COMPREHENSIVE SERVICES

We offer competitive repair and calibration services, as well as easily accessible documentation and free downloadable resources.

SELL YOUR SURPLUS

We buy new, used, decommissioned, and surplus parts from every NI series. We work out the best solution to suit your individual needs.

Sell For Cash Get Credit Receive a Trade-In Deal

OBSOLETE NI HARDWARE IN STOCK & READY TO SHIP

We stock New, New Surplus, Refurbished, and Reconditioned NI Hardware.



Bridging the gap between the manufacturer and your legacy test system.

0

1-800-915-6216



www.apexwaves.com

sales@apexwaves.com

All trademarks, brands, and brand names are the property of their respective owners.

Request a Quote



cRIO-9068

NI CMS-9068, NI MMS-9068, and NI EMSA-9068

NI Condition Monitoring Device, NI Motor Monitoring Device, and NI Electromagnetic Signature Analysis Device for NI InsightCM[™]

This document describes how to maintain the CMS-9068 NI Condition Monitoring Device, MMS-9068 NI Motor Monitoring Device, and the EMSA-9068 NI Electromagnetic Signature Analysis Device. The CompactRIO-based CMS-9068, CompactRIO-based MMS-9068, and the CompactRIO-based EMSA-9068 are bundles of hardware and software that include the following components and features:

- cRIO-9068 integrated controller and chassis
- NI C Series modules installed in the chassis
- Pre-installed NI InsightCM Application software
- Network configuration via USB drive



Note Complete the steps in the NI InsightCM Monitoring Device Quick Start before using this document.



Note The chassis and modules included in the cRIO-9068 have been individually certified and rated for safety, environmental, and regulatory information. Refer to *ni.com/manuals* for complete hardware documentation for each device, including safety, environmental, and regulatory information.

Contents

Controller Front Panel	2
Mounting the Device	3
Dimensions	3
Mounting Requirements	4
Ambient Temperature	
Mounting the Device Directly on a Flat Surface	
Mounting the Device on a Panel	7
Mounting the Device on a DIN Rail	9
Mounting the Device on a Rack	.10
Mounting the Device on a Desktop	.10
Installing C Series I/O Modules in the Chassis	.12
I/O Module Arrangements	. 13
Removing I/O Modules from the Chassis	.15
Connecting to a Network	. 15



Grounding the Chassis	15
Wiring Power to the Controller	16
Powering On the Controller	17
Understanding LED Indications on the Controller	17
POWER LED.	18
STATUS LED	18
USER1 LED.	18
USER FPGA1 LED	18
Troubleshooting Network Communication.	19
Resetting the Network Configuration of the Controller	19
Where to Go Next	20
Worldwide Support and Services	21

Controller Front Panel

The following figure shows the I/O ports and other features of the cRIO-9068 controller.

(3) (2) NATIONAL INSTRUMENTS NI cRIO-9068 POWER STATUS ACT/ LINK USER1 (4) **USER FPGA1** C V2 2 10/100 RESET INPUT 9-30 V = DO NOT SEPARATE CABLES WHEN ENERGIZED IN HAZARDOUS LOCATIONS (5) 25 W MAX 1 10/100 0 0 0 0 0 0 0 0 0 0 0 (6) 0 0 0 0 0 0 O PORT 1 / RS232 PORT 2 / RS232 PORT 3 / RS485

Figure 1. cRIO-9068 Controller Front Panel

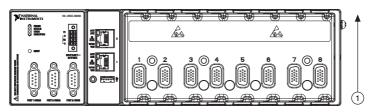
- 1. LEDs
- 2. Reset button
- 3. Power connector
- 4. RJ-45 Ethernet port 2
- 5. RJ-45 Ethernet port 1

- 6. USB port
- 7. RS-485 Serial port
- 8. RS-232 Serial port
- 9. RS-232 Serial port

Mounting the Device

To obtain the maximum allowable ambient temperature of 70 °C, you must mount the cRIO-9068 horizontally on a flat, metallic, vertical surface such as a panel or wall. You can mount the cRIO-9068 directly to the surface or use the NI Panel Mounting Kit. The following figure shows the cRIO-9068 mounted horizontally.

