Siltronix Swan 1011 Transceiver, Carrier Oscillator Alignment.

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I will assume you have received a Siltronix or Swan 1011 Transceiver, which probably requires alignment of the internal carrier oscillators. Improper adjustment of these two oscillators will make the radio pretty much unusable. The most common cause of trimmer capacitor miss-adjustment is the result of a visit by the "golden screwdriver hack tech."

Typical Symptoms: Very poor or restricted audio during receiver operation. Poor or distorted transmit audio, power output erratic and uncontrolled mode operation. IE tune, load, power and mic gain adjustments don't function as expected or described in the manual.

You will need to understand what a typical modulated AM Radio "Signal" looks like on a spectral display or paper graph. This common graph is often shown depicted in ARRL and "W6SAI Radio" Handbooks as a centered carrier signal peak (up from a bottom graph baseline), with at least two smaller sideband peaks, one to each side of the center carrier. The two sideband peaks contain the voice information. Just to follow through, I'll mention that only one sideband is required for communications as the voice information in both the Upper & Lower Sidebands is the same. Hence the communications mode labeled Single Side Band (SSB).

Looking at figure 5, page 15 of the Siltronix Owners Manual, a similar type of spectral display is shown. It just happens to be the very important graph of the transceiver crystal filter response. Note the horizontal "X-axis" shows the spectral (frequency) "bandwidth" and the vertical "Y-axis" displays the (amount) "response" above or below a base line. A spectral display/graph of an AM Carrier would be very similar to figure 5, the X-Y scale values would be different and a zero base line would be at the bottom. Add a bit more width to the figure 5 graphic along with the two sideband "peaks", one on each side and you've pretty much got an idea of what the classic modulated AM waveform should look like.

After all that is said and done, I want to bring up a few points that are the focus of the alignment. The carrier may be shown with some measure/value of horizontal width to its peak, which is not a big concern now. The width of the two sidebands, are of great interest, of which you need to know or assume their values. For the rest of this text, assume the width to be the standard HF radio SSB bandwidth of about 3Khz (kilohertz) per sideband. In typical SSB Radio operation, each sideband will be about 3KHz in width ("wide"). A complete AM signal has both 3Khz sidebands (although only one is required), and the carrier, which is given a typical "high fidelity" 10Khz bandwidth. One can remove a sideband and use only 6Khz bandwidth with the same results.

The Siltronix Swan 1011 produces an AM mode waveform of only one sideband and the carrier using the internal 6Khz wide crystal filter. It's an efficient and simple method to produce AM mode operation in this type of radio. Since SSB has a smaller bandwidth requirement, it uses the same crystal filter.

The goal of the carrier oscillator alignment is to properly position the internal generated "AM signal" in front of the crystal filter window. The crystal filter will then remove the at least one sideband (in the am mode) along with the carrier (in any one of the sideband modes. The just above text says it all and is well worth reading again.

How to do the "rough" basic oscillator alignment:
You will need a quality wattmeter and a dummy load (termination) that can handle at least 40 watts constant power (100% duty cycle), a set of the proper size plastic shaft adjustment screwdrivers, which fit into the trimmer slots and a copy of the manual.

If the radio needs a complete alignment, do this portion first. Then align the remaining radio sections per the manual and return to recheck the carrier oscillator positions. A partially working radio should allow the proper adjustment of the carrier oscillators. In extreme cases of miss alignment, one might try a combination of both alignments to achieve a response from a "dead radio."

Allow the radio to warm up at least 20 minutes, for now remove the microphone and place the radio RF output into a dummy load through a wattmeter. Have all but two of the cover crews out so the cover can be safely removed. If the radio has been hit with a screwdriver (most have) adjust the rear panel PA bias knob to about 1/3 rotation up from off (off is full counter clockwise rotation). This gives you a relatively safe final tube bias value to start off your alignment.

Place the AF gain at 1/2, the RF gain ("full on") at full clockwise, the mode switch in AM, the pre selector-driver at mid range position, the mic gain off (full counter clock wise), the carrier insertion about the 9AM position, the tune and load control knobs about mid range. Turn the AF gain (volume control) nearly completely on/up. You should then be able to hear a white noise hiss from the speaker. Rotate the pre-selector/driver control through its range, hopefully at some point, you will hear the background noise rise and fall back. You want to adjust the control for peak noise, adjusting the AF gain down to ensure safe hearing levels. You only need enough volume to hear and peak the background noise.

