



Design & Equipment Department

DESIGNS DEPARTMENT HANDBOOK

NO. 5.112(76)

MD1/4 Stereo VHF Modulator

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MD1/4 Stereo VHF Modulator

1. INTRODUCTION

The modulator is intended for internal distribution of stereo signals operating in Band II, with partial crystal control. The unit requires a 76KHz signal from the Generator GE6/2 that enables the stereo multiplex signal to be produced. A crystal controlled automatic frequency control loop maintains the output carrier frequency and failure of control automatically mutes the R.F. output and the front panel lamp lights. This avoids an incorrect output frequency interfering on a multi channel communal distribution system. The R.F. output socket is a 75 ohm Belling Lee flush mounting at the rear of the unit and a front socket (50 ohm BNC) drilling is provided for local adaption.

2. OPERATION

The CH1/12A unit has code pins 61 and 66 and it requires 76KHz square wave at 4 volts peak to peak (from Generator GE6/2A external or a GE6/2B internal) at pin 15 (pin 3 earth) from which the multiplex stereo signal is derived. Power input is 12V at 100mA (approximately) across pin 14 positive and pin 3 of the rear connector. Audio inputs left and right are high impedance at standard signal level and care must be exercised in connecting the correct polarity of audio signal for stereo operation. The 19KHz pilot signal will be muted if pin 12 is connected to pin 3 on the rear connector.

3. PERFORMANCE SPECIFICATION

Note 0 dB = 0.775V rms

Power input	12V @ 100mA
L+R A.F. input (68.25KHz dev.)	+10dB
A.F. Response *	+ 1 dB 20 Hz to 10KHz
* Pre-emphasis	50uS
Stereo Separation	40 dB minimum
Pilot Deviation	6.75KHz
Deviation asymmetry error	1.25%
R.F. Output Level (75 ohm load)	100mV minimum
Harmonic content of output	-56 dB
Operating Temperature	0 to 50°C
Chassis	CH1/12A
Code Pin Numbers	61 and 66
Crystal Frequency	Output Frequency +10.7MHz
Internal Intermediate Frequency	10.7MHz

4. CIRCUIT DESCRIPTION

Encoder

The left and right audio signals are band limited and pre-emphasised before the time multiplexing switches (TR3 and TR4) operating at 38KHz. The switching frequency is derived from the 76KHz input signal, divided in 1C1 down to 38KHz, so maintaining equal mark space ratio for optimum stereo separation. R13 equalizes the two audio channels and R44/R46 combines the 19KHz pilot sinewave signal with the multiplex signal. The signal is level controlled and filtered before being passed to the modulator via TR11, L6 and L7.

Modulator

The VHF free running oscillator is TR13, with the frequency modulating varicap diode D5 across the tuned circuit L12, C79. The second diode D4 is part of the automatic frequency controlled loop. A buffer stage TR14 isolates the oscillator from the external terminating load and harmonic content of the signal is reduced by the output filter (L14, C85, and C86).

A.F.C.

To maintain the free running oscillator (TR13) frequency a small superhet receiver is included in the unit and from which an automatic frequency control loop is derived. A crystal controlled local oscillator TR15 provides the het. volts at the mixer TR12, where the free running oscillator (TR13) signal is heterodyned to an I.F. of 10.7MHz. This signal is then limited and quadrature demodulated against itself in 1C2 using the tuned circuit L11 C69 as the quadrature reference. An output proportional to frequency error available at pin 7 of 1C2 is filtered and passed to the varicap D4. This completes the A.F.C. loop. A second output from 1C2 at pin 12 is inversely proportional to the signal level applied to pin 1 of 1C2. Under normal conditions this output is low, TR16 is therefore inoperative and TR17 is in conduction. This maintains the base current to the oscillator TR13.

If the A.F.C. loop fails to hold the oscillator on frequency then the I.F. will change, due to the selectivity of L8, L9 circuits the input signal to 1C2 will drop, the level at pin 12 will rise and TR16 will pass into conduction. This causes D7 to light, TR17 will be inoperative and the oscillator TR13 will cease operation. The capacitor C97 ensures a switching on sequence to allow the A.F.C. to lock-up under normal conditions.

