Below is information I acquired from a refurbishment of my A3 7 years ago.

73,

Dale Martin

kg5u@hal-pc.org

http://www.hal-pc.org

Martin Ellis <jmellis@ihug.co.NZ> wrote in article

<328BDA25.6275@ihug.co.nz>…

> Subject: Re: How to test traps

> Date: Fri, 15 Nov 1996 11:20:57 +1300

> From: Martin Ellis <jmellis@ihug.co.nz>

> To: KJ4WH <grpowell@gate.net>

> CC: Ham-Ant@USCD.EDU

>

>

> > > From: KJ4WH <grpowell@gate.net>

> > > How to test yagi traps for Cushcraft A4 **********

> > > Can anyone tell me how to test the trap to see if it is indeed bad?

> > > Or, … do you have any other ideas on the cause?

> > > Gary Powell N4DL

>

Gary,

The week prior to ARRL SS CW Contest, I refurbished an old

A3 tribander. While it is not an A4, it uses the same or similar

traps.

I received a note from Cushcraft in response to a query I sent

them asking about the trap frequencies and a price list for

parts for the A3.

I needed to replace an element segment, all the hose clamps (they were not stainless), and all the trap end caps.

I also had a high swr on 20m for the last few years. And recently, 10m swr went high. So I bought a new A3S and brought down the old one.

I marked all the element segments and traps (d1, d2, d3, etc…de1, de2, de3, etc…r1, r2, r3, etc….) with a big felt-tip pen.

I took all the element segments off the beam down to to the center director, driven element and reflector element segments.

To remove the old, rusted hose clamps, I simply twisted the screw housings off with a pair of channel locks. It did no damage to the element segments.

I removed all the end caps from the traps.

I cleaned/burnished all the element segment joints.

I used an old B&W Model 600 Dip Oscillator to check resonance of all the traps. The 600 is a fine piece of equipment, but the resolution of the dial for determing the real resonant frequency is not that great. However, as long as the resonant frequency was in the ballpark, I was happy.

I used a couple of 2x4's to fix and maintain the position of the

traps as I checked them with the dip oscillator. Once I made a couple of measurements, I put some masking tape down on the table to mark the position of the 600. Essentially, it was simply a matter of pointing the 600 coil end to end with the end of the trap element segment away from the screw attachment end. As long as the paired traps were in the same ballpark resonant frequency range, I was happy.

I found one trap that had no resonant point. I checked the resistance of the trap (end trap element segment to end trap element segment). Open.

Next, I unscrewed the attachment screw. Using the procedure described below, I removed the trap cover. The trap element section consists of short piece of aluminum tubing, a length of fiberglas insulator, and another piece of aluminum tubing. The trap coil is wrapped on the insulator with the coil ends attached to the respective tubing piece with a sheetmetal screw.

Once the trap was free of the trap cover, I scrapped away a bit of the wire insulation of the coil and measured resistance between it and each end of the trap element segment to see which end was open. I removed the appropriate attachment screw, cleaned the aluminum element segment at the screw hole, cleaned the trap wire loop, reseated the screw, and checked the resistance. It was okay.

Ultimately, I removed all the covers of the traps to clean out any insect infestation (found only one, but it wasn't bad at all)--I am not sure how much stock to take in what I hear about insects infesting antennas anymore. I have birds resting on my beam, wasps

flying around the tower all the time, and I only found a bit of an infestation in one trap. Not bad!

What I did find was that some of the trap spacers were pretty eroded by something. I am ordering some replacements to put in the next time I work on the antenna.

Once I received the parts I had ordered from Cushcraft, it was a snap putting the antenna back together. I set element lengths for the CW portions of the bands. When it was raised to the 40' level of my 70' tower and mounted on the side of the tower pointing NW, I ran an SWR check and it was flat in the CW portion of the three bands. Great!

While lowering the antenna to the ground, we had let the reflector end element segment stab the ground and bend. When I went to remove it from the rest of the antenna, it broke away very easily. I near the break, but not part of it, I found a 3/8" hole burned in the the tubing. About four years ago, the house suffered what I thought then was a near lightning strike. I had lost a bunch of household equipment and ham equipment. I thought it was a near hit. I lost 2 TNC's, a TR-7845, a 286 computer, a terminal used for packetcluster work, garage door opener, a-c/heater controller, television, and phone answering machine.

