows (❷) to see other options.

6. If the product is not listed in the top section of the page, click the initial letter of the software product name (❸).

   Software products with that initial letter are listed at the bottom of the page (❹).

7. Click `Download` (❺) and follow the on-screen instructions to download the software.

Installation

Step 1 — Mounting the ECM DIO8

There are several alternative methods for mounting the ECM DIO8. Determine where to mount the ECM DIO8 and select from the following mounting options:

- **Wall mounting with a junction box**
- **Mounting to a flat surface** (see the next page)
- **Plenum-space mounting** (see the next page)

> **ATTENTION:**
> - Installation and service must be performed by authorized personnel only.
> - L'installation et l'entretien doivent être effectués uniquement par un technicien qualifié.
> - Extron recommends installing the ECM DIO8 into a grounded, UL Listed electrical junction box.
> - Extron recommande d'installer le ECM DIO8 dans un boîtier d'encastrement électrique mis à la terre, certifié UL.
> - Follow all national and local building and electrical codes that apply to the installation site.
> - Respectez tous les codes électriques et du bâtiment, nationaux et locaux, qui s'appliquent au site de l'installation.

Wall mounting with a junction box

The ECM DIO8 can be mounted in any standard 1-gang junction box (US, Flex55, EU, or MK). The junction boxes must be purchased separately and installed by following the instructions provided by the manufacturer.

> **NOTE:** For the installation to meet UL requirements and to comply with National Electrical Code (NEC), the ECM DIO8 must be installed in a UL Listed junction box (not included with the ECM DIO8).

1. Run eBUS and I/O signal cables to the junction box.
2. If the ECM DIO8 is powering a sensor, run a cable to carry 24 VDC from the sensor to the junction box.
3. If necessary, remove the two screws holding the mounting bracket to the back of the ECM DIO8. The bracket is not required for mounting the device in a junction box.
4. Connect the cables as described in **Step 3 — Connecting Cables** (see page 9).
5. Remove the plastic backing from one side of the hook and loop fastener and attach the fastener to the back of the ECM DIO8.
6. Remove the plastic backing from the other side of the hook and loop fastener.
7. Align the ECM DIO8 as required and press it firmly against the back wall of the junction box.
8. Cover the junction box with a lid (not provided).

Mounting to a flat surface

Use the provided mounting bracket to mount the ECM DIO8 to any flat surface.

1. Run eBUS and I/O signal cables to the mounting site.

2. If the ECM DIO8 is powering a sensor, run a cable to carry 24 VDC from the sensor to the mounting site.

3. If it is not already attached, secure the mounting bracket to the back of the ECM DIO8, using the two provided screws (see figure 8, ❶).
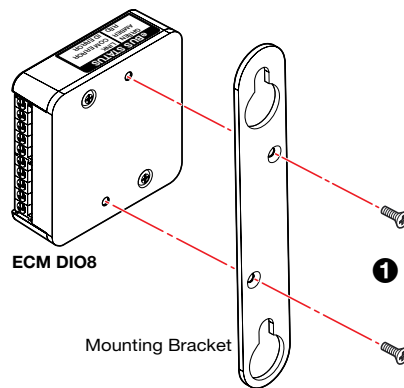

Figure 8. Attaching the Mounting Bracket to the ECM DIO8

4. Place the ECM DIO8, with the mounting bracket attached, against the mounting surface and mark the position of the holes (see figure 9, ❶).

5. Drill two pilot holes (diameter 11/16").

6. Insert two screws into the mounting surface, using fasteners that are appropriate for that surface. Leave about 0.25" (6.4 mm) of the screw exposed.

7. Fit the mounting bracket over the screw heads and slide the device up or down so that the screw is seated in the narrow slot of the bracket (❷).

