OVEN TEMPERATURE CONTROL UNITS UN1/15 AND UN1/15A

Introduction

The UN1/15 and UN1/15A are similar controllers which continuously adjust the current supplied to associated oven-heaters[1,2] in order to maintain a near-constant temperature inside the ovens. The oven temperature can be set to any desired value in the range 65 to 80 degrees C with either a normal tolerance of ±0·8 degree C or, for a specific combination of oven and control unit, a close tolerance of ±0·25 degree C.

The operating principle of both types of unit is the same and they are almost identical electrically and mechanically. Each unit is constructed on two printed boards which are mounted inside a copper box measuring about 4 in. by 2 in. by 1⅝ in. An external power supply of 6·3 volts at about 0·75 amperes maximum is used for both oven heating and control purposes.

Operating Principle

The simplified circuit in Fig. 1 shows an unbalanced bridge which has one arm (thermistor TH2) inside the controlled oven. The output voltage of the bridge is applied to a d.c. amplifier whose output current powers the oven-heater. If the temperature inside the oven rises above the required value set by RV1, the resistance of the thermistor falls and the bridge voltage at point A moves positive with respect to point B. This drives the input stage of the amplifier further into conduction, consequently the output stage is driven towards cut-off and the oven-heater falls to compensate for the temperature rise.

Thermistor TH1, in series with R1, is placed across the R3 arm of the bridge to reduce the effect of changes of transistor leakage-current with ambient temperature. Without this compensating circuit the first-stage leakage-current increase with rise in ambient temperature causes a reduction of heater current in the same way as a rise of oven temperature. However the presence of TH1 modifies the bridge output voltage to obviate the effect and by suitable choice of R1 the oven temperature can be held very nearly constant provided the ambient temperatures of the oven and control unit do not differ widely.

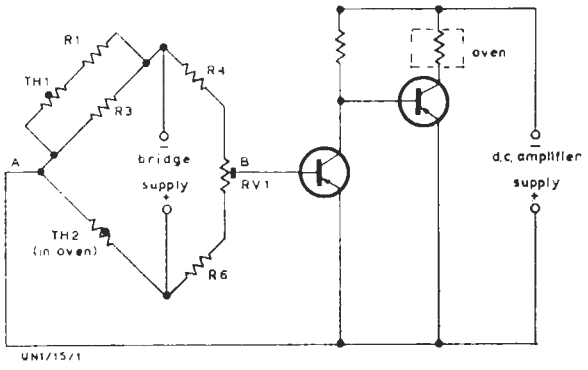

Fig. 1 Simplified Circuit showing Control System

Circuit Description

Although the two types of unit are almost identical, the practical circuits are shown separately in Fig. 2 because many equivalent components are designated differently. The following description uses the UN1/15A references unless specifically stated otherwise.

The 6·3-volts a.c. input is connected directly to a bridge rectifier D6 to D9 for the d.c.-amplifier and oven-heater supply, and via an isolating transformer to bridge rectifier D2 to D5 for the control-bridge supply. Initial setting-up of the control bridge is achieved by on-test selection of R12 in the UN1/15A and by adjustment of RV2 in the UN1/15.

RV1, used for adjusting the oven working temperature, can be mounted remotely, for example on the front panel of the parent unit[3]. If the variable setting facility is not required, fixed resistors to replace RV1 can be fitted inside the unit. The output of the three-transistor d.c. amplifier is shunted by C3 to prevent oscillation.

The normal tolerance condition can be met for any combination of oven and control unit, but for close-tolerance working with a particular oven the value of R1 is chosen to give precise compensation for leakage current.

