SCOTT DAK MARK X
RADIOTELEPHONE BASE STATION

Professional quality 40-Channel Phase-lock loop synthesized two-way CB Radiotelephone featuring vacuum tube output and RF driver.

90-DAY LIMITED WARRANTY

This equipment is warranted to be free from defects in material or workmanship for 90 days from date of delivery. Repair (or at our option, replacement) will therefore be made of any unit which proves to be defective during this period, provided the unit is returned properly packed, with all transportation charges prepaid, to an authorized warranty center or to the factory. Any repair approved hereunder will be made without charge to the owner for parts or labor. This limited warranty extends only to the original purchaser and is not transferable.

Claims under this limited warranty must be accompanied by the original sales ticket or shipping documents to establish date of purchase.

This limited warranty does not extend to units which have been subjected to misuse, abuse, neglect, accident or to units that have been used in violation of operating instructions.

Equipment which, in our judgment, show evidence of having been altered, modified or serviced without our authorization, or which has had its serial number altered or removed, will be ineligible for service under this limited warranty. Damage due to packaging and shipping is not covered by factory warranty.

M.H. SCOTT CO., INC.

8925 MCGAW COURT COLUMBIA, MD 21045

THIS TRANSCEIVER IS FCC TYPE ACCEPTED FOR USE IN CITIZENS CLASS D SERVICE

DAK MARK X SPECIFICATIONS

General

Frequency Control	PLL (Phase Lock Loop) Synthesizer
Channel	40 channels all installed
Mode of Operation	AM. LSB & USB
Power Source Voltage	117 VAC
Speaker (built-in)	4" dynamic type
Microphone	Low impedance or transistorised optional DM 100 power mike available

Receiver

System	SSB: Single Conversion superheterodyne AM: Dual conversion superheterodyne
Sensitivity	SSB: 0.25uV for 10dB S/N ratio AM: 1 μV for 10 dB S/N ratio
Selectivity	SSB: 2.4 KHz at 6 dB down AM: 6 kHz at 6 dB down
Clarifier	± 600 Hz
Audio Output	3 watts to 8 ohms
Squelch Range	SSB: 0.7uV to 1000 μ V AM: 1uV to 1000 μ V
IF	SSB: 10.695MHz AM: 1st: 10.695 MHz 2nd: 0.455 MHz

Transmitter SSB

Generation	Double balanced modulator with crystal latice filter
RF OUTPUT power	12 watts (PEP FCC max.)
Carrier Suppression	40 dB below mean power output
Unwanted Sideband Suppression	at least 60dB below modulated carrier level at + 20 kHz from carrier
Harmonic Suppression	at least 60dB below modulated carrier level

Transmitter AM

Modulation	High level pushpull modulator
RF Output Power	4 watts (FCC max.)
Harmonic Suppression	at least 60dB

M.H. SCOTT CO., INC. RESERVES THE RIGHT TO MAKE DESIGN CHANGES OR MODIFICATIONS WITHOUT INCURRING ANY OBLIGATION TO INCORPORATE THEM IN PRODUCTS PREVIOUSLY SOLD.

THE FCC REQUIRES A LICENSE BEFORE YOU OPERATE THIS TRANSCEIVER

Your MARK X is designed to operate under FCC Rules and Regulations Part 95. Operation of this unit is not permitted until you have applied for the necessary FCC licnese. The Class D Citizens Band License may be obtained by any citizen over 18 years of age by filling out FCC license application form 505. You are required to read and understand the applicable FCC rules and regulations. These can be obtained from the Superintendent of Documents, Government Printing Office, Washington D.C., 20225 requesting Volume VI of FCC Rules and Regulations (which includes Part 95). When you sign the application form, you certify that you have read the rules and regulations. Remember courtesy on the air is the mark of a good operator. Always listen before you transmit. Choose the least crowded frequency for your communications. Channel 9 is for emergency use nationwide. Never use Channel 9 except in an emergency.

TRANSMITTER INDENTIFICATION CARD

When you receive your license, you are required to fill out the Transmitter Identification Card, FCC Form 452-C, which will be found with the unit. You should fill out the card as follows:

1. Fill in your call sign.

2. Fill in the name of the licensee.

3. Fill in the address where the license is located.

4. Date of license expiration should be entered.

5. Enter your signature.

6. Affix the card to the unit.

DESCRIPTION

The DAK Mark X is designed for continuous operation under demanding conditions. It is ideal for any base station installation which is the heart of a properly functioning personal communication system.

The DAK Mark X is a hybrid two-way radiotelephone for base station CB operation. It incorporates transistors and integrated circuits in that portion of the circuitry where their performance is optimum. In the radio frequency driver and output stages it incorporates vacuum tubes which have inherent advantages over transistors for this application. A frequency synthesizer circuit provides 40 precisely controlled phase-lock loop transmit and receive channels in the 27-Mhz band engineered for trouble free performance. The DAK X is designed to provide the same operating convenicences and readout information considered essential on professional quality radiotelephone base equipment.

Meters and controls are laid out in a logical related sequence. An oversized digital readout, controllable from the center channel selector knob indicates instantly the channel in use. Four 3-inch illuminated meters provide continuous monitoring of standing wave ratio; plate current; percentage of modulation and incoming received signal strength. The plate current meter can be manually switched to read radio frequency power output alternatively.

A switchable automatic noise blanker; independent microphone gain control; standing wave ratio calibrate control; clarifier; continuously variable squelch and continuously variable volume are sequentially laid out on the brushed aluminum front panel. The panel is a standard 19" panel with standard EIA mounting holes. Two sturdy handles are provided for decorative trim and ease of moving the equipment. In addition to a standard microphone connector, a headphone jack is provided on the front panel for privacy.

A highly effective fast-attack speech compressor which requires no manual setting, assures maximum level of audio for penetration through crowded channels. Shaped audio characteristics in the audio stages provide rising response to emphasize speech frequencies, further improving signal clarity.

An oversized built-in loudspeaker provides excellent audio quality. A communications type push-to-talk microphone, desk mounted, is available as a standard accessory.

RECEIVER
AM Receiver

The AM receiver is a dual conversion superheterodyne providing crystal controlled PLL Operation on all 40 CB channels. Many features are included to allow optimum reception. An Automatic Noise Limiter effectively suppresses internally generated noise while a switchable Noise Blanker is provided to eliminate strong pulse-type ignition and other man-made noise. Two ceramic filters provide sharp selectivity and high adjacent channel rejection. Therefore, minimum interferance is caused by signals on other channels. A variable squelch control can be set to silence the receiver for undesired weak signals. Signal strength of the received signals is displayed on a front panel "S" meter. The RF gain control permits reduction of receiver sensitivity to prevent blocking by very strong stations. The Clarifier control functions on AM to allow better reception of incoming signals that are slightly off center frequency.

USB-LSB Receiver

The SSB receiver operates as a single conversion superheterodyne receiver. All controls except the Clarifier operate the same as for AM reception. However, to receive a SSB signal, the USB-LSB switch must be correct for the type of signal being received and the Clarifier must be carefully adjusted for each station being received. A Fast-Slow AGC switch is included to permit best SSB reception under various conditions.

TRANSMITTER
AM Transmitter

The transmitter offers crystal controlled operation on all 40 CB channels, with a 2 stage transistor RF pre-amp and tube type RF Driver exciting a 6DG6 tube type class "C" amplifier which is high level modulated by a push-pull transistor audio amplifier. The audio modulation is automatically controlled to permit high average modulation without causing improper operation.

The RF output passes through a pi-network tank into a continuous monitoring SWR bridge followed by a two-section low pass filter for maximum harmonic suppression.

The RF amplifier plate current is indicated by the plate current meter. At 4 Watts output into a 50 ohm load, normal indication will be about 60. When the plate current switch is placed in the RF POWER position, the output power will be shown on the upper scale in watts.

The standing wave reflected power is displayed on the SWR meter as the ratio of reflected RF power to forward RF power caused by mismatch in the external antenna circuit.

The speech level is variable up to 100% modulation and is automatically adjusted to provide the most effective high level modulation possible. Modulation percentage is read directly on the modulation meter.

The optional DAK DM-100 base station microphone is designed to properly match the input level as to impedance and sensitivity and will provide excellent performance and satisfaction.

SSB TRANSMITTER

Single Sideband transmission offers many advantages in communications. By eliminating the RF carrier frequency and the unnecessary sideband, communications effectiveness may be increased by as much as 4 times for the same transmitter power while doubling the number of available communications channels.

It is very important that the AM-USB-LSB switch be placed in the correct position. Reception will be difficult or impossible for both operators unless both use the same mode of communications.

Channel frequencies are crystal controlled in SSB as in AM operation. However certain operational differances will be apparent. There is no steady RF carrier present in SSB transmission; therefore the output power meter will show power only when you are speaking into the microphone and the meter will bounce wildly with speech. This is normal for SSB. Also, no SWR reading may be taken with any accuracy. A balanced modulator and crystal lattice filter are used to generate the SSB signals. The audio stages are controlled by an audio ALC (Automatic Level Control) amplifier. The average RF output is sensed and controlled by an RF ALC circuit. These circuits are included to avoid overmodulation and assure clear, crisp transmission quality.

