UTMC OTU Handbook
For ST950
And Stratos Outstation
667/HB/46000/004

THIS DOCUMENT IS ELECTRONICALLY APPROVED

AND HELD IN THE SIEMENS DOCUMENT CONTROL TOOL

All PAPER COPIES ARE DEEMED UNCONTROLLED COPIES

	Prepared By	Checked and Released
Division/BU	Mobility, Intelligent Traffic Systems	Mobility, Intelligent Traffic Systems
Department	Engineering	Engineering
Name	Jim Ballantine Kevin Napper	Dave Martin
Function	Lead Firmware Engineer	Engineering Manager
Date	May 17	May 17

Change History:

Version	Date	Change	Author
1	03-Oct-2013	First Release	Jim Ballantine
2	03-Nov-2014	Add Stratos Outstation	Jim Ballantine
3	November 2016	Add info on firewall & minor corrections	Kevin Napper

1 INTRODUCTION

1.1 Overview

This handbook details the configuration and operation of the UTMC OTU application and is generally independent of the platform on which the application is installed.

Platform specific information is clearly identified e.g.

This text relates to the ST950 platform. ST950

This text relates to the Stratos Outstation platform. Stratos OS

or else is covered in section 3 Platform Specific Information.

The handbook currently covers the OTU application on the following equipment:-

- ST950 Controller
- Gemini 3 Stratos Outstation

1.2 Contact Us

If you have any comments on this handbook, or need any further information, you can contact us at trafficwebmaster.stc@siemens.com.

1.3 Related Documents

667/AY/45025/002	3G OTU Site Selection Guide NB: contains 3G network options and procedures for 3G site assessments
667/HB/46000/003	MOVA 7 Handbook (for ST950 and Stratos Outstation)
667/HU/46000/000	User Interface Handbook (for ST950 and Stratos Outstation) NB: Includes web interface, licensing, Ethernet setup and firmware update.
667/HQ/46000/005	ST950 UG405 Quick Start Guide ST950
667/HQ/31601/000	UG405 OTU Quick Start Guide Stratos OS
667/HE/46950/000	Installation, Commissioning and Maintenance Handbook for the ST950 Controller ST950
667/HE/45950/000	Installation, Commissioning and Maintenance Handbook for the ST950 ELV Controller ST950
667/HB/52250/000	Installation, Commissioning and Maintenance Handbook for the Gemini 3 Stratos Outstation Stratos OS

1.4 Abbreviations

AC	Alternating Current
ASCII	American Standard Code for Information Interchange
Bit	Binary Digit
BOOTP	Bootstrap Protocol
CPU	Central Processing Unit
CSI	Controller Serial Interface
CSV	Comma Separated Value
DC	Direct Current
DCE	Data Communication Equipment
DDNS	Dynamic DNS
DNS	Domain Name System
DSL	Digital Subscriber Line
DST	Daylight Saving Time
FLASH	Non-volatile memory that may be programmed under software control
Full UTC	Full UTC MIB v1.0, also known as UTC type 2 or UG405 (UTMC ref: TS004.004:2008UM/008, Full UTC MIB)
GMT	Greenwich Mean Time
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communication
GVP	Generic Versatile Platform software layer
IO	Input and Output
ICMP	Internet Control Message Protocol
IP	Internet Protocol
JFFS2	Journaling Flash File System Version 2
LAN	Local Area Network
LED	Light Emitting Diode
LMU	Lamp Monitoring Unit
MD5	Message Digest 5
MIB	Management Information Base
MIB-II	Management Information Base II (Two)
NTP	Network Time Protocol
OS	Outstation
OSE	On Street Equipment
OSS	Outstation Support Server
OTU	Outstation Transmission Unit
PAP	Password Authentication Protocol
PC	Personal Computer
PCB	Printed Circuit Board
PIN	Personal Identification Number
PPP	Point-to-Point Protocol
PSTN	Public Switched Telephone Network
PSU	Power Supply Unit
RAM	Random Access Memory
ROM	Read Only Memory
ROMFS	ROM File System
RS232	EIA Data Communications Interface - Level based serial communications standard
RS485	EIA Differential Data Communications Interface - Differential serial communications standard
SHA-1	Secure Hash Algorithm 1

Simple UTC	Simple UTC MIB v0.2, also known as UTC type 1 (UTMC ref: TS004.004:2008 UM/004, Simple UTC MIB)
SNMP	Simple Network Management Protocol
Telnet	Telnet Protocol
TfL	Transport for London
TFTP	Trivial File Transfer Protocol
TMA	Traffic Management Act
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunications System
UTC type 1	See Simple UTC
UTC type 2	See Full UTC
UTMC	Urban Traffic Management and Control
UVMS	Urban VMS
VMS	Variable Message Sign
VPN	Virtual Private Network
XML	Extensible Markup Language
ZXO	Mains Zero Crossover

2 UTMC OTU

2.1 Overview

The UTMC OTU provides a communications interface between the UTC instation and the traffic controller or other on-street equipment, so that the instation can gather data on traffic conditions and coordinate the signal timings across a number of intersections.

The UTMC OTU performs the following main functions:-

- SCOOT loop sampling and reporting
- Reporting of controller stage and other controller conditions
- Forcing/demanding controller stages as requested by the UTC instation
- Maintenance of accurate clock time (e.g. via NTP)

The UTMC OTU can be configured to operate either UTC type 1 or type 2:-

2.1.1 Type 1 UTC

Type 1 or simple UTC operates via second-by-second messages sent between the instation and the OTU. It is provided for compatibility with earlier versions of instation software. It should only be used where type 2 UTC is not supported, as it is more susceptible to the effects of intermittent communications problems.

The type 1 UTMC specification is: TS004.004:2008 UM/004, Simple UTC MIB

2.1.2 Type 2 UTC (UG405)

Type 2 or full UTC operates via timestamped messages sent between the instation and the OTU. Messages are only sent when changes of control are required or when events are to be reported. The use of timestamps means that the operation of the system is less susceptible to breaks in communications, although this will vary with the communications profile configured at the instation.

The type 2 UTMC specification is: TS004.004:2008UM/008, Full UTC MIB

2.2 Interfaces

2.2.1 Network Interface Requirements

In order to ensure satisfactory UTC system performance the communications network should provide the following:-

1. Ethernet Interface: RJ45 Ethernet 10-BaseT or 100-BaseT presentation.
2. The network routing and firewall settings must enable (i.e. not block) the ports listed in section 2.2.1.1.
3. Network addresses are fixed and allocated by a Network Administrator.
4. The network delay should be typically less than 200mS (but see also item 8). The network delay is the delay caused to a message passing through the network from Instation to OTU or vice-versa.
5. For optimum system performance there should be **no breaks in communication exceeding 4 seconds** and **packet loss should be less than 0.1%** (but see also item 8).
6. The network bandwidth should be at least 128K bits-per-second for optimum performance. The load placed on the network by each OTU will vary depending on the actions being undertaken and the configuration of the OTU. Typical network traffic includes:-
    a. SNMP control and reply messages (typically 400 bytes-per-second)
    b. User interface traffic (web pages, remote handset and MOVAComm)
    c. User transfers of files e.g. export of the system log, export of controller data files.
    d. Periodic configuration backup (typically 50 Kbytes once per hour)
    e. Software upgrade (typically between 1 and 3 Mbytes, but could be more in some cases)

    Where the network bandwidth is low then the transfer of large amounts of data will delay the SNMP control and reply messages. Although full UTC (UTC type 2) is more tolerant of delays than simple UTC it can still be affected by significant delays. Putting the outstation off-control before performing such transfers will prevent the flagging of comms errors unnecessarily on the UTC instation.

    Experience has shown typical data usage figures of 0.25GB per month with some sites up to 0.5GB per month.
7. Individual network design considerations such as IP address allocation, traffic routing and network security are outside the scope of this list. However, it is not advised to operate across an open network without VPN protection and consideration of the possible effects of Denial-Of-Service (DOS) attacks.
8. Adjustments to Network requirements when used on a 3G/UMTS Network:

    When connected across a 3G/UMTS network the 3G communications profile (see Appendix L) should be used at the instation. This is more resilient to poor communications and can tolerate network delays of up to 1.5 seconds, communication breaks up to 25 seconds and packet loss in excess of 1%, though not as the norm. It should be noted that SCOOT can advance or retard the change time for the next stage at any point in the cycle. If this happens during a communication break then the previously prescheduled change will be used, this may result in a slight degradation in SCOOT performance. In isolated cases this will be of little consequence but should bursts of communication breaks occur then the degradation could be significant, particularly if it affects other junctions in the group. Where breaks are greater than 25 seconds the OTU may drop off control.

The techniques employed by the UTMC UG405 profile in conjunction with the 3G communications profile at the Instation will work to minimise the impact of these phenomena on SCOOT but 3G/UMTS communications should not normally be considered to be as reliable as a wired connection

For a 3G/UMTS network the requirements for network delays and communications breaks can be relaxed as follows:-

- Network delay should typically be less than 500 ms with fewer than 1% exceeding one second.
- No communication break should exceed 25 seconds.

Experience has shown that there will be longer durations where the network is unavailable due to maintenance work. Normally this will occur at off peak times such as during the night. The traffic manager should seek assurance from the cellular network operator as to when this will happen, ideally with pre-warning, and implement a suitable fall back plan.

There are a number of types of network service, such as via private or public APN that are available to a customer over a cellular network. These are discussed in the document 'Site selection Guide' 667/AY/45025/002.

2.2.1.1 Use of IP Network Ports and Services

The UTMC OTU uses the following IP ports. These ports must not be blocked by Firewalls or Routers.

Description	Protocol	Port	Direction *1	Notes
SNMP	UDP	161	Out	
HTTP/XML-RPC	TCP	80	Out	
HTTPS/XML-RPC	TCP	443	Out	
Telnet	TCP	23	Out	
MOVAComm	TCP	12001-12004	Out	Only required by MOVA
Network Time Protocol (NTP)	UDP	123 ***2**	In	
SNMP Inform (non-standard)	UDP	2201	In	Only required by full UTC (UTC type 2)
TFTP	UDP	69 *3	In	

***1 Direction** is with respect to the UTC Instation.

***2** The NTP reply port is dynamic and so for some networks the firewall needs to be configured for "inspect state" or "stateful inspection" so that it will remember the source port in the NTP query and allow the returning NTP reply through the firewall.

*3 Port used only during initiation. Data transfer ports are chosen by sender and receiver during initialisation.

