



A CLEAR-COM COMPANY

MasterMind SPG/TSG Changeover User Guide

ISSUE 3.1

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DOCUMENT NUMBER

33000607.docx

Issue 3.1

Issue	Date	Reason for Change	Approved
2.0	12 Aug 2011	Add 330-09-01, 330-12-01	
2.1	20 Nov 2008	Minor	
2.9	2 July 2015	Major re-format - draft	
3.0	27 March 2016	New logo	
3.1	05 April 2017	Updated logo, title page, header, footer	

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1. APPLICATION

The Trilogy MasterMind Changeover unit, type 330-00-xx, provides failure detection for a pair of synchronising pulse generators (SPGs), and the mechanism to switch between them automatically or manually.

Although the unit is designed as a companion to the Trilogy Mentor XL SPG, the MasterMind may be used for any monitoring and/or switching purpose, and with SPGs of other manufacture.

As standard, a single 330-12-00 module provides monitoring of sync pulse and colour burst level, for both "A" (main) and "B" (reserve) black/burst SPG feeds. Changeover is implemented by relay, defaulting to the "A" channel on power fail.

A 330-07-00 three channel relay board is also fitted as standard to allow other video feeds to be switched. Typical applications include switching test signals or pulse outputs.

An optional SDI monitoring and changeover module is available. This decodes the data stream and checks for the presence of the correct timing/framing words. Active buffers implement the changeover.

Modular in its construction, the MasterMind allows (over and above the standard configuration) up to 6 additional modules to be fitted. One slot is reserved exclusively for an AES/EBU digital audio module. The remaining slots might typically be used to provide the unit with a total of three black/burst modules and two serial digital video modules.

Alternatively a second 330-07-00 relay changeover module may be fitted in place of two of these additional modules, to provide a total of six changeover relays for miscellaneous video feeds.

1.1 AVAILABLE OPTIONS

A MasterMind changeover unit has 9 “slots” into which modules may be fitted. Optional modules occupy a specific number of these slots as follows:

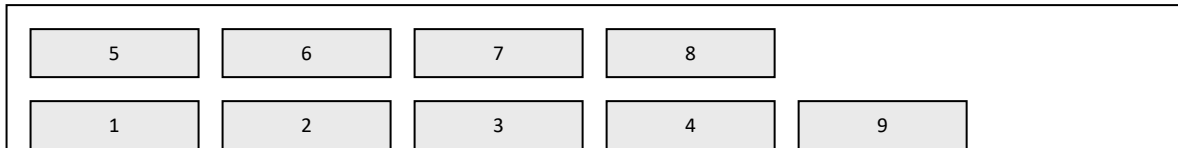
Module	Module Description	Number of slots	Status
330-07-00	Triple relay video switching	2	C
330-08-00	5 channel “balanced” relay switching	1	C
330-09-00	AES/EBU monitoring and changeover	1	C
330-09-01	Timecode monitoring and changeover	1	C
330-11-00	SD/HD-SDI monitoring	1	C
330-12-00	Black/burst monitoring and changeover	1	C
330-12-01	Tri-level sync monitoring and changeover	1	C

Notes:

- Status “C” indicates current production items June 2015.
- 330-08-00 module can switch balanced audio, AES, RS422, LTC or other similar signals.

1.2 POSITION OF OPTION BOARDS

The MasterMind chassis has 9 slots for fitting detection and changeover modules: these are shown in the diagram below.



View from the rear of MasterMind chassis

There are some restrictions on the location of module types, as shown below.

Module	Module Description	Number of slots occupied	Default Location	Preferred Locations
330-07-00	Triple relay video switching	2	1+2	5+6
330-08-00	5 channel “balanced” relay switching	1	-	9
330-09-00	AES/EBU monitoring and changeover	1	-	4
330-09-01	LTC monitoring and changeover	1	-	4
330-11-00	SDI monitoring and changeover	1	-	7,8
330-12-00	Black/burst monitoring and changeover	1	3	7,8
330-12-01	TLS (tri-level sync) monitoring & changeover	1	3	7,8

Standard module provision is:

- 1 x 330-07-00 Triple relay video switching module in slots 1 + 2
- 1 x 330-12-00 Black/burst monitoring and changeover module in slot 3.

Any additional modules will be factory fitted following the guidelines shown in “preferred locations” above.

1.3 MODULE IDENTIFICATION

To aid identification, modules with BNC connectors are fitted with a coloured plastic ring to the central BNC, visible from the outside of the chassis. See the table below for details.

Module	Module Description	Identification ring colour
330-07-00	Triple relay video switching	Orange
330-11-00	SDI monitoring and changeover	Blue
330-12-00	Black/burst monitoring and changeover	Violet
330-12-01	TLS (tri-level sync) monitoring & changeover	Yellow

1.4 TECHNICAL SUPPORT

UK & International

Please contact your supplier, or Trilogy at the UK headquarters:

Trilogy Communications Ltd
26 Focus Way
Andover
Hampshire
SP10 5NY
United Kingdom
E-mail: broadcastsupport@trilogycomms.com
Tel: +44 (0)1264 384000

1.5 WARRANTY

Conditions of the warranty may vary according to your terms of purchase. Please consult your sales documentation or if in doubt, contact your original supplier or Trilogy, quoting date of purchase and unit serial number.

1.6 UNPACKING

Carefully unpack the unit from its transit material and check the unit for signs of damage. Check the contents of the box against our despatch note and your original order to ensure that you have received the correct parts.

In the event that the unit has been damaged or does not match your order, immediately contact your supplier or Trilogy.

2. INSTALLATION

2.1 RACK MOUNTING

The 1U rack frame has integral 19" mounting ears for direct mounting in a standard 19" rack. Carefully place the unit in your rack and firmly attach it to the rack using 4 bolts.

IMPORTANT: This unit has air intakes on one side of the unit and fan assisted exhaust vents on the other side of the unit. Ensure that these have an unobstructed air flow, otherwise the unit will overheat. Pay particular attention to ensure that any rack wiring or cable trays do not obstruct the vent. 60mm of clear space should be allowed between the vents and any potential obstruction.

2.2 MAINS CONNECTION AND FUSING

Important
Power Supply Cord Used as Disconnect Means

CAUTION: THE POWER SUPPLY CORD IS USED AS THE MAIN DISCONNECT DEVICE. ENSURE THAT THE SOCKET OUTLET IS LOCATED / INSTALLED NEAR THE EQUIPMENT AND IS EASILY ACCESSIBLE.

