System Description

AutroSafe Interactive Fire Detection System

116-P-ASAFE-SYSTEMD/EGB Rev. G, 2015-09-02, Autronica Fire And Security AS

CE

This product contains static-sensitive devices. Avoid any electrostatic discharge.

The WEEE Directive

When the marking below is shown on the product and/or its literature, it means that the product should not be disposed with other household wastes at the end of its life cycle. During waste treatment, disposal and collection, please separate the product from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. This product should not be mixed with other commercial wastes for disposal.

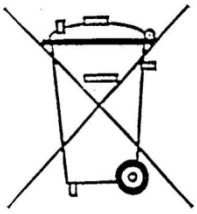


Table of Contents

1. Introduction

1.1 About the Handbook

This document provides a description of the AutroSafe Interactive Fire Detection System, Release 4.

1.2 The Reader

This handbook is intended for consultants, sales personnel, potential customers and distributors.

1.3 Reference Documentation

The table below shows an overview of the technical marketing documentation for AutroSafe Interactive Fire Detection System, Release 4.

Document Name	Part number	File name
System Description	116-P-ASAFE-SYSTEMD/EGB	asafesystemd_egb
Installation Handbook	116-P-ASAFE-INSTALL/DGB	asafeinstall_dgb
Commissioning Handbook	116-P-ASAFE-COMMISS/EGB	asafecommiss_egb
Connecting Loop Units	116-P-CONNECTLOOPUNIT/DGB	connectloopunit_dgb
User Guide, Remote Access	116-P-ASAFE-REMOTEAC/EGB	asaferemoteac_egb
Operator's Handbook	116-P-ASAFE-OPERATE/FGB	asafeoperate_fgb
User Guide	116-P-ASAFE-USERGUI/LGB	asafeusergui_lgb
Wall Chart	116-P-ASAFE-WALLCHA/LGB	asafewallcha_lgb
Menu Structure	116-P-ASAFE-MENUSTR/MGB	asafemenustr_mgb
Datasheet; Fire Alarm Control Panel BS-420	116-P-BS420/CGB	bs420_cgb
Datasheet; Operator Panel BS-430	116-P-BS430/CGB	bs430_cgb
Datasheet; Repeater Panel BU-BV-420	116-P-BUBV420/CGB	bubv420_cgb
Datasheet; Fire Brigade Loop Panel BU-110	116-P-BU110/CGB	bu110_cgb
Datasheet; Information Loop Panel BV-110	116-P-BV110/CGB	bv110_cgb
Datasheet; Controller BC-420	116-P-BC420/CGB	bc420_cgb
Datasheet; Controller Unit Rack BC-440	116-P-BC440/CGB	bc440_cgb
Datasheet; Power Cabinet BP-405	116-P-BP405/CGB	bp405_cgb
Datasheet; Power Unit BPS-405	116-P-BPS405/CGB	bps405_cgb
Datasheet; Power Unit BPS-410	116-P-BPS410/CGB	bps410_cgb
Datasheet; AutroKeeper BN-180	116-P-BN180/CGB	bn180_cgb

For detailed technical information on Phoenix Ethernet Switches, refer to Phoenix Contact web site at http://select.phoenixcontact.com/phoenix/dwl/dwlfr1.jsp?lang=en

For detailed technical information on DSL Modem and Fiber Converters, refer to www.korenicx.com

2. Compliance to Standards

2.1 Compliance with Regulations and Standards

AutroSafe Interactive Fire Detection System, Release 4, complies with IEC-61508 SIL2 requirements, EN 54-2, EN 54-4 and EN 54-13 regulations, AS 7240.2 and AS 7240.4 regulations, FM regulations (Factory Mutual) and the maritime SOLAS (Safety Of Life At Sea) requirements. The system complies to IMO SOLAS convention including the amendment Safe Return to Port (AutroSafe Dual Safety, see chapter 3.9).

Certified according to Construction Products Directive (CPD) and Marine Equipment Directive (MED).

2.2 EN 54-2 Functionality List

With reference to 12.2.1 in EN 54-2.
h) a general description of the equipment, including a list of the:

- optional functions with requirements of this European Standard (chapter 2.2.1 in this handbook)
- functions relating to other parts of EN 54 (chapter 2.2.2 in this handbook)
- ancillary functions not required by this European Standard (chapter 2.2.3 in this handbook)

2.2.1 Optional functions with requirements of this European Standard

EN 54-2 Clause	Imple-mented	Option text	Description/Requirement	AutroSafe functionality
7.8	Yes	Output to Fire Alarm Device(s)	Automatic transmission of fire alarm signals to fire alarm devices.	
7.9				
7.9.1	Yes	Output to Fire Alarm Routing Equipment	Automatic transmission of fire alarm signals to fire alarm routing equipment.	Indicated by separate light emitting indicator.
7.9.2	No	Confirmation input from Fire Alarm Routing Equipment	Reception and indication of signal from fire alarm routing equipment.	
7.10				
7.10.1	Yes	Output type A: Output to Fire Protection Equipment	Transmission of fire alarm signals to controls for automatic fire protection equipment.	Only Output type A implemented
7.10.2	No	Output type B: Indication of signals to Fire Protection Equipment		
7.10.3	No	Output type C: Confirmation input from Fire Protection Equipment		
7.10.4	No	Fault monitoring of Fire Protection Equipment	Reception and indication of fault warning signals from Fire Protection Equipment.	
7.11	Yes	Delays to outputs	Delay the actioning of outputs to fire alarm devices and/or fire alarm routing equipment and/or fire protection equipment.	Prepared through configuration. Entering Day-mode (input or menu) activates delays. Manual call points may override delays.
7.12	No	Dependency	Inhibit either the indication of fire alarm condition, or the operation of outputs, until confirmatory signals are received.	First release will meet the requirements of the “7.12 Co-incidence detection” of EN 54-2:1997. Outputs inhibited until confirmatory signals. Manual call points overrides co-incidence.
7.13	No	Alarm counter	Record the number of instances that the c.i.e. enters the fire alarm condition.	Search ‘filters’ in Log may give alarms or resets only (with date/time).
8.3	Yes	Fault signal from points	Faults shall be indicated at least as zone faults.	Interpreted to be better to give detailed point info.
8.4	No	Total loss of power supply	An indication shall be given for a period of at least one hour.	
8.9	Yes	Output to Fault Warning Routing Equipment	Transmission of fault signals to fault warning routing equipment.	

EN 54-2 Clause	Imple-mented	Option text	Description/Requirement	AutroSafe functionality
9.5	Yes	Disablement of addressable points	Disabling and enabling points individually, or in groups, by manual operation.	If all points within a detection zone are disabled, the indication changes to zone disablement.
10	Yes	Test condition	Testing the processing and indication of fire alarm signals from zones.	
11	No	Standardized input/output interface	Standardized input/output interface, suitable for the transmission and reception of signals to and from ancillary equipment.	Communication options available. Serial line protocol to cover required functionality in 11a) and 11b) to be defined. See also ancillary function list.
12.5	Yes	Integrity of transmission paths	12.5.4. c.i.e. in more than one cabinet.	Power supply in separate cabinet.

2.2.2 Functions relating to other parts of EN 54

EN 54 part no	Description
EN 54-4 Power supply equipment	Battery internal resistance and deep discharge.

2.2.3 Ancillary functions not required by this European Standard

Ancillary function	Description
Pre Alarm condition	A warning level from the detectors with zone indication on display. Point info. available. Implemented as a condition in line with those required by the standard.
Self Verifying Function	An automatic, calibrated test of all detectors, interfaces, connections and cables for 300- and 500-series equipment. Series 200 without SV.
DYFI+	Dynamic Filtering, introduced in our BS-100 c.i.e., further enhanced in AutroSafe and Autroprime.
Environmental Adaptivity	Autroprime detectors may be programmed for environments, clean, normal, industrial.
SOLAS functionality	Mandatory functional requirements given by Safety Of Life At Sea (SOLAS) for installations on ships.
Co-incidence detection	As defined in EN 54-2:1998 7.12 Co-incidence detection.
Delayed co-incidence detection	Norwegian requirement according to HO-2/98. (Also as described in EN 54-2:A1:2006 Annex E Type C dependency.)
Operator panels	Event indication and handling, menu available. (In accordance with Annex G, an ancillary function without requirements. See also above option: 11 Standardised input/output interface)
Repeater panels	Function / type of panel (Fire Brigade Panel or Information Panel) determined by switch settings (see Installation Handbook for details).
Short circuit isolators integrated in loop units.	Communication path between neighbouring loop units may be isolated in case of short circuit or break. Provided connection as a loop (recommended), no loop units will be lost in case of such a fault.
Alarm zones	Means of sub-dividing the alarming area in an installation during fire alarm condition

2.3 CE Marking Information

Autronica Fire and Security AS
7483 Trondheim

09

EN 54 –2:1997/A1:2006

Control and indicating equipment for fire detection and fire alarm systems for buildings

xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx

Provided options:
See chapter 2.2.1 in this handbook.

Other technical data:
See
AutroSafe Installation Handbook 116-P-ASAFEINSTALL/DGB

2.4 Terms, Abbreviations/Acronyms and Definitions

Term	Abbr/ Acron	Definition
Activation		To bring a *component* into (one of) its active activation states (depending on type, a component may have several active activation states). Examples of activation are turning a fire extinguisher on and making a sounder to issue a EVACUATE or ALERT signal. Components may be activated and deactivated either on command or on alarm.
Active Mode		The AutroSafe system is in Active Mode when it controls the detection loops (see Dual Safety).
AL_Com		The Autronica loop communication protocol for detectors and I/O units.
AL_Com+		The Autronica protocol between the panel and the Loop Driver.
Alarm Zone	AZ	The geographical area throughout which Fire Alarm Devices give identical alarm signals present identical audible information in response to the same event. An alarm zone is activated by one or several Detection Zones. The alarm zone assigned to the detection zone in alarm is called the parent alarm zone. Fire Alarm Devices in a parent alarm zone will always give EVACUATE signal. To any (parent) alarm zone there may be defined a number of neighbour alarm zones. Fire Alarm Devices in neighbour alarm

Term	Abbr/ Acron	Definition
		zones will give alert signal when its parent alarm zone gives EVACUATE signal.
AutroCom		The Autronica communication protocol between AutroSafe and AutroMaster or other third party systems.
AutroFieldBus	AFB	The Autronica serial interface and low level protocol for field devices (loop controllers and power units / AutroSafe).
AutroKeeper	BN-180	A unit that controls the Loop Driver's access to the loop.
AutroMaster ISEMS		The Autronica top-level graphical presentation system. ISEMS: Integrated Safety and Emergency Management System
AutroNet		The system's local area network.
BLC-Eq		Basic Loop Controller Equipment (equipment part for all Loop Units and I/O modules, i.e. Eq-part for Loop-Ctrl, Point-Ctrl, FPE-Ctrl etc.)
Component		An assembly of one or more modules, implementing a system function. The following components are defined in the AutroSafe Interactive Fire Alarm System (also see detailed description of *Components,* Chapter 1): Points (fire detectors, manual call points) Detection Zones Fire Protection Equipment (fire extinguishers, ventilation controllers) Fire Alarm Devices (sounders, information panel, visual indicator) Fire Alarm Routing Equipment Fault Warning Routing Equipment Operator Panels
Condition		Meaning similar to «state», but used only in conjunction with the control and indication equipment. (EN54 standard).
Control and indicating equipment	c.i.e	Equipment supplying power to, as well as accepting fault and alarm signals from detectors. A c.i.e. will indicate an alarm condition audibly as well as visibly and indicate the location of danger.
Deactivation		To bring a component into its inactive activation state (a component can have only one inactive activation state). Examples of deactivation are turning a fire extinguisher off and silencing a sounder.
Detection Loop		Wired from the Loop Module to connect all loop units.
Detection Loop		Loop circuit connecting a number of fire detectors, manual call-points and other Loop Units. A detector loop is connected to control and indicating equipment.
Detection Zone	DZ	One or more fire detectors and/or manual call-points logically belonging together for geographical, functional or other reasons.
Dual Safety	DS	An AutroSafe system consisting of a Primary System and a Secondary System. The purpose of the concept is to ensure that the Secondary System takes over the control of the detection loops if the Primary System is lost for any reason.
Fault Warning Routing Equipment	FWRE	Intermediate equipment which routes a fault warning signal from (B) to a fault warning signal receiving station.
Fire Alarm Device	FAD	Equipment used to give warning of fire, for example, sounder or visual indicator.
Fire Alarm Recieving Station		A centre from which the necessary fire protection measures can be initiated at any time.
Fire Alarm Routing Equipment	FARE	Intermediate equipment which routes an alarm signal from control and indicating equipment to a Fire Alarm Receiving Station.
Fire Detector		The part of an automatic fire detection system which constantly or at frequent intervals monitors suitable physical and/or chemical phenomena for detection of fires in the area under surveillance.
Fire Protection	FPE	Fire control or fighting equipment, e.g. extinguishing installation.

Term	Abbr/ Acron	Definition
Equipment		
Loop Unit		A Point, an I/O unit or an Electronic Sounder that is connected to a detection loop.
Manual Call-Point		A device for the manual initiation of an alarm.
Operation Zone	OZ	An Operation Zone defines the scope of an Operator Panel. One operation zone may encompass one or more detection zones. Operation zones are allowed to be contained in other operation zones, building an hierarchy consisting of different levels of operation zones. Operation zones must be fully contained in each other, i.e. the operation zone can not be partly contained in (overlap) another operation zone. One operation zone may be controlled by more than one Operator Panel.
Point		A detector or a manual call point.
PowerLoop		The Autronica loop communication protocol for high power gas and flame detectors. 2-wire loop for both power and communication.
Primary System		The AutroSafe system that is designed to be in Active mode during normal operation (see Dual Safety).
Secondary System		The AutroSafe system that is designed to be in Standby mode during normal operation (see Dual Safety).
SOLAS		A program version of the AutroSafe software, spesially designed for maritime application - Safety Of Life At Sea (SOLAS).
Standby Mode		The AutroSafe system is in Standby Mode when it is ready to take over the control of the detection loops if the system in Active Mode fails (see Dual Safety).
System Unit		A unit that is directly connected to AutroNet.

3. System Characteristics

3.1 Introduction

AutroSafe Interactive Fire Detection System, Release 4, provides advanced functionality within fire detection for a wide range of applications. The system is designed to meet requirements in the high-end segment of the land, maritime and offshore market, and is developed for worldwide standards and regulations.

AutroSafe 4 operates on a high-speed and fully redundant Ethernet-based network solution; AutroNet, providing extremely fast data transmission. A maximum of 64 system units (panels, controllers) can be connected to the AutroNet in a standard system (depends on the type of configuration). A standalone system is also possible, using the Fire Alarm Control Panel BS-420 (the mandatory panel in any system).

The system has a great capacity, and the fact that all types of loop units can be connected to the same detection loop gives large flexibility.

3.2 Safety Functions

The main safety function of the AutroSafe Interactive Fire Detection System is detection and action to alarms. The system supports both fire and gas detection and alarming. The cause & effect from input to output is very flexible and configurable.

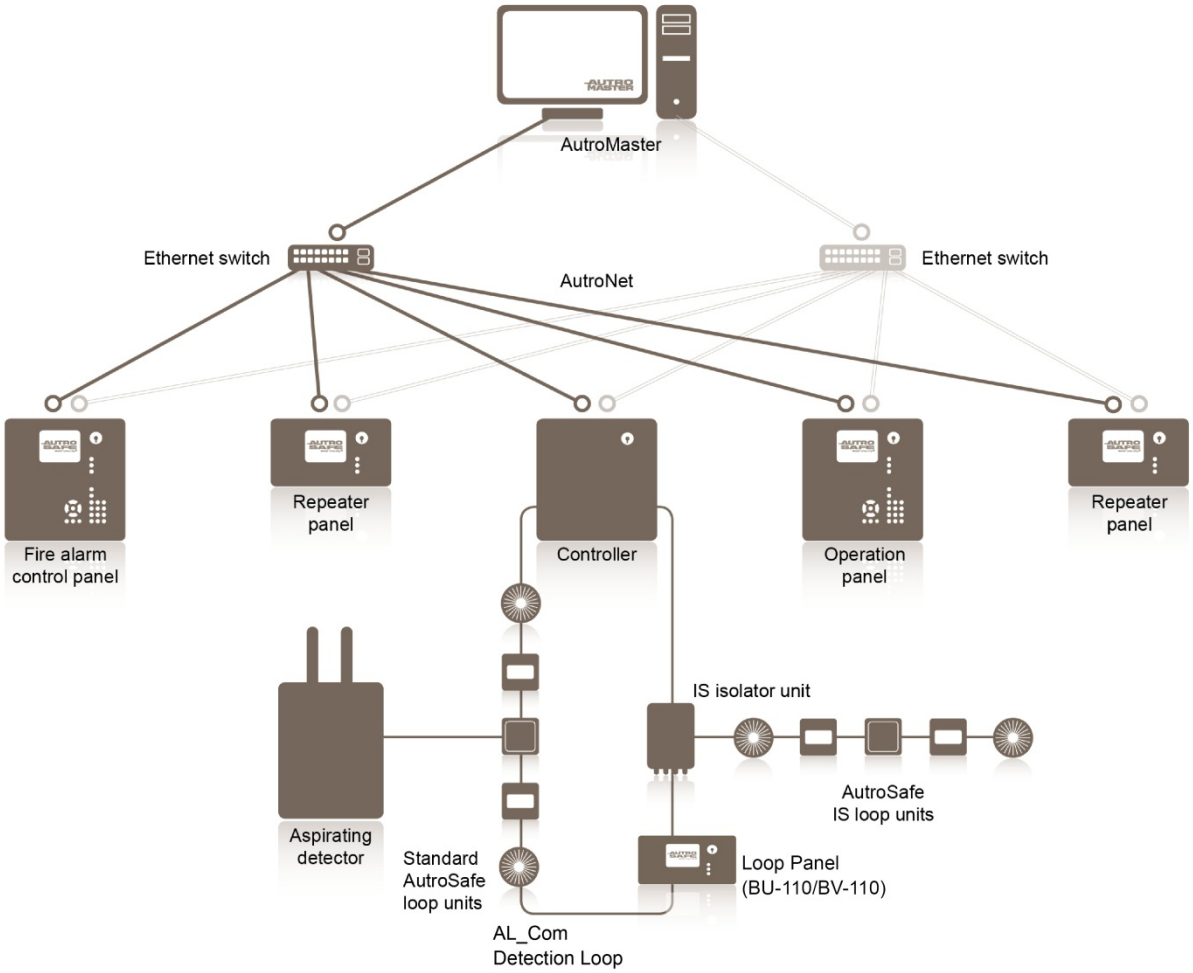
An alarm from a Point activates outputs to FPE (Fire Protection Equipment), FAD (Fire Alarm Devices) and FARE (Fire Alarm Routing Equipment) according to the Site Specific Configuration data. The Alarm causes Point and Detection Zone status to be sent to external systems via AutroCom, and appears at the panel by indicators and text in the display.

