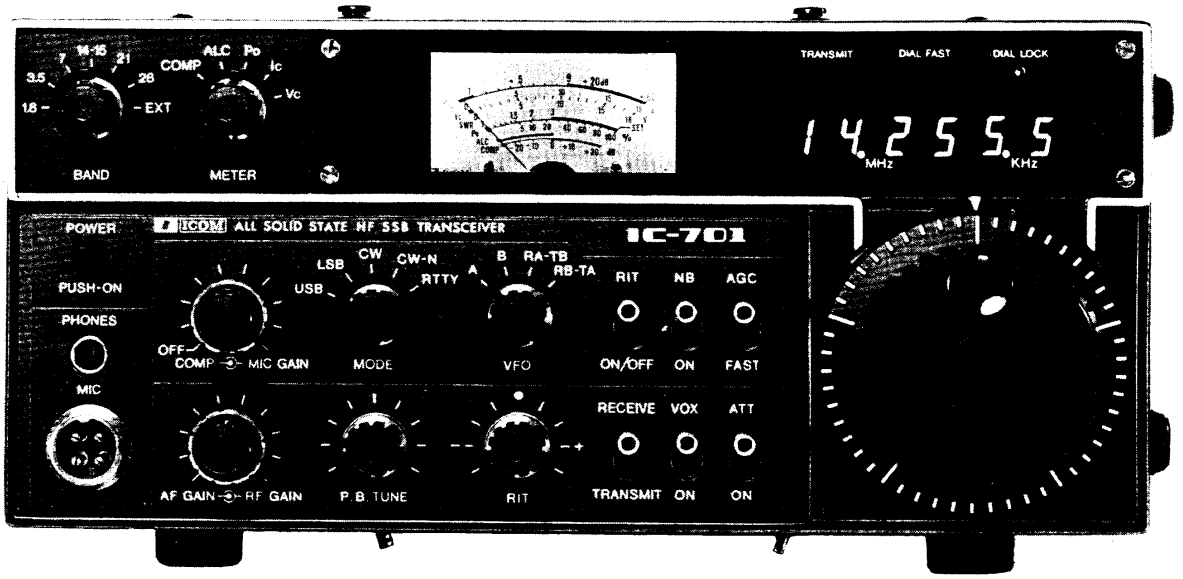
IC-701

HF ALL BAND ALL SOLID STATE TRANSCEIVER

INSTRUCTION MANUAL



ICOM

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SECTION I SPECIFICATIONS

GENERAL

Number of Semi-Conductors:

Transistors	128
F E T	23
IC (Includes LSI)	56
Diodes	265

Frequency Coverage:

1.8MHz ~ 2.0MHz
3.5MHz ~ 4.0MHz
7.0MHz ~ 7.5MHz
(7.3MHz~7.5MHz Receive Only)
14.0MHz~15.2MHz
(14.35MHz~15.2MHz Receive Only)
21.0MHz~21.5MHz
28.0MHz~30.0MHz (28.0MHz~29.7MHz Transmit Range)

Frequency Control:

LSI based 100Hz step Digital PLL synthesizer.
Independent Transmit-Receive Frequency Available on same band.

TRANSMITTER

DC Input Power:

SSB (A_3J)	200 Watts
CW (A_1), RTTY (F_1)	200 Watts

Continuously Adjustable Output power 0~Max.

Emission Mode:

A_3J	SSB (Upper sideband and Lower sideband)
A_1	CW
F_1	RTTY (Frequency Shift Keying)

Harmonic Output:

More than 40dB below peak power output

Spurious Output:

More than 60dB below peak power output

Carrier Suppression:

More than 40dB below peak power output

Unwanted Sideband:

More than 40dB down at 1000Hz AF input

Microphone:

Impedance 600 ohms
Input Level 10 millivolts typical
Dynamic or Electret Condenser Microphone

Frequency Readout:

6 digit LED 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°C to +60°C.

