PROGRAMME FAILURE MONITORS MN1/1, MN1/1A and MN1/3

Introduction

The MN1/1, MN1/1A and MN1/3 are programme monitors which give an indication if the level of the input audio signal drops below zero by about 15 dB for an interval which may be preset at 40, 80 or 120 seconds. Alternatively, the monitors can be used to initiate executive action such as starting up an unattended station.

The MN1/1A and MN1/3 are intended for use where a programme line is subject to pulse noise out of programme hours; each of these monitors provides a forward delay to render the circuit initially inoperative for a few seconds. The MN1/3 has a slightly higher sensitivity and (unlike the other versions) does not contain a power supply circuit. In all other respects, the MN1/1, MN1/1A and MN1/3 are identical. The monitors have a high input impedance and can be bridged across any 600-ohm source with no more than 0·3 dB loss.

All three types use printed wiring and are constructed on CH1/12A chassis with index pegs 3 and 24. Power and signal connections are made via a 15-way Painton connector.

Circuit Description

The circuit diagrams of the MN1/1, MN1/1A and MN1/3 are given in Fig. 1, Fig. 2 and Fig. 3 respectively. For each type, the main circuit divides into two parts; an amplifier with associated signal rectifier and relay, and an executive circuit with delay control. In the MN1/1 and MN1/1A the power supply circuit forms a subsidiary section.

Amplifier

The amplifier consists of TR1, TR2 and TR3; it feeds a voltage-doubling rectifier MR1, MR2 with C4 and C5. This is directly coupled to a Darlington pair [1] with relay RLA in the emitter circuit. RLA brings the executive circuit into operation and is held operated as long as the input signal remains above the predetermined minimum.

Transistor TR1 has emitter negative feedback (the applied feedback is less for the MN1/3, hence there is higher sensitivity; see Figs. 2 and 3) and thereby presents a fairly high impedance to the input transformer T1. Resistor R3 in parallel with the transformer secondary, helps to stabilise the input impedance conditions which would otherwise vary with the characteristics of TR1. Resistor R9 provides negative feedback (for MN1/1 and MN1/1A; R6 for MN1/3) and helps to stabilise the working point of TR2 base. Transistor TR3 is an emitter follower and provides a low impedance output to drive the signal rectifier circuit.

The forward time constant of the rectifier circuit is approximately 1 millisecond. The backward time constant, which controls the release of the relay, is of the order of 1 second. This time constant is given by C5 and the high input impedance of TR4/TR5 in parallel with the reverse resistance of the rectifiers MR1 and MR2 in series.

The zener diode ZD1 limits both peaks of the signal so that the output at the emitter of TR3 does not exceed 9·8 volts ±1 volt p-p. The standing potential across ZD1 biases it at about half its reference potential.

Executive Circuit

In the MN1/1 the executive circuit is brought into action as soon as relay A operates. This applies about 26 volts across R14, C8 and C9 which provide a time constant of about 17 milliseconds. As the capacitors charge, the potential across R15, R16, R17 and the base/emitter resistance of TR6 rises to about 26 volts negative. The potential at TR6 collector and TR7 base approaches earth and TR7 is cut off. TR8 is now fully conductive and relay B operates.

If the input signal fails for a period longer than about 1 second, relay A releases and C8 and C9 start to discharge through R15, R16, R17 and TR6 base/emitter resistance. The rate of discharge can be varied in three steps by operation of SWA and after 40, 80 or 120 seconds relay B will release as TR8 is cut off. The release of relay B initiates the executive action.

Resistor R26 provides positive feedback from the collector of TR8 to the base of TR7. This prevents any tendency for relay B to jitter at the operating point by speeding up the change-over between the non-conducting and conducting states of TR8.

The executive circuit in both the MN1/1A and MN1/3 operates as described above except as modified by the action of relay C. This relay is energised whenever the circuit is idling without an input signal because, under these conditions, TR7 is fully conductive (see Fig. 1A).

When a signal is applied relay A operates and C8 and C9 charge through R14 and R28. With SWA in the 40-second delay position there is a delay of 2 seconds before the potential across the capacitors rises sufficiently to cause TR6 to initiate the change-over between TR7 and TR8, thus releasing relay C and operating relay B. With SWA in the 120-second delay position the initial delay is about 8 seconds. From this point on the MN1/1A and MN1/3 circuits operates as already described for the MN1/1. The initial few seconds delay makes the circuit insensitive to any signals which persist for less than 2 seconds (with SWA in the 40-second position) and thus prevents any executive action being started by impulse noise on the line during out-of-programme periods.

