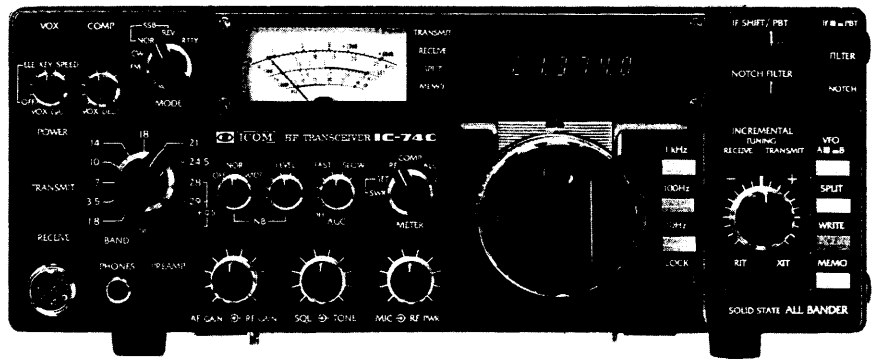
IC-740

HF ALL BAND TRANSCEIVER

INSTRUCTION MANUAL



ICOM

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SECTION 1 SPECIFICATIONS

GENERAL

Number of Semiconductors:

Transistors	85
FET	18
IC (Includes CPU)	48
Diodes	247

Frequency Coverage:

1.8MHz ~ 2.0 MHz
3.5MHz ~ 4.0 MHz
7.0MHz ~ 7.3 MHz
10.0MHz ~ 10.5 MHz
14.0MHz ~ 14.35MHz
18.0MHz ~ 18.5 MHz (Receive Only)
21.0MHz ~ 21.45MHz
24.5MHz ~ 25.0 MHz (Receive Only)
28.0MHz ~ 29.7 MHz

Frequency Control:

CPU based 10Hz step PLL synthesizer.
Independent Transmit-Receive Frequency Available on same band.

Frequency Readout:

6 digit 100Hz readout.

Frequency Stability:

Less than 500Hz after switch on 1 min to 60 mins, and less than 100Hz after 1 hour. Less than 1KHz in the range of $-10^{\circ}C$ to $+60^{\circ}C$.

Power Supply Requirements:

DC 13.8V ±15% Negative ground Current drain 20A max. (at 200W input)
AC power supply is available for AC operation.

Antenna Impedance:

50 ohms Unbalanced

Weight:

8.0 Kg

Dimensions:

111mm(H) x 286mm (W) x 374mm(D)

TRANSMITTER

RF Power:

SSB (A_3J) 200 Watts PEP input
CW (A_1), RTTY (F_1), FM (F_3)*
200 Watts input
Continuously Adjustable Output power 10 Watts ~ Max.

Emission Mode:

A_3J	SSB (Upper sideband and Lower sideband)
A_1	CW
F_1	RTTY (FSK)
F_3*	FM

*When optional FM unit is installed.

Harmonic Output:

More than 50dB below peak power output

Spurious Output:

More than 50dB below peak power output

Carrier Suppression:

More than 50dB below peak power output

Unwanted Sideband:

More than 55dB down at 1000Hz AF input

Microphone:

Impedance 1300 ohms
Input Level 120 millivolts typical
Dynamic or Electret Condenser Microphone with Preamplifier

RECEIVER

Receiving System:

Triple Conversion Superheterodyne with continuous Pass-Band Shift Control.

Receiving Mode:

A_1, A_3J (USB, LSB), F_1, F_3*

IF Frequencies:

1st 39.7315MHz
2nd 9.0115MHz
3rd 455KHz
with continuous Pass-Band Shift Control.

