

ICOM

# IC-211

SERVICE - ALIGNMENT PROCEDURES

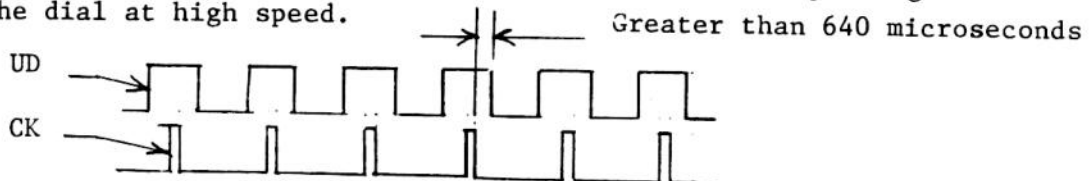
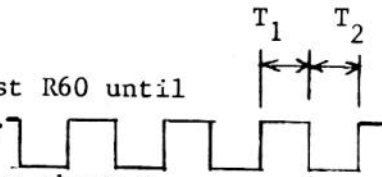
## OVERALL SERVICE ALIGNMENT FOR THE IC-211

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IC-211 ALIGNMENT

I. IC-211 Adjustment of Optical Chopper UD and CK

1. Attach triggered scope channel to R54 adjust R60 until  $T_1 = T_2$ . When spinning dial at high speed.
2. Move probe to R59 and adjust R58 for symmetry about a center line of top and bottom portions of the displayed waveform. This wave will be a sinusoidal wave with obvious cross over points marking the center reference for this adjustment. Again spin dial at high speed.
3. These two adjustments interact and back and forth adjustment is mandatory.
4. Now using the two end most terminals of the long phenolic terminal strip mounted to the front panel next to the photo sensor board. Attach the triggered scope trace to the second one from the left hand end. Attach the other probe from scope channel 2 to the end terminal. This will trigger the scope on the UD and display the CK signal in relation to it on the other trace. The waveforms and conditions following should be met when spinning the dial at high speed.



Essentially this means that the CK should occur near the middle of the UD pulse. If it is in the middle or to the right of center, things are generally ok. Check both directions.

Some things to look for are that the pots R60 and R58 should be within their active range that is within  $\pm 90$  of the center position. Adjustments beyond these limits will cause unreliable action of the chopper. Ideally, if the unit is aligned correctly the phototransistor and LED will be opposite each other. Slight adjustments of the position of the LED Board may improve operation of the chopper and bring the potentiometers into the required region. Additionally, the resistor in series with the thermistor may be lowered from 470 ohm to 330 ohm or even 220 ohm if necessary to give the required wave forms. Next the LED maybe changed if required. Last change the phototransistors, if problems are still encountered. Be sure to check for proper waveforms in both directions.

5. The biggest problem with this circuitry is intermittence in the solder joints of the display board. Check mainly all connections to IC's made to pads coming from underneath the IC body. Secondly check all the feed thru pins and touch up both front and back. Thirdly, touch up the solder joints to the connector pins for the molex connectors.
6. Some important failure checks.
  - a) If the dial clutch works but the LSI does not increment, check if UD and CK are getting to the LSI, if the brake doesn't work then the problem is probably on the display board.
  - b) The molex connectors are usually not a problem with the IC-211 as they are with the IC-245 so cleaning is usually not the solution if the problem disappears.
  - c) The feed thru joints in the PLL are subject to failure. Two of them are hard to fix because they are under the LSI socket.

## II. IC-211 Frequency Alignment of PLL

1. Go to 145.990. Monitor R41 and adjust C9 for a frequency of 2.99MHz.
2. Go to center frequency 145.000 on dial. Monitor output frequency of VCO with counter. RIT off.
3. Go to USB. Adjust L3 for 134.301200MHz (+1200Hz). Go to FM and adjust R16 for 134.300000Hz. Go to LSB and adjust R18 to 133.299000Hz. (-1000Hz). (R16, R18, both on small circuit board). Go to CW and check frequency is +800 to +900Hz on FM. Go to 144.999.9 on display and USB use R18 in PLL to get frequency of 134.30110MHz or (100Hz lower than 134.301200.) Go back and check all again. Tolerance +30Hz on all adjustments. Go to USB, set RIT control to center, turn RIT on and adjust R20 so that the frequency does not change when RIT is turned on and off.
4. Ground top end of R31 adjust R64 until VCO frequency reads 132.3000MHz. Look at Pd with scope, they should stabilize when locked. (Pd pulses at channel spacing rate = 10KHz.)
5. With top end of R31 grounded, tune to 147.000MHz and adjust L1 in the VCO for a frequency of 134.300.

