

USERGUIDE

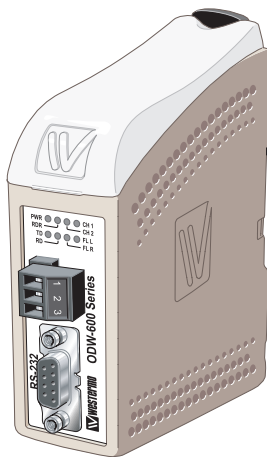
ODW-620-F2

Fibre Optic Modem

Industrial Converter

RS-232 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, either express or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, are made in relation to the accuracy and reliability or contents of this document. 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 the following Internet address:
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 the power supply. Ensure compliance to national installation regulations.

This unit uses convection cooling. To avoid obstructing the airflow around the unit, follow the spacing recommendations (see Cooling section).



Before mounting, using or removing this unit:

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

Warning! Do not open a connected unit. Hazardous voltages may occur within this unit when connected to a power supply.



Class 1 Laser Product

This unit is designed to meet the Class 1 Laser regulations. However, the user is warned not to look directly into fibre optical port or any connected fibre.

Care recommendations

Follow the care recommendations below to maintain full operation of the unit and to fulfil the warranty obligations.

This unit must not be operated with covers or lids removed.

Do not attempt to disassemble the unit. There are no user serviceable parts inside.

Do not drop, knock or shake the unit. Rough handling beyond 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 paint the unit. Paint can clog the unit and prevent proper operation.

Do not expose the unit to any kind of liquids (rain, beverages, etc).

The unit is not waterproof. Keep the unit within the specified humidity levels.

Do not use or store the unit in dusty, dirty areas. Connectors as well as other mechanical parts may be damaged.

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

Fibre connectors are supplied with plugs to avoid contamination inside the optical port.

The plug should be fitted when no optical fibre is inserted in the connector, e.g. during storage, service or transportation.

Note. Fibre Optic Handling

Fibre optic equipment requires careful handling as the fibre components are very sensitive to dust and dirt. If the fibre is disconnected from the modem, the protective plug on the transmitter/receiver must be replaced. The protective plug must be kept on during transportation. The fibre optic cable must also be protected in the same way. If this recommendation is not followed, it can jeopardise the warranty.

Cleaning of the optical connectors

In the event of contamination, the optical connectors should be cleaned by using forced nitrogen and some kind of cleaning stick.

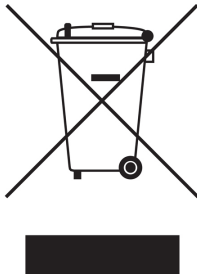
Recommended cleaning fluids:

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

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 55022, Emission IT equipment, class A
	EN 55024, Immunity IT equipment
	FCC part 15 Class A
	EN 50121-4, Railway signalling and telecommunications apparatus
	IEC 62236-4, Railway signalling and telecommunications apparatus
Safety	EN 60950-1, IT equipment

FCC Part 15.105 Notice:

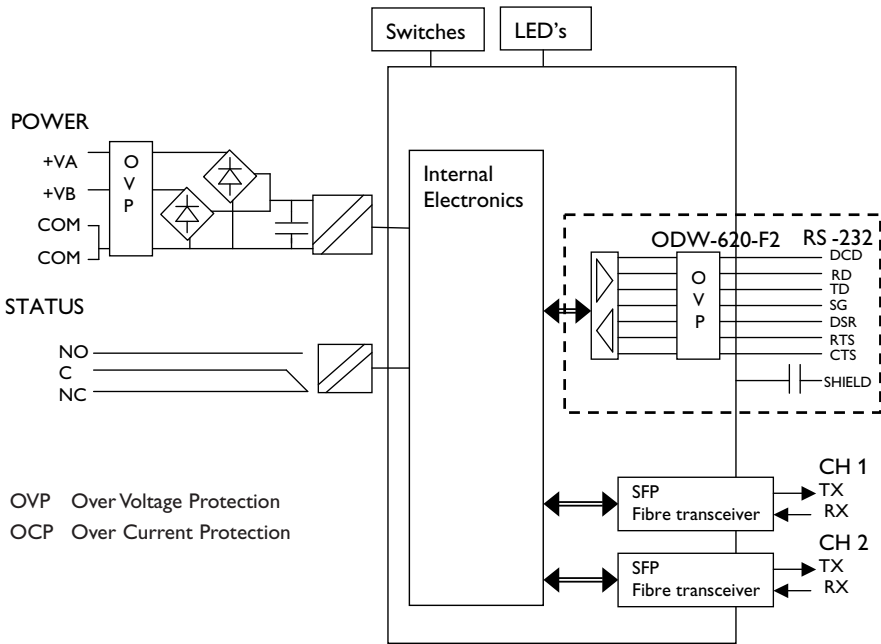
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

