

AI4NI's R-390A Checklists

This paper is still not complete.

Nothing in this work is original to Roger Ruszkowski. I acknowledge that I copied and pasted every bit of it from others. Contributors include at least the following Fellows. The contributions are not limited to the following Fellows. Additional names may be added at any time. Acknowledgements appear in no special order. :R-390@mailman.qth.net

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We want something that will sit there and run for month after month and need nothing but tubes and dial lamps. Nolan. 5/99.

Roger Ruszkowski
AI4NI

AI4NI's R-390A Checklists

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A. Current State

- ___ 01 Top cover should not be installed if rack mounted
- ___ 02 Bottom cover should not be installed if rack mounted
- ___ 03 RF deck cover should be installed
- ___ 04 Factory holes in left side to allow adjustment of mechanical filters
- ___ 05 A Check the VFO position you may not want to loosen some screws
- ___ 05 B Collins / Motorola VFO
- ___ 05 C Cosmos VFO
- ___ 06 IF output connector on back panel is present
- ___ 07 IF output cable is present
- ___ 08 All the knobs are present
- ___ 09 Any obvious broken parts
- ___ 10 Any missing parts
- ___ 11 Any leaking parts
- ___ 12 Any wire harness damage

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B. Modifications Installed

- ___ 01 Diode load hole in the front panel (not desired)
- ___ 02 Adjustment hole in the top dust cover for the meter adjustment.
- ___ 03 Micro dial on BFO
- ___ 04 Jumper from break-in on terminal board to ground
- ___ 05 A IF deck has no adjustments for mechanical filters
- ___ 05 B IF deck has trimmers only on top for mechanical filters
- ___ 05 C Chassis has no holes for under deck trimmer caps
- ___ 05 D Chassis has four added holes for under deck trimmer caps
- ___ 05 E Chassis has four manufactured holes for under deck trimmer caps
- ___ 06 A Ballast tube is original 3TF7
- ___ 06 B Ballast tube is 12 volt filament tube (12BY7 12.6 V .3 A)
- ___ 06 C Ballast tube is diode
- ___ 06 D Ballast tube is resistor
- ___ 06 E Ballast tube is removed with 12BA6 in BFO and VFO
- ___ 06 F Ballast tube is removed with 6.3 volt filaments for BFO and VFO
- ___ 07 A Solid state 26Z5's sockets unwired
- ___ 07 B Solid state 26Z5's sockets crimped over
- ___ 07 C Solid state 26Z5's diodes on top of sockets
- ___ 07 D Solid state 26Z5's no clue provided
- ___ 08 Spook cover on dial bezel
- ___ 09 Colored dial lights (red or blue)
- ___ 10 LED dial lamps
- ___ 11 EIA tube shields
- ___ 12 The selenium rectifier is replaced with bridge rectifier
- ___ 13 Replaced power filter caps
- ___ 14 Replaced AGC time constant caps
- ___ 15 Langford AGC diode modifications
- ___ 16 Other SSB modifications
- ___ 17 A Line filter is still original
- ___ 17 B Line filter is GFI friendly
- ___ 17 C Line filter is missing
- ___ 18 R390A has a quality capacitor for C553
- ___ 19 R390A black or brown beauties have been replaced in IF and RF

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- ___ 20 A R390A power supply filter caps original style
- ___ 20 B R390A power supply filter caps re-stuffed cans
- ___ 20 C R390A power supply filter caps re-stuffed other package
- ___ 20 D R390A power supply filter caps under deck
- ___ 21 A R390 power supply filter caps original style
- ___ 21 B R390 power supply filter caps re-stuffed cans
- ___ 21 C R390 power supply filter caps re-stuffed other package
- ___ 21 D R390 power supply filter caps replaced other
- ___ 22 A R390 Audio 1UF B+ filter caps original style
- ___ 22 B R390 Audio 1UF B+ filter caps re-stuffed
- ___ 22 C R390 Audio 1UF B+ filter caps replaced under deck
- ___ 23 Paper caps removed from Audio module.
- ___ 24 R390A C604 0.01 300 WVDC 20% paper replaced with .022 400 V
- ___ 25 R390A C605 0.01 300 WVDC 20% paper replaced with .022 400 V
- ___ 26 R390A C609 8uf 30 WVDC Tantalum Electrolytic replaced
- ___ 27 R390A 6626 MIL spec replacing the 0A2 commercial tube
- ___ 28 R390A R504 should have a value of 500 ohms.
- ___ 29 A Line meter is original type
- ___ 29 B Line meter is correct resistance but re faced
- ___ 29 C Line meter is modified circuit and meter
- ___ 29 D Line meter does not have correct face
- ___ 30 A Carrier meter is original type
- ___ 30 B Carrier meter is correct resistance but re faced
- ___ 30 C Carrier meter is modified circuit and meter
- ___ 30 D Carrier meter does not have correct face

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C. Cosmetic Clean Up

- ___ 01 Remove all of the knobs and lightly lube the set screws
- ___ 02 Pull all of the modules out of receiver
- ___ 03 Drop the front panel
- ___ 04 Rip it's gizzard out and scatter and toss the parts around
- ___ 05 Try but manage to not loose any of the parts
- ___ 06 Do not have any extra parts left over when finished
- ___ 07 Pull all the tube shields
- ___ 08 Pull all the tubes
- ___ 09 Remove the RF slug racks and springs
- ___ 10 Wipe each of the RF cores out with a damp Q-tips
- ___ 11 Wipe the slugs off, and eye ball them
- ___ 12 R390A All of the RF slugs are all the same
- ___ 13 R390A All of the Variable six IF slugs are the same
- ___ 14 R390 RF slugs type a
- ___ 15 R390 RF slugs type b
- ___ 16 R390 First IF slugs
- ___ 17 R390 Second IF slugs
- ___ 18 Remove the RF coil can assemblies
- ___ 19 Straighten the IF and RF can assemblies as needed
- ___ 20 Verify that the index washers were installed in the two big knobs
- ___ 21 Give the chassis a bath with soap and water let dry
- ___ 22 Wash the front panel with soap and water let dry
- ___ 23 Wash the modules with soap and water let dry
- ___ 24 Do not take apart the 6 camshafts and the antenna trimmer can.
- ___ 25 Do not oil the antenna trimmer insulating fiber washers
- ___ 26 Do not saturate / soak / submerge the slugs
- ___ 27 Clean the slug rack rollers by working penetrating oil into rollers
- ___ 28 Keep lubing and wiping them until only clean oil comes out
- ___ 29 Deoxit the tube sockets and coil sockets
- ___ 30 Deoxit the RF band switch
- ___ 31 Give rest of RF deck a bath (hard core or cosmetic)

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D. Hard Core RF Module Cleaning

- ___ 01 Disassemble the gear train
- ___ 02 When you take the split gears apart, tie them together
- ___ 03 Maintain the orientation that they were originally assembled with
- ___ 04 Except for the counter toss all of the parts in a coffee can
- ___ 05 Add favorite degreaser and let brew
- ___ 06 Work penetrating oil into the bearings of the camshafts
- ___ 07 Keep lubing and wiping them until only clean oil comes out
- ___ 08 Now bath the RF deck in soap and water (dish washer)
- ___ 09 Now bath the Gear parts in soap and water (dish washer)
- ___ 10 Dry the RF deck and gears (all day in the sun light)
- ___ 11 Use 10W30 Mobil 1 synthetic oil for the RF deck
- ___ 12 Use Pennzoil wheel bearing grease on the detent
- ___ 13 Use compressed air to work oil into the bearings of the camshafts
- ___ 14 Lubricate each part of gear train prior to assembly
- ___ 15 Reassemble the Gear Train
- ___ 16 Use compressed air to work oil into the gears
- ___ 17 Wipe out excess oil
- ___ 18 Conduct mechanical alignment of the Gear Train
- ___ 19 Deoxit all the tube socket pins
- ___ 20 Deoxit all the connector sockets
- ___ 21 Deoxit all the plug pins

