

 **TRIO**

**ALL BAND
COMMUNICATIONS
RECEIVER**

JR-599



OPERATING MANUAL



ALL BAND SSB COMMUNICATIONS RECEIVER JR-599

(1) The model JR-599 is classified into three models: CUSTOM DELUXE, CUSTOM SPECIAL (M) and CUSTOM SPECIAL (X). These models may be identified by their name plates attached on the front panels. The major differences of these models are as shown in the table below.

Model	IF Filter	VHF Converter
CUSTOM DELUXE	SSB, FM	Not equipped
CUSTOM SPECIAL (M)	SSB, FM, CW, AM	144 MHz converter
CUSTOM SPECIAL (X)	SSB, FM, CW, AM	50 & 144 MHz converter

(2) Optional filters and crystal converters are made available at dealers of our products for users to modify sub-models CUSTOM DELUXE and CUSTOM SPECIAL (M) into models CUSTOM SPECIAL (X) by their own hands.

We are sure that users can entertain themselves with a smart and pleasant QSO after reading this manual.

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SPECIAL FEATURES

1. All solid state circuits insure high quality reception of the amateur bands allocated over a frequency range from 1.8 to 29.7 MHz, the 50 and 144 MHz bands and WWV's 10 MHz standard signal.
2. Field Effect Transistor (FET) used as RF amplifier and mixer — a S/N, cross modulation and image characteristics better than vacuum tube receivers characteristics.
3. IC employed as IF amplifier provides high stability and gain.
4. VFO employing FET provides a highly-stable, low noise-factor output.
5. Precision type double gear mechanism and variable capacitor with linear characteristic provided for main tuning dial covering a 25 kHz band with its one complete turn — a receiving frequency readable to the nearest 500 Hz.
6. Fixed channel oscillators self-contained for 5 channels-spot reception available for 5 specific frequencies.
7. Amplifier type AGC circuit with time-constant selector switch — distortionless reception of a high input signal, which is specifically useful for SSB signal.
8. 100 and 25 kHz crystal controlled calibrator circuits incorporated — precise frequency calibration available for every one complete turn of main tuning dial as well as for use of this set as a frequency measuring set during QSO.
9. Receiver incremental tuning (RIT) circuit incorporated provides means for fine adjustment of receiving frequency or correction of a tuned frequency without manipulation of main tuning dial during a combined transmitter-receiver operation, as practised using a mated transmitter.
10. Ring, linear and ratio detectors equipped for SSB, AM and FM signal receptions respectively.
11. Crystal and LC filters serving as IF filters for SSB and FM receptions respectively, are easily selected as desired by means of a MODE switch depending on the condition of radio interference with a SELECTIVITY switch placed in AUTO position to interlock its electron switch with the MODE switch. "An additional crystal filter incorporated in model CUSTOM SPECIAL — for AM reception."
12. Beat frequency oscillator (BFO) operated under control of crystals for both SSB and CW receptions with an electronic switch provided for selection of an appropriate crystal.
13. RF attenuator inserted in antenna input circuit to provide means for adjustment of RF gain by 0, 20, 40 and 60 dB steps, as selected using a selector switch — enables model JR-599 to serve as a field strength measuring set.
14. Output transformerless (OTL) type audio frequency circuit adopted — high power output with low distortion factor available.
15. Operable from an AC 100, 117, 220 or 240 V source as well as a DC 12 V source, as selected by means of a voltage selector switch.
16. Provision is made for mounting a 50 and 144 MHz crystal converters. [Model CUSTOM SPECIAL (M) self-contains a 144 MHz converter and Model CUSTOM SPECIAL (X) both 50 and 144 MHz converter.]
17. A combined transmitter-receiver operation available when operated in conjunction with model TX-599 Transmitter, a combination transmitter for model JR-599 Receiver.
18. An extremely high-degree transmitter-receiver operation, or the so-called cross-operated VFO, is practicable when a combination of model JR-599 Receiver and Model TX-599 Transmitter are operated with their VFOs placed under control of the mated sets.
19. Communication speaker "SP-55" made available to insure higher-quality reception.

CIRCUIT DESCRIPTION

The block diagram of model JR-599 Receiver is as shown in Fig. 1. This receiver generally operates on the double superheterodyne system, in which the receiving signals ranging from 1.8 to 29.7 MHz including the WWV's 10 MHz standard signal are converted by the 1st mixer into the 1st IF signals ranging from 8.295 to 8.895 MHz, which are further converted by the 2nd mixer into the 2nd IF signal of 3.395 MHz.

For the receiving signals of 50 and 144 MHz the receiver operates on the triple superheterodyne system, in which the receiving signals are converted initially by a crystal converter into the 28 MHz band signals before they are applied to the RF unit.

1. RF Unit (UC1120J)

The signal entered from the antenna passes through the protective diodes to the ANT coil of this RF unit selected in accordance with the frequency band to which the signal belongs. The ANT coils are provided independently for all receiving bands to insure the supreme performance of the receiver set.

The signal passing through the ANT coil is applied to RF amplifier Q1 comprising field effect transistor (FET) 3SK22, where it is amplified enough.

An FET, featuring a better cross modulation characteristic and a high output impedance compared with ordinary transistors, enables the RF coil inserted succeeding to the RF amplifier to provide a higher Q.

The RF coils, similarly to the ANT coils, are provided independently for all receiving bands and mounted as a coil pack on a printed circuit board.

The amplified RF signal output ranging from 1.8 to 29.7 MHz is applied via the RF coil selected corresponding to the receiving band to gate 1 of 1st mixer Q2, to which the 1st local oscillator voltage

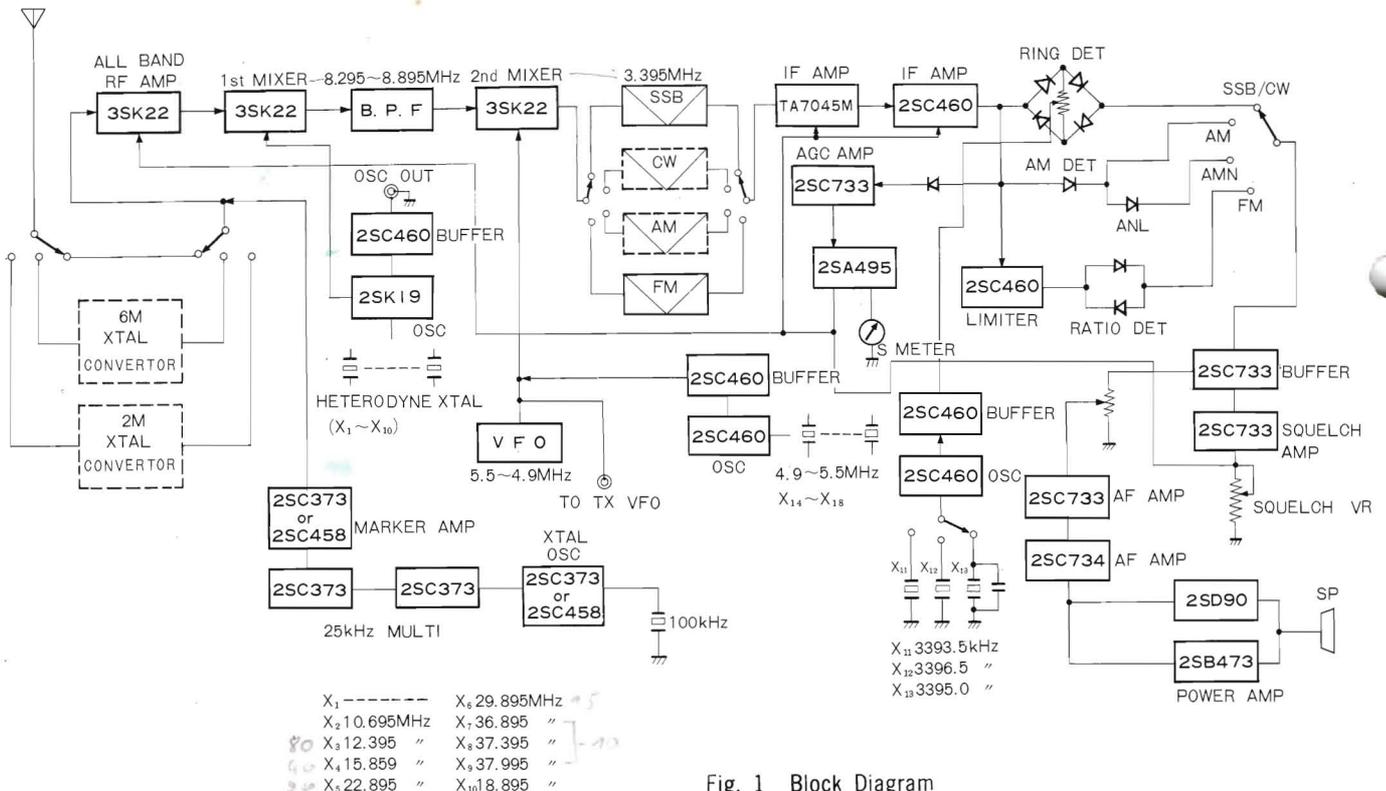


Fig. 1 Block Diagram

is injected through gate 2. Thus, 1st mixer Q2 comprising FET 3SK22 heterodynes its input signal with 1st local oscillator output to deliver the 1st IF signal ranging from 8.295 to 8.895 MHz.

1st local oscillator Q3 is an overtone oscillator employing type 2SK19 FET, to which a voltage of 9V is supplied as the B voltage from the regulated power supply.

The oscillation coils and crystals provided for 1st local oscillator Q3 are incorporated in a coil pack.

The output signal of 1st local oscillator Q3 is taken out from the collector of oscillator transistor and applied to 1st mixer Q2. Part of the output is fed through buffer Q4 comprising type 2SC460 transistor to the remote terminal. Buffer Q4 lowers the impedance of its input signal in order to have the output signal sent from the remote terminal to the transmitter operating under a combined transmitter-receiver basis serve as the 2nd mixer signal.

The RF unit also incorporates part of the AGC circuit extending from AGC control transistor Q5 to the input side of RF amplifier Q2, the gain of which being automatically controlled as follows:

Gates 1 and 2 to RF amplifier Q1 are kept closed when no signal presents with a voltage of 4V developing across Zener diode D3, normally based from the source voltage, and opened with the output of AGC control transistor Q5 when a signal presents to control the gain of RF amplifier Q1. In this case, FET used as RF amplifier Q1 provides a better AGC characteristic compared with ordinary transistors.

2. IF Unit (UC1212J)

The 1st IF signal delivered from 1st mixer Q2 in the RF unit is fed to band pass filter B.P.F. in this IF unit, where the unwanted frequency component of the input signal is rejected. The B.P.F. has a pass band of 600 kHz from 8.295 to 8.895 MHz.

The 1st IF signal is then applied to 2nd mixer Q1 consisting of an FET 3SK22, where it is heterodyned with the output signal of variable frequency oscillator (VFO) to turn into the 2nd IF signal. This signal is fed once to the filter unit and then conducted back to the IF unit, where it is applied to 1st IF amplifier ICQ2 (TA7045M). The

2nd IF signal output of 1st IF amplifier ICQ2 is applied to 2nd IF amplifier Q3 (2SC460), where it is further amplified.

The output signal of 2nd IF amplifier Q3 is fed to three types of detector circuit: a ring detector comprising diodes D4 ~ D7, an AM detector consisting of capacitor C14 (33 PF) and diode D3 (IN60) and a ratio detector comprising a discriminator transformer connected succeeding to limiter Q8 (2SC460). Thus, the ring detector detects the SSB and CW signals applied as its input signals into an AF signal. The AM detector detects the AM signal applied as its input signal into another AF signal. While, the ratio detector ratio detects the FM signal delivered from limiter Q8 (2SC460) into the third AF signal.

Part of 2nd IF amplifier Q3 is also applied via capacitor C13 to an AGC detector circuit consisting of diodes D1 and D2 (IN60). The detected output from diode D1 is fed to an AGC amplifier Q4, where it is amplified and applied to transistor Q5 (2SA495) serving as both an emitter follower and a current amplifier. Thus, transistor Q5 delivers two outputs: One output, which is taken out from the emitter side for the AGC, is fed to 1st amplifier ICQ2 and 2nd amplifier Q3 and, via resistor R22 (10 K Ω), to RF amplifier Q1 in the RF unit. Part of the above output is also fed via resistor R23 (220 K Ω) to squelch amplifier Q6. While, the other output, taken out from the collector side, is directly supplied to the S meter, thereby deflecting the meter depending on the AGC voltage detected.

The time constant of the above mentioned AGC circuit is determined by time constant capacitor C3 inserted succeeding to AGC amplifier Q4 but outside the IF unit.

The rise-up of the AGC circuit depends on the collector-emitter resistance of AGC amplifier Q4 when amplifier transistor Q4 conducts and the operation of the above-mentioned time constant capacitor Q3.

When the AGC circuit is started by the output of 2nd IF amplifier Q3, AGC amplifier Q4 offers a low impedance against time constant capacitor C3 because of its current amplification characteristic and, therefore, conducts at once owing to the time constant capacitor C3 discharged momentarily.

When the output of 2nd IF amplifier is cut off, on the contrary, AGC amplifier Q4 increases its impedance against time constant capacitor C3, thereby bringing itself to the cut-off condition slowly because of capacitor C3 charged gradually. Thus, it follows that AGC amplifier Q4 provides an ideal quick-start slow-release characteristic for its operation. (Note that the above-mentioned AGC operation applies to a case where the FUNCTION switch is placed in the (AGC) FAST position for the quick AGC operation. For the (AGC) SLOW position of FUNCTION switch AGC amplifier Q4 provides an AGC characteristic just opposite to the above characteristic because of the discharge and charge of time constant capacitor C3 conducted reversely.)

By the way, the output of AGC transistor Q5 applied via resistor R23 to squelch amplifier Q6 (2SC733) is amplified there and then applied to the base of buffer transistor Q7 (2SC733), thereby controlling the base voltage with the input signal. As a result, buffer transistor Q7 controls AF amplifier Q1 in the AF unit with its output to perform a squelch operation under control of the input signal.

Buffer transistor Q7, mentioned above, also acts as an emitter follower providing a higher impedance to conduct the detected SSB, CW, AM or FM signal with a lower impedance to the AF volume control outside the IF unit, as selected by the MODE switch from the 2nd IF amplifier Q3 output.

3. Filter Unit (UC1213J)

The filter unit is inserted outside the IF unit between the output of 2nd mixer Q2 and the input of 1st IF amplifier Q2 in the latter unit.

