Open Headset Interconnect Standard
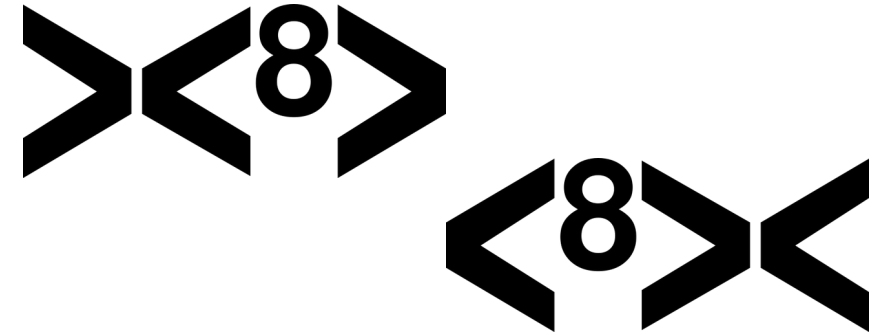
Mark Smith, N6MTS

Who am I?

Mark Smith, N6MTS

- Head Cheese, Halibut Electronics: https://electronics.halibut.com/

- A host of the Ham Radio Workbench Podcast: https://www.hamradioworkbench.com/

- Twitter and YouTube: @SmittyHalibut

- Mastodon/Fediverse: @smitty@halibut.com

Video

Who am I?

- **Ham**: Active ham since 1992.

- **College**: Two years in Electrical Engineering, but degree in Computer Engineering

- **Work**: 25 years in IT, Network and Unix Systems Engineering, and Information Security.

- **All Three**: Left IT in 2021, started Halibut Electronics to make Ham Radio and Audiophile electronics.

- First big product, SOAR: Satellite Optimized Amateur Radio. Available late 2022.
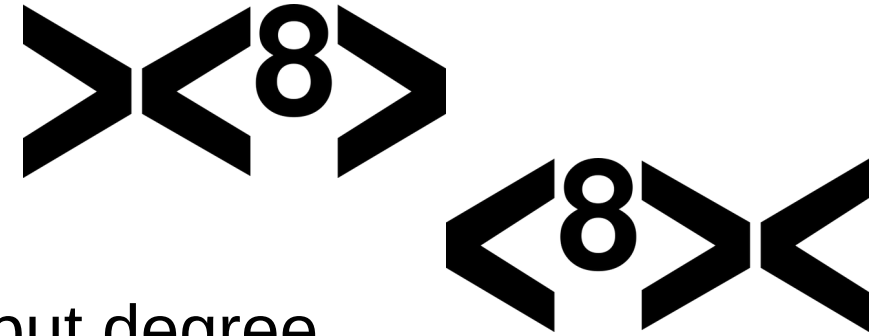
Video

Open Headset Interconnect Standard

- **Open**: Any individual or company may make devices compliant with this standard, with no obligation.

- **Headset**: Describes the signaling commonly found between a user and a radio: Microphone, Headphones, and Push To Talk.

- **Interconnect**: Describes both the physical and electrical connection of those signals between the user and radio.

- **Standard**: Devices built to this standard will work with other devices built to the same standard.
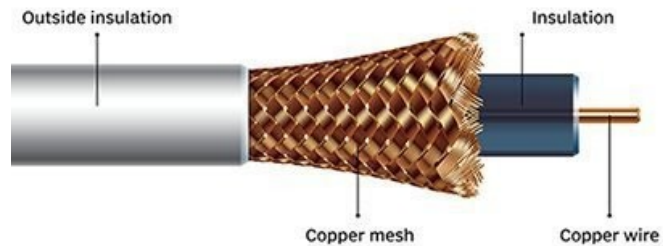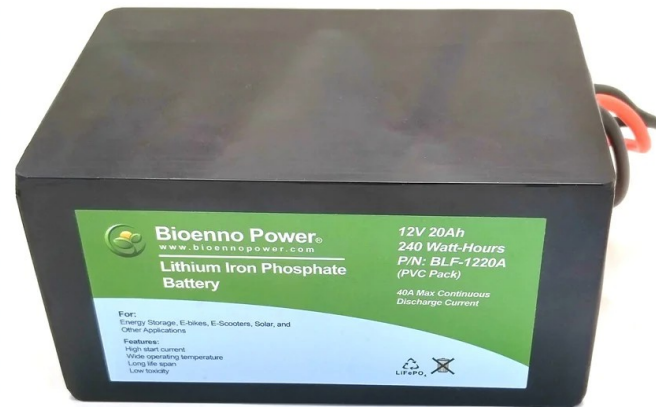
Video

Standards

We have electrical standards (defined, or defacto) for things like RF and Power:

- **RF**: 50 ohm impedance coax, 450 ohm twin lead

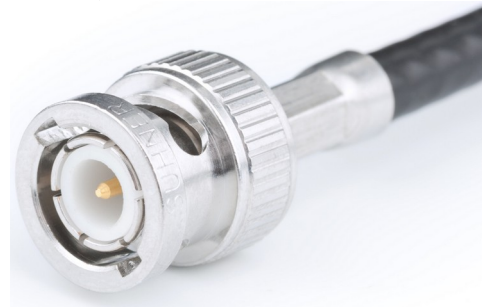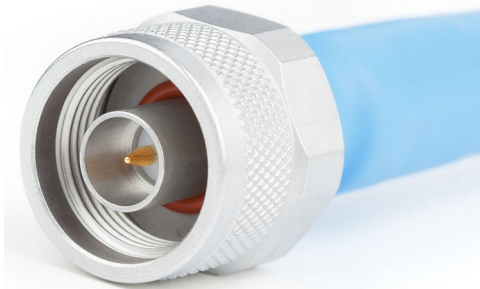- **Power**: +13.8vDC +/- 15%

Video

Standards

And one, or a few, physical standards that are easy to convert between:

- **RF**: PL-259, Type N, BNC, etc

- **Power**: Powerpole, 6-pin "Molex", "T" blades, etc

Video

Standards?

No such electrical standards exist for the User to Radio interface:

- **Microphone**: Dynamic, Electret, or Carbon? Balanced or single ended?

- **Audio out**: Headphone level, speaker level, or line level? Ground referenced or push-pull? Mono or stereo?

- **PTT**: GPIO style contact closure to ground, or completing the mic circuit?

Video

So many to choose from!

There are even more physical options to choose from!

- **Microphone**: 3.5mm TS/TRS? ¼" TS/TRS? XLR? "8-pin round" Aviation? 8 pin modular? 6 pin modular? What pinout?

- **Audio out**: 3.5mm TS/TRS? ¼" TS/TRS?

- **PTT**: On the mic connector? 3.5mm TS? ¼" TS?