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E. Cosmetic RF Module Cleaning

- ___ 01 Hang Gear Train over edge of bench
- ___ 02 Rotate the deck any way needed to work out dirt
- ___ 03 Use liberal amounts of cleaner to wash gears
- ___ 04 Use compressed air to push cleaner into parts and dirt out
- ___ 05 Use penetrating oil on first pass
- ___ 06 Use Alcohol on second pass
- ___ 07 Use degreaser on third pass
- ___ 08 Use simple soap on fourth pass
- ___ 09 Dry the RF deck and gears (all day in the sun light)
- ___ 10 Use 10W30 Mobil 1 synthetic oil for the RF deck
- ___ 11 Use Pennzoil wheel bearing grease on the detent
- ___ 12 Use compressed air to work oil into the bearings of the camshafts
- ___ 13 Use compressed air to work oil into the gears
- ___ 14 Wipe out excess oil
- ___ 15 Conduct mechanical alignment of the Gear Train
- ___ 16 Deoxit all the tube socket pins
- ___ 17 Deoxit all the connector sockets
- ___ 18 Deoxit all the plug pins

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F. Rebuild Inspection / Visual Inspection

- ___ 01 Spin all of the trimmers caps a couple of turns
- ___ 02 Tighten the screws holding the tube sockets to the chassis
- ___ 03 Check the value of all the resistors
- ___ 04 Check the value of all diodes
- ___ 05 Check the value of all capacitors
- ___ 06 Measure the resistance of all the front panel potentiometers
- ___ 07 Measure the resistance of the IF gain potentiometer
- ___ 08 Measure the resistance of the carrier meter zero potentiometer
- ___ 09 Remove all of the hoods of the chassis connectors to inspect
- ___ 10 Measure the resistance of EVERY damn wire in the chassis
- ___ 11 Inspect the power cord connections under the cover plate.
- ___ 12 Check the capacitors and resistors inside the IF transformer cans
- ___ 13 Test the dial lamps
- ___ 14 Check the selenium rectifier
- ___ 15 Check the antenna relay and inspected the contacts in the relay
- ___ 16 Check the main power micro switch
- ___ 17 Check capacitor C-553, which blocks B+ from the mechanical filters
- ___ 18 Check the 2UF AGC capacitor for leaking fluid
- ___ 19 Check C531 cause of audio and limiter function problems
- ___ 20 Check C547 cause of audio and limiter function problems
- ___ 21 Check C549 cause of audio and limiter function problems
- ___ 22 Check C603 capacitor mounted on the AF deck
- ___ 23 Check C606 capacitor mounted on the AF deck
- ___ 24 Check C609 8 ufd electrolytic capacitor mounted in the AF deck
- ___ 25 Check C-327, a 100 pf mica capacitor mounted in the RF deck
- ___ 26 Verify the values of the fuses
- ___ 27 Inspect the fuse holder operation
- ___ 28 Inspect the rear panel Antenna and IF output connectors
- ___ 29 Inspect the terminal board screws and jumpers
- ___ 30 Check all the tubes with a tube tester for minimum values
- ___ 31 Check the IF deck BFO bellows coupler.
- ___ 32 Check the IF deck band width switch operation

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G. Reassemble The Receiver

- ___ 01 Inspect the cams for burrs where the rollers ride on, hone if needed
- ___ 02 Inspect the gear clamps for cracks replace as needed
- ___ 03 Inspect the spline bolts in the gear clamps replace as needed
- ___ 04 Inspect the roller retainers on the slug racks these must roll freely
- ___ 05 Inspect slug racks for square true operation fix as needed
- ___ 06 Inspect slug racks for burrs and gouges on the end surfaces and fix
- ___ 07 Replace the RF deck transformer cans
- ___ 08 Replace the slug racks inspect for proper installation of racks
- ___ 09 Install the slug rack springs
- ___ 10 Install the calibration crystal oven
- ___ 11 Inspect the slug rack springs for poor tension replace as needed
- ___ 12 "Time" the RF deck band switch
- ___ 13 "Time" the OSC deck band switch
- ___ 14 Install OSC deck subassembly
- ___ 16 Check the alignment and operation of the OSC deck switch
- ___ 17 In R390 check the Oldham coupler between OSC and RF decks
- ___ 18 In R390 check the OSC deck switch "timing"
- ___ 19 Install RF subassembly deck
- ___ 20 In R390 install the calibration sub assembly deck
- ___ 21 Install VFO subassembly
- ___ 22 Check the VFO shaft alignment to the KHz shaft adjust as needed
- ___ 23 Check the VFO Oldham coupler spacing
- ___ 24 Install the VFO Oldham coupler spring
- ___ 25 Reinstall the front panel
- ___ 25 Conduct power supply module: visual inspection
- ___ 26 Verify power supply 115 volt switch setting
- ___ 27 Inspect the solder connections in power supply (diodes added)
- ___ 28 Install the power supply module
- ___ 29 Install the IF module
- ___ 30 Install the Audio module
- ___ 31 Lightly lube the set screws in the knobs and install the knobs
- ___ 32 Lightly lube the shafts of each front panel switches
- ___ 33 Lightly lube the shafts of each front panel potentiometers

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- ___ 34 Lightly lube the shafts IF gain potentiometer
- ___ 35 Lightly lube the shafts carrier meter adjust potentiometer
- ___ 36 IF deck lightly lube the shaft extensions bushings
- ___ 37 Reinstall the knobs
- ___ 38 Check the tightness on all of the screws and clamps
- ___ 39 Install the tubes
- ___ 40 Install selected tube shields
- ___ 41 All the knobs must operate freely
- ___ 42 Knobs must not be loose on shafts
- ___ 43 Verify all connectors are properly seated
- ___ 44 Ensure the wire harness is tucked in on the bottom side

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H. Mechanical Alignment

- ___ 01 Set Oven switch to OFF
- ___ 02 Loosen the dial lock, check the knob and lock operation
- ___ 03 Check the zero adjust knob adjustment operation
- ___ 03 Set the zero adjust to center
- ___ 04 Check the over run and under run on the KHz knob (10 turn stop)
- ___ 05 Adjust the KHz counter as needed (greater than 25 -963 , -972)
- ___ 06 Check the over run and under run on the MHz knob (10 turn stop)
- ___ 07 Adjust the MHz counter as needed
- ___ 08 Set the R390A to 7+000 Set the R390 to 2.000
- ___ 09 Check the cam alignment starting with the 8-16 MHz Cam
- ___ 10 A If the 8-16 MHz Cam need adjusting then loosen the following
- ___ 10 B Release the clamp for 2-4 the slug rack should fall
- ___ 10 C Release the clamp for 4-8 the slug rack should fall
- ___ 10 D Release the clamp for 16-32 the slug rack should fall
- ___ 10 E The 8-16 slug rack should also fall
- ___ 11 Hold the 8-16 and 16-32 cam in place
- ___ 12 Tighten the 16-32 MHz Cam clamp
- ___ 13 Hold the 4-8 cam in place
- ___ 14 Tighten the 4-8 MHz Cam clamp
- ___ 15 Hold the 2-4 cam in place
- ___ 16 Tighten the 2-4 MHz Cam clamp
- ___ 17 Adjust the 1-2 MHz Cam if needed
- ___ 18 Adjust the .5-1 MHz Cam if needed
- ___ 19 Adjust the 1st Variable IF Cam if needed
- ___ 20 Adjust the 2nd Variable IF Cam if needed
- ___ 21 Adjust the VFO if needed