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
Voltage dips and interruption	EN 61000-4-11	AC power ports	10 & 5 000 ms, interruption 200 ms, 40% residual voltage 500 ms, 70% residual voltage
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	EN 55022	Enclosure	Class B
	FCC part 15		Class A
Conducted emission	EN 55022	AC power ports	Class B
	FCC part 15	AC power ports	Class B
	EN 55022	DC power ports	Class A
Dielectric strength	EN 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		Operating	-40 to +60°C
		Storage & Transport	-40 to +70°C
		Maximum surface temperature	135°C (temperature class T4)
Humidity		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 60068-2-6	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			IP 21
Cooling	IEC 529	Enclosure	Convection
Mounting			Horizontal on 35 mm DIN-rail

Functional description



Converter serial interface – optical fibre

ODW-620-F2 is a fibre optic modem that converts between electrical RS-232 and a fibre optical link.

ODW-620-F2 can also be used to convert from RS-232 to RS-485 by using a ODW-620-F2 in the same link as ODW-630-F2.

Repeater – optical fibre links

ODW-620-F2 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.

Data rate up to 250 kbit/s

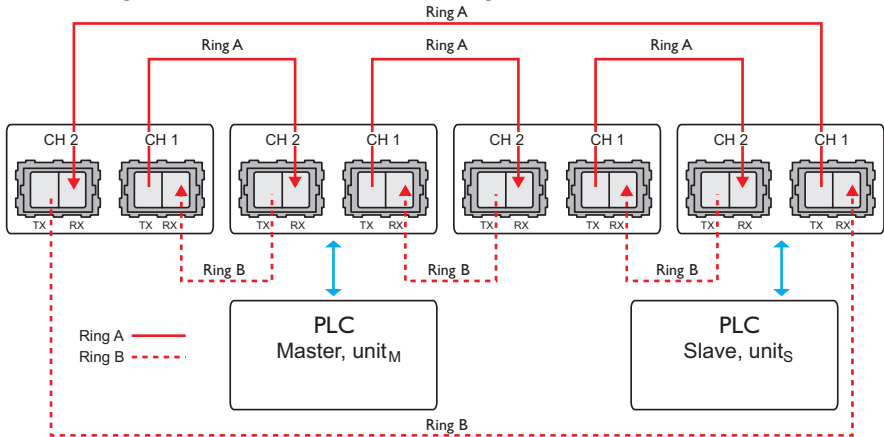
ODW-620-F2 converts data using rates from 300 bit/s up to 250 kbit/s. Retiming of the data ensures that the correct signal form is transmitted from the ODW-620-F2 converter.

Designed for harsh environments, such as industrial, road and railway applications

ODW-620-F2 complies with standards for industrial environments and railway signalling and telecommunications apparatus. Additionally, the wide climatic range of the ODW-620-F2 allows it to be installed in out-door cabinets without any additional measures, such as heating, etc.

Redundant ring via fibre optical network

Under normal operation the serial data is sent over ring A. Should a fault be detected on the fibre ring then the data will be carried on rings A and B.



Note! Ring A start up at TX (channel 1) and ring B ends up at RX (channel 1).

⚙️ Normal operation, data exchange between serial master and slave.

- ODW-620-F2 unit connected to the PLC master receives serial data at the electrical port, it converts and transfers this master frame via the fibre ring A. At this unit, the repeating of transferred frames is stopped until this transferred master frame has returned via ring A.

This master frame will be repeated through fibre ring A by all the other units. Each of these units will also convert the master frame to serial data and send it via the electrical port.

- ODW-620-F2 unit, to which the addressed Slave is connected, receives serial data from the Slave. This unit converts slave data and transfers the slave frame via ring A. The repeating of transferred frames is stopped until this transferred slave frame has returned via ring A.

- When the “first” ODW-620-F2 unit receives the master frame (the same frame that has been transmitted by this unit), or after a timeout, data conversion will be allowed again. The received slave frame will be converted and transmitted at the electrical port.
- When the ODW-620-F2 unit, connected to the PLC slave receives the slave frame (the same frame that has been transmitted by this unit), or after a timeout, data conversion at this unit will be allowed again.

