

**INSTRUCTIONS FOR  
SSB ALL BAND  
DELUXE TRANSMITTER  
ST-700**



## GENERAL DESCRIPTION

**SSB All-Band Deluxe Transmitter Model ST-700** is a handy A3, J1, A1, A3H transmitter featuring top performance and operating ease, and designed specifically for use in a ham station. It covers all amateur bands that lie between 3.5 Mc and 28 Mc (80 m to 10 m).

In order to insure utmost stability, transmitting tubes S200/6146 have been used in the final output stage to execute parallel operation, which makes a stable 100 W output available. In addition, the use of a mechanical filter designed for SSB application assures

a high performance of -500 dB or more with respect to carrier and sideband suppression.

For VFO, a backer circuit and a 3-stage double-gear precision tuning mechanism have been used, which assure excellent stability and frequency reading accuracy.

Complete with VOX, anti-trip, side-tone oscillator, press-to-talk, break-in keying, ALC, output meter and other accessory circuits, ST-700 is versatile and easy to operate.

Furthermore, the combined use of the STAR SR-700A communication type receiver makes "transceiver" operations possible.

## SPECIFICATIONS

- Transmitting frequency range**

Band	Frequency coverage
3.5 Mc	3.4 to 4.0 Mc
7.0 Mc	7.0 to 7.6 Mc
14.0 Mc	14.0 to 14.6 Mc
21.0 Mc	21.0 to 21.6 Mc
28.0 Mc	28.0 to 28.6 Mc
28.5 Mc	28.5 to 29.1 Mc
29.1 Mc	29.1 to 29.7 Mc
- Type of emission and maximum output**

A3J (SSB)	100 W (LSB, USB)
A1 (CW)	100 W
A3H (SSB, WC)	20 W
- Circuit system**

Filter type (mechanical filter)
- Modulation system**

Balanced modulation (with ring modulator)
- Carrier suppression**

-50 dB or more
- Superior sideband suppression**

-50 dB or more
- Tertiary cross modulation distortion**

-2.5 dB or more
- Output impedance**

50 ohms to 150 ohms—unbalanced output
- Frequency stability**

100 c/s or less after warmup  
100 c/s or less even with  $\pm 10\%$  power voltage variation
- Modulating frequency characteristic**

400 to 2,700 c/s
- Power input**

AC 100/115/230 V, 50~60 c/s
- Power consumption**

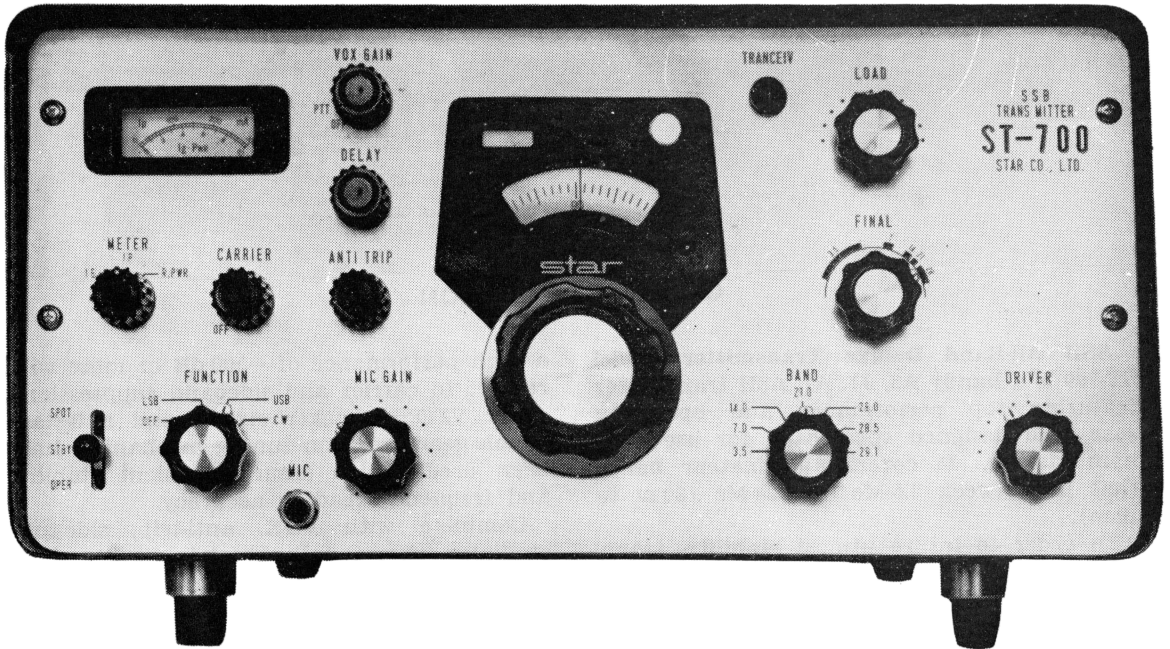
Approx. 285 VA

## CONSTRUCTION

### 1. Circuits and operating tubes

The overall circuit construction is shown

in Fig. 1. The names of all sections and operating tubes follow:



Microphone amplifier	V1	6EA8	Frequency scale calibration	
Carrier oscillator	V2a	6EA8 (T)	Band switch	BAND
Balanced modulator	CR1 to 4	1N34A	Driver tuning	DRIVER
Sideband mixer	V3	6AQ8	Final stage tuning	FINAL
Sideband oscillator	V4	6AQ8	Antenna load adjustment	LOAD
IF amplifier	V5	6DK6	Power OFF/LSB/VSB/CW switch	FUNCTION
VFO mixer	V6	6DK6	Transmit-receive and calibrate switch	SPOT-STBY-OPER
VFO	V7	6EA8	Modulation gain adjustment	MIC GAIN
All-band mixer and oscillator	V8	6AW8A	VOX ON-OFF and gain adjustment	VOX GAIN
Driver	V9	12BY7A	VOX delay resetting	DELAY
Power amplifier	V10, V11	S2001/6146	Anti-trip gain adjustment	ANTI TRIP
ALC	CR5, 6	1S182 × 2	Carrier injection	CARRIER
VOX amp. and relay control	V12	6EA8	Meter switch	METER
Anti-trip amplifier	V2b	6EA8 (P)	Transceive switch	TRANSCIVE
Side tone oscillator, cathode follower amplifier	V13	6EA8	REAR PANEL	
Voltage stabilizer discharge tube	V14	OB2	Bias voltage adjustment	BIAS
VOX	CR8, 9	1S182 × 2	CW monitor speaker volume control	SIDE TONE VR
Trip relay control	CR8, 9		Power output adjustment (meter)	RL POWER
Power output indicator	CR7			
Power rectifier-silicon diode	SR1 to 7	(SE-05B)		
<b>2. Operating controls</b>				
<b>FRONT PANEL</b>				
VFO tuning				