This unit incorporates four filters with diode switches provided for the SSB, CW, AM and FM signals respectively. These filters are so designed that an appropriate filter is selected by means of a diode switch when the MODE switch is placed in the position for a desired receiving signal.

Now, suppose that the MODE switch is placed in the SSB position for reception of the SSB signal. This applies a voltage of 13.8 V to the SSB terminal for the diode switch of filter XF-1. This causes a current to flow from the terminal through resistor R1 (220 Ω) in the two directions to resistors R2 (4.7 k Ω) and R3 (220 Ω). Thus, the

current passing resistor R2 flows as the forward current through diode D1 (1N60) and resistor R21 (1 k Ω) to the earth. While, the current passing resistor R3 flows as the forward current through resistor R4 (4.7 k Ω), diode D2 (1N60) and resistor R22 (1 k Ω) to the earth. Under the above condition a positive voltage of approx. 2.3 V is built up across resistors R21 and R22 to the earth. This applies a backward voltage to diodes D3 through D8 (1N60). As a result, diodes D1 and D2 turns ON and diodes D3 through D8 turns OFF, thereby allowing only the SSB signal to pass through filter XF-1 from 2nd mixer Q1 to 1st IF amplifier Q2. The ratio of the signals under the above ON and OFF conditions of the diodes is approx. 70 dB.

The XF-1 filter requires an external resistance of 4.7 k Ω and an external capacitance of 33 pF. Hence, the filter is so designed that it employs the DC resistors for diode switch as the external resistance of 4.7 k Ω and the internal capacitances of the printed circuit board and coils L1 and L2 (1 mH), the capacitance of lead wires and other stray capacitance as the external capacitance of 33 pF.

Other filters for the CW, AM and FM signals XF-2, XF-3 and a LC circuit are selected by their diode switches just in the same manner as described above when the MODE switch is placed in the CW, AM and FM positions, respectively.

4. VFO Unit (UC0116J)

The VFO Unit incorporates a variable frequency oscillator circuit, which delivers the output frequencies varied over a frequency range of 600 kHz from 5.5 to 4.9 MHz to the 2nd mixer in order to convert the 1st IF signals ranging from 8.895 to 8.295 MHz into the 2nd IF signal of 3.395 MHz.

A sub-dial scale is calibrated for the above frequency range from graduation 0 to graduation 600 at intervals of 1 kHz.

The variable frequency oscillator consists of oscillator transistor Q1 (3SK22) arranged as a modified Clapp oscillator circuit and operate quite stably with buffer transistor Q2 (2SK19).

The output of variable frequency oscillator is delivered through buffer transistor Q2 and one stage of harmonic filter to the output circuit, a Darlington circuit comprising amplifier transistors Q3 and Q4. Hence, the output circuit operate stably against the variation of its load.

The VFO unit also incorporates a receive incremental tuning (RIT) circuit.

The RIT circuit is operated from the RIT voltage generated in its generator circuit, which is incorporated in the UC1010J Unit and actuated by a receiver relay during the reception under the combined transmitter-receiver operation, and varies the VFO frequency regardless of the setting of VFO SELECT dial. The RIT control on the front panel provides means for controlling the above-mentioned RIT voltage.

Note that the VFO Unit should never be removed from its case or modified internally since its adjustment needs a high degree of adjustment technique.

5. Carrier (BFO) Unit (UC1214J)

The carrier unit incorporates a beat frequency oscillator (BFO) circuit.

The BFO circuit, consisting mainly of oscillator transistor Q2 (2SC460), buffer transistor Q2 (2SC460) and crystals X-1, X-2 and X-3 with a diode switch consisting of diodes D1 through D4 (1S1555), inserts a beat or carrier frequency in the ring detector for reception of the SSB or CW signal.

Oscillator transistor Q2 is the Pierce B-E circuit and its output frequencies are adjusted by means of trimmer capacitors TC1 through TC3 inserted in parallel with crystal X1 through X3 respectively.

Selection of a crystal for the BFO in reception of the CW, LSB or USB signal is performed by the above-mentioned diode switch as follows:

Suppose, for example, that the MODE switch is placed in the LSB position for reception of a LSB signal. This applies a power supply voltage of 13.8 V to the LSB terminal of the Carrier (BFO) Unit. As a result, a forward voltage is applied from the LSB terminal through resistor R4 (22 k Ω) and choke coil L4 (1 mH) to diode D4 (1S1555), thereby conducting the diode since the diode offers a low internal resistance because of the voltage applied. This in turn inserts crystal X3 connected in series with the diode via capacitor C6 (22 pF) across the base and emitter of oscillator transistor Q1. Hence, oscillator transistor Q1 starts in oscillation at the X3 crystal frequency, or 3393.5 kHz.

The beat frequency oscillator operates just in the same manner as mentioned above for reception of the USB or CW signal. But, its center frequency

3.395 MHz is shifted by 700 to 800 Hz for reception of the CW signal because the center frequency zero beats with the output signal of 2nd IF amplifier Q3 in this case owing to the fact that the output signal is continuous wave, and this makes it difficult to receive the incoming frequency.

The above-mentioned shift of the VFO frequency is accomplished by the diode switch as follows:

When the MODE switch is placed in the CW position, a DC voltage is applied from the CWR terminal of this carrier unit via resistor R1 (2.2 k Ω) and choke coil L1 (1 mH) to diode D1, turning the diode ON. This grounds crystal X2 through the diode without any capacitor and, therefore, insert the crystal directly across the base and emitter of oscillator transistor Q1. As a result, oscillator transistor Q2 starts in oscillation at a frequency a little lower than the crystal frequency. The beat tone for the CW reception may be adjusted through the use of trimmer capacitor TC1, which provides means for varying the BFO frequency by ± 200 Hz.

The output of BFO oscillator transistor Q1 is applied via a voltage divider circuit comprising capacitor C11 (10 pF) and C13 (22 pF) to buffer transistor Q2. Buffer transistor Q2, acting as an emitter follower, offers an output impedance as low as about 100 Ω , thereby minimizing variation of the output voltage and frequency.

6. 25 kHz / 100 kHz Marker Unit (UC1505J)

The 25 kHz / 100 kHz marker unit incorporates a marker signal generator circuit which generates a marker signal over a frequency range from 3.5 to 28 MHz at intervals of 25 or 100 kHz for calibration of the main tuning dial. Selection of a 25 or 100 kHz marker signal may be accomplished by means of the FUNCTION switch.

The marker signal generator circuit consists mainly of four transistors Q1 through Q4 (2SC373) and one 100 kHz crystal (HC/13U).

Transistor Q1, acting as an oscillator, oscillates with the 100 kHz crystal at a frequency of 100 kHz. Trimmer capacitor TC1 inserted in the collector circuit of oscillator transistor Q1 provides means for fine adjustment of the oscillator frequency.

The output of oscillator transistor Q1 is fed via capacitor C4 (33 pF) to diode D1, through which

it is shaped into a pulsed waveform occurring at a period of one fourth the 100 kHz and drives a free-running multivibrator consisting of transistors Q2 and Q3 at a period of just 25 kHz since the multivibrator has a free-running period of about 25 kHz.

The output of the multivibrator is applied to amplifier transistor Q4, through which it is shaped in the rectangular waveform and delivered to RF amplifier Q1 in the RF Unit.

When the FUNCTION switch is placed in the 100 kHz CAL position the emitter of transistor Q2 is grounded via the MS terminal of this unit, turning transistor Q2 off. This disables the multivibrator and allows transistor Q3 to operate as a mere amplifier. As a result, the 100 kHz pulsed signal from the oscillator transistor are conducted as they are to amplifier transistor Q4 and, therefore, to RF amplifier Q1.

7. Regulated Power Supply Unit (UC1010J)

The regulated power supply unit provides necessary operating voltages for the VFO, BFO and 1st local oscillator. Especially, it supplies a voltage with least variation to the VFO (including the RIT circuit) to prevent the VFO from changing its oscillator frequency with variation of the supply voltage.

The unit consists mainly of four transistors Q1 (2SA497), Q2 (2SC373), Q3 (2SC372) and Q4 (2SC372) and reference diode D1 (RD6A).

Transistor Q1 is the current control transistor, which controls the input current in accordance with an error voltage. Transistors Q2 and Q3 are the error voltage amplifier transistors. Transistor Q4 is the error voltage detector transistor and also serves as the temperature-characteristic cancelling transistor for transistor Q3. Diode D1 (RD6A) is the zener diode for producing a reference voltage.

The error voltage detected by error voltage detector Q4 is amplified through two amplifier stages of transistors Q2 and Q3. This allows the regulated power supply unit to provide an extremely excellent voltage stability.

The voltage stability due to a temperature change depends on the temperature characteristics of the reference voltage diode and the error voltage amplifier circuit.

The reference voltage diode used is zener diode RD6A, which has a temperature coefficient of 0.

While, the error voltage amplifier circuit consists of amplifier transistors Q2 and Q3 with transistor Q3 coupled through differential connection to error voltage detector diode Q4, and offers least variation of its characteristic due to temperature change because transistors Q3 and Q4 cancel their temperature characteristics. Further, current control transistor Q1 suffers from almost no change of its characteristic due to temperature change because it is a silicon PNP transistor.

In addition, this regulated power supply unit is so arranged that it protects current control transistor Q1 against an excessive current which might be flowed through the transistor when the output terminal is shorted to earth, as encountered in ordinary regulated power supply circuits.

Resistors R10 and R11 and variable resistor VR2 are provided to produce necessary RIT voltages to be fed to the RIT circuit in the VFO unit.

8. AF Unit (UC1307J)

The AF unit incorporates an AF amplifier circuit to operate the speaker. This amplifier circuit amplifies the AF output delivered via variable resistor VR4 (10 k Ω), or the AF volume control, from squelch buffer transistor Q7, which is connected through the MODE switch and detector circuits to 2nd IF amplifier transistor Q3.

The AF amplifier circuit, consisting mainly of four amplifier transistor Q1 (2SC733), Q2 (2SC734), Q3 (2SD90) and Q4 (2SB473), operates as follows:

The AF signal from squelch buffer transistor Q7 is conducted from the IN terminal of the unit via capacitor C1 to amplifier transistor Q1, where the signal is amplified on the voltage amplification basis. The output of amplifier transistor Q1 is amplified by amplifier transistor Q2 on both the voltage and power amplification bases. The output signal from amplifier transistor Q2 is applied to a power amplifier consisting of transistors Q3 and Q4, where it is amplified on the power amplification basis. Since transistors Q3 and Q4 are coupled through a complementary connection circuit to the preceding circuit, they form an output transformerless (OTL) circuit and, therefore, deliver the output signal with extremely small distortion compared with that of the conventional power

transformer transformer coupled to the preceding stage. A negative voltage is fed back from the joint of transistors Q3 and Q4 via resistor R10 (10k Ω) to the input side of transistor Q2, thereby not only reducing the distortion of output signal further but lowering the output impedance with the resultant improvement of damping factor. In addition, a negative DC current is fed back from the collector of transistor Q4 to the emitter of transistor Q2 because of transistors Q2, Q3 and Q4 connected in series and this reduces the variation of the voltage at the joint of transistors Q3 and Q4.

Variable resistor VR1 inserted in the collector circuit of transistor Q2 is the semi-fixed control VR1 for adjustment of the supply current to transistors Q3 and Q4 when no signal presents. The variation of the above supply current is compensated by thermister TH1 (5T32) inserted in parallel with the semi-fixed control. Capacitor C7 (33 pF) is a voltage cancelling capacitor for the negative feedback voltage to the collector side of transistor Q2.

9. Fixed Channel Unit (UC0113J)

The fixed channel unit incorporates oscillator transistor Q1 arranged so as to form a Pierce C-G oscillator circuit and emitter follower transistor Q2 acting as a buffer.

Oscillator transistor Q1 operates in conjunction with a fixed channel crystal selected by the CH SELECT switch among those which are mounted on a separate printed circuit board for reception of the fixed channel signals.

The output of oscillator transistor Q2 is fed through emitter follower Q2 to 2nd mixer Q2, where it is heterodyned with the fixed channel signal under reception.

10. Crystal Converter

The TRIO model JR-599 SPECIAL (X) are supplied with the 50 MHz Crystal Converter (CC-69) and the 144 MHz Crystal Converter (CC-29) to provide means for reception of the 50 and 144 MHz VHF bands.

(A) 50 MHz Crystal Converter CC-69 (UC-2302J)

The 50 MHz crystal converter consists mainly of RF amplifier Q1, mixer Q2 and two local oscillators Q3 and Q4, as shown in the circuit and block diagrams given in Fig. 2.

RF amplifier Q1 and mixer Q2 employ an FET 2SK19 and FET 3SK22 respectively. Local oscillators Q3 and Q4, each comprising transistor 2SC785, provide local oscillator frequencies of 22 and 23.7 MHz for the mixer operating with the A and B channel signals, respectively.

The input signal, i.e. the signal in a receiving frequency range from 50 to 51.7 MHz for channel A or from 51.7 to 53.4 MHz for channel B, is applied from the antenna to the ANT input circuit of the converter, from which it is fed through RF amplifier Q2 to mixer Q2.

Thus, mixer Q2 heterodynes the A channel signal of 50 to 51.7 MHz with the 22 MHz output of local oscillator Q3 into an HF signal of 28 to 29.7 MHz. For the B channel signal of 51.7 to 53.4 MHz, the mixer heterodynes the signal with the 23.7 MHz output of local oscillator Q3 into an HF signal of 28 to 29.7 MHz. These HF signals are then fed to the input circuit of the RF amplifier unit.

A protective circuit comprising diodes D1 and D2 is inserted in the ANT input circuit of this converter for protection of RF amplifier and mixer comprising an FET.

The RF amplifier stage is operated under an AGC to improve the selectivity.

In addition, a variable capacity capacitor is inserted in each tuning circuit for the RF amplifier and the mixer stages to vary the resonance frequency of tuning circuit and widen its substantial pass band simultaneously with selection of the A or B channel for improvement of the sensitivity and selectivity of the converter (Utility model applied for).

(B) 144 MHz Crystal Converter CC-29 (UC2301J)

The 144 MHz crystal converter consists mainly of RF amplifier Q1, mixer Q2, 2 local oscillators Q3 and Q4, and tripler Q5, as shown in the circuit and block diagrams given in Fig. 3.

RF amplifier Q1 and mixer Q2 employ an FET 2SK19 and FET 3SK22 respectively. Local oscillators Q3 and Q4, each comprising transistor 2SC535, provide local oscillator frequencies of 116 and 117.7 MHz for the mixer operating with the A and B channel signals, respectively. Tripler Q5, consisting of transis-

tor 2SC384, triples the frequency of each local oscillator output to obtain the above-mentioned local oscillator frequencies.

