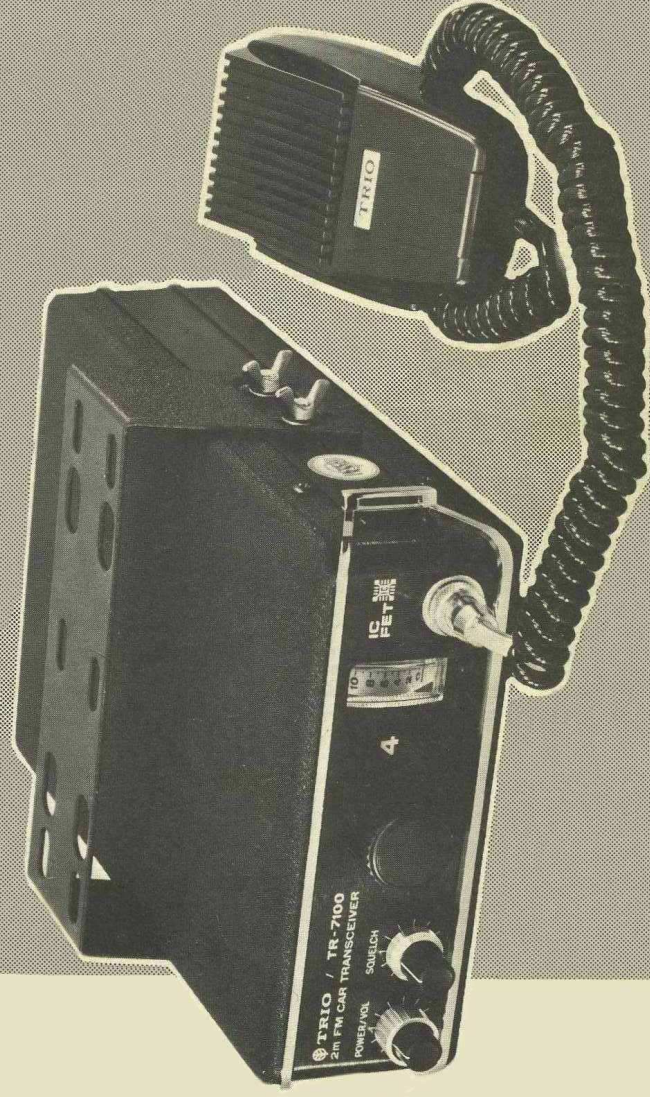


**2 METER
FM CAR TRANSCEIVER**

TR-7100



OPERATING MANUAL

WELCOME TO TRIO'S ALL SOLID STATE CIRCUITRY

Your TRIO'S TR-7100 all transistor 144MHz Band FM Car Transceiver is from TRIO'S new collection of precision-engineered unit with space age solid state circuitry. It's Superior performance is the result of TRIO'S engineers' many years of research in the transistorized field.

It's design based on the human engineering, is also unique and functional.

Go ahead-enjoy it. Your new TRIO TR-7100 expects rugged use. It was designed and engineered to take it.

TABLE OF CONTENTS

INTRODUCTION.....	1
SPECIAL TR-7100 FEATURES.....	2
CONTROLS AND THEIR FUNCTIONS.....	3, 4
CHASSIS TOP VIEW.....	5
CHASSIS BOTTOM VIEW.....	6
INSTALLING THE TRANSCEIVER.....	7, 8
OPERATING THE TRANSCEIVER.....	9, 10, 11, 12
OPERATING INSTRUCTION.....	13
FOR USE MOBILE STATION.....	14
CAUTIONS FOR HANDLING THE SET.....	15, 16, 17
TROUBLE SHOOTING.....	18, 19
SPECIFICATIONS.....	20
BLOCK DIAGRAM.....	21
SCHEMATIC DIAGRAM.....	22

SPECIAL TR-7100 FEATURES

Model TR-7100 is the FM Car Transceiver with 12 channels assigned exclusively for the 144 MHz band. The special features of this transceiver are as follows:

1. Complete solid state transceiver — employs abundant semiconductors including 1 FET, 25 transistors, 3 IC, 1 thyristor, 14 diodes and 2 Zener diodes, incorporated in a high-class circuit.
2. All crystal-controlled circuit used in both transmitter and receiver units — quite stable transceiver operation insured for reliable and comfortable on the car communications against variation of power supply voltage and temperature.
3. Double superheterodyne type of reception — allows reception of all bands in frequency range from 144 to 146 MHz with high sensitivity.
4. FET employed in the initial RF amplifier stage in receiver unit provides especially high-quality two signal characteristics such as cross modulation, inter modulation and suppressed sensitivity.
5. Dual-in-line package type IC μ PC16C used in IF amplifier stage — improved reliability, excellent limiting characteristic, and compact size.
6. Ceramic filter inserted in IF stage improves selective characteristic.
7. AF stage employing IC μ PC20C as an AF amplifier with less distortion.
8. FM signal generated and frequency multiplied 24 times by transmitter unit operating on phase modulation system — modulation linearity better enough to allow the user to enjoy communications with clear sound of speeches.
9. Epitaxial planer type RF transistor 2SC703 with an high output employed in the final stage power amplifier — provides an antenna output of more than 10 watts in the 144 to 146 MHz band.
10. A high-performance low-pass filter inserted as television interference prevention circuit in transmitter antenna circuit.
11. This set designed exclusively for vehicular use — operable regardless of the polarity of battery grounded and type of user's motor car and as a fixed station, provided that a power supply is installed separately.
12. A protection circuit provided to protect transistors and chemical capacitors against battery voltage applied with reverse polarity by mistake and another protection circuit for final stage power transistor — allow a beginner to use this set without anxiety.
13. No DC-DC converter employed because of all-transistorized circuitry — insures quiet communications without annoyance from DC-DC converter hum and with small power consumption reduced to less than one half of that of the transceiver using vacuum tube as final stage power amplifier.
14. Compact and stylish design as vehicular set — deserves well for installation in user's car.
15. Protrusions of front panel made as low as practicable and controls covered with flexible vinyl chloride sheet — safety insured even when user encounters a car accident by any chance.

CONTROLS AND THEIR FUNCTIONS

1. POWER/VOL

This is a composite power ON-OFF switch and volume control. The power ON-OFF switch is of the push-push type construction. That is, depressing the control turns on the set and depressing the control again turns off the set.

The volume control increases the volume of the set as it is turned clockwise.

2. SQUELCH

This is the squelch control. Turning the control clockwise to a setting around the mid-point of its rotary range turns on the squelch circuit.

3. CHANNEL

This is the channel selector switch. The switch may be rotated both clockwise and counterclockwise. It has the positions for 12 channels.

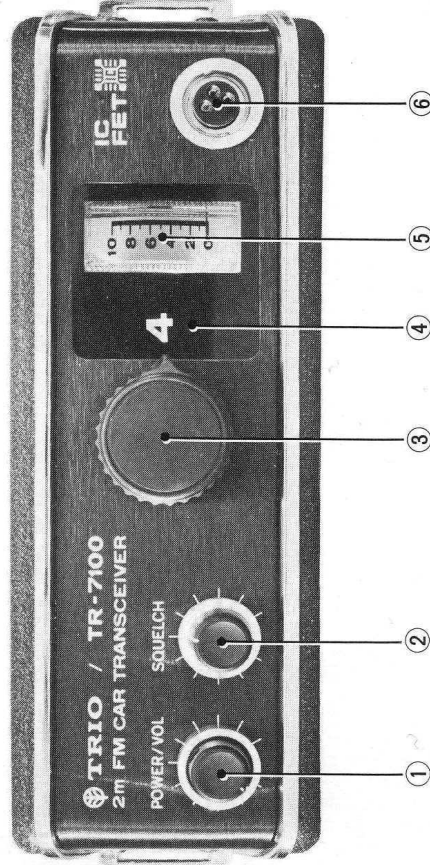


Photo 1. Model TR-7100, front view

4. CHANNEL INDICATOR WINDOW

This window indicates the number of the channel selected when the POWER/VOL control is depressed. When the POWER/VOL control is in the normal position, i.e. the set remains in its off condition, the channel number is not seen by the smoked acrylic resin plate covered on the window.

