

# **Assignment 2 Presentation**

## **EECE 443**

**Team 2: MCU TNC Design**

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# MCU TNC Assignment 2

David Cain, Kobe Keopraseuth, and Kaleb Leon

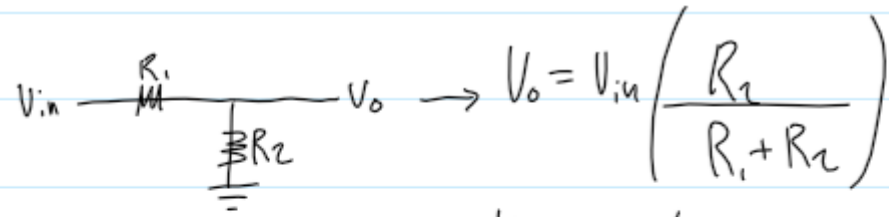
# Preliminary Design

- 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

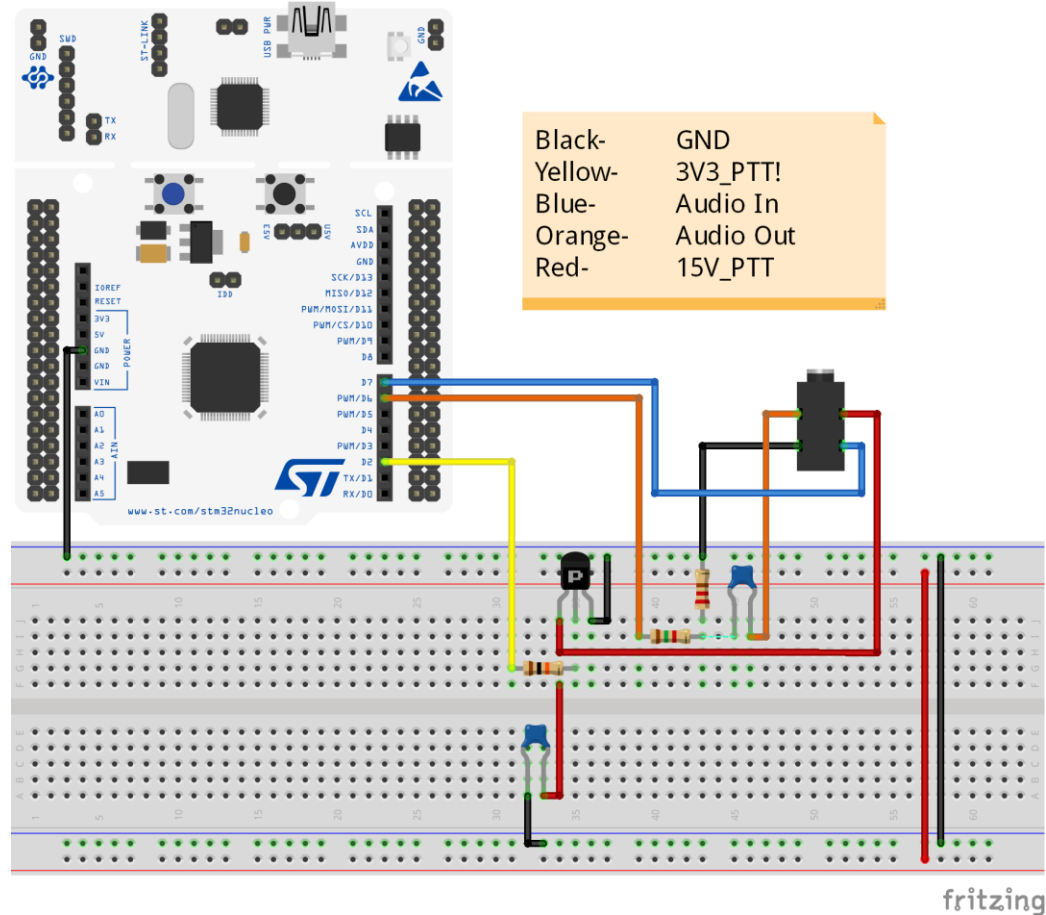
Need to lower 3.3V  $\rightarrow$  500mV