Sensitivity:

SSB, CW, RTTY
Less than 0.3 microvolts for 10dB S+N/N (preamp ON)
Less than 0.15 microvolts for 10dB S+N/N
FM* (preamp ON)
Less than 0.3μV for 20dB noise quieting

Selectivity:

SSB, RTTY	2.4KHz at –6dB
	4.5KHz at –60dB
(PBT max.)	2.2KHz at –6dB
	4.2KHz at –60dB
(PBT min)	700Hz at –6dB
	2.0KHz at –60dB
CW (AF Filter)	300Hz at –6dB
FM*	15KHz at –6dB
	30KHz at –60dB

Spurious Response Rejection Ratio:

More than 60dB

Audio Output:

More than 2.6 Watts

Audio Output Impedance:

8 ohms

SECTION 2 FEATURES

ALL BAND, ALL MODE, ALL SOLID STATE

The IC-740 covers all the Amateur HF frequencies from 1.8MHz to 29.9999MHz, including the new three bands of 10MHz, 18MHz and 24MHz. It offers not only SSB, but also CW and RTTY (FM option). All of the circuits in the IC-740, including the driver and final power stages are completely solid state, and provide about 100 watts output.

In addition, the low-pass filters switched by the BAND switch and the band-pass filters selected by an electronic signal from the CPU, make a no tune-up system.

OUTSTANDING RECEIVER PERFORMANCE

The IC-740 employs the ICOM DFM (Direct Feed Mixer) system and up-conversion system to improve a high receiver performance.

The ICOM DFM maintains a system where the incoming signals are directly fed to the first mixer, and the mixer is a high level Doubly Balanced Mixer developed exclusively by ICOM.

The up-conversion system uses a high side IF i.e., 39.7315MHz and in addition high performance third over-tone crystal filters provide excellent image and IF rejection ratio.

These advanced devices and system give higher spurious response rejection ratio, higher sensitivity and wider dynamic range.

PASS BAND SHIFT CONTROL

The IC-740 has a built-in Pass Band Shift system that allows you to continuously adjust the center frequency of the IF pass-band. By moving the control, you can eliminate interference from a nearby signal, thus providing clear reception. It can also be used as a tone control.

When the PBT switch is pushed in, this system acts as a pass-band tuning system that allows you to continuously adjust the pass-band up to 800Hz from the upper or lower side in SSB and CW. The PBT switch provides better performance to eliminate interference.

DUAL DIGITAL VFO WITH VARIOUS STEPS

The dual digital VFO consists of three digital Phase-Locked-Loops which are controlled by the Microcomputer Control System.

Three tuning frequency resolutions of 10Hz, 100Hz and 1KHz steps can be selected with the TUNING RATE switches.

Two separate VFO's can be used independently in the NORMAL (NOR) operation, and any desired in-band frequencies split transmit/receive can be used in the SPLIT (SPT) operation.

MEMORY CHANNELS

The IC-740 has a frequency memory for each band. Any in-band frequency of the VFO A can be stored into the memory, and it can be recalled at any time.

ADDITIONAL CIRCUITS

The IC-740 has a built-in Noise Blanker, VOX, CW Monitor, APC, SWR detector, and many other circuits for your convenience.

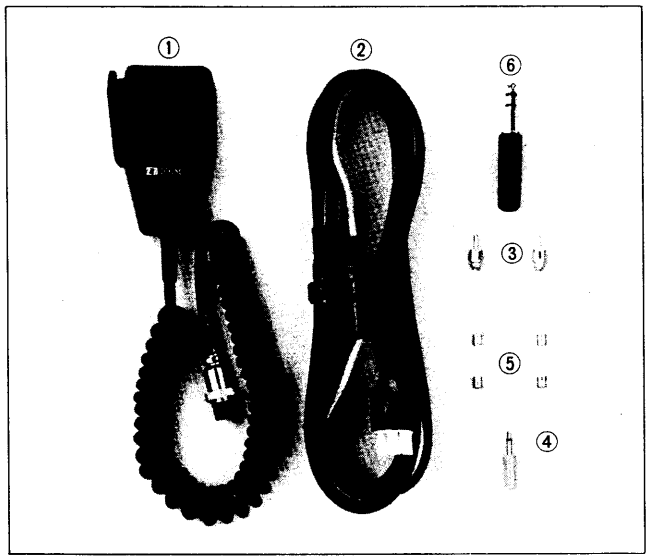
The IC-740 has everything you need to really enjoy HF operation, in an extremely compact, rugged and full featured transceiver.

