STEREO SOUND IN SYNC

LDM 1903/00/01 (8928 190 30001)

LDM 1904/00/01 (8928 190 40001)

INSTALLATION

Contents

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INSTALLATION

1. INSTALLATION INSTRUCTIONS

The following procedure should be carried out carefully to ensure safe, efficient and trouble-free operation of the Sound in Sync system.

(1) Install the equipment in a room that is reasonably dust-free.

(2) Ensure that there is sufficient space around each unit to allow adequate ventilation. Note that if the equipment is to work in the vicinity of other equipment or a source of heat, the temperature of the air reaching the equipment must be within the upper limit of 45°C.

(3) Ensure that all equipment and interconnecting cables are undamaged and lay the cables in such a way that there is no risk of them being chafed or otherwise damaged.

(4) Run a 3-core cable from each unit to the most convenient mains outlet, but leave the mains end disconnected. If the outlet is a circuit breaker switch it off and remove the fuses.

(5) Check that each unit is fitted with a fuse of the correct rating for the mains supply voltage in use, as designated on the rear panel, adjacent to the fuseholder.

(6) Ensure that the equipment is effectively earthed via the 3-core mains cable, and that all relevant local regulations are complied with. Note that the green earth terminal on the rear panel of each unit is provided for the convenience of the user and is not intended as the primary means of earthing.

(7) Connect the earthing link on the rear panel of each unit to provide one of the following selected conditions for the electrical earth (0V) line of the circuit:

(i) Black to Green: Normal condition of direct connection between Circuit Electrical Earth (0V) and Safety Earth (Dead Earth) (⏚) of the power supply.

(ii) Black to White: Indirect connection of Circuit Electrical Earth (0V) through a high-pass filter to Safety Earth (⏚). This connection is used to eliminate hum induction and other undesirable effects when direct connection is used.

(iii) Green to White: Circuit Electrical Earth (0V) isolated, with the earthing link serving no electrical function. A circuit configuration used when separate power supply and technical earth lines are available in the system.

(8) Check that the voltage selector on each unit is set for the mains supply voltage in use.

(9) Make all connections to the station's control and indicating equipment, in accordance with the interface information in the relevant system manual.

(10) Connect the equipment to the mains outlet and switch on the mains supply.

(11) Switch on the equipment, and after allowing a few minutes for it to settle at normal operating temperature, carry out the following initial test:

(i) If a coder and decoder are available together, feed video and audio at standard level into the encoder and check the video and audio outputs from the decoder.

(7) Connect the earthing link on the rear panel of each unit to provide one of the following selected conditions for the electrical earth (0V) line of the circuit:

(i) Black to Green: Normal condition of direct connection between Circuit Electrical Earth (0V) and Safety Earth (Dead Earth) (⏚) of the power supply.

(ii) Black to White: Indirect connection of Circuit Electrical Earth (0V) through a high-pass filter to Safety Earth (⏚). This connection is used to eliminate hum induction and other undesirable effects when direct connection is used.

(iii) Green to White: Circuit Electrical Earth (0V) isolated, with the earthing link serving no electrical function. A circuit configuration used when separate power supply and technical earth lines are available in the system.

(8) Check that the voltage selector on each unit is set for the mains supply voltage in use.

(9) Make all connections to the station's control and indicating equipment, in accordance with the interface information in the relevant system manual.

(10) Connect the equipment to the mains outlet and switch on the mains supply.

(11) Switch on the equipment, and after allowing a few minutes for it to settle at normal operating temperature, carry out the following initial test:

(i) If a coder and decoder are available together, feed video and audio at standard level into the encoder and check the video and audio outputs from the decoder.

(ii) If the coder alone is available, feed video and audio in at standard level and monitor the SIS output to verify that quaternary digits are inserted in the line sync period.

2. SAFETY

Some components are designated by this component safety symbol ⚠, either on the parts list or the circuit diagram, or both. Refer to the relevant service manual (see Information Finder).

If any designated component has to be replaced, it must, for safety reasons, be replaced only by a component of the type specified and the wiring to and from the fuseholder and voltage adaptor must be double-insulated.