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I. Knobology Dynamic Testing Monthly Test

- ___ 01 Set the Function Switch to MGC
- ___ 02 Eye ball the receiver in the dark for blue tube glow
- ___ 03 Eye ball the dial lights
- ___ 04 Get the head phones adjusted over the ears
- ___ 05 Set the Line Meter to 0
- ___ 06 Set the Line gain to 10
- ___ 07 Set the ANT Trim to 0
- ___ 08 Set the AGC to MED
- ___ 09 Set the LIMITER to OFF
- ___ 10 Set the Band Width to 2KHz
- ___ 11 Set the BFO Pitch to 0
- ___ 12 Set the BFO OFF
- ___ 13 Set the Break-in OFF
- ___ 14 Set the Audio Response to wide
- ___ 15 Set the Zero Adjust to center and confirm knob is not loose
- ___ 16 Release the Dial Lock and confirm knob is not loose
- ___ 17 Set the Local Audio to max and confirm knob is not loose
- ___ 18 Set the RF to max and confirm knob is not loose
- ___ 19 Run the Local Audio from end to end and confirm knob is not loose
- ___ 20 Listen for pot pop in the head phones
- ___ 21 Confirm Local Audio pot V603, V602A are good
- ___ 22 Switch the band pass filter from wide to sharp to wide
- ___ 23 Confirm band pass filter knob is not loose
- ___ 24 Listen for switch pop in the head phones
- ___ 25 Listen for narrow audio response in the head phones
- ___ 26 Confirm Filter, switch, V601A are good
- ___ 27 Set the LIMITER to ON
- ___ 28 Listen for switch pop in the head phones
- ___ 29 Run the LIMITER pot from end to end
- ___ 30 Listen for a change in Audio spectrum
- ___ 31 Set the LIMITER to OFF and confirm knob is not loose
- ___ 32 Confirm Limiter switch, V507 are good
- ___ 33 Set the Function to CAL

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- ___ 34 Listen for the Antenna Relay to click between MGC and CAL
- ___ 35 Set the BFO ON and confirm knob is not loose
- ___ 36 Set the Khz to 500Khz
- ___ 37 Vary the BFO Pitch and confirm knob is not loose
- ___ 38 Confirm the BFO pitch goes through zero and the knob stops work
- ___ 39 Set the Band Width to .1Khz, 1Khz, 2KHz, 4Khz, 8Khz, 16Khz
- ___ 40 Listen for a change in Audio spectrum and confirm knob is not loose
- ___ 41 Set the Band Width to .1Khz
- ___ 42 Set the BFO Pitch to zero, confirm knob adjustment for zero is good
- ___ 43 Vary the Khz Knob to get a zero BFO through the .1KHz
- ___ 44 Confirm V505, V701, V506B, V504, V503, V502, V501 are good
- ___ 45 Set the Band Width to 4Khz
- ___ 46 Set the MHz to 00
- ___ 47 Verify Mhz stop at 00
- ___ 48 Set the Khz to 500Khz and listen for a cal tone
- ___ 49 Move the Mhz knob up one detent
- ___ 50 Verify detent seats, verify band switch changes as needed
- ___ 51 Verify 2nd Crystal Oscillator crystal is within 1KHz on each Mhz
- ___ 52 Move the Mhz knob up one detent
- ___ 53 Verify Mhz stop at 31
- ___ 54 Dial Khz to 000
- ___ 55 Check counter under run
- ___ 56 Dial Khz to 000 and null cal tone to zero with BFO
- ___ 57 Dial Khz to each 100 KHz and note VFO spread
- ___ 58 Dial Khz to 900 and note that total VFO spread is less than 300 Hz
- ___ 59 Check counter over run
- ___ 60 Ground break in and set break in ON
- ___ 61 Confirm audio mutes
- ___ 62 Set break in OFF
- ___ 63 Confirm antenna relay operation in STANDBY and CAL
- ___ 64 Set the Function to AGC
- ___ 65 Set the AGC to SLOW, MED, FAST
- ___ 66 Observe that the carrier meter moves upscale and drops back to zero
- ___ 67 Set the Function to CAL
- ___ 68 Set the BFO ON

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- ___ 69 Dial KHz to a cal tone and adjust BFO for a tone
- ___ 70 Set the line gain to max
- ___ 71 Set the line meter switch to 0
- ___ 72 Set the line gain for a meter indication of 0
- ___ 73 Set the line meter switch to +10
- ___ 74 Observe the line meter reads -10
- ___ 75 CARRIER LEVEL meter deflection of at least 40 dB on Cal tone
- ___ 76 Set the Function to AGC
- ___ 77 Tune KILOCYCLE CHANGE control across any band
- ___ 78 Tune KILOCYCLE CHANGE control through several signals
- ___ 79 Output volume should be nearly constant
- ___ 80 Tune KILOCYCLE CHANGE control to one signal
- ___ 81 CARRIER LEVEL meter indicates strength of received signals
- ___ 82 Rotate ANT TRIM control to peak CARRIER LEVEL meter
- ___ 83 Set FUNCTION switch to MGC
- ___ 84 Tune the receiver away from any signal
- ___ 85 CARRIER LEVEL should not indicate (read zero)

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J. Adjust the IF gain R519

- ___ 01 Set the Line Meter OFF
- ___ 02 Set the Line gain to 0
- ___ 03 Set the ANT Trim to 0
- ___ 04 Set the AGC to MED
- ___ 05 Set the LIMITER to OFF
- ___ 06 Set the Band Width to 2KHz
- ___ 07 Set the BFO Pitch to 0
- ___ 08 Set the Audio Response to WIDE
- ___ 09 Set the Break-in OFF
- ___ 10 Set the Function to MGC
- ___ 11 Set the BFO to OFF
- ___ 12 Release the Zero Adjust
- ___ 13 Release the Dial Lock
- ___ 14 Set the Local Audio to max
- ___ 15 Set the RF to max
- ___ 16 Remove P114 from J514
- ___ 17 Remove P213 from J513
- ___ 18 Remove P218 from J518
- ___ 19 Remove J116 adapter from the back panel if necessary
- ___ 20 Couple P114 to J513
- ___ 21 Couple P116 to J116
- ___ 22 Couple J116 to the signal generator RF output
- ___ 22 Adjust signal generator for 455 KHz output frequency
- ___ 24 Adjust signal generator for 150 micro volt RF output
- ___ 25 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 26 Meter diode load output for -7 volts DC
- ___ 27 Place a 600 ohm load across the local audio output
- ___ 28 Place a 600 ohm load across the line audio output
- ___ 29 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
- ___ 30 Adjust the IF gain R519 for -7 V DC on the diode load
- ___ 31 Observe the local audio output level is greater than 400 milliwatts
- ___ 32 Local Audio should be 17.3 Volts AC across 600 Ohms 450 mw
- ___ 33 Line Audio should be 2.45 Volts AC across 600 Ohms 10 mw

