NL/100-880 and NL/155-1900

Netronics Optical Communication Links

(NL/100-880, NL/G-1000 and NL/155-1900)

Fast-Ethernet Giga-Ethernet and Up to 155Mbps Systems
With SFP Interface

NETRONICS OPTICAL COMMUNICATIONS

User Manual

Document Number 4703710, Rev. 1.2

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Standards

Standards Compliance

UL 1950; CSA 22.2 No 950; FCC Part 15 Class B; CE-89/336/EEC, 73/23/EEC

FCC Notice

WARNING: 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 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 instructions in the 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 for the interference at the user's own expense.
The user is cautioned that changes and modifications made to the equipment without approval of the manufacturer could void the user's authority to operate this equipment.

It is suggested that the user use only shielded and grounded cables when appropriate to ensure compliance with FCC Rules.

CE Mark

The CE mark symbolizes compliance with the EMC directive of the European Community. Such marking is indicative that the specified equipment meets or exceeds the following technical standards:

- EN 55022 - Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment
- EN 50081-1- Electromagnetic compatibility - of Radio Interference Characteristics of Information Technology Equipment Generic Emission standard Part 1 – Residential commercial and light industry environment
- EN 50082-1 - Electromagnetic compatibility -- Generic immunity standard Part 1: Residential, commercial and light industry environment
- EN61000-4-2 (previously IEC 1000-4-2) - Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Section 2 - Electrostatic discharge requirements
- EN61000-4-3 (previously IEC 1000-4-3) - Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Section 3 - Radiated electromagnetic field requirements
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- EN61000-4-5 - Electromagnetic compatibility for industrial-process measurement and control equipment
  Part 4: Section 5 – Surge Immunity requirements
- EN61000-4-6 - Electromagnetic compatibility for industrial-process measurement and control equipment
  Part 4: Section 6 – Immunity to conducted disturbances induces by radio frequency fields
- EN61000-4-8- Electromagnetic compatibility for industrial-process measurement and control equipment
  Part 4: Section 8– Power frequency magnetic field immunity requirements
- EN61000-4-11 – Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Section 11 – Voltage dips short interruptions and voltage variations immunity requirements
- EN61000-3-2 – Harmonic standard

- EN61000-3-3 – Voltage Fluctuation and Flicker standard
- CISPR 22 - Radiated and Line-conducted Class B
- EN 60950 - ITE Safety

Other Standards

1. CISPR 22: 1993
AS/NZS 3548: 1995, Class B
Joint Amendment No. 1: 1997, Joint Amendment No. 2: 1997

2. EN 60950+A1+A2+A3+A4+A11
ACA TS001-1997
AS/NZS 3260: 1993 A4: 1997

3. ITU G.703, G.704, G.706,G.736, G.737, G.738, G739, G740, G.775, G.823.

Netronics ® Laser Safety Certification

The NetLight is designed, built, and tested to be eye safe, even if the output beams are viewed directly, provided that no magnifying optics are used.
This product is Class 1M according to the American National Standard for Safe Use of Lasers, ANSI Z136.1-1993, provided that there is not a reasonable probability of accidental viewing with optics in the direct path of the beam where the NetLight is installed.
This product is Class 1M according to the International Standard of the International Electro technical Commission IEC 60825 ("Safety of laser products"), Part 1 ("Equipment classification requirements and user's guide" Ed 1.2; 2001) and Part 12 ("Safety of FSOCS used for transmission of information") The following explanatory label is applicable to these products:

LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
(BINOCULARS OR TELESCOPES)
CLASS 1M LASER PRODUCT

This product complies with United States FDA performance standards for laser products except for deviations pursuant to Laser Notice No. 50 as published in June, 2001, which allows for the use of the IEC 60825-1 classification standard. Under this standard, these products are Class 1M.
A 'Declaration of Conformity', in accordance with the above standards, has been made and is on file at Netronics.

Disclaimer

Netronics reserves the right to modify the equipment at any time and in any way it sees fit in order to improve it.

Netronics provides this document without any warranty of any kind, either expressed or implied, including, but not limited to, the implied warranties of merchantability or fitness for a particular purpose.

The customer is advised to exercise due discretion in the use of the contents of this document since the customer bears sole responsibility.

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About this User Manual

Audience

This manual is intended for the user who wishes to install, operate, manage and troubleshoot the NetLight NL/100-880 and NetLight NL/155-1900.

Qualifications

Users of this guide are expected to have:

- Working knowledge of Electro-optical equipment
- Working knowledge of LAN equipment (Layer 2 and 3)
- A License to install equipment on buildings/elevated structures
- A License to work with power line (mains) voltages 110/230 VAC

Training

Installers are required to do a training course on Netronics NetLight that includes:

- IR links (site survey, installation equipment, alignment, etc.)
- Indoors and outdoors installation
- On-the-job-training
- Proficiency tests

Experience

Installers are required to have experience in coax cable TV home pass installation, PTT home pass installation, LAN installation, IR equipment installation, and home electrical wiring.

Authorization

After all the requirements specified above (namely, Qualifications, Training, and Experience) have been met, the installer must receive authorization from Netronics certifying eligibility.

Safety Requirements

Introduction

All requirements stipulated in the safety laws of the country of installation must be abided by when installing the NetLight.

Caution!

In addition, ensure that the requirements noted in this chapter are met in order to reduce risk of electrical shock and fire and to maintain proper operation.

- When equipment is installed care shall be taken that length of exposed outdoor wiring does not exceed 140 ft.
- Unit shall be protected by a 2 pole circuit breaker rated maximum 10A in building installation. The circuit breaker shall be certified as branch circuit over current protector (UL Listed according to UL 489 standard in North America, and suitably certified in other countries) and have contact separation at least 3mm. Additionally, the unit shall be protected by suitably certified earth leakage device.
- Unit is intended for installation in Overvoltage Category II according to IEC 60664-1. If installed in Overvoltage Category higher than II, additional protection against transient over voltages shall be provided by installation. Components used to reduce transient overvoltage shall be
  - In US/Canada: Listed Surge Arrester (OWHX) or Listed or Recognized Surge Suppressor (XUHT/2), if it is after the branch circuit over current protection
  - In other countries: the device shall comply with the requirements of IEC 60643.

Before Installing

Power: Ensure that *all* power to the NetLight is cut off. Specifically, disconnect all NetLight power cords from the power line (mains).

Inspection: Ensure by inspection that no part is damaged.

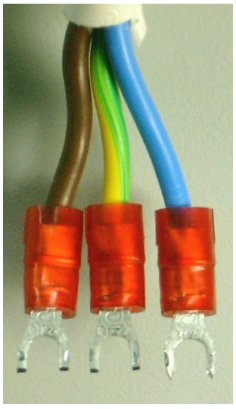


Figure A: 3 terminal cord forks

Before Powering On

Line Power: Ensure that the power from the line (mains) is as specified on the NetLight.

Power Cord: The supply wire of The NetLight must have the following specifications:
Flexible 3-conductor supply wire approved by the cognizant safety organization of the country. The supply wire must be with individual conductor wire having cross-sectional area 0.75

sq. mm. min. The supply wire should be with 3 terminal cord forks for M3.5 screws at both ends. Both of the power cord terminations must carry the certification label of the cognizant safety organization of the country.
Both protective earthing terminals shall be permanently connected to protective earth according to country national code.

When Installing

- Ensure, by visual inspection, that no part of the NetLight is damaged.
- Avoid eye contact with the laser beam at all times.
- Ensure that the system is installed in accordance with ANSI Z136.1 control measures (engineering, administrative, and procedural controls).
- Ensure that the system is installed in accordance with applicable building and installations codes.
- Install the NetLight in a restricted location as defined in this manual since it is a Class 1M FSOCS transmitter and receiver. A restricted location is a location where access to the transmission equipment and exposed beam is restricted and not accessible to the general public or casual passersby. Examples of restricted locations are: sides of buildings at sufficient heights, restricted rooftops, and telephone poles. This definition of a restricted location is in accordance with the IEC60825-I Part 12 requirements.
- Avoid using controls, adjustments, or procedures other than those specified herein as they may result in hazardous radiation exposure.
- Avoid prolonged eye contact with the laser beam (maximum 10 sec.).

Servicing

All servicing must be carried out only by qualified service personnel. Before servicing, ensure that all power to the NetLight is cut off!

Introduction

CAREFULLY READ THE ENTIRE MANUAL BEFORE INSTALLING

An InfraRed (IR) link allows connection without any cable between two distant sites. For that, two identical transceivers, each installed on one site and aligned to face each other, provide point-to-point connectivity. This configuration makes possible data transfer from one terminal to the other through the air over an optical wavelength carrier, the IR link – see picture in Figure B, below.

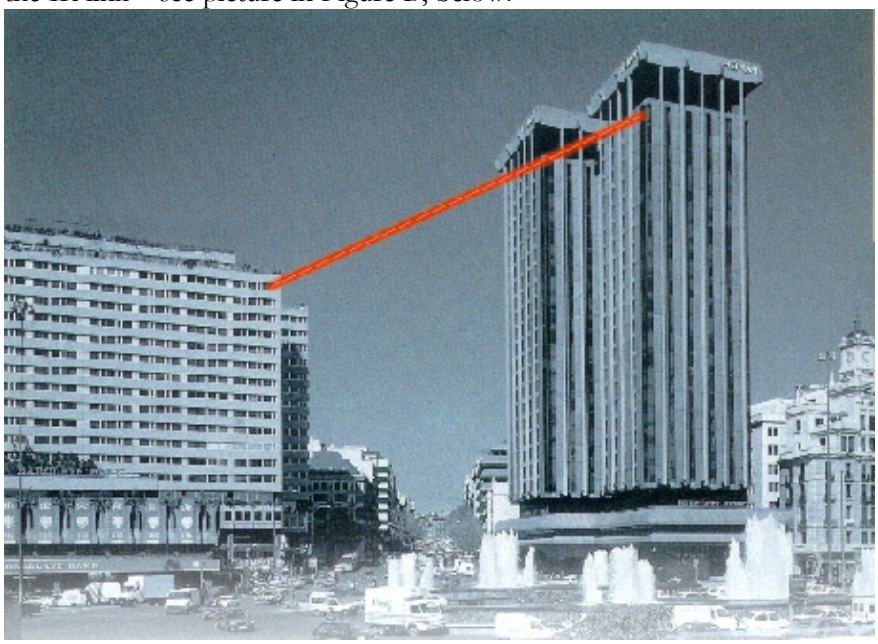


Figure B: IR Link

The installation of such a link can be summarized as 5 stages:

- Site survey
- Installation of the infrastructure
- Mounting of the equipment
- Aiming (alignment) procedure
- Testing and connecting to the Network

Always use appropriate safety equipment and procedures when working with electrical equipment and when working on roofs.

Chapter

1

Product description and Functioning

Caution!

When handling the NetLight, take special care not to damage the polycarbonate window!

Introduction

This User Manual deals with the four models of the NL/100-880 and NL/155-1900 series: NL/100-880, NL/G-1000, NL/155-1900 and NL/155-1900. The above models were enhanced creating fundamental differences with the previous versions.

The main enhancements are as follows:

- ✓ Interface based on SFP (Small Form-factor Pluggable), which allows for more flexibility for manufacturer, for distributors and for clients. The connector is LC.
- ✓ New SNMP management card based on web interface having several new functions and features.
- ✓ New power supply, which in the LV version (low voltage) can operate in the 24-60VDC range.
- ✓ Fusion option was added to the NL/G-1000 and can be upgraded in the field.
- ✓ The NetLights of the NL/155-1900 series no longer have Protocol Select. Instead they have Clock and Data Recovery automatically identifying the data rate and the clock and locking on it. There is no need to choose the protocol by means of DIP switches and the whole 10-155 Mbps operation range is covered by clock recovery.
- ✓ All models even the NL/100-880 have a rear door with window.
- ✓ In order to meet the safety requirements two changes were made in the power connector on the back panel: a - The terminal block was enlarged due to the requirement for a M3.5 screw. b - The power cover was cancelled.
- ✓ The power supply was separated from the interface. This allows replacing the P.S easily (by a trained technician) without the necessity to return the NL to the factory.
- ✓ The NL/100-880 /155 series was canceled. The option for an optical SFP was added to the NL/100-880. Therefore if somebody needs a NetLight for a short distance for Fast Ethernet with an optical interface, he can order the NL/100-880 and the required SFP.

For the previous version of these series and of the NL/100-880 please use the old manual (4703700).

Models

Table 1: Models of the NetLight[1]

Models	Part Number	Description
NL/G-1000	NL/G-1000/XYL/V* *Standard Model* *NL/G-1000/M8L/VS*	**NetLight G-1000**, Free Space Optics 400m@30db/km and 1000m@3db/km (clear weather), Selectable Protocol Link: Giga-Ethernet and Fibre Channel, visual alignment. XYL coding: SFP interface options: M8L, S3L, S5L (Standard model: NL/G-1000/M8L/VS). JT-SNMP-SW/E included (SNMP Unit with web based software, extended version License). Power supply S or 3 (See below for power supply options explanation). Basic accessories kit
NL/G-1000-F	NL/G-1000/XYL/F* *Standard Model* *NL/G-1000/M8L/FS*	**NetLight G-1000-F** with built-in Fusion, Free Space Optics 400m@30db/km and 1000m@3db/km (clear weather), Selectable Protocol Link: Giga-Ethernet and Fibre Channel, visual alignment. XYL coding: SFP interface options: M8L, S3L, S5L (Standard model: NL/G-1000/M8L/FS). JT-SNMP-SW/E included (SNMP Unit with web based software, extended version License). Power supply S or 3 (See below for power supply options explanation). Basic accessories kit supplied with the link: JAH-L, JMP and JITK-L.
NL/100-880	NL/100-880/FE-O/V* *Standard Model* *NL/100-880/FE-O/V3* *With Basic SNMP license* *NL/100-880/FE-O/VM3* *With Extended SNMP license* *NL/100-880/FE-O/VE3*	**NetLight 100-880**, Free Space Optics 360m@30db/km and 880m@3db/km (clear weather), Fast-Ethernet (100Mbps) link, 100BaseTX interface with an option for an Optical SFP interface (to be ordered separately), visual alignment. SNMP software JT-SNMP-SW/B or JT-SNMP-SW/E: optional Power supply S or 3 (See below for power supply options explanation), The PoE (Power over Ethernet) feature is included in the 3 (low voltage) version and only the 100Base-TX port has to be used. (Standard Model: NL/100-880/FE-O/V3). Basic accessories kit supplied with the link: JAH-L, JMP and JITK-L.
NL/155-1900	NL/155-1900/XYL/V* *Standard Model* *NL/155-1900/M3L/VS*	**NetLight 155-1900**, Free Space Optics 600m@30db/km and 1900m@3db/km (clear weather), Open Protocol 10-155Mbps with clock recovery, visual alignment. XYL coding: SFP interface

[1] NetLight100-880 or NetLight 155-1900.

	With Extended SNMP license NL/155-1900/M3L/VES	options: M3L, S3L, S5L (Standard model: NL/155-1900/M3L/VS), Fusion: optional. JT-SNMP-SW/B included (SNMP Unit with web based software, Basic version License) can be upgraded to JT-SNMP-SW/E (Extended version License). Power supply S or 3 (See below for power supply options explanation). Basic accessories kit supplied with the link: JAH-L, JMP and JITK-L.
NL/155-1900-F	NL/155-1900/XYL/F* *Standard Model NL/155-1900/M3L/FS* *With Extended SNMP license NL/155-1900/M3L/FES*	**NetLight 155-1900-F** with built-in Fusion, Free Space Optics 600m@30db/km and 1900m@3db/km (clear weather), Open Protocol 10-155Mbps with clock recovery, visual alignment. XYL coding: SFP interface options: M3L, S3L, S5L (Standard model: NL/155-1900/M3L/FS). JT-SNMP-SW/B included (SNMP Unit with web based software, Basic version License) can be upgraded to JT-SNMP-SW/E (Extended version License). Power supply S or 3 (See below for power supply options explanation). Basic accessories kit supplied with the link: JAH-L, JMP and JITK-L.
NL/155-1900/100-F	NL/155-1900/FET/F* *Standard Model NL/155-1900/FET/F3* *With Extended SNMP license NL/155-1900/FET/FE3*	**NetLight 155-1900/100-F** with built-in Fusion, Free Space Optics 600m@30db/km and 1900m@3db/km (clear weather), Fast-Ethernet (100Mbps) link, 100BaseT interface. Power supply S or 3 (See below for power supply options explanation), The PoE (Power over Ethernet) feature is included in the 3 (low voltage) version. (Standard model: NL/155-1900/FET/F3). JT-SNMP-SW/B included (SNMP Unit with web based software, Basic version License) can be upgraded to JT-SNMP-SW/E (Extended version License). Basic accessories kit supplied with the link: JAH-L, JMP and JITK-L.

Using the Part Number for Ordering

To place an order for a NetLight model having a specific configuration, use the Part Number format shown in *Models*

Table 1, noting the following:

'100' represents 100 Mbps (Fast-Ethernet) operation speed.
In 155 Series the '155' is omitted in the part number, the absence of "155" represents link operation speed in the range 10 to 155 Mbps.
'G' represents Giga link, Operation at Giga-Ethernet or Fiber Channel.
'X' represents Optical Fiber Mode.
Instead of X use one of the following:
M (for Multimode)
S (for SingleMode)
'Y' represents operating wavelength.
Instead of Y use one of the following:
8 (for 850 nm)
3 (for 1310 nm)
5 (for 1550 nm)
'L' represents the SFP interface with LC connector type.
'FE-O' (Fast Ethernet + Optical interface) represents 100Base-TX with RJ45 connector and an optional optical SFP interface
'FET' (Fast Ethernet) represents 100Base-TX with RJ45 connector
'V' represents existence/absence of Fusion.
Instead of V use one of the following:
V represents no built-in Fusion option.
F represents built-in Fusion option (on NL/G-1000 and NL/155-1900 only).
'M' represents existence of Basic SNMP license (for NL/100-880/100, NL/155-1900 series).
'E' represents existence of Extended SNMP license (for NL/100-880, NL/155-1900 series).
'S' represents power supply type.
Instead of S use one of the following:
S (for input to the power supply in the range 100-240 VAC)
3 (for input to the power supply in the range 24-60 VDC)

Examples

1 – NL/G-1000/M8L/VS means NL/G-1000: Giga-Ethernet link, Multimode, 850nm, LC connector (SFP), 100-240 VAC power supply.

2 – NL/155-1900/S3L/FE3: NL/155-1900-F: 10-155Mbps link, Singlemode, 1310 nm, LC connector, built-in Fusion and with Extended SNMP license, 24-60 VDC power supply.

3 – NL/100-880/FE-O/V3 means NL/100-880: Fast-Ethernet link (100Mbps), 100Base T interface with optional optical SFP interface, 24-60 VAC power supply. With PoE (Power over Ethernet)

General Description and Explanations

1. Front

Each NetLight head comprises a receiver, 1 transmitter a Telescope and an interface on the rear panel for connection to the peripheral equipment see Figure 1.1.

Front view
Showing the receiver side, the transmitters and the telescope

CAUTION!
AVOID EXPOSURE – INVISIBLE LASER RADIATION IS EMITTED FROM THIS APERTURE

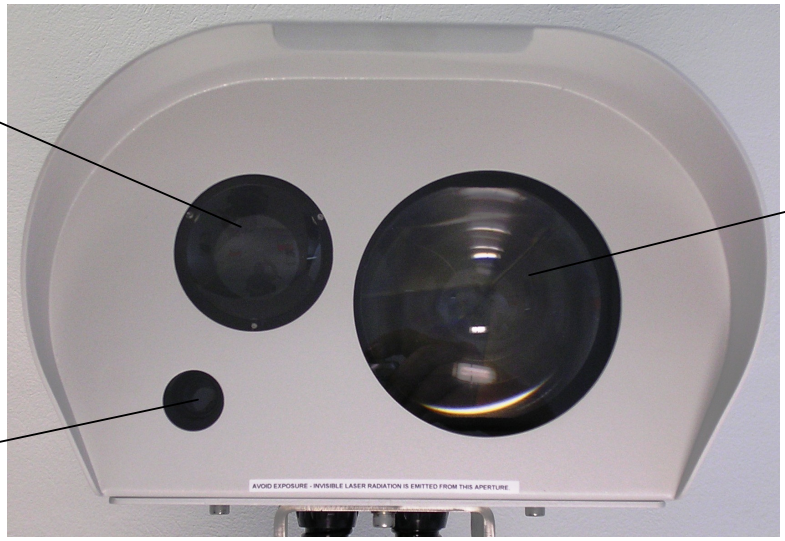


Figure 1.1: Front View

2. Back Panel: Display, indicators and selectors description and functioning

All models of the NL/100-880 and NL/155-1900 series are SNMP manageable. SNMP monitoring can be performed using Netronics MegaVision SNMP management server application.
The monitoring can also be performed by means of direct connection of the computer to the NetLight with an Internet browser serving as an interface (Internet Explorer, Firefox or any other browser can be used).
The accessibility level and the use of different features depend on the client's license.
See page 26 for detailed information about licensing and accessibility.

A. NL/G-1000 and NL/G-1000 -F - Gigabit-Ethernet Systems

The NetLight G-1000 supports Gigabit Ethernet (1.25 Gbps) and FibreChannel (1.0625 Gbps) protocols and is based on SFP interface.

Fusion (for Giga-Ethernet applications)

The NL/G-1000 can be ordered with the Fusion option (NL/G-1000 -F, P.N: NL/G-1000 /XYL/F*).
In this case the NL/G-1000-F model can be connected to the back-up radio system without special Netronics Switch and card supporting Fusion. This NetLight can be connected to any Giga-Switch with 1000Base-SX port, which should be connected to the optical port of the NetLight labeled "Redundant", while the back-up radio system is connected to a 10/100Base-T port of the same Switch.

Because in most cases, the interface to the radio is 100BaseTX, whereas the data flow from the NetLight is "forced 1000", if the switch is managed, it can be used to maintain QoS and prioritize packets on the data flow from the higher bit rate to the lower bit rate of the radio interface. If the switch is unmanaged, up to 90% packets are dropped at random, depending on utilization.

The fusion mechanism has a hysteresis of approximately 2dB. The unit enters fusion mode at a reading of approximately **15** on the display (Optical Power), and once in fusion mode, returns to FSO mode at a reading of approximately **24**.
In the presence of background light, these numbers will be offset by the background light contribution. However, the fusion threshold levels are independent of background light and triggered by actual signal level, so it maintains the same margin above the sensitivity threshold.

To learn more about Fusion operation mode and connections, please refer to pages 21-24.

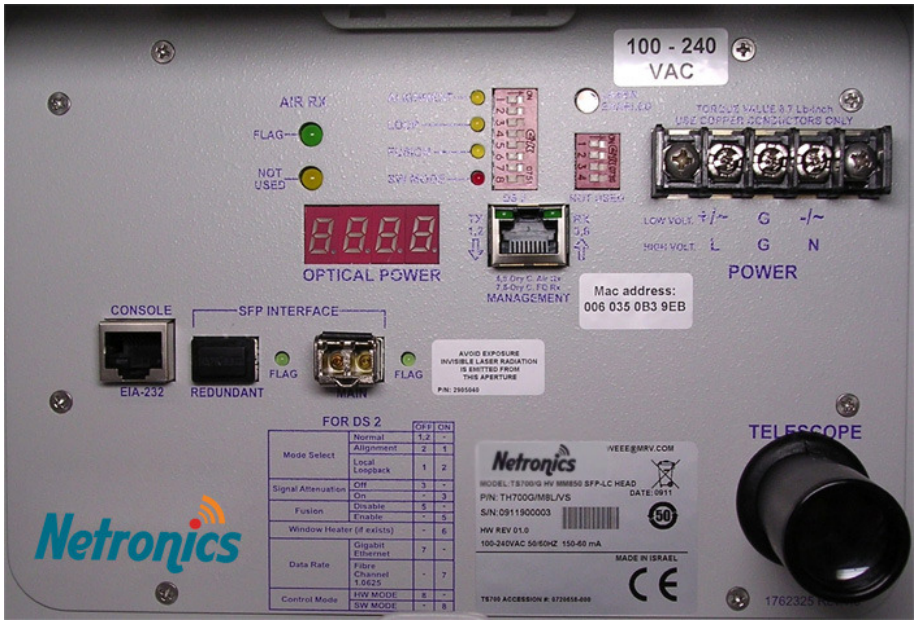
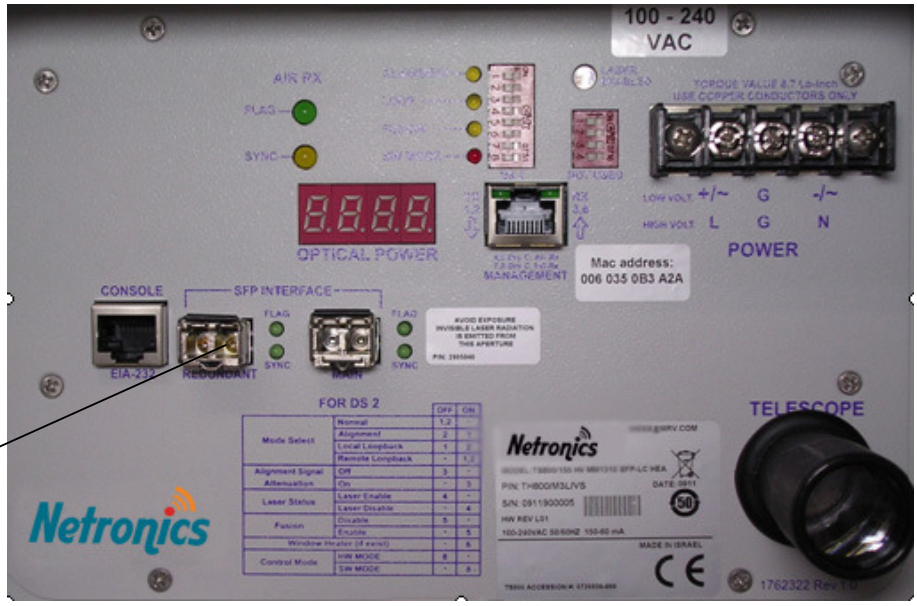


Figure 1.2: NL/G-1000 Model Back Panel



Additional SFP port populated for the Fusion option.

Figure 1.3: NL/G-1000 -F Model Back Panel

Back Panel Description

Table 2: NL/100-880/G and NL/G-1000-F Model Back Panel Controls, Interfaces, and Indicators

Connectors	Power	Power source Terminal Block (Main or UPS)
	Fiber optic	Fiber Optic interface port (SFP) for connection to the peripheral equipment. The standard interface is MM 850nm LC connector; other interfaces are available upon request (refer to price list or data sheet). In model NL/G-1000-F with the fusion option, there are two fiber optic interface ports for connection to the Fusion system; one primary and the other redundant.
	NL Console	RJ45 connection to the NL console for CLI (Command Line Interface) use. This connection requires a special cable (RJ45 to DB9) supplied by Netronics
	Management	Connection to 10/100BaseTX SNMP management interface. Pins 1,2: TX and 3,6 RX. Pins (4,5) and (7,8) of this connector can be used for dry contact purposes, for Air link flag and F/O flag alarms respectively

Selectors (DIP switch on the right side) *shown in Figures 1.2 and 1.3*	Not Used	This DIP switch (4 toggles) is not used in the NL/G-1000 models
Selectors (DIP Switch DS2 Toggles) *shown in Figures 1.2 and 1.3* *(ON=right side OFF= left side)*	Mode Select (Toggles 1, 2)	Set the Operating Mode **Normal**: DIP switch toggles #1 and #2 are in OFF position = Signal received via the F/O port is transmitted through the Air link TX. Signal received via the Air link RX is transmitted through the F/O TX. This operating mode is the one to use for regular working mode with the Network. **Alignment**: DIP switch toggles #1 ON and #2 OFF = Idle transmitted automatically **Loopback**: DIP switch toggles #1 OFF and #2 ON = Data received by the F/O RX is directly returned through the F/O TX. Data received by the Air Rx is returned through the Air TX
	Signal Attenuation (Toggle 3)	ATTENUATION: The signal (alignment signal or data signal) is attenuated (~9db) when the DIP switch toggle #3 is moved to ON position (to use when the installation distance is less than 100m and/or the power received is too high i.e. more than 1000). Switch back to OFF position for normal mode.
	Fusion (Toggle 5)	This switch toggle enables operation of NETRONICS's Fusion system (Built-in fusion option or switch option). For additional information, see pages 5, 21-24. Switch toggle 5 OFF: Fusion not Active (Disabled) Switch toggle 5 ON: Fusion active (Enabled).

	Window Heater (Optional) (Toggle 6)	Used only with the heating option (To be specified in the PO). Switch toggle 6 OFF: The heater is disabled Switch toggle 6 ON: The heater is enabled. The heating will start operating only if one of the following conditions is present: or the temperature is lower than 15°C; or the humidity level in the air is above 80%. There is a controller with a thermostat inside the NetLight, which controls the heating in accordance with the above conditions.
	Data rate (Toggle 7)	OFF position for Gigabit Ethernet, ON position for 1.0625Gb/s Fiber Channel
	Control Mode (Toggle 8)	When the DIP switch toggle #8 is in the OFF position, the NetLight is in the HARDWARE mode, i.e. the NetLight is controlled only at the NetLight itself by means of the switches on its back panel. When the DIP switch toggle is in the ON position, the NetLight is in the SOFTWARE mode i.e. the NetLight is controlled by the management Software and various functions can be activated by means of this management Software.

