OptiFlex™ BACnet Integrator (part no. G5CE)

Technical Instructions

AutomatedLogic

⚠ Verify that you have the most current version of this document. Go to the **Automated Logic® Partner Community** website to download it.

Important changes are listed in **Document revision history** at the end of this document.

Contents

What is the OptiFlex™ BACnet Integrator (part no. G5CE)?

The OptiFlex™ BACnet Integrator (part no. G5CE):

- Provides BACnet routing between any supported BACnet communication types
- Runs control programs
- Can have two BACnet/IP networks communicating on the Gig-E port
- Can serve as a BACnet Broadcast Management Device (BBMD) on each of the BACnet/IP networks
- Supports Foreign Device Registration (FDR)
- Supports DHCP IP addressing
- Has built-in network diagnostic capture functionality for troubleshooting
- Has network statistics that can be viewed numerically or as trend graphs
- Supports Rnet devices
- Works with the WebCTRL® v6.5 or later system with the latest cumulative patch
- Can serve as a gateway that can act as a:
  - Master or slave on a Modbus serial network
  - Server or client on a Modbus TCP/IP network
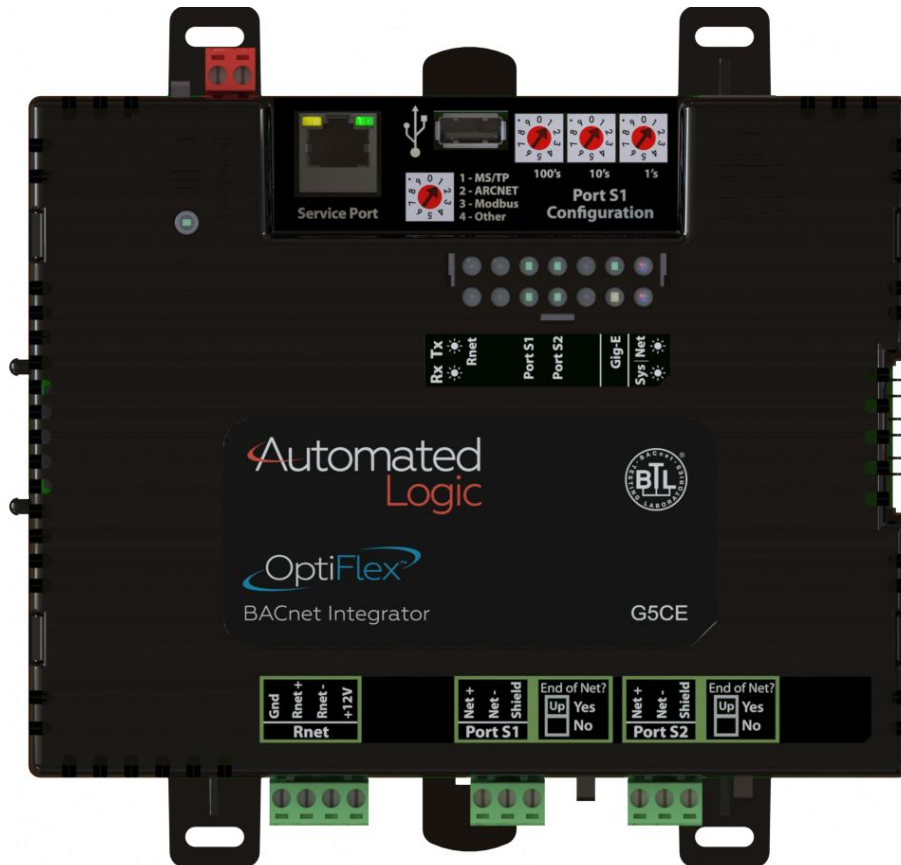
The G5CE has 4 physical ports for BACnet or Modbus communication:

Port	Port type	For routing this type of communication...	At...
Gig-E	10/100/1000 Mbps Ethernet	BACnet/IP, BACnet/Ethernet, and/or Modbus TCP/IP	10, 100, or 1000 Mbps (1 Gbps)
S1	High-speed EIA-485 port	BACnet/ARCNET or BACnet/MSTP or Modbus Serial	156 kbps 9.6 to 115.2 kbps 9.6 to 115.2 kbps
S2	Electrically isolated EIA-485 port	BACnet/MSTP or Modbus Serial	9.6 to 115.2 Kbps 9.6 to 115.2 kbps
Service Port	10/100 Mbps Ethernet HTTP/IP	BACnet/IP Service Port	10 or 100 Mbps

The G5CE also has the following ports:

- Rnet port for ZS sensors, Wireless Adapter for wireless sensors, and an Equipment Touch
- USB port for recovery
- Ethernet Service Port for connecting locally to controller setup pages and the OptiPoint™ interface

Critical Product Announcement

Due to the global semiconductor supply chain uncertainty, starting July 2022, the G5CE will no longer support communication over the ARCNET network. ARCNET-disabled G5CE controllers have a serial number starting with the prefix RT5 and have an updated label. See *To get the G5CE's serial number* (page 39).
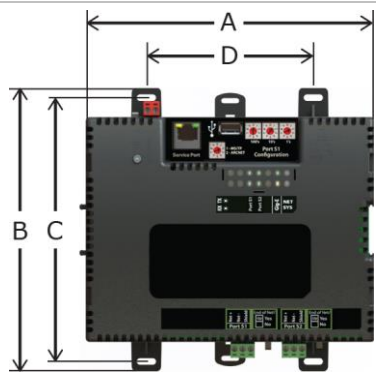
The G5CE's driver properties and controller setup pages only show available communication selection options.

Specifications

Driver	drv_fwex_< version >.driverx
Maximum number of control programs*	999
Maximum number of BACnet objects*	12000
Third-party BACnet integration points	1500
Third-party Modbus integration points	25

* Depends on available memory.

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Power	24 Vac ±10%, 50–60 Hz, 50 VA 26 Vdc ±10%, 15 W
Gig-E port	10/100/1000 BaseT, full duplex, Ethernet port for BACnet/IP and/or BACnet/Ethernet, or Modbus TCP/IP communication.
Port S1	For communication with either of the following: • A BACnet ARCNET network at 156 kbps • A BACnet MS/TP network at 9600 to 115200 bps • A Modbus serial network at 9600 to 115200 bps This port's **End of Net?** switch can be set to **Yes** to terminate the network segment.
Port S2	For communication with either of the following: • A BACnet MS/TP network at 9600 to 115200 bps • A Modbus serial network at 9600 to 115200 bps This port's **End of Net?** switch can be set to **Yes** to terminate the network segment.
Rnet port	• Supports Up to 15 ZS wireless and/or ZS sensors, and one Equipment Touch or OptiPoint™ interface • Supports local connection for a laptop running the WebCTRL® application • Supplies 12 Vdc/62.5 mA power across its rated temperature range. NOTE Ambient temperature and power source fluctuations may reduce the power supplied by the Rnet port. **NOTE** If the total power required by the sensors on the Rnet exceeds the power supplied by the Rnet port, use an external power source. The Wireless Adapter, Equipment Touch, or OptiPoint™ interface must be powered by an external power source. See the specifications in each device's Technical Instructions to determine the power required.
Service Port	Ethernet port at 10 or 100 Mbps for setting up the controller and troubleshooting through a local connection to a computer or connecting to the OptiPoint™ interface
USB port	USB 2.0 host port for device recovery
Microprocessor	32-bit ARM Cortex-A8, 600MHz, processor with multi-level cache memory
Memory	16 GBs eMMC Flash memory and 256 MB DDR3 DRAM (22 MB available to use). User data is archived to non-volatile Flash memory when parameters are changed, every 90 seconds, and when the firmware is deliberately restarted. **NOTE** When you change a parameter, you must wait 30 seconds before turning the power off, in order for the change to be saved.
Real-time clock	Real-time clock keeps track of time in the event of a power failure for up to 3 days.

Protection	Device is protected by a replaceable, fast acting, 250 Vac, 2A, 5mm x 20mm glass fuse. The power and network ports comply with the EMC requirements EN50491-5-2. ⚠️ **CAUTION** To protect against large electrical surges on serial EIA-485 networks, place a PROT485 at each place wire enters or exits the building.

LED status indicators	• Tricolor **NET** LED to show network status
	• Tricolor **SYS** LED to show system status
	• A **TX** (Transmit) and **RX** (Receive) LED for the following ports:
	
	   • Gig-E
	   • Port S1
	   • Port S2
	   • Rnet
	
	See *LEDs* (page 36).

Environmental operating range	-40 to 158°F (-40 to 70°C), 10-95% relative humidity, non-condensing **NOTES** • The G5CE is suitable for installation inside or outside the building envelope. • Install in a UL Listed enclosure only. • Do not change the position of the power or **End of Net** switch at temperatures below -22°F (-30C) to ensure proper operation and electrical connectivity.
Physical	Fire-retardant plastic ABS, UL94-5VA
Terminal blocks and connectors	Screw-type terminal blocks. 0.2 in (5.08 mm) pitch connectors
Mounting	35mm DIN rail mounting or screw mounting
Overall dimensions	A: 7.1 in. (18.03 cm) B: 6.95 in. (17.65 cm) Depth: 2.09 in. (5.31 cm)
Screw mounting dimensions	C: 6.45 in (16.38 cm) D: 4.1 in. (10.4 cm)
Weight	1 lb. 1 oz. (0.482 kg)
BACnet support	Conforms to the BACnet Building Controller (B-BC) Standard Device Profile as defined in ANSI/ASHRAE Standard 135-2012 (BACnet) Annex L, Protocol Revision 14

Compliance	United States of America: FCC compliant to Title CFR47, Chapter 1, Subchapter A, Part 15, Subpart B, Class A; UL Listed to UL 916, PAZX, Energy Management Equipment
	Canada: Industry Canada Compliant, ICES-003, Class A cUL Listed UL 916, PAZX7, Energy Management Equipment
	Europe: CE Mark, UK: UKCA EN50491-5-2:2009; Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment RoHS Compliant: 2015/863/EU REACH Compliant
	Australia and New Zealand: C-Tick Mark, AS/NZS 61000-6-3

Zone sensors

You can wire ZS sensors and/or a Wireless Adapter that communicates with wireless sensors to the G5CE's Rnet port. You can have up to 15 ZS and/or wireless sensors.

NOTES

- A control program can use no more than 5 ZS sensors, so you must use multiple control programs if your Rnet network has more than 5 sensors.
- ZS and wireless sensors can share the Rnet with an Equipment Touch or OptiPoint™ interface.