8. Tighten the screws to secure the ECM DIO8 in place (❸).

9. Connect the cables as described in **Step 3 — Connecting Cables** on page 9.
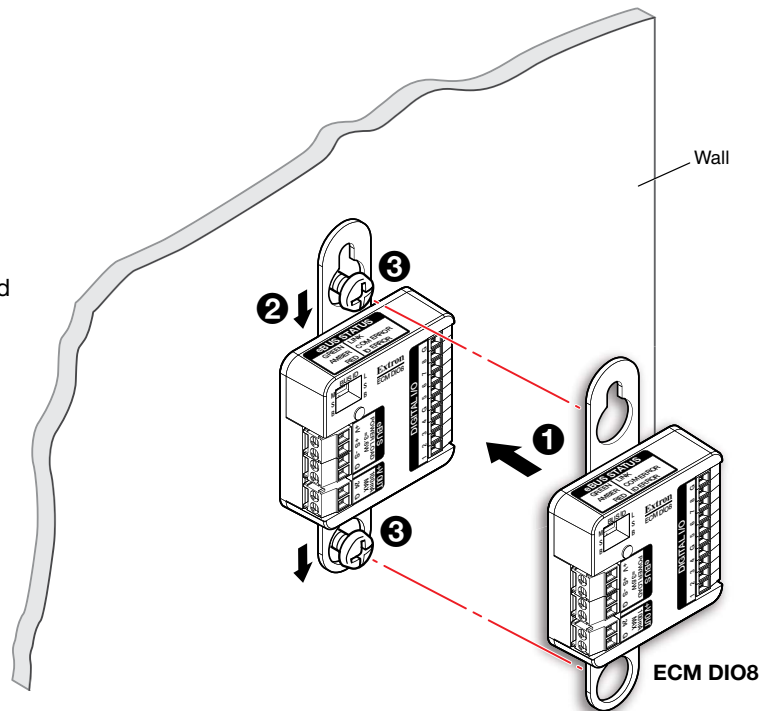

Figure 9. Mounting the ECM DIO8 to a Flat Surface

Plenum-space mounting

The ECM DIO8 is not plenum rated. It can be installed in a non-plenum area of the ceiling using the mounting bracket. If it is installed in a plenum space it must be mounted in a closed junction box with plenum rated cable or conduit for all connections.

Step 2 — BUS ID setup

Various combinations of the six DIP switches being set to On or Off, provide 64 addresses: 0 is a reserved eBUS ID and the configurable eBUS ID range is 1 through 63 (see the table on the two following pages). The section below shows an example of binary to decimal conversion.

	DIP Switch					
	1	**2**	**3**	**4**	**5**	**6**
Position	Off	Off	Off	Off	On	Off
Decimal	$2^5=32$	$2^4=16$	$2^3=8$	$2^2=4$	$2^1=2$	$2^0=1$
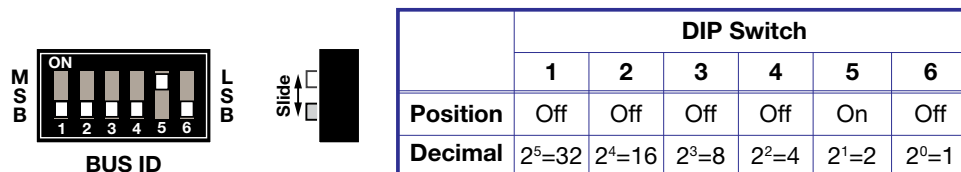
Figure 10. eBUS ID Setup

Add the decimal numbers for each of the DIP switches that are set to On to obtain the address of the device. In figure 10, only DIP switch #5 is on and the rest are off, which means the address for the device in figure 5 is 0+0+0+0+2+0=2.

NOTES:

- Any address can be used except address 0 (binary: 000000), which is reserved as the address of the controller.
- Switch 1 (on the left) is the highest value (32, the most significant bit) and is labelled MSB.
- Switch 6 (on the right) is the lowest value (1, the least significant bit) and is labelled LSB.
- **Up** = on = **1**, **Down** = off = **0**

The factory default address for the ECM DIO8 is 21 (BUS ID = Ø1Ø1Ø1). The ID can be changed to any valid value.

The table on the following two pages shows the DIP switch settings for all 64 possible addresses.

Setting eBUS ID numbers

In the table below, a DIP switch setting shown as Ø is equivalent to **Off**. A DIP switch setting shown as 1 is equivalent to **On**.

NOTE: The ID number Ø (switch setting ØØØØØØ) is reserved for the control processor and cannot be used by an eBUS device.