IC-211 Frequency Alignment of PLL (cont'd)

6. Unground R31. Adjust C35 in PLL for 137.300000MHz.
7. Dial in 147.005 and adjust C34 for 137.305000MHz. Go back and forth between C35 and C34 adjustments.
8. Some things to check and note.
  - a) PLL's and VCO's are matched pairs and are not necessarily interchangeable.
  - b) Look for bad connections on wires going to the VCO both inside and out (high failure rate).
  - c) Check if PLL, VCO, and display are ok in DIM mode. 5V regulator in PLL has a high probability of failure. Replace with Motorola only.
  - d) With PLC check -9V. Check for stability by taping the -9V supply. Check cap on PLC line. (.01uf from anode of tuning diodes to ground).
  - e) Put a copper plate on old DP-1 -9V supply if it does not have one.

Latest (as of 6/77) production changes in PLL module.

- a. R55 = 1K ohm
- b. R39 = 470 ohm
- c. C23 = 40pf
- d. C22 = 150pf

## 211 Frequency Alignment of PLL (cont.)

- e. C24 = 150pf
  - f. C15 = 10uf 16V
  - g. R26 = 4.7 K
  - h. R27 = 4.7K
  - i. R28 = 3K variable
  - j. RFC 100uh has been added from C78 feed thru to IC8 (8.2V regulator in PLL.)
  - k. C115 = 0.01uf (Base of IC8 to ground)
  - l. C111 = 0.01uf (Collector of IC8 to ground)
  - m. C113 = 0.01uf (across R35)
  - n. C58 = 0.1uf
  - o. Note that caps C101 and C102 from base to emitter of Q4 and Q6 respectively must be in that position to work with new LSI chips. Some earlier models may have caps between emitter and collector.
  - p. R83 = 10K
  - q. R41 must be 470 ohm for LSI's with no white dots and 820 ohm for LSI's with one or two white dots. They are not interchangeable.
0. If problems with levels inside of PLL check these things.
- a. Looking at R37 adjust L4, L5 and L6 in PLL for minimum of 100mv at highest frequency.
  - b. At the lowest frequency check the voltage at PD pin on LSI (pin 40) for 3.5 volts. Adjust L1 in VCO if necessary. This may require some juggling of adjustments in steps 4 and 5 above.

## III. TRANSMITTER ALIGNMENT - IC-211

- Step 1 Transmit idling current USB mode, no modulation, measured at J2.
- Final 50 ma R130  
Driver 25 ma R127
- Step 2 Power adjustment, ground CP10 (ALC), go to CW mode, key transmit, adjust C119, C123, C132, C134, C142, C144, for over 15 watts with the set tuned at center frequency 146.000 for U.S. version.
- Step 3 Go to USB, modulate w/1 KHz at 10 mv RMS, mic gain to maximum. Adjust R273 for 14 watts RF output. Modulate with 3 mv of audio alternately between 300 and 3000Hz and adjust C255 for equal power output at these two frequencies. Repeat the same for LSB using C259 to make the adjustment.
- Step 4 Back to CW, unground ALC, adjust R129 for 11 to 12 watts.
- Step 5 Go to FM - power control to maximum. R13 is 10 - 12 watts set for FM. Turn control down and set R14 for 1 watt. (Balance back and forth until ok at both ends). Check each end of the band. Maximum change +1 watt. If not balanced, adjust L16 thru 23 to get balance.
- Step 6 APC set: SWR switch to set. FM mode, go to SWR position dip "S" meter with R135. Take antenna off, adjust R126 (R136) for 20db reading. If dip cannot be obtained change C153, a 4pf to 2pf.



Step 7. Alignment of the 10.7 MHz osc is done on FM, after PLL alignment, to bring the transmitter on frequency.

Step 8. Alignment of VOX

1. Mic gain in normal position.
2. Adjust VOX gain for good pickup of voice but low sensitivity to background noise.
3. VOX delay for good switching time with normal voice and tempo.
4. Anti VOX adjust so will not activate with speaker noise at normal volume.

Step 9. If unstable power, check for tight driver mounting. Add solder lug to top of driver and ground to heatsink. Solder mounting screws on bottom of driver. The buffer amp for 10.7 MHz sometimes has bad solder joints.