Figure 2. cRIO-9068 Horizontal Mounting



1. Up

You can also mount the cRIO-9068 in other orientations, on a nonmetallic surface, on a 35-mm DIN rail, on a desktop, or in a rack, Mounting the cRIO-9068 in these or other configurations can reduce the maximum allowable ambient temperature and can affect the typical accuracy of modules in the cRIO-9068. For more information about typical accuracy specifications for C Series modules and temperature deratings caused by different mounting configurations, visit *ni.com/info* and enter the Info Code criotypicaljp.



Caution Make sure that no C Series modules are in the cRIO-9068 before mounting it.



Tip Before using any of these mounting methods, record the serial number from the back of the cRIO-9068 so that you can identify the cRIO-9068 in the NI InsightCM web application. You will be unable to read the serial number after you mount the cRIO-9068

Dimensions

The following figures show the front and side dimensions of the cRIO-9068. For detailed dimensional drawings and 3D models, visit ni.com/dimensions and search for the module number.

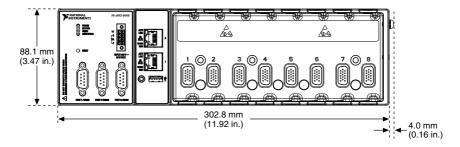
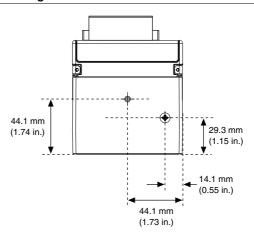


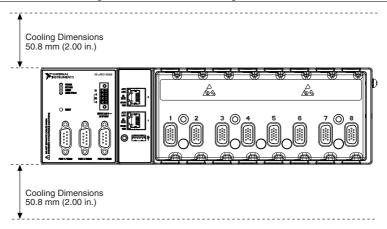
Figure 4. cRIO-9068 Side Dimensions



Mounting Requirements

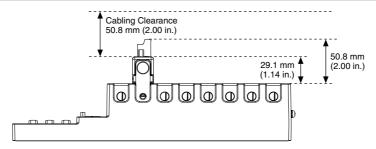
Your installation must meet the following requirements for cooling and cabling clearance.

Allow 50.8 mm (2 in.) on the top and the bottom of the cRIO-9068 for air circulation, as shown in the following figure.



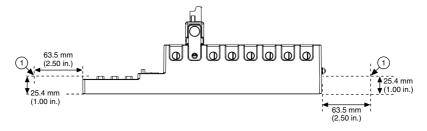
Allow the appropriate space in front of C Series modules for cabling clearance, as shown in the following figure. The different connector types on C Series modules require different cabling clearances. For a complete list of cabling clearances for C Series modules, visit ni.com/info and enter the Info Code crioconn.

Figure 6. cRIO-9068 Cabling Clearance



Ambient Temperature

Measure the ambient temperature at each side of the cRIO-9068, 63.5 mm (2.5 in.) from the side and 25.4 mm (1 in.) forward from the rear of the cRIO-9068, as shown in the following figure.



1. Location for measuring the ambient temperature

Mounting the Device Directly on a Flat Surface

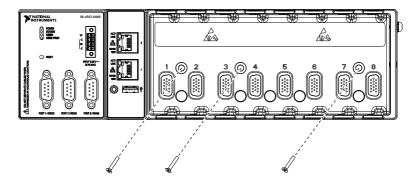
For environments with high shock and vibration, NI recommends mounting the cRIO-9068 directly on a flat, rigid surface using the mounting holes in the cRIO-9068.

What to Use

- cRIO-9068
- Screwdriver, Phillips #2
- M4 or number 8 screw (x3), user-provided, longer than 19 mm (0.75 in.) to pass all the way through the cRIO-9068

What to Do

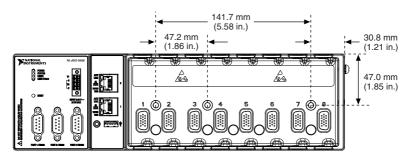
Complete the following steps to mount the cRIO-9068 directly on a flat surface.