Indicators (7-segment display, LEDs)	Air RX Flag LED	Green LED indicates signal received by the Air link receiver. Turns ON at the threshold level.
	Laser Enabled LED	Shining Red LED. Turns ON to indicate that laser in enabled to transmit light.
	SFP Flag LED (Right)	Green LED (Right one) indicates Data received by the main Fiber Optic receiver. Turns ON at the threshold level.
	SFP Flag LED (Left)	Green LED (Left one) indicates Data received by the redundant Fiber Optic receiver. Turns ON at the threshold level.
	Alignment LED	Yellow LED. Turns ON if the Alignment Operating Mode is selected.
	Loop LED	Yellow LED. Turns ON in LOOPBACK mode. Flashing in Remote Loop mode.
	Fusion LED	Yellow LED. Turns ON if the Fusion mode is enabled. Flashing when the Fusion (radio back-up system) is active.
	SW Mode LED	Red LED. Turns ON if the SW Mode (SOFTWARE) Operating Mode is selected.
	Management L (Link) (on the RJ45 connector)	Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment)
	Management D (Data) (on the RJ45 connector)	Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.
	Optical Power 7-segment display	Digital readout indicates the Optical Power level received by the Airlink receiver.

Alignment	***Telescope***	For fine alignment.

B. NL/100-880 - Fast-Ethernet System

The NetLight100-880 supports Fast Ethernet (100 Mbps) protocol.
The NL/100-880 model includes the option for an optical SFP. Therefore if somebody needs a NetLight for a short distance for Fast Ethernet with an optical interface, he can order the NL/100-880 and the required SFP (it can be purchased from Netronics or anywhere else).
Here as well if the SFP is plugged in its appropriate housing the 100BaseTX port operation is cancelled.
If somebody needs a NetLight for a short distance for a different protocol (155, E3, T3, etc…), he should order the NL/155-1900.

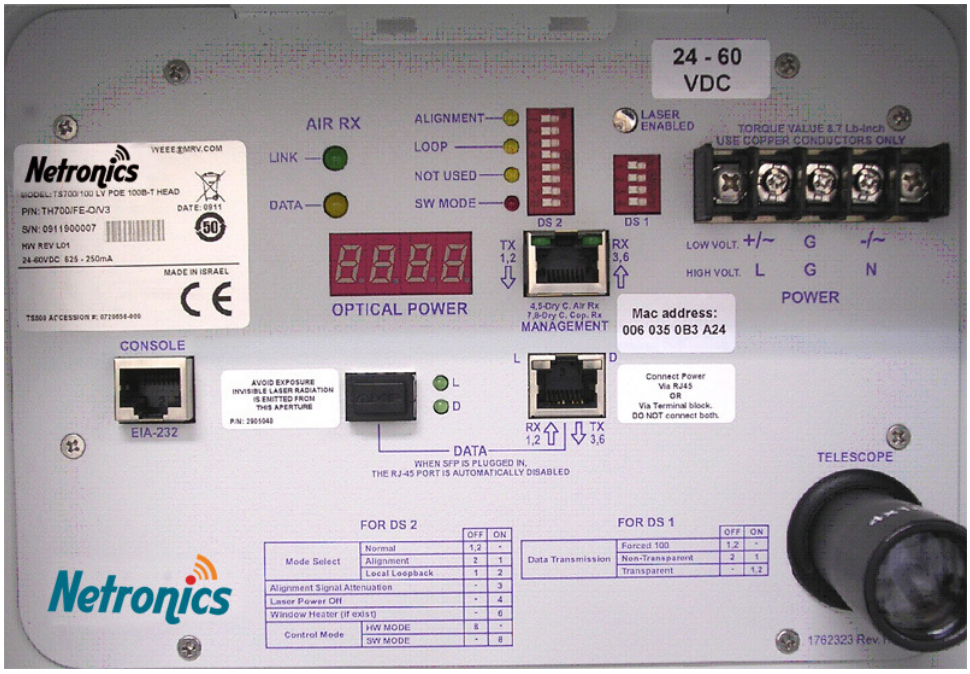
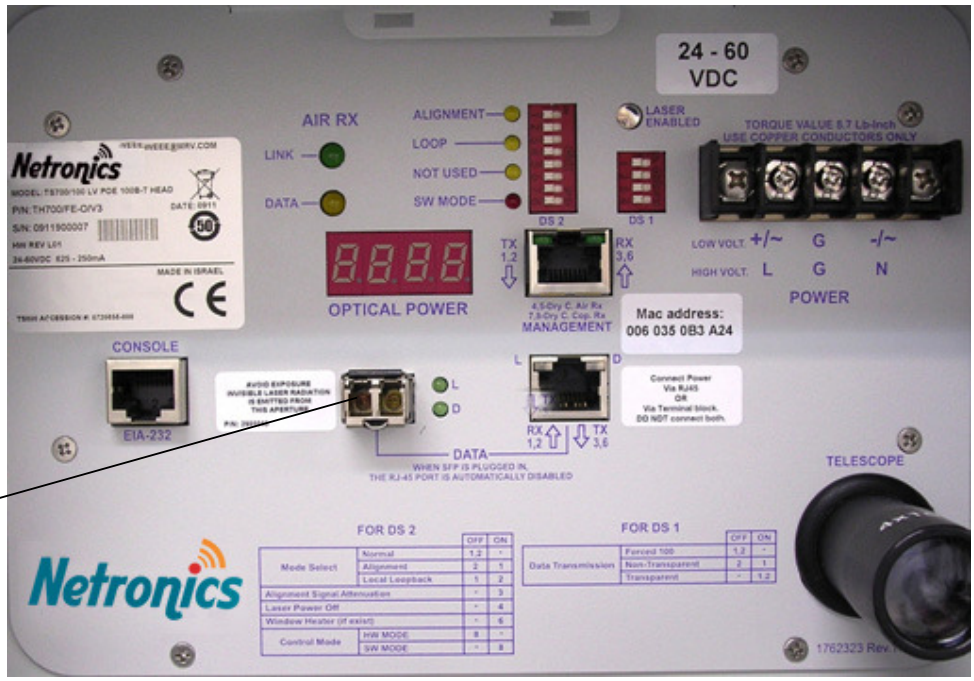


Figure 1.4: NL/100-880 Model Back Panel



SFP port populated for optical connection

Figure 1.5: NL/100-880 with SFP port (optional)

Back Panel Description

Table 3: NL/100-880 Back Panel Controls, Interfaces, and Indicators

Connectors	Power	Power source Terminal Block (Main or UPS)
	100Base-TX - DATA	Copper interface (RJ45) for STP cables. MDI-X connection (TX: pins 3,6 and RX: pins 1,2). Connection to the peripheral equipment. This connector can be used for Power-over-Ethernet (PoE) but only with the Low Voltage NetLight version (NL/100-880/FE-O/V3). The standard power for PoE is 48 VDC. Alternatively, the NL/100-880 can operate with 24-60 VDC via the power terminal block.. See appendix I.
	SFP – DATA *(Optional)*	Optional Fiber Optic interface port (SFP) for connection to the peripheral equipment. The standard NL/100-880 comes without the SFP module, it can be purchased from Netronics or anywhere else. When the SFP is plugged in the 100BaseTX port is automatically disabled. Note: Keep the cover on the housing if the SFP module is unplugged or not used.
	NL Console	RJ45 connection to the NL console for CLI (Command Line Interface) use. This connection requires a special cable (RJ45 to DB9) supplied by Netronics
	Management	Connection to 10/100BaseTX SNMP management interface. Pins 1,2: TX and 3,6 RX. Pins (4,5) and (7,8) of this connector can be used for dry contact purposes, for Airlink flag and F/O flag alarms respectively Note: the standard NL/100-880 model comes without an SNMP license; it can be ordered and activated anytime by software just by entering a code given by Netronics. For more information about SNMP licensing see page 26 or the price list.

Alignment	***Telescope***	For fine alignment.

Selectors (DIP Switch DS1 Toggles) *- - shown in Figures 1.4 and 1.5 (ON=right side OFF= left side)*	Data Transmission *(Toggles 1,2)*	Set the Data Transmission mode of the 100Base-TX port: - Forced100 mode: 1,2 OFF - Non-Transparent mode: 2 OFF, 1 ON - Transparent mode: 1,2 ON *See page 12 table 4 for setting the Data Transmission mode.* Note: The SFP port is always at Forced 100 mode.

***Note**: It's recommended to set the Main and Redundant ports at the same Data Transmission mode, either both forced100 or both Transparent mode or both Non-Transparent mode.*

Selectors (DIP Switch DS2 Toggles) *-- shown in Figures 1.4 and 1.5* *(ON=right side OFF= left side)*	Mode Select *(Toggles 1, 2)*	Set the Operating Mode **Normal**: DIP switch toggles #1 and #2 are in OFF position = Signal received via the F/O port is transmitted through the Air link TX. Signal received via the Air link RX is transmitted through the F/O TX. This operating mode is the one to use for regular working mode with the Network. **Alignment**: DIP switch toggles #1 ON and #2 OFF = Idle transmitted automatically **Loopback** DIP switch toggles #1 OFF & #2 ON= Data received by the wire line (F/O or copper) RX is directly returned through the wire line TX. Data received by the Air Rx is returned through the Air TX
	Alignment Signal Attenuation (Toggle 3)	ATTENUATION: The alignment signal is attenuated (~20db) when the DIP switch toggle #3 is moved to ON position.(to use when the installation distance is less than 200m only for alignment mode). Switch back to OFF position for normal mode.
	Laser Power Off *(Toggle 4)*	Turning off laser TX when the DIP switch toggle is moved to ON
	Window Heater (Optional) (Toggle 6)	Used only with the heating option (To be specified in the PO). Switch toggle 6 OFF: The heater is disabled Switch toggle 6 ON: The heater is enabled. The heating will start operating only if one of the following conditions is present: or the temperature is lower than 15°C; or the humidity level in the air is above 80%. There is a controller with a thermostat inside the NetLight, which controls the heating in accordance with the above conditions.
	Control Mode (Toggle 8)	When the DIP switch toggle #8 is in the OFF position, the NetLight is in the HARDWARE mode, i.e. the NetLight is controlled only at the NetLight itself by means of the switches on its back panel. When the DIP switch toggle is in the ON position, the NetLight is in the SOFTWARE mode i.e. the NetLight is controlled by the management Software and various functions can be activated by means of this management Software.

Indicators (7-segment display, LEDs)	Air RX Link LED	Green LED indicates signal received by the Airlink receiver. Turns ON at the threshold level. *For more details see pages 46-49*
	Air RX Data LED	Yellow LED blinking indicates Data transfer via the Airlink receiver to the interface. *For more details see pages 46-49*
	100Base-TX Link LED (L)	Left green LED indicates the presence of Link in the 100Base-TX connector (coming from the peripheral equipment). *For more details see pages 46-49*
	100Base-TX Data LED (D)	Right green LED blinking indicates Data transferred via the 100Base-TX interface. *For more details see pages 46-49*

	SFP (Optional), Link LED (L)	Upper green LED indicates Link detected in the optical SFP (coming from the peripheral equipment).
	SFP (Optional), Data LED (D)	Lower green LED blinking indicates Data transferred via the optical SFP interface.
	Alignment LED	Yellow LED. Turns ON if the Alignment Operating Mode is selected.
	Loop LED	Yellow LED. Turns ON in LOOPBACK mode. Flashing in Remote Loop mode.
	Not Used	This LED is not in use in the NL/100-880 model. (used for Fusion for other models)
	SW Mode LED	Red LED. Turns ON if the SW Mode (SOFTWARE) Operating Mode is selected.
	Laser Enabled	Shining Red LED: Turns ON when the Laser is ON and turns OFF when the laser is powered off by pushing the DS toggle #4 ON.
	Management L (Link) (on the RJ45 connector)	Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment)
	Management D (Data) (on the RJ45 connector)	Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.
	Optical Power 7-segment display	Digital readout indicates the Optical Power level received by the Airlink receiver.

NetLight and Switch configuration:

Table 4: NL/100-880 Data Transmission setting

NetLight "Data Transmission" setting Main Port	**Network Switch setting** ***(depending on Switch manufacturer and model)***
Forced 100	Forced 100
Non-Transparent	Auto-Negotiation / Forced 100
Transparent	Auto-Negotiation* / Forced 100

If both switches have 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).

For more explanation about Data Transmission setting please see page 42

C. NL/155-1900 and NL/155-1900-F, 1-155Mbps Systems

As mentioned in the beginning of the chapter this series can operate with all the data and protocol in the 10-155 Mbps range without affecting the performance. The NetLight identifies the protocol automatically and locks on it. In addition we have clock and data recovery for each protocol.
The standard NL/155-1900 model doesn't include the Fusion option.

Fusion (for Fast-Ethernet applications)

The NL/155-1900 can be ordered with the Fusion option (it can be added in the field as well), so it can be connected to a back-up radio system. This NetLight can be connected to any Switch (supporting 10/100) via standard converter, which should be connected to the optical port of the NetLight labeled "Redundant", while the back-up radio system is connected to the same Switch.

The NetLight can be also directly connected to MC (Media Converter) of the type 10/100 TX-100 FX (for example Netronics media converter MC102F)

In case of NetLight air link interruption, the data is rerouted from the main port to the redundant port.

To learn more about Fusion operation mode and connections, please refer to pages 21-24

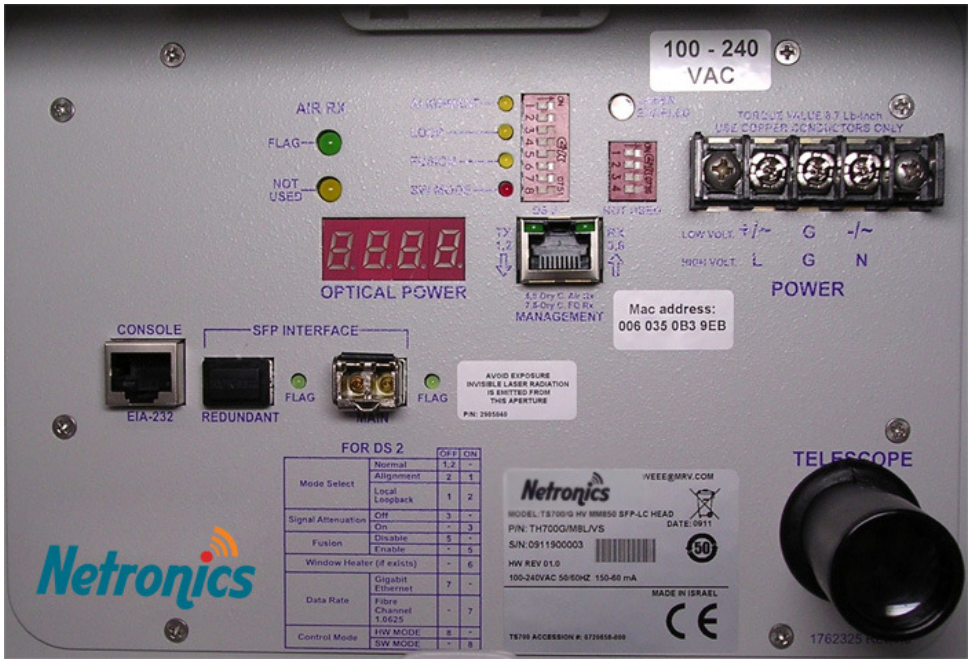
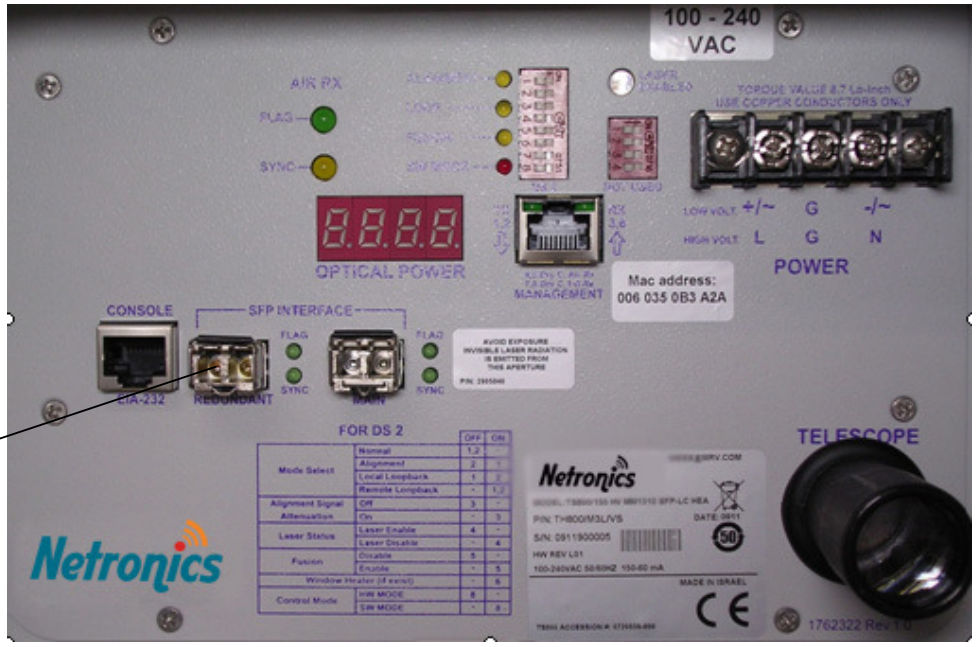


Figure 1.6: NL/155-1900 Standard Model Panel



Additional SFP port populated for the Fusion option.

Figure 1.7: NL/155-1900-F Model Panel

Back Panel Description

Table 5: NL/155-1900 and NL/155-1900-F Models Back Panel Controls, Interfaces, and Indicators

Connectors	Power	Power source Terminal Block (Main or UPS)
	Fiber optic	Fiber Optic interface port (SFP) for connection to the peripheral equipment. The standard interface is MM 1300nm LC connector; other interfaces are available upon request (refer to price list or data sheet). In model NL/155-1900-F with the fusion option, there are two fiber optic interface ports for connection to the Fusion system; one primary and the other redundant.
	NL Console	RJ45 connection to the NL console for CLI (Command Line Interface) use. This connection requires a special cable (RJ45 to DB9) supplied by Netronics
	Management	Connection to 10/100BaseTX SNMP management interface. Pins 1,2: TX and 3,6 RX. Pins (4,5) and (7,8) of this connector can be used for dry contact purposes, for Airlink flag and F/O flag alarms respectively. Note: the standard NL/155-1900 model comes with the Basic SNMP license; it can be upgraded to the extended version and activated anytime by software just by entering a code given by Netronics. For more information about SNMP licensing see page 26 or the price list.

Selectors (DIP switch on the right side) *shown in Figures 1.6 and 1.7*	Not Used	This DIP switch (4 toggles) is not used in the NL/155-1900 models
Selectors (DIP Switch DS2 Toggles) *shown in Figures 1.6 and 1.7* *(ON=right side OFF= left side)*	Mode Select (Toggles 1, 2)	Set the Operating Mode **Normal**: DIP switch toggles #1 and #2 are in OFF position = Signal received via the F/O port is transmitted through the Airlink TX. Signal received via the Airlink RX is transmitted through the F/O TX. This operating mode is the one to use for regular working mode with the Network. **Alignment**: DIP switch toggles #1 ON and #2 OFF = Idle transmitted automatically **Loopback**: DIP switch toggles #1 OFF and #2 ON = Data received by the F/O RX is directly returned through the F/O TX. Data received by the Air Rx is returned through the Air TX **Remote Loop** : DIP switch toggles #1 ON and #2 ON = The inverse of "LOOPBACK" – i.e. The signal travels via the airlink and at the remote Air RX is returned via the Air TX to the local unit. The F/O RX of the remote unit is looped to its F/O TX.
	Alignment Signal Attenuation (Toggle 3)	ATTENUATION: The alignment signal is attenuated (~20db) when the DIP switch toggle #3 is moved to ON position.(to use when the installation distance is less than 200m only for alignment mode). Switch back to OFF position for normal mode.
	Laser Status *(Toggle 4)*	Turning OFF laser TX when the DIP switch toggle is moved to ON (Laser Disable)
	Fusion (Toggle 5)	This switch toggle enables operation of Netronics Fusion system (Built-in fusion option or switch option). For additional information, see pages 13, 21-24. Switch toggle 5 OFF: Fusion not Active (Disabled) Switch toggle 5 ON: Fusion active (Enabled).
	Window Heater (Optional) (Toggle 6)	Used only with the heating option (To be specified in the PO). Switch toggle 6 OFF: The heater is disabled Switch toggle 6 ON: The heater is enabled. The heating will start operating only if one of the following conditions is present: or the temperature is lower than 15°C; or the humidity level in the air is above 80%. There is a controller with a thermostat inside the NetLight, which controls the heating in accordance with the above conditions.
	Control Mode (Toggle 8)	When the DIP switch toggle #8 is in the OFF position, the NetLight is in the HARDWARE mode, i.e. the NetLight is controlled only at the NetLight itself by means of the switches on its back panel. When the DIP switch toggle is in the ON position, the NetLight is in the SOFTWARE mode i.e. the NetLight is controlled by the management Software and various functions can be activated by means of this management Software.

Indicators (7-segment display and LEDs)	Air RX Flag LED	Green LED indicates data received by the Airlink receiver. Turns ON at the threshold level.
	Air RX Sync LED	Yellow LED. Turns ON if there is synchronization between the received air data and the NetLight clock recovery.
	SFP Main, RX Flag LED	Upper green LED indicates Data received by the Fiber Optic receiver. Turns ON when light from the fiber is present.
	SFP Main, RX Sync LED	Lower green LED. Turns ON if there is synchronization between the received data from the fiber and the NetLight clock recovery.
	SFP Redundant, RX Flag LED *(Optional)*	Upper green LED indicates Data received by the Fiber Optic receiver. Turns ON at the threshold level.
	SFP Redundant, RX Sync LED *(Optional)*	Lower green LED. Turns ON if the Fusion is active and there is synchronization with the received Data from the back up system.
	Alignment LED	Yellow LED. Turns ON if the Alignment Operating Mode is selected.
	Loopback LED	Yellow LED. Turns ON in LOOPBACK mode. Flashing in Remote Loop mode.
	Fusion LED	Yellow LED. Turns ON if the Fusion mode is enabled. Flashing when the Fusion (radio back-up system) is active.
	SW Mode LED	Red LED. Turns ON if the SW Mode (SOFTWARE) Operating Mode is selected.
	Laser Status	Shining Red LED: Turns ON when the Laser is ON and turns OFF when the laser is powered off by pushing the DS toggle #4 ON. The LED turns of also when there is no Data.
	Management L (Link) (on the RJ45 connector)	Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment)
	Management D (Data) (on the RJ45 connector)	Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.
	Optical Power 7-segment display	Digital readout indicates the Optical Power level received by the Airlink receiver.

Alignment	***Telescope***	For fine alignment.

D. NL/155-1900/100-F: Fast-Ethernet System with Fusion

The ***NL/155-1900/100-F*** is an additional product of the NetLight 155-1900 series. It supports the Fast-Ethernet protocol (100 Mbps) and has a 100Base-TX interface. The standard model of this product has the Fusion option, which allows for connecting to the NetLight of a back-up system like radio or similar one. The advantage of this model is the 100Base-TX interface enabling direct connection between the NetLight and the radio without using a converter. (See page 24 for connection details)

The standard model of the *NL/155-1900/100-F* is low voltage 24-60VDC, (P.N: NL/155-1900/FET/F3). In the default "3" version the product has the PoE feature (Power over Ethernet).
Alternately, any power source, which can supply 24-60VDC, can be used. In this case, the NetLight does not have the PoE feature and the power and the data have to be supplied separately.
Naturally, the high voltage (100-240VAC) version of the *NL/155-1900/100-F* (*NL/155-1900*/FET/FS) can be ordered as well; though of course this version does not have the PoE feature and the power and the data have to be supplied separately.

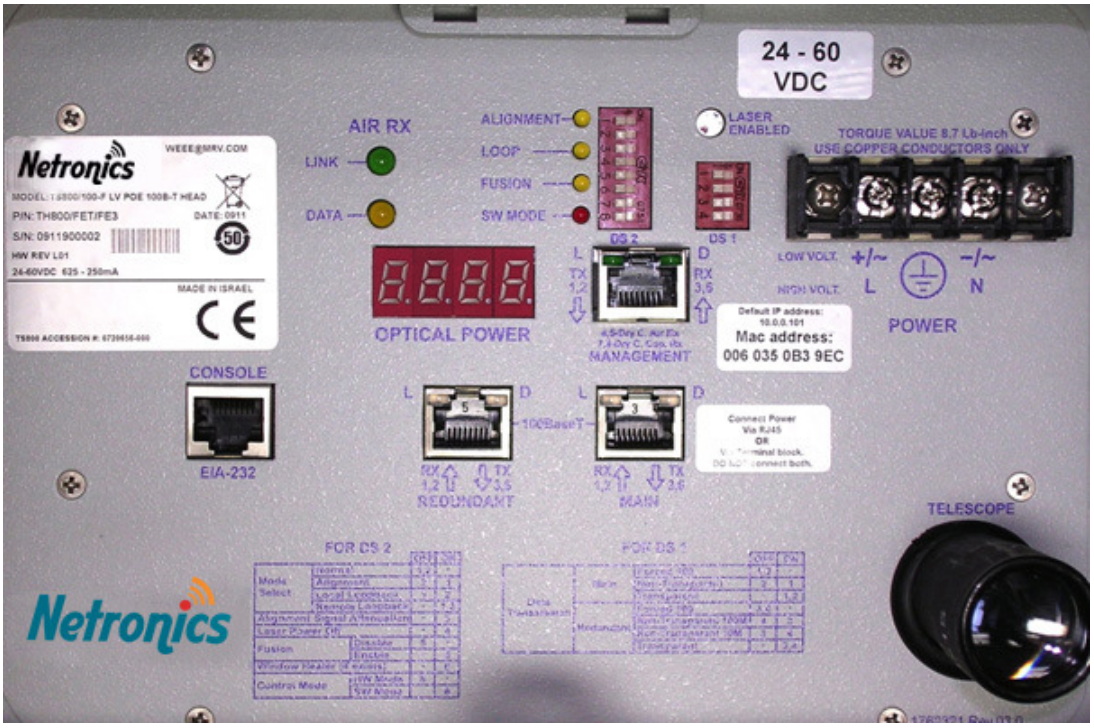


Figure 1.8: NL/155-1900/100-F Standard Model Panel

Back Panel Description

Table 6: NL/155-1900/100-F Standard Model Back Panel Controls, Interfaces, and Indicators

Connectors	Power	Power source Terminal Block (Main or UPS).
	100Base-TX Main	Copper interface (RJ45) for STP cables. MDI-X connection (TX: pins 3,6 and RX: pins 1,2). Connection to the peripheral equipment. This connector can be used for Power-over-Ethernet (PoE) but only with the Low Voltage NetLight version (NL/155-1900/FET/F3). The standard power for PoE is 48 VDC. Alternatively, the NL/155-1900/100 can operate with 24-60 VDC via the power terminal block. See appendix I.
	100Base-TX Redundant	Copper interface (RJ45) for STP cables. MDI-X connection (TX: pins 3,6 and RX: pins 1,2). Connect this port to the back-up radio (directly or through a 10/100 switch).
	Management	Connection to 10Base-T SNMP management interface. Pins 1,2: TX and 3,6 RX. Pins (4,5) and (7,8) of this connector can be used for dry contact purposes, for Air RX link and Copper RX link alarms respectively Note: the standard NL/155-1900 model comes with the Basic SNMP license; it can be upgraded to the extended version and activated anytime by software just by entering a code given by Netronics. For more information about SNMP licensing see page 26 or the price list.

Selectors (DIP Switch DS1 Toggles) *- - shown in Figure 1.8* *(ON=right side OFF= left side)*	Data Transmission *(Toggles 1,2,3,4)*	Set the Data Transmission mode of the Main port and the Redundant port: Main: - Forced100 mode: 1,2 OFF - Non-Transparent mode: 2 OFF, 1 ON - Transparent mode: 1,2 ON Redundant - Forced100 mode: 3,4 OFF - Non-Transparent mode 100M: 4 OFF, 3 ON - Non-Transparent mode 10M: 3 OFF, 4 ON - Transparent mode: 3,4 ON. *See page 20, table 7 for setting the Data Transmission mode.*

***Note**: It's recommended to set the Main and Redundant ports at the same Data Transmission mode, either both forced100 or both Transparent mode or both Non-Transparent mode.*

Selectors (DIP Switch DS2 Toggles) *-- shown in Figure 1.8* *(ON=right side OFF= left side)*	Mode Select (Toggles 1, 2)	Set the Operating Mode **Normal**: DIP switch toggles #1 and #2 are in OFF position = Signal received via the F/O port is transmitted through the Airlink TX. Signal received via the Airlink RX is transmitted through the F/O TX. This operating mode is the one to use for regular working mode with the Network. **Alignment**: DIP switch toggles #1 ON and #2 OFF = Idle transmitted automatically **Loopback** DIP switch toggles #1 OFF & #2 ON= Data received by the wire line (F/O or copper) RX is directly returned through the wire line TX. Data received by the Air Rx is returned through the Air TX **Remote Loop**: DIP switch toggles #1 and #2 ON= The inverse of "Loopback" – ie. The signal travels via the air link and at the remote Air RX is returned via the Air TX to the local unit. The wire line RX of the remote unit is looped to its wire line TX.
	Alignment Signal Attenuation (Toggle 3)	ATTENUATION: The alignment signal is attenuated (~20db) when the DIP switch toggle #3 is moved to ON position.(to use when the installation distance is less than 200m only for alignment mode). Switch back to OFF position for normal mode.
	Laser Power Off *(Toggle 4)*	Turns off laser TX when the DIP switch toggle is moved to ON
	Fusion *(Toggle 5)*	This switch toggle enables working with Netronics Fusion system (Built-in fusion option or switch option). For additional information, see page 13. Switch toggle 5 OFF: Fusion Disabled Switch toggle 5 ON: Fusion Enabled.
	Window Heater (Optional) (Toggle 6)	Used only with the heating option (To be specified in the PO). Switch toggle 6 OFF: The heater is disabled Switch toggle 6 ON: The heater is enabled. The heating will start operating only if one of the following conditions is present: or the temperature is lower than 15°C; or the humidity level in the air is above 80%. There is a controller with a thermostat inside the NetLight, which controls the heating in accordance with the above conditions.
	Control Mode *(Toggle 8)*	When the Dip Switch toggle #8 is on OFF position, the NetLight is in the HARDWARE mode, i.e. the NetLight is controlled only by the NetLight itself by means of the switches on its back panel. When the Dip Switch toggle is on ON position, the NetLight is in the SOFTWARE mode i.e. the NetLight is controlled by the management Software and various functions can be activated by means of this management Software.

