PROGRAMMING INSTRUCTIONS FOR GENERAL ELECTRIC MLS TWO-WAY MOBILE RADIO USING PROGRAMMER TQ2310

GENERAL ELECTRIC

TABLE OF CONTENTS

GE UNIVERSAL RADIO PROGRAMMER
SOFTWARE LICENSE AGREEMENT

THE SOFTWARE PROGRAM PROVIDED WITH THIS DOCUMENT IS FURNISHED UNDER A LICENSE AND MAY BE USED ONLY IN ACCORDANCE WITH THE FOLLOWING LICENSE TERMS.

General Electric Company (GE) grants to you (the "User") a nonexclusive, paid up license to use the accompanying Software, the media on which it is recorded, and user's manual (referred to collectively herein as the "PRODUCT"), for your own use on a single, designated GE Universal Radio Programmer under the following terms and conditions:

1. User agrees that the techniques, algorithms, and processes contained in the PRODUCT constitute trade secrets of GE. User agrees to take all measures necessary to protect the confidentiality of the PRODUCT and GE's rights herein. User shall not disclose or divulge any information regarding the PRODUCT or permit anyone else to do so.

2. User shall not reproduce or copy the product, in whole or in part (in its original or any other language), or permit anyone else to do so for any purpose whatsoever, except as necessary for User to use it on the single Programmer for which it is licensed hereunder. User shall not make or permit any change or modification to the PRODUCT.

3. User shall not transfer the PRODUCT or any part thereof. This license does not include the right to sublicense and may not be assigned.

4. The Software and user's manual are copyrighted under United States and International laws by GE. User agrees not to remove any GE copyright, trademark or other notices or product identification.

5. If User does not comply with all of the terms and conditions of this license agreement, GE may terminate this license and require User to return the PRODUCT. User's liability shall include (but not be restricted to) all costs incurred by GE in recovering the PRODUCT and all damages arising from User's default. User acknowledges that unauthorized distributing, copyright, duplicating or otherwise reproducing all or any part of PRODUCT, or User's failure to protect its confidentiality, will materially damage GE.

6. User shall be solely responsible for determining the appropriate use to be made of the PRODUCT and establishing its limitations in User's own operations.

NOTE

It is the responsibility of the individual who installs any radio equipment to confirm that the operator of the equipment is legally licensed for the use of the frequencies programmed into the radio.

Figure 1 - TQ2310 Suitcase Programmer

INTRODUCTION

GENERAL

This manual presents the necessary programming instructions and procedures you must follow when programming the General Electric MLS mobile radios using the Universal Radio Programmer TQ2310.

The Universal Radio Programmer (URP) may be used to program all GE field programmable radios and control units. The instructions in this manual however, are directed solely to programming the MLS mobile radios.

PROGRAMMING EQUIPMENT

The URP consists of several hardware and software modules (EPROMs) to program the radio. Figure 1 shows the TQ2310 layout. The various modules are described below. In addition a unique software module and interconnect cable is required to program the radios as well as an EEPROM socket adapter.

- Software Module - TQ2349
- Socket Adapter - TQ2330
- Interconnect Cable - TQ2347

Hardware modules contained in the TQ2310 include:

- Panasonic Handheld Computer, RL-H1800
- Panasonic I/O Adapter, RL-P6001
- Panasonic AC Adapter, RD-9498
- Panasonic Mini Printer, RL-P1004 or Printer Cassette Adapter RL-P1004A
- Panasonic RS-232 Serial Interface, RL-3001 - TQ2325 and TQ2318
- General Electric Program Storage Module
- General Electric Data I/O Module

The handheld computer offers a full keyboard to input data and also provides a 26 character LCD display. It contains 8K bytes of memory for data files. To familiarize yourself with the operation and capabilities of the microcomputer, refer to the Panasonic Instruction manual provided with the programmer.

