The DX Magazine
TECHNICAL

In Re Coaxial Switches

Some Hands-On Observations of the Pros and Cons of Coaxial Switches, Including Some Personal Comments from YCCC Members

by Fred Hopengarten K1VR

If you'll take a careful look at the front cover of the January 1991 issue of *CQ* Magazine, you'll see a rack of 10 switches at K1EA. These are used to select whether an antenna goes to the left-hand station, or the right-hand station. Together, K1EA and K1VR own over 30 coax switches. Along the way, we've made some observations.

MFJ

In the course of building his station, Ken K1EA discovered that there are, in his opinion, several design and construction defects in the manufacture of MFJ model MFJ-1702 two-position coaxial switches. This opinion is also shared by our common friend and helper, Owen Gallagher (a Stratus engineer awaiting the "no code" era), a fellow who is very good at looking at questions which are a mixture of mechanical and RF issues.

√ When the switch is in the center, between detents, both positions are shorted to the centered, or all three ports are connected together. So one guy's transmitter can transmit into the other guy's receiver. The switch is a make before break.

√ They don't use ball bearings for the detent, as Daiwa does. Ball bearings provide a nice feel and snap to the switch.

√ The contact surfaces on the switch were not aligned. Every one was misaligned.

√ A number of the SO-239s were loose, so tightening a cable caused the contacts to rotate, and the switch didn't work at all.

√ The quality of soldering was lousy.

And there were more!

As a result, K1EA and K1VR buy Daiwa model CS-210 switches for two-way coax switching.

Daiwa

I purchased Model CS-201 switches, from Marty NB1H, at HRO's New Hampshire store, at a quantity 10 price of $24.95. They are used for switching antennas between the "run" station and the "multiplier" station. This is only a few dollars more than the comparable MFJ switch, and represents a reasonable value.

2/3 Position Switches

Manufacturer	Model	Positions	Max. Freq.	Power	VSWR	Com.Pos.
MFJ	1702B	2	500 MHz	2.5 KW	<1.2	Yes
Daiwa	CS-201	2	600 MHz	2.5 KW	<1.2	No
B&W	CS-3G	3	150 MHz	NA	<1.2	No
Alpha Delta	D-2	2	450 MHz	NA	NA	Yes

Comparison of 2/3 position coaxial switches. NA=not available; Com.Pos.=common position where input, and all antennas, are grounded. The Alpha Delta switch includes static discharge protection.

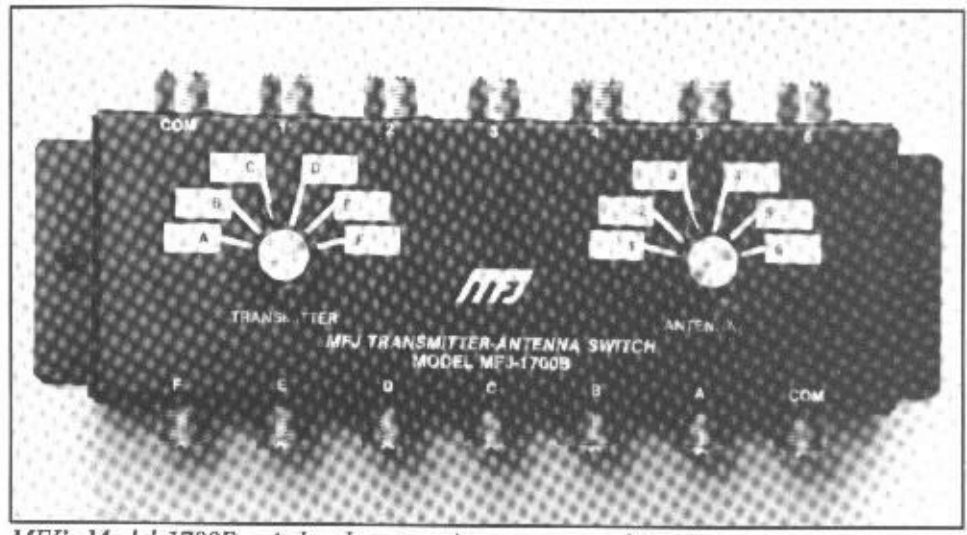
The only problem Ken and I have found with the Daiwa switches is that the SO-239 (female panel mount coax jack) has only four dimples. Using right-angle adapters to bring cables away from the switch may require some rearranging of cables, as a full circle of choices is not available.

