- Yagi Troubleshooting Guide -

The Most Common Problems

(Read this First!)

- The antenna is out of calibration, perform the calibration as described in the manual.
- The factory defaults have been inadvertently changed, reset factory defaults "all". There are two default modes, "all" and "current". "Current" only resets the band segment you are currently on.
- The control cable is mis-wired.
- Interaction between power lines, other antennas, metal roofs, house wiring, gutters, etc, and the antenna.
- The automatic tuner is enabled on your rig, your linear or your external tuner that is in line.
- Your antenna selector is on the wrong antenna
- Your rig is in the split mode and worse case, to a different band!
- A low pass filter is in line and 6 meters has very high SWR.
- Your in-line linear has a transmit / receive switch some of which may be poorly designed or faulty. This can make the SWR give incorrect higher readings. Remove as many things in-line on the coax as possible so you get a more accurate SWR reading.
- Low cost SWR meters, especially those built into transceivers, can give incorrect readings, both higher and lower than reality. They also can be drastically affected by the length of the coax line. Removing a few feet of line can cause drastic differences in the reading ranging from 10% to as much as 100% ! Directional couplers such as the Bird watt meter or antenna analyzers are much more reliable. Make sure you really have a problem before you hit the panic button.
- Blown driver board from shorting the control cable with power plugged into the controller. Even with the power button pushed "off" the cable is energized.
- Broken or damaged control cable or connector. See Cable Problems section.
- Bad coax or coax connector. We have seen bad coax that an analyzer said was good. Substitution is the sure way.
- Damaged driver board is pulling power supply voltage down causing the microprocessor to malfunction. Check to see if the green LED is lit on power supply
- **Ground the controller**, this prevents crashes of the microprocessor and provides a path for static discharge.
- The rubber plugs that were installed in the telescoping poles for shipping and handling purposes were not removed.
- PL-259 was not tightened with PLIERS – Do NOT trust your fingers – This is a common problem
- Miswire causing the stepper motor on one or more elements to run backwards.

GENERAL:

Be aware that just because the controller display says an element is a certain length there is no guarantee that it is, the motor could be running backwards due to a miswire, the element could have mechanical problems, or a broken wire in the control cable (the motor will run with only one winding driven in some cases) or a faulty driver board. The controller runs open loop and has no way of knowing if the element is really moving**.** The motors in the elements make three distinct noises:

1. A ratcheting sound lasting 1 – 2 seconds at the start and finish of the motor running. This is the rpm ramp-up the stepper motors require and is normal.

2. A smooth whirring sound indicating normal operation.

3. A loud rattling sound that sounds like gears slipping indicates the stepper is stalling. This occurs during the middle portion of a "calibrate" with the smooth running sound before and after it and is normal. Any other time (even for brief durations) this noise indicates unwanted stalling of the motor and should be investigated.

Check the resistance with an ohmmeter between the center conductor and ground of the coax connected to the antenna, it should read zero ohms.

HIGH SWR:

Whenever the antenna has a problem you will most likely observe higher than expected SWR. However, this is not always the case, as there are many situations where the SWR looks good but one element on the antenna may not be working at all. This is what makes it so difficult to diagnose problems and why we emphasis **building and wiring the antenna carefully**. In our experience an SWR of 1.4:1 or less is normal. In most cases the lowest SWR will not be at the same frequency as the best performance. This is because we have optimized the antenna for performance first, SWR second.

If the problem is with the driven element the SWR can be very high (over 3:1 and as high as 10:1). If the problem is with a passive element the SWR will not be over about 3:1 no matter how far off the passive element is.

