



**Manual**  
**Neon 2000 Family**  
**Neon Remote Terminals (NRT)**  
**2015F Globalstar Satellite NRT**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules in the U.S.A. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This equipment has been tested for compliance with European regulations as follows:

Application of Council Directive:  
2004/108/EC

Standards to which Conformity is declared:  
EN-61000-6-1:2001  
EN-61000-4-2:1995  
EN-61000-4-3:1995  
EN-61000-4-4:1995  
EN-61000-4-6:1996  
ENV-50204:1995

Any changes or modifications to this equipment not expressly approved by the manufacturer Unidata Pty Ltd could void the user's authority to operate this equipment.



### Revision History

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### References

This manual should be read in conjunction with the associated StarlogV4 User Manual which describes the setting up of logging schemes for NRT terminals as well as all other Unidata Data loggers.

This manual should also be read in conjunction with the Neon Server Documentation which is available in PDF form from the Unidata web site and is also available as help screens within the Neon Server system.

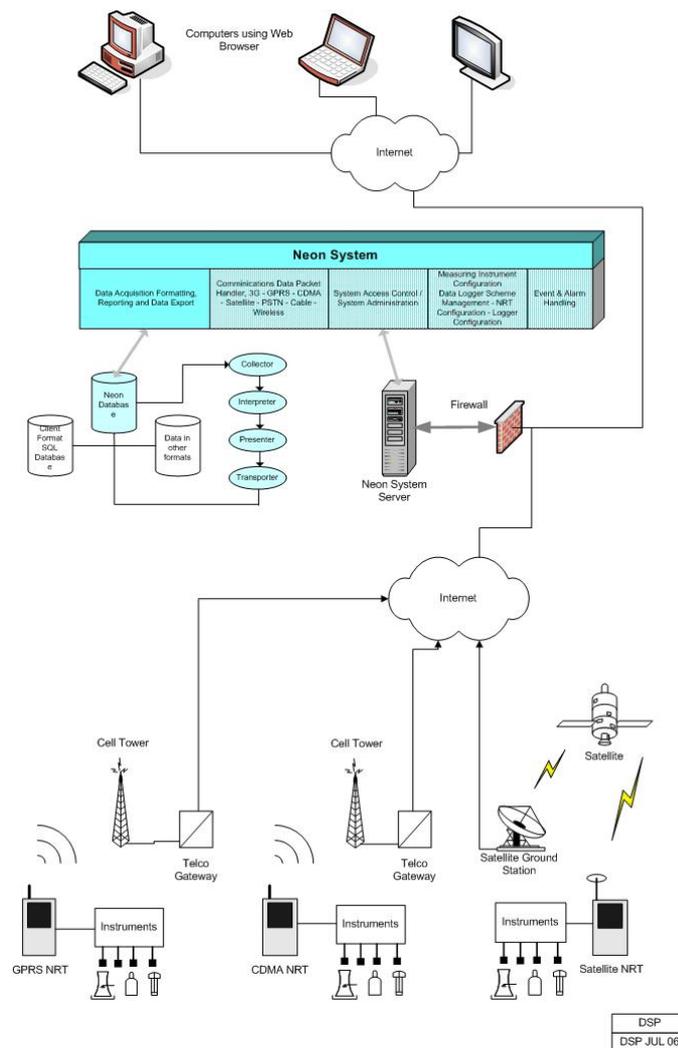
The NRT Terminal User Manual, the StarlogV4 User Manual and the Neon Server User & Administrator Documentation form part of the documentation suite for the overall Neon System.

## 1.0 NEON TECHNOLOGY AND MODULES OVERVIEW

Neon is a system for collecting measurements from field instruments and transmitting the measurements to a central system for data recording, analysis, reporting and data transfer to other external systems.

