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SYSTEM/PROJECT/PRODUCT: GEMINI

## GEMINI TRAFFIC OUTSTATION COMPATIBILITY

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## 1. INTRODUCTION

### 1.1 PURPOSE

The purpose of this document is :-

- 1) To define the compatibility between all issues GEMINI (PB683) and GEMINI (12684) firmware
- 2) To define the compatibility between all hardware issues

### 1.2 SCOPE

All issues of GEMINI firmware and hardware

### 1.3 GLOSSARY

Meridian	-	Configuration Management tool for documents and source files
CTS	-	Clear To Send
I/O	-	Input/Output
MOVA	-	Microprocessor Optimised Vehicle Actuation
OMU	-	Outstation Monitoring Unit
PROM	-	Programmable Read Only Memory
RAM	-	Random Access Memory
RMS	-	Remote Monitor System
TRL	-	Transport Research Laboratory

## **2. GEMINI – TRAFFIC OUTSTATION FIRMWARE DESCRIPTIONS**

### **2.1 FACILITIES SUPPORTED**

The following is a very brief overview of all the facilities of the Gemini unit.

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.

GEMINI firmwares PB683 and 12684 includes the following applications:

- The RMS OMU Application
- The Bus Processor Application
- The Car Park Application
- The SIETAG OMU - OTU Application (relies on the Bus Processor Application)
- The DUSC Application
- The Reactive DUSC facility and the Vehicle Classifier facility
- TRL MOVA Application
- UTMC OTU
- UTMC VMS

#### **2.1.1 The UTMC OTU Application**

- Communicates with the UTMC instation via SNMP Simple MIB, uses Ethernet for physical interface.
- Provides real time control of traffic junction
- SCOOT Detector sampling to support UTC SCOOT

#### **2.1.2 The UTMC VMS Application**

- Communicates with the SieSpace Instation via SNMP utmcVMS MIB
- Controls up to 8 UVMS signs via RS485 network
- Routes sign status back to SieSpace Instation via SNMP utmcVMS MIB

#### **2.1.3 The RMS OMU Application**

- communicates with the Remote Monitoring Instation over the normal telephone (PSTN) network with the Instation able to dial the OMU and vice-versa
- reports various events and faults of the controller to Instation by automatically dialling the Instation as soon as that event is detected, retrying if necessary
- monitors the lamps of the controller and reports any bulb failures or lamps off, to the Instation, plus it also monitors the controller's dim/bright changeovers

- has a number of general purpose outputs which can be set open or closed circuit from the Instation
- configuration data is downloaded from the Instation
- battery capable of supporting the OMU and modem so that it may dial the Instation and report mains power failure

#### **2.1.4 The Bus Processor Application**

- has facilities for vehicle logging and vehicle priority at traffic signals and access control

#### **2.1.5 The Car Park Application**

- counts vehicles entering and exiting a car park, keeping track of the car park occupancy level which it reports to an Instation via PAKNET and GPRS using the iConnector and Direct GPRS

Note: Unlike the other applications, which can all be used simultaneously within a single unit, the Car Park application cannot be used in conjunction with any other application.

#### **2.1.6 The TRL MOVA Application**

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, which provide both vehicle counts and presence information. Each traffic lane approaching the junction has one or more detectors.*

For more information, refer to the TRL booklets AG10, AG11 and AG12, or the Highways Agency document MCH 1542.

#### **2.1.7 The SIETAG OMU - OTU Application**

- has a facility for routing vehicle detections via the MCE141 serial port to an OTU then onwards to the UTC system (use in journey times analysis).

### **2.1.8 The DUSC Application**

- has facilities for controlling the stage-to-stage (or phase-to-phase) movements of the associated traffic controller, according to plans downloaded from the RMS Instation. Different plans can be introduced according to the time of day.
- can be set up for the ST800 Enhanced Serial Link control. The 141-handset cable can feed information between the OMU and the traffic controller, via the ST800 Enhanced Serial Link.

