

TR-720 Airband Transceiver



OPERATING MANUAL

OPERATING MANUAL
TR-720 VHF/AM HAND-HELD TRANSCEIVER

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SECTION 1
GENERAL DESCRIPTION

Model TR-720 is a fully synthesized VHF/AM Hand-held transceiver designed to be used in an aircraft NAV-COM band between 108.000MHz and 135.975MHz in 25kHz steps. Variable frequency selection is accomplished with thumb-wheel switches, while a slide switch provides 3 programmable channels in the band which can be selected by the user.

The TR-720 may be utilized for fully portable operation to produce 3-watt (PEP) output with an internal rechargeable NiCd battery pack. Mobile or aircraft operation on 13.8VDC to 28.0VDC is accomplished by an optional DC adapter model CCR-240

A rubber flexible antenna is provided for hand-held operation, and standard BNC antenna connector allows to use of an external antenna for mobile and base station operation.

An optional palm-size hand-held speaker/microphone unit, with push-to-talk function is available for noisy portable or mobile operation. An earphone jack is provided for private listening when desired.

A combination type LED lamp gives indication of the status of TR-720, as well as battery condition.

SECTION 2
OPERATING CONTROLS

2-1. GENERAL

The purpose of this section is to acquaint you with the operation of the TR-720 transceiver. A description of the displays and control functions is presented. Figure 2-1 illustrates the controls and indicators discussed in this section. Table 2-1 briefly discusses the function of each listed item.

2-2. DISPLAYS AND CONTROLS

(1) ANTENNA CONNECTOR

This twist off radio frequency connector mates with the rubber flex antenna supplied with the TR-720. Connect the antenna by gently pushing it on to the radio and twisting it clockwise until it locks. Remove the antenna by gently pushing it on to the radio, twisting it counter-clockwise until it unlocks, and pulling the antenna away from the TR-720. With the flex antenna removed, connect the TR-720 to an external antenna system.

(2) MEMORY/DIAL SELECT SWITCH

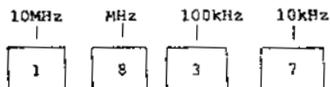
Slide the switch to MEMORY position. Operation is made by three (3) pre-programmed frequencies without regard to any settings of the FREQUENCY SELECTION switch.

(3) SQUELCH CONTROL (SQL)

This control rotates to select the threshold for rejection of background channel noise. It is adjusted, and operates, only in the receive mode, and does not affect the transmitter. It also does not change the volume of received signal. For proper operation of the receiver, turn the control fully counter-clockwise. If the radio is turned on, you will hear the hiss of channel noise when the channel is not being used. Turn the control clockwise until the noise just disappears. If you turn the control beyond the threshold point, you will reduce the sensitivity of the receiver. Therefore, turn the control no farther than necessary to remove the channel background noise.

(4) FREQUENCY SELECTION SWITCH

A four-dicade thumb wheel switch selects the operating frequency. Add 100MHz to the diald frequency to read operating frequency. See example below for 118.375MHz.



The last 10kHz digit indicates the operating frequency in every 25kHz step.

CAUTION: The 10kHz thumb wheel switch utilizes mechanical stopper to avoid further rotation. Do not attempt to change frequency by turning single direction. Further rotation beyond 0 or 7 may damage the switch.

(5) VOLUME CONTROL & ON-OFF SWITCH

Rotate this control clockwise to turn the TR-720 on. You will hear a click when the radio is turned on. Turn the control for the desired audio level from the speaker. To turn the radio off, turn the control counter-clockwise until you feel the click of the switch

(6) EARPHONE JACK

This miniature jack (3.5mm Ø) allows use of the supplied earphone for listening in a loud environment, or for private listening.

(7) EXTERNAL MICROPHONE-SPEAKER CONNECTOR

This 6-pin jack allows use of the accessory MPE-20 speaker-microphone. The threaded connection allows secure connection of the MPE-20. When an external microphone-speaker is used, internal speaker and speaker will be disconnected.

(8) LED INDICATOR

This LED lamp provides three functions. Transmit indicator, Receive indicator, and Battery condition indicator. This LED lamp glows RED continuously when the TR-720 is transmitting. This LED lamp glows GREEN whenever the TR-720 receiving a signal, when the channel is busy or when you reduce the squelch threshold and hear channel noise. Therefore when setting the squelch control you can turn it until the the GREEN light just goes out.

