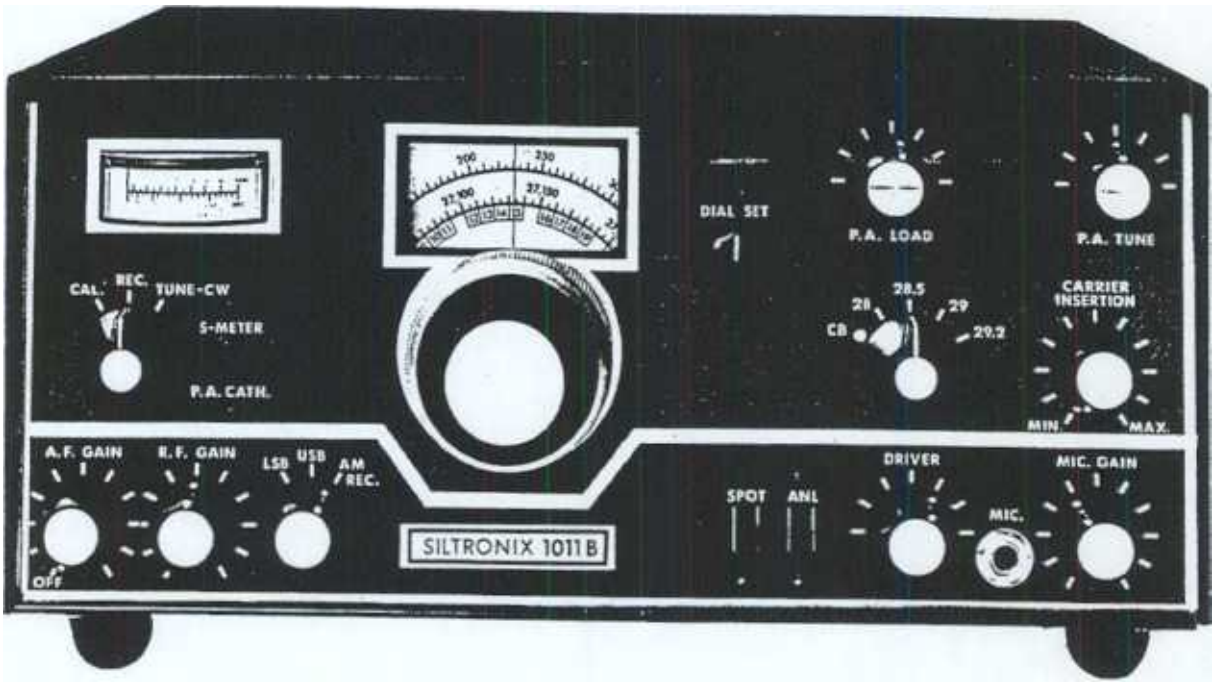
INSTALLATION
OPERATION AND MAINTENANCE
SILTRONIX MODEL 1011B



INTRODUCTION

The Siltronix Model 1011B Single Sideband Transceiver is designed to be used in SSB, AM, or CW modes in the 10 meter amateur radio band. In addition, the 1011B is also a tunable receiver in the CB band.

Power input exceeds 260 watts, P.E.P., on single sideband, 60 watts on AM, and 180 watts on CW. The Model 1011B includes automatic gain control (AGC), automatic level control (ALC), and grid block keying.

The internal AC power supply permits fixed station or portable operation wherever 117 volts, 50-60 Hertz is available.

Export models for 208-220-240 volts are available on special order.

For 12-14 volts DC operation in mobile, marine or portable applications, a DC converter unit, model 14A is available. It attaches to the back of the 1011B in place of the AC power cord connector. Its dimensions are only 1½ x 3 x 4 in.

The Model 1011B generates a single sideband signal by means of a crystal lattice filter, and the transceive operation automatically tunes the transmitter to the received frequency. Provisions are included in the transceiver for operation on either upper or lower sideband.

SPECIFICATIONS

FREQUENCY RANGES
28.0-28.5 MHz
28.5-29.0 MHz
29.0-29.5 MHz
29.2-29.7 MHz
26.96-27.26 MHz (Receive only)

POWER INPUT
Single Sideband, Suppressed Carrier:
260 watts, P.E.P. minimum
CW: 180 watts, DC input
AM: (Single Sideband with Carrier):
60 watts DC input

DISTORTION
Distortion products down approx. 30 db.

UNWANTED SIDEBAND SUPPRESSION
Unwanted sideband down more than 50 db.

CARRIER SUPPRESSION
Carrier suppression greater than 50 db.

RECEIVER SENSITIVITY
Less than 0.5 microvolt at 50 ohms impedance for signal-plus-noise to noise ratio of 10 db.

AUDIO OUTPUT AND RESPONSE
Audio output, 3 watts to 3.2 ohm load. Response essentially flat from 300 to 3000 cps in both receive and transmit.

TRANSMITTER OUTPUT
Wide-range Pi-network output matches resistive loads from 50 to 75 ohms.

METERING
Power amplifier cathode current 0-400 ma. on transmit, S-Meter 0-70 db over S9 on receive, Relative Output in TUNE-CW.

FRONT PANEL CONTROLS
A.F. GAIN, R.F. GAIN, Sideband Selector, Function Switch (CAL. REC. TUNE-CW), Meter Switch, Tuning Dial, Dial Set, SPOT Switch, ANL Switch, P.A. LOAD, P.A. TUNE, Band Switch, CARRIER INSERTION, DRIVER Control, MIC jack, MIC GAIN.

REAR PANEL CONTROLS AND CONNECTIONS
P.A. BIAS Potentiometer, AUX RELAY jack, CW KEY jack, Outboard VFO Connector, HEAD PHONES jack, Fuse Holder, Antenna Connector, Jones plug Power connector, S-Meter Zero.

OTHER CONTROLS AND CONNECTIONS
Carrier Balance Control - Located on bottom Cover.
VOX CONNECTOR - Located on side of the chassis.

VACUUM TUBE COMPLEMENT

V1	12BA6	VFO Amplifier
V2	12BE6	Transmitter Mixer
V3	6GK6	Driver
V4	6LF6	Power Amplifier
V5	6BZ6	Receiver RF Amplifier
V6	12BE6	Receiver Mixer
V7	12BA6	First IF Amplifier
V8	12BA6	Second IF Amplifier
V9	12AX7	Product Detector/Receive Audio
V10	6AV6	AGC Amplifier/Rectifier
V11	6GW8	AF Output
V12	12BA6	100 KC Calibrator
V13	6JH8	Balanced Modulator
V14	12AX7	Microphone Amplifier

TRANSISTOR COMPLEMENT

Q1	2N706	Oscillator
Q2	2N5130	Buffer
Q3	2N706	Carrier Oscillator

POWER REQUIREMENTS
117 VAC, 50-60 Hz at 4 amps. (208-220-240 volt, 50-60 Hz at 2.5 amps., export model). 12-14 volts DC operation with model 14-A converter unit plugged into back of 1011B. Current drain: 8 amps, receive mode. 12 amps average with voice modulation, 25 amps maximum in TUNE position.

DIMENSIONS

Height	5½ in.
Width	13 in.
Depth	11 in.

WEIGHT

Weight	24 lbs.

INSTALLATION

GENERAL

The installation of the Siltronix 1011B is not at all difficult, and it involves only the placement of the transceiver in its operational area (fixed or mobile); connection of power (either 117 volts AC, or 12 volts DC); and the connection of an antenna. The following paragraphs are therefore devoted to the installation requirements involving microphones, fixed and mobile operation, and recommended antenna types. Before actual installation, be sure to check for possible shipment damage. Remove the cabinet (three screws on each side), and check to make sure that all tubes are firmly in place. Remove packing from around the P.A. tube.

FIXED INSTALLATION

Locate the 1011B in an area which is well ventilated and which provides complete operational freedom of the front panel controls. Connect the AC power cord to the 12 pin Jones connector on the rear panel. If the 1011B is a 117 volt model, plug the power cord into a standard 117 volt 50-60 Hz outlet having a capacity of at least 10 amps. If the 1011B is an Export model, it should be first set to the proper voltage tap: 208, 220, or 240 volts, 50-60 Hz. Remove the cabinet, and locate the terminal strip near the top of the power transformer. There are 3 terminal lugs and a decal which indicates the voltage tap for each. Connection has been made to the 220 volt tap at the factory. If your supply voltage is 208 or 240 volts, unsolder the red wire and move it accordingly.

FIXED ANTENNA

A standard PL-239 coax connector plug will fit the antenna connector on the rear panel of the 1011B. For feed line runs up to 50 feet, RG58 or RG59 is recommended. For longer runs, RG8 or RG11 produces less line loss, particularly on 10 meters.

Any of the common antenna systems designed for use on the 10 meter amateur band will work well with the 1011B. However, the amateur should consider an antenna system which best fits his operational requirements. For example, a rotatable beam antenna is usually best suited for DX operation. Methods for constructing antennas and antenna tuners are described in detail in the ARRL Antenna Handbook and similar publications. It is recommended that these publications be consulted during the design of any antenna system.

MOBILE INSTALLATION

Many different methods of mobile installation are possible, and it is expected that hams will find methods which are best suited for their installation requirements. Siltronix has available a Mobile Mounting Kit which is suitable for under-the-dash installations. Figure 1 shows the recommended mounting methods using this kit.

DC CONVERTER, MODEL 14A

For 12-14 volt DC operation in mobile installations, it will be necessary to use the 14A converter, which plugs directly into the back of the 1011B in place of the AC power cord.

MOBILE ANTENNAS

The standard type mobile antennas designed for 10 meters or CB band will perform well with the 1011B. Generally speaking, a full length 8 or 9 foot whip will be more efficient than the shorter inductively loaded types.

MICROPHONE

The microphone input is designed for high impedance microphones only. The choice of microphone is important for good speech quality, and should be given serious consideration. The crystal lattice filter in the transceiver provides all the restriction necessary on audio response, and further restriction in the microphone is not required. It is more important to have a microphone with a smooth, flat, response throughout the speech range. The microphone plug must be a standard ¼ in. diameter three contact type. The tip connection is for push-to-talk relay control, the ring connector is the microphone terminals, and the sleeve is the common chassis ground. The microphone manufacturer's instructions should be followed in connecting the microphone cable to the plug. Either hand-held or desk type microphone with push-to-talk control will provide a suitable installation. For VOX operation, this feature may be disabled, if desired, by opening the microphone case and permanently connecting the contacts which control the microphone.

CONTROL FUNCTIONS, FRONT PANEL

POWER ON-OFF SWITCH (On AF GAIN control)
Turns power supply On and OFF.

FUNCTION SWITCH (CAL. REC. TUNE-CW)

Calibrate – All voltages are applied to receiver. Grounds cathode of V12. Dial adjustment can be made at any 100 KHz point on the dial.

Receive – All voltages are applied to receiver. Normal position for Push-to-talk or VOX operation of transceiver.

