

SOLDERING & PL259'S

By Bill Carpenter AB3ME Jan 9, 2020

WHAT KIND OF SOLDER SHOULD BE USED WHEN SOLDERING ELECTRONICS

- For **electronics soldering**, the “most commonly used type” is lead-free rosin core **solder**. This type of **solder** is usually made up of a Tin/Copper alloy. You **can** also **use** leaded 60/40 (60% tin, 40% lead) rosin core **solder** but it's becoming less popular due to health concerns.
- When selecting **flux** core solder, it is important to use **rosin core** solder for electrical applications. Acid core solder should only be used for plumbing applications. Rosin flux is commonly used for soldering electrical circuits and is intended specifically for that purpose.
- The ideal solder is .030" to .032" diameter 60/40 rosin core solder for our discussion this evening.



Read Cautionary
Information on
Opposite End

"44"
ROSIN
CORE
SOLDER
454g
(1 lbs)

Sn60Pb40
J-STD-006A 11/2004
66 24-6040-0023
430403

.75 mm
(.030")
44H

Long Life
Advantage
A Lead Free

ROHS
COMPLIANT
REWORK
SOLDER

WHAT TEMPERATURE DOES SOLDER MELT AT?

- 60/40 solder is made of 60% tin and 40% lead. It has a melting point of around **190°C, (374 F)** depending on the exact composition. Iron tip temperatures of at least 300°C (**572 F**) are recommended. It is also very soft, meaning that cracks do not form so readily if the joint moves during cooling.

WHY DOES MY SOLDER NOT STICK?

- A classic reason **solder** won't **stick** to something is because you're **not** getting it hot enough. ... Touch some **solder** on it, and it **should** melt almost instantly. Put a nice little blob of **solder** on the tip of the iron. Press the blob of **solder** into the metal to be **soldered**.

WHAT ABOUT USING FLUX WHEN SOLDERING.

- In soldering of metals, **flux** serves a threefold purpose: it removes any oxidized metal from the surfaces to be soldered, seals out air thus preventing further oxidation, and by facilitating amalgamation improves wetting characteristics of the liquid solder.
- Apply flux before you solder something, not after or during....heat the flux before applying any solder.
- Don't **overheat** the flux if you decide to use it.
- **Use** the right amount of heat to solder the joint. ... If you heat the joint too long, you'll burn the flux (it'll smoke and turn black) and make it difficult to get the solder to flow into the joint. Applying just the right amount of heat comes with practice, but it's not hard **to** learn.
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WHAT DOES TINNING MEAN WHEN SOLDERING?

- Whatever it is you are **soldering**, you should '**tin**' both contacts before you attempt to **solder** them. This process coats or fills the wires or connector contacts with **solder** so you can easily melt them together. To **tin** a wire, apply the tip of your iron to the wire for a second or two, then apply the **solder** to the wire.

TEMPERATURE CONTROL:

- The simplest and cheapest soldering iron types don't have any form of temperature regulation. Simply plug them in and switch them on! Thermal regulation is "designed in" (by physics, not electronics!). These irons may be described as "thermally balanced" so that they have some degree of temperature "matching," but their output will otherwise not be controlled.
- Unregulated irons form an ideal general-purpose iron for most users, and they generally cope well with printed circuit board soldering and general inter-wiring. Most of these "miniature" types of iron will be of little use when attempting to solder large joints (e.g. very large terminals or very thick wires or PL259's) because the component being soldered will "sink" heat away from the tip of the iron, cooling it down too much. (This is where a higher wattage comes in useful.)

THIS IS AN EXAMPLE OF SOLDERING IRON TO NOT USE AS TEMP OF THE TIP IS NOT KNOWN.

- It is rated as 60 watts and is available from Amazon for \$5.89. You get what you pay for!
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WHAT IS A GOOD TEMPERATURE-CONTROLLED SOLDERING IRON TO PURCHASE?