	DIP Switch Setting						Decimal Value		DIP Switch Setting						Decimal Value
	1	2	3	4	5	6			1	2	3	4	5	6	
	Ø	Ø	Ø	Ø	Ø	Ø	0		Ø	Ø	1	1	1	1	15
	Ø	Ø	Ø	Ø	Ø	1	1		Ø	1	Ø	Ø	Ø	Ø	16
	Ø	Ø	Ø	Ø	1	Ø	2		Ø	1	Ø	Ø	Ø	1	17
	Ø	Ø	Ø	Ø	1	1	3		Ø	1	Ø	Ø	1	Ø	18
	Ø	Ø	Ø	1	Ø	Ø	4		Ø	1	Ø	Ø	1	1	19
	Ø	Ø	Ø	1	Ø	1	5		Ø	1	Ø	1	Ø	Ø	20
	Ø	Ø	Ø	1	1	Ø	6		Ø	1	Ø	1	Ø	1	21
	Ø	Ø	Ø	1	1	1	7		Ø	1	Ø	1	1	Ø	22
	Ø	Ø	1	Ø	Ø	Ø	8		Ø	1	Ø	1	1	1	23
	Ø	Ø	1	Ø	Ø	1	9		Ø	1	1	Ø	Ø	Ø	24
	Ø	Ø	1	Ø	1	Ø	10		Ø	1	1	Ø	Ø	1	25
	Ø	Ø	1	Ø	1	1	11		Ø	1	1	Ø	1	Ø	26
	Ø	Ø	1	1	Ø	Ø	12		Ø	1	1	Ø	1	1	27
	Ø	Ø	1	1	Ø	1	13		Ø	1	1	1	Ø	Ø	28
	Ø	Ø	1	1	1	Ø	14		Ø	1	1	1	Ø	1	29

	DIP Switch Setting						Decimal Value		DIP Switch Setting						Decimal Value
	1	2	3	4	5	6			1	2	3	4	5	6	
MSB … LSB	Ø	1	1	1	1	Ø	30	MSB … LSB	1	Ø	1	1	1	1	47
MSB … LSB	Ø	1	1	1	1	1	31	MSB … LSB	1	1	Ø	Ø	Ø	Ø	48
MSB … LSB	1	Ø	Ø	Ø	Ø	Ø	32	MSB … LSB	1	1	Ø	Ø	Ø	1	49
MSB … LSB	1	Ø	Ø	Ø	Ø	1	33	MSB … LSB	1	1	Ø	Ø	1	Ø	50
MSB … LSB	1	Ø	Ø	Ø	1	Ø	34	MSB … LSB	1	1	Ø	Ø	1	1	51
MSB … LSB	1	Ø	Ø	Ø	1	1	35	MSB … LSB	1	1	Ø	1	Ø	Ø	52
MSB … LSB	1	Ø	Ø	1	Ø	Ø	36	MSB … LSB	1	1	Ø	1	Ø	1	53
MSB … LSB	1	Ø	Ø	1	Ø	1	37	MSB … LSB	1	1	Ø	1	1	Ø	54
MSB … LSB	1	Ø	Ø	1	1	Ø	38	MSB … LSB	1	1	Ø	1	1	1	55
MSB … LSB	1	Ø	Ø	1	1	1	39	MSB … LSB	1	1	1	Ø	Ø	Ø	56
MSB … LSB	1	Ø	1	Ø	Ø	Ø	40	MSB … LSB	1	1	1	Ø	Ø	1	57
MSB … LSB	1	Ø	1	Ø	Ø	1	41	MSB … LSB	1	1	1	Ø	1	Ø	58
MSB … LSB	1	Ø	1	Ø	1	Ø	42	MSB … LSB	1	1	1	Ø	1	1	59
MSB … LSB	1	Ø	1	Ø	1	1	43	MSB … LSB	1	1	1	1	Ø	Ø	60
MSB … LSB	1	Ø	1	1	Ø	Ø	44	MSB … LSB	1	1	1	1	Ø	1	61
MSB … LSB	1	Ø	1	1	Ø	1	45	MSB … LSB	1	1	1	1	1	Ø	62
MSB … LSB	1	Ø	1	1	1	Ø	46	MSB … LSB	1	1	1	1	1	1	63

Step 3 — Connecting Cables

The ECM DIO8 can be powered by an eBUS connection to a control processor, distribution hub, or a 12 VDC power supply. Do not connect power to either unit until you have read these Attention notifications.

