Designers, Consultants and Manufacturers of Public Address - Voice Alarm, Firephone, Emergency Communications Equipment.

The PRISM voice alarm equipment is designed to meet the relevant section of BS5839 Parts 1, 4, and 8, BS/EN60849 and the code of practice of the BFPSA for voice alarm systems.

The 'PRISM' equipment is unique in the control of the system by not incorporating the use of any microprocessors or time-shared multiplexing and yet offers the flexibility required by the specification, using the fire retardant cables required to be installed on the site.

Using techniques developed for the 'PYROVOX' range of equipment including MOSFET amplifiers, and a **P**OLY **R**ADIAL **I**NFRA-**S**ONIC **M**ONITOR, the Prism system provides an extremely cost effective way off constructing custom requirements for medium to large installations.

A typical voice alarm system would include the following: -

- 19 inch rack unit.
- 2U chassis' fitted with either 4 x 100 Watt, 2 x 200 Watt or 2x 100 Watt fully monitored MOSFET power amplifiers.
- 2U Power supply(s)/battery charger(s), containing 2 off 500 VA independent sources, which may be distributed, up to eight amplifier locations (dependant on amplifier loading).
- 3U Battery standby chassis' for each power supply chassis fitted.
- 3U standard 'eurocard' control frame(s), which can accommodate up to 16 control and monitoring cards.

In addition, the 'PRISM' system may be interfaced to a multi-zoned Fire control panel, either directly, or via a custom built mimic, permitting both automatic and manual control of system status.

All control signals utilise conventional D.T.M.F. audio signalling, allow simple, reliable and comprehensive control of all parameters, without recourse to microprocessor technology.

The 'PRISM' system permits multi-channel function with up to 8 simultaneous signals being routed as required.

All critical signal paths are monitored with an Infra (sub) Sonic signal, which is generated within the control rack and distributed throughout the system, to the 'end of line' units.

The critical path includes input switching and selection, output transformer and loudspeaker lines.

Infrasonic Monitoring

It is essential that any monitor signal applied to loudspeaker lines must be inaudible, and must therefore be either above or below the range of the human ear. An alternative to the ultrasonic techniques described above is the application of infrasonic (subsonic) monitor signals, generated below the range of human hearing.

A major advantage of this approach is the realisation that the troublesome line capacitance mentioned above is frequency dependent, becoming increasingly significant as the frequency rises. At infrasonic frequencies the effect is negligible, and can be ignored in the development of appropriate circuit design.

The PRISM system can accommodate any number of paging microphones with each unit having the capability to page any zone. Each microphone is connected via a simple 6 core telephone type connector.

Automatic message generators can be automatically activated to provide appropriate priority evacuation sequences.

All 'PRISM' modules have connections made via the front panel, thus negating the requirement for rear rack access, and increasing rack location options.

The critical path includes input switching and selection, output transformer and loudspeaker lines. The system can accommodate any number of paging microphones with each unit having the capability to page any zone. Each standard microphone is connected via a simple 6 core telephone type connector.

Automatic message generators can be automatically activated to provide appropriate priority evacuation sequences.

All 'PRISM' modules have connections made via the front panel, thus negating the requirement for rear rack access, and increasing rack location options.

The 'PRISM' system utilises a distributed power supply network, and conforms to the relevant sections of BS5839 and BS7443 with regard to the dual source requirement for all amplifiers.

Standard system requirements are specified as 100% modulation for voice announcements, and -3dB for tone, to allow for system balance regarding speech intelligibility and sound pressure levels.

For tone only systems requiring 100% continuous modulation, with no minimum R.A.S.T.I. requirement, extra capacity may be specified if required.

Consideration of the proposals for BS5839 (Part 8 - Section 15.3) has been included in this specification.

Equipment rack options

The 'PRISM' equipment is fitted within standard 19 inch rack enclosures. Few systems are identical so rack sizes will vary from design to design. Once all design parameters have been taken into account, suitable size and number of racks will be chosen to suit the system required.

Racks come in six different heights. All racks are 600mm wide and 600mm deep.