ATTENTION: LE CORDON D'ALIMENTATION EST UTILISÉ COMME INTERRUPTEUR GÉNÉRAL. LA PRISE DE COURANT DOIT ÊTRE SITUÉE OU INSTALLÉE À PROXIMITÉ DE L'ÉQUIPEMENT ET ÊTRE FACILE D'ACCÈS.

The MasterMind is fitted with a single switched mode mains power supply, which will cope automatically with a wide input voltage range (see specification, section 10), connected via an IEC mains plug on the rear of the unit. This should be wired according to the instructions provided with a mating mains socket using suitable cable. See below for earthing requirements.

Mains cable conductors are to be three core (two wire with ground) wire gauge 18 AWG (cross sectional area 0.75mm²) Jacket to be SJT.

Covers are only to be removed by trained personnel. Shock hazard exists with covers removed; therefore disconnect mains supply before removal. Interconnection between circuit boards and panels are all SELV as defined by IEC/EN/CSA/UL 60950-1-200X. The equipment signal connections must only be connected to SELV circuits to prevent hazards from improper connection.

2.3 EARTHING REQUIREMENTS

The unit is provided with a single 4mm earthing stud on the rear panel. Incoming mains earth from the IEC connector is internally bonded to both the chassis and technical 0V to meet safety requirements and performance specifications. The stud allows the addition of an earth strap, if required, in rack installations.

2.4 REMOTE CONNECTOR PIN-OUT

The chassis is fitted with a fixed 25 way Sub-D socket. This gives indications of the unit status, and allows remote control of the selected through path. All inputs and outputs are grounded for the function stated. Pins are outputs unless indicated otherwise.

Pin	Function	Information
1	B Selected.	Ground = A, +5V = B
2	A Fail.(global)	0V = Fail, Hi Z = OK
3	B Fail.(global)	0V = Fail, Hi Z = OK
4	PSU Fail.(global)	Ground = PSU Fail, OC = PSU OK
5	Regulator Fail.(global)	Low (0V) = Fail, +5V = OK
6	Force Output to A.	INPUT (Ground to force A)
7	Force Output to B.	INPUT (Ground to force B)
8	Option Module 2 A Fail	0V = Fail, Hi Z = OK
9	Option Module 2 B Fail	0V = Fail, Hi Z = OK
10	Option Module 3 A Fail	Black/Burst Main Fail. 0V = Fail, Hi Z = OK
11	Option Module 3 B Fail	Black/Burst Reserve Fail. 0V = Fail, Hi Z = OK
12	Option Module 4 A Fail	AES / LTC Main Fail. 0V = Fail, Hi Z = OK
13	Option Module 4 B Fail	AES / LTC Reserve Fail. 0V = Fail, Hi Z = OK
14	Option Module 5 A Fail	0V = Fail, Hi Z = OK
15	Option Module 5 B Fail	0V = Fail, Hi Z = OK
16	Option Module 6 A Fail	0V = Fail, Hi Z = OK
17	Option Module 6 B Fail	0V = Fail, Hi Z = OK
18	Option Module 7 A Fail	0V = Fail, Hi Z = OK
19	Option Module 7 B Fail	0V = Fail, Hi Z = OK
20	Option Module 8 A Fail	0V = Fail, Hi Z = OK
21	Option Module 8 B Fail	0V = Fail, Hi Z = OK
22	Auto Changeover	Low (0V through 10kΩ) = Manual, +5V = Auto
23	Local Alarms Disabled.	Ground = Local Alarm Off, OC = Local Alarm On
24	Remote Alarms Disabled.	Ground = Remote Alarm Off, OC = Remote Alarm On
25	Ground.	

Notes:

- The following indications are **not** inhibited by setting the Remote Alarms switch to *Off*:
 - Manual Mode
 - Local Alarms Off
 - Remote Alarms Off
- The options indicated on pins 6 & 7 are only available if the Relay Changeover Card 330-07-00 is **not** fitted, when additional option cards may be fitted.

2.5 330-09-00 AES/EBU MONITORING AND CHANGEOVER MODULE

The chassis is fitted with a fixed 15 way Sub-D socket.

Pin	Function
1	Ground/Chassis
2	Main 1 input -
3	Reserve 1 input -
4	Output 1+
5	Main 2 input +
6	Reserve 2 input +
7	Ground/Chassis
8	Output 2-
9	Main 1 input +
10	Reserve 1 input +
11	Ground/Chassis
12	Output 1-
13	Main 2 input -
14	Reserve 2 input -
15	Output 2+

2.6 330-08-00 5 CHANNEL RELAY MODULE FOR BALANCED SIGNALS

This module is suitable for switching analogue audio, LTC, RS232, AES audio or other similar signals (without monitoring). The chassis is fitted with a fixed 37 way Sub-D socket.

The table below shows connector pins for each channel in the form (+,-) for balanced audio.

Channel	Main Input	Reserve Input	Output	Chassis
1	20,2	22,4	21,3	1
2	24,5	26,7	25,6	23
3	27,9	29,11	28,10	8
4	31,12	33,14	32,13	30
5	34,16	36,18	35,17	15
Pins 19 and 37 are also connected to chassis.				

3. CONFIGURATION

All configuration controls are located behind the front panel. To open, unscrew the latches in the direction indicated, and then pull the front panel towards you. Integral hinge wires allow the front panel to remain attached to the unit.

Behind the panel there are 6 toggle switches, 1 push switch and a bank of dual-in-line switches. A detailed indication of the status of the unit is displayed on 33 LEDs located along the front edge of the main circuit board. These are arranged as 8 groups of 4, plus a single “global fail” indicator.

All switches and LEDs are identified by a plate mounted above them. The function of each switch is described below.

- The 'Main' Channel is referred to as Channel A. This is the default in the event of a power failure.
- The 'Reserve' Channel is referred to as Channel B.

For a full description of the operation of the unit, please refer to section 4.

3.1 TOGGLE SWITCHES

3.1.1 DELAY ON/OFF

Selects the period for which a failure must persist *before* the output switches to the B channel. It is recommended that the delay is switched **ON** to ensure that the unit does not false trigger on glitches, especially when SDI detector modules are used.

3.1.2 LOCAL ALARM ON/OFF

Silences the internal alarm and enables an LED instead. A remote output reflects the status as Ground = Local Alarms Off.

3.1.3 BATTERY ON/OFF

This switch isolates the internal batteries. The unit is shipped with the batteries isolated. Note the batteries cannot be trickle charged unless this switch is on. The batteries are used to power the internal alarm and global fault LED in the event of a power failure (itself a fault condition)

3.1.4 MODE MANUAL / AUTO SELECT

This switch allows the operational mode to be selected as Manual or Automatic. The monitoring and alarm functions are not affected. The state of this switch is reflected on a remote output as Ground = Manual Mode.