### 3. External connection

Antenna terminal (coaxial connector)	ANT
Receiver antenna terminal	RX. ANT
Ground terminal	GND
VFO output terminal (6R pin jack)	TROV
Press-to-talk terminal	PTT
Anti-trip terminal	ANTI TRIP
Mute terminal	MUTE

Speaker terminal	SPKR
Auxiliary terminal (6R pin jack)	AUX (without wiring)
Key jack	KEY
Remote octal socket	REMOTE

### 4. Dimensions

385 mm wide by 185 mm high by 370 mm deep (excluding leg height).

### 5. Weight

Approx. 19.6 k

## CIRCUIT DESCRIPTION

### 1. Microphone amplifier

Use a crystal or a high-impedance type dynamic microphone with ST-700. Output from the microphone is 2 to 20 mV in open voltage during general conversations at a distance of 10 to 30 cm from the microphone. This voltage is given approx. 40 dB amplification by the pentode section of V1 6EA8. Since the input impedance of the balanced modulator is approx. 600 ohms, impedance matching is accomplished with the triode section as the cathode follower. This section simultaneously serves as the VOX amplifier, thus providing very high gain. In order to prevent inductive hum from degrading the S/N ratio, shielded wire has been employed for that portion of the AC power cord which passes near this part. In other words, consideration due a hi-fi amplifier has been given to the wiring circuitry.

### 2. Carrier oscillator

Oscillation of 45.3 kc carrier is accomplished by the use of a 6EA8 (T) crystal oscillator V2a. The plate tuning circuit employs the tap-down system to eliminate the possibility of any adverse effect on stability. Between the carrier frequency and the frequencies in the pass-band of the mechanical filter, the carrier suppression and tone quality are easily affected, and a trimmer is provided for correction purposes. The secondary side of the plate tuning circuit not only supplies the carrier to the balanced modulator but also delivers the output for injection of the carrier for AM and CW to the output of the mechanical filter via the CARRIER control.

### 3. Balanced modulator

AF output from the microphone amplifier and 453.5 kc carrier output are fed to the balanced modulator where they are converted

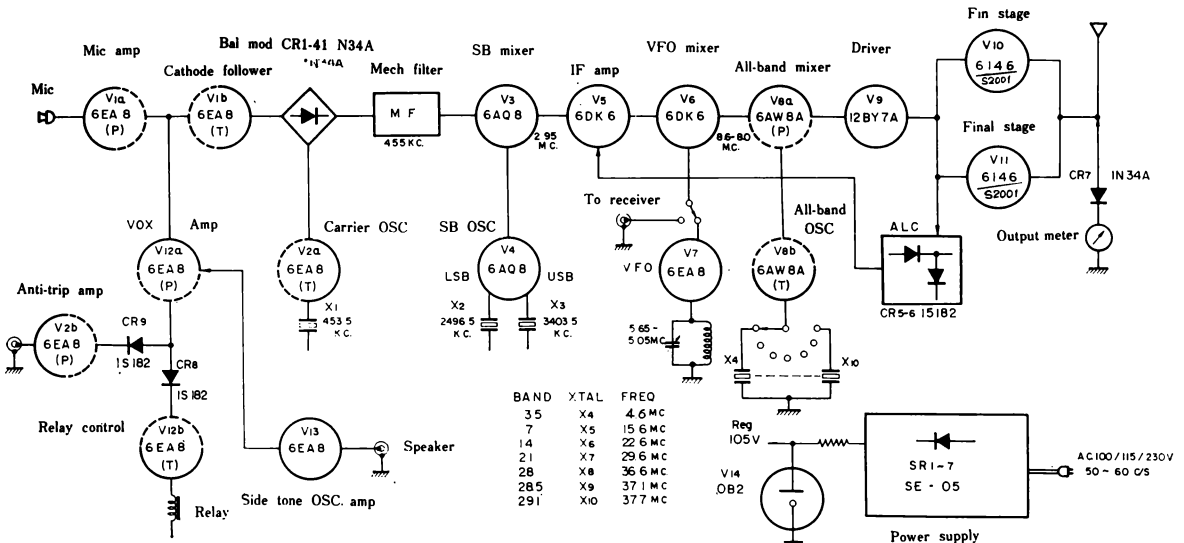


Fig. 1 Block diagram of ST-700

into modulation double sideband waves with the carrier suppressed. The circuit composed of the four germanium diodes is called a ring modulator, i.e., a high-performance modulator one would expect in a professional SSB transmitter. This circuit is a switching circuit in which the diodes correspond to switches. The carrier operates these switches. It is a symmetrical circuit so that adjustment of the balance control and trimmer makes it possible to reduce the carrier to practically zero.

#### 4. Mechanical filter

The mechanical filter operates on the principle of mechanical resonance and has very steep skirt characteristics as shown in Fig. 2. The double sideband waves with carrier suppressed are caused to pass through the filter where the lower sideband is filtered out to make the upper sideband available as an SSB signal. The carrier frequency is intermediately placed in the skirt of the mechanical filter to assure improved carrier suppression. On the output side, therefore, a suppression of -50 dB or more can be obtained.

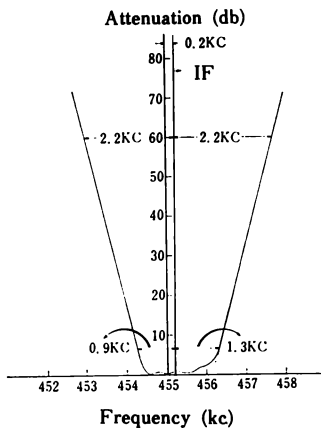


Fig. 2 Characteristics of mechanical filter

#### 5. Sideband mixer

While SSB from the mechanical filter is USB, V3 6AQ8 converts 453.5 kc SSB into 2950 kc and simultaneously allows the use of both LSB and USB by switching the frequency of the V4 sideband oscillator.

