WIDE BAND SOUND AND VISION MODULATOR MD1/502

Introduction

The MD1/502 can provide a complete television signal, sound and vision, on any channel in Bands I, II or III or at U.H.F. It generates its own r.f. signals and the modulation may be either 405-line positive with a.m. sound or 625-line negative with f.m. sound. Colour signals can be handled. The sound and vision carriers are combined in a hybrid unit and the output signal is of double-sideband form. Channels are changed by the use of pre-aligned units.

The modulator is capable of a variety of applications, for example:

(a) As a source of r.f. for test purposes.
(b) For closed circuit distribution systems.
(c) For programme injection purposes.

The modulator is designed on a plug-in unit basis, the units being interchanged according to the system required as indicated on the block diagram of Fig. 1 and as listed below. Each individual unit is built on to a CH1/12A chassis and all are mounted on a PN3/23A panel (2 panels for 625-line system) with a PN3A/10 termination panel.

List of Units

405-Line System	*625-Line System*
Panel A	*Panel A*
AM18/508	AM18/508
AM3/501A	AM3/501A
GE2/502	GE2/502
MD1/503A or MD1/506A (two off)	MD1/503A or MD1/506A MD1/503B or MD1/506B
UN1/546	UN1/546
FL4/14	FL4/14
Hybrid Unit (Hatfield Instrument Co. Ltd.)	Hybrid Unit (Hatfield Instrument Co. Ltd.)
PS2/33	PS2/33
Panel B	*Panel B*
Not required	MD3/501
	UN15/501
	CO2/510
	PS1/10
	MX1/509, OS2/511 } for u.h.f. working only

General Specification

405-Line System (*Positive vision modulation with a.m. sound*)

Output Level	175 mV to 275 mV p-p
Output Impedance	75 ohms
Input Impedance	
Video	75 ohms
Sound	600 ohms
Input Level	
Video	1 V p-p composite
Sound (100% modulation)	+8 dB relative to 1 mW
Non-linearity Distortion	3%
k rating (2T pulse and bar	less than 1%

Harmonic Distortion Due to Audio Modulator

1 kHz, 40% mod.	less than 0·5%

625-line System (*Negative vision modulation with f.m. sound*)

As above except for the following:

Sound Input Level (50 kHz deviation at 400 Hz)	+8 dB relative to 1 mW

Harmonic Distortion Due to F.M. Modulator at 75 kHz Deviation

1 kHz	−54 dB
100 Hz	−46 dB
Differential Gain Error	less than 2%
Differential Phase Error	less than 0·5°

General Description

A block diagram of the MD1/502 is given in Fig. 1.

