

Eddystone Broadcast

E2072 'Guardian' Audio Fail and Changeover Unit

Installation and Operation

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**Eddystone Broadcast Ltd.
26, Arden Rd.
Arden Forest Industrial Estate
Alcester, Warwickshire
B49 6EP, England
Tel. 44 (0)1789 762278
Fax. 44 (0)1789 766033
www.eddystone-broadcast.com**

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SECTION ONE : INTRODUCTION

! CAUTION !

These Audio Fail and Changeover Units use **mains supply voltages**. Installation, operation and maintenance of these units must therefore, only be carried out by suitably qualified personnel, familiar with and fully utilising the safety procedures such equipment demands.

NO attempt at installation should be made without full reference to and compliance with SECTION TWO : INSTALLATION – especially section 2.2.1 A.C. Supply Connector

NO attempt at internal maintenance should be made without full reference to and compliance with the appropriate sections (external fuse changing is detailed in INSTALLATION).

1.1 : GENERAL DESCRIPTION

The E2072 is an Audio Fail and Changeover unit capable of automatic and manual operation with both local and remote control. Depending on the options fitted, it can detect a failure in Composite/MPX and/or Audio analogue stereo or AES/EBU digital programme source signals and then switch to reserve programme sources. It has separately controlled internal changeover relays for the Composite/MPX and the Audio analogue/digital signals. The time to detect a failure and the threshold levels for that failure can be preset by a front panel controls. The facility to remotely select an alternative Audio main programme source is also provided.

One variant is available, the E2072-01. Three options (Analogue Stereo, AES/EBU and Composite/MPX) for that variant are available, at least one of which must be fitted.

The unit is supplied in a standard 19 inch rack mount steel box of 1U height and approximately 250mm depth. The front panel uses a single momentary tactile switch and separate high intensity red, green and yellow light emitting diodes (leds). The rear panel has a standard D connector for remote control inputs and outputs, 75Ω BNC coaxial connectors for MPX signals, XLR connectors for Left/Right analogue and AES/EBU signals and an additional stereo 1/4in jack socket for connection to a low level reserve audio programme source such as a CD or MP3 player. This last input is internally amplified with two levels of gain being selectable. For the mains supply, a standard three pole IEC connector is provided. Although this mains connection carries a protective earth wire, a separate earth terminal is also provided for permanent connection to a 'rack ground'.

The unit is capable of operation from 85-264V AC single-phase mains supplies. Total power consumption does not exceed 25VA (actual consumption largely depending on the current consumed by any external devices powered by the unit). The AC supply connector has its own fuse, accessible from the rear panel. A re-settable fuse protects a +12V DC supply output from the unit.

The unit uses micro-controller based software control, utilising up-datable 'flash' memory. Comprehensive hardware/software 'watchdogs' are incorporated which illuminate a front panel CPU ALARM led if a software fault occurs. This automatically switches off other front panel leds as their indications may be erroneous in this circumstance and also defaults all path routing relays to select the normal main programme sources (as is the case when the unit is not powered).

The unit consists of a single main printed circuit board connected to separate front panel sections, one or two plugged-in Digital Signal Processing boards, an AES/EBU receiver board (as required by options) and a switched mode power supply, allowing easy replacement of all these sections. These are described as follows (1.1.1 - 4 inc.).

Front and rear views (E2072-01GA), a block diagram (E2072-01BK) and a circuit diagram (E2072-01CT) are bound at the rear of this handbook. These should be consulted whilst reading the handbook text.

1.1.1 Main (and Front Panel) Board

This board contains all the control circuitry utilising a single micro-controller. The board is powered by regulated +12V dc from the switched mode power supply (see section 1.1.4) and contains an additional +5V and -11.5V regulators for other circuitry on the board. The +12V supply is also made available, via a re-settable fuse, at the rear CONTROL connector, principally for external relays/switches and remote monitoring/control equipment. The three small front panel boards containing the DELAY switch, led displays and two threshold setting potentiometers are connected to the Main Board by miniature ribbon cable connectors.

The majority of inputs and outputs are via chains of parallel to serial and serial to parallel converters respectively. These inputs are from the internal option setting switch, SW5, from the AES/EBU Input Board and from the rear panel CONTROL connector (1)SK04. The outputs are to the front panel led displays (except signal PRESENT leds) to all the signal path selector control relays and again to the rear panel CONTROL connector. Conversion to streams of serial data at the micro-controller ports is required because of the high number of inputs and outputs.

The internal software option setting switch, SW5, allows various operating functions and parameters to be preset for specific systems being controlled (see section 2.3.4).

All inputs and outputs at the rear panel connectors are protected by either relay isolation or by zener diodes, current limiting resistors and capacitor/resistor/impeder filtering. External audio reserve programme source equipment control is via two internal changeover relays which can be configured as separate momentary start/stop command (2 x pole/no contacts) or as a continuous on/off command (pole/nc/no contacts). These relays are controlled directly from micro-controller outputs.

Other outputs directly from the micro-controller provide external indication of 'Alternative' programme source selected (via the rear panel CONTROL connector) and provide 'W.Dog Pulse' outputs to drive the hardware watchdog mono-stable circuit, which provides a front panel CPU ALARM led and rear panel remote indication if the program within the micro-controller fails to run. In this case, the mono-stable automatically turns off all the serially derived front panel and signal path relay outputs so that no erroneous display is presented and so that all path relays select the normal main signal sources (as is the case when the unit has no power applied).

Inputs directly to the micro-controller are from the front panel DELAY switch and from the optional DSP and AES/EBU Input Boards. These latter inputs indicate presence and correct operation of the boards (for 'plug and play') as well as presence of signals above the set threshold levels. The Main Board has provision for up to two DSP Boards and a single AES/EBU Input Board (see following sections 1.1.2 and 1.1.3). At least one DSP Board must be fitted for any operation to take place.

Other single inputs are from the on-board programming connector.

Separate path selector relays are provided to enable changeover from main to reserve Composite/MPX programme sources, changeover from main to reserve Audio programme sources (analogue left/right or AES EBU) selection of an alternative main Audio programme source and forcing left or right channel to be the sole source for both main Audio programme source channels. All the Audio signal paths are balanced, floating within the unit. The Audio reserve programme source can, if required, be connected via a rear panel 1/4in stereo jack socket instead of via the XLR connectors. This jack input, which is selected via internal links, has two levels of gain (+6dB and +12dB) set by a rear panel switch. The gain is provided by an operational amplifier, followed by a balanced output buffer.

Three other operational amplifiers are provided to buffer and amplify the main Composite/MPX, the main Audio analogue left and the main Audio analogue right programme source signals to feed the following DSP Boards (see following section 1.1.2). In the case of the Audio sources, these are transformer isolated.