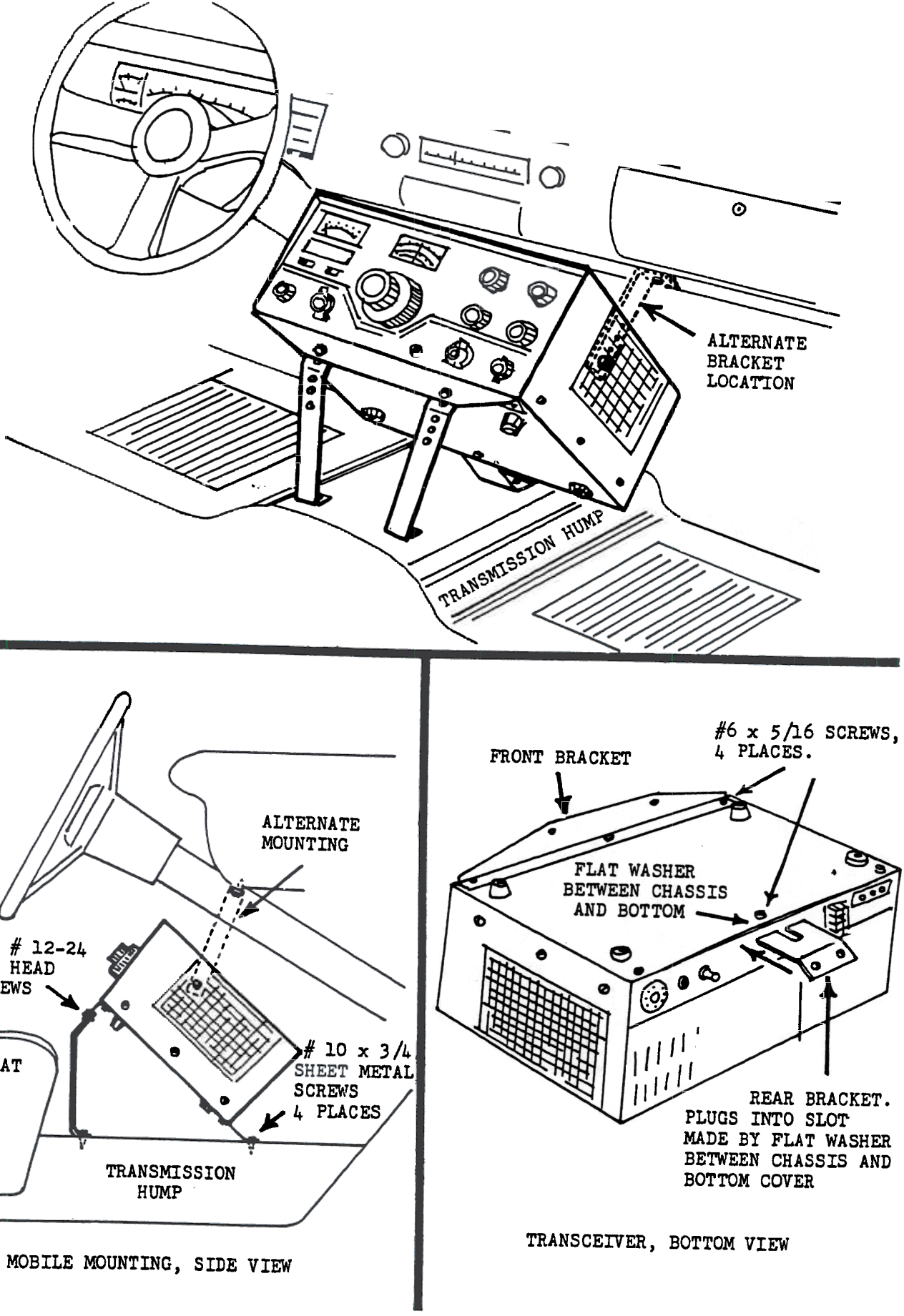


FIGURE 1. MOBILE MOUNTING ON TRANSMISSION HUMP UNDER DASH

TUNE-CW – Transmitting circuits are energized. C1502 is disconnected from ground, shifting the carrier frequency into the filter passband. Carrier is fully inserted. P.A. cathode resistor, R406 is switched in the circuit, reducing input power. Transmitter is tuned in this position. CW transmissions made in this position.

MIC. GAIN
Controls potentiometer R1404 in the grid of V14A, and controls amount of audio to the balanced modulator.

R.F. GAIN
Controls variable resistor R505, common in the grids of Receiver Mixer, V6; RF amplifier, V5; I.F. Amplifiers, V7 and V8.

A.F. GAIN
Controls potentiometer R1101 in grid circuit of AF output, V11, and controls audio volume.

MAIN TUNING
Controls C1608 in frequency determining tank circuit of VFO.

DRIVER
Controls C2A and C2B in plate tanks of transmitter Mixer and Driver.

P.A. TUNE
Controls C407 in Pi-network to tune final power amplifier plate to resonance.

P.A. LOAD
Controls C408 in Pi-network to match impedance of output load. Tunes input to Receiver R.F. Amplifier.

BAND SWITCH
Switches tank coils and associated capacitors in VFO, VFO Amplifier, Driver, and Transmit Mixer.

Sideband Selector Switch
LSB – Receive and Transmit on Lower Sideband.
USB – Receive and Transmit on Upper Sideband.
AM REC. – Receive AM signals. (Insert carrier with Carrier Insertion control to transmit.)

ANL Switch
Automatic Noise Limiter

SPOT Switch
Inserts carrier for AM tuning in REC position.

Meter Switch
Reads cathode current in P.A. CATHODE position. Reads S-UNITS in S-METER position. Reads RELATIVE OUTPUT in S-METER position when Function Switch is in TUNE-CW position.

DIAL SET
Dial adjustment can be made at any 100 KHz point with Calibrator on.

MIC
Microphone plugs into this jack.

CONTROL FUNCTIONS, REAR PANEL

P.A. BIAS
Adjust idling current for P.A. Tube. (40 ma.)

AUX RELAY
12 volts DC for auxiliary relay control.

CW KEY
CW key plugs into this jack.

ANTENNA
Antenna feedline (50 - 75 ohm) plugs into this connector.

FUSE HOLDER
4 amp fuse.

EXT OSC
Model 508 or 510X external VFO connection.

HEAD PHONES
Headphones plug into this jack. Disconnects internal speaker.

S-METER ZERO
Adjust S-Meter to zero with antenna disconnected.

POWER CONNECTOR
AC power cord plugs into this connector. Model 14A DC converter plugs in to this connector for mobile operation.

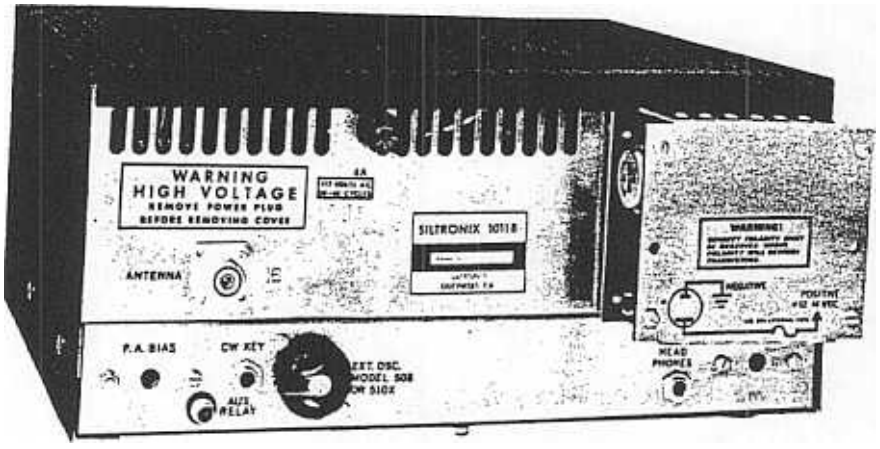


FIGURE 2. SILTRONIX MODEL 1011B, REAR VIEW.

Before connecting any cables to the Siltronix 1011B transceiver, perform the following steps:

① Locate the P.A. compartment and remove the packing material from the P.A. tube.

② Rotate the Function Switch to the REC. position.

③ Rotate the AF GAIN control counter clockwise to operate the power switch to the OFF position.

④ Rotate the CARRIER INSERTION control full counter clockwise to the minimum position.

CONNECTIONS

① Connect a wire from earth ground to the ground stud located on the rear of the chassis. This is not essential, but is strongly recommended.

② Connect a 50 or 75 ohm antenna feed-line to the coaxial connector on rear panel. A 50 ohm dummy load may also be used.

③ Connect the AC power cable to the Jones connector on the rear panel.

④ Connect the AC power cable to the proper voltage source.

WARNING

Dangerous high voltage is present on the plate of the power amplifier whenever the power supply is energized.

RECEIVE OPERATION

① Rotate the A.F. GAIN control clockwise to about the 3 o'clock position. The power switch will operate, applying voltage to the transceiver. The dial and meter lights should illuminate.

② Wait approximately one minute to allow the tube filaments to reach operating temperature. During this waiting period, perform the following steps:

a. Rotate Frequency Range switch to desired range.
b. Rotate Tuning Dial to desired frequency.
c. Rotate MIC. GAIN fully counter clockwise.
d. Set P.A. TUNE control to 12 o'clock position.
e. Set DRIVER control to 12 o'clock position.
f. Set P.A. LOAD control to 12 o'clock position.
g. Rotate RF GAIN control to 3 o'clock position.
h. Place SIDEBAND SELECTORswitch in USB mode.

③ Carefully adjust the DRIVER and the P.A. TUNE controls for maximum receiver noise.

NOTE

The DRIVER control resonates the transmitter driver stages and the receiver RF amplifier plate circuit. The P.A. TUNE and P.A. LOAD controls adjust the input and output capacitors in the transmitter power amplifier final plate circuit, as well as the receiver RF amplifier grid circuit. Proper adjustment of these controls in the receive position will result in approximately resonant conditions in the transmitter stages.

RECEIVER TUNING (SSB)

Precise tuning of a single sideband signal is very important. Do not be satisfied to merely tune until the voice can be understood, but take the extra care of setting the dial to the exact spot where the voice sounds natural. Above all, avoid the habit of tuning so that the voice is pitched higher than normal. This is an unfortunate habit practiced by quite a number of operators.

The following points help to explain the effects of mistuning:

1. If you tune so the received voice is higher than normal pitch, you will then transmit off frequency, and your voice will sound lower than normal pitch to the other station. He will probably retune his dial to make you sound right. If you keep this up, you will gradually waltz one another across the band. If both of you are mistuning to an unnatural higher pitch, you will waltz across the band twice as fast. (And someone will no doubt be accused of frequency drift.)

2. Mistuning results in serious harmonic distortion on the voice, and should be quite noticeable to the average ear. Some will claim that if they don't know how the other person's voice actually sounds, they can't tune him in properly, but this is not true. With a little practice, it will be fairly easy to tell. Some voices are relatively rich in harmonics, and are easier to tune in than a person with a "flat" voice. Also, a transmitter, which is being operated properly with low distortion will be easier to tune in than one which is being over-driven and is generating excessive distortion. There is no mistaking when you have a station tuned right on the nose. It will sound just like "AM" so to speak. Mainly, avoid the habit of tuning so everyone sounds higher than normal pitch, or like "Donald Duck". This is incorrect, unnecessary, and sounds terrible.

3. Your Siltronix 1011B will automatically transmit on exactly the same frequency as the one to which you are listening.

4. If it is desired to receive on Lower Sideband, rotate the SIDEBAND SELECTOR switch to the LSB position.

RECEIVER TUNING (AM)

Refer to the RECEIVE OPERATION paragraph above, and perform all the steps.

(1) After adjusting the DRIVER and the P.A. TUNE controls for maximum receiver noise, rotate the SIDE BAND SELECTOR switch to the AM REC. mode.

(2) Rotate the tuning dial until an AM signal is heard.

(3) Place the SPOT switch in the ON (UP) position. This removes the bias from the carrier oscillator, allowing the carrier to be heard in the receiver.

(4) Zero beat the carrier with the tuning dial.

(5) Turn off the SPOT switch.

(6) The AM station should be on frequency, with excellent voice reception.

TRANSMITTER TUNING

CAUTION

READ CAREFULLY. BE SURE THAT YOU UNDERSTAND AND REMEMBER THESE NOTES WHEN TUNING THE TRANSMITTER.

1. The most important detail to keep in mind when tuning the transmitter portion of your Siltronix 1011B is that the P.A. TUNE control must be resonated as quickly as possible.

2. The P.A. tube is dissipating all the power input when it is not in resonance, and can be permanently damaged in just a few seconds.

3. Once resonance has been established, the P.A. tube can operate at full power input for quite a while, although we recommend 30 seconds as a safe maximum. But it is most important to realize that the 30 second limit assumes that the P.A. TUNE control has been immediately resonated. This rule applies generally to all transmitters.

4. Do not tune more often than necessary. The P.A. tube will last for many months, or even years, with normal operation, but excessive tuning will shorten tube life.

TRANSMITTER TUNING STEPS

(1) Make the following preliminary adjustments:

a. Sideband selector switch in USB position.
b. Tuning dial to desired frequency.
c. Mic Gain at minimum.
d. Carrier Insertion to full CCW (MIN) position.
e. Meter Switch in P.A. CATHODE position.
f. Function Switch in REC position.
g. P.A. BIAS control on rear panel to full CCW position.
h. Microphone with press-to-talk switch plugged into Mic Jack on front panel.

(2) Press the Mic switch and observe the meter for any reading. Meter should read approximately 0. If the meter does not read approximately 0, it indicates that the CARRIER is not completely balanced out. Locate the CARRIER BAL hole on the bottom cover. With the Mic switch pressed, use an alignment tool and adjust the carrier balance pot until the meter "dips" at its lowest reading. This adjustment should not be required often.