### **2.1.9 The Reactive DUSC Application**

- has facilities to monitor flow and occupancy.
- can have specific events set up and monitored, which are reported back to the RMS Instation.
- can have Switch Overrides set up and implemented by the RMS Instation, to trigger a specific condition for a configured duration.

### **2.1.10 The Vehicle Classifier Application**

- can simultaneously classify and log vehicle transitions across up to 8 loop pairs.
- can record flow, occupancy, speed, headway and class, based on 14 user defined length categories.
- can provide output control to an external device for a given vehicle detection
- can output messages via the 141 serial port or any of the RS485 ports to control various message signs (e.g. blister, UVMS).
- is activated via a valid licence code in a configuration download from an RMS instation.

## **2.2 SOFTWARE LICENCES**

The Processor has the capability to run all of the GEMINI applications, but to allow some facilities to operate, Licence Codes require to be entered to enable these facilities.

The following require Licence Codes before the facility is usable –

- 1) MOVA

- 2) Vehicle Classification
- 3) UTMC OTU
- 4) UTMC VMS.

The Licence codes for these facilities are available from Poole



## **2.3 SUMMARY OF FIRMWARE ISSUE STATES (PB683)**

### **2.3.1 For PB683 issue 1**

First issue of GEMINI firmware used for FAT. This issue was based upon PB680 issue 17 and PB681 issue 15 (OMU/MOVA firmware on previous outstation platform).

### **2.3.2 For PB683 issue 2**

Release for Field Trials

### **2.3.3 For PB683 issue 3**

Release for Field Trials

### **2.3.4 For PB683 issue 4**

Release for Field Trials

### **2.3.5 For PB683 issue 5**

Release for full Production

- Mova 3-day emergency licence key time increased to 7 days.

### **2.3.6 For PB683 issue 6**

Not released

### **2.3.7 For PB683 issue 7**

Corrects communications lockups on modem and handset ports

## 2.4 KNOWN PROBLEMS AND FUTURE ENHANCEMENTS (PB683)

Restrictions or possible enhancements to this issue of firmware are as follows –

MAN0000103 – A user can initiate a self test remotely. This will fail if the CPU I/O loop-back is not present. This will require a site visit to reset the unit and restore normal operation.

MAN0000276 – MOVA DETSCN.C bug reported by TRL – LPHASE= -1 does not work.

MAN0000345 – The Vehicle Count Facility causes unit to reset if a Count Report is followed by a report of significantly shorter length

MAN0000349 - The VMS fault reporting system is reporting 'UNKNOWN FAULT'.

MOVA initialisation command INI=2 does not work, use INI=1 which initialises both OMU and MOVA.

## **2.5 SUMMARY OF FIRMWARE ISSUE STATES (12684)**

### **2.5.1 For 12684 Issue 1**

First issue which includes all the features of PB683 issue 7 except that MOVA version is updated from Issue 4 to Issue 5. It corrects the MOVA initialisation problems experienced with PB683.

### **2.5.2 For 12684 Issue 2**

Release for Field Trials

### **2.5.3 For 12684 Issue 3**

Release for Field Trials

### **2.5.4 For 12684 Issue 4**

Release for Full Production

## **2.6 KNOWN PROBLEMS AND FUTURE ENHANCEMENTS (12684)**

Restrictions or possible enhancements to this issue of firmware are as follows –  
None

## 2.7 COMPATIBILITY

### 2.7.1 PB683 Firmware

Firmware Issue	Compatibility considerations
PB683 issue 1	First issue of new GEMINI firmware for engineering test purposes only. Not released to production
PB683 issue 2	First OMU firmware released for production.
PB683 issue 3	Second issue of new firmware
PB683 issue 4	Third issue no compatibility problems
PB683 issue 5	No compatibility problems
PB683 issue 6	Not a general release - No compatibility problems
PB683 issue 7	No compatibility problems