Indicators (7-segment display and LEDs)	Air RX Link LED	Green LED indicates signal received by the Airlink receiver. Turns ON at the threshold level. *For more details see pages 50-53*
	Air RX Data LED	Yellow LED blinking indicates Data transfer via the Airlink receiver to the interface. *For more details see pages 50-53*
	100Base-TX Link LED (L)	Left green LED indicates the presence of Link in the 100Base-TX connector (coming from the peripheral equipment). If a 10Mbps back-up is connected and the Fusion is active, the Main becomes 10Mbps and the LED will blink. *For more details see pages 50-53*

	100Base-TX Data LED (D)	Right green LED blinking indicates Data transferred via the 100Base-TX interface. *For more details see pages 50-53*
	10/100Base-TX Redundant, LINK LED (L)	Left green LED indicates the presence of Link in the 100Base-TX connector (coming from the peripheral equipment) If a 10Mbps back-up is connected and the Fusion is active the LED will blink *For more details see pages 50-53*
	10/100Base-TX Redundant, DATA LED (D)	Right green LED blinking indicates Data transferred via the 100Base-TX interface. *For more details see pages 50-53*
	Alignment LED	Yellow LED. Turns ON if the Alignment Operating Mode is selected.
	Loopback LED	Yellow LED. Turns ON in LOOPBACK mode. Flashing in Remote Loop mode.
	Fusion LED	Yellow LED. Turns ON if the Fusion mode is enabled. Flashing when the Fusion (radio back-up system) is active.
	SW Mode LED	Red LED. Turns ON if the SW Mode (SOFTWARE) Operating Mode is selected.
	Laser Enabled	Shining Red LED: Turns ON when the Laser is ON and turns OFF when the laser is powered off by pushing the DS toggle #4 ON.
	Management L (Link) (on the RJ45 connector)	Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment)
	Management D (Data) (on the RJ45 connector)	Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.
	Optical Power 7-segment display	Digital readout indicates the Optical Power level received by the Airlink receiver.

Alignment	***Telescope***	For fine alignment.

NetLight and Switch configuration:

Table 7: NL/155-1900/100-F Data Transmission setting

NetLight "Data Transmission" setting Main Port	**Network Switch setting** ***(depending on Switch manufacturer and model)***
Forced 100	Forced 100
Non-Transparent	Auto-Negotiation / Forced 100
Transparent	Auto-Negotiation* / Forced 100

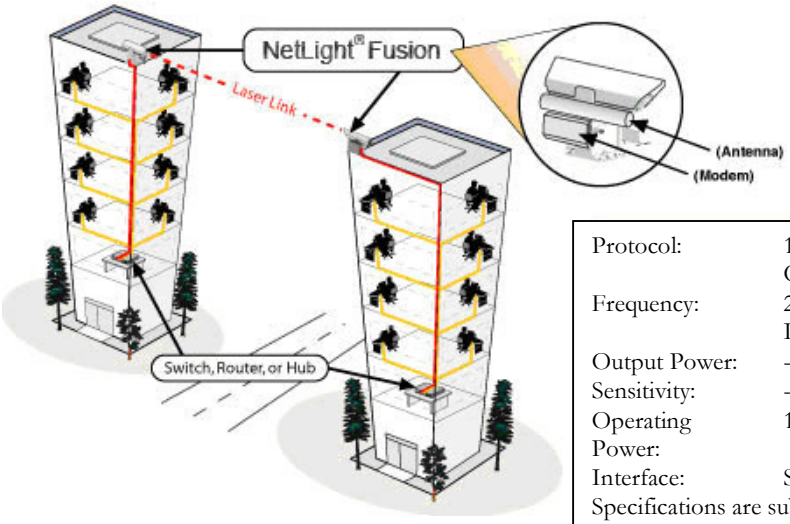
*******If both switches have has 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).*

For more explanation about Data Transmission setting please see page 51

Fusion

Maximizing Link Availability in All Weather Conditions.

The NetLight Fusion was designed to combine the best features of two transport media, laser light and radio waves, to form a single, seamless, wireless communication link between network devices. By leveraging both technologies, we can provide the 99.999% availability that your network requires.



Protocol:	10BaseTX (IEEE 802.1 1 b or 802.11a Or 802.11g)
Frequency:	2.4 - 2.4835 GHz or 5.5-5.8Ghz ISM band (ETSI, FCC
Output Power:	-4 to 24 dbm or up to 20dbm
Sensitivity:	-85 dBm
Operating Power:	110/220 VAC, 500/250 mA
Interface:	Shielded RJ45

Specifications are subject to change at any time without notice.

Figure 1.9: NL & Fusion

The NetLight Fusion has been specifically constructed to maximize link availability between network nodes. These systems use the internationally unlicensed, 2.4 GHz ISM band and are used as a backup for a number of NetLight systems.

NetLight Fusion systems have an optical wireless link that provides Fast Ethernet connectivity as the primary link and Ethernet RF as the backup link. These systems operate in most weather conditions, including heavy rain, snow, and fog with nearly 100% link availability. Ease of installation and freedom from licensing make these systems very simple to deploy.

Examples of Fusion connections and operation mode

1 - Fiber connection

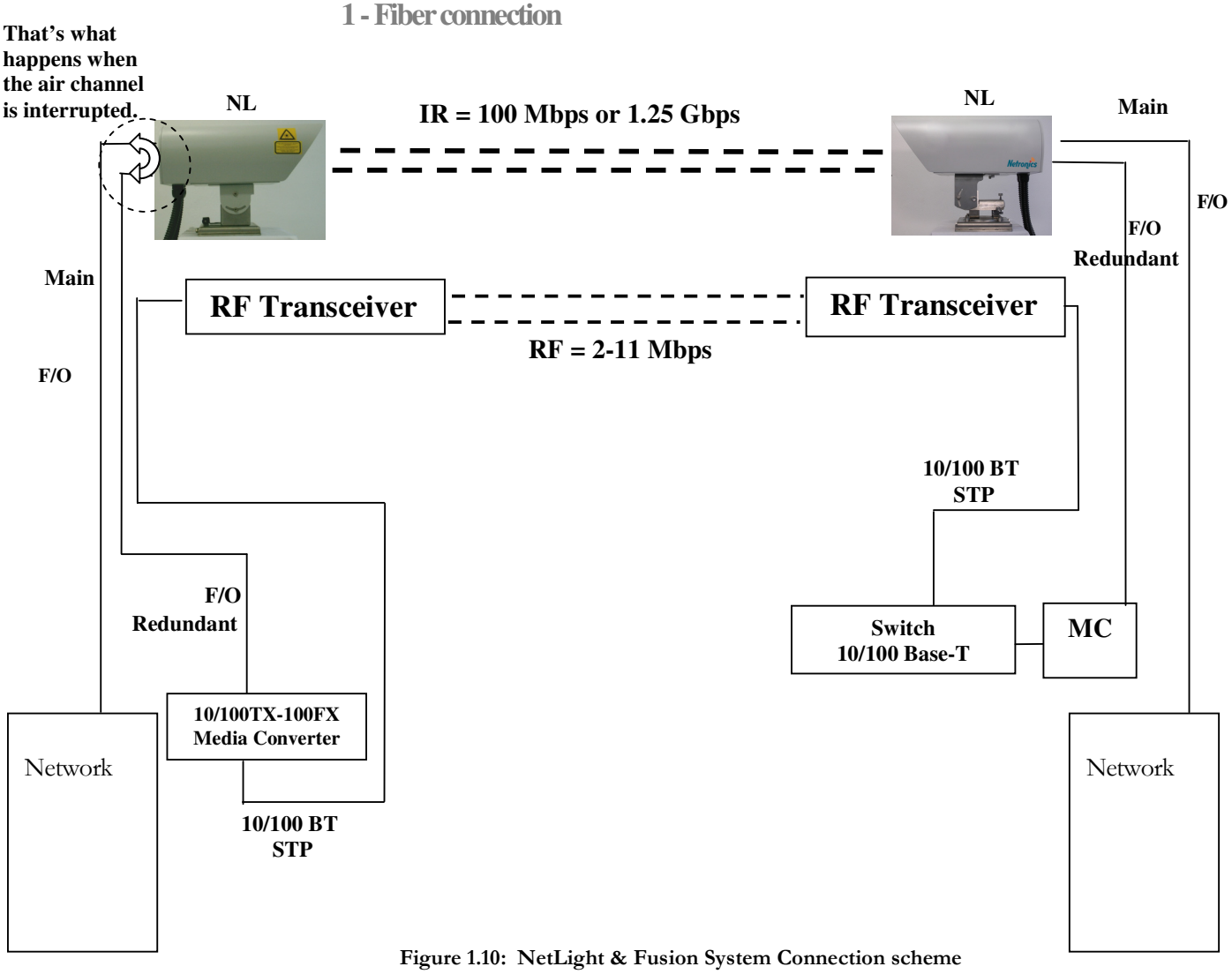


Figure 1.10: NetLight & Fusion System Connection scheme

For a description of the Back Panel and all the functions, see Paragraph A Figure 1.3 and table 2, Paragraph C Figure 1.7 and table 6 and Paragraph D Figure 1.8 and table 6.

Fusion Operation Mode

When at least one of the air channels (IR) is cut for more than one second or drops to approximately 17 mV at the display readout (15mV for the NL/G-1000-F, see page 5):

1. Netlight switches to Fusion mode
2. Data is transmitted from Main module to Redundant module without passing through the air channel
3. The signal is converted to 10/100Base-T by the Switch and the data Rate decreases to ~2-50 Mbps (depending on RF system)

The system switches back to IR channel (NetLight) only when the display readout on both sides increases to approximately 65 mV (24mV for the NL/G-1000-F, see page 5).

Note: To activate the Fusion option, set DIP Switch toggle 5 to the ON position.

2 – NL/G-1000, NL/155-1900 or For NL/155-1900/100-F Fusion connections

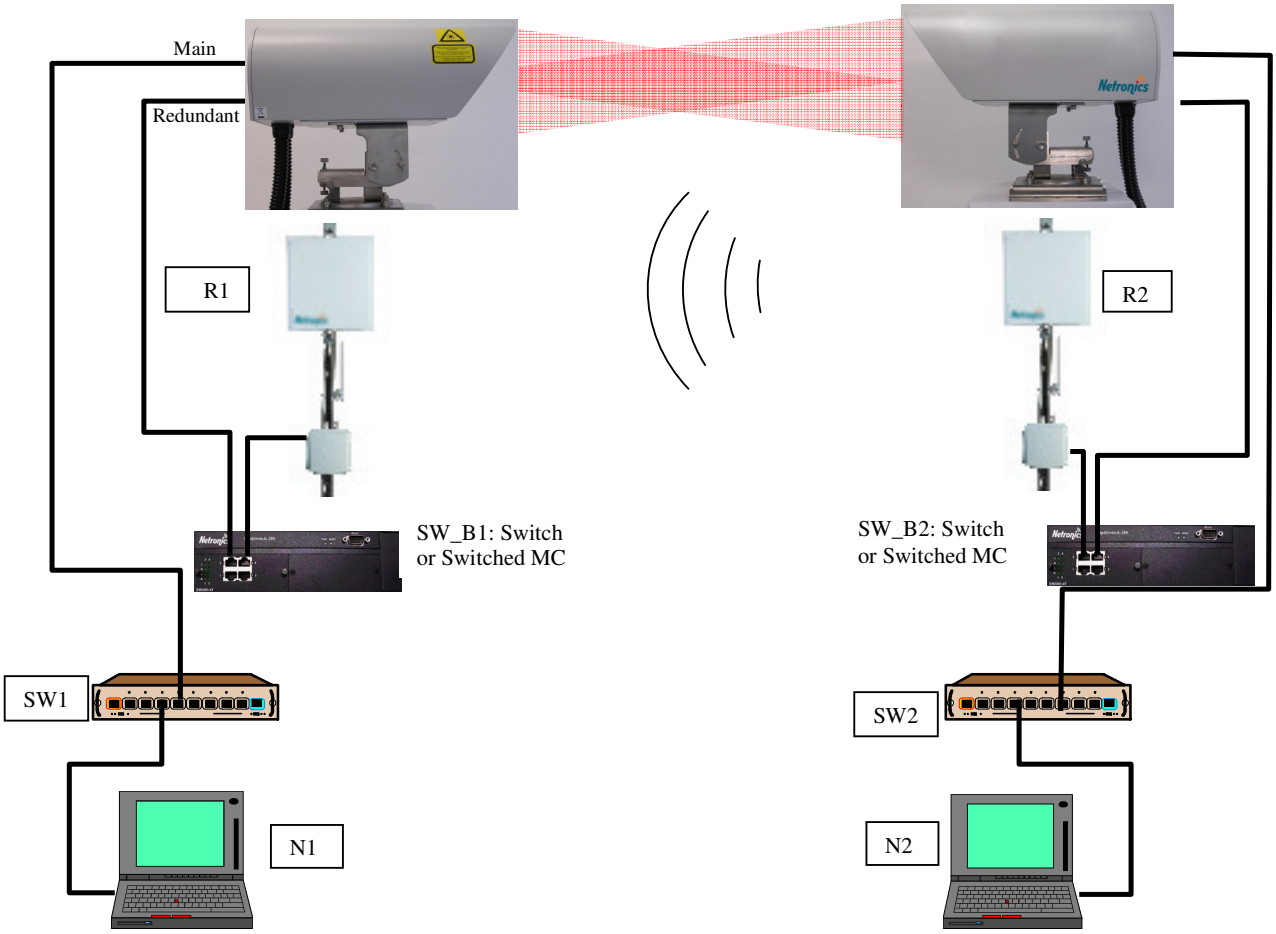


Figure 1.11: Option 1, the back-up RF system is connected to a Switch

Ports configuration for the NL/155-1900/100-F:

Table 8: NetLight and switches ports setting for Fusion connection

NL/155-1900/100-F Ports		Switch1 connected to NL Main Port	Switch2 connected to NL Redundant Port	Transition time NL-Backup and Back
Main Port	**Redundant Port**			
Forced 100	Forced 100	Forced 100	Forced 100	NL-Backup : 1-3 sec / Back : < 1sec
Non-Transparent	Non-Transparent	Forced 100	Forced 100	NL -Backup : < 1sec / Back : < 1sec
Non-Transparent	Non-Transparent	Auto-Negotiation	Auto-Negotiation	NL -Backup : 5-10 sec / Back : < 1sec
Non-Transparent	Non-Transparent	Forced 100	Auto-Negotiation	NL -Backup : < 1sec / Back : < 1sec
Non-Transparent	Non-Transparent	Auto-Negotiation	Forced 100	NL -Backup : 5-10 sec / Back : < 1sec
Non-Transparent	NT-10	Auto-Negotiation	Auto-Negotiation	NL -Backup : 5-10 sec / Back : 5-6 sec
Non-Transparent	NT-10	Auto-Negotiation	Forced10	NL -Backup : 1-3 sec / Back : 3-4 sec
Transparent	Transparent	Forced 100	Forced 100	NL -Backup : 5-10 sec / Back : < 1sec
Transparent	Transparent	Auto-Negotiation*	Auto-Negotiation*	NL -Backup : 50 sec / Back : < 1sec

* If the switch has 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).

The behavior can be different according to the switches manufacturer and model.

b – Option 2: NL/155-1900/100-F Radio connected directly to the NetLight

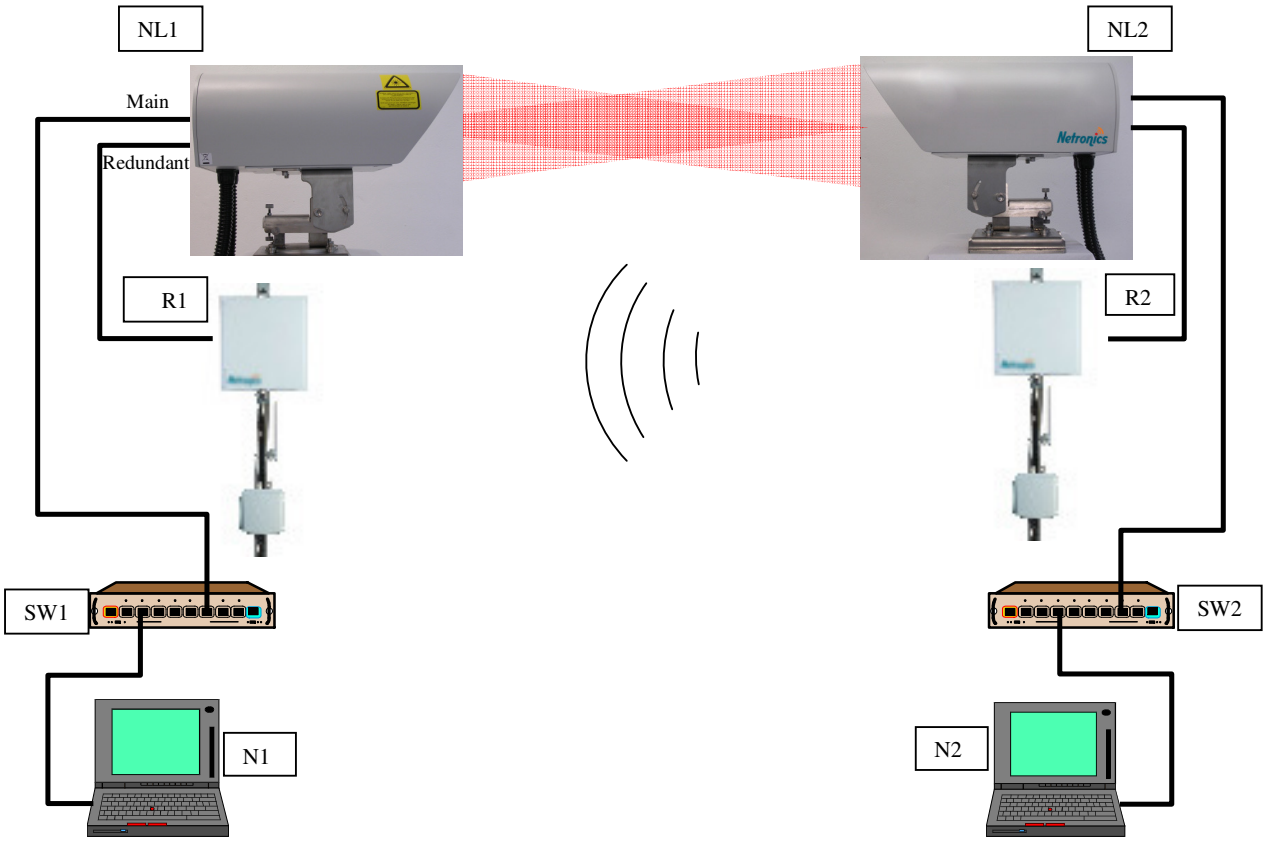


Figure 1.12: Option 2, the back-up RF system is connected directly

Ports configuration for the NL/155-1900/100-F:

Table 9: NetLight and switches ports setting for Fusion connection, Radio connected to NL

NL/155-1900/100-F Ports		Switch connected to NL Main port	Radio connected to NetLight	Transition time NL-Backup and back
Main port	Redundant port			
Non-Transparent	Non-Transparent	Forced100	Auto-Negotiation	NL-Backup : <1 sec Back : < 1sec
Non-Transparent	Non-Transparent	Auto-Negotiation	Auto-Negotiation	NL -Backup : 5-6 sec Back : < 1sec
Non-Transparent	NT-10	Auto-Negotiation	Auto-Negotiation	NL -Backup : 5-10 sec Back : 5-10 sec
Transparent	Transparent	Forced100	Auto-Negotiation	NL -Backup : 5-10 sec Back : < 1sec
Transparent	Transparent	Auto-Negotiation*	Auto-Negotiation	NL -Backup : 50sec Back : 2-5 sec

***** If the switch has 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).

The behavior can be different according to the switches and Radio manufacturer and model.

Loop and Remote Loop Operation Mode

Loop

In this state, the device performs a loop on the twisted pair through the Line Interface, as well as another loop from AIR RX to AIR TX.

Local Loopback

The device on the side of the technician is in LOOP state when DIP switch "1" is "OFF" and DIP switch "2" is "ON".

Remote Loop

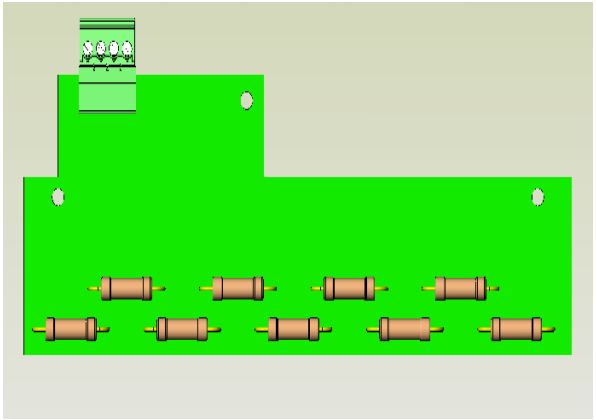
The device on the opposite side turns to loop state by being controlled from the near device (Master) – DIP switch "1" and "2" are in "ON"
In the opposite device (Slave), both DIP switches – 1 and 2 – should be "OFF" (Normal)

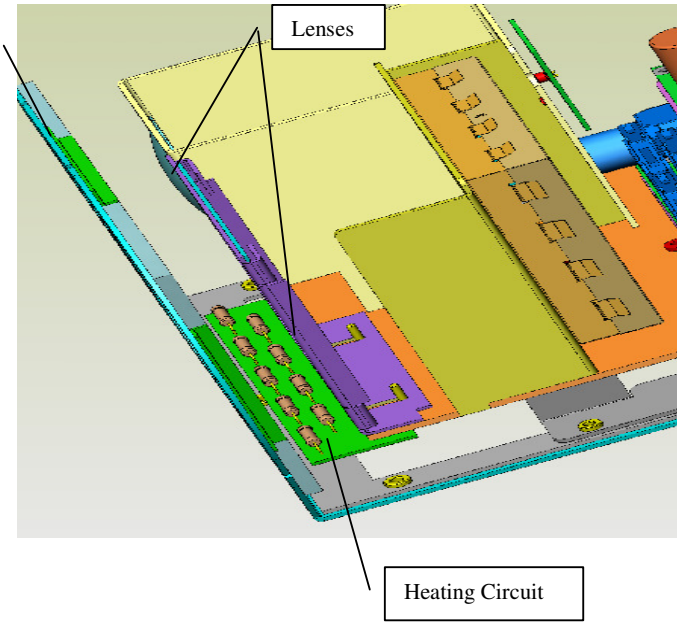
Heating

All our NetLight systems are designed with our special internal air circulation feature, based on dissipation of the power supply heat. This prevents the formation of condensation on the lenses under all weather conditions without the need for additional heating at low temperatures

In spite of the aforesaid, an optional heating can be ordered separately (P.N NLX00-HEAT for a link). We recommend this solution only for extremely adverse weather conditions such as heavy snow with strong wind or high humidity.
The dissipated heat of about 11W creates a differential of about 5-6° between the glass and the environment. The Heating is controlled by a Switching and control circuit.

***Note**: In NLX000/XXX/X3 version (Low Voltage 24-60VDC), when the feed comes from the PoE the heating can't be used. In order to use the heating option the feed should come from the power terminal block. With the heating option, the total power consumption of the NetLight is 25W.*





Figures 1.13a and 1.13b: Heating System

Monitoring and Management options

The new generation of NetLights, including the NL-100-880 series, are already equipped with an SNMP card. The MegaVision application can be used to manage a NetLight, and it is now possible to use a web-based interface as well, as described in the "NetLight Management" user guide.

Software versions & Licensing

The web-based application has two versions: Basic and Extended. The following license types are available:

Part Number	Description
JT-SNMP-SW/B	License for the NetLight's web-based SNMP software, Basic version.
JT-SNMP-SW/E	License for the NetLight's web-based SNMP software, Extended version.
JT-SNMP-SW/UP	Upgrade the license for the NetLight's web-based SNMP software from the Basic version to the Extended version.

Table 10: SNMP software licenses Part Numbers.

Basic Version

The Basic version allows the user to view data without carrying out any actions, such as Reset or Loopback.
The following products are supplied with the Basic version by default:
NL/155-1900/100, NL/155-1900.

Extended Version

The Extended version allows access to almost all of the application's functionality and modules (with the exception of the Measurements module). It is possible to carry out actions such as Reset and Loopback and use the data logging options.

The following products are supplied with the Extended version by default:
NL/G-1000, NL/G-2300, NL/155-5400/100, NL/155-5400, NL/G-3500.

The following products are *not* supplied with either version by default:
NL/100-880 and NL/G-2300

When no license is supplied, you can order the Basic or Extended license (see part numbers in the table above). When the Basic license is supplied by default, you can order the Extended version. Upgrading can be carried out at any time, even after the NetLight has been installed.

It is important to note that the license is supplied according to the NetLight's MAC address so it is not possible to use the license for another product. Therefore, if you wish to purchase or upgrade a license you need to supply the product's MAC address.

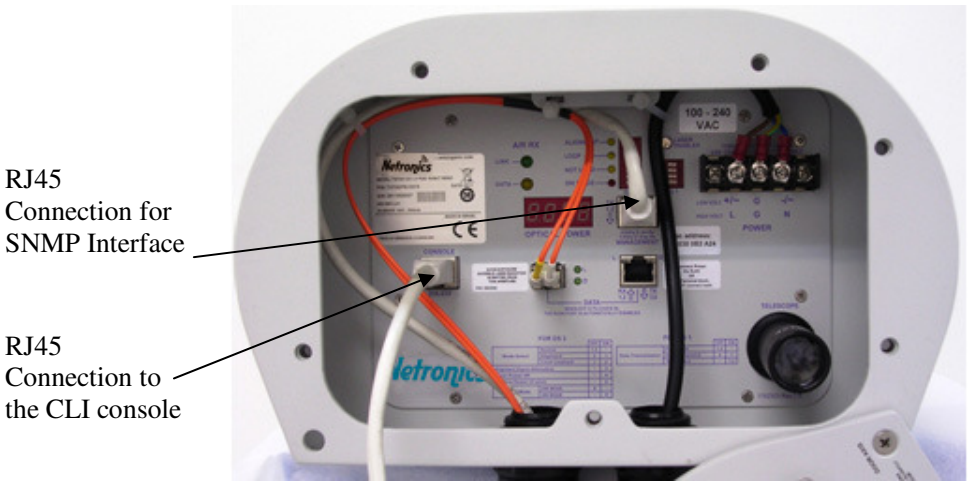


Figure 1.14: Management connections

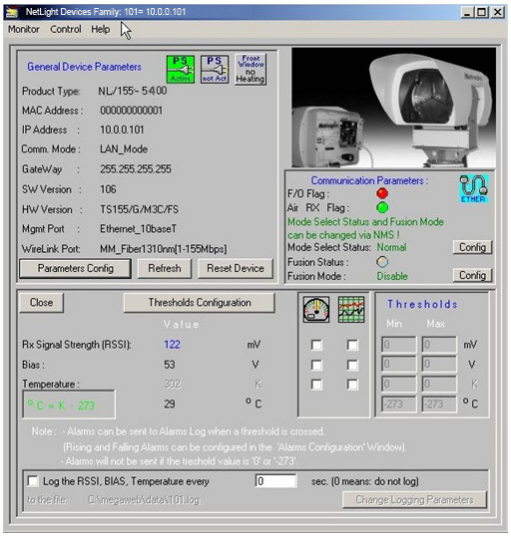


Figure 1.15: MegaVision Interface

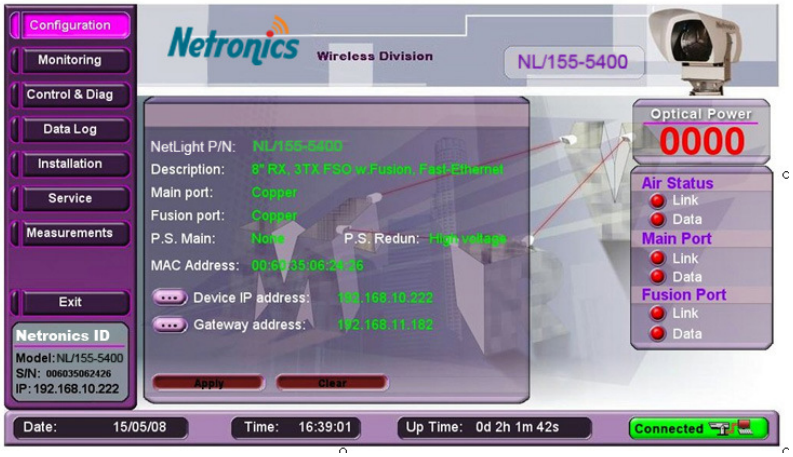


Figure 1.16: Web Interface

Note: Pins (4, 5) and (7, 8) of the management RJ45 connector can be used for dry contact purposes, for Airlink flag and F/O flag alarms respectively.