⚠ **CAUTION   Rnet power**

The Rnet port provides 12 Vdc at 62.5 mA maximum that can be used to power zone sensors. When determining which devices to put on the Rnet, verify that the total current draw of the sensors does not exceed the controller's Rnet power. See the sensor's T*echnical Instructions* to determine the power required.

Touchscreen devices

You can connect the G5CE to the touchscreen devices using the Rnet port or the Ethernet Service port.

Rnet port

You can wire an Equipment Touch or OptiPoint™ interface to the G5CE's Rnet port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server. The Rnet port can have one Equipment Touch or OptiPoint™ interface, plus ZS sensors and/or a Wireless Adapter that communicates with wireless sensors.

NOTE These touchscreen devices are not powered by the Rnet port.

- The OptiPoint™ interface requires a 24 Vdc external power source.
- The Equipment Touch requires a 24 Vac external power source.

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Ethernet port

You can connect the OptiPoint™ interface to the G5CE's Ethernet Service port to view or change the controller's property values, schedule equipment, view trends and alarms, and more, without having to access the system's server.

NOTES

- These touchscreen devices are not powered by the Ethernet port.

- The OptiPoint™ interface requires a 24 Vdc external power source.

⚠ **CAUTION**   A touchscreen device can share a power supply with the Automated Logic® controller if:

- The power source shared by the controller and Equipment Touch is AC power.
- The power source shared by the controller and OptiPoint™ interface is DC power.
- You maintain the same polarity.
- You use the power source only for Automated Logic® controllers.

To mount the G5CE

The G5CE must be mounted in a metal enclosure or cabinet which is properly rated for the location where it is being installed.

NOTE   We recommend screw mounting when installing in a high temperature and high humidity environment.

DIN rail mount

1   Push down and pull out the center tabs shown below to clear the din rail trough on the back of the controller.

2 Place the controller on the DIN rail so that the rail is in the trough on the back of the controller.

3 Push the center tabs towards the controller until you hear them click.

4 Pull gently on the controller to verify that it is locked in place.

Screw Mount

Leave about 2 in. (5 cm) on each side of the controller for wiring.

Insert #6 screws through the mounting holes. Use no more than 8 in.lbs. torque to secure plastic tab to mounting surface.
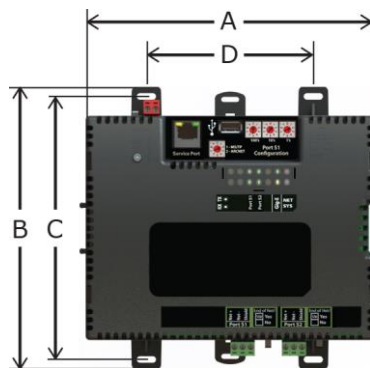
A:	7.1 in. (18.03 cm)
B:	6.95 in. (17.65 cm)
C:	6.45 in. (16.38 cm)
D:	4.1 in. (10.4 cm)
Depth:	2.09 in (5.31 cm)

Wiring for power

⚠ **WARNING**   Do not apply line voltage (mains voltage) to the controller's ports and terminals.

⚠ **CAUTIONS**

- The G5CE is powered by a Class 2 power source. Take appropriate isolation measures when mounting it in a control panel where non-Class 2 circuits are present.
- Automated Logic® controllers can share a power supply as long as you:
  - Maintain the same polarity.
  - Use the power supply only for Automated Logic® controllers.

To wire for power

1. Make sure the G5CE's power switch is in the **OFF** position to prevent it from powering up before you can verify the correct voltage.
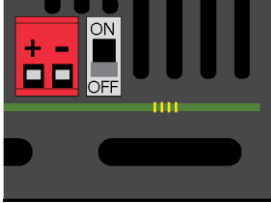
2. Remove power from the power supply.
3. Pull the red screw terminal connector from the controller's power terminals labeled **24 Vac/Vdc** (**+/-**).
4. Connect the power supply's wires to the red screw terminal connector.
5. Connect an 18 AWG or larger wire from the power supply's negative (-) terminal to earth ground. This wire must not exceed 12 in. (30.5 cm).
6. Apply power to the power supply.
7. Measure the voltage at the red screw terminal connector to verify that the voltage is within the operating range of 20 to 30 Vac or 23.4 to 30 Vdc.
8. Insert the red screw terminal connector into the controller's power terminals.
9. To verify the polarity of the wiring, measure the voltage from the negative terminal of the red screw terminal connector to a nearby ground. The reading should be 0V.
10. Turn on the expander's power switch.
11. Verify that the ⏻ LED on top of the controller is on.
12. Measure the voltage at the red screw terminal connector to verify that the voltage is within the operating range of 20 to 30 Vac or 23.4 to 30 Vdc.

Addressing the G5CE

Set this port's address ...	In this location...	See...
IP	Service Port	*To set the IP address* (page 10)
Port S1	On the controller's rotary switches	*To set the Port S1 address and baud rate* (page 12)
Port S2	Service Port	*To set the Port S2 address and baud rate* (page 12)

To access the controller setup through the **Service Port**:

1 Connect an Ethernet cable from a computer to the controller as shown below.
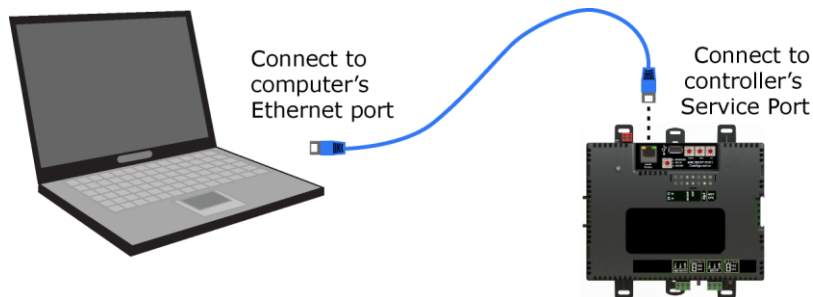
2 Turn off the computer's Wi-Fi if it is on.

3 If your computer uses a static IP address, use the following settings:

- Address: 169.254.1.x, where x is 2 to 7
- Subnet Mask: 255.255.255.248
- Default Gateway: 169.254.1.1

4 If it uses a DHCP address, leave the address as it is.

5 Open a web browser on the computer.

6 Navigate to http://local.access or http://169.254.1.1 to see the Service Port controller setup pages.

See *To set up the controller through the Service Port* (page 29) for general information on using the controller setup pages.

To set up autobaud

The G5CE can automatically receive or establish the baud rate on a serial network. When you configure a device on the network for autobaud and then power it up, the device detects the incoming baud rate on the network and sets its baud to match.

Autobaud does not work unless there is a device on the network, whether Automated Logic® or third party, that has the baud rate already set. You can manually set the baud rate on more than one device, as long as the rate is the same for every device.

NOTES

- The received baud rate stays intact during power cycles.
- We recommend you set the baud rate manually on the router for the network.

MS/TP

MSTP Autobaud can be configured in either the:

- **Service Port** controller setup pages > **BACnet** tab > **Port S1** or **Port S2**

  or

- The WebCTRL® interface, on the **Network** tree, select your G5CE > **Driver** > **BACnet Router Properties** > **MS/TP Configuration** on Port S1 or on Port S2. See *BACnet Router Properties* (page 22).

Modbus

Modbus Serial Autobaud can be configured in either the:

- **Service Port** controller setup pages > **Modbus** tab > **Modbus RS-485** > **Port Configuration**
  or

- The WebCTRL® interface, on the **Network** tree, select your G5CE and go to **Driver** > **Communication Status** > **Modbus Serial**

NOTE See the *Modbus Integration Guide*.

NOTE If you set **Autobaud** or make other changes in the controller setup pages, you must upload the changes to the system database the first time you access the controller in the WebCTRL® interface. This preserves those settings when you download memory or parameters to the controller.

To set the IP address

You must define the G5CE's IP addressing (IP address, subnet mask, and default gateway) in the Service Port controller setup pages so that the controller can communicate with the WebCTRL Server on the IP network. This IP addressing must match the IP addressing defined in SiteBuilder in the controller's **Properties** dialog box.

Use one of the IP addressing schemes described below with the associated instructions that follow.

Use a...	If...
DHCP IP Address generated by a DHCP server	The IP network uses a DHCP server for IP addressing
Custom Static IP Address from your network administrator	You do not use a DHCP server and the answer to any of the following questions is yes. Will the WebCTRL® system: • Share a facility's existing IP data network? • Have 254 or more devices with static IP addresses? • Be connected to the Internet? • Have at least one device located on the other side of an IP router? • Have any third-party IP devices?
Default IP Address that your system creates	The answer to all of the above questions is no.

NOTE Carefully plan your addressing scheme to avoid duplicating addresses. If third-party devices are integrated into the system, make sure your addresses do not conflict with their addresses.

To set a DHCP IP address

1. On the controller setup **Modstat** tab, find the controller's **Ethernet MAC address** and write it down.
2. On the **Ports** tab under **IP Port**, select **DHCP**.
3. Click **Save**.
4. Write down the **IP Address**.
5. Give the DHCP network administrator the IP address and Ethernet MAC address and ask him to reserve that IP address for the controller so that it always receives the same IP address from the DHCP server.

To set a custom IP address

1 Obtain the IP address, subnet mask, and default gateway address for the controller from the facility network administrator.

2 On the controller setup **Ports** tab under **IP Port**, select **Custom Static**.

3 Enter the **IP Address**, **Subnet Mask**, and **Default Gateway** addresses that the network administrator gave you.

4 Click **Save**.

To set a default IP address

Default IP addressing assigns the following to the controller:

- IP address = 192.168.168.**x**
  where **x** is the setting on the rotary switches in the range from 1 to 253
- Subnet Mask = 255.255.255.0
- Default Gateway = 192.168.168.254

1 Set the controller's three rotary switches to a unique address on the network. Set the left rotary switch to the hundreds digit, the middle switch to the tens digit, and the right switch to the ones digit.
EXAMPLE The switches below are set to 125.
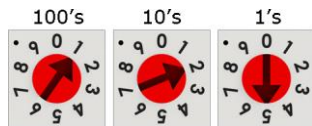
2 On the controller setup **Ports** tab under **IP Port**, select **Default IP Address**.

3 Click **Save**.

⚠ CAUTIONS

- If you are using Port S1, the rotary switches also determine that network's address. Although the ARCNET address range is 1 to 255, the Default IP address range is 1 to 253. Setting the rotary switches to 0 will set the Default IP address to 1. Setting the switches to 255 will set the Default IP to 253. Do not set the switches to 254.