Waters and B&W

These two brands are virtually identical in construction. Common elements include the use of wafer switches (no isolation). No center-off position. Unused antennas are not grounded. On the other hand, they use good Amphenol SO-239s, they are easy to mount, they come in five- and six-position models, they are relatively inexpensive, widely available, and they work just fine in most single-operator situations, if you can live without, or substitute another form of lighting protection.

Alpha Delta TM

At the 1989 Dayton HamVention, Ken Wolff K1EA and I wandered by the Alpha Delta booth, manned by Don Tyrell W8AD, the president and founder of Alpha Delta. (Yes, W8 Alpha Delta). He showed us a new switch that he was introducing, the Delta-4. It looked rugged. It looked safe. But most important, it looked like it had isolation. We each bought one, and put them "on the shelf."



MFJ's Model 1700B switches between six antennas and six rigs.

Along came the 1990 CQ World War CW Contest. K1EA moved up from multi-single to multi-multi, and I moved up from single-op to multi-single. Time to take the coax switches off the shelf and them into the fray.

At K1VR, in the multi-single category, it looks like I may have placed fourth in the USA. (Drat... I placed second in the ARRL DX CW.) I found that the switch sloshed. It had a non-crisp feeling. Sometimes I couldn't feel the detents well. It did however, work. But the loose, mushy feeling was a problem. On Tuesday, after the contest, I took a hard look at the situation.

The Delta-4 switch has a shaft that goes all the way through the body of the switch, and out the other side. I had the switch mounted hard against a piece of pine, in a specially constructed wooden switch rack. The problem was that the shaft wanted to stick out just a bit. Just a wee bit. But the pineboard pushed the shaft back in, causing the mushy feeling.

The fix was to put washers on each of the two screws between the pine and the switchplate, allowing space for the shaft to stick out the back (just a wee bit) without touching anything. In addition, I added one more washer straight up the shaft, to stabilize the switch. The problem is that that washer isn't sitting around a screw, so I'll probably have to

4/6 Position Switches

Manufacturer	Model	Positions	Max. Freq.	Power	VSWR	Com.Pos.
MFJ	1704	4	500 MHz	2.5 KW	<1.2	Yes
MFJ	1701	6	30 MHz	2 KW	NA	No
Daiwa	CS-401	4	800 MHz	2.5 KW	<1.2	No
B&W	CS-6G	6	150 MHz	NA	<1.2	No
Alpha Delta	D-4	4	450 MHz	NA	NA	Yes

Comparison of 4/6 position switches. Same notes as on page 10.

glue it to the back of case, a slightly awkward solution.

At K1EA, Ken's problem was substantially worse. ETO had loaned him a prototype Alpha 87A, RF sensing and automatically bandswitching, with no tune up, as it is microprocessor controlled. It is the model that they haven't released yet, but the were hoping for some good publicity. The amplifier had its software problems, frankly, but they seem to be working on those cures.

The Delta-4 switch just plain failed after a while, when K1AR (the CHOP, or Chief Operator for you youngsters) tried going into the far right (in this case, 80 meters) position. Toward the end of the contest, K1AR replaced the Delta-4 by screwing and unscrewing PL-259s.

Opening up the case, arcing was apparent. The switch had failed.

Without phoning, I sent the switch off to AD, UPS, with no "Return Authorization." I did enclose a cover letter explaining what had happened. Four business days later, probably the day he received it, I received a call on December 19, 1990 from Don Tyrell W8AD. The essence of his remarks follows.

