MODULATOR MD1/506

Introduction

The MD1/506 accepts an audio or video signal and produces an r.f. output which is amplitude modulated by the input signal. It consists of an oscillator feeding a Cowan type diode-bridge modulator via a doubler/tripler stage. The fundamental oscillator frequency is set in Band I or Band II to give any required output frequency from 100 MHz up to the top of Band III. The units are pre-aligned and not directly tunable between channels. An external power source is required.

The MD1/506 was designed to form part of the MD1M/505 or the MD1/502 Wide Band Sound and Vision Modulators. It is mounted in a CH1/12A chassis with index-pegs 15 and 39.

General Specification

Video Input	−5dB w.r.t. 1V p-p with bottom of syncs at OV
R.F. Output (vision or sound)	0·35 V to 0·55 V p-p
Sound Input Level (for 100% modulation)	+8 dB w.r.t. 1 mV (i.e. '0' programme level which peaks to +8 dB.
Input Impedance (modulation)	,75 ohms
Carrier Leak	less than 4 mV p-p
Non-linearity Distortion	less than 3%
k rating (625-line 2T pulse and bar signal)	less than 0·5%
Differential Gain Error	less than 2%
Differential Phase Error	less than 0·5°

continued overleaf

Circuit Description

The circuit diagram is given in Fig. 1. The crystal-controlled oscillator TR1 may be pre-set to any frequency in Bands I and II. Inductor L1 is the main tuning control; L2 and C5 suppress spurious oscillatory modes.

Transistor TR2 is a buffer amplifier driving the doubler/tripler TR3. Transistor TR4 is a tuned amplifier and drives the Cowan type bridge modulator. This type of modulator has a number of advantages:

(a) It is simple, robust and suited to unbalanced operation.

(b) When balanced, there is no r.f. output in the absence of modulation but, by mixing a d.c. bias with the modulation input, a normal full carrier double side-band a.m. signal is produced.

(c) With a large r.f. drive, the output is reasonably independent of drive amplitude.

The differential capacitor C23, adjusts the balance of the bridge and is set for minimum carrier leakage. Bias for the modulator is supplied from an associated unit. For 625-line working with negative modulation, a negative bias is required; for the 405-line system with positive modulation and with the bottom of syncs at or near zero carrier level, the d.c. component of the signal itself provides the required bias. For a.m. sound a bias is required but the polarity is not important. If frequency changing is involved, as in the MD1/502 when operating with f.m. sound, bias is not required.

The r.f. filter, L5 and L6 with C25, isolates the modulator input from the r.f. circuits. The filter in the r.f. output lead removes unwanted products of the modulation process.

Maintenance

Routine maintenance is not required but the following checks can be made occasionally and after a change of frequency (see table of component values on Fig. 1).

The Low-pass Filter in the modulator input should cause no degradation of a pulse-and-bar signal. This can be monitored with an oscilloscope and high-impedance probe at the junction of R16 and R17.

Oscillator Adjustment

The circuit should not oscillate if the crystal is removed. If it does oscillate screw in the core of L2 until oscillation just ceased.

With the crystal in position, check the frequency with a counter connected to SKT A. The core of L1 is set just off the point of peak output on the 'slow' side; the frequency should then be correct. The oscillator output, measured at the junction of C10 and C29 should be 2 volts p-p. A final check of the frequency should be made at SKT A after a 30-minute run with all screening in position. Any readjustment of L1 must be made with a non-metallic trimming tool.

Doubler/tripler Adjustment.

Monitor on the base of TR3 with an oscilloscope and high-impedance probe or with an r.f. valve voltmeter and adjust C30 for maximum output at the fundamental frequency.

With the r.f. valve voltmeter at the junction of C37 and R23, adjust C34 and C35 for a maximum at the doubled or tripled frequency.

With the valve voltmeter at the junction of C41 and T1 adjust C39 for maximum output. This should be between 5 volts and 6·5 volts p-p.

The coupling between L11 and L12 should not be disturbed as this may introduce unwanted sub-harmonics into the output.

