

KENWOOD

HF RECEIVER

T-599D

INSTRUCTION MANUAL

KENWOOD CORPORATION

T-599D OPERATING MANUAL

WARNING

High tension voltages always exists in this transmitter at all vacuum tubes during transmission, and even during reception if the transmitter is operated on a combined transmitter-receiver basis. Be careful enough, therefore, not to make access carelessly to these tubes even during the stand-by period and reception to prevent electric shock. Also, never fail to disconnect the power cord from the set and ground the smoothing capacitor before proceeding to check of the interior of the set.



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T-599D SPECIFICATIONS

TRANSMITTING FREQUENCY RANGE	3.5 MHz band 3.50 ~ 4.00 MHz 7.0 MHz band 7.00 ~ 7.30 MHz 14.0 MHz band 14.00 ~ 14.35 MHz 21.0 MHz band 21.00 ~ 21.45 MHz 28.0 MHz band 28.00 ~ 28.50 MHz 28.5 MHz band 28.50 ~ 29.10 MHz 29.1 MHz band 29.10 ~ 29.70 MHz
MODE	SSB (A3J), CW (A1) and AM (A3)
POWER REQUIREMENTS	110 ~ 120/220 ~ 240 VAC, 50/60 Hz
POWER CONSUMPTION	350 watts maximum
PLATE POWER INPUT	200 watts PEP for SSB operation 160 watts DC for CW operation 80 watts DC for AM operation
AUDIO INPUT IMPEDANCE	600 ohms or 50 kohms, as selected by a selector switch
RF OUTPUT IMPEDANCE	50 ~ 75 ohms
FREQUENCY STABILITY	Within 100 Hz during any 30 minute period after warmup. Within ± 2 kHz during the first hour after 1 minute of warmup.
AUDIO FREQUENCY RESPONSE	400 to 2600 Hz/within -6db
CARRIER SUPPRESSION	Carrier better than 40db down from output signal.
SIDEBAND SUPPRESSION	Unwanted sideband is better than 40db down from the output signal.
HARMONIC RADIATION	Better down 40db down from output signal.
MODULATION SYSTEM	Balanced modulation for SSB and low power modulation for AM.
SSB GENERATION SYSTEM	Filter type
KEYING	Block bias keying
TUBES AND SEMICONDUCTORS EMPLOYED	3 vacuum tubes, 4 FET, 1 IC, 30 transistors, 34 diodes, 3 zener diodes, & 1 varicap.
DIMENSIONS	10-5/8" W x 5-1/2" H x 12-3/16" D (inches) 270 W x 140 H x 310 D (mm)
WEIGHT	27 lbs. (12.5 kg)

T-599D FEATURES

1. The model T-599D is the high class SSB transmitter leading the age of solid state communications equipment.
2. Use of IC and FET insures a circuit construction of high reliability and stability.
3. Covers all HF bands, as selected by a single switch MODE with positions LSB, USB, AM and CW.
4. Both sideband low power amplitude modulation system adopted enables to emit an AM signal with a quality and efficiency far better than the SSB signal emitted by an injected-carrier SSB system.
5. VFO employing FET provides a highly stable and low-distortion output. Precision type double gear mechanism and variable capacitor with linear characteristics provided for main tuning dial covering a 100 kHz band with its one complete turn — a transmitting frequency readable to the nearest 1 kHz.
6. Compact and unique design matched best to the mechanical sense of modern users insure a well-matched combination with the mated receiver model R-599D, enabling users to compose a far pleasant shack.
7. Two transmitting tubes S2001A (6146B) used as final stage amplifier tube deliver a stable output with high efficiency.
8. Complete countermeasure provided for TVI — final stage package and other units are all shielded to eliminate leak of unwanted wave to the utmost.
9. Carrier injection automatically conducted for AM and CW transmission in accordance with the corresponding setting of FUNCTION switch on front panel.
10. High-frequency type crystal filter used for SSB generator provides extraordinary excellent characteristics such as shape factor for transmission of high quality and stable SSB signal.
11. Amplifier type transistor ALC circuit adopted provides an ALC voltage with sharp rise characteristic, which not only effectively suppresses generation of the splatter due to over-driving of final stage amplifier tube but also allows A1 signal (telegraph) to preserve ALC effect — emission of clear signal with less distortion is insured at all times.
12. Meter provided for monitor of ALC voltage enables users to keep model T-599D on air with proper operating level at all times.
13. Provision of transverter terminal — operable with a VHF transverter for SSB operation on VHF range.
14. An extremely high degree radio operation such as a combined transmitter-receiver operation and the so-called cross-operated VFO is available when operated in combination with model R-599D Receiver.
15. Built-in side tone oscillator insures a precise CW operation.
16. High performance transistor VOX circuit insures a clear and lisp way of QSO for users.
17. Reduction gear mechanism for plate tuning makes the operation on a knob easier, by spreading its rotation range.
18. Provision of all meter, accessory circuits, switch and terminal required for a high class SSB transmitter, such as a meter with positions IP, RF, ALC and HV, a semi-break-in system for CW operation, an automatic voltage regulator circuit, a microphone impedance selector switch with positions Low and Hi and PTT terminal.
19. Fan motor equipped for model T-599D provides an increased cooling effect to final stage tube with resultant long life of the tube expected.

SECTION 1. CIRCUIT DESCRIPTION

Model T-599D is the highest class HF SSB transmitter operating in the frequency band 3.5 to 29.7 MHz. It employs the solid state components throughout its circuit excepting the final stage amplifier and its driver.

This transmitter uses those circuits which are almost all constructed in individual units employing printed circuit boards. This has contributed greatly to have the units provide high and uniform performance.

All units are marked with their identification numbers, which are used not only in the present text but also in the schematic and block diagrams.

In brief, this transmitter conducts the voice input signal applied to the microphone and converted into the RF signal through the signal path shown below (which is presented by the heavy lines in the block diagram given in Fig. 1) to the antenna to emit the signal during its transmitting operation.

Microphone → Microphone amplifier → Balanced modulator (BM) → Crystal filter → IF amplifier → 1st mixer →

BPF → 2nd mixer → Driver amplifier → Power amplifier → Antenna.

In the course of the above signal path, a carrier output is applied to BM, a VFO output to the 1st mixer and a heterodyne crystal oscillator output to the 2nd mixer.

In addition, the transmitter incorporates a VOX amplifier, side tone oscillator, ALC amplifier, bias control circuit and regulated power supply.

1. MICROPHONE AMPLIFIER (X52-0009-00)

The AF signal from the microphone is applied to the MIC terminal of the unit, from which it passes through a two-position input impedance selector switch for 600 Ω and 50 kΩ to the microphone amplifier comprising three stages of amplifiers Q1, Q2 and Q3.

Initial stage amplifier Q1 (2SC1000), also acting as a VOX

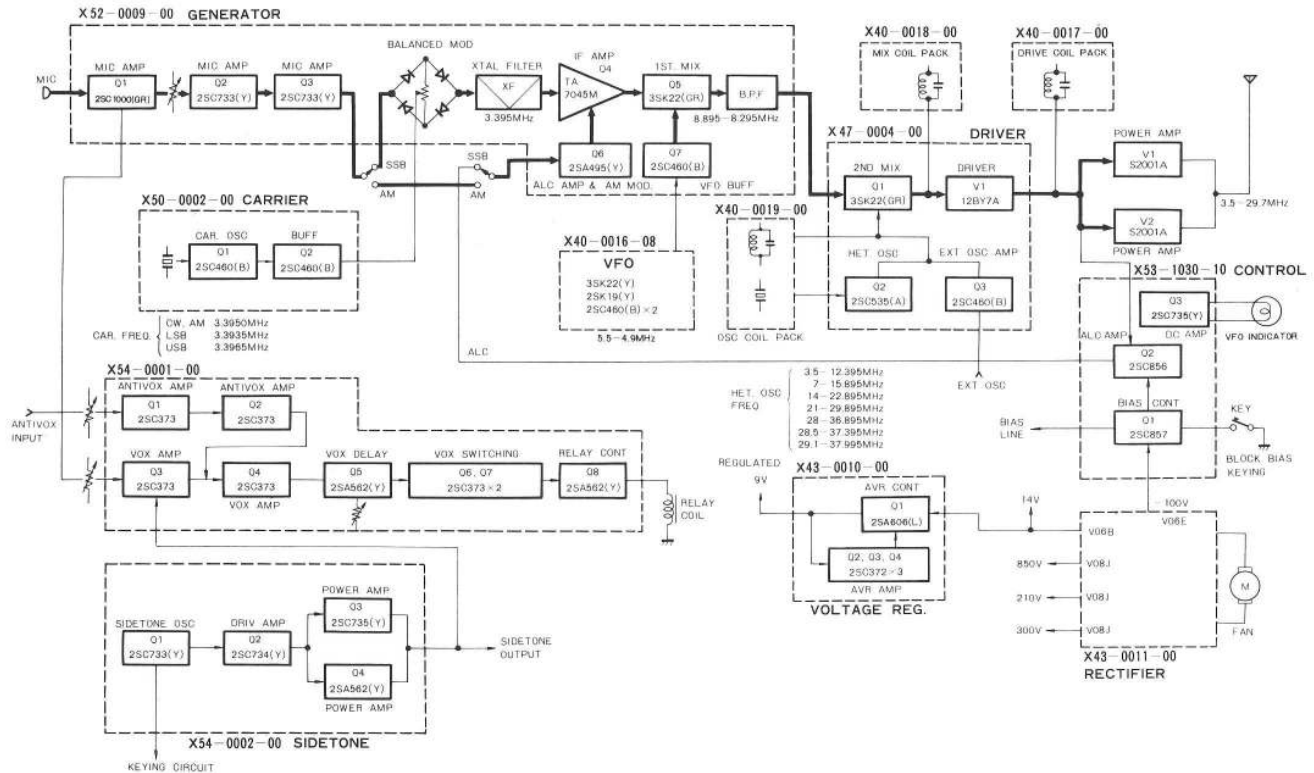


Fig. 1. T-599D Block Diagram

amplifier, provides a gain of approx. 25 dB. The output of amplifier Q1 is fed through the microphone gain control to the 2nd and 3rd stage amplifiers Q2 and Q3 (2SC733) directly coupled.

The 2nd and 3rd stage amplifier transistors are operated with a large negative voltage fed back from their output sides to the input sides respectively. This enables these amplifier transistors to amplify their AF input without distortion as well as to lower the impedance of their output, thereby matching their output well to the next stage, a balanced modulator.

2. BALANCED MODULATOR (X52-0009-00)

The AF signal from the microphone amplifier enters the ring modulator comprising four diodes D1 through D4 (1N60).

The ring modulator, the most popular one as the balanced modulator, provides facilities for switching the AF signal with the carrier frequency supplied from the carrier oscillator. Because of its circuit construction employing symmetrical circuits, the modulator balances the carrier components out of the AF signal at its output side to provide a suppressed-carrier DSB signal.

For the CW and AM operation, DC voltage is applied to the modulator in lieu of the AF signal. This causes the modulator to lose the balance of its symmetrical circuits and deliver carrier component to its output. Control CAR LEVEL (VR2) provides means to set the level of the carrier to be supplied.

3. CARRIER OSCILLATOR CIRCUIT (X50-0002-00) (See Fig. 2)

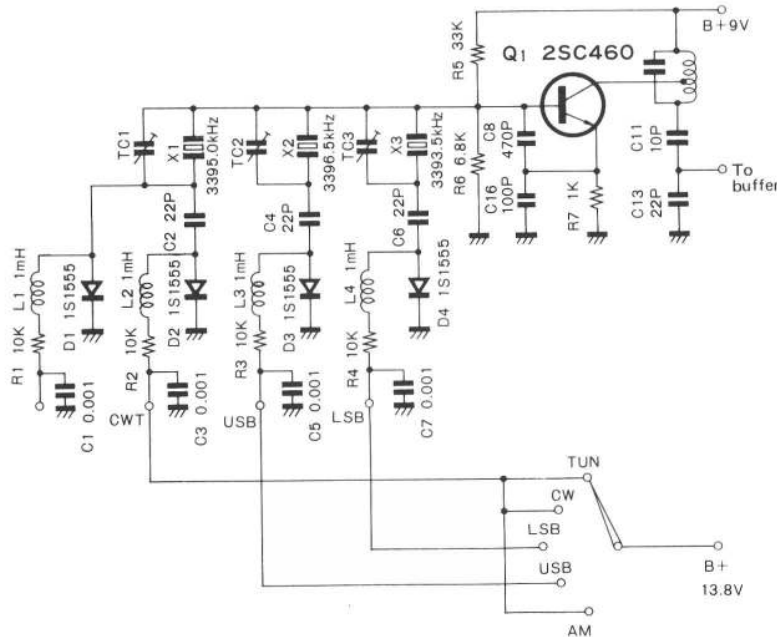


Fig. 2. Carrier OSC

Table 1 Component Units of Model T-599S

Unit name	Unit No.
Generator Unit	X52-0009-00
Carrier Unit	X50-0002-00
VFO Unit	X40-0016-08
Driver Unit	X47-0004-00
OSC Coil Pack Unit	X40-0019-00
MIX Coil Pack Unit	X40-0018-00
Driver Coil Unit	X40-0017-00
Control Unit	X53-1030-10
VOX Unit	X54-0001-00
Side Tone Unit	X54-0002-00
AVR Unit	X43-0010-00
Rectifier Unit	X43-0011-00

The carrier oscillator frequencies are 3393.5 kHz for LSB transmission, 3396.5 kHz for USB transmission and 3395.0 kHz for CW and AM transmissions.

The carrier oscillator consists mainly of transistor Q1 (2SC460) and transistor Q2 (2SC460), the former being operated as an oscillator and the latter as a buffer.

Oscillator Q1 is of the Pierce oscillator circuit with diodes D1 through D4 (1S1555) inserted in series with its crystals respectively, across the base and emitter. The oscillator frequency is selected through switchover of the above-mentioned diodes.

Diodes D1 through D4 offer a high resistance when no voltage is applied to them, thereby opening the oscillator circuit under the normal condition. Application of an external voltage to these diodes, however, causes the diodes to reduce their resistances to around 10 Ω and complete the oscillator circuit, allowing oscillator Q1 to start in oscillation. Trimmer capacitors inserted in parallel with the crystals provide means for fine adjustment of oscillator frequency.

The output of oscillator Q1 is divided by capacitors C11 (10 pF) and C13 (22 pF) and then applied to the base of emitter follower Q2 (2SC460). Owing to this emitter follower, the output impedance of the oscillator is lowered to approx. 100 Ω. This minimizes the fluctuation of oscillator output voltage and frequency due to the variation of load.