POWER SUPPLY

Be certain to discharge filter capacitors prior to service. There are two power supplies incorporated in the DAK X Radio-telephone. The high-voltage supply provides both grid bias and plate/screen voltage for the driver and final R.F. amplifier. This power supply produces high voltages and should be considered dangerous. Respect high voltage. Do not attempt to service any part of the high-voltage system unless fully qualified.

The low-voltage supply provides regulated voltage to the P.L.L. frequency determing stage; the transmit R.F. preamp and all receiver stages.

The power input to the power supply is 117 volt 60Hz A.C.. The input is fully filtered with a toroid filter to prevent R.F. leakage into the power line.

Reduction of possible television interference emanating from the DAK has been given every consideration in design. The use of an S.W.R. meter to continuously monitor the antenna system; low pass filters in the R.F. output and high efficiency toroid filters in the A.C. power line, plus the inherent harmonic reduction of the final R.F. two section pi-network tank circuit make the DAK MARK X one of the cleanest signals on the air, exceeding F.C.C. and D.O.C. radiation standards.

1. S.W.R.-STANDING WAVE RATIO METER

Indicates condition of antenna system. High S.W.R. reading indicates serious antenna trouble. Lowest reading best between 1.0 and 2.0. Higher reading 2.0 to 3.0 indicates slight out-of-tune antenna. Greater than 3.0 indicates serious out-of-tune antenna or other problems associated with antenna or coax cable feed line.

2. PLATE CURRENT-R.F. POWER OUTPUT METER

In the Plate Current position of switch, meter will indicate plate current of R.F. power amplifier tube. This reading should be about 60 in AM and about 15 in SSB with no audio input. When switch is in the R.F. Power position, upper scale of meter will indicate output watts into antenna circuit.

3. MODULATION INDICATOR METER — AM ONLY

Modulation indicator will show percentage of modulation of R.F. carriers. The F.C.C. requires a compressor to limit modulation to 100%. Modulation in excess of 100% causes severe interference with other stations on adjacent channels and to television and other radio equipment and actually reduces the range of communications. Best operating range is between 90 to 100% modulation.

4. SIGNAL STRENGTH METER

"S" meter indicates signal strength of received signals. R.F. gain control should be turned on full for accurate "S" meter indication.

5. SPEAKER BUILT INTO SIDE OF CABINET

External speaker can be connected through jack provided on rear of cabinet.

6. MICROPHONE INPUT CONNECTOR

For wiring detail of connector refer to schematic drawing. Recommended accessory microphone includes installed connector.

7. SWR CALIBRATE CONTROL

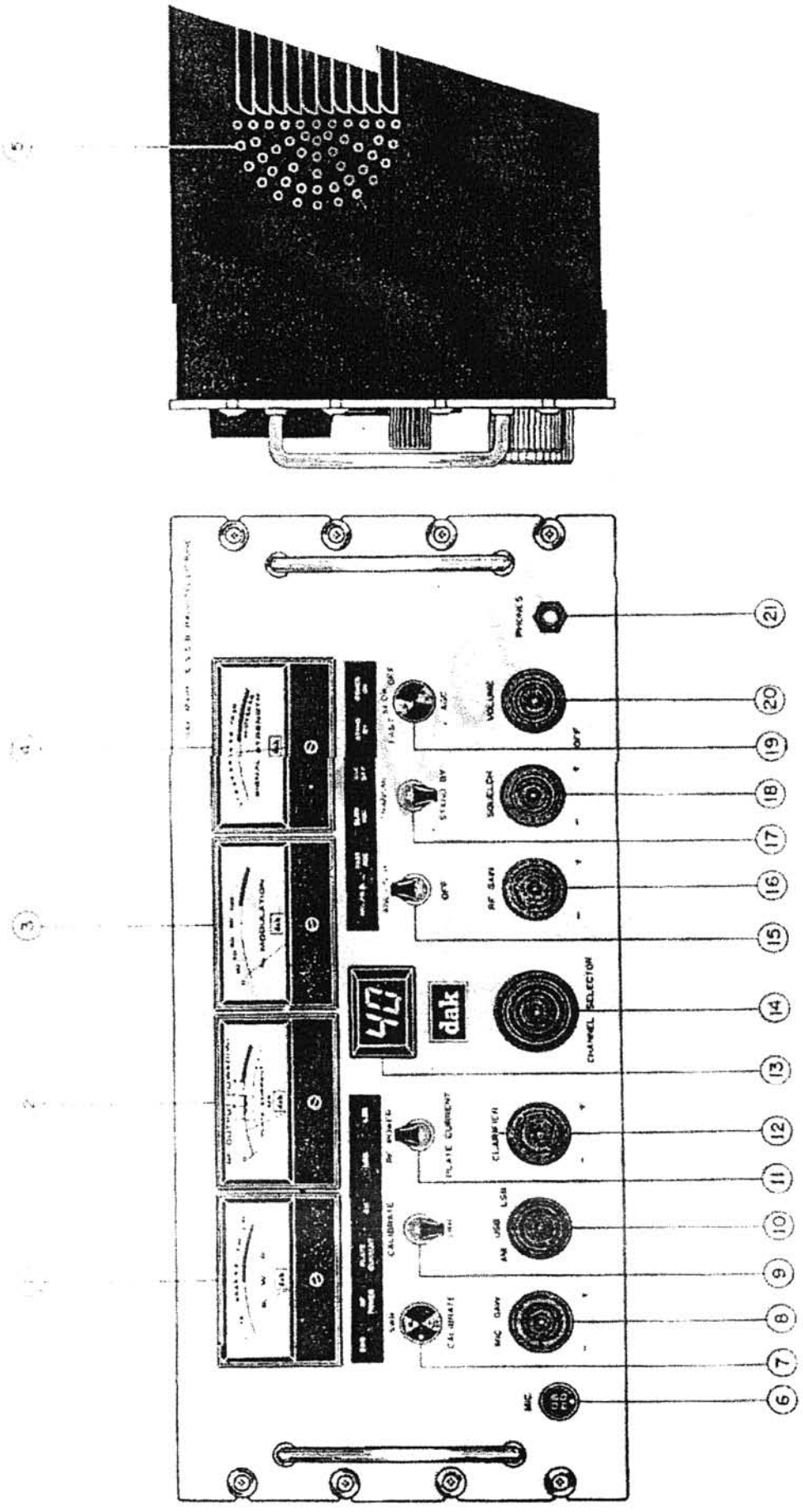
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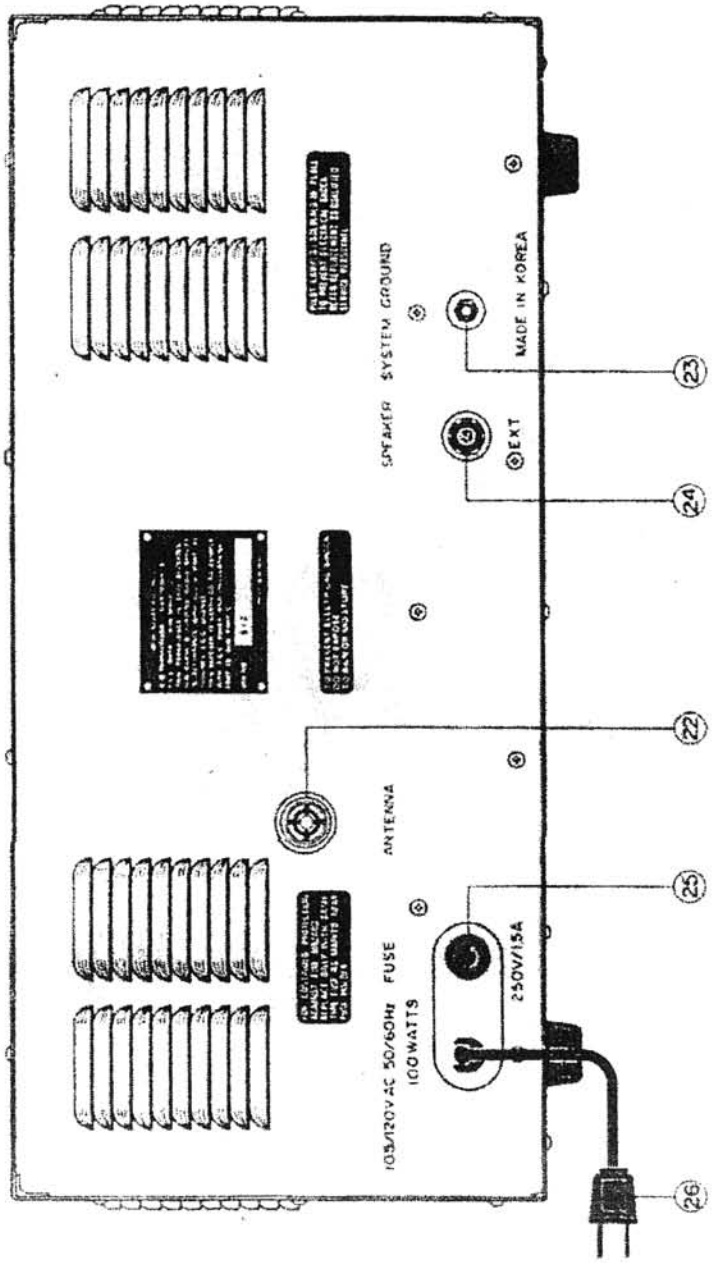
8. MICROPHONE LEVEL CONTROL.