To ensure that the safety is available in the life cycle of the system internal diagnostic runs continuously and alerts if any discrepancies are found.

See Operator’s Handbook for more information on modes of operation.

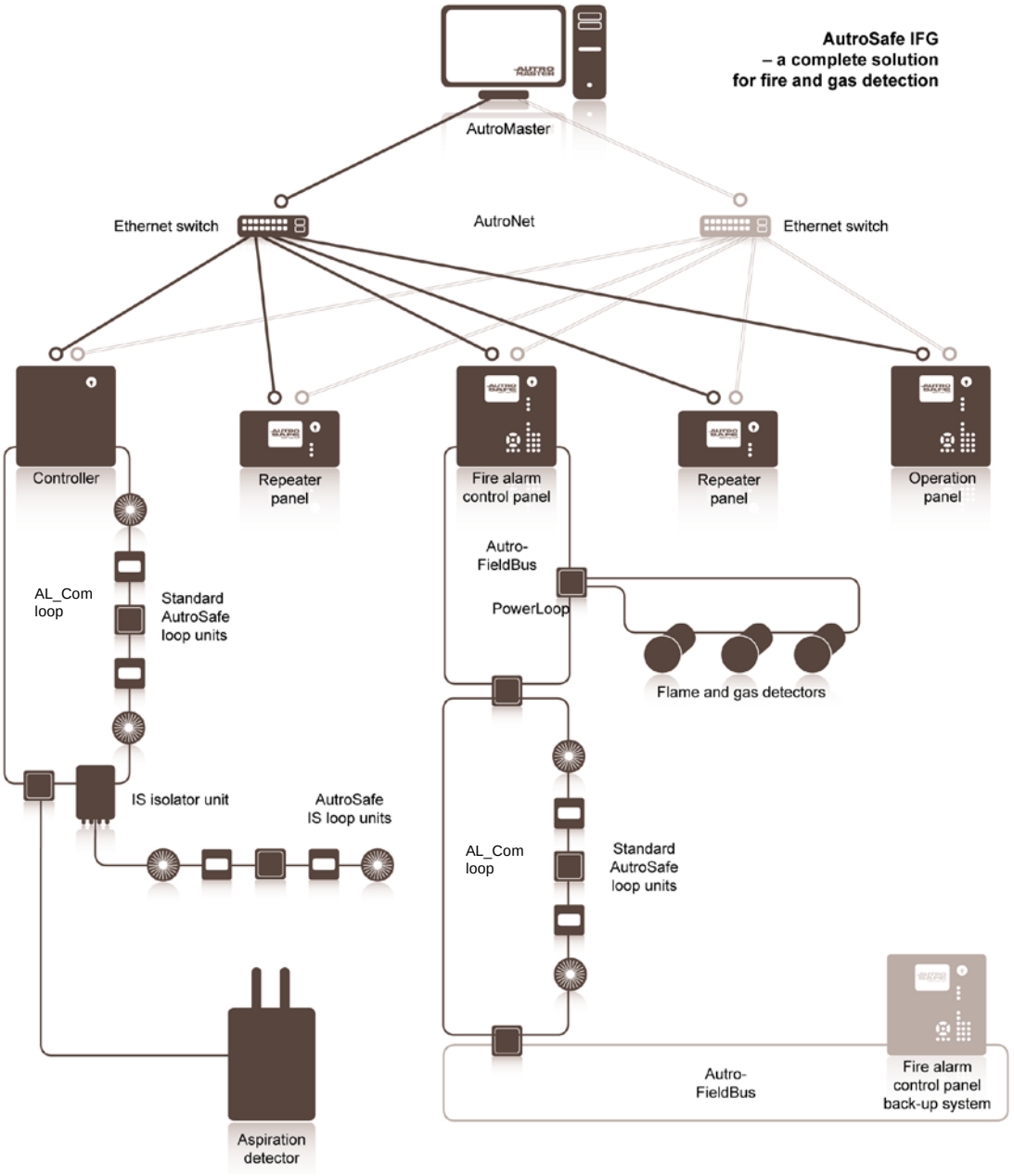
3.3 Onshore Market / Maritime Market

The illustration below shows an example of an installation for the onshore or maritime market.



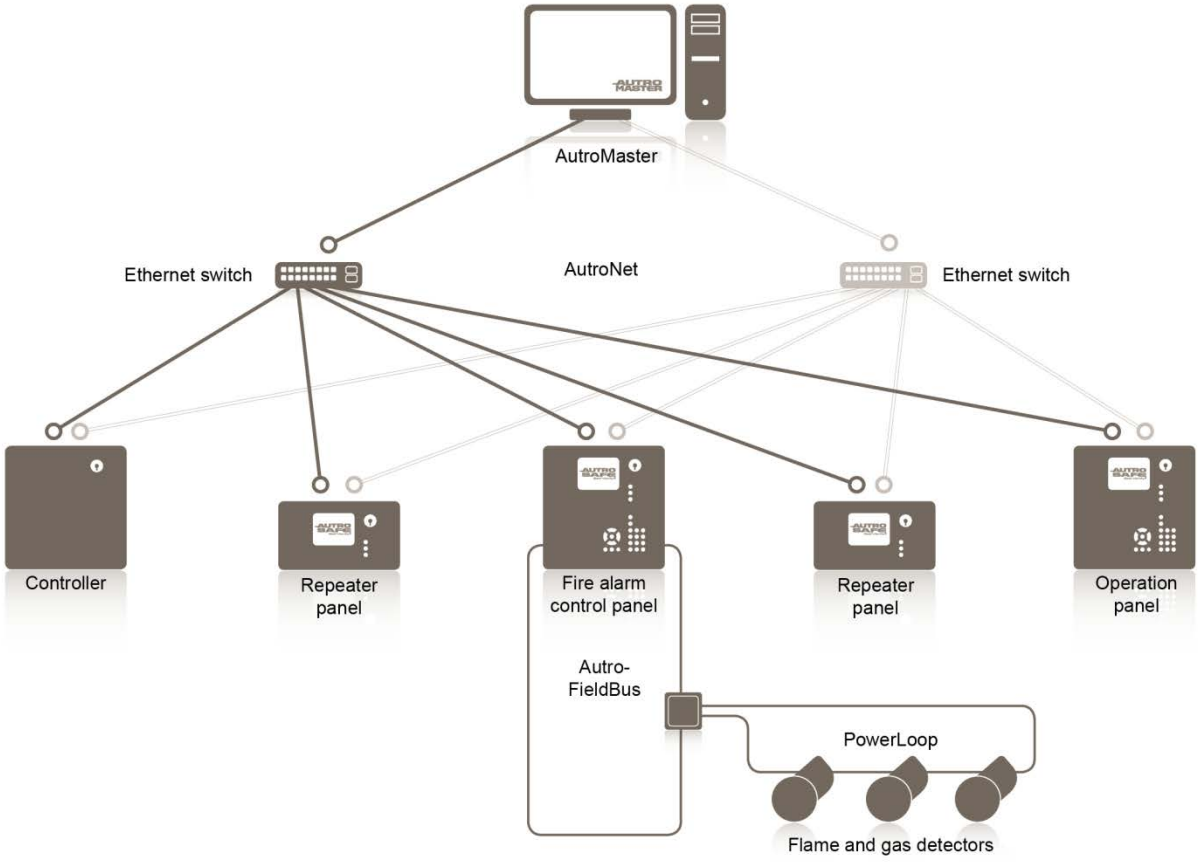
3.4 Petrochemical, Oil & Gas Market

The illustration below shows an example of an installation for the petrochemical market (Integrated Fire and Gas Detection – IFG).



3.5 Maritime Gas Installation

The illustration below shows an example of a Maritime Gas installation.



3.6 AutroNet - the Local Area Network

AutroSafe Interactive Fire Detection System, Release 4, features an Ethernet-based local area network called AutroNet. The main circuit board in each single panel/cabinet provides two Ethernet ports, enabling redundancy.

AutroNet consists of one of the following solutions:

- AutroNet Redundant Star Topology – AutroSafe's standard redundant network
- AutroNet Single Star Topology – a system consisting of several panels with a single network connection to one panel or several panels
- AutroNet Ring Topology – a redundant network with ring topology

The maximum number of system units supported by AutroNet depends on the type of system (see System Capacity below). In a standard system the maximum number is 64.

For detailed information on network solutions, including guidelines and information on Ethernet switches, refer to Example of Network Solutions, chapter 5.

3.7 AutroFieldBus – the Low Level Protocol for Field Devices

AutroFieldBus is the system's serial interface and low level protocol for field devices (loop controllers and power units). All power cabinets and field devices communicate on the AutroFieldBus to achieve fault monitoring and control, .

3.8 System Capacity

Maximum number of	Standard System	Dual Safety System	SIL2 System
System units (panels) per system (connected to the local area network; AutroNet)	64	16 (Pri) 16 (Sec)	32
Loop units per system	15000	5000	7500
Modules per fire alarm control panel / controller	12	18	12
Detection Loops per fire alarm control panel / controller	6	12*	6
Loop units per system unit (panel)	512	1024	512
Loop units per detection loop	127	127	127
Loop units per branch on a detection loop	32	32	32
Loop units per Intrinsically Safe (IS) branch on a detection loop	20	20	20
Loop units per Powerloop	15	15	15
Socket sounder / loop sounders per detection loop	40	40	40
AutroFieldBus units connected to AutroFieldBus	31	31	31
Ethernet ports per fire alarm control panel / controller	2	2	2
USB host ports per fire alarm control panel / controller	2	2	2

* 6 Loops on panel internal I/O stack and 6 loops on BSD-321 I/O stack.

3.9 AutroSafe Dual Safety Concept

3.9.1 Description

AutroSafe version 4.3 and more recent versions feature the AutroSafe Dual Safety concept.

The concept is based on two individual AutroSafe systems physically connected to the same set of fire detection loops. One system acts as the Primary System and the other as the Secondary System. The purpose of the concept is to ensure that all detection loops are able to communicate with the Secondary System if the Primary System or parts of the Primary System for any reason fails to communicate with some or all detection loops (for more details, see chapter 3.9.3).

The two AutroSafe Systems, using an AutroKeeper (BN-180) in addition to each Loop Driver Module, provides a total system with a primary and a secondary loop control (AutroSafe Dual Safety).
An AutroMaster can communicate with both the Primary and Secondary System via AutroCom.

3.9.2 AutroKeeper BN-180

Patented component to meet the SOLAS requirement “Safe Return to Port”, NO20083912
Patent application PCT/NO2009/000319

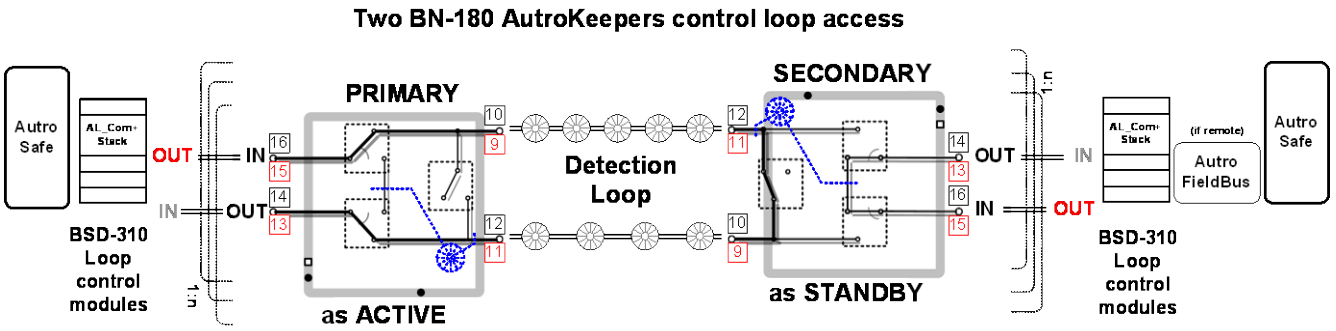
Two AutroSafe Interactive Fire Alarm Systems using AutroKeepers (BN-180) to access one set of detection loops, provides a total system with a primary and a secondary loop control. If, by any reason, the primary loop control fails, the secondary loop control will take over, and fire detection is thus maintained. Redundancy is achieved without introducing two set of detection loops and thus avoiding twice the amount of cabling and detectors.

The AutroKeeper is physically placed between the Loop Driver Module (BSD-310) and the detection loop and thus controlling/providing the loop controller access to the loop. The AutroKeeper’s function is to make sure that only one system through one loop controller can control the detection loop or part of the detection loop at the same time. The two AutroKeepers connected to one loop will communicate using the detection loop and strive to make sure that one of the two is in active mode and the other is in standby mode (see definitions, chapter 2.4).

The AutroKeepers will continuously monitor critical parameters to ensure loop access without conflict through either the primary or the secondary AutroKeeper. As already implied the AutroKeeper giving loop access is in active mode while the other AutroKeeper is in standby mode. User commands are available to **appeal** for a transfer of control to the AutroKeeper in standby mode.

Commands may be rejected due to loop access conflicts or the standby AutroKeeper not being able to take over. Automatic switchover also has acceptance and rejection criteria like this.

A detection loop switchover makes the active AutroKeeper standby and the standby AutroKeeper active. The transfer/switchover time is so short that the loop units will be operating during the switchover, powered by their internal battery capacitor (version dependent).



An AutroKeeper in standby mode creates galvanic isolation between its loop controller (system) and the detection loop. Thus, the two systems connected to one set of loops, can have different sources of power. A detection loop earth fault will only be detected and will only affect the system on the detection loop's active side. A disabled loop will set both AutroKeepers in standby mode and leave the loop unpowered and floating.

The AutroKeeper will normally have one 24VDC power input. If power is lost, the AutroKeeper will still be operational by using power provided from the detection loop, but it will try to leave the active mode. If both power sources fail, there will be a switchover if the standy AutroKeeper is ready to become active.

3.9.3 Scenarios for Transfer of Loop Control / Switchover of Loop Access

Manual transfer of loop control:
The System “appeals” AutroKeeper for transfer and the appeal is accepted. This causes immediate transfer on a per loop basis. The AutroMaster or AutroSafe may also appeal a “Take” or “Give”, which is on a per panel basis, including at most all of its loops. Transfer will occur for all loops if the appeal for transfer of all loops is accepted.

Automatic switchover of loop access:

- The AutroKeepers watch the state of the two Systems (Primary and Secondary), by communicating with them. They also watch the other AutroKeeper. Based on what they see, there may be a delayed switchover to a better alternative, on a per loop basis.
- If the loop access is such that two loop controllers may communicate on the loop, this is detected by the AutroKeepers. The one that detects this “collision” first will withdraw to standby mode.
- If a loop looses power or it is disconnected, there will be an immediate switchover. If there is a shortcircuit, then the loop will be raised again by the side that was active when the shortcircuit occurred.

For all these scenarios the action may fail. In any case the connected system will be informed at any new or present mode.

3.9.4 Connection of Loop Driver Modules

To avoid twice the amount of Autrosafe panels compared with existing non Dual Safety systems, the panel loop capacity is doubled from 6 to maximum 12 detection loops. A set of maximum 6 Loop Driver Modules are stacked together in the panel I/O stack. If more than 6 Loop Driver Modules are to be connected to one panel, two or more I/O stacks have to be used. One I/O stack can be connected to the panel's main board directly (AL_Com+ flat ribbon cable length maximum 3 meters).

An alternative connection to be used is through the panel AutroFieldBus by using the AutroFieldBus Protocol Converter BSD-321. The AFB capacity is up to 12 BSD-321 for the connection of Loop Driver Modules and the maximum AFB cable length is 1000 meters (see AFB spec. for more details). Booster equipment can be added to expand the AFB cable length even further.

The connections that are to be used between the Primary/Secondary System and the detection loops depend on distances and the number of Loop Driver Modules/detection loops used. Refer to Rules of Thumb and the examples in chapter 3.9.6 and 3.9.7.

3.9.5 Rules of Thumb

Note that the following rules of thumb goes for both systems in a Dual Safety configuration:

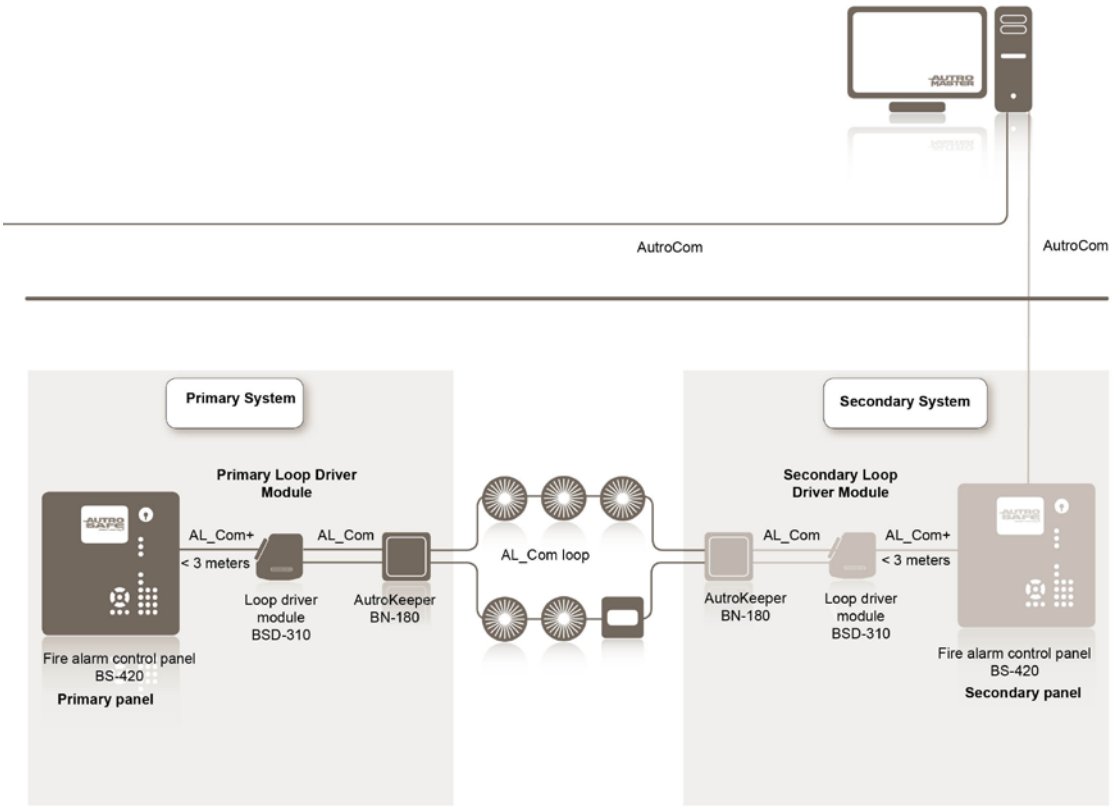
- Up to 12 Loop Driver Modules can be connected to one panel through AutroFieldBus (up to 12 I/O stacks). This solution has to be used if the cable length between the panel's main board and the I/O stack exceeds 3 meters, but can also be used for cable lengths less than 3 meters.
- Only Loop Driver Module BSD-310 can be used (not BSD-311).