5. METER

This meter acts as an S meter for signal input and an output meter for signal output. Switchover of the meter circuit for an input signal or an output signal is automatically performed. The meter acts as the input meter during reception.

6. MIC

This is the connector for the microphone. Operate the set with the microphone supplied with the set, connected to this connector. Pressing

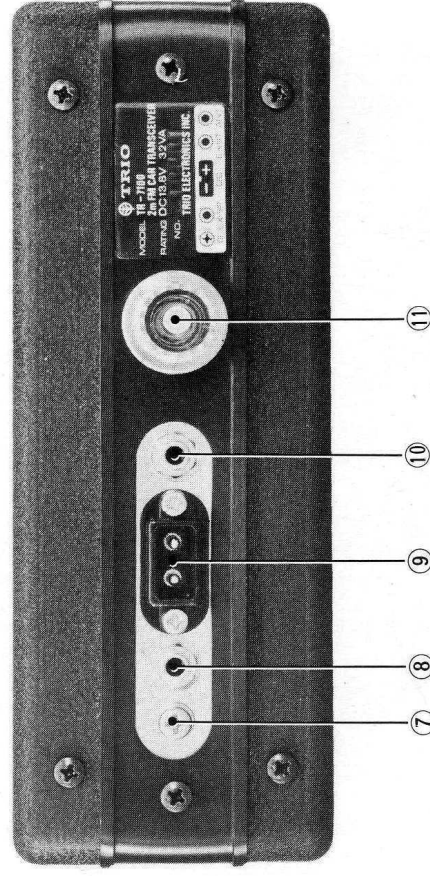


Photo 2. Model TR-7100, rear view

CONTROLS AND THEIR FUNCTIONS

the press-to-talk switch on the microphone places the transmitter unit in the plug supplied with the set.

7. G TERMINAL

This is the grounding terminal for the set.

8. EX SP TERMINAL

This is the external speaker terminal. When user wants to an external speaker, connect the speaker to this terminal through the use of the plug supplied with the set.

9. DC TERMINAL

This is the terminal for the DC power supply. Connect the power line to this terminal through the use of the power cord and socket supplied with the set.

10. EX ST TERMINAL

This is the external stand-by terminal. This terminal is connected to the transceiver circuit in parallel with the press-to-talk switch on the microphone.

11. ANT TERMINAL

This is the terminal for the antenna lead wire.

12. HOLES FOR MOUNTING BRACKET FIXING SCREWS

These holes are provided for the screws fixing the mounting bracket in position on a motor car. As for the screws, use those supplied with the set without fail.

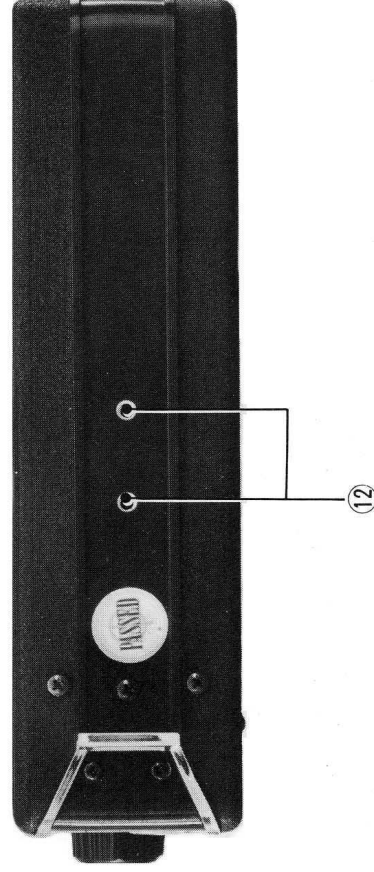
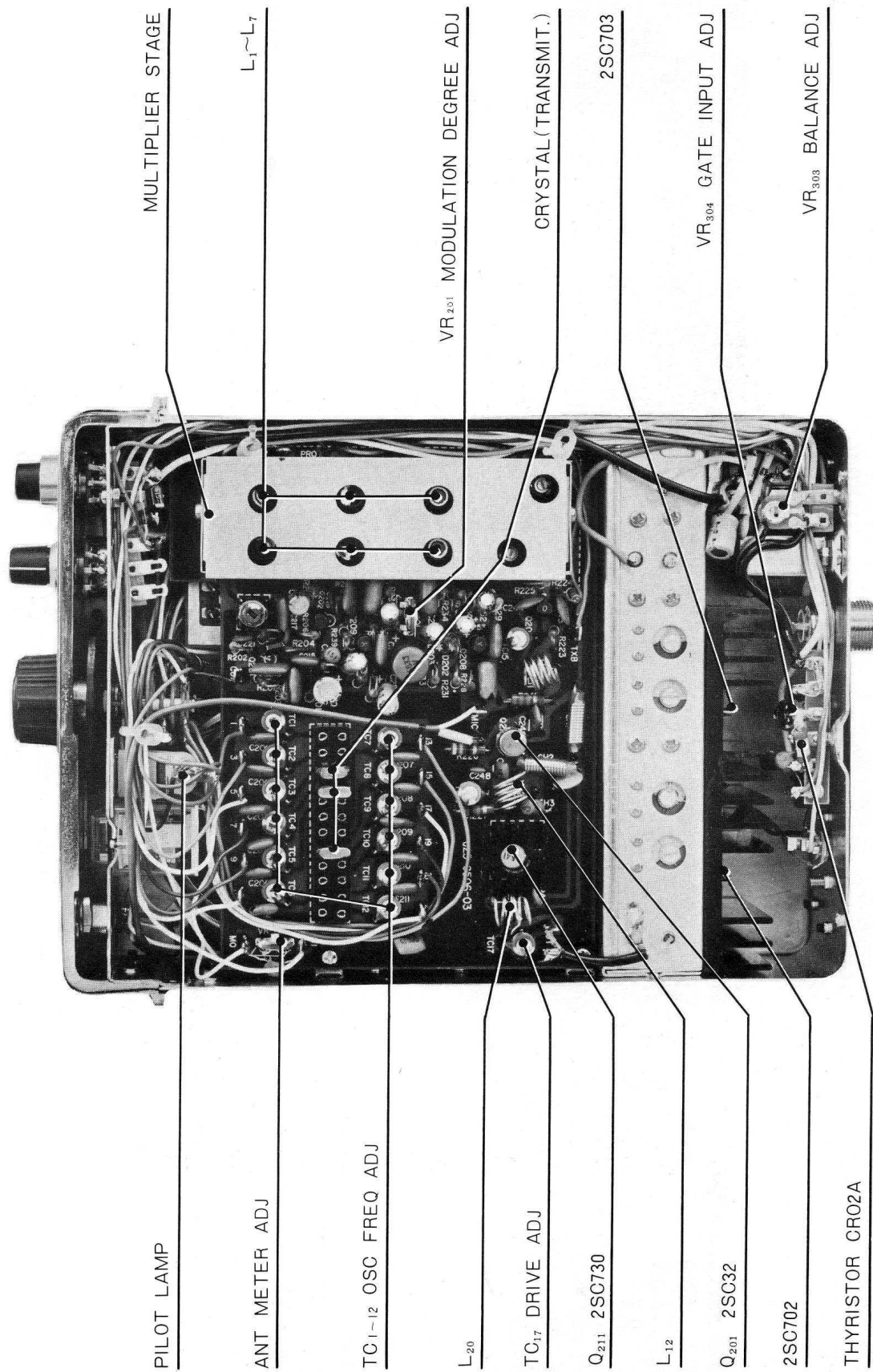
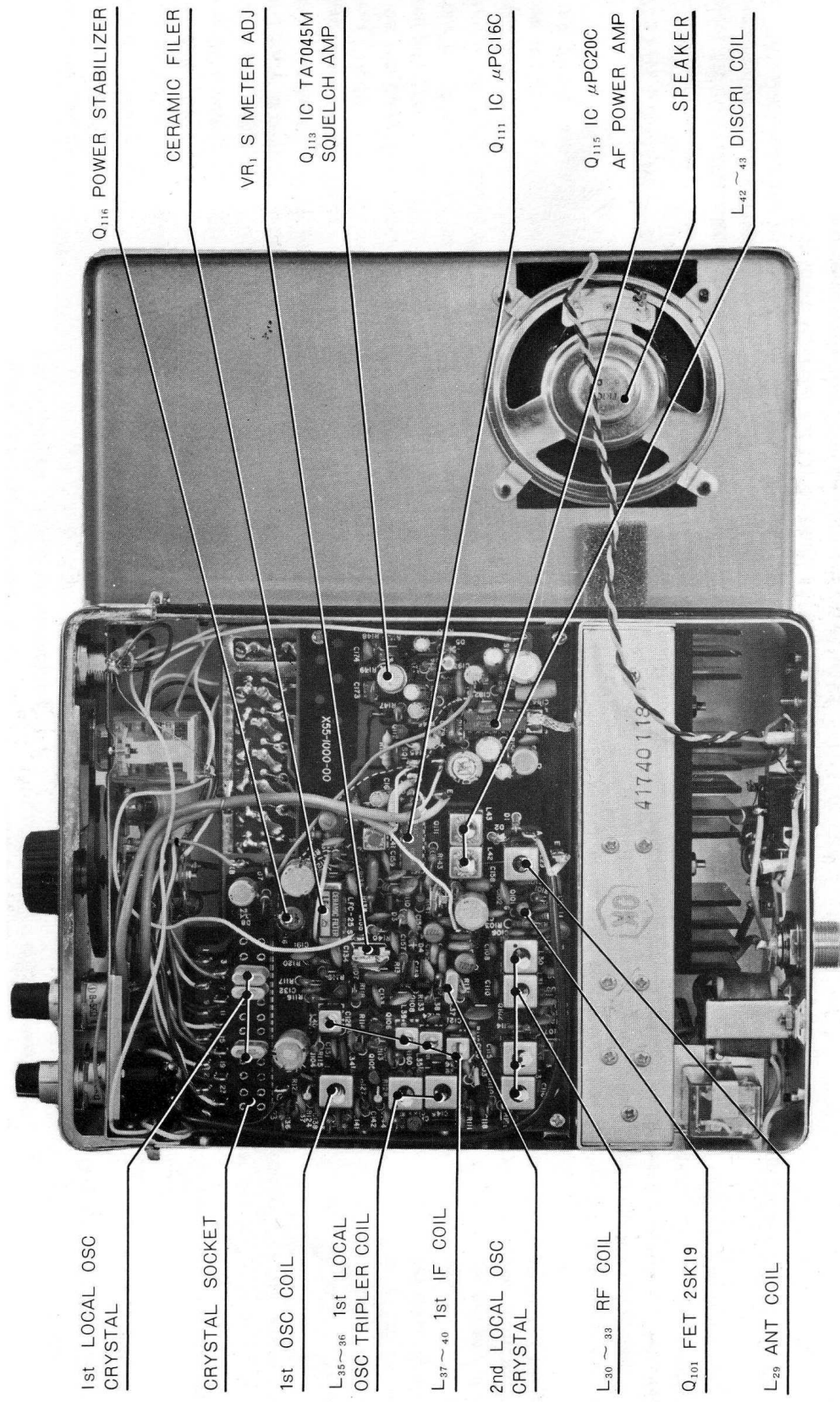