SECTION 3 INSTALLATION

BE SUARE TO READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE OPERATION

3-1 UNPACKING

Carefully remove your transceiver from the packing carton and examine it for signs of shipping damage. Should any be apparent, notify the delivering carrier or dealer immediately, stating the full extent of the damage. It is recommended you keep the shipping cartons. In the event storage, moving, or reshipment becomes necessary they will be handy. Accessory cables, plugs, etc., are packed with the transceiver. Make sure you have not overlooked anything.



1. Microphone (IC-HM7) 1
2. DC Power Cord 1
3. Pin Plugs 2
4. External Speaker Plug 1
5. Spare Fuses (20 Amp) 2
6. 3-P Key Plug. 1

3-2 RECOMMENDATIONS FOR INSTALLATION

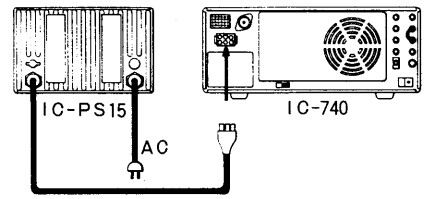
1. Avoid placing the IC-740 in direct sunlight, high temperature, dusty or humid places.
2. The temperature of the set will usually become relatively warm during transmission. Any equipment should be at least 1 inch (3cm) away from the unit so as to provide good ventilation. Be sure that nothing is on and just behind the rear PA heatsink to ensure good ventilation. Also avoid places near outlets of heaters, air conditioners etc.
3. Place the unit so that the controls and switches can easily be handled and the frequency indication and meter can easily be read.
4. For mobile installation, an optional mounting bracket is available. Select the best location that can stand the weight of the unit and that does not interfere with your driving in any way.
5. Use the Ground Lug!

3-3 POWER SUPPLY

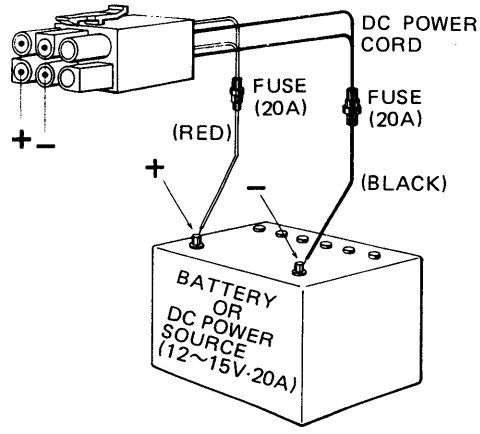
For AC operation, use the special power supply IC-PS15, or optional built-in power supply IC-PS740. If you would like to use your car battery or any other DC power supply, be sure that its output voltage is 12-15 Volts and the current capacity is at least 20 Amps. The maximum power consumption of the set during transmission runs from 16-20 Amps, so keep that in mind if the unit is installed in your automobile, and turn it on after you have started the engine. Attention should also be paid to the condition of the battery and electrical system.

The connection of the DC power cord supplied with the IC-740 is done in the following way: First make sure that the power switch of the unit is in the OFF position and the T/R switch is in the receive position. Connect the cord to the DC power supply with the RED lead to the positive terminal and the BLACK lead to the negative terminal. (Reverse connection will cause the protection circuit to operate and blow the fuse.) Connect the DC plug to the socket on the rear panel of the IC-740. Refer to the drawing below.

For AC operation



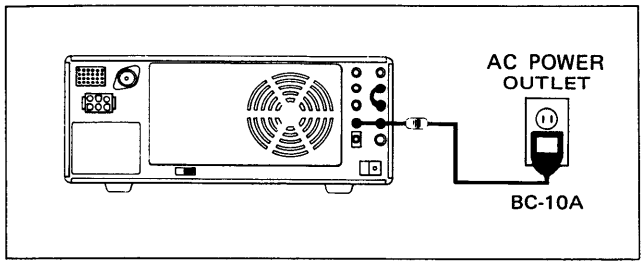
For DC operation



3-4 MEMORY BACK-UP

To retain the memory in the CPU, keeping the operating frequencies of the VFOs even when the main Power Switch is turned OFF, connect a power source of 9 to 12 Volts DC to the Memory Back-Up terminal on the rear panel. For mobile installation this can be accomplished by direct connection to the car battery, since the current drain is low.