Everything else (TS-930, rotator, wattmeter/SWR meter--both of which were connected to the antenna at the time of the strike--stereo, VCR's, clock radios, kitchen appliances, washer/dryer, etc.) was just fine. Lightning is strange stuff.

==========

Here's a message Cushcraft sent me about troubleshooting their antennas.

==========

Adjusting the Antenna

The suggested element lengths will be correct for most installations. The local environment may shift the point of best VSWR. In this situation you may improve VSWR for a specific frequency by making equal length adjustments on each side of the center of the driven element.

To adjust the highest frequency band adjust the tubing length between the center of the element and the first trap on the element. To adjust a center frequency band adjust the spacing between the trap for that band and the next higher frequency trap.

To adjust the lowest frequency band adjust the length of tubing beyond the lowest frequency trap.

If you have a yagi adjust the driven element only. Leave the reflector and director elements set to the suggested lengths.

Troubles in the Antenna

If you fail to get a good VSWR on one band there are three possible problems: One is that a trap is bad or mis-tuned. Another is that nearby metal or other antennas have de-tuned the antenna. The third is that a length of tubing section

has changed possibly due to loose clamps.

First verify that all element lengths are correct and if you have a yagi make sure that the element spacing is correct. If the reflector and director spacings are swapped it will have a serious effect on the impedance of the antenna. Rotate the antenna and check VSWR at different azimuth headings. Any variation in the VSWR is an indication that nearby guy wires or other antennas are having an effect on the tuning of the antenna.

A trap is a high Q parallel resonant circuit. If the next lower frequency does not work then a coil may be open. Do not try to take a trap apart since this will void the warranty. The balance between inductance and capacitance is critical and requires special equipment to assure proper adjustment. Refer to the trap troubleshooting section for checking individual traps.

VSWR changes with weather

Ice or heavy snow tat sticks to the elements and traps will cause the resonant frequency to shift lower since the radiator will appear to be fatter. If you antenna is close to the ground the effect of more conductive soil during wet weather will shift the resonant frequency lower due to capacitive loading. Any cracked or torn plastic caps will allow moisture to ingress thus affecting the resonant frequency of the traps. Putting any type of a sealant on the butt end of the traps will likely de-tune them and create

voltage breakdown problems since the outer end of a trap is a high voltage point.

VSWR Changes with Power

If VSWR varies with power level on one or more bands the problem may be in the VSWR bridge (or harmonic content of your PA). There can be a non-linear variation of diode action at different power settings. This is common with inexpensive bridges. It is possible to overload a diode in the forward power mode. The diode is now on a different slope of the curve in relation to the reflected power diode which is not overloaded. The end result is that your VSWR will apparently increase when you go from low to high power. Example: 1.1:1 at 50 watts, 1.4:1 at 800 watts. Observe VSWR as you slowly increase power. If VSWR slowly increases you may be overloading your bridge. If you see a large jump in VSWR at a specific power level, not related to a slow increase in power, you have voltage breakdown

troubles with your antenna system. Causes: Poor or intermittent connection in coax or connection in a trap. High voltage breakdown in a trap can be detected by sniffing the end cap to determine if it has burned.

VSWR too high on one or more bands
Mistake in assembly or a defective trap. See trap troubleshooting. Look for a trap in backwards. Look into tubing at each end of the trap. The end where the self-tapping screw threads are visible is the end that should be closest to the boom.

Trap Troubleshooting

The traps are a very robust unit that should not require any attention. Amateur power levels should not be capable of damaging the coils or causing arcing under peak power conditions. Therefore trap problems will usually be traced to mechanical faults that are easily corrected.

The first step you should take when you suspect a problem is to locate the antenna so that you can work on it easily. For safety's sake it is a good idea to have both your feet on the ground. (the traps should be marked before removal so that proper reassembly is assured).

Check each trap to insure that the cover is tightly secured. The cover is the 1-5/8" tubing between the two large black end caps. Any movement of this cover will cause an intermittent VSWR condition on the antenna. You may easily test for a loose cover while the antenna is still assembled. Grasp the cover in one hand and the trap tubing in the other hand, apply a moderate amount of pressure first in a clockwise and then a counterclockwise direction about the axis of the element. If the cover slips even a small amount it will require tightening. Remove the black cap from the trap on the side towards the boom of the antenna. A hex head screw will then be visible underneath. Tighten the screw with an appropriate screwdriver or nut driver. Be careful not to apply so much force as to strip out the sheetmetal screw. If the hole is already stripped, or gets stripped accidentally, it is an easy matter to be fixed by substituting a #10 3/8" or 1/2" self-tapping screw into the enlarged hole.