Photo 3. Model TR-7100, side view

CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW



INSTALLING THE TRANSCEIVER

1. ACCESSORIES

Model TR-7100 is supplied with the accessories listed below. Check the contents of the container against the following list when unpacking the container.

One microphone (dynamic type)
One mounting bracket
Four insulator rings (rubber)
Two spare fuses (3A)
One DC power cord (with socket and fuse)
Two small single-head plug (for EX SP and EX ST)
One copy of instruction manual
Crystals (installed in the set)
Two 144.48 MHz crystals (one each for transmitter and receiver units)
Two 144.60 MHz crystals (one each for transmitter and receiver units)
Two 145.32 MHz crystals (one each for transmitter and receiver units)
One microphone hook
Four thumb screws (6 mm diameter)
Four bolts (6 mm diameter)
Four nuts (6 mm diameter)
Twelve flat washers (6 mm diameter)
Four spring washers (6 mm diameter)

2. INSTALLATION PLACE AND METHOD

When user wants to operate Model TR-7100 as a fixed radio station, select an installation place where the transceiver is not exposed to high humidity or direct sun beam.

In case where Model TR-7100 is to be installed in user's car for a mobile station use, mount the transceiver set to the body of the motor car under the dash board completely using the mounting bracket, bolts and washers. If the set is mounted improperly, it may sometimes be fall down from its position or the mounting plate of the car may be damaged, owing to the vibrations of the car. Also, check the material of

the installation place beforehand for rigidity. As to details, refer to later paragraph.

3. GROUNDING SYSTEM OF CAR'S BATTERY

Use the fuse inserted power cord supplied with the transceiver set to connect the set to its power supply. The cord has two lines color coded in red and black. Of these colors, the red signifies the positive polarity and the black the negative polarity.

When mounting the transceiver set to the motor car, never fail to check whether the car battery is grounded at the positive side or at the negative side.

To mount the set to the car with the vehicular battery grounded at the negative side, there is no need of electrically insulating the set specifically from the body of the car. So, the set can be installed in the car by bolting the mounting bracket for the set directly to the body of the car without using the insulator rings supplied.

In case of the motor car with the vehicular battery grounded at the positive side, proceed to the installation work with sufficient cares. First, the transceiver set must be electrically insulated from the body of the car.

Note that this transceiver set has a preventive circuit for the input circuit, which protects the input circuit against the voltage input with the reverse polarity connected to the set by mistake. This prevents the set being damaged from the voltage input. But, put such fact in mind that the set is disabled by the operation of the protective circuit in the above case.

As to the method for mounting the set in a motor car, refer to the later paragraph concerned.

4. ANTENNA

The antenna for this transceiver set has an impedance of 50 Ω .

INSTALLING THE TRANSCEIVER

When the set is to be operated as a fixed station, install a multi-element Yagi antenna with the possible highest directivity at a higher position. In this case, set up the antenna of the fixed station for transmission and reception of the signal polarized vertically, since the set used as a mobile station employs the antenna vertically polarized. Photo 4. shows an example of the antenna for fixed station use practically used. As seen from Photo 4., the elements of Yagi antenna are attached vertically to their supports, whereas Yagi antenna is normally used with its elements attached horizontally to their supports for reception of the horizontally-polarized signal.