It should be noted that all the above described sections of the Main Board are always fitted, even if not required by the option fitted. The only difference between the options is in the fitting of the DSP and AES/EBU Boards (see following sections 1.1.2 and 1.1.3).

1.1.2 Digital Signal Processing (DSP) Boards

One DSP Board is fitted to process the Composite/MPX signals (/M option) and a separate but identical DSP Board is fitted to process the Audio analogue left/right (/S option) or, in conjunction with an AES/EBU input Board (see following section 1.1.3) the AES/EBU signals (/E option).

On the combined /SM and /EM options two such identical DSP Boards are fitted. The DSP Board software is able to perform either Composite/MPX or Audio analogue left/right - AES/EBU signal processing, the position in which it is fitted in the Main Board determining which of the two processing programmes is run. The DSP Board is programmed using an I²C input to an EEPROM fitted on the board.

The DSP Board uses a standard stereo DSP processor which also has 10 channels of programmable input/output with some also usable as additional A/D converter inputs. The twin analogue audio inputs are high impedance and the twin 'processed' audio outputs are via analogue buffer amplifiers, which include a degree of additional low-pass filtering. Input A/D converters and output D/A converters are 24bit with a sampling frequency of 96kHz. The Main Board +5V supply is reduced to +3.3V by an on-board regulator for the DSP processor and other devices on the board (apart from the analogue output buffers which operate at +5V).

The board is 'plug and play' and thus will operate automatically in the mode determined by the position in which it is fitted (left for /M, middle for /S or /E). When this board is not fitted in a particular position, or if it does not run the programme correctly, the relevant front panel leds will remain off.

On the Composite/MPX (/M option) a DSP Board is fitted in the left hand socket on the Main Board. In this case, the main programme source signal is directed into the audio A/D converter of just one of the stereo channels. All following processing functions are then performed digitally. The signal is first filtered separately by a 300Hz to 3kHz bandpass filter (to recover the principle audio components of the Composite/MPX L+R 'sum' signal) and by a 100Hz wide bandpass filter centred at 19kHz (to recover the pilot tone). The filtered signals are separately presented to the analogue 'stereo' outputs, via the twin output D/A converters, for test purposes only.

The digital L+R signal is then peak detected (positive and negative peaks) with a time constant appropriate for typical programme material, with the resulting dc level applied to one input of a comparator. The other variable comparison or threshold level is derived from the analogue dc level set by the front panel COMP ADJ potentiometer. This is directed to one of the additional A/D converters (8 bit, 96kHz) on the DSP Board processor and thence to the comparator. When the detected and smoothed L+R sum signal is above the set level, the output of the comparator is at a high voltage, which directly illuminates in 'real-time' the front panel COMP PRESENT green led and signals to the Main Board processor that audio is present on the Composite/MPX main programme source signal.

Similarly, the digital 19kHz signal is also peak detected with an appropriate time constant, with the resulting dc level applied to one input of another comparator. In this case, the other comparison or threshold level is fixed. When the detected and smoothed 19kHz signal is above the fixed level, the output of the comparator is at a high voltage, which signals to the Main Board processor that the 19kHz pilot is present on the Composite/MPX main programme source signal

On the Audio analogue left/right (/S option) a DSP Board is fitted in the middle socket on the Main Board. In this case, the main programme source signal is directed into the twin audio A/D converters (left to one converter, right to the other). All following processing functions are then performed digitally. The left and right signals are first filtered separately by 300Hz to 3kHz bandpass filters (to recover the principle audio components of the left and right channels). The filtered signals are separately presented to the analogue 'stereo' outputs, via the twin output D/A converters, for test purposes only.

The digital left and right signals are then separately peak detected (positive and negative peaks) with time constants appropriate for typical programme material, with the resulting dc levels applied to separate comparators. The other variable comparison or threshold level for both comparators is derived from the analogue dc level set by the front panel AUDIO ADJ potentiometer. This is directed to one of the additional A/D converters (8 bit, 96kHz) on the DSP Board processor and thence to the

comparators. When the detected and smoothed left or right signal is above the set level, the output of that comparator is at a high voltage, which directly illuminates in 'real-time' the relevant front panel AUDIO LEFT PRESENT or AUDIO RIGHT PRESENT green led and signals to the Main Board processor that audio is present on the left or right main programme source signal.

On the Audio AES/EBU (/E option) a DSP Board is again fitted in the middle socket on the Main Board but now with the additional AES/EBU Input Board fitted in the right hand socket (see following section 1.1.3). In this case, the main programme source signal is first directed into the AES/EBU Input Board. The receiver circuit on that board, under control of the DSP Board, then transfers the left and right channel signals in digital form over an I²S bus to the DSP Board. All following processing functions are then also performed digitally. The left and right signals are first filtered separately by 300Hz to 3kHz bandpass filters (to recover the principle audio components of the left and right channels). The filtered signals are separately presented to the analogue 'stereo' outputs, via the twin output D/A converters, for test purposes only.

The digital left and right signals are then separately peak detected (positive and negative peaks) with time constants appropriate for typical programme material, with the resulting dc levels applied to separate comparators. The other variable comparison or threshold level for both comparators is derived from the analogue dc level set by the front panel AUDIO ADJ potentiometer. This is directed to one of the additional A/D converters (8 bit, 96kHz) on the DSP Board processor and thence to the comparators. When the detected and smoothed left or right signal is above the set level, the output of that comparator is at a high voltage, which directly illuminates in 'real-time' the relevant front panel AUDIO LEFT PRESENT or AUDIO RIGHT PRESENT green led and signals to the Main Board processor that audio is present on the left or right main programme source signal.

Note that if the AES/EBU Input Board does not detect a valid clock on the incoming signal, the DSP Board is automatically disconnected from that signal and should not normally display any activity (the front panel AES/EBU status led will be red in this circumstance, with the reserve programme source automatically selected).

1.1.3 AES/EBU Input Board (/E option only)

This board uses a standard AES/EBU receiver to convert the standard AES/EBU digital audio signal to I²S 'Inter-IC-Sound' bus standard signals, which feed the Audio DSP Board (see previous section 1.1.2) with the DSP Board as the 'master'. The input to the board is capacitor fed and transformer isolated, presenting an approximately 108Ω load. The Main Board +5V supply is reduced to +3.3V by an on-board regulator for the receiver and other devices on the board.

The board also generates an 'AES OK' status signal, which is used to detect the presence of the clock of the input signal. If present (at 32kHz, 44.1kHz or 48kHz) the front panel AUDIO AES/EBU led will be green otherwise it will go red and initiate a change to the AUDIO AES reserve programme source. This signal also causes the associated DSP Board to be disconnected from any remaining spurious signal (see previous section 1 1.2)

The board is 'plug and play' and thus when fitted (along with a DSP Board in the middle audio position) will automatically make the Audio Fail and Changeover Unit into a /E option. When this board is not fitted, the front panel 'AUDIO AES/EBU' led will remain off.