3.1.5 SELECT B/A

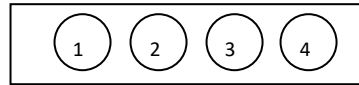
This switch allows manual selection of Channel A or B, when switched to Manual Mode.

3.1.6 REMOTE ALARMS ON/OFF

This switch disables the Remote Alarm outputs except for Remote & Local Alarm, and Manual Mode. Reflected on Remote Output as Ground = Off.

3.2 LED INDICATORS

Behind the front panel, a total of 33 LEDs provide detailed information on the status of the unit. These are arranged in 8 groups of 4, plus a single LED designated “global fail”. The 8 groups correspond to module positions 1 to 8 as shown in the diagram in Section 1.2 on page 7.



LED Arrangement (1 of 8 groups)

Card Present	Main Fail	Reserve Fail	Regulator Fail	
LED 1	LED 2	LED 3	LED 4	
0	0	0	0	Card not fitted
1	0	0	0	Card fitted but disabled (see note 1)
1	0	0	0	Card fitted, enabled, all OK (see note 1)
1	1	0	0	Card fitted, enabled, main channel failed
1	0	1	0	Card fitted, enabled, reserve channel failed
1	1	1	0	Card fitted, enabled, both channels failed
1	x	x	1	Card fitted, regulator failed

Key:

- “0” indicates LED is off
- “1” indicates LED is on
- “x” indicates don’t care

Note:

1. To distinguish between these two states, where the LED indication is identical, check the current setting of the enable/disable toggle switch.

3.3 RESET

This pushbutton resets the unit if the alarm or the relays are latched. Refer to Section 4 (Operation) for full details.

3.4 CHANNEL DISABLE SWITCHES (LABELLED CARD PRESENT)

The bank of DIL switches can be used to disable the fail outputs of cards which are fitted but unused. The switches can also be used to prevent the unit switching over if the inputs to a particular card must be temporarily disconnected. Set the switches “down” to enable (i.e. card is present) or “up” to disable (i.e. card not present).

3.5 INTERNAL JUMPER LINKS

There are no other user adjustments for this unit. Each module has a number of internal jumper links which should be left at the factory settings. For reference, the jumper links perform the following functions:

330-07-00 Triple Relay Changeover Module	
There are no links on the module.	
330-09-00 AES/EBU Monitoring and Changeover Module	
Refer to section 5.	
Main Logic Module	
J20	Disables battery during manufacture
J21	Disables battery during manufacture
330-11-00 SDI Serial Digital Video Monitoring Module	
S1	Not currently used.

4. OPERATION

The precise operation of the unit is determined by the switch settings described above. This section describes the operating principles and the effect of various switch settings.

4.1 OPERATING PRINCIPLES

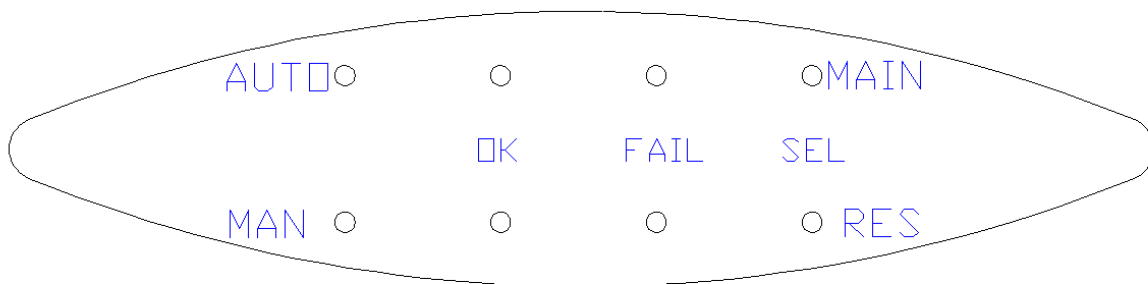
The core unit monitors inputs from a number of designated monitoring modules, each of which monitors two inputs of its own, designated Channel 'A' and Channel 'B'.

- Channel A is the Main input and is the default in the event of a power failure
- Channel B is the Reserve.

The following modules do not monitor, but change over only when the other modules switch:

- 330-07-00 Triple Relay Switching Module
- 330-08-00 5 Channel Relay Module for balanced signals.

4.1.1 FRONT PANEL LEDs.



LEDs are provided on the front panel to indicate:

- whether automatic or manual operation is selected
- whether the MAIN and/or RESERVE inputs are good
- whether the MAIN and/or RESERVE inputs are failed
- whether the MAIN or RESERVE input is selected

4.1.2 AUTOMATIC OPERATION AND RESET SWITCH.

The unit switches to the B input and the local/remote alarms will be activated (assuming they are enabled - see above) *only* -

- a. if any A input fails on an enabled monitoring channel and
- b. any B input has not failed on an enabled detector

In all other cases, the A inputs will be routed to the outputs.

Once B has been selected, it will remain selected and the alarms activated until *either* -

- a. any B input fails on an enabled monitoring channel. In this case the unit will revert to A (and the alarms will remain present)
- or
- b. the reset button is pushed after the A input is restored. This will cancel all alarms.

"Forcing" control inputs on the rear panel D-connector are available that will override the automatically selected output. These are *only* available when the unit is switched to Automatic.

If, in normal operation, a B input fails, the alarms will be activated, and selection of B will not occur, even if an A input subsequently fails.

In all fault conditions, the unit must be manually reset once the fault has been fixed.

4.1.3 EXTERNAL FAULT ON THE OUTPUT OF THE UNIT

An additional feature is provided to detect a fault on the output of the changeover unit.

If the unit detects that an A input has failed, it will switch to B. If a B input then fails within 1 second of it being selected, the unit will flag *both* channels as having failed and latch A as the selected output. A reset will be required to restore normal operation once the fault is cleared.

The assumption, in this situation, is that the fault is caused by equipment external and downstream to the SPG/Changeover combination. For example, the cable from the changeover unit may have developed a short circuit or may be un-terminated.

4.1.4 PSU OR REGULATOR FAILURE.

If the main PSU fails, input A will be selected. If the battery switch and local alarms switch is on, PSU failure will be indicated by the audible alarm sounding.

Each module within the unit has separate voltage regulators. Detection of failure of any module's regulators will latch the output to A and light both fail lamps.

4.1.5 DELAY SWITCH (SEE 3.1.1)

With the Delay Switch set to off, a detected fault will be indicated on the remote connector, and a changeover to the B input effected within 125 ms.

With the Delay Switch set to on, the individual alarms on the remote connector will still indicate individual input failures within 125 ms, but the Reserve Output will not be selected unless the failure persists for at least 1 second.

