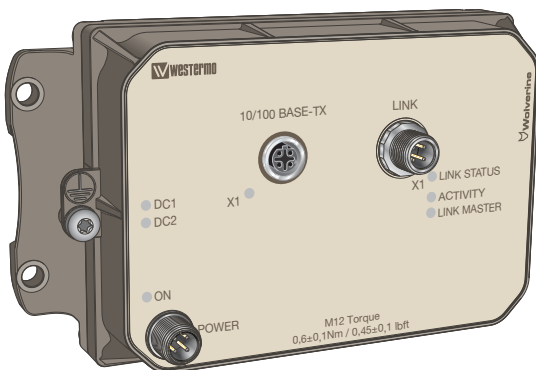


USERGUIDE

DDW-02-B1

EN 50155 Ethernet Broadband Bridge



Legal information

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More information about Westermo can be found at the following Internet address:

<http://www.westermo.com>

Safety



Before installation:

Read this manual completely and gather all information on the unit. Make sure that you understand it fully. Check that your application does not exceed the safe operating specifications for this unit.

This unit should only be installed by qualified personnel.

This unit should be built-in to an apparatus cabinet, or similar, where access is restricted to service personnel only. The power supply wiring must be sufficiently fused, and if necessary it must be possible to disconnect manually from all power supply. Ensure compliance to national installation regulations. This unit relies on convection heating. Make sure that it is installed so that the ambient temperature is within the specified temperature range, e.g. by avoiding obstruction of the airflow around the unit. Also check chapter EN 45545-2 mounting notes.

Before mounting, using or removing this unit:

Prevent access to hazardous voltage by disconnecting the unit from all power supply.



WARNING

Do not open connected unit. Hazardous voltage may occur within this unit when connected to power supply.

Before powering-up, a protective earthing conductor must be connected to the protective earthing terminal and have a cross-sectional area of at least 1.5 mm². Note that this unit can be connected to two different power sources.

To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cord.

Care recommendations

Follow the care recommendations below to maintain full operation of unit and to fulfill the warranty obligations:

- ⌘ Do not attempt to disassemble the unit. There are not any user serviceable parts inside.
- ⌘ Do not drop, knock or shake the unit. Rough handling above the specification may cause damage to internal circuit boards.
- ⌘ Do not use harsh chemicals, cleaning solvents or strong detergents to clean the unit.
- ⌘ Do not expose the unit to any kind of liquid (water, beverages, paint etc), unless all connectors are connected or fitted with protective caps (delivered with the unit), tightened to the specified torque. Connected cables must have the appropriate ingress protection code.
- ⌘ Do not use or store the unit in dusty or dirty areas, unless all connectors and the ventilation membrane are sufficiently protected.
- ⌘ Do not cover or bring mechanical force to the ventilation membrane on the back of the unit.

If the unit is not working properly, contact the place of purchase, nearest Westermo distributor office or Westermo Tech support.

Maintenance

No maintenance is required, as long as the unit is used as intended within the specified conditions.

Product disposal



This symbol means that the product shall not be treated as unsorted municipal waste when disposing of it. It needs to be handed over to an applicable collection point for recycling electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will help to reduce hazardous substances and prevent potential negative consequences to both environment and human health, which could be caused by inappropriate disposal.

Simplified EU declaration of conformity

Hereby, Westermo declares that the equipment is in compliance with EU directives. The full EU declaration of conformity and other detailed information are available at the respective product page at www.westermo.com.

Agency approvals and standards compliance

Type	Approval / Compliance
EMC	EN 61000-6-1, Immunity residential environments
	EN 61000-6-2, Immunity industrial environments
	EN 61000-6-3, Emission residential environments
	EN 61000-6-4, Emission industrial environments
	EN 50121-3-2, Railway applications – Rolling stock – apparatus
	EN 50121-4/IEC 62236-4, Railway signaling and telecommunications apparatus
	IEEE 16 - IEEE Standard for Electrical and Electronic Apparatus on Rail Vehicles
	Tested and verified for FCC part 15, class A
Safety	EN/IEC 60950-1 IT equipment
Environmental	EN 50124-1 – Railway applications – Insulation coordination
	EN 50155 – Railway applications – Electronic equipment used on rolling stock
	EN 61373 – Railway applications – Rolling stock equipment. Shock and vibration tests
	IEC 60068-2-27 – Shock
	IEC 60068-2-64 – Vibration, broadband random and guidance
	IEEE 1478 – Environmental conditions for transit rail car electronic equipment
	EN 45545-2 Fire protection

FCC Part 15.105 Notice:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- ⌘ Reorient or relocate the receiving antenna
- ⌘ Increase the separation between the equipment and receiver
- ⌘ Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- ⌘ Consult the dealer or an experienced radio/TV technician for help.

