SIEMENS

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Controller Configuration Handbook 667/CC/53950/000

for

ST950 Plus + Controller

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1 INTRODUCTION

1.1 Purpose

This ST950 Plus+ Controller Configuration Document is designed to provide general guidelines to Field Service Controller Configuration Engineers when configuring controllers, at both controller requisition time and at final assembly in depots.

Additionally, the document will assist in the manufacture of controllers; including final factory build and subsequent confirmation, prior to delivery to Field Service.

Ongoing development means that some of the delivered items may differ in detail from the photographs included in this handbook.

1.2 Scope

This document describes the configuration of the ST950 Plus+ controller.

This includes the Power and redundancy options the number of CIC's based on the required controller configuration. All ST950 Plus+ controllers are ELV.

The configuration of export controllers is not detailed by this document.

This document is only relevant to the initial release and will be updated when the additional facilities are made available so please check you are working from the latest version of this document.

1.3 Related Documentation

Document Number	Document Title
667/HH/46000/000	ST950 Plus+ Controller Handset Handbook
667/RE/29050/000	Siemens OID Elexon Codes
667/HB/47200/000	WiMag Vehicle Detection System General Handbook
667/GA/27087/000	Equipment Mounting Frame Assembly
667/DZ/30600/000	Gemini Family Tree
667/DZ/52250/ETC	Stratos Outstation Family Tree
667/GA/27067/000	Additional Panel Assembly
667/HB/46000/001	ST950 Plus+ Facilities Handbook

Pre-Requisites for Field Service Operative

1.3.1 Qualifications

Only skilled or instructed personnel with relevant technical knowledge and experience, who are also familiar with the safety procedures required when dealing with modern electrical/electronic equipment, are to be allowed to use and/or work on the equipment. All work shall be performed in accordance with the Electricity at Work Regulations 1989 or the relevant local, state and government regulations.

Any personnel working on an ST950 Plus+ Controller should have completed the following training courses:

- HA Sector Scheme Sector 8 Modules 5XX
- M609 – Junction Traffic Controller Maintenance for ST950 ELV,
- M703 – IC4 Configuration
- XXXX – ST950 Plus+ intersection design tool/CAD Not in this release all designs by Consultancy Services.

Training requirements for non-UK users may be different.

1.3.2 Required Tools

In addition to a standard Engineer's tool kit, the following tools are required when carrying out any work on the ST950 Plus+ Controller:

Description	Part Number
Netbook kit	667/1/32380/000
USB cable - standard A Plug to B Plug	Generic
T-bar key	667/2/20234/000
S-18 key – Main Cabinet	4/MC 289
Serial handset Techterm,	667/4/13296/001
Smart Card Reader for license transferral	667/1/45964/000
WiFi Dongle	418/4/53481/000
Old Oyster handset,	667/4/13296/000
Larger Screened Oyster handset	667/4/13296/002
Manual Panel key Type 900	667/4/13651/000
ST950 Plus+ Site Installation Tool	667/TZ/53002/000

1.4 Abbreviations and Definitions

Abbreviation	Definition
3G/4G	Third / fourth generation of mobile telecommunications technology
AC	Alternating Current
Aux	Auxiliary
CIC	Cabinet Interface Card (provides serial interface to Nodes)
CLF	Cableless Linking Facility
CLS	Central Light Source
CPU	Central Processing Unit
CTB	Cable Termination Backplane (provides physical connection to street cabling)
DC	Direct Current
DFM	Detector Fault Monitor
EFC	Enhanced Facilities Controller
ELV	Extra Low Voltage
FT	Fixed Time
GPS	Global Positioning System
GSPI	General Serial Peripheral Interface
GVP	Generic Versatile Platform
I/O	Input/Output
IC4	Intersection Configurator version 4 (UK controller configuration application)
IDB	Intelligent Detector Backplane
IRM	Integral Remote Monitoring
LED	Light Emitting Diode
LMF	Lamp Monitor Facility
LPU	Logic Power Unit
LRT	Light Rail Transit
LV	Low Voltage (Mains)
mA	milliamps
MOVA	Microprocessor Optimised Vehicle Actuation
mS	milliseconds
MTCS	Master Time Clock System
Node	Module that translates serial Comms to On street optics and I/O
NTP	Network Time Protocol
OMU	Outstation Monitor Unit
OTU	Outstation Transmission Unit

PCB	Printed Circuit Board
RAM	Random Access Memory
RFL	Reset Fault Log (Handset Command)
RLM	Red Lamp Monitoring
RM	Redundancy Module. Shares 48V Lamp Power amongst working PSU's
RMS	Root Mean Square
ROW	Right Of Way
SDE	Speed Discrimination Equipment
SDE/SA	Speed Discrimination Equipment / Speed Assessment
SL	Smart Loop (Serial buried detector).
SVD	Selective Vehicle Detector
UTC	Urban Traffic Control
V2X	Vehicle to Infrastructure (Autonomous Vehicles)
VA	Vehicle Actuated
wrt	With Respect To

2 ST950 PLUS+ CONTROLLER SYSTEM OVERVIEW

The Siemens ST950 Plus+ Controller is the latest in a long line of highly integrated traffic controllers. The Plus+ Version of the ST950 is ELV 48V DC Positive with respect to ground.

The ST950 Plus+ controller is Supplied in Grey or Black single door cabinets. Up to 3 CIC's and 6 PSU's can be housed in a single cabinet

The main features of ST950 Plus+ are:

- Conforms to TOPAS specification TOPAS 2500
- Serial Comms to Nodes reducing the size and quantity of cables.
- 32 phases, 32 stages.
- 8 streams.
- 8 maximum green sets.
- 8 hurry calls which are in priority order.
- 8 uni-directional detector loop units.
- Multi-mode operation with stage ripple change facility for improved intersection capacity.
- Fully configurable lamp sequences for worldwide application.
- Fully integral and configurable lamp monitoring of both incandescent and LED signals.
- Flexible part-time and start-up modes, allowing any stream to be sent in and out of part-time mode without affecting any others.
- Cableless linking (Plan) facility with sophisticated plan timetables and 32 plan groups.
- Event timetable which supports actions based on 32 independent events with easy programming.
- Time system with full date details – automatically time synchronised to central system where the controller linked to Siemens UTMC central system.
- Date stamped rolling log providing detailed history of events and faults, coupled with improved presentation to aid recognition of entries.
- Uncomplicated web browser user interface capable of multi-language support
- Support for up to 240 I/O lines via I/O cards and Intelligent Detector Backplanes
- RS232 and USB interfaces for handset, modem and GPS

The essential differences between the ST950 Plus+ and other members of the ST950 family of controllers are:

- LSLS or LSC cards replaced by CIC's The Lamp switching and monitoring being achieved in the Nodes.
- Reduced on site cabling and installation time.
- Local processing in nodes of LED Optics allows mixed power levels as LED technology improves with lower powers available.
- Individual Red, Amber and Green outputs replaced by Serial Arms or Rings of serial Data.

3 ST950 PLUS+ HARDWARE ALLOCATIONS AND CONNECTIVITY

3.1 ST950 Plus+ Outercase Selections

With reference to **Table 1** the ST950 is supplied in a single door large Outercase.

The ST950 CPU card is house in a 19” Rack Assembly which is mounted in a swing frame.

Other items such as SLD4 Detection, Wimag and Stratos Outstation can be mounted in the rack or on an additional 19” 3U Rack as appropriate.

Please note, to assist configuration engineers in their choice of Outercase the relationship between Outercase, Power Supplies, Redundancy Modules and CIC’s in the ST950 Plus+ is detailed in section 3.2

Standard Items Included in controller cabinet, chosen from **Table 1**

- 48V DC Power Supply
- Soft Start relay.
- 24V DIN mounted logic supply
- Master Switch Assembly
- RM (redundancy module)
- CTB/CIC
- 19"Swing Frame with Rack Assembly
- Manual Panel

Table 1 – ST950 Outercase Selection

Part Number	Description
667/1/53950/020	ST950 Plus+ Cabinet Grey 1 CIC + RM
667/1/53950/021	ST950 Plus+ Cabinet Black 1 CIC + RM
667/153030/000	ST950 Plus+ Master Switch Assembly Standard
667/1/53030/001	ST950 Plus+ Master Switch Assembly High Load

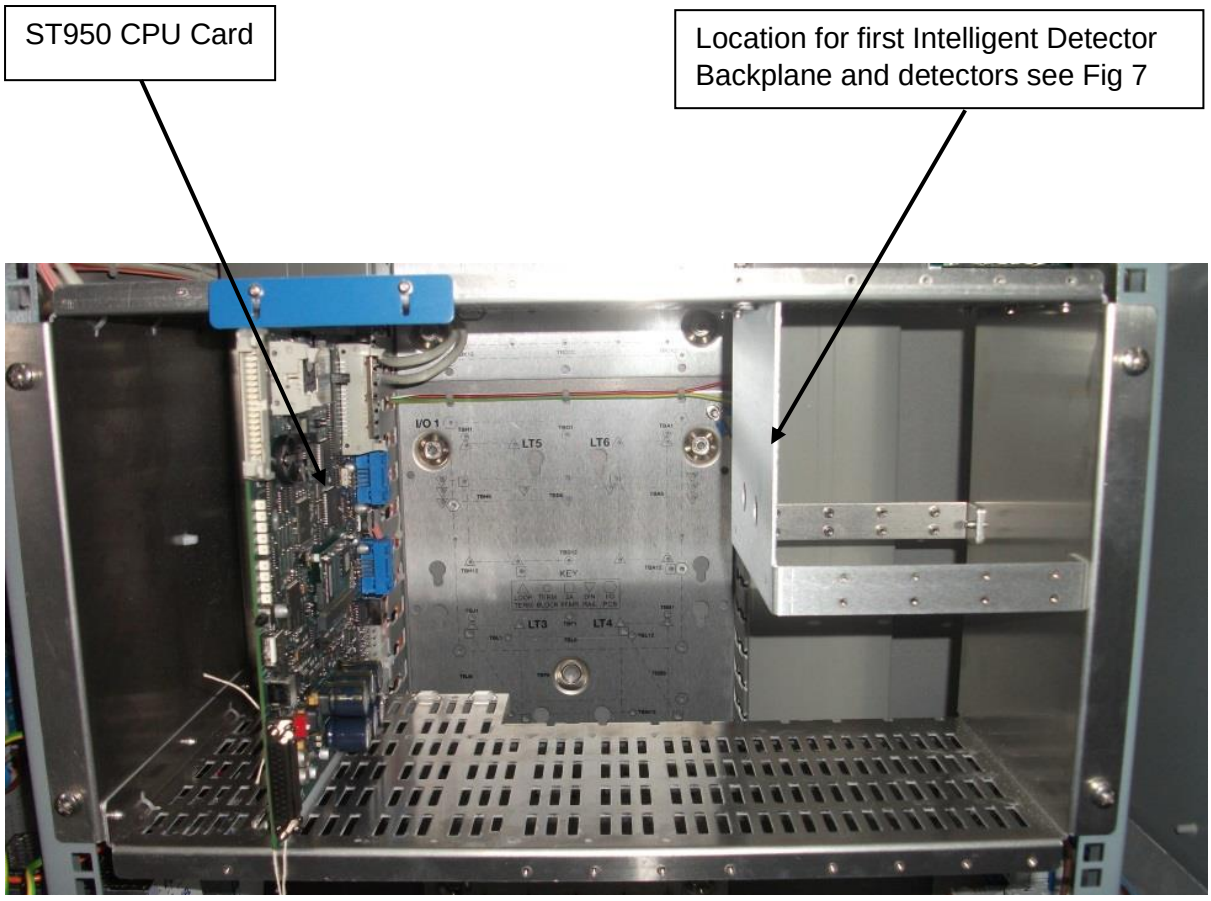
Figure 1 - ST950 Plus+ Controller overview

3.2 Rack Assembly

3.2.1 Rack Assembly Mounting Position

The ST950 Plus+ Outercase is configured with a 19 inch swing frame, to which the ST950 Rack Assembly is mounted. The Rack Assembly will be positioned in the Swing Frame as shown in **Figure 1**. Information on exact positioning of the ST950 Plus+ Rack Assembly should be sought from manufacturing drawing detailed in the related document section of this handbook. The ST950 Rack Assembly should not be ordered separately as it is included in the Outercase, ordered from **Table 1**. The components mounted within the ST950 Rack Assembly are shown in **Figure 2**.