(3) Press the Mic Switch and with a screwdriver, adjust the P.A. BIAS control located on the rear panel, until the meter reads approximately 40 ma. P.A. Idling current. This point is indicated on the meter scale by a small triangular symbol. The permissible idling current range is 30 to 50 ma. If the idling current tends to creep upward slightly with warm-up, set it at 30 ma. Excessive creep indicates that the P.A. tube is gassy, and may need to be replaced soon. This adjustment should not be required often.

(4) If this is the first time you are tuning the transmitter, set DRIVER control, P.A. LOAD control, and P.A. PLATE control to the straight up (12 o'clock) position. After gaining experience in tuning these controls, they may be pre-set to previously determined positions.

NOTE

UP TO NOW THE TRANSMITTER HAS BEEN "IDLING" AND THERE HAS BEEN NO PARTICULAR TIME LIMIT INVOLVED. THE FOLLOWING STEPS APPLY GRID DRIVE, AND REQUIRE *CAUTION.* OBSERVE THE RECOMMENDED 30 SECOND TIME LIMIT.

(5) Set METER SWITCH to the S-METER position. Rotate FUNCTION SWITCH to the TUNE-CW position and:

a. Rotate DRIVER control for maximum meter reading.

b. IMMEDIATELY rotate P.A. TUNE control for maximum meter reading. This is the critical "resonating" adjustment which must be done quickly to preserve P.A. tube life.

Rotate P.A. LOAD control for maximum.

d. Re-adjust P.A. TUNE control for maximum. This adjustment should be repeated each time the P.A. load control is adjusted.

NOTE

With the Meter switch in the S-Meter position, and the Function Switch in the TUNE-CW position, the meter is reading *RELATIVE OUTPUT.* This RELATIVE OUTPUT reading has no relationship with the true output of the transmitter. To obtain a true indication of the transmitter output, place the Meter switch in P.A. CATHODE, and rotate the Function Switch to TUNE-CW. Normally, when the transmitter is in resonance, the meter reading should be approximately 300 ma. or higher. With high line voltage and new tubes it may read as high as 350 ma. Note that the 1011B operates at reduced power in the TUNE-CW position. The P.A. cathode bias resistor, R-406, is in the circuit during TUNE and CW operation. In voice mode, the bias resistor is shorted out, and the 1011B operates at full P.E.P. input rating.

⑥ The preceding steps complete the Transmitter Tuning procedure for SSB. Return the Function Switch to the REC. position.

VOICE TRANSMISSION (SSB)

After tuning up as outlined above, switch the Function Switch to the REC. position. Place the Meter Switch in the P.A. Cathode position. Press the microphone press-to-talk switch, and while speaking into the microphone, slowly rotate the MIC. GAIN control until occasional peak readings of 100 to 125 ma. are obtained. With most microphones, the MIC. GAIN control will be set between 9 and 12 o'clock, but it may vary considerably. The ALC circuit will help limit cathode current, but turning the MIC. GAIN up too high will still produce flat-topping and spurious signals, so it is important to hold it down. The meter is quite heavily damped, and its reading with average voice modulation may not look very impressive, but the voice peaks are going well over the 260 watt input power rating of your Siltronix transceiver.

NOTE

The Transceiver will not modulate with the Function Switch in the CAL. position.

AM TRANSMITTER TUNING

① Tune the transmitter to full output as you would for SSB transmitter tuning.

② Rotate MIC. GAIN control to full CCW (minimum) position.

③ Place the SIDEBAND SELECTOR switch in the AM REC. position.

④ Place the Meter Switch in the P.A. CATHODE position.

⑤ With the microphone press-to-talk switch pressed, rotate the CARRIER INSERTION control until cathode current is approximately 125 ma.

⑥ While talking in a normal tone of voice into the microphone, increase the MIC. GAIN control setting until the meter barely kicks upward. This setting will result in excellent AM transmissions.

CW TRANSMITTER TUNING/OPERATION

① Tune the transmitter to full output as you would for SSB transmitter tuning.

② Insert a CW key in the Key Jack on the rear panel of the transceiver.

③ In CW operation, it is necessary to switch the Function Switch to the TUNE-CW position when transmitting, and back to the REC. position while receiving.

④ While receiving, the carrier oscillator frequency is located 300 cycles outside the passband of the crystal lattice filter, thus providing a single heterodyne note, or "single signal" for CW reception. When transmitting in CW mode, the carrier frequency is moved approximately 800 cycles higher, placing it well inside the passband. This frequency shift is termed "Off-set CW transmit frequency", and avoids the problems encountered when the receive and transmit frequency are exactly the same. This is desirable for voice communication, of course, but when using the CW Keying mode the receiver must be tuned off frequency several hundred cycles in order to hear an audio beat. By providing this shift automatically CW operation is greatly simplified.

GENERAL DISCUSSION

The Siltronix 1011B transceiver provides single sideband, suppressed carrier transceive operation, and generates the single sideband signal by means of a crystal lattice filter. To permit a logical discussion of this mode of operation, certain definitions are necessary.

In a normal AM signal (double sideband with carrier), a radio frequency signal is modulated with an audio frequency signal. This is considered by many to be merely a case of varying the amplitude of the carrier at an audio rate. In fact, however, there are actually sideband frequencies generated, which are the results of mixing the RF and the A.F. signals. These sidebands are the sum of, and the difference between, the two heterodyned signals. In the detection of this conventional AM signal, the two sidebands are mixed with the carrier to recover and reproduce the audio intelligence. This is an inefficient means of transmission, because only 25 percent of the transmitted power is used to transmit intelligence. There are other attendant drawbacks also. The bandwidth of AM voice transmission is approximately 6 KHz, while the actual demodulated audio is only approximately 3 KHz. The result is inefficient use of the frequency band, and over half of the allotted band is unusable due to heterodynes, interference, and congestion.

In the single sideband, suppressed carrier mode of transmission, only one of the sideband signals is transmitted. The other sideband and the carrier are suppressed to negligible level. In addition to increasing the transmission efficiency by a factor of four, single sideband effectively doubles the number of stations or channels which can be used in a given band of frequencies.

It should be remembered that in the single sideband, suppressed carrier mode of transmitting, the unwanted sideband and carrier are only suppressed, not entirely eliminated. Thus, with a transmitted signal from a transmitter with 50 db sideband suppression, the other or unwanted sideband will be present, and will be transmitted, but its level will be 50 db below the wanted sideband. When this signal is received at a level of 20 db over S9, the unwanted sideband will be present at a level of approximately S5. The same is true of carrier suppression. With carrier suppression of 60 db, and a signal level of 20 db over S9, carrier will be present at a level of approximately S3 to S4.

For the following discussion refer to the schematic diagram, and to Figures 3, 4, and 5.

SIGNAL GENERATION

When the push-to-talk switch on the microphone is pressed, the transmitter portion of the transceiver is activated, and it generates a single sideband, suppressed carrier signal in the following manner. Carrier is generated by Q3 Carrier Oscillator, which is a Pierce oscillator with the crystal operating in parallel resonance. This stage operates in both the transmit and receive modes. When transmitting, the RF output of the oscillator is injected into the control grid of the Balanced Modulator, V13. This balanced modulator is a beam deflection tube, and operates similar to a cathode ray tube in that the electron beam from the cathode is deflected to one output plate or the other by the charge appearing on the deflection plates. The carrier signal fed to the control grid of the balanced modulator appears on both plates of the output. The two plates are connected to Transformer T1301. The deflection plate DC voltages are adjusted by means of the carrier balance control, R1305, so that the RF being fed to the output plates will cancel out, and the output from T1301 will be zero. Audio signals from the Microphone Amplifier, V14, are applied as a modulating voltage to one deflection plate, and the two sidebands resulting from the sum and difference frequencies of the audio and carrier signals appear in the output of transformer T1301. Carrier suppression is approximately 60 db down. The Carrier Insertion control limits the amount of carrier that can be inserted in AM and thus protects the final amplifier from being over driven.

The double sideband, suppressed carrier signal is then coupled from the secondary winding of T1301 to the crystal filter, which suppresses the lower sideband, and permits only the upper sideband to be fed to the First IF Amplifier V7. The carrier frequency is generated at approximately 5500.0 KHz, normal sideband. With the opposite sideband crystal, the carrier crystal frequency will be 5504.6 KHz, and this positions the double sideband signal on the other side of the filter response curve, attenuating the upper sideband by at least 50 db.

Q1, the VFO 2N706 Oscillator, operates in the common base configuration as a Colpitts oscillator. Q2, the buffer, is used for isolation. The extremely good regulation achieved through using the Zener diode regulator D1712 across the bias supply voltage, also contributes to the stability.

The VFO in the Model 1011B exhibits extremely good stability after the initial warm-up period. Drift from a cold start will be less than 2 KHz during the first hour. After the initial warm-up period, drift will be negligible.

The single sideband, suppressed carrier signal from the First I.F. Amplifier is fed to the Transmit Mixer, V2, where it is heterodyned with the VFO signal. The resultant signal at the desired transmit frequency is amplified by the Driver, V3; and the Power Amplifier, V4. The signal from the VFO Amplifier is initiated in the transistorized VFO/Buffer circuit Q1 and Q2. The signal from the VFO is routed to the VFO Amplifier, and is mixed with the single sideband from the IF amplifier, resulting in output in the 10 meter band. When the transceiver is in the TRANSMIT mode, the gain