It should be noted that the transceiver set using the Yagi antenna provides its sensitivity only for the receiving signal coming from one direction only, that is has a directivity for reception of the signal. For this reason, there is a need of installing a rotary mechanism (motor) with the antenna to change the direction of antenna over a horizontal angle of 360°

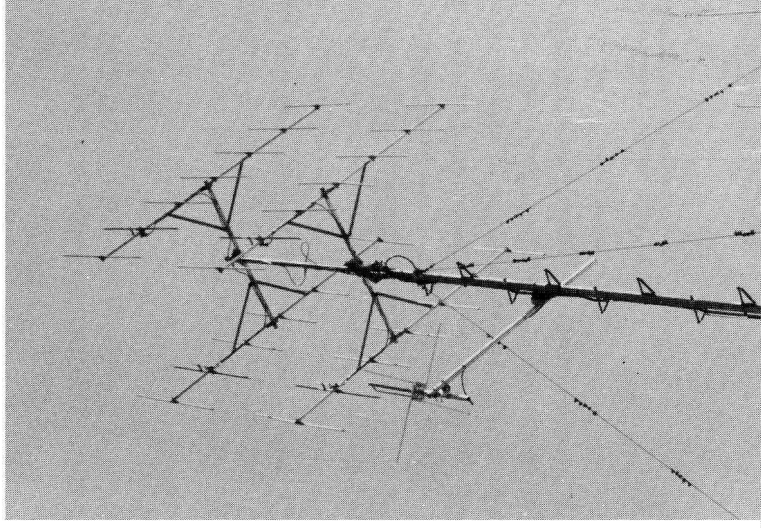


Photo 4. Transmitting and Receiving Antennas for 144 MHz Band, an example

OPERATING THE TRANSCIVER

1. INSTRUCTIONS FOR OPERATING THE SET AS A FIXED STATION

When the user wants to operate this transceiver set as a fixed station, the mounting bracket for the set can be used as a stand, as shown in Photo 5. The mounting angle of the set can also be adjusted as desired using the thumbscrews.

This transceiver set operates with a self-contained speaker. It may be operated with an earphone or an external speaker. In this case, connect the earphone or external speaker to the EX SP terminal (with an impedance of $8\ \Omega$) using the plug supplied with the set.

But, note that the self-contained speaker is disabled and, therefore, delivers no sound output during the time when the EX SP terminal is connected to either the earphone or the external speaker.

Next, note that this transceiver set is provided with no built-in power supply, because it is designed exclusively for vehicular-mount operation. Accordingly, it is necessary for the set to provide the DC power supply additionally when the set is operated as a fixed station.

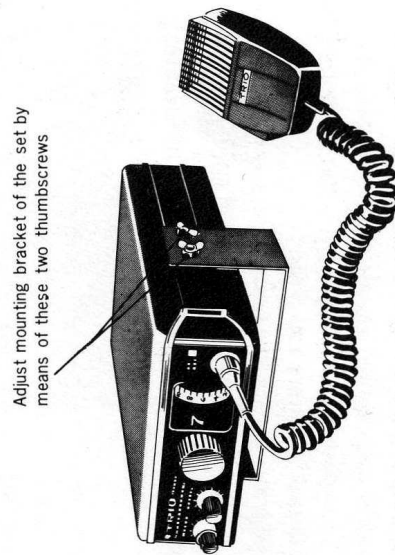


Photo 5. Adjust mounting bracket

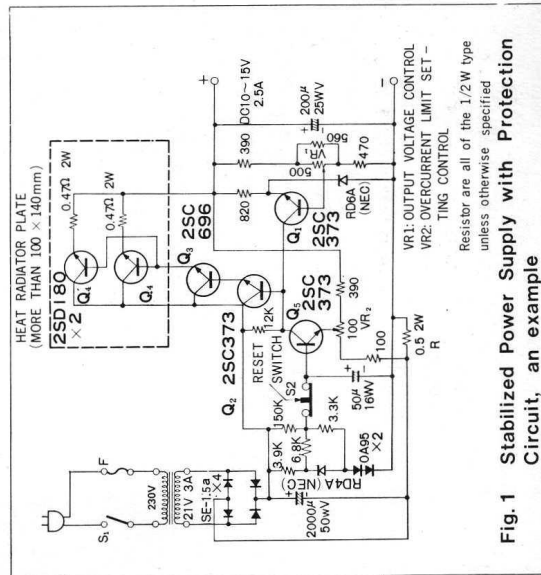


Fig. 1 Stabilized Power Supply with Protection Circuit, an example

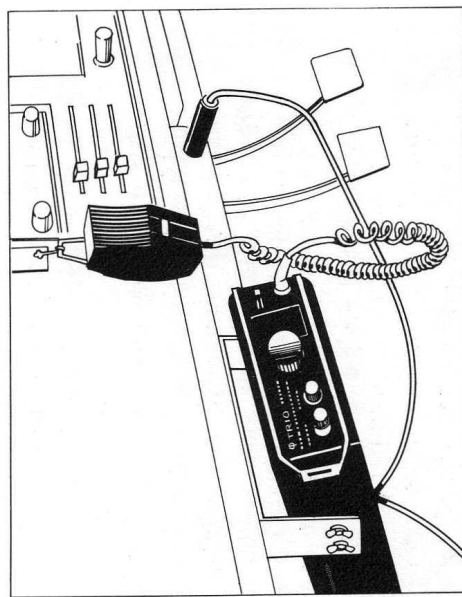


Photo 6. Location of the transceiver in vehicular installation

The power supply voltage for the set is DC 13.8 V (operating voltage range: 12 ~ 15 V) as the reference voltage and the current draw under transmission is approx. 2.3 A.

For the above reason, it is necessary for the user to use a stabilized power supply having the specifications which are excellent enough to meet the above requirements.

If the transceiver set is operated from a power supply with a poor voltage regulation or a small current capacity, it not only fails to deliver the rated power output but also may yield a cause of spurious radiation to result in a improper operation.

Fig. 1 shows the circuit diagram of a constant voltage stabilized power supply with a protection circuit for overcurrent, given as a reference for the user who wants to make the power supply for this set by its own effort.

OPERATING THE TRANSCEIVER

2. VEHICULAR OPERATION

1. Installation

The installation place for this transceiver set depends of the type of a motor car on which the set is mounted. So, the requirements for the installation place can not be given generally. In brief, however, the place shall be such where the set may be operated without any trouble to its operating controls and others and further be operated easily. Generally speaking, the place under the dash board at the auxiliary driver seat is most suitable as the installation place. When the set is installed in the above place, be careful to fix the set in a position where the auxiliary driver does not strike his knee or leg on it when the car is stopped with its wheels braked suddenly. (Refer to Photo 6)

2. Identification of vehicular battery grounded at positive or negative polarity side

Prior to actual installation of the transceiver set on a motor car, it is necessary to check the battery for the grounded line.

As the most simple method for identification of the battery about its grounded polarity is to locate the positive or negative battery terminal connected to the body of the car. For instance, suppose the negative terminal of the battery is connected to the body and it means that the battery is grounded at the negative polarity side.

If the user has a circuit tester on hand, then identification of the battery grounding can be made securely in accordance with the procedure given below.

First, set up the circuit tester for a DC voltmeter operation (with its range selector switch set at the 15 or 30 V range).

With the negative lead wire of the tester connected to the body of the car, where the metal ground is free from paint or stains, observe the voltage while bringing the positive lead wire of the tester into touch with the positive terminal of the vehicular battery. If the

voltmeter gives an indication on the order of 12 to 13 V, it shows that the battery is grounded at the negative polarity side. If the meter gives no indication when the positive lead wire is brought into contact with the positive battery terminal and deflects reversely with the lead wire brought into contact with the negative battery terminal, it shows that the battery is grounded at the positive polarity side.