23U
27U
32U
37U
41U
46U

Racks are despatched from the factory with heavy duty lockable castors fitted. This is purely to aid in the moving of racks to there preferred positions on site. Sturdy adjustable feet are fitted to the racks once their desired locations have been agreed. Where two or more racks are used, suiting kits are supplied to make the whole structure rigid.

Cable entries are via top or bottom gland plates (dependant on site requirement). There is no requirement to obtain access to the rear of the 'PRISM' racks. Connections to the amplifier(s), power supply(s) etc are made from the front therefore negating the need for rear access. This can be very advantageous when space is of a premium.

As standard, racks are supplied with top entry terminations. At the top of each rack(s) a removable panel reveals the connection terminals for all external requirements. Din rail terminals are supplied on vertical rails clearly labelled for identification. Using this method, field engineers do not have a requirement to access racks from above to terminate cables, therefore negating the need for tight and awkward spaces.

Racks are supplied with glazed lockable doors, vented rear back panels and raised canopies for ventilation purposes. As the PRISM system primarily runs stone cold there is no need for ventilation requirements. A bespoke cable rack runner is utilised within the racks. These units not only act as covers for each chassis fitted below

Amplification

PRISM amplifiers come in three different sizes 2 x 200 Watt, 4 x 100 Watt and 2 x 100 Watt.

Power amplification within the system is provided by modular 19 inch rack mounted units. Each 2U high 19" chassis unit contains 4 identical power amplifiers, which are configured as 2 x 200 Watt, 4 x 100 Watt or 2 x 100 Watt bridge amplifiers.

Each amplifier is based around a complementary pair of high power lateral MOSFETs, and is optimised for voice alarm use by careful selection of operational parameters.

All inputs and outputs are via locking plug and socket on the front panel as follows: -

100 volt line output	-	2 or 4 outputs of Speakon 4 pole plugs and sockets
Power supply inputs	-	2 or 4 inputs XLR 3 pole plugs and sockets
Mains input	-	IEC 3 pole mains plug and socket
Control inputs	-	8 pole RJ45 connectors (blue)
Audio inputs	-	8 pole RJ45 connectors (grey)
Fault outputs	-	8 pole RJ45 connectors (yellow)

Heatsinks are rear mounted so cooling of the output devices at full power is achieved by free flowing air through the control rack.

In addition to the power amplifiers a pre-amplifier is mounted within the chassis to provide the following functions: -

- Audio input socket (type RJ45) from control rack module CS568.
- Control input socket (type RJ45) from control rack module CS568.
- Fault output socket (type RJ45) to external control.
- Volume control potentiometers for each amplifier.
- Monitor calibration level potentiometers for each amplifier.
- Calibration LED for each amplifier.
- Fault LED's for each amplifier.
- Active LED for each amplifier to indicate amplifier in use.
- Dual Healthy LED's, illuminated during normal conditions.
- Momentary lamp test switch to test above indicators.

Specification for 100 watt amplifier chassis	
Output into system load	100 watts ± 2dB
Input sensitivity	0dB (0.775 volts)
Frequency response	100 Hz – 20kHz ±3dB
Signal to noise ration	> 80dB
100 volt line output	Limited to 160Hz – 12kHz ± 3dB
Distortion	< 0.82% THD @ 100 volt line
DC power supply	± 24 volts @ 7.07 Amps

Specification for 200 watt amplifier chassis	
Output into system load	200 watts ± 2dB
Input sensitivity	0dB (0.775 volts)
Frequency response	100 Hz – 20kHz ±3dB
Signal to noise ration	> 80dB
100 volt line output	Limited to 160Hz – 12kHz ± 3dB
Distortion	< 0.82% THD @ 100 volt line
DC power supply	± 24 volts @ 10 Amps

Power Supply Unit

The PRISM power supply chassis provides a distributed network of DC supplies. Each chassis contains 2 × 500VA ± 24 volt DC supplies. Each supply is completely independent, and is floating to allow appropriate 0 volt (ground) routing to be achieved.