1.1.4 Switched Mode Power Supply

This is a separate, fully enclosed 25W, AC to DC converter module, supplying regulated +12V dc to the Main Board. Its AC input is connected via a separate standard filtered IEC mains input connector with an integral fuse. Its input range is 85-264V AC, 50/60Hz, with no adjustments required.

1.2 : VARIANTS AND OPTIONS

There is only one variant (the E2072-01) with three hardware options as follows :

S	Audio Analogue Stereo Fail Detection and Switching
M	Composite/MPX Fail Detection and Switching
E	AES/EBU Fail Detection and Switching

Note that options S and E are mutually exclusive and that at least one option must be fitted
Available options are thus E2072-01/S, E2072-01/M, E2072-01/E, E2072-01/SM and E2072-01/EM
Options can be changed as required using simple 'plug and play' modules, which require no setting-up. Internal soldered links will also need changing when changing from /S to /E option or vice versa.

1.3 TECHNICAL SPECIFICATIONS

<p>Left (AES)/Right Audio Interface Ports</p> <p>(only functional on /S or /E options)</p>	<p>On the /S option, twin (Left/Right) 3pin XLR sockets for each of the main, alternative and reserve programme sources. Twin (Left/Right) 3pin XLR plugs for the output of the selected source. A 1/4in stereo jack socket is also provided as an internally selectable alternative for the reserve programme source.</p> <p>When only a single main channel input (left or right) is registered as failed, the remaining good channel is directed to both main channel inputs (i.e the source effectively becomes mono).</p> <p>On the /E option, AES/EBU signals only make use of the Left (AES) connectors.</p> <p>All XLR ports are balanced (floating) but can be made unbalanced by grounding within the plugs or sockets used for the leads connected to the unit. Internal switches enable the main programme inputs to present 600Ω loads if required.</p> <p>The 1/4in stereo jack socket reserve input is high impedance (10kΩ) unbalanced. This feeds an amplifier with 6dB or 12dB gain (selectable using a rear panel switch). This amplifier has a floating balanced output.</p>
<p>Composite/MPX Interface Ports</p> <p>(only functional on /M option)</p>	<p>75Ω BNC sockets for the main and reserve programme sources and for the output of the selected source. Note that the screens of the cables are connected to chassis within the unit.</p> <p>Note that 50Ω or 75Ω plugs may be used to connect to these sockets.</p>
<p>Controls and Displays (front panel)</p>	<p>Single front panel switch to select delay period before signal failure causes change from main to reserve programme sources (6 steps from 5 to 140 secs). Hold on main (infinite '∞' delay) and hold on reserve can also be selected by this switch. All these switch settings (indicated by yellow or red leds) apply simultaneously to both Composite/MPX and Audio changeover functions. One or five seconds delays for return to main programme sources can be selected internally.</p> <p>Two separate twenty turn threshold level setting controls, one for Composite/MPX (/M option) and one for both left and right Audio (/S and /E options). The signal levels, below which signal failure is recognised, can be separately adjusted between about -30dBu (app. 70mV peak to peak) and +5dBu (app. 4V peak to peak). In the case of AES/EBU signals, this is with the AES/EBU coder at fsd=+20dBu. Signals present above the set threshold levels are indicated, in real-time, by green leds</p> <p>Other red, green or yellow leds indicate the present status and settings of the unit. A regularly flashing led indicates that that setting has been forced by an external remote command. Leds related only to specific S, E or M options remain off if that option is not fitted or not working correctly.</p> <p>If the main board microprocessor fails, this is indicated by the red 'CPU ALARM' led. In this situation all other leds remain off and the path routing relays are directed to the normal main programme sources.</p>

Remote Control and Monitoring	<p>Rear panel 25 Way D connector socket for parallel control and monitoring of major functions and status (see section 2.2.14).</p> <p>The connector also has a +12Vdc supply output for ancillary equipment (at approx. 150mA maximum) as well as floating relay contact outputs, which can turn on external programme source equipment when Audio analogue stereo or AES reserve sources have been selected. Internal link settings enable these relay contacts to be configured as single-pole changeover (continuous operation during selection of reserve) or as two pairs of momentary on contacts (one 'Start' pair making contact for one second when reserve is selected and one 'Stop' pair making contact for one second when main is re-selected).</p>
Environmental	<p>Ambient Temperature (operating) : 0 to +45 deg.C Ambient Temperature (storage) : -20 to +70 deg.C Relative Humidity (operating) : Less than or equal to 90%, non condensing. Altitude (operating) : Up to 3000 metres a.s.l.</p>
Mechanical	<p>Width : 483mm (19 in.) Height : 43mm (1U) Depth : 280mm intrusion into rack (including connectors) Weight : Approx. 3.5kg</p>
Power Supply	<p>85Vto 264 AC (universal input, switched mode, power supply) Both 50- 60Hz single phase plus protective earth. Power Consumption variable, but less than 25VA, dependent on external loading.</p>

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SECTION TWO : INSTALLATION

! CAUTION !

These Audio Fail and Changeover Units use **mains supply voltages**. Before commencing installation, it is recommended that the complete INSTALLATION section is read and understood. **The instructions should then be strictly followed, by suitably qualified personnel, otherwise sub-standard or even dangerous operation may result.**

2.1 : PHYSICAL DIMENSIONS AND FITTING

2.1.1 Installation Accessories

Various installation accessories may be supplied as required. A list of these (including spare fuse) is given below. Actual requirements depend on the configuration of the equipment supplied (e.g. options fitted, separate to or already fitted into a 19 inch rack, whether or not leads are supplied ready made etc.). Note that extra, unlisted parts may be required for connections to any other equipment supplied (see manuals supplied with them).

Typical Quantity	Description	Function
3 (/M Option only)	BNC type 50Ω or 75Ω coaxial free plug(s) plus coaxial cable as req'd.	For connection to Composite/MPX main, reserve and output connectors.
2-6 (/S /E Options only)	XLR 3 pin cable plug plus screened cable as req'd.	For connection to analogue Left/Right and digital AES/EBU main, reserve and alternative inputs.
1-2 (/S /E Options only)	XLR 3 pin cable socket plus screened cable as req'd.	For connection to analogue Left/Right and digital AES/EBU outputs.
1 (/S Option only)	1/4in stereo jack plug plus screened cable as req'd.	For connection to analogue Left/Right stereo reserve input jack socket.
1	25 Way D plug c/w cover.	For connection to remote control and monitoring equipment.
Length as req'd	Multi-core screened cable (number of cores as required).	Control/monitor leads.
Length as req'd	Grounding wire/strap.	For safety earth lead.
1	IEC mains connector/lead.	For connection to mains supply.
4	Screws c/w plastic cup washers and rack caged nuts.	For fixing unit into 19 inch rack.
1	1A (T) HBC 5x20mm Fuse.	For protection of mains supply input.

