www.westermo.com

ODW-730-F2

Fibre Optic Modem

Industrial Converter RS-485 to Fibre Optic Link
Repeater, line and redundant ring

General information

Legal information

The contents of this document are provided “as is”. Except as required by applicable law, no warranties of any kind are made in relation to the accuracy and reliability or contents of this document, either expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. Westermo reserves the right to revise this document or withdraw it at any time without prior notice.

Under no circumstances shall Westermo be responsible for any loss of data or income or any special, incidental, and consequential or indirect damages howsoever caused.

More information about Westermo can be found at **www.westermo.com**

Safety and Regulations

Warning signs are provided to prevent personal injury and/or damages to the product.

The following levels are used:

Level of warning	Description	Consequence personal injury	Consequence material damage
 WARNING	Indicates a potentially hazardous situation	Possible death or major injury	Major damage to the product
 CAUTION	Indicates a potentially hazardous situation	Minor or moderate injury	Moderate damage to the product
 NOTICE	Provides information in order to avoid misuse of the product, confusion or misunderstanding	No personal injury	Minor damage to the product
 NOTE	Used for highlighting general, but important information	No personal injury	Minor damage to the product

Before installation:

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

WARNING - SAFETY DURING INSTALLATION

The product must be installed by qualified service personnel and built in to an apparatus cabinet or similar, where access is restricted to service personnel only.

WARNING - HAZARDOUS VOLTAGE

Do not open an energized product. Hazardous voltage may occur when connected to a power supply.

WARNING - PROTECTIVE FUSE

It must be possible to disconnect manually from the power supply. Ensure compliance to national installation regulations. Replacing the internal fuse must only be performed by Westermo qualified personell.

CAUTION - CLASS 1 LASER PRODUCT

Do not look directly into a fibre optical port or any connected fibre, although the product is designed to meet the Class 1 Laser regulations and complies with 21 CFR 1040.10 and 1040.11.

CAUTION - ELECTROSTATIC DISCHARGE (ESD)

Prevent electrostatic discharge damages to internal electronic parts by discharging your body to a grounding point (e.g. use a wrist strap).

CAUTION - HANDLING OF SFP TRANSCEIVERS

SFP transceivers are supplied with plugs to avoid contamination inside the optical port. They are very sensitive to dust and dirt. If the fibre is disconnected from the product, the protective plugs on the transmitter/receiver must be connected. The protective plugs must be kept on during transportation. The fibre optics cables must be handled the same way.

Care recommendations

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

- Do not drop, knock or shake the product. Rough handling above the specification may cause damage to internal circuit boards.
- Use a dry or slightly water-damp cloth to clean the product. Do not use harsh chemicals, cleaning solvents or strong detergents.
- Do not paint the product. Paint can clog the product and prevent proper operation.

If the product is used in a manner not according to specification, the protection provided by the equipment may be impaired.

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

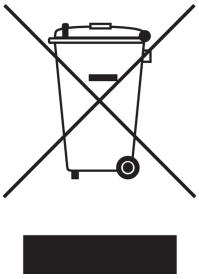
Cleaning of the optical connectors

In the event of contamination, the optical connectors should only be cleaned by the use of recommended cleaning fluids and correct cleaning equipment.

Recommended cleaning fluids:

- Methyl-, ethyl-, isopropyl- or isobutyl-alcohol
- Hexane
- Naphtha

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.

Declaration of Conformity

Hereby, Westermo declares that this product is in compliance with applicable EU directives and UK legislations. The full declaration of conformity and other detailed information is available at **www.westermo.com/support/product-support**.