⚙ Behaviour under faulty conditions

- Elapsed time from any kind of failure at the fibre optic network until data exchange after a corrective action depends on total length of fibre ring.
This is typically 40–500 ms (local unit). During that time, the transferred data frames should be seen as corrupted or missed.

Note: Be ware of that full duplex will not work in redundant ring.

Failure	Indications
Fibre interruption ring A, TX	On: FL R
Fibre interruption ring A, RX	On: FL L
Fibre interruption ring A, RX & TX	On FL L
Fibre interruption ring B, TX	On: FL R
Fibre interruption ring B, RX	On: FL L
Fibre interruption ring B, RX & TX	On: FL L
Fibre interruption ring A and B (e.g. CH1 or CH2 both TX & RX)	On: FL L &/or FL R
Low power on the receiver (May indicate bad fibre)	FLL flicker

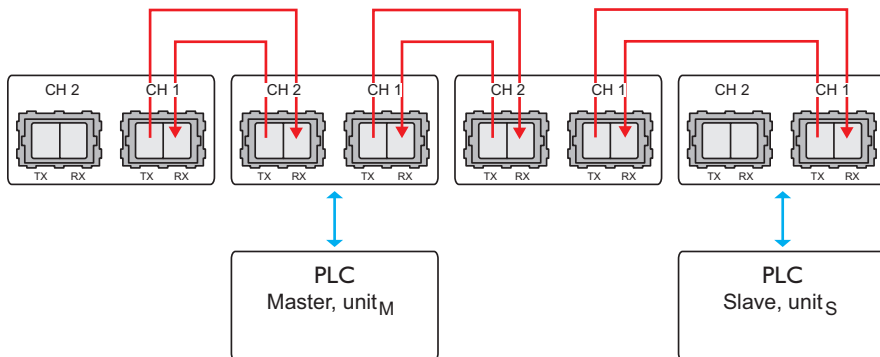
⚙ Recovery from faulty status

- ODW-620-F2 will automatically recover to the previous operating status when a failure disappears. This involves recovery from multi drop application to Redundant ring A/B when ring is up and running and recovery from Ring B to Redundant ring A when the ring is up and running.
- The time to recover from the failure status depends on total length of fibre ring.
This is typically 40–500 ms. During that time the transferred data frames should be seen as corrupted or missed.

Multidrop via fibre optical network

The data is transferred via the fibre optical network to the serial ports of all units. If ODW-620-F2 is connected to two optical fibre links (mid unit) converted data will be transmitted in both directions, via both CH 1 and CH 2. With only one optical fibre link (end unit) converted data will be transmitted in one direction, via CH 1 only.

Data received from one ODW-620-F2 optical fibre port will be repeated through the other optical fibre port and it will also convert the frame to serial data.



Example

- Redundant ring, one data exchange between master and one slave.
One a master and 11 slaves with data rate 9600 bit/s dependent mode. 12 ODW-620-F2 units with a total fibre length of 40 km. A data exchange between master and one slave.
1. Fibre: The total optical fibre ring length delay.
 $40 \times 5 \mu\text{s} = 200 \mu\text{s}$
 2. Optical repeaters:
The optical repeater delay x Number of optical repeaters
(excluded the two units connected to PLC master and slave).
 $10 \times 3.0 \mu\text{s} = 30 \mu\text{s}$
 3. Converter electrical to fibre:
Signal processing delay x 2
(ODW-620-F2 units connected to a master and addressed slave).
 $(1 t_{\text{bit}} + 0.6 \mu\text{s}) \times 2 = (105 \mu\text{s} + 0.6 \mu\text{s}) \times 2 = 211 \mu\text{s}$
 4. Converter fibre to electrical:
Signal processing delay x 2
(units connected to PLC master and slave).
 $0.6 \mu\text{s} \times 2 = 1.2 \mu\text{s}$
 5. The system delay is calculated by summing the delays in item 1 to 4 above:
 $200 \mu\text{s} + 30 \mu\text{s} + 211 \mu\text{s} + 1.2 \mu\text{s} = 442 \mu\text{s}$