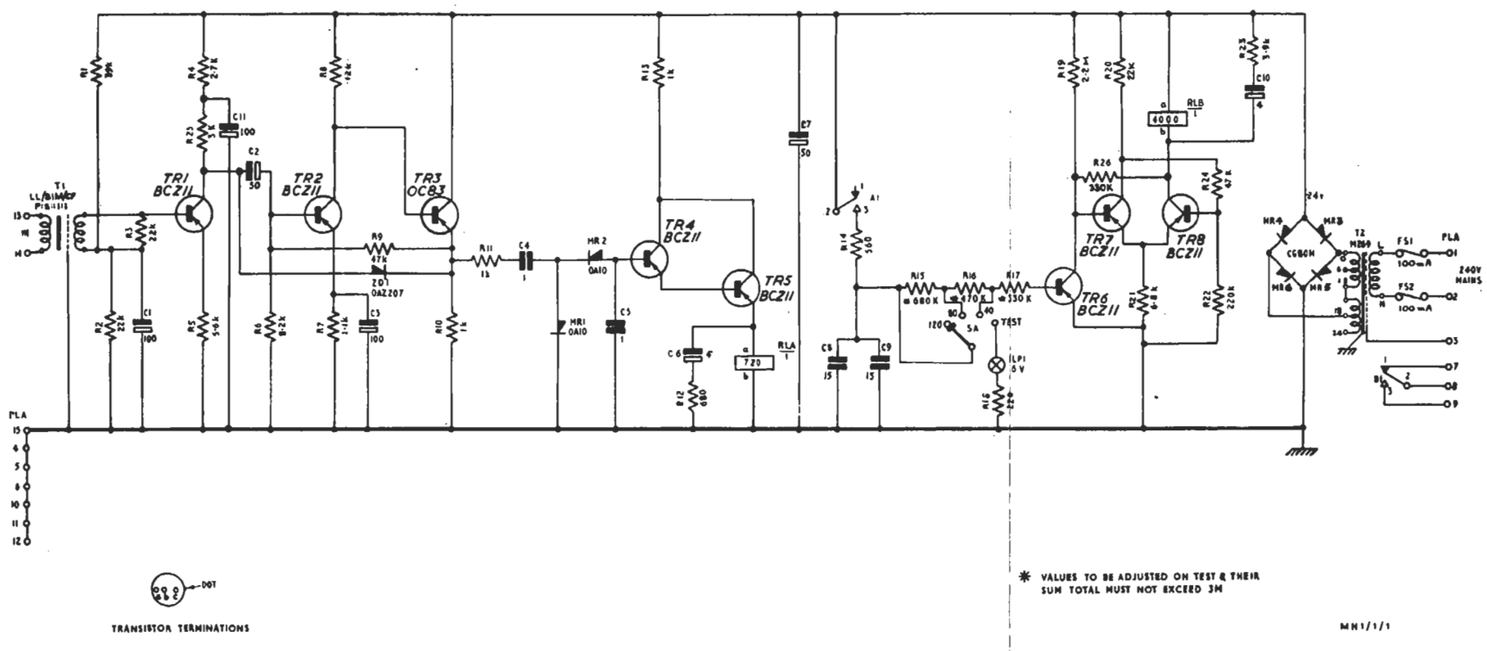

Fig. 1. Circuit of the Programme Failure Monitor MN1/1

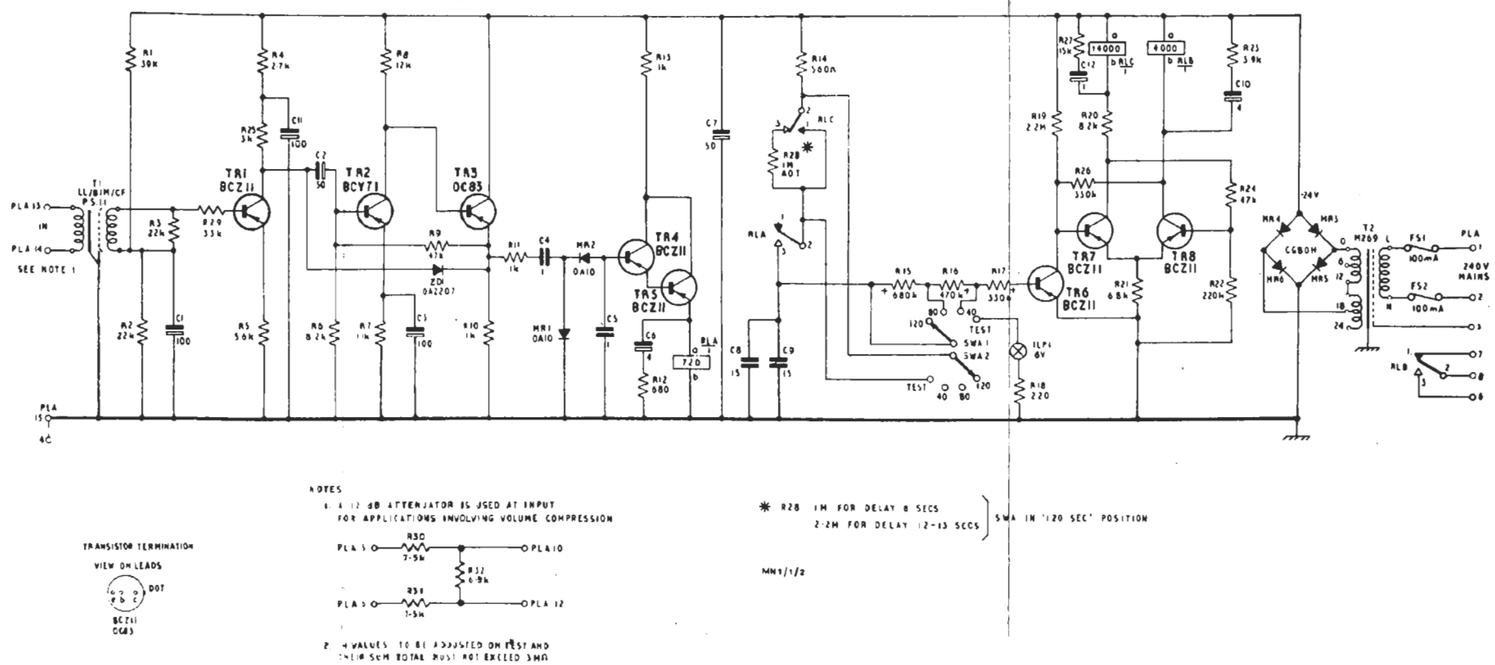

Fig. 2. Circuit of the Programme Failure Monitor MN1/1A

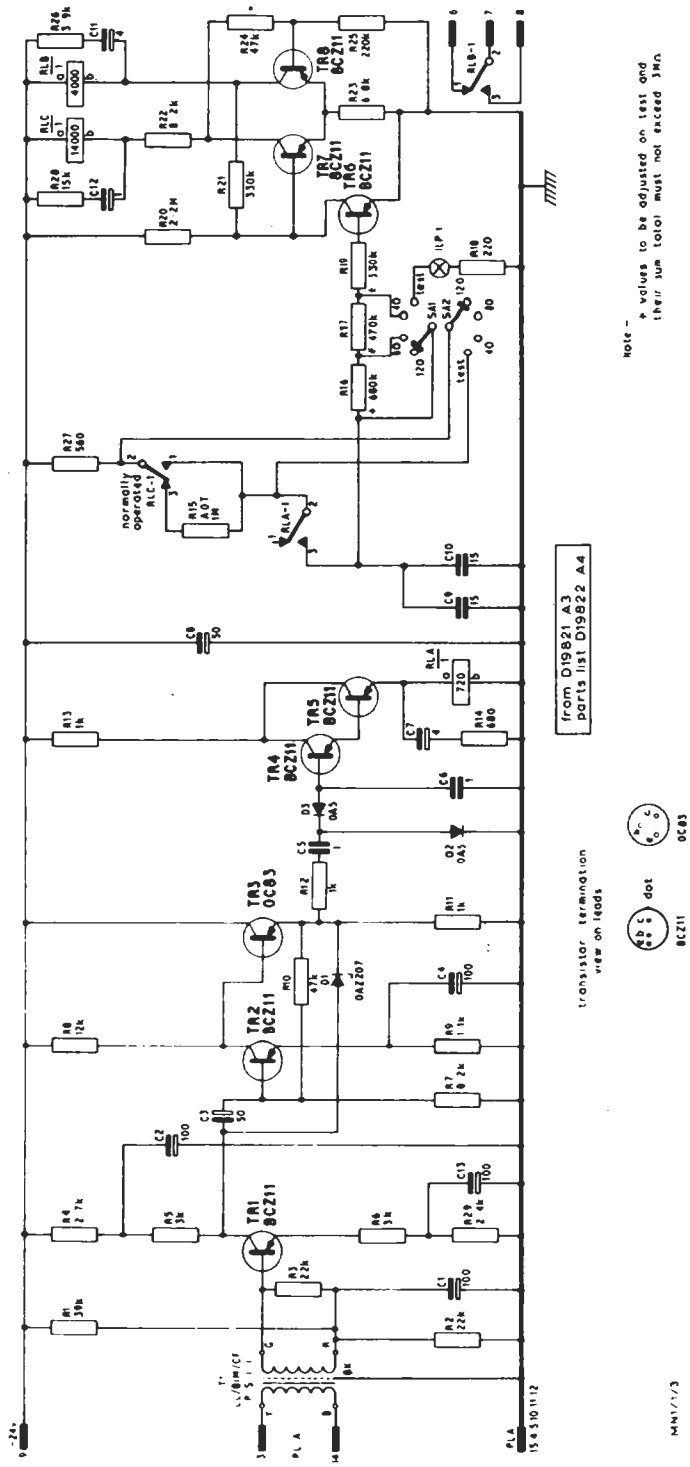

Fig. 3. Circuit of the Programme Failure Monitor MN1/3

Power Supply (MN1/1 and MN1/1A only)

This consists of a bridge-rectifier circuit fed from transformer T2. This transformer has two 12-volt secondary windings, both centre-tapped. It is connected to give 18 volts r.m.s. input to the bridge circuit. The output voltage across the reservoir capacitor C7 is approximately 26 volts.

General Data

With no input signal, the voltages listed below are typical, all being measured with an Avometer Model 8.

Measuring Point	*Voltage*
d.c. line	−27·0
TR1 collector	−18·8
TR3 emitter	−13·8
TR6 collector	− 7·0
TR7 collector	− 6·7
TR8 collector	−27·0

Voltage across ZD1, 5 volts

MN1/1 and MN1/1A power requirements: 240 volts, 16mA a.c., with switch SA in *Test* position and zero level input signal.

MN1/3 Maximum power requirement: 24 volts, 50 mA d.c.

Test Procedure

Apparatus Required

Amplifier-detector (ATM/1 or similar).
1-kHz tone source (output impedance 600 ohms, output level up to +20 dB).
Oscilloscope.