The printer is a 40 column dot matrix printer and utilizes a thermal printer mechanism and drive electronics. Special heat sensitive paper must be used in the printer and as such is subject to fading over extended periods of time when exposed to excessive heat or certain types of adhesives. It is suggested that a photocopy be made when a permanent file is to be maintained.

The Program Storage Module houses the programmable EPROMs that contain the computer application programs to program the radio equipment. Eight sockets are provided for the application programs. Refer to EPROM Installation Instructions for details.

COMMUNICATING WITH THE TQ2310

The software for the MLS radio uses a series of multiple choice menus and prompts to guide you through the programming sequence. The user responds by answering multiple choice questions or entering data via the computer keyboard.

Menus are displayed one line at a time on the computer LCD display screen. The Primary Menu contained in the TQ2310 software is an index of programs and functions that are available in the Program Storage Module. These are identified by number. Enter the number of the program or function on the keyboard for the program you wish to run or modify. The name of the program will then be displayed followed by the menu of subprograms available to service the selected program.

Typically, the Primary Menu in the TQ2310 displays the following - a line at a time:

1 = CALCULATOR
2 = CLOCK/CONTROLLER
3 = FILE SYSTEM
X = The last entry on the menu

"X" is used to symbolize the last entry displayed from the menu. Adding EPROMs (software modules) to the Program Storage Module will force "X" to a higher number and display the name of the EPROM.

The EPROMs identify the programming capabilities of the programmer as then configured. For example, when the MLS software module is installed, one entry on the Primary Menu will be "MLS".

Select the number associated with MLS to display the Program Menu.

To select an item from the Primary Menu, enter the number of the item on the keyboard. For example, pressing the 2 key will select CLOCK/CONTROLLER.

Forms/Key Definitions

The speed of the menu display can be controlled or stopped by pressing the STP/SPD key. The following key sequences will help you test this capability.

Refer to sheet 1 of the Panasonic Instruction Manual for definitions of the keyboard display for the handheld computer.

STP/SPD STP/SPD - Stop/Restart the display.

STP/SPD 0 - Selects the fastest speed.

STP/SPD 1 - Selects the slowest speed.

Forms are also displayed one line at a time. However, you may control form modification or programming by using the arrow keys and the ENTER key. The up (▲) and down (▼) arrows select which line of the form is being displayed on the screen. The left (◀) and right (▶) arrows position the cursor over the character position that can be changed. The cursor is limited to specific fields on the LCD display. The computer will beep if you attempt to move the cursor to an illegal position. The computer will also beep if you use the up arrow to go past the first line or the down arrow to go past the last line. Each time upon completion of a form, press the ENTER key. This stores the information into computer memory. You may abort the current operation any time by pressing the CLEAR key.

NOTE

DO NOT attempt to use the "HELP" key as described in the Panasonic literature during execution of the MLS program. The "HELP" key for use in defining the function keys f1, f2, f3 (if desired) should be done prior to selecting the MLS program.

The control keys c1, c2, c3, c4 are not defined for this application.

Programming I/O Options

The Universal Radio Programmer provides the capability to store and access MLS radio data using two different media, the MLS radio, and a file stored in the RAM area of the Panasonic HHC.

MLS File

The Programmer file system can store a single copy of a MLS Program in an internal file that remains intact as long as the Hand Held Computer batteries are not completely discharged, the unit is not powered off with the slightly hidden "all-off" switch in the back of the unit, or until the file data is modified or "overwritten" by the user via a "copy" operation. (Of course, the Programmer system can simultaneously store single copies of data for different radios: CELLULAR, PHOENIX, MLS, etc.)

Data may be read and previewed, printed, reprogrammed, etc. in the MLS file. Data may be copied from the file to the EEPROMS, and vice versa.

See Appendix A for additional discussions of the file system and file manipulation.

PROGRAM MENU FLOW

The program menu provides you with some insight as to what you can do in programming or reprogramming the MLS mobile radios. Figure 2 is an overview of the Program Menu Flow. A review of this diagram will help you to organize the programmable data before you actually begin to program the radio.