Figure 2-1 CONTROLS/INDICATORS/CONNECTORS

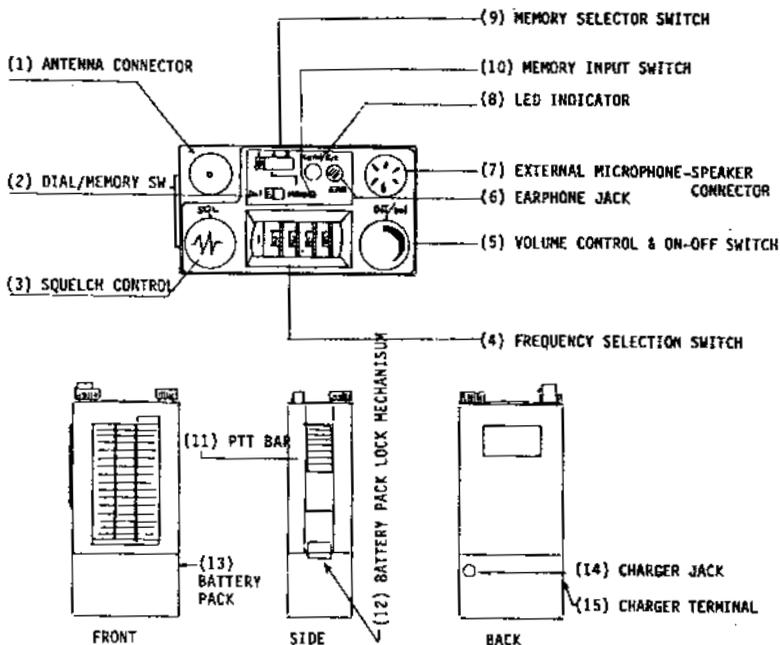


TABLE 2-1 BRIEF DESCRIPTION

REF. #	NAME OF CONTROLS, CONNECTORS, & INDICATOR	DESCRIPTION
1	ANTENNA CONNECTOR	Use for antenna connection.
2	DIAL-MEMORY SWITCH	Select dialed frequency or memory frequency.
3	SQUELCH CONTROL	To remove back-ground channel noise.
4	FREQUENCY SELECTOR	To dial the desired channel frequency.
5	VOLUME-ON/OFF CONTROL	Power on-off and to adjust audio volume level.
6	EARPHONE	Earphone jack for plug-in earphone.
7	EXTERNAL MIC-SPEAKER JACK	For connection of external speaker-microphone or airline head-set adaptor.
8	LED INDICATOR	Transmit, Channel Busy and Battery Condition LED.
9	MEMORY SELECTOR	For selection programmed memory channels.
10	MEMORY INPUT	Memory input switch.
11	PTT BAR SWITCH	PTT lever switch for transmit-receive changeover.
12	BATTERY PACK LOCK	Battery pack lock mechanism.
13	BATTERY PACK	Contain NiCd battery cells.
14	CHARGER JACK	Provide for charging by wall type charger.
15	CHARGE TERMINAL	Provide for desk-top charger.

- (8) LED INDICATOR (Cont'd)
It also indicates whenever the battery voltage drops to a point where the operation of the radio becomes marginal. When the battery voltage level is low, the RED LED will not glow in the transmit mode. This means battery charging is required to ensure continued operation. See section 3 for a full description of proper battery charging.
- (9) MEMORY SELECTOR SWITCH
This three-position slide switch selects any three pre-programmed frequencies within a operating range.
See section 4 for a full description of operation.
- (10) MEMORY INPUT SWITCH
This small button is used to put the frequency into the memory circuit of the TR-720. See section 4 for a full description of operation.
- (11) PTT BAR (PRESS-TO-TALK BAR)
The PTT bar switches the TR-720 into transmit when it is depressed. When it is released the TR-720 returns to the receive mode.
- (12) BATTERY PACK LOCK MECHANISM
This metal lever locks the battery pack into position. Pull it up and twist the battery pack to remove the battery. See section 3 for a full description how to remove the battery.
- (13) BATTERY PACK
The battery supplied with the radio is a special sealed rechargeable NiCd pack. It includes a charging jack which mates with the wall charger supplied with the TR-720. It also mates with the DC charger supplied with the TR-720. Full information on the battery is included in Section 3.
- (14) CHARGE JACK
The charge jack on the side of the battery pack mates into the supplied wall charger and DC charger, or the accessory quick charger. See section 3 for the proper way to charge the battery.
- (15) CHARGE TERMINAL
The built-in terminals on the side of battery pack allow charging with the accessory desk-top type drop-in battery charger.