4. FILTER AND IF AMPLIFIER (X52-0009-00)

The signal from the balanced modulator enters a crystal filter.

The crystal filter has a shape factor (a ratio between the frequency pass bands of the filter at 6 and 60 dB down points) of less than 2 as shown in Fig. 3.

Especially, this filter features no ripple in its pass band and, therefore, delivers a SSB signal with high tone quality. The SSB signal whose other sideband is rejected by the filter is applied to IF amplifier Q4 comprising an integrated circuit (IC).

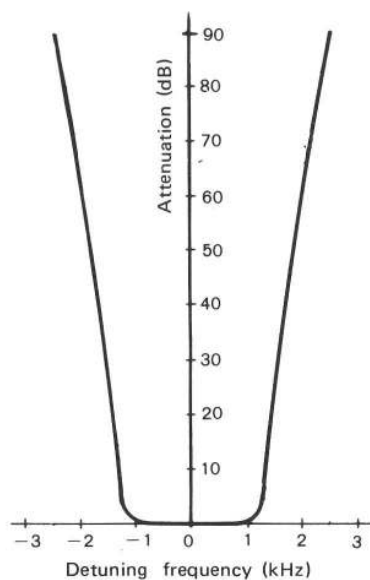


Fig. 3. Response of Filter

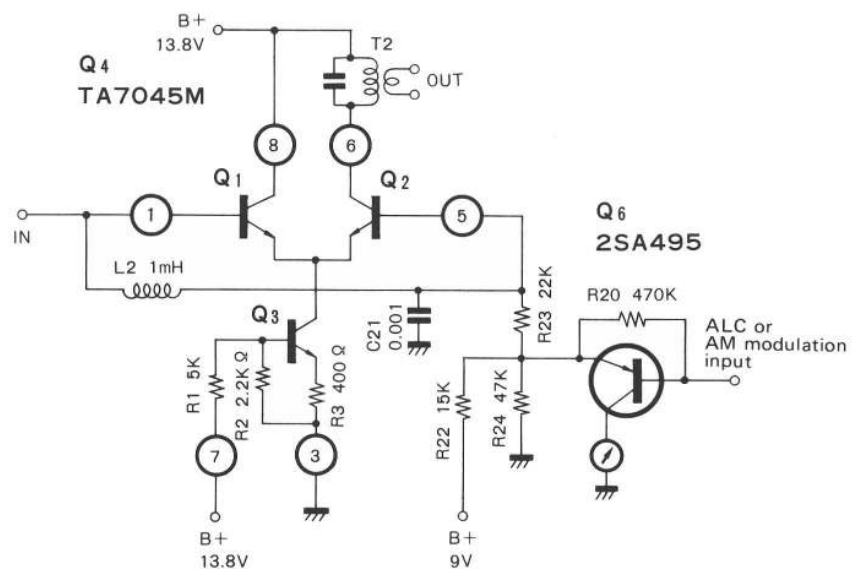


Fig. 4. IC and Bias Circuit

The IC (TA7045M) used for IF amplifier Q4 has a circuit construction shown in Fig. 4. That is, it mainly consists of three transistors and three resistors.

In the IC shown in Fig. 4 transistor Q1 and Q2 are operated as a differential amplifier and transistor Q3 as a regulated current circuit to compose a circuit which is extremely stable about its temperature and DC characteristics. For this reason, it is possible to perform a stable, high-gain IF amplification only by this IC stage.

To the bias circuit of the bases of the differential amplifier transistors in the above IC, the ALC voltage and the modulation voltage required for the AM transmission is applied through emitter follower Q6 (2SA495).

During the AM transmission the AM modulation signal is fed from the output of microphone amplifier Q3 through emitter Q6 to the IC. While, the carrier frequency 3395.0 kHz obtained by collapsing the balance of the balanced modulator is also applied through the crystal filter to the IC.

Accordingly, the carrier frequency is modulated with the modulation signal on the normal double sideband basis within the IC, thereby producing the AM signal given in the A3 type, in stead of the A3H type. This enables model T-599D to emit an AM signal with an extremely high-quality tone characteristic, which cannot be obtained using a conventional SSB transmitter in which the carrier is re-inserted in the SSB signal.

5. 1ST MIXER AND BAND PASS FILTER (X52-0009-00)

The 1st IF signal from the IC enters 1st mixer Q5 (3SK22), where it is heterodyned with the output signal of VFO ranging 5.5 to 4.9 MHz to produce the 2nd IF signal between 8.895 and 8.295 MHz.

Mixer Q5 (3SK22), a field effect transistor (FET), provides an E_g-I_d characteristic curve with a wide square characteris-

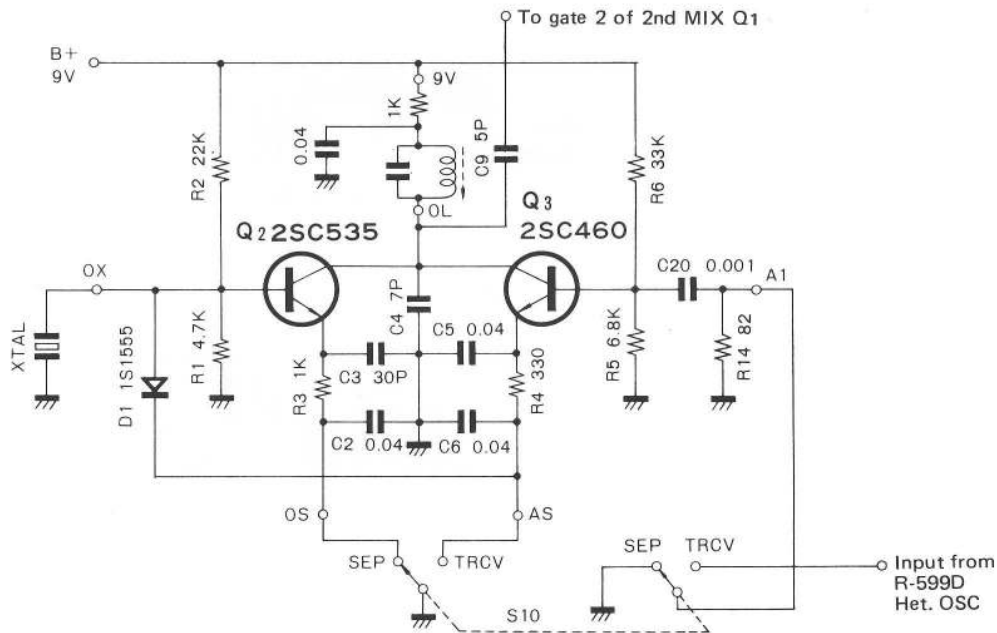


Fig. 5. Heterodyne OSC and AMP for Combined Transmitter-Receiver Operation

tic section and acts as a better mixer.

The sideband signal from the IC is applied to the No. 1 gate of this mixer with the output of VFO applied to the No. 2 gate.

Emitter follower Q7 (2SC460) inserted between the mixer and VFO acts as a buffer to prevent the transmitter and receiver circuits from interfering with each other during the time when model T-599D is operated with model R-599D receiver in their combined transmitter-receiver operation.

The SSB signal delivered from the 1st mixer enters band pass filter (B.P.F.). This band pass filter, consisting of three tuning circuits, has a center frequency of 8,595 kHz and its pass band is ± 300 kHz (-6 dB). It rejects the unwanted frequency component such as the spurious frequency from its SSB signal input and delivers its output to the 2nd mixer.

6. VFO UNIT (X40-0016-08)

Variable frequency oscillator VFO provides oscillator frequencies ranging from 5.5 MHz (at setting 0 of its dial scale) to 4.9 MHz (at setting 600 of its dial scale) and separated at intervals of 600 kHz.

This oscillator is an important block which determines the frequency stability and the accuracy of dial scale of this transmitter.

The oscillator employs an field effect transistor (FET) as its oscillator transistor. It is further provided with three stages of buffer to eliminate the effect due to the variation of load. These both contribute to insure a high frequency stability.

The oscillator circuit is composed of a clapp circuit using an FET followed by three buffers each employing an FET, and a harmonic filter and an output stage comprising two transistors connected so as to form a Darlington circuit and acting as a low impedance buffer.

The VFO unit is of the enclosed type and completely adjusted. So, it should never be removed from the cabinet case or modified about its internal circuit. If users fail to observe this caution, the resultant performance of this transmitter cannot be guaranteed.

7. 2ND MIXER (X47-0004-00, X40-0018-00)

The SSB signal of 2nd IF frequency delivered from BPF enters the No. 1 gate of 2nd mixer Q1 (3SK22), where it is mixed with the output of heterodyne crystal oscillator

injected to the No. 2 gate to turn into the SSB signal in each amateur band selected. In this case the mixer delivers its output as the difference frequency between its input signals, so that the locations of the LSB and USB signal on the frequency spectrum are reversed.

The 2nd mixer also employs an FET and, therefore, serves as a low-distortion mixer as the 1st mixer does.

The plate tuning circuit (X40-0018-00) is composed of a basis coil of 3.5 MHz to which coils of more than 7 MHz are connected in parallel. While, the drive variable capacitor is so designed that it is set to the 12 o'clock position at the center frequency of each band.

8. HETERODYNE CRYSTAL OSCILLATOR (X47-0004-00, X40-0019-00)

The heterodyne crystal oscillator acts as the 2nd local oscillator to the 2nd mixer.

Transistor Q2 (2SC535) forms a three-times overtone oscillator. Its crystals and tuning coils are mounted on a separate unit (X40-0019-00) and are so designed that they are selected for each desired band.

The tuning coil provided for 28 MHz band is so designed that it is added with three coils one by one to generate the frequencies for bands 28, 28.5 and 29.1 MHz respectively.

The output of oscillator Q2 is injected to the No. 2 gate of 2nd mixer Q1.

Transistor Q3 (2SC460) is the amplifier for the heterodyne crystal oscillator output sent from model R-599D receiver working on a combined transmitter-receiver operation. A transceive switch is provided to turn on or off the emitter circuit of transistor Q2 or Q3 to operate transistor Q2 or Q3 as the heterodyne oscillator or the amplifier for external heterodyne oscillator input, respectively.

Diode D1 (1S1555) conducts by the bias voltage to the base of transistor Q2 and ground the base of transistor Q2 when transistor Q3 operated because of terminal AS grounded with the transceive switch, thereby eliminating the effect from the Q2 circuit to the Q3 circuit operation completely (See Fig. 5).

9. DRIVER AMPLIFIER (X47-0004-00, X40-0017-00)

The SSB signal heterodyned to each amateur band in the 2nd mixer enters driver amplifier V1 (12BY7A) operating as class A amplifier, where it is amplified enough to drive

final stage power amplifier (S2001A x 2). The plate tuning circuit (X40-0017-00) of this driver amplifier stage has the circuit construction similar to that of the 2nd mixer. But, a link coil is added to the 3.5 MHz coil to derive the output of a VHF transvertor and other from this tuning circuit. Turning transvertor switch to ON, not only connects the link coil to output terminal but also applies the negative voltage to the screen grids of final stage power amplifier tubes to disable only the final stage tubes. This driver amplifier stage and the 1st and 2nd mixer stages are keyed through blocking the bias voltage to them for the CW transmission. By this keying model T-599D provides a keying waveform with smooth rising edge and less space wave as described in paragraph CONTROL unit about a block-bias keying.

10. FINAL STAGE POWER AMPLIFIER

The SSB signal for each band amplified by the driver amplifier enters the final stage power amplifier consisting of tubes V1 and V2 (S2001A) connected in parallel, where it is amplified linearly to the signal with the specified power level.

The output of the final stage power amplifier is delivered through the antenna matching circuit comprising a π matching network to the antenna. This final stage power amplifier is operated as a class AB1 amplifier. Its rated input is 160W (CW). Two type S2001A tubes are formed into the best AB1 class amplifier when the base current per tube is set to approx. 30 mA (the plate current of the tube when no SSB signal presents). The bias voltage under the above condition is approx. -45 to -50 V.

The antenna side capacity of the π matching network is selected for each band by switching the fixed capacitors and load variable capacitors as required so that the π match-

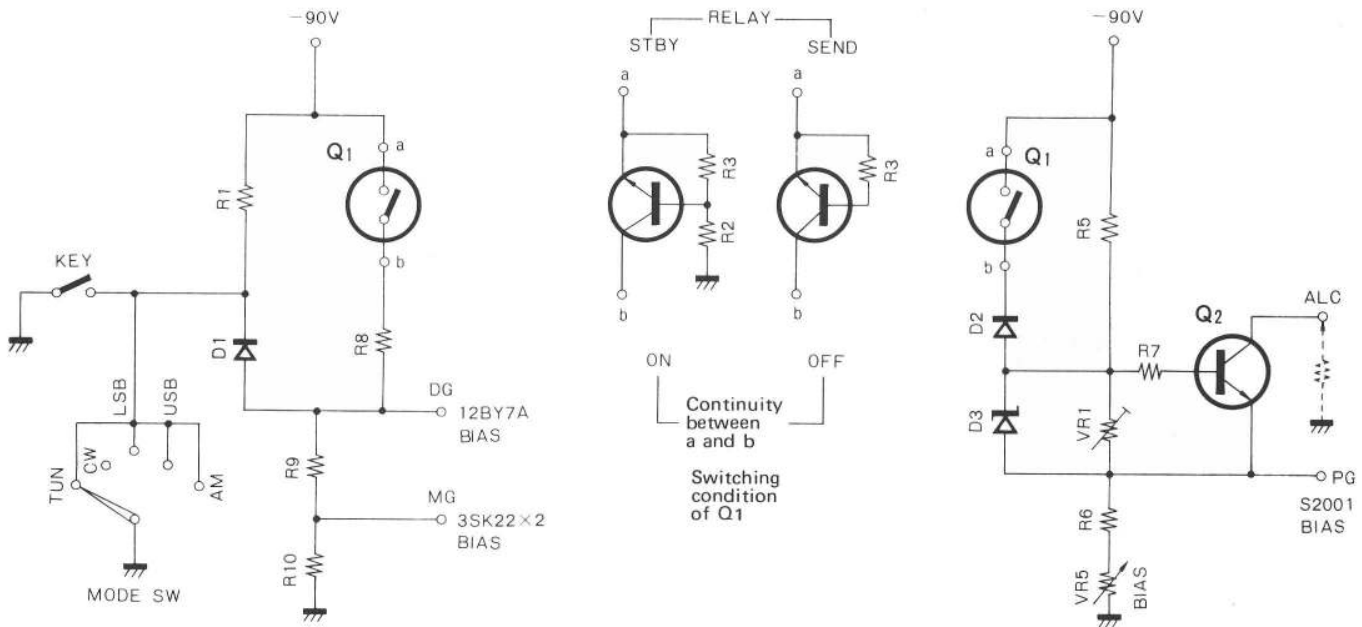


Fig. 6 Bias Control Circuit

ing network is matched to the antenna ($50 \sim 75 \Omega$) at an almost fixed position.

