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SYSTEM/PROJECT/PRODUCT: 3U Traffic Outstation

SIEMENS
3U TRAFFIC OUTSTATION HANDBOOK

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Function: Engineer

THIS DOCUMENT IS ELECTRONICALLY HELD AND APPROVED

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SAFETY WARNINGS

In the interests of health and safety, when using or servicing this equipment, the following instructions must be noted and adhered to:

(i) Only Skilled or Instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical or electronic equipment are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at work Regulations 1989 and the relevant Highways Agency (DoT) procedures of test and maintenance.

(ii) Such personnel must take heed of all relevant notes, cautions and warnings in this hand book, and any other documents and handbook associated with the equipment including, but not restricted to, the following:

(a) The equipment must be correctly connected to the specified incoming power supply.

(b) The equipment must be disconnected/isolated from the incoming power supply before removing protective covers or working on any part from which protective covers have been removed.

(c) The equipment contains batteries that must be disposed of in a safe manner. If in doubt of the correct procedure, refer to the Siemens instructions.

MP 5/07/98 Issue 2

Maintenance Provision (MP)

1. Product Reference

Siemens Remote Monitoring System Outstation Monitoring Control Unit (RMS OMCU)
Siemens Car Park Count OMCU
Siemens Bus Processor
Siemens MOVA Unit

2. Specifications

The Outstation Monitoring Unit is design to meet the following Highway Agency specification:

MCE 0152A

3. Installation and Commissioning

Methods of Installation and Commissioning are detail in the Siemens Traffic Controls document:

667/HB/26568/000 Siemens 3U Traffic Outstation Handbook

4. Spares and Maintenance

All maintenance and repairs should be carried out in accordance with the Siemens Traffic Controls document:

667/HB/26568/000 Siemens 3U Traffic Outstation Handbook

5. Modifications

There are no approved modifications, with the exception of those listed in the following Siemens Traffic Controls document:

667/HB/26568/000 Siemens 3U Traffic Outstation Handbook

6. **Warning**

Use of components other than those permitted above or modifications or enhancements that have not been authorised by Siemens Traffic Controls may invalidate Statutory Approval of this product.

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1. INTRODUCTION

1.1 PURPOSE

This document is intended to provide sufficient information to the user to install, configure and maintain the 3U Traffic Outstation, either as a Siemens RMS OMCU, a Bus Processor or a Siemens MOVA unit.

1.2 SCOPE

This document covers the Siemens OMCU, Bus Processor and MOVA units.

This document does not include any details about the MOVA strategy or how to set up the MOVA configuration. For details about the MOVA strategy and for more information about the operation of the MOVA unit, refer to the MOVA documents listed below.

1.3 RELATED DOCUMENTS

RMS Instation Users Handbook 667/HB/26131/000

RMS DUSC Users Handbook 667/HB/26131/100

TC12 Installation, Commissioning and Maintenance Handbook .. 667/HE/43100/000

Monitoring and Control of Traffic control equipment via the PSTN..... MCE 0152

TRL MOVA Traffic Control Manual.....AG10

TRL MOVA Data Set-Up Guide AG11

TRL MOVA Equipment User Guide.....AG12

Installation Guide for MOVA (Issue B, December 1999) .....MCH 1542

1.4 ABBREVIATIONS

AC - Alternating Current
CCITT - Committee Consultatif International de Telegraphie et Telephonie
CLF - Cable-less Linking Facility
CPU - Central Processing Unit
DC - Direct Current
DUSC - Dial Up Strategic Control
GSM - Global System for Mobile communication
I/O - Input and Output
LAN - Local Area Network
LED - Light Emitting Diode
LMU - Lamp Monitoring Unit
MOVA - Microprocessor Optimised Vehicle Actuation
OEM - Other Electrical Manufacturers
OMCU - Outstation Monitoring Control Unit
OTU - Outstation Transmission Unit
PCB - Printed Circuit Board
PROM - Programmable Read Only Memory
PSTN - Packet Switched Telephone Network

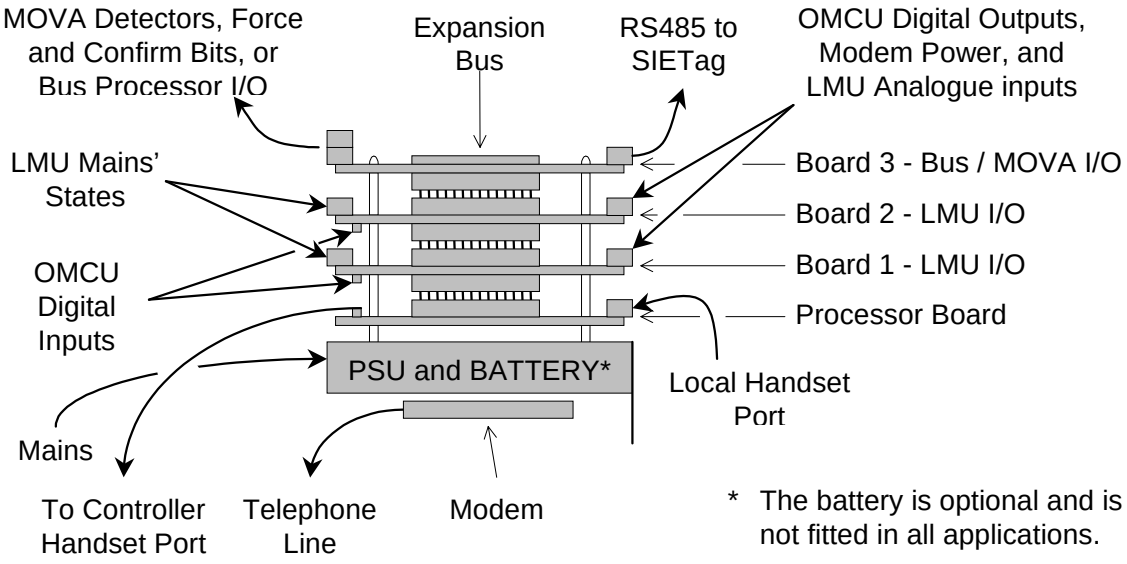
PSU	-	Power Supply Unit
RAM	-	Random Access Memory
RMS	-	Root Mean Square **or** Remote Monitoring System
TCSU	-	Traffic Control and Systems Unit
TRL	-	Transport Research Laboratory
VC	-	Vehicle Classification

2. PRODUCT DESCRIPTION

2.1 INTRODUCTION

Figure 1 shows an overview of a Siemens Traffic Outstation (shown with 2 LMU I/O boards and a single Bus / MOVA I/O board) and how it connects as a system.

Figure 1 - Overview



Important ***Board 1 must be fitted at the bottom of the stack and where both LMU I/O boards and Bus / MOVA I/O boards are required, the LMU I/O boards must be fitted first. However, early versions of the OMCU were arranged with I/O board 1 at the top – no change is required to these units.***

The Siemens Traffic Outstation provides a number of different facilities depending on the firmware fitted:

PB680 firmware provides the RMS OMCU, DUSC, Flow, Occupancy, OMCU Events and Switch Override, and Bus Processor applications or the Car Park Count application.

PB681 firmware provides the Siemens TRL MOVA application along with the RMS OMCU and Bus Processor applications (in issue 10 onwards).

The RMS OMCU application monitors TR0141 intersection and 'mid-block' (or 'stand-alone') pedestrian controllers and most pre-TR0141 traffic controllers. It reports back faults and status of both the Traffic Controller and the OMCU itself to the Instation. The configuration for the intersection to be monitored is downloaded from the Instation to the OMCU. See section 4.1 for more information on the OMCU application.

The DUSC application has the same facilities as the RMS OMCU application, but can also control traffic controllers via timetable events (e.g. Introduce a plan at 9am

on Monday, and isolate the plan at 6pm on Friday). See section 4.2.9 for more information on the DUSC application.

The Flow application can be connected to up to 16 detectors. Each detector can provide flow data over a configured period of time. If the flow data meets the 'up threshold', a flow alarm is raised. If the flow data meets the 'down threshold', the flow alarm is cleared. Flow data is stored in the 'Operations Log', and can be uploaded to the RMS Instation. See section 4.2.10 for more information on the Flow application.

The Occupancy application can be connected to up to 16 detectors. Each detector can provide occupancy data over a configured period of time. If the occupancy data meets the' up threshold', an occupancy alarm is raised. If the occupancy data meets the 'down threshold', the occupancy alarm is cleared. Occupancy data is stored in the 'Operations Log', and can be uploaded to the RMS Instation. See section 4.2.11 for more information on the Occupancy application.

There are up to 16 OMCU Events, which are inputs to the OMCU and 16 Switch Overrides, which are outputs from the OMCU. The OMCU Events are monitored and when they meet predefined conditions a message is sent to the Instation. The Instation can then make a decision as to whether a new plan and/or switch should be introduced (Switch Overrides). By adjusting plans and/or switches at adjacent traffic junctions the traffic flows within an area can achieve an increased flow capacity. Switch Overrides are activated by the Instation when an OMCU Event has been reported. A Switch Override will remain active for a fixed period of time, or until cancelled by the Instation. See section 4.2.12 for more information on the OMCU Events and Switch Overrides.

The Bus Processor application can be connected to up to 12 SIETAG readers and provides both logging and access control functions. See section 4.2.5 for more information on the Bus Processor application.

The MOVA application is a new strategy for control of traffic light signals at isolated junctions. See section 9 for more information on the MOVA application.

The Car Park application determines the current occupancy of a car park and sends this to a 'SIESpace' Instation over a PAKNET communications interface. This information can then be used by the Instation to guide vehicles to car parks that have spaces. See section 10 for more information on the Car Park application.

All of the applications within a unit (except the Car Park application) can be used simultaneously; limited only by the number of I/O boards that can be accommodated.

The hardware platform is a self contained unit consisting of a CPU board that is microprocessor based, one or more I/O Boards, the PSU, and optionally a Modem and Battery if required (see Figure 1 overleaf).

Where a Modem is present, it can be connected through a land line to the PSTN or via a GSM 900 digital network. The unit can be communicated with and will report back faults via the PSTN or GSM. When a modem is not present, all Instation functions are available locally via a local RS232 'handset' port. The platform has the facility to share a PSTN connection with other compatible equipment. The GSM version of the unit is available for situations where a PSTN connection is not available or is not cost effective (see sections 2.6.2 and 4.2.9).

The unit is mains powered and can be fitted with a battery to support the unit in the event of a mains failure, which allows it to dial the Instation to report the mains failure.

The complete unit fits within a Traffic Controller's Roadside Cabinet. It is designed to fit within an existing 3U detector rack, in an additionally supplied 3U rack, or directly onto the rack mounting uprights. It can be mounted in an Ancillary housing if necessary.

When fully configured it occupies 192mm of a standard 3U rack, and is of a modular design. The boards are interconnected by way of an expansion bus and up to 3 I/O boards may be fitted. The main features of each individual board, assembly and the expansion bus are highlighted in the following sections.

This Unit meets all the Environmental and EMC requirements as specified in section 2.3 of MCE 0152A, and specifications TR2130A and TRG1068A.

2.2 Siemens Traffic Outstation Equipment

The Siemens OMCU (667/1/28850/000) together with the OMCU cables 667/1/28852/000, is capable of monitoring a Traffic controller with up to 16 phases and up to 48 digital inputs. It can also control a number of isolated outputs.

The OMCU normally uses one or more LMU I/O boards each providing up to 10 lamp monitor channels, 16 digital inputs, and 4 digital outputs. An alternative I/O board providing 4 RS485 communication channels, 48 digital inputs and 16 digital outputs may also be fitted. This board is primarily used by the Bus Processor and MOVA applications and thus is known as the Bus / MOVA I/O board.

A number of optional kits are available which, when added to the Basic OMCU, allow connection to any Controller. MOVA and BUS Processing kits are also available. The sections 2.2.1 to 2.2.3 that follow show the combinations of facilities and the way the components are connected.

2.2.1 Basic OMCU

The Basic OMCU (667/1/28850/000) can be used with an ST700 or ST800 Controller. See Figure 2 below for details.

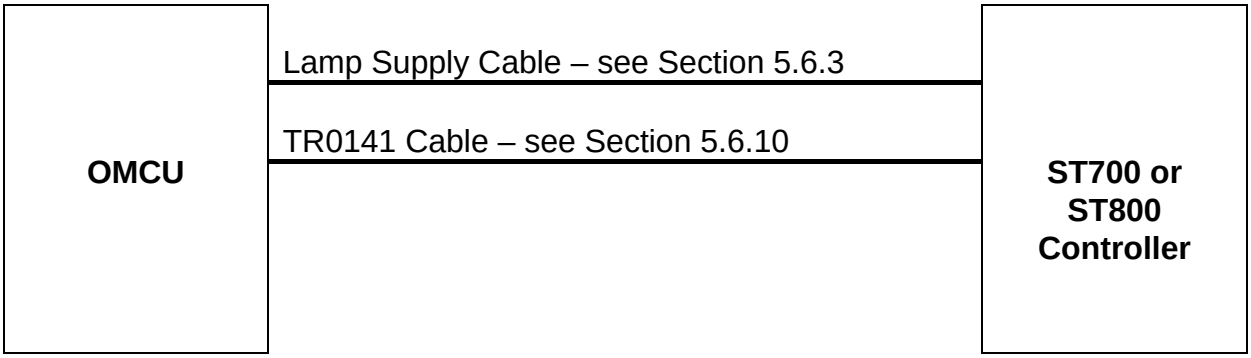


Figure 2 - Basic OMCU to ST700 or ST800

For connection to other Controllers, use the OMCU/LMU I/O Cables kit (667/1/28852/000). If additional I/O is required, also add the OMCU/LMU I/O Board and Cables kit (667/1/28853/000).

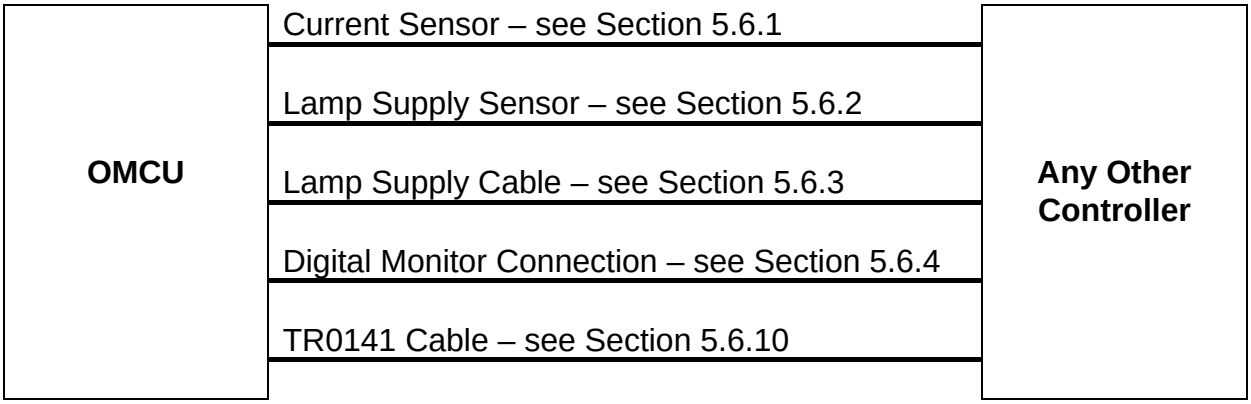


Figure 3 - Basic OMCU to Any Other Controller

2.2.2 MOVA

The MOVA Kit (667/1/28851/000) converts a standard OMCU into a MOVA unit. The MOVA firmware replaces the OMCU firmware.
See Figure 4 below for details of the MOVA connections to an ST700 or ST800 Controller; connections to all other controllers are shown in Figure 5.

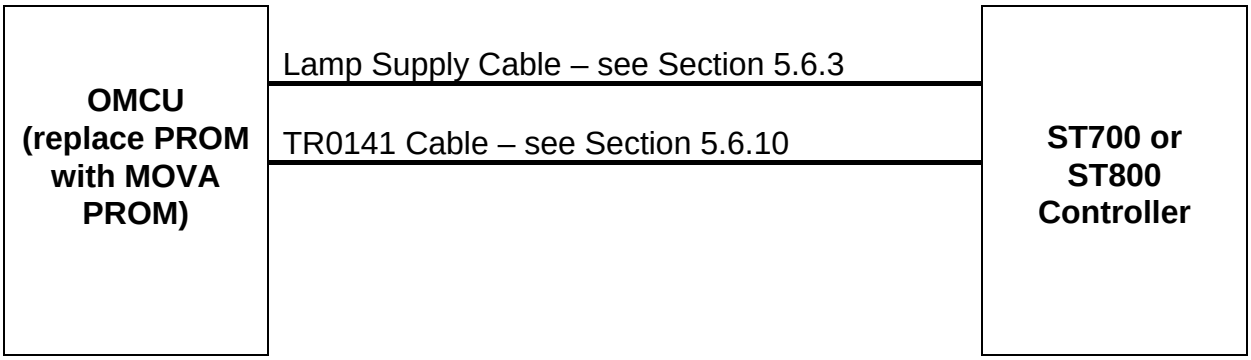


Figure 4 – MOVA to ST700 or ST800

The MOVA unit described in Figure 4 may be used with other types of Controllers by adding the MOVA I/O All Controller kit (667/1/28855/000).
If OMCU functionality is required in addition to MOVA, also add the cable kit(s) described in Figure 3.

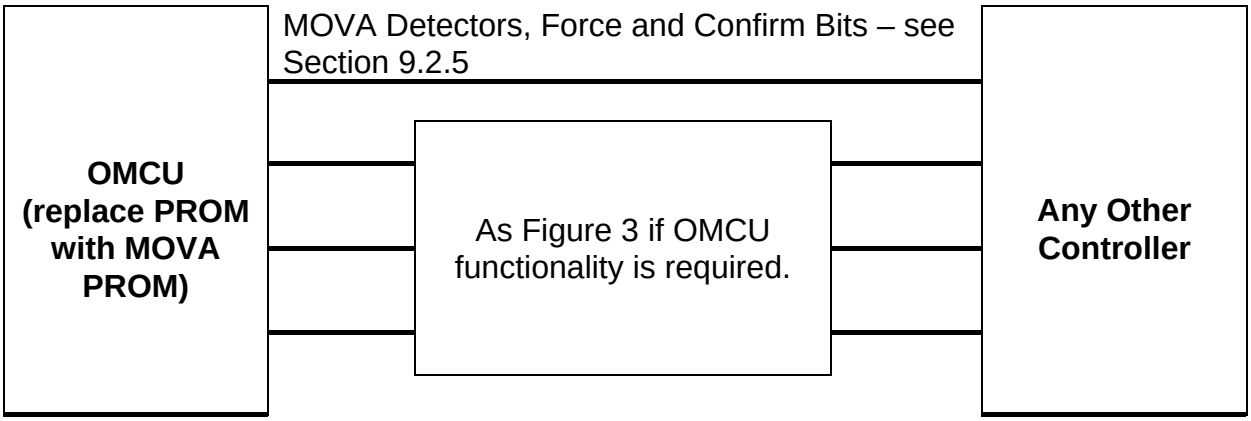


Figure 5 - MOVA to Any Other Controller

2.2.3 BUS Processing

Bus Processing may be performed by adding the Bus PCB and Cable kit (667/1/28856/000) to the Basic OMCU. If OMCU functionality is also required, also add the cable kit(s) described in Figure 3.

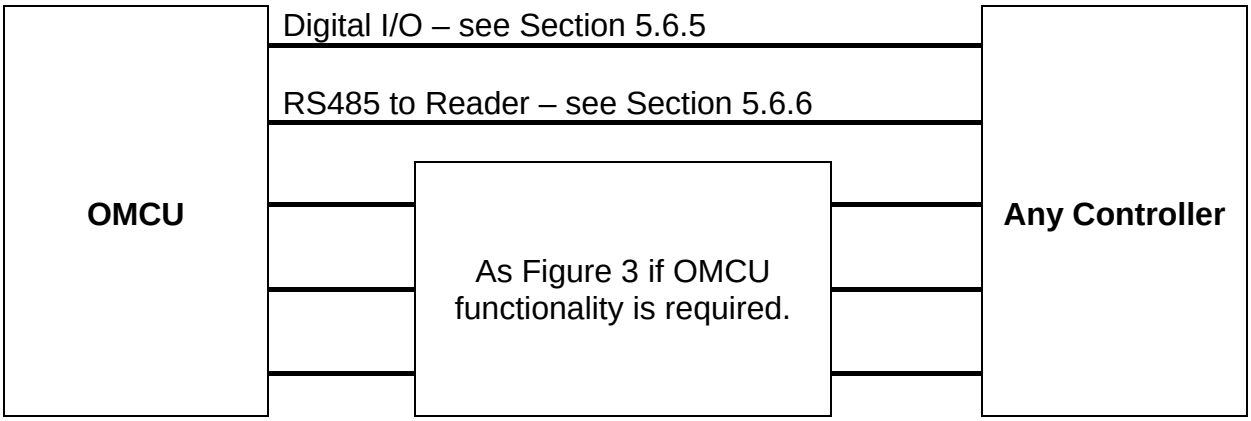


Figure 6 – BUS Processing to Any Controller

2.3 PROCESSOR UNIT

This is a 3U 220mm long, 100mm wide and 17mm high extended Eurocard. It is a multi-layer PCB, using mostly surface mount components. It provides the processing power required by the unit. The processor unit is based on IBM's Power PC range of 32-bit microprocessors (403GA) with highly sophisticated on-chip peripheral capabilities. This, along with the dual channel communications device (Siemens ESCC2 SAB82532-2) and an extensive use of surface mount devices has ensured denser system construction, with high performance.

The board provides the expansion bus that extends the system using one, two or three I/O boards. For details see section 2.8 on page 21.

2.3.1 Processor Unit's Features

(a) Battery backup of the entire RAM (see Section 7.6.3(b) on page 88). For Bus Processor applications this board also provides capacitive support allowing the RAM backup battery to be changed without loss of data.
(b) The Expansion Bus for fast board to board data transfers. The CPU board can address up to 3 I/O boards.
(c) Three programmable RS232 Serial communications Ports:
- Handset Port.
- Traffic controller TR0141 Port.
- Modem Port.

(d) Battery backed-up Real Time Clock. This may be enhanced by the connection of a Radio Clock that synchronises the internal clock with time transmitted by the MSF Rugby transmitter (or optionally by the connection of a GPS receiver to the MCE141 serial port (or RS485 serial port on a Bus / MOVA IO board)).
(e) Firmware PROM (either PB680 or PB681, see page 12)
(f) Power Fail (low voltage inhibit)
(g) Watchdog monitor
(h) Processor error indication

(i) Voltage Regulation (allowing a range of DC input)
(j) Status LED indicators (also see section 7.3 which starts on page 83)
(k) Power dissipation less than 100 mW.

2.4 LMU I/O BOARD

This is a 3U 220mm long, 100mm wide and 14mm high extended Eurocard. It is a multi-layer PCB, using mostly surface mount components. When required for OMCU monitoring, up to three LMU I/O boards may be fitted to meet the entire controller's monitoring requirements. I/O boards access the processor board by way of the Expansion Bus, see section 2.8 on page 21 for more details.

This board provides the power for the modem, with a choice of three different voltages offered.

A Zero Cross Over circuit provides timing to the software, for the mains based monitoring signals.

Finally there is a modem sharing circuit which allows two systems within the controller cabinet to share a modem to the PSTN.

2.4.1 LMU I/O Board Features

Each I/O board has the following features:

(a) 10 High Voltage Photo-coupled Isolated Inputs (Controller mains supply and green and wait voltages).
(b) 16 Low Voltage Photo-coupled Isolated Inputs (Detectors, Micro Switches and logic signals)
(c) 10 Analogue Inputs, surge protected (voltage and current Monitoring by way of voltage monitoring transformers and toroidal coils).
(d) 4 Isolated Relay Outputs with current limit (series 182 Ω resistors) on the first three outputs.
(e) Expansion Bus connection
(f) Modem Sharing Circuit (future enhancement)
(g) Modem Power supply Selection Circuit (choice of three supplies)
(h) Power dissipation less than 50 mW.
(i) 5V Failing Warning Circuit (monitors the battery supported DC input supply for a low level).
(j) Zero crossover Circuit (mains' timings).
(k) Board address decoding (board expansion facilities).

2.5 BUS / MOVA I/O BOARD

This is a 3U 220mm long, 100mm wide and 18mm high extended Eurocard. It is a multi-layer PCB, using mostly surface mount components. When used for Bus Processor or MOVA applications, the unit can be fitted with up to three Bus / MOVA I/O boards. If OMCU monitoring functions are also required, then a mix of LMU I/O boards and Bus / MOVA I/O boards can be fitted. I/O boards access the processor board by way of the Expansion Bus, see section 2.8 on page 21 for more details.

This board provides four RS485 communications links enabling communications with RS485 based equipment such as SIETAG and optionally the GPS receiver.

The 48 digital inputs and 16 digital outputs meet the TR0141 specification and thus provide MOVA and DUSC with its stage force bit outputs to, and confirm inputs from, any traffic controller configured with a UTC/MOVA/DUSC interface. It also provides MOVA and DUSC with its detector inputs that can be connected in parallel to the controller.

This board also provides the power for the modem, with a choice of three different voltages offered. Unlike the LMU I/O board which uses one of its digital output relays to switch the modem power, the Bus / MOVA I/O board has this switching capability built in.

2.5.1 BUS / MOVA I/O Board Features

Each I/O board has the following features:

(a) 4 x RS485 Channels (Bus Beacon and Radio LAN Interfaces)
(b) 48 x TR0141 Digital Inputs (MOVA Detectors and Stage Confirm Inputs)
Note. When this board is configured as I/O board 1, the last four inputs are reserved and should not be used.
(c) 16 x TR0141 Digital Outputs (relays) with current limit (182Ω resistors)
(d) 2 of the 16 outputs can be switched down to 22Ω
(e) Expansion Bus connection
(f) Modem Power supply selection circuit (choice of three supplies)
(g) Power dissipation less than 2.5W when not supplying a modem (up to 3.6W when supplying the modem via the 5V supply and up to 5.3W supplying the modem via the 13.65V supply)
(h) 5V Failing Warning Circuit (monitors the battery supported DC input supply for a low level)
(i) Board address decode (board expansion facilities)

2.6 THE MODEM UNIT

There are two options available, a PSTN modem or a GSM modem unit.

2.6.1 The PSTN Modem Unit

This is an OEM unit for communication on the PSTN or private circuit.

(a) Hayes 'AT' compatible
(b) Auto dialling pulse and tone
(c) Auto answering
(d) CCITT from 300 bit/s up to 33,600 bit/s
(e) Powered from the DC supply from the first I/O board
(g) On line status indicators

2.6.2 The GSM TC35 Modem Unit (option)

This replaces the M20 GSM Modem which is lo longer available.

This modem is a dual band GSSM900/1800 unit but limitations of the aerial restrict it's use in this application to the GSM900 network (Vodaphone or Cellnet).

To use the GSM OMCU the Instation must be equipped with the PACE PCM33.6 or the Dynalink PK5-5600 Modem. See section 8.4.3 for compatibility details. Note that new or additional Instation modems may be required to support the GSM OMCU alongside other 5U and 3U units.

The user is responsible for setting up airtime agreements with their chosen network supplier, ensuring that there is adequate signal coverage at the site and obtaining the appropriate SIM card, which must be as follows:

SIM Card
3V type
Phase 2
Data only
PIN Disabled

If a GSM OMCU is used, an aerial must be fitted close to the Controller. The aerial feeder is a fixed length of 15 metres. Where no signal pole is available within approximately 8 metres of the controller cabinet, suitable aerial mounting arrangements will need to be provided.

The OMCU firmware should be PB680 issue 7 or later.

There is one LED on the TC35 GSM unit. When the TC35 is powered the LED will flash; the LED comes on permanently once a GSM service is recognised.

See drawing 667/CF/26598/010 in Appendix B for installation and set-up instructions.

Note that the issue of the TC35 firmware must be 4.0 or above. To determine the issue of the firmware connect the 9 pin port on the TC35 to a PC serial port running a terminal emulator. Set the PC to 2400 bits per second, 8 bits no parity, 1 stop bit. Press the return key several times followed by ati<return> The TC35 should reply with:
Siemens
TC35
Revision 4.0
OK

2.7 THE POWER SUPPLY UNIT (PSU)

This is a 127mm long, 76.2mm wide and 37mm high OEM unit, which supplies the system with +13.65V. The OMCU uses an optional float charged battery held within the PSU case to provide total system backup in the event of mains' failure.

2.7.1 The Power Supply Unit (PSU) Features

(a) Wide range of AC input voltage
(b) 3000V isolation from the mains
(c) Can be fitted with a single 12V sealed lead acid battery (see section 7.6.3(a) on page 88)
(d) Automatic switching to the battery support in the event of mains failure to the system
(e) Automatic recharge on restoration of mains supply to the system
(f) 3 years minimum battery life (also see section 7.4 on page 85)

2.8 THE EXPANSION BUS

This is a set of 64 way plugs and sockets. Each board in the system has a connector fitted that passes through the PCB and becomes a socket on the component side and a plug on the solder side. The boards connect using these sockets and plugs through an additional connector, starting with the processor, by plugging an I/O board into its socket, then an I/O board into the I/O's socket and so on.

All boards provide buffering for Address, Data and Control signals and also distribute the logic supplies.

2.8.1 The Expansion Bus Features

(a) 24 Address lines
(b) 16 Data Lines
(c) 15 Control Lines
(d) +5V supply
(e) 13.65V Supply (Battery supported when optional battery fitted)
(e) Mechanical fixing at 25.4mm spacing
(f) "Plug able" (to allow expansion)

3. SPECIFICATIONS

3.1 INTRODUCTION

The following sections describe the full Electrical, Mechanical, Environmental, Isolated Outputs, Isolated Extra Low Voltage Inputs, Isolated Low Voltage Inputs, Analogue Inputs and Communications specifications of the unit.

3.2 ELECTRICAL

3.2.1 Mains Supply

Normally the unit is powered from an auxiliary mains supply provided within the controller. In controllers without this facility or if this is not convenient, a suitable alternative mains supply must be provided, being careful not to compromise the safety of the controller (Refer to Engineering if in doubt).

Voltage: 230V AC RMS, +15% to -20%

Frequency: 46 - 54 Hz

Mains fused: The recommended rating of this external fuse is 2A anti-surge. (The mains cable is rated to 6A, fuses up to 5A may be used)

3.2.2 Power Supply

The unit incorporates its own internal power supply unit that provides the necessary supply voltages to all of the boards and assemblies associated with the complete unit. The boards are designed and implemented to operate from a single voltage regulated supply.

Output Supply: Regulated 13.65V DC

Rating: 3.15A

Powering: Processor board, I/O board(s), Modem and Charging the Battery

3.2.3 Power Dissipation

Low power CMOS devices are used throughout the unit to keep the power dissipation as low as possible.

Total power consumption: 8.0 W typical (using maximum configuration of 3 I/O boards and battery float charging)

3.2.4 Support Batteries

The unit can be fitted with two rechargeable batteries.

The first is the optional Unit Support Battery, which supports the entire unit including the modem, for a minimum of four minutes under all conditions in order that the OMCU may inform the Instation of a mains power failure.

Note that some units, e.g. MOVA only units, do not require and will not be shipped with a Unit Support Battery.

The other, the RAM Battery, is always fitted and supports the RAM memory and the Real Time Clock during power failures for an excess of 7 months. On Issue 4 and later CPU boards this battery is plug-able to allow easy replacement.

Newer processor boards include a 'Gold Cap' capacitor that allows the RAM battery to be changed without loss of RAM data. The Gold Cap device provides a minimum of 30 minutes support.

The two batteries have the following specifications:

Battery	Type	Support
Unit Battery	12V Lead Acid	20 minutes (Typical)
RAM Battery	Nickel Metal Hydride 418/4/39820/000	In excess of 7 months after the Unit Support battery of 20 minutes has expired.

3.3 MECHANICAL

The construction of the unit is based on the standard 3U high, IEC297 Eurocard rack system. The unit does not use the conventional back plane approach. Instead it uses an expansion bus (see section 2.8 on page 21), to interconnect the boards electrically. It does not require the rack to have guide rails, but if present they need to be on 25.8mm spacing. Mechanically the boards are held in a stack, by four sets of pillars and fixings, and held in place on a mounting plate. The mounting plate, also accommodates the Modem and PSU assemblies, and is used to fix the total unit assemblies to the 3U rack, or cabinet mounting side angle bracket.

3.4 ENVIRONMENTAL

Temperature: -15°C to +60°C ambient

Humidity: 20% to 95% non condensing at 40°C

3.5 ISOLATED OUTPUTS

The I/O boards are each equipped with a number of relay isolated outputs, four normally open contacts on an LMU I/O board and 16 change-over contacts on a BUS / MOVA I/O board. The following describes the electrical characteristics of these outputs:

	LMU I/O Board Output	MOVA I/O Board Output
On Output Impedance	182Ω ± 1%, 0.5 Watts *	182Ω ± 1%, 0.1 Watts †
Off Output Impedance	100kΩ min.	100kΩ min.
Continuous Current Sink	50mA ‡	50mA ‡
Breakdown Voltage	1500V	1500V
Isolated Voltage	1500V	1500V
Relay Type	Normally Open	Change-Over

Notes:
* Only the last three outputs on each LMU I/O board have the series resistor fitted. The first output is used to control the modem power (on the first board only) and so has no series resistor.
† The last two isolated relay outputs (circuits 15 & 16) have a switch that enables the resister value to be selected as either 182Ω or 22Ω (this allows for different applications).
‡ The continuous current sink is limited by the resistors.

3.6 DIGITAL INPUTS

Each LMU I/O board supports 16 fully software configurable photo-coupled extra low voltage isolated digital inputs and each BUS / MOVA I/O board supports 48 TR0141 compliant digital inputs. These digital inputs have the following input electrical characteristics:

	LMU I/O Board 5V Working	LMU I/O Board 24V Working	MOVA I/O Board Inputs
Input Impedance	4700Ω	>12000Ω	4300Ω*
'Off' Threshold	< 1V	< 12V	> 50kΩ
'On' Threshold	> 3V	> 18V	< 600Ω
Recommended Max. Voltage	25.6V	39.4V	n/a
Absolute Max. Voltage	49.4V	49.4V	+1kV / -7V
Isolation Voltage	2500V RMS	2500V RMS	n/a

* Referenced to 13.8V

Each of the LMU I/O board inputs employs an opto Isolator, with additional circuitry to protect against reverse voltages and a degree of current limiting. The inputs are polarity sensitive and one polarity sense give 5V working whilst the other gives 24V working. Also see 5.6.4) Digital Monitor Connections (LMU I/O Board Only).

3.7 ISOLATED MAINS VOLTAGE INPUTS

Each LMU I/O board also supports 10 fully software configurable photo-coupled mains voltage inputs and a fully configured OMCU provides 30 such inputs. The function of these inputs is to provide an isolated means of detection of the presence or absence, of the mains' signal at the phase drive output terminal blocks. The following describes the electrical characteristics of a single input.

Each of the inputs again uses an opto Isolator, with additional circuitry, to protect against reverse voltages, to allow a wide range of mains inputs (including 50 - 0 - 50V AC working for Welsh Office application), also provides current and voltage limiting.

The High Voltage inputs have the following input electrical characteristic:

Input Impedance:	99kΩ
Absolute Max. Applied Voltage:	580V RMS
Min. Voltage to guarantee signal on condition:	40V RMS
Isolation Voltage:	2500V RMS

3.8 ANALOGUE INPUTS

Each LMU I/O board supports 10 fully software configurable analogue inputs. The function of these, when connected to appropriate current sensing toroidal transformers, is to measure the current supply to the lamps, or when connected to the appropriate voltage monitor transformer, measures the true level of the lamp supply voltage (dim or bright). The following describes the electrical characteristics of a single input.

Each of the inputs is multiplexed to an analogue to digital converter. The analogue inputs are designed to work with both the current sensing transformer that will measure currents from 0A to 6A peak (and will accept short term current flows of 12A) and the Voltage monitor transformers, which will measure voltages from 0 to 276V.

Current sensing:	6A peak
Voltage monitor:	9V peak to peak @ nominal mains

3.9 COMMUNICATIONS

The processor board contains three serial RS232 communications interfaces and the first LMU I/O board contains a forth. Each Bus / MOVA I/O board contains four RS485 communications interfaces which are described on the following page.

These interfaces are fully software programmable in terms of their transmission characteristic. The first RS232 Channel has the additional facility in that it can be software configured on the direction of the RS232 interface, i.e. DCE or DTE, in this application it is permanently configured as a DCE in order to connect to a controller's 141 handset port.

The four RS232 communications interfaces are shown on 667/GA/26580/000 sheet 2 in Appendix B and are as follows:

3.9.1 Communications Channel 1 (TR0141 Port)

Location: On back edge of Processor Board (see 667/GA/26580/000 Sheet 2) in Appendix B

Connector Type: 25 Way 'D' Type on the end of a flying ribbon cable connected to Plug PL4.

3.9.2 Communications Channel 2 (Modem Port)

Location: Towards the back edge of Processor Board (see 667/GA/26580/000 Sheet 2) in Appendix B

Connector Type: 25 Way 'D' Type on the end of a flying ribbon cable connected to Plug PL2

3.9.3 Communications Channel 3 (Handset)

Location: On front edge of Processor Board (see 667/GA/26580/000 Sheet 2) in Appendix B

Connector Type: 25 Way 'D' Type mounted on board. See Section 3.9.6 for details.

3.9.4 Communications Channel 4 (Modem Sharing)

Location: On front edge of LMU I/O Board (see 667/GA/26580/000 Sheet 2) in Appendix B

Connector Type: 18 Way Single In Line mounted on board

(Note this port is **not** used by 'MOVA Phone Line Sharing' described on page 108.)

3.9.5 RS485 Communications Interfaces

In addition to the four RS232 communication interfaces, each Bus / MOVA I/O Board includes four serial RS485 communication interfaces located on the 14 way IDC board connector mounted on the front of the board.

Interface: RS485

Isolation: 1000V

Link Type: Master on Multi-drop line

Master Bias: 560Ω Bias Resistors

Line Termination: Two 120Ω Terminating Resistors (selected by switches)

3.9.6 RS232 Handset Interface

Type

RS232C CCITT V24 and V28

Method of Connection

Traffic Outstation – Cannon DP 25-way socket connector
Terminal Device – Cannon DP 25-way plug connector

Pin Allocation

Pin 1 – Protective ground
Pin 2 – Transmit data from terminal to controller
Pin 3 – Received data from controller to terminal
Pin 4 – Request to send
Pin 5 – Clear to send
Pin 6 – Data set ready
Pin 7 – Signal ground
Pin 9 – 5V supply (see below)
Pin 10 – 5V supply (see below)
Pin 18 – 5V supply return
Pin 19 – 5V supply return
Pin 20 – Data terminal ready

Pins 9 and 10 are connected to the Traffic Outstation's 5V logic supply and can supply a maximum of 250mA in total.

Bit Format

START BIT	1	2	3	4	5	6	7	PARITY	STOP BIT
(SINGLE BIT)	(LSB	•	•	•	•	•	MSB)	(EVEN)	(SINGLE BIT)

Baud Rate

1200, 9600 or 19200 Baud – Auto-detect

Mode

Full duplex

Character set

ISO alphabet No. 5 (ASCII)

4. OMCU FACILITIES

4.1 INTRODUCTION

The Siemens 3U Traffic Outstation provides a flexible multi-function hardware and software platform, with sufficient interfaces to allow sophisticated monitoring and control tasks to be developed and executed.

Section 4.2 highlights the facilities available on the 3U Traffic Outstation when used as a Siemens RMS OMCU, Bus Processor or Car Park Count OMCU.

Section 4.2.9 describes the facilities available with the GSM OMCU option.

Section 4.2.9 describes the DUSC facility.

Section 4.2.10 describes the Flow facility.

Section 4.2.11 describes the Occupancy facility.

Section 4.2.12 describes the OMCU Events and Switch Overrides facility.

Section 4.2.13 describes the Vehicle Classification facility.

In addition, the 3U Traffic Outstation may be used as the hardware platform for the MOVA software developed in association with the Transport Research Laboratory. See section 9 which starts on page 101.

4.2 OMCU AND BUS PROCESSOR FACILITIES

The following provides an outline of the facilities supported by the Siemens OMCU. During the configuration process, timing limit, Bus data, DUSC data, Vehicle Classification data, flow data, occupancy data, OMCU Event data, Switch Override data and status check data is downloaded to the OMCU, through the PSTN, to provide the following facilities:

- Signal Lamp monitoring
- Detectors and Push Button monitoring
- Controller Status Checks
- Controller Timing Checks
- DUSC Facility
- Flow Facility
- Occupancy Facility
- OMCU Events and Switch Overrides Facility
- Vehicle Classification Facility
- Local bus priority facilities in association with the Siemens SIETAG reader system or certain TCSU London Bus Priority beacons
- Vehicle selective access control, also in association with the Siemens SIETAG reader system or certain TCSU London Bus Priority beacons

Any fault detected is logged and reported to the Instation identifying the type (i.e. signal lamp or detector, etc.) and location (i.e. Phase A-RED or stage 2 demand, etc.).

Some reported faults are automatically 'cleared' by the OMCU itself; others can only be 'cleared' by manual means at the Instation. The following lists indicate which reports clear automatically.

In addition to the OMCU Fault Log, an Operations Log is also maintained which records all activity related to Vehicle Classification, Bus / Access control actions, Flow statistics and Occupancy statistics. This may be interrogated locally at the OMCU or uploaded to the Instation for further analysis.

Note: Not all of the following will be applicable to every controller.

4.2.1 Signal Lamp Monitoring

Under this category the following is provided:
(a) Signal lamp bulb failure (phase and colour) - automatically cleared.
(b) Wait lamp bulb failure - automatically cleared.
(c) Regulatory Sign tube failure - automatically cleared.
(d) Dim/Bright change failure - automatically cleared.
(e) Pedestrian Flash Failure - automatically cleared.
(f) Switch Sign bulb failure - automatically cleared.
(g) Signal Lamps on or off - automatically cleared.
(h) Signal lamps flashing or not flashing - automatically cleared. (Applicable to export sequences only.)

4.2.2 Detector and Push-Button Monitoring

Under this category the following is provided:
(a) Detector Fault - both stuck active and inactive
(b) Push Button fault - both stuck active and inactive
(c) Dual or Single Fault Timer monitoring - on any selected digital input
(d) Detector Transition Counting
(e) Detector Counting - N and N + 1 algorithms

4.2.3 Controller Status Checks

Under this category the following is provided:
(a) Controller mode, i.e. Manual, Fixed-Time, V.A
(b) Controller Stuck - applicable to Fixed-Time mode only
(c) Controller ignoring demands - including call/cancel and filter demands
(d) Controller mains supply re-applied.
(e) Conflicting Phase Greens
(f) Stage sequencing fault
(g) External signal active, e.g. cabinet door open
(h) TR0141 controller fault log
(i) Controller/OMCU Handset Terminal connected

4.2.4 Controller Timing Checks

(These checks are **not** normally required on a 141 controller)

Under this category the following is provided:
(a) Short Stage Minimum
(b) Short and Long Stage Extensions
(c) Long Stage Maximum
(d) Long Alternative Stage Maximum
(e) Short Phase Inter-green
(f) Long Inter-Stage
(g) Long All-Red
(h) Variable Maximum Timing Log
(i) SDE/SA Extension Request Log

4.2.5 Bus Processor Functions

When used for Bus Processor applications, the unit can be connected to up to 12 SIETAG readers (see section 5.6.6 for wiring) to provide both logging, priority and access control functions.

Vehicles to be given access/priority are fitted with an electronic tag that may be programmed with, amongst other things, vehicle operator identification and individual vehicle number. A loop is located in each access lane, which is used by a reader to interrogate tags as they pass over. Data from the tags is filtered by the outstation which will log the information and can be programmed to output access requests to barriers or other equipment such as Traffic Controllers, via up to 16 isolated relay contacts (expandable to 48 with additional I/O boards).

Several levels of filtering may be configured in each outstation. Filtering options range from specific access just for uniquely identified vehicles through to all vehicles of a particular operator. Access may be restricted by time of day and individual or groups of vehicles may be blacklisted.

The Bus processor is also able to interface to certain City of London (TCSU) bus priority beacons and provides similar facilities to those described for SIETAG above.

The following version of firmware is required for the standard Bus Processor functionality.

	3U unit firmware
Bus Processor :	PB680 issue 6 or later

4.2.5.1 Routing SIETAG Vehicle Detections to an OTU

An overview of the SIETAG OMCU - OTU facility is shown in the following figure.

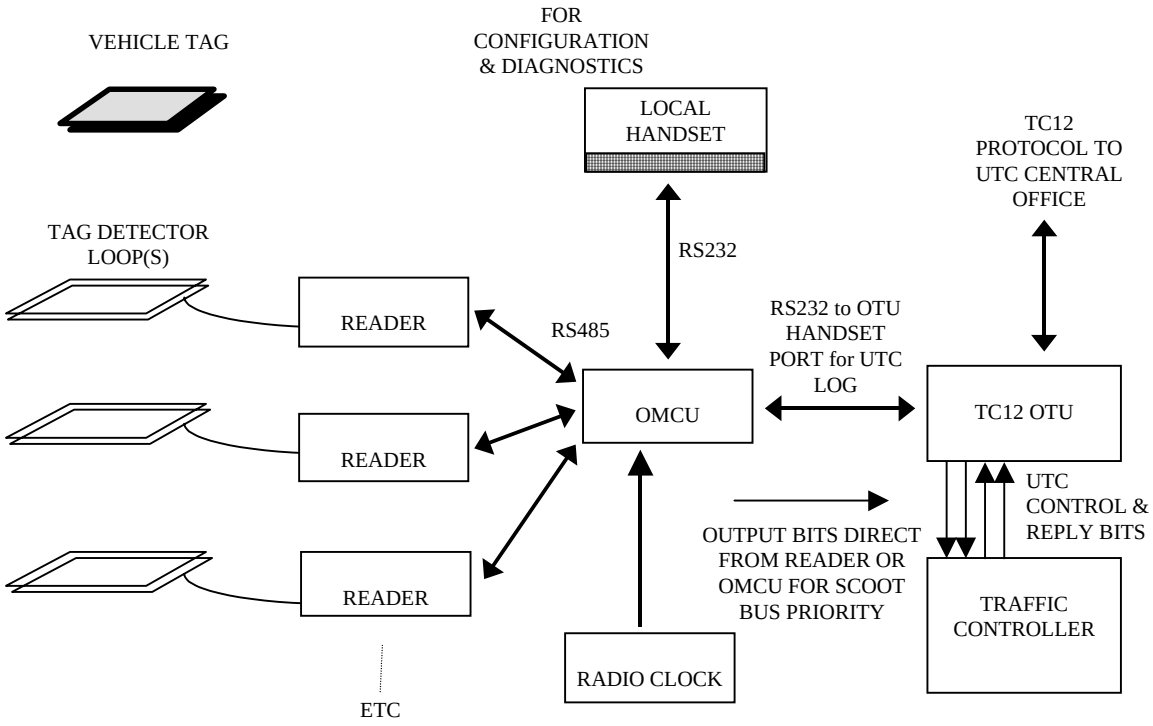


Figure 7 – SIETAG OMCU to OTU

The Bus processor may be locally configured via the handset (LDV=4) to route SIETAG vehicle detections through the 141 serial port to an OTU as a sequence of 13 GED environmental sensor commands. Each set of 13 commands comprises of the original 8 bytes of the vehicle detection, prefixed by a time stamp and the identification of the SIETAG reader that supplied the detection. The SIETAG reader identification must be configured by the user via the handset (using the BID handset command - see section 11.10), otherwise a default of 0 is returned for each vehicle detection, irrespective of the SIETAG reader that supplied the vehicle detection.
NOTE: The Loop number supplied with vehicle detections from V3.3 or later SIETAG readers is not supplied to the OTU.
The data byte accompanying each command is decoded by the OTU and relayed as 16 reply bits to a UTC Instation where the information can be used for applications such a travel times analysis.

This facility uses the standard 141 serial cable 667/1/26579/000 to connect the unit to the OTU handset port.

Once the OMCU - OTU cable is connected and LDV=4 entered, the XXC command can be used to gain access to the OTU handset (XXO is used to revert to the OMCU handset).

The OTU must be appropriately configured to provide the throughput to the UTC using the following handset commands.

Normal OTU configuration parameters, such as:

Mnemonic	Description
GAD	OTU Address
GMM	Line Characteristics of OTU / UTC Link
GNO	Total Number of OTUs on the same OTU / UTC Link
GRW	Number of Reply Bytes (2 required for this application)
GOE	Enable UTC Reply / Control Byte Interface

Plus the following to configure the configure and enable the environmental sensor interface:

Mnemonic	Description
GRL r b = 57	Assign Environmental Sensor Data to Reply Bytes (16 bits), starting at reply byte ‘r’ bit ‘b’
GEC n = 1	Enable Environmental Sensor Channel ‘n’ (repeat for n = 1 to 13)

Details on the use of the OTU handset commands can be obtained from the TC12 Installation, Commissioning and Maintenance Handbook 667/HE/43100/000.

NOTE: When this facility is configured, the unit cannot perform controller monitoring via the 141 serial port.

The following version of firmware is required for the standard Bus Processor functionality plus the routing of the vehicle detections to an OTU.

Bus Processor + SIETAG Vehicle Detections Routed to an OTU :	PB680 issue 12 or later

4.2.6 ST800 Enhanced Link

The ST800 enhanced serial link provides a new high data rate link over the standard 141 cable between the Siemens ST800 traffic controller and the Siemens 3U Traffic Outstation. This link allows the two units to continuously communicate with each other in order to provide a more integrated overall traffic product.

Normally, a Siemens 3U Traffic Outstation requires lots of wires to be connected to various points in the traffic controller to allow the OMCU to monitor and control the controller. This new enhanced link has removed the need for much of the wiring and less wiring not only simplifies the installation, but also should provide a more reliable product – fewer wires mean fewer connections that can fail.

As a more integrated product, the traffic controller provides some of the facilities that previously only the OMCU could provide. The controller performs the lamp monitoring and detector fault monitoring, passing any fault information to the OMCU for reporting to the RMS Instation. The controller’s digital inputs and mains states,

etc. are also passed over the serial link allowing the OMCU and MOVA applications to read them as though they were connected directly to the unit.

For more information on MOVA using the enhanced 141 link, see section 9.6.4 on page 117.

The OMCU enhanced 141 link is configured on RMS screen 010, by selecting the Monitoring Type as “Serial” rather than “Full” when the controller type is “800P”. The ST800 traffic controller itself does not need to be configured to enable the enhanced serial link to the OMCU application.

However, the ST800 traffic controller needs to be configured to use ‘Serial MOVA’ rather than its normal digital I/O UTC interface. Also, the “MIO” handset command may be required to configure MOVA to use the enhanced 141 link rather than its I/O board. Again, see section 9.6.4 on page 117 for more information on MOVA and the enhanced 141 serial link.

The facility uses the standard 141 serial cable and requires the following firmware issues or later – check using the PIC handset commands on the controller and on the 3U Traffic Outstation:

	3U unit firmware	ST800 firmware
For OMCU (and not MOVA):	PB680 issue 8 or later	PB800 issue 5 or later
For MOVA, with or without OMCU:	PB681 issue 10 or later	PB800 issue 14 or later

The OMCU handset command EEL can be used to examine the state of the enhanced link (see section 11.8 on page 179).

When the enhanced ST800 link is enabled, the OMCU handset commands operate as described below (any commands not listed operate as before):

Command	Operation (when enhanced link enabled)
LMR, KAC, KLS, KAS	These commands are inactive - use the corresponding lamp monitor commands directly on the controller.
KDB	Displays dim/bright state based on the controller lamp supply voltage received via the serial link.
KLM	Displays the lamps’ on/off state as received from the controller via the serial link. The OMCU reverts to using the state of its second mains’ state input, if the controller link fails. If the mains state input is not connected and the link fails, then ‘lamps off’ is reported.
PGS	Displays the phase green states received from the controller via the serial link
CPP	Current Phase Pattern, derived from phase green states (the phase patterns are defined on the configuration data screens for the OMCU).

Command	Operation (when enhanced link enabled)
CST	Displays the current stage for stream 0, received from the controller via the serial link
MDE	Displays the controller mode for stream 0, received from the controller via the serial link
MSI	Displays the OMCU mains state inputs (not controller greens)
DIP	Displays the OMCU digital inputs (not controller inputs)
SOB & SOP	Displays/sets the OMCU digital outputs (not controller outputs)

4.2.7 Car Park Count Detection

A mechanism is provided to enable car park occupancy to be determined.

A total of 10 detector loops can be connected to the OMCU. These are configured as either car park entry or exit loops. The occupancy of the car park is determined by the difference in the number of vehicles entering and exiting the car park.

See section 10 for more details.

The following data is transmitted to the Instation:

- Car park Occupancy
- Failed Detector Loops (both stuck active and inactive)
- Power Fail
- Cabinet Door open
- Car park state (Full, Almost Full, Empty or Closed)
- Loop Counts

4.2.8 PAKNET interface

When the OMCU is being used to detect car park occupancy, the information is passed back to the SIESpace Instation via a PAKNET interface, rather than using the PSTN.

PAKNET is Vodafone's packet data network. This is connected to the Instation via a 'Radio-Pad', which is an asynchronous terminal device that replaces the modem on the OMCU.

4.2.9 DUSC Facility

The DUSC facility is very similar to CLF used in the ST800 traffic controller, whereby plans are introduced at specific times of day and each plan cycles through a configured sequence of groups in a repeating cycle. At each configured group time within the cycle, the OMCU activates the specified outputs to influence the controller movements (See DUSC user handbook for full details).

Plans are introduced by the timeswitch table i.e. dependent on the time of day, day of the week and (optionally) on the date. Plans can also be introduced via the

handset or via user defined conditioning. The DUSC facility has the following features:

(a) Up to 16 plans, with 32 groups per plan. Up to 32 streams.

(b) Timeswitch table with up to 64 entries.

(c) Plan compliance checking and fault reporting.

(d) Fault report of simultaneous green confirms (G1, G2 active).

(e) Real time update information includes current plan, current group, forces, confirms, on/off control and cycle time.

(f) “Remote Reconnect” (RR) input available on OMCU to disable plan control for maintenance purposes.