3. CONNECTIONS

Notes:

1. Connector types refer to connectors installed on rear panel.
2. All open collector outputs are rated for 50V/500mA individual maximum. Advised individual limit is 50V/60mA, based on a conservative assessment of IC package rating.
3. All relay contacts are rated for 125V/2A maximum.
4. All +5V logic inputs are pulled up to +5V and protected with series resistors.
5. Rear panel connections for monitoring are detailed in Part 4.

3.1 Coder

3.1.1 Video

Loop-through input for 1V p-p composite video. If the loop-through facility is not required the feed must be terminated at the unused socket with 75 ohms.

3.1.2 SIS

Two Sound-in-Sync 75-ohm outputs are provided for sending to Sound in Sync Decoders. Correct level is obtained when the outputs are terminated with 75 ohms.

Sound-in-Sync is produced by inserting pulses into the line sync pulses of the incoming video signal. If for any reason this is not present, pulses are inserted into the internally generated standby sync. This may be either line sync or composite (mixed) sync, selection being made by setting Link X18 on the Asynchronous Data Processor module to LS or MS, respectively.

3.1.3 Audio Connections

Audio Input	
Pin 1	Ground
Pin 2	Channel A (Red)
Pin 3	Channel A (Blue)
Pin 4	Channel B (Red)
Pin 5	Channel B (Blue)

3.1.4 Auxiliary Input

An external 728 kbits/s NICAM-728 bitstream, with its accompanying clock, can be input here for insertion into video. Also a C_0 signal, with its accompanying clock, can be input here for synchronising the coder. The inputs accept RS-422 balanced 5V signals; each input also has a +1.5V bias, which, if connected to an RS-422 inverse input, allows the corresponding true input to accept a TTL-level input signal.

15-way D-type plug

Pin No.	Function
1	728 kbits/s data in (RS-422 true)
9	728 kbits/s data in (RS-422 inverse)
2	+1.5V bias out
10	0V
3	728 kHz data clock in (RS-422 true)
11	728 kHz data clock in (RS-422 inverse)
4	+1.5V bias out
12	0V
5	C_0 in (RS-422 true)
13	C_0 in (RS-422 inverse)
6	+1.5V bias out
14	0V
7	C_0 clock in (RS-422 true)
15	C_0 clock in (RS-422 inverse)
8	+1.5V bias out

3.1.5 Auxiliary Output 1

A 728 kbits/s NICAM-728 bitstream from the internal NICAM coder, with its accompanying clock, is output here. A C_0 signal, synchronised to the NICAM-728 bitstream, with its accompanying clock, is also output here. The data and data clock are in RS-422 balanced 5V format; the C_0 and C_0 clock are 5V HCMOS logic signals, each with a +1.5V bias to allow a one-to-one connection between this output and a coder auxiliary input.

15-way D-type socket

Pin No.	Function
1	728 kbits/s data out (RS-422 true)
9	728 kbits/s data out (RS-422 inverse)
2	Not connected
10	0V
3	728 kHz data clock out (RS-422 true)
11	728 kHz data clock out (RS-422 inverse)
4	Not connected
12	0V
5	C_0 out (+5V HCMOS)
13	+1.5V bias out
6	Not connected
14	0V
7	C_0 clock out (+5V HCMOS)
15	+1.5V bias out
8	Not connected

3.1.6 Auxiliary Output 2

The 728 kbits/s NICAM-728 bitstream that is inserted into the video, with its accompanying clock, is output here. The data and data clock are in RS-422 balanced 5V format. This output may be directly connected to the top 9 pins of a coder auxiliary input, or a one-to-one connection made to a decoder auxiliary input.

9-way D-type socket

Pin No.	Function
1	728 kbits/s data out (RS-422 true)
6	728 kbits/s data out (RS-422 inverse)
2	Not connected
7	0V
3	728 kHz data clock out (RS-422 true)
8	728 kHz data clock out (RS-422 inverse)
4	Not connected
9	0V
5	Not connected

3.1.7 Remote Control

3.1.7.1 Clock and I/O Control

When the Clock and I/O module is in Remote mode, the input lines A3, A2, A1, and A0 become effective for remotely controlling signal selection and lock mode. They may be either 5V logic or pull-downs to indicate a zero and open circuit to indicate a 1.

