Terminating Small Wires

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19-APR-2013

Terminals & Tools

Lately I have had numerous questions regarding terminating small gauge wires in the 22-26GA range for marine *communications* such as NEMA 0183 wires etc.. When specialized terminals are not available I will often use miniature ring terminals and a standard bus bar with #4, #6 or even #8 screws.

Terminating these small gauge wires often proves to be an obstacle for many boat owners. These are some of the attempts at terminating small wires I have seen over the years that have caused issues:

-Twist & solder

-Cramming additional wire into a larger terminal & then crimping

-Folding wire then inserting into the wrong sized terminal & crimping

-Use of wrong sized terminal and the wrong crimp tool

-Wire nuts

-Euro Strips with no "pressure plate"

-Scotch Locks

-Twisting wire around a screw

Unfortunately none of the above methods work robustly, repeatably and reliably on 22-26GA wire on boats. Some of them "can" work but they are rarely well enough executed to be a solidly reliable termination. These wires are very fragile and require attention to detail.

This photo shows the tools and small ring terminals I used for this article. To give the size of the small ring terminals some perspective I placed a blue 14-16GA crimped terminal above the 24GA wires & terminals. The blue terminal is terminated to 16GA wire...

The small 22GA - 26GA uninsulated ring terminals are a mix of product from Russell Industries Inc. and 3M Inc. I generally prefer the 3M when I can get them.

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Small Gauge Wire Stripper

One thing I see consistently over and over is nicked wire strands or completely missing strands. When you are dealing with 22-26GA wire you simply can not afford to lose any strands while stripping the wire. You also can't afford to damage them.

For this article I treated myself to a new Paladin small GA wire stripper. My old one was so rusty and crappy looking I just could not bring myself to using it in pictures.

This is the Paladin GripP 20 / model # PA1118 and strips wire from 20GA to 30GA. It is available for about $15.00 from Amazon and other retailers. I bought mine locally at HR Distributors in Portland, ME. There are many brands of 20-30GA strippers out there so just find one you like. If working with small wires a properly sized strip tool is a critical item to have.

One feature I really like about the Paladin P-20 tool is that it locks closed. For those of us who reach into a tool bag on a daily basis this is a great feature to avoid cut fingers.

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D-Sub Crimp Tool

Having written a few articles on crimping, before this one, I knew I needed to find an "affordable" tool for making these terminations to avoid getting "blasted"...

For these crimps I personally use a heavy duty ratchet crimp tool with modular dies but they are more expensive and many boaters, based on history of my articles, would resist this expense. This tool I find to be a tremendous value, and one that makes a very good crimp on small terminals. I sought out this inexpensive, but also good quality tool, specifically for this article.

PLUG: Donations to my site fund purchases, testing and research like this. If you get something from this article

and buy this tool, that you'd otherwise not have known about, please take the time to support my site. Please remember this site is 100% reader supported!!!

The tool is made by GC Electronics and is called the D-Sub/Double-D Service Tool. The model number is 12-464. I paid $22.00 for mine at HR Distributors in Portland, ME. They ship anywhere.

H.R. Distributors (LINK)

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GC Electronics #12-464

I snapped a shot of the package back board.

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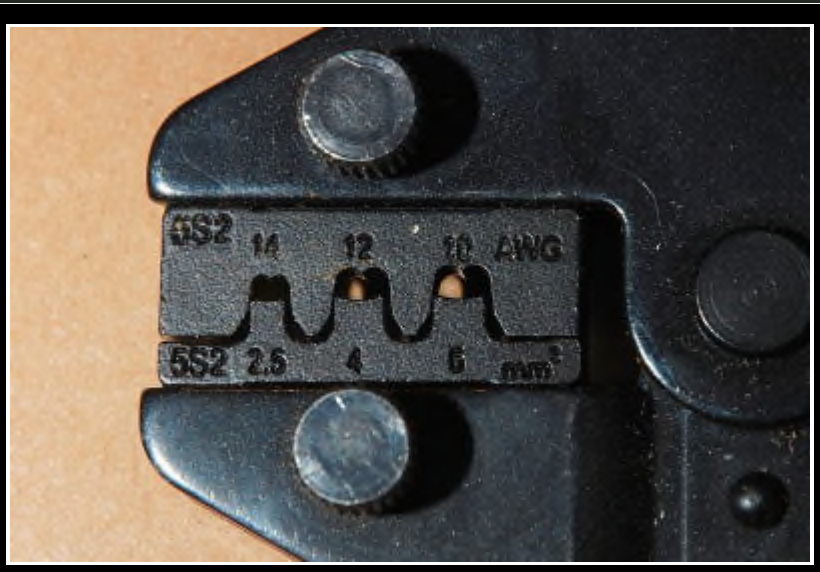
More Expensive D-Sub Tool

