OPTIMA OUTSTATION

INSTALLATION, COMMISSIONING AND MAINTENANCE HANDBOOK

UCM 345488

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1. Document Introduction

1.1 Purpose of Document

This document is intended to provide the information required for an engineer to install, configure and maintain the Optima Outstation, which is an enhancement of, and replaces the Remote Monitoring Unit (RMU). This document was re-written at issue 8, to incorporate the addition of digital IO options and a new suite of software applications.

1.2 Scope of the Document

The scope of this document covers the Optima Outstation (900-1501-200 & 900-1501-210) and the installation of the Outstation using the optional equipment outlined in **Table 2**. Any installation using alternative methods of power and/or communications should be treated as a separate case and the contents of this document should not be relied on for installation, commissioning and support of such installations.

1.3 Notices

Throughout this document there are notices warning of potential health and safety risks when working with the Optima Outstation if safe working procedures are not followed. There are three types of notice used:

Warning notices are intended to serve as a reminder to personnel to take care when undertaking testing, there may be a personal or environmental danger to be aware of or a risk to the equipment if the guidance is not followed.

Electrical Hazard notices serve as a reminder to personnel to observe safety precautions due to the risk of electric shock. It is expected that all work shall be undertaken in accordance with the Electricity at Work Regulations and BS7671.

ESD Warning notices serve as a reminder to personnel to observe safety precautions due to the risk of electrostatic discharge damaging the equipment. Appropriate protection such as anti-static wrist bands should be used when handling boards.

Information notices are used to highlight points of interest that are not necessarily a safety hazard. These use the blue information sign shown here.

1.4 Health and Safety Warning

Warning: Persons permitted to use and/or work on this equipment must be appropriately qualified and trained. The contents of this handbook and all other relevant documents, safety notes, labels, etc **MUST** be observed.

Electrical Hazard: This equipment may be connected to Mains Voltage. The mains power supply MUST be isolated before any connections are made/removed or maintenance work commenced.

Electrical Hazard: This equipment **MUST** only be connected to the specified incoming mains power supply, in accordance with the current regulations.

Warning: This equipment **MUST NOT** be used or modified in any other way other than that for which it is intended. Any such use or modification will invalidate any warranty.

2. Optima Outstation Functional Description

The Optima Outstation has been developed to provide bolt-on UTC (UG405 UTMC2) and four streams of MOVA 8 control to existing traffic controllers. In addition, it can allow controllers supplied by any manufacturer to be added to the Telent Optima Hub. The Optima Outstation also provides a platform for several other applications. Available software applications are:

- **UG405 UTMC2**: Freestanding UTC control to any supported controller.
- **MOVA 8**: Up to four streams of MOVA can be configured.
- **Remote Monitoring**: Connect any supported controller to the Telent Optima Hub.
- **Bus Priority**: RTIG 1.0 or 1.1 compliant Bus Priority
- **Remote IO**: IO bits can be sent between Optima Outstations / Optima Controllers over a network connection.
- **Sensor A**: UDP protocol developed to interface to Vivacity cameras and any other sensor that complies with that interface definition.

The Outstation consists of a single board computer, running the Linux operating system, mounted onto a carrier board which provides a battery backed power supply. For UTC and MOVA applications, up to three 48 input / 24 output digital IO cards can be added, which stack above the CPU attached to the carrier. The Outstation can be ordered with no IO (200-1501-230) or with one factory fitted IO board (200-1501-240). Up to three IO boards are supported, to add a board order the Optima Outstation IO board expansion kit (200-1501-220).

The battery back-up function is designed to support the Outstation and the approved 4G/DSL router for a period of up to two minutes in the event of mains power failure to allow a “last gasp” power fail message to be sent to the Optima Hub if configured.

The Outstation plugs into the handset port of any supported TOPAS 2523B compliant traffic controller and polls the controller for faults. When a fault is detected it is sent to the Optima Hub for display on the Graphical User Interface (GUI). The Optima Hub system is described in its user manual – UCM 302681.

Figure 1 - Telent Outstation with no IO Fitted

3. Equipment

3.1 Standard Equipment

The Optima Outstation can be ordered as a fully assembled unit either with no IO or with one IO board fitted. An IO board yields 48 inputs and 24 outputs. Up to three IO cards are supported, totalling 144 inputs and 72 outputs. Additional IO cards are available as an expansion kit. Part numbers are detailed in **Table 1**.

Table 1 - Optima Outstation Variants

Part Number	Item	Description
200-1501-230	Optima Outstation with no IO board.	Standard build, narrow front panel, pre-assembled with all required cables.
200-1501-240	Optima Outstation with one IO board.	Standard build, wide front panel, pre-assembled with all required cables. Supports 48 inputs and 24 outputs.
200-1501-220	Optima Outstation IO board expansion kit	Provides one IO board and all required cables to add additional 48 inputs 24 outputs. Maximum number of IO boards is three.

IO board cables are available and are given in **Table 2**.

Table 2 - Optima Outstation IO Cables

Part Number	Item	Description
900-1501-130	IO Board Input Cable	Resistor colour coded in two groups of eight, with inputs 1-8 and 9-16 labelled. Three required per IO board. Each loom should be labelled to avoid confusion.
900-1501-140	IO Board Output Cable	Resistor colour coded in a single group of eight inputs. Each output pair consists of one solid colour wire and one white/colour striped wire. Three required per IO board. Each loom should be labelled to avoid confusion.

The power supply, communications equipment and a bracket to mount them are available as options to allow for situations where power and/or comms are already available. A list of all optional equipment is provided in **Table 3**.

Important! Outstations with IO **MUST** have the supplied Micro SD card fitted, as this stores configuration backups and dynamic data for installed applications.

Note: The routers are supplied unconfigured and should be set up as per the router configuration guides – UCM 437460 (4G) and UCM 417665 (DSL).

Table 3 - Optional Equipment

Part Number	Item	Description
IWPL0011AA	Optima Accessory Bracket	Mounting bracket with DIN rail and pre-drilled mounting holes
EQMT0052AA	24 V_{DC} Power Supply	DRB-30-24-1 30W 24 V DIN Rail mounted power supply
KOPS0297AF	Optima RMU Wiring Kit	2 m of 3 core mains cable, earth cable, crimp and self-tapping screws (to mount router to accessory bracket)
EQMT0066AA	Teltonika RUT950 4G Router	4G router to provide mobile communications
MSTU0011AA	External 4G Puck Antenna	Puck antenna to mount to top of controller cabinet
200-1501-060	DSL Router Kit	DSL Router and power connector
200-1601-080	19" Rack Mount DIN rail 6U Plate	Rack mounted DIN rail (6U plate)
200-1601-090	19" Rack Mount DIN rail 3U Plate	Rack mounted DIN rail (3U plate)

4. Assembly

Standard Optima Outstation versions are shipped pre-assembled at the factory. Outstations requiring more than one IO board should be assembled by the depots.

ESD Warning! Care must be taken when handling the Outstation and associated circuit boards due to the risk of damage from electrostatic discharge. Appropriate protection such as anti-static wrist bands should be used when handling.

4.1 Standard Optima Outstation Versions

4.1.1 Optima Outstation: No IO Board (200-1501-230)

This version of the Outstation ships with the narrow front panel. **Figure 2** shows the Outstation with the Nanos CPU board visible.

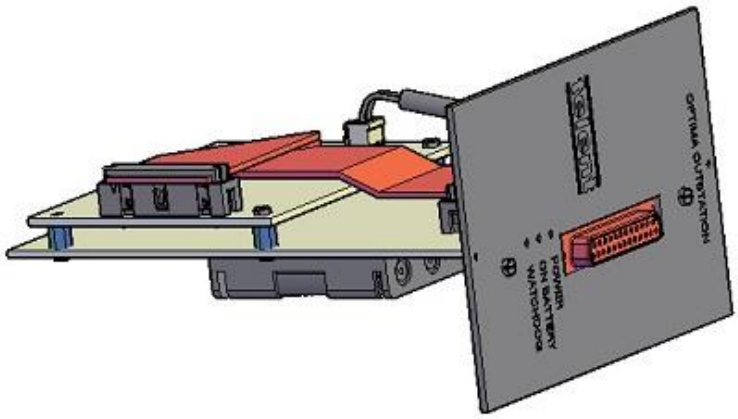


Figure 2 - Optima Outstation with no IO - Nanos CPU Side

The **Figure 3** shows the outstation with the battery holder visible.

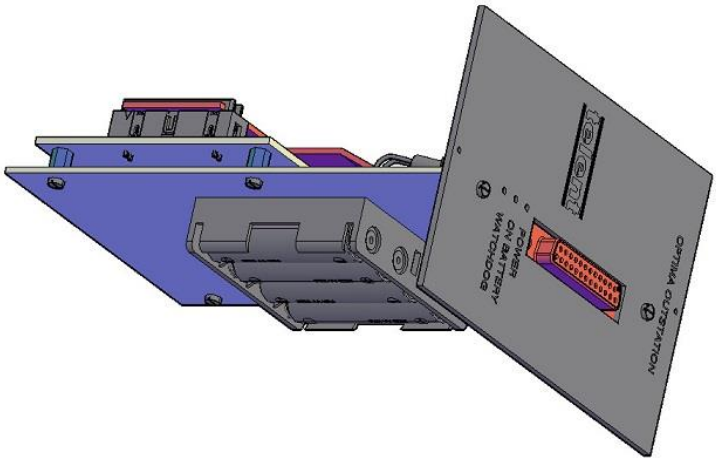


Figure 3 - Optima Outstation with no IO – Battery Holder Side

4.1.2 **Optima Outstation: One IO Board (200-1501-240)**

This version of the Outstation ships with the wide front panel to accommodate the IO board, three input and three output wiring looms.

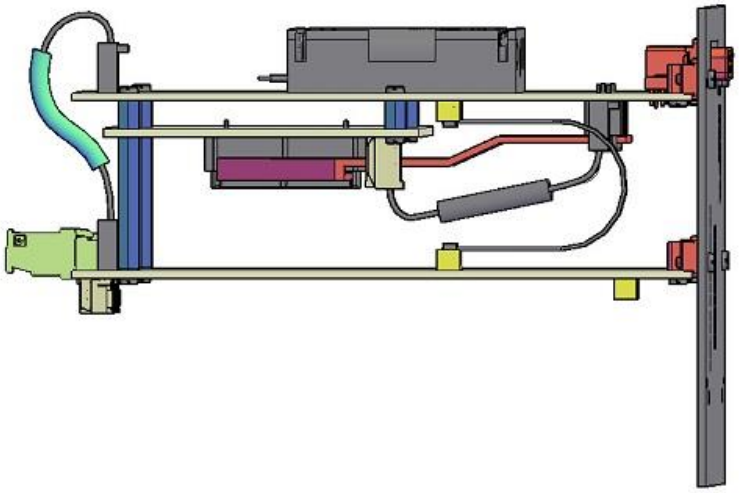


Figure 4 - Optima Outstation with One IO Board

4.2 Optima Outstation: Adding IO boards

4.2.1 **Adding Second IO Board: Assembly Steps**

1. Remove the two M2.5 pan-head screws fixing the rear of the first IO board to the stand-offs and set aside.
2. Replace these two screws with the supplied 34 mm stand-offs and secure the first IO board.
3. Connect the 24 V_{DC} power cable and IO board serial data cables to the first IO board. The connectors for both cables are polarised so will only orientate one way.
4. Fit the IO board to the stand-offs and secure with the two screws set aside in step 1.
5. If not already fitted, secure the front panel mounts to the IO board with the supplied M2.5 pan-head screws.
6. Fix the front of the IO board to the front panel with the supplied M2.5 pan-head screws.
7. Connect the 24 V_{DC} power cable and IO board serial data cable to the IO board. The connectors for both cables are polarised so will only orientate one way. For the power cable, use the inboard connector, leaving the outboard connector for supplying the next IO board if required.

4.2.2 **Adding Third IO Board: Assembly Steps**

1. Remove the two M2.5 pan-head screws fixing the rear of the second IO board to the stand-offs and set aside.
2. Replace these two screws with the supplied 34 mm stand-offs and secure the rear of the second IO board.
3. Remove the two M2.5 pan-head screws fixing the front of the second IO board to the stand-offs and set aside.
4. Replace these two screws with the supplied 34 mm stand-offs and secure the second IO board.
5. Connect the 24 V_{DC} power cable and IO board serial data cables to the second IO board. The connectors for both cables are polarised so will only orientate one way.
6. Fit the IO board to the stand-offs and secure with the two screws set aside in steps 1 and 3.
7. Connect the 24 V_{DC} power cable and IO board serial data cable to the IO board. The connectors for both cables are polarised so will only orientate one way. For the power cable, either connector may be used as this is the final IO board.

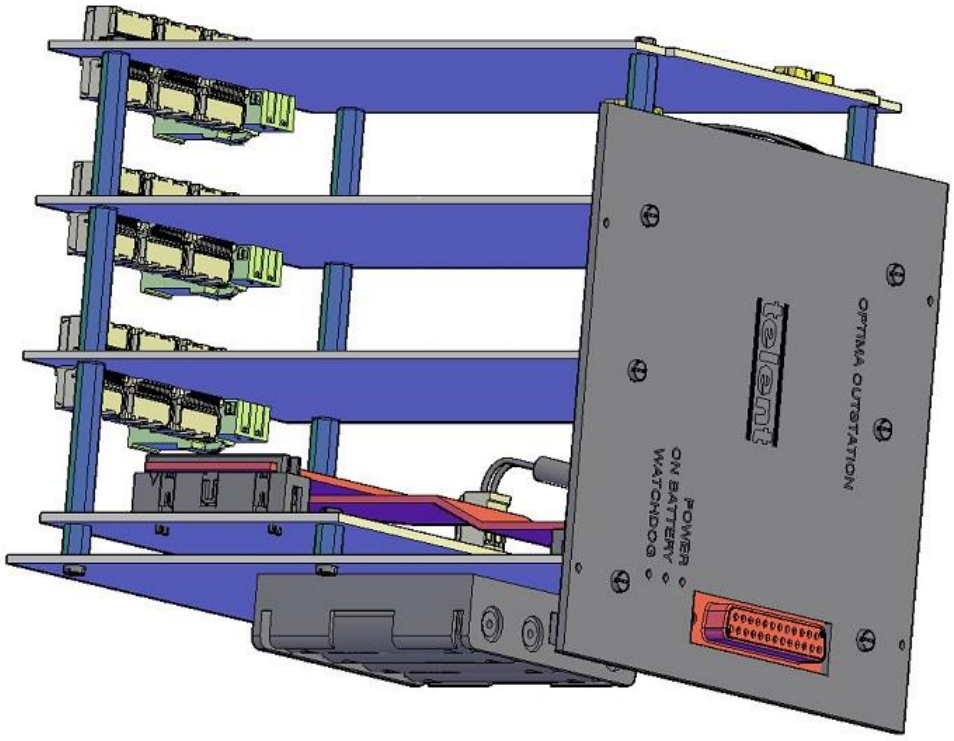


Figure 5 - Optima Outstation with Three IO Boards

Figure 6 - Close-up of Panel Mounting Brackets

5. Installation

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when handling the Outstation or sub-components and circuit boards.

Electrical Hazard: This equipment **MUST** be earthed. Correct installation into an Earth bonded 3U rack is all that is required. Visual verification of the Earth bonding should be supported by appropriate electrical continuity checks of that Earth.

5.1 Installation pre-requisites

5.1.1 Rack capacity

The Outstation requires the following free capacity in a 3U rack for the different hardware options:

- 88 mm for basic Outstation,
- Additional 88 mm for the Optima accessory bracket (although the router and power supply can be DIN rail mounted if required,
- 122 mm for Outstation with 1 IO board,
- 122 mm for Outstation with 2 IO boards,
- 160 mm for Outstation with 3 IO boards.

The DSL router requires 90 mm of DIN rail.

The optional rack mounted DIN rail plates can be used to provide additional DIN rail space if required.

5.1.2 Tools

The 4G option requires installation of an external 4G antenna (MSTU0011AA) using a suitable 17 mm drill bit to drill the mounting hole in the top of the cabinet.

Appropriate flat and cross blade screw drivers, side cutters, wire strippers and tie-wraps for tidying the wiring will be required.

A suitable meter will be required to check the Earth bonding continuity of the installed Outstation.

5.2 Battery Installation

Before fitting the Outstation inside the rack, insert the 4x AA batteries supplied with the Outstation into the battery holder, see **Figure 7**.

When inserting the batteries pay careful attention to their orientation which is shown on the base of the battery holder, see **Figure 8**. The springs are located at the battery negative terminal.

Figure 7 - Fitted Batteries

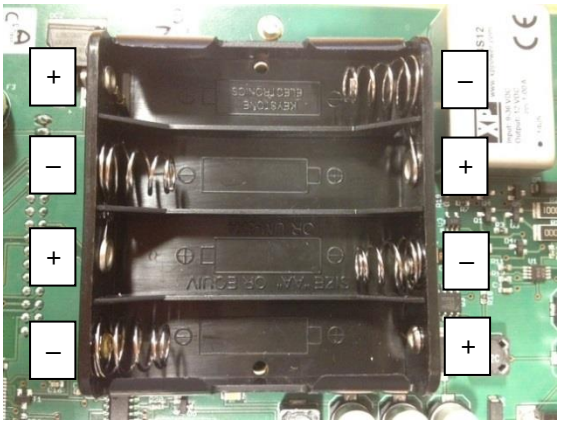


Figure 8 - Battery Orientation

Note: The batteries supplied are GP ReCycko NiMH rechargeable batteries. Replace with the same or AA equivalents with the following capacity and temperature ranges:

Minimum Capacity:	2000mAh
Standard Charge:	0 – 45 ºC
Fast Charging:	10 – 45 ºC
Discharge:	-20 – 50 ºC
Storage:	-20 – 30 ºC

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when handling the Outstation or sub-components and circuit boards.

5.3 Fitting the Outstation

Insert the Outstation into the card guide in the 3U rack and secure with the two captive mounting screws on the front panel, **Figure 9**.

Figure 9 - Outstation in 3U Rack

5.4 4G Communications Option

Note: The routers are supplied unconfigured and should be set up as per the router configuration guide – UCM 437460 (4G).

5.4.1 4G Router Preparation

It is recommended that the SIM card is inserted, and the router fitted to the accessory bracket before installing the bracket into the 3U rack.

Important! Note the telephone number of the SIM card as this can be used to remotely restart the router if necessary.

SIM card slots are now accessible without removing the rear cover as in older versions. The RUT950 rear panel is shown below, with the two SIM card slots visible.

Figure 10 - RUT950 Rear Panel Showing SIM Card Slots

5.4.2 **Antenna Installation**

Drill a 17mm hole in the controller cabinet, the position of this should be on a flat portion of the cabinet ideally mounted on the top as shown in **Figure 11.**

To fix the antenna to the cabinet pass the cable through the new hole and fit the locking washer and nut, being careful not to trap the cable as shown in **Figure 12.**

The recommended torque setting is 42 Nm.

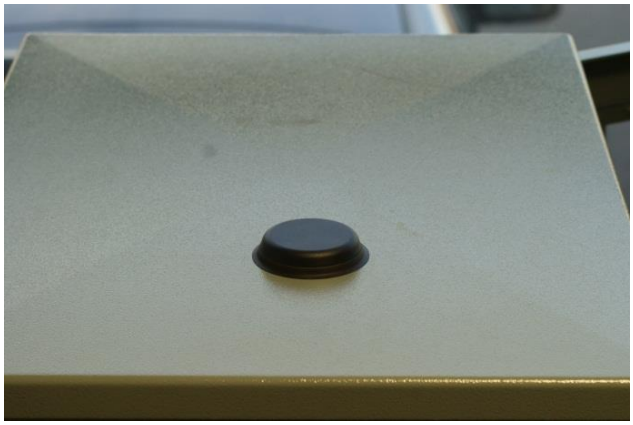


Figure 11 - Puck Aerial Position

Figure 12 - Puck Aerial Fixing

5.4.3 **RUT950 4G Router fitting**

Using the two self-tapping screws (No 4 – 2.9mm x 5mm) supplied with the Optima Outstation wiring kit (KOPS0297AF) attach the router to the accessory bracket as shown in **Figure 13.** The screws attach to the slot in the centre of the router.

Note: Once fitted to the accessory bracket it may be difficult to install the SIM card into the router.

Figure 13 - Accessory Bracket

5.4.4 **Power supply fitting**

Fit the power supply to the DIN rail on the Accessory Bracket as shown in **Figure 14**.

Figure 14 - Router and PSU on Accessory Bracket

Note: It may be beneficial to fit the Outstation power and mains cables to the DC power supply at this point, see sections 5.6 and 5.8.

5.4.5 **Fitting the Accessory Bracket**

Insert the Accessory Bracket into the 3U rack and secure with the supplied screws. The accessory bracket, where possible, should be installed next to and on the right-hand side of the Outstation, **Figure 15**.

Figure 15 - Outstation and Accessory Bracket Positions

Once fitted to the rack the earth bonding cable should be installed.

Using the supplied earth cable attach the end with the M4 ring terminal to the earth stud of the Accessory Bracket (visible in **Figure 14*)*** and secure with the M4 locking washer and nut, supplied and pre fitted to the Accessory Bracket earth stud.

Route the other end (with no crimp) to the earth terminal block inside the cabinet. Cut the cable to length, strip the sheath back sufficiently and attach to the earth bonding terminal block.

5.4.6 **Cabling**

5.4.6.1 **4G Antenna Cable**

The router has 2 connectors labelled “Mobile”. Connect the antenna cable to the router connector which is also labelled (on the top of the unit) “MAIN ANT” or “MAIN ANTENNA” and tighten. On some models this is on the right of the panel while on other models it was on the left, **Figure 16**.

Figure 16 - Router Aerial Connection

5.4.6.2 Network Cable

Connect the network cable from the socket marked LAN 1 on the router to the RJ45 socket on the rear of the Outstation, **Figure 17**.

Figure 17 - Network Connections

5.4.6.3 Router Power Cable

Plug the 2x2 rectangular connector of the router power cable (ASSY0137AD) into the power socket of the router and plug the other end, with the header connector fitted, onto the connector labelled J3 on the rear of the Outstation, **Figure 18**.

Figure 18 - Router Power

5.5 DSL Communications Option

The router is the **Insys MRX3**.

5.5.1 DSL Router Preparation

Note: The routers are supplied unconfigured and should be set up as per the router configuration guide – UCM 417665 (DSL).

5.5.2 Accessory Bracket Installation

The DSL router does not fit on the accessary bracket but the bracket may still be used to mount the Outstation power supply as per sections 5.4.4 to 5.4.5.

5.5.3 Cabling

Note that, unlike the 4G router, the LAN ports on the DSL router have been configured for specific connections i.e. Optima Controller, Outstation, CCTV and Laptop. If any of these facilities are not fitted, then the port should be left unconnected.

Figure 19 - LAN Ports

5.5.3.1 External Communications Cable

Use the supplied cable to connect the DSL (RJ45) port on the router to the telephone socket in the cabinet.

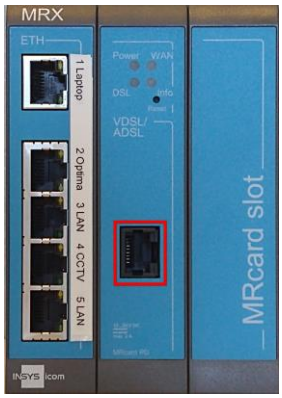


Figure 20 - DSL Port

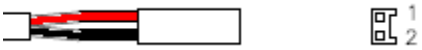
5.5.3.2 Network Cable

Connect the network cable from the socket marked 3 or LAN (if labelled) on the router to the RJ45 socket on the rear of the Outstation, **Figure 21**.

Figure 21 - Network Connection

5.5.3.3 Router Power Cable

Important! Ensure that the Molex connector on the router power cable has been fitted in the correct orientation for the Outstation. The red wire may be brown on some cables.



Connector	Wire Colour
PIN 1 12V	RED
PIN 2 0V	BLACK

Figure 22 - Outstation Power Connections

Connect the bare ends of the router power cable to the power connector on the router, taking care to connect the red (or brown) wire to the V+1 terminal and the black wire to the GND terminal. Plug the other end, with the header connector fitted, onto the connector labelled J3 on the rear of the Outstation, **Figure 23**.

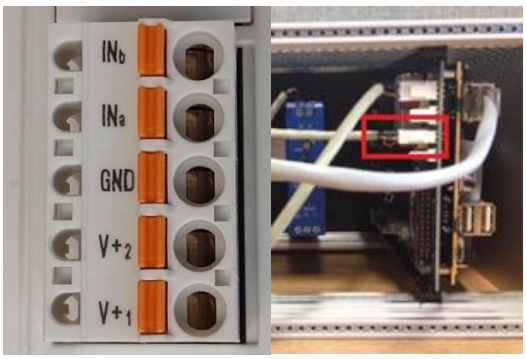


Figure 23 - Router Power

5.6 Outstation Power Cable

The Outstation power cable (ASSY0137AA) may be supplied with the sheath stripped back sufficiently on the bare ends of the cable, otherwise strip back sufficient sheath to insert the wires into the power supply screw terminals.

Connect the brown wire to the screw terminal marked **+V** and the black wire to the to the screw terminal marked **-V**, these are located at the top of the power supply, **Figure 24**.

Connect the other end of the cable to the connector labelled J1 on the rear of the Outstation, **Figure 24**.

