

# Operator's Manual

MM101813V1  
Rev. D, Nov-05

*future*  
The Future of Mobile Radio



## Hand Held Controller CU101239V1

**tyco**  
Electronics

**M/A-COM**

# MANUAL REVISION HISTORY

REV	DATE	REASON FOR CHANGE
R1A	Jun. 2002	Initial Release
R2A	Nov. 2002	Deleted Installation information
R3A	Oct. 2003	M/A-COM Conversion
D	Nov. 2005	Added P7100, P5100, and M7100 radios.

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# SAFETY INFORMATION

## ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

During transmissions, your M/A-COM radio generates RF energy that can possibly cause interference with other vehicular devices or systems. Turn off the radio in areas where signs are posted to do so. **DO NOT** operate the transmitter in areas that are sensitive to electromagnetic radiation such as hospitals, aircraft, and blasting sites.

## OPERATING RULES AND REGULATIONS

Two-way FM radio systems must be operated in accordance with the rules and regulations of the Federal Communications Commission (FCC). As an operator of two-way radio equipment, you must be thoroughly familiar with the rules that apply to your particular type of radio operation. Following these rules will help eliminate confusion and will assure the most efficient use of existing radio channels. This will provide a smooth operating radio network.

When using the radio, remember these rules:

1. It is a violation of FCC rules to interrupt any distress or emergency message. As the radio operates in much the same way as a telephone “party line”, always listen and assure the absence of the “**BSY**” display to make sure that the line is clear before sending any messages. If someone is sending an emergency message, such as reporting a fire or asking for help in an accident, **KEEP**

OFF THE AIR! Emergency calls have priority over all other messages.

2. Use of profane or obscene language is prohibited by Federal law.
3. It is against the law to send false call letters or a false distress or emergency message.

The FCC requires that conversations be brief and confined to business. To save time, use coded messages whenever possible.

1. Using the radio to send personal messages (except in an emergency) is a violation of FCC rules. Send only those messages essential for the business operation.
2. It is against Federal law to repeat or otherwise make known anything overheard on the radio. Conversations between others sharing your channel must be regarded as confidential.

## **OPERATING TIPS**

The following conditions tend to reduce the effective range of two-way radios and should be avoided whenever possible.

- Operating the radio in low terrain areas or while under power lines or bridges.
  - Operating the radio inside of a vehicle or inside metal or steel framed building unless using an outside antenna.

## **INSTALLATION**

The Hand Held Controller (HHC) operates with the JAGUAR™ 725M, M7100 and Orion™ mobile radios. It also can be used with the Vehicular Charger for P7100, P5100, JAGUAR 700P/Pi and M-RK™ radios.

For installation information, refer to MM101984V1, Hand Held Controller Installation Manual.

## **PROGRAMMING**

The Hand Held Controller is shipped with the current version of software installed. The configuration of the Hand Held Controller is programmed using ProGrammer™ software, TQS3385 Version R10A or later, and the programming port of the radio. Refer to the Hand Held Controller Installation Manual, MM101984V1, for more information.

# CONTROLS

This section describes the buttons, keys, and rotary knob on the Hand Held Controller used to operate the radio.



## POWER ON/OFF VOLUME KNOB

The Power ON/OFF Volume Knob is located on the top left front of the Hand Held Controller. This rotary knob turns on the radio and adjusts the receiver (or optional speaker) volume. Rotating the control clockwise out of detent applies power to the radio.



Rotating the control clockwise increases the volume level. Minimum volume levels may be programmed into the radio to prevent missed calls due to a low volume setting. While adjusting the volume, the display will momentarily indicate the volume level (ie VOL=31). The volume range is from a minimum level of 0 (displayed as OFF) up to 31, which is the loudest level.

## **RAMP UP/DOWN CONTROL**

The Ramp Up/Down Control is located on the right side of the hand held controller. The UP portion of the control has two raised dots and the Down portion has one raised dot. This control is used to scroll through System, Group list or can be programmed for any key. The list may be programmed to run at a continuous loop or programmed to stop at the highest number as the Up button is depressed and stop at the lowest number as the Down control is depressed.

## **PTT BUTTON**

The **Push To Talk** (PTT) button is located on the left side of the Hand Held Controller. This button is depressed and held when sending a call.

## **Emergency**

The Emergency button is located at the top center of the Hand Held Controller. This button is depressed and held for a programmable time period when initiating an emergency call request.

## **Clear**

The Clear button is located on the left side of the Hand Held Controller above the PTT button. The Clear button serves several purposes depending on the operating mode. Primarily, this button is depressed to exit the current operation and remove all displays associated with it.

## DISPLAY

The Hand Held Controller's display is shown in Figure 1. The display is backlit for night use. It has three lines with 12 alphanumeric-characters used to show group, system or channel, and call status information.



**Figure 1: Hand Held Controller Display**

## KEYPAD

The Keypad on the Hand Held Controller (Figure 2) is similar to a telephone keypad but with 3 additional buttons for a total of 15 keys. Numbers 1-9,\*, 0, and # each have secondary functions. Most of the keys can be programmed to have a primary function. A symbol or abbreviated word describing its standard primary function is labeled on the keycap. Each labeled keycap is associated with a radio feature (or primary function). The top row of the keypad contains the Up and Down buttons and the Menu (M) button. The radio must be programmed to operate with the Hand Held Controller keypad.



**Figure 2: Hand Held Controller Keypad**

The keypad key functions can be remapped to any of the primary function keys using ProGrammer software. Refer to the Hand Held Controller Installation Manual, MM101984V1, for more information. It is recommended

that the blank keypad form (located in the Keypad Remapping section) be completed if the changes are made to the key functions on the Hand Held Controller keypad.

## **OPTIONAL KEY CONFIGURATION**

The key functions, described below can be programmed to any key location desired. Key functions available will be dependent on the programming of the radio used. These key functions are changed using ProGrammer. Keep in mind, the key represents the primary function programmed for that key location.

### **KEY DESCRIPTIONS**


**ALM** External Alarm. Toggles the external alarm On/Off. The external alarm indicates the radio is receiving an individual call (or T99 decoded call in conventional). Press the key once to enable external alarm and press again to disable external alarm

**ALM2** External Alarm 2. Toggles the external alarm 2 On/Off. The external alarm indicates the radio is receiving an individual call (or T99 decoded call in conventional). Press the key once to enable external alarm 2 and press again to disable external alarm 2.