The input signal, i.e. the signal in a receiving frequency range from 144 to 145.7 MHz for channel A or from 145.7 to 147.4 MHz for channel B, is applied from the antenna to the ANT input circuit of the converter, from which it is fed through RF amplifier Q1 to mixer Q2.

Thus, mixer Q2 heterodynes the A channel signal of 144 to 145.7 MHz with the 116 MHz output of tripler Q3, or the A channel local oscillator frequency, into an HF signal of 28 to 29.7 MHz. For the B channel signal of 145.7 to 147.4 MHz, the mixer heterodynes the signal with the 117.7 MHz output of tripler Q3, or the B channel local oscillator frequency,

into an HF signal of 28 to 29.7 MHz. These HF signals are then fed to the input circuit of the RF amplifier unit.

A protective circuit comprising diodes D1 and D2 is inserted in the ANT input circuit of this converter for protection of RF amplifier and mixer, comprising an FET respectively.

The RF amplifier stage is operated under an AGC to improve the selectivity.

In addition, a variable capacitor diodes is inserted in each tuning circuit for the RF amplifier and the mixer stages to vary the resonance frequency of tuning circuit and widen its substantial pass band simultaneously with selection of the A or B channel for improvement of the sensitivity and selectivity of the converter (Utility model applied for).

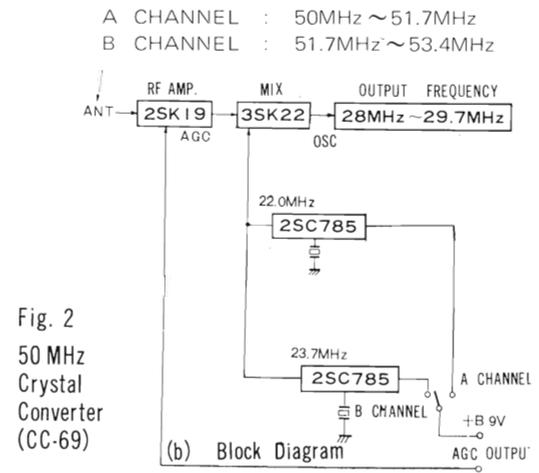
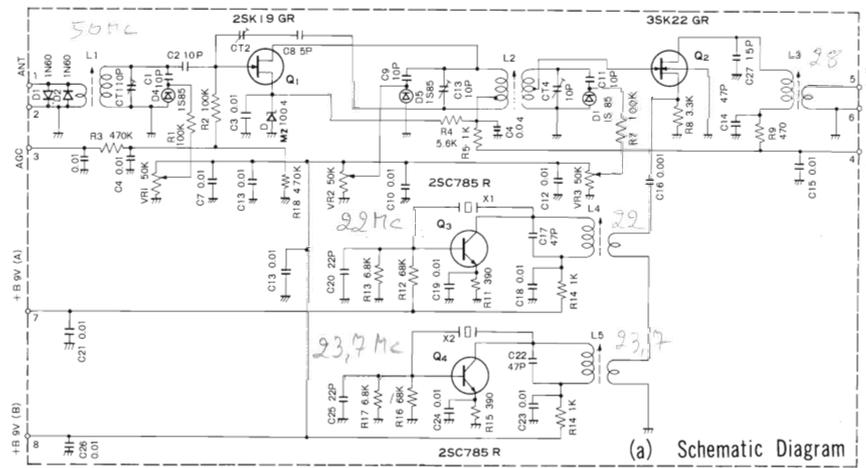


Fig. 2
50 MHz
Crystal
Converter
(CC-69)

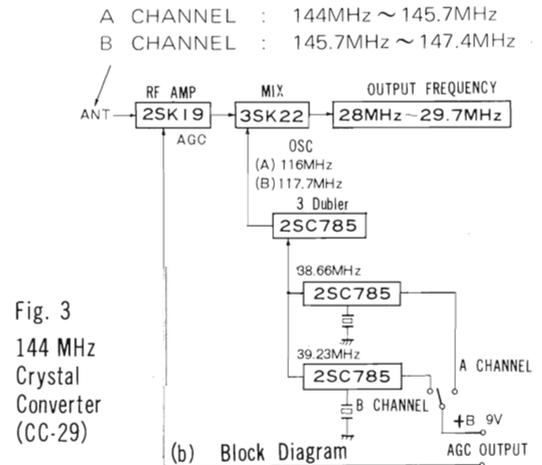
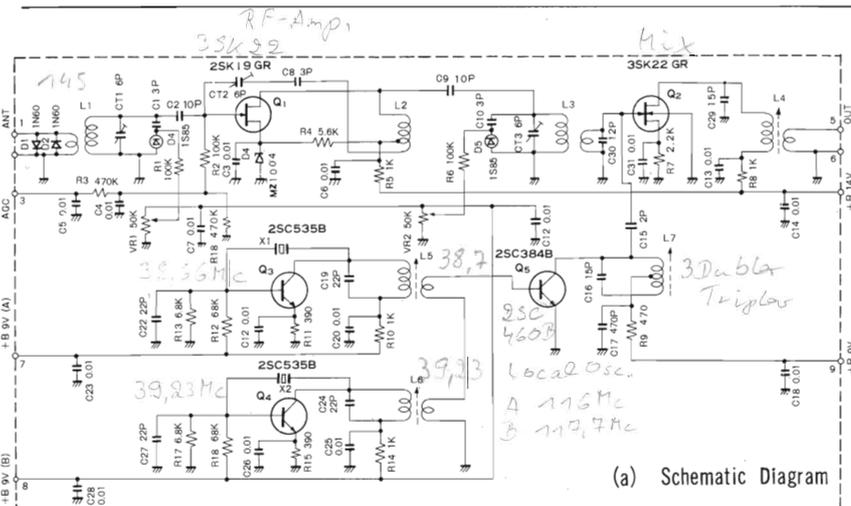


Fig. 3
144 MHz
Crystal
Converter
(CC-29)

CONTROLS AND THEIR FUNCTIONS

Front Panel Controls (Photo 1)

(1) BAND (Main Band Selector Switch)

Main band selector switch BAND, a 10-position rotary switch provides means for selection of a desired receiving band among the 8 bands allocated over a frequency range from 1.8 to 29.1 MHz the WWV's 10 MHz standard signal and an external band.

(2) BAND (Auxiliary Band Selector Switch)

Auxiliary band selector switch BAND, a 5-position rotary switch, provides means to

select either HF or VHF band as the operating band. When this switch is placed in the HF position, it makes the main band selector switch effective to select any band for reception as mentioned in item (1) above. In other positions, the switch inserts a 50 or 144 MHz crystal converter in the receiver circuit for reception of the 50 or 144 MHz band respectively. (Note that this switch is ineffective on model JR-599 CUSTOM DELUXE provided that the model is operated with no 50 or 144 MHz crystal converter mounted additionally. This is because said model is marketed without the converter.)

(3) POWER (Power Switch)

The POWER switch provides power ON-OFF control to the receiver. In the ON position, it applies power to the power supply circuit and places the receiver in the tuning condition.

(4) RIT (Receiver Incremental Tuning Control)

Control RIT provides means for fine adjust-

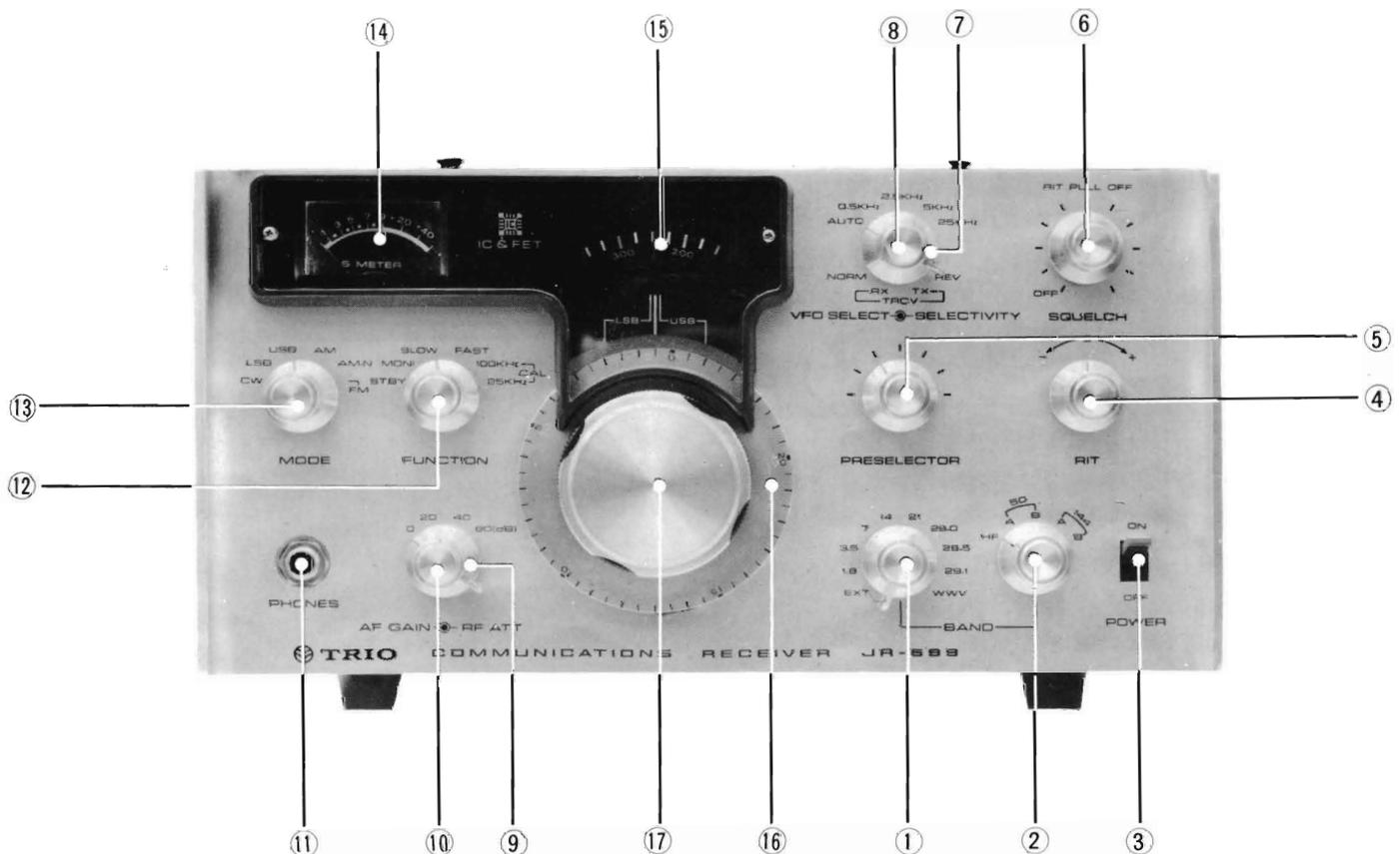


Photo 1 Front Panel

ment of a receiving frequency when this receiver is operated with model TX-599 Transmitter as a combined transmitter-receiver.

If the user want to operate this receiver on the QSO basis, set up the receiver and model TX-599 for a combined transmitter-receiver operation.

Then, set the BAND switches and main tuning dial on the receiver for the nominal transmitting frequency of a desired partner station with the RIT switch placed in position O. Tune the receiver to the actual transmitting frequency of the partner station and proceed to the QSO operation.

If the receiving frequency shifts during the QSO operation, re-tune the receiver to the current receiving frequency by turning the RIT control to and fro, instead of manipulating the main tuning dial. Otherwise, the transmitting frequency of the local station will be shifted.

(5) PRESELECTOR (RF Amplifier Tuning control)

The PRESELECTOR switch is the tuning control for the RF amplifier stage of this receiver. This control should be adjusted until the receiver provides the maximum sensitivity.

(6) SQUELCH (Squelch Control)

The SQUELCH control serves as the ON-OFF control for both the squelch and RIT operations. That is, turning this control clockwise from the OFF position intensity the squelch control to the IF output until the audio frequency circuit is disabled for regeneration of the incoming signal.

While, pulling the knob of this control out of its normal position turns the RIT switch off.

(7) (8) VFO SELECT – SELECTIVITY (Composite VFO and Selectivity Selector Switch)

The VFO SELECT – SELECTIVITY control is a composite switch consisting of a VFO and selectivity selector switches.

The VFO SELECT switch, a 4-position rotary switch forming the upper knob of the VFO SELECT-SELECTIVITY switch, provides means to select a desired VFO under the combined transmitter-receiver operation of models JR-599 and TX-599. Normally, this switch should be kept in the NORM position.

The SELECTIVITY switch, a 5-position rotary switch forming the lower knob of the VFO SELECT-SENSITIVITY switch, provides means to select an adequate IF band depending on the type of emission for the signal under reception of the condition of radio interference. In other words, this switch should be placed at a position for which the speaker delivers the sound output which is most easy to hear.

(9) (10) AF GAIN – RF ATT (Composite AF Gain – RF Attenuator Selector Switch)

The AF GAIN – RF ATT control is a composite switch consisting of an AF GAIN control and an RF ATT switch.

The AF GAIN control, a control forming the upper knob of the AF GAIN – RF ATT switch, is the volume control for the speaker output. Turning this control clockwise increases the volume of speaker output.

The RF ATT switch, a 4-position rotary switch forming the lower knob of the AF GAIN – RF ATT switch, provides means to insert a resistance attenuator of 60 dB at 20 dB step in the input circuit of the RF amplifier stage. Using this switch, therefore, model JR-599 may be used to make measurement of a field intensity.

(11) PHONES (Phone Jack)

The PHONES jack is provided for connection of a headphone plug.

(12) FUNCTION (Function Selector Switch)

The FUNCTION switch, a 6-position rotary switch, provides means to place model JR-599 under a desired functional condition such as a stand-by operation, monitor, slow and fast responses and calibration, as obtained by turning the switch in the STABY, MONI, SLOW, FAST, 100 kHz and 25 kHz positions respectively.

(13) MODE (Receiver Mode Selector Switch)

The MODE switch, a 6-position rotary switch, provides means to select an adequate mode of the receiver operation depending on the type of emission of the signal to be received.

(a) CW (Continuous Wave)

Switch position CW is provided to operate the receiver on an incoming continuous wave for reception of the Morse telegraph codes.

(b) LSB (Lower Side Band)

Switch position LSB is provided to operate the receiver on an incoming LSB signal for reception of the 3.5 and 7.5 MHz bands. This is because it is an international custom to use the LSB of SSB signal for transmission and reception of the 3.5 and 7 MHz bands.