11. ALC AND BIAS CONTROL CIRCUIT (X53-1030-10)

This unit produces a block bias to the transmitter circuit through the use of a relay and key. It also takes out the ALC voltage from the grid current of the final stage power amplifier.

Fig. 6 shows the bias control, or block bias circuit rewritten from the circuit diagram in a simplified form.

A voltage of -90 V is applied from the -90 V supply via two routes, including resistor R1 and transistor switch Q1 respectively, to this block bias circuit.

The route including resistor R1 is under control of a key circuit. For the SSB and AM mode of operation it is forcedly grounded by the MODE switch and, therefore, is disconnected by diode D1 from terminals DG (for bias circuit of driver amplifier tube 12BY7A) and MG (for bias circuit of 1st and 2nd mixers). For the CW mode of operation, it is opened from the MODE switch and generates block bias voltages at terminals DG and MG through keying.

Q1 is a transistor switch controlled by a relay. It is turned ON to place itself in a stand-by condition with block bias voltages presented at terminals DG and MG when terminal RS of the unit is grounded. And it is turned OFF with terminals DG and MG kept at a ground potential when terminal RS is disconnected from the ground, thereby placing the transmitter in the transmitting condition.

Under the break-in keying, the transmitter operates as follows:

Turning key to ON \rightarrow starting of sidetone oscillator \rightarrow
VOX operation \rightarrow operation of relay (terminal RS \rightarrow
open) \rightarrow Q1 turns OFF \rightarrow block bias disappears \rightarrow
transmitter starts in operation.

The bias voltage for the final stage power amplifier is applied from terminal PG of this unit and, in case transistor switch Q1 is ON (i.e. under the receiving condition), a high bias voltage is applied to the final stage from terminal -C of this unit with no concern kept to variable resistor BIAS (provided outside of this unit) to disable the final stage.

When transistor switch Q1 turns OFF (i.e. under the transmitting condition), the bias circuit of the final stage amplifier is disconnected by diode D2 from the DG and MG circuit, thereby allowing to vary only the bias voltage to the final stage using variable resistor BIAS.

Q2 is the amplifier transistor (2SC856) for deriving the ALC voltage. It detects and amplifies the current flowing through ALC gain variable resistor VR1 (the grid current of the final stage power amplifier) to provide an ALC voltage. Accordingly, this amplifier transistor operates securely for continuous grid current encountered in case of the CW mode of operation, thereby keeping the linearity of the final stage power amplifier properly at all times.

In addition, the ALC circuit is so designed that it rises up with a shorter time constant and discharges with a longer time constant.

Zener diode D3 is a protective diode for ALC amplifier transistor Q2.

12. VOX AMPLIFIER AND ANTI-VOX CIRCUIT (X54-0001-00) (See Fig. 7)

(A) VOX Amplifier Circuit

Part of the AF output from the 1st microphone amplifier is fed to terminal MV of this unit. The AF signal is then applied to, and amplified by amplifier Q3.

The output of this amplifier is rectified by diode D6 and turns into a DC signal, which is in proportionate to the input signal.

The above DC signal is applied to a time constant circuit consisting of transistors Q4 and Q5, to which the output circuit of an anti-VOX circuit is also connected.

When the signal from a receiver operating on a combined transmitter-receiver basis with this transmitter is applied to the anti-VOX circuit, transistor Q2 turns on in that circuit. This short-circuits across diode D6 or shorts the input to transistor Q4 to ground, disabling the VOX amplifier circuit. If there presents no signal from the receiver, diode D6 applies the DC voltage to the base of transistor Q4.

This causes transistor Q4 to turn ON and lower the base voltage of transistor Q6 because of collector current of Q4.

Transistor Q5 is for providing a discharging path for the VOX amplifier holding capacitor C10 ($3.3\mu\text{F}$). Where transistor Q4 is in its cut-off condition because of no signal input, transistor Q5 offers the same potential at its base and emitter with its emitter and collector open-circuited. As a result, capacitor C10 is charged from the 9 V supply with a voltage set by variable resistor DELAY.

If transistor Q4 turns ON from the DC voltage applied to it under the above condition, the base potential of transistor Q5 is lowered. This turns on transistor Q5 and, therefore, allows capacitor C10 to discharge its charge through transistor Q5.

Since the discharge current of capacitor C10 is hFE times

as large as the base current of transistor Q5, it is possible to have capacitor C10 discharge thoroughly even when there flows a minute collector current in transistor Q4. For this reason, the time constant circuit is capable of providing an almost constant VOX hold time even when a small AF input presents at the circuit.

Transistors Q6 and Q7 form a Schmitt circuit, in which the former is in the ON condition and the latter in the OFF condition when no signal input presents.

When transistor Q6 lowers its base voltage by the collector current of transistor Q4 turned on by the AF input, the above-mentioned transistors Q6 and Q7 invert their conditions, that is Q6 turns OFF and Q7 turns ON.

The conduction of transistor Q7 causes part of its collector current to flow in the base of relay control transistor Q8, thereby turning on transistor Q8.

Terminal VS of this unit is provided to ground the loop of Schmitt circuit comprising transistors Q6 and Q7 for disabling the VOX amplifier circuit. While, terminal SS is provided to flow the base current through transistor Q8 instead of transistor Q7 to operate the VOX relay.

This VOX amplifier circuit, having separate delay circuit and shaping circuit (Schmitt circuit) as mentioned above, features:

- (1) A quick rise time and sufficient hold time provided by an ideal time constant circuit.
- (2) A Schmitt circuit which frees the relay from an unsteady state such as chattering, as encountered in the releasing operation at the end of hold time.
- (3) A preamplifier Q3 which, emphasizing the higher frequency region of voice signal, enables the VOX circuit to operate satisfactorily against a consonant in a word.

(B) Anti-VOX Circuit

The anti-VOX signal applied to terminal AV of this unit enters transformer T1, where it is stepped up. The output of transformer is then rectified by a full wave rectifier circuit comprising diodes D1 through D4 to turn into a DC voltage. This DC voltage is applied to transistor Q1, cutting off the transistor.

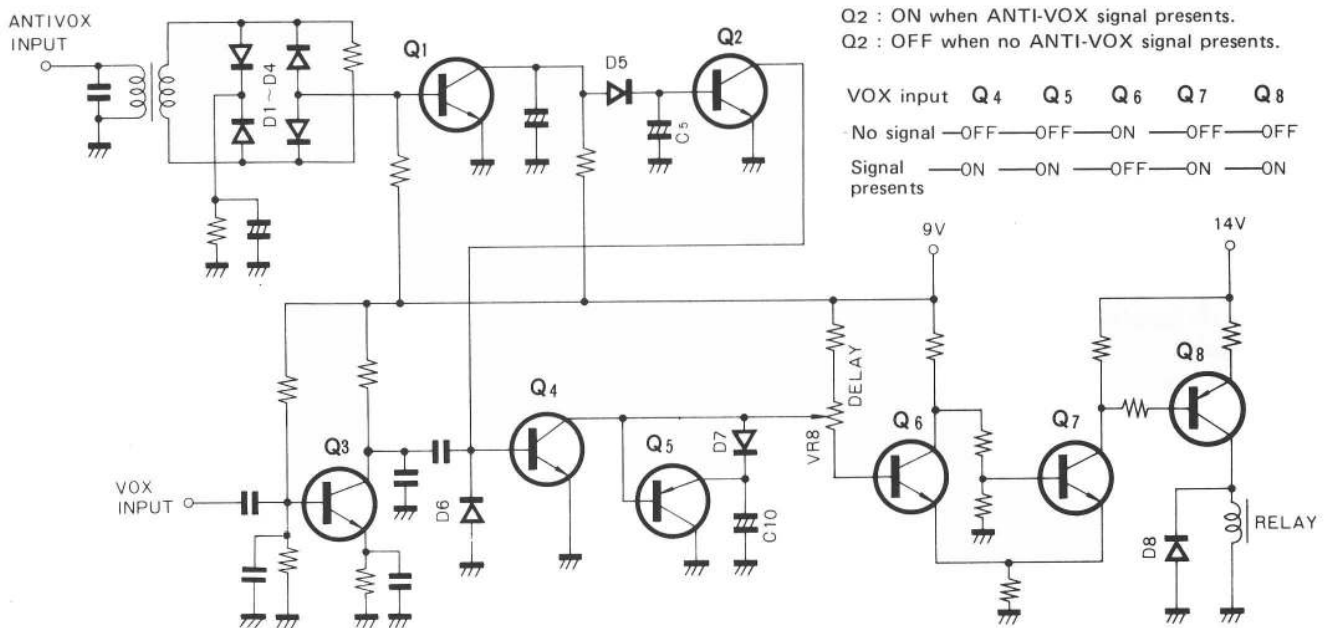


Fig. 7. VOX and ANTI-VOX Circuit

When cut-off, transistor Q1 raises its collector voltage which is repeated as a DC voltage through diode D5 to the base of transistor Q2. This DC voltage not only charges time constant capacitor C5, but also turns transistor Q2 ON, thereby short-circuiting rectifier D6 to disable the VOX amplifier circuit.

Time constant capacitor C5 in the anti-VOX circuit has a small capacity. This is intended to have transistor Q2 operate quickly and to have the VOX circuit restore to normal as soon as the anti-VOX input is removed.

The above-mentioned anti-VOX circuit has the following features:

- (1) Full wave rectifier circuit employed in the input circuit insures a complete anti-VOX operation regardless of the rising edge of an anti-VOX input which may be either positive or negative pulse.
- (2) A short time constant of anti-VOX circuit. This shortens the rise time of anti-VOX circuit for performance of an ideal anti-VOX operation, in which the VOX amplifier circuit is completely disabled at the moment the anti-VOX input enters terminal AV and also restored to normal as soon as the input is removed from terminal AV.

13. SIDE TONE OSCILLATOR (X54-0002-00)

The side tone oscillator is provided to monitor the keying performed during the CW mode of operation as well as to actuate the VOX amplifier circuit for a break-in keying. This oscillator consists of transistors Q1 (2SC733), Q2 (2SC734), Q3 (2SC735) and Q4 (2SA562).

Transistor Q1 is phase-shifter type oscillator which delivers an oscillator frequency of approx. 750 Hz. Transistor Q2 acts as amplifier. And transistors Q3 and Q4 are coupled with a complementary connection to form an OTL circuit, which delivers an output large enough to operate a 8 Ω speaker with an output power of approx. 100 mW.

Part of the above-mentioned OTL circuit is fed to the VOX amplifier circuit for performance of semi-break-in keying.

The oscillator circuit is turned on and off by the diode switch inserted in the phase shifter circuit loop. But, it is not started unless the key is inserted into the KEY jack to apply a voltage to the base of oscillator transistor Q1.

14. AVR (AUTOMATIC VOLTAGE REGULATOR UNIT) (X43-0010-00)

The AVR unit supplies power to the VFO, carrier oscillator,

heterodyne oscillator and other circuits of this transmitter requiring stable B supply voltage.

This AVR unit generally operates as follows:

The variable component of the output produced by variation in the load or the input voltage is amplified by an error amplifier comprising transistors Q2 and Q3 (2SC372). The output of error amplifier is then applied to current control transistor Q1 (2SA606) to vary its internal resistance, thereby eliminating the variable component of the output voltage. In other words, this unit operates as a sort of automatic voltage control circuit.

Transistor Q4 is the transistor for cancelling the temperature characteristics of transistor Q3. While, diode D1 is a Zener diode provided to produce the reference voltage.

The voltage stability of an automatic voltage control circuit against a temperature change depends mainly on the reference voltage and the temperature characteristic of error voltage amplifier. The present AVR unit employs Zener diode WZ-061 with a temperature coefficient of zero as its constant voltage diode. It also operates error voltage amplifier transistors Q3 and Q4 on a differential connection. So, the variations in these transistors' characteristics due to temperature cancel to each other. These contribute greatly to reduce the variation in the characteristic of this unit due to temperature.

In addition, the current control transistor is a silicon PNP transistor and, therefore, offers no problem about the variation in its characteristic due to temperature.

This AVR unit is further characterized by its complete protecting operation against the excessive current, which might be flowed when its output terminals are shorted, compared with any conventional voltage regulator circuit in which the current control transistor may sometimes be damaged by the excessive current flowing when the output terminals are shorted.

Resistors R10 and R11 and variable resistor VR2 connected to the RIT circuit, are used to produce the RIT voltage.

15. POWER SUPPLY CIRCUIT (X43-0011-00 OR CABINET)

The power supply circuit consists mainly of a power transformer and its separate secondary windings with necessary rectifier elements.

The power supply for the final stage power amplifier, comprising an independent high-voltage winding of the power transformer and a voltage doubler circuit, delivers an output voltage of 800 V when it is operated with the load. Because of its independent circuit construction, the power supply for the final stage power features a better power

regulation and also exerts no effect to other circuits.

The 300 V supply for driver amplifier tube 12BY7A, the 210 V supply for the screen grid of the final power amplifier and the -90 V bias supply are generated by their independent rectifiers, which are connected to a separate secondary winding of the power transformer.

Since these power supplies are operated with sufficient bleeder currents, they provide the necessary voltages for their loads with sufficient stability even though they incorporate no special power regulating means.

The 14 V low tension supply, consisting of an independent low-voltage winding of the power transformer and a bridge rectifier accompanying a 0.1H smoothing choke coil and a 1,000 + 1,000 μ F capacitor, provide its load with the necessary voltage containing less ripples.

In addition, a regulated +9V B supply voltage, obtained from the +14V supply, is fed to major circuits from the AVR unit.