ATTENTION:

- Always use a power supply supplied or specified by Extron. Use of an unauthorized power supply voids all regulatory compliance certification and may cause damage to the power supply and the unit.

- Utilisez toujours une source d'alimentation fournie ou recommandée par Extron. L'utilisation d'une source d'alimentation non autorisée annule toute certification de conformité réglementaire et peut endommager la source d'alimentation et l'unité.

- If not provided with a power supply, this product is intended to be supplied by a UL Listed power source marked "Class 2" or "LPS" and rated output 12 VDC, minimum 1.0 A.

- Si le produit n'est pas fourni avec une source d'alimentation, il doit être alimenté par une source d'alimentation certifiée UL de classe 2 ou LPS, avec une tension nominale 12 vcc et 1,0 A minimum.

- Unless otherwise stated, the AC/DC adapters are not suitable for use in air handling spaces or in wall cavities.

- Sauf mention contraire, les adaptateurs CA/CC ne conviennent pas à une utilisation dans les espaces d'aération ou dans les cavités murales.

- The installation must always be in accordance with the applicable provisions of National Electrical Code ANSI/NFPA 70, article 725 and the Canadian Electrical Code part 1, section 16. The power supply shall not be permanently fixed to building structure or similar structure.

- Cette installation doit toujours être conforme aux dispositions applicables du Code américain de l'électricité (National Electrical Code) ANSI/NFPA 70, article 725, et du Code canadien de l'électricité, partie 1, section 16. La source d'alimentation ne devra pas être fixée de façon permanente à la structure de bâtiment ou à d'autres structures similaires.

NOTES:

- Connect up to eight eBUS devices for each IPCP Pro control processor.

- Wire the connectors in the same way at both ends.

- Do not exceed a total of 1000 feet (305 meters) of cable for connections between the IPCP Pro and all the eBUS devices.

- Do NOT power an ECM DIO8 from more than one power source. Power can be provided by an IPCP Pro control processor, a PS 1220EB power supply or an Extron 12 VDC power supply. If more than one power source is used in a system, make sure that the devices powered by the first source are isolated from the devices powered by the second source disconnecting the +V pin of the first source.

Up to eight devices can be connected to one control processor. In order for the control processor to be successfully configured, each device connected to the same control processor must have a unique six-bit, BUS ID, which is set with the DIP switch assembly on the front panel of the ECM DIO8 (see **figure 1**, **A**, on page 1). If two or more modules have the same bus ID, address conflicts may prevent the panels from being recognized by the IPCP Pro control processor. If there is an address conflict, the status LED (see **figure 1**, **B**) lights solidly (see **Step 5 — Testing and Troubleshooting the System** on page 12).

Connecting the eBUS cable

Connect eBUS port (see **figure 1**, **C**, on page 1) to a control processor, a power supply, or another eBUS device using a standard eBUS cable. Before powering on the control processor, read the Attention notifications above. The four connectors are:

- **+V** (red*) — Carries 12 VDC power from the controller, active hub, or power supply
- **+S** (green*) — Carries the positive data signal
- **-S** (white*) — Carries the negative data signal
- **G** (black*) and two drain wires — Ground

Extron STP20-2/1000 or STP20-2P/1000 cable is recommended for eBUS connections. If you use different cable, the wire color may be different.

The diameter of the ground wire and the two drain wires, when they are combined, is too large to fit into the captive screw holder on the eBUS terminal. Use a wire nut to combine a pigtail wire with the ground wire and the two drain wires. The pigtail is inserted into the eBUS connector in the usual way, as shown in **figure 12**, on the following page.
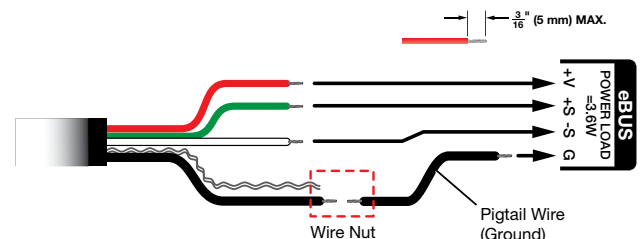