Typical Connections

1 - Fiber Connection

In order to implement a connection, each transceiver must be connected to the peripheral/testing equipment through fiber optic cables. A correct connection is indicated by the display on the back panel of the transceiver (see the section Display and Results pages 46 and 47).

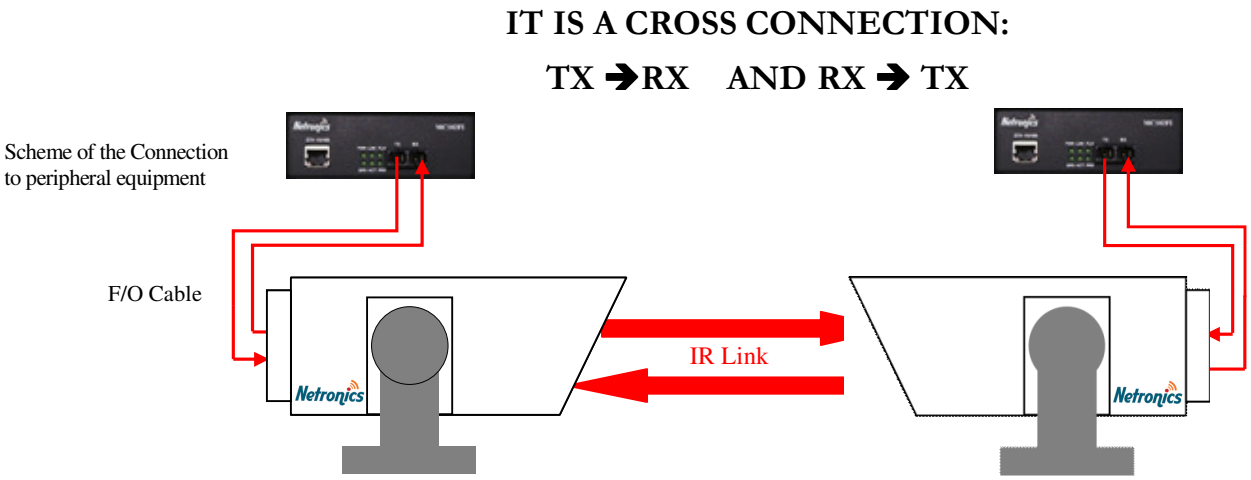


Figure 1.17: Typical Connection for Models G,155, G-F and 155-F

2 - Copper Connection

In order to implement a connection, each transceiver must be connected to the peripheral/testing equipment with an STP cable. A correct connection is indicated by the display on the back panel of the transceiver (see the section Display and Results pages 46-47).

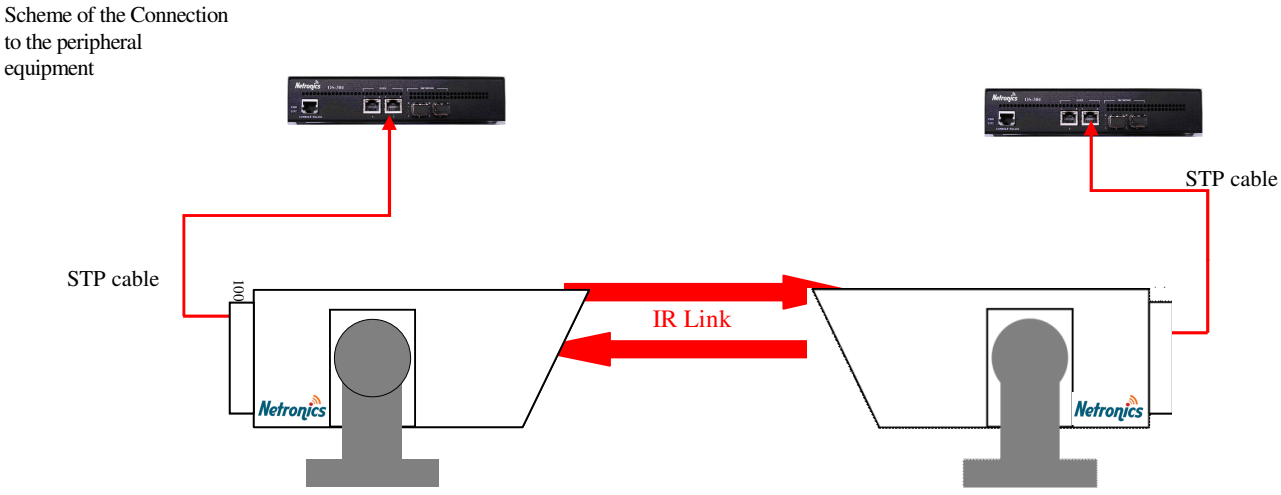
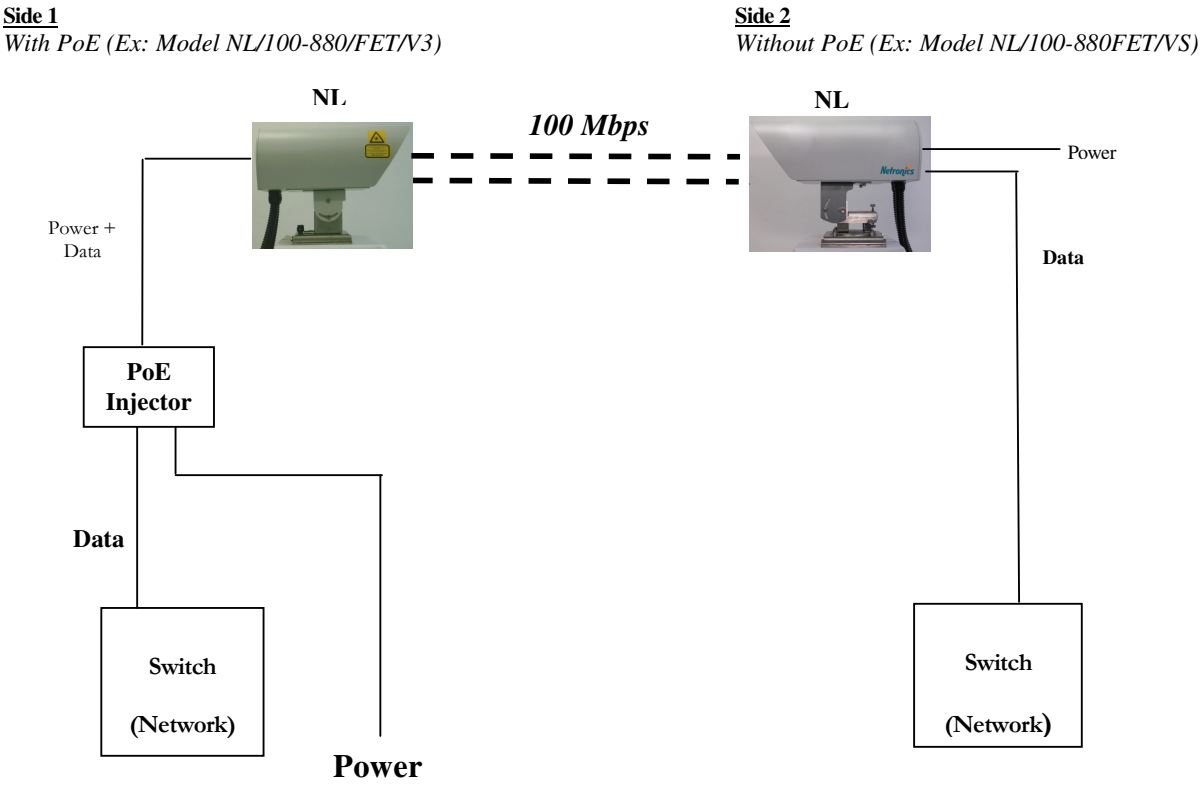


Figure 1.18: Typical Connection for Model NL/100-880 and NL/155-1900/100

Figure 1.19: Example of NL/100-880 and NL/155-1900/100-F connection



Note: This is an example only. Two sides can be with PoE or without PoE

The connections should be:

- With a cross cable between a switch and the NetLight (the cross cable can be between the switch and the injector **or** between the injector and the NetLight)
- With a straight cable between a PC or Laptop and the NetLight
- With a cross cable between a switch and the Power Injector

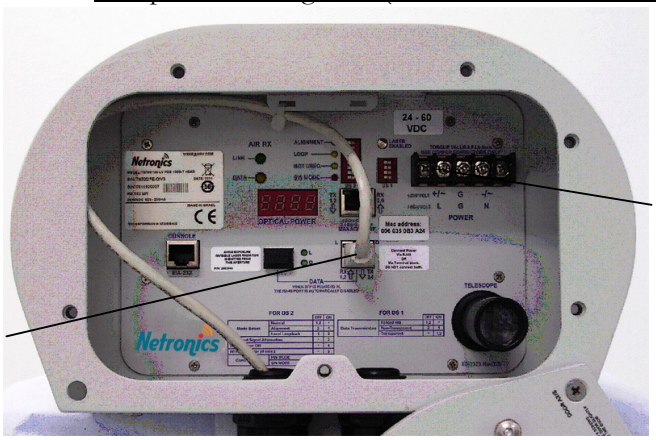
3 – NL/100-880 and NL/155-1900/100 Power connection

a – High voltage connection

Figure 1.20: High voltage power connection

b – Low Voltage connection
There are 2 options:

i - Option 1: Using PoE (Power over Ethernet up to 15W)



The Terminal block is not used.

PoE cable. This cable comes from the peripheral equipment and contains Data and Power.

Figure 1.21: Low voltage power connection, Option 1 Using PoE

ii – Option 2: PoE not used

Low Voltage (24-60VDC), Terminal Block.

Data FO cable.
(In this case the STP cable can be connected instead of the FO cable)

Figure 1.22: Low voltage power connection, Option 2 PoE not used.

Chapter

2

Site Survey

The first step before every installation is to visit the sites to be linked. in order to make sure that the connection is feasible, to find out potential obstacles or difficulties and to decide on the location and mounting points of the transceivers.

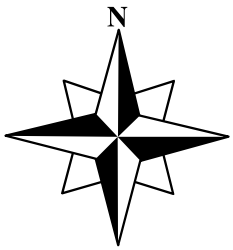
Line of Sight

A necessary condition for linking two distant buildings is that the two mounting sites must be within clear sight of each other.

Pay attention to:

- Growing vegetation and increasing foliage during spring
- Building sites (cranes movements, etc.)
- Chimneys (intervening smoke can interrupt the beam from time to time).

Orientation



Direct sunlight can overload the airlink receiver to saturation level. Avoid, as far as possible, the East-West direction for the link.

***Note**: In case this is not possible, the surrounding buildings could shield the transceiver from the direct sunlight otherwise outages lasting several minutes (depending on the time of the year and the angle of the sun) could occur. The system will fully recover once the sun is out of the receiver field-of-view.*

Location & Range

1. The mounting of the transceiver must be very rigid (preventing the installation from twists of even as little as 1 mrad). The key to the required rigidity is to attach the mounting accessories on strong mounting points such as:
   - Stiff building structures
   - Concrete or reinforced concrete surfaces

[1] In case such situations cannot be avoided, special mounting accessories and techniques must be designed and considered (see section Particular Figure Cases\Techniques page 61)

Prefer	Avoid	Pay attention to
Concrete Parapet Structural wall or column	Old constructions Soft material (asphalt, etc.) Non-uniform surfaces Wooden and metal structures	Colored windows Double glazing The proximity of power radio antennas

For reasons of convenience, it is always preferable to install the units indoors as long as all the required conditions previously described are met and the customer/building owner allows it. However, when windows are present in the beam path, the attenuating factor of the glass must be considered regarding the distance and the required fade margin.

2. Referring to the data in Appendix A: Product Specifications, set and record the distance between the two NetLights of the link. (You can use any of the following equipment to determine the distance: rangefinder laser binoculars, GPS receiver, maps, etc.)
3. Noting that two NetLight units are required per link, record the quantity of each model of the NetLight required.
4. Record the bearing to the opposite site by compass.
5. Record the number of links to be installed at the site.
6. Note whether additional sheltering is needed for the NetLight, for e.g., against strong winds (120km/h or more)

CONSULT FACTORY IN CASE OF DOUBT !

Figure 2.1 and Figure 2.2 show optimal and acceptable locations for the NetLight links. Notice that in both figures the NetLights are mounted on rooftop edges and high enough above the ground.

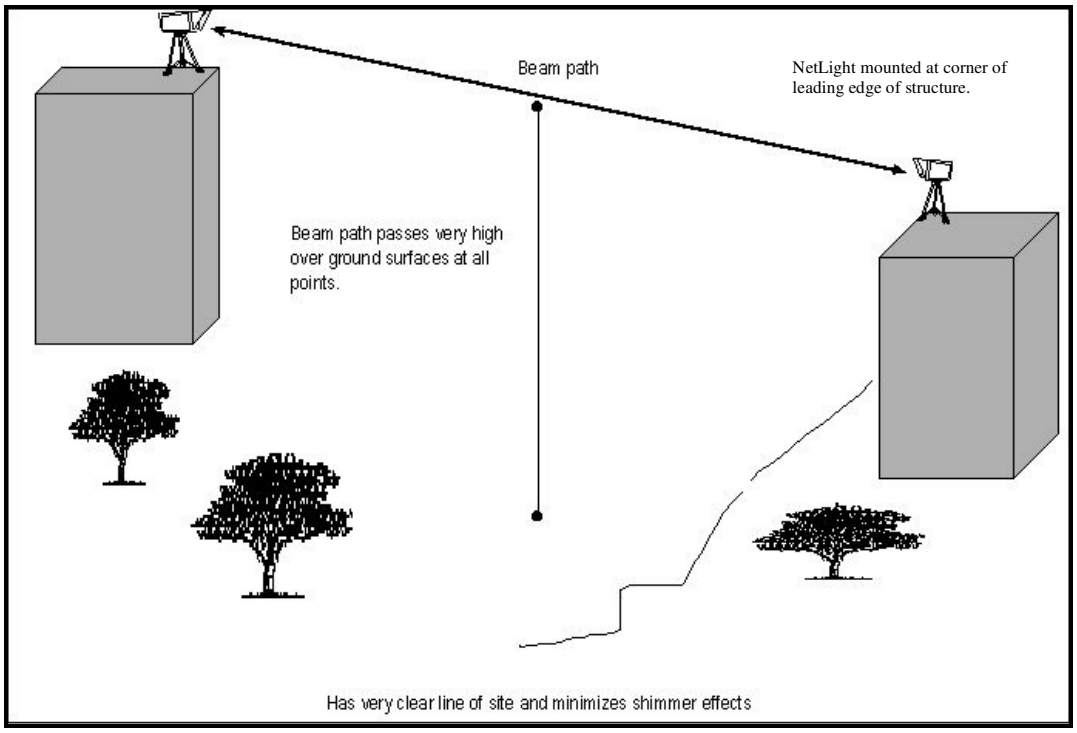


Figure 2.1: Optimal Mounting

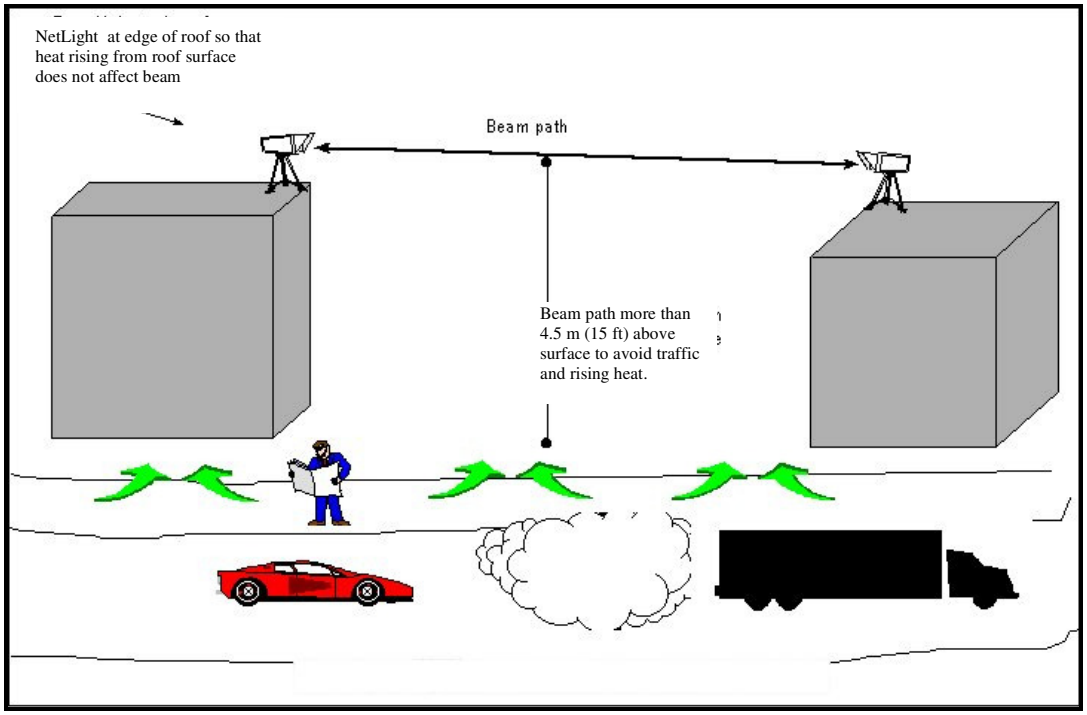


Figure 2.2: Acceptable Mounting

Figure 2.3 shows an unrecommended NetLight link location because of interference by IR. Notice that the NetLights are mounted far from the rooftop edges or are too close to the ground.

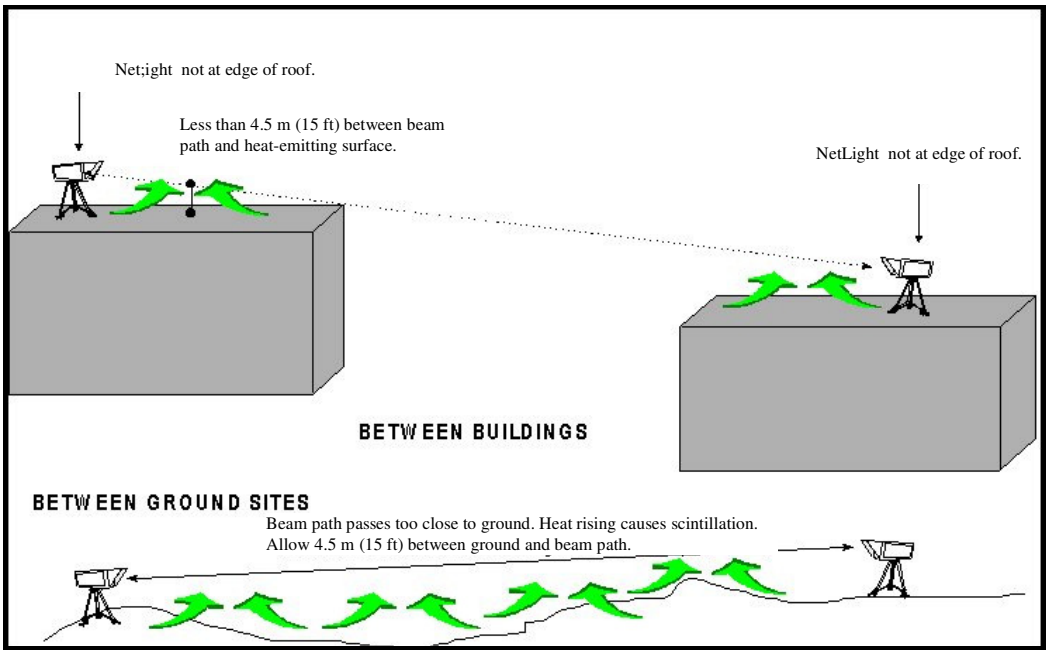


Figure 2.3: Unrecommended Mounting

Figure 2.4 shows an *unacceptable* NetLight link location because of interference by passing vehicles. Notice that the NetLights are mounted far from the rooftop edges and not high enough above the ground.

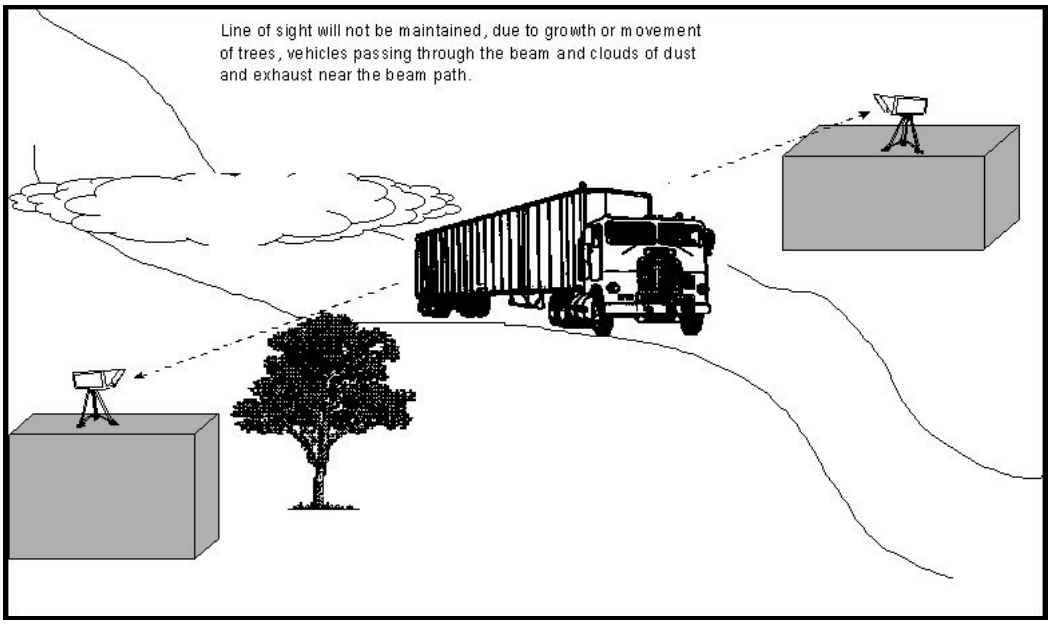


Figure 2.4: Unacceptable Mounting

Mounting Environment & Stability

1. When deciding the mounting location, you should look on the rooftop for vibration sources such as compressors, elevators, motors, and try to avoid them.
2. Photograph the mounting location so as to select the best mounting option. Figure 2.5 shows mounting locations on a rooftop in descending order of preference. Location **1** is the best; location **7** is the worst.

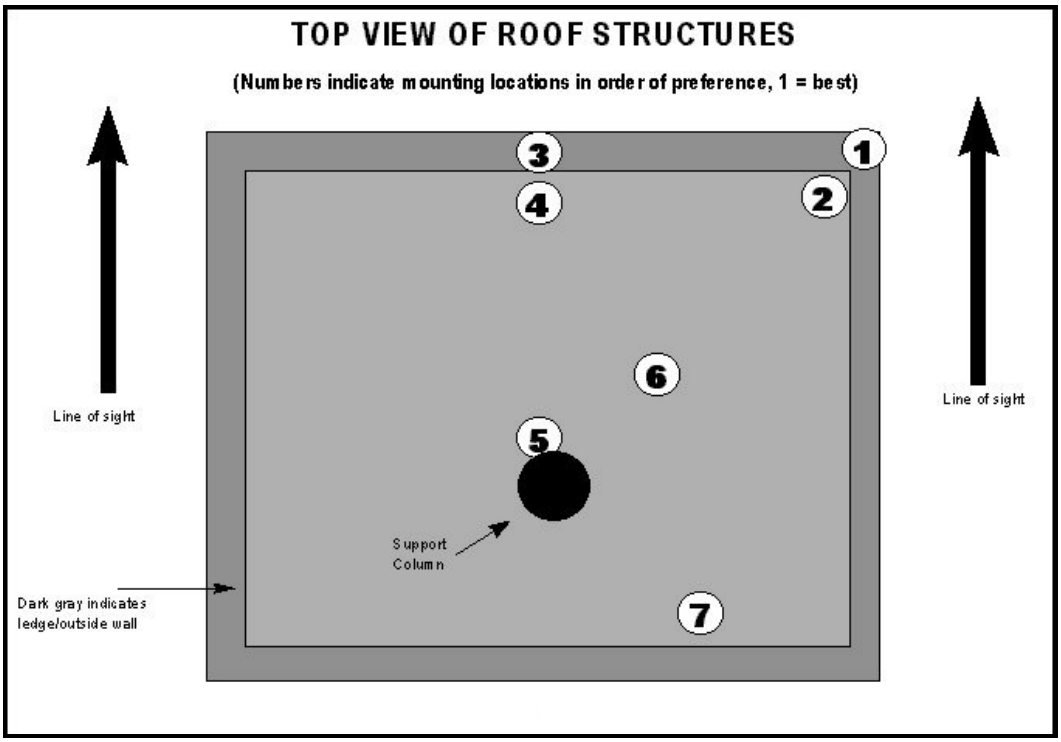


Figure 2.5: Mounting Locations in Order of Preference

Note: *If the only option to mount the NetLight is at points 5, 6 or 7, it has to be mounted at least 2 m above the rooftop to avoid roof scintillations and people crossing the link beam (If possible, avoid placing the NetLight on a mast).*

3. Avoid surfaces with high reflectivity (e.g., white walls) behind the NetLight so as to reduce interference with the optical signal.
4. Get customer approval for the *exact* positions where the NetLights will be mounted. Using paint, mark these positions.
5. Note the height that each NetLight will be above or aside the rooftop.
6. Identify the floor or wall type and dimensions of the location at which it is planned to mount the NetLight.
7. For each NetLight head, select one of the following mounting options[2] and record it.
    a. **Parapet/Ledge Mounting** (Figure 2.6) – This is a standard mounting option that uses only the Plate (JMP).
    b. **Wall Mounting** (Fig. 2.8) – This is a standard mounting option that uses the Plate (JMP) as well as the two Brackets (JMB).
    c. **Floor Pedestal Mounting** (Figure 2.7) – This is a non-standard mounting option that uses the Plate (JMP) as well as a Floor Pedestal (e.g., M015C).
    d. **Wall Pedestal Mounting** (Figure 2.9) – This is a non-standard mounting option that uses the Plate (JMP) as well as a Wall Pedestal (e.g., M054C).
    e. **Extended Wall Mounting** (Figure 2.10) – This is a non-standard mounting option that uses the Plate (JMP) as well as an Extended Wall (e.g., M062C).
    f. **Angle Bracket Mounting** (Figure 2.11) – This is a non-standard mounting option that uses the Plate (JMP) as well as an Angle Bracket (e.g., M001).

Figure 2.6: Parapet/Ledge Mounting (using JMP only)

Figure 2.7: Floor Pedestal Mounting (using JMP and MO15C)

Figure 2.8: Wall Mounting (using JMP and JMB)

Figure 2.9: Wall Pedestal Mounting (using JMP & MO54C)

[2] For more information on these mounting options, refer to *NetLight Installation Guide* (Publication No. 46366).

Figure 2.10: Extended Wall Mounting (using JMP and MO62C)

Figure 2.11: Angle Bracket Mounting (using JMP and M001)

Transmitting through a Window

1. Determine the number of surfaces the beam transits or is reflected from, the reflectivity of each surface, and condensation/precipitation collection areas.
2. Use the data below to determine whether the light beam attenuation is acceptable.

   4% attenuation for each surface of light reflection.

   15% attenuation for a double pane window.

   Attenuation due to tint in windowpane must be taken into consideration in choosing the right NetLight model. (The % attenuation depends on the tint and must be measured.)
3. Ensure that the angle of incidence[3] of the beam striking the windowpane is between 1° and 45°.

	Note
	On high buildings, for indoor window installation, the user should consider that occasionally the window-cleaning elevator might block the link beam.

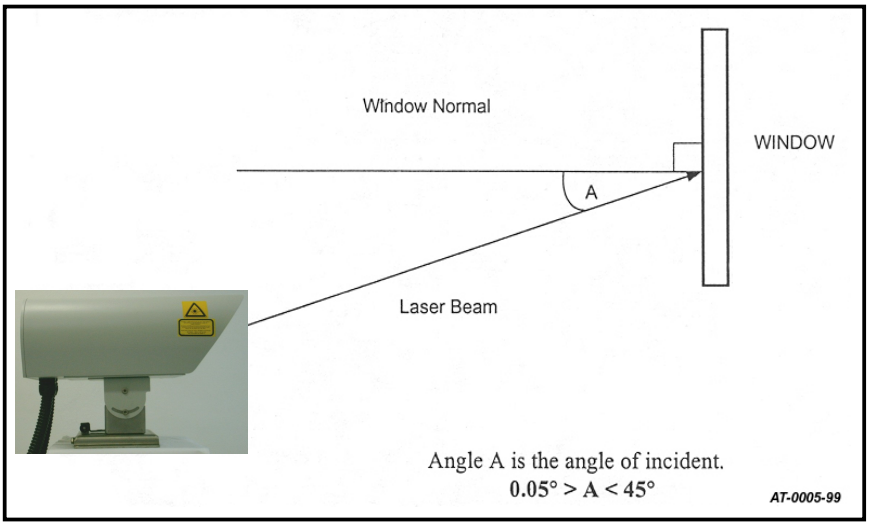


Figure 2.12: Arrangement for transmitting through a window.

[2]Angle which the light beam makes with the perpendicular to the windowpane

Chapter

3

Infrastructure

The only infrastructure required for operating the transceiver and linking the sites is Power and Data/Signal connection to the peripheral networking equipment. This must be ready prior to the airlink installation.

IN OUTDOOR INSTALLATIONS, USE SHIELDED AND WEATHERPROOF MATERIALS (CABLES, INLETS, AND CONNECTORS) COMPLIANT TO THE SAFETY STANDARD IN FORCE.