Primary power is derived from a 230 volt AC 50Hz supply, which is transformed and rectified to provide a ± 24 volt DC supply. This supply, rated at 10 Amps RMS, is distributed via independently fused outputs to an appropriate number of amplifier chassis depending on amplifier loading. In addition, the supply is regulated and used to charge the secondary supply standby batteries. This secondary supply is used in the event of primary (mains) failure, and is supplied with sufficient capacity to meet the specification, 24 hours standby + ½ hour with tone and message into system load.

Each power supply chassis is constructed using: -

- A 500VA toroidal mains transformer, 230 Volt AC 50HZ primary, 0 - 30V, 0 - 30V secondary.
- A 25 Amp chassis mounting bridge for each secondary winding.
- CS567 decoupling, DC mixing and charger board (2 off).

Each chassis contains two such supplies. The output from each pair of DC mixing boards is fed, via independent fusing, to a three way XLR socket mounted on the front panel. Each power supply may be routed to a maximum of four amplifier chassis, thus making a total of eight output connectors from each chassis. Mains in to each chassis is via a standard IEC connector, with each transformer primary being fused separately on the front panel via a 5Amp (T) fuse.

Fault Indication

Each mixer charger board is monitored continuously for correct function, with fault indication being visible on each board, as well as being relayed, a) to the front panel and b) to the overall control system.

The system is monitored for the following: -

- Mains failure
- Battery charge fail
- Battery connection open circuit
- Battery low

Each charger/mixer board indicates a separate fault condition on the front panel, and is relayed as a single fault to the control system. In addition separate mains or battery fail LED's are fitted to each charger. All fault LED's are yellow/amber.

Specification for Power Supply (2 per chassis)	
Capacity	500VA
AC supply input voltage	230V AC 50Hz @ 5 Amps (220V – 240V)
DC output	± 24 volt DC @ 10 Amps
Fault indication	Mains/battery fail (internal), charger fail (external)

Battery Support

Each Power Supply chassis is supported by an adjacently mounted 3U battery chassis. Each battery chassis contains 8 × 12 volt, 12 A/Hrs sealed lead acid batteries, configured as 2 independent ± 24 volt DC supplies. Each 24 volt 'pair' is separately fused within the chassis for safety, and these fused outputs are taken via a 4 way XLR socket to a corresponding 4 way XLR plug on the power supply chassis front. Failure of any battery connection or fuse will indicate as a battery failure on the power supply. To prevent excessive battery discharge under prolonged conditions of mains failure, each power supply chassis contains circuitry to automatically disconnect the battery supply once it has discharged below ± 18 volt DC, to prevent deep discharge damage. This circuit may only be re-set by restoration of the mains supply. Certain systems may require a larger battery standby. When this is required the 12Ah 12V batteries are usually replaced with 17Ah 12V versions.

Control Rack

Signal generation, audio mixing, routing and control logic for the PRISM system are all supplied as various plug in modules to the control rack.

This is presented as a 3U rack frame designed to accept 220mm × 100mm "Eurocard" PCB's, with a 340mm side plate to allow recessed PCB mounting to enable easy routing of front connected cables. A pivoted plate is fitted at the front of the frame.

Priority Structure

The priorities for 'PRISM' are achieved by a vertical and horizontal structure, thereby allowing a more flexible approach to the system.

The priorities are as follows: -

Vertical Priority, (a higher priority automatically overrides all other lower priorities per amplifier).

1st priority	——	Fire microphone
2nd priority	——	Message1 (Evacuate message and tone output.)
3rd priority	——	Message2 (Alert message and tone output.)
4th priority	——	General paging microphone module
5th priority	——	Non emergency messages
6th Priority	——	Not allocated
7th Priority	——	Test source
8th Priority	——	System monitor generator.

Horizontal Priority

A horizontal priority can be included into the following vertical slots: -

The 1st, and 4th, slots can accommodate 2 inputs on a first come first served basis or one of the inputs having priority over the other 3 (it is possible to cascade this function).
E.g. This allows for more than one fire microphone to be available on a site but only one to be used at any one time, or a selection of general paging microphones on a first come first served basis.

Message Cards

The "Evacuation & Alert" message & tone are controlled by the closure of a relay contact in the Fire Panel for each zone, this is a free issued card which plugs into the standard Cerberus Fire Panel. This information is serially fed to the VA rack and latched, until reset by the Fire Panel.