For AC operation it is recommended that the optional BC-10A be used.



3 - 5 ANTENNA

Antennas play a very important role in radio communication. If the antenna is inferior, your transceiver cannot give you the best performance. With a good antenna and feeder cable having 50 ohm impedance, you should easily get the desired matching and performance. Carefully install a high performance antenna that suits the frequency band(s) you wish to operate on and place it as high as possible. Be especially carefull of the condition of the connectors as loose connections will deteriorate the performance. Be sure to connect the ground terminal of a whip antenna, if used, to the body of your car.

As the output is quite high avoid connecting the antenna connector to open lines and do not transmit under mismatched conditions. Otherwise the final stage could be overloaded and cause a malfunction of the unit.

3 - 6 GROUND

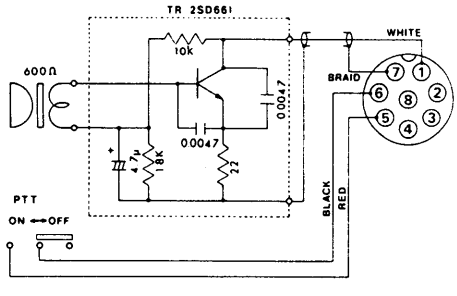
In order to prevent electrical shocks, TVI, BCI and other problems, be sure to connect a heavy wire ground, as short as possible, from a good earth point to the ground terminal on the rear panel.

3 - 7 MICROPHONE

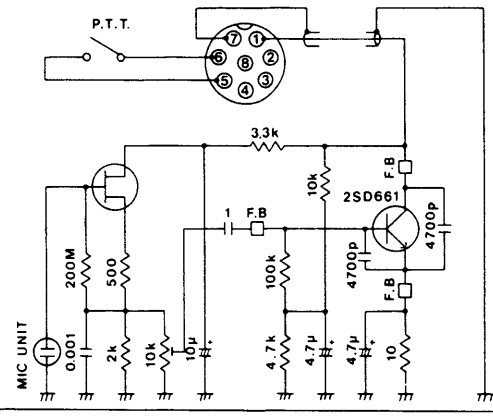
The microphone supplied with the IC-740 is the IC-HM7 which contains a preamplifier. The optional electret condenser type stand microphone IC-SM5 can be used. Their circuit diagrams are shown.

Should you wish to use a different microphone, make certain it has a proper preamplifier.

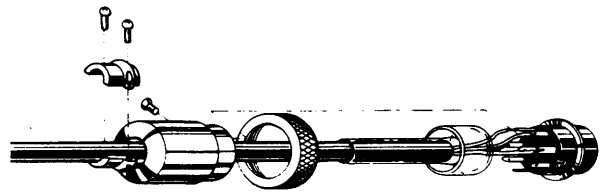
Schematic diagram of IC-HM7



Schematic diagram of IC-SM5



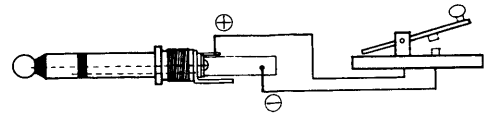
Microphone plug exploded view



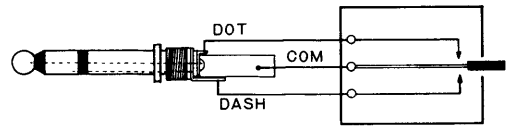
3 - 8 CW KEY

When operating CW, connect a key to the Key Jack with a 1/4 inch 3-P plug. The connection of the plug is shown below.

Wiring for a hand key or external electronic keyer.



Wiring for an iambic paddle (when optional keyer unit is installed.)