4.1.6 MANUAL OPERATION

In Manual Mode, the unit follows the A/B select switch (see 3.1.5), but the alarms will still be activated should any failure occur.

4.1.7 BATTERY ON/OFF

It should be noted that disabling the battery back-up will also prevent the batteries from being trickle charged and there will be no supply to the internal alarm.

5. 330-09-00 AES / EBU MONITORING AND CHANGEOVER MODULE

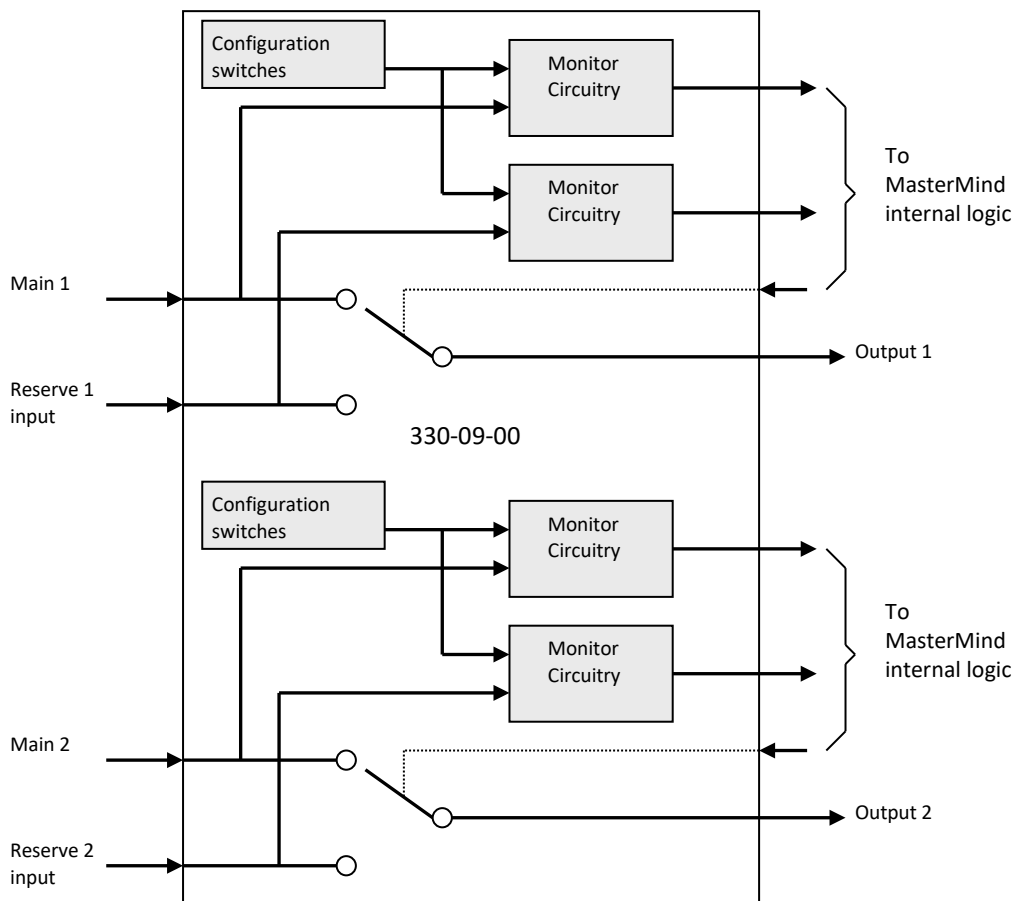
The MasterMind may be fitted with an optional AES Monitoring and Changeover module. This section gives instructions for its use. An alternative build of this module, designated 330-09-01, provides monitoring and changeover of LTC (Timecode) signals. See section 5.3 for more information.

5.1 GENERAL

The AES module has a dedicated position in the frame and occupies a single unit width. It has four AES inputs, termed Main 1, Reserve 1, Main 2 and Reserve 2. It has two AES outputs termed Output 1 and Output 2.

The module monitors all four inputs and reports the presence of each signal to the MasterMind internal logic. Under control of the internal logic, Main 1 or Reserve 1 can be routed to Output 1 and Main 2 or Reserve 2 can be routed to Output 2.

When the unit is not powered, Main 1 is routed to Output 1 and Main 2 is routed to Output 2.