Figure 2 - ST950 Plus+ Rack Assembly



3.2.2 Master Switch Assembly

The Master Switch Assembly should be ordered at the same time as the cabinet. This in turn is part of the Controller build, selected from **Table 1**. Configuration Engineers should calculate the load anticipated and select the appropriate Controller build using the Site Configuration Tool. Please refer to the ST950 Plus+ General Handbook for information on calculating controller loads.

3.2.3 CIC Cards and CTB's

The CIC cards Support 3 Rings or 6 Arms. In addition, there are 12 "Passive Safe" Per CIC but these will not be implemented in the first Roll out of the Plus+ controller. The Rings will also not be supported on the first roll out so effectively each CIC can currently ONLY support 6 Arms.

The Maximum Number of CIC's supported by the ST950 Plus+ in the first release is 3 all of which are supported without an expansion cabinet.

Outercase from **Table 1**, in addition to determining the wiring, number of CIC's, Power Supplies, Redundancy Modules and Soft Start Kits will be dependent upon the number of Arms/Rings, Number of Nodes and cable lengths. This list will be created by the Sie Configuration Tool.

Further information on controller selection should be sought from the ST950 Plus+ Controller General Handbook 667/HB/53950/000

3.2.4 48V 480W PSU

The number of power supply units depends upon the following:

- Number and type of Nodes
- Additional loads such as Regulatory signals
- Length of cables (longer cables increase the load on the PSU's)
- Number of CIC's
- Power distribution and required level of Redundancy.

The number of required power supply units is therefore generated by the ST950 Plus+ intersection design tool

3.2.5 ST950 CPU Card

The ST950 CPU Card will be mounted to a designated position in the Rack Assembly, as shown in **Figure 2**. The CPU Card holds the IC4 controller configuration and performs the function of configuration, control and management. The main external data interfaces of the CPU Card are:

- Interface to CIC Cards
- Serial Interfaces (GSPI) to IO Cards and Intelligent Detector Backplanes
- Manual Panel
- RS232 interface to handset, Gemini^2 or Stratos Outstation
- USB interfaces

- Ethernet Interface

3.2.6 CPU I/O Card

The ST950 Controller can be equipped with additional Input/Output cards, remote from the CPU card see section **3.13** However, the ST950 can also be equipped with a CPU I/O Card, mounted in a daughter board arrangement on the CPU Card. Please refer to **Figure 3**.

Figure 3 – CPU I/O Card

This option may be used in preference to a standard I/O board particularly where interfacing to a 3rd Party OTU such as a Dynniq Chameleon.

Table 2 – Serial Link Connections

Component	Input	Output
CPU card	Serial link derived from CPU card	RJ45 Serial Link Output Socket
CPU I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Upper I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
Termination Panel Lower I/O Card	RJ45 Serial Link Input	RJ45 Serial Link Output
First Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output
Second Intelligent Detector Backplane	RJ45 Serial Link Input	RJ45 Serial Link Output

3.3 Termination Panel

With reference to **Figure 4** the mounting of both standard equipment and optional equipment to a Controller is achieved using Termination Panels. The Termination Panels do **not** need to be ordered separately as they are contained within the Outercase, selected from **Table 1**. Termination panels will be positioned centrally at the rear of the ST950 Plus+ cabinet, one above the other when two panels are fitted. Certain large items have designated positions within the controller, others are subject to optimisation. For this reason, some items may vary slightly in position, from one controller to another. Termination panels have stencilled graphics to assist in the positioning of equipment. (Lower panel shown)

Figure 4 –View of the ST950 Plus+ Termination Panel

3.4 Master Switch Assemblies

There are two versions of master switch assembly based on the controller's size and number of power supplies fitted. The standard version for up to four 10Amp power supplies uses the standard 16A Master Fuse and a 6 Amp C curve Controller Supply Switch/Breaker . With more than 4 supplies the high capacity 32A Fuse is fitted, and the Controller Supply Breaker raised to 16A curve D. The assembly occupies a position in the bottom right hand corner of the ST950 Plus+ Controller.

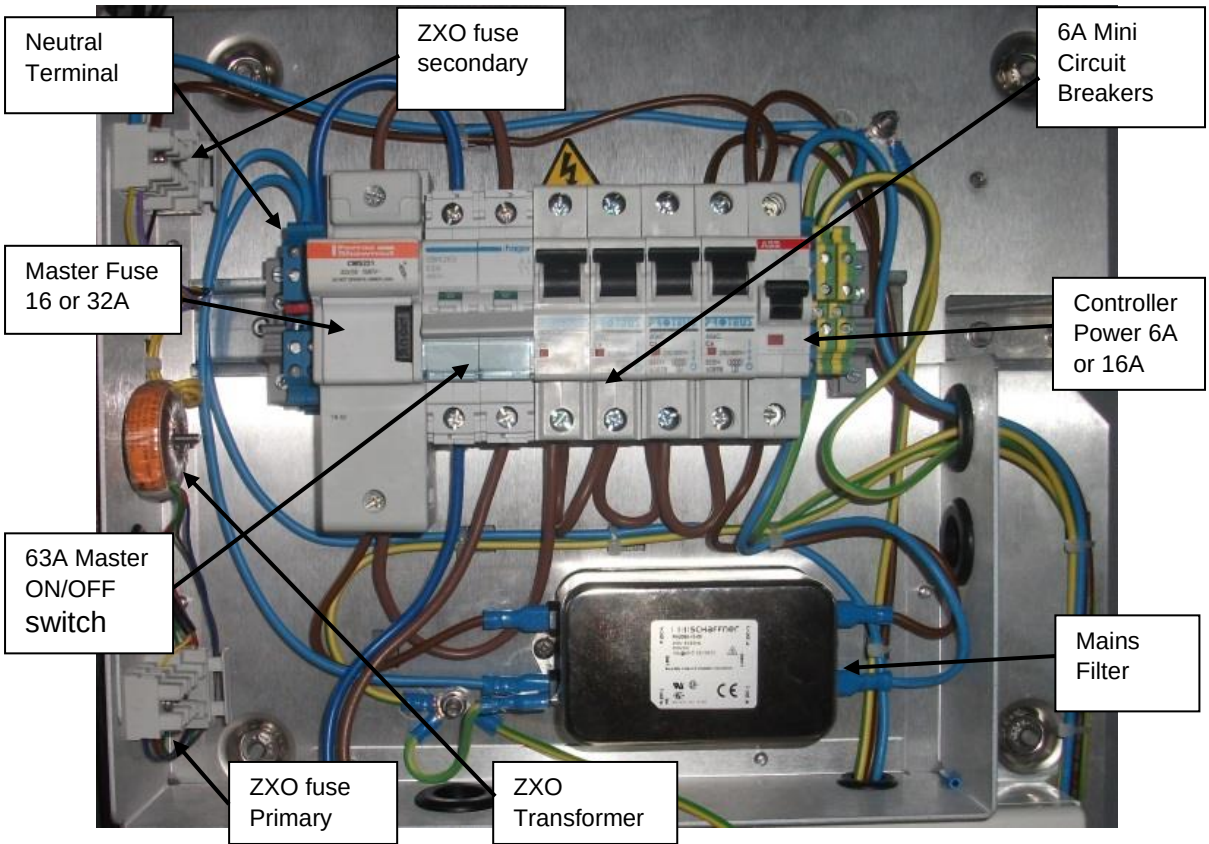
With reference to **Figure 5**, the mains supply voltage is applied to the main ON/OFF 63A Switch, within the Master Switch Assembly, for onward supply to the ST950 Plus+ Traffic Controller.

The live connection is taken from the main ON/OFF 63A Switch and applied to a master fuse the fuse rating is either 16A or 32A depending upon the number of power supplies fitted. The output from the fuse unit is applied to a mains filter, as shown in **Figure 5**, for onward distribution to the Master Switch Assembly.

An additional output is taken from the main fuse unit and supplied a series of Auxiliary 6A Mini Circuit Breakers. These additional mini circuit breakers provide a controller working supply, Aux1, Aux2 and Aux3 typically utilised to provide power to a Router or third party OTUs, the 4th 6A breaker is for the maintenance socket supply. The total permitted Auxiliary load is 8Amps.

The neutral connection for the mains filter unit is taken from the neutral terminal, also detailed in **Figure 5**.

Figure 5 – Master Switch Assembly



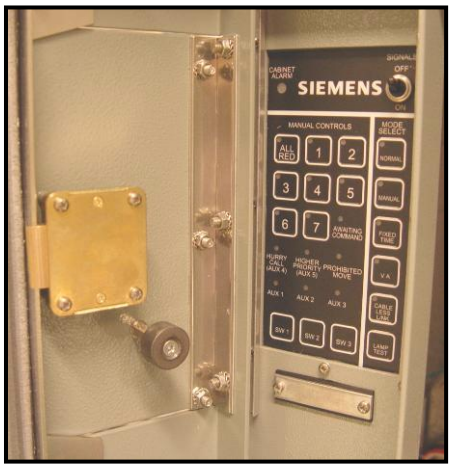
3.5 The Manual Panel

The Manual Panel is contained within a secure compartment in the top left-hand corner of the controller cabinet. The Manual panel is unchanged from the ST800,900 and other ST950 variants. Access to the manual panel may be gained via the manual panel access door or by opening the controller cabinet main door. The manual panel forms part of the Outercase, chosen from **Table 1**, and therefore should **not** be specified separately.
The detector fault monitoring LED indicator is repeated from the manual panel to the outer case using a lens. The lens kit and should be ordered separately, if the unit is required. Please refer to the parts listing for this item

Instruction on the fitting of the DFM Lens kit should be sought from drawing No. 667/CH/27104/000.

The 34-way ribbon cable from manual panel connects into socket PL3 on the CPU Card; marked Manual Panel.

Figure 6 – ST950 Plus+ Manual Panel



3.6 Mimic Panel

The Mimic panel allows the state of the traffic phases to be seen at the controller. The panel has RAG indicators for all 32 possible phases and are labelled by Phase Letter A through to F2 This will not be available in release 1 of the ST950 Plus+ Controller.

3.7 Intelligent Detector Backplanes

Intelligent Detector Backplanes do not form part of the base Controller Cabinet and therefore should be specified separately. Each Intelligent Detector accommodates four SDL4 Cards. Notes on the SLD4 Detector Cards are provided later in this document. **Figure 12** provides a listing of required components when selecting the Intelligent Detector Backplanes and accompanying SLD4 cards. Please also refer to the parts list for these items.