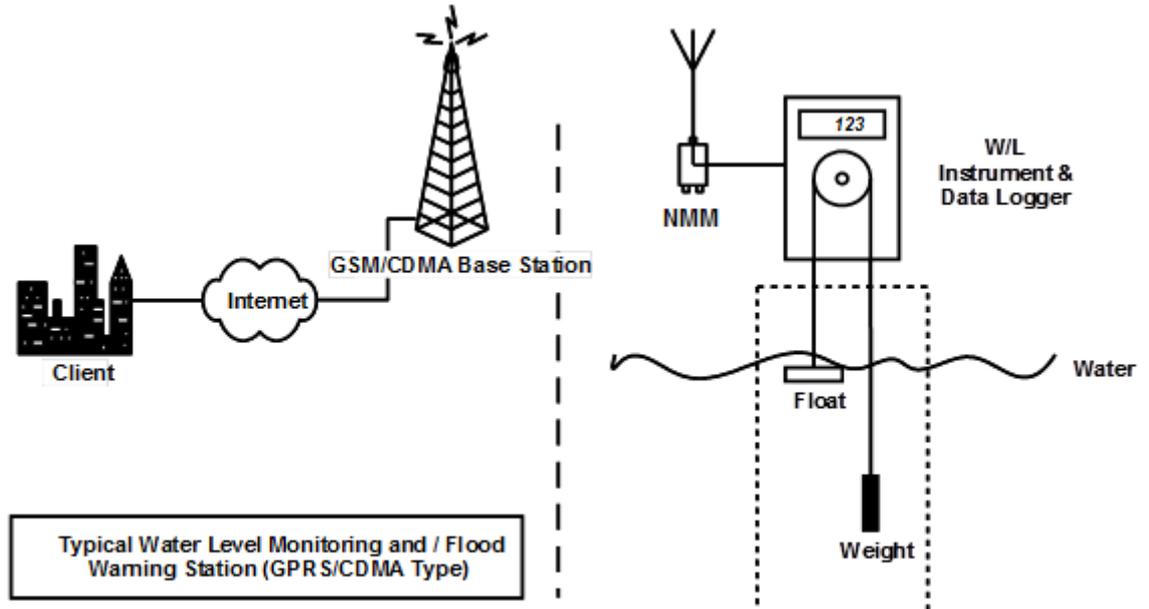
The Neon system also provides facilities for data collection, analysis, reporting and field measurement equipment and management within specified areas as defined by the system. Examples of this include country wide access, regional access and different access levels according to the rights and privileges of users, e.g. supervisor level, manager level, coordinator level and read only user level. The Neon System is suited to a range of uses such as environmental monitoring of remote instrumentation and automated industrial and utility metering.

The Neon system may be offered on a system basis, with the customer purchasing the server and a software license from Unidata, or can be provided on an application service basis where the customer pays a service fee for Unidata to run the application on a Unidata central server.



Overview of the Neon System

### 1.1 Typical Neon Measurement System



The figure above is an example of a Neon installation showing an NMM connected to a Water Level Instrument. Every day the NMM will send a “packet” of information containing the data in raw format via GSM / 3G to the Neon server. The Neon server extracts the raw data from the packet. The data is then stored on a secure server until the client accesses the data using a standard Web Browser.

### 1.2 The Internet

The Internet provides the transport mechanism between the Neon Servers and the telecommunication provider gateways. This means that NMM units can be used anywhere in the world.

### 1.3 GSM

GSM (Global System Mobile) is a cell phone standard developed for second-generation (2G) digital cellular networks used by mobile phones in most parts of the world. GSM provides the “backbone” upon which GPRS, voice and data communication travel.

### 1.4 GPRS

GPRS (General Packet Radio Service) is an IP-enabled cellular solution for urban communications. The power requirements are low and the GPRS electronics are fully integrated within the NMM. GPRS communications are generally available wherever GSM communications are available.

By this means a logger or field instrument connected to a GPRS-enabled communications device (such as a Neon NMM) can deliver data to any Internet connected computer.

GPRS provides an always-connected service – i.e. there is no dial up required. Typically the user pays for data use and not for time.

### **1.5 3G**

3G is the third generation of mobile telecommunications technology. 3G provides for faster information transfer rates.

### **1.6 Satellite Packet Data Service**

There are several low earth orbit and equatorial orbit packet data service providers. The NMM Satellite uses either the Globalstar system or the Inmarsat system.

The Globalstar system provides a service very similar to the Cellular based GSM GPRS service except via a satellite network.

The Inmarsat system provides IP (Internet Protocol) connectivity via the international Inmarsat GEO Satellite network from any location on the globe, except the Arctic and Antarctica. The Inmarsat system is used by Ethernet models of NMM.

### 1.7 NRT Internal Architecture

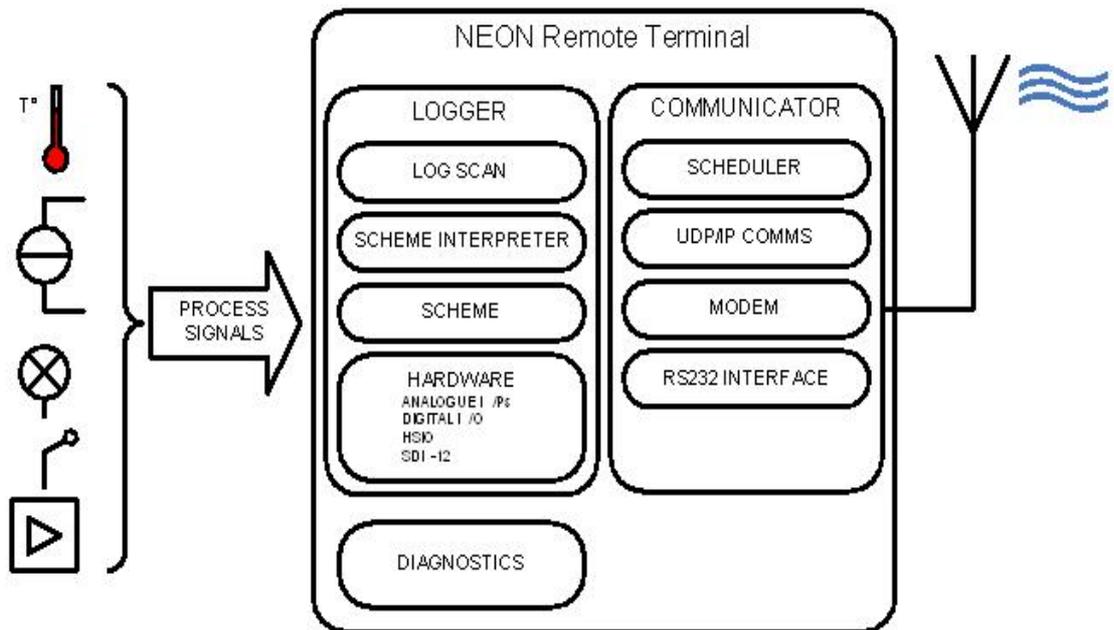
The NRT Internal architecture is shown below. It contains two discrete sections,