2.1.2 Rack Mounting

If the Audio Fail and Changeover Unit is not supplied ready mounted in a 19 inch rack, this will be required to be done at time of installation. The 19 inch rack requires at least 1U space for the unit which is fixed to the front of the racking using four screws, plastic cup washers and caged nuts. The total intrusion into the rack, including rear panel connectors, is approximately 280mm.

2.2 : EXTERNAL CONNECTIONS

2.2.1 AC SUPPLY Connector

This is a standard IEC connector PL14, at the left rear of the unit, intended for connection to a single phase (plus protective earth) supply. The supply range is 85-264VAC (50-60Hz). The input is protected by a 20mm 1A(T) HBC fuse fitted in a carrier in PL14.

! CAUTION !

The mains supply lead to the unit must use at least **3A rated three core (P+N+protective earth)** insulated cable. **An approximately 3A HBC fuse MUST be provided at the supply distribution board, or in the associated plug at the supply outlet, to protect this lead.** Also, since the supply input circuitry contains a filter, which passes current to the unit's chassis, **the chassis must be connected to a safety ground** via the earthing bolt provided adjacent to the mains supply input connector.

The IEC lead terminates at the supply outlet in three wires, generally colour coded as follows :-

Brown	Line
Blue	Neutral
Green/yellow	Prot. Earth

Care MUST be taken to connect these leads to the supply as detailed in the above table. If a lead with different coloured wires is used, further advice MUST be taken.

2.2.2 COMP MAIN Connector (functional on /M option only)

This is a 75Ω BNC coaxial socket SK03, at the right rear of the unit, used for connection to the main Composite/MPX programme source. A 50Ω or 75Ω BNC plug can be used for connection to this input, with matching screened coaxial cable, not exceeding three metres in length. This input is internally switched to the COMP O/P connector when the unit's front panel 'COMP RESERVE' red led is off.

2.2.3 COMP RES Connector (functional on /M option only)

This is a 75Ω BNC coaxial socket SK02, at the right rear of the unit, used for connection to the reserve Composite/MPX programme source. A 50Ω or 75Ω BNC plug can be used for connection to this input, with matching screened coaxial cable, not exceeding three metres in length. This input is internally switched to the COMP O/P connector when the unit's front panel 'COMP RESERVE' red led is on or flashing.

2.2.4 COMP O/P Connector (functional on /M option only)

This is a 75Ω BNC coaxial socket SK01, at the right rear of the unit, used for connection of the selected main or reserve Composite/MPX programme source signal to its intended destination (typically an FM Exciter). A 50Ω or 75Ω BNC plug can be used for connection to this output, with matching screened coaxial cable, not exceeding three metres in length. This output is internally switched to the COMP MAIN Connector when the unit's front panel 'COMP RESERVE' display red led is off and is switched to the COMP RES connector when the led is on or flashing.

2.2.5 LEFT (AES) MAIN I/P Connector (functional on /S and /E options only)

This is a three pin XLR connector SK13, at the left rear of the unit, used for connection to the left analogue (/S option) or the AES (/E option) main programme source. This input is internally switched to the LEFT (AES) O/P connector when the unit's front panel 'AUDIO RESERVE' red led is off (unless the ALT MAIN I/P has been selected as the main source). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

If required, a floating 600Ω load resistor can be switched across pins 2 and 3 using internal switch SW3/LK3 (see section 2.3.2)

2.2.6 RIGHT MAIN I/P Connector (functional on /S option only)

This is a three pin XLR connector SK12, at the left rear of the unit, used for connection to the right analogue main programme source. This input is internally switched to the RIGHT O/P connector when the unit's front panel 'AUDIO RESERVE' red led is off (unless the ALT MAIN I/P has been selected as the main source). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

If required, a floating 600Ω load resistor can be switched across pins 2 and 3 using internal switch SW2/LK2 (see section 2.3.2)

2.2.7 LEFT (AES) ALT MAIN Connector (functional on /S and /E options only)

This is a three pin XLR connector SK11, at the left rear of the unit, used for connection to the left analogue (/S option) or the AES (/E option) alternative main programme source. This input replaces the LEFT (AES) MAIN I/P when the front panel 'ALT' yellow led is flashing and is thus then internally switched to the LEFT (AES) O/P connector when the unit's front panel 'AUDIO RESERVE' red led is off. Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

2.2.8 RIGHT ALT MAIN Connector (functional on /S option only)

This is a three pin XLR connector SK10, at the middle rear of the unit, used for connection to the right analogue alternative main programme source. This input replaces the RIGHT MAIN I/P when the front panel 'ALT' yellow led is flashing and is thus then internally switched to the RIGHT O/P connector when the unit's front panel 'AUDIO RESERVE' red led is off. Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

2.2.9 LEFT (AES) RESERVE Connector (functional on /S and /E options only)

This is a three pin XLR connector SK09, at the middle rear of the unit, used for connection to the left analogue (/S option) or the AES (/E option) reserve programme source. This input is internally switched to the LEFT (AES) O/P connector when the unit's front panel 'AUDIO RESERVE' red led is on or flashing (unless, in the case of the /S option, the 1/4in Jack Input has been selected as the reserve source – see section 2.3.3). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

2.2.10 RIGHT RESERVE Connector (functional on /S option only)

This is a three pin XLR connector SK07, at the middle rear, of the unit used for connection to the right analogue reserve programme source. This input is internally switched to the RIGHT O/P connector when the unit's front panel 'AUDIO RESERVE' red led is on or flashing (unless the 1/4in Jack Input has been selected as the reserve source – see section 2.3.3). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable plug at the unit's end which is wired as follows :-

	Balanced Source Twin screened cable	Unbalanced Source Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within plug)

2.2.11 RESERVE Stereo Connector (functional on /S option only)

This is a 1/4in stereo jack socket SK08, at the middle rear of the unit, used for connection to a low level, unbalanced, analogue stereo reserve programme source. It replaces the LEFT/RIGHT RESERVE XLR inputs when selected by internal links (see Section 2.3.3). When so selected, this input is internally switched, via a stereo balanced output amplifier, to the LEFT/RIGHT O/P connectors when the unit's front panel 'AUDIO RESERVE' red led is on or flashing. Twin screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a stereo 1/4in jack plug at the unit's end which is wired as follows :-

Tip	Left Channel
Ring	Right Channel
Sleeve	Chassis ground (screen)

2.2.12 LEFT (AES) O/P Connector (functional on /S and /E options only)

This is a three pin XLR connector PL06, at the middle rear of the unit, used for connection of the main or reserve left analogue (/S option) or AES (/E option) programme source signal to its intended destination (typically an FM Exciter). This output is internally switched to the LEFT (AES) MAIN or ALT connector when the unit's front panel 'AUDIO RESERVE' red led is off. It is switched to the LEFT (AES) RESERVE connector when the red led is on or flashing (or, in the case of the /S option, via a balanced stereo amplifier, to the left input of the 1/4in Jack Input when that input has been selected as the Reserve source – see section 2.3.3). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable socket at the unit's end which is wired as follows :-

	Balanced Load Twin screened cable	Unbalanced Load Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within socket)

On the AES /E option PL06 is the sole output of the digital AES/EBU signal.