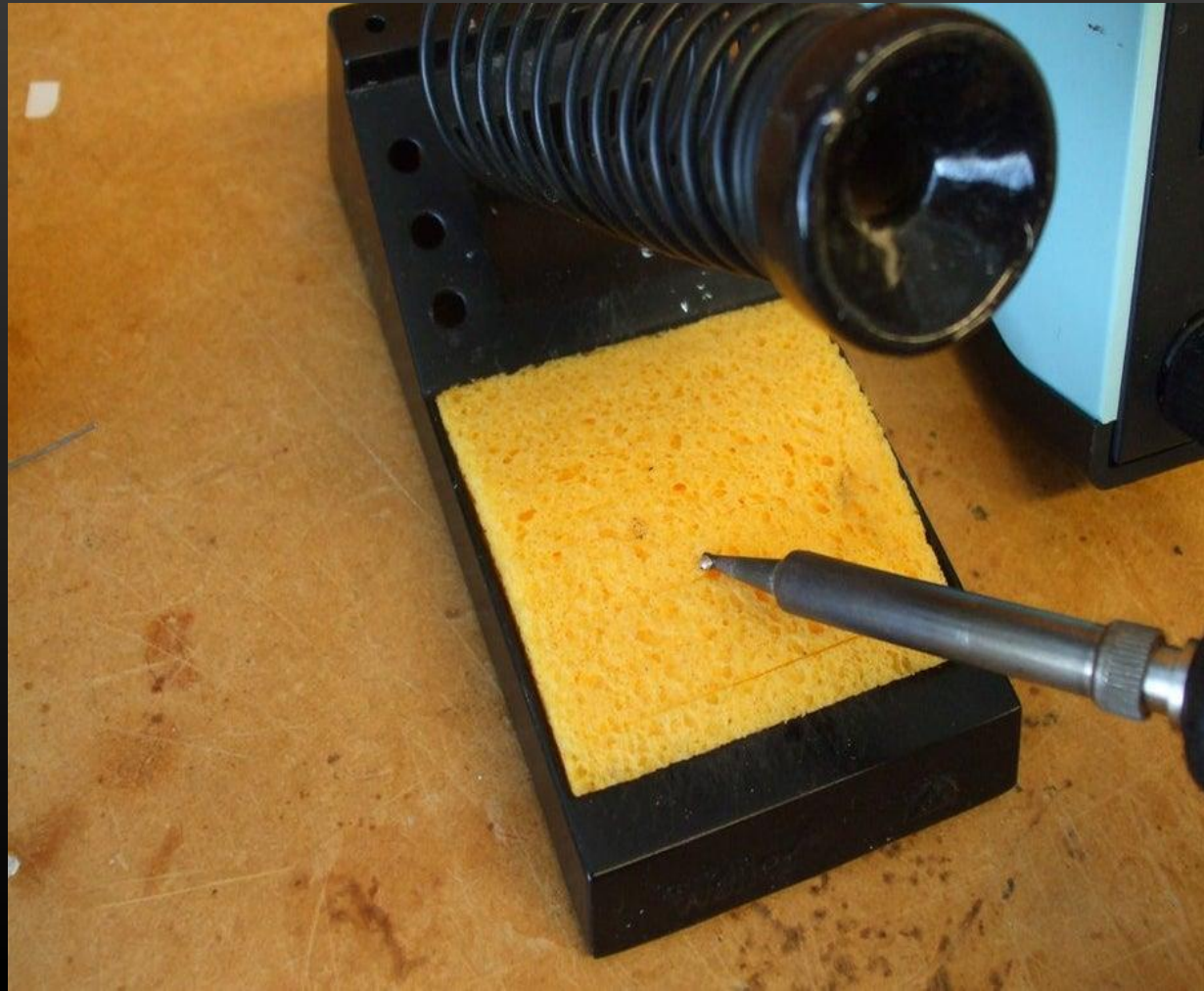
- This Weller station is available from Amazon for \$115.



ACTUALLY SOLDERING:

- Step 1: Begin by making sure the tip is attached to the iron and screwed tightly in place.
- Step 2: Turn on your soldering iron and let it heat up. If you have a soldering station with an adjustable temp control, set it to 400° C/ 752° F.
- Step 3: Wipe the tip of the soldering iron on a damp wet sponge to clean it.
- The purpose of the sponge is as follows; the sponge is porous, so it holds water. Rubbing a hot soldering iron tip on a wet sponge causes the solder to contract at a different rate than the soldering iron, helping to knock off any globs of solder that may be clinging to the tip.

SPONGE WITH IRON HOLDER....