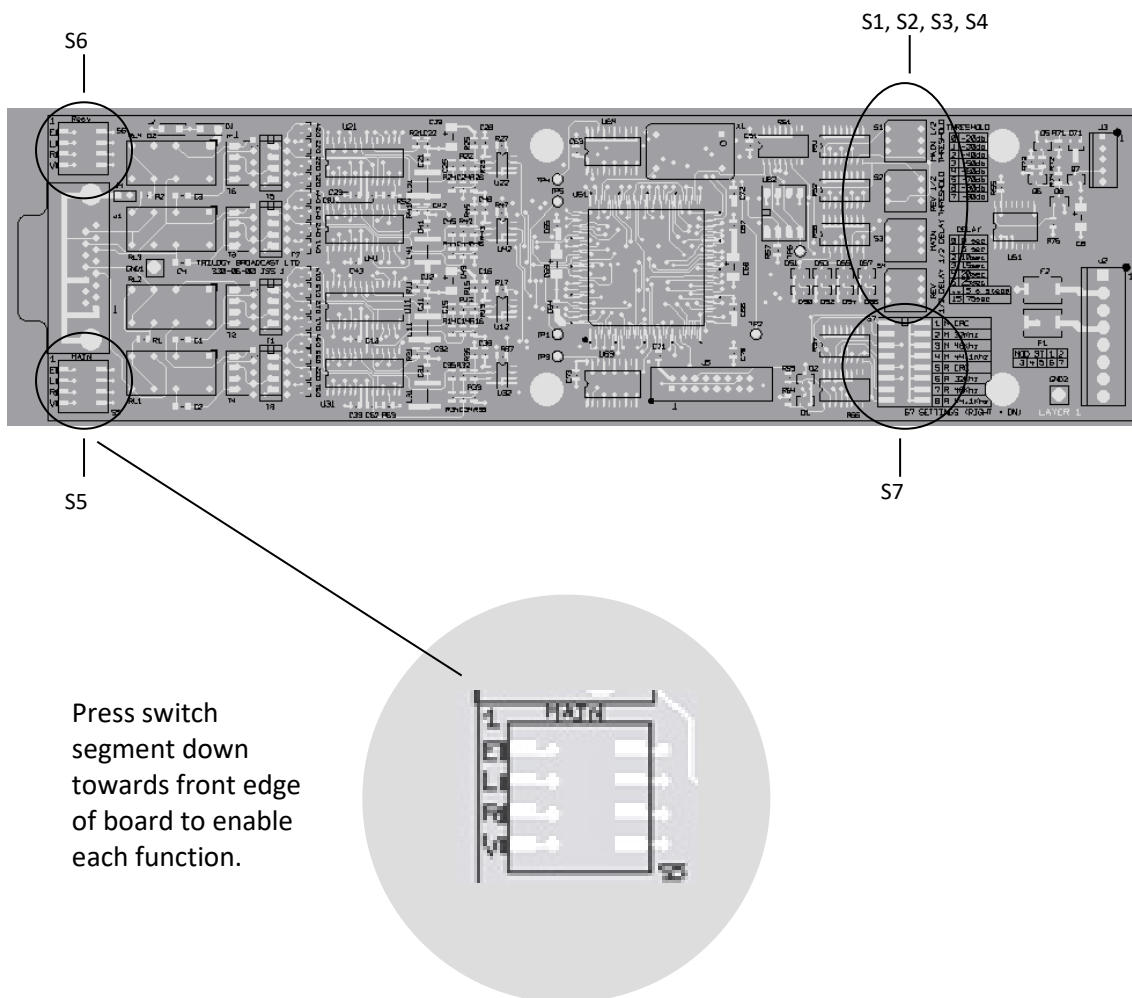


Some features of the monitoring circuitry can be configured using switches on the module. These include:

- Enable/disable the monitoring for any of the AES inputs. See 5.2.1.
- Enable/disable monitoring of the audio level contained within the AES signals. The amplitude at which an error is indicated and the delay before the error is reported are configurable. See 5.2.2.
- Enable/disable monitoring of the AES Validity flag. See 5.2.1.
- Enable/disable monitoring of the Channel status CRC. See 5.2.1.3.
- Selection of AES frequency for which an error will be indicated. See 5.2.1.3.

5.2 CONFIGURATION

Configuration of the AES Module is achieved using switches on the PCB. There are two 4-way switches at the module edge, either side of the 15 way D-connector and there are a number of multi-way switches within the module.



5.2.1 S5 AND S6

There are 2 four-way piano key style switches at the front of the board, one either side of the 15 way D-type. They house the most frequently used controls. Note that each switch function applies to Main 1 *and* Reserve 1 (S5) or Main 2 *and* Reserve 2 (S6), ensuring that each signal of each Main/Reserve pair is treated equally.

5.2.1.1 S5

Switch Pos.	Function when down (on). See diagram above.
1 ('E').	Enable Main/Reserve 1 monitoring. If this is off, monitoring of these signals will be disabled.
2 ('L').	Enable Main/Reserve 1 channel 1 audio level monitoring. If this switch is off, the audio content of the channel 1 of the AES signals will be disregarded. If this switch is on, the audio level will be compared against a threshold and an error reported if it is below the threshold for a pre-set amount of time.
3 ('R').	Enable Main/Reserve 1 channel 2 audio level monitoring. If this switch is off, the audio content of the channel 2 of the AES signals will be disregarded. If this switch is on, the audio level will be compared against a threshold and an error reported if it is below the threshold for a pre-set amount of time.
4 ('V').	Enable Main/Reserve 1 AES validity monitoring. If this is on, the validity bit in the AES data stream will be monitored and an error will be reported if this bit indicates that non-audio data is present.

5.2.1.2 S6

Switch Pos.	Function when down (on). See diagram above.
1 ('E').	Enable Main/Reserve 2 monitoring. If this is off, monitoring of these signals will be disabled.
2 ('L').	Enable Main/Reserve 2 channel 1 audio level monitoring. If this switch is off, the audio content of the channel 1 of the AES signals will be disregarded. If this switch is on, the audio level will be compared against a threshold and an error reported if it is below the threshold for a pre-set amount of time.
3 ('R').	Enable Main/Reserve 2 channel 2 audio level monitoring. If this switch is off, the audio content of the channel 2 of the AES signals will be disregarded. If this switch is on, the audio level will be compared against a threshold and an error reported if it is below the threshold for a pre-set amount of time.
4 ('V').	Enable Main/Reserve 2 AES validity monitoring. If this is on, the validity bit in the AES data stream will be monitored and an error will be reported if this bit indicates that non-audio data is present.

5.2.1.3 S7

S7 is an 8 way DIL switch and all switch positions should be set to OFF (left).

5.2.2 S1, S2, S3, S4

A series of multi-position rotary switches, internal to the module, set the delay and audio threshold of the audio monitoring circuitry. These settings will only have an effect if the audio monitoring is enabled using S5 and S6. When enabled, if the audio level is consistently below the threshold for at least the delay period, an error will be reported.

S1 and S3 set the threshold and delay values respectively for the Main/Reserve 1 signals, and S2 and S4 set the threshold and delay values respectively for the Main/Reserve 2 signals.

Threshold settings (S1 and S2)

Switch Pos.	Value
0.	-20dB (WRT to peak)
1.	-30dB
2.	-40dB
...	(Successive steps of 10 db)
7.	-90db
8-9	Not used.

Delay settings (S3 and S4)

Switch Pos.	Value (330-06-00)	Value (330-09-00)
0.	Zero delay	Zero delay
1.	5 seconds	5 seconds
2.	10 seconds	10 seconds
...	(Successive steps of 5 sec.)	(Successive steps of 5 sec.)
9.	45 seconds	45 seconds
A	n/a	50 seconds
...	n/a	(Successive steps of 5 sec.)
F	n/a	75 seconds

Notes

- If the delay is adjusted whilst the unit is powered, the unit may take up to 1 ½ minutes to settle – this may be avoided by power cycling the unit.

5.3 330-09-01 TIMECODE MONITORING AND CHANGEOVER

This module may only be fitted in slot 4 of the MasterMind chassis. Only the channel enable switches S5 and S6 are active, all other switches do not function. See section 5.2.1 for details of S5 and S6. In operation, if a valid LTC signal is not detected for 500 mS, the fail condition is declared.

6. 330-11-00 SD/ HD SDI MONITORING AND SWITCHING MODULE

6.1 GENERAL

The 330-11-00 provides two inputs, switched to a single output, suitable for changing between A and B (Main and Reserve) feeds of SD or HD SDI video.

The module will switch to the B (Reserve) path if the following conditions are detected:

- Lock Error. Set whenever the device has not correctly locked.
- Format Error. Set when the device is locked but ASI rather than SMPTE is detected.

Also:

- **Data Error.** Set when an error (detailed below) within the received data stream has been detected by the device. This condition is a logical OR of all detectable errors listed. The Data error signal can be disabled by turning DIP switch '1' on. Default is enabled.