Interface specifications

Power	
Rated voltage	12 to 48 VDC 24 VAC
Operating voltage	10 to 60 VDC 20 to 30 VAC
Rated current	400 mA @ 12 V 250 mA @ 24 V 100 mA @ 48 V
Rated frequency	DC: – AC: 48 to 62 Hz
Inrush current I ² t	0.2 A ² s
Startup current*	1.0 A _{peak}
Polarity	Reverse polarity protected
Redundant power input	Yes
Isolation to	RS-232 and Status port
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm ² (AWG 24 – 12)
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-232 and Power port
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm ² (AWG 24 – 12)
Shielded cable	Not required

RS-232	
Electrical specification	EIA RS-232
Data rate	300 bit/s – 250 kbit/s
Data format	9 – 12 bits. Only needed in redundant ring
Protocol	Start-bit followed by 8 – 11 bits
Retiming	Yes
Transmission range	15 m
Isolation to	Status and Power port
Connection	9-pin D-sub female (DCE)
Shielded cable	Not required, except when installed in railway applications as signalling and telecommunications apparatus and located close to rails*
Conductive housing	Isolated to all other circuits and housings

* To minimise the risk of interference, a shielded cable is recommended when the cable is located inside 3 m boundary to the rails and connected to this port.

The cable shield should be properly connected (360°) to an earthing point within 1 m from this port. This earthing point should have a low impedance connection to the conductive enclosure of the apparatus cabinet, or similar, where the unit is built-in. This conductive enclosure should be connected to the earthing system of an installation and may be directly connected to the protective earth.

Optical Power Budget

The allowed link length is calculated from the optical power budget (OPB), the available optical power for a fibre-optic link, and the attenuation of the fibre, comprising losses due to in-line connectors, splices, optical switches and a margin for link ageing (typical 1.5 dB for 1300 nm).

The worst-case optical power budget (OPB) in dB for a fibre-optic link is determined by the difference between the transmitter's output optical power (min) and the receiver input sensitivity (max).

FX (Fibre)	SM-LC80	SM-LC40	SM-LC15	MM-LC2
Fibre connector	LC duplex	LC duplex	LC duplex	LC duplex
Fibre type	Singlemode 9/125 µm	Singlemode 9/125 µm	Singlemode 9/125 µm	Multimode, 62.5/125 and 50/125 µm
Wavelength	1550 nm	1310 nm	1310 nm	1310 nm
Transmitter Output optical power min/max	-5/0 dBm**	-5/0 dBm**	-15/-8 dBm**	-20/-14 dBm*
Receiver Input sensitivity, max	-34 dBm	-34 dBm	-31 dBm	-31 dBm
Receiver Input optical power, max	-5 dBm***	-3 dBm***	-8 dBm	-8 dBm
Optical power budget, worst-case	29 dB	29 dB	16 dB	11 dB
Transceiver type	Small Form Factor Pluggable (SFP) Multi-Sourcing Agreement (MSA) compliant			
Laser class	Class 1, IEC 825-1 Accessible Emission Limit (AEL)			

* Output power is power coupled into a 62.5/125 µm multimode fibre

** Output power is power coupled into a 9/125 µm singlemode fibre

*** The optical power should be reduced by at least 5 dB (SM-LC80 and Bi-di LC-60) or 3dB (SM-LC-40 and Bi-di LC-40) between the optical output and input.