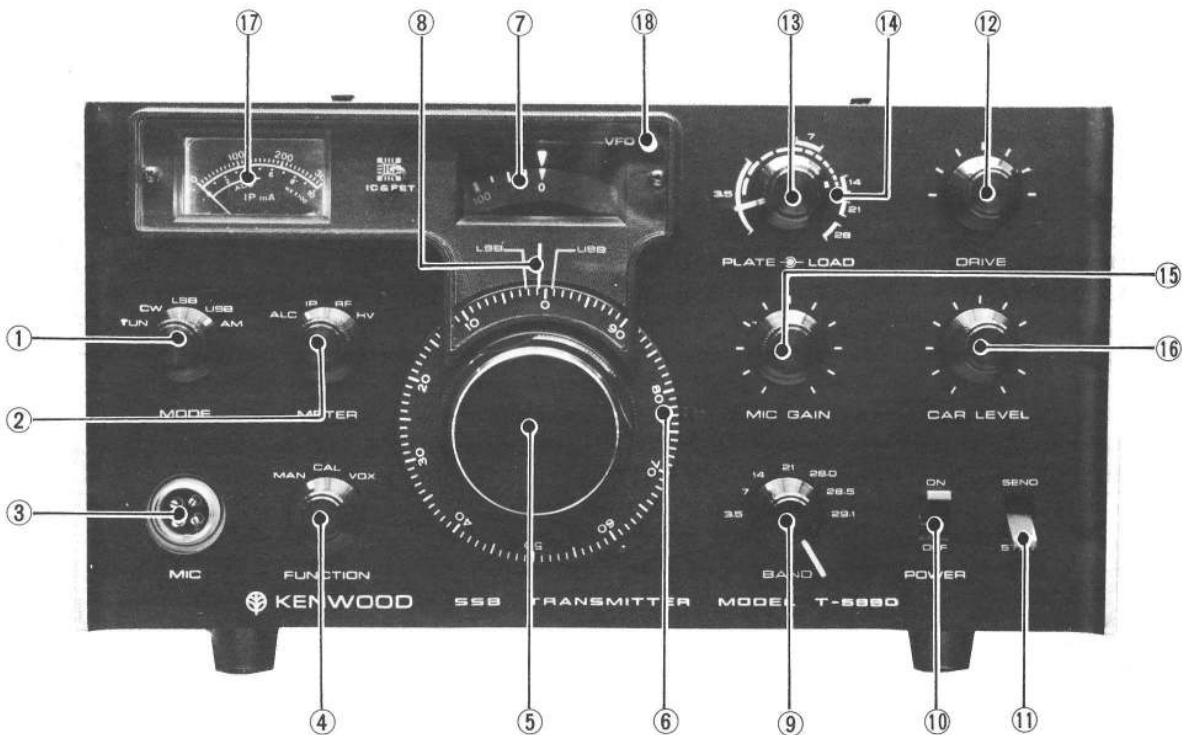


Fig. 8. Front Panel Controls

SECTION 2. OPERATING CONTROLS

FRONT PANEL CONTROLS (See Fig. 8)

(1) MODE

This is the switch with 5-positions TUN, CW, LSB, USB and AM for selecting mode of emission.

When this switch is set to the TUN position, the transmitter circuit is placed in the running condition excepting the final stage power amplifier and microphone amplifier. Hence, tune the driver amplifier, the preceding stage of the final stage power amplifier using the meter set at position ALC after placing switch SEND ◀▶STBY(11) in the SEND position.

In positions CW, LSB, USB and AM, the switch allows the transmitter to emit the telegraph, lower sideband, upper sideband and telephone (double sideband) signal respectively.

(2) METER

This is the meter range selector switch with 4-positions ALC, Ip, RF and HV.

When this switch is placed in the ALC position, the meter reads the ALC voltage to provide means for observing the drive level to the final stage power amplifier. In the Ip position, the switch allows the meter to indicate the plate current (or more precisely the cathode current) of the final power amplifier tube. In the RF position, the switch causes the meter to read the RF voltage presenting at the transmitter output terminal. For the HV switch position, the meter indicates the plate voltage of the final power amplifier.

(3) MIC

This is the microphone connector. It provides for connection of a microphone to which the plug supplied with the transmitter set is attached.

Place the impedance selector switch mounted on the bottom plate of the set in the appropriate position in accordance with the output impedance of the microphone.

(4) FUNCTION

This is the selector switch for type of control to the combined transmitter-receiver operation.

When this switch is placed in the MAN position, the trans-

mitter is operated under manual control. In the VOX position, the switch allows the transmitter to operate under VOX control. For switch position CAL, the switch enables the transmitter to emit the signal for calibrating a receiver.

(5) MAIN TUNING DIAL (KNOB)

The main tuning dial is the knob with the main-dial and sub-dial scales interlocked with its shaft.

This dial provides means to tune the transmitter circuit with a desired transmitting frequency within a frequency range from zero to 600 kHz.

The dial knob is large-sized and weights appropriately to provide flywheel effect, so that it allows users to tune the transmitter to the desired transmitting frequency quite easily.

Note that this dial is stopped at a point when rotated outside the 0 to 600 kHz range of the sub-dial scale.

Do not try to rotate the dial beyond the above point. Otherwise, the reduction displacement mechanism for the dial may be damaged.

(6) MAIN DIAL SCALE

The main dial scale covers 100 kHz in one revolution in 1 kHz steps. The angular displacement of the main tuning dial knob is transferred to this scale through a displacement reduction mechanism. The scale is kept in position with spring tension for easy slipping against the dial knob when moved for frequency calibration.

(7) SUB-DIAL SCALE

The sub-dial scale is the disc scale mounted below a rectangular small window at the upper center section of front panel.

The scale calibrated around the circumference of the disc for a frequency range from 0 to 600 kHz at intervals of 25 kHz. This scale, being mounted on the shaft of the main tuning dial, shifts its position by one graduation for every 1/4 turn of the main tuning dial, or a frequency band covering 25 kHz.

(8) INDEX PLATE FOR SUB-DIAL SCALE

The index plate for sub-dial scale is marked with three straight lines, which interface with the graduations of the

sub-dial scale. Of these the central line provides means to read the transmitting frequency of the sub-dial scale under the CW type of emission.

The left and right side lines provide the same means as that provided by the central line mentioned above under the LSB and USB types of emission respectively.

Thus, the precise transmitting frequency is obtained as a sum of the settings of main and sub-dial scales read off to any one of the above three index lines.

(9) BAND

This is the band selector switch, which provides means for selection of a transmitting band among the 7 amateur bands from the 3.5 to the 29.7 MHz.

(10) POWER

The POWER switch provides power ON-OFF control facilities to the transmitter. In the ON position, it applies power to the power supply circuit. This causes a pilot lamp to light.

(11) SEND ◀▶ STBY

This is the stand-by switch for switching a combined transmitter-receiver from the transmitting to the receiving conditions or vice versa.

When this switch is placed in the SEND position, it places the transmitter-receiver in the transmitting condition. In the STBY position, the switch disables the transmitter and places the receiver, if connected, in the receiving condition. Note that this switch should be placed in the STBY position when the transmitter is operated under a VOX control or using a PTT (push to talk) button.

(12) DRIVE

This is the tuning control for driving to the final stage power amplifier.

To tune the final stage for the maximum driving, adjust the control until the meter set at the ALC or RF position give the maximum deflection.

(13) PLATE

The PLATE control, the inner knob of a composite control with a double axis knob, provides means to adjust the final stage variable capacitor.

The setting of this control which indicates a rough position of each band, should be read on the outer scale marked on the panel.

(14) LOAD

The LOAD control, the outer knob of a composite control with a double axis knob, provides means to adjust the antenna load variable capacitor.

The setting of this control should be read on the inner load-impedance scale marked on the panel. The scale increase the impedance value as its graduations are read clockwise.

(15) MIC GAIN

This is the control for adjustment of microphone gain. This control should be set so that the meter set for the ALC range does not deflect out of the ALC scale.

Note that the microphone gain should be set to the possible lowest value for prevention of an overdrive to the microphone amplifier in order to insure emission of high-quality signal.

(16) CAR LEVEL

This is the variometer for adjustment of carrier output under the CW and AM type of emission.

Clockwise rotation of this variometer increases the carrier output.

(17) METER

This is the meter, which indicates the ALC voltage, the plate current of the final stage power amplifier, the RF output of the transmitter and the plate voltage of the final stage power amplifier, as selected by meter range selector switch METER.

(18) VFO INDICATOR

Lights indicating that the VFO is operating.

REAR PANEL CONTROLS

(See Fig. 9)

(1) RX ANT

This is the antenna terminal to the receiver when an antenna is to be used commonly for a combined transmitter-receiver operation.

Switching of the antenna to the transmitter or the receiver is performed by the relay within the transmitter.

(2) ANT

This is the antenna terminal.

Mind to connect the antenna or dummy load to this terminal without fail before turning the transmitter on.

This terminal matches to a load impedance of 50 to 75 Ω .

(3) GND

This is the ground terminal.

Never fail to ground the transmitter completely through the use of this terminal for prevention of dangers as well as for elimination of interference to television and broadcast channels.

(4) POWER CORD

This is the power cord.

Plug the free end of this cord in the plug socket for AC 50 or 60 Hz, 110 ~ 120/220 ~ 240 V line available.

(5) EXT AC

This is a service socket which allows users to derive an

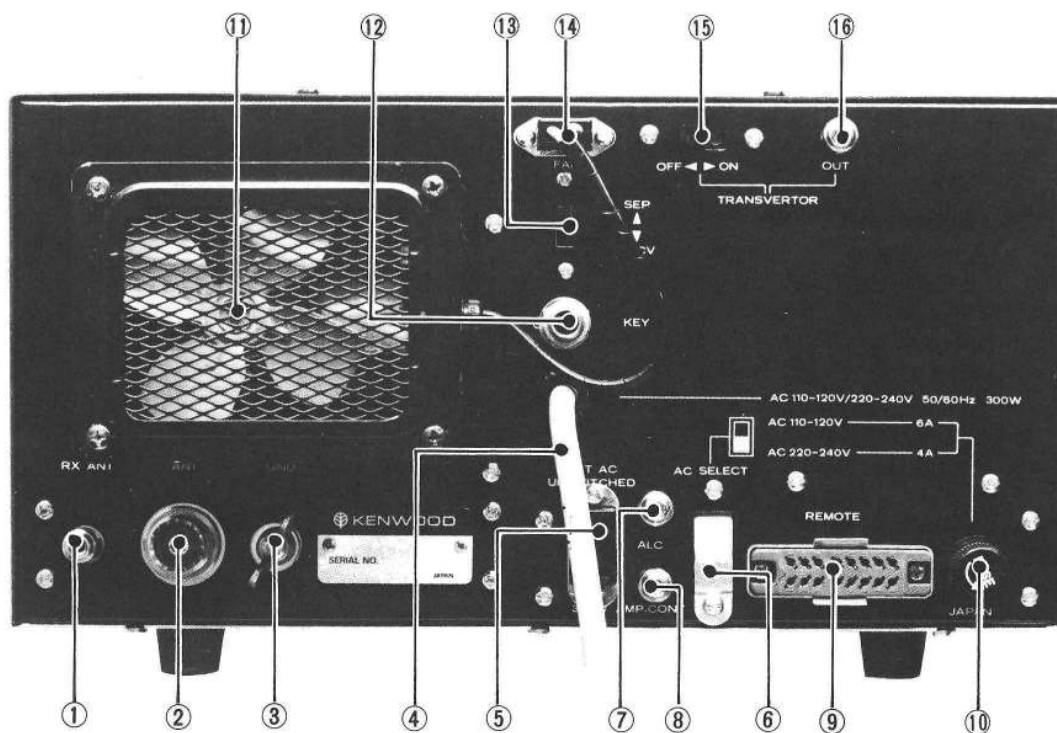


Fig. 9 Rear Panel Controls

AC power externally from the transmitter, provided that the power cord (4) is connected to an AC source.

Using this socket, the AC power up to 300 W may be derived regardless of the POWER switch on the transmitter.

(6) AC SELECT

This is the selector switch for AC source. It provides means to select either of AC 110 ~ 120 V or 220 ~ 240 V source. Normally, however, it is fixed to the 220 ~ 240 V position.

(7) ALC INPUT

ALC input from a linear amplifier when one is used in conjunction with T-599D.

(8) AMP CONT

Controls the relay contained in the linear amplifier.

(9) REMOTE

This is the connector for remotely connecting the transmitter to the receiver for the combined transmitter-receiver operation. When make connection to the receiver, with the ANT cable connect RX ANT terminal to the receiver's ANT connector. The VFO, side tone outputs, heterodyne oscillator input, anti-VOX input, linear amplifier ALC input and external relay control input are available at this connector.

(10) FUSE

This is the fuse holder for AC source.

Insert a 4 A fuse in this holder when operating this set in a 220 ~ 240 V area. For the operation in a 110 ~ 120 V area, use a 6 A fuse.

(11) VENTILATING GRILLE OR COOLING FAN

This is a ventilating grille provided for the compartment of motor fan.

(12) KEY

This is the jack for a telegraph key.

(13) SEP ◀▶ TRCV

This is the operation selector switch for a combined transmitter-receiver when the T-599D is operated in combination with the R-599D.

When the switch is placed in the SEP position, the T-599D and R-599D operate independently.

In the TRCV position, the switch allows the T-599D and R-599D to operate as a combined transmitter-receiver. In this case, the combined transmitter-receiver may be operated on a transceive or crossed-VFO basis as selected by the VFO-SELECT control on the R-599D.

(14) FAN

This is the connecting terminal for motor fan supply.

(15) TRANSVERTOR ON ◀▶ OFF

This is the ON-OFF switch for a VHF transvertor.

The switch should be kept in OFF position when no transvertor is connected to the transmitter.

When this switch is turned to ON with a VHF transvertor connected to the transmitter, the final stage power amplifier is disabled and the output of the driver amplifier appears on terminal TRANSVERTOR OUT (16).

(16) TRANSVERTOR OUT

This is the output terminal for the transvertor.

TOP CHASSIS CONTROLS (Fig. 10)

(1) VOX

This is the control for adjustment of the sensitivity of

VOX amplifier.

When the transmitter is operated in a noisy environmental condition, speak into the microphone held as close to the mouth as possible with this control set at a rather counter-clockwise position to provide a lower sensitivity.

(2) ANTI-VOX

This is the control for adjustment of the anti-VOX voltage. This control should be set to such position that prevents the voice input applied from the speaker to the microphone from actuating the VOX circuit to place the transmitter in the transmitting condition.

(3) DELAY

This is the variometer for adjustment of the holding time of VOX relay. Clockwise rotation of this variometer lengthens the holding time.

(4) BIAS

This is the variometer for adjustment of the bias voltage to the final stage power amplifier tube. This variometer should be adjusted so that the meter reads a plate current of 60 mA with the MODE switch set at either LSB or USB position when no signal input presents.

