

onway Router on5800



User Manual

2026-07-09

onway ag, Switzerland



1 Safety Instructions

Please carefully observe all safety instructions in the manual.

Compliance Information

The onway routers must be used in compliance with any and all applicable national and international laws and with any special restrictions regulating the utilization of the communication module in prescribed applications and environments.

Information about the accessories / changes to the device

- Please only use original accessories to prevent injuries and health risks.
- Changes made to the device or the use of non-authorized accessories will render the warranty null and void and potentially invalidate the operating license.
- onway routers must not be opened (SIM cards may be used according to the instructions).

Information about the device interfaces

- All systems that are connected to the onway router interfaces must meet the requirements for SELV (Safety Extra Low Voltage) systems.
- Interconnections must not leave the building nor penetrate the body shell of a vehicle.
- Connections for antennas may only exit the building or the vehicle hull if transient overvoltages (according to IEC 62368-1) are limited by external protection circuits down to 1500 V_{peak}. All other connections must remain within the building or the vehicle hull.
- Always keep a distance of more than 40 cm from the antenna in order to reduce exposure to electromagnetic fields below the legal limits.
- Devices with a WLAN interface may be operated only with the applicable regulatory domain configured. Special attention must be paid to country, number of antennas and the antenna gain. The maximum allowed gain is 3 dBi in the relevant frequency range. To use WLAN antennas with a higher gain, contact onway about custom radio configurations. The antenna gain and cable attenuation need to be correctly configured by certified specialized personnel. A misconfiguration will lead to loss of the approval.
- Cellular antennas attached to the router must have an antenna gain of no more than 2.5 dBi. The user is responsible for the compliance with the legal regulations.
- Only CE-compliant power supplies with a current-limited SELV output voltage range may be used with onway routers.

General safety instructions

- Observe the usage limitations of radio units at filling stations, in chemical plants, in systems with explosives or potentially explosive locations.
- The devices may not be used in airplanes.
- Exercise particular caution near personal medical aids, such as pacemakers and hearing aids.
- onway routers may also cause interference in the nearer distance of TV sets, radio receivers and personal computers.
- Never perform work on the antenna system during a thunderstorm.
- The devices are generally designed for normal indoor use. Do not expose the devices to extraordinary environmental conditions worse than IP40.
- Protect them against aggressive chemical atmospheres and humidity or temperatures outside specifications.

2 Specifications and Features

Interfaces

- 2× Ethernet (10/100/1000 Mbit/s) with auto MDX
- 2× Ethernet (10/100/1000/10 000 Mbit/s) with auto MDX
- 1× USB 3.2 Gen 2×1 Host
- 1× USB-C
- 1× USB-to-UART serial console port
- 1× RS232/RS422/RS485

Options

- Three 4×4 MIMO 5G and LTE-Advanced Category 20 modems
- One 2×2 dual-band 802.11ax WLAN module (AP or station mode)
- One Digital I/O card with 16 binary signals, IN or OUT
- Up to four internal SSD mass storage disks for content
- 16× Micro-SIM card slots, internal
- Advanced multi-band GNSS Receiver including support for GPS L1/L2C and dead-reckoning with integrated inertial sensors and optional wheel speed input.

Dimensions

- Size of 4U mounting base, excluding connectors and rack handles:
- Width: 260 mm
- Height: 180 mm with feet
- Depth: 310 mm
- Weight: 6800 g, depending on options

Environmental Conditions

- Input voltage: 24 V to 110 V (DC, $\pm 30\%$)
- Operating temperature range: -40°C to 70°C , 85°C for 10 min (EN 50155:2021, class OT4, ST1)
- Storage temperature range: -40°C to 85°C (EN 50155:2021 and EN 60068-2-2, Bb)
- Humidity: 55°C and 25°C , 100 % RH max. (EN 50155:2021)
- Altitude: 3000 m maximum (EN 50125-1:2014, class AX)
- Compliance level: This product is prepared for use in EN 50155 systems.