Video

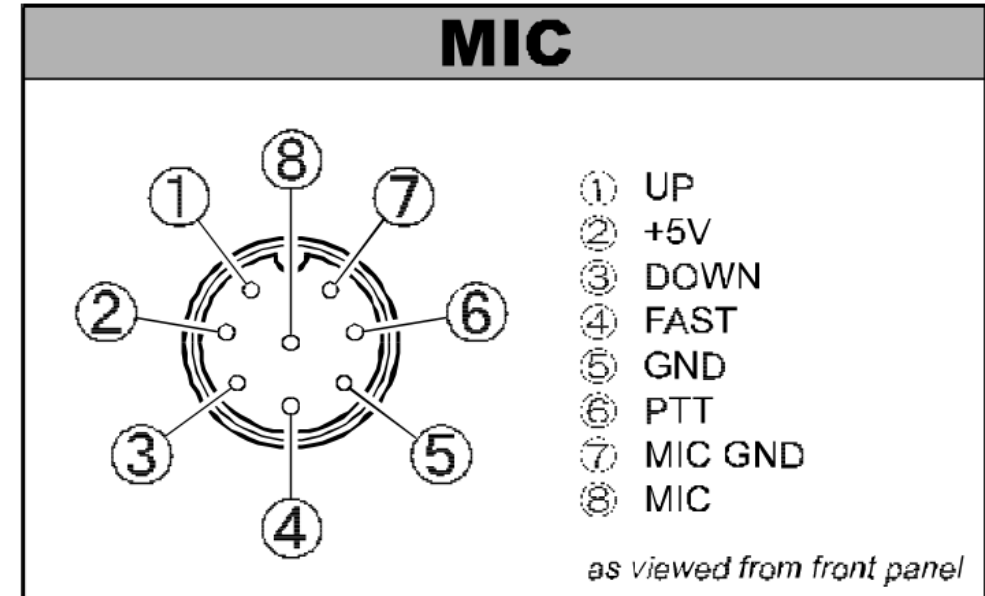# The problem is...

Heil Pro 7 Headset:

Yaesu FT-920 Microphone pinout:

Video

The solution?

Heil AD-1-Y Adapter:
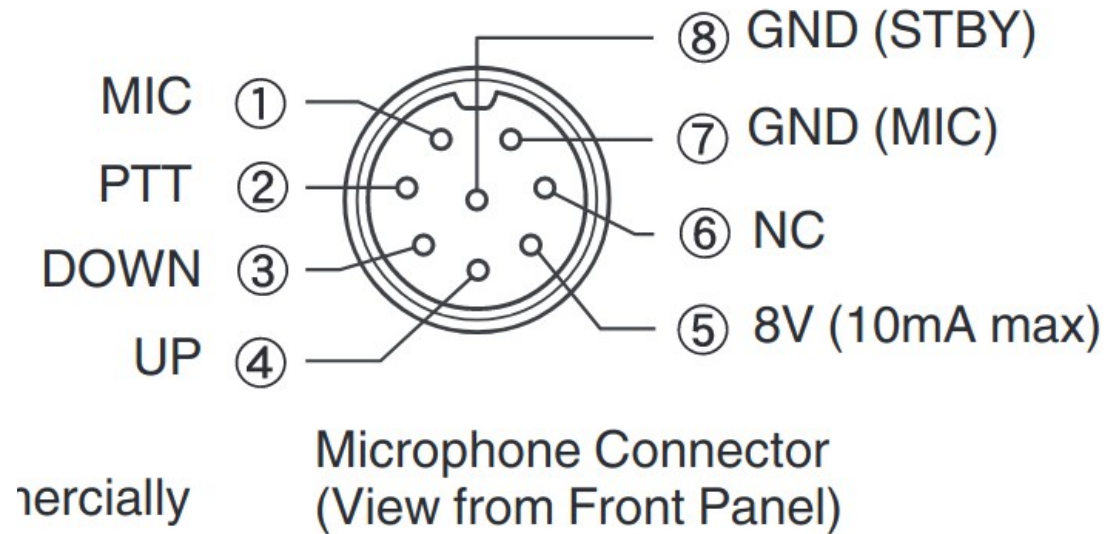
Heil Pro 7 Headset:

rophone pinout:

Mono Plug

able

MIC

① UP
② +5V
③ DOWN
④ FAST
⑤ GND
⑥ PTT
⑦ MIC GND
⑧ MIC

as viewed from front panel
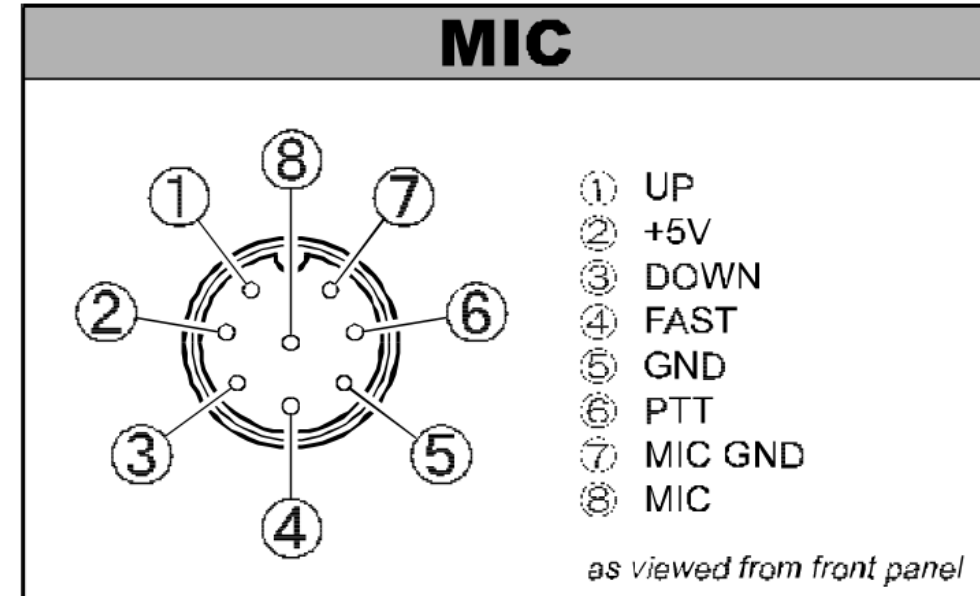
Video

But, I've got a Kenwood too.

Kenwood TS-890S Microphone pinout:

Yaesu FT-920 Microphone pinout:

Video

But, I've got a Kenwood too.

Heil Pro 7 Headset:

Stereo 1/8" to 1/4" Adapter

Mono Plug

1/8" Stereo Plug

Kenwood TS-890S Microphone pinout:

MIC ①
PTT ②
DOWN ③
UP ④

⑧ GND (STBY)
⑦ GND (MIC)
⑥ NC
⑤ 8V (10mA max)

Microphone Connector
(View from Front Panel)
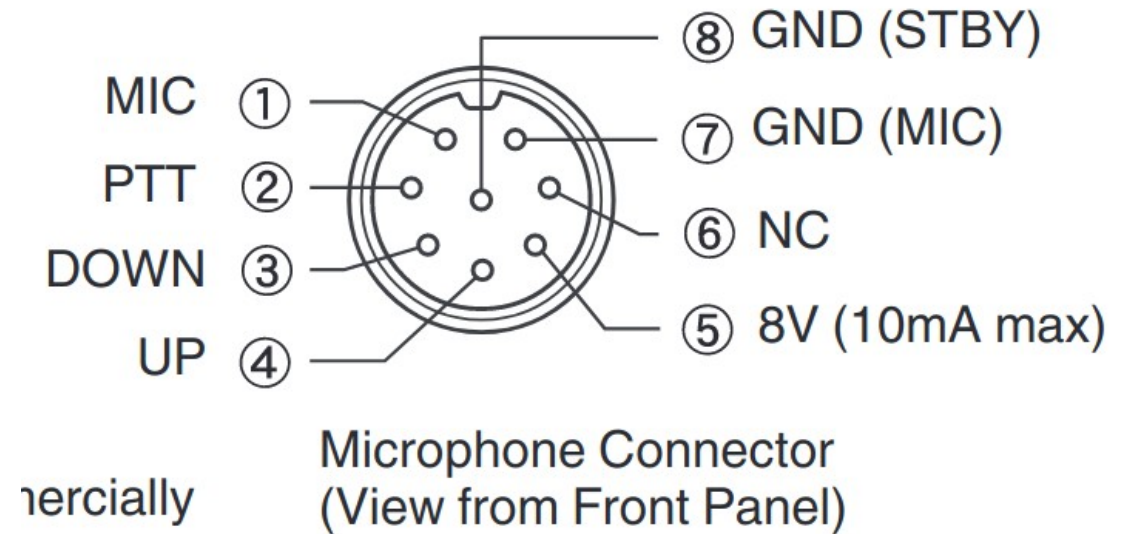
Video

Bob has me covered...

