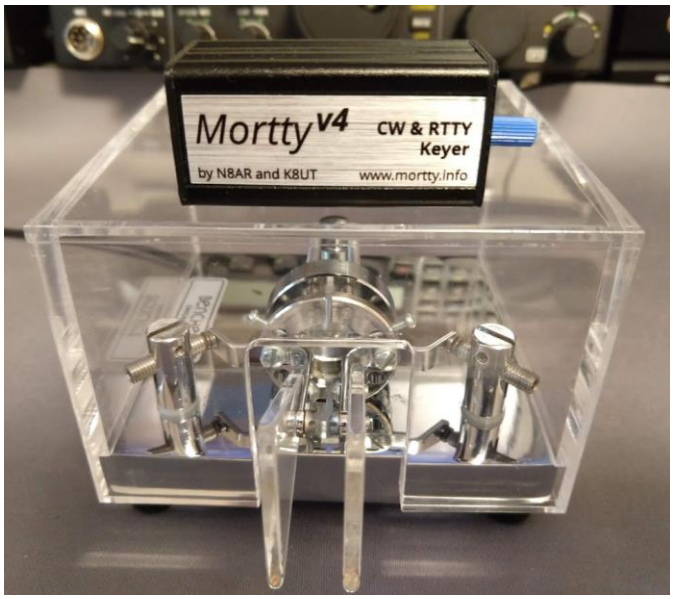
Mortty^{v4} - Morse Code and RTTY Keyer

Mortty^{v4} is a fully assembled and tested keying solution that provides a miniature enclosure and a computing platform for three freeware keying programs: K0SM's TinyFSK RTTY Keyer, K3NG's CW Keyer, or W1HKJ's nanoIO dual mode program.

Unlike full-featured - and more expensive - hardware solutions for CW and RTTY keying that are widely available to amateurs, Mortty is an inexpensive solution that depends upon the configuration and control features incorporated in popular logging and control programs. This tiny box measures only 2 inches long and 1 inch square (50mm by 25mm). The input end has a USB mini-B jack to connect a computer and a 3.5mm TRRS jack to connect a CW paddle. The output end has a CW speed pot; four LEDs for power, push to talk (PTT), Radio 1 and Radio 2 transmit; and a 3.5mm TRRS output jack that provides PTT, CW and FSK signals to your transceiver.

Compare the **Mortty^{v4} CW and RTTY Keyer** to the Competition:

- Twice the Features
- Half the Price



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Disclaimer: This device controls equipment that could be damaged by said device. You are responsible for installing, configuring, testing and verifying that the device performs properly in your environment. The developers cannot be held liable for any direct, indirect, consequential or incidental damages to other pieces of software, equipment, goods or persons arising from the use of this device.

By operating this device, you accept the above terms of copyright and disclaimer.

This document revisions:

r1.0	2020-07-01	Mortty v4 release
r1.0m	2020-09-16	Corrected descriptions of outputs and cables

Mortty^{v4} Overview

Key Features

- Fully assembled and tested
- CW speed pot
- Four status LEDs - power, PTT, Radio1 Tx, Radio2 Tx
- Dual-mode CW and RTTY with fldigi and nanoIO
- Two radio SO2R operation with CW Keyer/N1MM+
- AUX I/O feature for monitor tone or pushbuttons
- Simple Plug & Play installation and operation
- Standalone (no PC required) CW Keying with inexpensive cell-phone battery pack (not ncluded)
- Small, lightweight, portable for mobile, Field Day, or back-country treks
- Rugged RFI-resistant metal enclosure
- Flash upgradeable and software reconfigurable

Setting Expectations

- **What's missing from this miniature design?**
  - For CW - No macro pushbuttons, no monitor speaker.

