

WIRES & CONNECTIONS

TechNite Talk, Alachua County ARES®
August 6, 2026

(Meeting Info)

- Brett NH2KW will be chairing meeting next week – Aug 12
- No one yet knows if the move-in date of AUG 11 is going to hold!
- Brett & others are working to find more information.
- Possibly we won't know exact details until Monday.
- Thank you for your patience with Alachua County!

Electrical Connections Abound!

- Microphone: 3-8 or more wires
- Antenna – at least two wires
- Power – at least two wires
- USB – four wires
- Headphone – 2 or 3 wires
- Key – two or 3 wires
- Possibly keyboard connector
- Possibly video connector (external monitor)
- Ethernet connector (8 wires)

Other devices add **even more connectors**

- Batteries
- Power supplies
- Antenna Tuners
- SWR meters
- Signalink / Digirig
- Laptop (power, mouse, USB, audio, ethernet etc etc)

Connections: Huge Failure Point

- Properly designed radios rarely lose semiconductors
- CONNECTORS present multiple points of failure
- Every connector has both
 - Wire interface (**potential point of failure**)
 - Pin/Jack interface (*less likely point of failure*)

Problems in connectors

- Tricky wire stripping (e.g. teflon insulation)
- Very tricky soldering in tight spaces
- Special purpose crimpers required for powerpole / coax connectors / RJ modular crimpers
- Difficulty understanding numbering of all types!!
- Wrong gauge of wire – crimp may come loose

1. WIRE CONNECTIONS:

Wire Types

- SOLID – typically house wire
- STRANDED
 - Un-tinned: will corrode in weather conditions
 - Tinned: ***all marine wires are tinned***
- FLEX WEAVE – tiny untinned wires, doesn't kink



**547-Antenna Wire, 12
AWG All Copper
Stranded PE Jacket
Flexweave**

Ampacity Chart

Size	60°C	75°C	90°C	<u>COMMENT</u>
18AWG			14	Heathkit used huge amounts #18
16AWG			18	I use marine #16 up to 15Amps
14AWG		20	25	NEC requires 15A breaker
12AWG		25	30	NEC allows 20A breaker
10AWG	30	35	40	
8 AWG	40	50	55	

TWO LIMITS: (1) Voltage Losses; (2) Insulation melt or ignition!

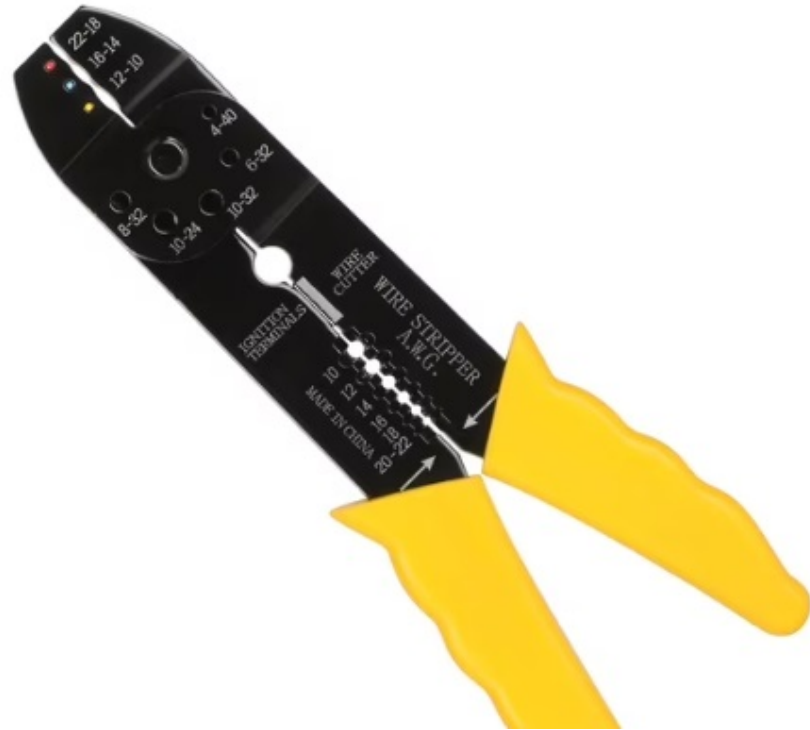
Insulation Types

- **THHN** (housewire) Thermoplastic High Heat-resistant Nylon coated. **PVC insulation layer**, protective nylon jacket. Rated to 600V. Rated up to 90°C
- **Teflon** (PTFE) synthetic fluoropolymer. Operates continuously from -190°C to 260°C melting point 620°F 327°C **NEEDS SHARP STRIPPER OR FRAYS**
- **Silicone** insulation operates up to 230°C
- Note: 60/40 solder melts around 190°C – teflon still solid!

