SOUND IN SYNCS DECODER CD3/504

Introduction

The CD3/504 accepts a composite video and sound (sound-in-syncs) signal, separates it into its video and binary-coded-sound components, gates regenerated sync pulses into the video signal, and decodes the sound signal. The decoded sound is processed in an expander unit which is controlled by an out-of-band pilot tone added to the original audio signal in the associated coder[1]. The expander add a limiter which is located in the coder, together form a compandor which improves the overall signal-to-noise ratio of the audio signal.

The decoder incorporates monitoring units whose function is to detect video disturbances and minimise the effect of such disturbances on the audio signal. Among the monitoring circuits provided is an overall-fault monitor; this operates an alarm in the event of a continuous fault or a rapid succession of intermittent faults.

A block diagram, showing the way in which the units comprising the decoder are interconnected, is given in Fig. 1. Power supplies are provided by a mains-powered PS2L/123 Power Supplier.

General Specification

Audio (when fed from CD2M/505)

Frequency Response	±0·7 dB between 40 Hz and 13·5 kHz, −3 dB between 25 Hz and 14 kHz (typical)
Harmonic Distortion	less than −50 dB at 1 kHz with a signal level of 0 dB w.r.t. 1 mW less than −50 dB at 1 kHz with a signal level of +10 dB w.r.t. 1 mW less than −50 dB at 100 Hz with a signal level of 0 dB w.r.t. 1 mW
Signal-to-noise Ratio	65 dB peak-signal to peak-weighted noise
Output	0 dB w.r.t. 1mW peaking to +8 dB w.r.t. 1 mW
Output Impedance	150 Ω nominal balanced (intended for 600 Ω termination)

Video

Input Signal Range	+6 dB to −8 dB w.r.t. 1V p-p (with S.I.S.)
Input Impedance	75 Ω nominal
Pulse k-rating	2%
Bar k-rating	2%
Differential-phase Distortion	0·25°
Output	1V p-p nominal with regenerated syncs

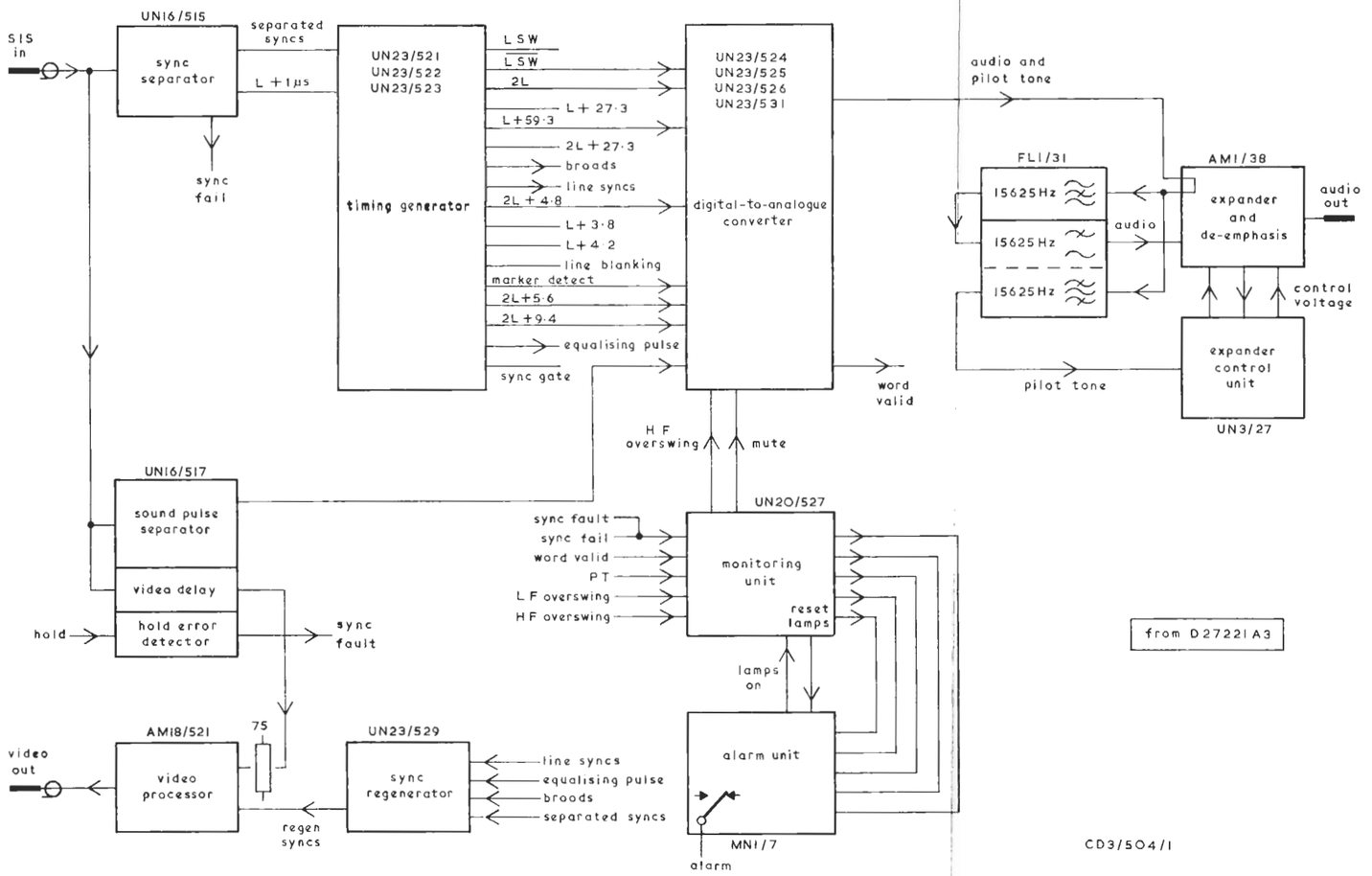

Fig. 1. Block Diagram of the S.i.s. Decoder CD3/504

The decoder consists of the following plug-in units mounted on a PN3/23 chassis:

Sound in Syncs Audio Expander	AM1/38	Timing Oscillator	UN23/521
Sync Stabilising Amplifier	AM18/521	Sound in Syncs Gating Unit	UN23/522
Sound in Syncs Audio Filter	FL1/31	Sound in Syncs Gating Unit	UN23/523
Sound in Syncs System Monitor	MN1/7	Sound in Syncs Shift Register	UN23/524
Sound in Syncs Audio Expander Control Unit	UN3/27	Sound in Syncs Staticiser Unit	UN23/525
Sound in Syncs Sync Separator Unit	UN16/515	Sound in Syncs Counter Logic Unit	UN23/526
Sound in Syncs Sound Pulse Separator Unit	UN16/517	Sync Regenerator Unit	UN23/529
Sound in Syncs Error Signal Detection Unit	UN20/527	Sound in Syncs Sample and Hold Unit	UN23/531

and an FL4/566 Filter which is inserted between the AM18/521 and the video output.

Logic

The logic circuits of the decoder use T.T.L. and M.E.C.L. integrated circuits. T.T.L. and M.E.C.L. logic levels are shown in Fig. 2.

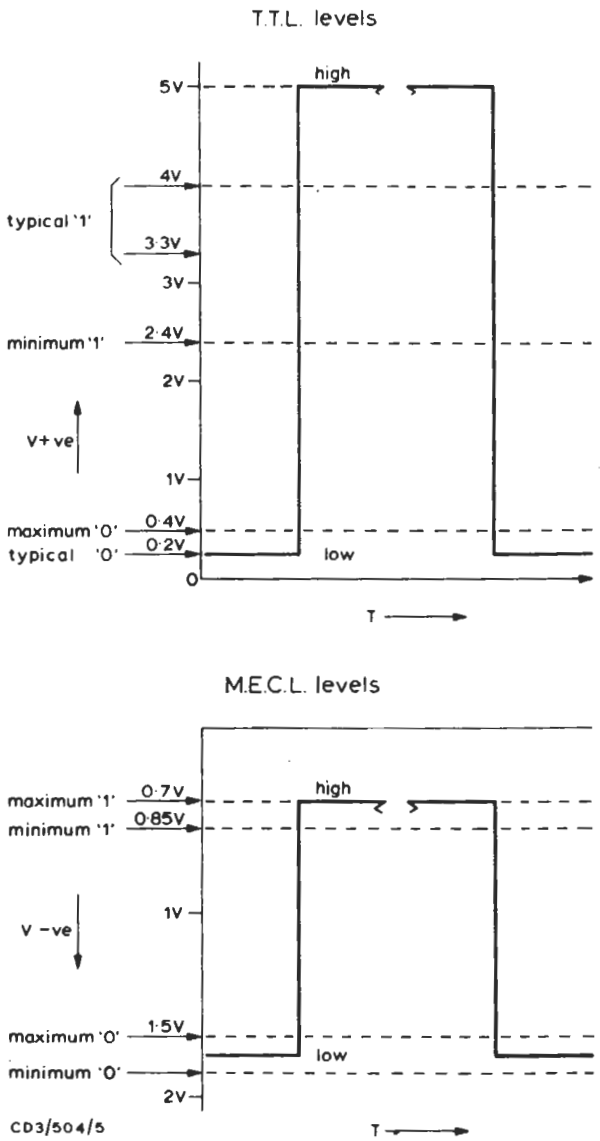

Fig. 2. S.i.s. Logic Levels

General Description

The following description deals briefly with the decoder as a whole. For more detailed information on individual units of the decoder see the appropriate Instructions.

Video

The composite video and sound input signal is passed through delay lines in the UN16/517 unit which delay the signal by up to 620 ns (155 ns of which is adjustable in 5-ns steps). The delayed signal is then passed to the AM18/521 stabilising amplifier where it is blanked (thereby removing the sound signal)and regenerated syncs are gated into the video waveform. The sync pulses are derived from the UN23/529 unit and are adjusted to have the same amplitude as the broad pulses contained in the input signal.

The delay applied to the input signal compensates for the delay involved in regenerating and reshaping the sync pulses.

Timing-pulse Generator

The digital-to-analogue conversion and sync-regeneration processes which are carried out in the decoder require a number of pulse waveforms which must be synchronised with the input signal and accurately timed. These waveforms are derived from the UN23/521 Timing Oscillator which is driven by separated-sync pulses.

The oscillator, which has a frequency of approximately 10 MHz, is started by the leading edge of separated syncs and drives a counter. When the count reaches 630 (i.e. 63 μs after the start) both counter and oscillator are stopped until the arrival of the next sync pulse; during this period the counter is reset to zero. The action of stopping the counter starts a ramp generator, the resulting ramp waveform provides an oscillator-correction voltage which ensures that the period between the counter stopping and the arrival of the next sync pulse is maintained at 1 μs. The various outputs of the counter are gated in UN23/522 and UN23/523 units to provide the pulse waveforms required by the other units of the decoder.