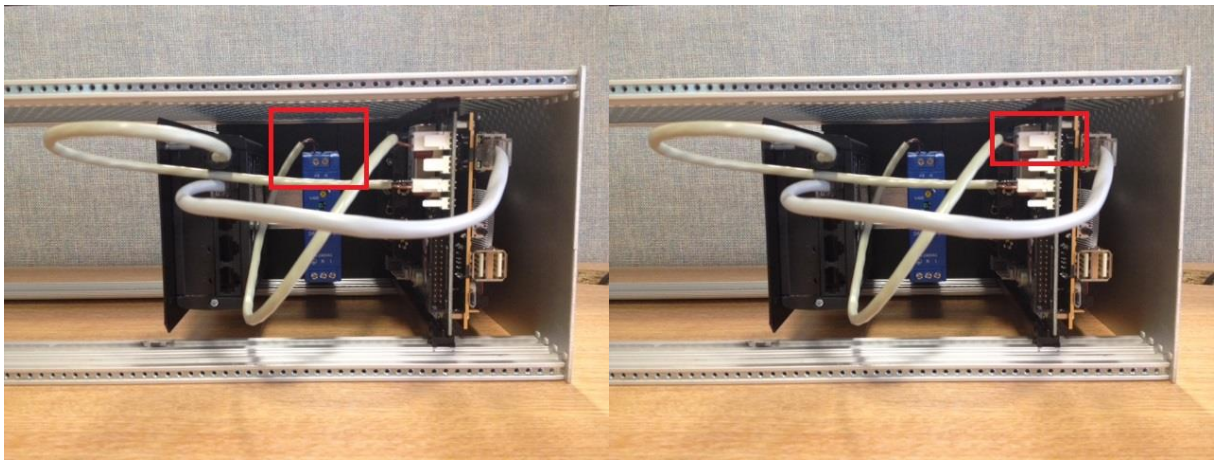


Figure 24 - Outstation Power

5.7 Outstation to Controller Handset Cable

Plug the black header connector of the Outstation to controller handset cable (ASSY0137AB) onto the connector labelled **X3** on the rear of the Outstation, **Figure 25**.

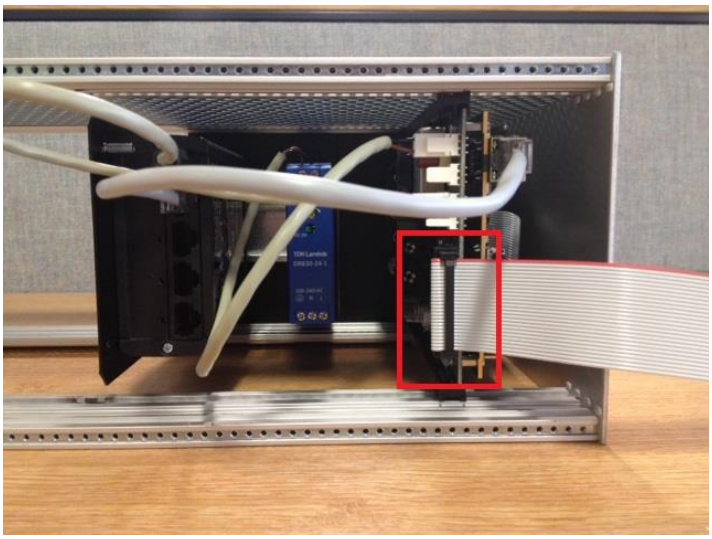


Figure 25 - Outstation Handset Cable

Plug the blue D-Type connector of the Outstation to controller handset cable (ASSY0137AB) onto the handset port of the Traffic Signal Controller. This will be in a different position depending on the controller type being used.

The Outstation to controller handset cable should be routed from the Outstation to the handset port of the Traffic Signal Controller to be monitored by the Outstation. It may be necessary to “hide” some slack of the cable; this should be done by folding the ribbon cable and securing it at the back of the Outstation or controller.

Some Siemens controllers (ST700, ST750, ST800, ST900 or ST950) may be set up with MOVA control from an external Siemens OTU via their handset port (rather than via parallel IO connections). If the Siemens OTU must remain in place then the Outstation to controller handset cable should connect to the Siemens OTU rather than directly to the controller (with the original cable left in place between the Siemens OTU and controller).

5.8 DC Supply Mains Cable

The DC Power Supply AC mains cable included in the Optima Outstation Wiring Kit (KOPS0297AF) should be connected to the DC power supply mains input screw terminals, labelled 100-240VAC, at the bottom of the power supply, **Figure 26**.

The earth wire of the mains supply cable should be connected to the cabinet earth bond terminal block.

The Live and Neutral cables should be connected to a suitable 5 A Fused supply.

Warning: Persons permitted to use and/or work on this equipment must be appropriately qualified and trained.

Electrical Hazard: All electrical installations must conform to the requirements of BS7671 and the Electricity at Work Regulations (1989). Deviations from these requirements could not only be unsafe but could lead to incorrect or sub-standard operation.

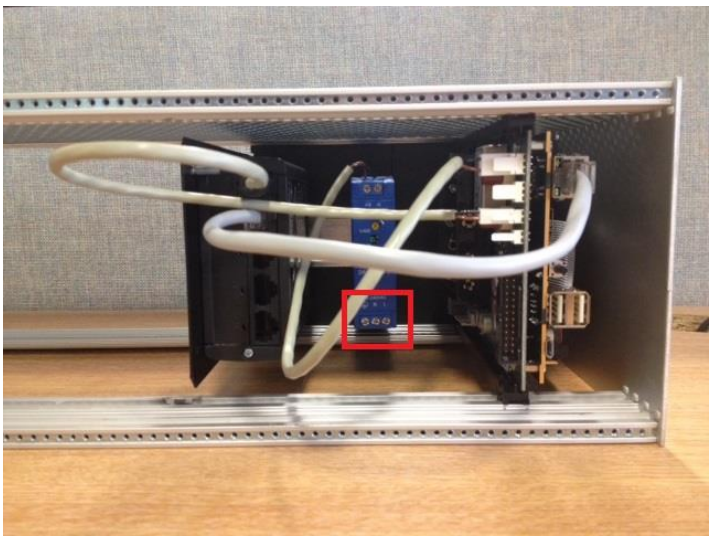


Figure 26 - PSU AC Power In

5.9 IO Board Connections and Cable Forms

Each IO board is supplied with a two-way detachable plug on connector J11, which is used to supply the input circuit with a sensing voltage. This 2-pin connection requires Input “High” (+ V_{DC}) and “Low” (GND) voltages. This is typically controller +24 V_{DC} and GND/0 V_{DC} respectively but can be in the range specified by TOPAS TR2523 [2] for input circuits. **Figure 27** shows this connection highlighted inside a red box. The Input “High” pin is nearest to the Output connector. The pins on the detachable connector are polarised so once wired can only be inserted the

correct way. Suitable wiring for this should be supplied by the end user. Equipment wire like that used in the input and output looms is recommended.

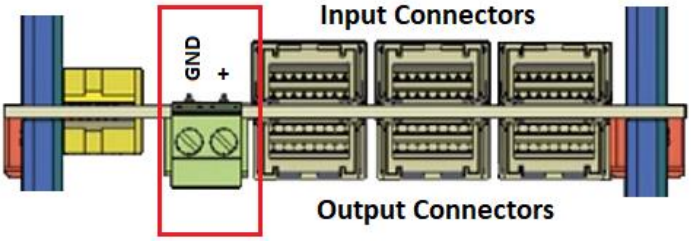


Figure 27 - IO Input Sense Connection J11

IO board cable looms are 16-input cable forms (with inputs 1-8 and 9-16 labelled) or 8 output cable forms. The cables plug into the right-angle connectors on the IO boards as shown in **Figure 28**.

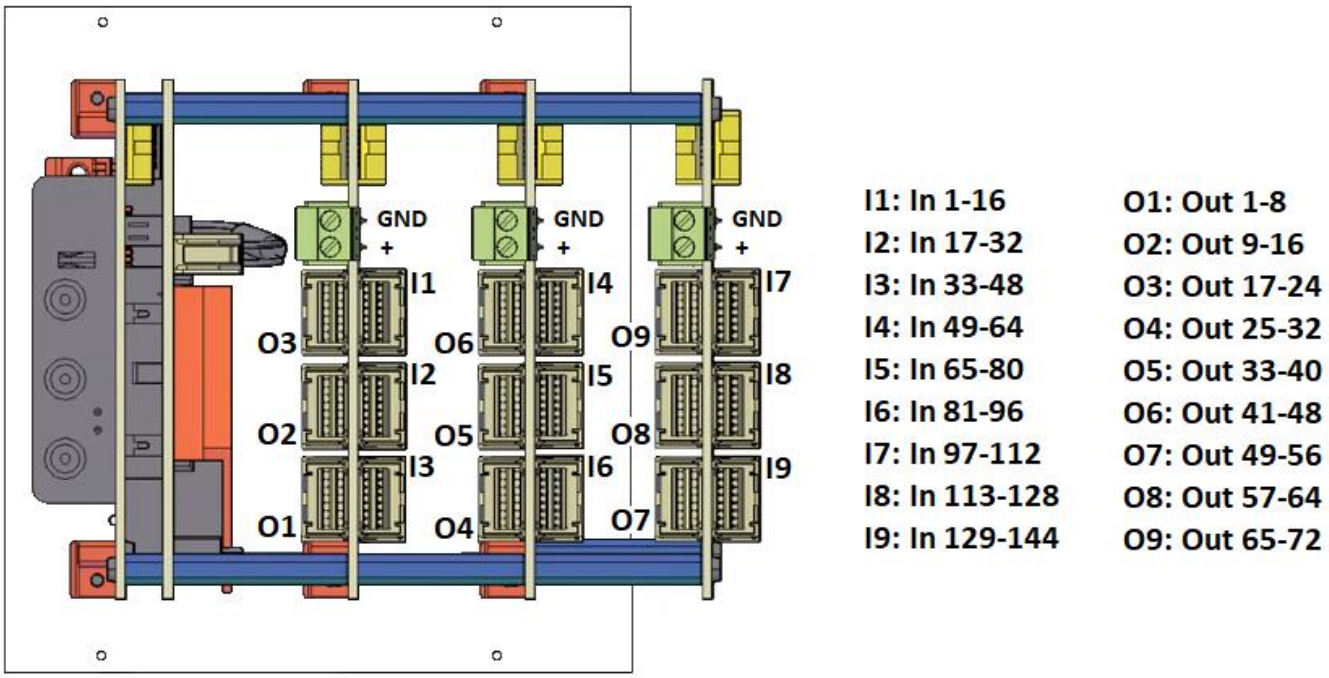
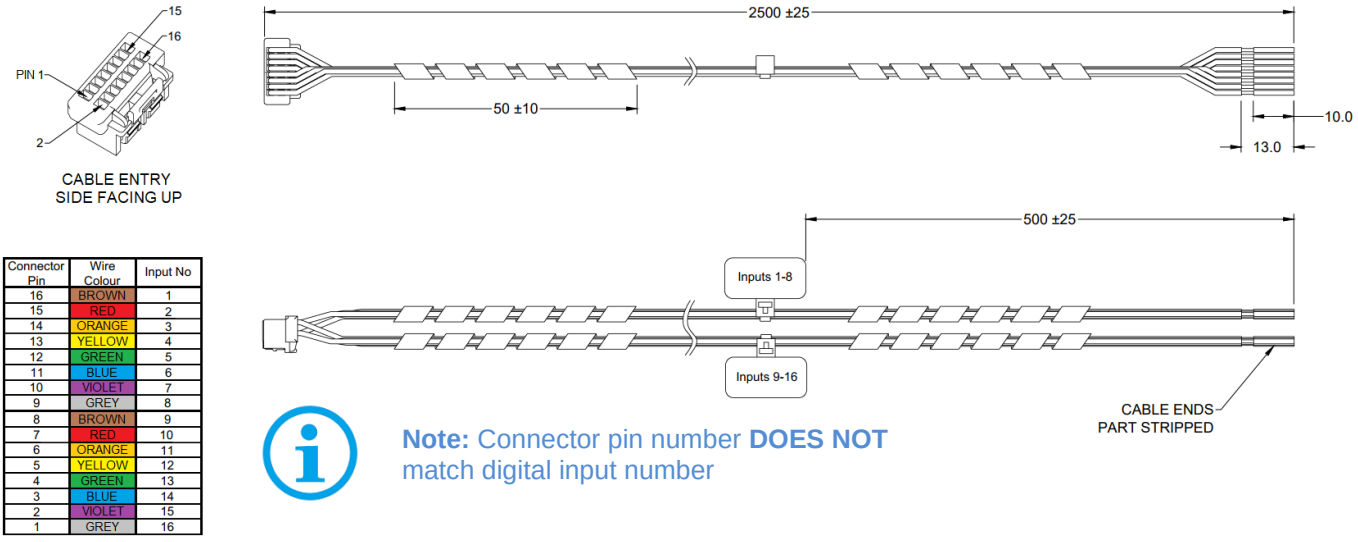


Figure 28 - Optima Outstation IO Loom Connections

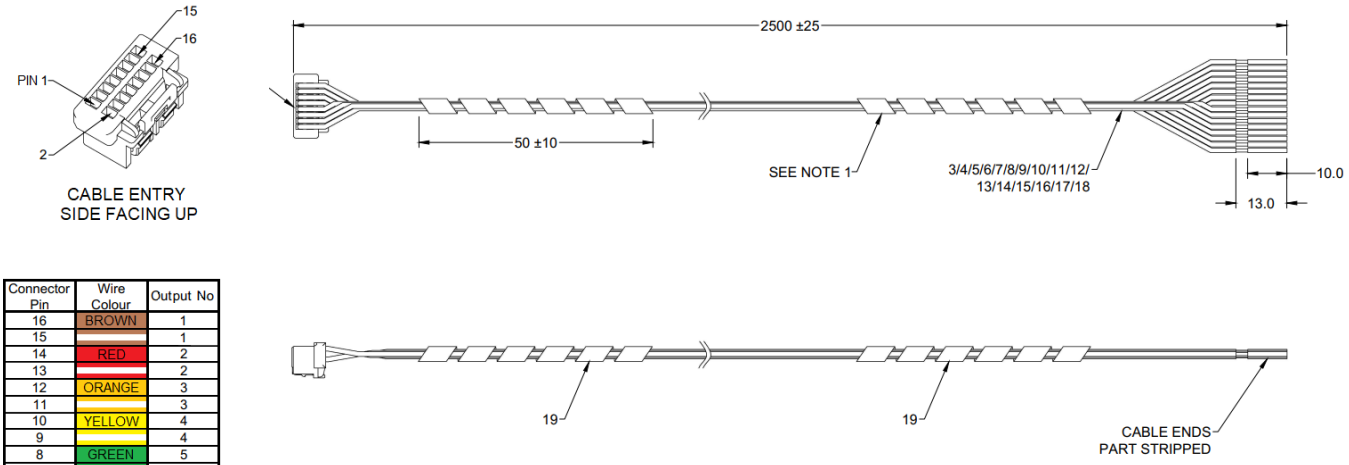
The IO board cable input loom (900-1501-130) is shown in the drawing below. The input loom follows the resistor colour code for each of the collection of 8 inputs. Where more than one loom is required, the installer should label the looms accordingly.



Connector Pin	Wire Colour	Input No
16	BROWN	1
15	RED	2
14	ORANGE	3
13	YELLOW	4
12	GREEN	5
11	BLUE	6
10	VIOLET	7
9	GREY	8
8	BROWN	9
7	RED	10
6	ORANGE	11
5	YELLOW	12
4	GREEN	13
3	BLUE	14
2	VIOLET	15
1	GREY	16

Figure 29 - Optima Outstation Input Cable Connection Detail

The IO board cable output loom (900-1501-140) is shown in the drawing below. The output loom follows the resistor colour code for each of the collection of 8 output pairs, with one core having a white stripe. Where more than one loom is required, the installer should label the looms accordingly.



Connector Pin	Wire Colour	Output No
16	BROWN	1
15		1
14	RED	2
13		2
12	ORANGE	3
11		3
10	YELLOW	4
9		4
8	GREEN	5
7		5
6	BLUE	6
5		6
4	VIOLET	7
3		7
2	GREY	8
1		8

Figure 30 - Optima Outstation Output Cable Connection Detail

6. Web Interface Overview

This section describes the Outstation Web Interface.

6.1 Web Interface Pre-requisites

The connection is made using the LAN, with a standard Ethernet cable, with any up-to-date web browser supporting HTML5. If connecting with a PC directly to the unit, the Outstation has the following network settings:

- IP Address: 192.168.1.2
- Subnet: 255.255.255.0

The PC should use a **different** IP address in the same range, e.g. 192.168.1.3

Note: If connecting via a router, then the PC network settings should be set to DHCP.

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

6.2 Web Page Map

Software ⇨		Add / Remove applications, application status, reboot
System ⇨		Up times, CPU, memory and disk usage.
Settings ⇨		Remote monitoring and network settings, internal configuration back up and configuration download / restore.
Status ⇨		RM status, software version, battery health and fault data.
Time ⇨		Current time (static on page load), NTP settings.
Handset ⇨		Web based Handset, for Connecting or Watching, not Reconfigure.
BusPriority ⇨	Configuration	General settings, licence and bus priority rules view /create
↳	Status	Default page, with application log.
IO ⇨	Configuration	Hardware configuration, aliases, delays, unidirectional, counter bits, count recording, logic, messages and options. Upload / Download configuration.
↳	Status	Default page, graphical IO view, software version and current errors.
↳	Count Data	Graphical representation of counts, save image and export data.

[continued]

MOVA (per stream)	Configuration	Licence, detector bits, confirm bits, force bits, output bits, options. Upload / Download configuration.
	Control	Default page. Telent implementation of TRL Web Interface.
RemoteIO	Configuration	View, add, remove sites, upload / download configuration.
	Status	Default page. Remote IO connection log.
SensorA	Configuration	Settings, detection rules view /create
	Status	Default page. SensorA status and application log.
UG405	Configuration	View, add, remove sites, device MAC.
	Status	Default page. UG405 status and application log.
	Bits	View control / reply bit status in real time.

7. Software Installation

The Remote Monitoring application software will always be installed on the Outstation, although if the Remote Monitoring function is not required it can be disabled.

7.1 Package installation

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

Open a web browser and navigate to the IP address of the Outstation. The default IP address is:

http://192.168.1.2/

A window will appear asking for login credentials (contact Engineering at Warwick for details).

The following page will be displayed on new Outstation hardware. Legacy RMU hardware, with the same version of software installed, will display the same page but without the Handset option. Menu items depend on installed packages.

Figure 31 - Outstation Web Interface: Index Page (Not all Apps Installed)

The Software page can be used to update the software or install new software applications. Legacy RMU hardware will not support additional applications and can only be used for Remote Monitoring.

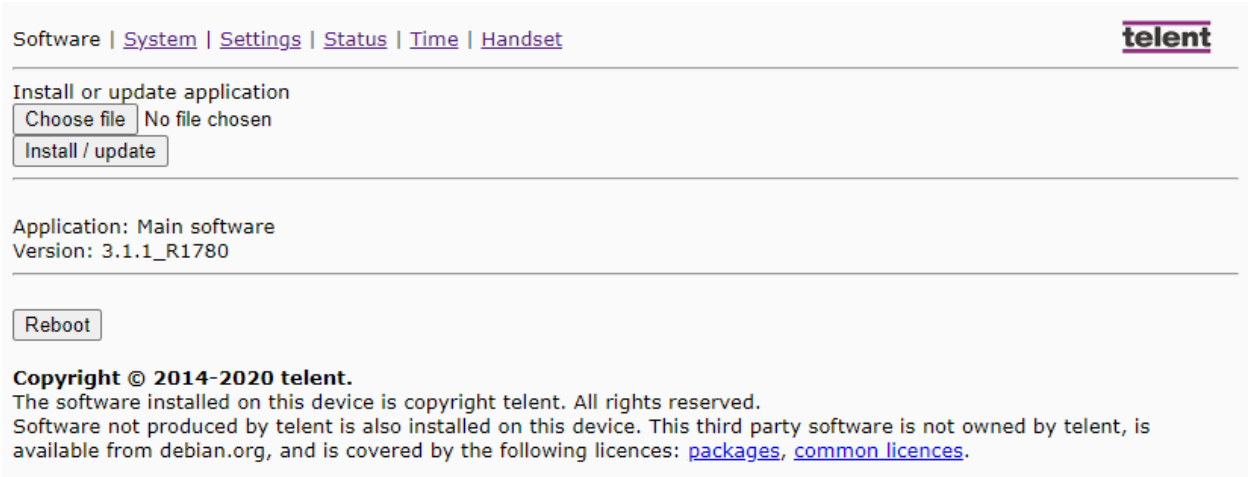


Figure 32 - Outstation Web Interface: Software Page

To install or update software click the "**Choose file**" button and select the required Outstation software (.osw) file. Once selected click the "**Install / update**" button and wait for the software to be installed.

The main software provides the web interface and the Remote Monitoring functionality. If the Outstation is going to be connected to the Optima Hub then it will not be necessary to update the main software as this will be done

automatically when it connects. If it will be on a different network, then install the required version of the main software.

Optional software applications should only be installed where they are required. The web pages will include additional functionality when other applications are installed. Packages are available from the Traffic Product Support software downloads webpage. The following packages are available:

- Telent IO Driver – Required to support IO hardware but includes other useful tools.
- UG405 – Supports direct connection to UTMC2 servers via UG405 protocol for UTC and SCOOT.
- MOVA – Up to four streams of MOVA8 are available.
- RTIG Bus Priority – Receive RTIG messages and set virtual bits for other applications based on rules.
- Remote IO – Send and receive parallel IO data over an IP network
- Sensor A – Receive messages from Vivacity cameras and set virtual bits for other applications based on rules.

7.2 Package Licensing

The following packages require a licence file in order to function. These are:

- RTIG Bus Priority
- UG405
- Each Stream of MOVA

The licence keys are entered in the configuration tabs of the application Web Interface.

7.2.1 RTIG Bus Priority

In the figure below, the Licence field is shown highlighted red due to no licence key being present. Copy and paste the licence key into that field and the "**Reconfigure**" button will be highlighted yellow to indicate a change needs to be saved. Click the "**Reconfigure**" button to save the licence.

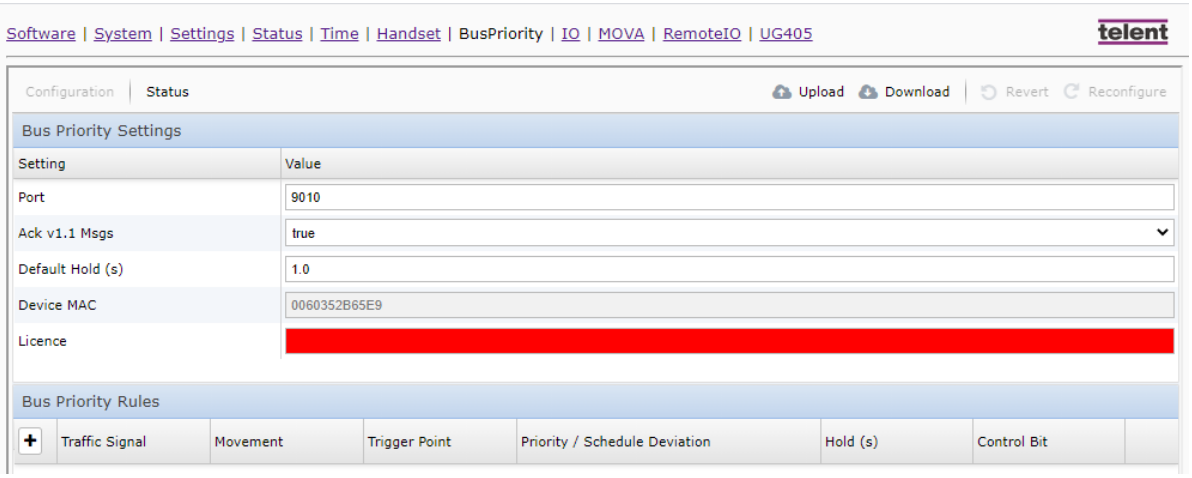


Figure 33 - Outstation Web Interface: RTIG Bus Priority Licensing

Note: The licence key will be saved as part of the configuration file generated by pressing the "**Download**" button and will be restored when the configuration file is uploaded.

7.2.2 **MOVA Streams**

Each MOVA stream has a configuration page. Within that is a Licence tab, where the device MAC address is shown on the left and the licence Key field is on the right. Copy and paste the key into this field and press the "**Reconfigure**" button which will change to yellow after entering the key.

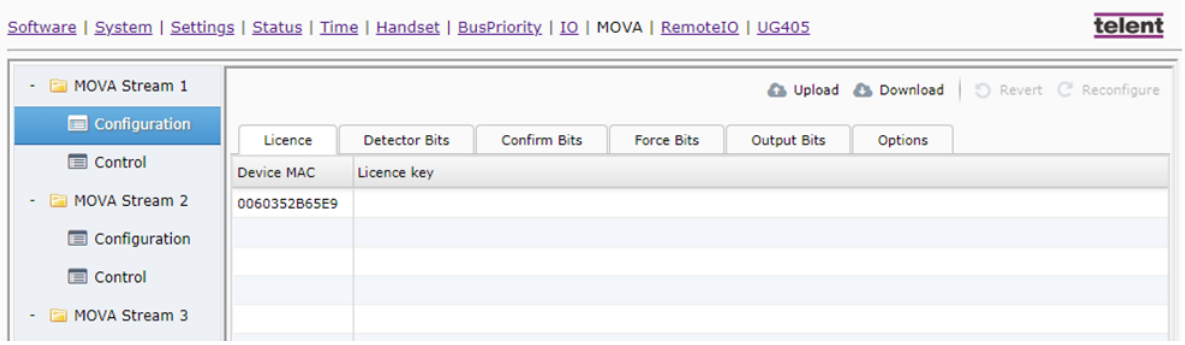


Figure 34 - Outstation Web Interface: MOVA Licensing

Note: The licence key for a stream will be saved as part of the configuration file generated by pressing the "**Download**" button on the configuration page for that particular stream and will be restored when the configuration file is uploaded.

7.2.3 **UG405**

For UG405, the process is slightly different. Open the UG405 Web Interface and click on the "**Configuration**" tab. Open the "**Parameters**" tab if not already open by default. If no parameters are displayed, click the "**+**" button and a new line will be created. Click on the drop-down box, which will be highlighted red, and select "**licence**" from the list.

Paste the licence key into the "**Value**" field of the licence parameter. Click on the "Reconfigure" button to save the changes and activate the licence. If there are any issues with the licence, a message will appear in the Application log viewed in the "**Status**" tab.