In the event of a power failure, the module defaults to input A (Main) by bypass relay.

6.2 DATA ERRORS

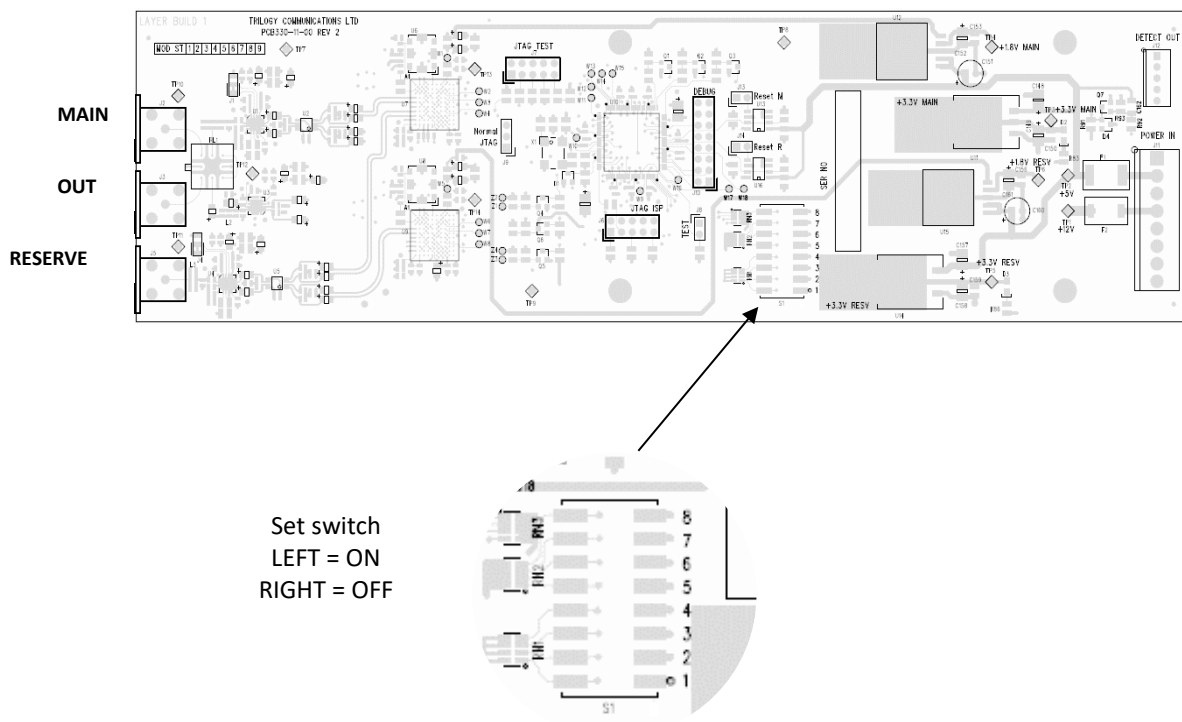
See note above.

Data Error	Description
Video Standard Error.	Set when a mismatch between the received SMPTE352M packets and the calculated video standard occurs.
Luma Checksum Error.	Set when ancillary data packet checksum error has been detected in the Y channel.
Chroma Checksum Error.	Set when ancillary data packet checksum error has been detected in the C channel.
Start of Active Video Error.	Set when TRS errors are detected in either 8-bit or 10-bit TRS words. In HD mode only Y channel TRS codes will be checked.
End of Active Video Error.	Set when TRS errors are detected in either 8-bit or 10-bit TRS words. In HD mode only Y channel TRS codes will be checked.
Active Picture CRC Error.	Set in SD mode when an Active Picture (AP) CRC mismatch has been detected in Field 1 or 2
Full Field CRC Error.	Set in SD mode when a Full Field (FF) CRC mismatch has been detected in Field 1 or 2.
Luma CRC Error.	Set in HD mode when a mismatch occurs between the calculated and received CRC values in the Y channel.
Chroma CRC Error.	Set in HD mode when a mismatch occurs between the calculated and received CRC values in the C channel.
Line Number Error.	Set in HD mode when a mismatch occurs between the calculated and received line numbers.

6.3 S1 DIP SWITCH FUNCTIONS

Default position is all switches OFF.

No.	Function	OFF	ON	Note
1	Data Error	Enabled	Disabled	User option.
2	Not Used			Leave OFF
3	JTAG/Host Mode	JTAG mode	Host mode	For factory use only
4	20/10 bit Mode	20 bit	10 bit	For factory use only
5	IO Processor	Off	On	For factory use only
6	Not Used			Leave OFF
7	Not Used			Leave OFF
8	Not Used			Leave OFF

