A.M. AND CARRIER DETECTOR UNIT UN20/17

Introduction

The UN20/17 is designed to be used with low, medium or high frequency amplitude modulated transmitters to detect the failure of carrier and/or modulation. The unit can operate with r.f. inputs between 10 volts and 860 volts r.m.s. This range corresponds to transmitter powers between two watts and 14·8 kW.

Failure of carrier and/or modulation causes a relay to de-energise. A single change-over contact is available for switching. A separate power supplier is not required because a voltage derived from the rectified carrier is used to power the unit.

The components are mounted on a printed wiring board which is housed in a diecast aluminium box. Input and output connections are made via terminals on the box.

A.M. time constant	90 ±42 seconds
Relay contact rating	10 mA at 50 volts
Overall dimensions	
Length	194 mm (7 5/8 in.)
Width	119 mm (4 11/16 in.)
Depth	73 mm (2 7/8 in.)
Weight	1·19 kg (2 lb 8 oz)
Operating temperature range	0 to 40 degrees C

Circuit Description

Fig. 1 is a circuit diagram of the UN20/17. An r.f. input is applied directly to capacitor C1 which with one or more of capacitors C2 to C6 forms a potential

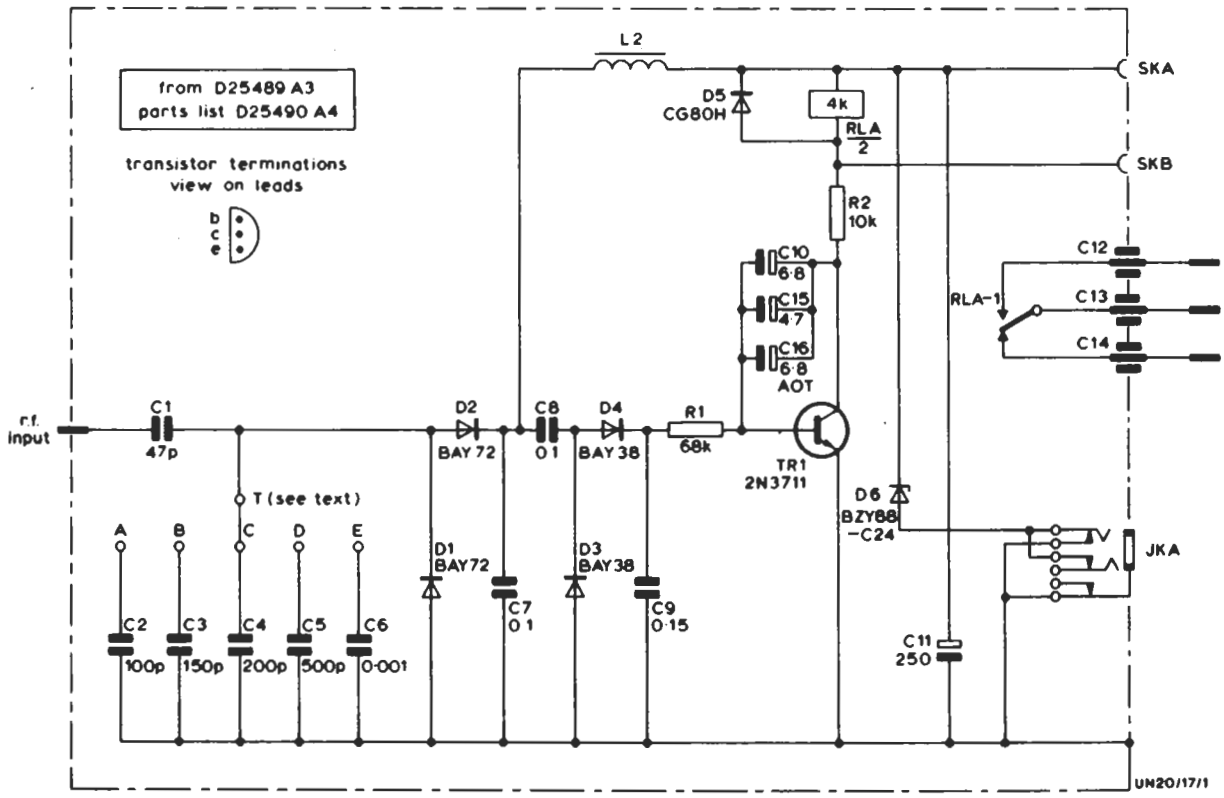

Fig. 1. Circuit of the UN20/17

General Specification

Frequency of input signals	Within the low, medium or high frequency broadcast bands
Associated transmitter power (with respect to a 50 ohm feeder)	Between 2 watts and 14·8 kW
Power required to operate unit	Approximately 0·1 watt
R.F. time constant	5 seconds
Minimum level of speech modulation to operate relay	10 per cent

divider. The chosen ratio of the divider depends upon the power of the transmitter with which the unit is used.