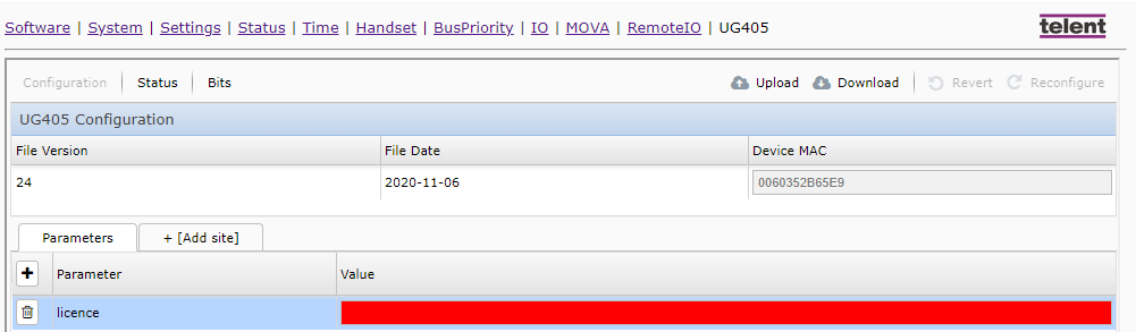


Figure 35 - Outstation Web Interface: UG405 Licensing

Note: The licence key for UG405 will be saved as part of the configuration file generated by pressing the "**Download**" button and will be restored when the configuration file is uploaded.

8. Commissioning

8.1 Front Panel Indicators

8.1.1 Front Panel Layout

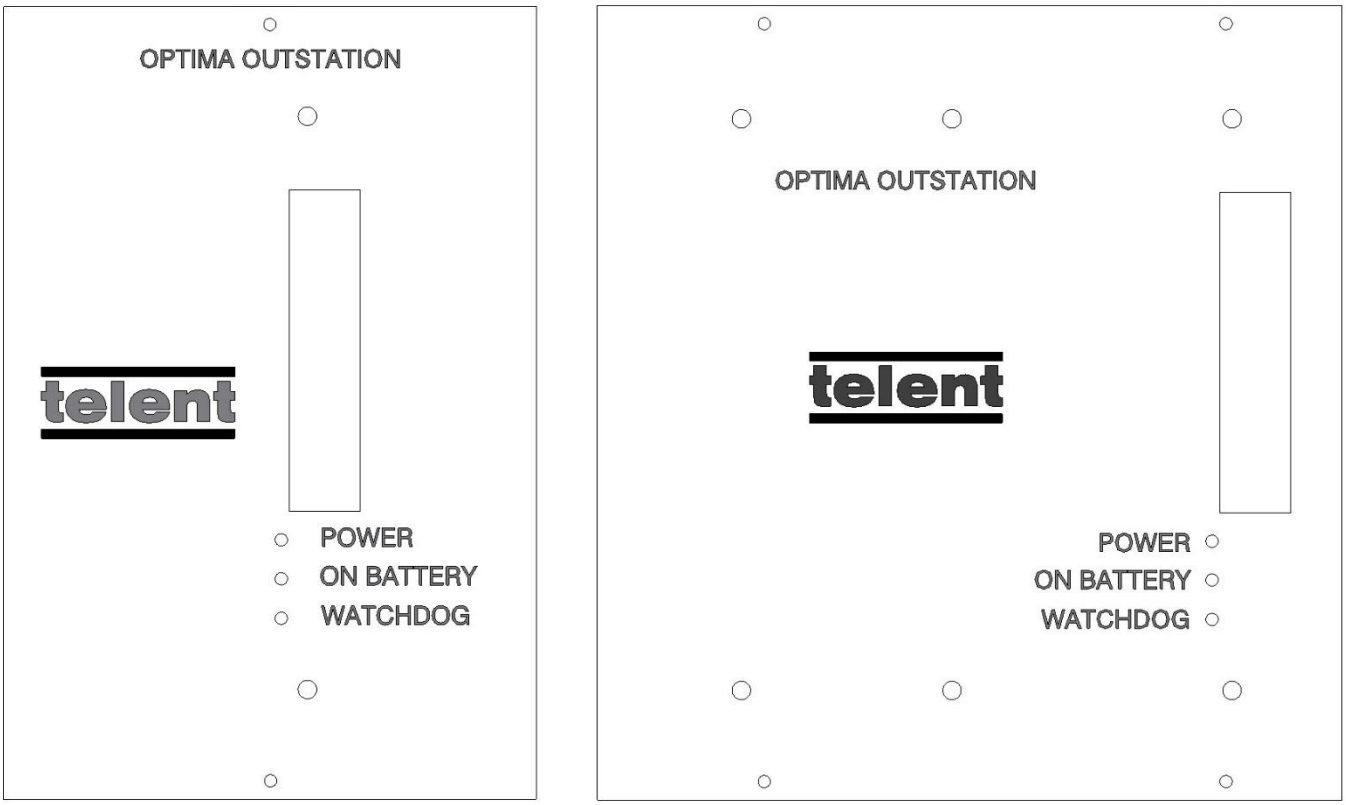


Figure 36 - Outstation Front Panel Options: No IO (Narrow), With IO (Wide)

8.1.2 Power

The green "**POWER**" LED indicates that the Outstation is powered, either by the power supply or from the integral battery back-up.

8.1.3 On Battery

The red "**ON BATTERY**" LED indicates that the Outstation is currently operating using the integral battery back-up supply.

8.1.4 Watchdog

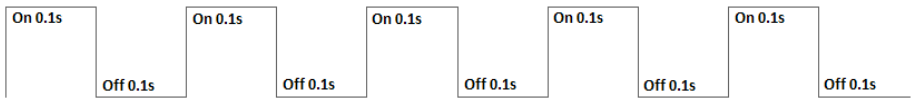
The blue "**WATCHDOG**" LED flashes at different rates depending on the current operational status of the Outstation as outlined in **Table 4**. The table is ordered in priority i.e. if a handset is connected then this will be reflected as the current status regardless of whether there is a controller fault.

The watchdog LED will not flash during the boot process.

Although the current status of the Outstation can be determined in some detail by analysing the flash rate, the Outstation is operational if any type of flash is observed.

Important: Fault status patterns (Polling, Fault Detected) will only occur if RM is active.

Table 4 - Watchdog LED Description

Status	Explanation	Flash Pattern – drawings cover a 1 second period for comparison
Handset Connected	Handset connected to Outstation	 One short on per second
Polling	Outstation polling controller for faults	 Constant 5Hz flash
Fault Detected	Controller fault detected	 Three short off per second
Comms Fault	No communication with Instation	 Two short off per second
Idle	Default state – no controller faults detected	 One short off per second

8.2 Configuring Time Settings

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

The Web Interface "**Time**" page can be used to view or change the Network Time Protocol (NTP) settings. Select the required NTP server source from the drop-down box and click Update to save the change.

Note: The time displayed on this page is always Greenwich Mean Time (GMT).

Figure 37 - Outstation Web Interface: Configuring Time

Possible NTP server settings are:

- **Internet**: fetch time from a public pool of servers on the internet.
- **UG405 Instation**: fetch time from the UG405 Instation. If the UG405 Instation address changes then switch to fetching time from the new address.
- **RM Instation**: fetch time from the Optima Hub.
- **None**: do not use NTP.
- **Other**: specify a custom NTP server address.

If the Outstation is being used for UG405 UTC applications, then always use the NTP server specified by the UTC system administrator. Often this will be the same as the UTC server, but not always.

Settings are updated when the "**Update**" button is pressed and are implemented without the need to reboot the unit.

Note: It may take a few minutes for the unit time to synchronise to the new server settings.

8.3 Handset Functionality

The handset can be accessed from the 25-way handset connector on the front of the unit, or via the Web Interface.

Note: The Reconfigure option is not available on the Web Interface Handset page as there is no guarantee that the operator is local to the unit.

The following port settings are the default settings for the local handset port on the Outstation:

- Baud rate: 1200
- Data bits: 7
- Parity: Even
- Stop bits: 1
- Flow Control: None

The handset port has a built in 5 V_{DC} supply, protected by a 1500 mA fuse, F3 on the Carrier board. This is indicated with a red arrow in **Figure 38**. Check this fuse if a powered terminal such as an Oyster or Tech Term doesn't power up when connected.

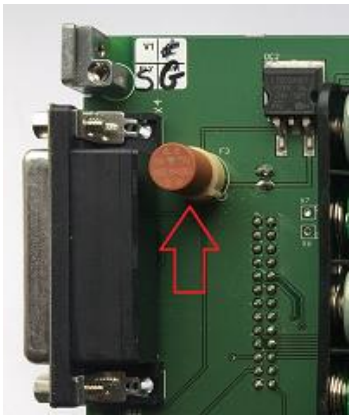


Figure 38 - Handset Power Fuse Location

8.3.1 Handset Modes

Pressing **ESC** at any time on a handset connected to the Outstation will display the following three options:

- `[C]onnect` - Typing **C** will allow pass through of handset commands to the traffic signal controller.
- `[W]atch` - Typing **W** will display the output of the controller handset port as seen by the Outstation.
- `[R]econfigure` - Typing **R** will enter the Outstation configuration screens.

8.3.2 Connect

Handset Input	Handset Response	Notes
C	`Connected`… The standard controller prompt may also be displayed.	The handset is now connected to the traffic signal controller and all commands typed will be sent to the controller.
ESC	`[C]onnect, [W]atch, [R]econfigure`	The Handset is now connected to the Outstation and commands will no longer be sent to the controller.

8.3.3 **Watch**

Handset Input	Handset Response	Notes
W	**`Watching`**… Any output from the controller as a response to the Outstation polling process will be displayed.	The handset is now only observing the output of the controller and no inputs can be made.
ESC	**`[C]onnect, [W]atch, [R]econfigure`**	The Handset is now connected to the Outstation and commands will no longer be sent to the controller.

8.3.4 **Reconfigure**

Handset Input	Handset Response	Notes
R	**`Password>`**	To reconfigure the Outstation a password is required.
(password supplied by Engineering at Warwick)	**`Select (+/-/=/.)`** (Followed by a parameter)	The handset is now able to view and modify the configuration.
+ (Plus)	**`Select (+/-/=/.)`** (Followed by a parameter)	The next parameter will be displayed – see below for a list of parameters.
- (Minus)	**`Select (+/-/=/.)`** (Followed by a parameter)	The previous parameter will be displayed – see below for a list of parameters.
= (Equals)	**`Select (+/-/=/.)`** (Followed by a parameter)	The current parameter will be cleared and can now be set – see below for a list of parameters.
. (Full Stop)	**`[S]ave, [U]ndo, [R]econfigure`**	The configuration will be exited, and a further input is required to return to the main prompt.
S	**`Wait`**… **`[C]onnect, [W]atch, [R]econfigure`**	The Outstation will save the changes and commit them to the active configuration. **Note:** Changes will not be made active until saved.
U	**`[C]onnect, [W]atch, [R]econfigure`**	The Outstation will not commit any changes to the active configuration and all changes will be lost.
R	**`Select (+/-/=/.)`** (Followed by a parameter)	The handset is now able to view and modify the configuration. **Note:** The changes previously made will still be visible but will not be made active until saved.

Handset Input	Handset Response	Notes
ESC	`[C]onnect, [W]atch, [R]econfigure`	The handset is now connected to the Outstation and commands will no longer be sent to the controller

8.3.5 **Configuration Parameters**

Table 5 - Configuration Parameters

Parameter	Description
Site ID	Unique alphanumeric code, with no spaces, up to 16 characters in length. This will typically be the unique code applied to the controller by the local authority.
Site Name	Alphanumeric string, which can contain spaces, up to 64 characters in length. This will typically be a short description to identify the junction, e.g. junction name.
Controller Type	Selected from a drop-down list which contains all supported controller types. If the controller type to which the Outstation is to be connected is not present, contact the system administrator.
Instation	Optima Hub Instation server address to which the Outstation will connect. This should be set to 172.31.32.1 in order to connect to the Optima Hub. This should be left blank if a connection to the Optima Hub is not required.
ipAddress	IP address of the Outstation. By default, the address is 192.168.1.2 which will be suitable in most installations. If the Outstation is being used for other functions and needs to be installed on a different network (e.g. for UG405) then these settings should be changed to values provided by a suitable authority for that network. If the IP address, IP netmask and IP gateway are all removed and left blank the Outstation will use DHCP to allow an address to be automatically assigned by a DHCP pool.
ipNetmask	Subnet mask of the Outstation. By default, the netmask is 255.255.255.0 which will be suitable in most installations. If the IP address is changed from the default settings the netmask must be changed to the correct value for the network on which it is connected.
ipGateway	Default gateway used by the Outstation to forward network traffic to the Internet. By default, the gateway is 192.168.1.1 which will be suitable in most installations. If the IP address is changed from the default settings the gateway must be changed to the correct value for the network on which it is connected, this will typically be the router address.
controllerAddr	IP address of the connected controller if the controller Web Interface should be made available to the Optima Hub. See 8.4.1. Normally this should be left blank.
outstationAddr	IP address of the outstation unit if its Web Interface should be made available to the Optima Hub. See 8.4.1. Normally this should be left blank.

Parameter	Description
allowUpdates	Allow the Outstation software to be updated to the latest available version by the Optima Hub. Normally this should remain ticked (Y from the handset). Untick (or N from the handset) if a special version of software is required on this site.
reportAppEvents	Allows optional applications, such as MOVA, to send event messages to the Optima Hub. This option should remain ticked unless for a specific reason such messages are to be suppressed.
vpnServer	Address used by the Outstation to connect to the Optima Hub Instation server. This can be in the form of a URL or an IP address. By default, the URL is telenttrafficrm.co.uk which will be suitable in most installations.
vpnPort	Four-digit TCP port number to be used for VPN traffic. The VPN port number is local authority specific. This should be left blank if a connection to the Optima Hub is not required.
ctrlBaud	If the controller has had its baud rate changed from the default baud rate for that controller type, then this number should be changed to match it. Otherwise leave it blank.

8.4 Remote Monitoring Configuration

The recommended method to configure the Outstation for Remote Monitoring is to use the Web Interface as detailed in section 8.4.1.

Alternatively use a standard traffic signal controller handset which complies with TOPAS 2523B. The steps required to configure the Outstation RM with the handset are outlined in section 8.4.2.

Once configured, carry out the checks detailed in section 8.4.3.

8.4.1 Configuring Using the Web Interface

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

Connect a computer to the same network as the Outstation or directly to the Outstation network port with an ethernet cable.

Open a web browser and navigate to the following address:

http://192.168.1.2/

A window will appear asking for login credentials (contact Engineering at Warwick for details).

The page shown in **Figure 39** will be displayed, the links may vary depending on what packages are installed.

Figure 39 - Outstation Main Web Page

To enter the settings page, click on "**Settings**" at the top of the page. The page shown in **Figure 40** will be displayed.

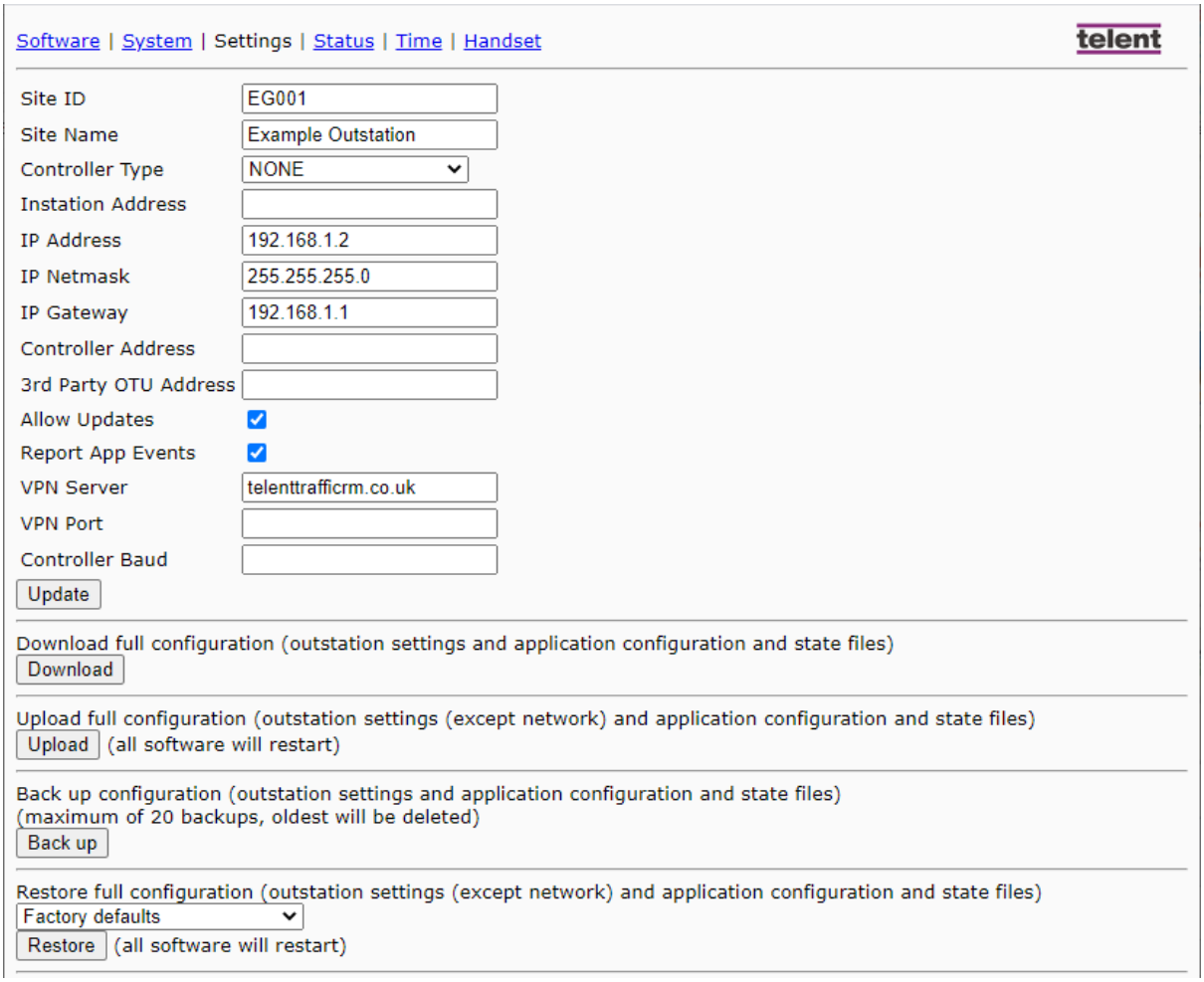


Figure 40 - Remote Monitoring Configuration Page

Each Outstation should be given a "**Site ID"**. This is a unique alphanumeric code, with no spaces, up to 16 characters in length. This will typically be the unique code applied to the controller by the local authority. This is the **Site ID** which will be shown on the Optima Hub.

If the "**Site Name"** is populated then it will be used as the **Site Name** when the site is added to the Optima Hub, if no other site name is given at that point. It should be an alphanumeric string, which can contain spaces, up to 64 characters in length. This will typically be a short description to identify the junction, e.g. junction name.

The **Controller Type** should be selected if the Outstation is to monitor a controller. If the required controller type is not available then leave it set to NONE and fill in the other details. Once the Outstation connects to the Optima Hub it may receive a software update which could include other controller types.

If the serial link to the controller will be via a Siemens OTU (only relevant with certain Siemens controllers) then make sure to select the controller type which includes the text "+MOVA".

Note that the Siemens ST950 has 2 options: polling for faults every 2 minutes or every 90 minutes. If the controller is licenced for frequent handset access then choose the 2-minute option, otherwise choose the 90-minute option.

The “**Instation Address**” is the Optima Hub Instation server address to which the Outstation will connect. This should be set to 172.31.32.1 in order to connect to the Optima Hub. This should be left blank if a connection to the Optima Hub is not required.

Important! The following setting is customer dependent and should be retrieved from the Site List used when configuring routers.

The “**VPN Port”** is The VPN port number is local authority specific. This should be left blank if a connection to the Optima Hub is not required.

If the controller has had its baud rate changed from the default baud rate for that controller type, then the “**Controller Baud**” should be changed to match it. Otherwise leave it blank.

Some controllers to which the Outstation can be connected have web interfaces. Some third-party OTU (MOVA) units also have web interfaces. It may be desirable to make these accessible, via the Outstation, to the Optima Hub. This should only be done if it has been shown that the connected controller or OTU web pages work correctly via such a proxy.

Important! Do not do this if the Web Interface of the controller or OTU of interest allows remote level 3 access without an engineer being on site.

Proxy access to a unit’s web interface will only be possible if the installed router has enough spare LAN ports and the controller or OTU of interest is not already networked. To do this, the controller or OTU should be configured with an IP address on the Outstation network: 192.168.1.3 for a controller or 192.168.1.4 for an OTU. It should be connected to a LAN port on the Outstation router.

Note: Any port on the router labelled as LAN may be used.

To allow the Outstation to make the web pages available, enter the controller / OTU IP address(es) into the “**Controller Address**” / “**3rd Party OTU Address**” fields.

The “**Allow Updates**” setting is normally ticked and should only be un-ticked if a different version of software is required for the specific site. Most sites will require the most recent software available, so this option should remain ticked.

The “**Report App Events**” setting allows optional applications, such as MOVA, to send event messages to the Optima Hub. This option should remain ticked unless for a specific reason such messages are to be suppressed.

The “**IP Address**”, “**Netmask**” and “**Gateway**” settings should remain at their default values if the Outstation is being used for Remote Monitoring. If the Outstation is being used for other functions and needs to be installed on a different network (e.g. for UG405) then these settings should be changed to values provided by a suitable authority for that network.

Important! Upon completion of the settings, click the “**Update**” button to save the changes or they will be lost.

The Outstation will restart with the updated settings after an update is performed.

8.4.2 **Configuration Using a Handset**

Note: Refer back to section 8.3 (Handset Functionality) for more information on using the handset.

Connect a handset to the D-Type connector on the front of the Outstation. If the display is blank, then press **ESC**.

The following options are available:

[C]onnect	- Typing **C** will allow pass through of handset commands to the traffic signal controller.
[W]atch	- Typing **W** will display the output of the controller handset port as seen by the Outstation.
[R]econfigure	- Typing **R** will enter the Outstation configuration screens.

Type **R** to reconfigure

When prompted type the password (supplied by Engineering at Warwick)

```
[C]onnect, [W]atch,
[R]econfigure
R
Password>
```

The configuration options will then be displayed with their current value. To scroll through the options at any point press **+** or **–** to scroll forwards and backwards respectively. To change a parameter type **=** followed by the desired value.

Use the handset to navigate to the Site Id

Type **=** followed by the site ID. For example; **=SCN0001**

Press **Enter** (Or Return)

```
Select (+/-/=/.)
siteId
=4
siteId01
=SCN0001
```

Site Name will be displayed

Type **=** followed by the site Name. For example; **=OXFORD CIRCUS**

Press **Enter** (Or Return)

```
Select (+/-/=/.)
siteName
=RMU4/Fridge
siteNameCIRCUS
=OXFORD CIRCUS
```

Controller Type will be displayed

Type **=** followed **+** or **–** to scroll through the list. Find the desired controller from the list and Press **Enter** (Or Return)

```
Select (+/-/=/.)
ctrlType
=OPTIMA
ctrlTypeL
=SENTINEL
```

Scroll through to find "**Instation**"

If the Outstation should connect to the Optima Hub then use 172.31.32.1 as the Instation address, otherwise leave it blank.

Type **=** followed by the Instation address (if a connection to the Optima Hub is required).

```
Select (+/-/=/.)
instation
=192.168.41.21
```

Press **Enter** (Or Return)

"**ipAddress**" will be displayed (default 192.168.1.2) – this should not be changed **–** type **+**

"**ipNetmask**" will be displayed (default 255.255.255.0) – this should not be changed – type **+**

"**ipGateway**" will be displayed (default 192.168.1.1) – this should not be changed – type **+**

"**controllerAddr**" will be displayed (default blank) – see information in previous section – type **+**

"**outstationAddr**" will be displayed (default blank) – see information in previous section – type **+**

"allowUpdates" will be displayed (default Y) – see information in previous section – type "+"

"vpnServer" will be displayed (default telenttrafficrm.co.uk) – this should not be changed – type "+"

VPN Port will be displayed

Type **=** followed by the "**vpnPort**" number retrieved when configuring the router. If a connection to the Optima Hub is not required then make sure this is blank.

```
Select (+/-/=/.)
vpnPort
=
vpnPort
=1234
```

Press **Enter** (Or Return)

The controller baud rate will be displayed. If the controller has had its baud rate changed from the default baud rate for that controller type, then this number should be changed to match it. Otherwise leave it blank.

To change the baud rate type **=** followed by the required baud rate for the connected controller and **Enter** (Or Return).

```
Select (+/-/=/.)
ctrlBaud
=
ctrlBaud
=9600
```

Type . (A full stop)

The following Options are available:

[S]ave	- Typing **S** will save the configuration changes.
[U]ndo	- Typing **U** will undo the changes and exit the configuration options.
[R]econfigure	- Typing **R** will return to the configuration options.

If the configuration changes that have been made are correct, then type **S** to save the configuration.

If a mistake has been made type **R** to re-enter the configuration options.

If the configuration changes should not be made active, type **U** and the changes will not be saved.

Note: Any changes to the configuration of the Outstation will not become active until the configuration has been saved.

8.4.3 Site Status checks

8.4.3.1 Using the Web Interface

Navigate to the "**Status**" page of the Outstation Web Interface.

Figure 41 - Outstation Status Page

The Site and Name configured for the Optima Hub will appear here. If a successful connection to the Optima Hub has been established the RM status will change from “Not Connected” to “Connected”. Other information on the Status page includes the status of the connected controller, software versions and battery health. In the figure above, the controller is not communicating on its handset port, which may not be connected, or the controller is without power.

Important! After the Outstation restarts with the updated RM settings, it may take around 15 seconds for the VPN to connect and the RM status change to “Connected”.