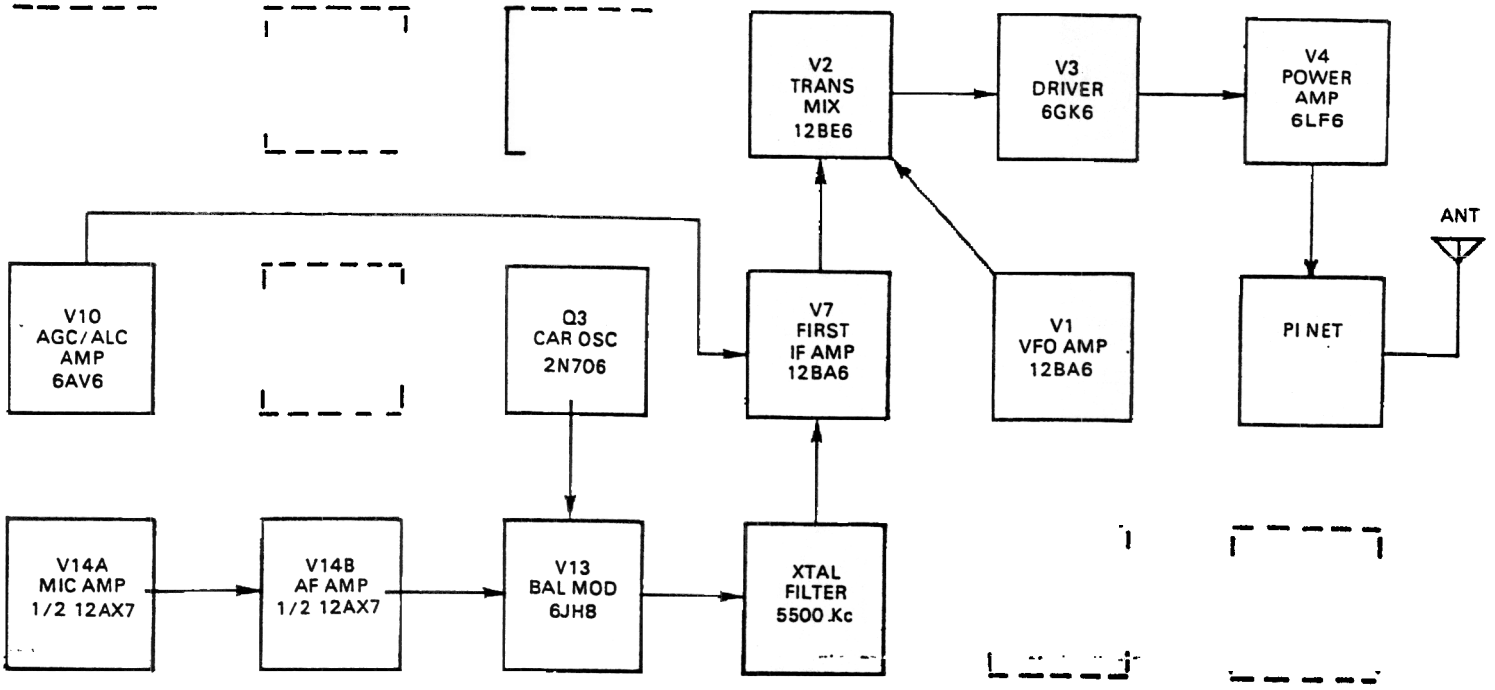


FIGURE 3. BLOCK DIAGRAM, TRANSMIT MODE

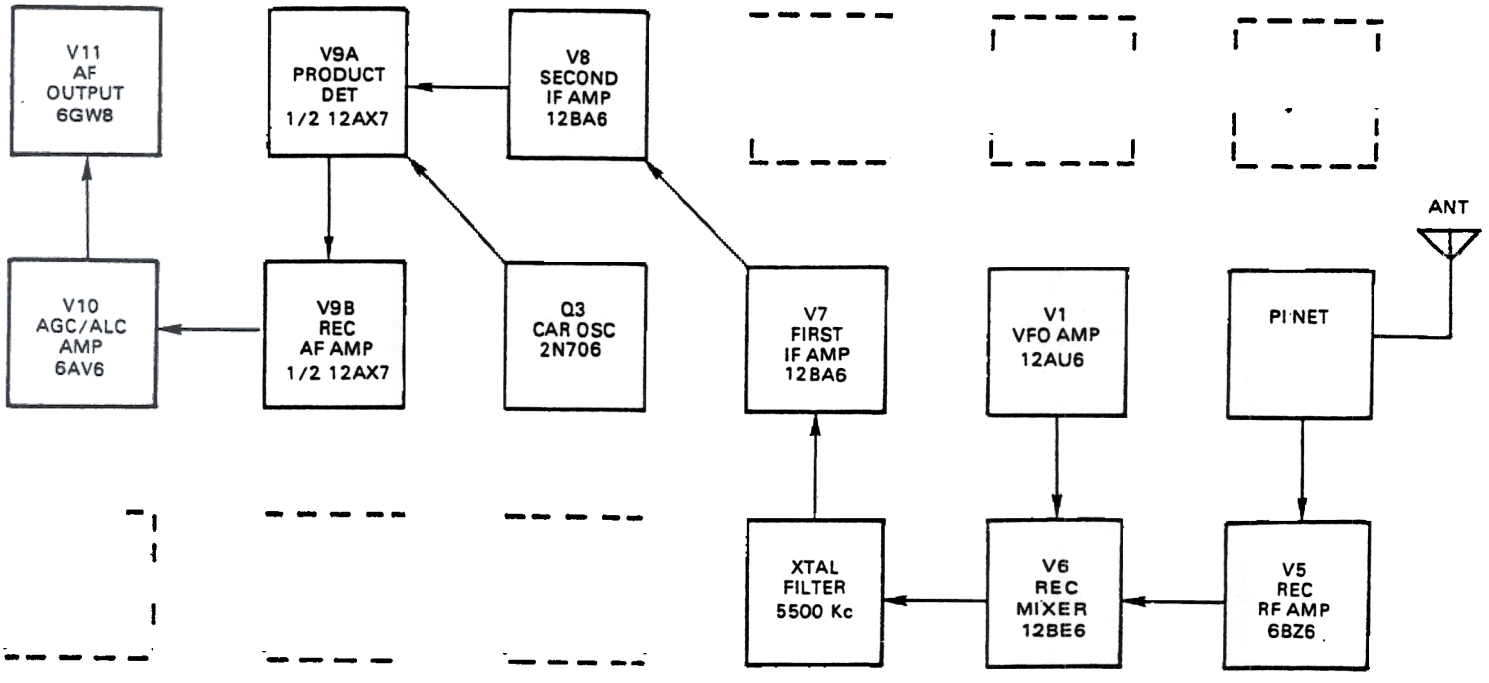


FIGURE 4. BLOCK DIAGRAM, RECEIVE MODE

of the First IF Amplifier is controlled through the Automatic Level Control (ALC) network (using the AGC Amplifier V10) to control the gain of the stage in response to the average input power to the Power Amplifier. This ALC system will compensate for any extremely strong input signals, but does not completely eliminate the necessity of proper adjustment of the Mic. Gain Control. This feature will help prevent the transmitter from flat topping and spurious emissions, but considerable distortion may occur if the Mic. Gain Control is not properly adjusted. Refer to Operating Instructions.

TUNE AND CW OPERATION

Normally, the frequency of the carrier oscillator is approximately 300 Hertz outside the 6 db passband of the crystal lattice filter. In TUNE position, the frequency of the carrier oscillator is moved approximately 800 Hertz to place it well within the passband of the crystal lattice filter. A similar procedure is followed for CW to allow full carrier output during CW operation.

RECEIVE

In RECEIVE position, or at any time when the transmitter is not in TRANSMIT, all circuits used in transmitting are disabled through the relay controlled circuits, K1. The relay is energized for transmitting and de-energized for receiving. One contact, when de-energized, allows signals from the transmitting tank circuit and antenna to be fed to the Receiver R.F. Amplifier, V5; where they are amplified and then fed to the control grid of the Receiver Mixer, V6. The local oscillator signal from the VFO Amplifier is now used to heterodyne the received signal to the IF frequency. All I.F. amplification is accomplished at this frequency, nominally 5500.0 KHz, through IF amplifiers V7 and V8. In the Product Detector, V9A, the IF signal is heterodyned with the carrier frequency generated by Carrier Oscillator, Q3. The resultant audio is then amplified by V9B, which then couples to the AGC amplifier, V10, and the audio output stage, V11.

FREQUENCY CALIBRATION

Frequency calibration of the Model 1011B is in 5 KHz increments. Dial accuracy and tracking are quite good, but caution must always be observed when operating near band edges. Measuring the frequency with the 100 KHz calibrator when working near band edges is recommended.

DIAL SET

A DIAL SET control has been provided so that dial adjustment can be made at any 100 KHz point on the dial. With calibrator on, set the dial to any 100 KHz point closest to the frequency you wish to work. Now adjust DIAL SET control to zero-beat the VFO with the 100 KHz Calibrator. This provides greater accuracy of dial readout.

CAUTION

CARE MUST BE EXERCISED WHEN TUNING FOR THE 100 KHz HARMONICS OF THE CALIBRATOR. SEVERAL SIGNALS MAY BE HEARD, ALTHOUGH THEY WILL BE DEFINITELY WEAKER THAN THE CORRECT HARMONICS.

TRANSMIT AND RECEIVE SWITCHING

Transmit and receive switching is performed by relay K1. In TRANSMIT, only those tubes that operate in the transmit mode are operative, all others being biased to cutoff through the relay contacts. In RECEIVE, with the relays de-energized, the tubes that are used only in transmit are cut off in the same manner. Relay K1 when de-energized, feeds signals from the output Pi-network to the receiver. Note that relay K1 will not operate when the BAND SWITCH control is in "CB" position.

POWER RATING

The Siltronix 1011B is capable of 180 watts, P.E.P. input under steady state two-tone test conditions. The peak envelope power, when voice modulated, is considerably greater, typically 260 watts, or more.

The built-in power supply produces a no-load plate voltage of approximately 880 volts. Under TUNE conditions, or CW operation, this voltage will drop to approximately 680 volts. Under steady state two-tone modulation, the voltage will drop to approximately 710 volts. If the power amplifier idling current is 40 ma., and the two-tone current, just before flat-topping, is 200 ma., the peak two-tone current will be 300 ma. Under these conditions, the P.E.P. input will be 710 volts times 300 ma. = 213 watts. Under voice modulation, because average power is considerably less, the power amplifier plate and screen voltages will be maintained higher, even during voice peaks, by the power supply filter capacitors. Peak plate current will therefore also be higher than with two-tone test conditions. Under typical operating conditions, peak plate current before flat-topping will be 350 ma. at 800 volts, to result in an input of 280 watts P.E.P. Readings of cathode current will not reflect this power input, however, because of the damping in the cathode current meter. Cathode current readings under normal voice input should not average more than 100 to 120 ma.

POWER AMPLIFIER PLATE DISSIPATION

There is often a misunderstanding about the plate dissipation of tubes operated as AB1 amplifiers under voice modulation. In the Siltronix 1011B, while in the transmit mode, and with no modulation, the plate voltage will be approximately 830 volts, the plate current 40 ma., and the power input 33 watts.

Authorities agree that the average voice power is 20 to 20 db below peak voice power. Normally, some peak clipping in the power amplifier can be tolerated, and a peak-to-average ratio of only 6 db may sometimes occur. Under such conditions, the average power input will be 80 watts, and average plate current will be 100 ma. With power amplifier efficiency of 65 percent, plate dissipation will be approximately 26 watts. The 6LF6 is rated at 40 watts, continuous duty cycle, in normal TV service. Thus it can be seen that under normal operating conditions, the Power Amplifier tube in the 1011B is not being driven very hard. Note, however, that proper modulation level must be maintained by correct setting of Mic. Gain, and that the length of time in TUNE position must be limited to not more than 30 seconds at a time.

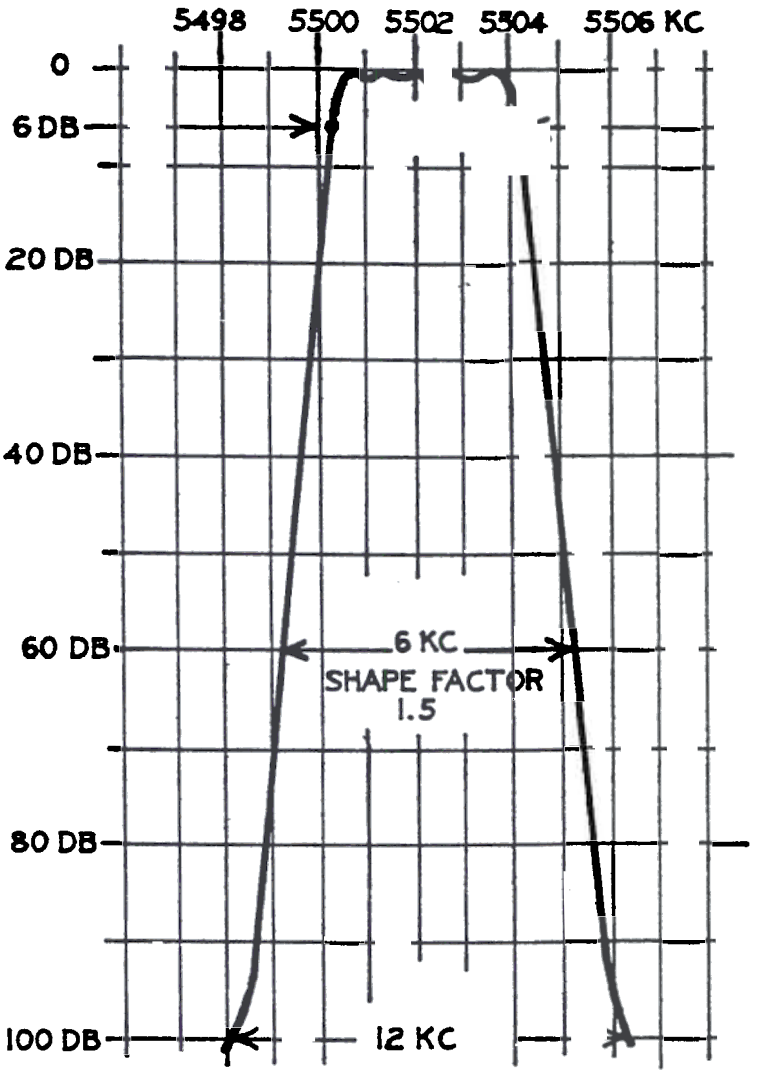


FIGURE 5. CRYSTAL FILTER CHARACTERISTICS

ALIGNMENT AND TROUBLESHOOTING

The alignment procedures presented in this section are routine touch-up procedures for all tuned circuits and other adjustments. It is recommended that the procedures be performed in the order presented. However, if complete realignment is not required (as may be the case when just one tube is replaced), perform just those procedures required. Refer to Figures 6 and 7 for component placement.

RECEIVER ALIGNMENT

Receiver alignment involves only the adjustment of the Second I.F. coil. The R.F. coils which affect receiver performance are also used in the TRANSMIT mode. Their adjustment is covered under "TRANSMITTER ALIGNMENT".

(1) After allowing approximately five minutes for warm-up, tune the receiver to the middle of the band and on a "clear" frequency.

(2) Adjust the P.A. TUNE, P.A. LOAD, AND DRIVER controls for maximum noise.

(3) Adjust the Second I.F. coil (L801) for maximum background noise.