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 50121-4, Railway signalling and telecommunications apparatus
	IEC 62236-4, Railway signalling and telecommunications apparatus
	DNV Standard for Certification no. 2.4
Safety	UL/CSA 60950-1, IT equipment

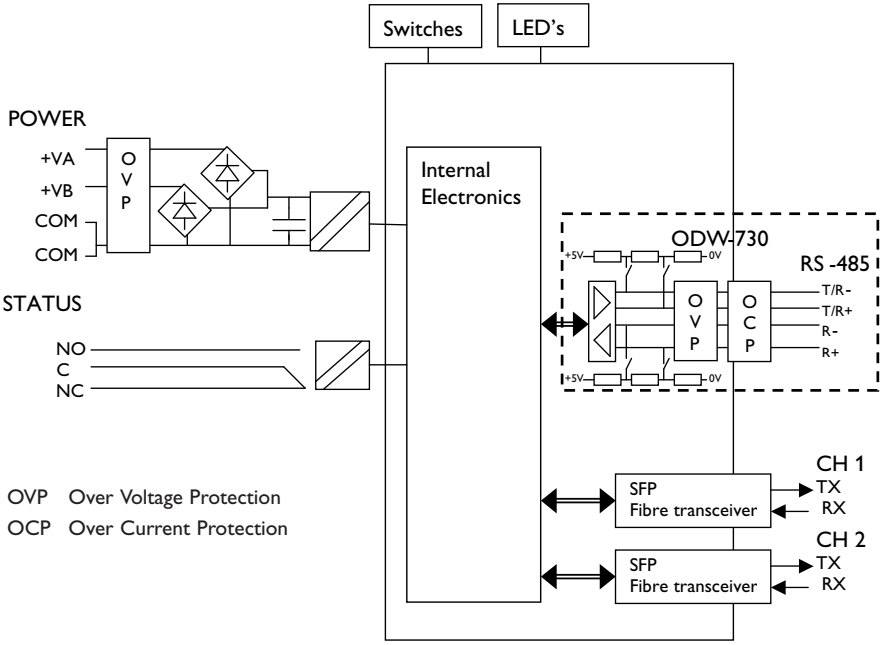
FCC Part 15.105 Notice:

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 not installed and used in accordance with the instruction manual, 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.

Type tests and environmental conditions

Electromagnetic Compatibility			
Phenomena	**Test**	**Description**	**Level**
ESD	EN 61000-4-2	Enclosure contact	± 6 kV
		Enclosure air	± 8 kV
RF field AM modulated	IEC 61000-4-3	Enclosure	10 V/m 80% AM (1 kHz), 80 – 800 MHz 20 V/m 80% AM (1 kHz), 800 – 1000 MHz 20 V/m 80% AM (1 kHz), 1400 – 2700 MHz
RF field 900 MHz	ENV 50204	Enclosure	20 V/m pulse modulated 200 Hz, 900 ± 5 MHz
Fast transient	EN 61000-4-4	Signal ports	± 2 kV
		Power ports	± 2 kV
Surge	EN 61000-4-5	Signal ports unbalanced	± 2 kV line to earth, ± 2 kV line to line
		Signal ports balanced	± 2 kV line to earth, ± 1 kV line to line
		Power ports	± 2 kV line to earth, ± 2 kV line to line
RF conducted	EN 61000-4-6	Signal ports	10 V 80% AM (1 kHz), 0.15 – 80 MHz
		Power ports	10 V 80% AM (1 kHz), 0.15 – 80 MHz
Pulse Magnetic field	EN 61000-4-9	Enclosure	300 A/m, 6.4 / 16 µs pulse
Mains freq. 50 Hz	EN 61000-4-16	Signal ports	100 V 50 Hz line to earth
Mains freq. 50 Hz	SS 436 15 03	Signal ports	250 V 50 Hz line to line
Radiated emission	CISPR 16-2-3	Enclosure	EN 61000-6-3
	ANSI C63.4		FCC part 15
Conducted emission	CISPR 16-2-1	AC power ports	EN 61000-6-3
	ANSI C63.4	AC power ports	FCC part 15
	CISPR 16-2-1	DC power ports	EN 61000-6-4
Dielectric strength	UL 60950	Signal port to all other isolated ports	2 kVrms 50 Hz 1min
		Power port to other isolated ports	3 kVrms 50 Hz 1min 2 kVrms 50 Hz 1min (@ rated power < 60V)
Environmental			
Temperature	EN 60068-2-1 EN 60068-2-2	Operating	–40 to +60°C
		Storage & Transport	–40 to +60°C
		Maximum surface temperature	135°C (temperature class T4)
Humidity	EN 60068-2-30	Operating	5 to 95% relative humidity
		Storage & Transport	5 to 95% relative humidity
Altitude		Operating	2 000 m / 70 kPa
Service life		Operating	10 year
Vibration	IEC 608-2-6	Operating	7.5 mm, 5 – 8 Hz 2 g, 8 – 500 Hz
Shock	IEC 60068-2-27	Operating	15 g, 11 ms
Packaging			
Enclosure	UL 94	PC / ABS	Flammability class V-1
Dimension W x H x D			35 x 121 x 119 mm
Weight			0.26 kg
Degree of protection			IP21
Cooling	IEC 529	Enclosure	Convection
Mounting			Horizontal on 35 mm DIN-rail

