

AEC Weekend Seminars

Looking beyond the screwdrivers and wrenches . . .

Tools

Tools

Looking beyond the screwdrivers and wrenches . . .

- There are a few electrical system tools unique to building an airplane.
 - Specialty crimp tools
 - Insertion/extraction tools for crimped on pins
 - Special wire strippers (Teflon/Tefzel)
 - Cable cutting tools

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- Color coded hex nut drivers in sizes 1/4" to 9/16" are very handy compared to a loose socket stuck on the end of a handle.
- A good nut driver has a hollow shaft that allows the user to run a nut down on a long screw.

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- This is the first tool in every professional aircraft electrician's toolbox. . . . The AMP "T-Head PIDG" crimper.
- I purchased one of these from Cessna salvage in 1961 for about \$25 and had it rebuilt at AMP for about \$75.
- The new tool today is over \$600.



- The T-head tool offers ratchet handles and insulation grip, die-height adjustment.
- If you make a living with your tools, this is an excellent, one-in-a-lifetime-investment.

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- Dozens of companies offer this ratchet-handled tool that installs red thru yellow PIDG terminals.

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- A study of the effectiveness installation of PIDG terminals with a low cost tool.



- Terminal on the left was installed with the \$high\$ tool. It's a bit prettier than the \$low\$ installation.
- A microscopic cross-section of the terminal crimped to the wire with both tools shows a gas-tight installation.

Looking beyond the screwdrivers and wrenches . . .

- Installation of machined pins common to most Mil-Spec (including our favorite D-Subminiature) connectors, you don't get any better than a Daniels hand tool and the positioners appropriate to the pins being installed.
- Typical pricing for this tool and ONE positioner is on the order of \$400.



Looking beyond the screwdrivers and wrenches . . .

- The most common machined pin installation in OBAM aircraft systems is the D-Subminiature devices found on instruments and avionics.
- This single application tool for D-Sub pins is widely available on the ‘net and sells for about \$35.



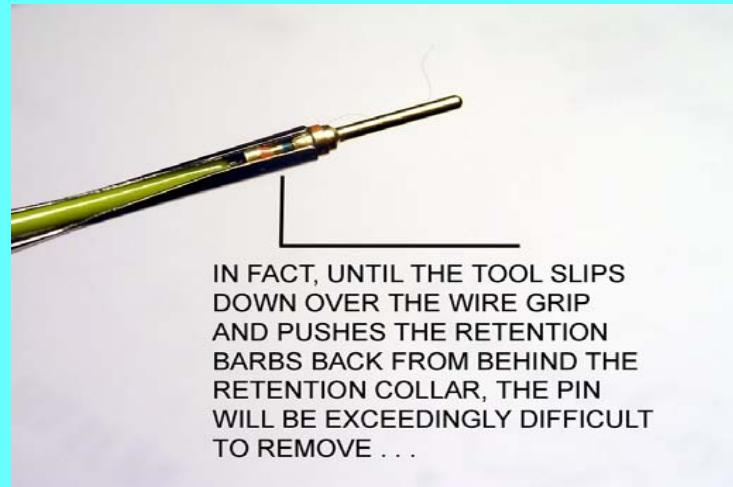
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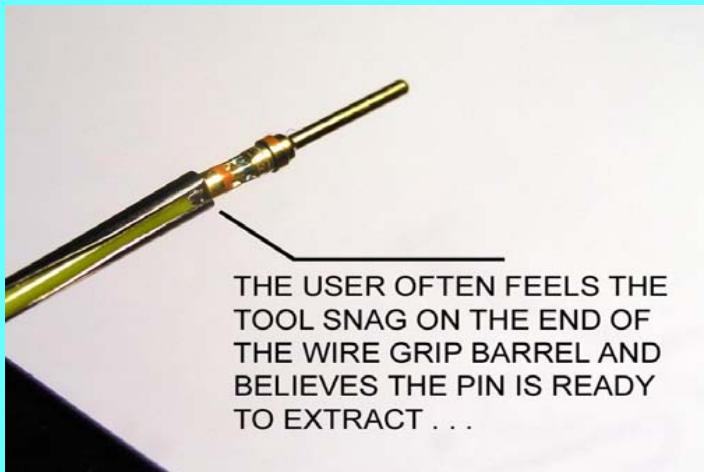
Tools



THE RED END OF THE TOOL IS USED TO SEAT A CRIMPED PIN IN THE CONNECTOR HOUSING. THE WHITE END SLIPS PAST THE PIN AND RELEASES BARBS THAT RETAIN THE PIN IN A HOUSING.



IN FACT, UNTIL THE TOOL SLIPS DOWN OVER THE WIRE GRIP AND PUSHES THE RETENTION BARBS BACK FROM BEHIND THE RETENTION COLLAR, THE PIN WILL BE EXCEEDINGLY DIFFICULT TO REMOVE . . .



