

January 3, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-1

Receiver Desensing Noticed In Cw Mode

Disconnect R19 from E14 and reconnect to G15.

Transmitted Voice Heard In Speaker

Add a .001 capacitor [PN 21-14] from F15 to F13.

January 13, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-2

Output Transistor Replacement

After power has been applied and an output transistor has been found electrically damaged, all four output transistors should be changed.

In cases where physical damage has occurred such as the stud being broken off during construction and power has not been applied, only the one damaged transistor can be replaced. It must be replaced with one from the same vendor. No other matching considerations are required.

This information is not for general customer distribution.

January 24, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-3

Beat Note Heard In Transmitted Signal
In CW and Tune Mode

The USB generator may not be completely disabled during transmit in the CW or Tune mode. The result would be two signals being transmitted approximately 700 cycles apart. This can be detected either by listening to it in a receiver or by watching it on an oscilloscope. IT looks much like a low level tone modulated signal.

Change R625 27K 1/4 watt resistor to a 22K 1/4 watt resistor, [PN 1-45-12].
Change C622 from 10 mfd to 15 mfd, [PN 25-252].

January 27, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-4

No T/R Frequency Shift Using The Remote
VFO while In Low Power

A change is needed in the transceiver to allow the remote VFO to shift transmit and receive frequencies while in low power.

SB-104:

- 1) Add a wire from the RX IF/Audio circuit board pin F-7 to lug 3 of the accessory socket.

SB-644:

- 2) Disconnect the wire going to the jumper wire between pins 2 and 5 in the 11 pin accessory plug and reconnect it to pin 3.
-

January 29, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-5

Excessive Noise with The RF Control Down
And The AF Gain Control Up

Remove R569 330K from the Receiver IF/Audio circuit board. This will allow section A of IC502 to operate quieter.

February 27, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-6

Service Hints - Low Power

The output power specification is 100W +/- 1db, which means output power can be from 80W to 125W and be within specs.

If the output power is below specs, check the following:

1. SWR The output reduces as the SWR increases. Check the Antenna dummy load with an ohmmeter. It should measure 50 ohms. All coax cables should be checked for good connections.

NOTE: A monitor scope in the line causes some SWR at the higher frequencies, enough to cause the SB-104 to reduce in output power (particularly on 10 meters).

2. Power supply voltage should be 13.8VDC under load, at the transceiver.

3. Check the 11 volt regulator. It should be at least 11 volts. A slight change in value (within 10 %) of R254 and R255 causes the output to change considerably.

4. Check ALC filter board wiring. The loop through the toroid must go through in the proper direction. If not, power will be only approximately 10%. Interchange the in and out cables for a check.

If power returns or comes up, the toroid or wire loop are miswired.

5. IC-301 also affects power output. Interchange IC-301 with other 442-18 IC's located in the kit, or select one from stock.

6. The gain of Q-301 affects full power output. If needed, select the lowest gain transistor for the power output closest to 100W. (NOTE: NOT THE HIGHEST OUTPUT, THE ONE CLOSEST TO 100W!)

Power can be lost for two main reasons. 1) Not enough amplifier gain, and 2) too much ALC cutoff. Momentarily shorting Q303 from B-C will disable the ALC circuit causing the transmitter to operate at full power when in tune position (Approximately 150W output). If obtained, this will indicate the condition of the amplifier circuits being good. If the power does not come up, there is an amplifier gain problem.

If full operating power cannot be restored after checking the above, replace each transmitter circuit board with known operating ones to isolate the problem.

January 29, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-7

SB-104 Circuit Improvements

"Pop" Heard In The Transmitted Signal when The VOX "Drops Out".

Change C1 .1 mfd to 10 mfd [PN 25-54, + end to Pin 7]. This cap may not appear in the schematic. It goes from connector pin C7 to ground.

NOTE: The .1 cap can be left in and the 10 mfd added across.

Better Noise Blanker Performance

Add a 390 ohm resistor [PN 1-48] from the center arm to ground of the RF

gain control (rear section).

10 Meter Oscillations During Alignment

Solder a ground clip [PN 258-95] to the 10 meter shield on the TX/IF circuit board. The ground clip must touch the compartment shield in front of the circuit board when plugged in.

Other Improvements

The following will be made in future SB-104 runs and have come about through design and evaluation of new products. It is not necessary to make these changes in existing kits.

- - Add a 500 mfd capacitor [PN 25-157] from terminal J-1 to ground (ground lug on the receiver antenna jack for improved driver B+ decoupling).
- - Change R903 on the driver circuit board from 100 ohms 2 watt to 220 ohms 2 watts [PN 1-13-2] for improved intermodulation distortion.

NOTE: Although this change may contribute to cooler operation of the driver transistors, if overheating is a problem, check first for broken transistor studs. If the plastic part of the transistor case "feels" considerably hotter than the heat sink, suspect broken studs.

There are instructions in the kit manual to prevent this type of damage for which Heath will not be liable if it occurs.

- - Add a 39 pf capacitor across R-314 on the Transmitter IF circuit board to improve harmonic suppression of the IF signal.
- - Change C227 from .05 mfd to 47 mfd [PN 25-223] on the Transmitter Audio/Regulator circuit board to improve the 11 volt regulator filtering.

February 10, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-8

Incorrect Diodes

An undetermined amount of diodes may have been shipped to be used in D306 to D309 which are the four diodes in the balance mixer on the transmitter IF circuit board. The incorrect diodes we have seen so far have a blue colored body. The correct diodes are clear glass, and may not have a part number printed on them.

Check for the proper diodes in each SB-104 serviced. Incorrect diodes may cause spurious radiation.

The correct part number is 56-87. The INCORRECT part you may see is 56-78.

February 21, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-9

Heterodyne Oscillator Coil Interaction

Adjacent heterodyne oscillator coils may be interactive to the point where one band may be completely inoperative.

If one heterodyne oscillator is not operative, be sure to first check the adjacent band coil settings.

March 21, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-10

VFO Drift and USB/LSB Shift

L1201 is supplied preset on the lower peak with the slug near the back of

the VFO. If this coil is not adjusted on the peak near the front of the VFO, a shift problem and VFO instability will occur. The display between USB and LSB will not adjust correctly to read the same frequency when switched. The VFO may also tend to drift. Be sure the slug is at the front of the VFO when aligning as stated in the manual alignment procedures.

April 11, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-11

Check Out And Alignment Procedures

TEST EQUIPMENT REQUIREMENTS:

- Oscilloscope: 15 Mhz vertical bandpass; triggered [IO-4510 or better.]
- RF Generator: Calibrated output attenuator; Frequency Range 3 to 30 Mhz [Radiometer MS-27G or equivalent.]
- Audio Generator: 100 to 3000 Hz sine wave output; adjustable output level [IG-18 or equivalent.]
- 100 Khz Crystal Calibrator: Harmonic output 100 Khz to 30 Mhz [HD-20 or equivalent.]
- VTVM: High input impedance [IM-18 or equivalent.]
- AC VTVM: Calibrated in decibels [IM-38 or equivalent.]
- Bench Supply: 13.8 VDC; less than 2% regulation, no load to 20 amps [HP-1144 or equivalent.]
- DC Voltage Supply: 0 to 11 v. at 1 amp [IP-28 or equivalent.]
- Wattmeter: 150 watts at 50 ohms [HM-102 or equivalent.]
- Dummy load: 150 watts; 50 ohms resistive load [HN-31 or equivalent.]
- PTT Microphone: High impedance, approximately 25K ohms [HDP-21A or equivalent.]
- 2 ea. Speaker: 8 ohms impedance [HS-24 or equivalent.]
- Probes: 10:1 LC Probe [PKW-101 or equivalent.]
RF Probe [PK-3 or equivalent.]
VTVM Probe [PKW-4 or equivalent.]
- Receiver: Monitor [SB-303 or equivalent.]
- Monitor Scope: SB-614 ((Do not use SB-610)).
- Assorted cables: See attached sheet for cables and test lead needed for interconnecting test equipment and UUT.

SB-104 TRANSCEIVER AND TEST EQUIPMENT INTERCONNECTING CABLES

Part numbers of connectors, wire and cables needed to make the test cables are listed at each part. the 134- part numbers are cable assemblies and it is only necessary to add the specified connector to one end of complete these cables.

Make about 6 "jumper leads" of various lengths to use for temporarily connecting circuit points together during troubleshooting. Install an insulator on each alligator clip.

Cable Assembly No: 134-237

'REC Jack to RF Generator'
[other end of cable has PN 438-4]

Cable Assembly No: 134-36 (2ea) 1. AC VTVM to Patch Out Jack
2. Audio Gen. to Patch in Jack
[other end of these cables has PN 438-30]

Cable Assembly No: 134-36 'HD-20 Xtal Cal. to REC Jack'
[other end of cable has PN 438-47/70-11 (on center conductor) & PN 260-16 with 73-34 insulator (on braid)]

Piece of cable [PN 343-2] 4' long 'Ant Jack to Wattmeter'
the One end with connector 438-9 & insert 438-12,
other end with connector PN 438-4]

Piece of cable [PN 343-2] less than 5' 'Wattmeter to Dummy Load'
438-12. Both ends with connector 438-9 & insert

Piece of red wire [PN 341-2] 4' long & black wire [PN 341-1] 4' long (IP-27 leads) one end of the wires has alligator clips [PN 260-16/insulator 73-34] and the other ends are crossed into a (dual banana plug) [PN 438-30].

SB-104 ALIGNMENT PROCEDURE

The following checks and alignment of the SB-104 transceiver is made with all circuit boards plugged in. Always turn the unit off when you remove or insert a circuit board.