Functional description



Converter serial interface – optical fibre

ODW-730 is a fibre optic modem that converts between electrical RS-485 and a fibre optical link.

ODW-730 can also be used to convert from RS-485 to RS-232 by using a ODW-730 in the same link as ODW-720.

Repeater – optical fibre links

ODW-730 is a fibre optic repeater that repeats received data from one fibre link out to the other link. This is useful e.g. for long distance communication, where electromagnetic interference may occur or when isolation of the electrical network is needed. The maximum optical fibre distance depends on selected fibre transceiver and fibre type. Distances up to 80 km (50 miles) are available.

Interface specifications

Power	
Rated voltage	12 to 48 VDC and 24 VAC
Operating voltage	10 to 60 VDC and 20 to 30 VAC
Rated current	400 mA @ 12 V 200 mA @ 24 V 100 mA @ 48 V
Rated frequency	DC and 48 to 62 Hz
Inrush current I^2t	0.2 A^2s
Startup current*	1.0 A_{peak}
Polarity	Reverse polarity protected
Redundant power input	Yes
Isolation to	RS-485 and Status port
Connection	Detachable screw terminal
Connector size	0.75 – 2.5 mm^2 (AWG 18 – 13) Connect the unit using at least 18 AWG (0.75 mm^2) wiring
Shielded cable	Not required

* External supply current capability for proper startup

Status	
Port type	Signal relay, changeover contacts
Rated voltage	Up to 48 VDC
Operating voltage	Up to 60 VDC
Contact rating	500 mA @ 48 VDC
Contact resistance	< 50 mΩ
Isolation to	RS-485 and Power port
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm^2 (AWG 24 – 13)
Shielded cable	Not required

Branch circuit protection (fuse) is required for this unit with rating not exceeding 20 A. Product should be connected to UL Listed power supplies rated 12 – 48 VDC, min 500 mA or 24 VAC, min 500 mA or reliably grounded DC SELV source.

RS-422/485	
Electrical specification	EIA RS-485, 2-wire or EIA RS-422 4-wire twisted pair
Data rate	300 bit/s – 1.5 Mbit/s
Data format	9 – 12 bits
Protocol	Start-bit followed by 8-11 bits
Retiming	Yes
Turning time (2-wire RS-485)	One t_{bit} t_{bit} = 1 / Baud rate (Baud rate in bit/s)
Transmission range	< 1200 m, depending on data rate and cable type (EIA RS-485)
Settings	120 Ω termination and failsafe biasing 680 Ω
Protection	Installation Fault Tolerant (up to ±60 V)
Isolation to	Status and Power port
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm² (AWG 24 – 13)
Shielded cable	Not required