If all your traps pass the mechanical test and seem to be installed properly, then a frequency check is in order. (The traps should be marked before removal so that proper reassembly is assured.)

Place a trap on an insulated surface (such as a large cardboard box) and couple a dip oscillator to it as shown. Make sure to couple it to the end of the trap that was closest to the boom, the end of the trap that was self-tapping treads visible inside the tubing. Insert the tip of the dip oscillator coil slightly into the tubing. When a dip is found pull the oscillator coil out of the end of the trap slightly and re-dip the oscillator. Continue to pull the dip oscillator coil out of the tubing and re-dip until you have the smallest perceptible dip. It should be noted that the dip meter frequency is lower than the operational frequency of the trap. This is caused because the trap will load the dip oscillator and lower its frequency.

TRAP	Oper Freq.	Dip Osc Freq.
TA	28.60	27.50
TB	21.50	20.39
TC	21.30	20.20
TD	28.00	27.00
TE	28.80	27.60
TL	24.90	24.15
TM	18.11	17.29
TN	21.30	20.20

TK 14.18 12.62

You should use the listed oscillator frequencies as a guide.
Temperature and humidity can have a +/- 100KHz effect on traps.
If the readings are within 200KHz of the listed amounts, do not
worry, the effect upon the assembled antenna will be minimal.
Shorted turns or other serious defects will cause wide shifts
from the norm. One or two megahertz is a definite indication
of a defective trap. If you find such a trap, do not attempt
to repair it yourself as this would void the warranty. All
coils are sealed and are difficult to repair properly. When
all traps are checked and corrected, reinstall them in the
proper order and your antenna is now ready for action.

==========

Here's a note a friend forwarded to me on how to work on the traps.

==========

Subj.: A3S Biting Partial Dust

Date: 95-08=15 19:50:30 EDT

From: CARLO2@MACCVM.CORP.MOT.COM (Brian McGinness)

Sender: owner-cq-contest@tgv.com

Reply-to: CARLO2@MACCVM.CORP.MOT.COM (Brian McGinness)

To:

To: CQ-CONTEST@tgv.com

Hi Ward. I could not reply directly because you did not give

your email address at the end. Some of us out here are still on ancient mainframe e-mail systems! Hi.

Your traps can be both tested and repaired quite easily. To test them you need a functioning grid-dip-meter or an MFJ antenna analyzer with their grid-dip antenna for it.

I have found the best way to couple to the trap using the MFJ is to slide the stubby antenna inside the inner trap tube, and hold the whole thing up in the air on the end of the analyzer so other objects do not influence it. Then you will see a SLIGHT dip in the SWR at the resonant freq of the trap. It is a very slight, hardly noticeable dip depending on how well you are coupled. I suspect the dip is easier to see using a real grid-dip meter.

I don't have the exact trap frequencies with me, but the inner 10 meter trap should dip around 27.5 (plus or minus a few hundred kc, it is not critical) and the outer 15 meter trap should have a dip around 20.3 or so, if I remember correctly.

No doubt all your traps are full of bug stuff. Actually, in spite of what Cushcraft says, they are easy to open and repair. To open them, remove the end caps. Then loosen the single cover screw, and slide the center tube up inside the trap as far as it will go (away from the screw end). Then stick the HANDLE of a rubber mallet or hammer into the trap past where the screw went, and tap the trap down against the hammer to use the handle to drive the end insulator out of the side that is not screwed in. That will generate enough force to slip the

insulator past the points in the cover that are center punched to hold the trap together. Do no try to pry the insulators out, it will not work, they have to be driven out with force. To reassemble, tap the insulator back into the trap cover with a rubber mallet.

While inside the trap, check for corrosion at the screw terminals and the trap inductor, and clean any debris and scorched areas.

YOUR RESULTS MAY VARY!!! Work carefully with them, and you can fix them yourself, although it does take the proper touch.

Good luck and 73,

Brian

WA3WJD

carlo2@maccvm.corp.mot.com

==========