INITIAL CHECKS

1. Depress the on button. Release all other buttons.
 - Pilot lamp lights.
 - Display lights.
2. Check for 4.5 volts DC [plus or minus .5 volts] at terminal B4 and 10.5 volts DC [plus or minus .5 volts] at B1.
3. Set bandswitch to 3.5: Lift COUNTER Board [A] from connector pins.
 - Display reads F FFF.F
4. Switch BAND switch through all positions, starting at 3.5. First digit should light in the following sequence:

BANDSWITCH	FIRST DIGIT
3.5	Blank
7.	Blank
14.	1
21.	2
WWV	1
28.	2
28.5	2
29	2
29.5	2

5. Depress the 100 Hz button.
 - Digit on the right end of display extinguishes.
6. Plug in COUNTER board [A] and set BAND switch to 3.5. Lift the HFO/PRE-MIXER board [D] from connector pins.
 - Release all pushbuttons except ON.
 - Display reads 6600.0

- Depress USB switch; display reads 6603.6.
 - Depress LSB switch; display reads 6606.4.
 - Depress CW switch; display reads 6604.3.
 - Plug in HFO/PRE-MIXER board [D].
7. Lift TX IF/PRE-DRIVER board [C] from connector pins.
 - Check that the tips of choke L-311 on board C are not shorting against the shield.
 8. Connect a microphone and depress the PTT switch.
 - Receiver mutes.
 9. Depress PTT switch on microphone and depress HI button.
 - T/R relay pulls in.
 - T/R relay drops out with PTT switch released.
 10. Depress VOX and HI buttons; speak into microphone and turn VOX GAIN control slowly CW.
 - T/R relay pulls in when speaking and drops out when you cease talking.
 11. Turn VOX DELAY CW and speak in microphone.
 - T/R relay holds for a length of time after you cease talking. The hold-in time will decrease as DELAY control is turned CCW.
 12. Release VOX button and check the voltage on the foils at L-952 and L-953 on the PA board.
 - The voltage on these foils is zero.
 13. Depress the TUNE button.
 - T/R relay pulls in; approximately .6 volts should be measured at the indicated foil patterns on the PA board.
 14. Release TUNE button.

HFO COIL ADJUSTMENTS

- Install HFO/PRE-MIXER board [D] on extender board.
- Set VTVM to +DC; 1.5V range.
- Connect the positive lead of the voltmeter to TP [free lead of 2200 ohm near Q402; and the negative lead to chassis.
- Adjust each HFO coil as described in the following chart. Each coil may peak at two points throughout its tuning range. Use the peak that occurs at the bottom of each coil. After the bottom peak is found, turn the slug CCW to zero volts. Now, turn the slug CW for peak voltage; typically .1V DC to .5V DC.

BAND SWITCH	COIL NUMBER	ROTATE SLUG FOR PEAK VOLTAGE, THEN ROTATE SLUG AS DESCRIBED.
3.5	L401	1/2 turn CW*

7.0	L402	1 turn CCW**
14.0	L403	1 turn CW
WWV	L404	1/2 turn CW
21.0	L405	1 turn CW
28.0	L406	1 turn CW
28.5	L407	1 turn CW
29.0	L408	1 turn CW
29.5	L409	1 turn CW

* = Clockwise
** = Counterclockwise

- Release ON button and reinstall HFO/PRE-MIXER board (D).

VFO ADJUSTMENT

- Set bandswitch to WWV.
- Depress USB buttons.
- Connect RF probe to VFO connector PL201, pin 1 [coax center lead] and adjust VFO LEVEL ADJUST control (R1232), at hole FY, CW for .5 volts reading on VTVM.
- Check for a stable display (+/- 1 count) at all positions of the band-switch. Turn VFO LEVEL ADJUST CCW, if necessary, to obtain a stable display.

VFO FREQUENCY AND SHIFT ADJUSTMENTS

- Set Bandswitch to 3.5.
- Turn the MAIN TUNING until the display will go no lower. If the display is unstable, repeat VFO output adjustments.
- Remove the MAIN TUNING knob.
- Adjust the VFO FREQUENCY ADJUST control (hole ET) for a display of 3475.0 or the point which gives the reading closest to 3475.0. This readout may appear at two positions of the coil slug. The correct position is where CCW rotation of the slug causes a lower frequency to be displayed.
- Reinstall and tune MAIN TUNING knob for display of 3800 KHZ.
- Remove MAIN TUNING knob.
- Depress USB button and record frequency display.
- Depress LSB button and adjust VFO SHIFT ADJUSTMENT (C1211) at hole ES with a small screwdriver. Remove the screwdriver after each adjustment and check the frequency. Adjust C1211 until the LSB frequency is the same as the USB frequency. Check 3500 KHZ and 4000 KHZ. The side band shift should be less than plus or minus .5 KHZ at each point.
- Reinstall customer's black tape over holes ES and ET; reinstall MAIN TUNING knob and tighten the two set screws.
- Check stability of frequency display at all positions of the bandswitch. Turn the VFO LEVEL ADJUST slight CCW to stabilize the display as necessary. Adjusting this control beyond the point necessary for a stable display will increase noise and birdies.

RECEIVER ALIGNMENT

Preselector BPF And 8.65 BPF Alignment

- Set transceiver controls as follows:

- Bandswitch - 3.5
- RF Gain - FCW
- ALC Button - IN
- USB Button - IN
- AGC - OFF
- ANT Switch - SEP
- LEVEL - FCCW

- Install RECEIVER FRONT END board (G) on an extender board.
- Connect 100 KHZ crystal calibrator to REC antenna jack.
- Connect AC VTVM to PATCH OUT jack.
- Set AC VTVM range switch to .1 V.
- Adjust AF gain control for a -10 dB reading on the meter scale (noise output).
- Turn transceiver to calibrator harmonic at 3800 KHZ. Turn to the side of receiver bandpass (high pitched beat note) until AC VTVM indicates -5 dB.
- Adjust the three PRESELECTOR BPF trimmers for maximum indication on AC VTVM.
- Tune transceiver to calibrator harmonic at 3500 KHZ and adjust LOW END trimmer for maximum output.
- Adjust trimmers at coils L725 and L726 (8.65 BPF) for maximum output. Adjust these trimmers for the most uniform response across the 80 meter band.
- Follow the same procedure and adjust the PRESELECTOR BPF's for the 40 through 10 meter bands. Refer to the chart below for the location of the trimmers and the three frequencies used for the adjustment of each filter. Do not adjust the trimmers at coils L725 and L726.

high

[[Looking at component side of Board G, where coils L725 and L726 are in the upper left-hand corner of the board, there is shown (5) rows of 3-trimmers on the right 2/3 of the board. Trimmer L704 is shown at the extreme lower left corner of the board. Again looking at the board - component side - the 3 trimmers are, reading from top to bottom::

MATCHING TRIMMER	HIGH END TRIMMER	LOW END SWITCH	BAND
		29.0-29.5	
		28.0-28.5	
		21.0	
		14.0	
		7.0	
		3.5]]

[[The next chart shows mid-band adjustments for the 3 trimmers:

BAND	F R E Q U E N C I E S		
	MID-BAND (ADJ. 3 TRIMMERS)	LOW END	HIGH END
29.0	29400	29000	29700
29.5			

28.0								
28.5		28400		28000		29000		

21.0		21100		21000		21400		

14.0		14200		14000		14400		

7.0		7100		7000		7300		

3.5		3800		3500		4000		

[[Hope this can be followed, please advise if not]]

3.395 MHZ Receiver Trap Adjustment

- Connect RF generator to REC antenna jack and AC VTVM to PATCH OUT jack.
- Tune generator to 3.395 MHZ and tune transceiver to 3.5 MHZ.
- Adjust trimmer capacitor at L704 of RECEIVER FRONT END board (G) for minimum output.

NOTE: Due to the location of the 3.395 trimmer, this adjustment is hard to get at. The board (G) will have to be removed and the trimmer adjusted in increments until the correct setting is reached. The position of the trimmer of L704 will be changed in future runs for

easier

access to the adjustment.

- Reinstall FRONT END board (G).

S Meter Adjustment

- Set the generator and transceiver to 3800 KHZ.
- Set AGC switch to FAST.
- Set the generator output for 50 uV and tune the receiver for maximum output.
- Adjust the S Meter LEVEL ADJUST on the RECEIVER IF/AUDIO board (F) for an S-9 reading on the S meter.

Receiver Sensitivity Measurement

The receiver sensitivity is specified at less than 1 uV for 10 dB signal plus noise-to-noise ratio.

- Set the controls of the transceiver as follows:

Bandswitch - 3.5
 RF Gain - FCW
 USB Switch - IN
 AGC - OFF
 ON Switch - IN

- Connect AC VTVM to PATCH OUT jack.
- Connect generator to REC Antenna jack.
- Set generator for unmodulated RF to 50 uV output.
- Tune generator and transceiver to center of band [3800 KHZ].

- Reduce generator output to zero.
- Set AC VTVM range switch to .1 V.
- Adjust AF GAIN control for a -10 dB reading on the meter scale [noise output].
- Increase generator output and tune the receiver for a maximum indication of 0 dB on the AC VTVM [signal plus noise output].
- If the output of the generator is 1 uV or less, the receiver is within specifications.
- Check the sensitivity of the remaining bands.

NOTE: The sensitivity of the receiver on the 20 meter band can be improved by a slight toughup adjustment of HFO coil L405. This is the only band that a noticeable increase in sensitivity is achieved by a touch of the HFO coils.

8.64 MHZ IF Rejection Check

The IF rejection is specified at -60 dB.

- Set bandswitch to 7.
- Connect RF generator to REC antenna jack and AC VTVM to PATCH OUT jack.
- Tune receiver and generator to 7.25 MHZ.
- Make sensitivity measurements and note generator output reading for a 10 dB S+N/N.
- Tune generator to 8.65 MHZ and increase generator output until the VTVM reading is the same as obtained in the sensitivity measurement.
- If the generator output was increased 60 dB or more to obtain the same VTVM reading, the IF rejection of the receiver is within specifications.

NOTE: If on 50 dB of rejection is obtained during this test, check that coils L1 or L3 are not shorted to the chassis or across the lugs of terminal strip AE. To prevent a short at these points, dress the coils away from the lugs of the terminal strip and place a piece of fish paper between each coil and chassis.

COUNTER CLOCK CALIBRATION

- Connect antenna to REC antenna jack.
- Set bandswitch to WWV (15000 KHZ) or 7 (CHU, Canada, 7335 KHZ).
- Tune to zero beat station selected.
- Adjust the MAIN TUNING until the voice announcements sound natural.
- Adjust the TIME BASE TRIMMER capacitor on the upper right hand corner of COUNTER board (A) for a readout of 15000.0 or 7335.0.

TRANSMITTER ALIGNMENT

Low Power Transmitter Check

- Check that the coil slug of L321 on the TX IF/PREDRIVER board (C) is flush with the bottom of the coil form and reinstall this board.