2-3. OPTIONAL ACCESSORIES

Optional accessories for the TR-720 expand its feasibility and makes it possible to extend the operational features. Refer to figure 2-3 for available accessories. The items marked with (S) are supplied with the TR-720 as standard supply.

(1) ANTENNA GROUP

*FLEXIBLE RUBBER ANTENNA (S)

High performance rubber flexible antenna is used for hand-held portable operation. The supplied antenna is tuned to the NAV-COM frequency, therefore, be sure to check the tuning frequency in case different type of antenna is used.

(1) ANTENNA GROUP (Cont'd)

*QUARTER WAVE MOBILE ANTENNA WITH MAGNETIC BASE

This antenna is used for mobile operation.

It is ideal to use tentative base station antenna, if the TR-720 is used as base station.

(2) AUDIO ACCESSORY GROUP

*EARPHONE (S)

Provided to use private listening of the TR-720.

Plug it into EAR jack, this may disconnect the internal speaker.

*SPEAKER-MICROPHONE WITH BELT CLIP (MODEL MPE-20)

This palm-size hand-held type speaker-microphone unit with press-to-talk switch is available for noisy portable or mobile operation.

*AIRLINE HEAD-SET ADAPTOR

This unit is provided to match the standard airline type head-set to the AR-720. All the transmission and reception are made through the airline type head-set.

(3) MANUAL GROUP

*OPERATING MANUAL (S)

This manual offers important information which is necessary to operate the TR-720, including operating procedures and operational precautions.

*SERVICE MANUAL

The service manual offers technical descriptions which are necessary for maintenance and service. Schematic diagram, parts list, and component layout are the part of the service manual.

(4) POWER PACK GROUP

*STANDARD POWER PACK (MODEL BP-45) (S)

This battery pack is supplied with the TR-720. This battery pack offers at least 8 hours operation for 5*(TX), 5*(RX), 90*(STBY) at single charge. Thermal protector is included in this pack to allow one hour rapid charge by optional quick charger model ACH-15.

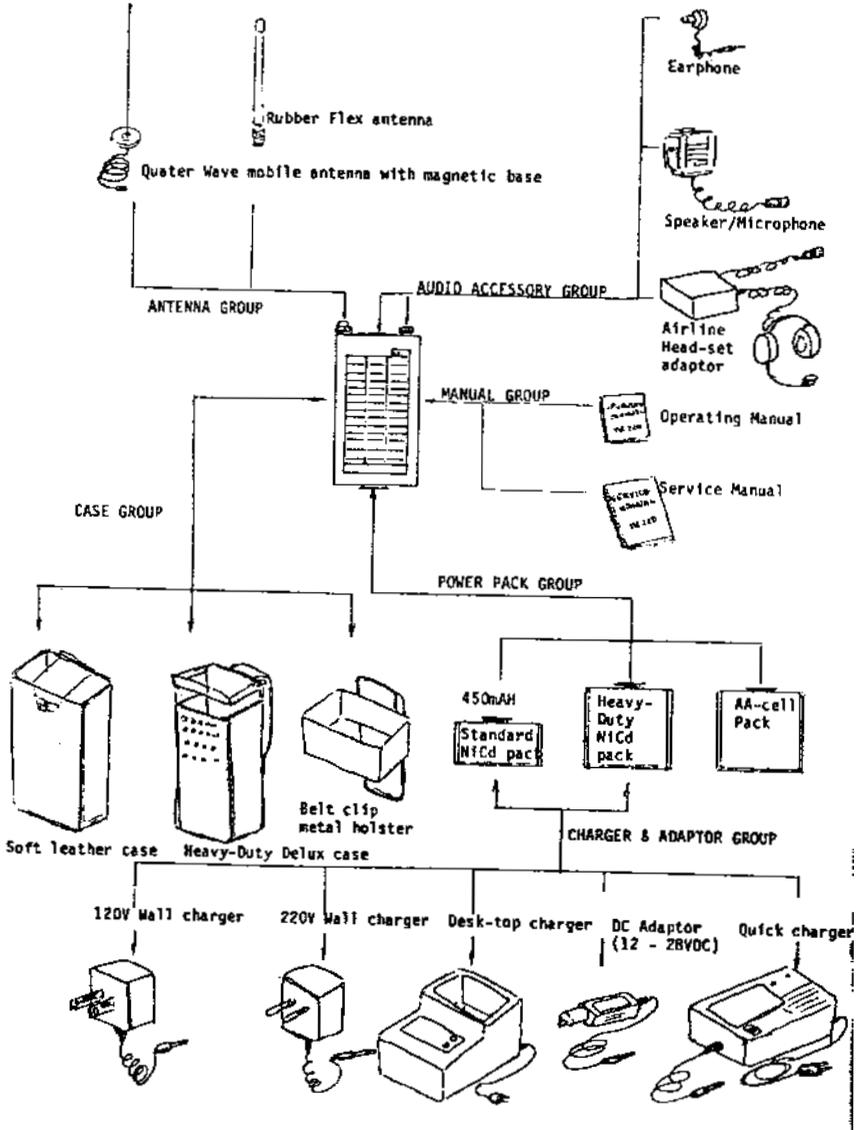
*HEAVY-DUTY POWER PACK (MODEL BP-75)