Wire stripping

- Stranded vs solid (slightly different size)
- Crude Solution: diagonal cutters (may use to nip insulation around)
- Cheap crimpers that come in assortment packs (not very sharp)
- High quality wire strippers (SHARP round cuts!) **STRONGLY RECOMMEND YOU PURCHASE!!**

Wire Strippers

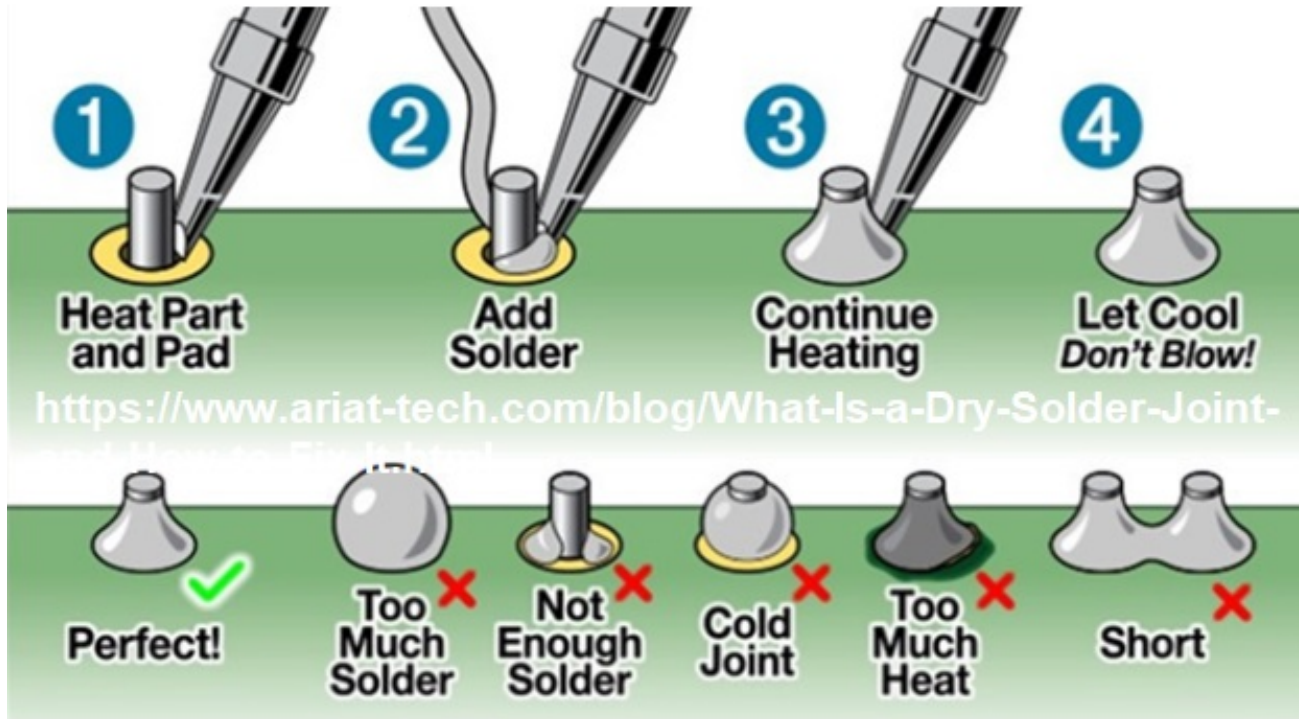


Wire-to-Wire Connections

- 1) Twist & Solder
- 2) Wire Nut (electrician's favorite)
- 3) Crimp Butt Connector
- 4) Screw Terminals
- 5) WAGO connectors



Solder Joint



Use GRAVITY to your advantage when needed. Molten solder flows DOWNWARD and this can allow you to control flow.