3 Connectors and Indicators



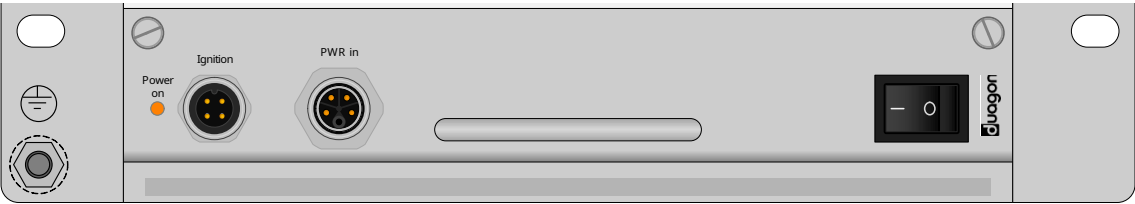
ON5800 Router Front View

The ON5800 Router is a modular 4U rack router and is populated with the following modules, from left to right:

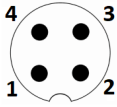
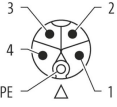
- Power Supply (bottom)
- G28M CPU Module
- G239 Radio Module 1 (2× 5G modems, 1× GNSS)
- G239 Radio Module 2 (1× 5G modem, 1× WLAN)
- G403 Digital IO Module
- 2× SSD Storage Modules

The description of the modules, their connectors, and their LEDs is given in the following sections.

Power Supply



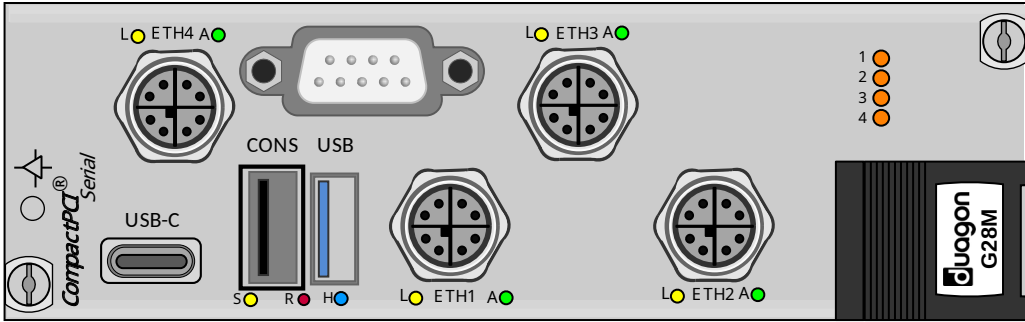
Power supply Front View

Name	Label/Connector	Function
Power	On	Power LED
Ignition	M12 A-coded male	Ignition input
	Pin 1 Pin 2 Pin 3, 4	24 V to 110 V DC nominal 0 V Not connected
PWR in	M12 K-coded male	Power input
	Pin 1, 4 Pin 2, 3 PE	24 V to 110 V DC nominal 0 V Shield
PSU output power	0/1	Power Switch

Power Status Indicator

Name	Label	Color	Description
Power Status	On		Rack power supply is turned on
		 at 1 Hz	Stand-by mode
		 at 4 Hz	Shutdown in progress
			Rack not powered

Interface Connectors G28 Module



G28 Module Front View

Interface Name	Connector	Function
ETH1	M12 X-coded	Gigabit Ethernet port 1
ETH2	M12 X-coded	Gigabit Ethernet port 2
ETH3	M12 X-coded	10 Gigabit Ethernet port 3
ETH4	M12 X-coded	10 Gigabit Ethernet port 4
USB-C	USB-C	1 x USB-C port
CONS	USB-A	USB-to-UART serial console
USB	USB-A	USB-3.2 host port
DSUB	Male DE-09	full RS232/422/485, optional

System Status Indicators G28 Module

Name	Label	Color	Description
System	S		G28M in normal operation
			at < 0.1 Hz Stand-by
			n flashes Extended system error
			at 1 Hz Critical system error
			System switched off
Hotswap	H		starts flashing Hot-swap switch open, shutdown starts
			stops flashing Hot-swap switch closed, shutdown in progress
			Hot-swap switch open, system has been shutdown
			Hot-swap switch closed

Name	Label	Color	Description
ETH 1-2	L		Link Up
			Link Down
	A		Activity
ETH 3-4	L		Link Up, currently not implemented
			Link Down, currently not implemented
	A		Activity, currently not implemented