Each emergency message is supplied as pre-recorded data on a single 4Mb EPROM, fitted to a standard 100mm by 220mm Eurocard PCB, which plugs via a 32 way DIN41612 connector to the control rack backplane. The PCB also contains circuitry to allow the data to be converted to an audio signal, with a bandwidth of 100Hz to 8kHz (± 3dB). In addition, tone generation circuitry is provided to allow generation of emergency and alert tones where required. Sequential control of tone and message data is provided as a series of variable potentiometers, allowing tone generation with periodic message interruption, adjustable within the range specified below. Each message card is monitored for function by periodic automatic activation during quiescent operation. In addition, all message cards automatically indicate a "PCB out" if removed from the control rack. Card activation is automatic on receipt of any "Evacuation" or "Alert" signal from the control system as appropriate. The card may be manually triggered via a closing pair trigger on the front edge. In this case, zone activation becomes an independent function.

Specification for Message Cards	
Dimensions	100mm x 220mm.
Connections	32 way DIN 41612.
Power requirements	+12 Volts DC (±10%) @ 50mA.
Variable controls	Tone level. Overall volume level. Pre-message delay time (pre-tone length). Inter-message time (gap length).
Visual indicators	Unit active and Audio fault.
Storage medium	Non-volatile EPROM (max 4Mbit).
Digital format	8 bit companded linear.
Sampling rate	18.75kHz.
Frequency response	100Hz to 8kHz (-3dB) standard.
Tone generators	720Hz and 880Hz (±10%). Intermittent tone 720Hz. Two tone evacuation tone is 720Hz and 880Hz alternate.
Activation	Normally open or closed trigger. Automatic via control system.
Audio	0dB - to audio mixing buss.
Fault monitoring	Pulsed audio validity monitor. Visual fault indication of audio fault.
Operational sequence	Trigger applied - tone activates immediately (message latches). Message begins after pre-set pre-tone length (2 to 10 seconds). Tone muted during message. End of message tone is re-instated for period determined by the gap length (15 seconds to 2 minutes). Message repeats. Silence alarms or reset from the fire panel to mute.

Microphone pre-amplifier

The microphone pre-amp is a standard 220mm Eurocard, with two front mounted RJ45 connectors, designed to be connected to (up to) two remote microphones. These two inputs are scanned continuously so that an interrupt request from any microphone will effectively 'lock out' other microphones on the scan, this providing a 'first come first served' paging priority. All locked out units receive a busy indication. The PCB may be cascaded with others should more than two inputs be required. A further option allows one of the inputs to be a priority input, so that use of that microphone will automatically override any other on the scan. This approach permits a priority paging system utilising only one of the buss priorities. Any higher buss priority will automatically override any paging input in use when required, and the option is given to disable all paging microphones during emergency conditions.

Specification for Pre-amplifier	
RJ45 front edge connector pin out	Pin 1 – Busy Pin 2 – Press to talk Pin 3 – 0dBM audio balanced Pin 4 – 0dBM audio balanced Pin 5 – O volts (ground) Pin 6 - + 12 volts (re-settable fuse 100mA) Pin 7 – Zone code Pin 8 – Zone code
Equalisation	-3dB @ 100Hz -3dB @ 10kHz + 6dB @ 2.7kHz (slope: - 6 dB per octave).
Compression threshold	-10dB
Compression ration	4:1

Voice alarm control panel

The 'PRISM' system can be interfaced to the Master Fire Panel, by a custom built Fire Control Panel, permitting both automatic and manual control of system status.

The provision of a voice alarm control panel, in addition to the main fire alarm control system, allows comprehensive control of all voice alarm parameters, and presents a visual indication of the complete system status at all times. The use of separate, illuminated, momentary switches for the control of all variables allows for simple and intuitive control of the system.

The panel is connected to both the main fire panel, and to the voice alarm amplification equipment, via monitored links, to allow comprehensive control under several operating modes. The following paragraphs describe the various options available, and further describe the functions of all controls.