(i) Locking and Remote/Local

A3	A2	
1	1	Local control (overrides 'Remote' selected locally).
1	0	Free-running.
0	1	Locked to External Data Clock. If it fails, falls back to free-running; Signal Fail indicated.
0	0	Locked to Ext C_0 clock and C_0. If either fails, falls back to free-running; Signal Fail indicated.

(ii) Signal Selection to Asynchronous Data Processor for Insertion in Sync Pulses

A1	A0	
1	1	Bitstream generated from analogue audio inputs.
1	0	External Data and Clock. If data fails, falls back to Tone 2; Signal Fail indicated. If Clock fails, uses internal clock; Signal Fail indicated.
0	1	Tone 1.
0	0	Tone 2.

(iii) Tally-backs

The open-collector tally-back outputs B0 to B3 follow coding of A0 to A3, indicating fall-back conditions due to signal failure when relevant, rather than requested conditions. If Local Control is selected, either locally or remotely, B3 and B2 are 1, to indicate 'local' and they do not indicate the lock condition selected. B4 is a remote Signal Fail indication.

3.1.7.2 Audio Decoder Control Inputs

The two Select inputs select the bitstream source for monitor decoding as follows:

S1	S0	
1	1	Data to be inserted in video.
1	0	External data.
0	1	Data from internal NICAM coder.
0	0	Not used.

3.1.7.3 Mute Control

The active low MUTE signal acts to mute the audio output of the Audio Decoder.

3.1.7.4 Auxiliary Power

+5V at 100mA maximum for powering external remote control equipment.

3.1.7.5 Composite Sync Output

A composite sync output, 1V across 75 ohms.

25-way D-type socket

Pin No.	Function
1	A0 remote control input (+5V logic)
14	A1 remote control input (+5V logic)
2	A2 remote control input (+5V logic)
15	A3 remote control input (+5V logic)
3	0V
16	B0 tally-back output (open collector)
4	B1 tally-back output (open collector)
17	B2 tally-back output (open collector)
5	B3 tally-back output (open collector)
18	B4 tally-back output (open collector)
6	0V
19	Audio Decoder Select 0 input (+5V logic)
7	Audio Decoder Select 1 input (+5V logic)
20	0V
8	Audio Decoder $\overline{\text{MUTE}}$ input (+5V logic)
21	0V
9	Not connected
22	Not connected
10	Not connected
23	Not connected
11	0V
24	+5V/100mA max auxiliary power output
12	0V
25	Composite Sync output (2V unloaded/1V across 75R)
13	0V

3.1.8 Control and Additional Data In

All the inputs may be 5V logic or pull-downs to indicate a zero and open circuit to indicate a 1. The Control, Additional and Nordic data bits are only read if input ENABLE is low; MUTE is unaffected by input ENABLE. Additional and Nordic data must be stable when the Additional Data Read Strobe is low; Control data must be stable when the Control Data Read Strobe is low.

25-way D-type plug

Pin No.	Function
1	$\overline{\text{MUTE}}$ in (+5V logic)
14	0V
2	C_1 control data bit in (+5V logic)
15	C_2 control data bit in (+5V logic)
3	C_3 control data bit in (+5V logic)
16	C_4 control data bit in (+5V logic)
4	AD_0 additional data bit in (+5V logic)
17	AD_1 additional data bit in (+5V logic)
5	AD_2 additional data bit in (+5V logic)
18	AD_3 additional data bit in (+5V logic)
6	AD_4 additional data bit in (+5V logic)
19	AD_5 additional data bit in (+5V logic)
7	AD_6 additional data bit in (+5V logic)
20	AD_7 additional data bit in (+5V logic)
8	AD_8 additional data bit in (+5V logic)
21	AD_9 additional data bit in (+5V logic)
9	AD_{10} additional data bit in (+5V logic)
22	0V
10	CIB_0 Nordic data bit in (+5V logic)
23	CIB_1 Nordic data bit in (+5V logic)
11	0V
24	Additional Data Read Strobe out (open collector)
12	Control Data Read Strobe out (open collector)
25	0V
13	Input $\overline{\text{ENABLE}}$ in (+5V logic)

3.2 Decoder

3.2.1 SIS

Loop-through input for 1V p-p composite sound-in-sync video. If the loop-through facility is not required the feed must be terminated at the unused socket with 75 ohms.

