MOTOROLA

"MT500" SERIES

FM Two-Way
Portable Radio

INSPECTION

Check the contents to be sure that all items ordered have been included.
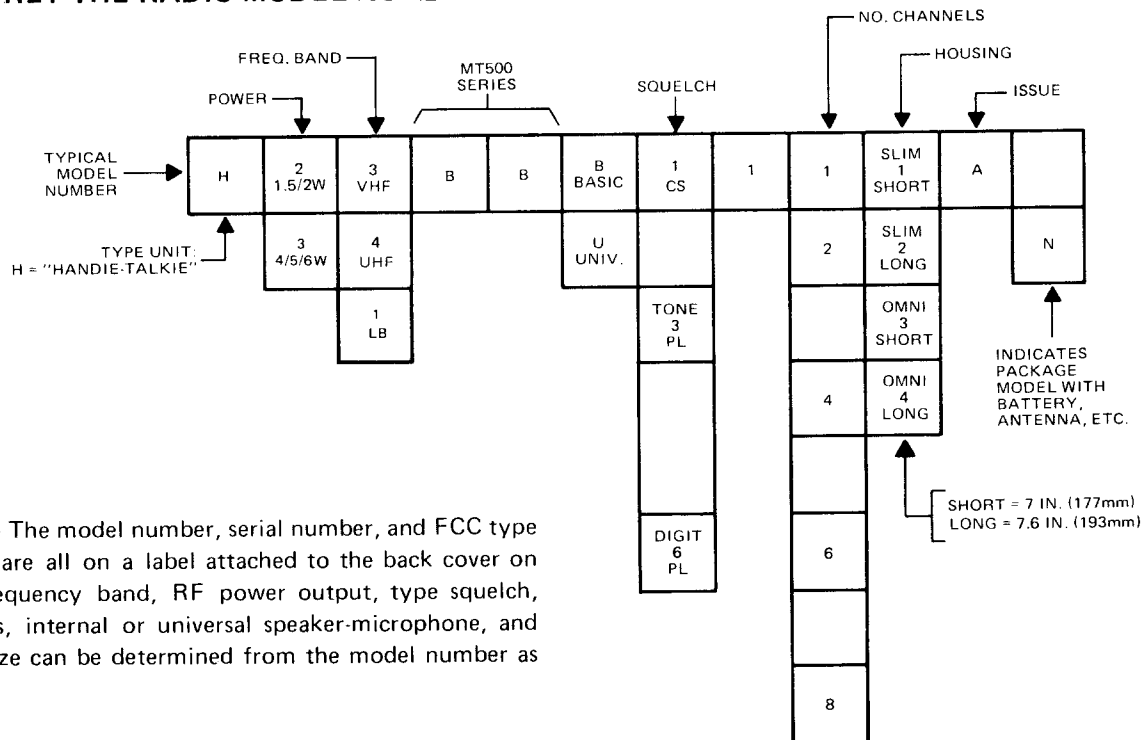
Inspect the equipment thoroughly as soon as possible after delivery. If any part of the equipment has been
damaged in transit, report the extent of damage to the transportation company immediately.

REQUIRED ACCESSORIES

The following items are included in applicable package model ("N" suffix in model number).

Model No.	Description	Application
NLN4462	Nickel-Cadmium Battery	Slim-Line Models
NLN4463	Nickel-Cadmium Battery	Omni-Housing Models
NAB6001	Antenna, Helical (30-36 MHz)	Low Band Models
NAB6002	Antenna, Helical (36-42 MHz)	Low Band Models
NAB6003	Antenna, Helical (42-50 MHz)	Low Band Models
NAD6219	Antenna, Helical (150-162 MHz)	VHF Models
NAD6220	Antenna, Helical (162-174 MHz)	VHF Models
NAE6050	Antenna, Flexible (406-512 MHz)	UHF Models
NLN6803B	Carrying Case With T-Strap	Slim-Line, Short Models
NLN6844B	Carrying Case With T-Strap	Slim-Line, Long Models
NLN6845B	Carrying Case With T-Strap	Omni-Housing, Short Models
NLN6846B	Carrying Case With T-Strap	Omni-Housing, Long Models