With reference to **Figure 7** and drawing 667/GA/27087/000, Intelligent Detector Backplanes and associated SLD4 Detector Cards are fitted into 19" Racks Kits. As the numbers of Intelligent Detector Backplanes increase the number of 19" Racks Kits required will increase. Unless otherwise stated, in a work specification, the first 19" Rack Kit will be fitted to the 19" Swing Frame below the Controller Rack Assembly. The first three Intelligent Detector Backplanes will be fitted to this 19" Rack Kit. If more than three Intelligent Detector Backplanes are required a second 19" Rack kit should be specified, which will be fitted below the first 19" Rack Kit. The Intelligent Detector Backplane 4, 5 and 6 will be fitted to this second 19" Rack kit. For further information on the inter-relationship between Intelligent Detector Backplanes, SDL4 Cards, Processor Card and I/O Cards please consult the ST950 General Handbook. The area above the Rack Assembly in the 19" Swing Frame is designated as the area for fitting a 19" Rack Kit, to mount a Gemini or Stratos Outstation Unit (further information on the Gemini Unit or Stratos Outstation is provided later in this document). With further reference to **Figure 7**, the Gemini or Stratos Outstation will be fitted on the right hand side of a 19" Rack Kit, viewed from the front of the 19" Swing Frame.

Configuration Engineers should note when referencing the cases below that an Infrared communications link provides automatic set-up between SLD4 cards. This link operates horizontally but not vertically. To provide this link between vertically mounted SLD4 cards a link cable should be fitted between Intelligent Detector Backplane on associated horizontal levels. Please refer to parts listing for link cable. Please also refer to **Figure 8** which shows the required link.

Important Note

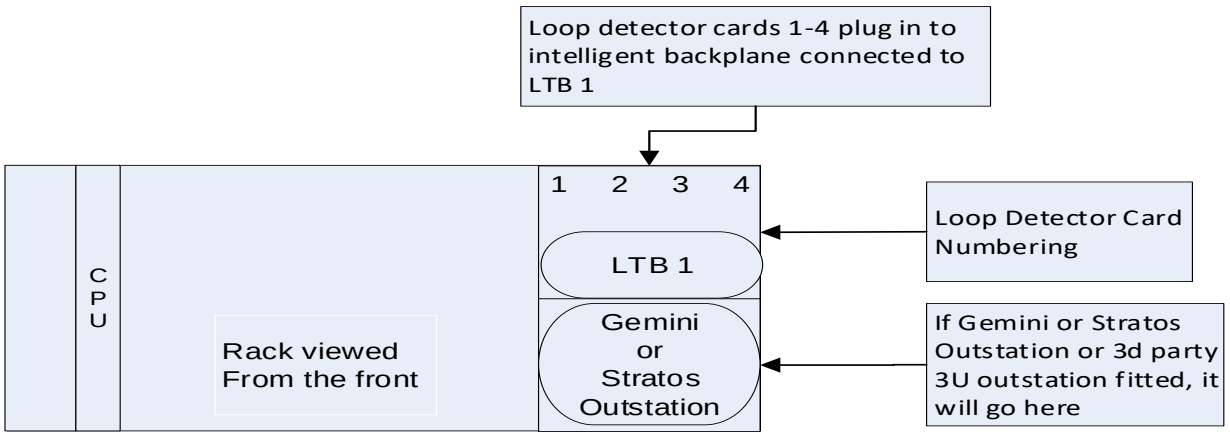
Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication link between SLD4 cards and the restrictions this communication technique has on the positioning of SLD4 Cards is contained in the that section.

Communications between CPU Card and Intelligent Detector Backplanes are carried out via GSPI serial link, using Cat5e cable/RJ45 connector. The GSPI serial link communication protocol relies on addressing techniques to ensure the appropriate information is delivered to the intended component. This means that the order in which the components are connected to the link is not imperative to successful communications. However, to maintain consistence build configuration the sequence of connections set out in **Table 2** should be used.

With reference to **Figure 8**, power is provided to the Intelligent Detector Backplanes from the Detector Power Supply Kit. Additional power can be provided for Intelligent Detector Backplanes, refer to paragraph 3.12.

Loop activation signals are passed to the Intelligent Detector Backplanes from the Loop Terminal Card via PL8. Refer to paragraph 3.10 for information on Loop Termination Cards.

Figure 7 – ST950 Plus+ – Swing Frame layout



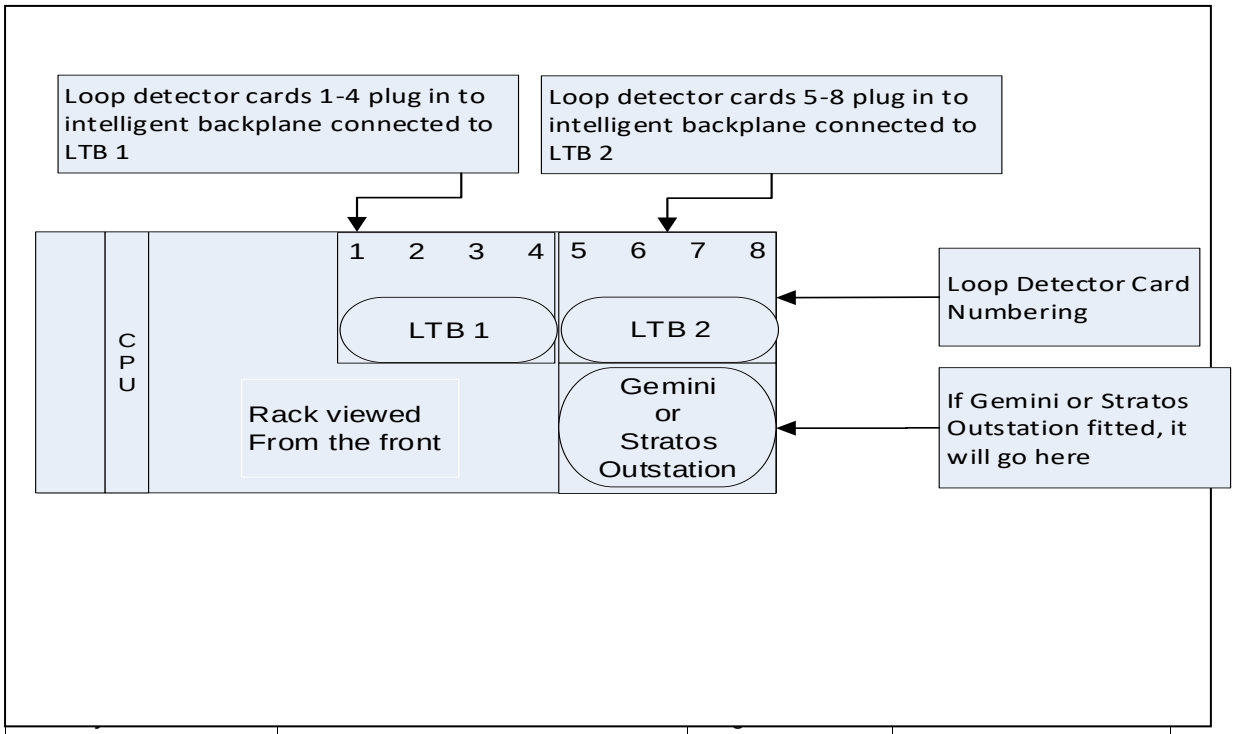
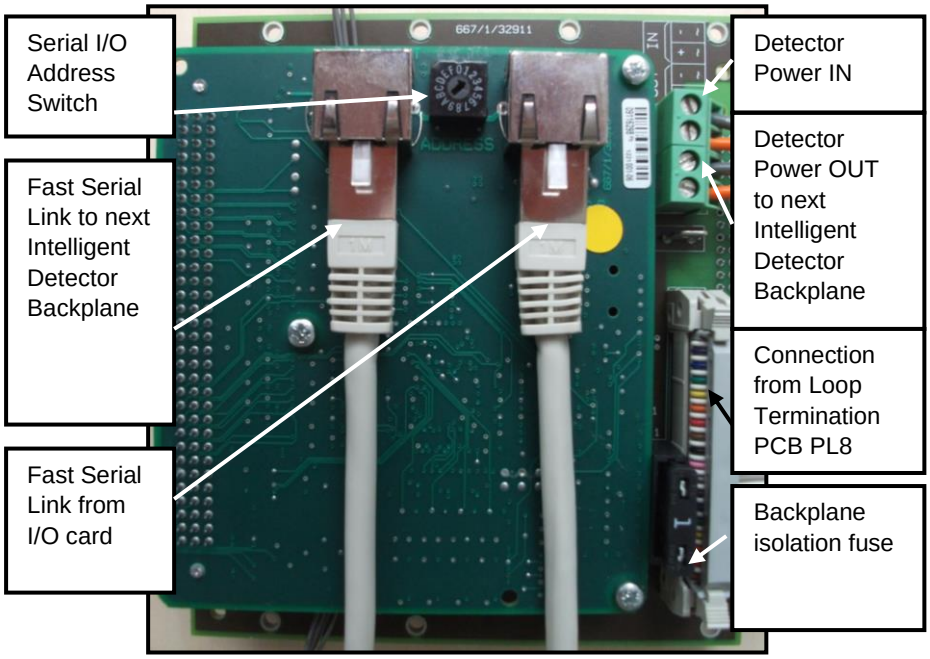


Figure 8 shows the connections of the serial link to the first Intelligent Detector Backplane. The sequence of connection set out in **Table 2** should be followed. The GSPI serial link is connected from the first Intelligent Detector Backplane OUT socket into the second Intelligent Detector Backplane IN socket. This sequence of connections should be followed for connection between first Intelligent Detector Backplanes and the final Intelligent Detector Backplane. Please also note that a separate infrared connection is required for SLD4 automatic set-up. This link operates horizontally and therefore SLD4 cards must be mounted alongside each other to communicate in this fashion. Please refer to **Figure 8** which shows the required connection to continue this infrared link vertically.

Figure 8 – IDB Serial Connection



View Intelligent Detector Backplane with comms PCB removed

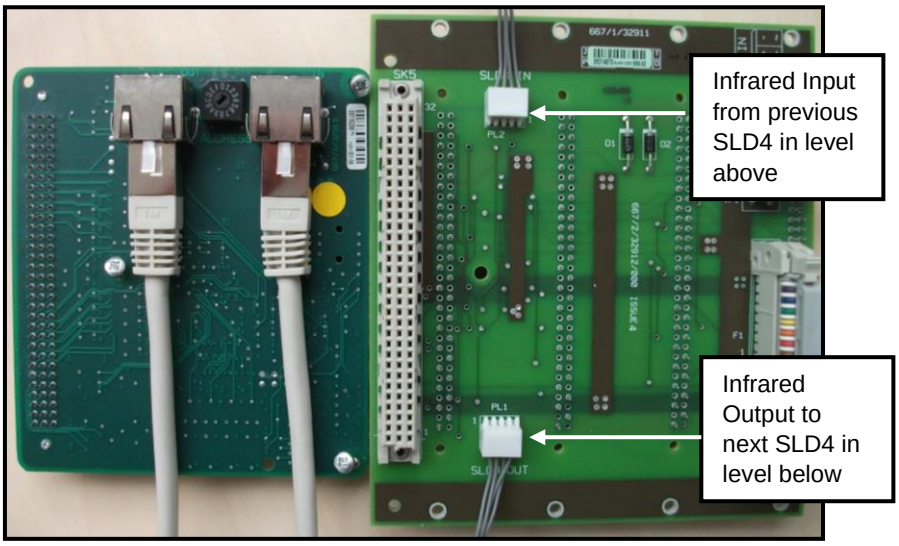


Figure 9 – Position of IR linking cables

3.8 Single detector backplane

If preferred, Single Detector Backplane may be fitted Single Detector Backplane do not form part of the Outercase, chosen form **Table 1**, and therefore should be specified separately, The optimisation of the Single Detector Backplane follows the same sequence of positioning as that detailed in section 3.6.