### 2.7.2 12684 Firmware

Firmware Issue	Compatibility considerations
12684 issue 1	First issue of 12684 firmware for engineering test purposes only. Not released to production. This firmware includes all the features of PB683 issue 7, except the version of MOVA is updated the MOVA 5 (from MOVA 4). MOVA 5 requires different licence code values (LIN & LIF) to MOVA 4. MOVA 5 site data is different and not compatible to MOVA 4. (And vice-versa). MOVA 5 provides expanded I/O capability with an increased number of links, force bits, stage/phase confirms and detector inputs.
12664 issue 2	Not released
12684 issue 3	Not released
12684 issue 4	First firmware released for production

### 2.7.3 Changing Firmware from PB683 to 12684 and 12684 to PB683

A firmware update tool is available to enable firmware issues to be changed. This update tool 'GEMINI FIRMWARE UPDATE TOOL' is available on the Siemens Traffic Control Website ([www.siemenstraffic.com](http://www.siemenstraffic.com)). Technical Bulletin STAB05-0025 describes the use of this tool.

## **2.8 FIRMWARE IDENTIFICATION**

This section details the method by which the firmware can be positively identified.

### **2.8.1 Application release**

The firmware version is marked on the white area on the GEMINI CPU PCB next to the battery and on the label attached to the Gemini unit.

### **2.8.2 PIC Handset Command**

The PIC handset command responds with the firmware Part Number and Issue State as follows:

e.g. for PB683 firmware - PB683 ISS05

e.g. for 12684 firmware – 12684-4 (where -4 means issue 4).

### **2.8.3 Instation Firmware ID Command**

The 'FirmwareID' command, issued at the RMS Instation, dials up the selected unit and reports the firmware part number and Issue State.

### 3. GEMINI – TRAFFIC OUTSTATION HARDWARE DESCRIPTIONS

The following base variants of GEMINI units are manufactured –

PART NUMBER	DESCRIPTION
667/1/30600/001	GEMINI – PSTN
667/1/30600/002	GEMINI – GSM POLE ANTENNA
667/1/30600/003	GEMINI – CAR PARK
667/1/30600/004	GEMINI – UTMC
667/1/30600/005	GEMINI – GSM CASE MOUNTED ANTENNA
667/1/30600/021	GEMINI – PSTN WITH PLUG
667/1/30600/025	GEMINI – GSM CASE ANTENNA WITH PLUG
667/1/30600/100	GEMINI – OMU/CPU UPGRADE

I/O Card variants require specifying at time of order.

#### 3.1 SUMMARY OF HARDWARE ISSUE STATES

##### 3.1.1 PSU Assembly – 667/1/30604/000

###### 3.1.1(a) Issue 1

ANL04088 – First Issue

##### 3.1.2 CPU PCB – 667/1/26608/001

###### 3.1.2(a) Issue 1

ANL03425 – First Issue

###### 3.1.2(b) Issue 2

ANL03432 – Development update

###### 3.1.2(c) Issue 3

ANL03434 – Development update

###### 3.1.2(d) Issue 4

ANL03519 – Change test procedure

###### 3.1.2(e) Issue 5

ANL03636 – First Production Release

###### 3.1.2(f) Issue 6

ANL04018 – Correction of Parts List

###### 3.1.2(g) Issue 7

ANL03985 – PCB layout changed

**3.1.2(h) Issue 8**

ANL04239 – Modifications to handset port

**3.1.2(i) Issue 9**

ANL04394 – Correction to items list

**3.1.2(j) Issue 10**

ANL04491 – Improvement to PCB layout to aid manufacturing

**3.1.2(k) Issue 11**

TS002274 – Firmware issue added to items list

**3.1.2(l) Issue 12**

TS002658 – Artwork change to improve soldering during manufacture.