HOW TO INTERPRET THE RADIO MODEL NUMBER

Model number decoder diagram with the following labels and values:

TYPICAL MODEL NUMBER	POWER	FREQ. BAND	MT500 SERIES		SQUELCH		NO. CHANNELS	HOUSING	ISSUE
H	2 1.5/2W	3 VHF	B	B	B BASIC	1 CS	1	1	SLIM 1 SHORT	A
	3 4/5/6W	4 UHF			U UNIV.			2	SLIM 2 LONG	N
		1 LB				TONE 3 PL		4	OMNI 3 SHORT	
								6	OMNI 4 LONG	
						DIGIT 6 PL		8		

TYPE UNIT: H = "HANDIE-TALKIE"

SHORT = 7 IN. (177mm)
LONG = 7.6 IN. (193mm)

INDICATES PACKAGE MODEL WITH BATTERY, ANTENNA, ETC.

MODEL NUMBER - The model number, serial number, and FCC type acceptance number are all on a label attached to the back cover on your radio. The frequency band, RF power output, type squelch, number of channels, internal or universal speaker-microphone, and housing type and size can be determined from the model number as illustrated.

OPTIONS - The radio configuration may be modified by a wide variety of options. Some options add circuits or functions to the basic model, and some options delete functions from the basic model. However, only a few of the options affect operating procedures. The major variations in operation are described, following the basic operating procedure.

# INSTALLATION OF BATTERY, EXTERNAL SPEAKER-MICROPHONE, AND EXTERNAL ANTENNA

INSTALL THE BATTERY - Turn the battery cover screw 1/4 turn counterclockwise to unlock the cover. Remove the cover. Insert a freshly charged battery with the label facing out and down and the battery contacts facing down (into the radio). Replace the cover and turn the screw 1/4 turn clockwise.

BATTERY COVER

EXTERNAL SPEAKER-MICROPHONE CONSIDERATIONS - Universal model radios have an accessory connector on the side. These radios also contain an internal speaker-microphone and will operate without the external speaker-microphone attached. To attach the external speaker-microphone, fit the connector lip into the groove on the top edge of the radio frame and pivot the plug down against the side of the radio. Secure the plug to the radio by tightening the screw on the plug into the threaded retainer.

ACCESSORY
CONNECTOR

RETAINER
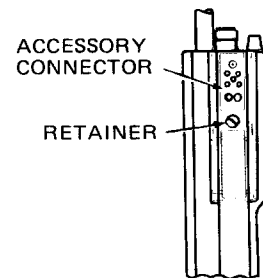
ANTENNA AND SPEAKER JACKS - The antenna jack (Ψ) is used to attach an external 50-ohm antenna, and also for test purposes. The speaker jack ( ) is used with an optional lapel speaker or earpiece, and also for test purposes. The radio speaker is inoperative when an external speaker is connected to the speaker jack. The two jacks are fitted with threaded protective caps which should be left in place when the jacks are not being used.
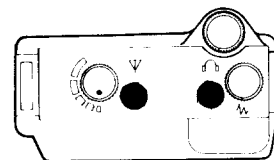
CONTROLS AND SWITCHES

VOLUME CONTROL - Turns the radio on and off and adjusts the receiver audio volume.

**SQUELCH CONTROL** - Mutes background noise and reduces unwanted signals.

PTT (Push-to-Talk) SWITCH - Press to talk via the transmitter. Receiver operates only when released.

FREQUENCY SELECTOR SWITCH - Selects the operating channel - - toggle switch on two-channel radios, rotary switch on 3 - to 6 or 8 - channel radios.

"PL" DISABLE SWITCH - Used on "Private-Line" models. Receiver operates only with the proper "Private-Line" signal in the " ♭ " position. Receiver responds to all on-channel signals when in the " ♭ " position.