LSB is obtained as follows:

2496.5 kc (sideband oscillation) + 453.5 kc  
(carrier oscillation = 2950 kc (first intermediate frequency))

USB is available as follows:

3403.5 kc (sideband oscillation) - 453.5 kc

(carrier oscillation) = 2950 kc (first intermediate frequency)

In this circuit, SSB signals are applied out of phase to each grid of the duplex triode. At the same time, signals from the sideband oscillator are applied in phase to the grids of the duplex triode. At the same time, signals from the sideband oscillator are applied in phase to the grids of the duplex triode. As a result, the plate output in the case of SSB signals is combined in push-pull operation but signals from the sideband oscillator do not appear in the output because of mutual cancellation on the plate side.

#### 6. Side band oscillator

In the V4 6AQ8, the respective triodes serve as 2496.5 kc and 3403.5 kc adjustment-free crystal oscillators. The cathodes are switched by the FUNCTION switch to obtain LSB or USB output. Leakage of output from this section may cause harmful spurious radiation and this section is carefully shielded.

#### 7. IF amplifier

The 2950 kc signal is amplified by V5 6DK6. Since ALC (automatic level control) is provided in this stage, a hi-gm tube 6DK6 is used to allow for amplification with sufficient margin.

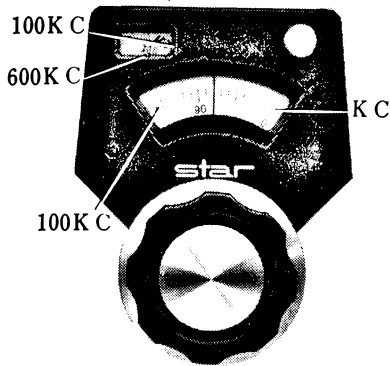
The tuning circuit provided in the grid is a 2496.5 kc trap.

#### 8. VFO mixer

The 2950 kc SSB signal is mixed with 5650 to 5050 kc here for conversion into 8.6 to 8.0 Mc. The injection method is cathode injection of V6 6DG6. Between the VFO and the cathode, a low-pass filter with a cut-off frequency of approx. 7 Mc is provided to filter out the higher harmonics of the VFO. In addition, the output of the VFO of "transceiver" type receiver also can be injected from here.

#### 9. VFO

Oscillation of 5050 to 5650 kc is accomplished by a high-stability backer circuit in which all electrodes are grounded by large capacitance. The oscillator circuit is made up of components noted for highest quality, such as a frequency-linear variable condenser, a steatite bobbin and similar quality items. Precise temperature compensation is thereby assured. The tuning mechanism is a three-stage double gear system in which one rotation is equivalent to approx. 30 kc. A frequency range of 600 kc can be read directly. The OV VFO output is made available by means of a cathode follower.



### 10. All band mixer and oscillation

The 8.6 to 8.0 Mc SSB signals are mixed with the crystal oscillator output of the triode part of V8b by V8a, a 6AW8 (P) all-band mixer for conversion into individual amateur bands from 3.5 Mc to 29.7 Mc by the upper heterodyne.

It should be noted that the 80 m band utilizes lower heterodyne conversion, and that the LSB, USB and frequency scale of the 80 m band is the reverse of the other bands (indicated by red letters). Of the crystal oscillator circuits of the triode section, those for the 80 m and 40 m bands are adjustment-free circuits while those for other higher bands are 3rd over tone circuits. The adjustment-free circuit is lower in oscillation output than the over-tone circuit, and accordingly, the mixer output is suppressed at low frequencies. However, the higher the frequency, the lower the gain, hence an aligned output is obtainable as a result.

The mixer of the pentode section is a grid injection type mixer designed to obtain effective gain.

### 11. Driver

Signals converted into all bands are given more than 30 dB amplification by V9 12BY7A to obtain sufficient output to drive the final stage. The output in this stage is approx. 1 W but is increased to 100 W in the final stage, so that the introduction of even slight feedback can cause oscillation. For this reason, all stages that follow must be carefully shielded. As a result, the driver 12BY7A whose Cpg (grid-plate capacitance) is small (0.063 PF) has been chosen. In the tuning circuits of the grid and plate sides, the tracking is accomplished by the use of 2-section 2-gang variable capacitors.

### 12. Final stage

The final stage is an S2001/6146 parallel connection. The plate voltage is approx. 840 V, the screen voltage 250 V, and the grid bias is so adjusted that approx. 50 mA cathode current will flow as the base current.

### 13. VOX

VOX (Voice Operating Control) automatically switches transmission and reception according to voice delivered to the microphone.

Voice signals shunted from the output side of V1a are given further amplification by V12a 6EA8 (P) and are rectified by the silicon diode 1S182. The rectified voice signals are converted into DC positive voltage by the time-constant circuit, and are applied to the control grid of V12b 6EA8 (T). Since negative bias voltage is impressed on the grid of V12b, it is usually maintained in cut-off condition. When the output of the voice signals delivered from the microphone exceeds the cut-off voltage, V12pr current is allowed to flow, which

### 6EA8

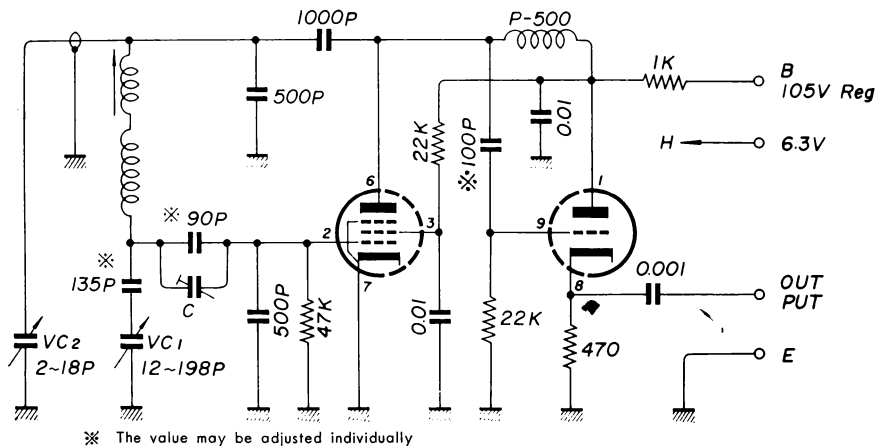


Fig. 3 Circuit diagram of 6EA8

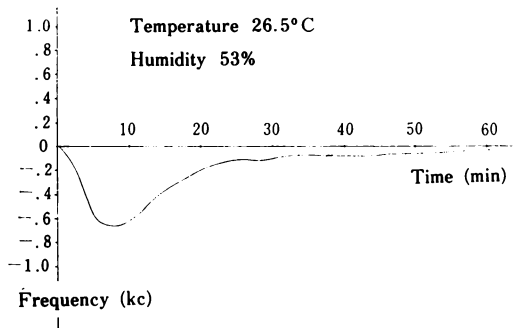


Fig. 4 VFO drift characteristics

actuates the relay connected to the plate, for switch-over from reception to transmission.