For long time operation, this battery pack offers minimum 16 to 20 hours of continuous operation under 5*(TX), 5*(RX), 90*(STBY) conditions at single charge. It also includes thermal protector for rapid charge by optional quick charger model ACH-15.

*AA-CELL PACK

Provide to use dry-cell (AA type) battery. This pack can contain 8pcs. of AA-size dry-cell batteries for emergency or substantial power source where the recharging is impossible, such as at balloon cruising etc.

Figure 2-3 ACCESSORIES



(5) CHARGER & ADAPTOR GROUP

***WALL TYPE CHARGER (S)**

Plug-in type charger is designed to charge the NiCd pack of the TR-720. Allow at least 8 hours for full charge. 220 volts type is also available for some overseas countries.

***DESK-TOP TYPE CHARGER**

This broup-in type charger is much convenient for business operation of the TR-720. Built-in trickle charge function in the charger provide for trickle charging. 220 volts type is also available on special order.

***QUICK CHARGER**

Designed to charge the battery within a short period, normally 30 to 60 minutes for full charge. (Standard NiCd pack)
Built-in overcharge protection circuit protects the battery from overcharge. This charger can be used both standard NiCd pack and heavy-duty NiCd pack.

***DC ADAPTOR (S)**

Designed to charge the battery from car or aircraft battery source. The unit is designed to take 12 to 28VDC input. This adaptor is designed to use via cigarett lighter jack of vehicle.

(6) CASE GROUP

***SOFT LEATHER CASE (S)**

To prevent damage of the unit from the shock. This case is supplied with the TR-720.

***HEAVY-DUTY DELUX CASE**

This genuine leather carrying case is suitable for business operation which require tough and durable carrying case.

***BELT CLIP METAL HOLSTER**

Provided to use the unit with the belt. Easy to install onto the belt.

SECTION 3
BATTERY FACTS

3-1. GENERAL

There are a number of facts about NiCd batteries which will help you understand the most effective way to operate your radio. Since the battery life determines the length of time that you can operate your unit, proper care of the batteries will mean longer time between charges. The twist-off battery pack supplied with the TR-720 incorporates a special NiCd cell manufactured by GENERAL ELECTRIC CO. The design of the cell allows one hour charging of the pack with the accessory quick charger. The cell is also protected against overcharging.