PRIMARY MENU

The Primary Menu displays the contents of the Program Storage Module. One of the lines displayed will read MLS along with a location or access number for the software module.

Entering the access number/letter for MLS on the keyboard displays the program menu shown below a line at a time.

1 = PRIMARY MENU
2 = PROGRAM/REVIEW
3 = PRINTOUT
4 = COPY-SINGLE
5 = COPY-MULTIPLE
6 = HEX PRINTOUT

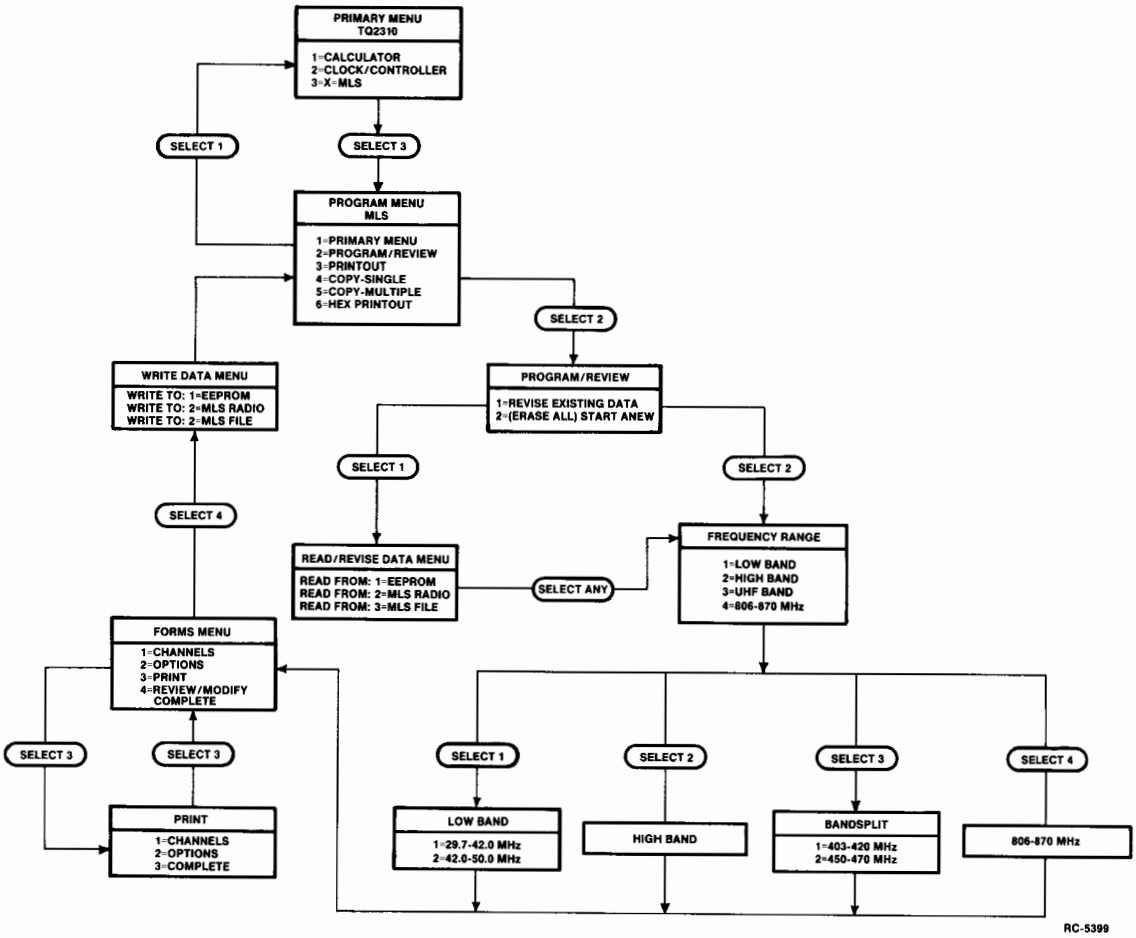
Each line identifies a function or series of functions that can be executed.