Depending on the version of radio and its state of alignment, the tune and load controls might also peak the resting receiver background noise. Adjust the tune, load and the pre selector/driver controls for peak background noise (hiss). These adjustments place the actual tuning

controls relatively close to their actual working value. If the tune or load control doesn't change the noise level, return it to near mid position and proceed to the next step.

Now we need to quickly peak the same three controls in the transmit mode for max power into the dummy load. Key the radio with the front mounted tune switch and peak the three knobs for max power. Hopefully you will have some type of carrier output. If you have no carrier output, replace the mic into the proper jack and try keying the transmitter. Hard to do without three hands, but again you should quickly adjust the three controls for max power output to the dummy load, as indicated on the wattmeter. If you have no readable output power, repeat the above on any one of the sideband modes. After trying all of the above without a readable power output, you should contact a GOOD TECHNICIAN WHO KNOWS TUBE HF RADIOS WELL, as there is a serious problem. It really doesn't matter how much power you get from the radio at this time, but you do need to see anything from a few watts to well over one hundred.

Now we will assume the controls are near their most optimum positions. Carefully lifting the radio up or placing in on its side, locate the bottom carrier balance control. Key the radio with the MIC ONLY; turn the carrier insertion and the mic audio gain off (full counter clockwise). Adjust the bottom carrier balance control for minimum wattmeter power.

With the carrier and mic gain insertion off, the bottom insertion control is used to null (adjust for minimum) carrier. The minimal carrier is desired, but a radio with grossly miss adjusted carrier oscillators might not drop much. You will never remove the entire AM carrier, even from a 100% radio, but you should be able to get it too less than a few watts max. I've been able to get the residual carrier to less than 1/4 watt on a properly aligned radio. If you don't get a large null, try one of the side band modes next. If you fail to null in any position, don't sweat it, we'll fix it very soon. A lot of power is much better than no power (broken radio). Keeping in mind, the bottom carrier balance control is always reset to minimum carrier null on a wattmeter.

You've read many warnings about High Voltage. In the following steps, we'll have the cover off the radio. This means High Voltage is easy to touch when poking around and about the final tube area. BE CAREFULL, DON'T GO NEAR THE FINAL COMPARTMENT! FOR THE NEXT ADJUSTMENTS, USE A PLASTIC HANDLE ALIGNMENT TOOL. It might be time to visit Radio Shack or your local Electronic Parts Store for some basic tuning tools. They really are not that much money and you'll need them for in depth radio stage alignment.

Replace the radio to a normal flat and level position, turn the radio off and remove any remaining top cover screws. Pull the cover straight up and off, set it aside for the moment and turn the radio back on. Note the final tube location and stay away from it during your work.

Using the Manual Pictures as a reference, have a look around inside the radio. Page 18 of the Manual shows a similar top view of the chassis internals. Near the front lower left section of figure 6 (the chassis view) you will see the large carrier oscillator crystals (Y1501 & Y1502) next to the two related trimmer caps (C1507 & C1503). Slap yourself if you've thought about adjusting L801 and forget about it. Your next adjustments will only be to the two trimmer caps, C1507 and C1503. Those two trimmer capacitors are the focal point of this entire text. Find a plastic alignment tool, which properly fits the capacitor top slot.

Take a moment to mark the current trimmer capacitor physical positions as a return reference point (should you become lost). I use a small felt pen or a pencil will do. A bit of acetone (nail polish remover) on a Q-Tip might be required to remove the felt pen marks after the alignment. I later replace the position marks with new final adjustment indications. One capacitor adjusts both one sideband and the AM mode. The other trimmer capacitor adjusts only the remaining sideband oscillator.

With the mic gain and carrier insertion controls off, the mode switch in AM, use a mic to key the radio. Slightly move one of the trimmer capacitors while watching the wattmeter. If anything changes, you have the capacitor adjustment for the AM and one side band modes as described. If you see no output level change on the wattmeter, return the adjustment to its original position and try the other capacitor. One of the two trimmers should make an adjustment in the power output as read on the wattmeter.

Key the radio and quickly run the carrier oscillator AM mode trimmer capacitor back and forth to get an idea of the direction where maximum power can be found. Un-key the transmitter and allow ample cooling time for the final tube. When your again ready, key the radio and run the power up to 30 or more watts with the adjustment, then drop it back down as close to zero as possible. From the >30 watt output dropping back down toward zero, the idea is to stop as close to the first back to zero trimmer position as possible, without going past that first near zero power dip point.

You then move to USB and verify the AM adjustment cap is the same one required for the USB work. Again key the radio and sweep the trimmer while watching the wattmeter. If that same trimmer adjustment doesn't do anything to that sideband try the other side band via the front panel mode switch. Again, your goal is to locate and note which adjustment trimmer common to the AM and one sideband mode.