(g) There are 3 methods of interfacing with an ST800/700…

- Control Force and Reply (See section 4.2.9.1 - Force Bit Control Installation)
- 141 cable (See section 4.2.9.2 - ST800 Enhanced Serial Link Control Installation)
- Detector Control (See section 4.2.9.3 - Detector Control Installation)

	3U unit firmware
DUSC Facility :	PB680 issue 13 or later

4.2.9.1 Force Bit Control Installation

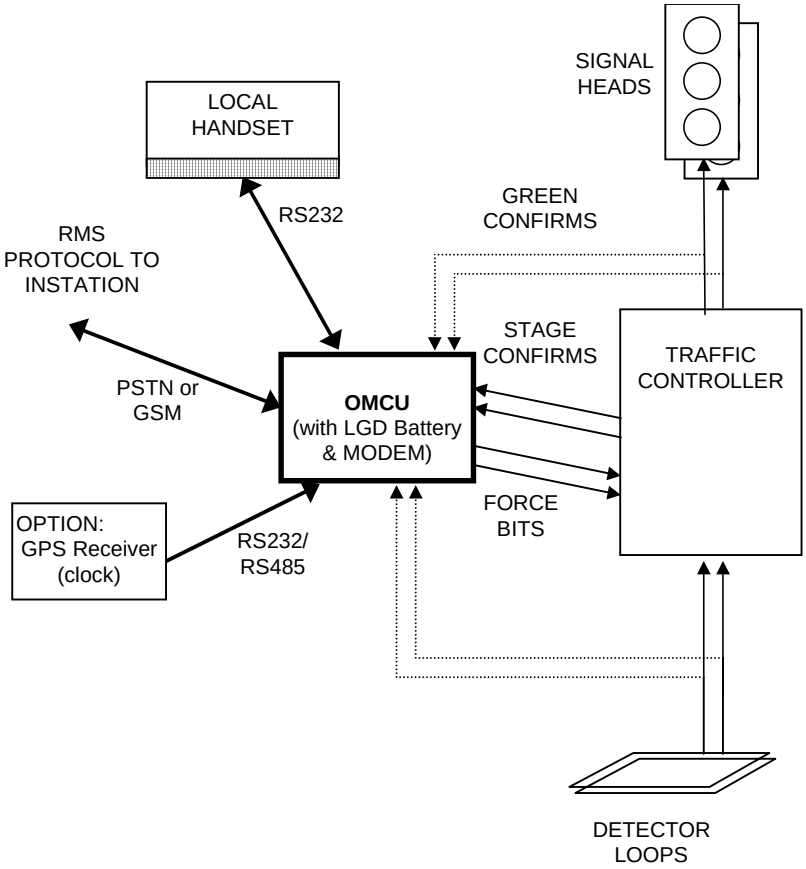


Figure 8 – Force Bit Control Set-up

Figure 8 shows how an OMCU can be set up for Force Bit control. This type of set-up is used when the controller provides a UK standard UTC style interface. It shows the 'Force Bits' from the OMCU being fed into the traffic controller, via the TR0141 UTC Interface. It also shows the 'Stage Confirms' coming back from the traffic controller to the OMCU. Although the 'Demand Bits' and 'Green Confirms' are still being sent to the OMCU for lamp monitoring and DFM, etc, the CLF ignores this information, as it is getting it's information from the stage confirms.

4.2.9.2 ST800 Enhanced Serial Link Control Installation

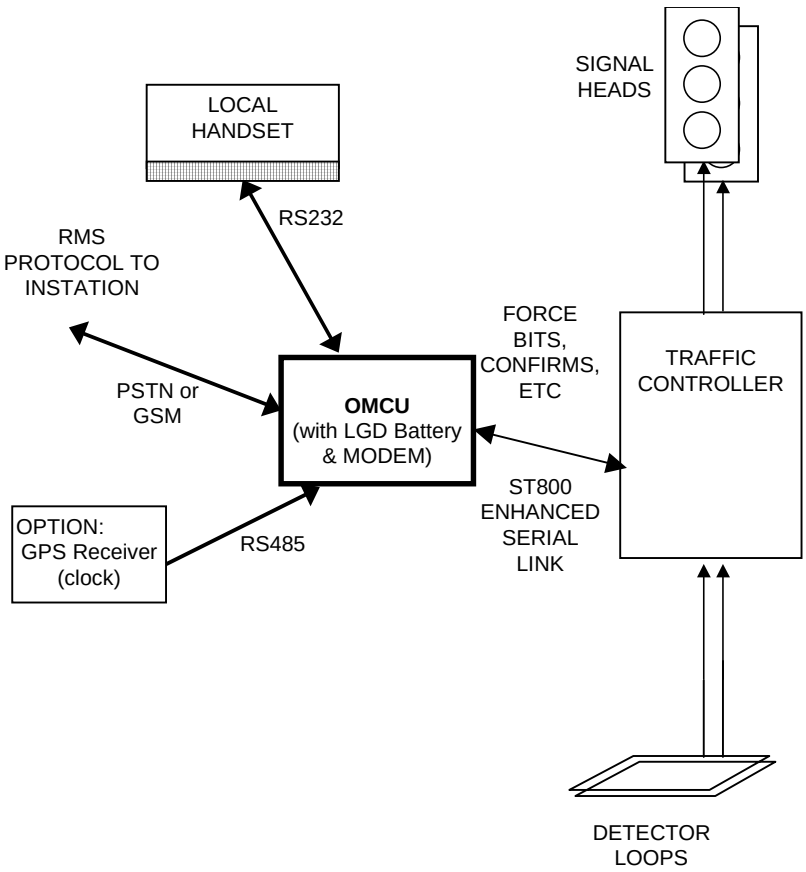


Figure 9 – ST800 Enhanced Serial Link Control Set-up

Figure 9 shows how an OMCU can be set up for the ST800 Enhanced Serial Link control. It shows all the information being fed between the OMCU and the traffic controller, via the ST800 Enhanced Serial Link.

4.2.9.3 Detector Control Installation

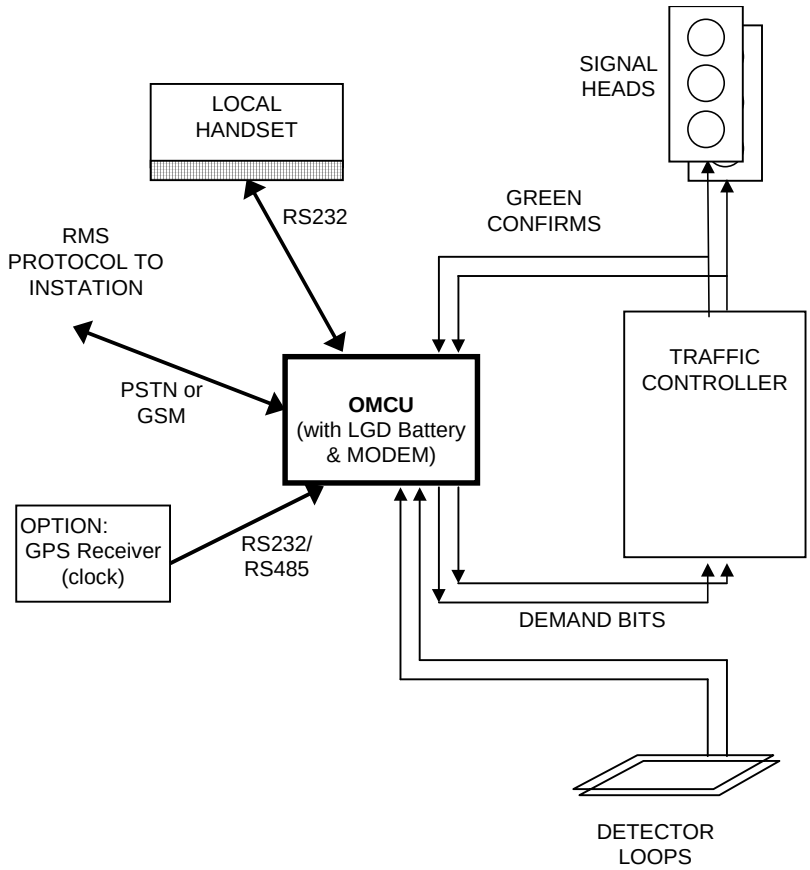


Figure 10 – Detector Control Set-up

Figure 10 shows how an OMCU can be set up for Detector control. This set-up is only used where controllers are not to UK standard with a UTC interface, i.e. it can be used with any vehicle actuated controller. It shows the 'Demand Bits' from the Detector Loops being fed into the OMCU, which are then sent out from the OMCU to the traffic controller. It also shows the 'Green Confirms' coming back from the traffic controller to the OMCU.

4.2.10 Flow Facility

The Flow facility has 16 detectors, each provides flow data over a configured period of time. Configuration data for this facility includes:- Flow Up Threshold, Flow Down Threshold, Flow Smoothing Factor and Flow Count Period.

The Instation will send a Log Flow Request to the OMCU. It will request the OMCU to start/stop accumulating smoothed flow data after a specified delay. The delay is computed by the Instation so that the command will be executed by the OMCU at the time of day specified by the user.

The OMCU will reply to the Log Flow Request with a message indicating that the Log Flow Request has been received.

For each interval completed a report is generated and stored in the Operations Log. When the final interval has been completed and report generation has been enabled, a report is written to the Fault Log to indicate that Flow Logging has been completed and is ready for uploading.

More accurate values of flow data can be obtained at 2 or 3 sites, using the N+1 Count data. The flow threshold would be for the complete carriageway rather than individual lanes.

In addition to the collation of the flow data, the flow data can be monitored and compared to the configured up/down thresholds. If the flow data meets the ‘up’ or ‘down’ threshold, the related OMCU Event can be activated/deactivated and the flow alarm is raised/cleared.

	3U unit firmware
Flow Facility :	PB680 issue 17 or later

4.2.11 Occupancy Facility

The Occupancy facility has 16 detectors, each provides occupancy data over a configured period of time. Configuration data for this facility includes:- Occupancy Up Threshold, Occupancy Down Threshold, Occupancy Smoothing Factor and Occupancy Count Period.

The Instation will send a Log Occupancy Request to the OMCU. It will request the OMCU to start/stop accumulating smoothed occupancy data after a specified delay. The delay is computed by the Instation so that the command will be executed by the OMCU at the time of day specified by the user.

The OMCU will reply to the Log Occupancy Request with a message indicating that the Log Occupancy Request has been received.

For each interval completed a report is generated and stored in the Operations Log. When the final interval has been completed and report generation has been enabled, a report is written to the Fault Log to indicate that Occupancy Logging has been completed and is ready for uploading.

In addition to the collation of the occupancy data, the occupancy data can be monitored and compared to the configured up/down thresholds. If the occupancy data meets the ’up’ or ‘down’ threshold, the related OMCU Event can be activated/deactivated and the occupancy alarm is raised/cleared.

	3U unit firmware
Occupancy Facility :	PB680 issue 17 or later

4.2.12 OMCU Events and Switch Override Facility

The maximum number of OMCU Events and Switch Overrides is 16. Each OMCU Event and Switch Override is independent and more than 1 can be active simultaneously.

Configuration data for the OMCU Events facility includes:- Debounce Active Delay and Debounce Inactive Delay.

An OMCU Event has to be continuously active for the configured active debounce time, before a report is written to the Fault Log, indicating the OMCU Event is active. Conversely, an OMCU Event has to be continuously inactive for the configured inactive debounce time, before a similar report is written to the Fault Log, indicating the OMCU Event is inactive. The Instation then processes these events via a decision tree and takes the appropriate configured response (Switch Override).

The RMS Instation can request a Switch Override at the OMCU, when the OMCU Event becomes active. The OMCU will reply to the Switch Override Request with a message indicating that the Switch Override Request has been received.

When the OMCU starts the Switch Override (start time is reached) and report generation is enabled, a report will be written to the Fault Log to identify the start of the Switch Override.

The Switch Override will remain active for a fixed period of time, or until cancelled from the Instation.

A similar report will be generated at the end of the Switch Override, (end time is reached, assuming that an indefinite override period has not been specified) if enabled.

Events and Switch Overrides Facility :	3U unit firmware PB680 issue 17 or later

4.2.13 Vehicle Classifier Facility

The Vehicle Classification facility provides classification of vehicles by length into a maximum of 14 user specified length categories. Vehicles that exceed the length in the longest length category are assigned to the “Unassigned” length category. Vehicles that are not able to be measured (e.g. transit one of the loops only) have zero length and are assigned to the “Unmeasured” category. Each length category is configurable to provide user names for the categories, e.g. “Car / Small Van”.

Vehicles may be logged on up to 8 loop pairs distributed across up to 4 sites, each site containing up to 8 lanes. It is recommended that the facility use standard SDE/SA loops of typically, 2m loop length and 3.5m loop separation. The ST4R loop detector is also recommended.
It is important to note that differently sized loop pair configurations must be assigned to different sites.

The vehicles may be individually logged in the Operations Log when they are detected as VC events. The VC event identifies the vehicle type, length, speed, headway and action taken (if any) on detecting the vehicle. Each value may be optionally configured for inclusion / exclusion from the VC event.
VC event logging may be enabled / disabled for any given lane within a given site via the configuration download.

The user is able to freely specify up to 32 detection conditions via special conditioning e.g. vehicles of between 2m and 5.5m in length occurring at a given site travelling in excess of 80kph. Of these 32 detection conditions, up to 16 may be selected for statistic collection purposes.
NOTE : Non-vehicle classifier special conditioning mnemonics may be used in the definition of the detection conditions, however they should not be mixed with the vehicle classifier special conditioning mnemonics.
Vehicle detections may be collected over a user specified averaging period of between 1 and 60 minutes to be summarised in the Operation Log as TD events by average speed, average occupancy and average headway. The average speed, headway and occupancy values may be recorded on a site or a lane basis or be omitted entirely. The statistic categories increment during the averaging period to reflect the occurrence of user defined detection conditions. These category counts are presented in the Operations Log alongside the summary information in the TD event described above. The statistic categories may be omitted from the TD event.
The data collection is synchronised to the minute boundary. The time stamp associated with the TD event corresponds to the end of the averaging period.
TD event generation may be enabled / disabled via the configuration download.

When a vehicle detection satisfies a detection condition, a DC event may be recorded in the Operations Log identifying the detection condition. It is possible for a single vehicle detection to satisfy more than one detection condition (depending on how the detection conditions have been defined) and hence there may be more than one DC event associated with a single vehicle detection.

The DC, VC and TD events in the Operations Log may be selectively uploaded to the RMS instation for analysis.

The occurrence of a user defined condition may be used to force the activation of one or more OMU outputs (up to a maximum of 16 allocated across 2 output ports) to trigger an action in an external device such as a traffic controller. A configurable text message may also be presented to one or more message signs such as UVMS or a SIESPACE sign. A sign may be connected to the 141 serial port or one of the available RS485 serial ports on a 1 to 1 basis. The text message is displayed for a configurable period and may be subsequently blanked by a blanking message applicable to the sign or be replaced by a second text message. NOTE : If a second text message is output to the sign, the message will remain on the sign until another action causes the same sign to be addressed. Alternatively, the sign configuration could perform a self blanking using a suitable inactivity timeout.

Confirmation checks are carried out to detect the absence / presence of an expected input state arising from an output activation. The absence of an expected input state for a configured period generates a fault in the Fault Log. The presence of the an expected input state for a configured period clears the fault (if the fault is present).
The fault may be manually reset by the RMS instation operator.
NOTE : Confirmation checks are not performed on sending text messages to a sign.

Vehicle absence / presence faults are generated in the Fault Log if a vehicle is not detected over a loop / detected over a loop for longer than the configured absence /

presence time. Both fault types are automatically cleared by the OMU. Both fault types may be manually reset by the RMS instation operator.

The Vehicle Classification facility also supports a loop pair fault algorithm. This algorithm identifies a loop pair as faulty if one of the loops is activated on N consecutive occasions with no activations on the other loop. The fault is cleared by the OMU if there are M activations (not necessarily consecutive) of both loops. N and M are configurable values.
The loop pair fault may be manually reset by the RMS instation operator.

There is a set of read only handset commands to allow the user to examine the Vehicle Classifier configuration data items – see section 11.18.

The Vehicle Classification facility requires the use of an STCL supplied licence code in order to be activated. The licence code is based on the OMU telephone number and is downloaded as part of the Vehicle Classification configuration data from an RMS instation.

Vehicle Classification Facility :	3U unit firmware PB680 issue 17 or later

4.2.14 Remote Automatic incident Detection (RAID)

With possession of the requisite licence the RAID facility can be enabled in the OMCU. RAID, an acronym for Remote Automatic incident Detection, is a new incident detection algorithm that has been developed as part of the EU 5th Framework PRIME project (**P**rediction of congestion and incidents in **R**eal time, for intelligent **I**ncident **M**anagement and **E**mergency traffic management).

A fully operational RMS resident RAID system has functionality split between the outstation and instation. The outstation carries out low level loop detection and algorithm resolution to arrive at a value for the Average Loop Occupancy Time Per Vehicle (ALOTPV). ALOTPV is a measure of the average occupancy of a vehicle detector loop during a configurable measurement period (typically around 30 seconds).

Calculated values for ALOTPV are compared with pre-configured thresholds to detect occurrences of congestion and then alert the traffic operator via the instation. A maximum of 16 inputs are supported, these can be raw detector inputs from each loop or, as per DUSC, inputs that have been conditioned via a downloaded conditioning rule. Conditioning can carry out boolean operations on the raw detector inputs. The results of threshold comparison are then fed to the OMCU Event feature which enables control over the point at which a threshold being exceeded is reported. For example one traversal of a threshold may not be considered indicative of a congestion condition but if it were exceeded consecutively for say 5 averaging periods it would. The event functionality provides a mechanism to facilitate this.

In addition a means of logging ALOTPV over a configurable period of time is supported. This logged data can then be retrieved from the outstation and used by the instation for traffic analysis and reporting.

The instation provides the means of setting thresholds and logging criteria for ALOTPV and communicating them to the outstation via the normal configuration data file. Additionally it is anticipated that different thresholds will be required for different times of the day, days of the week or special occasions. To enable this requirement a maximum of eight sets of thresholds is provided for each input.

A number of new handset commands have been incorporated in the firmware to assist in field maintenance and fault diagnostics. These are covered in more detail in the handset section, The new three letter acronyms are:-

CODE	DESCRIPTION AND REMARKS
RTS	**R**aid **T**hreshold **S**et in current use.
RLO	**R**AID A**LO**TPV – current value of ALOTPV n
RTG	**R**AID A**TG**BV – current value of ATGBV n (future implementation)
ROT	**R**AID AL**O**TPV **T**hreshold – threshold for ALOTPV[n][Threshold Set]
RGT	**R**AID AT**G**BV **T**hreshold – threshold for ATGBV[n][Threshold Set] (future implementation)
ROH	**R**AID AL**O**TPV **H**igh – Shows 16 ALOTPV detectors, 1 indicates that the ALOTPV was above the high threshold during the last averaging period.
RGL	**R**AID AT**G**BV **L**ow – Shows 16 ATGBV detectors, 1 indicates that the ATGBV was below the low threshold during the last averaging period. (future implementation)
RAP	**R**AID **A**veraging **P**eriod – Time in seconds over which RAID measurements are calculated.
REN	**R**AID **En**abled – check if RAID license enabled. 0 = disabled, 255 = enabled

The RAID facility requires the use of an STCL supplied licence code in order to be activated. The licence code is based on the OMU telephone number and is downloaded as part of the RAID configuration data from an RMS instation.

	3U unit firmware
RAID Facility :	PB680 issue 20 or later

4.3 GSM OMCU

The GSM OMCU is an extension to the Siemens RMS OMCU described in section 4.2 above. It provides an extremely cost effective means to monitor and control equipment where standard PSTN connection is not available or where the line installation costs are prohibitive.

See Sections 2.1 and 2.6.2 for further details of the GSM option.

4.3.1 Remote Monitoring

The GSM version provides all the facilities of a standard 3U OMCU and is capable of monitoring a wide variety of traffic signal and pedestrian controllers. The unit is configured from a RMS via a dial-up link to perform the monitoring and control functions required.

When a fault or other defined event is detected, it is logged at the unit and a call is made to the Instation to report the occurrence. If required, particular types of fault or event can be configured as “non urgent” so that these are logged but not reported to the Instation, unless a more urgent fault is detected or a call is made from the Instation.

Integral n+1 count units allow simple detector equipment to be used to monitor traffic flows, which are reported to the Instation automatically or on operator request.

Direct connection to a wide range of traffic controllers via their handset port allows an operator at the Instation to interrogate the controller remotely and make changes to the controller operation.

Variable Message Signs and access control equipment such as barriers may also be controlled.

4.3.2 Bus Priority and Access Control

When used for Bus Priority and access control applications, the GSM OMCU is able to connect up to 12 SIETAG readers using a suitable I/O board to provide logging, priority and access control functions.

Vehicles to be given access / priority are fitted with an electronic tag that may be programmed with, among other things, vehicle operator identification and individual vehicle number. A loop is located in each access lane, which is used by a SIETAG reader to interrogate tags as they pass over.

Data from the tags may be filtered by the GSM OMCU, which logs the information and can be programmed to output access requests to barriers or other equipment such as Traffic Controllers, via up to 16 isolated relay contacts. (These may be expanded up to 48 by the addition of extra I/O boards.)

Several levels of filtering may be configured from the Instation and downloaded to the GSM OMCU. Filtering options range from specific access or priority just for uniquely identified vehicles through to all vehicles of a particular operator. Access / priority may be restricted by time of day and individual or groups of vehicles may be blacklisted.

Bus Processor and OMCU functions can be performed simultaneously, limited only by the number of I/O boards that can be accommodated.

5. INSTALLATION

WARNING

THIS EQUIPMENT MAY ONLY BE INSTALLED BY SIEMENS TRAFFIC CONTROLS OR BY TRAINED PERSONNEL.

AUTHORISED INSTALLER MUST ENSURE THAT INSTALLATION OF THIS EQUIPMENT DOES NOT INTERFERE OR DEGRADE THE DESIGN SPECIFICATION OF THE HOST EQUIPMENT IN ANY WAY WHATSOEVER.

ENSURE THAT THE UNIT IS NOT CONNECTED TO THE PSTN LINE DURING INSTALLATION AND SWITCH OFF ALL MAINS TO CABINET PRIOR TO STARTING.

THIS UNIT CONTAINS BATTERIES WHICH, UNDER FAULT CONDITIONS, MAY LEAK HAZARDOUS SUBSTANCES.

CARE MUST BE TAKEN WHEN FITTING BATTERIES OR HANDLING THE UNIT. FIT BATTERIES ONLY WITH SPECIFIED OR EQUIVALENT TYPE. BATTERIES FITTED INCORRECTLY COULD CAUSE AN EXPLOSION.

THE UNIT IS ONLY COMPLETELY DISCONNECTED AND ISOLATED FROM THE INCOMING MAINS SUPPLY WHEN THE MASTER SWITCH IN THE CONTROLLER IS TURNED TO THE OFF POSITION. REMOVING THE MAINS LEAD IS NOT SUFFICIENT.

ZX0 WIRES FROM THE PSU TO THE FIRST LMU I/O BOARD (NEAREST CPU)

The red and black wires that come from under the power supply cover, through the ferrite are at mains potential when the unit is switched on. For 240V operation, these wire connect to pins '14' and '11' on the expansion board connector 'PL2' (for full details of the connections see section 5.2.4 of this handbook which starts on page 51.)

The mains supply must be completely removed from the unit prior to:

- **Disconnecting these wires for any reason, e.g. replacing unit.**
- **Any ZX0 circuit setting adjustments as defined in section 5.2.4.**
- **Any operation that would leave these wires exposed.**

If, for any reason, these wires are left exposed and unattended (e.g. change out unit) they must be safely terminated with the unit unplugged from the mains' supply. The unit must not have mains applied to it until the wires are connected or safely terminated, for example by removing additional wires so that only the bullet connections, which provide protection against accidental contact with mains potentials, remain.

During a unit change out, the Green Voltage Detector connections can be left intact on cableform 667/1/26586/000 which connects to the controller (as defined in section 5.6.5 which starts on page 65).

5.1 INSTALLATION CHECK LIST

The checklist on the following page should be used to install the unit together with the Instation computer printout for the equipment to be monitored. Installation techniques are shown on drawing 667/GA/26577/000 in Appendix B .

For GSM OMCU installation, see also 667/CF/26598/010 in Appendix B

For further guidance on each step refer to the appropriate section in the REFERENCE column. 'WORKS ORDER' indicates that the relevant Works Order or Works Specification should be consulted.

The checklist should be followed in sequence unless a particular step is not required. Refer to the 'OMCU', 'C/P [Car Park Count OMCU]', 'BUS [Processor]' and 'MOVA' columns to determine whether the step applies to the application or applications that are required. For example, if the unit is to perform both OMCU and Bus Processor facilities, then all activities in both the 'OMCU' and 'BUS' columns should be undertaken.

5.1.1 Users Responsibilities

It is the responsibility of the user (or purchasing authority) to:

(a) Provide a Telephone connection (if PSTN connection with the unit is required).

(b) If the unit is to be installed within an existing controller - ensure that adequate space is available for mounting the unit (dimensions are given in section 2.1) and fixings are available. An ancillary outer-case will be required if space is not available (see section 5.7 on page 73).

(c) Provide one auxiliary mains supply or suitable alternative mains supply outlet for the unit's power supply (supply capability to be at least 1A RMS, and limited to a maximum of 6A).

(b) For the GSM Option, arrange the following:
   (i) Ensure that good GSM coverage is available at the point where the aerial will be mounted.
   (ii) Arrange the airtime agreement and SIM card for the GSM modem. The SIM should be configured 'Data only' and **must not** have the PIN enabled. For details see section 2.6.2.

INSTALLATION CHECKLIST

STEP	OMCU	C/P	BUS	MOVA	FUNCTION	REFERENCE
1	OMCU	C/P	BUS	MOVA	Check unit supplied is as per installation computer print out	WORK ORDER
2	OMCU	C/P	BUS	MOVA	Check unit contains correct I/O boards. **Ensure LMU I/O boards are issue 3 or later if fitted with Bus/MOVA boards.**	WORKS ORDER
3	OMCU	C/P	BUS	MOVA	Check unit has the correct firmware fitted, e.g. PB681 for MOVA.	WORKS ORDER
4	OMCU	C/P	BUS	MOVA	Set up board address switches	5.2.1
5	OMCU	C/P	BUS	MOVA	Set up modem power selection	5.2.2
6	OMCU	C/P	—	—	Set up 50/60Hz operation selection	5.2.3
7	OMCU	—	—	—	Set up 120/240V AC operation selection	5.2.4
8	—	—	BUS	—	Set up RS485 terminating resistors	5.2.5
9	—	—	BUS	MOVA	Set up Bus/MOVA output relay resistors	5.2.6
10	OMCU	—	—	—	50V-0-50V voltage monitor required?	5.2.7
11	OMCU	C/P	BUS	MOVA	Switch the RAM battery on	5.2.8
12	OMCU	C/P	BUS	MOVA	Install unit and connect safety earth lead to cabinet earth point	5.3 to 5.5
13	OMCU	—	—	—	Connect lamp current sensors (Unless using ST800 enhanced serial link)	5.6.1
14	OMCU	—	—	—	Connect lamp supply sensor (Unless using ST800 enhanced serial link)	5.6.2
15	OMCU	C/P	—	—	Connect mains voltage detector cableforms	5.6.3
16	OMCU	C/P	—	—	Connect digital monitors cables (Unless using ST800 enhanced serial link)	5.6.4
17	—	—	BUS	—	Connect Bus Processor digital I/O	5.6.5
18	—	—	BUS	—	Connect RS485 cables, e.g. for SIETAG	5.6.6
19	—	—	—	MOVA	Connect MOVA digital I/O cables (Unless using ST800 enhanced serial link)	9.2 & 9.3
20	—	—	—	MOVA	Connect MOVA phone line sharing.	9.4
21	OMCU	C/P	BUS	MOVA	Complete post installation check	5.6.8
22	OMCU	C/P	BUS	MOVA	Identify all connectors/cable forms	5.6.9
23	OMCU	C/P	BUS	MOVA	Connect all connectors to the unit	–
24	OMCU	—	—	MOVA	Connect 141 cable to controller handset port (req'd for MOVA if using ST800 link)	5.6.10
25	—	—	BUS	—	Connect 141 cable to OTU handset port (req'd for BUS if using OTU link)	5.6.11
26	OMCU	C/P	BUS	MOVA	Connect the unit to mains outlet	5.6.12
27	OMCU	C/P	BUS	MOVA	Restore controller and unit mains supply	–
28	OMCU	C/P	BUS	MOVA	Switch on unit supply	–
29	OMCU	C/P	—	—	Connect unit support battery	5.6.13
30	OMCU		BUS	—	Commission the OMCU / BUS applications	Section 6
31	—	C/P	—	—	Commission the Car Park Count unit	Section 6
32	—	—	—	MOVA	COMMISSION THE MOVA APPLICATION	9.5

THE REST OF SECTION 5 TAKES YOU THROUGH THE STEPS IN THE INSTALLATION CHECKLIST (FROM THE PREVIOUS PAGE) IN MORE DETAIL…

Section 5.2 takes you through the steps that 'configure' the hardware before the unit it is installed.

Sections 5.3, 5.4 and 5.5 take you through the steps to install the unit.

And finally, section 5.6 takes you through all the steps involved in connecting up all the various interfaces to the unit.

5.2 SET-UP

STEP	OMCU	C/P	BUS	MOVA	FUNCTION	REFERENCE
1	OMCU	C/P	BUS	MOVA	Check unit supplied is as per installation computer print out	WORK ORDER
2	OMCU	C/P	BUS	MOVA	Check unit contains correct I/O boards. **Ensure LMU I/O boards are issue 3 or later if fitted with Bus/MOVA boards.**	WORKS ORDER
3	OMCU	C/P	BUS	MOVA	Check unit has the correct firmware fitted, e.g. PB681 for MOVA.	WORKS ORDER

The unit, prior to its installation and commissioning, requires configuring for the type of application, either on site or at a depot.

The hardware has a number of options as follows, which require selection before power is applied to the unit…

5.2.1 I/O Board Position Selection (All Board Types)

4	OMCU	C/P	BUS	MOVA	Set up board address switches	5.2.1

Each LMU I/O board has a 4-way DIL switch S1 and each Bus MOVA I/O board has two 2-way DIL switches S5 and S6.

Three of these four switches provide the I/O board with its own unique address within the 3U Traffic Outstation unit.

Caution ***On each I/O board, only one of the three board address switches should be in the 'ON' position while the unit is powered.***

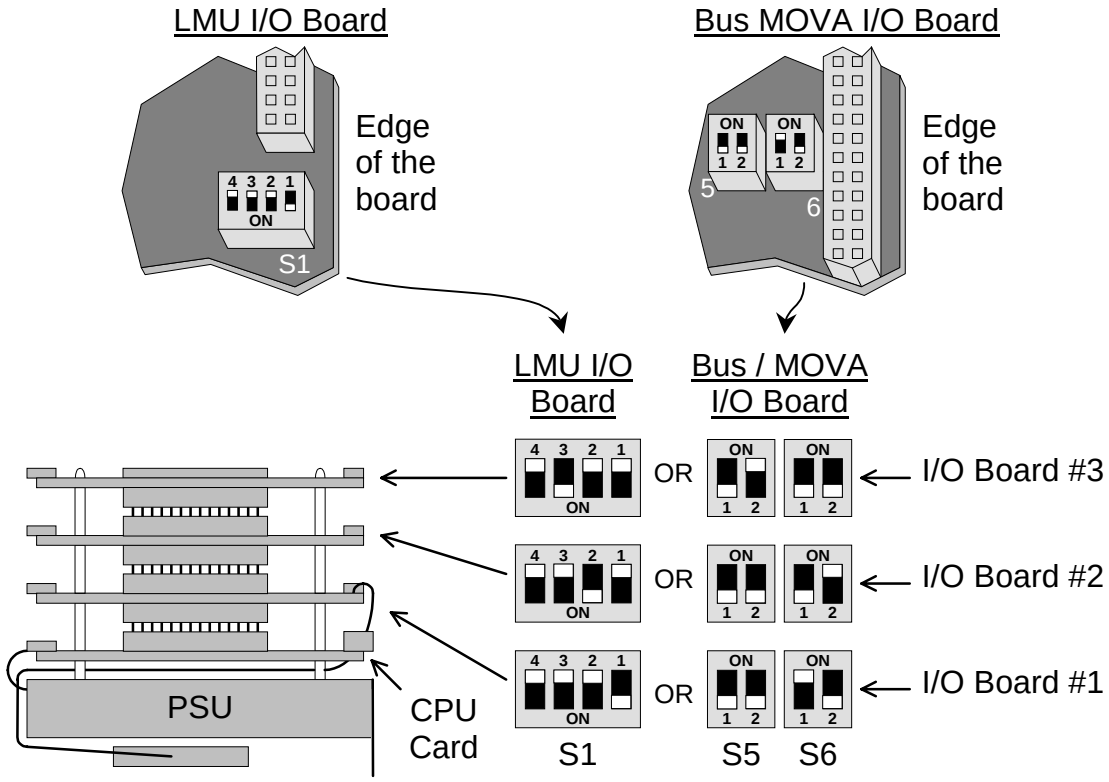


Figure 11 – I/O Board

Switch position 4 of S1 on the LMU I/O board is used for switching the lamp monitor between 50Hz and 60Hz operation (OFF = 50Hz, ON = 60Hz), see section 5.2.3.

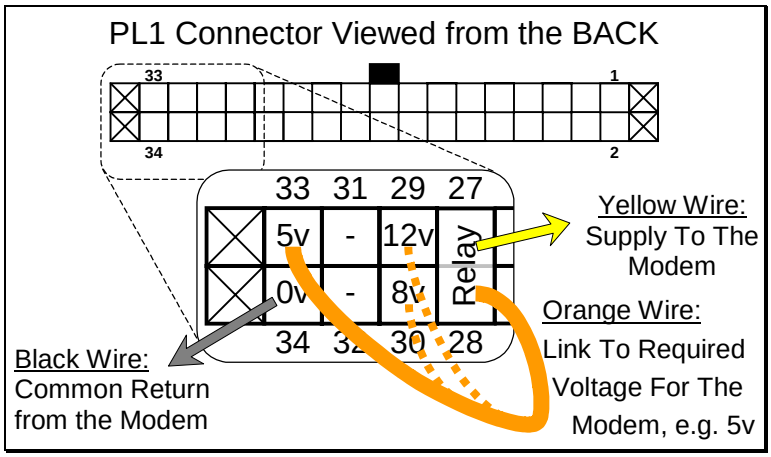
5.2.2 Modem Power Supply Selection (All Board Types)

5	OMCU	C/P	BUS	MOVA	Set up modem power selection	5.2.2

The unit can supply any one of three different voltage supplies, 5V, 8V and 12V all at 300 mA capability from I/O Board #1, which may be an LMU or a Bus / MOVA I/O board. Check which supply is required by the modem using the Modem Supply List shown on 667/GA/26580/000 Sheet 2 in Appendix B .

On the LMU I/O board, insertion of the modem power lead into the relevant connector socket in the LMU analogue connector PL1 selects which supply to use as follows. The orange link wire connects to the first relay on the board, which is used to control power to the modem as part of its initialisation sequence.

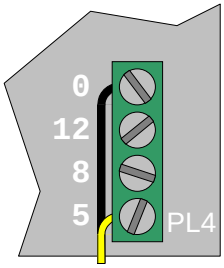
Cableform Position	Voltage Supply	Wire colour of power cable
PL1 socket 27	Supply to Modem	Yellow wire
PL1 socket 28	Link (see below)	Orange wire
PL1 socket 29	12V Supply	Orange wire (if 12V required)
PL1 socket 30	8V Supply	Orange wire (if 8V required)
PL1 socket 33	5V Supply	Orange wire (if 5V required)
PL1 socket 34	Common Return	Black wire



For Example:
To select 5V as the modem power supply:

1) Insert the black wire in to socket 34 for 0V.
2) Insert the orange link wire in to sockets 28 and 33 to select 5V.
3) Finally insert the yellow wire in to socket 27 (Modem +ve supply).

On the BUS / MOVA I/O board, the modem power is available on a separate connector PL4 which is located near the front right-hand corner of the board. The orange wire is not required as the necessary power switching for use during initialisation is built into this board. If the modem power leads are fitted with berg crimps, then the crimps should be cut approximately in half to form a bullet which can be inserted into this connector.



IMPORTANT

Before connecting the plug into the modem with the unit powered up, check with a multi-meter that the correct power supply selection has been made.

5.2.3 50/60 Hz Operation (LMU I/O Board Only)

6	OMCU	C/P	—	—	Set up 50/60Hz operation selection	5.2.3

The unit can operate with 50Hz or 60Hz mains' supplies, for export purposes. To ensure the OMCU's lamp monitoring circuit operates correctly, set the timing to the required frequency using the fourth switch on the DIL 4-way switch S1 on the LMU I/O boards. See section 5.2.1 on page 49 for the position of this switch.

ON For 60Hz operation.

OFF For 50Hz operation.

5.2.4 120/230V AC Operation (LMU I/O Board Only)

7	OMCU	—	—	—	Set up 120/240V AC operation selection	5.2.4

WARNING

ZX0 WIRES FROM THE UNIT TO THE FIRST LMU I/O BOARD (NEAREST CPU)

The red and black wires that come from under the power supply cover through the ferrite are at mains potential when the unit is switched on.

The mains supply must be completely removed from the unit prior to:
- **Disconnecting these wires for any reason, e.g. replacing the unit.**
- **Any ZX0 circuit setting adjustments as defined in this section.**
- **Any operation that would leave these wires exposed.**

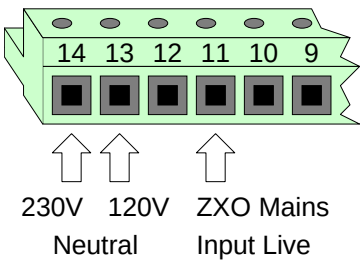
If, for any reason, these wires are left exposed and unattended (e.g. change out unit) they must be safely terminated with the unit unplugged from the mains' supply. The unit must not have mains applied to it until the wires are connected or safely terminated, for example by removing additional wires so that only the bullet connections, which provide protection against accidental contact with mains potentials, remain.

The unit's Power Supply operates from 85 to 265V AC, and therefore needs no external set-up to operate from either 120 or 230V AC.

However the OMCU's lamp monitor Zero Crossover circuit requires setting. This setting is achieved by selecting the correct input connector socket on the High Voltage cable form. The Basic Unit 667/1/28850/000 is supplied with one of the High Voltage Cableforms 667/1/26586/800 fitted, with the selection for 230V already made on that cableform.
If the OMCU cable 667/1/28852/000 is requested then high voltage cable 667/1/26586/000 is provided with 230V operation selected. If 120V setting is required, change the setting as detailed, before applying mains. The relevant connector socket positions for the 120V or 230V setting is described on the following page.

Note that if OMCU lamp monitoring is not required, then the wires from the PSU can be left unconnected since the female bullets have plastic covers that naturally insulate them.

Cableform Position	Voltage Supply
PL2 pin 11	ZXO Mains Input (Mains Live)
PL2 pin 13	Neutral Return 120V Operation
PL2 pin 14	Neutral Return 230V Operation



Note 1: Before applying the mains' power, recheck the correct voltage setting has been selected and the Zero Crossover Mains' Input (ZXO Mains I/P) has been connected.

Note 2: Pins 11, 13 and 14 should be connected as shown on the first LMU I/O board only. These pins should be left unconnected on the second and third boards fitted to a unit.

If 120V operation is required then a different variant of the Voltage Monitor Transformer must be used. The 100V Welsh Office version is 667/7/25172/500, see section 5.2.7. A design for a 120V version would need to be requested.

5.2.5 RS485 Terminating Resistors (BUS / MOVA I/O Board Only)

8	—	—	BUS	—	Set up RS485 terminating resistors	5.2.5

RS485 communication channels must be correctly terminated to allow reliable operation. The termination load of each channel on the Bus / MOVA I/O board can be set up using a number of switches as defined below.

Channel	Switch Settings	Term' Load	Switch Settings	Term' Load	Switch Settings	Termination Load
1	S2/1 on S2/2 on	60Ω	S2/1 on S2/2 off	120Ω	S2/1 off S2/2 off	Not Terminated
2	S4/1 on S4/2 on	60Ω	S4/1 on S4/1 off	120Ω	S4/1 off S4/2 off	Not Terminated
3	S3/1 on S3/2 on	60Ω	S3/1 on S3/2 off	120Ω	S3/1 off S3/2 off	Not Terminated
4	S1/1 on S1/2 on	60Ω	S1/1 on S1/2 off	120Ω	S1/1 off S1/2 off	Not Terminated

The total termination impedance (the 'sum' of both ends) for each channel should be 60Ω. For links up to 250m the I/O board can provide the total termination. If a longer link is required, the far end of the link should be terminated with 120Ω and the I/O board set to only provide a 120Ω termination.

The total termination impedance must be calculated, based on the terminal impedance provided by all other equipment connected to the communication channel. So in some circumstances, where termination is provided by that equipment, the I/O board may need to be set to 'not terminated' (no resistors selected).

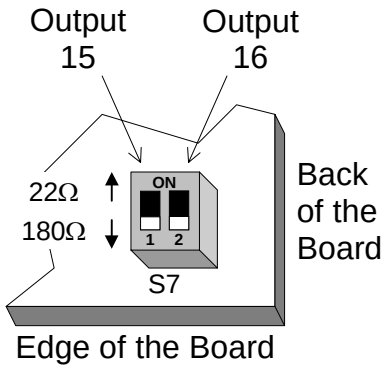
5.2.6 Output Resistor Options (BUS / MOVA I/O Board Only)

9	—	—	BUS	MOVA	Set up Bus/MOVA output relay resistors	5.2.6

The BUS / MOVA I/O board has two switches to select the resistor values on the last two outputs:

The first switch selects the resistor values for output 15 while the second switch selects the resistor value for output 16.

The 'ON' position selects 22Ω, while 'OFF' selects the normal 180Ω. Unless 22Ω is specifically required, the 180Ω position should be selected.



5.2.7 Welsh Office 50V - 0 - 50V Working (LMU I/O Board Only)

10	OMCU	—	—	—	50V-0-50V voltage monitor required?	5.2.7

To set the OMCU to work on the Welsh Office 50V-0-50V system, a different variant of the Voltage Transformer 667/7/25172/500 is required. Also the current sensor 667/7/25171/000 is limited to half the normal number of lamps.

5.2.8 RAM Battery Back-Up

11	OMCU	C/P	BUS	MOVA	Switch the RAM battery on	5.2.8

The processor board has a battery fitted to support the RAM and Real Time Clock during periods of mains' failure. The battery circuit has an isolation switch (S1) which is set to the off position for transit by the factory. This switch must be switched to the ON position prior to installation.

5.3 INSTALLATION INTRODUCTION

12	OMCU	C/P	BUS	MOVA	Install unit and connect safety earth lead to cabinet earth point	5.3 to 5.5

A standard hardware installation, in terms of location and cable routing, is not possible, as different manufacturer's cabinets differ in size, model and occupancy. Use of the following guidelines provides a level of standardisation. Any new controller that is not covered in this handbook will require the form 667/ST/17500/000 to be completed and returned to Poole Engineering to ensure that BS5750 and approval requirements are met. (A copy of this document is available from Siemens Poole when required.)

5.4 HARDWARE INSTALLATION

5.4.1 General Installation

The unit assembly is a 3U extended unit, requiring 192mm of 3U Rack space. This feature, together with the configurable cableforms, provides sufficient flexibility to install the hardware in most controllers, in one of the three positions described below. Also see Appendix B for details of part numbers.

(a) The unit may occupy unused space, in a suitable rack with sufficient space, which exists in a controller's cabinet. See bottom half of 667/GA/26577/000 drawing in Appendix B .

(b) If no suitable rack space exists as in (a), the unit rack mounting facility can be used (the M6 screws in rack angles) to allow the unit installation. See top half of 667/GA/26577/000 drawing in Appendix B .

(c) If all fails, then an alternative suitable method should be adopted, with the collaboration of Poole Engineering using form 667/ST/17500/000 as defined in section 5.3, or use an Additional Outercase. If the Additional Outercase method is used, then additional installation work is required (see section 5.7 on page 73).

The OMCU comes as a Basic Unit containing one LMU I/O board and the 141 cable. This is the basic OMCU for use with ST800/700 series controllers. For other controllers an OMCU cable unit kit is required. The OMCU may require further Expansion kits (containing one LMU I/O board and all its fixings), depending on the size of the intersection. Before an OMCU can be installed, these expansion kits require assembling to the Basic Unit. To assemble these expansion kits to the Basic unit, use the methods and Items Lists on General Assembly drawing 667/GA/26580/000 in Appendix B .

For MOVA fit 667/1/28851/000 and if necessary, depending on the controller type, fit 667/1/28854/000 or 667/1/28855/000.

Prior to the development of a combined OMCU/MOVA unit, a MOVA unit with a separate OMCU unit was normally supplied with the two units already built into a new 3U rack. If sufficient space is not available in the controller cabinet for this rack, then the units may be removed from the rack and each installed separately as described above.

The following are important points to remember during assembly and installation when the OMCU is fitted with LMU I/O boards:

- Ensure that the rear cables (High Voltage and Low Voltage), are connected to their monitoring points and plugged into the unit, before installing the unit into the Rack or Cabinet.
- Ensure that the Mains' feed from the PSU assembly to the High Voltage cable form is connected for the correct voltage; see section 5.2.4, which starts on page 51.
- Ensure that the voltage protection covers on the I/O board or boards are fitted and securely fixed.

5.4.2 Radio Clock Installation

[This section only applies to Bus applications]

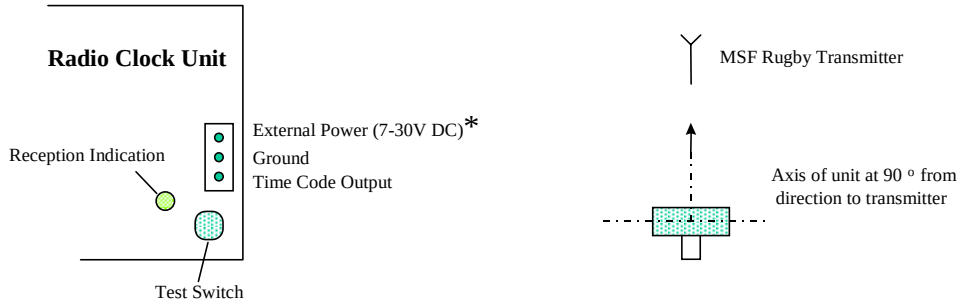
The optional Radio Clock is a separate unit that is mounted external to the OMCU using a bracket supplied with the unit. It provides a time signal to the traffic outstation received from the MSF Rugby transmitter. This is used to synchronise the internal real time clock.

The system has good tolerance to interference and only requires valid reception for a few minutes each day to maintain the accuracy of the clock. It is however a sensitive radio receiver operating at 60Khz (for Rugby MSF transmissions) and certain precautions are necessary.

- It should not be located near to radio transmitters.
- It should be kept as far away as practicable from a SIETAG reader or vehicle detector loops. In some cases detector loops might have to be set to operate on different channels as they can radiate at the same frequency as the Rugby transmitter.
- It must be orientated correctly to point towards the Rugby transmitter. See below and also see 'RCS' on page 185 for details on the use of the handset for verifying radio reception.

Cabling to the Radio Clock should be separate from other intersection cables, particularly detector loop feeders, to avoid electrical noise being injected into the Radio Clock via its supply. A screened cable is recommended.

The Radio Clock is required to be connected to a digital input on a Bus / MOVA I/O Board (defined during the configuration process) and to signal ground. The current version of the radio clock derives power from its internal battery and no additional power connection is required. Earlier versions (with 3-core connection cable) require an external supply, which may be derived from the OMCU via the 13.8V bullet connector at the rear of the OMCU. If the I/O cable 667/1/26585/010 is used then a dedicated supply connection is provided.



Internal Connections for the Radio Clock

Correct Orientation for the Radio Clock

* External power not required on later models.

Figure 12 – Radio Clock Unit

5.5 CABLE AND WIRING

[This section applies to all applications]

It is not possible to adopt a standard cable routing, as mention in 5.1, but the following guidelines should be adhered to:

(a) Secure all cables to the controller frame or other suitable locations.
(b) Cables should not obstruct the maintenance work on the controller, the unit being installed, or any other equipment fitted within the cabinet.

5.6 INTERFACING

[This section applies to all applications]

This comprises the connection of the various types of circuits contained in the unit to different equipment being monitored. For example:

OMCU Circuit	Traffic Controller Monitoring Point
Analogue Circuits	Current sensors for monitoring Aspect Current and Voltage Monitoring Transformer for monitoring Lamp Supply voltage.
Low Voltage Circuit	To monitor Phase Greens
Extra Low Voltage Circuit	Digital Signal Monitors e.g. Detector Inputs, Controller Micro Switches, etc.

This is not an exhaustive list and other applications exist. The following sub-sections detail the methods for the interfaces mentioned...

5.6.1 Current Sensors and Digital Outputs Connections

13	OMCU	—	—	—	Connect lamp current sensors (Unless using ST800 enhanced serial link)	5.6.1

Warning ***The current sensors must not be fitted to mains' leads carrying current unless they are plugged into their respective LMU I/O boards to terminate them; otherwise they may produce a high voltage.***

Each controller signal output, which is to be monitored, requires one current sensor as described on the RMS Instation computer printout. Examples of output types to be monitored are indicated in the following list. They all require one current sensor unless otherwise stated:

(a) Each 3-aspect vehicle phase
(b) Each 2-aspect pedestrian phase
(c) A 3-aspect pelican vehicle phase
(d) A 2-aspect pelican pedestrian
(e) Each group of wait lamps associated with the same pedestrian phase
(f) Each green arrow (or filter) phase

(g) Each switched sign phase

(h) If regulatory signs are to be monitored then they need to be grouped together

(i) Each "flashing amber signal group" phase requires one or two current sensors, depending on monitoring requirements (this phase type is applicable to export signal sequences only)

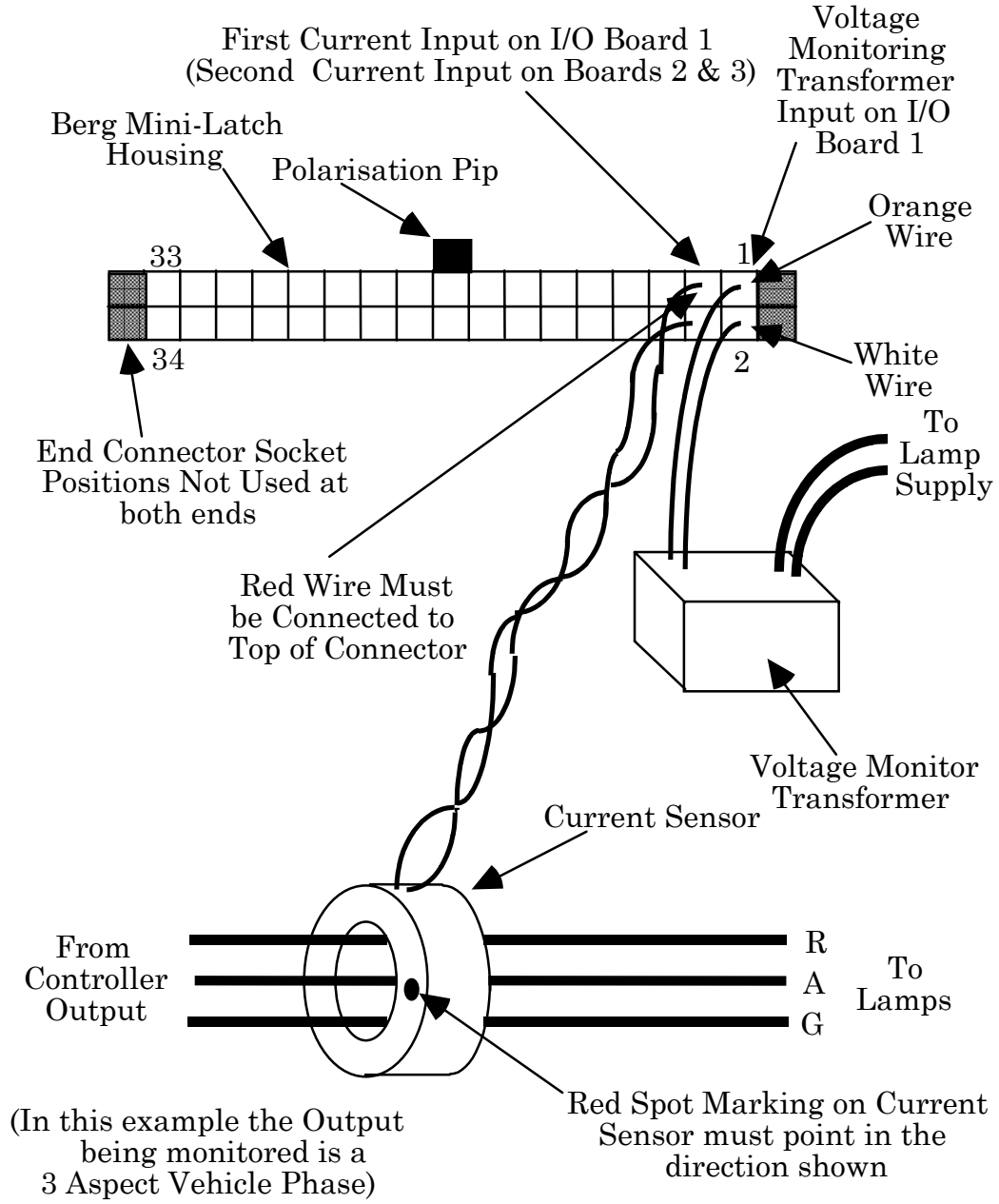
Each current sensor can monitor currents up to 4.25A RMS.

If the nominal load current (not including the red/ambers) of a particular controller output exceeds approximately 4.0A RMS, then that output should be split and treated as two separate outputs.

The maximum regulatory sign load is restricted to 7 signs (21 tubes) per input (choke/ballast types only allowed).

The current sensors measure the current flowing in the wires that are passing through their core. To maintain the correct relationship between the current flowing in the conductor and the output from the sensor, the sensors must be connected the correct way round (see following diagram).

