Siemens Traffic Controls
Sopers Lane
Poole
Dorset
BH17 7ER

HEIMDALL ABOVE GROUND SCOOT and MOVA DETECTOR

GENERAL HANDBOOK

THIS DOCUMENT IS ELECTRONICALLY HELD AND APPROVED

PREPARED: A Rhodes

FUNCTION: Product Engineer

Issue	Change Ref	Date
3	TS004728	October 2008
4	TS007704	October 2014

HEALTH AND SAFETY AT WORK

Safety of Installation and Maintenance Personnel

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

(1) 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/electronic equipment, are to be allowed to use and/or work on this equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989.

(2) Such personnel must take heed of all relevant notes, cautions and warnings in this Handbook and any other Document or 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 and/or isolated from the incoming power supply before removing any protective covers or working on any part from which the protective covers have been removed.

(c) **Mains voltages may be present within Traffic Signal heads.** Before any maintenance work within the Signal Head is carried out, any mains supply to it must be isolated / switched off.

(d) Only trained / competent persons should work on this equipment. This includes persons who are employed to change bulbs. All wiring has basic insulation and should be regarded as hazardous, i.e. hazardous voltages are accessible if the insulation is damaged.

(e) Surfaces within the associated traffic signal get hot, e.g. lamp, lens and reflector. Therefore care should be taken when working in such areas.

(f) Any power tools must be regularly inspected and tested.

(g) Any ladders used must be inspected before use to ensure they are sound and not damaged.

(h) When using a ladder, before climbing it, ensure that it is erected properly and is not liable to collapse or move. If using a ladder near a carriageway ensure that the area is properly coned off and signed.

(i) Any personnel working on site must wear the appropriate protective clothing, e.g. reflective vests, etc.

Wireless Safety

The Heimdall detector hardware is a microwave device.

This product does emit RF signals which are below the statuary requirements. However, it is recommended that precautions are taken to reduce prolonged exposure when operating directly in front of the Heimdall antenna area.

The Heimdall detectors may also include a wireless device which will only transmit when a wireless connection is made from authorised maintenance personnel using Siecom software. When connected to Siecom, the wireless transmitter within the plastic case should have a separation of at least 20cm between the case and the body of the user or nearby persons, excluding hands, wrists, feet and ankles.

Safety of Road Users

It is important that all personnel are aware of the dangers to road users that could arise during repair and maintenance of traffic control equipment.

Ensure that the junction area is coned and signed as necessary to warn motorists and pedestrians of any dangers and to help protect the personnel working on the site.

Personnel should also ensure the safety of pedestrians, especially children, who may come into contact with parts of the signal poles.

MAINTENANCE PROVISION (MP)

1. Product Reference

Heimdall Above Ground Detector

2. Specifications

The Heimdall Detector is designed to meet the following specifications:

667/BH/31900/001	Heimdall Above Ground SCOOT and MOVA Specification

3. Installation and Commissioning

Methods of Installation are described in this handbook. In addition, there is also a document written specifically for installation engineers who do not need all the information contained in this document. This document is listed as:

667/1/31900/340	SCOOT and MOVA Detector Installation Instructions

Table 1 – Installation Document

4. Spares and Maintenance

The Heimdall Above Ground Detector unit is designed for 'return to base' repair - there are no user serviceable parts contained within the enclosure. In the case of a faulty device, replace the unit, ensuring product settings (DIP switches, see section 3.7) and orientation (see section 3.6.1) are identical to those on the original unit.

5. Modifications

There are no approved modifications for this product.

6. Warning

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

TABLE OF CONTENTS

FIGURES

TABLES

1. INTRODUCTION

1.1 Purpose

This handbook gives a general description and specification for the Heimdall SCOOT and MOVA above ground detectors. It outlines the general procedures for installation, commissioning and maintenance.

Detailed installation instructions can be found in this document and in addition, the appropriate installation guide (reference section 1.2).

1.2 Related Documents

667/HE/20661/000 – General Installation Principles
667/HE/20662/000 – Signals and Poles (for reference only)
667/HE/20663/000 – Detectors and Cable Terminations
667/HE/20664/000 – Installation and Testing
667/HE/20665/000 – General Installation guide for Above Ground Detectors
667/HB/30875/000 – SieCom Handbook

1.3 Definitions

AGD	Above Ground Detector
CRC	Cyclic Redundancy Check
CR/LF	Carriage Return/Line Feed
DIP	Dual In-Line Package
DFM	Detector fault Monitor
EEPROM	Electrically Erasable & Programmable Memory
HA	Highways Agency
LED	Light Emitting Diode
MP	Maintenance Provisions
PCB	Printed Circuit Board
PDA	Personal Digital Assistant
PLL	Phase-locked Loop
RF	Radio Frequency
SCOOT	Split Cycle Offset Optimisation Technique
SieCOM	Siemens Intelligent Traffic Signal Communications Terminal
SiTOS	Siemens Traffic Communications Protocol
STC	Siemens Traffic Controls

1.4 Issue History

1	Release
2	Update
3	Update for FMCW release issue 3

2. General Detector Information

The Heimdall series of above ground detectors incorporates ‘state of the art’ radar antenna design tailored to the specific requirement of SCOOT and MOVA applications.

The detector is housed in a low profile enclosure to reduce ‘eye clutter’.

Figure 1 : Heimdall Detector

2.1 Identification Label

The detector will have an identification label affixed to the back of the unit. The label identifies the detector type, part number, any optional extras and serial number.

Figure 2 – Example (SCOOT) Detector Product Label

2.2 Interface

The Heimdall detector has three main interfaces.

LED

An LED indicator is mounted on the side of the detector which gives a visual indication of the detector status. The LED will be ON for the detect state.

The LED indicator is built into the side access door, which may be fitted so that it either faces forwards (towards on-coming traffic) or backwards (away from on-coming traffic) dependant on detector type - see section 4

Interface Cable

Detectors are supplied with a standard interface cable fitted with a Bulgin Buccaneer connector – see section 3.5

Configuration DIP Switches

All detectors are fitted with configuration DIP switches.

Refer to the detailed detector specification (section 4) and commissioning section (section 5) for detailed explanation of these configuration facilities.

2.3 Product Options

There are several additional interface options available. These are identified as follows;

SiTOS Serial Interface:

The SiTOS interface provides a facility to transfer detailed detector status/information to a controller equipped to use the SiTOS (serial) communication protocol. Section 3.8 should be referenced when installing detectors equipped with this option.

Siemens Wireless Link:

A wireless add-on can be included with allows the Heimdall detector to be configured wirelessly using the Siemens SieCom facility.

Section 6.2 should be referenced for further information.

Second Isolated Relay Output:

A second, isolated, detector output may be added for an additional detector status output. The second detector output may for example, be used to identify a fault condition.

2.4 Electrical Details

All Heimdall detectors can be powered from either:

24V AC ± 20% (48 to 63 Hz)

or

24V DC ± 20%

Detailed current requirements are dependant on detector type, and this information may be found in the appropriate detector specification section (reference section 4).

2.5 Mechanical Details

a) Weight

Less than 1.6Kg

b) Dimensions

150mm x 135mm x 90mm (h x w x d) - to the bottom of mounting bracket.

3. HEIMDALL DETECTOR – GENERAL INSTALLATION INSTRUCTIONS

3.1 General Introduction

This section outlines the general information required when installing a Heimdall Above Ground detector.

3.2 Tools Required

As well as a standard Installers tool kit, the following are required when installing and maintaining the Heimdall Detector:

- 1.5mm Allen key – for side access door and lid
- T-8 Torx driver – alternative tool for side access door and lid.
- 13mm Socket spanner - for angular adjustment and installation of detector
- Small flat bladed screwdriver – for DIP switch adjustment

3.3 Order of Installation

The recommended order in which installation should take place is as follows:

1. Read the Safety Warning on page 2 of this Handbook.
2. Unpack items from packaging (reference section 3.4)
3. Set configuration DIP switches (in most cases the detectors will be supplied ready to fit, if it is required change these settings then consult appropriate detector requirements in section 4)
4. Fit Detector to appropriate mounting structure (refer to appropriate detector requirements – reference section 4).
5. Perform initial Detector Alignment (refer to appropriate detector requirements – reference section 4)
6. Connect detector to bulkhead mating connector
7. Final commissioning (section 5).

3.4 Detector packaging

Heimdall Detectors are supplied individually in a packing box. The label on the side of the box details the detector type and part number.

Each detector box contains the following:

- Heimdall Detector with the interface lead attached;
- A mating connection lead which will (typically) be installed within the traffic signal enclosure;

- Gasket, grommets and fixing screws for the mating connector installation;
- Optional labels detailing the Heimdall Wireless Link access addresses.
- Quick Installation Guide

Figure 3 – Heimdall Detector

Figure 4 – Mating Cable & Fixing Kit

3.5 Electrical Connections – Bulkhead Connector

3.5.1 General

All Heimdall detectors are equipped with a captive lead and a standard 9 pin ‘Buccaneer’ connector (see Figure 5).

