Assignment 2 Presentation

EECE 443

Team 2: MCU TNC Design
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MCU TNC Assignment 2

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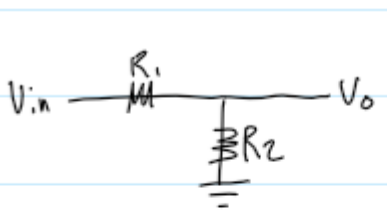
Preliminary Design

- Simulations
  - BJT PNP Circuit - http://tinyurl.com/uvuus54
  - Voltage Divider - http://tinyurl.com/tjcqvlk
- Calculations
- Drawings
- Bill of Materials
- Instructions of Assembly
- Failure Mode Effects Analysis
- Level 0/Level 1 Diagram

Calculations

Need to lower $3.3V \rightarrow 500mV$

Use a voltage divider —

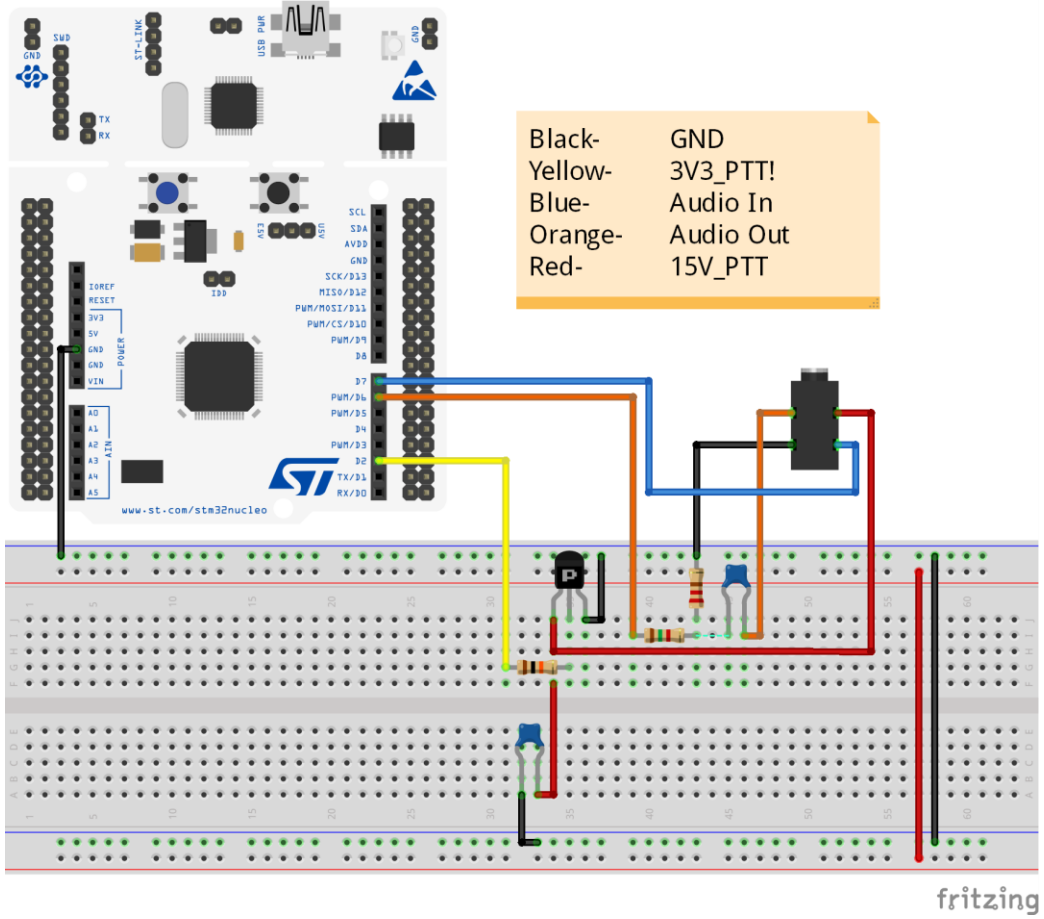


$$V_o = V_{in}\left(\frac{R_2}{R_1 + R_2}\right)$$

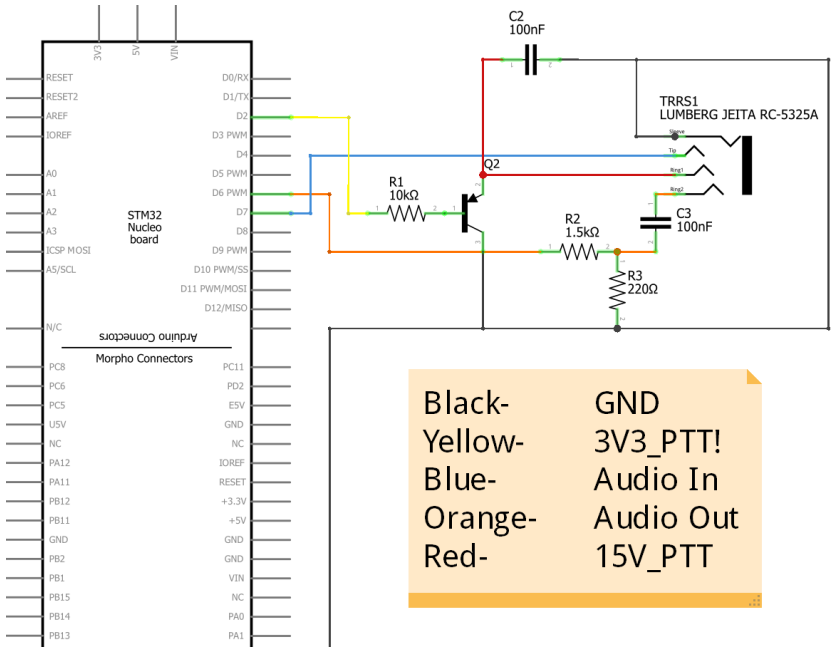
$$V_o = 3.3V\left(\frac{220}{1.5K + 220}\right) = 422mV \simeq 500mV$$

Voltage Divider Calculations

Drawings



Breadboard Layout



Schematic Layout

Bill of Materials

Item	Purchase Link	Cost Per	Amount	Total per Comp	Received (by)
STM32F446RE Nucleo board	https://www.mouser.com	$14.00	3	$42.00	Kobe
P-Channel MOSFET	505PBF?qs=sGAEpiMZZMsl	$0.88	10	$8.80	Kobe
Resistor Kit	ww.sparkfun.com/produc	$7.95	1	$7.95	Kobe
Capacitor Kit	ww.sparkfun.com/produc	$7.95	1	$7.95	Kobe
Analog Discovery 2	-2-100msps-usb-oscilloscc	$279.00	1	$279.00	Kobe
3PCS 400 tie-Points breadboard	r=678214a0-1137-4905-9a	$7.98	1	$7.98	Kobe
3.5 mm/2.5 mm jack	1699?qs=sGAEpiMZZMsMy	$0.95	10	$9.50	Kobe
jumper wires(M-M, M-F,F-F)	od_rd_r=69f380b1-3793-46	$5.79	3	$17.37	Kobe
			Total:	$380.55	