A **LOGGER** section where the terminal connects to the field transducers and the logging scheme, scan rates and diagnostics are managed.

The StarlogV4 support software allows a user to generate a logger scheme which defines transducer information, logging scan rates, logger interval etc and various engineering unit definitions. These files are called, for example the LDR and KBD files.

A **COMMUNICATOR** section which deals with communications to the server. This section contains, for example, a scheduler component and the modem component, either a Cellular Network modem or a Satellite Network modem. The communicator manages functions such as the reporting interval, the number of communications attempts per communications session, etc.

The StarlogV4 support software allows a user to generate a configuration file for the Communicator section, called an FPO file in which the user sets the required communications parameters.



## 2.0 SUMMARY OF NEON REMOTE TERMINALS

Neon Remote Terminals (NRT units) are small, ultra-low power microprocessor-based devices designed to collect data from data loggers and SDI-12 instruments. This data is then sent via Cellular Networks or Satellite packet data to a Neon server on a programmed schedule or as required for alerts.

The NRT also incorporates a fully-programmable data logger so that simple analogue and digital signals may be directly connected and recorded.

NRTs are classified according to the communications network over which they communicate. That is as either: Terrestrial (Cellular), Satellite (Globalstar or Inmarsat) or Ethernet.

There are many different models of Neon Metering Modules.

- Plastic case models are referred to as Neon Remote Terminals (NMMs),
- Plastic case models with an LCD are referred to as Neon Remote Modules (NRMs) and
- Metal enclosure models are referred to Neon Remote Terminals (NRTs).

This manual refers to all NMMs/NRMs/NRTs as NRTs because all 2015F's are NRTs.

All Neon Remote Terminals are small self-contained units in compact cases that connect to sensors in the field, collect readings from those sensors and transmit the collected data to a central Neon server. The type of network over which the collected data is transmitted varies from model to model.

The Neon central server system can be provided either on a Neon Data Service basis or on a Neon Client System basis. Both provide a central computer system to monitor and receive data from many Neon Remote Terminals in the field.

All Neon Remote Terminals are designed to automate collection of remote data from environmental monitoring, industrial measurements and utility metering via a communications network from any location within the network coverage area.

Fully bi-directional communications are possible via the Neon server. Data can be collected directly and the Neon module can be programmed from any internet connection.

The Neon modules also support integrated logging or automated collection of data from an external data logger.

All Neon Remote Terminals utilise built-in modems that support packet data. They have long battery life and low operating costs through use of advanced microcontroller technology.

All Neon Remote Terminals provide Input /Output functions as standard, including analog and digital inputs and SDI-12 data logger interface. There is also Modbus support via a partial implementation of the Modbus protocol, which allows for reading from and writing to specific registers within the Modbus RTU on an RS485 connection. Further details are available on request.

## 2.1 2015F Neon Remote Terminal – Satellite

The 2015F NRT Satellite is a small self-contained metal cased Neon Remote Terminal that communicates with the Neon server via the Globalstar satellite network.



## 3.0 NRT LED INDICATOR

The simplest indicator is the red LED which is visible in the window of the unit.

On first power on the LED will be brightly on (not flashing) for 10 seconds indicating the unit is in the process of being reset. Do not interrupt this initial start-up process. If the initial start-up is interrupted you should power down, wait a few minutes, and then power up again.

- **Slow flashing bright LED.** One flash per second indicates the NRT is establishing a network connection via the internal modem. This process takes approximately 10 to 20 seconds.
- **Fast flashing bright LED.** 3 to 5 flashes per second indicate the PPP session is running and the NRT is communicating through the internal modem to the host server. If the NRT is programmed to hold the PPP session open all the time, i.e. the always on mode, the LED will continue to flash at this rate.
- **Slow brief flashing (dim) LED.** One dim flash every Scan Interval (typically every 5 seconds) indicates normal NRT operation (sleeping). No communication is in progress. The NRT has been programmed to log data and will only establish communications at the defined reporting interval with which it has been configured.
- **Very occasional bright single flash.** This indicates the scheme is actively logging rather than sleeping at that particular time. If you have a scheme which has a 5 second Scan rate and a 1 minute Log Interval, you will see dim flashes (indicating sleep) every 5 seconds (i.e. every scan interval), then one bright flash on the minute, indicating that a log is in progress. This cycle repeats at the Log Interval, hence the LED will brightly flash every 1 minute.