3.9.6 Example 1: Connections Using AL_Com+ only

The figure below illustrates an example of the system concept where a Primary System and a Secondary System share a detection loop.

The distance from the Primary Panel to the Loop Driver Module is less than 3 meters. An AL_Com+ flat ribbon cable is used between the panel AL_Com port and the I/O stack (including the Loop Driver Module).

The distance from the Secondary Panel to the Secondary Loop Driver Module is less than 3 meters. An AL_Com+ flat ribbon cable is used between the panel AL_Com port and the I/O stack (including the Secondary Loop Driver Module).



3.9.7 Example 2: Connections using both AL_Com+ and AutroFieldBus

The figure below illustrates an example of the system concept on a vessel where a Primary System and a Secondary System share a detection loop.

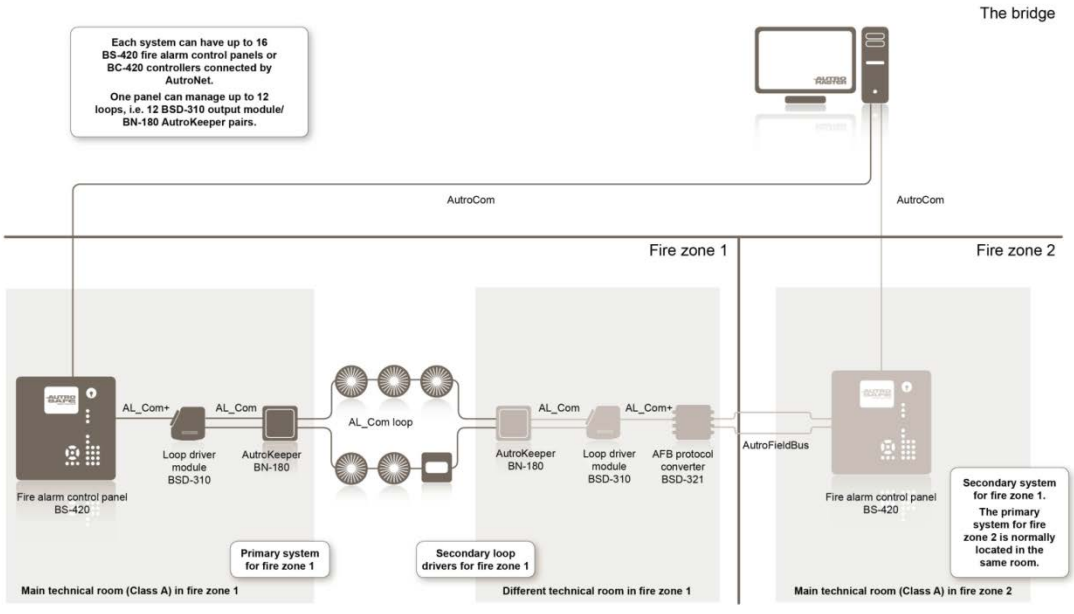
The detection loop covers an area of Fire Zone 1, and all equipment in the Primary System plus the Loop Drivers in the Secondary System are located in this fire zone.

The panels in the Secondary System are located in Fire Zone 2. Only the AutroFieldBus crosses the boundary between the fire zones.

An AutroMaster (top-level Integrated Safety and Emergency Management System) is located on the bridge, and communicates with both the Primary and Secondary System via AutroCom. The AutroMaster operator has a complete graphical view of the entire system, and can easily see which system is in Active or Standby Mode during normal operation (see definitions, chapter 2.4). If necessary, the operator can manually transfer the control of detection loops from the Primary to the Secondary System, and vice versa.

The distance from the Primary Panel to the Primary Loop Driver Module is less than 3 meters. An AL_Com+ flat ribbon cable is used between the panel AL_Com port and the I/O stack (including the Loop Driver Module).

The distance from the Secondary Panel to the Secondary Loop Driver Module is more than 3 meters. An AL_Com+ flat ribbon cable (maximum 3 meters) is used between the AutroFieldBus (AFB) Protocol Converter BSD-321 and the I/O stack (including the Secondary Loop Driver Module). The AFB Protocol Converter is connected to the panel's AFB. The AFB cable length can be up to 1000 meters. Booster equipment can be added to exceed the AFB cable length even further.



3.10 Dual CPU concept

By combining the functionality of Dual Safety and analyzing certain events in the system (see criteria below), the AutroSafe supports dual processing of signals for increased reliability. In a Dual Safety system, loops will be transferred individually on certain faults (for more details, see chapter 3.9.3).

In a Dual CPU configuration *all* loops will be transferred from primary to secondary system based on the following criteria:

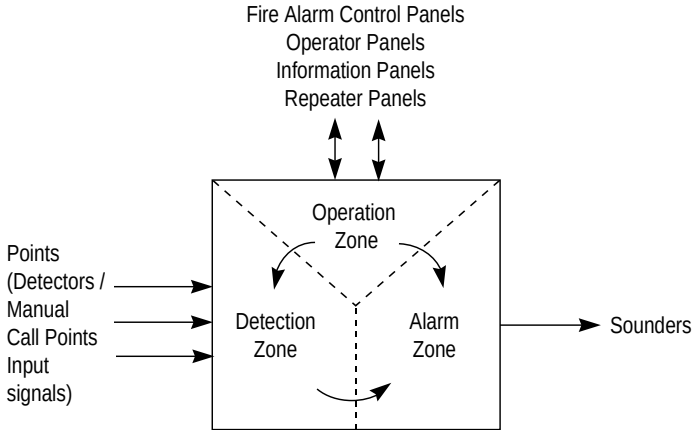
- Same criteria as for Dual Safety (see chapter 3.9.3.)
- Faults on both networks in primary or secondary system
- Loss of external communication links where “Loss of Comm Loop Switch over” is enabled.(see Configuration Handbook for details)

Distributing the processors provides higher reliability by eliminating the problem of single source of failure. With Dual CPU, the redundant processor in the secondary panel can be installed in a different location than the primary panel.

3.11 Zoning Concept

To describe the functional hierarchy of the system we use the term "zone". Assigning system components to zones enables hierarchical control from detection to activation of alarm. This hierarchy consists of the following zones:

- Detection Zone (DZ)
- Alarm Zone (AZ)
- Operation Zone (OZ)



For detailed information on each zone, refer to Appendix.

3.12 Communication Ports

The system offers the following communication ports:

- 2 Ethernet ports for AutroNet and/or AutroCom, plus downloading of configuration data and system software
- 1 AL_Com+ interface
- 1 AutroFieldBus (AFB) interface
- 1 RS-232, RS-422 or RS-485 serial port for communication with third party equipment (AutroCom/ESPA4.4.4/MODBUS/VDR)
- 2 USB host ports for the connection of a printer and for the connection of a memory stick for downloading configuration data and system software
- FailSafe relay output

3.13 AutroMaster ISEMS

AutroMaster ISEMS is an Integrated Safety and Emergency Management System which can be used together with the AutroSafe Interactive Fire Detection System.

The AutroMaster ISEMS has an intuitive control and monitoring interface, providing an easy-to-understand graphical presentation of the premises and events that may occur. Navigation is fast and instinctual, and the powerful zoom functions allow you to monitor all areas in great detail.

3.14 Interfacing Peripheral Equipment

For communication with peripheral equipment / third-party equipment the following protocols are used:

- ESPA 4.4.4, allowing connectivity with devices such as AutroTel alarm routing via telephone networks and pocket paging systems.
- NMEA-0183, allowing connectivity with devices such as the maritime Voyage Data Recorder (VDR).
- MODBUS, allowing connectivity with Programmable Logic Controllers (PLC).

3.15 Language Options

AutroSafe version 4 supports the following languages (listed in alphabetical order):

- Danish
- Dutch
- English
- English (version intended for the Oil & Gas market)
- Finnish
- French
- German
- Hungarian
- Icelandic
- Italian
- Norwegian
- Polish
- Portuguese (Brazilian)
- Russian
- Spanish
- Swedish

3.16 Environmental Requirements

For information on environmental requirements for AutroSafe equipment, refer to separate datasheets.

3.17 Configuration / Service

3.17.1 Downloading from one central point

Downloading of configuration data or system software to the entire system can be done from one central point during normal operation. The USB port is used for downloading data from a USB memory stick.

To replace the existing configuration data with new configuration data, a system restart must be performed after the configuration is downloaded.

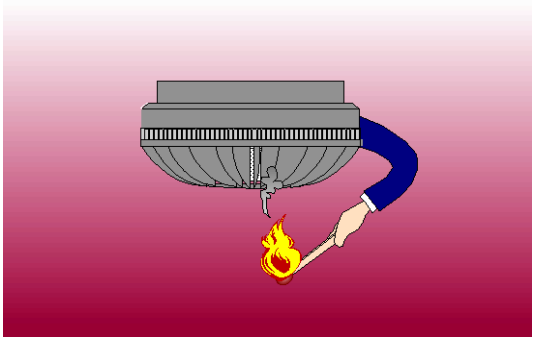
3.17.2 AutroSafe Remote Access

AutroSafe provides access to a web site where you can perform system service functions from a computer via the Ethernet connections. Refer to the User Guide, 116-P-ASAFE-REMOTEAC/EGB.

3.18 SelfVerify® Function

AutroSafe SelfVerify® solves all issues of manual maintenance, leaving time-consuming and costly physical testing no longer necessary. With AutroSafe SelfVerify®, the system checks all detectors, interfaces, connections and cables – from detector chamber to alarm output – every single day.

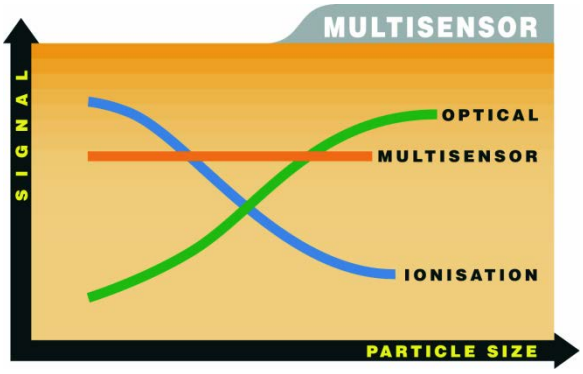
Not only does the system test whether a detector is capable of provoking an alarm, it even verifies the sensitivity of every detector with a calibrated signal. The SelfVerify system ensures that each detector always responds to the correct alarm level. In the event of irregularities, the display on the operating panel will accurately pinpoint the source of any problem.



3.19 Operation Classes for different Detection Methods

The MultiSensor detector can be set to three different *Operation Classes*, allowing you to choose the MultiSensor's detection method and calculation. The Operation Classes are as follows;

- MultiSensor (optical detection with heat enhancement)
- Heat only (thermal detection only) - class A1
- MultiSensor with Heat (a combination of optical detection with heat enhancement *and* Heat class A1)

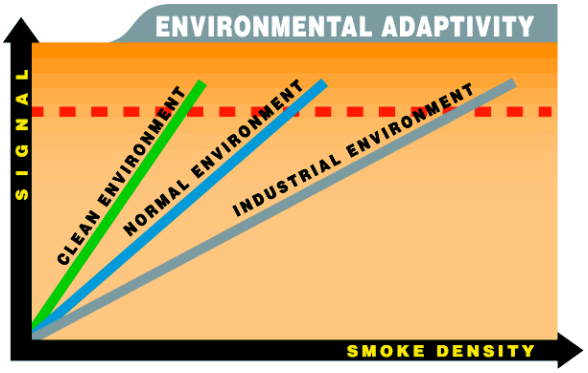


By means of a command from AutroCom (AutroMaster) it is possible to disable the smoke detection for a given time and make the MultiSensor work as a pure heat detector. The MultiSensor will return automatically to its configured Operation class when the time has elapsed.

3.20 Performance Classes for Environmental Adaptivity

AutroSafe uses detectors that can be programmed to one of three different *Performance Classes*, with sensitivity settings covering the following environments:

clean environments, for example laboratories, data rooms etc.
normal environments, for example offices and hospitals etc.
industrial environments, for example, factories and warehouses etc.



By choosing a sensitivity setting that suits the environment, it is possible to achieve an accurate and reliable system, providing the optimal detection, whilst virtually eliminating false alarms.

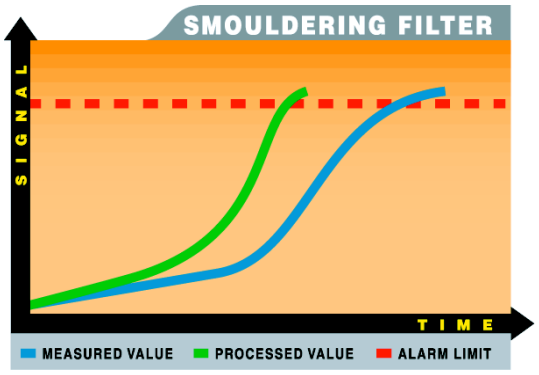
All three different sensitivity settings comply with the C.E.N. regulations EN-54.

3.21 Interactive Detectors with *Dynamic Filtering (DYFI+)*

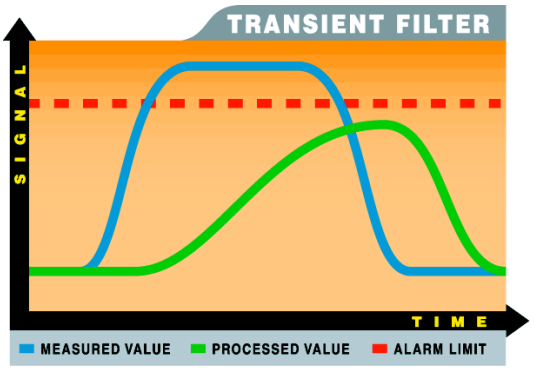
AutroSafe features detectors with the digital filter technology *DYFI+.* False alarms are virtually eliminated, and the system provides the earliest possible warning of a potential fire - before it becomes a problem.

The *DYFI+* digital filtering is present in each detector. Each detector has three different filter functions:

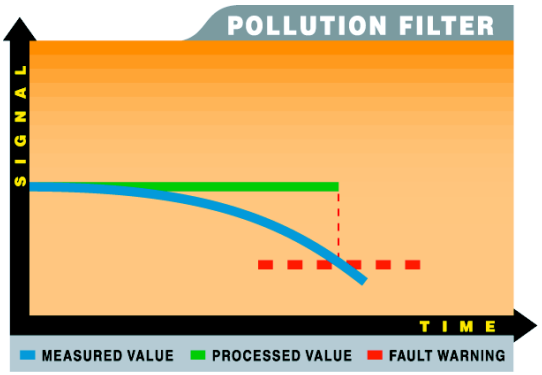
The *smouldering fire filter* provides accurate and quick detection in the event of a smouldering fire, i.e. in a situation where a potential fire with no flames develops during a longer period.



The *transient filter* virtually eliminates false alarms caused by phenomena that are not related to a real fire. Such phenomena can be short pulses caused by, for example, vapour, cigarette smoke etc.



The *pollution filter* maintains the chosen sensitivity throughout the detector's entire lifetime, even with a polluted detector..



3.22 Built-in Short-circuit Isolator

The loop resistance on the detection loop is continously monitored to register a possible break or short-circuit on the detection loop. Each individual detector has a built-in *short-circuit isolator*.

In the event of a short-circuit in the detector cable, the short-circuit location will be isolated as the short-circuit isolator will be activated in the detectors on either side.

3.23 Integrity of Transmissions Paths

Reference document EN 54-2, chapter 12.5.2.

Means, specified and provided, to limit the consequences of faults (short-circuit or interruption):

Detection loop:
- Built-in short-circuit isolator (no loop units lost in case of a short-circuit or interruption).

AutroFieldBus:
- Built-in short-circuit isolator (no loop units lost in case of a short-circuit or interruption).

AutroNet:
- The main circuit board in each single panel/cabinet provides two Ethernet ports, enabling redundancy

3.24 FWRE, Common Trouble and Fault Relay Outputs

3.24.1 Fault Warning Routing Equipment (FWRE) Output

Fault Warning Routing Equipment (FWRE) has 3 states:
- OK: 8mA current is sourced (max 10V), reverse polarised. Relay is deactivated.
- FAULT condition: 24V is sourced to the output. Relay is activated.
- De-energised panel or System Fault: Open output. Relay is deactivated.

3.24.2 Common Trouble Output

Common Trouble connected to a BSB-310 output no 1-3 or BSJ-310 has 2 states:
- OK: The system is operational. Relay is deactivated.
- Activated: One or more faults, Inhibits, Disablements are present in the system. Relay is deactivated.

Common Trouble connected to a BSB-310 output no 4 has 3 states, just like the FWRE:
- OK: 8mA current is sourced (max 10V), reverse polarised. Relay is deactivated.
- FAULT condition: 24V is sourced to the output. Relay is activated.
- De-energised panel or System Fault: Open output. Relay is deactivated.

3.24.3 Fault Relay Output

Fault Relay on the BSA-400 main board, connections available on the Terminal block has 2 states:
- Normal: No faults are detected in the system. Relay is activated
- Fault: One or more faults are present in the system. Relay is deactivated.
- De-energised: Relay is deactivated

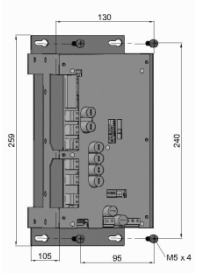
3.25 Heat Dissipation

Note that it is important to calculate the power consumption in order to ensure an acceptable temperature range during normal system operation. High temperatures within the specified temperature range will reduce the lifetime.

Cooling is strongly recommended if the Fire Alarm Control Panels/Controllers or system racks are placed in environments where the temperature during normal operation is likely to exceed +55^{o}C for long periods of time. Note that batteries placed in high temperatures will have reduced lifetime and need to be replaced more often.