ACCESSORY CONNECTOR - Normally used to attach an external speaker-microphone. Present only on universal (BBU) models.
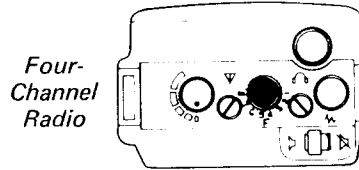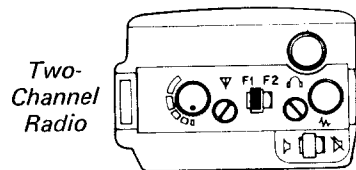
ANTENNA - Fixed antennas normally supplied. Optional collapsible type must be extended before operation.
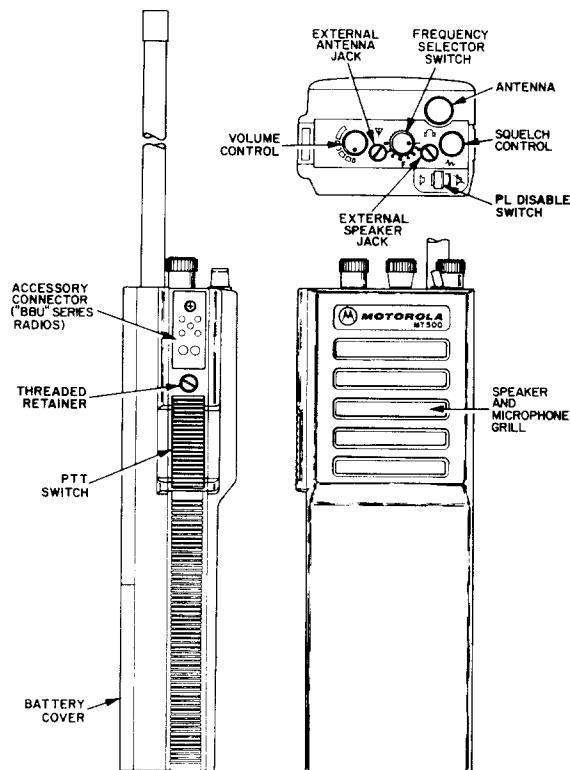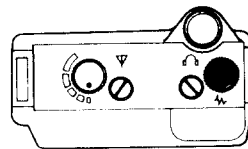
BASIC OPERATING PROCEDURE

1. Rotate the volume control one-half turn clockwise to turn on the radio..

2. If your radio has more than one channel, set the frequency select switch to the desired position (F1, F2, etc.)

Two-Channel Radio

Four-Channel Radio

3. Rotate the ᴧᴧ (squelch) control to the fully counterclockwise position.

4. If your radio is a carrier squelch model, proceed to step 5. If your radio is a "Private-Line" model, place the PL Disable switch in the " ♭ " position.
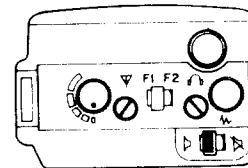
5. Listen for a broadcast and set the volume control to a comfortable listening level.

6. When the channel is clear, slowly rotate the ᴧᴧ (squelch) control clockwise until the noise just stops. This is the threshold setting. DO NOT adjust the control further. Excessive squelch reduces the radio sensitivity.
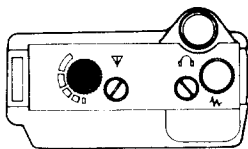
7. Your radio is now set to receive calls on your frequency. If your radio is a "Private-Line" model, set the PL Disable switch to the ♮ position to receive only the calls coded for your radio.

8. Do not interrupt another user. Listen for broadcasts on your channel. If your radio is a "Private-Line" model, momentarily place the PL Disable switch in the " ♭ " position to monitor the channel. The channel must be clear before transmitting.

9. Hold the radio in a vertical position with the speaker-microphone grille two to three inches from your mouth and speak in a normal tone of voice.
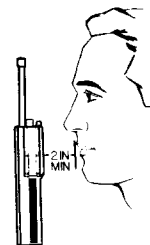
10. Press the push-to-talk switch on the side of the radio and speak slowly and clearly into the grille area. When finished transmitting, release the push-to-talk switch to receive. Remember, if you transmit while the other party is talking, he will not hear you.
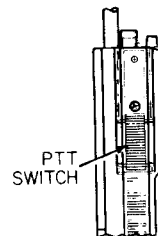
11. To turn the radio off, rotate the volume control counterclockwise until a click is heard and the mechanical stop is reached.

PTT SWITCH

MODEL VARIATIONS AND OPERATION

SELECTIVE CALL MODELS - Radios equipped with this option have a monitor-reset switch in the location where the "Private-Line" switch is shown.