2.2.1.2 UTMC OTU Firewall

One threat to security is that of an attacker attempting to gain control by generating SNMP traffic from an unauthorised source. This should be blocked using a firewall to only allow such traffic from the authorised source. This is usually achieved using the comms equipment but the UTMC OTU also contains a firewall which can be used to provide additional security if required. This can be accomplished as follows:

- Open the System – Settings – Web Interface web page.
- Tick *Enable Advanced Options* and press the *Save* button.
- Open the System – Advanced – Network – Firewall – Rules web page.
- Press the *Add Row* button twice to add two new rules.
- Replace the text in the new rules with the following:
  - allow udp from <IP address of instation> to me 161
  - deny upd from any to me 161
- Press the *Save* button.
- Open the System – Advanced – Network – Firewall web page.
- Ensure that *Enable IP Firewall* is ticked.
- Open the System – Settings – Web Interface web page.
- Untick *Enable Advanced Options* and press the Save button.

2.2.2 Note that this uses the IP address of the instation so any changes to this will require reconfiguration of the firewall.Controller Interface

The interface between the UTMC OTU and the controller can be either via freestanding, serial (also known as semi-integral) or integral as listed below. The various interface port names are listed in section 2.6.1 in the description of the Card/Port field.

Integral: The control and reply bits are transferred internally in software via virtual ports. ST950

Freestanding: The control and reply signals are wired via TR2523 compliant voltage-free relay contacts. Stratos OS

Serial (or semi-integral): The control and reply bits are transferred via RS232 serial cable.

2.3 Commissioning

This section describes typical sequence of operations to be carried out when commissioning the UTMC OTU.

Pre-requisites:-

1. The controller has already been configured for UTC control, including the allocation of detectors for SCOOT loop sampling where this is required.
2. The controller has been installed and commissioned.
3. The junction data has been defined and entered into the UTC instation
4. The "CSV" file for the junction has been exported from the UTC instation and is available. The CSV file defines the control and reply bit functions required on the UTMC OTU.
5. The appropriate UTMC OTU licence has been obtained. ST950
6. The IP network has been set up and is operating.
7. The Outstation unit is installed and connected. Stratos OS

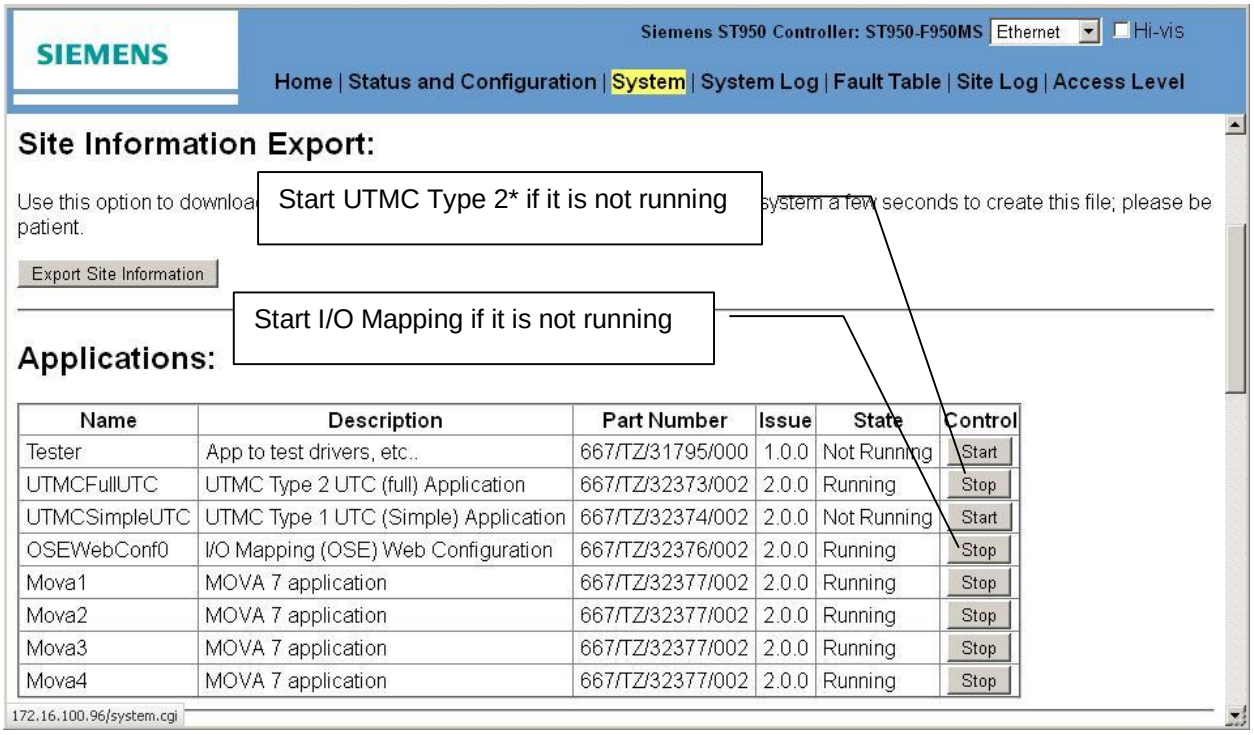
2.3.1 UTMC OTU Licence

Licences are installed using the GVP licence manager (*Status and Configuration – System – Settings – Licence System – Manager)*.

Please refer to the User Interface Handbook (667/HU/46000/000) for details on installing licences.

2.3.2 Starting the Applications

On the System web page, ensure that the UTMC Type 2 and I/O Mapping applications are running:-

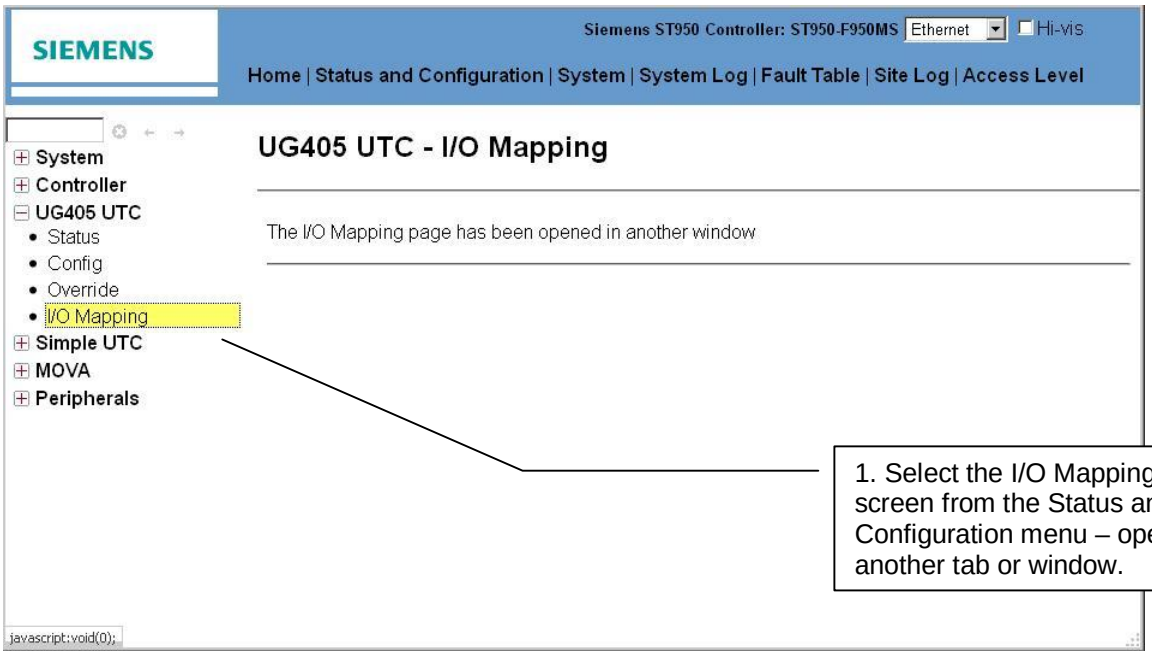


Name	Description	Part Number	Issue	State	Control
Tester	App to test drivers, etc..	667/TZ/31795/000	1.0.0	Not Running	Start
UTMCFullUTC	UTMC Type 2 UTC (full) Application	667/TZ/32373/002	2.0.0	Running	Stop
UTMCSimpleUTC	UTMC Type 1 UTC (Simple) Application	667/TZ/32374/002	2.0.0	Not Running	Start
OSEWebConf0	I/O Mapping (OSE) Web Configuration	667/TZ/32376/002	2.0.0	Running	Stop
Mova1	MOVA 7 application	667/TZ/32377/002	2.0.0	Running	Stop
Mova2	MOVA 7 application	667/TZ/32377/002	2.0.0	Running	Stop
Mova3	MOVA 7 application	667/TZ/32377/002	2.0.0	Running	Stop
Mova4	MOVA 7 application	667/TZ/32377/002	2.0.0	Running	Stop

*If simple UTC is required, start the UTMC Type 1 application instead.

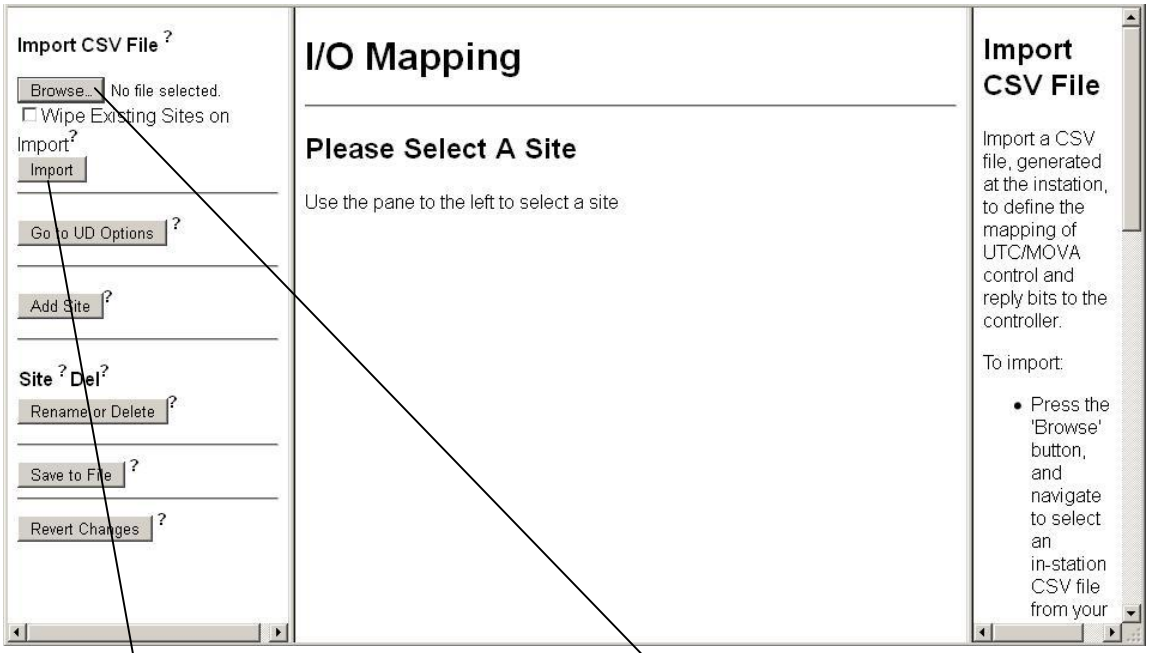
2.3.3 Importing the CSV file

The CSV file is generated at the instation and defines the control and reply bits to be used on the OTU. See Appendix G for example CSV file content.



