



**Manual**  
**Neon 2000 Family**  
**Neon Remote Terminals (NRT)**  
**2023F Remote Terminal Lite**

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**

File name/Revision	Date	Author & Change Details	Checked/ approved
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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.

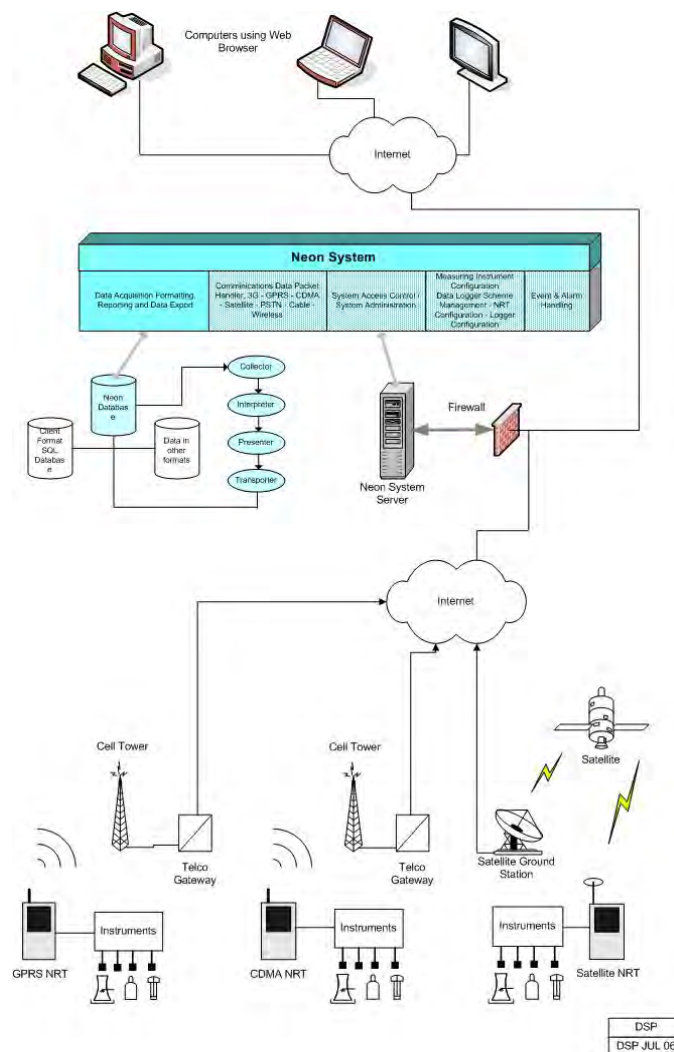
The NRT Terminal User Manual, the StarlogV4 User Manual and the Neon Server User & Administrator Documentation form part of the documentation suite for the overall Neon System.