Location of Interface ports, LED's and DIP-switches

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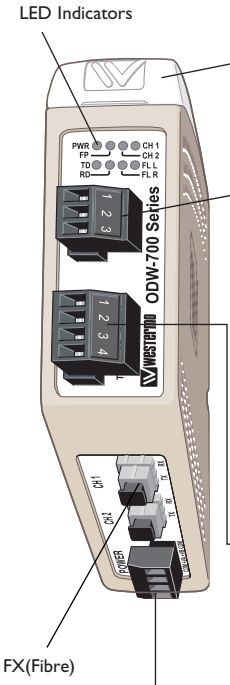


Status
screw terminal

Position	Description	Product marking
1	Contact with C when fibre optical links are in operation	NO
2	Common	C
3	Open (no contact with C) when fibre optical links are in operation	NC

RS-422/485
screw terminal

Position	Direction*	Description	Product marking
1	In	R+ (EIA RS-485 A')	R+
2	In	R– (EIA RS-485 B')	R–
3	In/Out	T+ (EIA RS-485 A)	T/R+
4	In/Out	T– (EIA RS-485 B)	T/R–

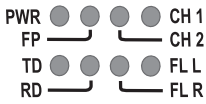
Power
screw terminal

Position	Direction*	Description	Product marking
1	In	Common voltage	COM
2	In	Voltage A	+VA
3	In	Voltage B	+VB
4	In	Common voltage	COM

* Direction relative this unit

LED indicators

LED	Status	Description
PWR Power	ON	Power is on.
	OFF	Power is off.
FP	ON	Focal point
	OFF	Redundant ring member or multidrop unit.
CH 2 Channel 2 link status	ON	Fiber link to other unit has been established at CH 2.
	Flashing	Optical power detected but link to other unit has not been established at CH 2.
	OFF	No optical power detected and no link to other unit has been established at CH 2.
CH 1 Channel 1 link status	ON	Fiber link to other unit has been established at CH 1.
	Flashing	Optical power detected but link to other unit has not been established at CH 1.
	OFF	No optical power detected and no link to other unit has been established at CH 1.
TD	Flash	Data received on the electrical interface and transmitted out on the optical interface.
	OFF	No data received on the electrical interface.
RD	Flash	Data received on the optical interface and transmitted out on the electrical interface.
	OFF	No data received on the optical interface.
FL R Failure link remote	ON	Remote fibre link failure. A fibre link is out of operation at any other unit than this one.
	Flashing	Hardware error or invalid configuration.
FL L Failure link local	ON	Local fibre link failure. A fibre link is out of operation at this unit.
	Flashing	Hardware error or invalid configuration.

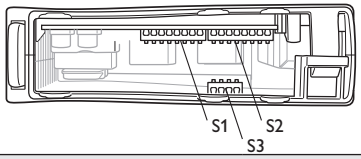


Note: During power up, all LED's will turn on for about 1 second.

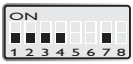
DIP-switch settings

CAUTION - ELECTROSTATIC DISCHARGE (ESD)

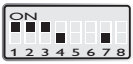
Prevent electrostatic discharge damages to internal electronic parts by discharging your body to a grounding point (e.g. use a wrist strap).



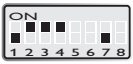
S1 DIP-switch, asynchronous mode speed selection