Continued overleaf

Digital to Analogue Conversion

The binary-coded sound component of the input signal is separated from the composite video and sound signal in the UN16/517 unit and applied to the digital-to-analogue converter, shown in block diagram form in Fig. 3. The digits of a sound pulse group (two 10-bit samples plus a marker pulse) are read into a 22-bit shift register where tests are carried out to ensure that the marker pulse has the correct time relationship to the leading edge of syncs, and that no spurious data (a 22nd bit) follows immediately after the pulse group. If the tests are satisfactory, the digits of one sample are transferred via a parallel store (staticiser) to a counter which is thus set up to the numerical value of the sample.

The reconstituted audio signal present at the output of the digital-to-analogue converter is applied to two circuits. In one the signal is filtered to remove the pilot tone and any multiples of the sampling frequency; in the other the pilot tone is extracted and used to derive a control voltage. Both the filtered audio signal and the control voltage are then applied to the audio expander unit where the control voltage is used to adjust the gain of the audio signal in a manner which complements the action of the compressor and so restores the audio signal to its original dynamic range.

Monitoring

The object of monitoring is to anticipate signal

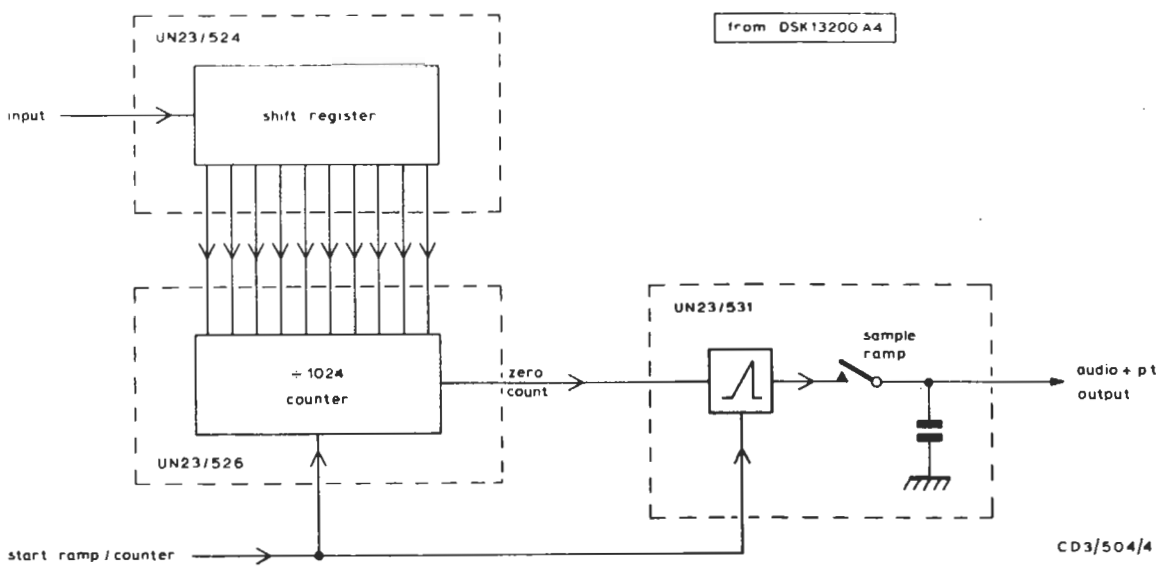

Fig. 3. Block Diagram of the Digital-to-analogue Converter

On the receipt of a command pulse the counter starts to count down towards zero and, simultaneously, a ramp generator is started. When the count reaches zero both counter and ramp generator stop. The ramp voltage is then sampled and held in a capacitor, the voltage developed across the capacitor equals the amplitude of the original sample prior to coding. The sequence of events outlined above is repeated for the digits of the second sample of the sound pulse group; both conversions are carried out before the next sound pulse group is separated from the video waveform.

If the marker pulse is incorrect, or if spurious data occurs immediately after the end of the pulse group, the digits are not transferred from the shift register to the staticiser and the counter repeats the information provided by the previous pulse group.

disturbances and to minimise their effect on the audio signal. The action taken either holds up the transfer of data into the counter of the digital-to-analogue converter or mutes the audio signal.

A hold is applied if:

(a) the marker pulse is absent or does not have the correct time relationship to the leading edge of syncs;

(b) a transition is detected during the pulse group which exceeds the top or bottom of the group by more than 4 dB;

(c) a 22nd digit is detected immediately after the pulse group.

A mute is applied if:

(a) sync pulses are missing from the incoming signal (one missing sync pulse is sufficient to apply a mute);

(b) the video signal exceeds an amplitude of 4 dB above white level or 4 dB below sync bottoms for more than 10 μs during any line period;
(c) more than three holds are encountered in less than 10 lines;
(d) the timing generator goes out of lock.

Visual indications of a number of possible fault conditions are provided by a lamp panel on the MN1/7 unit. Each fault indication lasts until five seconds after all faults have been cleared; therefore, if a number of different faults occur at intervals of less than five seconds, the lamps indicate the fault total since the first of the series of faults. The lamp indicators can be reset to give the fault state at any moment by pressing a button on the UN20/527 unit.

An overall system-fault indication is provided which monitors the individual fault conditions and operates if any fault is present for more than five seconds, or if more than approximately 25 intermittent faults occur in 30 seconds. Associated with the system-fault circuit is a relay which can be used to operate an external alarm.

Operational Adjustments

To maintain optimum operating conditions the following adjustments should be made if some plug-in units are replaced. The decoder will continue to operate, but with impared performance, if these adjustments are not carried out.