3.2.2 Video

Two 75 ohm video outputs are provided. Correct level is obtained when the outputs are terminated with 75 ohms.

3.2.3 Audio Connections

Audio Output (Stereo and Monitoring)	
Pin 1	Ground
Pin 2	Channel A (Red)
Pin 3	Channel A (Blue)
Pin 4	Channel B (Red)
Pin 5	Channel B (Blue)

Audio Output (Mono)	
Pin 1	Ground
Pin 2	Red
Pin 3	Blue

3.2.4 Auxiliary Input

An external 728 kbits/s NICAM-728 bitstream, with its accompanying clock, can be input here for decoding by the internal NICAM decoder. The inputs accept RS-422 balanced 5V signals; each input also has a +1.5V bias, which, if connected to an RS-422 inverse input, allows the corresponding true input to accept a TTL-level input signal.

9-way D-type plug

Pin No.	Function
1	728 kbits/s data in (RS-422 true)
6	728 kbits/s data in (RS-422 inverse)
2	+1.5V bias out
7	0V
3	728 kHz data clock in (RS-422 true)
8	728 kHz data clock in (RS-422 inverse)
4	+1.5V bias out
9	0V
5	Not connected

3.2.5 Auxiliary Output 1

A 728 kbits/s NICAM-728 bitstream extracted from the SIS video, with its accompanying clock, is output here. The data and data clock are in RS-422 balanced 5V format. This output may be directly connected to the top 9 pins of a coder auxiliary input, or a one-to-one connection made to a decoder auxiliary input.

9-way D-type socket

Pin No.	Function
1	728 kbits/s data out (RS-422 true)
6	728 kbits/s data out (RS-422 inverse)
2	Not connected
7	0V
3	728 kHz data clock out (RS-422 true)
8	728 kHz data clock out (RS-422 inverse)
4	Not connected
9	0V
5	Not connected

3.2.6 Auxiliary Output 2

The 728 kbits/s NICAM-728 bitstream that is fed to the internal NICAM decoder, with its accompanying clock, is output here. A C_0 signal, synchronised to the NICAM-728 bitstream, with its accompanying clock, is also output here. The data and data clock are in RS-422 balanced 5V format; the C_0 and C_0 clock are 5V HCMOS logic signals, each with a +1.5V bias to allow a one-to-one connection between this output and a coder auxiliary input.

15-way D-type socket

Pin No.	Function
1	728 kbits/s data out (RS-422 true)
9	728 kbits/s data out (RS-422 inverse)
2	Not connected
10	0V
3	728 kHz data clock out (RS-422 true)
11	728 kHz data clock out (RS-422 inverse)
4	Not connected
12	0V
5	C_0 out (+5V HCMOS)
13	+1.5V bias out
6	Not connected
14	0V
7	C_0 clock out (+5V HCMOS)
15	+1.5V bias out
8	Not connected

3.2.7 Remote Control

3.2.7.1 Clock and I/O (Reframer) Control

When the Clock and I/O (Reframer) module is in Remote mode, the input lines A3, A2, A1, and A0 become effective for remotely controlling signal selection and lock mode. They may be 5V logic or pull-downs to indicate a zero and open circuit to indicate a 1.

(i) Locking and Remote/Local

While Tone 1 or Tone 2 is selected, the local oscillator is locked or free-running as follows:

A3	A2	
1	1	Local control of signal selection and lock mode (overrides 'Remote' selected locally).
1	0	Locked to Clock regenerated from SIS. If data from SIS fails, free running; Signal Fail is indicated.
0	1	Locked to Ext Clock. If Ext Clock fails, free running; and Signal Fail indicated.
0	0	Free running.

(ii) Remote Signal Selection

This depends upon control lines A1 and A0 as follows:

A1	A0	
1	1	From SIS. If data fails, Tone 2; and Signal Fail indicated.
1	0	Ext data. If data fails, Tone 2; and Signal Fail indicated.
0	1	Tone 1.
0	0	Tone 2.

