SIEMENS

Mobility, Traffic Solutions
Sopers Lane, Poole, Dorset
BH17 7ER

WiMag Vehicle Detection System
General Handbook

Part no.
667/HB/47200/000

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Function	Product Engineer (Product Development)	Hardware Engineering Manager
Signature		
Date		

Preface
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 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 Handbooks associated with this equipment.

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

(4) 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 or switched off.

(5) Only trained / competent persons should work on this equipment.

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

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

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

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

(10) Any personnel working on site must wear the appropriate protective clothing with high visibility jackets and safety boots as a minimum.

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.

Wireless Safety

The WiMag detection system is a wireless based system.

This product system 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 antenna area.

Product Advisory Notice : Sensys

Product Advisory Notice

SENSYS Networks
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email / info@sensysnetworks.com
web / www.sensysnetworks.com

Date: September 2, 2008

ID: 152-240-001-015 Rev A

Scope: All Sensys customers and dealers

Type: SAFETY & PROCEDURES

LITHIUM THIONYL CHLORIDE BATTERIES

Sensys Networks uses Lithium Thionyl Chloride batteries in the following products:
Sensors (VSN240-F, VSN240-T, VSN240-S)
Repeaters (RP240-B, and RP240-B-LL)

Lithium batteries are widely used in electronic products because they contain more energy per unit - weight than conventional batteries. However, the same properties that deliver high energy density also contribute to potential hazards if the batteries are damaged. Improper use or handling of the batteries may result in leakage or release of battery contents, explosion or fire.

Following are the recommendations of the battery manufacturer for proper use and handling of batteries in the Sensys devices mentioned above:

- **DO NOT** charge or attempt to recharge the batteries (batteries are NOT rechargeable)
- **DO NOT** crush or puncture batteries
- **DO NOT** short-circuit the batteries
- **DO NOT** force over-discharge of the batteries
- **DO NOT** incinerate or expose batteries to excessive heating
- **DO NOT** expose battery contents to water
- **DO** dispose of batteries and devices containing batteries in accordance with local regulations

Sensys Networks sensors contain no serviceable parts and should never be disassembled. Installation and removal of sensors from pavement should only be done by trained personnel and care should be taken to insure that the sensor casing is not punctured or crushed.

Additional safety information is available from the battery's manufacturer:
Sensor battery cell: http://www.able-battery.com/msds/ABLE_MSDS_ER14505.pdf
Repeater battery cell: http://www.able-battery.com/msds/ABLE_MSDS_ER34615.pdf

MAINTENANCE PROVISION (MP)

Product Reference

WiMag Vehicle Detection System – 667/1/47200/ETC.

Installation and Commissioning

Methods of installation, configuration and commissioning are described in this handbook. In addition, there are a series of documents which have more specific detail but are supplied by the OEM (Original Equipment Manufacturer). These documents are listed in section 1.2 below.

Spares and Maintenance

The WiMag system elements are designed for 'return to base' repair with the exception of battery replacement of the repeater.

Modifications

There are no approved modifications for this product.

Warning

Use of components other than those indicated within this document or modifications or enhancements that have not been authorised by Siemens will invalidate Type Approval of this product.

CONTENTS

FIGURES

TABLES

1 Introduction

1.1 Scope

This handbook provides a general description of the WiMag Vehicle Detection System and some if the key elements. This document outlines the detailed procedures for installation, commissioning and maintenance.

1.2 Related Documents

Reference	Title	Author/Contact
667/CC/47200/000	Method Statement – WiMag Sensor Installation	Siemens
667/HK/47200/ETC	WiMag Junction Configuration Spreadsheet	Siemens
667/HB/47200/001	System Design Guide for IPS and WiMag	Siemens
667/HB/47200/100	WiMag BVD Interface User Manual	Siemens
P/N 152-240-001-009	Sensys Networks VDS240 Wireless Vehicle Detection System – Design Guidelines for Freeway & Arterial Applications	Sensys
P/N 152-240-001-012	Sensys Networks VDS240 Wireless Vehicle Detection System – Design Guidelines for Intersection Applications	Sensys
P/N 152-240-020-028	Quick Start Guide - FlexNode Line Powered (Europe)	Sensys
P/N 152-240-020-002	Quick Start Guide for RP240-B-LL Repeater	Sensys
P/N 152-240-015-017	Quick Start guide for Flex-AP-ED Access Point	Sensys
P/N 152-240-001-071	Traffic Dot Set Up and Operating Guide	Sensys
P/N P 510.548.4620 F 510.548.8264	VSN240-M MicroRadar Sensor Installation Quick Start Guide.	Sensys
667/CI/47230/000	Installation instructions for Signal Head Mounting Kit	Siemens
667/CI/47235/000	Installation instructions for Pole Mounting Banding Kit	Siemens
667/CX/47200/000	WiMag Site Survey Template	Siemens
667/GA/27121/000	OTU Supply Kit Assembly	Siemens
667/CI/47240/ETC	WiMag Extension Pole Kit Assembly	Siemens

1.3 Definitions

Abbreviation	Explanation
WiMag	Wireless Magnetometer
STS	Siemens Traffic Solutions
PoE	Power Over Ethernet
I/O	Input Output
PD	Powered Device
RF	Radio Frequency
IP	Internet Protocol
VA	Vehicle Actuated
MOVA	Microprocessor Optimised Vehicle Actuation
OSS	Open source software
SCOOT	Split, Cycle and Offset Optimization Technique

SDE	Speed discrimination equipment
AP	Access Point (Sensys Product)
uR	Micro-Radar

1.4 Issue History

Issue	RFC	Author
1	First Issue	A. Rhodes
2	TS006728	A. Rhodes
3	TS006813	A. Rhodes
4	TS007010	A. Rhodes
5	TS007240, TS007462 Mantis issues 21412, 21531,18869, 18868	A. Thorpe, A Rhodes
6/7	TS007914/TS007948 – Includes Bicycle detection sensor.	K.W. Poppelmann, A. Rhodes
8	TS008007 – Add fault find guide, GR sensor	A. Rhodes
9	TS008578 – Add Compatibility Mode warnings	O. Oluwatudimu
10	TS008748 – Obsolete 4 Port PoE, Update from AP240 to Flex-AP-D-XCS	M. Quinn/A Rhodes
11	TS009451 – Line powered repeater installation instructions	M. Jeerh

2 System Overview

The WiMag system is made up of a number of key components, each of which plays an important part. The heart of the WiMag system is a wireless magnetometer sensor, which is installed just beneath the surface of the road. The sensor monitors the background magnetic flux, and the disturbances of the magnetic flux caused by vehicles are then detected. The sensor passes the detect information wirelessly back through to an access point. The information is then passed via an interface card to a traffic controller.

Note: The WiMag system vehicle detection latency is more than the SDE requirement of 2ms. So the WiMag system cannot be used to provide vehicle detections for speed discrimination.

Two illustrative system diagrams (below) are provided for reference.

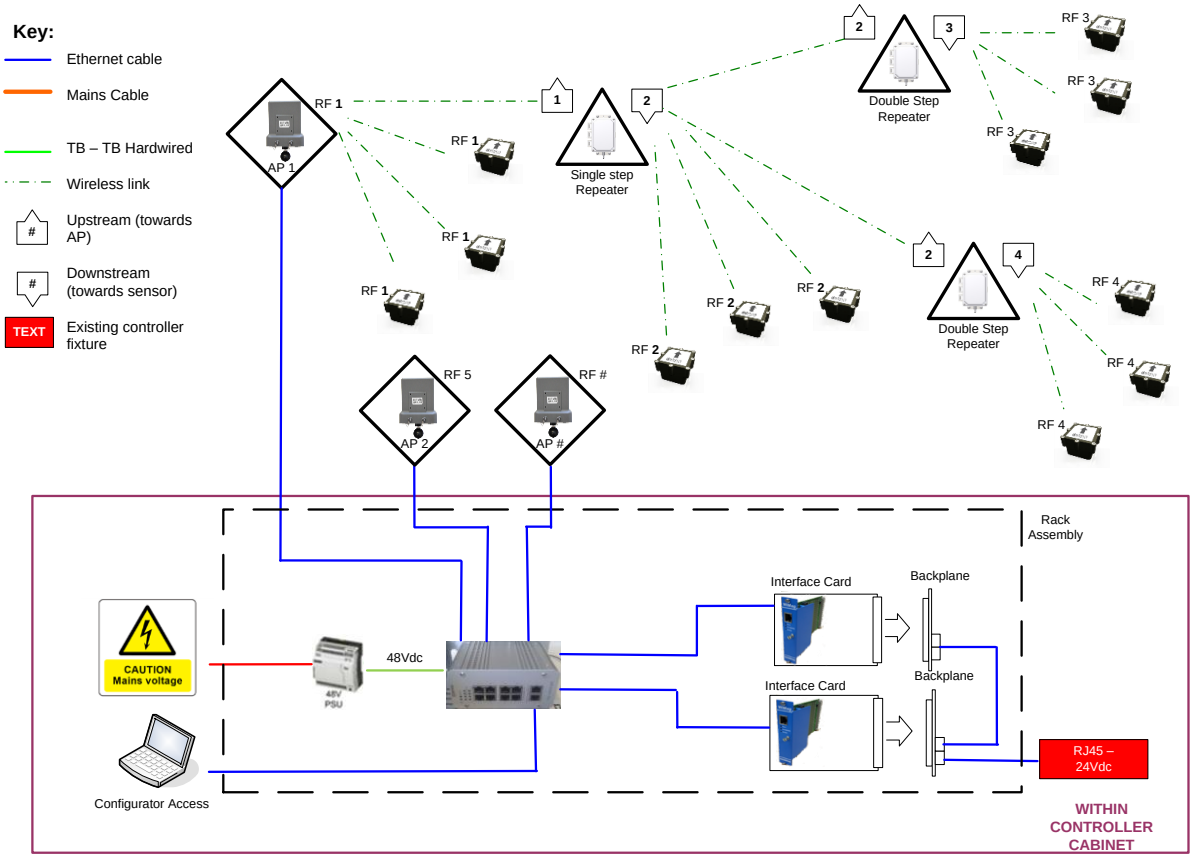


Figure 1 : Diagram of a typical Standard WiMag System Overview – Large Systems

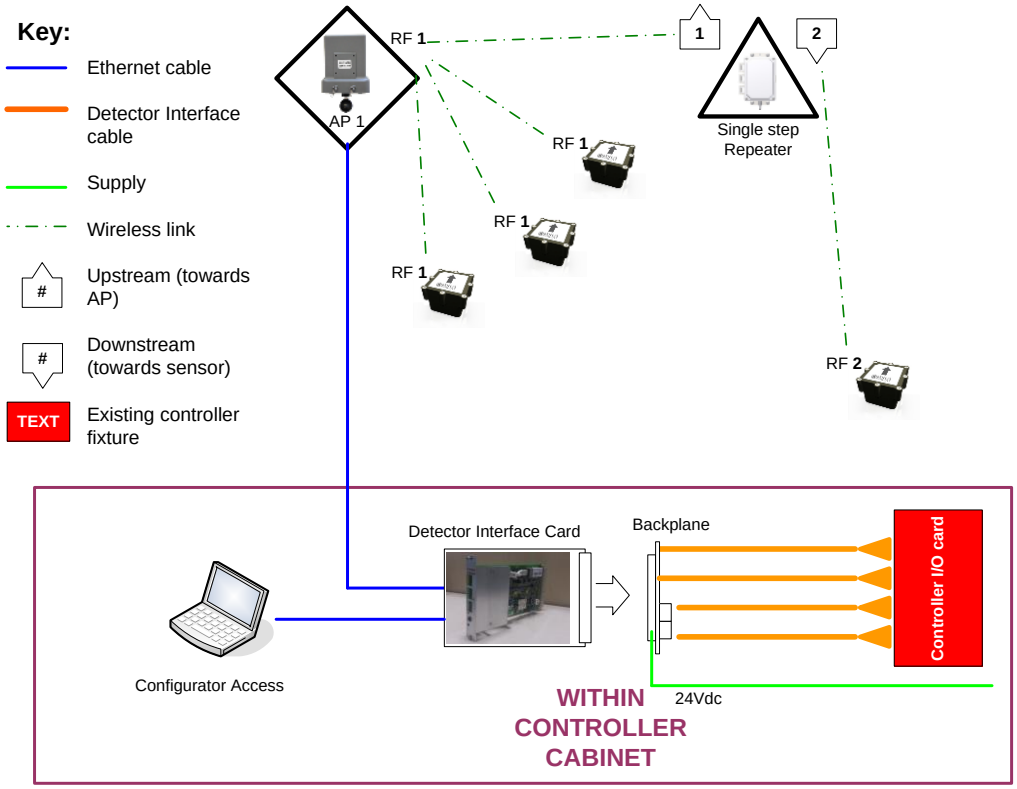


Figure 2 : Diagram of a Typical Standard WiMag System - Small System

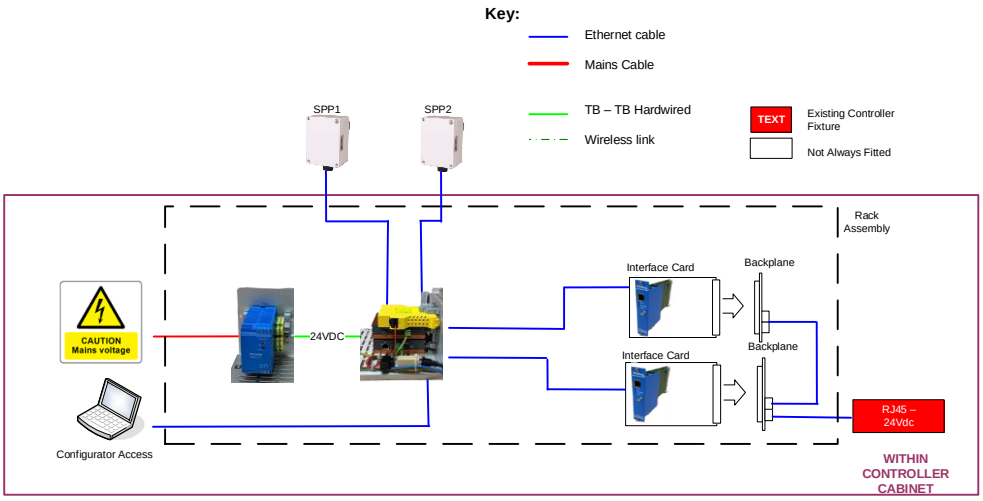


Figure 3 : WiMag FlexRack System Overview

2.1 Software Versions

The WiMag systems uses a large number of system elements, many of which run independent software. This section outlines the current software releases (at time of publication).

Sensys Hardware	Current F/W Release	Notes
FlexAP (FLEX-AP-D-XC)	3.0.10.18	Backwards compatible with AP240
FlexControl (FLEX-CTRl-M)	3.0.10.18	
SPP	40	Radio to be used with FlexControl
Access Point (AP240)	1.8.16	Obsolete from October 2018
FlexNode (FLEX-NODE-LPDC-XC)	115.4.7	Line Powered Repeater
Repeater (RP240-BH-LL)	115.2.7	LL – Long Life Battery Repeater
Repeater (very old)	110.1.7	H/w obsolete from March 2016
Sensor F-2 (New)	131.5.3	
Sensor F (Old)	127.3.3	H/w obsolete from Jan. 2016
Bike Sensor (uR)	165.6.14	Please note 153.6.14 is not recommended by Siemens

Siemens Hardware	Current F/W Release	
Standard Interface Card	3.0	
Detector Interface Card	2.0	
XPORT(-04)	1.0	H/w obsolete from June 2014
XPORT(-05)	2.0	May report as 4.5.0.28

Software	Release	
Traffic Dot	2.14.7	See Sensys Website for latest version

Note: All elements are backward compatable (e.g. obsolete sensor f/w will work with newer repeater f/w).

Note: It is **highly recommended** that the latest Traffic Dot is used, in order to ensure that all system elements are ‘visable’ to the user.

3 System Elements – Common WiMag Detection Equipment

3.1 Magnetometer Sensor

The magnetometer sensor is a loop equivalent product that utilises disturbances in the magnetic field to detect passing and/or stationary vehicles.

Figure 4 : Magnetometer Sensor

The sensor is a wireless in-road magnetometer. It has an inbuilt low-power wireless transmitter/receiver and a dedicated battery. The battery is designed to have a life expectancy of at least 10 years. The sensors will continuously self-calibrate so that the earths magnetic fluctuations are always considered as part of the detection decision.

The magnetometer sensor is manufactured by Sensys Networks Inc. Siemens supply the VSN240-F variant, which can be used for both road and stop-line applications.

Configuration of this device is performed through the access point (reference section 0 below).

Siemens Part Number	640/4/90028/000
Power Supply	• non-replaceable primary Li-SOCl2 3.6V battery pack • 7.2 Ah (nominal capacity)
Dimensions	7.4 cm x 7.4 cm x 4.9 cm
Weight	0.3 kg
Environmental	• designed for in-road mounting • IP68 ingress protection
Operating Temp.	-40ºC to +85ºC

Table 1 : Magnetometer Sensor Specifications[1]

[1] Full data sheet may be found on the Sensys website : http://www.sensysnetworks.com/

Siemens Part Number	640/4/90028/003
Power Supply	• non-replaceable primary Li-SOCl2 3.6V battery pack • 7.2 Ah (nominal capacity)
Dimensions	7.4 cm x 7.4 cm x 4.9 cm
Weight	0.3 kg
Environmental	• designed for in-road mounting (12cm deep) • IP68 ingress protection
Operating Temp.	-40ºC to +85ºC

Table 2 : Deep Install Magnetometer Sensor Specifications

3.2 MicroRadar™ Sensor

MicroRadar sensors are installed very close to the roadway surface and are capable of detecting trains, cars, trucks, and bicycles.

MicroRadar sensors can be used in conjunction with VSN240 magnetometer sensors, and can be used in both dedicated and shared lanes

Installs seamlessly as a supplement to an existing primary detection system

Figure 5 : MicroRadar™ Sensor

Figure 6 : MicroRadar™ installed in its clamshell for easy installation

Siemens Part Number	**640/4/ 90028/001**
Power Supply	• non-replaceable primary Li-SOCl2 3.6V battery pack • 7.2 Ah (nominal capacity)
Dimensions	7.4 cm x 7.4 cm x 5.8 cm
Weight	0.3 kg
Environmental	• Designed for flush mounting in roads/cycle paths • Performance diminishes in standing Water and in slushy conditions • IP67 ingress protection
Operating Temp.	-40ºC to +85ºC

Table 3 : MicroRadar Sensor Specifications

The sensor is a wireless in-road MicroRadar sensor. It has an inbuilt low-power wireless transmitter/receiver and a dedicated battery. The battery is designed to have a life expectancy of at least 10 years. The magnetometer sensor is manufactured by Sensys Networks Inc. Siemens supply the VSN240-M variant, which can be used for both road and stop-line applications.

For more details on setup please see section Bicycle Sensor Configuration7.3.3 and Appendix B.

3.3 Flex-AP Access Point

The access point is effectively a wireless gateway that maintains two-way wireless links to the sensors and repeaters. It establishes overall time synchronization, transmits configuration commands and message acknowledgements, and receives and processes data from the sensors.

The access point has a wired connection (via a RJ45 connector) to relay the magnetometer sensor detection data to a roadside traffic controller via an interface card.

Table 4 : Acccess Point (AP)

There are multiple variants of the access point that have been provided by the manufacturer, Sensys Networks Inc, however Siemens supply the Flex-AP variant only.

The access point requires 48V supply, which is derived from a PoE interface, via an appropriate street Ethernet cable.

Siemens Part Number (USB)	656/4/21421/000
Man'f Part Number	Flex-AP-D-XCS
Input Voltage	•36-58 VDC (48 VDC nominal) •via PoE cable to RJ45 connector
Power Consumption	• 2 W
Dimensions	22.8 cm x 12.1 cm x 9.6 cm
Weight	• 0.7 kg • mounting kit: add'l 0.5 kg
Environmental	• designed for weatherproof, outdoor operation • IP67 ingress protection
Operating Temp.	-40ºC to +80ºC

Table 5 : Access Point Specifications[1]

Note: It is **highly recommended** that **Flex-AP-D-XCS** is specified and used. This includes an internal load that will allow for proper operation with the Siemens WiMag Loop Replacement Card (667/1/47280/000).

[1] Full data sheet may be found on the Sensys website : http://www.sensysnetworks.com/

3.4 RP240-BH Repeater

The repeater can be used to extend the distance a magnetometer can be installed from an access point. As many as two repeaters operating in tandem can be installed between a sensor and access point, thereby increasing the distance further. To simplify deployment, repeaters are battery-powered.

Figure 7 : Repeater

Siemens Part Number	640/4/90029/000 – Long Life Variant
Power Supply	• non-replaceable primary Li-SOCl2 3.6V battery pack
Recommended Battery Replacement	Unit replacement expected after eight years of operation.
Dimensions	13.4 cm x 10.6 cm x 13.5 cm
Weight	• 0.8 kg • mounting kit; add'l 0.5 kg
Environmental	• designed for weatherproof, outdoor operation • IP68 ingress protection
Operating Temp.	-25ºC to +85ºC

Figure 8 : Repeater Specifications[1]

[1] Full data sheet may be found on the Sensys website : http://www.sensysnetworks.com/

3.5 RP240-BH Flex-Node

An alternative repeater, Flex-Node, can also be used to extend the distance a magnetometer can be installed from an access point. As many as two repeaters operating in tandem can be installed between a sensor and access point, thereby increasing the distance further.

The flex-node uses an external PSU and therefore mitigates for battery maintenance.