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- ___ 34 Phone Audio should be .78 Volts AC across 600 Ohms 1 mw
- ___ 35 Line Audio at .78 Volts across 600 should be Line Meter Zero VU
- ___ 36 Set the Line Meter to +10
- ___ 37 Set the signal generator modulation on
- ___ 38 The Line Meter should read above 0 VU (10 mw)
- ___ 39 Set the Line Gain off max until the Line Meter reads 0 VU (10 mw)
- ___ 40 Set the signal generator modulation off
- ___ 41 Set the Meter Switch to -10
- ___ 42 Observe 30 db change (20 db on switch plus 10 db on meter scale)
- ___ 43 The Line Meter should read less than -10 VU (SN + N > 30 DB)
- ___ 44 Set the Line Meter to OFF
- ___ 45 Set the Line Gain to 0

K. Alternate Procedure To Set The IF Gain Control

Once the receiver has been fully mechanically and electrically aligned, the final procedure to perform before "buttoning it up" is to set the IF gain control. The manual specification to set the IF Gain control for a level of -7 volts on the diode load for 150uv @455kc into J-513 is far too hot.

Many otherwise very sensitive R390A's are thought not be hearing weak signals, because these signals are covered by excess noise generated in the IF module. The most common single item responsible for holding an R390A back is not lack of sensitivity. Rather it is internally generated IF deck noise.

- ___ 01 Allow the receiver to warm up for at least 1 hour then:
- ___ 02 Terminate the antenna input (just ground the balanced inputs)
- ___ 03 Set receiver for 15.2 MHz (Selected point of mechanical alignment)
- ___ 04 Set the "FUNCTION" switch to MGC
- ___ 05 Select the 4kc filter with the "BANDWIDTH"
- ___ 06 Set "RF GAIN" control to 10 or maximum
- ___ 07 Peak the "ANTENNA TRIM" for maximum noise
- ___ 08 Use the "LINE LEVEL" meter for peaking noise
- ___ 09 Set "Line Meter" switch to -10db scale
- ___ 10 Set "Line Gain" control to full CW or "10."
- ___ 11 Adjust IF gain control, R-519 to between -4 to -7 VU on Line Meter
- ___ 12 Set the "FUNCTION" switch to AGC
- ___ 13 Re-zero the carrier meter control, R-523
- ___ 14 Set controls above for normal operation
- ___ 15 Remove antenna short and reinstall antenna
- ___ 16 Power up the oven and verify function of the thermostat
- ___ 17 Turn the oven off
- ___ 18 Leave receiver on for at least 14 days to reform caps

AI4NI's R-390A Checklists

L. IF Module Alignment

- ___ 01 Continue with the prior setup
- ___ 02 Adjust signal generator for 455 KHz output frequency
- ___ 03 Adjust signal generator for 150 micro volt RF output
- ___ 04 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 05 Meter diode load output for -7 volts DC
- ___ 06 Place a 600 ohm load across the local audio output
- ___ 07 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
- ___ 08 Set the Band Width to 2 KHz
- ___ 09 Adjust C571 (Top Trimmer) for max diode load output
- ___ 10 Adjust C513 (Bottom Trimmer) for max diode load output
- ___ 11 Set the Band Width to 4 KHz
- ___ 12 Adjust C570 (Top Trimmer) for max diode load output
- ___ 13 Adjust C514 (Bottom Trimmer) for max diode load output
- ___ 14 Set the Band Width to 8 KHz
- ___ 15 Adjust C568 (Top Trimmer) for max diode load output
- ___ 16 Adjust C515 (Bottom Trimmer) for max diode load output
- ___ 17 Set the Band Width to 16 KHz
- ___ 18 Adjust C569 (Top Trimmer) for max diode load output
- ___ 19 Adjust C516 (Bottom Trimmer) for max diode load output

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M. To Stagger Or Not To Stagger

- ___ 01 Continue with the prior setup
- ___ 02 Set the Band Width to 16 KHz
- ___ 03 Set the Function to MGC
- ___ 04 Adjust signal generator for 455 KHz output frequency
- ___ 05 Adjust signal generator for 150 micro volt RF output
- ___ 06 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 07 Meter diode load output for -7 volts DC
- ___ 08 Note the position of the top slug in T501
- ___ 09 Adjust the top slug of T501 for maximum output
- ___ 10 Return the top slug in T501 to its original position
- ___ 11 Adjust signal generator for 467 KHz output frequency
- ___ 12 Adjust the top slug of T501 for maximum output
- ___ 13 Note the position of the top slug in T501
- ___ 14 If the slug was tuned closer to 467 than 455 the module is staggered
- ___ 15 If the module is to be stagger tuned then use the stagger tune steps

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N. To Stagger Tune IF

- ___ 01 Adjust signal generator for 467 KHz output frequency
- ___ 02 Adjust the top slug of T501 for maximum output
- ___ 03 Adjust the bottom slug of T502 for maximum output
- ___ 04 Adjust signal generator for 443 KHz output frequency
- ___ 05 Adjust the bottom slug of T501 for maximum output
- ___ 06 Adjust the top slug of T502 for maximum output
- ___ 07 Adjust signal generator for 455 KHz output frequency
- ___ 08 Adjust the bottom slug of T503 for maximum output
- ___ 09 Adjust the top slug of T503 for maximum output

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O. To Straight Tune IF

- ___ 01 Adjust signal generator for 455 KHz output frequency
- ___ 02 Adjust the top slug of T501 for maximum output
- ___ 03 Adjust the bottom slug of T501 for maximum output
- ___ 04 Adjust the top slug of T502 for maximum output
- ___ 05 Adjust the bottom slug of T502 for maximum output
- ___ 06 Adjust the bottom slug of T503 for maximum output
- ___ 07 Adjust the top slug of T503 for maximum output

AI4NI's R-390A Checklists

P. Adjust Z503 AGC

- ___ 01 Continue from part J above
- ___ 02 Set the function switch to AGC
- ___ 03 Meter the AGC voltage for -1 to -2 volts on the AGC jumper
- ___ 04 Adjust the signal generator for an AGC voltage in the meter range
- ___ 05 Adjust Z503 for maximum AGC voltage on the AGC jumper
- ___ 06 Set the function switch to MGC

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Q. IF And Audio Module Tube Optimizing

Optimizing the vacuum tube lineup in the signal path is another technique to maximize performance. Start with the tubes in the IF strip. These are the 5749W's IF amps, V-501, V-502 and V-503. The 6AK6 4th IF amp V-504 and the detector, V-506, a 5814A. Continue with the Audio module tubes.

Then do the RF module tubes last. The tubes can be optimized before any alignment is conducted. But the usual procedure is to do a signal alignment, conduct the tube optimization and then do another complete signal alignment.

Normal procedure is to conduct the signal alignment and tube optimization together in module by module stages IF and Audio modules, then RF and oscillator modules.

Watch the noise level of each tube with the modulation off. The meter should lie quietly. If the meter needle is bouncing then consider this as additional noise from the tube. It may take several passes in a poor receiver to grade other noisy tubes out of the receiver and reach acceptable levels of performance. Use the best tubes on hand and place them in the optimum performance order.

New tubes may not be better than existing tubes. When new tubes are received, grade them against all like tubes on hand. Keep track of the spares and their values. If the signal to noise ratios are good some meter bounce is expected.