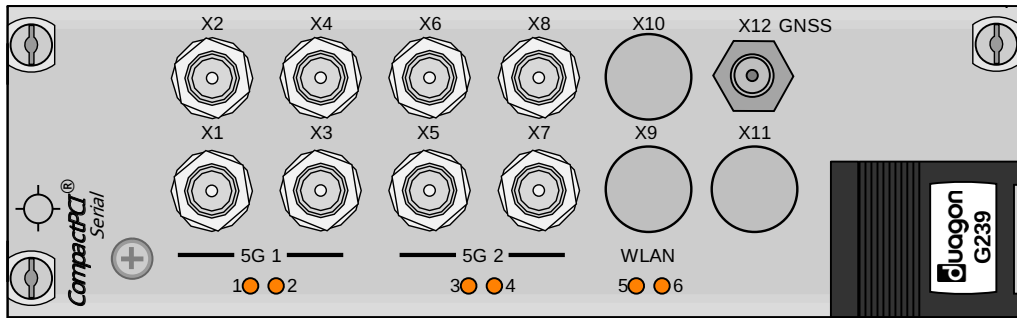
Note

For extended error diagnostic LED code please refer to the duagon g028 user manual.

Software Status Indicators G28 Module

Name	Color	Description
LED1		System in regular mode
		System booted in recovery mode
		System is down
LED2		All VPN conn. redundantly established over all uplinks
	 at 0.5 Hz	VPN connections partially available
		VPN connection down
LED3		GNSS 3D fix including altitude
	 at 0.5 Hz	GNSS 2D fix without altitude or dead-reckoning fix
	 at 2 Hz	Satellites in view, but no GNSS fix
		No GNSS satellites in view
LED4		unused

Interface Connectors G239 Radio Module 1



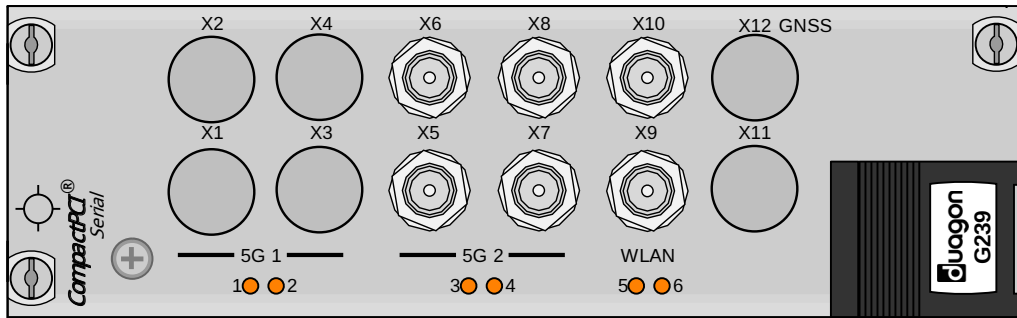
G239 Radio Module 1 Front View

Interface Name	Connector	Function
X1 - X3	QLS/QMA receptacle	5G cellular modem 1 4×4 MIMO RX/TX antenna
X4	QLS/QMA receptacle	5G cellular modem 1 4×4 MIMO RX only antenna
X5 - X7	QLS/QMA receptacle	5G cellular modem 2 4×4 MIMO RX/TX antenna
X8	QLS/QMA receptacle	5G cellular modem 2 4×4 MIMO RX only antenna
X9 - X11	Spare	Spare
X12	QLS/QMA receptacle	GNSS antenna

Status Indicators G239 Radio Module 1

Name	Color	Description
LED1	●	unused
LED2	●	IP connectivity on modem 1 established
	⦿ at 0.5 Hz	Modem 1 connected to mobile network
	⦿ at 2 Hz	Unable to connect modem 1 to mobile network
	●	No SIM detected on modem 1
LED3	●	unused
LED4	●	IP connectivity on modem 2 established
	⦿ at 0.5 Hz	Modem 2 connected to mobile network
	⦿ at 2 Hz	Unable to connect modem 2 to mobile network
	●	No SIM detected on modem 2
LED5	●	Module has power
	●	Module is off
LED6	●	unused