**AUX 1/AUX 2** These keys are used to control output 1 or 2. Their definition is programmable.

<b>CLR</b>	This function exits the current operation or entry mode. In conventional operation, this function will allow the user to monitor the channel for activity.
<b>CONTR</b>	This function adjusts the contrast of the radio display.
<b>DIS</b>	This function adjusts the brightness of the backlight.
<b>DSKEY</b>	Displays the encrypted keys programmed for the selected system. Use the ramp buttons to view the encrypted key for the selected group or channel.
<b>ECP1S</b>	This function key is used as a toggle switch to turn On/Off the EDACS <sup>®</sup> Conventional Priority Scan feature.
<b>EMER</b>	This function declares emergencies.
<b>ENC1</b>	This function sends the Tone Encode programmed for sequence A.
<b>ENC2</b>	This function sends the Tone Encode programmed for sequence B.
<b>FEATURES</b>	This function displays the features enabled in the radio.
<b>GRP</b>	This key function is used to enter the group select mode and select a new group.
<b>GRPDN</b>	Decrements the group by one (1).
<b>GRPUP</b>	Increments the group by one (1).
<b>HOME</b>	This function returns the radio to the home system/channel on conventional

systems and to the home group on trunked systems.

- HKSW** Performs the programmed hookswitch action. Also see IHKSW.
- IHKSW** Performs the programmed hookswitch action with inverted logic. Also see HKSW.
- IND** This function provides access to the individual call list.
- LASTSG** This function returns the radio to the last system/channel (conventional systems) or the last system/group (trunked systems) used prior to implementing the HOME function.
- MAC1-10** This key function will start or execute the corresponding macro as programmed in the personality.
- MCRST** This function will reset all macro key mappings back to their original key or button assignments.
- MENU** Primary function - accesses the menu list. This is a list of additional features that are not available directly from the keypad. Secondary function - Pressing  activates a selected item within a list. After the menu list is accessed, select a menu item from the list via RAMP controls and activate it with this key. Once activated, MENU continues its secondary function for activating a

selected parameter setting until the radio returns to its normal receive state. This is similar to an enter key.

**MSG** Access to the message list (0-9). The Message key permits the transmission of a preprogrammed message to an EDACS Site.

**MURPS** Toggles (MuRPS) On/Off. MuRPS uses ProSound™/ProScan™ data to select the desired radio in a dual radio configuration.

**MUTE** In dual radio configuration only, this function key mutes the selected radio. No audio will be heard at the speaker unless the radio is unmuted by toggling this key function again or the timed event, determined by the Mute Time-Out control, expires.

**MUTE 1** In dual radio configuration only, this function key mutes Radio 1 (Master Radio). No audio will be heard at the speaker from Radio 1 unless the radio is unmuted by toggling this key function again or the timed event, determined by the Mute Time-Out control, expires.

**MUTE 2** In dual radio configuration only, this function key mutes Radio 2 (Slave Radio). No audio will be heard at the speaker from Radio 2 unless the radio is unmuted by toggling this key function



again or the timed event, determined by the Mute Time-Out control, expires.

- NODAT** This function toggles the data feature of the radio On and Off.
- NOIS** Enables/disables the noise blanker on the Orion and JAGUAR 725M Low Band radios.
- OPT1** This feature will execute the function programmed for the Option 1 button. The Option 1 button is programmable on a per system basis in the System Setup (General Tab) screen.
- OPT2** This feature will execute the function programmed for the Option 2 button. The Option 2 button is programmable on a per system basis in the System Setup (General Tab) screen.
- PA** This key function enables and disables the Public Address feature.
- PHN** This function enables the interconnect call feature.

<b>PROFI</b>	This function will toggle ProFile™ On/Off. ProFile provides the capability to "over-the-air" read and write personality data and feature encryption data. ProFile also includes the ability to remotely read a radio's serial number ROM. ProFile does not require an external data device be attached to the radio.
<b>PTT</b>	This function will key the microphone and start the radio transmitting.
<b>PVT</b>	This function enables or disables Private Mode for the System/Group displayed. See the PRIVATE OPERATION section.
<b>RAD</b>	This function will select the radio that is not the currently selected radio in a dual radio configuration.
<b>RAD1</b>	This function will select Radio 1 in a dual radio configuration.
<b>RAD2</b>	This function will select Radio 2 in a dual radio configuration.
<b>REV</b>	Used to access the radio revision information. Once the radio revision information is accessed, the ramp keys can be used to scroll through the list of revision information.
<b>SCAN</b>	Toggles scan operation On/Off.
<b>SCANA</b>	This function adds groups or channels to the scan list.

<b>SCAND</b>	This function deletes groups or channels from the scan list.
<b>SCNAD</b>	This function adds/deletes groups or channels to and from the scan list.
<b>SG1-SG5</b>	This function will select the system/group or channel programmed for the corresponding key. Up to 5 system/group or channel combinations can be defined for the SG1-SG5 keys. When a SG1-SG5 key function is selected, the radio will change to the system/group or channel programmed for that key function.
<b>SL1-SL8</b>	The SL1-SL8 (Siren/Light) keys are designed to control an optional Siren/Light package. This function will activate the siren/light combination defined for the corresponding SL1-SL8 key function.
<b>SLHRN</b>	Activates the siren/light/horn function.
<b>SLRST</b>	This function turns all siren and light combinations Off.
<b>SRKR</b>	This function toggles the external speaker On/Off.
<b>SQLCH</b>	Enters the squelch mode. From the squelch mode the user can adjust squelch from the keypad.

<b>ST0-ST9</b>	Selects a Status key (0-9) which transmits a preprogrammed status condition to an EDACS Site. This list is accessed with the STAT key function. Each of the Status conditions (0-9) may be programmed to a key on the keypad. This would allow selecting the Status condition without accessing the list with the STAT key function.
<b>STAT</b>	Access to the Status entries (0-9).
<b>SYS</b>	This key function is used to enter the system select mode and select a new system.
<b>SYSUP</b>	Increments the system selection by one (1).
<b>SYSDN</b>	Decrements the system selection by one (1).
<b>SYSSC</b>	This function will toggle Wide Area System Scan, ProSound / ProScan or 3-Site Scan On/Off.
<b>T99EN</b>	This function toggles Type 99 Decode On/Off.

**TALK** This function toggles Talk Around On/Off. This function applies to conventional systems only. On conventional channels defined for Talk Around, this function does not apply. On conventional repeater channels, this function enables the radio to transmit and receive on the same frequency.