    However… Mortty^{v4} now includes an AUX I/O feature for an external device. See Appendix 4.
- **Mortty software and operating modes - choose one of three pre-installed programs:**
  - K3NG's CW Keyer emulates the widely supported Winkeyer v2.3 protocol
  - K0SM's RTTY FSK keying via widely supported TinyFSK protocol
  - W1HKJ's Dual-Mode Sketch supports both CW and RTTY operation using nanoIO and fldigi
- **Changing the pre-installed Mortty software takes about one minute and requires no tools**

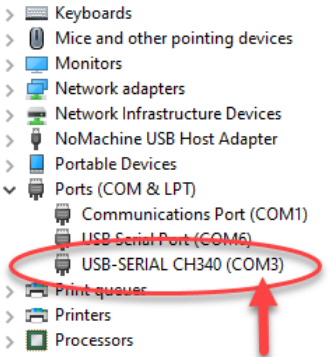
Required Materials

- **Logging software compatible with *K1EL Winkeyer* (CW), *TinyFSK* (RTTY) or *nanoIO* / *fldigi* software**
- **Cable and connectors from Mortty's output (3.5mm jack) to your radio's PTT and CW or FSK inputs**
  - If you have one radio and run either the CW Keyer or TinyFSK programs, you need a standard three conductor 1/8" (3.5mm) Tip Ring Sleeve (TRS) jack and cable. You probably have one of these headphone-style cables in your junk box, but they are readily available from many sources (Amazon, eBay, Best Buy, Newark…) and also from the Mortty website
  - If you have two radios and plan to run the CW Keyer program in SO2R, or one radio and plan to operate nanoIO with fldigi's dual-mode program, then you need a four conductor 1/8" (3.5mm) Tip Ring Ring Sleeve - TRRS) jack and cable. This cable, often referred to as an A/V Camera cable, is available from many sources (Amazon, eBay, Best Buy, Newark…) and also from the Mortty website

Step 1. Connect Mortty^{v4} to Your Computer

Using the USB cable provided in the Mortty package, connect Mortty to one of your computer's USB ports. Windows should automatically recognize the new device and install an appropriate CH340 UART serial port driver. Successful installation will be announced with the familiar Windows tone and a brief text notice near the status bar of the PC. Open Windows Device Manager dialog window by right-clicking on the Windows Start icon and selecting Device Manager.

In Device Manager, examine the **Ports (COM & LPT)** section for a new serial port described as a CH340 UART. Note the serial port number assigned by Windows. You will need this number when configuring your logging software.



If you receive an error from Windows or your driver did not automatically install, refer to the Troubleshooting appendix of this documentation.

Step 2. Connect Mortty^{v4} to Your Radio

Choose one of the following cable options for your radio connection.

Option 1: Single Radio Operation with the CW Keyer Sketch or TinyFSK Sketch programs

Single Radio operation requires a three conductor 3.5mm stereo (TRS) plug and cable to connect to your rig. If you intend to operate CW the cable will connect to your rig's PTT and CW key line. For TinyFSK RTTY operation the cable will connect to PTT and your rig's FSK input.

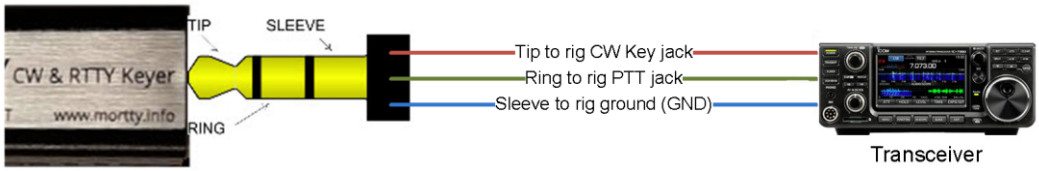
TIP - CW (K3NG CW Keyer Sketch) **or**
RTTY (K0SM TinyFSK Sketch)

RING - Push To Talk (PTT) for RTTY and CW
SLEEVE - Ground

Example shows connectors with RCA plug terminations. Refer to your radio's documentation for the connections needed at the radio end of this cable:

CABLE HINT: Consider sacrificing a standard 3.5mm (1/8") stereo cable with a TRS connector for this purpose. Cut off one end and replace it with the connectors required for your radio. Ed W0YK suggests buying one of the following pig-tail cables from Mouser: 172-7434-E (36" right angle connector) or 172-7435-E (72" straight connector)

For CW Keyer Sketch operation connect sleeve to ground, ring to PTT and tip to the CW key jack