This is an F Type crimp die I can use for F / B type crimps of larger wire. It is used for D-Sub / F Type / B Type terminals. This die is for 14GA to 10GA but is shows the "butt cheeks" better than my die for 22-26GA does. On the top of the die just below the 14, 12, 10 is the little "dimple" that looks like butt cheeks. It is what "folds and rolls" a D-Sub style terminal over giving it a "double D" type profile.

This die is actually a double D-Sub which simultaneously rolls and forms the strain relief and crimps the bare wire.



Note: AMP and Molex interchangeably call this type of tool an F Type or B Type crimp. These terminals are not F or B type but this type of crimp tool works extremely well for this small gauge wire..

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Ring Terminals

These are the ring terminals I use for terminating small wires to bus bars. GPS power / NMEA 0183 cables, VHF communication wires, NEMA 0183 etc. etc. all bundle very small 22-26GA wire in these harnesses.

I find it neat, clean, reliable & strong to use this method for terminating these wires. Often out the other side of the bus bar you'll be using larger GA wires anyway and mating a 22GA wire to a 16GA or 14GA often proves trouble prone.

An external speaker for a Standard Horizon VHF would be a good example of an item that would really really suffer if you kept that wire at its small "harness" gauge. Install rings, wire them to a busbar and out the other side of the busbar increase the wire gauge. Simple enough...

The middle connector is my favorite for this task and it's made by 3M. 3M rates/labels this as 24-26GA, but it will just barely fit a 22GA AWG wire perfectly. The model number of these terminals is MU24-6K. They also make an MU24-8K. The "6" & "8" signify the ring size the "24" the nominal wire size..

If you are using a terminal strip with #6 screws buy the MU24-6K, if using a bus bar with #8 screws use the MU24-8K. I buy these locally from HR Distributors in Portland, ME...

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Crimp Dies & Terminals

This is another tool I could use for this task and is a better quality ratchet tool with modular dies. This one is a non-USA made Molex tool. This tool is still a notch below the USA made AMP or Molex tools I normally use, but also a lot less money. For this article all terminations were made with the less expensive GC Electronics 12-464 tool and I found it to make a very good crimp, especially for the money.

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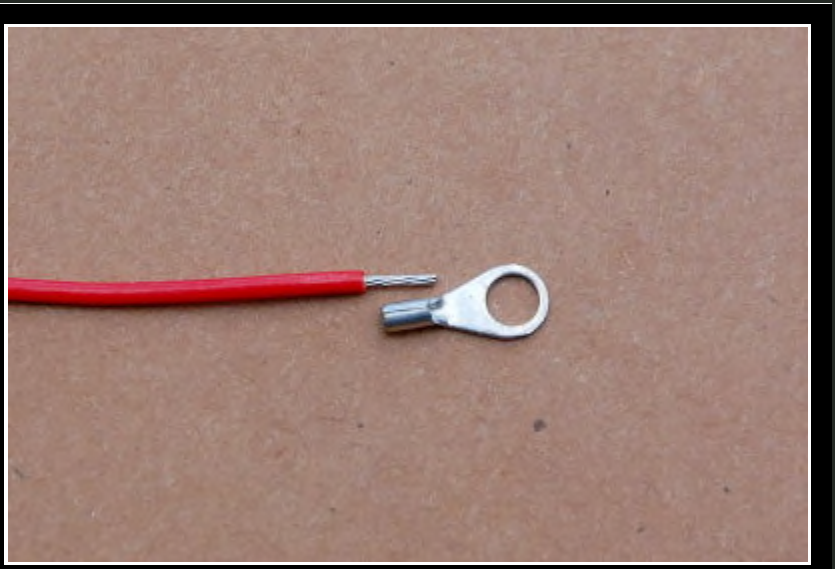
Strip The Wire

To begin strip the wire end. This is a little "long" so you want to trim it a bit. The 20-30GA stripper also has a good wire cutter on it.

You ideally want one wire diameters thickness protruding out the ring end of the terminal.