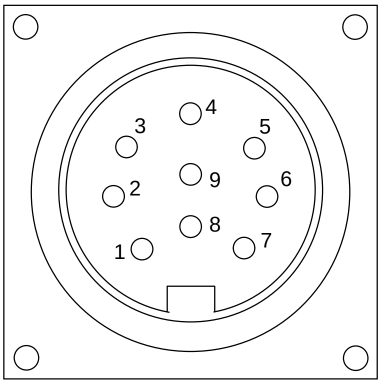

Figure 5 – Buccaneer Bulkhead Connector (front view)

The wires from this connector should be terminated in accordance with the details shown in sections below.

Note 1: Particular attention should be paid to the correct termination of the power supply wires. The RED wire should be used for the POSITIVE AC/DC supply feed and the Black wire for the NEGATIVE supply return.

Note 2: When installing this detector with a 24 AC source, please ensure the 24 AC source is derived from an earthed secondary transformer (as used in standard traffic installations).

Note 3: When using 24 AC supply, only use battery powered interface equipment (e.g. laptop, PDA). Do not connect mains powered/connected equipment to the Heimdall series of detectors, as this will cause the detectors to fail.

Note 4: When installing this detector with a Siemens ELV controller or a Siemens ELV controller additional supply, please ensure the RED wire of the interface cable is connected to the POSITIVE (common) connector, the BLACK wire is connected to the NEGATIVE (-24VDC) source and the GREEN (screen) is connected to the POSITIVE (common) connector.

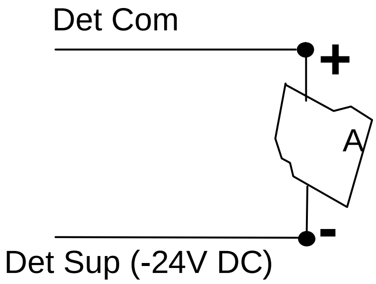

Figure 6 : ELV Detector Power Connections

The pin out for the connector is as specified in the Highways Agency Specifications: TR2505 and is detailed in the following tables.

The Heimdall detector provides additional facilities using the spare connections within the 9 way connector. These are all outlined in the tables below (Table 2, Table 3 and Table 4).

3.5.2 Standard Output Cable

Applicable to: Standard and Wireless Variants (667/1/31900**/xx0 & /xx2)**

Connector Pin No.	Comment	Colour Code
1	Detector Supply (Positive) AC/DC	Red
2	Detector Supply (Negative) AC/DC	Black
3	Screen	Green
4	Detector O/P #1&2 (Common)	White
5	Detector O/P #1 (Normally Open)*	Yellow
6	Detector O/P #1 (Normally Closed*	Blue
7	Not Used	Violet
8	Not Used	Orange
9	Not Used	Brown

Note: *** This signal condition refers to the state when the detector is un-powered (detect state).**

Table 2 – Standard Output Cable Configuration

3.5.3 SiTOS Output Cable

Applicable to: SiTOS variant (667/1/31900**/xx1)**

Connector Pin No.	Comment	Colour Code
1	Detector Supply (Positive) AC/DC	Red
2	Detector Supply (Negative) AC/DC	Black
3	Screen/ RS485 Ground	Green
4	Detector O/P #1&2 (Common)	White
5	Detector O/P #1 (Normally Open)*	Yellow
6	Detector O/P #1 (Normally Closed*	Blue
7	Detector O/P #2 (Normally Open)*	Violet
8	SiTOS RS485 (Terminal A)	Orange
9	SiTOS RS485 (Terminal B)	Brown

Note: *** This signal condition refers to the state when the detector is un-powered (detect state).**

Table 3 – Standard Output Cable Configuration

3.5.4 Isolated Second Output Cable

Applicable to: Second Output Variants (667/1/31900**/xx3 & /xx4)**

Connector Pin No.	Comment	Colour Code
1	Detector Supply (Positive) AC/DC	Red
2	Detector Supply (Negative) AC/DC	Black
3	Screen	Green
4	Detector O/P #1 (Common)	White
5	Detector O/P #1(Normally Open *)	Yellow
6	Detector O/P #1(Normally Closed *)	Blue
7	Detector O/P #2 (Common)	Violet
8	Detector O/P #2 (Normally Open *)	Orange
9	Detector O/P #2 (Normally Closed *)	Brown

Note: *** This signal condition refers to the state when the detector is un-powered (detect state).**

Table 4 : Output Cable Configuration with Isolated Second Detector O/P

3.6 Alignment Features

The Heimdall detectors have two built-on features which help with alignment - angle markings and 'gun-sight'.

3.6.1 Angle Markings

The Heimdall detector mounting-base has a series of markings which denote 5 degree angle steps. An installer may use these as an aid to alignment, with regards to detector angle.

The Heimdall detector body has an arrow which lines up with one of several notches that are moulded onto the mounting-base (see Figure 7). To make the setting easier, every third notch is larger (major) than the intervening (minor) notches.

With the arrow lined up with the first major notch (the one nearest to the rear of the detector) the angle of the detector is zero (horizontal). The next two minor notches are 5 degrees and 10 degrees from horizontal (detector tilted forwards). The next major notch will align the detector to 15 degrees from the horizontal.

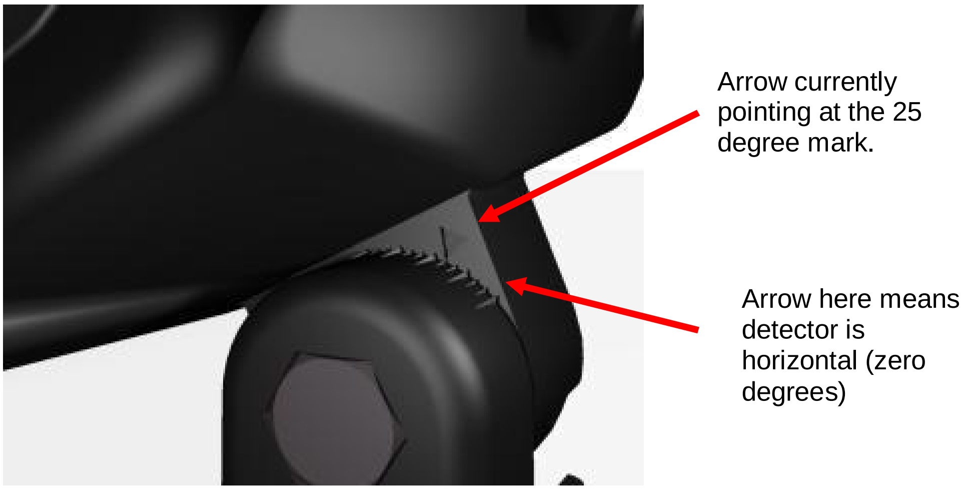

Figure 7 : Angle Notches on Heimdall Detector

It should be noted that these angles are all in relation to the mounting surface of the detector which is not necessarily the same as that of the road surface.

3.6.2 'Gun-Sight'

'Gun-sight features are moulded onto the detector case lid, which an installer may use to help align the detector. The detector specifications (reference section 4.0) will each indicate the appropriate aiming point depending on detector type.

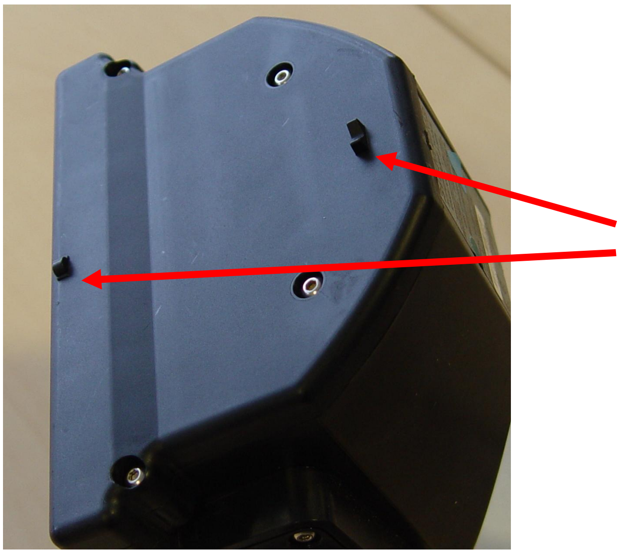

Figure 8 : 'Gun sight' features on Heimdall Detector

3.7 General Detector Configuration Facilities

All Heimdall detectors are equipped with switches that enable the unit to be installed, for the majority of applications, without the need for any special terminal (handset) equipment.

Access to these switches is gained by removal of the side access door. This comes with a 'built-in' retention mechanism to prevent it falling to the ground when removed from the body. Before removal, make a note of the cover's orientation and ensure it is replaced the same way round (refer to appropriate detector specification (section 4) for orientation).

The switches on the PCB nearest the front of the detector (Digital Processor Board) control the basic functions of the detector and are described in more detail in the appropriate sections (4.x) of this handbook. This switch is referred to, throughout this document, as the 'Detector Configuration DIP Switch'.

The switches provided on the PCB nearest the rear of the detector (Special I/O Board) control the operation of the Siemens Serial Interface (SiTOS). This switch is referred to, throughout this document, as the 'SITOS Interface board DIP Switch'.

For applications that require communication with a SiTOS enabled controller (or any SiTOS enabled master communications device)[1], this will require the SiTOS enabled detector to be enabled for SiTOS communications. The Detector Configuration DIP switch 8 is used to control this mode of working.