8.4.3.2 Using the Handset

If the following options are not displayed press **ESC**:

[C]onnect

[W]atch

[R]econfigure

Type **?** (question mark):

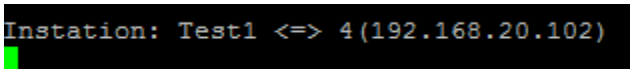
The following information will be displayed:

```
[C]onnect, [W]atch,
[R]econfigure
?
Network: 192.168.20.102, VPN: DOWN
```

- Network: - Returns Outstation network address. If network connection not active, status will show: **DOWN**
- VPN: - Returns Outstation VPN address. If VPN connection not active, status will show: **DOWN**

Press any key:

The following information will be displayed:



- Instation: - Returns Outstation's Instation name to which it is connected. If the Instation is inaccessible the status will show: **Not Connected**

8.5 IO Driver Configuration

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

The Telent IO driver (tIOd) software must be installed in order to use any attached IO boards. This software provides communication between the IO boards and any other installed software. It also provides communication between software applications using virtual bits. The IO driver also provides several useful features for manipulating the behaviour of the IO, such as call cancel, unidirectional logic, count and count recording, logic and special RM message triggering.

8.5.1 Status

Figure 42 - Outstation Web Interface: IO Driver Status

Outstations can be built with 0, 1, 2 or 3 IO boards. Each board provides 48 inputs and 24 outputs. With a single board the inputs are named I1 to I48 and the outputs are named O1 to O24. With two boards the inputs would be I1 to I96 and the outputs would be O1 to O48. Three boards give I1 to I144 and O1 to O72.

The TF bit is active if a handset is connected to the controller. This includes a handset connected to the front panel of the Outstation or a virtual handset on the Outstation Web Interface or from the Optima Hub. However, the TF bit is only on while the connection is routed through to the controller: started by pressing "**C**" and ended by pressing "**ESC**".

Users can create named bits which will also be shown on this page. All bit names should be short strings of letters and numbers, without spaces, although underscores may be used. Names are case sensitive, so using upper case in one place and lower case in another will create two different bits. Names should not be longer than eight characters long. Each bit may only be controlled by one application and errors will be generated if more than one application is configured to output bits with the same name.

Each bit on the "**Status**" page shows the current state, with dark blue being inactive and yellow being active. The hardware inputs and outputs can be configured with alternative behaviour. This will change how they are displayed to indicate that the state of the bit in the software may not reflect the physical state on the wire. Bit states on the Web Interface update no more than twice per second. If a bit changes more often than that then the real number of state changes will not be visible on the Web Interface.

The state of a bit can be temporarily over-ridden for testing purposes. Clicking on a bit opens a pop-up that gives options to force the state of the bit active or inactive or release the override. Any overridden bits are outlined in red. Overrides can be useful to check the Outstation reacts correctly or override the software output state to force a certain state on physical output.

Important! Overrides are temporary and will be automatically removed after a few seconds if the Web Interface is closed. They cannot be used as a fix to force an IO one way or the other in the event of an issue on site.

Type of bit	Inactive	Active
Overridden by Web Interface	I1	I1
Active closed	I2	I2
Active open	I3	I3
Pulse on close	I4	I4
Pulse on open	I5	I5
Toggle after period or count	I6	I6
Clone of another bit shows greyed	I49	I49

Figure 43 - Outstation Web Interface: IO Driver Bit Status

If the driver has any errors, then these will be available to view by clicking on the **Errors** page link.

8.5.2 Configuration

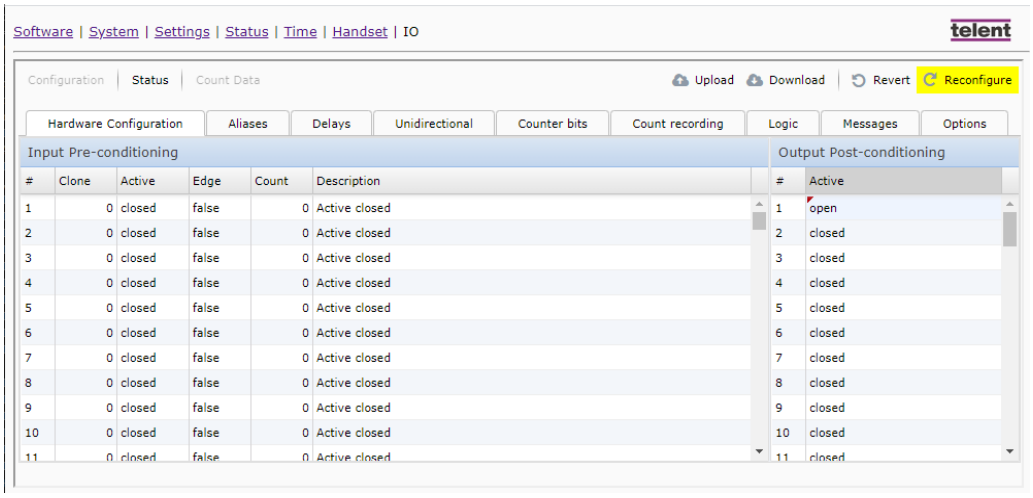


Figure 44 - Outstation Web Interface: IO Driver Configuration

The “**Configuration**” page is to view and change the driver configuration. The “**Download**” button allows the saved configuration file to be fetched from the Outstation and stored on the computer. The “**Upload**” button sends a previously downloaded file and restarts the driver with those settings.

Double click on a setting to edit. Changed settings show a red mark. If a box is highlighted, by clicking on it or tabbing to it, simply start typing the new content without double clicking to enter edit mode.

The “**Reconfigure**” button saves the changes and restarts the driver.

The “**Revert**” button reverses all the changes, reloading the saved configuration to the Web Interface.

8.5.2.1 Hardware Configuration

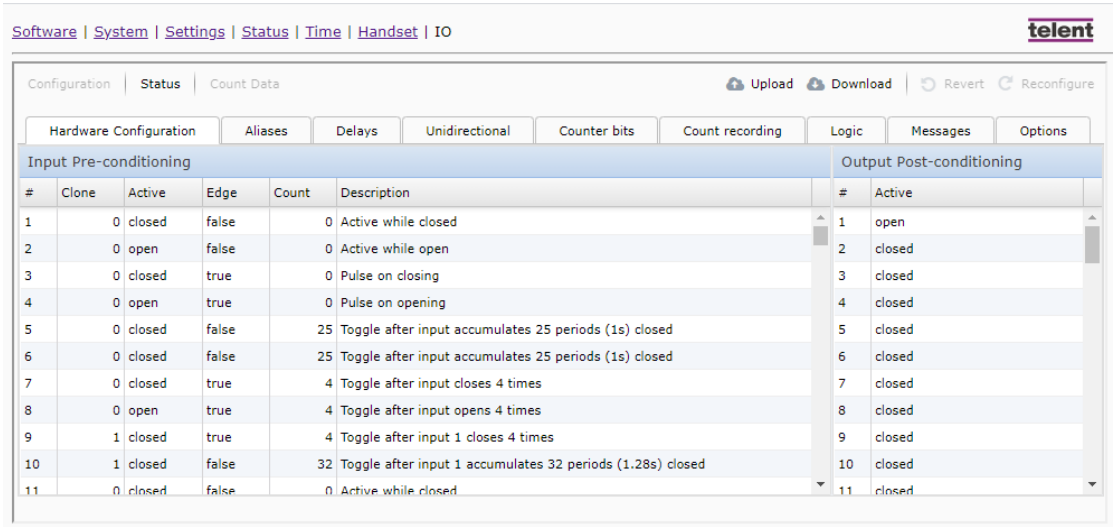


Figure 45 - Outstation Web Interface: IO Driver - Hardware Configuration

The “**Hardware Configuration**” tab controls how the driver interacts with the hardware. The configuration covers the maximum number of inputs and outputs. The actual number of inputs and outputs that can be used will depend on the number of IO boards fitted. For example, if a single IO board is fitted then the inputs numbered 1 to 48 here will correspond to bits named I1 to I48 in the driver.

Outputs can be configured such that the physical output is closed when the software bit is active (this is the default) or so that it is open when active.

The default configuration starts with each input bit configured to be active when the corresponding physical input is closed. By changing the setting in the “**Active**” column, this behaviour can be inverted.

If the setting in the “**Edge**” column is “**true**” then edge detection is enabled. Input 3 in the above example is *Active closed* and *Edge true*, so will be active momentarily when the input changes from open to closed.

If “**Edge**” is “**false”** then a non-zero “**Count”** value indicates that the bit should toggle between Active and Inactive every time that the input accumulates enough time in the “**Active**” state. The count is in periods of twenty-fifths of a second. A count of 32 will therefore provide a bit suitable for a UG405 *Vehicle Occupancy Bit*.

If “**Edge**” is “**true**”, then a non-zero “**Count**” value indicates that the bit should toggle between on and off every time the input has changed to the “**Active**” state “**Count**” number of times. This is appropriate for a UG405 *Vehicle Count Bit* where the vehicle count comes from a single input. This is not suitable for N+1 counting vehicles across multiple detectors/lanes which must be configured on the dedicated “**Counter bits**” tab.

A non-zero value in the "**Clone**" column means that this bit will use the physical input from another bit. If a single input needs to be configured in multiple ways, then it can be cloned to multiple bits. In the example above, bits I1, I9 and I10 all use physical input 1 but I1 will show the actual state of input 1 while I9 and I10 are count and occupancy bits.

Note: It is possible to configure bits that do not have hardware fitted as clones of inputs which do. If a single IO board is fitted, and all 48 inputs were already used, count or occupancy bits could be added from I49 onwards, cloning existing inputs but configuring different behaviour.

The "**Description**" column describes how the bits have been configured to behave. This is not editable.

8.5.2.2 Aliases

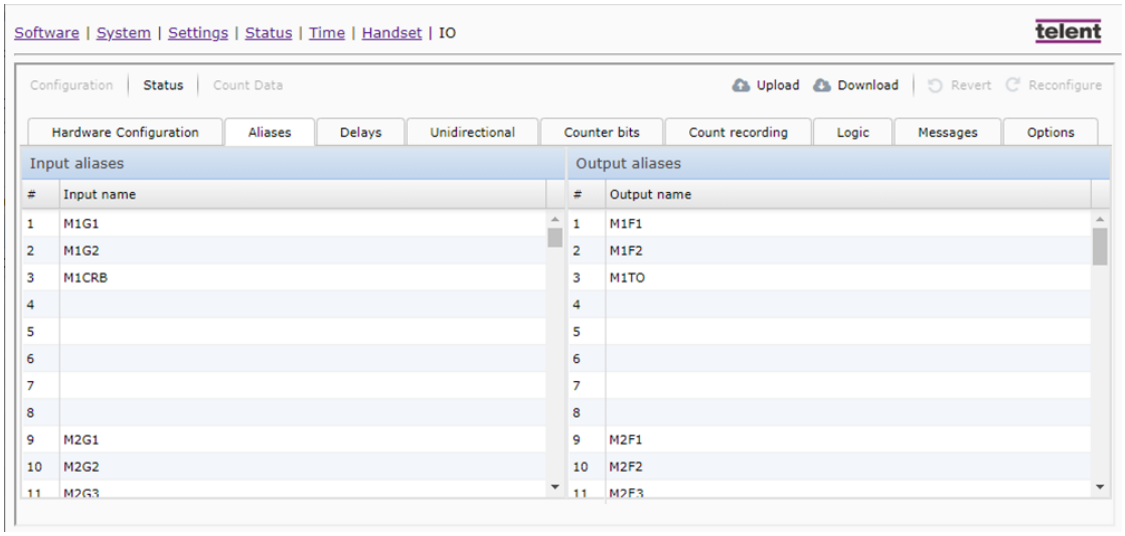


Figure 46 - Outstation Web Interface: IO Driver – Aliases

The Aliases tab assigns alternative user defined names to input and output bits. An alias is another name for the same bit. Both the original name and the alias will be visible on the **Status** page, and either may be used in the configuration of other applications or IO driver functions.

8.5.2.3 Delays

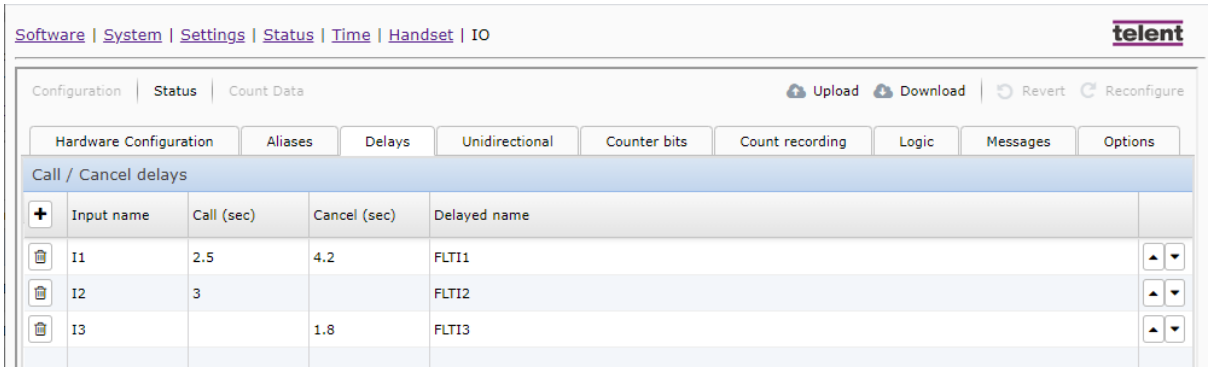


Figure 47 - Outstation Web Interface: IO Driver - Delays

The Delays tab allows the creation of new bits which will follow the state of an existing bit, but only if it stays active or inactive for the given call or cancel time. "**Input name"** is the existing bit and "**Delayed name"** is the name of the new bit to create. The "**Call**" and "**Cancel**" times are in seconds with a step size of 0.1 s. Missing delay times are interpreted as zero.

In this example *FLTI1* will only activate when I1 has been active continuously for 2.5 seconds and will only deactivate again when I1 has been inactive for 4.2 seconds. *FLTI2* will activate after 3 seconds of I2 being active but will deactivate as soon as I2 deactivates.

8.5.2.4 Unidirectional

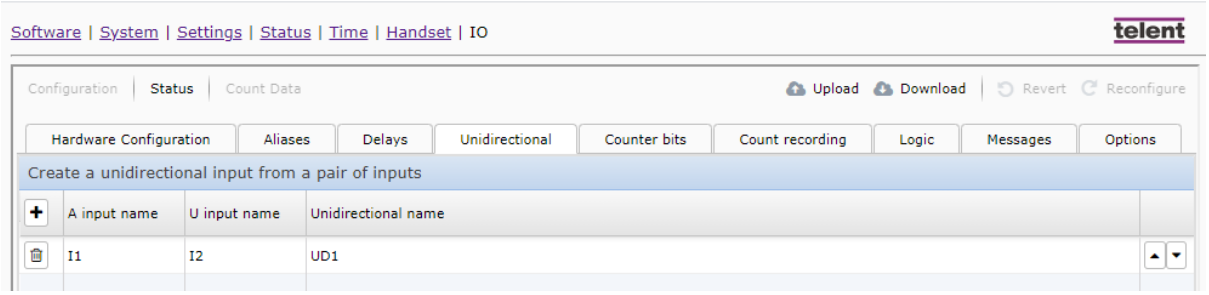


Figure 48 - Outstation Web Interface: IO Driver – Unidirectional

The Unidirectional tab allows the creation of unidirectional detector bits from a pair of existing bits. The unidirectional bit follows the **A input**, but only if the **U input** was inactive in the sample before the **A input** goes active. This example creates a bit named **UD1** which will follow the state of **I1** so long as **I2** is inactive just before **I1** activates.

8.5.2.5 Counter bits

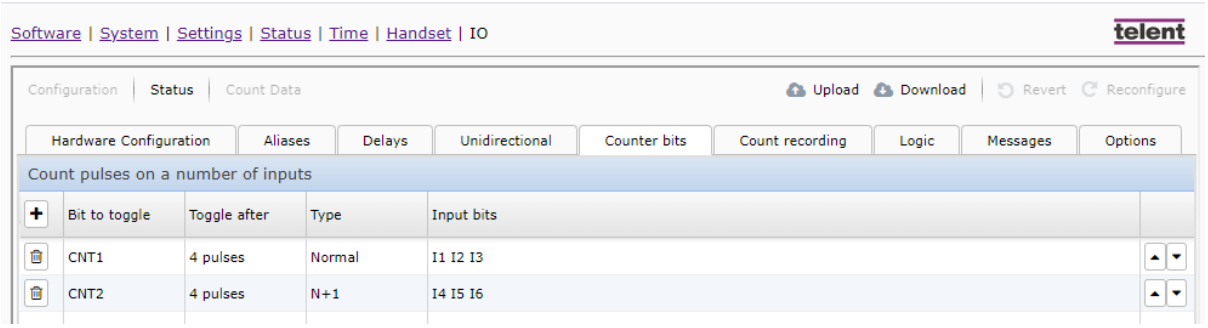


Figure 49 - Outstation Web Interface: IO Driver – Counter Bits

The Counter bits tab allows the creation of count bits which toggle every time a given number of detections have been seen. This is suitable for a UG405 *Vehicle Count Bit* where the vehicle count comes from multiple inputs. The "**Bit to toggle"** is the name of the new bit to create. The "**Input bits"** is a list of bits to watch for pulses.

Note: Input bits in a list are separated by a blank space and not comma.

The "**Toggle after"** is the number of pulses which must be counted for the new bit to toggle. The number of pulses must be a power of 2 (between 2 and 1024). A pulse is counted each time a bit activates and deactivates. Whenever the count value exceeds the "**Toggle after"** value, it is reduced by that amount and the "**Bit to toggle"** is inverted.

For Normal counters the "**Input bits**" is a list of one or more bits. The counter will count the total number of pulses on all the given bits.

Note: Counting on a single physical bit can be done in the "**Hardware Configuration**" tab more efficiently.

For N+1 counters the "**Input bits**" is a list of 3 or 4 inputs corresponding to detectors across 2 or 3 lanes.

Important! The order of N+1 counter inputs is critical to correct operation of the count.

For N+1 counters with 3 inputs (A B C) – the counter is incremented for:

- Every pulse on the first input (A)
- Every pulse on the third input (C)
- Every pulse on the second input (B) which did not overlap a pulse on A or C

For N+1 counters with 4 inputs (A B C D) – the counter is incremented for:

- Every pulse on the first input (A)
- Every pulse on the last input (D)
- Every pulse on the logical result of (B AND C)
- Every pulse on the second input (B) which did not overlap a pulse on A or C
- Every pulse on the third input (C) which did not overlap a pulse on B or D

8.5.2.6 Count Recording

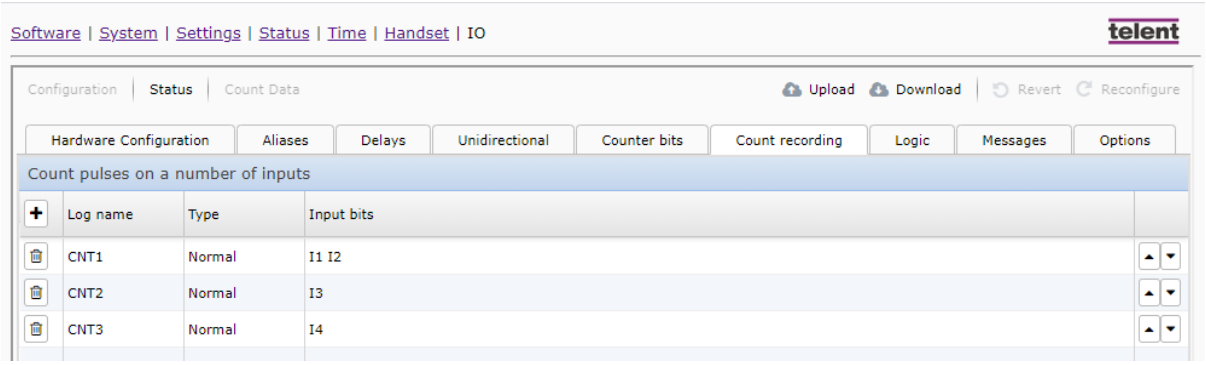


Figure 50 - Outstation Web Interface: IO Driver – Count Recording

The Count Recording tab allows counts to be logged. The "**Type**" and "**Input bits**" fields are the same as on the Counter Bits tab but this tab does not create any new bits. The count values are stored and reset every 15 minutes and stored values can be viewed on the "**Count Data**" page. The "**Log name**" is the name which will be displayed on the Count Data page when viewing the data.

Important! Rebooting the Outstation or reconfiguring the IO driver will reset the day's count data.

Note: Data is stored on the Outstation for 14 days. Data is sent to the Optima Hub once per day, so data gathered that day is available the following day.

8.5.2.7 **Logic**

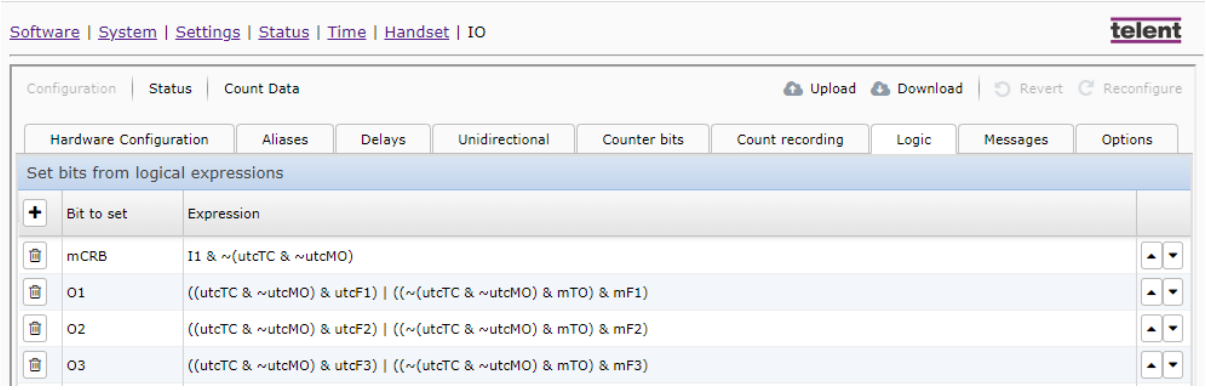


Figure 51 - Outstation Web Interface: IO Driver – Logic

The Logic tab allows creation of new bits whose values are controlled by logical expressions involving other bits. Each "**Expression"** is made up from other bit names, brackets and the symbols **~**, **&** and **|**.

- The ampersand symbol & forms an expression which is the logical AND of the bits or expressions either side of it.
- The vertical line or pipe symbol | forms an expression which is the logical OR of the bits or expressions either side of it.
- The tilde symbol ~ before a bit name or an opening bracket forms an expression which is the inverse of the bit or expression following it.

The logical expressions are all evaluated before writing the results to the bits created in the "**Bit to set**" column. If expression 2 uses the bit set by expression 1, it will not change state at **exactly** the same time as expression 1 but later. A chain of expressions which use the results of other expressions could build up noticeable delays.

Important! The creation of bits purely as intermediate values for other expressions is not recommended due to delays that can build up in processing the end results.

It is better to bracket sub-expressions which are re-used and let the software optimise the processing. In the example above, the expression ***(utcTC & ~utcMO)*** is used as part of all the other expressions. By writing the expression in the same way each time it is used, the software will be able to efficiently use the same value in all those places.

8.5.2.8 **Messages**

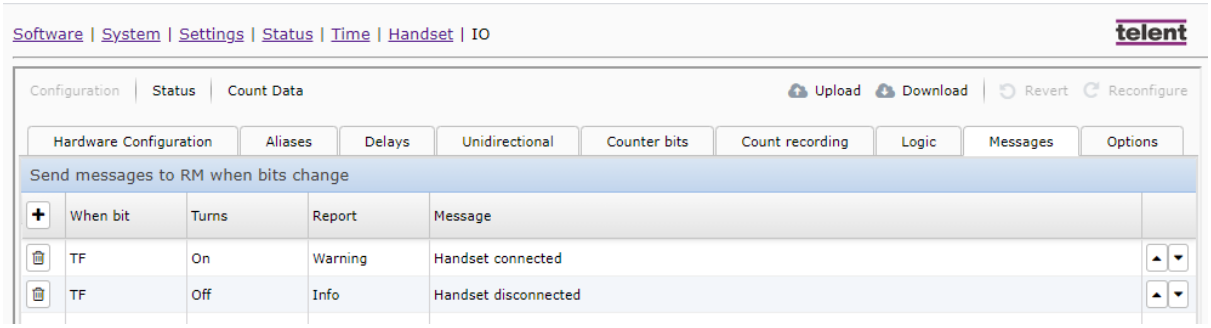


Figure 52 - Outstation Web Interface: IO Driver – Messages

The "**Messages**" tab configures events which will send messages to the Optima Hub when bits change state. This is only relevant if the Outstation is connected to the Optima Hub. The message can be reported with a choice of severities listed in the "**Report**" field:

- Fault,
- Warning,
- Information.

Note: The maximum message length is 100 characters.

8.5.2.9 **Options**

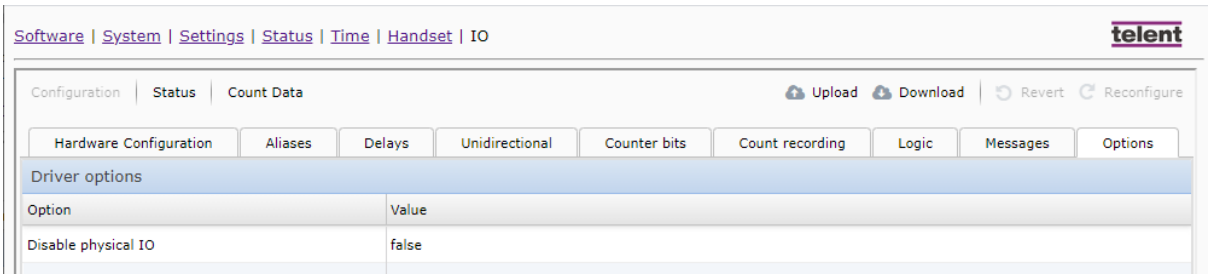


Figure 53 - Outstation Web Interface: IO Driver – Options

If the driver software is installed on an Outstation *without* IO boards fitted, then the option "**Disable physical IO**" can be set to "**true"** to stop the driver searching for IO boards and logging an error when it finds none.