Unit Changed	*Adjustment Required*
AM1/38	2,3
AM18/521	5
FL1/1/31	2
UN3/27	2,3
UN16/517	4
UN23/531	1

Note that adjustments 1, 2 and 3 must be carried out in that order

1. Ramp Adjustment and Sit
(Adjustments on UN23/531)

(i) Feed the decoder from a correctly-aligned coder with no audio signal applied.
(ii) Use an oscilloscope of known accuracy to monitor SKA (*Sawtooth Mon.*) on the UN23/531 unit. Check that a twice-line-frequency sawtooth is present (see Fig. 4).
(iii) Adjust R22 so that the base of the sawtooth is at −2·5V with respect to earth.
Adjust R17 so that the variation in peak level between the tops of successive sawteeth is 420 mV.
After completing these adjustments check that the tops of the sawteeth are approximately equally displayed on either side of the 0V level.
(iv) Replace the AM1/38 and UN23/531 units in the decoder.

2. Pilot Tone Gain
(Adjustments on UN3/37)

(1) Check that the associated coder is *not* receiving an audio signal.
(ii) Place the UN3/27 unit on an extender board.
(iii) Use a meter or an oscilloscope to monitor the *Control Voltage Mon.* test point and adjust R44 so that the d.c. voltage at this point is +200 mV.
(iv) Replace the UN3/27 in the decoder.

3. Audio Gain
(Adjustments on AM1/38)

(Not normally required if adjustment 2 has been carried out.)

(i) Apply a 250-Hz audio signal to the associated coder at a level of 0 dB w.r.t. 1 mW.
(ii) Place the AM1/38 unit on an extender board.
(iii) Terminate the decoder audio input in 600 ohms.
Measure the output level. Adjust R37 on the AM1/38 unit for a reading of **0 dB** w.r.t. 1 mW.
(iv) Replace the AM1/38 unit in the decoder.

4. Reinserted Sync Timing
(Adjustments on UN16/517)

When changing the UN16/517, ensure that the delay line taps on the new unit are the same as those on the old unit.

To check the re-inserted sync timing:

(i) Apply a pulse-and-bar signal to the associated coder.
(ii) Use a double-beam oscilloscope with two probes to monitor the input and output of the decoder.
(iii) Display the sync pulses and measure the time difference (at the half-amplitude point) between the leading edges of input and output syncs.
(iv) Measure the time difference between the input and output video signals at a convenient point (such as the leading edge of the white bar at the half-amplitude level).
(v) The measurements obtained in (iii) and (iv) should be within 10 ns of each other. If they are not, adjust the delay line tapping accordingly.

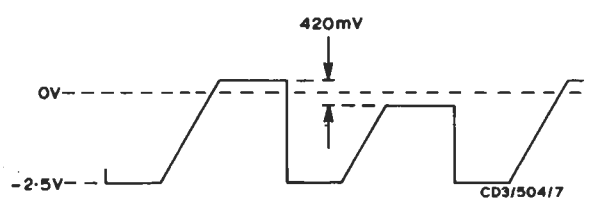

Fig. 4. Waveform at UN23/531 SKA

(b) the video signal exceeds an amplitude of 4 dB above white level or 4 dB below sync bottoms for more than 10 μs during any line period;
(c) more than three holds are encountered in less than 10 lines;
(d) the timing generator goes out of lock.

Visual indications of a number of possible fault conditions are provided by a lamp panel on the MN1/7 unit. Each fault indication lasts until five seconds after all faults have been cleared; therefore, if a number of different faults occur at intervals of less than five seconds, the lamps indicate the fault total since the first of the series of faults. The lamp indicators can be reset to give the fault state at any moment by pressing a button on the UN20/527 unit.

An overall system-fault indication is provided which monitors the individual fault conditions and operates if any fault is present for more than five seconds, or if more than approximately 25 intermittent faults occur in 30 seconds. Associated with the system-fault circuit is a relay which can be used to operate an external alarm.

Operational Adjustments

To maintain optimum operating conditions the following adjustments should be made if some plug-in units are replaced. The decoder will continue to operate, but with impared performance, if these adjustments are not carried out.

Unit Changed	*Adjustment Required*
AM1/38	2,3
AM18/521	5
FL1/1/31	2
UN3/27	2,3
UN16/517	4
UN23/531	1

1. Ramp Amplitude and Sit
(Adjustments on UN23/531)

(i) Feed the decoder from a correctly-aligned coder which does not have a signal applied to its audio input.
(ii) Remove the AM1/38 unit from the decoder; using an extender board and a 15-way Painton plug, feed the signal developed between pins 14 and 3 of the back connector to the high-impedance input of an accurately calibrated ATM/1 or equivalent. Place the UN23/531 on an extender board and adjust R17 to obtain a meter reading of −15.5 w.r.t. 1 mW.
(iii) Use an oscilloscope probe to monitor SKA (Sawtooth Mon.) on the UN23/531 unit. Check that a twice-line-frequency sawtooth is present and that it is modulated by pilot tone. Adjust R22 on the UN23/531 until the most negative portion of the waveform is at −2.5 volts.
(iv) Replace the AM1/38 and UN23/531 units in the decoder.

2. Pilot Tone Gain
(Adjustments on UN3/37)

(1) Check that the associated coder is *not* receiving an audio signal.
(ii) Place the UN3/27 unit on an extender board.
(iii) Use a meter or an oscilloscope to monitor the *Control Voltage Mon.* test point and adjust R44 so that the d.c. voltage at this point is +200 mV.
(iv) Replace the UN3/27 in the decoder.

3. Audio Gain
(Adjustments on AM1/38)

(Not normally required if adjustment 2 has been carried out.)