Power Supply Requirements:

DC 13.6V ±15% Negative ground Current drain
18 A max. (at 200W input)
AC power supply speaker console is available for AC operation.

Antenna Impedance:

50 ohms Unbalanced

Weight:

7.3Kg

Dimensions:

111mm x 241mm x 311mm (H x W x L)

RECEIVER

Receiving System:

Triple Conversion Superheterodyne with continuous Bandwidth Control

Receiving Mode:

A_1, A_3J (USB, LSB) F_1 (Output FSK audio signal)

IF Frequencies:

1st	9.0115MHz
2nd	10.75MHz
3rd	9.0115MHz

with continuous Bandwidth Control

Sensitivity:

Less than 0.25 microvolts for 10dB S+N/N

Selectivity:

SSB. RTTY	±1.2KHz at –6dB
	(Adjustable to ±0.5KHz Min)
	±2.0KHz at –60dB
CW	±250Hz at –6dB
	±700Hz at –60dB
CW-N	±100Hz at –6dB
	±500Hz at –60dB (with Audio Filter)

Spurious Response Rejection Ratio:

More than 60dB

Audio Output:

More than 1.5 Watts

Audio Output Impedance:

8 ohms

SECTION 2 FEATURES

ALL BAND, ALL MODE, ALL SOLID STATE

The IC-701 covers all the Amateur HF frequencies from 1.8MHz to 29.999.9MHz plus 15MHz WWV. It offers not only SSB, but also CW and RTTY. All of the circuits in the IC-701, including the driver and final power stages are completely solid state, and provide about 100 Watts output.

COMPUTER COMPATIBLE TUNING SYSTEM

The local oscillator circuit (VFO) employs a C-MOS LSI for the PLL that has been custom-made on the basis of ICOM's advanced digital technology. The VFO circuit is a digital PLL circuit that controls frequency determination by pulses produced by the tuning control. Unlike conventional PLLs, it controls the VCO by combining and dividing crystal oscillator frequencies. Therefore, its stability is much higher than conventional VFOs. In addition, the pulse control system makes it possible to set and change frequencies with external digital signals.

With a computer programmed and connected to the rear accessory socket, you can easily control frequencies, change bands, scan, on the IC-701. This system will give you the maximum of performance and versatility.

DUAL DIGITAL VFO'S

The IC-701 contains two built-in digital VFO's located in ICOM's custom LSI, providing the ultimate in versitility.

DIGITAL READOUT AND FULL METERING

The frequency is presented in bright easy to read LEDs, with no backlash or waiting time. The mulit-function meter shows you relative signal strength in receive, power output, ALC, SWR, compression level, final transistor voltage and current. All the important information you need to know.

PASS BAND TUNING AND SPEECH PROCESSOR

The IC-701 has a built-in Pass Band Tuning system developed by ICOM that allows you to continuously adjust the pass band of the IF. By turning the control, you can eliminate interference from a nearby signal, thus providing clear reception. It can also be used as a tone control. During transmit, the Pass Band Tuning circuit can be used as a Speech Processor providing increased "talk power" for outstanding DXing.

OUTSTANDING PERFORMANCE

The RF amplifier circuit using MOS FETs, the Schottky barrier diode balanced mixer and other circuits provide excellent Cross Modulation and Two-Signal Selectivity characteristics. The IC-701 has excellent sensitivity demanded especially for mobile operation, high stability, and with two Crystal Filters having high shape factors, exceptional selectivity.

The Same Schottky diode mixer is used in the transmitter, and, with the band pass filter and high performance K-Constant two stage low-pass filter, ensures transmission of pure signals with very low spurious emission.

ADDITIONAL CIRCUITS

The IC-701 has a built-in Noise Blanker, VOX, an Auto Dimmer for control of the readout and meter illumination, CW Monitor, APC, SWR detector, and many other circuits for your convenience.