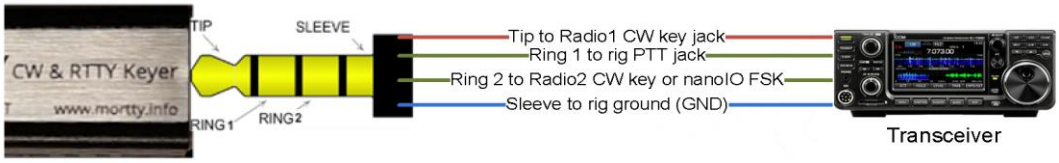
For RTTY TinyFSK Sketch operation connect sleeve to ground, ring to PTT and tip to the FSK line. These inputs are found on an auxiliary connector on the rear of most radios

Option 2. Single Operator Two Radio (SO2R) or Single Radio Dual Mode Operation (nanoIO)

The four conductor output jack on Mortty[v4] accepts a three signal (TRRS) 3.5mm plug. If you plan to operate Single Operator Two Radio (SO2R) with the **CW Keyer Sketch** or Single Radio Dual Mode Operation with the **nanoIO Kketch**, prepare the following cable:

TIP – CW key jack on your rig
RING 1 - Push To Talk (PTT) for RTTY and CW
RING 2 – Radio 2 CW key or Radio 1 nanoIO FSK jack
SLEEVE – Ground

Example shows connectors with RCA plug terminations. Refer to your radio's documentation for the connections needed at the radio end of this cable:



CABLE HINT: Consider buying a Tip Ring Ring Sleeve (TRRS) cable, often referred to as an A/V Camera cable. Available from many sources (Amazon, eBay, Best Buy, Newark…) and also on the Mortty website

On the A/V camera cable:

Yellow RCA jack is Tip (Radio 1 CW key)
White RCA jack is Ring 1 (Push To Talk)
Red RCA jack is Ring 2 (Radio 2 CW key or nanaIO FSK)

IMPORTANT: Some A/V cables have been found to be color-coded differently. If you have problems, use an ohmmeter to verify Mortty outputs to your radio.

Step 3. Connect Mortty^{v4} to Your Logging Program

Your Mortty order specified which of the three keying program (called "Sketches" in Arduino-speak) you wanted pre-installed on the Arduino Nano processor. The sketch name – CW Keyer, TinyFSK, or nanoIO – is written on the Morrty package.

For CW Keyer Operation

K3NG's CW Keyer sketch emulates version 23 of the popular K1EL Winkeyer, which is supported by most logging programs. Follow your logging program's instructions for configuring and using a Winkeyer.

For TinyFSK Operation

K0SM's TinyFSK sketch is supported by many logging programs and digital mode applications. The list includes (at least) WriteLog, N1MM Logger Plus, DXLab WinWarbler, Ham Radio Deluxe, G3YYD's 2Tone, MMTTY… and probably others. Refer to your logging software's documentation for TinyFSK interface instructions.

For nanoIO/fldigi Operation

The dual mode nanoIO sketch requires that you operate the corresponding fldigi digital program. Refer to the links provided for nanoIO and fldigi operation.

*IMPORTANT: Using Mortty with your logging program requires Mortty's processor be in **Operate Mode**. (NOTE: the opposite of Operate Mode is Program Mode, which is used for uploading and programming the processor). The correct sequence for enabling Mortty's Operate mode is: 1) Insert the output cable into Mortty's output jack, 2) Apply power to Mortty by connecting Mortty to a computer USB port, 3) Launch your logging program.*

*Why? When Mortty is plugged into your computer **and a cable is plugged into the output jack**, the Arduino Nano processor initializes in **Operate Mode** and Mortty is ready to receive keying commands from your logging program. When Mortty is plugged into your computer **and there is no cable plugged into the output jack**, the Arduino Nano processor initializes in **Program Mode** and Mortty is listening for compiler and developer commands to install a new program sketch.*

Appendices

Appendix 1. Troubleshooting Device Driver Problems

If you receive an error message when connecting Mortty to your computer, you may need to manually download/install the CH340G driver. If you are not sure if the driver installed correctly, open the Windows Device Manager and examine the **Ports (COM & LPT)** section for the new serial port. If the device is not listed, refer to these websites for instructions:

The latest version of the driver is CH341. Drivers are available here for Windows, Mac, linux, and android platforms. Download the CH341_SER.EXE driver here:

http://www.wch.cn/download/CH341SER_EXE.html

Look for installation/configuration information here: (or just google "CH341G driver")

https://forum.arduino.cc/index.php?topic=397368.0
https://sparks.gogo.co.nz/ch340.html
https://www.youtube.com/watch?v=4YkXXNcNzh0

WINDOWS UPDATE = OFF? Dave K6LL encountered problems because Windows did not automatically assign a USB com port to the Arduino Nano. He intentionally operates his PC with Updates turned off, and his computer had not received the Update that would have enabled the CH340 driver. There are good reasons to disable Updates on your computer, but in doing so you may need to temporarily enable Windows Updates or manually install the driver yourself.