THE USER OFTEN FEELS THE TOOL SNAG ON THE END OF THE WIRE GRIP BARREL AND BELIEVES THE PIN IS READY TO EXTRACT . . .

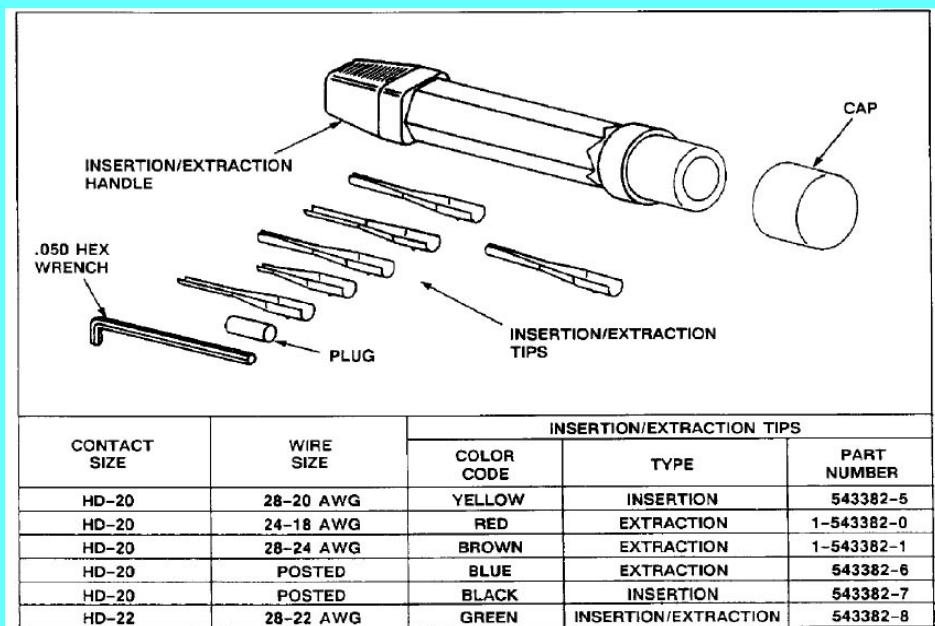
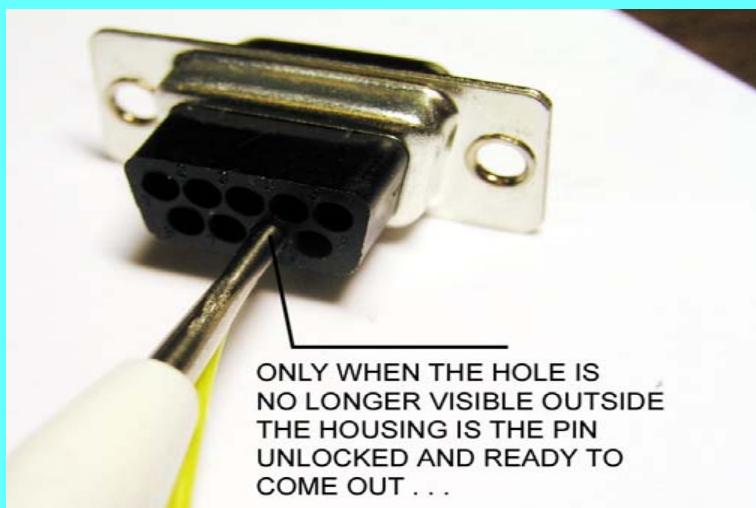
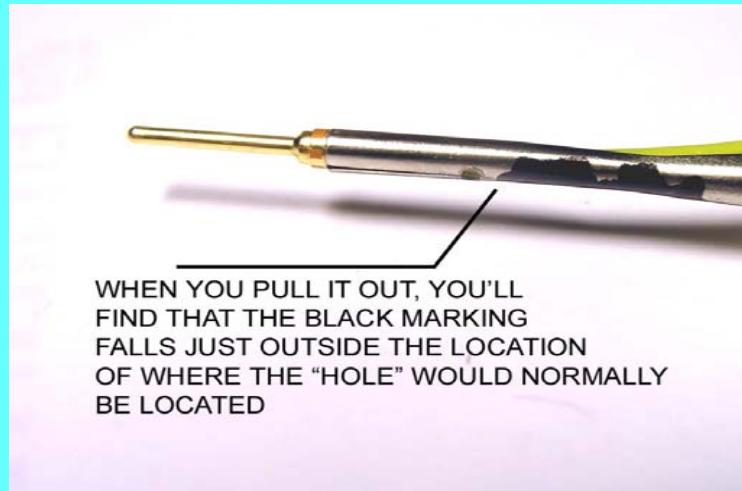