Permits adjustment of microphone level up to 100%.

9. CALIBRATE/S.W.R. SWITCH. — ACCURATE ONLY ON AM.

In "up" position to be used in conjunction with S.W.R. calibrate control. Down position permits reading of S.W.R. on meter. To calibrate, raise switch to calibrate and adjust S.W.R. Calibrate Control while transmitter is on, so meter needle is set on the calibrate mark. Depress switch lever and meter will then read antenna system S.W.R.


PHONES
VOLUME
SQUELCH
RF GAIN
CHANNEL SELECTION
CLARIFIER
USB LSB AM
MIC GAIN
MIC
dak


SPEAKER SYSTEM GROUND
MADE IN KOREA
EXT
ANTENNA
FUSE
250V/1.5A
103/120V AC 50/60Hz
100WATTS
23
24
22
25
26

10. LSB/USB/AM SWITCH

This switch controls the mode of operation for the transmitter and receiver simultaneously and allows selection of conventional AM or SSB operation on either upper or lower side band In order to communicate with another transceiver you must use the same operating mode.

11. R.F. POWER — PLATE CURRENT SWITCH.

See 2 above

12. CLARIFIER CONTROL

When receiving SSB signals, adjust the clarifier knob carefully and set it at a position where the incoming signal can be clearly heard. Because of the characteristics' of a SSB signal, it is extremely important to adjust this control. With improper clarifier adjustment, the signal will be distorted and difficult to understand. After adjusting it to clarify once, no further adjustment is needed if you stay on the same mode and channel, receiving the same station.

*Carrier is produced but not transmitted in the two side band modes, LSB/USB. During reception the frequency must be generated in the radio to process the received signal for clearest reception.

13. L.E.D. (LIGHT EMITTING DIODE) CHANNEL NUMBER DISPLAY.

See 14 below.

14. CHANNEL SELECTOR SWITCH.

Select any of 40 channels as indicated on digital L.E.D. readout.

15. ANL N.B (NOISE BLANKER) SWITCH

In the NB (up) position, annoying impulse noise will be blanked out (actually turning the receiver off momentarily) so that certain types of noises are not heard at all. The noise blanker is used when the automatic noise limiter's (built-in) effectiveness is partially blocked by impulse noise with a strength of S-9 or greater.

16. R.F. GAIN CONTROL

Permits adjustment of incoming signal strength. Used primarily to reduce very strong local blocking signals. Must be turned up completely (clockwise) for proper "s" meter readings.

17. TRANSMIT STAND BY SWITCH.

Permits transmitter section to be on standby with tube filaments on. Receiver not affected.

18. SQUELCH

Used to quiet receiver during absence of received signals. When it is desired to listen to a strong local signal only, turning the squelch control clockwise will prevent weak signals from turning on the received audio

19. AGC SWITCH

Selects AGC time constant that gives best S.S.B reception — slow is usually best except under rapidly changing signal conditions.

20. ON-OFF/VOLUME CONTROL.

Turns unit on and adjusts desired audio listening level.

21. HEADPHONE JACK

Privacy of headphone listening provided by convenient front panel receptacle.

22. ANTENNA CONNECTION

For use with PL-259 type coaxial connector.

23. SYSTEM GROUND

Rear chassis mounted.

24. EXTERNAL SPEAKER JACK

Rear chassis mounted.

25. FUSE HOLDER

Rear chassis mounted. Uses type 3AG 1.5 amp.

26. POWER LINE CORD

UL approved.

RECOMMENDED ACCESSORY

MICROPHONE: SCOTT-DAK DM100

The DM100 is a high quality dynamic push-to-talk microphone mounted on a handsome utilitarian base with integrated solid state preamplifier. The microphone incorporates a tilt head for adjusting to the user's most comfortable operating position. The base contains a wide bar-type push-to-talk switch which can be operated with extremely light pressure. This switch actuates the transmitter control relay transferring the antenna from receiver to transmitter and effectively putting your station on the air. A locking level on the base permits locking of the push-to-talk switch should it be necessary for any reason. Base and stand is moulded of high-impact plastic making weight ideal for hand held use and comfortable to the touch.

The base of the microphone contains a solid state preamplifier. On the surface of the stand is a flush mounted control which will prevent accidental moving when adjusted to the level you desire. This control provides a range of 50 dB. A 9-volt battery is supplied with the microphone. It is mounted in the base and will provide power for the preamplifier equal to the shelf life of the battery. The coiled cord is terminated in a 4-pin lock-type female microphone connector to match the DAK X input.

The shaped frequency response of the dynamic transducer from 200 to 5,000 Hz assures the best possible voice transmission and elimination of unwanted room reverberation, mechanical noise, and both low and high-frequency response which does not contribute to intelligibility of voice transmission. The dynamic microphone is extremely rugged to both physical and environmental abuse and is the type incorporated in virtually all commercial and military communications equipment.

ANTENNA

Efficient performance of your DAK Mark X requires the best possible radio frequency radiator or antenna. Many types are available. Selection is a matter of available space, personal preference and the type of coverage you desire. You should consult your dealer for his specific recommendations. Almost without exception, base station antennas are packaged complete with hardware and some interconnecting cable. Usually no tools are required although some mounting methods require the drilling of holes. The better your transmitting antenna, the better your reception and transmission. You should work closely with your local dealer to insure the optimum radiator for your installation.

RADIOTELEPHONE INSTALLATION

1. Your Class D citizens band equipment license must be posted at the main control station location.

2. Rules Part 95 must be read and understood.

Carefully unpack the DAK X and place it in the operating position after plugging in the power cord and connecting the antenna. Insert the microphone connector and tighten the threaded locking ring. The antenna should be inserted in the SO239 female connector on the back panel of your radiotelephone. If a ground connection is available, it may be connected to the ground terminal on the back panel.

The unit should not be mounted in a closed cabinet without ventilation. The amount of heat genrated by the components is not significant, but some air circulation around th cabinet is desirable. The equipment is designed to operate from a 117 volt A.C. 60 Hz source. It should not be connected to any other voltage or frequency. Power to the receiver and the transmitter is controlled from the right hand ON-off/volume control directly below the signal strength meter. Familiarize yourself with the controls by referring to the detailed description in the manual. The transmit/stand-by switch must be in the transmit position in order to operate your radiotelephone from the microphone push-to-talk switch Before you attempt any communications, calibrate your SWR meter on AM and read your SWR to make certain it is at an acceptable level. If the SWR exceeds 2.5 by improper installation of the PL259 connector, improper connection of the coaxial line at the antenna or serious error in setting the length of your antenna elements. This must be corrected so that the SWR is in the "black area" of your SWR indicator. You are then ready to transmit and receive on all 40 channels. Actually using the controls will familiarize you quickly with their independent function. Initially, you should have the squelch control fully counterclockwise. The R.F. Gain Control fully clockwise and the Microphone Gain Control fully clock wise.

WARNING

As prescribed in Part 95.58, paragraph (e) of the FCC Rules and Regulations, the manufacturer of the transceiver is required to issue the following warnings.

1. Certain repairs and adjustments to this transceiver may be made legally only by a person in possession of a valid First or Second Class FCC Radiotelephone Operators License (or equivalent in Canada), or by a person under the direct supervision of a holder of such a license. This applies particularly to those repairs or adjustments, such as replacement of crystals and transmitter oscillator components, which might affect the transmitter's ability to comply with FCC regulation.

2. Use only approved replacement parts when servicing the transmitter. The use of a component (such as a crystal, semiconductor, capacitor, etc.) having different electrical characteristics and ratings than that originally used could result in a violation of the FCC Regulations and is therefore prohibited.

CAUTION FOR ALIGNMENT

Proper alignment of the DAK X is a complex process requiring the following equipment: Frequency Counter; Oscilloscope; VOM; VTVM with RF Probe audio single and two-tone generators; RF generator for receiver alignment; and 50 ohm dummy load.

It should not be attempted by inexperianced persons or without the proper test equipment.

Tampering may cause serious damage and may render the warranty void.

CAUTION FOR AM TRANSMITTER TESTING

To prevent nuisance blowing of F301, AL 5A, fuse, do not apply a steady tone signal to the unit while keying the transmitter in the AM position with the transmit-stand by switch, S8, in the standby position. Excessive modulator current will blow the low voltage fuse.

PROTECTIVE COVER

Remove the chassis cover. Caution: There is line voltage when power is applied.

PRE-ALIGNMENT FREQUENCY CHECK

Before alignment, use the frequency counter through a 1000pF coupling capacitor connected in series with the counter input probe to check the operating frequencies at the following points.

1. Place the Mode switch, S2, in the USB position, the Channel Selector to channel 19. Connect the frequency counter to TP2 and adjust the Trimmer Capacitor, CT3, for a reading of 10.24000MHz.

2. Set the clarifier control to mid range and switch S-2 to U.S.B. Connect both a VTVM with an RF probe and the frequency counter to TP3. Adjust the core of T3 for a maximum indication on the VTVM. Adjust Trimmer Capacitor, CT1, for a reading of 20.105MHz ± 40Hz. Check clarifier range. Should be ± 600Hz. Place S-2 in the LSB position, adjust CT2 for a reading of 20.1035 MHZ ± 40Hz.