- Connect a wattmeter and a 100 watt dummy load to ANT jack.
- Set controls as follows:

BANDSWITCH - 3.5
 LEVEL - FCCW
 SIDETONE - FCCW
 ANTI-VOX - FCCW
 PWR, TUNE and ON button - IN
 All Other Buttons - OUT

CAUTION: Never change bands when the TUNE button is IN.

- Advance LEVEL control and check for power output at the middle of the band and within 25 KHZ of the lower and upper band edges. Panel meter will read about 1 on the relative power scale; 1 watt or greater on the wattmeter. The meter should not deflect when the band-switch is set to WWV.
- Release TUNE button and set the bandswitch to the next higher band. Check the output at the middle and each edge of all bands.
- Depress the ALC button and advance the MIC/CW LEVEL control. The ALC meter should show a full scale indication as the LEVEL control is advanced on all bands.
- Turn AF GAIN control to 9 o'clock and advance SIDETONE control for a comfortable listening level.

10 Meter IF/PREDRIVER Filters Adjustments

- Set transceiver controls as follows:

BANDSWITCH - 28
 ALC BUTTON - IN

- Connect dummy load to ANT jack.
- Tune the transceiver to 28.1 MHZ.
- During the following coil adjustments, the ALC indication will vary with the setting of the LEVEL control. Keep the meter reading at mid-range.
- After each coil is adjusted, turn the LEVEL control FCCW. The ALC meter indication must drop to zero.
- Refer to the pictorial below for the location of each coil on the TRANSMITTER IF/PREDRIVER board (C).

[[[Looking down at the this board, the 3.395 MHZ coil (L321) is at the top of the board, far righthand side. The other coils are [reading from left to right:

L309 [29.6], L310 [28.1]. L320 [29.6], L319 [29.1] and then and the extreme right edge, L321 [3.395 MHZ]]]]

- Depress TUNE button and peak coil L310 [28.1 MHZ].
- Release TUNE button.
- Set bandswitch to 29 and tune to 29.1 MHZ.
- Depress TUNE button and peak coil L319 [29.1 MHZ].
- Release TUNE button.
- Set bandswitch to 29.5 and tune to 29.6 MHZ.

- Depress TUNE button and peak coils L309 and L320 [29.6 MHZ].
- Repeat the preceding steps until maximum output is obtained across the 10 meter band.
- Release TUNE button.

CW Check

- Connect wattmeter and dummy load to ANT jack.
- Connect speaker to SPKR jack.
- Plug key into KEY jack. A positive voltage is present at this jack so the leads of any "grid block keyer" must be reversed.
- Set the controls as follows:

BANDSWITCH - 7
 LEVEL - FCCW
 PWR, VOX, CW and ON BUTTON - Depressed.
 All Other Buttons - Released.

- Tune to 7000 KHZ.
- Close the key. The panel meter should read between 1/2 and 1 as the LEVEL control is advanced.
- Adjust SIDETONE Control for a comfortable volume level.

P. A. Circuit Board Check

CAUTIONS:

1. Check that all five cables in the P.A. compartment are properly connected. If an error is made at this point, you may have to replace the four power transistors.
2. Whenever the transceiver is operated in both HI power and TUNE, the duty cycle requires an OFF period [receive mode] of five times the TUNE time. [Example: 10 seconds TUNED followed by 50 seconds with TUNE button released]. This must be carefully observed in the following steps. Complete duty cycle information is given in the "Operations" section of the SB-104 Operations Manual, Page 261.
3. Do not exceed 30 seconds in the HI power and TUNE modes.
4. Read the following nine steps before preceeding to make the P.A. circuit board check.

- Set front panel controls as follows:

LEVEL - FCCW
 BANDSWITCH - 7
 VOX DELAY - FCCW
 PWR, USB, HI and ON BUTTONS - Depressed
 All other Buttons - Released

- Connect a wattmeter and dummy load to the Ant Jack.
- Depress the TUNE button.
- In the following steps, turn the LEVEL control FCCW only when making a check. Return the LEVEL control to the FCCW position after a check is made.

- Advance the LEVEL control. The panel meter should read above 12 on the upper scale. The wattmeter should read 80 to 125 watts.
- Depress the ALC button. The panel meter should read not less than full scale.
- Rotate LEVEL control FCCW; ALC meter should read between no deflection and 3.
- Release the TUNE button.
- Perform the preceding five steps at 20 through 10 meter positions of the band switch, being careful to observe the duty cycle. There should be no output at the WWV position.
- Perform the following 3.395 trap adjustment. Then, repeat the last five steps of the P.A. check at the 80M position.

3.395 Trap Adjustment

- Set the bandswitch to 3.5 and tune transceiver to 3500 KHZ.
- Depress PWR, HI and TUNE buttons.
- Turn the MIC/CW LEVEL FCCW.
- Adjust coil L321 on the right side of the TRANSMITTER IF/PREDRIVER board (C) for a dip in the power output. Then adjust the coil CCW until the power output is 80 watts.

SWR "Power Down" Check

- Turn unit off.
- Interchange the IN and OUT plugs on the ALC/FILTER board (K).
- Depress the TUNE and ON buttons.
- Turn the LEVEL control CW.
- Output should be "powered down" considerably (wattmeter should indicate approximately 15 watts output).
- Reinstall the IN and OUT plugs in their proper jacks.

Carrier Suppression

Transceiver carrier suppression specification is 50 dB down from 100 Watts.

- Connect the wattmeter and dummy load to the ANT jack.
- Connect the microphone.
- Turn the bandswitch to 7.
- Turn the MIC/CW LEVEL FCCW.
- Depress the PWR, USB, HI and ON buttons. Other buttons released.
- Connect an RF probe to the OUT jack of the ALC/FILTER board (K).
- Key the transmitter with the PTT switch for short periods and alternately adjust R666 and C649 on the CARRIER GENERATOR/XTAL FILTER board (E) for the best possible null as indicated on the VTVM. Carrier suppression is within specifications if this voltage is 2/10

volts

or less when the power output in the HI power mode is 100 watts.

- the
- Depress the LSB button. If the meter indication is any higher, make the best possible compromise adjustment between USB and LSB.

ALC Metering Check

for The operator of the transceiver is instructed to adjust the ALC meter a total change of 6 units on voice peaks. Either low power output or sideband 'splatter' will result if 100% modulation does not occur at the 6 unit difference point.

- CW
- Connect monitor scope [SB-614] and dummy load to the ANT jack of transceiver.
 - Depress the PWR, VOX, CW and ON buttons.
 - Depress the HI button and advance the LEVEL control only to the point where the meter reading ceases to increase. Note the height of the pattern on the monitor scope.
 - Turn LEVEL control FCCW.
 - Depress the HI, ALC, USB and ON buttons.
 - Depress PTT switch on microphone.
 - Speak into the microphone and advance LEVEL control until voice peaks obtain the same height as the CW signal. The peaks of the signal should be sharp, [giving a 100% Modulation Voice Pattern].
 - The panel meter should indicate the total change of approximately 6 units on voice peaks. Advancing the LEVEL control beyond this point should result in overmodulation [as indicated on the monitor scope].

SERVICE HINTS

- lead will chassis and ohm amplifier increase power on
1. When connecting probes to a circuit for tests, connect the ground of the probe as close as possible to the point of measurement. This will minimize the signal pickup in a ground loop.
 2. Check all coax cables used in the unit for proper grounding of the shields. Tighten the hardware used to mount solder lugs on the chassis and check the solder connection of each coax shield.
 3. If the second harmonic content of the output signal in the high power mode exceeds specifications, check for interchanged 100 ohm and 10 resistors on the P.A. circuit board.
 4. To eliminate or confirm the ALC circuit as a cause of low power output, connect a jumper wire between pin 5 of the transmitter IF board and the 5 volt line. This will allow the transmitter amplifier stages to operate at maximum gain, causing the output power to increase to 175 watts. If a problem exists in the amplifier stages, the power output will remain low. If the power output increases to 175 watts, this would indicate a problem exists in the ALC circuits.
 5. If power output is normal on the 10 through 40 meter bands, but low

the
cause
overheat.

the 80 meter band, with the power output decreasing as you tune from high to the low end of this band, check for and remove a jumper wire between lugs 2 and 3 of bandswitch S1C. This wiring error will also cause C957 and C963 [25 uF electrolytics] on the P.A. board (H) to overheat.

- line
for
measured at
6. Each "S" unit on the S-Meter is approximately equal to 3 dB.
 7. If the VFO frequency shifts when transmitting, check the 11 volt line for proper regulation (10.75 VDC; +/- .5V] and zener diode ZD1201 for proper type [PN 56-19; 9.1V].
 8. The VFO output voltage on 80 meters can be measured directly with an IM-28 VTVM set to 1.5 VAC range. Approximately .5 RMS can be measured at PL201, pin 1 (coax center lead).

April 14, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-12

ALC Meter Reads Upscale with

No Input

In transmit, it is considered normal for the meter to read as high as 3 units with no input. Therefore, the transceiver is operating properly if 100% modulation occurs at the point where the ALC meter reads 6 units above the "no input" reading.

11 V. Supply Out of Tolerance [10.75VDC +/- .5V]

To insure that the 11 V supply operates within this specified tolerance [10.75VDC +/- .5V] install the following change: R255 from 470 ohm 10% to 470 ohm 5% [PN 1-157]. Install this change only when needed.

NOTE: The low voltage supplies are specified as follows:

5 V. line - 4.5 VDC +/- .5V
11 V. line - 10.75VDC +/- .5V

Distorted Transmission

To prevent distortion when using a microphone with an output greater than -44 dB, install the following change: R621 from 22 ohm to 100 ohm [PN 1-1-12}

Low or No Output From VFO

Check that the leads of control R1232, VFO Level Adjust, are through the board and soldered.

Noise Blanker Check

A quick check to determine if the noise blanker is operating is to intermittently ground the IF output pin at the RECEIVER FRONT END board. [Pin G-1]. With the noise blanker switch off, noise spikes will cause S-meter readings of S-9 or greater, and when the noise blanker is switched on the meter reading will drop to the lower one third of the scale.

April 14, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-13

VFO FM-ING

The following changes should be made on any SB-104 which has an FM-ing problem due to battery or mobile operation. These changes will be made in production as soon as possible.