Power for the Single Detector Backplanes is obtained from Detector Power Supply Kit, as detailed in paragraph 3.12. Please refer to **Figure 10** and 11 for the Single Detector Backplane connection scheme. Please also refer to the parts listing for this item.

Please Note it you are using a single detector backplane you will need an I/O card for the loop outputs to be inputted to the controller.

Figure 10 – Single Back Plane wiring positions

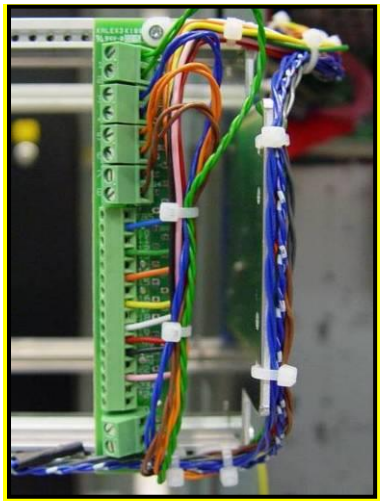
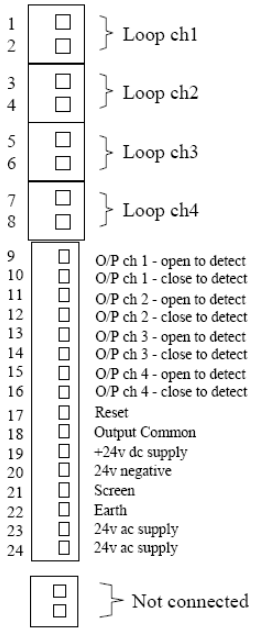


Figure 11 – Single Detector Backplane Connection Scheme



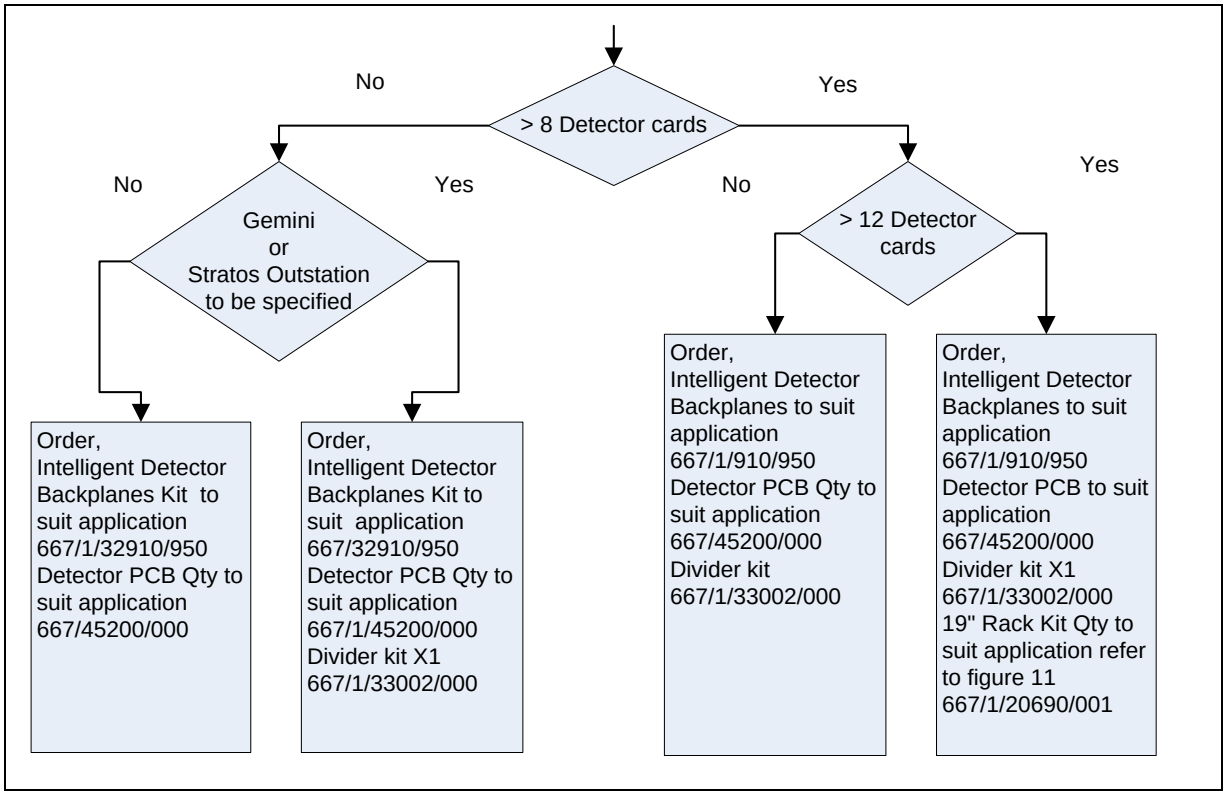
3.9 SLD4 Detector Cards

The Detector cards specifically designed for use with The ST950 Plus+ controller are not fitted into the controller cabinet. For the first phase of ST950 Plus+ release the “Smartloop” will not be available so SLD4’s Intelligent detector backplanes and the Loop termination panels will need to be fitted and called up. Once “Smartloop” is launched the Controller Cabinet mounted SLD4 will remain an option when a Smartloop is not appropriate.

Until “Smartloop” is released the ordering process for Selection of detection will remain as before as outlined in **Figure 12**

SLD4 detector cards are inserted into Intelligent Detector Backplanes. Each Intelligent Detector Backplane will accommodate four SDL4 Detector Cards. The SDL4 Detector Cards have an infrared facility to communicate with each other; this allows automatic setup. The infrared beam travels horizontally between SLD4 cards and therefore only those SLD4 cards that are mounted alongside each other can utilise this infrared communications technique. Communications between SLD4 Cards mounted vertically, with respect each other must be connected using a link cable. Please refer to the parts listing. Please also refer to **Figure 8** which shows the required connection.

Figure 12 – Ordering Sequence for Detector Back Planes and Detector Cards



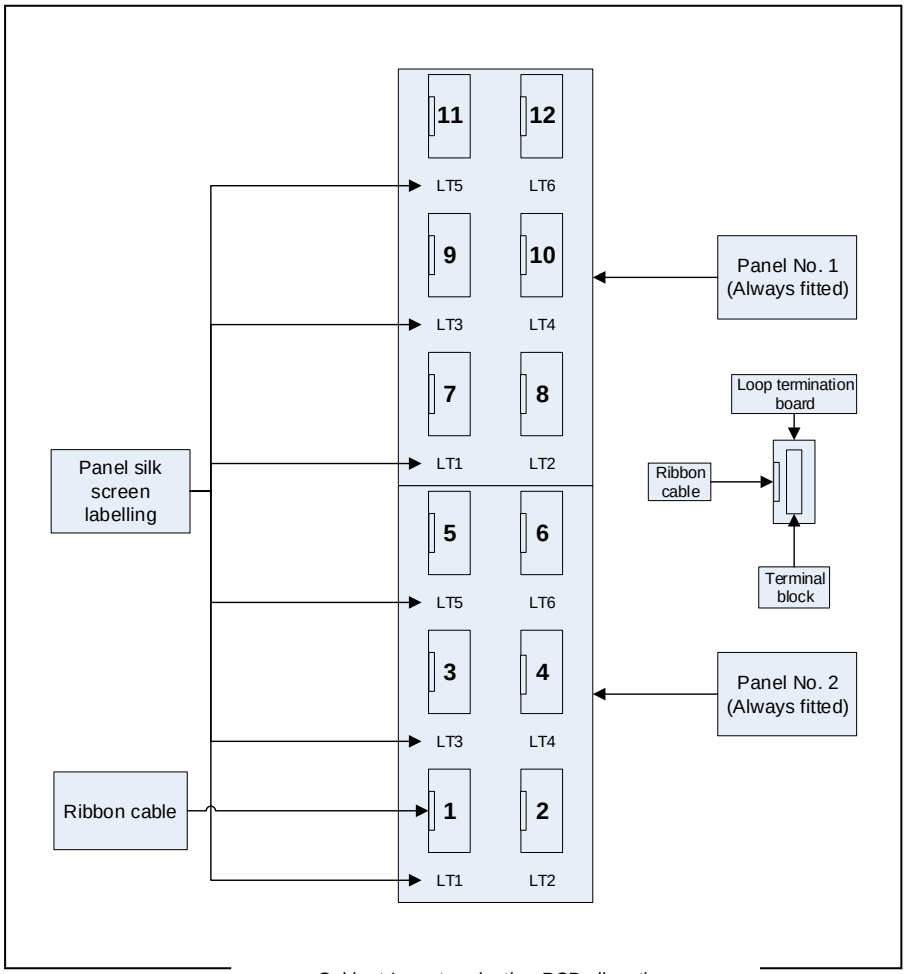
Important Note

Configuration Engineers should read the notes in the WiMag section regarding Backplane positioning. Important information on the relationship between SDL4 Cards, the Infrared communication technique between SLD4 cards and the restrictions this communication technique has on the positioning of Detector Cards is contained in the that section.

3.10 Loop Termination Cards

The following section defines the order of allocation for the detector loop termination Cards starting at the bottom left of panel No. 2. These boards are directly connected to the Intelligent Detector Backplanes via a twisted pair ribbon cable Please note the Loop termination PCB is part of the intelligent Detector Backplane Kit and therefore it is not required to order this item separately.