If you reach the point where you believe you have good tubes through the receiver and the meter just will not lie quietly, then you have to start looking for, leaky caps, poor resistors, bad solder joints, dirty tube sockets, dirty connector pins, loose or corroded tie lugs.

- ___ 01 Set the Line Meter OFF
- ___ 02 Set the Line gain to 0
- ___ 03 Set the ANT Trim to 0
- ___ 04 Set the AGC to MED
- ___ 05 Set the LIMITER to OFF
- ___ 06 Set the Band Width to 2KHz
- ___ 07 Set the BFO Pitch to 0
- ___ 08 Set the Audio Response to WIDE
- ___ 09 Set the Breakin OFF
- ___ 10 Set the Function Switch to MGC
- ___ 11 Set the BFO to OFF
- ___ 12 Release the Zero Adjust
- ___ 13 Release the Dial Lock
- ___ 14 Set the Local Audio to max
- ___ 15 Set the RF to max
- ___ 16 Remove P114 from J514
- ___ 17 Remove P213 from J513

AI4NI's R-390A Checklists

- ___ 18 Remove P218 from J518
- ___ 19 Remove J116 adapter from the back panel if necessary
- ___ 20 Couple P114 to J513
- ___ 21 Couple P116 to J116
- ___ 22 Couple J116 to the signal generator RF output
- ___ 22 Adjust signal generator for 455 KHz output frequency
- ___ 24 Adjust signal generator for 150 micro volt RF output
- ___ 25 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 26 Meter diode load output for -7 volts DC
- ___ 27 Place a 600 ohm load across the local audio output
- ___ 28 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
- ___ 29 In pass one gather all the spare 5749's
- ___ 30 Pull the BFO and VFO 5759 tubes (V505, V701)
- ___ 31 Pull the AGC IF AMP (V508)
- ___ 32 Remember the goal is best signal to noise ratio or each tube
- ___ 33 Set the signal generator modulation on and record the audio output
- ___ 34 Set the signal generator modulation off and record the audio output
- ___ 35 The difference in these two values is the merit of the tube in V501
- ___ 36 Place each spare 5759 into V501 to find a merit value for the tube
- ___ 37 Grade the spare 5749's from worse to best
- ___ 38 Place the worse tube in V503
- ___ 39 Place the second poorest tube in V502
- ___ 40 Start over and re-grade the 5749's in V501 (32, 33, 34)
- ___ 41 Select the very best signal to noise 5749 for the V701 (VFO)
- ___ 42 Place the second best 5749 in V501
- ___ 43 Place the third best 5749 in V502
- ___ 44 Place the fourth best 5749 in V503
- ___ 45 Place the fifth best 5749 in V505 (BFO)
- ___ 46 Place the sixth best 5749 in V508 (AGC IF AMP)
- ___ 47 In pass two gather all the spare 6AK6's
- ___ 48 Remove V604 Line Audio
- ___ 49 Set the signal generator modulation on and record the audio output
- ___ 50 Set the signal generator modulation off and record the audio output
- ___ 51 The difference in these two values is the merit of the tube in V504
- ___ 52 Place each spare 6AK6 into V504 to find a merit value for the tube

AI4NI's R-390A Checklists

- ___ 53 Place the worse tube in V603 Local Audio
- ___ 54 Start over and re-grade the 6AK6's in V504 (49, 50, 51)
- ___ 55 Place the best 6AK6 in V504 (4th IF Stage)
- ___ 56 Place the second best 6AK6 in V603 Local Audio
- ___ 57 Place the third best 6AK6 in V604 Line Audio
- ___ 58 In pass three gather all the spare 5814's
- ___ 59 Remove V507, V509, V205, V206
- ___ 60 Set the signal generator modulation on and record the audio output
- ___ 61 Set the signal generator modulation off and record the audio output
- ___ 62 The difference in these two values is the merit of the tube in V601
- ___ 63 Place each spare 5814 into V601 to find a merit value for the tube
- ___ 64 Place the worse tube in V602
- ___ 65 Place the second worse tube in V506
- ___ 66 Start over and re-grade the 5814's in V601 (60, 61, 62)
- ___ 67 Place the best 5814 in V506 Detector
- ___ 68 Place the 2nd best 5814 in V601 1st AF AMP and Follower
- ___ 69 Place the 3rd best 5814 in V602 Local AF AMP
- ___ 70 Place the 4th best 5814 in V507 Limiter
- ___ 71 Place the 5th best 5814 in V205 Calibration Oscillator
- ___ 72 Place the 6th best 5814 in V206 100 KC Multivibrator
- ___ 73 Place the 7th best 5814 in V509 AGC Rectifier
- ___ 74 Adjust signal generator for 455 KHz output frequency
- ___ 75 Adjust signal generator for 150 micro volt RF output
- ___ 76 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 77 Meter diode load output for -7 volts DC
- ___ 78 Set the Band Width to 2 KHz
- ___ 79 Adjust the IF gain R519 for -7 V DC on the diode load
- ___ 80 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
- ___ 81 Set the signal generator modulation on and record the audio output
- ___ 82 Set the signal generator modulation off and record the audio output
- ___ 83 Meter local audio output for 1 milliwatt, 0 db, or .775 Volts AC
- ___ 84 If the difference must be greater than 27 db. (30 likely)
- ___ 85 Remove all test equipment
- ___ 86 Return the receiver connections to their original configurations

AI4NI's R-390A Checklists

R. Adjust T208, C520, L503, and Zero BFO

- ___ 01 Set the Line Meter OFF
- ___ 02 Set the Line gain to 0
- ___ 03 Set the ANT Trim to 0
- ___ 04 Set the AGC to MED
- ___ 05 Set the LIMITER to OFF
- ___ 06 Set the Band Width to 2KHz
- ___ 07 Set the BFO Pitch to 0
- ___ 08 Set the Audio Response to wide
- ___ 09 Set the Break-in OFF
- ___ 10 Set the Function to MGC
- ___ 11 Set the BFO OFF
- ___ 12 Release the Zero Adjust
- ___ 13 Release the Dial Lock
- ___ 14 Set the Local Audio to max
- ___ 15 Set the RF to max
- ___ 16 Adjust signal generator for 455 KHz output frequency
- ___ 17 Adjust signal generator for 75 micro volt RF output
- ___ 18 Adjust signal generator for 30 % audio tone modulation (400 Hz)
- ___ 19 Meter diode load output for -7 volts DC
- ___ 20 Place a 600 ohm load across the local audio output
- ___ 21 Meter local audio output for 450 milliwatts, 27 db, or 17.3 Volts AC
- ___ 22 Connect the signal generator to E211 through a capacitor.
- ___ 23 Adjust signal generator for diode load output of -7 volts DC
- ___ 24 Adjust T208 for peak (This adjustment is broad)
- ___ 25 Adjust signal generator for diode load output of -7 volts DC
- ___ 26 The signal level should be less than 75 micro volt RF output (50)
- ___ 27 The signal with 30% modulation should output 450 milliwatts audio
- ___ 28 Set the signal generator modulation on and record the audio output
- ___ 29 Meter local audio output for 450 milliwatts 27 db, or more
- ___ 30 Set the signal generator modulation off and record the audio output
- ___ 31 Meter local audio output for 1 milliwatt, 0 db, or less
- ___ 32 Set the Band Width to .1 KHz
- ___ 33 Rock the signal generator for maximum diode load output