4. System Units

System Units		Description
Fire Alarm Control Panel	 BS-420 BS-420M BS-420G BS-420G2	BS-420 is a complete fire alarm control panel with full operating capabilities. The panel serves as a operating panel for one or several *operation* zones. All alarm handling and system features can be controlled and monitored from the panel. The fire alarm control panel is available in three different variants specifically designed for the land market (BS-420), maritime market (BS-420M) and petrochemical oil & gas market (BS-420G) / IEC 61508 SIL 2 approval (BS-420G2).
Operator Panel	 BS-430 BS-430G2	The Operator Panel serves as a operating panel for one or several defined *operation* zones. All alarm handling and system features can be controlled and monitored from this panel.
Controller	 BC-420 BC-420G2	The Controller serves as a connection unit for Loop Driver Modules and I/O modules.
Controller Rack Unit	 BC-440 BC-440G2	The Controller Rack Unit BC-440 serves as a connection unit for the detection loop, alarm sounders, controls and inputs. It is a variant of the BC-420 Controller prepared for rack installations. Together with the IO modules the unit will have the full functionality of the BC-420 Controller.
Repeater Panel	 BU-BV-420 BU-BV-420G2	The Repeater Panel BU-BV-420 serves as both a Fire Brigade Panel and an Information Panel. Settings on a dipswitch determine the type of panel . The Fire Brigade Panel allows you to operate alarms related to the relevant *operation* zone. The Information Panel serves as an indication device only. It provides information related to the *operation* zone(s).

System Units		Description
Power Cabinet	 BP-405	• The Power Cabinet BP-405 provides space for two 12V/18Ah batteries (not included). The maximum power available is 24V/5A.
Power Supply Unit BPS-405 / BPS-410		BPS-405: 24V/5A power supply BPS-410: 24V/10A power supply Both units include: ■ Power Board BSF-400, including: ▪ AutroFieldBus interface ▪ 115VAC /230VAC input ▪ 6 outputs 24VDC (max. 2A each) ▪ 1 fault relay output

5. Examples of Network Solutions

5.1 Introduction

This chapter deals with general guidelines, Ethernet switches, DSL modems, fiber converters and a selection of different examples of network solutions.

In the examples the following parameters vary:
- the type of AutroNet topology (refer to next chapter)
- the number of system units
- the use, number and type of switches
- the use and the number of DSL modems and fiber converters
- the transmission length between the system units/switches or between the system units/DSL modems/fiber converters
- the cabling (Cat 5 cable max. 100m, or single-mode/multi-mode optic fibre)

5.2 AutroNet Topologies

AutroNet consists of one of the following network topologies:
- AutroNet Redundant Star Topology
- AutroNet Single Star Topology
- AutroNet Ring Topology

5.3 General Guidelines

- The smallest network solution consists of two panels (example 1). The use of Cat 5 cable type/category allows a maximum transmission length of 100 meters between panels/switches.
- The transmission length between two panels using Cat 5 cable type/category can be extended by using Ethernet switches (example 2).
- A network solution based on Star Topology or Single Star Topology (AutroNet) with more than two panels requires the use of switches (example 3).
- A network solution based on Ring Topology does not require switches. DSL modems and fiber converters can be used to exceed the transmission lengths between the system units
- To secure AutroNet redundancy (communication between panels), the origin of power to switches serving one network shall be from a different source than the origin of power to the switches serving the other network, such that a power cable break or power loss in one network will not affect the operability of the other.
- Transmission lengths that exceed 100 meters require the use of single-mode or multi-mode optic fibre.

5.4 Phoenix Ethernet Switches

5.4.1 Overview

A network solution based on Star Topology or Single Star Topology (AutroNet) with more than two panels requires the use of switches. Only Phoenix Ethernet switches (see table below) are approved and supported by Autronica Fire and Security AS.

All Ethernet switches can be used for the Onshore market. Only Ethernet switches that are indicated in coloured rows (the first 9 that are listed) can be used for the Maritime market and the Petrochemical Oil & Gas market.
The switch type and the number of switches depend on the actual installation / network design (number of panels and the distances between the panels/switches). For information on current consumption, see chapter 13.3.3.

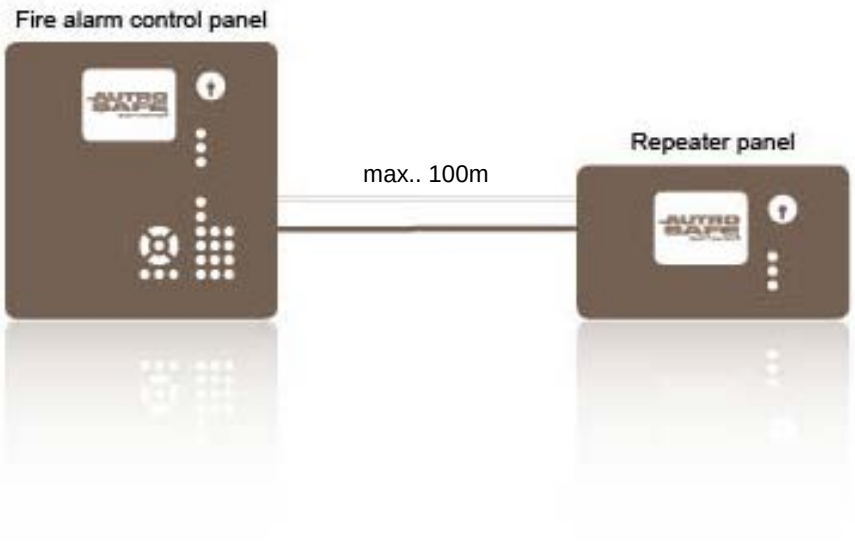
Switch type (Phoenix)	Description	Autronica part number
FL SWITCH SFNT 5TX	5 RJ45 ports	116-5151-030.2127
FL SWITCH SFNT 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2128
FL SWITCH SFNT 8TX	8 RJ45 ports	116-5151-030.2129
FL SWITCH SFNT 7TX/FX	• 7 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2130
FL SWITCH LM 5TX	5 RJ45 ports	116-5151-030.2131
FL SWITCH LM 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2132
FL SWITCH LM 4TX/2FX	• 4 RJ45 ports 2 fibre optic multi-mode ports (SC)	116-5151-030.2133
FL SWITCH LM 4TX/FX SM	• 4 RJ45 ports 1 fibre optic single-mode port (SC)	116-5151-030.2134
FL SWITCH LM 4TX/2FX SM	• 4 RJ45 ports 2 fibre optic single-mode ports (SC)	116-5151-030.2135
FL SWITCH SFNB 5TX	5 RJ45 ports	116-5151-030.2136
FL SWITCH SFNB 8TX	8 RJ45 ports	116-5151-030.2137
FL SWITCH SFN 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2138
FL SWITCH SFN 7TX/FX	• 7 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2139
FL SWITCH SFN 6TX/2FX	• 6 RJ45 ports 2 fibre optic multi-mode ports (SC)	116-5151-030.2140
FL SWITCH SFNB 4TX/FX SM 20	• 4 RJ45 ports 1 fibre optic single-mode port (SC)	116-5151-030.2142

SFNT: Standard Function Narrow High Temperature Unmanaged Switches
LM: Lean Managed Switches

5.5 AutroNet Redundant Star Topology

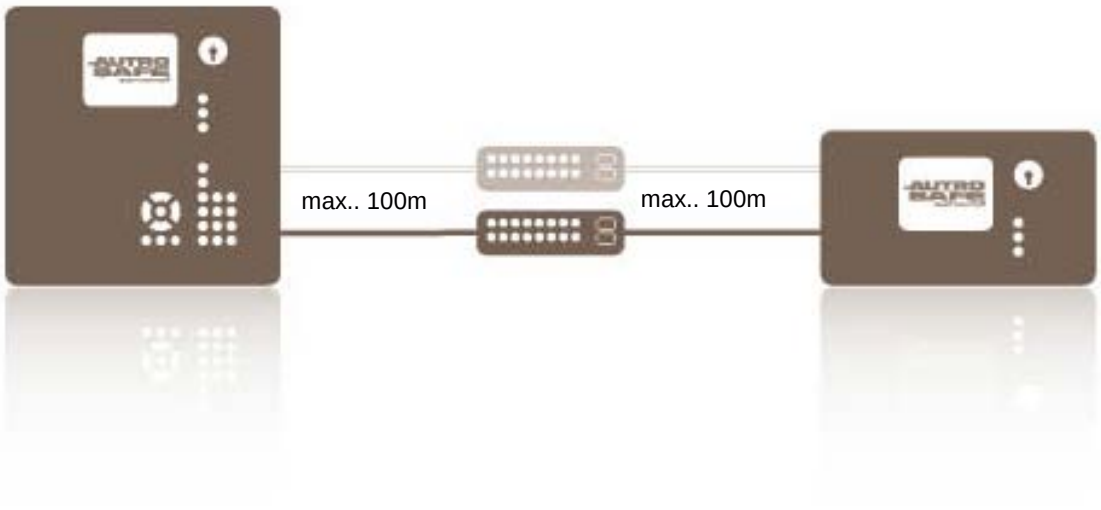
5.5.1 Network Solution – Example 1

A system equipped with maximum two panels can be installed without the use of any Ethernet switches. In this case, the transmission length between the two panels cannot exceed 100 meters.



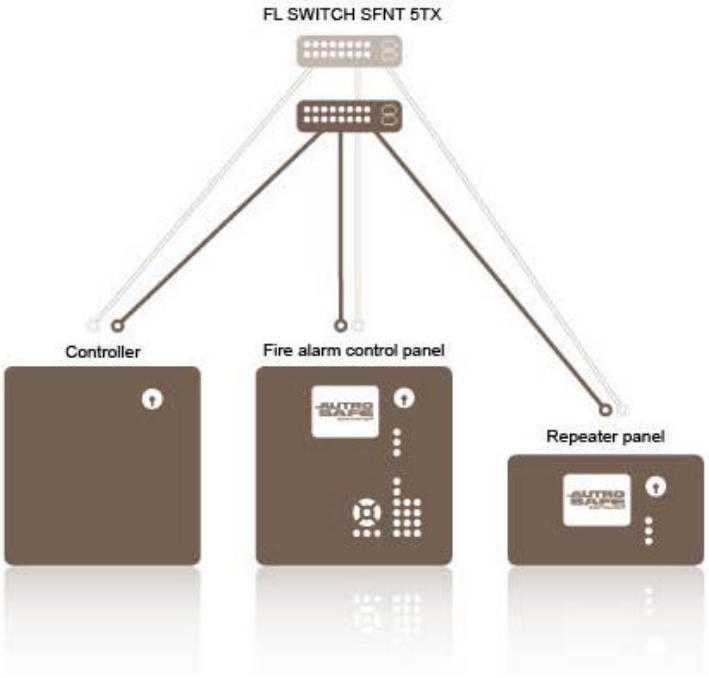
5.5.2 Network Solution – Example 2

The maximum transmission length between the two panels is increased (compared to example 1) by using Ethernet switches to boost the signal.



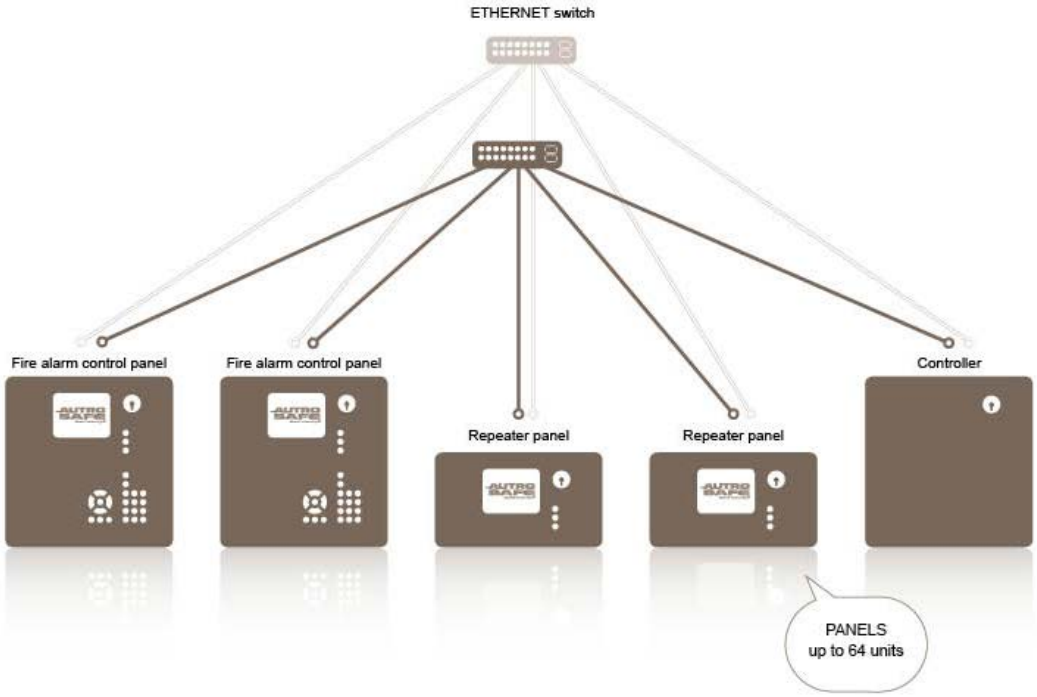
5.5.3 Network Solution – Example 3

A simple network system. The transmission length between the panels and an Ethernet switch does not exceed 100 meters.



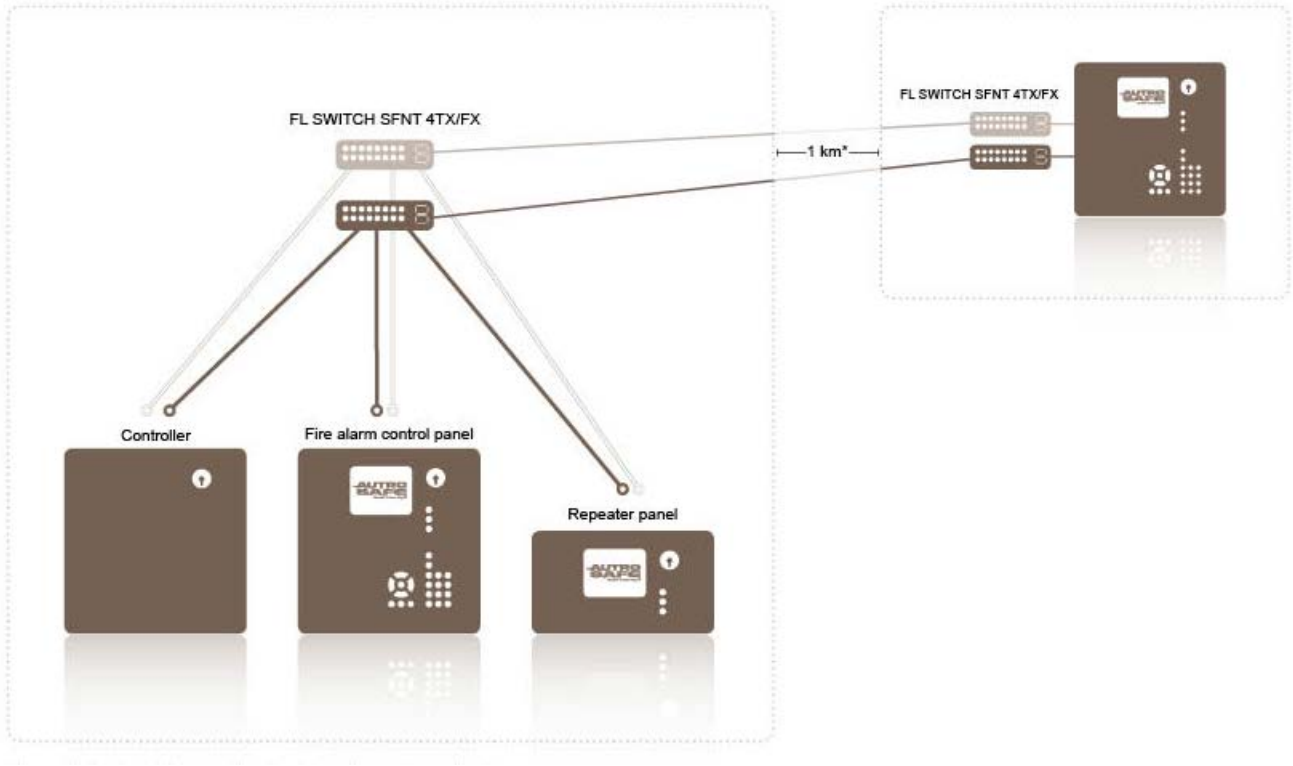
5.5.4 Network Solution – Example 4

The simplest Ethernet switch is equipped with five Tx ports. The switch allows five connections, for example, five panels can be included in a system.



5.5.5 Network Solution – Example 5

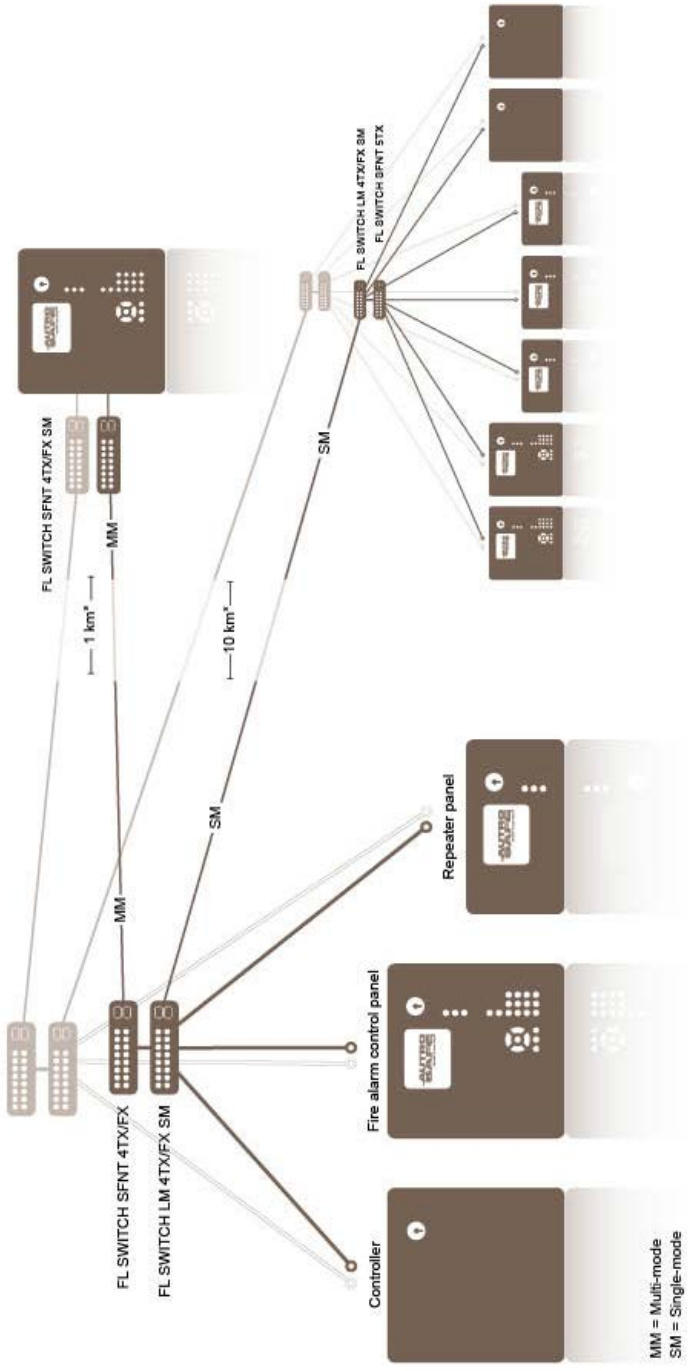
If the transmission length between two Ethernet switches exceeds 100 meters, a fibre optic cable can be used to achieve longer distances. Multi-mode optic fibre is a type of optic fibre mostly used for communication over shorter distances, such as within a building. An Ethernet switch equipped with a multi-mode fibre optic port is required.