Interface Connectors G239 Radio Module 2



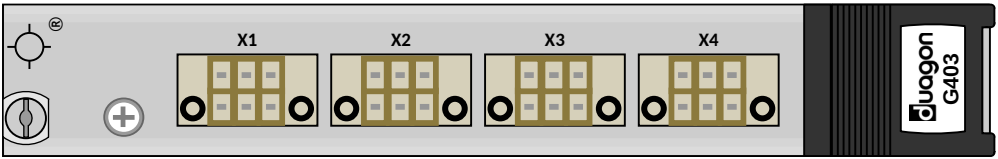
G239 Radio Module 2 Front View

Interface Name	Connector	Function
X1 - X4	Spare	Spare
X5 - X7	QLS/QMA receptacle	5G cellular modem 2 4×4 MIMO RX/TX antenna
X8	QLS/QMA receptacle	5G cellular modem 2 4×4 MIMO RX only antenna
X9	QLS/QMA receptacle	Wifi RX/TX antenna 1
X10	QLS/QMA receptacle	Wifi RX/TX antenna 2
X11 - X12	Spare	Spare

Status Indicators G239 Radio Module 2

Name	Color	Description
LED1 - LED3	●	unused
LED4	● -●- at 0.5 Hz -●- at 2 Hz ●	IP connectivity on modem 2 established Modem 2 connected to mobile network Unable to connect modem 2 to mobile network No SIM detected on modem 2
LED5	● ●	WLAN module has power WLAN module is off
LED6	● access point ● client/mesh -●- access point, at 0.5 Hz -●- client/mesh, at 0.5 Hz -●- at 2 Hz ●	AP operational and some clients connected Connected to a configured network AP operational, no clients connected Currently not connected to any configured network WiFi interface configuration error WiFi off

Interface Connectors G403 Digital IO Module



G403 Digital IO Module Front View

Interface Name	Pin	Name	Pin	Name	Function
X1	1	VS+	2	VS-	Power supply group 1
	3	IO[11]	4	IO[12]	Digital I/O group 1
	5	IO[13]	6	IO[14]	
X2	1	VS+	2	VS-	Power supply group 2
	3	IO[21]	4	IO[22]	Digital I/O group 2
	5	IO[23]	6	IO[24]	
X3	1	VS+	2	VS-	Power supply group 3
	3	IO[31]	4	IO[32]	Digital I/O group 3
	5	IO[33]	6	IO[34]	
X4	1	VS+	2	VS-	Power supply group 4
	3	IO[41]	4	IO[42]	Digital I/O group 4
	5	IO[43]	6	IO[44]	

All Digital I/O groups have a power supply of 24 – 110 VDC.

Warning

Each digital I/O group is **galvanically isolated** from each other. This means:

- To use a pin, its group power supply (VS+ and VS-) has to be connected.
- The voltage applied to an input pin has to be referenced against VS- of its I/O group and be between VS- and VS+.
- The pin output levels are referenced against VS- and VS+ of its I/O group. The return path of the consumer has to be referenced against the same ground.
- They can share the same power supply, but the group power supplies have to be tied together externally.

Failure to do so might damage the router and/or the connected devices.

Note

As a mating connector, a 6-pin spring cage terminal block with a pitch of 3.5 mm can be used e.g. Phoenix Contact DFMC 1.5/ 3-ST-3.5-LR (article number 1790496) or DFMC 1.5/3-STF-3.5 (article number 1790302).

SSD Storage Modules



G501 SSD Storage Module

Two SSD storage modules are installed in the router. The disks are numbered from right to left, hence the module of the right hand side contains the first disk and the one to its left the second disk. Each module has its own status LEDs that are described in the following table.

Status Indicators SSD Storage Modules

Name	Color	Description
LED1		Disk error (check system logs)
		No error
LED2		Disk locate function is active
		Disk locate function is inactive
LED3		Disk is accessed (read/write activity)
		No disk activity
LED4		Power supply status OK
		Disk isn't powered

Software Interface Mapping

The network interface naming and numbering used in the router configuration is different compared to the labels on the router housing. Refer to the following table to map between the two naming and numbering schemes.

Interface Name	Config Name
ETH 1–4	lan0–lan3
5G 1–3	mbm0–mbm3, mbm2 is unused
WLAN	wfi1

Antenna Options

The installed cellular modems have multiple antenna ports. Four ports for 5G modems with 4×4 MIMO support. For optimal performance, these antennas should all be connected and use different polarizations and/or directions when using individual antennas.