#### 14. ANTI TRIP

In VOX transmission and reception, signals from the other station may enter the microphone and operate the VOX and cause repeated transmission and reception, thus giving rise to a condition of oscillation. The ANTI TRIP device prevents this condition.

The incoming signals are led out from the speaker terminal of the receiver for amplification by V2b 6EA8 (P). The amplified signals are rectified by the silicon diode 1S182 and are made available as negative voltage.

If this voltage is applied to the VOX current diode as inverse bias, the VOX relay remains inoperative except when the signal delivered from the microphone exceeds the inverse bias voltage plus grid bias. Correction is accomplished by proper adjustment of the speaker and microphone positions and the anti-trip control. When proper correction is accomplished, the VOX is no longer operated by voice from the speaker.

#### 15. Press-to-talk (PTT)

The transmitter in a press-to-talk condition when the VOX GAIN control is placed in minimum position. When so adjusted, VOX does not operate, but the transmission-reception switching relay is ready for operation upon call. The bias to be supplied to the relay control tube is available from the microphone

jack. When the press-to-talk switch of the microphone is depressed, the set is in transmitting condition.

#### 16. Side tone and break-in keying

In CW operation, V13 6EA8 serves as an approx. 1000 c/s oscillator, and connection of a speaker makes it possible to monitor CW transmission as a side tone. If VOX is operated with this signal, break-in keying is introduced for speedy operation. The side tone output can be reduced by the volume control to prevent disturbance. When the volume control is placed in maximum position, it is possible to obtain sufficient sound for demonstration purposes in schools or radio clubs. A special monitor speaker is not necessary. The speaker of the receiver can be used for this purpose by means of the built-in relay.

#### 17. Power supply

The power supply is fully solid-state composed of silicon diodes. A large-capacity power transformer has been selected to provide sufficient margin. In addition, careful arrangement of the B terminal is intended exclusively for the final stage and assures excellent regulation. Thus, as the power supply for the final stage and the other circuits are separate, excellent power supply regulation is achieved. As a result, by taking the screen voltage of the final stage in this manner, voltage variation is reduced to a minimum without the use of a special stabilizer.

#### 18. ALC circuit

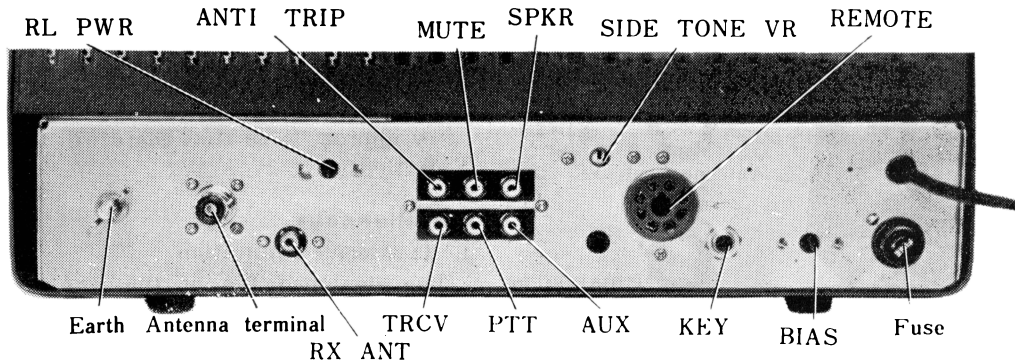
As current begins to flow through the grid of the final-stage tube, an AC voltage is produced in the series resistance of the grid circuit because of changes in the signal voltage. This AC voltage is rectified by two germanium diodes to make DC negative voltage available for application as bias voltage to the control grid of the IF amplifier tube 6DK6. Should the final stage tube be over-excited, the amplification degree of the IF amplifier tube is automatically reduced to prevent distortion. Under CW operation, it is grounded, hence no voltage application.

## OPERATING INSTRUCTIONS

#### Preparations for transmission

The power requirement for the ST-700 is AC 100 V, 115 V or 230 V 50/60 c/s. The set, however, will operate normally between 90 and 110 W.

1. Place the FUNCTION switch located at the lower left of the front panel at OFF.
2. Set the transmission-reception change-over switch to STBY.
3. Connect a dummy load (50 ohms or 75



ohms) or a lamp to the antenna output terminal.

4. Set the band switch to a desired band.
5. Place the carrier injection VR (carrier) located at the left of the front panel at OFF.
6. Place the VOX, ON-OFF & GAIN control VR (VOX, GAIN) located at the upper left of the front panel at OFF.
7. Connect the AC power cord to the power supply.

In addition to the above, adjust the key injection mute, anti-trip and VFO circuits properly to make necessary preparations for remote work with the receiver. Be sure to ground the ground terminal securely.