Use sufficiently HOT iron so you can move FAST. Avoid overheating semiconductor junctions. "Heat sink" with pliers

I prefer 60/40 solder for lower melting point. Just don't inhale it.

Vehicle DC power cables

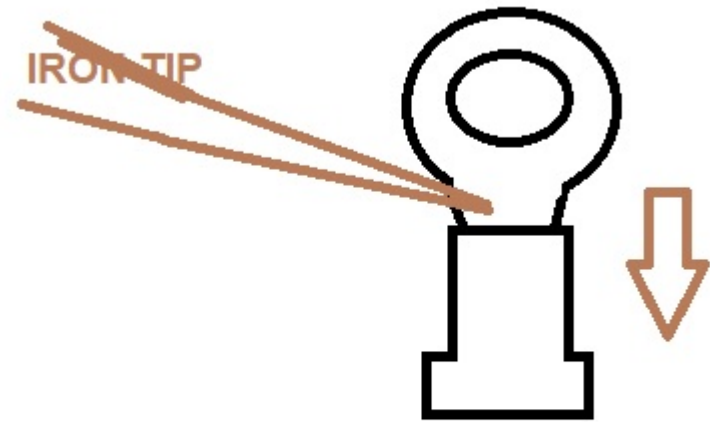
- They ALWAYS put a fuse in BOTH (+) and (-) lines
- Protects against **unexpected current flows**.
- Remember, the fuse protects against the WIRE CATCHING FIRE
- **Unpleasant** to have a wire catch fire in a car...
- Cig. Lighter only for <10A. Strongly recommended to go direct to battery. (I added a powerpole to the truck battery.)
- ***Marine regulations require fuse within 18" of the power origination to protect against wire fire.***

Solder vs. Crimp?

- Vehicular wiring favors crimp: does not have “solder wicking” that can cause a stress point for vibration at end of the wicking. Proper crimping makes metal-to-metal direct contact, excluding oxygen.
- In my experience:
 - Mechanical connection first (twist, etc)
 - Judicious soldering then, more reliable than most of MY crimps
 - “Your Mileage May Vary”
 - I like DIELECTRIC GREASE if there is any weather issue.

Soldering crimp terminals

- If your wire is too small and the crimp is not optimal, adding a tiny bit of solder can help.
- If your wire is too small, consider doubling/ tripling until it is the right size.
- Crimps don't work well to solid wire in my experience!



Hold so solder goes **DOWN** and not onto the ring terminal.

Heatshrink tubing

- Doesn't get loose and sticky like some electrical tapes
- Limited "shrink" so sizes must be chosen carefully.
- Buying assortment is helpful
- **Usually requires a Heat Gun** – hair drier not enough. In a pinch, a match or flame can be CAREFULLY used.



2. CONNECTORS

- MOST of our ham radio experience with wiring deals with CONNECTORS – not so much wire-to-wire connections.
- But every connector has multiple wire-to-metal contacts.
- Similar issues to previous discussions.

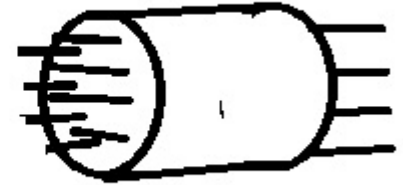
Wire-to-Connector

Common connector types

- Screw terminals / crimp spade/ring terminals
- Bullet crimp connectors
- PowerPole connectors (one contact each)
- PL-259 connectors (two contacts)
- RJ-45 and other modular connectors (4, 6, 8 contacts)
- Special MOLEX connectors (power, antenna tuner)
- 1/4" mono- and stereo "phone" connectors (6+ mm)
- 3.5 and 2.5 mm mono and stereo audio connectors
- DIN and mini-DIN connectors (multiple contacts)

Soldering Wires To Connectors

- Can be tricky on multi-pin connectors
- Very close together!
- Strip exactly the right amount
- Wire may fit inside recess in pin; if not, you'll be forced to "side-side" solder...
- **Plastic connector construction may melt if you aren't quick enough (ouch!)**
- Pin-Pin short if you don't provide heatshink or other insulation.
- Use hot-enough iron, third-hand holder, sleeving or heatshink



This difficulty is what makes pre-made cables so much more expensive! If you can learn to do or repair yourself, save \$\$\$.

Always try to STRAIN RELIEF the wire and don't PULL by the wires!