Before importing the CSV file on the Stratos Outstation, be sure to select either “freestanding” or “semi-integral” as appropriate. See section 2.6.1 for details.

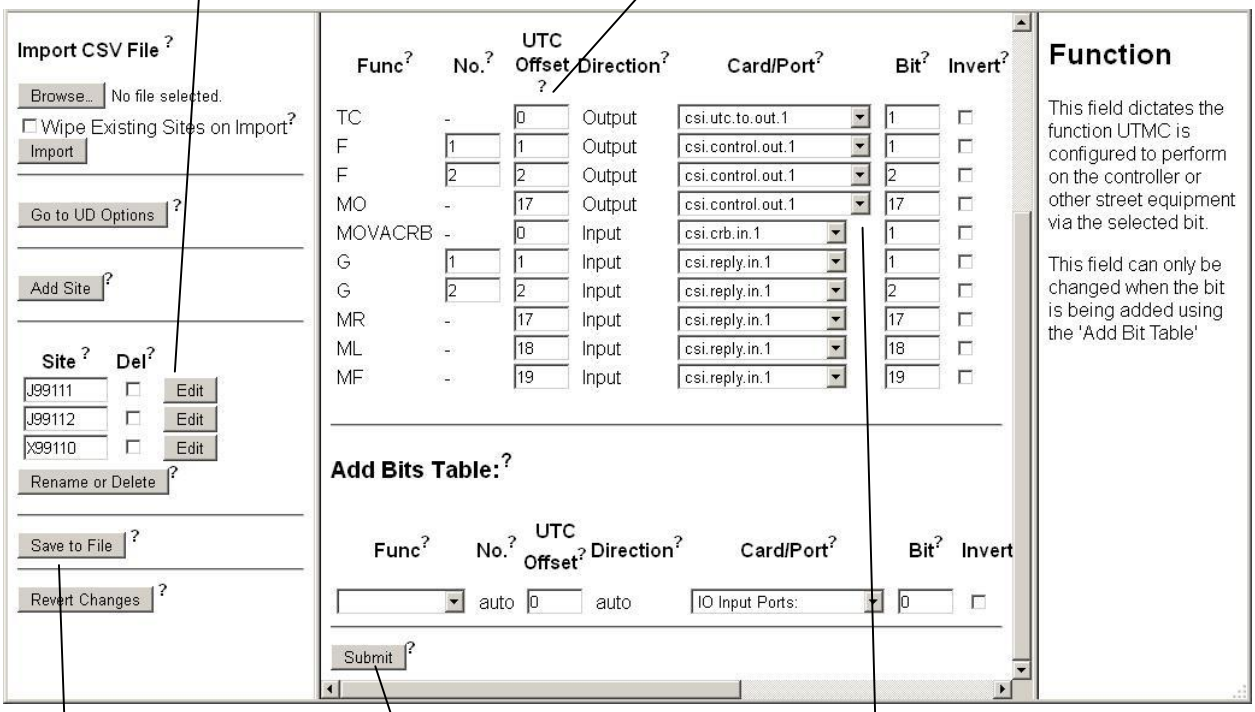
Stratos OS



Modifying and Saving the I/O Bit Mapping

1. Select the Site to edit.

NB: UTC offsets start at 1. Values of 0 are used for locally generated signals not sent to or received from UTC instation.



2. Control and reply bits are given a default mapping from the csv file. This mapping can be changed if required.

3. Use “Submit” to save the changes on each screen.

4. Check SCOOT detector mapping (see following page).

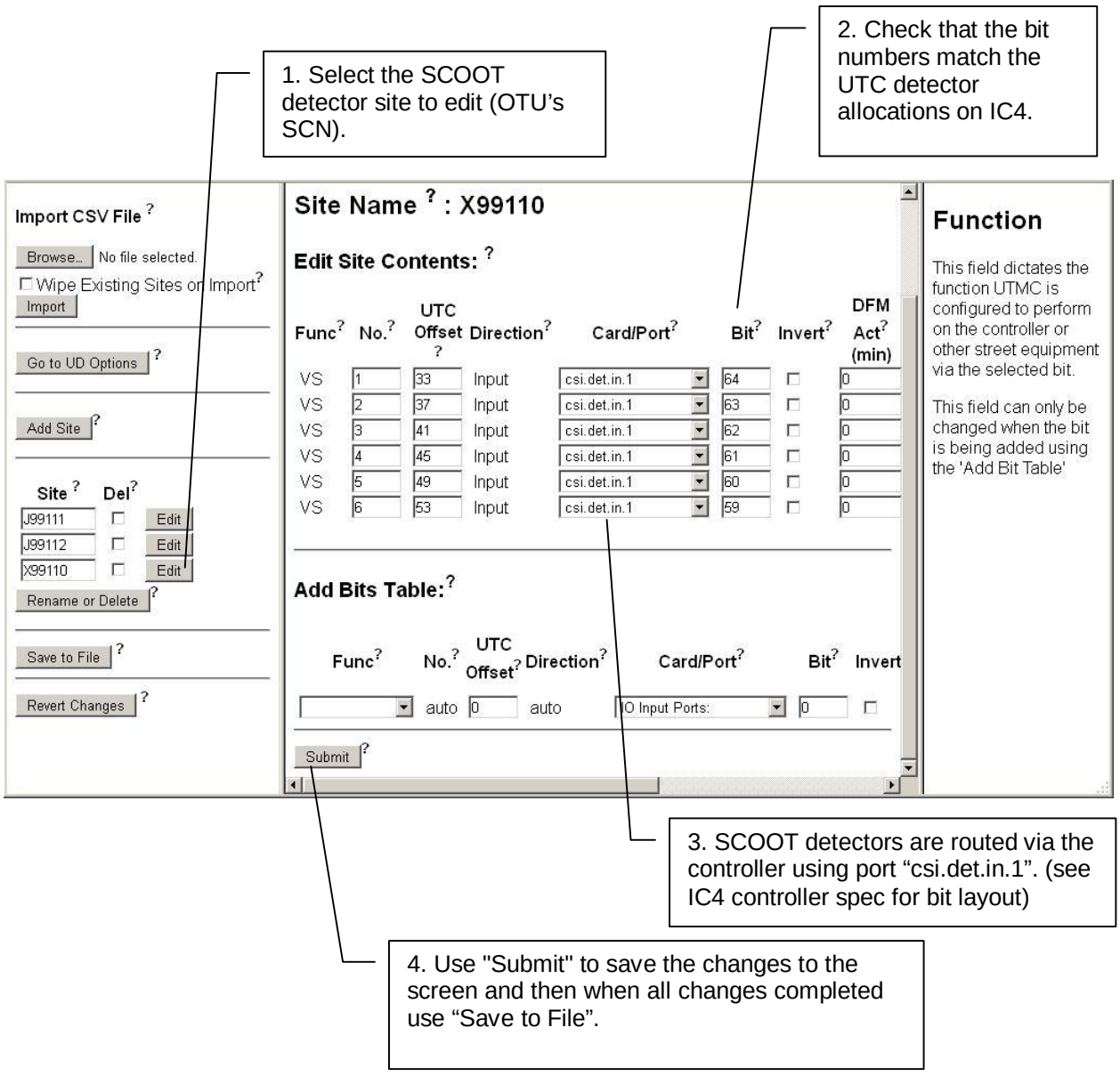
5. Use “Save to File” to activate and store all changes.

On the ST950, the MOVA MR, ML and MF bits are set by the controller special conditioning and so are mapped to port “csi.reply.in.1” rather than “internal”.

ST950

2.3.4 SCOOT Detector Mapping via Controller

The controller can be configured to pass SCOOT detectors to the OTU. This is configured on the IC4 "UTC and MOVA Detectors" screen. It is recommended that SCOOT loop 1 is allocated to detector 64, SCOOT loop 2 is allocated to detector 63, since this is the default applied when a csv file is imported.

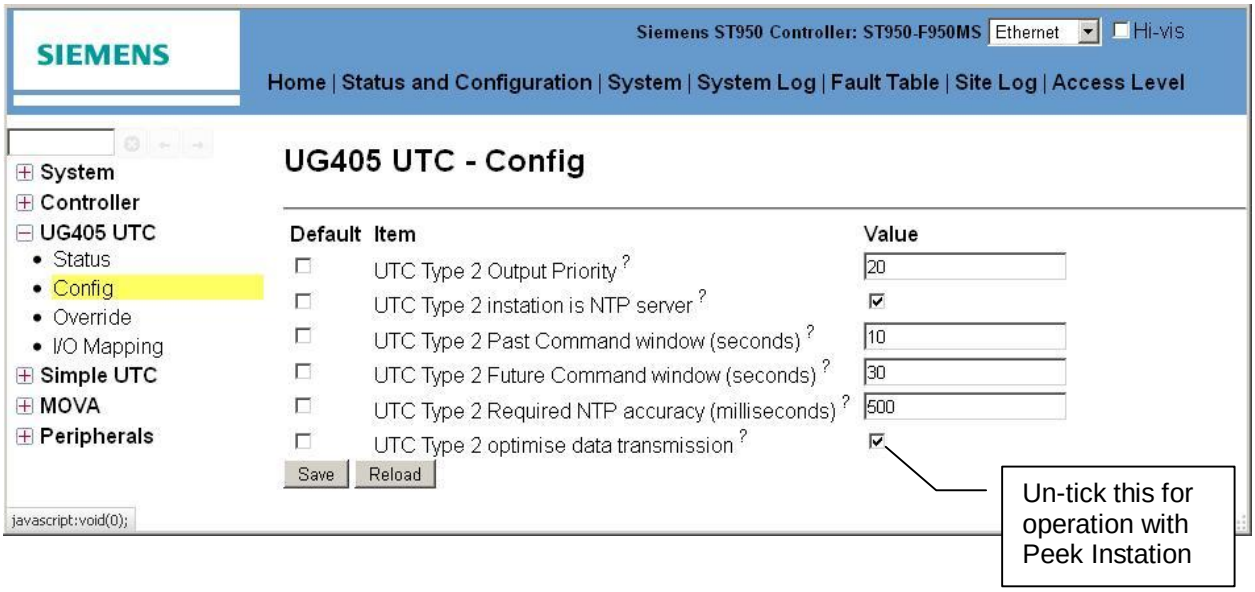


2.3.5 Interfacing with a PEEK Instation

In order for the UTMC OTU to operate correctly with a Peek UTMC instation, SCOOT data optimisation should be disabled on the "Config" web page as described in the following section.
Also ensure that the correct number of SCOOT detectors are configured to match the instation, otherwise the SCOOT detector data at the instation will not be correct.