Use a voltage divider —

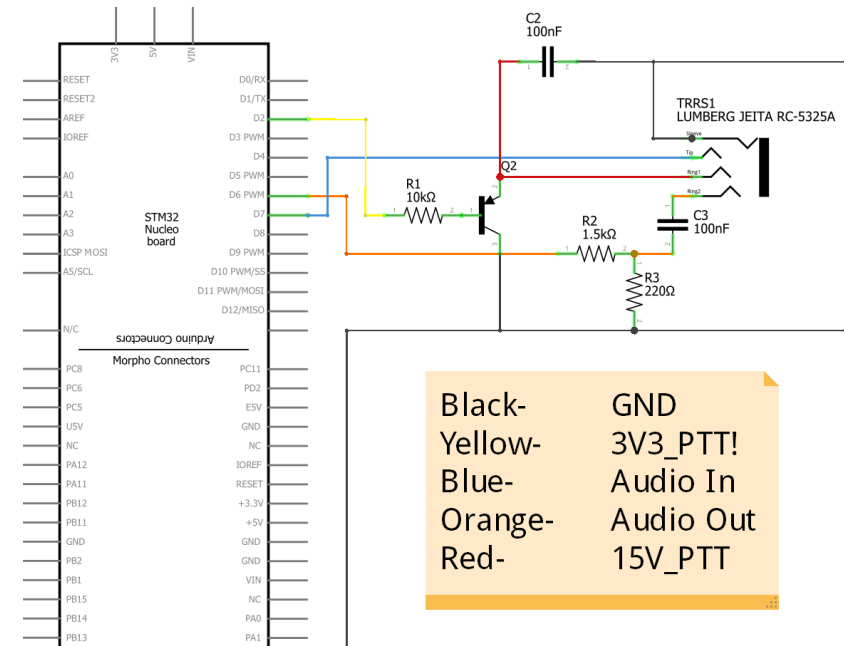

$$V_o = V_{in} \left( \frac{R_2}{R_1 + R_2} \right)$$
$$V_o = 3.3V \left( \frac{220}{1.5K + 220} \right) = 472mV \approx 500mV$$

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	<a href="https://www.mouser.com">https://www.mouser.com</a>	\$14.00	3	\$42.00	Kobe
P-Channel MOSFET	<a href="#">505PBF?qs=sGAEpiMZZMsI</a>	\$0.88	10	\$8.80	Kobe
Resistor Kit	<a href="http://www.sparkfun.com/produ">www.sparkfun.com/produ</a>	\$7.95	1	\$7.95	Kobe
Capacitor Kit	<a href="http://www.sparkfun.com/produ">www.sparkfun.com/produ</a>	\$7.95	1	\$7.95	Kobe
Analog Discovery 2	<a href="#">r-2-100msps-usb-oscillosco</a>	\$279.00	1	\$279.00	Kobe
3PCS 400 tie-Points breadboard	<a href="#">r=678214a0-1137-4905-9a</a>	\$7.98	1	\$7.98	Kobe
3.5 mm/2.5 mm jack	<a href="#">1699?qs=sGAEpiMZZMsMy</a>	\$0.95	10	\$9.50	Kobe
jumper wires(M-M, M-F,F-F)	<a href="#">d_rd_r=69f380b1-3793-46</a>	\$5.79	3	\$17.37	Kobe
			Total:	\$380.55	