On VFO oscillator board, change:

R1201 from 4700 to 1200 [PN 1-10]
R1202 from 10K to R.F.C. [PN 45-82]
R1203 from 1000 to 470 [PN 1-6]
R1206 from 47 to 150 [PN 1-66]
D1201 from IN191 to IN458 [PN 56-24]
ZD1201 from 9.1V to 7.5V [PN 56-97]

Although the FM-ing problem may not exist when operating from a 13.8 VDC power supply, the FM-ing problem would occur if customer operated the unit mobile, or if his power supply was improperly adjusted. Therefore, to eliminate this potential problem, the above changes should be installed in all units serviced.

April 23, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-14

Improving CW Keying Characteristics

- 1] Remove two gray wires from lug 6 of R2.
- 2] Connect the 6 1/2" gray wire from S4 lug 1 to the GRN lug.
- 3] Discard the short gray wire [that went from lug 6 to the GRN lug].
- 4] Connect a gray wire from R2 lug 6 to terminal strip BE lug 3.
- 5] Connect a 5uf electrolytic [PN 25-149] between lug 3 and GND lug of terminal strip BE; (+) lead to lug 3.

Note: The lug numbers for R2 as shown on the large SB-104 schematic are incorrect. R2A [MIC GAIN] and R2B [CW LEVEL] lug numbers should be interchanged; i.e., R2A lug numbers should be 3, 2 and 1 with lug 1 ground. R2B lug numbers are 4, 5 and 6 as shown [lug 4 is directly opposite lug 1 of R2A].

May 2, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-15

Improved TR Switching

Change C622 to a 22 mfd capacitor [PN 25-212]. This supercedes bulletin SB-104-3.

Relay RF Bypass

The switching terminal of the accessory relay is being RF bypassed to ground to prevent crosstalk within the relay. Very often, the customer elects to ground one of the relay terminals to pin 6 of the accessory plug. Pin 6 is not an RF ground, although it is at DC ground.

Add a .001 capacitor [PN 21-140] from pin 10 of the relay to ground.

Inadequate Carrier Suppression

In the next manual, the customer will be instructed to look for two null settings of the capacitor. If only one null is found, remove capacitor C645 [33pf] and continue with the carrier suppression adjustment. Either one of the two nulls is correct.

No Receive

L501 wound Incorrectly

Some [PN 40-1686] coils (L501) were made wrong. The original coil had two lugs. The new coil has three lugs and the coils ends have been wired to the wrong lugs.

The coil need not be replaced. Simply unsolder the wire from the center lug and move it to the unused lug. The correct wiring is when the two extreme lugs are used.

June 16, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-16

Insufficient Range
L321 - 3395 Trap

In some cases, C348 may have to be changed to a 620 pf capacitor [PN 20-167].

In many cases, the trap has to be adjusted to a frequency less than 3395 MHz in order to allow for full output on the low end of the 80 meter band. In cases where the trap cannot be adjusted low enough in frequency, the capacitor has to be changed.

September 2, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-17

"Blurp" of Sidetone on Initial Receiver Muting
When Keyed in Cw Mode

Change: R564 [820K ohm] to 330K [PN 1-31].

September 19, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-18

SERVICE HINTS

Power Drops on 20 Meters when Unit Gets Warm

Suspect capacitor C909, .01 mfd [PN 21-176] for the above condition. Direct replacement cures the problem.

Audio Output Transistors Overheating

Change resistor R532, .33 ohm 2 watt to .82 ohm 2 watt [PN 3-1-2].

WWV 14 or 21 MHz Heterodyne Crystal Fails To Oscillate

Change capacitor C414 from 10 pf to 18 pf [PN 21-60].

Low Power Output on 15 Meters

The values of L317 and L318 are more critical on 15 meters than any other band.

Try interchanging coils L317 and/or L318 with any coil from L311 to L316 to obtain the best and most uniform output across the 15 meter band.

October 14, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-19

Inadequate Carrier Suppression

Be sure the carrier suppression trimmer [C649] goes through two complete nulls for a 360 degree rotation when making the adjustment.

If only one null is noted and the metal part of the trimmer falls to the

left, remove the 33 pf capacitor [C645].

If only one null is noted and the metal part of the trimmer falls to the right, replace C645 with a 62 pf capacitor [PN 20-109].

This information adds to information found in Bulletin No: SB-104-15.

Transmit - - Audio Input Distortion

It has been found the input preamplifier can be overloaded very easily, particularly when using high level microphones.

Replace R207, 4.7 meg to a 1.5 meg 1/2 watt resistor [PN 1-36].

Transmitter Automatically Keys in The CW Mode or VOX Delay Control Peaks in The Center

These problems have been traced to leaky capacitors at C208 or C222. In future runs, these two capacitors are being changed to [PN 27-47].

Also, all the other .1 capacitors are being changed to PN 21-199 on this circuit board.

Use these new part numbers only if replacement is necessary.

Output Transistor Abuse By Advancing The Mike Level Control Too Far, Or Using Speech Processor

Advancing the mike level control way beyond the normal operating point or using a speech processor fills in the valleys in the RF envelope and increases the output duty cycle.

Operators insisting on doing this should observe the CW duty cycle rating chart in the SB-104 Operations Manual.

Low Power On 15 Meters

Change capacitor C332 from a 75 pf capacitor to a 50 pf capacitor [PN 20-97].

October 28, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-20

P.A. Oscillations Using CTC Transistors

If you notice any oscillations on the 80 and 40 meter bands using CTC transistors, add a 390 ohm resistor [PN 1-48] across RFC-902.

The resistor can neatly be tucked underneath the rfc against the top side of the circuit board.

November 12, 1975

SB-104
Solid State Transceiver

Bulletin No:
SB-104-21

Improved Receiver Sensitivity

1. Remove the wire between G-2 and G-13.
2. Cut the large orange wire 2 1/2" from breakout #7. Connect both wires to G-2.
3. Change Q-701 and Q-704 to PN 417-274.
4. Change R-719 from a 100 ohm resistor to a 2.2uH choke [PN 45-73].
5. Change L734 to PN 40-1875.

February 23, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-22

Harmonics And Spurious Radiations Near The Output Signal

The following changes to correct for undesired radiations should be made to all units received for service:

Change:	R955	.51 ohm	to	475-12 Ferrite Bead
	R956	.51 ohm	to	475-12 Ferrite Bead
	R329	4700 ohm	to	12K ohm [See SB-104-26]
	L952	5 Turns	to	4 Turns
	L953	5 Turns	to	4 Turns

To remove one turn from L952 and L953 (refer to Pictorial 11-7 in the Assembly Manual), unsolder the leads at AB and AA, pull the wire end through LF/LE and LA/LB, cut the wire to proper length, and resolder to the foil at AB and AA.

To install the ferrite beads at R955 and R956 use lengths of buss wire equivalent to 1 watt resistor leads.

February 23, 1976

SB-104
Solid State Transceiver

Bulletin No.
SB-104-23

AC Hum With AF Gain AT Minimum

The hum coming from the speaker with the AF gain control at minimum can be reduced by removing the blue and violet wires from the wiring harness to the ON-OFF switch, and repositioning them as shown in the illustration below.

The wires must be positioned as shown, and as close to the chassis as possible. If a hum is still faintly audible, re-position the violet lead as needed to eliminate the hum.

[[NOTE: The illustration shows the Violet and Blue wires pulled out of the harness/do NOT cut cable lacing/ 3" from the ON/OFF switch. The Blue wire is positioned around [to the right] of the terminal strip and connected to pin 6 then 5. The Violet wire is positioned under the harness [to the right], then back again under the harness [to the left] to be connected to pin 3 then 4.]]

February 25, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-24

Spurious Radiation on 40 and 20 Meters

The following change should be made to all SB-104's received for service to prevent RF being fed back into IF amplifier IC 301 through the ALC line.

ADD:	.01 uF [PN 21-176]	from chassis pin C4 to nearest ground lug.
	" "	from chassis pin C5 to nearest ground lug.

March 2, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-25

Power Drop-Off On 20 Meters

If power drops off on the 20 Meter band after a period of on-and-off keying, and then returns again after the unit has been shut down for a while, the problem may be caused by dielectric heating of the ferrite bead at the junction of L316 and anode of D328.

If this problem occurs, change the ferrite bead to a 100 ohm [PN 1-1-12] resistor.

March 9, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-26

Harmonics and Spurious Radiations Near The Output Signal

Bulletin SB-104-22 called for changing R329 on the "C" board from 4.7K to 15K. This value has been changed to 12K [PN 1-14-12].

March 9, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-27

High Level 3395 Khz Spur on 80 Meters

A high level spur at 3395khz may be present in some units due to incorrect tuning of the 3.395Mhz trap on the transmit IF board. This problem can be avoided by removing the old 3.395 trap on the transmit IF "C" board, and installing a new trap as follows:

1. Remove and discard L321 and C348.
2. In the L321 circuit board holes near the top edge of the board install an 8-40 pf [PN 31-76] with the slotted side toward the top edge of the board.
3. In the next lower set of holes, install a 150 pf [PN 20-149] capacitor. DO NOT use the holes screened for C348.
4. Next, install a 13.25 uH [PN 40-1877] coil at C348.
5. Remove circuit board D, and pre-set the front panel controls to the 3.5 mhz band, MIC/CW Level control full counterclockwise.
6. Put the meter in the POWER position, depress the HI and TUNE pushbuttons.
7. Turn the MIC/CW Level control full clockwise. Adjust the 8-40pF trimmer for a minimum [null] on the power meter.
8. Turn off the unit, and reinstall circuit board "D".

March 9, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-28

Skewed Receiver Response On 80 Meters

A number of units tested by Engineering have shown the 80 meter bandpass response to be skewed toward the low end because of the tuning response of the tuned circuits and trimmer capacitors. To correct for this skewed response, make the following changes:

	FROM		TO
	----		--
Change:	C703 130 pF		105 pF [PN 20-162]
	C707 130 pF		105 pF [PN 20-162]
	C764 1-8 pF trimmer		8-40 pF [PN 31-76]
	C769 1-8 pF trimmer		8-40 pF [PN 31-76]

Remove and discard: C763 5pF

Realign the receiver according to the manual.