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Insert The Terminal

While these small uninsulated terminals are not technically D-Sub style I have found they perform best when crimped with a D-Sub crimp tool. Over the years I have tested these small terminals with piles of crimp tools and found the D-Sub style dies do the best job of any tool I have used.

To crimp these rings Insert with the seam facing the "butt cheek" dimple. I have done it both ways and this way holds best and the wire breaks before the crimp lets go.

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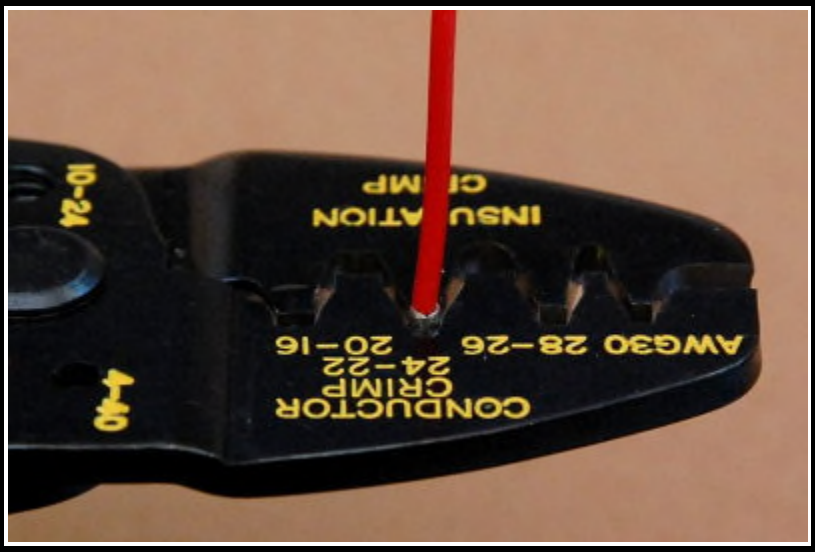
Insert The Stripped Wire

With the terminal in the tool insert the stripped wire and make the crimp.



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Crimp Top

Once the terminal has been crimped it should look like this.

You will notice a bit of wire sticking out the ring end and the "butt cheek" folds are even on both sides. If you don't get the dimple right over the seam the "butt cheeks" will be uneven and the termination will not be as strong. If you wear reading glasses I would suggest wearing them when working with these terminals...

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Crimp Bottom

Here's what the bottom side of the crimp will look like. You can see that the "crimp" is placed in the middle of the barrel and either end of the barrel has some overhang that remains uncrimped..

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Appreciate the tutorial and especially the identification of suitable tools. I think, in keeping with the miniaturization of yacht electronics, the next boat I buy will be one in a bottle. And after working with the small wires, it may well be a bottle of gin.

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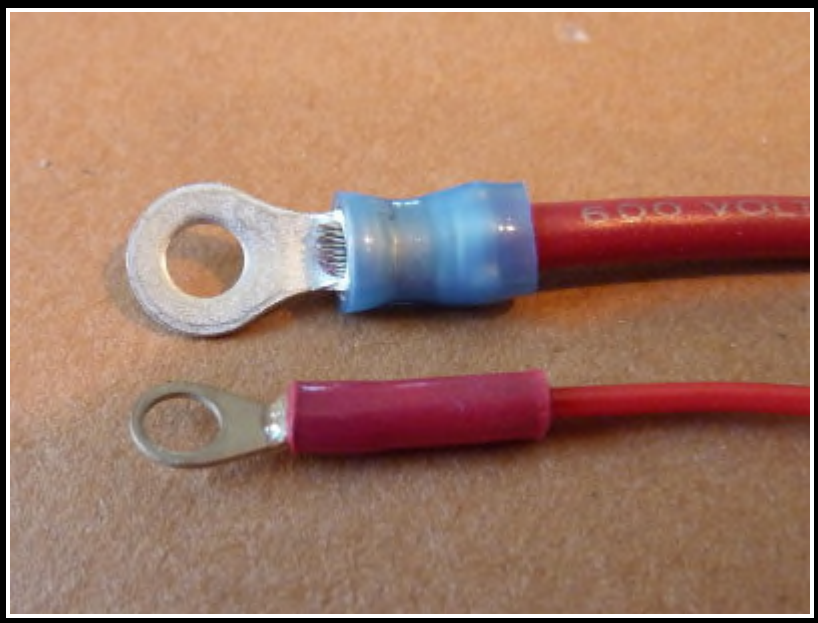

16GA Compared to 24GA

To give some perspective of the size wire we are dealing with in this article I placed a blue 14-16GA ring terminal terminated to 16GA wire next to this 24GA wire.

