INSTRUCTION MANUAL

STANDARD WARRANTY

[redacted]

TABLE OF CONTENTS

GENERAL SPECIFICATIONS

Frequency Coverage:

CONTROLS AND JACKS

FRONT: Crystal Switch, Function Switch, Sideband Selector, Band Switch, RF Tune, Gain, Plate Tuning, Plate Loading, Frequency Control Switch, Plate Current/Relative Output Meter Switch and Crystal Control Indicator Light.

SIDE: Anti-Vox/Sidetone Gain, Vox Gain, Microphone Jack, Xtal Access Door with Frequency Chart.

REAR: Power Connector, Mute Jack, Receiver Antenna Jack, Anti-Vox/Sidetone Jack, Key Jack, Antenna Connector, Ground Post, Speaker, R-4/R-4A/R-4B Injection Jack, and Vox Delay Potentiometer.

INSIDE: Carrier Balance Control.

DIMENSIONS: 5½" high, 10-3/4" wide, cabinet depth 11-5/8", overall length 12-1/4".

WEIGHT: 12 pounds, 7 ounces.

POWER REQUIREMENTS:

Model AC-4 Power Supply - operates on 120 or 240 V. 50/60 Hz. or
Model DC-4 Power Supply - operates on 12 V. DC negative ground and has 120 V.

I. DESCRIPTION

The R L DRAKE Model T-4B Transmitter offers selectable single sideband, semi break-in CW, and controlled carrier AM transmission with capabilities for covering the 160 through 10 meters Amateur bands as well as many other non-ham band frequencies (MARS coverage, etc.).

The T-4B is a complete transmitter which may be used for transceiving with the R-4/R-4A/R-4B Receiver or for independent receive/transmit usage. A front panel switch on the T-4B selects between transceiving with the R-4/R-4A/R-4B VFO, the T-4B, or independent frequency control.

The T-4B may be crystal controlled in the transmit mode for novice, MARS, DX, or net operation.

The T-4B has CW sidetone oscillator, automatic transmit/receive switch-

II. INSTALLATION INSTRUCTIONS

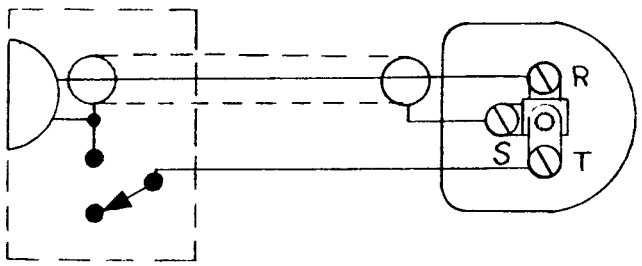
A. UNPACKING

Carefully remove your T-4B from its packing carton and examine it closely for signs of shipping damage. Should any be apparent, notify the delivering carrier immediately, stating the full extent of the damage.

Fill out and mail the enclosed registration card so that your warranty will

E. RECEIVER MUTING

The RCVR MUTE jack provides a short circuit to ground on receive and an open



MICROPHONE

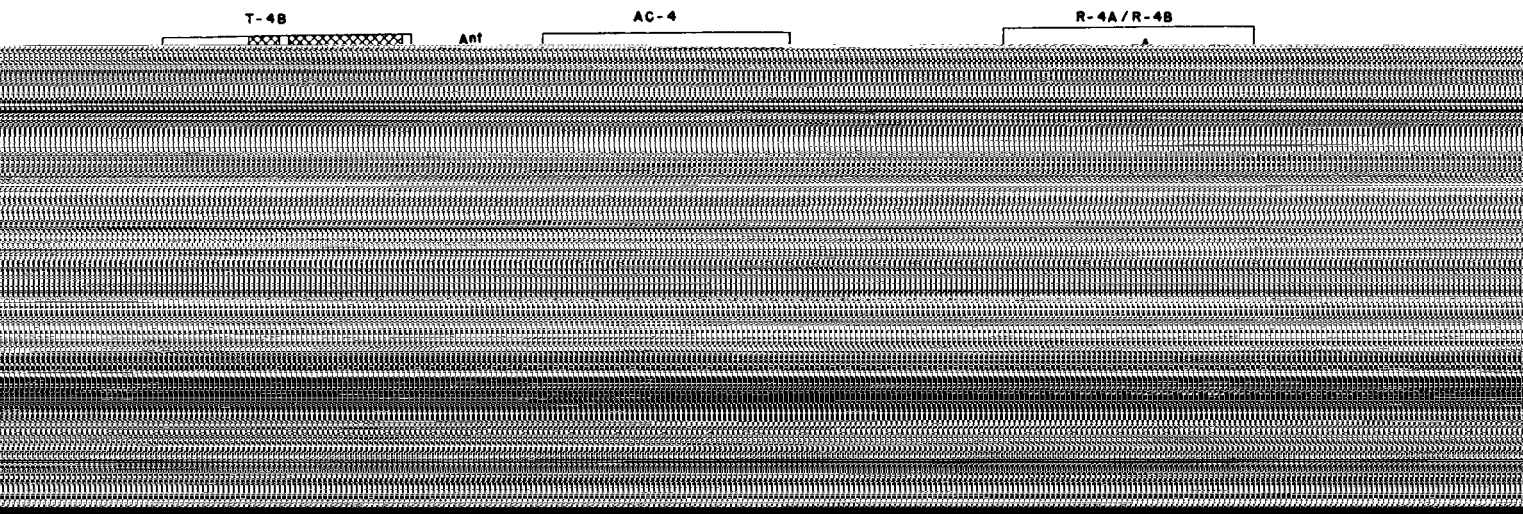
S-230 CONNECTOR
(SWITCHCRAFT)

