

Tachometer

Build Manual

Hardware Version: 4



CHAPTER 1

INTRODUCTION

Thank you for purchasing the Tachometer kit. This manual will guide you through assembling the tachometer from the provided components.

It is assumed the builder can hand-solder components and has the necessary tools to work with the components. There are no tools, nor solder provided in the kit.

1 In the Box

- All the components needed to build the tachometer. This includes a pre-programmed micro controller.
- A printed BOM detailing all the components provided in the kit.
- Speed sensor (optional)

2 Tools Required

These tools are not provided as part of the kit.

- Soldering Iron
- Solder (lead free or leaded)
- Miniature side cutters
- Philips screwdriver (PH1)
- Anti-static wrist strap
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2.1 Soldering

The PCB is an ENIG board that is suitable to solder with lead-free or leaded solder. It is recommended to use electrical solder and not plumbing solder or other types of solder.

The board is designed for hand soldering.

3 Printed Circuit Board

3.1 Resistors

There are only two resistor values used, 330Ω and $1\text{k}\Omega$ $\frac{1}{4}\text{W}$ resistors. The $1\text{k}\Omega$ resistor goes to position R10. The 330Ω resistors go in the remainder of the resistor positions. Start with

the 330Ω resistors, solder them in place one at a time and trim the leads.

3.2 Diode & Bridge Rectifier

The diode are polarised components and need to be fitted the correct way around. The stripe on the diode body should match up to the stripe on the PCB.

The diodes can be challenging to solder, as the copper pour areas that underlay the diodes will soak up a lot of heat from the soldering iron. It may be necessary to increase the soldering iron temperature to ensure that there are no faulty connections in this area.

D9 is the SB150. The leads on this need a tight bend to allow fitting to the board.

The bridge rectifier (D1) is soldered directly to the board. The alternating current symbols (~) on the rectifier must point to the bottom of the board.

3.3 Ceramic Capacitor

Install the ceramic capacitor (C1).

3.4 IC Sockets

The IC sockets are also polarised and should be fitted in the same orientation as marked on the PCB. It is strongly recommended that the 8-pin socket be retained, as it can be difficult to solder

in this area due to the copper pour layers. Trying to solder the buck regulator directly may result in damage to the regulator.

3.5 Tactile Switches

The four tactile switches will only fit into the board in the correct orientation. This is otherwise a simple soldering job.

3.6 DIP Switch

Install the ceramic capacitor (C1).

Install the RUN/SET DIP Switch. The “ON” in the switch should point to the right hand side of the board.

3.7 Step 7: MOSFETS

There are five PMOS and ten NMOS FET's used. The N-MOSFETS provided have a wide leg spacing and cannot be fitted into the wrong positions. Likewise, the P-MOSFETS have a narrow leg spacing and cannot be fitted into the NMOS positions. If you find you are needing to bend the legs of the MOSFETS, stop and check that you are placing the FETS in the correct locations.

Fit the NMOS transistors first, then using the NMOS transistors as a height reference, fit the PMOS transistors.

The PMOS transistors are much harder to solder due to the close leg spacing. Take care that there are no shorts across the PMOS legs.

3.8 Step 8: 7 Segment Displays

The 7-Segment displays are a tight fit into the board. Fit all the displays before soldering. When fitting, start with the center digit and the alternatively fit the left and right digits until all five digits are placed.

Once all five digits are placed, ensure they are properly seated and then solder the digits to the board. It is best to solder one pin per digit on the top row and bottom row at a time. Do not solder the entire digit at once, as this may result in overheating and damage to the displays.

3.9 Step 9:LED

The red LED is installed in the +5V LED spot on the left hand side of the board. The short leg (cathode) goes to the square pad.

3.10 Step 9: 3-Pin headers

When placing the 3-pin headers ensure they are at right angles to the circuit board. After installing the headers, place the jumpers on the headers.

3.11 Step 10: Inductor, Electrolytic Capacitors and PPTs

Some of these are mounted on the copper pour layers, so it is advisable to have more heat input when soldering these components.

The electrolytic capacitors are polarised, so take care that the positive on the capacitor is mounted where the + symbol is displayed on the board.

3.12 Step 11: Terminal Blocks

Note: The terminal blocks are mounted on the back side of the board. This is done to keep the wires and cables out of the way and out of site. The terminal blocks must be orientated to allow the wire to be terminated from the direction of the center of the board.

3.13 Step 12: Integrated Circuits

Install the two integrated circuits.

4 Hardware

The enclosure needs to have the two holes drilled for the cable glands. The holes can either be drilled on the long-side (top/bottom) or in the short-side. (left/right). The choice of long-side or short-side is based on how you will be mounting the unit.

The one cable gland is an 8mm gland (for the sensor), and the second is a 13mm gland (for the power).