#### IV. Receiver Alignment - IC-211

Step 1 Receiver Tuning. SSB mode. Tune L52, L7, L9, L10 at center frequency 145.000 for a peak. Tune L52 for sensitivity at high and low ends if necessary.

AGC on fast, tune L7 for peak, increase input signal enough to move S meter. (Note that L7 is used to balance noise levels on USB and LSB.) L6 tune for smooth S meter response while sweeping frequency generator across Bandpass of receiver. S meter should not have a rippled response. L6 is used to match the circuit to the FLI filter. Rx SSB sensitivity check: With -10dbu input set AF output meter to 0db. Remove input signal and AF output meter should change greater than 14db.

Step 2 Fast and slow AGC: Set AGC on fast, R106 all the way to maximum resistance, look at emitter of Q19. With no signal set R92 for 4 volts +1 volt. At this point, with 30dbu signal input, set receiver frequency to give about a 1KHz audio note. Look at CP12, set R106 for 0.4 volts AC (measured on AC voltmeter). Readjust back and forth; necessary to get good balance, as these controls definitely interact.

Step 3 In FM set signal generator for S5 reading on receiver S meter. Center the center meter with the signal generator, adjust L45, L43, and L44 for a peak. Reduce input and adjust L40 for maximum audio signal on scope (looking at the speaker lead). With no signal, inject 10.7 MHz at CP8, adjust R146 for center meter zero. With signal, remove the 10.7 MHz signal and tune to either side of center.

Receiver Alignment - IC-211 (cont'd)

meter with signal generator. It should go off to  $\frac{1}{2}$  scale maximum in each direction. Adjust with R148, if necessary.

- Step 4 Receiver sensitivity in FM -10dbu.
- Step 5 S meter adjustment. Inject +8dbu input 1 KHz modulation at +5KHz deviation into receiver at center frequency. Adjust R167 to set "S" meter to S5.
- Step 6 With no signal, adjust L43 to center the center meter on noise. Go back and adjust R167 for S meter reading as in Step 5.
- Step 7 USB S meter adjustment. Adjust R132 for zero S meter with no signal input. Put in a 90 dbu signal and adjust R26 for a little past 60 on S meter. Go to -10dbu input signal and adjust R132 for S meter reading of 1 balance back and forth as these controls interact.

## V. Problems and Production Changes - IC-211

1. USB 144.43 Receiver spurious signals, if a problem, make sure the following values are in the set:

C261 100p

R282 680 ohm

C256 30 p dip mica

C253 30 p dip mica

C261 200p

FM 144.34 change C189 from 100 to 200 pf. If that doesn't fix, then try a 10pf from the CP at R197 to ground. This may foul up S meter.

2. If no CW transmit then styrenes C252, C258 are suspect.
3. VOX problem in CW, RIT on will affect chirp on Transmit change cap C7 from 0.1uf to 0.01uf mylar.
4. Mod to LSB to prevent drop out at high temperature. Change C38 from .01 ceramic to .1 mylar.
5. Put in 3 receiver switching diodes to prevent catastrophic loss of receiver sensitivity. Shorten the leads on the capacitor on the bottom of the main board from the center tap of L52 to ground to improve receiver performance. (Symptom is extremely low receiver sensitivity.)
6. C60 (100uf) change for background tone on transmit caused by oscillation of the IDC. It is probably bad if this occurs.
7. If R10 in the PLL is touching the case, then it will result in the registers in the LSI clearing in the transmit mode.
8. IC8 pin 9, bad soldering will cause RIT to affect transmit frequency.

9. Make sure the RF connector is grounded to the circuit board.
10. If the display increments on turn on, C-11 a 470uf cap, mounted on the rear deck is bad or missing.
11. Remove C295 from ground land of R281/C260 to main circuit board ground. This was used to change the BFO frequency slightly.
12. On unit w/low power output.
  - a. Check G2 of Q28 should be 4 volts at high power setting.
  - b. Check for intermittents in output curcuitry.
13. The RF gain control should move the S meter to 20 db for FM and 60 db for SSB.

VI. Rough Bench Check Procedure - IC-211

1. Transmit power and balance.
2. Power control in FM.
3. Monitor USB transmit, check mic gain.
4. Check CW keying.
5. Check deviation.
6. Sensitivity check FM and USB at center frequency.
7. A/B VFO switching and tracking.
8. Check all 6 switches, (RIT, NB, AGC, Rx/TX, VOX, DIM.)
9. Check speaker.
10. Squelch.
11. Memory.
12. Dial lock, .....
13. Check that nothing changes when the covers are replaced.