Figure 9 : Flex-Node

Siemens Part Number	640/4/90040/000 – FlexNode 640/4/90042/000 – Antenna
Manf. Part Number	FLEX-NODE-LPDC-E-XC FLEX-ANT-OMNI
Power Supply	• 9-24VDC
Dimensions	24.13 cm x 14.19 cm x 10.97 cm
Weight	• 0.6 kg • mounting kit; add'l 0.5 kg
Environmental	• designed for weatherproof, outdoor operation • IP67 ingress protection
Operating Temp.	-40ºC to +80ºC

Figure 10 : Flex-Node Specifications

4 System Elements – WiMag Communications Rack Assemblies

There are a number of variants of the WiMag communications rack. These communications rack assemblies are designed to enclose most of the control cabinet elements of the WiMag system within one easily maintainable area.

The standard rack contains a minimum of one standard interface card, POE and associated backplane.

The standard rack also allows for additional interface cards to be added for installations where a large number of magnetometer sensors and/or access points are required. A fully equipped rack is able to support up to 60 magnetometers. The standard rack can accommodate 7 Access Points, via the POE.

The 3U FlexRack is similar but also includes one FlexControl unit and one FlexIsolator. This rack includes a PSU module. Currently the 3U FlexRack can only support a total of two standard interface cards due to limitations of the Ethernet switch.

There is a 2U FlexRack variant that is a smaller version of the 3U FlexRack with the onboard components powered by a nearby Loop Detector Replacement card.

Figure 11 : Standard WiMag Communications Rack

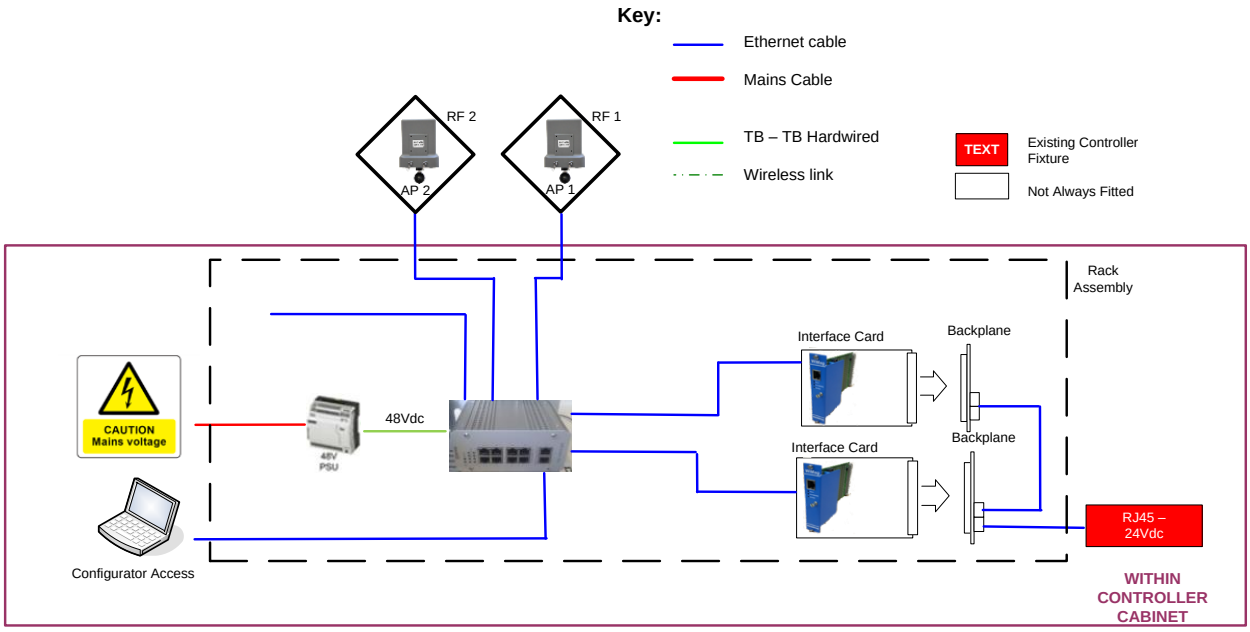


Figure 12 : Standard WiMag Communications Rack System Overview

Figure 13 : WiMag FlexRack – 2U

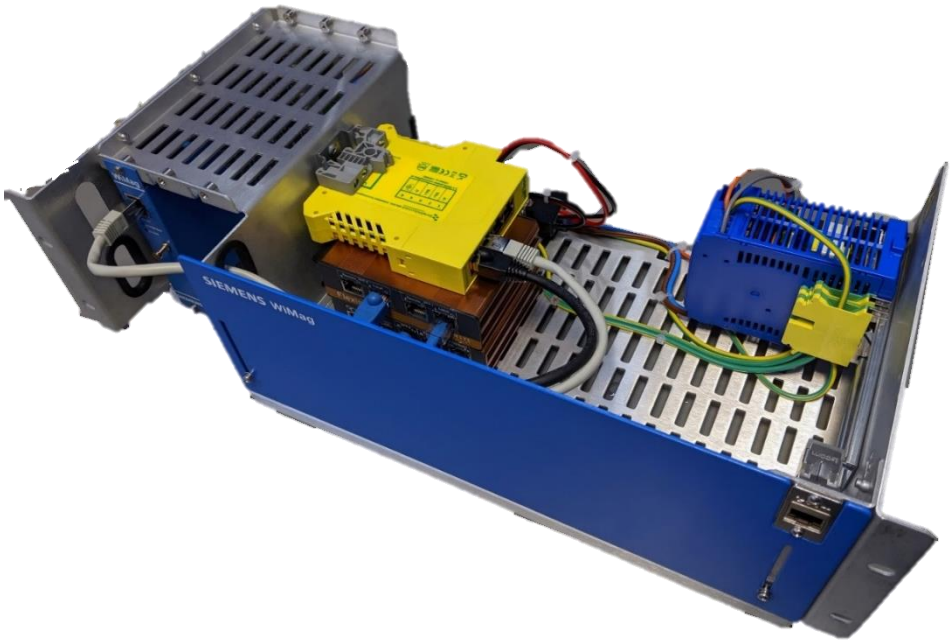


Figure 14 : WiMag FlexRack – 3U

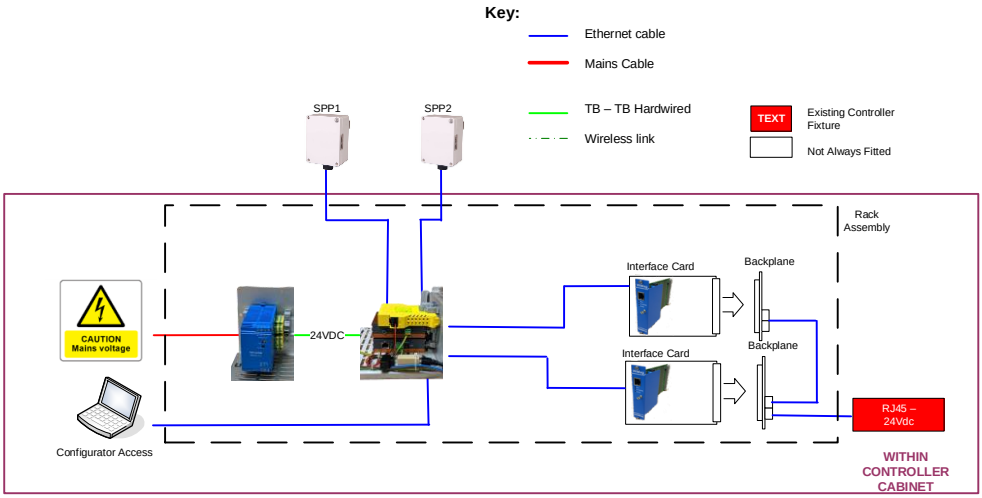


Figure 15 : WiMag FlexRack System Overview

The following sections outline the various system elements required for WiMag communications rack assemblies.

4.1.1 Four Port PoE Switch (OBSOLETE Appendix C.1)

4.1.2 Eight Port PoE Switch

Figure 16 : Eight Port PoE Switch

The eight port PoE switch provides dual functionality, namely as an unmanaged Ethernet switch and as the PoE supply for the access point.

The eight port switch has ten Ethernet ports of which eight are PoE ports. This device provides support for up to eight Access Points, depending on configuration. These ports are used to power the access points but can also be used for non-PoE devices as the PoE switch device utilizes auto-detection. Each port will detect if an appropriate powered device (PD) has been connected prior to activating the power.

4.2 SPP and FlexControl (AP)

The FlexRack contains the Access Point, in the form of the FlexControl, and manages the radio(s), known as SPP as well as other onstreet equipment. The FlexControl interfaces with interface cards via the ethernet port in the same way as a STRATOS Outstation and together makes up the gateway. The SPP radio part is mounted pole top which has two advantages;

- The weight (<0.5Kg) and size (12cm x 9cm x 6cm) of the radio is significantly smaller and therefore installation and maintenance is facilitated.
- The majority of configuration is performed on the controller part which is mounted within the controller cabinet.

Figure 17 : SPP Radio and FlexControl

Siemens Part Number (FlexControl)	640/4/90030/100
Siemens Part Number (SPP Radio)	640/4/90030/150
Manf Part Number (FlexControl)	FLEX-CTRL-M
Manf Part Number (Std External Antennal)	APCC-SPP
Input Voltage	9 – 28VDC (nominal 24VDC)
Power Supply	700mW (30mA at 24VDC)
Dimensions	10.9 cm x 8.8 cm x 3 cm
Weight	0.24kg
Environmental	Designed for road side cabinet installation
Operating Temp.	-40ºC to +85ºC
Detector Interface	Ethernet to WiMag Interface card variants

4.4 FlexIsolator

The FlexIsolator provides some safety and length extension to the SPP wired interface (between the FlexControl and the SPP Radio module).

Figure 18 : FlexIsolator

Siemens Part Number)	640/4/90040/100
Manf Part Number	FLEX-ISOL-M
Input Supply	Supplied by FlexControl
Output Voltage	15VDC (2W unregulated)
Dimensions	10.9 cm x 8.8 cm x 3 cm
Weight	0.22kg
Environmental	Designed for road side cabinet installation
Operating Temp.	-40ºC to +85ºC

4.5 The Standard Interface Card

Figure 19 : Standard Interface Card

Siemens Part Number	667/1/47221/000
Input Voltage	24VDC and 24VAC
Power Supply	1.2W (50mA at 24VDC)
Dimensions	13.4 cm x 10.6 cm x 13.5 cm
Weight	0.1 kg
Environmental	Designed for road side cabinet installation
Operating Temp.	-25ºC to +70ºC
Detector Interface	SIO and GSPI (20 sensors and 4 faults)

Note: The standard interface card uses a specific detector backplane (667/1/47217/300) which is supplied as part of the WiMag standard interface kit (667/1/47210/100). This backplane provides the access to the SIO/GSPI interface port.

Note: The power at the backplane is derived from the controller's serial interface interconnect system. The controller serial interface system is not an Ethernet system and must not be routed to any of the Ethernet switches.

The standard interface card will allow the controller to interface with up to **twenty** wireless sensors and **four** fault output states.

The standard interface card provides a bridge between the Sensys equipment (access point, repeater and sensor) and the traffic controller, using the SIO (serial I/O) protocol. The interface between the card and the controller is an Ethernet cable. The protocol (SIO) means that the standard interface card, as far as the controller is concerned, will 'look' like an I/O board.

The card requires an address to be set for SIO functionality. The backplane provides a rotary address switch for the purpose.

Each magnetometer sensor is mapped, at the access point, such that the detection from a sensor is routed to an interface card. Please refer to section 7 for details on configuration and mapping. The interface card is integrated to a controller installation thus providing a link between the magnetometer sensor and the controller.

Each interface card can cater for a maximum of 20 sensors along with an additional 4 fault outputs.

Each fault output state is a multiplexed state of five detector fault states. i.e. faults for detectors 1 to 5 multiplex to fault 1 output on the Standard Interface Card.

The 20 detector states and 4 fault states map to the equivalent of the 24 inputs from an I/O card.

The backplane uses a rotary switch to set the card address as per an I/O card.

There are three LED indicators on the front panel which provide status and fault indication.

4.5.1 Controller Configuration

When using IC4 to generate a controller configuration, the recommendation is to **select 24/0 as the card interface type**.

4.5.2 Front Panel Description

Figure 20 : Standard Interface : Front Panel

4.5.3 Status LEDs Indications

The WIMAG Standard Interface Card detector provides a visual indication of output in the form of LEDs, these will be visible in all ambient light conditions:

- 1x Fault State – Red : will only be ‘ON’ when any one of the mapped detectors is in fault state or the Access Point reports lost communication to that detector.
- 1x System Run – Red : This in normally ‘ON’ when the card status is considered good.
- 1 x SW Run – Red : This in normally ‘ON’ when the card software is running.

5 System Elements - WiMag Loop Detector Replacement Card

Figure 21 : WiMag Loop Detector Replacement Card

Siemens Part Number	667/1/47280/000
Input Voltage	24VDC and 24VAC
Power Supply	5.7W (236mA at 24VDC) not including access point loading
Dimensions	13.4 cm x 10.6 cm x 13.5 cm
Weight	• 0.1 kg
Environmental	• designed for roadside cabinet installation
Operating Temp.	-25ºC to +70ºC
Detector Interface	4 sensors (solid state relays)

Note: The power at the backplane must be derived from an appropriate power supply (e.g. 50VA LV Detector Transformer Kit, 667/1/27853/000 – other options are available : reference section 19 for details).

The Loop Detector Replacement Card is a direct WiMag replacement version of a loop detector card. The Loop Detector Replacement Card uses a standard detector backplane and will therefore allow the controller to interface with up to **four** wireless sensors.

The Loop Detector Replacement Card provides a bridge between the Sensys equipment (access point, repeater and sensor) and the traffic controller and may be used as a direct replacement for loop detector cards.

Up to four magnetometer sensors are mapped, at the access point, such that the detection from a sensor is routed to an interface card. Each interface card can cater for a maximum of 4 sensors along with an optional master fault output.

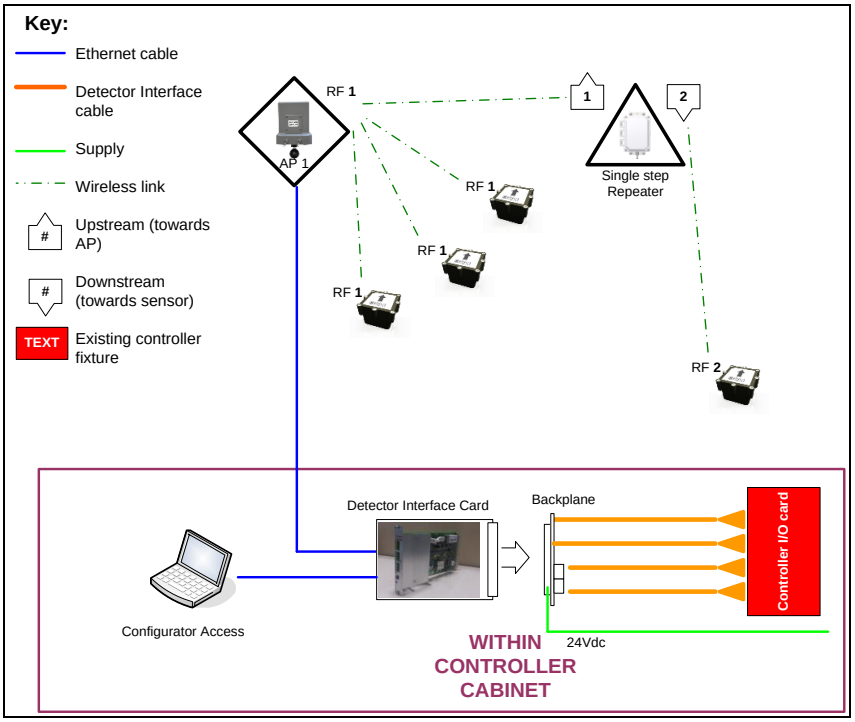


Figure 22 - Diagram of a Typical WiMag System - Small System

The WiMag Loop Detector Replacement Card also includes two PoE enabled ports, which will provide power directly to two Access Points (depending on configuration), without the need for an external power supply nor a PoE switch. However, this does mean the 24V supply to the backplane must not be derived directly from the controller. The 24V must be derived from a suitable detector supply kit, which is normally provided as part of a standard controller installation.

Cards may be linked together to increase the number of magnetometers which are able to be supported and this solution is ideal for small sites or where WiMag is to be retrofitted into controllers in place of existing loop detectors.

5.1 Front Panel Description

The Loop Detector Replacement Card has a number of status Indicator LEDs and a single push button. This section describes each of these functions.

Figure 23 : Loop Detector Replacement Card Front Panel

The 'push button' on the front panel which provides the following functionality;

- Tap once to enable/toggle the LEDs (see below),
- hold for 5 seconds to perform an board reset.

Note : During a board reset, all of the front panel LEDs will illuminate briefly to indicate that a reset has been performed.

5.2 Status LEDs Indications

The WIMAG Loop Detector Replacement Card detector provides a visual indication of output in the form of LEDs, these will be visible in all ambient light conditions:

There are two modes for the 4x2 LED array;

Mode 1;

- 4x Detector Output State – Red : when activated these LED will be ‘ON’ when there mapped detector is in detect state.
- 4x Detector Fault State – Red : when activated these LED will be ‘ON’ when the mapped detector is reporting a fault or the Access Point reports lost communication to that detector.

Mode 2;

Status indication provided by top left LED only. This LED shows the current state of the firmware. 50/50 ratio flash indicates normal operation. 80(on)/20(off) flash indicates that a major fault is present and the firmware has entered shutdown mode.

In addition there is a power status LED;

- 1 x POE Power State – Red : This in normally ‘OFF’ when the supply circuitry is considered good. Will illuminate when there is a supply failure e.g. supply drops below 12V.

5.3 PoE Port Indications

The two PoE Ethernet ports provide both the communications and power to connected Access points. In order to assist with installations and diagnostics, the two small LEDs, on the port, have the following descriptions;

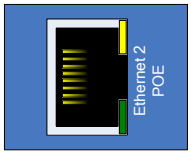


Figure 24 : PoE Port Indicators

Top LED (Yellow)

- LED Off : PoE supply is not active.
- LED On : PoE supply and attached device active*.

Bottom LED (Green)

- LED Off : Ethernet link is not active.
- LED On : Ethernet activity

5.4 Service Port Indications

The service Ethernet Ports provides a port suitable for laptop connections or for onwards Ethernet linking (reference sections 7 and 14 for further details). In order to assist with installations and diagnostics, the two small LEDs, on the port, have the following descriptions;

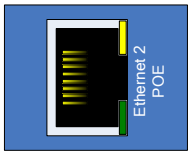


Figure 25 : Service Ethernet Port Indicators

Top LED (Yellow)

- LED Off : No Ethernet activity
- LED On : Ethernet activity.

Bottom LED (Green)

- LED Off – Green : No Ethernet device attached
- LED On – Green : Ethernet device attached

5.5 Serial Interface Port

The Serial Interface Port is for Engineering diagnostic use only.

6 System Design Methodology

6.1 Site Survey

Note: It is strongly recommended that some of the site survey is concluded prior to system design commences.

The site survey should be, as a minimum, a review of the site using tools such as Google Earth or Google Maps.

However it is recommended that for existing sites, where the WiMag system is expected to replace existing detection methodologies, a site visit should be executed. The site survey template provides a checklist of the key elements that should be considered/reviewed on a site survey visit.

Part Number	Document Description
667/CX/47200/000	WiMag Site Survey Template

This design methodology for the WiMag Vehicle Detection System is covered in detail in the following documents.

Sensys Part Number	Document Description
P/N 152-240-001-009	Sensys Networks VDS240 Wireless Vehicle Detection System Design Guidelines for Freeway & Arterial Applications
P/N 152-240-001-012	Sensys Networks VDS240 Wireless Vehicle Detection System Design Guidelines for Intersection Applications
667/HB/47200/001	System Design Guide for IPS and WiMag

Table 6 : Sytem Design Guidelines[1]

However, the Sensys Networks design guides are generalised. This section outlines specific design elements that are required for a successful implementation using Siemens interface card and controller. In addition, Siemens have carried out extensive testing and therefore there are several default settings that are applied when using the WiMag access points in Siemens installations.

[1] Both documents can be found in the Sensys Networks web page: http://www.sensysnetworks.com/

The following aspects should be considered when referring to the above design documents:

1. All references to **Contact Closure Cards (CCC)** should be ignored and cross referenced to **Siemens WiMag standard interface card**
2. All references to Access Point Controller Card (APCC) and AccessBox should be ignored. These are not supplied by Siemens.
3. **Access Points** will be installed at a height of 5m and therefore the range to the sensors will be 30m[1] maximum or 25m for deep install versions.
4. **Repeaters** are to be mounted at a minimum preferable height of 6m. However, if this is not available then they are to be mounted at a minimum height of 5m. Standard sensor range is 45m[2] or 40m deep install variants.
5. The **Power supply** to access points will always be via a 48V PoE switch, which will be assembled as part of the **WiMag Communications Rack** or the WiMag Loop Detector Replacement Card, when fitted.
6. The section relating to the **data backhaul** is to be ignored as this is covered by the standard controller implementation.
7. **Sensor locations** are defined by standard VA, SCOOT and MOVA loop location requirements. All three standards do allow for an element of deviation from ideal locations.
8. WiMag is not for use in SDE/SA applications.
9. The reader is to refer to 'System design Guide' for IPS and WiMag 667/HB/47200/001.

6.2 Design Guidelines for Access Points

The reader is now referred to 'System Design Guide' for IPS and WiMag (667/HB/47200/001).

[1] Assumes VSN240-F-2 or VSN240-F-GR
[2] As above

6.3 Design Guidelines (Other Equipment)

This section outlines some of the equipment choices that are required to ensure a successful deployment.

6.3.1 Standard Interface Cards

1. Each interface card can ‘handle’ 20 magnetometer sensors.
2. The sensors need not originate from the same access point to be useable on one card.
3. Sensors from one access point need not terminate on the same interface card.