The transmission length depends on the fibre optics cable specifications.

5.5.6 Network Solution – Example 6

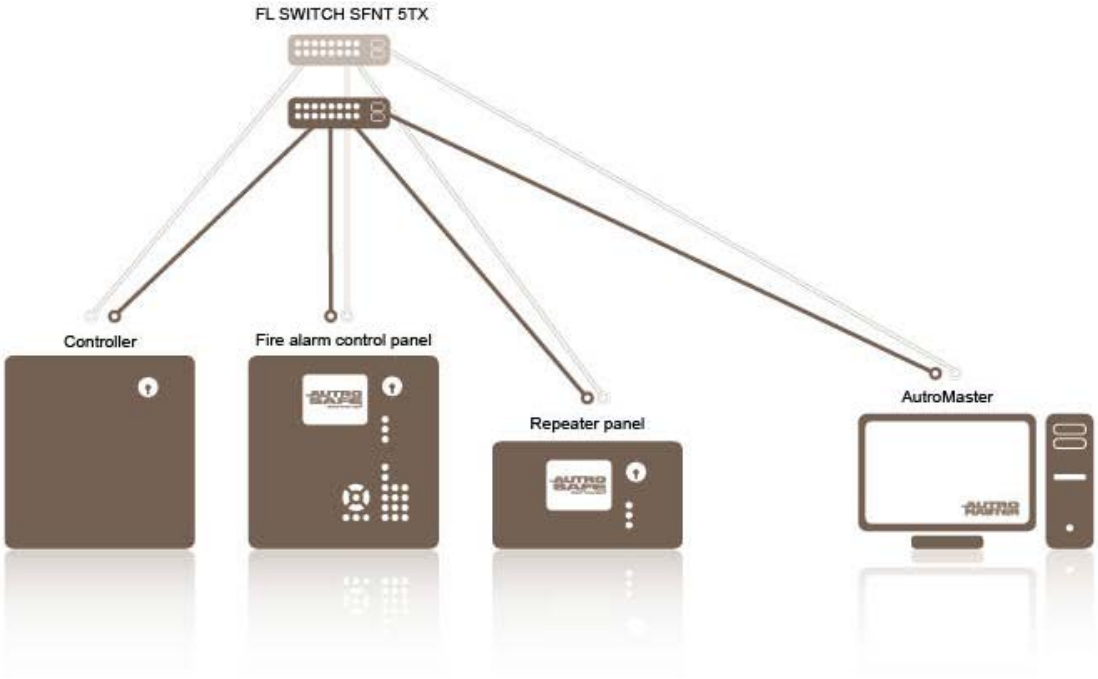
If the transmission length between two Ethernet switches exceeds 100 meters, a fibre optic cable can be used to achieve longer distances. Single-mode fibers are mostly used for communication links longer than 1000 metres.



The transmission length depends on the fibre optics cable specifications.

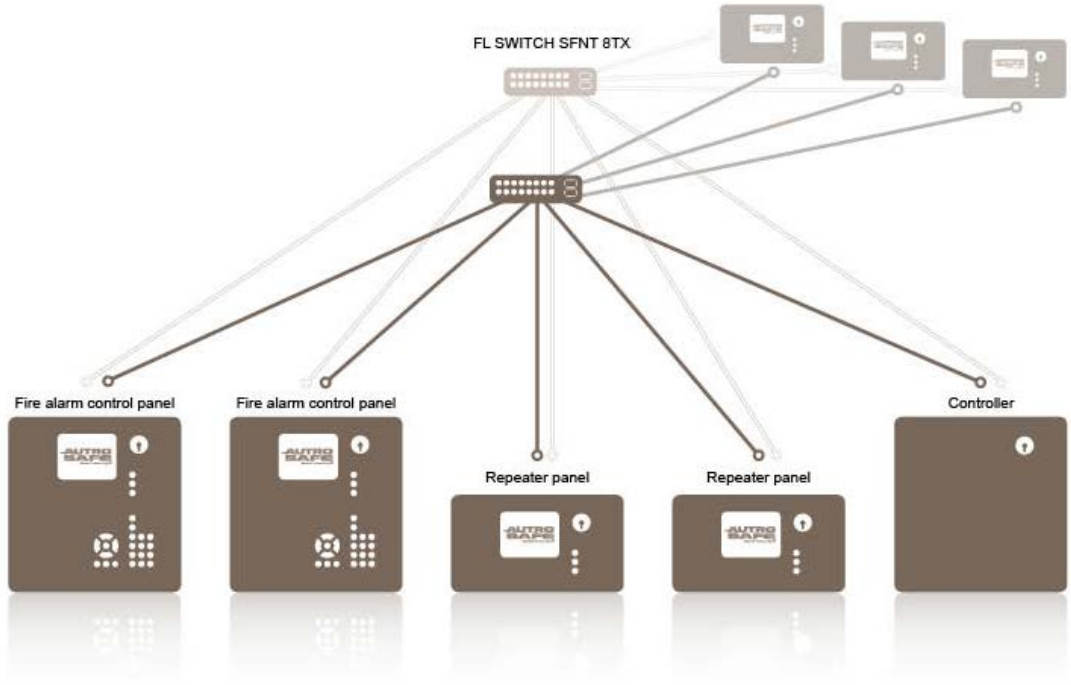
5.5.7 Network Solution – Example 7

All AutroSafe panels within a system are linked together using an internal Ethernet network. The AutroSafe system uses the same network to communicate with AutroMaster ISEMS (Integrated Safety and Emergency Management System).



5.5.8 Network Solution – Example 8

By using a single (two for redundancy) Ethernet switch, up to eight AutroSafe panels can be linked together making one system.

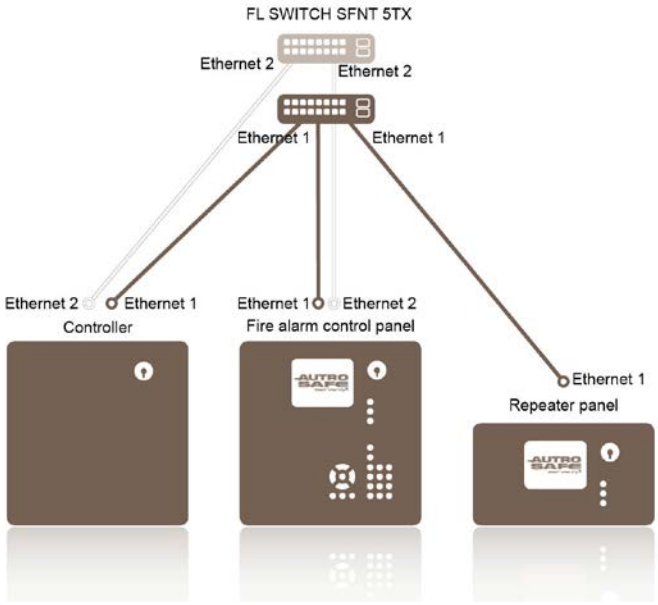


5.6 AutroNet Single Star Topology

5.6.1 Network Solution - Example 9

As an option, AutroSafe 4 allows also single Ethernet connections to one or several panels in a system consisting of several panels if redundancy is not required. Ethernet 1 must always be used for single Ethernet connections.

In the example below all panels have redundant connections to the system, except for the Repeater Panel, which has a single Ethernet connection.

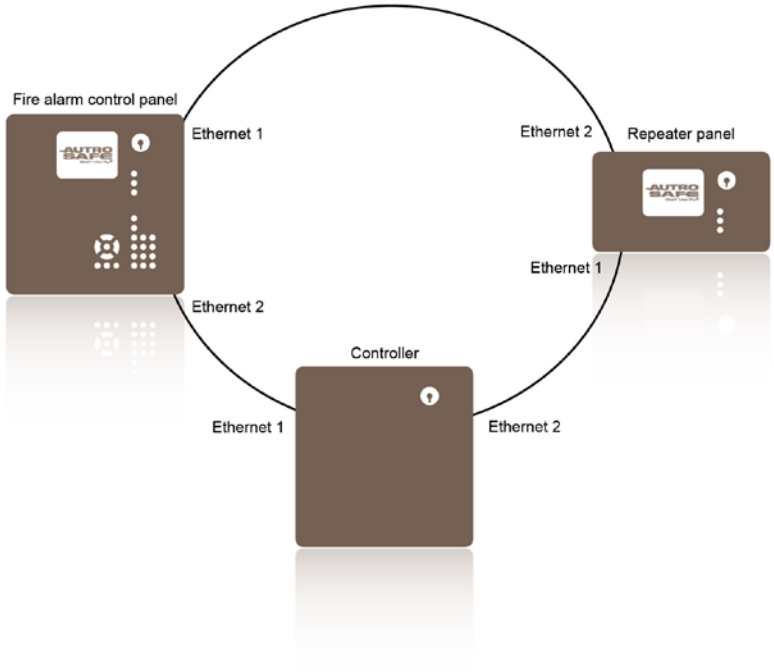


5.7 AutroNet Ring Topology

5.7.1 Network Solution – Example 10

In an AutroNet Ring Topology all panels are connected to each other forming a closed loop. The first panel is connected to the second, the second is connected to the third, and so on, preferably from Ethernet 1 (Connector J1) to Ethernet 2 (Connector J2) , from Ethernet 2 to Ethernet 1, from Ethernet 1 to Ethernet 2 and so on.

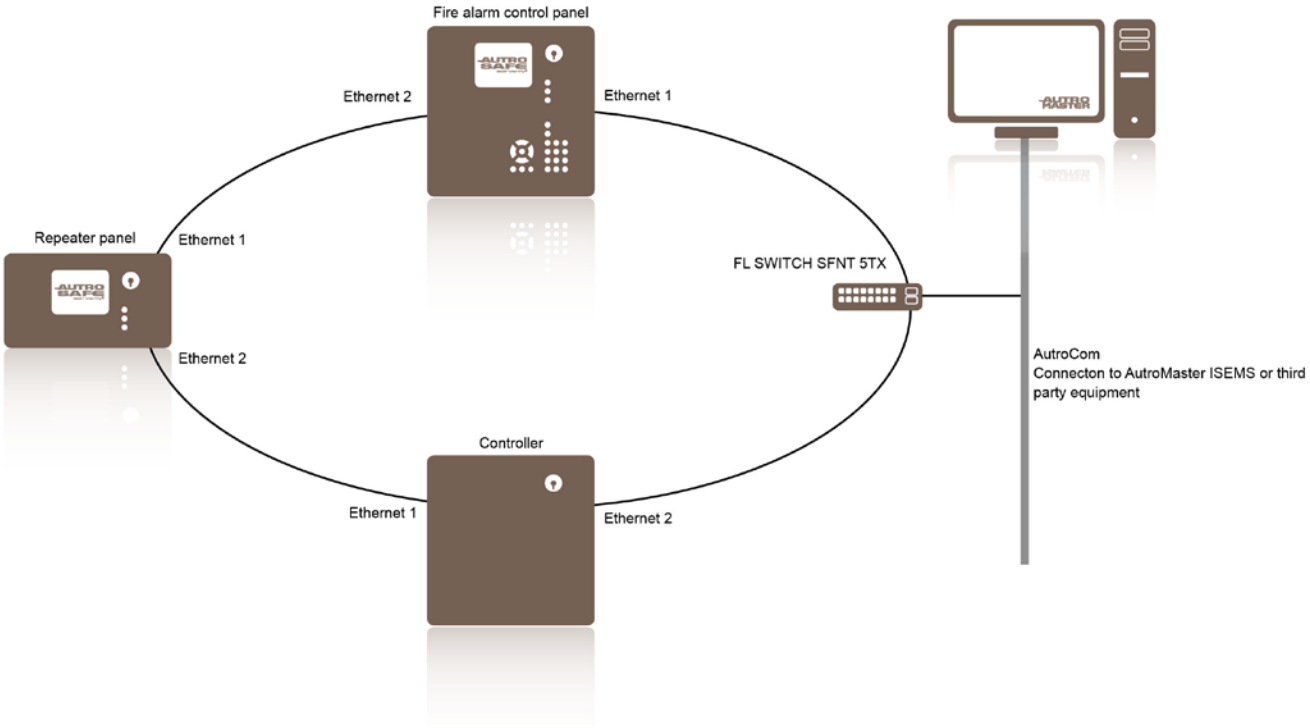
A ring topology is a redundant network, as all panels will continue to operate even with a single break or short-circuit on the ring.



5.7.2 Network Solution – Example 11

A system solution with an AutroNet Ring Topology can communicate with AutroCom (AutroMaster ISEMS or third party equipment) via an Ethernet switch.

In this example, the Ethernet switch is connected to the ring between a Fire Alarm Control Panel and a Controller. In the Configuration Tool, AutroCom can be added to either of these two panels, but the one that is chosen must be physically connected to AutroCom, for example, to Ethernet 1 (Connector J1) on the Fire Alarm Control Panel.



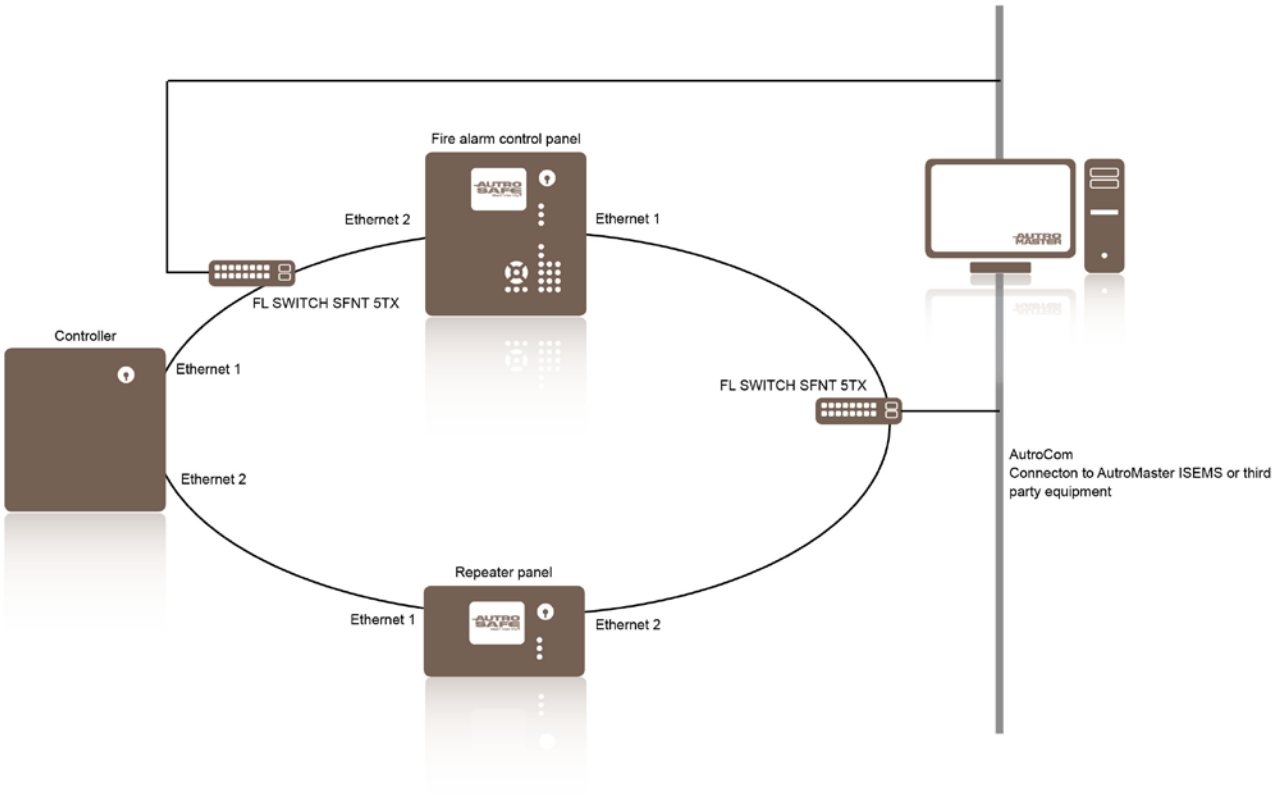
5.7.3 Network Solution – Example 12

A system solution with an AutroNet Ring Topology can communicate with AutroCom (AutroMaster ISEMS or third party equipment) via an Ethernet Switch.

In this example, a redundant connection to AutroCom is achieved by using two Ethernet switches. One Ethernet switch is connected to the ring between a Fire Alarm Control Panel and a Repeater Panel, the other is connected to the ring between the Controller and the Fire Alarm Control Panel.