(c) USB (Upper Sideband)

Switch position USB is provided to operate the receiver on an incoming USB signal for reception of the bands above the 14 MHz band. This is because it is a general rule to use the USB of SSB signal for transmission and reception of the bands above the 14 MHz band.

Users should be careful enough not to select a wrong sideband signal for reception of a SSB band. Otherwise, the receiver fails to demodulate the incoming signal at all.

(d) AM (Amplitude Modulation)

Switch position AM is provided to operate the receiver on an incoming amplitude-modulated signal for reception of the radiotelephone speech.

If the receiver is operated on an incoming SSB signal with the MODE switch placed in this AM position by mistake, the speaker merely numbles out its sound output. When operating the receiver with the incoming signals belonging to the bands below 7 MHz band, therefore, never fail to turn the MODE switch in the LSB position. For the signals belonging to the 14 MHz band or higher, turn the switch in the USB position.

(e) AM.N (Automatic Noise Suppression)

Switch position AM.N is provided to suppress the annoying pulsed noises due to the atmospheric, motor cars engine and

so on appearing in the sound output of speaker during reception of an incoming signal from an AM station.

(f) FM (Frequency Modulation)

This is the switch position provided to operate the receiver on an incoming FM signal with the built-in 50 or 144 MHz crystal converter inserted in the receiver circuit.

(14) S METER

The S METER indicates the level of the signal under reception, as read on its scale in dB.

The scale is so calibrated that the meter reads 40 dB when it deflects to graduation S-9.

(15) 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 bears the blue and orange graduations which, starting with the zero blue graduation, are calibrated alternately around the circumference of the disc for a frequency range from 0 to 600 MHz 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 one complete turn of the tuning dial, or a frequency band covering 25 kHz.

(16) Main Dial Scale

The main dial scale is the disc scale tightly kept in position against the bottom side of the main tuning dial with spring pressure.

The scale bears the black and red graduations, which, starting with the zero black graduations, are calibrated around the entire circumference of the disc for frequency ranges from 0 to 25 kHz and 25 to 50 kHz, the former being marked with black figures and the latter red figures. Hence, it provides means for indicating the receiving frequency to which the receiver tuned through the use of the main tuning dial.

Because of its constructional characteristic, this scale may be calibrated quite easily by

shifting its zero graduation to a point for which the receiver zero beats with the calibration signal while depressing and turning it with the black knob incorporated to the main tuning dial below the dial knob.

(17) Main Tuning Dial

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 receiver circuit with a desired band signal within a band width of 600 kHz, for which it shifts the main-dial and sub-dial scale graduations by 25 kHz for every one complete turn of its knob.

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 double gear mechanism for the dial may be damaged.

Rear Panel Controls and Terminals (Photo 2)

(1) HF ANT

This is the antenna terminals provided for exclusive use with HF antenna having an impedance of 50 to 75Ω and providing a receiving band from 1.8 to 28 MHz.

(2) SPEAKER

This is the AF output terminals provided for connection of an external speaker. This terminals have an output impedance of 8Ω, but speakers with voice coil of 4 – 16Ω are also available.

(3) REMOTE

The REMOTE terminals are the connecting terminals for a transmitter to be operated in combination with this receiver.

When this receiver is to be operated with model TX-599 Transmitter, connect between the REMOTE terminals of the receiver and

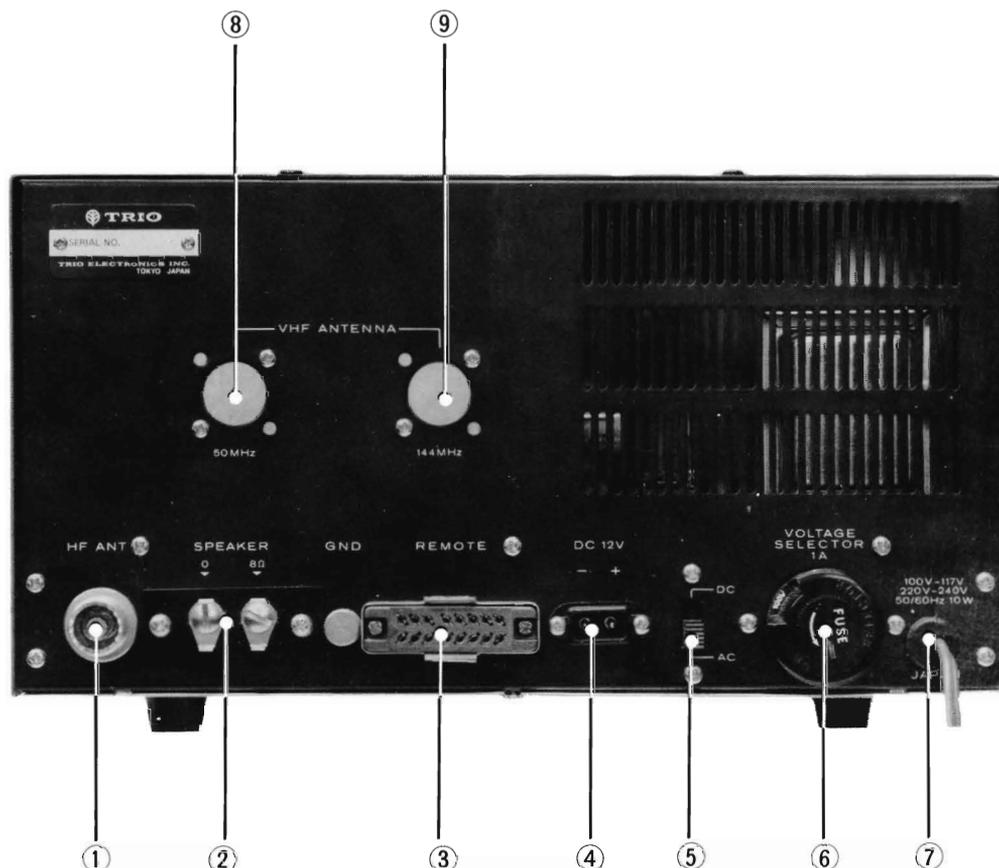


Photo 2 Rear Panel

transmitter using the cord supplied with the transmitter for the above purpose.

If the transmitter to be operated is the one other than model TX-599, use the cord with plug connector supplied with the receiver to connect between the transmitter and receiver.

(4) DC Input Terminals

This is the input terminals provided for connection of a DC source to this receiver.

The requirement for the DC source is such that the source should provide an output voltage of 12 to 15 V and a current capacity of 1A.

(5) AC – DC selector switch

This is a selector switch for selection of an AC or DC source. But, the switch is normally fixed in the AC position. When it is desired to operate the receiver from a DC source, remove the stopper from the switch, turn the switch in the DC position, and fix it in that position by means of the stopper.

(6) VOLTAGE SELECTOR

This is a plug socket with a built-in 1A fuse mounted for connection of an AC input line. The socket is provided with 100, 117, 220 and 240 volts terminals at the output side for selection of an AC 100, 117, 220 or 240 volts source.

(7) AC power cord

This AC power cord connects the receiver to an AC 110, 117, 220 or 240 volts source providing a line frequency of 50 or 60 Hz when plugged in the AC line outlet available.

(8) VHF ANTENNA

This is the M type connector provided as the antenna terminals for exclusive use with the 50 MHz band antenna having an impedance of 50 to 70 Ω .

Note, however, that model JR-599 DE-LUXE is not provided with this connector because it self-contains no 50 MHz crystal coverter.

(9) VHF ANTENNA

This is the M type connector provided as the antenna terminals for exclusive use with the 144 MHz band antenna having an impedance of 50 to 70 Ω .

Note, however, that model JR-599 DE-LUXE is not furnished with this connector because it self-contains no 144 MHz crystal converter.

OPERATING INSTRUCTIONS

1. Accessories

The model JR-599 Receiver is supplied with the accessories listed below.

Users are requested to check the contents of JR-599's container against the list below when unpacking the container.

16-pin connector (plug)	1
2-pin connector (plug)	1
Spare legs	2
Operating manual	1

2. Installation Place

Select a place where dry air and less moisture prevail and further the receiver installed is not exposed to direct sun beams at the installation place. Also, refrain from locating the receiver near an object generating high heat, since the receiver is a product using the transistors throughout its circuit.

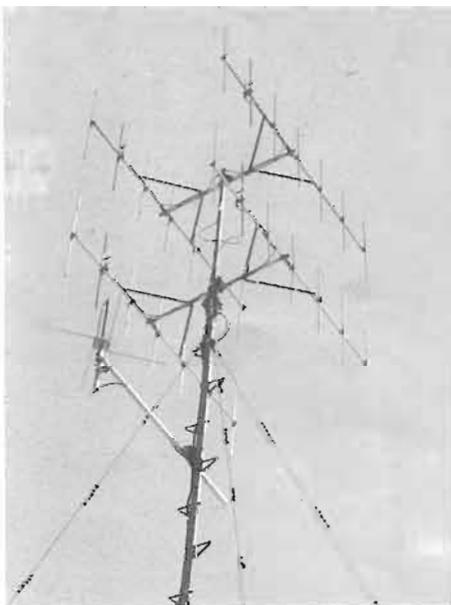


Photo 3 An Example of Antenna (For VHF)

3. Power Source

This receiver is operable from an AC 100, 117, 220 and 240 V, 50 or 60 Hz source, as selected by means of the VOLTAGE SELECTOR plug socket.

If the input voltage suffers from an error of input voltage, for instance an error of more than $\pm 10\%$ to AC 100 V input, insert an appropriate voltage regulator externally between the receiver and the power line to adjust the input voltage to 100 volts.

A fuse having a current carrying capacity of 1A is enough for use as the power fuse.

4. Antenna

In order to have this receiver fully demonstrate its performance, it is a prerequisite to operate the receiver with an antenna providing better characteristics.

A vertical or inverted - L type antenna may be erected easily as a simple antenna which meets the above requirement. Otherwise, it is recommendable to use a transmitting antenna designed for an amateur radio station commonly as a receiving antenna through provision of a selector switch and this will enable the receiver to receive a high-quality signal.

Use of a dipole or Yagi antenna is also recommendable since such antenna is employed widely among amateur radio stations.

Mind to ground the receiver set without fail to insure a stable reception and prevent dangers such as short-circuiting.

Photo 3 shows an example of the antenna operable with this receiver.

5. Speaker

Selects high-quality speaker with an input impedance of 4 to 16 Ω for operation with this receiver and it is sure that users can entertain themselves with the high-quality sounds furnished by the receiver. In this connection, the TRIO has already marketed models SP-50, SP-10 and SP-55 Speakers to respond the demand of users.

6. Receiving Procedure

First set up the model JR-599 for operation by connecting the power line, the antenna and the speaker to their associated terminals. Then, set the front panel controls to the positions as shown

below. Also, refer to paragraph given under the titles "Front Panel Controls" and "Rear Panel Controls".

POWER: OFF
BAND: A desired band and HF
RF ATT: 0 dB
AF GAIN: Center
MODE A desired mode of receiver operation
FUNCTION: FAST
PRESELECTOR: Center
RIT: 0
VFO SELECT: NORM
SELECTIVITY: AUTO
SQUELCH: OFF But, depress the inner knob against the panel face to turn the RIT circuit ON.
AC-DC selector: AC

When the model JR-599 is to be operated in combination with a transmitter, never fail to connect between the receiver and transmitter by inserting the connecting cord with 16-pin connector supplied with the receiver in their REMOTE terminals.

When all above-mentioned steps are completed, turn the POWER switch to ON. This lights all pilot lamps, which illuminate the dial surfaces and meter darkened higher to until they are loomed clearly on the front panel, Here, carry out the following steps:

- (1) Slowly turn the main tuning dial until the receiver is tuned to the desired signal.
- (2) Adjust the PRESELECTOR control until the receiver provides the maximum gain.
- (3) Set the AF GAIN control at a position for which the speaker gives a sound output at an adequate volume.
- (4) Place the FUNCTION switch in either SLOW or FAST position depending on the level fluctuation of the signal under reception.
- (5) Normally keep the RF ATT switch in the 0 dB position. Use switch positions 2, 40 and 60 dB when the receiver is used to measure the field strength quantitatively.
- (6) Turn the SQUELCH control to a point where the AF input circuit is just cut off electrically. Setting the control at such a critical point

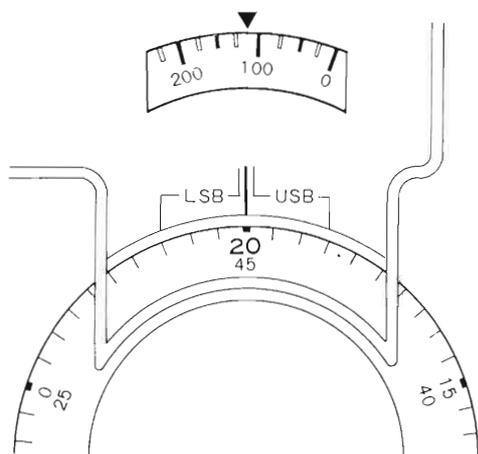
makes it possible to turn on the AF input circuit as soon as an input signal presents and, therefore, is effective to eliminate the unwanted noise during reception of no signal.

