

Bob Eldridge, VE7BS
920 Erickson Road
RR2 Pemberton, BC
V0N 2L2
E: ve7bs@rac.ca

MORE ABOUT RG-6 CABLE

Discussion is still in progress on the problems arising from incorrect installation of F-connectors to RG-6 cable. Several participants on the Topband Reflector are or have been associated with the Cable TV industry and have waded in with their advice.

RG-6 is so widely used in Cable TV – and is so often discarded in what the industry regards as short lengths – it is obtainable by Radio Amateurs at very little cost. But you have to be careful how you install F-connectors. The shielding braid and foil being of aluminum, you can't solder it, so compression fitting is the norm.

The situation is complicated by the variety of shielding combinations – single, double, quad – and often the use of a metal-coated Mylar foil.

The latest round of discussion started with N4ZR reporting erratic R/Z values of a short length of RG-6 as displayed on an MFJ-259B meter, worsened when the cable was wiggled at the connector.

The ensuing responses to the question went back and forth, and I have done my best to clean out repetition.

QUA – A TOPICAL DIGEST

I have left in some indication of the professional experience of the authors of the postings, and you can use this to decide how valid you consider the advice to be. Most of it is verbatim, some is paraphrased. I have not always tried to insert quotation marks, but as usual, I remind you that I just pass these things on from selected sources.

So here goes...

First, this was the question from N4ZR:

"I'm having a repeated weird problem with compression F connectors on quad-shield RG-6. When I connect a short length (say 4 feet) of cable to my MFJ-259B, I would expect R>650. Instead, when I wiggle the coax, occasionally I see the display change to R=0 and X= several hundred ohms at 1.8 MHz. This makes no sense to me – the R implies a short, but where's all the X coming from?"

The first response was from W8JI:

"R doesn't come from a short, it comes from no loss resistance, or more correctly very low loss resistance. It sounds like the connector you have is not contacting all the shields. This is typical for mismatched connectors and cable, or improperly manufactured cables. It could be somewhere else also, but I've seen this before with quad shield.

Remember how RF current flows. It flows on the outside of cables, unless it has a connection path to the inner shield. If you have cable with Mylar on the inside of one or more shield layers, and a connector that only contacts the outside of the outer shield, the inner shields that carry nearly all of the desired transmission line currents will be insulated and isolated from the shield at the connector. Every shield has to be contacted at the connector, or at least the inner shield does.

This might not be it, but it is a common issue with quad shield. Dual shield is much more forgiving of connectors. You'll never detect the leakage in dual shield in outside runs. If you have nasty common mode problems, a thicker shield will help. It is also just as simple to add a few dozen or a few hundred ohms of common mode choking to regular dual shield cables and knock down CM ingress to levels that cannot be noticed.

BNC's are worse [than F connectors], as a general rule. They rely on spring pressure for the shield path. Look into a type match error between the cable you have and the connectors, or a connector installation error."

W8ZR commented:

There are different compression F connectors for ordinary RG-6 and for quad-shield RG-6. I use 'Ideal' brand connectors with matching compression tool, and there is a colour-coded band for the two types of cables (blue for RG-6 and black for quad-shield). It is not always easy to find the installation instructions, but for quad shield especially, it is very important to follow the directions so as to make sure the multiple aluminum foil and braided shields make appropriate contact at the connector.

The 'Ideal' blue-banded connectors for RG-6 are part number #89-055, and the black-banded ones for quad shield are #89-056. They both use compression tool #30-603. And another: I never have problems with F connectors. I buy quality Belden RG-6/U Quad Shield... as well as the right F connectors, and use a quality compression tool. There are several F connector sizes. The right one goes on the cable rather easily if it is stripped properly...."

And from W9RC:

"Belden has produced a 3 minute, 37 seconds video promoting their ProSNS line of Snap-N-Seal F connectors. Just run a search for 'Belden ProSNS'. A plastic guide tube helps to transition the prepared cable end into the connector. After full insertion, the guide tube pops out of the assembly and is discarded. That feature probably qualifies as one of those 'flash of genius' novelty ideas... Other YouTube videos show a similar braid flaring, especially when using quad-shield. But be suspicious of any information that does not come from the product's vendor. In quantities, these connectors are inexpensive enough to purchase from well-known industrial suppliers."

W8JI added:

"Be careful using any non-approved assembly method, or using improper connectors. Many cables (I'm not sure exactly what percentage, but I saw a lot of them) use aluminized Mylar to form the foil shield. You can usually see the Mylar on close inspection; it often is blue or a blue tint. This insulates one side of the foil.



**Canada's largest selection of
Wouxun & TYT radios
and accessories.**



TCA readers, order online
and save 5% with coupon code TCA2013

Fleetwood Digital Products
Web: <http://www.fleetwooddp.com>
Email: radio@fleetwooddp.com
Phone: (604) 800-4042



The shield that must have the best integrity at connectors is the shield just outside of the centre conductor. Nearly all shield current is on the inside of that shield. If you do not get a good solid connection to the INSIDE wall of that shield, the cable will have all sorts of issues. It doesn't matter how solid the outside shield connections are, because the innermost surface of the innermost shield does all of the real work.

The inner wall connection can be, and usually is, by conduction across the cut end of the shield. Say the inner shield is Mylar on the dielectric side, or bonded to the dielectric. The bare outside contacts the braid with pressure. The current just travels across the cut end edge (a very short path) to the inside of the inner shield.