Power

Source

The power requirement for standard units is 100-240VAC @ 50/60Hz - 15W.

***Note**: Units requiring low Voltage: 24-60 VDC - 15W can be factory set upon request.*

It is recommended to use a Surge Suppression System to avoid damage to the equipment when power supply is unstable. Protection should be at least 25,000A.

Cabling

Standard 3-conductor power cords are required. (See Safety requirements, Page iv)

Data/Signal Cabling

1. For NL/100-880 , NL/G-1000, NL/G-1000-F, NL/155-1900-F

Type

For connecting the Transceiver to the peripheral equipment, a dual-fiber cable is required (one fiber for transmission, the other for reception). The standard recommended cable is MM 62.5/125 µm fiber or SM 9/125 µm for fiber.

Connectors

Each fiber should be terminated with the ordered type of connector on the transceiver end (SC, ST).

***Note**: The NL/100-880 needs an FO cable only when the optional optical SFP is used (instead of the 100Base-TX).*

Optical Fiber testing.

The cabling installer must specify the attenuation of each fiber installed.

A simple power loss test can inform us about the condition of the fibers. This test consists in measuring (with an optical power meter) the output power at one end of the tested fiber when a fiber source is connected at the other end. If the values are in dBm, the difference between the input power and the output power gives the power attenuation of the fiber (in dB).

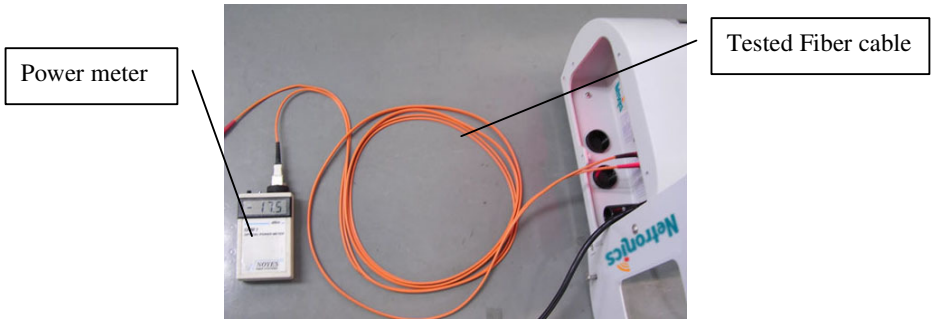


Figure 3.1: F/O cable test.

In case the above equipment is not available, a simple visual test may be performed to locate and reject badly damaged fibers. Place a light source at one end of the fiber and intermittently block it and observe the light coming out of the other end. (This procedure does not guarantee that a fiber is acceptable)

A standard 62.5µm fiber optic cable is characterized by an attenuation factor of about 3 to 5 dB/km. A loss value of more than 3 dB for runs up to 200m indicates that the fiber may be faulty.

Note: *The fiber optic cables must be installed by a specialist*

HANDLE THE FIBERS VERY CAREFULLY.

2. For NL/100-880 and NL/155-1900/100-F

Type

For connecting the Transceiver to the peripheral equipment, 2-pair STP Category 5 cable is required (one pair for transmission, the other for reception). This cable must be a **straight** one when the peripheral has an MDI-X 100Base-TX interface and a C**ross** one otherwise.

Examples: generally the connection to a PC or Laptop is with a straight cable. The connection to a switch is generally done with a cross cable (if there is a PoE injector between the switch and the NetLight, the cross cable can be between the switch and the injector **or** between the injector and the NetLight).

For PoE (Power over Ethernet), 2 more pairs STP Category 5 cable are required. (**Use only for the Low Voltage version**: NL/100-880/FE-O/V3 or NL/155-1900/FET/F3))

Connectors

The cable should be terminated with an RJ-45 connector at the Transceiver end.

Chapter

4

Setting and Bench Test

It is always easier and more convenient to locate a failure and solve a problem in a lab on a bench than on a roof under bad conditions. Accordingly, it is strongly recommended to perform a bench test with all the modules prior to installation in order to check the equipment compatibility and to validate the configuration.

See Unpacking Instructions in Appendix C.

Bench Test Arrangement

The NetLights are delivered to the clients not mounted on the Aiming head. In this case, when the back door is opened and secured in its place, it hangs over the NetLight basis and the NetLight can't stand straight and leans on the door, which can damage the door's hinges.
Therefore there are two ways to perform the Bench test, as can be seen on the following figures.

The first way is to mount the NetLight on its Aiming head and do all the tests before installation with the alignment head.

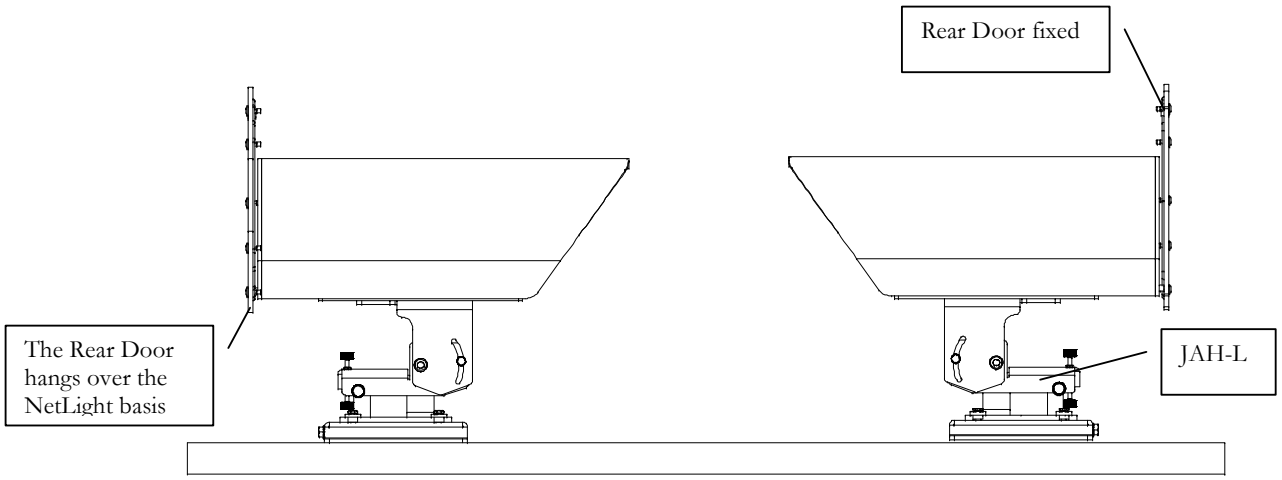


Figure 4.1: Bench test with NetLight mounted on the Aiming Head (JAH-L.)

The second way is to put under the NetLight some object (minimum height - 3 cm), which will make the NetLight stand straight without leaning on the door. The foam, used for NetLights packaging can be used for this purpose.

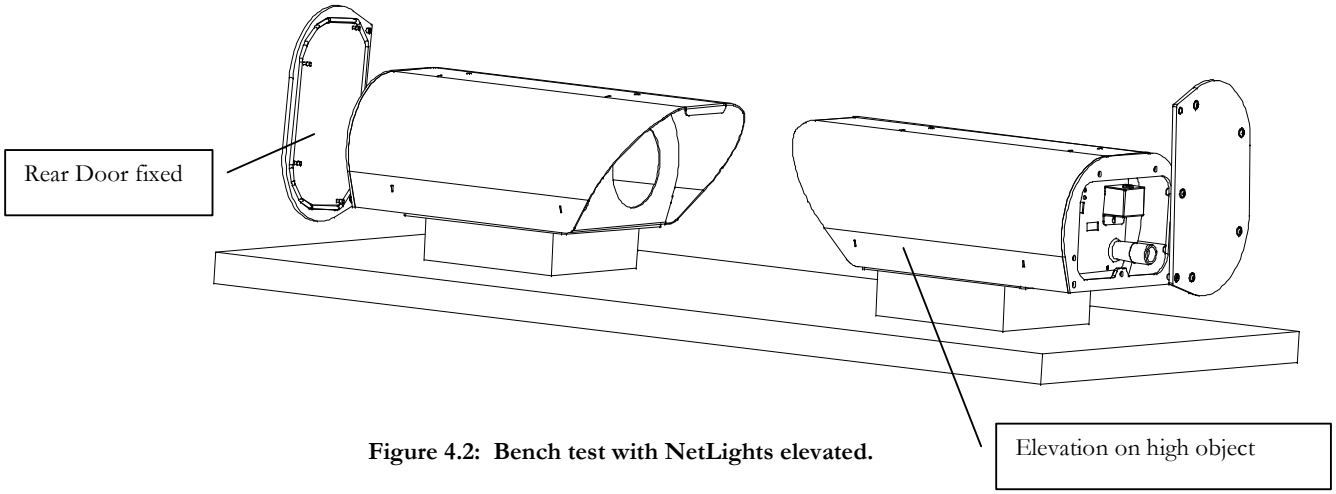


Figure 4.2: Bench test with NetLights elevated.

Compatibility and Set-Up

1 – NL/G-1000 and NL/G-1000-F

Compatibility

Peripheral equipment
Check the operation of the peripheral equipment connected with cables (see Configuration 1 below).
Interfaces
Check the specifications compatibility (type, data rate) between the NetLight and the peripheral equipment interfaces.

Test Equipment

Chose an appropriate Bit Error Rate (BER) tester for checking the physical link quality. A portable one is preferable since it is more convenient for use in the field.

A ping test or a file transfer between two workstations - connected to the networking equipment - is useful and easy to implement for testing the performance of the whole configuration.

Setup

Mode Select DIP switch toggle (DS2)
Set DIP switch toggles 1 and 2 to the OFF position for normal operation.

Other DIP switch toggles on DS2

- Signal attenuation: Set DIP switch toggle 3 to the OFF position for regular operation power. Set it to ON position (Signal attenuated) if you have saturation at the Receiver
- Set DIP switch DS2 toggle #7 to appropriate Data rate – OFF for Gigabit Ethernet, ON for FibreChannel.

- For bench tests purposes we recommend to set the other toggles to the OFF position.

***Note**: The Dip switch on the right side is not used in this NL model*

2 – NL/155-1900 and NL/155-1900-F

Compatibility

Peripheral equipment
Check the operation of the peripheral equipment connected with cables (see Configuration 1 below).
Interfaces
Check the specifications compatibility (type, data rate) between the NetLight and the peripheral equipment interfaces.

Test Equipment

Chose an appropriate Bit Error Rate (BER) tester for checking the physical link quality. A portable one is preferable since it is more convenient for use in the field.

For example: the OC3 port plus SONET and ATM analyser manufactured by Fluke.

A ping test or a file transfer between two workstations - connected to the networking equipment - is useful and easy to do for testing the performance of the whole configuration.

Setup

The NL/155-1900 Series are no longer "Protocol Select", they have Clock and Data Recovery automatically identifying the data rate (between 1 and 155Mbps) and the clock and locking on it.

Mode Select DIP switch toggle (DS2)
Set DIP switch toggles 1 and 2 to the OFF position for normal operation.

Other DIP switch toggles on DS2

- Laser Status: Set DIP switch toggle 4 to the OFF position
- For bench tests purposes we recommend to set the other toggles to the OFF position.

***Note**: The Dip switch on the right side is not used in this NL model*

2 – NL/100-880 and NL/155-1900/100-F

Compatibility

Peripheral equipment
Check the operation of the peripheral equipment connected with cables (see Configuration 1 below).
Interfaces
Check the specifications compatibility (type, data rate) between the NetLight and the peripheral equipment interfaces.

Test Equipment

Chose an appropriate Bit Error Rate (BER) tester for checking the physical link quality. A portable one is preferable since it is more convenient for use in the field.

A ping test or a file transfer between two workstations - connected to the networking equipment - is useful and easy to implement for testing the performance of the whole configuration.

Setup

Mode Select DIP switch toggle (DS2)
Set DIP switch toggles 1 and 2 to the OFF position for normal operation.

Other DIP switch toggles on DS2

- Laser Status: Set DIP switch toggle 4 to the OFF position
- For bench tests purposes we recommend to set the other toggles to the OFF position.

Data Transmission DIP switch (DS1)
Set DIP switch toggles 1 and 2 for the Data Transmission mode.
Explanations:
The NL/100-880 and the NL/155-1900/100 have three modes of operation for the copper interface - Forced, Transparent, and Non-Transparent.
The **Forced100** mode is self-explanatory, and is the same as "forced" for any Ethernet interface -it forces the communication interface to 100MBps Full Duplex.
The **Transparent** mode is simply a mode where the NetLight plays no part in the speed and mode configuration. Instead, it allows the interface equipment (ie. switches) on both end to negotiate between themselves - whether in Forced mode or Auto-Negotiation mode. The one caveat here is that one cannot use this mode when both switches are 10/100/1000 ports set to Auto-Negotiation, as the two switches will settle on gigabit speed, while the NetLight is bandwidth limited to 100 Mb/s.
The **Non-Transparent** mode is a hybrid mode, which separates the two ends of the link, while enabling interface with Auto-Negotiating ports. Effectively, the Non-Transparent mode is auto-negotiated with the port to which it is attached, but dictates one speed. It does so by sending FLP bursts, and advertising the link speed the user of the NetLight defines. For the main port, this must be 100 Full Duplex. For the Fusion port, this should be defined according to the speed suitable for the radio interface port being used.

Recommendations:
If Standards switches are used, it's recommended to set all the equipment (NetLight, computers, switches…) in forced100 mode (1 & 2 to OFF position).

If special or non standard switches are used, and there is no link at Forced100 mode (or the above configuration doesn't work), then set the Data Transmission mode to Non-Transparent mode and set the equipment connected to it (computer, laptop or switch) in Auto-negotiation modes or Forced100 mode (In this case the LIN – Line integrity Notification – feature will not work).
The third option is to set the NL in Transparent mode and set the equipment connected to it (computer, laptop or switch) in Auto-negotiation modes or

Forced100 mode (In this case the LIN – Line integrity Notification – feature will work). However the Non-Transparent mode is preferred.
In NL/100-880 the toggles 3 and 4 in DS1 are not used.
In NL/155-1900 the toggles 3 and 4 in DS1 are used for Data Transmission of the redundant port (Fusion).

SET ALL PERIPHERAL EQUIPMENT TO FULL DUPLEX MODE

Note: *If both switches have 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).*

Note: *There are many switches on the market. Though all of them work in Ethernet, our experience shows that many companies manufacture special switches. For example, we noticed that certain switch models (from a large company) from time to time send auto-negotiation signals (also in Forced100 mode). Therefore with these models we have to work in Transparent or Non-Transparent mode and not in Forced100 mode as in the Forced100 mode the NetLight does not allow the Auto-negotiation signal to go through.*

It's recommended to set the Main and Redundant ports at the same Data Transmission mode, either both Forced100 or both Transparent mode or Non-Transparent mode.

Test Configurations

IN ALL THE FOLLOWING CONFIGURATIONS TAKE CARE TO ADJUST THE TRANSCEIVERS OUT OF SATURATION, ALIGNING THEM SLIGHTLY IN AN ANGLE SO THAT THE DIGITAL READOUT SHOWS A READING LOWER THAN 1200 BUT HIGHER THAN 100.

Bench test

To learn more about NetLight Bench Test, please refer to Appendix E.

Peripheral equipment and cable testing

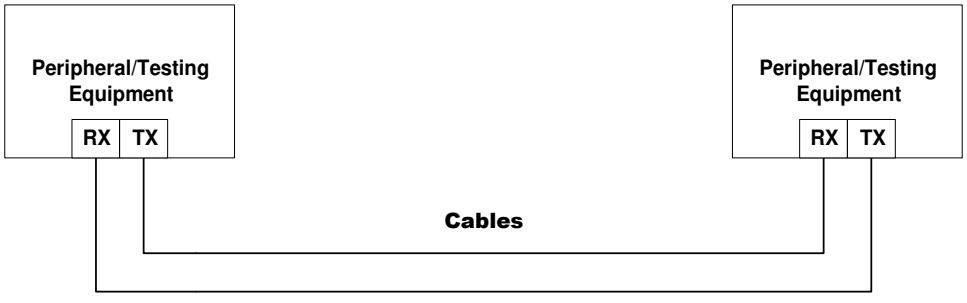


Figure 4.3: Configuration 1 (Applicable to all models)

1-way Airlink
BER test

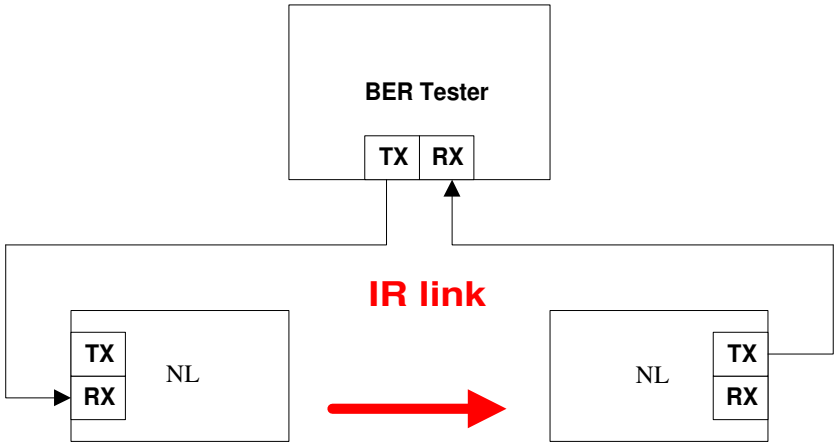


Figure 4.4: Configuration 2: (Applicable to all models)

Loop-back Airlink
BER test

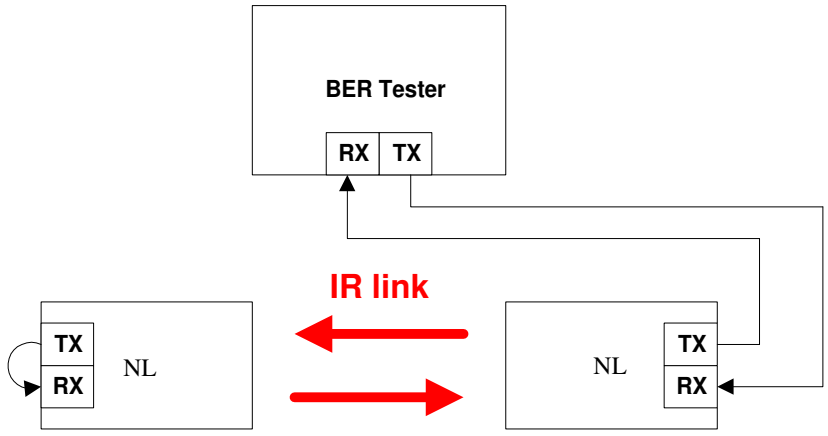


Figure 4.5: Configuration 3: (Applicable to all models)

Whole configuration operating test (Ping test or File transfer) for Ethernet or Fast Ethernet systems

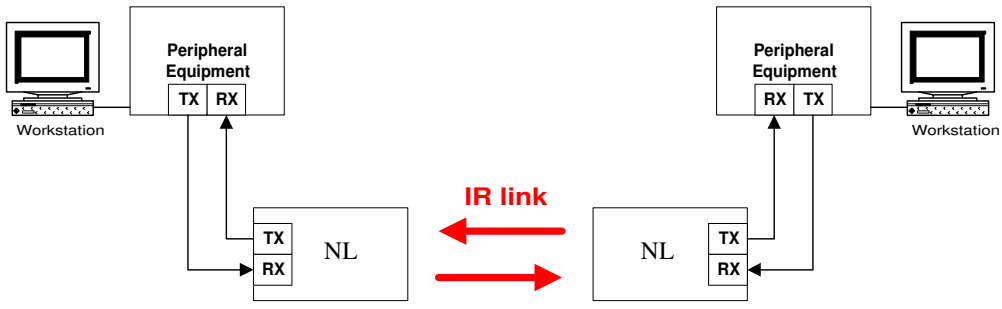
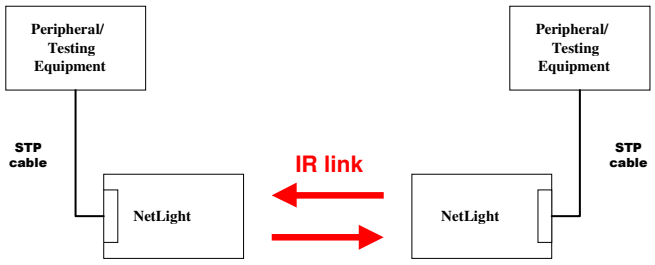
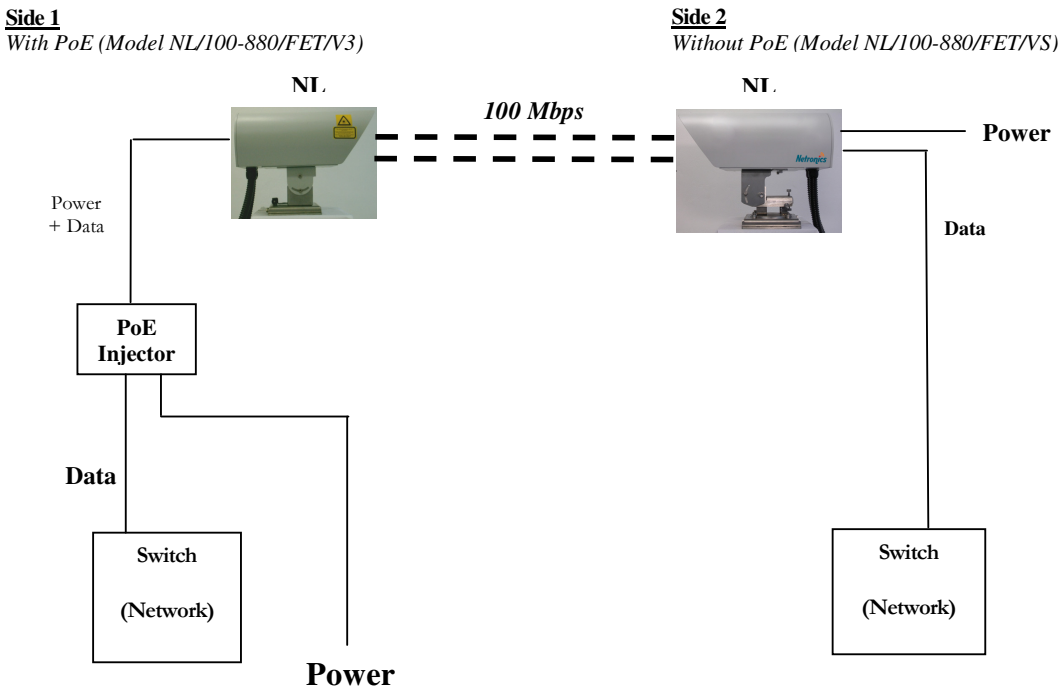


Figure 4.6: Configuration 4 (Applicable to all models)



Whole configuration operating test for all models

Figure 4.7: Configuration 5 (Applicable to all models)



Note: This is an example only. Two sides can be with PoE or without PoE

Figure 4.8: Configuration 6 (Applicable to NL/100-880 or NL/155-1900/100-F)

Some recommendations

- A PC / Laptop should be connected to the NL with a straight cable.
- A switch should be connected to the NL with a cross cable.
- A PC or Laptop connected to the NL should be configured in the same Data Transmission mode as the NetLight and should be set in full duplex mode.

Display and Results

1 – NL/G-1000 & NL/G-1000-F

Proper Display

1 - Indicators

Indicator → Position ↓	AIR RX FLAG	LASER Enabled	Loop	Fusion[1]	SW Mode[2]	SFP Main Flag[3]	SFP Redun. Flag[3]	Manag. L[4]	Manag. D[4]
ON	x	x				x			
OFF			x	x	x		x	x	x

Table 10: Indicators

Notes

1 - This LED switches ON, when the fusion option is enabled. It starts blinking, when fusion is active, i.e. when the IR link stops operating and the back-up link becomes active.

2 - When the RSM-SNMP is connected and you choose to control the NetLight by software (MegaVision or Web browser), move the DIP Switch #8 to ON position and this LED will switch ON.

3 - In case the tested NetLight has a Fusion option, the LED of the redundant F/O should be switched off if the backup is not connected.

4 – LINK LED Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment).
DATA LED Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.

2 – Received power

100 < OPTICAL POWER < 1000

Expected Results

The BER must be less than 10E-12 (10^{-12}) for on-going tests and error-free for short tests.

The PING test and file transfer procedure should not post any *TIME OUT alarm* or last too long time so long as the cabling connection is OK.

2 – NL/100-880

Proper Display

1 - Indicators

Indicator →	AIR RX		Data 100Base-TX **or** SFP	
Position ↓	Link	Data	Link	Data
ON	x	blinking	x	blinking
OFF				

Table 11: Indicators at normal operation with Data

2 –Other connections and behaviors

The following is applicable only when the 100Base-TX port is used

In this paragraph we will describe the behavior of the two heads of the NetLight link in different Data Transmission modes.
This model of NetLight (NL/100-880/FE-O/V*) has three Data Transmission modes (Forced 100, Non-Transparent and Transparent) and the switches generally have two operation modes (Forced 100 and Auto negotiation). Therefore there can be many operation configurations, but not all of them are possible and some configurations will not work.
The following table describes how to set the switch for each NetLight configuration:

NetLight "Data Transmission" setting Main Port	**Network Switch setting** ***(depending on Switch manufacturer and model)***
Forced 100	Forced 100
Non-Transparent	Auto-Negotiation / Forced 100
Transparent	Auto-Negotiation* / Forced 100

***** *If the switch has 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).*

Table 12: NL/100-880 Data Transmission setting

In the four following tables (Tables 13 - 16) we will show the status of the LEDs and the optical power in both NL heads in different configurations.

Another important point: in these four different configurations we suppose that the two NL heads are powered on, situated opposite each other and aligned (the optical power is present); and the NL are in the normal position (Dipswitches 1 & 2 are OFF).

In each table we describe the behavior of the LEDs and the optical power in different modes:

1) The switches are not connected to the NetLight.
2) The NetLight on one side (side A) is connected to the switch and the NetLight on the other side (side B) is not connected to the switch.
3) Each of the two heads of the link is connected to its switch.
4) Each of the two heads of the link is connected to its switch, but the link is blocked, i.e. the beam is blocked in the air and there is no optical reception.

In the four above modes we suppose that there is no data transmitted between the two links and the NetLights are just connected to the switches.

5) Each of the two NetLights is connected to its switch and is transmitting data in the system.
6) Each of the two NetLights is connected to its switch and is transmitting data in the system, but the link is blocked.

Configuration	Switch set at Auto negotiation mode and NetLight set at Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF*	Alive	ON	Blinking	ON	OFF*	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000
Switches are Connected to NetLights and Data is present	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000

* For the 2-3 first seconds these LEDs are blinking

Table 13: Switches set at Auto negotiation mode and NetLights set at Transparent mode

Configuration	Switches set at Forced100 mode and NetLights set at Transparent mode or Forced100 mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000
Switches are Connected to NetLights and Data is present	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000

Table 14: Switches set at Forced100 mode and NetLights set at Transparent mode or Forced100 mode

Configuration	Switch set at Auto negotiation mode and NetLight set at Non-Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF*	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF*	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000

* For the 1-2 first seconds this LED is blinking

Table 15: Switches set at Auto negotiation mode and NetLights set at Non-Transparent mode

Configuration	Switch set at Forced100 mode and NetLight set at Non-Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000

Table 16: Switches set at Forced100 mode and NetLights set at Non-Transparent mode

Behavior glossary:

Alive:	There is a readout in the optical power in accordance with the alignment
000:	There is no reception and the optical power is 0
Blinking:	The LED switches ON and OFF quickly (blinking)
ON:	Powered on continuously
OFF:	Turned off all the time

3 - Received power

100 < OPTICAL POWER < 1000

Expected Results

The BER must be less than 10E-12 (10^{-12}) for on-going tests and error-free for short tests.

The PING test and file transfer procedure should not post any *TIME OUT alarm* or last too long time so long as the cabling connection is OK.

3 – NL/15501900 & NL/155-1900-F

Proper Display

1 - Indicators

Indicator →	AIR RX		SFP RX[1]		Management[2]		Align.	Loop	Fusion[3]	SW Mode[4]	Lasers Status
Position ↓	Flag	Sync	Flag	Sync	L	D					
ON	x	x	x	x							x
OFF					x	x	x	x	x	x	

Table 17: Indicators

Notes

1 - In case the tested NetLight has a Fusion option, the LEDs of the redundant SFP should be switched off if the backup is not connected.

2 – LINK LED Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment).
DATA LED Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.

3 - This LED switches ON, when the fusion option is enabled. It starts blinking, when fusion is active, i.e. when the IR link stops operating and the back-up link becomes active.

4 - When the RSM-SNMP is connected and you choose to control the NetLight by software (MegaVision or Web browser), move the DIP Switch #8 to ON position and this LED will switch ON.

2 - Received power

100 < OPTICAL POWER < 1000

Expected Results

The BER must be less than 10E-12 (10^{-12}) for on-going tests and error-free for short tests.

The PING test and file transfer procedure should not notify any *TIME OUT alarm* or last too long time compared to cabling connection.

4 – NL/155-1900/100-F

Proper Display

1 - Indicators

Indicator →	AIR RX		100Base-T Main		100Base-T Redundant[1]		Management[2]		Align.	Loop	Fusion[3]	SW Mode[4]	Lasers Status
Position ↓	Link	Data	Link	Data	Link	Data	L	D					
ON	x	blinking	x	blinking									x
OFF					x	x	x	x	x	x	x	x	

Table 18: Indicators at normal operation with Data

Notes

1 - In case the tested NetLight is connected to a Back up link, the LEDs of the redundant 100Base-T port should be switched off if the backup is not active.