**TXPWR** This function toggles between high (HI) and low (LO) power.

**WAIL** This function activates the siren/light wail.

**YELP** This function activates the siren/light yelp.

### **CALL Messages**

During radio operation, various messages are displayed on line three of the Hand Held Controller. The four call status messages are described in the following table.

<b>MESSAGE</b>	<b>MEANING</b>
<b>BSY</b>	Indicates a carrier is being received (the channel is busy).
<b>SCN</b>	Indicates that radio is scanning.
<b>TX</b>	Indicates that radio is transmitting.
<b>P</b>	Indicates that radio is in Private Mode for the System/Group displayed.

## **FEATURE AND FUNCTION MESSAGES**

Additional feature and function messages, which will appear on the Hand Held Controller, are in the tables on the following pages. The Message column shows the message as it will appear in the display and the text in the Description column explains the message.

MESSAGE	NAME	DESCRIPTION
VOL=31	Volume Level	Indicates the current volume level. The volume level display ranges from OFF (silent) to 31 (loudest).
UNKNOWN	Caller's ID Not Received	Indicates that an individual call is being received, but the caller's ID was not received.
TX DATA	Transmit Data	Trunked mode only. Indicates the radio is transmitting a data call.
RX DATA	Receive Data	Trunked mode only. Indicates the radio is receiving a data call. Displayed on line 2.
DATA OFF	Data OFF	Trunked mode only. Indicates radio is in the data disabled state. Displayed on line 1.
DATA ON	Data On	Trunked mode only. Indicates radio has been toggled to the data enable state. Displayed for two seconds on line 1 when toggled to enable state.
SYSC ON	System Scan Features On	Trunked mode only. Indicates the System Scan features are enabled.
SYSC OFF	System Scan Features OFF	Trunked mode only. Indicates the System Scan features are disabled.
T99 ON	Type 99 Decode On	Conventional mode only. Indicates the Type 99 Decode feature is enabled.
T99 OFF	Type 99 Decode OFF	Conventional mode only. Indicates the Type 99 Decode feature is disabled.
NB ON	Noise Blanker On	Conventional mode only. Indicates noise blanker feature is enabled on low band (29-50 MHz) version.
NB OFF	Noise Blanker OFF	Conventional mode only. Indicates noise blanker feature is disabled on low band (29-50 MHz) version.
PA ON	Public Address On	Indicates that the public address function of the radio is enabled.
PA OFF	Public Address OFF	Momentary (2 seconds) indicates that public address function of the radio was disabled.
ALRM ON	External Alarm Enabled	Indicates that the external alarm function of the radio is enabled.
ALRM OFF	External Alarm Disabled	Momentary (2 seconds) indicates that external alarm function of radio was disabled.
PVT DIS	Private Mode Disabled	Indicates that private mode is disabled or no encryption key has been programmed for the selected group/channel or special call.
FRCD PVT	Forced Private Operation	Indicates that forced private operation has been pre-programmed into radio.
NO KEY #	Encryption Key Missing	Flashing indicator indicates that no encryption key or an incorrect encryption key is programmed into the radio.
BCKL=1-6	Backlight	Display intensity and keypad back light level.

MESSAGE	NAME	DESCRIPTION
SEL PHN	Select Phone	After pressing the PHN key, selecting an entry from the phone list by typing the entry number will display this message on Line 1.
SEL INDV	Select Individual ID	This is displayed on line 1 when an entry from the individual ID list is selected after pressing the INDV key. The entry is a number between 1 and 32 inclusive (trunked mode only).
SYS ALL	System All Call	Displayed on line 1 to indicate a system all call has been received (trunked mode only).
Ggg-v.vv	Code Group and Revision Number	This is code group and revision number that is displayed in line 2 when menu item "REVISION" is selected. The 'gg' is the group number of the software. The 'v' is the hardware version. The last two, 'vv', is the revision of the software.
*PHONE*	Phone Call	This is displayed when an initiated phone call is in progress. This is displayed on line 2 of the display.
DUAL	Dual Control Operation	Displayed on idle control unit when configured as dual control operation.
NO ENTRY		This indicates that there is no data stored in one of the programmable items in either the phone list or individual call list. The user programmable items are items 1 through 10 in each list.
INV SYS	Invalid System	Displayed when the current system is an invalid type.
CHN=1-99	Channel = 1 - 99	This is displayed on line 1 of the display is conventional channel index when the group key is depressed.
FIX LIST	Fixed List	Priority scan list is fixed and cannot be changed using add and delete keys.
FIXED P1	Fixed Priority 1	Priority 1 scan channel is fixed and cannot be changed using add and delete keys.
(c) 1995 - 2004		This is displayed in line 2 when the message M/A-COM is displayed in line 1 of the display while displaying different items under menu when 'REVISION' is selected by the operator.
EM	Emergency	This indicates an emergency has been declared by the LID that follows the display, 'EM'. An example of this is "EM 01201".
*INDV*	Individual Call	This is displayed in line 2 of the display when an individual call is in progress (trunked mode and T99 mode only).
*GROUP*	Group Call	This indicates a group call is in progress and is displayed on line 1 of the display (trunked mode and T99 mode only).



MESSAGE	NAME	DESCRIPTION
SPKR ON	External Speaker On	This is displayed when the external speaker is enabled.
SPKR OFF	External Speaker OFF	This is displayed when the external speaker is disabled.
BANK=1-8		This is the bank of keys which are going to be loaded when the key loader loads encryption keys. This is only valid for radios which support VGS, VGE, or DES encryption. It is displayed on line 2 of the display when the encryption key loader is connected.
REGR_0x	Dynamic Regroup	Indicates which group in dynamic regroup operation has been enabled where "x" is a digit of 1 to 8 (trunked mode only).
KEY LOAD		This is displayed in line 1 of the display
KEY ZERO		This is displayed on line 2 of the display when the operator depresses the reset and option buttons simultaneously for approximately two seconds. The encryption keys are zeroed.
SYS KEY	System Key	This is displayed on line 1 of the display in the display key mode of the menu. The key of the key name display is displayed in line 2.
GRP KEY	Group Key	This is displayed on line 1 of the display in the display key mode of the menu for trunked systems only. It is followed in the second line with a key number 'KEY = <1..7>'. '
CHN KEY	Channel Key	This is displayed on line 1 of the display in the display key mode of the menu for conventional systems only. It is followed in the second line with a key number 'KEY = <1..7>'. '
KEY=1-7		This is displayed on line 2 of the display in the display key mode of the menu for conventional when 'SYS KEY' or 'CHN KEY' are displayed in line 1 and for trunked when 'SYS KEY' or 'GRP KEY' are displayed in line 1.
PRS NAME	Personality Name	This is displayed in line 1 of the display under the revision selection of menu. The personality name is displayed on line 2 at the same time.
M/A-COM		This is displayed on line 1 of the display under the revision selection of menu. The copyright year is shown in line 2 of display at the same time.