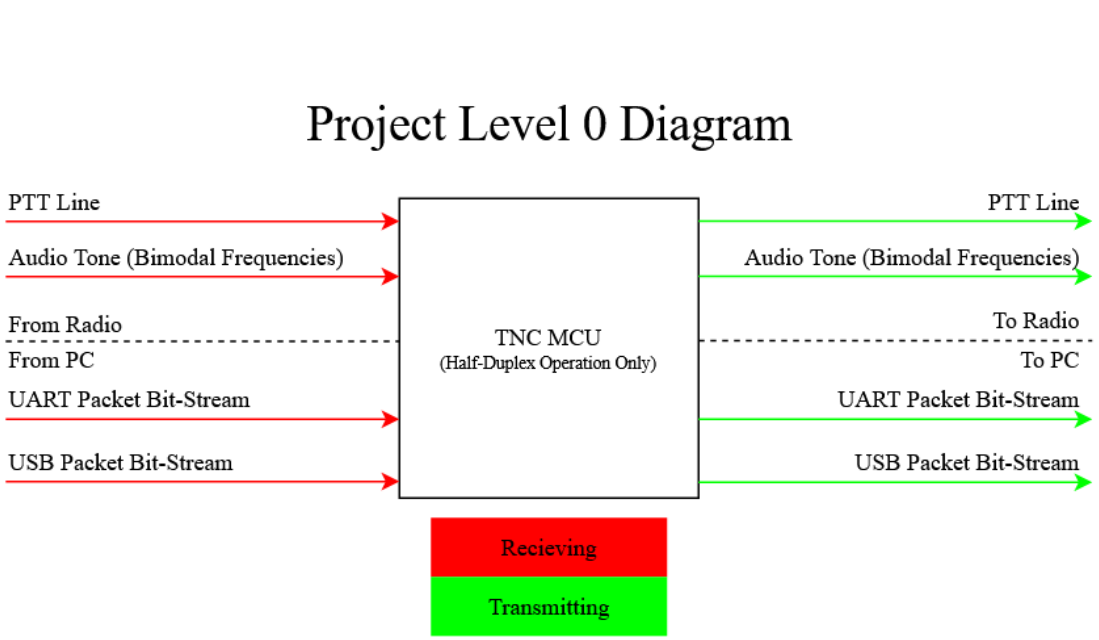
Bill of Materials Sent
to Mentors

Failure Mode Effects Analysis

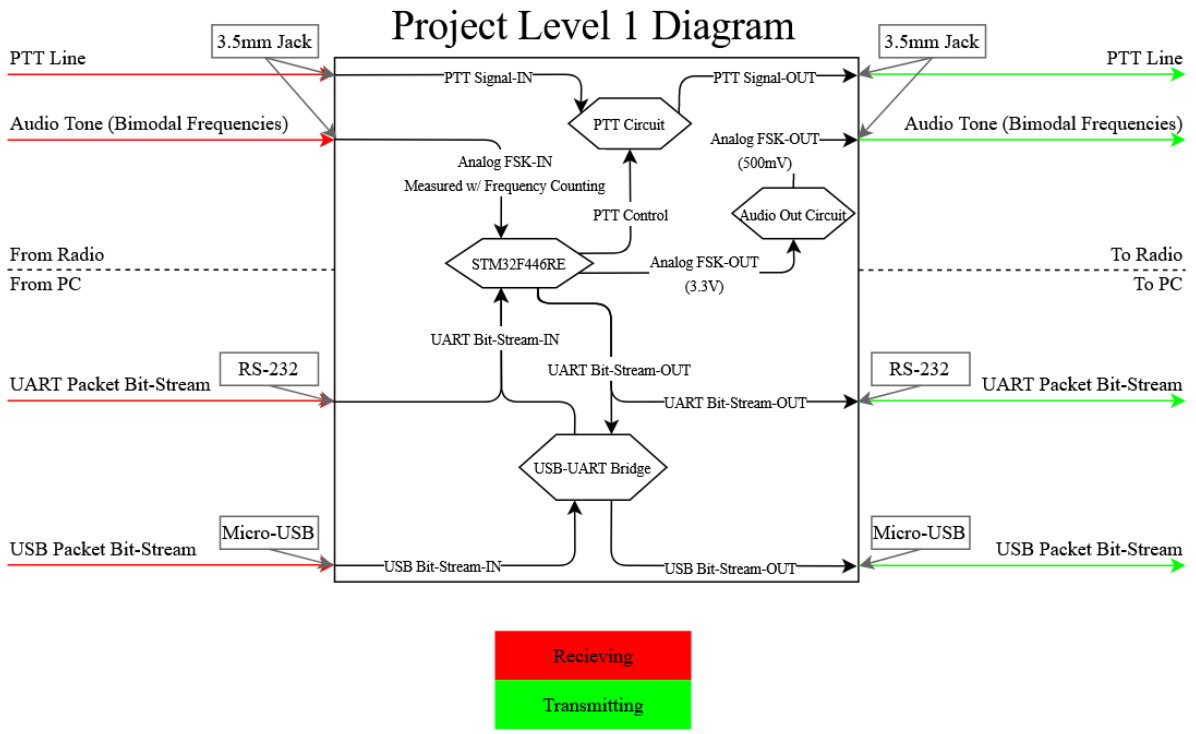
Process Step/Input	Potential Failure Mode	Potential Failure Effects	Potential Failure Causes	Action Recommended
Bits in packets	Receiving TNC/Computer mistakes bits for flags	-Misinterpretation of information from receiving end -Disposal of packet due to invalid size	-Bits, anywhere in payload of KISS packet, are arranged as "11000000" -Bits, anywhere not in flags of HDLC packet, are arranged as "01111110"	**Bit stuffing:** -In KISS mode, a "1" is added after every "00000" arrangement in payload. Receiving TNC removes added "1" after every "00000" -In a HDLC, a "0" is added after every "11111" arrangement. Receiving TNC removes added "0" after every "11111"
Packet format	-Invalid Packet Format: -Less than 136 bits in frame -Not bounded by opening and closing flags -Octect not aligned	-Inaccurate information received	-Code failure -Excess noise on the received audio to digital conversion	-Receiving TNC disposes packet -Rewrite Code