When the NRT periodically communicates with the Neon server, the LED will

- slowly flash as it establishes a network connection, then
- quickly flash while it actually communicates with the Neon server (uploads log data, downloads its scheme, processes queued commands, etc), then
- slowly flash as it disconnects from the network

The durations of each stage will vary according to the telemetry type of the NRT and how much data is transferred between the NRT and Neon server.

If an NRT has been configured on the Neon server to Auto Cold Boot, then after the 10 second start up illumination, the NRT will immediately start a normal comms cycle, as previously described, following the normal slow flashing, fast flashing, slow flashing cycle.

## 4.0 GLOBALSTAR NRT SETUP AND TEST

The NRT Satellite has an internal Globalstar/ Qualcomm Satellite modem specifically for use on the Globalstar Satellite system. You will need to contact Globalstar in your region and set up an account for use of the Globalstar service.

The Globalstar regional office will require the Electronic Serial Number of the modem and may need to have the modem set up for the regional operating parameters. Once the Globalstar modem has been registered with Globalstar and the account has been set up and the Electronic Serial number registered it is ready for use.

Attach receive and transmit antenna cables taking care not to bend / distort them to the Globalstar satellite Modem. Note the antenna is an active one and is clearly marked with TX and RX as are the cables. If you mix up the TX and RX cables you can damage the antenna and modem, so take great care to check this.

### 4.1 Satellite NRT Site Installation

Take the complete NRT Satellite unit out of the building and set it up with a laptop computer where there is a clear view of the sky. The installation site needs to be selected to give the best unobstructed view of the sky, for Globalstar satellites, and an unobstructed view of the satellite, if an Inmarsat system is being used. As far as possible, there should be a minimum of trees and buildings restricting the clear view of the sky.

### 4.2 Globalstar Satellite Site Installation

The Globalstar satellites cross from one horizon to the other horizon in approximately 20 minutes, assuming a coverage view of the sky of 160 degrees, i.e. 80 degrees each side of the vertical. Globalstar antennas should therefore be mounted horizontally, pointing directly overhead.

If you only have an 80 degree view of the sky, i.e. 40 degree look angle from the vertical, you may not see satellites for some time. Also you will only see a passing satellite for half the horizon to horizon transit time, so you will only be able to see that particular satellite for 10 minutes. These important factors need to be considered when installing the NRT Satellite.

Also, Globalstar satellites do not always pass directly overhead. That is, they do not always traverse 180 degrees of the sky. Typically they rise from one point on the horizon and set via another that can be at any compass point. When a satellite rises and sets only a few degrees apart on the horizon, it does not rise very high into the sky and will only be visible for less than the maximum time.

However, there are multiple Globalstar satellites in orbit, so it is also possible for one satellite to come into view before the first goes out of site, allowing for longer coverage. In practice it is common for satellite sessions to last anywhere from a few minutes up to around 40 minutes. NRTs only need a very small window (less than a minute) for the satellite to be in view to allow for communications to complete. But it must be noted that Globalstar satellites will not always be visible when it is time for the NRT to communicate at its scheduled time with the Neon server. Globalstar coverage has improved greatly in recent years but it is still not perfect.

### 4.3 NRT Connections

NMM wiring connections are listed in the separate “Unidata Manual - NRT Family Cables & Connection Supplement” companion document.

## 5.0 NRT POWER REQUIREMENTS

### 5.1 Internal Power

The NRT Terminals can be powered by internal batteries and / or with an external battery supply. The recommended batteries are SAFT Lithium batteries which are specified in this manual. The Lithium batteries provide high inrush current required for modern cellular hand phones.

The NRT Satellite has three Lithium Batteries for the internal battery supply.

### 5.2 External Power

If required the NMM can be powered by an external supply of 6 to 16VDC @ 2A peak (while transmitting) and 25mA (while receiving) and 30uA while on standby. Unidata recommends 12V 7.2AH SLA (Sealed Lead Acid) batteries as a good external supply. External instrumentation must be separately powered if more than 500uA is required. The download schedule is the largest consumer of power.

The Continuous Drain Equivalent rating can be used to size the external power requirements and duration of external power supplies. However, external power sources should have an additional 100uA at 12V or 50uA at 6V continuous drain added, (due to parasitic losses in the NMM circuitry).

The decision to use an external power supply should be based on the projected or known frequency of battery changes, i.e. if a high download schedule is required and frequent battery replacement is going to prove difficult or expensive, then an external power supply is desirable.