- 1. Prepare the surface for mounting the cRIO-9068 using the *Surface Mounting Dimensions*.
- 2. Align the cRIO-9068 on the surface.
- 3. Fasten the cRIO-9068 to the surface using the M4 or number 8 screws appropriate for the surface. Tighten the screws to a maximum torque of 1.3 N · m (11.5 lb · in.).

Surface Mounting Dimensions

The following figure shows the surface mounting dimensions for the cRIO-9068.



Mounting the Device on a Panel

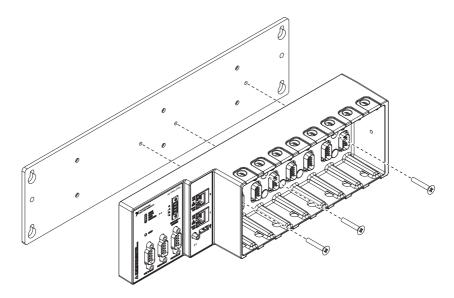
You can use the NI panel mounting kit to mount the cRIO-9068 on a panel.

What to Use

- cRIO-9068
- Screwdriver, Phillips #2
- NI panel mounting kit, 782863-01
 - Panel mounting plate
 - $M4 \times 23$ screw (x3)

What to Do

Complete the following steps to mount the cRIO-9068 on a panel.



- 1. Align the cRIO-9068 and the panel mounting plate.
- 2. Fasten the panel mounting plate to the cRIO-9068 using the screwdriver and M4 \times 23 screws. NI provides these screws with the panel mounting kit. Tighten the screws to a maximum torque of 1.3 N \cdot m (11.5 lb \cdot in.).



Note You must use the screws provided with the NI panel mounting kit because they are the correct depth and thread for the panel mounting plate.

3. Fasten the panel mounting plate to the surface using the screwdriver and screws that are appropriate for the surface. The maximum screw size is M5 or number 10.

Panel Mounting Dimensions

The following figure shows the panel mounting dimensions for the cRIO-9068.

355.6 mm (14.00 in.) 336.5 mm (13.25 in.) 17.6 mm (0.69 in.) (0.29 in.) 31.7 mm (1.25 in.) 31.7 mm (1.25 in.) (3.47 in.) 63.5 mm (2.50 in.)

Figure 9. cRIO-9068 Panel Mounting Dimensions

Mounting the Device on a DIN Rail

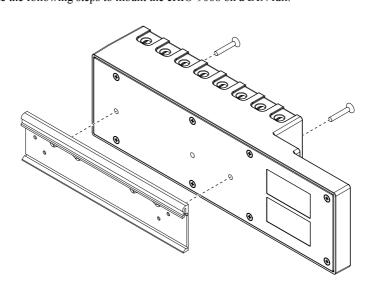
You can use the NI DIN rail mounting kit to mount the cRIO-9068 on a standard 35-mm DIN rail

What to Use

- cRIO-9068
- Screwdriver, Phillips #2
- NI DIN rail mounting kit, 779018-01
 - DIN rail clip
 - $M4 \times 25$ flathead screw (x2)

What to Do

Complete the following steps to mount the cRIO-9068 on a DIN rail.



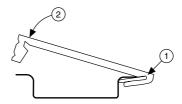
- Align the cRIO-9068 and the DIN rail clip.
- Fasten the DIN rail kit to the cRIO-9068 using the screwdriver and M4 \times 25 flathead screws. NI provides these screws with the DIN rail mounting kit. Tighten the screws to a maximum torque of 1.3 N \cdot m (11.5 lb \cdot in.).



Note You must use the screws provided with the NI DIN rail mounting kit because they are the correct depth and thread for the DIN rail clip.

Clipping the Device on a DIN Rail

Complete the following steps to clip the cRIO-9068 on a DIN rail.



- Insert one edge of the DIN rail into the deeper opening of the DIN rail clip.
- 2. Press down firmly to compress the spring until the clip locks in place on the DIN rail.