If the terminals have polarity, be sure to make the correct connection. Note that the keyed voltage when switching with semiconductors or relays with resistors in the circuit, should be adjusted to be below 0.4 Volts!

3 - 9 EXTERNAL SPEAKER

The IC-740 contains an internal speaker, and is also designed so that it can drive an external speaker from the

external (EXT) speaker jack on the rear panel. Be sure the impedance of the external speaker is 8 ohms, and remember that with the external speaker connected, the internal speaker is disabled.

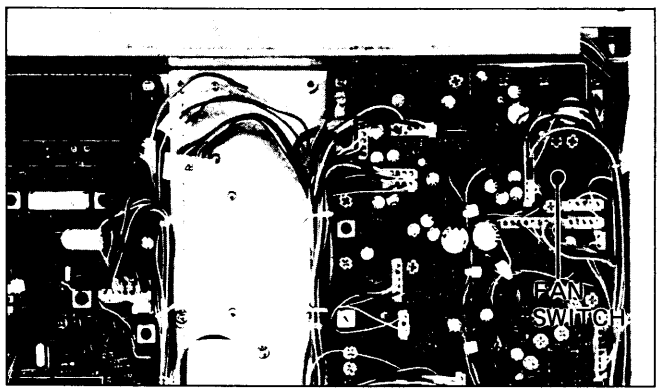
3 - 10 HEADPHONES

Any good headphone set, including stereo type, that have 4-16 ohms impedance can be used. With the plug inserted halfway into the PHONES jack, both the headphone and speaker will operate. This is convenient when others wish to listen in on the station, or you wish to record contacts using a tape recorder connected to the headphone jack. With a stereo headphone set inserted this way, however, the headphone will lose the sound on one side. With the plug inserted completely, only the headphone works.

3 - 11 COOLING FAN

The rear of the PA unit is designed to provide for adequate cooling, but with 200 Watt input the final stage produces quite a bit of heat, and its temperature may rise during prolonged transmissions. The fan is connected to a temperature monitoring circuit which monitors the temperature of the final stage. The fan operates as follows:

1. The fan does not operate in the receive mode.
2. When you slide the FAN switch located on the MAIN unit under the top cover (Refer to the picture shown below.) toward the front panel side, the cooling fan will operate during both transmit and receive modes to provide more efficient cooling.



3. When the temperature rises to a point (75°C) detected by the monitor circuit the fan will operate during both transmit and receive and much more rapidly to provide additional cooling. At this time stop transmitting and investigate the cause of overheating i.e., antenna mismatch, etc. Correct the cause of the overheating before starting to transmit again.

3 - 12 POWER SUPPLY

It is recommended that you use the IC-PS15 or the built-in unit IC-PS740 as a power supply for base station operation.

If you wish to use another type of power supply make sure that it meets the voltage, current requirements. Note carefully the overvoltage protection, for a runaway regulator can destroy the IC-740, be especially careful that a voltage of more than 16 Volts cannot be supplied to the transceiver. Do not connect the power supply, antenna, accessory plug, or microphone with the Power Switch in the ON position. Be especially careful not to transmit without an antenna or dummy load hooked up. If the fuse blows replace it with a 20 Amp fuse, only after fixing the cause. Do not turn the Power Switch ON and OFF repeatedly for this may cause the readout to mis-display. Should this occur, turn the set OFF and wait for approximately 30 seconds before turning it back ON.

