# Tode Hardware

## General Manufacturing Guide

### Equipment, Tools, Supplies, Procedure and Settings

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# Table of Contents



# 1. Introduction

The Tode System

- Tode-RC = Handheld Remote Control Models
  - Model #AMP Arduino Mega Pro (No RF Module)
  - Model #AMPE32T30 Arduino Mega Pro + Ebyte E32-433T30D (1W/30dbm) RF module
  - Model #AMPE32T20 Arduino Mega Pro + Ebyte E32-433T20D (250mW/20dbm) RF module
  - Model #AMPXBEE Arduino Mega Pro + Digi XBee RF Module

- Tode-SideIO = Input/Output Stations
  - Model #TSIOST Tode SideIO with Screw Terminals
  - Model #TSIOAP Tode SideIO with Aviation Plugs

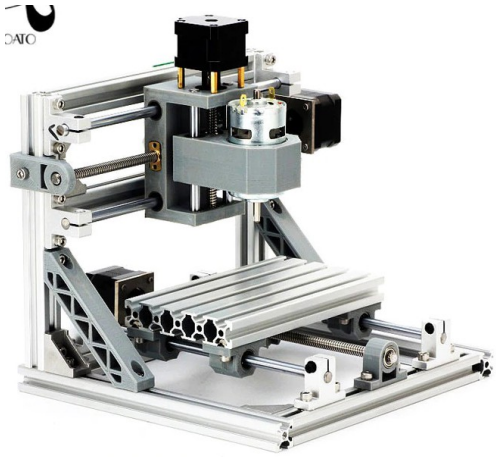
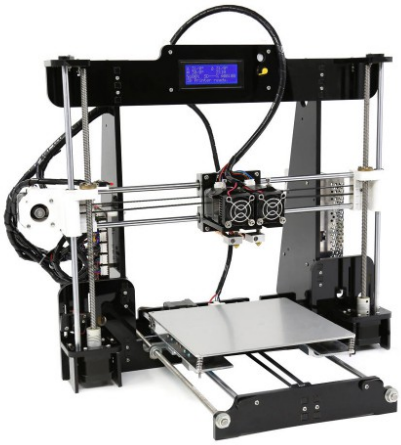
Manuals

- User Manual Operator Instructions including Setup and Wiring
- Hardware Development How to build the hardware including detailed circuit diagrams
- Firmware Development How to adjust and create firmware for the Tode

The Tode System is liscensed under the MIT Liscense. It's hosted on Github.com at:
https://github.com/TGit-Tech/Tode-RC

# 2. Workstation $770

## 2.1 Equipment $530

| | | |
|---|---|---|
|  |  |  |
| ✔ CNC Mill ( ~ $150 )<br>○ DIY CNC1610<br>○ Equipped with End-Stops and Board-Level Clips<br>○ Using bCNC controller and GRBL v1.1<br><br>Various CNC Mill models will work | ✔ 3D Printer ( ~ $150 )<br>○ Anet A8<br>○ Cura<br><br>Various 3D Printers will work. | ✔ Reflow Oven T-962 ( ~ $230)<br>○ Infrared IC Heater<br>○ 800W<br>✔ |

## 2.2 Tools $120

| | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| Solder Iron<br>With Tiny Tips<br>Price $40 | Dikes / Cutters<br>Price: $10 | Wire Strippers<br>Price $12 | Manification<br>Price $40 | Tweezers Kit<br>Price: $10 |

## 2.3 General Supplies $120

| | | | | |
|---|---|---|---|---|
|  |  |  |  |  |
| No-Clean<br>Price: $4.00 | Leaded<br>Solder Paste<br>Price: $16.00 | Wick<br>Price: $3.50 | 0.031" 60/40<br>Rosin-Core Solder<br>Price $8.00 | |
|  |  |  |  | |
| Pyramid CNC Bits<br>0.2mm Tip<br>45-deg<br>Price $10/10pcs | V-Shape CNC Bits<br>0.2mm Tip<br>10-deg<br>Price: $10.00/10pcs | Drill CNC Bits<br>0.1 to 1.0mm (10)<br>1.0 to 3.0mm (10)<br>Price $20.00/20pcs | 22AWG Stranded<br>Colored Wire<br>Price $20/6-roll | Liquid Tin<br>Price $20 |

## 2.4 CNC Routing a PCB ( Settings & Process )

1. Using the CNC machine shown in Workstation::Equipment
2. Using the 3D Printed 3" x 4" Cu-Clad PCB Holder
3. Using Isolation Bit 45-deg, 0.2mm tip, Diamond Shape
4. Using Flatcam Settings
   a) Speed: 45 mm/s
   b) Depth: -0.045mm
5. Using bCNC
6. Load PCB onto CNC1610 using PCB holder
7. Load the Trace Isolation Bit ( Suggest 45-deg 0.2mm Tip Diamond Shape )
8. Open bCNC
9. Home the CNC
10. Enter Command G01 X22Y17 F300
11. Zero Coordinates
12. Manually move bit close but not touching PCB
13. Zero Z Coordinate
14. Probe
15. Open File
16. Set Autolevel margins
17. Scan for Autolevel
18. Probe again and Autolevel Zero
19. Remove Autolevel Probe Wire
20. Start Isolation Routing
21. Preform Isolation Routing
22. Preform Hole Drilling
23. Preform Edge-Cuts
24. Sand & Treat with Liquid Tin