MIXER AND LIMITER MX1/2

The MX1/2 is a frequency-changer which accepts a 2·6-MHz frequency-modulated input and a 13·3-MHz sine-wave input and produces two frequency-modulated 10·7-MHz outputs. The 2·6-MHz signal is limited to remove unwanted amplitude modulation before being passed to the frequency-changing stage.

The MX1/2 is constructed on a printed-circuit board contained in a BX1/5 copper screening-box. An external 12-volt d.c. supply of about 10 milliamps is required.

General Specification

2·6 MHz Input	Typically 75 mV to 130 mV p-p
13·3 MHz Input	200 mV r.m.s. (150 mV minimum)
Input Impedances	75 ohms unbalanced
10·7 MHz *Filter* Output	15 mV ±2 mV p-p
10·7 MHz *Mon.* Output	25 mV ±2·5 mV p-p
Output Impedances	50 ohms unbalanced (Note: If the *Mon.* output is not required, a 50-ohm termination must be applied.

Circuit Description

The circuit diagram of the MX1/2 is shown in Fig. 1.

The 2·6-MHz f.m. signal is amplitude-limited by TR1 and D1 and passes via a phase-splitting bandpass filter to the bases of the push-pull-connected frequency-changer transistors TR2 and TR3. The 13·3-MHz signal is applied to the emitters of TR2 and TR3 via a phase-splitting input tuned circuit. The collector load of the frequency-changer transistors comprises a 10·7-MHz bandpass tuned circuit from which a common output is taken through C15. This output passes via resistive networks to give the required levels and output impedances at the *Filter* and *Mon.* terminals.

Test Procedure

During testing all unused inputs and outputs must be terminated by 75 ohms and 50 ohms respectively.

1. Feed the inputs at the correct levels and connect the power supply.
2. Check that the outputs are within specification.
3. Measure the relative levels of 10·7 MHz and 13·3 MHz at the *Filter* output. If the 13·3-MHz level is higher than 20 dB below the 10·7-MHz level, adjust RV1 for minimum 13·3-MHz output.
4. Measure the 13·3-MHz voltages at test points A and B. These should have a minimum value of 50 mV r.m.s. and be within 3 mV of each other. If the unbalance is greater than 3 mV, adjust the cores of L5 and L6 to equalise the voltages at A and B and then tune L4 for maximum amplitude.
5. Remove the 13·3-MHz input and apply a 75-ohms termination.
6. Measure the 2·6-MHz voltages at test points C and D. These should be 6 mV ±1 mV and within 1 mV of each other. (The precise level is set up initially by on-test selection of R5.) If the unbalance is greater than 1 mV, the 2·6-MHz bandpass filter must be readjusted. To do this the 2·6-MHz input must be supplied from a sweep generator and a simultaneous display of the two test point outputs provided. L2 and L3 provide the necessary individual adjustments of output voltages and L1 is tuned to centre the bandpass response on 2·6 MHz.
   The response to the 0·1-dB points should be ±100 kHz if the unit is used for monophonic programme work only but is expanded to ±125 kHz in an MX1/2 used for stereophony; R4 is selected on initial line-up to give the required response.
7. Connect an oscilloscope, through a low-capacitance probe, to display the 2·6-MHz waveform at TR1 collector.
8. Reduce the input to below limiting level (about 15 mV) and check the tuning of L9.
9. Increase the input to 80 mV r.m.s. and check that the TR1 collector waveform is peak-clipped at an amplitude of about 130 mV p-p.
10. Restore the inputs to the specified levels and check the overall bandwidth at the *Filter* output. This should be ±100 kHz or ±125 kHz at the 0·2-dB down points, depending upon the modulation system (mono or stereo) with which the particular unit is employed.
    L7 in the 10·7-MHz output stage is tuned for maximum amplitude and a critically-coupled bandpass response is obtained by adjustment of L8 and C16.