### 5.3 Battery Life Table

Approximate NRT Terrestrial Battery Life	Approximate Download Schedule	Approximate Scan Rate	Approximate Log Interval	Approximate Continuous Drain Equiv
5 years	1 per day	5 secs	15 minutes	0.12 mA
4 years	4 times per day	5 secs	15 minutes	0.21 mA
1 year	1 per hour	5 secs	15 minutes	0.53 mA
52 days	1 per 5 minutes	5 secs	1 minute	5.2 mA
10 days	1 per minute	5 secs	5 seconds	26 mA

Table 1

## 6.0 NRT COMMISSIONING

Once the NRT has been installed and all connections made, field commissioning can be conducted. Ensure that a SIM card has been installed (see next section).

Commissioning tests may be performed as follows.

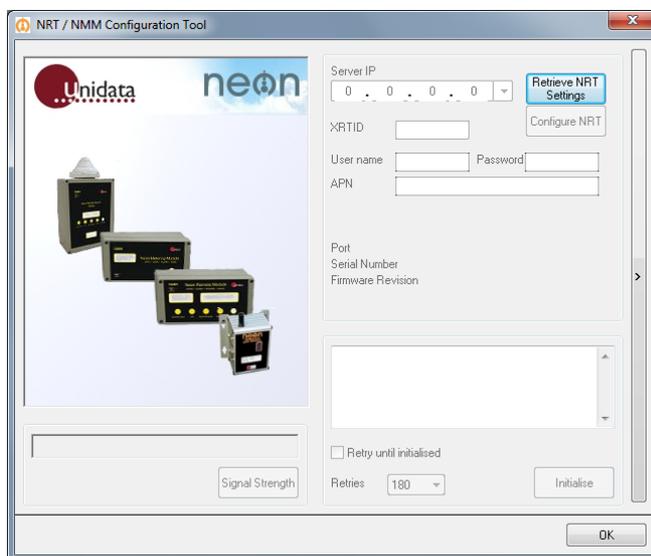
### 6.1 NRT Powered On

Confirm that the status LED, visible through the transparent window on the front of the unit, is flashing. With the NRT in an idle state the LED will flash faintly once every second.

### 6.2 NRT Confirm Configuration

Confirm proper configuration by connecting the NRT to a laptop computer running StarlogV4.

- Launch the STARLOGV4 (laptop computer) application.
- Press the 'Select' icon and select the scheme corresponding to the NRT
- Click on the 'Configure/Initialise' button to open the "NRT/NMM Configuration Tool" dialog
- Press the 'Retrieve NRT Settings' button at top right of the dialog



- Confirm that the correct Server IP address has been configured
- Confirm that the correct NRT ID (XRTID) has been configured
- Check the firmware version and NRT Model type
- If all checks are confirmed, the NRT may be Initialised

### 6.3 Globalstar Signal Strength and Registration

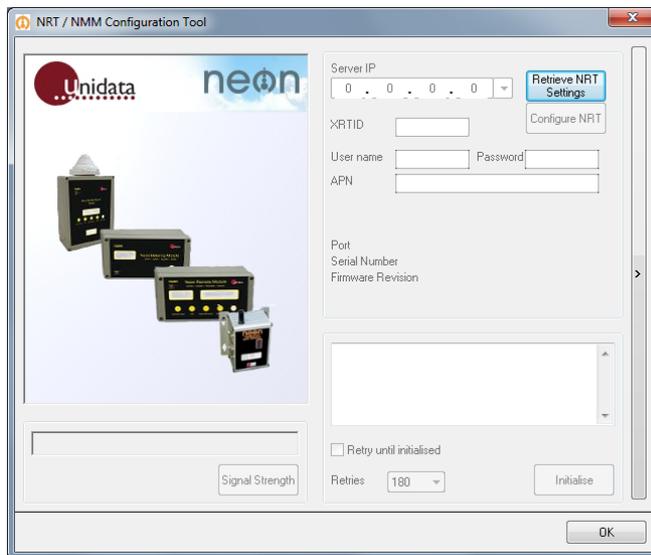
Globalstar modems do not require a SIM card but must be properly configured before they can register onto the Globalstar satellite network and allow the NRT to communicate with the Neon server.

Registration, Signal Strength and other satellite network information may be checked by using StarlogV4.

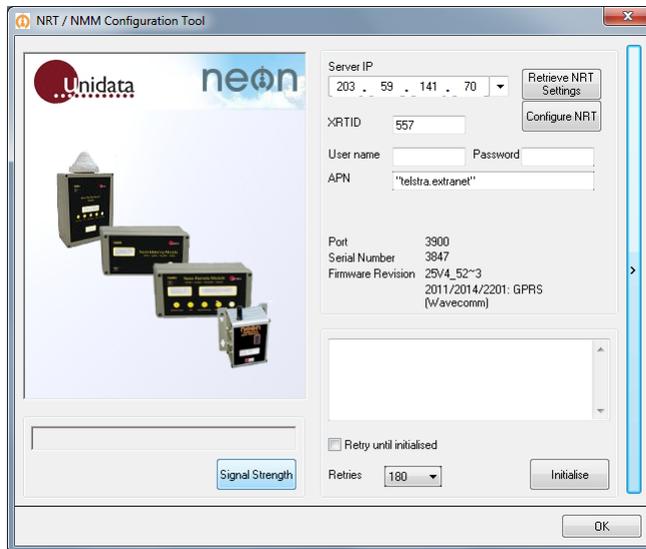
Globalstar modems do not really have signal strength. Instead they display a connection state in place of RSSI. The connection state must be 3 or 4 before the modem can connect to a satellite.