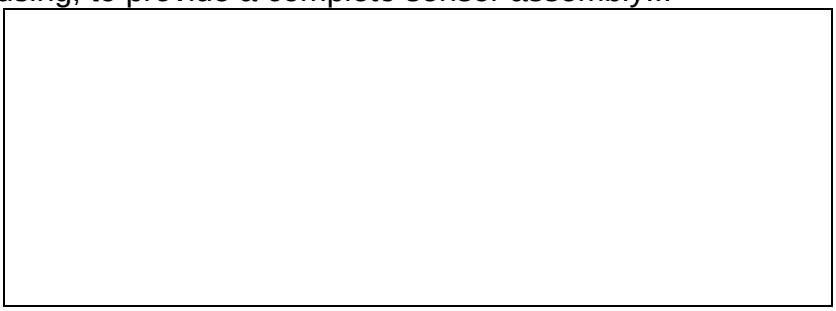
Figure 13 - Current Sensor Connection



For more details see 667/GA/26580/000 sheet 2 in Appendix B . The current sensor should be mechanically secured by passing a TYWRAP or equivalent through the sensor hole and around a suitable fixing point.

Caution ***The sensors may produce a high voltage when current is passed through the core if they are not terminated into an I/O Board.***

The sensors are terminated with Berg Mini PV terminals and are clipped into a Berg mini latch housing, to provide a complete sensor assembly...



The mini latch housing is the Analogue connector 508/4/26138/002, which plugs into PL1 on the I/O Board. The PL1 circuit allocation is as follows:

Also see 667/GA/26580/000 sheet 2 in Appendix B

Pin No.	Description
PL1 pin 1 PL1 pin 2 *[2]*	ANALOGUE INPUT 1 *[1]*
PL1 pin 3 PL1 pin 4 *[2]*	ANALOGUE INPUT 2
PL1 pin 5 PL1 pin 6 *[2]*	Analogue Input 3
PL1 pin 7 PL1 pin 8 *[2]*	Analogue Input 4
PL1 pin 9 PL1 pin 10 *[2]*	Analogue Input 5
PL1 pin 11 PL1 pin 12 *[2]*	Analogue Input 6
PL1 pin 13 PL1 pin 14 *[2]*	Analogue Input 7
PL1 pin 15 PL1 pin 16 *[2]*	Analogue Input 8
PL1 pin 17 PL1 pin 18 *[2]*	Analogue Input 9
PL1 pin 19 PL1 pin 20 *[2]*	Analogue Input 10

Pin No.	Description
PL1 pin 21 PL1 pin 22	Isolated Relay Output 1 *[3]*
PL1 pin 23 PL1 pin 24	ISOLATED RELAY OUTPUT 2
PL1 pin 25 PL1 pin 26	Isolated Relay Output 3
PL1 pin 27 PL1 pin 28	Isolated Relay Output 4 *[4]*

Pin No.	Description
PL1 pin 29	+12V modem supply *[5]*
PL1 pin 30	+8V modem supply *[5]*
PL1 pin 31 PL1 pin 32	Not used
PL1 pin 33	+5V modem supply *[5]*
PL1 pin 34	0V COMMON RETURN *[5]*

Notes:

[1] 'Analogue Input 1' on I/O Board 1 is reserved for the voltage monitor transformer.
[2] Pins 2, 4, 6, 8, 10, 12, 14, 16, 18 and 20 are commoned on the LMU I/O Board.
[3] Relay Output 1 may connect to a MOVA unit – see section 9.4 on page 108.
[4] Reserved for controlling the modem power on the first LMU I/O board.
[5] See section 5.2.2 on page 50 for details on the modem power connections.

5.6.2 Lamp Supply Sensor Connection

14	OMCU	—	—	—	Connect lamp supply sensor (Unless using ST800 enhanced serial link)	5.6.2

The lamp supply sensor (Voltage Monitoring Transformer) should be connected to the cabinet lamp supply as follows and the sensor should be mechanically secured to a suitable location within the controller. See the previous page for details on PL1.

Red	Lamp Supply
Black	Lamp Supply Common (Neutral)
Orange	Pin 1 Of Analogue Connector PL1 Of First LMU I/O Board
White	Pin 2 Of Analogue Connector PL1 Of First LMU I/O Board

5.6.3 Green Voltage Detector Connections

For ST800/700 enhanced serial link the mains voltage detector cableform 667/1/26586/800 is used. This provides connections to PL2 pins 1, 2 and 12 together with 11 and 14. Pin 2 connects to the Lamp Supply (ST800 PL2 d10, ST700 SK2/6.) All other controllers use cable 667/1/26586/000.

15	OMCU	C/P	—	—	Connect mains voltage detector cableforms	5.6.3

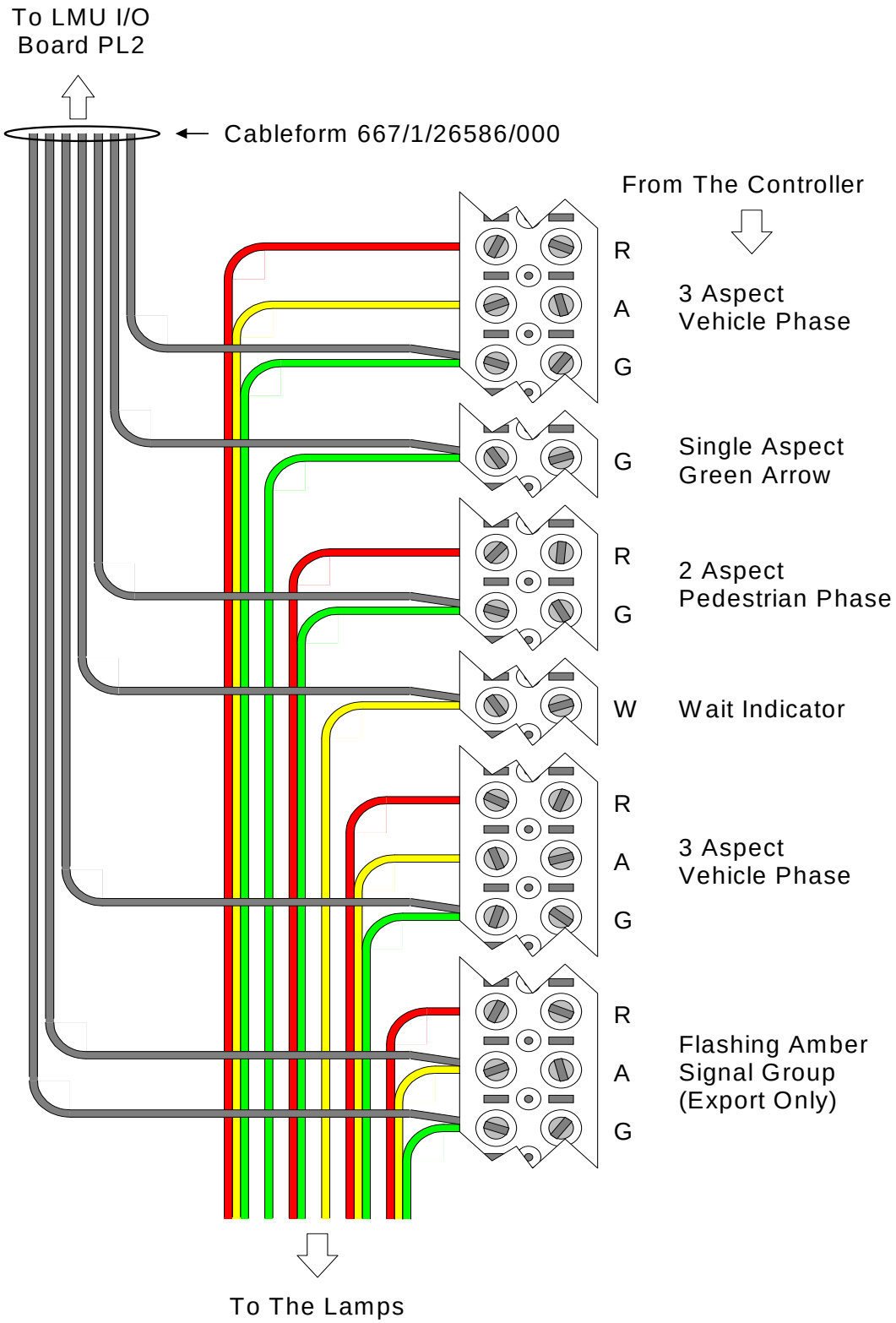
With the exception of the regulatory signs, each controller output monitored requires a connection to the green lamp drive voltage for that output. For single aspect outputs, the drives to those aspects are used in place of the green signal.

Connection to the unit is via cableform 667/1/26586/000 and each state connection must be terminated, as indicated in Figure 14 overleaf, and as detailed in the Instation Computer Printout.

Pin No.	Wire Colour	Description	ST800/700 Serial Link	All Other Controllers
PL2 PIN 1	**WHITE**	Input 1	Not normally used	Controller Mains
PL2 PIN 2	**GREY**	Input 2	Lamp Supply	Green Drive A
PL2 pin 3	**VIOLET**	Input 3	If using the ST800 Enhanced Serial Link (see section 4.2.6) then these inputs are not normally used	Green Drive B
PL2 pin 4	**BLUE**	Input 4		Etc...
PL2 pin 5	**YELLOW**	Input 5		See note below
PL2 pin 6	**ORANGE**	Input 6		
PL2 pin 7	**RED**	Input 7		
PL2 pin 8	**BROWN**	Input 8		
PL2 pin 9	**GREEN**	Input 9		
PL2 pin 10	**PINK**	Input 10		
PL2 pin 11	**RED**	ZXO Mains Input ---------- See section 5.2.4		
PL2 pin 12	**BLACK**	Common NEUTRAL (for above Inputs)		
PL2 pin 13		ZXO Return (120V) --------- See section 5.2.4		
PL2 pin 14	**BLACK**	ZXO Return (230V) --------- See section 5.2.4		

Note: This connector is also used by the OMCU to monitor the state of other mains level signals, such as the controller's mains supply (after its switches and fuses) for example, which is normally connected to the first mains state input on the first LMU I/O board.

Figure 14 - Typical Green State Connections



5.6.4 Digital Monitor Connections (LMU I/O Board Only)

16	OMCU	C/P	—	—	Connect digital monitors cables (Unless using ST800 enhanced serial link)	5.6.4

Digital Monitor points within the controller should be connected using the cableform 667/1/26585/000 as detailed on the Instation Computer Printout.

The connectors for these cableforms are on the underside of the board; i.e. on the opposite side to the mains' states connector. The silk-screening for their identifications (PL3 and PL4) and arrows are located on the topside of the board, near the edge.

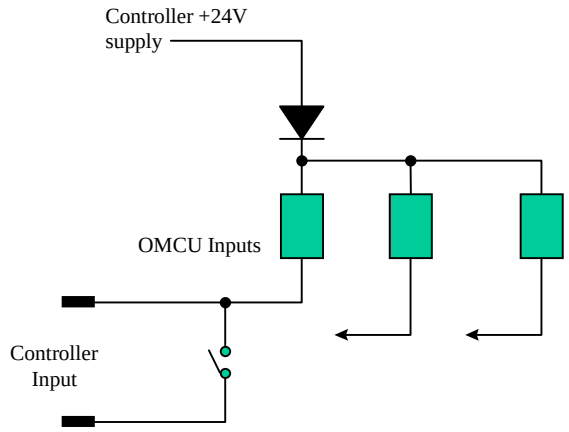
These Inputs are not polarity conscious, but are voltage conscious. This means they are connected one way for 24V logic working and the other way for 5V logic working. Hence the method of selecting 24V or 5V working is by reversing the inputs to the I/O Board.

For example, referring to the Extra Low Voltage Input 0, then for 24V working, connect the lead from PL4 pin 1 to the +ve signal and PL4 pin 2 to the -ve signal. For 5V working, connect the lead from PL4 pin 2 to the +ve signal and PL4 pin 1 to the -ve signal.

Most modern controller vehicle detectors will switch with an "on state" to their outputs with a threshold below 1V. If this is the case, then set all these circuits for 5V working. This has the advantage of using the inputs the same way round for all inputs on an installation, and is the preferred method.

If this method is used, but occasional false detections or drop out occur (probably caused by noise), then reverse all 24V detector monitors inputs at that installation. The common lead(s) should be taken to the appropriate point within the controller. These commons for the 24V working are typically the detector supply voltage itself; i.e. +24V and the odd number pins are used. Whereas for logic signals working is typically referenced to the Controllers +5V supply and the even number pins are used.

This may not solve the problem in all cases as noise at voltages higher than common supply voltage may trigger the 'reverse circuits'. (For example, when monitoring 24V signals, if the signal voltage goes above the common voltage by between 1V to 3V the 5V monitor circuit will be triggered.) If such problems occur a diode (1N4007) may be inserted between the common supply and the OMCU inputs as shown.



There are two Extra Low Voltage cableforms to each I/O Board. They are made from ribbon cable and therefore need to be spilt as required to suit the routing at the installation. It is therefore recommended that care be taken during the configuration

process at the Instation, to ensure that detectors on a terminal block should not be split over different ports.

Each cableform can cater for up to 8 inputs, and have the same colour coding, as defined below. The input ports are allocated to LMU I/O Boards in the following order. If Bus / MOVA I/O boards are also fitted, then the OMCU application can also read the inputs on those boards, see section 5.6.5 overleaf.

1st LMU I/O Board	**Ports 0 (PL4) & 1 (PL3)**	**Inputs 1 to 16**
2nd LMU I/O Board	**Ports 2 (PL4) & 3 (PL3)**	**Inputs 17 to 32**
3rd LMU I/O Board	**Ports 4 (PL4) & 5 (PL3)**	**Inputs 33 to 48**

The connectors for these cableforms are on the underside of the board; i.e. on the opposite side to the mains' states connector. The silk-screening for their identifications (PL3 and PL4) and arrows are located on the topside of the board, near the edge.

5V	24V	PORT 0 – PL4			PORT 1 – PL3		
		Connector and Pin	Ribbon Wire Colour	Input No.	Connector and Pin	Ribbon Wire Colour	Input No.
-	+	PL4 PIN 1	BROWN	1	PL3 pin 1	BROWN	9
+	-	PL4 pin 2	RED		PL3 pin 2	RED	
-	+	PL4 pin 3	ORANGE	2	PL3 pin 3	ORANGE	10
+	-	PL4 pin 4	YELLOW		PL3 pin 4	YELLOW	
-	+	PL4 pin 5	GREEN	3	PL3 pin 5	GREEN	11
+	-	PL4 pin 6	BLUE		PL3 pin 6	BLUE	
-	+	PL4 pin 7	VIOLET	4	PL3 pin 7	VIOLET	12
+	-	PL4 pin 8	SLATE		PL3 pin 8	SLATE	
-	+	PL4 pin 9	WHITE	5	PL3 pin 9	WHITE	13
+	-	PL4 pin 10	BLACK		PL3 pin 10	BLACK	
-	+	PL4 pin 11	2nd BROWN	6	PL3 pin 11	2nd BROWN	14
+	-	PL4 pin 12	2nd RED		PL3 pin 12	2nd RED	
-	+	PL4 pin 13	2nd ORANGE	7	PL3 pin 13	2nd ORANGE	15
+	-	PL4 pin 14	2nd YELLOW		PL3 pin 14	2nd YELLOW	
-	+	PL4 pin 15	2nd GREEN	8	PL3 pin 15	2nd GREEN	16
+	-	PL4 pin 16	2nd BLUE		PL3 pin 16	2nd BLUE	

Important ***The supplied crimp on the end of the cable should be inserted into the appropriate terminal block and spare wire should be tied back. The cable should not be cut in order to shorten it.***

Any of these ports, up to a total of four, may be used for N+1 flow counting. If this is the case the uses of the first five inputs on the port have the following fixed allocation:

Input 0 - "A" detector (by convention furthest from the Kerb)
Input 1 - "B" detector
Input 2 - "C" detector
Input 3 - "D" detector
Input 4 - "U" detector (U/D loop for "A")
Input 5 - Available for use as a normal OMCU digital input
Input 6 - Available for use as a normal OMCU digital input
Input 7 - Available for use as a normal OMCU digital input

Once the N+1 flow-counting function has been allocated to a port, the use of the five input lines is fixed as indicated. If some of these five inputs are not required (e.g. for a 2 lane approach, "D" would not be required) they must be left unconnected. Where U/D operation is not required, the "U" input must be left unconnected.

THEY MUST NOT BE USED FOR ORDINARY DETECTOR OR DIGITAL INPUTS.

However, inputs 5 to 7 on a ‘count’ port can be used as normal OMCU digital inputs.

5.6.5 BUS / MOVA Board Digital I/O

17	—	—	BUS	—	Connect Bus Processor digital I/O	5.6.5

The Bus / MOVA I/O Board has different digital input and output connectors than the LMU I/O board described in section 5.6.4. If a Bus / MOVA I/O board is fitted to an OMCU to perform bus processor functions, then this section details the digital I/O connections on that I/O board. However, if the I/O board is used for MOVA, see sections 9.2, 9.3 and 9.4 which start on page 103

The table on the following page shows the functions associated with the digital I/O connectors on the I/O board. It shows the Buffered Input’s and Isolated Output’s numbering allocation for the first and second I/O boards, although the actual I/O line numbers used by the unit will depend on the position of the boards in the stack.

There are different cableforms that may be connected to PL1 and PL2 connectors of the I/O board. These are to cover differing connection requirements. For the relevant cableforms and their wire colours and terminal block allocations see drawing 667/GA/26585/003, 667/GA/26585/004 and 667/GA/26585/010 at the back of this handbook.

I/O Board Connector PL1 and PL2 Connector Allocation

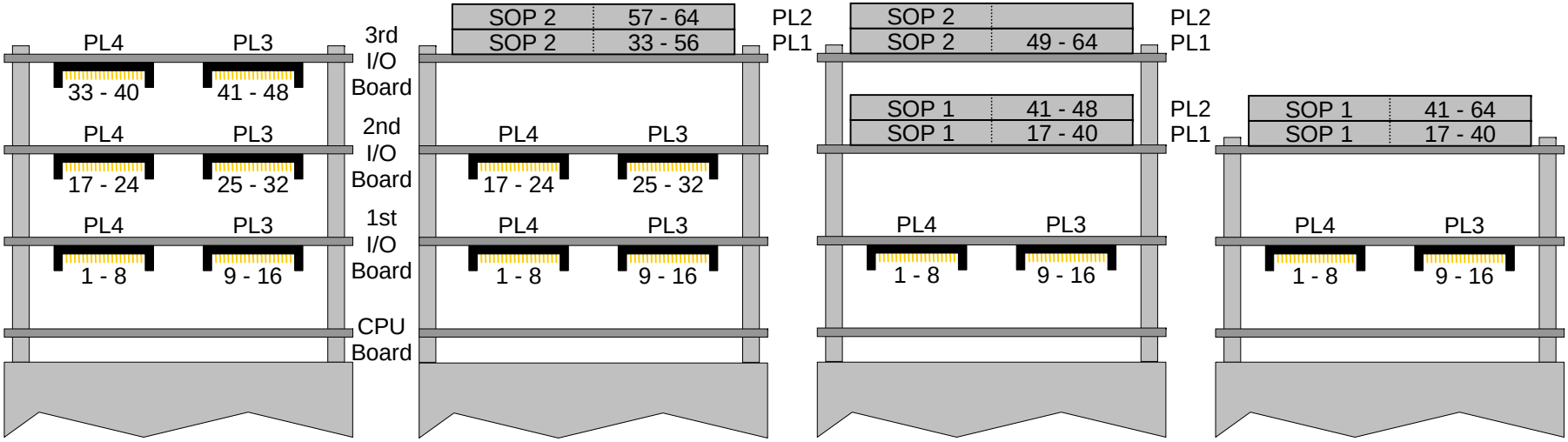
Pin	Board 1 PL1	Board 1 PL2
1	Buffered I/P 1	Buffered I/P 25
2	Buffered I/P 2	Buffered I/P 26
3	Buffered I/P 3	Buffered I/P 27
4	Buffered I/P 4	Buffered I/P 28
5	Buffered I/P 5	Buffered I/P 29
6	Buffered I/P 6	Buffered I/P 30
7	Buffered I/P 7	Buffered I/P 31
8	Buffered I/P 8	Buffered I/P 32
9	Buffered I/P 9	Buffered I/P 33
10	Buffered I/P 10	Buffered I/P 34
11	Buffered I/P 11	Buffered I/P 35
12	Buffered I/P 12	Buffered I/P 36
13	Buffered I/P 13	Buffered I/P 37
14	Buffered I/P 14	Buffered I/P 38
15	Buffered I/P 15	Buffered I/P 39
16	Buffered I/P 16	Buffered I/P 40
17	Buffered I/P 17	Buffered I/P 41
18	Buffered I/P 18	Buffered I/P 42
19	Buffered I/P 19	Buffered I/P 43
20	Buffered I/P 20	Buffered I/P 44
21	Buffered I/P 21	Do Not Use
22	Buffered I/P 22	Do Not Use
23	Buffered I/P 23	Do Not Use
24	Buffered I/P 24	Do Not Use
25	I/P Common Ret	I/P Common Ret
26	I/P Common Ret	I/P Common Ret
27	n/open O/P 1	n/open O/P 9
28	n/closed O/P 1	n/closed O/P 9
29	common 1	common 9
30	n/open O/P 2	n/open O/P 10
31	n/closed O/P 2	n/closed O/P 10
32	common 2	common 10
33	n/open O/P 3	n/open O/P 11
34	n/closed O/P 3	n/closed O/P 11
35	common 3	common 11
36	n/open O/P 4	n/open O/P 12
37	n/closed O/P 4	n/closed O/P 12
38	common 4	common 12
39	n/open O/P 5	n/open O/P 13
40	n/closed O/P 5	n/closed O/P 13
41	common 5	common 13
42	n/open O/P 6	n/open O/P 14
43	n/closed O/P 6	n/closed O/P 14
44	common 6	common 14
45	n/open O/P 7	n/open O/P 15
46	n/closed O/P 7	n/closed O/P 15
47	common 7	common 15
48	n/open O/P 8	n/open O/P 16
49	n/closed O/P 8	n/closed O/P 16
50	common 8	common 16

Pin	Board 2 PL1	Board 2 PL2
1	Buffered I/P 49	Buffered I/P 73
2	Buffered I/P 50	Buffered I/P 74
3	Buffered I/P 51	Buffered I/P 75
4	Buffered I/P 52	Buffered I/P 76
5	Buffered I/P 53	Buffered I/P 77
6	Buffered I/P 54	Buffered I/P 78
7	Buffered I/P 55	Buffered I/P 79
8	Buffered I/P 56	Buffered I/P 80
9	Buffered I/P 57	Buffered I/P 81
10	Buffered I/P 58	Buffered I/P 82
11	Buffered I/P 59	Buffered I/P 83
12	Buffered I/P 60	Buffered I/P 84
13	Buffered I/P 61	Buffered I/P 85
14	Buffered I/P 62	Buffered I/P 86
15	Buffered I/P 63	Buffered I/P 87
16	Buffered I/P 64	Buffered I/P 88
17	Buffered I/P 65	Buffered I/P 89
18	Buffered I/P 66	Buffered I/P 90
19	Buffered I/P 67	Buffered I/P 91
20	Buffered I/P 68	Buffered I/P 92
21	Buffered I/P 69	Buffered I/P 93
22	Buffered I/P 70	Buffered I/P 94
23	Buffered I/P 71	Buffered I/P 95
24	Buffered I/P 72	Buffered I/P 96
25	I/P Common Ret	I/P Common Ret
26	I/P Common Ret	I/P Common Ret
27	n/open O/P 17	n/open O/P 25
28	n/closed O/P 17	n/closed O/P 25
29	common 17	common 25
30	n/open O/P 18	n/open O/P 26
31	n/closed O/P 18	n/closed O/P 26
32	common 18	common 26
33	n/open O/P 19	n/open O/P 27
34	n/closed O/P 19	n/closed O/P 27
35	common 19	common 27
36	n/open O/P 20	n/open O/P 28
37	n/closed O/P 20	n/closed O/P 28
38	common 20	common 28
39	n/open O/P 21	n/open O/P 29
40	n/closed O/P 21	n/closed O/P 29
41	common 21	common 29
42	n/open O/P 22	n/open O/P 29
43	n/closed O/P 22	n/closed O/P 30
44	common 22	common 30
45	n/open O/P 23	n/open O/P 31
46	n/closed O/P 23	n/closed O/P 31
47	common 23	common 31
48	n/open O/P 24	n/open O/P 32
49	n/closed O/P 24	n/closed O/P 32
50	common 24	common 32

Note

Handset commands and displays use numbering of inputs and outputs starting from 0 rather than 1

The OMCU application (in PB680 and PB681 issue 10 and later) can also read the digital inputs on any Bus / MOVA I/O boards that are fitted. The following diagram and table summarise where the OMCU's 64 detector inputs are located when various combinations of I/O boards are fitted. For example, in addition to the 32 inputs on two LMU I/O boards, the OMCU can also monitor all 32 MOVA detectors on a MOVA I/O board (PL1 1 to 24 and PL2 1 to 8):



3 LMU I/O Boards (Or Less), But No Bus/MOVA I/O Boards

2 LMU I/O Boards plus 1 Bus/MOVA I/O Board

1 LMU I/O Board plus 2 Bus/MOVA I/O Boards

1 LMU I/O Board plus 1 Bus/MOVA I/O Board

OMCU Detectors	Board No.	Board Type	Connector and Pins	
1 – 8	1	LMU	PL4	1 – 16
9 – 16	1	LMU	PL3	1 – 16
17 – 24	2	LMU	PL4	1 – 16
25 – 32	2	LMU	PL3	1 – 16
33 – 40	3	LMU	PL4	1 – 16
41 – 48	3	LMU	PL3	1 – 16
49 – 56	-			
57 – 64	-			

Board No.	Board Type	Connector and Pins	
1	LMU	PL4	1 – 16
1	LMU	PL3	1 – 16
2	LMU	PL4	1 – 16
2	LMU	PL3	1 – 16
3	B / M	PL1	1 – 8
3	B / M	PL1	9 – 16
3	B / M	PL1	17 – 24
3	B / M	PL2	1 – 8

Board No.	Board Type	Connector and Pins	
1	LMU	PL4	1 – 16
1	LMU	PL3	1 – 16
2	B / M	PL1	1 – 8
2	B / M	PL1	9 – 16
2	B / M	PL1	17 – 24
2	B / M	PL2	1 – 8
3	B / M	PL1	1 – 8
3	B / M	PL1	9 – 16

Board No.	Board Type	Connector and Pins	
1	LMU	PL4	1 – 16
1	LMU	PL3	1 – 16
2	B / M	PL1	1 – 8
2	B / M	PL1	9 – 16
2	B / M	PL1	17 – 24
2	B / M	PL2	1 – 8
2	B / M	PL2	9 – 16
2	B / M	PL2	17 – 24

OMCU Detectors
1 – 8
9 – 16
17 – 24
25 – 32
33 – 40
41 – 48
49 – 56
57 – 64

The table on the following page identifies the board, connector, pin and wire colour for each OMCU detector in these four cases…

OMCU Detectors On Bus / MOVA I/O Boards
(PB680 AND PB681 ISSUE 10 AND LATER)

3 LMU I/O Boards (no Bus / MOVA I/O Boards)

I/O Board #1 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	1
		3 ORA	4 YEL	2
		5 GRN	6 BLU	3
		7 VIO	8 SLA	4
		9 WHI	10 BLA	5
		11 BRO	12 RED	6
		13 ORA	14 YEL	7
		15 GRN	16 BLU	8
	PL3 Ribbon 16W	1 BRO	2 RED	9
		3 ORA	4 YEL	10
		5 GRN	6 BLU	11
		7 VIO	8 SLA	12
		9 WHI	10 BLA	13
		11 BRO	12 RED	14
		13 ORA	14 YEL	15
		15 GRN	16 BLU	16
I/O Board #2 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	17
		3 ORA	4 YEL	18
		5 GRN	6 BLU	19
		7 VIO	8 SLA	20
		9 WHI	10 BLA	21
		11 BRO	12 RED	22
		13 ORA	14 YEL	23
		15 GRN	16 BLU	24
	PL3 Ribbon 16W	1 BRO	2 RED	25
		3 ORA	4 YEL	26
		5 GRN	6 BLU	27
		7 VIO	8 SLA	28
		9 WHI	10 BLA	29
		11 BRO	12 RED	30
		13 ORA	14 YEL	31
		15 GRN	16 BLU	32
I/O Board #3 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	33
		3 ORA	4 YEL	34
		5 GRN	6 BLU	35
		7 VIO	8 SLA	36
		9 WHI	10 BLA	37
		11 BRO	12 RED	38
		13 ORA	14 YEL	39
		15 GRN	16 BLU	40
	PL3 Ribbon 16W	1 BRO	2 RED	41
		3 ORA	4 YEL	42
		5 GRN	6 BLU	43
		7 VIO	8 SLA	44
		9 WHI	10 BLA	45
		11 BRO	12 RED	46
		13 ORA	14 YEL	47
		15 GRN	16 BLU	48

2 LMU I/O Boards plus 1 Bus / MOVA I/O Board

I/O Board #1 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	1
		3 ORA	4 YEL	2
		5 GRN	6 BLU	3
		7 VIO	8 SLA	4
		9 WHI	10 BLA	5
		11 BRO	12 RED	6
		13 ORA	14 YEL	7
		15 GRN	16 BLU	8
	PL3 Ribbon 16W	1 BRO	2 RED	9
		3 ORA	4 YEL	10
		5 GRN	6 BLU	11
		7 VIO	8 SLA	12
		9 WHI	10 BLA	13
		11 BRO	12 RED	14
		13 ORA	14 YEL	15
		15 GRN	16 BLU	16
I/O Board #2 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	17
		3 ORA	4 YEL	18
		5 GRN	6 BLU	19
		7 VIO	8 SLA	20
		9 WHI	10 BLA	21
		11 BRO	12 RED	22
		13 ORA	14 YEL	23
		15 GRN	16 BLU	24
	PL3 Ribbon 16W	1 BRO	2 RED	25
		3 ORA	4 YEL	26
		5 GRN	6 BLU	27
		7 VIO	8 SLA	28
		9 WHI	10 BLA	29
		11 BRO	12 RED	30
		13 ORA	14 YEL	31
		15 GRN	16 BLU	32
I/O Board #3 – BUS/MOVA I/O Board	PL1 Berg 50W	1 BLU		33
		2 YEL		34
		3 BRO		35
		4 VIO		36
		5 ORA		37
		6 SLA		38
		7 PIN		39
		8 RED	BLU	40
		9 RED	GRN	41
		10 RED	WHI	42
		11 RED	BRO	43
		12 RED	ORA	44
		13 RED	SLA	45
		14 BLU	GRN	46
		15 BLU	WHI	47
		16 BLU	BRO	48
		17 BLU	ORA	49
		18 BLU	SLA	50
		19 GRN	ORA	51
		20 GRN	BRO	52
		21 GRN	SLA	53
		22 BRO	SLA	54
		23 ORA	BRO	55
		24 ORA	SLA	56
	PL2 Berg 50W	1 BLU		57
		2 YEL		58
		3 BRO		59
		4 VIO		60
		5 ORA		61
		6 SLA		62
		7 PIN		63
		8 RED	BLU	64

1 LMU I/O Board plus 2 Bus / MOVA I/O Boards

I/O Board #1 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	1
		3 ORA	4 YEL	2
		5 GRN	6 BLU	3
		7 VIO	8 SLA	4
		9 WHI	10 BLA	5
		11 BRO	12 RED	6
		13 ORA	14 YEL	7
		15 GRN	16 BLU	8
	PL3 Ribbon 16W	1 BRO	2 RED	9
		3 ORA	4 YEL	10
		5 GRN	6 BLU	11
		7 VIO	8 SLA	12
		9 WHI	10 BLA	13
		11 BRO	12 RED	14
		13 ORA	14 YEL	15
		15 GRN	16 BLU	16
I/O Board #2 – BUS/MOVA I/O Board	PL1 Berg 50W	1 BLU		17
		2 YEL		18
		3 BRO		19
		4 VIO		20
		5 ORA		21
		6 SLA		22
		7 PIN		23
		8 RED	BLU	24
		9 RED	GRN	25
		10 RED	WHI	26
		11 RED	BRO	27
		12 RED	ORA	28
		13 RED	SLA	29
		14 BLU	GRN	30
		15 BLU	WHI	31
		16 BLU	BRO	32
		17 BLU	ORA	33
		18 BLU	SLA	34
		19 GRN	ORA	35
		20 GRN	BRO	36
		21 GRN	SLA	37
		22 BRO	SLA	38
		23 ORA	BRO	39
		24 ORA	SLA	40
	PL2 Berg 50W	1 BLU		41
		2 YEL		42
		3 BRO		43
		4 VIO		44
		5 ORA		45
		6 SLA		46
		7 PIN		47
		8 RED	BLU	48
I/O Board #3 – BUS/MOVA I/O Board	PL1 Berg 50W	1 BLU		49
		2 YEL		50
		3 BRO		51
		4 VIO		52
		5 ORA		53
		6 SLA		54
		7 PIN		55
		8 RED	BLU	56
		9 RED	GRN	57
		10 RED	WHI	58
		11 RED	BRO	59
		12 RED	ORA	60
		13 RED	SLA	61
		14 BLU	GRN	62
		15 BLU	WHI	63
		16 BLU	BRO	64

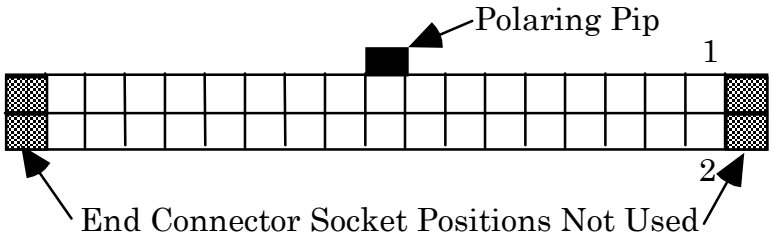
1 LMU I/O Board plus 1 Bus / MOVA I/O Board

				OMCU Inputs
I/O Board #1 – LMU I/O Board	PL4 Ribbon 16W	1 BRO	2 RED	1
		3 ORA	4 YEL	2
		5 GRN	6 BLU	3
		7 VIO	8 SLA	4
		9 WHI	10 BLA	5
		11 BRO	12 RED	6
		13 ORA	14 YEL	7
		15 GRN	16 BLU	8
	PL3 Ribbon 16W	1 BRO	2 RED	9
		3 ORA	4 YEL	10
		5 GRN	6 BLU	11
		7 VIO	8 SLA	12
		9 WHI	10 BLA	13
		11 BRO	12 RED	14
		13 ORA	14 YEL	15
		15 GRN	16 BLU	16
I/O Board #2 – BUS/MOVA I/O Board	PL1 Berg 50W	1 BLU		17
		2 YEL		18
		3 BRO		19
		4 VIO		20
		5 ORA		21
		6 SLA		22
		7 PIN		23
		8 RED	BLU	24
		9 RED	GRN	25
		10 RED	WHI	26
		11 RED	BRO	27
		12 RED	ORA	28
		13 RED	SLA	29
		14 BLU	GRN	30
		15 BLU	WHI	31
		16 BLU	BRO	32
		17 BLU	ORA	33
		18 BLU	SLA	34
		19 GRN	ORA	35
		20 GRN	BRO	36
		21 GRN	SLA	37
		22 BRO	SLA	38
		23 ORA	BRO	39
		24 ORA	SLA	40
	PL2 Berg 50W	1 BLU		41
		2 YEL		42
		3 BRO		43
		4 VIO		44
		5 ORA		45
		6 SLA		46
		7 PIN		47
		8 RED	BLU	48
		9 RED	GRN	49
		10 RED	WHI	50
		11 RED	BRO	51
		12 RED	ORA	52
		13 RED	SLA	53
		14 BLU	GRN	54
		15 BLU	WHI	55
		16 BLU	BRO	56
		17 BLU	ORA	57
		18 BLU	SLA	58
		19 GRN	ORA	59
		20 GRN	BRO	60
		21 GRN	SLA	61
		22 BRO	SLA	62
		23 ORA	BRO	63
		24 ORA	SLA	64

5.6.6 BUS / MOVA Board RS485 Serial Ports

18	—	—	BUS	—	Connect RS485 cables, e.g. for SIETAG	5.6.6

The following Table shows the RS485 connector pin assignments on each BUS/MOVA I/O board.



Connector Viewed from the BACK

RS485 Connections (PL3)

PL3 Pin Number	Board 1 Pin Function	Board 2 Pin Function	Board 3 Pin Function
1	Serial port 0 A	Serial port 4 A	Serial port 8 A
2	Serial port 0 B	Serial port 4 B	Serial port 8 B
3 & 4	not used	not used	not used
5	Serial port 1 A	Serial port 5 A	Serial port 9 A
6	Serial port 1 B	Serial port 5 B	Serial port 9 B
7 & 8	not used	not used	not used
9	Serial port 2 A	Serial port 6 A	Serial port 10 A
10	Serial port 2 B	Serial port 6 B	Serial port 10 B
11 & 12	not used	not used	not used
13	Serial port 3 A	Serial port 7 A	Serial port 11 A
14	Serial port 3 B	Serial port 7 B	Serial port 11 B

Note that the RS485 serial port numbers are determined by the board address (set as described in section 5.2.1). Thus for example, the second I/O board is always allocated RS485 serial port numbers 4 to 7, even if the first I/O board is a LMU I/O type.

For the relevant cableform and their wire colours and terminal block allocations see drawing 667/GA/26585/004 at the back of this handbook.

Normally, each SIETAG unit in a Bus Processor will be connected to one of these RS485 serial ports. An overview of the SIETAG bus processor functions is given in section 4.2.5. The wiring is as follows:

‘A’ connects to SIETAG backplane pin 21
‘B’ connects to SIETAG backplane pin 15

NB: Ensure that the Sietag backplane is fitted with a link connecting the through-hole immediately above silk screen number "14" to the through-hole above silk screen number "21".

The line termination resistors on the BUS/MOVA I/O board should be set to 120 Ω as described in section 5.2.5.

The serial port to which each reader is connected must correspond with the data configured for the OMCU on RMS screen 500. The SOP command can be used to check that the BUS/MOVA I/O boards are being correctly detected by the OMCU, see page 182.

The OMCU RS485 serial port configuration must match the Sietag reader in order to receive data i.e. 9600baud, parity disabled, 1 stop bit and 8 data bits. The serial ports are configured on RMS screen 510 or via the POC command in section 11.10.

The DBM command (see section 11.9) can be used to display received characters on the RS485 serial ports. The SIETAG reader outputs an "LI" text string repeatedly in the idle state. While a vehicle tag is being detected, the reader outputs the tag number in HEX, e.g. "LM 123456789ABCDEF"

5.6.7 MOVA Digital I/O

19	—	—	—	MOVA	Connect MOVA digital I/O cables (Unless using ST800 enhanced serial link)	9.2 & 9.3
20	—	—	—	MOVA	Connect MOVA phone line sharing.	9.4

The MOVA digital I/O cables and the phone line sharing connections are detailed in sections 9.2, 9.3, and 9.4, which start on page 103.

5.6.8 Post Installation Checks

21	OMCU	C/P	BUS	MOVA	Complete post installation check	5.6.8

(a) Routing of cables

Signals for the following groups may be bunched together but must not be grouped to other cables or other cabinet signals to reduce the occurrence of extraneous signals upsetting the monitoring unit.

Group 1 - Digital Monitoring Signals.
Group 2 - Analogue Monitoring Signals.
Group 3 - Green Volts Detect Signals.

(b) Earth Continuity

The EARTH CONTINUITY RESISTANCE must not exceed 0.5 Ω on exposed metal parts of the unit when measured with reference to the EARTHING TERMINATION POINT of the cabinet.

(c) Check On Integrity of Neutral Connections

With the controller switched on and cycling and a multi-meter set to measure AC volts - measure the voltage between each green feed and neutral, when the green is off. The voltage should be less than 5V RMS to meet IEE Regulations BS7671, if it is not then the neutral connection between the controller and the signal head(s) being tested may be faulty. Inspect all neutral runs that appear faulty, to ensure they are not loose or corroded.

5.6.9 Cable Form Identification

22	OMCU	C/P	BUS	MOVA	Identify all connectors/cable forms	5.6.9
23	OMCU	C/P	BUS	MOVA	Connect all connectors to the unit	–

The label sleeve attached to all Monitoring Cable Form Assemblies, with the specific purpose of identifying the I/O Board and connector to which the cable form assembly is connected, should be marked with a permanent marker pen to identify its connector ID and board location, as follows:

For example: ‘PL1/1’ = Plug 1 - Board 1
‘PL4/3’ = Plug 4 - Board 3

All the cables should be connected to the unit at this point.

5.6.10 TR0141 Cable Installation (Controller)

24	OMCU	—	—	MOVA	Connect 141 cable to controller handset port (req’d for MOVA if using ST800 link)	5.6.10

The OMCU communicates with a controller using ribbon cable 667/1/26579/XXX. The variant depends on the type of controller being monitored. Section 7.5 on page 87 lists the different variants of this cable.

Insert this cable into plug PL4 (SIL 18 way) on the processor board (see drawing 667/GA/26580/000 in Appendix B), and the other end (25 way 'D' Type), into the appropriate 'Handset Socket' of the controller.

Note: This cable is required if MOVA is to use the enhanced serial link to an ST800 even if the OMCU application is not required, see section 4.2.6 on page 32.

5.6.11 TR0141 Cable Installation (OTU)

25	—	—	BUS	—	Connect 141 cable to OTU handset port (req’d for BUS if using OTU link)	5.6.11

The OMCU communicates with an OTU using ribbon cable 667/1/26579/000.

Insert this cable into plug PL4 (SIL 18 way) on the processor board (see drawing 667/GA/26580/000 in Appendix B), and the other end (25 way 'D' Type), into the appropriate 'Handset Socket' of the OTU.

Note: This cable is required if the unit is to use the 141 serial link for routing SIETAG vehicle detections to an OTU.

5.6.12 Mains Supply Connection

26	OMCU	C/P	BUS	MOVA	Connect the unit to mains outlet	5.6.12
27	OMCU	C/P	BUS	MOVA	Restore controller and unit mains supply	–
28	OMCU	C/P	BUS	MOVA	Switch on unit supply	–

IMPORTANT

The wires in the mains' lead are coloured as follows:

BROWN – LIVE

BLUE – NEUTRAL

GREEN / YELLOW – EARTH

Mains' power is supplied to the unit through a 6A rated 3-core flex.

Normally the unit is powered from an auxiliary mains supply provided within the controller. In controllers without this facility or if this is not convenient, a suitable alternative mains supply must be provided, being careful not to compromise the safety of the controller (Refer to Poole Engineering if in doubt).

Do not connect the mains supply input of the unit to the lamp supply of the controller, as this will cause the unit to operate incorrectly.

Mains fused: The recommended rating of this external fuse is up to 5A anti-surge.

5.6.13 Connect Unit Support Battery

29	OMCU	C/P	—	—	Connect unit support battery	5.6.13

To connect the Unit Support Battery, the fuse (Part Number 518/4/90285/008 supplied separately), is inserted in the Battery Fuse Holder on the front panel. If the unit is to be left not powered after installation, this fuse should be removed and stored in a safe place, ready for insertion during commissioning.

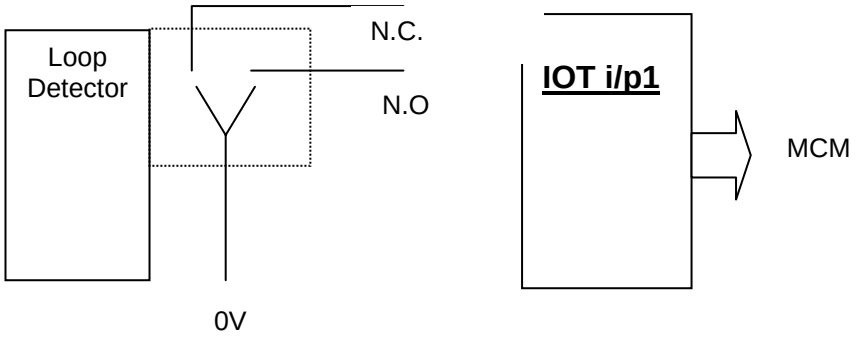
Remember that MOVA and Bus Processor units do not normally require a 'Unit Support Battery'; consult the Works Specification for requirement.

5.6.14 Peek TRX Controller I/O connections

When installing the Siemens OMU the detector monitoring inputs require access to the same 24VDC supply as is used to reference the detector inputs. At present this is not directly available.

To make the 24VDC supply available to the Siemens OMU the supply should be taken from the back of the TRX backplane. Soldering a wire to the connector pin "+24VDC" on the TRX backplane should make the connection. This wire is then connected to the wires from the OMU I/O connector, odd numbered pins (1, 3, etc). It is suggested that the first wire (brown) is used and all other odd numbered pins connected to this brown wire using a connector block. The detectors being monitored using this method should not exceed a current loading of 250mA under normal operating conditions.

Any detectors monitors that are used to monitor loop detectors wired using TRX detector backplanes can still access the relevant detector input using a screw terminal on the IOT PCB.



Therefore if a loop detector is configured as input 1 it can be monitored on the terminal block labelled i/p1 on the IOT PCB.

5.7 INSTALLATION OF THE UNIT IN ADDITIONAL OUTERCASE

When considering installation of a unit it is not always possible to mount it in the same cabinet as the controller. In these circumstances an additional outercase will be needed which can be installed up to 8 metres from the controller.

6. OMCU COMMISSIONING

WARNING

THIS EQUIPMENT MAY ONLY BE COMMISSIONED BY SIEMENS TRAFFIC CONTROLS OR BY TRAINED PERSONNEL.

ENSURE THAT THE UNIT IS NOT CONNECTED TO THE PSTN LINE JACK UNIT AT THE COMMENCEMENT OF COMMISSIONING TESTS.

ZX0 WIRES FROM THE PSU TO THE FIRST LMU I/O BOARD (NEAREST CPU).

The red and black wires, which come from under the power supply cover through the ferrite, are at mains potential when the unit is switched on. For 240V operation, these wire connect to pins '14' and '11' on the expansion board connector 'PL2' (for full details of the connections see section 5.2.4 of this handbook which starts on page 51.)

The mains supply must be completely removed from the unit prior to:

- **Disconnecting these wires for any reason, e.g. replacing unit.**
- **Any ZX0 circuit setting adjustments as defined in section 5.2.4.**
- **Any operation that would leave these wires exposed.**

If, for any reason, these wires are left exposed and unattended (e.g. change out unit) they must be safely terminated with the unit unplugged from the mains' supply. The unit must not have mains applied to it until the wires are connected or safely terminated, for example by removing additional wires so that only the bullet connections, which provide protection against accidental contact with mains potentials, remain.

During a unit change out, the Green Voltage Detector connections can be left intact on cableform 667/1/26586/000 which connects to the controller (as defined in section 5.6.3 which starts on page 61).

6.1 INTRODUCTION

The checklist on the following pages should be used to commission the OMCU and Bus Processor applications if they are required.

The checklist should be followed in sequence unless a particular step is not required. Refer to the 'OMCU', 'Car Park [Count OMCU]' and the 'Bus [Processor]' columns to determine whether the step applies to the type of unit being commissioned. If the unit is to perform both OMCU and Bus Processor facilities for example, then all activities in both the 'OMCU' and 'BUS' columns should be undertaken.

Section 9 which starts on page 101 describes MOVA and includes its commissioning steps. If the OMCU and MOVA applications are required within the same unit, then the OMCU commissioning checklist must be followed **and then** the MOVA commissioning checklist.

In most cases, the unit has all of its timing and configuration data downloaded from the central office. On site set-up can be performed where required for bus processing functions, see section 11.10.

6.2 OMCU COMMISSIONING CHECKLIST

	OMCU	Car Park	BUS	CHECK	REFERENCE
1	3	3	3	**Installation check** Check all the connections have been installed in accordance with the Customer Supplied Instation instructions.	Installation spec. produced by RMS Instation if available
2		3		**Count Outstation Checks** The car park to be monitored should be checked to verify that: a) All the detection is working; b) Correct detectors are wired to the entry and exit loops. c) That the RUN LED (LP3) is indicating the OMCU is powered and running.	

	OMCU	Car Park	BUS	CHECK	REFERENCE
3	✓			**Controller Checks** The controller to be monitored should be checked to verify that: a) All lamps are working, including WAIT lamps; b) All the detection is working; c) All push buttons are working; d) The controller is fully serviceable and servicing all demands and extensions; e) The controller timing is correct; f) That the RUN LED (LP3) is indicating the OMCU is powered and running.	
4	✓	✓	✓	Ensure the RAM backup battery and the OMCU Support battery (where equipped), are both connected and switched on. If the modem has an on/off switch ensure it is switched on.	5.2.8 & 5.6.13
5	✓	✓	✓	Plug the handset into the OMCU HANDSET connector and hit the <return> key a number of times, until the sign-on message 'SIEMENS OMCU' or the prompt character is displayed. NB: Firmware PB680 issue 5 and later will auto-baud to 1200, 9600 or 19200 baud and requires the key presses to determine the baud rate.	
6	✓	✓	✓	Check using the FLT code that the OMCU Fault logs only contain the 'Equipment Data Invalid' report - if not then initialise the OMCU and Bus Processor applications, using INI=1 and recheck. **Important:** Use INI=3 to completely re-initialise an integrated OMCU and MOVA unit running PB681, see section 9.6.2 on page 115.	11.8
7	✓	✓	✓	Check with the OMCU Handset that the OMCU Operating Mode is "FIRST POWER UP", i.e. OPM <CR> responds with 'OPM:5'.	11.8
8	✓	✓	✓	On firmware issue 5 or later, use the TOD command to set up the correct day, date and time.	11.8

	OMCU	Car Park	BUS	CHECK	REFERENCE
9	✓	✓	✓	If the OMCU digital I/O Ports are connected, check that they respond to detector and controller mode changes, etc, using the DIP handset command.	Instation config sheet & 11.4
10	✓			Check the OMCU mains state inputs respond to the monitored controller signals (phase greens, wait indicators, controller supply etc) using the MSI handset command.	Instation config sheets and 11.4
11	✓			Where fitted, check the current sensor input gives appropriate readings for the phase, during red, green, amber, etc. Also check that the magnitude of the reading corresponds with that expected for the phase lamp load using the KAC handset command. Typical values can be found in the Fault finding section.	Instation config sheets & 11.5
12	✓			Check that, where dimming is fitted, the KAC1 1 code shows the correct readings for both dim and bright states.	Instation config sheets & 11.5
13	✓		✓	**DUSC Facility Check (If Configured)** The OMCU provides the ability to copy the detector inputs through to the outputs. This is controlled using the 'COD' handset command. This allows the VA operation to be maintained even though the OMCU is unconfigured. The BUS/MOVA I/O board provides changeover output relays. The 'inverse' sense would be selected when the 'normally closed' output relay contact is being used. Check that the Outputs from the OMCU are connected to the correct inputs on the Controller. Use handset command SOP to display OMCU outputs. Check that the green confirm inputs on the OMCU are connected to the correct outputs on the Controller. Use handset command DIP to display OMCU outputs.	11.14

	OMCU	Car Park	BUS	CHECK	REFERENCE
14	✓		✓	If the OMCU is connected to a TR 0141 controller handset port, check that the controller can be interrogated through the OMCU using the XXC and XXO handset commands. Since the OMCU is not configured at this stage the SCT code may be used to initialise the OMCU UART to the appropriate configuration.	11.8
15	✓		✓	If the controller is an ST800 and will be monitored using the enhanced 141 serial link, check that the OMCU and ST800 firmware issues will support the link (use PIC commands).	See 4.2.6 for required firmware issues
16			✓	If required, set up the OMCU ID using the JID command (only necessary if customer requires ID to be configured before PSTN communication is established, e.g. TCSU).	11.10
17			✓	If present, ensure the radio clock is functioning correctly using the RCS command.	11.8.5
18			✓	Use the DBM command to confirm that the RS485 channels are correctly connected and working. Monitor actual vehicles or use a dummy transponder or Protocol analyser to simulate messages. Note: If both LMU and Bus/MOVA I/O boards are used on the same unit, ensure the LMU I/O boards are issue 3 or later (otherwise the RS485 channels may not function).	5.6.6 and 11.9
19	✓		✓	If the telephone line exists, plug in a telephone and dial the OMCU number, which should give engaged tone. If the telephone works, and there is someone at the Instation, it is possible to check the download and monitoring. Normally the Instation is notified that the OMCU is ready to be tested at a later date. Go to step 29.	

	OMCU	Car Park	BUS	CHECK	REFERENCE
20	✓		✓	**Dial Out & Dial In Checks** Connect OMCU Telephone Connector and a Telephone Handset (e.g. BT ref. 248/2) into a Dual Outlet Adapter (BT ref. LJU10/3A). Connect the Dual Output Adapter into the line Jack Unit.	
21	✓		✓	Use the Telephone handset to dial the Instation Operators and inform them the OMCU is ready for Configuration Data Download. (Preferably within an agreed time, e.g. 5 minutes.) DO NOT FORGET TO REPLACE TELEPHONE RECEIVER.	
22	✓		✓	Check that, within the agreed time, the Telephone Handset Bell (Bleeper, etc.) rings twice at which point the OMCU answers.	
23	✓		✓	The Comms LED on the processor should show data being transmitted in both directions by flashing. (If the LED does not flash, lift the telephone receiver, it is probably a voice call.)	7.3.3
24	✓		✓	OMCU Handset "Operating Mode" should show "CONFIG DOWNLOAD" (OPM : 2).	11.8
25	✓		✓	After a period of time, the Comms LED on the processor should go off, indicating that the call has terminated. The OMCU Handset "Operating Mode" should show "MONITORING" (OPM : 0) in which case continue with the following steps. If OPM is not 0, go back to step 20.	11.8

	OMCU	Car Park	BUS	CHECK	REFERENCE
26	✓	✓	✓	**Support Battery Check (If Fitted)** With the battery connected, check that when the power is removed from the OMCU, the OMCU within one minute dials the Instation and a mains failure report' is logged on the Instation system printer. If the battery does not support the OMCU, then charge the Support battery for at least 10 minutes by restoring the mains and repeat this test. Restore power to the OMCU and check that the OMCU reports "mains restoration" to the Instation within one minute.	
27	✓			**OMCU-ST800 Link** If the controller is an ST800, monitored using the enhanced 141 serial link, check that the enhanced link is operating, using the EEL command (EEL:3 is OK).	4.2.6 for facility description & 11.8 for EEL command
28		✓		**Car Park Count Check** When OMCU is being used to provide car park count facility then all configuration data is set up via the handset. Use handset command ‘LDV=3’ to set up the default car park count data. See section 10 for details of this facility.	Section 10 for facility description
29			✓	**SIETAG Vehicle Detections Routed via 141 Port Check** When the OMCU is being used to provide routing of SIETAG vehicle detections via the 141 serial port then all configuration data is set up via the handset. Use handset command ‘LDV=4’ to set up the default configuration data.	