3 - 13 CAUTIONS

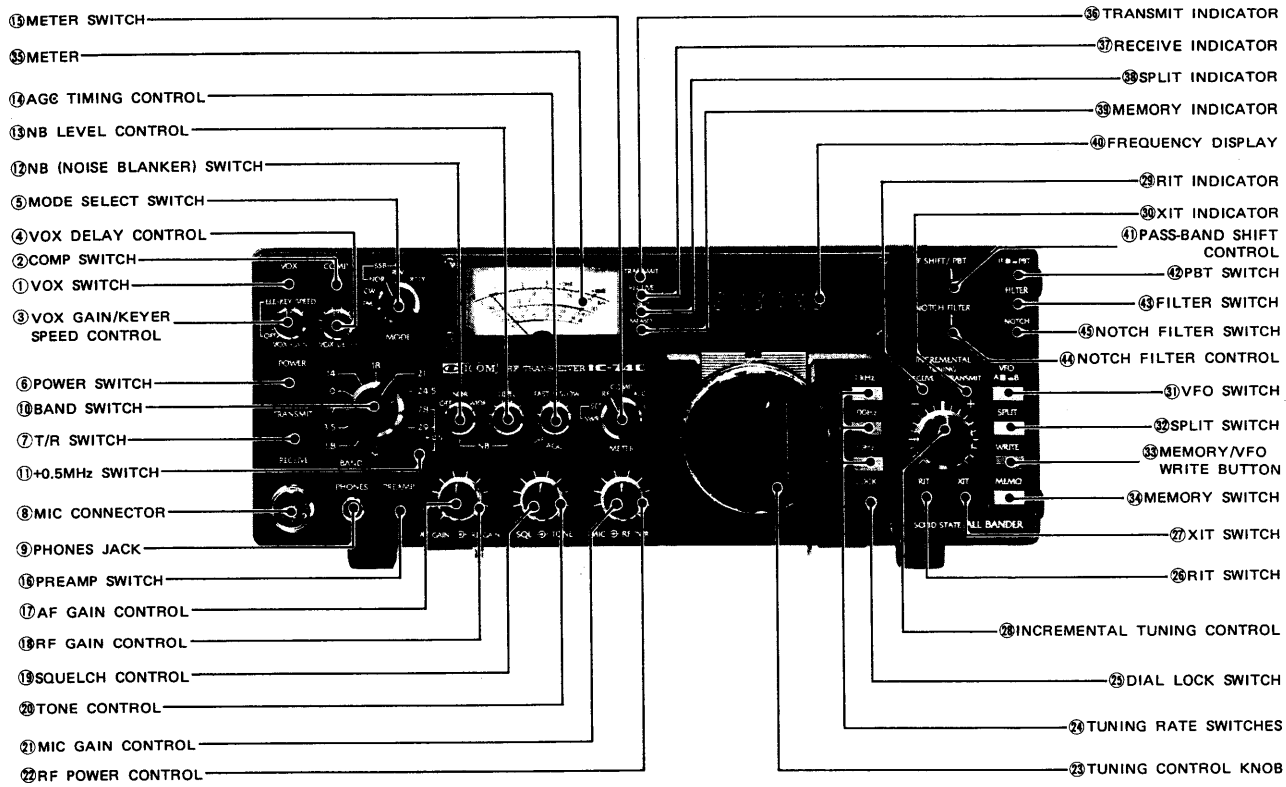
As the unit has already been closely adjusted with highly sophisticated measuring instruments, never tamper with the turnable resistors, coils, trimmers, etc.

C-MOS is used in the Logic unit as well as the PLL. C-MOS ICs are very susceptible to excessive static charges and over current and care must be used when handling them. Therefore, avoid touching the Logic unit and the nearby circuitry unless absolutely necessary. When it is necessary to check the circuitry, observe the following points.

Ground all measuring instruments, the soldering iron, and other tools. Do not connect or disconnect the C-MOS IC from its socket, or solder it when the power is on. Do not apply voltage of less than −0.5 or more than +5 Volts to the input terminals of the IC. DO NOT MEASURE WITH AN OHMMETER.

SECTION 4 OPERATING CONTROLS

4 - 1 FRONT PANEL



1. VOX SWITCH

This switches the VOX circuit ON and OFF. When it is in the ON (in) position, in SSB or FM, T/R switching is accomplished by means of a voice signal. In CW operation, semi-break-in switching by means of keying is possible.

2. COMP (SPEECH PROCESSOR) SWITCH

Switches the speech processor circuit ON and OFF. This circuit enables greater talk power and better results in DX operation.

3. VOX GAIN/KEYER SPEED CONTROL

This control adjusts input signal level via the microphone to the VOX circuit. For VOX operation in SSB and FM, adjust the control so that the VOX circuit will operate with normal speech.