Caution Ensure that no C Series modules are in the cRIO-9068 before removing it from the DIN rail

Mounting the Device on a Rack

You can use the following rack mount kits to mount the cRIO-9068 and other DIN railmountable equipment on a standard 482.6 mm (19 in.) rack.

- NI Sliding Rack-Mounting Kit, 779102-01
- NI Rack-Mounting Kit, 781989-01



Note You must use the NI DIN rail mounting kit, 779018-01, in addition to a rackmounting kit.

Mounting the Device on a Desktop

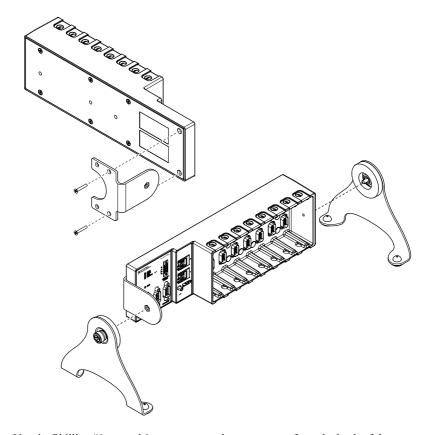
You can use the NI desktop mounting kit to mount the cRIO-9068 on a desktop.

What to Use

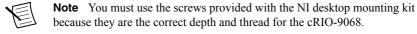
- cRIO-9068
- Screwdriver, Phillips #1
- Screwdriver, Phillips #2
- NI desktop mounting kit, 779473-01
 - Desktop mounting brackets (x2)
 - Adapter bracket
 - $M3 \times 20$ screw (x2)

What to Do

Complete the following steps to mount the cRIO-9068 on a desktop.



- 1. Use the Phillips #1 screwdriver to remove the two screws from the back of the cRIO-9068.
- Use the screwdriver and the M3 \times 20 screws to attach the adapter bracket to the cRIO-9068. NI provides these screws with the desktop mounting kit.



- Align the brackets with the mounting holes on the ends of the cRIO-9068. 3
- Use the Phillips #2 screwdriver to tighten the captive screws on the end of the brackets. 4

Desktop Mounting Dimensions

The following figures show the desktop mounting dimensions for the cRIO-9068.

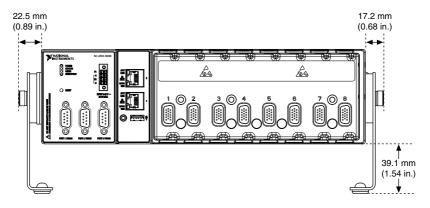
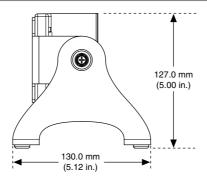


Figure 11. cRIO-9068 Desktop Mounting Side Dimensions



Installing C Series I/O Modules in the Chassis



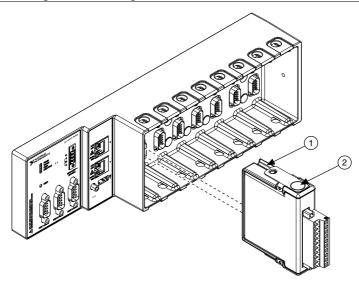
Note Before you install a C Series I/O module in the chassis, ensure that no I/O-side power is connected to the module. If the device is in a nonhazardous location, the chassis power can be on when you install modules.

Complete the following steps to install a C Series I/O module in the chassis.

Align the module with a slot in the chassis, as shown in the following figure. The module slots are labeled 1 to 8, left to right.



Note NI InsightCM device firmware requires that you install certain types of modules in certain slots. Refer to the I/O Module Arrangements section of this document for a list of supported modules and corresponding chassis slots.



- 1. Insertion groove
- 2. Latch
- Squeeze the latches and insert the module into the slot. 2.
- 3. Press firmly on the connector side of the module until the latches lock the module into
- Repeat these steps to install additional modules.