March 18, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-29

Springs Simplify Cabinet Installation

An often encountered problem after servicing SB-104's and other units using the two-piece wrap-around cabinet with side rails is keeping the side rails and the #10 flat washers separated.

If the PN 258-53 springs are cut in half and slipped over the threads of the #10 mounting screws, the #10 flat washer will be compressed against the cabinet sides and the cabinet halves can be easily installed.

If the cabinet retainer does not clamp the cabinet halves securely, remove turns from the spring until a good fit is made.

March 23, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-30

Spurious Responses on Ten Meters

Some of the high level spurious responses found on ten meters is due to the high VFO injection which occurs when the VFO attenuator pad is bypassed on transmit. This should be corrected in all SB-104's received for service by clipping out the 1000 ohm resistor at R1251.

This change keeps the attenuator pad and VFO filter in the circuit at all band switch settings by disabling switch transistor Q1251.

In addition to this change, put four large ferrite beads [PN 475-12] on the grey lead from chassis connector pin K5 to lug 8 of the relay. Glue ferrite beads to chassis with PN 350-12.

March 24, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-31

Improved Sensitivity

The following change should be made to all SB-104's received for service:

Remove and discard	L733
Remove and discard	C787

This change eliminates the series resonant circuit from the collector of Q703 to ground, and improves the performance of the PN 40-1875 coil at L734.

March 24, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-32

Improved +11 Volt Regulation

The 680 oh, 5% resistor at R254 [See Bulletin No. SB-104-12] may not work well in all cases. When the +11 volt buss is found to be low, R254 should be replaced with a 750 ohm, 5% resistor [PN 1-96].

This bulletin does not apply to the HW-104, since all production units have the 750 ohm resistor installed at R254.

April 9, 1976

SB-104/HW-104
Solid State Transceiver

Bulletin No:
SB-104-33

Product Improvements

Low Power On All Bands

Select R-332 with a D.V.M. to 1.2K 1% or slightly higher. Future runs will use a 1% resistor. The part when specified in will be assigned a new number.

Keep in mind, the power spec is 80-125 watts. Too much power can cause additional problems. An ideal performance would be 100 w on all bands.

Carrier Suppression

Carrier suppression can be improved, if there's ample power on all bands, by lowering the value of R314[1K] to as low as 390 ohm.

The carrier balance adjustment can be accurately made by watching the "S" meter on another receiver tune to frequency and adjusting for minimum reading. Couple the receive antenna to the SB-104 to provide an adequate reading. Also, see Bulletin No. SB-104-19.

Unstable And Excessive Harmonic And Spurs 15 & 10 Meters

ALC Board

If the SB-104 has been oscillating for some reason, theres a possibility coils L801, L802 and L803 have been overheating. There will be no physical sign of this now. Direct replacement cures the problem.

Driver Board

The Driver Board mounting holes (3) do not have the solder resist cleared for secure grounding when the hardware is installed. Each board must be disassembled, solder resist cleaned from around the holes, tinned and reassembled. If the transistors have been oscillating on this board they will probably be getting hot as a sign now. They must be replaced.

C Board

When first keyed a spur occurs due to late ALC action. Remove C322 on ALL SB-104's serviced.

If one band has more output than others and you suspect spurs, change any one [or more] of the corresponding output resistors R337, R339, R343 or R345 to 100 ohms [PN1-1-12]. The most likely one is 40 meter R343.

Chassis

The four ferrite beads in Bulletin No. SB3-104-30 should be cemented down with the same cement used for the coils [PN 350-12]. This is for mechanical reason only.

Low Sensitivity

G Board

To improve the 80 meter sensitivity, change L734 to PN 40-1726. Remove 2 turns before installing this coil. Future runs will have a coil for this location with its own part number. When it's available, you will be advised.

In the first 3 runs, the coils were not color coded. We also find, many of these coils in the B,P,F,S, are below Q spec. If you have a sensitivity problem change to the new number. 80 to 10 meters is usually the more difficult ones to meet spec.

New 10 M coil [PN 40-1875 (Red)]
New 80 and 40 M coils [PN 40-1882 (White)]

The new numbers are found in the most recent manuals. Also a cross reference is in the HW-104 service data book. Also suspect the (3) 8.65 MHz B.P.F. coils [PN 40-1805].

E Board

Remove R613

Change R619 from 560 ohms to 100 ohm [PN 1-1-12].

April 21, 1976

SB-104/HW-104
Solid State Transceiver

Bulletin No:
SB-104-34

Trimmer Capacitors Tune Full Open

The 40M and 15M bandpass filter trimmers C718 and C741 usually trim fully open, preventing proper tuning of the filter and reducing sensitivity. Make the following changes in all SB-104/HW-104's received for service.

Change: C719 30 pF s.m. to 24 pF s.m. [PN 20-77]
Remove and Discard C742 3.9 pF disc.

The capacitor plates in the square black trimmers are indicated by the indented and raised spots on the capacitor body -- the capacitor is fully meshed when the indented and raised spots are closest to each other.

April 21, 1976

SB-104/HW-104
Solid State Transceiver

Bulletin No:
SB-104-35

Low Sensitivity On 10M and 15M, Other Bands OK

In cases of reduced sensitivity, bypassing the 8.65 MHz band reject filter located under the chassis should result in an increase of not more than 1 db on 10M and 15M. Check the series and shunt torroids by pulling them slightly away from the terminal strip and re-checking the filter attenuation. A noticeable improvement in signal-to-noise ratio indicates the insulating formvar on the torroid windings had been broken at point of contact.

April 22, 1976

SB-104
Solid State Transceiver

Bulletin No:
SB-104-36

Incorrect Wires In Harness

Wiring Harness [PN 134-887] should have a WH/BR/BR wire and a WH/BR wire coming from BO#1 and BO#4. In kits with series number 05551 harnesses were found with two WH/BR/BR wires or two WH/BR wires at these breakouts causing the unit to be wired incorrectly. SB-104 store stock with this series number should be checked for the correct wires in this harness.

Factory stock is being corrected.

April 22, 1976

SB-104/HW-104
Solid State Transceiver

Bulletin No:
SB-104-37

Low Sensitivity On All Bands

The following performance checks will help to isolate specific problem areas in receivers with low sensitivity:

1. Set the SB-104 front panel controls as follows to prevent damage to the signal generator if the transmitter is accidentally keyed:

MIC/CW Level ----- full CCW
HI ----- out
TUNE ----- out

2. Turn the receiver RF gain full CW. With no signal applied, set the volume control for a noise reference level that is high enough to mask the receiver's own hum and noise. If an IM-38 is being used to read the audio

output, set the meter to the 0.3 volt range, and then set the noise reference level at -10 db. [Some of the following steps may require a resetting of the reference level before measurement due to changes in receiver noise level].

NOTE: In the follow two steps it will be necessary to isolate input leads during signal injection. This can be done by unsoldering input leads, or, by using the extender card with the pin 1 through 6 extender block shifted over one space to isolate pin 1 on the circuit board.

3. Isolate pin F1 on the F board and inject a 3395 kHz, .6 microvolt signal through a .01 mfd capacitor to the pin. The output should increase by 10 db or more. If not, the problem is probably in the IF strip or AGC.
4. Isolate pin E1 and inject a 3395 kHz, .18 to .2 microvolt signal to the pin. Tune the signal generator across the filter passband; the output should peak at least 10 db or better. If not, the problem is the crystal filter or its input and output circuits.
5. Install the extender block properly on the extender card, and put the G board on the extender card [pin 1 no longer has to be isolated]. With an RF probe, check the voltage at pin G6. This voltage should be approximately .5 to .6 volts on 80M and 40M, and .4 volts on all other bands. If the voltages are significantly lower, the problem is with HFO output amplifier Q405 or the appropriate HFO oscillator on the D board.
6. With an RF probe, check the VFO voltage at pin G4. This voltage can be as low as .4 volts without seriously affecting receiver sensitivity, and should be around .45 to .50 volts. If the voltage exceeds .5 volts, reset the VFO output level to .48 volts at the MIDDLE of the VFO range.
7. Set the bandswitch to 80M and turn off the 80M HFO oscillator by rotating the oscillator slug until the display shows 66XX.X. Remove the filter end of the jumper wire connecting C762 with the filter output bus, and inject an 8.6 MHz, .8 microvolt signal to the jumper wire. The output should increase by 10 db or more. If not, there is a problem in the 8.395 to 8.896 MHz bandpass filter. If it is difficult to keep the bandpass characteristic flat over its 500 kHz passband when tuning C764 and C769, the Q of the [PN 40-1805] coils is probably too low, and they should be changed. Normally C764 will set the low end response and C769 will set the high end, and the passband will be relatively flat. The following components make up the 8.395 MHz to 8.895 MHz bandpass filter:

L725	C764	C774	C771
L726	C766	R721	C767
L727	C773	C769	C772

If the output of this step is acceptable, reconnect the jumper wire to the filter output bus, and re-set the 80M HFO slug to start the oscillator. Tune through the oscillator range slowly, noting the output noise response [adjust the VFO as necessary to avoid "birdies" and other spurious responses]. A slight decrease in receive noise will be noticed at one point as the slug is turned through the oscillator range. Using this minimum noise point as the final oscillator setting will give the best signal-to-noise ratio on 80M. The other bands can be tuned the same way, but the effect will be less noticeable.

8. Reset the noise reference level, and tune the receiver to 3750 kHz. Inject a 1 microvolt, 3750 kHz signal through a .01 mfd capacitor to pin G24. There should be a 10 to 12 db increase in output. Check all other bands at mid-band; the output should also be at least 10 db to 12 db better. If not, the problem is most likely in the Q of the bandpass filter toroids, or, the bandpass filters have not been properly tuned.
9. If the output in the preceding step is acceptable, insert the G board into the chassis and watch for an INCREASE in the reference noise level. If this increase is 3 db or more, and the signal-to-noise ratio is equally degraded, coil L729 is no longer self-shielding and must be replaced.