## 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

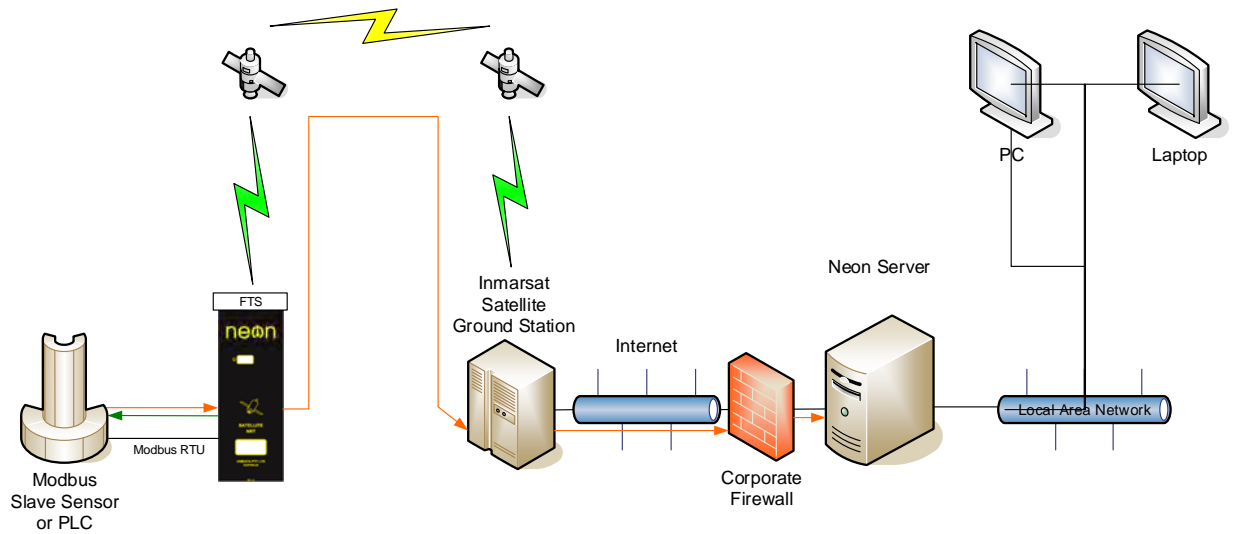
### 1.1 Neon Remote Terminals

There is a range of different Neon Remote Terminals available. This manual confines itself to presenting details of the 2023F Remote Terminal Lite.

While the models may be different, and the interfaces available in various models are different, the basic operation of all Neon Terminals and Modules is the same.



Remote Terminal Lite



Typical Neon Measurement System

## 1.2 Typical Neon Measurement System

The figure above is an example of a Neon installation showing an NRT connected to a Water Level Instrument. Every day the NRT will send, via GPRS to the Neon server, a “packet” of information containing the data in raw format. 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.

## 1.3 The Internet

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

## 1.4 Satellite Packet Data Service

There are several low earth orbit and equatorial orbit packet data service providers. The Ethernet Family of Satellite NRTs uses the Inmarsat system.

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 NRT.

### 1.5 NRT Internal Architecture

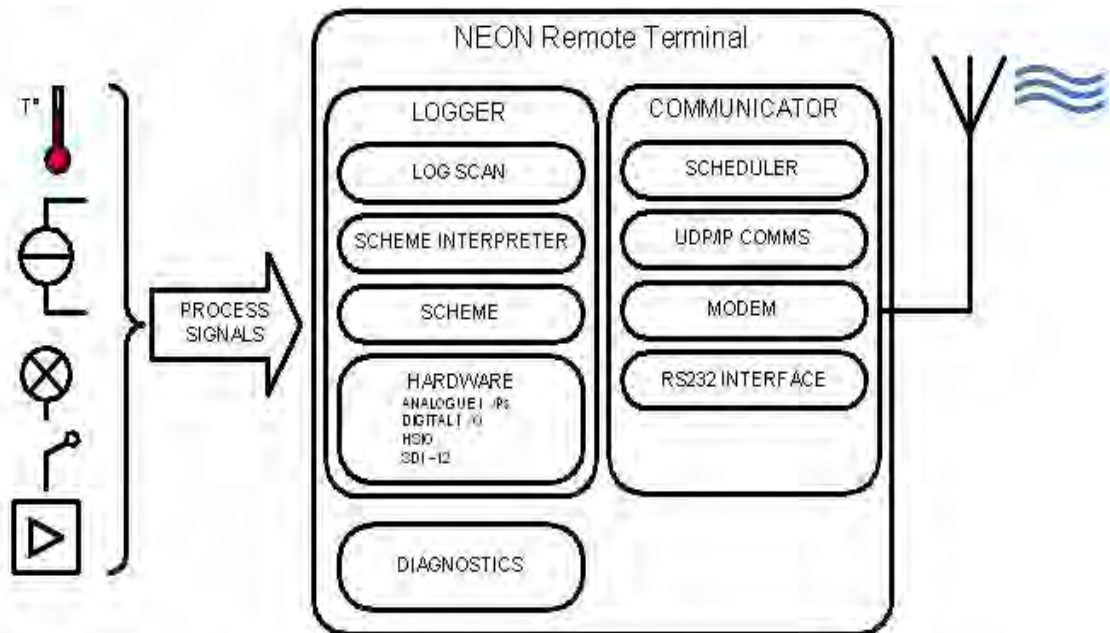
The NRT Internal architecture is shown below. It contains two discrete sections,

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 2018F'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 2023F Neon Remote Terminal Lite

The 2023F NRT Lite is a small self-contained unit that communicates with the Neon server via the Inmarsat satellite network.