2.2.13 RIGHT O/P Connector (functional on /S option only)

This is a three pin XLR connector PL05, at the right rear of the unit, used for connection of the main or reserve right programme source signal to its intended destination (typically an FM Exciter). This output is internally switched to the RIGHT MAIN or ALT connector when the unit's front panel 'AUDIO RESERVE' red led is off. It is switched to the RIGHT RESERVE connector when the red led is on or flashing (or, via a balanced stereo amplifier, to the right input of the 1/4in Jack Input when that input has been selected as the reserve source – see section 2.3.3). Screened cable, not exceeding three metres in length, should be used for the interconnecting lead.

The lead terminates in a three pin XLR cable socket at the unit's end which is wired as follows :-

	Balanced Load Twin screened cable	Unbalanced Load Single screened cable
Pin 1	Chassis ground (screen)	Chassis ground (screen and link to Pin3)
Pin 2	Signal (+) floating	Signal
Pin 3	Signal (-) floating	Link to Pin1 (within socket)

2.2.14 CONTROL Connector

This is a 25 Way D socket SK04 at the rear of the unit. This is used to enable basic external monitoring and control. Multi-core screened cable, not exceeding 3 metres in length, should be used for the interconnecting lead.

The lead terminates in a 25 Way free D plug at the Unit's end which is wired as follows :-

Pin	Function	Options
1	Force Delay to 140 secs input - (pull to ground to select 140 secs fail delay)	All
2	Force Delay to ∞ input – (pull to ground to select infinite fail delay)	All
3	Force Alt I/P to be audio main programme source input – (pull to ground to replace Main L/R I/P by Alt. L/R I/P)	/S /E
4	Common - (chassis ground for all inputs and outputs)	All
5	Alt I/P Selected output - (pulled to ground when Alt I/P selected instead of Main)	/S /E
6	Audio L/R Analogue (or AES) Present output – (pulled to ground when both L and R channels of the analogue or AES signal are above the threshold set by the front panel control)	/S /E
7	Audio L/R Analogue Both on Left output – (pulled to ground when both Left and Right Audio analogue outputs are connected to the left analogue input)	/S
8	AES (Clock) Present output – (pulled to ground when AES clock present)	/E
9	Comp/MPX Pilot Present output – (pulled to ground when Comp/MPX pilot present)	/M
10	Common - (chassis ground for all inputs and outputs)	All
11	Continuous Relay N/O contact or Momentary Start Relay N/O Contact output (for controlling external reserve Audio L/R analogue or AES programme source)	/S /E
12	Continuous Relay Pole or Momentary Start Relay Pole output (for controlling external reserve Audio L/R analogue or AES programme source)	/S /E
13	+12v dc fused supply output (150mA maximum)	All
14	Force Audio L/R Analogue to Both Left input - (pull to ground to connect both Left and Right Audio analogue outputs to the left analogue input)	/S
15	Force Audio L/R Analogue to Both Right input - (pull to ground to connect both Left and Right Audio analogue outputs to the right analogue input)	/S
16	Force Comp/MPX to Reserve input - (pull to ground to connect Comp/MPX output to the Comp/MPX reserve input)	/M
17	Force Audio L/R Analogue (or AES) to Reserve input - (pull to ground to connect L/R Audio analogue (or AES) output to the L/R analogue (or AES) reserve input)	/S /E
18	CPU status output (pulled to ground when Main Board CPU good)	All
19	Audio L/R Analogue Both on Right output - (pulled to ground when both Left and Right Audio analogue outputs are connected to the right analogue input)	/S
20	Audio L/R Analogue (or AES) on Reserve output - (pulled to ground when L/R Audio analogue (or AES) output is connected to the L/R analogue (or AES) reserve input)	/S /E
21	Comp/MPX (L+R) Present output - (pulled to ground when the Comp/MPX <u>sum</u> L+R signal is above the threshold set by the front panel control)	/M
22	Comp/MPX on Reserve output - (pulled to ground when Comp/MPX output is connected to the Comp/MPX reserve input)	/M
23	Momentary Stop Relay Pole output – not used in Continuous mode (for controlling external reserve Audio L/R analogue or AES programme source)	/S /E
24	Continuous Relay N/C contact or Momentary Stop Relay N/O Contact output (for controlling external reserve Audio L/R analogue or AES programme source)	/S /E
25	Common - (chassis ground for all inputs and outputs)	All

Any of the 'pulled to ground when' status outputs required to be used, must be returned to a supply of no greater than 25V and must be limited to drawing no more than 50mA each by additional external resistance (100Ω is provided internally).

All of the 'pull to ground to' inputs are internally pulled up to +5V via 12kΩ and must be continuously fed from a voltage free source of less than 1kΩ to ground to operate (open circuit for a high non-operating state). These inputs are protected against constant application of up to ±25V dc directly applied.

The start and stop relay contacts and poles are fully floating and can switch up to 1A at 30V DC. They can provide momentary stop/start or continuous on/off control as determined by an internal switch and link (see section 2.3.4).

2.3 SETTING UP PROCEDURES

2.3.1 Fuses

If any problems occur after the Audio Fail Changeover Unit has been installed and switched on, fuses may need to be checked and possibly replaced. However, a blown or re-settable fuse failure would generally indicate the presence of a fault, which would need correcting.

The type, function and access to fuses is as follows :

Type	Function	Access
1A (T) HBC 5x20mm Fuse One only	For protection of mains supply input circuitry. If the fuse goes open circuit, all of the Unit's front panel displays will go out and control will cease. All the internal path routing relays will select the main inputs (L and R analogue, AES and Comp/MPX) to be connected to the outputs.	At the left rear of the Unit, the single small fuseholder part of the associated mains input socket. (1)FS1/(1)PL14 ! CAUTION ! this is a high energy circuit and thus care must be taken if replacing the fuse with power on.
0.5A Hold, 60V Resettable Fuse One only.	For protection of the Unit's +12V supply output on pin 13 of (1)SK04 ('Control'). If the fuse goes high impedance, any external items powered by this supply will not be operative.	Inside Unit, on rear left middle of Main Board (FS1). Note this fuse will automatically reset if the Unit is temporarily disconnected from the mains supply, or the supply is temporarily switched off, or if the external connection is removed.

