IVN-8563 User Manual

Contents

IVN-8563 User Manual

The IVN-8563 User Manual provides detailed descriptions of the product functionality and the step-by-step processes for use.

Looking For Something Else?

For information not found in the User Manual for your product, such as specifications and API reference, browse **Related Information**.

Related information:

- Software and Driver Downloads
- Release Notes
- License Setup and Activation
- Dimensional Drawings
- Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center
- PXIe-8623 Features
- IVN-8563 Specifications

IVN-8563 Overview

The IVN-8563 is a single-channel, two-port media converter that converts data between 10/100BASE-TX Ethernet and 10BASE-T1S automotive Ethernet with minimal latency. The IVN-8563 is ideal for applications that require Ethernet connectivity for testing and validating automotive electronic control units (ECUs).

Figure 1. The IVN-8563
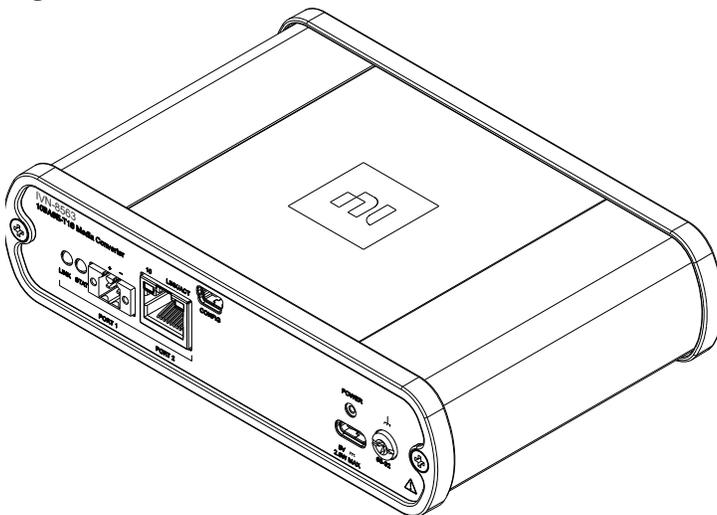
IVN-8563 Key Features

The IVN-8563 transforms data 10/100BASE-TX Ethernet and 10BASE-T1S automotive Ethernet with minimal latency, and supports configuration for use in multidrop networks.

These are the key features of the IVN-8563:

- The IVN-8563 is a single-channel, two-port media converter that converts data between 10/100BASE-TX Ethernet and 10BASE-T1S Automotive Ethernet with minimal latency.
- The IVN-8563 supports multidrop networks and custom PLCA settings for network communication.
- The IVN-8563 supports firmware updates performed by the end-user.
- When paired with a device such as the PXIe-8623, the IVN-8563 supports NI-XNET monitor path and endpoint path.

> **Note** The IVN-8563 does not require driver support and is not directly supported by NI-XNET.

Related information:

- PXIe-8623 Features
- PXIe-8623 Data Path Overview

IVN-8563 Driver Support

The IVN-8563 does not require driver support and is not directly supported by NI-XNET. For NI-XNET monitor path and endpoint path support, pair the IVN-8563 with a device such as the PXIe-8623 Automotive Ethernet Interface Module.

Related information:

- PXIe-8623 Features
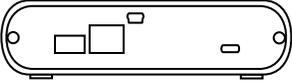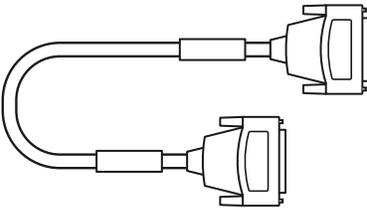- Using Ethernet (NI-XNET User Manual)

Components of a IVN-8563 System

IVN-8563 is designed for use in a system that may require hardware, drivers, and software to optimize IVN-8563 for your application. Use the minimum required IVN-8563 system components as a starting point for building your system.

> **Note** A system and the surrounding environment must meet the requirements defined in the relevant specifications.