The 2023F NRT Lite provides four signal connections that may all be individually configured as any combination of analog inputs, digital inputs, counter channels or digital outputs.



## 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 SATELLITE ANTENNA POINTING

Inmarsat satellites are geostationary satellites that appear to not move in the sky. This means that provided the satellite antenna is correctly pointed, NRT access to an Inmarsat satellite is essentially guaranteed.

The Remote Terminal Lite, however, uses an omni-directional antenna, which does not require pointing.

Inmarsat M2M satellite modem antennas are very directional in order to achieve high

## 5.0 SATELLITE AIRTIME RESELLERS

Inmarsat airtime needs to be purchased from one of the many Inmarsat resellers in Australia. Unidata will assist in discussing requirements with airtime providers.

Unidata does not recommend any particular one. Unidata purchases airtime from the highest tier reseller and they are the most likely to offer the best airtime pricing. Please contact Unidata for a referral.

## 6.0 NRT INSTALLATION

The following section describes the NRT installation procedure, using Model 2001-811 as an example. The installation process is similar for all models.

### 6.1 Modem Registration

2023F Remote Terminal Lite modems do not require a SIM card. However, the modem must be registered with an Inmarsat satellite airtime provider before it can register onto the satellite network. Your chosen Inmarsat airtime reseller will take care of this.

### 6.2 Neon Setup Recommendations

The NRT should be registered as part of a scheme before being installed in the field. This will allow for commissioning of the NRT and verification that communications can be established between the NRT and the Neon server.

Once in the field the NRT should be placed in the area of greatest signal strength. A good test for this is to use a mobile phone using the same carrier as the NRT, as the signal strength indicator will show the best location.

Note that due to the slow refresh rate of the mobile phone signal strength indicator, it is necessary to hold the mobile phone in place for between 30 to 60 seconds to obtain an accurate reading. If a mobile phone on the same carrier network is not available it is possible to use the NRT itself to determine signal strength.

Avoid installing the NRT enclosure in direct sunlight, as cool operating temperatures will aid longevity of the internal components.

Avoid placing the NRT enclosure inside a metal box, or in an area with large amounts of metal around the NRT enclosure, as this can adversely affect the communication abilities of the NRT. If the NRT must be located within a metal enclosure, an external antenna will be required.

Install the NRT enclosure in a secure location to avoid tampering and vandalism.

Position the enclosure to ensure cables from NRT to field devices are as short as practical.

### 6.3 NRT Connections

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

### 6.4 Field Installation of an NRT in a Weatherproof Enclosure

Determine the location for the NRT based on site requirements as well as the installation recommendations stated on the previous pages.

Loosen the four plastic cover screws at the front of the weatherproof enclosure and remove the cover.

For the purpose of this section, it is assumed that the NRT is operational as described in Installation Recommendations.

Fit the aluminium NRT mounting plate onto the base of the weatherproof enclosure, aligning horizontally so that the four threaded inserts are uppermost and to the right-hand side. Align the drilled mounting holes in the plate with four fixing points, to position the NRT in the upper part of the enclosure once mounted. Secure using the four short thread-cutting screws, taking care not to over-tighten.



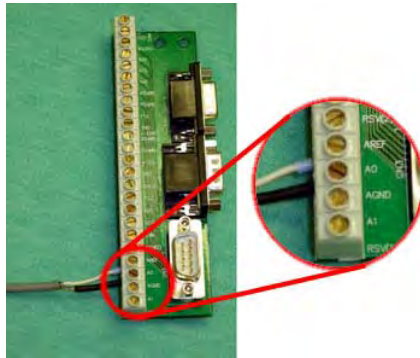
NRT Example which is secured within a Weatherproof Enclosure

Mount the NRT onto the plate, securing it with the four short machine screws as shown in the figure above.

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

After feeding the wires from the external device through the rubber gland(s), connections to the field termination strip (FTS) are required. Refer to the external device documentation to determine the exact connections.