2.3.2 Left Main Input and Right Main Input Impedance Setting (/S Option only)

! CAUTION !

The following switch settings require the top dust cover to be removed. The mains supply to the Audio Fail and Changeover Unit MUST be switched and disconnected before removing the cover. Once set as required, the cover must be re-fitted before the unit is reconnected to the mains power supply.

The impedance setting links are detailed on diagram E2072-01GA bound at the rear. The links are either physically removable, two position, shorting types (LK) or miniature changeover switches (SW).

The impedance setting switches SW/LK2-3 are at the right rear of the main printed circuit board (to access, remove top dust cover – 12 M3 screws).

Switch/Link	Function	Default (Factory) Setting
SW2/LK2	Right Channel Input Impedance – High Z or Low Z (600Ω)	High Z
SW3/LK3	Left Channel Input Impedance – High Z or Low Z (600Ω)	High Z

For the High Z setting the switches should be in the rear facing positions. For the Low Z, 600Ω setting, they should be in the front facing positions. Normally both should be in the same setting position.

Note that on the /E (AES) option these switches should be left in the High Z position.

2.3.3 Left/Right Reserve Input XLR or 1/4in Jack Input Setting (/S Option only)

! CAUTION !

The following switch settings require the top dust cover to be removed. The mains supply to the Audio Fail and Changeover Unit **MUST** be switched and disconnected before removing the cover. Once set as required, the cover must be re-fitted before the unit is reconnected to the mains power supply.

The input connector setting links are detailed on diagram E2072-01GA bound at the rear. The links are four physically removable, two position, shorting types fitted on two 6 pin headers CON14 and CON15 at the middle rear of the main printed circuit board (to access, remove top dust cover – 12 M3 screws).

Switch/Link	Function	Default (Factory) Setting
CON14	Right Channel Reserve Input – XLR or 1/4in Jack	XLR
CON15	Left Channel Reserve Input – XLR or 1/4in Jack	XLR

For the XLR inputs all the four links should be in the right hand positions. For the 1/4in jack input they should all be in the left hand positions.

The 1/4in jack position is normally selected when the programme source for the L/R analogue stereo reserve signal only has a relatively low output level (e.g, a CD or MP3 player). As well as providing a more conventional physical connection for such a source, this input also includes a stereo amplifier with high input impedance (10k Ω) and either +6dB or +12dB gain to amplify the lower level. The gain level is selected using the rear panel switch (1)SW01 underneath the jack socket.

2.3.4 Internal Software Settings

! CAUTION !

The following switch settings require the top dust cover to be removed. The mains supply to the Audio Fail and Changeover Unit **MUST** be switched and disconnected before removing the cover. Once set as required, the cover must be re-fitted before the unit is reconnected to the mains power supply.

The switch SW5 and associated link SW4/LK4 are detailed on diagram E2072-01GA bound at the rear

The internal software option setting switch SW5 (eight way DIL switch) is at the middle right of the main printed circuit board (to access, remove top dust cover – 12 M3 screws).

Software Option DIL Switch SW5							
No.	Function	Off	On	No.	Function	Off	On
1	Return to Main Delay	Fast (1S)	Slow (5S)	5	Not Used		
2	Stop/Start Relay Function (note; also requires setting of SW4/LK4 – see following guide)	Continuous (SW4/LK4 on)	Momentary (SW4/LK4 off)	6	Not Used		
3	Pilot Detector	Enabled	Disabled	7	Not Used		
4	Not Used			8	DIL Switch test	Normal	Test

The switches should be checked or set during installation using the following guidelines.

1	This switch determines the delay before the Main MPX or Left/Right Source is reselected after it becomes continuously good again after a failure has caused a Reserve channel to be selected.
2	<p>This switch determines if the Left/Right Reserve programme source control provided by relay contacts (pins 11,12, 23 and 24 of rear panel CONTROL connector SK04 – see section 2.2.14) is continuous or momentary.</p> <p>When continuous is selected, three of the available relay outputs provide a changeover switch function, which remains active during the whole of the period that Left/Right Reserve is selected.</p> <p>When momentary is selected the four available contacts form into two isolated pairs. One pair makes contact for one second when Left/Right Reserve is selected ('Start') the other pair makes contact for one second when Left/Right Main is selected ('Stop').</p> <p>It is important to note that the separate single switch SW4/LK4 MUST be in the 'On' position when Continuous is selected and MUST be in the 'Off' position when Momentary is selected. SW4/LK4 is located on the Main Board at the rear middle left between relays RLB and RLC.</p>
3	On the /M Composite/MPX option, this switch determines if absence of a 19kHz pilot tone on the main Composite/MPX programme source will cause a changeover to the reserve Composite/MPX programme source. This will happen when the switch is 'off', so enabling the detector. If the Composite /MPX main programme source is essentially mono (i.e. no pilot), this switch should be set to 'on' to disable the detector.
8	This switch is for test purposes only (checking the operation of the whole of the DIL switch) and MUST be left in the 'off' normal position.

The factory default settings for SW5 is all 'off' and thus SW4/LK4 'on'.

2.3.5 Front Panel Control Settings

During installation, the front panel DELAY switch, COMP ADJ potentiometer (/M option) and AUDIO ADJ (/S and /E options) will need setting for automatic operation (see section 3.2).

For automatic operation, the DELAY switch can be set between 5 and 140 seconds (six steps). This equals the time for which the main programme source signal is continuously below the COMP or AUDIO ADJ preset levels before the reserve programme source is automatically selected. The delay applies to both COMP and AUDIO (on /SM and /EM options) though the selection of the two reserve programme sources is made completely independently i.e. one can be on main and one on reserve.

For normal programme content a delay of 30 or 45 seconds is usually optimum. Longer delays may be chosen if the programme content contains longer quiet periods (as sometimes encountered in the broadcasting of ceremonies). Shorter periods may be chosen if required. The switch may also be used to select a longer delay temporarily or to set both COMP and AUDIO both permanently on the main programme sources ('∞' infinite delay) or permanently on the reserve programme sources ('Reserve' delay) see section 3.3. Independent automatic return to main programme sources occurs one or 5 seconds after the main programme source is continuously above the COMP or AUDIO ADJ preset levels, time depending on the setting of SW5 switch 1 (see previous section 2.3.4).