**3.1.2(m) Issue 13**

TS002820 – Update of firmware from PB683 to 12684

**3.1.2(n) Issue 14**

TS002627 – Varnish areas around xtal oscillators

**3.1.2(o) Issue 15**

TS002949 – Change 15 way and 3 way connectors for SMT types.

**3.1.3 I/O Board Assembly – 667/1/26570/000****3.1.3(a) Issue 1**

DRF 0204 – First Issue

**3.1.3(b) Issue 2**

83/18636 - Development Update

**3.1.3(c) Issue 3**

ANL00383 – correct issue status generated by 83/18636

**3.1.3(d) Issue 4**

ANL01603 – If communications on Link 1 or 2 stop when additional Bus I/O Boards are added, remove R90 on both OMU I/O Boards and remark them as Issue 4. The Bus Processor function will not work correctly if R90 is fitted.

**3.1.3(e) Issue 5**

ANL02957 – Add new Part Number to BOM

**3.1.3(f) Issue 6**

ANL03239 – Component Update

**3.1.3(g) Issue 7**

ANL03539 – ADC Reference circuit updated



**3.1.4 Bus/Mova I/O Board - 667/1/27881/000****3.1.4(a) Issue 1**

ANL01009 - First Issue

**3.1.4(b) Issue 2**

ANL01132 - First Production build – item 346 to be changed

**3.1.4(c) Issue 3**

ANL01345 - First Numeric issue – item 344 to be changed

**3.1.5 Digital I/O Board – 667/1/27881/001****3.1.5(a) Issue 1**

ANL03394 – First Issue

**3.1.6 PSTN Modem Kit – 667/1/26598/005****3.1.6(a) Issue 1**

ANL03552 - First Issue

**3.1.6(b) Issue 2**

ANL03582 – Development update

**3.1.6(c) Issue 3**

ANL03674 – Development update

**3.1.6(d) Issue 4**

TS002715 – Change the modem power lead to 667/1/30617/001.

**3.1.7 GSM Pole Mounted Antenna Kit – 667/1/26598/020****3.1.7(a) Issue 1**

ANL03552 – First Issue

**3.1.7(b) Issue 2**

ANL03848 – Update to introduce Cabinet Mounted Antenna as an alternative.

**3.1.7(c) Issue 3**

TS002329 – Correct /GA/ items numbers

**3.1.8 GSM Cabinet Mounted Antenna Kit – 667/1/26598/021****3.1.8(a) Issue 1**

ANL03848 – First Issue

**3.1.9 Radio Clock Kit – 667/7/28191/000**

**3.1.9(a) Issue 1**

ANL01183 – First Issue

**3.1.9(b) Issue 2**

ANL01839 – Update version of Clock Mode to an ‘isolated’ version

**3.1.9(c) Issue 3**

ANL02401 – Updated specification to remove ‘Non Stop Synchronisation’ option

### 3.2 MODEM POWER AND MODEM/CPU COMMS CABLE COMPATIBILITY

MODEM	MODEM POWER CABLE	MODEM/CPU COMMS CABLE
PSTN – DYNALINK (667/7/26582/004)	667/1/30617/001	667/1/30618/000
GSM – TC35 (656/4/21380/001)	667/1/30616/000	667/1/30618/000

**NOTE** - To ensure correct connection to the telephone line, always use the Modem to Line cable supplied with the PSTN modem.

### 3.3 KNOWN PROBLEMS, RESTRICTIONS AND FUTURE ENHANCEMENTS

I/O Board 667/1/26570/000, if link 1 or 2 communications stop when fitting an extra I/O Board, remove resistor R90 on both boards. The Bus Processor function will not work correctly with R90 fitted. An OMU can operate with or without R90 fitted.

On early issues of the Gemini Processor Card (667/1/26608/001), the Handset Port Connector (SK2) was easily damaged due to insufficient support of this connector. Modification to the support of this connector mounting arrangements have been made by adding a 'holding' bracket. Any unit in the field that has not had this modification actioned should be returned to the Repair Department for upgrade.