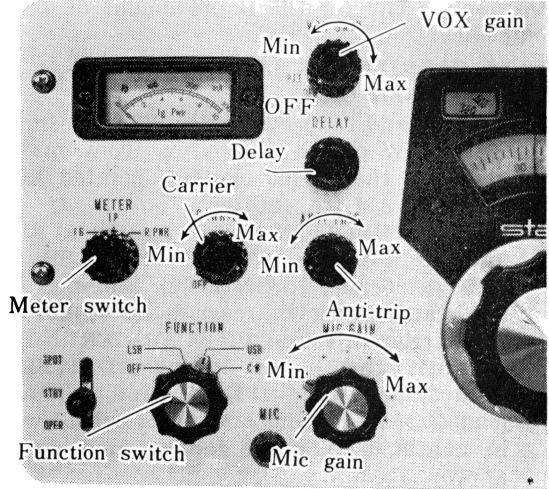
**Emission of radio waves**

**SSB (A3J)**

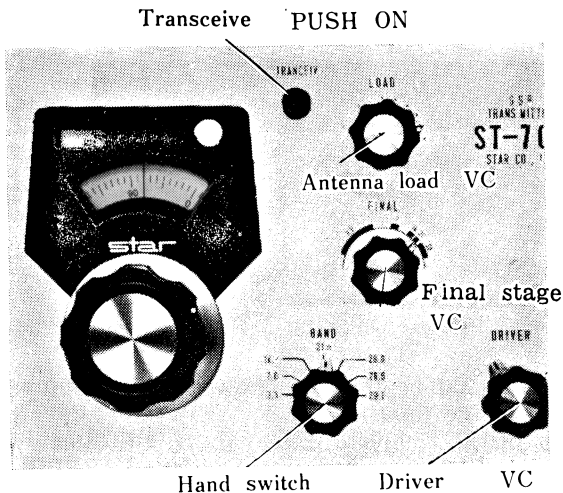
1. Set the FUNCTION switch located at the lower left of the front panel to LSB, and switch the power supply on. Allow approx. 10 to 15 minutes for warmup until the operations of the VFO and other circuits become stable.
2. Set the SPOT-STBY-OPEN switch to OPER. The meter located at the upper left of the front panel will show the current which will flow through the plate of the final-stage tube when the meter switch is placed at IP. In the ST-700, bias is pre-adjusted so that a current of approx. 50 mA will flow. If there is a large departure from this value, adjust the bias control VR (BIAS) located in the rear of the set.
4. Set the meter switch (METER) to output indication (R. RWR) and adjust the final stage tuning (FINAL) and antenna load variable condenser (LOAD) so that maximum output will be obtained. At this point, the indication of  $I_p$  will be 230 mA or thereabouts at maximum input. In order to eliminate the possibility of overheating the final stage tube, sufficient care

should be taken to prevent the detuning of the final stage.

5. After completing the above adjustments, rotate the carrier injection VR (CARRIER) fully counter-clockwise to OFF, insert the microphone into the microphone jack, set the modulation gain control VR (MIC, GAIN) to a proper position, and start transmission. By so doing, FB SSB radio waves will be emitted.
6. Switchover between LSB and USB can be made easily by setting the FUNCTION switch to either LSB or USB. Note that the USB and LSB are reversed in the 3.5 Mc band. By international convention, the ham bands are limited to LSB for bands below 7Mc, and USB for bands above 7Mc.
7. When an antenna is connected to the transmitter, the final stage tuning (FINAL) and the antenna load (LOAD) should be re-adjusted so that maximum output will be available. The antenna coupling circuit is of  $\pi$  matching type and is designed to achieve optimum conditions with output







impedance of from 50 to 75 ohms. However, it can be used satisfactorily up to 150 ohms approximately. If, however, antenna impedance exceeds 150 ohms as in the case of a long wire antenna system, SWR may become large and operation unstable because of reflections. In such a case, it is advisable to use an antenna coupler.

#### CW (A1)

Set the FUNCTION switch located at the lower left of the front panel to CW. While pressing the KEY, rotate the carrier injection VR (CARRIER) properly clockwise. While injecting the carrier by degrees, adjust the driver tuning (DRIVER), final stage tuning (FINAL) and antenna load (LOAD) until the desired output is obtained. The transmitter has a built-in tone oscillator to make the CW break-in possible. At the same time, connection of an external speaker makes it possible to monitor CW for the improvement of QSC efficiency.

#### FULL CARRIER SSB (A3H), REDUCED CARRIER SSB (A3A)

As a full and reduced carrier SSB transmitter with 20 W output at approx. 100 W maximum input, the ST-700 can be operated like an ordinary AM transmitter.

1. Set the FUNCTION switch located at the lower left of the front panel to LSB or USB (according to Section 6, Emission of SSB) and inject the carrier by adjusting the carrier injection VR (CARRIER).

Adjust the driver tuning (DRIVER), final stage tuning (FINAL) and antenna load (LOAD) so that maximum output will be obtained when the indication of  $I_p$  is approx. 130 mA.

In the general DSB transmitter, the full SSB power under 100% modulation is  $\frac{1}{2}$  of the carrier power. To use the ST-700 for full carrier SSB operation, the modulation gain VR (MIC, GAIN) should be reduced by approx.  $\frac{1}{2}$  so that there will be no distortion.

### Miscellaneous.

#### 1. Transceive connection

The combined use of the STAR SR-700A communication type receiver with the ST-700 makes transceive operations possible. Output from the receiver VFO OUT should be connected to the 6P pin jack marked TRCV located in the rear of the set.

Press the VFO output change-over (TRANSCIVE) pushbutton located at the upper right of the front panel, and the button will lock when the VFO output switching is complete. Thus, the VFO of the transmitter is automatically switched to the VFO of the receiver.

The ST-700 and SR-700A use the same common VFO which are produced under rigid quality control. However, there may be a slight difference between the two VFO's. In such a case, adjust the driver tuning (DRIVER) properly until proper driver output is obtained. (Use the connecting cord which is provided for connection of the transmitter and receiver.)

#### 2. Accessories

The following accessories are supplied.

Name	Quantity	Remarks
Cabinet legs	2	Short
Coaxial connector	1	
3-pole plugs	2	Microphone and key
Fuses	2	3A
Pilot lamps	2	8 V swan type
GT plug	1	
Transceive connection cord	1	Approx. 1.2 m

#### 1. Side tone CW monitor break-in

Telegraph monitor and break-in are easily available by the use of the built-in 1 kc phase-shifting type oscillator.

Connect the speaker to the SIDE-TONE-SP terminal located in the rear of the set.

Sound volume can be adjusted easily by the SIDE TONE VR located in the rear of the transmitter. The receiver speaker may be used in common by means of the transmission-reception switchover relay. In this case, of course, no extra speaker is needed.

The FUNCTION switch located at the lower left of the front panel should be placed at CW.

The VOX GAIN VR located at the upper left of the front panel should be rotated fully clockwise from the OFF position. The ANTI TRIP VR (ANTI TRIP) of the same stage should be rotated fully counter-clockwise to the minimum position. Be sure to operate this ANTI TRIP VR, because otherwise the output from the receiver makes the operation unstable.

## 2. VOX ANTI TRIP

Automatic transmission-reception switch-over by transmission with SSB/SSB WC mode can be made easily by adjusting the VOX GAIN VR located at the upper left of the front panel. With the VOX GAIN VR at minimum position, manual operation must be by P.T.T. (PRESS-TO-TALK). The VOX operation of the ST-700 varies somewhat with the value of impressed bias voltage.