SECTION 3
BATTERY FACTS (Cont'd)

The nominal capacity of the battery pack is 490mA/H. Translated into hours of operation of the radio, this means that the radio could operate approximately 12 hours in the stand-by mode - or approximately 5 hours of continuous receiving at medium audio levels - or approximately 45 minutes continuous transmission. Of course few people operate their radio continuously in one mode. Batteries for communications service are normally rated for a useful life at a mix of 90% standby, 5% receive, and 5% transmit. Using this standard, the expected operating time between charges would be about eight and a half hours. Everybody operates their portable differently, so the time between charges will also differ considerably. The estimates above offer a guideline for battery life.

Another interesting fact about NiCd batteries is that they have a memory. This means that a battery which is always partially discharged, and then recharged will eventually lose part of its maximum capacity. To overcome this handicap, you should try to remember to periodically use the radio until the battery is fully discharged, and then charge the battery fully.

NiCd batteries do not like to be overcharged either. The wall charger supplied as a standard item does not automatically reduce the charging rate when the battery is fully charged. Therefore, if you plug the charger into the battery and leave it for longer than the standard 16 hour charging period, you will begin to deteriorate the effective life of the NiCd pack. Accessory battery chargers for the TR-720 take into account this fact and automatically correct the charge rate when the battery is fully charged. Their use is described in their own operating instructions.

Another characteristic of NiCd batteries is that they lose their charge slowly when not being used. Therefore most NiCd packs are designed to accept a small current as a trickle charge to maintain their full charge. The accessory drop-in charger automatically switches into a trickle charge mode when battery is fully charged.

All this sounds complicated, but all you have to remember is - periodically use the battery to full discharge - try not to overcharge the battery pack - learn operating habits which minimize the current drain on the battery.

3-2. BATTERY REPLACEMENT

To remove the battery pack, simply depress the locking mechanism on the side of the TR-720 towards the top panel and twist the pack a quarter turn counterclockwise. Figure 3-1 shows this action. Replace the battery pack by reversing the process. The first time you try this it may feel awkward, but after repeating it a few times you will become more adept. All of accessory battery packs available for TR-720 are connected in the same manner.

3-3. CHARGING THE BATTERY

The wall type plug-in battery charger supplied with the TR-720 mates into the charging jack on the side of the battery pack. Plug the charger into a 110 volts wall receptacle and then into the battery pack. The charging cycle with this charger is overnight (12 to 16 hours). For longest battery life try to avoid leaving the charger plugged into the pack for more than 24 hours at a time.

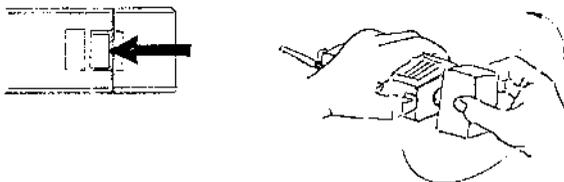
The TR-720 can be operated while it is being charged, but the charging time is increased by about 50% (18 to 24 hours). You can also charge the battery pack when it is disconnected from the TR-720, allowing you to operate for long periods of time by exchanging battery packs.

3-4. CHARGING THE BATTERY BY DC ADAPTOR

Plug the DC adaptor into a cigarette lighter receptacle of the vehicle and then into the battery pack. The charging rate is approximately 45mA whether the engine of the vehicle is running or not. This accessory operates only in a negative ground automobile or aircraft which has 13VDC to 28VDC battery voltage. The TR-720 can be operated while it is being charged by DC adaptor charger, but the charging time is increased by about 50% (18 to 24 hours) for full charge.

It is recommended to use DC adaptor as a back-up power supply when the unit is used in a vehicle.

Figure 3-1 BATTERY REPLACEMENT



SECTION 4 OPERATION

4-1. UNPACK THE RADIO

Remove the TR-720 from its packing box and make certain that all of the standard accessories have been included. Listed below is a standard item in the packing box.

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QTTY.</u>
1.	TR-720 Transceiver, Main unit	1
2.	BP- 5 Standard NiCd pack(Attached unit)	1
3.	Wall type charger (120 or 220VAC)	1

4-1. UNPACK THE RADIO (Cont'd)

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
5.	Rubber Flex antenna	1
6.	Operating Manual	1

The battery pack is shipped with only a surface charge, so the battery must be charged overnight before prolonged use of the TR-720.

4-2. OPERATING PROCEDURE

The TR-720 is designed to provide maximum ease of operation. All operating controls are mounted on a top of the TR-720 except PTT lever switch. All operating controls and indicator are designed for maximum visibility and control with minimum effort.