Type tests and environmental conditions

Environmental phenomena	Basic standard	Description	Test levels
ESD	EN 61000-4-2	Enclosure	Contact: ± 6 kV Air: ± 8 kV
Fast transients	EN 61000-4-4	Power port	± 2 kV
		Signal ports	± 2 kV
		Earth port	± 1 kV
Surge	EN 61000-4-5	Power port	L-E: ± 2 kV, 12Ω , $9 \mu\text{F}$, $1.2/50 \mu\text{s}$ L-L: ± 1 kV, 2Ω , $18 \mu\text{F}$, $1.2/50 \mu\text{s}$ L-E: ± 2 kV, 42Ω , $0.5 \mu\text{F}$, $1.2/50 \mu\text{s}$ L-L: ± 2 kV, 42Ω , $0.5 \mu\text{F}$, $1.2/50 \mu\text{s}$
		Ethernet ports	L-E: ± 2 kV, 2Ω
Power frequency magnetic field	EN 61000-4-8	Enclosure	300 A/m; 0, 16.7, 50, 60 Hz
Pulsed magnetic field	EN 61000-4-9	Enclosure	300 A/m
Radiated RF immunity	EN 61000-4-3	Enclosure	20 V/m @ (80 MHz – 2.7 GHz) 1 kHz sine, 80% AM 10 V/m @ (2.7 – 6 GHz) 1 kHz sine, 80% AM
Conducted RF immunity	EN 61000-4-6	Power port	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
		Ethernet ports	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
		Earth port	10 V, 80% AM, 1 kHz; (0.15 – 80) MHz
Radiated RF emission	CISPR 16-2-3 ANSI C63.4 (FCC Part 15)	Enclosure	Class B (30 – 2000 MHz) Class B (30 – 2000 MHz)
	CISPR 16-2-1	Power port Ethernet ports	Class B Class B
Dielectric strength	EN 60950-1	Power port to all other ports	1.5 kV ACrms, 50 Hz, 1 min
		Fast Ethernet ports to all other ports	1.5 kVACrms, 50 Hz, 1 min
		Link to all other ports	1.5 kVrms, 50 Hz, 1 min
Environmental			
Temperatures	EN 60068-2-1	Operating	-40 to $+70^\circ\text{C}$ (-40 to $+158^\circ\text{F}$)
	EN 60068-2-2	Storage and transport	-50 to $+85^\circ\text{C}$ (-58 to $+185^\circ\text{F}$)
Humidity	EN 60068-2-30	Operating	5 to 95% relative humidity
		Storage and transport	5 to 95% relative humidity
Altitude		Operating	2 000 m / 70 kPa
Service life		Operating	15 years
MTBF		1,568,000 hours	MIL-C217F2, GB, 25°C ($+77^\circ\text{F}$)
Vibration	IEC 60068-2-64 (random)	Operating	2 m/s ² (RMS) 5 – 150 Hz
Shock	IEC 60068-2-27	Operating	10 g, 30 ms, 20 g, 11 ms
Enclosure	EN 60950-1	Zinc	Fire enclosure
Dimension W x H x D With connectors			See "Dimensions" chapter for details
Weight			1.4 kg
Degree of protection	EN 60529	Enclosure	IP67
Cooling			Convection

Description

Made easy for extending Ethernet

The Wolverine series consists of Ethernet extenders and bridges for propagating Ethernet traffic over existing cabling. The Ethernet link can be allowed to be extended over longer distances than possible with pure copper Ethernet and at data rates of up to 70 Mbit/s.

The DDW-002-B1 makes it possible to reuse many types of pre-existing copper cables since it is based on power line communication (IEEE 1901). A network with the DDW-002-B1 devices is capable of bridging high bandwidth Ethernet traffic over 2-wire cables, even when there are corroded connectors. The powerline communication standard is designed to establish a reliable communication link over both twisted pair and parallel cabling.

This can lead to considerable financial savings when refurbishing a train with Ethernet communication, as existing train couplers can be reused without the need for a costly rebuild or even replacement. By simply installing a DDW-002-B1 on each side of the coupler, a bridge connecting the Ethernet networks on each side is created. The fact that no configuration is needed further contributes to the ease of use.

Designed for harsh industrial environments

The DDW-002-B1 has been thoroughly tested by certified labs to ensure its compliance with the standard for electronic equipment used on rolling stock, the EN 50155. For several characteristics, Westermo exceeds the requirements mandated by the standard. Furthermore, the design is based on Westermo's long experience within the rolling stock market, which brings benefits such as vibration safe integrated connector threading, IP67 ingress protection with GORE-TEX® membrane to prevent condensation water build-up and ultimately a high MTBF and long service life under the harshest conditions.