A bias control VR is provided on the surface of the chassis. Adjustment of this VR makes it possible to obtain approx.  $-10$  to  $-25$  V DC, although it is present so that  $-15$  V DC will be applied to the VOX and ANTI TRIP circuits. Deepening this bias lowers the sensitivity, and making it more shallow raises the sensitivity. However, avoid making it too shallow, because the VOX and ANTI TRIP circuits become unstable.

Operation of the ANTI TRIP circuit is much the same as that of the VOX circuit except for

the fact that it delivers output whose polarity is inverse to that of the VOX circuit. The ANTI TRIP VR, however, should be normally placed at the fully counter-clockwise minimum position. The gain should be adjusted according to the magnitude of receiver output.

## 3. Delay

For VOX delay re-setting, adjustment of the re-setting time is accomplished by changing the input time constant of the relay control tube V12b. The time is delayed by rotating the VR (DELAY) located at the left of the front panel clockwise from the fully counter-clockwise position. In the ST-700, the adjustment is possible up to approx. 0.5 sec. Set the VR to a proper position.

## 4. Output meter (R. PWR. METER)

The DC current meter located at the left end of the front panel can be switched to the following three positions.

- (1) Measurement and monitoring of final stage tube  $I_g$
- (2) Measurement and monitoring of  $I_p$
- (3) Monitoring of final stage output

The last position (3) can be conveniently used for the adjustment of the final stage output. Pointer swing can be adjusted by the RL. PWR. VR located in the rear of the set.

The output indication is not a direct-reading value but a relative value of output. Therefore, the transmitter should be used in a transmitter where the meter shows a maximum indication.

# MAINTENANCE AND READJUSTMENT

## 1. Case disassembly

Remove the four bottom screws, push the chassis from behind, and the chassis can be drawn out as a unit.

## 2. Panel disassembly and reassembly

When there is a need for disassembling the panel, follow the following procedure.

- (1) Remove all control knobs. Each control knob is held in place with two screws. Unfasten the two screws and pull the control knob out.
- (2) Remove the mounting nuts of switches, controls and jacks.
- (3) Disconnect the wiring of the calibrator and variable condenser.
- (4) Remove the mounting screws located at both ends of the panel.
- (5) Remove the meter mounting screws.

For reassembly, reverse the procedure and tighten the two screws of each control knob securely. The switch control knob should be held in such a way that the opposite push screw of the pointer will fit on the cut portion of the shaft. By so doing, proper indication can be obtained.

## 3. Replacement of illumination lamp

Use any 8 V swan base lamp.

## 4. Replacement of tube

The tubes include several 6EA8's, 6AQ8's and 6DK6's which are interchangeable for checking purposes. In the final stage, either type S2001 or 6146 may be used. After replacement, however, the BIAS should be adjusted so that a cathode current ( $I_k$ ) of approx. 50 mA will flow as base current.

### 5. Servicing of diode

The silicon diodes used for the first high voltage power supply (see schematic) should have an inverse peak current of 1000 mA or more. Diodes whose inverse peak current is smaller (such as E-05b), should be connected in series.

For the second high voltage power supply (see schematic) use diodes an inverse peak current of 600 mA or more (SE-05b). The silicon diode for bias rectification, may be any general diode for TV receiver purpose. For the anti-trip, relay control and ALC circuits, use diodes such as the 1S182 with an inverse peak voltage of 100 V or more. For the balance modulator, use type 1N34A.

The 1N34A provided in the output meter circuit may be replaced by another diode.

If the main tuning control knob fails to rotate smoothly because of accumulation of dust on the main tuning shaft, add a small amount of oil such as sewing machine oil to the first shaft (the shaft of the main control knob) of the main tuning mechanism.

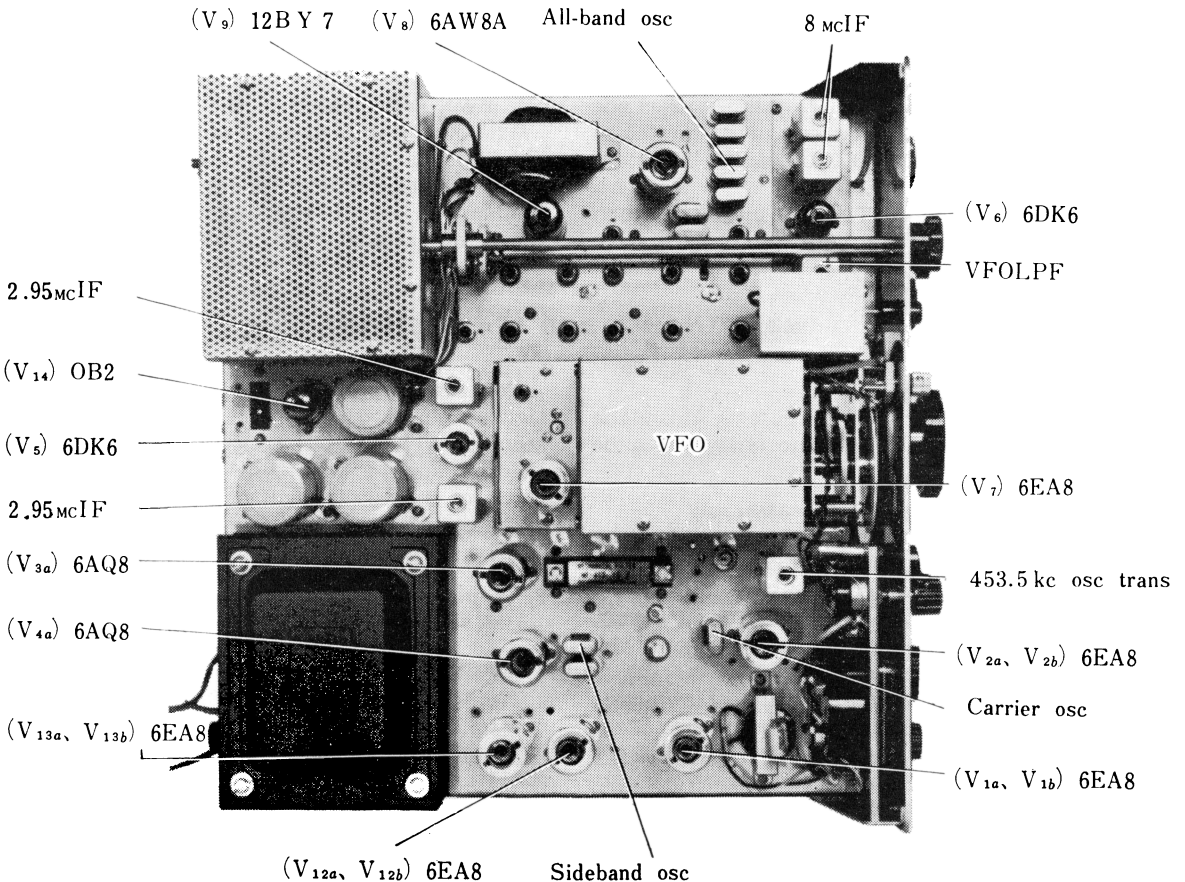
Be sure not to apply oil to the double gear mechanism, because oil will cause backlash.