	OMCU	Car Park	BUS	CHECK	REFERENCE
30		✓		**PAKNET check (if Fitted)** With car park count systems the PAKNET interface is used to transmit data to the Instation. The following parameters must be set-up via the handset. a) Enable the PAKNET interface via handset command RCT. b) Set the Instation PAKNET address via handset command RCA. c) Set the address of the OMCU via handset command ADR. Ensure that the pad is powered via a din rail mounted 12V relay. See section 10.2.2	Section 10 for facility description
31	✓			**RAID** If RAID should be operational verify that this is the case by checking that the licence is valid using the REN handset command.	4.2.14
32	✓		✓	**Conclusion Of Tests** Remove the Dual Outlet telephone adapter from the Line Jack Socket and insert the OMCU Telephone connector.	
33	✓	✓	✓	Check that the OMCU Fault Log is clear using the FLT handset code.	11.6
34	✓		✓	Disconnect any other test equipment. **The OMCU is Ready For Service**	
35	✓		✓	If the OMCU is to be left not powered after the commissioning is complete, then both the RAM Backup and UNIT Support Batteries must be switched off.	5.2.8 & 5.6.13

7. MAINTENANCE

WARNING

THE MAINS SUPPLY TO THE UNIT AND THE ASSOCIATED TRAFFIC CONTROLLER MUST BE SWITCHED OFF PRIOR TO ANY MAINTENANCE WORK BEING CARRIED OUT ON THE UNIT.

ANY UNAUTHORISED USE OF COMPONENTS OR MODIFICATIONS OR ENHANCEMENTS WITHOUT PRIOR APPROVAL BY SIEMENS TRAFFIC CONTROLS COULD RESULT IN INVALIDATION OF THE TYPE APPROVAL OF THIS PRODUCT.

THIS EQUIPMENT MAY ONLY BE MAINTAINED BY SIEMENS TRAFFIC CONTROLS OR BY TRAINED PERSONNEL.

THIS UNIT CONTAINS BATTERIES, WHICH UNDER FAULT CONDITIONS, MAY LEAK HAZARDOUS SUBSTANCES. CARE MUST BE TAKEN WHEN REPLACING BATTERIES OR HANDLING THE UNIT.

REPLACE BATTERIES WITH ONLY THE SAME OR EQUIVALENT TYPE. DISPOSE OF USED BATTERIES BY RETURNING TO POOLE SITE OR DEPOT. BATTERIES REPLACED INCORRECTLY COULD CAUSE AN EXPLOSION.

ZX0 WIRES FROM THE PSU TO THE FIRST LMU I/O BOARD (NEAREST CPU).

The red and black wires, which come from under the power supply cover, through the ferrite are at mains potential when the unit is switched on. For 240V operation, these wire connect to pins '14' and '11' on the expansion board connector 'PL2' (for full details of the connections see section 5.2.4 of this handbook which starts on page 51.)

The mains supply must be completely removed from the unit prior to:

- **Disconnecting these wires for any reason, e.g. replacing unit.**
- **Any ZX0 circuit setting adjustments as defined in section 5.2.4.**
- **Any operation that would leave these wires exposed.**

If, for any reason, these wires are left exposed and unattended (e.g. change out unit) they must be safely terminated with the unit unplugged from the mains' supply. The unit must not have mains applied to it until the wires are connected or safely terminated, for example by removing additional wires so that only the bullet connections, which provide protection against accidental contact with mains potentials, remain.

During a unit change out, the Green Voltage Detector connections can be left intact on cableform 667/1/26586/000 which connects to the controller (as defined in section 5.6.3 which starts on page 61).

7.1 INTRODUCTION

With authorisation from Siemens Traffic Controls, the user or a third party may carry out first line maintenance work on the unit. To obtain authorisation the user or third party must undergo a basic training course, provided by Siemens Traffic Controls.

7.2 FIRST LINE

The authorised agent is restricted to first line maintenance work only. Maintenance work beyond first line should be referred to Siemens Traffic Controls.

The authorised agent may carry out the first line maintenance, detailed as follows:

(a) Board Replacement
(b) Fuse Replacement
(c) Connector Replacement
(d) Interface Cable Replacement
(e) Battery Replacement
(f) Modem Replacement
(g) PSU Replacement

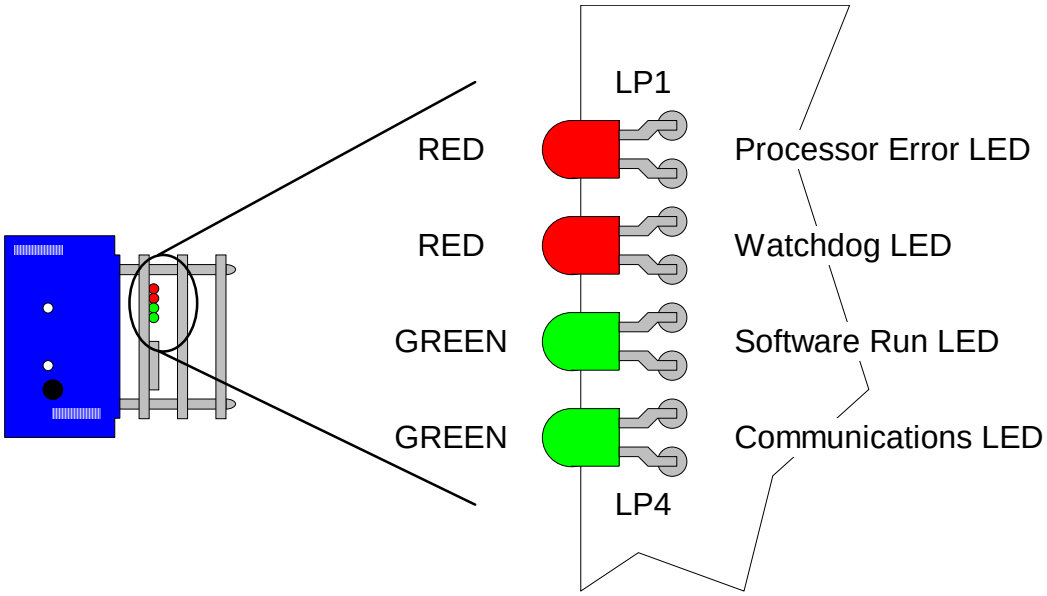
7.3 FAULT FINDING

The unit is a modular design, which simplifies faultfinding to a board or assembly level. Section 8 which starts on page 89 provides guidelines to faultfinding and Repair to modular level. The status LED indicators on the processor board provide a visual identification of the fault condition existing on the unit.

The OMCU software has a diagnostic routine, which when accessed by the handset, can identify many other types of fault conditions. See section 11 for detailed handset command codes and replies, along with their associated fault indications.

Note that the handheld handsets commonly used to interrogate traffic controllers and other traffic equipment (including OMCUs) cannot be used to interrogate the MOVA application since it requires menu driven application running on a PC. See section 9 for more information about the MOVA unit.

The four LED indicators on the processor board give the following status or fault indication:



7.3.1 Processor Error LED

This red LED has two states:

(a) OFF indicates no processor error.

(b) ON STEADY indicates there is an error with the processor.

7.3.2 Watchdog Failure LED

This red LED has two states:

(a) OFF indicates no watchdog failure.

(b) ON STEADY indicates the watchdog has timed out.

7.3.3 Communications LED

This green LED has four states:

(a) OFF STEADY indicates no call active.

(b) OFF but FLASHING ON briefly indicates ringing **or** modem being configured.

(c) ON STEADY indicates call active (carrier present).

(d) ON but FLASHING OFF briefly indicates data being received during call.

7.3.4 Software Run LED

LED State	OMCU (PB680 issue 1 to 4)	OMCU (PB680 issue 5 or later)	MOVA† (PB681)
On Steady	Monitoring	—	—
Slow Flash*	—	Monitoring	On Control
Fast Flash*	Fault	Fault	Off Control
Off	No Power	No Power	No Power

* The slow flash rate is approximately one second on / one second off, whereas the fast flash rate is much faster (several flashes per second).

† **When both the OMCU and MOVA applications are running on the same unit, then the run LED will flash at the fast rate when either the OMCU has detected a fault or the MOVA application is not on control.**

If the software run LED is off, then this indicates that the board has lost power, e.g. mains power has been lost and the battery is now flat, or there is a major board fault that prevents the software running or the LED is faulty.

If an OMCU unit is not operating normally, i.e. the LED is flashing quickly, then it:

(a) has urgent faults present which have not yet been reported to the Instation (the OMCU will be either dialling the Instation or in PSTN retry),

(b) is not monitoring, i.e. unconfigured, monitoring turned off, config data invalid, config being downloaded, or

(c) has detected a OMCU ‘hard’ error condition, e.g. repeated failure of internal software check

If a MOVA unit’s LED is flashing quickly then:

(a) MOVA is disabled or has been switched off control ‡,

(b) the MOVA unit has confirmed one or more faulty detectors (the ‘fault’ will not be cleared until the error log is manually cleared), or

(c) the MOVA software has failed internally

‡ Note: After any power break, the MOVA unit will remain off control until the controller has performed one complete cycle in its fallback mode. This is known as the MOVA warm-up cycle.

7.4 ROUTINE MAINTENANCE

Units only require annual maintenance, which can be performed at the same time as the inspection of associated controller or other equipment. On these visits, trained personnel must switch off the mains power to the controller and the unit.

7.4.1 Annual Maintenance

For a unit fitted with battery support, switch the mains power off and check the unit is supported by the battery for a minimum of 10 minutes. Do this by inspecting the RUN LED and waiting until the power failure has been reported to the Instation. This tests the condition of the Unit Support battery, and if the unit loses support within 10 minutes, the battery must be replaced. After the 10 minutes is up, remove the battery fuse, which will power down the unit.

For any type of unit, carry out all the following procedures:

(a) General inspections of the unit in situ for any contamination, overheating of components, corrosion or battery leakage. Rectify where necessary.

(b) Check the tightness of all interface cables and re-tighten where necessary.

(c) Check the condition of the interface cables; that there is no chafing of the insulation and that the general condition of the insulation is good. Replace any damaged or worn cables.

(d) Check the mechanical tightness of the main securing screws of unit and re-tighten where necessary.

(e) Restore mains power to the controller and the unit. Check the controller and other associated equipment is operating correctly. Then check the unit has retained its configuration by observing the RUN LED returns to its normal operating state, i.e. on steady or flashing slowly. In the case of an OMCU, this will be after the power restoration has been reported to the Instation; or in the case of a MOVA unit, once the controller has performed one complete cycle.

    If the RUN LED continues flashing quickly then see section 7.3.4 and use the handset port to examine the unit. This check only tests the RAM memory support battery has not failed. It does not check its capacity and ability to support the RAM during long power cuts.

(f) Force the unit to call the central office and prove communications to the operator. This can be achieved using the OMCU handset command CAL=1.

Note: Routine replacement of fuses is NOT considered necessary.

This completes the annual maintenance of the unit.

7.4.2 5-Yearly Maintenance

It is recommended that every five years, in addition to the annual maintenance routine described above, rechargeable batteries be replaced. These are the optional Unit Support battery and the RAM backup battery. See Section 7.6.3 for part numbers.

7.5 PART NUMBERS

Plug 3 pin Rectangular 3A	508/4/29174/004
OMCU 95 Power PC Firmware	667/1/12680/000
Detector 11” Rack Kit	667/1/20690/000
Detector 19” Rack Kit	667/1/20690/001
Traffic O/S Mounting Kit	667/1/26577/000
Traffic O/S Unit Assembly	667/1/26580/000
I/O Expansion Kit (OMCU)	667/1/26580/001
Bus/MOVA I/O Expansion Kit	667/1/26580/002
Standard GSM OMCU	667/1/26580/010
Traffic O/S Preliminary Assembly	667/1/26581/100
Traffic O/S Battery Kit	667/1/26594/000
Traffic O/S Lasat Modem Kit	667/1/26598/000
Traffic O/S Pace Modem Kit	667/1/26598/001
GSM Modem Kit	667/1/26598/010
Power Processor PCB Assembly	667/1/26601/002
Current Monitoring Transformer	667/7/25171/000
Voltage Monitoring Transformer	667/7/25172/000
TR0141 Cable Standard	667/1/26579/000
TR0141 Cable C3000/TCL/Monitron	667/1/26579/001
TR0141 Cable Microsense	667/1/26579/002
Cableform Low Voltage (1.5m)	667/1/26585/000
Cableform Low Voltage (1m)	667/1/26585/001
Bus/MOVA I/O Expansion Cable	667/1/26585/003
Bus/MOVA RS485 I/O Cable	667/1/26585/004
Cableform High Voltage	667/1/26586/000
Cableform Low Voltage Output	667/1/26589/000
Siemor Cable Kit	667/1/26592/000
Basic OMCU	667/1/28850/000
MOVA Add to Basic OMCU Kit	667/1/28851/000
OMCU Free Standing Cables Kit	667/1/28852/000
OMCU Free Stand I/O Expansion + Cable	667/1/28853/000
MOVA I/O All Controllers	667/1/28855/000
BUS PCB and Cable Kit	667/1/28856/000

7.6 SPARES

The following spares should be held by the authorised maintenance agent. Some of the parts listed in Section 7.5 above are also available as spares. Contact Siemens Poole for details.

7.6.1 General

LMU I/O PCB Assembly 667/1/26570/000

BUS / MOVA I/O PCB Assembly 667/1/27881/000

PSU I/P 85-264V AC O/P 15V 3A 605/4/97046/000

Voltage Sensor (for Welsh Office only) 667/7/25172/500

7.6.2 Interface Cables

OMCU/LMU High Voltage Cable 667/1/26586/800

BUS / MOVA I/O Cable (Without T/Bs) 667/1/26585/005

BUS / MOVA I/O Cable (TCSU) 667/1/26585/010

Analogue Connector 508/4/26352/017

Cableform DC power 667/1/26584/000

MOVA to T400/ST800 Cable 667/1/26604/000

MOVA Terminal Block Kit 667/1/26605/000

7.6.3 Batteries

RAM Back-up Battery 3V rechargeable 418/4/39820/000

Note:

1. Lead Acid Batteries have a one-year shelf life, if stored at below 20°C, at which stage they must be recharged to maintain their efficiency. Consult the manufacturer's data for this recharge procedure. It is recommended that batteries should not be held as spares, but ordered as and when required from Siemens Poole.
2. When replacing the battery take particular note of its orientation. The battery must not be installed upside down (i.e. The connections tags must be pointing upwards). See also Technical Bulletin TB 41-0087

7.6.4 Fuses

Battery Fuse (5mm x 20mm 5A Q/B 250V) 518/4/90285/008

Fuse Holder (Panel Mounted) 516/4/00142/000

BUS/MOVA I/O QB 250mA 250V 518/4/90285/011

Fuse Holder for BUS/MOVA I/O Fuse 516/4/97060/000

8. FAULT FINDING AND REPAIR

8.1 INTRODUCTION

The following section comprises of battery, telephone connection information and warnings, together with quick reference tables, to provide a guide to aid fault tracing on the unit for first line maintenance purposes:

Table 8.4.1 : PSTN Communication Failures
Table 8.4.2 : GSM Communication Failures
Table 8.4.3 : MODEM COMPATIBILITY
Table 8.5 : EQUIPMENT FAILURES
Table 8.6 : POWER FAILURES

Section 11 provides a description of the codes that can be used in fault finding. These codes are often referred to in tables 8.4 to 8.6 as HANDSET CODE.

8.2 BATTERY FAILURES

If one of the batteries has failed, it must be replaced with the specified battery or equivalent (see section 7.6.3 on page 88). Exercise great care when handling old batteries, which may be leaking, and during replacement of new ones, to ensure no damage occurs to either.

WARNING

OLD BATTERIES MUST BE DISPOSED OF IN ACCORDANCE WITH THE 'CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS 1988'.

SPENT BATTERIES MUST BE DISPOSED THROUGH AN APPROVED HAZARDOUS WASTE DISPOSAL CONTRACTOR.

DO NOT PUNCTURE BATTERIES.

DO NOT DISPOSE OF BATTERIES IN ANY FIRE.

DO NOT ATTEMPT TO RECHARGE FAILED BATTERIES.

8.3 TELECOMMUNICATIONS APPROVAL WARNING

The PSTN Modem is approved for connection to the Public Switched Telephone Network. This approval may be invalidated if any authority other than the original manufacturer repairs the equipment.

8.4 COMMUNICATIONS FAILURES

8.4.1 TABLE FOR PSTN COMMUNICATIONS FAILURES

Note that use of the term 'modem' applies equally to PSTN modems and GSM modules.

Symptom	Diagnosis	Action
(a) Unit will not answer Instation calls	PSTN line out of order or disconnected	Check the line by disconnecting the unit from the line socket and inserting a telephone handset. Try a voice call to and from the service depot. If line is OK, the modem is powered and its connections are OK, replace modem.
	Telephone cable disconnected	Check the PSTN connections to the modem and the Line connection socket. If modem is powered, and connections OK, replace the modem.
	Modem failed	Check if the modem's ''ON" LED is lit, if yes replace modem. If no check that the modem is switched on and voltage on the modem power cable is present (see section 5.2.2 on page 50). If no voltage present, replace I/O board providing the power. Note that a MOVA unit which is sharing the telephone line with an OMCU will normally switch off the power to its modem, leaving the OMCU to answer any calls from the RMS Instation (see section 9.4 on page 108). NB: If the unit comm's LED is repeatedly flashing, the unit is attempting (but failing) to initialise the modem. Replace modem and/or check compatibility.
	Unit out of service	Check that the statuses of the LEDs on the Processor board are correct (see section 7.3 which starts on page 83). If not, power down and power up the unit. If fault persists, replace the processor board.
	Unit power failed	Check that the mains input to the unit is present. If yes, replace the unit's PSU. If no, then check the mains supply and fuses.
	Modem incompatible with Instation modem	Check that the unit and Instation are using compatibly configured modems. Refer to section 8.4.3.

Symptom	Diagnosis	Action
(b) Unit will not dial Instation	Instation Number incorrect.	Check the configured Instation telephone number is correct using CTN and TNP (section 11.7 on page 174). If correct replace modem, if not reload the unit's configuration.
	Unit in a retry sequence	Check the unit is in a retry sequence using RSC and RTR (section 11.7 on page 174). If not replace modem.
	PSTN line out of order or disconnected	Check the line by disconnecting the unit from the line socket and inserting a telephone handset. Try a voice call to and from the depot. If line OK, modem is powered, and connections OK, then replace modem.
	Telephone cable disconnected	Check the PSTN connections to the modem and the Line connection socket. If modem is powered, and connections OK, then replace modem.
	Modem failed	Check if the modem's ''ON" LED is lit, if yes replace modem. If no check the modem is switched on and voltage on the modem power cable (see section 5.2.2 on page 50). If no voltage present, replace I/O board providing the power. Note that a MOVA unit which is sharing the telephone line with an OMCU will normally switch off the power to its modem and pass any fault to the OMCU which then dials the RMS Instation (see section 9.4 on page 108).
	Unit out of service	Check that the status of the LEDs on the Processor board is correct (see section 7.3 which starts on page 83). If not power down and power up the unit. If fault persists, replace the processor board.
	Modem incompatible with Instation modem	Check that OMCU and Instation are using compatibly configured modems. Refer to section 8.4.3.
(c) Download failure	Wrong configuration for the unit or faulty unit	Check unit can support facilities being configured. If not, load the corrected configuration. If yes, replace the unit's processor board and re-configure. If fault still persists replace the unit.

Symptom	Diagnosis	Action
(d) Unit to Instation link communications not completed or intermittent	PSTN line intermittent (OMCU only)	Check using handset codes CDC, CTR and MDC, what types of faults and the rate of their occurrences (see section 11.7). If this information indicates an intermittent PSTN line, request a line check by the appropriate authority.
	Modem intermittent (OMCU only)	Check using handset codes CDC, CTR and MDC, what types of faults and the rate of their occurrences (see section 11.7). If this information indicates an intermittent Modem, check if the modem power and data connectors are securely inserted. If yes, then replace the modem and its cables. If the fault still persists, replace the unit.
	MOVA Communications Problems	Check the modem power supply is stable and to specification (see section 5.2.2 on page 50). If yes, replace the modem and its cables, if no, replace the I/O board that provides the modem power. If problems persist, request a line check by the appropriate authority.

8.4.2 TABLE FOR GSM COMMUNICATIONS FAILURES

Note that use of the term 'modem' applies equally to GSM modules.

Symptom	Diagnosis	Action
(a) Unit will not answer Instation calls	GSM Network unavailable or blocked.	Check with the Service provider (e.g. BTCellnet or Vodaphone), that the particular SIM Card / phone number are enabled for DATA and are not in any way blocked. The service provider will be able to check the phone number and SIM card through their network. Note:- PLEASE note any network restrictions that may apply, which are noted in the GSM modem installation and commissioning section. It is possible that some SIM cards may have one number for data and another for voice. It must be ensured that the correct number is used. If only ONE number is provided it MUST be DATA only.
	Arial cable disconnected	Check the Arial connections between the modem and the arial. The arial should be mounted on the signal pole closest to the controller cabinet. If modem is powered, and connections OK, replace the modem.
	OMCU to GSM communications	Check that the OMCU comms LED is not continually flashing as this indicates the OMCU is failing to communicate with the GSM modem. Check the modem to OMCU connections, check that the cable is plugged into LP2 on the OMCU processor and into the modem. Check that the modem comms are set up correctly as described in section 2.6.2. Replace cable / OMCU / Modem until successful comms achieved.

Symptom	Diagnosis	Action
(a) Unit will not answer Instation calls (continued)	GSM Modem failed	Check if the modem's ‘‘ON” LED is lit. (NB On the GSM modem this is a small LED on the top surface of the modem near the SIM Card entry point. Once installed it is likely to be on the modem surface nearest the OMCU PSU plate and so its reflection may be easier to see. The LED has 3 states - Constant On – Powered correctly and service available. Flashing – Powered but GSM service is not available. Off – No power to GSM modem. Check that the modem is switched on and voltage on the modem power cable is present (see section 5.2.2 on page 50). If no voltage present, replace I/O board providing the power. Note that a MOVA unit which is sharing the telephone line with an OMCU will normally switch off the power to its modem, leaving the OMCU to answer any calls from the RMS Instation (see section 9.4 on page 108). NB: If the OMCUs comm's LED is repeatedly flashing, the unit is attempting (but failing) to initialise the modem. Replace modem and/or check compatibility. See section 8.4.3 Modem Compatibility.
	Unit out of service	Check that the statuses of the LEDs on the Processor board are correct (see section 7.3 which starts on page 83). If not, power down and power up the unit. If fault persists, replace the processor board.
	Unit power failed	Check that the mains input to the unit is present. If yes, replace the unit's PSU. If no, then check the mains supply and fuses.

Symptom	Diagnosis	Action
(b) Unit will not dial Instation	Modem incompatible with Instation modem	Check that the unit and Instation are using compatibly configured modems. Refer to section 8.4.3.
	Instation number incorrect	Check the configured Instation telephone number is correct using CTN and TNP (section 11.7 on page 174). If correct replace modem, if not reload the unit's configuration.
	Unit in a retry sequence	Check the unit is in a retry sequence using RSC and RTR (section 11.7 on page 174). If not replace modem.
	GSM Network unavailable or blocked	Ref above
	Arial cable disconnected	Ref above.
	GSM Modem failed	Ref above
	Unit out of service	Ref above
(c) Download failure	Modem incompatible with Instation modem	Check that OMCU and Instation are using compatibly configured modems. Refer to section 8.4.3.
(d) Unit to Instation link communications not completed or intermittent	Wrong configuration for the unit or faulty unit	Check unit can support facilities being configured. If not, load the corrected configuration. If yes, replace the unit's processor board and re-configure. If fault still persists replace the unit.
	PSTN line intermittent (OMCU only)	Check using handset codes CDC, CTR and MDC, what types of faults and the rate of their occurrences (see section 11.7). If this information indicates an intermittent GSM Service / line, request a check by the appropriate Service provider.

Symptom	Diagnosis	Action
(d) Unit to Instation link communications not completed or intermittent (continued)	Modem intermittent (OMCU only)	Check using handset codes CDC, CTR and MDC, what types of faults and the rate of their occurrences (see section 11.7). If this information indicates an intermittent modem, check if the modem power and data connectors are securely inserted. If yes, then replace the modem and its cables. If the fault still persists, replace the unit.
	MOVA Communications Problems	Check the modem power supply is stable and to specification (see section 5.2.2 on page 50). If yes, replace the modem and its cables. If no, replace the I/O board that provides the modem power. If problems persist, request a line check by the appropriate authority.

8.4.3 Modem Compatibility

OMCU Type and Firmware	OMCU Modem	RMS Instation Pace PMC33.6 or Lasat 288 forced V21 (300baud)	RMS Instation Pace PMC33.6 or Lasat 288 auto baud	Maximum Data Rate with auto baud Instation Modem
OMCU (5U) PB201 All Firmware Issues	N/A	OK	OK	300 baud
OMCU (3U) PB680 All Firmware Issues	Lasat 144	OK	I/S to OMCU only	300 baud
OMCU (3U) PB680 Issues 2 to 4	Lasat 288	OK	OK	2400 baud
OMCU (3U) PB680 Issues 5 onwards	Lasat 288	OK	OK	19200 baud
OMCU (3U) PB680 Issues 2 to 4	Pace PMC33.6	OK	OK	300 baud
OMCU (3U) PB680 Issues 5 onwards	Pace PMC33.6	OK	OK	19200 baud
OMCU (3U) PB680 Issues 2 to 4	M20 GSM	Not Compatible	OK	2400 baud
OMCU (3U) PB680 Issues 5 onwards	M20 GSM	Not Compatible	OK	9600 baud

8.5 TABLE FOR EQUIPMENT FAILURES

Symptom	Diagnosis	Action
(a) Unit not operating	Software watchdog has triggered	Check the state of the Watchdog LED (see section 7.3 which starts on page 83), if lit power down and power up the unit to cause a reset. If Watchdog LED lights again, replace the processor board. If the Watchdog LED lights again, replace the unit.
	Processor board failed	Check the state of the Processor Error LED (see section 7.3 which starts on page 83), if lit power down and power up the unit to cause a reset. If Processor Error LED lights again, replace the processor board. If the Processor Error LED lights again, replace the unit.
	Voltage Monitor Transformer failed (OMCU only)	Check using the Handset code FLT for fault LOF. If the fault exists and the lamps at the intersection are on, check using handset code KAC1 1 to display the reading from the Voltage Monitor Transformer. If the reading is 0 replace the Voltage Monitor Transformer. If the reading is above 0 replace the I/O board.
	Unit not configured	If the RUN LED is flashing quickly (see section 7.3 which starts on page 83) then the unit may not be configured. On an OMCU, use the handset command OPM to find out the operating mode (see page 184), while on a MOVA unit, check that the site data is still present by using the PC comm's applications to display the site filenames. Reload the configuration / site data if necessary.
	Unit disabled	If the RUN LED is flashing quickly (see section 7.3 which starts on page 83) then the unit may be disabled, e.g. monitoring disabled in the case of an OMCU.
	Incorrect board addresses	Check the state of the LEDs and the handset output. If all LEDs are extinguished and no output is produced on the handset then it is likely that the unit cannot detect a power active signal from the first board. Check the board address switches (see section 5.2.1 which starts on page 49).

(continued overleaf)

Symptom	Diagnosis	Action
(a) Unit not operating (continued)	Software not running	If the RUN LED is flashing and an error message is being continually output on the handset, this indicates that an internal check has repeatedly failed. Power down and power up the unit to cause a reset. If fault persists, replace the processor board and then whole unit.
	Expansion port failed	Check the Board address switches for all the I/O boards are set correctly, to select that I/O board relative to its position in the stack (see section 5.2.1 on page 49). If yes, replace the Processor board. If no, set the switches to the correct setting.
(b) Input and Output (I/O) board faults	Digital input failed	Monitor the relevant input(s) using the OMCU handset code DIP (see section 11.4) or use the MOVA commissioning screen. If, the indications are incorrect, replace the relevant I/O cable and board. If, the indications are correct, replace the processor board. If the fault persists, replace the unit.
	Digital output failed	Monitor the relevant output(s) using the OMCU handset codes SOB or SOP (see page 182) or use the MOVA commissioning screen. If the output does not function as displayed, replace the relevant I/O cable and board. If the fault persists, replace the unit.
	Green State inputs failed (OMCU only)	Monitor the relevant input(s) using the Handset code MSI (see section 11.4) for correct operation. If, the indications are incorrect, replace the relevant I/O board. If, the indications are correct, replace the processor board. If the fault persists, replace the unit.
	Voltage Monitor input failed (OMCU only)	Monitor the Voltage Monitor Transformer Analogue inputs using the Handset code KAC (see section 11.5), for correct operation. Observe the handset display and check that the varying reading is approximately between 650 to 800 for bright or 450 to 600 for dim (160V setting). If, the readings are incorrect, replace the relevant I/O board. If, the readings are correct, replace the processor board. If the fault persists, replace the unit.

(continued overleaf)

Symptom	Diagnosis	Action
I/O board faults (continued)	Current sensor inputs failed (OMCU only)	Monitor the relevant input(s) using the Handset code KAC (see section 11.5), for correct operation. Observe the handset display and check that the varying reading is approximately 50 per bulb for bright or 40 per bulb for dim. If, the readings are incorrect, replace the relevant I/O board. If, the readings are correct, replace the processor board. If the fault persists, replace the OMCU.
	Unit not able to read the inputs and outputs on certain groups of ports belonging to an I/O board	Check that the address switches of suspected boards are set correctly (see section 5.2.1 on page 49). If OK, replace that I/O board. If not OK, set the switches to the correct setting.
(c) Handset port not operating	Terminal configured wrong	Check that the terminal is set correctly to act as a dumb terminal, at 1200 baud (or 9600 baud for a MOVA unit), with 1 start bit, 7 data bits, 1 stop bit and even parity.
	Unit is ‘Auto Bauding’	OMCU software PB680 issue 5 and later can operate the handset port at either 1200, 9600 or 19200 and thus ‘auto-bauds’ to determine the required speed. Therefore, it does not generate the initial ‘SIEMENS OMCU’ prompt until <return> is pressed a few times.
	Wrong type of terminal	If the terminal can not be set to act as a dumb terminal, at 1200 baud (or 9600 or 19200 baud for OMCU PB680 issue 5 and later), with 1 start bit, 7 data bits, 1 stop bit, and even parity, then replace the terminal.
	Handset port failed	Check the terminal is set correctly and that its interconnection cable is not damaged. If the handset port still does not work, replace the processor board.

8.6 TABLE FOR POWER FAILURES

Symptom	Diagnosis	Action
(a) Unit not operating	PSU failed	Check the unit has mains power. If yes, replace the PSU. If no, then check the cabinet's mains fusing and power supply.
	Mains Input failed	Check the cabinet's mains supply to the unit and repair as necessary. If fault still persists due to no mains, request the electricity authority to restore mains supply.
(b) OMCU has no Unit Battery Support.	Battery Fuse failed	Check the battery fuse on the front panel and replace if blown.
	Battery cable connections failed	Remove the unit. Check, by removing the protective cover from the PSU and battery area, that the bullet connectors, Faston tags and screw terminals are connected correctly, and refit if necessary.
	Unit Support Battery failed	When the Mains power is switched off, or has failed. If the battery fuse on the front panel is not blown, and the battery cables connections are sound, then replace the Unit's support battery (see section 8.2 on page 89).
(c) Unit has no Configuration or fault data support	RAM support battery switch failed	Check the RAM support battery switch is in the "ON" position. If not, move the switch to the "ON" position and recheck if the unit now has RAM memory support. If the fault still persists, replace the processor board.
	RAM support battery charger failed	With the switch in the OFF position and the unit powered up check the voltage across the RAM battery greater than 3.6V. If this is the case replace Processor board.
	RAM support battery failed	If the RAM support switch is in the "ON" position and the battery charger is providing more than 3.6V, replace the battery (see section 8.2 on page 89).

9. MOVA

9.1 MOVA Introduction

IMPORTANT: BEFORE LOADING ANY CONFIGURATION DATA, REFER TO SECTION 9.6.7 ON PAGE 120.

The following is an extract from the introduction of AG10.

> *MOVA stands for Microprocessor Optimised Vehicle Actuation, a new strategy for control of traffic light signals at isolated junctions - junctions uncoordinated with any neighbouring signals. MOVA is designed to cater for the full range of traffic conditions from very low flows through to a junction that is overloaded. For the major part of the range, before congestion occurs, MOVA operates in a delay minimising mode; if any approach becomes overloaded, the system switches to a capacity maximising procedure.*
>
> *The MOVA system requires vehicle detection by inductive loop or equivalent detectors that provide both vehicle counts and presence information. Each traffic lane approaching the junction has one or more detectors.*

This 3U Traffic Outstation Handbook covers the installation, maintenance and commissioning steps for the Siemens MOVA unit.

Also refer to the Highways Agency Installation Guide for MOVA (MCH 1542) and the TRL booklets AG10, AG11 and AG12. These documents complement this handbook by covering the design of MOVA intersections, such as determining the location of the vehicle loops and the construction of the MOVA site data, as well as commissioning the completed MOVA intersection.

The Siemens MOVA unit combines the TRL MOVA software with the Siemens 3U traffic outstation hardware as used by the Siemens RMS OMCU.

Since the OMCU and MOVA share the common hardware platform, the installation and maintenance of a Siemens MOVA unit is very similar to the installation and maintenance of the OMCU. Therefore…

See section 5 for the installation and section 7 for maintenance details.

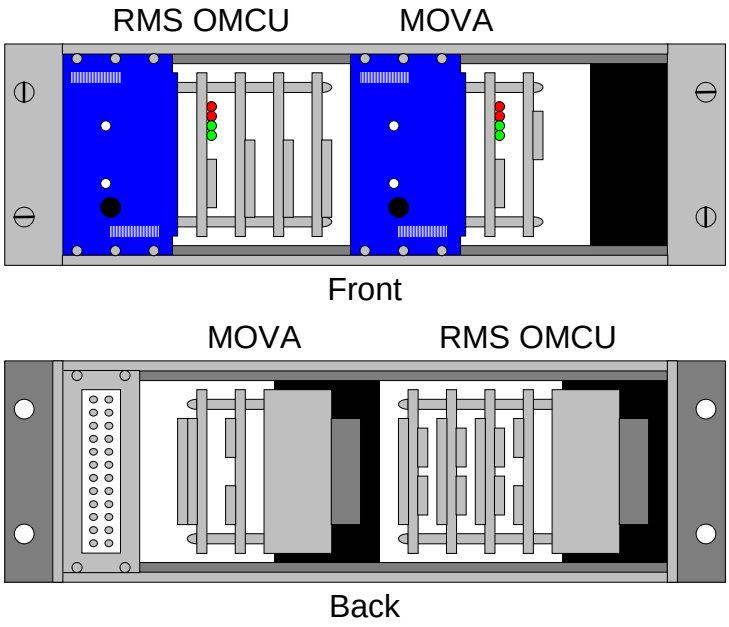
However, commissioning a MOVA unit is very different from commissioning an OMCU or Bus Processor and thus this is covered later in this section.

Prior to issue 10, only the MOVA application is present in the PB681 firmware PROM. From PB681 issue 10 onwards, the MOVA and OMCU applications are both available within the same ‘3U Traffic Outstation’ unit. See overleaf…

The Original Siemens MOVA unit

Prior to issue 10, the OMCU application was not available in the PB681 MOVA firmware PROM. Therefore, if the traffic controller was required to be monitored by a Siemens OMCU, a separate OMCU unit needed to be installed.

These two 3U units were normally supplied 'ready built' in a single 19" 3U rack as shown right, and could share the same telephone line, see section 9.4 on page 108.



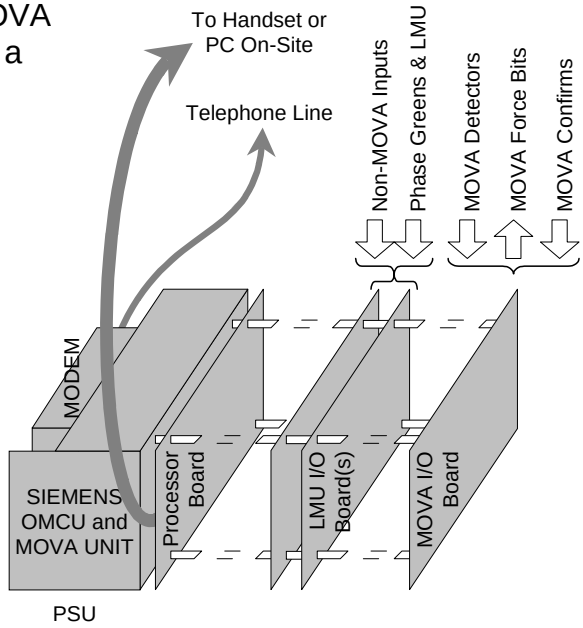
Note that MOVA units installed this way can be upgraded with the new firmware, i.e. issue 10 or later. The new firmware will automatically detect and function as either a separate MOVA unit phone line sharing with a separate OMCU or as a new 'integrated' OMCU/MOVA unit (see section 9.6.3 on page 116 for more information).

The Integrated Siemens OMCU and MOVA Unit

From PB681 issue 10 onwards, both the MOVA and OMCU applications are available within a single '3U Traffic Outstation', known as an 'Integrated OMCU and MOVA unit'.

This unit is fitted with a single processor board fitted with PB681 rather than PB680 firmware, one or two LMU I/O boards to provide the OMCU with its detector and mains' state inputs, and one Bus / MOVA I/O board to provide MOVA detectors, force and confirm bits.

Note: Most of these I/O boards will not be required if the enhanced serial link to ST800 option described in section 4.2.6 on page 32 and section 9.6.4 on page 117 is used.



9.2 MOVA Interfaces

Since the MOVA unit uses the same hardware platform as the OMCU, the interfaces are similar to those of the OMCU and thus most are covered by section 5.6 which starts on page 57.

There are two main exceptions:

(i) Access to the MOVA application through the handset port.

Access to the MOVA application is via a PC running suitable software connected to the 25 way D-Type port on the front of the processor board, see section 9.6.1 on page 114. The same software must also be used to communicate with the MOVA unit across the telephone line, see section 9.7 on page 128.

The MOVA application will not communicate with the small portable handsets commonly used to interrogate other traffic equipment as it uses full screen displays rather than simple handset commands.

On an Integrated OMCU and MOVA unit, this PC application can be used to communicate locally with the OMCU application as well as the MOVA application.

(ii) The digital inputs and outputs used by MOVA are pre-allocated since the MOVA site data is hardware platform independent. The MOVA application will automatically use the 48 inputs and 16 outputs of the first BUS / MOVA I/O board that is fitted as follows:

a) Detector inputs (1 to 32)

b) Confirm inputs (G1 to G10) plus the Controller Ready Bit (CR)

c) Force bit outputs (F1 to F13) plus the Take Over Bit (TO), but note that MOVA can currently only control up to 8 stages (F1 to F8)

d) The phone line sharing handshaking signals to a separate OMCU (DM & MF)

e) The ‘SP - Sync Pulse’ output which is only used during development

MOVA I/O CONNECTOR 2 (PL2 - TOP)

	MORE FORCE BITS (OUTPUTS)														CONFIRM INPUTS						MORE DETS				
49		SP	SP		F13	F13		F11	F11		F9	F9	0v			G10	G8	G6	G4	G2	CR	31	29	27	25	1
50	T0	T0		MF	MF		F12	F12		F10	F10		0v			DM	G9	G7	G5	G3	G1	32	30	28	26	2

MOVA I/O CONNECTOR 1 (PL1 - BOTTOM)

	FORCE BITS (OUTPUTS)												DETECTOR INPUTS												
49		F7	F7		F5	F5		F3	F3		F1	F1	0v	23	21	19	17	15	13	11	9	7	5	3	1	1
50	F8	F8		F6	F6		F4	F4		F2	F2		0v	24	22	20	18	16	14	12	10	8	6	4	2	2

The use of each detector input, each confirm bit input and each force bit output and their terminal positions should be recorded on a MOVA Installation Sheet. An example of a MOVA Installation Sheet is given on pages 228 and 229.

Also note that PB681 issue 10 can use the enhanced 141 serial link to an ST800 through which it obtains all of its detectors and confirms from, and passes its force bits to, the controller. See section 4.2.6 on page 32 and section 9.6.4 on page 117.

9.2.1 Detector Inputs and Push-Buttons

The detector inputs (1-32) are normally connected in parallel to the controller at the controller's terminal blocks.

Important Ensure that the detector inputs have been configured in the correct sense in the MOVA site data. For example, on a Siemens T400 or ST800 controller, the detector inputs are normally open circuit, closing when a vehicle is detected.

Note: On an Integrated OMCU and MOVA unit, the OMCU can monitor the MOVA vehicle detector inputs on the MOVA I/O board. Therefore these detectors do not need to be wired into the OMCU's LMU I/O board(s) as well as the MOVA I/O board. See section 5.6.5 which starts on page 65.

It is recommended that Push button inputs be configured as follows…

The controller should be configured to provide an output for each pedestrian phase, which is then connected to the configured MOVA pedestrian detector input, rather than connecting the MOVA unit directly to the push-button input(s).

This output should be activated when the controller has a demand registered for that phase and thus are sometimes referred to as a 'wait confirms'. But note that they must be configured in the same sense as the detectors (e.g. normally open, closing when a demand has been latched) which may be in the opposite sense to the stage- and phase-confirm outputs.

9.2.2 Confirms and Controller Ready Inputs

The stage- and phase-confirm outputs from the controller should be configured as held closed, opening when the stage/phase is active. The Controller Ready Bit should be closed when the controller is ready.

Therefore, being physically normally open contacts, if the controller fails, then the MOVA unit will see the controller ready bit disappear and multiple stage confirms, and thus it will release control of the junction.

Unlike earlier versions of the MOVA software, version M4.0 does not normally require separate phase confirms for phases which overlap stages, i.e. for phases which appear in more than one stage. Thus, since MOVA can only control 8 stages, 10 confirm inputs should be adequate - one per stage plus two spare.

9.2.3 Force Bits and Take Over Outputs

When the MOVA unit is on control, it closes the 'Take Over' relay output and closes the required stage force bit relay output.

9.2.4 Other I/O Signals

The ‘SP - Sync Pulse’ output is only used during development and should be left unconnected.

The ‘MF- MOVA Fault’ and ‘DM - Disable Modem’ signals are used by the telephone line sharing option described on page 108.

If this facility is **not required**, then prior to PB681 issue 10 firmware, the **‘DM’ input must be connected to 0V** and the ‘MF’ output left unconnected. On issue 10 and later firmwares, this facility can be disabled using the PLS handset command instead, see section 9.6.3 on page 116.

9.2.5 I/O Allocation

The standard cableform connects into these connectors and provides flying leads for each pin. Since there are two connectors on each BUS / MOVA I/O board, PL1 and PL2, then each board requires two identical cables. It is therefore recommended that the cableforms be clearly identified before installation commences.

The wire colours used are described on the following page.

If more inputs are required, then a second BUS / MOVA I/O board can be fitted, also shown on the following page. This increases the number of detector inputs by 32 and the number of confirm-inputs by 16. However at the time of writing, the current version of the MOVA firmware (M4.0) will only make use of confirm bits 11 to 16 on the second board and none of the detector inputs.

An alternative cableform is available which simplifies connecting the MOVA unit up to a Siemens T400 or ST800 traffic controller and this is described on page 107.

I/O Summary:

MOVA Connection		Connected to…
MOVA Detectors	⇦	Controller detectors (and ped. outputs)
Confirm and Controller Ready Bits	⇦	Controller UTC terminal blocks (Outputs)
MOVA Force Bits (Fn and TO)	⇨	Controller UTC terminal blocks (Inputs)
PL1 & PL2 Input 0V	⇨	Controller detector ground connection
Phone Line Sharing (MF and DM)	⇔	Separate Siemens OMCU (see page 108)

Remember to record the name and terminal block positions of all the MOVA inputs and outputs on a MOVA Installation Sheet (to be kept with the unit). An example sheet is given on pages 228 and 229.

MOVA Digital I/O Connections

Pin	Wire Colour	Board 1 PL1	Board 1 PL2	Board 2 PL1	Board 2 PL2
1	Blue	Detector 1	Detector 25	Detector 33	Detector 57
2	Yellow	Detector 2	Detector 26	Detector 34	Detector 58
3	Brown	Detector 3	Detector 27	Detector 35	Detector 59
4	Violet	Detector 4	Detector 28	Detector 36	Detector 60
5	Orange	Detector 5	Detector 29	Detector 37	Detector 61
6	Slate	Detector 6	Detector 30	Detector 38	Detector 62
7	Pink	Detector 7	Detector 31	Detector 39	Detector 63
8	Red / Blue	Detector 8	Detector 32	Detector 40	Detector 64
9	Red / Green	Detector 9	Controller Ready	Detector 41	Confirm Bit 11
10	Red / White	Detector 10	Confirm Bit 1	Detector 42	Confirm Bit 12
11	Red / Brown	Detector 11	Confirm Bit 2	Detector 43	Confirm Bit 13
12	Red / Orange	Detector 12	Confirm Bit 3	Detector 44	Confirm Bit 14
13	Red / Slate	Detector 13	Confirm Bit 4	Detector 45	Confirm Bit 15
14	Blue / Green	Detector 14	Confirm Bit 5	Detector 46	Confirm Bit 16
15	Blue / White	Detector 15	Confirm Bit 6	Detector 47	Confirm Bit 17
16	Blue / Brown	Detector 16	Confirm Bit 7	Detector 48	Confirm Bit 18
17	Blue / Orange	Detector 17	Confirm Bit 8	Detector 49	Confirm Bit 19
18	Blue / Slate	Detector 18	Confirm Bit 9	Detector 50	Confirm Bit 20
19	Green / Orange	Detector 19	Confirm Bit 10	Detector 51	Confirm Bit 21
20	Green / Brown	Detector 20	DM Input	Detector 52	Confirm Bit 22
21	Green / Slate	Detector 21	Do Not Use	Detector 53	Confirm Bit 23
22	Brown / Slate	Detector 22	Do Not Use	Detector 54	Confirm Bit 24
23	Orange / Brown	Detector 23	Do Not Use	Detector 55	Confirm Bit 25
24	Orange / Slate	Detector 24	Do Not Use	Detector 56	Confirm Bit 26
25	White	Input 0V	Input 0V	Input 0V	Input 0V
26	White	Input 0V	Input 0V	Input 0V	Input 0V
27	Blue	F1 n/open	F9 n/open		
28	Yellow	-	-	-	-
29	Brown	F1 common	F9 common		
30	Violet	F2 n/open	F10 n/open		
31	Orange	-	-	-	-
32	Slate	F2 common	F10 common		
33	Pink	F3 n/open	F11 n/open		
34	Red / Blue	-	-	-	-
35	Red / Green	F3 common	F11 common		
36	Red / White	F4 n/open	F12 n/open		
37	Red / Brown	-	-	Outputs On	Outputs On
38	Red / Orange	F4 common	F12 common	Second Board	Second Board
39	Red / Slate	F5 n/open	F13 n/open	Are Not Used	Are Not Used
40	Blue / Green	-	-	By MOVA	By MOVA
41	Blue / White	F5 common	F13 common		
42	Blue / Brown	F6 n/open	MF n/open		
43	Blue / Orange	-	-	-	-
44	Blue / Slate	F6 common	MF common		
45	Green / Orange	F7 n/open			
46	Green / Brown	-	Not Used	-	-
47	Green / Slate	F7 common			
48	Brown / Slate	F8 n/open	TO n/open		
49	Orange / Brown	-	-	-	-
50	Orange / Slate	F8 common	TO common		

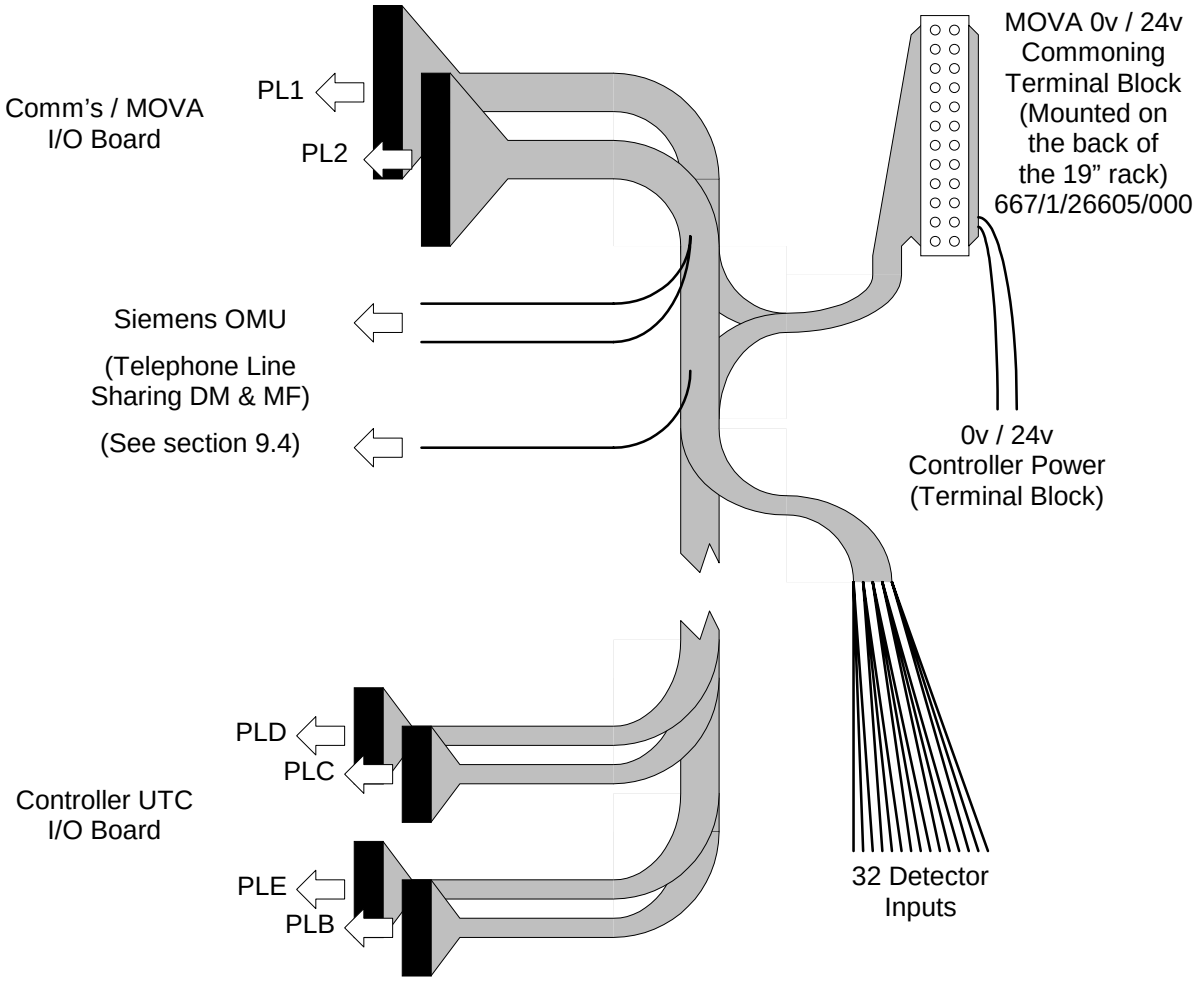
9.3 Connection To A Siemens T400 or ST800

To simplify connecting the MOVA unit to a Siemens Type 400 or Type 800 traffic controller, an alternative cableform is available.

Note that no I/O cables will be required if MOVA is to use the enhanced serial link to an ST800, see section 9.6.4 on page 117.

This cableform connects the first BUS / MOVA I/O Board's connectors PL1 and PL2 directly to the controller's UTC Expansion I/O Board's four connectors PLB, PLC, PLD and PLE. This cable also commons the 24V and 0V connections and thus only requires two wires to be connected to the controller's 24V and 0V supplies.

It cannot however replace the detector cables (or the phone line sharing signals) and these still have to be connected during installation. Note that the colours of these wires are the same as the colours used in the standard cableform that is detailed on the previous page.



I/O Cable between Siemens MOVA and a T400 or ST800 - 667/1/26604/000

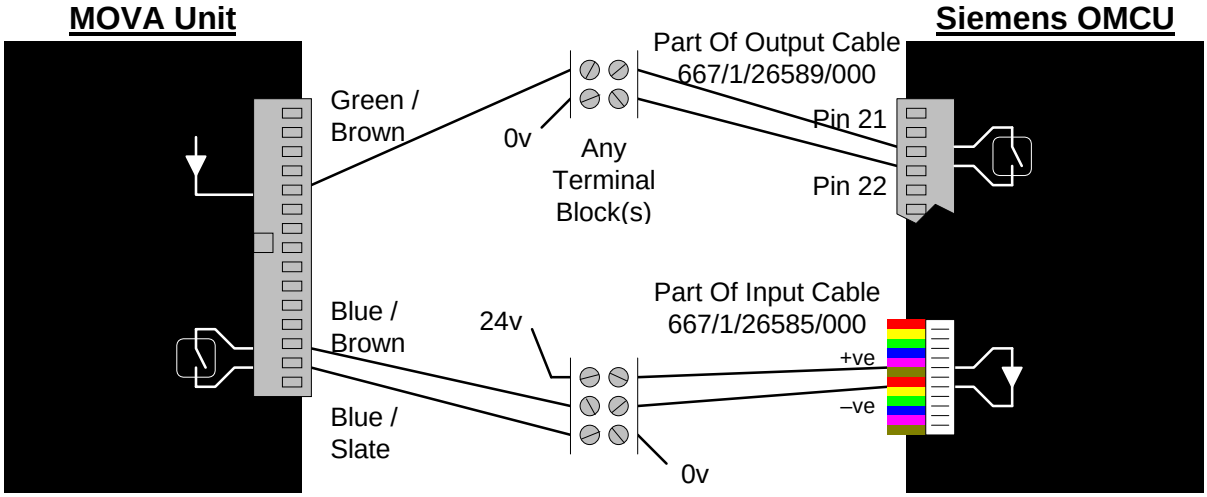
9.4 Telephone Line Sharing Connections

When a separate Siemens OMCU unit and Siemens MOVA unit share the same telephone line, the two units 'communicate' with each other using two I/O lines. For details of how to communicate remotely to telephone line sharing units, see section 9.7.2 on page 129.