8.5.3 **Count Data**

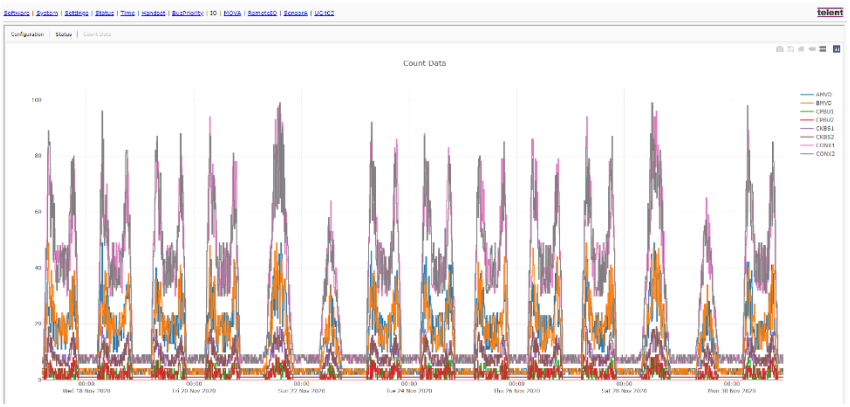


Figure 54 - IO Driver Count Data: 14 Day

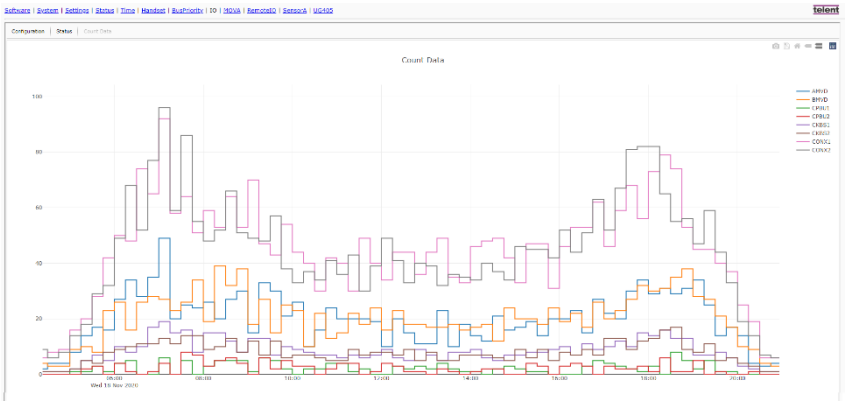


Figure 55 - IO Driver Count Data: Working Day

Figure 56 - IO Driver Count Data: Weekend Day

The “**Count Data**” page displays data stored as a result of configuring Count Recording in the IO driver. There are several controls available in the top right-hand corner of the screen:


Save an image of the plot as a Scalable Vector Graphics (SVG) file.


Save a Comma Separated Variables (CSV) file containing the data displayed in the plot.

Reset the plot to original zoom level if the mouse has been used to zoom into the data.Double clicking on the graph will have the same effect.

Enable the “show dataset on hover” function, which displays values for the nearest data point to the mouse pointer.


Enable the “compare data on hover” function, which displays values for each logged count at the nearest time to the mouse pointer.

Each counter created in the Count Recording configuration will be displayed in a different colour and the configured “**Log name**” is displayed in the key to the right of the data. Individual counters can be turned on and off by clicking on them in the key. Double clicking a counter in the key will turn off all other counters and just display that one.

In the example above, a 14-day count was recorded on a pedestrian crossing near a railway station. The weekday shows distinct AM and PM peaks of activity, whereas the weekend shows a single peak as most commuters travel on a weekday at this site. The Saturday plot shows a single early afternoon peak corresponding to shoppers.

8.6 UG405 Configuration

If the UG405 software is installed it can be used to allow a remote Instation to use IO bits to manage a connected traffic light controller. This requires that the Outstation be on a UTMC network. This network should protect the Outstation from unauthorised access. If the network provides for access from the Outstation to the internet then the Outstation could be configured to connect to the Telent Optima Hub.

Warning: The network **MUST NOT** allow the Outstation to be directly accessible from the internet.

8.6.1 **Status**

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

The "**status**" page shows the current status of the UG405 software.

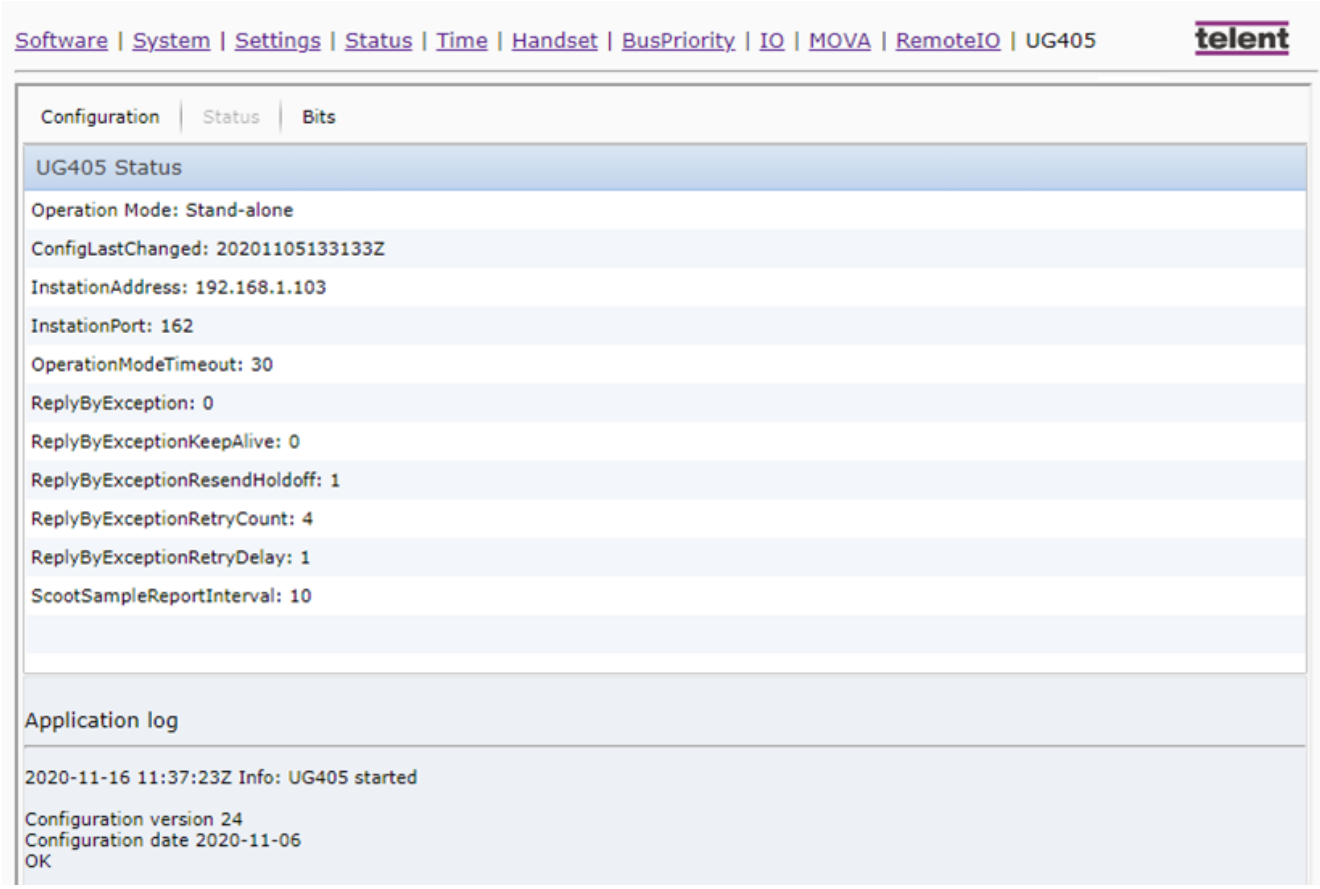


Figure 57 - The UG405 Status Page

The top pane shows the Operation Mode and the current values of the fields in the Config section of the UG405 Management Information Base (MIB). The Operation Mode can be one of:

- Not Running – the software is not yet running, cannot run due to faults, or has not been licensed,
- Stand-alone – the software is running but the in-station has not requested a networked mode,
- Monitor – the in-station has requested monitor mode,
- UTC Control – the in-station has requested control mode,

The bottom pane shows a log of any faults and start-up information. In the example above, configuration version information and configuration date are shown. OK indicates that the configuration is correct and there are no errors.

Note: The log file time is GMT, as indicated by the Z (zero offset) given in the time stamp.

8.6.2 **Configuration**

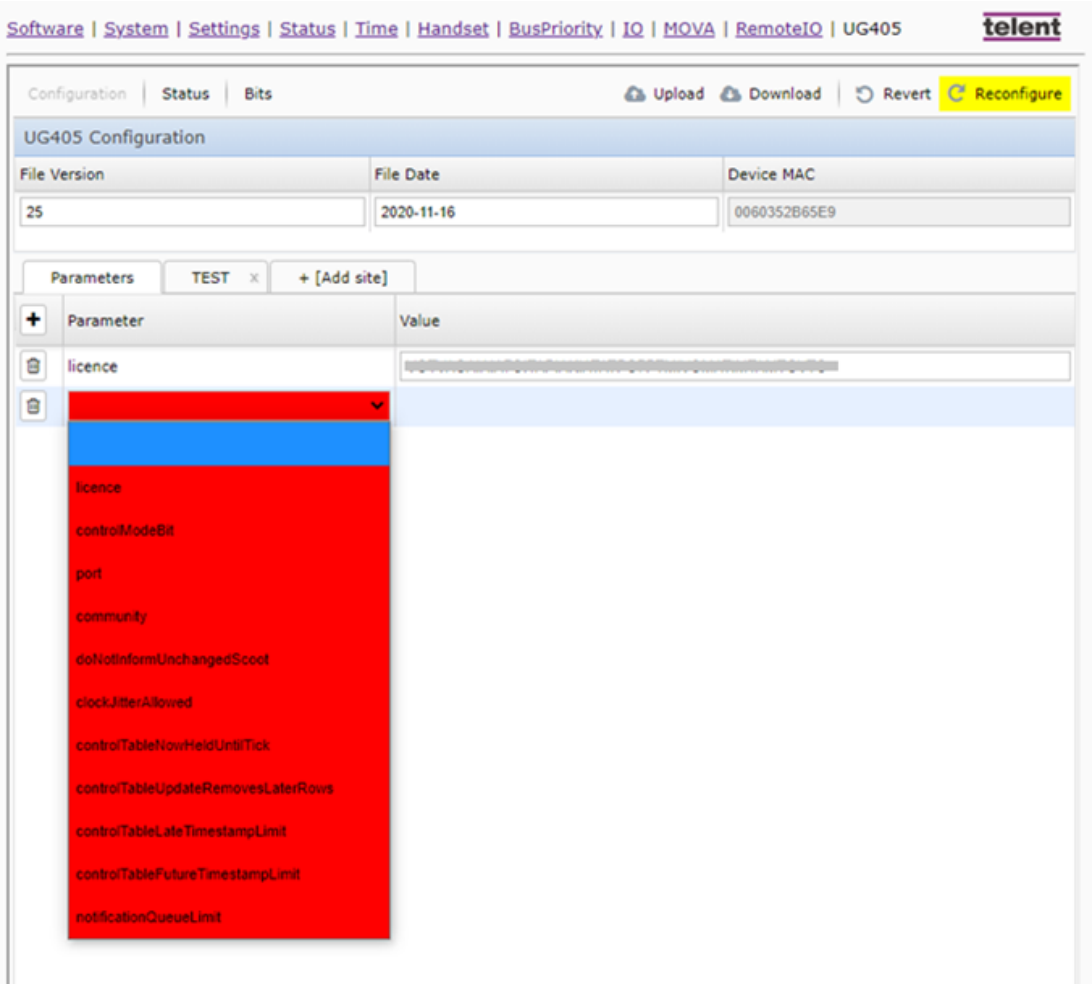


Figure 58 - Selecting UG405 Parameters

The UG405 software requires a licence to run – see section 7.2.3 for information on licensing the software. Click the "**+**" to make any required modifications to parameter defaults. The possible parameters are:

controlModeBit – Bit to set while the operation mode is "UTC Control". There is no default. If this parameter is set then a new bit is created, with the given name, and will be on while the operation mode is "UTC Control". This can be used elsewhere (e.g. by Logic expressions configured in the IO driver).

port – Port number on which the application accepts Simple Network Management Protocol (SNMP) messages. Default is 161.

community – SNMP community string. Default is UTMC.

doNotInformUnchangedScoot – If this is "**true**" then SCOOT inform messages are discarded if they contain the same data as the previous SCOOT notification. Default is "**true**".

clockJitterAllowed – The maximum number of seconds the clock is allowed to change by. If the clock changes by more than this amount, then the mode is changed to stand-alone. Default is 3 seconds. Range is 0 to 3600 seconds.

controlTableNowHeldUntilTick – If this is "**true**" then setting a control table value with a timestamp which is now (either a timestamp of 1 or the current time or allowable recent past) will buffer the change until the time ticks to the next second. If this tick causes an event which changes this bit, or other immediate writes happen before the tick which changes this bit, then intermediate states will never make it as far as the hardware and so will be lost. Default is "**false**".

controlTableUpdateRemovesLaterRows – If this is "**true**" then setting a control table value will remove all control table rows with the same site ID which have timestamps later than the row being updated. Default is "**true**".

controlTableLateTimestampLimit – A control table value may be set with a timestamp in the past by up to this number of seconds. The update will happen as if the timestamp were 1 (i.e. immediately). Default is 10. Range is 0 to 30.

controlTableFutureTimestampLimit - A control table value may be set with a timestamp in the future by up to this number of seconds. Timestamps further in the future will be refused with an error. Default is 43200. Range is 0 to 79200.

notificationQueueLimit – Maximum number of SNMP notifications which can be held waiting. If this is exceeded, then the mode is dropped to stand-alone and the notifications are discarded. Default is 100. Range is 0 to 1024.

Clicking on the "**+[Add site]**" tab creates a pop-up window where a site name can be entered. This name will be provided by the customer and is usually a short alphanumeric string.

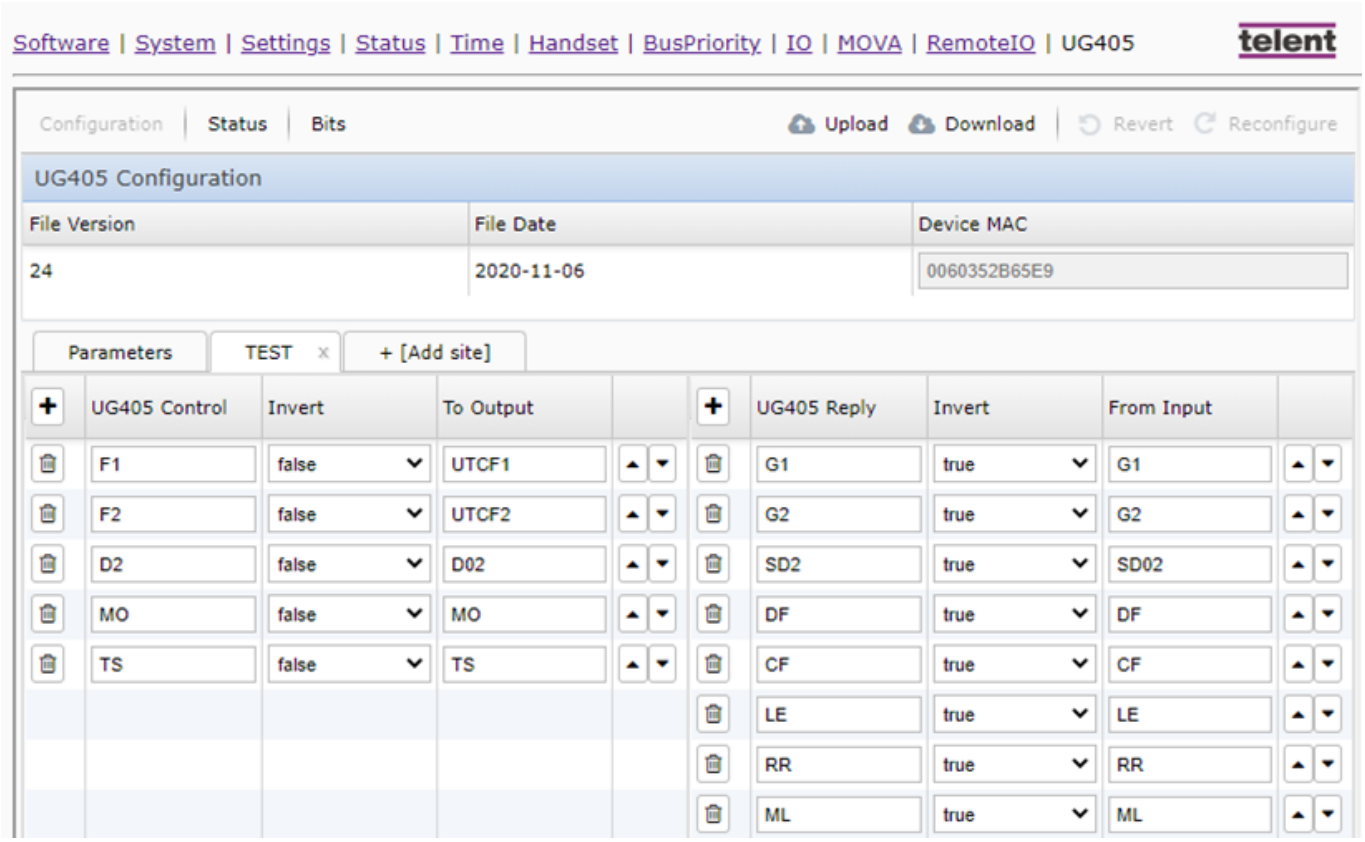


Figure 59 - Configuring Control and Reply Bits

For each site, add the required control and reply bits. When a bit has been added, the empty fields will be highlighted red, to prompt the user to fill in the missing data. Clicking in the field brings up a drop-down list of all available hardware inputs/outputs and bits, and the user simply selects the one to use. The field can also be typed, and if a bit doesn't exist, the field will be highlighted yellow and will be created by the IO driver.

Important! A new, undefined bit created here (highlighted yellow until changes saved) will be added to the available bits in the IO driver status page, but they **will not do anything** until configured within the IO driver, for example in the logical expressions section.

The "**UG405 Control**" and "**UG405 Reply**" columns refer to the names in the MIB which the Instation will send or receive.

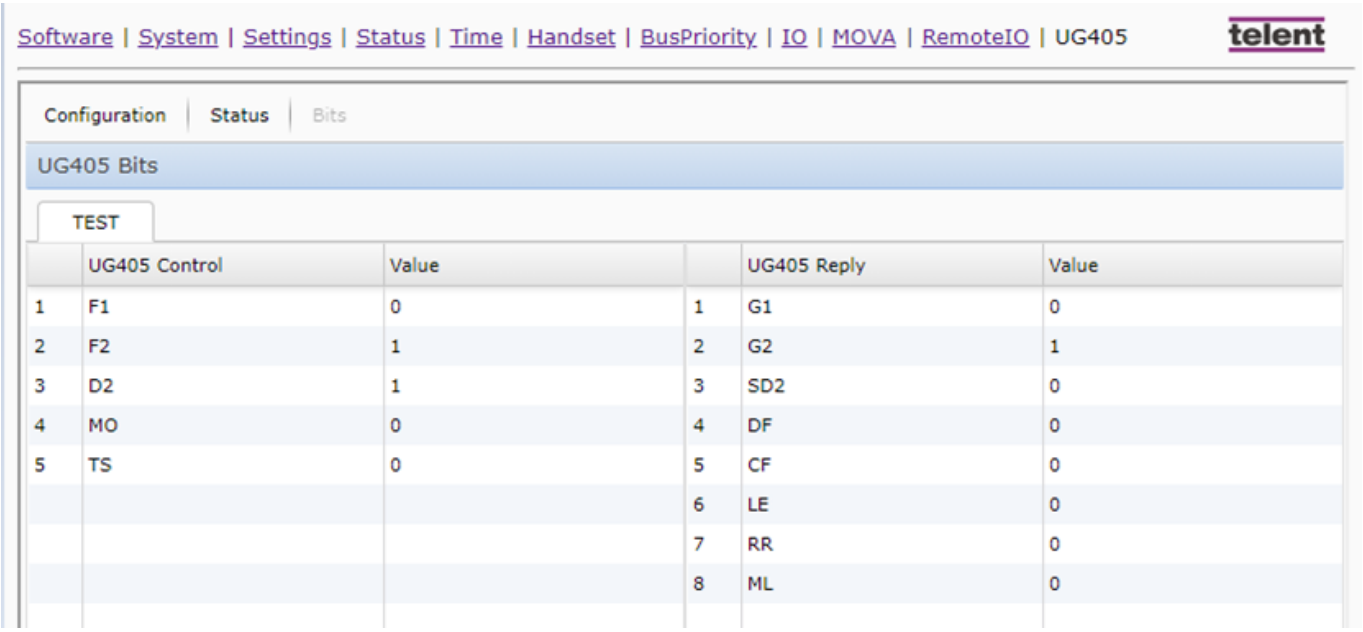
The "**To Output**" column specifies the bit names in the IO driver that the corresponding control bit will be written to. The "**From Input**" column specifies the bit names in the IO driver that the corresponding reply bit will be read from. Input and output bits can be hardware bits (e.g. I1), aliases, or virtual bits from another application or logic in the IO driver.

The "**Invert**" columns allow for the control or reply bit to have the opposite sense to the corresponding output or input bit.

Click the “**Reconfigure**” button to save the changes and wait for the application to restart. As with the other applications on the Optima Outstation, the configuration can be saved for future reference by downloading it or applied by uploading and reconfiguring.

Tip: A site can be renamed by downloading the configuration file, editing in a suitable XML editor and uploading / saving changes.

8.6.3 **Bits**



	UG405 Control	Value		UG405 Reply	Value
1	F1	0	1	G1	0
2	F2	1	2	G2	1
3	D2	1	3	SD2	0
4	MO	0	4	DF	0
5	TS	0	5	CF	0
			6	LE	0
			7	RR	0
			8	ML	0

Figure 60 - Monitoring Control and Reply Bits

The “**Bits**” page shows the current values of all the configured UG405 bits.

8.7 MOVA Configuration

The MOVA 8 application can be installed and licensed for up to four streams. The default MOVA web page on the Optima Outstation Web Interface is the "**Control**" page for stream 1.

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

8.7.1 Configuration

Each stream has a configuration page which can be used to license the stream and map bit names in the IO driver to bits in the MOVA dataset.

Note: The "**Reconfigure**" button is yellow if the web page contains changes which have not been saved to the configuration file.

The "**Download**" button allows the saved configuration file to be fetched from the Outstation and stored on the computer. The "**Upload**" button allows the application to be reconfigured from a previously downloaded configuration file.

8.7.1.1 Licence

Each stream of MOVA requires a licence to run – see section 7.2.2 for information on licensing the software.

8.7.1.2 Detector bits

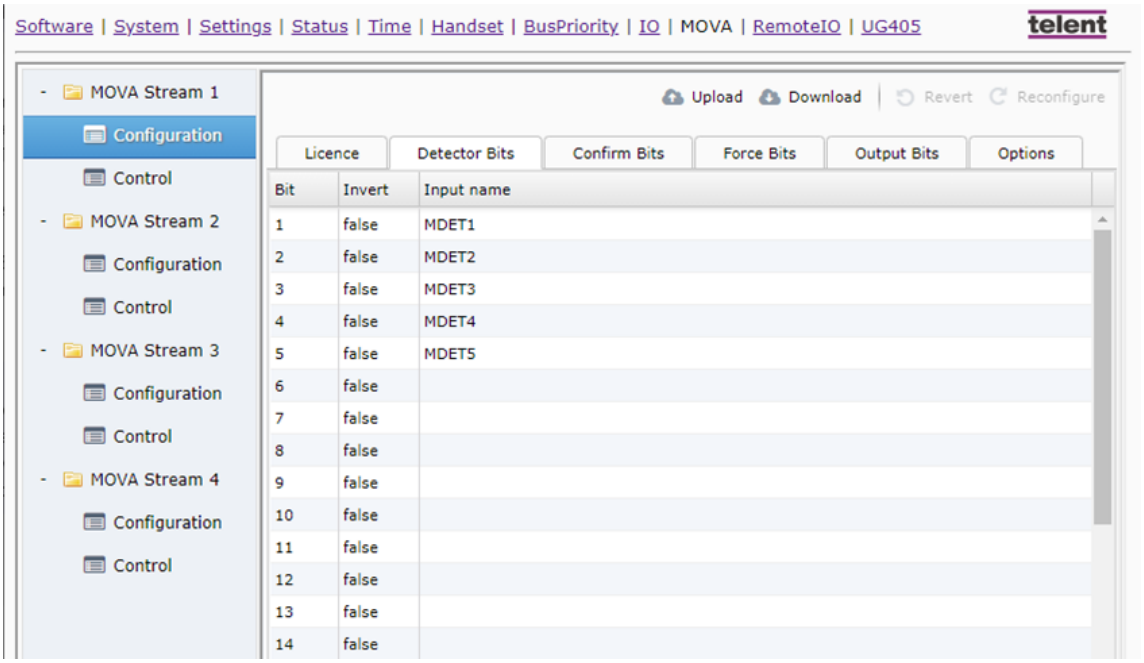


Figure 61 - Configuring MOVA Detector Bits

MOVA will require some detectors but the number will depend on the site and the MOVA dataset used. Up to 64 detectors can be used in each stream, and each detector in the dataset will have a number between 1 and 64. Edit the "**Input name**" field for each detector required by the dataset and enter the name which the driver knows for the corresponding input. This can be directly from a hardware input (e.g. "**I1**") or from an alias or a virtual bit created by logic in the driver or from another application. It is possible to invert any bits which do not already have the correct sense.