3. Return the Mode Switch, S2, to the USB position. Connect the frequency counter to TP5 and adjust CT5 for a reading of 10.695 MHz ± 50Hz. Place the Mode Switch, S2, in the LSB position and adjust CT4 to read 10.692 MHz ± 50 Hz.

VCO CIRCUIT ALIGNMENT

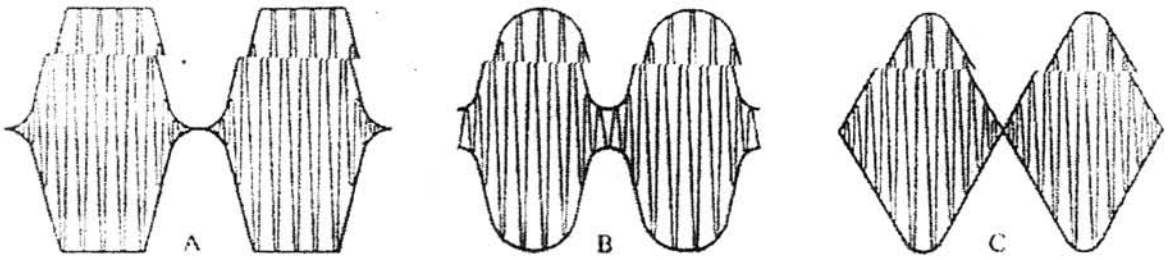
1. Place the Channel Selector in the channel 1 position.
2. Connect the VOM (12 VDC range) between ground and TP4.
3. Adjust the core provided in the VCO Block to obtain a reading of 3V ± 0.1V, starting from top to bottom when turning the core.
4. Place the Channel Selector to the channel 40 position. The reading should be with in 0.7 — 1.4V

DRIVER STAGE ALIGNMENT

1. Apply a 2.4 KHz, 2.5 mV audio signal to the MIC input.
2. Place the Channel Selector in the channel 40 position and the Mode Switch S2, in the USB position.
3. Connect an oscilloscope and 50 ohm dummy load to the ANT connector.
4. Adjust T1 for maximum amplitude on the oscilloscope display.
5. Place the Channel/Selector in the channel 1 position and adjust T2 for maximum amplitude.
6. Turn standby-transmit switch to transmit, Connect V.M to pin 8 of VT202 and GND, adjust RV 202 to read 0.07 V at no audio condition. Adjust RV 802 to give 15mA reading on plate current meter.
7. Place the Channel Selector in the channel 40 position and adjust T4 for maximum amplitude.
8. Place the Channel Selector in the channel 1 position and adjust T5 for maximum amplitude.

SSB RF Power Amplifier Stage Alignment

1. Place the Channel Selector in the channel 19 position and the Mode switch in the USB position.
2. Feed a 2.4KHz, 25mV audio signal to the microphone input.
3. Connect an oscilloscope to the emitter of Q7 and adjust T11 for a maximum amplitude display on the oscilloscope.
4. Turn T6 core for max, then adjust RV11 to obtain a reading of about 125mV — 140mV (peak to peak) on the oscilloscope.
5. Connect the oscilloscope to the ANT connector in parallel with the wattmeter.
6. Temporarily adjust RV2 fully counterclockwise and adjust L201, C902, C903, and L902 for maximum power output.
7. Adjust L201, C902 for CH1, CH40 balance sometimes it is necessary to realign L902, T6.
8. Decrease the audio signal to the microphone input to zero and adjust RV4 and RV5 for minimum amplitude of carrier leakage on the oscilloscope diaplay.
9. Feed two signals, 500Hz to 2400Hz, of 25mV to the microphone input and adjust RV2 to obtain 10 watts of PEP power. Make sure the PEP power output at each channel is with in 9 to 11 watts. The waveshape displayed on the oscilloscope should conform to the waveshape shown in figure 1-C.
10. Place the Mode switch in the LSB position. Check to see the AM/USB alignments are not affected, and that similar results are obtained in this mode of operation.



Waveforms Figure 1

AM RF Power Stage Alignment

1. Place the Mode switch in the AM position and the Channel Selector in channel 19 position.

2. Adjust RV201 for an RF power output of 3.9 watts as indicated on the wattmeter.

AM Modulation Alignment

1. Apply a 1KHz, 25mV audio input signal to the MIC circuit.

2. Adjust RV 204 so that the modulation depth is 80% to 95%. Adjust RV 801 to calibrate modulation meter.

3. Decrease the signal input to 2.5mV and check that the modulation depth is 50% or higher.

NOTE: To figure modulation percentage use the formula in figure 2.

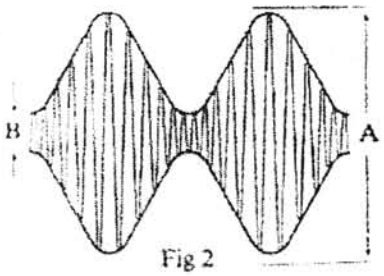


Fig 2

$$\text{Modulation ratio} = \frac{A-B}{A+B} \times 100\ [\%]$$

Modulation waveform

RF Power Meter Alignment

Adjust RV 602 for AM, RV 603 for SSB so that the RF power meter provided on the front panel of the equipment indicates the same wattage as the wattmeter.

ADJUST RV603 with single 1KHz tone input.

SWR METER CALIBRATION

Remove the 50 Ohm RF dummy load and key transmitter on AM with the "CAL-SWR" switch in CAL position. Adjust the "SWR CAL" control (VR801) to give full scale (∞) S.W.R. meter reading. Switch to S.W.R. position and adjust RV601 (on SWR board) to give same full scale (∞) indication on SWR meter.

Attach 50 ohm dummy load to ANT, key the transmitter on AM, adjust VR801 for full scale in "CAL" position, and switch to "SWR", reading should be under 1.5. Higher readings on known 50 ohm load may indicate trouble in the low pass filter or coax cables.

RECEIVER ALIGNMENT

AGC Alignment

1. Connect the VOM to terminal number 15 on the main p.c. board and chassis ground.

2. Place the Mode switch in the AM position.

3. Adjust RV8 to obtain a reading of 1.6 — 2V.

Receiver Sensitivity Alignment

1. Set the signal generator to 27.185 MHz, 1 KHz, 30% modulation and set the transceiver to channel 19.
   NOTE: This alignment should be performed with an extremely small signal input from the signal generator to avoid inaccurate alignment due to AGC action, about 1.0 μV in 50 ohm

2. Adjust T7, T8, T9, T10, T13, T14 and T15 for maximum audio output as indicated on the AC VTVM (or oscilloscope, if used).

3. Turn the core of T7 one turn clockwise.

Squelch Circuit Alignment

1. Place the Mode switch in the AM position.

2. Set the signal generator to provide an RF input signal of 1000 μV, 1 KHz, 30% modulation.

3. Rotate the squelch control fully clockwise.

4. Adjust RV9 so that the squelch just breaks with the 1000 μV signal input.

5. Place the Mode switch in the USB position and adjust RV10 so that the squelch just breaks with the 1000 μV signal input.

S-Meter Adjustment

1. Set the signal generator to provide a 100μV signal input and place the Mode switch in the USB position.

2. Adjust RV7 so that the S — meter indicates "9".

3. Place the Mode switch in the AM position and retune the signal generator slightly to obtain maximum audio output.

4. Adjust RV6 so that the S — meter indicates "9".

TRANSCEIVER SERVICING

Transceiver has been fully tested prior to shipment and will not normally require further adjustments.

RETURNING THE UNIT FOR SERVICE

In the event repair is necessary please return your DAK X to an authorized warranty center. If necessary to return to our service headquarters, pack your transceiver extremely carefully. Use UPS prepaid. Please enclose a description of difficulty experienced as well as when and where unit was purchased. Damage due to packing and shipping is not covered by factory warranty.

M.H. SCOTT CO., INC.
8925 McGAW COURT
COLUMBIA, MD 21045

AVAILABLE CITIZEN BAND FREQUENCIES

Your transceiver provides operation on all available U.S. Citizens Band channels. Frequencies are listed in accompanying table.

