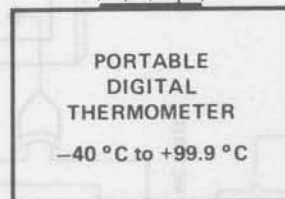


*the ONE page*  
**APPLICATION IDEA FROM MOTOROLA**



Resolution 0.1 °C

Accuracy  
 ± 0.3 °C at  
 Tamb = 0 °C to 50 °C

An accurate digital thermometer can be built with a transistor sensor (BC585) and an analog-to-digital converter (MC14433). The transistor sensor has a temperature coefficient of about  $-2$  millivolts/°C. So with a  $\Delta t$  of 100 °C, the  $\Delta V$  of the sensor will be 200 mV. Using the ratio-metric function of the MC14433 it is easy to calibrate the thermometer.

$$V_{out} \text{ (display)} = 2000 \frac{(V_X - V_{AG})}{(V_R - V_{AG})} \text{ where } V_X - V_{AG} = \Delta V \text{ (sensor)}$$

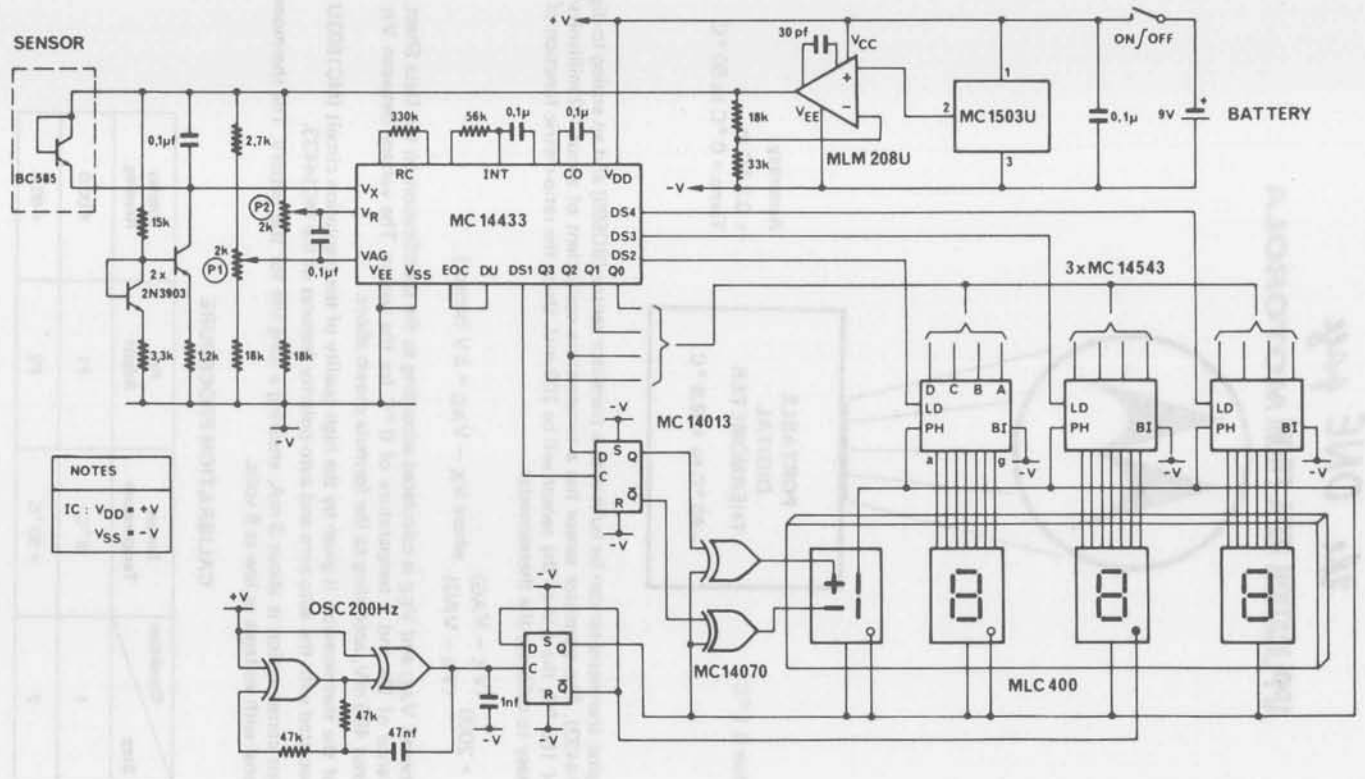
The voltage between  $V_{AG}$  and  $V_{EE}$  is calculated according to the specification on the Data Sheet, the resistance tolerance of 5% and a temperature of 0 °C for the sensor. The voltage between  $V_R$  and  $V_{AG}$  will be about 400 mV, according to the formula shown above.

The accuracy of the thermometer is given by the high quality of the regulation circuit (MC1503U and MLM208U) associated with the auto-zero and auto-polarity features of the MC14433.

The total current consumption is about 3 mA, ensuring a long life for the battery. The thermometer remains functional with voltages as low as 8 volts.

**CALIBRATION PROCEDURE**

Step	Condition	Sensor Temperature	Pot Adjust	Display Reading
1		0 °C	P1	± 00.0
2		+ 90 °C	P2	+ 90.0



NOTES  
 IC : V<sub>DD</sub> = +V  
 V<sub>SS</sub> = -V

PORTABLE DIGITAL THERMOMETER (- 40°C to +99.9°C)