Heil Pro 7 Headset:

Heil AD-1-K Adapter:

Microphone pinout:

⑧ GND (STBY)

⑦ GND (MIC)

⑥ NC

⑤ 8V (10mA max)

Connector
(front Panel)

Mono
Plug

able

Video

What about Icom?

Heil Pro 7 Headset:

Icom IC-7300 Microphone pinout:

Stereo 1/8" to 1/4' Adapter

Mono Plug

1/8" Stereo Plug

able

① Microphone input
② +8 V DC output
③ Microphone key input (up/down)
④ Squelch line output
⑤ PTT
⑥ GND (PTT ground)
⑦ GND (Microphone ground)
⑧ AF output
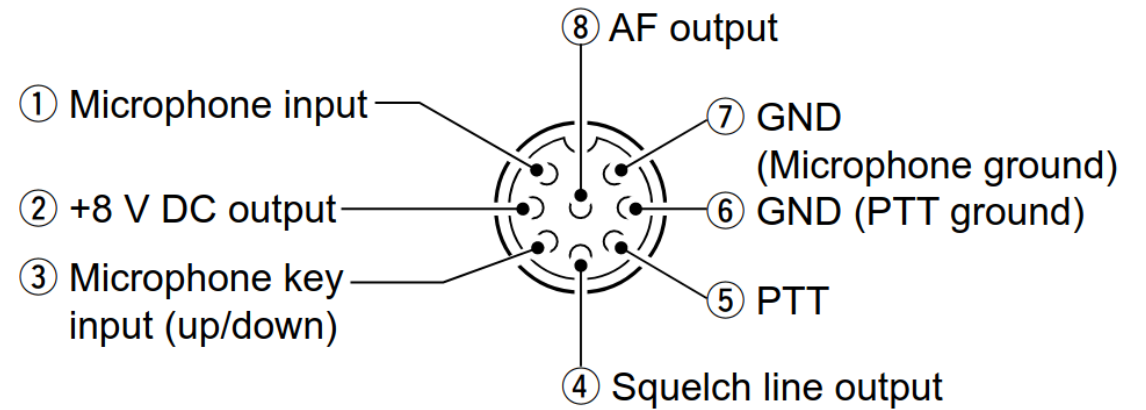
Video

Same connect-- oh… Never mind...

Yaesu FT-920 Microphone pinout:

MIC

① UP
② +5V
③ DOWN
④ FAST
⑤ GND
⑥ PTT
⑦ MIC GND
⑧ MIC

as viewed from front panel

Kenwood TS-890S Microphone pinout:

MIC ①
PTT ②
DOWN ③
UP ④
⑧ GND (STBY)
⑦ GND (MIC)
⑥ NC
⑤ 8V (10mA max)

nercially

Microphone Connector
(View from Front Panel)

Icom IC-7300 Microphone pinout:

⑧ AF output
① Microphone input
② +8 V DC output
③ Microphone key input (up/down)
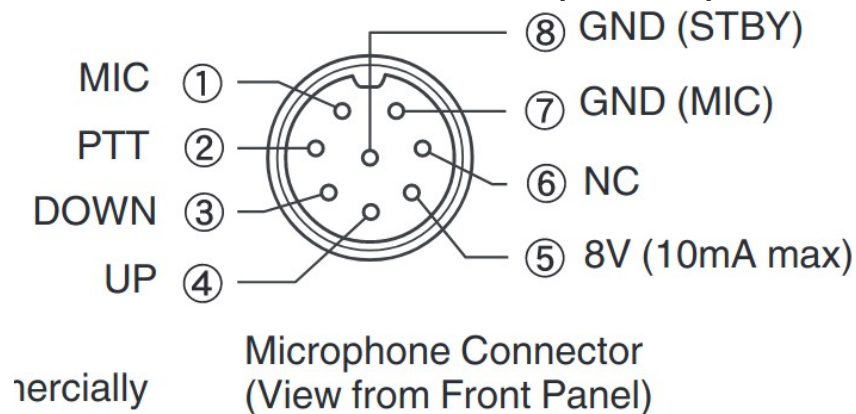⑦ GND (Microphone ground)
⑥ GND (PTT ground)
⑤ PTT
④ Squelch line output

Video

What about Icom?

Heil Pro 7 Headset:

Icom IC-7300 Microphone pinout:

Stereo 1/8" to 1/4 Adapter

Mono Plug

1/8" Stereo Plug

able

① Microphone input

② +8 V DC output

③ Microphone key input (up/down)

⑧ AF output

⑦ GND (Microphone ground)

⑥ GND (PTT ground)

⑤ PTT

④ Squelch line output
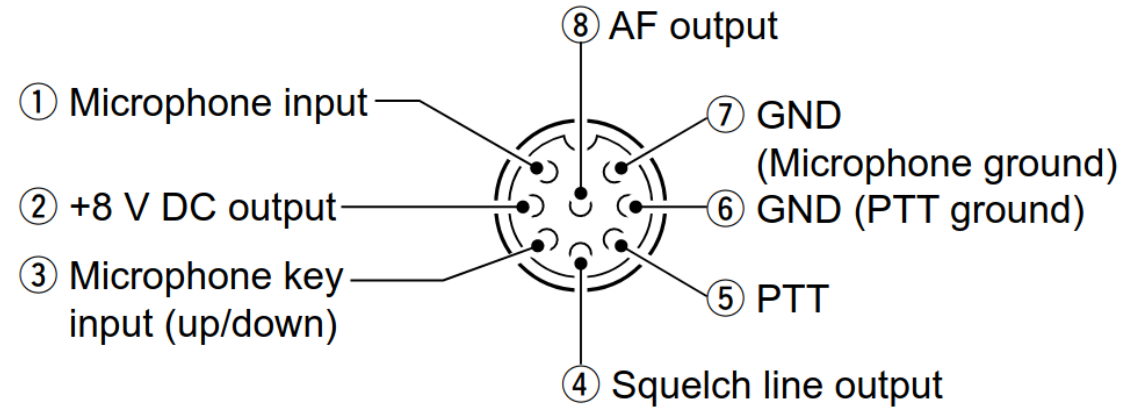
Video

Bob *still* has me covered...

Heil AD-1-iC Adapter:

Heil Pro 7 Headset

Mono Plug

Cable

AD-1-iC

PTT FOOTSWITCH

...one pinout:

AF output

⑦ GND
(Microphone ground)
⑥ GND (PTT ground)

⑤ PTT

Squelch line output

Video

But, wait a minute...