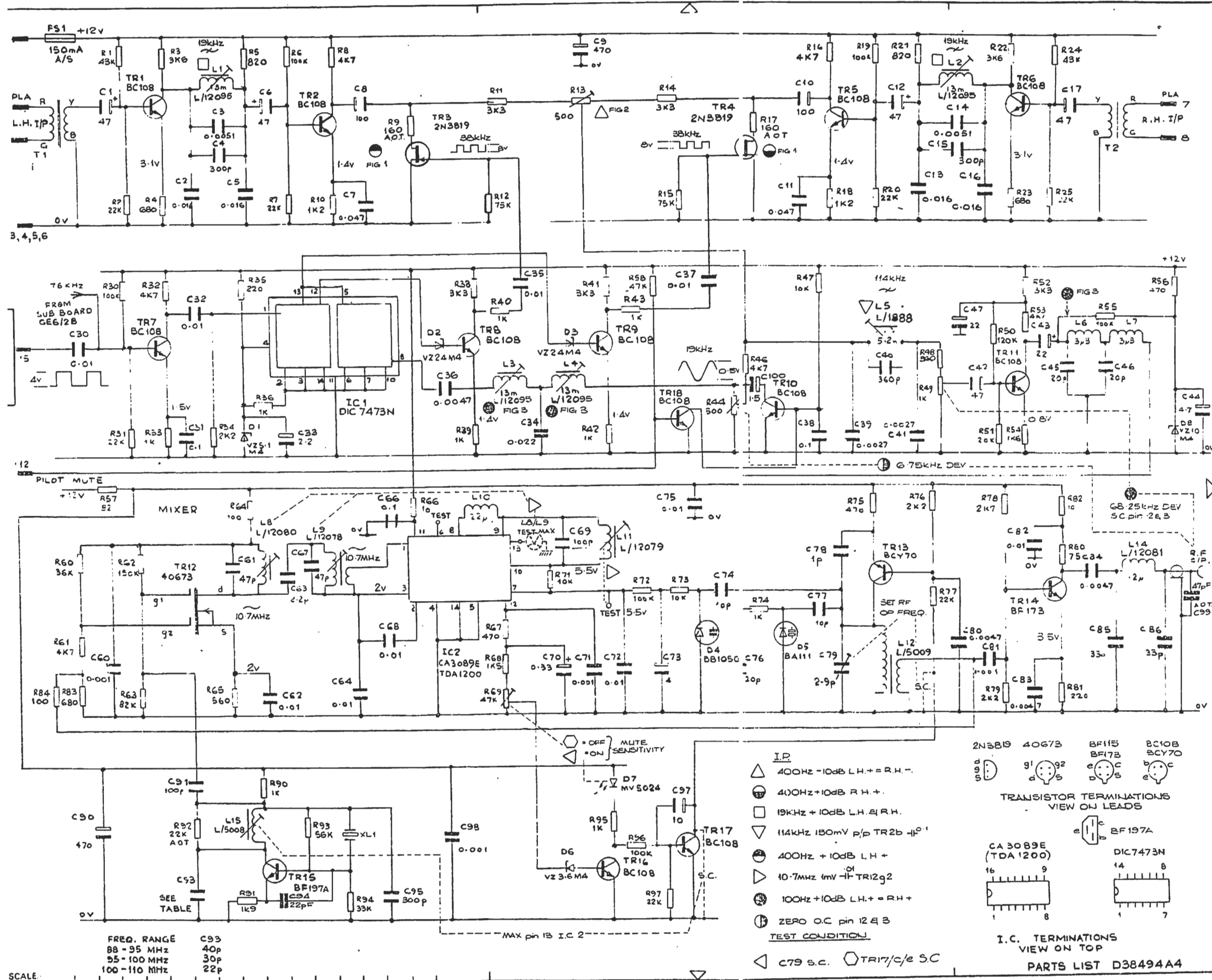
5. MAINTENANCE AND ALIGNMENT

While the red lamp D7 is extinguished then it can be assumed that the unit is working correctly. The modulator may be checked in conjunction with a stereo VHF receiver by applying the appropriate audio signals to the unit.

Alignment details are shown on the drawings. An audio source, oscilloscope, deviation meter and frequency counter will be required to complete the full alignment.