MESSAGE	NAME	DESCRIPTION
GR	Group ID	This indicates that the call is a group call and is followed by the GID of the caller (trunked mode only).
ID	Individual ID	This indicates the call is an individual call and the ID number of the caller, example "ID 2725" (trunked mode only).
WHC=1	Who Has Called	This display indicates the number from the <i>Who Has Called</i> list. Individual calls received but not responded to are stored in a <i>Who Has Called</i> list. This list is accessible by pressing the # key and then the INDV key after the Individual call has timed out or the Clear button is pressed. This display is on line 2 and the LID of the caller is displayed on the top line. Currently the list is not implemented and the display will always be WHC=1.
PHONE	Phone Call	Displayed when a phone call is received from the site. It is displayed in line one of the display. Line 2 of the display will contain the display *INDV*" when line 1 contains this message. The radio interprets a received phone call as an individual call.
CONV FS	Conventional Failsoft	Displayed when a failure of the EDACS system occurs. All communication will be in conventional mode (trunked mode only).
MENU		Displayed when the menu key is pressed and remains displayed in line 1 until one chooses a menu item.
SYS=1-64	System = 1 - 64	This is the system number for the current base station of the system displayed in line 1. It is displayed in line 2 of the display. Press the system key to obtain this display.
GRP=1-64	Group = 1 - 64	This is the group number of the group displayed in line 2 of display. It is displayed in line 1 of the display. Press the group key to obtain this display. There are up to 48 groups available (i.e. 3 banks of 16). The maximum groups programmed in a radio is determined by the personality.
INDV=1-99	Individual = 1 - 99	This display indicates which item in the individual call list is being displayed. It is displayed in line 2 of the display. The name or ID of the item in the list is displayed in line 1 of the display.
PHN=1-99	Phone = 1 - 99	This display indicates which item in the phone list is being displayed. It is displayed in line 2 of the display. Line 1 of the display will be the last 3 characters of the list item contents.

<b>MESSAGE</b>	<b>NAME</b>	<b>DESCRIPTION</b>
<b>QUEUED</b>	Call Queued	Trunked mode only. Indicates the system has placed the call in a request queue.
<b>SYS BUSY</b>	System Busy	Trunked mode only. Indicates the system is busy, no channels are currently available, the queue is full or an individual call is being attempted to a radio that is currently transmitting.
<b>DENIED</b>	Call Denied	Trunked mode only. Indicates the radio is not authorized to operate on the selected system.
<b>CC SCAN</b>	Control Channel Scan	Trunked mode only. Indicates the control channel is lost and the radio has entered the Control Channel Scan mode to search for the control channel.
<b>WA SCAN</b>	Wide Area Scan	Trunked mode only. Indicates the control channel is lost and radio has entered the Wide Area Scan mode to search for a new system (if enabled through programming).
<b>TALKARND</b>	Talk-around	Conventional mode only. Indicates the radio is operating on conventional channels in talk-around mode (no repeater).
<b>*RXEMER*</b>	Receive Emergency	Trunked mode only. Indicates an emergency call is being received. This message will be flashing on line two.
<b>*TXEMER*</b>	Transmit Emergency	Trunked mode only. Indicates an emergency call has been transmitted. This message will be flashing on line two.

## **ALERT TONES**

The radio provides audible alert tones or "beeps" to indicate the various operating conditions. These alert tones can be enabled or disabled through programming. Alert tones may only be audible if optional speaker is installed.

### **CALL ORIGINATE**

A short mid-pitched alert tone sounds after keying the radio (Push-To-Talk button is pressed). This indicates the radio has been assigned a working channel or that the radio is transmitting on a conventional channel and voice communication may begin immediately. In conventional mode, this tone may be delayed after the PTT button is pressed due to G-STAR™ signaling (if enabled through programming).

### **AUTOKEY (TRUNKED MODE ONLY)**

After being placed in queue or releasing the PTT button prior to a working channel assignment, the site calls the radio when a channel becomes available. At this point, the radio automatically keys the transmitter (autokey) for a short period to hold the channel. The radio sounds a mid-pitched tone when it is clear to talk; immediately press the PTT button to keep the assigned channel.

### **CALL QUEUED (TRUNKED MODE ONLY)**

A high-pitched tone after pressing the PTT button indicates the system has placed the call request in the queue. The

receiving unit(s) also hear the tones, indicating they will receive a call shortly. If the PTT button is released, the radio will autokey whenever a channel becomes available (see Autokey).

## **SYSTEM BUSY (TRUNKED MODE ONLY)**

Three low-pitched beeps will be heard if the radio is keyed when the system is busy, if no channels are available for sending the message, if the call queue is full, or if an individual call is being attempted to a radio that is transmitting. Releasing the PTT button and rekeying initiates a new channel.

## **CALL DENIED (TRUNKED MODE ONLY)**

If the radio is keyed and a low-pitched tone is heard then the radio is not authorized on the system that has been selected.

## **CARRIER CONTROL TIMER**

If the programmed time for continuous transmission is exceeded, five short high-pitched warning tones followed by a long low-pitched tone will be heard. The transmitter will shut down shortly after hearing the alert, interrupting communications. Release and re-key the PTT button to maintain communications. This will reset the carrier control timer and turn the transmitter back on.

## **KEY PRESS ALERT**

A short tone or "beep" sounds to indicate a key has been pressed. A short low-pitched tone indicates no action was taken because the key is not active in the current mode.

## **DUAL CONTROL SWITCHING**

When control is switched to a previously idle control unit, two short high-pitched tones will sound at the control unit where PTT was pressed, that is now the active controller.

# **BASIC OPERATION**

## **TURNING ON THE RADIO**

Rotate the Power ON-OFF/Volume knob clockwise out of détonne to turn the radio on. A short beep (if enabled through radio programming) indicates the radio is ready for operation. The display indicates, if programmed, the last selected system name on line one and the last selected group or channel on line two.

In the EDACS trunked environment, if communication with the system's control channel cannot be established, the CC SCAN message will be displayed. This may occur if, for example, the radio is out of range of the trunking site. It may be necessary to move to another location or select another trunking system to re-establish the control channel link for trunked mode operations.