(i) Apply a 250-Hz audio signal to the associated coder at a level of 0 dB w.r.t. 1 mW.
(ii) Place the AM1/38 unit on an extender board.
(iii) Terminate the decoder audio input in 600 ohms.
Measure the output level. Adjust R37 on the AM1/38 unit for a reading of 0 dB w.r.t. 1 mW.
(iv) Replace the AM1/38 unit in the decoder.

4. Reinserted Sync Timing
(Adjustments on UN16/517)

When changing the UN16/517, ensure that the delay line taps on the new unit are the same as those on the old unit.

(i) Feed the decoder with a video test signal (Adjustments on AM18/521)

(i) Feed the decoder with a video test signal containing field information (e.g. a pulse-and-bar signal containing field information) and monitor the waveform at the video output of the decoder with an oscilloscope. Set the back-porch blanking level of the output waveform to a convenient point on the display.
(ii) Place the AM18/521 on an extender board.
(iii) Observe the oscilloscope display and adjust R25 so that back-porch blanking level is at the same level as the black level component in the active line.
(iv) Observe the oscilloscope display and adjust R97 so that sync pulses are inserted at the correct d.c. level.
(v) Replace the AM18/521 in the decoder.

Fault Finding

The waveforms that should be present at the various test points on the front panels of the plug-in units are shown in Figs. 4 and 5. A comparison of the monitored waveforms with those shown should enable a faulty unit to be identified.

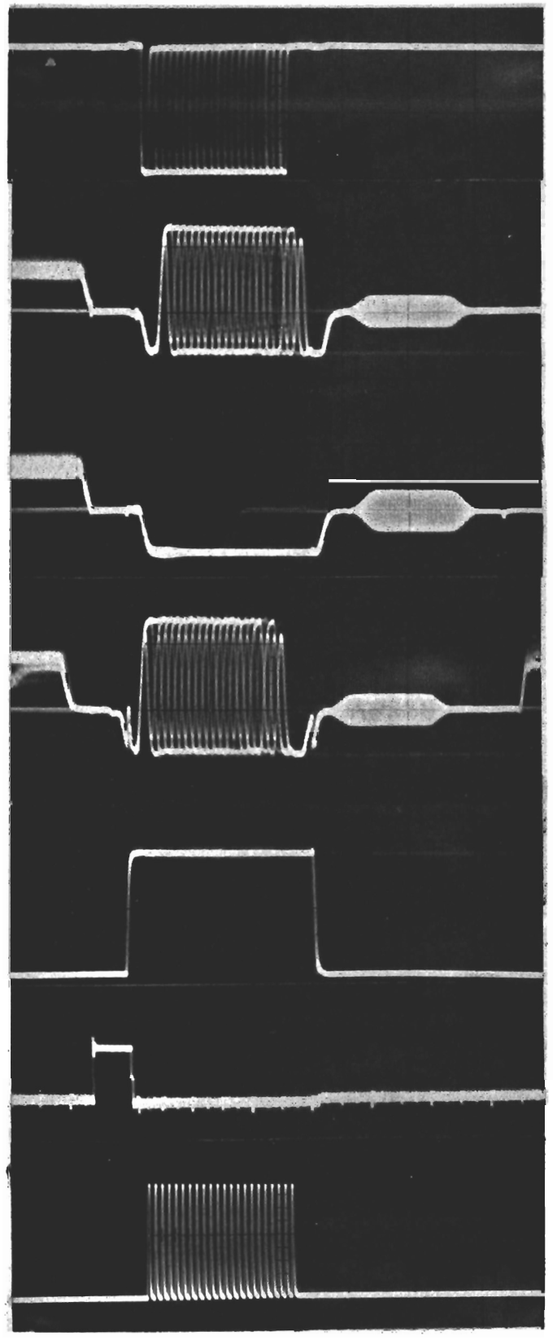

Fig. 4. Waveforms in the CD3/504
(a) UN16/517 separated digits (about 2V)
(b) AM18/521 video input (about 1V)
(c) AM18/521 video output (sync component 0·3V)
(d) UN16/515 video input (about 1V)
(e) UN16/515 syncs output (4V)
(f) UN23/521 reset pulse (about 1V)
(g) UN23/524 shift pulses (about 3·8V)
(time base 2 μs/cm, amplitudes are p-p)

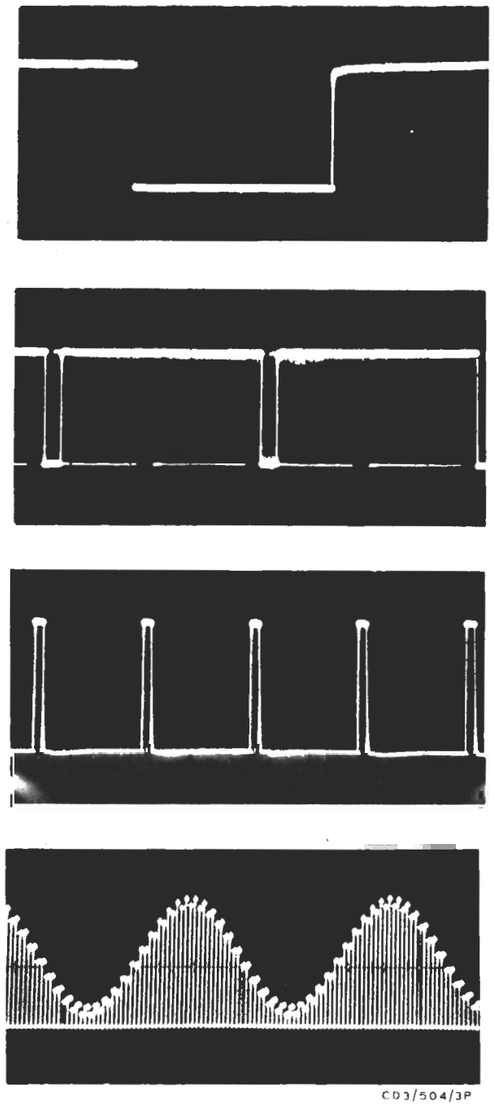

Fig. 5. Waveforms in the CD3/504
(a) UN23/529 field pulse (2V, 50 μs/sq)
(b) UN23/529 regen syncs (2V, 20 μs/sq)
(c) UN23/531 2L pulses (10V, 20 μs/sq)
(d) UN23/531 sawtooth mon (2V, 200 μs/sq)