When the radio is turned on, it is in the carrier squelch mode and operates as described in the basic operating procedure.

To operate as a pager, momentarily operate the monitor-reset switch to the " ▷ " position and release it. Your radio now operates as a pager. When you are paged, you will hear a pulsed tone for an individual call, and a continuous tone for a group call. The radio automatically switches to the carrier squelch mode and you will hear the caller's voice. You may now transmit and receive as described in the basic operating procedure.

If you have not been paged, but wish to transmit, first monitor the channel by pressing and holding the monitor-reset switch in the " ▷ " position. When the channel is clear, release the switch and transmit as described in the basic operating procedure.

After receiving a page or after completing a two-way conversation, the radio will remain in the carrier squelch mode. To reset to the pager mode, momentarily operate and release the monitor-reset switch.

External Spkr-Mic Connector

UNIVERSAL MODELS - The universal model radios operate as standard radios with an internal speaker-microphone, or a remote speaker-microphone can be attached. With the remote speaker-microphone attached, the push-to-talk button on. the remote microphone is used instead of the lever on the side of the radio. Operation is as previously described in the basic operating instructions.

TIME-OUT-TIMER OPTION - Radios equipped with this option contain a special circuit which turns off the transmitter and emits an alert tone from the speaker after continuously transmitting for about 60 seconds. When the PTT switch is released, the alert tone is stopped and the receiver operates normally. Another transmission may be initiated immediately after releasing the PTT switch. This option also alerts you if the transmitter is accidentally keyed — preventing channel tie-up.
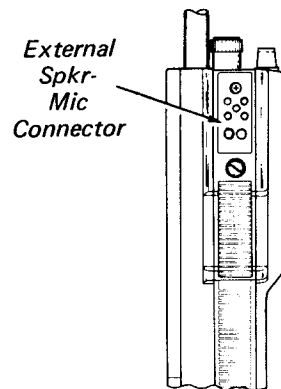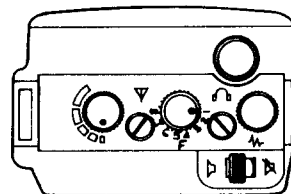
"PAC●RT" TRANSMIT-ONLY "PL" OPTION - Radios equipped with this option are used within the PAC●RT Portable/Mobile Vehicular Repeater System. With the radio PL Disable switch in the " ⋈ " position, the radio operates in the portable-to-base mode; as a result, all messages from the portable radio are repeated through the PAC●RT Vehicular Repeater to the base station. With the radio PL Disable switch in the " ⊳ " position, the radio operates in the portable-to-portable mode, and the portable radio operator can talk with other portable radio operators in the system without activating any repeaters. (This option available in VHF and UHF).

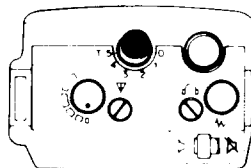**SINGLE-TONE REMOTE SIGNALING OPTION** - Radios equipped with this option have either a toggle switch ("slim-line" radios) or a rotary switch ("omni" radios) for the single-tone select switch.
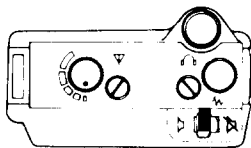
| One-Tone
Single-Tone Radio | One- to Five-Tone Single-Tone
One-Channel Radio | One- to Five-Tone Single-Tone
Two-Channel Radio | One- to Five-Tone Single-Tone
Multiple-Channel Radio |
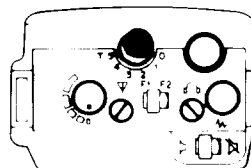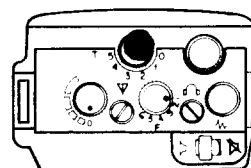
With the single-tone selector switch in the "O" position ("omni" radios) or in the " ⊳ " position ("slim-line" radios), the radio operates in its carrier squelch mode and operates as described in the "Basic Operating Procedure." If the "omni" radio is equipped with the tone PL option, it operates in the same manner as described in the "Basic Operating Procedure."