(iii) Tally-backs

The open-collector tally-back outputs B0 to B3 follow coding of A0 to A3, indicating fall-back conditions due to signal failure when relevant, rather than requested conditions. If Local Control is selected either locally or remotely B3 and B2 are 1, to indicate 'Local' and they do not indicate the Lock condition selected. B4 is a remote Signal Fail indication.

3.2.7.2 Mute Controls

The appropriate active low MUTE signals to mute the audio outputs of the Audio Decoder and DAC and Transformer modules.

3.2.7.3 Auxiliary Power

+5V at 100mA maximum for powering external remote control equipment.

3.2.7.4 Composite Sync Output

A composite sync output of 1V across 75 ohms.

25-way D-type socket

Pin No.	Function
1	A0 remote control input (+5V logic)
14	A1 remote control input (+5V logic)
2	A2 remote control input (+5V logic)
15	A3 remote control input (+5V logic)
3	0V
16	B0 tally-back output (open collector)
4	B1 tally-back output (open collector)
17	B2 tally-back output (open collector)
5	B3 tally-back output (open collector)
18	B4 tally-back output (open collector)
6	0V
19	Not connected
7	Not connected
20	0V
8	Audio Decoder $\overline{\text{MUTE}}$ input(+5V logic)
21	0V
9	DAC and Transformers $\overline{\text{MUTE}}$ input (+5V logic)
22	0V
10	Not connected
23	Not connected
11	0V
24	+5V/100mA max auxiliary power output
12	0V
25	Composite Sync output (2V unloaded/1V across 75R)
13	0V

3.2.8 Control and Additional Data Out

All the outputs are open collector. Additional Data and Nordic Data change when the Additional Data Write strobe is low; Control Data changes when the Control Data Read strobe is low.

25-way D-type socket

Pin No.	Function
1	0V
14	C_0 control data bit out (open collector)
2	C_1 control data bit out (open collector)
15	C_2 control data bit out (open collector)
3	C_3 control data bit out (open collector)
16	C_4 control data bit out (open collector)
4	AD_0 additional data bit out (open collector)
17	AD_1 additional data bit out (open collector)
5	AD_2 additional data bit out (open collector)
18	AD_3 additional data bit out (open collector)
6	AD_4 additional data bit out (open collector)
19	AD_5 additional data bit out (open collector)
7	AD_6 additional data bit out (open collector)
20	AD_7 additional data bit out (open collector)
8	AD_8 additional data bit out (open collector)
21	AD_9 additional data bit out (open collector)
9	AD_{10} additional data bit out (open collector)
22	0V
10	CIB_0 Nordic data bit out (open collector)
23	CIB_1 Nordic data bit out (open collector)
11	0V
24	Additional Data Write Strobe out (open collector)
12	Control Data Write Strobe out (open collector)
25	0V
13	0V

4. LINK-SELECTABLE USER OPTIONS

4.1 Coder

4.1.1 Synchronisation of External Data and C_0

The External Data and External C_0 inputs at the Auxiliary Input have separate associated input clocks, which may be either synchronous or asynchronous. The extent to which a Coder can be synchronised to these external references depends, in some cases, upon whether these two clocks are synchronous or not. The link X16 on the Clock & I/O module needs to be set to 'A' (asynchronous) or 'S' (synchronous) accordingly. If in doubt, the safe position is 'A'. A fuller explanation is given in the section for the module in the associated Coder handbook (see Information Finder).

4.1.2 Tone 2

There are four sources of sound data for insertion into the sync pulses:

(a) Data generated from analogue audio inputs.

(b) External Data at the Auxiliary Input.

(c) Tone 1; internal digitally generated line-up tone.

(d) Tone 2; internal digitally generated link-selectable tone.