The Control Panel has the following control and display functions: -

- Visual display of the 'Automatic' cause and effect as directed by the Fire Control panel.
- System fault indication by yellow/amber LED.
- System 'on' indicator by green LED.
- Manual override of the zones giving the 'Evacuate' tone and message (Red switch and LED).
- Manual override of the zones giving the 'Alert' tone and message (amber switch & LED).
- Manual override of the zones giving a "mute" output (white switch & LED).
- Manual Paging to any of the zones singularly or collectively + 'all call' (green switch & LED).

All control signals utilise conventional D.T.M.F. audio signalling, allow simple, reliable and comprehensive control of all parameters, without recourse to microprocessor technology.

Hand held noise cancelling fist microphone with integral 'press to talk' switch. Fully monitored by SPL to the capsule, pre–amplifier and associated wiring to the central rack, including the 'press to talk' switch.

Zone controls

Each individual voice alarm zone has a separate illuminated momentary push button for the control of the following parameters: -

- Evacuation – RED indication
- Alert – YELLOW indication
- Mute – LIGHT GREEN indication

All the above indications flash intermittently if selected automatically by the fire panel, and have a solid illumination when manually selected.

- Fire Microphone– GREEN indication

The fire microphone indications are always set manually, and therefore always have a solid illumination.

In addition, further individual zone indications and controls may be provided, where specified. These might include zone fault indications, and 'special message' zone selection switches. The panel also houses visual indicators for power and common system faults, and has a 'LAMP TEST' pushbutton to verify the state of all pushbutton indicators.

Common Controls:

In addition to the individual zone controls, several 'common' controls are provided: -

- 'EVACUATE ALL' – a non-illuminated momentary push button that simultaneously activates all zones into the 'evacuation' state, and illuminates all zone evacuation indicators.

- 'ALERT ALL' – a non-illuminated momentary push button, that simultaneously activates all zones into the 'alert' state, and illuminates all zone alert indicators.

- 'CANCEL' – a non-illuminated momentary push button, which clears all selected states.

N.B. The above functions are only active when the 'Manual (ON)' operational mode is selected, they remain inoperative in the 'Auto (OFF)' mode.

- 'FIRE MIC ALL' – an illuminated momentary push button which pre-selects all zones ready to receive fire microphone audio upon activation of the fire microphone 'press to talk' switch.
- 'FIRE MIC CANCEL' – a non illuminated momentary push button which clears all selected 'fire mic' zones.

Operational Modes

The Voice Alarm control system may be operated in one of two modes. Selection is made via a two way key switch mounted on the front panel. This key may be removed in any position, to permit authorised mode access where required. An engraved arrow on the key switch advises the selected mode when the key is removed.

The two operational modes are:

'AUTO' : (OFF)

The panel only responds to 'evacuation' or 'alert' states instigated by the fire panel. These instructions are presented to the control system by a series of 'closing contact' outputs from the fire panel. These may be implemented in several ways, depending on the make of fire panel employed:

'Fire Loop' output cards may be installed within the panel rear enclosure, with latching relays responding to the fire panel data. Alternatively, a serial link may latch the instructions via the CSL 682/683 interface. A third, less commonly used option can employ 'Bell Line' outputs from the fire panel, if required.

In all cases, the 'latched' fire data is converted to 'pulse' data for correct system operation.

In the 'AUTO' mode the manual pushbuttons relating to the 'evacuate', 'alert' and 'mute' functions are disabled, although it should be noted that the 'Fire Microphone' pushbuttons remain operative in all modes.

All states activated by the fire panel are registered with a flashing indication of the selected function.

Note that where both 'alert' and 'evacuate' instructions are latched simultaneously to the same zone, only the 'evacuation' instruction will be acknowledged.
Note that in this mode the system may only be reset by the activation of a separate 'closing contact' reset instruction from the fire panel.

'MANUAL' : (ON)

Where selection of this mode is made during an incident, all existing fire panel activations will be maintained until modified.

Each zone may be manually instructed by depressing any of the required 'evacuate', 'alert' or 'mute' pushbuttons. These functions are mutually exclusive, and may be selected as required. Only one function per zone is active at any time.