The COMP ADJ (/M option) and AUDIO ADJ (/S and /E options) are normally preset at delivery to correspond to -15dBu (400mV peak to peak sinewave). If required however, they may be individually re-adjusted anywhere in the range -30dBu (70mV peak to peak) to +5dBu (4V peak to peak) to ensure that the actual normal programme content is always above threshold level, as indicated by the adjacent green COMP PRESENT (/M option) and AUDIO LEFT and RIGHT PRESENT (/S and /E options) leds. Note that some flickering of these leds is allowable as long as they never remain off for greater than the set delay period. In the case of audio, this applies to both LEFT and RIGHT leds.

2.3.6 Remote Control and Monitoring

Remote and control and monitoring of the Audio Fail and Changeover Unit is made possible by connections to the rear panel CONTROL connector. Section 2.2.14 details the pin-outs, operation and electrical characteristics of this connector. The following table lists the individual operations.

Pin	Function	Options
1	Force Delay to 140 secs input - flashes relevant front panel led	All
2	Force Delay to ∞ input - flashes relevant front panel led	All
3	Force Alt I/P to be audio main programme source input- flashes relevant front panel led *	/S /E
5	Alt I/P Selected output	/S /E
6	Audio L/R Analogue (or AES) Present output - both L and R channels must be present	/S /E
7	Audio L/R Analogue Both on Left output	/S
8	AES (Clock) Present output	/E
9	Comp/MPX Pilot Present output **	/M
11	Continuous Relay N/O contact or Momentary Start Relay N/O Contact output ***	/S /E
12	Continuous Relay Pole or Momentary Start Relay Pole output ***	/S /E
14	Force Audio L/R Analogue to Both Left input- flashes relevant front panel led ****	/S
15	Force Audio L/R Analogue to Both Right input- flashes relevant front panel led ****	/S
16	Force Comp/MPX to Reserve input - flashes relevant front panel leds	/M
17	Force Audio L/R Analogue (or AES) to Reserve input - flashes relevant front panel leds	/S /E
18	CPU status output (pulled to ground when Main Board CPU good)	All
19	Audio L/R Analogue Both on Right output	/S
20	Audio L/R Analogue (or AES) on Reserve output	/S /E
21	Comp/MPX (L+R) Present output – the sum of L+R must be present, L or R may be absent	/M
22	Comp/MPX on Reserve output ***	/M
23	Momentary Stop Relay Pole output ***	/S /E
24	Continuous Relay N/C contact or Momentary Stop Relay N/O Contact output	/S /E

The required operations are enabled by connections to suitable parallel interface remote control and monitoring equipment, which meets the requirements given in section 2.2.14.

*The Force Alt I/P to be audio main programme source input (pin3) is the only way by which an alternative main programme source may be selected. When this is done, operational references to the Audio 'main programme source' would refer to this alternative input.

**The Comp/MPX Pilot Present output is not affected by the state of the pilot detector (on or off – see section 2.3.4). Even when the detector is disabled, this output will still indicate if a 19kHz pilot is found to be present.

***The relay contacts (pins 11, 12, 23 and 24) are used to switch on sources of reserve programme content when the audio reserve programme source is selected and then to switch it off again on return to audio main programme source. Momentary start/stop (2 x pole/no) or continuous on/off (pole/nc/no changeover) control can be selected by use of internal DIL switch SW5, switch 2 in association with SW4/LK4 (see section 2.3.4).

****The Force Audio L/R Analogue to Left or Right inputs (pins 14 and 15) can only be used one at a time to produce a mono signal output from either the Left or Right input. If both are connected to ground at the same time, they will cancel each other, causing operation to remain on stereo.

Remote operation is further covered in section 3.4

SECTION THREE : OPERATION

Once installed and set up as described in Section Two, manual operation and automatic control can be provided using the Audio Fail and Changeover Unit. This unit also provides comprehensive remote control and monitoring facilities. Note that the references to 'Composite/MPX' only applies to units fitted with the M option and references to 'Audio' only apply to units fitted with the /S (analogue) or /E (AES) option.

3.1 CONTROLS AND DISPLAYS

The front panel controls and displays available and their functions are as follows :-

3.1.1 COMP ADJ and AUDIO ADJ Preset Potentiometers and Leds

These preset potentiometers are used to set the levels at which the main programme sources will register as being present. The two potentiometers are completely independent allowing different levels to be set for Composite/MPX and Audio (analogue or AES left and right channels). The unit is normally delivered with both these potentiometers set for -15dBu sinewave (approximately 400mV peak to peak). Setting of these on installation is detailed in section 2.3.5.

The associated 'COMP PRESENT' led shows green when the Composite/MPX Left+Right component is above the COMP set level. The associated 'AUDIO LEFT PRESENT' and 'AUDIO RIGHT PRESENT' leds show green when audio left and right channels respectively are above the AUDIO set level. These leds indicate the instantaneous states of these signals and are not affected by the setting of the DELAY switch (see 3.1.3 below).

It should be noted that these potentiometers and led displays only monitor the main or (in the case of the audio channel) alternative main programme sources, not the reserve programme sources. The AUDIO ALT led flashes yellow when the alternative source is remotely selected, effectively replacing the normal main source (see sections 2.2.14 and 2.3.6).

3.1.2 CPU ALARM Led

If the main board microprocessor is not operating correctly, the red CPU ALARM led is illuminated and all other front panel leds are switched off. In this situation, all the internal path routing relays default to selecting the normal main programme sources (as is the case when the unit is not powered).

3.1.3 DELAY Switch and Leds

This single momentary switch is used to select the delay period before the reserve signal programme source is selected after the main signal programme source falls continuously below the preset levels (see section 3.1.1 above). This delay applies to both Composite/MPX and Audio programme sources although the automatic switching of the two different main programme sources is fully independent. Six different delays ranging between 5 and 140 seconds can be selected.

This switch can also select infinite delay (∞) which effectively means that both Composite/MPX and Audio are held on their respective main programme sources, even if they are not present above the set levels. Similarly, the switch can also select 'RESERVE' which means they are both held on their respective reserve programme sources.

The delay etc. selected is indicated on the eight leds adjacent to the switch. Reserve, 140 seconds or ∞ delay can also be remotely selected (see sections 2.2.14 and 2.3.6). When this is done, the relevant led flashes to indicate that that delay is being remotely forced. This delay then takes precedence over the delay selected by the switch. The switch-selected delay etc. remains indicated by a non-flashing led and is automatically re-selected when the remote control input is removed. If only a flashing led displayed, then the remotely forced setting is the same as that selected by the switch.

3.1.4 COMP Status Leds (functional on /M option only)

These leds, on the left hand side of the front panel, indicate the status of the main Composite/MPX signal. The three leds remain off if the /M option is not fitted or if the associated DSP board is not working correctly.

The L+R led is green when the Composite/MPX L+R sum signal is verified as being continuously above the preset COMP level (see 3.1.1) for at least one or 5 seconds (depending on the setting of the internal software option switch SW5 - see section 2.3.4). Note that even if one channel (L or R) is low or has failed, as long as the sum L+R is above the preset level, the led will remain green.