BOTTOM CHASSIS CONTROLS (Fig. 11)

(1) MIC IMP

This is the selector switch for microphone impedance. This switch is set to the 50 k Ω position before its shipment. When placed in the opposite position, the switch makes the microphone amplifier circuit ready for connection of a microphone with an impedance of 600 Ω .

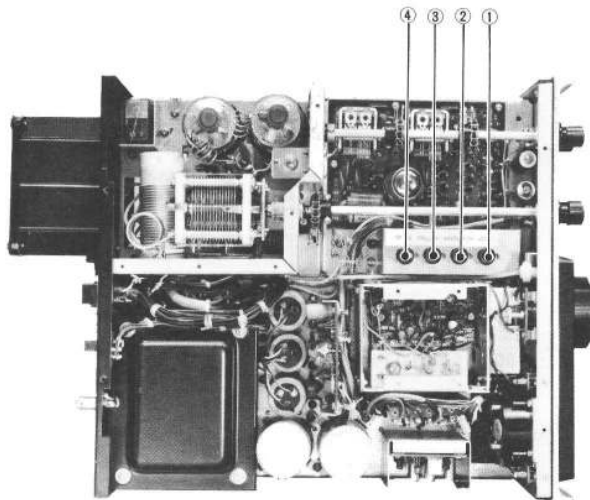


Fig. 10. Top Chassis View

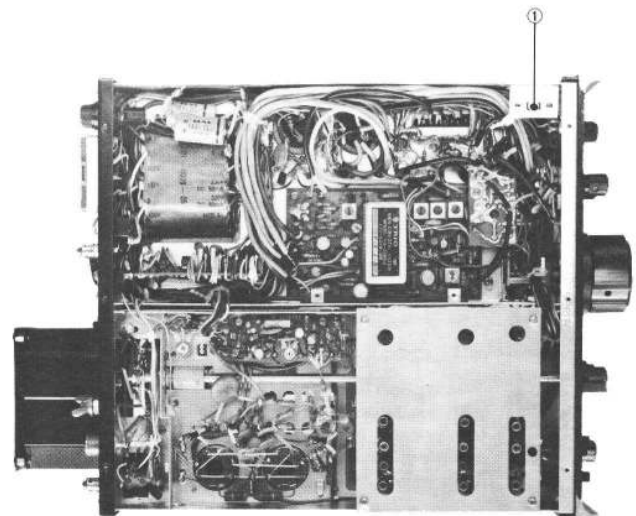


Fig. 11. Bottom Chassis View

SECTION 3. OPERATING INSTRUCTIONS

1. ACCESSORIES

The model T-599D is supplied with the accessories listed below.

Users are requested to check the contents of T-599D' cardboard carton against the list below when unpacking the carton.

4-pin connector plug (for microphone cord use) (E07-0403-05)	1
Connecting cord (for connection to model R-599D receiver)	1
US plug (E14-0101-05)	3
Spare legs (J02-0005-14)	2
Adjustment rod (W01-0005-04)	1
ANT cord (for connection to model R-599D)	1
Fuse (4A or 6A)	1

2. INSTALLATION PLACE

Select a place where dry air and less moisture prevail and further the transmitter installed in not exposed to direct sun beams as the installation place. Also, be careful to provide appropriate space for the rear and both sides of the transmitter set, since the tubes of the set generate a

considerable heat. In addition, refrain from placing an object on the set.

3. POWER SOURCE

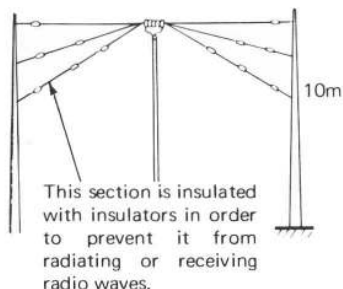
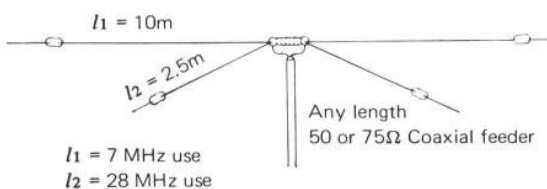
This transmitter is operable from an AC 110 ~ 120 V or 220 ~ 240 V, 50 or 60 Hz commercial source.

When the AC source suffers from a voltage deviation of more than $\pm 10\%$, operate the transmitter set with an appropriate voltage regulator to set the input voltage to the standard voltage. In this case, it is necessary to select the voltage regulator having at least a rated current capacity of 3 amperes.

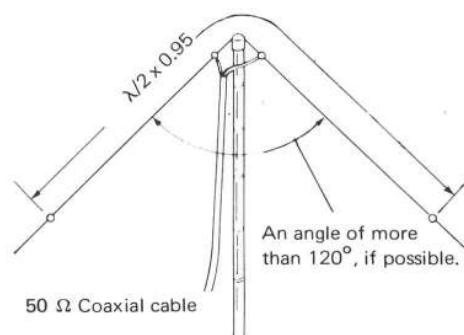
4. ANTENNA

It is a prerequisite to use a good antenna in order to have this transmitter fully demonstrate its performance. It is recommendable, therefore, to erect a robust antenna with sharp beam characteristic and the possible highest gain at a position as high as practicable.

As for an amateur radio station, it is a general practice to use a single antenna commonly for transmission and recep-



(a) Double Doublet Antenna



(b) Inverted - V Antenna

Fig. 12. Examples of Antennas

tion.

For transmission, the insufficient characteristics of an antenna may be compensated to some extent provided that this transmitter is operated with a linear amplifier connected between the transmitter and the antenna.

For reception, however, the quality of an antenna becomes extremely important since the user could not make a QSO with a partner station if he fails to hear the talk from the partner station at all.

The typical antennas recommended for use with this transmitter are shown in Fig. 12.

Also, it is desirable to match the transmitter set thoroughly to the antenna, since mis-matching of the set to the antenna may result in an interference to television and broadcast channels when the set delivers a high power output.

The antenna terminals of this transmitter set is so designed that it provide an output impedance of 50 to 75 Ω . This enables a doublet antenna using 75 Ω coaxial feeder to be connected as it is to the antenna terminals of the set. But, a high impedance antenna such as the inverted-L long wire antenna or the doublet antenna using parallel feeders should be connected to the transmitter set through the use of an antenna coupler. (See Fig. 13)

Recently various types of antenna are available on the market. Almost all of these antennas seem to have an

impedance of 50 ~ 75 Ω . When purchasing an antenna, however, make reference to its operating manual to make sure that the antenna has an impedance of 50 to 75 Ω .

5. MICROPHONE

The quality of the sound output from the speaker differs greatly depending on the type and characteristic of the microphone. So, it is requested for the users to use a high quality microphone with this transmitter.

As to the sensitivity of a microphone, this transmitter is designed under such assumption that the microphones having an impedance of 600 Ω will offer a standard sensitivity of -70 to -80 dB and those having an impedance of 50 k Ω a standard sensitivity of -50 to -60 dB. Accordingly, the transmitter is operable with almost all types of the dynamic microphone.

For the crystal type microphones, the transmitter may be substantially operable with any of them with more or less lowered frequency response in the lower frequency region provided that it is set for a microphone impedance of 50 k Ω .

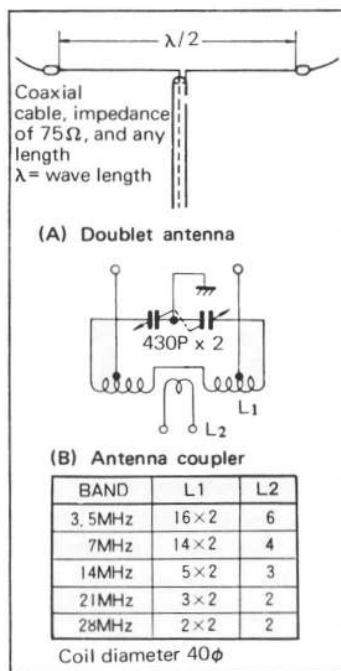


Fig. 13. ANT Coupler

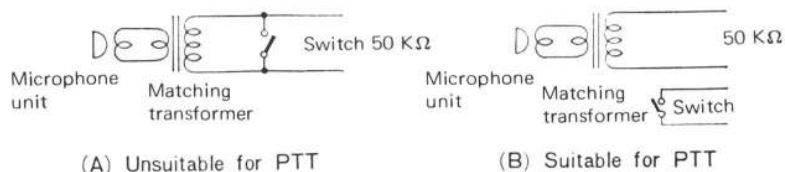


Fig. 14. Microphone with a Switch

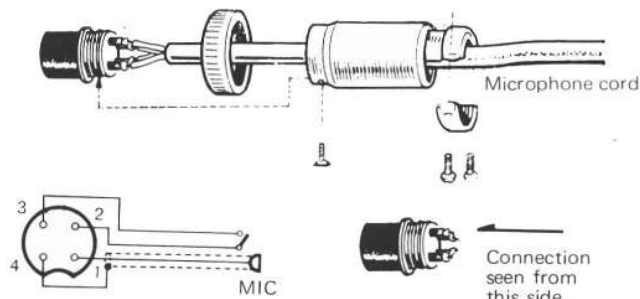


Fig. 15. Microphone Cord Connection

This is sometimes advantageous because a sort of voice is more legible when the response in its lower frequency region is lowered somewhat.

There are two types of microphone switch available, as shown in Fig. 14, (A) and (B). The switch shown in Fig. 14, (A) is the type which short-circuits the microphone circuit and, therefore, cannot be used for PTT operation. While, the switch shown in Fig. 14, (B) has its own circuit independent to the microphone circuit and can be used with the microphone on the PTT basis.

To connect the microphone cord to the microphone, proceed as illustrated in Fig. 15 using the connector supplied with the transmitter set.

6. CONNECTION TO RECEIVER AND LINEAR AMPLIFIER

The REMOTE connector of this transmitter has the pins described below.

Connection of this transmitter to model R-599D receiver, therefore, may be accomplished by merely connecting them with the connecting cable supplied with the transmitter set as shown in Fig. 16.

To connect the transmitter to other type receiver, proceed as illustrated in Fig. 17.

REMOTE connector pins and their functions

Pin No.	Function
(1)	VFO OUT — Delivery and reception of VFO output to and from the receiver under a combined transmitter-receiver operation.
(2)	Not used.
(3)	Pin for calibration under a combined transmitter-receiver operation (with model R-599D).
(4)	RL — Delivers relay supply to model R-599D. Interlocked with the STBY switch of this transmitter.
(5)	Not used.
(6)	ALC — Input terminal for ALC input from linear amplifier.
(7)	Not used.
(8)	TRCV OSC — Input terminal for heterodyne oscillator input from model R-599D under a

combined transmitter-receiver operation.

- (9) Ground.
- (10) ANTI-VOX — Input terminal for anti-VOX voltage from the receiver.
- (11) VFO B — Terminal for connection of B supply for VFO of this transmitter. Under a combined transmitter-receiver operation with model R-599D, provides for connection of the VFO SELECT switch of R-599D.
- (12)~(14) One contact of the remote relay is repeated to these pins. May be used for control of the stand-by, linear amplifier, transvertor etc. for the receiver other than R-599D.
- (15) SIDETONE — Output terminal for sidetone. When this terminal is connected to R-599D, a sidetone may be heard through the receiver speaker. For other receiver, connect a 8 Ω speaker and the speaker will deliver an output of approx. 50 mW.
- (16) Ground

The T-599D transmitter is equipped with a relay switch contact (AMP CONT) at the rear panel for use with the linear amplifier.

This contact is closed to the ground during transmission. A set of circuits, relay switch contacts, is repeated to pins (12), (13) and (14), which are switched as follows.

Pin No.	During stand-by	During transmission
(12) ~ (13)	OFF	ON
(14) ~ (13)	ON	OFF

An ALC input terminal is also provided either at the rear panel or in the REMOTE socket (pin 6) to receive ALC signal from the linear amplifier. Connection may be made with either the accessory pin plug or adding, by soldering, an appropriate length of lead to the interconnecting cord. (See Fig. 17.)

Connect leads from pins 12 and 13 or AMP CONT terminal to the STAND-BY terminal of the linear amplifier and connect lead from ALC terminal or pin 6 to the ALC output of the linear amplifier.

The ANT output of T-599D should also be connected to the input terminal of the linear amplifier.

The receiver antenna may be connected to the RX ANT terminal if the linear amplifier includes an antenna-through circuit.

The above connections differ more or less depending on the type of the linear amplifier to be used.

Users, therefore, are requested to refer to the linear amplifier operating manual for difference.

7. PRELIMINARY OPERATIONS

To operate this transmitter set, proceed in accordance with the following procedure. But, make test or adjustment of the set with a dummy load, if available. In this connection, a 100 W electric lamp may be used as a dummy load although it has a little higher impedance.

(A) Setting Transmitter Controls

Connect the power source, dummy load (or antenna), grounding wire and microphone to the transmitter set and place the operating controls on the front and rear panels in the following positions:

(1) Front Panel

MODE – TUN
 METER – ALC
 FUNCTION – MAN
 BAND – a desired band
 POWER – OFF
 SEND ◀▶ STBY – STBY
 DRIVE – Around center
 PLATE – Around the band selected
 LOAD – Fully counterclockwise
 MIC GAIN – Fully counterclockwise
 CAR LEVEL – Fully clockwise

(2) Rear Panel

SEP ◀▶ TRCV – SEP
 TRANSVERTOR – OFF

(3) MIC IMP

(on the bottom plate)

The position matched to the microphone to be used.

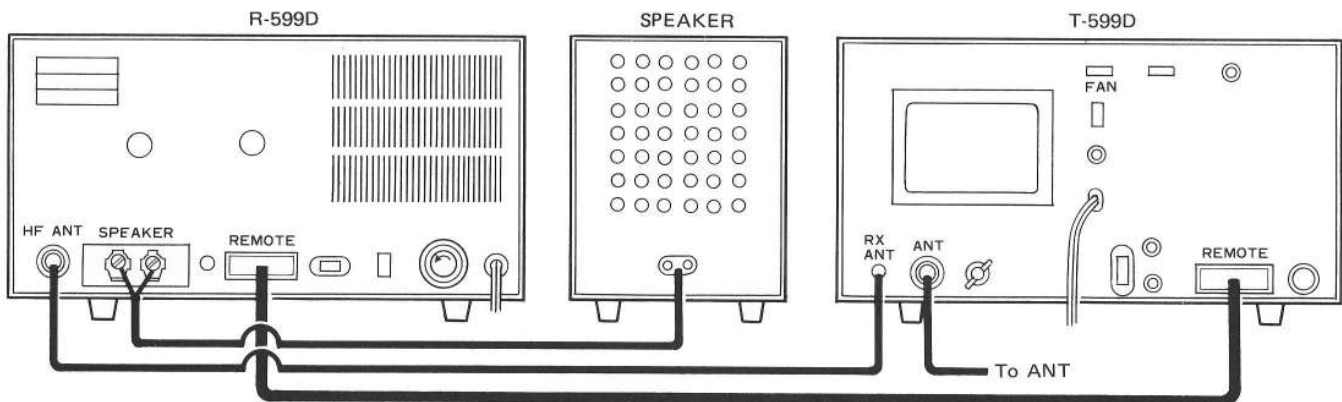


Fig. 16. Connections for a Combination of R-599D and T-599D

An example in which switchover between the transmitter and the receiver is performed by tuning on and off the B supply. One contact of switching relay is repeated to terminals No. 12, No. 13 and No. 14 respectively. Use these terminals after making reference to the use of the terminals in the text. Solder lead wires to pins No. 13 and No. 14 of 16-pin socket.