- If you set the Default IP address on the controller setup **Ports** tab and then change the rotary switches, you must do one of the following to correct the IP address in the controller:

  ○ Go to the controller setup **Ports** tab and click the **Update IP Address**.
  ○ Cycle the controller's power.

  You will then need to correct the IP address in SiteBuilder.

NOTE The default address is an intranet address. Data packets from this address are not routable to the Internet.

To set the Port S1 address and baud rate

The address should be in one of the following ranges based on the port's use.

- For ARCNET, the range is 1 to 255.
- For MS/TP, the range is 0 to 127.
- For Modbus, the range is 1 to 247.

You set this address on the G5CE's three rotary switches. Set the left rotary switch to the hundreds digit, the middle switch to the tens digit, and the right switch to the ones digit.

EXAMPLE The switches below are set to 125.
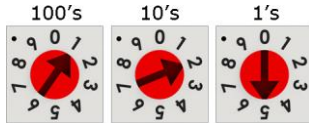
⚠ **CAUTION** If you are using a Default IP address, the rotary switches also determine the IP address.

For MS/TP, set up autobaud or the port's baud rate

1   On the controller setup **BACnet** tab under **Port S1**, select the **MSTP Baud Rate** or select **Yes** for **MSTP Autobaud**. The default is 76,800 bps.
    NOTES
    ○ See *To set up autobaud* (page 9) for details.
    ○ If not using autobaud, enter the identical baud rate for all devices on the same MS/TP network segment.
2   Click **Save**.

Modbus

For Modbus, see the *Modbus Integration Guide*.

To set the Port S2 address and baud rate

For MS/TP, set up autobaud or the port's baud rate

1   On the controller setup **BACnet** tab under **Port S2**, type the address in the **MSTP Address** field. The address must be in the range 0 to 127.
2   Select the **MSTP Baud Rate** or select **Yes** for **MSTP Autobaud**. The default is 76,800 bps.
    NOTES
    ○ See *To set up autobaud* (page 9) for details.
    ○ If not using autobaud, enter the same baud rate for all devices on the MS/TP network.
3   Click **Save**.

Modbus

For Modbus, see the *Modbus Integration Guide*.

Wiring for communications

The G5CE communicates on the following ports.

Port	Protocol	Port type(s)	Speed(s)
Gig-E	BACnet/IP, BACnet/Ethernet, and/or Modbus TCP/IP	Ethernet	10, 100, or 1000 Mbps (1 Gbps)
Port S1 [1]	BACnet/ARCNET	EIA-485	156 kbps
Port S1 [1] or **Port S2**	BACnet/MSTP Modbus Serial	EIA-485	9.6 to 115.2 kbps [2] 9.6 to 115.2 kbps [2]
Service Port [3]	HTTP/IP	Ethernet	10 Mbps 100 Mbps
Rnet Port	See *Wiring devices to the G5CE's Rnet port* (page 15).		
USB Port	USB2.0	USB	

[1] Set the **Port S1 Configuration** rotary switch to:
   0 if port is not used
   1 for MS/TP
   2 for ARCNET
   3 for Modbus
   4 is for future use

[2] Default for MS/TP is 76.8 kbps.
   Default for Modbus is 38.4 kbps.

[3] See To set up the controller through the Service Port.

Wiring specifications

For...	Use...	Maximum Length
Ethernet	Cat5e or higher Ethernet cable	328 feet (100 meters)
ARCNET [1] and MS/TP [2]	22 AWG, low-capacitance, twisted, stranded, shielded copper wire	2000 feet (610 meters)

[1] See the *ARC156 Wiring Technical Instructions*.

[2] See the *MS/TP Networking and Wiring Technical Instructions*.

⚠ **WARNING** Do not apply line voltage (mains voltage) to the controller's ports and terminals.

To connect the G5CE to the Ethernet

Connect an Ethernet cable to the Gig-E Ethernet port.

NOTE If your system has controllers on different IP subnets separated by an IP router, you must configure one controller on each subnet as a BACnet Broadcast Management Device (BBMD). Do not configure more than one BBMD per subnet as this may cause circular routes. See "Setting up BACnet Broadcast Management Devices (BBMDs)" in SiteBuilder or WebCTRL® Help.

To wire to a BACnet/ARCNET network

1 Turn **off** the G5CE's power.

2 Check the communications wiring for shorts and grounds.

3 Connect the communications wiring to **Port S1**'s screw terminals labeled **Net +**, **Net -**, and **Shield**.

  NOTE   Use the same polarity throughout the network segment.

4 If the controller has a **Port S1 Configuration** rotary switch, set it to 2.

5 If the G5CE is at either end of a network segment, set the port's **End of Net?** switch to **Yes**.

  NOTE The controller's **End of Net** switch applies network termination and bias. If the controller is at the end of a network segment that includes a DIAG485 that has its **Bias** jumper in the ON position, set the **End of Net?** switch to **No** and connect a 120 ohm termination resistor to the **Net+** and **Net-** terminals. See *DIAG485 Technical Instructions* for more information.

6 Turn on the controller's power.

7 To verify communication with the network, get a Module Status report in the WebCTRL® interface for a controller on the ARCNET network.

  NOTE This step requires that you have set up the router in SiteBuilder and downloaded it from the WebCTRL® interface.

To wire to a BACnet MS/TP network

An MS/TP network can be wired to either **Port S1** or **Port S2**.

1 Turn **off** the G5CE's power.

2 Check the communications wiring for shorts and grounds.

3 Connect the communications wiring to the **Port S1** or **Port S2** screw terminals labeled **Net +**, **Net -**, and **Shield**.

  NOTE   Use the same polarity throughout the network segment.

4 If you are using **Port S1**, and the controller has a **Port S1 Configuration** rotary switch, set it to 1.

  NOTE If **Port S1** is not being used for any network, set this rotary switch to 0.

5 If the G5CE is at either end of a network segment, set the port's **End of Net?** switch to **Yes**.

  NOTE The controller's **End of Net** switch applies network termination and bias. If the controller is at the end of a network segment that includes a DIAG485 that has its **Bias** jumper in the ON position, set the **End of Net?** switch to **No** and connect a 120 ohm termination resistor to the **Net+** and **Net-** terminals. See *DIAG485 Technical Instructions* for more information.

6 Turn on the controller's power.

7 To verify communication with the network, get a Module Status report in the WebCTRL® interface for a controller on the MS/TP network.

  NOTE This step requires that you have set up the router in SiteBuilder and downloaded it from the WebCTRL® interface.

To wire a third-party device

BACnet: You can wire a third-party BACnet device to the G5CE's **Gig-E** port, **Port S1**, or **Port S2**. See the *BACnet Integration Guide* for the G5CE.

Modbus: You can wire a third-party Modbus TCP/IP device (client or server) to the G5CE's **Gig-E** port or a Modbus master or slave device to **Port S1** or **Port S2**. See *Modbus Integration Guide* for the G5CE.

Wiring devices to the G5CE's Rnet port

You can wire the following devices to the G5CE's Rnet port in a daisy-chain configuration:

- ZS sensors
- Wireless Adapter that communicates with wireless sensors
- Equipment Touch
- OptiPoint™ interface

See the device's T*echnical Instruction*s for complete wiring instructions.

NOTES

- ZS sensors, a Wireless Adapter, and an Equipment Touch can share the same Rnet.
- The Rnet communicates at a rate of 115.2 kbps.

To communicate through the BACnet/IP Service Port network

You can connect to the Service Port to access your network through the WebCTRL® application.

1 Connect an Ethernet cable from a computer to the controller as shown below.
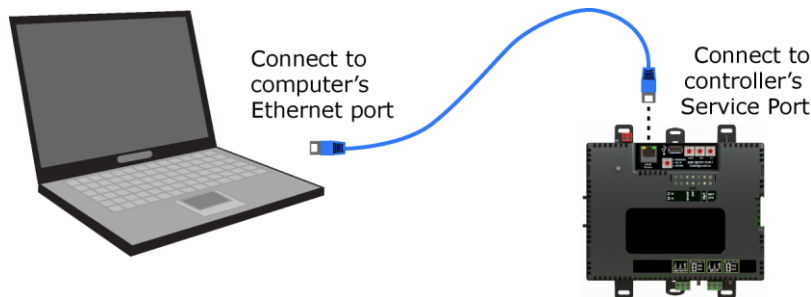
2 Turn off the computer's Wi-Fi if it is on.

3 If your computer uses a static IP address, use the following settings:
   ○ Address: 169.254.1.x, where x is 2 to 7
   ○ Subnet Mask: 255.255.255.248
   ○ Default Gateway: 169.254.1.1

4 If it uses a DHCP address, leave the address as it is.

5 Open a web browser on the computer and login to your WebCTRL® application.

6 On the **System Configuration** ⚙ tree, select **Connections** > **Properties** > **Configure** tab.

7 Select **BACnet/IP Service Port Connection** from the drop-down list and click **Add**.

8 If needed, enter the **Service Port Network Number** as follows:

- **0** - the computer or the OptiPoint™ interface communicates only with the G5CE and not the network

- **1** to **65534** - the G5CE's network number for network communication

- **65535** - searches for an available network number from 65531 to 65534. If any of these numbers are not available, you will have to assign a network number and enter it.

9 Click **Accept**.

10 On the right of the page, in the **Networks using selected connection** table, click the checkbox next to the network you want to connect to.

11 Click **Accept**.

12 On the **Configure** tab, select the **BACnet/IP Service Port Connection** and click **Start**. The status changes to **Connected**.

Downloading the G5CE

Download to send the following items to the G5CE:

Item	Notes
Up to 999 control programs, depending on available memory	Must be in **WebCTRLx.x\webroot**<system_name>**\programs**.
drv_fwex driver	The driver must be in **WebCTRLx.x\webroot**<system_name>**\drivers**. **NOTE** To verify that you have the driver's latest version, Go to the Automated Logic® Partner Community website. Compare the latest version to the G5CE's driver in SiteBuilder.
Editable properties	
Schedules	

If you change any of the above items or the G5CE's address after the initial download, you must download again. The first download takes longer than subsequent downloads.

⚠️ **CAUTIONS**

- The G5CE will lose stored data, such as trends, when you download.
- The G5CE outputs will not maintain their states when you download. This could cause equipment controlled by the G5CE to shut down and/or restart.

To download from the WebCTRL® interface

1 On the WebCTRL® **Network** tree, select the G5CE.

2 Click **Downloads**.

3 Do one of the following:
- If the controller is in the Downloads list, go to step 4.
- If the controller is not in the list:
  a. Click **Add**.
  b. In the pop-up, select the controller.
  c. Select **All Content**.
  d. Click **Add**.
  e. Click **Close**.