I/O Module Arrangements

For the cRIO-9068, NI InsightCM requires static and dynamic C Series I/O modules installed in a specific arrangement. The following table lists the module types you can install in slots under the different arrangements that NI InsightCM supports.

Table 1, cRIO-9068 I/O Module Arrangements

Slot Number	Supported Arrangements					
	CMS 1	CMS 2	CMS 3	CMS 4	MMS	EMSA
1	Static	Dynamic	Dynamic	Dynamic	NI 9242	NI 9770
2	Static	Dynamic	Dynamic	Dynamic	NI 9239	NI 9770
3	Static	Static	Dynamic	Dynamic	NI 9239	NI 9770
4	Static	Static	Dynamic	Dynamic	NI 9239	NI 9770
5	Static	Static	Dynamic	Dynamic	NI 9239	NI 9770

Table 1. cRIO-9068 I/O Module Arrangements (Continued)

Slot Number	Supported Arrangements					
	CMS 1	CMS 2	CMS 3	CMS 4	ммѕ	EMSA
6	Static	Static	Dynamic	Dynamic	NI 9239	NI 9770
7	Static	Static	Static	Dynamic	NI 9239	NI 9770
8	Static	Static	Static	Dynamic	NI 9239	NI 9770



Note You do not need to fill every slot in the chassis. Fill the slots in order following the arrangements in Table 1.

Arrangements with Dynamic Modules

If the arrangement contains any dynamic input modules, such as the NI 9232, install those modules in adjacent slots beginning with slot 1. You must fill at least slot 1. After slot 1, fill module slots in ascending order.

For example, if the CMS-9068 arrangement contains NI 9232 dynamic input modules and NI 9205 and NI 9425 static input modules, install the modules in the order shown in the following table:

Table 2. Example CMS-9068 Arrangement

CMS-9068 Slot Number	Module Installed	Module Type
1	NI 9232	Dynamic
2	NI 9232	Dynamic
3	NI 9232	Dynamic
4	NI 9232	Dynamic
5	NI 9232	Dynamic
6	NI 9232	Dynamic
7	NI 9205	Static
8	NI 9425	Static

Arrangements with Only Static Modules

If the arrangement contains only static modules, install the modules in adjacent slots beginning with slot 1. You must fill at least slot 1. After slot 1, fill module slots in ascending order.

For example, if the cRIO-9068 arrangement contains NI 9205, NI 9207, NI 9211, NI 9213, NI 9229, NI 9239, and NI 9425 static input modules, install the modules in the order shown in the following table:

Table 3. Example cRIO-9068 Arrangement

cRIO-9068 Slot Number	Static Module Installed
1	NI 9205
2	NI 9207
3	NI 9211
4	NI 9213
5	NI 9229
6	NI 9239
7	NI 9425
8	Empty

Removing I/O Modules from the Chassis



Note Before you remove a C Series I/O module from the chassis, ensure that no I/O-side power is connected to the module. If the device is in a nonhazardous location, the chassis power can be on when you install modules.

To remove a C Series I/O module from the chassis, squeeze the latches on both sides of the module and pull the module from the chassis.

Connecting to a Network

Use a standard Category 5 (CAT-5) or better shielded, twisted-pair Ethernet cable to connect the RJ-45 Ethernet port on the cRIO-9068 to an Ethernet hub.



Caution To prevent data loss and to maintain the integrity of your Ethernet installation, do not use a cable longer than 100 m.

The first time you power up the cRIO-9068, it attempts to initiate a DHCP network connection. If the cRIO-9068 cannot initiate a DHCP connection, it connects to the network with a link-local IP address with the form 169.254.x.x. After the chassis powers up, refer to Resetting the Network Configuration of the NI InsightCM cRIO Controller.

Grounding the Chassis

Complete the following steps to connect the chassis grounding terminal to the grounding electrode system of your facility.

- Attach a ring lug to a 2.0 mm² (14 AWG) or larger wire. 1.
- 2. Remove the grounding screw from the grounding terminal on the right side of the chassis.
- Attach the ring lug to the grounding terminal. 3.