Table 1. Minimum Required IVN-8563 System Components

Component	Description and Recommendations
IVN-8563	Your IVN-8563 device.
Cables and Accessories	Cables and accessories allow connectivity to/from your instrument for measurements. Refer to **Cables and Accessories** for recommended cables and accessories and guidance.

Optional IVN-8563 Related Products

Use related products to optimize IVN-8563 for your application.

Table 2. Optional Related Products and Descriptions

Product type	Product Name	Description
Automotive	PXIe-8623	This 4-port module is ideal for developing

Product type	Product Name	Description
Ethernet Interface Module		applications to test and validate automotive electronic control units (ECUs). The **_PXIe-8623 User Manual_** contains information about PXIe-8623 hardware and software requirements.

Cable Recommendations and Accessory Part Numbers

The IVN-8563 has specific cable requirements for each connector.

Cables

Cabling for port 1 connections must be 10BASE-T1S compliant, shielded or unshielded twisted pair cable, with a maximum length of 25 m and cable impedance of 100 Ω ±10%.

Cabling for port 2 connections must be Cat 5e or higher Ethernet cable.

The included USB type-A to USB type-C cable connects a suitable power source, such as a PC or an industrial controller, to the USB type-C power connector on the IVN-8563.

A USB cable with a USB mini-B (miniUSB) connector is required for advanced device configuration. Note that the CONFIG port is for configuration only and cannot power the device.

Accessories

Table 3. Accessory Descriptions and Part Numbers

Accessory	Part Number	Description
NI 9913 DIN rail mounting kit	781740-01	Contains one clip for mounting the IVN-8563 on a standard 35 mm DIN rail.

Wiring the IVN-8563

A terminal block header is required to connect to the IVN-8563 10BASE-T1S port (PORT

1). The IVN-8563 kit includes a compatible plug. Attach the plug to a twisted-pair cable.

IVN-8563 Theory of Operation

The IVN-8563 has two communication ports. one USB mini-B (miniUSB) port to support device configuration, and one USB type-C port to supply power. Port 1 is a 10BASE-T1S port for Automotive Ethernet connections using two-position terminal blocks. Port 2 is a 10/100BASE-TX ports for Ethernet connections using 8-pin, modular RJ-45 connectors. The 10BASE-T1S interface uses an Onsemi NCN26010 10 Mb/s Industrial Ethernet MACPHY Controller. Weidmuller OMNIMATE SL-SMT 3.50/02/90LF terminal block headers are used to connect to these ports. Compatible plugs are included with the IVN-8563. The 10BASE-T1S port can be configured as coordinator or follower.

The USB mini-B (miniUSB) connector allows you to access and modify the device configuration. A USB cable with a USB mini-B (miniUSB) connector is required. This cable is not included with the IVN-8563.

Use the included USB type-A to USB type-C cable to power the device from a standard USB 3.0 port on your computer, NI PXI controller, CompactRIO controller, or other industrial controller.

IVN-8563 Block Diagram

The IVN-8563 provides a single channel to transform data between 10/100BASE-TX Ethernet and 10BASE-T1S automotive Ethernet. Use the IVN-8563 block diagram to visualize the data conversion channel.

10BASE-T1S is the standard for 10 Mbit/s automotive Ethernet. The physical connection consists of an unshielded twisted pair cable over which two connected nodes transmit and receive simultaneously in point-to-point half-duplex operation. The channel consists of one port for 10BASE-T1S communication and one port for 10/100BASE-TX communication. The IVN-8563 uses a two-position terminal block to connect a 10BASE-T1S automotive Ethernet system to the device.
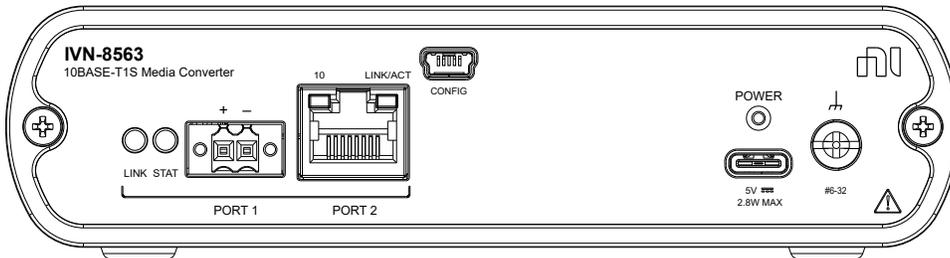
Figure 2. IVN-8563 Block Diagram