[1] The SiTOS facility requires a particular variant of the Heimdall detector. See Section 1.2

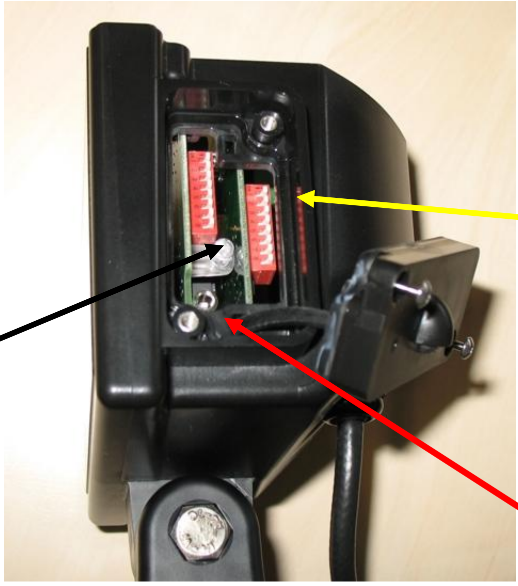

Figure 9 – Heimdall Detector (View with Side Access Door removed)

Priority of configuration is as follows:

1. **If the Digital Processor board dip switch 8 is set to ‘0’ –**
   - DIP switches 1 to 7 have full control of the detector configuration settings.
   - The terminal handset has no write access, with the exceptions where the DIP switch settings allows for terminal settings to be applied. However the user Terminal will have full read access.
   - SiTOS has no write or read access.

2. **If the Digital Processor board dip switch 8 is set to ‘1’ –**
   - SiTOS has full configuration with both read and write access.
   - The settings of dip switches 1 to 7 are ignored.
   - User Terminal will normally not have any write access. The exception is the command SME=249 (override command). This has the effect of temporarily disabling SiTOS access and allowing the terminal to have full write access to the configuration setting. The temporary period will terminate after 20 minutes of terminal inactivity.

If Dip switch 8 is set to 1, but a SiTOS interface is not connected, then the (wireless/wired handset) user terminal will have full write and read access. This situation occurs since an unconnected SiTOS will not overwrite the setting applied by the terminal handset.

3.8 Heimdall Serial Communications Installation (SiTOS)

The Heimdall Detector can be equipped with a serial communications facility to enable the detector status, configuration parameters and vehicle data (if appropriate) to be requested by a SiTOS enabled host controller (equipment).

This facility utilises the industry standard RS485 two wire serial communication technique. A number of detectors can be attached to a common pair of wires and can be interrogated on an individual basis. To achieve this it is necessary to assign a unique address to each detector on the common pair using the dual-in-line switch located on the special serial interface card (see Table 5 for details).

SiTOS DIP Switch Number							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SW 1: **Line** **Termination** 0 = Disabled 1 = Enabled	**SW 2,3:** **Not Used**		**SW 4 to 8:** **(SW 4 = MSB, SW 8 = LSB)** **Detector Address:** 0,0,0,0,0 = Address 0 (00h) 0,0,0,0,1 = Address 1 (01h) ………… 1,1,1,1,1 = Address 31 (1Fh)				

Table 5 – Serial Communication (SiTOS) Configuration Switches

Note: Some DIP switches may be marked with ON/OFF. For the purposes of definition, OFF is equal to 0 and ON is equal to 1.

Each detector address should be set in accordance with the installation information supplied with the host equipment. This will also define when the ‘Line Termination’ switch (SW 1) should be used.

4. HEIMDALL Above Ground Detectors – Technical Details

This section outlines specific technical details of the SCOOT and MOVA detector.

Installation will normally be followed by commissioning. The final commissioning details may be found in section 5.

4.1 SCOOT and MOVA Detector

4.1.1 Performance Details

Operating Range:	N/A.
Lane Width:	Replicates the function of a normal single lane SCOOT or a MOVA 'in' loop.
Vehicle Approach Speed Range:	0Km/Hr (0 MPH) to 112 Km/Hr (70 MPH)
Detection Presence Time:	1 to 30 minutes (4 minutes default)
Detector Location:	Normally located on the 'nearside' road position.
Detector Mounting Height Range:	Various Pole/Mast heights (above the ground) can be accommodated from 3.3m to 8.0m[1].
Accuracy:	98% accuracy on vehicle count
LED Orientation	Facing Backwards (reference section 2.2)

4.1.2 Part Number

Description	**Siemens Part No.**
SCOOT and MOVA Detector	667/1/31900/04X

Table 6 – Heimdall SCOOT and MOVA Detector Part Number

Note: In the above table 'x' will be replaced by the following:

0 - Basic Detector

1 - Basic Detector with RS485 (SiTOS) Serial Interface

2 - Basic Detector with Wireless Link Interface

3 - Basic Detector with a Second Solid-State Relay Output

4 - Basic Detector with both a Wireless Link & a Second Solid-State Relay Output

[1] Actual SCOOT 'footprint' will be dependant on the mounting height.

4.1.3 Power Consumption

The overall power consumption will depend whether any additional facilities are provided. Table 7 below lists the typical current requirements:

Detector Type	**24V AC Supply**	**24V DC Supply**
SCOOT and MOVA Detector	143mA	113mA

Table 7 – Detector Power Consumption

Note: When power is first applied to the detector the following surge currents are drawn from the supply:

DC Supply: 3.2 Amps (max) for < 2 ms when the supply is 29V DC.

AC Supply: 4.2 Amps (max) for < 2 ms when the supply is 29V AC.

If the detector has additional facilities fitted then the currents listed in Table 8 below should be added to that shown Table 7.

Additional Facility	**24V AC Supply**	**24V DC Supply**
Siemens SiTOS Serial Interface (connected)	6mA	5mA
Siemens Wireless Interface (connected)	11mA	10mA

Table 8 – Additional Facilities Power Consumption

Refer to Section 9 for details on power and cable length calculations.

4.1.4 Detector Installation Instructions

4.1.4.1 Detector Position

The detector should be located on a suitable mounting pole located alongside the detection zone.

Please ensure the installation location of the detector is clear from obstructions, such as signs, trees etc. such that there is a clear line of sight from the detector to the road.

Failure to adhere to this recommendation will reduce detector performance.

4.1.4.2 Detector Height

The detector should be located on a suitable mounting pole located alongside the detection zone. The detector may be mounted at any height between 3.4 and 8m, with the 4m height considered optimum. Ensure that the appropriate height range has been selected, using the appropriate DIP switches, as detailed in section 4.1.5 or using the appropriate terminal command DMH.

The equivalent loop size will vary depending on installation height, thus:

4m – equivalent loop size 1.8m

6m - equivalent loop size 2.3m

8m – equivalent loop size 2.7m

The factory default is for installation heights <4.5m.

4.1.4.3 Detector Angle

The initial installation angle will change depending on the installation height. As a guide these are listed as:

4m – 55 degrees from horizontal

6m – 75 degrees from horizontal

8m – 85 degrees from horizontal

4.1.4.4 Detector Alignment - default

The detector default setup uses a static detection algorithm. The detector is aimed perpendicular to the traffic flow and just below the centre of the carriageway, as shown in Figure 10 below. To use this installation method, ensure DIP switch 6 is set to ‘0’, or using the appropriate terminal command ‘DAA’ is set to ‘0’[1]. This is factory default.

For optimum performance, it is recommended that this alignment is used.

[1] **Please read section 0 carefully to fully comprehend configuration priority**

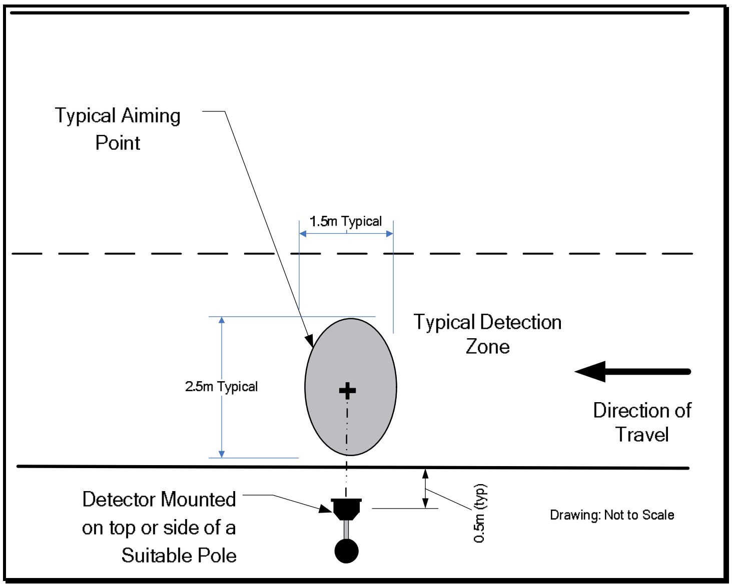

Figure 10 – SCOOT and MOVA Detector Installation – Plan View (4m installation – Static Algorithm)

4.1.4.5 Detector Alignment – optional

With this optional method, the detector uses a combined 'movement & static' detection algorithm. In this case the detector is aimed slightly towards oncoming traffic and towards the centre of the centre of the carriageway, as shown in Figure 11 below.

To use this installation method, use configuration DIP switch 6 (set to '1'), or using the appropriate terminal command 'DAA' set to '1', to activate the combined 'movement & static' detection algorithm.