ACTUAL SOLDERING...CONT.

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- **Step 4:** Tin what you intend to solder and ensure the iron tip is properly tinned.
- Proper tinning optimizes **tip** life. Most **tips** consist of a copper base material, plated with **iron** to prevent erosion. **Iron**, however, tends to oxidize rapidly. When oxidation occurs, the **tip becomes** covered with a **black** or brown scale, which **will** not wet with **solder** – greatly reducing heat transfer. Tinning the tip prevents this happening.

TIPS WHEN SOLDERING

- **Keeping tip clean:**
- **You can** rub the tip of the **soldering iron** with **steel wool** or a Brillo pad. **You can** dampen it somewhat but keep any water drips away from the electrics. Rub the pad gently over the tip of the **soldering iron** to **take** away any surface stains, rust or coloring. **Clean** it down to a shiny finish.
- **Inspect your work:**
- Clean the solder joint after it is cooled using alcohol and or a brass brush. The residue left from the internal or applied flux will oxidize over time if you do not remove it.
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- “cold” solder joints can be indicated by a rounded top when cooled, properly applied solder should appear in a “flowed” fashion to the eye.

SOLDERING IRON TIP CLEANER-BRASS.

- Available at Amazon for \$9.59



Examples of bad soldering

Cold Solder Joint



Bad Solder Joints



Extreme over-heating
and pad lifting



No adhesion to lead-oxidized lead



Solder resting on pad, not adhering



Soldering on and not adhering to
pad-insufficient pad heating



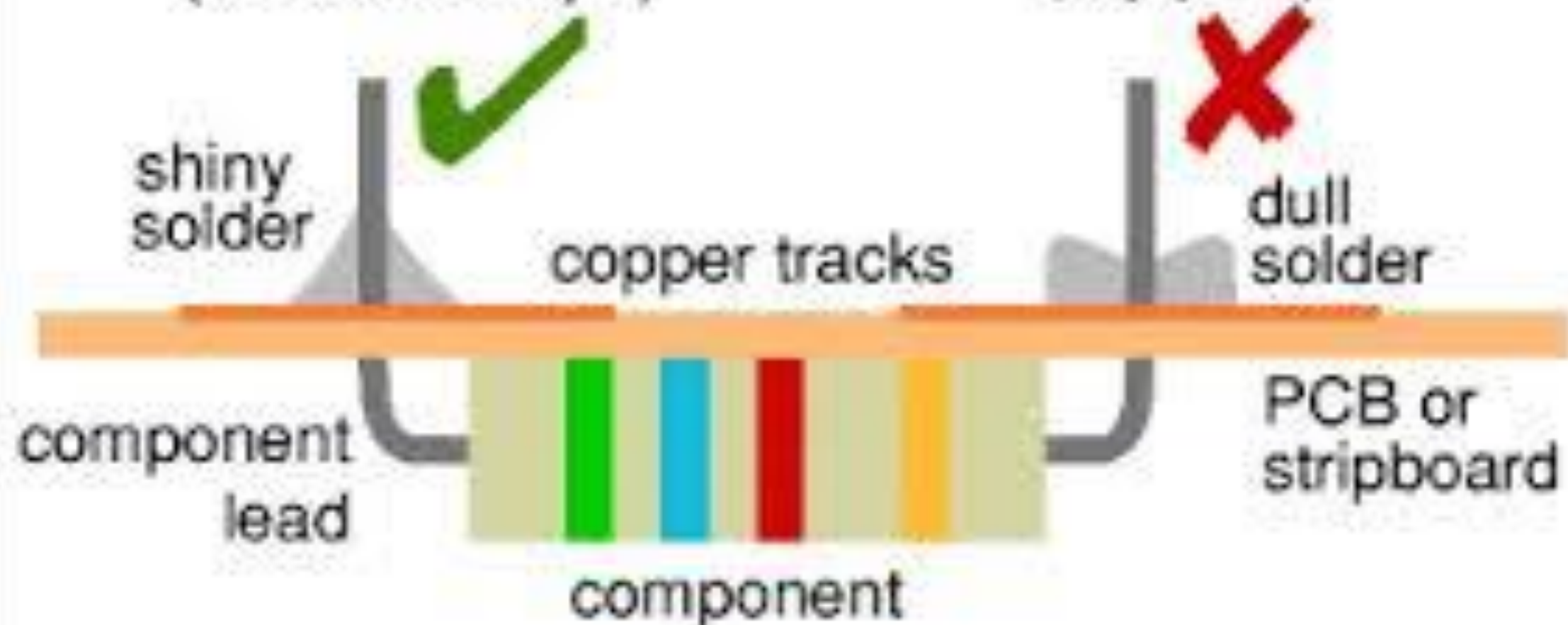
Solder was applied to the first pad and
then transferred to the second