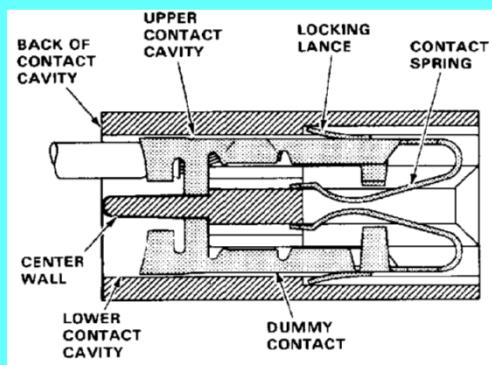
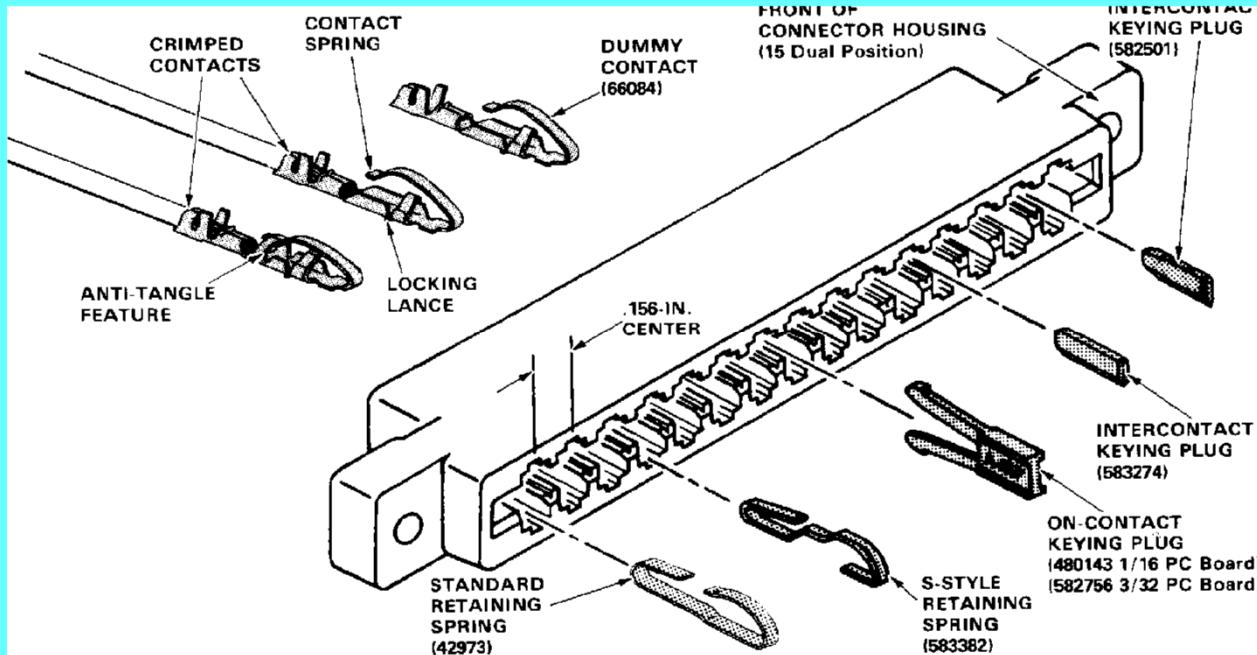
THE BETTER QUALITY EXTRACTION TOOLS HAVE A HOLE IN THE BARREL ABOUT .35" FROM THE END . . .

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- Legacy avionics along with most strobe systems use the “open barrel” sheet metal pins that require some specialty tools for installation and maintenance.
- This is the AMP-Leaf connector used to make wire-bundle connection to etched circuit card edge fingers.

Looking beyond the screwdrivers and wrenches . . .

EXTRACTION TOOL FOR AMP-LEAF AND SIMILAR CONNECTORS TYPICAL OF THOSE USED ON MICROMONITOR AND OTHER PRODUCTS . . .

- (1) BEGIN WITH POCKET SCREWDRIVER WITH SHANK ON THE ORDER OF .10 TO .13" IN DIAMETER.
- (2) USE BENCH GRINDER OR DREMEL MOTOTOOOL TO FORM END INTO TAB 0.090" WIDE, 0.040" THICK, 0.350" LONG. TAPER THE TIP SLIGHTLY AS SHOWN AND BREAK SHARP CORNERS.
- (3) TO REMOVE SEATED PIN. SLIP END OF TOOL INTO SLOT ADJACENT TO THE PIN'S WIRE GRIP. GO STRAIGHT IN, IF YOU PUT SIDE PRESSURE ON IT MAY FLATTEN RATHER THAN RETRACT THE LATCHING TAB.
- (4) WHEN THE TOOL IS FULLY INSERTED, A GENTLE TUG ON WIRE AND TOOL SHOULD REMOVE THE PIN. BEFORE INSERTING THE PIN INTO ANOTHER CAVITY, MAKE SURE THE LOCKING TAB HASN'T BEEN FLATTENED TOO MUCH . . . BEND IT OUT A TAD IF NECESSARY TO INSURE POSITIVE LOCK.