J. SPEAKER

The T-4B has a built-in speaker. Connection to this speaker is made available at the jack marked SPKR on the rear of the T-4B.

K. GROUND REQUIREMENTS

The T-4B should be attached to a good earth ground through as short and as


T-4B
Ant
AC-4
R-4A/R-4B

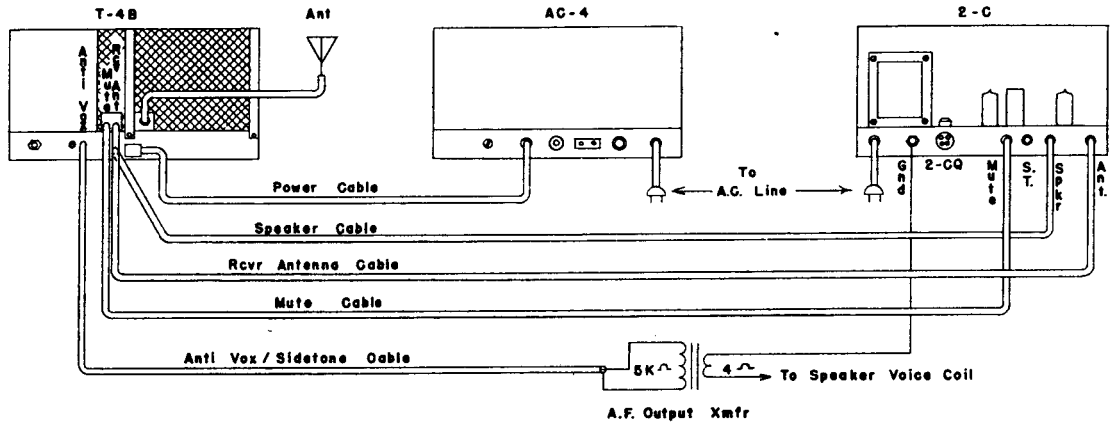


FIG. 3 CONNECTING THE T-4B TO A RECEIVER OTHER THAN THE R-4, R-4A, R-4B

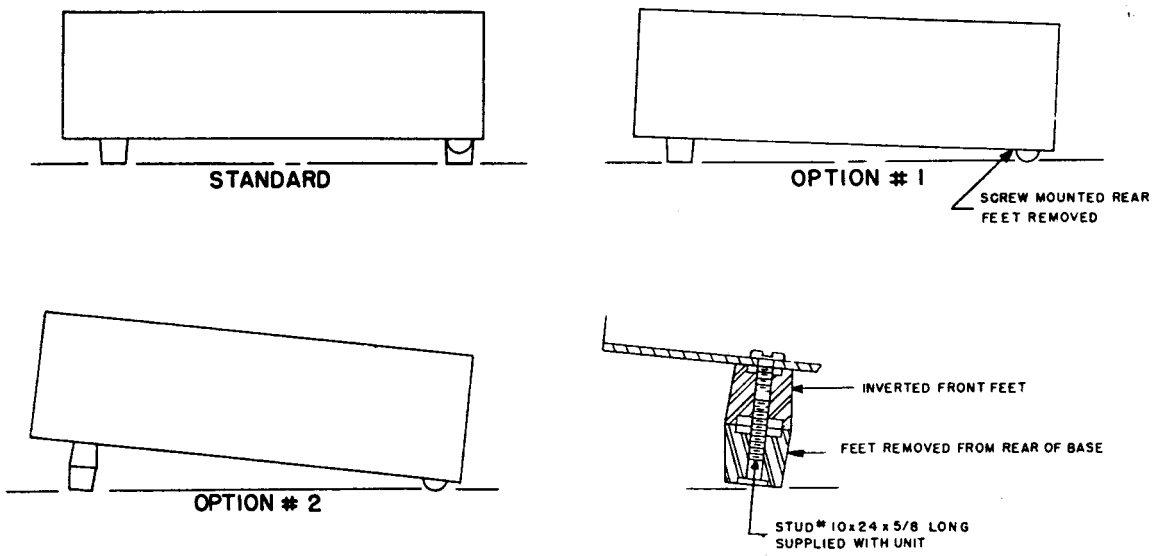


FIG. 4 VIEWING ANGLE OPTIONS

III. CONTROL FUNCTIONS

A. FRONT CONTROLS

1. FREQUENCY CONTROL - The Frequency control switch determines whether the T-4B or R-4/R-4A/R-4B controls the transmitting and receiving frequency.