Figure 13 – Loop Termination Card Optimisation

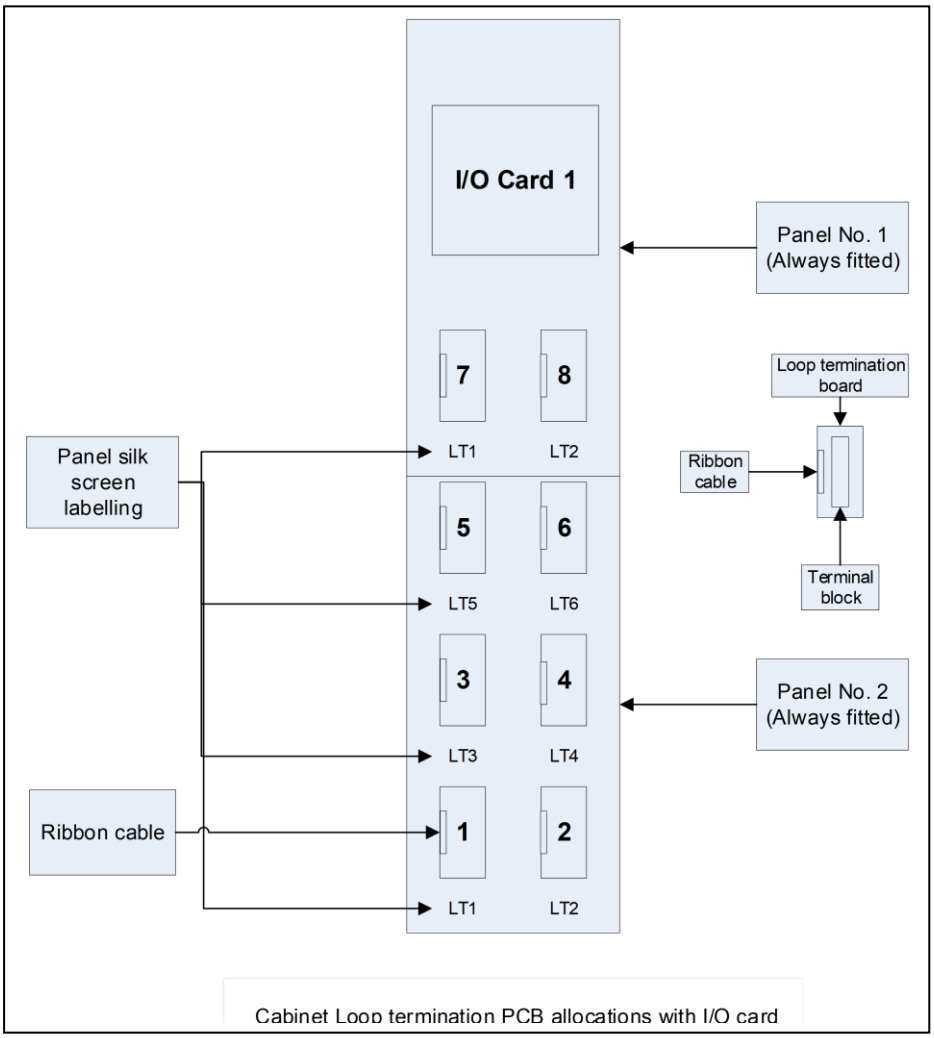


Cabinet Loop termination PCB allocations

Notes/Rules:

Panels 1 and 2 are always fitted
Loop Termination PCBs MUST be in the same cabinet as the Detector cards and intelligent backplanes connected to them i.e. it is NOT permissible to take the twisted ribbon cable joining the backplane to Loop Termination PCBs from one cabinet to another
PCB positions are silk screened LT1 etc
Loop Termination Board 1 allocated to Panel 2, position LT1
Loop Termination Board 2 allocated to Panel 2, position LT2
Loop Termination PCB 3 allocated to Panel 2, position LT3
Loop Termination PCB 4 allocated to Panel 2, position LT4
Loop Termination PCB 5 allocated to Panel 2, position LT5
Loop Termination PCB 6 allocated to Panel 2, position LT6
Loop Termination PCB 7 allocated to Panel 1, position LT1
Loop Termination PCB 8 allocated to Panel 1, position LT2
Loop Termination PCB 9 allocated to Panel 1, position LT3
Loop Termination PCB 10 allocated to Panel 1, position LT4
Loop Termination PCB 11 allocated to Panel 1, position LT5
Loop Termination PCB 12 allocated to Panel 1, position LT6

Figure 14 – Loop Termination I/O Positions

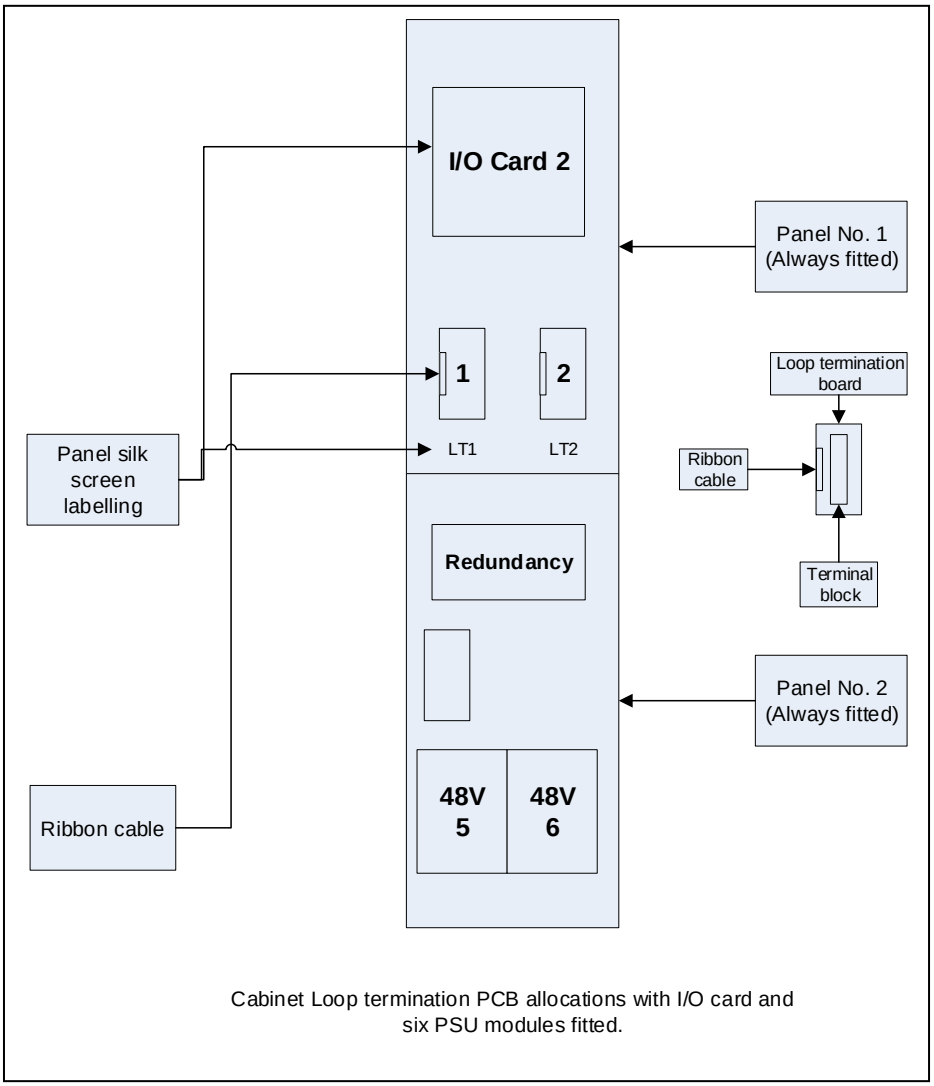


Allocation Sequence Rules:

Panels 1 and 2 are always fitted
Card positions are silk screened LT 1 etc. With reference to **Figure 14** the Loop Termination Boards Should be allocated in the following order;

Loop Termination Card 1 allocated to Panel 2, position LT1
Loop Termination Card 2 allocated to Panel 2, position LT2
Loop Termination Card 3 allocated to Panel 2, position LT3
Loop Termination Card 4 allocated to Panel 2, position LT4
Loop Termination Card 5 allocated to Panel 2, position LT5
Loop Termination Card 6 allocated to Panel 2, position LT6
Loop Termination Card 7 allocated to Panel 1, position LT1
Loop Termination Card 8 allocated to Panel 1, position LT2
Positions LT3,4,5 and LT6 on Panel 1 can NOT be used when I/O card fitted.

Figure 15 – Loop Termination I/O Positions



Allocation Sequence Rules:

Panels 1 and 2 are always fitted

2nd I/O card fitted (First I/O card mounted on CPU) 6 power supplies and 3 redundancy modules fitted.

Card positions are silk screened LT 1 etc. With reference to **Figure 16** the Loop Termination Boards.

Loop Termination Card 1 allocated to Panel 1, position LT1

Loop Termination Card 2 allocated to Panel 1, position LT2

Figure 17 – Loop Termination Card

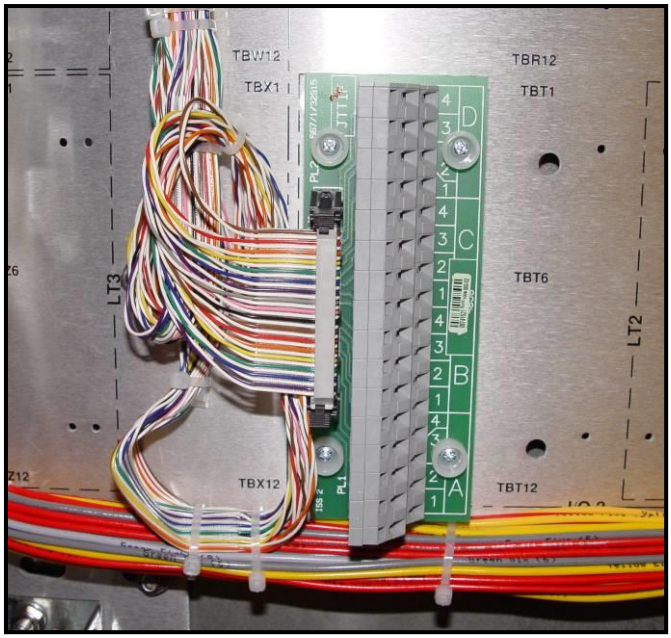


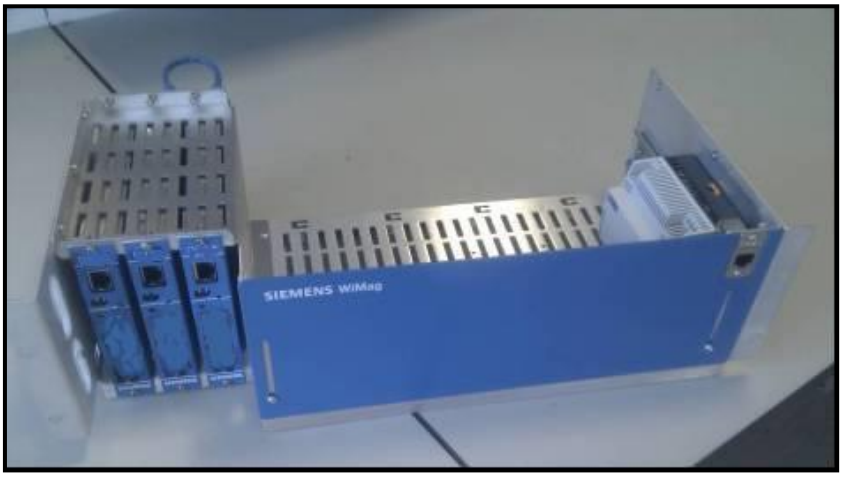
Figure 17 shows a Loop Termination Card. PL2 on the Loop Termination PCB should be connected to the associated Intelligent Detector Backplane.

3.11 WiMag

3.11.1 WiMag 3U Rack Kit (19”) System

There are multiple versions of WiMag and it is not included in the Outercase ordered from **Table 1** and therefore must be specified separately. Please refer to the parts listing for this item. The following configuration procedure details a basic controller WiMag installation. Full system installation details should be sought from the WiMag Detection System General Handbook, detailed in the related documentation section.
With reference to **Figure 18**, the cabinet mounted equipment required as part of the WiMag installation is mounted to the 19” WiMag Communications Rack Assembly. This unit will be installed below the ST950 Plus+ Rack Assembly. The WiMag Communications Rack Assembly will hold up to three Standard Interface Cards, servicing 20 WiMag sensors each. Each of the Standard Interface cards plugs into an individual backplane PCB. Sufficient space is available behind the centre section of the WiMag Communications Rack Assembly to house the necessary 4/8 port Power Over Ethernet (POE) Switch. A Power Supply Unit will be installed on the righthand side of the WiMag Communications Rack Assembly. The standard WiMag Communications Rack Assembly is supplied with one Standard Interface Card, and associated backplane. Additional Standard Interface Cards should be ordered at controller configuration time. The appropriate POE unit should also be ordered at controller configuration time.