When the optional electronic keyer unit is installed and the set is in CW mode, this control adjusts keying speed of the keyer.

4. VOX DELAY (VOX time constant) CONTROL

This controls the transmit to receive switching time. Adjust it so transmit to receive switching will not occur during short pauses in normal speech.

5. MODE SELECT SWITCH

Selects any one of four operating modes (FM is option). There are two modes in SSB mode as follows:

SSB-NOR: For normal SSB operation, upper sideband (USB) for 10MHz band and above, and lower sideband (LSB) for 7MHz band and below.

SSB-REV: For reverse SSB operation, lower sideband (LSB) for 10MHz band and above, and upper sideband (USB) for 7MHz band and below.

6. POWER SWITCH

The POWER SWITCH is a push-lock type switch which controls the input DC power to the IC-740. When the external AC power supply (IC-PS15) or optional built-in

AC power supply (IC-PS740) is used, the switch also acts as the AC power supply switch. When the switch is pushed in and locked, power is supplied to the set. When the switch is pushed again and released, power is cut to all circuits except the PA unit. When the BC-10A is used, power will also be supplied to the CPU. (Refer to page 3.)

7. T/R (TRANSMIT/RECEIVE) SWITCH

This switch is for manually switching from transmit to receive and vice versa. Set the switch to RECEIVE (down) and the IC-740 is in the receive mode. Set the switch to TRANSMIT (up) and it switches to transmit. When switching with the PTT switch on the microphone or with the VOX switch set to ON, the T/R switch must be in the RECEIVE position.

8. MIC CONNECTOR

Connect the supplied microphone or optional microphone, IC-SM5 or scanning microphone IC-HM10 to this jack. If you wish to use a different microphone, refer to the drawing on page 4.

9. PHONES JACK

Accepts a standard 1/4 inch headphone plug for headphones of 4 ~ 16 ohms. Stereo phones can be used without modification.

10. BAND SWITCH

The BAND SWITCH is a 10 position rotary switch used for selecting one of the 500KHz segments. The selectable bands are 1.8MHz, 3.5MHz, 7MHz, 10MHz, 14MHz, 18MHz, 21MHz, 24MHz and 28MHz. (28MHz band is separated to four 500KHz segments, and use ⑪ + 0.5MHz switch for upper 500KHz segments on 28MHz and 29MHz.)

11. +0.5MHz SWITCH

This switch is for selecting upper 500KHz segment on 28MHz or 29MHz band. This switch is negated when the other band is selected.

12. NB (NOISE BLANKER) SWITCH

When pulse type noise such as automobile ignition noise is present, set this switch to the NOR or WIDE position. The noise will be reduced to provide comfortable reception.

The blanking time can be selected NORMAL and WIDE by this switch. It will be effective against any type noises.

13. NB LEVEL CONTROL

Controls the threshold level of the noise blanker. Adjust the control so that incoming noises will be disappeared.

14. AGC TIMING CONTROL

For changing the time-constant of the AGC (Automatic Gain Control) circuit. By turning the control clockwise, the AGC voltage is released more slowly. Adjust the control to provide comfortable reception.

When the control is in the OFF position, the AGC function is turned OFF and the S-meter does not swing even if a signal has being received. (The AGC does not actuate on the FM mode.)

15. METER SWITCH

In the transmit mode, the meter has five functions.

1. Ic	Indicates the collector current of the final transistors.
2. ALC	Indicates the ALC level. The meter begins to function when the RF output power reaches a certain level.
3. COMP	Indicates the compression level when the speech processer is in use.
4. RF	Indicates an approximate RF output power.
5. SET/SWR	SWR can be measured by setting this switch to the SET position and calibrating the meter needle to the "SET" position with the RF POWER control, then setting this switch to the SWR position.

16. PREAMP SWITCH

Switches the preamplifier for the receiver.

17. AF GAIN CONTROL

Controls the audio output level in the receive mode. Clockwise rotation increases the level.