- (7) Finely tune the receiver to the receiving signal by tuning the RIT control, which varies the VFO frequency just a little. Hence, it is possible for the user to catch two different signals momentarily by operating the RIT control as follows: Pull the SQUELCH control towards you to disable the RIT control. Catch a certain incoming signal using the main tuning dial. Depress the SQUELCH control to restore the RIT control to its normal condition. Then, catch another incoming signal by operating the RIT control. These steps make it possible for the user to catch the abovementioned signals momentarily by pulling and depressing the SQUELCH control to turn the RIT control off and on.
- (8) Note that on model CUSTOM DELUXE the SELECTIVITY switch inserts the SSB filter in the receiver circuit in its all positions excepting position 25 kHz, in which it inserts an LC filter coil having a pass band of 25 kHz in the circuit. This LC filter coil is required for FM reception of this receiver, but generally not required for reception of HF bands.
- (9) The MODE switch should be placed in an appropriate position depending on the type of emission used in the partner station. But, it is a general practice to use the LSB position for the SSB signal lower than 7 MHz and the USB for the signal higher than 14 MHz. Switch position AM.N is provided for reception of the AM signal under extraordinary heavy noises. Placing the MODE switch in the AM.N position inserts a noise limiter in the receiver circuit at the output side of AM detector, thereby limiting the noise level. In the FM position, the switch inserts the FM detector in the receiver circuit for reception of the FM signal. In this case, however, place the SELECTIVITY switch in either AUTO or 25 kHz position because the FM signal generally features a wider band width.
- (10) Reading a receiving frequency. The main tuning dial shifts a receiving frequency by 25 kHz for every one complete turn. This shift of receiving frequency is

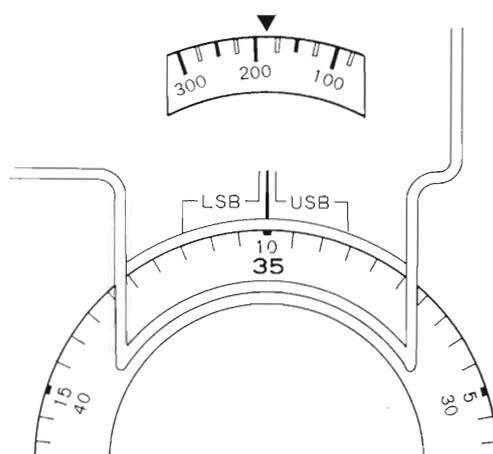
indicated on the main and sub tuning dial scales. The main tuning dial scale has the black and red graduations calibrated over frequency ranges of 0 to 25 and 25 to 50 kHz and accompanying the figures marked in the same color. While, the subdial scale has the blue and orange graduations calibrated alternately from 0 to 600 at intervals of 25 kHz. Now, suppose that the main- and sub-dial scales are set as shown in the left-hand diagram in Fig. 4. And the receiving frequency may be read off from the main and sub-dial scales as follows:

First, observe the dial setting for the receiving frequency on the sub-dial scale. Read the value of the graduation of the scale set closest to the actual setting at the right side with

respect to the center red vertical line. And you will get a reading of 100 kHz as read off from the graduation marked in blue. Then, read the value of the main-dial scale setting to the red vertical index provided above the scale between the LSB and USB indexes using the graduation marked in black because the reading of the sub-dial setting is read using the graduation marked in blue. And you will get a reading of 25 kHz. Add the readings of the main- and sub-dial settings and the sum gives the frequency of the receiving signal under reception and, in the present example, is 120 kHz. While, the right-hand diagram shows another example of the main- and sub-dial scales set to the 185 kHz. If the receiving frequency band selected is the 14 MHz, then

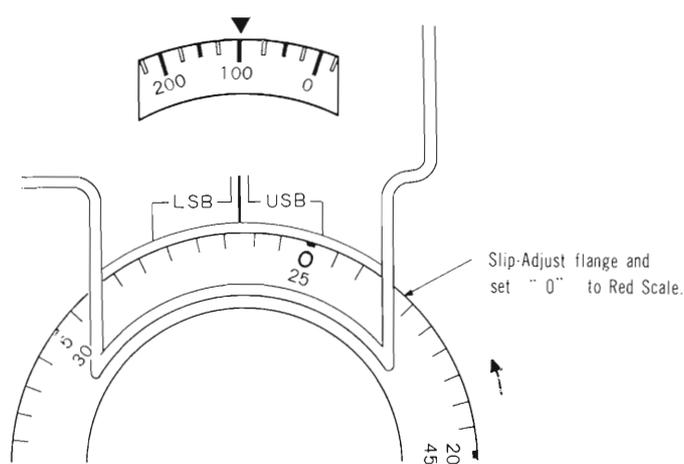


(a) 120kHz

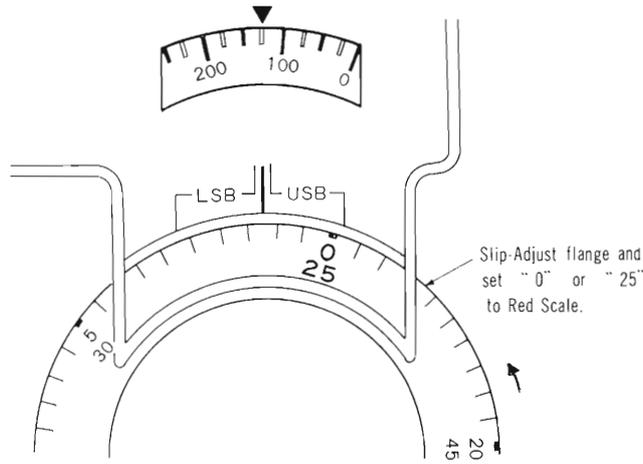


(b) 185kHz

Fig. 4



(a) To calibrate when FUNCTION switch is turned to the 100kHz.



(b) To calibrate when FUNCTION switch is turned to the 25kHz.

Fig. 5

it follows that the frequencies under reception are 14.120 and 14.185 MHz respectively. Note, however, that the main-dial scale reading should be taken using the graduation marked in red provided that the auxiliary-dial scale reading is taken using the graduation marked in orange. The vertical red index used in the above example is provided for reading the receiving frequencies in the CW, AM and FM receptions. For the SSB reception, use the main-dial scale in connection with the right-hand USB index for reception of the USB signal and the left-hand LSB index for reception of the LSB signal.

- (11) To calibrate the main-dial scale, proceed as follows using the calibration signals provided by the calibrator circuits self-contained. Set the FUNCTION switch to the 100 kHz CAL position and the MODE switch to the CW position. Slowly turn the main tuning dial and you will hear the beat tones appearing and then dying away through the speaker as the dial is turned clockwise. Find a setting of the scale against the vertical red index where the receiver zero beats precisely. Depress the main-dial scale using the black knob assembled around the main tuning dial and turn the scale until its zero graduation is precisely set to the setting and this completes the calibration of the scale to the 100 kHz calibration signal.

Here, switch the MODE switch to the 25 kHz CAL position and you will hear a zero beat tone at intervals of 25 kHz when the main-dial is turned. Depress the main-dial scale and set the zero graduation of the scale to the setting of a zero beat occurring closest to the signal under reception. Read the values of the main- and sub-dial scales under the above condition and you will find the frequency of an unknown signal under reception. Fig. 5 illustrates the procedure for calibration of the main-dial scale.

(A) Operating instruction for Model JR-599 CUSTOM SPECIAL

The model JR-599 Receiver CUSTOM SPECIAL (X) self-contains a CW and AM filters and a 50 and 144 MHz converters. Hence,

the receiver may be operated more conveniently in the following steps compared with the model JR-599 Receiver CUSTOM DELUX.

- (1) When the receiver is operated with the SELECTIVITY switch placed in the AUTO position, it can be operated with an appropriate filter merely by placing the MODE switch in a desired position. In other words, a filter having the band width corresponding to the position of the MODE switch is inserted in the receiver circuit as follows when the MODE switch is placed in a desired position.

MODE switch Position	Band width	Filter selected
CW	0.5 kHz	CW filter
LSB, USB	2.5 kHz	SSB filter
AM, AM.N	5 kHz	AM filter
FM	25 kHz	

- (2) When the receiver is operated with the MODE switch placed in a certain position, it can be operated with any desired band merely by switching the SELECTIVITY switch from the AUTO to a desired position.
- (3) When the receiver is operated with the SELECTIVITY switch placed in the CW position, the CW filter is automatically inserted in the receiver circuit by merely switching the MODE switch to the CW position. If the SELECTIVITY switch is placed in the 0.5 kHz position, the CW filter can be inserted in the receiver circuit regardless of the position of MODE switch.
- (4) To receive any incoming signal in the 50 MHz band, proceed as follows:
With the auxiliary BAND switch placed in the 50 MHz position, place the main BAND switch in the 28.0 position and the receiver is set up for reception of the incoming signal in a frequency band from 50.0 to 50.6 MHz. Turning the main BAND switch to the 28.5 position causes the receiver to set up itself for reception of the signal in a frequency band from 50.5 to 51.1 MHz. Thus, turning the main and or auxiliary BAND

switches further sets up the receiver for reception of the signals in the 50 MHz band as listed below:

Switch position		Receiving frequency range
Main BAND	Auxiliary BAND	
28.0	50 A	50.0 to 50.6 MHz
28.5	50 A	50.5 to 51.1 MHz
29.1	50 A	51.1 to 51.7 MHz
28.0	50 B	51.7 to 52.3 MHz
28.5	50 B	52.2 to 52.8 MHz
29.1	50 B	52.8 to 53.4 MHz

It should be noted that an antenna with better characteristics is required for the receiver to such extent that the receiver sensitivity depends solely on the antenna when the receiver is operated for reception of the 50 MHz band. For this reason, the model JR-599 CUSTOM SPECIAL (X) should be connected to the antenna installed specifically for reception of the 50 MHz band. Also, use the antenna connector on the rear panel marked 50 MHz for connection of the antenna lead wire.

- (5) To receive any incoming signal in the 144 MHz band, for reception of the 50 MHz band above except BAND switch should be placed in the 144 A and B positions. The switch positions and the receiving frequency range in this case are as shown below.

Switch position		Receiving frequency range
Main BAND	Auxiliary BAND	
28.0	144 A	144.0 to 144.6 MHz
28.5	144 A	144.5 to 145.1 MHz
29.1	144 A	145.1 to 145.7 MHz
28.0	144 B	145.7 to 146.3 MHz
28.5	144 B	146.2 to 146.8 MHz
29.1	144 B	146.8 to 147.4 MHz

As seen from the above figures, the model JR-599 CUSTOM SPECIAL (X) is capable of covering a frequency range of 3.4 MHz for reception of the 144 MHz band.

Note that the receiver needs an antenna with better characteristic for reception of the 144 MHz as in case of the 50 MHz band reception. For this reason, the model JR-599 CUSTOM SPECIAL (X) should be connected to the antenna installed specifically for reception of the 144 MHz band. Also, use the antenna connector on the rear panel marked 144 MHz for connection of the antenna lead wire.

(B) Combined transmitter-receiver operation using a combination of models JR-599 and TX-599

The model JR-599 Receiver can be operated with the model TX-599 Transmitter as a combined transmitter-receiver when the receiver and transmitter are installed together and set up as described below.

- (1) Connect between the REMOTE terminals on the models TX-599 and JR-599 as shown in Fig. 6 using the connecting cable with 16-pin connector supplied with the model TX-599.

Connect the antenna to the antenna terminal of the transmitter. Also, connect the RX-ANT terminal on the transmitter to the antenna terminal of Model JR-599 with connecting cable. Then, throw the switch on the rear receiver panel into the TRCV position. The above completes the set-up of the models TX-599 and JR-599 for a combined transmitter-receiver operation.

- (2) As for the operation of the model TX-599 under a combined transmitter-receiver operation, refer to the operating manual for model TX-599.

When the VFO SELECT switch on model JR-599 is in the NORM position, models JR-599 and TX-599 operate separately even though they are set up for the combined transmitter-receiver operation.

When models JR-599 and TX-599 set up for the combined transmitter-receiver operation are operated with the VFO SELECT switch on model JR-599 set at the RX position, the VFO in model

JR-599 operates for both transmission and reception.

If the VFO SELECT switch is placed in the TX position under the above condition, then the VFO in model TX-599 operates for both transmission and reception. If the VFO SELECT switch is placed in the REV position, the VFO of model JR-599 operates in lieu of that of model TX-599 for transmission and the VFO of TX-599 in lieu of that of model JR-599 for reception. This means that models JR-599 and TX-599 operate on the so-called reversed VFO operation.

- (3) When the FUNCTION switch on model JR-599 is placed in the MONI position under the combined transmitter-receiver operation, the speaker delivers the sound output of the signal transmitted by model TX-599, thereby providing means for monitoring the signal under transmission. The volume of the monitor sound output can be adjusted appropriately by means of a semi-fixed resistor in model JR-599.

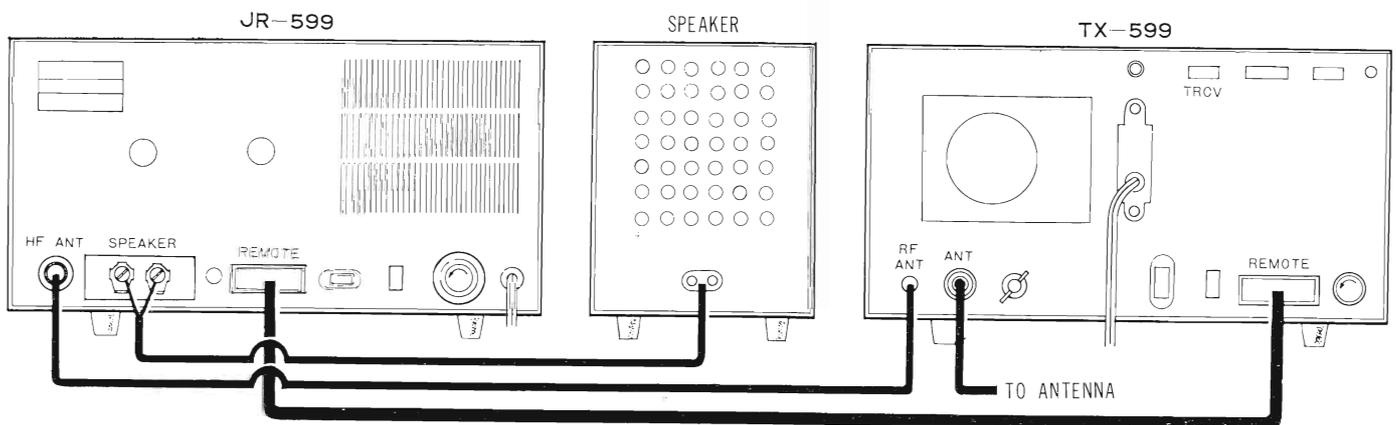


Fig. 6 Connection Diagram for a Combination of models JR-599 and TX-599

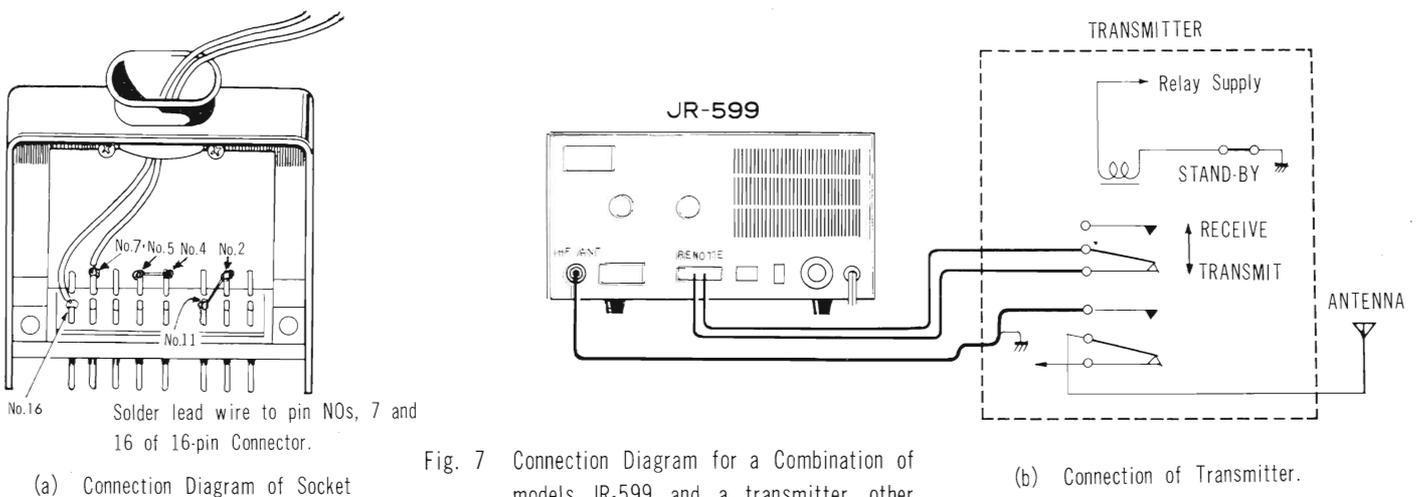


Fig. 7 Connection Diagram for a Combination of models JR-599 and a transmitter other than model TX-599.