7 System Configuration

Important:

The following points must be considered before commencing the configuration of a WiMag Vehicle Detection System;

1. The WiMag system design must be completed before configuration.
2. The WiMag system configuration should be completed before installation and based on a completed junction design. Although the system can be configured after installation the time impact to the commissioning of the system may not be considered viable.
3. The configuration is normally completed at the 'Field Service Depot' that has been allocated to the installation.
4. Do not adjust any other settings other than those indicated as this may impact system performance significantly and may mean the system is no longer considered approved for installation.
5. Configure the equipment in the order presented below.

Hint: To configure each of the WiMag system elements, a fully operational WiMag communications rack/WiMag Loop Detector Replacement Interface Card could be used.

7.1 Configuring the interface Cards

Access to the standard interface card and the loop replacement interface card is via an Ethernet connection, located on each card's front panel. For the standard communications rack installation, a single interface card is supplied as part of the WiMag communications rack assembly. Larger installations may require additional cards, which are supplied as separate add-on kits. The add-on kits do include the appropriate backplane.

Part Number	Document Description
667/HB/47200/100	BVD Interface User Manual

Table 7 : Interface Card Configuration and User Guide

7.1.1 Standard Interface Card : Configuration

Note: The following actions require that the interface card and communications rack are suitably powered.

Note: During the first configuration cycle ensure only one interface card is connected to the rack. This is achieved by temporarily disconnecting the Ethernet connection from the front of any interface card that may be fitted within the rack assembly but is not being configured.

1. Configure the laptop/pc to the same IP address range of the interface card. The factory default IP address of the interface card is **10.10.10.10**. Subnet mask **255.0.0.0**.(e.g. set the laptop IP address to 10.10.10.9)
2. Connect the PC/laptop to the WiMag Communications rack maintenance Ethernet port.

Figure 26 : WiMag Communications Rack Maintenance Port

3. Type the card's IP address into the address bar of Internet Explorer. The factory default IP address for the interface card is **10.10.10.10**

WARNING: When browsing to WiMag Interface Cards using Internet Explorer, **IE must be set to Compatibility Mode** for configuration changes to be accepted correctly (see section 16.4.1). Alternatively, use Firefox to complete the following instructions.

a. If you are not able to connect to the interface card, this could be because the interface card's IP address may have been changed. To return the IP address to the factory default (10.10.10.10) power cycle the card with the 'configuration link' removed. The 'configuration link' in pictured in Figure 27, it may be necessary to remove the cards front panel to gain access to this link.

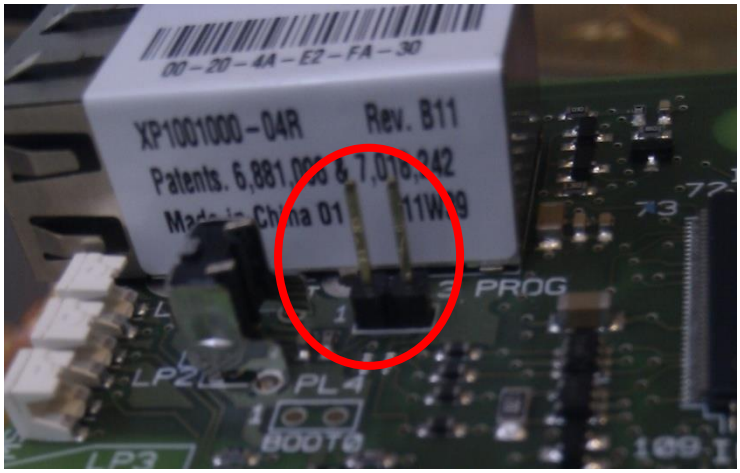


Figure 27 : Standard Interface Card Configuration Link

4. Set the 'new' IP address of the interface card, as per the configuration sheet.
5. If required, a 'Username' and 'Password' may be set. This will be indicated on the configuration sheet. However, it is generally recommended that username and password are kept blank.
6. Ensure the interface card is configured to set inputs to permanent detect if link to Wimag access point timeouts. Ensure the 'Activate error output' and 'Activate detection zone outputs' boxes are ticked, and ensure the 'Timeout' value is set to 3000 (30s).

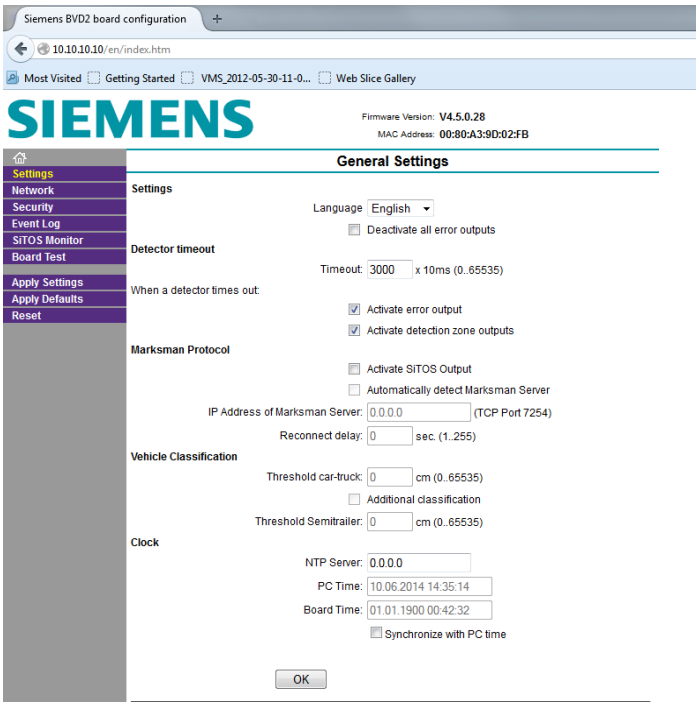


Figure 28 : General Settings Screen

7. Set any other settings of the interface card as per the configuration sheet. Any deviations from the configuration sheet should be recorded on said sheet.

8. On completion of the settings – click on the '**Apply Settings**' and allow the unit to reboot

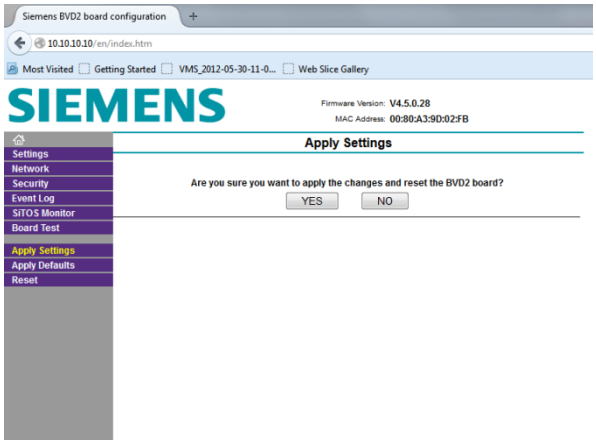


Figure 29 : Apply Settings Screen

9. Disconnect the Ethernet connector from the front of the card.
10. Pull the interface card from the rack
11. Re-apply the 'configuration link' if removed.
12. Re-insert the card and re-connect the Ethernet cable from the front.
13. Re-connect to the interface card using the appropriate IP address, remembering to re set your laptop/pc's Ethernet address accordingly.
14. In order for the interface card to interface with the controller, the GSPI address needs to be set appropriately. This is achieved by using the rotary switch, as found on the backplane. Reference Figure 30 below and section 13.4.1 for details.
15. Connect the next interface card, if applicable, and repeat steps 1 to 15. This also applicable for a third card.

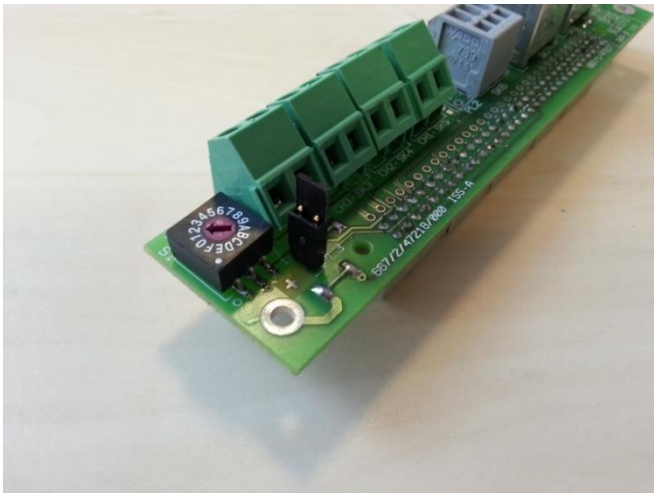


Figure 30 : Backplane Address Switch and Address Link

7.1.2 WiMag Loop Detector Replacement Card : Configuration

Note: During the first configuration cycle ensure that there is no oward linking to other cards. This is achieved by temporarily disconnecting the Ethernet connection from the front of any interface card that links on to a secondard card.

1. Confirm the location of the ‘configuration design document’
2. Configure the laptop/pc to the same IP address range of the interface card. The factory default IP address of the interface card is **10.10.10.10**. Subnet mask **255.0.0.0**.(e.g. set the laptop IP address to 10.10.10.9)
3. Connect the PC/laptop to the service port of the WiMag Loop Detector Replacement Card.

Figure 31 : WiMag Loop Detector Replacement Card

4. Type the card's IP address into the address bar of Internet Explorer. The factory default IP address for the interface card is **10.10.10.10**

WARNING: When browsing to WiMag Interface Cards using Internet Explorer, **IE must be set to Compatibility Mode** for configuration changes to be accepted correctly (see section 16.4.1). Alternatively, use Firefox to complete the following instructions.

a. If you are not able to connect to the card, this could be because the card's IP address may have been changed. To return the IP address to the factory default (10.10.10.10) power cycle the card with the 'configuration link' removed.

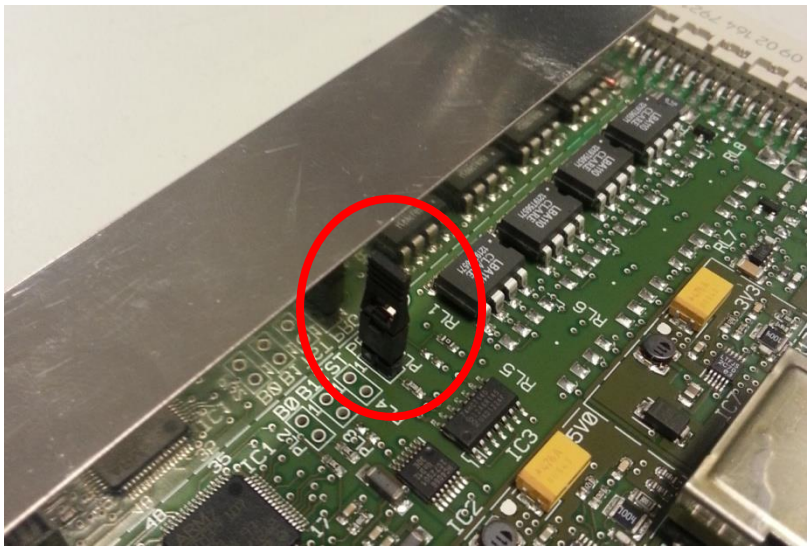


Figure 32 : Loop Detector Replacement Card Configuration Link

5. Set the 'new' IP address of the interface card, as per the configuration sheet.
6. If required, a 'Username' and 'Password' may be set. This will be indicated on the configuration sheet. However, it is generally recommended that username and password are kept blank.

7. Ensure the interface card is configured to set inputs to permanent detect if link to Wimag access point timeouts. Ensure the ‘Activate error output’ and ‘Activate detection zone outputs’ boxes are ticked, and ensure the ‘Timeout’ value is set to 3000 (30s).

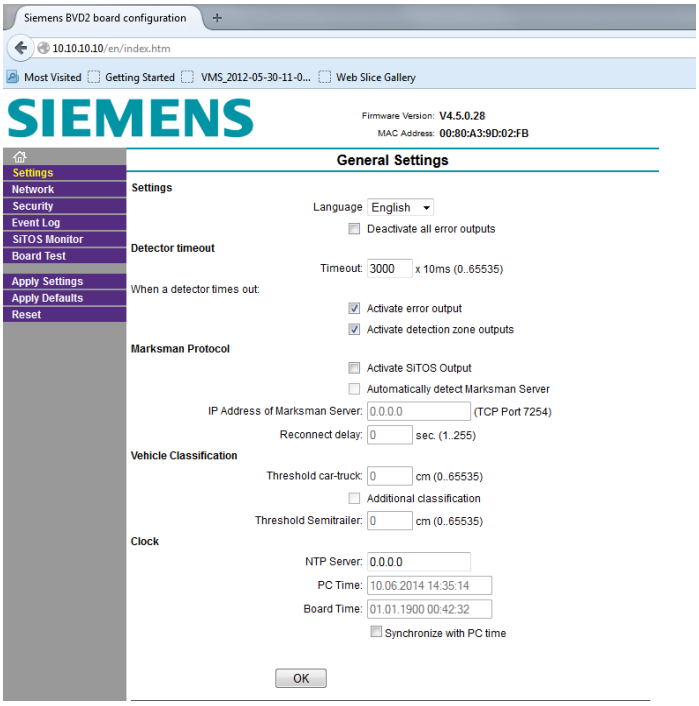


Figure 33 : General Settings Screen

8. Set any other settings of the interface card as per the configuration sheet. Any deviations from the configuration sheet should be recorded on said sheet.
9. On completion of the settings – click on the ‘**Apply Settings**’ and allow the unit to reboot

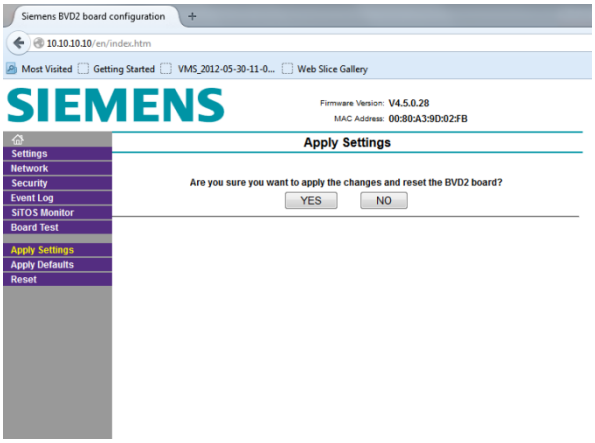


Figure 34 : Apply Settings Screen

10. Disconnect the Ethernet connector from the front of the card.
11. Pull the interface card from the rack
12. Re-apply the ‘configuration link if removed.

13. Re-insert the card and re-connect any required Ethernet cables from the front.
14. You may re-connect to the interface card using the appropriate IP address, remembering to re set your laptop/pc's Ethernet address accordingly.
15. Insert or connect to the next interface card, if applicable, and repeat steps 1 to 14.
16. Step 15 may be repeated for a third card.

7.2 Configuring Access Points, Repeaters and Sensors

The configuration of the access point, repeater and magnetometer sensor(s) are all performed by using the Traffic Dot software application. The reader is to refer to the 'Traffic Dot Set Up and Operating Guide' for detail instructions on operating the Traffic Dot application and configuration of the access point, repeater and sensors.

This section outlines specific settings that Siemens require, in order to operate the WiMag vehicle detection system in an optimal manner.

Note: Deviation from these settings is likely to mean the WiMag vehicle detection system does not function correctly for traffic control.

Note: Configuration of the access point requires the access point to be powered. This is normally achieved by connecting the access point to a powered WiMag Communications rack (reference section 10.2) or when using a WiMag Loop Detector Replacement Card.

Note: Apply settings to the access point via the TrafficDot configuration software.

Note: Ensure only a single access point is connected at any one time. This will ensure that there are no IP connectivity issues, during the setup stage.

Note: It is recommended, to aid installation, that each item in the system is labelled/marked with its own identification and settings to ensure there is no confusion during installation.

Sensys Part Number	Document Description
P/N 152-240-020-002 Rev C	Quick Start Guide for RP240-B-LL Repeater
P/N 152-240-015-017 Rev A	Quick Start guide for FLEX-AP-ED Access Point
P/N 152-240-001-071 Rev B	Traffic Dot Set Up and Operating Guide
P/N P 510.548.4620 F 10.548.8264	VSN240-M MicroRadar Sensor Installation Quick Start Guide

Table 8 : Configuration Guides[1]

[1] All documents are available on the Sensys website : http://www.sensysnetworks.com/

7.3 Initial Connection

1. Ensure all Repeaters and Sensors are within the radio coverage of the Access Point
2. Connect to the Access Point using the TrafficDot application: If this is the first connection then the default IP address for all Access Points is **192.168.2.100,** Subnet mask: **255.255.255.0**
3. If this is the first configuration of the access point – the user will be asked if the access point should be set to 'Master Mode'. The user should select the access point and set to 'Master Mode'.
4. Activate TrafficDot's Advanced Mode. It must be active during initial system configuration to allow colour codes to be selected. Click ***Advanced*** on the main toolbar, followed by ***Set Advanced Mode…*** to enable.
5. The junction design is to be uploaded to the access point and appear as a map image on which devices can be placed. This helps to ensure that the junction design and the system configuration match up correctly. Designs to be uploaded to the access point must be in **PNG, JPEG OR GIF picture format** and **no more than 80kb** for correct operation.
6. Created lanes and devices should then be placed on the map image to match their placement within the junction design. These added map elements are to be named as dictated by the junction design/configuration sheet (reference section **Error! Reference source not found.**).
7. Lanes and available devices should appear within TrafficDot's ***Main Display*** when ***Map view*** is selected.

7.3.1 Repeater Configuration

The following steps should be applied to each applicable repeater.

1. Selecting a repeater within TrafficDot will open the ***Repeater Config Window***. 'Upstream Channel', 'Downstream Channel' and 'Colour Code' are to be copied directly from the junction configuration spreadsheet to the ***Config*** tab within this window. All other repeater settings are to be left unchanged.

   'Upstream' is normally set as per the access point (AP) and downstream will be the channel set for repeater to sensor communications. Note, the two channels are not to be set to the same value.

7.3.2 Vehicle Sensor Configuration

The following steps should be repeated for each sensor.

1. Selecting a sensor within TrafficDot opens the ***Sensor Config Window***. The junction configuration spreadsheet will denote the 'Name', 'Description' and 'Colour Code' for each sensor. Any special settings attributed with individual sensors will also be noted within the configuration spreadsheet.
2. Check Sensor Mode: The mode of operation for each sensor can be selected within the ***Cmds*** tab of the ***Sensor Config Window***. By default, all sensors should be set to **'B (Count)'**. This should only be changed if specifically noted within the junction configuration spreadsheet.
3. Set Sensor RF Channel: The sensor Radio Frequency channel is also selectable within the ***Cmds*** tab of the ***Sensor Config Window***. Channels should be set as specified within the junction configuration spreadsheet.

4. The following settings can then be entered into the window's ***Position*** and ***Advanced*** tabs. Unless specifically noted as otherwise, all sensors should be given the following default settings.

NOTE: Any other settings that appear within these tabs that have not been listed in Table 9 are to be left unchanged.

Tab	Setting	Value
Position	Enabled	Checked
	Name	Copy from **'Name'** field of Configuration Spreadsheet
	Description	Copy from **'Description / Dot Address'** field of Configuration Spreadsheet(reference section Interface Card IP Addressing 7.3.6)[1]
	Horizontal position	Disabled
	Vertical position	Lead (0)
	Sensor location ID	Auto-filled
Advanced	Linear Filter	None
	Axis Detection	Z and X (Normal)
	Reorder Axis	Unchecked
	Colour Code	Copy from **'Junction Colour Code'** field of Configuration Spreadsheet

Table 9 : Sensor Configuration Settings

[1] The Dot Address for each sensor specifies which standard interface card it is to communicate to, as well as which of the cards 20 outputs the sensor appears on.

7.3.3 Bicycle Sensor Configuration

The bicycle sensor configuration provides for a multitude of settings. This section, in combination with Appendix B, provides the recommended set up for this detector type.

The bicycle sensor is generally able to differentiate between bicycles and other vehicles. The Traffic Dot interface will also allow for the two detections types to be routed to differing outputs on a WiMag card. For details on how to configure the settings please refer to Section 7.3.7, for Siemens specific settings, in combination with the Traffic Dot Set Up and Operating Guide (P/N 152-240-001-071).

In general the recommended settings for bicycle detection and count are:

- **Sample Rate** – 4Hz
- **Detection Distance** - 6 Ft
- **Auto baseline - 5 m**in
- **Auto baseline Sensitivity** – 4 (below example shown as 2)

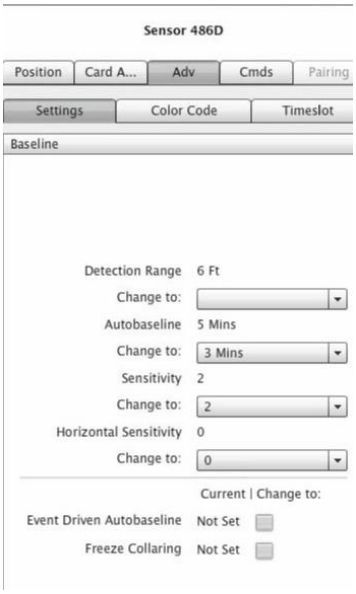


Figure 35 : Advanced Settings

Figure 36 : MicroRadar Command to Sensor window

For the MicroRadar (664/4/90028/001) to work as a Bicycle detector, the sensor must be set to “Bike Zone” using the TrafficDot 2 interface software.

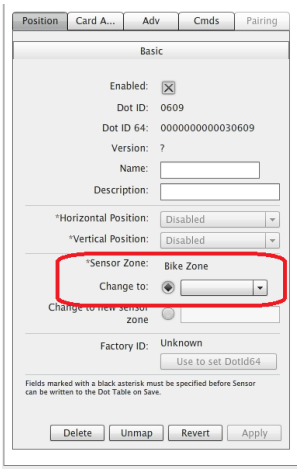


Figure 37 : Bike Zone Setting

For details on how to configure the settings please refer to the Traffic Dot Set Up and Operating Guide **(**P/N 152-240-001-071).