S-METER ADJUSTMENT

With the antenna disconnected, R.F. GAIN control fully clockwise, and METER switch in S-METER position, set R705, located on the rear panel, for zero meter reading. Make sure no local signals are being received.

TRANSMITTER ALIGNMENT

To adjust the Power Amplifier Bias:

Switch METER switch to P.A. CATHODE position.

Rotate CARRIER INSERTION control fully counter clockwise.

After allowing approximately five minutes for warm-up, key the transmitter with the microphone switch. Without speaking into the microphone, adjust the Carrier Balance control on the bottom cover for a Null.

Again key the transmitter with the microphone switch, and without speaking into the microphone, adjust the P.A. BIAS control on the rear panel until the meter reads 40 ma. of *idling current.* This point is indicated on the meter by the "*delta*" symbol.

2. The alignment of transmitter circuits involves the adjustment of tuned circuits in the VFO Amplifier, V1; the Transmit MIXER, V2; and the DRIVER stage, V3. It is recommended that a 50 ohm dummy load be connected to the antenna jack during this series of adjustments.

   (a) Set the tuning dial to approximately 28.3 MHz, and the DRIVER control at 12 o'clock.

   (b) Set P.A. LOAD control to 9 o'clock.

   (c) Set METER switch to P.A. CATHODE.

   (d) Press Mic. button. Check *idling current.* It should be on the *"delta"* symbol when the CARRIER BALANCE control is nulled, and the CARRIER INSERTION control is fully counter clockwise. Adjust P.A. BIAS control if necessary.

   (e) With Mic. button pressed, adjust CARRIER BALANCE control for slight increase in meter reading, 50 to 60 ma. Adjust P.A. TUNE control to resonance (dip).

   (f) Adjust coils L101, L201, and L301, for maximum reading. When reading goes higher than 80 ma., or so, adjust CARRIER BALANCE control for 60 ma. again.

   (g) Adjust coils carefully for maximum peak. Exercise caution with CARRIER BALANCE control. Do not exceed 100 ma. reading for more than a few seconds. Be sure P.A. TUNE control is resonated (adjusted for "dip" in meter reading).

3. Power Amplifier Neutralization.

   (a) After allowing approximately five minutes for warm-up, tune transmitter to approximately 28.3 MHz.

   (b) Set the P.A. LOAD control to 9 o'clock.

   (c) Set METER switch to P.A. CATHODE.

   (d) Key the transmitter with the Mic. button, and without speaking into the microphone, adjust the CARRIER BALANCE control for a reading of approximately 100 ma. Quickly adjust the DRIVER control for a peak. Quickly re-adjust the CARRIER BALANCE control to 100 ma. if it increased to a higher reading.

   (e) With the Mic. button still pressed, rotate the P.A. TUNE control through its range from 9 o'clock to 3 o'clock. You will note a pronounced "dip" in meter reading at resonance. Observe any tendency

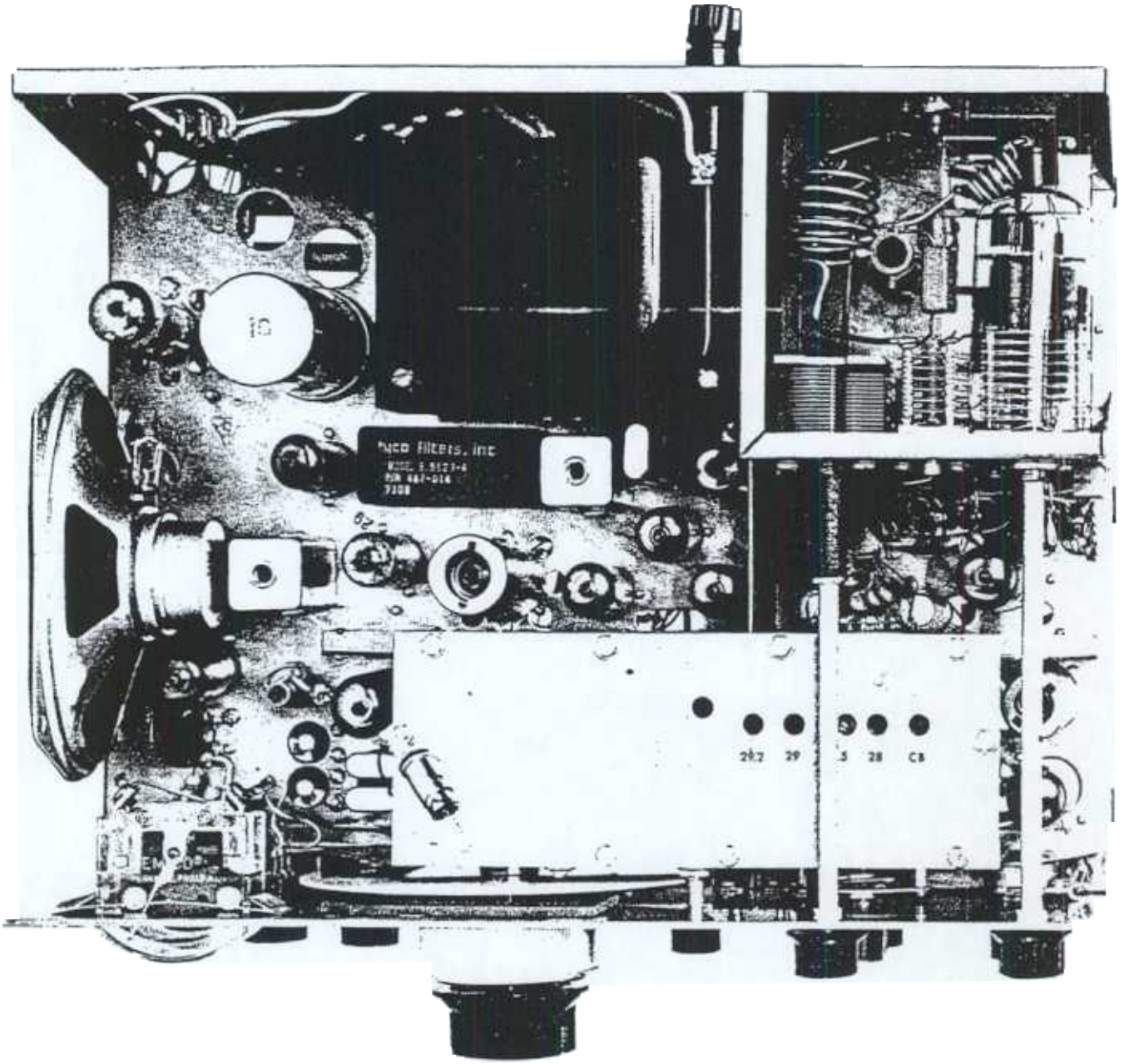
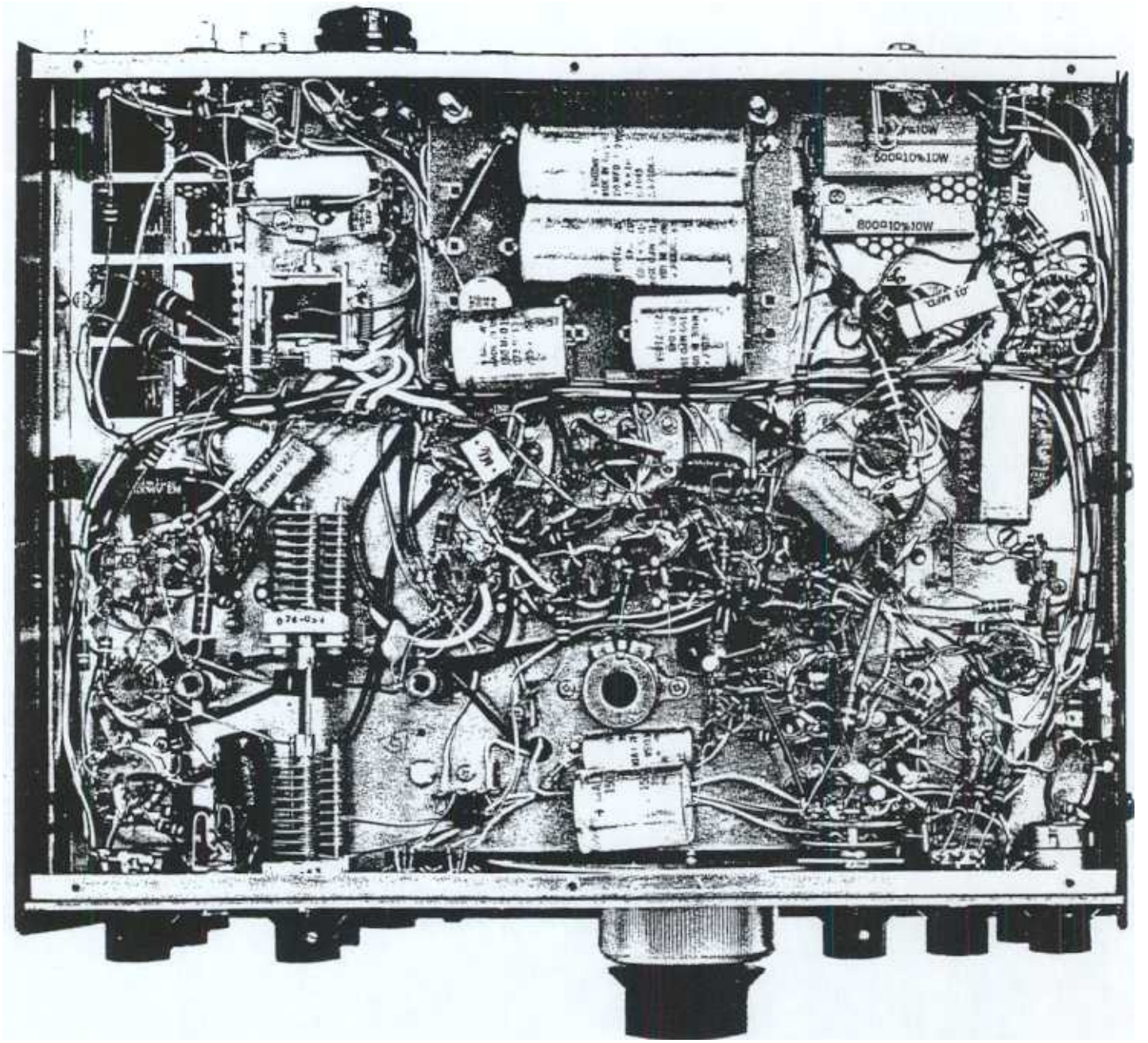


FIGURE 6. SILTRONIX MODEL 1011B TOP VIEW.



RO MODE BOTTOM W.

for the meter to "peak" above the 100 ma. plateau on either side of resonance. If there is such a peak, adjust C401, the P.A. NEUTRALIZING trimmer to suppress the peak. When properly neutralized, the meter reading will hold steadily at 100 ma. except for the sharp dip at resonance, but there will be no peak above the 100 ma. level.

(f) Key the transmitter with the Mic. button, and re-adjust the CARRIER BALANCE control for minimum Power Amplifier current. Power Amplifier idling current should be on the *"delta"* symbol. If not, repeat the Power Amplifier Bias adjustment described in TRANSMITTER ALIGNMENT, STEP 1.

4. Carrier Frequency Adjustment.

A dummy load wattmeter and audio generator are required for this adjustment.

(a) After allowing a five minute warm-up period, tune the transmitter to approximatley 28.3 MHz.

(b) Key the transmitter with the Mic. button, and adjust the CARRIER BALANCE control for minimum power amplifier current.

(c) Insert 1500 Hertz of audio from an audio generator into the Mic. Jack on the front panel. Adjust the gain of the audio generator and the Mic GAIN control (R1404) until the wattmeter reads approximately 10 to 15 watts.

(d) Adjust the First I.F. coil, L701, for maximum output. Adjust both slugs of the balanced modulator transformer, T1301, for maximum output.

(e) Increase gain of audio generator until the wattmeter reads 40 watts. Sweep generator down to 200 Hertz and adjust the USB carrier oscillator trimmer, C1503, for a reading of 10 watts.

(f) Switch to the LSB position. Adjust the LSB carrier oscillator trimmer, C1501, for a reading of 10 watts.

(g) Re-check with audio generator set at 1500 Hertz and 40 watts. Sweep down to 200 Hertz and re-adjust carrier oscillator trimmers, if required, for 10 watts.