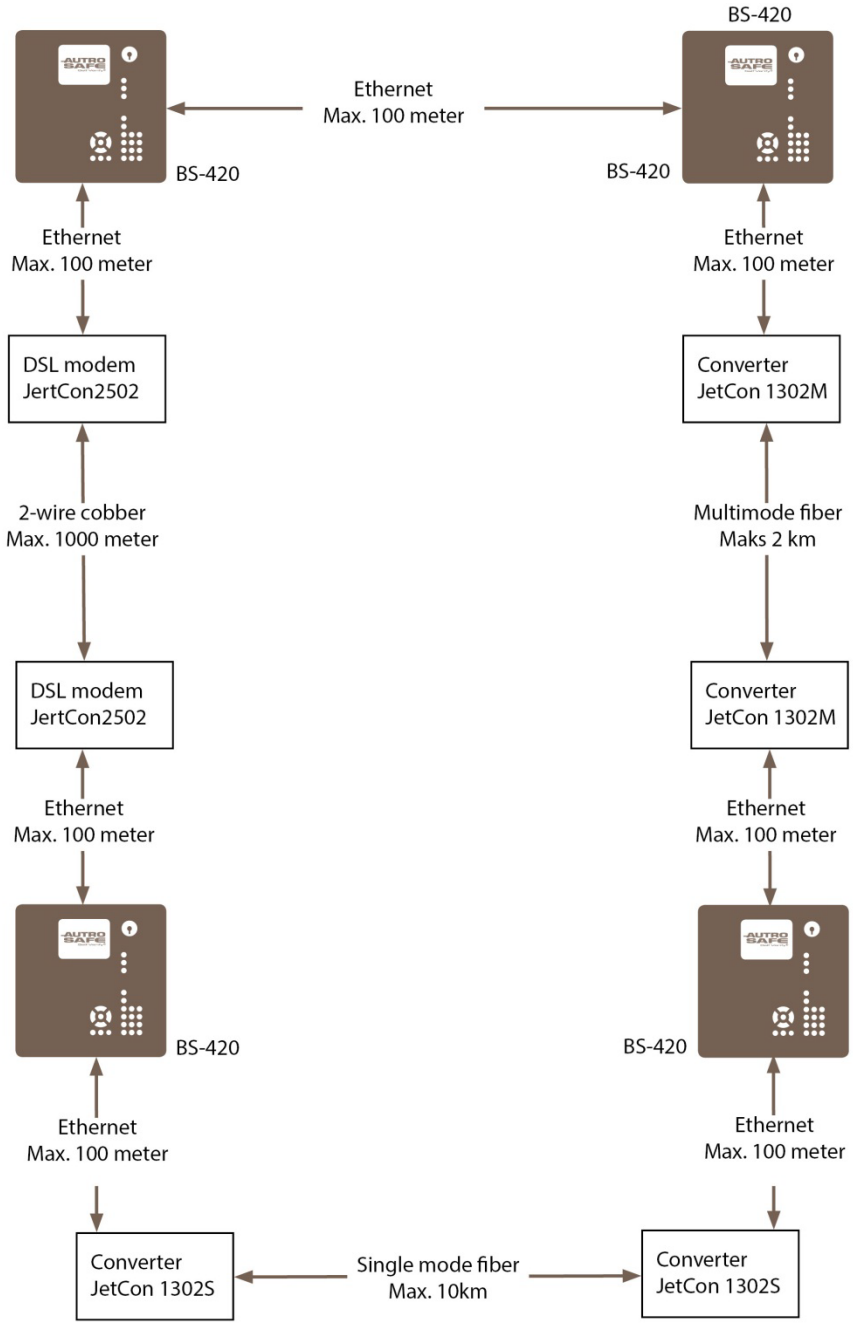
In the Configuration Tool, AutroCom can be added to the Fire Alarm Control Panel (Ethernet 1, Connector J1) and to the Controller (Ethernet 1, Connector J1). This solution not only provides a redundant connection to AutroCom, it also provides panel redundancy as two panels are connected to AutroCom.

Alternatively, a redundant connection to AutroCom can be achieved by adding AutroCom to both Ethernet 1 and Ethernet 2 on the Fire Alarm Control Panel (no panel redundancy).



5.7.4 Network Solution – Example 13

In this example all panels are connected to each other by means of DSL modems and fiber converters in an AutroNet Ring Topology.



6. Internal Modules

6.1 Module Capacity inside the Fire Alarm Control Panel and Controller

Each Fire Alarm Control Panel or Controller provides an internal *Power Module,* BSS-310 and *Communication Module*, BSL-310. In addition to these 2 mandatory modules, each system unit can accommodate up to a maximum of 12 *optional* modules. Refer to the next chapter.

The limitation of 12 modules is due to the total capacity in one system unit. Maximum 6 of these modules can be *Loop Driver Modules,* due to traffic capacity and power consumption.

6.2 Overview

The *Fire Alarm Control Panel* and the *Controller* can be equipped with the same modules. All outputs are freely programmable from all detectors, manual call points and input signals.

All modules have the same dimensions and are easily plugged onto each other on a standard mounting rail inside the unit.

Modules in the Fire Alarm Control Panel / Controller		Description
Loop Driver Module	BSD-310 / BSD-311	Each Loop Driver Module provides 1 detection loop with 127 loop units.
Loop Driver Module	BSD-310/N	Each Loop Driver Module provides 1 detection loop with 127 loop units. Zone 2 only.
Output Module, monitored	BSB-310A	Each module provides 4 monitored output circuits (sounder output circuits). May be used for Fire Alarm Devices (FAD), Fire Alarm Routing Equipment (FARE), Fire Protection Equipment (FPE) and other fault outputs.
Output Module	BSJ-310	The module can be used for relay or LED operation. Each module provides 8 open collector non-monitored outputs.
Input Module, monitored	BSE-310	Each module provides 4 monitored inputs.
Input Module	BSE-320	Each module provides 8 non-monitored and galvanic isolated inputs.
Communication Module	BSL-310	The module serves as an interface for the common internal communication line between the I/O modules.
BS-100 Loop Interface	BSD-330	The BS-100 Loop Interface, BSD-330 is used as an interface between the AutroSafe detector loop protocol and BS-100 loop protocol. The interface makes it possible to connect BS-panel type detectors to the AutroSafe system, including detectors used in systems BS-3, BS-30, BS-60, BS-80, BS-90 and BS-100.
Power Module	BSS-310A	The module provides 24V and 5V to the I/O modules.
Dual Power Monitoring Module	BSS-311	The Dual Power Monitoring Module BSS-311 provides redundant power input to the BSS-310A module

7. Loop Units

7.1 Overview

The AutroSafe System offers a wide range of fire alarm detectors, manual call points and input/output units, control units and alarm units that are developed and approved according to European directives (CPD) requiring EN 54 compliance.

Both input and input/output units are also available with the SV-function. Input units can also be delivered in series 500 and 500/Ex.

For more information on loop units, refer to the Product Catalogue. Detailed information for each loop unit is provided on separate data sheets.

7.2 Detectors

The detectors are available both with or without the *Self-Verifying Function* (SV-function).

The system offers the choice of the following three main series:

- *Series 200*, standard interactive addressable units.
- *Series 300* with SelfVerify, interactive addressable units.
- *Series 500* with SelfVerify, interactive addressable units designed for use in heavy-duty applications and hazardous areas.

The system also offers *Exn* and *Ex ia-approved* versions intended for high-risk applications. Smoke detector *series S* comprise special *high sensitive* smoke detectors.

Each individual detector has a built-in *short-circuit isolator*. In the event of a short-circuit in the detector cable, the short-circuit location will be isolated as the short-circuit isolator will be activated in the detectors on either side.

7.3 Input and Output Units

AutroSafe offers a wide range of input and output units for many different applications. The system features Exn, Exia and Exd approved input and output units for high risk applications. All input and output units feature automatic addressing and short-circuit protection.

7.4 Manual Call Points and Release Stations

AutroSafe offers a wide range of manual call points for different applications, every unit features SelfVerify. Two main series are available:

- *Series 300* with SelfVerify, interactive manual call points.
- *Series 500* with SelfVerify, interactive addressable manual call points designed for use in heavy-duty applications and hazardous areas.

The system also offers *Exn* and *Ex ia-approved* versions intended for high-risk applications.

7.5 Control Units

Autronica offers control units for enabling and disabling of detectors, as well as daytime/nighttime units.

7.6 Alarm Units

Autronica offers a wide range of alarm units for monitoring on detection loops or dedicated alarm outputs.

7.7 Loop Panels

Loop Panels		Description
Fire Brigade Loop Panel BU-110	 BU-110	The Fire Brigade Loop Panel features the following: ■ Connected and powered by the detector loop ■ The panel presents fire alarms on the display ■ The panel allows Silence and Reset of alarms
Information Loop Panel BV-110	 BV-110	The Information Loop Panel features the following: ■ Connected and powered by the detector loop ■ The panel presents fire alarms, faults and disablements ■ Scrolling function within each window ■ No system operations are allowed (Silence, Reset, menu functions)

8. Detectors for Special Requirements

8.1 Overview

Some situations or applications demand a little more from the fire detection system. For these Autronica deliver custom solutions with special detectors.

For more information on these detectors, refer to the Product Catalogue. Detailed information for each detector is provided on separate data sheets.

8.2 Aspirating Detectors

Aspirating detectors function by sampling air via a network of pipes, sampled air is passed through a dust filter and into a detector chamber where the air is analysed for traces of smoke. The detectors are capable of detecting the small amounts of smoke that are generated in the initial phases of a smouldering fire, ensuring the earliest possible warning of a potential fire while distinguishing real smoke from dust and pollutants, reducing unwanted alarms to a minimum. Every detector is “trainable” for the specific environment in which it is installed. Typical applications include laboratories, large open spaces, corrosive environments, archives/historical buildings and industrial areas.

The AutroSense series are stand-alone detectors, but can also be connected to fire alarm panels. These are highly sensitive detectors with patented “artificial intelligence” (ClassiFire), which means they are able to adapt to any environment regarding optimal sensitivity, alarm limits and minimum unwanted alarms.

8.3 Flame Detectors

Flame detectors are especially suitable for use in connection with the general protection of large open areas where spreading of flames are expected to happen very quickly. They detect radiation from fires, the detection based on ultraviolet radiation (UV radiation), infrared radiation (IR radiation) or a combination of UV and IR radiation. Typical applications are large open areas, such as atria, aircraft hangars and shopping centres as well as storage rooms for flammable substances.

8.4 Beam Detectors

Beam detectors are used in large open areas instead of a quantity of point smoke detectors. The detector protects a given area by sending signals (infrared light beam) between a transmitter and receiver, and detect dimmer or changes in frequency by heat or smoke. Beam detectors are suited to applications in open spaces where costs associated with point smoke detectors would be prohibitive. Typical applications include warehouses, hotels, hospitals, schools, public buildings, etc.

9. Communication Modules

Autronica provides a large range of communication modules:

- AutroFieldBus Protocol Converter BSD-321; interfacing AutroFieldBus and AL_Com+
- AutroSafe Communication Module BSL-310; interfacing the common internal communication line between all the different I/O modules
- Multi Mode Fibre Optic Converter BSL-321; amplifier for AutroFieldBus networks.
- Single Mode Fibre Optic Converter BSL-322; amplifier for AutroFieldBus networks.
- AUTROLON/AutroFieldBus Communication Amplifier, BSL-325; amplifier for communication signals on networks
- AutroSafe BU-70 Interface Module BSL-337; enables connection of BU-70/BU-100/BU-101 (BS-100 systems) to AutroSafe.

In addition, Autronica provides integrated fire and gas modules intended for the oil & gas market (refer to Product Catalogue and separate datasheets).

Furthermore, Autronica provide the AutroSafe OPC Server, enabling communication between several fire detection systems and other control systems. The solution improves the compatibility between AutroSafe and surveillance systems from other manufacturers.

For more information on these communication modules, refer to the Product Catalogue. Detailed information for each module is provided on separate datasheets.

10. Detection Loops

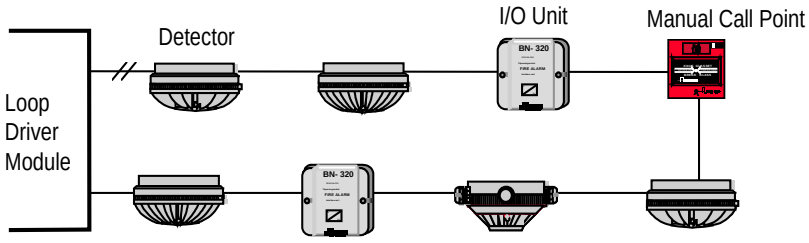
10.1 Description

A detection loop is connected directly to the Loop Driver Module. A maximum of 6 Loop Driver Modules can be installed in one Controller or Fire Alarm Control Panel.

The detection loop must be wired as a *loop*. This installation method provides optimum safety. The cable for the detection loop must be in accordance with local/national regulations.

Note that all types and series of AutroSafe detectors, manual call points and I/O units can be connected to the same detection loop.

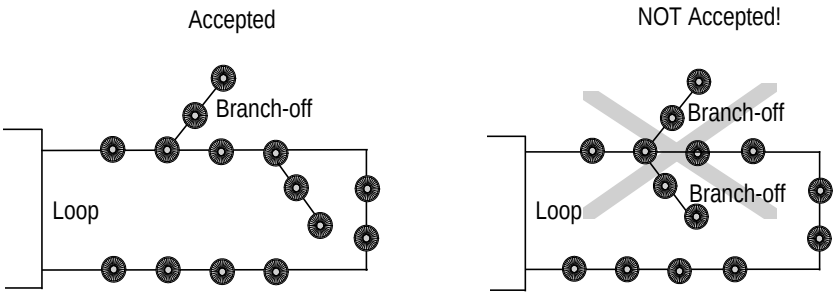
Detectors, manual call points and input/output signals are freely programmable during system configuration.



10.2 Branch-offs

For optimum safety and as a general rule, the detection loop must be wired as a *loop*. If necessary, a *branch-off* can be connected to a detection loop if the existing cable layout requires this, but this is *not* recommended, as the safety will be reduced. To ensure a correct addressing of the detectors on a branch-off when configuring the system, *there can not be more than one branch-off per detector.*

For safety reasons, the number of detectors on each branch-off must be kept to a *minimum* (a maximum of 32 detectors on each branch-off), as the detectors on a branch-off will not operate in case of a break og shortcuit on the branch-off.



10.3 Capacity on the Detection Loop

10.3.1 Maximum Loop Units

There can be a maximum of 127 loop units per detection loop.

A loop unit is defined as a point (detector or manual callpoint, an I/O unit or an Electronic Sounder) that is connected to a detection loop.

10.3.2 Current Consumption

The table below shows the current consumption for loop units in *normal status* and in *alarm status.* A detector with active LED indication will also draw current on the detection loop. In a configuration where it is required that several LEDs must be activated simultaneously, the number of detectors on the loop must be reduced.

Loop Unit	Current Consumption in Normal Status	Current Consumption in Alarm Status
Detector, Manual Call Point and I/O Unit	0,3mA	0,3mA
Electronic Sounder (BBR-200)	0,3mA	5mA

The maximum number of activated LEDs is 6 when using Loop Driver Module BSD-310, and 18 when using the Loop Driver Module high-power version BSD-311.

Loop Driver Module	Maximum Current Consumption
BSD-310 (standard version)	100mA
BSD-311 (high-power version)	200mA

10.3.3 Guidelines

Scores
To easily estimate the type of loop driver module to be used and the maximum length of the detection loop when projecting, each type of loop unit is given a score.

Each detector, manual callpoint or I/O unit is to be given **1** score.
Each electronic sounder is to be given **15** scores.

Type of loop driver module
The type of loop driver module (standard or high-power version) to be used depends on the total number of scores.

Total no. of scores	Type of loop driver module
1-300	BSD-310
301-450	BSD-311
451-600	BSD-311
> 600	Not allowed.

Maximum lenght of detection loop
The table below shows the maximum length of the detection loop based on the cable dimension and the total number of scores (2-wire cable measured from output to input).

	BSD-310	BSD-311	
Cable dimension	Scores 1-300	Scores 301-450	Scores 451-600
0,75mm2	1100m	660m	430m
1mm2	1470m	880m	580m
1,5mm2	2200m	1320m	870m
2mm2	2940m	1760m	1160m
2,5mm2	3670m	2200m	1450m

10.3.4 Example - using Scores to Estimate

A detection loop consists of 60 detectors, 10 manual callpoints, 14 electronic sounders and 10 I/O units, which adds up to 94 loop units (below the limit of 127).

The following scores apply:

60 detectors:	60 scores
10 manual callpoints:	10 scores
14 electronic sounders:	210 scores
10 I/O units:	10 scores
Total number of scores:	290 scores

In this example, the total number of scores is below 300, and the standard loop driver module BSD-310 can thus be used. The maximum length of the detection loop for various cable dimensions is shown in the second column of the table above (within the range of 1-300 scores).

10.3.5 Example – using Exact Values to Calculate

A detection loop consists of 86 detectors, 10 manual callpoints, 5 I/O units and 26 electronic sounders, which adds up to 127 loop units (within the limit of 127).

86 detectors:	86 x 0,3mA=	25,8mA
10 manual callpoints:	10 x 0,3mA=	3mA
5 I/O units:	5 x 0.3mA=	1,5mA
26 electronic sounder:	26 x 5mA=	130mA
Total current consumption:		160,3mA

In this example, the high-power loop driver BSD-311 is required, as the total power consumption is > 100mA and <200mA (see table below). The calculation is based on values measured in alarm status (worst case).

Loop Driver	Maximum Current Consumption	Maximum resistance (Ω) / capacitance (F)
BSD-310 (standard version)	100mA	• *Standard* loop driver module BSD-310: R_{max}=50Ω total and C_{max}=0,5µF
BSD-311 (high-power version)	200mA	• *High-power* version BSD-311: R_{max}=20Ω total and C_{max}=0,5µF

The cable type, cable dimension and maximum cable length, plus the maximum resistance and capacitance is included in the table below (refer to Cable Specifications, chapter 11). As the high-power version BSD-311 is required in this example, the maximum resistance is R_{max}=20Ω total and the maximum capacitance is C_{max}=0,5µF.

Cable type / category	Cable dimension	Maximum cable length (m)	Maximum resistance (Ω) / capacitance (F)
2 x 0,75mm^2	18 AWG	400m	*High-power* version BSD-311: R_{max}=20Ω total and C_{max}=0,5µF
2 x 1,5 mm^2	15 AWG	800m	
2 x 2,5 mm^2	13 AWG	1320m	

Note that when measuring the total resistance on the detection loop, always measure the resistance on the plus-wire and multiply the measured value by 2.

10.3.6 Example – Calculating the Exact Cable Length

The following equation can be used to calculate the exact cable length of a detection loop:

L = the total cable length
r_+ = the resistance on the plus-wire (<10Ω)
A = the cable dimension (mm^2)
ρ = the specific resistance of copper (0,017)

$$L = \frac{r_+ \times A}{\rho} = \frac{r_+ \times A}{0{,}017}$$

Example:

$$L = \frac{10\Omega \times 1{,}5mm2}{0{,}017 \ \frac{\Omega \times mm2}{m}} \sim 882m$$

The cable dimension (1,5mm^2) and calculated cable length (882m) requires the use of the high-power loop driver module version BSD-311 (as shown in the shaded row in the table below).