Dealing with PowerPole connectors

- You CAN solder them if no crimper available
- NO SOLDER on the contact portion!!!
- Only a powerpole crimper crimps perfectly – don't try anything else!!
- Comes with 3 opening sizes (15/30/45 Amp)
- Be certain you didn't crimp on top of insulation!
- Wire too small? Crimp will come loose – double up wire! Or solder

PowerPole: how it assembles

- The connector has to slide in OVER the spring.
- If the wire isn't stiff enough, you can push with a tiny screwdriver or jaw of small needle nose pliers.

Cutaway view of a Powerpole connector.

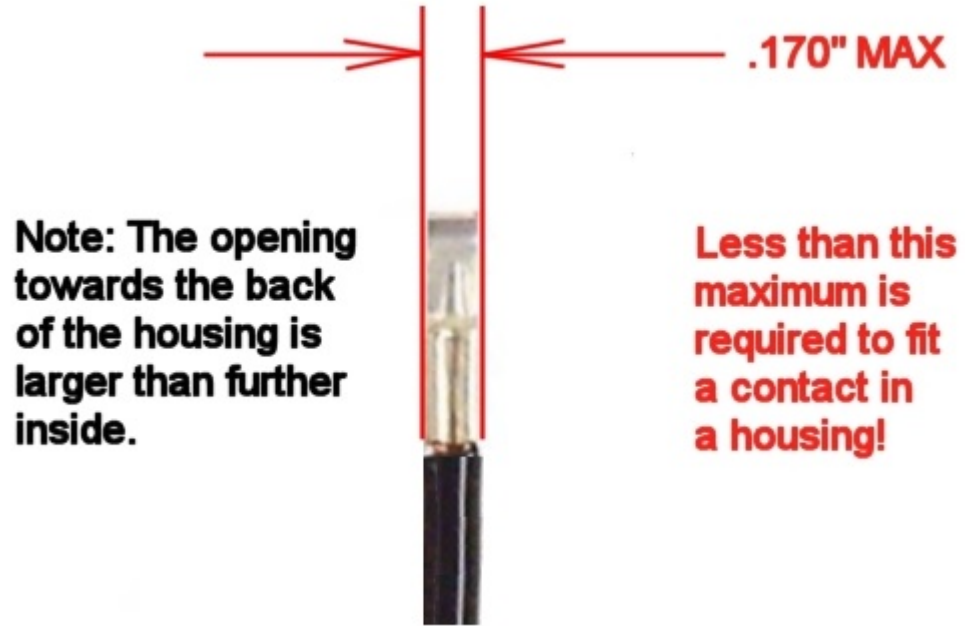
Note that the contact must fit through the gap between the housing and the spring and that the contact is snapped over the end of the spring.



CREDIT: <https://powerwerx.com/help/powerpole-assembly-instructions>

PowerPole Dimensions

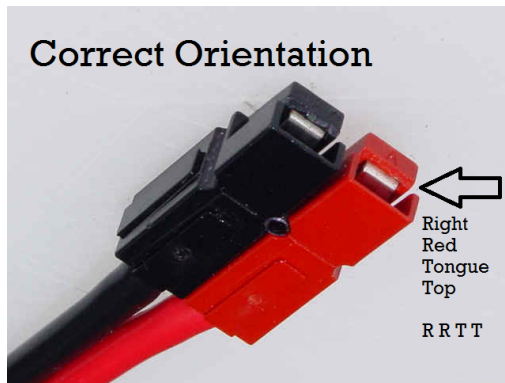
- You must not compromise the connector leaf that has to fit thru an opening, and over the spring!
- NO SOLDER past the wire!!



CREDIT: <https://powerwerx.com/help/powerpole-assembly-instructions>

Polarity Protection???

- ONLY if you assemble properly!!!
- “**Red Right UP**” is key to this.
- When you Look from the front, at the business end, the RED must be on the RIGHT, and the metal connector piece must be UP.
- If you do it wrong, you CAN assemble two connectors together to blow a radio....