   - In SPOT position, low level transmitter stages are switched on and the receiver is not muted to allow the receiver to be tuned to the

Since relay operation on CW depends partially on sidetone voltage fed through the VOX system, the GAIN control must be turned up slightly on CW to obtain positive relay action.

8. SIDEBAND - This control switches between either of two 2.4 KHz crystal filters for sideband selection. You will notice that lower sideband which is marked with an "X" must be used for CW and AM operation. The FUNCTION switch is also marked with an "X" in these positions.

9. BAND - The BAND control is a six position switch used to select the amateur band desired or to switch the RF circuits to the correct tuning accessory frequency ranges. The frequency range which may be tuned for each setting of the band switch control is given on the chart on Page 24

10. FUNCTION - The FUNCTION switch is a four position switch which determines the mode of output.

WARNING: - The TUNE position of this switch automatically places the transmitter on the air. Consideration should be given to other control settings as described under "TUNE UP PROCEDURE", to avoid damage to the final amplifier tubes, and to avoid unnecessary interference.

B. SIDE CONTROLS & JACKS

1. VOX - The VOX control is used to adjust the gain of the VOX amplifier and relay release time on CW.

2. ANTI VOX/SIDETONE - Adjusts the ANTI VOX sensitivity and sidetone output level.

3. MIC - The MIC jack consists of a .210 inch diameter phone jack of the three conductor variety to accommodate microphones with push-to-talk switches. A matching plug is provided with this equipment.

5. INJ - Serves to couple the T-4B to the frequency controlling circuits of the R-4/R-4A/R-4B Receiver if transceive operation is to be used.

6. KEY JACK - This normally closed jack provides a means to connect a

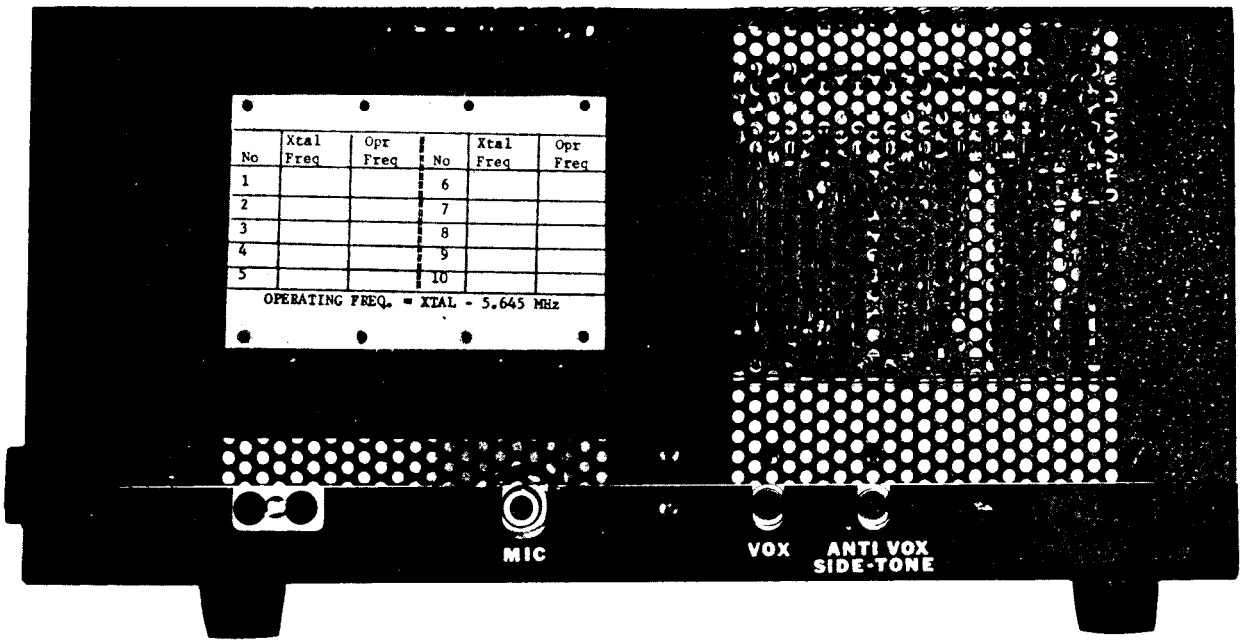
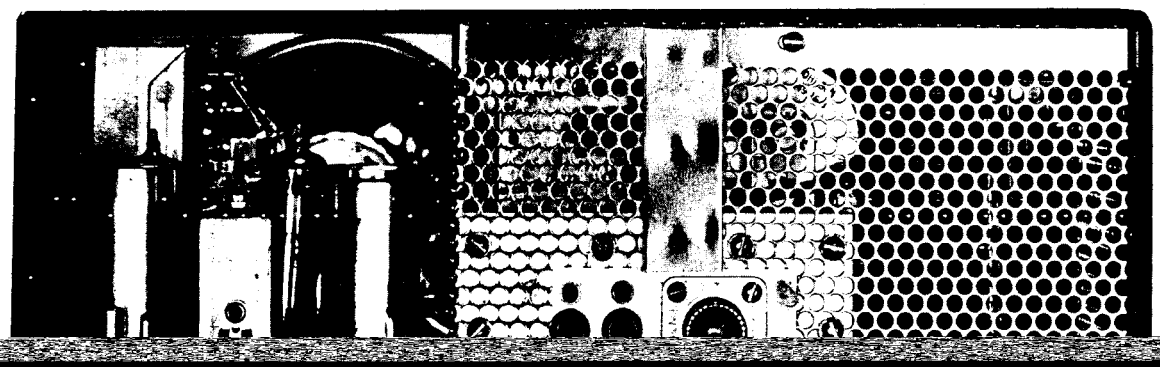