(b) Connection of Transmitter.

(C) Combined transmitter-receiver operation using a combination of model JR-599 and a transmitter other than model TX-599.

When model JR-599 is to be operated in combination with a transmitter other than model TX-599 for a combined transmitter-receiver operation, connect the REMOTE terminal on model JR-599 to the STAND-BY switch or a control relay in the transmitter as shown in Fig. 7 (a) using the connecting cable with 16-pin connector supplied with the receiver. Also, connect the antenna terminals of the receiver to the antenna duplexer relay provided for the transmitting antenna of the transmitter.

(D) Operation of model JR-599 from a DC power source

To operate model JR-599 from a DC power source, proceed as follows:

Throw the AC-DC selector switch on the rear panel into the DC position. Solder the 2-pin connector supplied with model JR-599 to one end of lead wires, connect the free end of the lead wires to the DC power source, and plug the 2-pin connector of the lead wires to the DC socket on the rear panel of model JR-599. In this case, select the power source and lead wires appropriately so as to prevent model JR-599 from being powered with an input voltage, which is excessively higher or lower than the reference voltage of 12 V. Especially, be careful not to connect the power leads to the DC socket with wrong polarities.

It should be noted that the fuse provided on model JR-599 is ineffective to the DC source. When operating model JR-599 from a DC source, therefore, insert a 2A fuse in the power leads between the DC source and the receiver.

ACCESSORIES CIRCUIT

1. Fixed Channel Crystals

Model JR-599 self-contains a printed circuit board incorporating a fixed channel oscillator in order to control the 1st mixer output with crystals in lieu of the VFO for performance of a spot frequency reception.

The fixed channel oscillator is provided with a printed circuit board, on which 5 channel crystal holders are mounted and so arranged that they may be selected as desired by means of a CH SELECT switch on the board. Hence, model JR-599 may be operated for a spot reception by selecting any of 5 channel crystals which, each having a crystal frequency required to receive a desired spot frequency, are placed in the above-mentioned holders. Suppose, for instance, that the user desires to receive the spot signals in the 14 MHz band and the relation existing between the

receiving frequencies and the crystal frequencies are as shown below.

Receiving frequency	Crystal frequency
14.0 MHz	5.5 MHz
14.1 MHz	5.4 MHz
14.2 MHz	5.3 MHz
:	:
14.6 MHz	4.9 MHz

Note, however, that the above-mentioned CH SELECT switch inserts the VFO in the receiver circuit in lieu of the fixed channel crystals when it is placed in the VFO position. Also, mind such fact that the crystal frequency of a crystal differs substantially depending on the test circuit employed. When determining the crystal frequency of a crystal, therefore, never fail to test the crystal using the test circuit shown in Fig. 8.

It should be noted here that channel 1 crystal holder provides for insertion of only type HC-61/U crystal and other crystal holders for insertion of type HC-25/U crystal. These crystals are made available at the dealers of our products.

2. Mounting of CW Filter

Model JR-599 DELUXE is marketed without a CW filter. If the user wants to mount the CW filter purchased on model JR-599 DELUXE, proceed as follows:

Remove the outer case from the receiver sets and remove a shield cover from the filter unit.

Place the CW filter on the printed circuit board of filter unit as instructed by mark CW on the board and solder the filter in that position. To facilitate the above works, it is recommendable to proceed with the works after removing the mounting screws of the printed circuit board.

Next, re-connect the lead wires of the filter unit. There are a total of 3 pairs of lead wires color coded in green, purple and orange and connected to the terminals of the filter unit, respectively. Of these, disconnect the pair of lead wires color coded in purple and connect them to terminal CW. See Fig. 9. The above completes mounting of the CW filter. Place the shield case over the filter unit and put the outer case on the receiver set.

1. Frequency : Anyone Frequency in a Frequency Range from 4.900 to 5.500 MHz.
2. Type : HC-25/U or HC-6/U
3. Oscillation : Fundamental Frequency
4. Operating temperature range and permissible temperature error : within $\pm 0.002\%$ (at normal temperature)
5. Test Circuit is as shown below.

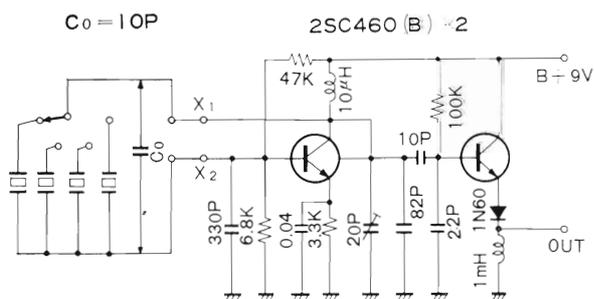


Fig. 8 Crystal Test Circuit

3. Mounting of AM Filter

Model JR-599 DELUXE is marketed without an AM filter. If the user wants to mount the AM filter purchased on model JR-599 DELUXE, proceed as follows:

Remove the outer and shield cases in the same manner as did in the mounting works for the CW filter. Place the AM filter on the printed circuit board of filter unit as instructed by mark AM on the board and solder the filter in that position.

Disconnect a pair of lead wires color coded in orange from the SSB terminals of the filter unit while referring to Fig. 10 and connect and solder them to the AM terminals on the unit.

The above completes mounting of the AM filter. So replace the outer and shield cases to their original positions.

4. Mounting of 50 MHz Crystal Converter

Model JR-599 CUSTOM DELUXE is marketed with no 50 MHz crystal converter CC-69 mounted. So, if the users want to mount crystal converter CC-69 on model JR-599 CUSTOM DELUXE after purchasing the converter, proceed as follows:

Remove the outer case while taking care not to miss the screws removed.

Solder the lead wires and others supplied with the crystal converter to the terminals of the printed circuit board of the converter as shown in Fig. 11 in accordance with their color codes established between the wires.

Locate the mounting place for the converter on the chassis of model JR-599 as instructed by a label on the chassis. Screw four hexagon socket heads supplied with the converter onto the chassis. Place the converter on the chassis with its mounting holes aligned to the bosses of the hexagon heads and fix it in position using four mounting screws.

Remove the patch plate from the rear panel and attach the antenna connector for the 50 MHz band use to the receiver.

Then, solder the lead wires of the converter properly and securely to the receiver circuit as shown in Fig. 11 in accordance with their color codes. The lead wire soldered to the AGC terminal of the converter should be connected to the AGC terminal of the RF unit.

As for the operating instructions for this crystal converter, refer to the operating instructions for model JR-599 CUSTOM SPECIAL given in the previous paragraph.

5. Mounting of 144 MHz Crystal Converter

Model JR-599 CUSTOM DELUXE are marketed with no 144 MHz crystal converter CC-29 mounted. So, if the users want to mount crystal converter CC-29 on models JR-599 CUSTOM DELUXE after purchasing the converter, proceed as follows:

Remove the outer case and bottom plate from the receiver set.

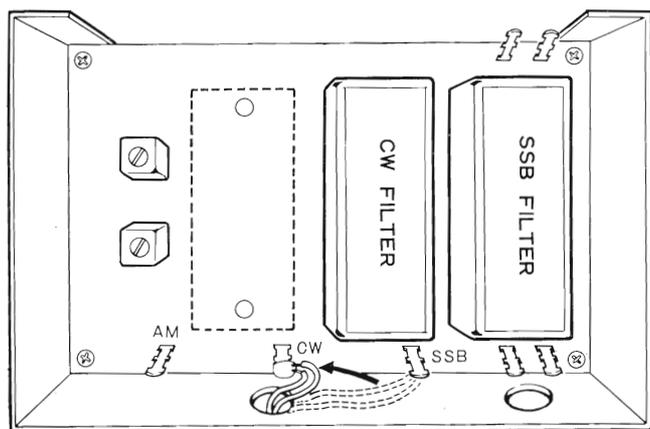


Fig. 9

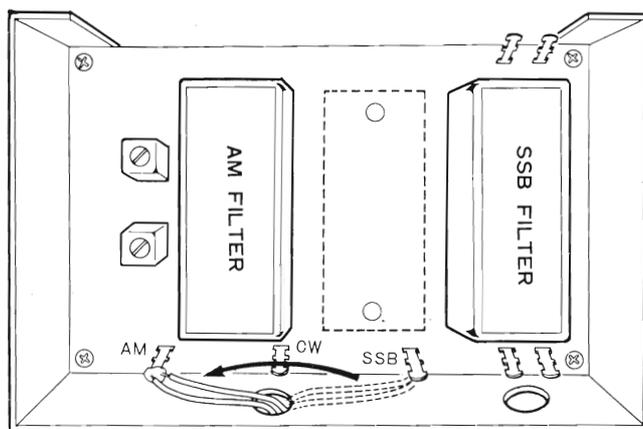


Fig. 10

Solder the lead wires and others supplied with the crystal converter to the terminals of the printed circuit board of the converter as shown in Fig. 12 in accordance with their color codes.

Locate the mounting place for the converter on the chassis of models JR-599 CUSTOM DELUXE as instructed by the label on the chassis. Screw four hexagon socket heads supplied with the converter onto the chassis. Place the converter on the chassis with its mounting holes aligned to the bosses of the hexagon heads and fix it in position using four mounting screws.

Remove the patch plate from the rear panel and attach the antenna connector for the 144 MHz band use to the receiver.

Then solder the lead wires of the converter properly and securely to the receiver circuit as shown in Fig. 12 in accordance with their color codes. The white lead wire soldered to the AGC terminal of the converter should be connected to the AGC terminal of the RF unit. While, the white-red wire soldered to the 9 V terminal should be connected to the 144 MHz contact on the BAND switch.

The dealers of our products are also ready to accept customers' request for mounting the filter and converter on the receivers. So, contact the dealers about the mounting works, if desired.

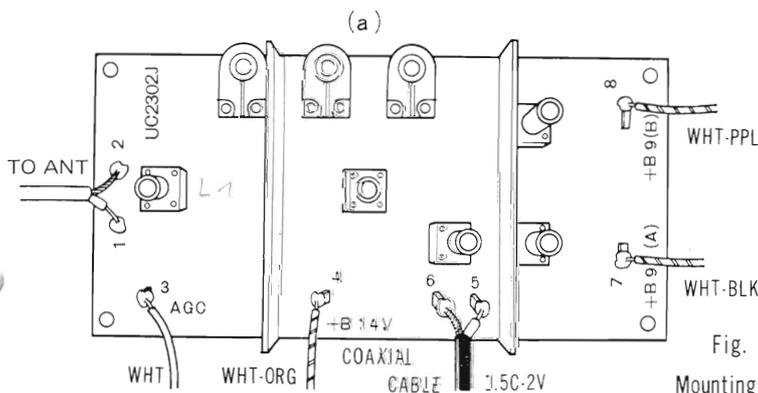


Fig. 11
Mounting of 50MHz Crystal Converter

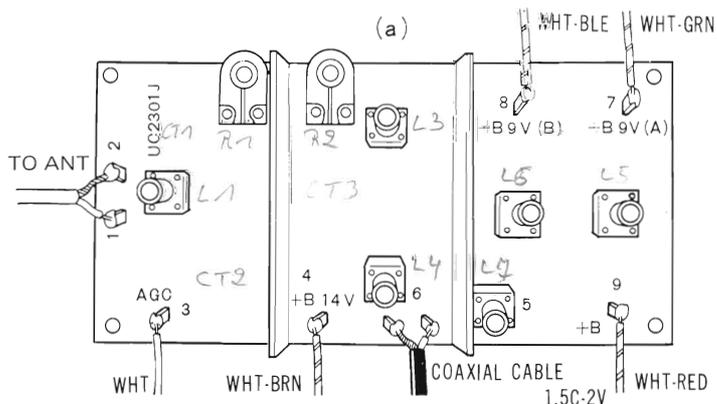
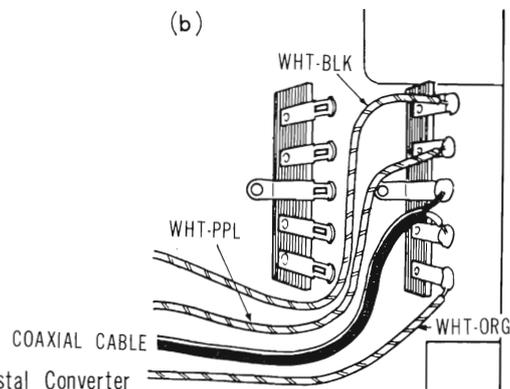
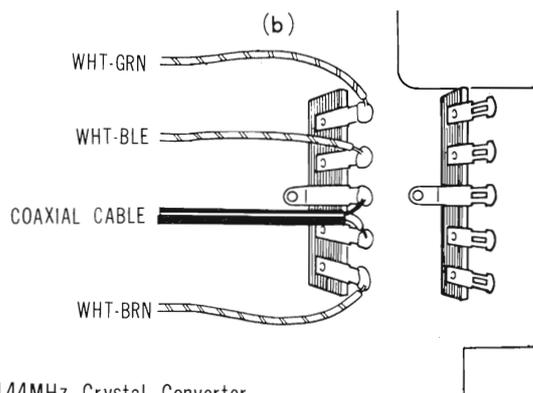


Fig. 12
Mounting of 144MHz Crystal Converter



ALIGNMENT

Model JR-599 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. In order to operate the JR-599 under the best operating condition at all times, therefore, it becomes necessary to re-adjust the receiver once every two or three years.

