The Nitty-Gritty of Getting Digital Wired Up At Your Ham Shack

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I talk with lots of hams who are somewhat hesitant to try digital ham radio modes, because they are unsure how to actually get it all connected   That isn't an unreasonable concern!   But it ***can be done,*** and this article will help you get started.   Once you have digital connected up at your station, you'll be able to do a very very large number of digital modes, as well as HF WINLINK and even packet VHF/UHF as well as packet WINLINK.   All available via free software.

The basic problem is simple: get 3 signals from your transceiver connected to your Signalink (or equivalent interconnection device):   **microphone**, **speaker (audio)** and "**push to talk**".   It's similar to what was required in past days to wire up a phone-patch box.   All "digital" modes basically send audio tones or warbles into the mic, and decode the tones that come out of the speaker of a normal voice ham radio transceiver!   The **microphone** signal is a few millivolts and goes INTO your radio. The **speaker (audio)** signal is usually a few hundred millivolts and comes FROM your radio.   For most modern radios, the **PushToTalk** wire presents a small positive voltage (a few volts, perhaps 3 or 5) and if you short it to ground (with a mechanical switch or a transistor) only a very small current (a few milliamperes) will flow, but the radio will dutifully switch into TRANSMIT mode.

Interference: Of course, the **microphone** wire can easily pick up 60 cycle hum as well as radio frequency interference (RFI) so if possible, use shielded wire or twisted pair (with the second wire being grounded) for that one.   Often the **Push To Talk** wire goes to a semiconductor inside the modern radio....and hence can RECTIFY any radio frequency picked up....causing undesired activation (lockup) of the transmitter!

PURCHASING PREMADE AUDIO CONNECTION CABLE

If you can purchase a pre-made audio cable for your rig, it will come with all the connectors, and also a list of how to set the internal jumpers. These are typically about $20.   Problem solved!   You don't really need any "modules" or anything else --- just the little 24 gauge jumpers that Tigertronics provided. (See the section below) Insert them as directed by the instructions that come with your pre-made audio cables and **you're good to go**.   DONE!!

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MAKING YOUR OWN AUDIO CABLE

ADVANCE PLANNING

Find the pinout for your rig's mic and audio output connectors. Look in your owners' manual or Google it online. No matter whether you are doing this for HF, VHF, SSB, FM – you need to know the same things. Which pin is mic input? Which pin is ground? Which pin is PTT (PushToTalk). Some mic connectors have speaker-audio available on them – some rigs have an accessory jack with audio out (that may be independent of your volume setting, a nice feature). Write down your settings:

My Rig's Mic Connector:

Signal	Pin	
Microphone	_____	
Push-to-talk	_____	
Mic Ground	_____	
Push to talk ground	_____	(if there is one)
speaker audio	_____	(may be present elsewhere on your rig, e.g. a 3.5mm jack

Order the appropriate connector(s) for your transceiver.

Take a d.c. voltmeter and measure the voltage (open circuit) of your push-to-talk pin versus ground (red lead on the push-to-talk pin, black lead on grounded metal of your rig). It should be POSITIVE and only a few volts. The Signalink uses a RELAY output, so it doesn't care what the polarity is, but if you are using some alternate system to connect the audio from your computer into your rig, it may have a transistor output and the polarity may be important to you. Read instructions as applicable.

Start with an Ethernet Cable

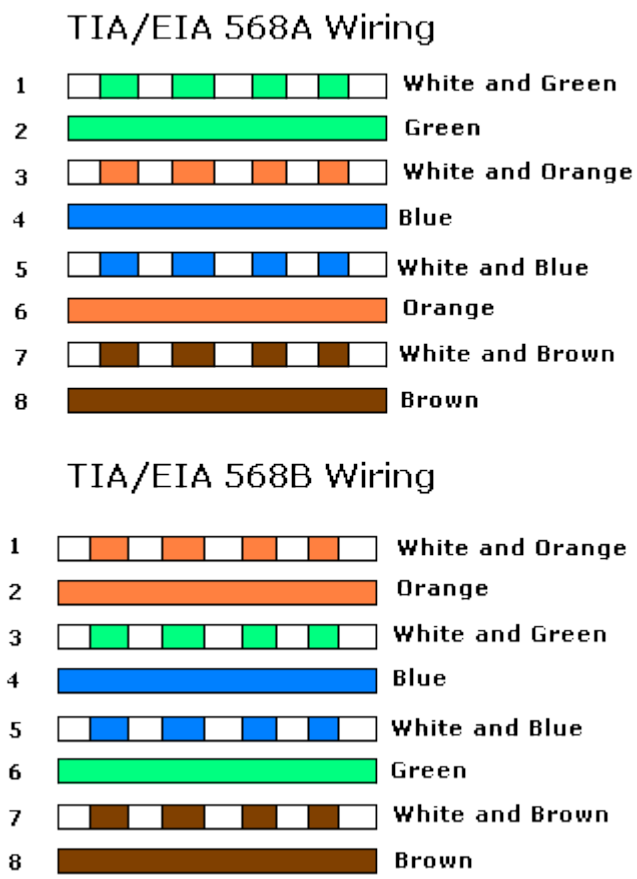
The easiest way to make your own audio cable is to start with a short pre-made ethernet cable (e.g., Home Depot, Walmart, or online)--they're usually $3-$5. If you can find one with shielding, that's even better, but if you have to, you can even add braid or foil on the outside of the premade cable when you're done, to make it shielded (connect to ground). Using the pre-made Ethernet cable takes care of making the RJ45 plug to go into the back of the Signalink.