Figure 18 - WiMag Control Unit



The selected POE device should be installed prior to the installation of the WiMag Communication Rack being installed in the controller. The POE is secured into the WiMag Communications Rack on the DIN rail, as illustrated in **Figure 19**, 21 and 22.

Figure 19 – POE Unit

Connect a non-POE Ethernet port to the user maintenance Ethernet port using a supplied Ethernet cable.

Figure 20 – POE Unit

Figure 21 – POE Unit

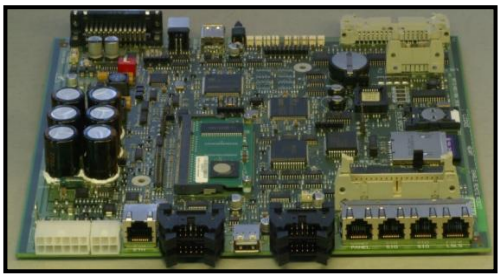
48V DC Power is provided to the Power Over Ethernet switch from the WiMag Communications Rack Power Supply. The Grey wire from the PSU will be connect to the +VE terminal and the white return wire will be connected to the –VE terminal of the POE switch.

Figure 22 – POE Unit

The backplane is used to provide power to the interface card. Backplanes are connected together using Ethernet cable. The first Backplane is connected to the PHS (PL2 or PL4) PCB at the controller's Processor PCB. On those occasions when the Ethernet ports on the PHS PCB occupied an output port on an Intelligent Detector Backplane will be utilised. Please refer to **Figure 23** and 25.

Figure 23 – WiMag Backplane

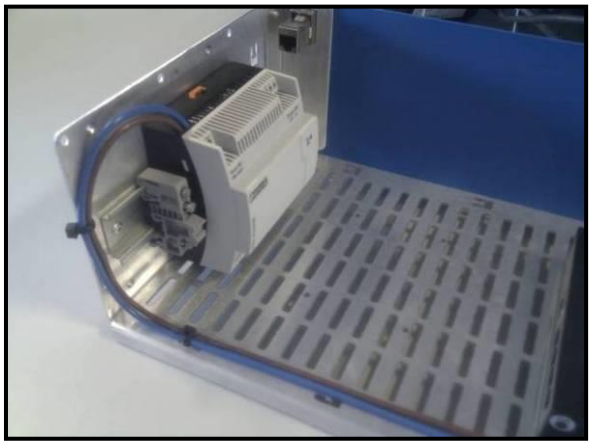
Figure 24 – CPU Board



The Standard Interface Cards are connected from the front Ethernet port to the appropriate ports on the POE switch.

The WiMag Communications Rack Assembly will be provided with unfiltered mains from the controller Master Switch Unit. Live is to be taken from the 6amp auxiliary miniature circuit breaker, marked as 'AUX1 MCB', Neutral from the neutral block and Earth from any main earthing stud.

Figure 25 – WiMag Tray



The instructions above details the basis configuration procedure for the WiMag system into a ST950 Controller The final configuration and commissioning of the Standard Interface outputs and the interface with street installed equipment should be sought from the WiMag Detection System General Handbook.

3.11.2 WiMag Loop Detector Replacement Card

Under normal circumstances WiMag Detection signals will be processes by components in the WiMag system, detailed in section 3.11.1.
However, to allow the minimum amount of equipment to be installed in a controller the WiMag loop detector replacement card has been developed to provide up to 4 magnetometers.
The WiMag Loop Detector Replacement Card plugs into either an individual detector backplane or a dedicated intelligent Detector Backplane. Configuration Engineers should configure controllers to ensure that the WiMag Loop Detector Replacement Cards are inserted into their own Intelligent Detector Backplane or Single Detector Backplane. This is because the WiMag Loop Detector Replacement Card has particular power requirement that are not compatible with the SLD4 Detector Cards. Additionally, WiMag Loop Detector Replacement Cards should not be mounted between SLD4 Cards as this would interrupt the infrared communications link between SLD4 Cards; referred to in the sections detailing Intelligent Detector Backplanes and SLD4 Cards.

3.12 Loop Detector and Ancillary Power

Detector Power General

The detector power for up to 16 detector channels of SLD4 comes from the main 24V logic supply.

This is only suitable for driving small low power detector cards within the controller cabinet.

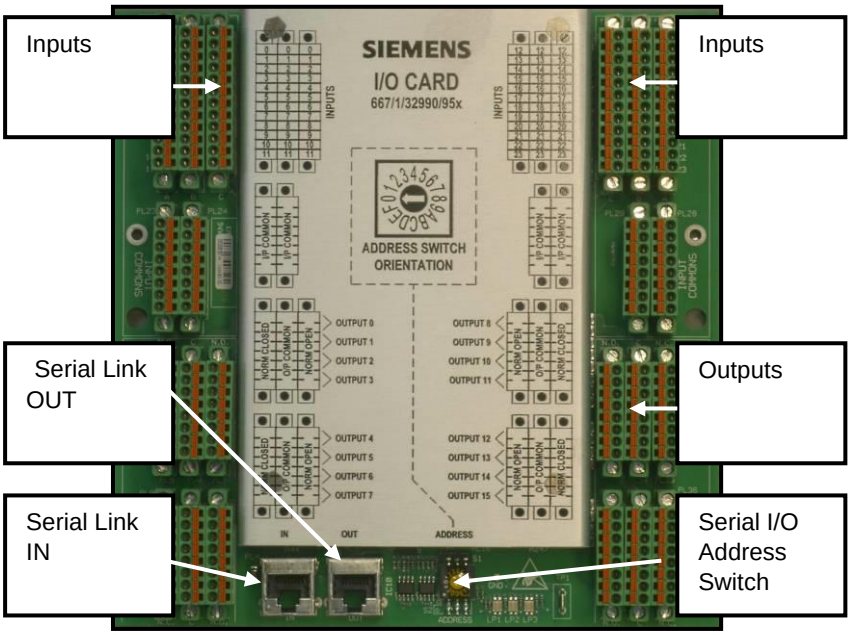
If an additional supply is required a second logic supply module can be used but currently no documentation or drawings are available for this, so engineering at Poole will need to be consulted.

3.13 Serial I/O Cards

Serial I/O cards would normally only be used to connect to a 3rd Party Outstation such as a Dyniq Chameleon or It might also be required for linking to adjacent sites but there are inputs and outputs available on RAG nodes that could be used if only a couple of bits are required. With all this in mind current builds of ST950 Plus+ Controller should be limited to a single Serial I/O card or the use of the CPU I/O card. The printing for additional I/O cards is present because these panels are shared with the ST950ELV controllers.

The Serial Input/Output (I/O) Kits do not form part of the Outercase selected from **Table 2** and therefore should be ordered separately. Two types of I/O cards, remote from the CPU Card, are available one with 4 outputs/24 inputs and one with 16 outputs/24 inputs. Four I/O cards can fit in the ST950. **Figure 26** sets out the stencil indications on the Terminal Panel, which aids position optimisation.

Figure 26 – Serial I/O Card



The I/O cards communicate with the CPU card via the RJ45 Cable/Cat5 connector, as a serial link. The serial link communication protocol relies on addressing techniques to ensure the appropriate information is delivered to the intended component. This means that the order in which the components are connected to the serial link is not imperative to successful communications. However, to maintain consistency of build the sequence of connections set out in **Table 2** should be used.

As stated above, once connected into the serial link, the CPU card identifies the I/O by the appropriate address. The address is set on the I/O card, shown **Figure 26**. Controller special instructions will provide details on assigned inputs and outputs.

Figure 27 and **Figure 28**,**14** and **15** illustrate the mutual optimisation that must be carried out when allocating space to both I/O card and Loop Termination Cards.