2.3.6 Other UTMC OTU Configuration Settings (not normally required)

2.3.6.1 UG405 UTC Settings



UTC Type 2 Output Priority

Priority of the UTC Type 2 force bits, relative to other force bits such as those from MOVA. Range 0 to 50, default 20.

UTC Type 2 instation is NTP server

When this item is Enabled, the instation IP address is used to automatically set the NTP server address. When Disabled, the NTP server address has to be defined manually on the NTP configuration web screen.
Default Enabled.

UTC Type 2 Past Command window (seconds)

This is the earliest time difference from now for which SNMP SET requests will be accepted. Commands received with timestamp of more than this number of seconds before the current time will be ignored and an out-of-time-range error will be placed in the system log. Range 1 to 300 seconds. Default 10 seconds.

UTC Type 2 Future Command window (seconds)

This is the latest time difference from now for which SNMP SET requests will be accepted. Commands received with timestamp of more than this number of seconds after the current time will be ignored and an out-of-time-range error will be placed in the system log. Range 4 to 600 seconds. Default 30 seconds.

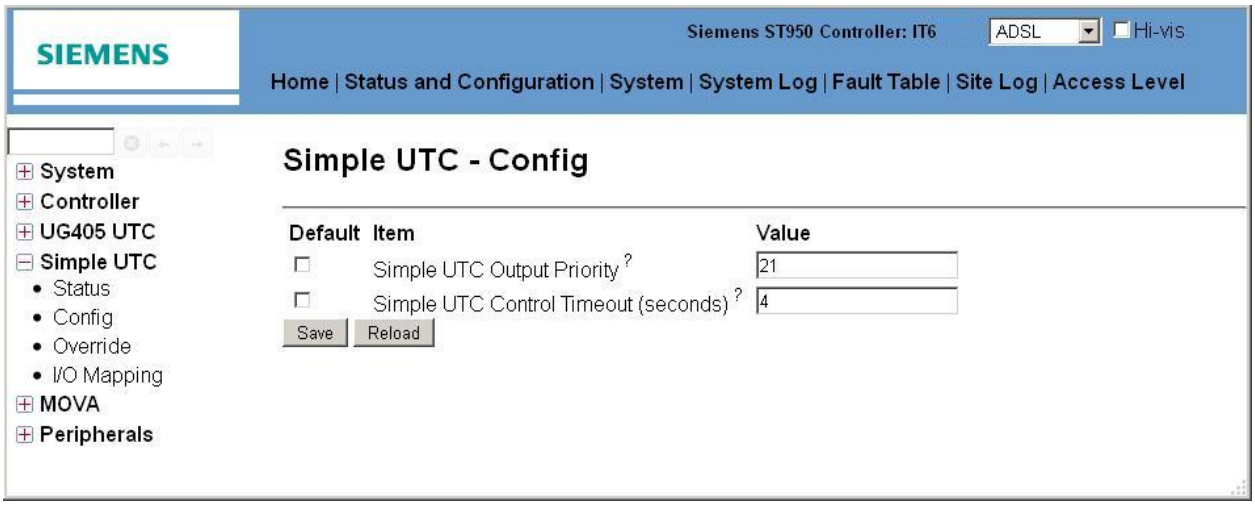
UTC Type 2 Required NTP accuracy (milliseconds)

This is the synchronisation accuracy which must be achieved by NTP before the outstation will start timestamped control-reply operation. Range 100 to 1000mS. Default 500 mS.

UTC Type 2 Optimise Data Transmission

When enabled the OTU will not transmit successive duplicate SCOOT data. When connected to a Siemens instation this should be enabled. When connected to a PEEK instation it should be disabled. Ensure that the number of configured SCOOT detectors matches the instation.

2.3.6.2 Simple UTC Settings



Simple UTC Output Priority

Priority of the Simple UTC force bits, relative to other force bits such as those from MOVA. Range 0 to 50, with 50 being the highest priority. The default is 21.

Simple UTC Control Timeout (seconds)

Simple UTC control message timeout, in seconds. If no control message is received from the instation for this period of time, then the outstation drops off UTC control. Range 3 to 30 seconds. Default 4 seconds.

2.3.7 Changing the Default Template Configuration

In most cases, the configuration of each OTU will start from the factory default settings. However, if required, a different template configuration can be created with alternative default settings.

2.3.7.1 Preparing the Default Template Configuration File

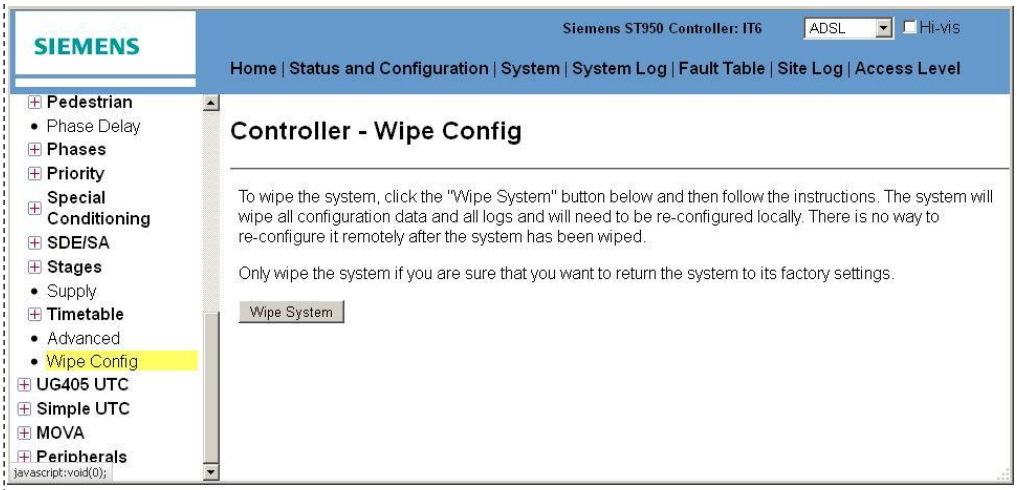
In order to create a default template, a “clean” unit is required, so that no site specific configuration values such as IP address are included in the template.

CAUTION: Once a unit has been wiped, remote access to it is lost and it will need to be re-configured locally. It is recommended that the procedure is carried out in the depot, not on the street.

1. Prepare a “clean” unit as follows:-

On the ST950 wipe the configuration data via the web interface .

ST950



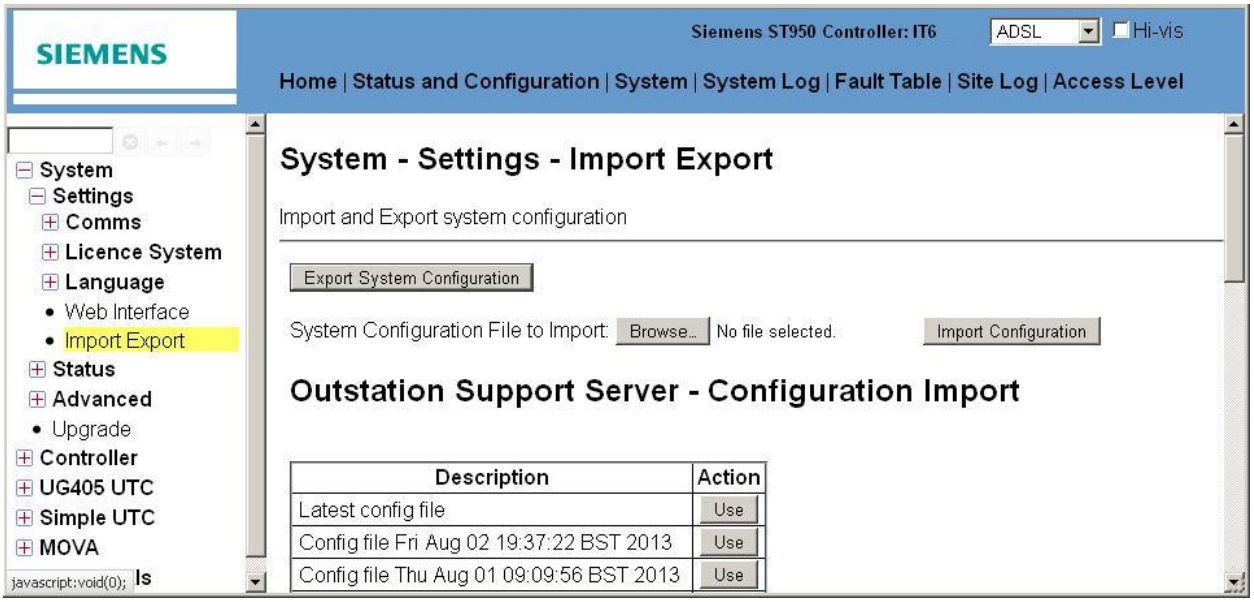
On the Stratos Outstation use the configuration wipe procedure in section 3.3.1.

Stratos OS

2. Configure the OTU via the web interface with the default settings required. Ensure that only the required items are modified and that no site-specific data is set up i.e. do not define IP address, site name etc.
3. Export the configuration using the Import Export web page and save the exported file.
4. Rename the exported file e.g. Template.xml

2.3.7.2 Using the Default Template Configuration File

1. Start with the unconfigured OTU, to which the defaults are to be applied.
2. Import the configuration template file prepared above (e.g. Template.xml) using the Import Export web page.
3. Enter the site-specific configuration data as normal (IP address, I/O mapping etc).