WWW.AEROELECTRIC.COM



- This tool offers the range of b-crimp dies needed to install the open barrel, sheet metal pins . . .



- Note that openings C, D and E have the sculptured die that fold wire grip tabs of the sheet metal pin over onto the wire.
- Openings A and B are used to close the insulation grip tabs in a “bear hug” .
- ..

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FIGURE 1



FIGURE 3



FIGURE 5. NOTE SHORTER TRIM ON STOP TABS . . . ALMOST BUT NOT QUITE ZERO LENGTH . . .

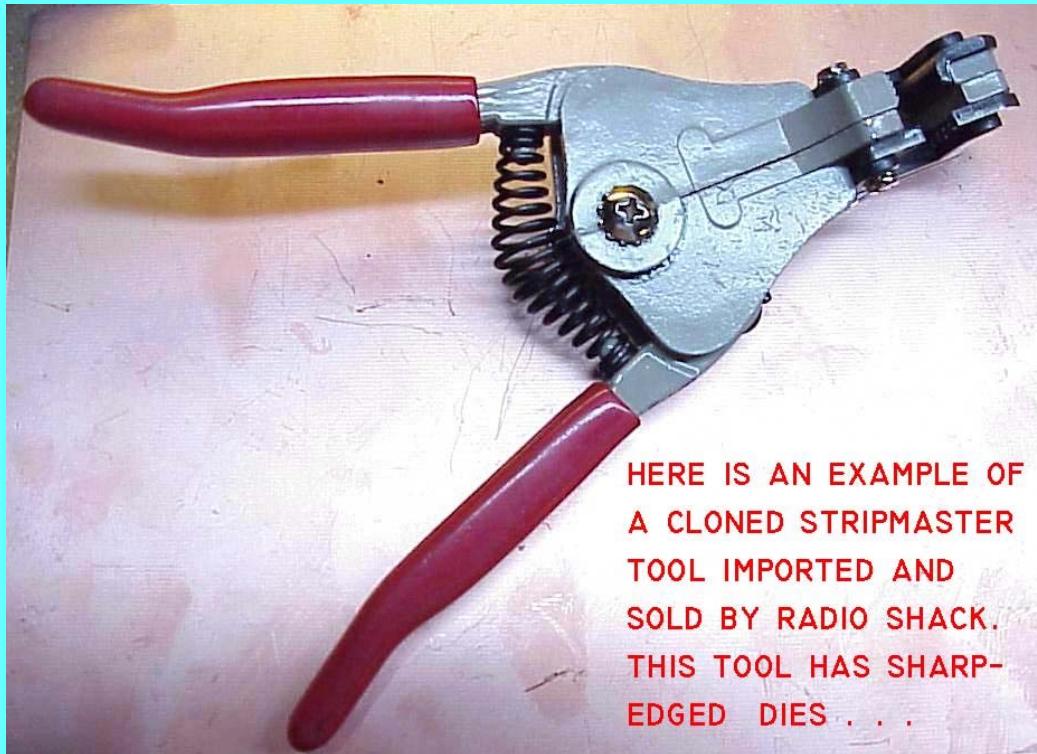


- These pins are typical of Molex and AMP Mate-n-Lock plastic connectors . . .
- Proper installation folds the wire grip into a "B" crimp and the insulation grip into a "bear hug".

Looking beyond the screwdrivers and wrenches . . .



- Tools for removing Molex/Mate-n-Lock style pins is a thin walled tube that slides down over the pin to depress a locking barb . . .
- A spring loaded plunger is pushed down the center of the tube to extract the pin.
- The same tool is used for both male and female pins.
- Unfortunately, there's enough difference between similar sized AMP and Molex products to require specific extraction tools.