## **SYSTEM/GROUP/CHANNEL SELECTION**

In the following description of System/Group/Channel Selection, the term group is used for both group and channel.

Either systems or groups can be selected by entering the select mode and following the selection mode rules. Pressing SYS or GRP, respectively, from the keypad enters the system select or group select modes.

## SELECTION MODE RULES

### System Select – Method 1

1. Press **1 SYS** to access system list.
2. Press **▲** and **▼** to scroll through the list of systems.
3. Press **M** to select desired system.

### System Select – Method 2

1. Press **1 SYS** to access system list.
2. Enter a system number.
3. Press **M** to select desired system.

### System Select – Method 3

Use **▲** and **▼** to find the desired system (only if programmed as SYSUP/SYSDN).

### Group Select – Method 1 (System)

1. Press **2 GRP** to access group list.
2. Press **▲** and **▼** to scroll through the list of groups.
3. Press **M** to select desired group.



## Group Select – Method 2

1. Press **2GRP** to access group list.
2. Enter a group number.
3. Press **M** to select desired group.

## Group Select – Method 3

Use **▲** and **▼** to find the desired group (only if programmed as GRPUP/GRPDN).

## **MODIFY SCAN LIST**

1. Press **3SCN** to toggle scan OFF. Verify **SCN** is **not** displayed.
2. Select group or channel.
3. Press **9DEL** once to view current group or channel from the list.
4. Press **9DEL** again to remove group or channel from the list.
5. Press **6ADD** once to view current group or channel.
6. Press **6ADD** again to add as a normal group or channel.  
Press **6ADD** twice to add as a Priority 2 group.  
Press **6ADD** three times to add as a Priority 1 group.
7. Press **3SCN** to re-start scanning.

## BACKLIGHT ON/OFF

1. Press **(M)** to access the menu.
2. Press **(▲)** or **(▼)** to scroll through menu until “BCKLGHT” appears.
3. Press **(M)** to select Backlight menu.
4. Press **(▲)** **(▼)** to adjust backlight setting from 1-6 (6= brightest).
5. Press **(M)** to enter new setting.

## CONTRAST ADJUST *(Supported on JAGUAR Radios Only)*

1. Press **(M)** to access the menu.
2. Press **(▲)** or **(▼)** to scroll through menu until “CONTRAST” appears.
3. Press **(M)** to select Contrast menu.
4. Press **(▲)** or **(▼)** to scroll through contrast setting from 1 - 8. (1 being the least contrast and 8 being the greatest).
5. Press **(M)** to enter new contrast setting.

## DECLARING AN EMERGENCY

1. Press and hold the red Emergency/Home button (the length of time is programmable; check with the system administrator).
2. **\*TXEMER\*** flashes in the display until the emergency is cleared.
3. Press PTT and TX momentarily turns on.
4. Release PTT when the transmission is complete.

## RECEIVING AN EMERGENCY CALL

When receiving an emergency call from the selected group and system, the BSY indicator will be displayed. The message **RXEMER** flashes in the display on line three until the emergency condition is cleared. Follow standard emergency procedures.

### Nuisance Delete

A channel can temporarily be deleted from the scan list if it is not the currently selected channel.




1. Turn Scan On.
2. When the radio receives a call on the channel that is to be “temporarily deleted”, press the delete key twice. The channel is removed from the scan list until the radio is power cycled.

## TRANSMITTING A CALL IN TRUNKED MODE




### Group Call

1. Select desired group.
2. Press the Push-To-Talk button.
3. TX will be displayed.

### Individual Call

1. Press  to access the individual call list.
  2. IND will be displayed.
  3. Press  or  to scroll through individual call list
- OR**
4. Enter LID from keypad.
  5. When the desired ID appears in the display press the Push-To-Talk button. TX will be displayed.

### Phone Call

1. Press  to access the phone call list.
2. PHN will be displayed.
3. Press  or  to scroll through phone call list or Enter number from keypad.
4. When the desired phone number appears in the display press the Push-To-Talk button. TX will be displayed.

## RECEIVING A CALL IN TRUNKED MODE


### Group Call

1. Select a group or turn scan ON and make sure group is in scan list.
2. The group name or “GR xxxxx” will appear to indicate a call.

### Phone Calls

1. When the call is received, the receive audio sounds and the display reads: \*PHONE\*
2. Respond by pressing PTT. If you do not respond, radio will continue to ring to indicate an incoming call.

### Individual Calls

1. When the call is received, the receive audio sounds and the display reads : I D xxxxx \*I NDV\*
2. Respond by pressing PTT. If you do not respond, radio will continue to ring to indicate an incoming call.
3. If the call is cleared with no response, the radio will store Who Has Called and display: \*WHC\*
4. Press the  key to display the ID.
5. Press the Push-To-Talk button to return the call or press the Clear/Monitor button to clear the \*WHC\*.

# CONVENTIONAL OPERATION

## OUTSIDE ADDRESS

The same outside address (works similar to Channel Guard operations) must be programmed in the transmitting and receiving radios when Aegis™ or ProVoice™ digital or private operation is enabled. If address is not correct, the radios will not communicate.

## CHANNEL GUARD

Channel Guard encode is transmitted on analog clear channels only. Channel Guard decode will operate on either a clear or private channel. The exception is when G-STAR signaling is used (see G-STAR section).

## G-STAR

When G-STAR is programmed on a private channel, the radio will transmit G-STAR in clear mode and then switch to private for the voice portion of the call. If G-STAR is sent with Channel Guard, then both are sent in clear mode and then the radio switches to private mode. Emergency G-STAR data burst is transmitted in clear mode.

## RECEIVING A CALL

1. Select desired conventional system and channel or turn scan ON and make sure desired channel is in scan list.
2. When the radio receives a call, the radio will unmute and the channel name will appear in the display.

## SENDING A CALL

1. Select desired system and channel.
2. Ensure the channel is not busy by pressing the **Monitor/Clear** button momentarily. If you hear audio or if **BSY** is displayed, the channel is busy.
3. When you are sure the channel is not busy, press the Push-To-Talk button and speak into the microphone.

## **SIREN/LIGHT OPERATION**

*(Mobile Radios Only)*

Each siren/light key is designed to control an optional siren/light package.

Each siren/light key (except RESET) can be programmed for either CANCEL or ADDITIVE operation. If programmed for CANCEL, then all other siren/light activity is cancelled except for the activity associated with this key. If programmed for ADDITIVE, then a key press will add its respective siren/light activity to the current siren/light activity. It is important to note that while the lights are additive, only a single siren can be active at a time. The current siren will be determined from the recently pressed key that contains a siren assignment. Each siren/light key (except RESET) can be programmed for either TOGGLE, MOMENTARY or TIMED.