10 BASE-T1S
Automotive Ethernet

10/100 BASE-TX
Ethernet

| Terminal Block | ←→ | 10BASE-T1S PHY | ←→ | 10/100BASE-TX PHY | ←→ | RJ-45 Connector |
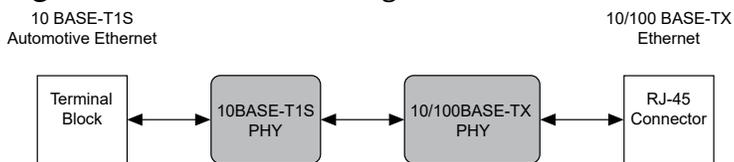
IVN-8563 Front Panel

The IVN-8563 front panel includes a 2-pin terminal block connector, RJ45 Ethernet connector, USB connectors for power and configuration, a grounding screw, and LED status indicators.

Figure 3. IVN-8563 Front Panel

LINK	The LINK LED indicates the data link state.
STAT	The STAT LED indicates the IVN-8563 PLCA status.
PORT 1	PORT 1 is a 10BASE-T1S port for two-position terminal block connections.
PORT 2	PORT 2 is a 10/100BASE-TX port for 8-pin RJ45 Ethernet connections.
CONFIG	The CONFIG connector is a USB mini-B (miniUSB) connector for advanced device configuration scenarios.
POWER	The POWER connector is a USB type-C connector that supplies power to the IVN-8563.
⏚	A lug for grounding the IVN-8563.

IVN-8563 Pinout

Refer to the following tables for descriptions of the terminal block (10BASE-T1S) and RJ45 (10/100BASE-TX) pin assignments.

Table 4. 10BASE-T1S Terminal Block Pin Assignments
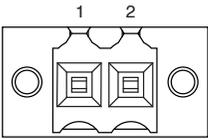
Connector	Pin	Signal
	1	10BASE-T1S Positive (+)
	2	10BASE-T1S Negative (-)

Table 5. 10/100BASE-TX RJ45 Pin Assignments
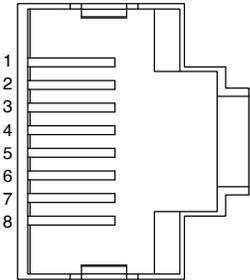
Connector	Pin	Signal
	1	Receive+
	2	Receive-
	3	Transmit+
	4	RCT
	5	TCT
	6	Transmit-
	7	No Connection (NC)
	8	GND

IVN-8563 LEDs

LEDs on the left side of the front panel indicate Link and Activity on the 10BASE-T1S automotive Ethernet port. LEDs on the RJ45 connectors indicate Link, Activity, and 100 Mbit speed on the 10/100BASE-TX Ethernet port.

Table 6. LED Indicators

LED	LED State	Behavior
LINK	Green	Link enabled on port 1
	Red (Steady)	Firmware update in progress
	Red (Blinking)	Firmware update failed
	Off	Link not enabled on port 1
STAT	Green	PLCA is enabled on port 1
	Red (Steady)	N/A
	Red (Blinking)	Configuration file error
	Off	PLCA is not enabled on port 1
10	Steady[1]	10 Mbit link speed selected on port 2
	Off	100 Mbit speed selected on port 2
LINK/ACT	Steady	Link established on port 2, no activity present
	Blinking	Link established on port 2, activity present
	Off	No link established on port 2

1. 10 Mbit link speed is the default setting. This LED will be on steady even when no cable is attached.