4 Select the controller in the Downloads list.

5 Click **Start**.

NOTES

- If the download fails, locate, and resolve the problem, then retry the download.
- You can also download from the **Devices** page.

Adjusting the G5CE driver properties

After you download the driver and control program(s) to the G5CE, you may want to change the driver's properties in the WebCTRL® interface to suit your application.

1 On the WebCTRL® **Network** tree, click ▷ to the left of your G5CE.

2 Click ▷ to the left of **Driver** to see its children.

3 Make changes as needed on the **Properties** page for **Driver** and any of its children.

Driver

The **Driver** page provides the following information plus the items described in the table below:
- The date/time of last parameter change or the last time the database was archived
- If control programs, properties, and schedules were successfully stored in memory
- Undelivered Alarm Status

TouchScreen Control	
TouchScreen Schedule Edit Enable	Check this field to allow a user to edit this controller's schedules from an Equipment Touch or System Touch Schedules screen.
	NOTE Schedules edited on an Equipment Touch or System Touch are not uploaded to the WebCTRL® application. This could result in the controller operating on a schedule that differs from the one you see in the WebCTRL® interface.

Controller Clock	
Clock Fail Date and Time	Date and time the controller uses when its real-time clock is invalid.
Time Synch Sensitivity (seconds)	When the controller receives a time sync request, if the difference between the controller's time and the time sync's time is greater than this field's value, the controller's time is immediately changed. If the difference is less than this field's value, the controller's time is slowly adjusted until the time is correct.
Network Microblocks	
BACnet third party integration points capacity, **integration points requested**, and **integration points active**	Shows how many third-party BACnet points the G5CE allows (capacity), how many points are in the control program (requested), and how many are currently active (not disabled in WebCTRL®). For example, if the G5CE allows 1500 points, the control program has 1450 points, and you disabled 30 points in WebCTRL®, you would see: Integration points capacity: 1500 Integration points requested: 1450 Integration points active: 1420
Modbus integration points capacity and **integration points active**	Shows how many Modbus points the G5CE allows (capacity) and how many are currently active.
Number of poll retries before Network Input Microblocks indicate failure	The maximum number of retries after the initial attempt that a Network microblock will attempt to communicate with its target device. If unsuccessful, the point will transition to an idle state for 30 seconds before attempting to communicate again. Change this field only if directed by Technical Support.
Periodic rebinding interval	If a microblock uses a wildcard in its address, this timer determines how often the microblock will attempt to find the nearest instance of its target. For example, if an outside air temperature address uses a wildcard, a VAV application will look for the outside air temperature on the same network segment or on the nearest device containing that object.
Debug	
Enable Debug Messages	Enable only if directed by Automated Logic® Technical Support.

Device

The **Device** page provides the following information plus the items described in the table below:

- BACnet device object properties for the G5CE
- The character sets supported by this device for BACnet communication

Configuration	
BACnet System Status	The current state of the controller: Operational Download in Progress Download Required Backup in Progress Non-Operational
The following fields refer to all networks over which the G5CE communicates.	
APDU Timeout	How many milliseconds the device will wait before resending a message if no response is received.
APDU Segment Timeout	How many milliseconds the device will wait before resending a message segment if no response is received.
Number of APDU Retries	The number of times the device will resend a message.
Controller Clock	
Time Broadcaster will synchronize time every ____	If you have third-party BACnet devices on one of the router's networks, you can have the router send a BACnet time sync to those devices at the interval you define in this field.
Time Synchronization Recipients	To define third-party BACnet devices as Time Synchronization Recipients: 1 Click **Add**. 2 Select **Device ID, Address**, **Local Broadcaster**, or **Global Broadcaster** in the **Recipient Type** field. 3 If you selected **Device ID** or **Address**, enter the information. 4 Click **Accept**.

Notification Classes

A BACnet alarm's Notification Class defines:

- Alarm priority for Alarm, Fault, and Return to Normal states
- Options for BACnet alarm acknowledgment
- Where alarms should be sent (recipients)

Alarms in the WebCTRL® application use Notification Class #1. The WebCTRL® application is automatically a recipient of these alarms.

Priorities	**NOTE** BACnet defines the following Network message priorities for Alarms and Events.

Priority range	Network message priority
00–63	Life Safety
64–127	Critical Equipment
128–191	Urgent
192–255	Normal

Priority of Off-Normal	BACnet priority for Alarms.
Priority of Fault	BACnet priority for Fault messages.
Priority of Normal	BACnet priority for Return-to-normal messages.
Ack Required for Off-Normal, Fault, and Normal	Specifies whether alarms associated with this Notification Class require a BACnet Acknowledgment for Off-Normal, Fault, or Normal alarms. **TIP** You can require operator acknowledgment for an Alarm or Return-to-normal message (stored in the WebCTRL® database). In the WebCTRL® interface on the **Alarm** > **Enable/Disable** tab, change the acknowledgment settings for an alarm source or an alarm category.
Recipient List	
Recipients	The first row in this list is from the WebCTRL® application. Do not delete this row. Click **Add** if you want other BACnet devices to receive alarms associated with this Notification Class. **NOTE** Additional entries in this table may be lost after a download.
Recipient Description	Name that appears in the **Recipients** table.
Recipient Type	Use **Address** (static binding) for either of the following: • Third-party BACnet device recipients that do not support dynamic binding • When you want alarms to be broadcast (you must uncheck **Issue Confirmed Notifications**). This use is rare.
Days and times	The days and times during which the recipient will receive alarms.
Recipient Device Object Identifier	Type the **Device Instance** from SiteBuilder (or from the network administrator for third-party devices) in the **#** field.
Process Identifier	Change for third-party devices that use a BACnet Process Identifier other than 1. The WebCTRL® application processes alarms for any 32-bit Process Identifier.
Issue Confirmed Notifications	Select to have a device continue sending an alarm message until it receives delivery confirmation from the recipient.
Transitions to Send	Uncheck the types of alarms you do not want the recipient to get.

Calendars

Calendars are provided in the driver for BACnet compatibility only. Instead, use the **Schedules** feature in the WebCTRL® interface.

Common and Specific Alarms

On these pages, you can enable/disable, change BACnet alarm properties, or set delays for the following BACnet alarms:

Common alarms:

- All Programs Stopped
- Excessive COV
- Program Stopped
- Locked I/O
- Controller Halted
- Control Program
- Duplicate Address

Specific alarm:

- Dead Controller Timeout

NOTE To set up alarm actions for controller generated alarms, see *Setting up alarm actions* in the WebCTRL® Help.

Controller Generated Alarm	
Description	Short message shown on the **Alarms** page or in an alarm action when this type of alarm is generated.
Events	
Alarm Category and Alarm Template	See *Customizing alarms* in WebCTRL® Help.
Enable	Clear these checkboxes to disable Alarm or Return to normal messages of this type from the G5CE.
Notification Class	In a typical WebCTRL® system, the Notification Class is 1; however, if needed, you can associate a different notification class with the alarm. See *Notification Classes* (page 19) to set up alarm delivery options for a specific Notification Class.

BACnet Router Properties

The **BACnet Router Properties** page provides the following information plus the items described in the table below:

- The G5CE's Ethernet MAC address
- Whether **Port S1** is being used for ARCNET, MS/TP, Modbus, or is disabled
- Whether **Port S2** is being used for MS/TP, Modbus, or is disabled

ARCNET Configuration	
Address	The address that is set on the three rotary switches.
MS/TP Configuration	
Address	For Port S1—The address that is set on the three rotary switches. For Port S2—A unique address on the MS/TP network.
MS/TP Autobaud	To enable autobaud, select **Yes**. This device will receive its baud rate from the master device.
MS/TP Baud Rate	Set this to a baud rate that all other devices on the MS/TP network are set to.
Max Masters	To increase MS/TP performance, enter the highest address used on the MS/TP network for a master controller. This number must be less than or equal to 127.
Max Info Frames	This is the maximum number of information messages a controller may transmit before it must pass the token to the next controller. Valid values are 1 to 255. 🔆 **TIP** Set **Max Info Frames** to a number in the range 20 to 100 so that the router does not become a bottleneck for traffic being routed from a high-speed network to the slower MS/TP network.
End of Network Switch Status	
Switch Status	This displays the state of the **End of Net?** termination switch for the Port S1 and Port S2 networks. **End of Network Switch Status** Port S1 End of Network: ☐ Port S2 End of Network: ☐
BACnet Network Numbers	
Network numbers	These numbers must match the numbers defined on controller setup **Ports** tab. See *To set up the controller through the Service Port* (page 29). Check **Autogenerated** only if you plan to let the controller autogenerate the network number. **NOTE** When downloaded from the WebCTRL® application, these numbers match those set using SiteBuilder.

IP Configuration	
Allow remote management of IP configuration	When this field is enabled, you can set up IP addressing through an external tool. IP addressing is typically set up through the Service Port.
Enable IP configuration changeover	Only for custom static IP addressing—Select this field to remotely change the router's **IP Address**, **Subnet Mask**, and **Default Gateway Address**. Type the new addresses and the **UDP Port** that your server is using to communicate to all controllers. In the **Changeover timeout** field, enter: • A specific length of time for the controller to attempt to communicate with the **Next Default Gateway Address**. The controller will use the **Next** setting as soon as the controller can communicate with the **Next Default Gateway Address**, or when the timeout occurs, whichever comes first. • **0:00** to have the controller use the **Next** settings as soon as the controller can communicate with the **Next Default Gateway Address**. See "To remotely change a controller's IP address" in WebCTRL® Help for more information on using this feature.

NAT Configuration	
Enable NAT Routing	Reserved for future use.

BACnet Router Options	
Ignore all Reject-Message-to-Network, Reason=1 messages	Clear to delete and rediscover a router if a network's router indicates that the network is no longer present (reason=1). Select to continue routing messages to a network even if its router indicates that the network is no longer present.

Color/Prime Variable Caching	
Peer Caching Enabled	This checkbox will be checked for the router that was defined in SiteBuilder as the peer caching router.
Disable Color Cache	Clear (enable) to improve responsiveness in retrieving colors. Select (disable) to reduce network traffic to third-party (non-color-supporting) devices. **NOTE** Selecting this checkbox also disables dead module alarms.
Dead Controller Timeout	After this period (minutes:seconds) of non-response from an Automated Logic® controller, the router sends an alarm to the server.
Reports colors to	The BACnet Object Identifier of the router that was defined in SiteBuilder as the peer caching router.