AI4NI's R-390A Checklists

- ___ 34 Adjust signal generator for diode load output of -7 volts DC
- ___ 35 Record the signal generator output level
- ___ 36 The following steps should produce six marks around C520
- ___ 37 Switch the generator output up 60 db (two switch steps on URM 25)
- ___ 38 Increase the generator frequency until output drops to -7 volts DC
- ___ 39 Adjust C520 for a dip in the diode load voltage
- ___ 40 Mark the can and label this H (5 o'clock)
- ___ 41 Adjust C520 for the other side dip in the diode load voltage
- ___ 42 Mark the can and label this H (7 o'clock)
- ___ 43 Decrease the generator frequency until output drops to -7 volts DC
- ___ 44 Adjust C520 for a dip in the diode load voltage
- ___ 45 Mark the can and label this L (4 o'clock)
- ___ 46 Adjust C520 for the other side dip in the diode load voltage
- ___ 47 Mark the can and label this L (8 o'clock)
- ___ 48 Divide each pair of dips and mark the can C
- ___ 49 Set C520 to the C mark (either 4:30 or 7:30)
- ___ 50 Rock the signal generator (to 455) for maximum diode load output
- ___ 51 Adjust signal generator for diode load output of -7 volts DC
- ___ 52 Set the Band Width to 1 KHz
- ___ 53 Adjust L503 for peak output
- ___ 54 Set the BFO switch ON
- ___ 55 Loosen the clamp on the BFO shaft extension
- ___ 56 Zero the BFO knob
- ___ 57 Zero the BFO against the signal
- ___ 55 Tighten the clamp on the BFO shaft extension
- ___ 56 Set the BFO switch OFF
- ___ 57 Disconnect the generator

S. 2nd Crystal Oscillator Alignment

When adjusting the 2nd Crystal Oscillator you can hear the noise peak better than you can measure it with the meter. Peak the caps up with both the meter and head phones.

- ___ 01 Meter the local audio output across a 600 Ohm load
- ___ 02 Meter the diode load for - 7 volts DC
- ___ 03 Use a good set of head phones to monitor the audio output
- ___ 04 Set the function switch to CAL
- ___ 05 Set the BFO OFF
- ___ 06 Set the KHz to 500
- ___ 07 Set the KHz to 31
- ___ 08 Set the Bandwidth to 2 KHz
- ___ 09 Rock the KHz to produce maximum indication on the diode load
- ___ 10 Set the Local Output meter range to provide a mid scale reading
- ___ 11 Use the head phones to hear the noise peak as you make adjustments
- ___ 12 Screw the slug of T401 out until only one peak can be obtained while turning trimmer capacitor 31 through its entire range.
- ___ 13 Set trimmer capacitor slightly away from peak
- ___ 14 Adjust the slug in T401 for peak output
- ___ 15 Readjust capacitor 31 and ensure it has two peaks.
- ___ 16 Adjust capacitor 31 to peak (watch the meters for best indication)
- ___ 17 Move the MHz down one detent (you can hear the noise peak)
- ___ 18 Adjust the corresponding capacitor to peak
- ___ 19 Stop at 8MHz

T. 1st Crystal Oscillator Alignment

- ___ 01 Meter the local audio output across a 600 Ohm load
- ___ 02 Meter the diode load for - 7 volts DC
- ___ 03 Use a good set of head phones to monitor the audio output
- ___ 04 Set the function switch to CAL
- ___ 05 Set the BFO OFF
- ___ 06 Set the KHz to 500
- ___ 07 Set the MHz to 7
- ___ 08 Set the Bandwidth to 2 KHz
- ___ 09 Rock the KHz to produce maximum indication on the diode load
- ___ 10 Adjust the slug in T207 for peak output

U. VFO Band Spread Test

- ___ 01 Set the Line Meter OFF
- ___ 02 Set the Line gain to 0
- ___ 03 Set the ANT Trim to 0
- ___ 04 Set the AGC to MED
- ___ 05 Set the LIMITER to OFF
- ___ 06 Set the Band Width to 2KHz
- ___ 07 Set the BFO Pitch to 0
- ___ 08 Set the Audio Response to wide
- ___ 09 Set the Break-in to OFF
- ___ 10 Set the Function to CAL
- ___ 11 Set the BFO to ON
- ___ 12 Set the Zero Adjust to center
- ___ 13 Release the Dial Lock
- ___ 14 Set the Local Audio to max
- ___ 15 Set the RF to max
- ___ 16 Set the KHz knob to -000
- ___ 17 Adjust the BFO Pitch to zero beat
- ___ 18 Set the KHz knob to +000
- ___ 19 Rock the KHz knob to zero beat
- ___ 20 The VFO band spread should be less than 300 Hertz

V. VFO Band Spread Adjustment

- ___ 01 If needed continue from the preceding section
- ___ 02 Set the FUNCTION switch to CAL
- ___ 03 Set the MHz to 9 MHz
- ___ 04 Set the Zero Adjust to center
- ___ 05 Set the KHz knob to 000
- ___ 06 Remove the Oldham coupler spring
- ___ 07 Remove the VFO from the receive
- ___ 08 Remove the end point adjustment cap screw
- ___ 09 Attach the output cable and harness cable
- ___ 10 Adjust the VFO shaft for a zero beat
- ___ 11 Mark the coupler and VFO face (9,000 3,455)
- ___ 12 Set the KHz knob for 9,+000 (9,+000 2,455)
- ___ 13 Dial 10 turns on the VFO shaft and align the marks
- ___ 14 If the span is not exact make a small adjustment to the end point
- ___ 15 Do not over adjust the end point to a complete zero beat
- ___ 16 Observe the pitch is closer to zero beat
- ___ 17 Back off the 10 turns on the VFO shaft (only work one way)
- ___ 18 Set the KHz knob to 000
- ___ 19 Adjust the VFO shaft for a zero beat
- ___ 20 Mark the coupler and VFO face (9,000 3,455)
- ___ 21 Set the KHz knob for 9,+000 (9,+000 2,455)
- ___ 22 Dial 10 turns on the VFO shaft and align the marks
- ___ 23 If the span is not exact make a small adjustment to the end point
- ___ 24 Do not over adjust the end point to a complete zero beat
- ___ 25 Observe the pitch is closer to zero beat
- ___ 26 Repeat steps 17, 18, 19, 20, 21,22, 23, 24 and 25 until span is exact
- ___ 27 Make a small adjustment to the end point (CW longer CCW shorter)
- ___ 28 Do not over adjust the end point to a complete zero beat
- ___ 29 replace the end point cover screw
- ___ 30 Return the VFO shaft to its original location
- ___ 31 Reinstall the VFO into the receiver
- ___ 32 Carefully verify the 10 turn operation of the VFO
- ___ 33 Adjust the mechanical position of module for best shaft alignment