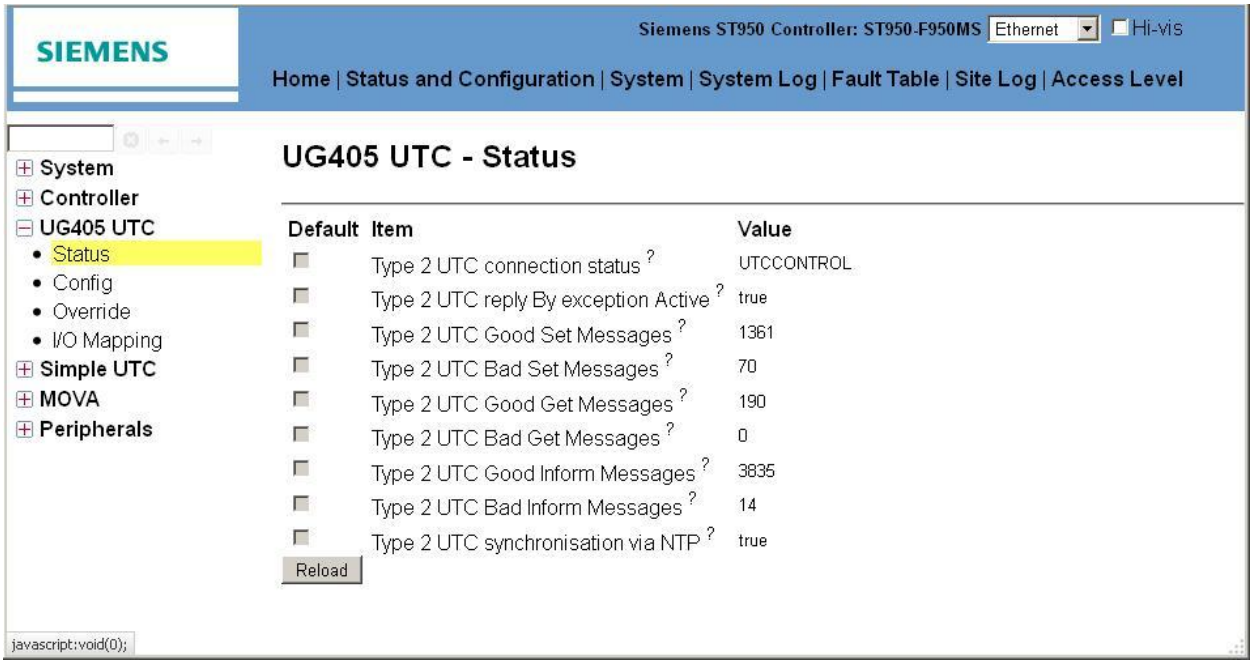


2.4 Status Display

When the UTC application is running and receiving correct SNMP messages from the instation then the COM LED will be illuminated, flashing off each time an SNMP message is received. If the COM LED is not illuminated, it means that there is a communications problem with the instation (see section 2.5).

2.4.1 Type 2 UTC Status Screen

This screen displays the current status and transmission statistics for the UG405 type 2 UTC function.



Type 2 UTC connection status

Indicates if the outstation is currently receiving type 2 UTC Set messages. Values are:-

STANDALONE: In standalone mode all output bits are set to zero. Reply bits are not sent but can be polled.

MONITOR: In monitor mode all output bits are set to zero. The OTU sends informs to the instation if enabled in the MIB.

UTCCONTROL: instation control messages being received i.e. on-control from instation.

Type 2 UTC reply By exception Active

Indicates if “reply by exception” operation is currently active:-

true indicates that the outstation is sending timestamped informs to the instation when changes are detected.

false indicates that only polling of inputs is available..

Type 2 UTC Good Set Messages

Number of valid SNMP UTMC type 2 UTC Set messages received since last restart.

Type 2 UTC Bad Set Messages

Number of invalid SNMP UTMC type 2 UTC Set messages received since last restart.

Type 2 UTC Good Get Messages

Number of valid SNMP UTMC type 2 UTC Get messages received since last restart.

Type 2 UTC Bad Get Messages

Number of invalid SNMP UTMC type 2 UTC Get messages received since last restart.

Type 2 UTC Good Inform Messages

Number of SNMP UTMC type 2 UTC Inform messages sent to the instation without requiring retry, accumulated since last outstation restart.

Type 2 UTC Bad Inform Messages

Number of SNMP UTMC type 2 UTC Inform messages sent to the instation that required retransmission, accumulated since last outstation restart.

Type 2 UTC synchronisation via NTP

This field Indicates if the outstation time is currently being synchronised via NTP (Network Time Protocol). NTP synchronisation is required for timestamping of events.

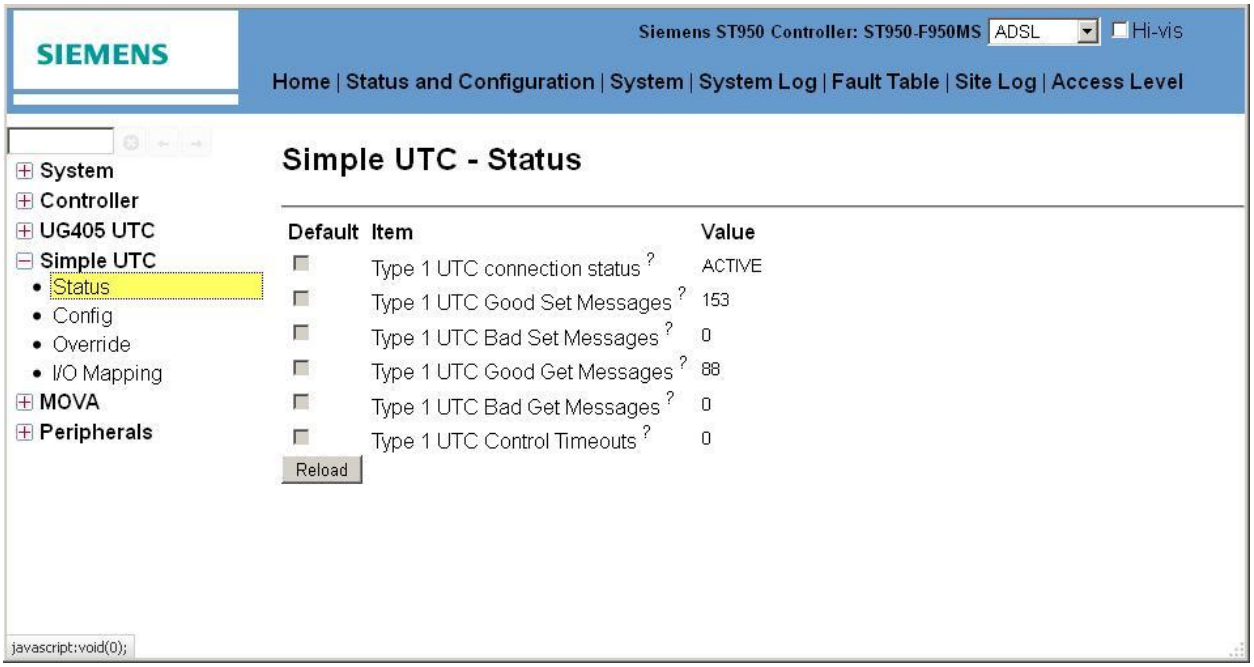
Reload

Press ‘Reload’ to refresh the data on the screen.

If the ratio of bad messages to good messages significantly exceeds the values defined in section 2.2.1 then there could be a problem with the network and this should be investigated.

2.4.2 Type 1 UTC Status Screen

This screen displays the current status and transmission statistics for the simple UTC function.



Type 1 UTC connection status

Indicates if the outstation is currently receiving type 1 UTC Set messages. Values are:-

IDLE (or blank): no messages currently being received.
STARTING: first Set message received.
ACTIVE: messages being received i.e. on-control from instation.

Type 1 UTC Good Set Messages

Number of valid SNMP UTMC type 1 UTC Set messages received since last restart.

Type 1 UTC Bad Set Messages

Number of invalid SNMP UTMC type 1 UTC Set messages received since last restart.

Type 1 UTC Good Get Messages

Number of valid SNMP UTMC type 1 UTC Get messages received since last restart.

Type 1 UTC Bad Get Messages

Number of invalid SNMP UTMC type 1 UTC Get messages received since last restart.

Type 1 UTC Control Timeouts

Number of UTMC type 1 UTC control timeouts since last restart i.e. the number of times missing Set control messages have caused the controller drop off UTC and revert to local control.

Reload

Press 'Reload' to refresh the data on the screen.

If the ratio of bad messages to good messages significantly exceeds the values defined in section 2.2.1 then there could be a problem with the network and this should be investigated.

2.5 Fault Finding

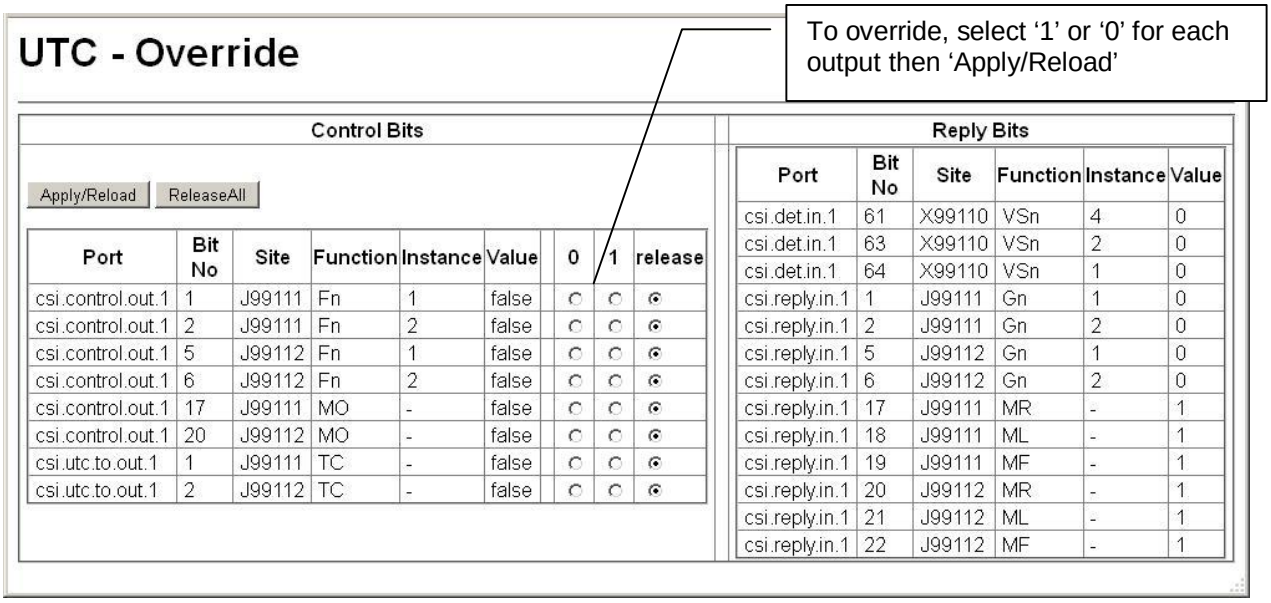
Check the UTC Override Screen shows force and reply bits active. If no force bits are being activated, check with the instation operator that the site is on-control and not isolated. Also ask the instation operator if there are any faults recorded for the site e.g. configuration mis-match and check that the configuration of control and reply bits matches the UTC instation.