If you do something to miss that good solid end connection to the inner foil edge, like folding a Mylar shield over so the blue side is out, the connection is by stray coupling over what can be a pretty long length of cable, adding many feet to the shield connection path. Or you might have no connection at all. Generally avoid quad shield, because the extra layers are unnecessary and can often cause connection problems. This is especially true outside with lightning and age.

While they do use tape foil shield cables, CATV systems rarely use quad shield cables. As a matter of fact I just bought a bunch of drop cable from a CATV system, and it is all single foil single braid. This is true for the drop, which has a messenger strand, and the house wiring, which is identical without a messenger strand.

And more from W8JI:

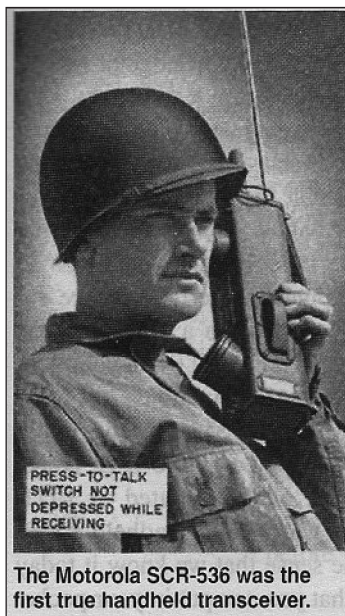
"In the late 70s and early 80s, I was a systems engineer at a company that had dozens of small cable systems. We inherited some systems near an FM/AM station that had a second harmonic on a local TV channel video frequency.

The former cable system operator had given up, after installing quad shield and all sorts of special cables. 100% of their problems were isolated power and CATV grounds, letting the AM signal loop through the system, and the quad shield developing poor connections letting the FM harmonic in. We ripped all that stuff out, and went with normal hardline and good quality drop cable, bonded the cable grounds to the entrance and breaker panels, and nearly 100% cured the system. We had a dumpster load of special cable that was nothing but connector headaches.

The standard drop cable is a bonded foil with single braid, it has been that way since the late 1970s. The current best grade is 'Brightwire' by CommScope. Any good cable will far exceed FCC specs without a quad shield.

Single-foil single-shield 'Brightwire' has over 120 dB of external shield current to centre conductor current isolation on 160 metres, and it gets better as you go up in frequency. I can't imagine anyone needing more than 80 dB isolation outside the house, and maybe 100 dB if it is in a noisy house. But if you feel you need quad cable, consider this: quad cable connector installation involves five specific steps, each performed carefully and correctly:

- 1) Use an RG-6 stripping tool to remove the jacket. Inspect the braid wires to be sure none of the wires are damaged. Never use a knife to remove the jacket; inevitably it will damage the fragile braid wires no matter how careful you are.
- 2) Carefully fold back only the outer braid and spread the braid wires evenly around the circumference of the cable jacket. Verify that no wires are broken. All of the braid wires should lay flat over the jacket, should not be more than a quarter-inch long, and should not be bunched up.
- 3) Remove the foil tape between the two braid shields. Do not use a knife to assist in foil tape removal. This step is time consuming and often ignored. The connector will be very difficult to install if the foil tape is not removed.
- 4) Carefully fold back the inner braid and spread the braid wires evenly around the circumference of the cable jacket. Verify that no wires are broken. All of the braid wires should lay flat over the jacket, should not be more than 1/4 inch long, and should not be bunched up.
- 5) Install the proper connector for quad shield cable. Be sure the connector is fully seated. If you need to use great force to mate the connector something is wrong. Either you used the wrong connector or the cable was improperly prepared. If somehow you manage to force the connector onto the cable, the connector will be intermittent and unreliable."



Improper connector installation is so pervasive in the cable TV industry that CommScope prepared an illustrated paper on improper connector installation: <http://docs.commscope.com/Public/ImproperQuadPrep.pdf>

RADIOS TO GO! Getting the most from your Handheld Transceiver

Written by Steve Ford, WB8IMY, and assisted by the ARRL publication staff, this book starts with the history of the term "HT" (short for "Handie Talkie", originally applied to the tube-equipped military SCR-536 and now a trademark jealously guarded by Motorola).

It goes on to discuss the things to consider when buying any handheld transceiver, single or multiband, especially the pros and cons of going for high power (5W or so) capability to receive signals outside the Amateur bands, whether analog or digital D-Star (for data).

Chapters are devoted to the care and feeding of batteries; to memories and common frequency offsets for the various bands; to programmed scanning; to CTCSS, DTMF and DCS; to IRLP and EchoLink; to antennas; to microphones and headsets; to sources of programming software; to APRS and satellites. Appendices cover bandplans for the bands from 28 MHz to 1300 MHz. ARRL #3077, US\$17.95.

ARDUINO AND PICAXE

Ham Radio for Arduino and Picaxe, from the ARRL and edited by WA5ZNU, is an interesting guide to experimenting with single-board microprocessors, mostly the open-source Arduino devices and software, Picaxe and ATtiny. It is a collection of specific projects, all described and explained in detail. Each one is self-contained, but many could be used as the basis for the creation of something bigger.

There are data loggers (including a thermic logger for voltage, HF and high temperature), CW-sending devices (including AXEKEY), an APRS iGate, a solar tracker, a talk timer, a DTMF Controlled SSTV Camera, a spectrum Waterfall, an SWR Scanner, several appendices on Argent and Arduino products.

This is a book for the technically inclined, but there are many "getting started" references for readers not yet deep into construction. From ARRL Order #3244, and from sources of ARRL publications US\$34.95.