INTERACTION PROBLEMS:

The most common reason for higher than expected or shifted SWR is unexpected interactions. Usually only one or two bands are affected but not always and the antenna will probably have reasonable gain and front to back. It is important to take good notes so if you need to call us we can do a better job of helping you. Record the SWR on each band and each direction mode at least one place in the band, this is a good idea anyway so you can assess the health of your antenna over time. Rotate the antenna and look for changes in SWR greater than .2 or so, this indicates interaction if it changes very much. The usual culprits are slopers, other nearby antennas, gutters, power lines, house wiring, metallic guy wires, etc. If the SWR is not too high you can "tune" it out by using the "Create, Modify" mode to adjust **only the driven element** for best SWR and save it as described in the manual. Don't adjust the passive elements to improve SWR it will degrade the performance. Adjusting the driven element won't. Otherwise you will need to change your installation to reduce the interaction to an acceptable level.

CABLE PROBLEMS:

The control cable uses 4 wires per motor (one motor in each element housing). Each motor has two wires for each of its two motor windings. This test assumes the antenna is connected to one end of the control cable and the measurements are taken at the 25-pin connector that mates to the controller. You need a ohmmeter capable of measuring 15 – 35 ohms with reasonable resolution or at least one that you can tell the difference between a dead short and 15 ohms. Remove the 25-pin subD control cable connector from the controller. Hold it so you are looking at the pins with them pointing at you. Orient the connector so the row with 13 pins is on top, now the upper left-hand pin is pin 1. You should read between about 18 ohms to 30 ohms depending on cable length between the pins listed below. (100' is about 23 ohms)

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The Dipole: (has a driven only)

	Pin Numbers		
Driven	1 – 2	20 ohms	(approximately)
	3 – 4	20 ohms	

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The 2 Element: (has a driven & director)

	Pin Numbers		
Driven	1 – 2	20 ohms	(approximately)
	3 – 4	20 ohms	
Director	5 – 6	20 ohms	
	7 – 8	20 ohms	

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The 3 Element: (has a driven, director & reflector)

	Pin Numbers		
Driven	1 – 2	20 ohms	(approximately)
	3 – 4	20 ohms	
Director	5 – 6	20 ohms	
	7 – 8	20 ohms	
Reflector	9 – 10	20 ohms	
	11 – 12	20 ohms	

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The 4 Element & MonstIR: (have a driven, director 1, director 2 & reflector)

	Pin Numbers	
Driven	1 – 2	20 ohms (approximately)
	3 – 4	20 ohms
Director 1	5 – 6	20 ohms
	7 – 8	20 ohms
Reflector	9 – 10	20 ohms
	11 – 12	20 ohms
Director 2	14 – 15	20 ohms
	16 – 17	20 ohms

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Next make sure there is an open circuit between the following pins. (Any reading < 100 K ohms is bad)

- Connector case to any pin
- pin 1 to any pin except pin 2
- pin 3 to any pin except pin 4
- pin 5 to any pin except pin 6
- pin 7 to any pin except pin 8
- pin 9 to any pin except pin 10
- pin 11 to any pin except pin 12
- pin 14 to any pin except pin 15
- pin 16 to any pin except pin 17
- pin 13 is NOT used

If your antenna passes this test it **does not** mean it is wired correctly. You could still have swapped two elements or even wired the whole thing backwards (started at the wrong end of the terminal strip) and it will still measure correctly because each connector pair has a motor winding connected to it but it is the wrong one. This test just takes you to the next step of trying to determine if the antenna is wired correctly and then finally determining if the elements are physically moving. This is an open loop system and the controller has no way of knowing if the elements are really moving when commanded to.

MISWIRED CABLE:

It can be a difficult to figure out what exactly has been miswired. Once you have determined it is likely you have a miswire it is advisable to go up on the tower and check the terminal wiring. Since there are many combinations of incorrect wiring we will give just a few examples of common miswires and the symptoms they cause.

- **Two or More Elements are Swapped:**

This is easy to do if you don't mark the 4 conductor cables before you tape them along the boom. The SWR will usually be high on every band. Often by changing the controller frequency, while keeping the transmit frequency fixed, the SWR may go quite low at a higher or lower controller frequency. In any case of SWR problems don't be surprised if the SWR is okay when you switch to the 180 degree mode. If it isn't good in the forward mode you have a problem.