Appendix 2. Installing Program Sketches

Install the Arduino Integrated Development Environment - the IDE

You need to install the Arduino IDE to manage and upload applications (called "Sketches" in Arduino land). You can read about using the Arduino IDE for Windows here: https://www.arduino.cc/en/Main/Software

Put Mortty^{v4} in Program Mode:

Unplug Mortty's USB Input and the rig Output cables. Insert the USB Input cable. The blue POWER LED should light and remain lit. The red PTT LED will blink between 1 and 7 times when Windows activates the UART device drive.

Launch the Arduino IDE

Start the Aruino IDE program. In the >Tools drop-down menu, set the following: Board = Arduino NanoSet; Processor = Atmega328P (old bootloader); Port = (Windows serial port number assigned to the Nano).

Choose the sketch to be uploaded

In the Arduino IDE drop-down menu, select >File >Open and select the sketch you wish to install (CW Keyer, TinyFSK, nanoIO)

Upload the sketch

In the Arduino IDE drop-down menu, select >Sketch >Upload. At the end of the upload process the IDE dialog window should read "avrdude done. Thank you."

Appendix 3: Reference Links to Arduino Sketch Programs

TinyFSK Sketch

Description by its author, Andy Flowers, K0SM: http://www.frontiernet.net/~aflowers/tinyfsk/
Link to the TinyFSK download: http://www.frontiernet.net/~aflowers/tinyfsk/TinyFSK.ino

Another reference, with some good step-by-step instructions: *Programming an Arduino for TinyFSk*, by Dave K6LL: http://lists.contesting.com/archives//html/RTTY/2016-02/msg00001.html

CW Keyer Sketch

Description by its author, Anthony Good, K3NG: https://blog.radioartisan.com/arduino-cw-keyer
Link to the CW Keyer download: https://github.com/k3ng/k3ng_cw_keyer
Another reference: *A Few Good CW Keyers*, by Jeff Blaine, AC0C: http://ac0c.com/main/page_home_page.html

nanoIO Sketch and fldigi

Description by its author, David Freese: http://www.w1hkj.com
Link to fldigi download: https://sourceforge.net/projects/fldigi/files/fldigi/
Link to the nanoIO download: http://www.w1hkj.com/files/nanoIO/

Other references:

fldigi Users Manual http://www.w1hkj.com/FldigiHelp/index.html
nanoIO Interface http://www.w1hkj.com/files/nanoIO/