Operation of the radio with the single-tone selector switch in the numbered position or in the " ⋈ " position is the same as that of a standard radio when it is in the transmitting mode. By pressing the push-to-talk switch, the radio automatically sends out the selected tone after a turn-on delay of 10 ms. The tone duration is fixed at approximately 750 ms.

The microphone is muted before and during the tone transmission. Monitoring of the tones over the radio loudspeaker is provided so that the radio operator will know when the tone has been transmitted and can start his voice message. The transmitted tone is monitored at a low level and is independent of the radio volume control.

RADIOS WITH UNIT ID AND EMERGENCY CALL OPTIONS - Radios equipped with these options transmit an identifying code to the base station which tells the operator which radio is "on-the-air."

NOTE
You cannot transmit a voice message while the tones are being transmitted.

Radios Equipped for Unit ID Operation: Operate the radio in the normal manner. When the transmitter is turned on by pressing the PTT switch, you will hear the ID tones being transmitted. When the tones end, start your voice message in the normal manner.

Radios Equipped for Unit ID and Emergency Call Operation: To send an emergency call, momentarily depress the Emergency Call pushbutton. You will not hear anything, but the radio then sends two ID/emergency messages every 8.5 seconds for 35 seconds. To stop sequence early, depress the PTT switch and resume normal operation.
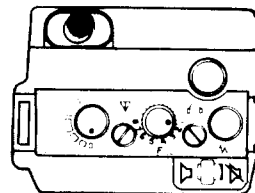
Radios Equipped for "Touch-Code" Operation:
1. The "Touch-Code" keys must be depressed vertically to the pad with the finger tip. An audible tone will be heard when the keys are depressed properly. The tone indicates that proper contact has been made and the radio has transmitted the tone.
2. To encode (transmit) "Touch-Code";
   • Depress the PTT switch and hold while depressing the desired keys as described above.
   • Release the PTT switch to receive.
3. Radios incorporating ANI;
   • Depress the PTT switch and hold while depressing the "*" key to transmit the ANI connect code.
   • Encode your number as in No. 2 above.
   • Depress the PTT switch and hold while depressing the "#" key to transmit the ANI disconnect code.
   • Make sure the ANI code sequence has finished transmission before releasing the PTT switch. Prematurely releasing the PTT will cancel the code.

BATTERIES

BATTERY TYPES AND SIZES - Your radio will operate from an optional mercury battery or a rechargeable nickel-cadmium battery. Each type is available in two sizes; slim-line and omni. The omni battery is larger, for the larger housing, and provides an extended duty cycle when used in low power model radios. You cannot replace a slim-line battery with an omni battery due to difference in size. Low-band radios use omni-size NLN6936A batteries only.

NICKEL-CADMIUM BATTERIES (RECHARGEABLE) - Nickel-cadmium batteries are available in either size. The recommended batteries are the NLN4462A (slim-line) or the NLN4463A (omni).

1. Your Motorola nickel-cadmium rechargeable battery is a safe, dependable power system specifically designed for use in your high quality, high performance Motorola communications products.

   Additional information on Motorola's Ni-Cd batteries can be obtained by writing to:

   BATTERY DEPARTMENT
   MOTOROLA, INC.
   8000 W. SUNRISE BOULEVARD
   FT. LAUDERDALE, FLORIDA 33322

2. RECHARGE BEFORE USING

   To insure optimum capacity and performance, your nickel-cadmium battery should always be charged before using.

3. CHARGING TEMPERATURE

   Battery charging should occur, whenever possible, with your battery at about 77° F, room temperature. Charging a cold battery (below 45° F) may result in leakage of electrolyte, and ultimately, in failure of the battery. Charging of a hot or warm battery (above 95° F) will result in reduced discharge capacity, affecting performance of the radio.

4. SHORT CIRCUITS

   Care should be taken to avoid external short circuiting. Sustained high rate discharges (i.e., a paper clip placed accidentally across the contacts) will damage the battery and may create a burn or fire hazard.