10. If the output in the preceding step is acceptable, connect the signal generator to the receiver antenna jack and switch the antenna switch to "SEP". The output may decrease as much as 2 db on 40M due to the attenuation of the 8.65 MHz band reject filter. If the attenuation is greater than 2 db on 40M, or more than 1 db on all other bands, there is a problem with the 8.65 MHz band reject filter. [See Bulletin No: SB-104-35].
11. Connect the signal generator to the RF output antenna jack, switch the antenna switch to "COM", and repeat step 7. The difference in output should be negligible. Any additional attenuation of output indicates problems with the filters on the ALC board, or with the antenna relay.

May 11, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-38

Improved ALC Meter Action

The drive voltage developed at the base of Q302 is often insufficient to swing the meter to full scale. Change R322 from 10K to 6800 ohm [PN 1-27-12] to increase the drive voltage. This change is being made in the next production run.

May 11, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-39

R11 Overheats

The 15 ohm current limiter R11 on lug 1 of the band switch is being change from 15 ohm 1/2 watt to 15 ohm 1 watt [PN 1-12-1] to correct for an overheating problem with the resistor.

May 19, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-40

SB-104 Modifications

The following list is a circuit board and chassis breakdown of modifications that have been done to the SB-104 since introduction.

CIRCUIT BOARD A

- -NO CHANGES- -

CIRCUIT BOARD B [PN 85-1580-3]

CHANGE	PART NO	REASON
Change R-254 to 750 ohm	1-96	Increase 11 volts
Change C-227 to 47 mfd	25-223	Stabilize 11 volts
Change C-208 to .1 mfd	27-47	Reduce Leakage
Change C-222 to .1 mfd	27-47	Reduce Leakage
Change R-207 to 1.5 meg	1-36	Reduce mic gain

CIRCUIT BOARD C [PN 85-1420-6]

CHANGE	PART NO	REASON
Add ground clip to 10 mtr coil cover	258-95	Eliminate 10M osc
Add 39 pF capacitor C-373 across R-314	21-167	Lower 40M spurious
Change C-332 to 50 pF	20-97	Increase 15M bandpass
Change R-329 to 12K ohm	1-14-12	Lower 40M spurious
Remove and discard C-322		Better keying
Remove and discard L-321 & C-348		
Replace by attached procedure	20-149	Reduce 3.395 spurious
	40-1877	on 80 meter
	31-76	
Change R314 to 390 ohm	1-23-12	Reduce noise on XMT

Change R332 to 1210 ohm 1%	2-68-11	Constant pwr output
Change C369 to 390 pF	20-106	Improve 80M passband
Change R322 to 6800 ohm	1-27-12	Improve ALC/meter

NEW 3.395 MHZ TRAP ON C BOARD

A high level sput at 3395 kHz may be present in some units due to incorrect tuning of the 3.395 MHz trap on the transmit IF board. This problem can be avoided by removing the old 3.395 trap on the transmit IF "C" board, and installing a new trap as follows:

1. Remove and discard L321 and C348.
2. In the L321 circuit board holes near the top edge of the board install the an 8-40 pF [PN 31-76] with the slotted side toward the top end of the board.
3. In the next lower set of holds, install a 150 pF [PN 20-149] capacitor. Do NOT use the holes screend for C348.
4. Next, install a 13.25 uH [PN 40-1877] coil at C348.
5. Remove circuit board D, and pre-set the front panel controls to the 3.5 MHz band, MIC/CW level control full counterclockwise.
6. Put the meter in the POWER position, depress the HI and TUNE pushbuttons.
7. Turn the MIC/CW Level control full clockwise. Adjust the 8-40 pF trimmer for a minimum [null] on the power meter.
8. Turn off the unit, and reinstall circuit board "D".

CIRCUIT BOARD D [PN 85-1418-2]

CHANGE	PART NO.	REASON
-----	-----	-----
Change C-414 to 18 pF	21-60	Reliable 20M HFO starting

CIRCUIT BOARD E [PN 85-1581-5]

CHANGE	PART NO.	REASON
-----	-----	-----
Change R-625 to 22K ohm	1-45-12	Better BFO Switching
Change C-622 to 22 mfd	25-212	Better BFO Switching
Change 6-21 to 100 ohms	1-1-12	Reduce Transmit Gain
Remove and discard R-613		Improve 80M Sensitivity
Change R-619 to 100 ohm	1-1-12	Decrease background noise

VFO FILTER BOARD

CHANGE	PART NO	REASON
-----	-----	-----
Remove and discard R-1251		Lower 10M spurs

CIRCUIT BOARD F [PN 85-1462-4]

CHANGE	PART NO	REASON
-----	-----	-----
Remove and discard R-569		Lower background noise
Change R-564 to 330K ohm	1-31	Better Muting
Change R-532 to .82 ohm	3-1-2	Stabilize audio output

CIRCUIT BOARD G [PN 85-1708-2]

CHANGE	PART NO	REASON
Change C-703 to 105 pF	20-162	Better 80M sensitivity
Change C-707 to 105 pF	20-162	Better 80M sensitivity
Change C-764 to 8-40 pF	31-76	Better IF bandpass
Change C-769 to 8-40 pF	31-76	Better IF bandpass
Remove C-763 and discard		
Change Q-701 to this-----	417-274	Increase sensitivity
Change Q-704 to this-----	417-274	Increase sensitivity
Change R-719 to 2.2 mfd choke	45-73	Increase sensitivity
Change L-734 to 4.5 mfd coil	40-1875	Increase sensitivity
Remove L-733 and C787 and discard		
Remove and discard C-742		
Change C-714 to 24pF	20-77	Improve peaking
		Improve peaking

CIRCUIT BOARD H [PN 85-1422-2]

CHANGE	PART NO	REASON
Change R-954 to ferrite bead and wire	475-12	Reduce Harmonics
Change R-956 to ferrite bead and wire	475-12	Reduce Harmonics
Change L-952 to 4 turns		Reduce Harmonics
Change L-953 to 4 turns		Reduce Harmonics

Refer to Pictorial 11-5 for PA Board

CIRCUIT BOARD J

CHANGE	PART NO	REASON
Change R-903 to 220 ohm 2 watt	1-13-2	Reduce Driver Temperature
Change RFC 902 with 390 ohms	1-48	Reduce Oscillations

CIRCUIT BOARD K

Remove and discard L814		Reduce Oscillations
-------------------------	--	---------------------

DISPLAY BOARD

No Change

DC UP CONVERTER

No Change

VFO BUFFER BOARD

CHANGE	PART NO	REASON
Change R-1201 to 1200 ohms	1-10	Eliminate FM
Change R-1202 to 350 mfd RFC	45-82	Eliminate FM
Change R-1203 to 470 ohms	1-6	Eliminate FM
Change R-1206 to 150 ohms	1-66	Eliminate FM
Change D-1201 to 1N458	56-24	Eliminate FM
Change ZD-1201 to 7.5V Zene	56-97	Eliminate FM

CHASSIS CHANGES

CHANGE	PART NO	REASON
Change R5 to 0.15 ohm	3-14-2	Stabilize 5V regulation
Install 4 ferrite beads on wire connected to K5	475-12	Eliminate Oscillation
Install .001 mfd capacitor from F13 to F15	21-14	Reduce "talkback"
Install a wire from F7 to asscess. socket lug 3		SB-644 Compatability
Install a 10 mfd from C7 to Ground		

[+side to C-7]	25-54	Reduce T/R "pop"
Install 390 ohm from G5 to ground	1-48	Noise Blanker Compatability
Install 500 mfd from J1 to Ground	25-157	Improve B+ decoupling
Install .001 mfd capacitor from pin 10 of relay to ground [C15]	21-140	Eliminate Oscillation
Remove and discard C4		Increase power on 15 & 10 M
Install .1/100V from pin C4 to ground		
Install a .01 ufd from pin C5 to ground		
Install .1 mfd cap. from C4 to ground	21-195	Eliminate Oscillation
Install .01 mfd cap. from C5 to ground	21-176	Eliminate Oscillation
Remove wire between G2 and G3. Cut Orange 13.8 V wire running past G board. Install both ends of this wire onto G2 and [S2].		Increase Sensitivity

IMPROVING CW KEYING CHARACTERISTICS

1. Remove two gray wires from lug 6 of R2.
2. Connect this 6 1/2" gray wire from S4 lug 1 [R2] to the GND lug.
3. Discard short gray wire going to R2 ground lug.
4. Connect a gray wire from R2 lug 6 to terminal strip BE lug 3.
5. Connect a 5 uF electrolytic [PN 25-149] between lug 3 and GND lug of terminal strip BE; [+] lead to lug 3.

June 4, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-41

Low Power On All Bands

Change: R-332 from 1.2K to 1210 ohm 1% [PN 2-68-11].

This change will be in -02 level HW-104's and the -06 level SB-104's.

June 4, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-42

Improved Passband On

80 Meters

The 80 meter transmitter passband response is being improved by changing C369 to 390pF [PN 20-106]. This change is being made in the next production run, and should be made in all SB-104's received for service.

June 18, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-43

ALC Meter Reads Above "3" On Transmit With No

Modulation

Variations in characteristics due to parts tolerances of ZD301 and Q302 will cause the ALC meter to read between zero and 3 when the transmitter is keyed without modulation, Change ZD301 and/or Q302 until a combination is found that brings the meter reading below 3 on the scale.

June 18, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-44

Stabilizing 80/40 Meters

The 80/40 output should be stabilized in all units received for service by making the following change:

Change R345 from 1000 ohms to 100 ohms [PN 1-1-12]
Change R343 from 1000 ohms to 100 ohms [PN 1-1-12]

June 18, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-45

Improving The 40M Transmit Passband

The 40 meter transmit passband can be significantly improved by making the following change in all units received for service:

Change C-342 from 75pF to 62PF [PN 20-109].

June 18, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-46

Eliminating Transmit Chirp

Chirp may be experienced during CW keying; the following change should be made in all SB-104's received for service:

Change C6 from 500 ufd to 1000 ufd [PN 25-219].

June 18, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-47

VFO Filter Board

A change in screening is being made on the VFO filter board, changing the board from PN 85-1516-1 to PN 85-1516-2. Components will be deleted from the new board and the remaining components are being re-numbered, as follows:

	85-1516-1 [Old Board]	85-1516-2 [New Board]	Value
FROM:	R-1255	TO:R-1252	150 ohms
	R-1254	R-1251	68 ohms
	R-1266	R-1253	68 ohms
	C-1254	C-1252	105 pf
	C-1256	C-1254	105 pf
	C-1253	C-1251	.01 uf
	C-1255	C-1253	620 pf

The new board will be incorporated in all future productions runs.