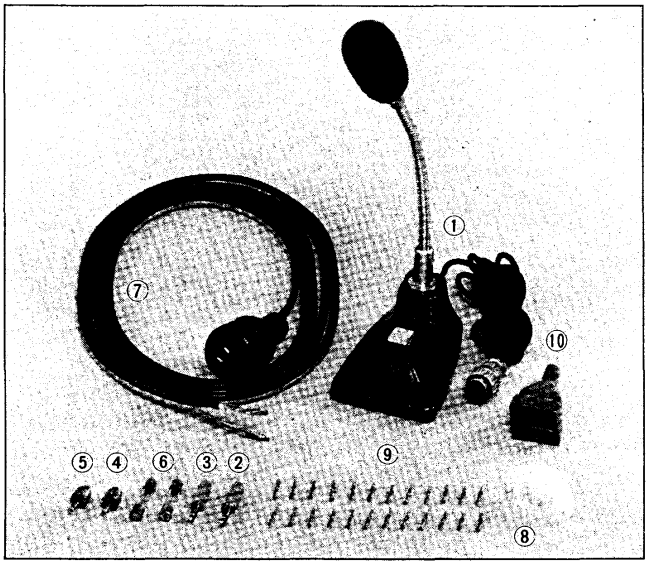
The IC-701 has everything you need to really enjoy HF operation, in an extremely compact, rugged transceiver.

SECTION 3 INSTALLATION

BE SURE TO READ THE FOLLOWING INSTRUCTIONS BEFORE USE.

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-SM2) 1
2. External Speaker Plug 1
3. Key Plug 1
4. Scope Terminal Plug 1
5. Transverter terminal Plug 1
6. Spare Fuse (20 Amp) 2
7. DC Power Cord 1
8. Accessory Plug (24 Pin) 1
9. Accessory Plug Pins 24
10. Accessory Plug Boot 1

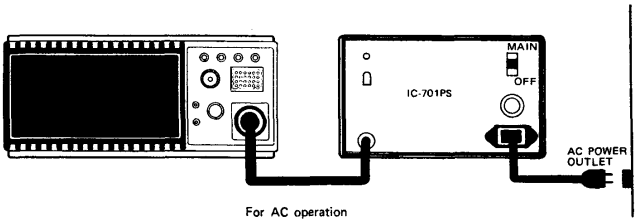
3 - 2 RECOMMENDATIONS FOR INSTALLATION

1. Avoid placing the IC-701 in direct sunlight, high temperature, dusty or humid places.
2. The left side of the unit, when facing it, functions also as a heatsink. The temperature there 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!

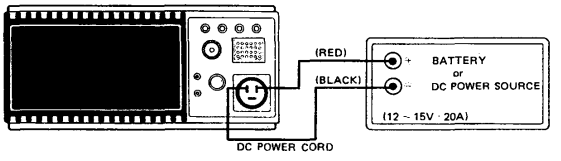
3 - 3 POWER SUPPLY

For AC operation, use the special power supply IC-701PS. 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-701 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-701. Refer to the drawing below.



For AC operation



For DC operation

3 - 4 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 careful 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.