Channel	Frequency	Channel	Frequency
1	26.965	21	27.215
2	26.975	22	27.225
3	26.985	23	27.255
4	27.005	24	27.235
5	27.015	25	27.245
6	27.025	26	27.265
7	27.035	27	27.275
8	27.055	28	27.285
9	27.065	29	27.295
10	27.075	30	27.305
11	27.085	31	27.315
12	27.105	32	27.325
13	27.115	33	27.335
14	27.125	34	27.345
15	27.135	35	27.355
16	27.155	36	27.365
17	27.165	37	27.375
18	27.175	38	27.385
19	27.185	39	27.395
20	27.205	40	27.405

CRYSTAL CONTROLLED "PHASE-LOCKED LOOP" SYNTHESIZING SYSTEM

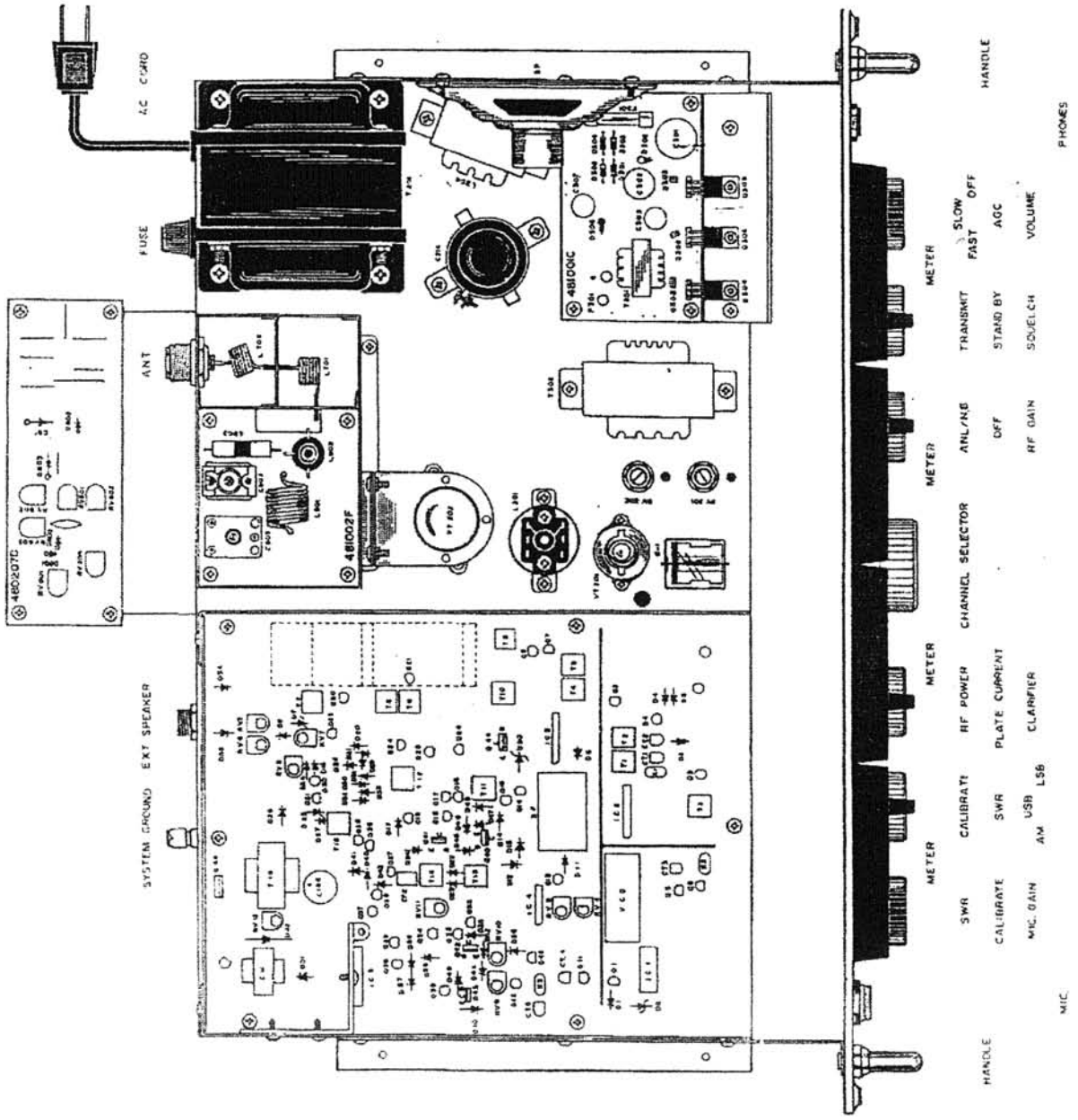
This transceiver uses a frequency synthesizing system which employs three crystals and the PLL (phase locked loop) circuit to produce 40 transmitting and 40 receiving channels, both AM and SSB. The accompanying chart shows the operating mode.

CRYSTAL FREQUENCIES

Xtal 1 (AT TP3) = 20.105 MHz USB/AM, 20.1035 MHz LSB
Xtal 2 (AT TP2) = 10.240 MHz AM/USB/LSB
Xtal 3 (AT TP5) = 10.695 MHz AM/USB, 10,692 MHz LSB

N CODE – FREQUENCY CORRELATION CHART

CHANNEL NO.	CHANNEL FREQ. (MHZ)	"N" CODES	VCO FREQUENCY		CHANNEL SWITCH OUTPUT (PLL Inputs)					
			AM/USB	LSB	P0	P1	P2	P3	P4	P5
1	26.965	255	17.555	17.5535	1	1	1	1	1	1
2	26.975	254	17.565	17.5635	0	1	1	1	1	1
3	26.985	253	17.575	15.5735	1	0	1	1	1	1
4	27.005	251	17.595	17.5935	1	1	0	1	1	1
5	27.015	250	17.605	17.6035	0	1	0	1	1	1
6	27.025	249	17.615	17.6135	1	0	0	1	1	1
7	27.035	248	17.625	17.6235	0	0	0	1	1	1
8	27.055	246	17.645	17.6435	0	1	1	0	1	1
9	27.065	245	17.655	17.6535	1	0	1	0	1	1
10	27.075	244	17.665	17.6635	0	0	1	0	1	1
11	27.085	243	17.675	17.6735	1	1	0	0	1	1
12	27.105	241	17.695	17.6935	1	0	0	0	1	1
13	27.115	240	17.705	17.7035	0	0	0	0	1	1
14	27.125	239	17.715	17.7135	1	1	1	1	0	1
15	27.135	238	17.725	17.7235	0	1	1	1	0	1
16	27.155	236	17.745	17.7935	0	0	1	1	0	1
17	27.165	235	17.755	17.7535	1	1	0	1	0	1
18	27.175	234	17.765	17.7635	0	1	0	1	0	1
19	27.185	233	17.775	17.7735	1	0	0	1	0	1
20	27.205	231	17.795	17.7935	1	1	1	0	0	1
21	27.215	230	17.805	17.8035	0	1	1	0	0	1
22	27.225	229	17.815	17.8135	1	0	1	0	0	1
23	27.255	226	17.845	17.8435	0	1	0	0	0	1
24	27.235	228	17.825	17.8235	0	0	1	0	0	1
25	27.245	228	17.835	17.8335	1	1	0	0	0	1
26	27.265	225	17.855	17.8535	1	0	0	0	0	1
27	27.275	224	17.865	17.8635	0	0	0	0	0	1
28	27.285	223	17.875	17.8735	1	1	1	1	1	0
29	27.295	222	17.885	17.8835	0	1	1	1	1	0
30	27.305	221	17.895	17.8935	1	0	1	1	1	0
31	27.315	220	17.905	17.9035	0	0	1	1	1	0
32	27.325	219	17.915	27.9135	1	1	0	1	1	0
33	27.335	218	17.925	17.9235	0	1	0	1	1	0
34	27.345	217	17.935	17.9335	1	0	0	1	1	0
35	27.355	216	17.945	17.9435	0	0	0	1	1	0
36	27.365	215	17.955	17.9535	1	1	1	0	1	0
37	27.375	214	17.965	17.9635	0	1	1	0	1	0
38	27.385	213	17.975	17.9735	1	0	1	0	1	0
39	27.395	212	17.985	17.9835	0	0	1	0	1	0
40	27.405	211	17.995	17.9935	1	1	0	0	1	0


AC CORD
FUSE
ANT
SYSTEM GROUND
EXT SPEAKER
481002F
481004C
480207C
METER
SWR
CALIBRATE
CALIBRATI
SWR
RF POWER
PLATE CURRENT
CHANNEL SELECTOR
ANL/NB
OFF
RF GAIN
TRANSMIT
STAND BY
SQUELCH
SLOW
FAST
OFF
AGC
VOLUME
HANDLE
PHONES
MIC GAIN
AM
USB
LSB
CLARIFIER
MIC

VOLTAGE MEASUREMENT CHARTS

(AM Receive-Transmit)

Ref. Desig.		E	B	C
Q1	Rx	3.8	.25	5.6
	Tx	3.8	.25	5.6
Q2	Rx	1	1.5	9.3
	Tx	0	0	9.3
Q3	Rx	1.08	1.5	9.2
	Tx	1.08	1.5	9.2
Q4	Rx	0	0	0
	Tx	0	0	0
Q5	Rx	.5	.82	5.6
	Tx	.5	.82	5.6
Q6	Rx	0	.6	.82
	Tx	0	.6	.82
Q7	Rx	0	.7	0
	Tx	1.5	.7	7.2
Q8	Rx	0	0	13.8
	Tx	.76	1.55	13
Q11	Rx	0	0	0
	Tx	0	0	0
Q12	Rx	2.8	3.2	9.4
	Tx	2.5	3.0	8.0
Q13	Rx	0	0	0
	Tx	0	0	0
Q14	Rx	0	0	9.4
	Tx	1.05	0	3.2
Q15	Rx	0	0	9.4
	Tx	1.05	1.63	3.2
Q16	Rx	0	0	0
	Tx	0	0	0
Q17	Rx	0	0	0
	Tx	0	0	0
Q18	Rx	0	0	0
	Tx	0	.75	0
Q19	Rx	0	0	0
	Tx	0	0	0
Q20	Rx	1.45	1.85	10.8
	Tx	.4	.45	10.8
Q21	Rx	0	0	0
	Tx	0	.75	0
Q22	Rx	1.5	1.75	12.2
	Tx	.2	.4	13
Q23	Rx	0	4.7	13
	Tx	0	4.7	13
Q24	Rx	0	.65	7.8
	Tx	0	0	0