Meeting the requirements for rolling stock, makes the DDW-002-B1 also very well suited for deployment in other applications with severe operating conditions and extreme environments.

Interface specifications

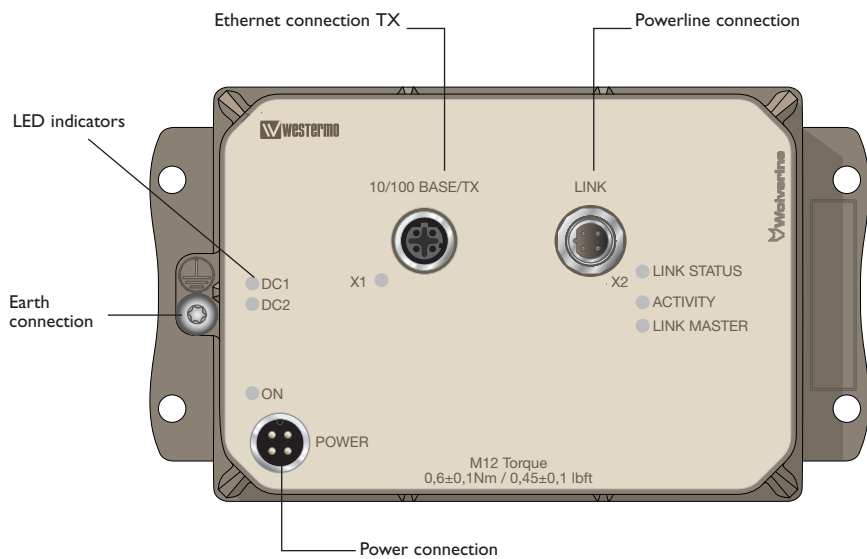
DC, Power port	
Rated voltage	24 to 110 VDC
Operating voltage	16.8 to 143 VDC (14.4 VDC for 100 ms, 154 VDC for 1 s)
Rated current	350 mA @ 24 VDC and 90 mA @ 110 VDC
Rated frequency	DC
Inrush current, I ² t	1 mA ² s @ 24 V and 6 mA ² s @ 110 V
Startup current*	535 mA @ 24 V 145 mA @ 110 V
Polarity	Reverse polarity protected
Redundant power input	Yes
Isolation to	1500 VAC rms to all other
Connection	4 pin male M12 A-coded connector, use Westermo cable 3146-1106 for 1.5 m 3146-1107 for 5 m
Connector size	M12, recommended cable area 0.5 mm ² (minimum 0.25 mm ²), cable dimensions depend on choice of M12 connector

* External supply current capability for proper start-up

X1 Ethernet ports	
Electrical specification	IEEE std 802.3. 2005 Edition
Data rate	Auto-negotiation (10 Mbit/s or 100 Mbit/s)
Duplex	Auto-negotiation (full or half)
Circuit type	X1: TNV-1
Transmission range	Up to 150 m with CAT5e cable or better
Isolation to	1500 VAC rms to all other ports
Connection	4-pin M12 D-code, auto MDI/MDI-X, use e.g. Westermo cable 3146-1100 M12-M12 – 1 m 3146-1101 M12-M12 – 5 m 3146-1103 RJ45-M12 – 1 m 3146-1104 RJ45-M12 – 5 m
Shielded cable	Not required, but recommended in severe electromagnetic environments
Conductive housing	Yes
Number of ports	1

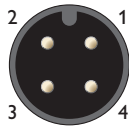
X2 Powerline interface	
Data rate	Up to 70 Mbit/s (depending on cable characteristics and temperature)
Connection	4-pin M12 B-code
Transmission range	Up to 300 m (depending on cable characteristics and temperature)
Electrical specification	Supports communication over wires powered from 0 to 143 VDC.

Location of interface ports and LEDs




Connector pinout

Power connection

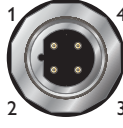
Pin number	Signal	
No 1	+DC1	
No 2	+DC2	
No 3	-COM	
No 4	-COM	

Ethernet connection

Pin number	Signal	
No 1	TD+	
No 2	RD+	
No 3	TD-	
No 4	RD-	
Housing	Shield	

Auto MDI/MDI-X is used. The table shows signals in MDI mode.