If the user fails to identify the battery about its grounded polarity, ask the identification work to a maintenance shop for the motor cars or a gasoline service station.

3. Installing the set to a car with a vehicular battery grounded at negative polarity side

When the user's car is of the type with a vehicular battery grounded at the negative polarity side, there is no trouble about mounting the set to the car since the grounded polarity of the vehicular battery coincide with that of this set. Hence, the set can be installed in the car as illustrated in Fig. 2. To accomplish this, proceed as follows:

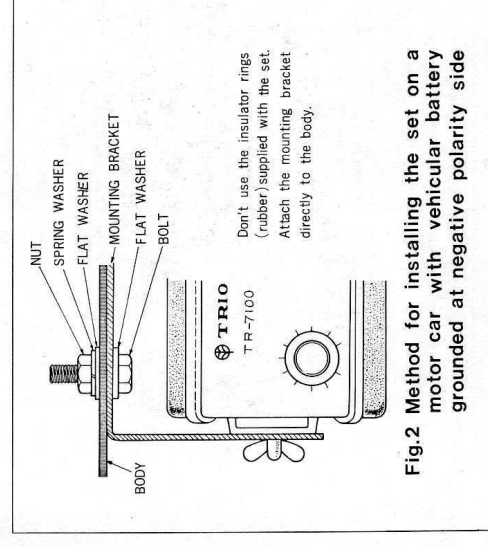


Fig.2 Method for installing the set on a motor car with vehicular battery grounded at negative polarity side

OPERATING THE TRANSCEIVER

Mount the set to the mounting bracket first as shown in the figure and bolt the bracket directly to the body at a location below the dash board using the bolts and nuts and the spring and flat washers supplied with the set. Then, adjust the thumbscrews until the set is positioned at a mounting angle for which the set is operated most easily.

4. Installing the set to a car with a vehicular battery grounded at the positive polarity side

In case of the car with a vehicular battery grounded at the positive polarity side, proceed as follows:

Mount the set to the mounting bracket in the same manner as described in item 3 above and then bolt the bracket to the body of the car using four insulator rings in addition to the bolts and nuts and the spring and flat washers to insulate the set electrically from the body of the car as illustrated in Fig. 3. In this case, the antenna should also be insulated from the body. This may be accomplished

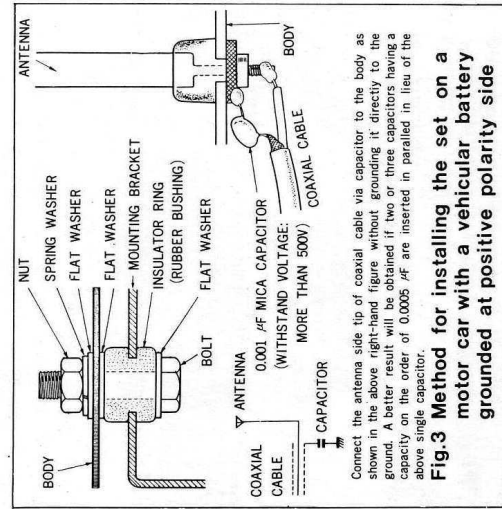


Fig.3 Method for installing the set on a motor car with a vehicular battery grounded at positive polarity side

by grounding the external shielding of the coaxial antenna cable via 0.001 μ F mica capacitor to the body.

5. Vehicular antennas

There are various kinds of the mobile antenna for the 2m FM car transceiver marketed as the vehicular antenna, for instance the ceiling-extension type of a ground plane antenna, the gutter mount type whip antenna (for window frame use), and etc. Of these, the ground plane antenna is superior than the whip antenna from a view point of their electrical performances.

As the methods for installing the vehicular antennas, there are several methods avail, as practised by laying the antenna over the ceiling of car room, by drilling the antenna hole in the top of the body and by fixing the antenna along the gutter above the window frames. Among those, the method practised by fixing a whip antenna along the gutter is most simple. If the antenna is installed on the car using the above method, it is easily installed on the car by

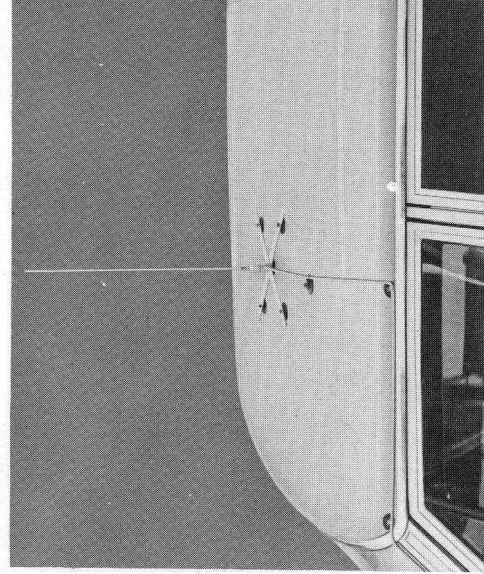


Photo 7. Ground plane antenna

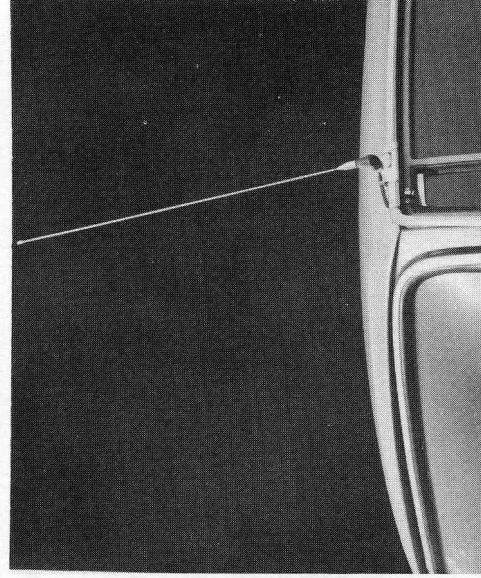


Photo 8. Whip antenna

OPERATING THE TRANSCEIVER

merely fixing it to the body of the car with screws without drilling or deforming the body at all.

It should be noted that the cable connecting between the antenna and the transceiver must be of the coaxial type (the 3D2V is suitable for this purpose), be cabled along the gutter to the bonnet and then be led in the car. In this case, fix the cable to the body of the car with cable rings at appropriate intervals in order to prevent the cable from becoming a loose cabling.

If the cable is led in the car through the door, it will be subjected to such trouble as the open-circuit occurred at the course of its run or the bottom of antenna when the door is opened or closed repeatedly even if it apparently looks like rigid.

Photos 7 and 8 show the ground plane and whip antennas actually installed on the car for reference purpose.

6. Connection of the set the vehicular battery

To connect this transceiver set to the vehicular battery, connect the set with the power cord supplied to the battery with the red and

black cord conductors securely connected to the positive and negative battery terminals respectively.

If the above connections are made improperly, it adversely affects not only the performance of this set but also that of the battery.

Then, fix the laid cord rigidly to the body of car at appropriate intervals lest the cord should be swung. Cut off the surplus of the cable.

Note that the set may be connected to the vehicular battery by plugging a power cord plug in the cigar lighter provided in front of the driver's seat as shown in Photo 9 (b). The plug required for this connection is available in a dealer for motor car's parts or the car corner in a department store.

7. Microphone hook

To hold an idle microphone in a position, utilize the microphone hook supplied with the set as follows:

Select the location of the microphone hook first. Peel off the silicon paper from the rear surface of the microphone hook plate. Then, plaster the hook plate securely on the surface of the material for holding the hook while keeping the hands out of the adhesives of the plate.

Leather or metal surface may be used as the surface of said material for holding the hook.

Note, however, that the surface of the material for holding the hook should be dusted or wiped dry beforehand. (Refer to Photo 9, (a)).