Cable type / category	Cable dimension	Maximum cable length (m)	Maximum resistance (Ω) / capacitance (F)
2 x 0,75mm^2	18 AWG	400m	*High-power* version BSD-311: R_{max}=20Ω total and C_{max}=0,5μF
2 x 1,5 mm^2	15 AWG	800m	
2 x 2,5 mm^2	13 AWG	1320m	

11. Cable Specifications

For the complete information on cable specifications, refer to Cable Specifications, part number 116-P-ASIFGCABLESPEC/CGB (file name: asafeifgcable_cgb).

For specific information on cable specifications for integrated fire and gas detection systems, refer to the separate IFG handbook; System Design and Engineering, 116-P-SYSDEENGIN-IFG/XGB.

12. Shielding and Earthing

The shielded cable shall be connected to the instrument earth (IE) at one end and left floating at the other end.

12.1 Definitions

Local Frame Earth
The electrical connection to the framework at the described physical position, such as the frame or chassis of a cabinet, the power cable outlet etc.

Shield
Conductive structure encapsulating the wire in a harness or cable, normally in the form of a mesh or foil forming a Faraday cage.

Armour
Mechanical protection to avoid physically damaging electrical cables or circuits.

Instrument Earth (IE)
An earth reference that is normally used to reference measurements of electrical signals. It may be the same as the Protective Earth (single earthed systems).

Protective Earth (PE)

An earth reference that is normally used as a coupling path for unwanted electrical signals, like transients and over-voltage. The chassis or framework of the installation is normally considered to be the local Protective Earth. As the name implies, it is intended to provide a safe electrical potential for human safety.

Ground
Synonym for Earth, in this handbook Earth is used.

12.2 Single Earth Systems - PowerLoop

Firstly, consider a Single Earth system for simplicity.

Please note that an Integrated Fire and Gas system with PowerLoop shall by no means be designed as a single earth system. Refer to section 12.3 for details about keeping the PowerLoop as a dual earth system.

1) All PowerLoop cabling shall be shielded.

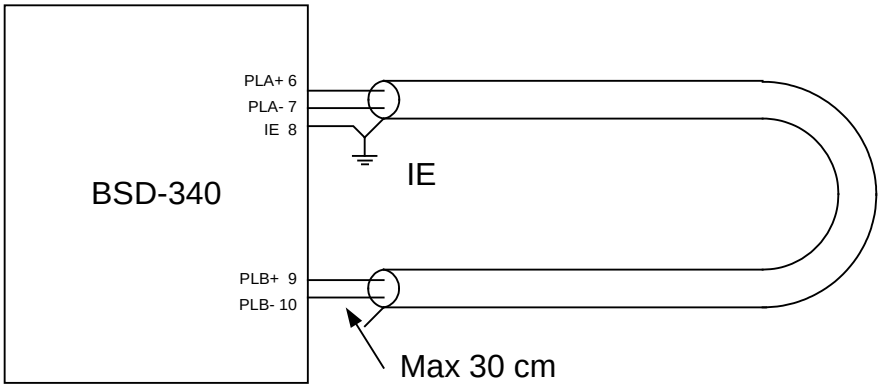
Every segment of the PowerLoop cable has to be protected by a shield that effectively attenuates the radiated field from the cable.

The shielding is required to avoid radiated emissions and hence crosstalk from one PowerLoop to any other. Armouring is normally not considered to be a sufficient shield.

2) Shield shall be terminated at one end only.

The shield shall be terminated close to the BSD-340 PowerLoop Driver. As the cable forms a full loop, the return path of the cable shield shall not be terminated. No electrical connection to earth shall be made anywhere in the system, i.e. the units shall be installed and galvanically isolated from the chassis.

The termination of the shield will be defined by the site installation, to a earth terminal in the cabinet or similar.



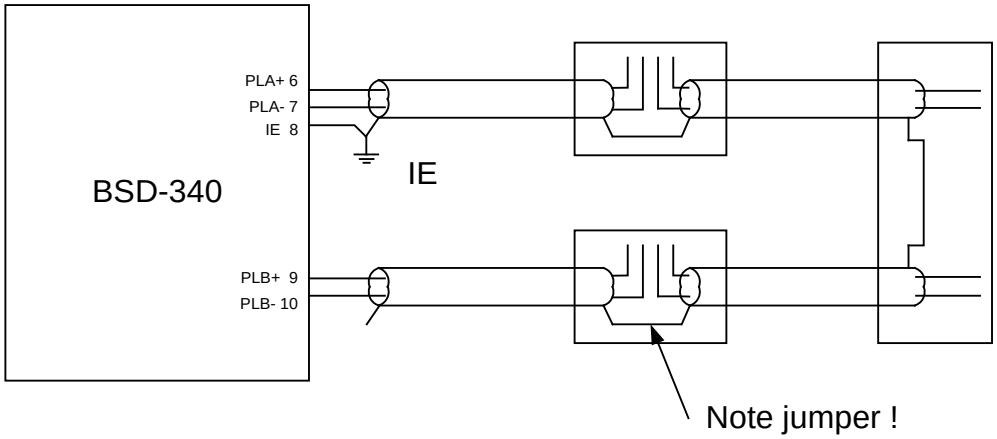
3) Maximum permissible non-shielded length of cable - 30 cm

This implies that the internal cabling in a rack or enclosure where the BSD-340 and / or the Loop Units are installed also needs to be fully shielded. The requirement includes termination / junction boxes and all field wiring as well.

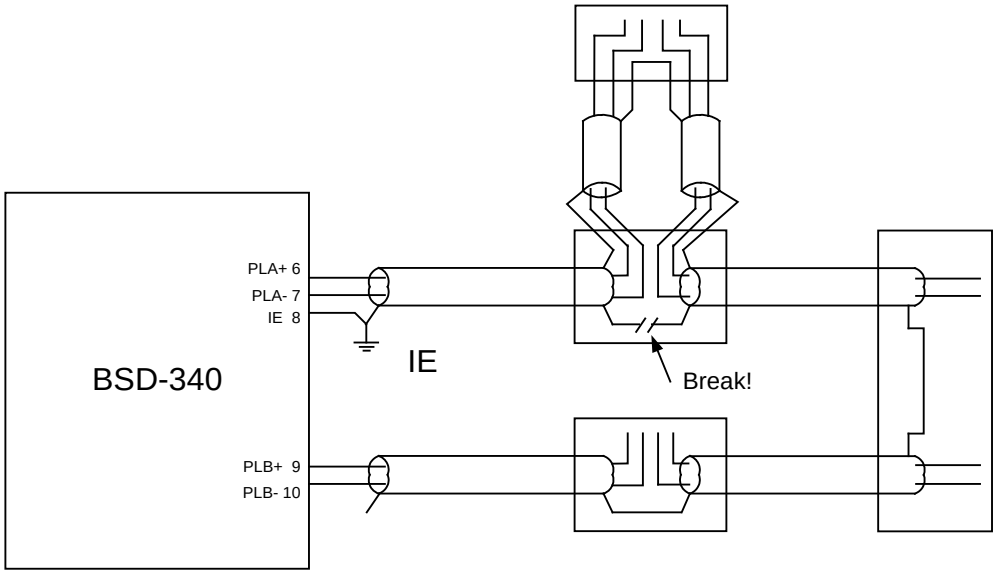
4) Shield shall be continuous

The PowerLoop cable will be split in two segments, separated by field equipment including junction boxes or Loop Units. The shield shall be continued through these separations. There shall be no electrical connection to the local frame earth.

In the following figure the junction boxes includes a strap / jumper to continue the shield between the cable segments (these straps / jumpers should be made of a suitable low-impedance cable).



If there are break-outs from the main loop (to make local small loops that return to the same break-out box), care shall be taken to avoid local closed loops. See the figure below.

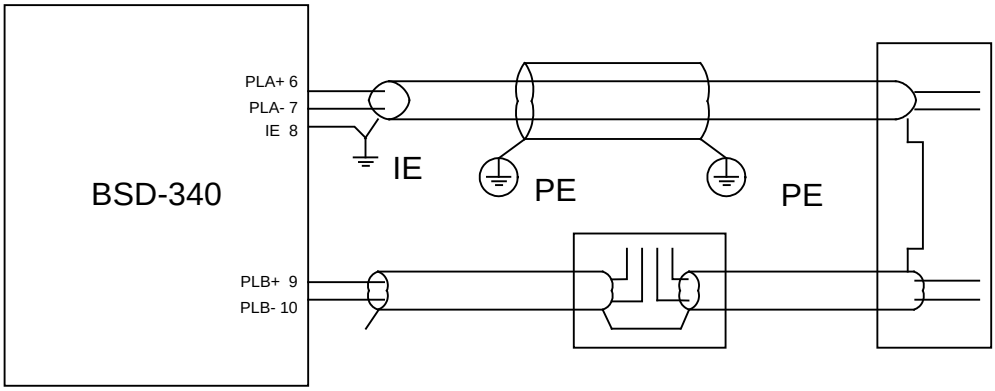


5) Maximum cable length

The PowerLoop Calculator will define the maximum length of each cable segment, this tool however determines length only from the power loss of the specified cable. The cable or wire capacitance will not affect the cable length as much as the resistive loss will restrict the power, not the communication.

12.3 Dual Earth Systems - PowerLoop

PowerLoop installations use both Instrument Earth (IE) and Protective Earth (PE) as two separate earthing paths. In this case, the shield (inner layer of cable) shall be continuous and earthed at one end only. The outer braid, shield or armour, is then connected to the Protective Earth connection. This will normally be the local connection point to the PE, the chassis of the cabinet or a chassis connection close to the field equipment. The two earth systems shall be kept isolated.

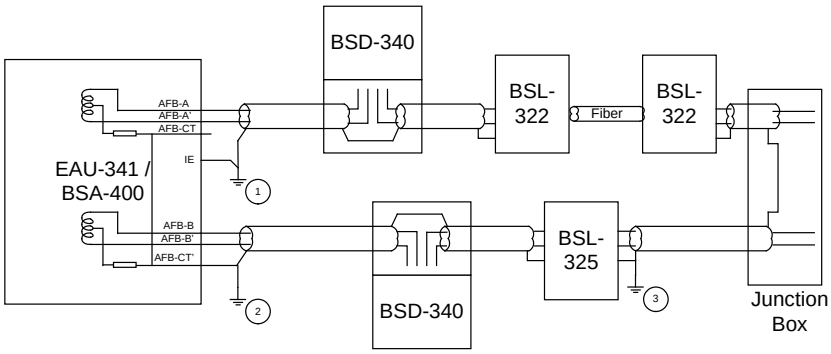


PE will make earth loops as they are terminated at multiple points, however the loop area will be narrow or closed as the armour will be close to the frame or earth. It is essential that the armour is kept on the same equipotential around to avoid EMC problems or large current flow in the PE. PE may be connected through glands to the junction boxes to form a continued protective armour or shield. Still the internal shield and IE shall be kept isolated from the PE.

12.4 Shielding and Earthing AutroFieldBus

A description of the local earthing requirements for each unit that may be connected to AutroFieldBus is included in the respective datasheets. In the total system overview, some key issues needs to be taken care of:

- Shielded cable is recommended. There are no absolute requirements for shielding, however if severe electromagnetic interference is expected, shielding should be applied. Unshielded cable may be used inside the cabinet.
- If shielded cable is used, the shield shall be kept continous. Care should be taken to avoid earth/shield loops. As a guideline, connect the shield to the B-side of the AutroFieldBus Driver EAU-341 / Controller Board BSA-400 and not to the A-side.
- If segments of the AutroFieldbus cable is isolated, as it will be when including BSL-325 Booster, BSL-321 Multimode Fiber or BSL-322 Single Mode Fiber, local earthing of the isolated segments is required. See figure for example. We follow the cabling counter-clockwise:



The cable shield is referenced to earth at Earthpoint 2 according to the guidelines above. Through the BSD-340 the shield is continued. There's a galvanic isolation in the Booster (BSL-325) that makes the cable (on the right side) floating. To avoid this, the Center Tap of the transformer of the AutroFieldBus (internal in the BSL-325) is terminated to the local Earth at Earthpoint 3.

An alternative is to rather bring the reference from the other side of the Booster across it, to continue the shield in that way. Note that the bus needs to be referenced by connecting the CenterTap (pin 3 or 6) to Earth. On the left side, this is ensured by the AFB-CT to Earth at the EAU-341 / BSA-400, while the BSL-325 right side needs to be tied to Earth or to the reference of It's left side, by for instance connecting pin 3 to 6.

Further on, the BSL-322 to BSL-322 also isolates. If there had been several fiber jumps, each individual cable segment between the fiber segments would have to be earthed. In this case, the segment following passes through a BSD-340, the shield is kept continous and it is referenced to earth at Earthpoint 1, close to the EAU-341 / BSA-400. An alternative to this would be to terminate at the other end of this segment, at the BSL-322.

The main rule is: Ensure that all segment's shield are terminated at one end and one end only.

Dual Earth systems acts similar to the description of the PowerLoop, as long as the inner Instrumental Earth shield is kept according to the above rules, the outer protective shield may be terminated at multiple locations.

12.5 Earth Fault Detection - AutroFieldBus

The Earth Fault detection mechanism monitors the cable segment that is electrically connected to the AutroFieldBus Driver EAU-341 / Controller Board BSA-400. However, if the cable is interrupted electrically by a BSL-325 Booster or a Fibre modem, these segments may need additional Earth Fault Monitoring. This may be achieved by including a BSD-321 into this segment, and enable the Earth Fault Monitoring at this device.

Care shall be taken to avoid two units monitoring the same segment, as they may interfere with each other on this feature.

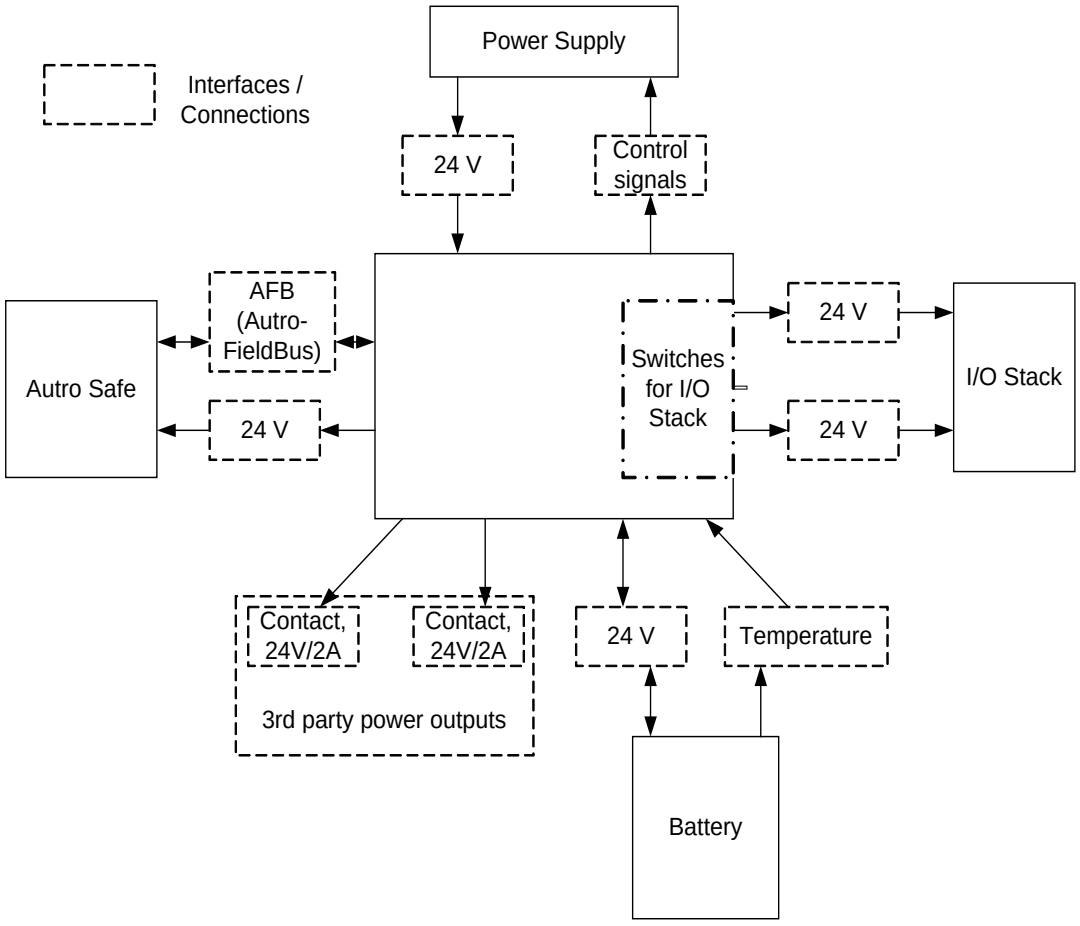
All earth fault monitoring is done towards Instrument Earth (IE) in the units.

13. Power Distribution, Calculation and Consumption

13.1 Introduction

The power supply provides power to AutroSafe, AutroSafe's existing I/O module stacks, battery monitoring and charging, plus 24 voltage contacts for other external equipment.

- 2 x 24V outputs of 2A to AutroSafe panel
- 2 x 24V outputs of 2A to I/O stack
- 2 x 24V outputs of 2A to third-party equipment
- 1 input for battery
- 1 input for battery charger
- Communication
- Power control for battery
- Control signals for battery charger
- All internal voltage levels are monitored
- Temperature sensor for compensation of charger voltage



The Power Cabinet BP-405 supplies a maximum of 5A, of which 3A is available for the fire detection system. 2A is used for the charging and maintenance of the battery. Note that the maximum load for each output (A1, A2, B1, B2, C1, C2) is 2A.

Output A supplies 2A and functions as a single output for all Controllers BC-420 and panels (BS-420, BS-430, BU-BV-420).

Output C supplies 2A to the internal modules mounted on the rail inside the Controller BC-420 and Fire Alarm Control Panel BS-420.

Note that if there is a maximum load from both output A and C, the total load would be 4A, which in this case would exceed the limit of 3A. It is therefore important to calculate the total power consumption for each Power Cabinet BP-405 to ensure that this limit is not exceeded.

The example described in the next chapter shows how you can easily find out if the power consumption in a system is within the given limits.