BATTERIES (Cont'd)

5. MEMORY EFFECT

A nickel-cadmium battery is said to be exhibiting memory effect when its *charge* capacity has been reduced by a) continuous overcharge or b) repetitive shallow cycling.

a) Long Continuous Overcharge

If your battery is lightly or infrequently used, and it is allowed to charge over a long period (30 - 60 days), it may develop memory effect. That is, voltage may be sufficiently depressed on its first charging cycle to reduce the effectiveness of your radio transmission.

b) Repetitive Shallow Cycling

A more common type of memory effect is induced by uniform shallow cycling. For example, if you call on your battery to repeatedly deliver 50% of its capacity, the remaining 50% can temporarily become inactive, and when called upon to deliver, may show a sharp decrease in its ability to deliver terminal voltage.

Any nickel-cadmium battery which shows early signs of reduced capacity should be checked for memorization before being returned or discarded.

If your battery is exhibiting memory effect, memory can be easily eliminated by letting the battery discharge completely using an unsquelched radio followed by a normal recharge. One or two deep cycles are usually sufficient.

6. Your Motorola battery was designed to be used with a high quality Motorola charger. Charging in non-Motorola approved equipment may lead to permanent charger or battery damage and will void your battery warranty.

7. Proper care of you Motorola rechargeable nickel-cadmium battery will insure its effectiveness allowing peak performance of your high quality Motorola Portable radio.

MERCURY BATTERIES (NOT RECHARGEABLE) - The optional mercury battery will provide longer life than the nickel-cadmium battery, but it cannot be recharged. Mercury batteries are available in either slim-line or omni sizes: NLN6683A (slim-line), NLN6936A (omni, high power), and NLN6762A (omni, low power).

OTHER MOTOROLA BATTERIES - The following older style nickel-cadmium batteries may be used in the MT500 radios but will provide reduced duty cycles: NLN6682, NLN6899, NLN6761, and NLN6900. These batteries may also be recharged in the MT500 chargers.

NICKEL-CADMIUM BATTERY CHARGERS

SINGLE-UNIT BATTERY CHARGERS - The single-unit chargers are available for either the slim-line or omni model radios. Also, these chargers are available as either standard-charge or rapid-charge. All of the chargers will charge a single battery while in or out of the radio. The radio receiver may be operated while installed in the charger, however, charging time is increased.

The rapid chargers will recharge an MT500 nickel-cadmium battery fully in one hour. These rapid chargers are equipped for automatic reduced slow charge after the full charge is completed. This reduced slow charge permits leaving the battery in the charger indefinitely.

The standard charge battery charger will charge an MT500 battery in about 16 hours. Leaving the battery in the charger for more than 72 hours is not recommended.

MULTIPLE-UNIT BATTERY CHARGERS - There are four multiple-unit standard-charge battery chargers available for slim-line or omni batteries, and four rapid-charge chargers for slim-line or omni batteries. These chargers hold up to 12 batteries, in or out of the radio. Their characteristics are the same as described for the single-unit chargers.

VEHICULAR CHARGERS - Vehicular chargers are available, either slim-line or omni models. These chargers mount in an automobile and hold a single radio. The radio is operational while the battery is being charged. The chargers are available for 6- to 12-volt ignition systems. Order with appropriate charger cable and antenna cable.

Single-Unit Battery Charger

Multiple-Unit Battery Charger

Vehicular Charger

TABLE OF CHARGERS

Housing Type	Charge Rate	Single-Unit Chargers		Multiple-Unit Chargers		Vehicular Chargers
		117 V	234 V	117 V	234 V	
Slim-line	Standard	NLN4557 NLN6684	NLN4559 NLN6993	NLN4558	NLN4559	NLN6691
	Rapid	NLN4565	NLN4567	NLN4566	NLN4568	
Omni-housing	Standard	NLN4561 NLN6804	NLN4563 NLN6997	NLN4562	NLN4564	NLN6892
	Rapid	NLN4569	NLN4571	NLN4570	NLN4572	

6000 series models are stellar blue color, others are shadow bronze color.

ACCESSORIES

Motorola offers several accessories to increase your communications efficiency. Consult your Motorola sales representative for a complete list of equipment.

Some of the more popular accessories are listed below.

