Multiface™ Kit Assembly Guide

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INTRODUCTION

Thank you for purchasing the Multiface kit from Tandy.

The Multiface is a multi-purpose IO (Input/Output) expansion interface for the Raspberry Pi. Bringing together a selection of interfacing components on to a single circuit board the Miltiface makes an ideal experimentation and prototyping system.
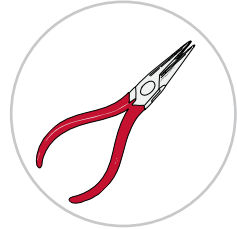
ASSEMBLY NOTES

TOOLS
You will need the following tools to assemble your kit...
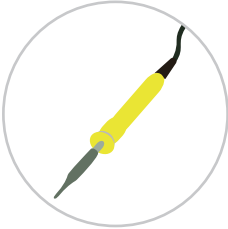
Soldering Iron   **Side Cutters**   **Long-Nose Pliers**

OTHER HELPFUL TOOLS
In addition to the main tools the following tools; although not essential will assist in the assembly of the kit. IC pin straightener, anti-static wrist strap, multi-meter with resistance measuring mode, de-soldering pump or braid.

ASSEMBLY
Tandy kits feature our unique in-line assembly system; making them easy to follow. With our in-line assembly system all of the components have been provided in a sealed plastic sleeve in the recommended assembly order. Simply open each section in turn and install them on the circuit board to complete the kit. Each component is clearly labelled for easy identification.

SOLDERING
Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between the component and circuit board. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

It is easy to make a good solder joint by following a few simple rules:

1. Use the right type of soldering iron. A 15 to 25watt standard soldering iron designed for electronics or a temperature controlled soldering station with a 2 to 3mm conical or pointed tip fitted should be used.
2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cleaning pad; then apply solder to the tip to give it a thin coating of solder. This process is called tinning, and will protect the tip and enable you to make good connections.
3. Apply the iron to the component lead and circuit board pad at the same time and apply the solder to the joint rather than the iron.

NOTE: Always use solder 60/40 Rosin core or lead-free solder intended for electronics use. We recommend a fine grade of between 0.5 and 1.0mm for best results.

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PARTS LIST

Inspect the kit and check each part against this list. Do NOT remove the parts from the plastic sleeve at this point as doing so would make the components more difficult to identify during construction.

1	10KΩ Resistors (R1,R2,R16,R17,R18,R34)
2	470Ω Resistors (R3-R15)
3	UF2003 Diode (D1-D4)
4	IC Sockets 8pin (U6, U10), 16pin (U7,U12), 20pin (U3, U4, U5), 28pin (U8).
5	4.7KΩ SIL Independent Resistor Array (RN1 - RN3)
6	Tactile Switches (S1, S2, S3)
7	3mm Red LEDs (D1 - D13)
8	100nF Ceramic Capacitors
9	Pin Headers
10	12Mhz Ceramic Resonator (X1)
11	2.2A Resettable Fuse (F1)
12	Screw Terminals
13	10uF Electrolytic Capacitor
14	3.3V Voltage Regulator (U1)
15	Motor Controller (U7)
16	ULN2003 Darlington Driver IC (U12)
17	74HC244 Hex Buffer (U3, U4, U5)
18	MCP 3002 10bit AD (U6)
19	MCP 4802 (U10)
20	ATMEGA328P-PU Micro-controller (U8)
21	Shunt Jumpers

STEP-BY-STEP ASSEMBLY

Remove the circuit board from the packet and identify the top side, the top has the Tandy logo printed on it, all of the components will be placed on this side of the board and soldered on the underside.
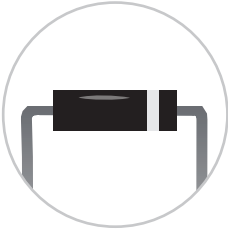
RESISTORS
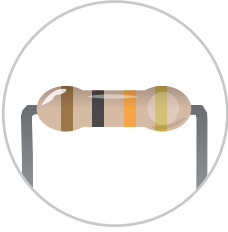
The first component to solder are the 10KΩ resistors marked R1, R2, R16, R17, R18 and R19 on the circuit board. Use your long nose pliers to carefully bend the wires at 90 degrees from the body of the resistor, parallel to each other so they will fit through the holes on the circuit board. Resistors can be inserted either way round as they are not polarity sensitive, however it does look neater and make identifying things easier if you solder them all in the same direction.