8. External stand-by terminal

There are a external stand-by terminal on the rear side of this transceiver set. This terminal is provided for connection of a stand-by switch intended for use with a mouth microphone. In this case, mount the stand-by switch on the driver seat at appropriate position.

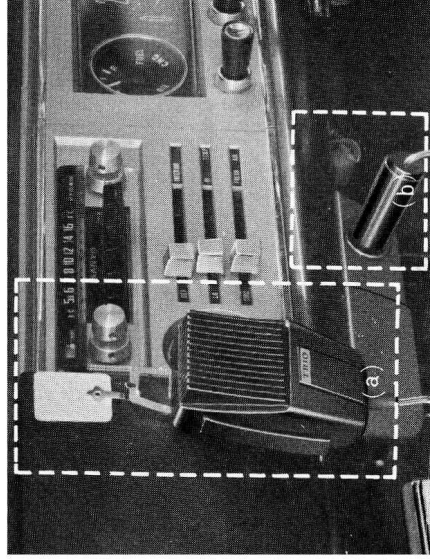


Photo 9. Microphone hook and use of cigar lighter

OPERATING INSTRUCTIONS

When turning the switches of this transceiver set to ON for the first time, carry out the following steps:

1. Connect the transceiver set to the power supply, antenna and microphone.
To connect the set to the power supply, connect it to the vehicular battery with the supplied power cord with the positive and negative conductors connected properly and securely to the battery terminals. An improper connection of the set to the power supply and others will result in a cause of trouble.
2. Depress the POWER/VOL control on the front panel. This turns on the set and indicates the channel number in the channel indicator window. Then, turn the control (volume) clockwise to an appropriate setting. In this case, keep the SQUELCH control in its extreme counterclockwise position.
The speaker delivers noise output under the above condition.
3. Turn the CHANNEL selector switch to channel 4 (which receives and transmits the channel signals of 144.48 MHz).
4. The above steps allow the transceiver set to receive an input FM signal, if any.
5. Upon reception of an incoming FM signal, look at the signal meter in the channel indicator window and the user can check the intensity of the input FM signal.

This transceiver set is so set that the meter deflects over the full scale for approx. 30 dB input signal, and that the meter gives no indication for the signal having a level of 0 dB or less.

6. As a particular nature of an FM receiver, this set has such a defect that it delivers larger noise output from the speaker and makes it difficult to hear the speeches when no signal presents at the receiver unit input. In such case, hear the sound output of the speaker with the SQUELCH control turned on to suppress the noise output.

The operating point of the SQUELCH control is a setting around the mid-point of the variable range of the control. If the control is turned too clockwise, the squelch circuit is actuated with a small input signal and then kept as it is in the ON position. For this reason, set the

SQUELCH control to a setting where the squelch circuit just opens.

The above steps causes the speaker to deliver the sound output only when an input signal presents at the receiver unit.

7. To transmit the signal, depress the press-to-talk switch on the microphone and a relay is operated to emit the signal from the transmitter unit.
During transmission, speak into the microphone with the microphone brought as close to the mouth as possible not to pick up the unwanted external sounds.
8. The signal meter operates as the RF meter through automatic switchover during transmission. It will deflect to around position 8 for the rated output.
9. This transceiver set self-contains the crystals for channel 7 (144.60 MHz) and channel 25 (145.32 MHz) in addition to the crystal for channel 4 (144.48 MHz). Utilize these crystals as desired.
10. When stopping the set, never fail to turn off the POWER switch.

FOR USE MOBILE STATION

When this transceiver set is used as a vehicular set, it is conceivable that the set will be operated under all sorts of the operating conditions as encountered during the stop or high-speed run of the motor car.

A description will be given herein about the operation of the set used as a mobile station in order to have the user enjoy the hum as long as possible.

1. First, always perform the safety operation of the motor car and operate the set with the utmost care, although these are very matter-of-fact sayings.

If any danger is expected by any chance, don't operate the set.

2. Pay special attention when operating the set during driving the car over the place where there is a heavy traffic, on a high-speed high way or a slow-speed section of a road designated by the Public Safety Commission, and at the points where the motor car must be stopped temporarily.
3. Operate the set carefully during driving lest the user should be absorbed in the communications to result in an unsteady steering of the handle.
4. Perform transmission as short as possible by speaking the necessary matters into the microphone in a simple and clear manner.

CAUTIONS FOR HANDLING THE SET

1. Never allow the transceiver set to emit the signal under a condition where the antenna terminals are shorted to each other or opened.
2. Don't install this set in the motor car at a location close to the hot-air outlet of the car heater.
3. This transceiver set is durable for the transmission continued over a sufficiently long time. But, it is desirable to place the set in the receiving condition now and then to prevent the set from being continuously placed in the transmitting condition for an extremely long time.
4. Operate the set from a DC 12 ~ 15 V power supply. The rated power supply voltage is DC 13.8 V.

TABLE 1 CHANNEL PLAN

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
○ 1	144.36 MHz	15	144.92 MHz
○ 2	144.40	16	144.96
3	144.44	○ 17	145.00
○ 4	144.48	18	145.04
5	144.52	19	145.08
6	144.56	20	145.12
○ 7	144.60	21	145.16
8	144.64	22	145.20
9	144.68	23	145.24
○ 10	144.72	24	145.28
11	144.76	○ 25	145.32
○ 12	144.80	26	145.36
13	144.84	27	145.40
14	144.88	28	145.44

The numbers marked ○ are presented on the frequency dial scale.
On the channels 4, 7 and 25, crystals are provided.

1. FREQUENCY DIAL INDICATION

The frequency dial scale carries the numbers of the channels which, being provided by this transceiver set, coincide with the frequencies of these channels which have a prefixed mark ○ in their column of Table 1.

The channels in Table 1 are assigned to a frequency range from 144.36 to 145.44 MHz at intervals of 40 kHz. Indicated numbers are 1, 2, 4, 7, 10, 12, 17, 25. Further, other 4 channels indicated A, B, C and D instead of number respectively are provided as the spare channels.

2. EXPANSION OF CHANNELS

To expand the channels of this transceiver set using the spare receiving and transmitting crystals, which are available at the dealers of our products, proceed as follows:

Remove four screws each from the upper and lower lids of the set and remove the lids from the chassis.

Locate the crystal sockets for the channels to be expanded in the receiver and transmitter units. The receiver unit is the printed circuit board which is incorporated to the chassis at the speaker side. The transmitter and multiplier units are incorporated to the chassis at the opposite side of the receiver unit.

Insert the receiving and transmitting crystals respectively in the sockets located in the receiver and transmitter units. These receiving and transmitting crystals are marked ㊶ and ㊷ at their backs respectively.

Then, proceed to adjustment of the oscillator frequency of the transmitter unit for the channels expanded. But, no adjustment is required for the oscillator frequency of the receiver concerning the channels expanded, because the oscillator circuit of the receiver is of the non-adjustment type and operate well with the crystals newly inserted.

To adjust the oscillator frequency of the transmitter unit, proceed as follows:

Locate the ceramic trimmers provided close to the crystal sockets in which the new transmitting crystals are inserted.

With a frequency counter connected to the output of the transmitter

CAUTIONS FOR HANDLING THE SET

unit adjust the trimmer for a new crystal until the counter read the frequency assigned to the crystal.

Repeat the above step to the trimmers for other crystals newly inserted.

The variable ranges of the ceramic trimmers are approx. ± 2.5 kHz in the 144 MHz band.

The oscillator frequency for the expanded channels may also be adjusted practically by operating the transmitter unit with a partner station. To accomplish this, proceed as follows:

Catch a partner station through a transmitting channel and ask that station to receive the transmitting signal from an expanded channel at the same channel.