Schematic Diagram shows the current and voltage values of the JR-599 under the normal operating condition, as measured on the terminals of all component units using a DC vacuum tube voltmeter.

A more precise adjustment, however, requires to prepare many high-grade measuring sets and exceeds the region of the maintenance work permitted to the users because of the limited number of their measuring sets. For this reason, the adjustment procedure given below concerns

with the adjustments practicable merely using a circuit tester. As to the adjustments beyond the users' maintenance region or any trouble of the component parts, make contact with the dealers of our products for the adjustments or repairs and the dealers will adjust or repair the set on a charged basis.

It should be noted that the users are requested not to make adjustment or repairs of the VFO, crystal filter, coil pack and BPF because of the high degree of skill required in the adjustment technique for said components. If the users fail to observe the above caution, the TRIO cannot guarantee the performance of the set adjusted or repaired.

1. Marker Oscillator (UC1505J) (See Photo 4)

If the marker oscillator suffers from a frequency error by any chance despite of such fact that it is precisely adjusted to the 100 kHz at the factory, proceed as follows:

Set up the receiver for reception of the WWV's 100 kHz standard signal and, while receiving the signal, adjust trimmer TC1 with a screwdriver until the marker oscillator zero beats with the standard signal, as heard through the speaker.

2. AVR Unit (UC1010J) (See Photo 5)

If the AVR unit fails to provide a voltage of 9

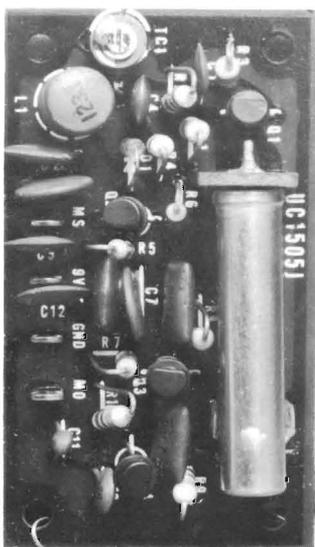


Photo 4 UC1505J

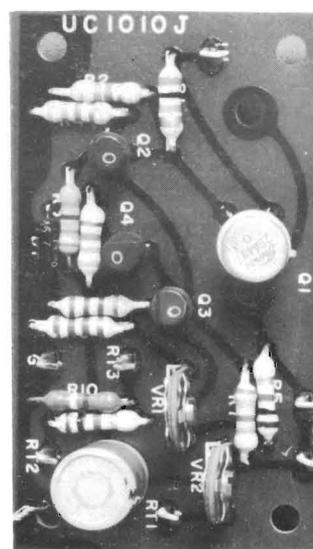


Photo 5 UC1010J

V at its OUT terminal, adjust VR1 until a voltage of 9 V presents at the terminal.

To make zero adjustment of the RIT control concerning the receiver incremental tuning signal generator circuit involved in this unit, proceed as follows:

Precisely set the RIT control to position 0. Tune the receiver to the 100 kHz standard signal and, while making the 100 kHz marker oscillator output beat with the standard signal, adjust VR2 until the speaker delivers the same number of beat tones for the RIT control placed in the ON and OFF positions.

3. AF Unit (UC1307J) (See Photo 6)

When semi-fixed control VR on this AF unit is improperly adjusted, the audio frequency output is distorted excessively. In such case, disconnect the read wire from the B terminal on the printed circuit board of the unit. Set a circuit tester at a current measuring range of approx. 100 mA and insert it between the terminal and the disconnected lead wire with the plus terminal of the test connected to the red lead wire. Turn the AF GAIN control on the front panel to the extreme counterclockwise position to cut off the input to the AF unit. Then, adjust VR1 until the tester reads 40 mA precisely. In carrying out the above step, however, be careful to turn VR1 slowly.

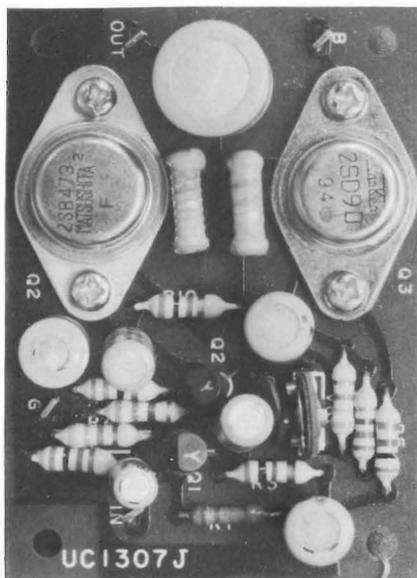


Photo 6 UC1307J

Otherwise, the current varies abruptly.

Note that the POWER switch on the front panel should be turned off without fail when the lead wire is disconnected from or reconnected to the printed circuit board.

4. Fixed Channel Unit (See Photo 7)

If the crystal used has a crystal frequency which is not a multiple of the 25 kHz marker frequency, then it is impossible to make adjustment of the fixed channel frequency unless a frequency meter or counter is available. But, if the crystal frequency is a multiple of the 25 kHz marker signal, for instance 5125 kHz, the channel frequency may be adjusted by making use of the marker signal.

Insert the crystal to be adjusted in its holder for a fixed channel and set the CH SELECT switch to the position corresponding to that channel.

Turn the FUNCTION switch on the front panel to the 25 kHz CAL position. This should cause the speaker to deliver a beat tone. Adjust the trimmer capacitor inserted in parallel with the crystal in the fixed channel unit until the speaker gives a zero beat tone. In the above adjustment, it is adequate to place the MODE switch in the LSB position.

5. Monitor Circuit (See Photo 8)

When model JR-599 is operated with model TX-599 or other transmitter for performance of a combined transmitter-receiver operation, the monitor circuit is inserted in the receiver circuit for monitoring the transmitting signal. In this case, adjust VR2 until the monitoring output from the speaker is set to an appropriate volume.

6. Side Tone Circuit (See Photo 7)

The side tone circuit, similar to the monitor circuit, is inserted in the receiver circuit when model JR-599 is operated with a transmitter for transmission and reception of the telegraph signal under the combined transmitter-receiver operation.

The volume of the side tone output from the speaker may be adjusted by means of VR5.

MAINTENANCE

1. Removal of Cabinet Case

Top Plate: Remove two screws on the top plate located at the extreme rear section. Then, remove a total 6 screws from the right and left side plate. Lift the top plate upwards and the plate can be removed from the chassis.

Bottom Plate: Remove 6 setscrews holding the bottom plate to the chassis and the plate can be removed from the chassis. Note that the legs provided have nothing to do with removal of the bottom plate. Also, use a + screwdriver for removal of setscrews and place the removed screws in a container. This will prevent the screws from missing and insure a speedy work.

2. 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.

3. Pilot Lamp

Model JR-599 employs tubular pilot lamps. If any of these pilot lamps suffers from an open circuit by any chance, replace it with a replacement lamp which is available at the dealers of our products. When purchasing the lamp, however, never fail to designate the ratings of the lamp; 14 V, 200 mA.

Note that replacement of the pilot lamp used in the meter section may be facilitated provided that the replacement work is performed after removal of the metal fittings fixing the meter to the panel.

4. Fuse

Model JR-599 employs a 1A glass-tube fuse. If this fuse is blown out by any chance, inspect the receiver circuit thoroughly for any possible cause of a blown fuse, remove the cause of trouble, and replace the faulty fuse.

5. Cleaning

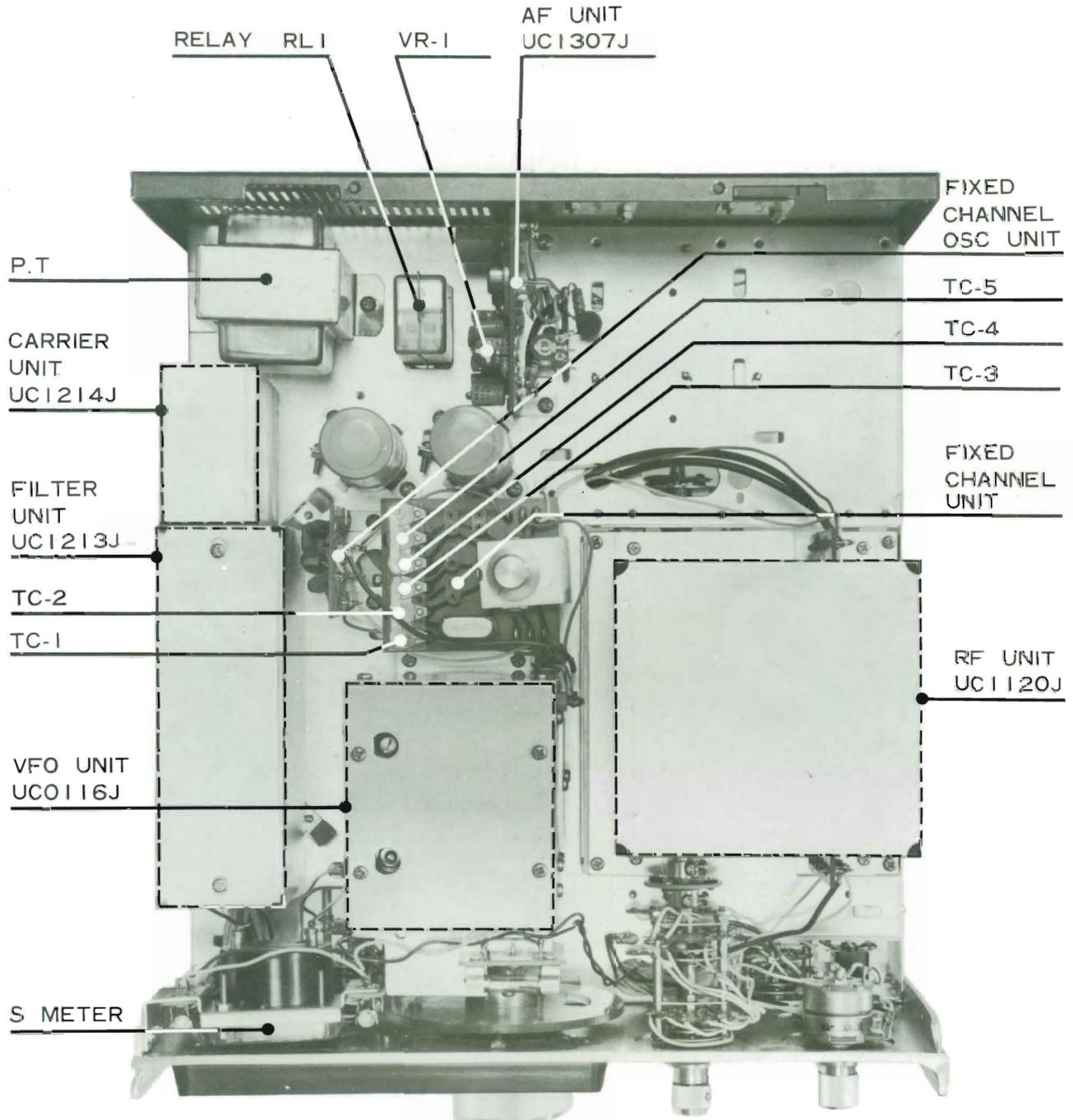
The control knobs and the like become dark owing to the rust generated by sweat or hand-stained when they are in service for a long time. Hence, remove the knobs as required and wash them in neutral cleaner. And you may enjoy a smooth and favourable operation to the receiver using the clean knobs.

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 receiver take on an entirely new charm.

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

■ CHASSIS TOP VIEW

Photo 7



RELAY RL-1

VR-1

AF UNIT
UC1307J

FIXED
CHANNEL
OSC UNIT

P.T.