FIGURE 5 SIDEVIEW



IV. TUNING PROCEDURE

> WARNING: UNDER NO CIRCUMSTANCES SHOULD OPERATION OF THE T-4B BE ATTEMPTED UNLESS IT HAS BEEN CONNECTED TO A PROPER ANTENNA OR A DUMMY LOAD OF SUFFICIENT POWER HANDLING CAPACITY.

A. BIAS ADJUSTMENT

Before any type of operation is attempted it will be necessary to set

When tuning up in transceive, the R-4/R-4A/R-4B preselector and the T-4B RF Tune must be adjusted for peak plate current. The preselector can be set later to the correct position for maximum sensitivity while receiving.

Depress the METER control and rotate it for a mid scale indication on the

TRANSCEIVE ALIGNMENT (continued)

Set the controls as follows:

CONTROL or SWITCH	R-4, R-4A, or R-4B	T-4B
BANDSWITCH	3.5	3.5
FUNCTION	Slow AVC	SSB
PASSBAND	4.8 with knob at 12 o'clock	------
AUDIO	1 o'clock	------
FREQ. CONTROL	----------	SPOT
ANTI-VOX	----------	Full clockwise
SIDEBAND	----------	Set to the sideband that gives the loudest "canary" sound.
PRESELECTOR	Both R-4B, R-4A, R-4 and T-4B Preselectors should be set to about 6.5 and both adjusted	

V. OPERATION

In the following discussion concerning operation on various modes, it is assumed that the T-4B has already been tuned up on the desired band as described in the Tuning Procedure.

A. VOICE CONTROLLED & PUSH-TO-TALK OPERATION ON SSB

Preset the controls as follows:

Plug a key into the KEY jack on chassis rear and leave in key up condition. If an electronic keyer is used, connect it for grid block keying. If the sidetone is to be heard on transmit, the anti-vox circuit must be connected

transmitter final is not operating but the frequency controlling stages are on and output will be heard in the receiver. On SSB set the receiver and the T-4B to the same SIDEBAND. Bring the receiver to the transmitter frequency with the MAIN TUNING dial. A beat note will be heard in the receiver and its pitch will decrease as zero beat is approached. When the two units are near the same frequency, a chirping sound will be heard very much like

3. Be particularly careful to stay within the confines of the amateur band to be used. This is an easy thing to forget on transceive since your transmitter will be operating on the frequency on which you are listening.

4. Note that band switches, sideband selectors, Preselector, and RF Tune controls on both the receiver and transmitter must always be properly set whether transceive or separate receive and transmit functions are being used.

The choice of whether or not to transceive when the option is available is largely a matter of operator preference. When operating SSB, it has become standard practice for all stations in contact to be on exactly the same frequency. Transceive is very convenient under this condition. However, when working an elusive DX station which is operating outside the American phone band, separate control is mandatory. When operating in a round table in which one or more stations differ in frequency by a few hundred cycles, it is better to leave the transmitter set on the round table frequency and use separate control of the receiver to follow the strays.

On CW, if the note that your ear is trained to prefer differs from that employed by the T-4B shifted carrier system, transceive may lead you to chase each other up or down the band as each retunes to get the pitch he likes. RCV.VFO/XMIT XTAL control solves this problem.

F. OPERATION ON ACCESSORY TUNEABLE RANGES

The design of the T-4B Transmitter when used with the R-4/R-4A/R-4B Receiver will permit operation of the units on many tuneable ranges out-

From this point on, the tuning procedure should be the same as described for various modes of operation on the ham bands.

When selecting crystals for tuneable operation outside ham bands, the crystal chart (Figure #16 on Page 40) should be followed carefully. Use of other crystals may result in illegal output on other frequencies as well as on the desired frequency.