Any one of the four sources can be selected either remotely or by switches accessible behind the front panel. Tone 2 is also a fall-back tone, selected automatically if the External Data, when selected, should fail. Tone 2 itself is link-selectable from a choice of 10 tones/sounds; the link used is X18 on the Clock & I/O module, which has positions labeled 'A' to 'J'. The following table and notes give details of the tones available:

	C_{1-4}	AD_{0-10}	CIBs	Ch A/Mono 1/Left	Ch B/M2/Right
Tone 1	0001	00000000000	00	1kHz, 0dBu	1kHz, 0dBu
Tone 2A	0001	00000000000	00	Silence	Silence
B	0000	00000000000	00	1kHz, -20dBu	2kHz, -20dBu
C	0000	10000000000	00	62.5Hz, 0dBu	125Hz, 0dBu
D	0000	01000000000	00	250Hz, 0dBu	375Hz 0dBu
E	0000	00100000000	00	375Hz, 0dBu	500Hz, 0dBu
F	0000	00010000000	00	250Hz, 0dBu	312.5Hz, 0dBu
G	0000	00001000000	00	250Hz, 0dBu 312.5Hz, -3dBu	937.5Hz, 0dBu 312.5Hz, -3dBu
H	0000	00000100000	00	312.5Hz, 0dBu 375 Hz, -3dBu	500Hz, 0dBu 375Hz, -3dBu
I	0000	00000010000	00	625 Hz, 0dBu 750 Hz, -3dBu	937.5Hz, 0dBu 750Hz, -3dBu
J	0000	00000001000	00	Multitone	Multitone

Notes 1. Application Control bits C_{1-3} have the following significance:

C_1	C_2	C_3	
0	0	0	Stereo signal comprising alternate A-channel and B-channel samples.
0	1	0	Two independent mono sound signals (designated M1 and M2) transmitted in alternate frames.
1	0	0	One mono signal and one 352 kbit/s transparent data channel transmitted in alternate frames. (Not valid for this equipment unless coded externally.)
1	1	0	One 704 kbit/s transparent data channel. (Not valid for this equipment unless coded externally.)

2. Application Control bit C_4 is the Reserve Sound Switching Flag, set to '1' to signal to a receiver that the digital sound signal is the same programme as the FM signal, but to a '0' if the signals are different. This enables a receiver to decide whether to switch to FM sound if the digital sound should fail, or intermediate broadcaster's equipment to decide whether to mute the digital sound and/or switch to an alternative source if the digital signal is a test signal rather than programme. (See 4.1.5 below). For this reason Tone 2 which is the fall-back tone has C_4 set to '0' in all cases except 2A which is silence.

3. Levels in the table assume equipment set up to the UK NICAM 728 audio headroom specification, i.e. 14.8dB for a 0dBu signal at 2kHz.

4. Tone 1 is intended as a line-up tone.

5. Tone 2 is intended as a fall-back tone to indicate a fault condition, or as an alternative test tone.

6. The choice of tone 2 from the ten available is made by a moveable link (X18) on the Clock & I/O module.

7. Eight of the 11 tones can be identified by the Additional Data bits AD_{0-10}, and all are chosen to be identified audibly, as follows:

Tone 1 is the only tone having the same single frequency on left and right channels.

Tone 2A is silence.

Tone 2B is the only tone at -20dBu.

Tone 2C has left : right frequency ratio of 1 : 2 (musically an octave).

Tone 2D has left : right frequency ratio of 2 : 3 (musically a fifth).

Tone 2E has left : right frequency ratio of 3 : 4 (musically a fourth).

Tone 2F has left : right frequency ratio of 4 : 5 (musically a major third).

Tone 2G is three tones, musically a major triad, lowest note on the left, highest on the right and middle note in the centre.

Tone 2H - as 2G but first inversion of the major triad.

Tone 2I - as 2G but a minor triad.

Tone 2J is the only multitone.

8 Tones 2B to 2I all have left channel lower pitch than right channel, giving an easy means to check that left and right are routed correctly.

9. The multitone gives a means of checking the frequency response from a single test signal by using a spectrum analyser. It consists of 16 tones, each at -12.04dBu, giving a combined amplitude of 0dBu. The frequencies are spaced approximately evenly on a logarithmic scale and are (in Hz) 62.5, 125, 187.5, 250, 375, 562.5, 812.5, 1125, 1562.5, 2187.5, 3000, 4125, 5687.5, 7812.5, 10687.5, 14500.