Intermittent connections have been experienced between the Processor Card and I/O cards. This has been due to the length of the PCB standoff used. The original Standoff was 25mm in length and prevented full insertion of the 64 way connector between cards. A 23mm standoff is now used.

### 3.4 COMPATIBILITY

The Family Tree structure for the GEMINI UNIT is 667/DZ/30600/000.

LMU I/O boards (667/1/26570/000) can be combined with Bus/Mova I/O boards (667/1/27881/000) and Digital I/O boards (667/1/27881/001), but only a maximum of 3 I/O boards can be used.

The I/O boards must be fitted as follows :-

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.

Unit Support Battery – this supports the entire unit including the modem for a minimum of four minutes under all condition in order that the OMU may inform the Instation of a mains power fail.

Modem power is normally gained from the CPU PCB (PL3 where +5v and +12v are available) but can be gained from I/O board #1 (i.e. the first I/O board – can be either LMU or Bus/MOVA type).

If LMU type I/O PCB is used, PL1 connector can supply the modem power, but if Bus/MOVA I/O PCB is used, PL4 connector can supply the modem power. Output voltages that are selectable at these connectors are 5v, 8v and 12v.

## 3.4.1 PCB Compatibility

**Table of Board Type/Issue to Application**

		DUSC	MOVA	SIESPACE	UTMC	BUS	OMU
PCB TYPE	ISSUE						
<b>PSU Assembly 667/1/30604/000</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>CPU 667/1/26608/001</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>004</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>005</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>006</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>007</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>008</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>009</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>010</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>011</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>012</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>013</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>014</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>015</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>I/O Board 667/1/26570/000</b>	<b>Use S1.1/3 to select address – 1 to 3 Use S1.4 for switching lamp monitor between 50/60 Hz</b>						
	<b>001</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>004</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>005</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>006</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
	<b>007</b>	<b>Y</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>
<b>Bus/MOVA I/O 667/1/27881/000</b>	<b>Use switches S5.12 and S6.1/2 to select address - 1 to 3</b>						
	<b>001</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>		<b>Y</b>	<b>Y</b>	<b>Y</b>
<b>Digital I/O</b>	<b>Use switches S5.12 and S6.1/2 to select address - 1 to 3</b>						

<b>Board 667/1/27881/001</b>							
	<b>001</b>					<b>Y</b>	
<b>PSTN Modem Kit 667/1/26598/005</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>004</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
<b>GSM Pole Mtd Antenna Kit 667/1/26598/020</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
<b>GSM Case Mtd Antenna 667/1/26598/021</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
<b>Radio Clock Kit 667/7/28191/000</b>							
	<b>001</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>002</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>
	<b>003</b>	<b>Y</b>	<b>Y</b>			<b>Y</b>	<b>Y</b>

Y – denotes can be used for this application

**3.4.2 Modem Compatibility**

GEMINI Firmware	GEMINI Modem	RMS Instation Pace PMC33.6 or Lasat 288 or Dynalink PKS-5600 forced V21 (300baud)	RMS Instation Pace PMC33.6 or Lasat 288 or Dynalink PKS-5600 auto baud	Maximum Data Rate with auto baud  Instation Modem
GEMINI PB683 Issues 1 onwards	Dynalink PKS-5600- A-P/M	OK	OK	19200 baud
GEMINI PB683 Issues 1 onwards	TC35 GSM	Not Compatible	OK	9600 baud
GEMINI 12684 Issues 1 onwards	Dynalink PKS-5600- A-P/M	OK	OK	19200 baud
GEMINI 12684 Issues 1 onwards	TC35 GSM	Not Compatible	OK	9600 baud

NOTE – When using a Dynalink PKS-5600-A-P/M as an instation modem a PSU RS Part No. - RS 293-2448 along with a 9-25 way cable RS Part No. - RS 202-644 is required.