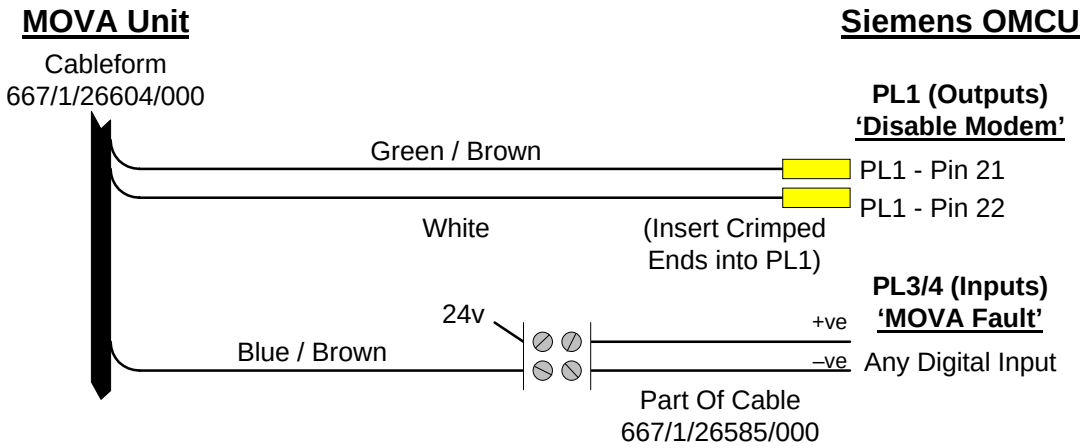
The 'MOVA Fault' (MF) I/O line is an output from the MOVA unit to any detector input on the OMCU. It is used primarily to inform the OMCU when the MOVA unit has detected a fault, with the OMCU configured to report this event to the RMS Instation.

The 'Disable Modem' (DM) I/O line connects the first digital output of the OMCU to an input on the MOVA unit. It is used primarily to request that the MOVA unit switches off its modem so that the OMCU can have complete control of the telephone line until the OMCU is instructed otherwise by the Instation. Note:Open circuit disables MOVA's modem so if telephone line sharing is not required, connect DM direct to 0V.

The following diagram shows how these signals are connected between the MOVA unit and the OMCU. Note that the I/O connections on the OMCU side are described in more detail in section 5.6.1 (page 57) and section 5.6.4 (which starts on page 63).



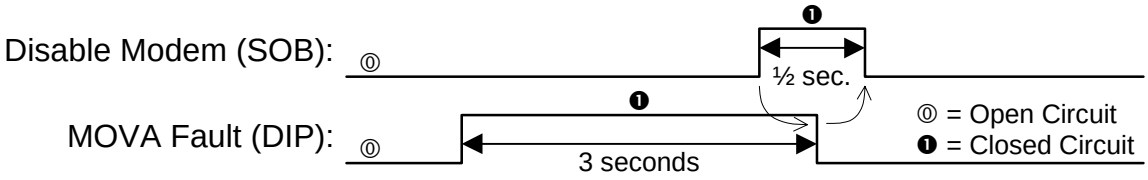
However, if the MOVA to T400/ST800 cableform described on the previous page is used, then the connections are greatly simplified:



If problems are experienced with the telephone line sharing system, the following should help diagnose the cause of the problem:

- Check that the OMCU has been installed, commissioned and configured correctly. The telephone line sharing system between the MOVA unit and the OMCU will not function if the OMCU does not contain the necessary special conditioning.
- Check that wires between the MOVA unit and the OMCU are as shown on the previous page.
- Check the following diagrams show the expected states of these signals. Normally, both signals will be open circuit, therefore the OMCU handset command DIP should show the 'MOVA Fault' signal as a '0' ('No Fault') and the SOB handset command should have bit 0, the 'Disable Modem' signal, set to '0' ('MOVA Modem Disabled').

The first diagram shows the MOVA unit passing a fault (or any other 'Phone Home' request - see section 9.7.4 on page 132) to the OMCU and the OMCU acknowledging the fault after confirming the presence of the MOVA fault signal for a few seconds. All timings are approximate.

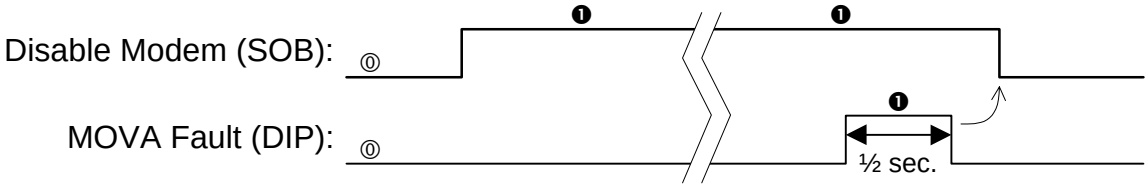


To check this sequence, first check that both signals are in their normally open circuit state, i.e. DIP and SOB both show '0'.

- Set the MOVA 'phone home' flag to '99' (see section 9.7.4 on page 132).
- Use DIP to check the 'MOVA Fault' input to the OMCU changes from '0' to '1'.
- Check that approximately three seconds later it returns to zero.
- Set the MOVA 'phone home' flag to '99' again.
- Use SOB to check that approximately three seconds later, the 'Disable Modem' output is pulsed, i.e. changes from '0' to '1' and then back to '0'.

Note that if the OMCU is not configured correctly, or does not 'see' the 'MOVA Fault' signal, or the MOVA unit does not 'see' the 'Disable Modem' signal from the OMCU, then the MOVA unit will leave its MOVA Fault output active. The phone home flag will remain set to '99' until it 'sees' its 'Disable Modem' input go active.

The second shows the OMCU releasing the 'Disable Modem' signal when the 'Enable MOVA' option is selected at the RMS Instation. When the subsequent call to the MOVA unit is complete, the MOVA unit pulses its 'MOVA Fault' signal to ask the OMCU to re-instate the 'Disable Modem' signal. Note that if the MOVA unit does not pulse the MOVA fault signal, e.g. because no call was made to the MOVA unit, then the OMCU will re-instate the 'Disable Modem' signal after 5 minutes (not shown).



9.5 MOVA Commissioning Checklist

The following checklist should be used to commission a Siemens MOVA unit. The steps are expanded upon in section 9.6, which starts on page 113.

Note that where a separate OMCU unit and MOVA unit are both being installed together into a controller and the two units are to share the same telephone line, then the OMCU should be commissioned and configured first, before the MOVA unit is commissioned, see section 6.

If an Integrated OMCU and MOVA unit is being installed, it is recommended that the OMCU application be commissioned before the MOVA application. The checklist should be followed in sequence:

Step	Section	Action to be Performed
1)	5	Check that the MOVA unit has been installed correctly.
2)	6	Check that the OMCU has been commissioned correctly (when MOVA is installed along side a separate 3U OMCU or where an integrated OMCU and MOVA unit is being installed).
3)	5.2.8	Ensure the RAM backup battery is switched on.
4)	9.6.7	If using issue 10 or later firmware, all the cables can be connected since the unit can now be re-initialised **after** the correct site data has been loaded to ensure a 'clean start'. *Warning for units running firmware prior to PB681 issue 10* *Disconnect the MOVA I/O cables from the back of the unit's I/O Board. Always disconnect the I/O cables prior to initialising the unit and reconnect them after the correct site data has been loaded.* *Do not run the unit with I/O cables connected while the default site data is still present prior to loading the new site data.*
5)	-	Switch on the MOVA unit's mains supply.
6)	7.3.4	Check that the RUN LED (LP3) is flashing. Note that MOVA will flash this LED at the fast rate since the unit is not 'On Control'.
7)	9.6.1	Connect the PC to the MOVA unit's local port (the 25 way D-type connector on the front of the processor board) and start the MOVA communications application.
8)	9.6.2	Initialise MOVA by entering the handset command INI=2. If the OMCU application is not required, enter INI=3 to completely re-initialise the whole unit. *[Prior to issue 10 – set the 'Phone Home' flag to 77]*
9)	9.6.3	Ensure the unit has correctly determined whether the Phone Line Sharing facility to a separate OMCU is required ('PLS:1' if enabled and 'PLS:0' if disabled). If not, investigate the reason and correct.

Step	Section	Action to be Performed
10)	9.6.4	If MOVA is to use a Bus / MOVA I/O Board, check that the SOP handset command shows the correct type of I/O boards have been detected and that MOVA is using one of them, see page 182. If MOVA is to use the enhanced serial link to an ST800 but the OMCU has not been configured, enable the facility manually using '`MIO=2`' and check that the enhanced serial link is active, i.e. '`EEL:3`'.
11)	9.6.5	Enter the correct MOVA licence number, e.g. '`LIC=1234 5678`'.
12)	9.6.6	Set the time and date in the MOVA unit.
13)	9.6.7	Download the site data into the MOVA unit from the PC and then clear the MOVA working data as instructed on the screen (only available from PB681 issue 10 onwards).
14)	9.6.8	Use the commissioning screen to check for following. a) MOVA is currently not enabled (MOVA enabled = 0) b) The Controller is ready* (CRB = 1) c) The Confirm bits are all set to '1', except for the current stage which should be set to '0'. Watch the controller perform at least one complete cycle to check that each stage and phase confirm bit is being activated correctly by the controller. * It may be necessary to press the 'Normal' button on the controller's manual panel before it will activate the 'Controller Ready Bit'.
15)	9.6.8	Also use the commissioning screen to check the operation of each detector is correct. The detector display normally shows '0', turning to a '1' when a vehicle passes over the loop (or the controller has latched a pedestrian demand). Also check that vehicles in adjacent lanes do not activate the loop.
16)	9.6.8	**Important:** The following causes the MOVA unit to take control of the Intersection and care should be taken to avoid undue disruption to traffic flows. Still using the commissioning screen, force each stage in turn and check that the controller moves to the required stage and that the correct stage / phase confirm bits are activated.
17)	9.6.9	Check that the Error Log contains no unexpected entries and then clear the error log.

Step	Section	Action to be Performed
18)	9.6.10	Again using the commissioning screen, put the MOVA unit on control: a) Set the 'MOVA enable' flag to '1' * b) Close communications ('FI' from the menu) c) Switch the MOVA unit's power off and back on d) Return to the commissioning screen Check that as the controller changes from stage to stage that the 'Warm-up Count' increments. * MOVA cannot be enabled if the licence number is invalid (9.6.5).
19)	9.6.10	When this count reaches the number of stages plus one (e.g. 6 on a 5-stage controller) the MOVA unit will put itself on control. Check : a) The 'On Control' flag changes from '0' to '1'. b) The 'TO' bit changes from '0' to '1'. c) The MOVA unit demands the current (or next) stage. d) The 'Error Count' remains at zero.
20)	9.6.10	Examine the operation of the controller under MOVA control to ensure that reasonable operation is achieved, e.g. no demands are been ignored and no excessive queues build-up, and that no faults have been generated and the error count remains at zero.
21)	9.6.11	**Telephone Options** The MOVA unit can be installed with various telephone line options: a) Older MOVA units share a single telephone line with a separate Siemens OMCU, see section 9.4. b) In a new 'Integrated OMCU and MOVA unit', the OMCU application is always responsible for dialling the RMS Instation. This would have been checked during the OMCU commissioning sequence. c) The MOVA unit can also function without a telephone line. For both options a) and b), the telephone line should have already been checked as part of commissioning the OMCU. Therefore, no additional telephone tests are required for MOVA.
22)	9.6.12	This completes the commissioning steps. The MOVA unit can be now be left to control the traffic. Note that for highly critical junctions were the loss of a detector without the historical flow data could result in serious complications, it may be necessary to leave the MOVA disabled for one week with the controller running in its fall-back mode. When the unit has built-up this back-up data, the unit can be enabled. Note that the unit can be enabled remotely if a telephone line is fitted.

Siemens MOVA Commissioning Complete

9.6 MOVA Commissioning Detail

This section expands on the steps in the commissioning checklist from the previous section…

Note that where a separate OMCU unit and MOVA unit are both being installed together into a controller and the two units are to share the same telephone line, then the OMCU should be commissioned and configured first, before the MOVA unit is commissioned, see section 6.

If an Integrated OMCU and MOVA unit is being installed, it is recommended that the OMCU application be commissioned before the MOVA application. The checklist should be followed in sequence:

Step	Section	Action to be Performed
1)	5	Check that the MOVA unit has been installed correctly.
2)	6	Check that the OMCU has been commissioned correctly (when MOVA is installed along side a separate 3U OMCU or where an integrated OMCU and MOVA unit is being installed).
3)	5.2.8	Ensure the RAM backup battery is switched on.
4)	9.6.7	If using issue 10 or later firmware, all the cables can be connected since the unit can now be re-initialised **after** the correct site data has been loaded to ensure a 'clean start'. *Warning for units running firmware prior to PB681 issue 10* *Disconnect the MOVA I/O cables from the back of the unit's I/O Board. Always disconnect the I/O cables prior to initialising the unit and reconnect them after the correct site data has been loaded.* *Do not run the unit with I/O cables connected while the default site data is still present prior to loading the new site data.*
5)	-	Switch on the MOVA unit's mains supply.
6)	7.3.4	Check that the RUN LED (LP3) is flashing. Note that MOVA will flash this LED at the fast rate since the unit is not 'On Control'.

9.6.1 Communicating Locally with the MOVA Unit

7)	9.6.1	Connect the PC to the MOVA unit's local port (the 25 way D-type connector on the front of the processor board) and start the MOVA communications application.

Connect a normal controller handset cable (such as the IPT cable 667/1/17523/003) from the PC to the 25 way port on the front of the MOVA unit. Also see Section 3.9.6.

Start the PC in the usual way. If the PC starts Microsoft Windows, then start an MS-DOS Prompt within Windows. At the MS-DOS prompt, type "CD \MOVA" for example to set the current directory to the location of the MOVA Communications program and the MOVA data files.

To start the MOVA Communications program enter "MOVAC" (see note 1 below). The program will ask which PC COM port the serial cable is connected to.

It will then ask whether the MOVA unit is connected locally or remotely via a modem. Select local communications and then press 'Return' until the unit responds.

If nothing is displayed, check that the cable has been connected to the correct serial COM port and that no other applications on the PC are using the same serial port.

Using PB681 issue 10 onwards, connection is initially to the OMCU handset application not the MOVA menu application (even if the OMCU application itself is not required and is unconfigured). To connect through to the MOVA application, simply enter '`MOVA`' (or '`XXM`') while connected to the OMCU handset application. When '`FI`' (Finish) is entered from the MOVA menu, the connection will return to the OMCU handset application.

Before the MOVA unit displays its main menu, it may display its current time and date. If necessary, correct this using section 9.6.6 on page 119.

If the Instation is communicating remotely with the MOVA unit, then access to MOVA on site will be refused until the call is complete. Likewise, while an engineer on site is connected to MOVA, remote communications from the Instation to MOVA are refused. The Instation will have to try again later.

To close communications with the MOVA unit, type '`FI`' and press 'Return' at the main menu. This will allow the MOVA unit to tidy-up and close the communications. The serial cable can now be safely disconnected from the front of the MOVA unit and the MOVA Communications application can be closed by pressing F10.

Note 1: The previous versions of MOVAC were called MOVAC1 (for COM port 1) and MOVAC2 (for COM port 2). These have been superseded by the new MOVAC application, which is available from Siemens on a floppy disk (which also includes MOVA Setup) by quoting the part number 667/1/28054/000 issue 3 or later.

9.6.2 Complete Initialisation

8)	9.6.2	Initialise MOVA by entering the handset command INI=2. If the OMCU application is not required, enter INI=3 to completely re-initialise the whole unit. *[Prior to issue 10 – set the 'Phone Home' flag to 77]*

Prior to Issue 10:

To re-initialise the MOVA unit, enter 'LF' to 'Look at Flags' from the MOVA main menu and then 'S' to 'Set flags'. Then enter 'L' to select the phone home flag. The MOVA unit will display the current value of the flag (normally zero) and ask for the new value. Enter '77' and press 'Return'. The 'Phone Home' flag is described in more detail in sections 9.7.3 and 9.7.4 that start on page 131.

As always after a flag has been changed, the MOVA unit will display the current state of all the flags again, but in this case, the unit will reboot before it has chance to finish this display. After a few seconds, press 'Return' to re-establish communications with the MOVA unit. It will display its current time and date which will need correcting (see section 9.6.6) since it will have been reset along with the rest of the MOVA unit's memory.

Issue 10 and later firmwares:

Initialisation of either a PB680 or a PB681 unit is requested using the enhanced INI handset command:

Firmware	Command	OMCU Initialised	MOVA Initialised	Complete Initialisation
PB680	INI=1	✓	-	✓
PB680	INI=2	} Commands Rejected on PB680		
PB680	INI=3			
PB681	INI=1	✓	-	-
PB681	INI=2	-	✓	-
PB681	INI=3	✓	✓	✓

On PB681 firmware, initialising the OMCU application using INI=1 does not clear any MOVA data. Similarly, initialising the MOVA application using INI=2 does not clear any OMCU data. However, the complete unit is rebooted after any INI command is entered.

Complete initialisation effectively forces the 'first time power-up condition' by clearing the entire RAM within the unit. It is recommended that 'INI=3' is entered when a new PB681 unit is first installed to ensure that all data has been initialised. In addition to clearing the working data of the OMCU and the MOVA applications like INI=1 and INI=2 respectively, INI=3 also clears additional items which are not cleared by INI=1 and INI=2. This includes the handset commands PLS (section 9.6.3) and MIO (section 9.6.4), the MOVA licence number (section 9.6.5), the real time clock (section 9.6.6), and all three MOVA site data stores (section 9.6.7).

9.6.3 Phone Line Sharing Facility (PLS)

9)	9.6.3	Ensure the unit has correctly determined whether the Phone Line Sharing facility to a separate OMCU is required (‘PLS:1’ if enabled and ‘PLS:0’ if disabled). If not, investigate the reason and correct.

Prior to PB681 issue 10, the ‘phone line sharing’ facility was always enabled and the PLS handset command was not available. If the facility is not required, the ‘DM’ input had to be connected to 0V as described in section 9.2.4 on page 105.

The ‘phone line sharing’ facility allows the MOVA unit to share the telephone line with a separate Siemens OMCU as described in section 9.4 on page 108. The unit will automatically attempt to determine whether the ‘phone line sharing’ facility is required after complete initialisation, i.e. INI=3 or first time power-up, as follows:

If no LMU I/O boards are fitted then it implies that the OMCU application within this PB681 unit is not going to be used, just the MOVA application. Therefore, the ‘phone line sharing’ facility is enabled by default so it can be connected to a separate OMCU.

If an LMU I/O board is fitted, then it implies that the OMCU application within this PB681 unit is going to be used and not a separate OMCU unit. Therefore, the ‘phone line sharing’ facility is disabled by default.

Regardless of what the unit decides, the ‘phone line sharing’ facility can be disabled using the handset command “PLS=0” or enabled using the handset command “PLS=1”.

Tip! When a local handset is connected to a unit running PB681 firmware, it will normally display `STCL OMCU+MOVA` to identify that the firmware is capable of providing both the OMCU and MOVA applications. However, if phone line sharing to a separate OMCU is enabled, the unit will display `SIEMENS MOVA` to clearly identify this as the MOVA unit, not the OMCU.

9.6.4 Serial Link Between MOVA and an ST800 (MIO)

10)	9.6.4	If MOVA is to use a Bus / MOVA I/O Board, check that the SOP handset command shows the correct type of I/O boards have been detected and that MOVA is using one of them, see page 182. If MOVA is to use the enhanced serial link to an ST800 but the OMCU has not been configured, enable the facility manually using 'MIO=2' and check that the enhanced serial link is active, i.e. 'EEL:3'.

The Siemens OMCU has had the option for some time of using an enhanced serial link to an ST800 traffic controller to monitor the traffic controller. Through this link the OMCU receives information such as the detector and green states to provide a more integrated traffic product and to remove the need for almost all of the OMCU's external wiring.

This enhanced serial link can now also be used by MOVA in the new integrated OMCU and MOVA unit (PB681 issue 10 or later). Over this link MOVA obtains the states of all of its detectors and the stage/phase confirms from the ST800 traffic controller and passes back the required force bits. Note that the ST800 traffic controller must be configured to use 'Serial MOVA' for this facility to function. See section 4.2.6 on page 32 for more details.

The unit will automatically attempt to determine whether MOVA should use its Bus / MOVA I/O Board or the enhanced serial link after complete initialisation, i.e. INI=3 or first time power-up, as follows:

If one or more Bus / MOVA I/O boards are fitted, then MOVA will initially attempt to use the first Bus / MOVA I/O board fitted ("MIO:1").

If only LMU I/O boards are fitted and no Bus / MOVA I/O boards, then MOVA will initially not attempt to read any inputs or set any outputs ("MIO:0"). If the OMCU is subsequently configured by the Instation to use the enhanced serial link, then MOVA will also automatically attempt to use the enhanced 141 link ("MIO:2").

Regardless of what the unit decides, MOVA can be manually configured to use the first Bus / MOVA I/O board by entering "MIO=1" or to use the enhanced serial link by entering "MIO=2".

Important ***If MOVA is required to use a Bus / MOVA I/O board, always use the handset command SOP to check that the correct I/O boards have been detected by the firmware and that MOVA is using the first of these (see page 182). However, if MOVA is required to use the enhanced serial link, then check for 'EEL:3' (section 11.8) and check that the controller firmware supports, and is configured to use serial MOVA (section 4.2.6). The fault 'MSF – MOVA Serial Fault' will be raised if MOVA cannot communicate over the link (see section 11.6.2 on page 162 for more details on the OMCU/RMS fault log).***

9.6.5 MOVA Licence Number (LIC)

11)	9.6.5	Enter the correct MOVA licence number, e.g. '`LIC=1234 5678`'.

From PB681 issue 10 onwards, a valid licence number is required before MOVA can be put on control.

The licence number is unique to each individual site and is made up of two four-digit numbers separated by a space. To obtain a licence number for a new site, contact the Siemens RMS Helpdesk at Poole.

You will be asked to provide the following information before a licence number can be issued:

1) The Pinnacle reference number or Works Order number.
2) The site reference number, e.g. SCN, STS or EM number.
3) The location of the junction, e.g. the names of the intersecting roads.
4) The customer who purchased the MOVA unit, e.g. the local authority.
5) The filename of the MOVA site data.
6) Is it a new MOVA installation or a replacement of an existing* unit?
   (* Even if the existing unit was another manufacturer's MOVA unit)
7) The telephone number of the site.

Once a licence number has been issued for the unit, it should be written down on the MOVA Installation sheet for the unit and kept in the controller cabinet. Therefore, should the licence number need to be re-entered, e.g. after replacement of the complete unit, then the licence number can just be re-entered from that sheet. An example MOVA Installation sheet is given on pages 228 and 229.

9.6.6 Setting the Time and Date (CT)

12)	9.6.6	Set the time and date in the MOVA unit.

The unit may display its current time and date before displaying its main menu when connection is first established with the MOVA unit, particularly after a mains power failure or after being initialised. Alternatively, enter ‘CT’ from the MOVA main menu to check the unit’s current time and date.

```
Time is 28/ 9/98 15:32:28
Do you want to change times <Y or N> ?
```

Typing ‘Y’ then ‘Return’ will allow the time and date to be changed. Any other character (or ‘Return’ on its own) will be taken as ‘No’.

The time and the date must both be entered as 6-digit numbers, with a leading zero for values in the range 1 to 9 and without any separators. For example:

```
Enter time [HrMnSc] 093700
Enter date [DyMoYr] 010998
```

Note that the new time is only accepted when the ‘Return’ key is pressed to enter the date. Therefore the time entered should be 10 or 20 seconds ahead to allow time for the date to be entered and then ‘Return’ can be pressed at the correct time.

After the new date and time have been entered, the current time is displayed again so that it can be checked that it has been accepted correctly.

After the date and time, the summertime adjustment days in March and October can be changed. Again, the values must be entered with a leading zero for dates in the range 1 to 9.

```
Do you want to enter British Summer Time days <Y or N> y
Enter DAY in MARCH {2 digits - eg 01}, COMMA, DAY in OCTOBER [eg 23,15]
```

Tip! The unit’s clock can also be viewed and changed using the OMCU handset command ‘TOD’, see page 183.

9.6.7 Download New Site Data (RS, LD, CN and DS)

13)	9.6.7	Download the site data into the MOVA unit from the PC and then clear the MOVA working data as instructed on the screen (only available from PB681 issue 10 onwards).

Caution: If the new site data contains a different number of links, lanes or stages, or different time-of-day data then MOVA must be re-initialised. Only if the configuration is the same as the configuration currently running in the MOVA unit (except for minor changes to timing values), can the new site data be downloaded without initialising the unit.

*Prior to issue 10, this meant that the I/O cables at the back of the unit MUST be disconnected while the unit is initialised and the new data loaded. This ensures that the MOVA unit is not monitoring the junction while running its default data set. When the new data has been loaded, the I/O cables can be reconnected. With later issues of firmware, MOVA can be re-initialised **after** the new site data has been loaded so the I/O cables do not need to be disconnected.*

New site data can be downloaded into the MOVA unit using the 'Read in Site data' option – 'RS' from the MOVA main menu.

This option is password protected to prevent unauthorised changes to the site data and can only be attempted locally. The password is case sensitive and is defaulted to 'AVOMGO'.

Up to three 'plans' can be loaded into the MOVA unit's memory. Normally, only plan 1 will be used. However, it is possible to configure the MOVA unit to switch between the plans at different times of day, hence up to three plans, numbered 1 to 3 may have to be downloaded.

No time of day changes – If only one plan is to be downloaded, then the site data file name is usually suffixed by the '.PT' extension. Enter the name of site data file without the '.PT' extension and when asked, select plan number '1'. When loading is complete, the MOVA unit will recognise that this plan data contains no time of day changes and will not require any more plans to be downloaded.

Three plans – When the site data contains time of day changes, each plan has to be downloaded into the MOVA unit one after the other. Enter the name of site data file without the extension and the three plans should be listed on the screen, e.g.

```
Enter the name of the file without any extension
  (or QUIT to abort) ... E12345

     1.  E12345.P1
     2.  E12345.P2
     3.  E12345.P3
  key number of the file you wish to transmit . . .
```

Start with plan 1, and download the site data with the extension '.P1'. When that data has been loaded, the MOVA unit will insist that two more plans be downloaded so

that all three plans in its memory have the same number of stages, links and lanes, etc.

When the download of a plan is complete, the MOVA unit will display the following:

```
finished

Reading site data in to plan 1 complete.

Do you want to clear the MOVA working data?

1) If you are about to read in another plan then answer "N".
2) If you have just read in new site data that only makes minor changes and
   would like to keep the old working data (e.g. the vehicle flows and the
   assessment log) then answer "N".
   Note that the new data must contain the same number of stages, links and
   lanes and the same time-of-day information as the previous site data.
3) If you have just read in the last of three plans or the one and only plan
   for this site, and the unit has just been initialised or this new site
   data makes major changes, then answer "Y" so the unit can perform a
   clean start with the new site data.

Do you want to clear the MOVA working data <Y or N> ? Y

The MOVA unit will now reboot in order to clear all of its working data, load
the new site data and begin monitoring the intersection.
Note: MOVA will be initially disabled. Use the "Look" screen to put MOVA back
      on-control after a warm-up cycle.

Press [Return] to reconnect to the unit after it reboots...
```

Checking the Site Data

When new site data has been loaded, check it by displaying the site data using the ‘LD’, ‘CN’ and ‘DS’ options.

If more than one plan has been downloaded, the ‘LD’ option allows one of the three plans to be loaded into the working area. The ‘CN’ option shows the names of the plans loaded into each of the three backup stores and the name of the plan that currently resides in the working area. If there are no time of day changes, i.e. only one plan has been loaded then the MOVA unit will automatically load that plan into its working area.

The ‘DS’ option displays all the site data of the plan currently residing in the working area. The MOVA unit pauses after each section, so that the data does not scroll off the top of the screen.

Important: It is recommended that a 3½” floppy disk containing the up to date site data file(s) is kept on site so that the site data may be reloaded by field services after the replacement of the CPU board for example. The disk should be protected from dust and moisture and should be placed in the coolest part of the controller.

9.6.8 Commissioning Screen (LOOK)

14)	9.6.8	Use the commissioning screen to check for following. a) MOVA is currently not enabled (MOVA enabled = 0) b) The Controller is ready* (CRB = 1) c) The Confirm bits are all set to '1', except for the current stage which should be set to '0'. Watch the controller perform at least one complete cycle to check that each stage and phase confirm bit is being activated correctly by the controller. * It may be necessary to press the 'Normal' button on the controller's manual panel before it will activate the 'Controller Ready Bit'.
15)	9.6.8	Also use the commissioning screen to check the operation of each detector is correct. The detector display normally shows '0', turning to a '1' when a vehicle passes over the loop (or the controller has latched a pedestrian demand). Also check that vehicles in adjacent lanes do not activate the loop.

The commissioning screen is used extensively to check the operation of the detectors, the force bits and the confirm bits. To display the commissioning screen, type 'LOOK' from the MOVA Main Menu.

Note that from issue 10 of the firmware, the commissioning screen normally appears by default since it includes the menu at the bottom (details overleaf).

```
                    SIEMENS MOVA COMMISSIONING SCREEN
Detectors:    1  2  3  4    5  6  7  8    9 10 11 12   13 14 15 16
              0  0  1  1    1  1  1  0    0  0  0  0    0  0  0  0

             17 18 19 20   21 22 23 24   25 26 27 28   29 30 31 32
              0  0  0  0    1  0  1  0    0  1  1  1    0  0  0  0

Confirms:   CRB  1  2  3    4  5  6  7    8  9 10 11   12 13 14 15
              1  0  1  1    1  1  1  0    0  0  0  0    0  0  0  0

Force Bits:        HI/TO    1  2  3  4    5  6  7  8
                     1      1  0  0  0    0

 MOVA enabled. . 1  Warmup. . . . . 6  Multi stage . . 0  On control. . . 1
         Demanded stage . . . 1  Watchdog . . . 9  Error count . . . 0

                       MOVA COMMISSIONING SCREEN OPTIONS
Press:   M  to enabled or disable MOVA;     C  to set MOVA on or off control;
         R  to refresh the whole screen;    X  to exit Commissioning Screen;
         Z  to zero the error count;
         1,2,3,... to force a stage (or 0 to cancel current force);

Press a Key:
       --- Press a key listed above  or  Press <Space> for Main Menu ---
```

The top of the screen shows the live state of all the detector inputs numbered 1 to 32, followed by the Controller Ready Bit (CRB) and confirm bit inputs numbered 1 to

15 from the controller, and the force bits that the MOVA unit is currently outputting. The 'MOVA enabled' and 'On Control' flags and the 'Warm-up' and 'Error' counts are described in more detail in section 9.6.10.
For inputs on the Bus MOVA IO card, 0 = input open circuit, 1 = input short circuit.
For semi-integral MOVA, the input sense can be inverted or not, dependant on the controller configuration.

The 'Multistage' flag is set to '1' if the confirm inputs indicate more than one stage is active, e.g. when the controller has failed or the I/O cables have been disconnected from the back of the MOVA unit.

The 'Demanded stage' entry shows the stage that MOVA is currently demanding, or would try to demand if it was on control.

The 'Watchdog' count should normally increment every half a second and remain in the range 0 to 20. It is used internally by the MOVA software to ensure that the various MOVA sub-systems are functioning correctly.

While the commissioning screen is active (and the description of these keys is being displayed), then the state of the 'MOVA enabled' flag and the 'On Control' flag can be toggled by simply pressing 'M' or 'C' respectively. Similarly, the 'Error Count' can be cleared back to zero by simply pressing 'Z'.

Pressing 'X' will exit the commissioning screen and the MOVA Main Menu will be displayed. We recommend that you exit the commissioning screen before pressing 'F1' to record displayed information such as the error log to a file and press 'F2' to stop recording to the file before typing 'LOOK' to restart the commissioning screen.

Pressing the space bar toggles between the above single key press commands and the MOVA Main Menu (not available prior to issue 10):

```
                        SIEMENS MOVA COMMISSIONING SCREEN
Detectors:     1  2  3  4    5  6  7  8    9 10 11 12   13 14 15 16
               0  0  1  1    1  1  1  0    0  0  0  0    0  0  0  0

              17 18 19 20   21 22 23 24   25 26 27 28   29 30 31 32
               0  0  0  0    1  0  1  0    0  1  1  1    0  0  0  0

Confirms:    CRB  1  2  3    4  5  6  7    8  9 10 11   12 13 14 15
               1  0  1  1    1  1  1  0    0  0  0  0    0  0  0  0

Force Bits:         HI/TO    1  2  3  4    5  6  7  8
                      1      1  0  0  0    0

 MOVA enabled. . 1  Warmup. . . . . 6  Multi stage . . 0  On control. . . 1
         Demanded stage . . . 1  Watchdog . . . 9  Error count . . . 0

                             SIEMENS MOVA MAIN MENU
RS - Read in Site data    VM - View MOVA Messages       DF - Display Flows
CN - Check fileNames      DE - Display Error log        CF - Clear Flows
DS - Display Site data    CE - Clear Error log          LF - Look at/set Flags
LD - Load Data set        DA - Display Assessment log   CT - Check/set Time
                          CA - Clear Assessment log     FI - FInish
  Enter Option:
     --- Enter Option from the Menu  or  Press <Space> for Screen Keys ---
```

While the MOVA Main Menu is being displayed, enter the two-letter menu option required and press 'Return'. When the required option completes, the commissioning screen will automatically re-appear.

16)	9.6.8	**Important:** The following causes the MOVA unit to take control of the Intersection and care should be taken to avoid undue disruption to traffic flows. Still using the commissioning screen, force each stage in turn and check that the controller moves to the required stage and that the correct stage / phase confirm bits are activated.

(Remember to press <SPACE> to display the 'Screen Keys' before attempting to use any of the 'single key' commissioning screen commands)

To test the force bits and the confirms from the controller, the MOVA unit should first be switched off-line, i.e. if the 'MOVA Enabled' flag is set to '1', press 'M'.

Then to force a stage simply press the number of the required stage, e.g. press '1' for stage 1 and then press '2' when stage 2 is required.

The MOVA unit will keep forcing the selected stage for about one minute after the key is pressed. To end the test, press '0'.

To exit the commissioning screen, press any key except 'M', 'C' and 'Z' and the numbers '0' through to '9'. You will then be asked to confirm that you wish to exit the commissioning screen. Press 'Y' to exit or any other key to return to the commissioning screen. Therefore, the simplest way to exit is to press 'Y' twice.

9.6.9 The Error Log (DE and CE)

17)	9.6.9	Check that the Error Log contains no unexpected entries and then clear the error log.

To display the error log, enter 'DE' from the main menu,

This displays timestamped reports of any warnings or errors detected by the MOVA unit. This log may help diagnose the reason why the MOVA unit has gone off control for example.

At the end of the log, the MOVA unit will display some debug information that can normally be ignored:

```
CRASH(1-4)=         0         0         0         0
TERM=   0 RCV(2)=   0 ABO=       0
```

To clear the error log, enter 'CE' from the main menu.

It is recommended that the error log be cleared after each site visit if all entries can be explained and the unit is functioning normally. Then the engineer making the next visit to site will only see faults that have occurred since the last visit.

9.6.10 Enabling MOVA Control

18)	9.6.10	Again using the commissioning screen, put the MOVA unit on control: a) Set the 'MOVA enable' flag to '1' * b) Close communications ('FI' from the menu) c) Switch the MOVA unit's power off and back on d) Return to the commissioning screen Check that as the controller changes from stage to stage that the 'Warm-up Count' increments. * MOVA cannot be enabled if the licence number is invalid (9.6.5).
19)	9.6.10	When this count reaches the number of stages plus one (e.g. 6 on a 5-stage controller) the MOVA unit will put itself on control. Check : a) The 'On Control' flag changes from '0' to '1'. b) The 'TO' bit changes from '0' to '1'. c) The MOVA unit demands the current (or next) stage. d) The 'Error Count' remains at zero.
20)	9.6.10	Examine the operation of the controller under MOVA control to ensure that reasonable operation is achieved, e.g. no demands are been ignored and no excessive queues build-up, and that no faults have been generated and the error count remains at zero.

This section describes in the more detail the 'MOVA Enabled' and 'On Control' flags and their interaction with the 'Error Count' count and the 'Warm-up' count.

Both flags must be set to '1' before MOVA will attempt to control the junction. If either flag is set to '0', then MOVA will not attempt to control the junction at that time, but may still be monitoring the traffic flows over its detectors.

The 'MOVA Enabled' flag is normally only changed by the user, not by the MOVA unit itself. It is this flag which must be set to '1' by the user to allow the MOVA unit to take control of the junction and should be set to '0' to disable the MOVA unit for a long period of time.

Note that the OMCU will log the fault MOF 'MOVA Off' (see section 11.6) and report 'MOVA Disabled' to the RMS Instation when MOVA is disabled, i.e. when the 'MOVA Enabled' flag is set to 0.

The 'On Control' flag is normally only changed by the MOVA unit itself, although the user can change its state manually. If the 'MOVA Enabled' flag is set, then following the warm-up cycle, the MOVA unit will set the 'On Control' flag and start to control the junction.

During the warm-up cycle, the MOVA unit will increment the warm-up count on the commissioning screen every time a new stage starts. When this count reaches the

number of stages plus one (e.g. 6 on a 5-stage junction) then the warm-up cycle is said to be complete. This warm-up cycle allows the MOVA unit to gather information about the junction before it takes control.

Following various fault conditions, the MOVA may put itself off control by clearing the 'On Control' flag and incrementing its 'Error Count'. Depending on the nature of the fault, the MOVA unit will increment the 'Error Count' by one, two or five.

Every hour on the hour the MOVA unit decrements the 'Error Count' unless it has reached the value of 20 when the unit will reset the 'MOVA Enabled' flag back to 0.

9.6.11 Modem Commissioning

21)	9.6.11	**Telephone Options** The MOVA unit can be installed with various telephone line options: a) Older MOVA units share a single telephone line with a separate Siemens OMCU, see section 9.4. b) In a new 'Integrated OMCU and MOVA unit', the OMCU application is always responsible for dialling the RMS Instation. This would have been checked during the OMCU commissioning sequence. c) The MOVA unit can also function without a telephone line. For both options a) and b), the telephone line should have already been checked as part of commissioning the OMCU. Therefore, no additional telephone tests are required for MOVA.

For more information on communicating remotely with the MOVA, see sections 9.7.1 and 9.7.2, which start on page 128.

9.6.12 Completing MOVA Commissioning

To close communications with the MOVA unit, type '`FI`' at the main menu. This will allow the MOVA unit to tidy-up and close the communications. The serial cable can now be safely disconnected from the front of the MOVA unit and the MOVA Communications application can be closed by pressing F10.

9.7 MOVA Communications Notes

Assistance on communicating locally with the MOVA unit during commissioning is provided in the previous section within the appropriate steps in the commissioning checklist, e.g. section 9.6.1 on page 114.

This section provides information on communicating remotely with a Siemens MOVA unit via the telephone network and describes some of the options which may be useful once MOVA is functioning normally.

It does not cover all the aspects of communicating with a MOVA unit as these are covered in the TRL documentation, see section 1.3. It is primarily concerned with how to perform the tasks required to install, commission and maintain the Siemens MOVA unit and how it differs from the other MOVA units on the market.

9.7.1 Communicating Remotely (Not Phone Line Sharing)

If the MOVA unit at the outstation is sharing the same telephone line as a separate Siemens OMCU, as described in section 9.4 on page 108, then refer to section 9.7.2 instead.

To communicate remotely with the MOVA unit requires the unit to be fitted with a modem connected to the PSTN line in the controller cabinet. The Instation will also require a modem connected to the PSTN telephone network and to a serial COM port on the PC at the Instation running the same MOVA communications program as used locally.

From the RMS Instation, simply select ‘Enable MOVA’ from the Outputs menu. See its associated help for assistance. The unit can also be contacted remotely from any PC with a modem as follows:

Start the PC and communications program using the instructions in section 9.6.1, which start on page 114, except when the program starts, select remote rather than local communications.

Before communicating with the MOVA unit, the modem connected to the PC must be instructed to ring-up the MOVA unit first. Note that the MOVA unit will automatically configure its modem to answer any telephone calls.

Reset the modem by typing ‘ATZ’ and wait for an ‘Ok’ response from the modem.

As instructed on the screen, enter ‘AT+MS=2,0’ to select V22bis protocol. If the modem responds with an error, it may be because it does not recognise that command. If so, try the older version of the command ‘ATF5’ or consult the modem’s documentation.

Enter ‘ATD’ followed by the telephone number of the site. Check whether an STD code is required and also check whether ‘9’, for example, needs to be dialled first to obtain an outside line.

To summarise, the following should appear on the screen…

```
ATZ .....to reset the modem
Ok .....accepted by the modem
AT+MS=2,0 .....to select V22bis protocol
Ok .....accepted by the modem
ATD 9 01202 123456 .....ask the modem to dial the given number
CONNECT.....response from modem indicating connection made
Please wait .....message from MOVA application*
```

* If dialling a single integrated OMCU/MOVA unit, press 'Return' three times after the 'connect' message from the modem to connect to the MOVA application rather than the RMS OMCU application.

After a short delay, the MOVA unit will then ask for the password to validate remote access. The password is defaulted to 'AVOMIN' although it can be changed.

Once the password has been accepted, the MOVA unit communicates remotely in exactly the same way as it does locally. The only exception is that downloading plans and manually forcing stages are prohibited during remote communications.

To end communications with the MOVA unit, select the 'FI - Finish' option from the MOVA unit's main menu. This allows the MOVA unit to tidy-up and close the communications and hang-up, resulting in 'NO CARRIER' being displayed at the Instation. At this point, press F10 to close the MOVA Communications application.

9.7.2 Communicating Remotely with a Phone Line Sharing MOVA Unit

When a Siemens MOVA unit and a separate Siemens OMCU unit share the same telephone line, see section 9.4 on page 108, then the OMCU can be considered as 'in charge' of the telephone line, in that:

1) The OMCU will normally answer all telephone calls, and,

2) If the MOVA unit detects a fault and wishes to 'phone home', then it simply passes the event to the OMCU and it is the OMCU which reports it to the RMS Instation.

Therefore, to communicate remotely with the MOVA unit, the OMCU must be contacted first to request that it allow the MOVA unit to answer the next telephone call.

When the call to the MOVA unit has been completed successfully, the OMCU will automatically regain control of the telephone line and answer any subsequent calls.

If a call to the MOVA unit is not completed successfully, e.g. due to an excessively noisy telephone line, then subsequent attempts can be made to contact the MOVA unit without first contacting the OMCU.

However, the OMCU will only allow calls to the MOVA unit for five minutes. After this time the OMCU will regain control of the telephone line and answer any subsequent

calls. This does not limit MOVA calls to five minutes since any call that is in progress between the Instation and the MOVA unit will not be terminated.

In the unlikely event that the OMCU detects an urgent fault while a call is in progress between the Instation and the MOVA unit, then the OMCU will interrupt the MOVA unit's telephone call to report the fault to the RMS Instation.

Contacting the MOVA unit from an RMS Instation:

Select the 'Enable MOVA' option under the 'Outputs' menu in the RMS Instation application to contact the OMCU and allow subsequent calls to be answered by the MOVA unit.

Once this call to the OMCU has finished, the MOVA unit can be called as if it had the telephone line to itself by following the instructions in section 9.7.1, and selecting the 'MOVA Communications' application from the 'Tools' menu also within RMS to start the MOVA communications application.

NOTE: If the intention is to use the same serial COM port and modem as used by RMS to also communicate with the MOVA unit, then the RMS comms window should be closed before starting the MOVA Communications application and then re-started when the MOVA application is closed.

Contacting the MOVA unit without an RMS Instation:

If the RMS Instation is not available, then the following MS-DOS application also supplied on issue 2 and later versions of the MOVA Communications Disk 667/1/28054/000 will contact the OMCU and allow subsequent calls to be answered by the MOVA unit.

Prior to starting the MOVA communications application, enter the following to run the 'STCLMOVA' application:

```
        STCLMOVA 1      - if the modem is connected to COM port 1
or      STCLMOVA 2      - if the modem is connected to COM port 2
```

Once the application has successfully reached the OMCU, the MOVA unit can then be called as if it had the telephone line to itself as in section 9.7.1.

Note that the parameter ('1' or '2') may be omitted in which case the application will use the COM port specified in the file SQTSETUP.SAV. For more information see the '`ReadMe.TXT`' file also supplied on the disk.

Closing Communications:

To end communications with the MOVA unit, select the '`FI`' option from the MOVA unit's main menu.

This allows the MOVA unit to tidy-up, close the communications and hang-up, resulting in 'NO CARRIER' being displayed at the Instation. At this point, press F10 to close the MOVA Communications application.

When a successful call to MOVA is finished, the MOVA unit will switch off the power to its modem and return complete control of the telephone line to the OMCU again. Subsequent calls are therefore answered by the OMCU even if the call was completed within the five-minute time-out period described above.

9.7.3 MOVA Flags (LF and SF)

The MOVA flags can be viewed, and then changed, using the LF (Look at Flags) option from the main menu:

```
      stage force bits                BST
 1  2  3  4  5  6  7  8 HI TO      Mar  Oct    MARK1 MARK2    FLAG(29-32)
 0  0  0  0  0  0  0  0  0  0       23   15     1234     0    0   0   0   0

error phone watch con- MOVA ready hour stage stage  assess error 0=VA
count  home  dog  trol mess  flag flow stuck dmnded -ment   log  1=MOVA
   0     0   13     0    0     1    0     0     1      1      0     0

Do you want to Set Flags <S>
           Look at Flags <L>
         Clear force bits <C>
           set Force bits <F>
  or Return to MAIN MENU <R> ?
```

The majority of these flags can be ignored, either because they are more easily viewed and changed using the commissioning screen for example, or because the flags are set directly by other options from the main menu.

The Look Flags sub-menu gives five options. In reverse order these are:

`Return to MAIN MENU <R>`
The fifth and final option is used to return to the main menu.

`Clear force bits <C>`
`Set Force bits <F>`
The third and forth options allow force bits to be tested. This option is only provided for backward compatibility as it is recommended that the commissioning screen be used to test the force bits.

`Look at Flags <L>`
The second option displays all the flags and the menu again. Use this option to ‘refresh’ the display, e.g. when looking for a change of state of a particular flag.

Set Flags <S>

The first option can also be called directly from the main menu by typing ‘SF’ rather than ‘LF’. This option allows some of the flags to be changed:

```
SET FLAGS :
 Flag(17)  ERROR COUNT   . . . . . <X>
 Flag(18)  PHONE HOME  . . . . . <L>
 Flag(20)  ON CONTROL FLAG {1=ON CONTROL}  <C>
 Flag(21)  MOVA MESSAGE LOG  {note 1}  . . <M>
 Flag(23)  HOURLY FLOW LOG   {note 2}  . . <F>
 Flag(26)  ASSESSMENT LOG    {note 2}  . . <A>
 Flag(27)  ERROR LOG         {note 1}  . . <E>
 Flag(28)  VA {=0} / MOVA {=1} FLAG  . . . <V>
           for HELP {notes} enter  . . . . <H>

 ENTER CHOICE (or Q to quit) ...
```

The ‘error count’ and the ‘on control’ and ‘VA/MOVA’ flags are more easily modified using the commissioning screen which is described in section 9.6. The ‘phone home’ flag is covered in the following section below.

The MOVA messages, hourly flow, assessment and error log flags should not need to be changed as viewing these logs should be performed using the explicit options from the main menu. However, the logging of hourly flow and assessment data can be switched on and off using these flags. By default, the MOVA unit records both normal assessment data and hourly flow data* in its assessment log. Changing the setting of these two flags can alter this.

* Prior to issue 10, hourly flow data was not logged by default.

For example, to get the MOVA unit to also record hourly flow data in its assessment log, type ‘F’ and press ‘Return’. The MOVA unit will then display the current value of the flag and ask for the new value. At this point, enter ‘1’ followed by ‘Return’ to set the hourly flow flag to ‘1’. This can be confirmed when the MOVA unit displays all the flags again.

```
 ENTER CHOICE (or Q to quit) ... F
 FLAG(23) =  0 Enter new value =
```

9.7.4 Phone Home Flag

The phone home flag is one of the many flags that can be viewed using the LF (Look at Flags) option from the main menu, see above.

If the phone home flag is set to ‘99’, either by the MOVA unit itself or directly by the user using the ‘Set Flags’ option, then the MOVA unit will ‘Phone Home’.

Regardless of the firmware issue, if the unit is connected to a separate Siemens 3U OMCU for phone line sharing, the ‘event’ is passed to the separate OMCU unit and the ‘Phone Home’ flag is cleared.

If the MOVA unit is not connected to separate OMCU unit, then its actions depend on the firmware issue…

Prior to issue 10 firmware, the MOVA application itself would attempt to phone a modem connected to a printer for example. When the call has been made, the flag is returned to its original value, normally zero.

From issue 10 onwards, the OMCU application within the unit will report ‘MPH - MOVA Phone Home’ to the RMS Instation (see section 11.6.2 which starts on page 162); the MOVA application does not actually phone home itself. In this case, the phone home flag returns to its original value, normally zero, as soon as the ‘MPH - MOVA Phone Home’ fault has been passed to the OMCU application. The fault will remain active in the OMCU (and at the RMS Instation) until it is manually cleared by the operator at the Instation (and the Instation has phoned the OMCU).

Note that if the telephone line sharing system is being used, the flag will return to zero as soon as the ‘fault’ has been passed to the separate Siemens OMCU. If the value remains at ‘99’ then the wiring between the MOVA unit and the OMCU should be checked. Also check that the OMCU contains the relevant special conditioning to handle the DM and MF I/O lines. See section 9.4 which starts on page 108.

Normally, the MOVA unit will only ‘phone home’ when it has detected an unrecoverable error, e.g. when its error count has reached or exceeded 20 preventing the MOVA unit putting itself back on-line.

However, by setting the ‘Phone Home’ flag to a value in the range 1 to 20, the user can force the MOVA unit to phone home whenever the error count reaches this limit.

For example, it may be useful to set the ‘Phone Home’ flag to ‘1’ to force a MOVA unit to ‘Phone Home’ whenever the error count is set to ‘1’ or higher, i.e. whenever the unit detects any fault. Alternatively, setting the flag to ‘5’ would force the MOVA unit to ‘Phone Home’ only after more serious faults.

Prior to issue 10, the 'Phone Home' flag could also be used to re-initialise the MOVA unit, see section 9.6.2 on page 115.

9.7.5 View MOVA Messages (VM)

The commissioning screen is mainly concerned with checking the I/O connections to the MOVA unit. To aid diagnosis of run-time problems with the MOVA algorithm, MOVA produces a series of output messages.

To view these MOVA messages, select the ‘VM - View MOVA Messages’ option from the main menu:

```
ENTER OPTION . . .  VM

Enter number of minutes messages output for <1-9> or 0 for continuous
   (NB - Press ANY key to pause messages)  ENTER NUMBER ...

Abandon messages now? (y/n)Y

Return to continue
```

Enter ‘0’ so that the MOVA unit outputs messages continuously since the messages can be stopped at any time by simply pressing any key and then pressing ‘Y’ to

confirm that you do wish to stop the messages. The main menu will re-appear after 'Return' is pressed.

The messages themselves are by no means self-explanatory because it is essential to minimise the amount of text within each message.

Once the messages start appearing, press the 'F3' key and the MOVA Communications application will show a full screen display of the information it receives in the messages in a much more understandable form.

In fact, so much information is contained within the messages that two screens are required to show it all. Press the 'F5' key to toggle between the two screens.

To exit view messages, press the 'F4' key to close down the full screen displays and then press any key to inform the MOVA unit that no more messages are required.

9.7.6 Other Menu Options

The 'LP - Load data from Prom' option does not perform any function on the Siemens MOVA unit as there is no PROM data store. All of the site data resides in battery backed RAM.

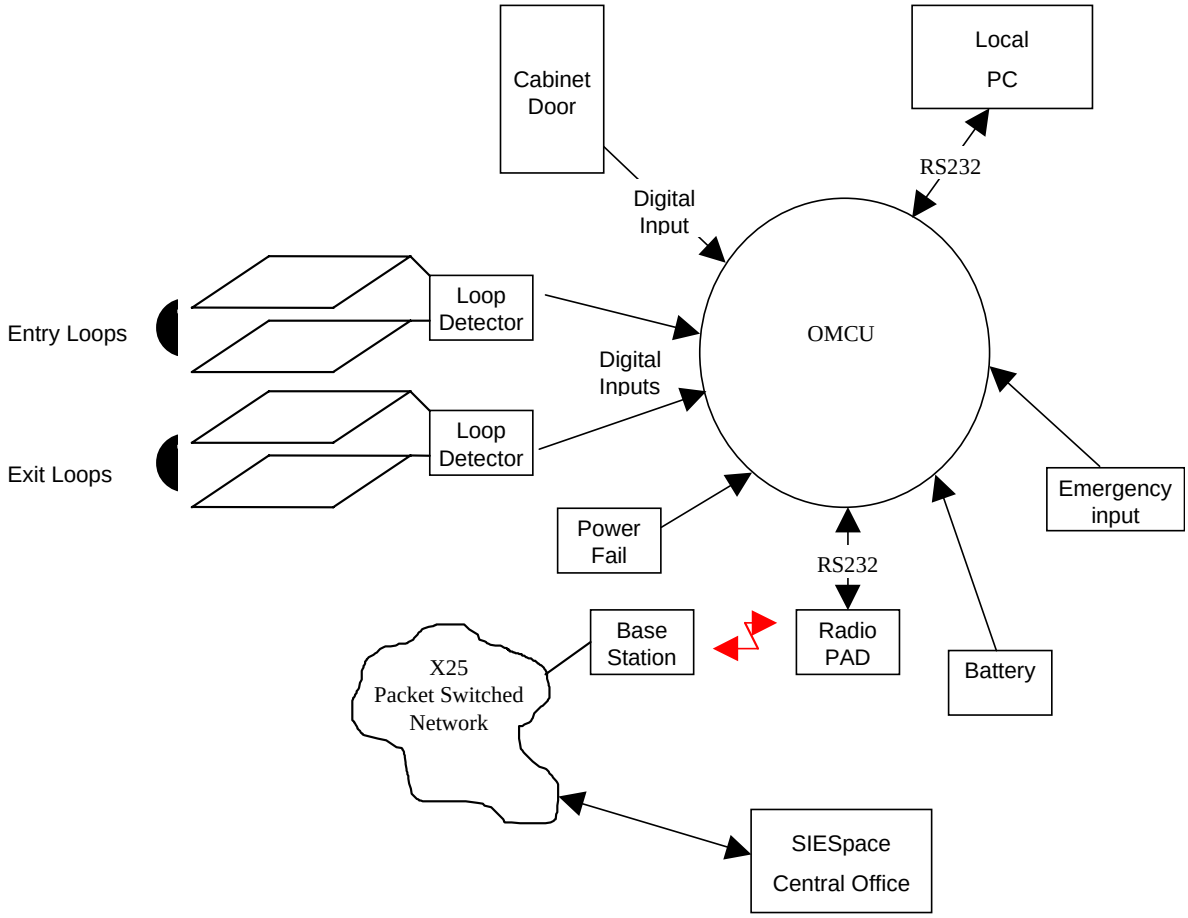
Details about displaying the average flows and the assessment log can be found in the document AG12 available from TRL.