DETACHABLE SWIVEL CASE COMPONENTS

Item	Slim-Line Size		Omni-Housing	
	Short	Long	Short	Long
Holster	NLN4525B	NLN4526B	NLN4527B	NLN4528B
Belt Loop, 2.5 in. or	NLN4529		NLN4529	
Belt Loop, 3.0 in.	NLN4530		NLN4530	
T-Strap or	NLN4532		NLN4532	
Full Flap	NLN4531		NLN4531	
Nylon Strap	NLN5476		NLN5476	
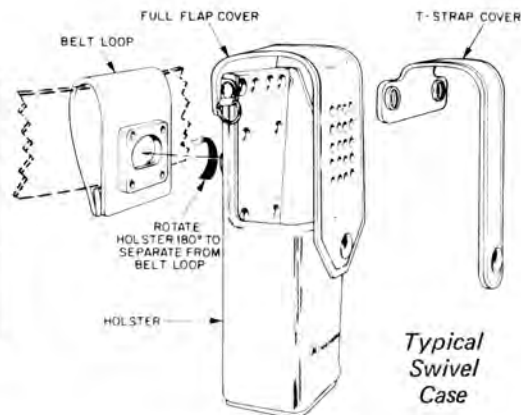
Typical Swivel Case

COLLAPSIBLE ANTENNAS

NAD6322	150.8 - 162 MHz (6-section)
NAD6324	162 - 174 MHz (5-section)
NAE6271	406 - 512 MHz (2-section)

EXTERNAL SPEAKER-MICROPHONE

NMN6082	Coiled Cord Type
NMN6081	Straight Cord Type
NMN6083	Speaker-Microphone Antenna (UHF)

HEADSETS

NMN6050	Safety Helmet Type
NMN6064	Noise Cancelling with Boom Microphone (Requires NLN4477 Cable Adaptor)
NMN6065	Noise Cancelling with Cup Microphone (Requires NLN4477 Cable Adaptor)

Typical External Speaker-Microphone

IF YOU EXPERIENCE DIFFICULTY:

Check the following items before requesting service.

1. Review steps in Basic Operating Procedure.

2. On multiple-frequency models, be sure the selector switch is set to the correct channel.

3. If you have a "Private-Line" model and cannot receive in fringe areas, check the squelch control setting. It must be set to threshold position as described in the basic operating instructions.

4. If operation is poor, check the antenna. It must be undamaged and operated in the vertical position for maximum range. Collapsible antennas must be fully extended. Also, collapsible antennas provide better operation than helical antennas in fringe areas.

5. Try several different operating locations.

6. Transmitter check - Transmit to another portable radio, or communications receiver. If the receiver has a signal strength 'S' meter, comparison readings can be made against another portable radio.

7. Recheck the complete operating procedure.

SAFETY 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 this equipment. Proper use of this radio will result in exposure below the OSHA limit.

DO NOT hold the radio such that the antenna is very close to, or touching, exposed parts of the body, especially the face or 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.

DO NOT hold the transmit (PTT) switch on when not actually desiring to transmit.

DO NOT allow children to play with any radio equipment containing a transmitter.

DO NOT operate a portable transmitter near unshielded electrical blasting caps or in an explosive atmosphere unless it is a type especially qualified for such use.
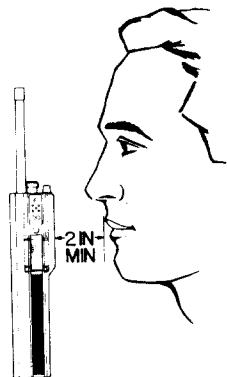
MT500 MODELS APPROVED FOR USE IN HAZARDOUS ATMOSPHERES

FACTORY MUTUAL
INTRINSICALLY SAFE APPROVED MODELS

Low power, universal VHF and UHF MT500 radios, properly equipped with the H753 option, are approved by Factory Mutual as intrinsically safe for use in:

Class I & II, Divisions 1 & 2, Groups C, D, E, F, & G atmospheres.

The H753 option provides both an intrinsically safe back cover label, stating the above listings, and the NLN8232 Rapid Charge Battery to identify the radio as Factory Mutual Approved.