Heil Pro 7 Heads[...]   Heil AD-1-iC Adapter: [...]hone pinout:

AF output

Heil P7-IC-ELEM Microphone Element:

⑦ GND
(Microphone ground)
⑥ GND (PTT ground)

⑤ PTT

Squelch line output

Mono
Plug

[...]able

HEiL SOUND™
Pro 7
Headset Cartridge
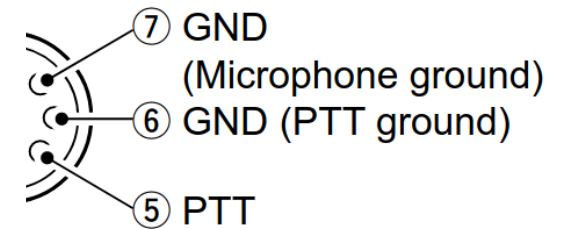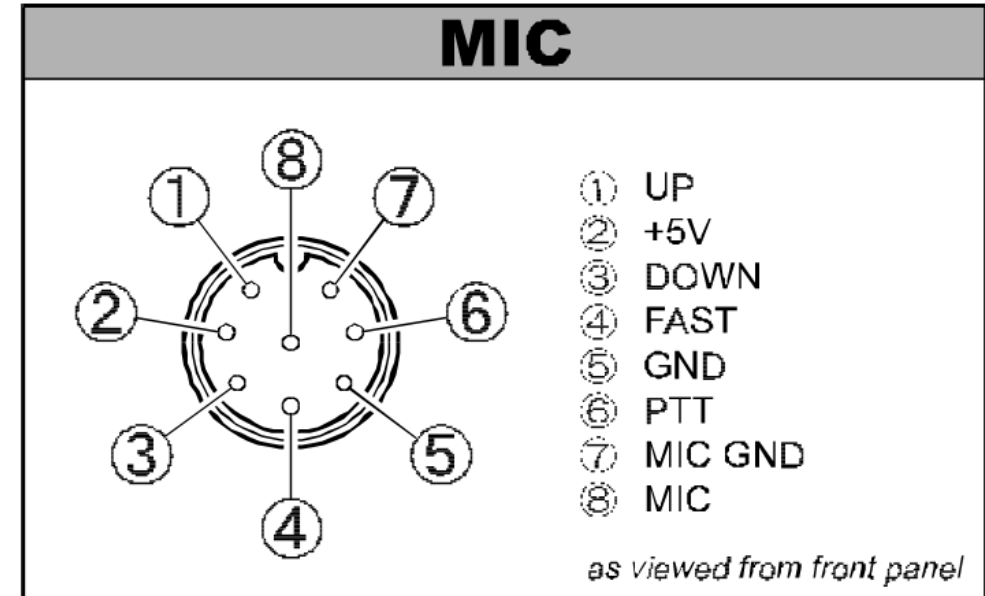
Video

Another headset,

CTIA "PC Gaming Headset"
or "Mobile Phone" pinout:

Yaesu FT-920 Microphone pinout:

L R
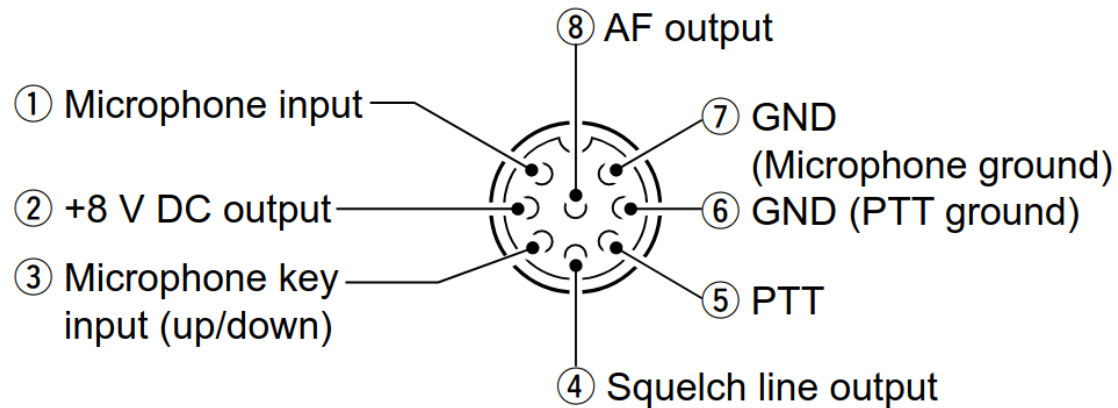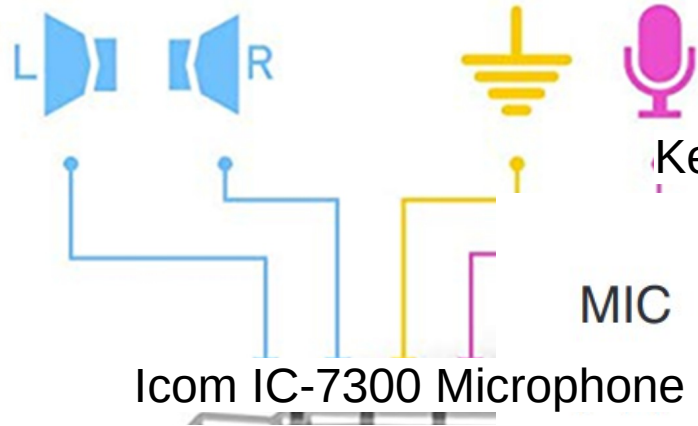
MIC

① UP
② +5V
③ DOWN
④ FAST
⑤ GND
⑥ PTT
⑦ MIC GND
⑧ MIC

as viewed from front panel
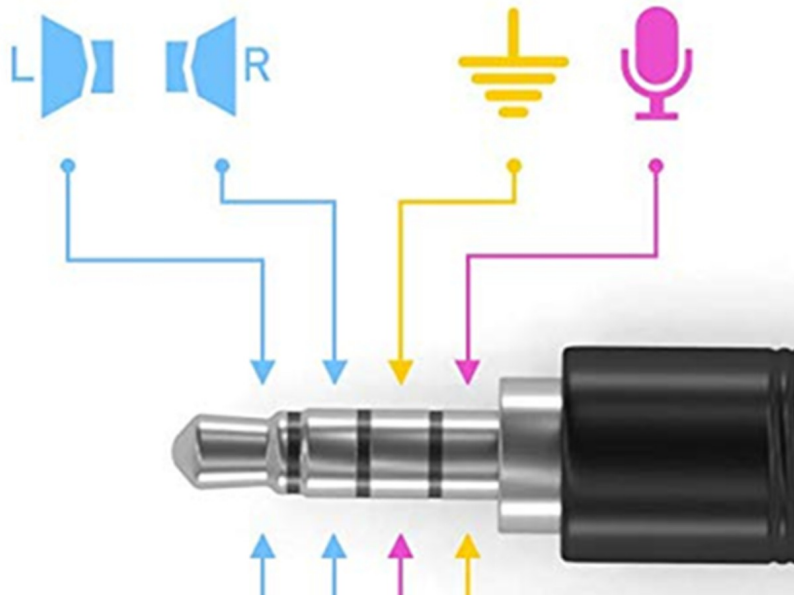
Video

Another headset, 3 more adapters...