Once you know which sideband is adjusted in common with the AM trimmer, go back to that trimmer's SSB mode and reset the trimmer to first near zero drop point from a wattmeter read higher power level. You might need to again adjust the bottom carrier balance control at the dip for minimum power. In any SSB Mode, the bottom balance control can and should be null down for minimum power output.

You have just located the trimmer for one SSB mode that is common to the AM mode. Hopefully in the SSB mode for that trimmer, you keyed the radio with the mic (and all the mic gain and carrier insertion controls are set to min/off) and swept the cap to produce a pretty large power output (read on the wattmeter), then reversed the capacitor so the power output drops to the first zero (or very near zero) point and stopped there. You then use the other trimmer capacitor for the remaining SSB mode, adjusted the same way. You will peak it and drop it to the first near zero power point. You may at anytime null a carrier in SSB mode switch positions with the underside carrier balance control. Your almost home now...

Protect your final tube...
On an aligned radio, pressing the front panel meter current switch with the transmitter mic keyed on, check the SSB mode zero signal (minimum RF output) tube current and reset it with the rear panel bias control to the required "Delta" symbol.

From memory, that's about 40mA resting (idle) current. A slight bit high is ok, too low is bad news. After your complete alignment, always recheck the "zero signal anode current" of the final tube per the Owners Manual information. You should now be about ready to Rock and Roll, the Carrier Oscillators are probably close enough to allow you to talk on the radio. Have a friend with an unmodified radio listen to your signal FROM A DISTANCE. If he/she can understand anything you say, the oscillators are on the right filter slope. It doesn't matter if you sound a slight bit goofy or off frequency, just that your radio sounds semi readable and you can be understood. Completion of the Owners Manual alignment and proper operation instructions should clear up most of the remaining problems.

Always a possible technical quirk...
Your alignment might have placed the oscillator on the wrong side/edge of the crystal filter window. If your Signal Audio is totally unreadable on your friend's distant receiver, you might need to repeat the "peak then down to zero" trimmer sweep, but rotate the trimmer capacitor the other direction down from the highest wattmeter reading. This would swap the internal generated signal to the "other side" of the crystal filter window on some radios.

Transmit mode places a generated RF Signal into the "Crystal Filter." In each SSB mode you mic transmit and sweep a trimmer to find the Carrier Oscillator Signal, then remove the unwanted carrier by moving it just outside the filter window, raising or lowering its frequency.

The first zero point read on the wattmeter. Generation of AM is described in the Owners Manual. One section of the modulator circuit is actually unbalanced (AM Mode switch selection) with the front panel carrier insertion control. There is one last separate carrier oscillator adjustment for the AM Mode only. Symptoms are normal SSB Mode operation, but the AM Mode still has problems after youíve completed the described trimmer adjustments from this text.

On the circuit diagram a third trimmer capacitor is shown on the LSB-USB-AM Mode Switch in series with one of the Y1501/Y1502 crystals. It is probably mounted on or near the Mode Switch, underneath the bottom cover. In most cases, itís often spared miss adjustment by a Hack Technician by the shear luck of its physical location. Unless your absolutely sure it needs to be adjusted, leave it alone. I mention it because you might have a radio with every possible adjustment tweaked. They seem to be more the rule vs. the exception these days.

The separate AM trimmer adjustment is similar to the C1507/C1503 procedure. The difference is after a completed carrier null. The AM Mode trimmer is set to bring the carrier back into the filter window. The first rise or peak up from the carrier null is probably near the position you want the oscillator placed. It should not change the SSB Modes although it is interactive with that entire section. For the most part, hope that specific AM mode offset capacitor has remained in its original factory set position.

Your Now Homeward bound...

On a good radio, you've done all you need to do. On a tweaked radio, you will now be ready to complete the remaining alignments as described in the manual. You should now be able to adjust AM mode transmit carrier power using the front panel insertion control. The bottom carrier balance should be reset for min carrier in the SSB modes over the next few operations.

You will always have a small carrier in the AM mode, even with the insertion control off (full CCW rotation). Never run over 25 watts AM Power unless you want to buy 8950 PA tubes. On SSB modes, set the mic gain up at 2/3 or 3/4 rotation and have fun. A non-powered Astatic D104 crystal cartridge mic works best with the Siltronix transceivers. It has a high impedance microphone audio input.

See the http://sonic.ucdavis.edu/siltronix web page for other tips, thoughts and maintenance ideas.

Good luck, Feel free to Email if you have any questions.
Cheers and enjoy your radio
73's
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