Supply Voltage

To power the router, a supply voltage of 24 VDC to 110 VDC must be provided on the *PWR-in* connector. The *Ignition* connector must be provided with a voltage of 24 V to 110 V DC even if the ignition sense isn't used. As the ignition circuitry is galvanically isolated from the power supply, its supply doesn't have to be the same as the one powering the router. Providing the *Ignition* connector a voltage of at least 24 V DC powers the router, whereas connecting *Ignition* to ground or leaving it floating shuts down the router after a configurable delay.

The required power supply rating depends on the installed options, but must be at least 80 W at 24 V DC. Under full load the rating must be 120 W at 24 V DC.

Reset

On the left side of the G28 module there is a Reset Button. Pressing this button restarts the system.

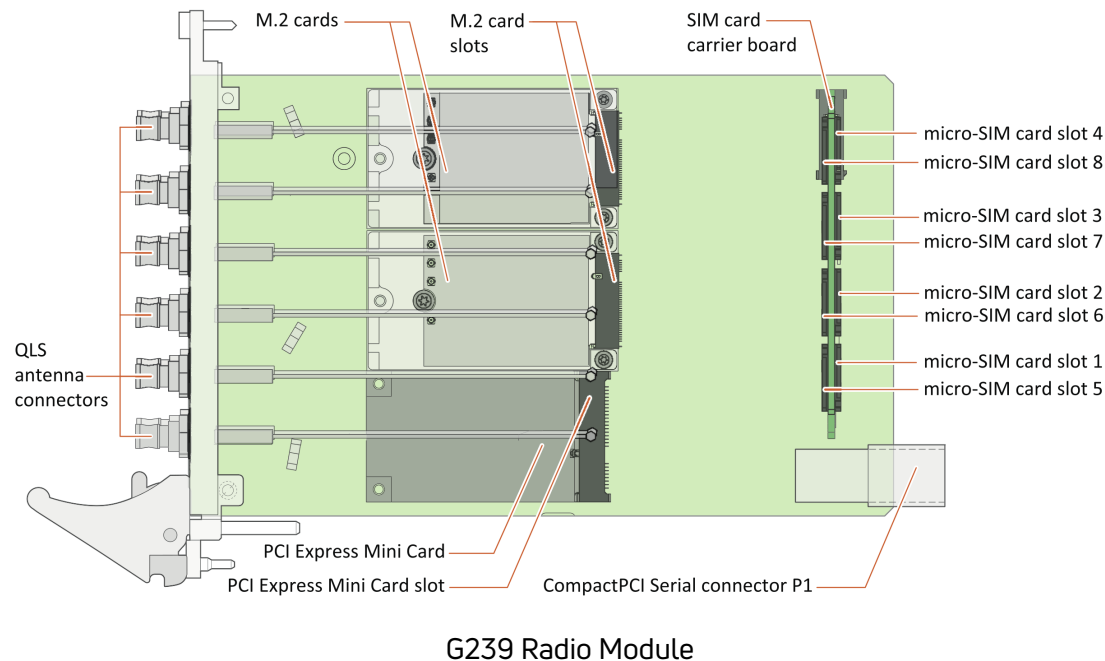
USB and SSD Mass Storage Devices

Both the USB-A and the USB-C port on the router support USB 2.0/3.0 mass storage devices, directly or through an adapter. If enabled in the configuration or if the device has a signed partition, the device will be mounted automatically upon insertion. A storage device on the USB-A port is named USB1, while a device on the USB-C port is named USB2. Connecting mass storage devices through USB hubs is not supported. The mass storage devices may not contain any bootable partitions.

Up to four SSD disk storage modules can be equipped, which will be named by the router as SSD1 to SSD4, with the numbering starting from the right side.

SIM installation

To insert the SIM cards, the router has to be switched off and the G239 radio modules have to be removed. There are eight SIM slots on each G239 module. They can be assigned by software to one of the two modems on the same radio module.



SIM slot mapping

The micro-SIM card slots on each G239 module are numbered from 1-8. To identify SIM slots in software, *system-wide* unique SIM slot identifiers are used. The SIM slots of the first G239 module are mapped to system-wide slot numbers 1-8, whereas the second G238 SIM slots are mapped to system-wide slot numbers 11-18. While SIM slots have unique system-wide identifiers, they can be assigned to modems on the same G239 module, only.