- 4. Tighten the grounding screw to $0.5 \text{ N} \cdot \text{m}$ (4.4 lb · in.) of torque.
- Attach the other end of the wire to the grounding electrode system of your facility using a method appropriate for the application.



Note If you use shielded cabling to connect to a C Series I/O module with a plastic connector, attach the cable shield to the chassis grounding terminal using 1.3 mm² (16 AWG) or larger wire. Attach a ring lug to the wire and attach the wire to the chassis grounding terminal. Solder the other end of the wire to the cable shield. Use shorter wire for better EMC performance.

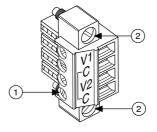
For more information about ground connections, visit *ni.com/info* and enter the Info Code emcground.

Wiring Power to the Controller

The cRIO-9068 requires an external power supply that meets device specifications. The cRIO-9068 filters and regulates the supplied power and provides power for all I/O modules installed in the chassis. The cRIO-9068 has one layer of reverse-voltage protection.

The following figure shows the terminal screws, which secure the wires in the screw terminals, and the connector screws, which secure the power connector on the front panel.

Figure 13. COMBICON Power Connector



- 1. Terminal screws
- 2. Connector screws

Complete the following steps to connect a power supply to the chassis.

- Connect the positive lead of the power supply to the V1 or V2 terminal of the COMBICON power connector installed on the front panel of the cRIO-9068 and tighten the terminal screw.
- 2. Connect the negative lead of the power supply to one of the C terminals of the power connector and tighten the terminal screw.
- 3. Optionally, connect the positive lead of another power supply to the other V terminal and the negative lead to one of the C terminals.

Tighten the connector screws.



Note If you connect power to both the VI and V2 terminals, ensure that the voltage difference between the two power inputs, measured at the controller power connector, is at least 500 mV.



Note The controller draws power from either the V1 or V2 terminals depending on which terminal has a higher voltage. The controller does not draw power from both terminals. The controller switches between the V1 and V2 terminals without affecting operation.



Caution The C terminals are internally connected to each other. If you use two power supplies, ensure that they share a common ground.



Caution The C terminals are internally connected to the controller to prevent a faulty ground connection from causing the chassis ground to float. If you reverse the input voltage, the positive input voltage is connected directly to the chassis. The controller provides built-in reversed-voltage protection, but reversed voltage can damage connected peripherals if the chassis ground is not reliably connected to earth ground.



Caution Do not tighten or loosen the terminal screws on the power connector while the power connector is plugged in to the controller or while the power supply is on

Powering On the Controller

When you apply power to the CompactRIO device, the controller runs a power-on self test (POST). The Power and Status LEDs turn on briefly. When the Status LED turns off, the POST is complete. If the LEDs do not behave in this way when the device powers on, refer to the information in this document about understanding LED indications.

Understanding LED Indications on the Controller

The following figure shows the LEDs on the cRIO-9068.

Figure 14. LEDs on the cRIO-9068



POWER LED

The POWER LED is lit while the cRIO-9068 is powered on. This LED indicates that the power supply connected to the controller is adequate.

STATUS LED

The STATUS LED is off during normal operation. After the device powers on, the cRIO-9068 indicates specific error conditions by flashing the STATUS LED a certain number of times every few seconds. If you observe this behavior after the device powers on, contact NI support.

USER1 LED

The USER1 LED can display the indications described in the following table:

Table 4. USER1 LED Indications

Indication	Description			
Flashing rapidly	Indicates an error condition. Open the InsightCM web application to the Devices tab on the Dashboard page to see the device status.			
Flashing steadily	Indicates normal operation.			
Solid	Indicates that USB operations are in progress, such as reading or writing the connection information file. You can safely remove the USB drive when this LED resumes blinking steadily.			
	Note This device polls USB drives every 15 seconds, so you might need to wait up to 15 seconds after a USB operation begins for the LED to light.			

USER FPGA1 LED

NI Monitoring Devices do not use the USER FPGA1 LED.