To identify manually selected functions, all indications are **solid** – only fire panel instructions have a **flashing** indication. The system may be reset by activation of the common 'CANCEL' pushbutton.

In this mode, both fire panel and manual instructions are registered. All fire panel instructions will be displayed with a 'flashing' indication, whilst manual instructions will register as solid indications. All updated instructions will be registered appropriately.

Note that activation of the common 'CANCEL' pushbutton in this mode will automatically reset all manual instructions, but will re-instate all fire panel selections.

To manually silence the system in this mode, it will be necessary to activate the 'MUTE' pushbuttons, and a genuine reset will only be achievable manually once all fire panel instructions have been cancelled.

Optional Functions

In addition to the functions described above, individual specifications may require other facilities to be provided. These might typically include individual zone fault leds, and possibly the selection and relay of non-emergency pre-recorded messages.

Where the latter function is required, there will be included on the panel a series of zone selection switches (normally blue), together with activation buttons for the relay of the selected message.

This facility is actioned by selection of the zones to be activated, and subsequent activation of the selected message pushbutton. Upon completion of the message relay, the selection buttons are automatically cancelled.

It should be noted that this option is automatically disabled during any emergency activation of the system.

Fire microphone

There are two type of fire microphone. 'All call' and 'zoned'. A hand held noise cancelling microphone is used for both units. The microphone has an integral 'press to talk' switch, and is either mounted within a self contained wall mounting enclosure, or to the front of a custom panel. In zoned cases electronic latching illuminated selection switches identify each zone. The microphone is fitted with a coiled (1 metre extended) lead, which provides power to and audio return to the pre-amplifier PCB assembly. Dual green power indicators are provided for connection confirmation and dual amber system fault indicators. The enclosure is fitted with a pre-amplifier to convert the low level microphone signal to a balanced 0dBM for onward transmission to the central control racks, thereby reducing the possibility of interference and noise injection. The microphone and 'press to talk' switch are fully monitored for correct operation.

Specification for Noise cancelling microphone	
Frequency response	300Hz to 7kHz (noise cancelling mode)
Microphone impedance	600 Ohms
Output level	-80dB (0dB = 1V/ubar, d = 2cm @1kHz)
Weight	180 gramms
Mounting	By clip support

Specification for microphone pre-amplifier	
Frequency response	200Hz to 12kHz
Output impedance	600 Ohms
Supply	0V – 12V + DC @20mA
Press to talk	Closing contact (monitored)
System busy output	By volt free changeover contacts

Speaker lift off output	12 volts @ 100mA (when PTT is operated)
Connections	2½mm screw terminals

Paging microphone

Paging microphones are supplied as desk mounted units. These are made as custom built units, therefore zone switches can be specific for each job. Electronic latching illuminated zone selection switches are fitted and a momentary press to talk switch. The microphone head is mounted in foam to act as an anti-shock facility that is mounted on a flexible gooseneck, 300mm long. A windshield is provided to act as an anti-pop filter. A six core flexible lead 3 metres long is terminated with a multi pin plug. A single gang patriss 85mm by 85mm is supplied for the connection of the microphone and the installation cables. A green power indicator is provided for connection confirmation. A red busy indicator is provided for microphone use. The base is fitted with a pre-amplifier to convert the low level microphone signal to a balanced 0dBM for onward transmission to the central control racks, thereby reducing the possibility of interference and noise injection.

Specification for paging microphone	
Overall size	(W) 262mm x (H) 78mm Rear, 33mm Front x (L) 160mm
Gooseneck dimensions	
Element	Dynamic
Frequency response	100Hz to 12kHz
Sensitivity	Uni-directional
Impedance	-72dB ± 3dB @1kHz
Output	Balanced
Pop filter	Separate moulded foam shield
Front panel indicators	
Power led	Green
Busy led	Red

Specification for paging microphone pre-amplifier	
Frequency response	200Hz to 12kHz
Impedance	600 Ohms
Supply	0 volts – 12 volts + DC @ 20mA
Press to talk	Closing contact
Connections	Multi pin plug and socket. Screw connections for cables, on a single gang patriss 85mm x 85mm.