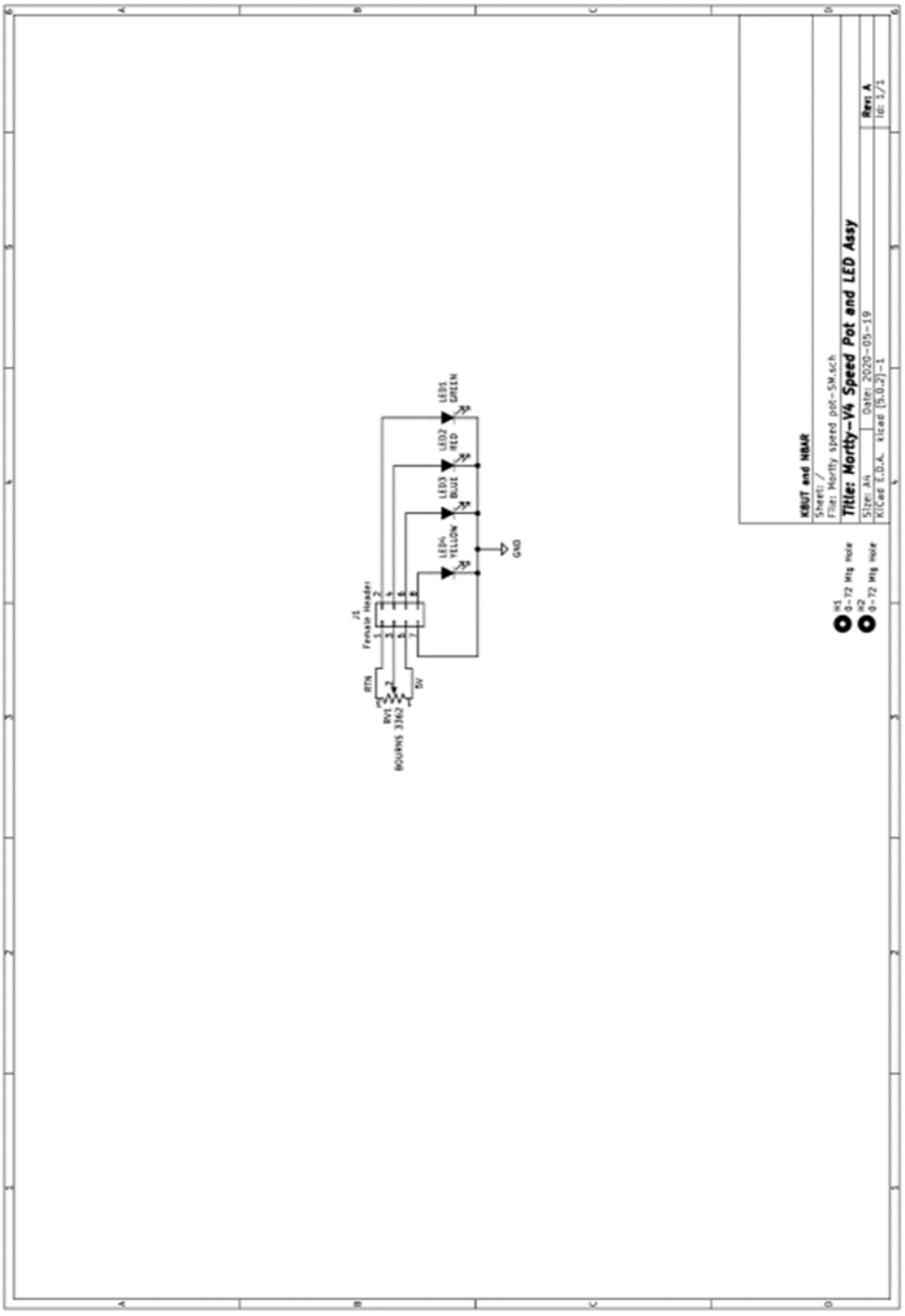
Appendix 4: DIY - Using Mortty^{v4}'s AUX I/O feature