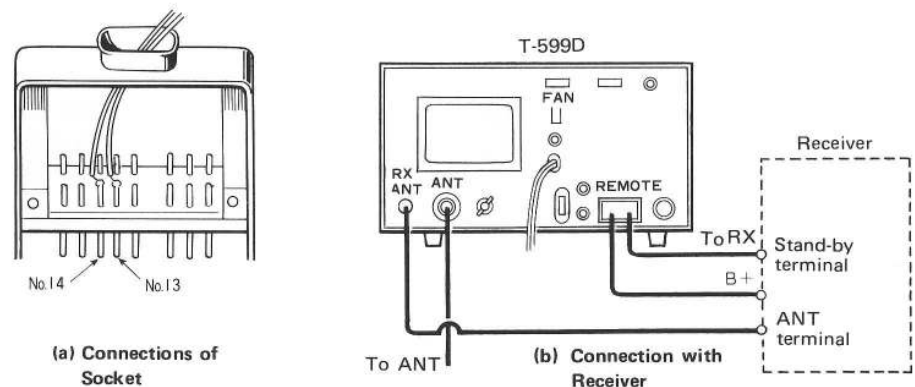


Fig. 17. Connections for a Combination of T-599D and R-599D

(B) Adjustment of Transmitter

Adjust the transmitter set as follows for proper emission of its signal.

- (1) Turn the POWER switch to ON. This causes the sub-dial and meter scales to be illuminated on the front panel. Wait 2 to 3 minutes until the heaters of vacuum tubes are warmed up. Also make sure that the VFO indicator is on.

- (2) Turn the stand-by switch from STBY to SEND. This places the transmitter circuits excepting the final stage power amplifier and the microphone amplifier, in the running condition. Adjust control DRIVE until the meter set at the ALC position gives the maximum deflection.

Note that the meter set for the ALC range may sometimes remain undeflected when the BAND switch is in the 28 MHz position. In this case, set the MODE switch to the CW position and adjust the DRIVE control until the meter reads a maximum I_p .

With the MODE switch set at either LBS or USB position and the METER switch at the I_p position, check to see that the meter reads an I_p of 60 mA.

- (3) Turn the MODE switch from either USB or LSB to CW and quickly adjust the PLATE control until the meter dips. This is necessary because tuning the MODE switch from either USB or LSB position to the CW position increases the I_p abruptly and causes an I_p of 250 mA to flow in the final stage power amplifier if the amplifier is detuned greatly. Note that the set does not flow the I_p , i.e. the plate current, in the final stage power amplifier tube provided that the key is connected to the set under the above condition. In this case, therefore, depress the key or disconnect the key from the set beforehand.
- (4) Set METER switch at the RF position and adjust the DRIVE control until the meter gives a maximum deflection. Then, turn the LOAD control clockwise until the meter is set to the maximum value. Adjust the PLATE control then in the same manner as mentioned above because turning the LOAD control collapses the tuning of the PLATE control. Repeat adjustment of the LOAD and PLATE controls alternately while observing the meter until the meter is set to the maximum value.

- (5) Turn the stand-by switch from the SEND to the STBY positions. This completes adjustment of the transmitter set for transmission.

Note that the above adjustment should be completed as quick as possible. Otherwise, the final stage power amplifier S2001A may be damaged. So, be careful not to have the amplifier tube deliver its full power continuously for more than 10 seconds. When the adjustment is not completed within 10 seconds, restore the stand-by switch once to the STBY position and leave the set as it is for more than 10 seconds before starting the same adjustment again.

8. OPERATION

This paragraph handles with the matters required for operation of this transmitter set, including simple adjustments.

(1) Input Level

Operate this transmitter set with the I_p set to 230 mA or less during the CW transmission. Increasing the I_p value mentioned above may damage the final stage power amplifier S2001A.

For transmission of the SSB signal, adjust the MIC gain control within the set so that the I_p assumes a value of less than 120 mA even at its peak.

Mind that an excessive input may result in a distorted output signal and this will affect adversely to other amateur stations.

During transmission of the AM signal, set the MIC gain control in such manner that the meter set for the I_p indicates an I_p without any vibration.

(2) AM Transmission

When this transmitter set is operated on the AM type of emission, make the adjustment of the final stage power amplifier with the MODE switch set at the CW position without fail. After the above adjustment, therefore, turning the MODE switch from the CW to the AM positions makes the set ready for AM type of emission.

Note that the modulated signal may fail to extend its peak fully if the adjustment of the final stage power amplifier is performed with the MODE switch set at the AM position.

Sometimes it may happen that the final stage power amplifier draws a large plate current under the above condition provided that the final stage is adjusted for band 14 MHz or less. In such case, adjust the CAR LEVEL control until the plate current does not exceed 150 mA as a maximum value.

It is normal operation that no deflection of ALC meter in the AM mode and deflection of ALC meter in the AM mode with the stand-by switch set at the STBY position are occurred.

(3) VOX Operation

Turning the FUNCTION switch to the VOX position with the stand-by switch placed in the STBY position makes it possible for the user to automatically switch the combined transmitter-receiver from transmission to reception or vice versa using his voice.

When heavy noises prevail around the user, turn the VOX gain control on the top of the chassis counterclockwise appropriately and speak into the microphone with a louder voice or with the mouth brought close to the microphone. Use of a microphone having unidirectional characteristic in such case is very effective.

Also, pay attention to keep the AC source voltage at the standard voltage at all times, since the large fluctuation of the source voltage may cause the VOX relay to operate dully.

This transmitter set self-contains an ANTI-VOX circuit to prevent the VOX circuit from operation during the time when the speaker is delivering the sound output of the receiver set.

Adjust the ANTI-VOX control on the top of the chassis within the cabinet case so as to have the VOX circuit not to work during the delivery of the sound output from the speaker under the combined transmitter-receiver operation. In making this adjustment, be careful not to make the ANTI-VOX circuit effective enough to work from the noise or other when the partner station stops its transmission. Otherwise, the transmitter cannot be switched to its transmitting condition sooner after the transmission from the partner station is over.

The DELAY control provides means to vary the holding time of the VOX circuit to prevent the VOX relay from chattering at the end of a talk. Since the manner of talking differs depending on the user, the DELAY control should be so adjusted that the VOX relay does not operate so often during transmission of talk.

(4) PTT Operation

If a user employs a microphone with the push-to-talk (PTT) switch, keep the following in mind:

To operate this transmitter on the PTT basis with a receiver connected to form a combined transmitter-receiver, depress the push-to-talk switch on the microphone for transmission and release the switch for reception with the stand-by switch left in the STBY position. This is because the PTT switch is connected in parallel with the stand-by switch.

(5) SSTV Operation

The T-599D will adapt very well to slow scan television operation. The only cabling required is a connector between the MIC connector of the T-599D and the output of the television console.

Be careful to keep the input power of the transmitter down to a safe level with the MIC GAIN control. If you exceed the plate power dissipation capability of the tubes, they will be damaged.

(6) NOVICE Operation

The Kenwood T-599D offers the unique opportunity to the beginning amateur of buying a top quality ham rig which adapts to novice operation at very little cost. So the initial equipment investment is good for whatever level of license the operator advances to.

For the novice to operate the Kenwood within the legal power limitations, all he has to do is remove one of the final tubes from the final RF section. Alternately, adjust the car level control to keep the plate input power below 75 watts (approximately 90 ma). Adjusting the carrier level yields much less power output because it reduces the efficiency of the tubes.

(7) CAL (Calibration)

When the FUNCTION switch is placed in the CAL position, the transmitter circuits other than the final stage power amplifier and the microphone amplifier are placed in the running condition with the carrier automatically injected. Hence, set the main tuning dial of the receiver to this signal and it follows that the receiver is calibrated to the receiving frequency.

(8) Reading a Transmitting Frequency on Dial Scales and Calibration of Main Dial Scale

The main dial shifts a transmitting frequency by 100 kHz for every one complete turn.

This shift of transmitting frequency is indicated on the main- and sub-dial scales.

Transmitting frequencies are read out as the sum of readings on the sub-dial scale and the skirt of the main tuning dial. The vertical red index line is provided for reading the transmitting frequencies in the CW and AM transmission. For the SSB transmission, use the main-dial scale in connection with the right-hand USB index for the USB signal and the left-hand LSB index for the LSB signal.

(See Fig. 18)

To calibrate the main-dial scale, set the zero graduation with the marker point of the receiver through adjustment of the calibration of this transmitter.

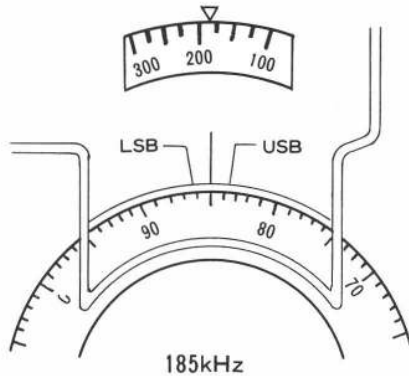


Fig. 18. Frequency Readout

(9) Combined Transmitter-Receiver Operation with Model R-599D

When this transmitter model T-599D is operated in combination with receiver model R-599D to form a combined transmitter-receiver, the user may operate the transmitter and receiver on a combined transmitter-receiver basis.

(a) Connections

To operate models T-599D and R-599D as a combined transmitter-receiver, connect between the REMOTE sockets of both models with the 16-pin connecting cable supplied with this set.

Connect the antenna to the ANT terminal of this transmitter and then connect the RX ANT terminal of the transmitter to the antenna terminal of model R-599D receiver using the connecting cable.

Then, set the SEP ◀▶ TRCV switch on the rear panel of the transmitter to the TRCV position. Try to operate the transmitter for transmission of the SSB signal under the above condition with the FUNCTION switch of the receiver placed in the MONI position. This may cause the speaker to deliver an indistinct sound output owing to a slight difference existing in the carrier oscillator frequency of the transmitter and the BFO frequency of the receiver. Hence, adjust the trimmer capacitor of the BFO (Carrier unit X50-0002-00) in the receiver until the transmitting and receiving frequencies are set properly to each other to turn the above speaker's sound output into a clear one (Fig. 19).

In the transmitter and receiver are adjusted once as mentioned above, then they would be operated without later adjustment provided that they are checked now and then about the above adjustment.

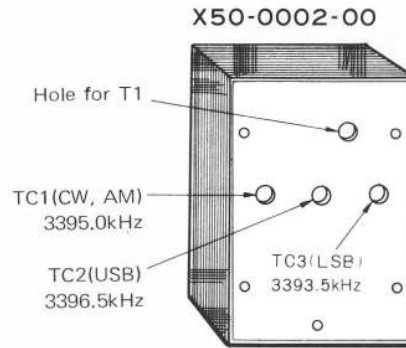


Fig. 19. Adjustment of Carrier Unit

(b) Combined Transmitter-Receiver Operation and Crossed-VFO Operation

Selection between a combined transmitter-receiver and a crossed-VFO operations may be accomplished by means of the VFO SELECT switch on the receiver.

The VFO SELECT switch functions as follows:

- NORM — In this position the switch allows the VFOs of the transmitter and receiver to operate independently.
- RX — The transmitter and receiver operate as a combined transmitter-receiver by the operation of the VFO in model R-599D receiver.
- TX — The transmitter and receiver operate as a combined transmitter-receiver by the operation of the VFO in model T-599D transmitter.
- REV — The VFO of the T-599D transmitter is used for reception and the VFO of the R-599D receiver is used for transmission.

(c) The Inter-Connections of the Same Two VFOs Mentioned Above Yield Various Features More Than Those Obtained Merely From the Combination of the Transmitter and Receiver.

First, the two VFOs available yield the same effect as that obtained using 2 sets of combined transmitter-receiver.

If it is desired to shift the transmitting and receiving frequencies of a combined transmitter-receiver, the frequencies can be shifted only within the RIT range provided that the transmitter-receiver operates as one set. In order to have the frequencies shifted

greatly, it is necessary for the transmitter and receiver to operate their VFOs independently. While, the fact that the transmitter and receiver connected as mentioned above and their respective VFOs are used independently for their combined transmitter-receiver operation is similar to that there are two sets of combined transmitter-receiver. This makes it possible for the user to perform a check when the transmitting and receiving frequencies differ greatly from each other, for instance to check whether or not the combined transmitter-receiver catches any other station with the transmitting frequency or to transmit the receiving frequency as it is. Such type of operation is generally called the crossed-VFO operation.

Secondly, it becomes unnecessary for the user to perform the calibration of the transmitting and receiving frequencies of the combined transmitter-receiver, required for ordinary separate type transmitter and receiver. Although this merit is natural as a combined transmitter-receiver, it is usually required for speedy operation of the transmitter-receiver.

Thirdly, in case where it is desired to store the frequency received once, the frequency of the receiver or transmitter may be transferred to the transmitter or receiver respectively without any instrumental error through the zero beat method conducted with the FUNCTION switch on this transmitter set at the CAL position, thereby allowing the transmitter-receiver to serve as a memory. In this case, however, the FUNCTION switch should be restored to the MAN or VOX position as soon as the operation is over, since the transmitter delivers no transmitting output if its FUNCTION switch is in the CAL position.

- (d) Be sure that the SEP ◀ ▶ TRCV switch on the rear panel of this transmitter is in the SEP position under its transmitter-receiver operation. Otherwise, the receiving sensitivity of the R-599D is reduced greatly when its VFO SELECT switch is placed in the TX, REV position.