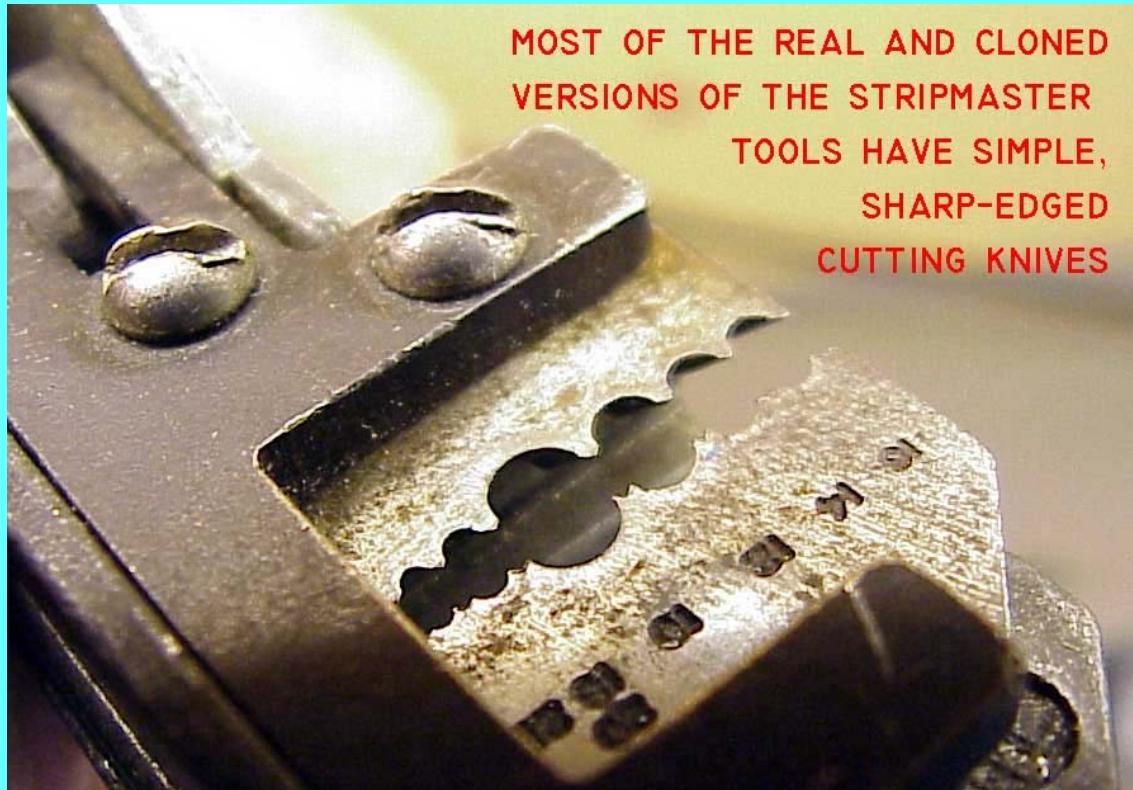
HERE IS AN EXAMPLE OF
A CLONED STRIPMASTER
TOOL IMPORTED AND
SOLD BY RADIO SHACK.
THIS TOOL HAS SHARP-
EDGED DIES . . .

- This is probably the most popular and most successful wire stripping tool on the market.
- Ideal Stripmaster tools and their clones are available for \$20 to \$180.
- There's a good reason for this variability in prices . . .