GOOD JOINT

(volcano shape)

BAD JOINT

(dry joint)



FINISHED SOLDER APPEARANCE

12. Screw UG-175 into PL-295 and solder at exposed UG-175 positions.



Solder here, too!

Solder should flow and appear shiny when cool.
No gray lumps!

JEK 11/04/02/05

CORRECT



INCORRECT

COAX STRIPPING TOOL

- This coax stripping tool is available at Amazon.com for \$6.50. and the tubing cutter for \$11.24. These are helpful in stripping and preparing the coax.

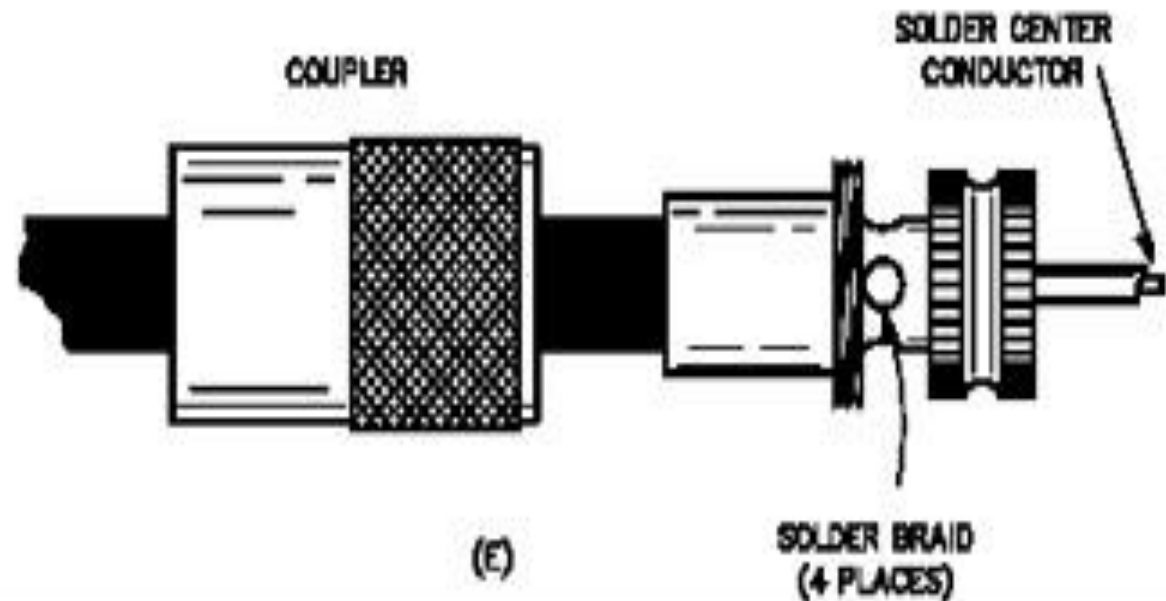
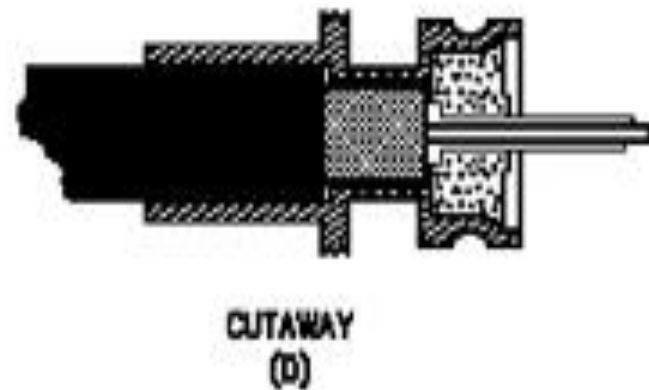
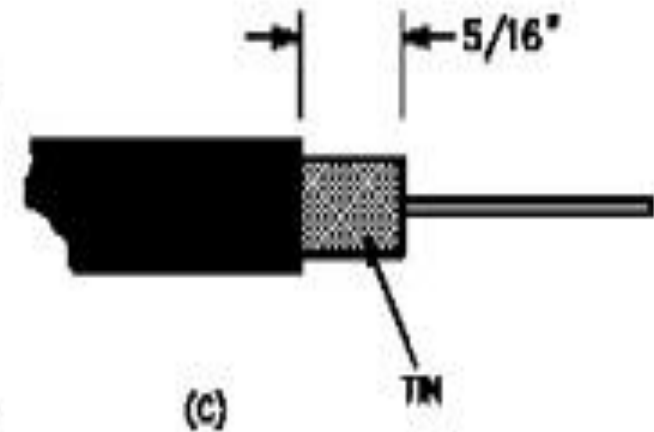
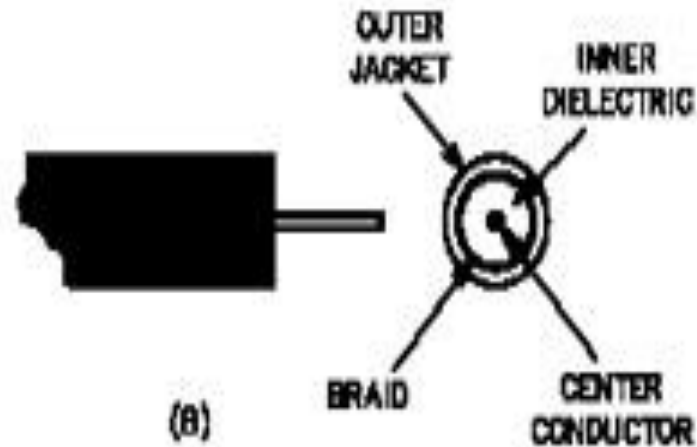
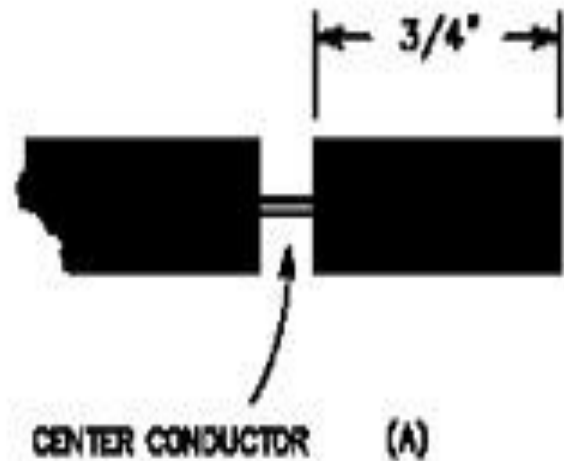