10. By negotiation with Varian TVT Limited, alternative frequencies can be supplied with the following limitations:

Tone 1, Tone 2A and Tone 2B must be 1kHz or multiples thereof either singly or in combination.

Tones 2C to 2J must be 62.5Hz or multiples thereof, either singly or in combination.

Amplitude levels cannot exceed those set by the NICAM 728 specification.

4.1.3 System Good in Terminal Mode

X9 on the Monitor 1 module controls whether 'System Good' indication is allowed ('A'), or not allowed ('N') when Monitor 1 is operating in Terminal Mode. For normal operation X9 has no effect.

4.1.4 Language Selection During Dual-language Transmissions

X17 and X18 on the Audio Decoder module allow the user to select either or both languages during dual Monophonic broadcasts, according to the following table.

LINKS		OUTPUTS	
X17	X18	Left	Right
b-c	b-c	M1	M1
a-b	b-c	M1	M2
b-c	a-b	M2	M1
a-b	a-b	M2	M2

4.1.5 Response to Reserve Sound Switching Flag

In the NICAM 728 data stream, Application Control Bit 4 (C_4) indicates whether the FM mono broadcast and the stereo broadcasts are transmitting the same material. If this bit is logic 0, indicating that the broadcasts are different, while X4 on the Audio Decoder module is in its normal position (b-c), the decoder IC will mute; but if X4 is in Position a-b, the decoder will not mute, allowing test transmissions to be monitored.

4.1.6 Mute Enable

With X3 on the Audio Decoder module in its normal position (b-c), the decoder IC will mute when greater than 1 in 100 parity errors are detected, and unmute when the parity error rate drops below 1 in 400. Under test or experimental conditions, it may be useful to disable this mute function by setting X3 to Position a-b.

4.1.7 Line Sync or Composite Sync on Standby

Standby Sync can be selected to be Line Sync only or Composite (Mixed) Sync by setting X18 on the Asynchronous Data Processor module to 'LS' or 'MS' respectively.

4.2 Decoder

4.2.1 System Good in Terminal Mode

X9 on the Monitor 1 module controls whether a 'System Good' indication is allowed ('A'), or not allowed ('N') when Monitor 1 is operating in Terminal Mode. For normal operation X9 has no effect.

4.2.2 Tones 1 and 2

4.2.2.1 Sources of Sound Data

There are four sources of sound data for decoding:

(a) Data extracted from the SIS input.

(b) External Data at the Auxiliary Input.

(c) Tone 1: internal digitally generated tone, normally a line-up tone.

(d) Tone 2: internal digitally generated 'tone', normally silence.

Any one of the four sources can be selected remotely or by switches accessible behind the front panel. Tone 1 and Tone 2 are both link-selectable from a choice of eight tones/sounds/silence, listed below. As well as being selected deliberately, Tone 2 is the fall-back tone, selected automatically if either the SIS Data or the External Data, when selected, should fail, or when the Reframer circuitry detects a discontinuity in the incoming bit-stream. Tone 2 should therefore normally be silence; though another tone could be chosen for test purposes, e.g. to make the reframing deliberately audible.

Tone 1 and Tone 2 are selected at X12 on the Clock and I/O (Reframer) module, from the following:

Tone A:	Stereo and Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left and Right:	1kHz, 0dBu (UK headroom).
Tone B:	Stereo and Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left and Right:	1kHz, 0dBu (EBU headroom).
Tone C:	Stereo and Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left and Right:	1kHz, -3dBu (UK headroom)

Tone D:	Stereo:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left :	750Hz, 0dBu (UK headroom).
	Right:	1250Hz, 0dBu (UK headroom).
	Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	M1:	250Hz, 0dBu (UK headroom).
	M2:	1750Hz, 0dBu (UK headroom).
Tone E:	Stereo and Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left and Right:	Multitone, 0dBu (UK headroom).
Tone F:	Stereo and Mono:	C_4=0, AD_{0-10}=0, CIBs=0.
	Left and Right:	Multitone, 0dBu (EBU headroom).
Tone G:	Stereo and Mono:	C_4=1, AD_{0-10}=1, CIBs=0.
	Left and Right:	Silence.
Tone H:	Stereo and Mono:	C_4=1, AD_{0-10}=0, CIBs=0.
	Left and Right:	Silence.