BACnet Firewall

If this IP controller is accessible from the Internet, you can increase security by enabling its BACnet firewall. When enabled, this feature prevents the controller from responding to BACnet messages from unidentified sources and allows communication only with IP addresses that you define. These can be all private IP addresses and/or a list of IP addresses. Follow the instructions in the WebCTRL® interface to set up the BACnet firewall.

Network Diagnostics - Statistics

This page shows the network statistics for each of the G5CE's ports that are in use. This same information is provided in a *Module Status report* (page 38).

Click the **Error Rate Trend** or **Packet Rate Trend** link at the bottom of each section to see the statistics displayed as trend graphs. You can also access these trends by clicking on the driver in the network tree, and then selecting **Trends** > **Enabled Points** > and the desired trend graph.

Click a port's **Reset** button to set all of the numbers to zero so the counting can start over.

Router Statistics	
Error Counters	**Dropped Packets**—Data packets that could not be delivered. **Route Not Found**—Packets that could not be delivered because the requested network does not exist. **Route Unreachable**—These are routed packets whose destination network is either busy or offline
Network Activity	Shows the number of incoming and outgoing unicast and broadcast packets for each of the G5CE's networks.
Router Sourced Packets	Shows the number of packets initiated by the G5CE that are not in response to a request from another device. The numbers in this table will also appear in the appropriate columns in the **Network Activity** tab.
Trends	**Error Rate Trend**—Shows the total number of errors within the trend sampling interval. **Packet Rate Trend**—Shows the total number of packets transmitted and received within the trend sampling interval.
Gig-E Port Statistics	
BACnet/IP Statistics	**BACnet/IP Rx Unicast Packets**—BACnet/IP packets received from a single BACnet device. **BACnet/IP Tx Unicast Packets**—BACnet/IP packets transmitted to a single BACnet device. **BACnet/IP Rx Broadcast Packets**—BACnet/IP broadcast packets received by the G5CE. **BACnet/IP Tx Broadcast Packets**—BACnet/IP broadcast packets transmitted by the G5CE. **Whitelist Rejections** (if *BACnet Firewall* (page 23) is enabled)—Messages blocked by the BACnet Firewall because the IP address that sent the message was not in the whitelist.
Ethernet Statistics	**Ethernet Rx packets**—All packets (including non-BACnet packets such as a ping) received by the G5CE. **Ethernet Tx packets**—All packets (including non-BACnet packets such as a ping) transmitted by the G5CE. **Receive Errors (total)**—All errors related to received packets such as CRC errors, FIFO errors, frame errors, length errors, missed errors, and overrun errors. **Transmit Errors (total)**—All errors related to transmitted packets such as aborted errors, carrier errors, dropped errors, FIFO errors, heartbeat errors, and window errors. **Dropped Packets**—Packets dropped by the G5CE's Ethernet interface.

| Trends | **Error Rate Trend**—Shows the total number of errors within the interval time. |
| | **Packet Rate Trend**—Shows the total number of packets transmitted and received within the trend sampling interval. |

Port S1 Statistics when used for ARCNET	
Error Counters	**Node Reconfiguration**—The ARCNET reconfigurations initiated by the G5CE.
	Bus Reconfiguration—An ARCNET reconfiguration not generated by the G5CE (such as when a controller connects to the network).
	Excessive NACK—Excessive NACKs received by the G5CE's ARCNET chip. Excessive NACKs are usually the result of a station which is unable to process a steady stream of packets due to buffer overflows or slow responses.
	Dropped Packets—Dropped receive and transmit frames. These may be dropped due to buffer allocation failures, length errors, or NACKed transmit packets.
Activity Counters	**BACnet/ARCNET Rx Packets**—BACnet/ARCNET data packets received by the G5CE.
	BACnet/ARCNET Tx Packets—BACnet/ARCNET data packets transmitted by the G5CE.
Latency	**Average Value (milliseconds)**—The average time from when a packet is queued to be transmitted until it is actually transmitted on the bus.
	Maximum Value (milliseconds)—The maximum time from when a packet is queued to be transmitted until it is actually transmitted on the bus.
Trends	**Error Rate Trend**—Total number of errors within the interval time on this network, including break errors, framing errors, etc..
	Packet Rate Trend—BACnet/ARCNET data packets transmitted through router, not the total utilization.

Port S1 Statistics when used for MSTP or **Port S2 Statistics**	
Error Counters	**UART Errors**—UART receive and transmit errors such as break errors, framing errors, parity errors, and overrun errors.
	Invalid Frames—Received MS/TP frames that contain an error such as CRC.
	Dropped Packets—Dropped receive and transmit frames. These may be dropped due to buffer allocation failures, length errors, or APDU timeouts (in the case of transmit frames)
	Dropped Tokens—Dropped tokens that have been retransmitted.
	No responses—Messages that did not receive a response from the destination device.
Activity Counters	**BACnet/MSTP Rx Packets**—BACnet/MSTP data packets received by the G5CE.
	BACnet/MSTP Tx Packets—BACnet/MSTP data packets transmitted by the G5CE.

Latency	**Average Value (milliseconds)**—The average time from when a packet is queued to be transmitted until it is actually transmitted on the bus.
	Maximum Value (milliseconds)—The maximum time from when a packet is queued to be transmitted until it is actually transmitted on the bus
Trends	**Error Rate Trend**—Total number of errors within the interval time on this network, including break errors, framing errors, etc.
	Packet Rate Trend—Percentage of total bus bandwidth used to transmit data packets.
	NOTE This is for all bus traffic, not just traffic generated by the G5CE.

Network Diagnostics - Packet Capture

This page allows you to capture network communication on a port and then download the capture file for troubleshooting. Choose one of the following capture options:

- **Start/Stop** - Define the start and stop criteria, and then click **Start** and **Accept** to begin the capture. When the capture stops, the capture file is generated.
  NOTE If a Start/Stop capture is running on any other port, the **Get capture file** button will be disabled until all Start/Stop captures have completed.

  ○ **Start capture:** - When you check **At (mm/dd/yyyy hh:mm AM/PM)**, enter the time and date, and click **Start**, the packet capture begins at the date and time you specified.

  NOTE The hours field is validated from 0 to 12, and minute field is validated from 0 to 59.

  ○ **Continuous** - Click **Start** and **Accept** to begin the capture. Click **Save** to momentarily stop the capture and create the capture file. The capture will automatically resume. Click on the **Start/Stop** option to end the **Continuous** capture.

  ○ If the port is set up for MS/TP, select an option in the **Capture** section.

To download the capture file

Capture files are Wireshark files that are added to the Device Log Archive .tgz file. Do the following to view the files.

1 If you do not have Wireshark installed on your computer, download the latest version from the *Wireshark website (http://www.wireshark.org)*.

2 Run the install program, accepting all defaults. Include WinPcap in the installation.

3 On the WebCTRL® **Packet Capture** page, click **Get capture file** to download the .tgz file. The message appears "Retrieving the file, this may take a little while". Click **OK**.

> **NOTE** If the size of the .tgz is large, there could be a considerable delay (for example, over 2 minutes) after you click **Get capture file** until your browser begins the download.

4 Open the .tgz file. The files are in the **captures** folder.
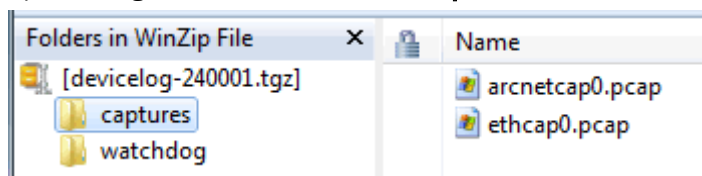
Capture file names are based on the ports.

NOTES

- If you have an MSTP capture file for both Port S1 and Port S2, the file names will be:
  mstpcap0 for Port S1
  mstpcap1 for Port S2
- Clicking **Get capture file** generates the port's .pcap file. If the port has a .pcap file from a previous capture, that file will be overwritten.

5 Extract the .pcap file from the .tgz file.

6 Open the .pcap file in Wireshark.

Communication Status

The **Communication Status** page shows the status of the protocols currently running on the G5CE's ports.

Standalone Controller Detection

You can use the fields on this page with a binary input in your control program to detect when the controller does not receive a write request from the selected network within the specified amount of time. The input remains OFF as long as write requests are received, but switches to ON if the controller does not receive a request within the specified time. The binary input must have the Expander number and Input number set to **99** and the I/O Type set to **Special**.

Modbus Serial, Modbus TCP/IP, and Modbus Error Definitions pages

If the controller will be used with Modbus devices, see the *Modbus Integration Guide* for information on using these pages.

To set up Network Statistic trends

To view the *Network Statistics* (page 24) as trend graphs, go to one of the following on the WebCTRL®

Network 🔳 tree:

- Under **Driver**, on the **Network Diagnostics** > **Statistics** page, click a Trend link at the bottom of each section.

- On the **Driver** page, click the **Trends** drop-down button, select **Enabled Points** and then the graph you want.

You can define:

- How the graph looks on the trend's **Configure** tab.
- How you want trend samples to be collected on the **Enable/Disable** tab. See table below.

| Field	Notes
Sample every _:_:_ (hh:mm:ss)	(Recommended method) To record the value at a regular time interval, enter hh:mm:ss in this field.
Sample on COV (change of value)	To record the value only when the value changes by at least the amount of the **COV Increment**, set the **Sample every** field to 0:00:00 and enter a value in the **COV Increment** field.
Max samples	Network Statistic trends have a non-configurable maximum trend log buffer size of 1440. **NOTE** Trending consumes memory in the controller. Click **Reset** to delete all samples currently stored in the controller.
Stop When Full	Check this field to stop trend sampling when the maximum number of samples is reached.
Enable trend log at specific times only	Collects trend data for the specific period of time you define in the time and date fields.
Enable Trend Historian	Archives trend data to the system database.
Store Trends Now	Writes all trend data in the controller to the system database without having to enable trend historian.
Write to historian every __ trend samples	Writes all trend data in the controller to the system database each time the controller collects the number of samples that you enter in this field. This number must be greater than zero and less than the number entered in the Max samples field. The number of trends specified must be accumulated at least once before the historical trends can be viewed. **NOTE** Any trends not stored in the historian will be lost if the controller loses power.
Trend samples accumulated since last notification	Shows the number of samples stored in the controller since data was last written to the database.
Last Record Written to Historian	Shows the number of trend samples that were last written to the database.
Keep historical trends for __ days	This is based on the date that the sample was read. Select the first option to use the system default that is defined on the **System Settings** > **General** tab. Select the second option to set a value for this trend only.