(10) Meter Set RF Range

When set the RF range, the meter reads the RF output voltage during transmission. But, its deflection varies depending on the impedance of antenna. Especially, when the transmitter feeds its output to the antenna on the voltage feeding basis, the meter may sometimes deflects out

of its full scale. In such case, the meter may be restored to normal by adjusting the semi-variometer for the meter set at the RF range. But, it is recommendable to examine the antenna or insert an antenna coupler and etc. because the above symptom indicates a proof that the transmitter is mis-matched to the antenna.

(11) ALC Meter

When the METER switch is placed in the ALC position, the meter deflects when there presents a large input at the transmitter.

If the meter deflection is kept in the scale range marked ALC, the output suffers from less distortion and splatter. When the meter set at the ALC range deflects over the above-mentioned scale range in SSB mode, the output increases its distortion. Therefore, always keep the meter in said scale range while observing the meter under the SSB transmission.

(12) Adjustment of Bias Voltage

If the final stage power amplifier tube and other is replaced, it sometimes becomes necessary to adjust the bias voltage. In such case, make adjustment of the BIAS variometer on the top of the chassis within the cabinet case as follows: With the MODE switch set at the LSB or USB position and the transmitter placed in the transmitting condition without microphone input, adjust the BIAS variometer until the meter reads an Ip of 60 mA (as a total of two final stage tubes.).

(13) Side Tone

Adjust the side tone to an appropriate volume since its volume depends on the operating condition of the transmitter and its user. To make this adjustment, turn semi-fixed variable resistor VR1 on the side tone unit (X54-0002-00) until the speaker delivers the side tone with appropriate volume. In case where the transmitter is operated in combination with model R-599D receiver, adjust the volume control in the receiver.

SECTION 4. ADJUSTMENT AND MAINTENANCE

High tension voltages always exists in this transmitter at all vacuum tubes during transmission, and even during reception if the transmitter is operated on a combined transmitter-receiver basis. Be careful enough, therefore, not to make access carelessly to these tubes even during the stand-by period and reception to prevent electric shock. Also, never fail to disconnect the power cord from the set and ground the smoothing capacitor before proceeding to check of the interior of the set.

Model T-599D is marketed as a complete product and, therefore, needs no special adjustment when it is initially placed in its service. But, its components may be detuned more or less with the lapse of time.

Therefore, check the transmitter for proper tuning condition now and then. If it becomes evident that the trans-

mitter is out of its tuning condition, then proceed to the adjustment in accordance with the procedure given below. Table 2 shows the current and voltage values of the T-599D under the normal operating condition, as measured on the terminals of all components using a DC vacuum tube voltmeter with a high input impedance. So, if the voltages and currents are measured using a circuit tester, their values may differ from those given in the table below.

A more precise adjustment, however, requires to prepare many high-grade measuring sets. But, the adjustments given herein are those which may be performed using a circuit tester and the like. If the user encounters difficulty in making such adjustment or repairs, forward the faulty set to the dealer of our products and the dealer will adjust the set on a charged basis.

The description given below is about adjustment of each

TABLE 2

(A)

Unit No.	Transistor	(Note1)	E	B	C
X50-0002-00	Q 1 2SC460		0.85	1.4	9.0
	Q 2 2SC460		1.55	2.2	9.0
X52-0009-00	Q 1 2SC1000		1.2	1.9	4.5
	Q 2 2SC733		0.35	0.9	2.1
	Q 3 2SC733		1.50	2.1	3.8
	Q 4 TA7045M		Refer to next page "C" table.		
	Q 5 3SK22	R S	(Note2)0 0.95	-4.8 0	-2.0 0
	Q 6 2SA495	R S	6.8 (Note3)2.2	6.2 1.5	0
	Q 7 2SC460	R S	2.7 3.1	3.3 3.8	14.5 13.5
X47-0004-00	Q 1 3SK22	R S	(Note2)0 0.75	-3.75 0	-2.8 -0.5
	Q 2 2SC535	SEP TRCV	1.7 0	1.25 0.2	7.5 8.0
	Q 3 2SC460	SEP TRCV	2.7 0.87	1.55 1.48	7.5 8.0
	V 1 12BY7A		Refer to next page "C" table.		
X53-1030-10	Q 1 2SC857	R S	-94 -95	-94 -95	-94 0
	Q 2 2SC856	R S	-94 -50	-94 -50	6.3 (Note3)1.5
	Q 3 2SC735	ON OFF	0	0.74 0	0.09 14.5

Unit No.	Transistor	(Note1)	E	B	C
X54-0001-00	Q 1 2SC373	R A	0	0.65 0.6	0.13 0.65
	Q 2 2SC373	R A	0	0.23 0.67	0 0
	Q 3 2SC373		0.6	1.2	6.1
	Q 4 2SC373	R V	0	0 0.25	8.5 0.65
	Q 5 2SA562	R V	8.5 0.65	8.5 0.65	0
	Q 6 2SC373	R V	5.4 4.5	6.0 0.65	6.3 8.6
	Q 7 2SC373	R V	5.4 4.5	3.8 5.2	14.5 11.7
	Q 8 2SA562	R V	14.5 13.3	14.5 12.5	0 13.2
X54-0002-00	Q 1 2SC733		0.55	1.10	8.9
	Q 2 2SC734		0.68	1.33	6.3
	Q 3 2SC735		7.0	7.6	14.5
	Q 4 2SA562		7.0	6.3	0
X43-0010-00	Q 1 2SA606		14.5	13.8	9.0
	Q 2 2SC372		5.3	5.9	13.8
	Q 3 2SC372		5.5	5.7	5.9
	Q 3 2SC372		5.5	6.15	9.0

(B)

Unit No.	Terminal	(Note1)	Voltage	
X52-0009-00	AF5	(Note4)	1.4	
	AF6	(Note5)	0.4	
	CAR		[1.0]	
	MG	R		-7.0
		S		0
	B1	R		14.5
		S		13.5
	B2	R		0
		S		13.5
	SM		0	
	ALC	R		6.2
		S	(Note3)1.5	
	BS		9.0	
	VFO		[1.0]	
OUT	R		[0]	
	S	(Note6)[0.5]		
X50-0002-00	BS		9.0	
	LSB		-0.4	
	USB		-0.7	
	CWT	R		14.5
S			13.5	
X40-0016-08	OUT		[1.0]	
	R		5.4	
	B		9.0	
X47-0004-00	OUT		[1.0]	
	14	R	14.5	
		S	13.5	
9		9.0		
AS	SEP		3.0	
	TRCV		0	

Unit No.	Terminal	(Note1)	Voltage	
X47-0004-00	OS	SEP	0	
		TRCV	0.17	
	MG	R		-7.1
		S		0
	OX	SEP		1.25
		TRCV		0.5
	OL		7.5	
	MD	R		14.5
		S		13.5
	MVC	(Note7)		14.5
	DG	R		-46.0
		S		0
	H		(6.3)	
	DP	R		318
300	R		318	
	S		290	
DVC	(Note7)		330	
X53-1030-10	MG	R	-7.0	
		S	0	
	DG	R	-46.0	
		S	0	
	RS	R	0	
		S	-94	
	KEY	R	0	
		C	-60	
	-C		-94	
	PG	R	-94	
S		-50		
ALC	R	6.2		
	S	(Note3)2.1		

Unit No.	Terminal	(Note1)	Voltage
X53-1030-10	VR	R	-37
		S	-20
X54-0001-00	SS	R	14.8
		V	12.0
	RL	R	0
		V	13.2
	9V		9.0
	TV	(Note8)	8.5
	TB	R	8.5
		V	0.65
	TO	R	8.5
		V	0.65
	VS	R	3.8
		V	5.2
	14	R	14.8
		V	14.0
X54-0002-00	KY1	K	13.6
		C	12.8
	KY2	K	-60
		C	0
	OE	K	0
		(Note9)	1.6
B	K	14.5	
	C	13.5	
X43-0010-00	IN	R	14.5
		S	13.5
	OUT		9.0
RT1		5.4	

Unit No.	Terminal	(Note1)	Voltage
X43-0011-00	HV	R	(338)
		S	(310)
	850	R	910
		S	815
	300	R	315
		S	290
	C25	R	335
		S	315
	210	R	235
		S	215
	C26	R	242
		S	228
	-C	R	-94
		S	-97
C28	R	-102	
	S	-100	
14	R	14.8	
	S	14.0	
14B	R	(6.8)	
	S	(6.6)	
14A	R	(5.7)	
	S	(5.5)	
100	R	(75)	
	S	(72)	
230	R	(187)	
	S	(178)	
320	R	(260)	
	S	(255)	

(C)

Pin	(Note1)	Q 4 TA7045M	V 1 12BY7A	V 1 S2001A	V 2 S2001A
1	R	6.8	0	0	0
	S	(Note3)1.7	2.6	1.1	1.1
2	R		-46	(6.3)	(6.3)
	S		0		
3	R	0	0	235	235
	S			215	215
4	R		0	0	0
	S			1.1	1.1
5	R	6.8	0	-94	-94
	S	(Note3)1.7		-50	-50

Pin	(Note1)	Q 4 TA7045M	V 1 12BY7A	V 1 S2001	V 2 S2001
6	R	14.5	(6.3)	0	0
	S	13.5		1.1	1.1
7	R	0	318	0	0
	S	13.5	290		
8	R	14.5	200	0	0
	S	13.5	150		
9	R		0		
	S				
P	R			910	910
	S			815	815

- Note 1 R: Under stand-by condition.
S: Under maximum CW transmitting output.
SEP: SEP ◀▶ TRCV switch at SEP Position.
TRCV: SEP ◀▶ TRCV switch at TRCV Position.
A: ANTI-VOX input Signal with 0.5 V input.
V: VOX and CW side tone Operate.
K: CW operation with Strand-by Key inserted.
C: CW operation with Key downed.
ON: VFO on
OFF: VFO off
- Note 2 Read E, B and C as S, G1 and G2 respectively.
D is same as 14 V Supply line.

* Measurement is made using a vacuum tube voltmeter. The value shows the voltage to the chassis.
The value in () denotes the AC voltage and that in [] the RF voltage.

- Note 3 Approx. 5.5 V if meter set at ALC range does not deflect.
Note 4 MODE Switch set at AM. O at positions other than AM.
Note 5 MODE Switch set at Position TUN, CW and AM.
O at Position other than TUN, CW and AM.
Note 6 Value varies depending on how ALC circuit functions.
Note 7 3.5 MHz band. O for the band other than 3.5 MHz band.
Note 8 DELAY VR control placed in the extreme counterclockwise position.
Note 9 Operations other than CW operation.

unit. As to the locations of the units and parts appearing in the description, refer to the "TOP VIEW OF THE T-599D" and "BOTTOM VIEW OF THE T-599D". (Shown in pages 32 ~ 33)

1. ADJUSTMENTS

(1) Carrier Oscillator (X50-0002-00)

As to the carrier oscillator unit, adjust the carrier oscillator for its oscillating condition and output frequency. In order to check the oscillator for existence of its output, use a receiver on the detector shown in Fig. 20 and proceed as follows:

Slowly turn the core of oscillator transformer T1 clockwise until the oscillator stop its oscillation. Turn back the core about half turn until the oscillator just starts in oscillation again. Perform this adjustment with the MODE switch set first at the LSB position. Then, check the oscillator for normal oscillation with the MODE switch set at positions CW and USB.

Next, finely adjust the oscillator frequency using trimmers TC1, TC2 and TC3 inserted in parallel with the crystals respectively. For more precise oscillator frequency, however, use of a frequency counter and the like is required for the measurement. As a simple method, on the contrary, it will be enough to check the quality of the transmitter output while monitoring the output by the receiver.

(2) Carrier Balance (X52-0009-00)

Connect the dummy load to the antenna terminal of this transmitter. With the MODE switch placed in the CW position, tune the transmitter until the meter set for the RF range gives the maximum deflection (with the BAND switch set at the 7 or 14 MHz position).

Adjust the CAR LEVEL control on the front panel until the carrier level is so adjusted that the meter set for the ALC range reads approx. 200 mA on the Ip scale.

Then, turn the MODE switch to the LSB position to raise the sensitivity of the meter to the maximum. This would cause the meter to deflect if the balance of the balanced modulator to the carrier has been lost. In the above check, the MIC GAIN (VR) control should be placed in the extreme counterclockwise position.

To balance the balanced modulator to its carrier input, adjust trimmer TC1 and VR (VR1) on the generator unit (X52-0009-00) alternately from the bottom plate.

When switching the MODE switch to USB make deflection of the meter, adjust TC1 and VR1 so that the meter deflect showing the same carrier suppression.

(3) Generator Unit (X52-0009-00)

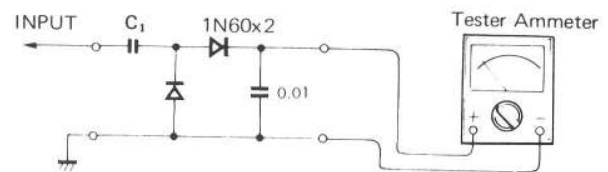
With the MODE switch set at the CW position, adjust the cores of T1 and T2 until the meter set for the RF range gives the maximum deflection. In this case, never manipulate T3 ~ T5 (BPF) if the user has no marker and sweep generators.. Otherwise, we cannot guarantee the performance of the set adjusted.

(4) Heterodyne Crystal Oscillator (X40-0019-00)

To adjust the heterodyne crystal oscillator frequency, locate the crystal oscillator coil in the coil pack just behind the front panel and adjust its core as described below using a hexagon screwdriver.

Slowly turn the core clockwise until the oscillator stops to operate. Turn back the core about 0.5 to 1 turn to a setting at which the oscillator starts in oscillation and fix it in that position. Be careful, in this case, not to set the core too close to the above setting. Otherwise, the operation of the oscillator will become unsteady.

The operating condition of the heterodyne crystal oscillator may be checked by means of the meter set for the RF range provided that its succeeding stages are in operation. If the succeeding stages are not in operation proceed to as follows: Connect the detector shown in Fig. 20 to the OL terminal of the driver unit (X47-0004-00) via capacitor having a small capacity (1 to 2 pF) and repeat the above steps for all bands.



C₁ has a capacity from 1 to 100 pF. Select the capacity of C₁ depending on the magnitude of signal and the impedance of circuit. But, select C₁ with the possible minimum capacity required.

Fig. 20. Detector

(5) Driver Tuning (X40-0018-00, X40-0017-00)

To tune the driver stage, first locate the mixer tuning coil located at the center in the coil pack and the driver plate tuning coil at the final stage power amplifier side and then proceed as follows:

Set the MODE switch at the CW position, the VFO to the center of each band (3.75, 28.8, 21.225, 14.175 and 7.15 MHz), and the DRIVE variable capacitor to the 12 o'clock position.