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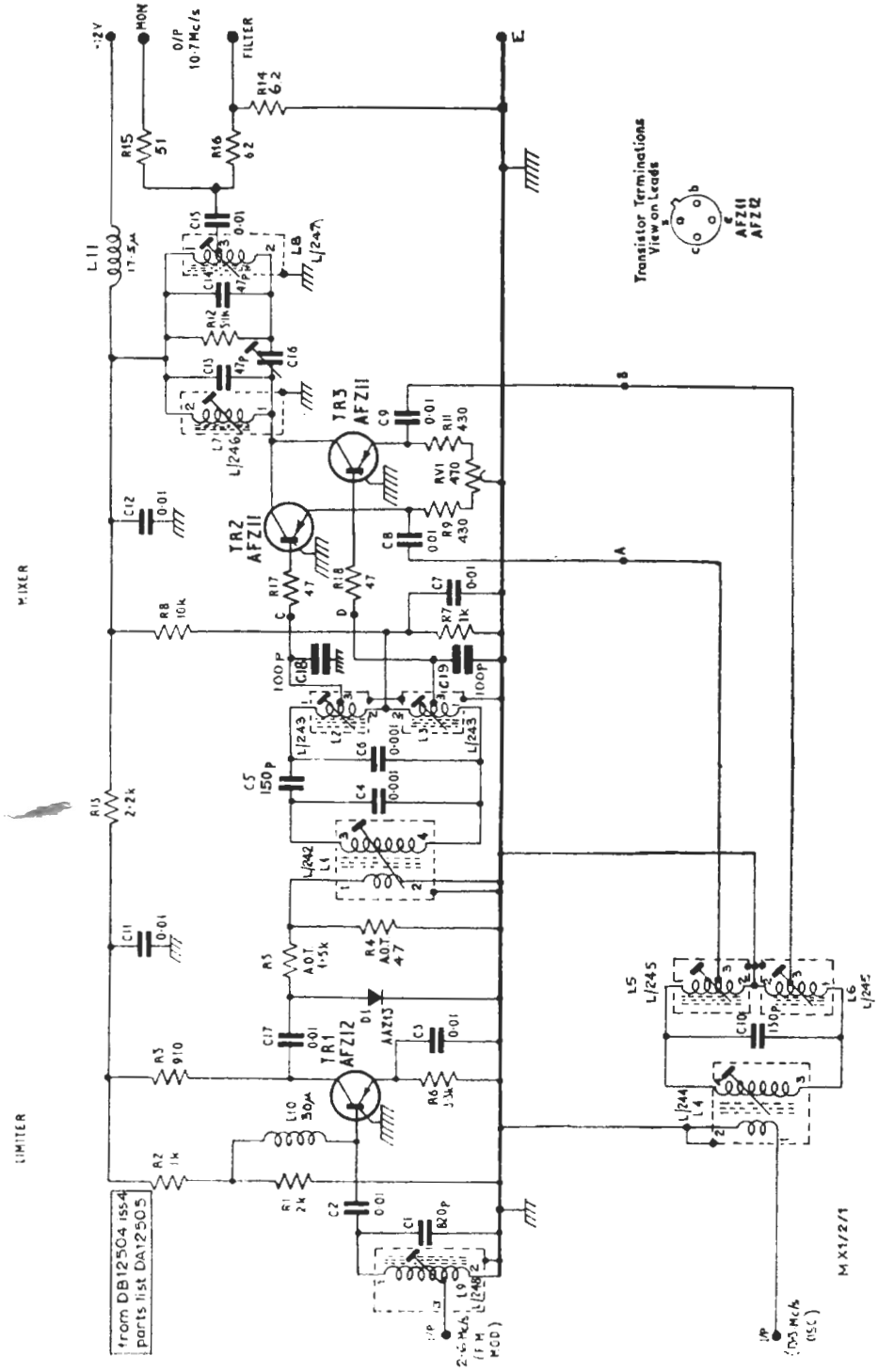

Fig. 1 Circuit of the MX1/2