For optimum performance, it is **not** recommended that this alignment is used. However, this alignment can be used where vehicles moving towards the detector are the only ones that will trigger but a drop in detection performance is acceptable. This may be of use on installations, for example, with very narrow lanes.

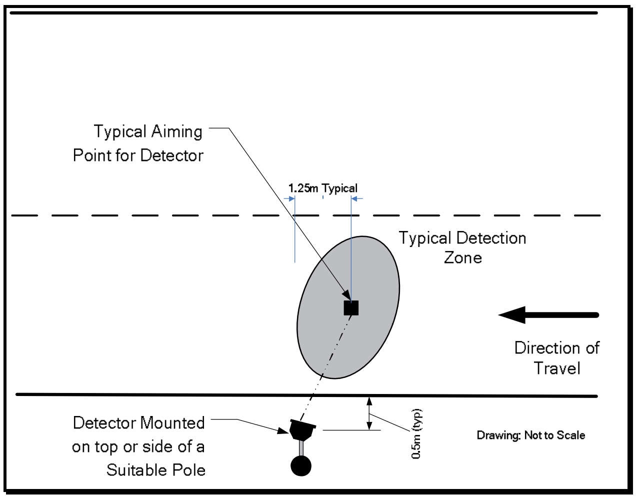

Figure 11 – SCOOT and MOVA Detector Installation – Plan View (4m installation – Static & Movement Algorithm)

4.1.5 Side Access Configuration Dip Switch Settings

Configuration DIP Switch Number							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
SW 1,2: **Detector Height** 0,0 = < 4.5 m 0,1 = 4.5m to 6.5m 1,0 = > 6.5m 1,1 = As per 0,0		**SW 3,4:** **Detector LED** 0,0 = Normal Detector O/P, 0,1 = Permanently Off, 1,0 = Detector O/P for 20 mins. after power applied, 1,1 = Normal Detector OP.		**SW 5:** Not Used	**SW 6:** **Detection Alignment** 0 = Perpendicular (static only) 1 = Angled (static + movement)	**SW 7:** **DFM** 0 = Default monitor time (20hours inactive) 1 = 'fault monitor time' is set by the Engineer's Terminal	**SW 8:** **Remote Configuration** 0 = Disabled 1 = Enabled

Note: Some DIP switches may be marked with ON/OFF. For the purposes of definition, OFF is equal to 0 and ON is equal to 1.

Table 9 – SCOOT and MOVA Detector Configuration Switch Settings

Refer to section 5 for detailed information regarding final commissioning.

5. COMMISSIONING

The detector should have been installed as detailed in Section 3 and Section 3.7, which include the adjustments for the tilt / alignment to the specific point on the road surface.

5.1 General Installation Check

Before applying power to the Detector, ensure that the following checks are undertaken:

- Detector power leads are connected to the correct terminals within the pole;
- The correct detector relay outputs are used. For a standard detector these are usually **blue & white** (i.e. closed for detect);
- The detector basic configuration dual-in-line switch located on the Digital PCB has been set correctly (refer to the sections specific to the detector).

  Note: In most instances the default setting, all off (0), will be the correct setting, unless special circumstances apply. See the specific installation instructions for each particular detector to determine the correct setting.
- The Serial Communications interface terminations (if required) are connected to the appropriate signal leads within the pole;
- The Serial Communications interface Address Switch (if applicable) has been set to the correct address for that particular communications line to the associated controller (see Controller Configuration documentation).
- The wireless interface MAC address label (if supplied) is stored in a suitable location (e.g. the nearest traffic controller cabinet).

5.2 Final Commissioning Procedures

Power is applied to the unit and the operation of the detector observed by looking at the output from the indicator LED which is visible on the side door. If necessary, adjustment can be made to the alignment by:

- ‘slackening off’ the mounting nut slightly,
- making the minor adjustment whilst, at the same time, observing the detector operation by looking at the LED;
- re-tighten the mounting nut.

The controller’s input status should then be checked to ensure the detector signal is connected as required.

Ensure the detector configuration access door is replaced correctly. Refer to appropriate detector specification (reference 4).

6. HANDSET CODES

A range of functions and setting can be accessed on each Heimdall detector by using appropriate terminal software and hardware.

The full list of User Terminal codes are defined in Section 6.7.

6.1 Interfacing with Heimdall using a Terminal (Emulator) and a cable serial Interface

Either a PC or a PDA, in conjunction with appropriate terminal software[1], may be used as a terminal.

The terminal (either PC or PDA) should be connected to the Serial Interface connector on the detector using a suitable serial interface cable (667/1/31962/000).

The Detector communicates at 19200 baud using 8 data bits with **no** parity bit, **one** stop bit (8,N,1) and no ‘Flow Control’.

When the Terminal is connected and the ‘***return***’, ‘***enter***’ or ‘***CR/LF***’ key pressed a number of times ‘***SIEMENS***’ should be displayed together with a prompt character ***‘>’*** indicating that the terminal has been recognised and is awaiting a user commend.

The user command tables can be found in section 6.7.

6.2 Interfacing with Heimdall using Siecom and a wireless/cable serial Interface

The Heimdall detector can be accessed by a wireless device using the STC Siecom Terminal application (part number 667/1/30875/000).

The following instructions assume the Siecom software has been installed on a PC or PDA, as required. For detailed Siecom installation details please refer to the Siecom users Handbook (reference section 1.2).

It is recommended that the appropriate Heimdall detector Equipment Definition File (EDF - 667/YK/31977/001) has been installed in order to enable access to all appropriate handset commands.

6.2.1 Managing Sites

Prior to attempting communication with the on-site equipment, you need to create and select a 'site' definition file, using the Siecom software. A site will normally be associated with each detector location.

A ‘site’ definition file contains information on the communication method, wireless address (where appropriate), equipment type, communication settings, and any additional useful reminder information.

---

[1] Example terminal software for PC would be Hyperterm and for a PDA ZTerm.

Site Definition File Creation

To create a new site definition file, select **Site -> New** from the menu. A blank site properties window is displayed allowing the site information to be entered.

Site Definition File Selection

To select an existing site definition file select **Site -> Open** from the menu. A file browsing window will be displayed to allow the site file to be selected. Once the file has been selected a prompt will be displayed asking if you want to connect to the site. If you are opening the site to make configuration changes or just to view the settings select the 'No' button. If you want to connect to the equipment select the 'Yes' button, see section on Site Connection 6.2.2

Saving Site Definition File Changes

To save select the menu Site -> Save.

Cloning a Site Definition File

It is possible to clone a site by opening an existing site definition file, changing the address and specific information and selecting **Site > Save As...**

Site Definition File Properties

Info Tab:

- **Site Id**
  This is the unique site reference identifier and will be used as the default file name for the site definition file. Can also be used in scripts.
- **Name**
  A user friendly name for the site. Can also be used in scripts.
- **Description**
  This gives the user information regarding equipment configuration, location, etc.

Settings Tab:

- **Primary Equipment File**
  Allows an equipment file to be specified. The primary file is configured for the equipment, whose handset port, Siecom will be connected to. In this case the Heimdall Equipment Definition file would be used. All sites must have a correctly configured primary file as this contains the information on how to talk to the specific type of equipment. When the equipment file is changed a prompt will ask if you want to use the default communication settings for the equipment. Under normal circumstances 'YES' should be selected, as this will remove the need for manual input of some of the communications settings referenced below.

Comms Tab:

- **Connection Type**
  Set the connection tab to indicate 'wireless' for wireless connections or 'direct' for cabled connection.

- **Address (not required for 'direct' connections)**
  Since the connection type is wireless then the (MAC) address of the Heimdall unit must be used. The wireless Heimdall MAC address is in the format 00:04:3E:25:XX:XX where X is a hexadecimal digit in uppercase. This address will normally be found supplied with the unit and should be stored safely (e.g. in the nearest controller cabinet). **If the MAC address has been misplaced, the unit will need to be returned to Siemens for address recovery;**

Siemens Traffic Controls
R&R Department
Sopers Lane
Poole, Dorset
BH17 7ER

The following settings are those loaded from a specified equipment file, if selected.

- **Baud Rate**
  The baud rate should be set to 19200 for correct Heimdall communications.

- **Data Bits**
  Number of data bits should be set to **8**.

- **Stop Bits**
  Number of stop bits for each byte should be set to **1**.

- **Parity**
  Type of check bit used to validate the byte should be set to **None**.

Click the OK button to close the properties window. At this point any changes are not saved. To save, select **Site -> Save**.

6.2.2 Site Connection

Once a site file has been successfully opened it is possible to connect to the equipment by selecting **Site -> Connect** from the menu. For wireless connections this can take a number of seconds especially if the Bluetooth is switched off, and also depending on the current environmental conditions. It is recommended to start at a close distance for the first connection to ensure range is not an issue. Generally once the connection is established the range can be increased to a point beyond that at which an initial connection could be achieved.

If the correct EDF has been installed, a successful wireless connection will be indicated by '***SIEMENS***' together with a ***'>'*** being displayed.

If repeated connections fail, then a SOFT reset of the Pocket PC may be required.

6.2.3 Site Disconnection

Once the equipment connection is no longer required, select **Site -> Disconnect** to close down the connection to the equipment.

6.3 Access Levels

This section describes how to use the terminal to view and modify data within the Detector.

There are two levels of access as follows:

Level 1 (R)	Read Only
Level 2	Modify/Initialise data items.