PANAVISE TO HOLD YOUR WORK

AVAILABLE @ AMAZON FOR \$52.00



PREPARING RG 213 COAX:



PL259 ADAPTERS.....

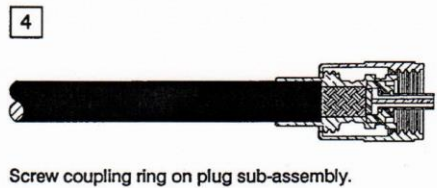
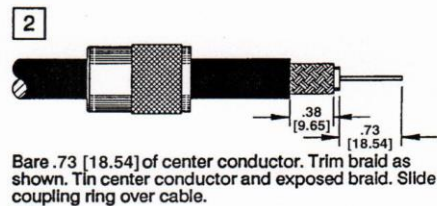
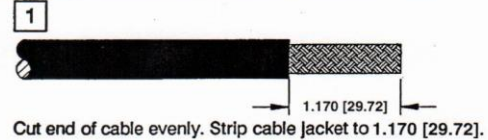
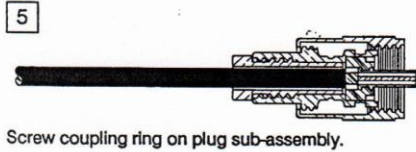
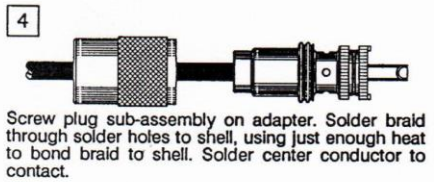
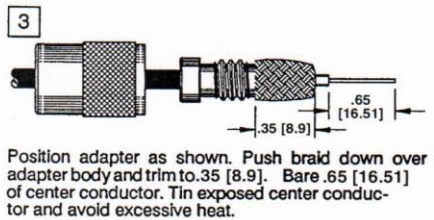
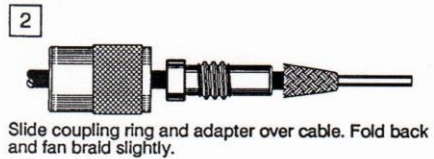
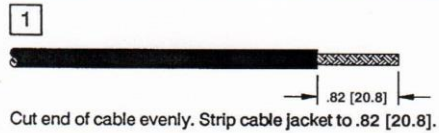
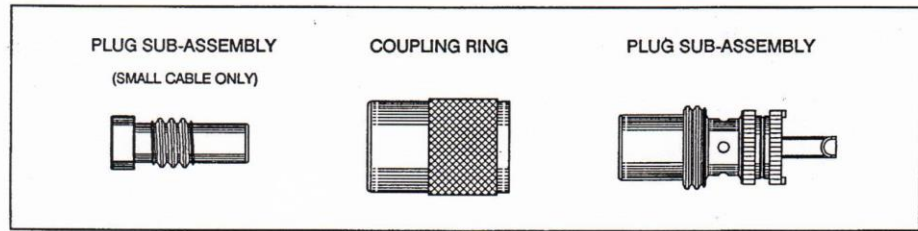
- These adapters do come in two different inside diameters, so match your coax accordingly.
- UG176/U-S is for RG8X or LMR240 has a larger inside dia.
- F-RG59 is for RG59U= has a smaller inside diameter
- These are readily available from RF Parts, HRO, DX Eng.



PL259 BODY PREP

- File or groove out holes @ PL259 body to allow easier soldering and bond to braid: correct amount and bond to shield, will be indicated by a concave surface when solder is cooled.





ACTUAL ASSEMBLY

CABLE PREP DEMONSTRATION

Use a somewhat dull knife to cut the outer sheath of the coax. If you do not do this often, you will inevitably cut thru the braid and compromise it in the process.

The use of a tubing cutter allows scoring of the outer sheath and cutting evenly....bend the entire cable over your finger and gently cut thru the scored line to the braid surface....easier to control the blade this way

Use the tubing cutter to cut the tinned braid to the proper length shown in the previous slide. The same tool can be used to cut the braid back 1/16" to allow the dielectric to protrude, thus preventing braid contact to the outer portion of the body.

SOLDERING DEMONSTRATION...

TIPS THAT HELP:

- **Use a bench vice or something to hold the prepped coax.**
1. Use a drop of liquid soap immediately behind the PL259 barrel when threading it on to the outer sheath of the coax. It will lubricate the threads, allow installation to be easier, and will not effect the cable in any way.
 2. Wrap the .030 solder around the exposed shield tightly in a coil to allow quickly tinning of the braid when needed. Silver plated braid does not need to be tinned....only the type that is bare copper. Quickly swipe the soldering iron side of the tip to melt the solder and not damage the insulation. Repeat as necessary thus avoiding melting of insulation and tinning the bare copper.