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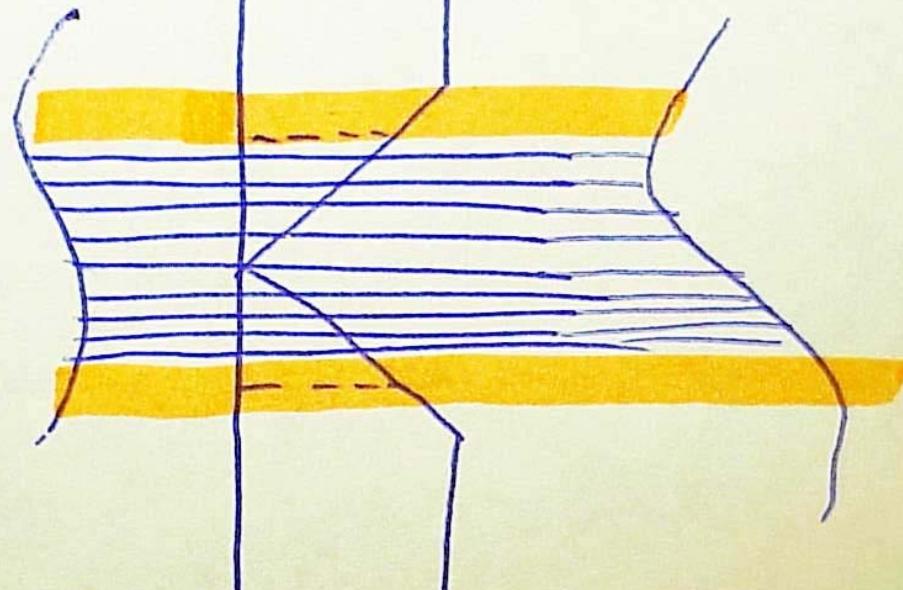
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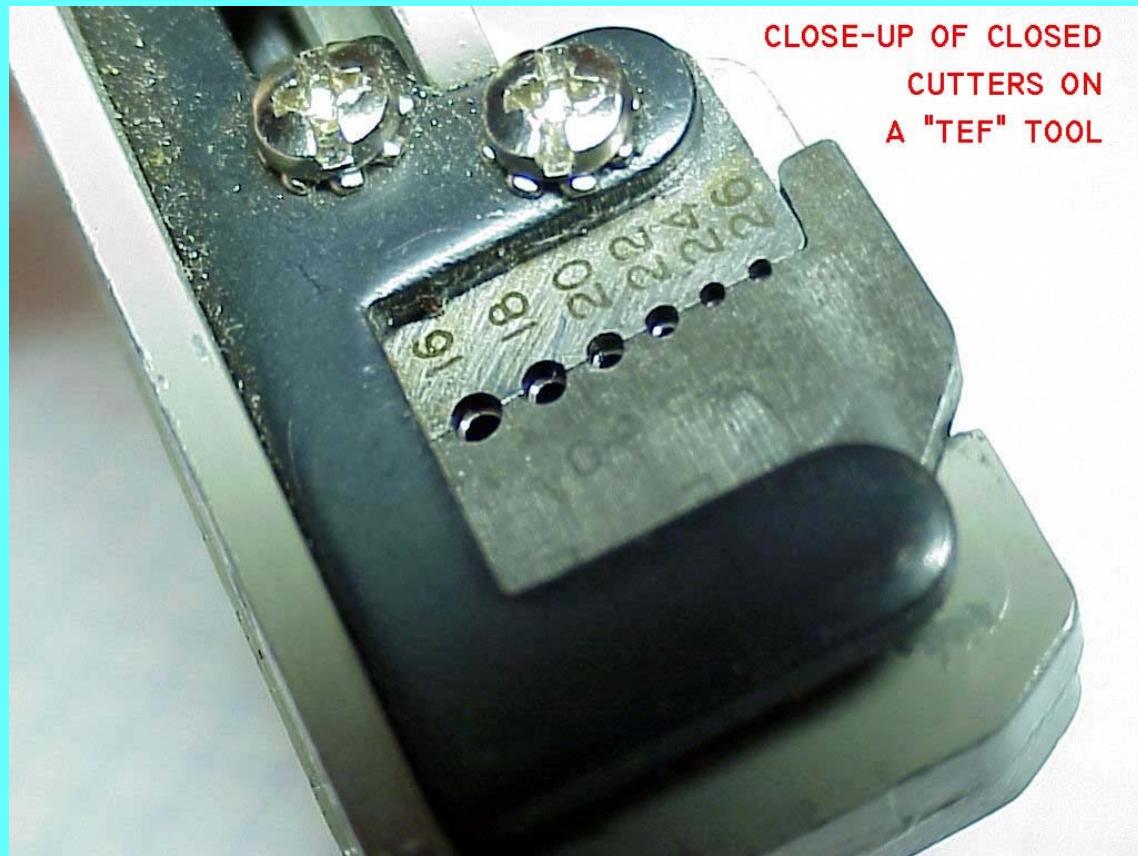


- The low cost tools have sharp edged dies that literally cut the wire's insulation.

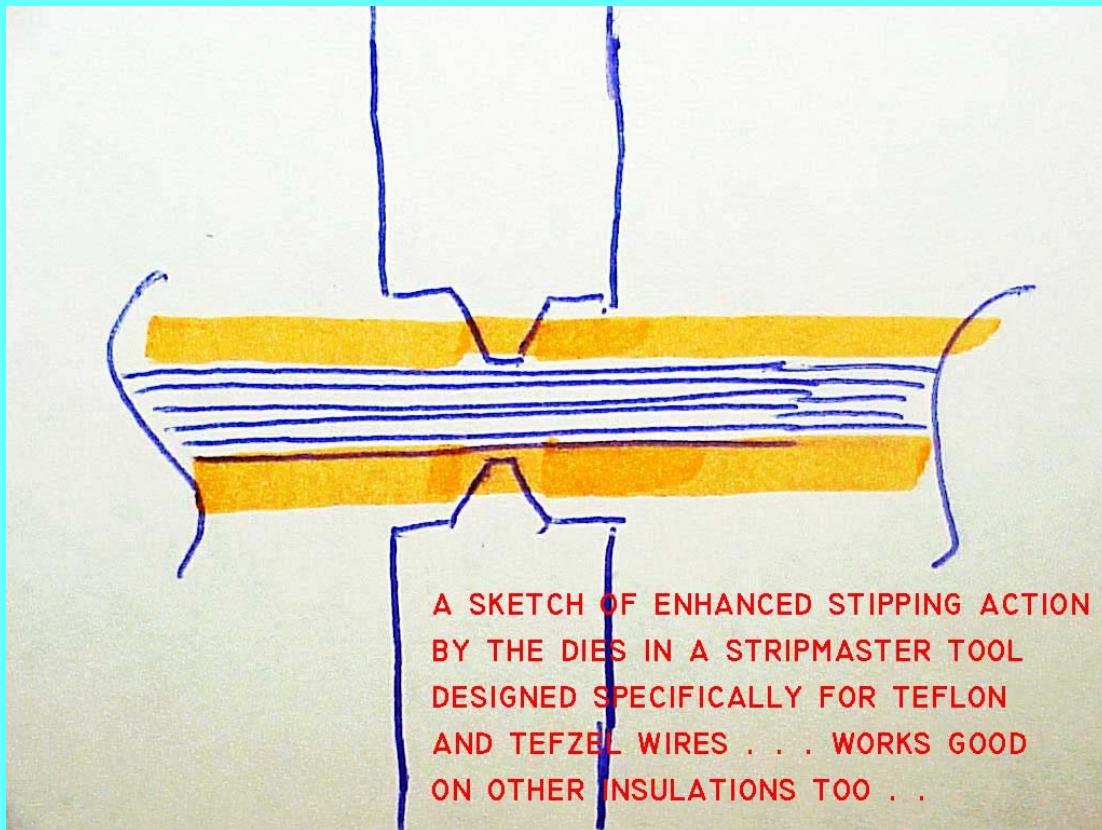
HERE'S A SKETCH THAT SHOWS CLOSURE OF THE SHARP-EDGE STRIPMASTER DIES ON A WIRE TO BE STRIPPED . . .



