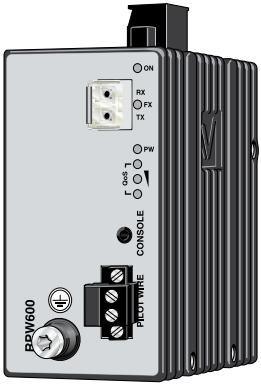
User Guide
6621-2260

Pilot wire modem



RPW600M / RPW600F

Legal information

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Safety

Before installation:

Read the user guide 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.

Before mounting, using or removing this unit:

Prevent access to hazardous voltage by disconnecting the unit from power supply. Warning! Do not open connected unit. Hazardous voltage may occur within this unit when connected to power supply.

Care recommendations

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

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

Do not attempt to disassemble the unit. There are no 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 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 water-proof. 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 part may be damaged.

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

As long as no optical fibre is mounted on the connector, e.g. for storage, service or transportation, should the plug be applied.

Note. Fibre Optic Handling

Fibre optic equipment needs special treatment. It is very sensitive to dust and dirt. If the fibre will be disconnected from the modem the protective hood on the transmitter/ receiver must be connected. The protective hood must be kept on during transportation. The fibre optic cable must also be handle the same way.

If this recommendation not will be followed it can jeopardise the warranty.

Cleaning of the optical connectors

In the event of contamination, the optical connectors should be cleaned by the use of 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.

General

RPW600 Pilot Wire modems are used with RED615 line differential protection and control IEDs to enable the galvanic protection communication connection over twisted pair media, better known as Pilot Wire in the area of line differential protection applications.

Two different variants of the RPW600 modems are available, a master (RPW600M) and a follower (RPW600F) which always are needed to be used as counterparts in pilot wire communication link. To enable ease of use, no setting or configuration is needed with either of the RPW600 modem variants.

Pilot wire link lengths typically up to 8 km with 0.8 mm^2 twisted pair cables can be applied. With twisted pair cables in good condition even longer distances can be achieved. The achieved link length also depends on the noise levels in installations.

As important part of the line differential protection scheme the RPW600 modems fulfill the same EMC- and environmental standards as RED615 line differential protection and control IEDs. The pilot wire connection in the RPW600 modem caters for 5 kVac (RMS, 1 min) level insulation against earth potential as a standard.

Environmental conditions

Phenomena	Test	Description	Test levels
Temperature		Operating	–20 to +55°C
		Storage & Transport	–40 to +85C
Humidity		Operating	5 to 95% relative humidity
		Storage & Transport	5 to 95% relative humidity
Altitude		Operating	Up to 2 000 m / 70 kPa
Enclosure	UL 94	Zink	Flammability class V-1
Dimension W x H x D			52.5 x 100 x 101 mm
Weight			0.6 kg
Degree of protection	IEC 529	Enclosure	IP 40
Cooling			Convection
Mounting			Horizontal on 35 mm DIN-rail

Type tests immunity

Environmental Phenomena	Basic Standard	Level
Electrostatic discharge Test	EN 61000-4-2	6kV/8kV (contact/air) Performance Criteria B
RF field AM modulated	EN 61000-4-3	20V/m 80–2700 MHz Performance Criteria A
Electrical fast transient Burst	EN 61000-4-4	±4.0 kV (power ports) ±4.0kV (signal ports) Performance Criteria A
Surge	EN 61000-4-5	±4.0 kV (L-E power) ±2.0 kV (L-L power) ±2.0 kV (L-E signal) ±1.0 kV (L-L signal) Performance Criteria B
RF conducted	EN 61000-4-6	10V/m 0,15 to 80MHz (power & signal port) Performance Criteria A
Power frequency (50 Hz) magnetic field	EN 61000-4-8	300 A/m
Slow damped oscillatory wave immunity test, 1 MHz burst	EN 61000-4-18	2.5 kV (CM)1.0 kV (DM)
Power frequency immunity test	IEC 60255-22-7	
Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	EN 61000-4-29 (DC port)	Dips: 30 %, 60% 10, 30, 50, 100, 300, 1000 ms Interruptions: 1, 3, 10, 30, 50, 100, 300, 1000, 5000 ms Variations: 80%, 120%, 10 s Performance Criteria A < 50ms Performance Criteria B > 50ms

Type tests emission

Environmental phenomena	Basic Standard	Environment
Radiated emission Enclosure 30 MHz – 230 MHz 230 MHz – 1000 MHz	EN 55022 Class A	EN 55022
Conducted emission DC power port 0.15 – 30 MHz	EN 55022 Class A	EN 55022

Type tests temperature

Environmental Phenomena	Standard	Test values
Cold test	IEC 60068-2-1 Test Ad	–25°C; 96 h –40°C; 16 h
Dry heat test	IEC 60068-2-2 Test Bd	+55°C; 96 h +85°C; 16 h
Damped heat test, cyclic	IEC 60068-2-30	6 cycles, 12+12 h +25°C ... +55°C
Storage test	IEC 60068-2-48	–40°C; 96 h +85°C; 96 h