The bicycle sensor may require specific settings and installation depending on the use cases. Refer to Appendix B for use case specific information on bike sensor installation and configuration.

7.3.4 Final Access Point Configuration

1. If required the Access Point radio frequency channel can be selected within the ***AP Config - Radio*** tab of the ***Access Point Config Window***.
2. Setting the frame rate: The communications frame rate can be set by going to the '**AP Config'** screen. Select the '**Event**' sub-tab. Adjust the '**Transmit Interval'** to **0.0625s** (below example shows 0.125s).[1]
3. The '**Extra Latency'** should also be set to '**0.125 sec**' while the user is on the '**Event**' tab. This will add a latency to the detection system but ensures the system has sufficient time to utilise the 'detection timestamp's reported by the sensors.

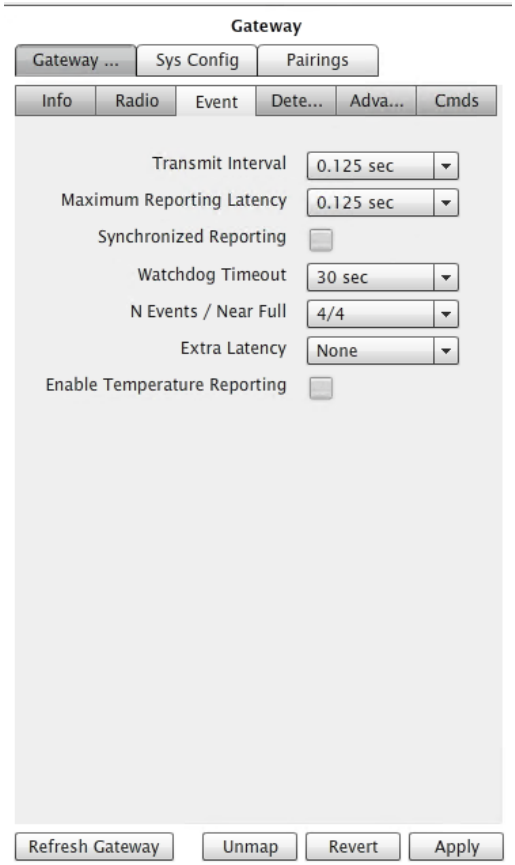


Figure 38 : Setting the Transmit Interval

4. Setting the timeout period: The detection timeout (retune) is to be set at 4 minutes as default. This is set by going to the '**AP Config'** screen. Select the '**Detection**' sub-tab. Adjust the '**Count Recalibrate Timeout**' to 4 minutes. This timing can be adjusted depending on application requirement.

[1] This value should be set to 0.125s if tandem repeaters are to be used. This is a restriction of the system.

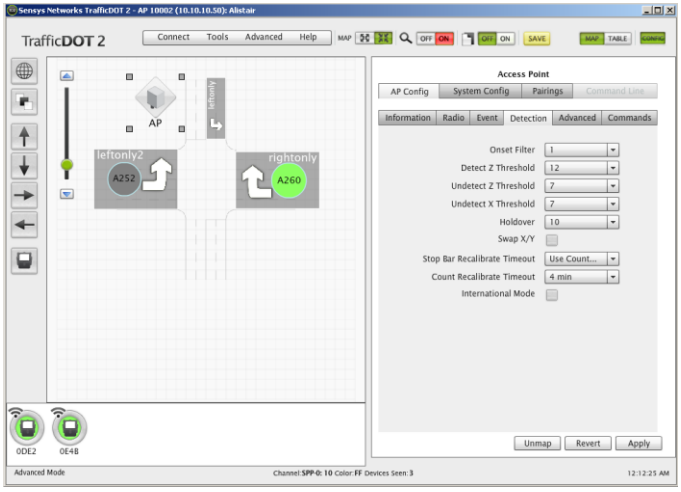


Figure 39 : Recalibrate Timeout Setting

5. International Mode: The access point should be set to international mode. This setting ensure that the 'recalibration timeouts' drop down list will only have the appropriate values required for HA approval. This setting is managed by selecting the Access Point within TrafficDot, which displays the ***Access Point Config Window***. Within this window, click ***AP Config*** and open the ***Detection*** tab. At the bottom of the tab select '**International Mode**'.
6. Set Access Point Colour Code: Selecting the Access Point within TrafficDot opens the ***Access Point Config Window***. Within this window, click ***AP Config*** and open the ***Advanced*** tab. The junction colour code should then be copied from the configuration spreadsheet into the ***AP Colour Code*** field.
7. Siemens protocol must be switched on within the access point to ensure correct communications with the standard interface card. Open the ***System Config - Other*** tab in the ***Access point Config Window*** and click ***Custom Application Settings***, then check the ***STS Enable*** box to switch Siemens protocol on.

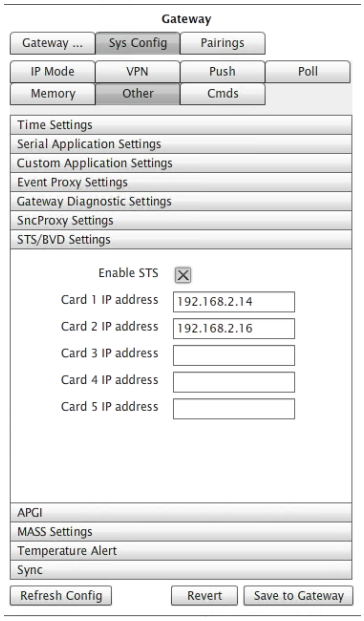


Figure 40 : Enable STS setting

8. Set Access Point IP Address: The Access Point IP address can be set within the ***System Cnfig - Network*** tab of the ***Access point Config Window***. The new IP address is to be copied from the junction configuration spreadsheet into the ***IP Address*** field. All other fields in this tab can be left blank.
9. Ensure the 'Apply' button is pressed at the bottom so that all the settings are applied.
10. It is recommended that the access point is rebooted at this stage.

7.3.5 Configuration for SCOOT Systems

The standard SCOOT loop detection area is normally expected to be 2m x 2m. The detection zone of the WiMag sensor is likely to be in the region of 1.5m x 1.5m. Therefore, in order to ensure correct emulation of a SCOOT loop, an additional detection extension is applied to the detect output. This has the effect of elongating the detection area.

The following steps should be repeated for each sensor.

1. Selecting a sensor within TrafficDot opens the Sensor **Config** Window.
2. Select the '**Card Addresses**' tab.
3. Add a values of 100 in the field titled '**Extension (millisecs):**'.

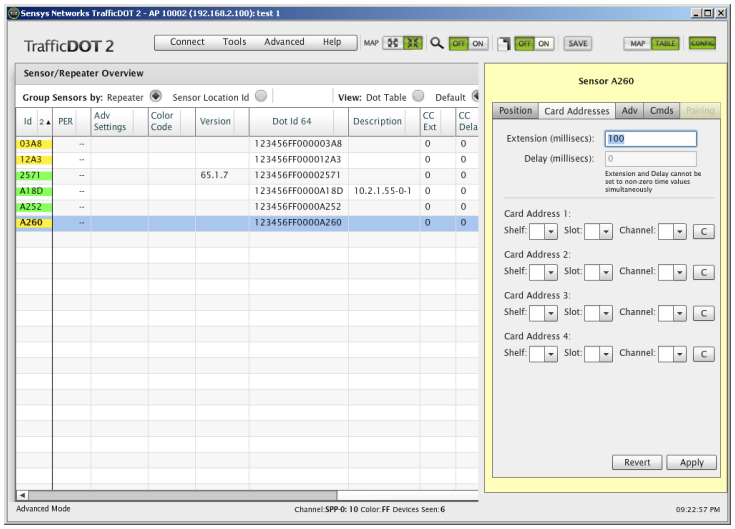


Figure 41 : Detection Extension for SCOOT detectors

7.3.6 Interface Card IP Addressing for Standard Interface Card /Loop Detector Replacement Interface Card

The access point needs to route the detection data to an appropriate interface card. This is done by applying the following configuration;

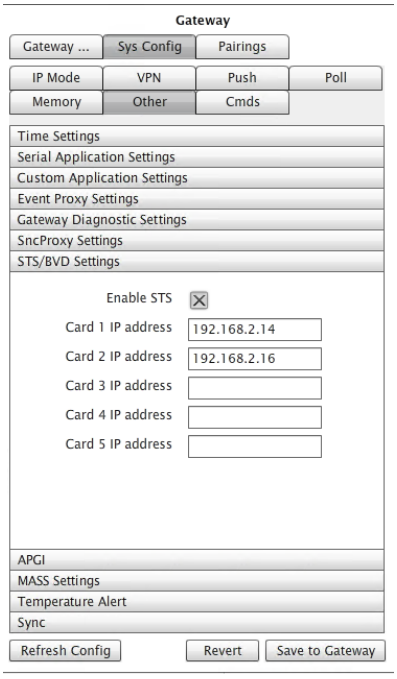


Figure 42 : AP System Configuration

1. The Siemens protocol must be switched on within the access point to ensure correct communications with the standard interface card. Open the ***System Config - Other***

tab in the ***Access point Config Window*** and click ***Custom Application Settings***, then check the ***STS Enable*** box to switch Siemens protocol on.

2. Select the sensor within TrafficDot, that you want to route to a standard interface card - open the ***Sensor Config Window***. The junction configuration spreadsheet will denote the 'Name', 'Description' and 'Colour Code' for each sensor. Any special settings attributed with individual sensors will also be noted within the configuration spreadsheet.
3. Change the 'Description' field such that the following information is provided;

XXX.XXX.XXX.XXX-0-#

where; XXX.XXX.XXX.XXX is the IP address of the interface card

- is the interface output allocation number (1 to 20)

For example, if the requirement is to route the sensor to the third output on an interface card whose IP address is 192.168.2.55 , the description will be set as 192.168.2.55-0-3.

Note: Any changes to the description requires the sensor data to be saved and the access point should be rebooted.

7.3.7 Interface Card IP Addressing for Standard Interface Card /Loop Detector Replacement Interface Card – Bike Detectors

The access point needs to route the detection data to an appropriate interface card. This is done by applying the configuration as per the section above. However, one difference is that the bike detectors have up to three channels available.

The channels are; All, Cars, Bikes

These channels will appear as A, C or B in the Traffic Dot 2.0 GUI.

To map these to individual interface card channels the following configuration should be carried out;

1. Change the 'Description' field such that the following information is provided;

XXX.XXX.XXX.XXX-0-$\#_1$;0-$\#_2$;$\#_3$

where; XXX.XXX.XXX.XXX is the IP address of the interface card

$\#_1$ - is the interface output allocation number (1 to 20) for detector channel A

$\#_2$ - is the interface output allocation number (1 to 20) for detector channel C

$\#_3$ - is the interface output allocation number (1 to 20) for detector channel B

7.3.8 Configuration Files

In order to ensure a speedy recovery, after an unlikely failure, the configuration file for each access point should be downloaded and stored for future use.

Note: For Siemens installations and maintenance contracts it is recommended that the configuration file is stored on the 'TIE Server'.

To download the configuration file the following actions should be performed;

1. Connect to the access point using the 'Traffic Dot Application'
2. Select the access point on the map (or in the table) which should bring up the '***Config Window'***.
3. Select the '***System Config****'* tab.
4. Then select the '***Command***' sub-tab.
5. Use the '***Backup***' option to save the configuration file.

Note: It is recommended that the file name should be in the format of APXX_######.AP where XX is the access point ID and ##### is the junction reference.

Figure 43 : Configuration Download – Command Tab

To upload and recover the access point to pre-configured settings, the following actions should be performed;

1. Connect to the access point using the 'Traffic Dot Application'
2. Select the access point on the map (or in the table) which should bring up the '***Config Window'***.
3. Select the '***System Config****'* tab.
4. Then select the *'**Command**'* sub-tab.
5. Use the '***Restore***' option to upload the configuration file.
6. Select the '***AP Config'*** tab
7. Then select the '***Commands***' sub-tab.
8. Select 'Reboot' to reboot the access point. The access point will then recover with the pre-defined configuration.

8 General Installation Instructions

8.1 Special Tools Required for Non-Civils Based Installation

The following non-standard tools are likely to be required when involved in the installation of a WiMag vehicle detection system.

1. Ethernet Jack Crimping Tool (8000 Series Crimping Tool, RJ45 WE/SS UT)
2. Ethernet cable checking tool (Greenlee NC-500 CAT5 Cable Tester)

8.2 Order of Installation

The following order of installation can be used as a suggestion, in order to ensure an orderly implementation of the WiMag vehicle detection system.

1. Install the WiMag Sensors
2. Install the Ethernet cabling
3. Install Access points and repeaters
4. Terminate the Ethernet cables and confirm correct assembly
5. Install WiMag Communications Rack or WiMag Loop Detector Replacement Card as required.

9 Installation of WiMag Sensors

The instructions for the installation of the magnetometer/MicroRadar sensors are covered in a separate document, 667/CC/47200/000 (METHOD STATEMENT).

10 Installation of the Access Point (AP240/FLEXAP) and SPP Radio

The access point can be mounted on a signal head, on an existing pole (e.g. lighting column) or by using an extension pole mounted on a standard traffic pole.

The first is designed for signal head mounting (667/1/47230/000) and will typically be used for the access point. The second is a pole mounting banding kit (667/1/47235/000), which will be used for attachment to existing poles such a lighting columns. The later is typically used with repeaters. The last, extension pole installation, is used to ensure the access point can be mounted at 4,5[1] or 6m from ground level.

Each access point kit comes fitted with a standard mounting ball.

10.1 Signal Head Mounting Kit

The signal head mounting kit (667/1/47230/000) has a double socket arm, an access point L-bracket. The socket arm is used to secure the access point to the mounting ball on the bracket.

The ball mounting system allows access points and repeaters to be freely orientated into the optimum position for correct radio connectivity with all other system elements.

Figure 44 : Mounting Ball and Double Socket Arm

[1] 5m is the preferred minimum

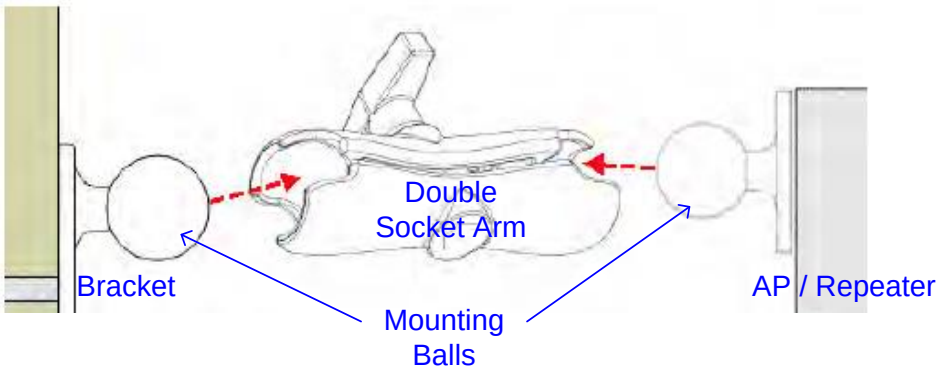


Figure 45 : Ball and Socket Mounting Detail

10.1.1 Mounting the Access Point

Part Number	Document Description
667/CI/47230/000	Installation instructions for Signal Head Mounting Kit

Table 10 : Signal Head Mounting Kit Document Reference

Due to cabling requirements, it is recommended that access points are mounted on traffic signal poles. A specially designed L-bracket allows the access point to be fixed to the top of a traffic signal head.

The following steps provide for the mounting of the access point above a signal head;

1. Remove the rear bolt from the signal head mounting bracket.
2. Replace with the M10 bolt provided.
3. Fit the access point L bracket using the M10 washer and nut provided, making use of the front signal head mounting for anti-rotation.
4. Attach the double socket arm to the L-bracket.
5. Attach the AP to the double socket arm.
6. Orientate the AP in the direction depicted, within the junction/installation drawing, and tighten the double socket arm to secure.

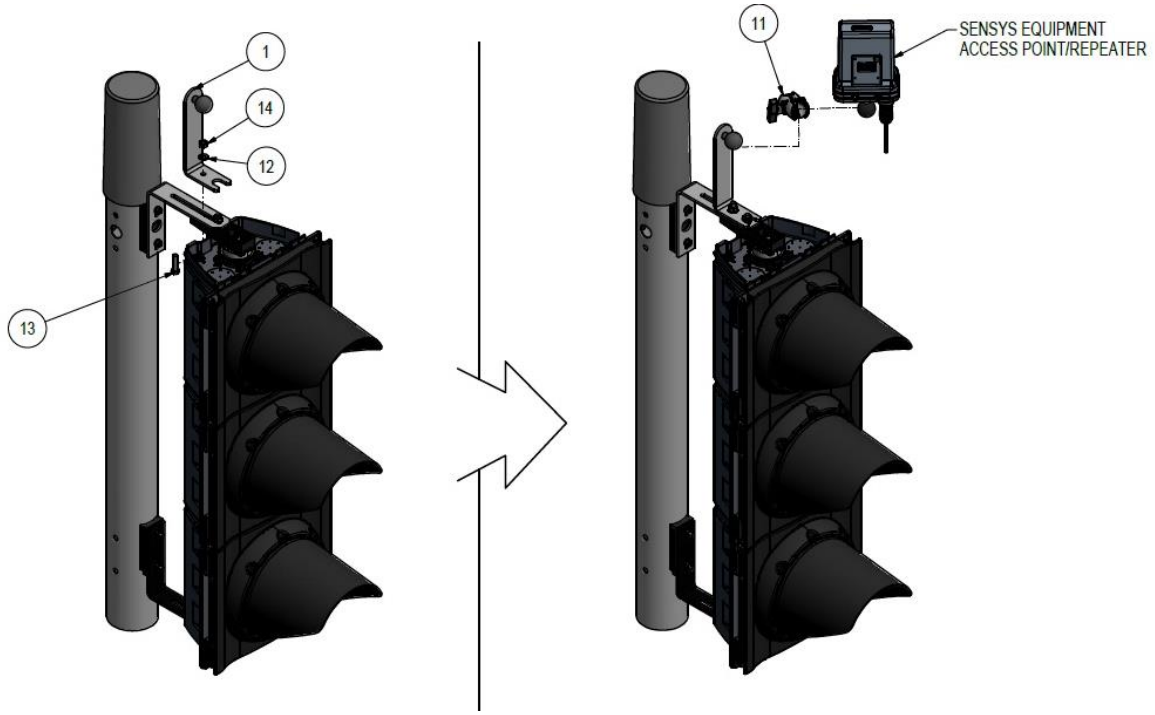


Figure 46 : Access Point Mounting Detail

Note: In cases where the access point is to be mounted on an non-standard traffic pole, the pole mounted banding kit (667/1/47235/000) can be used and the access point is to be mounted as described in section 11.1 and 11.2 below.

10.2 Pole Mounting Kit

Refer to section 11.1, below, for details.

10.3 Extension Pole Installation

The Extension Pole Installation method can be found in document 667/CI/47240/ETC.

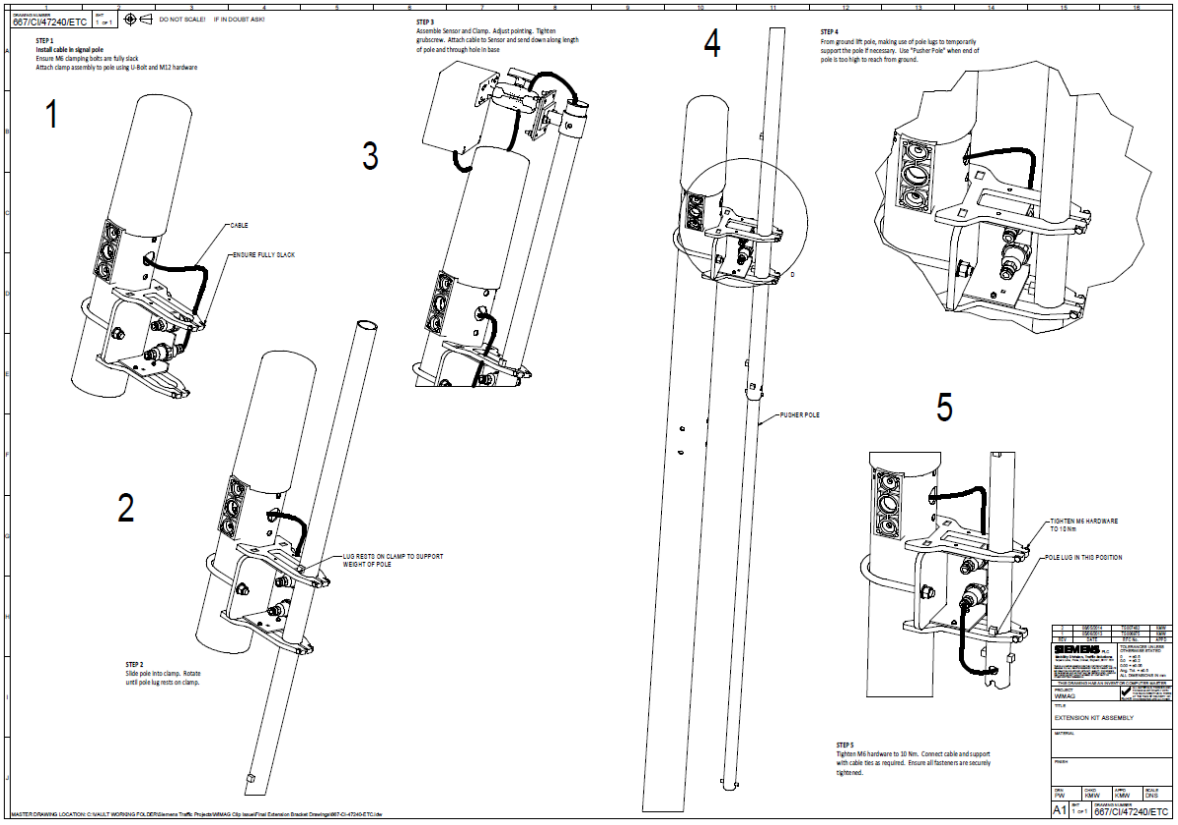


Figure 47 : Extension Kit Assembly Instructions (667/CI/47240/ETC)

The kit 667/1/47225/X00 (0 = grey, 1 = black) should be used to attach the extension pole to the signal pole.