To set up the controller through the Service Port

Using a computer and an Ethernet cable, you can communicate with the G5CE through a web browser to:

- View the controller's Module Status report
- View/change controller and network settings. Changes take effect immediately.
- Troubleshoot
- Use BACnet/IP Service Port to access the WebCTRL® application or a touchscreen device. See *To communicate through the BACnet/IP Service Port network* (page 15).

1 Connect an Ethernet cable from a computer to the controller as shown below.
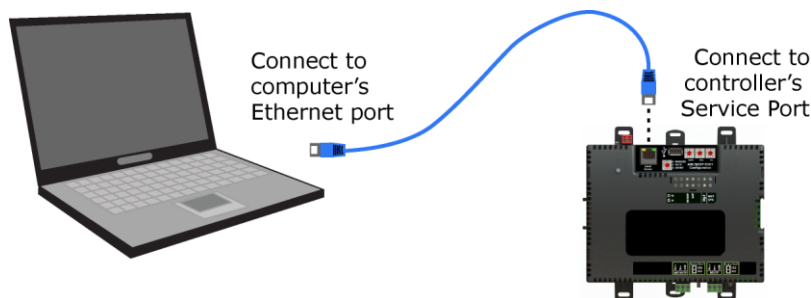
2 Turn off the computer's Wi-Fi if it is on.

3 If your computer uses a static IP address, use the following settings:
- Address: 169.254.1.x, where x is 2 to 7
- Subnet Mask: 255.255.255.248
- Default Gateway: 169.254.1.1

4 If it uses a DHCP address, leave the address as it is.

5 Open a web browser on the computer.

6 Navigate to http://local.access or http://169.254.1.1 to see the Service Port controller setup pages.

NOTE The first time you access the controller in the WebCTRL® interface after you have changed settings through the Service Port, be sure to upload the changes to the system database. This will preserve those settings when you download memory or parameters to the controller.

ModStat tab

This tab provides the controller's Module Status report that gives information about the controller and network communication status. See *Appendix - Module Status field descriptions* (page 43).

Device tab

The information on the **Devices** tab is typically defined in the WebCTRL® interface and then downloaded to the controller. However, you would set the information on the controller setup **Device** tab if the controller is stand-alone without a WebCTRL® system.

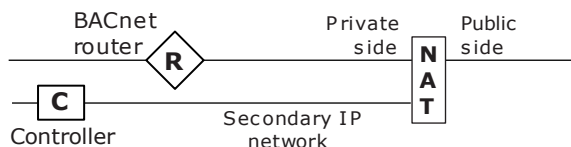| BACnet Object	
Device Instance	**Autogenerated**—The Device Instance is automatically set to a number equal to the (IP network number) x 100 + rotary switch address. **Assigned**—Lets you enter a specific number that is unique on the BACnet network.
Device Name	**Autogenerated**—The Device Name is automatically set as the word device + the Device Instance. For example, device2423911. **Assigned**—Lets you enter a specific name that is unique on the BACnet network.
Device Location	You can enter an intuitive location for the device in the WebCTRL® interface.
Device Description	You can enter an intuitive description for the device in the WebCTRL® interface.
Configuration	
APDU Timeout	How many milliseconds the device will wait before resending a message if no response is received.
APDU Segment Timeout	How many milliseconds the device will wait before resending a message segment if no response is received.
APDU Retries	The number of times the device will resend a message.
Controller Information	
Clear Counts/Logs	Clears Reset counters and the three message history fields from the Module Status.
Data Backup and Restore	
Backup	Displays time of the last backup. Click button to backup the controller's control programs, properties, and schedules.
Restore	Displays time of the last restore. Click button to restore the most recent backup of the controller's control programs, properties, and schedules.

Ports tab

IP Port	
IP Addressing	Select the type of addressing the controller is to use. See *Addressing the G5CE* (page 8).

Port S1	
End of Network	Indicates status of the controller's **End of Net?** switch.
Active Protocol	Indicates status of the controller's **Port S1 Configuration** rotary switch. 0=Disabled 1=MS/TP 2=ARCNET 3=Modbus
Address	The address that is set on the three rotary switches. See *To set the Port S1 address and baud rate* (page 12).

Port S2	
End of Network	Indicates status of the controller's **End of Net?** switch.
Active Protocol	The protocol that has been enabled for Port S2 on the BACnet or Modbus tab.

BACnet tab

The information on the **BACnet** tab is typically defined in SiteBuilder or the WebCTRL® interface and then downloaded to the controller. However, you would set the information on the controller setup **BACnet** tab if the router is stand-alone without a WebCTRL® system.

IP Port	
BACnet Network Number	**Disable Routing**—Select if the IP port is not used. **Autogenerated**—The BACnet/IP network number is automatically set to 2400. **Assigned**—Lets you enter a specific number.
BACnet UDP Port	The port that the WebCTRL® application will use for BACnet communication.
Enable NAT Routing	**For future use.** Check if the G5CE is behind a NAT router (firewall).
Global NAT IP Address	**For future use.** Public IP address of the NAT router.
Global NAT BACnet UDP Port	**For future use.** Port number assigned to the NAT router's public interface.

BACnet Secondary IP Net Number	If the G5CE has two BACnet/IP networks communicating on the Gig-E port, enter the second IP network number in this field. If the G5CE is behind a NAT router and there is a second network with BACnet/IP devices behind the NAT router, enter the second network number in this field to logically connect the G5CE to the devices on the second network.
BACnet Secondary UDP Port	If the G5CE has two BACnet/IP networks communicating on the Gig-E port, enter the port number that the WebCTRL® application will use for BACnet communication. This port must be different than the **BACnet UDP Port**.
Ethernet Port	
Address	A factory assigned Ethernet MAC Address for the **Gig-E** port.
BACnet Network Number	Specify a number for the BACnet/Ethernet network or set to 0 if the port is not used.
Port S1	
End of Network	Indicates status of the controller's **End of Net?** switch.
Active Protocol	Indicates status of the controller's Port S1 rotary switch. 0=Disabled 1=MS/TP 2=ARCNET 3=Modbus
Address	The address that is set on the three rotary switches. See *To set the Port S1 address and baud rate* (page 12).
MSTP Autobaud	Select **Yes** to enable this slave device to automatically receive its baud rate from a master on the network that has the fixed baud rate.
MSTP Baud Rate	Set this to a baud rate that all other devices on the MS/TP network are set to.
MSTP Max Master	To increase MS/TP performance, enter the highest address used on the MS/TP network for a master controller. This number must be less than or equal to 127.
MSTP Max Info Frames	This is the maximum number of information messages a controller may transmit before it must pass the token to the next controller. Valid values are 1 to 255. 💡 **TIP** Set **Max Info Frames** to a number in the range 20 to 100 so that the router does not become a bottleneck for traffic being routed from a high-speed network to the slower MS/TP network.
BACnet Network Number	Select: **Disable Routing** if Port S1 is not used. **Autogenerated** to have the network number for Port S1 automatically set to a number equal to ((IP network number + rotary switch address) x 10). **Assigned** to enter a specific number.

Port S2	
End of Network	Indicates status of the controller's **End of Net?** switch.
Active Protocol	Shows one of the following: • **Modbus** if enabled on the **Modbus** tab • **BACnet/MSTP** if you enter a **BACnet Network Number** below for an MS/TP network • **Disabled** if neither of the above have been done
Address	The controller's unique address on the MS/TP network.
MSTP Autobaud	Select **Yes** to enable this slave device to automatically receive its baud rate from a master on the network that has the fixed baud rate.
MSTP Baud Rate	Set this to a baud rate that all other devices on the MS/TP network are set to.
MSTP Max Master	To increase MS/TP performance, enter the highest address used on the MS/TP network for a master controller. This number must be less than or equal to 127.
MSTP Max Info Frames	This is the maximum number of information messages a controller may transmit before it must pass the token to the next controller. Valid values are 1 to 255. 💡 **TIP** Set **Max Info Frames** to a number in the range 20 to 100 so that the router does not become a bottleneck for traffic being routed from a high-speed network to the slower MS/TP network.
BACnet Network Number	Select: **Disable Routing** if Port S2 is not used. **Autogenerated** to have the network number for Port S2 automatically set to a number equal to ((IP network number + rotary switch address) x 10) + 3. **Assigned** to enter a specific number.
Home Network	This is typically the network that is communicating with the building automation system's application. This sets the BACnet Address of the Device object.

Modbus tab

If the controller will be used with Modbus devices, see the *Modbus Integration Guide* for information on using this tab.

Security tab

BACnet Firewall	If your BACnet Firewall configuration in the WebCTRL® interface did not include the WebCTRL® server IP address, thus blocking communication with the WebCTRL® server, you can disable the controller's BACnet Firewall on the controller setup **Security** tab. **NOTE** You can enable the BACnet Firewall only in the WebCTRL® interface.

To communicate locally through the Rnet port

You can connect a computer running WebCTRL® to the G5CE's **Rnet** port to download or troubleshoot.

PREREQUISITES

- A computer with a USB port
- A USB Link Kit. See the *USB Link Kit Technical Instructions*.
  NOTES
  - The USB Link Kit driver is installed with a WebCTRL® v5 or later system. Please refer to the Silicon Labs website and search "CP210x USB to UART Bridge VCP Drivers" for the most current device drivers. Install the driver before you connect the USB Link Kit to your computer.
  - You will use only the portion of the USB Link Kit that has the USB connector.

  ⚠ **CAUTION**   If multiple controllers share power but polarity was not maintained when they were wired, the difference between the controller's ground and the computer's AC power ground could damage the USB Link Kit and the controller. If you are not sure of the wiring polarity, use a USB isolator between the computer and the USB Link Kit. Purchase a USB isolator online from a third-party manufacturer.

- A 3-pin screw terminal connector and 3-wire cable

1   Connect one end of a piece of 3-wire cable to the 3-pin connector.
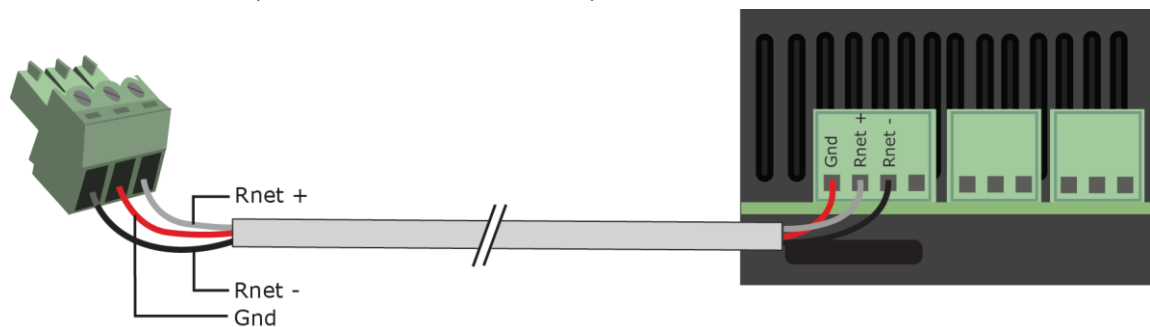
2   Connect the other end of the 3-wire cable to the G5CE's **Rnet** port as shown in the drawing above in step 1.