The procedure below shows some of the communications parameters that can be checked using StarlogV4.

- Reconnect to the NRT if not already connected.
- Launch STARLOGV4 (laptop computer) application.
- Press the 'Select' icon and select the scheme corresponding to the NRT
- Click on the 'Configure/Initialise' button to open the "NRT/NMM Configuration Tool" dialog
- Press the 'Retrieve NRT Settings' button at top right of the dialog



- Press the 'Signal Strength' button

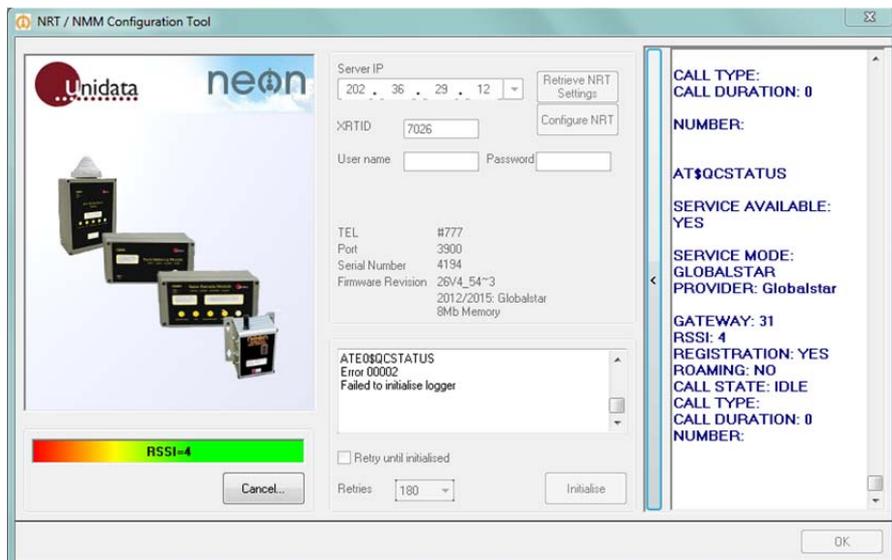


- Press the vertical 'Show / Hide Logger Communications' bar located along the right edge of the configuration dialog. It is marked with a '>' symbol.

After a short delay (10 seconds or so), the RSSI signal strength will be displayed. RSSI must be 3 or 4 for the NRT to be able to connect to the satellite network.

You may need to leave the NRT satellite for 10 minutes for the satellite modem to acquire one of the satellites and update the parameters.

The right dialog pane will display satellite network configuration information, including Gateway number, RSSI and Registration status.

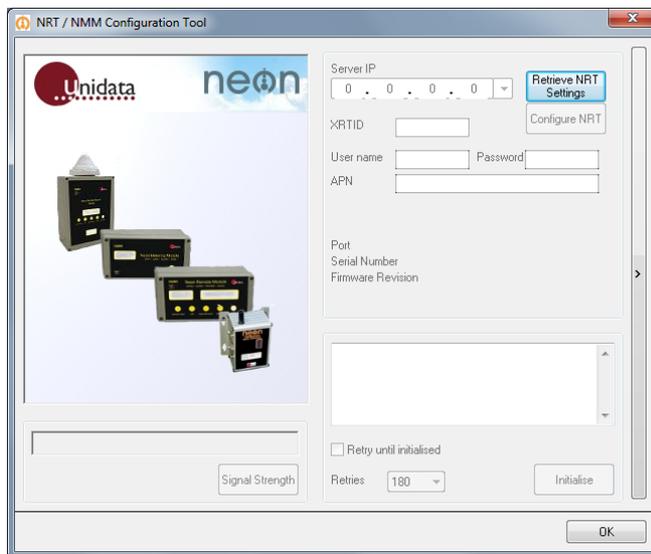


If the modem has been correctly registered onto the satellite network, REGISTRATION will be 'YES'. GATEWAY will change away from '-1' to a satellite gateway number.