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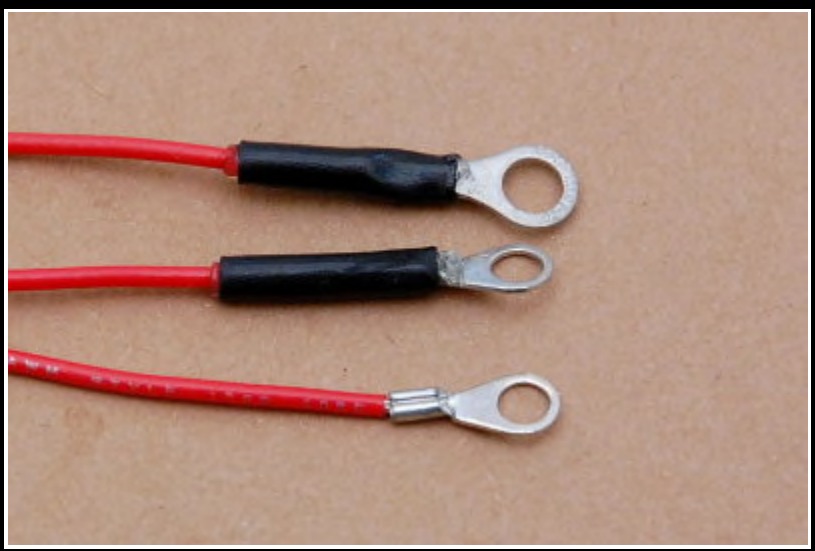
Three Ring Sizes

In this photo I have a #4, #6 & #8 ring terminal shown. Two of them have been strain relieved with dual wall adhesive lined heat shrink and the bottom one is how it comes out of the crimp tool.



The black shrink was only used for photographic contrast. Normally I would use red, as shown in the last photo, so as not to insinuate this red wire is a negative conductor.

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Dual Wall heat Shrink

Because these wires are so delicate I prefer to use a "dual wall" adhesive lined heat shrink as strain relief. I also use a 1/8" diameter so when it shrinks to fit a small wire it is a tad thicker than a smaller diameter shrink. This provides great strain relief and creates a water tight seal between wire and terminal.

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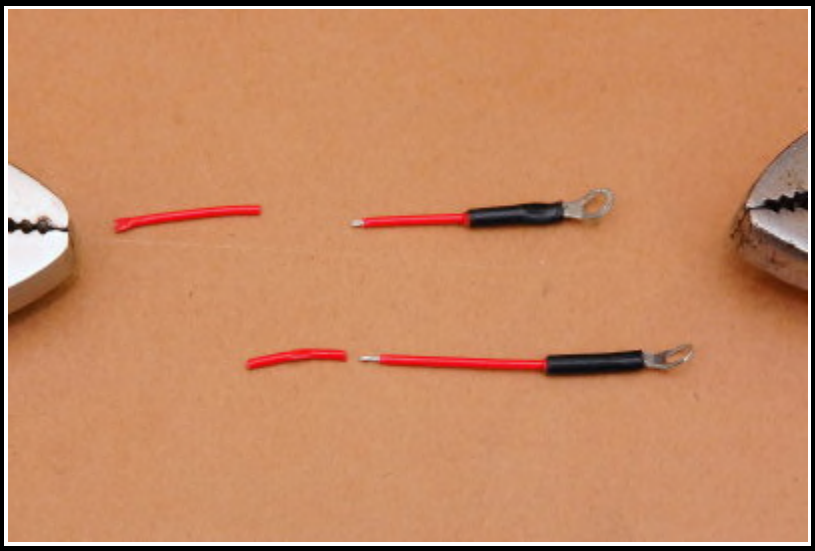
How Do They Fair..?

All the terminations in this article were made with the GC Electronics 12-464 D-Sub crimp tool.

The proof is always in how they perform. To test these two terminals I held the ring end with one pair of pliers and the wire end with another set of pliers. I then pulled. In both cases the wire failed right in the middle. The crimp held perfectly which is exactly what you want with these small terminals and wires.



Good luck with your project!

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