Access Level 1 (R)

No special access codes are required for *Access Level 1* as it is 'Read Only' and does not change any detector data/configurations etc.

Access Level 2

To enable *Access Level 2* access, enter the appropriate **'SME'** numeric code, as described in Section 6.7.2.

Level 2 access will remain enabled for approximately 20 minutes or until the terminal is unplugged or the wireless link has been disconnected. Entering the security code again will give another 20 minutes of level 2 access.

6.4 Command Format

All operator commands commence with a three-character command code indicating the parameter to be monitored or changed. See Section 6.7 for a full list of commands.

This 'mnemonic' is normally an abbreviation of the associated parameter making them easier to remember, for example, entering the mnemonic '**DOS**' displays the **Detector Output Status** on the User Terminal

Following the three-character mnemonic may be one or two indexes before the required information is displayed.

For example;

MPT

After the 'mnemonic' and the indexes (if any), the Detector will display the current value of the parameter. A colon '**:**' is used to separate this from the mnemonic and indexes.

Therefore, to view the current value of the Detector Presence Timeout Period, the following command would be entered and then the result would be displayed:

Keystrokes	Display
MPT↵	MPT:4,0

i.e. The detector output will timeout after continuous detection of 4 minutes duration

To modify the value, the full command can be entered followed by an equal sign '=' and the new value required.

> Note: Write access may need to be entered first before data can be modified; see page 32, and most commands have configurable range limits to limit the range of values that can be entered.

Keystrokes	Display
MPT =5,0↵	MPT:5,0

Once the required parameter is being displayed, the value can be modified by simply entering '=' and the new value, without needing to re-enter the mnemonic and the indexes:

Keystrokes	Display
MPT↵	MPT:4,0
=	MPT=
5,0	MPT=5,0
↵	MPT:5,0

Once a command has been entered and the result is being displayed, the '**+**' and '**-**' keys can be used to display the information for the next or previous index:

Keystrokes	Display	Comment on Detected Vehicle
FLG↵	FLG 1:23	Last event (stored in log position 1) is error 23 (unit bootup)
+	FLG 2:255	No error in event log position 2
-	VCL 1:23	Error 23 (unit bootup) at log position 1

6.5 Terminal Error Codes

If the command entered contains an error, the command is re-displayed up to the point at which the error was detected and then one of the following error codes is displayed.

For example, entering the following command results in the error message shown:

Keystrokes	Display
SPH=100000↵	SPH=1000*R

Table 10 below, lists all of the terminal error codes.

Error Code	Name	Description
*A	Access Level	Access level for this command has not been enabled.
*B	System Busy	The terminal system is still busy storing the data from the previous command into checksum protected memory.
*C	Not Configured	The facility to which the command relates is not available on this Detector.
*F	Fixed Index	The + and - keys are not applicable to current command.
*I	Inaccessible	The facility to which the command relates is not accessible, i.e. Detector not configured to provide the facility or communications has with the host has failed.
*M	Mnemonic Not Recognised	The three-character command mnemonic is not recognised.
*N	Needless Index	An index (+ or -) has been added to a command without an index.
*O	Index Out of Range	The index (+ or -) entered is Out of Range for the current command.
*P	Premature End Of Line	The command line contains insufficient data, i.e. additional index or value input required.
*R	Range Error	The preceding value is out of range; i.e. is outside of the limits defined for that command.
*S	Syntax Error	Invalid character detected at the point immediately preceding the asterisk.
*U	Upload Only	The detector is in 'Firmware Upload Mode'. Only commands 'SME' & 'LNF' are recognised.
*V	Invalid Current Address	An '=', '+' or '-' operation has been attempted but no valid terminal command is currently being displayed.
*W	Write Protected	Modification of the information specified in preceding command not permitted. The information is read only.

Table 10 – Terminal Error Codes

6.6 Terminal Displays

In addition to the 'static' displays described so far, the detector may be continuously updating some outputs.

For example, entering '**DOS'** displays the current detection status:

Keystrokes	Display	Comment
DOS↲	DOS:0	No vehilcle detected
	DOS:1	Vehilcle detected
	DOS:0	No vehilcle detected
	...	...

Although not clear from the above diagram, the new display will appear on the same line as the original, thus overwriting the old display, and not on the following line as the diagram may imply.

Note: Functions that have data changes which occur more often than once a second may not be accurately reflected on the terminal display.

For example;

If ‘DOS’ is used to display detector activations, then very short activation (<200mS) may not appear on the terminal display.

6.6.1 SieCom Implemention

The user may find they are using the Siemens SieCom interface connection with either a cable connection or a wireless link. In both cases, if a continuous updated is required the command **‘POLL’**[1] must precede the updateable command.

For example; ‘POLL DOS’ will provide a continuous updated display of the detector output condition.

[1] This is a function of the Siecom terminal interface not the detector unit. If terminal connection is made via a normal terminal unit (e.g. hyperterminal), then the ‘POLL’ command will not be required.

6.7 Detector Terminal Handset Commands

6.7.1 Status Commands

	DESCRIPTION AND REMARKS	
ADD	ADD: < SiTOS Detector Address, 0 to 31>	R
DOS	DOS 0: < Detector Output 0 Status, 0 or 1> (‘0’= Inactive, ‘1’= ‘Active’) DOS 1: < Detector Output 1 Status, 0 or 1> (‘0’= Inactive, ‘1’= ‘Active’) DOS is updated every 200mS and indicates detector states.	R

Table 11 – Status Commands

6.7.2 Test & Access Facilities

	DESCRIPTION AND REMARKS	
DEF	DEF: <Reset Configurations to Default, n> Where: n = 0 – Normal Operation = 1 – Return the detector handset Configuration values to the ‘factory default’ setting.	2
LED	LED = <0 or 1> Where: 0 – LED display is as per the IND command (default) 1 – LED Flashing for 10 minutes to confirm Bluetooth connection. LED will report return to normal operation after ten minutes (LED: 0).	2
SME	SME = 249 Access enable code for ‘Level 2’. **Notes;** **1) This is the only command that can be written whilst the detector is under SiTOS control.** **2) The SiTOS control is applied by using DIP switch 8 on the Digital Processor card. (I.e. Left hand card when viewed through the access door).** **3) Detailed clarification can be found in section 6.3** **4) Timeout i.e. SME:0 after ‘20’ minutes of inactivity.**	------

	DESCRIPTION AND REMARKS	
STE	STE = <value> Self Test Facility – Reference Production Self Test Facilities Section 6.7.2. **STE=1** Basic test sequence, with manual intervention and checks. **STE=2** Basic test sequence together with a SiTOS serial interface check. **STE=4** Basic Tests together with tests of dual-in-line switches on Digital pcb. **STE=5** Basic test sequence together with a SiTOS serial interface check and tests of dual-in-line switches on both PCBs**.**	2

Table 12 – Test & Access Facilities

6.7.3 Identities and Issue States

	DESCRIPTION AND REMARKS	
PIC	PIC : <Text> **P**rogram **I**dentity **C**ode number. Normal response is: Part number, Firmware issue number, **For example: 31900 00.02.009**	R

Table 13 – Detector Identities & Issue State

6.7.4 Facilities / Equipment Configured

	DESCRIPTION AND REMARKS	
DET	DET <Detector Type, n> Where: n = 4 – SCOOT/MOVA Detector	R

	DESCRIPTION AND REMARKS	
DFO	DFO <Detector Fault Output Setting, 0 or 1> 0 – Second Relay or Solid State output provides the same indication as the first (default) 1 – Second Relay or Solid State output provides the function of a 'Fault Output' indication. (See also the DFM command) Default setting will be 0. **Note: If set, 'DIR 3' Command takes priority.**	2
DAA	DAA <Detector Alignment Algorithm> 0 – Perpendicular to traffic flow 1 – Toward Traffic Flow	2
DFM	DFM <Detector Fault Monitor Period, x:y> x – 0 to 23 (Monitor period in hours – default is 0) y – 0 to 59 (Monitor period in minutes – default is 0) The default setting of 0:0 indicates that the facility is disabled. **Note: 'Hours' & 'Minutes' are separated by a colon (i.e. DFM=10:30 <return>, sets the DFM time to 10 hours & 30 minutes).**	2
DMH	DMH <Detector Mounting Height, 0 – 2> 0 –Mounting Height #1 (<4.5m), (default) 1 –Mounting Height #2 (4.5 to 6.5m), 2 –Mounting Height #3 (>6.5m)	2
IND	IND <Detector Output Indication, 0- 3> 0 – LED indicates detector output (default), 1 – LED permanently off, 2 – LED indicates detector output for 20 minutes after power applied.	2
MPT	MPT <Maximum Presence Time, x,y> x,y is the time in minutes and seconds after which the detector will return to the 'in-active' state even though the vehicle may still be present. (x – time in minutes, 0 to 255; y – time in seconds, 0 to 59). Default is MPT= 4,0 (4 minutes recovery time).	2

Table 14 – Detector Facilities / Equipment Configured

6.7.5 Fault Log Commands

The fault log is described in more detail in Section 7.4

	DESCRIPTION AND REMARKS	
FFS	FFS <Fault Flag 0 to 63> : <Value 0 to 255> <Abbreviation> View the fault log flags using the **F**ault **F**lag **S**can which only shows fault flags which are set followed by a short abbreviation of the name of the fault to help identify it.	R
FDS	FDS <Fault Data 0 to 63> : <Value 0 to 255> <Abbreviation> View the fault log data using the **F**ault **D**ata **S**can. Similar to FFS in that it only displays fault data Bytes which are not all zeroes i.e. entering FDS <ret> will display the first active Fault Log Flag.	R
FLD	FLD <Fault Log Data 0 to 31> : <Value 10 Bytes of data> View the Data associated with a particular fault. Each displayed value can be up to 10 Bytes in length.	R
FLG	FLG <Current Entry in the Event Log, Run-Time Period (Y:DDD:HH)> Use of the ‘**-**‘ (minus) key will step back through the previous logged faults.	R
RFL	RFL : <Value 0 to 2> Used to **R**eset the **F**ault **L**og using ‘RFL=1’. Response will be ‘RFL:0’. Clears all the entries in the Fault Log arrays FFS & FLD	2

Table 15 – Fault Log Commands

7. MAINTENANCE

Before starting any maintenance work, read the Safety Warning on page 2 of this Handbook.