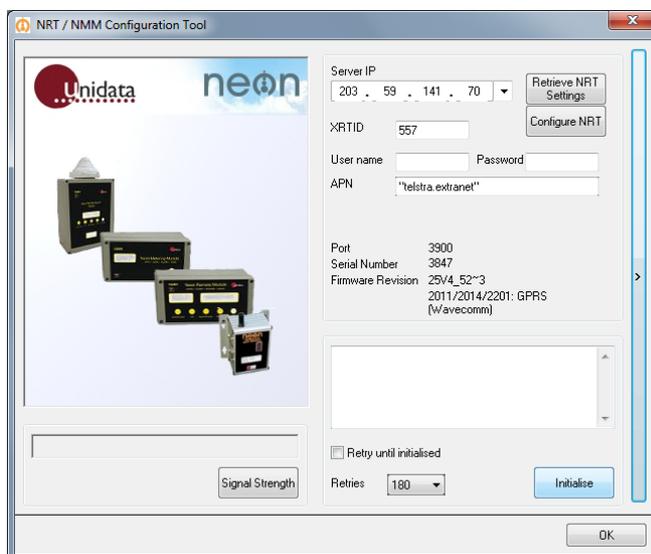
When it has been confirmed that the Globalstar modem has connected to the satellite network, exit the Signal Strength option by pressing the Cancel button. You may then exit the “NRT/NMM Configuration Tool” dialog by pressing the OK button at bottom right of the dialog.

### 6.4 NRT Initialisation

- Reconnect to the NRT if not already connected.
- Launch STARLOGV4 (laptop computer) application.
- Press the ‘Select’ icon and select the scheme corresponding to the NRT
- Click on the ‘Configure/Initialise’ button to open the “NRT/NMM Configuration Tool” dialog
- Press the ‘Retrieve NRT Settings’ button at top right of the dialog



- Press the ‘Initialise’ button



- The NRT will attempt to communicate with the Neon server and initialise itself.

Once communications have been established, the NRT will download any required scheme and configuration files and complete the initialisation process. The NRT should respond with a PASS message after 2 or 4 minutes. Please be patient waiting for this message.

Common Initialisation failure codes and their causes are illustrated in the table below

NRT Failure Code	Description	Resolution
00002	Failed to open GPRS & establish PPP	a) Modem is not functioning (see Troubleshooting) b) Unit is not within carrier range (see Troubleshooting) If necessary install a better aerial or change carriers. c) Access data is incorrect (see Initial Setup, and confirm your access settings with your carrier.) d) No SIM installed e) SIM has not been correctly activated by carrier (often happens when establishing accounts with a new carrier – contact your carrier.)
00004	GEN_REQ I/O Failed	NRT is not set up correctly in database. If you are managing your NRT subscriptions, check that the NRT number you have assigned to the unit exists in the database, that its devices have been assigned to clusters, and that those clusters have schemes loaded against them. If Neon Support is managing your subscription, contact your account manager.
00009	COMMS I/O Failed (RS-232 to external logger)	Check your cable connections to the external logger, and that the logger is in a state to receive a new program.

Once all commissioning tests have been completed successfully, the NRT is field-commissioned and ready for use.

## 7.0 BATTERY TESTING

### 7.1 Battery Check

The presence of a battery can be verified without opening the NRT.

Look for the flashing LED through the window on the front of the NRT unit.

If the NRT is in an idle state, the LED will flash faintly once every second.

If the LED is not flashing, you will need to open the NRT and verify the presence of a battery:

If a battery is installed and the LED is not flashing, the NRT will need to be initialised. (See section on NRT Initialisation).

### 7.2 Battery Replacement

Always wait at least 1 minute between removing a battery and either replacing the same battery or inserting a new battery. This is to allow any residual charge within the NRT to dissipate.

The NRT battery should only be replaced with a SAFT LSH20. This is a spiral wound Lithium Thionyl Chloride [Li-SOCl<sub>2</sub>] battery with a terminal voltage of 3.6 volts.

Failure to replace the battery with the correct type may cause communication failure.

For further information on the battery and where to purchase replacements, please refer to [www.saft.com](http://www.saft.com)

**WARNING:** Care should be taken when handling lithium batteries as misuse may cause damage to the NRT or the battery cells may explode.

Ensure that the battery terminals are NOT shorted and that there are no loose wires in the vicinity of the battery.

## 8.0 ATTACHING AN EXTERNAL POWER SUPPLY

This section describes the procedure for attaching an external power supply to the NRT.

Remove the cover of the weatherproof enclosure and remove the NRT if a weatherproof enclosure is provided.

Rubber self-sealing glands are provided in the base of the weatherproof enclosure for external wiring connections. To keep the enclosure weatherproof, all wires leading to the NRT must pass through these glands.

Connect the wires from the external power supply to the field termination strip. The connection points are +12V and GND.

Ensure all wires are firmly attached to the field termination strip and return the NRT to the weatherproof enclosure.

Replace the cover of the weatherproof enclosure.

## 9.0 NRT SATELLITE ANTENNA INFORMATION

### 9.1 Mounting Antennas On-Site

This section describes the Satellite Data Voice Module (SDVM, also called an Outdoor Unit or ODU) hardware, including specifications for antennas and antenna cable. It also describes how to calculate antenna cable length and mount antennas.

### 9.2 Modem Antenna Specifications

The GSP-1720 modem is to be used with an aluminium Satellite Data Voice Module (SDVM), as shown in the figures below. The modem SDVM has a passive transmit and an active receive section. The transmit (Tx) and receive (Rx) connectors are labelled on the antenna.