CTIA "PC Gaming Headset"
or "Mobile Phone" pinout:

Yaesu FT-920 Microphone pinout:

L ◀| |▶R

MIC

Kenwood TS-890S Microphone pinout:

MIC ①

⑧ GND (STBY)

⑦ GND (MIC)

⑥ NC

⑤ 8V (10mA max)

① UP
② +5V
③ DOWN
④ FAST
⑤ GND
⑥ PTT
⑦ MIC GND
⑧ MIC

as viewed from front panel

Icom IC-7300 Microphone pinout:

⑧ AF output

① Microphone input
② +8 V DC output
③ Microphone key input (up/down)

⑦ GND (Microphone ground)
⑥ GND (PTT ground)
⑤ PTT
④ Squelch line output
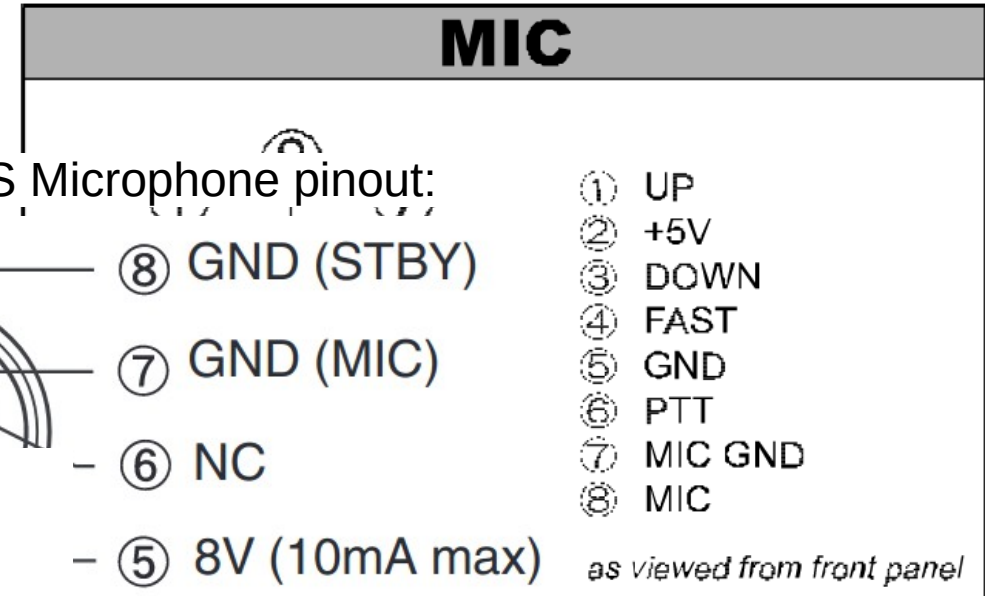
onnector
)nt Panel)
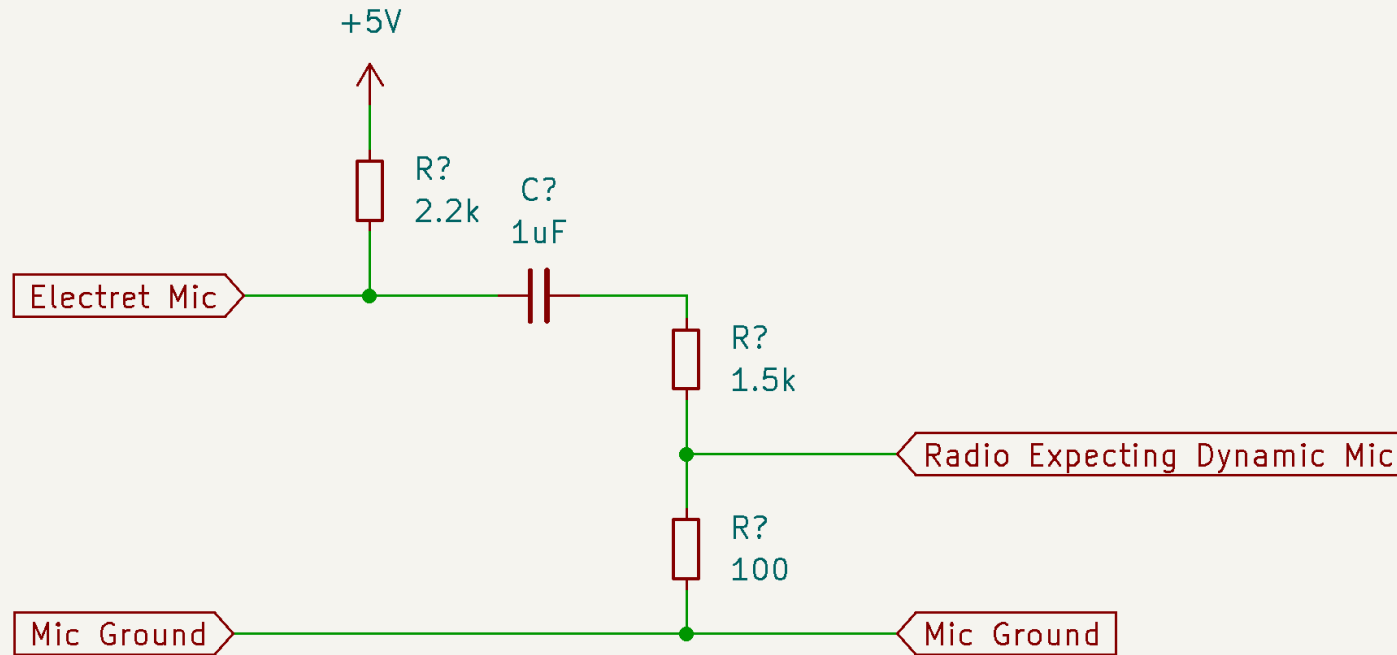
Video

"Your audio is distorted!"

CTIA "PC Gaming Headset"
or "Mobile Phone" pinout:

Yaesu FT-920 Microphone pinout:

+5V

R?
2.2k

C?
1uF

Electret Mic

R?
1.5k

Radio Expecting Dynamic Mic

R?
100
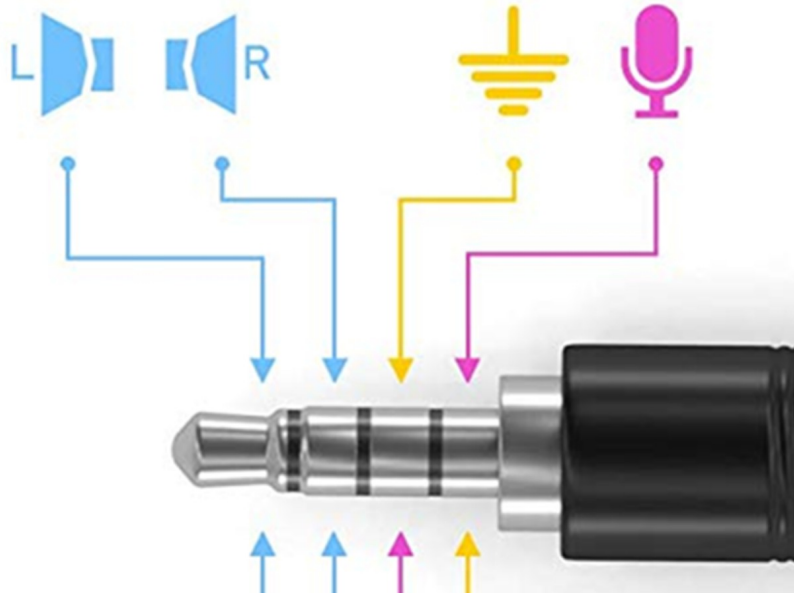
Mic Ground

Mic Ground

UP
+5V
DOWN
FAST
GND
PTT
MIC GND
MIC

viewed from front panel

Video

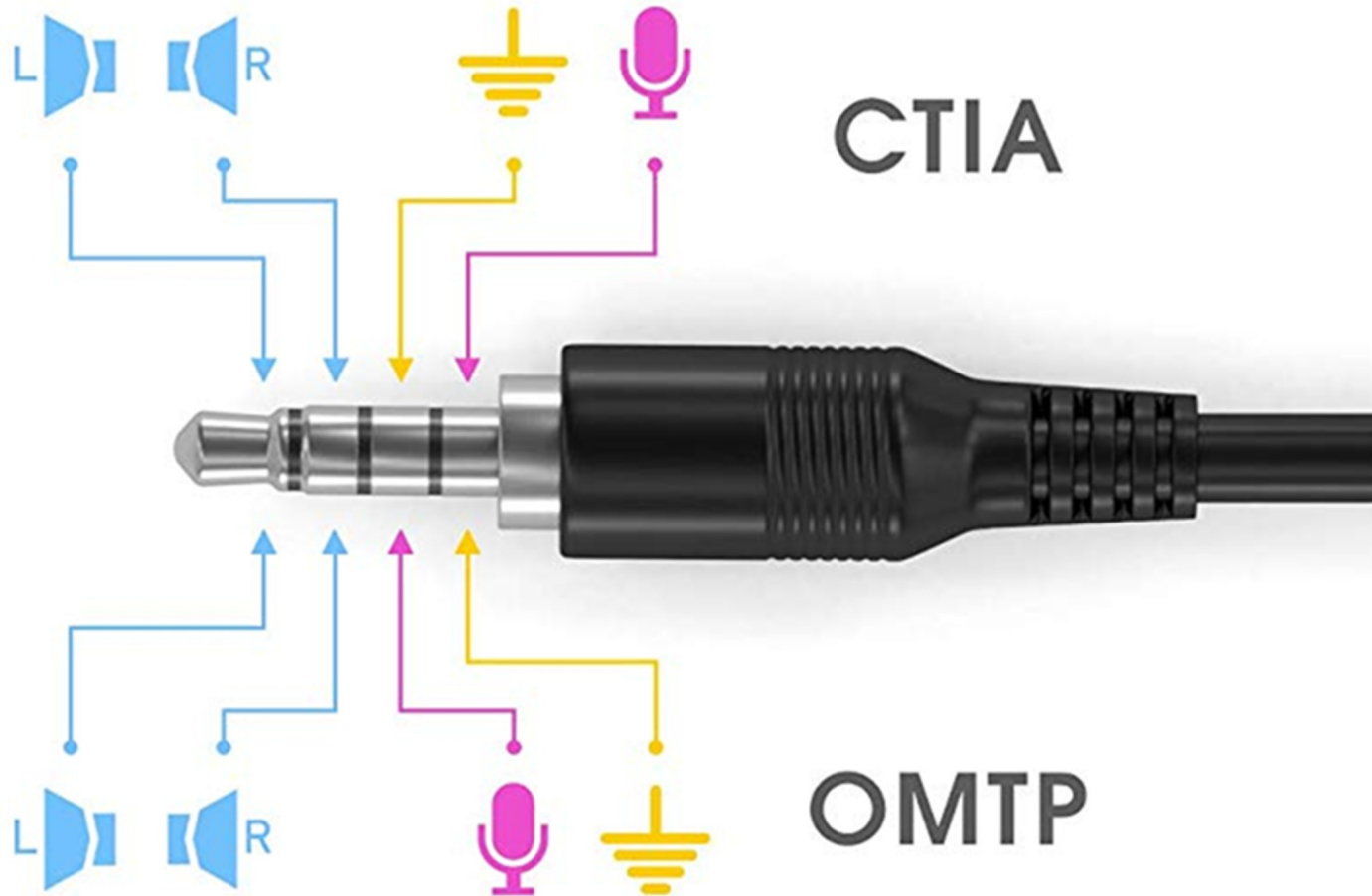# Which 3.5mm TRRS was that?

CTIA "PC Gaming Headset"
or "Mobile Phone" pinout:

Video

Which 3.5mm TRRS was that?

CTIA "PC Gaming Headset"
or "Mobile Phone" pinout:

Video

Your Adapter Game is strong.

This is quickly getting out of hand.

It's a full mesh of adapters, from every different headset to every different radio.
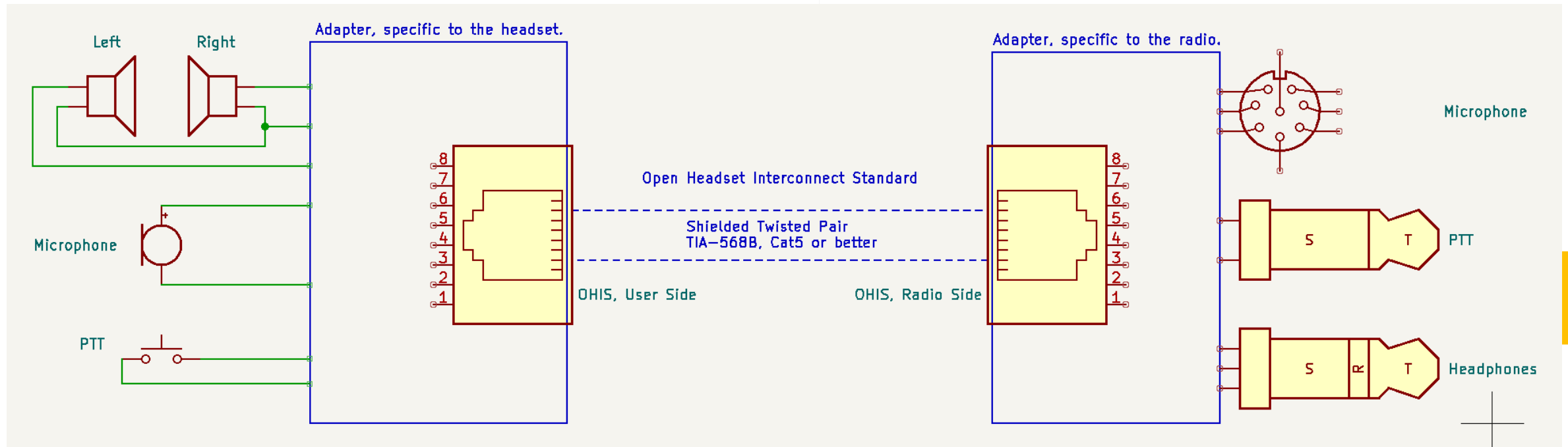
How do we address this?

Video

Open Headset Interconnect Standard

- **User** side adapter: Specific to the headset, stays with the headset.

- **Radio** side adapter: Specific to the radio, stays with the radio.

- Open Headset Interconnect Standard is the connection between them.

Video

Technical Summary

Physical:

- **Connector**: 8P8C Modular. (Commonly, but incorrectly, known as RJ-45.)