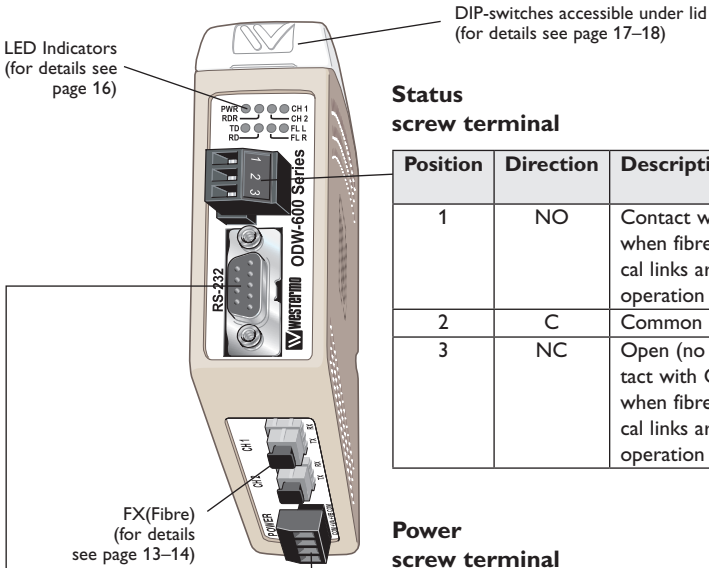
FX (Fibre)	Bi-di LC-60	Bi-di LC-40	Bi-di LC-20	Bi-di MM LC-2
Fibre connector	LC Simplex	LC Simplex	LC Simplex	LC Simplex
Fibre type	Singlemode 9/125 µm	Singlemode 9/125 µm	Singlemode 9/125 µm	Multimode 62.5/125 and 50/125 µm
Wavelength nm, connector 1 Wavelength nm, connector 2	Tx 1310, rx 1550 Tx 1550, rx 1310	Tx 1310, rx 1550 Tx 1550, rx 1310	Tx1310, rx 1550 TX 1550, rx 1310	Tx 1310, rx 1550 Tx 1550, rx 1310
Transmitter Output optical power min/max	-5/0 dBm **	-8/0 dBm **	-10/0 dBm **	-10/-8 dBm *
Receiver Input sensitivity, max	-34 dBm	-34 dBm	-28 dBm	-28 dBm
Receiver Input optical power, max	0 dBm***	0 dBm***	0 dBm	-0 dBm
Optical power budget, worst-case	29 dB	26 dB	18 dB	18 dB
Bit error rate (BER)	$< 1 \times 10^{-10}$	$< 1 \times 10^{-10}$	$< 1 \times 10^{-10}$	$< 1 \times 10^{-10}$
Transceiver type	Small Form Factor Pluggable (SFP) Multi-Sourcing Agreement (MSA) compliant			
Laser class	Class 1, IEC 825-1 Accessible Emission Limit (AEL)			

* Output power is power coupled into a 62.5/125 µm multimode fibre

** Output power is power coupled into a 9/125 µm singlemode fibre

*** The optical power should be reduced by at least 5 dB (SM-LC80 and Bi-di LC-60) or 3dB (SM-LC-40 and Bi-di LC-40) between the optical output and input.

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



Status screw terminal

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

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

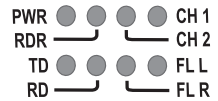
RS-232 D-sub

Position	Direction*	Description
D-sub		
1	Out	Data Carrier Detect (DCD)
2	Out	Received Data (RD)
3	In	Transmitted Data (TD)
4		Not connected
5	–	Signal Ground (SG)
6	Out	Data Set Ready (DSR)
7	In	Request To Send (RTS)
8	Out	Clear To Send (CTS)
9		Not connected

* Direction relative this unit

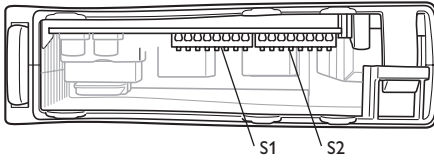
LED indicators

LED	Status	Description
PWR Power	ON	In service (power)
	Flashing	Fault condition
	OFF	Out of service
RDR	ON	Redundant ring mode
	OFF	Multidrop mode
CH 2	ON	Fiber link at port CH 2 in operation. Data can be transmitted
	OFF	Fiber link at port CH 2 out of operation
CH 1	ON	Fibre link at port CH 1 in operation. Data can be transmitted
	OFF	Fibre link at port CH 1 out of operation
TD Serial data Receive	Flashing	Receive accepted data on the serial port. Data will be transmitted to the fibre link
	OFF	–
RD Fibre link data Receive	Flashing	Received data on the fibre link. This frame is transmitted to the serial port.
	OFF	–
FL R (Red) Failure Link Remote	ON	Remote fibre link failure. A fibre link is out of operation at any other unit of the optical network
	OFF	All fibre links are in operation at all other units in the fibre optical network
FL L (Red) Failure Link Local	ON	Local fibre link failure. This unit has identified a fibre link failure
	OFF	Fibre link of this unit is in operation



Configuration

All needed configurations and parameter settings are done by the DIP-switches, located under the top lid.



DIP-switch settings

Before DIP-switch settings:

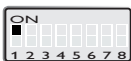
Prevent damage to internal electronics from electrostatic discharges (ESD) by discharging your body to a grounding point (e.g. use of wrist strap)

Note: Disconnect power before DIP-switch settings.