7.1 Routine Maintenance Visits

The interval between visits depends on local conditions but may consist of the following:

- check the detector securing bolt to ensure it has not worked loose,
- re-align the detector if necessary,
- ensure the configuration access door is properly retained and seated,
- clean the LED indicator lens with a soft cloth to remove dirt and grime,
- check the connection lead for any damage.

7.2 First Line Maintenance

First line maintenance will be achieved on a modular replacement basis.

Check which type of detector is fitted, make a note of its alignment to the installation and only replace with a similar part. When carrying out detector maintenance or replacement, wherever possible, remove the suspect item from its mounting position and work on the ground.

Ensure the replacement detector configuration switches are set to the same positions as the original unit.

Read the accompanying installation information to see if the detector requires any additional special configuration using the terminal interface.

Install and re-align the detector to the previously noted position.

7.3 Second Line Maintenance

All faulty units should be returned for repair.

Siemens Traffic Controls
R&R Department
Sopers Lane
Poole, Dorset
BH17 7ER

7.4 Fault Log

7.4.1 Introduction

The detector's fault log holds all the faults that are currently active.

When the detector finds a fault, it sets the associated fault flag (normally to the non-zero value of 255) and may also set additional fault log data bytes.

In addition to the above fault log, which holds the currently active faults, the detector also contains an historic rolling log which records the elapsed time (in years, days and hours) that various events occurred since the unit was first powered-up. This will provide an approximate indication of the time and date that the event may have occurred.

7.4.2 Viewing the Fault Log

To display the currently active fault flags, enter 'FFS↵ or FDS↵', and for the fault data, enter 'FLD↵'.

The '+' and '-' keys can then be used to scroll through the active faults.

The FFS command provides a listing of all the possible detector faults with an indication if the fault is active or not. The '+' & '-' keys can be used to step through this array.

The FDS command provides a selective view of the Fault Log, only presenting faults that are currently active. Again the '+' & '-' keys can be used to step through this display.

7.4.3 Clearing the Fault Log

Entering 'RFL=1' will reset the fault log of any active faults that are able to be cleared.

Note: The historic rolling log is not cleared by entering RFL=1. However there will be an entry in the historic log indicating that the RFL command has been invoked.

This command should only be used **after each fault log entry has been investigated**.

After the RFL command has been invoked the output will indicate 'RFL: 0'. This indicated that all fault status flags have been set to zero (0). However, if the LED is not extinguished, then the fault(s) may not have cleared. Further investigation may be required to ascertain if a fault is still active.

7.4.4 Historic Rolling Log

The Heimdall detector contains a ‘rolling’ historic log that records the elapsed time when various events occurred. This elapsed time is defined as the period of time after the detector was initially installed and is presented as:

Years: Days: Hours

To display the log entries, the terminal command ‘FLG’ is used. See the ‘FLG’ command for further details on operation (reference section 6.7).

Each time stamped entry is added to the log when:

- the power is switched off and back on,
- when any fault is set, e.g. ‘FFS 11 DFMT:255’
- when any fault is cleared (RFL=1)

Note: The historic log is not cleared when a new detector configuration is loaded.

To view the historic rolling log, enter the command ‘FLG↵’, and the most recent entry is displayed. Use the ‘+’ and ‘-’ keys to scroll (move) through the historic log.

If the ‘+’ key is then used then a more recent entry is displayed. If the ‘-’ key is used, then the user may scroll through the log in the reverse direction.

To move directly to the most recent entry press <SPACE>.

If the power is cycled (switched off and back on), or the handset is disconnected, then the next time that ‘FLG↵’ is entered, the most recent entry will be displayed.

The table below details the description of each possible fault flag and historic log entry.

Fault Log Index	Description	Abbreviation	Category	No. of Fault Data Bytes	Description / Data Bytes	Further Comments / Byte Parameters
0	Front End Mismatch	FRMS	Hardware	2	Wrong RF Front End. Byte 0: Detector Type Byte 1: Front End Type	Byte 0 4 = SCOOT and MOVA Byte 1 7 = Unsupported type
1	NF Signal Fault	NFSG	Hardware	0	I or Q channel LF signal out of range.	
2	PLL Unlocked	PLLU	Hardware	0	RF-PLL is unlocked.	
3	HV Power Fault	HVPW	Hardware	0	RF-front-end supply voltage out of range.	
4 to 9	Reserved for future use.	--------	--------------	--------	----------------------------------	
10	Cycle Time Fault	CYCT	Software	0	Measurement cycle not finished within expected time.	
11	DFM Timeout	DFMT	Software	0	No valid detection within specified DFM time.	

Fault Log Index	Description	Abbreviation	Category	No. of Fault Data Bytes	Description / Data Bytes	Further Comments / Byte Parameters
12	EEPROM Fault	EEPF	Software	2	Engineering data.	BYTE 0: FUNCTION ID — ERROR RANGE 0 : WRITECHUNKHEADER() 1...4 1 : WRITECONFIGURATIONDATACHUNK() 1...3 2 : WRITEFAULTLOGDATACHUNK() 1...3 3 : WRITEFAULTLOGFLAGSTATUSCHUNK() 1...3 4 : WRITEALLCHUNKS() 1...3 5 : RECALCULATECHUNKCRC() 1...3 6 : UPDATECONFIGURATIONDATACHUNK() 1...3 7 : SETDETECTORTYPE() 1...2 8 : RESETFAULTFLAG() 1 9 : FINDCHUNK() 1...6 10 : READFAULTLOGENTRY() 1 11 : readFaultLogFlagStatus() 1 Byte 1: Error code returned by function
13	EEPROM Invalid Configuration	CONF	Software	1	Engineering data.	Configuration Data Chunk read from EEPROM is invalid Byte 0: Error code returned by readConfigurationDataChunk() CRC failure occurred on Configuration Data Chunk in EEPROM Parameter: Error code returned by the function that reads the Configuration Data Chunk out of the EEPROM.
14	EEPROM Invalid Fault Data	FLTD	Software	0	Fault Log Data is invalid.	CRC failure occurred on Fault Data Chunk in EEPROM
15	Detector Type Error	DETT	Software	0	Detector Type read from EEPROM is invalid.	All three locations in EEPROM storing the Detector Type showed CRC failures. Detector goes into Detector Type Input Mode. This should occur at production time only.
16	Soft Error	SOFT	Software	0	An undetermined firmware error occurred	The external watchdog has not been reset (kicked) in time (1.6 sec).

Fault Log Index	Description	Abbreviation	Category	No. of Fault Data Bytes	Description / Data Bytes	Further Comments / Byte Parameters
17	Boot Loader Error	BTLD	Software	2	Boot Loader CRC failed Byte 0: Boot Loader Version low byte. Byte 1: Boot Loader Version high byte.	The F/W checks the integrity of the Boot Loader during initialisation. This fault can be registered only if the Boot Loader at least managed to positively check and start the F/W. If this fault occurs the Boot Loader has to be reprogrammed as soon as possible! Parameters: Current revision of the Boot Loader Firmware (in Flash Section A).
18-24	Reserved for future use					
23	Latest Power Up	LPRU	Info	0	Power Up indication. This information code is used to log when the last power cycle occurred.	In order to be able to monitor power-ups this information fault code has been introduced. The time stamp of this information fault code indicates the time of the last power-up with respect to the “operating hours counter”. Since this is provided for information only, the status flag of this fault will always remain cleared.
24	Fault Status Flag(s) Cleared	FSFC	Info	0	Fault status flag(s) cleared. This information code is used to log when the ‘reset fault log’ (RFL) was used.	Since this is provided for information only, the status flag of this fault will always remain cleared.
25	Terminal Framing Error	TRFR	Software	2	Framing error on serial handset port: Byte 0: number of Handset Framing Errors (low byte) Byte 1: number of Handset Framing Errors (high byte)	The DSP built-in UART detected a framing error on the serial input line Terminal_RX, SCIRXDA (GPIO28). Parameters: Current value of terminal framing error counter
26	SiTOS Framing Error	STFR	Software	2	Framing error on SiTOS port: Byte 0: number of SiTOS Framing Errors (low byte) Byte 1: number of SiTOS Framing Errors (high byte)	The DSP built-in UART detected a framing error on the serial input line RS485_RX, SCIRXDB (GPIO23). Parameters: Current value of SiTOS framing error counter