Switch the transmitter unit to the expanded channel and adjust the ceramic trimmer for the crystal of that channel until the partner station reports that the receiving signal yields a clear sound through the speaker.

The crystals as the TR-7100 crystals are set to their natural frequencies when their trimmers are rotated half a complete turn from their normal positions.

3. PROTECTION CIRCUIT

This transistor set incorporates a protection circuit for the final stage transistor in the transmitter unit.

The protection circuit detects the reflected signal from the antenna, rectifies the detected signal voltage, and turns on thyristor CR02A-1 to disable the crystal oscillator for protection of the final stage transistor.

This circuit is not actuated when the antenna is matched properly to the output stage of the transmitter unit, because the reflected signal from the antenna is extremely small in this case.

But, the circuit is actuated when the transistor set is used under the conditions given below. Under such conditions, the transistor suffers from a large reflected signal and reduces its transmitter output to zero.

1. A condition where the transmitter unit of this transistor is placed in its transmitting condition with the antenna wire, antenna terminals or coaxial cable shorted, open-circuited or opened.
2. A condition where the transistor is operated with an antenna having an extremely bad SWR because of its mismatching to the transmitter unit. In this case, the protection circuit is actuated even though the antenna is not shorted or open-circuited. Match the antenna again to the transmitter unit in such case before operating the transistor.

The thyristor, once operated by turning on its gate, remains in its operating condition until its anode voltage is cut off.

When the protection circuit is actuated, therefore, turn off the transistor set immediately, repair the faulty part or circuit responsible to the trouble, and then, while pressing the press-to-talk switch on the microphone, check to see that the transmitter unit transmit the signal normally.

In case where the protection circuit is in its operating condition, the transmitter unit of course delivers no output and, therefore, the RF meter remains stand-still.

The RF meter also remains stand-still when the press-to-talk switch on the microphone is operated with the CHANNEL switch placed in the position for a channel for which no crystal is provided. The trouble in this case, therefore, means neither a faulty antenna system nor a faulty set.

4. ADJUSTMENT OF PROTECTION CIRCUIT

The model TR-7100 is shipped after the protection circuit is factory adjusted and should not be manipulated carelessly.

But, the protection circuit shall be adjusted by the procedure given below only when the circuit is actuated in spite of the following facts:

- a) The antenna system is not shorted or open-circuited.
- b) The antenna is matched properly to the transmitter unit. (i.e. provides a small SWR value).

CAUTIONS FOR HANDLING THE SET

- (1) First, connect the transmitter unit normally to the antenna through the protection circuit as shown in Fig. 4.
- (2) Open the protection circuit at the points connected by the dotted line in the figure.
- (3) With variable resistor VR304 turned to the extreme position at diode D302 side, place the transmitter unit in the transmitting condition.
- (4) Adjust variable resistor VR303 until the DC 3V tester gives the minimum indication. (If the protection circuit is adjusted well, the tester will indicate a value of approx. 0.02 V).
- (5) Then, disconnect the antenna from the antenna terminals.
- (6) Adjust variable resistor VR304 quickly (within 30 seconds) until the tester reads 0.6 V.
- (7) Restore the protection circuit to the original condition by reconnecting the points which are opened in step (2). This completes adjustment of the protection circuit.
- (8) Short or open the antenna terminals under the above condition to check to see that the protection circuit operates securely.

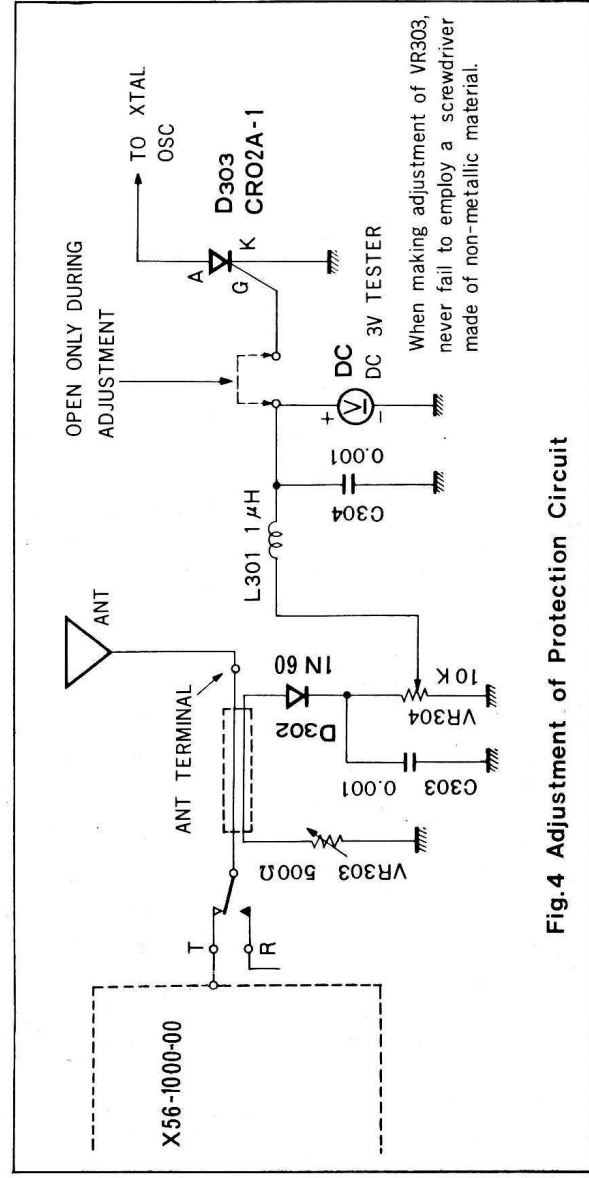


Fig.4 Adjustment of Protection Circuit

TROUBLE SHOOTING

TRANSMITTER TROUBLES

1. **No signal is emitted even when the user speaks into the microphone with the press-to-talk switch on the microphone depressed.**

(a) Final stage transistor protection circuit remaining in its operating condition.

Open-circuit coaxial cable, shorted connector and shorted or open-circuit antenna terminals may be considered as the cause of this trouble.

- (b) **Faulty final stage transistor**

No signal is emitted when the final stage transistor is faulty.

2. **Poor emission of transmitting signal**

(a) **Mis-matched antenna**

Poor emission of the transmitting signal may be caused by the antenna mis-matched to the transmitter unit even when the transceiver set itself operates normally.

To check the set for the above trouble, make measurement of the standing wave ratio using a SWR meter. If the meter reads a value of more than 3, adjust length of antenna elements until the meter reads a value of approx. 1.

(b) **Reduced battery voltage**

If the battery voltage is reduced to below 12 V, the transmitter unit cannot provide the specified power output.

3. **Transmitting signal not modulated**

Improperly-contacted, shorted or open-circuited microphone terminal may be responsible to this trouble.

The trouble may also be attributed to the stand-by relay failed to operate when the stand-by switch is depressed.

4. **Emission of television interference signal**

Model TR-7100 incorporates a TVI preventive circuit. So, it emits no television interference signal under the normal operating condition.

But, the antenna mis-matched to the transmitter unit or the antenna feeder other than coaxial cable may result in a cause for emission of television interference signal.

To remove this trouble, therefore, check to see whether the antenna is matched to the transmitter unit properly. To accomplish this, make measurement of the standing wave ratio as described in par. 2, (a).

RECEIVER TROUBLES

1. **No response from partner station despite of such fact that the transceiver operates normally for both reception and transmission**

If the transceiver fails to make the user communicate with a partner station in spite of such fact that it operates normally for both reception and transmission, it suggests the receiving and transmitting crystals mounted reversely in their sockets. This trouble is liable to happen when the channels are expanded by the user. So, be careful enough not to insert the crystals in wrong sockets when expanding the channel.