- **Cable**: Cat5 or better. Shielded is preferred but not required.

- **Wiring**: TIA-568A or 568B. Which pins pairs are on is important.

Allows the use of common off-the-shelf Ethernet cables.
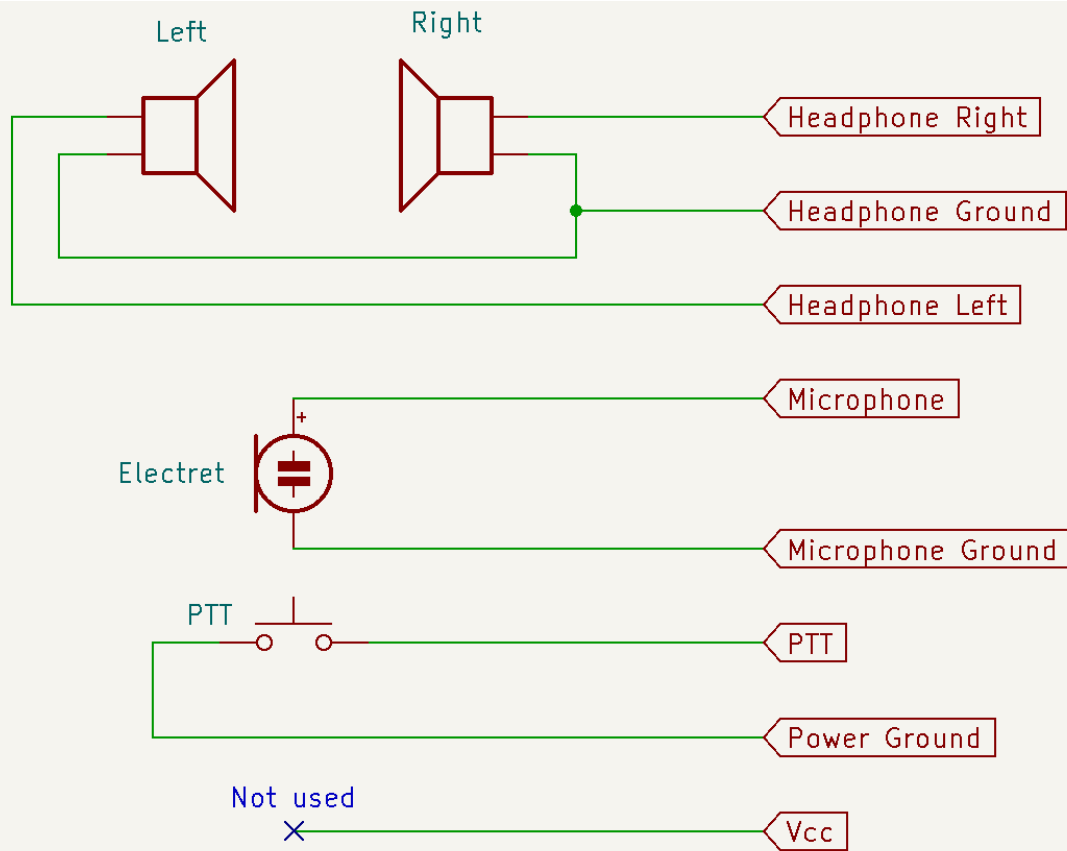
Video

Technical Summary

Electrical:

- **Microphone**: Electret level. +5vDC bias provided by Radio.

- **Audio Out**: Ground referenced, "Headphone" level, stereo.

- **PTT**: Simple contact closure to ground.

- **Power**: +5vDC 200mA provided by Radio for audio amplifiers, LED indicators, signal processing, etc.

Video

Technical Summary

Pin-out:

Left

Right

Headphone Right

Headphone Ground

Headphone Left

Microphone

Electret

Microphone Ground

PTT

PTT

Power Ground

Not used

Vcc

Simplest OHIS User Adapter:
Electret Mic Element

OHIS User Interface

Headphone Right	8
Power Ground	7
Microphone	6
Headphone Ground	5
Headphone Left	4
Microphone Ground	3
PTT	2
Vcc	1

Video

Technical Summary

Pin-out:

Left   Right

Headphone Right

Headphone Ground

Headphone Left

Pre Amp

Microphone

Dynamic   +

Microphone Ground

PTT

PTT

Power Ground

Not used

Vcc
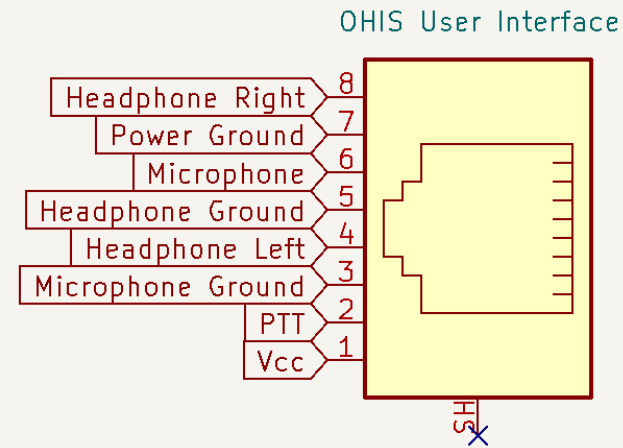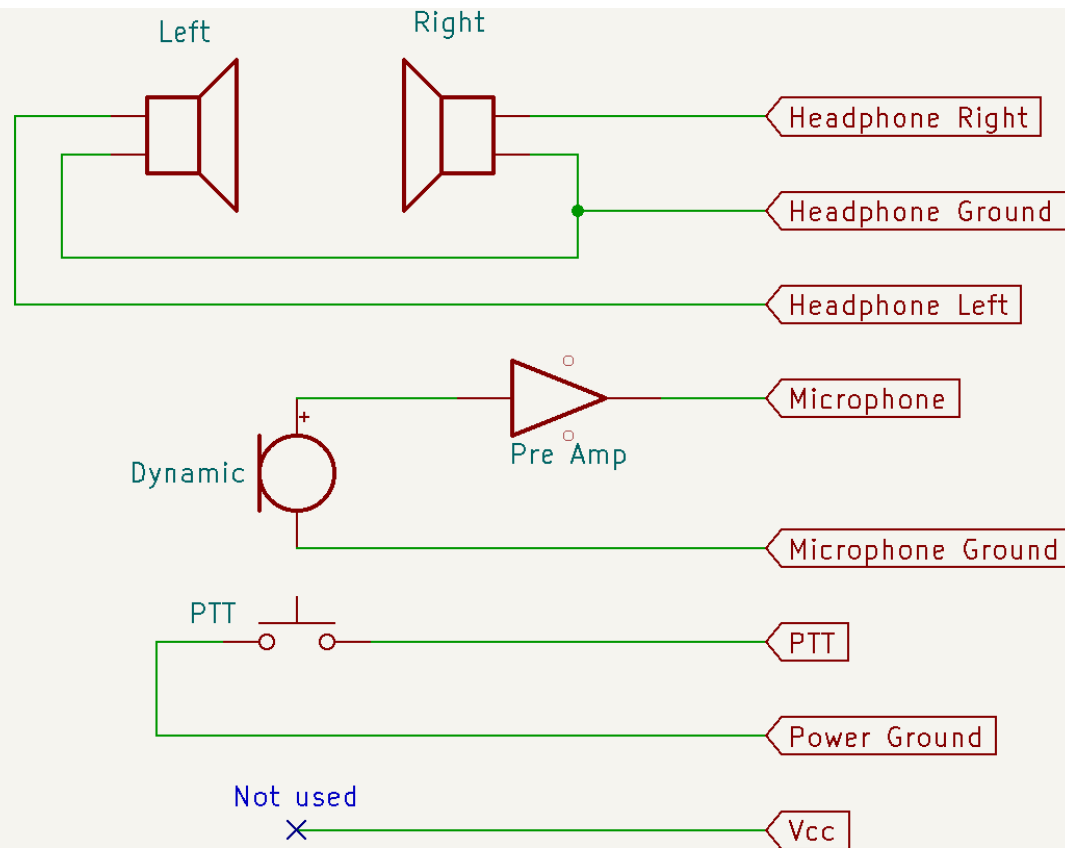
OHIS User Adapter:
Dynamic Mic Element