AI4NI's R-390A Checklists

- ___ 34 Adjust the Oldham coupler for a free spacing of shafts
- ___ 35 Replace the Oldham coupler spring
- ___ 36 Attach an antenna to the balanced input
- ___ 37 Tune WWV at 20MHz, 15Mhz, 10MHz or 5Mhz
- ___ 38 Set the BFO to OFF
- ___ 39 Set the bandwidth to .1Khz
- ___ 40 Set the KHz to 000
- ___ 41 Loosen the front KHz shaft clamp on the Oldham coupler
- ___ 42 Rock the VFO to peak WWV through the crystal filter
- ___ 43 Tighten the front KHz shaft clamp on the Oldham coupler
- ___ 44 Set the BFO to ON
- ___ 45 Set the BFO Pitch to 0
- ___ 46 Loosen the extension shaft clamp on the BFO
- ___ 47 Adjust the BFO shaft to zero the BFO Pitch
- ___ 48 Tighten the extension shaft clamp on the BFO
- ___ 49 Set the FUNCTION Switch to CAL
- ___ 50 Adjust the CAL Adjust Trim to zero the Calibration Oscillator

AI4NI's R-390A Checklists

W. RF Alignment

- ___ 01 Install a 600 ohm resistor on the line level output.
- ___ 02 Place a meter and 600 ohm load on the Local Audio output TS 585
- ___ 03 Connect the generator to the receiver's balanced antenna input
- ___ 04 Place a DC meter on the diode load
- ___ 05 Turn the receiver on and allow it to warm up for 1 hour
- ___ 06 Turn the signal generator on and allow it to warm up for 1 hour
- ___ 07 Set the R390 or R390A Function switch to "MGC
- ___ 08 Set the R390 or R390A Bandwidth to 2kc
- ___ 09 Set the R390 or R390A RF gain full CW (Clock Wise)
- ___ 10 Set the R390 or R390A AF line gain full CW
- ___ 11 Set the Line Meter range switch to + 10
- ___ 12 Set the R390 or R390A AF local gain full CW
- ___ 13 Set the R390 or R390A BFO off
- ___ 14 Set the Audio response to wide
- ___ 15 Set the Limiter to off
- ___ 16 Set the receiver and generator to the same frequency of choice
- ___ 17 Rock the generator for a peak in to the band pass
- ___ 18 Set the initial generator output to 10uv
- ___ 19 Set the generator modulation level to at 30% 400 Hz or 1 KHz
- ___ 20 Use the Ant Trim to peak the receiver
- ___ 21 Reduce the signal generator RF output for -7 volts DC
- ___ 22 Use 550 for L213, L224-1,, L224-2 Slugs 1st Octave
- ___ 23 Use 950 for C201-B, C230-1, C230-2 Caps 1st Octave
- ___ 24 Use 1,100 for L215-1, L215-2, L215-3 Slugs 2nd Octave
- ___ 25 Use 1,100 for C291-1, C291-2, C291-3 Caps 2nd Variable IF
- ___ 26 Use 1,250 for L232-1, L232-2, L232-3 Slugs 1st Variable IF
- ___ 27 Use 1,900 for L233-1, L233-2, L233-3 Slugs 2nd Variable IF
- ___ 28 Use 1,900 for C205-B, C233-1, C233-2 Caps 2nd Octave
- ___ 29 Use 2,250 for L217, L226-1, L226-3 Slugs 3rd Octave
- ___ 30 Use 3,800 for C209B, C236-1, C26-2 Caps 3rd Octave
- ___ 31 Use 4,400 for L219, L227-1, L227-2 Slugs 4th Octave
- ___ 32 Use 7,250 for C283-1, C283-2, C283-3 Caps 1st Variable IF
- ___ 33 Use 7,600 for C213B, C239-1, C239-2 Caps 4th Octave

AI4NI's R-390A Checklists

- ___ 34 Use 8,800 for L221, L227-1, L227-2 Slugs 5th Octave
- ___ 35 Use 15,200 for C217B, C242-1, C242-2 Caps 5th Octave
- ___ 36 Use 17,600 for L223, L229-1, L229-2 Slugs 6th Octave
- ___ 37 Use 30,400 for C221B, C241-1, C241-2 Caps 6th Octave
- ___ 38 Observe 27 DB (17 Volts AC) on the Local Audio
- ___ 39 This should also be 450 milliwatts on the Local Audio
- ___ 40 Observe + 10 on the Line Meter (0 VU + 10 switch)
- ___ 41 Set the signal generator to CW
- ___ 42 The Meter on the Local Level should drop 20 DB
- ___ 43 The Line Meter should drop 20 DB
- ___ 44 The signal generator RF level should be less than 3 micro volts
- ___ 45 Record the frequency and the output of the generator in micro volts
- ___ 46 This value is the 20 DB S/N + N receiver level at this frequency
- ___ 47 This is the relative receiver noise floor level at this frequency
- ___ 48 Use the following check the mechanical filters at one frequency
- ___ 49 Set BANDWIDTH KC switch S501 to position 1.
- ___ 50 Adjust the signal generator output for -5 volts on the diode load
- ___ 51 Tune the KILOCYCLE CHANGE to one side of the center
frequency until the multi-meter reads 2.5 volts.
- ___ 52 Note the frequency indicated on the receiver frequency counter.
- ___ 53 Tune the receiver KILOCYCLE CHANGE control to the other side
of the center frequency until the meter reads 2.5 volts.
- ___ 54 Note the frequency indicated on the receiver frequency counter
- ___ 55 Subtract the lower from the higher of the two values
- ___ 56 This is the receiver bandwidth for 1 KiloHertz Band Width 0.8 to 1.3
- ___ 57 Set BANDWIDTH KC switch S501 to 2 KHz position
- ___ 58 Repeat steps 50 through 55 for the 2 KHz band width 1.9 to 2.3
- ___ 59 Set BANDWIDTH KC switch S501 to 4 KHz position
- ___ 60 Repeat steps 50 through 55 for the 4 KHz band width 3.6 to 4.4
- ___ 61 Set BANDWIDTH KC switch S501 to 8 KHz position
- ___ 62 Repeat steps 50 through 55 for the 8 KHz band width 7.5 or more
- ___ 63 Set BANDWIDTH KC switch S501 to 16 KHz position
- ___ 64 Repeat steps 50 through 55 for the 16 KHz band width 12 or more
- ___ 65 No bandwidth test is required for 0.1 KC setting.

AI4NI's R-390A Checklists

X. RF Deck Tube Optimization

In the RF deck we want to check the 6DC6 1st RF, 6C4's Mixers, and 5654's Crystal oscillators. Use a frequency above 8 MHz to take the third conversion out of the process.

- ___ 01 Install a 600 ohm resistor on the line level output.
- ___ 02 Place a meter and 600 ohm load on the Local Audio output TS 585
- ___ 03 Connect the generator to the receiver's balanced antenna input
- ___ 04 Place a DC meter on the diode load
- ___ 05 Turn the receiver on and allow it to warm up for 1 hour
- ___ 06 Turn the signal generator on and allow it to warm up for 1 hour
- ___ 07 Set the R390 or R390A Function switch to "MGC
- ___ 08 Set the R390 or R390A Bandwidth to 2kc
- ___ 09 Set the R390 or R390A RF gain full CW (Clock Wise)
- ___ 10 Set the R390 or R390A AF line gain full CW
- ___ 11 Set the Line Meter range switch to + 10
- ___ 12 Set the R390 or R390A AF local gain full CW
- ___ 13 Set the R390 or R390A BFO off
- ___ 14 Set the Audio response to wide
- ___ 15 Set the Limiter to off
- ___ 16 Set the receiver and generator to the same frequency of choice
- ___ 17 Rock the generator for a peak in to the band pass
- ___ 18 Set the initial generator output to 10uv
- ___ 19 Set the generator modulation level to at 30% 400 Hz or 1 KHz
- ___ 20 Use the Ant Trim to peak the receiver
- ___ 21 Reduce the signal generator RF output for -7 volts DC
- ___ 22 Observe the power level on the Local Audio meter.
- ___ 23 Set the generator to CW
- ___ 24 Observe the power level on the Local Audio meter
- ___ 25 You expect a 20 DB drop in output on the Local Audio meter
- ___ 26 Swap all your 6DC6 tubes into the 1st RF.
- ___ 27 Measure the relative difference of each tube (step 20 - 25)
- ___ 28 Select the 6DC6 with the largest difference of signal to noise
- ___ 29 This tube may not be the one with the largest gain
- ___ 30 Swap all your 6C4 tubes into V203 2nd Mixer

