



# Digital Thermometer

Design and Instruction

Manual for Hobbyists and Engineers

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# Table of Contents

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1.0 Introduction

2.0 PIC Design and Overview

3.0 Schematic Diagram

As part of this project the following should be available as part of the project folder;

*Digital Thermometer.zip* which contains

1. Databooklet.pdf
2. Digital Thermometer.mbppi
3. Digital Thermometer.cfg
4. Myproject.mbas
5. Schematic Diagram.pdf
6. Digital Thermometer.hex

# 1 – Introduction

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This project is for the design of a digital thermometer. Using a Microchip PIC 16F1827 and MCP9700 this project is designed to read the output voltage of the thermometer IC (MCP9700) and convert the voltage into a temperature and output onto a series of 7 segment LED arrays.

The temperature range is -50.0 °C to +50.0°C. A reading is taken every two seconds.

On power up a 10 second delay is initiated to allow the thermometer IC to reach a steady state.

## 2 – PIC Design and Overview

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The 16F1827 is built up from a series of process subroutines. Each one takes care of either data acquisition or conversion. Generally there are two main processes. One to read the MCP9700 output voltage and convert it into a temperature. The second is the LED segment strobing that is required to display the output value.

Note that the interrupt routine cycles through a matrix with several display arranged bytes which are outputted sequentially onto port B. Port A is then adjusted so that only one segment is active at a time. The interrupt provides a switch rate such that each segment flashes 60 times per second approximately.

Note C1 is used to stabilise the voltage output from the MCP9700.

Below is the PIC chip connections, on the next page is the overall process.

Segment 2	Segment 1
Segment 3	Segment 0
MCP9700 Input	n/c
MCLR	n/c
Vss	Vdd
B0 (SEG A)	B7 (N/C)
B1 (SEG B)	B6 (SEG G)
B2 (SEG C)	B5 (SEG F)
B3 (SEG D)	B4 (SEG E)

*Figure 2.1 – PIC Chip Project Connections*

For calibration please follow the steps below;

1. Place voltmeter onto MCP9700 and read voltages between pins 2 and 3
2. Subtract 0.5v from the value
3. Adjust the calibration pot until the display value reads the value in step 2 \* 100

For example if the voltage between pins 2 and 3 read 0.753v then perform step 2

New value =  $0.753\text{v} - 0.500 = 0.253\text{v}$

Multiply by 100 °C/v:  $0.253\text{v} * 100\text{ °C/v} = 25.30\text{ °C}$

Adjust calibration pot to read 25.3 °C

That's it. Calibration complete