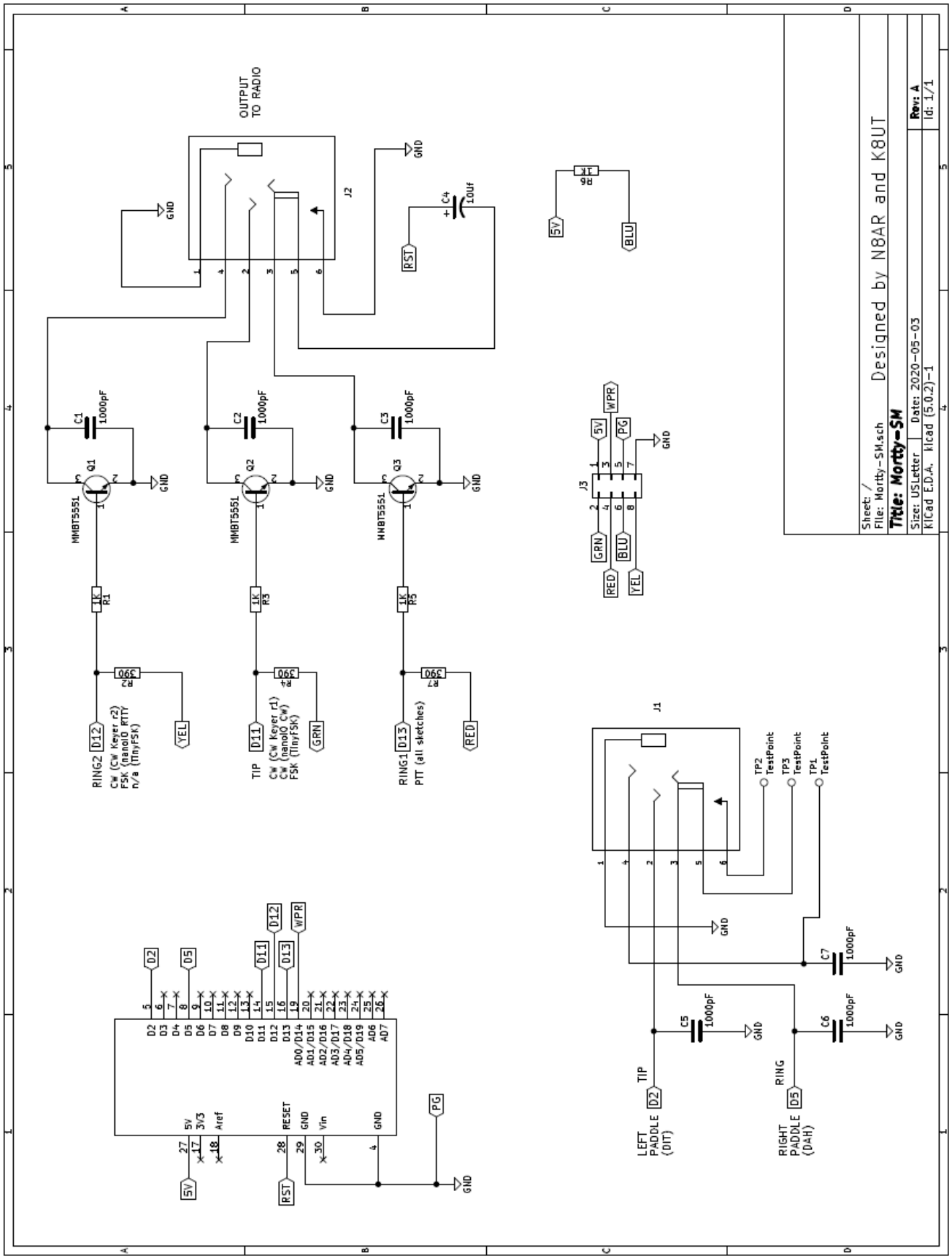
The input paddle port of Mortty^{v4} includes an unused third connection. Refer to the schematic in Appendix 4. Note that Ring2 of that TRRS jack leads to circuit board test point TP1. You could use that test point to extend a circuit from within Mortty, using a four conductor TRRS cable, to an external device - like a speaker (CW monitor tone), a pushbutton (put the keyer in command mode or send a keyer macro), or perhaps some other function not imagined by Mortty's developers.

TIP – Paddle Dot input
RING 1 – Paddle Dash input
RING 2 – AUX I/O to test point TP1
SLEEVE – Paddle Ground

Graphic shows RCA plug terminations. Cut these off to connect to your paddle and your aux device.

Appendix 5. Mortty^{v4} Schematics




OUTPUT
TO RADIO
J2
GND
C4
10uf
RST
5V
R6
BLU
C1
1000pF
C2
1000pF
C3
1000pF
Q1
Q2
Q3
MMBT5551
1K
R1
R3
R5
D6
D7
D8
RING2
D12
CW (CW Keyer r2)
FSK (nanoIO RTTY
n/a (TinyFSK)
YEL
TIP
D11
CW (CW Keyer r1)
CW (nanoIO CW)
FSK (TinyFSK)
GRN
RING1
D13
PTT (all sketches)
RED
J3
WPR
PG
GRN
BLU
RED
YEL
J1
TP2
TP3
TP1
TestPoint
C7
C5
C6
TIP
RING
D2
D5
LEFT
PADDLE
(DIT)
RIGHT
PADDLE
(DAH)
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
AD0/D14
AD1/D15
AD2/D16
AD3/D17
AD4/D18
AD5/D19
AD6
AD7
5V
3V3
Aref
RESET
GND
Vin
GND
RST
Designed by N8AR and K8UT
Sheet: /
File: Mortty-SM.sch
Title: Mortty-SM
Size: USLetter
Date: 2020-05-03
Rev: A
KiCad E.D.A. kicad (5.0.2)-1
Id: 1/1