10.4 Connecting the Access Point

The access point must interface to the WiMag communications rack/WiMag Loop Detector Replacement Card. This information is covered in sections 12, 13 and 14.

11 Installation of the Repeater and FlexNode

This section deals with the mounting of the repeater units. The repeater uses a similar ball and socket fixing mechanism as per the access point.

One of two mounting kits have been made available. The first is designed for signal head mounting (667/1/47230/000) (same as that used for mounting Access Points). The second is a pole mounting banding kit (667/1/47235/000), which will be used for attachment to existing poles such a lighting columns. The later is typically used with repeaters.

11.1 Pole Mounting Banding Kit

Repeaters, where possible, are to be affixed to street lighting columns as this gives an extended range of options for mounting height without the need for specialist mounting equipment. A simple clamping band is used to attach a square plate bracket to the pole and the double socket arm then mounts the repeater to the bracket.

Figure 48 : Square Plate and Clamping Band

11.2 Mounting Procedure

Part Number	Document Description
667/CI/47235/000	Installation instructions for Pole Mounting Banding Kit

Table 11 : Pole Mounting Kit Document Reference

To mount the repeater the following instructions are provided;

1. Feed the clamp band through the square ball plate using the custom clamp holes until the square ball plate is in the centre of the band.
2. Clean the area of the pole that will meet the ball plate. Remove the double stick tape cover from the back of the plate, wrap the clamp band around the pole and feed into the fastener. Tighten the clamp to secure it.
3. Attach the double socket arm to the ball plate.
4. Attach the repeater to the double socket arm.
5. Orientate the repeater in the direction depicted within the junction drawing and tighten the double socket arm to secure.

Note: In cases where the repeater is to be mounted on a traffic signal pole, the access point L-bracket (667/1/47230/000) can be used and the repeater is to be mounted as described in section 10.1 and 10.1.1 above.

11.3 FlexNode Repeater (aka Line Power repeater) Power Connection

Power to the Line Powered Repeater (LPR) will be transmitted via spare cores of existing pole cables running to that pole. The kit 667/1/47258/000 contains the parts required to enable this. Additional equipment required for mounting the LPR is listed in the table below.

Siemens Part Number	Document Description
667/1/47249/000	WIMAG EXTENSION MTG KIT - ACCESS POINT
667/1/47225/X00 X = 0, Grey X = 1, Black	WIMAG EXT BRKT CLAMP ASSY - DIA 114

Table 11-2 : Line Powered Repeater signal pole mounting kits

1. Assign and terminate two spare cores of signal cable to the terminal block attached to the controller cabinet rear panel (as instructed in section 13.3).

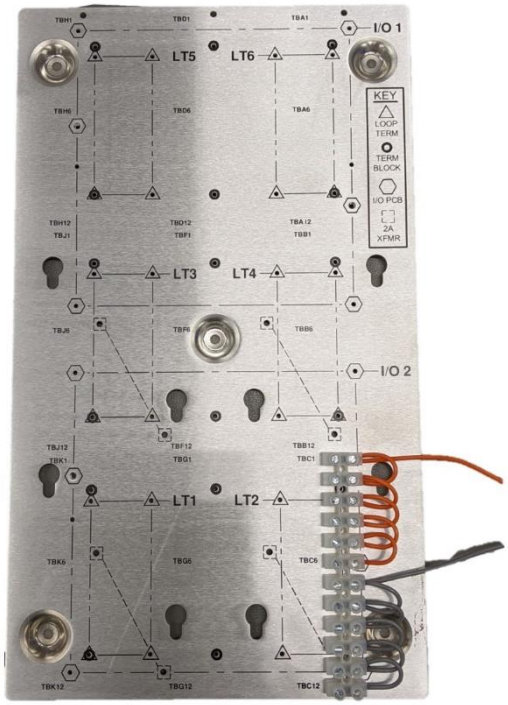


Figure 49 : Terminal block on controller cabinet rear additional panel

2. Connect the shorter of the supplied 2-core link cables to the terminals in the top cap terminal block with the corresponding core colours. Feed the cable through to the red aspect box.
3. Drill a 20 mm hole using the rear dimple on the side of the aspect box and fit the supplied M20 cable gland.

4. Attach FlexNode repeater to extension pole using 667/1/47249/000.
5. Terminate the longer length 2-core link cable to the bottom of the line powered repeater (as outlined in document below) and feed the cable down the inside of the extension pole. Press end cap onto extension pole near the LPR.

Sensys Part Number	Document Description
152-240-020-028 Rev A	Quick Start Guide - FlexNode Line Powered (Europe).pdf

Table 11-3 : Quick Start Guide for Line Powered Repeater

6. Attach the extension pole to the signal pole as instructed in section 10.3. Take care not to damage the connector at the end of free-hanging wire.
7. With the extension pole in the raised position, connect the cable from the LPR with that in the red aspect. Ensure the cable joint is inside the red aspect box and tighten the gland's grip on the link cable. Coil up any excess cable.

12 Cable Installation

Access points require an Ethernet connection from the WiMag Rack Assembly/WiMag Loop Detector Replacement Card. This the AP with both power and data communication.

The following cable, which is suitable for duct installation and to maintain safe use, is available from Siemens.

Part Number	Description
998/4/88384/ETC	Armoured CAT5E cable for duct installation

Table 12 : DUCT Installation Cable

Note: It is recommended that installations that have existing infra-structure should only use the armoured cable. The armoured cable can withstand the stresses of pulling through restrictive/occupied ducts.

Hint: It is recommended that the Ethernet cable is pulled through all conduits, prior to attaching the RJ45 termination jack. This ensures the termination is not compromised in any way during the pulling procedure.

Note: Sharp bends in the cable are to be avoided. A minimum bend radius of 4x the cable diameter (50mm) should be observed.

Note: To maintain product safety, the armoured part of the cable must be terminated at the controller end. For Siemens controllers the GB7:4/MC702 CET Gland kit is used.

1. Access points connect to the WiMag rack assembly via an Ethernet cable. This cable should be standard Ethernet compatible, outdoor rated, 4-pair CAT5 (or better).
2. The CAT5 cable is to be terminated with the RJ45 jacks (6671/147250/000) as a standard straight-through Ethernet cable at both ends. Cables are to be terminated according to the Table 13 : RJ45 Interface Cable Connection below.
3. Ethernet cables, from the junction's access points will enter the controller cabinet through ducting at its base.

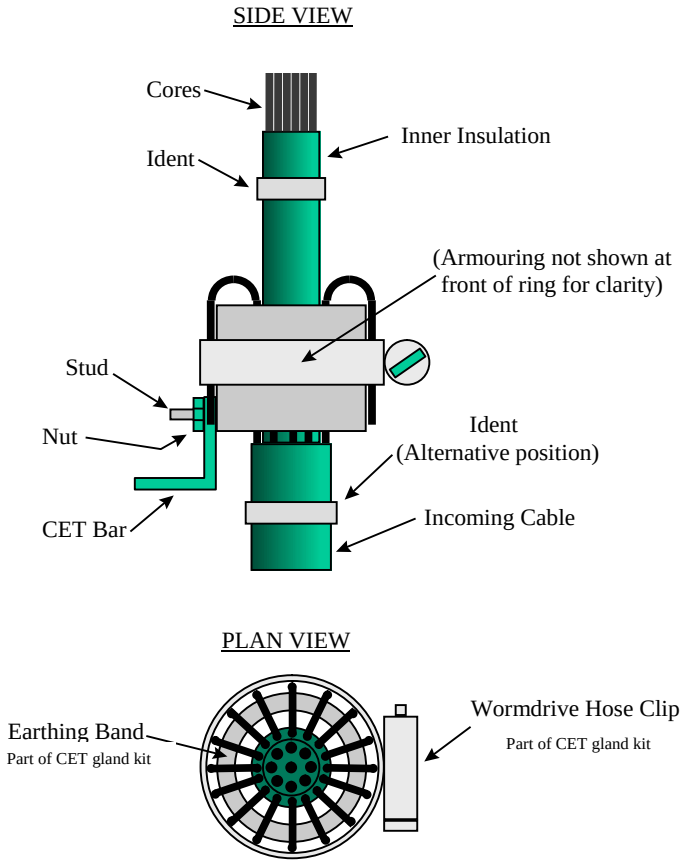


Figure 50 : Termination of Armoured Cable to CET Bar

Pin	Colour
1	White – Orange stripe
2	Orange Solid
3	White – Green stripe
4	Blue solid
5	White – Blue stripe
6	Green solid
7	White – Brown stripe
8	Brown solid

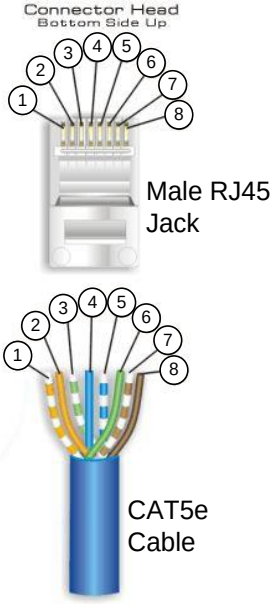


Table 13 : RJ45 Interface Cable Connection

13 Installation of the WiMag Communications Rack

13.1 Overview

The 3U and 2U racks should be assembled in accordance with general assemblies 667/GA/47260/200 and 667/GA/47260/300 respectively. They can be installed into a controller from the Factory or retrofitted into existing controllers. All components required for installation will be included with assembled racks.

13.2 Installing the PoE Switch

Note : The PoE switch should normally be pre-installed in the communications rack, variant /100 only.

1. The 8 port PoE switch is slid down the DIN rail and secured with a terminal block end stop.
2. Connect a non-PoE Ethernet port to the user maintenance Ethernet port using a supplied Ethernet cable.

Figure 51 : 8 Port PoE Device showing two free non-PoE ports (numbered 1 and 2)

Figure 52 : User Maintenance Ethernet Port

13.2.1 4 Port PoE Switch (Obsolete)

13.2.2 8 Port PoE Switch

The 48V supply is then wired from the switch, taking care that the +48V (grey) is connected to the +(ve) marked terminal and the return (white) is connected to the –(ve).

Figure 53 : Eight Port PoE Switch (DC Connection)

13.3 Mounting the WiMag Rack Assembly

The WiMag rack assemblies are 2U or 3U 19” units that mount within a standard controller swing frame.

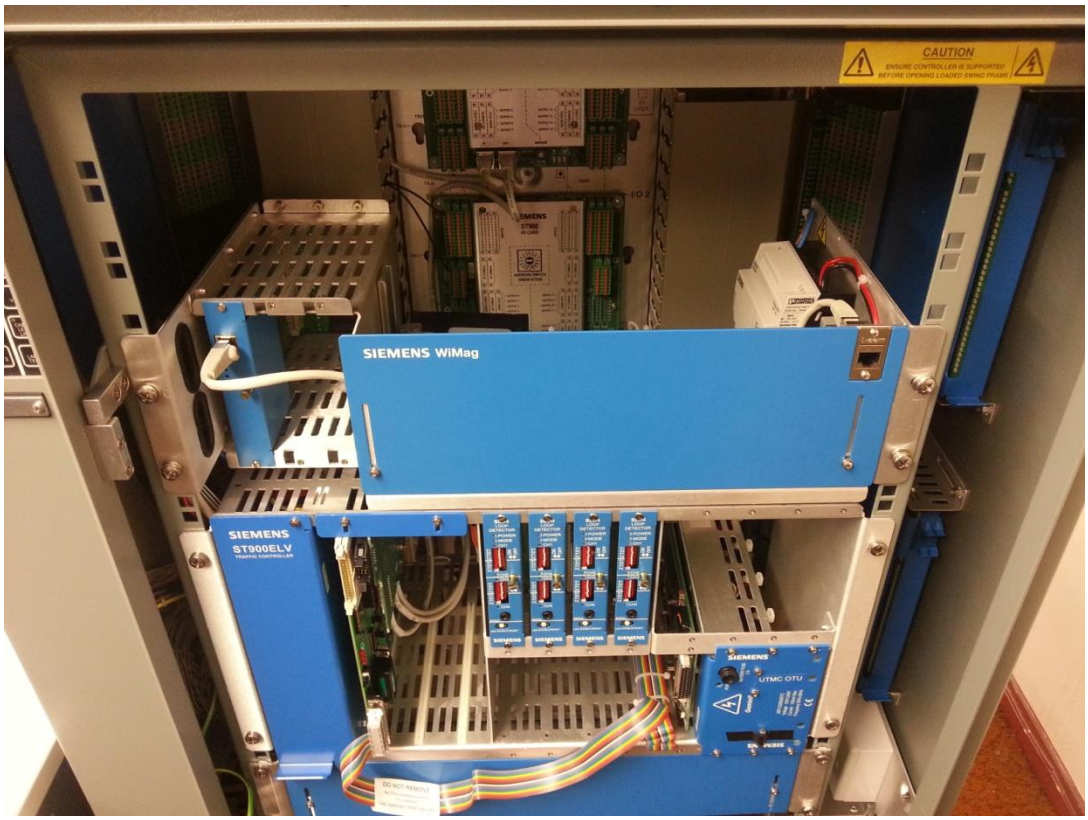


Figure 54 : Installed WiMag Rack in a Controller Assembly (/100 shown)

The rack assembly will also include the appropriate fixings required to mount the rack securely within the swing frame (667/1/27108/000).

Additionally, for the /200 and /300 Flexrack variants a wired terminal block assembly (667/1/33008/000) must be fitted to the rear additional panel in the controller cabinet. Begin populating from the bottom right of the panel (LT2), moving towards the top left, in the first available free slot. This assembly has been modified and is included with the rack.

13.4 Backplane connection

The backplane is the serial interface to the controller and is used to provide power to the interface card. The communication rack includes a 1m RJ45 Ethernet cable.

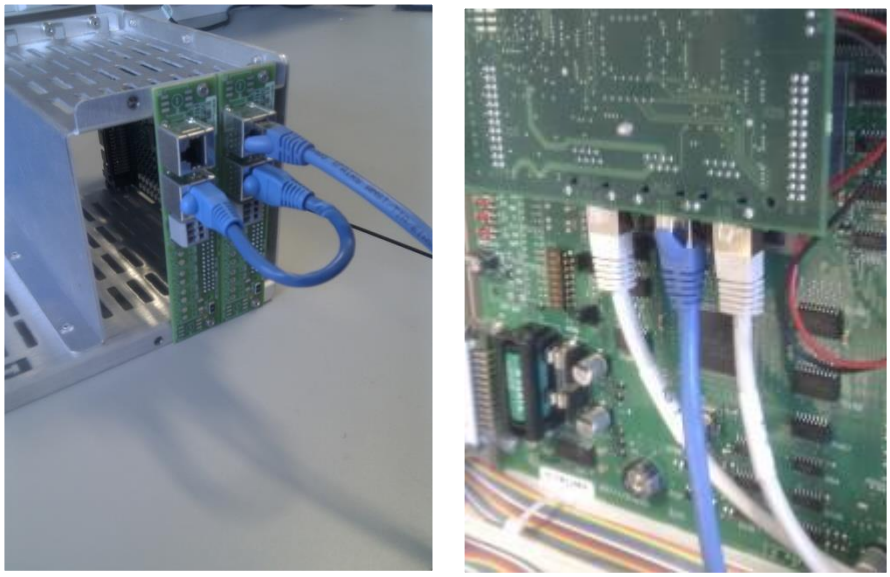


Figure 55 : Backplane Supply Connection and PHS Interface

This cable is then routed up the swing frame to a free serial connection, available on the PHS bus card. Either PL2 (IO) or PL4 (IO) on the PHS card will be suitable.

The PHS Bus is used to provide 24v required for the interface card[1].

If the PHS card sockets are fully occupied, due to use of intelligent backplanes, then one of the installed intelligent backplanes will have an available socket.

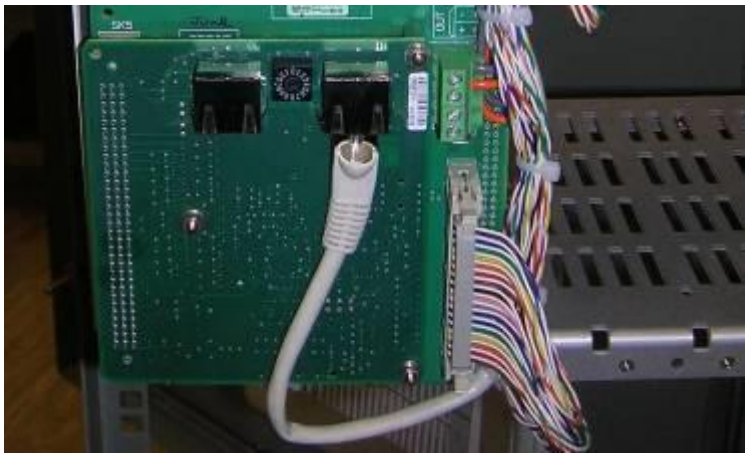


Figure 56 : Spare socket on an Intelligent Backplane

[1] In future versions the interface to the controller will be serial and will be via this interconnect.

13.4.1 Backplane Addressing

The backplane interfaces to the traffic controller using the SIO (serial I/O) protocol. This use of this interface (Ethernet cable) and protocol (SIO) means that the standard interface card, as far as the controller is concerned, will 'look' like an I/O board.

This means the standard interface card will need to have an address set.

Note: The interface card address can be found in the controller configuration.

Note: For addresses between 0 and 15, the user must ensure that the address link is in place (Reference Figure 57 below).

The card address is set by using the small rotary switch on the backplane. By locating the address switch on the backplane, the standard interface card can be replaced without having to reset the card address.

Note: The standard interface card uses a non-standard detector backplane (667/1/47217/300) which is supplied as part of the WiMag standard interface kit (667/1/47210/100).

Note: The power at the backplane is derived from the controller's serial interface interconnect system. The controller serial interface system is not the same as Ethernet and must not be routed to any of the Ethernet switches.

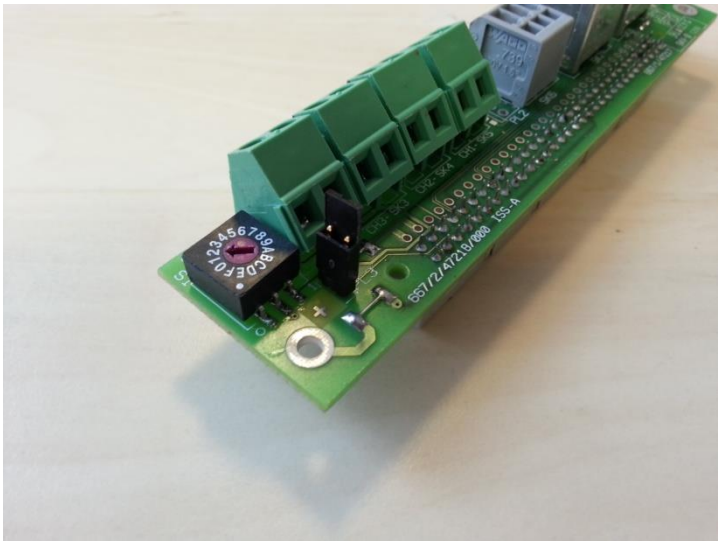


Figure 57 : Backplane Address Switch and Address Link

13.5 Main Supply connection

The WiMag communications rack also requires mains supply. For the 3U rack /100 variant, this is in order to power the 48V DC supply, which in turn is used to power the PoE switch for the Access Points. For the /200 and /300 Flexrack variants it powers a 24V DC supply, which in turn is used to power the Line Powered Repeater.

The WiMag Rack Assembly must be provided with mains from the controller Master Switch Panel (MSP). Live is to be taken from the auxiliary miniature circuit breaker, marked as 'AUX1 MCB', Neutral from the neutral block and Earth from any main earthing stud.

Figure 58 : Mains Connection for 48V DC PSU

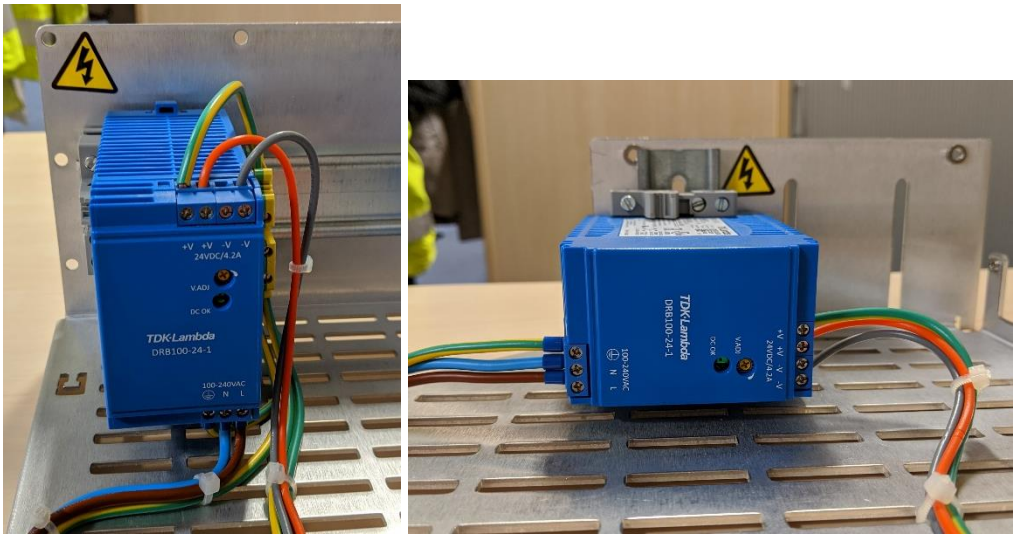


Figure 59 : Mains Connection for 24V DC PSU (*left: /200 variant; right: /300 variant*)

If the auxiliary MCB is not available or all neutral block terminations are occupied, an additional MCB can be fitted to the Master Switch Panel. This will be mounted on the DIN rail behind the blanking panels and cabled from the mains in on the adjacent AUX MCB. Instructions can be found in the documentation referenced below;

Part Number	Document Description
667/GA/27121/000	OTU Supply Kit Assembly

Table 14 : Pole Mounting Kit Document Reference

WARNING: The controller Master Switch MUST be in the OFF position before mains cabling is attempted. It must remain in the OFF position until all mains cabling is completed. DO NOT cable the WiMag rack assembly unit while the controller cabinet is live.