3   Connect the 3-pin connector to the portion of the USB link kit shown in the drawing below, then connect the USB connector to the computer.
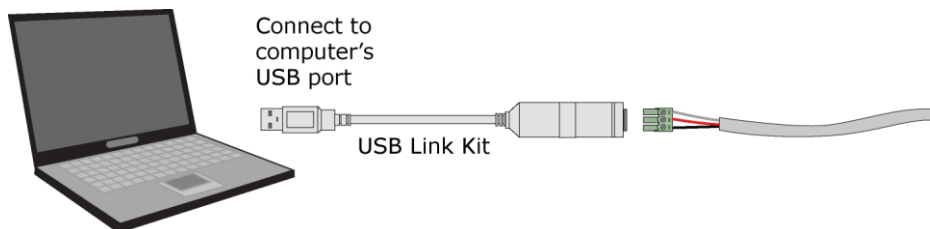
NOTE   If using a USB isolator, plug the isolator into your computer's USB port, and then plug the USB Link Kit cable into the isolator.

To set up a Local Access connection in the WebCTRL® interface

For the WebCTRL® application to communicate with the **Rnet** port, you must do the following:

1 On the **System Configuration** ⚙ tree, select **Connections**.

2 On the **Configure** tab, click **Add**.

3 From the **Type** drop-down list, select **BACnet/Rnet Local Access Connection**.
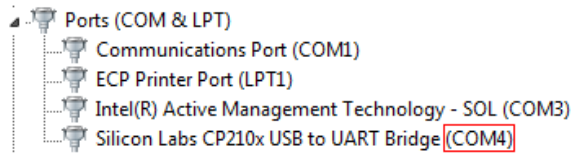
4 Optional: Edit the **Description**.

5 Type the computer's **Port** number that the USB cable is connected to.

    NOTE To find the port number, plug the USB cable into the computer's USB port, then select **Start** > **Control Panel** > **System** > **Device Manager** > **Ports (Com & LPT)**. The COM port number is beside **Silicon Labs CP210x USB to UART Bridge**.

```
▲ ·🖵 Ports (COM & LPT)
       🖵 Communications Port (COM1)
       🖵 ECP Printer Port (LPT1)
       🖵 Intel(R) Active Management Technology - SOL (COM3)
       🖵 Silicon Labs CP210x USB to UART Bridge (COM4)
```

6 Set the **Baud** rate to 115200.

7 Click **Accept**.

8 On the **View** tab, select **BACnet/Rnet Connection** from the drop-down list.

9 Click **Accept**.

10 On the **Configure** tab, select **BACnet/Rnet Connection**, then click **Start**.

    NOTE If an error message appears, make sure the COM port you selected is not in use. For example, PuTTY may be open and is holding the port open.

11 On the **Network** 🖧 tree, select the controller that you are connected to.

12 Click ▤, then select **Manual Command**.

13 Type `rnet here` in the dialog box, then click **OK**.

14 On the **Properties** page, click **Module Status**. If a Modstat report appears, the WebCTRL® application is communicating with the controller.

Troubleshooting

If you have problems mounting, wiring, or addressing the G5CE, contact Automated Logic® Technical Support.

LEDs

NET (Network Status) Tricolor LED

Color	Pattern	Condition	Message in Module Status	Possible Solutions
Red	On	Ethernet connection problem	No Ethernet Link	• Connect Ethernet Cable • Check other network components
Red	1 blink	One of the following BACnet/IP (Ethernet) DLL reporting issue: • Unable to create tasks • Unable to open socket for BACnet port	BACnet/IP error	Cycle power
Red	2 blink	Current default IP address does not match the current rotary switch setting	Default IP address mismatch	• Use the controller setup **Ports** tab to set the IP address • Cycle power to accept new IP address • Change rotary switches to match current default IP address
Red	3 blink	Unable to get address from DHCP	Error unable to find DHCP server	Check with network administrator

NET (Network Status) Tricolor LED

Color	Pattern	Condition	Message in Module Status	Possible Solutions
Blue	On	One of the following issues: • Port communication firmware did not load properly • Port communication firmware is not running • Invalid protocol selected	ARCNET/MSTP firmware error	• Change rotary switch to select valid protocol • Cycle power
Blue	1 blink	Invalid address selected for protocol	Invalid address selection for ARCNET/MSTP	Change rotary switch to valid address
Blue	2 blink	Router has same MAC address as another connected device	Duplicate address on ARCNET/MSTP	Change rotary switch to unique address
Blue	3 blink	Router is the only device on the network	No other devices detected on ARCNET/MSTP	• Check that network cable is connected properly • Check that baud rate is correct
Blue	4 blink	Excessive errors detected over 3 second period	Excessive communication errors on ARCNET/MSTP	• Check that network cable is connected properly • Check that baud rate is correct
Blue	5 blink	ARCNET traffic overload possibly due to circular router or excessive COVs (change of values)	Event System Error - FPGA RX FIFO full	• Check the network configuration for a circular route • Increase the time between COVs to reduce excessive COV traffic
Green	On	All enabled networks are functioning properly	No errors	No action required

SYS (System Status) Tricolor LED

Color	Pattern	Condition	Message in Module Status	Possible Solution
Red	1 blink	System is non-operational due to excessive control program abnormal exits	No control programs started due to frequent system errors	Remove control programs and download

SYS (System Status) Tricolor LED

Color	Pattern	Condition	Message in Module Status	Possible Solution
Red	2 blink	Restarting after an abnormal exit	Auto restart delay due to system error on startup	After 5 minute delay has expired, if condition occurs again then cycle power
Red	3 blink	System is non-operational due to one or more control programs halted	Control program stopped due to program error	Remove control program and download
Red	4 blink	Firmware image is corrupt	Firmware error	Download driver again
Red	Fast blink	Firmware error has caused the firmware to exit and restart	Fatal error detected	No action required
Green	1 blink	No errors	Operational	No action required
Green	2 blink	Download of driver is in progress	Download in progress	No action required
Green	3 blink	BACnet Device ID is not set	Download required	Download the controller
Green	Fast blink	Installation of recently downloaded driver is occurring	N/A	No action required
Blue	On	Router is starting up	N/A	No action required
Blue	Slow blink	Linux (operating system) is starting up	N/A	No action required
Blue	Fast blink	Linux is running but it could not start the firmware application	N/A	Download driver

To get a Module Status report

A Module Status report provides information about the controller and verifies proper network communication with the controller. You can get this report:

- In the WebCTRL® application—Right-click the controller on the **Network** tree, then select **Module Status**.

- In the WebCTRL® application—Select the controller on the **Network** tree. On the **Properties** page, click **Module Status**.

- On the controller setup **ModStat** tab—See *To set up the controller through the Comm/Service ports* (page 29).

See *Appendix - Module Status field descriptions* (page 43).

To get a Device Log

If Automated Logic® Technical Support instructs you to get the controller's Device Log containing diagnostic information for troubleshooting:

1 Select the G5CE in the WebCTRL® **Network** tree.

2 On the **Properties** page, click **Device Log**.

NOTE You can click **Device Log Archive** to download a file containing multiple Device Logs to your computer. This also contains any network packet captures that have been run from the *Network Diagnostics - Packet Captures* (page 26) driver page.

To get the G5CE's serial number

If you need the controller's serial number when troubleshooting, the number is on:

• A Module Status report (Modstat).

• A laser-etched number and QR code on the circuit board inside the controller.

• Some controllers have a sticker on the front with the serial number, MAC address, and a QR code.

See *To get a Module Status report* (page 38).

To replace the G5CE's fuse

If you turn on the controller's power switch and the ⏻ LED is not lit, the fuse that protects the controller may be blown. Remove the fuse and use a multimeter to check it.

The fuse is a fast acting, 250Vac, 2A, 5mm x 20mm glass fuse that you can purchase from one of the following vendors:

Manufacturer	Mfr. Model #
Littelfuse	0217002.HXP
Bussmann	S500-2-R
Belfuse	5SF 2-R
Optifuse	FSD-2A

Before replacing the fuse, try to determine why the fuse blew. Check the power wiring polarity of the G5CE and any other devices that share the power supply. Use the same polarity for all of them.

To replace the fuse:

1 Turn off the controller's power.

2 Remove the red power connector.

3 On both ends of the controller, insert a small flathead screwdriver as shown below, and then gently pry up the cover until it is released from the base.

Insert screwdriver
about 1/8 in (.32 cm)
to pry up on cover
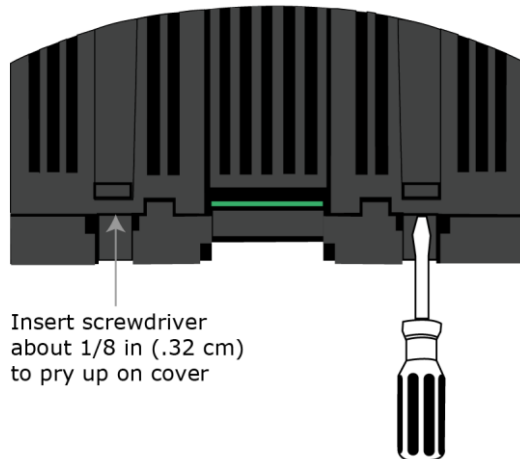
4 Remove the cover from the base.

5 The fuse labeled **F1** is located near the power connector. Use a fuse puller to remove the fuse.
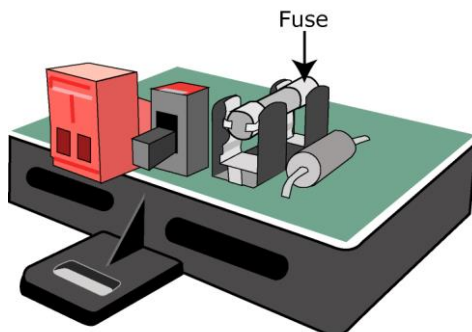
Fuse

6 Use the fuse puller to snap the new fuse into the fuse holder.

7 Replace the controller's cover.

8 Replace the power connector.

9 Turn on the controller's power switch.

10 Verify that the ⏻ LED on top of the controller is on.

To take the G5CE out of service

If needed for troubleshooting or start-up, you can stop communication between the WebCTRL® application and the G5CE.