Alignment Sequence should be completed to the full stop as necessary.

1. L1, L2.
2. L5.
3. R9, R17, R13.
4. L3, L4, R44.
5. L8, L9, L15, R69:(set for mean of both test conditions).
6. L11, C79, R69 (set for mean of both test conditions).
7. R49, R44.



THIRD ANGLE PROJECTION
All dimensions in millimetres unless otherwise stated
Normal tolerances
no decimal place ±1 mm
one decimal place ±0.3mm
two decimal places ±0.1mm
unless otherwise stated

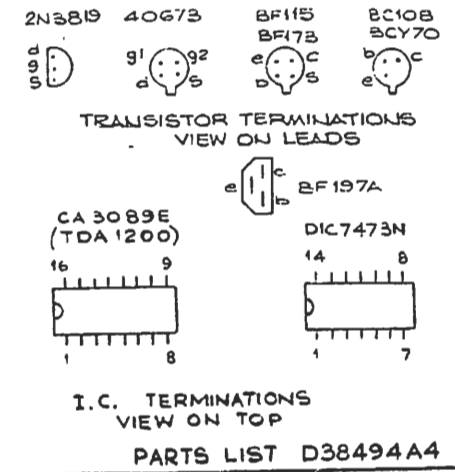
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**MD1/4
MODULATOR
V.H.F. STEREO
ALIGNMENT**

DRN	TCD	CKD	APPD
KK			

DESIGNS DEPARTMENT
D41591 A2

- IP**
- △ 400Hz -10dB L.H. + R.H. -
 - ⊙ 400Hz +10dB R.H. +
 - 19kHz +10dB L.H. & R.H.
 - ▽ 114kHz 180mV p/p TR2b -4P⁻¹
 - ⊕ 400Hz +10dB L.H. +
 - ▷ 10.7MHz 4mV -4P TR12g2
 - ⊗ 100Hz +10dB L.H. + R.H. +
 - ⊖ ZERO O.C. pin 12 & 3
- TEST CONDITION**
- ◁ C79 S.C.
 - TR17/c/e S.C.