Important! The MOVA configuration will allow an undefined bit name to be entered here. It will be created in the IO driver status page, but they **will not do anything** until configured within the IO driver, for example in the logical expressions section.

A detector can be removed by simply deleting any text in the Input name field.

8.7.1.3 Confirm Bits

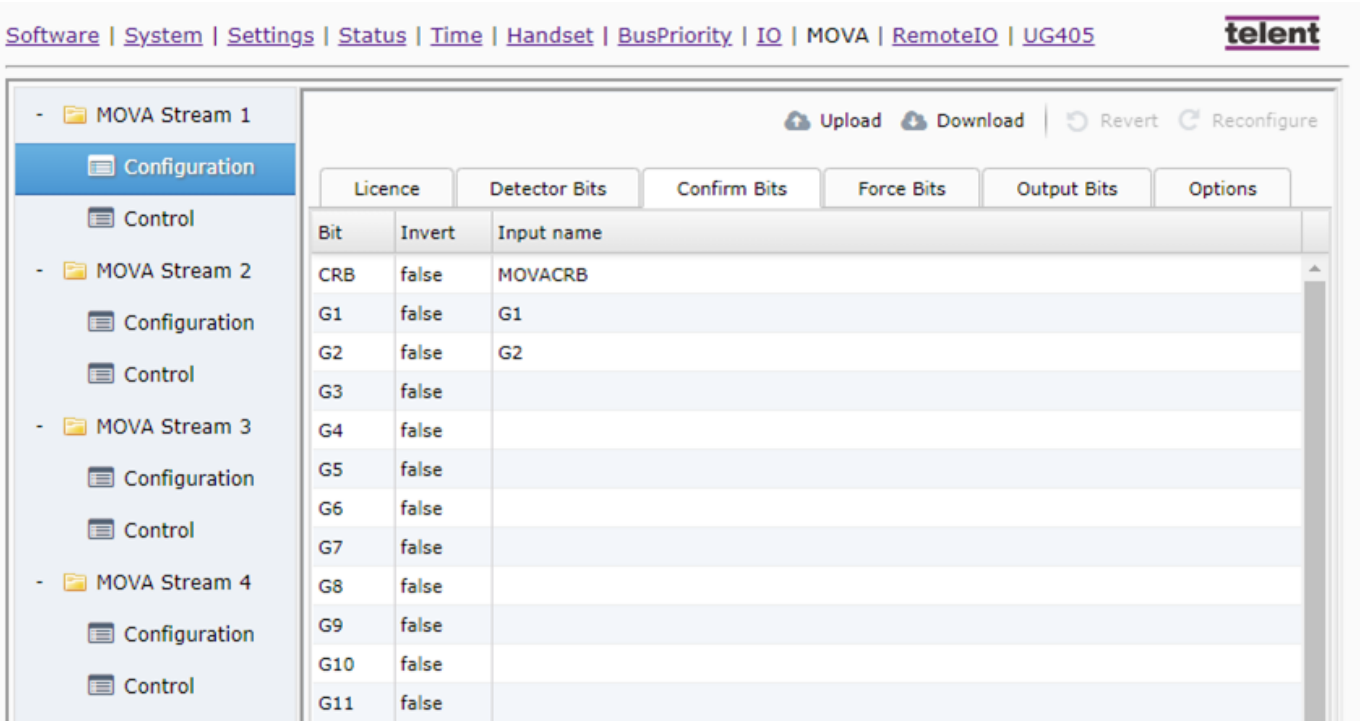


Figure 62 - Configuring MOVA Confirm Bits

MOVA will require a Controller Ready Bit (CRB) and some confirm bits (known as G bits) but the number will depend on the site and the MOVA dataset used. Up to 31 confirm bits can be used and each confirm bit in the dataset will have a number between 1 and 31. Edit the Input name for the CRB and each confirm bit required by the dataset and enter the name which the driver knows for the corresponding input. This can be directly from a hardware input (e.g. "**I1**") or from an alias or a virtual bit created by logic in the driver or from another application.

It is possible to invert any bits which do not already have the correct sense. The correct sense for CRB is that the controller is ready when the bit is on. A sign that the CRB is the wrong sense is when MOVA warms up but never assumes control (and control has been enabled). However the correct sense for G bits is that OFF confirms the

corresponding stage or phase (and all other G bits should be on). If this is not how the controller is configured, then the bits can be inverted either in the IO driver configuration or here.

8.7.1.4 **Force bits**

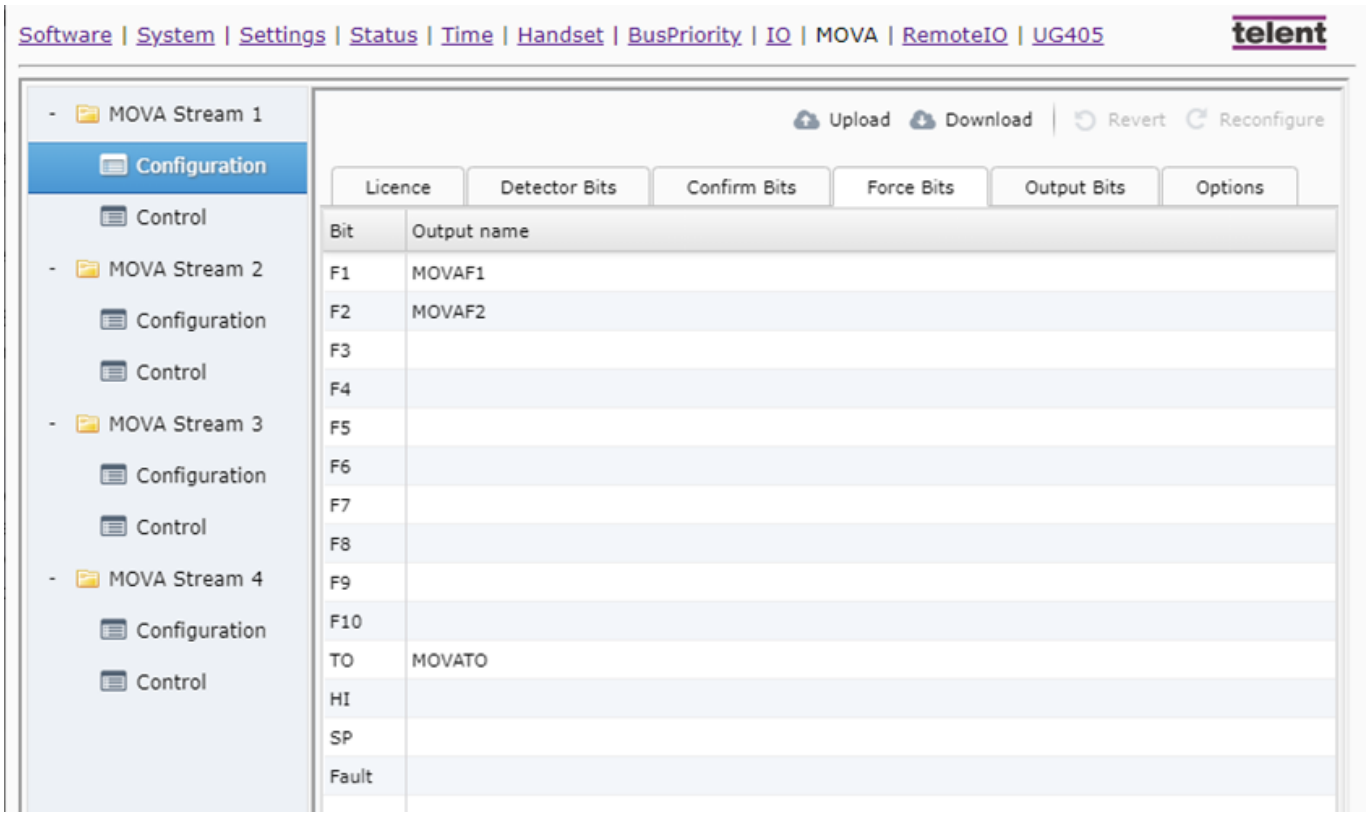


Figure 63 - Configuring MOVA Force Bits

MOVA will output a number of force bits (F bits), one for each stage it controls, and some stream related bits. Up to 10 force bits can be used to force stages. The **TO**, **HI**, **SP** and **Fault** bits can be used if required by the controller or left blank if they are not required. The **TO** (Take Over) and **HI** (Hurry Inhibit) bits will be set by MOVA whenever it is forcing stages and cleared when control is dropped. The **SP** (Sync Pulse) will toggle while the MOVA application is running (whether or not it is forcing stages). The **Fault** bit will be set while the MOVA internal error count is 20 or more.

Edit the Output name for each bit required by the dataset (and connected controller) and enter the name which the IO driver knows for the corresponding output. This can be a hardware output (e.g. **O1**) or an alias or a virtual bit feeding logic in the driver or another application.

8.7.1.5 Output Bits

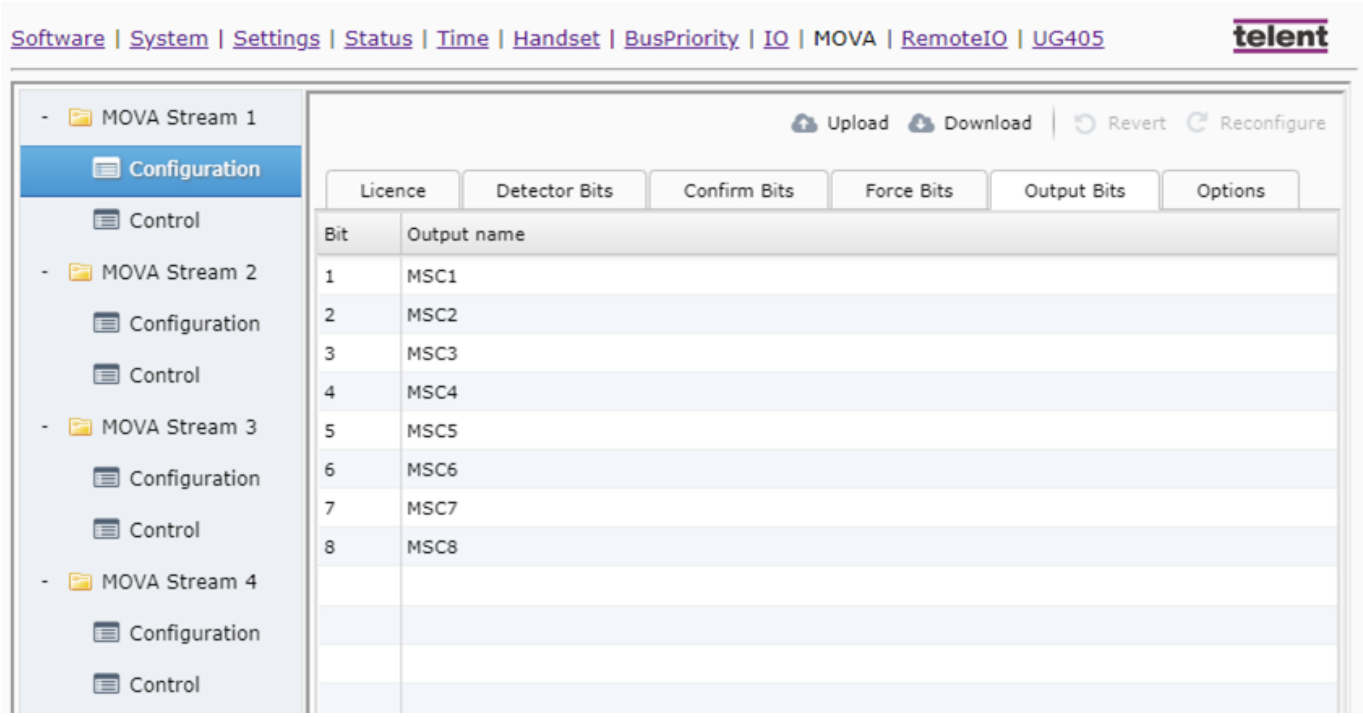


Figure 64 - Configuring MOVA (Special Conditioning) Output Bits

MOVA can have up to 8 additional outputs defined in the dataset which are controlled by special conditioning within the dataset itself. If any of these are required, then edit the Output name and enter the name which the driver knows for the corresponding output. This can be a hardware output (like O1) or an alias or a virtual bit feeding logic in the driver or another application.

8.7.1.6 Options

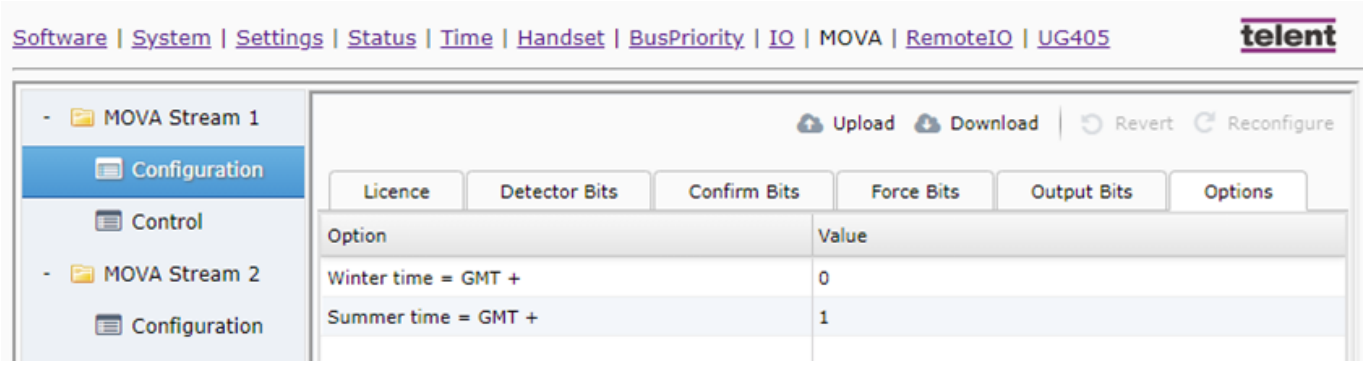


Figure 65 - MOVA Options

The Outstation clock is in GMT but the MOVA software normally adds 1 hour to this during British Summer Time (as currently defined). If the required time zone differs from this, then change these values. For example, to run the

site in GMT all year round change the “**Summer time**” offset to 0, or to run in permanent summer time change the “**Winter time**” offset to 1. These values can only be a whole number of hours (between -11 and 14).

8.7.2 Control

Each MOVA stream has a “**Control**” page which shows the TRL web pages for that stream. If the stream does not yet have a dataset then it will show the “**Dataset Manager**” page. The stream will not work until a dataset is provided.

8.7.2.1 Dataset Management

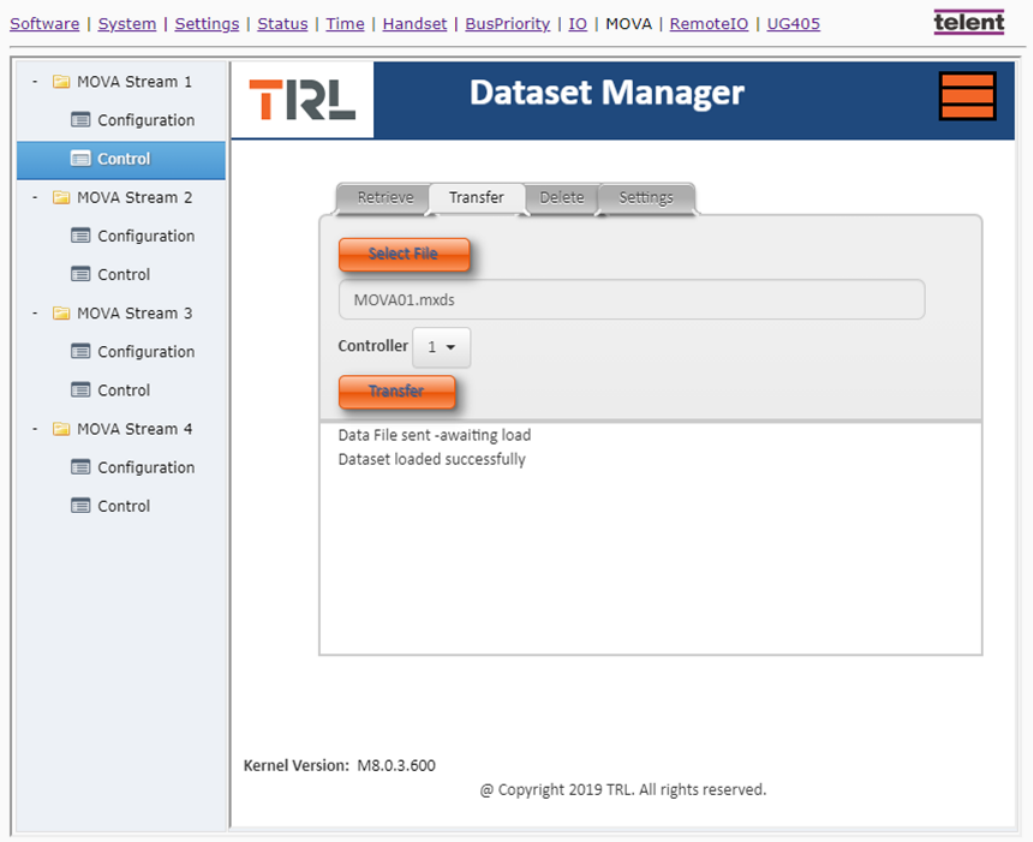


Figure 66 - MOVA Dataset Manager

Select the ***mxds*** file exported from MOVA Tools. If the dataset contains multiple streams, then select the correct stream from the “**Controller**” drop-down list. Click “**Transfer**” to send the dataset to the Outstation.

Loading a dataset does not mean that MOVA will run. The stream must also be enabled in the “**Settings**” tab of the “**Dataset Manager**” page.

Important! On first visit to a site (and the current state of MOVA is unknown) or if major changes to a dataset are to be made, it is recommended that the dataset is removed prior to transferring the new one. The “**Delete**” tab provides a button which will clear the dataset and wipe all working data from the unit and restart MOVA.

Datasets may be downloaded and saved using the “**Retrieve**” tab.

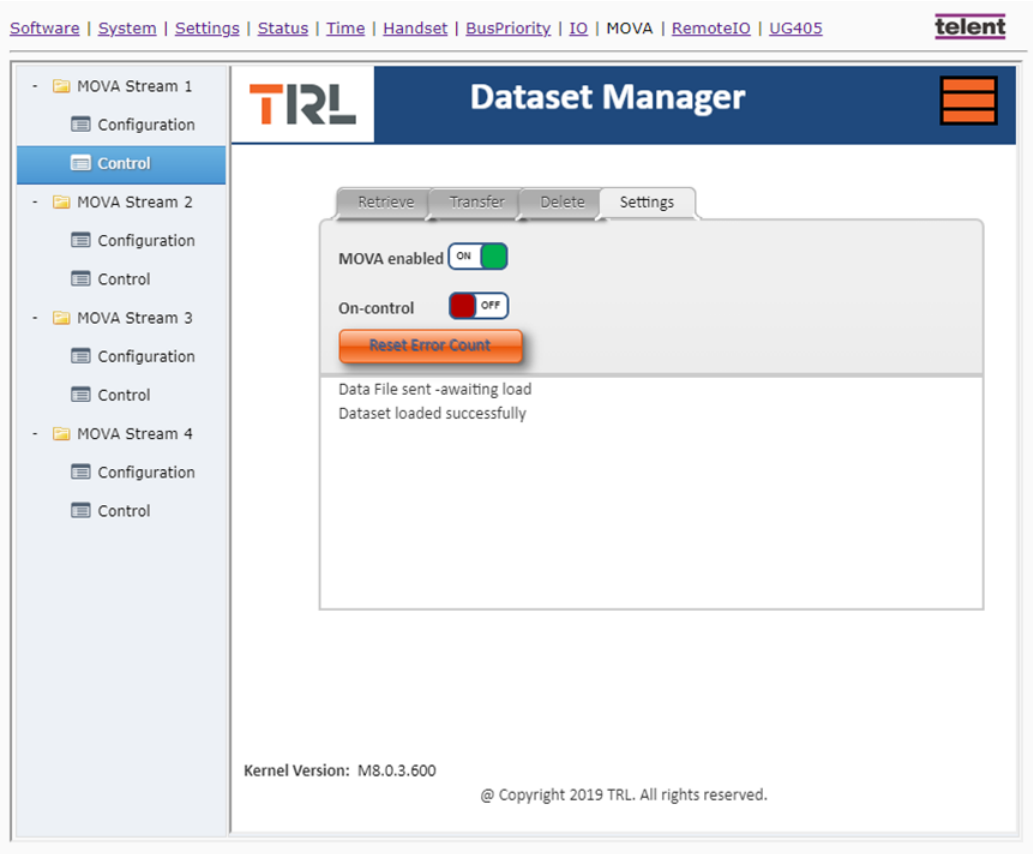


Figure 67 - Enable MOVA

Switch "**MOVA enabled**" to ON. If the stream is correctly licensed, then MOVA will now run for that stream. It will start in a warmup mode and need to see a number of confirm bit changes (and the CRB) before it will switch (automatically) to "**On-Control**". Usually the warm-up value is one greater than the number of configured stages.

Once the stream has been given a dataset the default page will change from the Dataset Manager to "**Online Data**".

The error count can be reset here, however the source of any errors should be noted and thoroughly investigated before a reset is performed in order to avoid MOVA going offline after leaving site.

8.7.2.2 **TRL Web Interface Menu**

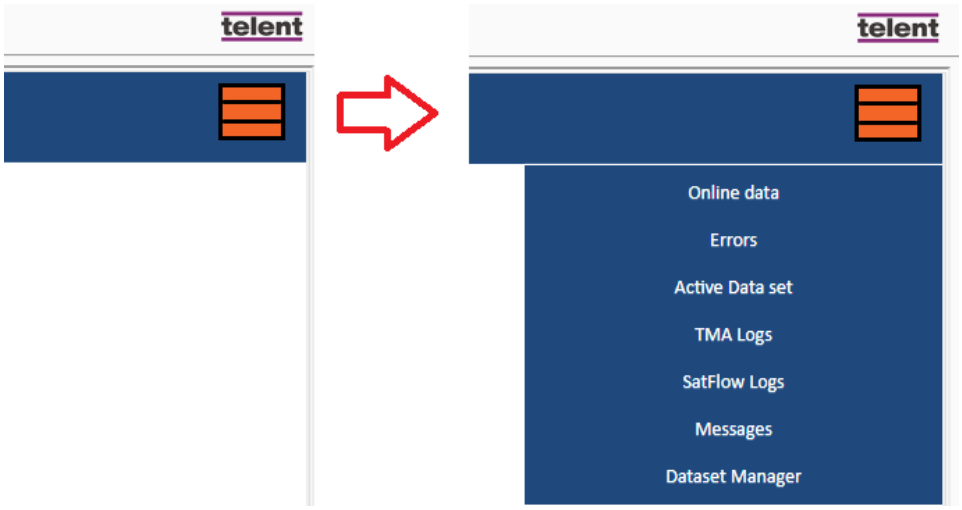


Figure 68 - TRL Web Interface Menu

The orange rectangles in the top right of the web page give access to the TRL web pages:

- Online Data: Overview of detection, control/confirm bits, flag settings etc.
- Errors: View the current Error log.
- Active Data Set: Displays the current dataset parameters.
- TMA Logs: Download the Traffic Management Act logs.
- SatFlow Logs: View or export the Saturation Flow logs.
- Messages: View MOVA messages
- Dataset Manager: Retrieve, transfer and delete datasets, reset error count and enable MOVA.

8.7.2.3 **Online Data**

"**Online Data**" shows an implementation of what was traditionally called the "Commissioning Screen" on older MOVA versions. Detectors, Confirm bits and Force bits are shown as blue squares. All 64 MOVA detectors (less commonly known as channels) are displayed. The usual format for MOVA detectors is normally open, closed to detect, so when a detector is active, the square turns yellow. For Confirms, the active state is open circuit, so all the inactive confirms will be yellow and the active one(s) will be blue. Active force bits are yellow.

Below the bit status are three common flags:

- MOVA enabled: MOVA cannot take control unless this flag is true.
- On-Control: This flag will change automatically when MOVA takes control.
- CRB: Provided by the controller, active indicates that the controller may be put under MOVA control.

Note: The CRB may not display correctly in the Online Data page during initial warm-up. This is a known issue within the MOVA software, outside of Telent's control.

Below the flags are the Error count and Warmup status indicators.

- Error count: Increased whenever MOVA encounters an error, up to a maximum of 20, when control is relinquished. For every hour of error free operation, the error count is reduced to a minimum of 0.
- Warmup: Usually the warm-up value is one greater than the number of configured stages.