Troubleshooting Network Communication

If the CMS/MMS/EMSA-9068 does not connect to NI InsightCM Application with a status of Online, try the following troubleshooting tips:

- Check the Ethernet cable connections on the CMS/MMS/EMSA-9068, host computer, and router
- If you have network firewalls or other security software enabled, try temporarily turning them off. You might also need to add an exception for NI InsightCM Application by completing the following steps:
 - Navigate to the standard Microsoft Windows Control Panel utility for managing firewall settings.
 - 2. Click Allow a program or feature through Windows Firewall.
 - 3. Click Allow another program.
 - Select NI InsightCM and click Add. 4
 - Click **OK** and close the firewall settings.
- Ensure that the ports are open to communication on the host computer. If you are using an intelligent switch on the network, ensure that the switch is not disabling these ports. Refer to the NI InsightCM Readme on ni.com/manuals for more information about host computer ports.
- If you have multiple network cards on the host computer, ensure that you use the Windows Control Panel to disable all other network adapters, such as wireless adapters. Turning off the wireless antenna is insufficient.

Resetting the Network Configuration of the Controller

Complete the following steps to reset the IP address and connection type of the controller.

Insert the USB drive into the USB port on the controller front panel. Within 20 seconds, the USER1 LED lights solid, which indicates that the device is reading from or writing to the settings file.



Tip You can use the blank USB drive included in the NI InsightCM Application kit, if available.

- Remove the USB drive when the USER1 LED returns to blinking steadily.
- 3. Insert the USB drive into a USB port on a computer.
- Browse the file structure of the drive to the <RootLevel>:\InsightCM\download 4. \NI-cRIO-ModelNumber-SerialNumber directory.
- To view the current IP address, skip to step 6. To change the IP address or set the IP address to be static, copy the JSON file beginning with networkInfo followed by the device hostname, such as networkInfo NI-cRIO-ModelNumber-Serial Number. ison, to the <RootLevel>:\InsightCM\upload directory on the USB drive. You might need to create the upload folder.
- 6. Open the JSON file beginning with networkInfo followed by the device hostname.

7. In the array that contains the line "IsPrimary":true, the following line displays the current IP address:

```
"IP Address":"x.x.x.x"
```

where x, x, x is the IP address.

- To change the IP address, enter the value you want to use. Otherwise, record the IP address.
- (Optional) To assign a static IP address, configure the following line in the array as shown:

```
"IP Address Request Mode":"1"
```

- 10. Save and close the file.
- 11. If you made changes to the file, insert the USB drive back into the USB port on the controller front panel. The USER1 LED lights solid, which indicates that the device is reading network and connection properties. You can remove the USB drive when the USER1 LED returns to blinking steadily.

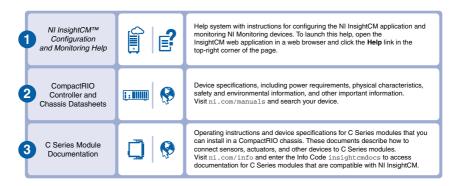


Tip To verify that the device successfully applied changes you made to the file, reinsert the USB drive in a computer and browse to the RootLevel>:
\InsightCM directory. If the changes were successfully applied, the upload folder no longer contains the JSON file you edited, instead, a folder named applied contains the file.

Where to Go Next

The following figure describes additional documentation and resources as you use the CMS/MMS/EMSA-9068.

Figure 15. Where to Go Next



Worldwide Support and Services

The NI website is your complete resource for technical support. At ni.com/support, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit ni.com/services for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the Worldwide Offices section of ni.com/ *niglobal* to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Information is subject to change without notice. Refer to the NI Trademarks and Logo Guidelines at ni.com/trademarks for information on NI trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering NI products/technology, refer to the appropriate location: Help»Patents in your software, the patents.txt file on your media, or the National Instruments Patent Notice at ni.com/patents. You can find information about end-user license agreements (EULAs) and third-party legal notices in the readme file for your NI product. Refer to the Export Compliance Information at ni.com/legal/export-compliance for the NI global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.

© 2014—2017 National Instruments. All rights reserved.