G. CRYSTAL CONTROLLED OPERATION

The design of the T-4B Transmitter permits operation on ten crystal controlled channels. Crystals for this operation are inserted in a ten place crystal socket behind an access door in the right side of the T-4B. A trimmer capacitor is provided below each crystal to calibrate it to exact frequency. A front panel switch selects numbers corresponding to crystal socket numbers. A "write on" chart is provided on the access door to index signal frequencies to switch numbers and to crystal fundamental frequencies. The T-4B is crystal controlled when Frequency control switch is in XTAL, RCV. VFO/XMIT XTAL, or SPOT positions.

An R-4/R-4A/R-4B Receiver connected with the injection cable to the T-4B, will be crystal controlled in the XTAL position of the FREQ. CONTROL switch at the T-4B operating frequency. In the RCV. VFO/XMIT XTAL position, the

Desired operating frequency = 29,701 KHz
Calculated crystal frequency = 29,701 KHz + 5645 KHz = 35,346 KHz,
35,346 KHz ÷ 3 = 11,782 KHz

Order a 11,782 KHz crystal

H. OPERATION WITH A LINEAR AMPLIFIER

The R. L. DRAKE Model L-4B Linear Amplifier was designed to match the T-4B Transmitter in appearance and drive requirements to run the maximum legal input power. The L-4B offers continuous 2000 watts PEP SSB, and 1000 watts DC on CW, AM and RTTY operation covering the ham bands 80 through 10 meters. All frequencies 3.5 to 30 MHz may be covered with some retuning of the input coils.

The T-4B Transmitter has sufficient output power to drive most linear amplifiers. A triode type grounded grid linear will usually present a satisfactory load (approximately 50 ohms) for the T-4B.

If your linear is of the grounded cathode type with high input impedance, it will be necessary to install a resistive pad between the transmitter and the linear that will present the proper impedance. Such a pad must be made of non-inductive resistors and must have adequate power handling capacity to prevent its being destroyed when the transmitter is turned on.

Antenna switching should be accomplished as shown in Figure #2. Many linear amplifiers have these relays built-in.

Before operating the T-4B with a linear amplifier, the instruction manual of the linear should be consulted. The instructions contained here are of necessity generalized and precedence should be given to any specific precautions in the instructions accompanying the linear amplifier since it is improbable that these could lead to any danger in the exciter.

To load the transmitters into a linear, preset the controls as follows:

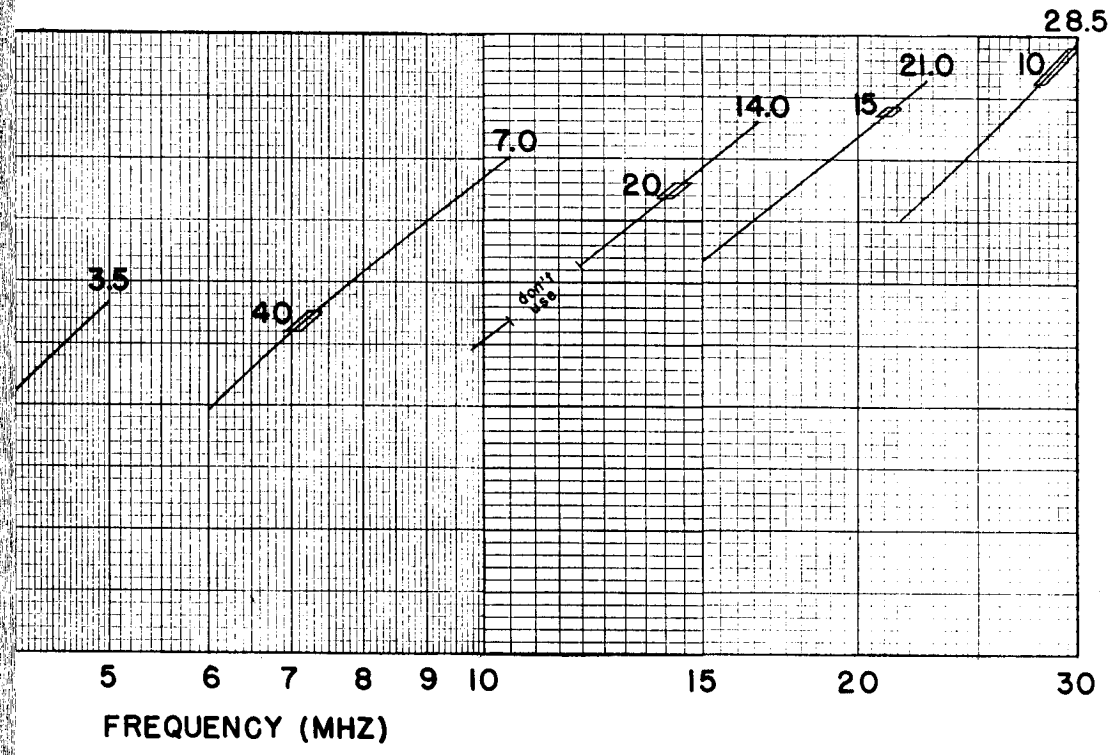
SIDEBAND----------Lower
GAIN----------Counter-Clockwise
BAND SWITCH----------Desired Band
RF TUNE----------Desired Band
LOAD----------Zero

Turn FUNCTION switch to TUNE and advance GAIN control until plate meter moves up scale slightly from idling current. Peak RF TUNE, being careful not to exceed .150 amps plate current and tune PLATE control for dip in plate current. Set LOAD control as indicated in accompanying table. Redip PLATE control and tune linear as described in the linear amplifier instructions.