- This is the easiest die set to fabricate but there is some risk of damage to strands.



- A die set sculptured for optimized stripping of Tefzel and Teflon doesn't cut the insulation . . .



- There are no sharp edges pushed against the strands.
- The dies achieve a uniform compression all around the insulation
- The resulting stress riser makes the insulation fail in tension right at the gripping when the tool is exercised to remove the insulation.



SIMPLE LOW DOLLAR STRIPPER
WILL WORK WELL WITH SOME
CARE AND PRACTICE . . .

- With a little practice, low cost tools like these can be used to accomplish effective stripping operations.
- One needs to calibrate the grip such that the insulation is not cut but simply compressed so as to create the desired stress riser.

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- This very popular “flush cutter” is also an effective wire stripping tool.

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- Soldering is an effective, low cost wire joining technique.
- A 25 watt, fine tip soldering iron is the minimum acquisition . . .

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- The Cadillac of soldering tools is made by Metcal.
- New tools can cost \$600+
- Good used solder stations can be purchased off Ebay for under \$200.
- Power supplies alone are good buys because you'll probably want to buy new wands anyhow.

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Butane Gas

Tools . . .



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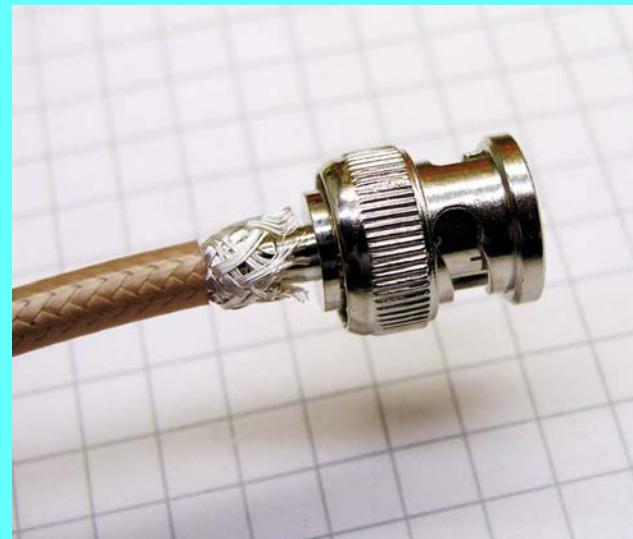
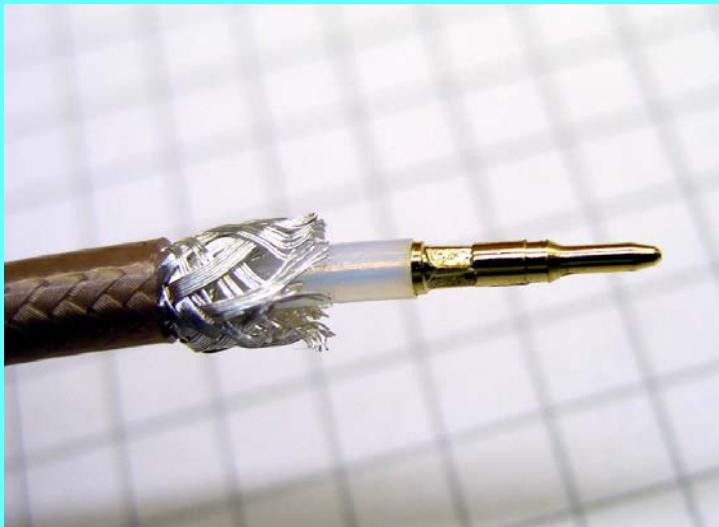
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- **BNC coax connectors** are installed on RG-400 coax using a hex die of **.213"** for the shield grip and **.068"** for the center pin.