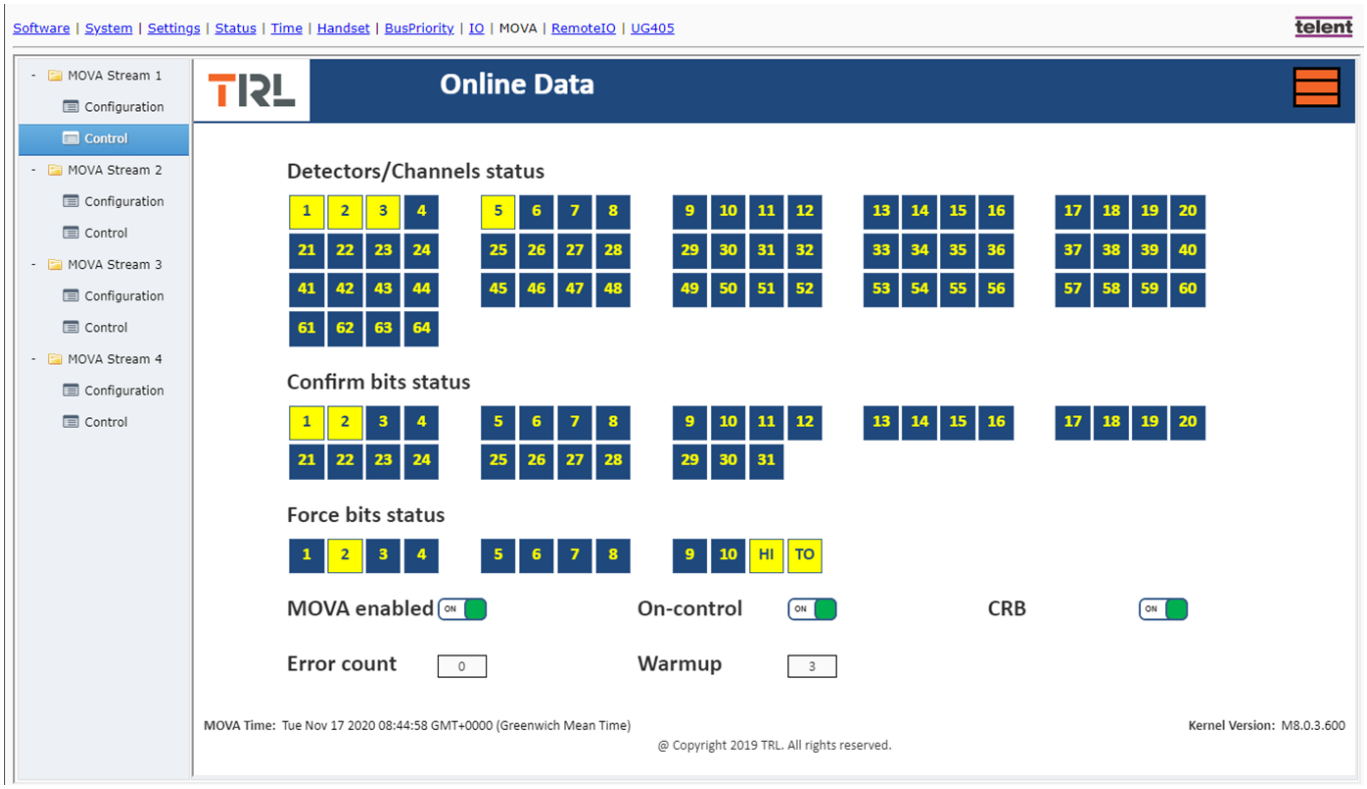


Figure 69 - MOVA Online Data

8.7.2.4 **Errors**

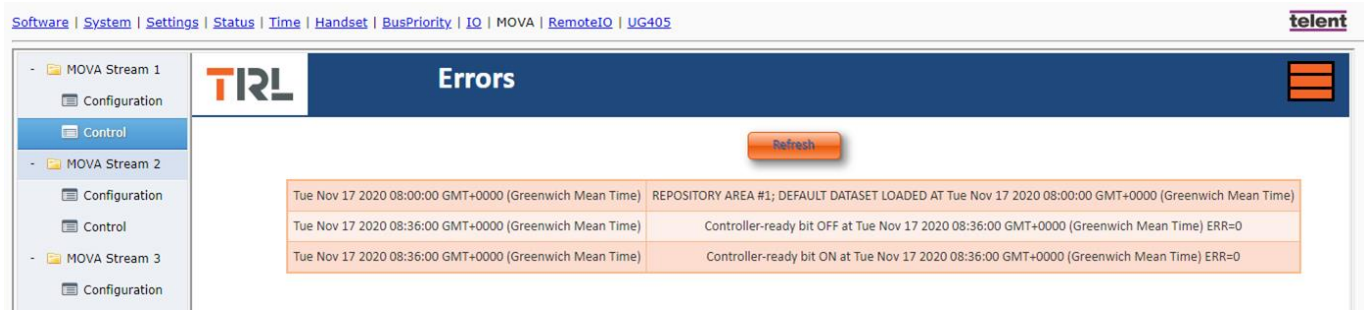


Figure 70 - MOVA Errors

MOVA errors are displayed on the "**Errors**" page. The only control here is the "**Refresh**" button. The date and time of the error is recorded, along with a short description.

Note: The error page is NOT refreshed automatically.

8.7.2.5 **Active Data Set**

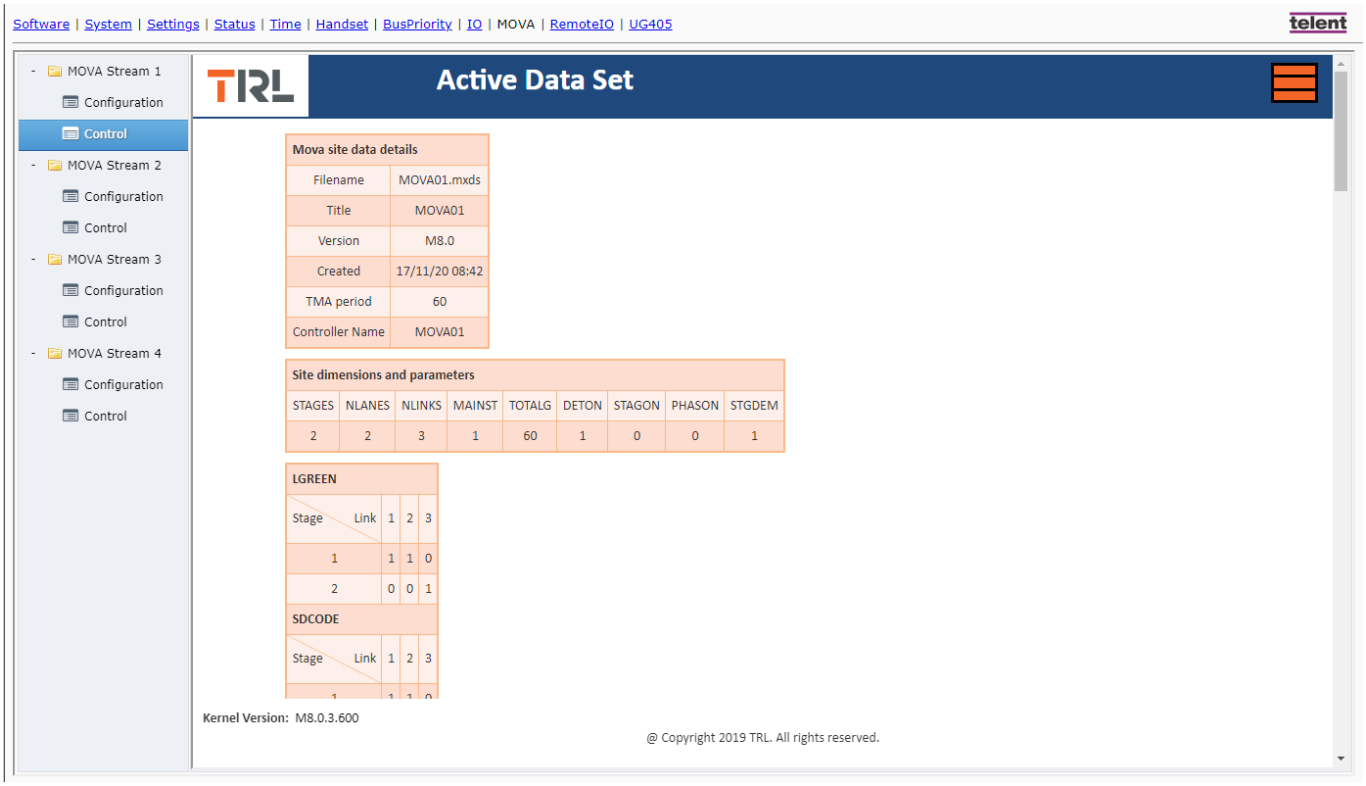


Figure 71 - MOVA Active Data Set

The "**Active Data Set**" page shows the current dataset installed for that stream, and the user can scroll through all the settings and browse the data.

8.7.2.6 **TMA Logs**

The Traffic Management Act Logs are available to download on this page. For more information see TRL MOVA Application Guides 44 and 45.

8.7.2.7 **SatFlow Logs**

The Saturation Flow logs are available to view and download on this page. For more information see TRL MOVA Application Guides 44 and 45.

Two controls are available, one to refresh the page and one to export the data to file, in CSV format.

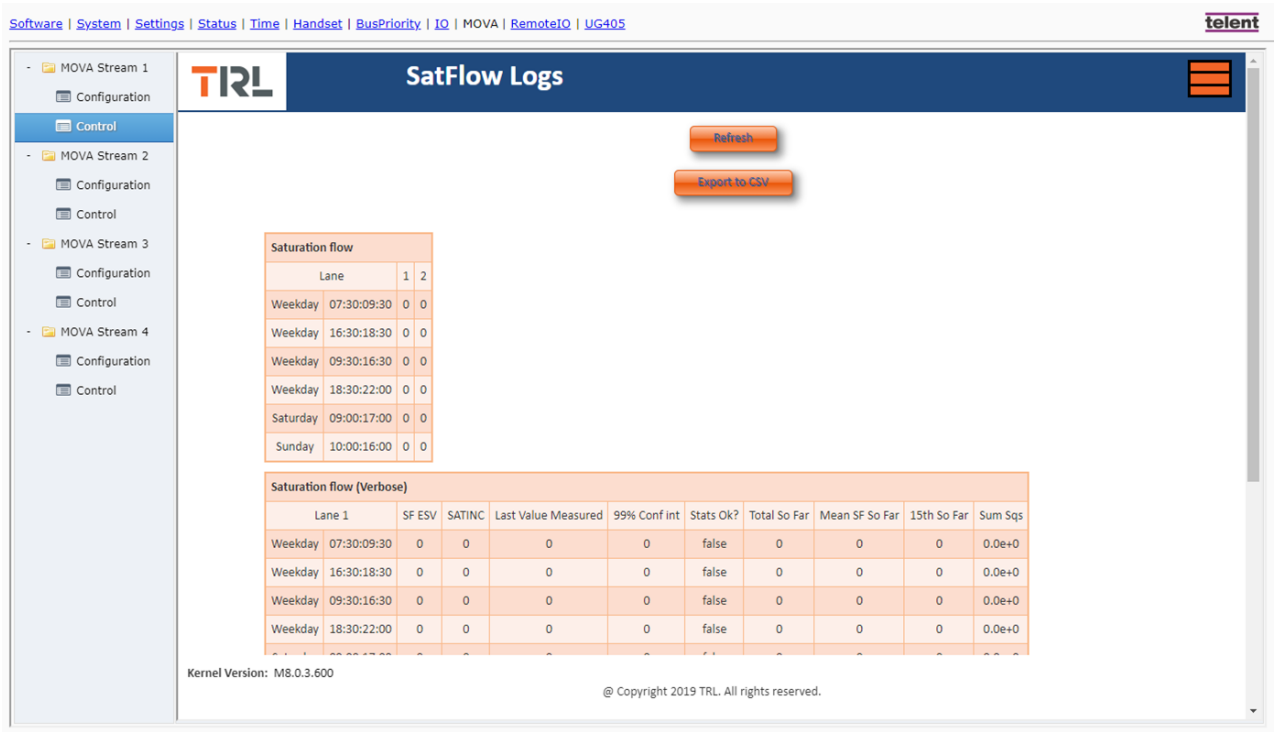


Figure 72 - MOVA SatFlow Logs

8.7.2.8 **MOVA Messages**

MOVA messages are displayed here, by default the window will auto-scroll as the messages appear. This can be disabled using the control underneath the message window to stop the messages moving and allow the user to manually scroll through the messages displayed. By default, Sat Flow messages are suppressed for clarity, but can be enabled by toggling the "**SF Message**" control.

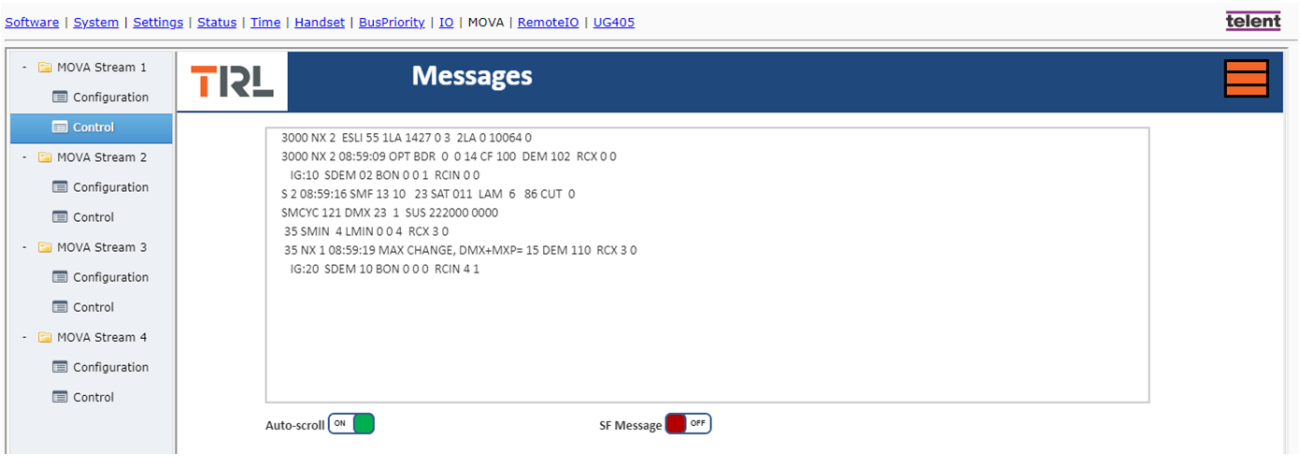


Figure 73 - MOVA Messages

8.8 Bus Priority Configuration

The BusPriority software can be configured to receive RTIG Priority Request information in the form of XML messages formatted to RTIG-T031 version 1.0 or version 1.1. This is used to control bits which can be used by other software or connected devices. The Outstation will need to be connected to a router allowing connections from a suitable Instation via a VPN. Where Remote Monitoring is configured it is also possible to connect to the Optima Hub if it has a suitable source of bus priority messages available.

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

Warning: The network **MUST NOT** allow the Outstation to be directly accessible from the internet.

The Outstation will listen for a TCP connection on a configured port number or connect to the Optima Hub. It will then listen for XML messages starting "`<rtig_tlp`" and check the values of various fields against the configured rules. Whenever a message matches a rule, a control bit will be turned on for a specified amount of time. The control bits can be hardware bits (e.g. ***O1***), aliases, or virtual bits to signal another application or logic in the IO driver.

An example incoming message could be:

```
 <rtig_tlp version="1.1" traffic_signal="1234" movement="2" trigger_point="0"
priority="2" schedule_deviation="2" sequence="42"/>
```

When a Priority Request message arrives with a version of 1.1 and a valid sequence number the software will respond with a Priority Request Acknowledgement message with a matching sequence number :

```
<rtig_tlpack version="1.1" sequence="42" quality="0" date_time="2020-10-
09T13:13:12+00:00"/>
```

Priority Request Acknowledgement messages will always have a "**quality**" field of "0" and a "**date_time**" field showing the UTC time when the message was received. The software does not produce Priority Request Result messages.

8.8.1 Status

Figure 74 - RTIG Bus Priority Status

The “**status**” page has a connection log which shows when the Instation connected or disconnected from the software. When the software starts running, or is reconfigured, it will log the number of rules it has successfully set up or any errors with the configuration.

8.8.2 **Configuration**

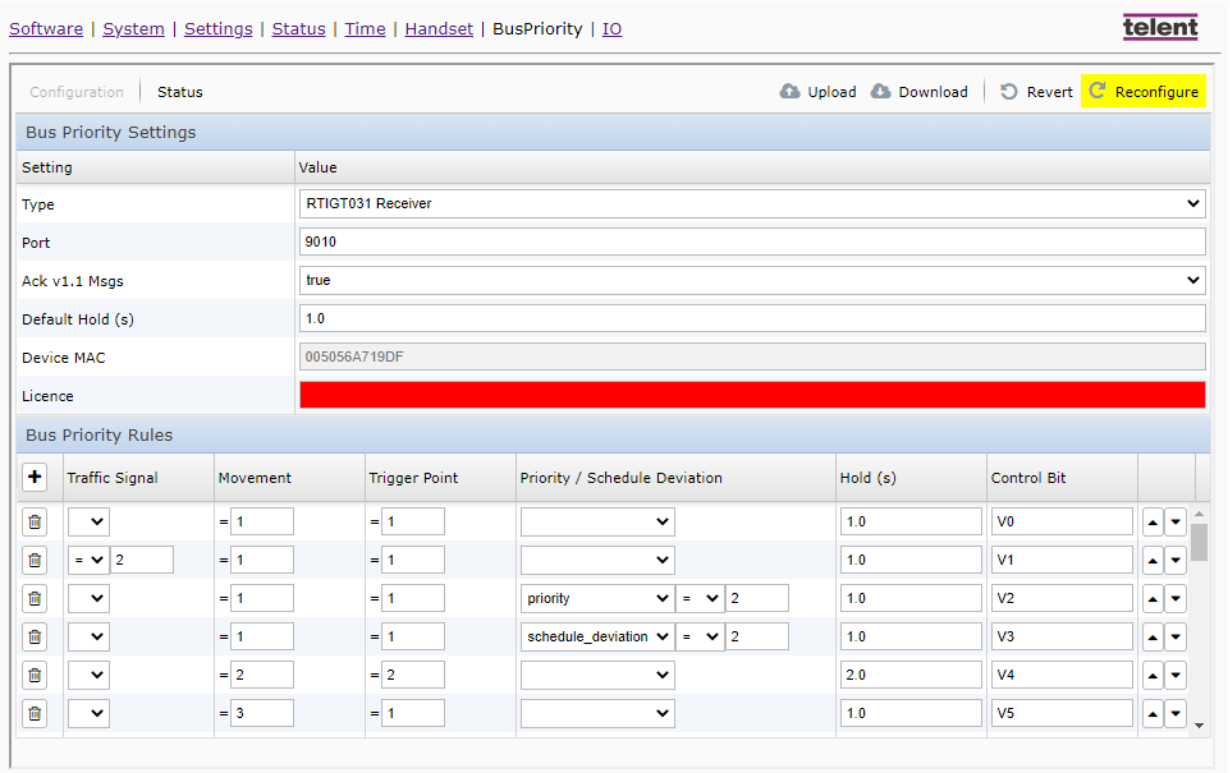


Figure 75 - RTIG Bus Priority Configuration

8.8.2.1 **Settings**

The BusPriority software requires a licence to run. Refer to section 7.2.1 for more information on how this is achieved.

The default Port number is 9010. This can be changed if the Instation needs to connect to a different port number. Any valid port number which is not used for something else can be used.

If the connection type is changed from the default of “RTIGT031 Receiver” to “RTIGT031 via Optima Hub” then a Traffic Signal number should be entered in the “Traffic Signal(s)” setting. More than one Traffic Signal number may be entered if required (separated by spaces). The Optima Hub will only pass messages to this Outstation where the traffic_signal number in the message matches (one of) the Traffic Signal(s) configured here.

When a `<rtig_tlp/>` message arrives with a version of 1.1 and a valid sequence number the software will respond with a `<rtig_tlpack/>` message with a matching sequence number. If this behaviour is not desired, then set “**Ack v1.1 Msgs**” to “**false**” and no responses will be produced.

The “**Default Hold (s)**” time will be used to populate the hold time of new rules when they are added. It defaults to 1 second.

8.8.2.2 **Rules**

Rules can be added to the configuration using the "**+**" icon and deleted using the dustbin icon. Each row added requires a valid "**Control Bit**" and "**Hold (s)**" time.

Each rule must specify a "**Movement**" and "**Trigger Point** value". If a message arrives with a matching movement and trigger point value, then the specified control bit will be set active for the specified hold time (normally 1s).

Rules can optionally specify a "**Traffic Signal**" value which must also be matched by a message to trigger the control bit. This would be useful if a controller is receiving messages for more than one traffic signal site and passing requests to other controllers.

Note: On sites which only receive messages for themselves, it is not necessary to configure traffic signal matching.

Rules can optionally specify "**Priority**" or "**Schedule Deviation**" values which must also be matched by a message to trigger the control bit. In these cases, it is also possible to specify a criterion other than an exact match to the given value:

- Greater than: >
- Greater than OR equal to: >=
- Less than: <
- Less than OR equal to: <=

Bit names which are invalid will be highlighted in red, as will values which do not fall within the ranges specified for the relevant RTIG-T031 parameter.

Important! Where ranges are different between version 1.0 and version 1.1, the wider range is checked.

The names of any hardware outputs or virtual bits which already exist will be offered in a drop-down list when entering a control bit name. An entered name which is not on this list will be highlighted in yellow to indicate that this will create a new virtual bit.

Note: The "**Reconfigure**" button is yellow if the web page contains changes which have not been saved to the configuration file.

Click the "**Reconfigure**" button to save the changes and restart the application. Click the "**Revert**" button to discard the changes and go back to the last saved configuration.

The "**Download**" button allows the saved configuration file to be fetched from the Outstation and stored on the computer. The "**Upload**" button allows the application to be reconfigured from a previously downloaded configuration file.

8.9 Remote IO Configuration

RemoteIO software can be configured to communicate with another Outstation or an Optima controller (running software 2.17 or later) via a local network connection. IO bits can be sent between the devices over this network connection. Where Remote Monitoring is configured it is also possible to connect to the Optima Hub and send IO triggers to other sites which are also connected to the Hub in this way.

ESD Warning! Appropriate protection such as an anti-static wrist band should be used when plugging into the LAN port on the Outstation.

It is possible to configure multiple such connections if required.

Note: Having multiple Outstations on the same network will necessitate giving them different IP addresses, and require suitable networking equipment.

Extra hubs or switches may be required to provide enough sockets for all the connected devices. For example, with the first Outstation at 192.168.1.2 a second could be added at 192.168.1.5 thus leaving 192.168.1.3 and 192.168.1.4 available for the controller/OTU if required.

8.9.1 Status

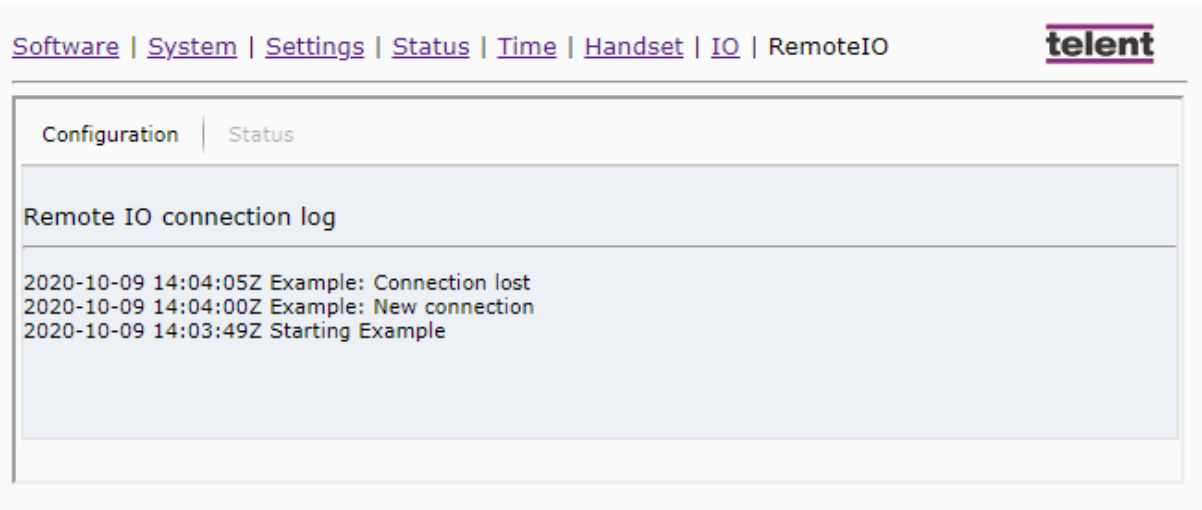


Figure 76 - Remote IO Status

The “**status**” page has a connection log which shows when the configured sites are connected or disconnected. When the software starts running, or is reconfigured, it will log the sites which have been configured and any errors with the configuration.

8.9.2 **Configuration**

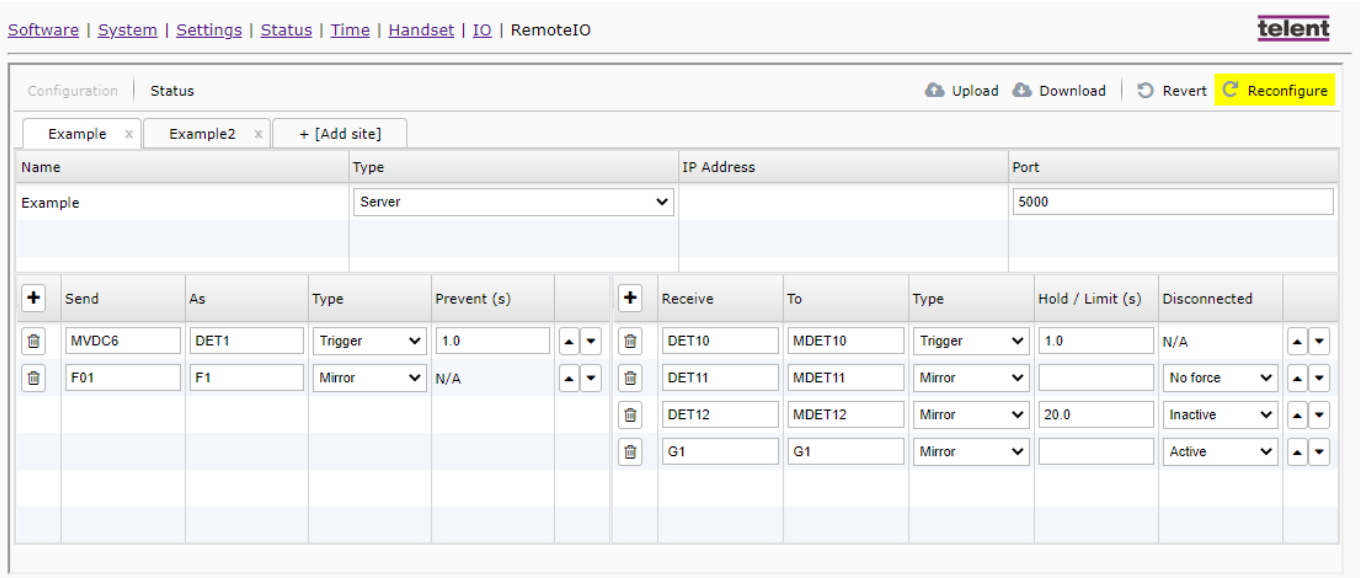


Figure 77 - Remote IO Configuration

Multiple connections may be configured, and a tab will be shown on the configuration page for each one. This allows for connections to multiple nearby sites at the same time. Click the "**+ [Add site]**" tab to add a new tab for a new connection. The sites must all have different names. Click the "**x**" by a site name to delete it. A confirmation dialog box will be displayed before deletion.