S1 DIP-switch



CTS always active



RTS signal will be transferred to remote modem. When the remote modem receives RTS, CTS will be set to high.*



300 bit/s



1 200 bit/s



2 400 bit/s



4 800 bit/s



9 600 bit/s



19.2 kbit/s



38.4 kbit/s



57.6 kbit/s



115.2 kbit/s



125 kbit/s



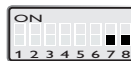
187.5 kbit/s



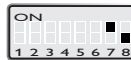
230.4 kbit/s



250 kbit/s



9 bits data format



10 bits data format



11 bits data format



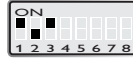
12 bits data format

* Only point-to-point application (end unit).

S2 DIP-switch



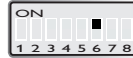
Multidrop- end unit
(Use chanal 1 for end unit)



Redundant ring
(Data rate must be set)



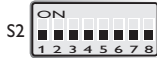
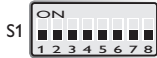
Multidrop, Mid unit .



Set status interface at local fibre link error*

* SW2: 6 ON: The status relay only change status in the unit that is connected in front of the fibre error.

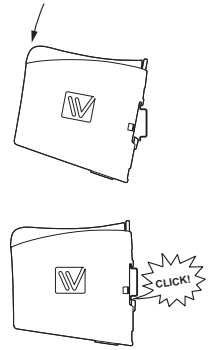
Factory settings



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

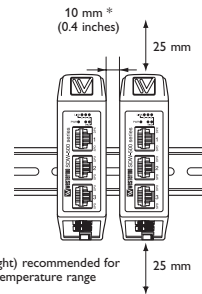
Mounting

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.



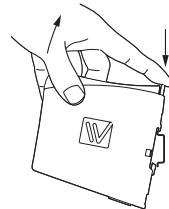
Cooling

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.



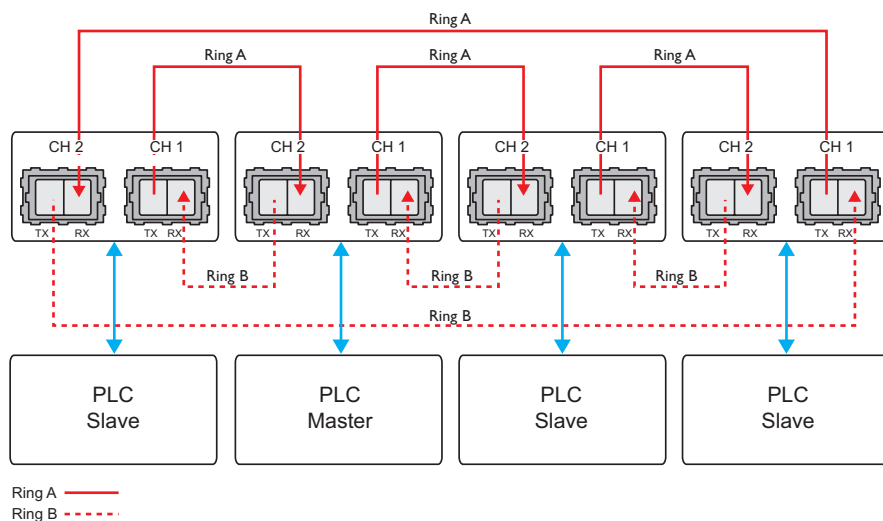
Removal

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



Start up guide, redundant ring application

Follow the steps below to get the unit up and running in a simple application.