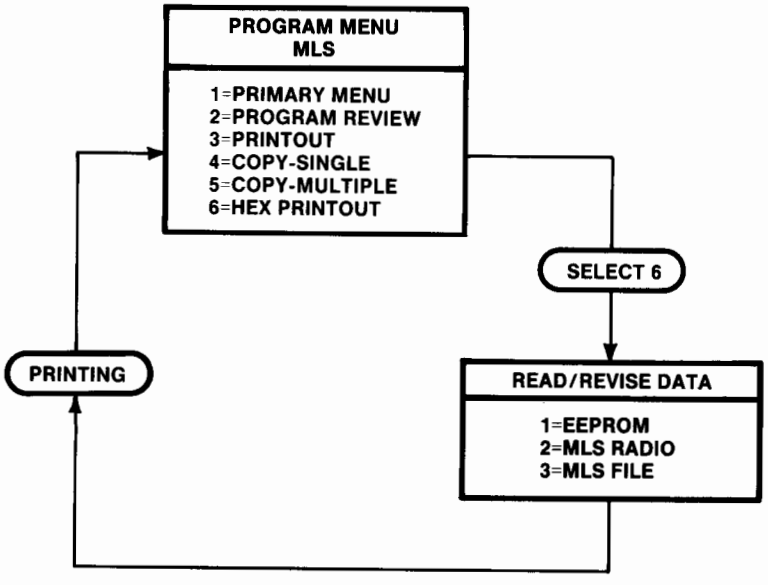
1 = PRIMARY MENU

Entering a 1 on the keyboard will return you to the Programmer's Primary Menu. i.e. 1 = CALCULATOR, 2 = CLOCK/CONTROLLER, etc. This is the only way you can return to the Primary Menu. Pressing the CLEAR key will return you to the MLS Program Menu. It will not return you to the Primary Menu.

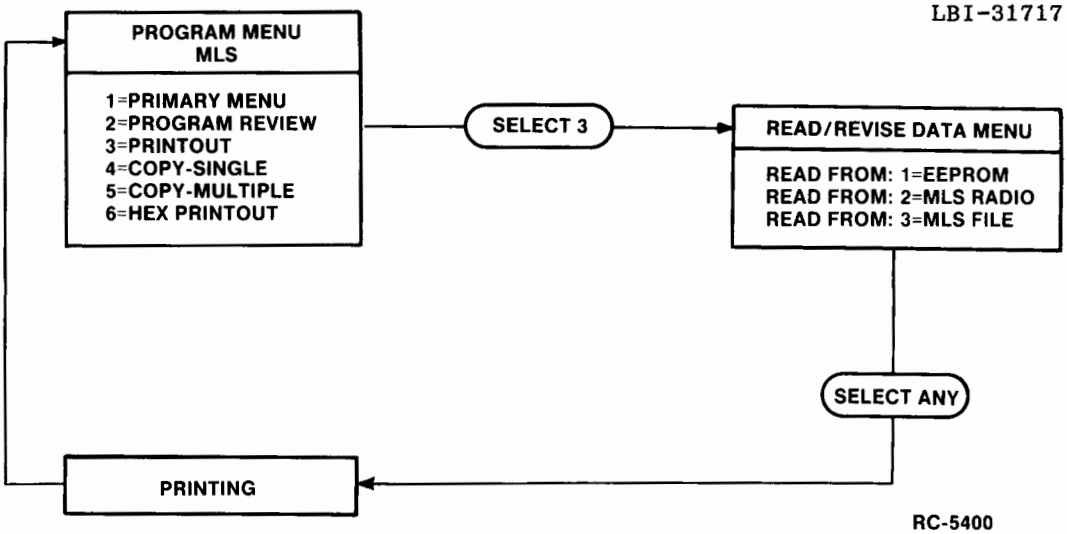
NOTE

Exercise CAUTION when using the CLEAR key to return to the menu when programming or entering data. Use of the CLEAR key will erase all data that you have entered.