In TOGGLE, each key press will toggle the state of the key between ON and OFF.

In MOMENTARY, a key's respective feature will only be active while the key is pressed and held.

When programmed for TIMED, the siren/light key activity will only be active during the programmable time-out window. The duration of the time-out window is programmable between from .5-127.5 seconds. When the timer expires, the activity will be terminated. If an additional time-out key (programmed for ADDITIVE) is pressed during the time-out window, then the time-out window is reset and both activities will terminate at the same time.



## DIGITAL VOICE (PROVOICE/AEGIS/VOICE GUARD® OPERATION)

Each system (trunked or conventional) in the radio is programmed for no digital voice operation or one of the three supported Digital Voice formats (ProVoice, Aegis, or Voice Guard). Aegis or ProVoice program-med systems have three different voice modes: clear (analog), digital and private. Voice Guard systems have two voice modes: clear (analog) and private. The voice modes are programmed on a per-group basis within each trunked system and on a per-channel basis within each conventional system. A radio must be equipped with the encrypt/decrypt option before it will operate in private mode.

### Transmit/Receive Mode Compatibility for Aegis/ProVoice Operation

<b>GROUP/CHANNEL PROGRAMMING (TRANSMIT)</b>	<b>CLEAR RECEIVE</b>	<b>DIGITAL RECEIVE</b>	<b>PRIVATE RECEIVE</b>
CLEAR	Yes	No	No
DIGITAL	Yes	Yes	No
PRIVATE	Yes	No	Yes*

\*assumes the proper cryptographic key is loaded

## Transmit/Receive Mode Capability for VoiceGuard Operation

GROUP/CHANNEL PROGRAMMING (TRANSMIT)	CLEAR RECEIVE	PRIVATE RECEIVE
CLEAR	Yes	No
PRIVATE	Yes	Yes*

\* assumes the proper cryptographic key is loaded



### NOTE

Conventional Aegis or encrypted channels require Channel Guard on the channel to operate correctly.

## CLEAR MODES

Aegis clear, ProVoice clear and Voice Guard clear modes are identical voice modes in which the radio transmits and receives only clear (analog) voice signals. These analog signals are non-digitized and non-encrypted. Clear mode transmissions can be easily monitored by unauthorized persons. Groups or channels programmed for clear operation cannot transmit or receive unencrypted digital or private messages.

## AEGIS/PROVOICE DIGITAL MODE

Aegis/ProVoice digital mode allows the radio to transmit and receive digitized voice signals. These digital signals provide improved weak signal performance and they cannot be easily monitored with a standard receiver. Groups and

channels programmed for Aegis or ProVoice digital operation transmit only digital signals. Private calls cannot be received or transmitted when the radio is in the Aegis or ProVoice digital mode because the radio does not know the cryptographic key used.

Message trunked group calls and individual calls will be answered back in the mode they were received, assuming the call or hang time is still active. Individual, phone, all and emergency calls will be transmitted clear if digital mode is disabled or inoperative.

1. If receiving an analog message trunked call, the radio will respond in analog mode during the hang time on the working channel.
2. If receiving an analog I-Call, the radio will respond in analog mode during the hang time.
3. When using the “WHC” feature to respond to an I-Call (after the hand time has expired), the call will be transmitted in the mode defined by the system mode as programmed for the current system if the ID being called is not in the I-Call list. If the ID is in the I-Call list, then the call will be transmitted as defined by the I-Call mode programmed in the list for that ID.

## **DTMF**

The over dial and hot keypad features for transmitting DTMF tones are not available while in the Aegis Digital Mode or ProVoice Digital Mode.

## ERROR Messages

**DSP ERR  
ERR=XXXX**

**DSP ERR**

**DIGV ERR**

*Power Up Only*

If any of the following error messages are displayed, the radio was either programmed incorrectly or needs servicing:

If the Aegis or ProVoice circuit board is not responding correctly, one of the following error messages will be displayed and the radio will require servicing:

**HARDWARE  
ERR= 3X**

*3x will be a number between 30 and 38*

## **AEGIS PRIVATE, PROVOICE PRIVATE, AND VOICE GUARD PRIVATE MODES**

The Aegis, ProVoice and Voice Guard private modes allow the radio to transmit encrypted messages and receive clear or private transmissions. The radio will transmit private if the group/channel is programmed for private operation and forced operation is pre-programmed.

If the radio was pre-programmed for autoselect, the radio will transmit in the following modes:

- **Private mode enabled.** Transmission always in private mode.
- **Private mode disabled.** If private call is received. Reply transmission will be in private mode if made during scan hang time. If reply transmission occurs after scan hang time, transmission will be in clear mode.

Aegis or ProVoice transmissions cannot be received by a radio set to receive a Voice Guard transmission. Accordingly, Voice Guard or ProVoice transmissions cannot be received by a radio set to receive an Aegis transmission and neither Aegis or Voice Guard transmissions can be received by a radio set to receive ProVoice.

Cryptographic keys are transferred to the radio using a cryptographic Keyloader. Up to seven different cryptographic keys, numbered 1-7, can be transferred from a Keyloader and stored in the radio. An individual key is automatically selected on a per-group/channel basis according to the radio's programming. Groups and channels within Aegis, ProVoice, or Voice Guard systems can be programmed for keys 1-7. Up to 8 banks of 7 keys can be stored for Aegis (DES and VGE) systems.

See Maintenance Manual for your radio for instructions on transferring and displaying and maintaining cryptographic keys and key numbers.

## **DUAL CONTROL OPERATION**

*(Mobile Radios Only)*

The M7100 and Orion mobile radios may be programmed to operate from two separate Control Units. This permits radio operation from two separate locations in the vehicle. Dual control operation is available in both trunked and conventional modes. Only one control unit can control the mobile radio unit at a time. The control unit that controls the radio operation is called the active controller and the second unit is called the idle controller.

### **Switching Control**

Control can be switched to the idle controller by pressing the PTT button on the microphone or Hand Held Controller associated with the idle controller. Once PTT is pressed, the radio will switch control to the idle controller unless the active controller is currently transmitting (i.e., PTT pressed on active controller), in which case the switch will not occur. When control is switched to the idle controller, two short high-pitched tones will sound at the controller where PTT was pressed to indicate that the idle controller is now the active controller and the previous active controller is now the idle controller.