Fault Log Index	Description	Abbreviation	Category	No. of Fault Data Bytes	Description / Data Bytes	Further Comments / Byte Parameters
27	SiTOS Parity Error	STPR	Software	2	Parity error on SiTOS port: Byte 0: number of SiTOS Parity Errors (low byte) Byte 1: number of SiTOS Parity Errors (high byte)	The DSP built-in UART detected a parity error (odd number of ‘1’ bits, including parity bit) on the serial input line RS485_RX, SCIRXDB (GPIO23). Parameters: Current value of SiTOS parity error counter
28	Signal Interference	SGIN	Warning	0	Radar signal is corrupted.	
29	Background Invalid	BGIN	Warning	0	No valid ground tracking signal available	SCOOT/MOVA/TASS.
30	Firmware Update Started	FWST	Info	3	New firmware upload started: Byte 0: Firmware Revision (old) Byte 1: Protocol Comms Version Issue (old) Byte 2: Protocol Comms Version Sub Issue (old)	Parameters: Previous (old) firmware revision
31	Firmware Update Finished	FWFN	Info	3	A new firmware has been loaded into the flash memory Byte 0: Firmware Revision (new) Byte 1: Protocol Comms Version Issue (old) Byte 2: Protocol Comms Version Sub Issue (old)	Parameters: New firmware revision
32 to 63	Reserved for Future Use	--------	--------------	--------	-----------------------------	

Table 16 – Fault Log Index

8. PART NUMBERS

Listed below are the part numbers for the Siemens Heimdall Above Ground Detector to be used as spares.

See the warning on page 4 regarding the use of parts other than those listed.

Description	Siemens Part No.
SCOOT/MOVA Detector	667/1/31900/04x
Bulkhead Mating Cable and Fixing Kit (6 way) (standard cable)	667/1/31961/000
Bulkhead Mating Cable and Fixing Kit (9 way) (used when SITOS or second isolated output required)	667/1/31961/001

Table 17 – Spare Part Numbers

Note: In the above table 'x' should be replaced by the following:

- **0 - Basic Detector**
- **1 - Basic Detector with RS485 (SiTOS) Serial Interface**
- **2 - Basic Detector with Wireless Link Interface**
- **3 - Basic Detector with a Second Solid-State Relay Output**
- **4 - Basic Detector with both a Wireless Link & a Second Solid-State Relay Output**

All the above part numbers provide the complete detector with all connection cables and associated connectors as shown in Figure 3 and Figure 4.

8.1 Additional Part Numbers

The following table lists some additional but useful part numbers:

Part Number	Description
667/1/30875/000	SieCom Terminal Interface
667/YK/31977/001	SieCom Equipment Definition File (EDF)
667/YK/31977/002	Siecom Site Definition File (SDF)
667/YK/31977/003	Siecom Quick Key File (QKF)
667/1/31962/000	Serial Interface Cable (Heimdall)

Part Number	Description
667/1/30200/058	Helios side mount & AGD bracket Assembly (ref. Figure 12)
667/1/31941/000	Extension Arm Bracket Assembly (ref. Figure 13)
667/1/31942/000	Spacer Bracket Assembly

Table 18 – Additional Part Numbers

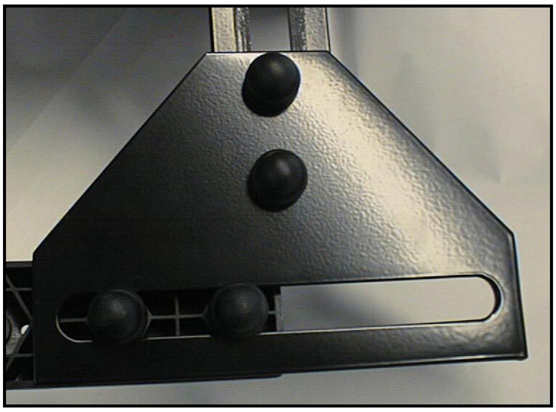

Figure 12 : Helios side mount & AGD Bracket Assembly

Figure 13 : Heimdall Extension Arm Bracket Assembly

9. POWER SUPPLIES AND CABLE REQUIREMENTS

9.1 Heimdall Detector Power Supply Options

The Heimdall detector may be powered by a nominal **24 volts ac or dc** supply and either method may be employed depending upon circumstances.

The Heimdall detector power supply voltage should be within **±20%** of its nominal value, i.e. **19.2v to 28.8v** dc or ac RMS, and should not be more than **29 volts** under any circumstances.

The power supply requirements for the Heimdall detectors are listed in the appropriate detector specification, Section 4.

9.2 Controller Power Supply Options

9.2.1 24V DC Supply

In general STC controllers are equipped with a 24 volt dc supply which is available for a small number of detectors. This supply may be used providing there is sufficient spare current capacity.

9.2.2 24V AC Supply – LV (Standard) Traffic Controllers

If the DC controller supply capacity is insufficient then an additional 24v ac voltage supply may be added.

The standard STC part numbers of the controller mounted AC Detector Supply kits are:-

Nominal 50VA, (2 amps):-	667/1/27853/000
Nominal 160VA, (6.6amps):-	667/1/20292/008

The kit contains a transformer, fusing and termination facilities.

The output of the transformer is nominally 25 volts but it will drop if the mains voltage falls to the legal minimum (207 volts, which is -10% on the standard European voltage of 230v or -13.75% on the standard UK voltage of 240v). Further voltage drops will occur due to the loading of the transformer, the initial tolerance of the transformer and the resistance of the cable.

Section 10, details the appropriate look-up tables for these transformers.

For more eccentric installations or non-standard transformer installation, section 11 details the appropriate method for calculating the appropriate cable lengths.

9.2.3 24V AC Supply – ST900ELV Traffic Controllers

If the traffic controller is an ELV type and an additional 24v AC supply is required, the controller mounted AC Detector supply kits are;

Nominal 50VA, (2 amps):-	667/1/33075/000
Nominal 160VA, (6.6amps):-	667/1/33074/000

The kit contains a transformer, fusing and termination facilities.

Section 11 details the method for calculating the appropriate cable lengths.

9.3 Cable Type

Throughout these sections it is assumed that the installation has been completed with a supply and return cable of 1 mm^2.

10. Permitted Cable Length 'Look-Up Tables'

This section assumes that the standard STC 24v AC Detector Supply transformer is used.

The standard STC part numbers of the controller mounted AC Detector Supply kits are assumed to be:-

Nominal 50VA, (2 amps):- 667/1/27853/000

Nominal 160VA, (6.6amps):- 667/1/20292/008

The following tables are provided to enable a very quick assessment to be made of the suitability of a particular AC supply transformer and the required loading/cable runs.

These tables err on the 'safe side' and if particular installations do not fit the scenarios presented then you will have to carry out the detailed calculations described in Section 10.

How to use the tables:

1. Determine how many other detectors are connected to the particular transformer.
2. Select the most appropriate table based on 'point 1' above. If there is no exact match with the tables given choose the next highest.
3. Determine how many detectors are to be connected to the cable in question.
4. Determine the required cable length.
5. The table can then be viewed to see if standard 'Serial' (S) or 'Parallel' (P) supply feeds should be used. A 'Blank' box is shown for situations which cannot be supported and a re-design is necessary or a more detailed calculation is required, as described in Section 10.

10.1 Detector Lookup Tables Using a 50VA Transformer

		No other Heimdall Detector connected to the transformer.						1 other Heimdall Detector connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	S	S	S	S	S	S	S	S
	100m	S	S	S	S	P	P	S	S	S	S	P	P
	150m	S	S	S	P	P		S	S	S	P	P	
	200m	S	S	P	P			S	S	P	P		

	250m	S	S	P				S	P	P			

		2 other Heimdall Detectors connected to the transformer.						4 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	S	S	S	S	S	S	S	P
	100m	S	S	S	P	P	P	S	S	S	P	P	
	150m	S	S	P	P			S	S	P	P		
	200m	S	S	P				S	P	P			
	250m	S	P	P				S	P				

		6 other Heimdall Detectors connected to the transformer.						8 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	P	P	S	S	S	S		
	100m	S	S	S	P			S	S	P	P		
	150m	S	S	P				S	P	P			
	200m	S	P					S	P				
	250m	S	P					S	P				

		10 other Heimdall Detectors connected to the transformer.						12 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S										
	100m	S	S										
	150m	S	P										

	200m	S	P										
	250m	P											

10.2 Detector Lookup Tables Using a 160VA Transformer

		No other Heimdall Detector connected to the transformer.						1 other Heimdall Detector connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	S	P	S	S	S	S	S	P
	100m	S	S	P	P	P		S	S	P	P	P	
	150m	S	P	P				S	P	P			
	200m	S	P	P				S	P				
	250m	S	P					S	P				

		2 other Heimdall Detectors connected to the transformer.						4 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	S	P	S	S	S	S	P	P
	100m	S	S	P	P	P		S	S	P	P		
	150m	S	P	P				S	P	P			
	200m	S	P					S	P				
	250m	S	P					P	P				

		6 other Heimdall Detectors connected to the transformer.						8 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Lengt	50m	S	S	S	S	P	P	S	S	S	S	P	P
	100m	S	S	P	P			S	S	P	P		

	150m	S	P	P				S	P				
	200m	S	P					S	P				
	250m	S						P					

		10 other Heimdall Detectors connected to the transformer.						12 other Heimdall Detectors connected to the transformer.					
		Detectors on Cable						Detectors on Cable					
		1	2	3	4	5	6	1	2	3	4	5	6
Cable Length	50m	S	S	S	S	P	P	S	S	S	P	P	P
	100m	S	S	P	P			S	S	P			
	150m	S	P					S	P				
	200m	S	P					S					
	250m	P						P					

11. Calculating Permissible Detector Supply Cable Lengths

This section can be used to calculate the permissible cable lengths for non-standard installation requirements, for example the ST900 ELV detector supply kits.