AM Receive-Transmit

Ref. Desig.		E	B	C
Q25	Rx	8.6	7.6	3.4
	Tx	0	0	0
Q26	Rx	0	0	0
	Tx	0	0	0
Q27	Rx	.6	.87	8
	Tx	0	0	13
Q28	Rx	0	.65	2
	Tx	0	0	.25
Q29	Rx	1.35	2	11
	Tx	0	.25	13
Q30	Rx	0	0	0
	Tx	0	0	0
Q31	Rx	0	0	0
	Tx	0	0	0
Q32 Squelched	Rx	1.7	1.7	0
	Tx	.9	.2	.7
Q32 Unsquelched	Rx	2.7	1.8	.7
	Tx	1.6	.5	.7
Q33 Unsquelched	Rx	0	.7	0
	Tx	0	.7	0
Q33 Squelched	Rx	0	0	.7
	Tx	0	.7	0
Q34 Unsquelched	Rx	0	0	3.3
	Tx	0	0	3.3
Q34 Squelched	Rx	0	.65	0
	Tx	0	0	3.3
Q35	Rx	0	0	0
	Tx	0	0	0
Q36	Rx	0	.7	0
	Tx	0	7	0
Q37	Rx	1.5	4.4	0
	Tx	1.5	4.3	0
Q38	Rx	1.5	6.9	0
	Tx	1.5	6.6	0
Q39	Rx	0	0	7.6
	Tx	0	0	7.3
Q40	Rx	0	0	0
	Tx	0	0	0
Q41	Rx	0	0	0
	Tx	0	0	0
Q42	Rx	9.2	9.1	0
	Tx	9.1	8.4	9
Q43	Rx	8.6	9.2	9.4
	Tx	.35	.8	9.3

USB Receive-Transmit

Ref. Desig.		E	B	C
Q1	Rx	3.8	.25	5.6
	Tx	3.8	.25	5.6
Q2	Rx	1	1.5	9.3
	Tx	0	0	9.3
Q3	Rx	1.08	1.5	9.2
	Tx	1.08	1.5	9.2
Q4	Rx	0	0	0
	Tx	0	0	0
Q5	Rx	.5	.82	5.6
	Tx	.5	.82	5.6
Q6	Rx	0	.6	.82
	Tx	0	.6	.82
Q7	Rx	0	.7	0
	Tx	1.65	.7	7.2
Q8	Rx	0	0	13.8
	Tx	.76	1.7	13.5
Q11	Rx	0	0	0
	Tx	0	0	0
Q12	Rx	2.5	3	8
	Tx	2.5	3	8
Q13	Rx	0	0	0
	Tx	4	4.7	6.8
Q14	Rx	.97	.83	8.2
	Tx	.6	1.1	8.6
Q15	Rx	.97	0	8.2
	Tx	.6	0	8.6
Q16	Rx	0	.7	1.9
	Tx	0	0	0
Q17	Rx	1.1	1.9	6
	Tx	0	0	.2
Q18	Rx	0	0	1.9
	Tx	0	.75	0
Q19	Rx	0	.5	5.6
	Tx	0	0	0
Q20	Rx	1.25	1.85	13.2
	Tx	.5	.45	13.2
Q21	Rx	0	0	0
	Tx	0	.75	0
Q22	Rx	1.3	1.75	12.8
	Tx	.2	.45	13.5
Q23	Rx	0	4.9	13.5
	Tx	0	4.9	13.5
Q24	Rx	0	.65	7.8
	Tx	0	0	0

LSB Receive-Transmit

Ref. Desig.		E	B	C
Q25	Rx	8.6	7.6	3.4
	Tx	0	0	0
Q26	Rx	0	0	0
	Tx	0	0	0
Q27	Rx	0	0	13.5
	Tx	0	0	13.5
Q28	Rx	0	0	0
	Tx	0	0	0
Q29	Rx	0	0	13.5
	Tx	0	0	13.5
Q30	Tx	1.5	2.2	7.7
	Tx	0	0	0
Q31	Rx	1	1.5	2.05
	Tx	0	0	0
Q32 Unsquelched	Rx	2.7	1.8	.7
	Tx	1.6	.5	.7
Q32 Squelched	Rx	1.7	1.7	0
	Tx	.9	.2	.7
Q33 Unsquelched	Rx	0	.7	0
	Tx	0	.7	0
Q33 Squelched	Rx	0	0	.7
	Tx	0	.7	0
Q34 Unsquelched	Rx	0	0	3.3
	Tx	0	0	3.3
Q34 Squelched	Rx	0	.65	0
	Tx	0	0	3.3
Q35	Rx	0	0	0
	Tx	0	0	0
Q36	Rx	0	.7	0
	Tx	0	0	0
Q37	Rx	1.5	4.4	0
	Tx	1.5	4.4	0
Q38	Rx	1.5	6.9	0
	Tx	1.5	1.5	0
Q39	Rx	0	0	7.6
	Tx	0	.75	0
Q40	Rx	8.4	8.2	0
	Tx	8.2	7.4	8
Q41	Rx	7.5	8.1	8.4
	Tx	.2	.7	8.2
Q42	Rx	0	0	0
	Tx	0	0	0
Q43	Rx	0	0	0
	Tx	0	0	0

LSB Receive-Transmit

Ref. Desig.		E	B	C
Q1	Rx	3.8	.25	5.6
	Tx	3.8	.25	5.6
Q2	Rx	1	1.5	9.3
	Tx	0	0	9.3
Q3	Rx	1.08	1.5	9.2
	Tx	1.08	1.5	9.2
Q4	Rx	0	.77	0
	Tx	0	.77	0
Q5	Rx	.5	.82	5.6
	Tx	.5	.82	5.6
Q6	Rx	0	.6	.82
	Tx	0	.6	.82
Q7	Rx	0	.7	0
	Tx	1.65	.7	7.2
Q8	Rx	0	0	13.8
	Tx	.76	1.7	13.5
Q11	Rx	0	.7	0
	Tx	0	.7	0
Q12	Rx	2.5	3	8
	Tx	2.5	3	8
Q13	Rx	0	0	0
	Tx	4	4.7	6.8
Q14	Rx	.97	.95	8.2
	Tx	.6	1.1	8.2
Q15	Rx	.97	0	8.2
	Tx	.6	0	8.2
Q16	Rx	0	.7	1.9
	Tx	0	0	0
Q17	Rx	1.1	1.9	6
	Tx	0	0	.2
Q18	Rx	0	0	1.9
	Tx	0	.75	0
Q19	Rx	0	.5	5.6
	Tx	0	0	0
Q20	Rx	1.25	1.85	13.2
	Tx	.5	.45	13.2
Q21	Rx	0	0	0
	Tx	0	.75	0
Q22	Rx	1.3	1.75	12.8
	Tx	.2	.45	13.5
Q23	Rx	0	4.9	13.5
	Tx	0	4.9	13.5
Q24	Rx	0	.65	7.8
	Tx	0	0	0

LSB Receive-Transmit

Ref. Desig.		E	B	C
Q 25	Rx	8.6	7.6	3.4
	Tx	0	0	0
Q 26	Rx	0	0	0
	Tx	0	0	0
Q 27	Rx	0	0	13.5
	Tx	0	0	13.5
Q 28	Rx	0	0	0
	Tx	0	0	0
Q 29	Rx	0	0	13.5
	Tx	0	0	13.5
Q 30	Rx	1.5	2.2	7.7
	Tx	0	0	0
Q 31	Rx	1	1.5	2.05
	Tx	0	0	0
Q 32 Unsquelched	Rx	2.7	1.8	.7
	Tx	1.6	.5	.7
Q 32 Squelched	Rx	1.7	1.7	0
	Tx	.9	.2	.7
Q 33 Unsquelched	Rx	0	.7	0
	Tx	0	.7	0
Q 33 Squelched	Rx	0	0	.7
	Tx	0	.7	0
Q 34 Unsquelched	Rx	0	0	3.3
	Tx	0	0	3.3
Q 34 Squelched	Rx	0	.65	0
	Tx	0	0	3.3
Q 35	Rx	0	0	0
	Tx	0	0	0
Q 36	Rx	0	.7	0
	Tx	0	0	0
Q 37	Rx	1.5	4.4	0
	Tx	1.5	4.4	0
Q 38	Rx	1.5	6.9	0
	Tx	1.5	1.5	0
Q 39	Rx	0	0	7.6
	Tx	0	.75	0
Q 40	Rx	8.4	8.2	0
	Tx	8.2	7.4	8
Q 41	Rx	7.5	8.1	8.4
	Tx	.2	.7	8.2
Q 42	Rx	0	0	0
	Tx	0	0	0
Q 43	Rx	0	0	0
	Tx	0	0	0

IC 2

Pin No.		1	2	3	4	5	6	7	8	9
Voltage	Rx	2.5	2	1.3	2.3	0	8.4	2.1	4.4	5.5
	Tx	2.5	2	1.3	2.3	0	8.4	2.1	4.4	5.5

IC 3

Pin No.		1	2	3	4	5	6	7	8	9
Voltage	Rx	0	0	0	0	0	0	0	0	0
	Tx	2.6	2	1.3	2.7	0	7.2	2	7.3	6.8

IC 4

Pin No.		1	2	3	4	5	6	7
Voltage	Rx	0	0	0	0	0	0	0
	Tx	3.1	3.4	3.5	0	6.3	8.3	4.7

IC 5

Pin No.		1	2	3	4	5	6	7	8	9	10
Voltage squelched		13.8	12.5	2.5	12	4	1.6	1.5	0	0	11
Voltage unsquelched		13.8	12.5	4	8.4	1.3	3.8	3.5	1.3	0	7.1

NOTE: All voltage readings are taken with the power source set at exactly 13.8 VDC.