For example: A temperature sensor, which is an analogue device, should be connected to an analogue channel (A0 or A1) as shown below.



Field Termination Strip with Analogue Device Connected

Once the field devices have been connected to the field termination strip mount it firmly onto the NRT as shown below.



An NRT installed with FTS connected

### Pole Mounting

The weatherproof enclosure can be pole-mounted using the supplied kit. First secure the pressed-steel backing plate to a suitable pole with the U-bolts, clamp plates, nuts and washers. Next, attach the weatherproof enclosure to the plate with the four 20mm machine screws through the casing corners, into the threaded holes in the plate. Do not over-tighten.

### Surface Mounting

Alternatively, the weatherproof enclosure can be mounted directly to a surface, attached with suitable screws through the casing corner holes.

The weatherproof enclosure can be closed once the NRT has passed field commissioning.

## 7.0 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.

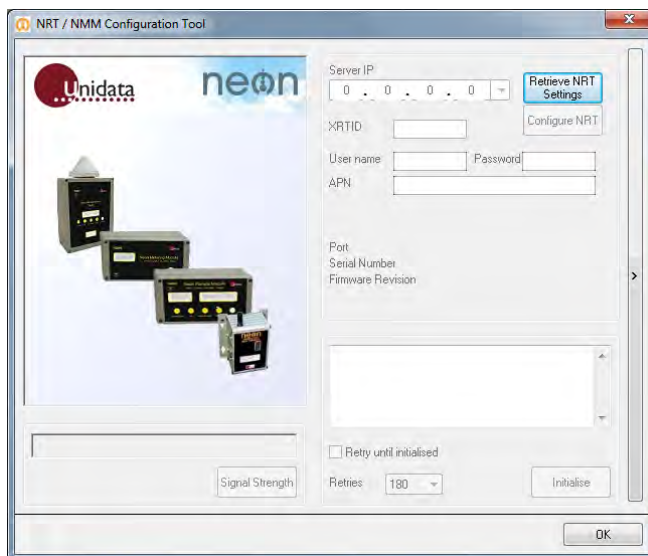
### 7.1 NRT Powered On

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.

### 7.2 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

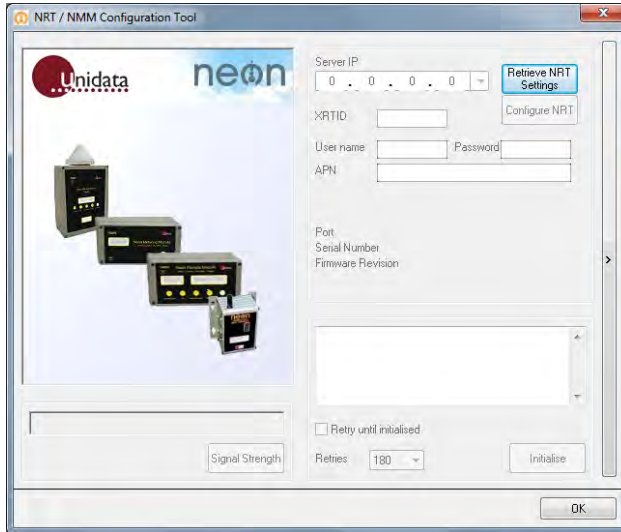


- Confirm that the correct Server IP address has been configured
- Confirm that the correct NRT ID (XRTID) has been configured
- Check the firmware version and NRT Model type
- If all checks are confirmed, the NRT may be Initialised

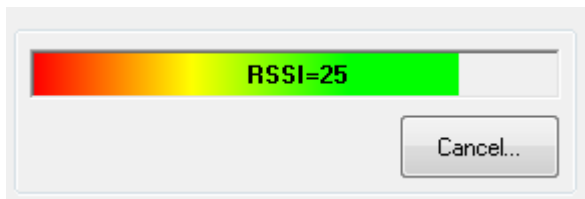
### 7.3 NRT Signal Strength Verification

- Connect a laptop computer to the NRT.
- Launch the STARLOGV4 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