18. RF GAIN CONTROL

Controls the gain of the RF section in the receive mode. Clockwise rotation gives the maximum gain. As the control is rotated counterclockwise, the needle of the METER rises, and only signals stronger than the level indicated by the needle will be heard.

19. SQUELCH CONTROL

Sets the squelch threshold level. To turn OFF the squelch function, rotate this control completely counterclockwise. To set the threshold level higher, rotate the control clockwise.

20. TONE CONTROL

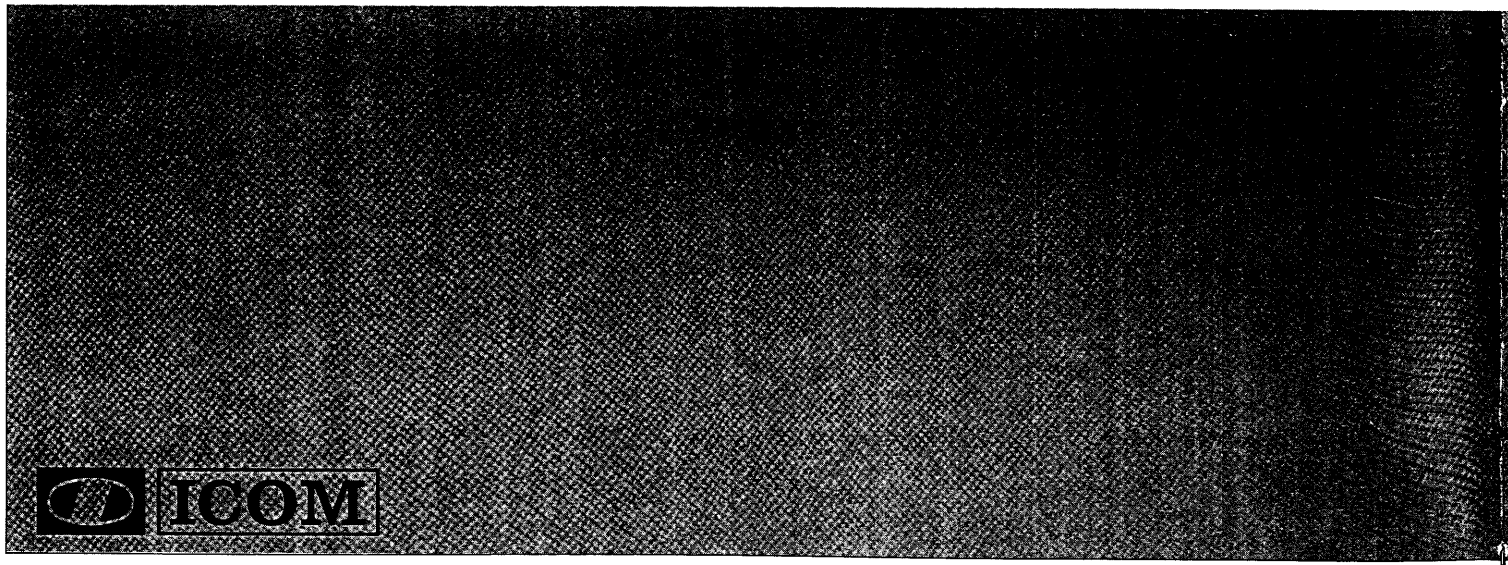
Controls the receiver audio tone. Ajust the control to provide comfortable reception.

21. MIC GAIN CONTROL

Adjusts the level of modulation according to the input of the microphone. Clockwise rotation increases the microphones gain. As the input will vary with different microphones and different voices, the knob should be turned until the Meter needle, in the ALC mode, begins to move slightly within the ALC zone. In the SSB mode when the speech processor is in use, the MIC GAIN CONTROL sets a clipping limit, while the RF POWER CONTROL sets the RF drive level to the maximum power level, where ALC starts at the saturation point of the amplifiers.

22. RF POWER CONTROL

Controls the RF output power 10 Watts to maximum (SSB: 100 Watts PEP, CW, RTTY: 100 Watts). Clockwise rotation increases the output power.



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