Now turn FUNCTION switch to desired mode of operation and advance GAIN control until desired amount of input to the linear amplifier is obtained.

Proper LOAD setting for 50 ohm resistive load:

BAND	LOAD	BAND	LOAD
160	2.5	20	4.5
80	3.5	15	4.5



...e useful range for each BAND switch position.

4. OPERATION

To receive RTTY signals, the passband selector lever on the receiver should be on the 1.2 KHz position and the knob should be pointing to

VI. THEORY OF OPERATION

The signal which is transmitted by your T-4B is the result of mixing three separate oscillators and the audio signals from the mike as well as in the case of AM or SSB. In going through the theory of operation, we will use

The two injection frequency transformers, T-4 and T-5, and the two driver transformers T-6 and T-7 are all permeability tuned by the RF TUNE control which positions their slugs in such a manner that the correct relationship

VII. SERVICE DATA

If you have technical questions or wish factory service on your transmitter, write to the R L DRAKE COMPANY, CUSTOMER SERVICE DEPARTMENT. We will completely align your transmitter for $10.00 (U.S.Funds) if it has not been tampered with or modified. Transportation charges are extra. Other repairs will be made on a time and material basis. Before returning equipment, please write first for authorization.

A. REMOVING TOP COVER

> WARNING: Extreme caution should be taken when the top and bottom covers of the T-4B are removed. High voltage is present at several points which could cause a lethal electrical shock!

1. Remove the 3 top screws on each side of the T-4B.
2. Remove cover by first pulling up on the rear and then on the front of the cabinet.

B. REMOVING BOTTOM COVER

1. Remove the 6 bottom screws from the sides of the T-4B.
2. Lift T-4B chassis out of bottom cover.

C. TUBE REPLACEMENT

In general, most trouble in radio equipment of good design is due to tube failure. The best method of finding defective tubes is by direct substitution. It is best not to rely too heavily on tube checkers.

The T-4B has been designed so that, with the exception of V-5 and V-6, tubes can be replaced without need for realignment. When V-5 and V-6 are replaced, the final amplifier section should always be neutralized. See Section C under Alignment Instructions. If V-5 and V-6 are replaced with a different brand than originally supplied, it will be necessary to realign the driver plate circuit. See Section A under Alignment Instructions. The T-4B is shipped with matched pairs of 6JB6A tubes. Matched pairs of 6JB6A tubes are available from the factory for $6.00 (U.S. Funds) per set plus postage at the time of this printing.

To replace the 6JB6A tubes, it will be necessary to remove only the top of the final amplifier cage. This can be accomplished by removing the forward and rear sheet metal screw holding the top to the cage and then lifting the top out of the two side clips. To replace the cage simply reverse the process. Be sure that the parasitic suppressors do not short to the cage.

D. TROUBLE-SHOOTING

Careful consideration has been given in the design of the T-4B to keep the maintenance problems to a minimum. However, it is quite possible that some problem will arise which cannot be cured by tube substitution. If this occurs, we suggest that you either return your unit to your dealer, or write direct to