13.6 Connecting a WiMag Access Point

For the 3U rack /100 variant, cabling to the access points outside the controller cabinet is required. An Ethernet connection from the WiMag Rack Assembly provides the AP with both power and data communication.

1. Access points connect to the WiMag rack assembly via an Ethernet cable. This cable should be standard Ethernet compatible, outdoor rated, 4-pair CAT5 (or better) with RJ45 male terminations.
2. Ethernet cables, from the junction's access points will enter the controller cabinet through ducting at its base.
3. The cables will then travel up the cabinet and plugged into a spare PoE port. The ports will be labelled ports 1 to 8.

Figure 60 : 8 Port PoE Device showing eight free PoE ports (numbered 1 to 8)

For the /200 and /300 Flexrack variants the access point – FlexControl module – is pre-installed on the rack inside the controller cabinet.

13.7 Additional Standard Interface Cards

Larger installations, with more than twenty detectors, will require additional interface card(s). The standard interface card kits (667/1/47210/100) are shipped with a corresponding back plane, link cable and interface cable.

To install the additional card:

1. Add the additional backplane alongside the existing backplane.
2. Set the new backplane with the card address; as per the configuration sheet.
3. Connect the link cable between the two backplanes.

Figure 61 : Additional Backplane

4. Insert the new interface card and fix to the rack using the two fixing screws.
5. Connect the interface card to a spare Ethernet port within the communications rack.

Figure 62 : Additional Interface Card

14 Installation of the Loop Detector Replacement Cards

14.1 Installing the Interface Card

The interface card can be used in a standard detector card rack.

1. Carefully insert the interface card (making sure the contacts of the rear plug connector are not bent).
2. Check that the backplane connector is engaged and tighten the two retaining screws.
3. Switch on the supply. This device may also be fitted whilst the power is on – 'Hot Plug'.

Figure 63 : Loop Detector Replacement Card

14.2 Supply connection

The Loop Detector Replacement Card derives its power from the 24V presented by the standard backplane. It is a requirement that the supply is suitable to power the interface card, WiMag Access Point and any other interface cards (or devices) present on that detector card rack.

Warning : When replacing a loop detector card, with a WiMag Loop Detector Replacement Card, care should be taken to ensure that the detector power supply capacity is not exceeded.

For Siemens Traffic Controllers, a detector supply transformer would be considered the correct supply source.

14.3 Connecting a WiMag Access Point

Access points are the only system elements installed outside the controller cabinet that require cabling. An Ethernet connection to the WiMag Loop Detector Replacement Card provides the AP with both power and data communication.

1. Access points connect to the Interface Card via a correctly prepared armoured Ethernet cable. This cable should be standard Ethernet compatible, outdoor rated, 4-pair CAT5 (or better) with RJ45 male terminations.
2. Ethernet cables, from the junction's access points will enter the controller cabinet through ducting at its base.
3. The cable's armouring is terminated at the cabinet base (see section 12 for details).
4. The cable will then travel up the cabinet and is plugged into one of the two PoE enabled Ethernet ports. The ports will be labelled ports 1 to 4.

14.4 Additional Loop Detector Replacement Cards

Larger installations, with more than four detectors, will require additional interface card(s).

To install the additional card:

Two cards, linked together, will allow for three access point and eight detector outputs. No additional configuration, other than a linking cable, will be required. The facility for onward linking is only limited by physical space and system IP addresses available.

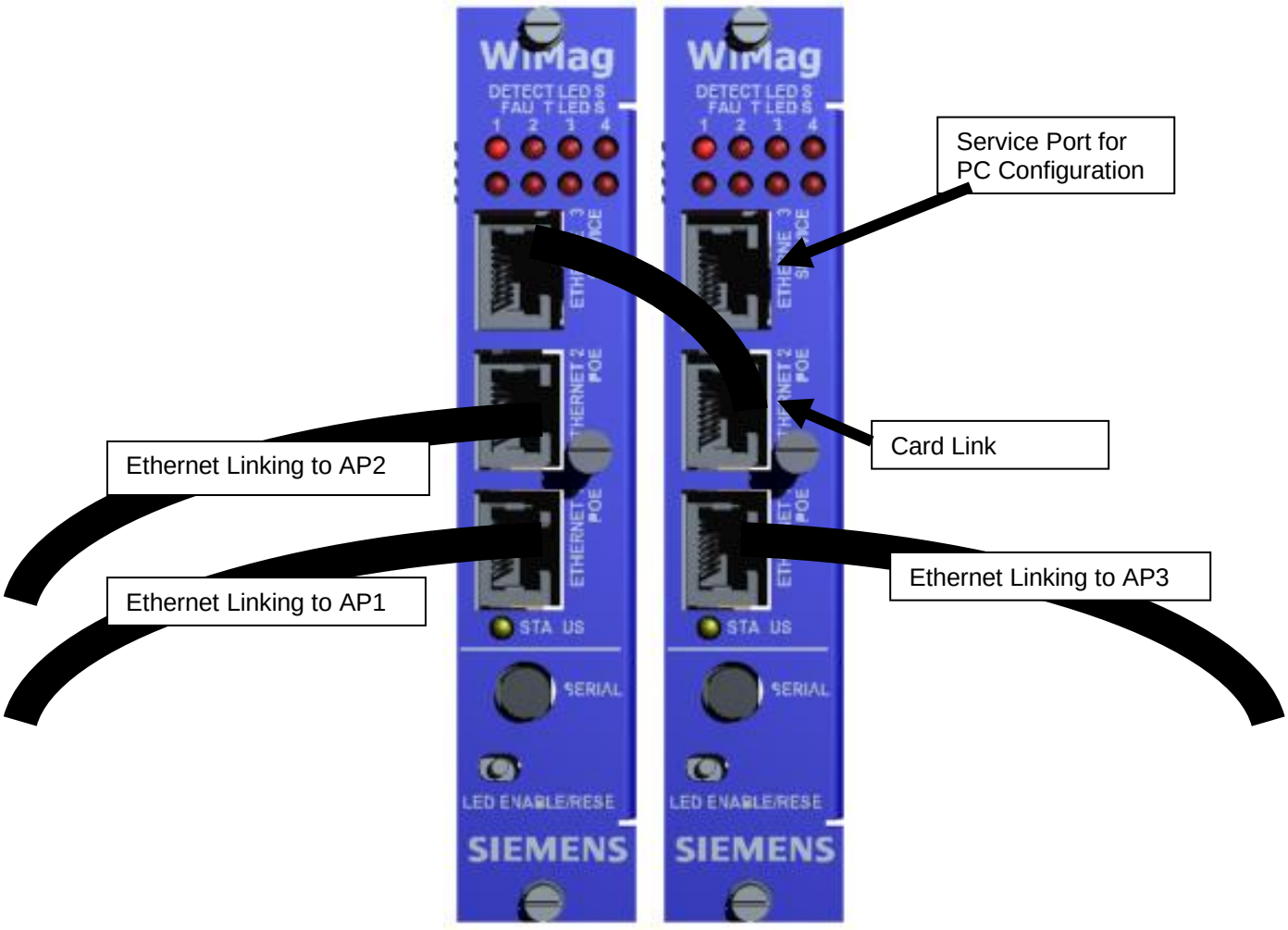


Figure 64 : Additional Card Linking

1. Insert the new interface card and fix to the rack using the two fixing screws.
2. Link the two interface cards using a linking Ethernet cable from the maintenance port on card 1 to a spare PoE port on interface card 2.

Linking cables can be supplied as required;

998/4/88351/002	CABLE PATCH CAT5e RJ45 FTP 0.2m GREY

15 Commissioning

This section is used to outline the commissioning methodology for the WiMag Vehicle Detection system.

15.1 Access Point Commissioning

The first step will be to confirm that the access point is operating as expected. The following steps should be performed on each access point;

1. Connect to the access point using the 'Traffic Dot 2.0' application
2. Enable the map mode.

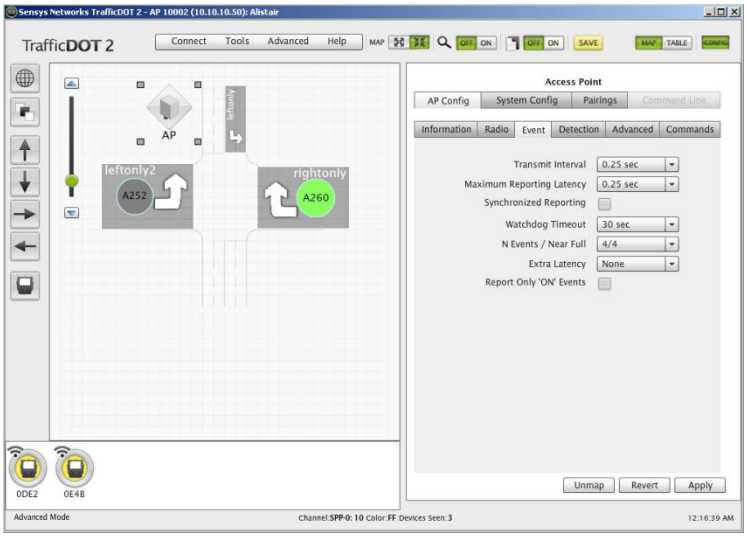


Figure 65 : Traffic Dot 2 Map Mode

3. Each detector should have been positioned on the map in its relative position.
4. Confirm each detector 'indication' is a reflection of the sensor's true status.

15.2 Standard interface Card/WiMag Loop Detector Replacement Card Commissioning

The access points connect to one or more interface card. The following step should ensure the interface card is receiving the detector information from the appropriate access point;

1. Connect to the interface card
2. Select the 'Board Test' page on the web interface

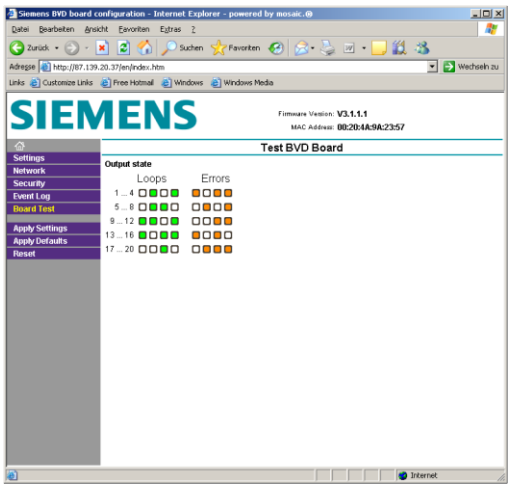


Figure 66 : Standard interface Card/WiMag Loop Detector |replacement Card

Board test page

3. Confirm each ‘loop indicator’ is a reflection of the sensor’s true status.

Note: The mapping between the loop and detector is held in the ‘Configuration Sheet’.

4. The interface card Software run LED should be illuminated ‘Green’ if there are no faults to report.

15.3 Controller Commissioning

The final step will be to confirm the controller is ‘seeing’ the appropriate detector status. The reader is to refer to the appropriate ‘controller handbook’ for details.

16 Maintenance (Fault Finding)

This section has been written to provide field staff with some suggested steps to fault finding/resolution of the WiMag system.

Engineers need to ensure they have the latest Traffic DOT when debugging.

16.1 Access point Flex-AP-ED

16.1.1 Incorrect laptop network configuration.

1. Set correct IP settings (address, mask, gateway), default AP IP address is 192.168.2.100, subnet mask is 255.255.255.0, set laptop static IP address 192.168.2.200
2. Ensure that laptop firewall is disabled.
3. Ensure that the laptop's local network adapter is enabled.
4. Check that laptop's alternative IP configuration is not in use.

16.1.2 Check the Ethernet cable between the AP and the PoE

1. Check cable for correct PIN out assignment (T-568B).If cable is damaged, re-terminate the connectors or replace the cable (as needed).
2. Use a cable tester
3. Connect the AP to the PoE using a short commercial made cable, verify the AP is working

16.1.3 Verify that POE is on.

1. Check for shorts, check that the PoE is powered

16.1.4 Check for damaged connector or AP

1. If damaged, replace and return for repair

16.2 Sensors

16.2.1 Disappeared Sensors (grey) after a long while since installation

1. Check if equipment is damaged or missing.
2. Verify that Master Mode is enabled.
3. Confirm AP or Repeater is active and within range, proper height, and orientation.
4. Confirm RF channels for all devices. Scan for missing devices.
5. Send sensor ID to Sensys Networks to check for potential issues

16.2.2 Disappearing Sensors right after commissioning

1. When the AP is set to Discovery Mode, the Access Point is temporarily set to the default system colour code ('FF'). This will mean the AP can 'see' all devices even when they are set to other colours. However, when Traffic Dot is disconnected the AP will revert back to the originally set 'colour' and will no longer communicate to 'other' sensors.
2. Ensure/confirm the 'disappearing sensor' is set to the same agreed system colour.

16.2.3 Wireless performance

1. Check RSSI on all sensors:

	AP240	Repeater 2nd Gen
VSN240-F-2	-78dBm	-83dBm
VSN240 (1st Generation)	-75dBm	-75dBm

Table 15 : Minimum Rssi Values for Appropriate Installations

The readings should be taken when there have been no vehicles across sensor for at least 30 seconds (idle time needs to roll back to one with no vehicles on it, f or the RSSI to refresh). If RSSI value is low, try changing geometry of SPP/AP or RP.

2. Check RSSI on all RPs: must be a value better than -78dBm
3. Due to the nature of the communications, it is unlikely that Wifi interference will be a significant issue. However, the LQI (link quality indicator value) will provide some clue. If the RSSI value is in the above mentioned range (good signal strength), the LQI value should be in the mid to high 90's. Values outside of this range may indicate a wireless performance issue.
4. Check for duplicate timeslots
5. Always set 'auto assign' time slot at the end of the commissioning process. If duplicate timeslots are still seen, manually change them

16.2.4 Battery level

1. 3.4V on sensors with about 1 month remaining typically

16.2.5 Active sensors are yellow or red (not green/black)

1. Confirm wireless performance is within spec (see above)
2. Check for duplicate timeslots
3. Always set 'auto assign' time slot at the end of the commissioning process. If duplicate timeslots are still seen, manually change them

16.2.6 Sticking Sensors (black)

1. Update the system configuration so that a non-default colour is used. This is particularly pertinent if there are multiple systems within the vicinity.

2. If there are duplicate timeslots, Auto-assign timeslots.
3. Ensure the system installation is appropriate: repeaters are set beyond the sensors, check wireless performance
4. Investigate for Magnetic Interference (see below)
5. Check the AP System Settings (thresholds, event) Check the recalibrate timeout values (under the AP's Detection tab). Five minutes is default.

16.2.7 Occasional Sticking Sensors

1. Check AP/System/Detection and AP/System/Event parameters for correctness
2. If wireless performance is appropriate, upgrade all sensors to latest firmware

16.2.8 Sensors not executing commands, settings not being modified

1. Update the system so that a non-default colour is used. This is particularly pertinent if there are multiple systems within the vicinity.
2. If there are duplicate timeslots, Auto-assign timeslots.
3. Ensure the system installation is appropriate (see above)

16.2.9 Magnetic Interference

1. There are some installation environments that may mean magnetic interference will cause false detection or “stick highs”. If magnetic interference is suspected (e.g. localised overheads power cables for trams or very localised underground power cables), the following step could be used to confirm that the issue is not magnetic:
2. Use Traffic Dot to set the sensor in question to ‘D Mode’. Typically the sensors are set in B Mode.
3. Enter ‘Superuser Mode’ (password ‘355/113’),
4. Set sensor to D (Raw XYZ) Mode
5. Go to Tools Charts XYZ Chart (real time plot of the detection axis).
6. If the tracking lines are relatively constant and the noise is between +3 and -10 then there is no magnetic interference. Values outside of these limits suggest a magnetic interference issue.
7. In case of noise caused by tram aerial power lines: in general do not install sensors closer than 4-6 meters (horizontally) from aerial power. Disable the Z axis and enable Filter 4 on the affected sensor. If occasional stuck highs are still observed, especially when a tram is breaking or accelerating even at some distance from the sensor, move the sensor a few meters further away. N.B. the impact of switching the Z axis off, is that the detection zone may become slightly more inconsistent and presence will be more difficult to maintain. Use an appropriate sensor extension e.g. 150-250ms
8. In case of noise caused by underground power cables (50Hz), if the noise is not excessive (within +- 20 from baseline), enable Filter 4. If stuck highs are still observed, move the sensor a few meters further away on the traffic lane. If the cable runs parallel to the lane, try moving the sensor to the side of the lane