"With respect to the shaft problem: Nothing like that has been brought to our attention so far. That was an error on our part though, so let me leave you with this thought. If anything happens and it fails, no matter when, I'll replace it with a brand-new one. My personal opinion is that if something was mismanufactured, we'll replace it no matter when.

"Early on, when we started manufacturing that switch, we used to cut those shafts ourselves. Now we have a spec, and the contractor manufacturer manufactures to that spec. In the early days, we could have cut one just a shade too long.

"On K1EA's switch: I've had a couple, but we've produced thousands. A couple came back for hot-switching, or in the case of the arc plug cartridge, if run at a high RF power level with the high SWR (2:1 or more). When the RF voltage and SWR voltage peak, the arc plug conducts and may produce an arc, because it thinks it has seen lightning. By the way, something happened in the rotating mechanism on Ken's switch too, so we'll replace it. I'm going to send K1EA's switch back to out contract manufacturer in Ohio for evaluation.

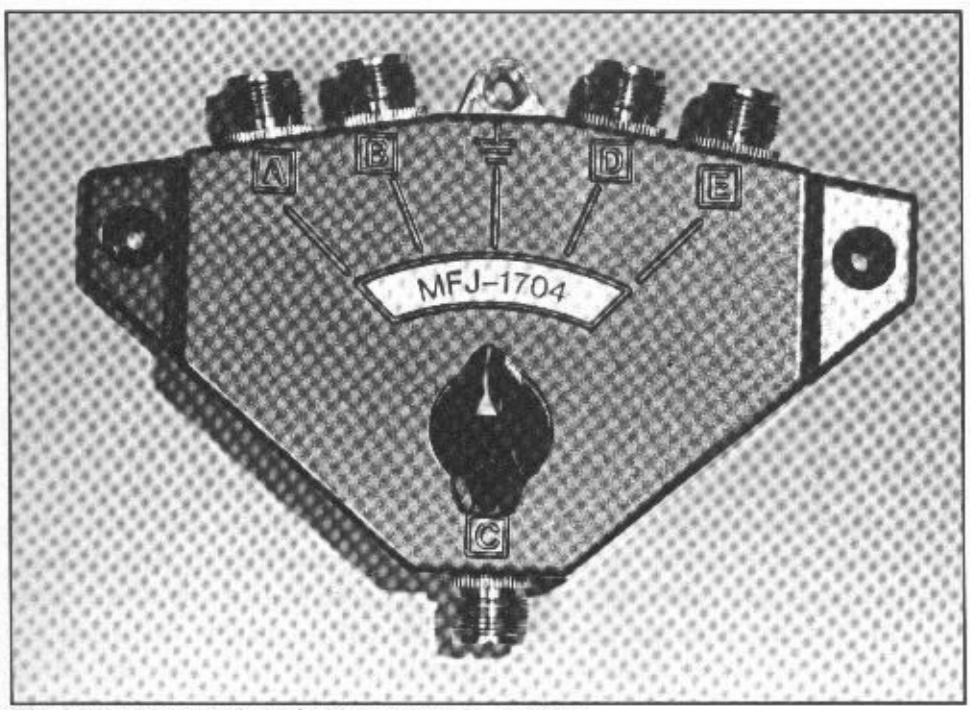
"We have a lot of Delta-4s in contest stations. The two-position version is a new switch, so there aren't as many out there yet. Of the Delta-4, we produce 3,000 per year, and they've been on the market for years. Probably we've had no more than 5-6 fail with an arcing problem. By the way, if you take out the gas pill, it will take more power, until you arc the Amphenol connector.

"Maybe that gas pill had the wrong breakdown voltage. Or, since you say it was specifically related to switching to the 80-meter antenna, it might have been a misaligned stripline. I'll check for that on template alignment. In any event, we'll get a new one out this week.

"I appreciate knowing these things, and your points are well taken. Thanks for your letter.

"The Delta-2 sells for around $49. It has center-off, cast-iron tracks, and a gas pill. The Daiwa two-way switch (which lacks those features) sells for around $29."