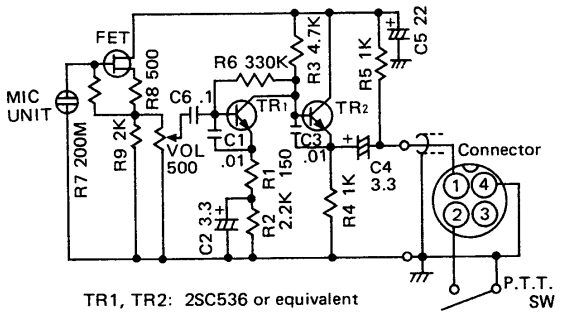
3 - 5 GROUND

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 - 6 MICROPHONE

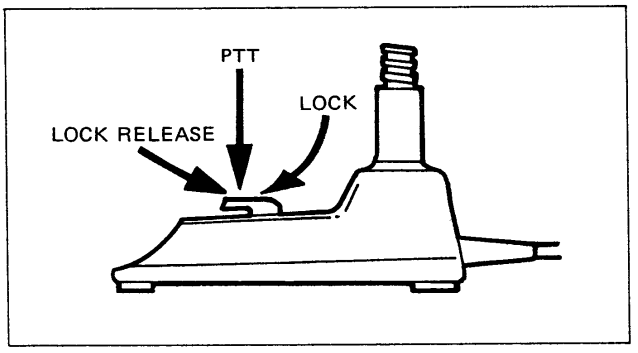
The microphone supplied with the IC-701 is the IC-SM2 which contains a pre-amplifier. It's circuit diagram is shown below. The IC-SM2 is an Electret Condenser type microphone.

Schematic diagram of IC-SM2

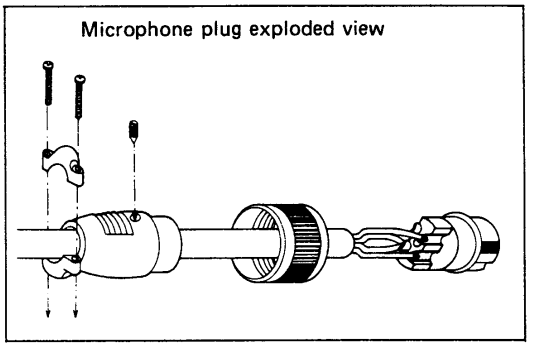


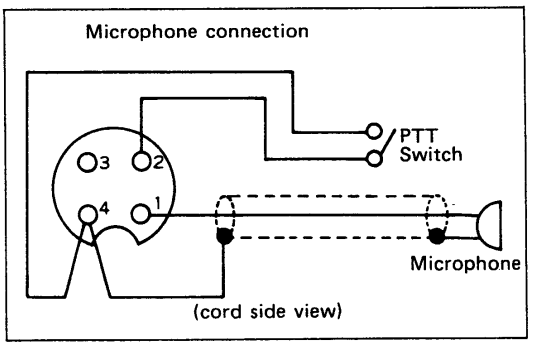
TR1, TR2: 2SC536 or equivalent

A sensitivity control is installed on the bottom side of the mic stand. By turning it in the "H" or "L" direction, the sensitivity will increase or decrease respectively. Adjust the control so as to get the proper sensitivity considering the distance to the mic, the loudness of your voice and the environmental conditions. The wind screen not only prevents background noise due to wind, but also protects the mic. Unless required, do not remove the screen from the mic. In order to operate the microphone, connect its plug to the mic socket on the IC-701. To transmit, press the PTT switch downward. When it is released, the IC-701 will return to the receive condition. For a long transmission, pull the PTT switch back while pressing it down until the switch is locked and it will remain in that position until it is pushed forward and released.



If you would like to use a different microphone in your car, an optional hand held dynamic microphone is available. If other types of microphones are used, be sure their impedance is between 500-600 ohms, and connect a 4 pin plug in the manner shown.





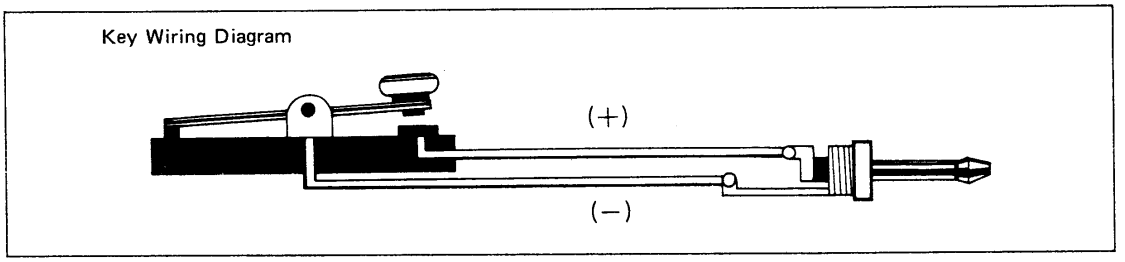
3 - 7 CW KEY

When operating CW, connect the Key to the Key Jack with the plug supplied. The connection of the plug is shown below.