In case of malfunction, first check power supply fuse and filament fuse in


V3
V2
T 14

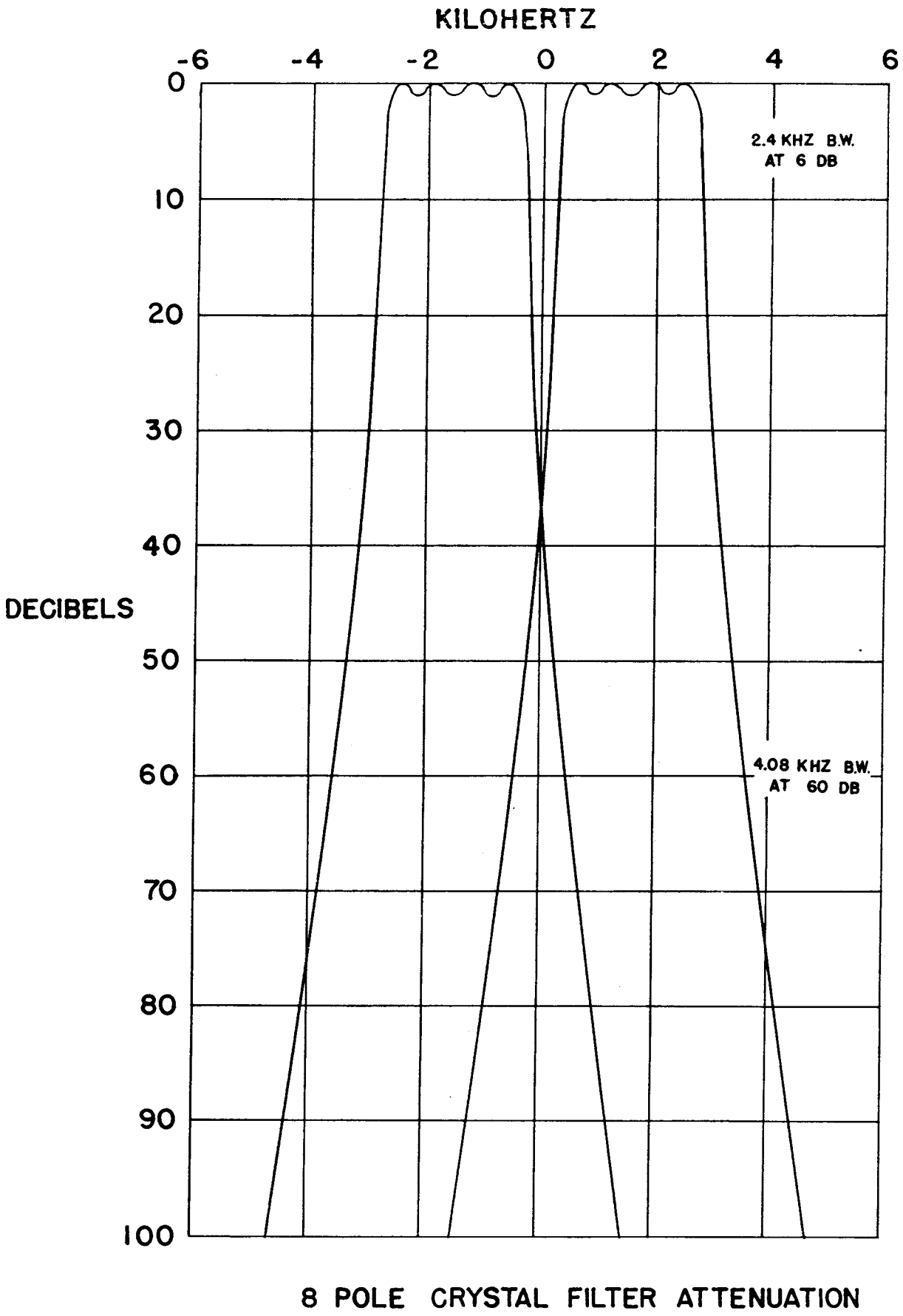

KILOHERTZ
-6
-4
-2
0
2
4
6
0
10
20
30
40
50
60
70
80
90
100
DECIBELS
2.4 KHZ B.W.
AT 6 DB
4.08 KHZ B.W.
AT 60 DB
8 POLE CRYSTAL FILTER ATTENUATION

FIG. 15

VIII. ALIGNMENT INSTRUCTIONS

Alignment of the T-4B will require the following equipment:

1. An 11 megohm VTVM with RF probe.
2. A 52 ohm dummy load of sufficient power handling capacity (Heathkit Cantenna).
3. The T-4B has a built-in RF output indicator which can be used. However,

f. Detune T-4 by touching the screw driver to the rotor contact of S-4

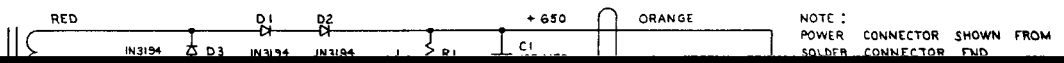
2. Depress output meter switch. Note meter reading and turn up meter sensitivity until meter reads well up scale. Then back off GAIN control until

IX. AC-4 POWER SUPPLY

The R. L. DRAKE COMPANY Model AC-4 is a complete power supply capable of supplying all of the required voltages for our TR-3 and TR-4 Transceivers as well as our T-4B and T-4X/T-4XB Transmitters with the proper filtering and regulation. The unit may be operated from 120 or 240 V AC, 50 or 60 cycles.

To connect, plug the female power connector on the end of the power cable into the male connector on the rear of the TR-3, TR-4, T-4B or T-4X/T-4XB. (See installation instructions for the appropriate equipment). A 6" lead terminated in a female phono plug extends from the power connector for connecting the MS-4 Speaker when the unit is used with our TR-3 or TR-4 Transceivers.