1 On the WebCTRL® **Network** tree, select the G5CE.

2 On the **Properties** page, check **Out of Service**.

3 Click **Accept**.

To revert to default settings

⚠️ **WARNING** This erases all archived information and user-configured settings. When recovery is complete, you must connect locally to the G5CE and manually reconfigure all BACnet, IP, and firewall information. We highly recommend that you revert the default settings only under the guidance of Automated Logic® Technical Support.

1 Copy the newest driver to the root directory of a FAT32-formatted USB flash drive.

   NOTE To verify that you have the driver's latest version, Go to the Automated Logic® Partner Community website. Compare the latest version to the G5CE's driver in SiteBuilder.

2 Remove power from the G5CE.

3 Set the rotary switches to **911**.

4 Apply power to the G5CE.

   NOTE The **Sys** and **Net** LEDs change to magenta after the boot sequence.

5 Plug the USB drive into the controller's USB port.

   NOTES

   ○ The **Sys** LED blinks faster when recovery is in progress.

   ○ When the **Sys** LED turns solid green, the process is complete.

6 Remove power from the G5CE.

7 Remove the USB drive from the USB port.

8 Set the rotary switches back to the normal address.

9 Apply power to the G5CE.

   NOTE The controller is now running the new version of the firmware and is in the default state.

10 Configure the IP address and all other necessary parameters.

Compliance

FCC Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1 This device may not cause harmful interference.

2 This device must accept any interference received, including interference that may cause undesired operation.

NOTE This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if it is not installed and used in accordance with this document, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

⚠ **CAUTION** Any modifications made to this device that are not approved by Automated Logic® will void the authority granted to the user by the FCC to operate this equipment.

CE and UKCA Compliance

⚠ **WARNING** This is a Class B product. In a light industrial environment, this product may cause radio interference in which case the user may be required to take adequate measures.

Industry Canada Compliance

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

BACnet Compliance

Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of BACnet International. BTL® is a registered trademark of BACnet International.

Appendix - Module Status field descriptions

Field	Description
Date/Time	Date and time the Modstat was run
CM	The controller's rotary switch address (MAC address)
Model Name	Identifies the Product Type
Device Instance	A unique ID assigned to the controller
Driver built	When the driver was built
Downloaded by	When and where the last download was performed
Application Software Version	The name of the first control program that is downloaded
Data Partition Version	Not applicable to this device.
# PRGs initialized # PRGs running	If applicable, the number of control programs that were downloaded vs. the number that are running. If these numbers are not the same, the controller has a problem such as lack of memory.
Driver version	The name, version, and date of the driver, as well as all the bundles and versions.
Reset Counters:	The number of times each of the following events have occurred since the last time the controller was commanded to clear the reset counters. See **NOTE** below this table.
Power failures	Interruption of incoming power
Commanded boots	Includes commands issued from the WebCTRL® interface such as the zap manual command, plus commands issued during a memory download.
System errors	Error in the controller's firmware or hardware
S/W Watchdog timeouts	Watchdog is firmware that monitors the application firmware for normal operation. If the watchdog firmware detects a problem, it restarts the application firmware.
H/W Watchdog timeouts	H/W Watchdog will restart the controller if it detects a severe problem with the controller's operating system
System status	Gives the current status of the controller's operation. See *LEDs* (page 36) for all possible conditions.
Network status	Gives the current status of the controller's networks. See *LEDs* (page 36) for all possible conditions.
System error message history	High-severity errors since the last memory download. Shows the most recent 10 messages. See **NOTE** below this table.
Warning message history	Low-severity errors and warning messages since the last memory download. Shows the most recent 10 messages. See **NOTE** below this table.

Field	Description
Information message history	Information-only messages since the last memory download. Shows the most recent 10 messages. See **NOTE** below this table.
ARC156 reconfigurations during the last hour	An ARCNET network normally reconfigures itself when a controller is added to or taken off the network. The **Total** field indicates the number of reconfigurations in the last hour. **Initiated by this node** indicates the number of reconfigurations initiated by this controller. Typical sources of the problem could be this controller, the controller with the next lower rotary switch address, any controller located on the network between these two controllers, or the wiring between these controllers. An excessive number in these fields indicates a problem with the network.
Core and Base board hardware	Gives the following information about the controller's boards: • Type and board numbers that are used internally by Automated Logic®. • The manufacture date and serial number.
Number of BACnet Objects	The number of BACnet objects that were created in the device and the number of those objects that are network visible.
Database Partition	**Non-Volatile** partition (16 MB maximum) contains data that needs to be preserved through a power cycle and archived to flash such as parameters and trend data. **Volatile** partition (6 MB maximum) contains data that does not need to be preserved through a power cycle such as status values that are calculated during runtime.
IP Networks - BBMDs	Shows the following information for each active IP network: **BBMD Active** shows whether the BACnet Broadcast Management Device is currently active (1) or inactive (0). **BBMD Entries**—the number of entries in the BBMD table (500 maximum). **FDT Entries**—the number of entries in the Foreign Device Table (500 maximum).
Third party integration points	Shows number of points used.
Network Information	The various network addresses for the controller. The **Current** and **Assigned** addresses will be the same unless the **Enable IP configuration changeover** on the **BACnet Router Properties** page is being implemented.
Statistics and Network Activity	Shows network communication statistics to assist with troubleshooting. See *Network Diagnostics - Statistics* (page 24) for more information.
Route Information Port Number	BACnet networks that a router is currently routing traffic to. The list changes as BACnet routers are added or removed from the system.

NOTE If you want to clear the Reset counters and the three message history fields, click the **Clear Counts/Logs** button on the controller's **Properties** page in the WebCTRL® application or in the controller setup **Device** tab.

Document revision history

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
6/9/22	Critical Product Announcement	New topic	X-PM-DD-E-BM
	Wiring for communications	Changed RS485 port to EIA-485	X-D
	Compliance > CE and UKCA Compliance	Added UKCA compliance	X-PM-AB-R-BH
	Specifications		
	Adjusting the G5CE driver properties > Device	Added Local Broadcaster and Global Broadcaster options in Controller Clock > Time Synchronization recipients	X-D
1/21/22	Specifications	Updated EU compliance	X-PM-BM-E
	Wiring devices to the G5CE's Rnet Port	Changed Rnet rate of communication from 115 kbps to 115.2 kbps	X-TS-BB-O
8/19/21	Specifications	Changed Real time clock specification to "up to 3 days" from "at least 3 days". Changed EU RoHS compliance code.	X-PM-BM-O
6/11/21	Touchscreen Devices	Added Ethernet port as a method of connecting the G5CE to touchscreen devices	X-PM-JD-E
	Specifications	Added statement that Service Port connects through a local connection to a computer or connects to the OptiPoint™ interface	
	What is the OptiFlex™ BACnet Integrator (part #G5CE)?	Added statement that Ethernet Service Port connects locally to controller setup pages and the OptiPoint™ interface	
	To communicate through the BACnet/IP Service Port network	Removed statement that you can access your network using a touchscreen connected to the Service Port. Updated procedure for connecting to BACnet/IP Service Port for WebCTRL® v8.0 interface	X-PM-BM-E
	Specifications	Changed Real Time Clock spec to "at least 3 days" from "up to 3 days"	
9/17/20	Specifications	Expanded Environmental operating range	X-TS-KC-E-KC
7/9/20	Troubleshooting > LEDs	Graphic with new LEDs for Rnet	X-D
	To communicate locally through the Rnet port, To set up a Local Access connection in the WebCTRL® interface	New topics for Rnet port	
	Wiring devices to the G5CE's Rnet port	New topic for Rnet port	
	Wiring for communications	Rnet port added to table.	
	Touchscreen devices	New topic for Rnet support	
	Zone sensors	New topic for Rnet support	
	Specifications	Added Rnet port and related details. LEDs - added new LED for Rnet	

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
	What is the OptiFlex™ BACnet Integrator (part #G5CE)?	Description now lists support for Rnet devices. Picture of controller updated. Port table/list includes Rnet.	
4/22/20	Wiring for communications	Port S1/S2 baud rate for Modbus changed from 1.2 to 115.2 kpbs to 9.6 to 115.2 kbps	X-D
	Troubleshooting > To revert to default settings	New topic	X-PM-KC-E-TS
	Adjusting driver properties > BACnet Router Properties	Added autobaud information.	X-PM-KC-O
	Addressing the G5CE > To set the Port S2 address and baud rate	Added autobaud information.	X-PM-KC-O
	Addressing the G5CE > To set the Port S1 address and baud rate	Added autobaud information.	X-PM-KC-O
	Addressing the G5CE > To set up autobaud	New topic	X-PM-KC-O
	To set up the controller through the Service Port > Device tab	Added Data Backup and Restore.	X-PM-KC-O
	To communicate through the BACnet/IP Service Port network	New topic	X-PM-KC-O
	To set up the controller through the Service Port	Added ability to access WebCTRL® application or a touchscreen device through BACnet/IP Service Port. Corrected the static IP address settings.	X-PM-KC-O
	To get the G5CE's serial number	A sticker is on the top of the controller and there is a laser-etched number and QR code on the inside circuit board.	X-PM-KC-O
	What is the OptiFlex™ BACnet Integrator (part #G5CE)?	Added BACnet/IP Service Port to the ports table.	X-D
10/1/19	Specifications	Updated BTL to Revision 14	X-PM-KC-O
3/7/19	What is the OptiFlex™ BACnet Integrator (part #G5CE)?	Added Modbus to the ports table.	X-D
	Specifications To mount the G5CE	Changed Depth dimension from 7.09 cm to 5.31 cm.	
	Wiring for communications	Added "NOTE 4 is for future use" to footnote 1 below table.	
	Driver	Added TouchScreen Schedule Edit Enable. Changed description of BACnet third party integration points capacity... Added Modbus integration points capacity, etc.	
	BACnet Router Properties	Added Allow remote management of IP configuration.	
	BACnet firewall	Changed "controller from receiving" to "controller from responding to".	
	Network Diagnostics - Statistics	Changed names of Trend links at the bottom of each section. Added Latency under Port S1 Statistics	

Important changes to this document are listed below. Minor changes such as typographical or formatting errors are not listed.

Date	Topic	Change description	Code*
10/1/18	Entire document	Major changes due to: - The addition of Modbus - Controller label changes - New and revised controller setup pages - Driver pages revisions	X-D
8/24/18	Driver	In description of "Number of integration points requested", removed "non-BACnet" from first line.	X-TS-TS-E

* For internal use only