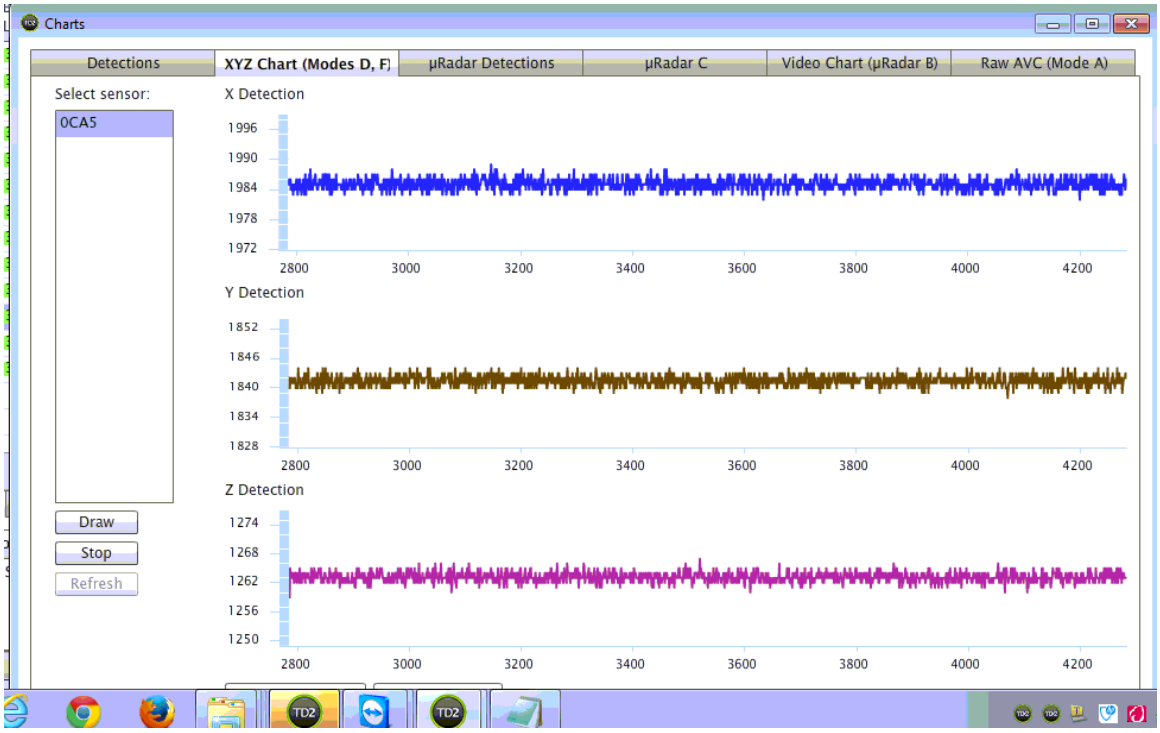


Figure 67 : Example of Normal Performance Observed using ‘D’ mode

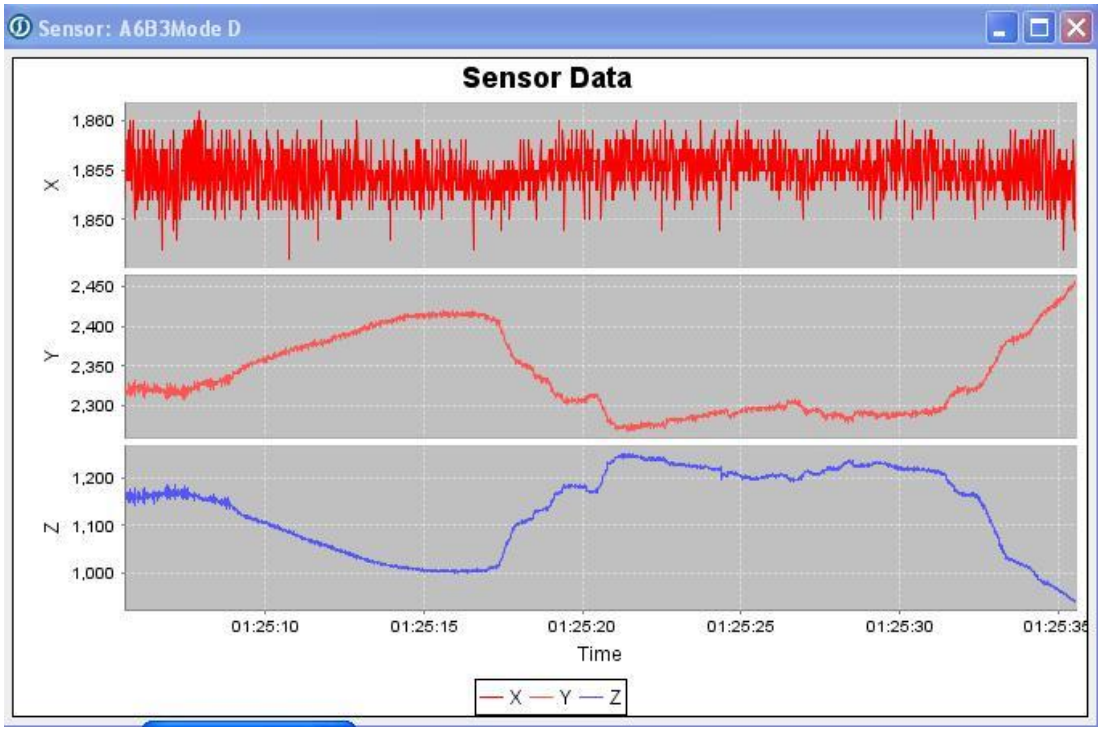


Figure 68 : Example of Magnetic Interference Observed using 'D' Mode

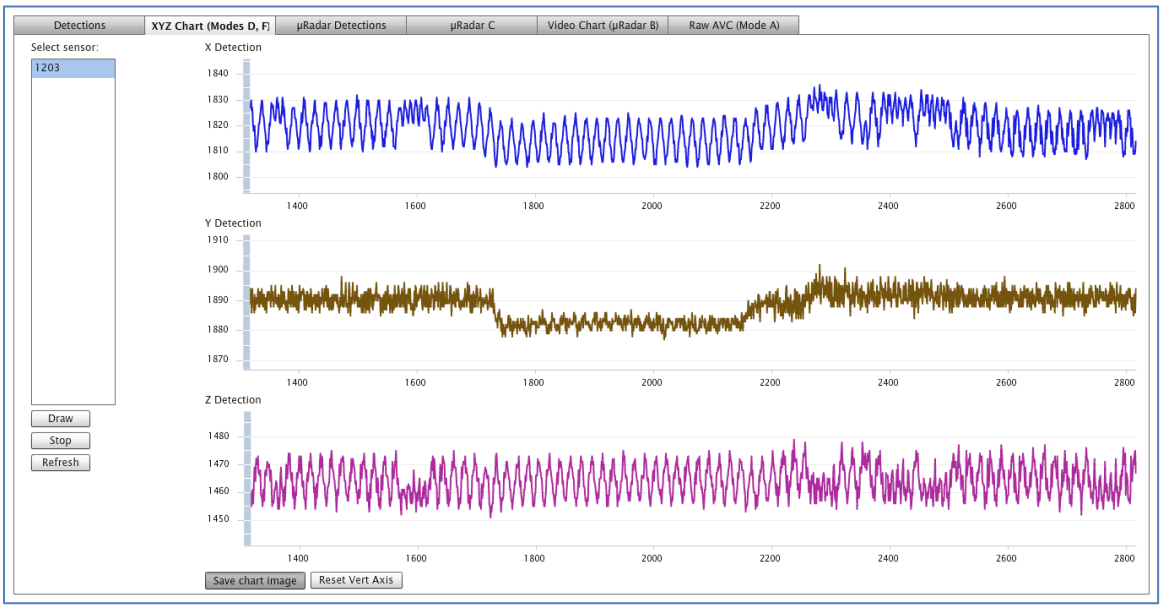


Figure 69 : Example of Interference from Underground Cables Observed using 'D' Mode

16.3 Repeaters

16.3.1 Connection issues (operating RP)

1. Confirm that battery is connected to RP.
2. Check RSSI on all RPs: must be a value less negative than -78dB
3. Due to the nature of the communications, it is unlikely that Wifi interference will be a significant issue. However, the LQI (link quality indicator value) will provide some clue. If the RSSI value is in the above mentioned range (good signal strength), the LQI value should be in the mid to high 90's. Values outside of this range may indicate a wireless performance issue.
4. Check distances and line of sight

16.3.2 Battery Level

1. 2.7V on RPs with about 1 month remaining typically
2. The previous generation RPs had the voltage measured after the regulator, so they always read about 3V (usually 2.96V). Those were all serial numbers up to 57FB and were produced through August 2013.

16.3.3 Non operating RP

1. Check if equipment is damaged or missing
2. Sufficiently charged battery - LEDs flash red and green when initially powered, then flash red about every 3 seconds.
3. Insufficiently charged battery - LEDs flash red and green consistently or not flash at all

4. If RP went offline before the end of the 2 or 7 year battery life (depending on model): check for signs of corrosion, or reset button (if present) hard to press, or moisture/water inside.
5. Otherwise replace battery if 2-year version, replace the RP if 7-year model

16.4 Standard and Detector Replacement Interface Cards

16.4.1 Interface Card Not Recognised or Unresponsive to Commands

If the interface card is not recognised, or if configuration settings do not update properly when changed, then the following steps should be considered as part of the diagnostics process;

1. Check the card address - The standard Interface card uses a rotary switch to set the GSPI address. Ensure that the jumper is set such that the link pins are ‘closed’.
2. Ensure the interface card was configured using ‘Firefox’ or IE with compatibility mode enabled. Failure to use the above browsers/browser settings could mean incompatible settings.

16.4.2 Environmental Error

If the controller reports ‘Environmental Error’ this actually refers to an interface card fault being reported. Examples of this are;

1. Access Point is not connected or powered
2. One or more sensors are reporting and error
3. The interface card itself is in fault mode.

17 Maintenance (Replacement and Repair)

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

17.1 Routine Maintenance Visits

The interval between visits depends on local conditions but typically would be every six months. Routine maintenance consists of the following:

1. Confirm that the battery levels for each detector is within expected/required levels
2. Confirm battery level for the repeater is within expected / required levels.

Battery level information is found by using the Traffic Dot application software (reference section 1.2).

17.2 First Line Maintenance

17.2.1 Standard Interface Card Replacement (667/1/47221/100)

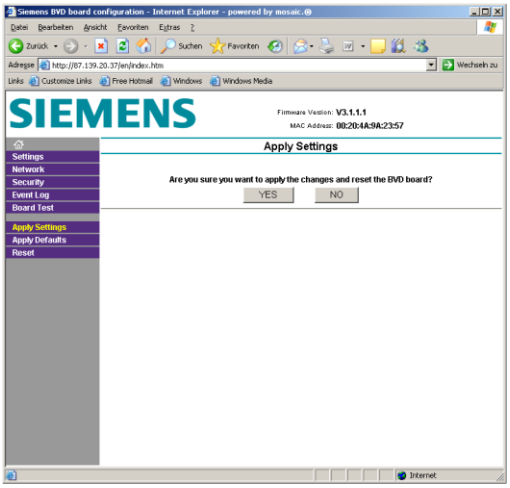
Full details of the 'interface card' GUI can be found in the following document;

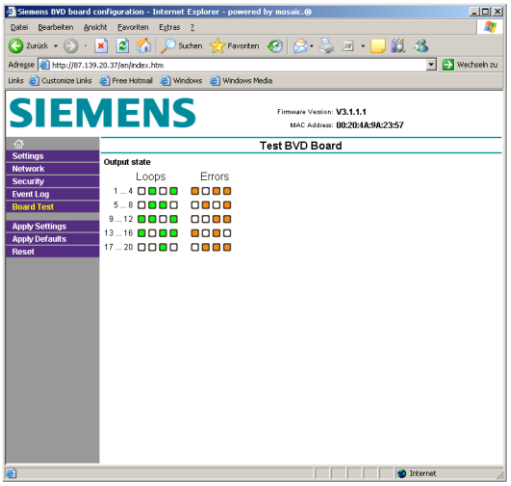
Part Number	Document Description
667/HB/47200/100	BVD Interface User Manual

Table 16 : Interface Card Configuration and User Guide

If the interface card requires replacing the following actions should be followed;

1. Ensure the 'configuration sheet' is available for reference.
2. **Important**: Disconnect the Ethernet connection from the front of the interface card.
3. Pull the interface card from the WiMag communications rack.
4. Prior to fitting the replacement interface card; ensure the 'configuration link' has been removed. This will ensure the interface card is in 'factory default mode'.
5. Fit the standard interface card and connect the Ethernet connection back onto the front of the card.
6. Connect to the interface card using the IP address **10.10.10.10**
7. Set the interface card as per the configuration sheet. Any deviations from the interface card should be recorded on said sheet.
8. On completion of the settings – click on the 'Apply Settings' and allow the unit to reboot.





9. Disconnect the Ethernet connector from the front of the card.
10. Pull the interface card from the rack
11. Re-apply the ‘configuration link.
12. Re-insert the card and re-connect the Ethernet cable back onto the front of the card.
13. Re-connect to the interface card using the appropriate IP address.
14. Confirm detection by observing the ‘Board Test’ facility

17.2.2 PoE Switch replacement

The PoE switch to be replaced will be one of two types; a four port or an eight port (408/4/54225/000). Replacement PoE will only be as an 8 port variant. The following instructions should be followed for a successful replacement;

1. Disconnect every Ethernet connection from the PoE switch. The field technician should be aware of which port each cable was connected to.
2. Unscrew the terminal connector on the PoE switch.
3. Loosen then remove the grey end block, situated above the switch.
4. Un-clip the PoE switch. Alternatively, if there is room available, slide the switch upwards and off the DIN rail.
5. Replacement is the reverse of removal.

17.2.3 48V PSU Replacement

The 48V PSU is used to provide 48v for the PoE switches. The following instructions should be followed for a successful replacement;

1. Switch off the mains supply to the WiMag communications rack. This will be the '**AUX MCB**' located in the mains distribution panel.
2. Before progressing to any further steps ensure the PSU is not powered. This can be confirmed by checking the LED marked 'DC OK'.
3. Remove the mains wiring (brown and blue wires) from the PSU.
4. Remove the 48v wiring from the PSU (grey and white wiring).
5. Remove the grey end block, to the left of the PSU.
6. Slide the PSU from the rack.
7. Replacement is the reverse of removal.

17.2.4 Access Point replacement

The access point is the key component to the WiMag vehicle detection system. All the sensor and repeater configuration items are accessed and stored within the access point.

The easiest way to ensure the access point can be replaced with minimum effort would be to maintain a copy of the configuration file offline.

The following instructions assume the configuration file is available.

1. Remove and replace the access point as per instructions in section 10.

Sensys Part Number	Document Description
P/N 152-240-015-017 Rev A	Quick Start guide for Flex-AP-ED
P/N 152-240-001-038 Rev B	Traffic Dot Set Up and Operating Guide

Table 17 : Configuration Guides[1]

2. Connect to the Access Point using the TrafficDot application: As this will be the first connection then the **default IP address for all Access Points is 192.168.2.100, Subnet mask: 255.255.255.0**
3. Activate TrafficDot's Advanced Mode. It must be active during initial system configuration to allow colour codes to be selected. Click ***Advanced*** on the main toolbar, followed by ***Set Advanced Mode…*** to enable.
4. The original configuration file may now be uploaded to the access point as per instructions laid out in section 7.3.7

[1] This dependant on the transmit interval, which is set as 0.0625s as default. Other values are available.

17.2.5 Repeater Battery Replacement

There is only one variant of the repeater battery. The short life repeater, which has an expected battery life of two years, does have a user replaceable battery (418/4/53471/000).

The long life repeater, which has an expected life of 8 years, does not have a user replaceable battery option.

The replacement of the batteries or repeater is covered in the following documentation;

Sensys Part Number	Document Description
152-240-020-002 Rev C	Sensys Quick Start Guide rp-ll.pdf

Table 18 : Quick Start Guide for a Repeater

It should be noted that for battery replacement there is no re-configuration required. If the long life repeater is to be replaced, reconfiguration is required once the repeater is powered and in place. Details are provided in the section below.

17.2.6 Repeater Replacement

There are two variants of the repeater namely the long life (640/4/90029/000) and short life (667/4/90029/001) variant.

The following steps should be followed for appropriate replacement of the repeater;

1. Remove repeater and replace
2. Re-configuration of repeater is as per battery replacement (reference section 17.2.5).

Sensys Part Number	Document Description
152-240-020-002 Rev C	Sensys Quick Start Guide rp-ll.pdf

Table 19 : Quick Start Guide for a Repeater

17.2.7 Sensor Replacement

The WiMag magnetometer sensor is not designed for replacement. If the battery has reached its end of life, the most appropriate method for replacement is the re-installation of a second sensor in a nearby location.

Full details of sensor installation can be found in the appropriate documentation;

Sensys Part Number	Document Description
667/CC/47200/000	The Installation of a WiMag Detector

Table 20 : The installation of a WiMag Detector

17.3 Second Line Maintenance

It is recommended that undamaged parts are reused where possible.

All other parts must be sent for repair or disposal, details of which, are held in the 'Global Service Support Plan (ref. 667/PA/47200/000) and in the sections below.

***NOTE:* Observe Anti Static Precautions at all times.**

Faulty parts being returned must always be sent back in the original packaging if available or in an approved anti-static packaging, along with a fully completed fault label, to;

Logistics Spares Returns Centre

Siemens Mobility,

Traffic Solutions,

Coalfield Way,

Ashby Park,

Ashby de la Zouch,

LE65 1JD

Any queries should be directed to the Service Logistics Manager on (01530) 258181

18 Disposal

18.1 Under Maintenance Contract

All items that have been replaced under a maintenance contract are sent back for replacement. The items will either be sent to the OEM for repair/replacement/disposal.

All Traffic Solutions, Siemens depots operates an **Environmental Management System (EMS).**

In accordance with its **Environmental Policy** Siemens applies the **Waste Hierarchy** when managing waste, **segregating waste** into a number of waste streams to optimise the re-use/recycling carried out by the approved waste contractors that take the waste away.

18.2 End of Life and Scrapping

End of life items and items involved in RTAs will normally be disposed of locally. In this situation the local depot will dispose of all elements under the local EMS policy.

One key item to recognise is that **Lithium batteries require disposal in accordance with COSHH regulations**.

19 Part Numbers / Spares List

The following lists can be referenced for replacement item part numbers.

19.1 WiMag Cabinet Equipment Spares – Rack Mounted Solution

PART NUMBER	Item DESCRIPTION
667/1/47260/100	WiMag 3U 19" Communications Rack Assembly (includes one interface card – no PoE)
667/1/47210/100	WiMag Standard Interface Card Kit (including backplane)
408/4/54225/000	8 PORT SWITCH
605/4/08695/001	48V DC Power Supply Unit
998/4/88323/000	CABLE ETHERNET PATCH UTP BLUE 1M STRAIGHT
998/4/88351/005	CABLE PATCH CAT5e RJ45 FTP 0.5m GREY
998/4/88351/002	CABLE PATCH CAT5e RJ45 FTP 0.2m GREY
531/4/04012/000	CONNECTOR MODULAR JACK RJ45 TO RJ45
667/1/47221/000	WiMag Standard Interface CARD KIT - NO BPLANE
667/1/47217/300	WiMag Standard Interface Card BACKPLANE
667/1/27121/000	ST800/700 OTU Supply Kit (Aux MCB)

19.2 WiMag Flexrack Equipment Spares

PART NUMBER	Item DESCRIPTION
667/1/47260/200	WiMag 3U 19'' Communications FlexRack Assembly
667/1/47260/300	WiMag 2U 19'' Communications FlexRack Assembly
667/1/47210/100	WiMag Standard Interface Card Kit (including backplane)
408/4/54242/004	Brainbox ethernet switch 4 port
605/4/08717/000	24V DC Power Supply Unit
998/4/88323/000	CABLE ETHERNET PATCH UTP BLUE 1M STRAIGHT
998/4/88351/005	CABLE PATCH CAT5e RJ45 FTP 0.5m GREY
998/4/88351/002	CABLE PATCH CAT5e RJ45 FTP 0.2m GREY
667/1/47221/000	WiMag Standard Interface CARD KIT - NO BPLANE
667/1/47217/300	WiMag Standard Interface Card BACKPLANE
667/1/27121/000	ST800/700 OTU Supply Kit (Aux MCB)

19.3 WiMag Cabinet Equipment Spares – Loop Detector Replacement Card

PART NUMBER	Item DESCRIPTION
667/1/47280/000	WiMag Loop Detector Replacement Card Kit
998/4/88351/002	CABLE PATCH CAT5e RJ45 FTP 0.2m GREY
667/1/17205/000	Standard Backplane

19.4 WiMag On Street Spares

Siemens Part Number	Item Description
640/4/90028/001	MicroRadar™ Sensor (VSN240-M)[1]
640/4/90028/000	Magnetometer Sensor (VSN240-F-2) inc. Clam Shell
640/4/90028/003	Magnetometer Sensor (VSN240-F-GR)[2]
656/4/21421/000	FLEX-AP FLEX-AP-(E)D-XC
	FLEX-AP FLEX-AP-(E)D-XCS (Preferred)
640/4/90029/000	Long Life Repeater
640/4/90040/000	FlexNode line powered repeater
640/4/90042/000	Omni-directional external antenna
667/1/47258/000	FlexNode line powered repeater installation kit
998/4/88384/000	Armoured CAT5E cable for duct installation
667/1/47250/000	Access Point Connector Kit (2 connectors per kit)
GB7:4/MC702	CET Gland Kit
418/4/53471/000	Short Life Battery Replacement for repeater
992/4/07898/000	Epoxy Resin for Sensor Installation
640/4/90028/100	Sensor Clam Shell (for replacement)

[1] No clamshell required
[2] As above

19.5 WiMag Bracket Assemblies

Siemens Part Number	Item Description
667/1/47230/000	Signal Head Mounting Kit
667/1/47235/000	Pole Mounting Kit (requires one of the banding options)
999/4/44374/130	FASTENER BAND CLAMP 100MM-130MM
999/4/44374/160	FASTENER BAND CLAMP 130MM-160MM
999/4/44374/190	FASTENER BAND CLAMP 130MM-190MM
999/4/44374/250	FASTENER BAND CLAMP 190MM-250MM
667/2/47231/000	WIMAG SIGNAL HEAD MOUNTING BRKT ANGLE
999/4/44316/001	WASHER NORD-LOCK LARGE DIA M10 A4 S/S
561/4/20925/000	FASTENER RAM DOUBLE SOCKET ARM 1.5IN
561/4/20926/000	FASTENER 1.5IN BALL WITH 3/8IN-16 THREAD
667/1/47240/004	Traffic Signal Pole Extension Mounting Kit (4m)
667/1/47240/005	Traffic Signal Pole Extension Mounting Kit (5m)
667/1/47240/006	Traffic Signal Pole Extension Mounting Kit (6m)

19.6 Standard 24VAC Controller Supplies

Siemens Part Number	Item Description
667/1/27853/000	Nominal 50 VA, (2 amps):- LV Controller
667/1/20292/008	Nominal 160 VA, (6.6amps) – LV Controller
667/1/33075/000	Nominal 50 VA, (2 amps):- ELV Controller
667/1/33074/000	Nominal 160 VA, (6.6amps) – ELV Controller

20 Open source software

The Wimag standard interface card (667/1/47221/000) and the Wimag detector replacement card (667/1/47280/000) both utilise open source software. The following section details the license conditions and copyright holder information of all the open source software being used.

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Appendix A - Backplane Connections

Siemens standard backplane (667/1/17205/000);

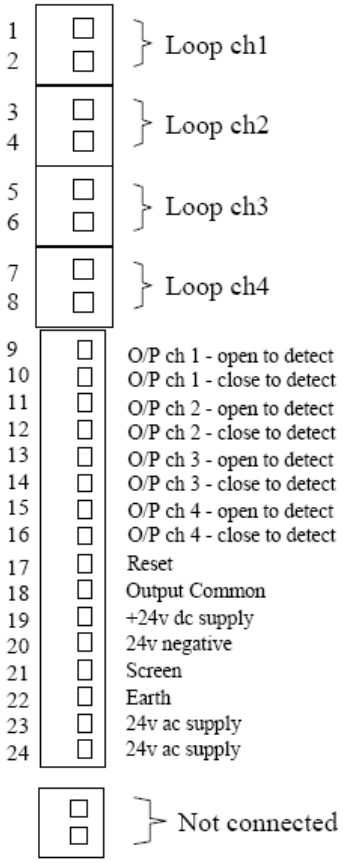

Figure A-1 : Standard Backplane Connections (for WiMag Loop Detector Replacement Card)

Appendix B – Bicycle Sensor User Cases

This section outlines the setup required for three identified user cases. The sections below also outline the restrictions/limitations of said scenarios.

There are three user cases that are considered here:

1) Bike only traffic
2) Mixed bike and road vehicle
3) Mixed bike and pedestrian

Within each of these user cases there are three applications which are considered. These are Stop line detection, VA detection and Count.

Note: Many of the settings and adjustments will require the user to be in **'Advanced Mode.'**

B.1 Bicycle Only Traffic

B.1.1 Stop line

In a dedicated bicycle lane, the MicroRadar sensor should be positioned approximately 15cm from the stop line at the edge of the bicycle lane and aimed along the bicycle lane. The sensor should be installed such that it is pointing towards oncoming traffic.