The remaining menu items are concerned with printing. These options are not applicable to the Siemens MOVA unit since it does not have a printer port. If printouts of the various logs are required, then the log should be displayed on the screen as normal and the output recorded to a file on the PC. From the main menu, press the 'F8' key to display the MOVA Communications menu which shows that 'F1' and 'F2' can be used to write the screen output to a file on the PC.

10. CAR PARK COUNT and PAKNET

10.1 Overview

The car park monitor facility is primarily designed for use with the PAKNET communication interface and a SIESpace Instation. The current occupancy of a car park is returned to the SIESpace Instation periodically. This information can then be used by the Instation to guide vehicles to car parks that have spaces.



The main functions of the car park monitoring are as follows:

- To monitor car park entry and exit loop inputs
- To generate a difference count indicating the current occupancy of the car park
- To report car park occupancy to a Central Office based on occupancy threshold monitoring
- To report car park occupancy to a Central Office based on timetable events
- To report car park occupancy to a Central Office when requested by a Central Office
- To report faulty loops and clearances to a Central Office
- To report power-fail and power restore to a Central Office
- To report cabinet door state to a Central Office
- To set the car park occupancy when requested by a Central Office to specified value

- To modify specific Car Park facility configuration data when requested by a Central Office
- To provide handset commands to modify the Car Park facility configuration data

10.2 OMCU Status Message to SIESpace

The OMCU generates the same status report format regardless of the reason for generating the status report. The status report contains the following information:

- Occupancy status
- Occupancy
- Vehicle count for each configured loop
- DFM state for each configured loop
- Ramp mode
- Car park state
- Door state
- Power fail
- Emergency input state

When the Central Office resets the difference count, the OMCU replies as above with the occupancy and the vehicle count for each loop set to 0.

A status message is automatically transmitted to the SIESpace Instation when any of the following events occur:

- Cabinet Door is opened or closed
- Power fail is detected or restored
- Routine Poll is requested
- Ramp-up or Ramp-down mode is entered
- Car park state changes (i.e. Spaces, Almost Full, Full , Closed)

10.2.1 Routine Poll

The OMCU contains a timetable that indicates the periodic rate at which status messages must be transmitted to the Instation.

This ensures that the Instation will receive a status message with a minimum time interval specified in the table. If an event occurs that forces a status message to be transmitted (e.g. cabinet door is opened) then the routine poll timer is reset. This ensures that a routine poll is not transmitted just after the status as a result of the event.

The timetable is initialised to the values indicated in section 10.4.1; these settings can only be modified using a SIESpace Instation.

10.2.2 Loss of comms to PAKNET pad

On loss of communications with the PAKNET pad, the OMCU switches OFF / ON the pad in an attempt to re-establish comms. The longer that comms is lost, the less frequently retries are attempted.

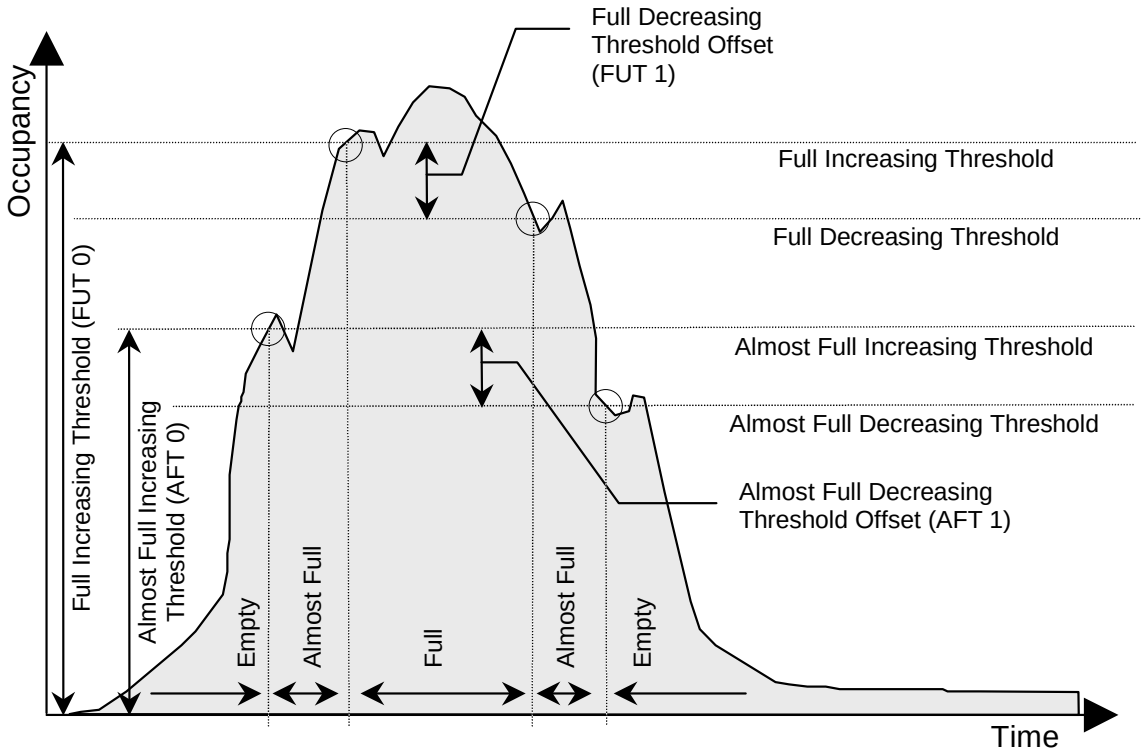
- Initially, every 10 seconds for 10 attempts
- Then, every hour for 5 attempts
- Then, every 24 hours until comms is re-established

Prior to PB680 issue 13 firmware, comms is only retried every 10 seconds for 10 attempts.

10.3 Difference Count and Thresholds Algorithm

The following describes the algorithm for the OMCU when used in the Car Park system.

Car Park States



OMCU Car Park Thresholds

The OMCU maintains 3 distinct states – ‘SPACES’, ‘ALMOST FULL’ and ‘FULL’. The car park occupancy is compared to these thresholds to determine whether a state transition is required.

- The ‘SPACES’ state is set when the almost full decreasing threshold is crossed from the ‘ALMOST FULL’ or ‘FULL’ states.
- The ‘ALMOST FULL’ state is set when the almost full increasing threshold is crossed from the ‘SPACES’ state or when the full decreasing threshold is crossed from the ‘FULL’ state.
- The ‘FULL’ state is set when the full increasing threshold is crossed from the ‘SPACES’ or the ‘ALMOST FULL’ states.

A status report is sent to the Central Office whenever any one of these thresholds is crossed.

Extrapolation

A straight line extrapolation is made N minutes into the future to assess whether the car park is filling or emptying at a fast enough rate to require more frequent status reports to the Central Office.

The extrapolation is based on two occupancy values (a) the current occupancy and (b) the occupancy from M minutes earlier. M is the fill rate calculation period (handset command FCP).

The value of N depends on the state:

- If the state is 'FULL' then N is set to the ramp down time threshold.
- If the state is 'SPACES' or 'ALMOST FULL' then N is set to the ramp up time threshold.

If the state is 'SPACES' or 'ALMOST FULL' and the car park is filling fast enough so that the 'FULL' state would be reached in N minutes. Then status reports are sent to the Central Office at X minute intervals (ramp up mode) where X is set to the ramp up period. The first status report is sent as soon as the decision is taken to enter ramp up mode.

If the fill rate changes so that the 'FULL' state would not be reached within N minutes then status reports are no longer sent to the Central Office at X minute intervals. If the occupancy reaches the 'FULL' state, status reports are no longer sent at X minute intervals.

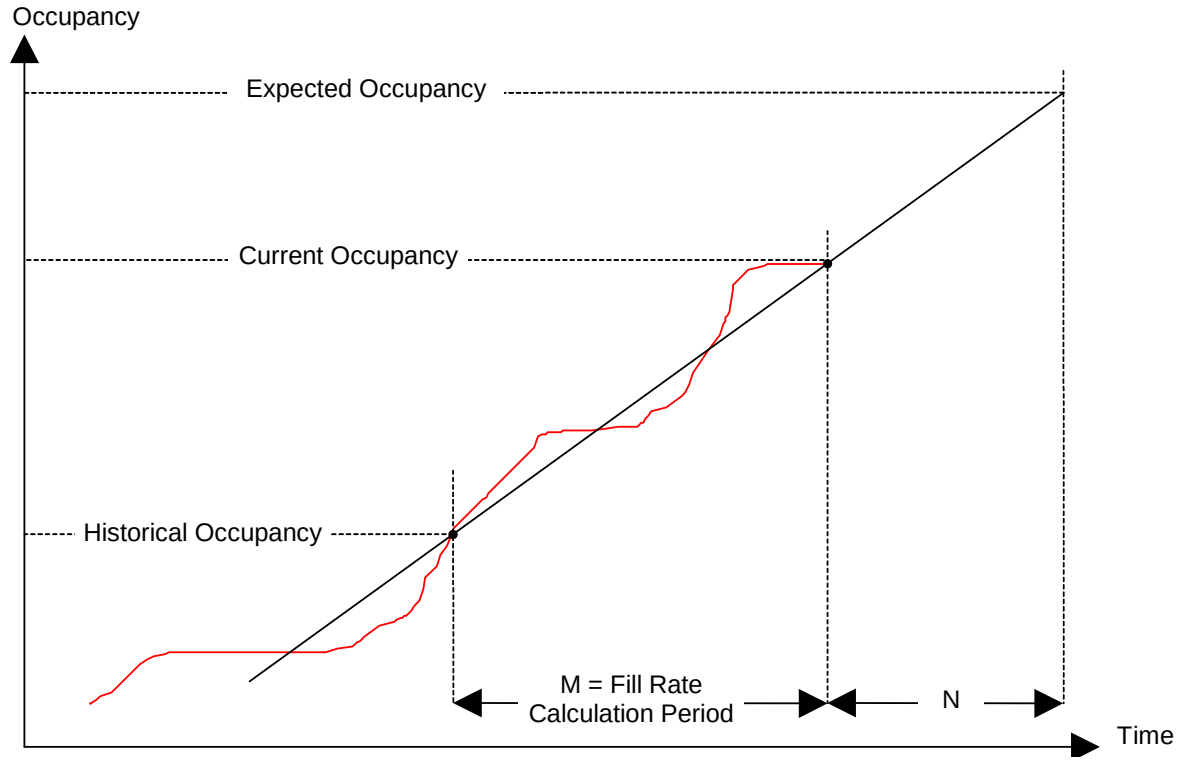


Figure 15 - Extrapolation

If the state is FULL and the car park is emptying fast enough so that the ALMOST FULL state would be reached in N minutes then status reports are sent to the Central Office at X minute intervals (ramp down mode) where X is set to the ramp

down period. The first status report is sent as soon as the decision is taken to enter ramp down mode.

If the emptying rate changes so that the ALMOST FULL state would not be reached within N minutes then status reports are no longer sent to the Central Office at X minute intervals. If the occupancy reaches the almost FULL state, status reports are no longer sent at X minute intervals.

The Historical Occupancy is calculated and stored at 1-minute intervals.

10.4 Configuration

The Car Park and PAKNET facilities are configurable from the handset. Sections 11.12 and 11.13 detail the relevant commands.

10.4.1 Car Park Configuration

This car park facility must be enabled via handset command LDV=3, this loads the following default values:

- Inputs 0 to 4 configured as Entry Loops
- Inputs 8 to 12 configured as Exit Loops
- Input 15 Door input
- 'NO DETECT' MONITORING DISABLED
- 'Permanent detect' monitoring disabled

- Car park full increasing threshold = 950
- Car park almost full increasing threshold = 900
- Car park capacity = 1000
- Car park almost full decreasing threshold offset = 20
- Car park full decreasing threshold offset = 20
- Fill rate calculation period = 15 minutes

The default values for the timetable (3 time slots only) are shown in the following table.

Time Slot	Frequency per Hour	Comments
00:00 to 07:00	1	Report sent every 60 minutes starting at 00:00
07:00 to 18:00	4	Report sent every 15 minutes starting at 07:00
18:00 to 00:00	2	Report sent every 30 minutes starting at 18:00

The handset commands are detailed in section 11.12.

10.4.2 Detector Fault Monitoring

Each of the car park entry and exit loops can be configured to have detector fault monitoring, by default this facility is disabled.

Each loop can provide a separate detector 'Active' and 'Inactive' time, the timing range is 0 to 255 minutes and hours respectively. Handset command CPL is used to set-up these times.

If the detector remains in either the 'active' or 'inactive' state for longer than the configured time then a failure is recorded. Once a DFM fault has been reported it remains active even if the detector starts to operate again.

To clear the fault firstly the detector fault must be fixed and have started to operate again (i.e. it has changed state at least once). Handset command RDF=1 must then be entered to clear the fault, the handset display will change to RDF:0 once all faults have been cleared (this may take up to 1 minute).

10.4.3 PAKNET Configuration

By default the PAKNET communication protocol is disabled. The following handset parameters have to be set-up to enable this facility.

RCA – Remote Comm's user address is the 14-character address of the Instation.
RCT – Comm's type – set to PAKNET.
ADR – Each OMCU on a car park system has its own unique address.

10.5 Installation

10.5.1 Interface Connector

An additional interface connector must be placed between the OMU modem cable and the PAKNET pad.
The pin outs for this connector are as follows :

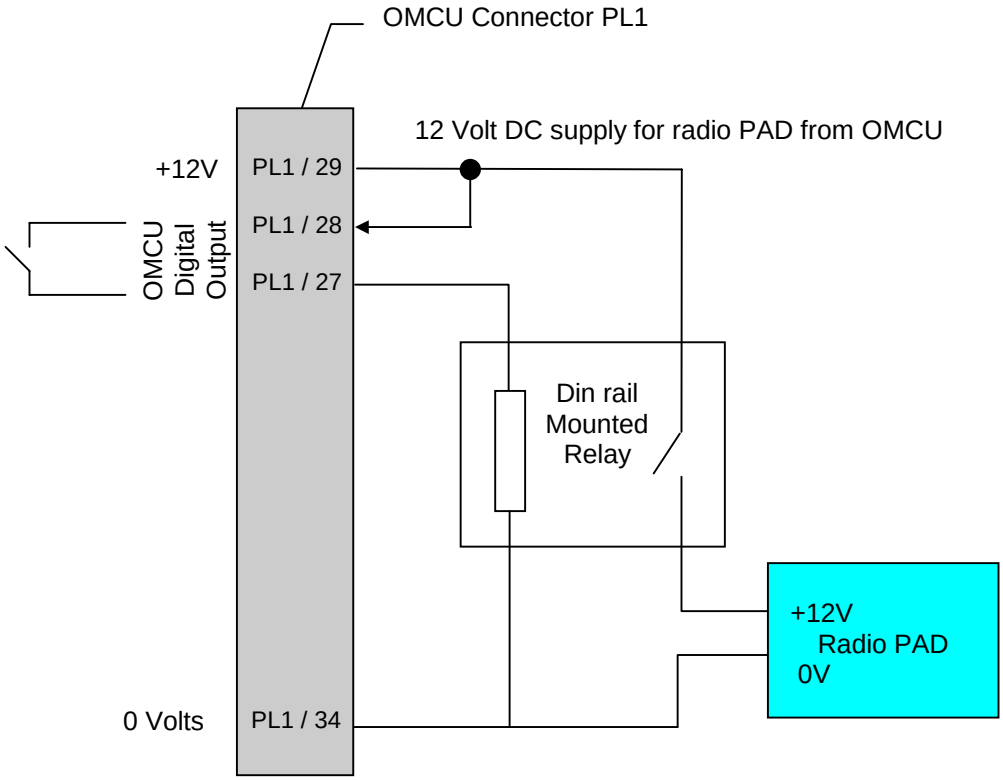
OMU		PAKNET Pad	
TX	2 ----------	2	TX
RX	3 ----------	3	RX
RTS	4 ----------	4	RTS
CTS	5 ----------	5	CTS
DSR	6 ----------	6	DSR
GND	7 ----------	7	GND
CD	8 ----------	8	CD
	9 ----------	9	
DTR	20 ----------	20	DTR
RI	22 ----------	22	RI

10.5.2 Radio Pad Power

The power to the radio pad is controlled by the OMCU. This allows the pad to be switched OFF / ON if a malfunction is detected.

The radio pad requires a 12V DC supply of power. This is supplied from the OMCU (PL1 connector pin 29). This power is passed through a relay mounted on a Din rail within the cabinet. This relay is controlled via an output from the OMCU (PL1 connector pins 27 and 28). The OMCU can then switch this output to turn the radio pad power Off/On.

Note: The radio pad must not be powered directly from the OMCU output as this current required is greater than the output relay's specification.



10.5.3 Door Switch

A Door switch can be provided to indicate to the Instation when the cabinet door has been opened. This input is connected to one of the low voltage inputs on the OMCU. By default the door switch is assigned to input 16 (PL3 pins 15 and 16)

Handset command DOR can be used to modify the OMCU input assigned to this facility.

10.5.4 Count Detector Loops

Detectors are wired into the required count loops, these should be connected as detailed in section 5.6.4.

11. HANDSET FACILITIES

11.1 INTRODUCTION

Access to the status information is gained by entering codes on an approved handset and interpreting the response on the display.

The handset port connector is a 25-way female D-type and operates at 1200 baud, even parity, 1 stop bit. Firmware PB680 issue 5 and later will auto-baud to 1200, 9600 or 19200 baud, on first receiving characters after the handset is plugged in.

This section lists all the handset codes, together with their data ranges and access levels for the OMCU, Bus Processor, Car Park and MOVA* applications.

* Prior to PB681 issue 10, none of the handset commands listed in this section were available in a MOVA unit. All functions were provided solely from the MOVA menu.

The following list gives a summary of all the Handset codes in an alphabetical order, for use as a quick lookup reference guide:

Table 11-1 HANDSET CODES

HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
ACF	-	-	0 - 1	CLF ACTION ON COMPLIANCE FAIL	R/O	11.14
ACT	1 - 30	0 - 3	VARIOUS	BUS: OUTPUT ACTION LIST	MAINT	11.10
ADR	-	-	0 - 254	REMOTE COMM'S OMCU ADDRESS	MAINT	11.13
AEC	-	-	0 -FFFF	ACCUMULATED ERROR COUNTS	R/O	11.3
AFT	-	0 - 1	0 - 16838	CAR PARK ALMOST FULL THRESHOLD	MAINT	11.12
AMX	-	-	0 - 3	ALT. MAX. SET NO.	R/O	11.3
APL	-	-	0 – 15, 255	ACTIVE CLF PLAN	R/O	11.14
ARM	-	-	0 - 2	SIETAG AREA MODE	MAINT	11.10
ARV	-	-	0 - F	SIETAG AREA VALUE	MAINT	11.10
ASS	0 - 255	0 - 10	VARIOUS	BUS: OUTPUT ASSOCIATION LIST	MAINT	11.10
BAS	-	-	0 - 2	SET DISPLAY BASE	OPEN	11.8
BFO	-	-	0 - 255	BUS DFM FAULT OUTPUT	MAINT	11.10
BFR	-	-	0 - 2	BUS DFM FAULT REPORTING TYPE	MAINT	11.10
BFT	-	0 - 15	0 - 255	BUS DFM FAULT TIME	MAINT	11.10
BMD	-	-	0 - 9	BUS MESSAGE DELAY	MAINT	11.9
BID	-	0 - 15	0 - FF	BEACON IDENTITY	MAINT	11.10
BRC	-	-	0 - 65535	BUS RECEIVE MESSAGE COUNT	MAINT	11.9
BRP	-	-	0 - 11	BUS RECEIVE PORT	MAINT	11.9
BRX	-	-	VARIOUS	BUS RECEIVE MESSAGE SIMULATION	MAINT	11.9
CAL	-	-	0 - 1	CALL INSTATION - MANUALLY	MAINT	11.8
CAO	0 - 31	0 - 3	0 - 255	CLF ACTION OUTPUTS	R/O	11.14
CBR	-	-	0,101-105	CONTROLLER BAUD RATE	MAINT	11.8
CCC	-	-	0 - 255	CLF COMPLIANCE FAIL CLEAR TIME	R/O	11.14
CCF	-	-	0 - 255	CLFCOMPLIANCE FAIL TIME	R/O	11.14

HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
CCL	-	0 - 9	0 - 255	CURRENT CAR PARK LOOP COUNTS	R/O	11.12
CCP	-	-	1	CALL CURRENT PLAN	MAINT	11.14
CCT	-	-	0 - 255	CURRENT CYCLE TIME	R/O	11.14
CCU	0 - 1	0 - 7	0 - 255	CALL CANCEL TIMERS	R/O	11.4
CDC	0 - 1	0 - 9	0 - 255	CALL DISCONNECT CAUSE STATS	MAINT	11.7.1
CDI	-	-	0 - 255	CLOCK DRIFT FROM INSTATION	R/O	11.14
CEC	-	0 - 31	0 - 1	CLF ENABLED COMPLIANCE	R/O	11.14
CFD	-	-	0 - 10	CONTROLLER FAULT DEBOUNCE	MAINT	11.14
CGR	-	0 - 7	0 - 31	CURRENT CLF GROUP	R/O	11.14
CGT	-	0 - 7	0 - 255	CURRENT CLF GROUP TIME REMAINING	R/O	11.14
CID	-	-	TEXT	CLF DATA SET IDENTITY	R/O	11.14
CKA	-	-	DATE	CLOCK TO ADVANCE	MAINT	11.14
CKM	-	-	TEXT	GPS CLOCK MONITOR	R/O	11.14
CKR	-	-	DATE	CLOCK TO RETARD	MAINT	11.14
CKS	-	-	TEXT, 0	LAST GPS CLOCK SYNCRONISATION	MAINT	11.14
COD	-	0 - 2	0 - 2	COPY DETECTORS TO OUTPUTS	MAINT	11.14
CON	-	0 - 3	0 - 65535	N + 1 COUNTER VALUE	R/O	11.4
COS	-	-	0 - 3	CAR PARK OCCUPANCY STATUS	R/O	11.12
COU	-	0 - 15	0 - 65535	DETECTOR COUNTER VALUE	R/O	11.4
CPC	-	-	0 - 16383	CAR PARK CAPACITY	MAINT	11.12
CPL	0 - 9	0 - 3	0 - 255	CAR PARK LOOP CONFIGURATION	MAINT	11.12
CPO	-	-	0 - 65535	CAR PARK OCCUPANCY	MAINT	11.12
CPP	-	-	0 - 23	CONTROLLER PHASE PATTERN	R/O	11.3
CPT	0 - 9	0 - 2	0 - 59	CAR PARK TIMETABLE	R/O	11.12
CPS	-	-	BINARY	CAR PARK STATE	R/O	11.12
CRQ	-	0	0 - 1	CALL REQUEST FLAG	R/O	11.7
CSI	-	-	TEXT	CLOCK SYNC FROM INSTATION	R/O	11.14
CSO	-	0 - 1	BINARY	CURRENT SWITCH OVERRIDE	R/O	11.17.2
CST	-	-	0 - 15	CONTROLLER STAGE	R/O	11.3
CTN	0 - 2	0 - 11	HEX	CONFIGURED TELEPHONE NUMBERS	R/O	11.7
CTR	0 - 1	0 - 2	0 - 255	CALL TERMINATION RECORD	MAINT	11.7.2
CUS	-	0 - 15	0 - FFF	SIETAG CUSTOMER IDENTITY	MAINT	11.10
CYC	-	0 - 15	0 - 255	CYCLE TIME FOR SPECIFIED CLF PLAN	R/O	11.14
DBM	-	-	-	DISPLAY BUS MESSAGES	R/O	11.9
DFA	-	-	0 - 30	SIETAG DEFAULT ACTION	MAINT	11.10
DIP	-	0 - 7	BINARY	DIGITAL INPUT STATES	R/O	11.4
DIP	0 - 2	0 - 5	BINARY	DIGITAL INPUT STATES (PB680 ISS 5+)	R/O	11.4
DOR	-	-	0 - 255	CAR PARK DOOR INPUT	MAINT	11.12
EBR	-	-	0 - 31	ENG BASE SEGMENT FOR RAM DISPLAY	OPEN	11.8
EDI	-	-	0 - 255	EMERGENCY DIGITAL INPUT	MAINT	11.12
EEL	-	-	0 - 255	EXAMINE ENHANCED 141 LINK	R/O	11.8
ENR	0 - FFFF	-	ENG	ENGINEERING RAM DISPLAY	R/O	11.8
ERR	-	-	0 & 1	RESTART REPORTS	MAINT	11.8
EVA	-	0 – 15	0 – 255	OMCU EVENTS DELAY TIME ACTIVE	R/O	11.17.1
EVI	-	0 – 15	0 – 255	OMCU EVENTS DELAY TIME INACTIVE	R/O	11.17.1

HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
EVS	-	0 - 1	BINARY	OMCU EVENT STATUS	R/O	11.17.1
EXR	-	0 - 1	BINARY	STAGE EXTENSION REQUESTS	R/O	11.3
FCP	-	-	0 - 63	CAR PARK FILL RATE CALCUL' PERIOD	MAINT	11.12
FDC	0 - 1	0 - 8	0 - FFFF	FAULT HAN. DIAGNOSTIC COUNTS	MAINT	11.6.1
FFC	aaa	0 - 15	0 - 15	FAULT FILTER COUNT	R/O	11.6
FFT	-	aaa	TIME	FAULT FILTER TIMER	R/O	11.6
FLG	-	-	-	VIEW TIMESTAMPED FAULT LOG	R/O	11.8
FLT	-	-	-	VIEW CURRENT FAULTS	R/O	11.6.2
FOC	-	0 – 15	0 – 65535	FLOW COUNT	R/O	11.15
FOD	-	0 – 15	0 – 65535	FLOW DOWN THRESHOLD	R/O	11.15
FOF	-	0 – 15	0 –100	FLOW SMOOTHING FACTOR	R/O	11.15
FOH	-	0 – 1	BINARY	FLOW HIGH	R/O	11.15
FOL	-	0 – 1	BINARY	FLOW LOW	R/O	11.15
FOP	-	0 – 15	0 – 100	FLOW COUNT PERIOD	R/O	11.15
FOS	-	0 – 15	0 – 65535	SMOOTHED FLOW RESULT	R/O	11.15
FOU	-	0 – 15	0 – 65535	FLOW UP THRESHOLD	R/O	11.15
FTR	-	0 – 3	0 - 255	PSTN FAULT TIMERS	R/O	11.7
FUT	-	0 - 1	0 - 16838	CAR PARK FULL THRESHOLD	MAINT	11.12
IFA	0 - 15	0 - 31	0 - 31	INFLUENCE ACTION NUMBER	R/O	11.14
IFN	0 - 15	0 - 31	0 - 3	INFLUENCE FUNCTION	R/O	11.14
INI	-	-	1 - 3	INITIALISE OMCU AND/OR MOVA	MAINT	11.8
IOP	-	0 - 7	BINARY	READ OMCU/INTERNAL PORTS	R/O	11.8.1
JID	-	-	0 - 9 + SP	JUNCTION IDENTITY	MAINT	11.10
KAC	1 - 23	0 - 1	0 - 1023	ANALOG DATA	R/O	11.5
KAS	1 - 23	0 - 6	BINARY	LAMP MON. ASPECTS BEING LEARNT	R/O	11.5
KDB	0 - 1	-	0 - 2	DIM/BRIGHT STATE OF CONTROLLER	R/O	11.5
KLS	-	-	BINARY	LAMP MONITORING LEARNING	R/O	11.5
KLM	-	-	6 - 8	LAMPS ON/OFF STATE	R/O	11.5
LAN	-	-	0 - FFF	L. A. N. ADDRESS FILTER	MAINT	11.10
LDV	-	-	0 - 4	LOAD INITIAL DEFAULT VALUES	MAINT	11.10
LIC	-	-	NUMBER	MOVA LICENCE NUMBER	MAINT	9.6.5
LIP	-	0 - 7	BINARY	LOGICAL INPUTS	R/O	11.4.1
LMO	-	-	0 - 1	LAMP MONITOR OVERRIDE	MAINT	11.5
LMR	0 - 1	-	0 - 1	LAMP MONITOR RESET/R-LEARN	MAINT	11.5
LTS	-	-	0 - 255	MODEM LOOPBACK TEST	R/O	11.8
MAP	-	0 - 9	0 - 7	PRIORITY MAP (TCSU BUS ONLY)	MAINT	11.10
MCI	-	0 - 1	ENG	MODEM CONTROL INDICATORS	R/O	11.7.3
MDC	0 - 1	0 - 12	0 - FFFF	MESS. HAN. DIAGNOSTIC COUNTS	MAINT	11.7.4
MDE	-	-	0 - 255	CONTROLLER MODE	R/O	11.3
MIO	-	-	0 - 2	MOVA I/O SETTING	MAINT	9.6.4
MON	-	aaa	ON/OFF	MONITORING ON/OFF	R/O	11.3
MOS	-	-	ASCII	USER DEFINED MODEM CONFIG STRING	MAINT	11.7
MSI	-	0 - 2	BINARY	MAINS STATE INOUTS	R/O	11.4
MTS	-	0 - 31	-	MONITOR CLF STATUS	R/O	11.14.1.1
OCC	-	0 - 15	0 - 65535	OCCUPANCY COUNT	R/O	11.16
OCD	-	0 – 15	0 – 100	OCCUPANCY DOWN THRESHOLD	R/O	11.16

HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
OCF	-	0 – 15	0 – 100	OCCUPANCY SMOOTHING FACTOR	R/O	11.16
OCH	-	0 – 1	BINARY	OCCUPANCY HIGH	R/O	11.16
OCL	-	0 – 1	BINARY	OCCUPANCY LOW	R/O	11.16
OCP	-	0 – 15	0 – 100	OCCUPANCY COUNT PERIOD	R/O	11.16
OCS	-	0 – 15	0 – 100	SMOOTHED OCCUPANCY RESULT	R/O	11.16
OCU	-	0 – 15	0 - 100	OCCUPANCY UP THRESHOLD	R/O	11.16
OFF	0 - 15	0 - 1	0 - 255	CLF OFFSET FROM THE BASE TIME	R/O	11.14
OLG	-	-	-	BUS OPERATIONS LOG	R/O	11.9
OPM	-	-	0 - 5	OMCU OPERATING MODE	R/O	11.8.2
OPS	0 - 2	-	BINARY	OUTPUT SENSE	MAINT	11.14
PDL	-	0 - 1	BINARY	LATCHED PHASE DEMANDS	R/O	11.3
PDR	-	0 - 1	BINARY	REVERTIVE PHASE DEMANDS	R/O	11.3
PDU	-	0 - 1	BINARY	UN-LATCHED PHASE DEMANDS	R/O	11.3
PGS	-	0 - 1	BINARY	PHASE GREEN STATES	R/O	11.5
PIA	-	-	0 - 2	PLANS ISOLATE ACTION	R/O	11.14
PIC	-	-	-	PROGRAM IDENTITY CODE	R/O	11.8
PLE	-	0 - 15	0 - 255	PLAN ENTRY TIME	R/O	11.14
PLI	-	0 - 15	0 - 15	PLAN INFLUENCE SET	R/O	11.14
PLS	-	-	0 - 1	MOVA PHONE LINE SHARING FACILITY	MAINT	9.6.3
PLT	0 - 15	0 - 31	0 - 255	PLAN TIME FOR SPECIFIED CLF PLAN	R/O	11.14
PLX	-	0 - 15	0 - 255	PLAN EXIT TIME	R/O	11.14
PME	-	-	0 -255	LEVEL 2 (MAINT) ACCESS CONTROL	OPEN	-
POC	0 - 11	0 - 4	VARIOUS	RS485 PORT CONFIGURATIONS	MAINT	11.10
POS	-	-	0 - 1	SET RS485 PORT SETTING	MAINT	11.10
PUD	-	0 - 4	0 - 255	POWER UP DATA	MAINT	11.8.3
RAM	-	-	256, 1024	NUMBER OF KB OF RAM INSTALLED	R/O	11.8
RAP	-	0 – 15	10 – 600	RAID AVERAGING PERIOD	R/O	11.19
RCA	-	-	ASCII	REMOTE COMMS USER ADDRESS	MAINT	11.13
RCB	-	-	0 - 4	REMOTE COMMS BAUD RATE	MAINT	11.13
RCD	-	-	0 - 255	RADIO CLOCK FAULT DELAY	MAINT	11.10
RCI	-	-	0 - 255	RADIO CLOCK INPUT	MAINT	11.10
RCR	-	-	0 - 2	RADIO CLOCK FAULT REPORTING	MAINT	11.10
RCS	-	-	-	RADIO CLOCK SIGNAL	R/O	11.8.5
RCT	-	-	0 - 1	REMOTE COMMS TYPE	MAINT	11.13
RCU	-	-	0 - 1	REMOTE COMMS UPDATE	MAINT	11.13
RDF	-	-	0 - 1	RESET CAR PARK DETECTOR FAULTS	MAINT	11.13
REN	-	0 - 15	0, 0xFFFF	RAID ENABLED	R/O	11.19
RET	-	-	0 - 300	REACTIVATION TIME	MAINT	11.10
RGL	-	0 - 1	8 bits binary	RAID ATGBV LOW	R/O	11.19
RGT	0 – 15	0 – 7	0–(2^{32}-1)	RAID ATGBV THRESHOLD	R/O	11.19
RIF	-	-	0 - FF	RETRY INHIBIT FLAG	R/O	11.7
RLO	-	0 – 15	0–(2^{32}-1)	RAID ALOTPV	R/O	11.19
RMP	-	0 - 3	0 - 63	CAR PARK RAMP MODE SETTINGS	MAINT	11.12
ROH	-	0 – 1	8 bits binary	RAID ALOTPV	R/O	11.19
ROT	0 – 15	0 – 7	0–(2^{32}-1)	RAID ALOTPV THRESHOLD	R/O	11.19

HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
RPL	-	-	0 – 15, 255	REQUESTED CLF PLAN	MAINT	11.14
RSA	-	0 - 31	0 - 31	RELATED STREAM FOR ACTION	R/O	11.14
RSC	-	-	0 - 255	RETRY STEP COUNTER	R/O	11.7
RTO	-	-	0 - 255	REAL TIME CLOCK (5AM) OUTPUT	MAINT	11.10
RTG	-	0 – 15	0–(2^{32}-1)	RAID ATGBV	R/O	11.19
RTR	-	0 - 2	0 - 255	RETRY TIMER	R/O	11.7
RTS	-	-	0 - 7	RAID THRESHOLD SET IN CURRENT USE.	R/O	11.19
SCT	-	-	0 - 6	SET 0141 CONTROLLER TYPE	MAINT	11.8
SDC	-	A - P	0 - FFFF	SDE/SA EXTENSION REQUESTS	R/O	11.3
SDF	-	-	0 – 1	SPEED DISPLAY FORMAT	MAINT	11.18.1.9
SEB	-	0 - 3	0 - FFFF	SOFT ERROR BUFFER	R/O	11.8.4
SEC	-	-	0 - 255	SOFT ERROR CURRENT COUNT	R/O	11.8
SES	0 - 9	0- 1	0 - FFFF	SOFT ERROR STATUS	R/O	11.8
SMS	-	-	ASCII	STAGE MONITOR STATUS	R/O	11.3
SOB	-	-	ENG	SET OUTPUT BITS	MAINT	11.8
SOP	0 - 2	-	BINARY	SET OUTPUT PORT	MAINT	11.8
SRC	-	0 - 15	0 - 255	BUS MESSAGE SOURCE	MAINT	11.10
STP	-	-	0 - 63	SET THROUGH PORT CONFIGURATION	MAINT	11.8
SWS	-	0 - 31	0 - 1	TIMESWITCH SETTINGS	R/O	11.14
TAF	-	-	1 - 3	SIETAG TAG FORMAT	MAINT	11.10
TAI	-	-	0 - 255	TAG INTERVAL	MAINT	11.10
TDY	-	0 - 15	TEXT	TIMETABLE DAY	R/O	11.14
TIM	CLR	-	0 - 1	CLEAR ALL TIMES VALUES	MAINT	11.3
TIM	EXL	0 - 15	0 - 255	LONGEST TIMED EXTENSION	MAINT	11.3
TIM	EXS	0 - 15	0 - 255	SHORTEST TIMED EXTENSION	MAINT	11.3
TIM	IGN	PH - PH	0 - 255	SHORTEST TIMED INTERGREEN	MAINT	11.3
TIM	MAX	0 - 15	0 - 255	LONGEST TIMED MAX GREEN	MAINT	11.3
TIM	MIN	0 - 15	0 - FF	SHORTEST TIMED MIN GREEN	MAINT	11.3
TMP	-	1 - 64	0 - 1	TEMP CONDITIONING FLAGS	MAINT	11.8
TNP	-	-	0 - 2	TELEPHONE NUMBER POINTER	R/O	11.7
TOD	-	-	TIME	TIME OF DAY	MAINT	11.8
TSD	-	0 - 63	DATE and 0 – 99	TIMETABLE SPECIAL DAY	R/O	11.14
TSH	0 - 31	0 - 1	DATE	TIMETABLE SPECIAL HOLIDAY	R/O	11.14
TSW	0 - 63	0 - 5	0 - 215	TIMESWITCH SETTINGS	R/O	11.14
VCC	-	0 – 4	0 – 255	VEHICLE CLASSIFIER COMMON CONFIGURATION	R/O	11.18.1.1
VCF	-	0 – 2	0 – 255	VEHICLE CLASSIFIER CONFIMRATION FAIL PARAMETERS	R/O	11.18.1.5
VDE	-	0 – 1	0 - FFFF	VEHICLE CLASSIFIER DETECT CONDITION EVENT LOGGING	R/O	11.18.1.12
VLC	0 – 31	0 – 1	0 – 255	VEHICLE CLASSIFIER LOOP CONFIGURATION	R/O	11.18.1.2
VMC	0 - 15	0 - 3	0 - FFFF	VARI-MAX LOG	R/O	11.3
VOA	0 – 31	0 – 6	0 – 255	VEHICLE CLASSIFIER OUTPUT ACTION LIST	R/O	11.18.1.3

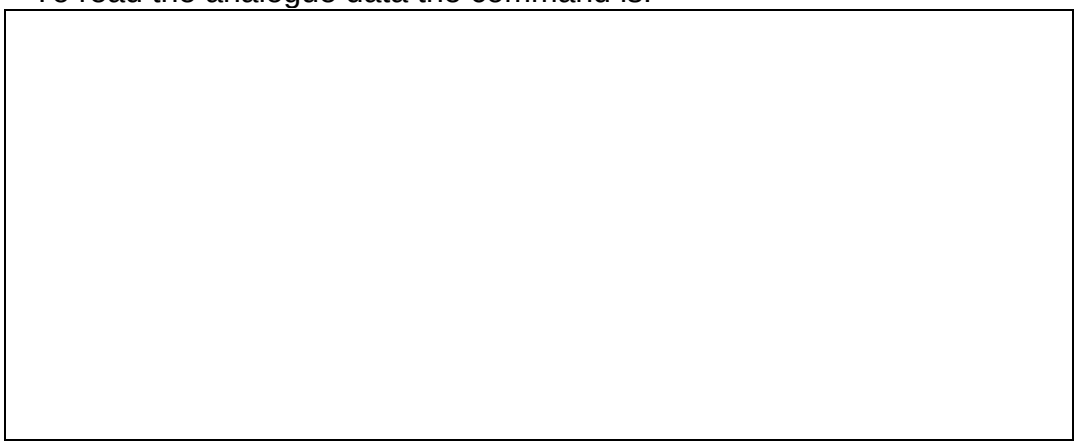
HSET CMD	MAJOR INDEX	MINOR INDEX	DATA	DESCRIPTION	ACCESS	SECT REF
VRC	-	-	0 – 65535	VEHICLE CLASSIFIER TEST MESSAGE COUNT	MAINT	11.18.1.11
VRX	-	0 – 5	0 – 255	VEHICLE CLASSIFIER TEST MESSAGE	MAINT	11.18.1.11
VSB	-	0 – 6	0 – 255	VEHICLE CLASSIFIER SPEED BANDS	R/O	11.18.1.8
VSM	-	0 – 31	0 – 15	VEHICLE CLASSIFIER DETECT CONDITION STATISTIC CATEGORY MAP	R/O	11.18.1.13
VSP	0 – 3	0 – 5	0 – 255	VEHICLE CLASSIFIER SITE PARAMETERS	R/O	11.18.1.4
VTD	-	0 – 2	0 – 60	VEHICLE CLASSIFIER TRAFFIC DATA PARAMETERS	R/O	11.18.1.7
VTM	0 – 4	0 – 1	TEXT	VEHICLE CLASSIFIER TRANSMISSION MESSAGES	R/O	11.18.1.8
VVT	0 – 15	0 – 1	TEXT, 0 - 255	VEHICLE CLASSIFIER VEHICLE TYPE CATEGORIES	R/O	11.18.1.10
XXC	-	-	-	SWITCH H/SET TO 141 CONTROLLER	OPEN	11.8
XXM	-	-	-	SWITCH H/SET TO MOVA	OPEN	11.8
XXO	-	-	-	SWITCH HANDSET TO OMCU	OPEN	11.8
XIP	-	-	BINARY	EXTERNAL INPUTS STATES	R/O	11.4

11.1.1 Command Format

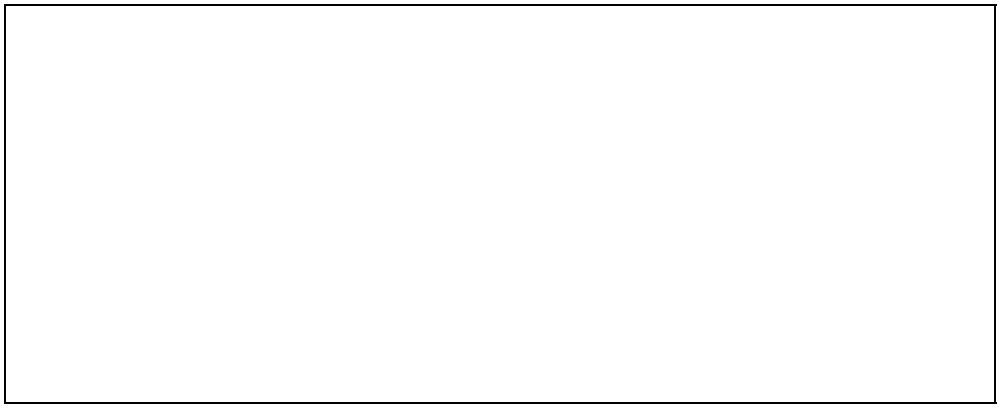
All operator commands start with a three letter command code indicating the parameter to the monitored or changed. This code may constitute the complete command, e.g. KDB for controller ‘DIM/BRIGHT’ state, or may be followed by one or two indexes indicating a specific parameter within the category determined by the code. For example, analogue data of specified input KAC requires to identify both the channel and the voltage or current on that ADC channel.

For read operations, following typing of the command code and any indices if applicable, operation of the ENTER (or ‘RETURN’) key terminates the command.
For write operations an equals sign ‘=’ followed by the parameter required is added to the read command before selecting ENTER (or ‘RETURN’). Thus, for example:

- To read the analogue data the command is:



- To reset the Power-up statistics data (first element of five) the command is:



The '+' (or '.+') and '-' (or '.-') keys may be used after a basic read command has been entered to enable the MINOR index (or MAJOR index) to be modified to scan the OMCU.

11.1.2 Display Format

The two basic display formats are:

- Echo display that is simply an echo of the information typed.
- Response display generated by the OMCU when the command is terminated by operating the ENTER (or 'RETURN') key or the '+' (or '.+') keys.

The response displays include:

- Read response display comprising a repeat of the command with spaces between the fields and a colon and data added, e.g.

```
PUD 0:0
```

- Write response display in which the command is repeated with the '=' replaced with a colon, i.e. identical to the corresponding read response display.
- Error response display in which the command is repeated with an asterisk and error code added, e.g.

```
PUD AB*S
```

Indicating the command has a syntax error and should be repeated correctly.

Other display formats comprise those without the command repeated due to lack of display character width; e.g. response to monitor digital inputs command DIP. Where the command deviates from the normal in either of these respects this is indicated in the command table.

11.1.3 Read Procedure (Monitor Existing Data)

1. Plug the handset into the socket on front of the OMCU.
2. When the OMCU displays the prompt character '-', type out the appropriate command and any index necessary, e.g. to determine the DIM/BRIGHT state of the controllers signal lamps enter KDB to produce the display:

   KDB

3. Terminate the command by operating the ENTER (or 'RETURN') key. The OMCU responds by repeating the display with a colon and the required data. (e.g. Bright state in this example), i.e. KDB : 1
4. Repeat Steps 2 and 3 for each operation using the '+' (or '.+') or '-' (or '.-') keys where possible to reduce key entry.

NOTE: If the OMCU detects an error on interrogating the command, instead of the normal response, the OMCU repeats the command display with an asterisk and error code added. The error codes used are listed in Table 11.2.

11.1.4 Write Procedure (Change Existing Data)

1. Plug the handset into the socket on front of the OMCU.
2. When the OMCU displays the prompt character '-', carry out the appropriate level access enabling operation (described in information supplied separately to each OMCU user).

   Type out the required command code, any index or indexes necessary, followed by '=' and the required value, e.g. to reset the Power Up state data (second element), enter 'PUD 1=0' which will be echoed back to the handset
3. Terminate the command by operating the ENTER (or 'RETURN') key. The OMCU responds to confirm the change by repeating the display with = changed to colon as shown below:

   ```
   PUD 1:0
   ```
4. Repeat step 3 and 4 for each operation using the '+' (or '.+') or '-' (or '.-') key where possible to reduce key entry.

NOTE: If the OMCU detects an error on interrogating the command instead of the normal display an error display comprising the command display with an asterisk and error code added. The error codes used are listed in Table 11.2.

11.1.5 Alternative Write Procedure (Change Data Following Read)

With access enabled as appropriate, a write procedure may be carried out following reading of the information to be changed by typing = followed by the new value. This immediately replaces the colon and the old value in the display. On operation of the ENTER (or 'RETURN') key to terminate the instruction, the OMCU repeats the display with = replace by a colon.

11.1.6 Switchable Handset Facility

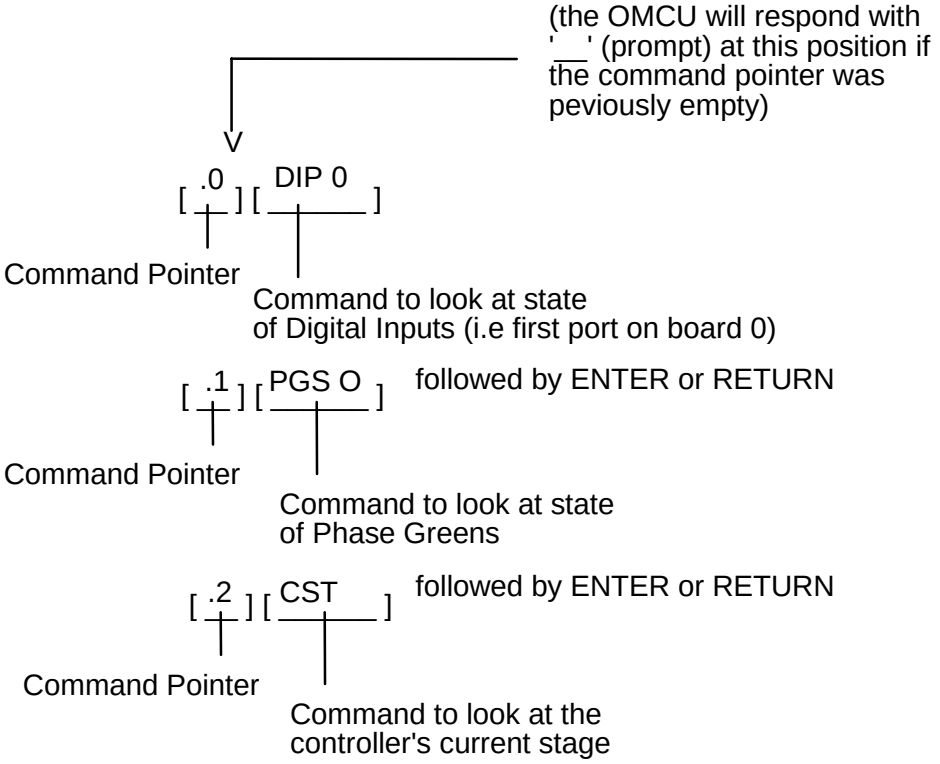
It is possible to store up to 10 handset commands, such that any of these commands may be subsequently recalled by pressing the "." (dot) key followed by the appropriate number. In this way it is possible to simply switch between one handset display and another. (See note)

Setting Up

Assume that the following controller data/status information is being studied:

(a) Detector Inputs
(b) Phase Green States
(c) Current Stage

The following would be entered:



The 3 command pointer .0, .1 & .2 have now been set.

Using Facility

The handset can now be used to invoke the previous commands by simply entering a '.' (dot) followed by 0, 1 or 2, e.g.

`.1` will display the status for Phases A to H.
`.2` will indicate the current stage.
`.0` will display the current status for input port 0, board 0.
`.1` will display the status for Phases A to H again.
`+` will now display the status for Phases I to 0 and will be remembered as the new command for '`.1`'
`.0` will display input port 0 again.
`.1` will display the status for Phases I to O.

The facility is not restricted to just the commands indicated above; any valid handset facility may be entered in any of the pointers in any order.

Note: On some handset commands it is not advisable to duplicate the command in two or more dot buffers. If this is done then access to the other duplicate command buffers will not be serviced. The commands affected are identified in the mnemonic code box.

11.2 HANDSET COMMAND ERROR CODES

Code	Name	Description/Mnemonic
A	Access Level	Access level for this command has not been enabled. Use PME.
C	Non-configured	THE FACILITY TO WHICH THE COMMAND RELATES IS NOT AVAILABLE
D	Data Integrity	The data cannot be set to the specified value. Data associated with other handset command must be modified before this command can be set to the specified value.
F	Fixed Base	The '+' or '-' keys are not applicable to current command.
I	Inaccessible	The facility to which this command relates is not accessible.
M	Mnemonic not recognised	The command mnemonic is not known. The command may require a later issue of firmware PROM.
P	Premature end of command line	The <enter> key has been pressed too soon for this command. Re-enter, with additional data.
R	Range error	Data or index value in preceding command out of range.
S	Syntax error	Invalid character at point preceding the asterisk.
V	Invalid current address	The <enter>, '=', '+' or '-' keys have been attempted on invalid command data.
W	Write protected	Attempt to modify read only data.