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 - 8 RTTY

When operating RTTY, connect the ACC socket pins 8 (ground) and 9 to your tele-typewriter through a high speed relay or a level converter to TTL level, and the tones for your terminal unit will be available from pin 4. For details, refer to "How to use RTTY", and "Transmit and Receive" sections in this manual.



3 - 9 EXTERNAL SPEAKER

The IC-701 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 POWER SUPPLY

It is highly recommended that you use the IC-701PS power supply for base operation. If you wish to use another power source, make sure that it meets the voltage, current, and regulation requirements. Pay particular attention to the overvoltage protection as a runaway regulator can destroy the IC-701. Make certain that more than 18 Volts does not get applied to the unit. When the power switch is in the ON position, do not connect the power cord, antenna, external speaker, Accessory plug, or the microphone to avoid possible trouble. Be sure not to transmit with the antenna disconnected. If the fuse blows, replace it with a new 20 Amp fuse after fixing the cause. Avoid turning the power switch ON and OFF repeatedly over a short time. Frequent repetitions may cause the frequency indicator to display the wrong frequencies. If such a malfunction should occur, turn OFF the switch and a few seconds later turn it ON again.

3 - 12 CAUTIONS

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

IN THE PLL UNIT, THE HEART OF THE TRANSCEIVER, A C-MOS LSI IS INCORPORATED. IF THE SEAL IS BROKEN WHEN A FAILURE OCCURS WITHIN THE TERMS OF THE GUARANTEE, THE REPAIR MAY BE AT THE USERS EXPENSE, SO DO NOT ATTEMPT TO OPEN THE PLL CASE!

C-MOS is also used in the digital driver 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 driver 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.