**Caution:** You must be careful to connect the Tx connector on the SDVM to the Tx connector on the modem, and the Rx connector on the SDVM to the Rx connector on the modem. Crossing the Tx and Rx cables can damage the modem.



GAT-17QP SDVM Passive Antenna Showing Connectors



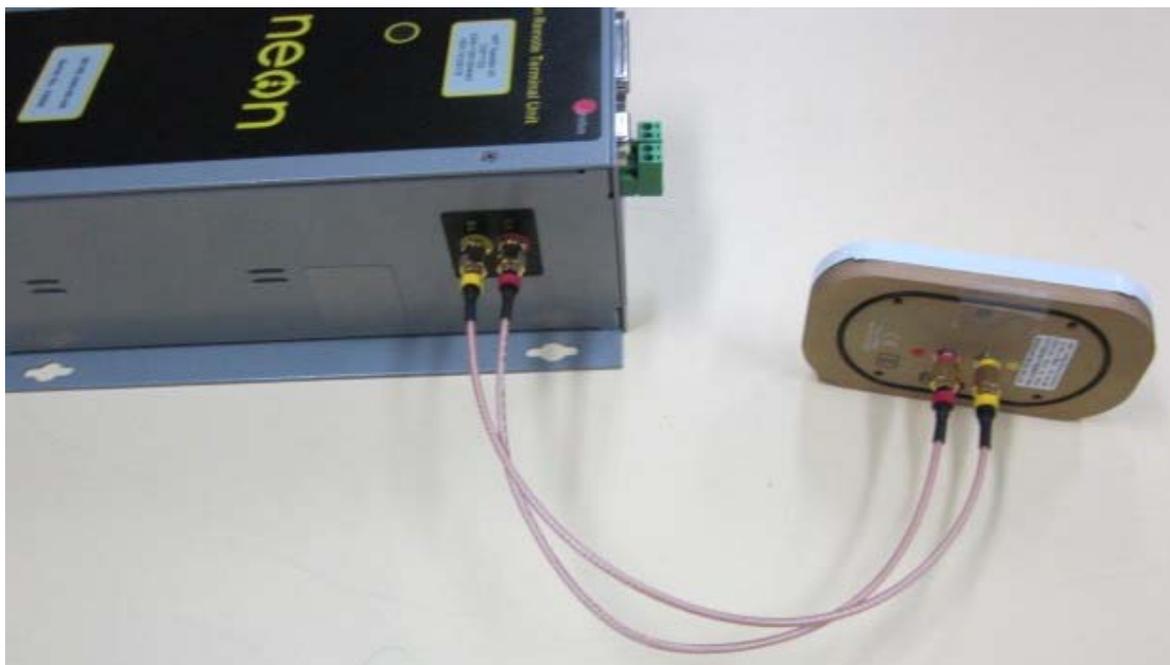
### 9.5 Antenna Cable Specifications

The SDVM antenna requires two (2) cables, one for transmit and one for receive:

- The required connectors are: plug SMA (SDVM bulkhead) to plug SMA (Enclosure).
- Transmit cable maximum 0.6 dB insertion loss @ 1618 MHz is required for the cable.
- Receive cable maximum 3.0 dB insertion loss @ 2492 MHz is required for the cable.
- 2015E comes with two internal cables:
  - SMA Female ST BH (Enclosure) to SMA Female RA 160mm (Modem Rx) Red
  - SMA Female ST BH (Enclosure) to SMA Male RA 160mm (Modem Tx) Yellow



- And two 300mm long external cables:



- Special length (1m, 2m, 3m) external cable can be ordered separately.

## 9.6 Calculating Antenna Cable Length

The maximum loss for an antenna cable of any length is 0.6 dB at 1.6 GHz for modem transmit and 3 dB at 2.5 GHz for modem receive.

You must take these losses into account when calculating antenna lengths for a GSP-1720 modem installation. For example, the GSP-1720 Modem Integrator's Kit utilizes three feet of LMR 195 cable, which has a loss of 0.6 dB at 1.6 GHz.

## 9.7 Mounting Antennas at the Field Site

When mounting an antenna on-site, you must position it properly to obtain Globalstar satellite signals. You can mount the antenna on a flat surface or on a pole. In either case, you should seal the antenna connectors against dirt and moisture.

**Caution:** The ODU antenna must be installed in a configuration that ensures a minimum line-of-sight separation distance of 21.5 centimetres (8.5 inches) is maintained at all times between the ODU antenna and any personnel.

## 9.8 Finding a Good Antenna Location

When installed in the field, the antenna of a GSP-1720 modem product must have a direct line of sight to the Globalstar satellites. Keep in mind that Globalstar satellites follow different paths across the sky, and you cannot predict where they will be.

Position the SDVM antenna outdoors where it has a clear view of the sky, unimpeded by tall obstacles such as buildings and trees.

Signal fading associated with trees, buildings, and other obstacles that prevent a clear line-of-sight to the satellite can cause degraded operation in a mobile environment.