4.2.2.2 Stereo and Mono Format of Tones

Stereo or Mono format of tones is normally selected automatically according to the format of the last-used incoming bit-stream; hence, tone D can be used for audible identification of the format of an incoming signal, or identification of left and right or M1 and M2. However, X11 link on the Clock and I/O (Reframer) module may be set for Mono or Stereo for test purposes, but should always be in position 'N' for normal operation, otherwise an improperly signalled format change could occur during reframing.

Except for silence, C_4 is set to 0, so that test tones may be monitored on one piece of equipment whilst muted on another, and so not pass on into the FM sound, for example.

Tones E and F can be used for checking the frequency response of a decoder using a spectrum analyser. Each multitone is composed of 10 components, each at -10dBu, making a combined level of 0dBu. The frequencies are spaced approximately evenly on a logarithmic scale and are (in Hertz):

250, 500, 750, 1250, 1750, 2500, 3750, 6000, 9250, 14 500.

The different Additional Data bits in tones G and H could be used to identify which of two reframers in a signal path is reframing or has fallen back to Tone 2 due to loss of signal.

Tones D, E and F repeat every 4 frames (except for C_0). The other tones are frame-repetitive (except for C_0).

By negotiation with Varian TVT Limited, alternative signals can be supplied with the limitations that all signal components must be multiples of 250Hz and amplitude levels cannot exceed those set by the NICAM 728 specification.

4.2.3 Reframing Mode

The Reframer circuitry has two modes of operation:

(a) FULL reframing, in which the 16-frame sequence is maintained, and the data may be delayed for up to 17ms.

(b) MINimum delay reframing, in which the maximum delay of data is 2ms for a Stereo Signal, or 3ms for a Mono signal, but the 16-frame sequence is not maintained.

FULL or MIN mode is selected by two moveable links, X24 and X25 on the Clock and I/O (Reframer) module.

4.2.4 Language Selection During Dual-language Transmissions

X17 and X18 on the Audio Decoder module allow the user to select either or both languages during dual Monophonic broadcasts,according to the following table:

LINKS		OUTPUTS	
X17	X18	Left	Right
b-c	b-c	M1	M1
a-b	b-c	M1	M2
b-c	a-b	M2	M1
a-b	a-b	M2	M2

4.2.5 Response to Reserve Sound Switching Flag

In the NICAM 728 data stream, control bit 4 (C4) indicates whether the FM mono broadcast and the stereo broadcasts are transmitting the same material. If this bit is logic 0, indicating that the broadcasts are different, while X4 on the Audio Decoder module is in its normal position (b-c), the decoder IC will mute; but if X4 is in Position a-b, the decoder will not mute, allowing test transmissions to be monitored.

4.2.6 Mute Enable

With X3 on the Audio Decoder module in its normal position (b-c), the decoder IC will mute when greater than 1 in 100 parity errors are detected, and unmute when the parity error rate drops below 1 in 400. Under test or experimental conditions, it may be useful to disable this mute function by setting X3 to Position a-b.

4.2.7 Overriding Mute (Audio Decoder Module)

With X16 on the Audio Decoder module in Position b-c, the audio may be muted remotely by 0V applied to Pin 8 of the Remote Control Connector on the rear panel. With X16 in Position a-b, this mute is controlled by X15: Position a-b to mute; b-c to unmute.

4.2.8 Overriding Mute (DAC and Transformers Module)

With X4 on the DAC and Transformers module in Position a-b, the audio may be muted by setting X3 to Position a-b, or unmuted by setting X3 to Position b-c.

With X4 on the DAC and Transformer module in Position b-c, the audio may be muted remotely by 0V applied to Pin 9 of the Remote Control Connector on the rear panel. By applying C_4 from the Control and Additional Data Output connector on the back panel to this remote mute input, the outputs of the DAC and Transformers module (stereo and mono) can be made to mute when a test tone (or fall-back tone) is selected (at the Coder or Decoder) while the test or fall-back tone is audible locally from the Audio Decoder module. (See Para. 4.2.2 and 4.2.5 above).