## **Control Switching Modes**

The radio can be pre-programmed for two modes of dual operation, Slaved and Independent. In the Slaved mode, the two controllers will use the same radio System and Group settings. The Independent mode permits each controller to have its own saved System and Group settings.

### **Slaved Mode Operation**

During Slaved mode operation, either controller can operate the radio with no change in System and Group settings when control is switched. Both controllers display the current information. If a key is pressed at the idle controller, other than PTT, Emergency, or siren and light keys as noted in the following paragraphs, a low tone will sound and the display will temporarily show DUAL on line one of the idle controller.

When control is switched in the Slaved mode system, all of the radio settings and states will remain in effect that have been selected on the active controller.

### **Independent Mode Operation**

During Independent operation, the radio system operates as if there are two radio units each controlled by a separate control unit. Each control unit maintains its own System and Group settings that are restored when control is switched.

The idle controller will display DUAL on line one to indicate that it is idle. If a key is pressed at the idle controller, other than PTT, Emergency or siren and light keys as noted in the following paragraphs, a low tone will sound at the idle controller.

When control is switched in Independent mode, the idle controller will restore its own System and Group settings instead of using the settings of the previously active controller. Any pending operations at the active controller, other than Emergency or siren and light operations, will be terminated.

### **Emergency Operation**

Either control unit (active or idle controller) can declare an emergency, provided the radio has been programmed to enable emergency declaration. If the idle controller declares an emergency, control is switched to the idle controller and any current transmission from the previously active controller is terminated.

### **Siren and Light Control**

Siren and light control is only available from the control unit that is pre-programmed for these functions. Typically, the control unit at the driver's location would be programmed. The control unit that has these functions programmed can activate them regardless of whether it is an active or an idle controller.

### **Dual Control Audio**

Audio output during dual control operation is a pre-programmed function. Default operation routes audio only to the active controller.



## **DUAL RADIO CONFIGURATION**

*(Mobile Radios Only)*

M7100 and Orion mobile radios may be configured to operate in a dual radio configuration that permits more than one radio to be controlled from a single control unit or control location. The radios could be different frequency splits, trunked/ conventional, etc.

In the dual radio configuration, the radios continue to operate as individual radios except with a common control unit. The control unit is used for display and control. The control unit display is shared by the multiple radio units and, when selected, a radio can be controlled by the control unit.

For dual radio configuration the control unit keypad must be pre-programmed for a variety of multiple radio buttons such as radio selection and radio mute.

### **Changing Selected Radio**

A radio unit may be selected by pressing the radio selection button (pre-programmed) on the control unit. Also, a button may be pre-programmed to rotate selection through the radio units; e.g., if radio #1 is selected, pressing the radio select button will select radio #2. Similarly, radio #2 will be selected if the radio select button is pressed when radio #1 was selected.

## **Shared Control Unit Display Modes**

Radios in the dual radio configuration share the control unit display. Pre-programming the radios determines what the control unit displays. There are two modes of display: alternating radio display or first come first serve display. (See Audio Modes Section.)

### **Alternating Radio Display**

In this mode the control unit display will alternate between showing the call information for the radios when more than one call is being received. This mode is available only if audio is summed (See Audio Modes Section.)

### **First Come First Serve Display**

In this mode the control unit display will show the call information of the radio that is providing the audio. A call in process prevents audio from other radios from being heard for the duration of the call. This mode corresponds with the first come first serve audio mode (See Audio Modes Section.)

## **Audio Modes**

In dual radio configuration, the audio from the mobile radio units can be pre-programmed to be summed or available on a first come first serve process.

## **Audio Summed**

When audio is summed, the audio from all radios will be available whenever the radios receive a call. If two radios receive a call simultaneously both calls will be heard in the speaker.

## **Audio First Come First Serve**

When audio is pre-programmed for first come first serve, the audio from the radio that receives a call first will be heard from the speaker for the duration of the call. During this time audio from the other mobile radios will be muted.

## **Muting A Specified Radio**

Pressing the control unit mute button associated with a particular radio will mute its audio for a pre-programmed time period. The time period can be cleared by pressing the control unit mute button or the radio selection button.

## **Multiple Radio and Siren/Light Operation**

For siren/lights to function correctly, both the master and slave radios must be programmed with the same siren/light information.

## **Dual Radio Configuration And Data Operation**

Only the master radio supports mobile data operation.

## **LAST SYSTEM/GROUP OR CHANNEL RECALL**

This feature enables the user to recall the last selected system/group after an EDACS emergency or home function, a conventional emergency or home function or system/group key function. This feature must be pre-programmed as "Enabled" to function. For example, if the Home button (pre-programmed) is pressed, the radio will go to the designated Home system/group or channel. If the Home button is pressed again, the radio returns to the previous system/group or channel. At this time the user can toggle between the Home system/group or channel and the previous system/group or channel. The operation is the same for the SG1-SG5 buttons.

## **MACRO KEY OPERATION**

Macro key operation permits the user to accomplish a series of key strokes with a single "macro" key stroke. Up to ten (10) macro keys can be defined, each capable of executing up to twenty (20) key strokes, to any pushbutton input (i.e., keypad keys, buttons, etc.). Each macro key can be pre-programmed to activate when pressed or when released.
















A macro key may also be pre-programmed to change the key stroke sequence the next time the macro key is activated. For detail operation and assignment of macro keys, contact your communications supervisor or administrator.

## **SENDING A MANUALLY ENTERED INTERCONNECT CALL**

1. Press and hold PTT to key the transmitter. While holding the PTT, press the # key. The radio will transmit the selected tone.
2. Release the PTT and listen for a dial tone. When the dial tone is heard, press and hold the PTT while entering the desired telephone number. If pre-programmed, as each digit is entered and transmitted, the DTMF sidetone will be heard from the speaker.
3. After all the digits have been entered and transmitted, release the PTT.
4. When someone answers, press the PTT and speak directly into the microphone. Release the PTT as soon as you stop talking to receive a reply.
5. At the completion of the call, press and hold PTT and then press the # key. Release the PTT.

## KEYPAD REMAPPING

If the keys have been remapped for new primary functions, complete the following for future reference.