Type tests mechanical

Environmental Phenomena	Standard	Test values
Vibration response test	IEC 60068-2-6 Test Fc	10 – 150 Hz 0.075 mm, 10 – 58 Hz 10m/s², 58 – 150 Hz 1 sweep cycles in each of the three directions
Vibration endurance test	IEC 60068-2-6 Test Fc	10 – 150 Hz 20m/s², 58 – 150 Hz 20 sweep cycles in each of the three directions
Shock response test	IEC 60068-2-27 Test Ea	Peak acc: 100 m/s² Duration: 11 ms 3 pulses in each of the six directions
Shock withstand test	IEC 60068-2-27 Test Ea	Peak acc: 300 m/s² Duration: 11 ms 3 pulses in each of the six directions
Bump test	IEC 60068-2-29 Test Eb	Peak acc: 200 m/s² Duration: 16 ms 1000 pulses in each of the six directions

Type tests insulation

Test	Standard	Test values
Dielectric test	EN 60255-5	5 kVac, Pilot Wire – Power 5 kVac, Pilot Wire – GND 2 kVac, Power – GND
Impulse voltageTest	EN 60255-5	5 kV
Isolation resistance test	EN 60255-5	0.5 kV, >100MΩ
Protective bonding resistance	EN 60255-27	<0.1 Ω (60 s)

Interface specifications

Power	
Rated voltage	24 to 110 VDC
Operating voltage	19,2 to 154 VDC
Rated current	200 mA @ 24 VDC 50 mA @ 110 VDC
Rated frequency	DC
Inrush current, I2t	0.11 A^2s @ 48 VDC
Startup current*	0.2 Apeak @ 24VDC
Polarity	Reverse polarity protected
Isolation to	All other
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.

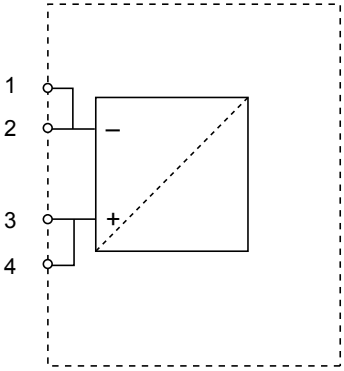
Pilot Wire	
Isolation to	All other
Connection	Detachable screw terminal
Connector size	0.2 – 2.5 mm^2 (AWG 24 – 12)
Shielded cable	Not required
Number of ports	1

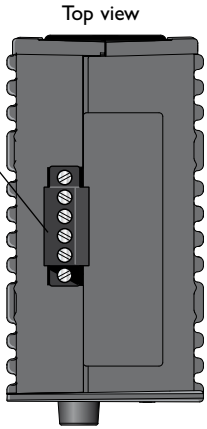
Ethernet FX	
Isolation to	All other
Connection	LC
Fibre type	Single-mode 9/125 or 10/125
Shielded cable	Not required
Number of ports	1

Console	
Electrical specification	TTL-level
Data rate	115.2 kbit/s
Data format	8 data bits, none parity, 1 stop bit, no flow control
Transmission range	15 m
Isolation to	All other
Connection	2.5 mm jack, use serial console cable

Power*

Position	Description	Product marking
1	Common	COM
2	Common	COM
3	+ Voltage	+DC
4	+ Voltage	+DC





* This unit is supplied with one power module and with redundant power input connections.

Ethernet FX

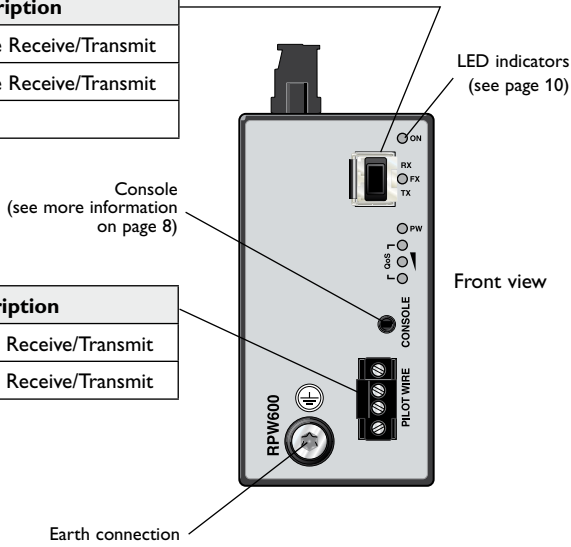
Position	Direction*	Description
1	In/Out	2-wire Receive/Transmit
2	In/Out	2-wire Receive/Transmit

* Direction relative this unit.

Pilot wire

Position	Direction*	Description
1	In/Out	2-wire Receive/Transmit
2	In/Out	2-wire Receive/Transmit

* Direction relative this unit.