- **Sample Rate** – 4Hz
- **Detection Distance** - 6 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Not Set
- **Latch Car Subchannel** – Not Set

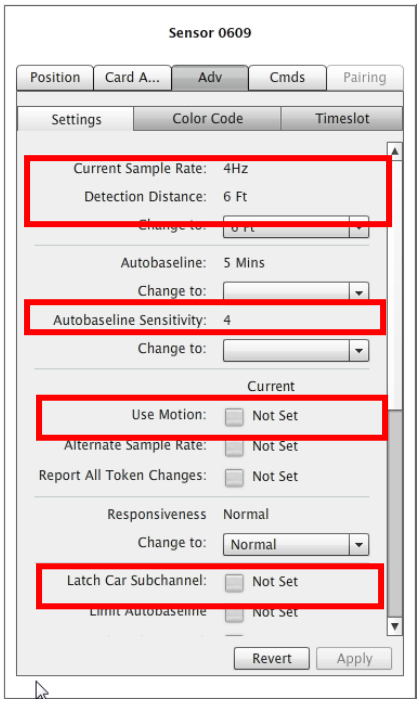

Figure 70 : Installation and Configuration for Bike Only Traffic - Stopline

This assumes a lane of 1.5m. If additional coverage is required, e.g. two adjacent lanes, then a second sensor is to be used.

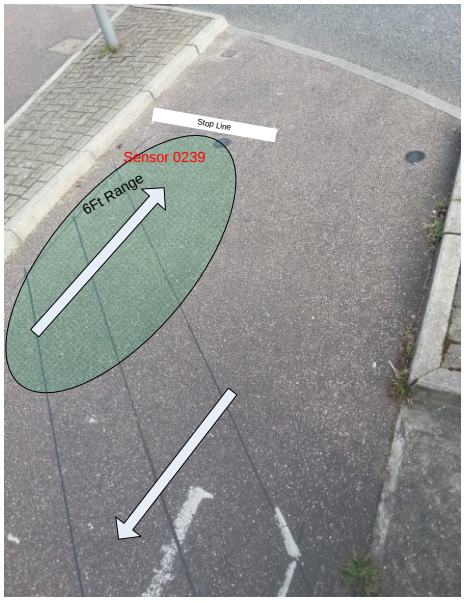

Figure 71 : Stop line Function for a Bicycle lane

B.1.2 VA Detection

The sensor should be installed such that it is pointing towards oncoming traffic and must be configured with 'Use Motion' setting enabled, as well the sample rate being set to 4Hz.

- **Sample Rate** – 4Hz

- **Detection Distance** - 8 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Set
- **Latch Car Subchannel** – Not Set

For details on how to configure the settings please refer to the Traffic Dot Set Up and Operating Guide (P/N 152-240-001-071).

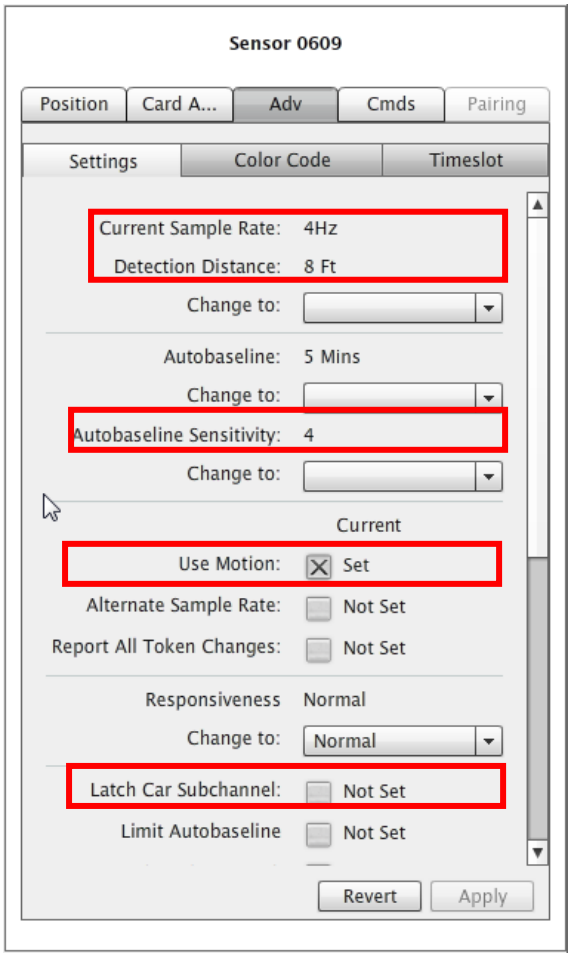

Figure 72 : VA/Count setup for Bike Only Lanes

B.1.3 Count

Install and configure as per the VA installation guidelines above.

Note: Multiple bikes that cross the detection zone simultaneously will be counted as a single bike.

B.2 Mixed Traffic : Bicycles and Vehicles

B.2.1 Stop line for mixed traffic

In traffic lanes where you need to differentiate between motor vehicles and bicycles, the MicroRadar sensor should be placed 15cm from the stop line.

- **Sample Rate** – 4Hz
- **Detection Distance** - 6 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Not Set
- **Latch Car Subchannel** – Set

An alternative installation could involve the bicycle reservation area being situated ahead of the vehicle stopline area.

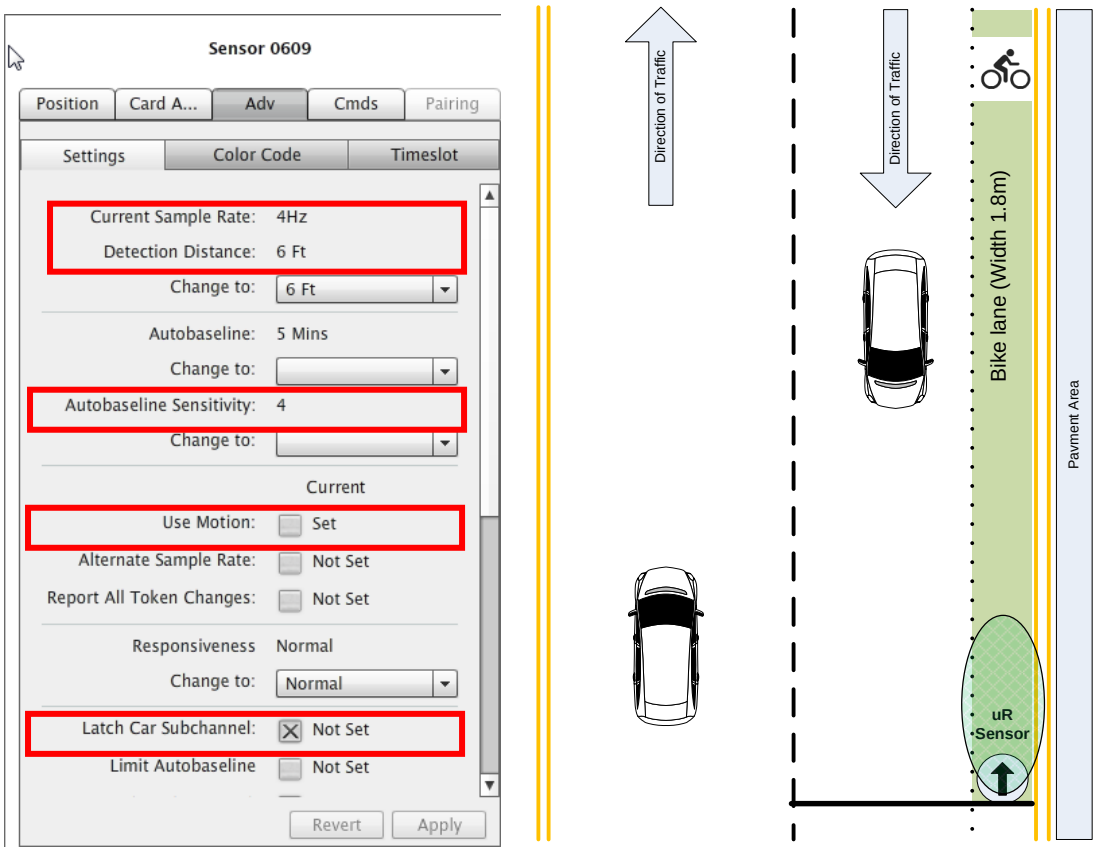

Figure 73 : Stopline sensor installation for mixed traffic

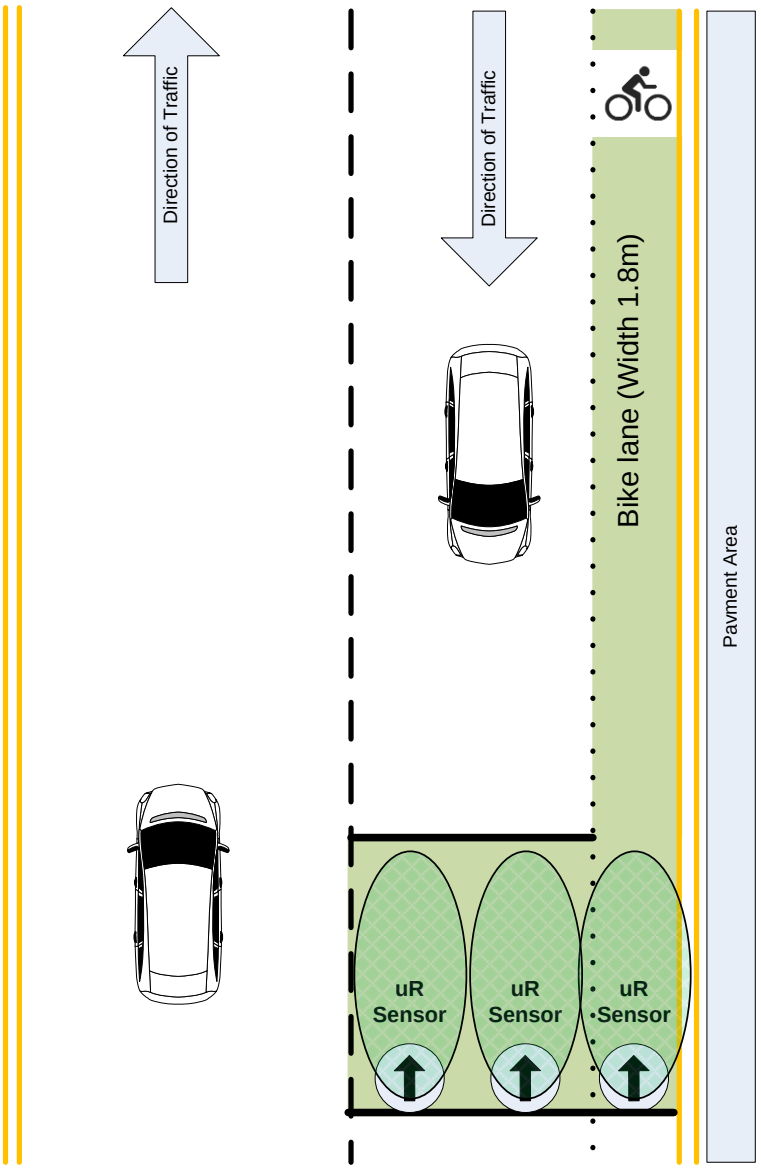

Figure 74 : Forward reservation area for Stopline bike sensors.

B.2.2 VA Detection for mixed traffic

In general the sensor should be installed such that it is pointing at 45degrees towards oncoming bicycle traffic. The sensor is to be configured with 'Use Motion' setting enable, sampling rate set to 4Hz and the sensitivity set to level 4.

- **Sample Rate** – 4Hz
- **Detection Distance** - 8 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Set
- **Latch Car Subchannel** – Set

For a 1.8m lane the detection distance should be set to 8ft.

.

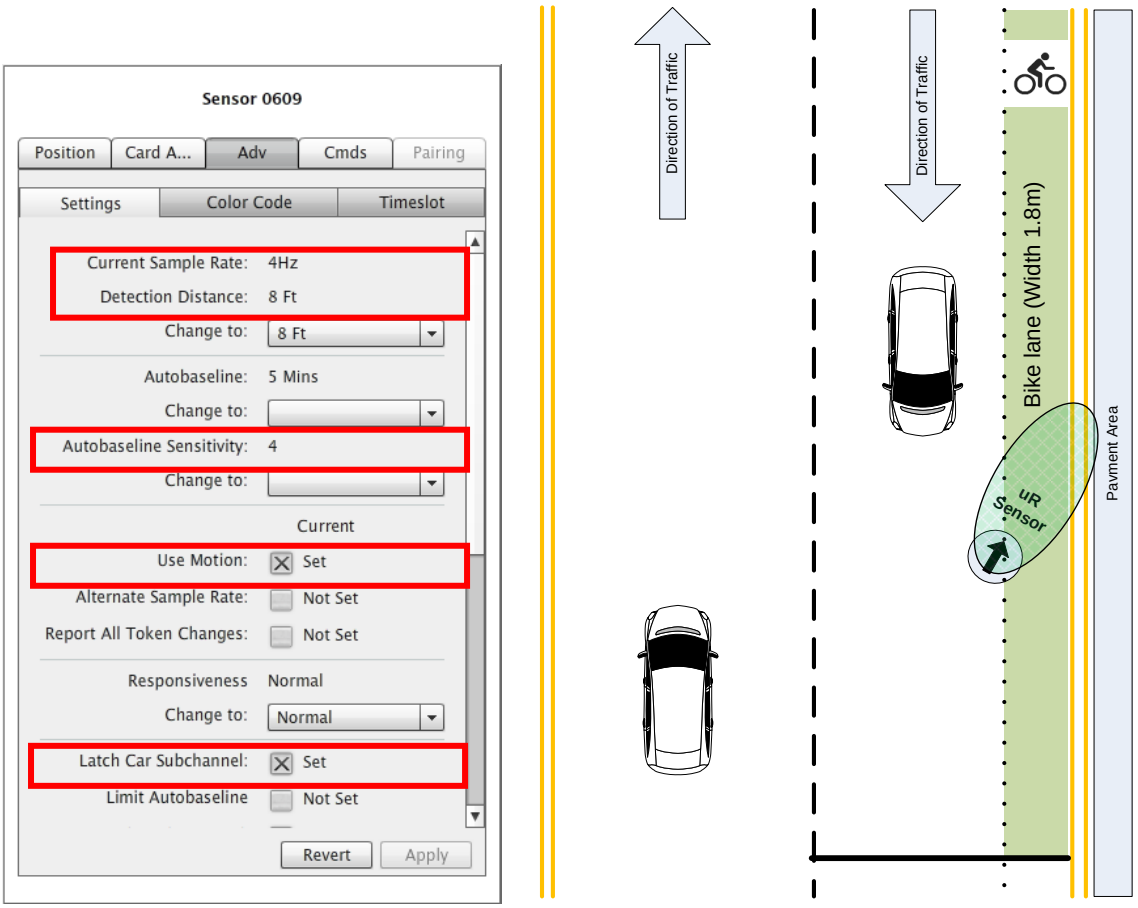

Figure 75 : VA and Count setup for shared traffic

Note: Multiple bikes that cross the virtual detection zone simultaneously will be counted as a single bike.

B.2.3 Count Detection mixed traffic

Install and configure as per the VA installation guidelines above.

Note: Multiple bikes that cross the virtual detection zone simultaneously will be counted as a single bike.

B.3 Mixed Traffic : Bicycles and Pedestrian

In general the separation between bicycles and pedestrians is poor and so these types of arrangements are not recommended without the customer being made fully aware.

B.3.1 Stop line for mixed bikes and pedestrians

Refer to section B.1.1 for general installation and setting instructions.

- **Sample Rate** – 4Hz
- **Detection Distance** - 6 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Not Set
- **Latch Car Subchannel** – Not Set

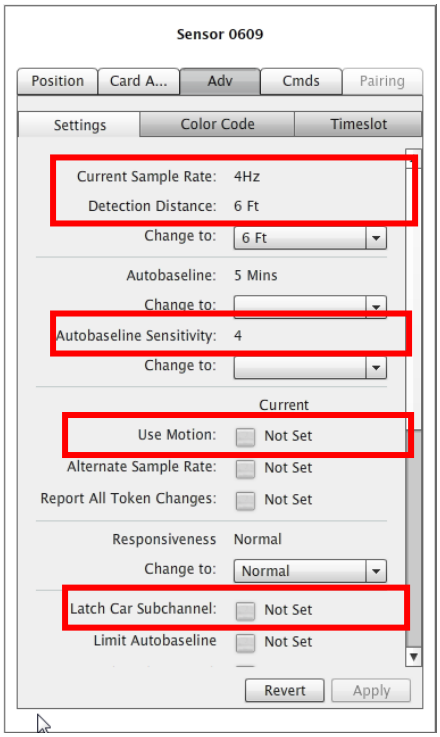

Figure 76 : Installation and Configuration for Mixed Bike and Pedestrian Traffic - Stopline

B.3.2 VA Detection for mixed bikes and pedestrians

Note: Pedestrians will be counted and therefore the count values generated will be inaccurate. It is recommended that the sensor is installed where the pedestrian traffic is minimised.

The sensor should be installed such that it is pointing towards oncoming traffic. Recommended configuration settings is shown below.

- **Sample Rate** – 4Hz
- **Detection Distance** - 8 Ft
- **Auto baseline Sensitivity** – 4
- **Use Motion** – Set
- **Latch Car Subchannel** – Not Set

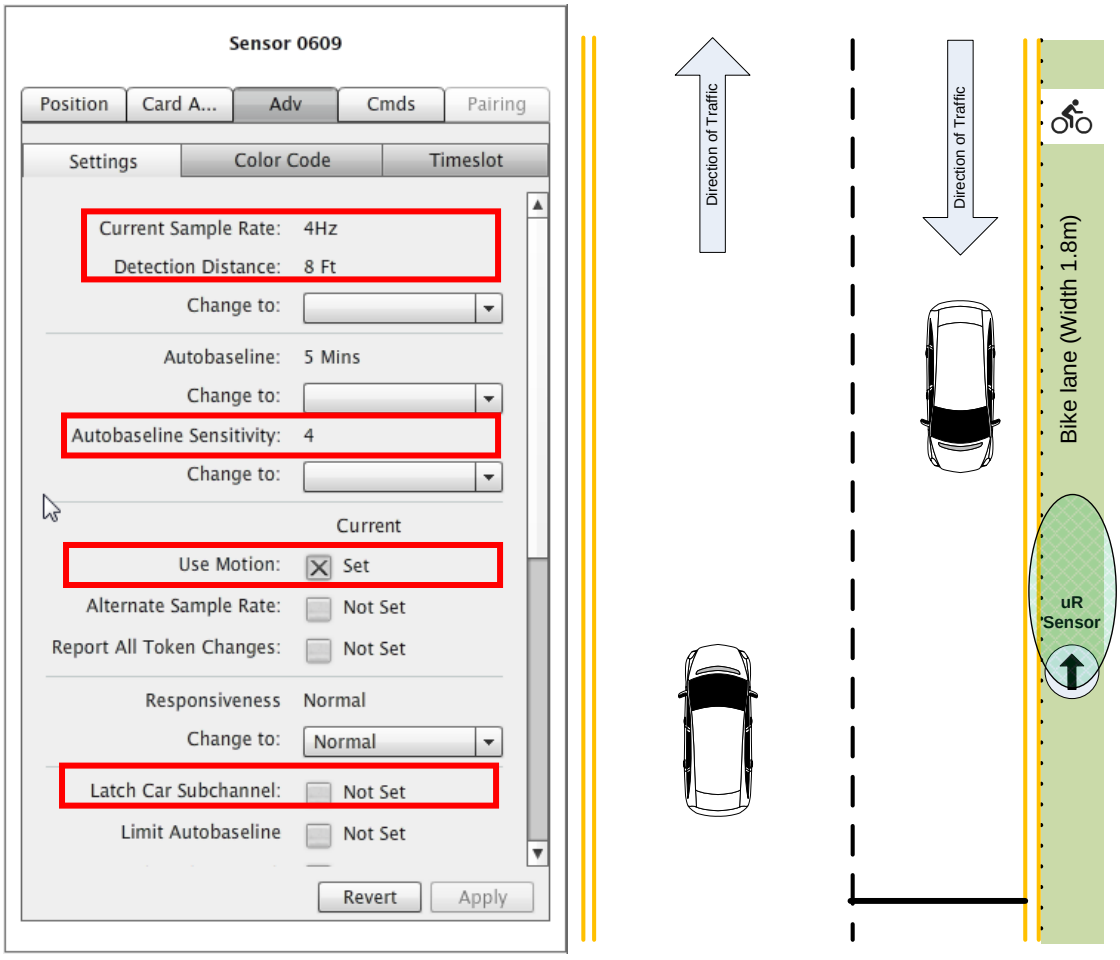

Figure 77 : Installation and Configuration for Mixed Bike and Pedestrian Traffic - VA

B.3.3 Count for mixed bikes and pedestrians

Install and configure as per the VA installation guidelines above.

Note: Pedestrians will be counted and therefore the count values generated will be inaccurate. It is recommended that the sensors are installed where the pedestrian traffic is minimised.

Note: Multiple bikes that cross the virtual detection zone simultaneously will be counted as a single bike.

Appendix C 4 Port PoE (Obsolete)

This section includes all information for the four port POE device currently used in conjunction with a WIMAG.

This product has now become obsolete only the 8 port variants will be available.

(408/4/54224/000) – Part No. Obsolete

C.1 Four Port PoE Switch (4.1.1)

Figure 78, 40 : Four Port PoE Switch

The four port PoE switch provides dual functionality, namely as an unmanaged Ethernet switch and as the PoE supply for the access point or points. The four port switch has five Ethernet ports of which four are PoE ports. This will provide support for up to 3 Access Points, depending on configuration. These ports are used to power the access points but can also be used for non-PoE devices as the PoE switch device utilizes auto-detection. Each port will detect if an appropriate powered device (PD) has been connected prior to activating the power.

C.3 Installation of PoE (13.1)

C.3.1 4 Port PoE Switch

The 48V supply is then wired from the switch, taking care that the +48V (grey) is connected to the appropriate +(ve) terminal on the switch – marked V1+ (PWR1). The return (white) will be connected to the terminal marked V1- (PWR1).

Figure 43 : 4 Port PoE Switch (48V DC Connection)

C.3.2 Installation of rack

Figure 50 : 4 Port PoE Device showing four free PoE ports (numbered 1 to 4)