Bill of Materials Sent  
to Mentors

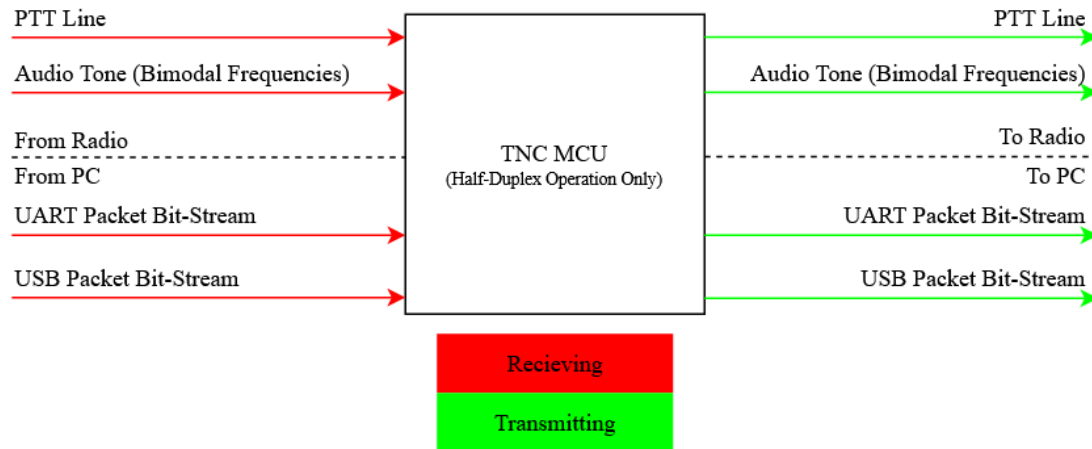
# Failure Mode Effects Analysis

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"	<b>Bit stuffing:</b> -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 -Octet 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	<b>-Inter-Frame Time Fill:</b> 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

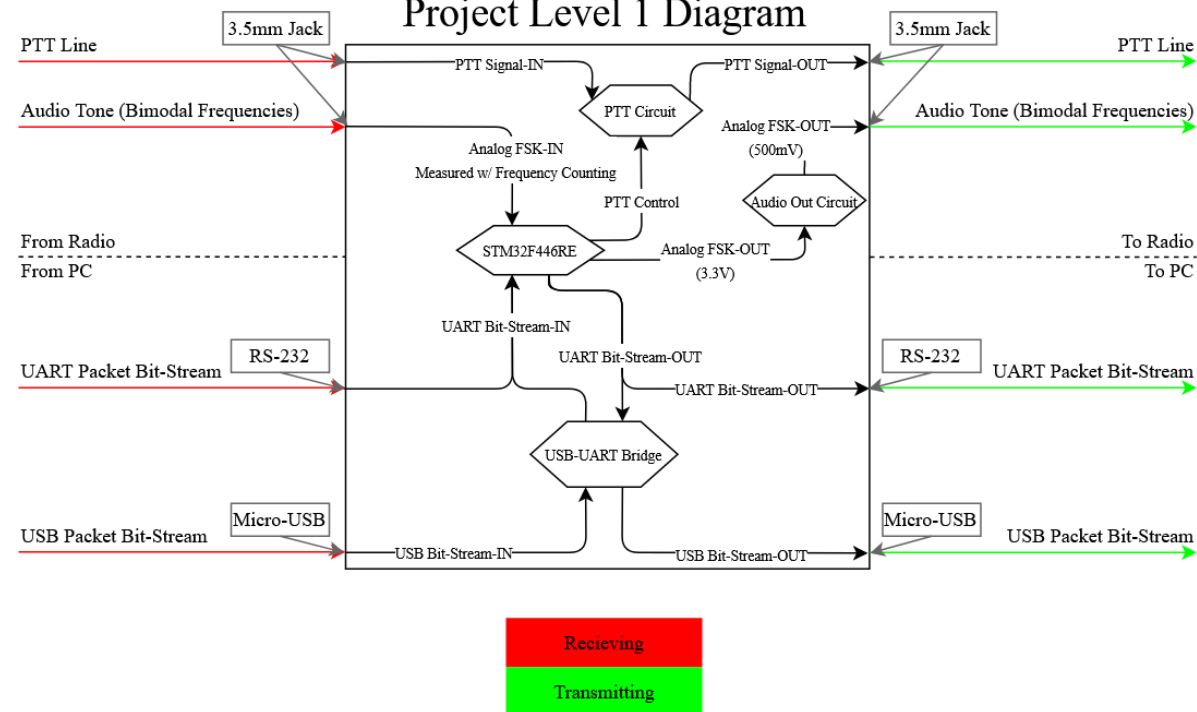
# Level 0/Level 1 Diagrams

## Project Level 0 Diagram



## Level 0 Diagram

## Project Level 1 Diagram



## Level 1 Diagram