Table 1, which was calculated for a frequency of 10 MHz, gives guidance to enable the unit to be used with transmitters of different power outputs. The connections for the potential divider are made from terminal T, see Fig. 1, to one or more of terminals A, B, C, D or E.

A proportion of the r.f. carrier input is applied to a voltage doubler circuit comprising diodes D1, D2 and capacitor C7. At the junction of capacitors C7 and C8 there is a direct voltage equivalent to the peak-to-peak r.f. carrier level and, if the carrier is modulated, an a.f. voltage. The direct voltage is filtered, stabilised at 24 volts by zener diode D6 and

used to power the unit.

The a.f. voltage is applied to a voltage doubler comprising diodes D3, D4 and capacitor C9. A direct voltage corresponding to the peak-to-peak level of the a.f. signal is applied to the base of the transistor TR1. It is necessary to ensure that the unit does not register normal pauses in programme content as a loss of modulation. This is achieved by using a time constant such that the carrier has to be unmodulated for a period of at least 80 seconds before the relay is de-energised. Transistor TR1 is connected as a Miller integrator [1]; the time constant [(C10 + C15 + C16) (R1 + R2)] is increased by a factor equal to the voltage gain of the transistor. The voltage across the relay varies with depth of modulation but eight per cent, or greater, tone modulation is sufficient to operate the relay.

Contacts of relay RLA are wired via feedthrough capacitors C12, C13 and C14. These capacitors are of a special design and each acts as a π-section low-pass filter.

Summarising the operation of the unit, relay RLA is de-energised (a) if the applied r.f. carrier fails for a period greater than five seconds, and (b) if modulation of the carrier ceases for a period greater than about 80 seconds.

Test Procedure

Apparatus Required

Source of r.f. power of at least two watts and variable in output; the output frequency should be within the low, medium or high frequency broadcast bands and there must be provision for amplitude modulation.

R.F. power meter.

Source of a.f. tone of variable amplitude.

Method of measuring depth of modulation.

Avo Model 8.

1. Remove any connection from terminal T and connect the UN20/17 to the output of the r.f. power source terminated in 50 ohms.
2. Measure the minimum power input to obtain 24 volts d.c. at socket SKA with respect to chassis.
   This should not be greater than two watts. Consistent operation requires that a current of between 2 and 10 milliamperes, measured at jack JKA, flows through diode D6.
3. Set the r.f. input to the working power level as determined in 2.
4. Modulate the r.f. input with the a.f. tone. Increase the depth of modulation from zero and at the same time measure the voltage between sockets SKA and SKB. Socket SKA is the positive terminal.
   A maximum voltage should be obtained with a modulation depth of eight per cent and greater.
5. Cut the modulation and check that the relay releases after approximately 80 seconds.
6. Restore the modulation and then remove the r.f. input. Check that the relay releases after about five seconds.

References

1. Principles of Transistor Circuits, S.W. Amos; Iliffe Books Ltd.

Table 1

Power Input	*50Ω feeder (unmodulated carrier)*		*Potential divider ratio*	*Connect T to:*
	r.m.s. volts	*p–p volts*		
2–8W	10–20	28–56		No connection
20–80W	32–64	90–180	1:3	A
37–148W	43–86	120–240	1:4	B
56–230W	53–107	150–300	1:5	C
82–330W	64–129	180–360	1:6	A & B
280–1100W	118–236	320–660	1:12	D
0·5–2·0kW	160–320	450–900	1:16	D & C
1·0–4·0kW	225–450	630–1270	1:22	E
2·8–11·2kW	375–750	1060–2100	1:37	C, D & E
3·7–14·8kW	430–860	1200–2400	1:43	A, B, C, D, & E