11.3 CONTROLLER MONITORING COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
AEC	-	-	-	**Accumulated Error Counts Display** (Total for unfiltered timing errors - see FFC command for individual errors making up this total)	RO
AMX	-	-	-	**Display alternative Maximum Set Number** Data 0 - normal MAX, 1,2 & 3 - Alternative MAX sets	RO
CPP	-	-	-	**Display controller Phase pattern** Data: 0 to 23 as defined in the OMCU configuration data for Phase pattern definition	RO
CST	-	-	-	**Display Controller Stage** Data: 0 to 15 for a valid stage, 255 for an unknown stage or inter-stage	RO
EXR	-	0-1	-	**Display Stage Extension Requests** Minor Index: 0 - stages 0 to 7 Minor Index:1 - stages 8 to 15 Data: 8 Bit binary	RO
MDE	-	-	-	**Display Controller Mode** Data: (See section 11.6.10 for mode numbers)	RO
MON	-	CFL	-	**Phase Conflict Monitoring** Data: (ON/OFF)	RO
MON	-	EXT	-	**Green Extension Monitoring** Data: (ON/OFF)	RO
MON	-	IDM	-	**Ignoring Demands Monitoring** Data: (ON/OFF)	RO
MON	-	IGN	-	**Inter-green Monitoring** Data: (ON/OFF)	RO
MON	-	LAR	-	**Long All-Red monitoring** DATA: (ON/OFF)	RO
MON	-	LIS	-	**Long Inter-Stage monitoring** DATA: (ON/OFF)	RO
MON	-	MAX	-	**Maximum Green monitoring** DATA (ON/OFF)	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
MON	-	MIN	-	**Minimum Green monitoring** DATA: (ON/OFF)	RO
MON	-	SDE	-	**SDE/SA monitoring** DATA: (ON/OFF)	RO
MON	-	SEQ	-	**Stage Sequence monitoring** DATA: (ON/OFF)	RO
MON	-	STK	-	**Controller Stuck monitoring** DATA: (ON/OFF)	RO
MON	-	VMX	-	**Vari-Max monitoring** DATA: (ON/OFF)	RO
PDL	-	0 – 1	-	**Display Phase Demands – Latched** MINOR INDEX: 0 – Phases A to H MINOR INDEX: 1 – Phases I to P DATA : 8 BIT BINARY	RO
PDR	-	0 – 1	-	**Display Phase Demand – Revertive** MINOR INDEX 0 – Phases A to H 1 – Phases I to P DATA: 8 Bit Binary	RO
PDU	-	0 – 1	-	**Display Phase Demands Unlatched** MINOR INDEX: 0 – Phases A to H 1 – Phases I to P DATA: 8 Bit Binary	RO
SDC	-	**1 A – P	-	**Display SDE/SA Extension request for each phase**. MINOR INDEX: PHASE. DATA: 0 to FFFFH	RO
SMS	-	-	-	**Stage Monitoring Status** DATA: Controller timing period.	RO
TIM	-	CLR	-	**Clear ALL measured controller timings.** (Enter 1 ; OMCU responds with 0 when actioned)	WO
TIM	**3 EXL	**2 0 - 15	-	**Display/Reset shortest measured extension time for each stage.** MINOR INDEX: STAGE DATA: Longest Extension in seconds and tenths of seconds.	RW

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
TIM	**3 EXS	**2 0 - 15	-	**Display/Reset shortest measured extension time for each stage** MINOR INDEX: STAGE DATA: Shortest Extension in seconds and tenths of seconds.	RW
TIM	**3 IGN	**1 PH - PH	-	**Display/Reset shortest measured inter-green time for each phase to phase movement** MINOR INDEX: PHASE to PHASE. DATA: Shortest Inter-green in seconds and tenths of seconds. (use + to inc from phase)	RW
TIM	**3 MAX	**2 0 - 15	-	**Display /Reset longest measured maximum time for each stage** MINOR INDEX: STAGE DATA: Longest MAX in seconds and tenths of seconds	RW
TIM	**3 MIN	**2 0 - 15	-	**Display Reset shortest measured minimum time for each stage** MINOR INDEX: STAGE DATA" shortest Min in seconds and tenth of seconds	RO
VMC	0 - 15	**2 0 - 3	-	**Display Vari - Max log** Major index: Related Stage Minor index: Vari – Max Band Data Range: 0 to FFFF Each Vari-Max stage is specially monitored to count the number of times the MAX GREEN terminates after the normal MAX period. These counts are stored in the bands 0 to 3 for each configured Vari-Max stage.	RO

Note **1 - Dependant upon the maximum number of PHASES configured.
Note **2 - Dependant upon the maximum number of STAGES configured
Note **3 - Command should be terminated (by <enter> or <carriage return>) after the major index has been entered, and the + & - keys used to access the appropriate data. The OMCU will automatically insert the minor index info.

The SMS command provides additional information on OMU timing monitoring. As the controller cycles through its stages, the SMS command will display a sequence of messages to show which timing period is being monitored (min, extension or max) at each point by the OMU.

SMS: INACTIVE	Timing monitoring not active
SMS: INTER STG	Inter-stage period active
SMS: MIN ACTIVE	Stage minimum timing period active
SMS: MIN END	Stage minimum completed
SMS: EXT MONITR	Stage extension timing active
SMS: MAX END	Stage max time terminating
SMS: AWAIT END	Timing monitoring for the stage has completed, waiting for end of stage
SMS: SHORT MIN	Min time was below the defined limit
SMS: SHORT EXT	Extension time was below the defined limit
SMS: LONG EXT	Extension time was above the defined limit
SMS: LONG MAX	The max time was above the defined limit

11.4 INPUT MONITORING COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CCU*	0 - 1	0 - 7	-	**Display Call/Cancel timers** Major index : 0 = Call time; 1 = Cancel time Minor index : Call/Cancel unit DATA: Time (in seconds)	RO
CON	-	0 - 3	0 - 65535	**Display N+1 COUNTER VALUES** Minor index: N+1 unit DATA: Count value	RO
COU	-	0 - 15	0 - 65535	**Display Detector Counter values** Minor index: Counter number DATA: Count value	RO
DIP (PB680 issue 4 and earlier)	-	0 - 7	00000000 to 11111111	**Display Digital Inputs** Minor index: 0 & 1 = I/O Board 0 2 & 3 = I/O Board 1 4 & 5 = I/O Board 2 6 & 7 = I/O Board 3	RO
DIP (PB680 issue 5 or later)	0 - 2 board no.	0 - 5 port no.	00000000 to 11111111	Display digital inputs in binary, for the selected board and port number. Not all ports may be equipped.	RO
LIP (PB680 issue 13 or later)	-	0 - 7	00000000 to 11111111	**Display Logical Input Ports** (see Section 11.4.1 for details)	RO

MSI	-	0 - 2	-	**Display Mains state inputs.** Minor index: **MSI 0** - first 8 mains I/Ps on first I/O Board. **MSI 1** - last 2 mains I/Ps on first I/O Board & first 6 mains I/Ps on 2nd I/O Board **MSI 2** - last 4 mains I/Ps on 2nd I/O Board & first 4 mains I/Ps on 3rd I/O Board. DATA: 8 Bit Binary (bit7 - input bit 7 etc)	RO
XIP*	-	-	-	**Display External Input states.** DATA: 8 Bit Binary (bit7 - input bit 7 etc)	RO

* Only valid if monitoring is on.

11.4.1 OMCU Logical Input Ports (LIP)

Displays the logical port data i.e. after it has been copied from either the OMU hardware inputs (freestanding OMU) or from the ST800/700 inputs (semi-integral OMU with enhanced serial link to ST800/700).

The port data is displayed after any configured inversions on the inputs.

The port number only counts input ports on the controller (output ports are skipped).

FORMAT: LIP <n>

Where <n> is the minor index (0 - 7) and results in the following:

LIP Port	ST800 I/P Port
LIP 0	0 – CPU card
LIP 1	1 – CPU card
LIP 2	2 – 1st I/O card
LIP 3	3 – 1st I/O card
	(ports 4 and 5 are output ports and are skipped)
LIP 4	6 – 2nd I/O card
LIP 5	7 – 2nd I/O card

11.5 LAMP MONITORING COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
LMO (PB680 issue 13 or later)	-	-	0 - 1	**Lamp monitor override** Enter 1; Lamp monitor override enabled, allowing OMCU to monitor lamps while using enhanced serial link. Enter 0; Lamp monitor override disabled.	Maint
LMR	-	-	-	**Lamp monitor RESET/RELEARN** (enter 1; OMCU responds with 0 when command accepted)	Maint
PGS	-	0 -1	-	**Display state of Phase Greens** minor index : 0 - phases A to H 1 - phases I to P Data: 8 Bit Binary Each bit represents a phase i.e. HGFEDCBA or PONMLKJI as defined by the minor index	RO
KAC	1 - 23 sensor number	0 - 1 0=curr 1=lamp supply voltage	-	**Display Lamp Monitor ADC readings** Even if the OMCU is unconfigured, the ADC values for all sensors are made available. This allows checking of the currents and voltages prior to OMCU configuration download. Typically 'bright' values are:- 40Watt lamp ⇒ KAC n 0:35 50Watt lamp ⇒ KAC n 0:44 240V lamp supply ⇒ KAC n 1:720	RO
KLS	-	-	-	**Display OMCU Learn Status** KLS <enter> Comment: Displays the combined learn status bits for all aspects of all configured sensors. Refer to KAS command following for bits 0 to 3, for the status bit definitions and layout. Only bits 0 to 3 are displayed, bits 4 to 7 are always 0.	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
KAS	1 - 23 sensor number	0 - 6 aspect pattern number	BINARY *NOTE1	**Display LMU Aspect Learn Status** Aspect pattern 0=red, 1=green or wait and 2=amber	RO
KDB	0 - 1	-	0 - 2	**Display Controller Dim/Bright State** KDB (lamp supply:0 - 1)<enter> Comment: Indicates the dim/bright state for each of the controller lamp supplies as shown below:- 0 – state undefined (no change has occurred) 1 – dim 2 – bright	RO
KLM	0	-	6 - 8	**Display Lamps ON/OFF State** KLM (lamp supply: 0 - 1) <enter> Comment: Indicates the state for each of the controller lamp supplies as shown below:- 6 – lamps off 7 – lamps on 8 – change in progress (debounce period)	RO

NOTE 1:

The meaning of each bit in the KAS binary display is listed below:

Bit 0 - AWAIT_DIM - Aspect not yet appeared in DIM
Set if current ‘dim/bright’ state is known to be bright and AWAIT_DIM_CHANGE is set. Cleared when ‘dim/bright’ state is dim and AWAIT_DIM_CHANGE is clear
Bit1 - AWAIT_BRIGHT - Aspect not yet appeared in BRIGHT
Set if current ‘dim/bright’ state is known to be dim and AWAIT_DIM_CHANGE is set. Cleared when ‘dim/bright’ state is bright and AWAIT_DIM_CHANGE is clear.
Note: Under certain conditions both AWAIT_DIM and AWAIT_BRIGHT bits can be set for an aspect. If this occurs neither bit will be cleared until the LMU has learnt the aspect in both dim and bright states.
Bit 2 - AWAIT_ASPECT - Aspect not yet appeared
Set on LMU initialisation. Cleared when aspect first learnt
Bit 3 - AWAIT_DIM_CHANGE - First dim/bright change assessment enabled
Set on LMU initialisation if dim/bright changeover monitoring is enabled.
Cleared after first dim/bright change assessment for the aspect has been completed
Bit 4 - CONF_LOAD - Aspect being assessed for load change
Set when either the ‘rise’ or ‘fall’ change counters are non-zero.
Bit 5 - CONF_DIM -Aspect being assessed for dim change counter is non-zero.
Cleared when both the ‘dim’ and ‘bright’ change counters are zero
Bits 6 & 7 - Not used

11.6 FAULT DATA COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
FDC	0 – 8	0 - 1	-	**Display Fault Diagnostics** See 11.6.1	RW
FFC	EXL	0 – 15 (**2)	-	**Display LONG EXTENSION fault** Filter count for each stage. Minor Index: stage Data: Fault Filter Count	RO
FFC	EXS	0 –15 (**2)	-	**Display SHORT EXTENSION** fault filter count for each stage. Minor Index: Stage Data: Fault Filter Count	RO
FFC	IDM	A – P (**1)	-	**Display IGNORING DEMAND fault** filter count for each stage. Minor Index: Stage Data: Fault Filter Count	RO
FFC	IGN	PH – PH (**1)	-	**Display INTER – GREEN fault** filter count for each phase. Minor Index: Phase to Phase Data: Fault Filter Count	RO
FFC	MAX	0 – 15 (**2)	-	**Display LONG MAX GREEN fault** filter count for each stage Minor Index: Stage Data: Fault Filter Count	RO
FFC	MIN	0 – 15 (**2)		**Display SHORT MIN GREEN fault filter** count for each stage Minor Index: Stage Data: Fault Filter Count	RO
FFT	-	EXL	-	**Display LONG EXTENSION fault** filter timer. Data: Time (hours-minutes).	RO
FFT	-	EXS	-	**Display SHORT EXTENSION fault** filter timer. Data: Time (hours-minutes).	RO
FFT	-	IGM	-	**Display INTERGREEN fault** filter timer Data: Time (hours-minutes).	RO
FFT	-	MAX	-	**Display LONG MAX fault** filter timer. Data: Time (hours-minutes).	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
FFT	-	MIN		**Display SHORT MIN fault** filter timer. Data: Time (hours-minutes).	RO
FLT (**3)	-	-	-	**View current Fault List** Selects first non-zero entry (see section 11.6.2 for details)	RO

NOTE: **1 - Dependant on number of PHASES configured
**2 - Dependant on number of STAGES configured
**3 - Restricted use of the '.' (dot) command

11.6.1 Fault Diagnostics (FDC)

This handset command allows access to general fault monitoring statistics.

This data is arranged in two sets accessed by the major & minor Indices:
Minor Index : 0 - Current information
Minor Index : 1 - Historic information

As each condition occurs the relevant count is incremented and when the number of characters received reaches its maximum value (FFFFH) then all counts are copied to the 'historic log' (minor index = 1) and then resets to zero.

When the OMCU is first installed all the data is reset to 0.

Note: All count information is displayed in HEX

FORMAT: FDC <m> <n>

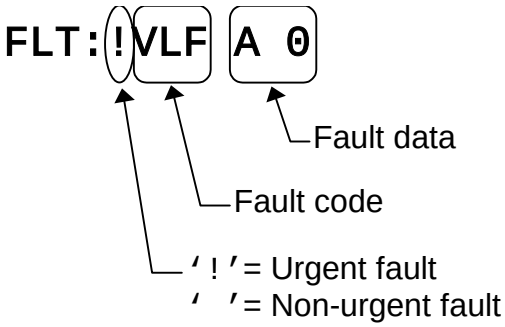
Here <m> is the 'major index' and <n> is the 'minor index'.

Major Index:
- 0 Number of reports entered into OMCU Fault Log.
- 1 Number of reports entered into the List area following a FLT Handset request.
- 2 Total number of reports generated.
- 3 Number of Dial requests made to the Instation.
- 4 Number of Fault Log Buffer overflows (due to too many unreported faults).
- 5 Number of Fault Log timer overflows (due to long periods of time between faults).
- 6 Number of Fault Log resets received
- 7 Number of Fault Log resets received for unreported faults.
- 8 Number of times Fault Log has been read

If the maintenance access code has been entered the log data may be reset by entering '=0".

11.6.2 General Fault Data Display Format

The FLT command displays a list of current faults (use + and - to scroll through the list). The format is as follows:



It should be noted that fault reports are only generated when the limits (as defined in the OMCU configuration data) are exceeded.

Where PB680 issue 5 (or later) firmware is fitted, the FLG command is also available. This command displays a time-stamped log of OMCU faults and events.

The fault codes used with the FLT and FLG commands are given in the following table.

* = Code only used in the fault log (FLG), not the current fault list (FLT)
† = More details on these codes is provided in the subsections after this table

Code	Description	<Additional Parameters> - Notes
ABF	Amber Ball lamp Fault	<phase> <no. of faults> - non UK
ABR*	Amber Ball lamp Replaced	<phase> <no. of faults> - non UK
BDC*	Bus config Data Change	<data group> - see section 11.11
BFC*	Bus DFM Fault Cleared	<beacon ID>
BUF	Bus DFM Fault	<beacon ID>
CCF	Compliance Fault	<plan no> <group no> <action no>
CCR*	Compliance Fault Reset	<plan no> <group no> <action no>
CDC*	141 Controller Data Change	
CDI	CLF Data Invalid	
CFL†	Green Conflict	<greens on>
CID†	Controller Ignoring Demand	<phase>
CLF*	CLF Download Activated	
COD	COD Override	
COR*	COD Override Reset	
CPS*	Car Park State	<car park state>
CSD*	Invalid Status Download	
DBF†	Dim Bright Fail	<dim status>
DBT*	Dial Back Test	
DLD*	Config data Downloaded	
DWN*	Invalid Download	<error code> <function id> <data id>
EDI†	Equipment Data Invalid	- configuration data sumcheck fail
EDS*	Invalid Equipment Data C/S	
ERR*	Soft Error	
ERT*	Error Rate Too high	
ESA†	External Signal Active	<signal no.>
ESI†*	External Signal Inactive	<signal no.>
FFC†*	Ferranti Fault Cleared	<Ferranti log no.>
FFL†	Ferranti Fault Log entry	<Ferranti log no.>
FLC*	Flow Logging Complete	
FOV*	Fault log Overflow	
FTR*	Fault log Timer Reset	
GAF	Green Arrow lamp Fault	<phase> <no. of faults>
GAR*	Green Arrow lamp Replaced	<phase> <no. of faults>
GFC†*	GEC 3000 Fault Cleared	<GEC 3000 log no.>
GFL†	GEC 3000 Fault Log entry	<GEC 3000 log no.>
GGF	G1G2 Active	

* = Code only used in the fault log (FLG), not the current fault list (FLT)
† = More details on these codes is provided in the subsections after this table

Code	Description	<Additional Parameters> - Notes
GGR*	G1G2 Inactive	
GPR*	Clear GPS Fault	
GPS	GPS Fault	<GPS fault>
GP0*	Detector Counts, Group 0	
GP1*	Detector Counts, Group 1	
HSI*	Handset plugged In	
HSO*	Handset Out	
INI*	OMCU RAM Initialised	
IOA*	IO line Override Active	
IPO	Instation Plan Override	<plan no>
IPR*	Instation Plan Override Reset	<plan no>
LAD*	Local Auto-Dial	
LAM	Long Alt. Max	<alt max no.> <stage>
LAR	Long All Red	
LEX	Long Extension	<stage>
LFL	Lamps Flashing	- input signal from controller
LIS	Long Inter-Stage	from <stage> to <stage>
LME*	Lamp Monitor data Error	
LMR*	Lamp Monitor Reset	
LMX	Long Max	<stage>
LNF*	Lamps Not Flashing	- input signal from controller
LOF	Lamps Off	
LON*	Lamps On	
LPC	Vehicle Classifier Loop Pair Fault Reset	<upstream input> <downstream input>
LPF	Vehicle Classifier Loop Pair Fault	<upstream input> <downstream input>
MCF†*	Controller Mode Change From	<mode no.>
MCH†	Controller Mode Change to	<mode no.>
MEN	MOVA Enabled (see MOF)	
MFC*	Microsense Fault Cleared	<Microsense mnemonic>
MFL	Microsense Fault Log entry	<Microsense mnemonic>
MOF	MOVA Disabled (‘MOVA Off’)	- see section 9.6.10 on page 126
MPH	MOVA Phone Home flag set	- see section 9.7.4 on page 132
MSF	MOVA Serial link Failed	- see section 9.6.4 on page 117
MSG*	Invalid Message	<error code>
MSR	MOVA Serial link Restored	- see section 9.6.4 on page 117

* = Code only used in the fault log (FLG), not the current fault list (FLT)
† = More details on these codes is provided in the subsections after this table

Code	Description	<Additional Parameters> - Notes
NPR	No Port Response	- from 141 controller handset port
OEA*	OMCU Event Active	<event number>
OEI	OMCU Event Inactive	<event number>
OLC*	Occupancy Logging Complete	
OOV*	bus Operations log Overflow	
PCF	PAKNET Comms Failure	
PCR	PAKNET Comms Failure reset	
PFC*	Plessey/Siemens Fault Cleared	<Siemens log no.>
PFF	Pelican Flash Fail	<phase>
PFL	Plessey/Siemens Fault Log entry	<Siemens log no.>
PLF	Pedestrian Lamp Fault	<phase> <colour> <no. of faults>
PLR*	Pedestrian Lamp Replaced	<phase> <colour> <no. of faults>
PON*	Power On	
PWF*	Power Fail	
RAD	Radio clock fault	<radio clock error type>
RCC*	Radio Clock fault Cleared	<radio clock error type>
RNR	Reply Not Recognised	- from 141 controller handset port
RSF	Reg. Sign lamp Fault	<sign ID> <no. of faults>
RSR*	Reg. Sign lamp Replaced	<sign ID> <no. of faults>
SEM	Short Extension/Max	<stage>
SEQ†	Stage Sequence error	from <stage> to <stage>
SHI	Short Intergreen	from <phase> to <phase>
SHM	Short Min	<stage>
SOA	Switch Override Active	<switovrd number>
SOI*	Switch Override Inactive	<switovrd number>
SOF	Site Power Fail	- see section 11.6.13 on page 172
SON	Site Power Fail Clearance	- see section 11.6.13 on page 172
SSF	Switched Sign bulb Fault	<sign ID> <no. of faults>
SSR*	Switched Sign bulb Replaced	<sign ID> <no. of faults>
STK†	Controller Stuck	
SWF	Switched sign tube Fail	<sign ID> <no. of faults>
SWR*	Switched sign tube Replaced	<sign ID> <no. of faults>
VAC	Vehicle Classifier Vehicle Absence Fault Reset	<input no>
VAF†	Vehicle Absence Fail (DFM)	<input no>
VCA	Vehicle Classifier Vehicle	<input no>

* = Code only used in the fault log (FLG), not the current fault list (FLT)
† = More details on these codes is provided in the subsections after this table

Code	Description	<Additional Parameters> - Notes
	Absence Fault	
VCF	Vehicle Classifier Confirm Fault	<output action>
VCL*	Vehicle Classifier Licence Fault	
VCP	Vehicle Classifier Vehicle Presence Fault	<input no>
VCR	Vehicle Classifier Confirm Fault Reset	<output action>
VLF	Vehicle Lamp Fault	<phase> <colour> <no. of faults>
VLR*	Vehicle Lamp Replaced	<phase> <colour> <no. of faults>
VPC	Vehicle Classifier Vehicle Presence Fault Reset	<input no>
VPF†	Vehicle Presence Fail (DFM)	<input no>
WDG*	Watchdog timeout	
WLF	Wait Lamp Fault	<phase> <no. of faults>
WLR*	Wait Lamp Replaced	<phase> <no. of faults>
XFC*	GEC CX Fault Cleared	<GEC CX log no.>
XFL	GEC CX Fault Log entry	<GEC CX log no.>
YPR*	Port Response returned	

<phase> : Letter A to P, identifying the controller phase, as configured for this OMCU

<stage> : A number 0 to 15, identifying the controller stage, as configured for this OMCU

<no. of faults> : The number of uncleared lamp faults recorded on this sensor

<beacon ID> : The configured beacon/reader identity number

<alt max no.> : The controller alternative max. green set number (1 to 3)

<sign ID> : The sign identity number as configured in the OMCU lamp monitoring data

<GEC CX log no.> : Controller fault log number, refer to CX controller handbook

<Siemens log no.> : Controller fault log number, refer to T200/T400/ST800 controller handbook

<Microsense mnemonic> : three-character fault mnemonic as read from the Microsense controller fault log

<radio clock error type> : 0 = No logic level signal detected from the radio clock on the configured OMCU input
1 = Radio clock is indicating reception quality is poor
2 = Noise/corruption detected on the logic level signal from the radio clock
See also RCS on page 185.

<plan no> : A number 0 to 15, identifying the plan number

<group no> : A number 0 to 31, identifying the group number within a plan

<action no> : A number 0 to 31, identifying the action numberwithin a group

<car park state> : 00 = Car Park Empty
01 = Car Park Almost Full
02 = Car Park Full

<error code> : Different error codes are used with different fault codes.

Valid with MSG :

00 = Invalid message type/ sub-type

0B = Invalid fault reset class

0D = Invalid data in counting message

0F = Invalid timestamp in ops log

Valid with DWN :

03 = Invalid function identity for equip data download

04 = Invalid data identity for equip data download

05 = Invalid data length for equip data download

Valid with CSD :

07 = Invalid function data identity for current status table download

09 = Invalid data index for current status table download

<function id> : A number identifying the function id of the invalid field

<data id> : A number identifying the data id of the invalid field

<GPS fault> : 8 bit value identifying detected GPS faults as follows:

Bit 0 = No data received from GPS receiver

Bit 1 = Corrupt data from GPS receiver -bad checksum.

Bit 2 = Unused.

Bit 3 = No valid satellite transmission

Other bits are unused and set to 0.

<event number> : A number 0 to 15, identifying the event number

<switovrd number> : A number 0 to 15, identifying the switch override number

11.6.3 Green Conflict Fault Data (FLT CFL)

When the OMCU detects a green/green conflict the following fault data will be presented:

FORMAT: `FLT:!CLF wxyz`

Where ‘wxyz’ are four HEX characters representing the conflict condition. A ‘1’ in the bit position representing the phases that were at GREEN when the conflict condition was detected, for example:

`FLT:!CLF 143A`

The above example indicates that phases B, D, E, F, K and M were all at GREEN when the conflict occurred:

```
   HEX:    1      4      3      A
Binary:  0001   0100   0011   1010
PHASES:  PONM   LKJI   HGFE   DCBA
```

11.6.4 Ignoring Demands Fault (FLT CID)

If the controller is ignoring any detector or push-button demands then the following fault data will be presented:

FORMAT: `FLT:!CID <phase>`

Where <phase> is a letter (A to P) representing the controller phase that is not being serviced.

11.6.5 Dim/Bright Fault (FLT DBF)

If the controller fails to change from DIM to BRIGHT (or vice-versa) at least once in 24 hours then the following fault data will be presented:

FORMAT: `FLT:!DBF n`

Where ‘n’ is a number representing the current state:

0 - currently DIM
1 - currently BRIGHT
2 - state undefined
3 - processing to determine state not yet started

11.6.6 Equipment Data Invalid Fault (FLT EDI)

If the sumcheck on the OMCU configuration data fails during ‘download’ or during periodic background check, then the following fault will be presented:

FORMAT: `FLT:!EDI`

11.6.7 External Signal Active / Inactive Fault (FLT ESA / ESI)

If the OMCU has been configured to raise a fault report when an External signal becomes active (e.g. door switch) then the following fault data will be presented:

FORMAT: `FLT:!ESA n`

If the external signal returns inactive, then the following fault data will be presented:

FORMAT: `FLT:!ESI n`

Where ‘n’ is a number (0 to 7) representing the External Signal identity as defined on the configuration from.

NOTE: External Signal 0 is normally used to monitor the state of the controller mains’ supply.

11.6.8 Ferranti TSC Fault Data (FLT FFL)

If the OMCU has detected a fault entry in the Ferranti controller’s own fault log then the following fault data will be presented:

FORMAT: `FLT:!FFL n`

Where ‘n’ is a number representing the fault log report number:

NUMBER	FAULT DATA
0	Fault received but not recognised
1	Unexpected Red Lamp On *2
2	Unexpected Amber Lamp On *2
3	Unexpected Green Lamp On
4	Conflict *2

5	Test Conflict
6	Test No-Conflict
7	Test Non-Equivalence
8	Non-Equivalence
9	Conflict Monitor Status Error
10	Safety Red Lamp Fail *2
11	Pedestrian Red Lamp Fail *2
12	Red Lamp Fail *2
13	Amber Lamp Fail *2
14	Green Lamp Fail *2
15	Permanent Detect
16	Permanent No-Detect
17	Detector Flow Error
18	System Stopped *1
19	Power Fail *1 *2
20	MIS Failure *2
21	Checksum Failure *2
22	Safety 2 Red Lamps Out *3
23	Safety Red Lamp Out *3
24	Red Lamp Out *3
25	Amber Lamp Out *3
26	Green Lamp Out *3
27	Wait Lamp Out *3
28	Red Excess Current *3
29	Amber Excess Current *3
30	Green Excess Current *3
31	Wait Excess Current *3
32	Green No Output Voltage *3
33	Checksum Failure *3

*1 These faults are not reported by the OMCU since they do not appear in the uncleared fault list produced by the RFL command.
*2 Mk I controllers only.
*3 Mk II controllers only.

11.6.9 GEC 3000 Fault Data (FLT GFL)

If the OMCU has detected a fault entry in the GEC 3000 controller's own fault log then the following fault data will be presented:

FORMAT: `FLT:!GFL n`

Where 'n' is a number representing the fault log report number:

NUMBER	FAULT DATA
0	(unused).
1	General fault header
2	Green conflict detected by software.
3	" " " " "
4	(unused).
5	(unused).

6	Current detector fault status
7	" " " "
8	" " " "
9	" " " "
10	(unused).
11	(unused).
12	(unused).
13	(unused).
14	(unused).
15	Accepted detector fault status
16	" " " "
17	" " " "
18	" " " "
19	(unused).
20	(unused).
21	(unused).
22	(unused).
23	(unused).
24	Phase non-correspondence
25	" " "
26	(unused).
27	(unused).
28	Hardware & firmware conflict pattern check
29	" " " " " "
30	(unused).
31	(unused).
32	EPROM or RAM sumcheck error.
33	Time Error (32mS).
34	J Address error.
35	" " "
36	" " "

11.6.10 GPS Fault (FLT GPS)

The OMU continually monitors the data stream from the GPS receiver (if configured). When a fault is detected, the following information will be presented.

FORMAT:
```
FLT:GPS nnnnnnnn
or
FLT:!GPS nnnnnnnn
```

The urgency indication is determined by the configured routing item.

nnnnnnnn represents the fault data as follows:
Bit 0 = no data received from GPS receiver (previous 3 seconds)
Bit 1 = Corrupt data from GPS receiver – bad checksum
Bit 2 = Unused (set to 0)
Bit 3 = No valid satellite transmission
Bits 4 to 7 = Unused (set to 0)

11.6.11 Mode Change Fault (FLT MCH)

If the OMCU has detected a change in controller operating mode the following fault data will be presented:

FORMAT: `FLT:!MCH 'n'`

Where 'n' represents the mode the controller moved to i.e.:

0 - Fixed Time
1 - Manual
2 - Vehicle Actuated
3 - Cableless Link
4 - Bus priority
5 - Emergency Vehicle
6 - Hurry Call No.1
7 - Hurry Call No.2
8 - UTC (or MOVA)
9 - Part-time
10 - Start-up

NB: The same mode numbers are used in the MDE handset command

11.6.12 Stage Sequence Fault (FLT SEQ)

If the OMCU has detected a non-permitted stage to stage movement the following fault data will be presented:

FORMAT: `FLT:!SEQ ff tt`

Where 'ff' and 'tt' are as the FROM and TO phase pattern numbers as defined in the OMCU's configuration data.

11.6.13 Site Power Fail/Clearance (FLT SOF/SON)

Logging of Site Power Fail/Clearance is only available in PB680 issue 13 or later.
If the OMCU reports the following criteria…

- OMU Power Failed - OMCU has lost mains power **AND**
- 141 Port Not Responding – Communications to the controller fail **AND**
- Lamps Off – Controllers signals are inactive for 3 seconds or longer

…the following Site Power Fail fault data will be presented:

FORMAT: `FLT:!SOF`

If the OMCU reports the following criteria…

- OMU Power Restored – OMU has regained mains power **OR**
- 141 Port Responding – Communications to the controller established **OR**
- Lamps On – Controllers signals are active for 3 seconds or longer

…the following Site Power Fail Clearance data will be presented:

FORMAT: `FLT:!SON`

The Site Power Fail fault and clearance will be reported with the same priority as configured for the OMU Power Failure report, i.e. “Urgent” or “Non-Urgent”.

11.6.14 Controller Stuck Fault (FLT STK)

If, during Fixed Time or CLF operation, the OMCU detects that the controller is not changing stage for more than the configured period, the following fault data will be presented:

FORMAT: `FLT:!STK`

11.6.15 Vehicle Absence Failure (FLT VAF)

The OMCU continually monitors detector inputs and if it senses that a particular input has not changed to the active condition for the configured time the following data will be presented:

FORMAT: `FLT:!VAF n`

‘n’ represents the number of the input that has failed in the range 0 to 63. See section 5.6.5, which starts on page 65, for locations of the OMCU inputs on the I/O Boards fitted. To determine the controller connections refer to the OMCU configuration data sheet for the particular I/O board.

11.6.16 Vehicle Presence Failure (FLT VPF)

The OMCU continually monitors detector inputs and if it senses that a particular input has not changed to the in-active condition for the configured time the following data will be presented:

FORMAT: `FLT:!VPF n`

See FLT VAF above for further details on the input number ‘n’.

11.7 PSTN COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CDC	0 - 1	0 - 9	-	**Call Disconnect Cause statistics log** (see section 11.7.1 for details)	Maint
CTR	0 - 1	0 - 2	-	**Call Termination Record** (see section 11.7.2 for details)	Maint
CRQ	-	0	-	**Display CALL REQUEST flag** Data: 0 = No call request active 1 = call request active	RO
CTN	0 - 2	0 - 11	HEX	**Configured Telephone Numbers** **Major Index: Telephone number pointer.** Minor Index: Digits 0 - 1 : Length of telephone number 2 - 11: Telephone Digits (Displayed in pairs). Data : HEX	RO
FTR	-	0 - 3	-	**Display PSTN FAULT TIMERS.** Minor index : 0= Message Timer (0 - 30 minutes) 1=Identity Timeout Timer (0 - 40s) 2=Carrier Detect Timer (0 - 15s) 3=Override Timer (0 - 30s). Data : Time (in seconds or minutes)	RO
MCI	-	0 - 1	-	**Display MODEM CONTROL INDICATORS** (see section 11.7.3 for details)	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
MDC	0 - 12	0 - 1	-	**Display MESSAGE HANDLER DIAGNOSTIC data.** (see section 11.7.4 for details)	Maint
MOS	-	-	ASCII	User defined modem configuration string	Maint
RIF	-	-	-	**Display RETRY INHIBIT flag** Data: 0-Inactive (dialling allowed) FF-Active (dialling not Allowed)	RO
RSC	-	-	-	**Display RETRY STEP counter.** Data: 0-255 (showing the dial attempt in the retry table)	RO
RTR	-	0 - 2	-	**Display RETRY TIMER** Minor Index: 0 - Hours 1 - Minutes 2 - Seconds Data: Time	RO
TNP	-	-	-	**Display TELEPHONE NUMBER POINTER** Data: 0 - 2 (showing which telephone will be dialled next).	RO

11.7.1 Call Disconnect Cause Statistics Log (CDC)

Whenever the OMCU disconnects itself from the telephone line the reason for that disconnection is stored in a log. By viewing this information the engineer can determine such things as:

- → The number of calls;
- → The quality of the line;
- → Whether there has been any unauthorised access to the OMCU.

The log is arranged in two groups - one is the current log the other is the historic log. The current log is copied to the historic log whenever any counter in the current log overflows.

FORMAT: CDC <m> <n>

Where <m> is the 'major index' and <n> is the 'minor index'.

The major index controls the log that is being viewed i.e.:

Major Index = 0 - Current Log
Major Index = 1 - Historic Log

The minor index controls the part of the log is being viewed i.e.:

Minor Index	Function
0	Manual clearance of MTF initiated call.
1	Good termination
2	Carrier failed
3	Not used.
4	Initiate/Dial timeout.
5	Not used.
6	Not used.
7	Message timeout (i.e. although carrier is present the Instation has not sent a message to the OMCU for at least 20 minutes).
8	Identity timeout (i.e. the OMCU has not received an identity request during the required period).
9	The OMCU detected a supply 'brown-out' and terminated the call that was in progress at the time.

If the maintenance access code has been entered the log data can be reset by entering '=0'.

11.7.2 Call Termination Record (CTR)

This log provides the engineer with information relating to the success of fault record transfers to the Instation. Again as in the CDC command describes above the major index provides access to both the historic and current log.

FORMAT: CTR <m> <n>

The major index <m> controls which log is being viewed i.e.:
Major Index = 0 - Current Log.
Major Index = 1 - Historic Log

The minor index <n> controls the part of the log is being viewed i.e.:

Minor Index	Function
0	Improperly terminated call (no abandon call received from the Instation).
1	Successful (i.e. faults transferred to the Instation).
2	Unsuccessful (i.e. faults not transferred to the Instation).

If the maintenance access code has been entered the log data can be reset by entering '=0'.

11.7.3 Modem Control Indicators (MCI)

This command displays the state of the modem interface (some indications are for hardware functions, others will be software). The default display is binary with a “1” indicating the signal is active.

FORMAT: MCI <n>

where <n> is the ‘minor index’.

First Byte (i.e. Minor index = 0):

BIT No.	SIGNAL NAME	STATE REPRESENTED
0	CLEAR TO SEND	Not used.
1	REQUEST TO SEND	Not used.
2	CARRIER DETECT	Instation carrier present.
3	DATA SET READY	Link established with the Instation modem
4	CALLING/ANSWERING	Call/answer sequence in progress (0 = calling & 1 = answering).
5	Not used	
6	CALL REQUEST	Auto-call by OMCU (not set if retry delay is preventing the OMCU from dialling out)
7	CALLING INDICATE	Answer to ringing tone required

Second Byte (i.e. Minor index = 1):

BIT No.	SIGNAL NAME	STATE REPRESENTED
0	CALL INTERRUPTED	Not used.
1	DATA LINE OCCUPIED	Call or answer in progress.
2	DATA TERMINAL READY	Ready to call or answer.
3 – 7	Unused.	

11.7.4 Message Diagnostic Data (MDC)

During any Instation - Outstation (OMCU) communication all characters and messages are checked for errors. This log stores these together with a total count of all good characters received.

Again as in previous logs two sets are stored one for current data (miner index = 0) and one for historic data (minor index = 1)

As each condition occurs the relevant count is incremented and when the number of characters received reaches its maximum value (FFFFH) then all counts are copied to the ‘historic log’ (minor index = 1) and then reset to zero. If any count reaches its maximum value whilst the character count is below its maximum limit then the value ‘locks’ at FFFFH.

Note: All count information is displayed in HEX.

FORMAT: MDC <m> <n>

where <m> is the ‘major index’ and <n> is the ‘minor index’.

MAJOR INDEX		COUNT TITLE
0		Good Characters received
1	}	Not used (characters which are received with
2	}	parity errors etc are substituted with ‘?’ and so
3	}	cause other error counts to be incremented.
4		Invalid character
5		Checksum error
6		Link message address error
7		Message type/sub-type unknown error
8		Repeat block requests
9		Message restart requests
10		Sequence errors
11		Transmit block-buffer usage
12		Error message buffer usage

If the maintenance access code has been entered the log data can be reset by entering ‘=0’.

11.8 MAINTENANCE COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
BAS	-	-	0 - 2	**Handset Display Base:** 0 = Binary, 1 = HEX, 2 = Decimal	open
CAL	-	-	0 - 1	**Call Instation:** Request local dial-back using configured telephone numbers. Write 1, OMCU responds with 0 when actioned	Maint
CBR	-	-	0, 101 - 105	**Controller Baud Rate:** Overrides configured setting when monitoring CX controller:- 0 = 1200 baud (default) 101 = 300 baud 102 = 1200 baud 103 = 2400 baud 104 = 4800 baud 105 = 9600 baud	Maint
CFD	-	-	0 – 10	**Controller Fault Debounce:** Delays reporting a fault from the controller until it has been received n times (0 – 10). 0 means no debounce needed ie. fault logged on first occurrence.	Maint
EBR	-	-	0 - 31	**Engineering Base** segment for RAM display Segment = EBR value x 10000H	open
EEL (PB680 issue 8 or later)	-	-	0 - 255	**Examine Enhanced 141 Link** to the ST800, values are:- 0 = Not configured 1 = Connecting 2 = Checking ST800 (1200 baud) 3 = Link active (19200 baud) 254 = Old ST800 firmware 255 = Controller not detected (link out/power off)	RO
ENR	0 -FFFF	-	ENG	**Engineering RAM** Display Starting segment defined by EBR command	RO
ERR	-	-	-	**Enable Restart Reports:** 0=Disable, 1=Enable	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
FLG	-	-		**Fault Log:** Display time stamped fault log, one line at a time. Shows the date and time of the most recent (approx. 1000) faults and events. See section 11.6 for fault abbreviations. <space key> moves to end of log + key shows earlier entry - key shows later entry	RO
FRE	-	0 - 3	0 - 99	**Processor Free Time:** FRE 0 = current free time FRE 1 = average free time FRE 2 = lowest current free time (over the last two seconds) FRE 3 = for engineering use only (lowest average since reset)	RO
INI	-	-	1 – 3	**Initialise OMCU:** INI=1 clears all OMCU RAM, fault log and configuration data. On a combined OMCU and MOVA unit, INI=1 just initialises the OMCU. Use INI=2 to initialise MOVA and INI=3 to completely initialisation the whole unit, see section 9.6.2 on page 115.	Maint
IOP	-	0 - 7	-	**Internal I/O Ports:** (see Section 11.8.1 for details)	Maint
LTS	-	-	0-255	**Modem Loop Back Test:** LTS=1 ..... TO START TEST LTS:2 ..... TEST RUNNING LTS:0 ..... Test passed LTS:255 ... Test failed	Maint
OPM	-	-	-	**OMCU Operating Mode:** (see Section 11.8.2 for details)	RO
PIC	-	-	-	**PROM Identity Code:** Data: OMCU firmware Identity & Issue	RO
PUD	-	0 - 4	-	**Power Up Data:** (see Section 11.8.3 for details)	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
RAM (PB680 issue 17 or later	-	-	256 or 1024	**RAM Installed** Displayed the number of Kilobytes of RAM installed in the OMU.	RO
RCS (PB680 issue 5 or later)	-	-	-	**Radio Clock Signal:** Displays message being received from the Radio Clock and Radio Clock error counts. See 11.8.5	RO
SCT	-	-	0 - 6	**Set 0141 Controller Type** 1=T200/T400, 2=C3000, 3=TLC, 4=Through Port, 5=CX, 6=Microsense 0=Command actioned. Only operates while the OMCU is unconfigured.	Maint
SEB	-	0 - 3	-	**Soft Error Buffer**. (see Section 11.8 for details)	RO
SEC	-	-	0 - 4	**Soft Error Count.** Displays the number of soft errors detected.	RO
SES	0 - 9	0 - 1	0 -FFFF	**Soft Error Status** - internal fault store for engineering diagnostics	RO
SOB	-	-	ENG	**Set output bits:** bits 0 to 2 are on LMU I/O board 0 bits 3 to 6 are on LMU I/O board 1 bit 7 is on LMU I/O board 2 When used with a Bus / MOVA I/O board as board 0, SOB sets the first 8 outputs on the board. Also see the SOP command that follows… NOTE : SOB always shows the state of the output ports, irrespective of any inversions configured using OPS.	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL

S0P
 	
(PB680 issue 5 or later)
	0 - 2
	board number
		-	BINARY	**Set output ports** - sets/displays the state of the 16 outputs on Bus / MOVA I/O board 'n' (0-2), e.g.
				`S0P n:0000000000000000`
				But, if board 'n' is not a Bus / MOVA I/O board, display will show:
				`S0P n:----------------`
				If board 'n' is being used by the MOVA application:
				`S0P n:-(MOVA OUTPUTS)-`
				If the first board is an LMU I/O board, then SOP 0 can be used to read and set the outputs on that and any subsequent LMU I/O boards just like SOB:
				`S0P 0:--------00000000`
				
				NOTE : SOP always shows the state of the output ports, irrespective of any inversions configured using OPS.
					Maint

STP (PB680 issue 5 or later)	-	-	0 - 63	**Set Through Port Configuration** STP=0 sets 300 baud, 7 data bits, 1 stop, no parity. Other options are selected:- 1200 baud - add 16 2400 baud - add 32 9600 baud - add 48 odd parity - add 4 even parity - add 8 2 stop bits - add 2 8 data bits - add 1 e.g. STP=24 sets 1200 baud, 7 data bits, even parity **Use with SCT=4 to operate.** NOTE : On Issue 13 or later, when a GPS receiver is configured on the 141 port, the baud rate is overridden to 4800.	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
TMP (PB680 issue 5 or later)	1 - 64 flag no.	-	0 - 1	**'Temp' Flags** used by OMCU conditioning. Flags can be changed to control conditioning operations (where configured on the OMCU).	Maint
TOD (PB680 issue 5 or later)	-	-	time format	**TOD** displays day, date and time. e.g. TOD: Thu 25-JUN-98 15:53:46 TOD=THU sets the day TOD=25JUN98 sets the date TOD=15:55:00 sets the time	Maint
XXC	-	-	-	**Switch HANDSET to 0141** Controller Note: Not usable via Remote Handset	open
XXM OR 'MOVA'	-	-	-	**Switch HANDSET to MOVA** Note: Not usable via Remote Handset or while connected to the controller (use XXO first)	open
XXO	-	-	-	**Switch HANDSET to OMCU** Note: Not usable via Remote Handset. Use 'FI' from the MOVA menu after XXM, not XXO.	open

11.8.1 OMCU I/O Port State (IOP)

The state of the OMCU's input/output ports may be displayed by the use of this command.

Also see DIP for digital inputs, MSI for mains' state inputs and SOP for digital outputs.

FORMAT: IOP <n>

Where <n> is the minor index (0 - 7) and results in the following:

Note: The display base binary

IOP 0	COMM'S CHIP PORT
IOP 1	PPC 8255 PORT 2
IOP 2	BOARD 0 MAINS I/Ps
IOP 3	BOARD 0 RELAY O/Ps (bits 0 - 3) and MAINS I/Ps (bits 6 & 7)
IOP 4	BOARD 1 MAINS I/PS
IOP 5	BOARD 1 RELAY O/Ps (BITS 0 - 3) and Mains I/Ps (bits 6 & 7)
IOP 6	BOARD 2 MAINS I/PS
IOP 7	BOARD 2 RELAY O/Ps (bits 0 - 3) and MAINS I/Ps (bits 6 & 7)

11.8.2 OMCU Operating Mode (OPM)

This command displays the current OMCU mode. Values are:

DATA	FUNCTION
0	Monitoring On
1	Monitoring Off
2	Configuration Data being downloaded
3	Configuration Download Fail
4	Configuration Checksum Failure
5	OMCU Unconfigured.

11.8.3 OMCU Power-Up Data (PUD)

This command displays the OMCU power-up diagnostic data:

MINOR INDEX	DATA	DESCRIPTION
PUD 0:	0 - 3	Last start-up type: 0 = Normal power-up 1 = Watch-dog fail & restart 2 = First time power-up 3 = Soft error & restart
PUD 1:	0 - 255	Normal power-up cumulative count
PUD 2:	0 - 255	Watch-dog timeout restart cumulative count
PUD 3:	0 - 255	First time power-up cumulative count
PUD 4:	0 - 255	Soft error power-up cumulative count

11.8.4 Soft Error Buffer (SEB)

If the OMCU operating system detects a 'soft error' this buffer will store relevant data on the error type. Any entries in this array should be conveyed to Traffic Engineering (Siemens Poole) for detailed analysis.

FORMAT: SEB <n>

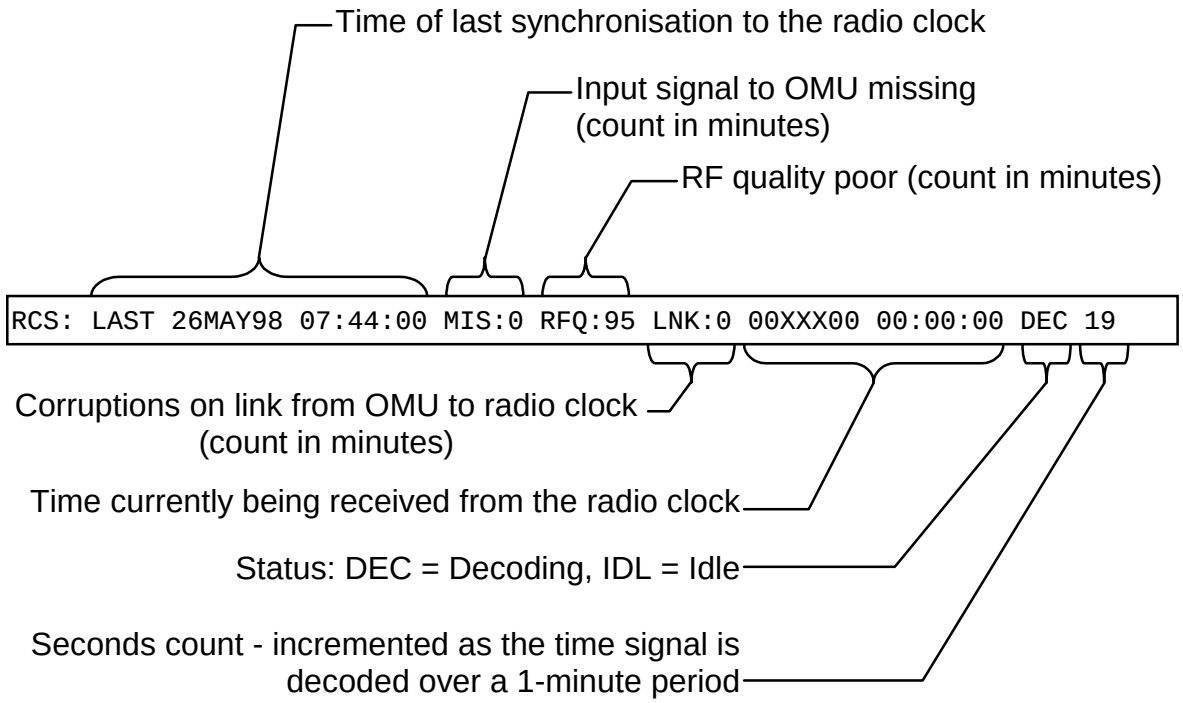
where <n> is the minor index (0 - 3) and enables access to the last four soft errors (0 is the most recent). The data is presented in HEX

The codes that most likely to be encountered are:

ERROR=0001	RAM read/write test fail
ERROR=0403	PROM checksum fail
ERROR=120?	Processor errors (bus errors, illegal instructions, unknown interrupts etc)
ERROR=138?	Bus / MOVA I/O Board UART errors (RS485 communications chip operation fault)
ERROR=161?	MOVA REQUESTED REBOOT – SEE MOVA ERROR LOG FOR REASON.

11.8.5 Radio Clock Signal (RCS)

RCS example display format:



With a correctly operating radio clock, the time of last synchronisation will be within one or two minutes of the current time, and the MIS, RFQ and LNK error counts will be zero.

The OMCU internal clock is only synchronised to the radio clock time signal when the radio clock signal has been received correctly over two consecutive minutes and the RF quality indicated by the radio clock is good.

After power on, the radio clock takes 10 to 15 minutes to indicate good RF quality to the OMCU. During this period, the RFQ error count is incremented. The error counts are cleared when the OMCU synchronises to the radio clock signal.

In times of poor radio propagation it may not be possible for the clock unit to synchronise the OMCU. However good reception is only required for a few minutes each day to maintain the accuracy of the OMCU's real time clock.

As an additional installation aid a signal reception indicator is present in the Radio Clock unit. When the 'test switch' within the Radio Clock is pressed the Reception Indication LED will flash regularly for about 1 minute if good signal strength is present. If random flashes are displayed then the reception is poor and the clock unit may not be correctly orientated.

11.9 BUS OPERATING COMMAND TABLE

Code	Major Index	Minor Index	Data Range	Description	Access Level
DBM	-	-	-	**Display Bus Messages**: Real time monitoring of bus/vehicle detection message reception on all RS485 channels.	RO
OLG	-	-	-	**Operations Log**: Display time stamped operations log, one line at a time. Shows the date and time of the most recent vehicle detections. See overleaf for description. <space key> moves to end of log + key shows earlier entry - key shows later entry	RO
BRX (Issue 13 or later)	-	-	-	**Bus Receive** message simulation: The character string entered is treated as if it had just been received on the first RS485 serial channel. Character strings beginning 0 - 9 or A - F have the TCSU 'framing' (STX, checksum and ETX) added automatically, unless the 2nd character is an 'L'. In this case the string is treated as a SIETAG detection from a V3.3 (or later) SIETAG reader, by appending a CR. Any other strings are just appended with CR (as used on	Maint

Code	Major Index	Minor Index	Data Range	Description	Access Level
				V3.0 or earlier SIETAG readers). NOTE : On earlier OMCU s/w versions, it is not possible to supply V3.3 or later test SIETAG vehicle detections.	
BRC (Issue 13 or later)	-	-	0 - 65535	**Bus Receive Count**: Repeats the BRX command for the given count. Allows simulation of a large number of detect messages, for test.	Maint
BRP (Issue 13 or later)	-	-	0 - 11 (4 ports per board)	**Bus Receive Port:** Identifies the RS485 serial channel on which the simulated Bus message is received.	Maint

TCSU specific command:

Code	Major Index	Minor Index	Data Range	Description	Access Level
BMD (Issue 13 or later)	-	-	0 - 9	**Bus Message Delay:** This command sets / displays the minimum delay in 6.67ms units by which the RS485 responses are delayed. 0 = 0ms minimum delay 1 = 6.67ms minimum delay 2 = 13.33ms minimum delay 3 = 20ms minimum delay (default) 4 = 26.67ms minimum delay 5 = 33.33ms minimum delay 6 = 40ms minimum delay 7 = 46.67ms minimum delay 8 = 53.33ms minimum delay 9 = 60ms minimum delay NOTE : In practise, the actual delay can be upto 6.67ms longer than the minimum due to processing times.	Maint

11.9.1 Operations Log Display Formats (OLG)

The Operations Log holds approximately 10,000 vehicle detect message entries if the processor board is fitted with large RAM chips (667/1/26601/002). Only around 1,000 entries (less on PB681 firmware) can be recorded if the small RAM chips are fitted (667/1/26601/001, now obsolete).

1. Bus Detect message entry, example:

```
25-APR-99 10:41:10 BID:6 B:6734256 R:560 PI:2 PO:2 O:1 M:90
```

BID: = Beacon ID (HEX, 1 - FF)

B: = Bus Radio ID (DECIMAL, 0 - 9999999)

R: = Bus Logical Route ID (DECIMAL, 0 - 999)

PI: = Priority Input Level in message (DECIMAL, 0 - 9)

PO: = Priority Output (DECIMAL, 0 - 7)

O: = Output Action (DECIMAL) :

0 = no output action defined
1 - 30 = Output Action List entry number
229 - 255 = rejection cause - beacon ID, route etc, see table overleaf

M: = Message count (DECIMAL, 0 - 99) - a separate count for each beacon

2. SIETAG Vehicle Detect message entry, example:

```
25-APR-99 10:51:10 R:6 W S:F C:2 A:0 T:3 I:4 OP:12 R:1 V:2C3 O:255 M:12
```

R: = Loop ID / Reader ID (HEX, 1-3F)

The first character (if present) identifies the number of the loop (0-3) connected to a SIETAG reader on which the vehicle was detected.

If not present the loop number is assumed to be 0.

W: = Tag type / Tag data format (ASCII)

'C' = contact monitor or conditioning input.

When vehicle detection received from a V3.0 SIETAG reader :

'W' = read/write
'S' = Siemens encrypted
'M' = multi-page
'R' = read only

When vehicle detection received from a V4.0 (or later) SIETAG reader :

'S' = Siemens encrypted
'O' = SIEMENS open
'T' = TIRIS Unknown

S: = Supplier code (HEX, 1 - FF)

C: = Customer Number (HEX, 1 - FFF)

A: = Area (HEX, 1 - F)

T: = Vehicle Type (HEX, 1 - F)

I: = Activation ID (HEX, 1 - F)

OP: = Operator (HEX, 1 - FF)

R: = Route Number (HEX, 1 - FFF) - not used by standard Tag

V: = Vehicle Number (HEX, 1 - FFFFFF)

O: = Output Action (DECIMAL) :

0 = no output action defined
1 - 30 = Output Action List entry number
229 - 255 = rejection cause - customer, zone etc, see table overleaf

M: = Message Count (DECIMAL, 0 - 99) - a separate count for each reader

3. Corrupt Detect message entry

```
25-APR-99 10:51:10 E:D4 M:.034578768.
```

E: = Error code (HEX) :

D2 = Invalid LAN Address
D4 = Invalid Message Type
D6 = Invalid Checksum
D8 = Bad Format Message

M: = Message characters as received on the serial port. Non-printing characters e.g. <STX> are displayed as a '.'