(1) MOUNTING ANTENNA

Always connect the rubber flex antenna to the antenna connector on the top panel of TR-720 when in the operation. Connect the antenna by gently pushing it on to the radio and twisting it clockwise until it locks.

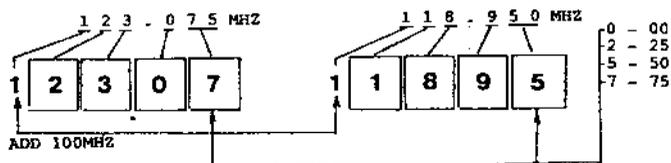
(2) TURN IT ON

Turn the squelch control fully counter-clockwise and turn the volume control clockwise until a click indicates that you have turned the radio on. If the battery is charged you will hear the hiss of channel noise. Adjust the volume control for a comfortable audio level and then adjust the squelch control to just remove the channel noise from the receiver.

The GREEN LED light should indicate whenever there is the squelch break in the receiver.

(3) FREQUENCY SELECTION BY FREQUENCY SELECTOR (THUMBWHEEL SWITCH)

Slide DIAL-MEMORY slide switch to DIAL position. A four section thumbwheel switch selects the operating frequency. Add 100MHz to the dialed frequency to determine operating frequency. The sixth digit, which is always a 0 or a 5, is redundant information not displayed on the frequency selector switch. Refer to examples illustrated below.



(4) FREQUENCY SELECTION BY MEMORY SWITCH

The TR-720 contains a three-channel frequency storage or memory capability. This feature allows the operator to switch between four frequencies (1 dialed frequency, 3 memorized frequencies) without changing the frequency selector thumbwheel switch. To program the frequency and to recall the frequency is discussed in this paragraph.

- (a) Slide the DIAL-MEMORY switch to MEMORY position. Select the memory channel number (No. 1 to No.3).
- (b) Select any frequency within a range of which you wish to program by frequency selector thumbwheel switch.
- (c) Push small yellow MEMORY INPUT button by the paper crisp or pencil. You will hear an alarm tone when you push in the button. This means the TRANSMIT frequency is programmed. For COM frequency, you will hear alarms twice, when you push in the button and release the button. The second alarm means that the RECEIVE frequency is programmed. For NAV frequency, the transmission is prohibited and so signal can be transmitted, therefore, only one alarm is heard when you release the button.
- (d) Slide the memory channel switch to the next number to program next frequency. The procedures are same as above.
- (e) After completion of the programming, slide the DIAL-MEMORY switch to DIAL position. To change or recall is very simple. First, slide the DIAL-MEMORY switch to MEMORY position, then select one of three memory channels whenever you desire to operate. To change the memory program, repeat the same step as discussed above.

NOTE: The memory circuit used in the TR-720 is backed-up by the battery pack. The back-up power is as low as 20uA. Therefore, the TR-720 can maintain memory frequencies as long as the battery pack is connected to the unit, although the battery require recharging.

The memory circuit of the TR-720 can hold memory frequencies at lease 1-hour without battery pack. While charging or replacing the battery pack, re-programming is not required, if the replacement is completed within 1-hour. If the replacement time exceeds 1-hour or over, or if you wish to charge the battery separate, reprogramming is necessary as described above procedures.

(5) TRANSMITTING

Simply hold the TR-720 about 2 to 3 inches from your mouth, press the PTT bar and talk. If you are using an accessory speaker-microphone, hold the microphone 2 to 3 inches from your mouth and press its PTT bar and talk. The RED LED light will glow to indicate transmission. If the LED lamp is not glow, refer to section 6, USER TROUBLESHOOTING GUIDE of this manual.

(6) TURNING OFF

To turn the TR-720 off, simply rotate VOLUME CONTROL knob fully counter-clockwise until click is heard.