2 – – LINK LED Left green LED, turns ON indicating the presence of Link in the management 100Base-TX connector (coming from the peripheral equipment).
DATA LED Right green LED, blinking indicates Data transferred via the management 100Base-TX connector.

3 - This LED switches ON, when the fusion option is enabled. It starts blinking, when fusion is active, i.e. when the IR link stops operating and the back-up link becomes active.

4 - When the RSM-SNMP is connected and you choose to control the NetLight by software (MegaVision or Web browser), move the DIP Switch #10 to ON position and this LED will switch ON.

2 –Other connections and behaviors

In this paragraph we will describe the behavior of the two heads of the NetLight link in different Data Transmission modes.
This model of NetLight (NL/155-1900/FET/F*) has three Data Transmission modes (Forced 100, Non-Transparent and Transparent) and the switches generally have two operation modes (Forced 100 and Auto negotiation). Therefore there can be many operation configurations, but not all of them are possible and some configurations will not work.
The following table describes how to set the switch for each NetLight configuration:

NetLight "Data Transmission" setting Main Port	**Network Switch setting** ***(depending on Switch manufacturer and model)***
Forced 100	Forced 100
Non-Transparent	Auto-Negotiation / Forced 100
Transparent	Auto-Negotiation* / Forced 100

***** *If the switch has 10/100/1000 capabilities, and the NetLight is set at Transparent mode, the switch has to be set at Forced100 mode (the auto-negotiation mode will not work).*

Table 19: NL/155-1900/100-F Data Transmission setting

In the four following tables (Tables 20 - 23) we will show the status of the LEDs and the optical power in both NL heads in different configurations.

Another important point: in these four different configurations we suppose that the two NL heads are powered on, situated opposite each other and aligned (the optical power is present); and the NL are in the normal position (Dipswitches 1 & 2 are down).

In each table we describe the behavior of the LEDs and the optical power in different modes:

1) The switches are not connected to the NetLight.
2) The NetLight on one side (side A) is connected to the switch and the NetLight on the other side (side B) is not connected to the switch.
3) Each of the two heads of the link is connected to its switch.
4) Each of the two heads of the link is connected to its switch, but the link is blocked, i.e. the beam is blocked in the air and there is no optical reception.

In the four above modes we suppose that there is no data transmitted between the two links and the NetLights are just connected to the switches.

5) Each of the two NetLights is connected to its switch and is transmitting data in the system.
6) Each of the two NetLights is connected to its switch and is transmitting data in the system, but the link is blocked.

Configuration	Switch set at Auto negotiation mode and NetLight set at Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF*	Alive	ON	Blinking	ON	OFF*	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000

* For the 1-2 first seconds this LED is blinking

Table 20: Switches set at Auto negotiation mode and NetLights set at Transparent mode

Configuration	Switches set at Forced100 mode and NetLights set at Transparent mode or Forced100 mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000

Table 21: Switches set at Forced100 mode and NetLights set at Transparent mode or Forced100 mode

Configuration	Switch set at Auto negotiation mode and NetLight set at Non-Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF*	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF*	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	OFF	OFF	000	OFF	OFF	OFF	OFF	000

* For the 1-2 first seconds this LED is blinking

Table 22: Switches set at Auto negotiation mode and NetLights set at Non-Transparent mode

Configuration	Switch set at Forced100 mode and NetLight set at Non-Transparent mode									
	NetLight Side A					NetLight Side B				
	Air RX LEDs		100Base-TX LEDs		Optical Power	Air RX LEDs		100Base-TX LEDs		Optical Power
	Link	Data	Link	Data		Link	Data	Link	Data	
Switches not connected to the NetLights.	ON	Blinking	OFF	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Switch side A connected to NL side A. NL in Side B not connected to switch	ON	Blinking	ON	OFF	Alive	ON	Blinking	OFF	OFF	Alive
Two NetLight heads (side A and side B) are connected to switches	ON	Blinking	ON	OFF	Alive	ON	Blinking	ON	OFF	Alive
Switches are Connected to NetLights but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000
Switches are Connected to NetLights and Data is present in both directions	ON	Blinking	ON	Blinking	Alive	ON	Blinking	ON	Blinking	Alive
Switches are Connected to NetLights and Data is present, but beam blocked by an obstacle.	OFF	OFF	ON	OFF	000	OFF	OFF	ON	OFF	000

Table 23: Switches set at Forced100 mode and NetLights set at Non-Transparent mode

Behavior glossary:

Alive:	There is a readout in the optical power in accordance with the alignment
000:	There is no reception and the optical power is 0
Blinking:	The LED switches ON and OFF quickly (blinking)
ON:	Powered on continuously
OFF:	Turned off all the time

3 - Received power

100 < OPTICAL POWER < 1000

Expected Results

The BER must be less than 10E-12 (10^{-12}) for on-going tests and error-free for short tests.

The PING test and file transfer procedure should not post any *TIME OUT alarm* or last too long time so long as the cabling connection is OK.

SNMP Management Setting and Operation

During the Bench test, after the link is tested and found in working order, SNMP management operation can be tested as well.
See "NetLight Management" User Manual for operation and activation instructions.
During the Bench test we recommended to set the DIP switch toggle #10 of DS2 to the OFF position (HW (Hardware) mode). In this position, after activating the SNMP management, the GUI on the computer only monitors the status and indicators; control is at the NetLight only.
In order to be able to both monitor the NetLight and to control the actions via the GUI described in the above manual, the DIP switch toggle #10 should be set to the ON position (SW (Software) Mode).
We would like to emphasize again that the SNMP can be seen via MegaVision or Web access by means of direct connection to the NetLight or via a network. See "NetLight SNMP Management Manual" for additional info on the SNMP operation and functioning.

Everything, which was explained in this chapter regarding the test method, peripheral equipment, the system behavior, set-up of the DIP Switches, indicators' behavior, etc. is also true for a real installation in the field.

Chapter

5

Installation

This chapter shows how to mount the NetLight and accessories at the site (see Appendix D for the required material).

See Unpacking Instructions in Appendix C.

CAUTION: NetLight must be mounted in the horizontal position only; max angle 45°

Accessories

The standard mounting accessories are supplied with the transceivers (NetLight heads) in the kit. They are designed for typical mounting on horizontal and vertical surfaces.

Description

The accessories kit (supplied by Netronics) consists of:

- The Mounting Plate for NL/100-880 and NL/155-1900 series (JMP)
- The Aiming Head (JAH-L)
- The Installer Tool Kit (JITK-L)

The JMP is used for mounting the transceiver on the support surface. (i.e. to a horizontal concrete surface/plate only). The JAH-L allows the aiming of the two units making the link (see chapter 6)

JMP – Mounting Plate

JMP
Mounting Plate
(Dimensions in mm)

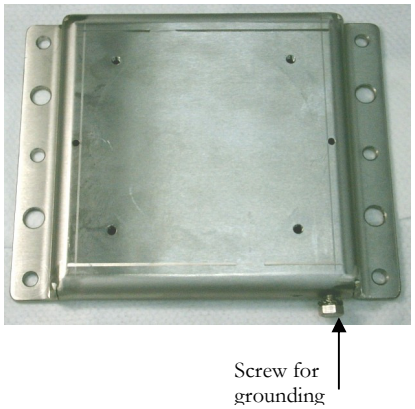
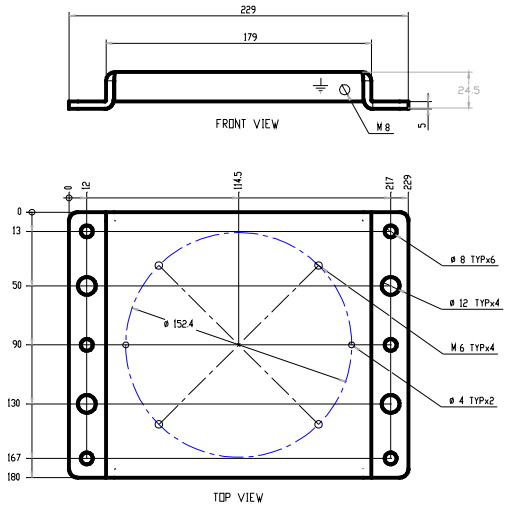
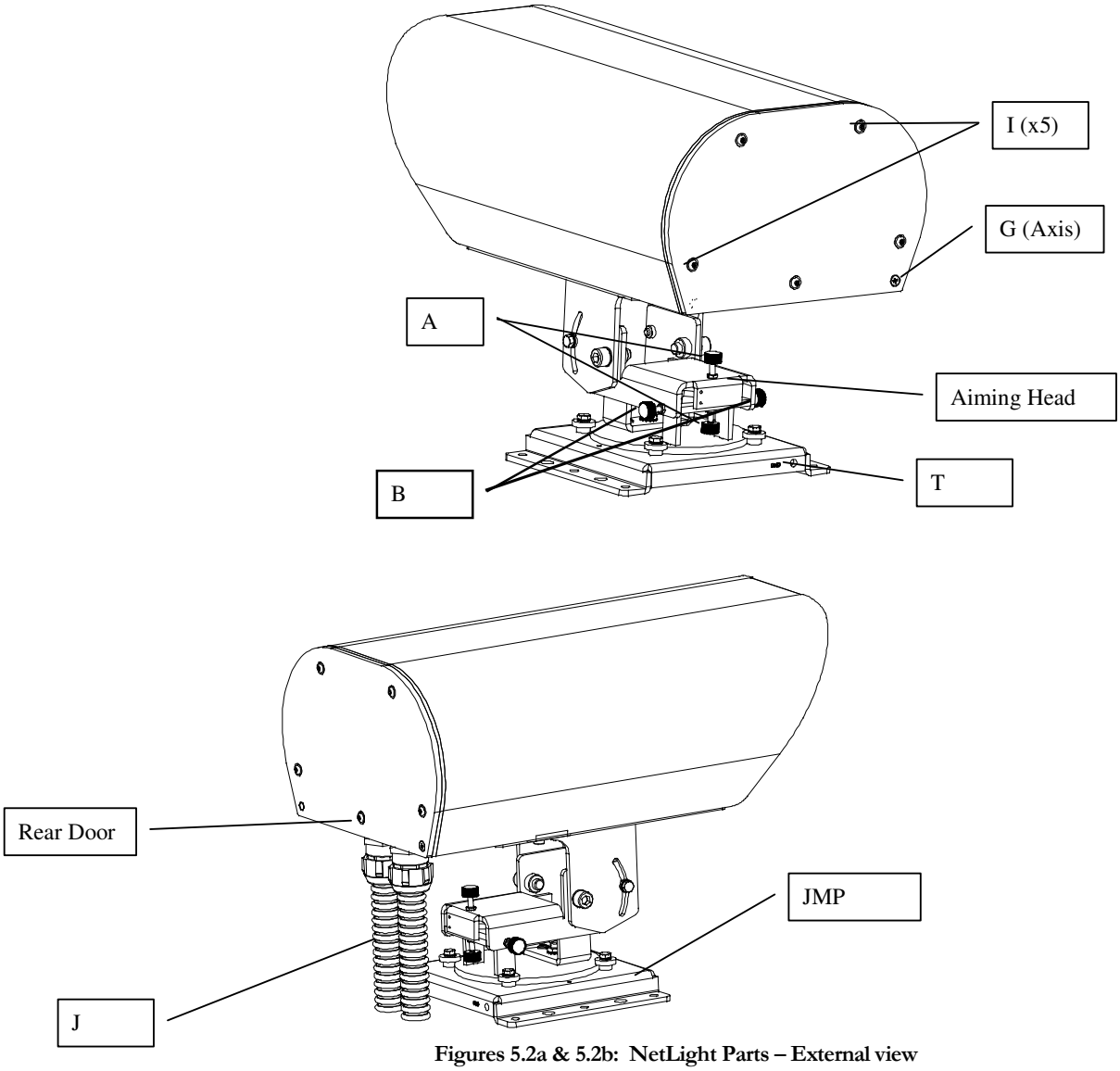


Figure 5.1a: JMP



Dimensions in mm

Figure 5.1b: JMP scheme



Figures 5.2a & 5.2b: NetLight Parts – External view

Table 24: NetLight Parts

Part	Description
A	Up-Down Fine Alignment Screws
B	Right-Left Fine Alignment Screws
G	Door Axis

Part	Description
I(x5)	Door lock Captive Screws
J	Cable Duct
T	Screw for Grounding

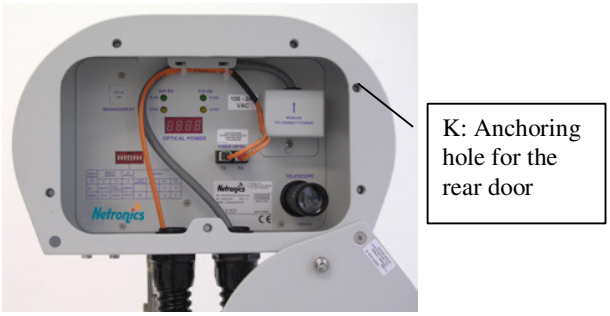


Fig. 5.3a: Rear door fixation

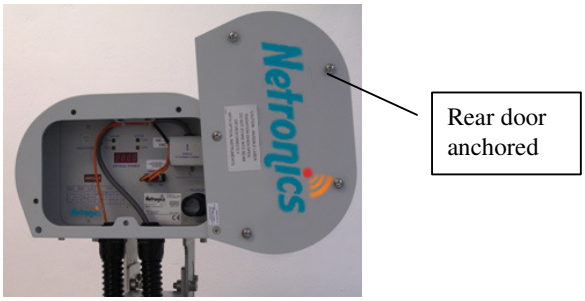
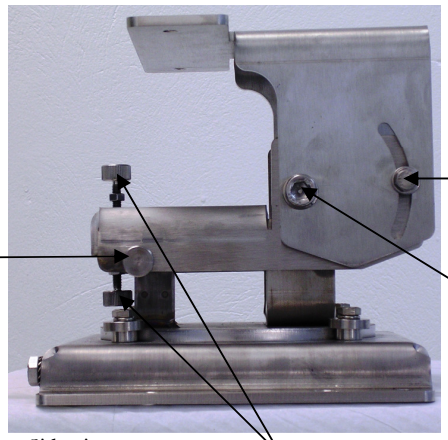


Fig. 5.3b: Rear door fixed

JAH-L – Aiming Head for NL/100-880 and NL/155-1900

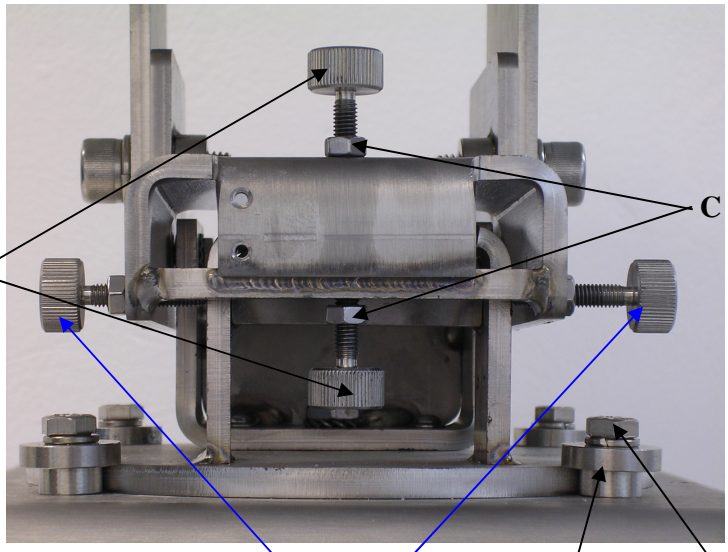
JAH-L

Figure 5.4
a,b,c,d: JAH-L

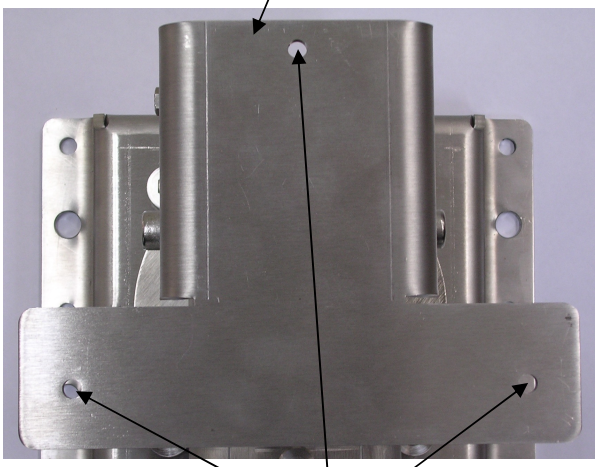


a. Side view

b. Perspective view



c. Back view



d. Top view

3x Holes for "H" screws (between JAH-L and the NetLight)

AIMING HEAD ADJUSTMENT AND LOCKS:

A: **Vertical (Up-Down) Fine Alignment Screws (x2)**
B: **Horizontal (Left-Right) Fine Alignment Screws (x2)**
C: **Fine Locking Nuts (x4)**
D: **Gross Elevation Axis & Vertical Locking Screws (x2)**
E: **Horizontal Locking Screws (x4).**
O: **Lug Bolts (x4) (Attachment between JAH-L & JMP)**
F: **Extra Elevation Locking Screws (x2)**

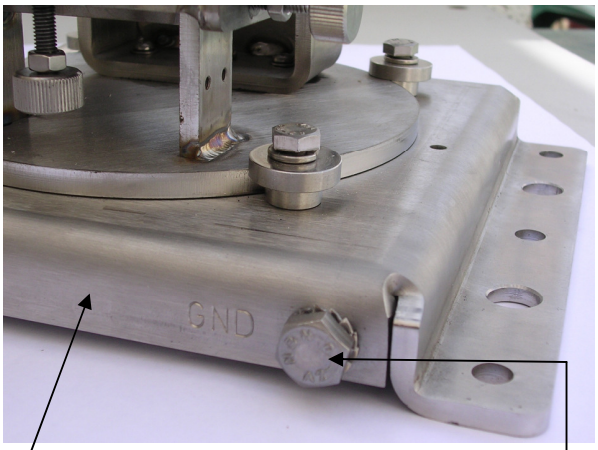


Figure5.5a. More details on JAH-L & JMP

JMP

T: Grounding Screw

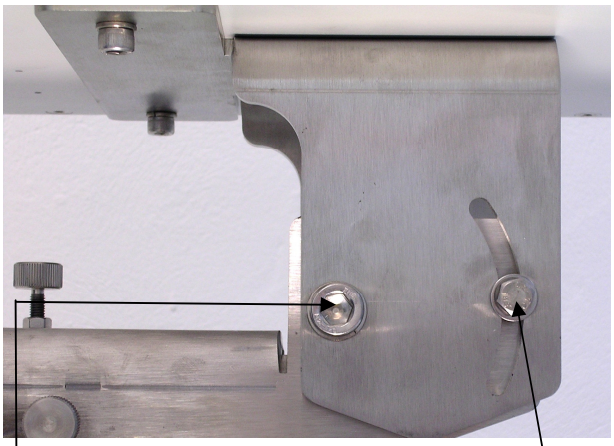


Figure5.5b. More details on JAH-L

D: Up-Down (Vertical) Axis and Locking screws

F: vertical Locking Screws

The Installer Tool Kit (JITK-L)

JITK-L: Installer Tool Kit

The JITK-L tool kit includes the work tools required for opening and closing nuts and screws of the NetLight for optimal installation. It is recommended that these tools be used. Netronics supplies this tool kit with each NetLight head. In addition to the tool kit, screws are supplied for mounting the JMP on a pedestal that is supplied by Netronics as an option.

Mounting

1- Detachment of the JAH-L from the JMP

The Aiming Head (JAH-L) and JMP are shipped connected to one another. Before mounting, in order to make installation on the mounting surface easier, the JMP must first be detached and connected to the fixation surface. Next, the Aiming Head and NetLight Head can be mounted.
To detach the JMP, screws 'E' (x4) should be loosened

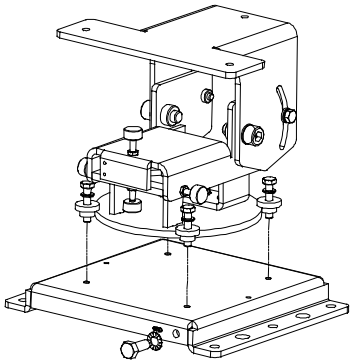


Figure 5.7: Detachment of JAH-L

2- Mounting the Accessories

- Horizontal surfaces (parapet, ...):

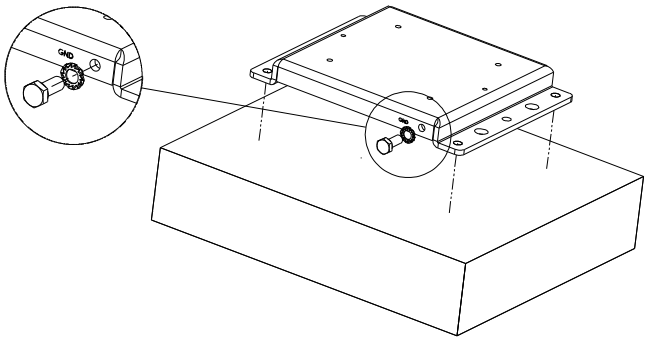


Figure 5.8: JMP on the fixation surface

THE JMP SHOULD BE ORIENTED IN SUCH A WAY THAT THE GROUNDING SCREW IS LOCATED ON THE BACK (CLOSE TO THE INSTALLER) AND THE FRONT IS FACING THE OPPOSITE SITE.

- Vertical surfaces (wall, rectangular column, ...):

Use a JMB (To be ordered separately, not included in the standard kit)

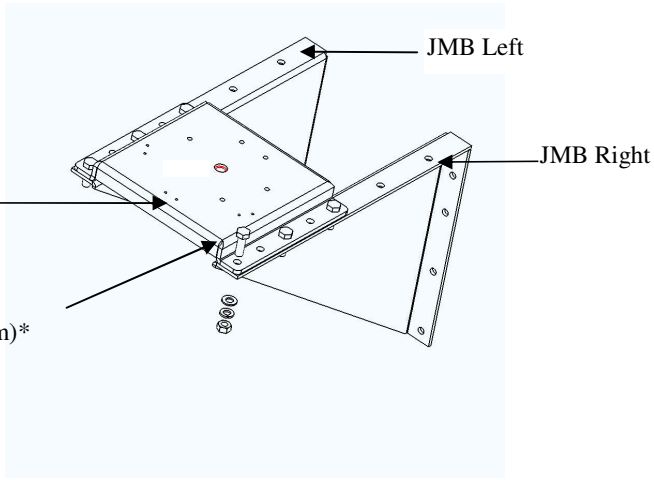


Figure 5.9: JMP on JMB

***Note**: For more convenience it is suggested to assemble the 3 parts of the JMB before mounting it on the surface.*

3- Attachment of the Transceiver (NL)

After securely attaching JMP to the mounting surface, mount the JAH-L on the JMP, screw the "E" screws through the Lugs. Mount the Transceiver front face oriented towards the opposite site using the provided screws (H). Tighten firmly these screws.

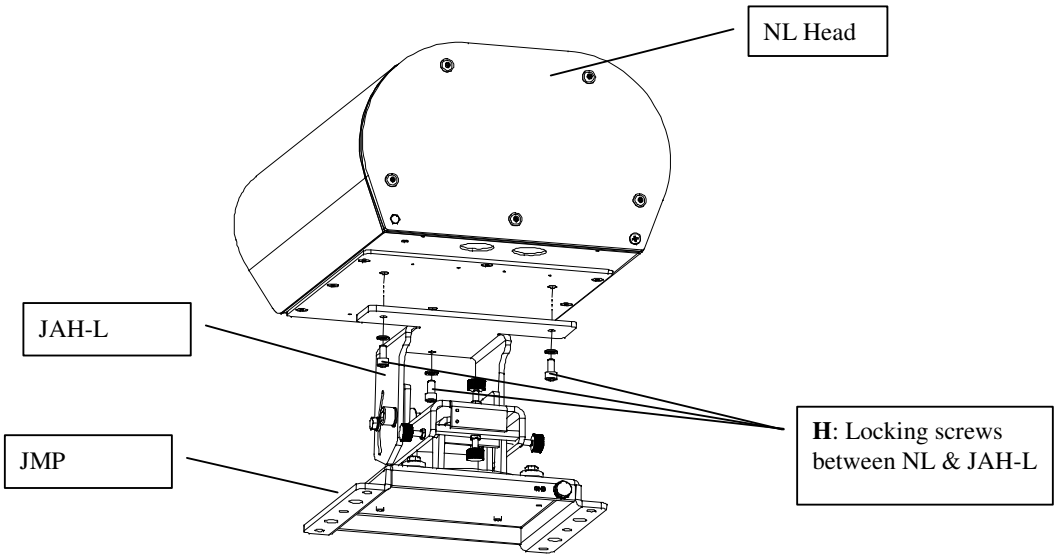


Fig. 5.10: Mounting NL on JAH-L

Screw 3 screws (M6 x 30mm length) with the spring washers to fix the transceiver on the JAH-L upper plate. These 3 screws should be locked tightly with the help of appropriate tools (see figure 5.10).

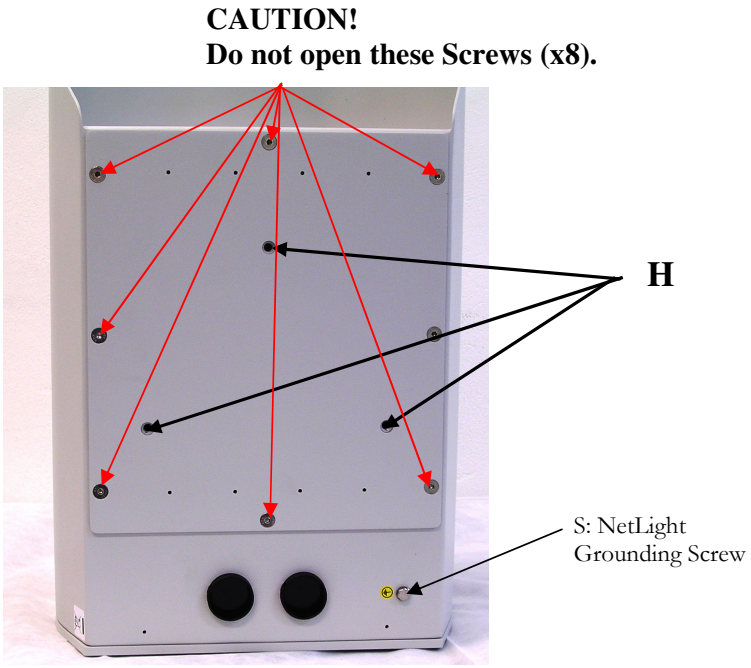


Fig. 5.11: Bottom view: Locking screws (H) between NL and JAH-L

Special Mounting

1- Mounting on the floor

In some cases the only place where the installation is acceptable, possible, or authorized is on the floor. **Avoid** installation on roofs with a metallic parapet or without a parapet by drilling holes in the roof floor.

To use the floor, a very stable tower standing on the floor is required. The transceiver will be fixed on the top of the tower.

Two techniques using a small concrete block are suggested for stabilizing the tower on the floor.

- The concrete slab material is poured directly on the base of the tower
- Four bolts are inserted in the concrete slab placed on the floor. The tower mount is fixed on the slab with the inserted bolts using nuts.

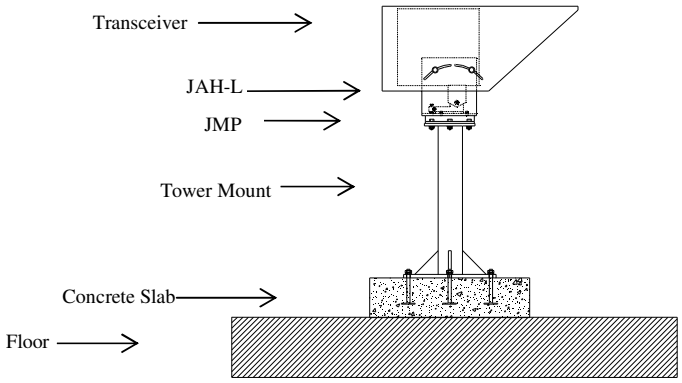


Figure 5.12: Mounting on a concrete slab

TAKE CARE TO REMOVE ANY INTERVENING SOFT MATERIAL, SUCH AS ASPHALT, BETWEEN THE SLAB/TOWER BASE AND THE FLOOR. ONCE THE INSTALLATION IS COMPLETED, RESTORE THE ROOF WATER-TIGHTNESS WITH SEALING MATERIAL AROUND THE SLAB.

2 - Poles and pedestals for particular installations.

Each installation is unique.
As a rule we supply essential installation accessories with the link alignment head (JAH-L or JAH-8 or AD-5000 and JMP). Any additional accessories required for particular installation cases should be taken care of separately in accordance with the installation location and type.
Each installer can manufacture additional accessories himself after consulting the specialists or in accordance with his own design.

The main principles that should be maintained are as follows:

- Long-term durability of the chosen material under outdoor conditions;
- Hardness of the material: very hard materials should be chosen, that's why aluminum should be thick;
- Accurate work: the accessories should be manufactured accurately, paying attention to the surfaces flatness;
- Installation stability: after fixing the accessories make sure that the structure is stable, does not move and is attached properly;

Notwithstanding the above, we at Netronics offer poles and pedestals of different sizes and forms, suitable for all models of the NetLights that we sell.
Our experience shows that due to such a wide choice of poles and pedestals, 99% of installations use the Netronics products. We strongly recommend consulting our representatives on the subject.

See below several pictures of some of the installation accessories offered by the company.