Stop-watch.
600-ohm termination.
Avometer Model 8.

Relay Operation

1. With switch SA in *Test* position, apply zero level to the input. Relay A should operate and lamp ILP1 should light. A reduction of the level to −11 dB (MN1/3, −16 dB) should cause no change but a further reduction to −20 dB (MN1/3, −22 dB) should cause the relay to release and the lamp to go out.
2. With switch SA in the *Test* position, gradually increase the input from −30 dB. Relay A should not operate at −20 dB (MN1/3, −22 dB), but should operate at −11 dB (MN1/3, −19 dB) causing lamp ILP1 to light.
3. With switch SA in *40* position and with an input of −11 dB (MN1/3, −16 dB) relay should operate.

Timing

1. With switch SA in *40* position, apply zero level to the input. Relay B should operate. Remove the input signal and with the stop-watch check that the relay remains in the operated position for 40 ± 6 seconds.
2. Repeat with switch SA in *80* position. The hold-on period after removal of the input signal should be 80 ±12 seconds.
3. Repeat with switch SA in *120* position. The hold-on period after removal of the input signal should be 120 ± 18 seconds.

Any departure from tolerance shown up by the above tests should be corrected by adjustment of R15, R16 or R17.

Amplifier Clipping Levels

If it should be necessary to check that the amplifier clipping levels are correct, first connect the high-impedance amplifier-detector and the tone source, terminated with 600 ohms, across the input of the monitor. Set the tone source to 1 kHz and proceed as follows.

1. With the oscilloscope connected to the junction of R5 and the emitter of TR1, increase the input level until the waveform, as indicated by the oscilloscope, is just clipped on one peak. The reading given by the amplifier detector should be +17 dB ±1 dB (MN1/3, +22 dB ±1 dB).
2. With the oscilloscope connected to the emitter of TR3 (or more conveniently to the junction of R11 and C4) first reduce the input level to about −25 dB and then gradually increase the level until the waveform, as indicated by the oscilloscope is just clipped on one peak. The reading given by the amplifier-detector should be −6 dB (MN1/3, −11 dB ±3 dB). Now increase the input level until both peaks are just clipped. The peak-to-peak signal indicated by the oscilloscope should be 9·8 volts ± 1 volt.

References

1. Designs Department Specification No. 5.61.(61)
2. B.B.C. Monograph No.26, August 1959.

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revised 3/71
JN 4/71