- Less than \$50 in tools will allow you to accomplish a first-class installation of BNC connectors onto your antenna feedlines . . .
- Keep in mind that when your airplane is finished, you can reduce the use-cost of these tools by selling them to another builder.

- Ya gotta have a heat gun. Harbor Freight has some inexpensive offerings.



- This is one of my all-time favorite heat guns. Made by Milwaukee and offered by Home Depot and Lowes, it has an adjustable heat feature.
- I think this tool sold for about \$40.



- A multimeter is an invaluable setup and troubleshooting tool
- The lowest cost digital devices are more accurate than . . .

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- The best we knew how to do in 1960 . . .
- STILL a perfectly capable diagnostic tool . . .



- This digital micrometer from Harbor Freight goes on sale for as low at \$15.
- There's a serial data port on these devices – HF doesn't sell a cable but data for utilizing this feature is available on the net.

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- This variable high current load tester sells at Harbor Freight for about \$60.
- This is a device that will check your battery's ability to get an engine started . . .
- However, it's NOT a measure of a battery's ability to get you home when the alternator goes south for the winter.

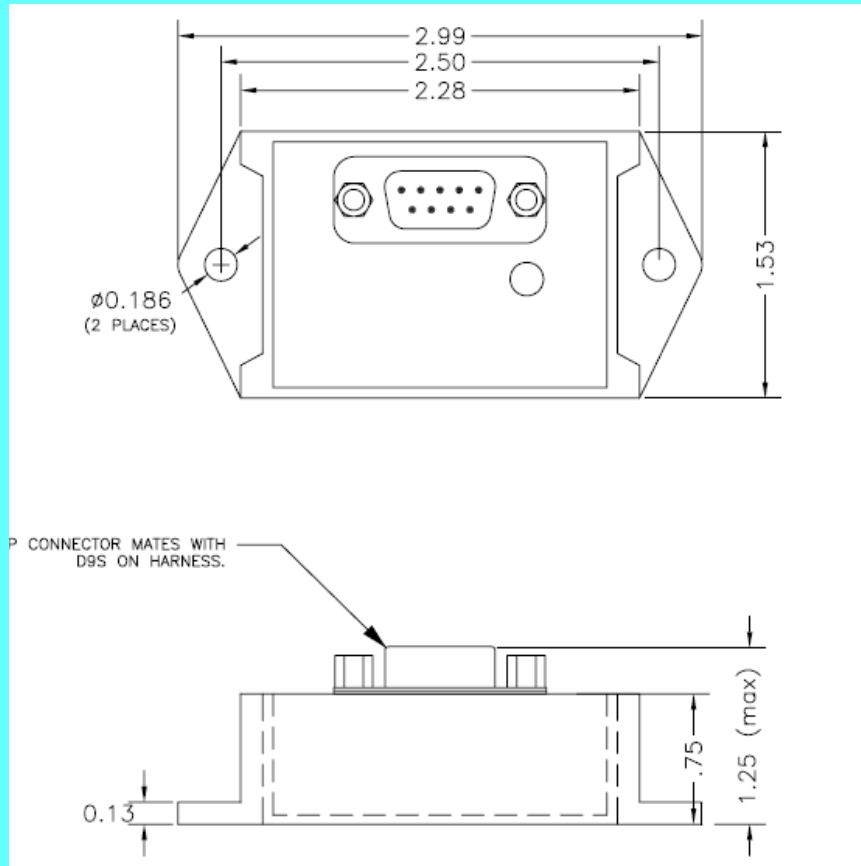
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- The folks at West Mountain Radio offer this very capable computer driven battery capacity measurement system.
- This \$100 product combined with a USB port equipped computer will allow you to make accurate evaluation of your ship's battery capacity.



- Coming over the hill . . .
- The AEC9044 Battery Capacity meter is 3 x 1.5 x 1.5 inches in size, weights about 3 ounces and will allow you to conveniently test your ship's battery capacity with a minimum of labor . . .

- I'm a first class sucker for "Quality Tools". My own tools include names like Craftsman, Fluke, HP, Tektronix, and SnapOn. However . . .
- Unless your plan to make a living with your tools, many products from suppliers of consumer grade tools are adequate to the task of getting your airplane assembled.
- Consider Ebay as a source of materials and tools. I've acquired a variety of useful tools that would not have taken up residence in my tool chests except that they could be acquired at very attractive prices!

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In a nutshell . . .

Tools

Materials and Tools Sources

Some useful sources for goodies to build your airplane . . .

- <http://aeroelectric.com>
- <http://bandc.biz>
- <http://steinair.com>
- <http://aircraftspruce.com>
- <http://digikey.com>
- <http://allelectronics.com>
- <http://wicksaircraft.com/>
- <http://www.goldmine-elec.com/>
- <http://www.ebay.com/>
- <http://alliedelec.com/>
- <http://www.newark.com/>

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Questions