Powerline connection

Pin number	Signal	
No 1	PLC1	
No 2	NC	
No 3	PLC2	
No 4	NC	

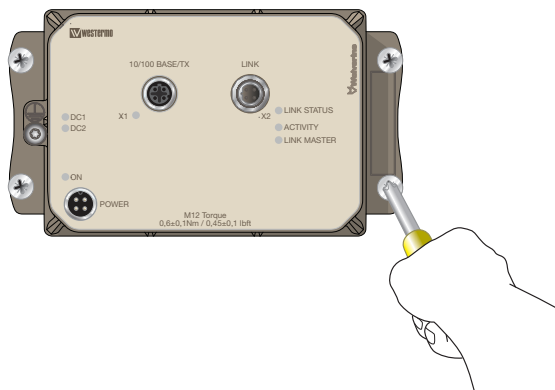
PLC1 and PLC2 are polarity free.

LED Indicators

LED	Status	Description
ON	OFF	Unit has no power
	GREEN	All OK, no alarm condition
DC1	OFF	Unit has no power
	GREEN	Power OK on DC1
	RED	Power failure on DC1
DC2	OFF	Unit has no power
	GREEN	Power OK on DC2
	RED	Power failure on DC2
X1	OFF	No Link
	GREEN	Link established
	GREEN FLASH	Data traffic indication
LINK STATUS	OFF	No PLC link established
	ON	PLC link established
ACTIVITY	OFF	No traffic on PLC link
	GREEN	PLC traffic on PLC link
LINK MASTER	OFF	Device is not link master (if PLC link established)
	ON	Device is link master in the established PLC network

Wall mounting

There are four 6 mm bore holes intended for mounting the unit. The unit can be mounted vertical or horizontal. Use four M5 screws with 12 mm washer on a flat and stable surface.



Connection of cables

Recommended tightening torque for the M12 connectors: 0.6 Nm

Note that unused connectors must be covered by a protective cap (delivered with the unit), tightened to the specified torque, in order to fulfill the specified ingress protection code.

Removal

Disconnect all cables and unscrew the unit from the wall. Time for replacement < 10 minutes.

Cooling

This unit relies on convection cooling. Make sure that it is installed so that the ambient temperature is within the specified temperature range, e.g. by avoiding obstruction of the airflow around the unit.

EN 45545-2 mounting notes

Two Viper units can be mounted together and as a single interior non-listed group in the sense of EN 45545-2 definitions. For multiple units the spacing requirements for interior non-listed groups must be met.

Getting Started

This product is an unmanaged Ethernet extender designed to propagate Ethernet traffic over existing cabling.

The DDW-002-B1 is easy to use and install. The units work in a pair over existing copper cabling infrastructure and automatically connect to each other when the remote device is sensed over the interconnecting lines.

The installation procedure to get the application up and running is simple. Connect the cable (twisted pair or parallel cable) to X2 pin 1 and 3 (polarity independent). Connect Ethernet to the X1 port on the front of the DDW-002-B1. Connect power to the devices.

The following settings are valid for the Ethernet interface:

- ⌘ Ethernet Auto-negotiation enabled
- ⌘ Auto MDI/MDI-X
- ⌘ Auto-polarity enabled

The DDW-002-B1 will automatically detect the possible data rate to the remote device (over the X2 - PLC interface).

The link performance can easily be measured after the powerline link is established. Different types of methods and tools can be used.

One example of recommended software for throughput testing is Iperf. Please refer to Iperf user documentation for instructions of usage.

Note! If the PLC link is not established or the established data rate is not sufficient for the application, the distance might be too long between the devices.

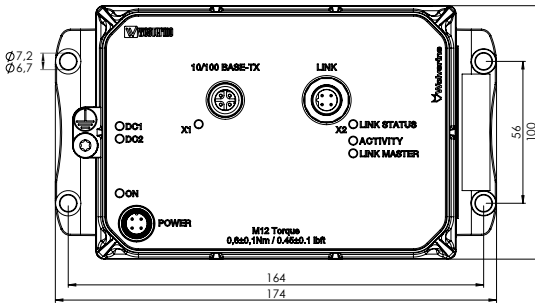
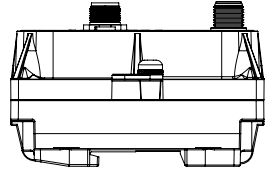
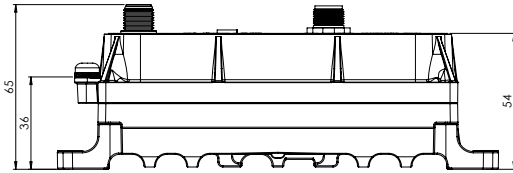
The device is an unmanaged unit. If data throughput performance needs to be adjusted or if no powerline connection is established, check cabling between the devices.

Configuration

All necessary configurations are preconfigured from factory and no other changes in the settings can be done.

Dimensions

Measurements are stated in millimeters.





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