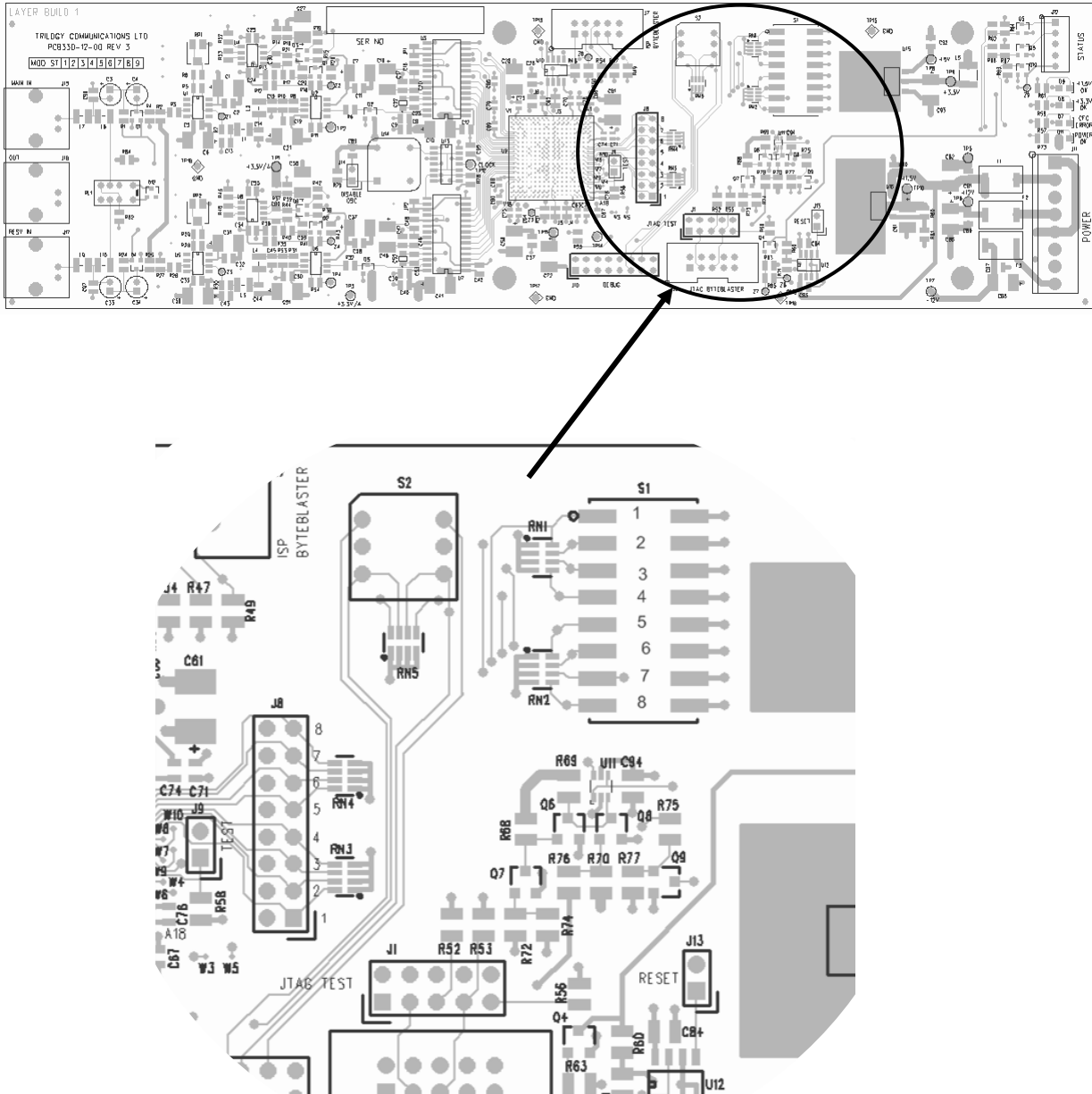


7. 330-12-00 BLACK AND BURST MONITORING AND SWITCHING MODULE

The 330-12-00 module is a two-input, one-output detection and switching module for video black and burst signals. In the event of designated fault conditions, set by on-board links and switches, the output will switch from “A” to “B”.

- Selected signal path is un-terminated and should be terminated externally.
- Un-selected signal path is terminated on-board with 75Ω.
- In the event of power failure, the output will be switched by relay to “A”.

7.1 SWITCH AND LINK LOCATION



7.2 DIP SWITCH S1 FUNCTIONS

Individual errors can be allowed to cause a “fail” condition or ignored as required. Other than Sync Amplitude, the enable setting applies to both channels. Default positions of switches are shown below in **Bold**.

No.	Function	OFF	ON	Notes
1	Sync Monitor A	Disabled	Enabled	User option.
2	Sync Monitor B	Disabled	Enabled	User option.
3	Line Standard	Disabled	Enabled	User option.
4	Burst Amplitude	Disabled	Enabled	User option.
5	Burst Frequency	Disabled	Enabled	User option.
6	Video Amplitude	Disabled	Enabled	User option.
7	Reserved	Disabled	n/a	Leave OFF.
8	Reserved	Disabled	n/a	Leave OFF.

Video Amplitude monitors signal excursions above peak yellow or below sync tip. If several consecutive samples are over range, an error is flagged. This also allows detection of un-terminated signals.

7.3 J8 LINK FUNCTIONS

The settings below are ignored unless the error is enabled by the appropriate DIP switch. Links are arranged in four pairs, as indicated below. Note that Default settings are applied if the links of each pair are Both On **or** Both Off. Alternative settings are applied if one link is Off and the other link is On. Fit link to position marked by appropriate threshold to select. Default position of all links is ON.

No.	Function	One link ON	Default
1	Sync Threshold	-9dB	-6dB
2	Sync Threshold	-3dB	-6dB
3	Burst Amplitude	-9dB	-6dB
4	Burst Amplitude	-3dB	-6dB
5	Burst Frequency	3.5 MHz	Either
6	Burst Frequency	4.5 MHz	Either
7	Line Standard	525 lines	Either
8	Line Standard	625 lines	Either

For example:

- To set a Sync Amplitude threshold of -3dB on Channel A only, set S1/1 to ON, S1/2 to OFF, J8/1 to OFF and J8/2 to ON.

7.4 OTHER LINK AND SWITCH FUNCTIONS

The following are provided to aid testing and have no useful function in normal operation.

Ref.	Function	Type	Default	Notes
S2	Test Select	Hex Switch	'0'	Switch Not Fitted
J9	Test Mode	2-pin Link	Open	
J13	Reset	2-pin Link	Open	Link Not Fitted
J14	Oscillator Disable	2-pin Link	Open	Link Not Fitted
J1	JTAG Test Header	5x2 Header	n/a	Header not Fitted
J2	JTAG Prog. Header	5x2 Header	n/a	
J7	ISP Header	5x2 Header	n/a	Header not Fitted
J10	Test Header	8x2 Header	n/a	

8. 330-12-01 TRI-LEVEL SYNC DETECTION AND CHANGEOVER MODULE

8.1 GENERAL

The 330-12-01 module is a two-input, one-output detection and switching module for tri-level sync signals used within a HD studio environment. In the event of designated fault conditions, set by on-board switches, the output will switch from “A” to “B”.

- Selected signal path is un-terminated and should be terminated externally.
- Un-selected signal path is terminated on-board with 75Ω.
- In the event of power failure, the output will be switched by relay to “A”.

8.2 TRI-LEVEL SYNC STANDARDS

The 330-12-01 can detect all tri-level sync standards currently supported by the Mentor XL Sync and Reference Generator. These are shown in the table below.

ID	Binary ID	Tri-Level Sync Standard
0	00000	1080p 60 Hz
1	00001	1080p 59.94 Hz
2	00010	1080p 50 Hz
3	00011	1080i 60 Hz
4	00100	1080i 59.94 Hz
5	00101	1080i 50 Hz
6	00110	1080p 30 Hz
7	00111	1080p 29.97 Hz
8	01000	1080p 25 Hz
9	01001	1080p 24 Hz
10	01010	1080p 23.98 Hz
11	01011	1080sf 30 Hz (same as 1080i 60Hz)
12	01100	1080sf 29.97 Hz (same as 1080i 59.94Hz)
13	01101	1080sf 25 Hz (same as 1080i 50Hz)
14	01110	1080sf 24 Hz
15	01111	1080sf 23.98 Hz
16	10000	720p 60 Hz
17	10001	720p 59.94 Hz
18	10010	720p 50 Hz
19	10011	720p 30 Hz
20	10100	720p 29.97 Hz
21	10101	720p 25 Hz
22	10110	720p 24 Hz
23	10111	720p 23.98 Hz

The binary ID is used to set the TLS standard, using switches 4 through 8 of DIP switch S1, as shown in section 8.3.