13.2 Power Calculation Example – 4 Power Cabinets BP-405

Power Cabinet 1	A1	Panel	BS-420 and BC-420	720 mA
	A2	Panel	BS-420 and BC-420	
	B1	External	• Fibre converters 2x LM 4TX/2FX	800 mA
	B2	External	• Fibre converters 2x LM 4TX/2FX	
•	C1	• Internal modules (I/O stack)	BS-420 and BC-420	1860 mA
	C2			
Total power consumption				3380 mA

All outputs in Power Cabinet 1 are correctly set up for redundancy and are below the limit of 2A. However, the total power consumption is 3,38A, meaning that the limit of 3A is exceeded by 0,38A. The total power consumption must be reduced by 0,38A, or another power cabinet has to be added.

Power Cabinet 2	A1	Panel	2 x BC-420	720 mA
	A2	Panel	2 x BC-420	
	B1	External		
	B2	External		
	C1	• Internal modules (I/O stack)	2 x BC-420	1860 mA
	C2			
Total power consumption				2580 mA

Power Cabinet 2 is correctly set up, as no outputs exceed the limit of 2A and the total power consumption is 2,58A, i.e. below the limit of 3A.

In order to reduce the total power consumption for Power Cabinet 1 to 3A (the limit), one of the fibre converters powered from Power Cabinet 1 can instead be powered from Power Cabinet 2. The total power consumption for Power Cabinet 1 will then be reduced by 400mA to 2980mA (<3A). Both Power Cabinets will now have a total power consumption within the limit of 3A.

Power Cabinet 3	A1	Panel	BU-BV-420	220 mA
	A2	Panel	BU-BV-420	
	B1	External	Various additional external equipment 24V	500 mA
	B2	External	Equipment that does not require redundancy	750 mA
	C1	• Internal modules (I/O stack)		
•	C2			
Total power consumption				1470 mA

A Repeater Panel BU-BV-420 is powered from a Power Cabinet 3.

Power Cabinet 3 supplies redundant power to the Repeater Panel BU-BV-420. In addition, it supplies power to equipment that does not require redundant power. If redundancy is not required, power can be supplied from one output (for example, output B1 or B2). Output C1 or C2 cannot be used to other equipment, as this output is shut off 3 seconds during an initialization of the system.

Power Cabinet 4	A1	Panel	1x BC-420	680 mA
	A2	Panel	1x BC-420 and BS-420	
	B1	External	Various relays and door magnets	2500 mA
	B2	External	Various relays and door magnets	
	C1	• Internal modules (I/O stack)	BC-420 and BS-420	2300 mA
	C2		BC-420 and BS-420	
Total power consumption				5480 mA

The power distribution from Power Cabinet 4 is not according to legal specifications of the Power Cabinet BP-405.

- BS-420 is not supplied with redundant power. Power must also be supplied from output A1.
- The power consumption from output C1 and C2 exceeds the limits. The internal modules (I/O stack) draw too much power.
- The total power consumption exceeds 3A.

Power consumption status:

- Output A
  The power consumption is below the limit (2A), but the BS-420 must have redundant power, and thus must be supplied with power from A1.
- Output B
  More than 2A is supplied to equipment that does not require redundant power. This means that this output can supply a maximum of 4A (2A + 2A).
- Output C
  This connection is not satisfactory as the power consumption is above 2A.

Conclusion:
The total power consumption (5480mA) related to the power distribution in Power Cabinet 4 is far too high. More power must be supplied. A separate power supply can be used to supply power to equipment that does not require redundancy. If the power consumption is reduced by 2,5A, power supplied from Power Cabinet 4 will be sufficient, as the power needed is no longer exceeding the total limit of BP-405. Port C is still above 2A and must be reduced either by removing components that are not needed or by using an additional Power Cabinet BP-405.

13.3 Power Consumption

13.3.1 System Units

System Unit	Current Consumption
Fire Alarm Control Panel BS-420 Controller BC-420	• 156mA/27,2VDC (idle) Max. 340mA/27,2VDC (lamp test)
Repeater Panel BU-BV-420	156mA/22,2V DC (idle) Max. 220mA/27,2V (lamp test)
Operator Panel BS-430	• 175mA/27,2V DC (idle) Max. 340mA/27,2V DC (lamp test)
Power Board BSF-400	85mA

13.3.2 Loop Units

For information on the current consumption for various loop units, refer to technical specifications provided in the relevant datasheets.

13.3.3 Phoenix Ethernet Switches

The current consumption for each Phoenix switch is shown in the rightmost column below.

Switch type (Phoenix)	Description	Autronica part number	Current Consumption (max.) @ 24V DC
FL SWITCH SFNT 5TX	5 RJ45 ports	116-5151-030.2127	120mA
FL SWITCH SFNT 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2128	160mA
FL SWITCH SFNT 8TX	8 RJ45 ports	116-5151-030.2129	153mA
FL SWITCH SFNT 7TX/FX	• 7 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2130	175mA
FL SWITCH LM 5TX	5 RJ45 ports	116-5151-030.2131	250 mA
FL SWITCH LM 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2132	380mA
FL SWITCH LM 4TX/2FX	• 4 RJ45 ports 2 fibre optic multi-mode ports (SC)	116-5151-030.2133	400mA
FL SWITCH LM 4TX/FX SM	• 4 RJ45 ports 1 fibre optic single-mode port (SC)	116-5151-030.2134	380mA
FL SWITCH LM 4TX/2FX SM	• 4 RJ45 ports 2 fibre optic single-mode ports (SC)	116-5151-030.2135	400mA
FL SWITCH SFNB 5TX	5 RJ45 ports	116-5151-030.2136	
FL SWITCH SFNB 8TX		116-5151-030.2137	138mA
FL SWITCH SFN 4TX/FX	• 4 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2138	140mA
FL SWITCH SFN 7TX/FX	• 7 RJ45 ports 1 fibre optic multi-mode port (SC)	116-5151-030.2139	190mA
FL SWITCH SFN 6TX/2FX	• 6 RJ45 ports 2 fibre optic multi-mode ports (SC)	116-5151-030.2140	230mA
FL SWITCH SFNB 4TX/FX SM 20	• 4 RJ45 ports 1 fibre optic single-mode port (SC)	116-5151-030.2142	175mA

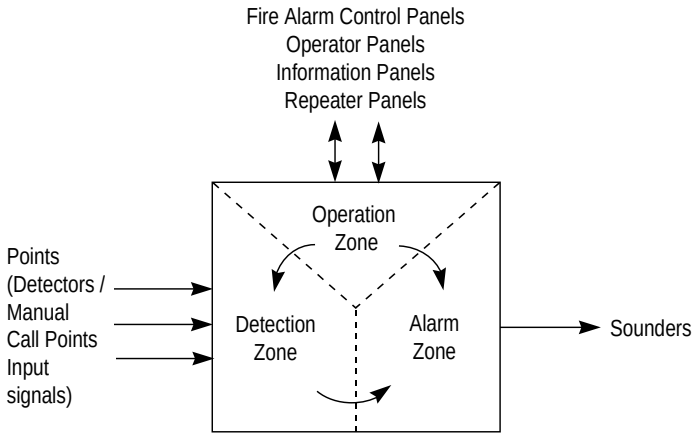
14. Appendix

14.1 Zoning Concept

14.1.1 General

To describe the functional hierarchy of the system we use the term "zone". Assigning system components to zones enables hierarchical control from detection to activation of alarm. This hierarchy consists of the following zones:

- Detection Zone (DZ)
- Alarm Zone (AZ)
- Operation Zone (OZ)



14.1.2 Detection Zone

A *Detection Zone (DZ)* is defined as a zone with one or more *points* (detectors or manual call-points) that logically belong together, determined by geographical/functional parameters (for example, the sales department on the second floor).

A point can only be assigned to one detection zone, and can only refer to one specific location in the system (for example, a specific office on the second floor in a building).

The Detection Zone will be the trigger to generate outputs to the Alarm Zone.

14.1.3 Alarm Zone

An *Alarm Zone (AZ)* is activated by one or several detection zones.

Example:
An alarm from one of the devices in DZ3 will activate sounders in AZ1.

Within the same alarm zone, alarm sounders give the same audible signal.

Geographically associated alarm zones can be defined as *neighbour* zones, such that these can operate outputs for alarm zones adjacent to the incident.

14.1.4 Operation Zone

An *Operation Zone (OZ)* defines the scope of an Operator Panel.

The operation zone can cover one floor or one building, and is designed to restrict the operators' sphere of influence on the system as a whole. At least one Fire Alarm Control Panel / Operator Panel should have the overall control of the system.

Operation zones on higher levels may encompass several other operation zones.

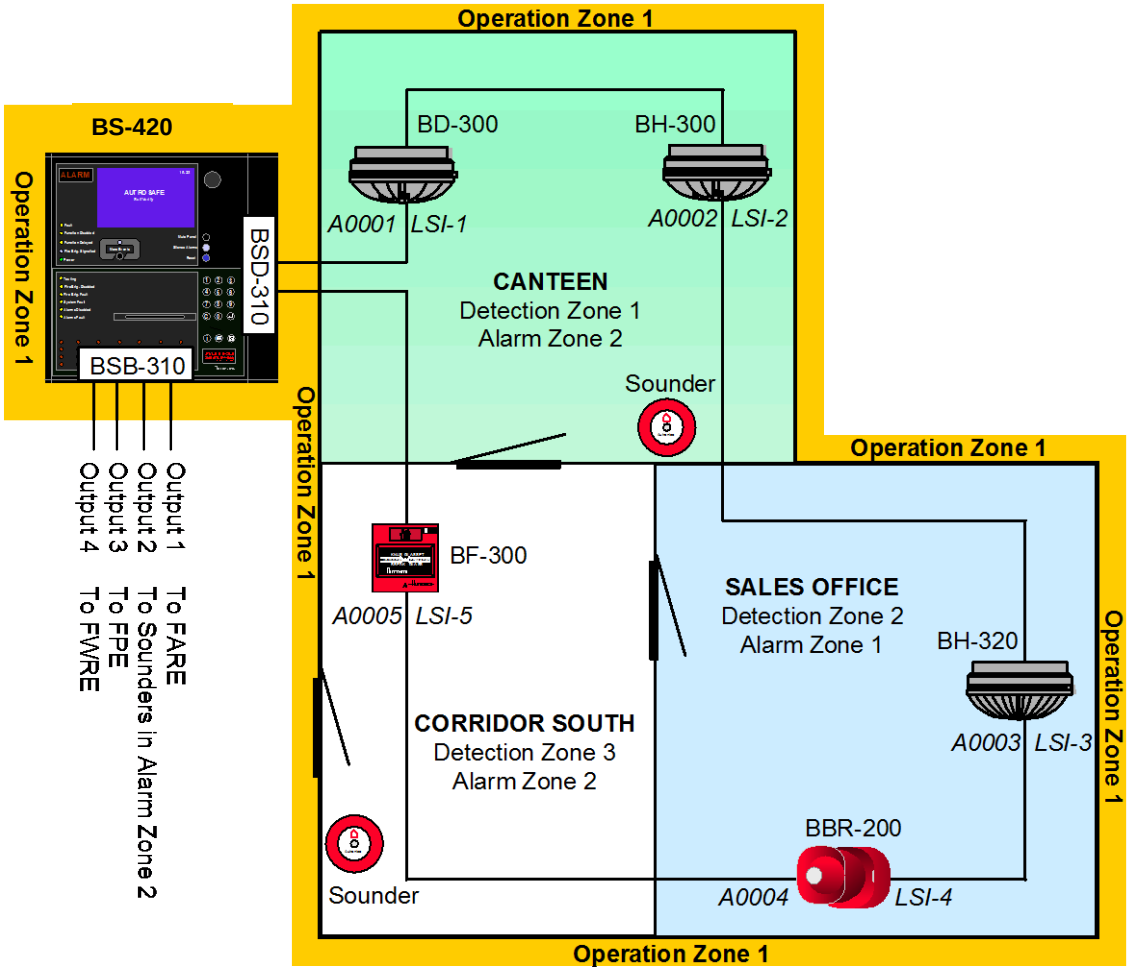
Input / Output units (for example, Door Control Units, Sprinkler Control Units etc.) can be controlled from an Operation Zone.
An Operation Zone given these properties and necessary parameter settings is referred to as a *Control Operation Zone*.

Different day / night operation for different areas (i.e. detection zones) requires the use of several Operation Zones / sub-operation zones with different Day / Night Operation. An Operation Zone given these properties and necessary parameter settings is referred to as a *Day / Night Operation Zone*.

14.2 Configuration Examples

14.2.1 Simple Configuration Example

The simple *configuration example* is based on the *AutroSafe Demo Board* configuration, and it looks like this:



The building is divided into three sections, the CANTEEN, the SALES OFFICE and the CORRIDOR SOUTH, each section defined as a *Detection Zone* (1, 2 and 3).

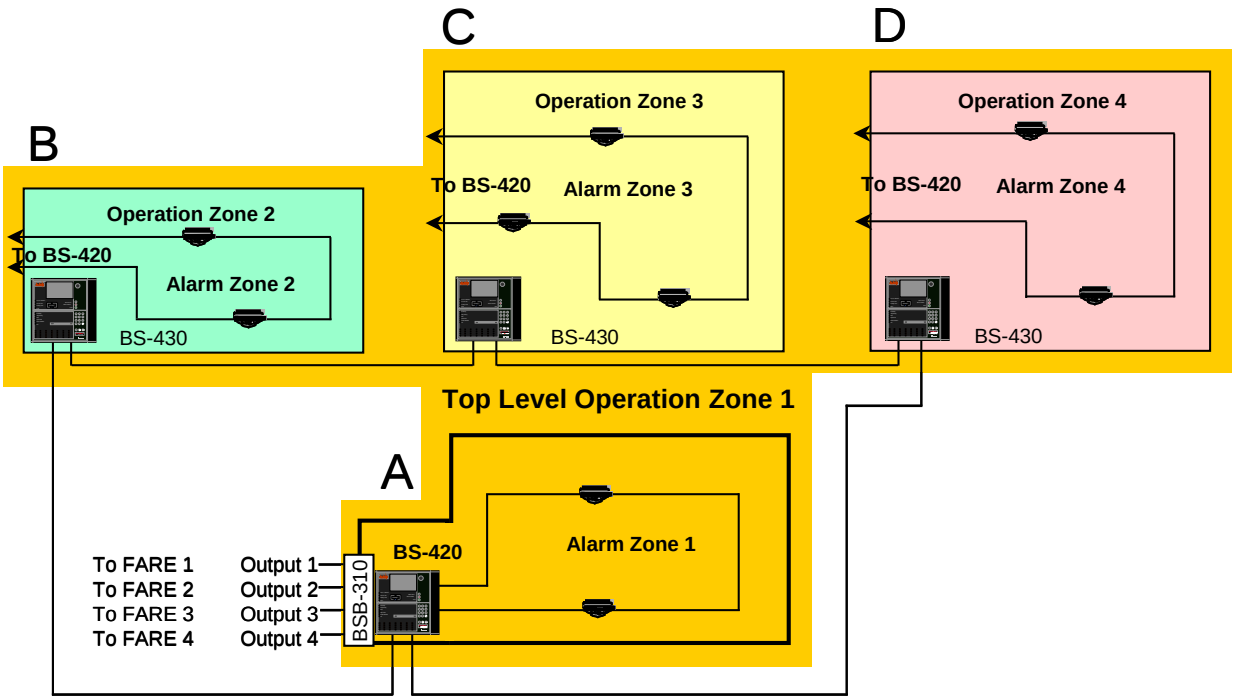
The system is divided into two *Alarm Zones* (1 and 2). The Electronic Sounder in Alarm Zone 1 is triggered when alarms are activated in Detection Zone 2, and the sounders (Fire Alarm Devices) in Alarm Zone 2 are triggered when alarms are activated in Detection Zone 1 and 3.

One *Operation Zone* defines the scope of the Fire Alarm Control Panel BS-420, including all Detection Zones, Alarm Zones, plus Fire Alarm Routing Equipment and Fire Warning Routing Equipment.

The BS-420 provides one Loop Driver BSD-310. All *Loop Units* are connected to this loop. The BS-420 also provides one Output Module BSB-310 with monitored outputs for Fire Alarm Routing Equipment (FARE), Fire Alarm Devices (FAD), Fire Protection Equipment (FPE) and Fault Warning Routing Equipment (FWRE).

14.2.2 Configuration Example with Several Operation Zones

The illustration below shows an *example* of a configuration with 4 operation zones, where Operation Zone 1 is on the top level encompassing the other operation zones (2, 3 and 4). The example shows 4 buildings. Building A is the main administration building with a Fire Alarm Control Panel.



The table below describes how the system is configured, and what is achieved.

Configuration	What is achieved
Operation Zones The Fire Alarm Control Panel in building A serves as an operating panel for all operation zones. The panel's defined *Operation Zone 1* is on the top level, encompassing *Operation Zone 2, 3 and* 4.	This configuration allows the Fire Alarm Control Panel to operate, control and monitor the entire building complex. Information is selectively routed. In the event of a fire alarm in building B, for example, detailed information (information on the detection zone/detector) will be shown only on the panel's display in building B and in the main administration building. Remote information on the fire alarm location, i.e. building B, will be shown on the panel's display in building C and D. The buzzer will be activated on the panels in building A and B in the event of an alarm.
Fire Alarm Routing Equipment (FARE) The Output Module (BSB-310) in the Fire Alarm Control Panel is configured as follows: Each Operation Zone (1-4) has a dedicated output.	A fire alarm in, for example, Operation Zone 3 will trigger output 3 on the output module. In this way, the fire brigade will be able to know exactly in which building the fire has occured, in this case, building C.
Alarm Zones Each building is defined as an Alarm Zone. The Detection Zones in each building are connected to each building's Alarm Zone, and in addition to the main administration building's Alarm Zone. In addition, the following Neighbour Zones are defined: C is defined as a neighbour zone to B. B and D are defined as neighbour zones to C. C is defined as a neighbour zone to D.	A fire alarm from a detector in building B, for example, will activate all sounders (default 0,5 second ON / 0,5 second OFF) in this building, plus in the main administration building. Simultaneously, a neighbour alert signal (default 0,5 second ON / 3,5 seconds OFF) on all sounders will be heard in building C.

Autronica is a leading innovator, manufacturer and supplier of fire safety equipment. Our products ensure safety in applications on land and sea worldwide. The company is owned by United Technologies Corporation (UTC) and employs more than 380 people with great skill and experience in the developing, manufacturing and marketing of fire safety equipment. Autronica Fire and Security AS is an international company based in Trondheim, a dynamic city known as the technological hotspot of Norway.

Protecting life, environment and property

Autronica Fire and Security AS
Haakon VIIS gt. 4, NO-7041 Trondheim, Norway | Tel: +47 90 90 55 00 | Fax: +47 73 58 25 01
E-mail: info@autronicafire.no | www.autronicafire.com