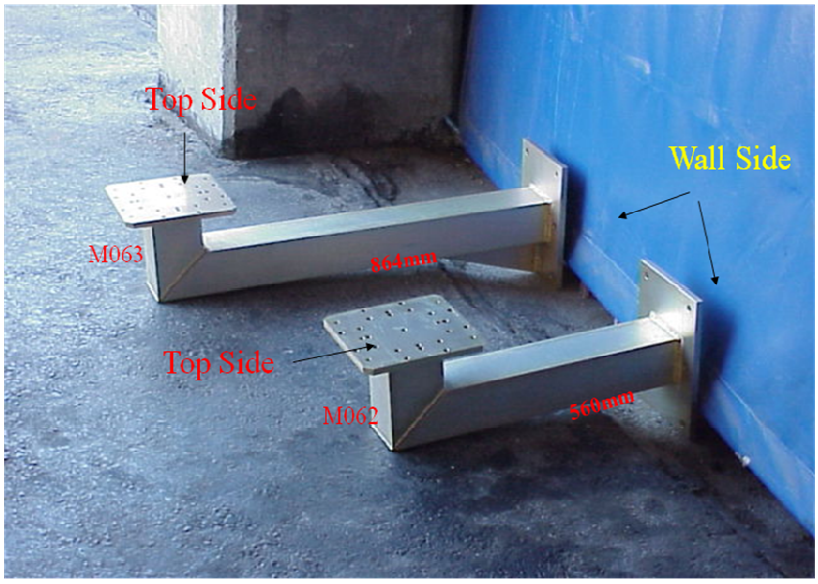


Fig. 5.13: Wall mount pedestals

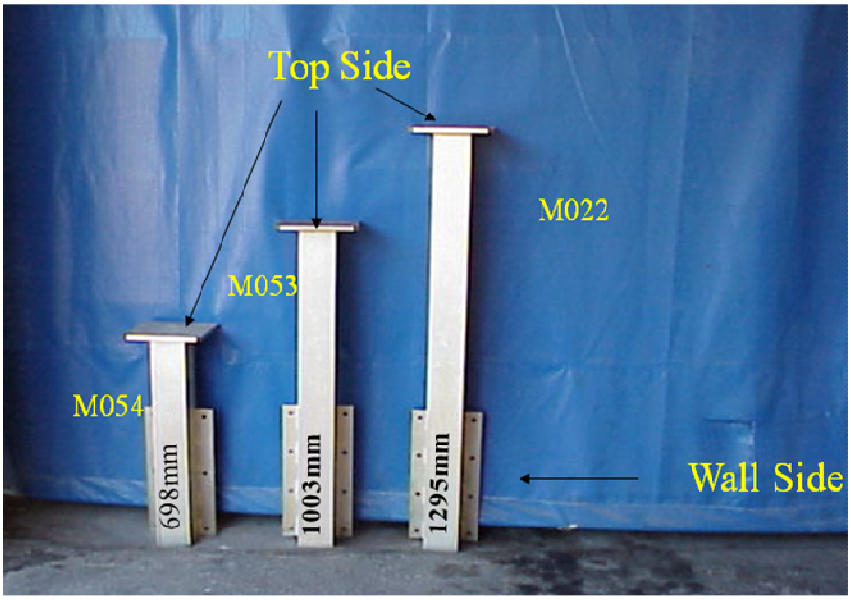


Fig. 5.14: Wall mount poles

Fig. 5.15: Examples of special installations

3- Mounting on a fragile/crumbly wall

On sites on which the installation on fragile (pre-fab) or crumbly (old building) walls is unavoidable, the best way to strongly fix the JMB is to use a metallic clamping plate on the other side of the wall as sketched below. In this technique a large section of the wall is clasped providing higher rigidity and stability.

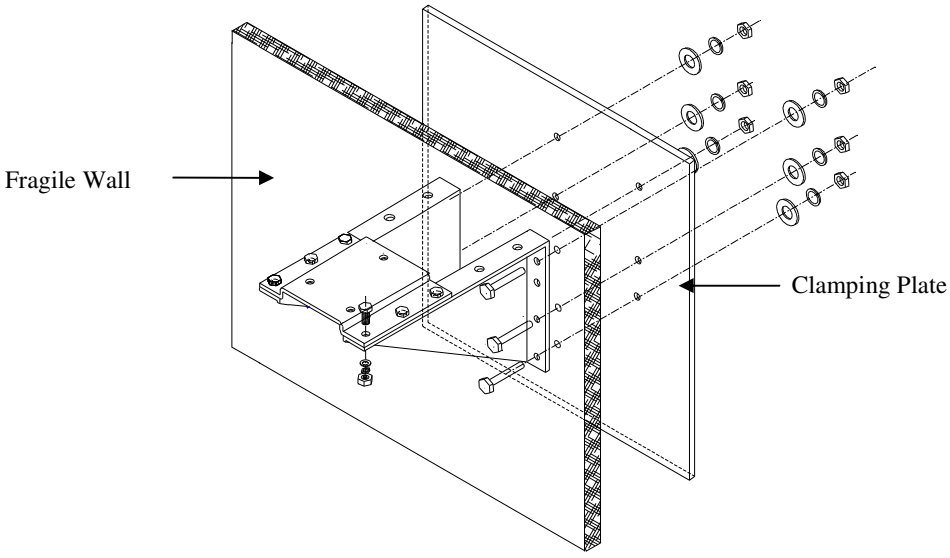


Figure 5.16: Mounting on a fragile wall

***Note**: The Tower Mount and the Clamping Plate are not provided with the equipment and should be supplied by the installer.*

Chapter

6

Aiming Procedure

Point to point connections require the orientation face to face of both "transceiving" ends of the link. Concerning wireless optical links, this should be done as accurately as possible in order to position the beam symmetrically all around the remote receiver.

Powering on the NetLight

1 – Make sure that the power cable is disconnected from the electrical power source.
2 – Undo the five screws H -- see Figure 6.1. Holding the Rear Door, Pull the door, turn it clockwise ¼ of a turn around the axis (I), so that a screw will be opposite hole "O". Fixe the door on the hole "O" with the screw.

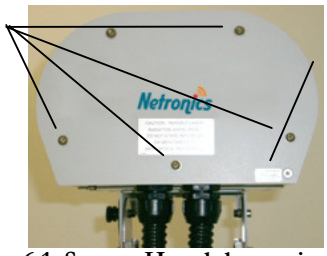


Fig. 6.1: Screws H and door axis

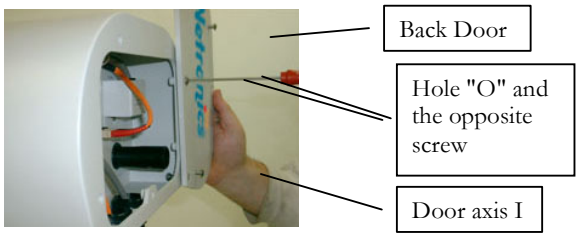


Fig. 6.2: Back Door Rotated ¼ of a turn

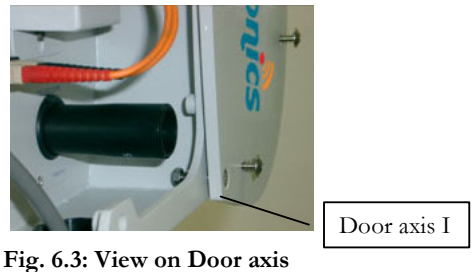


Fig. 6.3: View on Door axis

3 – Connect the wires of the power cable (see Figure 6.4) to the Terminal Block (see Figure 6.5) paying attention to L=Line, G=Ground & N=Neutral.

4 – After connecting the power cables to corresponding sockets, tightly close the screws of the Terminal block – see Figure 6.5. Gently jerk the cable to check that it stays connected. Cover the Terminal Block with a plastic cover (if available).

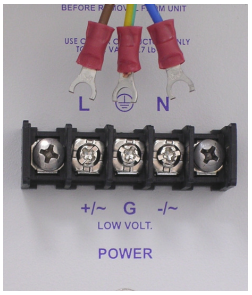


Fig. 6.4: Power cable & Terminal block

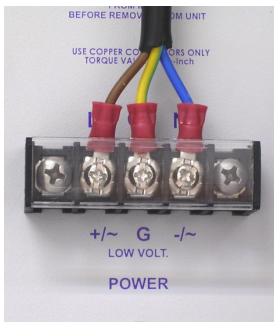


Fig. 6.5: Power Terminal Block Locked

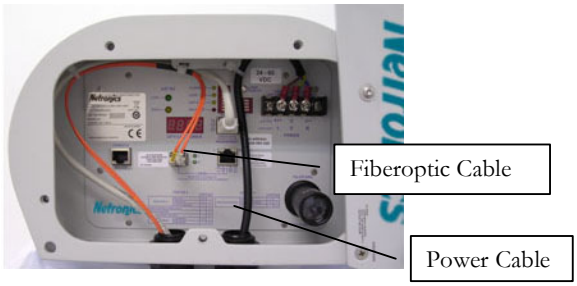


Fig. 6.6: Power Cable and Fiberoptic Cable

5 – Rotate and push the Back Door up, and tighten the five H screws.
6 – Connect the power cable to the electrical power source to power on the NetLight.

Transceiver Alignment

General

Point-to-point connections require face-to-face orientation of both transceiving ends of the link. With wireless optical links, the beam spot should be positioned symmetrically on the remote receiver, as accurately as possible.
Successful installation of the NetLight depends primarily on precise and accurate optical alignment. Carefully follow the instructions below!!!

Tools and Equipment

The following tools and equipment are required at each link end:

- A communication device (mobile phone or walkie-talkie)
- Optical-power meter, giving readings in miliwatts/microwatts or dBm. (The Optical power meter is convenient though not necessary.)
- JITK-L.

Procedure

Turn on the power to the NetLight heads from the power source.
Models NL/100-880, NL/155-1900 and NL/155-1900/100-F: Set DIP switch toggles 1, 2 to the "Alignment" position (indicated on the back panel). Toggle #1 at ON position and toggle #2 at OFF position.
Models NL/G-1000 and NL/G-1000-F: Even if the data port is left unconnected, the NetLight transmits an Idle Signal which can be used to perform alignment.

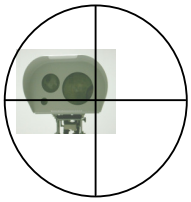
The transceiver alignment procedure is implemented in two stages:

- Coarse Alignment
- Fine Alignment

Coarse Alignment

This stage is intended to point, looking through the telescope, the transceiver at the opposite site and to get a first readout on the digital display.

Horizontal orientation



Loosen the four Lug Bolts (E screws and O lug bolts) so you can rotate the JAH-L freely. Rotate the Transceiver-JAH-L assembly left or right, so as to place the horizontal axis of the telescope reticule on the same horizontal level as the opposite site. Tighten the four Lug Bolts to maintain this position.

Vertical orientation

Similarly, slightly loosen the Gross Elevation Locking Screws (on the side of the Yoke, F and D screws) and rotate the Transceiver-JAH-L assembly up or down, so as to place the vertical axis of the telescope reticule on the same vertical level as the opposite. Tighten the four screws to maintain this position.

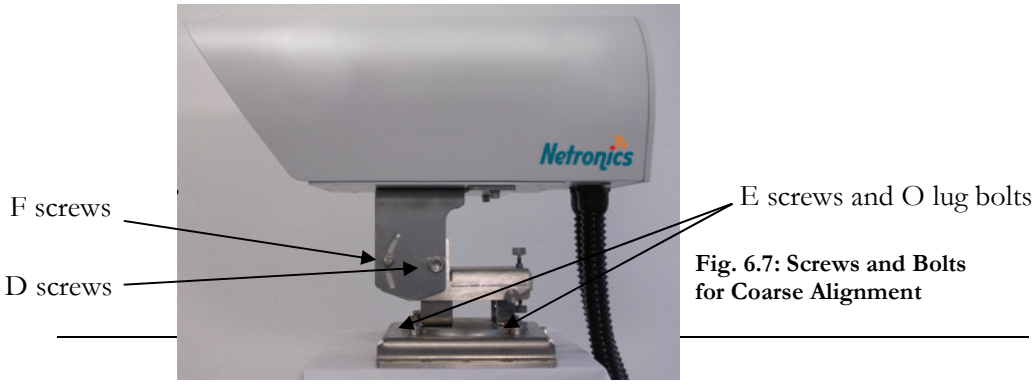


Fig. 6.7: Screws and Bolts for Coarse Alignment

Fine Alignment

The purpose of fine alignment is to position the center of the transmitted beam spot on the center of the NetLight receiver – in both directions (Fig 6.8). This is achieved by adjusting the horizontal and vertical motion screws (shown in Figure 6.9) until maximum power is received at the opposite NetLight.

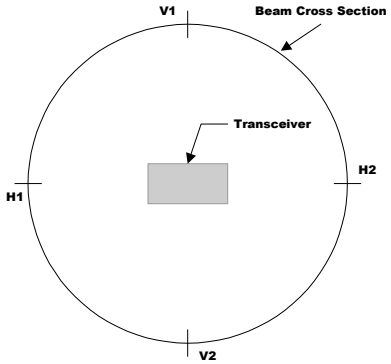


Figure 6.8: Front view – Transceiver at the middle of the beam cross section

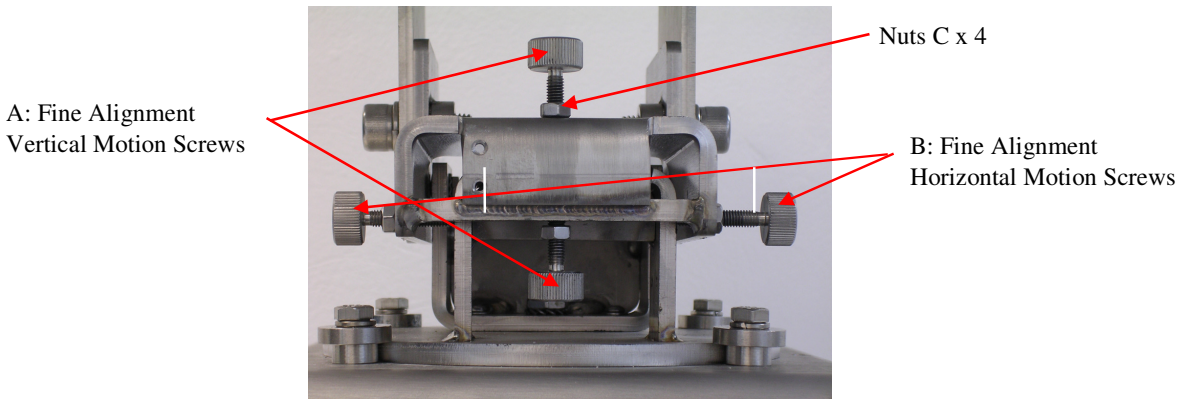


Figure 6.9: Fine Alignment Motion Screws

Before the Fine Alignment process loosen the 4 Fine Locking Nuts (nuts: C)
Fine Alignment Vertical Motion Screws – Two screws ('A'). Used for fine rotation of the NetLight in the vertical plane.
Fine Alignment Horizontal Motion Screws – Two screws ('B'). Used for fine rotation of the NetLight in the horizontal plane..

Notes

- *Two installers are required for fine alignment, one at each NetLight site.*
- *The installers should each have a walkie-talkie, a mobile phone or any other equipment to enable each to talk with the other working at the opposite site.*

The fine alignment procedure is as follows:

1. Find the horizontal and vertical Beam edges (H1, H2, V1, V2) by obtaining a reading between 50 and 80 on the 7-segment display.
2. Set successively the remote transceiver in the middle of the two segments [H1, H2] and [V1, V2].

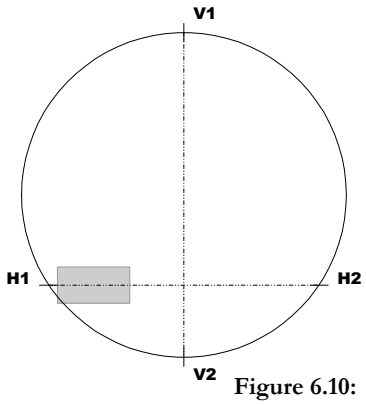


Figure 6.10: Position at the beginning (after the coarse alignment)

Important: Do ***not*** in any case select the head position for which the DVM reading is maximum! The best position of alignment is the beam center.

To determine the horizontal beam edges H1 and H2, move the local transceiver slowly left and right until the digital readout on the remote transceiver becomes 50. Identify these two points relative to reference points on the opposite site by looking through the telescope. By moving the local transceiver, set the remote transceiver at the middle of these two reference points.

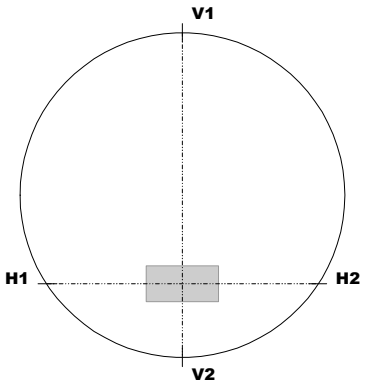


Figure 6.11: Position after the horizontal aiming

Repeat this process for the vertical positioning (middle of segment [V1,V2]).

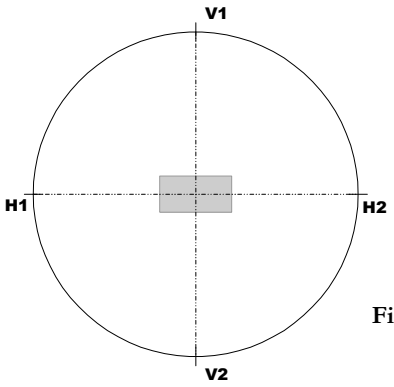


Figure 6.12: Final position after the vertical aiming

Once the position is reached, tighten firmly the 4 Alignment screws (2xA and 2xB) and then tighten firmly the 4 Fine Locking Nuts (nuts "C").

Repeat this procedure interchanging roles with the second installer at the opposite site, i.e., the second installer will move the remote transceiver while the first installer will report the digital readout at his end).

At the end of the procedure, the digital readout should be approximately the same on both transceivers (see Appendix B page 75 for expected readings).

For short distances below or close to the minimum distance specified for each model (see section Technical Specifications), pay attention that the digital readout does not exceed 1200.

Link Operating Test

Set back the Mode Select Dip-Switch on the Normal position (Toggles # 1 and 2). Set the other Dip-Switch toggles according to your application and the chosen features (Data rate, Transmission mode, Management control mode, heating....).

At both sites, connect with fiberoptic or STP cables coming from the peripheral equipment to the fiberoptic or copper port of the transceiver.

IT IS A CROSS CONNECTION:

TX → RX AND RX → TX

The SFP interface Flag and Sync. (100Base-Tx Link and Data on NL/100-880 and NL/155-1900/100-F) indicators should turn ON as soon as the peripheral equipment is powered ON.

A BER test is recommended. In case this is not possible at least check with the customer/user the performance of the whole link (see the chapter Bench Test).

Installation Log

Write down all the information about the installation (including digital readout and the setup of the transceivers) in an installation log. This information is a valuable reference for future maintenance or troubleshooting visits.

An example of an installation form is shown in Appendix H.

Before Closing the Rear Door

1. Check if you want the management in Hardware or Software mode
2. Check if you want to enable the heating (if it exists)
3. Ensure that all cable connectors are in the right place and secure.
4. All cables are properly held in position.

Visual Inspection

Visually check that all parts and cables are connected.

Closing the rear door

Rotate the Rear Door around the axis (G) and push it. Close the five screws (I) -- see Figure 6.13

.

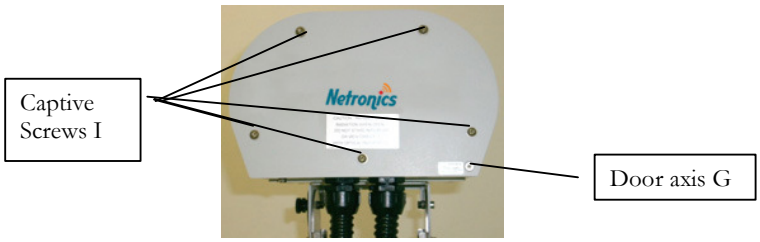


Fig. 6.13: Screws I and door axis

Installation Completion

Check that the heads appear as shown in the photographs below.

Fig. 6.14: Mounted NetLight – Left View

Fig. 6.15: Mounted NetLight – Back View

Fig. 6.16: Mounted NetLight – Front view

Chapter

7

Maintenance

Periodic Visits

Periodic visits (every three/six months, depending on the installation environment) should be planned for:

- Checking the display
- Checking the mounting
- Cleaning the optical aperture of the transceivers
- Cleaning the building windows for indoors installations.

At cleaning time, the reading of the digital readout should be noted in a service log book. If after the optical aperture is cleaned the reading is substantially lower than that noted at installation time, the aiming accuracy should be examined and restored if necessary.

***Note**: Aiming accuracy should be checked looking through the telescope and comparing the present scene sighting to the one sketched in the Installation Log at installation time.*

Product Specifications

NL/G-1000 Product Specifications

Part Number			**NL/G-1000 or NL/G-1000**
Model			NL/G-1000 or NL/G-1000-F
Standard P.N			**NL/G-1000/M8L/VS**
Application / Data Protocol			Giga bit-Ethernet, Fiber Channel
Performance	Rate		1.0625Gbps & 1.25 Gbps
	Range [(1)] @ 3dB/km		1100 m
	@ 5dB/km		950 m
	@ 10dB/km		730 m
	@ 17dB/km		570 m
	@ 30dB/km		**425 m**
	Minimum Range		Less than 10 m
	Bit Error Rate		Less than 1E-12 (unfaded)
	MTBF		10 years
Transmitter	Light source		1 VCSEL
	Wavelength		830-860 nm
	Total Output power		16 mW
	Beam divergence		3.5 mrad
Receiver	Detector		APD
	Field of view		8 mrad
	Sensitivity		-33 dBm
Interface	Type		SFP - Multimode (Single mode available upon request)
	Connectors		LC
	Wavelength		850 nm (other wavelength available)
	Cable		Up to 220m length @ 62.5um & Up to 500m length @ 50um
	Output power		-3 to -9.5 dBm
	RX Operating range		0 to –17 dBm
	Built-in Fusion		Optional – Optical SFP port
Power Supply			Factory set: 100-240 VAC @ 50/60 Hz or 24-60 VDC (V3 or F3 Versions) (15 W, 25 W with heating)
Environmental Information	Operating Temp.		-30 °C to +50 °C
	Storage Temp.		-50 °C to +70 °C
	Humidity		95% non-condensing
	Housing		Weatherproof – IP 66
	Eye safety Class		1M
Mechanical Design	Dimensions [mm]		Mounted on JAH-L: 470 X 282 X 355
	Weight	Unit	5 kg
		Accessories	5.5 kg
Diagnostics Indicators and Selectors	Indicators		Airlink: Flag, SFP main and redundant: Flag, Laser enabled, Alignment, Loopback mode, Fusion mode and activity, Software mode, Management TX and RX, Receive Signal Strength (Digital Display)
	Selectors		Alignment, Loopback (local), Signal attenuation (for short distance), Fusion activation, Data Rate, Control Mode.
	Dry Contact		4 dry contacts for: Airlink Flag, Fiber Optic Flag, Laser enabled and Power
	Management		JT-SNMP-SW/E included (SNMP Unit with web based software, extended version License)

NL/100-880 Product Specifications

Part Number			**NL/100-880**
Model			NL/100-880
Standard P.N			**NL/100-880/FE-O/V3**
Application / Data Protocol			Fast Ethernet
Performance	Rate		100 Mbps
	Range [(1)] @ 3dB/km		880 m
	@ 5dB/km		770 m
	@ 10dB/km		600 m
	@ 17dB/km		480 m
	@ 30dB/km		**360 m**
	Minimum Range		Less than 10 m
	Bit Error Rate		Less than 1E-12 (unfaded)
	MTBF		10 years
Transmitter	Light source		1 VCSEL
	Wavelength		830-860 nm
	Total Output power		5 mW
	Beam divergence		3.5 mrad
Receiver	Detector		Silicon Photodiode
	Field of view		14 mrad
	Sensitivity		-34 dBm
Interface	Type		100BaseTX or Optical SFP (optional) MM/SM 1310nm LC
	Connectors		RJ45 (LC for the Optical option)
	Cable		STP (F/O for the Optical option)
Power Supply			Factory set: 100-240 VAC @ 50/60 Hz or 24-60 VDC (V3 Versions) (15 W, 25 W with heating) **PoE (Power over Ethernet): In V3 version (Low voltage)**
Environmental Information	Operating Temp.		-50 °C to +60 °C
	Storage Temp.		-50 °C to +70 °C
	Humidity		95% non-condensing
	Housing		Weatherproof – IP 66
	Eye safety Class		1M
Mechanical Design	Dimensions [mm]		Mounted on JAH-L: 470 X 282 X 355
	Weight	Unit	5 kg
		Accessories	5.5 kg
Diagnostics Indicators and Selectors	Indicators		Airlink: Link, Data. 100BaseTX: Link, Data. Optical SFP (optional): Link, Data. Alignment mode, Loopback mode, Software mode, Laser status, Management TX and RX, Receive Signal Strength (Digital Display)
	Selectors		Alignment, Loopback (local), Laser On/Off, Window Heater (if exists), Control Mode., Data Transmission
	Dry Contact		2 Dry Contacts (AirLink and FO Link).
	Management		SNMP hardware present in the product. SNMP software licenses: JT-SNMP-SW/B or JT-SNMP-SW/E: optional P.N of the product including SNMP software license: NL/100-880/FE-O/V**M***: License for Basic version NL/100-880/FE-O/V**E***: License for Extended version

Notes:

[(1)] 3dB/Km: Light rain (5 - 10mm/hr) - Light Haze
5dB/Km: Light to medium rain (15 - 20mm/hr) - Haze
10dB/Km: Medium to Heavy rain (45mm/hr)-Light snow-Thick fog
17dB/Km: Cloudburst (100mm/hr)-Medium snow-Light snow
30dB/Km: Rain (up to 180mm/hr)-Blizzard-Moderate fog

NL/155-1900 Product Specifications

Part Number			**NL/155-1900 or NL/155-1900**
Model			NL/155-1900 or NL/155-1900-F
Standard P.N			**NL/155-1900/M3L/VS or NL/155-1900/M3L/FS**
Application / Data Protocol			Fast Ethernet, ATM, OC3,STM1, SMPTE, E3, T3, OC1/STM0 & and others between 10 and 155Mbps
Performance	Rate		10-155 Mbps
	Range [(1)] @ 3dB/km		1900 m
	@ 5dB/km		1600 m
	@ 10dB/km		1150 m
	@ 17dB/km		850 m
	@ 30dB/km		**600 m**
	Minimum Range		Less than 10 m
	Bit Error Rate		Less than 1E-12 (unfaded)
	MTBF		10 years
Transmitter	Light source		1 Laser
	Wavelength		830-860 nm
	Total Output power		28 mW
	Beam divergence		3 mrad
Receiver	Detector		Silicon Photodiode
	Field of view		14 mrad
	Sensitivity		-37 dBm
Interface	Type		SFP - Multimode (Single mode available upon request)
	Connectors		LC
	Wavelength		1310 nm (other wavelength available)
	Output power		-17 ± 3 dBm
	RX Operating range		-14 to –30 dBm
	Built-in Fusion		Optional – Optical SFP port
Power Supply			Factory set: 100-240 VAC @ 50/60 Hz or 24-60 VDC (V3 and F3 versions) (15 W, 25 W with heating)
Environmental Information	Operating Temp.		-50 °C to +60 °C
	Storage Temp.		-50 °C to +70 °C
	Humidity		95% non-condensing
	Housing		Weatherproof – IP 66
	Eye safety Class		1M
Mechanical Design	Dimensions [mm]		Mounted on JAH-L: 470 X 282 X 355
	Weight	Unit	5 kg
		Accessories	5.5 kg
Diagnostics Indicators and Selectors	Indicators		Airlink: Flag, Sync. Fiber Optic: Flag, Sync., Alignment mode, Loopback mode, Remote Loop Back mode, Fusion mode and activity, Software mode, Laser status, Management TX and RX, F/O Redundant Link and Sync., Receive Signal Strength (Digital Display)
	Selectors		Alignment, Loopback (local), Remote Loop Back, Alignment Signal Attenuation, Laser On/Off, Fusion activation, Window Heater (if exists), Control Mode.
	Dry Contact		2 Dry Contacts (AirLink and FO Link).
	Management		JT-SNMP-SW/B included (SNMP Unit with web based software, Basic version License) can be upgraded to JT-SNMP-SW/E (Extended version License).