8.3 MODULE SET-UP (DIP SWITCH S1)

The DIP switches on the board are used to set up the 330-12-01. The table below lists the function of each DIP switch.

DIP Switch Position	Function
1	Monitor TLS main input. When enabled, monitors TLS on the main input for correct standard and input levels. When disabled, fail condition is never declared.
2	Monitor TLS reserve input. When enabled, monitors TLS on the reserve input for correct standard and input levels. When disabled, fail condition is never declared.
3	Standard detection. When enabled, the TLS on the inputs are checked against the TLS standard set using the switches 4 – 8. If the input does not match, a “fail” condition is declared. When switch 3 is disabled, a “fail” condition is only flagged if the input is not a tri-level-sync standard.
4	Set Standard bit 0 (LSB of binary ID)
5	Set Standard bit 1
6	Set Standard bit 2
7	Set Standard bit 3
8	Set Standard bit 4 (MSB of binary ID)

For example, to configure the 330-12-01 to check for the presence of the 1080i / 50 Hz TLS standard:

- TLS standard ID 5 has a binary value of 00101
 - DIP 4 (LSB) is ON
 - DIP 5 is OFF
 - DIP 6 is ON
 - DIP 7 is OFF
 - DIP 8 is OFF

Other jumper links and switches on the 330-12-01 are disabled and do not provide any functionality.

9. TROUBLESHOOTING

9.1 IDENTIFYING PROBLEMS

This unit is provided, by its very nature, with a comprehensive set of fault monitoring facilities. If it is not behaving as you would expect, please ensure that:

- You have read this Instruction Manual thoroughly.
- Mains power is correctly applied, and the fuse in the IEC connector has not blown. If power is applied, one or more LEDs on the front panel will be lit.
- The signals you wish to monitor are correctly connected to the equipment.
- The unit is configured as you require. Read this user guide. The unit may simply require that the reset button is pressed.
- You examine the internal status LEDs to determine which module is indicating a fault. Check that the regulator fail LED is *not* lit, and that the appropriate "module present" LED *is* lit.
- Where appropriate, any downstream signals are correctly terminated. Incorrect output termination may cause an under, or over-amplitude error to be flagged.
- If you suspect a module is faulty, turn the unit off and re-power it 5 minutes later to allow the individual module thermal fuse to reset. Note that you will still have a path for SPG A when you remove power.

9.2 FAULT FINDING HINTS

1. Disable all input channel switches except the one you are checking.
2. Check that the input signal matches the option board, e.g. that you are feeding a Black & Burst signal into the correct type board. It may be necessary to remove the lid to verify this.
3. **Check that the input signal levels are correct and are neither double terminated nor un-terminated. The OK & FAIL LEDs on the front panel will indicate whether the signal is correct.**
4. If the power supply is suspected, remove the lid and check the voltage rails on the main Logic Board as follows:

+5V @ TP6
0V @ TP8
+12V @ TP5
-12V @ TP7

WARNING! Removing the lid may expose live mains voltages. Take care and if any doubt, do not carry out this test.

5. Check the operation of the fan. A fan failure going unnoticed for a long period may result in permanent failure.

10. SPECIFICATION**10.1 GENERAL**

Mains Power Requirement	90-260 V, 47-63 Hz, 40 VA maximum, depending on number of option boards fitted.
Height	44 mm (1U rack mounting)
Depth	435 mm (excluding mating connectors)
Width	482.6 mm (including rack ears)
Width	450 mm (excluding rack ears)

10.2 REMOTE ALARM OUTPUTS

Type	Open Collector
Max. Voltage	50 V D.C.
Max. current	500 mA

10.3 330-07-00 TRIPLE RELAY VIDEO SWITCHING MODULE

Return Loss	<-35dB @ 5 MHz <-20dB @ 270 MHz <-8dB @ 1.4 GHz
Crosstalk between A and B	<-65dB 0 - 5.5 MHz
SDI Jitter (HD and SD)	≈0.2UI with 100% colour bars

10.4 330-08-00 5 CHANNEL BALANCED SIGNAL RELAY SWITCHING MODULE

Changeover	By PO47 relay: power fail defaults to A inputs.
AES signal isolation (12MHz)	> 33dB
AES signal crosstalk (12MHz)	< -48dB
Audio signal isolation (20KHz)	> 80dB
Audio signal crosstalk (20KHz)	< -80dB

10.5 330-09-00 AES/EBU MONITORING AND CHANGEOVER MODULE**10.6 330-09-01 TIMECODE MONITORING AND CHANGEOVER MODULE**

Changeover	By relay: power fail defaults to A inputs.
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10.7 330-11-00 SD/HD-SDI MONITORING AND CHANGEOVER MODULE

Power	+5 V @ 750 mA, +12 V @ 30 mA
Power fail	Monitors +12V, +5V plus +3.3V and +1.8V for each channel.
Input Return Loss	<-18dB (SD & HD)
Output Return Loss	<-15dB (SD & HD)
Timing Jitter	< 0.30UI (SD & HD)
Alignment Jitter	< 0.20UI (SD & HD)
Changeover	Synchronous switching by serial receiver with buffer/driver.
Fail-safe	In the event of a power fail defaults to input A by bypass relay.
Error conditions	No Signal / Lock, Format Error or Data Error. <ul style="list-style-type: none"> ○ Lock Error. Set whenever the device has not correctly locked. ○ Format Error. Set when the device is locked but ASI rather than SMPTE is detected. ○ The Data Error signal is set when an error within the received data stream has been detected by the device. ○ The Data error signal can be disabled by turning DIP switch '1' on. Default is enabled.

10.8 330-12-00 BLACK/BURST MONITORING AND CHANGEOVER MODULE

Power	+5 V @ 130 mA, +12 V @ 70 mA, -12V @ 45 mA
Power fail	Monitors ± 12 V, +5 V plus +3.3 V and +1.5 V.
Threshold Accuracy	± 1 dB
Return Loss	<-40dB
Crosstalk between A and B	<-60dB @ 4.433 MHz
Changeover	By relay, power fail defaults to input A. The de-selected input is terminated into 75 Ω . Selected input must be externally terminated.
Fail-safe	In the event of a power fail defaults to input A.
Error conditions	No Signal, Sync Amplitude, Burst Amplitude, Burst Frequency, Line Standard, Video Amplitude Errors. Power Fail / Reset.