NOTE : A GAMBICA vehicle detection received from a SIETAG reader is recorded as an Invalid Message Type error (D4).

11.9.2 Operations Log Message Rejection Codes

229 = Invalid Loop Number
230 = Invalid Message Count
231 = Invalid Tag Mode in Configuration
232 = Invalid Area Mode in Configuration
233 = Vehicle Number not Found in Output Association List
234 = Invalid Area
235 = Tag Format not Found in Configuration
236 = Area not Found in Configuration
237 = Access Time not Found in Output Association List
238 = Operator Number not Found in Output Association List
239 = Customer Number not Found in Output Association List
240 = Invalid Tag Format
241 = Invalid Vehicle Type
242 = Invalid Vehicle Number
243 = Invalid Operator Number
244 = Invalid Activation ID
245 = Invalid Supplier Code
246 = Invalid Customer Number
247 = Beacon ID/Reader ID not Found in Configuration
248 = Output Activation Request List Full
249 = Beacon ID/Reader ID not Found in Output Association List
250 = Route Number not Found in Output Association List
251 = Invalid Beacon ID/Reader ID
252 = Invalid Radio ID
253 = Invalid Route Number
254 = Invalid Priority Level
255 = Blacklisted in Output Association List

11.10 BUS CONFIGURATION COMMAND TABLE

Code	Major Index	Minor Index	Data Range	Description	Access Level
JID	-	-	0 - 9 and <space>	**Junction ID:** The ID can only be set if the OMCU is unconfigured (forced by INI=1). 16 digits maximum, including the <space> character.	Maint
BID *For TCSU Beacon*	-	0 - 15 beacon list entry number	0 - FF	**Beacon ID:** 1-F = RS485 Beacon ID number. 10-FF = Beacon ID number used for contact or conditioning input. 0 = Not configured.	Maint
BID *for SIETAG Reader*	-	0 – 11 serial port number 12 - 15 not used	0 - FF	**SIETAG Reader ID:** 1-F = Assign this Reader ID to the RS485 serial port (index). There are 4 serial ports for each I/O board address. 10-FF = Reserved for indicating loop no. on multiplexed SIETAG reader 0 = Not configured.	Maint
SRC	-	0 - 15 as BID	0 - 255	**Message Source:** 99 = any RS485 serial channel. 100 = conditioning input bit 101 = Single RS485 detection per bus, within given re-activation time (See RET, below) 0-95 = contact monitored input line number 255 = not used	Maint
RET	-	-	0 - 300	**Re-activation Time:** 0-300 = If a vehicle is re-detected within this time (in seconds), then the second detection is ignored. This is only applied to the 16 most recent vehicles detected at the site.	Maint
BFT	-	0 - 15 as BID	0 - 255	**Bus DFM Fault Time:** 1-255 = The beacon/reader is reported faulty if no priority vehicle is detected for this number of hours. Reported OK on the next detection. Covers both RS485 and contact type inputs. 0 = no fault monitoring	Maint
BFO	-	-	0 - 255	**Bus DFM Fault Output:** 0 - 15 = output on i/o board 0 16 - 31 = output on i/o board 1 32 - 47 = output on i/o board 2 255 = no DFM output configured	Maint

Code	Major Index	Minor Index	Data Range	Description	Access Level
BFR	-	-	0 - 2	**Bus DFM Fault Reporting:** 0 = no fault reporting 1 = non-urgent (interrogation only) 2 = urgent report (dial out)	Maint
ASS	0 - 255 list entry number	0	0 - FF	**Output Association List** Beacon/Reader ID: 1-FF = accepted ID 0 = List entry not used	Maint
		1	0 - 255	Output Action: 1-30 = Activate this Output Action List entry number if the other conditions match 0 = No output action (other entries in List still processed) 255 = Blacklist i.e. any vehicle detection matching this route etc is prevented from activating an output, irrespective of other Output Association List entries.	
		2	0 - 998	Lowest accepted Route No. (TCSU only)	
		3	0 - 998	Highest accepted Route No. (TCSU only)	
		4	0 - FFFFFF	Lowest accepted Vehicle ID (SIETAG only)	
		5	0 - FFFFFF	Highest accepted Vehicle ID (SIETAG only)	
		6	0 - FFF	Accepted Customer (SIETAG only) 1-FFF = Customer number 0 = Any customer number accepted	
		7	0 - FF	Accepted Operator (SIETAG only) 1-FF = Operator number 0 = Any operator number accepted	
		8	0 - 10	Day of Week 1=Mon, 2=Tue, 3=Wed, 4=Thur, 5=Fri, 6=Sat, 7=Sun 8=Every day except Sunday 9=Mon to Fri, 10=Sat and Sun 0=Every day (default)	
		9	hh:mm	Start Time hh = hours, 0-24 mm = min, 0-59	
		10	hh:mm	Finish Time hh = hours, 0-24 mm = min, 0-59 If finish < start then the finish time is for the following day (i.e. spans midnight)	

Code	Major Index	Minor Index	Data Range	Description	Access Level
ACT	1 - 30 list entry number	0	0 - n	**Output Action List** Output Period: 0-n = Time for which the Detect Outputs are activated, **in 0.1 sec units** (100 sec max. for SIETAG, 2 sec max for TCSU)	Maint
		1	0 - n	Start Delay: 0-n = Time delay before activating the Detect Output, **in 0.1 sec units** (100 sec max. for SIETAG, 2 sec max for TCSU)	
		2	0 - n	Stop Delay (TCSU only) 0-n = Time delay after activating the Detect Output **in 0.1 sec units**.	
		3	0 - 255	Output Code (for TCSU) : 0-11 = Demand Output to be activated on i/o output board 0 255 = No output Output Code (for SIETAG): 0-47 = Demand output to be activated where the outputs are: 0-15 on I/O board 0 16-31 on I/O board 1 32-47 on I/O board 2 (TCSU style activation) 200 = The outputs to be activated are defined by the channel number and the 4 bits of the Activation ID. The Activation ID is mapped onto 4 outputs as follows : Channel 0 ➔ outputs 0 to 3 Channel 1 ➔ outputs 4 to 7 : Channel 11 ➔ outputs 44 to 47 201 = The 'bus' output is activated for the channel number (the Activation ID is ignored) The 'bus' output is activated as follows : Channel 0 ➔ output 1 Channel 1 ➔ output 5 : Channel 11 ➔ output 45 255 = No output	

Code	Major Index	Minor Index	Data Range	Description	Access Level
POC	0 - 11 (4 ports per board)	0	0 - 6	**RS485 Port Configurations** (use POS to implement) Baud rate: 0=300, 1=1200, 2=2400, 3=4800, 4=9600, 5=14400 and 6=19200	Maint
		1	0 - 3	Parity setting: 0=space, 1=odd, 2=even, 3=mark	
		2	0 - 1	Parity enable: 0=disable, 1=enable	
		3	1 - 2	Stop bits: 1 or 2	
		4	7 - 8	Data bits: 7 or 8	
POS	-	-	0 - 1	**Port Set:** 1=Set RS485 ports to the configured settings	Maint
LDV	-	-	0 - 4	**Load Default Values** and enter normal operating mode. This command only operates if the OMCU is unconfigured (forced by INI=1) 0 = No defaults loaded 1 = Load TCSU Bus Processor defaults 2 = Load SIEMENS Bus Processor defaults 3 = Load Car Park Processor defaults and enable car park counting. 4 = Load SIEMENS Bus Processor defaults + enable routing of SIETAG vehicle detections via 141 serial port NOTE: When LDV = 3 is entered the OMCU automatically performs a software restart.	Maint
RCI	-	-	0 - 255	**Radio Clock Input:** 0 - 47 = input on i/o board 0 48 - 95 = input on i/o board 1 96 - 143 = input on i/o board 2 255 = radio clock not used	Maint
(Issue 13 or later)				0 - 47 = input on i/o board 0 48 - 95 = input on i/o board 1 96 - 143 = input on i/o board 2 220 = GPS receiver connected to 141 serial port 255 = radio clock not used / no GPS receiver on 141 serial port	

Code	Major Index	Minor Index	Data Range	Description	Access Level
RCR	-	-	0 - 2	**Radio Clock fault Reporting:** 0 = no fault reporting 1 = non-urgent (interrogation only) 2 = urgent report (dial out)	Maint
RCD	-	-	0 - 255	**Radio Clock fault Delay :** 1 - 255 = fault delay in hours. 0 = no delay (any fault is reported)	Maint
RTO	-	-	0 - 255	**Real Time clock Output:** Pulsed at 05:00 AM each day. 0 - 15 = output on i/o board 0 16 - 31 = output on i/o board 1 32 - 47 = output on i/o board 2 255 = no output configured	Maint
MAP	-	0 - 9 input priority	0 - 7	**Priority Map:** (TCSU only) 0-7 = Priority Level to be output to the controller/OTU, binary coded onto three output lines, while the TCSU Output Action is being performed. Input priority 9 is used for contact monitoring.	Maint
LAN	-	-	0 - FFF	**LAN Address:** (TCSU only) 1-FFF = Only action detection messages with this LAN address - other values cause an error entry to be made in the operations log, along with the raw data. 0 = No LAN address filtering	Maint
TAI	-	-	0 - 255	**Tag Interval:** 0 - 255 = The time in seconds between the end of one vehicle detection and the start of the next vehicle detection transmitted on the 141 serial port	Maint

Additional, SIETAG specific, configuration data:

Code	Major Index	Minor Index	Data Range	Description	Access Level
DFA	-	0 – 15 as BID	0 - 30	**Default Action:** 1-30 = Output action to be taken when the customer number is not recognised 0 = no output action	Maint
CUS	-	0 - 15	0 - FFF	**Customer ID:** 1-FFF = Customer ID recognised by the Bus Processor. 0 = list entry not used	Maint

Code	Major Index	Minor Index	Data Range	Description	Access Level
ARM	-	-	0 - 2	**Area Mode:** 0 = no area filtering applied 1 = ZONE mode: discard vehicle message if area field is not equal to Area Value 2 = PRIORITY mode: discard vehicle message if area field is less than Area Value	Maint
ARV	-	-	0 - F	**Area Value:** 0-F = Sets either the zone or priority level for vehicle message filtering, depending on Area Mode.	Maint
TAF	-	-	1 - 3	**Tag Format:** 1 = Only Siemens encrypted tags are accepted - others are filtered out, but still logged. 2 = Only unencrypted tags are accepted 3 = Both encrypted and unencrypted tags are accepted (default).	Maint

11.11 Bus Config Notes

All configuration commands take effect as soon as they are entered, except for POC. The POC command changes the RAM data, but the hardware serial ports are not re-configured until the POS command is used or the OMCU is powered off then on.

When the handset connection is terminated, system log entry(s) are created indicating the changed area(s), with change codes allocated to each handset command used, as follows:

0 = BID, SRC, ASS
1 = MAP, ACT
2 = POC, POS
3 = BFT, BFO, BFR
4 = LAN
5 = LDV
6 = RCI, RCR, RCD, RTO
7 = RET
8 = CUS, ARM, ARV, TAF, DFA

Thus a change to all the data in the output association list will only result in a single log entry.

11.12 CAR PARK COUNT COMMAND TABLE

Code	Major Index	Minor Index	Data Range	Description	Access Level
FUT	-	0	0 - 16383	Car park full increasing threshold This value indicates the car par occupancy level when the car park state changes from **Almost Full** to **Full**.	Maint
		1	0 - 255	Car park full decreasing threshold offset This value is subtracted from the full increasing threshold and the result indicates the car park occupancy level when, the car park state changes from **Full** to **Almost Full**.	
AFT	-	0	0 - 16383	Car park almost full increasing threshold This value indicates the car par occupancy level when the car park state changes from **Spaces** to **Almost Full**.	Maint
		1	0 - 255	Car park almost full decreasing threshold offset This value is subtracted from the almost full increasing threshold and the result indicates the car park occupancy level when, the car park state changes from **Almost Full** to **Spaces**.	
CPC	-	-	0 - 16383	Car Park Capacity	Maint
CPS	-	-	Binary	Car park State Bit 0 = spaces Bit 1 = Almost full Bit 2 = Full Bit 3 = Closed	RO
COS	-	-	0 - 3	Car Park Occupancy Status 0 = Normal 1 = Underflow 2 = Overflow 3 = Overflow and Underflow	RO

Code	Major Index	Minor Index	Data Range	Description	Access Level
CCL	-	0 - 9	0 - 255	Current Car Park Loop Counts Indicates the number of vehicles counted by each entry or exit loop since the last status message was transmitted to the Instation.	RO
CPO	-	-	0 - 65535	Current Car Park Occupancy	RO
CPT	0 - 9	0	0 - 23	Timetable hours	RO
		1	0 - 59	Timetable Minutes	
		2	0 - 4	Frequency of events per hour	
FCP	-	-	1 - 63	Fill Rate Calculation Period The number of minutes of historical count data that the fill rate is computed over.	Maint
CPL	0 - 9	0	0 - 1	Car Park Loop Type 0 = Entry loop 1 = Exit loop	Maint
		1	0 - 255	0 - 47 = Input on 1st I/O board 48 - 95 = Input on 2nd I/O board 96 - 143 = Input on 3rd I/O board 255 = Loop not used	
		2	0 - 255	No Detect Period 1 - 255 = The car park loop is reported faulty if no vehicle is detected for this number of hours. 0 = Not monitored	
		3	0 - 255	Permanent Detect Period 1 - 255 = The car park loop is reported faulty if a permanent detection is present for this number of minutes. 0 = Not monitored	
DOR	-	-	0 - 255	Door Input 0 - 47 = Input on 1st I/O board 48 - 95 = Input on 2nd I/O board 96 - 143 = Input on 3rd I/O board 255 = Door switch not used	Maint
EDI	-	-	0 - 255	Emergency Digital Input 0 - 47 = Input on 1st I/O board 48 - 95 = Input on 2nd I/O board 96 - 143 = Input on 3rd I/O board 255 = Emergency input not used	Maint

Code	Major Index	Minor Index	Data Range	Description	Access Level
RMP	-	0	0 - 63	Ramp Up Time Threshold The number of minutes before the FULL state is reached at which ramp up mode is entered	Maint
		1	0 - 15	Ramp Up Period The interval in minutes between status reports to the Central Office whilst in ramp up mode	
		2	0 - 63	Ramp Down Time Threshold The number of minutes before the ALMOST FULL state is reached (from the FULL state) at which ramp down mode is entered	
		3	0 - 15	Ramp Down Period The interval in minutes between status reports to the Central Office whilst in ramp down mode	

11.13 PAKNET COMMAND TABLE

Code	Major Index	Minor Index	Data Range	Description	Access Level
RCA	-	-	14 ASCII digits 0 - 9	Remote Comm's user address (NUA) of the form : 2353ABCDEFGHIJ 2353 is the Data Network Identification Code allocated to the Vodafone Data Network by OFTEL. ABCD identifies the base station channel with which the Radio-PAD is communicating. EFGHIJ is the unique address of a port on the Radio-PAD. For example : The NUA of ports 100122 and 100123 on a Radio-PAD tuned to a base station channel with identification 1990 would be 23531990100122 and 23531990100123.	Maint
RCB	-	-	0 - 4	Remote Comm's Baud Rate where 0 = 300, 1 =1200, 2 = 2400, 3 = 4800, 4 = 9600	Maint
RCT			0 - 1	Remote Comm's type 0 = PSTN 1 = PAKNET	Maint
ADR	-	-	0 - 254	Address of the OMCU This is used to check the message received from the Instation is for this OMCU.	Maint
RDF	-	-	0 -1	Reset Detector Fault When a detector fault on the car park loops has been reported this command will clear the fault for any loops that have changed state since the failure was detected.	Maint
RCU	-	-	0 - 1	Remote Comm's Update This command requests the OMCU to dial the Instation and transmit the status message.	Maint

11.14 DUSC COMMAND TABLE

11.14.1 CLF Operating Commands

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
APL	-	-	CLF plan 0 - 15 or Isolate 255	**A**ctive **C**LF **P**lan is displayed. Use RPL to request a different plan or Isolate. NOTE: When CLF is isolated due to fault this command still indicates the requested plan, even though it's not running CLF.	RO
CCP	-	-	1	Call Current Plan i.e. when CCP=1 is entered, the OMCU rescans the timetable and re-establishes the current plan (if any) and timeswitch events (if any). Used to restore the OMCU back to normal operation after an RPL has been used.	Maint
CCT	-	-	0 - 255 secs	**C**urrent **C**ycle **T**ime shows the incrementing cycle time for the CLF plan which is currently running.	RO
CGR	-	Stream 0 - 31	CLF group 0 - 31	**C**urrent CLF **Gr**oup is displayed for the specified stream.	RO
CGT	-	Stream 0 - 31	0 - 255 secs	**C**urrent CLF **G**roup **T**ime remaining counting down to the end of the current group i.e. how long before the next group is due to start.	RO
CID	-	-	<text>	CLF Data Set Identity: This identity number/text is used to check which CLF data set is currently loaded into the OMCU working store.	RO
COD	-	BUS/ MOVA I/O board No (0 – 2)	0 - 2	Copy Detectors to Outputs on this board: 0 = Allow normal control of outputs (e.g. by CLF facility). 1 = Copy the state of the first 16 detector inputs over to the 16 outputs on this BUS/MOVA I/O board 2 = Copy the inverted state of the first 16 detector inputs over to the 16 outputs on this BUS/MOVA I/O board	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CYC	-	CLF plan 0 - 15	0 - 255 secs	**CYC**le time for the specified CLF plan. 0 to 254 = cycle time 255 = plan is disabled	RO
MTS	-	0 - 31 Stream No	-	**M**oni**T**or CLF **S**tatus for a Stream. See section 11.14.1.1 for more details.	RO
OPS	0 - 2 board number	-	BINARY	**O**ut**P**ut **S**ense This command sets / displays the state of the inversion sense bit for each of the 16 outputs on BUS/MOVA IO board N where N=0, 1 or 2. Outputs 0 - 15 are on board 0, 16 - 31 are on board 1 etc. 0 = do not invert 1 = invert OPS 0: controls the inverting of 8 outputs spread across a maximum of 3 LMU IO boards. If the second or third board is an LMU IO board the display will show: OPS N:---------- If board N is being used by the MOVA application: OPS N:-(MOVA OUTPUTS)-	Maint
RPL	-	-	CLF plan 0 - 15 or Isolate 255	**R**equested CLF **PL**an displays the plan requested by the timetable / user defined conditioning and can be used by the operator to request a different plan until the next timetable event (or CCP is used).	Maint
SWS	-	Event 0 - 31	0 - 1	Time**SW**itch **S**ettings displays the state of each timeswitch event, either active or inactive. 0 = inactive 1 = active	RO

11.14.1.1 Monitor CLF Status (MTS)

1) When a CLF plan is running

MTS n:<Time> <Source> Plan <Plan Number>:<Cycle Timer>,Group <Group Number>:<Group Timer>, Action <Action Number>,<Off Control Reason>

See table below for explanation of information types.

Information	Explanantion
<Time>	System time in hh-mm-ss format
<Source>	Identifies the source of the current CLF plan or isolate TTB = timetable RPL = RPL handset command OVR = Instation plan override CND = conditioning input
<Plan Number>	The CLF plan number 0 to 15
<Cycle Timer>	The CLF plan cycle timer counting up to the configured plan cycle time whereupon it reverts to 0 and the count restarts
<Group Number>	The currently running group 0 to 31
<Group Timer>	The active group timer counting downwards from the configured group time to 0 whereupon it reverts to the next configured group time and the count restarts
<Action Number>	is the active action 0 to 31, corresponding to the active group
<Off Control Reason>	The reason why the plan is not actively controlling the CLF outputs. If this field is blank, CLF is running the indicated plan. - COMP = Compliance fault - G1G2 = G1G2 fault - TTB = Timetable isolate - COND = User defined condition active, e.g. manual switch off - CFG = No CLF configuration or CLF configuration corrupt - ENT = Plan entry time active or no CLF plan - CYCL = Plan cycle time is 0 or 255 seconds. - LSUP = No lamp supply.

2) No CLF plan is running i.e. isolate

MTS n:<Time> <Source> Isolate

See Table above for explanation of information types.

3) No configuration present or configuration is invalid

MTS n:No Configuration Present

11.14.2 Accessing CLF Configuration Data Commands

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
ACF	-	-	0 - 1	CLF **A**ction on **C**ompliance **F**ail. This is the action that is performed when the OMCU detects a compliance failure. 0 = isolate mode 1 = continue normal CLF output control	RO
CAO	Action number 0 - 31	0 - 3	0 - 255	**C**LF **A**ction **O**utputs. Displays a pair of port numbers and masks identifying the output ports and the CLF outputs on a BUS MOVA IO board driven by the specified action. Minor index=0–port A (0-3) Minor index=1–port A mask(0-FF) Minor index=2–port B (0-3) Minor index=3–port B mask(0-FF) NB: Ports 0 & 1 are on the 1st board, ports 2 & 3 are on the 2nd board.	RO
CCC	-	-	0 - 255 secs	**C**LF **C**ompliance Fail **C**learance Time. This is the time that a confirm input condition must be present (may be across instances of the same group action) before a compliance fault clearance is raised.	RO
CCF	-	-	0 - 255 secs	**C**LF **C**ompliance **F**ail Time. This is the time that a confirm input condition must be absent (within the context of a single group action) before a compliance fault is raised.	RO
CEC	-	Action number 0 - 31	0 - 1	**C**LF **E**nable **C**ompliance. This displays an indication of whether compliance checking is enabled for a group action. 0 = disabled 1 = enabled	RO
IFA	Influence set 0 – 15	CLF group 0 - 31	Action number 0 - 31	**I**n**F**luence **A**ction number i.e. which action (and thus which stream) does this group introduce in the specified influence set.	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
IFN	Influe set 0 – 15	CLF group 0 - 31	Influe Type 0 - 3	**I**nfluence **F**u**N**ction i.e. which function does this group perform in the specified influence set.	RO
OFF	CLF plan 0 - 15	Time part 0 - 1	0 - 59 secs / mins	CLF **OFF**set from the configured base time (e.g. 2am) for the specified CLF plan. OFF <Plan> 0 : <0 to 59 seconds> OFF <Plan> 1 : <0 to 59 minutes>	RO
PIA	-	-	0 - 2	**P**lans **I**solate **A**ction i.e. what action is taken with the CLF outputs when the isolate state is entered. 0 = all outputs deactivated 1 = all output activated 2 = copy detector input states	RO
PLE	-	CLF plan 0 - 15	0 - 255 secs	**Pl**an **E**ntry time for the specified CLF plan i.e. the normal point in the cycle where the plan is required to start. 255 = plan can start at any point in the cycle.	RO
PLI	-	CLF plan 0 - 15	Influe set 0 - 15	**Pl**an **I**nfluence set used by the specified CLF plan.	RO
PLT	CLF plan 0 - 15	CLF group 0 - 31	0 - 255 secs	**Pl**an **T**ime for the specified CLF plan and group i.e. the time within the cycle that this group comes into effect, where any value larger than the cycle time disables the group for that plan. These times are specified as an offset from the start of the plan cycle. A group is associated with a unique action number, which in turn is associated with a unique stream. Two groups that affect the same stream should not be given the same group time as only one will be run i.e. ensure that each group runs for at least 1 second before the next group is introduced.	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
PLX	-	CLF plan 0 - 15	0 - 255 secs	**Pl**an **E**xit time for the specified CLF plan i.e. the normal point in the cycle where the plan is required to finish. 255 = plan can exit at any point in the cycle.	RO
RSA	-	Action number 0 - 31	Stream 0 - 31	**R**elated **S**tream for **A**ction. Displays the stream associated with the specified group action.	RO
TDY	-	Day Code 0 - 15	Text	**T**imetable **D**a**Y** codes displays the configured day codes where: 'Sun', 'Mon'… are displayed if the day code just selects a single day. 'Xsu', 'Xmo'… are displayed if the day code selects all but one particular day, e.g. 'everyday except Sunday' or 'everyday except Monday'. 'WEK', 'WKD' or 'WND' if everyday (all week), every weekday or just the weekends (Saturday and Sunday) are selected, respectively. If the days selected by the day code do not match those above, then 'MTWTFSS' is displayed with a '-' for each day not selected, e.g. 'M-W-F—' is displayed if only Monday, Wednesday and Friday are selected.	RO
TSD	-	Entry 0 - 63	Date DDMMMYY and Day Code 0 - 99	The **T**imetable **S**pecial **D**ays table defines up to 64 various dates when the normal timetable events should not be run, e.g. public holidays. On the specified date, the specified day code replaces the normal day code for that day.	RO

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL

TSH	Entry 0 - 31	Second Index 0 - 1 0 = start 1 = end	Date DDMMMYY	The **T**imetable **S**pecial **H**oliday table defines up to 32 periods between the specified start and end dates (inclusive) where different timeswitch events are executed, e.g. during school holidays.
				For example:
				`TSH 0 0:29-MAR-99`
				and
				`TSH 0 1:09-APR-99`
				These define a period from March 29th 1999 until April 9th 1999 inclusive where different timeswitch events run.
					RO

TSW	Entry 0 - 63	Second Index 0 - 5	Value 0 - 215	**T**ime**SW**itch settings contain 64 'timetable' entries numbered 0 to 63, identified by an 'N' in the following descriptions. Each entry consists of 6 items that are described in section 11.14.2.2. If any of the items are out of range, then the OMCU ignores the whole timetable entry. Note: If no timeswitch events are specified for the current day, then the last event on the previous day will continue to run. For example, the OMCU will still be running plan 1 today if plan 1 was the last plan called for yesterday and there are no timeswitch events specified for today. The OMCU will not revert to 'isolated' unless a specific timeswitch entry to 'isolate' the OMCU is specified for today.	RO

11.14.2.1 Influence Function (IFN)

Each influence function is described below:

Type	Explanation
0	**Deactivate -** Deactivate all outputs associated with this output action stream
1	**Activate -** Deactivate any existing outputs for the stream and activate the specified output action. NB: Any conditional activations (influence type 2) for the stream are discarded.
2	**Conditional -** If the condition specified for the output action is true or becomes true, then de-activate any existing outputs for the stream and activate the specified output action. These outputs remain active even if the condition is removed. NB: Any conditional activations (influence type 2) for the stream are discarded.
3	**Freeze -** The currently active output action on the stream is held. Only applicable following influence type 2.

11.14.2.2 Timeswitch settings (TSW)

TSW N 0 : <Day Code> (<Abbreviation>)

This first item specifies on which day or days the timetable event applies.
Day Codes 0 to 15 specify a normal day or normal days of the week, e.g. '`TSW N 0:3 (TUE)`' since code 3 is usually configured to mean just on Tuesdays, see TDY.
Day Codes 16 to 99 are 'Special Days' see TSD.
If 'Special Holiday Periods' are configured using TSH then:
Day Codes 0 to 15 only run outside these holiday periods.
Day Codes 100 to 115 only run within these holiday periods.
Day Codes 200 to 215 run regardless of holiday periods.

TSW N 1 : <0 to 23 hours>
TSW N 2 : <0 to 59 minutes>
TSW N 3 : <0 to 59 seconds>
The above items specify at which time the timetable event applies.

TSW N 4 : <Operation Code 0 to 4>
TSW N 5 : <Additional Operation Code Parameter>
These last two items specify the operation that should be carried out. The valid Operation Codes are described as follows :

TSW N 4 : 0
TSW N 5 : <Don't Care>
The operation code '0' tells the OMCU to isolate, i.e. drop out of CLF (cableless link facility) mode, returning to VA mode for example.

TSW N 4 : 1
TSW N 5 : <CLF Plan Number 0 to 15>
The operation code '1' tells the OMCU to start the CLF plan specified by 'TSW N 5'.

TSW N 4 : 3
TSW N 5 : <TimeSwitch Event Number 0 to 31>
The operation code ‘3’ tells the OMCU to introduce the timeswitch event specified by ‘TSW N 5’, without affecting any other timeswitches.

TSW N 4 : 4
TSW N 5 : <TimeSwitch Event Number 0 to 31>
The operation code ‘4’ tells the OMCU to cancel the timeswitch event specified by ‘TSW N 5’, without affecting any other timeswitches.

11.14.3 CLF Time Commands

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CDI	-	-	0 - 255	**C**lock **D**rift from **Instation** time displays the number of seconds by which the OMCU clock has drifted from the Instation at the last time synchronisation message. If the OMCU is deemed to be fast or slow or matches the Instation time then the output will denote this as follows CDI:Fast Ns CDI:Slow Ns Where N is the number of seconds of drift. CDI:On time CDI:No I/S Sync	RO
CKA	-	-	<Date 0 to 31> <Month JAN to DEC> <Year 00 to 99>	**C**loc**K** to **A**dvance by one hour at 2am on this date for daylight saving. Once actioned, the date is automatically adjusted to find the same day in the following year. Enter ‘CKA=0’ to cancel the date.	Maint

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CKM	-	-	text	GPS **C**loc**k m**onitor command is used to display the last message from the GPS receiver. This will indicate if the OMCU is getting valid GPS clock synchronisation times. The format of the display will be as follows:- CKM:$GPRMC,hhmmss,status Where : Hhmmss = time of day Status = A or V, A=available, V=not available.	RO
CKR	-	-	<Date 0 to 31> <Month JAN to DEC> <Year 00 to 99>	**C**loc**K** to **R**etard (be put back) by one hour at 2am on this date for daylight saving. Once actioned, the date is automatically adjusted to find the same day in the following year. Enter 'CKR=0' to cancel.	Maint
CKS	-	-	text or = 0	Displays the last GPS **C**loc**k S**ynchronisation time used to synchronise the OMCU. e.g. CKS: <CR> TUE3MAR99 11:57:33 Entering CKS=0<CR> will cause the GPS time displayed to be reset to 1st Jan 90 and the OMCU will resynchronise as soon as possible.	Maint
CSI	-	-	text	**C**lock **S**ynchronisation from **Instation** displays the last time at which the OMCU was synchronised by the Instation. When viewing the last synchronisation time using a display width of 20 characters or wider, then the display show the date and time of day on the one line. If the display width has been reduced to 14 characters, then the '+' key can be used to view the date and then the day of the week.	RO

11.15 FLOW FACILITY COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
FOC	-	0 – 15	0 – 65535	**Flo**w **C**ount – The flow count value prior to applying the smoothing algorithm	RO
FOD	-	0 – 15	0 – 65535	**Flo**w **D**own Threshold – The down threshold of the flow detector, shown as a count value	RO
FOF	-	0 – 15	0 – 100	**Flo**w Smoothing **F**actor – The percentage of the flow count average that is used to calculate the new flow average	RO
FOH	-	0 – 1	8 bits binary	**Flo**w **H**igh – Shows 16 flow detectors, 1 = High Threshold last achieved, 0 = Low Threshold last achieved (Hysteresis). Inverse of Flow Low. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO
FOL	-	0 - 1	8 bits binary	**Flo**w **L**ow – Shows 16 flow detectors, 1 = Low Threshold last achieved, 0 = High Threshold last achieved (Hysteresis). Inverse of Flow High. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO
FOP	-	0 – 15	0 – 100	**Flo**w Count **P**eriod – Time in minutes, over which to calculate flow	RO
FOS	-	0 – 15	0 – 65535	**S**moothed **Flo**w Result – The smoothed detector flow value	RO
FOU	-	0 – 15	0 – 65535	**Flo**w **U**p Threshold – The up threshold of the flow detector, shown as a count value	RO

11.16 OCCUPANCY FACILITY COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
OCC	-	0 – 15	0 – 65535	**Oc**cupancy **C**ount – The time in 10^{th}s of a second that the detector is occupied prior to smoothing	RO
OCD	-	0 – 15	0 – 100	**Oc**cupancy **D**own Threshold – The down threshold of the occupancy detector, shown as a percentage	RO
OCF	-	0 – 15	0 – 100	**Oc**cupancy Smoothing **F**actor – The percentage of the occupancy count that is used to calculate the new occupancy average	RO
OCH	-	0 - 1	8 bits binary	**Oc**cupancy **H**igh – Shows 16 occupancy detectors, 1 = High Threshold last achieved, 0 = Low Threshold last achieved (Hysteresis). Inverse of Occupancy Low. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO
OCL	-	0 - 1	8 bits binary	**Oc**cupancy **L**ow – Shows 16 occupancy detectors, 1 = Low Threshold last achieved, 0 = High Threshold last achieved (Hysteresis). Inverse of Occupancy High. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO
OCP	-	0 – 15	0 – 100	**Oc**cupancy Count **P**eriod – Time in minutes, over which to calculate occupancy	RO
OCS	-	0 – 15	0 – 100	**S**moothed **Oc**cupancy Result – The smoothed detector occupancy percentage	RO
OCU	-	0 – 15	0 – 100	**Oc**cupancy **U**p Threshold – The up threshold of the occupancy detector, shown as a percentage	RO

11.17 OMCU EVENT AND SWITCH OVERRIDE COMMAND TABLE

11.17.1 OMCU Events Commands

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
EVA	-	0 – 15	0 - 255	OMCU **Ev**ents Delay Time **A**ctive – Time (in minutes) to debounce event going active, before logging as active	RO
EVI	-	0 – 15	0 – 255	OMCU **Ev**ents Delay Time **I**nactive – Time (in minutes) to debounce event going inactive, before logging as inactive	RO
EVS	-	0 – 1	8 bits binary	OMCU **Ev**ent **S**tatus – Shows 16 OMCU events, 1 = active, 0 = inactive. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO

11.17.2 Switch Override Commands

CODE	MAJOR INDEX	MINOR INDEX	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
CSO	-	0 - 1	8 bits binary	**C**urrent **S**witch **O**verride - Shows 16 switch overrides, 1 = active, 0 = inactive. Index 0 shows bits 0 – 7, index 1 shows bits 8 – 15	RO

11.18 VEHICLE CLASSIFIER COMMAND TABLE

11.18.1.1 Vehicle Classifier Common Configuration

Code	Major Index	Minor Index	Data Range	Description	Access Level
VCC	-	0	0 – 4	**Number of Sites** Total number of loop sites	RO
		1	0 or 1 – 255	**Maximum Presence Time** The time in minutes after which continued loop activation generates a vehicle presence loop fault. 0 = disable the loop DFM	
		2	0 or 1 – 255	**Maximum Absence Time** The time in hours after which continued loop deactivation generates a vehicle absence loop fault. 0 = disable the loop DFM	
		3	0 or 1 – 32	**Loop Pair Fault Detection Threshold** The number of consecutive vehicle detections counted on either the upstream or the downstream loop to cause a loop pair fault to be generated. 0 = loop pair fault algorithm disabled.	
		4	0 or 1 - 32	**Loop Pair Fault Clearance Threshold** The number of (not necessarily consecutive) vehicle detections counted by both upstream and downstream loops that must be exceeded to cause a loop pair fault clearance to be generated. 0 = loop pair fault algorithm disabled.	

11.18.1.2 Vehicle Classifier Loop Configuration

Code	Major Index	Minor Index	Data Range	Description	Access Level
VLC	0 – 31 Loop number	0	0 – 255	**Loop Inputs** 0 – 47 = Input on 1st I/O card 48 – 95 = Input on 2nd I/O card 96 – 143 = Input on 3rd I/O card 255 = Loop not used	RO
		1	0 – FF	**Loop Configuration Instance** Bit 0 Loop Present Flag Bits 1 to 3 Site Number Bits 4 to 6 Lane Number Bit 7 Upstream Loop Flag where : Loop Present Flag : (0) = loop not in use or non-existent (1) = loop is present Site Number : Number of the site that contains the loop [1 – 4]. Lane Number : Number of the lane that contains the loop [0 – 7]. Upstream Loop Flag : (0) = downstream loop (1) = upstream loop or only loop	

11.18.1.3 Vehicle Classifier Output Action List

Code	Major Index	Minor Index	Data Range	Description	Access Level
VOA	0 – 31 Output action number	0	0 – 2	**Output Action Type** 0 = Output activation without confirmation 1 = Output activation with confirmation 2 = Transmit message on communications link	RO

If Output Action Type is 0 or 1 then the following data is displayed.

VOA	0 – 31 Output action number	1	0 – 255	**Activation Delay** The total number of seconds that must elapse before the outputs are activated.	RO
		2	1 – 255	**Activation Duration** The total number of seconds that the outputs are to be activated.	
		3	0 – 5 or 255	**Port A** Port number corresponding to one of the total number of 8-bit ports on one or more IO cards. Ports 0 and 1 are on the 1st IO card, ports 2 and 3 are on the 2nd IO card, ports 4 and 5 are on the 3rd IO card. 255 = port not defined.	
		4	0 – FF	**Mask A** Mask value applied to the output port in Port A. A bit set to a 1 indicates that the output is to be activated. A bit set to a 0 indicates that the output is to be ignored.	
		5	0 – 5	**Port B** See port A above.	
		6	0 - FF	**Mask B** Mask value applied to the output port in Port B. A bit set to a 1 indicates that the output is to be activated. A bit set to a 0 indicates that the output is to be ignored.	

If Output Action Type is 2 then the following data is displayed.

VOA	0 – 31 Output action number	1	0 – 255	**Activation Delay** The total number of seconds that must elapse before the first transmission message is sent.	RO
		2	1 – 255	**Activation Duration** The total number of seconds that must elapse before the second transmission message is sent.	
		3	0 – 4 or 255	**Transmission Message ID** Identifies the message pair to be transmitted on the transmission communications link. 255 = no message pair selected	

		4	0 – 11 or 250	**Transmission Communications Link** Indicates on which communications link the messages identified by Transmission Message ID are to be transmitted. 0 – 11 = RS485 serial port 250 = MCE141 port 255 = no port selected	

11.18.1.4 Vehicle Classifier Site Parameters

Code	Major Index	Minor Index	Data Range	Description	Access Level
VSP	0 – 3 Site number	0	0 – 255	**Loop Spacing** Distance in 0.01m increments that added to the minimum loop spacing is the loop spacing for all loop pairs at the site. The minimum loop spacing is 2.5m.	RO
		1	0 – 255	**Loop Length** Length in 0.01m increments that added to the minimum loop length is the distance from the upstream edge to the downstream edge of all loops at the site. The minimum loop length is 1.0m.	
		2	1 – 8	**Number of Lanes** The number of lanes at the site.	
		3	0 – 1	**Logging Control Byte 0** Bit 0 = Enable / Disable Traffic Data reporting. Bit set to a 1 indicates that the control is enabled. All other bits (bits 1 to 7) are set to zero.	

		4	0 – FF	**Logging Control Byte 1** Controls whether VC events are to be logged for a given lane at the site. Bit 0 = Logging enable for lane 0 : Bit 7 = Logging enable for lane 7 Bits 0 to 7 set to a 1 indicates logging enabled for the corresponding lane. If the lane is not defined at the site, the unused bit are set to 0.	
		5	0 – 1F	**Logging Control Byte 2** Controls which data is to be included in all VC events for the site when logging of VC events is enabled via logging control #1. Bit 0 = Vehicle type Bit 1 = Vehicle length Bit 2 = Vehicle speed Bit 3 = Vehicle headway Bit 4 = Output action Bits 0 to 4 set to a 1 indicates the corresponding data item is included in all VC events for the site. Bits 5 to 7 are set to 0.	

11.18.1.5 Vehicle Classifier Transmission Messages

Code	Major Index	Minor Index	Data Range	Description	Access Level
VTM	0 – 4 Message pair	0 - 1	See note	**Transmission Message** Transmission messages are grouped in pairs. A message consists of 40 bytes of binary data that are selected for transmission via one of the available serial communications links when a vehicle satisfies a detection condition that specifies an output action identifying a transmission message. The first byte of the message is the length of the message in bytes (not including the message length byte) [1-39]. Message length byte set to 0 for no message.	RO

Note : Message bytes that are non-printable i.e. have a binary value in the range 0 to 31 or 127 to 255 are displayed as \xx where xx is the ASCII hexadecimal representation of the message byte.
Message bytes that are printable i.e. have a binary value in the range 32 to 126 are displayed as the ASCII representation.
For example :
The 14 byte message “Mickey Mouse” + 2 bytes of CRC 1245 would be displayed on the handset as follows – VTM x y:\0EMickey Mouse\12E

11.18.1.6 Vehicle Classifier Confirmation Fail Parameters

Code	Major Index	Minor Index	Data Range	Description	Access Level
VCF	-	0	0 – 255	**Confirmation Fail Time** Time in seconds for which at least one confirmation input is inactive before a confirmation fault report is generated [1-255]. 0 = input confirm monitoring is disabled.	RO

Code	Major Index	Minor Index	Data Range	Description	Access Level
VCF	-	1	0 – 255	**Confirmation Fail Clearance Time** Time in seconds for which all confirmation inputs must be active before a confirmation fault clearance report is generated [1-255]. 0 = input confirm monitoring is disabled	RO
		2	0 – 2	**Confirmation Fail RRB** Urgency setting for confirmation fault and confirmation fault clearance reports i.e. not reported [0], reported on interrogation only [1] or urgently reported [2].	

11.18.1.7 Vehicle Classifier Traffic Data Parameters

Code	Major Index	Minor Index	Data Range	Description	Access Level
VTD	-	0	0 – F	**Statistics Selection** Indicates which information types each TD event contains. Can be one or more of the following (appropriate bit set to 1 to indicate statistic is present in TD event) : Bit 0 = Average speed Bit 1 = All configured statistic categories. There is a maximum of 16 categories Bit 2 = Average headway Bit 3 = Average occupancy Unused bits 4 to 7 are set to 0.	RO
		1	0 – 1	**Lane / Site Reporting** Indicates whether the TD event contains average speed, headway and occupancy statistics collected on a lane or a site basis. 0 = Site 1 = Lane	
		2	1 - 60	**Averaging Period** Indicates the period over which speed, headway and occupancy statistics are collected before averaging occurs. The value is a number of minutes.	

11.18.1.8 Vehicle Classifier Speed Bands

Code	Major Index	Minor Index	Data Range	Description	Access Level
VSB	-	0 - 6	0 – 255	**Speed Band** The speed of the vehicle in kph. Counts any vehicle whose speed is greater than the speed in the previous band definition (if any) and less than or equal to this speed. Set to 0 if band is not configured.	RO

11.18.1.9 Vehicle Classifier Speed Display

Code	Major Index	Minor Index	Data Range	Description	Access Level
SDF	-	-	0 – 1	**Speed Display Format** Determines in which format the vehicle speed is displayed by the OLG handset command when a VC or a TD event is read from the Operations Log. 0 = kph 1 = mph (default)	Maint

11.18.1.10 Vehicle Classifier Vehicle Type Categories

Code	Major Index	Minor Index	Data Range	Description	Access Level
VVT	0 – 15 Vehicle Type	0	Up to 20 ASCII chars 0 – 9 and A – F	**Category Text** ASCII text string identifying the type of vehicle being classified in the associated category. The first byte of the string contains the length of the string in bytes [0-19] (not including the length byte). This text is used by the OLG handset command when a VC event is read from the Operations Log.	RO
		1	0 - 255	**Vehicle Length** The length of the vehicle in 0.1m units. Counts any vehicle that is greater than the length in the previous category definition (if any) and less than or equal to this length. Set to 0 if the category is not configured.	

11.18.1.11 Vehicle Classifier Test Message

Code	Major Index	Minor Index	Data Range	Description	Access Level
VRX	-	0	0 – 3	**Site Number** Site number at which vehicle is detected.	Maint

		1	0 – 7	**Lane Number** Lane number at which vehicle is detected.	
		2	0 – 15	**Vehicle Type** Identifies the vehicle type.	
		3	0 – 2550	**Vehicle Length** Vehicle length in 0.01m units.	
		4	0 – 255	**Vehicle Speed** Vehicle speed in kph.	
		5	0 – 255	**Vehicle Headway** Vehicle headway in 0.1s units.	

The above test message is sent when the VRC command is assigned a count.

Code	Major Index	Minor Index	Data Range	Description	Access Level
VRC	-	-	0 - 65535	**Test Message Receive Count** Repeats the VRX command for the given count. Allows the simulation of a large number of vehicles for test purposes. .	Maint

11.18.1.12 Vehicle Classifier Detect Condition Event Logging

Code	Major Index	Minor Index	Data Range	Description	Access Level
VDE	-	0	0 - FFFF	**DC Event Logging** Identifies the detect conditions for which a DC event is logged when the detection condition is satisfied. Bit set to a 1 indicates event logged. The least significant bit corresponds to detect condition 0, the most significant bit corresponds to detect condition 15.	RO
		1	0 - FFFF	**VC Event Logging** Identifies the detect conditions for which a VC event is logged when the detection condition is satisfied. Bit set to a 1 indicates event logged. The least significant bit corresponds to detect condition 0, the most significant bit corresponds to detect condition 15.	

11.18.1.13 Vehicle Classifier Detect Condition Statistic Category Map

Code	Major Index	Minor Index	Data Range	Description	Access Level
VSM	-	0 – 31	0 – 15	**Statistic Category** Identifies the statistic category that is to be incremented each time the corresponding detection condition occurs (assuming counting for the detection condition is enabled). 255 = no statistic category	RO

11.18.2 Operations Log Capacity

The Operations Log holds approximately 12,000 VC events if the processor board is fitted with large RAM chips (667/1/26601/002). Only around 500 entries can be recorded if the small RAM chips are fitted (667/1/26601/001, now obsolete).

The following table provides a summary of Operations Log capacities containing TD events only for typical configurations assuming a 1 minute averaging period. For other averaging periods the log capacity is increased.

Number of Statistic Categories	16	16	16	1	8	1	1
Speed (Yes=1 / No = 0)	1	1	1	0	0	0	1
Occupancy (Yes=1 / No = 0)	1	1	1	0	0	0	0
Headway (Yes=1 / No = 0)	1	1	1	0	0	0	0
Number of Lanes (Maximum)	8	8	1	8	8	1	8
Number of Sites (Maximum)	4	1	1	4	4	1	4
Reporting (Lane = 0 / Site = 1)	0	1	0	0	1	0	1
Event Size (Bytes)	76	48	48	14	28	14	22
Log Capacity (Hours)	52	83	83	285	142	285	181
Number of Log Entries	3157	5000	5000	17142	8571	17142	10909

To derive the log capacity in hours for alternative averaging periods, multiply the appropriate log capacity in the above table by the alternative averaging period.

11.18.3 Operations Log Display Formats (OLG)

11.18.3.1 VC Event

The following defines the handset output format for a VC event when the OLG command is used.

Field	Max Size	Format	Range
TIMESTAMP	18	See below	See below
" L:"	3	Text	
SITE / LANE	2	Hexadecimal	0 – 3 / 0 – 7
" "	1	Text	
VEHICLE TYPE	Variable	Text	Depends on configured text.
" "	1	Text	
VEHICLE LENGTH	5	Decimal	0.0 – 25.5
"m "	2	Text	
VEHICLE SPEED	3	Decimal	0 – 255
"kph " or "mph"	4	Text	
VEHICLE HEADWAY	4	Decimal	0.0 – 25.5
"s O:"	4	Text	
OUTPUT ACTION	8	Hexadecimal	0 - FFFFFFFF The least significant bit corresponds to output action 0, the most significant bit corresponds to output action 31.

NOTE : A vehicle longer than 25.5m is limited to 25.5m in the VC event. A headway of greater than 25.5s is limited to 25.5s.

Examples

23-JAN-02 16:30:00 L:12 CAR 5.23m 50kph 6.2s O:1
A vehicle classed as a CAR on site 1 lane 2 was recorded with a length of 5.23m, a speed of 52kph and a headway of 6.2s. The detection invoked output action 0.

23-JAN-02 16:32:00 L:12 BIG THING 12.01m 70kph 25.5s O:100F
A vehicle classed as a BIG THING on site 1 lane 2 was recorded with a length of 12.01m, a speed of 70kph and a headway of 25.5s or more. The detection invoked output actions 0, 1, 2, 3 and 15.

NOTE : The above display format assumes all data fields are present in the VC event. The stored data content of the VC event is configurable so that not all of the above fields may be displayed by the OLG handset command for a given VC event.

11.18.3.2 DC Event

The following defines the handset output format for a DC event when the OLG command is used.

Field	Max Size	Format	Range
TIMESTAMP	18	See below	See below
" DC:"	4	Text	
DETECT CONDITION	1	Decimal	0 – 31

23-JAN-02 16:30:00 DC:1

11.18.3.3 TD Event

The following defines the handset output format for a TC event when the OLG command is used.

Field	Max Size	Format	Range
TIMESTAMP	18	See below	See below

followed by the following (assuming there are statistic categories present) :

“ ”	1	Text	
STATISTIC CATEGORY MASK	4	Hexadecimal	0 – FFFF The least significant bit corresponds to category 0, the most significant bit corresponds to category 15

followed by up to 16 statistic categories (there may be none as dictated by the configuration) :

“ “	1	Text	
STATISTIC CATEGORY	5	Decimal	0 – 65535

followed by up to 8 locations supplied with average speed, average headway and average occupancy values :

“ L:”	3	Text	
SITE / LANE	2	Hexadecimal	0 – 3 / 0 – 7
“ “	1	Text	
AVERAGE SPEED	3	Decimal	0 – 255
“kph ” or “mph ”	4	Text	
AVERAGE HEADWAY	4	Decimal	0.0 – 25.5
“s ”	2	Text	
AVERAGE OCCUPANCY	3	Decimal	0 – 100
“%”	1	Text	

NOTE : All, some or none of the speed, headway and occupancy data values may be present as dictated by the configuration.

Examples

23-JAN-02 16:30:00 1 4563 L:00 62kph 8.3s 11% L:10 74kph 5.1s 34%

Statistics category 0 holds a count of 4563. Site 0 lane 0 contains average vehicle speed, headway and occupancy of 62kph, 8.3s and 11% respectively. Site 1 lane 0 contains average vehicle speed, headway and occupancy of 74kph, 5.1s and 34% respectively.

23-JAN-02 16:32:00 L:00 40mph L:01 52mph

Site 0 lane 0 contains average vehicle speed of 40mph. Site 0 lane 1 contains average vehicle speed of 52mph.
There are no statistic categories or average vehicle headway and occupancy values.

23-JAN-02 16:30:00 C00F 1 0 1202 432 6565 232

Statistics categories 0, 1, 2, 3, 14 and 14 holds counts 1, 0, 1202, 432, 6565 and 232 respectively.
There are no average vehicle speed, headway and occupancy values.

11.19 RAID COMMAND TABLE

CODE	MAJOR INDEX	MINOR INDEX n	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
RTS			0 - 7	**R**aid **T**hreshold **S**et in current use.	read only
RLO	-	0 – 15	0–(2^{32}-1)	**R**AID A**LO**TPV – current value of ALOTPV n	read only
RTG	-	0 – 15	0–(2^{32}-1)	**R**AID A**TG**BV – current value of ATGBV n	read only
ROT	0 – 15	0 – 7	0–(2^{32}-1)	**R**AID AL**O**TPV **T**hreshold – threshold for ALOTPV[n][Threshold Set]	read only
RGT	0 – 15	0 – 7	0–(2^{32}-1)	**R**AID AT**G**BV **T**hreshold – threshold for ATGBV[n][Threshold Set]	read only
ROH	-	0 – 1	8 bits binary	**R**AID AL**O**TPV **H**igh – Shows 16 ALOTPV detectors, 1 indicates that the ALOTPV was above the high threshold during the last averaging period. Index 0 shows bits 0 – 7; index 1 shows bits 8 – 15	read only

CODE	MAJOR INDEX	MINOR INDEX n	DATA RANGE	DESCRIPTION AND REMARKS	ACCESS LEVEL
RGL	-	0 - 1	8 bits binary	**R**AID AT**G**BV **L**ow – Shows 16 ATGBV detectors, 1 indicates that the ATGBV was below the low threshold during the last averaging period. Index 0 shows bits 0 – 7; index 1 shows bits 8 – 15	read only
RAP	-	0 – 15	10 – 600	**R**AID **A**veraging **P**eriod – Time in seconds over which RAID measurements are calculated.	read only
REN	-	0 - 15	0, 0xFFFF	**R**AID **En**abled – check if RAID license enabled. 0 = disabled, 0xFFFF = enabled	

Appendix A MOVA INSTALLATION SHEETS

The following two A5 pages may be photocopied onto a single A4 sheet.

A copy of this sheet should be completed for each MOVA installation and kept in the controller cabinet as a record of the MOVA installation details for that site.

MOVA INSTALLATION SHEET (1/2)

Site Name and Location:

MOVA Licence Number:

Installation By: **Date:**

MOVA Detector Inputs

Det. No.	Use / Name	Controller / Det. Terminal
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Det. No.	Use / Name	Controller / Det. Terminal
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		

MOVA INSTALLATION SHEET (2/2)

MOVA Force and Confirm Bits

Det. No.	Use / Name	Cont. Terminal
TO		
F1		
F2		
F3		
F4		
F5		
F6		
F7		
F8		

Det. No.	Use / Name	Cont. Terminal
CRB		
G1		
G2		
G3		
G4		
G5		
G6		
G7		
G8		

Det. No.	Use / Name	Cont. Terminal
G9		
G10		

G11 to G16 require a 2nd Bus/MOVA I/O Card

G11		
G12		
G13		
G14		
G15		
G16		

Telephone Line Sharing with Siemens 3U OMCU (see section 9.4)

MOVA Unit	Terminal	OMCU Unit
DM Green/Brown		PL1/1 Pin 21
N/C	(0V)	PL1/1 Pin 22
N/C	(24V)	PL__/__ Pin ___ (MF +ve input)
MF Blue/Brown		PL__/__ Pin ___ (MF -ve input)
MF Blue/Slate	(0V)	N/C

MOVA Site Data

Plan	File Name	Fixed Site Data Checksum	All Site Data Checksum	Data Set Loaded
1				☐
2				☐
3				☐

Appendix B OMCU DRAWINGS

B.1 Introduction

Section B.2 contains a list of the drawings that are included at the back of this handbook.

B.2 Drawing List

(a) **667/GA/26580/000** Traffic Outstation Unit Assembly

(b) **667/GA/26577/000** Traffic O/S Unit Mounting Details

(c) **667/GA/26585/003** BUS/MOVA I/O Expansion Cable Assembly

(d) **667/GA/26585/004** BUS / MOVA RS485 Cable Assembly

(e) **667/GA/26585/010** TCSU/Bus I/O Expansion Cable Assembly

(f) **667/CF/26598/010** O/S GSM Modem Kit

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