5. VFO Calibration.

After allowing approximately five minutes for warm-up, tune the dial to the 200 KHz increment for any of the 10 meter ranges to be calibrated. For CB calibration, tune the dial to the 27,100 KHz increment. Using the 100 KHz crystal calibrator as a signal source, tune the signal for zero beat and note the corresponding dial reading. If the signal does not zero beat on the desired dial increment, locate the VFO cover and carefully adjust the correct trimmer until it does.

Use an insulated alignment tool for adjustment. Accuracy in other parts of the bands will be quite good, but remember that the 1011B is not to be considered a frequency standard; Be cautious when operating near band edges.

6. Troubleshooting.

The information contained in Figures 6 and 7, together with the voltage and resistance measurements in Table 1, and the information in Table 2, should be sufficient for most troubleshooting by the average licensed amateur radio operator.

TABLE 1. VOLTAGE AND RESISTANCE MEASUREMENTS

Voltage measurements were taken using a HEWLETT PACKARD Model 410C/B VTVM. Resistance measurements were taken using a SIMPSON MOdel 260 Volt-Ohm meter.

TUBE TYPE	R = Rec. T = Trans.	Socket Pin Numbers								
		1	2	3	4	5	6	7	8	9
V1 12BA6	R Volts	-.6	0	0	12.6AC	45	45	0		
VFO Amp.	T Volts	-.6	0	0	12.6AC	50	50	0		
	Ohms	1.2K	0	0	0.2	0	*	0		
V2 12BE6	R Volts	-1.2	0	0	12.6AC	250	-2	0		
Trans. Mixer	T Volts	-1.0	0	0	12.6AC	250	135	0		
	Ohms	100K	0	0	.02	*	11K	35K		
V3 6GK6	R Volts	0	-6.7	0	0	6.3AC	NC	255	0	0
Driver	T Volts	0	-6.7	0	0	6.3AC	NC	265	225	0
	Ohms	10	100K	0	0	0.3	NC	*	0.2	0
V5 6BZ6	R Volts	0	0	6.3AC	0	255	115	0		
Rec. R.F.	T Volts	0	0	6.3AC	0	255	0	0		
	Ohms	1.1M	0	0.1	0	14K	40K	0		
V6 12BE6	R Volts	-3.7	0	12.6AC	12.6AC	220	110	0		
Rec. Mixer	T Volts	-3.4	0	12.6AC	12.6AC	220	0	0		
	Ohms	200K	0	0	0	20K	20K	70K		
V7 12BA6	R Volts	-1.8	0	0	12.6AC	210	48	0		
1st I.F.	T Volts	-1.8	0	0	12.6AC	220	50	0		
	Ohms	500	0	0	0.1	15K	50K	0		
V8 12BA6	R Volts	-1.7	0	0	12.6AC	205	105	0		
2nd I.F.	T Volts	-1.7	0	0	12.6AC	225	0	0		
	Ohms	110K	0	0	0.1	15K	40K	0		
V9 12AX7	R Volts	55	-1	0	0	0	145	-.25	0	6.3AC
Det. A.F.	T Volts	-3	-1.6	0	0	0	0	-.25	0	6.3AC
	Ohms	400K	11K	300	0	0	125K	1M	0	0.2
V10 6AU6	R Volts	0	2.0	6.3AC	0	0	0	225		
AGC Amp.	T Volts	0	1.6	6.3AC	0	0	0	175		
	Ohms	500K	5K	0.2	0	0	700K	100K		
V11	R Volts	0	1.9	215	6.3AC	6.3AC	250	9	0	170
A.F. Output	T Volts	.7	0	0	6.3AC	6.3AC	250	0	0	0
	Ohms	22	10K	10K	0	0	8K	2.5K	1.1M	120K
V12 12BA6	R Volts	0	0	12.6AC	225	225	75			
100KC Cal.	T Volts	0	0	12.6AC	175	175	55			
	Ohms	1M	0	0.1	100K	200K	0			
V13 6JH8	R Volts	0	0	0	6.3AC	0	-1.4	0	0	0
Bal. Mod.	T Volts	45	45	75	6.3AC	0	-1.4	0	100	100
	Ohms	2K	.75K	500K	0.2	0	35K	0	75K	75K
V14 12AX7	R Volts	50	0	0	0	0	0	0	0	6.3AC
Mic. Amp	T Volts	45	0	0	0	0	75	0	0	6.3AC
	Ohms	1M	0	0	0	0	600K	0	10K	0.2
		1	2	3	4	5	6,7,8,9	10	11	12
V4 6LF6	R Volts	12.6AC	0	NC	0	-75	NC	0	0	12.6AC
Pwr. Amp.	T Volts	12.6AC	0	NC	0	-75	NC	0	180	12.6AC
	Ohms	0	2.4	NC	0	180K	NC	0	100	0

TABLE 2. TROUBLESHOOTING GUIDE

DEFECT	POSSIBLE CAUSE
PA Idling Current Unstable	1. Defective Power Amplifier Tube (V4). 2. Defective BIAS control and/or associated components. 3. Defective bias power supply.
Inability to Load per Operation Instructions	1. Antenna not resonant at operating frequency. 2. Defective transmission line. 3. Defective antenna loading coil(s). 4. Tubes V1 through V4 defective.
Insufficient Sideband Suppression	1. Carrier Oscillator (Q3) operating on incorrect frequency. 2. Crystal filter defective or mistuned.
Insufficient Carrier Suppression	1. Tube V13 defective. 2. Transformer T1301 defective or mistuned. 3. Carrier Oscillator (Q3) operating on incorrect frequency.
Microphonics in Transmitter	1. Tubes V13 and/or V14 defective. 2. IF coil L701 Defective or incorrectly adjusted. 3. Microphone defective.
Low Receiver Sensitivity	1. Tubes V5 through V10 defective. 2. Incorrect adjustment of the transmitter Pi-Network. 3. IF coil L801 incorrectly adjusted or defective. 4. K1 relay contacts defective.

TABLE 3. VFO AND CARRIER OSCILLATOR FREQUENCIES

Tuning Dial	V1 Injection Frequency	Q1 Osc. Frequency	Q3 Osc. Carrier Frequency
26,950 KC	21,450 KC	(1/2) 10,725 KC	5500 KC
27,260 KC	21,760 KC	(1/2) 10,880 KC	5500 KC
28,000 KC	22,500 KC	(1/2) 11,250 KC	5500 KC
29,700 KC	24,200 KC	(1/2) 12,100 KC	5500 KC

PARTS LIST

RESISTORS

All resistors are ½ watt 10% tolerance, unless otherwise noted.

R101	82 Ohm
R102	47K
R103	10K-2W
R104	56 Ohm
R201	27K
R202	100K
R203	100K
R204	10K-2W
R205	470K
R206	2.7K
R301	100K
R302	100K
R303	10 Ohm
R304	100 Ohm
R401	100 Ohm
R402	25K Bias Pot.
R403	4.7K
R404	1K
R405	3 Ohm-5W
R406	100 Ohm-5W
R407	2.7K
R408	15K
R501	100K
R502	220K
R503	470 Ohm
R504	10K
R505	25K R.F. Gain Pot
R506	10K
R507	470K
R601	47K
R701	1.5K
R702	33K-2W
R703	1K
R704	47K
R705	25K S-Meter Zero Pot
R706	15K
R707	47K-2W
R708	100K
R801	100K
R802	1K
R803	4.7K
R901	100K
R902	270 Ohm
R903	270K
R904	47K
R905	10 Meg
R906	1 Meg
R907	47K
R908	100K
R1001	1 Meg
R1002	270K
R1003	470K
R1004	4.7K
R1005	15K
R1006	2.2 Meg
R1007	270K
R1008	2.2 Meg
R1009	100K
R1101	1 Meg A.F. Gain Pot
R1102	10K
R1103	100K
R1104	1 Meg
R1105	270 Ohm
R1201	1 Meg
R1202	27K
R1203	100K
R1301	1K
R1302	10K
R1303	10K
R1304	270K
R1305	10K-1W
R1306	27K
R1307	27K
R1308	5K Car. Bal. Pot
R1309	1K
R1310	100K
R1311	27K
R1312	Selected Value
R1313	5K Carrier Insertion Pot
R1401	150K
R1402	47K
R1403	1K
R1404	1 Meg Mic. Gain Pot
R1405	270K
R1406	470K
R1407	2.2 Meg
R1408	47K
R1501	10K
R1502	68K-2W
R1503	22K
R1504	2.2K
R1505	1.5K
R1506	100 Ohm
R1601	2.7K
R1602	1.5K
R1603	1K
R1604	100K
R1605	470 Ohm
R1606	2.7K
R1607	1K
R1608	470 Ohm
R1609	470 Ohm
R1701	10K-2W
R1702	4.7 Ohm
R1703	150K-2W
R1704	150K-2W
R1705	800 Ohm-10W
R1706	1.2K-5W
R1707	270K
R1708	2.7K
R1709	800 Ohm-10W
R1710	500 Ohm-10W
R1711	100K

TRANSISTORS

Q1	2N706 Oscillator
Q2	2N5130 Buffer
Q3	2N706 Car. Oscillator

DIODES

D401	1N34A
D501	1N914
D701	1N914
D702	1N914
D703	1N914
D901	1N34A
D1001	1N914
D1002	1N34A
D1003	1N34A
D1201	1N34A
D1601	1N914
D1701	RCA 39804
D1702	1A-600V
D1703-1706	RCA 39804
D1707-1710	RCA 39804
D1711	RCA 39804
D1712	1N4742 Zener

COILS

L101	VFO Amp
L201	Trans. Mixer
L301	Driver
L302	82 uh
L401	82 uh
L402	55 uh
L403	Pi-Network
L404	30 uh
L701	5500KC I.F.
L801	5500KC I.F.
L1501	200 uh
L1601	VFO Coil
L1602	200 uh
L1603	200 uh
L1701	200 uh
L1702	17 uh

CAPACITORS

Unless otherwise specified, a capacitor is listed in pico farads with a whole number and in micro farads with a decimal number.

C101	.01 +80-20% 500V Disc
C102	.002 20% 1KV Disc
C103	27pf Disc
C104	1pf 500V Ceramic
C105	15pf Disc
C106	5pf Disc
C107	2pf Disc

C108	2pf Disc
C109	2pf Disc
C110	.01 +80-20% 500V Disc
C111	.002 20% 1KV Disc
C201	.05 200V Mylar
C202	.01 +80-20% 500V Disc
C203	470pf SM
C204	2pf 500V Ceramic
C205	.002 20% 1KV Disc
C2A	20pf Driver Tuning
C2B	20pf Driver Tuning
C302	.002 20% 1KV Disc
C303	510pf SM
C304	.002 20% 1KV Disc
C305	5pf
C401	20pf Neut. Trimmer
C402	15pf 3KV Disc
C403	.01 +80-20% 500V Disc
C404	.002 20% 1KV Disc
C405	.01 +80-20% 500V Disc
C406	270pf 2500V Mica
C407	40pf P.A. Tune
C408	410pf P.A. Load
C409	.01 +80-20% 500V Disc
C410	.01 +80-20% 500V Disc
C501	.01 +80-20% 500V Disc
C502	.01 +80-20% 500V Disc
C503	30pf Disc
C601	.01 +80-20% 500V Disc
C602	220pf Disc
C603	430pf SM
C701	1 MFD 50V
C702	50pf Disc
C703	.01 +80-20% 500V Disc
C704	.01 +80-20% 500V Disc
C705	2pf Disc
C706	.01 +80-20% 500V Disc
C801	.01 +80-20% 500V Disc
C802	.01 +80-20% 500V Disc
C803	.01 +80-20% 500V Disc
C804	50pf Disc
C805	50pf Disc
C901	220pf Disc
C902	.002 20% 1KV Disc
C903	150 pf Disc
C904	2 MFD 450V
C905	500pf Disc
C906	.002 20% 1KV Disc
C1001	.05 200V Mylar
C1002	.05 200V Mylar
C1003	.001 20% Disc
C1004	.01 +80-20% 500V Disc
C1005	.001 20% Disc
C1006	.001 20% Disc
C1007	.001 20% Disc
C1101	220pf Disc
C1102	.002 20% 1KV Disc
C1103	500pf Disc
C1104	.01 10% 1000V Tubular
C1201	50pf Disc
C1202	60pf Trimmer
C1203	150pf Disc
C1301	.01 +80-20% 500V Disc
C1302	.01 +80-20% 500V Disc
C1303	.01 +80-20% 500V Disc
C1304	.01 +80-20% 500V Disc
C1305	.01 +80-20% 500V Disc
C1306	220pf Disc
C1307	.002 20% 1KV Disc
C1401	.01 +80-20% 500V Disc
C1402	.1 10% 400V Mylar
C1403	.01 +80-20% 500V Disc
C1404	.01 +80-20% 500V Disc
C1405	.1 10% 400V Mylar
C1406	100pf Disc
C1407	.01 +80-20% 500V Disc
C1501	6-30pf Ceramic Trimmer
C1502	10pf Disc
C1503	6-30pf Ceramic Trimmer
C1504	270pf SM
C1505	270pf SM
C1506	.01 +80-20% 500V Disc
C1507	30pf
C1601	Selected
C1602	5pf Trimmer
C1603	5pf Trimmer
C1604	5pf Trimmer
C1605	Selected
C1606	5pf Trimmer
C1607	5pf Trimmer
C1608	10pf Main Tuning
C1609	Selected
C1610	2pf Dial Set
C1611	20pf Disc
C1612	270pf SM
C1613	6-30pf Ceramic Trimmer
C1614	.01 +80-20% 500V Disc
C1615	.01 +80-20% 500V Disc
C1616	300pf SM
C1617	27pf SM
C1618	.01 +80-20% 500V Disc
C1619	.01 +80-20% 500V Disc
C1620	.002 20% 1KV Disc
C1701	.01 +80-20% 500V Disc
C1702	100 MFD 35V
C1703	.01 +80-20% 500V Disc
C1705	.0047 1KV
C1706	.0047 1KV
C1707	150 MFD 150V
C1708	100 MFD 350V
C1709	100 MFD 350V
C1710	.002 20% 1KV Disc
C1711	.01 +80-20% 500V Disc
C1712A	80 MFD 400V
C1712B	80 MFD 400V
C1712C	5 MFD 400V
C1712D	5 MFD 400V
C1713	150 MFD 150V
C1714	150 MFD 150V