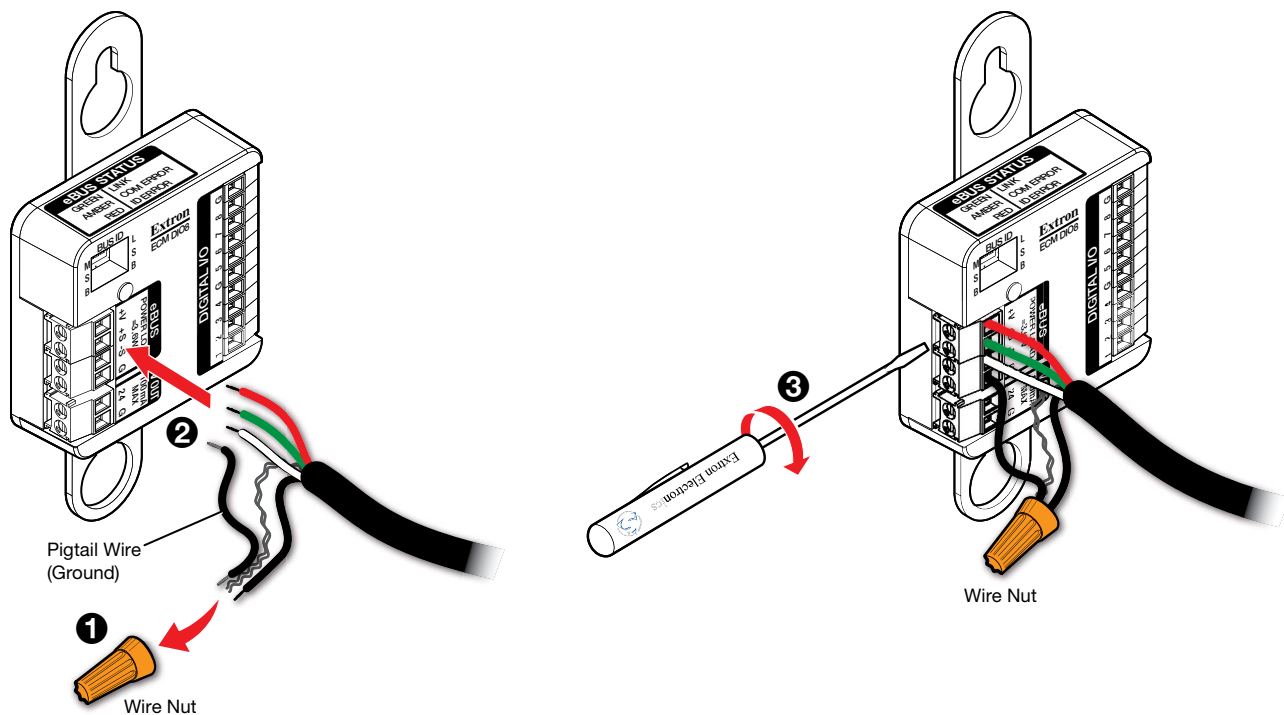**Figure 11.** Wiring the eBUS Cable

Figure 12. Connecting a Ground wire to the ECM DIO8

1. Cut about 2" (51 mm) from the end of the cable. Save the ground wire for use as a pigtail.

2. Remove about 1" (25 mm) of the jacket from the cable.

3. Remove the shield to expose about 3/16" (5 mm) of each wire.

4. Remove the shield to expose about 3/16" (5 mm) of wire at each end of the ground wire that was saved in step 1.

5. Gather the pigtail wire, with the ground wire and drain wires from the cable. Twist the exposed ends of the wires together into the provided wire nut (see figure 12, ❶).

6. Insert the +V, +S, -S, and the free end of the pigtail into the appropriate eBUS terminals (see **figure 11** on the previous page and figure 12, ❷).

7. Use a small flat-bladed screwdriver to secure the wires in the eBUS connector (❸).

The ECM DIO8 must receive power from only one source. The upper panel of figure 13 shows the device receiving power from the IPCP Pro 250 control processor. The +12 VDC wire runs from the control processor to the ECM DIO8.