Now follow the same procedure with the 470Ω resistors to be soldered in to the positions marked R3 through to R15.

DIODES

There are 4 diodes that will need their wires bent to match up with the holes on the circuit board. They need to be bent in a similar fashion to the resistors, however you should leave a gap of about 2mm from the body of the diode before the bend. Diodes must be inserted the correct-way-round to function correctly. You will notice a white line on the diode, this is the cathode and there is a corresponding white line printed on the circuit board to make it easy to identify which direction they should be inserted.

IC SOCKETS

The IC sockets are pretty self explanatory, there is a small notch at one end that helps identify which direction the IC should be installed. When soldering the IC sockets on to the circuit board line up the notch on the socket with the one printed on the board.

RESISTOR NETWORKS

The 3 resistor networks are marked RN1,2 & 3, it is pretty easy to see where they go as there is an outline showing their position just above the box marked 'Buffer Direction Settings'. While it doesn't really matter which way they are installed there is a dot on the board that marks pin 1 where you will find a corresponding dot on the resistor array.

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TACTILE SWITCHES

Now solder the three tactile switches in to the positions marked S1, S2 & S3. The switches are slightly rectangular so will only fit in one direction. If the switch does not appear to fit properly, turn it 90 degrees and it should fit.

LEDs

LEDs or Light Emitting Diodes must be soldered in the correct way-round or they will not light up. There are two ways to identify which way-round an LED should be used. The first is that the legs are different lengths, the shorter one goes at the top. There is also a flat edge on the side of with the short leg. You will see that the flat edge is printed on the circuit board to help with positioning.

CERAMIC CAPACITORS

These capacitors are not polarity sensitive so it is simply a case of poking the through and soldering them in to place. The blue capacitor should be fitted to position C3 next to the motor controller screw terminals.

PIN HEADERS

Start with the double-row headers down the left hand side of the board. In order to get them straight it is advisable to start by soldering a single pin in the top left corner and then check to see if the header is sitting straight and in-line. If you are unhappy with the alignment re-heat the joint and adjust the position. Once you are satisfied solder the bottom right-hand pin in place and check again that you are happy with the position. Now that the header is held in place by the two pins proceed to solder the rest of the pins on the header. Next solder the remaining single row headers in to position.

CERAMIC RESONATOR

The ceramic resonator is a 3 pin device that is installed next the ATMega micro-controller in the position marked X1. It can be fitted either way-round.

RESETTABLE FUSE

Now solder the fuse in to place in the position marked F1, it can be fitted either way-round.

SCREW TERMINALS

The screw terminals are used for connecting wires to a motor, the holes where the wires go in should be facing the outside edge of the board. Due to the thick pins and wide traces on the circuit board you will probably have to leave your soldering iron on contact with the board for longer before the solder will flow.

ELECTROLYTIC CAPACITOR

Electrolytic capacitor C1 must be installed the correct way round otherwise it may explode if connected incorrectly. You will notice a small + symbol printed where the positive leg of the capacitor should go. The positive leg is the longer leg should be inserted in to the hole where the + symbol is.

VOLTAGE REGULATOR

The voltage regulator is mounted flat, it will be easier to bend the legs before soldering it into place. Using your long nose pliers bend the legs about 3mm from the body, approximately in the centre of the thicker section of the logs. Now insert the regulator so that the hole lines up with the hole drilled through the circuit board and lays flat on the board; solder the three legs in position. Congratulations you have now completed the soldering part of the kit.

INTEGRATED CIRCUITS

Note: *Components supplied in silver bags are sensitive to static electricity that builds up on people and their clothes. Please take appropriate precautions to dissipate static before handling the components.*

You are now ready to install the Integrated Circuits (Chips) in to their sockets. Each IC has a small notch cut into it at one end in order to indicate the correct orientation of the IC. Assuming you have lined up the notches in the sockets correctly with the outlines printed on the board you simply line up the notches on the IC with the notch on the socket.

You will find that the legs on ICs are slightly spread out and will not therefore fit in to the socket. The legs will need to be bent slightly inwards so they are 90 degrees from the body in order to fit properly. We highly recommend using an IC pin straighter to perform this task as it ensures all pins are bent equally. With care the pins can be bent by pressing the side of the IC against a hard flat surface such as a workbench.