The RESERVE led shows red when the Composite/MPX output is connected to its reserve programme source. This led flashes red when this connection is remotely forced (see sections 2.2.14 and 2.3.6).

When the pilot detector is enabled (see section 2.3.4) the PILOT led shows green when a 19kHz pilot is detected continuously above a level of approximately -20dBu (225mV peak to peak) for at least 0.5 seconds. When detected continuously below that level, for at least one second, the led shows red. When the pilot detector is not enabled, the PILOT led remains off, though the rear panel output remains operative (see following paragraph)

The led operations are mimicked, in binary form by the rear panel CONTROL connector, apart from any 'flashing', indications being continuous (see sections 2.2.14 and 2.3.6).

3.1.5 AUDIO Status Leds (as functional on /S option only)

These leds, on the left hand side of the front panel, indicate the status of the main or alternative main Audio (analogue left/right) signals. The five leds remain off if the /S option is not fitted or if the associated DSP board is not working correctly.

The LEFT/RIGHT led is green when the left and the right signals are both verified as being continuously above the preset AUDIO level (see 3.1.1) for at least one or 5 seconds (depending on the setting of the internal software option switch SW5 - see section 2.3.4).

The MONO LEFT or RIGHT led shows red when both left and right channels of the Audio output are connected to either the left or the right main programme source channel (i.e. a mono output). This happens when just one of the main programme source channels (right or left) is verified as being continuously below the preset level for the selected delay period. The relevant led flashes red when such a connection is remotely forced (see sections 2.2.14 and 2.3.6).

The RESERVE led shows red when the Audio output is connected to its reserve programme source. This led flashes red when this connection is remotely forced (see section 2.2.14).

The AES/EBU led remains off when the /S option is fitted.

The led operations are mimicked, in binary form by the rear panel CONTROL connector, apart from any 'flashing', indications being continuous (see sections 2.2.14 and 2.3.6).

3.1.6 AUDIO Status Leds (as functional on /E option only)

These leds, on the left hand side of the front panel, indicate the status of the main or alternative main AES/EBU (digital left/right) signal. The five leds remain off if the /E option is not fitted or if the associated DSP board is not working correctly.

The LEFT/RIGHT led is green when the AES/EBU decoded left and right signals are both verified as being continuously above the preset AUDIO level (see 3.1.1) for at least one or 5 seconds (depending on the setting of the internal software option switch SW5 - see section 2.3.4).

The MONO LEFT and RIGHT leds remain off when the /E option is fitted (mono cannot be selected for the AES/EBU output).

The RESERVE led shows red when the AES/EBU output is connected to its reserve programme source. This led flashes red when this connection is remotely forced (see sections 2.2.14 and 2.3.6).

The AES/EBU led shows green when an AES/EBU clock signal is continuously present for at least 0.5 seconds. When continuously absent for at least one second, the led shows red.

The led operations are mimicked, in binary form by the rear panel CONTROL connector, apart from any 'flashing', indications being continuous (see sections 2.2.14 and 2.3.6).

3.2 AUTOMATIC OPERATION

Once the Audio Fail and Changeover Unit is installed and set-up as detailed in section 2.3.5, it is normally left unattended, operating automatically. In this situation it monitors Audio analogue (/S option) or Audio digital AES (/E option) and/or Composite/MPX (/M option) main programme sources. If a main source is continuously below the set threshold level for the set delay (5 to 140 seconds) then the appropriate reserve programme source is selected instead. The unit continues to monitor the main programme source and, if that source is then continuously above the set threshold for one or 5 seconds (depending on the setting of an internal software option switch) then it is reselected.

The Composite/MPX (/M option) main programme source should be a standard ITU BS450 stereophonic multiplex signal with a 19kHz pilot tone at about 8-10% of the total signal level. If a pilot tone is not present (i.e. mono) then the pilot detector must be disabled (see section 2.3.4).

When an Audio source (analogue or AES) and Composite/MPX sources are both being monitored in a single unit (options /SM or /EM) then automatic selection of the two reserve sources operates completely independently i.e. one can be on main and one on reserve. The threshold levels are also independently set, but the delay time has to be the same for both.

In addition to the above, the following applies to specific options :-

On Audio analogue (/S) option, if only one channel (left or right) is continuously below the preset level for the delay period, then the output of that channel is commoned with the other still present channel. Thus a mono main programmed source is created from either the remaining left or right main programme source. If the failed channel then becomes continuously above the set threshold for the one or 5 seconds, the main programme source is returned to be normal stereo.

On the Audio AES (/E) option, if the AES clock is continuously absent for one second, the reserve programme source is selected. In this case there may be some indication of signal present on the 'AUDIO LEFT PRESENT' green led. If the AES clock is then continuously present for 0.5 seconds, the main programme source will then be reselected as described in the first paragraph of this section.

On the Composite/MPX (/M) option, with the pilot detector enabled (see section 2.3.4) if the 19kHz pilot is continuously absent for one second, the reserve programme source is selected. In this case there may be some indication of signals present on the 'AUDIO LEFT PRESENT' and the 'AUDIO RIGHT PRESENT' green leds. If the pilot is then continuously present for 0.5 seconds, the main programme source will then be reselected as described in the first paragraph of this section.

3.3 MANUAL OPERATION

Manual operation directly from the front panel is mainly concerned with setting the delays and threshold levels required for Automatic Operation (see section 3.2 above). The procedure is described in section 2.3.5.

However, the DELAY switch can also be used to select infinite delay ('∞') whereby both Composite/MPX and Audio are both permanently held on their main programme sources, even if the sources are below the preset level. Similarly the switch can also select 'RESERVE' whereby they are both permanently held on their reserve programme sources. Note that this switch affects both

Composite/MPX and Audio selections, one cannot be set on reserve and one on main using this switch.

The DELAY switch may also be used to temporarily select a longer delay than normal to allow for the long quiet period sometimes transmitted during the broadcasting of ceremonies. The 140 second delay is the most useful for this purpose. Care however should be taken to return the delay to the original period as soon as possible.

3.4 REMOTE OPERATION

A number of the automatic or manual operations detailed in sections 3.2 and 3.3 can also be forced remotely via the rear panel CONTROL connector (see sections 2.2.14). This form of control is also the only means whereby the Audio alternative (main) programme source can be selected to replace its normal main programme source.

The remotely selected operation always over-rides the automatic or manual selection and is always indicated by the relevant front panel led flashing rather than being continuous. In the case of delays etc., normally selected by the front panel switch, being remotely forced instead, the original manual selection (if different) remains displayed by a continuous led. When the remote control is then removed, the original manual selection is automatically restored.

A list of the available remote control and monitoring operations is given in section 2.3.6.

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