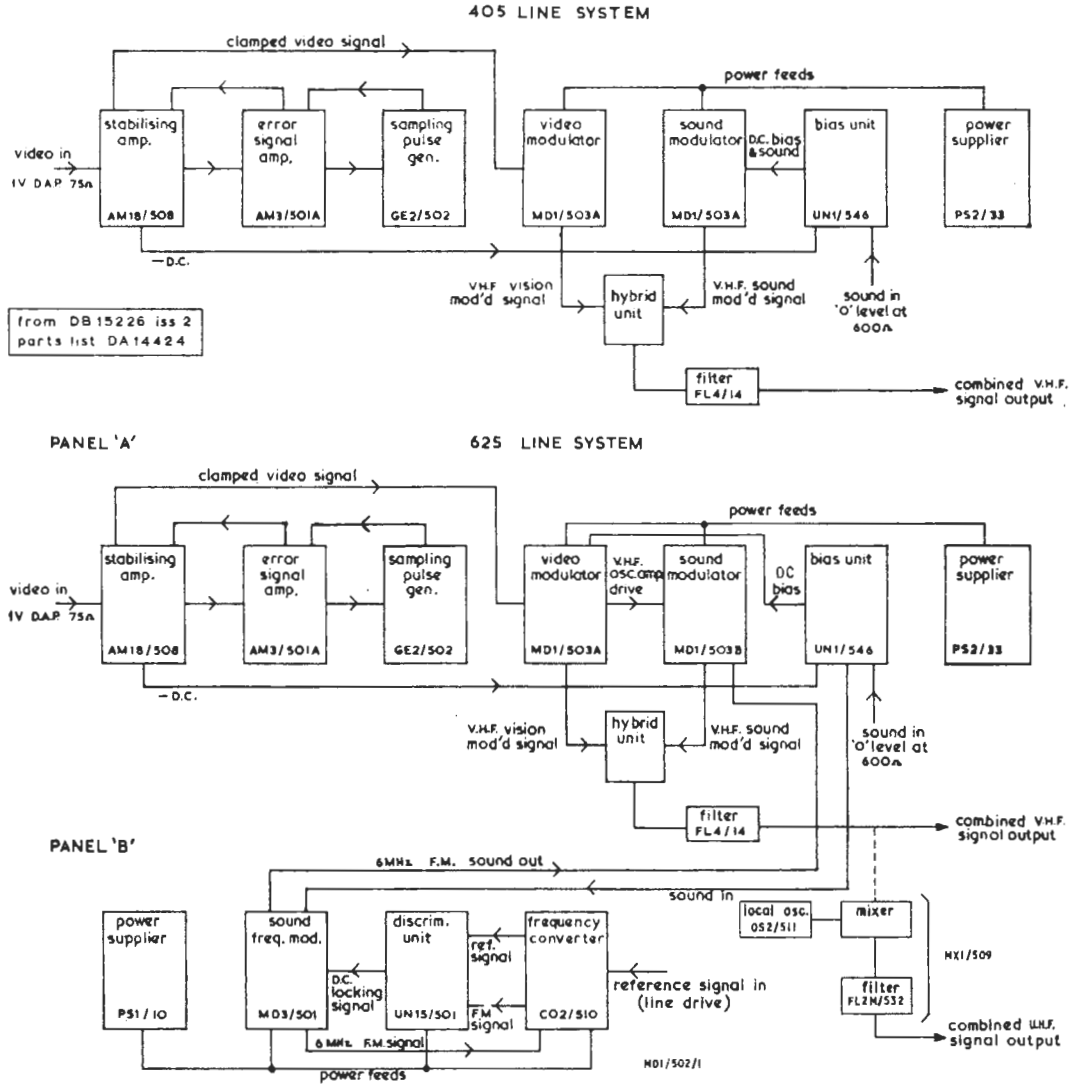

Fig. 1. Block Diagram of the MD1/502

The input video signal, after clamping, is fed to a MD1/503A modulator along with negative bias if negative modulation is required. The modulated signal then passes to a hybrid unit where it is combined with the corresponding sound signal. From the hybrid unit the combined signal passes to the output via a low pass filter to reduce the level of unwanted modulation products.

The sound signal in a 405-line arrangement is fed to the sound modulator MD1/503A via the bias unit where the necessary d.c. bias is added. The modulated output is then combined with the vision signal in the hybrid unit, as already stated.

In the 625-line arrangement, the sound signal is first frequency modulated on to a 6-MHz carrier which is then converted to the final carrier frequency in the sound modulator MD1/503B. The 6-MHz carrier can be locked to a reference signal (usually line drive) and, as one crystal controlled master oscillator is shared between the two modulators, the vision and sound carrier spacing is fixed and stable and exactly related to the reference signal. The output from the MD1/503B is combined with the vision signal in the hybrid unit, as before.

The hybrid unit and the filter are mounted at the back of the vision modulator.

If the Modulator is to be used in Band I or Band II, it will include an MD1/503A or MD1/503B, the crystal oscillator being on its fundamental frequency. If operation is to be from approximately 100 MHz to the top of Band III, the MD1/506 will be used with a crystal operating at half or a third of the output frequency.

For u.h.f. working, the combined output signal from the FL4/14 filter is taken to an MX1/509 converter, the sound and vision carrier frequencies being 31·5 MHz and 37·5 MHz respectively. The MX1/509 converter consists of a MX1/508 mixer and FL2M/532 filter with an OS2/511 local oscillator.

Maintenance

Routine maintenance is not required but the following checks may be made occasionally, or if the performance becomes suspect.

405-lines Working

1. With an input signal of 1 V p-p, 70/30 picture to sync ratio, the modulated envelope as monitored at the *R.F. Out* socket terminated with 75 ohms should have an amplitude of approximately 400 mV p-p.
   The vision carrier leak at the bottom of syncs should be less than 2% of the picture amplitude. Ensure that any carrier present is due only to modulator unbalance by slightly altering the d.c. level of the bottom of syncs as they leave the input clamp, (See Fig. 1). If the residual carrier is more than 2% the balance of the modulator should be checked as described in the relevant Technical Instruction.

2. To check the balance of the modulator bridge in the MD1/503A fitted in the sound modulator position, put the switch on the UN1/564 bias unit to its 625-line position to isolate the modulation input of the modulator and terminate the *6 MHz F.M. in* socket with 75 ohms. Monitor at the *R.F. out* (*Mod*) lead of the MD1/503A using an oscilloscope terminated with 75 ohms. Adjust C23 to give a minimum display (<2 mV).

3. The depth of sound modulation should be 100% and this is set by RV2 in the bias unit UN1/546. To adjust RV2, inject a 1 kHz signal at +8 dB into the audio listen jack while monitoring with a suitable oscilloscope connected to the R.F. Out (Mod) lead of the sound modulator.

4. The p-p amplitude of the vision and sound modulated envelopes should be the same. If not the 150-ohm attenuator in the bias unit should be adjusted to match the sound envelope to the vision.

625-lines Working

1. The balance of the vision modulator should be checked as described in the relevant Technical Instruction. The carrier leakage should be less than 2 mV p-p.

2. The residual vision carrier should be 20%. Adjustment is by RV1 in the bias unit.

3. The sound carrier deviation with an input of 1 kHz at +8 dB ±0·5 dB to the audio listen jack should be ±50 kHz. This is measured with a deviation meter connected to the *6-MHz F.M. out* socket on panel B.

4. Check that the 6-MHz oscillator in the sound frequency modulator MD3/501 is at the centre

of its locking range. To do this, connect a 625-line line-drive reference signal to the CO2/510 and monitor at the front panel socket of the UN15/501 discriminator. The display should consist of a sine wave with a superimposed pulse positioned centrally between the maximum and minimum points of the wave. If not, adjust the frequency of the oscillator in the MD3/501.

5. To check the sound modulator balance, terminate the *6 MHz F.M. in* socket with 75 ohms and with the R.F. out (Mod) lead from the modulator connected to the input of the FL4/14 output filter, monitor the output of the filter with an oscilloscope, terminated with 75 ohms. Adjust C23 in the modulator to give a minimum reading (less than 2 mV).

6. The ratio of the p-p levels of the sound and vision carriers should be 2·2. If the ratio is incorrect, the attenuator in the FL4/520 should be adjusted, but only after proving the performance of all the individual units of the MD1/502 under test.

7. With a pulse and bar input signal and using an RC5M/501 or DM1M/501 receiver, examine the demodulated response for correct pulse and bar performance. The results should lie within the specified receiver performance limits.

Reference

1. Designs Department Specification No. 4.17(65).

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