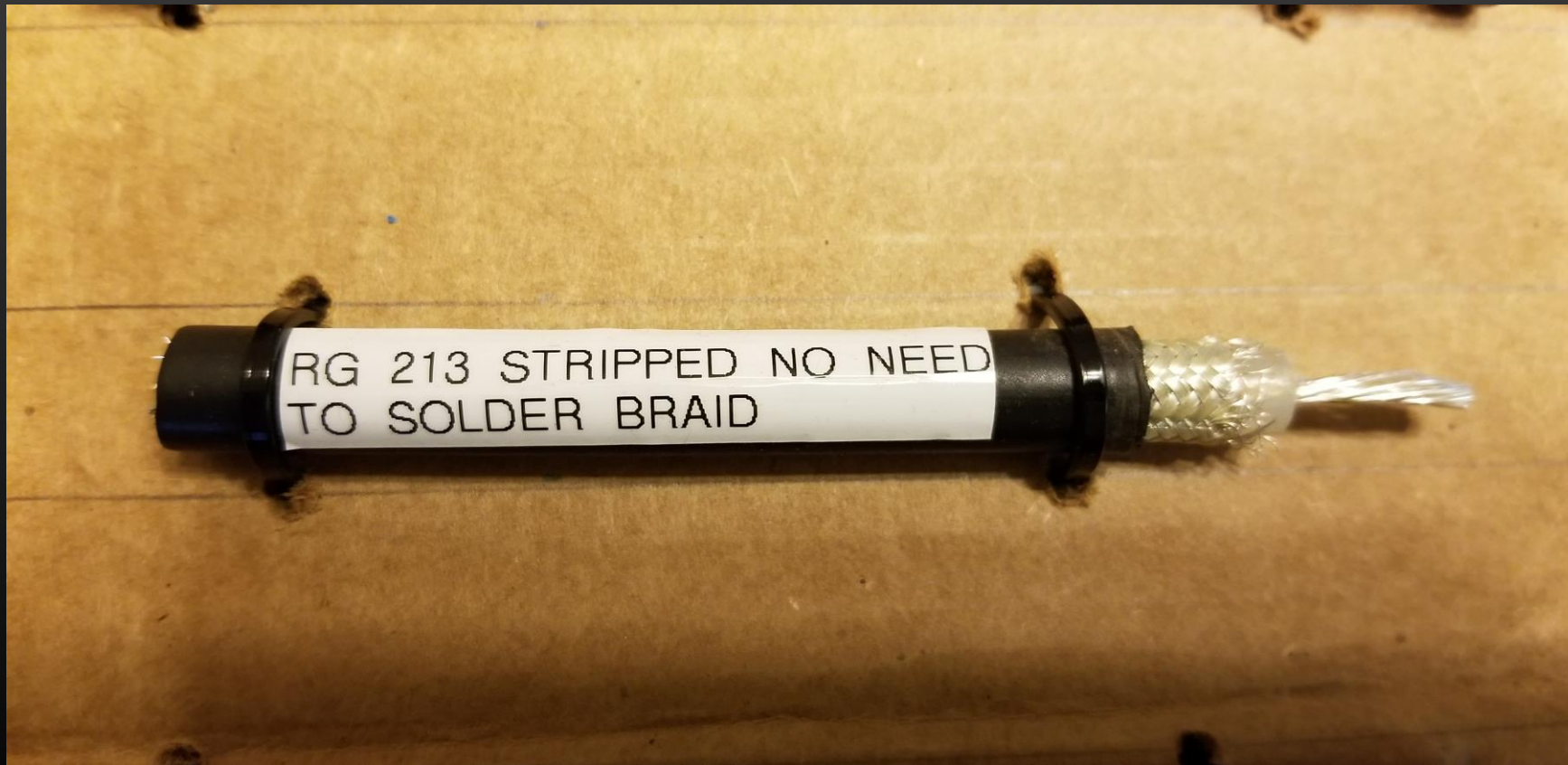
SOLDERING DEMONSTRATION CONTINUED.

2. Don't rush, allow each solder joint to cool before moving to the next!
3. Solder tip in a down slope position to prevent solder running back to insulation.
4. Last but not least....think about water penetration.
5. Connectors should be wrapped with good electrical tape such as 3M brand or equivalent. Spiral wrap two layers with the last layer pitched with the anticipated water flow. Coax seal is an alternative and better!

RG213 STRIPPED



THIS RG213 DOES NOT REQUIRE
TINNING



.031 SOLDER WRAPPED AROUND
BRAID TO ALLOW TINNING...APPLY
FLUX FIRST BEFORE DOING THIS.



RG213 WITH BRAID SOLDERED, READY FOR CONNECTOR BODY TO BE ATTACHED



CONNECTOR BODY ATTACHED. USE
DROP OF LIQUID SOAP ON SHEATH
JUST AHEAD OF CONNECTOR TO EASE
SCREWING IT ON TO CABLE



DISPLAY OF ALL SAMPLES USED IN THIS PRESENTATION