LED indicators

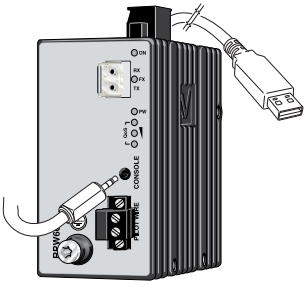
LED	Status			Description
ON	OFF			Unit has no power
	GREEN			Internal power ok
	RED			The unit is booting
FX Fibre link indication	OFF			Inactive link
	GREEN			Active link
	GREEN FLASH			Data is transmitted
PW Pilot wire link indication	OFF			Inactive link
	GREEN			Active link
	GREEN FLASH			Link negotiation
QoS Quality of service, pilot wire link quality indication	**LED 1**	**LED 2**	**LED 3**	QoS 1 2 3
	GREEN	GREEN	GREEN	Very good link (QoS-value above 15)
	OFF	GREEN	GREEN	Good link (QoS-value between 11-15)
	OFF	OFF	GREEN	Ok link (QoS-value between 6-10)
	RED	RED	RED	Weak link (QoS-value below 6)
	OFF	OFF	OFF	No link

Diagnostic

QoS indication

The QoS indication on the front of the unit gives an indication of the pilot wire link status.
If indication shows weak link it is recommended to improve the pilot wire characteristic. A weak link can be unstable and result in data transmission losses.

RPW-diagnostic tool connection

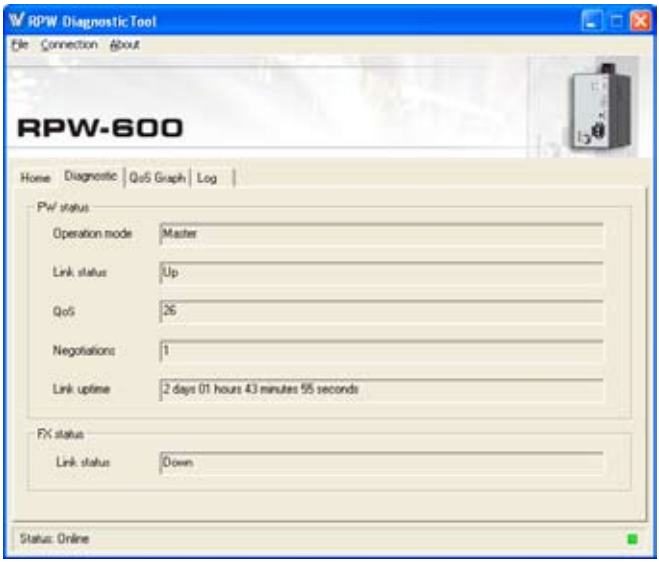


The RPW-diagnostic tool, which is part of the RPW-diagnostic kit, can be used for more advanced diagnostic and logging of diagnostic parameters. Connection to the RPW-unit is possible via the
console port in the front of the unit using the serial console cable, also part of the diagnostic kit.

The following steps needs to be taken

1. Connect the serial diagnostic cable to the console port. (Use only the cable provided in Diagnostic Kit).
2. Connect cable to your computer
(USB port, if drivers are needed they can be found on the CD in the RPW-diagnostic kit).
3. From RPW-diagnostic tool connect to the assigned port.

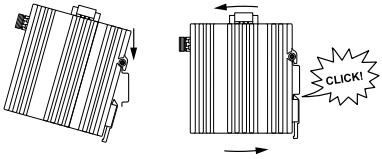
RPW-diagnostic tool



The RPW-diagnostic tool has a built in help. Set the pointer over a specific item and information about that part will pop-up automatically.

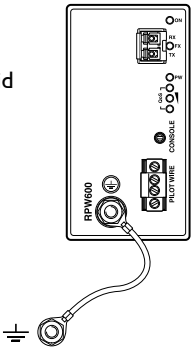
Mounting

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.



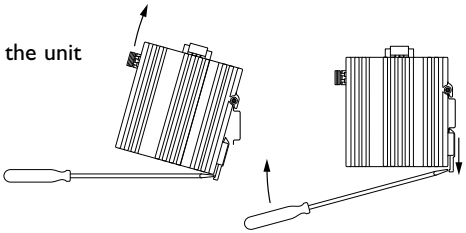
Earth connection

For correct function the ground connection on the unit needs to be properly connected to a solid ground. See figure.



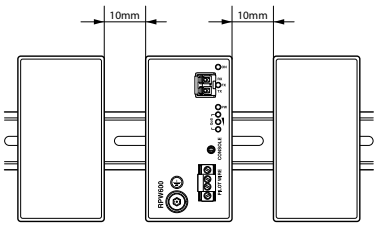
Removal

Press down the support at the back of the unit using a screwdriver. See figure.



Cooling

This unit uses convection cooling. To avoid obstructing the airflow 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.



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