With the transmitter placed in the transmitting condition, adjust the cores of the mixer and driver tuning coils while switching the BAND switch in the order of the 3.5, 28.5, 21, 14 and 7 MHz positions until the meter set for the RF range gives the maximum deflection for each range mentioned above. If the meter is set for the ALC range, the driver stage may be adjusted more finely excepting the 28 MHz band.

Since the coils in these stages are connected in series as well as parallel to each other, perform the adjustment with sufficient care so as to keep the adjustment procedure in the proper sequence and the test frequency within ± 25 kHz of the center frequency. Otherwise, the driver stage tuned to a band may fail to tune to other band.

Also, be careful enough to rotate the core slowly with adequate force from the direction directly above it. Otherwise, the core may be damaged.

(6) Neutralization of Final Stage Power Amplifier

The adjustment of the neutralizing circuit of final stage power amplifier should be made as follows with the transmitter set for the CW type of emission at the 21.225 MHz band. Then, turn the TRANSVERTOR switch on the rear panel to ON. This applies a negative voltage to the screen grid of the final stage, disabling the final stage.

With a high-sensitivity voltmeter connected to the ANT terminal of the transmitter, adjust neutralizing variable capacitor TC1 (on the top surface of the final stage power amplifier case) until the leaked output is minimized.

As a high-sensitivity voltmeter, the S-meter on the receiver may be used.

(7) Adjustment of AM SET VR

To adjust the AM SET VR control proceed as follows: First, make adjustment of the driver and final stages for maximum output with the MODE switch set at position CW for 14 MHz band.

Then, adjust the CAR LEVEL control on the front panel until the meter reads an Ip of 200 mA with the METER switch set at the ALC position.

Turn the MODE switch to AM under the above condition and adjust the AM SET VR control within the cabinet case until the meter reads an Ip of 150 mA.

2. SYMPTOMS DUE TO IMPROPER ADJUSTMENTS

(1) Carrier, VFO or Heterodyne Oscillator

If any one of the carrier, VFO and heterodyne oscillators fails to operate, this transmitter provides no transmitting output.

If the transmitter fails to provide its output for all bands, check the carrier or VFO oscillator for normal oscillation. If the transmitter fails to deliver its output for a specific band, check the heterodyne oscillator for normal oscillation.

(2) Carrier Balance

If the balanced modulator suffers from an unbalanced carrier, the meter set for the RF range cannot be zero when the SSB signal input is applied to the transmitter after all stages have been tuned completely with the MODE switch placed in the CW position. In this case, a carrier may be received by a monitor receiver.

(3) AM Carrier Level

If the AM carrier level is too high, the transmitting signal may suffer from an improper peak of modulated signal with the resultant deterioration of sound quality.

(4) IF Stage and Coil Pack

The meter set for the ALC range deflects dull and the transmitting output is reduced.

(5) Neutralizing to the Final Stage

If the neutralizing circuit to the final stage fails to operate properly, the final stage tube may start in self-oscillation (Ip of more than 60 mA flows even when no SSB signal presents) or the transmitting signal may suffer from an increased distortion and splatter.

(6) Final Stage Bias Circuit

If the bias circuit to the final stage fails to operate normally, the final stage tube S2001A will suffer from an increased plate loss with the resultant shorter life or the transmitting signal will suffer from an increased distortion and splatter.

(7) VOX Circuit

If the VOX circuit operates improperly, the VOX relay may fail to operate or release even if a voice input is applied to the microphone. Also, even when the relay operates, it starts in operation with a conspicuous delay.

(8) Lowered Line Voltage

When the input line voltage is lowered, the transmitter generally reduces its transmitting power output. This calls for users' special attention when this transmitter is operated at a place where the line voltage fluctuates greatly.

When the voltage is specifically lowered, the transmitter will suffer from a shifting oscillator frequency, a stopped oscillator or no transmitting power output.

If the line voltage is raised, on the contrary, the transmitter may suffer from damaged vacuum tubes and transistors.

3. MAINTENANCE

(1) Removal of Cabinet Case

Remove 4 each of black screws from the top plate and 6 black decorative screws each from the left and right side plates. Then lift up the cabinet case upwards and the case is removed from the chassis.

Remove 7 screws from the bottom plate and the bottom plate can be removed from the chassis. Note that the four legs provided have nothing to do with removal of the bottom plate.

Use a + screwdriver for removal of the screws. When removing the screws, place the removed screws in a container prepared. This will prevent the screws from missing and insure a speedy work.

(2) Vacuum Tubes and Transistors

If the final stage tube S2001A is operated under its detuned condition or with a plate voltage higher than 900 V, it suffers from an increased plate loss exceeding its rated value to result in a shorter life. To prevent such loss, it is necessary for users to tune the final stage thoroughly at all times and operate the transmitter with sufficient time spared.

When it happens that any vacuum tube should be replaced, replace it with the new one made by the same manufacturer, if possible. Don't try to use a used tube as a replacement

tube. Otherwise, the transmitter will be subjected to an unexpected trouble.

Transistor may be damaged from shorting caused during mere a pattern check. Be careful, therefore, to proceed to the pattern check with sufficient attention.

insulation.

(3) Resistors and Capacitors

If any resistor becomes faulty, replace it with a new one having a resistance of $\pm 10\%$ to the previous resistance. For instance, a $300\text{ k}\Omega$ resistor may be used in lieu of a $330\text{ k}\Omega$ resistor.

The above also applies to replacement of any faulty capacitor excepting the withstand voltage. Unless otherwise specified in the schematic diagram, the rating for this withstand voltage is 500 WV for those used in a vacuum tube circuit.

(4) Gear

Thoroughly clean and lubricate with machine oil the gearing such as the double gears of a dial, which are always subjected to friction, once a year. This alleviates the friction of gears.

(5) Pilot Lamp

This set employs tubular type pilot lamps having a current carrying rating of 300 mA at 8 V, which is available at the dealer where you have purchased the set.

As for replacement of the pilot lamp installed with the meter, remove the set screws on the top of the front panel which holds the meter in position, tilt the meter backward and you can replace the lamp quite easily.

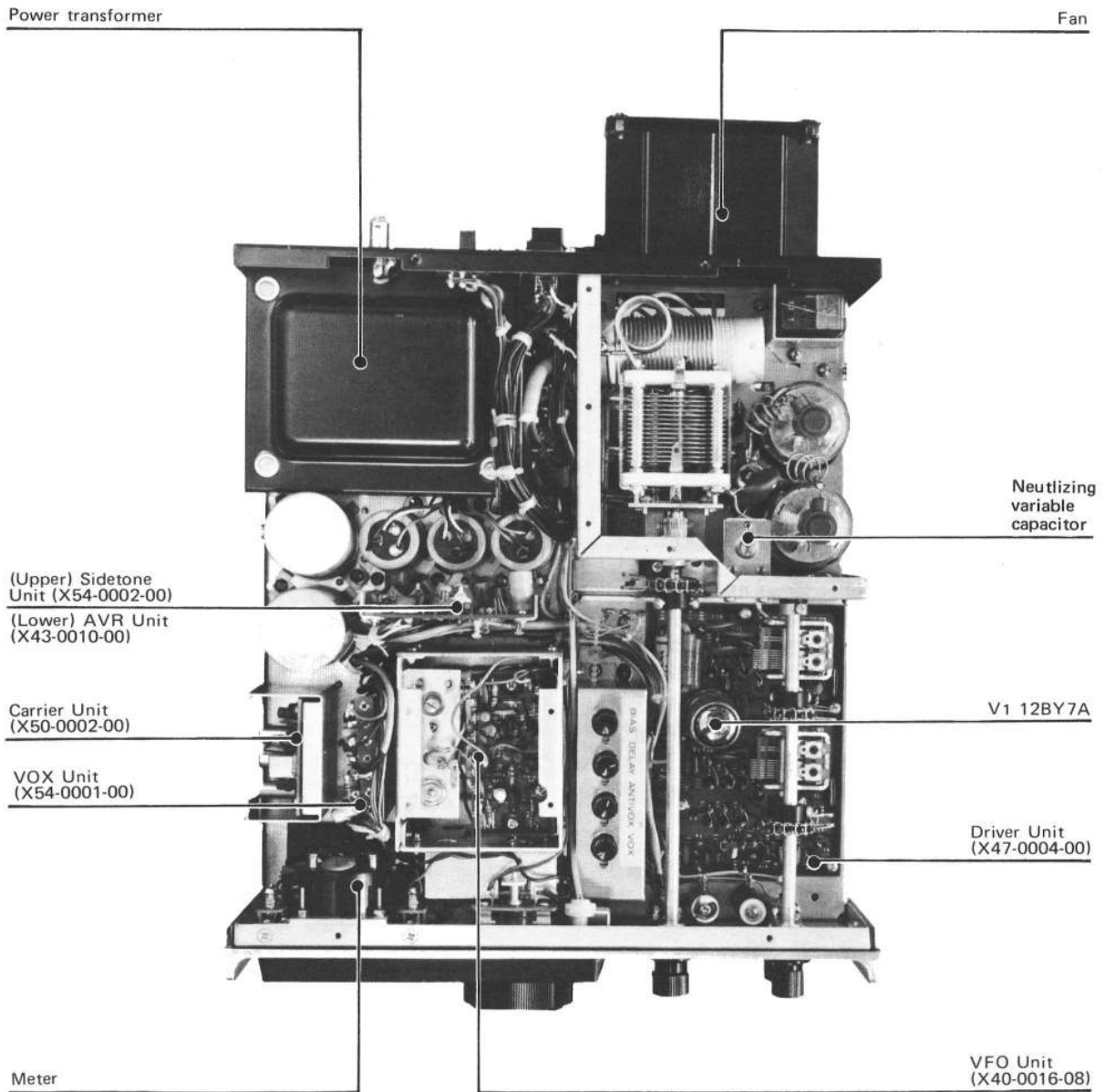
(6) Cleaning

The control knobs and the like become dark owing to the rust generated by sweat or handstained when they are service for a long time. Hence, remove the knobs as required and wash them in neutral cleaner. And you may enjoy a smooth and favourable operation to the transmitter using the clean knobs.

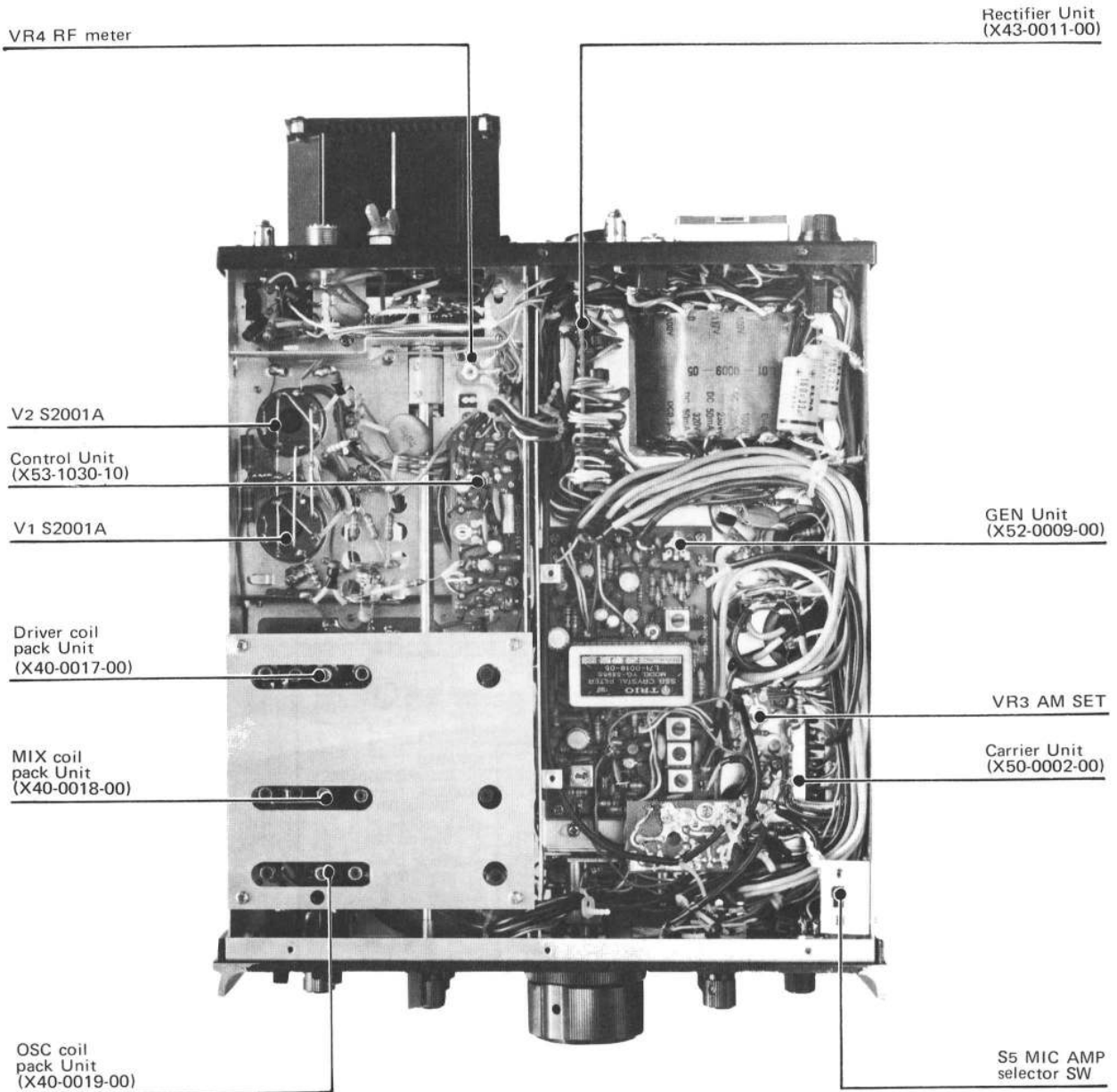
To remove the dust and stains from the panels and case, blast them with LP shower and the like and then wipe them clean with soft, dry cloth. This makes the transmitter take on an entirely new charm.

Also, clean the interior of the transmitter set once half-year since the dust and other are accumulated within the set and turned into such trouble as improper contact or

TOP VIEW OF THE T-599D(Fig 21)



BOTTOM VIEW OF THE T-599D(Fig 22)





Manufactured by TRIO ELECTRONICS, INC., Tokyo, Japan