IC 1 (P.L.L. 02)

Pin No.	Voltage	Channels Selected
1	5.6	N/A
2	1.8	N/A
3	.15	N/A
4	5.3	N/A
5	No Pin	
6	1.5 – 3.5	40 – 1
7	0	N/A
8	5.6	N/A
9	5.6	N/A
10	5.6	1,2,3,4,5,6,7,8,9,10,11,12,13,14, 15,16,17,18,19,20,21,22,23,24,25, 26,27,
11	5.6	1,2,3,4,5,6,7,8,9,10,11,12,13,25, 29,30,31,32,33,34,35,36,37,38,39,40
12	5.6	1,2,3,4,5,6,7,14,15,16,17,18,19,28, 29,30,31,32,33,34,35
13	5.6	1,2,3,8,9,10,14,15,16,20,21,22, 24,28,29,30,31,36,37,38,39
14	5.6	1,2,4,5,8,11,14,15,17,18,20,21,23, 25,28,29,32,33,36,37,40
15	5.6	1,3,4,6,9,11,12,14,17,19,20,22,25, 27,28,30,32,34,36,38,40
16	0	N/A

NOTE: All voltage measurements are taken with the power supply set at exactly 13.8 VDC.

SW1-b

2S1 1KK7

2S2 1KK7

LED 301

TRANSISTOR BASE INFORMATION

BOTTOM VIEW

2SC 900
2SC 945
2SC 1383

2SA 719
2SA 683
2SA 733

2SC 710
2SC 763

SIDE VIEW

2SC 460
2SA 509

BOTTOM VIEW

2SK 34

SIDE VIEW

2SC 2166
2SC 1969

SIDE VIEW

2SC 1847

SIDE VIEW

TA 7310P

SIDE VIEW

AN 612

2SA 496
2SC 496

2SC 372
2SC 373
2SC 394
2SC 733

2SC 1175
2SD 234

TA 7205P

LA 1103

E : EMITTER
C : COLLECTOR
B : BASE

S : SOURCE
G : GATE
D : DRAIN

NOTE
- INDICATES CHASSIS GROUND
- INDICATES P.C.BOARD GROUND
- INDICATES VALUE MAY VARY UNIT TO UNIT

(VCO BLOCK CKT)