The lower panel of figure 13 shows the ECM DIO8 is powered by the PS1220EB. In this case, the cable between the IPCP Pro 250 control processor and the power supply has the +12 VDC wire removed. The ECM DIO8 receives power from only the PS 1220EB.
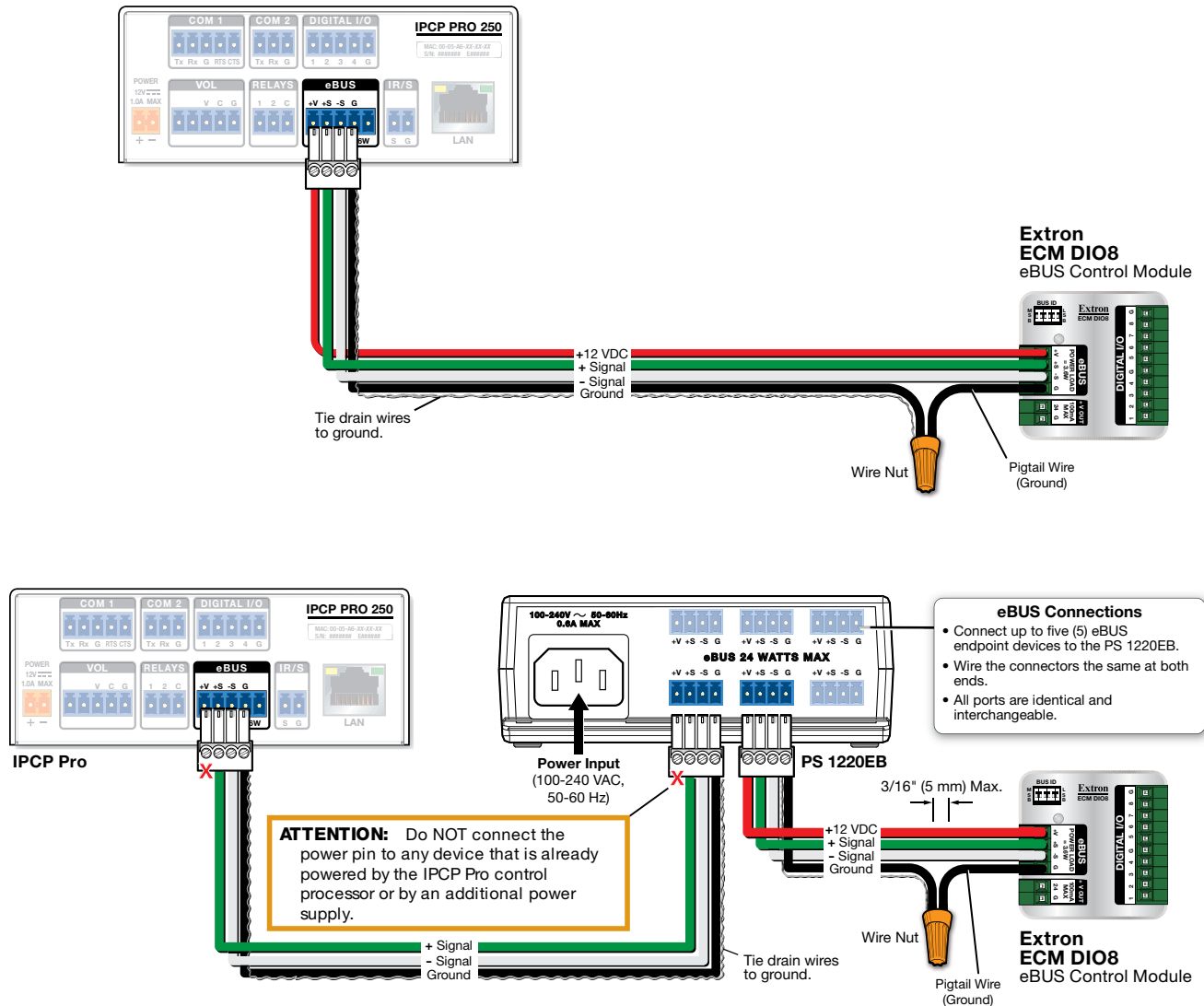

Figure 13. Powering the ECM DIO8

Connecting the digital I/O cables

The ECM DIO8 has eight software-selectable digital I/O ports that provide an interface with a variety of I/O devices, including sensors, and contact closure buttons. Extron software is used to configure or program the system to respond to the digital I/O signal in an appropriate manner.