Preparing the Environment

Ensure that the environment in which you are using the IVN-8563 meets the following specifications.

Ambient temperature range	0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)
Maximum Altitude	2,000 m (800 mbar)
Pollution Degree	2

Indoor use only.

Note Refer to the device specifications on http://www.ni.com/manuals for complete specifications.

Unpacking the Kit

> **⊘ Notice** To prevent electrostatic discharge (ESD) from damaging the device, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the device from the package and inspect the device for loose components or any other sign of damage.

   > **⊘ Notice** Never touch the exposed pins of connectors.

   > **✎ Note** Do not install a device if it appears damaged in any way.

3. Unpack any other items and documentation from the kit.

> **✎ Note** Store the device in the antistatic package when the device is not in use.

Verifying the Kit Contents

Verify that the following components are in your kit.

- IVN-8563, 10BASE-T1S Media Converter
- USB cable assembly, Type-C (male) to USB 3.1 Type-A (male), 1 m
- Connector plug
- Screwdriver, 2 mm, flathead
- ***Safety, Environmental, and Regulatory Information*** document

Safety Guidelines

⚠️ **Caution** Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.

⚠️ **Attention** Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

⚠️ **Caution** The product is designed for nonhazardous, live signals. You must ensure that all signals connected to the product are isolated from hazardous, live circuits and no unsafe voltages are present at the inputs. Voltages that exceed the specifications could result in damage to the product or electric shock.

⚠️ **Attention** Le produit est conçu pour les signaux en direct non dangereux. Vous devez vous assurer que tous les signaux connectés au produit sont isolés des circuits dangereux sous tension et qu'aucune tension dangereuse n'est présente aux entrées. Des tensions supérieures à celles mentionnées dans les spécifications peuvent endommager le produit ou provoquer un choc électrique.

Rated Voltages

Port 1	30 VDC, maximum

Current Rating

Port 1	92 mA, maximum

Note For safety certifications, refer to the product label or the Product Certifications and Declarations section.

DIN Rail Mounting

The NI 9913 DIN rail mounting kit (part number 781740-01) contains one clip for mounting the IVN-8563 on a standard 35 mm DIN rail. The four holes on the bottom of the IVN-8563 allow for mounting the device in multiple orientations.

Fasten the DIN rail clip to the IVN-8563 using two FLH #6-32 screws (included in the kit) with a #2 Phillips screwdriver. The following figure illustrates attaching the DIN rail clip.

Figure 1. DIN Rail Clip Installation Options
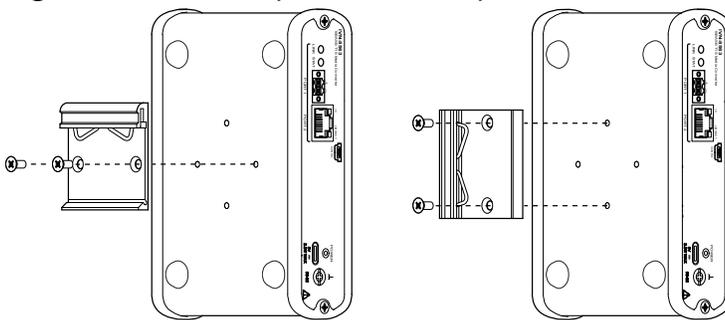
Clip the chassis onto the DIN rail with the larger lip of the DIN rail clip positioned up, as shown in the following figure.

Figure 5. DIN Rail Clip Parts
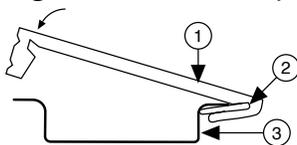
1. DIN Rail Clip
2. DIN Rail Spring
3. DIN Rail

> ✎ **Note** Use only the screws provided in the DIN rail kit. Using longer screws may damage the IVN-8563.