If not configured otherwise, the system-wide SIM slot number 1 is assigned to the first modem on the first G239 radio module, whereas slot number 2 is assigned to the second modem on the same radio module. The second G239 radio module has equipped a single modem only, but it is installed at the lower position. If not configured explicitly, it is assigned to the second per-module SIM slot, which on the second G239 radio module is system-wide slot number 12.

Modem interface	Default SIM slot	Assignable SIM slots
mbm0	1	1-8
mbm1	2	1-8
mbm3	12	11-18

GNSS Dead-Reckoning

Dead-reckoning is a method of estimating the current location based on a previously determined location and continuous integration of movement measured usually by inertial sensors. It allows a GNSS receiver to deliver a location estimate in the absence of a satellite signal. It does not usually improve location accuracy in combination with a satellite signal,

but it can help mitigate errors in multi-path environments like urban canyons and particularly helps bridge short signal outages, for example below bridges or in tunnels.

For the correct integration of movement measurements it is crucial that the router axes are properly aligned with the vehicle axes. The offset error should be less than three degrees in any axis to avoid performance degradation, a misalignment of ten degrees or more can result in failure. If the router axes are not aligned with the vehicles axes due to mounting constraints, the router configuration allows for orientation corrections for all (XYZ) axes.

The built-in GNSS receiver supports dead-reckoning functionality in two modes:

- **Automotive Dead-Reckoning (ADR):** This operation mode uses an internal Inertial Measurement Unit (IMU) consisting of a 3-axis accelerometer and a 3-axis gyroscope, as well as an external wheel-speed input. The wheel-speed input improves distance estimation and reduces noise while the vehicle is stationary.
- **Untethered Dead-Reckoning (UDR):** This mode relies solely on the Inertial Measurement Unit (IMU) and does not require any external wheel-speed input. For this receiver, this is the fallback mode if no wheel-speed input is available.

Note

The wheel-speed input is a software-only interface for this router, there is no connector or digital input for a physical wheel-tick signal. The wheel-speed data can be input through software interfaces like CAN or the REST API, if enabled in the router configuration.

In the router configuration, the dead-reckoning can be configured for different dynamic platform models. For optimal performance, the model should be selected to match the vehicle type the router is installed in. The following models are available:

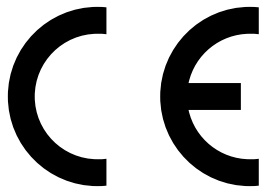
- **Automotive:** Four-wheeled road vehicles like cars or buses
- **Scooter:** Two-wheeled road vehicles like bicycles or electric scooters
- **Railway:** Rail vehicles like trains or trams, ADR mode only

Note

While most dynamic platform models can work either in ADR or UDR mode, the Railway model is limited to ADR mode only, which means that it requires the wheel-speed input.

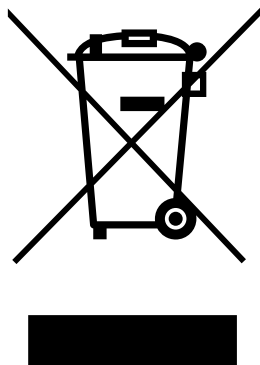
4 Conformity and Waste Disposal

Declaration of Conformity



onway routers comply with the relevant standards following the provisions of the RED Directive 2014/53/EU. To obtain a signed version of the Declaration of Conformity please contact the onway support.

Waste Disposal



This product is subject to the WEEE directive 2012/19/EU and compliant with the marking requirements. The WEEE symbol on this product indicates that it must not be disposed of with normal household waste at its end of life. Instead, it must be separated and returned to a designated collection point for waste electric and electronic equipment for proper recycling. Doing so helps to conserve natural resources and to protect the environment from unnecessary pollution.

5 Open Source Software Notice

This product does in part build on open source software. We are distributing such open source software to you under its respective license, and the licenses can be obtained here:

<https://support.onway.ch/onway-router/licenses/on5800/>

To obtain the corresponding open source codes covered by these licenses, please contact us at support@onway.ch.

Specific Acknowledgements

- This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit. (<http://www.openssl.org/>)

6 Contact Information

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