W8AD continues: "I used to use the Daiwa myself. I'm not a contester, but I do hang around DX pile-ups."



The MFJ-1704 switch includes a common position, which grounds the input as well as all output selections.

Conclusion

True to the word of W8AD, the replacement Delta-4 was received, by UPS from Arizona, January 7, 1991. In our view, Alpha Delta couldn't have been prompter or nicer. We are inclined to believe that the problems experienced were due to early production run problems.

It is an excellent idea to have a gas pill that acts as a fuse when lightning is present, dying for a cause. The basic concept for Alpha Delta switches is sound, the construction is sturdy, and

the protection provided to the station is valuable. I wish that Alpha Delta and Daiwa made a six-way switch (for six bands). Once lightning protection is achieved with the Alpha Delta switch, I am satisfied with the less-expensive Daiwa switches further down the same line.

Follow Up

After the above article appeared, several responses from YCCC members who use the YCCC PacketCluster® appeared in K1VR's electronic mailbox. As they are from sources usually considered reliable (journalistspeak), they are included below without further comment.

"You sparked my curiosity, so I opened up the two MFJ 1702 switches that I had on the shelf.

"Neither was make before break as Ken's was, but both of mine were different--one from the other--inside. The casting had been redesigned. The contact separation at break was greater by far in one than the other. I'm not sure which of mine was the older one, the blue or the green one.

"Both had misaligned contacts. Two of the six SO-239s were loose, but easily tightened with a set screw. One switch had SO-239s with four 'dimples,' the other with a 'normal' full set of dimples.

"The world still needs a more sensibly designed coax switch, with ease of mounting, and connectors in the rear!"

(s) Jack Schuster W1WEF

"I've been using an Alpha-Delta 4 for about a year. Power is 1500 Watts out at 75 Ohms, and sometimes a bit of SWR. No problems yet. Detents are sure. I chose it for the antenna center conductor grounding feature and the arc-plug. I guess earlier ones were back access to arc-plug and modern ones, like mine, are front access to the arc-plug.

"I also use a couple of Ameritron RCS-8V switches on the tower. They have served well. I use one of them for upper/lower/both switch on 20."

(s) John Kenny W1RR

"I have used a Daiwa CS-201 for 10 years to switch between two TX sources (transceiver and T-4XC) and the linear. In my present lash-up it is also used to select the transmit antenna, or a Beverage antenna for receiving on 80 and 160 (the Beverage is not used often).

"Note that infrequent use, as it may be related to the next comment. The only problem I have noticed is that when used as the receive antenna selector, the switch needs multiple action sometimes to 'clean the contacts,' or the very low level signals (especially on 160) are lost. Of course, I find the same thing in the bandswitch on the R-4C (when it leaves the 160 position once or twice a year).

"I have also used a B&W Model 376 (Protax®), five positions plus ground-all position, rotary switch for 10-12 years. For 5 years it has been used only to select between a dummy load, the 80-meter verticals, or the remote Ameritron RCS-8V switch up the tower. I have only two comments relative to the B&W Model 376:

"1) While still at my prior location, when it selected all antennas/dummy load, I once worked CE3ZM on 15 or 20 SSB with my dummy load. Obviously the isolation on the switch is poor, or my Heathkit dummy load can replace my Hy-Gain 205-BA!

"2) When I had some water come down the coax from the 160 dipole that K1VR launched into my Sudbury trees in 1982 (note: I built the dipole), the switch dripped some rusty water onto the shack floor. Haven't touched it since.

"I also have a Daiwa CS-401 that is still in the box, and has never been used. I can only comment that it appears to have a very good shelf life. It has been on the shelf 7 years, and still looks the same."

(s) Jim Dionne K1MEM

Jim Dionne K1MEM handles CQ Magazine's Worked All Zone awards, when he's not writing about coaxial switches.

[Copyright 1990 by Fred Hopengarten K1VR. This article first appeared in the January, 1991 issue of YCCC Scuttlebutt, *the newsletter of the Yankee Clipper Contest Club, Paul Young K1XM editor.]*