NL/155-1900-F Product Specifications

Part Number			**NL/155-1900-F**
Model			NL/155-1900-F
Standard P.N			**NL/155-1900/FET/F3**
Application / Data Protocol			Fast Ethernet
Performance	Rate		100 Mbps
	Range [(1)] @ 3dB/km		1900 m
	@ 5dB/km		1600 m
	@ 10dB/km		1150 m
	@ 17dB/km		850 m
	@ 30dB/km		**600** m
	Minimum Range		Less than 10 m
	Bit Error Rate		Less than 1E-12 (unfaded)
	MTBF		10 years
Transmitter	Light source		1 Laser
	Wavelength		830-860 nm
	Total Output power		28 Mw
	Beam divergence		3 mrad
Receiver	Detector		Silicon Photodiode
	Field of view		14 mrad
	Sensitivity		-37 dBm
Interface	Type		Electrical – 100BaseTX
	Connectors		RJ45
	Cable		STP
	Built-in Fusion		Included - 100BaseTX connection
Power Supply			Factory set: 100-240 VAC @ 50/60 Hz or 24-60 VDC (V3 Versions) (15 W, 25 W with heating) **PoE (Power over Ethernet): In V3 version (Low voltage)**
Environmental Information	Operating Temp.		-30 °C to +60 °C
	Storage Temp.		-50 °C to +70 °C
	Humidity		95% non-condensing
	Housing		Weatherproof – IP 66
	Eye safety Class		1M
Mechanical Design	Dimensions [mm]		Mounted on JAH-L: 470 X 282 X 355
	Weight	Unit	5 kg
		Accessories	5.5 kg
Diagnostics Indicators and Selectors	Indicators		Airlink: Link, Data. 100BaseTX Main: Link, Data. Alignment mode, Loopback mode, Fusion mode and activity, Software mode, Laser status, Management TX and RX, 100BaseTx Redundant Link and Data., Receive Signal Strength (Digital Display)
	Selectors		Alignment, Loopback (local), Remote Loop Back, Alignment Signal Attenuation, Laser On/Off, Fusion activation, Window Heater (if exists), Control Mode., Data Transmission
	Dry Contact		2 Dry Contacts (AirLink and FO Link).
	Management		JT-SNMP-SW/B included (SNMP Unit with web based software, Basic version License) can be upgraded to JT-SNMP-SW/E (Extended version License).

Digital Readout vs. Distance

These tables are only intended to give you an idea of what digital readout you could expect according to the distance to link.

D= Distance [m] R= Reading (Digital readout)

Normal Tx mode:

NL/G-1000
NL.G-1000-F

D	70	100	150	200	250	300	350	400	450	500	550	600	680	1000
R	850	610	420	300	230	185	150	125	110	90	75	65	55	30

Attenuated Tx Mode:

D	<35	50	70	100
R	>500	400	270	170

NL/100-880

D	50	100	150	200	250	300	350	400	450	500	550	600	650	700
R	560	520	420	360	300	240	180	140	120	100	80	60	40	30

NL/155-1900
NL/155-1900-F
NL/155-1900-F

D	50	100	200	400	500	600	800	900	1000	1100	1300	1500	1700	1900
R	960	760	520	410	380	330	210	170	130	100	70	40	35	25

Actual reading may **be greater or up to 15% lower**.

A note on the Digital Readout Charactersitics of the NL/G-1000

The digital readout of the NL/G-1000 works under a different principle from previous NetLights in the series. The readout level is derived from the actual light level at the photodetector, much like a standard optical power meter.
For this reason, background light entering the lens will also contribute to the reading. A typical reading with no signal on a sunny day would be 010 to 030. This will sum with the signal strength, so outside the reading at the minimum threshold would be higher than the reading for the corresponding signal in a bench test. Due to the AGC function, for higher signals the offset in the reading gradually becomes negligible. All this has no effect on the actual link performance. Please note, however, that the Air Rx LED is not affected by background light, and is purely a function of the received data level. So even with high background light reading, the Air Rx LED will not light in the absence of signal.
Moreover, in this NetLight model, the range of readings at any given distance varies more than in many other NetLights. This is due to the higher sensitivity receiver based on an APD rather than a PIN photodiode. The APD design has more variance in gain parameters, which offers optimal sensitivity and therefore fade margin, but adds another variable factor in the RSSI-to-received-power ratio. This range in the linear display can be of the order of ±20%, which in logarithmic terms is actually just ±1dB.

Unpacking Instructions for NetLight

The JMP is shipped assembled to the JAH-L, inside the accessories packing box. It must be dismantled prior to installation.

1. Unpack all the accessories.
2. Loosen completely the four 'E' screws (M6 hex), using wrench #10 and take the JAH-L off the base JMP (Save the screws for later use).

The packing box contains:

- 2 boxes with:
  - One Transceiver NL/100-880 or NL/155-1900
  - JITK – Installer tools kit and screws
  - CD manuals
  - Flexible ducts x 2
  - Flange x 2
- 2 Smaller boxes with accessories:
  - JAH-L & JMP

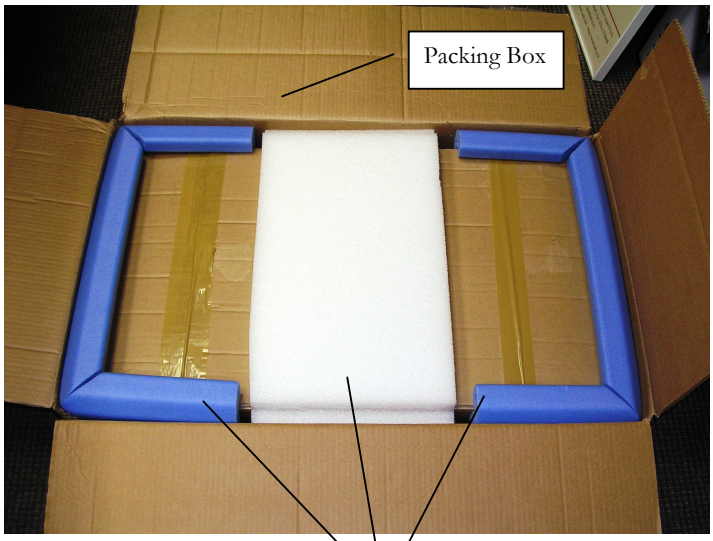


Fig C.1: The Packing box opened

Fig C.2: The Packing contains

KEEP IN SECURE PLACE ALL THE BOLTS AND SCREWS. YOU WILL NEED THEM FOR THE INSTALLATION.

Tool Kit, Equipment, and Materials

TOOLS

1. Electric drill (impact for masonry), reversible, with speed control and 0-13mm chuck
2. Drills set High Speed Steel (HSS) 3-13mm.
3. Concrete carbide .bit drills 6,8,9 and 10mm (regular and long shank).
4. Adjustable (crescent) wrench 6", 10".
5. Open-ring wrenches (spanners), standard and metric.
6. Vice grip pliers 10-12"
7. Cutter, long nose pliers, electrician's pliers (insulated).
8. Pen, Pencil, Permanent markers.
9. Lens cleaning clothes.
10. Screwdrivers (flat and Philips), sizes 1, 2, 3 + power screwdriver bits.
11. 50m extension cable + 3 outlet multiple electrical tap
12. 200g hammer.
13. Blade knife.
14. Ratchet handle driver.
15. Socket wrenches 8mm, 10mm, 11mm, 13mm, 14mm, ½" .
16. Netronics JITK-L, see next page for details.

MATERIALS

1. Anchors (wall plugs) "UPAT" 13mm diameter
2. Hex-head screws to fit wall plugs 40, 60, 75mm length.
3. Assortment of screws, nuts, washers, spring washers.
4. Electric insulation tape.
5. Super glue, tie wraps (Panduit™).
6. 20 mm fuse SB, 125mA, 160mA, 250mA, 500mA, 1A

ELECTRONIC & GENERAL EQUIPMENT

1. Digital voltmeter (DVM)
2. 2 Walkie Talkies or cellular phones.
3. Binoculars
4. Four STP cables (two cross and two straight) terminated with RJ-45 connectors each end.

OPTICAL EQUIPMENT (if relevant)

1. Optical Power Meter (Fotec, Noyes, Acterna…) with fiber sockets.
2. 2 sets of multimode (62.5 µm) and Singlemode (15µm) optical fibers with SC terminations.

LAB EQUIPMENT

E1/ETH/ATM/Fast Ethernet BER Test equipment- depending on NL model.

A LIST OF THE TOOLS SUPPLIED BY NETRONICS COMMUNICATIONS WITH EVERY NetLight HEAD

	Description	Qty	Where to use
a	WRENCH #10 for M6 Screws	1	**H:** JAH-L to NetLight box(x4) **E:** Lug screws (x4) **F:** Vertical Locking Screws (x2)
b	WRENCH #13 for M8 Hexa. Screws	1	**T:** JMP Grounding Screw Screws between JMP and JMB (if needed) Screws between JMP and pedestals (if needed)
c	WRENCH #8 for M5 screws and nuts	1	**C:** Fine Locking Nuts (on JAH-L) **S:** NetLight Grounding Screw
d	BALLDRIVER L, WRENCH 8mm	1	**D:** Gross Elevation Axis and Vertical Locking screws (x2)
e	BALLDRIVER L, WRENCH 3mm	1	**I:** Rear Door Screws (x5)
f	M8 SCREWS, WASHERS, SPRINGS, NUTS	4 of each	Optional. To mount JMP on standard pedestal
g	INSTALLATION TOOL CASE	1	Tool case

Wrenches Kit for NL Installation

NetLights Bench Test Procedure

Introduction

All NL Products are bench tested indoors prior to outdoor installation to ensure that the system is fully functional.
The bench test is a simple procedure whereby a link pair is aligned on the table and activated to simulate a channel of communication.

2 Points to Remember

1. Since the link distance during the bench test is very short (i.e. the devices activated are very close), the receivers will go into saturation unless the signal is attenuated.
To avert entering saturation, the transmit signal must be physically attenuated.
We recommend the simple procedure of inserting a piece of paper or the like into the beam path, or concealing a portion of the beam with an opaque (non-transparent) material. This will reduce the signal power entering the receiver.
Make sure to attenuate the signal enough so that the receiver's optical power meter value falls below the saturation estimate of the device. See table below for saturation estimate.

2. An additional derivative of the short link distance is the presence of reflections.
The signal will reflect off the front window of the receiver back at the transmitting device and may be mistaken as part of the opposite transmission.
This interference is commonly called "cross talk".
To avoid cross talk during the bench test, it is advisable to check whether interfering reflections exist by shutting off power to one device and verifying that the optical power meter reading in the other (active) device is zero.
This should be repeated for the opposite device.
Alternatively, a practical setup for bench testing the Light series (NL/100-880 and NL/155-1900 models) is presented in Figure E.2 and E.3; the bench test setup for the 8" series (NL/G-2300, NL/G-3500 and NL/155-5400) is presented in Figures E.1.
In the Light series (NL/100-880 and NL/155-1900 models) setup, a thin physical barrier, such as a piece of cardboard, is used as a wall to divide between the beam paths, thus ensuring that no cross talk occurs.
In the 8" series (NL/G-2300, NL/G-3500 and NL/155-5400) setup, the two devices are not centrally aligned; instead, only one corner of each device faces the opposite device. This allows for testing each transmitter separately. By rotating the devices 45 degrees, the next pair of transmitters is tested. Hence, testing all 6 transmitters in the link pair

requires only 3 rotations. With opaque masking tape, cover all transmitters that are not under test.

Table 1: Bench Test Information for NL Products

Product name	Opt. Power M. "Sub-Saturation" value	Potential for Interference
NL/100-880	1200	Low
NL/155-1900	1200	Med
NL/G-2300	1100	High
NL/155-5400	1200	High
NL/G-3500	1000	High

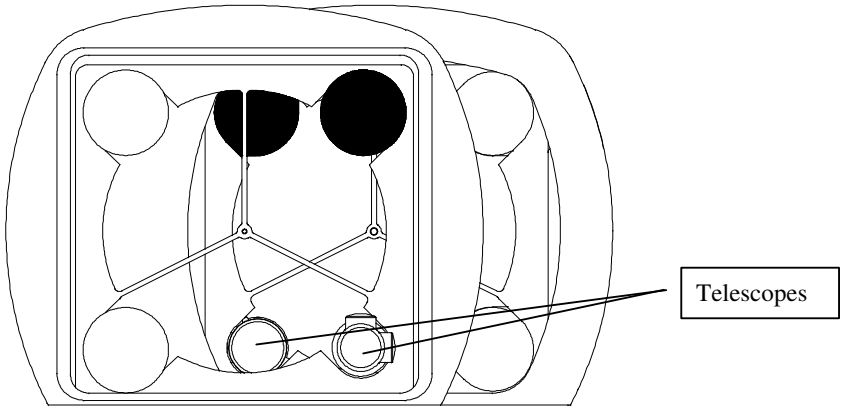


Figure E.1: Active Transmitters (Shown Darkened).

Bench Test for NL/100-880 and NL/155-1900 series with JAH-L

The Aiming head of the NL/100-880 and NL/155-1900 series was changed from AD-700 to JAH-L.
Therefore the NetLights are delivered to the clients not mounted on the Aiming head. In this case, when the back door is opened and secured in its place, it hangs over the NetLight basis and the NetLight can't stand straight and leans on the door, which can damage the door's hinges.
Therefore there are two ways to perform the Bench test, as can be seen on the following figures.
The first way is to mount the NetLight on its Aiming head and do all the tests before installation with the alignment head.

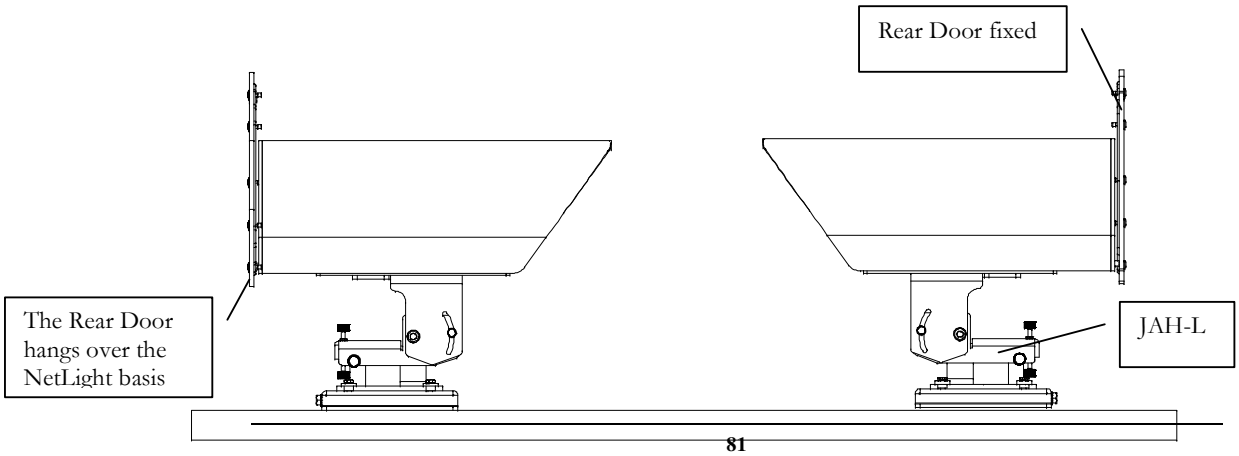


Figure E.2: Bench test with NetLight mounted on the Aiming Head (JAH-L.)

The second way is to put under the NetLight some object (minimum height - 3 cm), which will make the NetLight stand straight without leaning on the door. The foam, used for NetLights packaging can be used for this purpose.

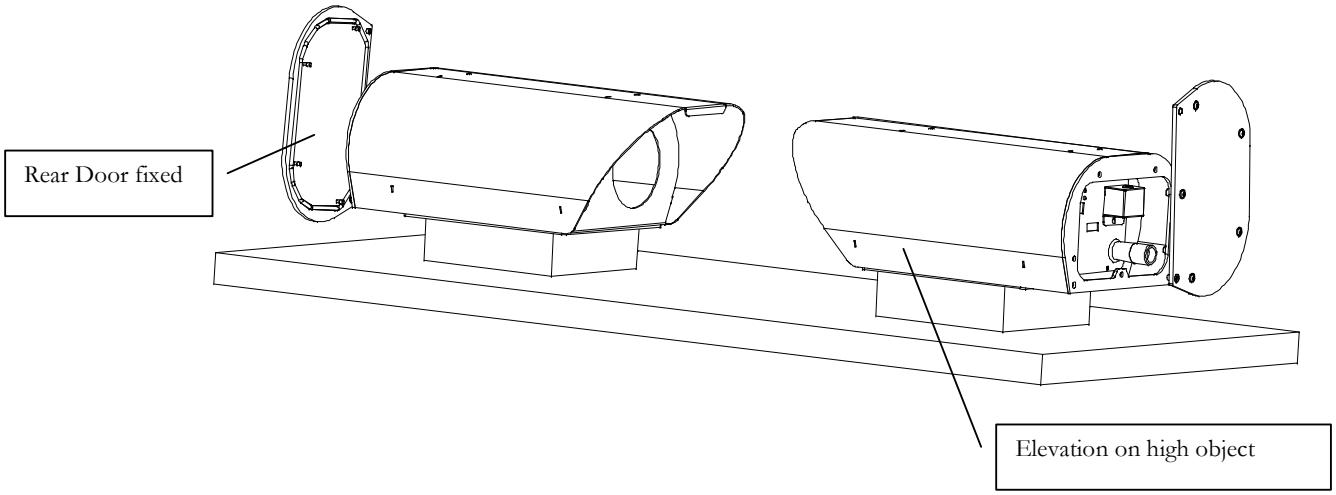


Figure E.3: Bench test with NetLight elevated.

Effect of Wind on NetLights

Introduction

The outdoor environment in which our devices are normally placed exposes the link to wind pressures that may affect the accuracy of the link's alignment.
Several factors play a role in the determination of the extent to which the directionality of a NL device may be affected by the wind:
Wind speed
Wind direction
Surface area of device perpendicular to wind
Mechanical stability of aiming head – device system.

For example, the mechanical stability is greatest along the side-side axis of the device. Although the surface area along the side of the device is greatest, the resultant wind force – even at very high wind speeds – will barely have an impact on the beam's direction, due to the rigid mechanics along the side-side axis.

Wind Limits for NL Devices

All NL devices have been tested in "worst-case" scenario of the above four factors.
The force necessary to deviate beam was measured from different direction.
From here[1], the minimum wind speed with maximum effect on beam deviation was determined.
The following table lists the minimum wind speeds for different NL products that may cause:
A momentary lapse in the communication.
An extended lapse requiring mechanical repair.

NL Device	Momentary	Extended
• 10" (E&F models)	110 km/hr	200 km/hr
• 10" with Windproof-L Accessory	Over 180 km/hr	Over 250 km/hr
• 4" (B,C, D models)	150 km/hr	Over 250 km/hr
• 4" with Windproof-S	220 km/hr	Over 300 km/hr
• Light (100-880& 155-1900 series)	150 km/hr	Over 250 km/hr
• PAL (NL1)	180 km/hr	Over 250 km/hr

[1] We include here the formula for calculating the effective wind force on a flat surface, given a known wind speed:

Wind Force = 0.79 x (Wind Speed)^2 x (Area of Surface)

For instance, assuming a wind speed of 27.78 m/s (equal to 100Km/hr) on a surface area of 0.04m^2 (400cm^2), the force is equal to 24.4 Newtons.

• 8" (Models G-2300, and 155-1900 series)	150 km/hr

FSO Chaining

What is Chaining?

The Chaining of FSO is required when the two sites are connected by more than one link using at least one additional building as a mid-point.

When is Chaining required?

The Chaining of FSO links is required in the following cases:

a) When there is no direct line of sight between the sites;
b) When the distance between the sites is too long;
c) When the distance between the sites is reachable with one link but the customer wants much more Power Budget for higher reliability.

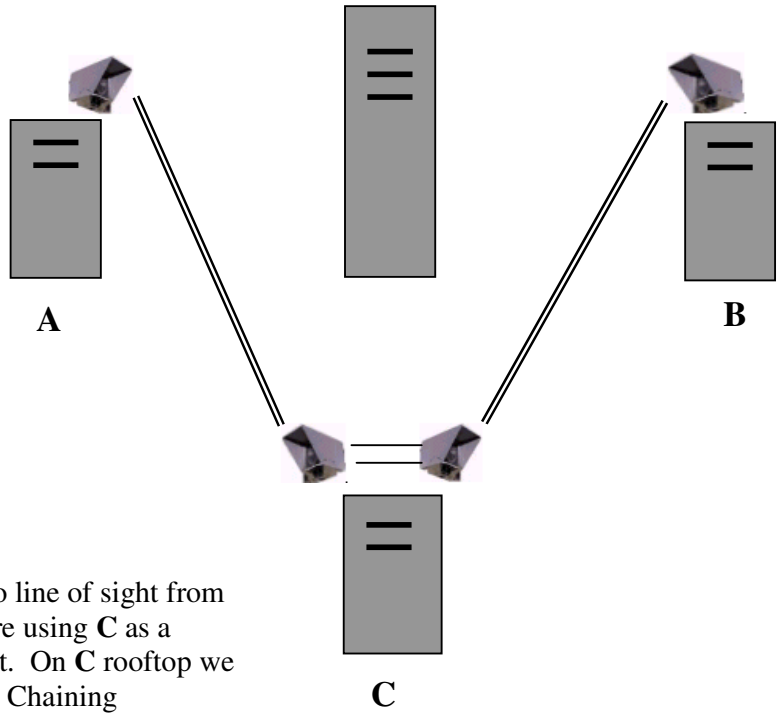


Fig G.1:

As there is no line of sight from **A** to **B**, we are using **C** as a repeater point. On **C** rooftop we used "Direct Chaining connectivity

Indirect Chaining

Indirect Chaining is required for connecting FSO units not including clock recovery circuits. In cases of indirect connectivity, the connection between the two FSO units on the same roof must be done through the Switch or Router or another means of connection that is located inside the building. For example, in Fig. 2, we use the indoor switch in building C for the chaining.

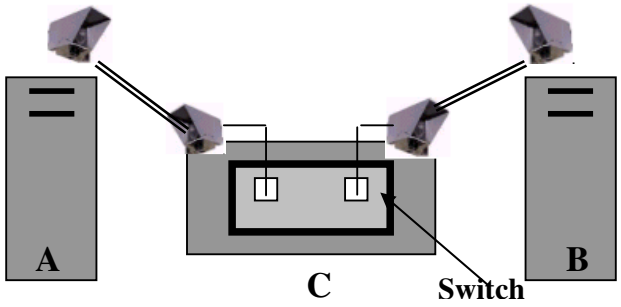


Fig. G.2
Indirect chaining

Direct Chaining

Direct Chaining is the capability to directly connect two FSO units on the same roof (used as repeaters) i.e.. direct crossing between Rx and TX of the two units. For example, in Fig. 3 connection is achieved on rooftop of building **C** without the need to enter the building.

Direct connection is possible for FSO that include clock recovery circuits. The clock recovery regenerates the signal and enables smooth direct chaining.

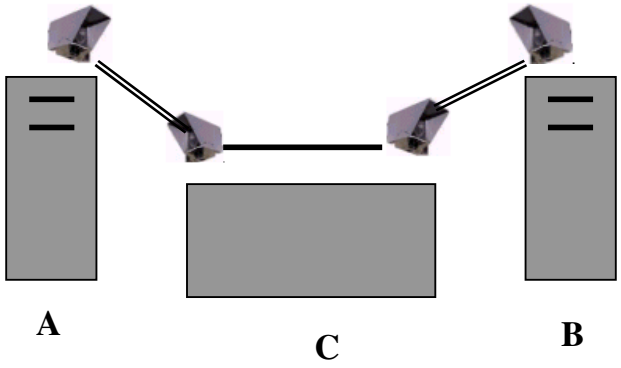


Fig. G.3
Direct chaining

Chaining Limits

The number of links that can be chained is limited due to the Jitter parameter. Sensitivity to jitter is different for every protocol and can vary with different manufacturers. The typical number is 3-4 chained links. If more chains are required, please consult your Netronics representative.

FSO products & Chaining

Product series	**Chaining**	**No of chained links**
NLG (100-1500 Mbps)	Direct	3-4
NL155 (1-155 Mbps)	Direct	3-4
NL100 (Fast-Ethernet)	Direct	3-4
NL34 (Open Protocol, 1-34 Mbps)	Indirect	3-4
NL10 (Ethernet)	Direct	3-4
NL Mux (Mux 4E1, 4T1)	Direct	No Limits*
NL2 (E1, T1)	Direct	No Limits*

**No Limits – it refers to Networking extentions. If the extentions are of TDM type (E1,E3,STM-1, STM-3), after some chains we might face some "jitter"problems. Therefore,in such cases, chaining should be considered on a case by case basis.*

Installation Log

D.1. Client / Dealer details

	Customer	Dealer
Company Name		
Address City Country		
Contact Person		
Tel		
Fax		
e-mail		

D.2. Application details

Type of network	☐ E1 , ☐ Ethernet , ☐ Token Ring , ☐ Fast Ethernet , ☐ FDDI , ☐ ATM , ☐ Other (Specify)
Product	
Evaluated distance by customer	
Address of installation (site A)	
Address of installation (site B)	

D.3. Sketch of the area

D.4. Site survey

Done by	
Customer representative	
Distance	
Date	

	Site A	Site B
Location		
Floor		
Orientation (NSEW)		
Installation site scheme		
Indoor / Outdoor		
Plate JMP / Bracket JMB		
Window attenuation		
On-line UPS		
Voltage required (110V / 230V)		
Ground earthing		
Radio antenna field		

Associated interface equipment	Site A	Site B
Manufacturer		
Type		
Model number		
Interface type		

D.5. Installation

Done by	
Customer representative	
Date	

	Site A	Site B
System model		
Serial number		
Location : Same as site survey, if not provide details		
Accessories : Same as site survey, if not provide details		
Digital readout		
Telescope calibration : if cannot , sketch the telescope view		

BER test	
BER equipment type	
Loopback location	
Error type (random, burst)	
Brief interruption test	

D.6. System failure

Visit made by	
Customer representative	
Date	

	Site A	Site B
Sketch of telescope view		
Digital readout		
Failure detail		
Action items		

Visit made by	
Customer representative	
Date	

	Site A	Site B
Sketch of telescope view		
Digital readout		
Failure detail		
Action items		

Power over Ethernet

The Power-over-Ethernet (PoE) option is available only for Low Voltage NetLight model NL/100-880 and NL/100-880 -F. PoE eliminates a separate DC power supply cable at each Access Point (AP) location, i.e., it allows for a single Ethernet cable providing both data and power to be run to each AP instead of two separate cables, one for power and the other for data. There are two types of PoE connections. One type utilizes all 8 wires of the Ethernet cable. The wires that are connected to pins 1, 2, 3, and 6 carry both power as well as data. The other type utilizes the four wires that are connected to pins 1, 2, 3, and 6 for carrying data, and the four other wires that connect to pins 4, 5, 7, and 8 for carrying power. Pin 4 is shorted to pin 5 and these are connected to the (+) terminal of the power supply. Pin 7 is shorted to pin 8 and these are connected to the (-) terminal of the power supply. Both are floating isolated voltage as is usual for a -48V Telecom supply. The NL/100-880 and NL/155-1900/100-F with PoE option support this second option only (as required per IEEE 802.3af standard) so proper connection to this pins should be provided.
The NL/100-880 and NL/155-1900/100-F can be connected by any of the following three methods:

1. The NetLight with PoE option is connected directly to *PoE-enabled* equipment –The only needed part is a straight (non-cross) Category 5 jr 5e cable, which will also supply power to the AP.
2. The NetLight with PoE option connected to *non-PoE-enabled* equipment through an external PoE adapter. The PoE adapter couples an Ethernet Line and DC Power (usually -48 VDC – see low voltage power requirement in Appendix A: specifications) onto an 8-wire straight (non-cross) Category 5 or 5e cable, as shown in Figure I.1. The other end of the PoE cable is connected directly to the NetLight with the PoE option. Adapters to be used with the NetLight are required to meet the IEEE 802.3af standard. Examples of brands of such adapters are: *HyperLink Technologies BT-CAT5-P1*, *PowerDsine 6001*. These two types of adapters are commercially available. This connection is illustrated on Figure I.1.
3. NetLight model NL/100-880 with PoE option connected to *non-PoE-enabled* equipment. In this case 8-wire straight (non-cross) Category 5 or 5e cable at the equipment side should be split on two wires groups. One group with standard pins 1, 2, 3, and 6 and carrying data to non-PoE enabled equipment. The other should be with four wires that connect to pins 4, 5, 7, and 8 for carrying power using external 48V power supply. Pin 4 is shorted to pin 5 and these are connected to the (**+**) terminal of the power supply. Pin 7 is shorted to pin 8 and these are connected to the (-) terminal of the power supply.

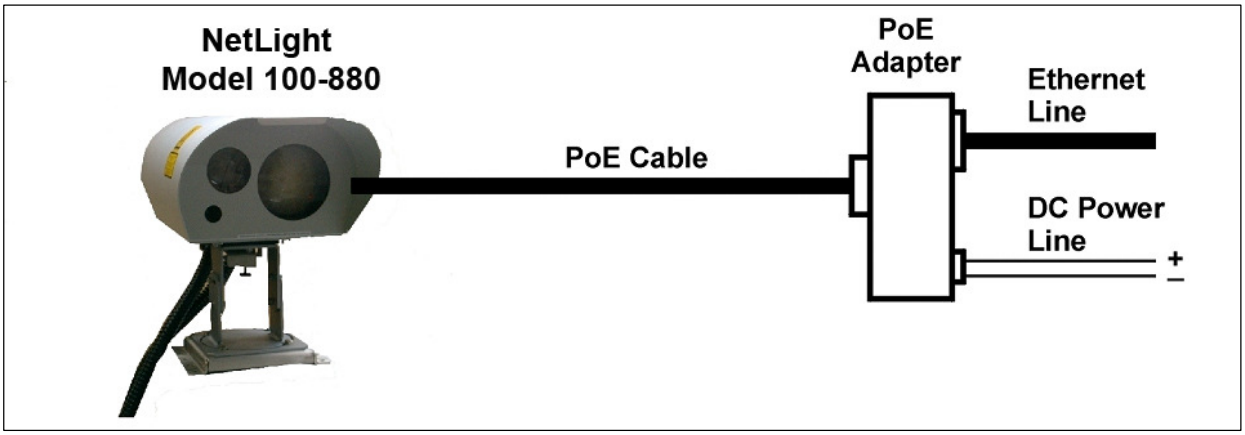


Figure I.1: Power-over-Ethernet Interconnection with external PoE adapter