### TROUBLE

In the event of trouble, first make a voltage check, referring to the voltages written on the wiring diagram:

### 8. Adjustment of crystal oscillator circuit

- (1) Carrier oscillation: For adjustment of 453.5 kc carrier oscillation, adjust the coil (453.5 kc OSC) so that maximum output will be available.
- (2) Sideband oscillation: Adjustment of the 2496.5 kc and 3403.5 kc sideband oscillations is unnecessary because they are produced by adjustment-free circuits.
- (3) All band oscillation: Adjustment of 4.6 Mc and 15.6 Mc oscillations is unnecessary because they are produced by adjustment-free circuits. For adjustment of other band (22.6 Mc, 29.6 Mc, 36.6 Mc, 37.1 Mc and 37.7 Mc) oscillations, connect an RF VTVM to pin 7 of 6AW8A (P) and adjust the core of each oscillating coil so that



maximum will be obtained. It is advisable to hold the core at a point a bit lower than maximum to allow for stable operation.

### 9. Adjustment of balanced modulator

Rotate the MIC. GAIN and CARRIER fully counter-clockwise and place the ST-700 in transmitting condition. Connect the RF VTVM to the output of the balance modulator and make coordinated adjustment of the balance control VR and variable condenser (TC1) until the output is reduced to a minimum. When the receiver is used as a meter, the adjustment should be made so that the S meter will give a minimum indication.

### 10. Adjustment of VFO

The VFO is held down to  $\pm 2.5$  kc of the transmitting frequency in the middle calibration point. If there is a departure, or if it is necessary to reduce the error of a desired frequency alone to zero, adjustment can be made in the same way as in the tracking adjustments of a radio receiver.

The errors are of two kinds; one is the result of frequency expansion and the other that of frequency contraction. If the dial scale shows expansion, determine C by adjusting the oscillator tube 6EA8 alone. In the even of contraction, reverse the procedure.

### 11. Adjustment of 8.0 to 8.6 Mc circuit

Disconnect cord which combines receiver with transmitter, from the receiver, set the dial scale of the VFO to 300 kc, and place the

ST-700 in transceive position (VFO OFF). To G1 (pin 1) of the VFO mixer (V6, 6DK6), supply 8150 kc output from a signal generator and find a point where the 8 Mc IF output reaches maximum. At this point, the band characteristics will be more than 400 kc at 3 dB down.

### 12. Adjustment of all band circuit

Place the DRIVE VC in the center position, supply the output of a signal generator to G1 (pin 7) of 6AW8 (P), and find a point where the output reaches maximum.

The frequency relationships between the BAND and the signal generator are shown in the following table. The 10 m bands (28 Mc, 28.5 Mc, 29.1 Mc) should be adjusted with the band switch at 28.5 Mc position. If there is no signal generator, adjustment can be made with the VFO set at a point corresponding to the desired frequency of each band.

(Example) For 3.5 Mc band adjustment, find the maximum point with 3650 kc as the center frequency.

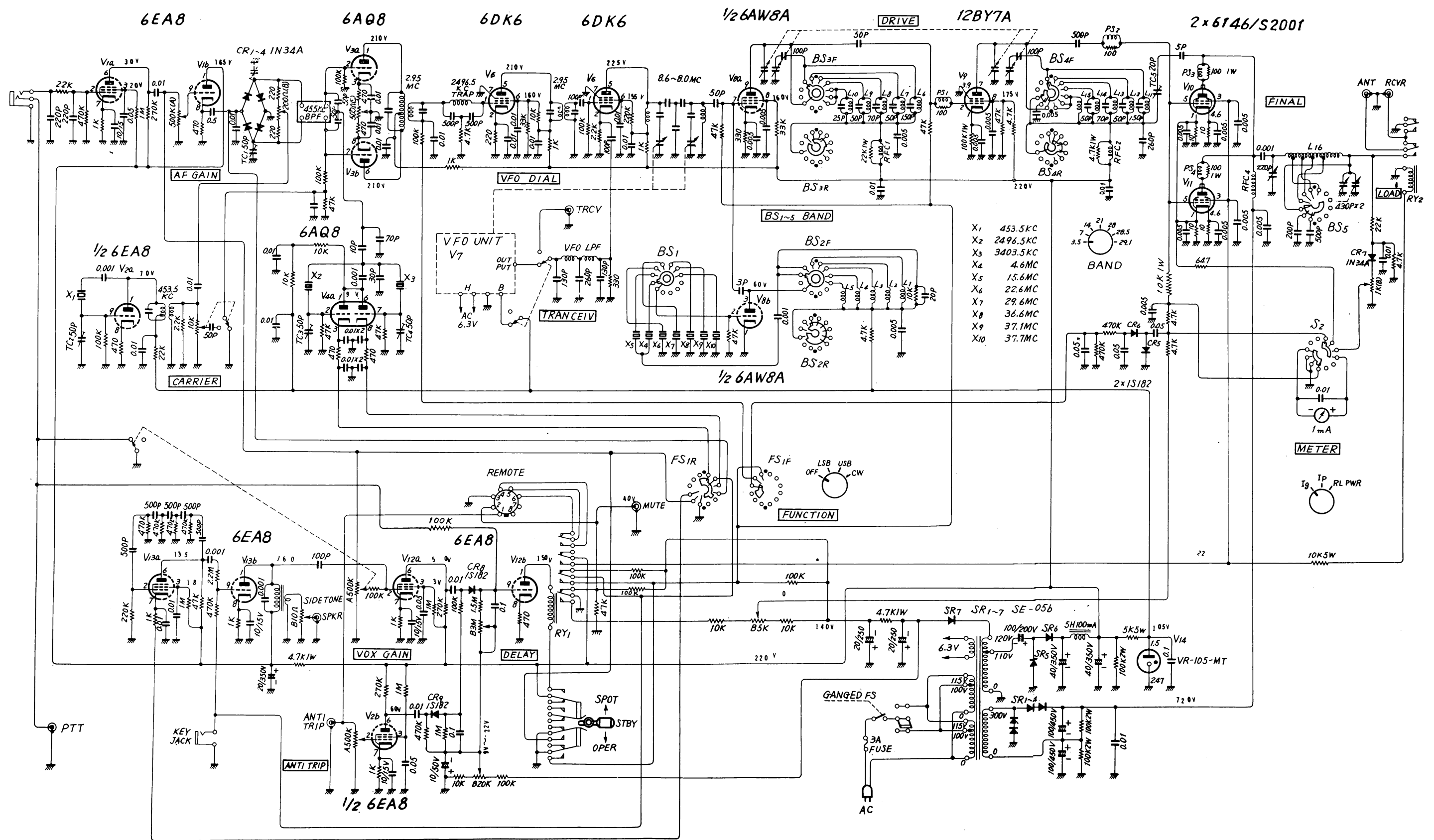
Band	Output Frequency of Signal Generator
3.5 Mc	3650 kc
7 Mc	7200 kc
14 Mc	14.2 Mc
21 Mc	21.2 Mc
28 Mc	29.0 Mc
28.5 Mc	29.0 Mc
29.1 Mc	29.0 Mc