5. Final Checks

(i) Feed the decoder with a video test signal containing field information. Allow a 30-minute warm-up period and monitor the video output with an oscilloscope which is triggered from mixed syncs. Check that active-line black level is the same as back-porch blanking level; check also that the sync pulse re-insertion level is correct.
If either level is incorrect place the AM18/521 unit on an extender board and adjust R25 (for black level/blanking level parity) and R91 for sync-pulse re-insertion level.

(ii) Check that normal line-sync and audio signals are obtained from the decoder when the associated coder is working on the reserve line-drive signal.

(iii) Check that, when the coder is working on line-drive, field pulses are not present at the decoder output. If they are, the UN23/529 unit may be faulty.

(iv) Examine sync pulses at the video output of the decoder and check that any switching spikes are less than 50 mV p-p.

(v) Display the decoder output on a picture monitor and check that no sound-on-vision effects are present.

Fault Finding

The waveforms that should be present at the various test points on the front panels on the plug-in units are shown in Figs. 5 and 6. A comparison of the monitored waveforms with those shown should enable a faulty unit to be identified.

Interconnections

All interconnections (other than power supplies) between the component units of the decoder are shown in Fig. 7 on page 9.

TES 9/72

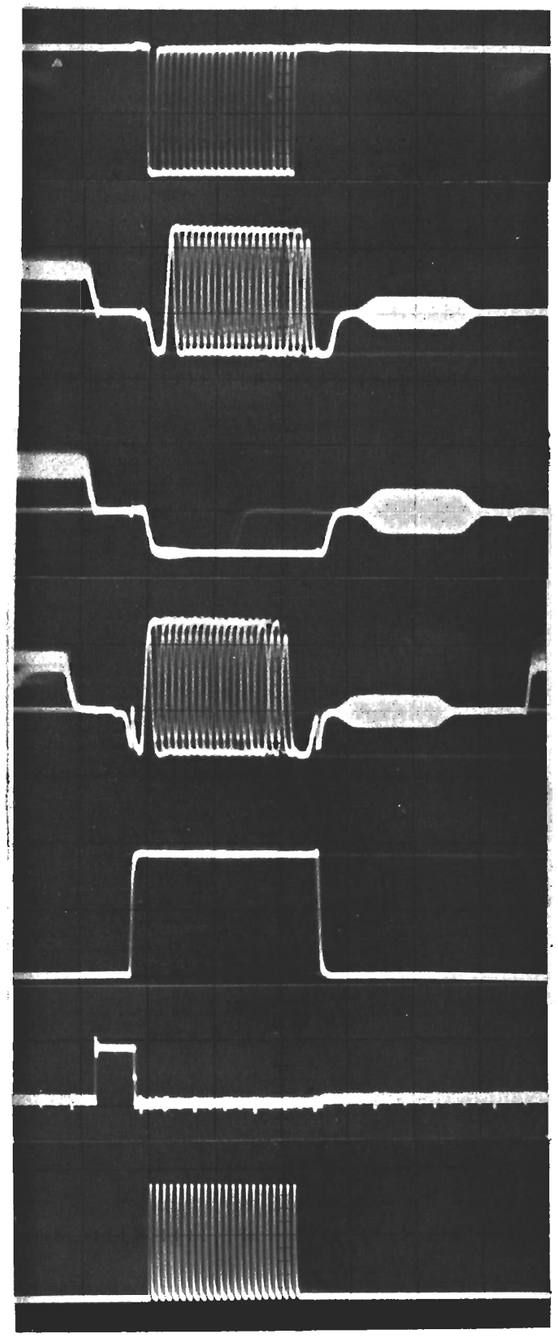

Fig. 5. Waveforms in the CD3/504
(a) UN16/517 separated digits (about 4V)
(b) AM18/521 video input (about 1V)
(c) AM18/521 video output (sync component 0·3V)
(d) UN16/515 video input (about 1V)
(e) UN16/515 syncs output (4V)
(f) UN23/521 reset pulse (about 0·7V)
(g) UN23/524 shift pulses (about 3·8V)
(time base 2 μs/cm, amplitudes are p-p)