Connecting the IVN-8563

Connect the IVN-8563.

1. Use twisted pair cabling with the provided terminal block to connect your 10BASE-T1S network to PORT 1 of the IVN-8563.
2. Use a Cat 5e Ethernet cable to connect 10/100BASE-TX network to port 2 of the IVN-8563.

> **Note** 10 Mbit link speed must be selected for port 2, indicated by the LED next to the port.

3. Use the included USB cable to supply power. Connect the USB type-C connector to the IVN-8563 and connect the type-A connector to a USB type-A port on your PC or controller.
4. Optionally, attach a grounding cable to the ground screw on the IVN-8563.

IVN-8563 Multidrop Network Configuration

You can configure the IVN-8563 for multidrop networks by loading a modified configuration file to the device. You must connect from a PC to the CONFIG port of the IVN-8563. The connection requires a USB cable with a USB mini-B (miniUSB) connector. This process is for advanced use-cases that require specific Physical-Level Collision Avoidance (PLCA) settings.

Default Configuration Settings

The IVN-8563 is configured for point-to-point configuration by default. In this mode, the `port1-termination` configuration option is `on` and the 100 Ω termination resistor across the MDI pins is enabled.

Multidrop Configuration Settings

For Multidrop configuration:

- Set the `port1-termination` configuration option to `off` for devices that are **drop nodes** (in the middle of the multidrop chain). The termination resistor is disabled for devices with this setting.
- Set the `port1-termination` configuration option to `on` for devices that are **end nodes** (at the ends of the multidrop chain).

Multidrop Configuration Process

1. Connect the USB type-C cable connector to supply power to the IVN-8563.
2. Connect a USB cable from a PC to the CONFIG port of the IVN-8563. The CONFIG port requires a USB cable with a USB mini-B (miniUSB) connector. The IVN-8563 appears as a mass-storage device on the connected PC.
3. On the connected PC, access the IVN-8563 mass-storage device. By default, the IVN-8563 is automatically assigned an available drive letter.
4. Locate and copy the `configuration.json` from the root of the IVN-8563 mass storage. For example, `E:\configuration.json`.

Note For convenience, store a copy of the original configuration file.

5. Modify a copy of `configuration.json` with the desired settings. Refer to the following table for information about supported settings.
6. Copy your modified `configuration.json` file to the IVN-8563 mass storage. Overwrite the existing file.
7. Once all file transfers are complete, disconnect the IVN-8563 from the PC.
8. Disconnect the USB type-C connector connector to remove power to the IVN-8563.
9. Connect the USB type-C connector to supply power to the IVN-8563. The IVN-8563 powers on and uses the modified configuration.

Note If your `configuration.json` contains an error, the STATUS LED blinks red. Correct the error and repeat the advanced configuration process.

Note To restore the default `configuration.json`, connect to the IVN-8563 and delete your modified `configuration.json`. The IVN-8563 generates an unmodified `configuration.json` during boot if no configuration file exists.

JSON Field Name	Valid Values	Description
`plca_configuration`	JSON object	A group of name-value pairs to configure a PLCA sublayer.
`enable`	true, false	Enable or disable PLCA.
`node-id`	numeric	The node ID of the IVN-8563. Set the node-id to zero to configure the IVN-8563 as coordinator.
`node-count`	numeric	The number of nodes on the network.
`to-tmr`	1 to 255 (expressed in bit times)	Specifies the time for a transmit opportunity.
`burst-cnt`	0 to 255 (expressed in bit times)	Specifies the maximum number of packets in a burst.
`burst-timr`	numeric	Specifies the time to wait for

| JSON Field Name	Valid Values	Description
		a new packet before moving to the next node.
`termination_configuration`	JSON object	A group of name-value pairs to configure the automotive ethernet port termination.
`port1-termination`	"off", "on"	Enables or disables termination for the automotive ethernet port. End nodes must set port1-termination to "on". All other nodes must set port1-termination to "off".