TRANSFORMERS

T1101	A.F. Output Trans.
T1301	5500KC Bal. Mod. Trans.
T1701	Power Trans.

Z401	Parasitic Suppressor

RELAYS

K1	3 PDT Relay, 12 VDC Coil

CRYSTALS

Y1201	100KC Crystal Calibrator
Y1501	5500KC Carrier Oscillator
Y1502	5504.6KC Carrier Oscillator

TUBES

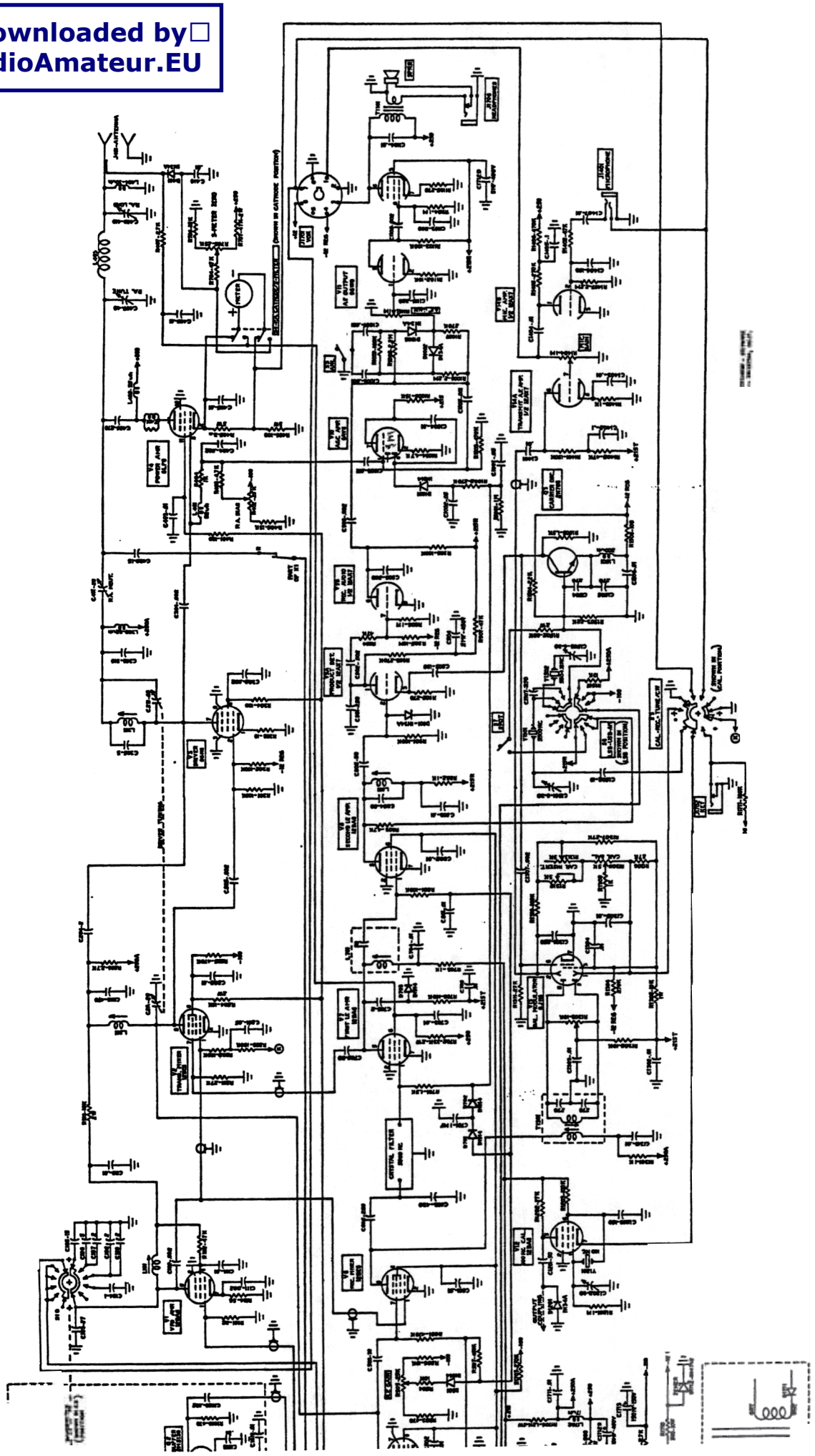
V1	12BA6 VFO Amp.
V2	12BE6 Trans. Mixer
V3	6GK6 Driver
V4	6LF6 Power Amp.
V5	6BZ6 Rec. RF Amp.
V6	12BE6 Rec. Mixer
V7	12BA6 First I.F. Amp.
V8	12BA6 Second I.F. Amp.
V9	12AX7 Prod. Det/Rec. Audio
V10	6AV6 AGC/ALC Amp.
V11	6GW8 A.F. Output
V12	12BA6 100KC Cal.
V13	6JH8 Bal. Mod.
V14	12AX7 Trans A.F./Mic. Amp.