2. **Almost no input sensitivity**

The receiver unit of this transceiver set almost fails to sense the incoming signal even though it operates normally, provided that the antenna system suffers from an open- or short-circuit.

It also suffers from a reduced sensitivity when the power supply voltage is lowered. In this case, the transmitting power output is also drastically reduced to zero.

3. **Signal meter deflects but no speaker output**

This trouble suggests the speaker line disconnected from the speaker terminal of the SQUELCH volume control too counterclockwise.

TROUBLE SHOOTING

4. No power presents at transceiver set

- (a) Improper connection of power cord to battery (connection of the cord to the battery with reversed polarities)
- (b) Blown fuse

5. Open-circuited pilot lamp

The pilot lamp may be open-circuited when it is used for many hours or subjected to a shock during its ON condition.

This transceiver set employs a 12 V, 3 W lamp intended for exclusive use with motor cars (transparent lamp) as its pilot lamp. This pilot lamp is available at a gasoline service stations or dealers for motor car parts.

To replace the pilot lamp, carry out the following steps:

Remove the upper lid, or the lid at the opposite side of the speaker, from the set.

Pull the lamp socket out of its bracket. With the socket held in one hand, turn the lamp counterclockwise until the lamp comes out of the socket while slightly pressing it against the socket.

6. Other troubles

If this transceiver set suffers from any trouble other than those described above, write or phone to the dealers of our products for repair of the set. Because, it is useless to manipulate the controls and trimmers other than those required for repairs.

SPECIFICATIONS

Transmitter Unit

TRANSMITTING FREQUENCY: 12 channel frequencies in the 144 MHz band
TYPE OF EMISSION: F3
TRANSMITTING POWER OUTPUT: 10 W
MODULATION SYSTEM: Phase modulation
MAXIMUM FREQUENCY DEVIATION: ± 15 kHz
FREQUENCY MULTIPLICATION: 24
FUNDAMENTAL OSCILLATOR FREQUENCY: 6 MHz band
UNWANTED RADIATION: Less than -60 dB
ANTENNA IMPEDANCE: 50Ω
MICROPHONE: Dynamic microphone with 500Ω press-to-talk switch

Receiver Unit

RECEIVING FREQUENCY: Same as transmitting frequency
TYPE OF EMISSION: F3
TYPE OF RECEPTION: Double superheterodyne
SENSITIVITY: More than 26 dB S/N for 1μ V input
SELECTIVITY: More than ± 12.5 kHz at -6 dB
FILTER: Ceramic filter
INTERMEDIATE FREQUENCY: 1st IF: 10.7 MHz
2nd IF: 455 kHz
AF OUTPUT: 0.7 W (under 10% distortion)

General Specifications

SEMICONDUCTORS COMPLEMENT:

FET	1	IC	3
Transistor	25	Diode	14
Thyristor	1		

POWER REQUIREMENTS
OPERATING VOLTAGE:

DC $11.6 \sim 15.0$ V.
Reference voltage: 13.8 V
Grounding at negative side grounding at positive side is also practicable by changing the installation method.

GROUNDING SYSTEM

POWER CONSUMPTION

DURING TRANSMISSION:

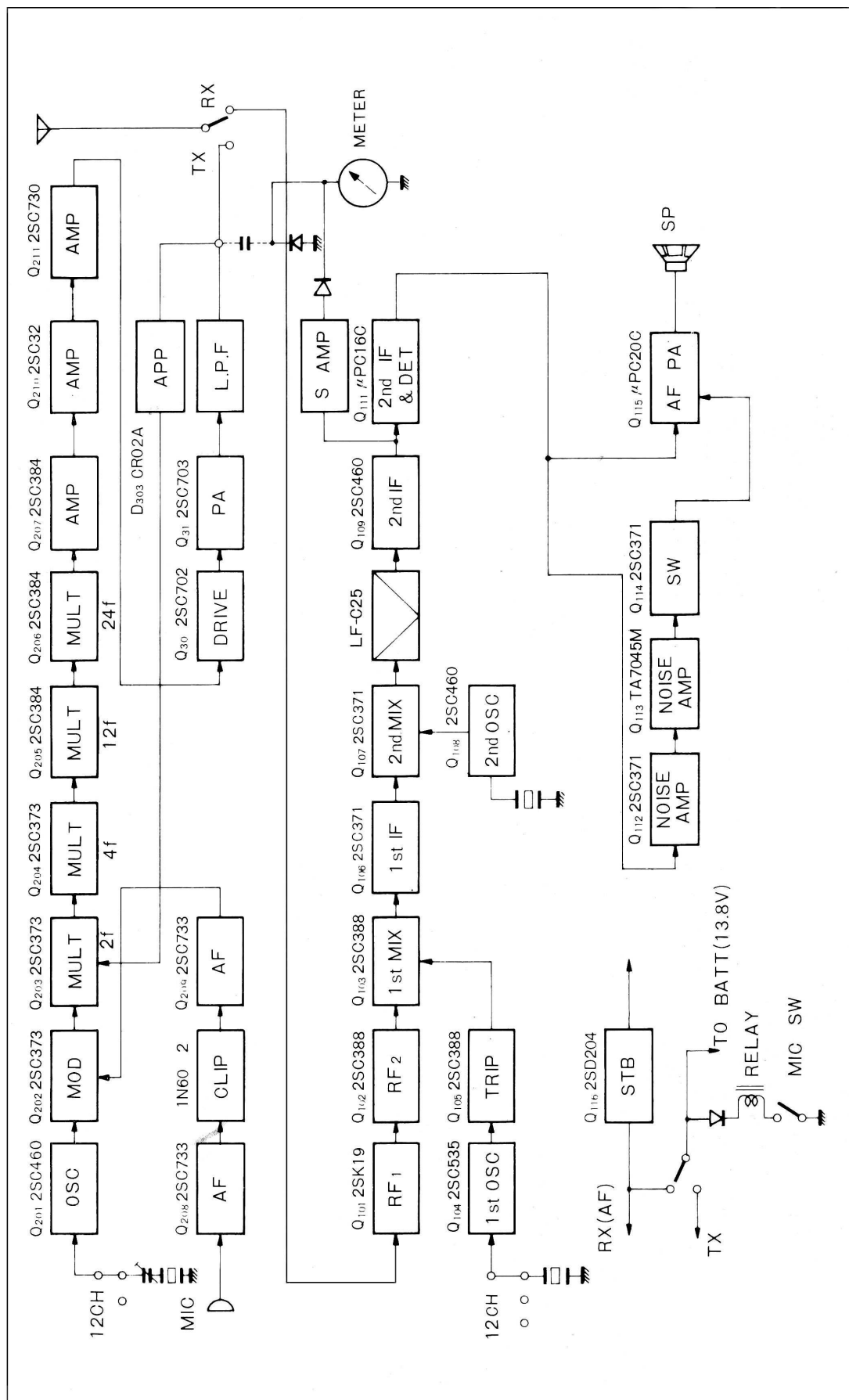
DURING RECEPTION:

DIMENSIONS:

WEIGHT:

Approx. 2.3 A (at 13.8 V supply voltage)
Approx. 0.35 A (at 13.8 V supply voltage)
 170 W x 60 H x 230 D (mm)
 $6\text{-}11/16$ "W x $2\text{-}3/8$ "H x $9\text{-}1/16$ "D (inches)
 4.62 lbs (2.1 kg)

BLOCK DIAGRAM



[illegible]

22

TR-7100 Serial No. _____

Owner _____



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