The ports are organized in a 10-pole captive screw connector, with the eight I/O ports labelled 1 through 8. The two remaining ports are ground (G) connections (see figure 14). Connect the sensor to one of the numbered digital I/O ports and to one of the ground ports. The cable is not provided. In figure 14, the OCS 100C occupancy sensor is also receiving power from the ECM DIO8 and the power cable is providing the ground connection.

See **Digital I/O Uses** on page 2 for the most common uses for these digital I/O ports.

Figure 14. Connecting cables to the ECM DIO8

Connecting the power cable to a sensor

If required, the ECM DIO8 can provide power (24 VDC, 100 mA maximum) to Extron or third-party sensors.

Connect the +V Out 2-pole captive screw to the sensor. The ground (G) terminal of the ECM DIO8 must be connected to the ground terminal of the sensor and the voltage output (24) terminal of the ECM DIO8 must be connected to the voltage input terminal of the sensor. The cable is not provided.

Step 4 — Configuring the System

Use Global Configurator Plus and Professional to configure the system or Global Scripter to program the system so that the system responds to the digital I/O signals in the appropriate manner (see the *Global Configurator Plus and Professional Help File* or the *Global Scripter Help File* for information about using these programs). For help with downloading these programs, see **Downloading Software** on page 3.

Step 5 — Testing and Troubleshooting the System

After configuring the system, test that it is working correctly.

1. Verify that the DIP switches on the EBPs are set to the desired address on each device and that there are no BUS ID conflicts in the system (see **Step 2 — BUS ID setup** on page 6).

2. The ECM DIO8 status LED (see **figure 1**, **B**, on page 1) provides information about power and communication status and bus ID address conflicts as follows:

   - **Off** — If the LED is unlit, the device is not receiving power.
   - **Amber LED** — Lights solidly when the device is receiving power but communication with the control processor is not confirmed.
   - **Red LED** — Lights solidly when there is an eBUS ID address conflict.
   - **Green LED** — Lights solidly when power and communication are both confirmed.

3. Verify that cables to and from the eBUS components are wired in the same way at each end (pin 1 to pin 1, pin 2 to pin 2, and so forth).

4. Test the system. Ensure that sensors or switches produce the desired effect and that the appropriate control commands or functions are triggered.

5. Make adjustments to wiring, BUS ID address, or system configuration as needed. Remember that the rear panel ports and DIP switches may not be accessible after the eBUS component is mounted. If needed, upload a revised configuration to the control processor.

If you have questions during installation and setup, contact the **Extron S3 Sales & Technical Support** or the Extron S3 Control Systems Support Hotline (1.800.633.9877).
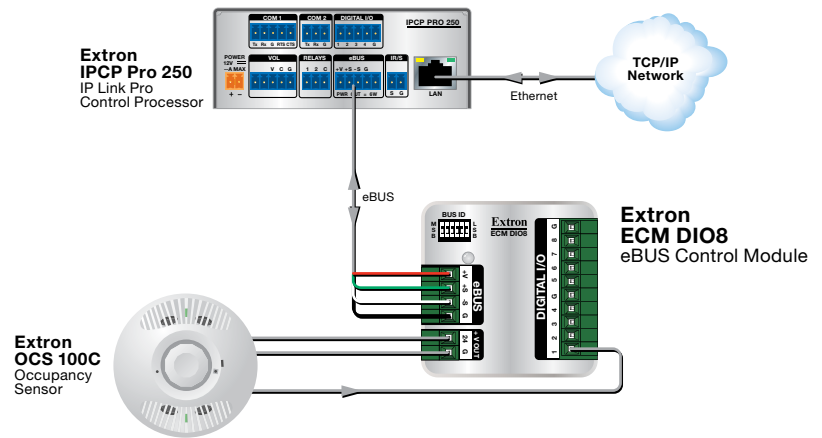
For information on safety guidelines, regulatory compliances, EMI/EMF compatibility, accessibility, and related topics, see the **Extron Safety and Regulatory Compliance Guide** on the Extron website.