<https://ham.stackexchange.com/questions/5959/on-anderson-powerpoles-does-the-red-on-go-on-the-left-or-right>

PL-259

- Original style required **soldering shield to a massive connector** – polyethylene inner insulation melts, center conductor SHORTS OUT
- Teflon Insulation? Soldering far safer!
- Crimp style: shield crimp can work loose & rotate



<https://mgs4u.com/wp-content/uploads/2021/04/PL-259-UHF-male-Solder-On-for-LMR-400-RG-213-RG-8-7500-UHF-Installation-Guide-PDF.pdf>



CRIMP PL-259

- Technique for assembly
- Requires correct crimper for your SIZE connector (RG58/RG8X/RG8)
- REMEMBER to slide the crimp ferrule and the heatshink onto the cable BEFORE assembling...



Center conductor extends through the brass center and needs soldering -- DO NOT MAKE A BLOB

Coax Crimpers

- Different size required for each one!!
- Some have removable “jaws”
- Easier for me to just have several tools
- Most of the time I’m doing RG8X



Ham Radio DC Power Cables

- AWG 16 useful for most VHF/UHF FM radios (10 Amps) – but nothing smaller!
- AWG 14 even better, should be used for longer wires
- AWG 10 is preferred for power cables to 100W HF rigs.
- Be careful with lots of connectors in series!
 - Literally every connection, every fuse in the EOC wiring setup was losing about 0.1V for the 7300 under full load!
 - I had not expected that level of loss of voltage.
 - Icom 7300 has a little voltmeter built-in, so you can SEE what is going on

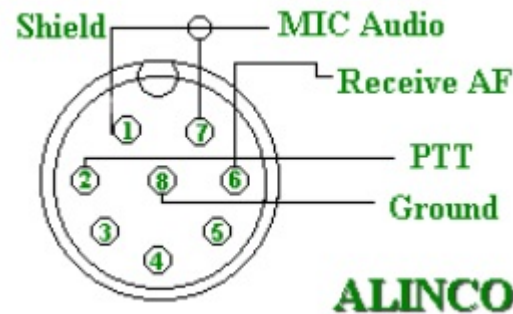
Mic Connector

- ICOM Favorite mic connector. Inexpensive on AMAZON. (I have used this for rotator control also)
- Tiny SCREW holds the plastic body within metal shell – don't lose it!!



Pin numbering VARIABLE

- Note carefully all drawings – ***from outside of cabinet side or from solder side? HUGE DIFFERENCE***
- Often pins are numbered in the plastic – use magnifying glass
- Note carefully if a CENTER pin
- CASE usually just grounded, but may not be the same as “mic ground”



Molex Connectors

- NOT my favorite
- Pins, once inserted, generally cannot be salvaged intact
- Getting new pins better choice.
- Male vs Female pins!!!
- Try to order extras to allow for “oops!”
- AMAZON does have some of these general types!
- ICOM uses a 6-pin molex for power cables.