Updating IVN-8563 Firmware

The IVN-8563 firmware can be updated by an end-user. The update process requires accessing an integrated microSD slot by removing the rear panel of the IVN-8563.

> (!) **Notice** There is no process to roll back to a previous firmware version once you initiate a firmware update. If a firmware update fails repeatedly, contact NI support.

Ensure you have a suitable screwdriver. Obtain a valid firmware update image.

1. Using a PC, copy the firmware update image to a microSD card. Place the image in the root of the microSD card storage. The firmware update image must not be compressed and must use the default firmware file extension.
2. Disconnect the USB type-C cable connector to remove power from the IVN-8563.
3. Remove the rear panel of the IVN-8563 by unscrewing the fasteners on each side of the panel.
   Figure 1. Removing the Rear Panel
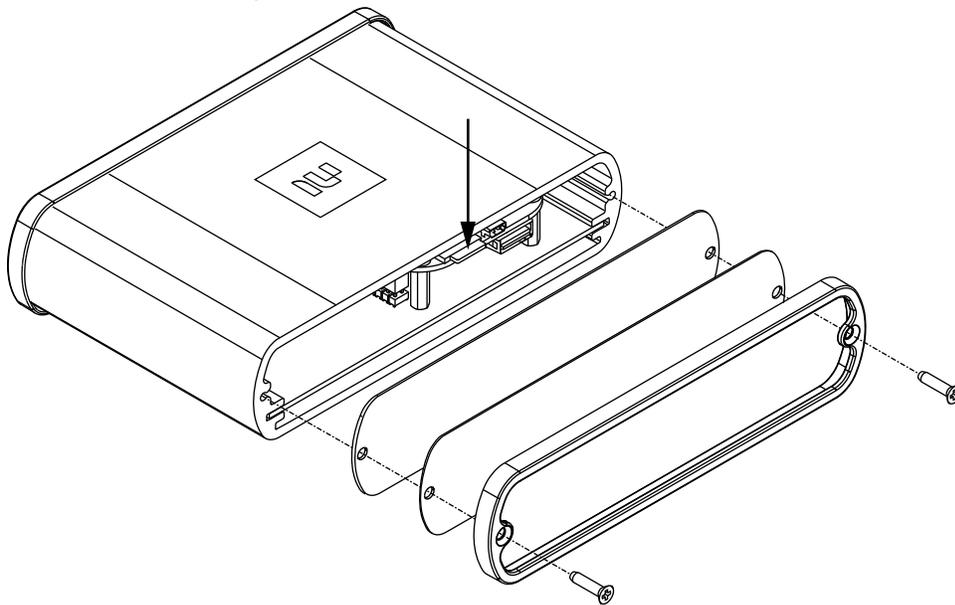
4. Locate the microSD slot on the IVN-8563 and insert the microSD card containing the firmware update. An arrow in the previous figure indicates the microSD slot.
5. Connect the USB type-C connector to supply power to the IVN-8563.
   ◦ The IVN-8563 powers on, loads the firmware image, and begins the firmware update process.

- ◦ The LINK LED glows steady red approximately 20 seconds after the IVN-8563 powers on.
6. Wait for the firmware update to finish.

   Once the update process completes, the IVN-8563 shuts down and all LED indicators turn off.

   If the firmware update fails, the update process halts and the LINK LED continuously blinks red. Disconnect power and remove the microSD card.

   There is no process to roll back to a previous firmware version once you initiate a firmware update. You must repeat the firmware update process to continue. If the firmware update fails repeatedly, contact NI support.

   Note that logging is not available for the firmware update process. Note that there is no method to determine the currently installed firmware version.
7. Remove the USB type-C cable.
8. Remove your microSD card.
9. Reattach the rear panel of the IVN-8563.
10. Connect the USB type-C cable to supply power to the IVN-8563.

The IVN-8563 powers on and functions normally.