The intrinsically safe rating by Factory Mutual states that electrical equipment is incapable of releasing sufficient electrical or thermal energy, under normal or abnormal operating conditions, to cause ignition of a specific hazardous atmosphere. This means that the MT500 radio has been thoroughly tested by Factory Mutual and carries their certification for operation in the hazardous atmospheres designated on the radio label. **Radios must ship from the Motorola factory with the hazardous atmosphere options and cannot be modified in the field.** Failure to use the radio with the approved battery will negate the approval. For approved radio and battery combinations and a complete explanation of Factory Mutual approvals, refer to Motorola brochure RO-04-40A.

Factory Mutual hazardous locations are arranged in classes, divisions, and groups.

Classes of hazardous locations are:

Class I - Atmospheres which contain concentrations of flammable gasses or vapors.

Class II - Atmospheres which contain ignitable amounts of dust.

Class III - Atmospheres which contain combustible amounts of fibers.

Divisions 1 and 2 refer to the probability that a hazardous atmosphere will be present, Division 1 being the higher probability.

Factory Mutual's groups indicate the type of hazardous environment. Groups A through D are flammable gases or vapors and Groups E, F, and G apply to combustible or conductive dusts. The following list presents those atmospheres for which the MT500 has approval:

GROUP C	GROUP D (Cont'd)	GROUP E
acetaldehyde	ethyl acetate	metal dust includes:
cyclopropane	ethylene dichloride	aluminum mag-
ether vapors	gasoline	nesium and
ethylene	heptanes	the commercial
unsymmetrical	hexanes	alloys
dimethylhydrazine	isoprene	
	methane	
	methanol	**GROUP F**
GROUP D	ketones	
	propanol	carbon blk
acetone	petroleum naptha	charcoal
acrylonitrile	octanes	coal
ammonia	pentanes	coke dust
benzene	propane	
butane	propylene	**GROUP G**
butyl alcohol	styrene	
butyl acetate	toluene	flour
ethane	vinyl acetate	starch
ethanol	vinyl chloride	grain dust
	xylenes	

MT500 portables that are approved by Factory Mutual can be used in those applications requiring reliable two-way, hand-held radios in the listed specific hazardous atmospheres. Motorola approved equipment and accessories, along with details of testing methods and competitive equipment approvals, are listed in the yearly catalog published by Factory Mutual Corporation. This catalog can be ordered from address on back cover.

MINE SAFETY AND HEALTH ADMINISTRATION
### (MSHA -- Formerly MESA) APPROVED MODELS

All high and low power VHF and UHF MT500 portables, if ordered with the H751 option, have been approved by MSHA for safe use in coal dust and methane gas atmospheres that are at times encountered in and around mining operations. The MSHA label provided by the H751 and H752 option is affixed to the back of the MT500. This label certifies that the MT500 can be used in the above designated environment.

RESETTING THE INTRINSICALLY SAFE BATTERY

The NLN8232 intrinsically safe (green) omni battery is equipped with a resettable circuit breaker. This circuit breaker will trip to protect the radio if the circuit experiences a current overload. To reset a tripped battery, momentarily connect a jumper from the negative terminal of the battery to each of the reset points on the side of the battery (see above diagram). If the battery fails to respond, the battery must be replaced.

TO RESET:
TEMPORARILY
CONNECT JUMPER
FROM NEGATIVE (-)
TERMINAL TO
TERMINAL (S) AT
SIDE OF BATTERY
(MAY REQUIRE
BOTH)
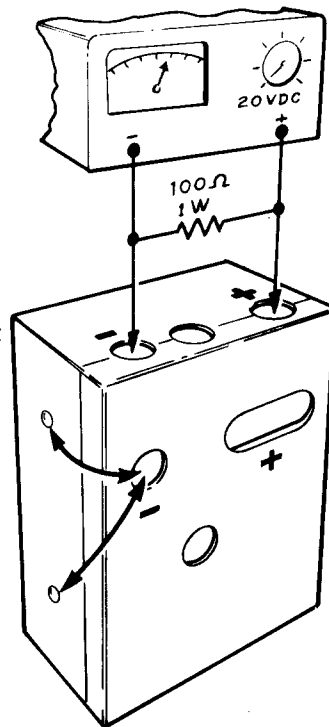
MOTOROLA INC.
Portable Products Division

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Portable Products Division
8000 W. Sunrise Blvd., Ft. Lauderdale, FL 33322
Printed in U.S.A. 5/81-IH

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