300 bit/s

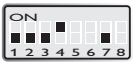


57.6 kbit/s



1.0 Mbit/s

1200 bit/s



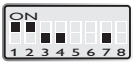
115.2 kbit/s

1.5 Mbit/s

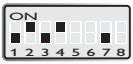
2400 bit/s

125 kbit/s

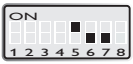
9 bits data format



4800 bit/s



187.5 kbit/s

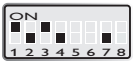


10 bits data format

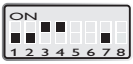
9600 bit/s

230.4 kbit/s

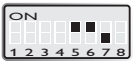
11 bits data format



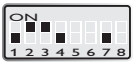
19.2 kbit/s



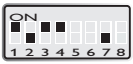
250 kbit/s



12 bits data format



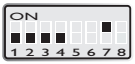
38.4 kbit/s



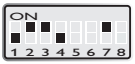
500 kbit/s

Supervision table when selecting data format								
Start bit	■	■	■	■	■	■	■	■
7 bit	■	■	■		■			
8 bit				■		■	■	■
Parity			■		■		■	■
1 stop bit	■		■	■			■	
2 stop bit		■			■	■		■
Number of bit	9	10	10	10	11	11	11	12

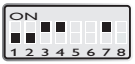
S1 DIP-switch, synchronous mode time frame selection



1.6 ms

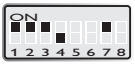


13 µs



2 µs

416 µs



8.6 µs

1 µs

208 µs

4.3 µs

500 ns

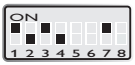
104 µs

4 µs

300 ns

52 µs

2.6 µs

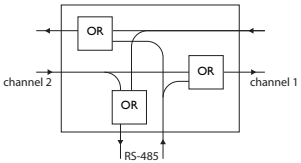


26 µs

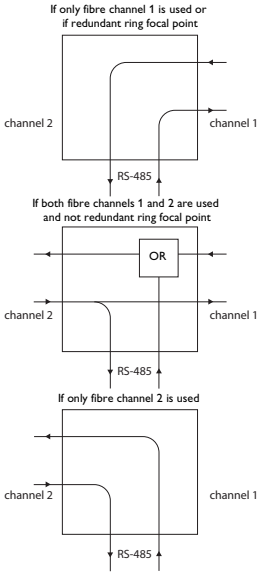
2.1 µs

S1 DIP-switch / Description V/Y mode

Y-mode

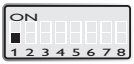


V-mode

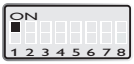


For applications that only require half duplex communication it is recommended to use Y-mode. Please see the ODW-730 Management Guide for further details.

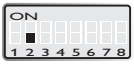
S2 DIP-switch



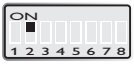
RS-485
2-wire



RS-422
4-wire



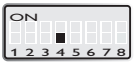
Multidrop mode.



Redundant ring mode.

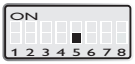
Multidrop mid unit or Redundant ring member.

Multidrop end unit. Redundant ring focal point.

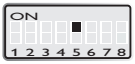


Use primary data channel.

Use secondary data channel.



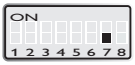
Single channel system redundant ring. E.g. only the primary or secondary channel is used.



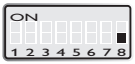
Dual channel system redundant ring. E.g. both the primary and secondary channel are used simultaneously.

Set status port on both local fibre link (FL L) and remote fibre link (FL R) errors.

Set status port on local fibre link (FL L) error only.



S2:7 has no function



Always OFF

S3 DIP-switch

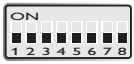
No termination and fail-safe

Termination with fail-safe (2-wire)

Termination with fail-safe (4-wire)