Transmitter	-Transmitter is kept on for an extensive amount of time	-Receiver is polling for an extensive amount of time for frames to be sent	-Delay in frames being sent	**-Inter-Frame Time Fill:** when necessary for a TNC to keep transmitter on while not sending frames, flags should be sent to fill in time between frames being sent
Microcontroller	**1.)** Transmits audio signals with improper frequencies **2.)** Receives audio signal with noise	**1.)** -Bit errors -Receiving TNC misinterprets data **2.)** -Bit errors in packets sent	**1.)** -Incorrect code/configuration **2.)** -Noisy environment	**1.)** -Reconfigure microcontroller or rewrite code **2.)** -check for good connections -Move to a less noisy environment
Push-to-talk (PTT)	**1.)** LED burns out **2.)** MOSFET gets too hot	**1.)** -User cannot tell if TNC is sending audio signal to radio. **2.)** -Can damage components near MOSFET -MOSFET can burn out and TNC cannot perform audio transmission	**1.)** -LED used is old **2.)** -MOSFET is consuming too much power -Insufficient MOSFET used to handle required Power -Improper capacitors and resistors used in PTT circuit	**1.)** -Replace old LED **2.)** -Add heat sink to MOSFET -Replace MOSFET with a better one -Reconsider using different resistors/capacitors in circuit

Failure Mode Effects Analysis

Level 0/Level 1 Diagrams



Level 0 Diagram



Level 1 Diagram