June 22, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-48

Change Capacitors To Higher Voltage Caps

Make the follow changes in all SB-104/HW-104's received for service:

Change: C-321 from PN 21-95 TO .1 ufd mylar [PN 27-47]
C-309 from PN 21-95 TO .1 ufd mylar [PN 27-47]
C-906 from PN 21-95 TO .1 ufd mylar [PN 21-47]

This changes the capacitors to ones with higher breakdown voltage ratings, and increases the RF bypassing.

((((NOTE: PN for the .1 ufd mylar replacement of C-906 is as shown on fiche))))

June 22, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-49

Erratic Display On 10 Meters

Erratic display on 10 meters can be caused by R-1252 loading the VFO line. Clip and remove R-1252 [470 ohms] on all SB-104/HW-104's received for service with the PN 85-1516-1 board installed.

August 3, 1976

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-50

Better Carrier Null

A null should be obtainable at two different settings of capacitor C-648; either setting can be used. If there is only one setting that gives a null, remove C-645 [33 pF] and repeat the null setting adjustment. If there is still only one setting that gives a null, install a 62 pF mica [PN 70-109] capacitor at C-645 and repeat the above step.

January 12, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-51

Low Output Power on 15 Meters

+++Information not available at this time+++

February 4, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-52

VFO Drift

+++Information not available at this time+++

February 4, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-53

Driver Transistor [PN 417-820] Installation at Q901 and Q902

+++Information not available at this time+++

March 17, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-54

Circuit Changes

+++Information not available at this time+++

May 27, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-55

Low Gain in HFO Amplifiers

+++Information not available at this time+++

October 10, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-56

Audio Level Control of Receiver Does Not Completely Reduce Volume

+++Information not available at this time+++

November 10, 1977

SB/HW-104

Bulletin No:

Solid State Transceiver

SB-104-57

Drivers Overheats in Standby

+++Information not available at this time+++

November 10, 1977

SB/HW-104
Solid State Transceiver

Bulletin No:
SB-104-58

20-Meter Power Roll-Off

+++Information not available at this time+++

February 2, 1978

SB/HW-104(A)
Solid State Transmitter

Bulletin No:
SB-104-59

VFO Dead

Check the solder pads at each corner of the PN 85-1205-3 circuit board to confirm that all solder resist has been scraped away. If the solder resist is not removed at these points, the oscillator will not run since the board is not grounded.

March 31, 1978

SB/HW-104(A)
Solid State Transmitter

Bulletin No:
SB-104-60

PA Board Cracks Or Transistors Break

When installing the four 360 pF capacitors in the SB-104 "mod kits" on the foil side of the PA circuit board, mount them as close as possible to the circuit board to prevent breaking the board or the power transistors when the heat sink is installed.

These capacitors were added so the PA would be more stable if used with an antenna tuner on 10 M. Production SB-104A's will have these capacitors mounted on the component side of the PA board.

Since the vendor is unable to supply us with 360 pF capacitors which are thin enough to be mounted between the circuit board and heat sink, the PN 830-24 "mod" kits are being inserted to instruct the customer not to install these capacitors.

April 4, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-61

R-907 Overheats

During extended periods of operation in the low power mode, R-907 may overheat.

Change: R-907 to a 1K ohm resistor [PN 1-9].

April 4, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-62

Broadcast Interference

When operating near strong AM broadcast stations, D-904 will rectify the signal, causing annoying interference. To remedy:

Add 4.7K ohm resistor [PN 1-8-12] across C-907, thus reverse-biasing D-904 in the receive mode.

Implement this change only as needed.

April 17, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-63

ALC/Filter Board Phono Connectors Shorting To
The Shield

Due to the proximity of the shield [PN 206-1265] to the circuit board, the possibility of the connectors shorting to the shield exists.

To prevent this, install a piece of fish paper [PN 75-108] on the shield directly behind the connectors.

Be sure the proper phono plugs [PN 438-46] are used on the cables.

April 21, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-64

Increased ALC Meter Action

C-827 on the ALC/Filter (K) circuit board should be changed to a .68 uf tantalum capacitor [PN 25-200].

This change will increase attack time on the ALC loop and decrease the possibility of "flat-topping."

This will be incorporated in future production lots.

May 24, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-65

Low Or Erratic ALC Action

Relocate diode D7 from across meter terminals to switch S2C, lug 2 to ground. The cathode is connected to ground.

May 24, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-66

40 Meter Not Linear Through Band

Replace C-341 with a 470 pF mica capacitor [PN 20-113]. This will broaden response and reduce the sharpness of the roll-off.

May 24, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-67

Reduction Of Talk Back

The following steps should be taken in units received for servicing because of a "talk-back" problem:

CHASSIS WIRING CHANGES

- Move the two large orange stranded wires from J1 to F19.
- Remove and discard the small orange wire between J1 and K3.
- Locate the small orange wire between J1 and relay lug 11. Relocate the J1 end to K3.
- Connect a new heavy stranded wire between J1 and H6.

F BOARD CHANGES

- Change R-581 to an 18M ohm resistor [PN 6-186].

- Change R-578 to an 1800 ohm resistor [PN 6-182].

The above procedure should remedy most "talk-back" problems. However, if a customer is not sufficiently placated; and only to avoid a refund; the following procedure may be performed:

SB SERIES

- Move the gray wire from the CW switch, lug 2 to Tune switch, lug 3.
- Remove the jumper wire which is between Tune switch, lug 3 and CW switch, lug 2.
- Relocate the white-violet wire from CW switch, lug 4 to HI switch, lug 6.
- Remove the jumper wire from between CW switch, lug 6 and LSB switch, lug 6.
- Relocate gray wire from CW switch, lug 6, to LSB switch, lug 6.
- Install a 100 ohm, 1/2 watt resistor [PN 6-101] from HI switch, lug 6 to CW switch, lug ? ((Fiche is unreadable, but could POSSIBILITY be lug 3)).
- Locate the orange wire from F19 to relay lug 11. Relocate the wire end at relay lug 11 to relay lug 3.
- Install an orange wire from F19 to CW switch, lug 4.
- Install an orange wire from K3 to CW switch, lug 6.
- Install a 560 ohm resistor [PN 6-561] between F19 and ground.

HW SERIES

- Relocate the diode from between CW switch, lug 5 and LSB switch, lug 6 to between USB switch, lug 6 [banded end] and USB switch, lug 1.
- Move the brown and gray wires from the CW switch, lug 6 to the USB switch, lug 1.
- Move the orange wire at relay lug 11 to relay lug 3.
- Install an orange wire between F19 and CW switch, lug 3.
- Install an orange wire between CW switch, lug 5 and K3.
- Install a 560 ohm, 1/2 watt resistor [PN 6-561] between F19 and ground.

May 30, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-68

Mounting Hole Missing At L-815

Presently, two types of ALC/Filer circuit boards [PN 85-2056-1] are being shipped in the SB-104A transceivers. Both types have the same part number.

When mounting L-815 [82 uH peaking coil], you will find that one board has two mounting holes- -the other only one. On circuit boards with only one hole, connect the second lead of L-815 to the switch, upper lug 14.

When the circuit board with the single hole is packed in a kit, Manual insert [PN 591-2650] will be included, which shows proper installation procedures.

The manual [PN 595-1992-01] shows normal 2-hole installation procedures.

July 24, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-69

Receiver Overload with Noise Blanker Installed

Occasionally local ham stations cause receiver overload in units where the noise blanker is installed, even when the Blanker is switched off.

To correct:

- Connect pin 6 of the Noise Blanker to ground.
- Rewire the front panel NB switch as shown in the schematic at the right.

((Center conductor from Board G with outer conductor grounded, wired to one side of switch. Same side - wire from switch to IN on Blanker Sw/outer conductor grounded. Wire from OUT on Blanker Sw/outer conductor grounded, to opposite side on NB switch. Other terminal of same side wire to Board E, with the outer conductor grounded))

This wiring change will route the RF signal directly to Board E when the switch is in the OUT position.

When the switch is in the IN position, the RF signal will go through the Noise Blanker.

August 21, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-70

"C" Board Information

Service Policy: SPC servicing centers may perform standard service procedures on circuit boards that are in or out of warranty. Factory-built "C" boards will be warranted for 90 days. BE SURE THE C BOARD IS AT FAULT BEFORE SENDING IT TO THE FACTORY FOR SERVICE.

The "C" boards are checked at the factory on a special fixture for spurious and harmonic content. The power output is set to 100 watts, +/- 1 dB.

Resistor R-332 may be any one of the following four values:

1180 ohm [PN 6-1181-12]
1200 ohm [PN 6-122-12]
1210 ohm [PN 6-1211-12]
1240 ohm [PN 6-1241-12]

Always replace R-332 with a resistor of the same value. Any deviation from the selected resistor value on the "C" board will void the warranty on the C board, driver board "J", power amplifier board "H" or ALC/Filter board, "K".

C-342 has been changed to 74 pF capacitor [PN 20-110] in the -02 level.

August 21, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-71

Shorted 11-Volt Supply; No Transmitter Output

If the bare wire on the top of the peaking coils, L-322 and L323 on the "C" board, is touching the shield plate between the C and B boards, it will short out the 11-volt supply and/or destroy R-305. To correct, install a piece of fish paper [PN 75-108] on the shield between the C and B boards.

August 21, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-72

Low Transmitter Output on 10 Meters

First check to verify the performance of the Driver, PA and ALC/Filter circuit boards, These boards may be verified by substituting a

"known-good" C board into the unit. All four segments of the 10 meter band should be checked. Proper power indicates these boards are good.

If there is proper power on 10 meters with the substituted C board, proceed as follows:

- Reinstall the customer's C board.
- Couple a frequency counter to the output of the C board at pins 23 and 24. The measured frequency should be 28 to 29.7 MHz, depending on which segment of the 10 meter band the unit is operating on. It is possible the 10 meter pre-driver coils; L-309, L-310, L-319 and L-320 are detuned enough to give a frequency output of 32 Mhz. This is the sum of the premix and IF frequencies, rather than the difference. The ALC/Filter board will attenuate this frequency, and thus, the unit will indicate low power out on the 10 meter band.
- Readjust the 10 meter coils for the proper frequency output. Follow with manual alignment.
- Continue the recommended alignment procedure in the manual.