Symptom	Possible Diagnosis	Action to Check Diagnosis
(a) No web page access from the Instation	Incorrect IP address	Use the 'WIZ' command to display the **IP address, Netmask and Gateway** settings and check these are as recommended by the Network Administrator. An incorrect **Gateway** value can keep the Ethernet from being brought up. Use the 'network' command to check if the Ethernet is up.
	Network Connectivity Fault	Use the ping command to check if the unit can transmit to a known IP address on the network e.g. the Gateway address. From the instation, use the ping command to check IP connectivity to the unit IP address. If the ping command works, then the Ethernet, modem & Network are connected – proceed to the next Possible Diagnosis. If the ping command fails, then check/replace each component in turn, including the interconnecting cables. The unit's Ethernet socket can be tested by plugging into a hub/PC off the network. Some modems have a separate IP address which can be tested with ping to check IP connectivity. Check with the Network Administrator that all IP ports required by the application (see 2.2.1) are opened and are not blocked by a Network Router or Firewall.
(b) Unit will not go on-control	Network Configuration Fault	Check with the Network Administrator that all IP ports required by the application (see 2.2.1) are opened and are not blocked by a Network Router or Firewall.
	Duplicate IP address	Disconnect the unit from the network and then use the ping command from a PC on the network to ping the allocated address. If there is a response to the ping command then the IP address already exists on the network and the conflict of addresses will need to be resolved.
	OTU Configuration Fault	Check if the configuration of the OTU matches that expected by the instation:- - type 1 or type 2 UTC - site names e.g. J12345 * - control and reply bit functions * - number of SCOOT loops configured * * check on the I/O Mapping web page and on the UTC override web page
	Controller Interface Fault	Check that the correct Green Confirm bits are being activated as the controller cycles through it's stages (see 2.5.1). The WIZ command can be used to display the port data being passed between the OTU and the controller.

Symptom	Possible Diagnosis	Action to Check Diagnosis
	NTP setup	For type 2 UTC, check that time is synchronised with the instation (see 2.4.1). Check that the NTP server address is correct on the NTP configuration web screen. For some networks, the NTP server address can be different from the UTC instation machine address.

2.5.1 UTC Display/Override Screen

This screen displays the UTC control and reply bit values from the controller interface. The control bits can be overridden to test the interface during commissioning. Any overrides are automatically deactivated after a timeout which is 5 minutes.



Apply/Reload

This control forces each output to the '1' or '0' state where this has been selected and then refreshes the screen data values. Any outputs which have not been forced, i.e. with 'release' selected, will remain under control of UTC. Control outputs which have been overridden are displayed in **bold** in the table.

Release All

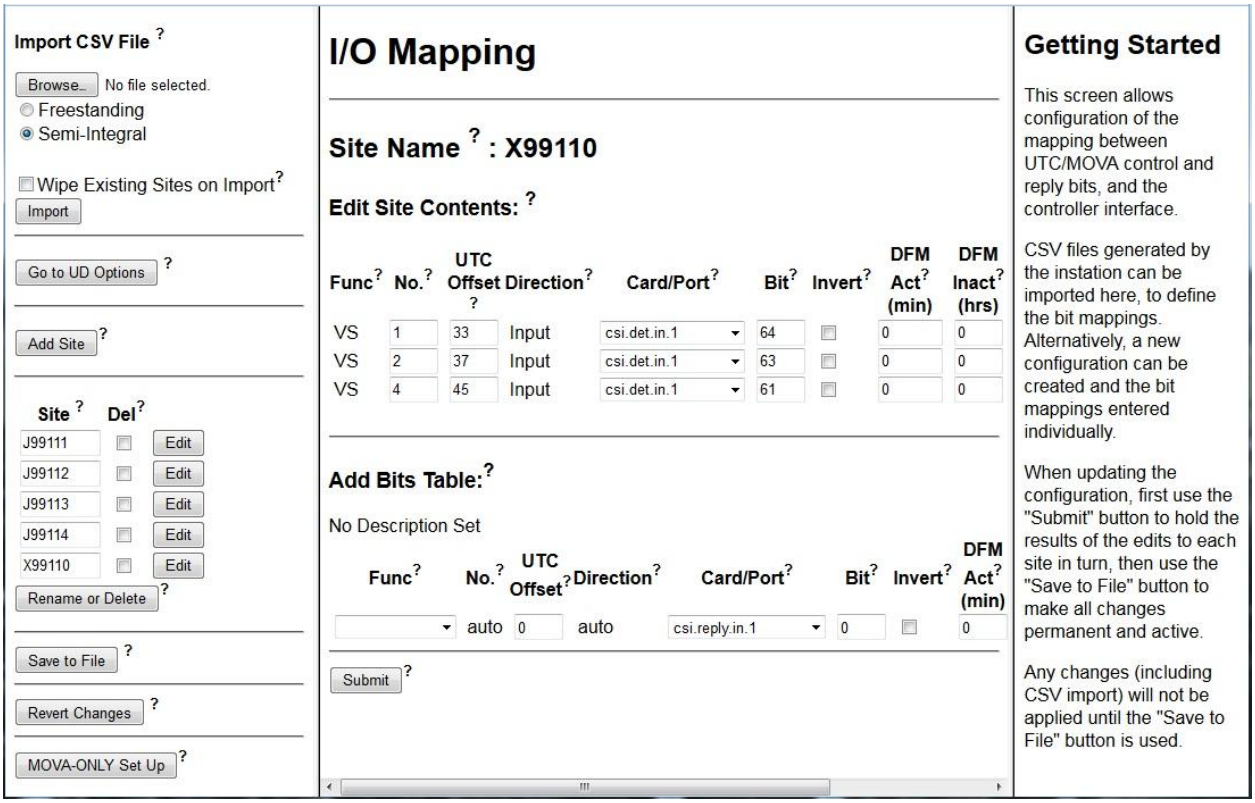
This control sets all overrides back to the 'release' state and then refreshes the screen data values.

2.6 Configuration Screen Descriptions

This section describes the operations available on the I/O Mapping Config screens. These screens are used to configure the I/O mapping for the OTU. The screens effectively define which UTC control and reply bits exist, what function they perform and how they are routed to the controller or other equipment e.g. SCOOT detectors.

Note: The screens can also be used for the mapping of MOVA I/O.

2.6.1 Site Creation and Input/Output Mapping



?

Pressing the **?** next to a field will bring up help text in the right-hand window pane.

Import CSV file

Use this interface to import a CSV (Comma Separated Value) file, generated at the instation, to define the mapping of control and reply bits to the controller.

To import:

- Press the 'Browse' button, and navigate to select an instation CSV file from your computer.
- For the Stratos Outstation platform, select either:-
  - o ‘Freestanding’ –control and reply bits are wired to the controller via individual I/O signals
    or
  - o ‘Semi-integral’ – control/reply bits are via the serial interface to a Siemens controller.

Stratos OS

- Press 'Import' to upload the selected file.
- Add Uni Directional Loops if required using "Go to UD Options" button

- Edit each site and update the configuration as required to match the installation.
- Press "Save to File" to make the settings permanent and active

Go to UD Options

Opens the Uni Directional Loop options page, where UD loops can be added to the configuration and edited. See section **Error! Reference source not found.**. The output of the UD loops appear as ports UD1, UD2 etc.

Add Site

This button adds a site with a default site name to the configuration. The site name should match that used by the UTC instation.

Edit (site)

To view or edit the contents of a site, press the 'Edit' link next to its name

Rename or Delete

To change the site name, edit the name in the text box, then press 'Rename or Delete' before continuing.
To delete a site, select the tick box next to the site name, and press 'Rename or Delete'.

Save to File

No settings are written or take effect until the 'Save to File' button is pressed.
Over the course of the edit session, press 'Submit' on each page to hold changes, until all edits are completed.
When 'Save to File' is pressed, the entered configuration is first validated. If all settings are correct, the configuration will be saved permanently, and take effect on the operation of the OTU. If invalid settings are found, they and the site in which they are contained are highlighted red. A configuration containing mistakes will **not** be saved.

Revert Changes

'Revert Changes' cancels all submitted changes from the current editing session and the configuration data is re-loaded.

MOVA-Only Setup

This button expands to show additional fields used to configure the I/O where there is only MOVA control and no UTC. The usage is described in more detail in the MOVA handbook 667/HB/46000/003.

Func

This field dictates the function UTMC is configured to perform on the controller or other street equipment via the selected bit.
This field can only be changed when the bit is being added using the 'Add Bit Table'

The available UTC control functions are:-

Item	Use
CP	Close Car Park
Dn	Stage Demand
DX	Common demand
EP	Bus Extension Permit
FF	Signals Flashing
FM	Fallback Mode (inhibit CLF)
Fn	Stage Force
GO	Gap Out
HI	Hurry Call Inhibit
LL	Local Link Inhibit

LO	Signals On
MO	MOVA Override
PV	Hold Vehicle
PX	Pedestrian Demand
SFn	Switch Facility
SG	CLF Group Sync
SO	Solar Override (to bright)
TC	Transmit Confirm – This bit is set to '1' by the OTU while UTC messages are being received from the instation.
TO	Take Over
TS	Time Sync

The following output functions are generated locally, for use with MOVA:-

MOVATO	MOVA Take Over
MOVAES1LIn	MOVA end of saturation flow type 1 on link
MOVAES2LIn	MOVA end of saturation flow type 2 on link
MOVAES3LIn	MOVA end of saturation flow type 3 on link
MOVAES4LIn	MOVA end of saturation flow type 4 on link
MOVAES5LIn	MOVA end of saturation flow type 5 on link
MOVAES6LIn	MOVA end of saturation flow type 6 on link
MOVAES7LIn	MOVA end of saturation flow type 7 on link
MOVAES8LIn	MOVA end of saturation flow type 8 on link
MOVAES9LIn	MOVA end of saturation flow type 9 on link
MOVAESLIn	MOVA end of saturation flow (any type) on link
MOVAOSATn	MOVA oversaturation on lane

The available UTC Reply functions are:-

Item	**Use**
BDn	Bus Detected
CA	Car Park Occupancy Threshold Exceeded
CF	Controller Fault Indication
CG	CLF Group Timer Sync Confirm
CL	Car Park Closed
CO	Cabinet Door Open
CR	Queue At Car Park Reservoir
CS	Time Synchronisation Confirm
CSn	Car Park Information
DF *[1]	Detector Fault
EC	Bus Extension Confirm
EV	Emergency Vehicle
FC	FallBack Selection Confirm
FR	Signals Flashing Confirm
Gn	Stage Green Confirm
GPn	General Purpose Reply
GR1	Group 1 Indication
GX	Vehicle Green Confirm
HC	Hurry Call Confirm or Request
LC	Local Link Inhibit Confirm
LE	Signal Aspects Extinguished Indication
LFn	Signal Aspect Failure
MC	Manual Control
MF *[1]	MOVA Fault
ML *[1]	MOVA Online

MR *1	MOVA Override Reply/Local MOVA Ready
PC	Pedestrian Stage Green Confirm
PR	Puffin Pedestrian Clearance Period
RF1	Vehicle Red Signal Aspect Failure 1
RF2	Vehicle Red Signal Aspect Failure 2
RR	Remote Reconnect
SB	Solar Bright Confirm
SCn	Switch Facility Confirm
SDn	Stage Demands
TF *2	Controller Handset Connected
TPn	RTIG Traffic Light Priority Trigger Point
VC *3	Vehicle Count
VO *3	Vehicle Occupancy
VQ *3	Queue Detector
VSn *4	SCOOT Detector Output
WI	Wait Indicator Confirm

ST950

*1 On the ST950, the DF, MF, MR & ML reply bits must be generated by the controller i.e. configured in IC4 special conditioning.