FREQ. RANGE
88-95 MHz C93 40p
95-100 MHz 30p
100-110 MHz 22p

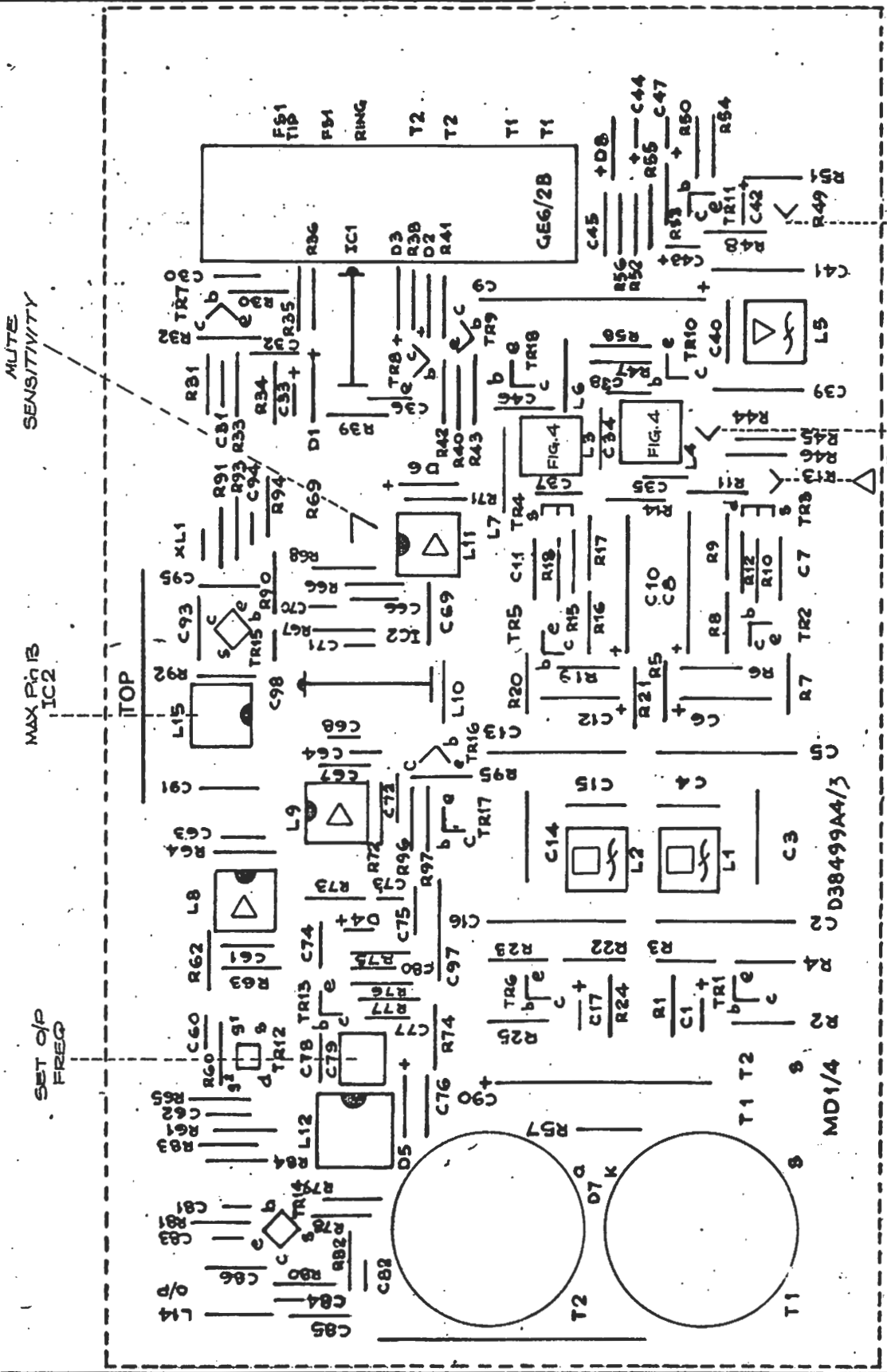
SCALE: 1:1

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PRINTED BOARD COMPONENT LOCATION ALIGNMENT

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CHANGE ISS



PRINTED WIRING ON REVERSE SIDE OF BOARD IS D38498 A2
USE WITH D41591 A2 ALIGNMENT CIRCUIT

MD1/4 ALIGNMENT
PRINTED BOARD
COMPONENT LOCATION

DRN	1/3
TCD	
CKD	
APPD	

DESIGNS DEPT

FIGURES AT TR11 COLLECTOR

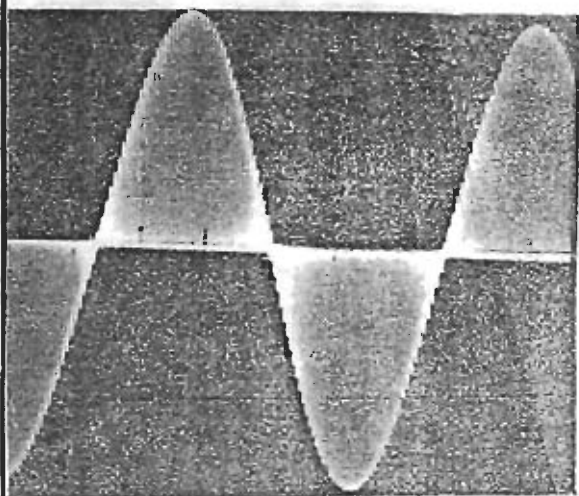


FIG. 1

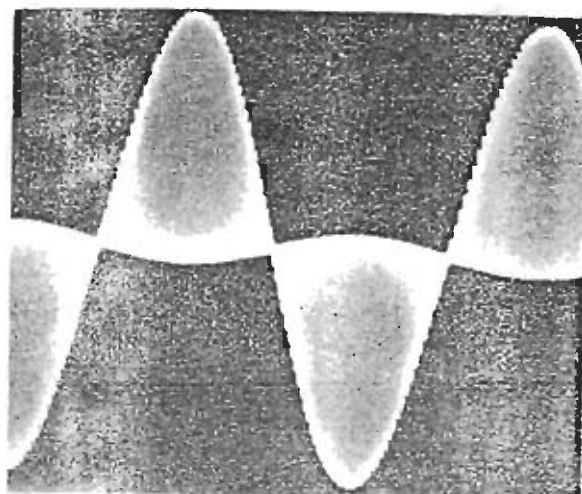


FIG. 1
(incorrect)