September 26, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-73

Driver Transistors Overheating

CTC devices, with a date code of BY323, at Q-901 and Q-902 [PN 417-830] on the Driver circuit board have a tendency to overheat. This occurs mainly in the idle condition. Use only CTC devices with date codes other than BY323.

October 12, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-74

Bandpass Filter Response Check with The IG-57A Sweep Generator

There are times when in checking the power output of the SB-104, the power may be low at one end or the other of a particular band. With the following procedure, this situation can be checked, and if necessary, the bandpass filters can be trimmed to even out the response.

Procedure:

1. Connect the sweep output of the IG-57A to the SB-104 VFO input. [Remove the VFO jumper.]
2. Set the generator attenuator to 20 dB.
3. Set the IG-57A to Low Sweep and adjust for wide sweep passing through the 5.0 - 5.5 MHz range. [This will simulate VFO tuning across the band.]
4. Connect a signal generator tuned to 5.0 MHz and then 5.5 MHz to the IG-57A External Marker input. This is to provide the marker reference.

NOTE: The IG-57A 4.5 MHz marker may also be used.

5. Connect a Demodulator probe to a suitable scope and monitor at either D6, Q-304 [collector], C-24 or the RF output jack [LOW POWER OUTPUT ONLY]. Check the response curves of the various bandpass filters.

This method can quickly isolate the bandpass filter which is causing the low power output at one end of the band problem.

A response curve of the 20 Meter Board D bandpass filter which is skewed low, causing low output at the high end of the band.

5.5 MHz Marker = 17.395 MHz at Board D

= 14.0 MHz at Board C
5.0 MHz Point = 17.895 MHz at Board D
= 14.5 MHz at Board C

October 12, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-75

VOX Amplifier Oscillation

It has been noted that the VOX may key the transmitter with the VOX gain fully CW and without a microphone connected. This is caused by an oscillation in the VOX amplifier.

To correct this, install a .001 uF capacitor [PN 21-140] from terminal B18 to ground. This will suppress the oscillation in the VOX amplifier.

November 20, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-76

Excessive 15 Meter HFO Signal At Antenna Jack In HI-Power Mode

Check to see if the ground foil located on the "C" board, between Q-302 and Q-303, is cut. If so, reconnect the cut ground foil. This foil should not be cut when installing modifications in this unit. Bulletin SB-104-54 and SBM-104-2 had instructed the technician and customer to cut the foil on the "C" board. Please cross out this step in SB-104-54. This step is also being removed from the instructions for mod kit SBM-104-2.

November 28, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-77

Burst Of RF On 10 Meter Band When Transmitter Is Keyed With PTT On SSB

A burst of 100 watt RF on the 10 meter band exists when the transmitter is keyed with PTT on SSB. This is caused by Q-601 remaining on too long due to the long discharge time of C-608. Thus Q-601 is still on when Q-602 turns on. On 10 meters, a signal of approximately 3395 kHz appears to be generated at the front end board and is amplified by the still turned on Q-602, passes through Q-602 to the input of the transmitter IF board where it is amplified and heterodyned to the 10 meter band. Here it is amplified again and passed to the driver and PA.

The solution is have Q-601 turn off before Q-602 turns on. To do this, remove the wire from chassis connector pin E3 to E11. Now, connect a wire from E3 to C7.

Since the newer SB-104A front end board [G] has higher gain, this problem may only exist in the "A" model units, but will not show up in all of them. It can show up in both high and low power and is dependent on the gain of the various circuits involved.

November 28, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-78

Update Of SBM-104-2 Modification

Kit

The instructions given on page 13 of the Modification Manual [PN 595-2016-0 through -03] for cutting the ground foil on the "C" board should be deleted when installing the PN 830-24 modification kit.

The 360 pF mica capacitors installed on page 19 of the same manual should not be installed, especially if a clearance problem exists between the foil side of the circuit board [PA], and the metal heat sink plate. The -04

edition of the manual [PN 595-2016] has deleted this instruction. If the capacitors are already installed and no clearance problem exists, leave them installed.

November 28, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-79

PA Board Oscillations

It has been found that the PA board oscillates at approximately 27 MHz in high power position on all bands, including 15 MHz with the microphone gain turned counterclockwise and in TUNE position.

This is caused by an open connection between the phone plug shield and the coax cable shield of the power amplifier output cable. Check for proper connections at these points.

Also, 3.5 MHz and 7.0 MHz bands oscillate at approximately 21 MHz with the same conditions listed above.

This is caused by open connections from the phone plug shields to the shields of the coax cables to the ALC/Filter board. Check for proper connections at these points.

December 11, 1978

SB/HW-104(A)
Solid State Transceiver

Bulletin No:
SB-104-80

Burst Of RF When PTT Is Released In SSB Mode

This burst of RF when the PTT is released can occur on all bands. Three causes of this are:

1. A spike on the audio output of board B caused by the +RX mute voltage applied to pin 2 of IC201B through R212. The solution is to let IC201B remain active all the time. This is done by connecting R212 to ground instead of Q-205's collector.
2. The rapid rise of the voltage on the PTT line. This is coupled to the input of IC201A through the stray capacitance at the MIC connector. Installing a .05 uF capacitor from B8 to ground slows the rise time enough to prevent this coupling.
3. The transmitter is keyed for the first time after power is first applied to the unit. The application of power to the unit causes a charge to build up on C-646 which, in turn, causes a short burst of carrier output when the balanced modulator is driven with a signal from the carrier oscillator. Subsequent keying will not produce the burst. Installing a 6.8K ohm resistor [PN 6-682-12] across C-646 will allow it to discharge. Then perform the carrier null adjustments.

To prevent the RF burst, make the following changes:

- Remove the jumper connecting R-212 to Q-205 collector. Connect R-212 to ground.
- Install a .05 uF capacitor [PN 21-143] from B8 to ground.
- Install a 6.8K resistor [PN 6-682-12] across C-646.

March 20, 1979

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-81

Q-603 oscillates

If the circuit of Q-603 oscillates, it may be caused by a too-high input impedance of some of the PN 417-274 FETs at Q-501 on the Receiver IF circuit board. This problem is apparent when the AGC is off and the RF

gain is varied. To correct the problem, replace Q-501 [PN 417-274].

August 27, 1979

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-82

Inconsistent Readout On 10 Meters

In November and December of 1978, a number of SB-104As, Series No. 04840, were produced with a wrong transistor installed. Two hundred "D" boards may have a 2N2102 instead of a 2N3866 transistor installed.

To correct, replace: 2N2102 with a 2N3866 [PN 417-205].

September 20, 1979

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-83

21 MHz Bandpass Filters On TX IF Difficult To Bring To Specs On Edges Of Band

Change C-356 to 5 pF ceramic disc capacitor [PN 21-78]. This will broaden the response on the bandpass filters before the redrivers. It will also reduce the spurious components on the output.

Make this change on an "as-needed" basis only.

November 19, 1979

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-84

Obtaining A more Logarithmic S-Meter Response

The S-meter in most units is largely insensitive to plainly audible signals, while allowing slightly louder signals to peg the meter [with R-534 set for an S9 meter reading at 50 microvolt signal at the antenna connector]. To provide a more logarithmic response, perform the following:

- Replace ZD-502 with a 1N191 signal diode [PN 56-26]. Install this diode opposite that shown on the circuit board, so that it is forward-biased [cathode towards R-534].
- Set R-534 to S9 with a 30 microvolt signal.

The meter will register slightly more accurately from S9 to +30 but will have little or no action above +40.

Perform this modification only if the customer specifically complains of this problem.

January 21, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-85

"RF" Talkback

+++Information not available at this time+++

February 7, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-86

Preventing Catastrophic Failure of Parts in Counter/Display Circuit

+++Information not available at this time+++

April 23, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-87

VFO Drift

+++Information not available at this time+++

April 23, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-88

Driver Board Overheats

+++Information not available at this time+++

August 27, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-89

Output Transistors Shorted to Ground

+++Information not available at this time+++

September 5, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-90

VOX Lockup with VOX Gain Control Set to Maximum

+++Information not available at this time+++

October 3, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-91

Alignment Tool Loading when Adjusting C333 or C337

+++Information not available at this time+++

September 11, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-92

Rotary Switch Detent Change

+++Information not available at this time+++

December 18, 1980

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-93

Transmitter Oscillations in Hi-Power Mode

+++Information not available at this time+++

March 25, 1981

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-94

Hum Heard in Headphones

+++Information not available at this time+++

November 30, 1981

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-95

Replacing Defective Q901 and Q902

+++Information not available at this time+++

February 17, 1982

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-96

Talkback and Oscillation on 10 to 15 Meters

+++Information not available at this time+++

April 23, 1982

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-97

No VFO Oscillation

+++Information not available at this time+++

May 25, 1982

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-98

Manual Correction - "C" Board X-Ray View

+++Information not available at this time+++

April 29, 1983

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-99

Simplified Talkback Modification

+++Information not available at this time+++

August 29, 1983

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-100

Low Power Output on 10 Meters and Possibly on 15 Meters

+++Information not available at this time+++

November 9, 1984

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-101

Power Drops Off on 20 Meters While Transmitting

If the power drops off while transmitting, especially in the CW mode, make the following change.

On the driver board, change:

C909 from a .01 uF capacitor to a .002 uF capacitor [PN 21-36].

October 28, 1988

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-102

300 Hz Frequency Error in LSB Mode

If trimmer capacitor C1211 on the oscillator board doesn't have enough range to properly adjust the oscillator in the LSB mode, change:

C1209 from a 12 pF capacitor to a 7.5 pF capacitor [PN 20-52]
D1201 from a [PN 56-24] diode to a [PN 56-56] diode.

Change both of the parts to correct the problem. Make this change only when needed.

April 28, 1989

SB-104A
Solid State Transceiver

Bulletin No:
SB-104-103

Sidetone Modulates Carrier

When the sidetone modulates the carrier, especially when the VOX control is FCCW, check for a shorted diode at D3 [PN 56-56] on the chassis.

That is everything I show up to 1989 on the SB-104(A). Enjoy!

73 de Joe W7LPF/4 [NNN0KUU]
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