SECTION 5
PRECAUTIONS & SAFTY INFORMATION

5-1. PRECAUTIONS

- (1) Never operate the TR-720 without an antenna, this can damage it.
- (2) The receiver section is very sensitive, and can be damaged by receiving excessively strong signal. Avoid this hazard by not using the TR-720 adjacent to the antenna of a high power transmitter.
- (3) The TR-720 is designed to operate properly from -10°C to $+60^{\circ}\text{C}$. (approximately 20 to 120 degree F)
Try to avoid using the TR-720 in temperatures outside that range. The TR-720 can be damaged by excessively high temperatures which can be caused by leaving it in a closed car in direct sunlight.
- (4) There are no user serviceable controls inside the TR-720. You should not open the case. In the event that service is required, find a qualified, licensed radio technician to perform the service, or return it to authorized service center.

5-2. SAFTY INFORMATION

The united states department of labor, through the provisions of the occupational safety and health act of 1970 (OSHA), has established an electromagnetic energy safety standard which applies to the use of this type of equipment. Proper use of the radio will result in exposure below the OSHA limit.

- (1) Do not hold radio such as the antenna gets very close to, or touching, exposed parts of the body, especially the face or the eyes, while TRANSMITTING. The radio will perform best if the microphone is two or three inches away from the lips and the radio is vertical.
- (2) Do not hold (Depress) transmit switch (PTT bar) on when not actually desiring to transmit.
- (3) Do not allow children to play with any radio equipment containing a transmitter.
- (4) Do not operate a portable transmitter near unshielded electrical blasting caps or in an explosive atmosphere unless it is type especially qualified for such an use.



SECTION 6
USER TROUBLESHOOTING

6-1. GENERAL

Listed below are some of the common user correctable mistakes seen in operation of the TR-720. Use this check list before taking the radio to be serviced.

	No sound from the speaker.	Intermittant sound.	Sound, but no signal.	Signals heard but no reply.	Poor signal reception	TX/RX OK but can't change frequency	RED LED can't glow.
Be sure the TR-720 is turned on	•						
Be sure battery is attached	•	•					
Be sure earphone is not connected	•						
Be sure battery pack is charged	•			•		•	
Adjust the squelch and volume control	•	•					
Try a different frequency	•	•	•	•			
Check the internal fuse above battery pack	•						
Check the antenna connection		•	•	•			
You are in a poor operating location		•	•	•			
Check DIAL-MEMORY switch	•		•		•	•	•
Is the channel COM band?			•			•	•
Try to receive local channel		•	•				
Did you put a memory?			•				•

No alarm when put memory —

SECTION 7
SPECIFICATIONS OF TR-720

GENERAL :

Model : TR-720 Air-band Transceiver
Frequency Range : 118.000MHz - 135.975MHz (Communication)
: 108.000MHz - 117.975MHz (VOR Receive only)
Number of channel : 720 -- Communication
: 200 -- VOR Receive only
Frequency determination : Microprocessor controlled C-MOS Phased locked loop
Frequency stability : +/- 0.001% (-10°C to +60°C, 25°C Ref.)
: +/- 0.002% (-30°C to +60°C, 25°C Ref.)
Operational mode : Amplitude modulation, 6A3
Type of communication : Simplex
Power consumption : 40mA @ Receiver squelched
: 130mA @ 300mW Audio output
: 700mA @ Transmit
Antenna Type & Impedance : Rubber flexible, 50-ohm unbalanced type.
Battery Type : 9.6V/450mAh NiCd battery pack, or
: 9.6V/750mAh NiCd battery pack, or
: 12V, 8 x AA size dry-cell batteries.

RECEIVER :

Receiver System : Dual conversion superheterodyne receiver
Usable sensitivity : Less than 1uV for 70dB SINAD
Selectivity : +/-15kHz @ 6dB bandwidth
: +/-40kHz @ 60dB "
Squelch sensitivity : 0.5uV threshold point, Noise type squelch
Audio output : 500mW maximum, less than 10% THD.
IF Image rejection : Greater than 60dB
Spurious response : Greater than 60dB

TRANSMITTER :

RF output power : 1.0W (DC), 3.0W (PEP) into 50-ohm load
Frequency stability : +/-0.002%, -30°C to +60°C, 25°C Ref.
Modulation System : Class B, Collector modulation
Spurious Harmonics : Greater than 60dB below carrier

SUPPLIED ACCESSORIES :

450mAh NiCd battery pack, Rubber flex antenna, Wall type charger,

AOR, LTD. Tokyo Japan