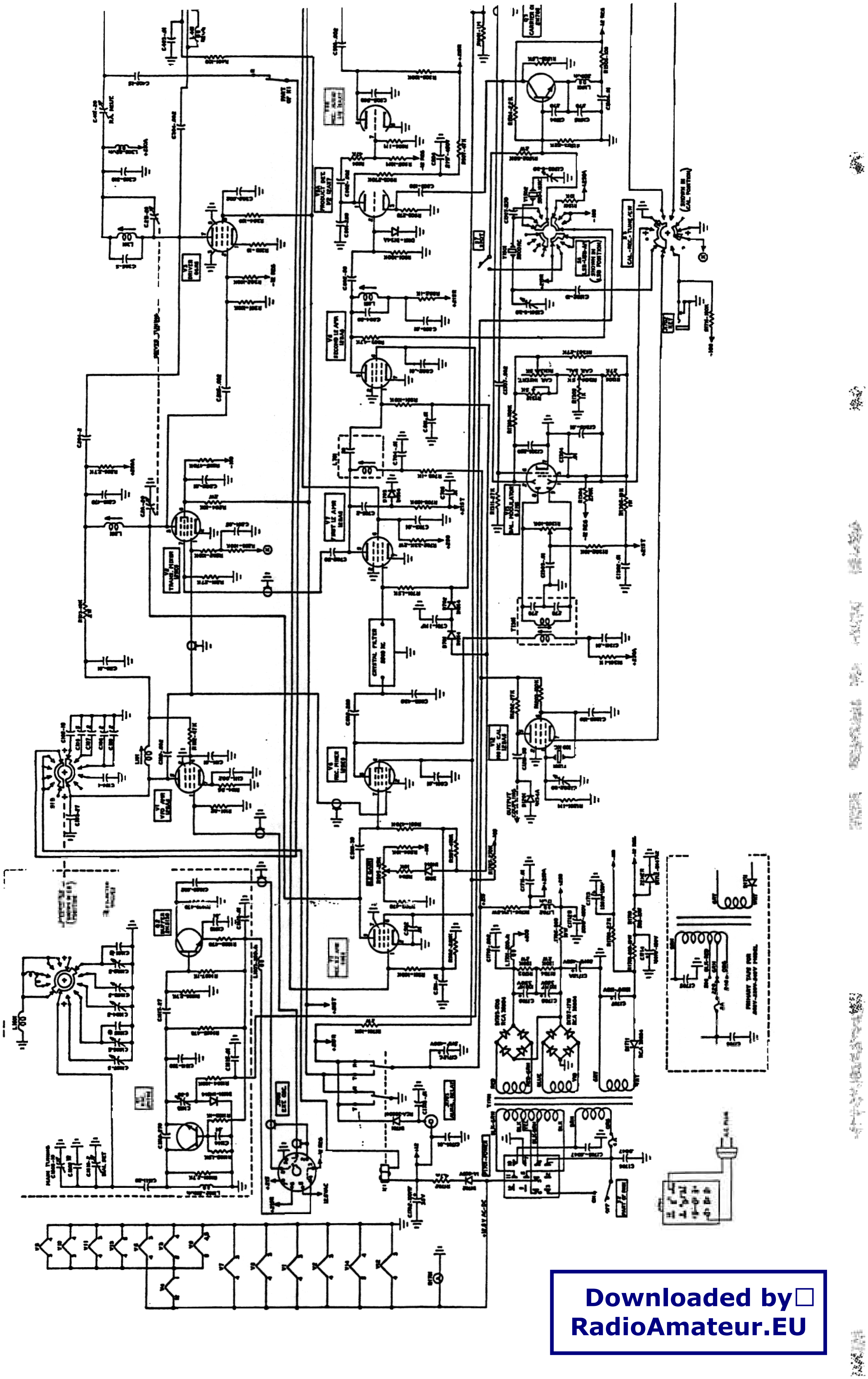
SWITCHES

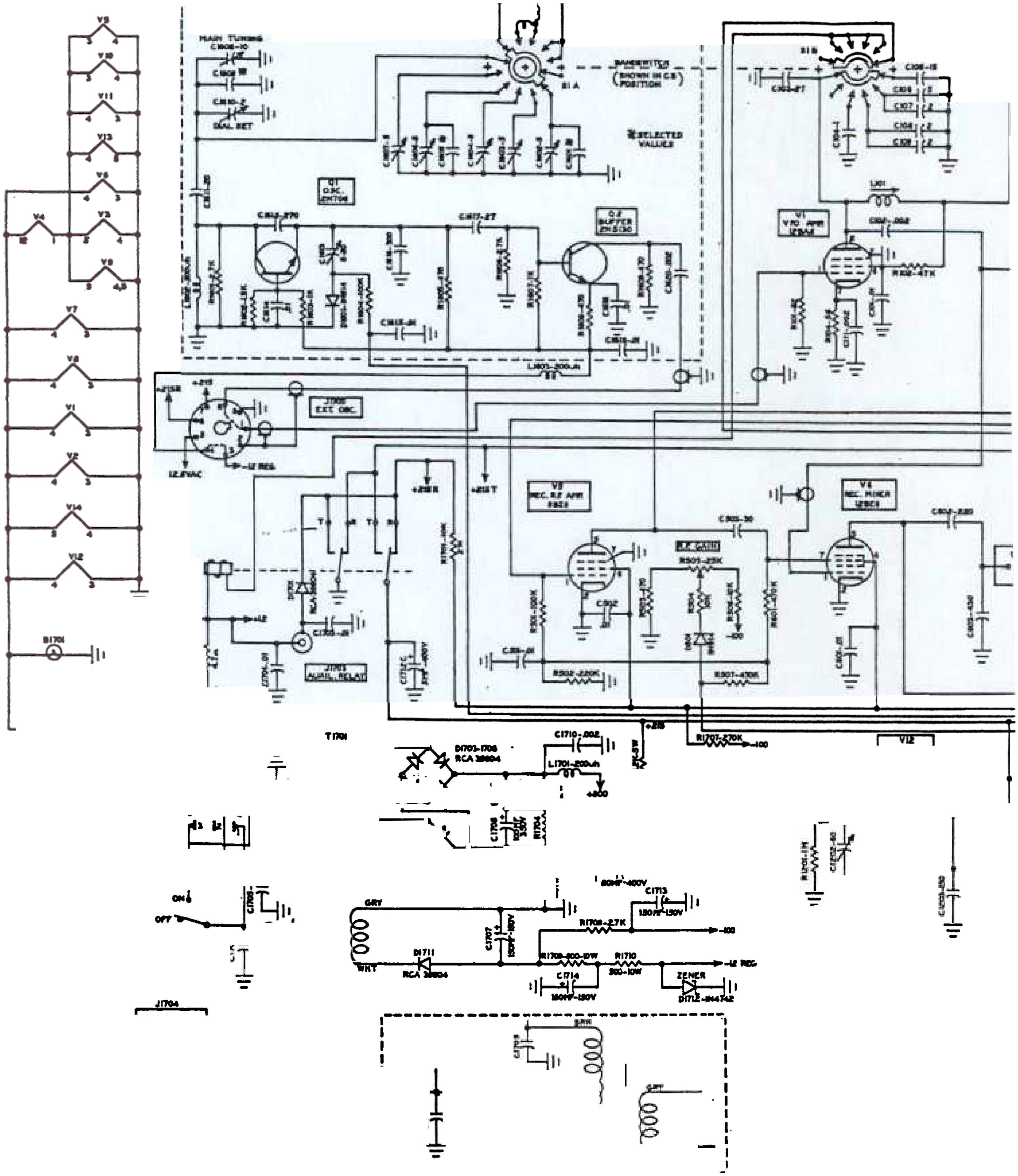
S1A-B	Bandswitch
S2	Power Off and On (Part of RF Gain)
S3	Cal. Rec. Tune/CW
S4	P.A. Cath./S-Meter
S5	ANL
S6	Sideband Selector
S7	Spot

WARRANTY POLICY

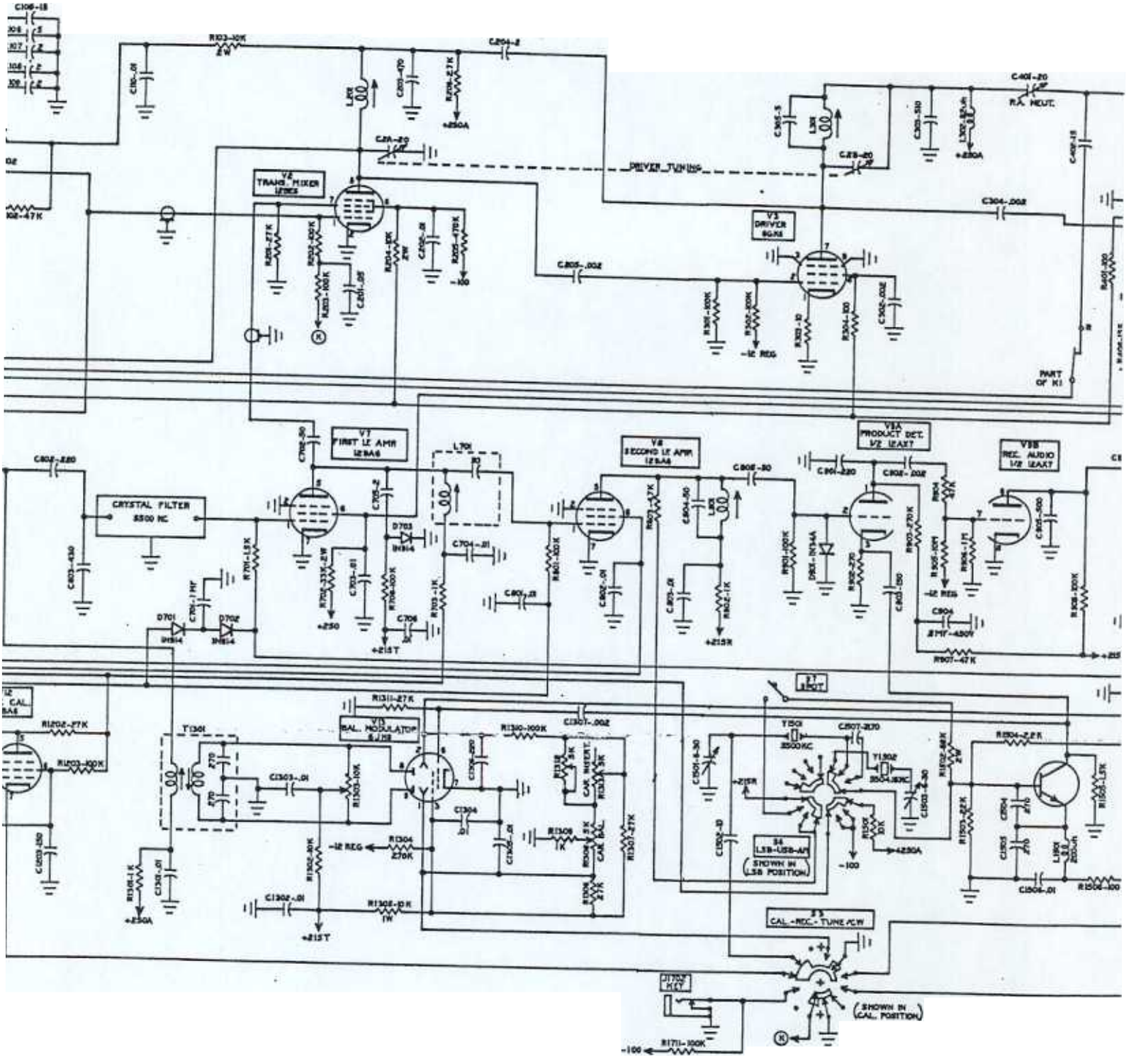
Siltronix Corporation warrants this equipment against defects in material or workmanship, except for tubes, transistors, and diodes, under normal service for a period of 6 months from date of original purchase. Tubes, transistors, and diodes are covered under the warranty policy for a period of 90 days. This warranty is valid only if the enclosed card is properly filled in and mailed to the factory within ten days of date of purchase. Do not ship to the factory without prior authorization. This warranty is limited to repairing or replacing only the defective parts, and is not valid if the equipment has been tampered with, misused or damaged. All returns for repairs must be sent freight prepaid. Siltronix will prepay the return freight.

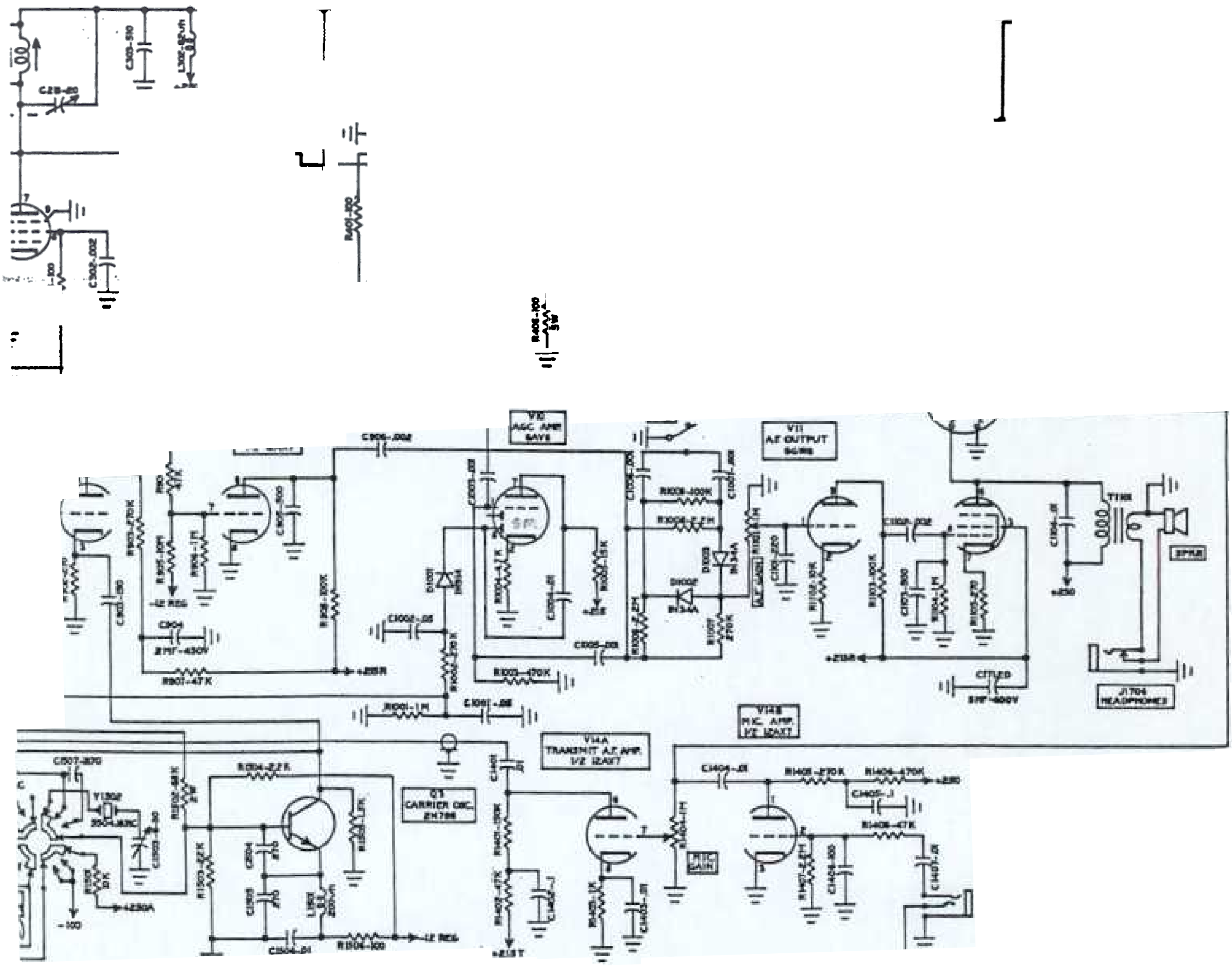






MAIN TUNING
DIAL SET
BANDSWITCH
(SHOWN IN C.S. POSITION)
S1A
S1B
*SELECTED VALUES
Q1 OSC. 2N706
Q2 BUFFER 2N5130
J1705 EXT. OSC.
12.6VAC
-12 REG
J1703 AUXIL. RELAY
V3 REC. RF AMP 6BZ6
V4 REC. MIXER 12BE6
V1 VFO AMP 12BA6
RF GAIN
B1701
T1701
D1703-1706 RCA 38804
L1701-200uh
V12
ON
OFF
J1704
GRY
WHT
D1711 RCA 38804
ZENER
D1712-1N4742
-12 REG
BRN


V2 TRANS. MIXER 12BE6
V3 DRIVER 6GK6
V4 SECOND I.F. AMP. 12BA6
V5A PRODUCT DET. 1/2 12AX7
V5B REC. AUDIO 1/2 12AX7
V6 BAL. MODULATOR 6JH8
V7 FIRST I.F. AMP. 12BA6
CRYSTAL FILTER 8500 KC
VARIABLE TUNING
R.F. NEUT.
PART OF K1
-12 REG
+250
+215T
+215R
+250A
-100
S1 LSB-USB-AM (SHOWN IN LSB POSITION)
S3 CAL.-REC.-TUNE (SHOWN IN CAL. POSITION)
J1702 KEY
CAR. INSERT.
CAR. BAL.
8500 KC
3504.83 KC
D701 1N914
D702 1N914
D703 1N914
D801-D804 1N34A


V10
AGC AMP
6AV6
V11
A.F. OUTPUT
6GW6
SPKR
J1704
HEADPHONES
V14B
MIC. AMP.
1/2 12AX7
V14A
TRANSMIT A.F. AMP.
1/2 12AX7
Q1
CARRIER OSC.
2N706
MIC
GAIN
A.F. GAIN

3-20-72/30

Siltronix Swan 1011 Transceiver, Carrier Oscillator Alignment.

By: Skipp May

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Your Now Homeward bound...

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

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

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

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