OHIS User Interface

8 Headphone Right
7 Power Ground
6 Microphone
5 Headphone Ground
4 Headphone Left
3 Microphone Ground
2 PTT
1 Vcc

SH
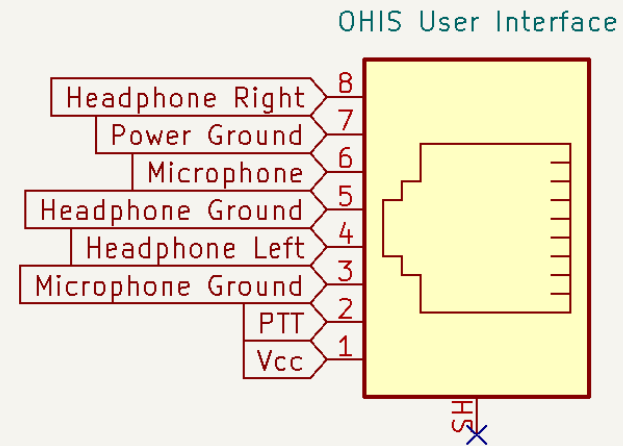
Video

Dynamic Mic Preamp

75k||27k = ~20k
1uF*20k = 8.0Hz

OHIS User

OHIS Radio

+5V

2.2k

Microphone

Dynamic Microphone

C1
1uF

R1
75k

Q1
S9013

R2
27k

R3
470

Mic Ground

deo
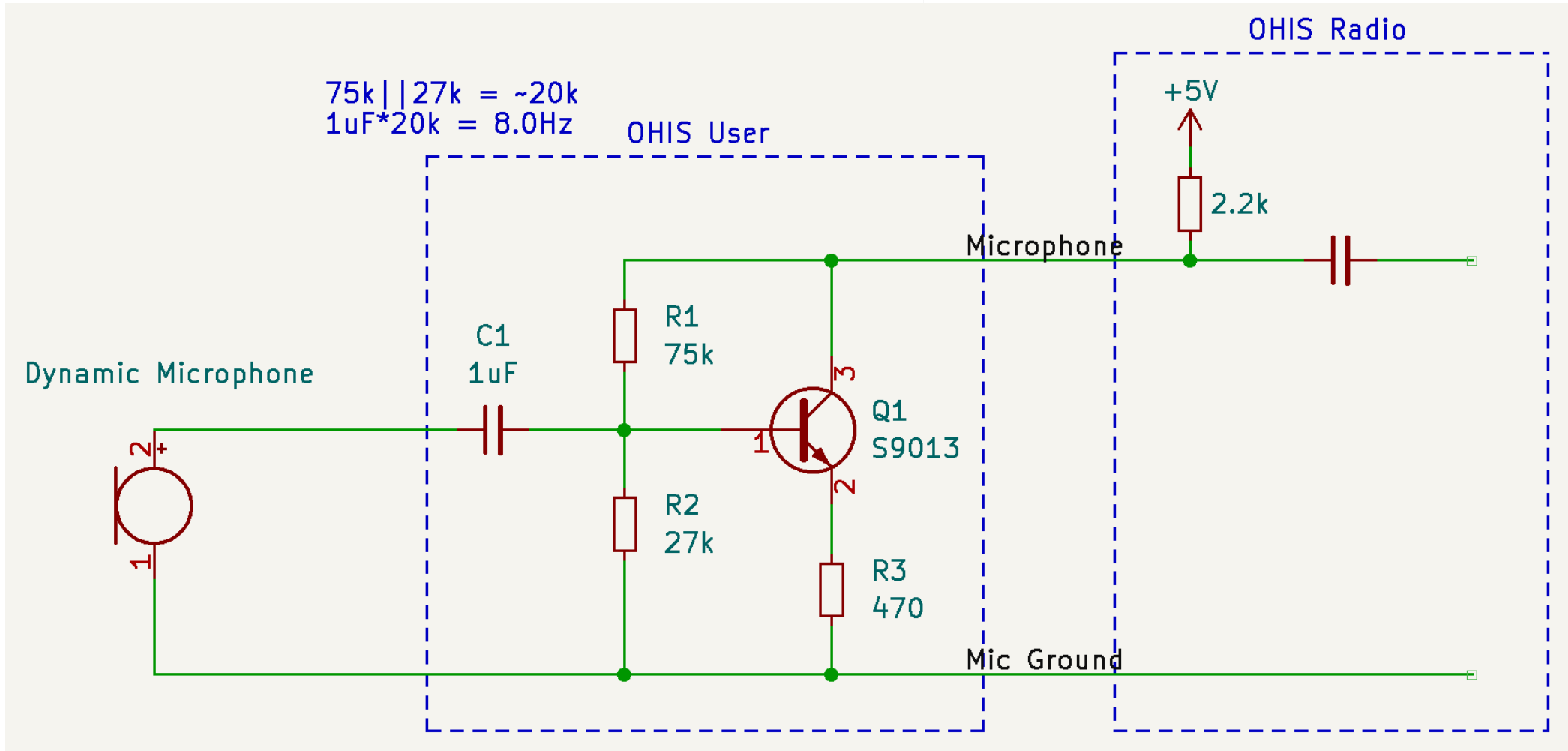
Technical Details...

See the Groups.io email list and GitHub repository at the end of this presentation.

Video

When is OHIS useful?

- When you have several different radios and headsets.

- When you operate in a shared environment and different users have their own headsets.

  - Examples: Field Day, club shack, or an Emergency Operations Center

- When you want to design and sell a device that goes between the User and the Radio, and have it work everywhere without overly complex input and output interfacing.

ahem ><8>

Video

When is OHIS over-kill?

- When you only have one radio, or one headset, or any situation where the "full mesh" problem doesn't apply.

- When you already have all the adapters you need.

- When you prefer the simplicity of a single adapter between you and your radio.

Video

Why an Open Standard?

- Halibut Electronics needed to solve this problem for future products.

- I am not Gillette.

- This is a good DIY project, and I love DIY projects.

    - Obviously, Halibut Electronics will sell adapters for people who don't want to have to solve it themselves. But I hope other companies will adopt the standard and sell adapters too.

Video

Learn more

Groups.io mailing list:

https://halibut-electronics.groups.io/open-headset-interconnect-standard/

GitHub repository:

https://github.com/Halibut-Electronics/Open-Headset-Interconnect-Standard

Video

Questions and Answers

Beginning now

Slide Title

Slide Content

Video