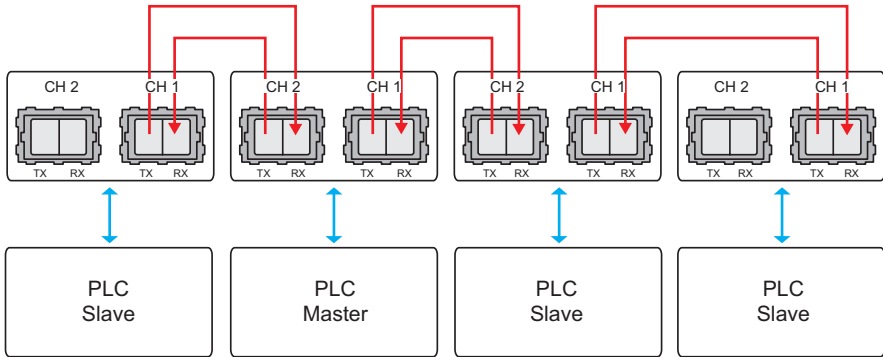


Prepare the master units

- ⌘ Configure network, with master and slaves. Check that it is running correctly with the electrical serial network.
Prepare the fibre optical network.
- ⌘ Redundant ring. Set switch S2:1 and 3 to ON and all others to OFF, at all units.
(If the status interface should be local, set S2:6 to ON)
- ⌘ Set present data rate with S1.
- ⌘ Connect the fibre links between the units.
- ⌘ Connect the power supply to all units.
 - The Fibre links should be in operation, indicated by active CH 1 and CH 2 LED's.
- ⌘ Connect each of the slaves to the port of corresponding ODW-620-F2.
- ⌘ Connect the master to the port of one ODW-620-F2.
- ⌘ The Redundant ring application is up and running.

Multidrop application

Follow the steps below to get the unit up and running in a simple application.



Prepare the units

- ⌘ Configure the network, with master and slaves. Check that it is running correctly with the electrical serial network.
Prepare the fibre optical network
- ⌘ Multidrop, mid units (CH 1 & CH 2). Set switch S2:2 to ON.
- ⌘ Multidrop, end units (CH 1 only). All switches should be set to OFF.
- ⌘ Connect the fibre links between the units.
- ⌘ Connect the power supply to all units.
 - The Fibre links should be in operation, indicated by active CH 1 and CH 2 LED's.
- ⌘ Connect each of the slaves to the serial port of the corresponding ODW-620-F2.
- ⌘ Connect the master to the port of one ODW-620-F2
- ⌘ The Multidrop application is up and running.

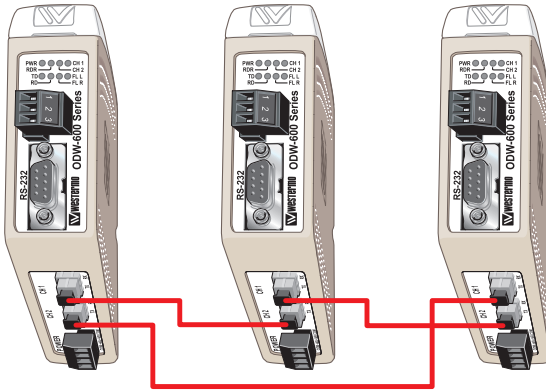
Note! ODW-620-F1 or ODW-630-F1 can be used as end units.

Start up guide

Note: With Bi-di fibre it is necessary to have one 1310 nm in one end and 1550 nm in the other end.

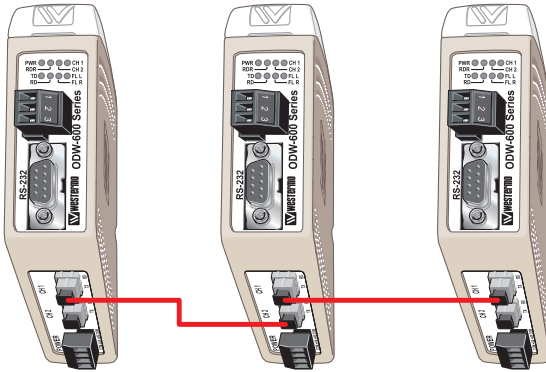
- Bi-di 1310 nm will transmit with 1310 nm and receive with 1550 nm.
- Bi-di 1550 nm will transmit with 1550 nm and receive with 1310 nm nm.

Redundant ring with Bi-di transceivers



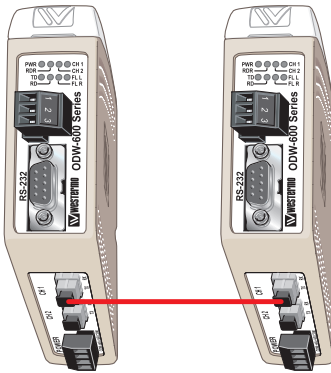
	Unit 1	Unit 2	Unit 3
CH2	Bi-di 1550 nm	Bi-di 1550 nm	Bi-di 1550 nm
CH1	Bi-di 1310 nm	Bi-di 1310 nm	Bi-di 1310 nm

Multidrop with Bi-di transceivers



	End unit 1	Unit 2	End unit 3
CH2	–	Bi-di 1550 nm	–
CH1	Bi-di 1310 nm	Bi-di 1310 nm	Bi-di 1550 nm

Point-to-point with Bi-di transceivers



	Unit 1	Unit 2
CH1	Bi-di 1310 nm	Bi-di 1550 nm



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