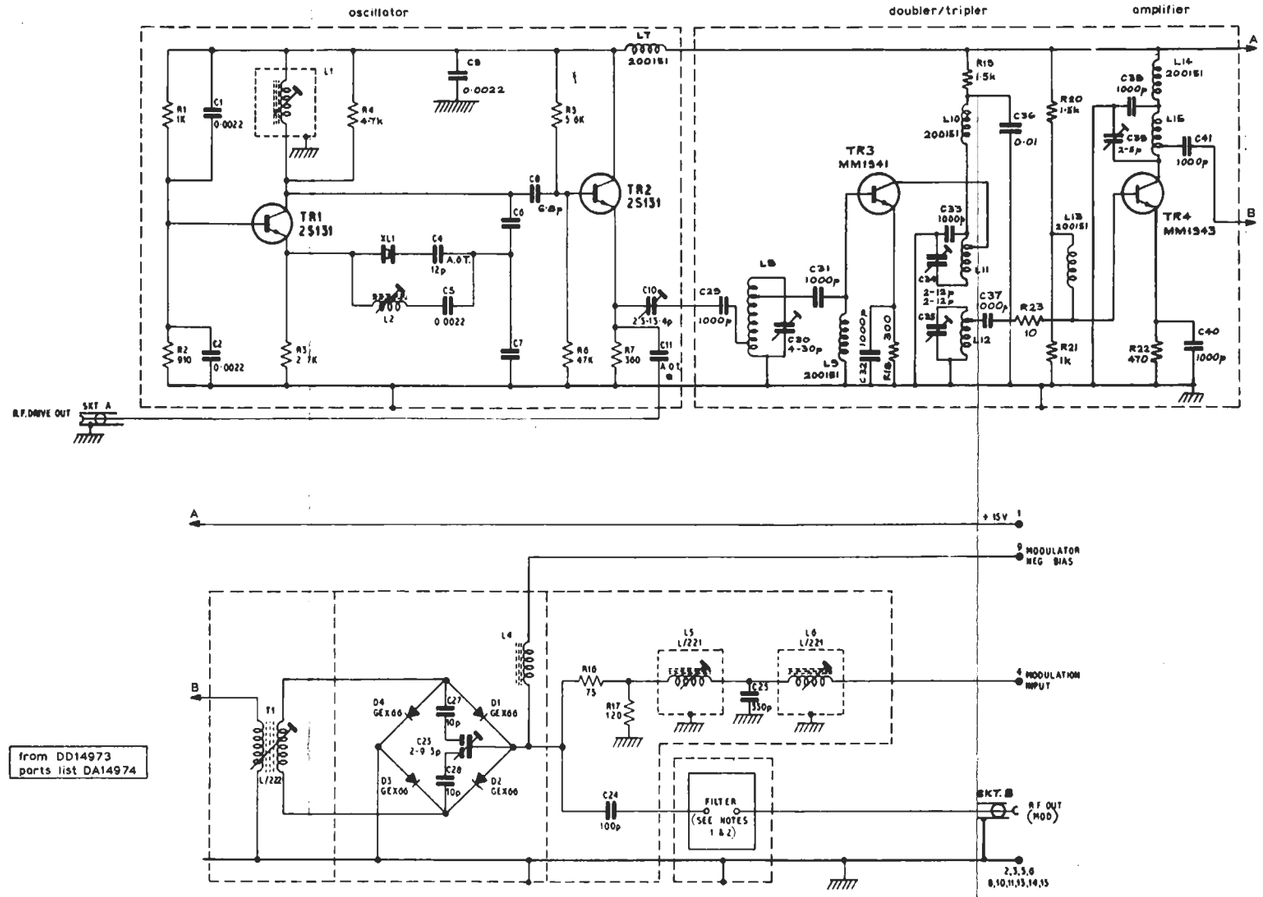
Modulator Bridge Adjustment.

Connect an oscilloscope, terminated with 75 ohms, to *R.F. Out*(mod). Terminate the modulation input with 75 ohms. Adjust C23 for minimum output which should be less than 4 mV. In some units there may be a resistor connected between one end of the secondary winding of T1 and chassis. This is added during manufacturing tests to assist the required minimum leakage. The value of this resistor will be between 68 ohms and 6·8 kilohms.

Reference

1. Designs Department Specification No.4.32(69)

AIB 3/71



from DD14973 parts list DA14974

CARRIER FREQ RANGE Mc/s	CG	CY		L1	L2
30 — 33	22p	22p		L/315	L/310
33 — 40	18p	18p		L/315	L/316
40 — 45	15p	15p		L/285	L/317
45 — 55	12p	12p		L/284	L/318
55 — 65	12p	12p		L/314	L/310
65 — 75	10p	10p		L/313	L/320
75 — 85	10p	10p		L/286	L/283
85 — 95	6·8p	6·8p		L/312	L/283

MD1/508/1T

NOTES –
1) FOR 405 VISION OR AM SOUND USE FILTER FL4/22 TO SUIT CHANNEL IN USE
2) FOR 625 VISION (WHEN USED WITH FM SOUND) USE FILTER FL4/520 TO SUIT FREQ IN USE
• 3) WHEN USED FOR 405 VISION & AM SOUND C11 TO BE 1pF

TRANSISTOR TERMINATIONS VIEW ON LEADS
(& CASE) c b e
2S131
MM1541
MM1543

Fig. 1. Circuit of the Modulator MD1/506