TESTING

TEST FOR SHORT CIRCUITS

Before plugging the board into anything use a multi-meter set to resistance to check for short circuits. Place the probes on the pin headers marked +5V & GND in the bottom right hand corner of the board. Your meter should give a high resistance reading, typically 2MΩ or higher. If it shows a resistance of close to zero inspect the board for solder connecting more than one pad together.

TEST VOLTAGE

Now connect the board to the raspberry Pi and turn the power on. With your test meter set to DC voltage, put the black probe on the GND pin and the red one on the pin marked 3V3 next to the voltage regulator. The voltage should read 3.3V +/- 10%, now you are ready to go.

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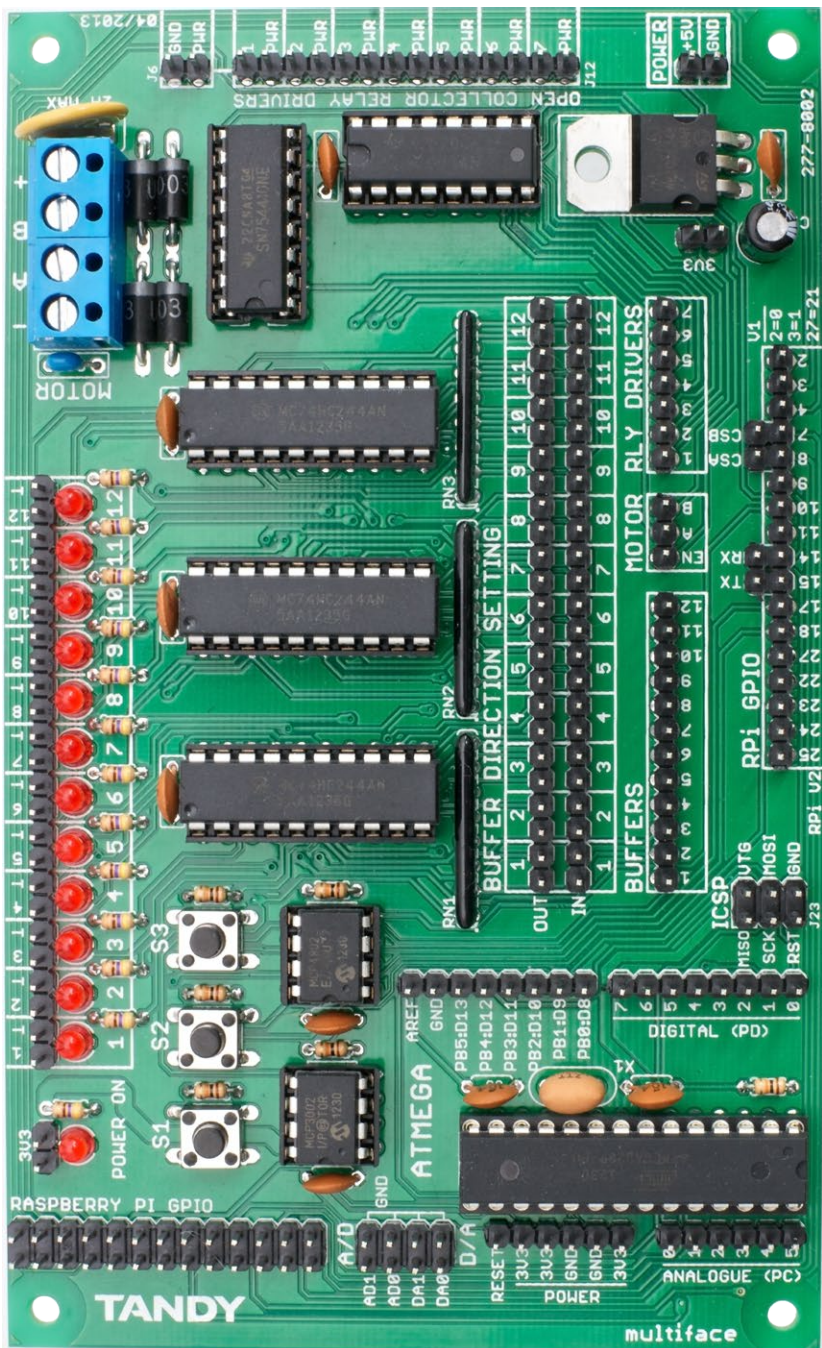
Completed Multiface Board.

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