Figure 29 – I/O Card Position Allocation

Panels 1 and 2 illustrated without Loop Termination Board Silk screen, detailing

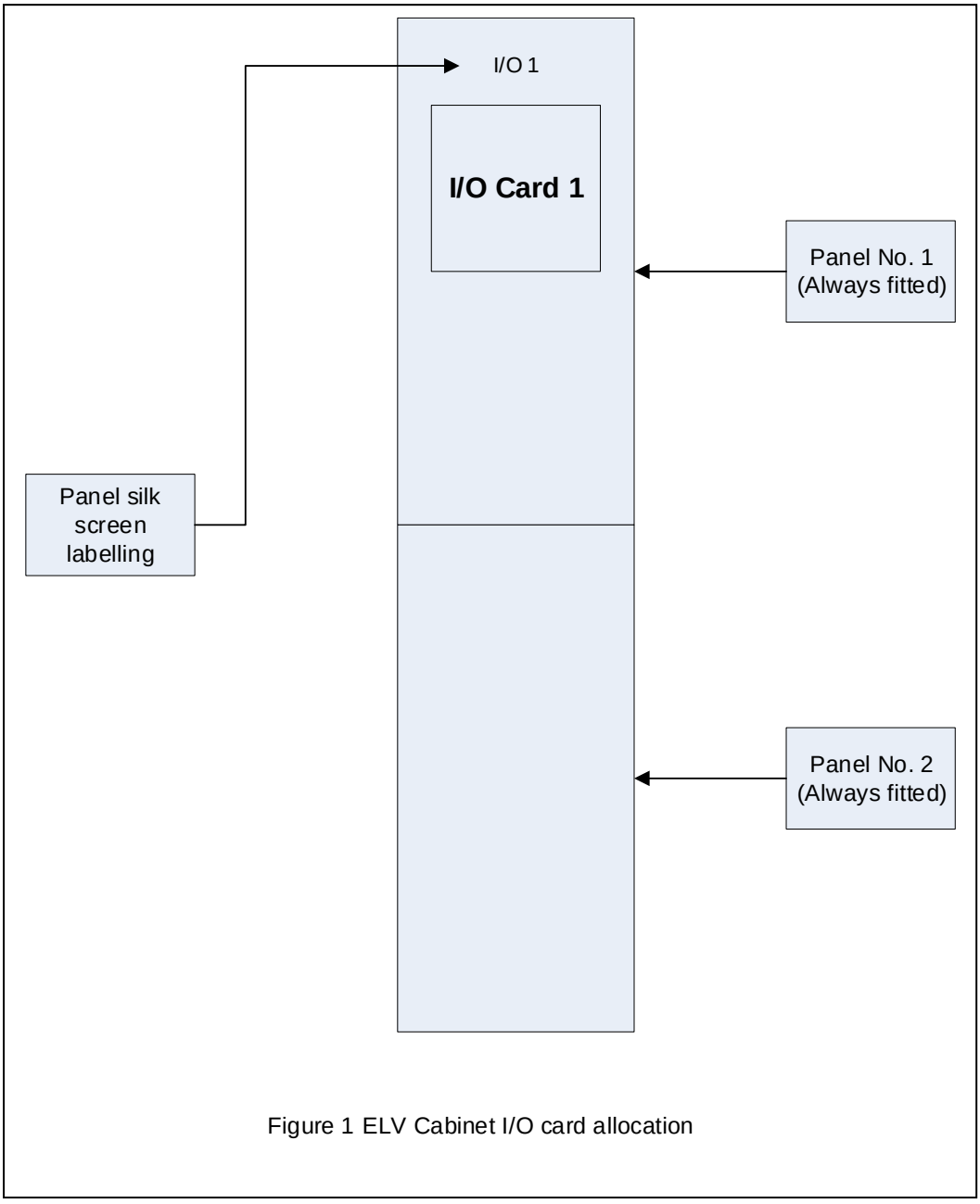


Figure 1 ELV Cabinet I/O card allocation

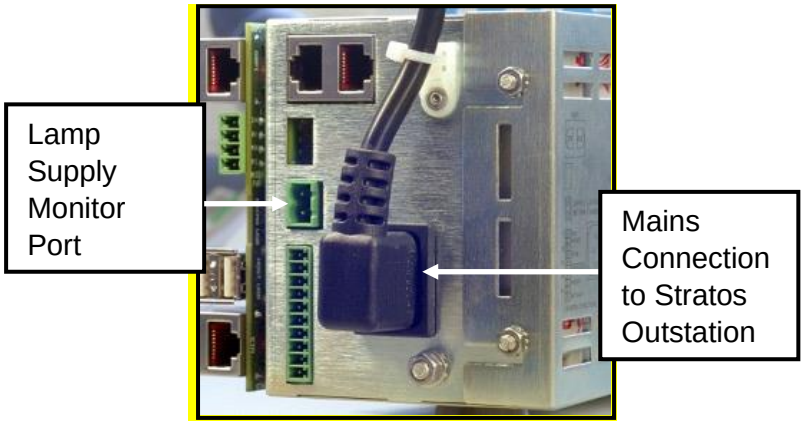
3.15 Stratos Outstation

Note you would normally not use a Stratos Outstation in an ST950 Plus+ controller since all the facilities of the unit can be achieved by suitable licences within the ST950 Plus+ controller. However, it may be used at the Customers request or where implementing features such as V2X. The ST950 Outercase is configured with a 19" Swing Frame and a Rack Assembly. With reference to **Figure 7** the area above the Rack Assembly is set aside for Stratos Outstation. Please also reference document 667/GA/27087/000, detailed in the related document section of the document. A 19" Rack Kit will be fitted to the ST950 as standard and need not be ordered separately. When a Stratos Outstation is specified it will be fitted on the right hand side of the 19" Rack Kit, as seen from the front of the 19" Swing Frame in **Figure 7**.

The Master Switch Unit has one 3 OTU/Aux Supply Kits fitted as standard to provide power for the Stratos Outstation and other auxiliary equipment such as Wimag. The Stratos Outstation has several applications; full information on the required configuration should be sought from the Stratos Outstation Family Tree, 667/DZ/52250/ETC. With reference to **Figure 30,** mains supply power for the Stratos Outstation is connected via a standard IEC C13 mains lead. The other boards in the system are powered over the RJ45 GSPI cables. To provide Lamp Supply monitoring on the Stratos Outstation the Lamp Supply Monitor Port is used.

It will be noted that the 19" Rack Assembly set aside for the Stratos Outstation will be largely empty when the Stratos Outstation is specified and completely empty when Stratos Outstation is not specified.

Figure 30 - Power for Stratos Outstation Unit



If the internal backup battery is fitted the Stratos Outstation can be mounted in any orientation apart from front panel facing down.

3.16 Regulatory Sign Supply Kit

Regulatory signs are supplied directly from the RAG Nodes, so no supply is required within the Controller. Up to 2 Plus+ regulatory Sign plates can be fed from each RAG Node. If a 3rd Party Nonstandard i.e. greater than 200mm non-Helios optic, then Engineering at Poole need to be consulted.

3.16.1 Regulatory Sign Monitoring

Regulatory Sign Monitoring is carried out by the RAG node to which they are connected. Only Helios Regulatory Signs specifically designed for Plus+ are supported.

Output channels are configured using the appropriate software configuration tools ST950 Plus+ Design Tool.

3.16.2 Additional Regulatory Sign Connection

If more than two regulatory signs are required, they can be fed from other Nodes with spare capacity on the same pole or adding an additional RAG Node in the Amber.
In exceptional circumstances Regulatory signs can be directly fed from a facility within the controller but this will not be offered in the first phase of ST950 Plus+ release.

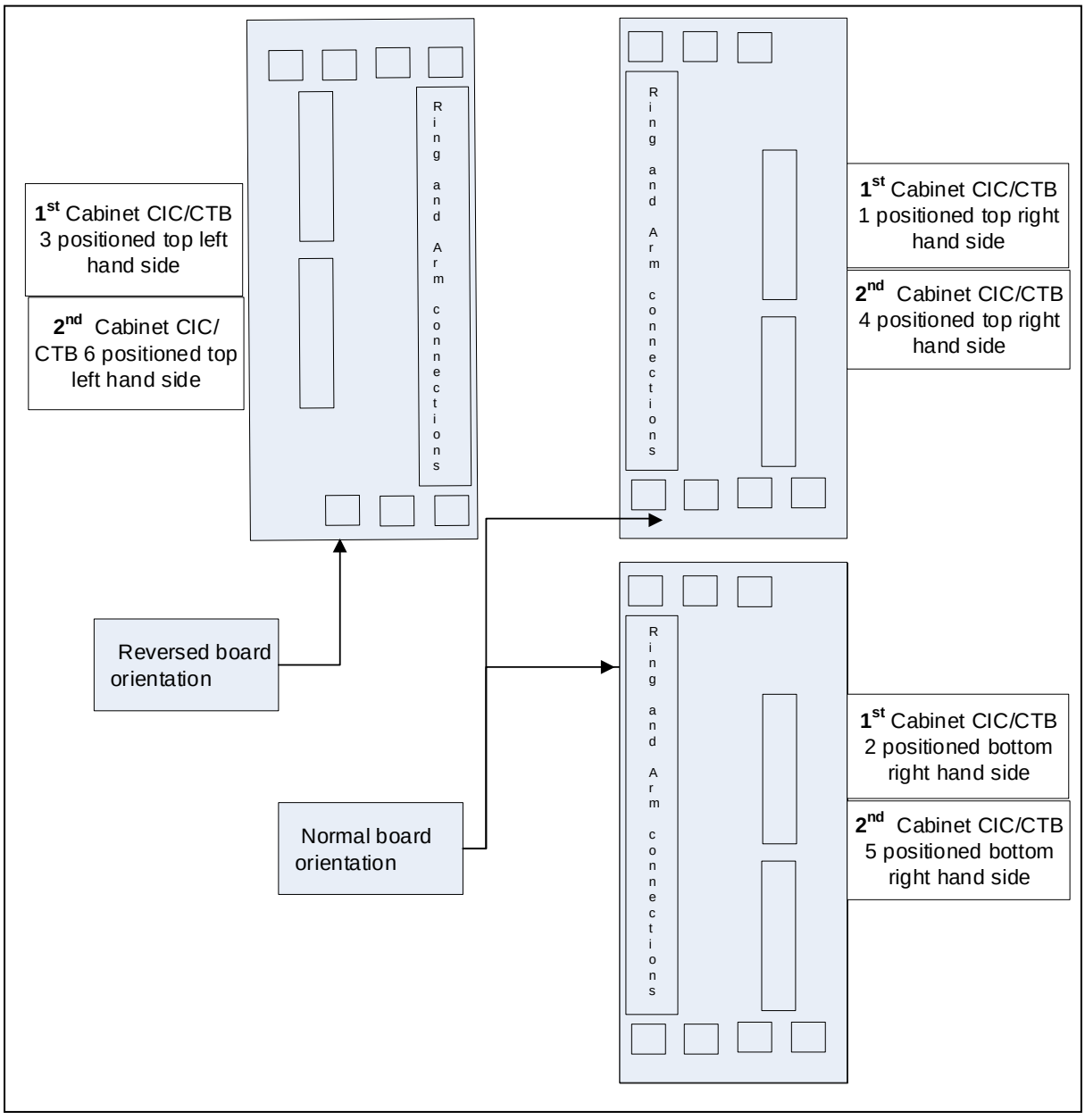
3.17 Location of CIC's

The Design tool will size the load and decide how many CIC's are required based on the number of Ring/Arms and the loading on each. The loading is affected by the lengths of the cable on each Ring/Arm as well as the number and type of nodes connected

3.17.1 CIC Cards Positioning

Each CIC card is inserted into an CTB (Cable Termination Board). The location of the CTB's within the cabinet are shown in **Figure 31** is a representation of the back panel in the ST950 Plus+ The first location is the top left in the same format as the locations of the LSLS modules on an ST950ELV

Figure 31 –ST950Plus+ CIC Positioning



3.17.2 Redundancy Module Load Distribution and CIC Connection

The Configuration of Power Supply Redundancy Modules and CIC's are determined by the Design tools. The power supplies locations 1 through to 6 are always placed in the same locations however the connectivity is determined by the design tool, the number of redundancy modules and CIC's

The Cabinet can support up to 3 Redundancy modules 3 CIC's and 6 power supplies. The basic rules are as follows each CIC has a redundancy module. Each redundancy module has up to 3 Power supplies allocated to it. (the actual configuration is determined by the configuration design tool and there is a set of drawings for each of the possible combinations).

The actual configuration required is dependent upon the number of Rings and arms required which determines the number of CIC's required and the load on each CIC determines how many power supplies are required.

The Basic controller build has 1 CIC, 1 Redundancy module and 2 Power supplies (extendable to 3).

The locations of Redundancy modules can be seen in Fig32, Fig33

3.18 48V DC Power supply Modules

The Design Tool calculates how many power supplies are required.

The minimum number is two with one redundancy module and one low inrush relay. The Redundancy Module and the low inrush relay can be used for builds of up to three 48Volt 10Amp power supplies. The mains side of the power supply have a hot swap mains connector to allow the supply to be replaced without powering down the controller. The locations of the first 4 power supplies 2 redundancy modules and 2 low inrush relays can all be fitted on the same panel fitted to the left-hand side of the controller cabinet.as shown in figures 34 and 35.

The 24Volt logic supply is always fitted and in addition to supplying the CPU and I/O can be used to supply up to 16 SLD4 detector cards. If other equipment such as WiMag is connected the load should be calculated and must not exceed 1 Amp.