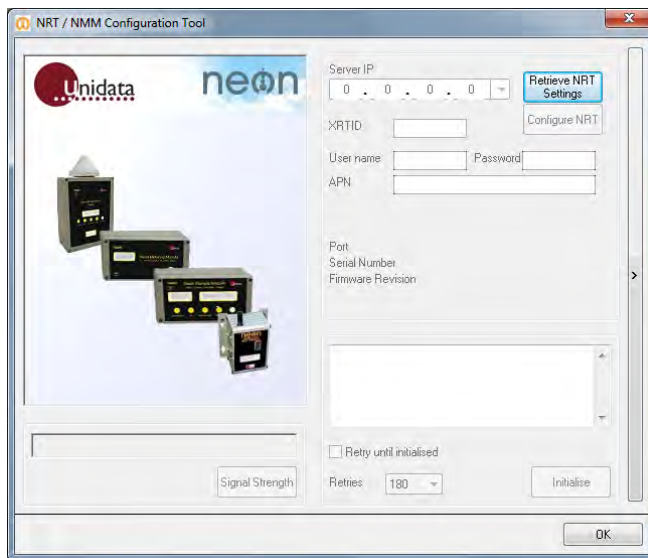
- Press the 'Signal Strength' button. After a short delay (10 seconds or so), the RSSI signal strength will be displayed. RSSI must be 16 or higher. If it is 99 then there is no connection to the cellular network.



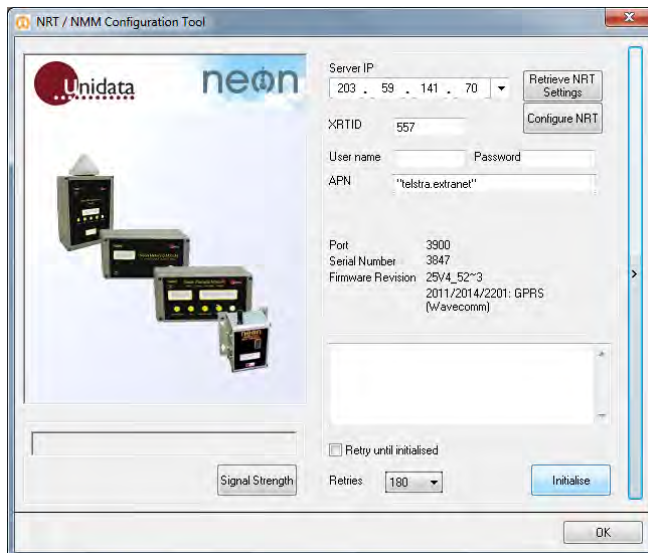
- 
- If there is sufficient signal, press the Cancel button to exit the Signal Strength option.

#### 7.4 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.

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



## 8.0 NRT POWER REQUIREMENTS

### 8.1 Internal Power

The 2023F Remote Terminal Lite requires external power.

However, internal Lithium batteries may be fitted to maintain the 2023F's logging functionality if external power is lost.

Keep in mind that loss of external power might also prevent collection of data due to coincidental loss of power to the instrumentation and external sensors.

### 8.2 External Power

The NRT must be powered by an external supply of 6 to 16VDC @ 2A (peak – while transmitting) and 25mA (receive) and 30uA 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 communications 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 NRT circuitry).

### 8.3 Internal Battery Life Table

2023F Remote Terminal Lites can be fitted with 3 internal Lithium batteries.

Battery life depends on the position of the internal Normal/Config switch.

The internal Lithium batteries never provide power to the external instruments and sensors.

When the switch is in the Config position, the batteries only provide power to the internal logger and communications sections of the NRT. They do not power the internal router component or the external instruments and sensors.

When the switch is in the Normal position, the batteries provide power to the internal logger and communications sections of the NRT **and** the internal router component, which can be upwards of 250mA depending on the particular NRT model.

Battery life is consequently quite long (up to 5 years) when the switch is in the Config position but is greatly reduced (one month) when in the Normal position.

Should the internal Lithium batteries go flat while no external power is available, the NRT will lose its scheme, stop logging and lose all its previously logged data. The NRT will need to be re-initialised when power is restored.