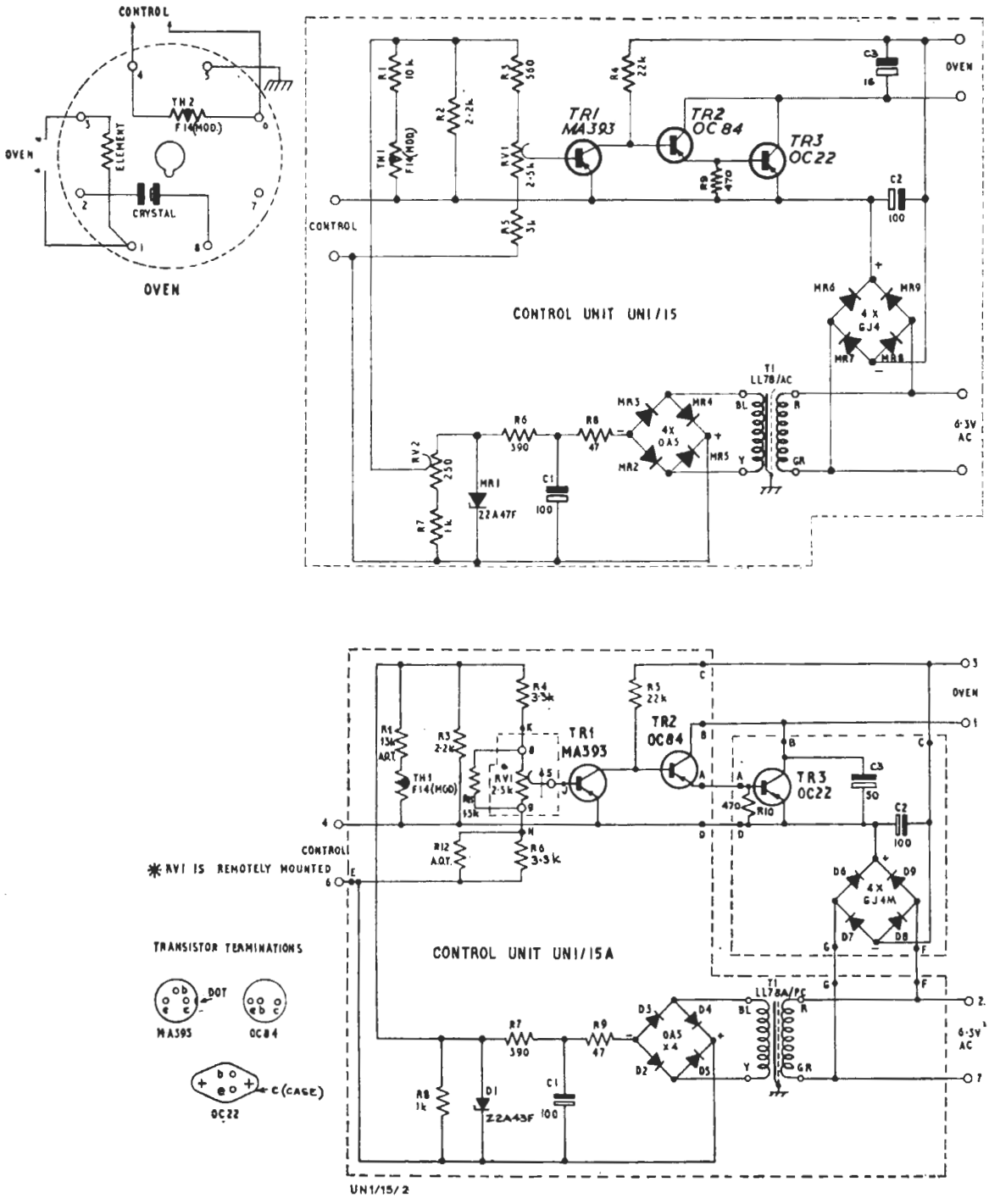

Fig. 2 Circuits of the UN1/15 and UN1/15A

Maintenance Notes

Setting-up procedures involve the use of specialised equipment and faulty units must be returned to Equipment Department for servicing. It may be possible in an emergency to bypass the unit and utilise the internal thermostat of the associated oven to maintain a measure of temperature stability. For example, if the unit is used with an OS2/20A, the 6·3-volt supply can be fed directly to the " normal working " terminals (3 and 7) of the oven whilst the control unit is being serviced.

References to Typical Associated Equipment

1. Oven Type QC 940B (Salford Electrical Instruments Ltd.)
2. OS2/20A
3. Oven Control Panel UN1/38

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