Figure 32 – ST950 Plus+ Power supplies and Inrush Limiter

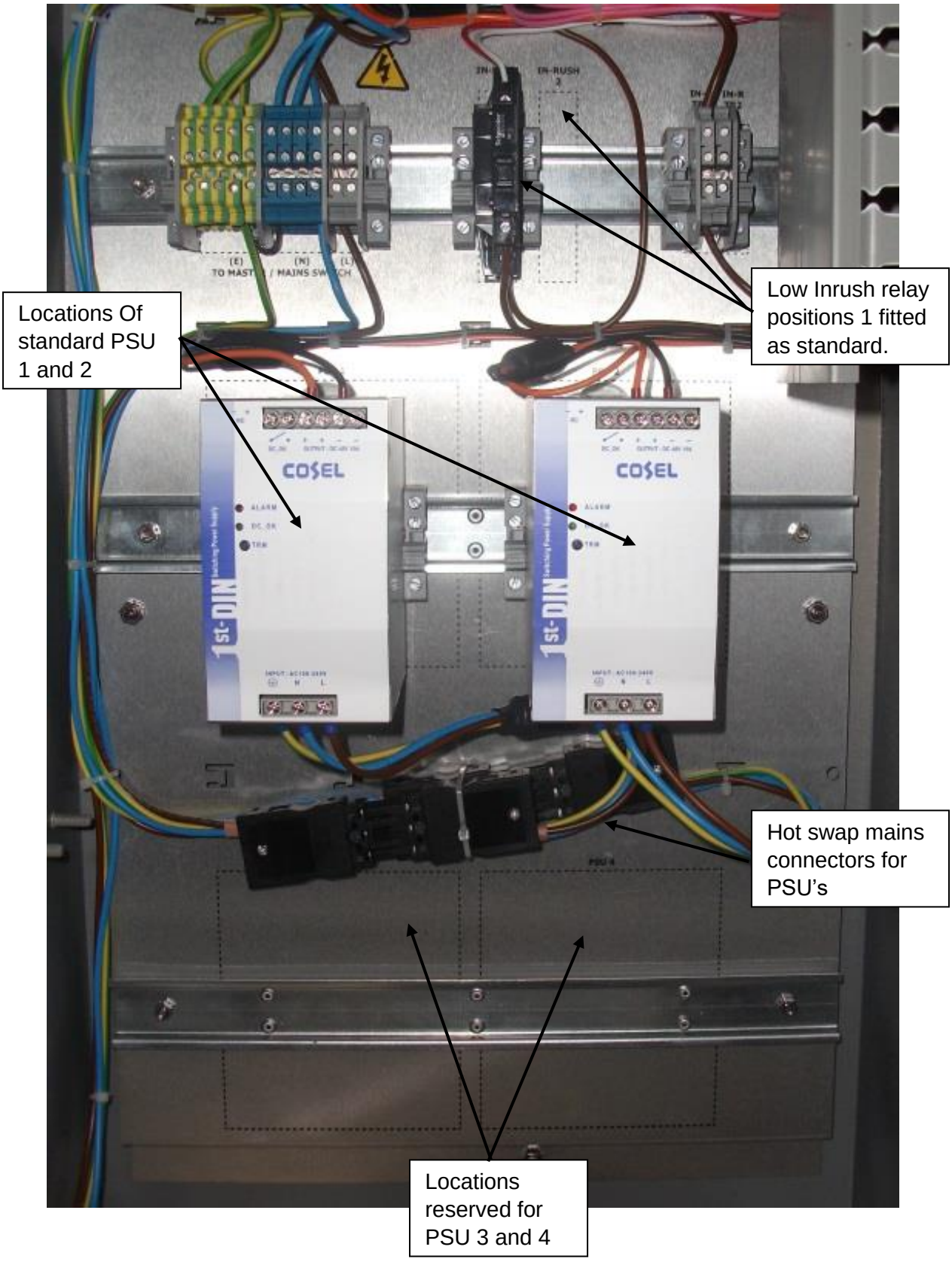
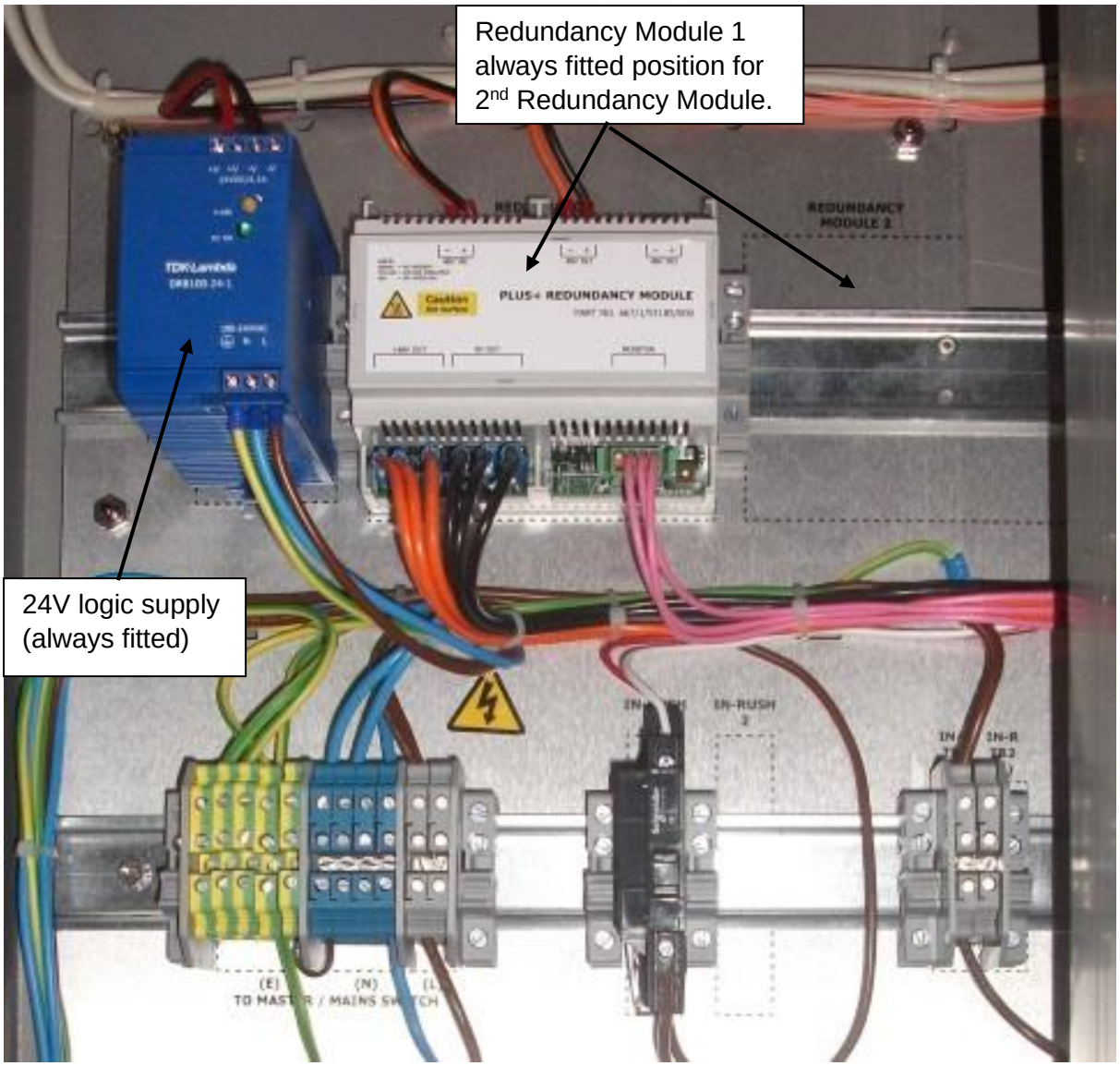
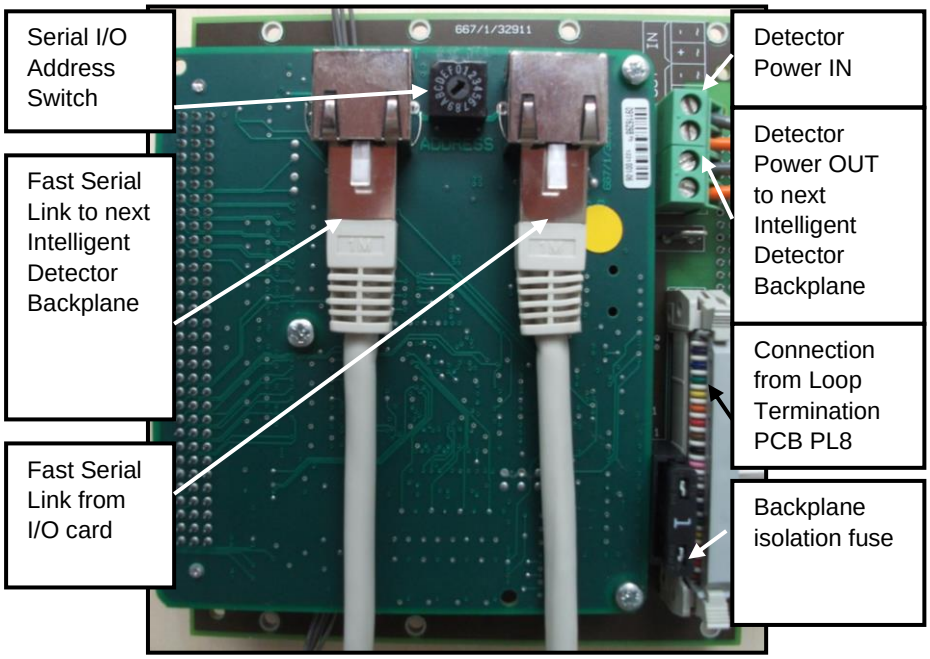


Figure 33 – ST950 Plus+ Redundancy Module.



3.19 Detector Power and Ancillary Power

Figure 34 – Detector Power



3.19.1 The Power for up to 16 SLD4 detectors is supplied by the 24V logic supply. The total auxiliary load (including SLD4 cards) must not Exceed 1A

3.20 Gemini2

Note. The Gemini Traffic Outstation is now an obsolete product so would not normally be a factory fit into the ST950 Plus+ controller it is included here as it may need to be fitted where customer requires its use when replacing an existing controller.

Warning! *It is important that the Gemini Last Gasp Dial Battery, within the Gemini Power Supply Unit, is orientated correctly; the battery terminal must be facing up. If the unit is to be mounted in such a way that the battery terminals are not facing up then it is necessary to implement certain modifications to ensure that the battery is not operating upside down. Please refer to document 667/HB/32600/000 for the necessary modifications.*

3.21 Audible Supply

No Separate Audible supply will be required Audible signal will be provided by the appropriate Node.

There is no additional equipment required in the controller.

These Nodes are:

Wait, Nearside and Demand unit, Nearside Combined

Full detail of these additional requirements should be sought from the ST950 Plus+ General Handbook.

Tactile Unit

3.21.1 Switched and Unswitched Tactiles

All Tactile units will be driven by the Appropriate Node:

There is no additional equipment required in the controller.

These Nodes are:

Wait, Nearside and Demand unit, Nearside Combined

Full detail of these additional requirements should be sought from the ST950 Plus+ General Handbook.

3.22 Solar Cell Kit of Parts

The Solar switch will be connected to the RAG Node in the Signal Aspect on which the Solar switch is mounted.

3.23 ST950 Plus+ Parts Listing

Table 7

Part Number	Description
667/1/53950/020	ST950 Plus+ Cabinet UK CIC With RM - Grey
667/1/53950/021	ST950 Plus+ Cabinet UK CIC With RM - Black
667/1/53900/000	Expansion cabinet kit - Grey Not released by Engineering
667/1/53900/001	Expansion cabinet kit - Black Not released by Engineering
667/1/46085/002	ST950 I/O card kit (4 outputs) - not included in controller build
667/1/46085/001	ST950 I/O card kit (16 outputs) - not included in controller build
667/1/46014/000	ST950 CPU I/O Kit 24 inputs 4 Outputs
667/1/45952/001	ST950 CPU I/O kit (4 outputs) cable form
667/1/53090/000	Plus+ CIC kit
667/1/53050/000	Plus+ CTB Backplane Kit
667/1/33002/000	Detector 6U rack expansion kit
667/1/32994/001	Backplane SLD4 Link Cable (short)
667/1/32994/002	Backplane SLD4 Link Cable (long)
667/1/27056/001	Manual Panel Full Kit
667/1/27104/000	DFM lens kit
667/1/47260/100	WiMag Standard 3U Rack Kit
667/1/47210/100	WiMag standard interface card kit
667/1/47285/000	WiMag Detector Card Replacement Interface Kit
408/4/54224/000	4 Port POE Switch
408/4/54225/000	8 Port POE Switch

4 CONTACT WITH TECHNICAL SUPPORT

For any support related questions, queries or problems please contact the Technical Support Department, Siemens Mobility, Traffic Solutions, Sopers Lane, Poole, BH17 1ER.

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