Factory default

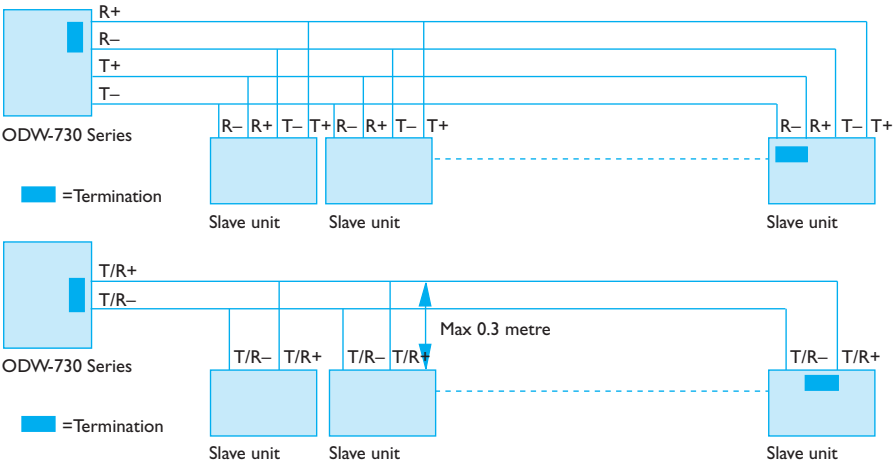
S1



S2

RS-485 termination at system level

The system should be installed in according to the RS-485 specification. A system should always form a bus structure where the termination is at the end points of the bus. See diagrams for details of how this is done with RS-485 2-wire and 4-wire.



N.B. R+/R–, T+/T– definitions are not standard, it can help to shift + and – if the unit does not work.

About the interfaces

Power terminal

The power terminal has two independent inputs, +VA and +VB, allowing redundancy should either fail. The ODW-730 power supply is galvanically isolated from all other internal electronics.

Optical fibre interfaces

ODW-730 uses Small From Factor Pluggable (SFP) transceivers that are in compliance with the Multi-Sourcing Agreement (MSA). This means that a wide range of different fibre tranceivers and connectors can be used.

RS-485 interface

A 4 position detachable screw terminal that can handle full duplex data rates up to 1.5 Mbit/s and can be set to either 2- or 4-wire RS-485 system.

When 4-wire RS-485 is selected, the terminals T/R+ and T/R– will always be set to transmit and terminals R+ and R– will always receive data. Manchester coded protocol can be tranferred with Synchroous mode.

Status port

The status port connects to an internal relay wich may be used to trigger an external alarm if a fault condition occurs. During normal operation pins 1 and 2 are in contact with each other, and pins 2 and 3 are isolated. During an optical link failure, or power failure, pins 1 and 2 are isolated, and pins 2 and 3 are in contact with each other.

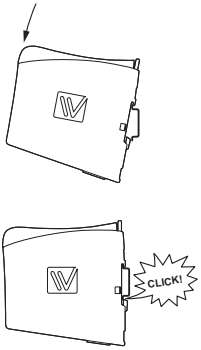
Optical link failures can be classified in to two categories, local or remote, as indicated by the FL L and FL R LED's. A local link failure is when an optical link is down at this particular unit. A remote link failure is when an optical link is down at some other unit.

From the factory, the status port is set to trigger on both types of link failures. However, by setting DIP-switch S2:6 to the ON position, the status port will only trigger when a local link failure has occured.

Mounting

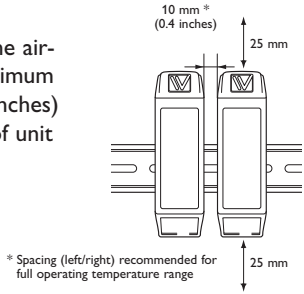
This unit should be mounted on 35 mm DIN-rail, which is horizontally mounted inside an apparatus cabinet, or similar.

Snap on mounting, see figure.



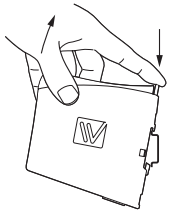
Cooling

This unit uses convection cooling. To avoid obstructing the air-flow around the unit, use the following spacing rules. Minimum spacing 25 mm (1.0 inch) above /below and 10 mm (0.4 inches) left /right the unit. Spacing is recommended for the use of unit in full operating temperature range and service life.



Removal

Press down the black support at the top of the unit. See figure.



Referring documents

For detailed information on how to configure the ODW-730-F2 for different applications.

Type	Description	Document number
Management Guide	Management Guide ODW-730-F2	6651-2255

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