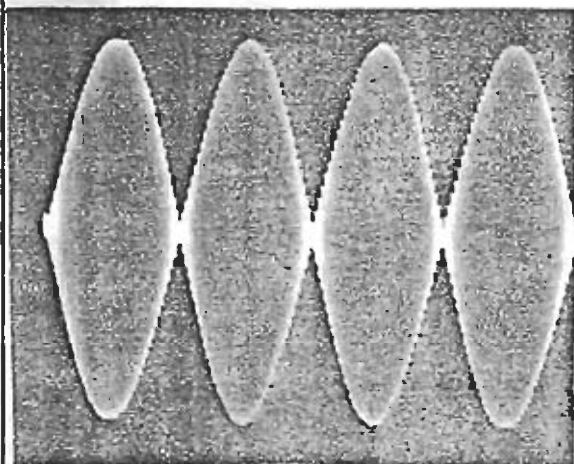


FIG. 2

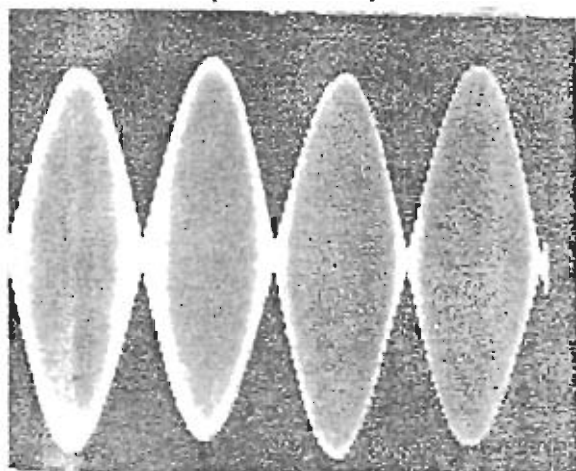


FIG. 2
(incorrect)

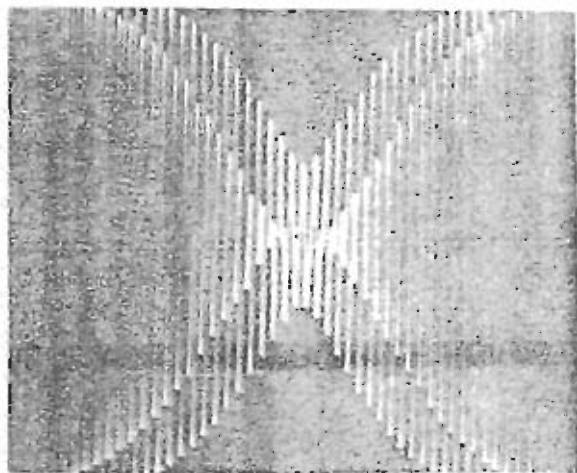


FIG. 3

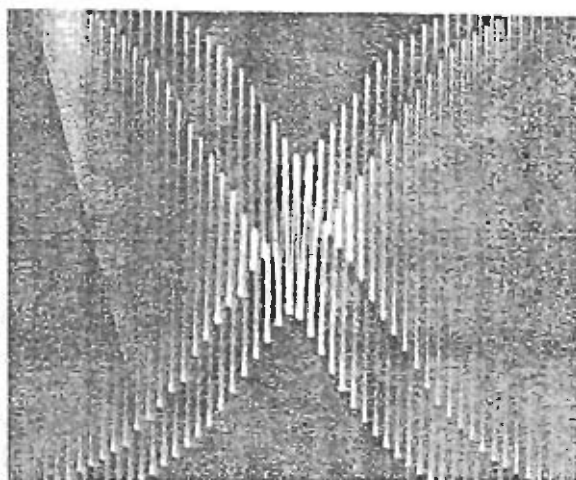


FIG. 3
(incorrect)

DSK 18709A4

MD1/4 FIGURES

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BBC

MD1/4 FIGURES

DRN	
TCD	
CKD	<i>18709A4</i>

DSK 18709A4