3 - 13 COOLING FAN

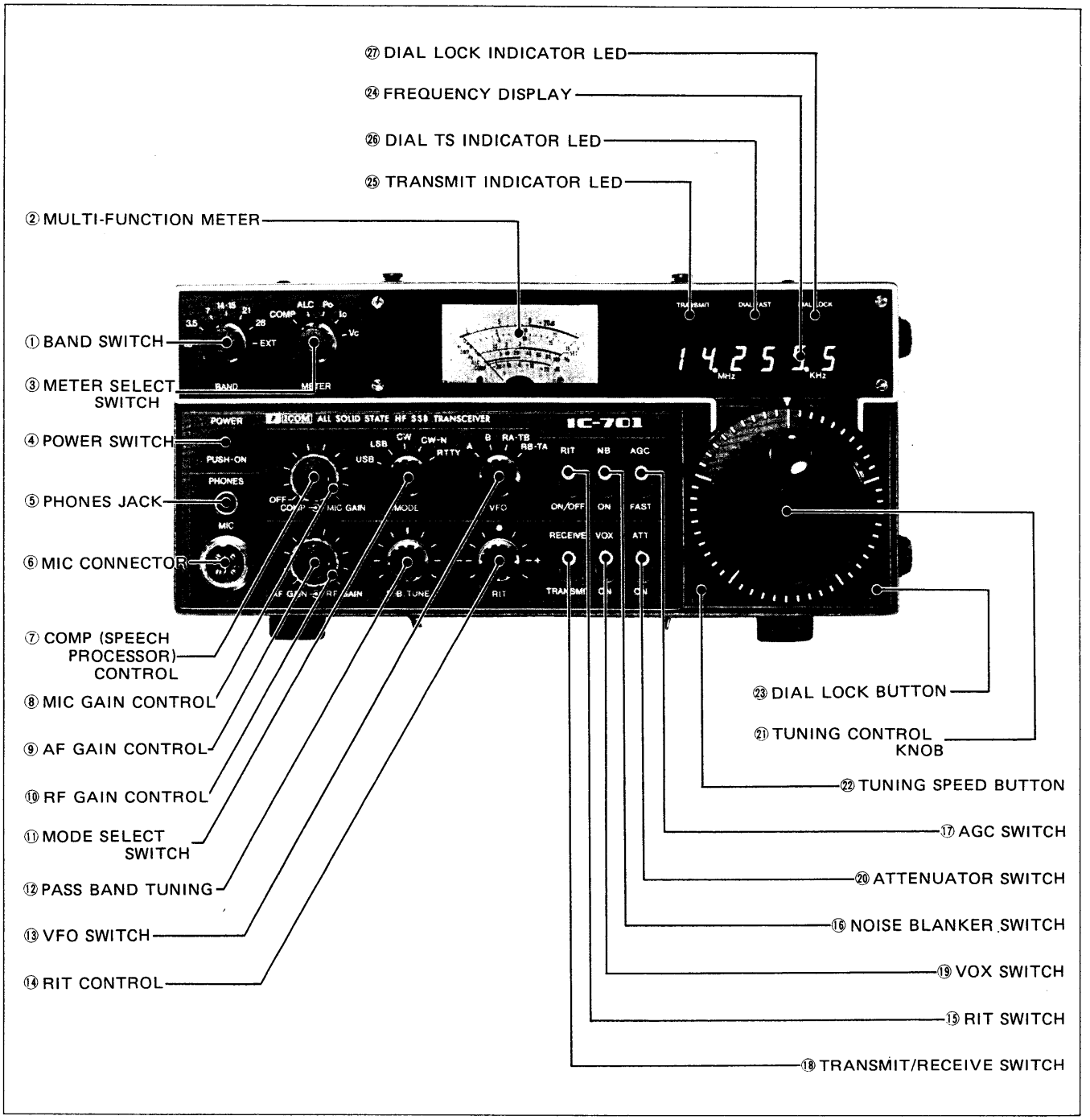
The rear of the PA unit is designed to achieve effective natural cooling. But with 200 Watts input, the final stage circuit produces quite a bit of heat and its temperature may rise during a very long, continuous transmission. If the temperature becomes high enough, the built-in cooling fan will start to spin. The fan is connected to the temperature monitoring circuit which detects the temperature of the final stage transistors. The operation of this fan is as follows:

1. The fan does not work during all reception.
2. During transmission, it does not work if the detected temperature is below a certain level.
3. When the temperature exceeds that level during a transmission, the fan will start to move air across the heatsink to cool it.
4. If the temperature of the final stage transistors rises to the danger point, the fan will turn at a much higher speed and frequency display will start to flash.
   THIS MEANS STOP TRANSMITTING!

1, 2 and 3 are normal conditions. 4 is abnormal. If the meter and display start to flash, stop transmitting and check for the cause of the excess heat. This could be antenna mismatch, environmental problems, etc., but be sure to rectify the problem before beginning to operate again.

SECTION 4 OPERATING CONTROLS

4 - 1 FRONT PANEL



1. BAND SWITCH

The BAND SELECT SWITCH is a 7 position rotary switch used for selecting one of the 6 Amateur bands covered by the IC-701 with a 7th position for external control. The selectable bands are 1.8MHz, 3.5MHz, 7MHz, 14MHz, 21MHz and 28MHz. In the EXT position, the band can be selected remotely. However, the switch should not be put in the EXT position without having the remote control connected. This will cause the rotary switch to rotate continuously and may cause excessive wear or damage.

2. MULTI-FUNCTION METER

With the IC-701 in the receive mode, this meter acts as an S meter regardless of the position of the meter select switch. Signal strength is indicated on a scale of S1-S9 and S9+20dB to S9+60dB.

In the transmit mode, the meter has 5 functions as outlined below which are selected by the meter select switch.

3. METER SELECT SWITCH

In the transmit mode the meter has 5 functions.

1. Vc Indicates the collector voltage of the final transistors.
2. Ic Indicates the collector current of the final transistors.
3. Po Indicates the relative output power. SWR can

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