PC SWITCH

BUFFER/MIXER/VCO

C3001 (TA7310P) IC 2

VCO OSC BLOCK

BUFFER

RF AMP/MIXER

C3001 (TA7310P) IC3

RF AMP

RF PRE-DRIVER

DC SWITCH

OSC 1

OSC 2

PLL2

BUFFER

BALANCE MOD

AN612 IC 4

MIXER

RF AMP

1ST DC AMP

2ND DC AMP

3RD DC AMP

1ST IF AMP

2ND IF AMP

3RD IF AMP

SSB DET

AVR

2ND AF AMP

1ST AGC AMP

1ST, 2ND, 3RD SQUELCH AMPS

AF ALC

IC 5 TA 7205P

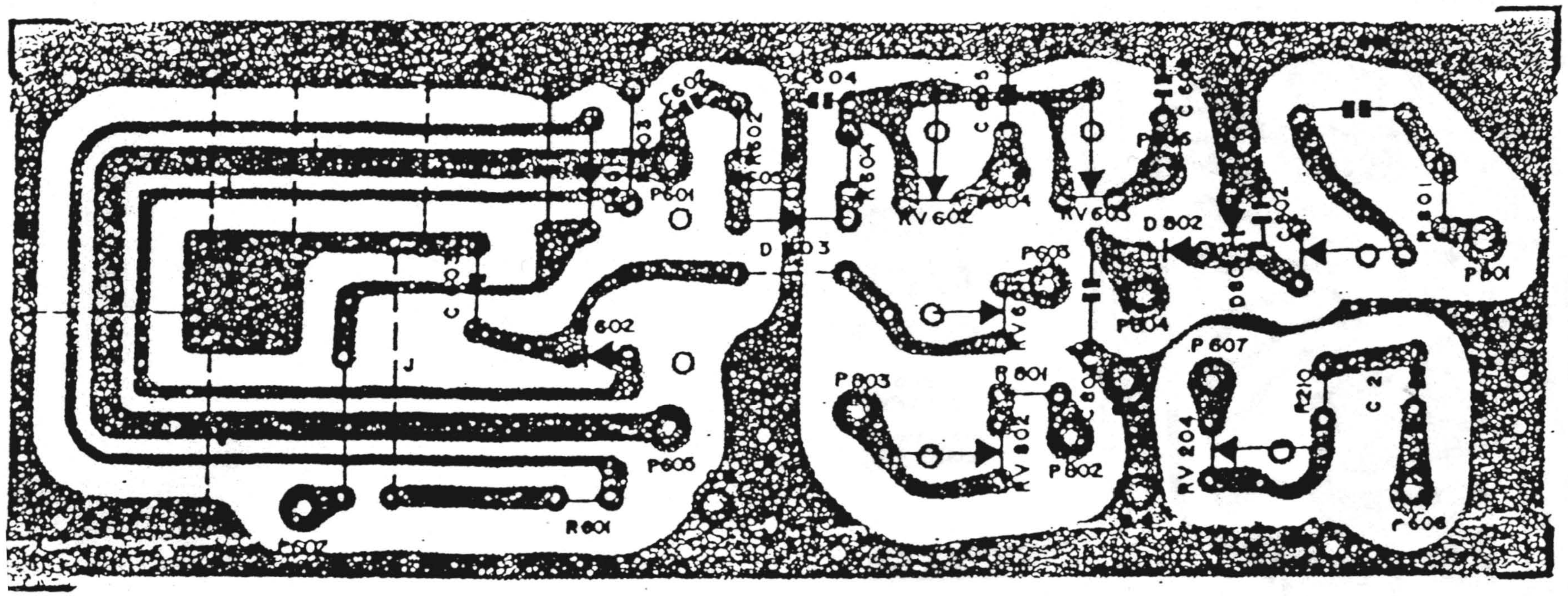
AUDIO AMP

AM AF ALC

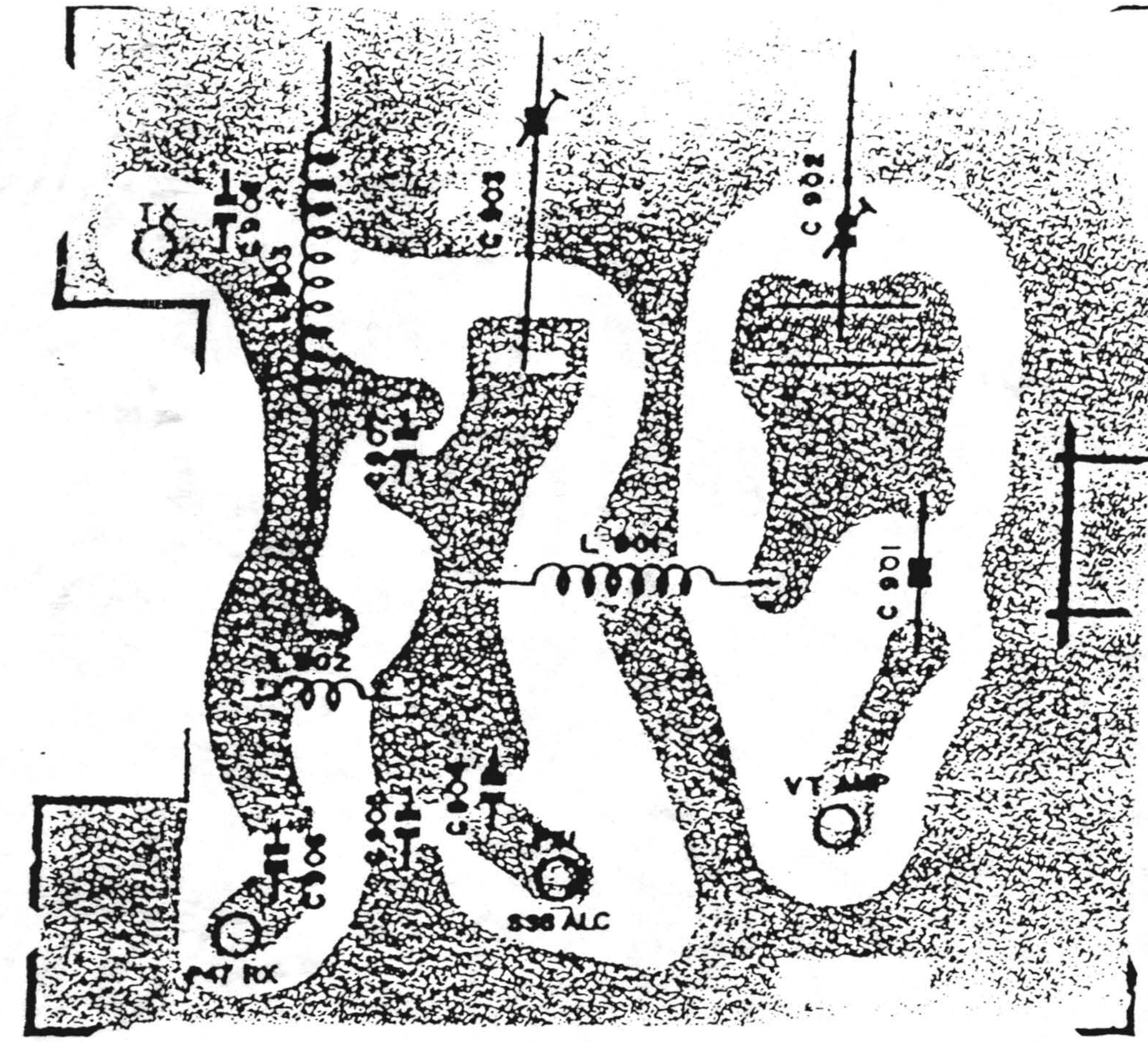
SSB AFALC

C250, C251 0.047KΩ

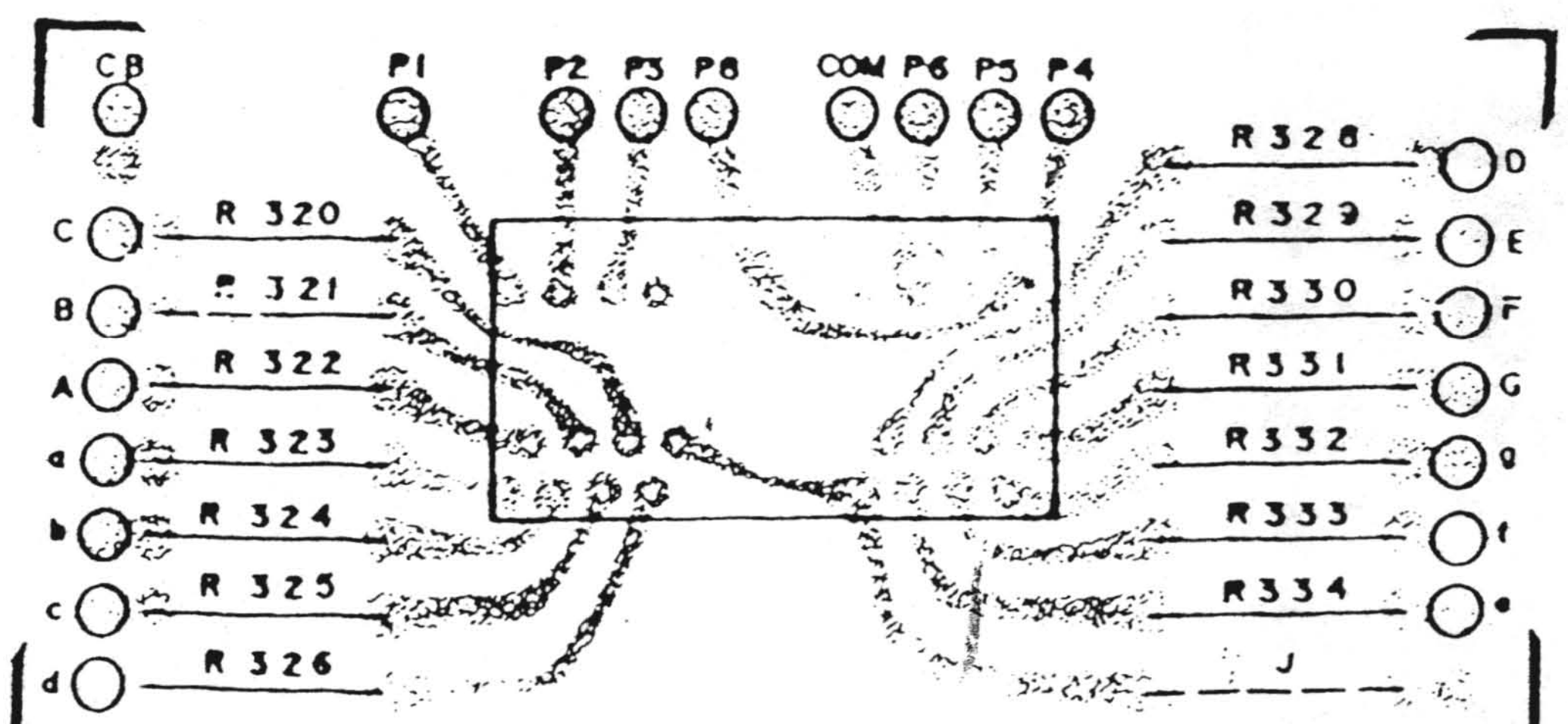
C161, C169 0.047KΩ



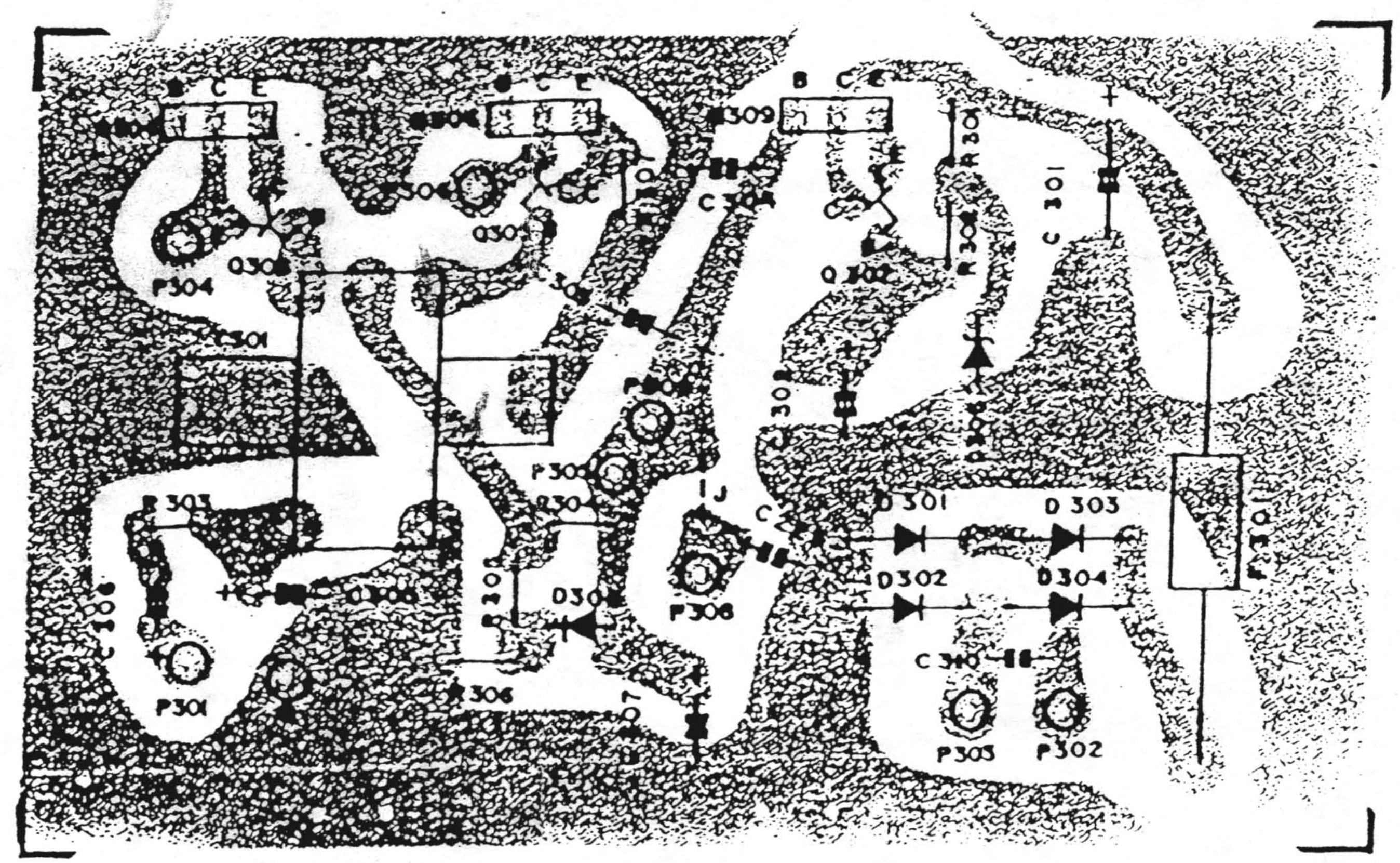
480207C B'd



481002F B'd



482103 B'd



481001C B'd