Each connection has a "**Type**" which is either:

- Server: Listens for a connection from another site,
- Remote: Connects to another site,
- Optima Hub: Connects to the Optima Hub.

Server type connections must be given a "**Port**" number. Remote type connections must be given the "**IP address**" of the Outstation or Optima controller it should connect to as well as a "**Port**" number.

Each connected site must also be running RemoteIO software and be configured with a matching port number and opposite Server/Remote type.

Each hardware or virtual bit listed in the "**Send**" column will have its value sent to the connected site. Each bit will be sent using the name in the "**As**" column. The connected site must be configured with names in its "**Receive**" column to match all the names in the "**As**" column here.

The "**Receive**" column should list all the names sent by the connected site. The "**To**" column specifies which hardware or virtual bits to write the received values to.

Note that bit names which are invalid will be highlighted in red. The names of any hardware bits or virtual bits which already exist will be offered in a drop-down list when entering a bit name in the "**Send**" or "**To**" column. Entering a name which is not on this list will be highlighted in yellow to indicate that this will create a new virtual bit.

Each bit can have a Type of either Trigger or Mirror. The connected site must be configured with corresponding bits having the same Type i.e. if a bit is sent as a Trigger bit it must be received at the other end as a Trigger bit.

Where the connection is to the Optima Hub, only Trigger bits are possible. The Type column is replaced by a To Site column. Use this column to specify the Site ID to which the Optima Hub should pass this Trigger.

A Trigger bit will send an event message when the bit goes active. After a message has been sent, further state changes of the same bit within the number of seconds in the Prevent column will not cause another message to be sent.

When an event message is received for a Trigger bit, the corresponding virtual or hardware bit (in the To column) will be held active for the number of seconds in the Hold column.

Trigger bits are suitable for passing events between sites.

A Mirror bit will send every state change so that the bit on the receive side of the connection will take the same value as the bit on the send side. The lag between the Send bit changing state and the To bit mirroring that change will depend on the latency of the network connecting the sites and may vary (meaning the time for which a mirror bit is active may not match the time for which the source bit was active). Mirror bits will generate more network traffic than Trigger bits. Mirror bits are suitable for passing IO bits over a reliable, low-latency network.

Mirror bits can have their on-time limited if required. If a value is entered in the Hold/Limit column then the bit will be turned off after it has been on for that many seconds. This is to allow a bit to time out if a message turning it off is not received from the connected site.

The Disconnected column allows Mirror bits to be forced off (or on) if there is no connection. Note that it may take a few minutes to detect the loss of a connection.

Note: The "**Reconfigure**" button is yellow if the web page contains changes which have not been saved to the configuration file.

Click the "**Reconfigure**" button to save the changes and restart the application. Click the "**Revert**" button to discard the changes and go back to the last saved configuration.

The "**Download**" button allows the saved configuration file to be fetched from the Outstation and stored on the computer. The "**Upload**" button allows the application to be reconfigured from a previously downloaded configuration file.

8.10 Sensor A Configuration

Sensor A is a UDP protocol developed to interface to Vivacity cameras and any other sensor that complies with that interface definition.

Vivacity interface definition version	Compatible SensorA software version
v0.1.0	1.3 or below
v0.5.0	1.4 or above

Note: Other sensor interfaces may be added as required, contact Traffic Engineering to discuss any new interface requirements.

When the SensorA software is installed it can be configured to receive information from Vivacity cameras and use it to control hardware outputs or virtual bits which can in turn be used by other software.

These cameras are configured to detect road users (pedestrian or vehicular) within defined boundaries. Each detection area is assigned a zone number which is **unique for that site**. It can then report occupancy and classification information for each zone.

This software can use the reported information to trigger bits to a connected controller or virtual bits to be used by another software application. Bits can be triggered by the total occupancy in a zone being above 0, which functions as a simple detector. If required, they can be configured to only detect certain classes of road user (e.g. pedestrians) or detect when the occupancy count meets some other condition.

8.10.1 Status

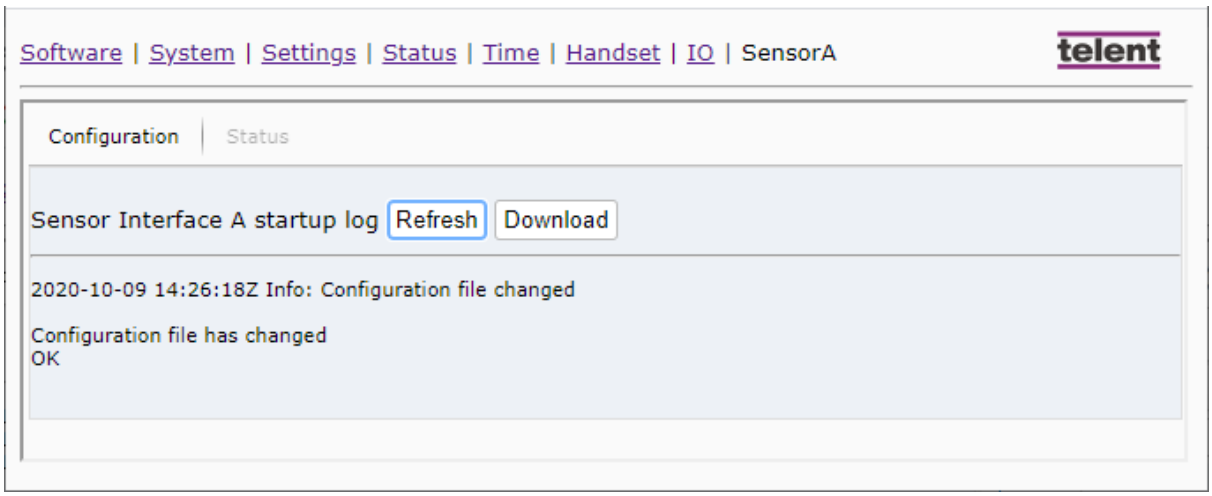


Figure 78 - Sensor A Status Page

The "**status**" page will show any errors which occurred when the application was started or reconfigured.

8.10.2 **Configuration**

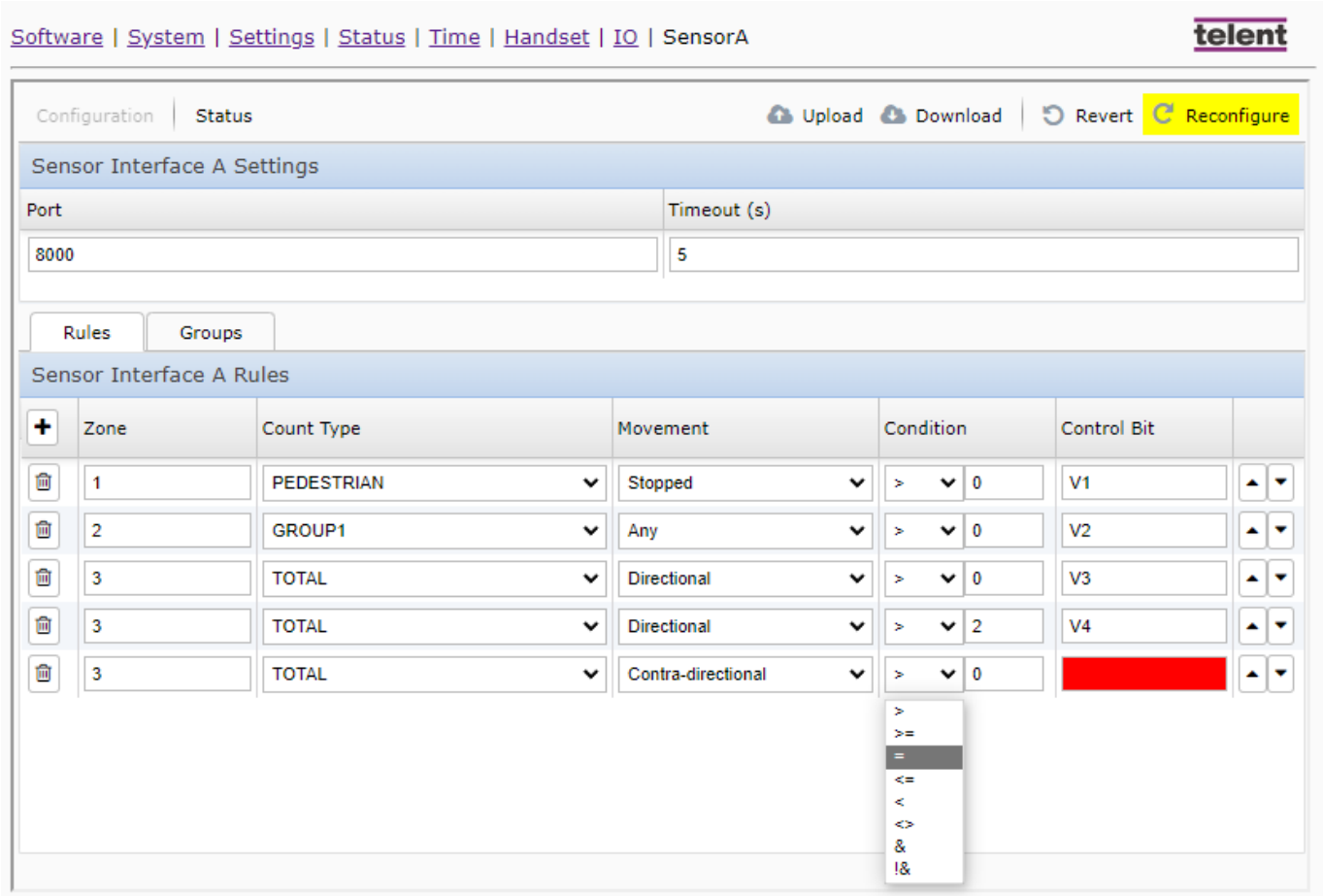


Figure 79 - Sensor A Configuration Page

8.10.2.1 **Settings**

The default "**Port**" number is 8000. This can be changed if the cameras have been configured to use a different port number.

By default, there is no "**Timeout**" value. Leave the timeout value blank if no timeout is required. If a timeout value is given and no messages are received for a zone for that many seconds, then any control bits set by rules for that zone will be set inactive. If a camera stops sending messages and no timeout is set, then it is possible for a bit to be left on.

Important! If a timeout is used, then it should be larger than any acceptable gap between messages, which may depend on the camera being used.

8.10.2.2 **Rules**

The "**Zone**" field specifies the zone number configured on the camera. Multiple cameras can be configured to provide information to a single Outstation provided they use unique zone numbers.

The “**Count Type**” allows for specific classifications to be checked. The following types of classified counts are currently supported:

- PEDESTRIAN
- CYCLIST
- MOTORBIKE
- CAR
- TAXI
- VAN
- MINIBUS
- BUS
- RIGID
- TRUCK
- EMERGENCY_CAR
- EMERGENCY_VAN
- FIRE_ENGINE
- WHEELCHAIR
- MOBILITY_SCOOTER
- PUSHCHAIR
- JOGGER
- E_SCOOTER
- PUSH_SCOOTER
- RENTAL_BIKE
- CARGO_COURIER_BIKE
- TAXI_ELECTRIC
- TAXI_OTHER
- VAN_SMALL
- VAN_LUTON
- BUS_COACH
- BUS_LONDON
- TOWED_TRAILER
- TRACTOR
- AGRICULTURAL_VEHICLE
- HORSE_RIDER
- DOG
- LICENSE_PLATE
- POWERED_WATERCRAFT
- UNPOWERED_WATERCRAFT

Important! If a camera can report any other classifications not listed, it should be configured not to do so.

Note that earlier versions of software had a different set of classifications as defined by v0.1.0 of the interface. If the sensor(s) conform to a different version of the interface to the software then classifications after FIRE_ENGINE should not be used.

The following count types are special values:

- TOTAL – checks the total occupancy for the zone
- GROUP1 to GROUP5 – sum-total of classified counts for a defined subset of classifications within the zone (groups are defined on the Groups tab)

The "**Movement**" value allows the rule to be limited to only count road users travelling in a certain direction as follows:

- Any – not limited by movement
- Stopped – only count road users which have stopped
- Directional – only count road users travelling in the direction configured as normal for the zone
- Contra-directional – only count road users travelling in the opposite direction to that configured as normal for the zone
- Stopped directional – only count road users which have stopped but were travelling in the direction configured as normal for the zone
- Stopped contra-directional – only count road users which have stopped but were travelling in the opposite direction to that configured as normal for the zone

The "**Condition**" value specifies the condition for which the "**Control Bit**" is activated. This is chosen by selecting an operator (default >) and a value (default 0). The operator can be one of:

- Greater than: >
- Greater than or equal to: >=
- Equal to: =
- Less than or equal to: <=
- Less than: <
- Not equal to: <>
- Logical AND: &
- Logical NAND: !&

For example &1 would set the Control Bit when the received count is an odd number.

Bit names which are invalid will be highlighted in red. The names of any hardware bits or virtual bits which already exist will be offered in a drop-down list on entering a bit name in the Control Bit column. If you enter a name which is not on this list, then it will be highlighted in yellow to indicate that this will create a new virtual bit.

Note: The "**Reconfigure**" button is yellow if the web page contains changes which have not been saved to the configuration file.

Click the "**Reconfigure**" button to save the changes and restart the application. Click the "**Revert**" button to discard the changes and go back to the last saved configuration.

The "**Download**" button allows the saved configuration file to be fetched from the Outstation and stored on the computer. The "**Upload**" button allows the application to be reconfigured from a previously downloaded configuration file.

8.10.2.3 **Groups**

The Groups tab allows for up to 5 groups to be defined. Any Count Type which is ticked for a group will be included in the counts for that group.

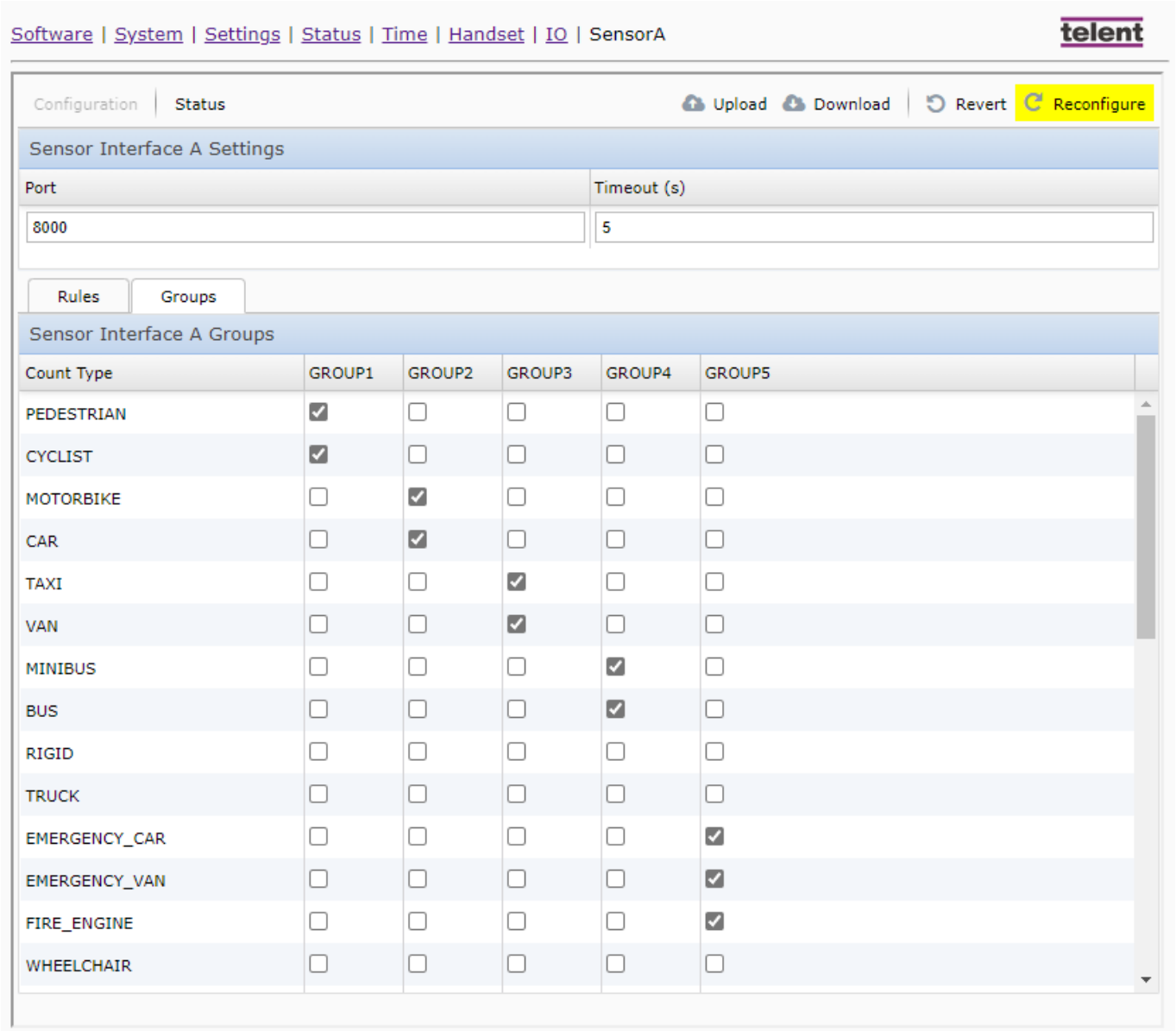


Figure 80 - SensorA Configuration, Groups

9. Maintenance

9.1 Diagnostics

9.1.1 Front Panel Indicators

For a detailed description of the front panel indicators on the Outstation refer to section 8.1 of this document.

9.1.2 Handset

For a detailed description of the available handset commands on the Outstation refer to section 8.3 of this document.

If the handset does not function when plugged in to the Outstation but the device is powered on and functioning correctly this may indicate that the Handset fuse has blown, refer to section 8.3 for fuse information.

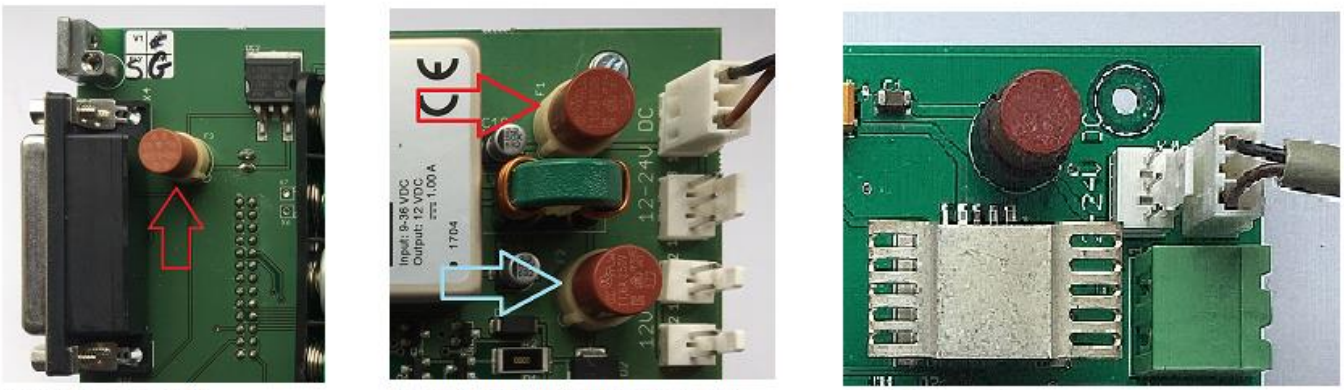
9.2 Battery Maintenance Schedule

The batteries should be inspected at each Periodic Inspection (PI).

Important! The batteries should be replaced every 3 years or at any sign of corrosion or leakage.

9.3 Fuses

The Outstation contains 3 fuses on the Carrier board and 1 on each IO board. The location of the fuses on the is shown in the figure below and the fuses are clearly labelled on the circuit board to identify them. A description of the function of each fuse is provided in **Table 6**.



Carrier Handset F3

Carrier DC Power F1 (red arrow)
Carrier Backup F2 (blue arrow)

IO DC Power F1

Figure 81 - Outstation Fuse Locations

Table 6 - Fuse Description

Fuse	Application	Fault Finding
F1	DC Supply	If this fuse is not present or has blown, the Outstation will not power on from the DC power supply.
F2	Back-Up	If this fuse is not present or has blown, the Outstation will function when powered by the DC power supply but when the power fails the Outstation will not be powered from the back-up power supply and will therefore switch off.
F3	Handset 5V	If this fuse is not present or has blown, the Outstation will not provide 5V power to the handset port and therefore a handset requiring power will not function when connected.
F1	DC Supply (IO Board)	If this fuse is not present or has blown, the Outstation IO driver will report a missing IO board and the IO will not function as expected, affecting all applications using IO.

Refer to **Table 7** for replacement fuse information. Fuses with different specifications to those specified should not be used. The fuses used in the production of the Outstation are manufactured by Littlefuse Wickman and are supplied by Farnell.

Table 7 - Fuse Part Numbers

Fuse	Type	Manufacturer Part Number	Farnell Part Number
F1	1.25A, 250V, Time Delay, TR5	37211250411	171-6330
F2	1.6A, 250V, Time Delay, TR5	37211600411	171-6692
F3	500mA, 250V, Fast Acting, TR5	37005000410	171-6609
F1 (IO)	1.25A, 250V, Time Delay, TR5	37211250411	171-6330

Refer to **Table 8** on the following page for a spare parts list. These items form part of higher-level kits of parts already listed in **Table 1**, however they may be available from Telent on request.

Table 8 - Miscellaneous Spare Parts

Part Number	Item	Description
500-1501-015	Mk2 CPU Carrier Board	Mk2 supports IO boards (Carrier board + NanosG20)
ASSY0136AA	NanosG20 to Carrier Board Power Cable	To connect NanosG20 power to carrier board
ASSY0136AB	NanosG20 to Carrier Board Comms Cable	To connect NanosG20 comms to carrier board
ASSY0137AA	Optima RMU Power Cable	Bare wires to Molex connector for Outstation power
ASSY0137AB	Optima RMU to Controller Handset Port Cable	Ribbon cable, with 25pin D-Type plug
ASSY0137AD	Optima RMU RUT 950 Router Power Cable.	Powers the 4G router from the Outstation
500-1501-110	IO Board PCB	PCB assembly providing 48 digital inputs and 24 isolated digital outputs.
900-1501-150	IO Board Serial Cable	Cable to provide data between the Carrier and IO boards, daisy-chained between extra IO boards.
900-1501-160	IO Board Power Cable	Cable to provide power from the Carrier board. Daisy-chained between extra IO boards.
800-1501-170	Optima Outstation Wide Front Panel	For use with Outstations that have 1 or more IO boards fitted. Normally factory fitted.
800-1501-180	Optima Outstation Narrow Front Panel	For use with Outstations not requiring IO. Normally factory fitted.

10. Document Control

10.1 Maintenance and Distribution

This document is subject to formal change and control procedures as required by the Quality Management System (QMS).

10.2 Amendment History

Issue	Date	Change Descriptions	Author
Issue 1	22/09/2015	First Issue	S Playle
Issue 2	26/02/2016	Corrected router p/n (A**B**) and clarified instructions after 1st off installations	Rob Harding
Issue 3	22/12/2016	Reverted to AA for router p/n	Rob Harding
Issue 4	28/04/2017	Added ADSL option	Rob Harding
Issue 5	11/09/2017	Fixed netmask error	Andy Cooke
Issue 6	27/02/2018	Add controller/outstation address	Andy Cooke
Issue 7	23/03/2018	Updated for RUT950	Rob Harding
Issue 8	20/05/2021	Updated for Outstation operation with additional IO boards.	Iain Ross
Issue 9	30/06/2021	BusPriority and RemoteIO via Optima Hub. Mirror bit time-out. Additional SensorA conditions.	Andy Cooke
Issue 10	06/09/2021	Change IP address allocation process	Andy Cooke
Issue 11	01/11/2021	Update antenna connector information	Andy Cooke
Issue 12	10/02/2023	Update SensorA for v0.5.0 interface	Andy Cooke

10.3 Abbreviations

AC	Alternating Current
DSL	Digital Subscriber Line
CPU	Central Processing Unit
CCTV	Closed Circuit Television
DC	Direct Current
GUI	Graphical User Interface
HTML5	Hyper Text Markup Language version 5
IO	Input / Output
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
MOVA	Microprocessor Optimised Vehicle Actuation
MIB	Management Information Base

NiMH	Nickel-Metal Hydride (battery type)
NTP	Network Time Protocol
OTU	Outstation Transmission Unit
PCB	Printed Circuit Board
PSU	Power Supply Unit
RM	Remote Monitoring
RMU	Remote Monitoring Unit
RTIG	Real Time Information Group
SCOOT	Split Cycle Offset Optimisation Technique
SIM	Subscriber Identity Module
TCP	Transmission Control Protocol
TOPAS	Traffic Open Protocols and Specifications
TRL	Transport Research Laboratory (Commercial Company)
UCM	Universal Content Management
UG405	Specification of MIB for UTMC2
UTC	Coordinated Universal Time
UTC	Urban Traffic Control
UTMC	Urban Traffic Management and Control

10.4 Referenced Documents

Title	Doc Ref	Issue
~~[1] RM site IP address log~~	~~288783~~	~~Latest~~
[2] Traffic Control Equipment Interfacing Specification	TOPAS 2523	B (Feb 2020)
[3] Optima Hub Operator User Manual	UCM 302681	Latest
[4] RM 4g Modem Configuration Guide	UCM 437460	Latest
[5] DSL Router Configuration Guide	UCM 417665	Latest