11.1 General Considerations

When considering power supply needs for the Heimdall detector, care must be taken to ensure that all power losses are taken into account. This is particularly true for supply feeder runs to each detector.

The following rules must be followed for each installation:

- The minimum allowed voltage at any time on any detector is **19.2 volts**
- This voltage applies at the minimum mains voltage of **207 volts** (which is -10% on the standard European voltage of 230v or -13.75% on the standard UK voltage of 240v).
- This voltage applies when the transformer is loaded with all the installed detectors volts (if applicable).
- The detector interface cable resistance must be allowed for in calculating the maximum permissible cable lengths.

The following fixed parameters will need to be applied to all calculations:

- The supply & return resistance for a 1 mm^2 cable is **0.042 ohms per metre.**
- Transformer secondary winding resistance
- Worst case no-load voltage
- Maximum supply current.

For the STC supplied 24 AC Detector Transformers the following table can be consulted:

Kit:-		160VA LV Supply 667/1/20292/008	50VA LV Supply 667/1/27853/000
Transformer part number		667/7/15855/005	667/7/00977/007
Resistance	Rs	0.309 ohms	1.3 ohms
Worst case no-load voltage at 207 volts mains (i.e. 230v -10%)	Vmin	21.26v	23.13v
Maximum current	Imax	6.6 A	2 A

Table 19 – STC AC Detector Supply Specification

For the STC supplied ELV detector power extension kit the following table can be consulted:

Kit:-		160VA ELV Supply 667/1/33074/000	50VA ELV Supply 667/1/33075/000
Transformer part number		667/7/15855/024	667/7/00977/024
Resistance	Rs	0.309 ohms	1.3 ohms
Worst case no-load voltage at 207 volts mains (i.e. 230v -10%)	Vmin	21.26v	23.13v
Maximum current	Imax	6.6 A	2 A

Table 20 – STC AC Detector Supply Specification

11.2 Method Outline

The voltage falls by **Rs** in (e.g. in Table 19**)** for each amp of current drawn from the transformer. For each individual cable there is a voltage drop down the cable of **0.042 volts** for each go-and-return metre of (1 mm^2) cable. Therefore the current must be calculated for each cable run using the current per detector shown in Table 7, Section 2.4, for each detector (I_S). The total current must then be calculated for all detectors supplied from the transformer. The maximum length of cable can be then calculated.

11.3 Calculating Cable Lengths

11.3.1 24V DC Supply Feed

When the Heimdall Detector is powered from the associated controller's 24V DC supply first calculate the total detector supply load. This must not exceed the limits of that available for this particular installation.

Check that the minimum supply voltage at this load is greater than the detector minimum voltage of 19.2V.

For each detector supply cable calculate:

$$\text{Maximum cable length} = \frac{\mathbf{Vs\ (min) - 19.2}}{\mathbf{total\ cable\ current \times 0.042}}$$

Where: Vs = 24V PSU output voltage negative tolerance.

0.042 = cable resistance in ohms per metre.

If longer cables are required, the arrangements must be revised. For example by using two cable cores in parallel the maximum cable length changes to:

$$\frac{\mathbf{Vs\ (min) - 19.2}}{\mathbf{total\ cable\ current \times 0.021}}$$

11.3.2 24V AC/DC Transformer Supply Feed

In order to use the STC Detector transformers it is necessary to perform specific calculations to ensure that the minimum supply voltage to the Heimdall detector is maintained under all circumstances.

To assist the reader quick reference 'look-up tables' are included in Section 10 of this document to provide the answer for installations where the same detector type is connected to the supply cable being considered. If more complicated installations are being considered then the procedures detailed below must be followed.

First calculate the lowest transformer voltage under worst case conditions using the **total** transformer current (i.e. the total supply current for all detectors installed):

V Xmfr (min) = Vs(min) - (Rs x total transformer current in Amps)

Where: **V Xmfr (min)** = the minimum transformer secondary voltage at full detector load.

Vs (min) = the minimum transformer secondary voltage at no load and minimum mains voltage.

Rs = the transformer secondary winding resistance.

Then subtract the minimum voltage at which the detector will work (**19.2 volts**). This gives the maximum voltage drop which can be allowed in any cable.

Max allowed voltage drop = **V Xfmr (min) - 19.2**

The maximum allowable length for each cable can then be calculated:

Maximum cable length = $\dfrac{\textbf{V Xfmr (min) - 19.2}}{\textbf{total cable current x 0.042}}$

(0.042 is the cable resistance in ohms per metre)

If longer cables are required, the arrangements must be revised. For example by using two cable cores in parallel the maximum cable length changes to:

$$\dfrac{\textbf{V Xfmr (min) - 19.2}}{\textbf{total cable current x 0.021}}$$

Running separate cables to each post improves the situation since the calculation applies to each cable, so that each cable will take less current. All loads on each cable must be allowed for including pedestrian crossing detectors and kerbside detectors.

Where the situation is more complicated due to sharing of cables it will be necessary to calculate the voltage at each detector - **This voltage must be at least 19.2 volts**.

The voltage at the end of any single cable is given by subtracting 0.042 x the length of the cable in metres x the current in the cable from the voltage at the start of the cable. This applies to 1 mm^2 cable with a separate return conductor for each run. This is based on the out-and-return resistance of the cable being 0.042 ohms per metre.

The calculations may be worked out using the tabular form shown below:

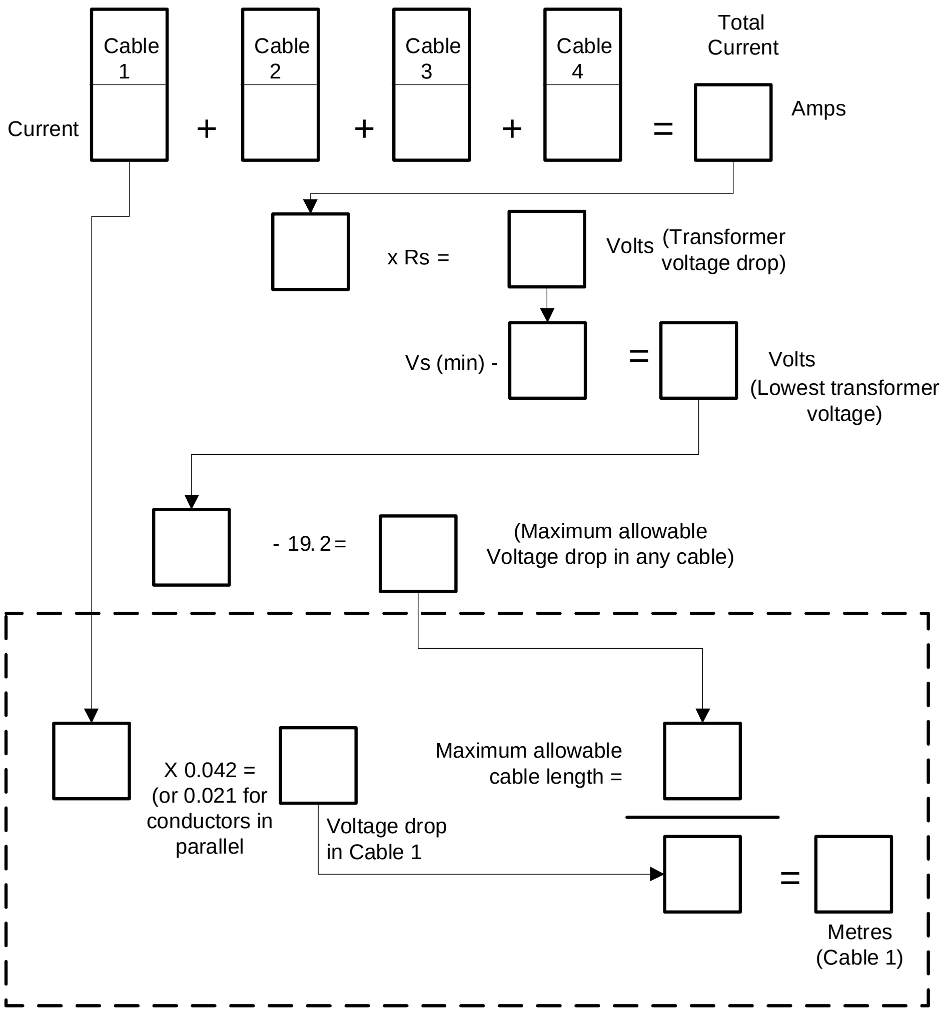

Table 21 - Calculation of Maximum Cable Length (Controller-mounted AC supply)

Note: The above chart yields the maximum length of one cable. The calculation within the dashed area must be repeated for the other cables.

INDEX