AI4NI's R-390A Checklists

- ___ 31 Measure the relative difference of each tube (step 20 - 25)
- ___ 32 Select the 6C4 with the largest difference of signal to noise
- ___ 33 Place the best 6C4 in the 1st Mixer
- ___ 34 Place the best 6C4 in the 2nd Mixer
- ___ 35 Place the best 6C4 in the 3rd Mixer
- ___ 36 Swap all your 5654 6AK5 tubes into V401 2nd Crystal Oscillator
- ___ 37 Measure the relative difference of each tube (step 20 - 25)
- ___ 38 Place the best 5654 in the 1st Crystal Oscillator
- ___ 39 Place the best 5654 in the 2nd Crystal Oscillator
- ___ 40 Grade all the spare tubes for future use

Older used tubes will often have a better signal to noise span than new tubes. So some day you have to put the new tubes into the receiver and start aging them so they can get quiet. A new 6CD6 is what it is, You stuck with it as the best you have.

You can put new 5654's 2nd Crystal Oscillator and 6C4's into the 3rd mixer. It gets them further down the amplifier chain and thus their higher noise level is masked by other stages. You may know a tube is not as good as another tube, but when used in the later stages you may not be able to measure the difference of the tubes when swapping them into the later stages.

AI4NI's R-390A Checklists

Y. Receiver Sensitivity Test

There may be an occasion when its appropriate to measure and record receiver sensitivity in real terms using an accepted standard. For radio receivers, real term sensitivity is expressed as the value of a modulated RF voltage applied to the antenna input necessary to provide a 10db S/N + N figure.

This means, what input voltage is required to raise audio output 10 db over the receiver noise floor. Some prefer to do the test with a band width of 2 Khz. Others prefer to do the test at 4 or 8 Khz.

If you are comparing the R390 to another receiver you would like to use the same band width. At 2 Khz you expect the receiver to have a 20db S/N + N figure. This test is preferred as a minimum signal test. How small of a signal on the antenna can still be copied?

An alternative test is, for a fixed signal level, how far is it above the noise floor. We see this in the If deck where we expect 150 micro volts to provide 30 DB of signal above the noise floor. In the RF deck or end to end test we expect 3 micro volts to provide 20 DB of signal above the noise floor. Measuring the receiver sensitivity in the R390A is an easy, straight forward procedure. The receiver Line Level meter can even be used to help with the measurement.

Here is the procedure for sensitivity:

- ___ 01 Turn the receiver and allow it to warm up for 1 hour
- ___ 02 Turn the signal generator and allow it to warm up for 1 hour
- ___ 03 Set the receiver and generator to the same frequency of choice
- ___ 04 Adjust the Kilocycle Change to peak the generator in the band pass
- ___ 05 Set the initial generator output to 1uv
- ___ 06 Set the initial generator modulation level to 400 Hz or 1kc at 30%
- ___ 07 Set the R390 or R390A Function switch to "MGC
- ___ 08 Set the R390 or R390A Bandwidth to 4kc
- ___ 09 Set the R390 or R390A RF gain full CW (Clock Wise)
- ___ 10 Set the R390 or R390A AF line gain full CW
- ___ 11 Set the R390 or R390A AF local gain full CW
- ___ 12 Set the R390 or R390A BFO off
- ___ 13 Disconnect the signal generator from the receiver
- ___ 14 Set the Line Meter range switch to -10
- ___ 15 Adjust the Line Gain for a -10db indication on the Line Level meter
- ___ 16 Use the Ant Trim to peak the receiver noise alone
- ___ 16 Readjust the Line Gain for a -10db on the Line Level meter
- ___ 17 This is the relative receiver noise floor level
- ___ 18 Connect the generator to the receiver's balanced antenna input

AI4NI's R-390A Checklists

- ___ 19 Reduce the RF output level of the generator.
- ___ 20 For a R390 Line Level meter value of 0
- ___ 21 Record the frequency and the output of the generator in micro volts
- ___ 22 This value is the 10db S/N + N receiver sensitivity at this frequency
- ___ 23 It should be less than .5uv
- ___ 24 The official specifications of the receiver call for 3 micro volts
- ___ 25 Work along the range of the VFO and conduct this test at each MHz
- ___ 26 .900, 1,900, 2,800, 3,700, 4,600, 5,500, 6,400, 7,300
- ___ 27 8,200, 9,100, 10,000
- ___ 28 To get a value for each Mhz crystal and the range of the VFO.
- ___ 29 Check the SN + N at the alignment points
- ___ 30 550, 950, 1,100, 1,250, 1,900, 2,200, 3,800, 4,400,
- ___ 31 7,250, 7,600, 8,800, 15,200, 17,600 30,400

Z. Signal-to-Noise Test

- ___ 01 Install a 600 ohm resistor on the line level output.
- ___ 02 Turn the receiver on and allow it to warm up for 1 hour
- ___ 03 Turn the signal generator on and allow it to warm up for 1 hour
- ___ 04 Set the R390 or R390A Function switch to "MGC"
- ___ 05 Set the R390 or R390A Bandwidth to 2kc
- ___ 06 Set the R390 or R390A RF gain full CW (Clock Wise)
- ___ 07 Set the R390 or R390A AF line gain full CW
- ___ 08 Set the R390 or R390A AF local gain full CW
- ___ 09 Set the R390 or R390A BFO off
- ___ 10 Connect the generator to the receiver's balanced antenna input
- ___ 11 Place a meter and 600 ohm load on the Local Audio output.
- ___ 12 Set the receiver and generator to the same frequency of choice
- ___ 13 Use the RF deck alignment point frequencies
- ___ 14 Conduct the test while performing RF deck alignments
- ___ 15 Use 550, 950, 1,100, 1,200, 1,900, 2,250, 3,800, 4,400,
- ___ 16 Use 7,250, 7,600, 8,800, 15,200, 17,600 30,400
- ___ 17 Rock the generator for a peak in to the band pass
- ___ 18 Set the initial generator output to 10uv
- ___ 19 Set the generator modulation level to at 30% 400 Hz or 1 KHz
- ___ 20 Use the Ant Trim to peak the receiver
- ___ 21 Set the Line Meter range switch to + 10
- ___ 22 Reduce the RF output level of the generator to 0 VU
- ___ 23 This should also be 450 milliwatts on the Local Audio
- ___ 24 This value is the 20 DB S/N + N receiver level at this frequency
- ___ 25 Set the signal generator to CW
- ___ 26 The Meter on the Local Level should drop 20 DB
- ___ 27 The Line Meter should drop to -20 DB
- ___ 28 This is the relative receiver noise floor level at this frequency
- ___ 29 It signal generator RF level should be less than 3 micro volts
- ___ 30 The official specifications of the receiver call for 3 micro volts