Which Wiring Standard Does Your Ethernet Cable Have?

Complicating this even a bit farther --- not all 8-wire RJ45 (typical Ethernet) male plugs are wired the same way. The wires of a Cat5 or Cat 6 twisted pair cable are pretty standard: orange, orange white; blue, blue white; green; green-white; brown, brown-white. But which PINS they go to differs between “A” and “B” versions of wiring protocols. If possible, purchase a pre-made Ethernet cable that is wired like the “B” standard, with the orange-white wire at #1 (at one end of the plug). On an “A” plug, the Orange-White wire will be the third wire in from the edge and you'll need to adjust the color code throughout this article. I have never yet seen an “A” wired Ethernet cable.

“B” Type RJ-45 WIRING COLOR CODE

PIN	WIRE COLOR
1	Orange White
2	Orange
3	Green White
4	Blue
5	Blue White
6	Green
7	Brown White
8	Brown



REF: http://pinouts.ru/NetworkCables/Ethernet10BaseTStraightThru_pinout.shtml
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To take advantage of the noise-reduction provided by the twisted pairs, I recommend using the following colors and settings:

COLOR	**SIGNAL**
ORANGE	Ground – if there are both "mic" and "PTT" grounds, connect both of them to this wire
ORANGE-WHITE	mic
GREEN WHITE	PTT
BLUE	Optionally connect to ground for better shielding
BLUE WHITE	Speaker Audio

(Note the brown and brown white wires aren't used.)

Connecting to your rig

Using the correct mic/speaker connectors as required for your transceiver, solder or connect those wires appropriately to your mic/speaker connectors. If your transceiver uses an RJ45 for its microphone, you're in luck and will probably only need the cut the premade Ethernet cable in half and make the appropriate wiring connections to get the right signals to the right places. Beware that not all manufacturers number their RJ-45's the same-- see the image on this web page for details: http://www.tigertronics.com/sl_wirebm.htm

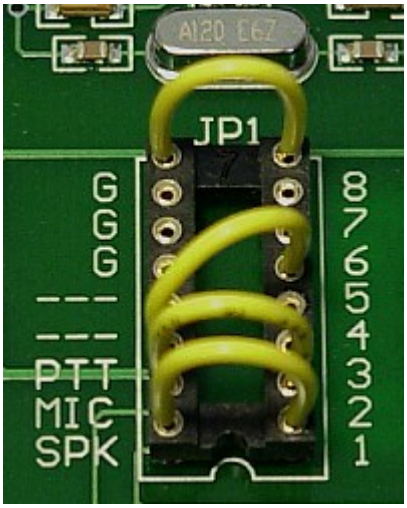
Your audio cable is now done! The only remaining issue is to make the proper internal jumper settings inside your Signalink to match your cable.

SIGNALINK INTERNAL JUMPERS

Possibly in order to accommodate a variety of different pre-made audio cables, Tigertronics put a connection block ***inside the Signalink*** that allows you to choose which pins of the female RJ45 jack on the back, have which signals. This introduces a nice flexibility (but more chances for error).

The connection block itself isn't complicated. On one side, the signals are plainly marked beside the female pin sockets (that perfectly accept the 24 gauge jumper wires Tigertronics provides): ***mic, speaker audio, push-to-talk***, and SEVERAL ***ground*** connections.

On the other side are the numbered pins corresponding to the numbered pins of the female RJ-45 socket, as in the photo below:



(This photo doesn't show the wiring you'll need)

All you have to do is use the provided 24 gauge jumpers to make the following connections, which match the cable you built:

SIGNAL (left side of connection block)	**PIN (right side of connection block)**
microphone	1
ground	2
push to talk	3
ground	4
speaker audio	5

NOTE: This connection scheme also happens to work for the premade cables for several popular radios, including the Baofeng UV5RA (and similar) and all those radios that connect via a 6-pin mini-DIN connector.

That's all there is! Now load up your FLDIGI or WINLINK or other digital communications software, adjust your transmit and receive signal levels as needed, set the delay as needed (none for WINLINK!) and have fun!