KEY	PROGRAMMED FUNCTION
	
	
	
	
	
	
	
	
	
	
	
	
	
	
	

## GLOSSARY

- Agency -** An agency is composed of multiple fleets. Units can be programmed to initiate agency calls to access multiple fleets. (Trunked Mode Only)
- Base/Unit Operation -** A programmed option used in some fleets so units can only hear and talk to a base dispatch unit, not to other mobiles or personals in the group. In this mode of operation, when a unit in a particular group is talking to the base dispatch unit, all other mobile and personal radios in that group will receive a "System Busy" tone if they try to access the system.(Trunked Mode Only)
- Control Channel-** A radio channel in a trunked system that is used to digitally communicate with the radios operating on the system when they are not engaged in active voice communications.
- Conventional Channel-** A radio channel (transmit/receive) that is allocated for conventional (non-trunked) use and may be manually selected by the operator.

- Conventional Mode-** Communicating on radio channels allocated for conventional use (i.e. conventional system).
- CCT -** Carrier Controlled Timer - a programmable timer that will disable a transmission if the length is exceeded.
- CG -** Channel Guard - a method of controlling speaker mute with a tone or digital code.
- Fleet -** A fleet of users consists of multiple groups (subfleets). Radios can be programmed to make fleet calls to simultaneously access multiple user groups.(Trunked Mode Only)
- Group Or Subfleet -** A group of users share the same program group identification number in their mobile and personal radios. All units in the same group will receive a dispatch call placed by any one unit in the group. (Trunked Mode only)
- Group Scan -** Programming that allows the radio to monitor many groups simultaneously (multi-group decode), permitting the user to both monitor and receive calls from these groups. The radio may be programmed with a scan hang time which causes the radio to remain on the scanned group for a pre-



programmed amount of time, responding only to calls of a higher priority such as priority scan group calls, individual calls, fleet calls, agency calls, etc. When activity on the scan group ends, and the pre-programmed time has expired, the radio returns to monitoring multiple groups. (Trunked Mode Only)

**Individual Call-**

Every radio in the system is programmed with a unique individual identification code. A mobile or personal unit can be programmed to call another particular unit by selecting the individual by name or ID number. (Trunked Mode Only)

**Queueing -**

The process that occurs when all channels in a trunked system are busy and calls must be addressed on a priority basis.

**SiteController-**

The computer controlled radio equipment at the repeater site that controls a trunking system.

**System(area)-**

The terms "system" and "area" are used interchangeably to refer to the particular group of station repeaters currently providing service to the radio.

<b>System Manager-</b>	A computer that performs the data basing and system monitoring for the site controller.
<b>System Scan-</b>	A programmed feature to scan (monitor activity on) separate trunked systems and receive calls on any of these systems. (Trunked Mode Only)
<b>Talk-around Mode-</b>	Also referred to as "direct mode", talk-around provides a direct unit-to-unit short range communications link. It is intended to maintain communications outside of the main system coverage area.
<b>Telephone Inter-Connect-</b>	This feature allows the user to initiate or receive telephone calls through the radio if the system is configured for this operation. (Trunked Mode Only)
<b>Trunked Group-</b>	A radio communications path shared by two or more users.

**Trunked Operation-** Trunked Operation refers to the use of a set of radio frequency channels by multiple user groups. By using high speed digital data the radio goes to an unused channel when a call is initiated and will also only respond to calls in the same user group. In this way conversation privacy between user groups is assured.

**Trunked Radio System-**

A radio system in which a limited number of radio channels is dynamically allocated to groups of people for communication purposes.

**Trunked System-**

A set of one or more trunked groups.

**T99 -**

Type 99 is a method of opening mute for selective page operations using sequential tones.

**Wide Area Encode-**

A programmed option which ensures all system scanning mobile and personal radios have time to lock onto the call before the initiating unit is allowed to talk.

**Working Channel-**

A radio channel (transmit/receive) that is automatically assigned by the site controller for voice or data communications.

# WARRANTY

- A. M/A-COM, Inc. (hereinafter "Seller") warrants to the original purchaser for use (hereinafter "Buyer") that Equipment manufactured by or for the Seller shall be free from defects in material and workmanship, and shall conform to its published specifications. With respect to all non-M/A-COM Equipment, Seller gives no warranty, and only the warranty, if any, given by the manufacturer shall apply. Rechargeable batteries are excluded from this warranty but are warranted under a separate Rechargeable Battery Warranty (ECR-7048).
- B. Seller's obligations set forth in Paragraph C below shall apply only to failures to meet the above warranties occurring within the following periods of time from date of sale to the Buyer and are conditioned on Buyer's giving written notice to Seller within thirty (30) days of such occurrence:
1. for fuses and non-rechargeable batteries, operable on arrival only.
  2. for parts and accessories (except as noted in B.1) sold by Seller's Service Parts Operation, ninety (90) days.
  3. for PANTHER™ Series handportable and mobile radios, two (2) years.
  4. for all other equipment of Seller's manufacture, one (1) year.
- C. If any Equipment fails to meet the foregoing warranties, Seller shall correct the failure at its option (i) by repairing any defective or damaged part or parts thereof, (ii) by making available at Seller's factory any necessary repaired or replacement parts, or (iii) by replacing the failed Equipment with equivalent new or refurbished Equipment. Any repaired or replacement part furnished hereunder shall be warranted for the remainder of the warranty period of the Equipment in which it is installed. Where such failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. Labor to perform warranty service will be provided at no charge during the warranty period only for the Equipment covered under Paragraph B.3 and B.4. To be eligible for no-charge labor, service must be performed at a M/A-COM factory, by an Authorized Service Center (ASC)

or other Servicer approved for these purposes either at its place of business during normal business hours, for mobile or personal equipment, or at the Buyer's location, for fixed location equipment. Service on fixed location equipment more than thirty (30) miles from the Service Center or other approved Servicer's place of business will include a charge for transportation.

- D. Seller's obligations under Paragraph C shall not apply to any Equipment, or part thereof, which (i) has been modified or otherwise altered other than pursuant to Seller's written instructions or written approval or, (ii) is normally consumed in operation or, (iii) has a normal life inherently shorter than the warranty periods specified in Paragraph B, or (iv) is not properly stored, installed, used, maintained or repaired, or, (v) has been subjected to any other kind of misuse or detrimental exposure, or has been involved in an accident.
- E. The preceding paragraphs set forth the exclusive remedies for claims based upon defects in or nonconformity of the Equipment, whether the claim is in contract, warranty, tort (including negligence), strict liability or otherwise, and however instituted. Upon the expiration of the warranty period, all such liability shall terminate. The foregoing warranties are exclusive and in lieu of all other warranties, whether oral, written, expressed, implied or statutory. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL THE SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT OR EXEMPLARY DAMAGES.

This warranty applies only within the United States.

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## NOTES

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Printed in U.S.A.