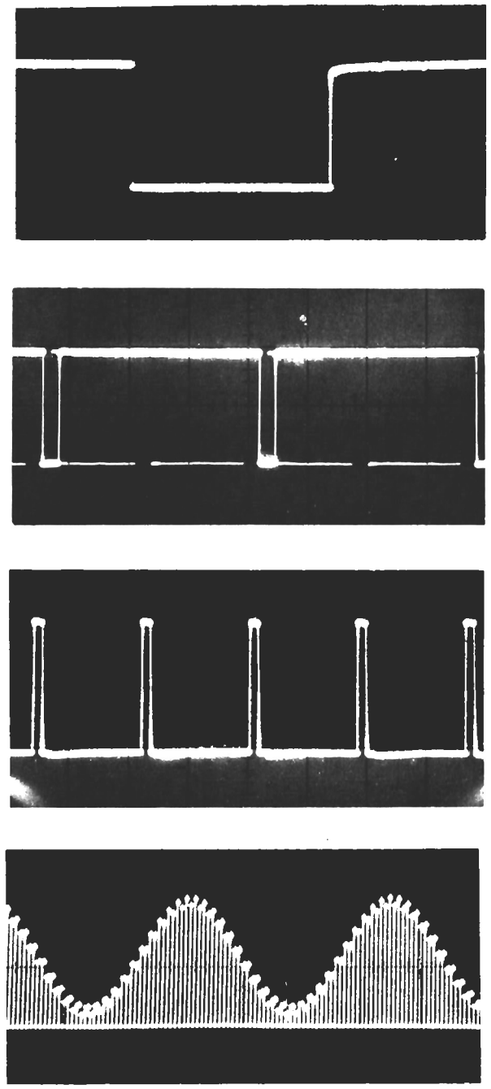

Fig. 6. Waveforms in the CD3/504
(a) UN23/529 field pulse (2V, 50 μs/sq)
(b) UN23/529 regen syncs (2V, 20 μs/sq)
(c) UN23/531 2L pulses (10V, 20 μs/sq)
(d) UN23/531 sawtooth mon (2V, 200 μs/sq)

power plug

power to units

+12V	2
−12V	3
+24V	6
+5·2V	8
−5·2V	9
0 V	1,4,5, 7,10,11,

POWER CONNECTION PINS ON UNITS

UNIT	+24V	+12V	−12V	+5·2V	−5·2V	0V*
AMI/38	8					3
AMI8/521		22	24	21		25
MNI/7				5	4	3
UN3/27	8 †	15 †	14			3
UN16/515		22		21	23	25
UN16/517		22	24	21		25
UN20/527		22	24	21		25
UN23/521		30	32	29	31	33
UN23/522		30	32	29	31	33
UN23/523		30	32	29	31	33
UN23/524				29		33
UN23/525				29		33
UN23/526			32		31	33
UN23/529				29	31	33
UN23/531		30	32	29	31	33

*Many units have more than one pin connected to the 0V (earth) line.

†A 270Ω resistor is connected between the +24V and +12V rails on the UN3/23 back wiring.

CD3/504/6T

Fig 6. CD3/504: Unit Interconnection Diagram

Pin No.	*Function*	*From or To*
UN23/526 Connections		
1	earth	
2	ramp hold in	UN23/531 (pin 15)
3	spare	
4	counter start in	UN23/523 (pin 22)
5	spare	
6	2L + 4·8 in	UN23/522 (pin 24) UN23/525 (pin 2)
7 and 8	earth	
9	ramp start out	UN23/531 (pin 14)
10 to 12	earth	
13	spare	
14	earth	
15	d 10 }	UN23/525 (pin 19)
16	d 9 }	UN23/525 (pin 20)
17	d 8 }	UN23/525 (pin 21)
18	d 7 } digit	UN23/525 (pin 22)
19	d 6 } inputs	UN23/525 (pin 23)
20	d 5 } to	UN23/525 (pin 24)
21	d 4 } counter	UN23/525 (pin 25)
22	d 3 }	UN23/525 (pin 26)
23	d 2 }	UN23/525 (pin 27)
24	d 1 }	UN23/525 (pin 28)
25 to 28	earth	
29	+5 V (not used) }	decoder power connector
30	+12 V (not used) }	via other unit connectors
31	−5 V }	
32	−12 V }	
33	earth	
UN23/524 Connections		
1	earth	
2	reset (L + 59·3) in	UN23/522 (pin 20)
3	earth	
4	shift start out	UN23/531 (pin 8)
5	earth	
6	h.f. overswing in	UN20/527 (pin 8)
7	word valid out	UN23/525 (pin 4) UN20/527 (pin 7)
8	shift stop out	UN23/531 (pin 5)
9	d 1 }	UN23/525 (pin 7)
10	d 2 }	UN23/525 (pin 8)
11	d 3 }	UN23/525 (pin 9)
12	d 4 }	UN23/525 (pin 10)
13	d 5 } digit	UN23/525 (pin 11)
14	d 6 } outputs	UN23/525 (pin 12)
15	d 7 }	UN23/525 (pin 13)
16	d 8 }	UN23/525 (pin 14)
17	d 9 }	UN23/525 (pin 15)
18	d 10 }	UN23/525 (pin 16)
19	transfer odd in	UN23/525 (pin 17)
20	transfer even in	UN23/525 (pin 18)
21	earth	
22	shift in	UN23/531 (pin 2)

Pin No.	Function	From or To
UN23/524 Connections *(contd.)*		
23 to 25	earth	
26	marker detect in	UN23/523 (pin 19)
27	spare	
28	digit in	UN16/517 (pin 18)
29	+5 V	decoder power connector via other unit connectors
30	+12 V (not used)	
31	−5 V (not used)	
32	−12 V (not used)	
33	earth	
UN23/525 Connections		
1	$\overline{\text{LSW}}$	UN23/522 (pin 17)
2	L + 59·3 in	UN23/522 (pin 20)
3	spare	
4	word valid in	UN23/524 (pin 7) UN20/527 (pin 7)
5	spare	
6	shift pulse in	UN23/523 (pin 20) UN23/531 (pin 20)
7	d 1	UN23/524 (pin 9)
8	d 2	UN23/524 (pin 10)
9	d 3	UN23/524 (pin 11)
10	d 4	UN23/524 (pin 12)
11	d 5 digit inputs	UN23/524 (pin 13)
12	d 6	UN23/524 (pin 14)
13	d 7	UN23/524 (pin 15)
14	d 8	UN23/524 (pin 16)
15	d 9	UN23/524 (pin 17)
16	d 10	UN23/524 (pin 18)
17	transfer odd out	UN23/524 (pin 19)
18	transfer even out	UN23/524 (pin 20)
19	d 10 out	UN23/526 (pin 15)
20	d 9 out	UN23/526 (pin 16)
21	d 8 out	UN23/526 (pin 17)
22	d 7 out	UN23/526 (pin 18)
23	d 6 out	UN23/526 (pin 19)
24	d 5 out	UN23/526 (pin 20)
25	d 4 out	UN23/526 (pin 21)
26	d 3 out	UN23/526 (pin 22)
27	d 2 out	UN23/526 (pin 23)
28	d 1 out	UN23/526 (pin 24)
29	+5 V	decoder power connector via other input connectors
30	+12 V (not used)	
31	spare	
32	−12 V (not used)	decoder power connector via other input connectors
33	earth	