*2 On the ST950, the TF reply bit must be generated by the controller i.e. configured in IC4 special conditioning.

Stratos OS

*1 On Stratos Outstation, these reply bits are controlled by the OTU when **Card/Port** is set to 'internal'.

*2 On Stratos Outstation, the TF reply bit can be controlled by the OTU by setting **Card/Port** to 'ctlr.handset.in.1' and **Bit** to 1. In this case, TF will be activated each time XXC is used to connect to the controller, either locally or remotely.

*3 These reply bits are controlled by processing within the OTU. The SCOOT inputs are sampled 4 times per second and can be mapped to either direct loop inputs, a UD unit or controller detectors.

*4 The SCOOT inputs are sampled 4 times per second and can be mapped to either direct loop inputs, a UD unit or controller detectors.

The following input functions are used locally with MOVA control:-

Stratos OS

MOVACRB	MOVA Controller Ready Bit
MOVADETn	MOVA Detectors

No.

Instance Number: Where the function operates on a group of bits, this field identifies which stage, detector, SCOOT unit, etc, being controlled or monitored by the item.
Numbering starts from One.
A '-' indicates that only one instance of this function should be used on each site.

UTC Offset

This field indicates the ordering of bit functions at the UTC Instation. When running full UTC (UTC type 2), this field is for information only. When running simple UTC (UTC type 1), this field is used to control the position of bits in the control and reply words.

The numbering starts at One. Note that on the Siemens instation MONI screen the bit displays are numbered from zero so that for example bit 004 on MONI would be given a UTC offset of 5. Functions which are only local to the outstation such as MOVATO and TC should be given an offset of zero.

Direction

This field indicates whether the item is an output (Control) or input (Reply).

Card/Port

Select the IO Port, or serial connection to be used:-

gspio1.in.0	8 inputs on GSPIO card address 1 (see also section 2.6.2)
gspio1.in.1	8 inputs on GSPIO card address 1
gspio1.in.2	8 inputs on GSPIO card address 1
gspio2.in.0	8 inputs on GSPIO card address 2
:	
etc	

csi.reply.in.1	32 inputs from controller for UTC confirms
csi.mova1.reply.in.1	32 inputs from controller for MOVA stream 1 confirms
csi.mova2.reply.in.1	32 inputs from controller for MOVA stream 2 confirms
csi.mova3.reply.in.1	32 inputs from controller for MOVA stream 3 confirms
csi.mova4.reply.in.1	32 inputs from controller for MOVA stream 4 confirms
csi.det.in.1	64 detector states from controller
csi. mova1.det.in.1	64 detector states from controller for MOVA stream 1
csi. mova2.det.in.1	64 detector states from controller for MOVA stream 2
csi. mova3.det.in.1	64 detector states from controller for MOVA stream 3
csi. mova4.det.in.1	64 detector states from controller for MOVA stream 4
csi.cond.in.1	16 conditioning inputs from controller
csi.crb.in.1	controller ready bits from controller for MOVA
UD1, 2 etc	Uni-direction unit 1, 2 etc. when configured on UD Options screen.

ST950

ST950

gspio1.out.3	8 outputs on GSPIO card address 1 (see also section 2.6.2)
gspio1.out.4	8 outputs on GSPIO card address 1
gspio2.out.3	8 outputs on GSPIO card address 2
:	
etc	

csi.control.out.1	32 control outputs to controller for UTC
csi.mova1.control.out.1	32 control outputs to controller for MOVA stream 1 forces
csi.mova1.control.out.2	32 control outputs to controller for MOVA stream 2 forces
csi.mova1.control.out.3	32 control outputs to controller for MOVA stream 3 forces
csi.mova1.control.out.4	32 control outputs to controller for MOVA stream 4 forces
csi.utc.to.out.1	1 UTC Transmission Confirm output to controller
csi.mova.to.out.1	4 MOVA Take Over outputs to controller, one for each MOVA stream
csi.cond.out.1	16 conditioning outputs to controller

ST950

mova1.alerts.in.1	TMA alert input for MOVA stream 1
mova2.alerts.in.1	TMA alert input for MOVA stream 2
mova3.alerts.in.1	TMA alert input for MOVA stream 3

mova4.alerts.in.1 TMA alert input for MOVA stream 4

Bit

Indicates the I/O bit number to be wired to the unit in the case of I/O Card, or the serial message bit assigned in the case of the Controller Serial Interface. See section 2.6.2 for GSPI port and bit numbering.

Invert

This field indicates whether the signal should be inverted or not. Select the checkbox to invert the signal.

The reply bits for a freestanding OTU should generally be inverted and all other signals left in their normal sense.

DFM Act

Time in minutes that the detector may be Active before a Detector Fault is asserted. Intended for use with detector inputs which are not already monitored by the controller.
Valid timeouts range from 1 to 5460 minutes. A typical value is 30 minutes.
A value of zero disables DFM.

DFM Inact

Time in hours that the detector may be InActive before a Detector Fault is asserted. Intended for use with detector inputs which are not already monitored by the controller.
Valid timeouts range from 1 to 96 hours . A typical value is 18 hours.
A value of zero disables DFM.

Delete Row

To delete an item, select the tick box in it's delete column, and press the Submit' button.

Description

This text field is available in the Add Bits Table to enter a short description for the item use. The text is displayed by hovering the mouse over the Function in the table.

Add Bits Table

To add an item to the site manually, select a function from the list, and enter the item's configuration values. Then press 'Submit'.

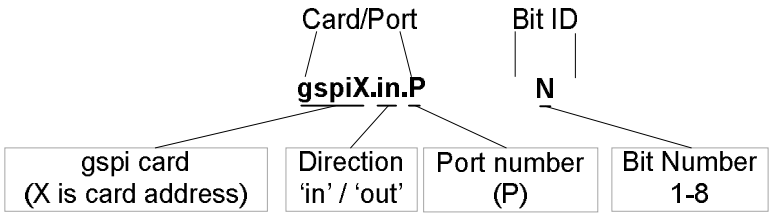
Submit

Pressing submit holds changes without saving them permanently, or causing them to take effect. This allows a series of changes on different pages to be created and verified before 'Save to File' is pressed, causing them to take effect.

You must press 'Submit' to save changes made to a page before navigating away from it.

2.6.2 GSPI IO Port and Bit Naming Convention

The inputs and outputs on each GSPI I/O card are identified on the I/O Mapping web pages according to the following convention.



Each I/O card comprises a number of 8-bit ports, some of which can be input ports and some of which can be output ports. So for example, on a card with 48 inputs and 16 outputs, the 6 input ports would be numbered 0 to 5 and the output ports would be numbered 6 and 7

GSPI Ports are numbered starting at 0.

The Bit ID's within a port are numbered starting at 1 and have a range of 1 to 8.

Some examples of I/O mapping are shown below:

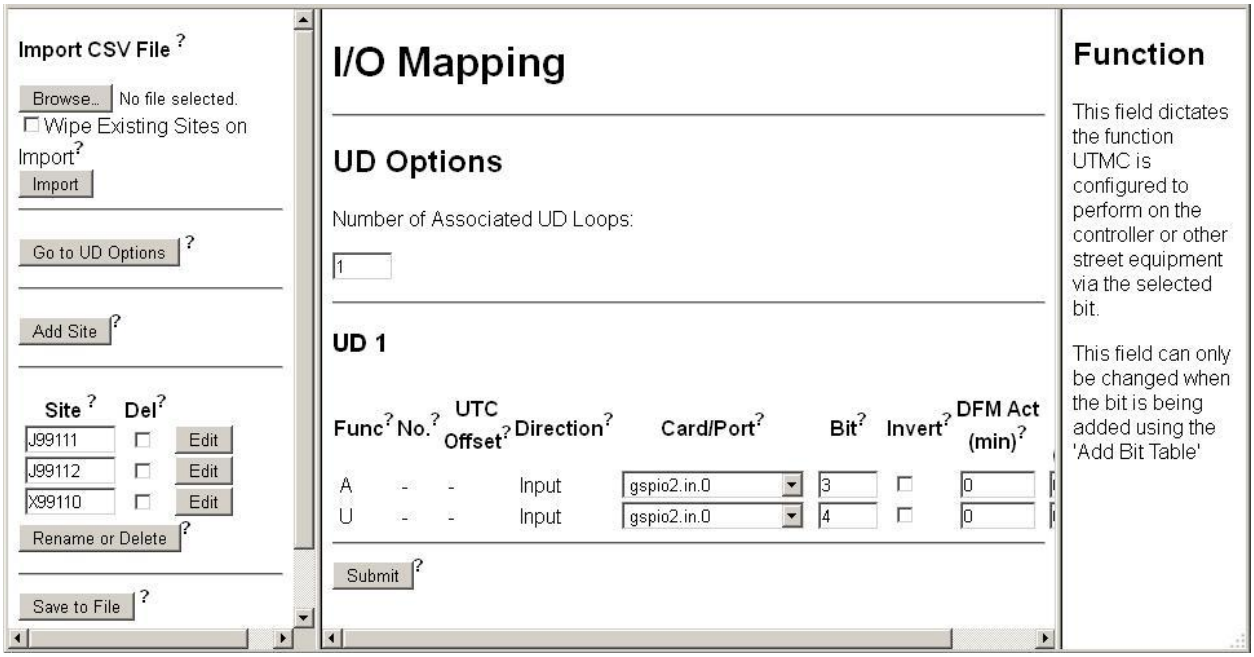
On the 1st I/O board, input 2 will be defined as:
Card/Port **gspi1.in.0**, Bit ID **2**

On the 1st I/O board Input 17 will be defined as:
Card/Port **gspi1.in.2**, Bit ID **1**

On the 2nd I/O board Output 13 will be defined as:
Card/Port **gspi2.out.7**, Bit ID **5**

On the 3rd I/O board Input 48 will be defined as:
Card/Port **gspi3.in.5**, Bit ID **8**

2.6.3 Uni-Direction Loops



Number of Associated UD Loops

Enter the number of Uni-direction units required and then press 'Submit'. The UD units are numbered automatically from 1 upward.