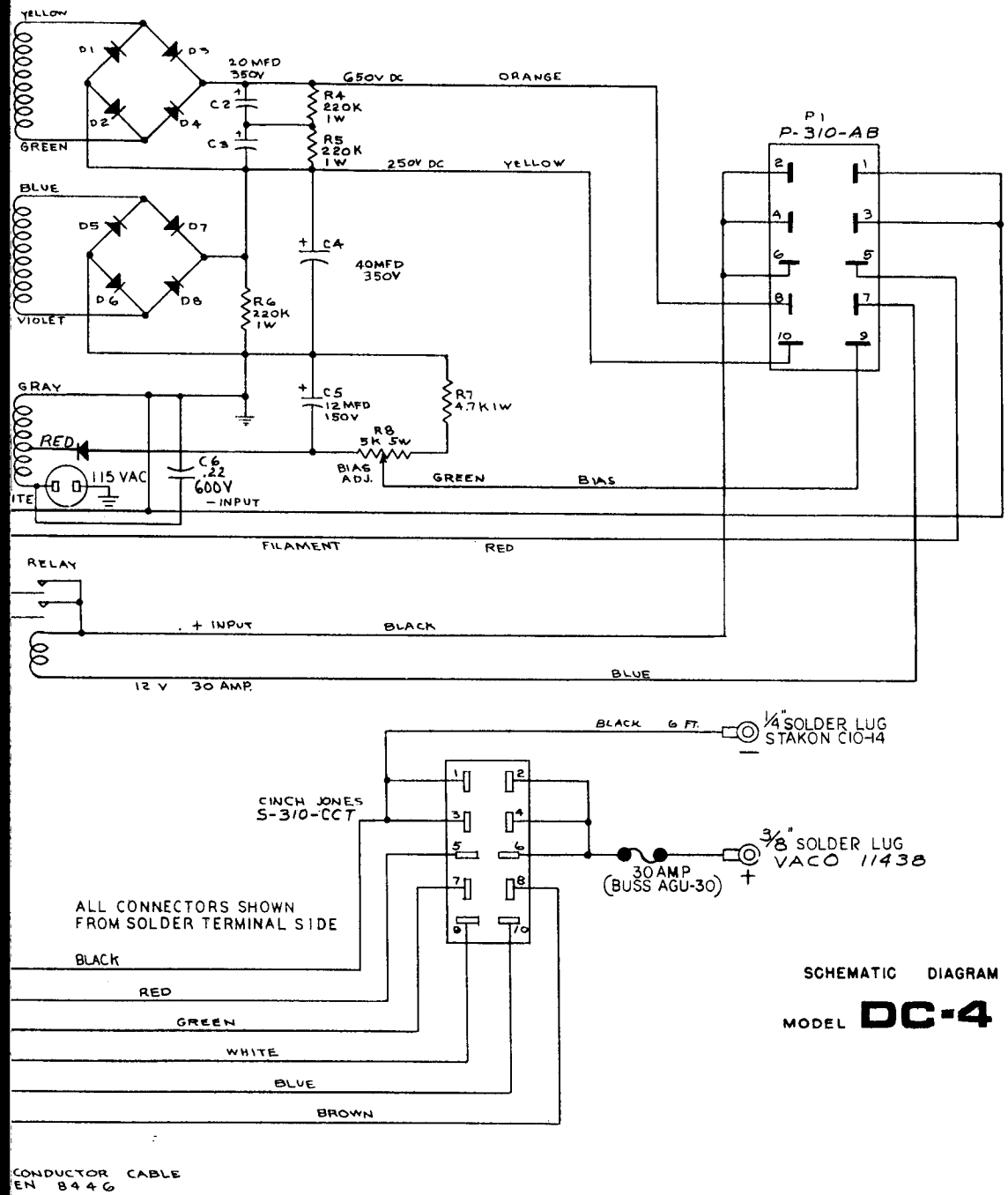
The bias adjustment should be set properly before any operation is attempted. (See Tune Up Procedure).



X. DC-4 POWER SUPPLY

GENERAL DESCRIPTION - The R. L. DRAKE Model DC-4 Power Supply is a self contained power converter which transforms 12 VDC to the voltage necessary to operate our TR-4, T-4XB or T-4B. A receptacle supplying 115 VAC permits operation of the R-4B/T-4XB or T-4B combination.

SPECIFICATIONS



SCHEMATIC DIAGRAM

MODEL **DC-4**

FIGURE #16 - CRYSTAL FREQUENCY CHART

CAUTION: USE OF THE T-4 or T-4XB ON FREQUENCIES NOT SHOWN IN THIS TABLE OR WITH CRYSTALS OTHER THAN THOSE SHOWN FOR A PARTICULAR FREQUENCY MAY RESULT IN ILLEGAL SPURIOUS OUTPUTS ON FREQUENCIES OTHER THAN INTENDED AND SHOULD BE AVOIDED.

USABLE FREQUENCY	DO NOT USE BETWEEN	CRYSTAL	OUTPUT FREQUENCY EQUALS DIAL PLUS	BAND SWITCH	RF TUNE
1.8 - 2.0	1.5 - 1.8	12.6	1.5	1.8 - 3.0	0.0 - 2.0
1.8 - 2.3		12.9	1.8	1.8 - 3.0	0.0 - 4.0
2.3 - 3.0	Do Not Use	None			

2KV

2KV

5-
6
SECTION

-VR

UT.

UTE