Pin No.	Function	From or To
UN23/531 Connections		
1	earth	
2	shift out	UN23/524 (pin 22)
3	spare	
4	line blank in	UN20/527 (pin 6) UN23/523 (pin 18)
5	shift stop in	UN20/527 (pin 5) UN23/524 (pin 8)
6 and 7	spare	
8	shift start in	UN23/524 (pin 4)
9 to 11	spare	
12	earth	
13	spare	
14	ramp start in	UN23/526 (pin 9)
15	ramp hold out	UN23/526 (pin 2)
16	audio out	AM1/38 (pin 14)
17	screen for 16	
18 and 19	spare	
20	shift pulse in	UN23/525 (pin 6) UN23/523 (pin 20)
21 and 22	spare	
23	mute in	UN20/527 (pin 4)
24 and 25	spare	
26	mute out	UN3/27 (pin 13)
27	2L equalising pulses in	UN23/529 (pin 18) UN23/522 (pin 18) UN16/517 (pin 12)
28	spare	
29	+5 V	decoder power connector via other unit connectors
30	+12 V	
31	−5 V	
32	−12 V	
33	earth	
UN20/527 Connections		
1	set in	MN1/7 (pin 7)
2	reset out	MN1/7 (pin 6)
3	sync fail in	UN16/515 (pin 1) UN16/517 (pin 16)
4	mute out	UN23/531 (pin 23)
5	osc. gate in	UN23/531 (pin 5) UN23/524 (pin 8)
6	line blanking	UN23/531 (pin 4) UN23/523 (pin 18)
7	word valid in	UN23/525 (pin 4) UN23/524 (pin 7)
8	h.f. overswing out	UN23/524 (pin 6)
9	pilot tone out	MN1/7 (pin 11) and error output connector
10	hold out	MN1/7 (pin 12) and error output connector
11		
12	timing gen unlock out	MN1/7 (pin 10) and error output connector
13	l.f. out	MN1/7 (pin 9) and error output connector
14	sync fail out	MN1/7 (pin 8) and error output connector
15	pilot tone alarm in	UN3/27 (pin 12)

Pin No.	Function	From or To
UN20/527 Connections *(contd)*		
16	timing gen unlock in	UN23/521 (pin 24)
17	sync amp in	AM18/521 (pin 6)
18	video in	AM18/521 (pin 14)
19 and 20	spare	
21	+5 V	decoder power connector via other unit connectors
22	+12 V	
23	spare	
24	−12 V	decoder power connector via other unit connectors
25	earth	
MN1/7 Connections		
1 and 2	spare	
3	earth	
4	−5 V	decoder power connector
5	+5 V	
6	reset in	UN20/527 (pin 2)
7	set out	UN20/527 (pin 1)
8	sync fail in	UN20/527 (pin 14)
9	l.f. in	UN20/527 (pin 13)
10	timing gen unlock in	UN20/527 (pin 12)
11	pilot tone alarm in	UN20/527 (pin 9)
12	hold in	UN20/527 (pin 10)
13	Changeover relay contacts	decoder error-output connector
14		
15		
FL1/31 Connections		
1 and 2	spare	
3	earth	
4	pilot tone out	UN3/27 (pin 6)
5	spare	
6	audio in	AM1/38 (pin 13)
7	earth	
8	strapped to 13	
9 and 10	spare	
11	audio in	AM1/38 (pin 12)
12	spare	
13	strapped to 8	
14	audio out	AM1/38 (pin 4)
15	earth	

Pin No.	*Function*	*From or To*
UN3/27 Connections		
1 and 2	spare	
3	earth	
4	pilot tone to AM1/38	AM1/38 (pin 5)
5	earth	
6	pilot tone in	FL1/31 (pin 4)
7	pilot tone from AM1/38	AM1/38 (pin 6)
8	+24 V	decoder power connector via AM1/38 (pin 8)
9	earth	
10	control voltage out	AM1/38 (pin 7)
11	earth	
12	pilot tone fail out	UN20/527 (pin 15)
13	mute in	UN23/531 (pin 26)
14	−12 V	decoder power connector
15	+12 V	
AM1/38 Connections		
1 and 2	spare	
3	earth	
4	audio from filter	FL1/31 (pin 14)
5	pilot tone in	UN3/27 (pin 4)
6	pilot tone out	UN3/27 (pin 7)
7	control voltage in	UN3/27 (pin 10)
8	+24 V	decoder power connector
9	audio output	decoder output connector
10		
11	spare	
12	audio to filter	FL1/31 (pin 11)
13	audio to filter	FL1/31 (pin 6)
14	audio in	UN23/531 (pin 16)
15	spare	

References to Typical Associated Equipment

1. Sound-in-syncs Coder CD2M/505.

TES 9/71