TC-5

CARRIER
UNIT
UC1214J

TC-4

TC-3

FILTER
UNIT
UC1213J

FIXED
CHANNEL
UNIT

TC-2

TC-1

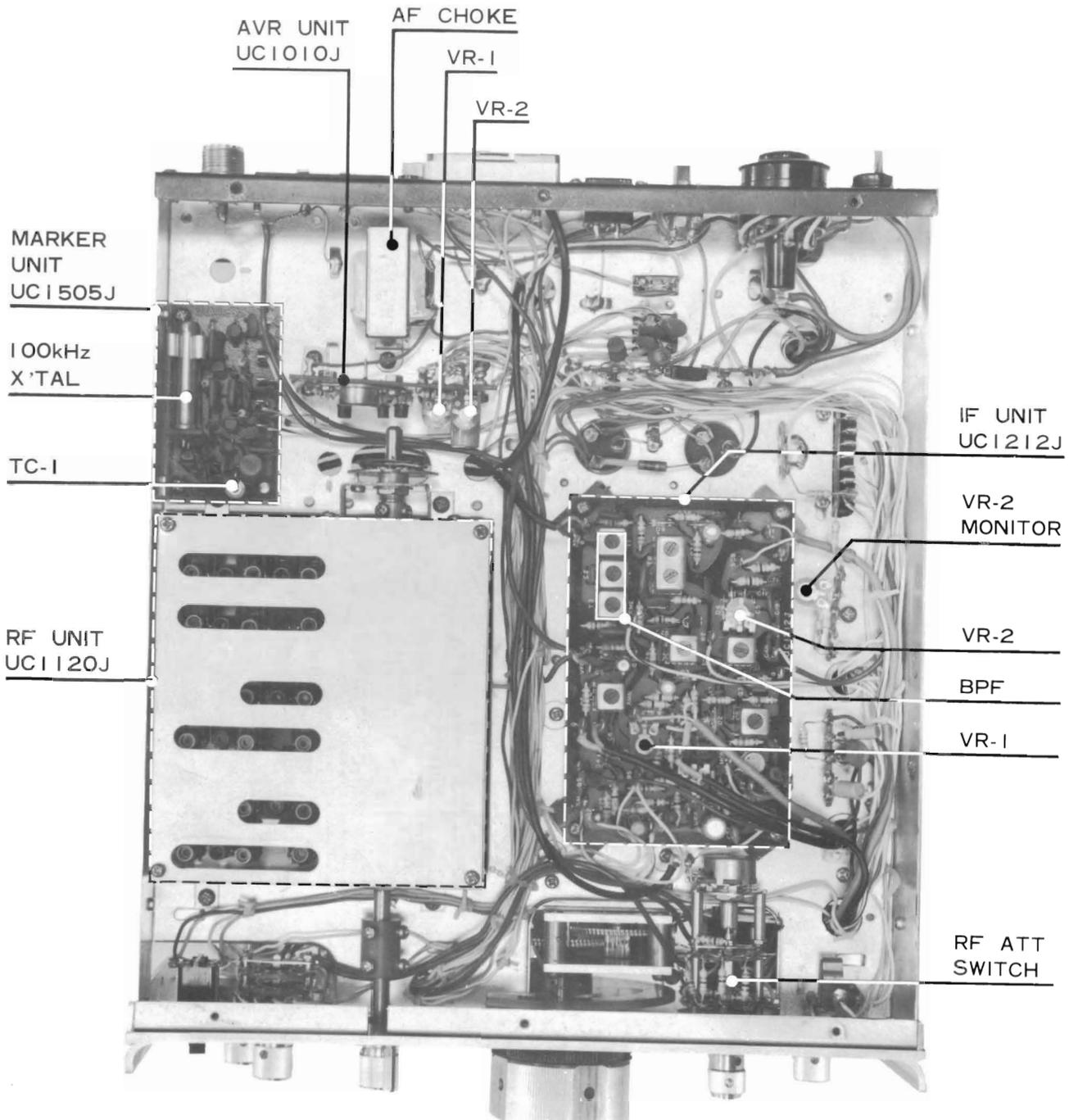
RF UNIT
UC1120J

VFO UNIT
UC0116J

S METER

CHASSIS BOTTOM VIEW

Photo 8



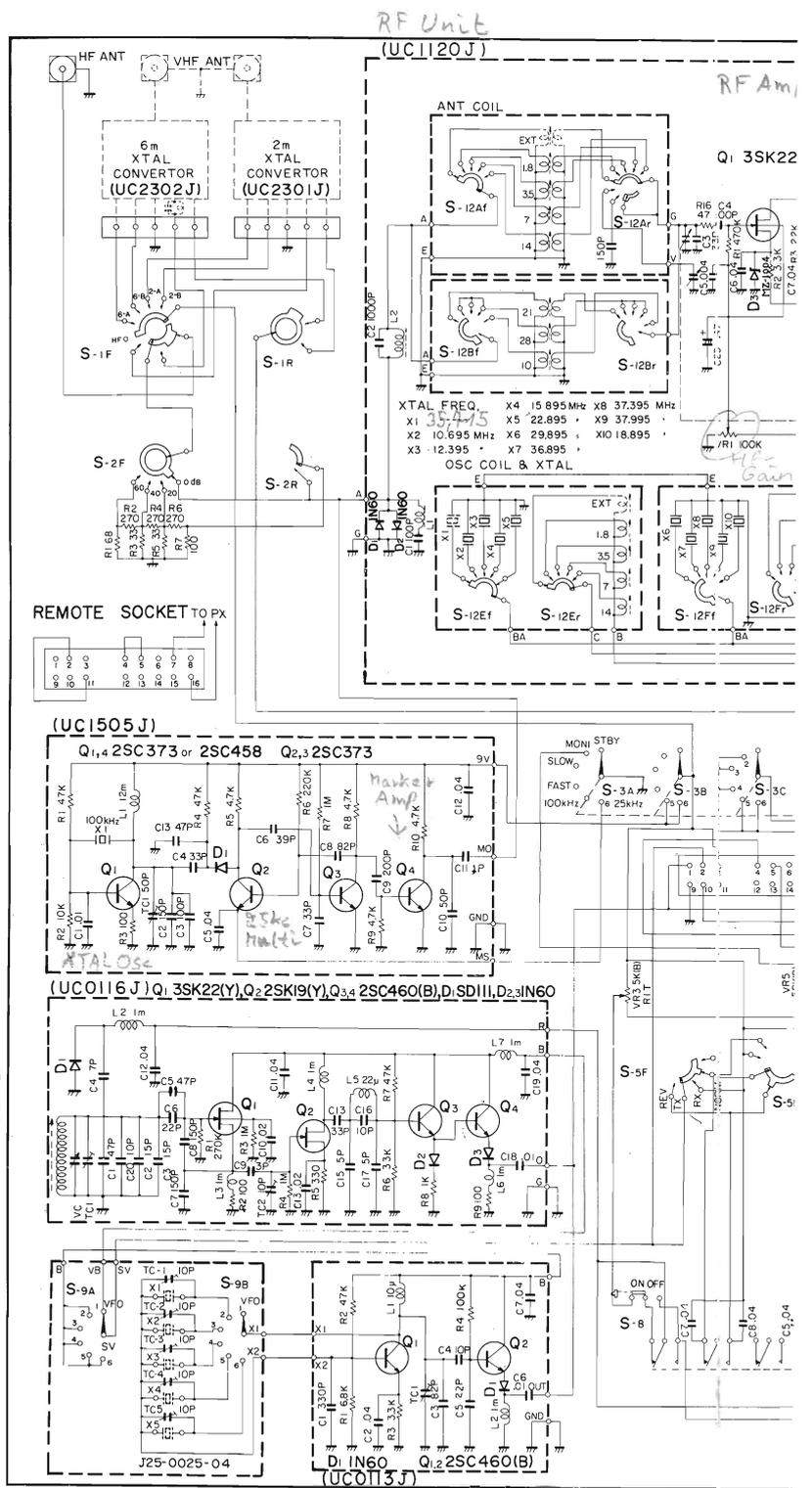
Buchse Remote

- 1 VFO 4,9-5,5 Mc + Fixed Channel Unit
- 2 wie 1: über S9-A + S-5F + S5-R
- 3 9V
- 4 Relais-Steuertlg. 1
- 5 + Spannung unregelt
- 6 frei
- 7 wie 4 Ltg. 2
- 8 Osc. Quarzfrequenzen
- 9 Ground
- 10 Lautspr. üb. Phonabuchse geschaltet
- 11-14 frei
- 15 NF über VR5 regelbar
- 16 Ground

Quarze für: Quarz
 18,068-18,168 26,963 Mc
 24,99-24,99 33,785 Mc

(alte Werte '96)
 vor '96: 4,97706 VFO
 5,5218 5,5-5,9 Mc
 in Abh. v. RIT R0

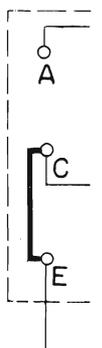
Marken
 Gener.



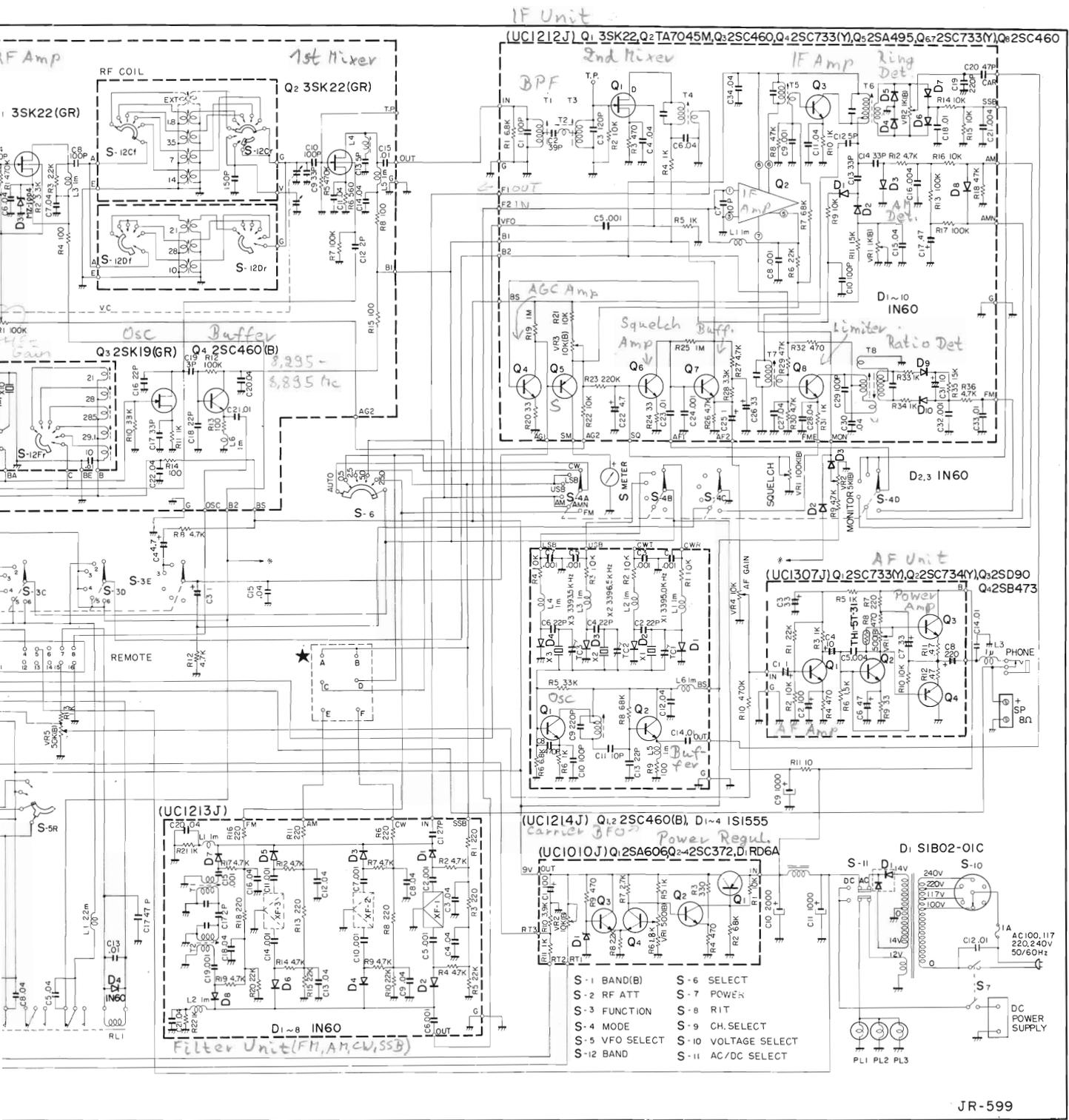
CAUTION

For Custom SPECIAL (X) type Models, the wiring inside the block marked * is changed as shown at right.

This model is also equipped with a 2-meter and 6-meter Xtal Converter Sections (UC2301J) (UC2302J), the schematic diagram for which appears in Fig. 2 and Fig. 3 on Page 9. It also is equipped with XF-2 and XF-3 of UC1213 J and the block code number is UC1213J2.



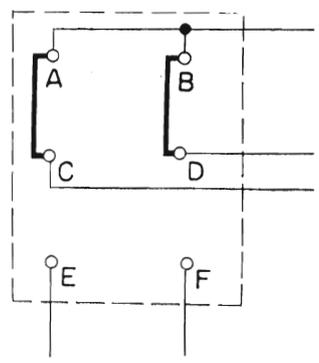
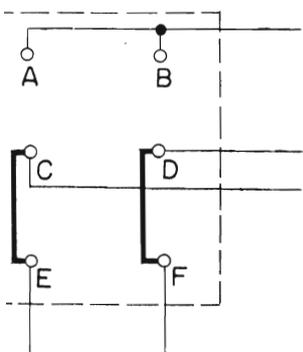
SCHEMATIC DIAGRAM



- S-1 BAND(B)
- S-2 RF ATT
- S-3 FUNCTION
- S-4 MODE
- S-5 VFO SELECT
- S-12 BAND
- S-6 SELECT
- S-7 POWER
- S-8 RIT
- S-9 CH. SELECT
- S-10 VOLTAGE SELECT
- S-11 AC/DC SELECT

JR-599

For Custom DELUXE type Models, the wiring inside the block marked * is changed as shown at right. This model is not equipped with a 2-meter and 6-meter Xtal Converters.



SPECIFICATIONS

ONLY MODEL JR-599 CUSTOM SPECIAL Type

RECEIVING FREQUENCY RANGE:

1.8 MHz BAND	1.80 ~	2.30 MHz
3.5 MHz BAND	3.50 ~	4.00 MHz
7.0 MHz BAND	7.00 ~	7.50 MHz
14.0 MHz BAND	14.00 ~	14.50 MHz
21.0 MHz BAND	21.00 ~	21.50 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
50.0 MHz BAND	50.00 ~	53.40 MHz

(only for model SPECIAL (X))

144.0 MHz BAND	144.00 ~	147.40 MHz
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(only for model SPECIAL (X), (M))

WWV	10.00
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TYPE OF RECEPTION: SSB, CW, AM and FM

ANTENNA INPUT IMPEDANCE:

50 ~ 75 Ω (Unbalanced)

SENSITIVITY:

SSB:

1.8~21 MHz BAND	0.5 μ V S/N 10dB or more.
28 MHz BAND	1.5 μ V S/N 10dB or more.
50 MHz BAND	1.5 μ V S/N 10dB or more.
144 MHz BAND	2 μ V S/N 10dB or more.

AM:

1.8~21 MHz BAND	2 μ V S/N 10dB or more.
28 MHz BAND	4 μ V S/N 10dB or more.
50 MHz BAND	2 μ V S/N 10dB or more.
144 MHz BAND	3 μ V S/N 10dB or more.

IMAGE RATIO: More than 50dB

IF INTERFERENCE: More than 50dB

SELECTIVITY:

SSB:

More than ± 1.1 kHz (at -6dB)
Less than ± 2.5 kHz (at -60dB)

CW: (only for model SPECIAL (X), (M))

More than ± 250 Hz (at -6dB)
Less than ± 750 Hz (at -60dB)

AM: (only for model SPECIAL (X), (M))

More than ± 2.5 kHz (at -6dB)
Less than ± 5.0 kHz (at -60dB)

FM:

More than ± 10 kHz (at -6dB)
Less than ± 40 kHz (at -20dB)

FREQUENCY STABILITY:

Within ± 2 kHz for 60 minutes from one minute after switching on the set.
Within ± 100 Hz after 15 minutes.

AF OUTPUT: More than 1W (at 10% noise output)

LOAD IMPEDANCE: 4 to 16 Ω

SEMICONDUCTORS COMPLEMENT:

10 FET's, 1 IC, 30 Transistors, 37 Diodes, 4 Zener diodes and 6 Variable capacitor.

POWER CONSUMPTION:

AC:	Less than 15 W
DC:	Less than 1A (at 13.8 V)

POWER REQUIREMENT:

AC:	100/117/220/240 V, 50/60 Hz
DC:	12 ~ 15 V

DIMENSIONS:

10-1/8" (270) W x 5-1/2" (140) H x 12-7/32" (310) D (mm)

WEIGHT: 12.54 lbs (5.7 Kg)



Manufactured by TRIO ELECTRONICS, INC., TOKYO, JAPAN.