**Although adjustment procedures are briefly discussed above, the ST-700 transmitter is precisely adjusted at the factory with respect to each item before shipment. It is advisable not to adjust internal controls unless you have absolute confidence in your ability to obtain a successful result.**

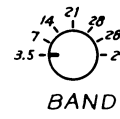
### **DANGER HIGH VOLTAGE**

Care should be taken to ensure full protection against the high voltage (approx. 800 V DC) which is applied constantly to the final stage tube of ST-700 during transmission and reception. Be sure to set the power switch OFF and discharge the rectifier condensers before making any internal check.

Care should be taken to ensure full protection against the high voltage (approx. 800 V DC) which is constantly applied to the final stage tubes of the ST-700 during transmission and reception.



- X1 453.5KC
- X2 2496.5KC
- X3 3403.5KC
- X4 4.6MC
- X5 15.6MC
- X6 22.6MC
- X7 29.6MC
- X8 36.6MC
- X9 37.1MC
- X10 37.7MC



METER

1 mA

IP RL PWR

10K.5W

2 x 6146/S2001

DRIVE

BS1-5 BAND

1/2 6AW8A

6DK6

6DK6

6AQ8

6EA8

AF GAIN

CARRIER

VOX GAIN

1/2 6EA8

VFO UNIT

TRANCEIV

FUNCTION

ANTI TRIP

KEY JACK

PTT

FINAL

ANT RCVR

LOAD

CR7 IN34A

1 mA

IP RL PWR

10K.5W

AC

GANGED FS

220 V

140V

100K

100K

100K

100K

100K

100K

100K

100K

100K

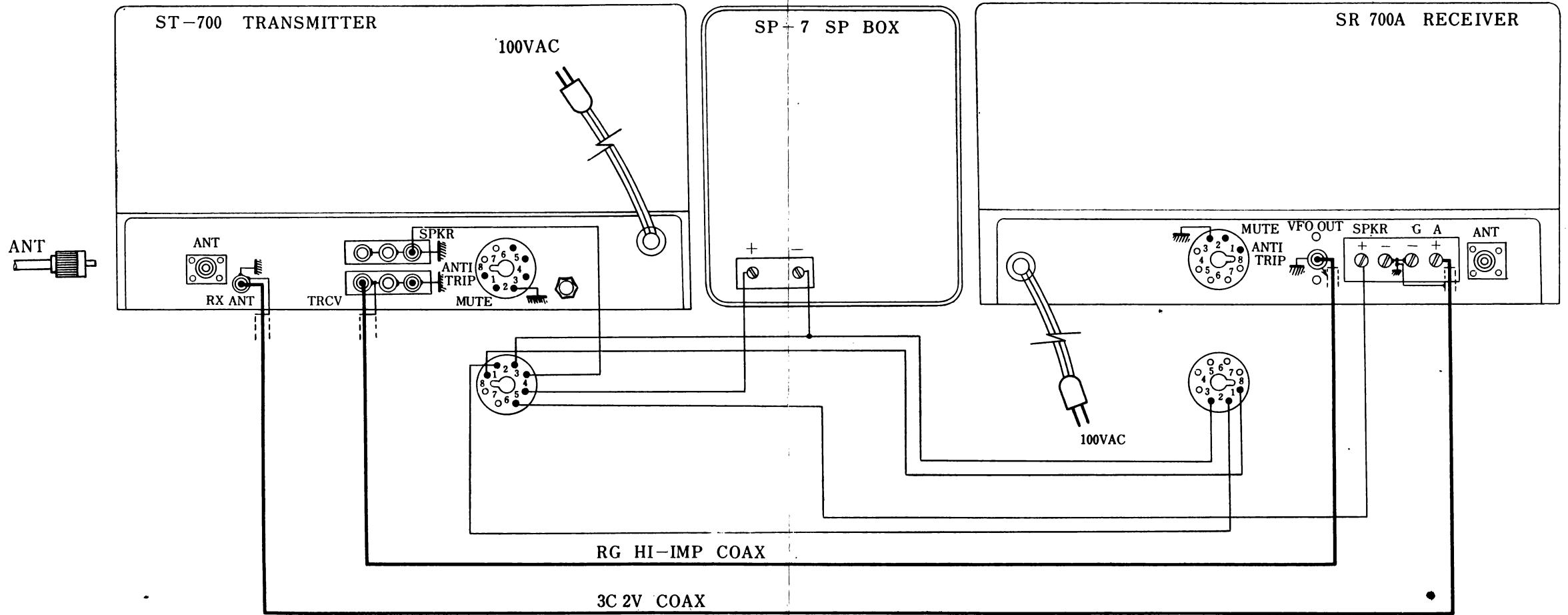
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# 送受信トランシーブ結線図



Receiver Transmitter Interconnection



# SCHEMATIC DIAGRAM OF VFO

## 6EA8