- **If you Suspect Elements are Swapped:**

First try to identify which one is the driven element. You can identify the driven element easily because it has a much greater effect on SWR than the passives do. The driven element is also very easy to identify by retracting all of the elements and then use "Create, Modify" to extend each element individually until signals are heard in the receiver. Obviously you will only hear signals when the driven element is extended. The best way to determine if the passives are switched is to point the antenna in the normal mode at a station you know the location of and then switch the antenna to 180-degree mode, if he gets stronger you probably have switched the passives. If it seems like they are switched you can use "Create, Modify" mode to "swap" the elements back by first recording what the controller says each one should be and then go put the reflector length into the director and vice-versa for the director. If the antenna now works normally you have swapped the cables of the two passives and will need to correct the wiring.

- **One or More Elements are not Moving:**

If the driven is not moving you will have very high SWR at all frequencies. However, it may have stopped at some length and you might have good SWR only at one particular frequency. Set the controller to 14.200 Mhz and monitor the SWR at that frequency. Next go into the "Create, Modify " mode and vary each element length and monitor the SWR while you do it (100 watts or less is okay) and watch for dramatic changes (.5 SWR change, minimum). When you adjust the driven element driven you should be able to get an SWR of 5:1 or greater. Always return the element you have just tested to its original length before testing the next one. The passive elements can only cause an SWR of 3.5:1 maximum no matter what length you make them. Adjust the passive elements from minimum length to maximum length and you should see at least a .5 change at some point. When the passive element is near the length of the driven element interaction is the greatest and you should see very noticeable change in SWR. You will find that Director 2 (on 4 element models) has much less of an affect on the SWR because it is so far away from the driven element, but you should still see at least a .4 change in the SWR reading. A classic symptom of one passive element not moving is a high SWR in the normal direction and a markedly better SWR in the 180 direction.

If any element does not affect the SWR the cause is one of the following:

- Bad or intermittent cable, check it again.
- Damaged driver board in the controller
- Mechanical problem with the element

Be aware that lightning or shorting the cable can partially disable a driver chip and it will still limp along moving the tape but you will see inconsistent SWR when changing from band to band.

Mechanical problems can range from an obstruction in the element, usually in the tip, such as packing material or in rare cases fiberglass bumps or imperfections. We check this by running a gage in the tip but once in a great while that doesn't catch it. **DO NOT ever tape or block the end of the element tip, water can collect and freezing can cause a blockage or trap the element.** The foam plug must be left in the tip so wind driven rain and bugs are kept out but the element can breathe.

- **Stepper Motor Running Backwards:**

A simple miswire can cause one or more element stepper motors to run backwards. Simply swapping the Black and Red wires or the Green and White in the 4 conductor cable will cause the motor to run backwards. If both pairs get swapped the motor will run normally.

	Motor Runs:	Motor Doesn't Runs:
o-------- Black o-------- Red o-------- Green o-------- White	**Normal**	o-------- Black o-------- Green o-------- Red o-------- White	**Driver Board Damaged**
o-------- Red o-------- Black o-------- Green o-------- White	**Backwards**	**Any** combination of **Black** to anything but **Red** or **Red** to anything but **Black** and: **Driver Board Damaged**
o-------- White o-------- Green o-------- Red o-------- Black	**Backwards**	**Any** combination of **White** to anything but **Green** or **Green** to anything but **White** and: **Driver Board Damaged**
o-------- Red o-------- Black o-------- White o-------- Green	**Normal**	

If the driven is backwards when you first command the antenna to go to a specific band the driven tries to go in (retract) and it can't so you hear nothing (unless it is an S9 + ++ signal) and the SWR will be **very** high. If you retract or go to a higher band the driven will start going out and you will hear signals and band noise. The SWR will probably be terrible but with a little imagination you can see that you might hit some combination where the SWR looks good, so this type of miswire can be very confusing.

The driven is the easiest to diagnose in this case. Passives are a little tougher. Run the element you want to test all the way out then all the way in using the "Create Modify" function and carefully look for a good SWR (use zoom for this test). If a director starts working at 4.5" or at very short lengths you can be sure that motor is running backwards.