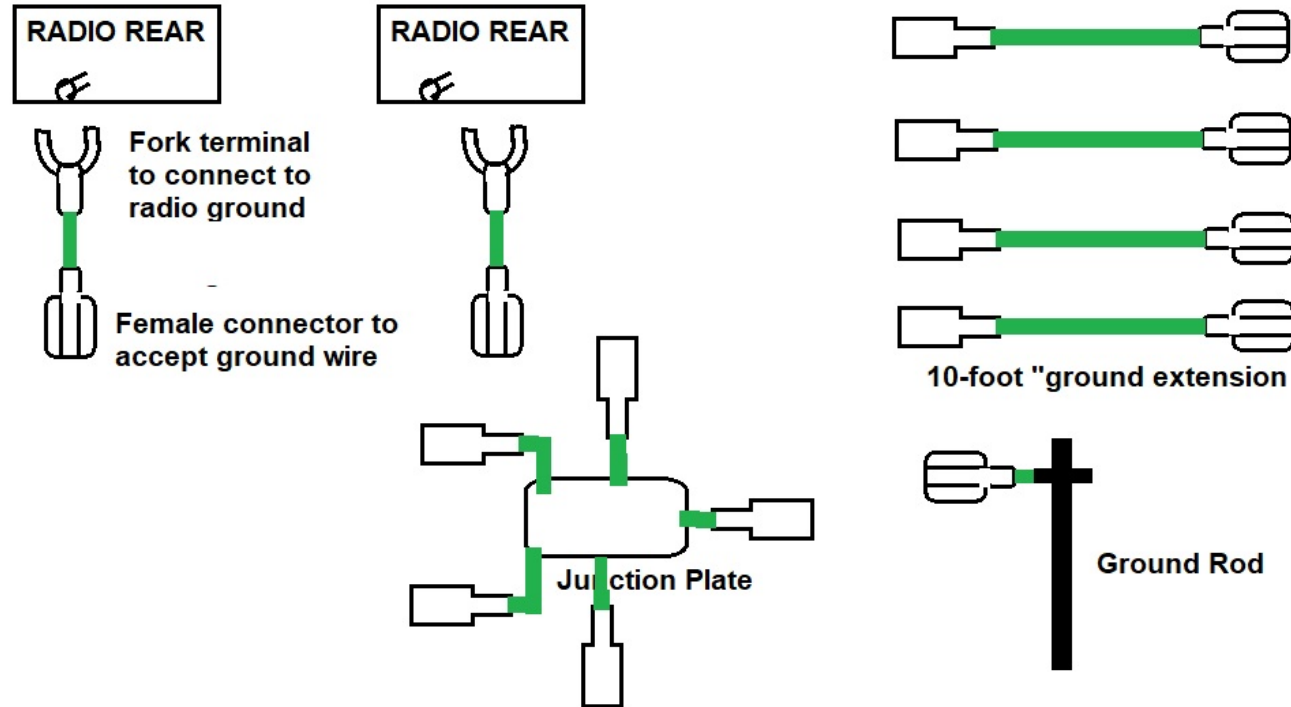


“Modular” connectors

- RJ-45 8-pin Ethernet & several mic's
- Also 6-pin and 4-pin versions.
- CAUTION: different manufacturers number from L→R or R→L viewed from top!!!
- \$10 crimper can do 8- and 6-pin connectors
- CORRECT SIZE OF WIRE is critical because the crimper forces contacts to pierce insulation and correct touch copper



3. Application Time #1: Ground Connections



4. APPLICATION TIME #2!

Help Ron get auto rotator started

- Yaesu G-450ADC (DC motor: 12-20 Volts, relatively low current (1-2A))
- ***Yaesu Rotators do not come with cables!***
- They only come with CONNECTORS.
- Up to YOU to choose the length to your antenna/rotator and assemble.



\$130 for 50-foot rotator cable!



Rotator Cable

Pin 1: Potentiometer / sensor **ground** or optional line (unused/omitted on 5-wire revision setups).

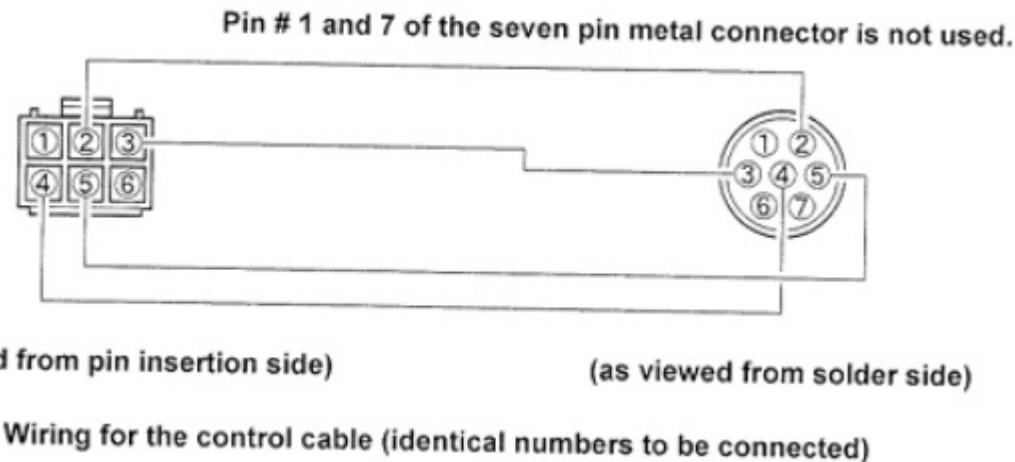
Pin 2: Potentiometer feedback (direction voltage input).

Pin 3: Potentiometer +DC reference voltage supply. **+5VDC**

Pin 4: Rotation control winding (Left / Counter-Clockwise motor drive).

Pin 5: Rotation control winding (Right / Clockwise motor drive).

Pin 6: Common motor winding / AC-DC return line.



Computer-Rotator Controller