UD Facility

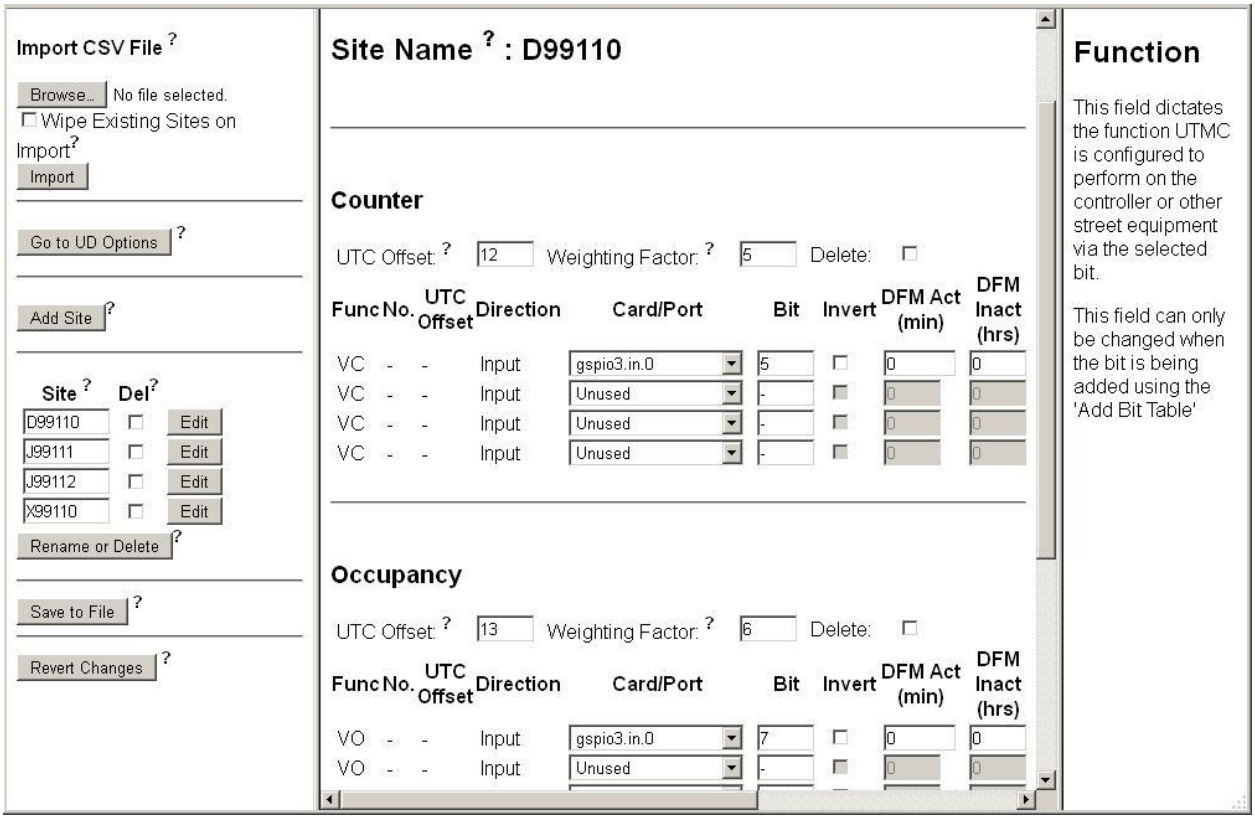
Each UD unit comprises an A-loop and a U-loop. The A-loop is the main loop and is installed so that traffic travelling in the normal forward direction will activate the A-loop first. The U-loop is installed so that traffic travelling in the reverse direction will activate the U-loop first.

The output of the UD unit is activated only if the vehicle is travelling in the normal forward direction.

Where it is required to monitor the reverse direction as well, then an additional UD unit can be configured with A and U loop inputs swapped over.

The output of the UD unit can be mapped to SCOOT, vehicle counting, vehicle queue and vehicle occupancy functions by selecting the UDn entry in the Card/Port field.

2.6.4 Count and Occupancy Loops



?

Pressing the '**?**' next to a field will bring up help text in the right-hand window pane.

Counter

One Counter function (VC) can be configured for each site which has been created on the OTU. The count bit changes state each time a certain number of vehicles, determined by the Count Weighting Factor, have been detected.

The simplest Counter function has a single input configured, which would count on a single lane (N-counting). Three inputs can be configured for counting the vehicles on two lanes together (N+1 counting). This arrangement handles vehicles which straddle both lanes by special placement of the loop detectors and provides a more accurate count. Also, four inputs can be configured for counting the vehicles on three lanes.

A count input can be mapped to a UD unit output (see section **Error! Reference source not found.**).

Count Weighting Factor

The Count Weighting Factor is used to define the number of counts required to cause the reply bit to change state, as shown in the table below. The value required depends on the maximum vehicle flow rate at each count site. Generally a weighting factor of approximately twice the maximum flow will be required. The value needs to match that configured at the instation.

Weighting Factor		Count for Reply Bit Change
1	-	1

2	-	2	
3	-	4	
4	-	8	
5	-	16	(default)
6	-	32	
7	-	64	
8	-	128	

Occupancy

One Occupancy function (VO) can be configured for each site which has been created on the OTU. The reply bit changes state when a certain vehicle occupancy has been accumulated, as determined by the Occupancy Weighting Factor.

The simplest Occupancy function has a single input configured, which would monitor occupancy on a single lane (N). Three inputs can be configured for monitoring occupancy on two lanes together (N+1). This arrangement handles vehicles which straddle both lanes by special placement of the loop detectors and provides a more accurate occupancy data. Also, four inputs can be configured for monitoring three lanes.

An occupancy input can be mapped to a UD unit output (see section **Error! Reference source not found.**).

Occupancy Unit Weighting Factor

This is used to define the number of internal occupancy counts required to cause the reply bit to change state. The internal count rate is 25 Hz for 100 percent occupancy so a weighting factor of 6 is normally used, giving a change of state every 1.28 seconds max, representing 100 percent occupancy. The value needs to match that configured at the instation.

Weighting Factor		Change Rate (sec) at 100% Occupancy	
1	-	0.04	
2	-	0.08	
3	-	0.16	
4	-	0.32	
5	-	0.64	
6	-	1.28	(default)
7	-	2.56	
8	-	5.12	

2.6.5 Queue Loops

One Queue function (VQ) can be configured for each site which has been created on the OTU. The Queue function has a single input.

Call Delay

Period in seconds for which a loop must be active before a queue is deemed to exist and the VQ reply bit set to ‘1’.
Range from 0 to 300 (i.e. 5 minutes). Default 3 seconds.

Cancel Delay

Period in seconds for which a loop must be inactive before a queue is deemed no longer to exist and the VQ reply bit cleared to ‘0’.
Range from 0 to 300 (i.e. 5 minutes). Default 3 seconds.

3 Platform Specific Information

3.1 Integral UTMC OTU and MOVA on the ST950

On the ST950 platform, MOVA runs as a separate controller mode and the MOVA forces and confirms are defined separately from the UTC forces and confirms.

The MR, ML and MF reply bits are not driven automatically. If they are required, then IC4 special conditioning instructions are needed to control the replies. See ST950 MOVA 7 Handbook for details.

3.2 Using Gemini Semi-Integral UTMC OTU with ST950

Generally, it is recommended that the OTU facility is provided by the ST950 internal OTU. However, where it is required to install an ST950 controller with a Gemini 2 (or Gemini 3) Semi-Integral UTMC OTU, the following points should be noted:-

- Two network points should be provided; one for the Gemini OTU and one for the ST950.
- The ST950 web pages will contain features for the internal OTU - these should be ignored and the Gemini OTU web pages used instead.
- The Gemini OTU will extract and display the controller's “ST900-style” rolling LOG on its web pages. This will only be a subset of the total fault information, so it is better to use the ST950 System Log for more comprehensive log information.
- There are two Fault Tables – one for the Gemini OTU and one for the ST950.
- There are two System Logs – one for the Gemini OTU and one for the ST950.
- If MOVA is also required, the MOVA facility in the Gemini OTU must be used (or else both MOVA and OTU can be configured as ST950 integral facilities, removing the need for the Gemini OTU completely).
- For systems with an OSS, there will be two entries at the OSS – one for the Gemini OTU and one for ST950.
- The Gemini OTU will be unable to retrieve the IC4 configuration file from the ST950 controller. The ST950 controller configuration file can be exported directly from the ST950 via the ST950 web interface.
- The Gemini OTU will fetch timing data (min times, max times etc) from the controller as for the ST900. However, this is a legacy facility and does not cover all of the ST950 controller timing data items. It is recommended that the ST950 web pages are used to view and change the controller timing data instead of using this facility.

3.3 Stratos Outstation Specific Information

3.3.1 Procedure for Wiping Configuration and Un-installing Firmware

There are two levels of initialisation, each of which is described below. It is important to follow the procedure correctly to activate the desired level of initialisation.

Configuration Wiping
This initialisation sequence will completely erase all working data, system logs, site logs and configuration settings.

CAUTION: Wiping will completely initialise the unit, clearing all working data, system logs, site logs and configuration settings. Once a unit has been wiped, remote access to it is lost and it will need to be re-configured locally to restore network access.

Any system backups which have already been created on the Heart mass storage device are not affected by the configuration wipe, and so can be used to restore all the files to that point if required.

Un-installing Firmware
This initialisation sequence will perform a configuration wipe as described above and in addition, the application firmware will be un-installed and the unit will return a base level of execution.

CAUTION: Do not follow this sequence without having a means of reprogramming the unit with new firmware e.g. USB stick image.

1. Ensure the unit is powered off.
2. Press and hold the reset button located in the middle of the CPU card, slightly toward the rear.
3. Power on the unit.
4. Continue to hold the reset button (while the red “BUSY” LED starts flashing) until the red “BUSY” LED is illuminated and steady – this takes approximately 15 seconds.

5. Release the reset button briefly and then press it again.
6. Continue to hold the reset button until either:-
   - after 5 seconds, **one** green CPU LED is illuminated and steady – **for configuration wiping**

   - after 10 seconds, **both** green CPU LED’s are illuminated and steady – **for firmware un-install**

7. Release the reset button.
8. The unit will now reboot and perform the initialisation.