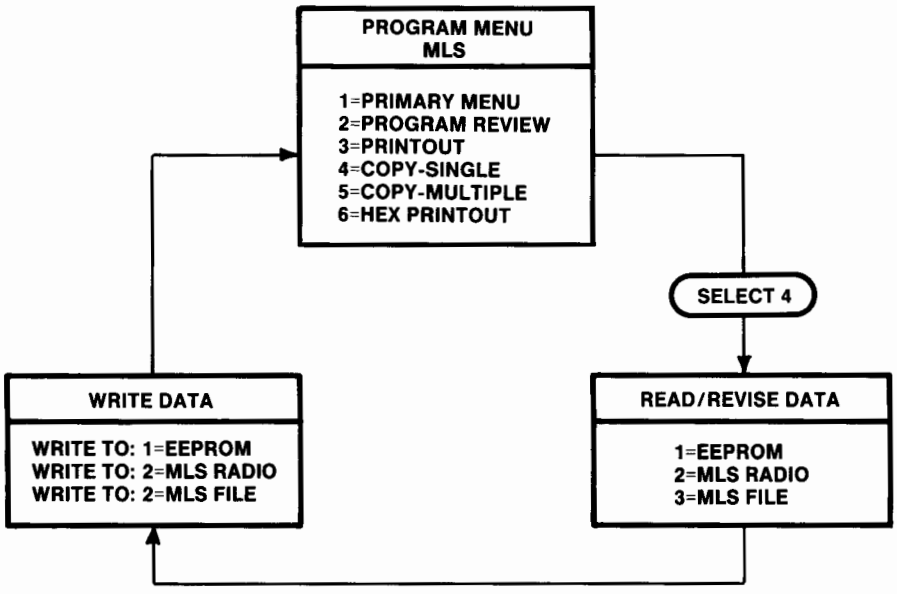

PRIMARY MENU
TQ2310
1=CALCULATOR
2=CLOCK/CONTROLLER
3=X=MLS
SELECT 1
SELECT 3
PROGRAM MENU
MLS
1=PRIMARY MENU
2=PROGRAM/REVIEW
3=PRINTOUT
4=COPY-SINGLE
5=COPY-MULTIPLE
6=HEX PRINTOUT
SELECT 2
WRITE DATA MENU
WRITE TO: 1=EEPROM
WRITE TO: 2=MLS RADIO
WRITE TO: 2=MLS FILE
PROGRAM/REVIEW
1=REVISE EXISTING DATA
2=(ERASE ALL) START ANEW
SELECT 1
SELECT 2
SELECT 4
READ/REVISE DATA MENU
READ FROM: 1=EEPROM
READ FROM: 2=MLS RADIO
READ FROM: 3=MLS FILE
SELECT ANY
FREQUENCY RANGE
1=LOW BAND
2=HIGH BAND
3=UHF BAND
4=806-870 MHz
FORMS MENU
1=CHANNELS
2=OPTIONS
3=PRINT
4=REVIEW/MODIFY
COMPLETE
SELECT 3
SELECT 3
SELECT 1
SELECT 2
SELECT 3
SELECT 4
PRINT
1=CHANNELS
2=OPTIONS
3=COMPLETE
LOW BAND
1=29.7-42.0 MHz
2=42.0-50.0 MHz
HIGH BAND
BANDSPLIT
1=403-420 MHz
2=450-470 MHz
806-870 MHz
RC-5399


PROGRAM MENU
MLS
1=PRIMARY MENU
2=PROGRAM REVIEW
3=PRINTOUT
4=COPY-SINGLE
5=COPY-MULTIPLE
6=HEX PRINTOUT
SELECT 6
PRINTING
READ/REVISE DATA
1=EEPROM
2=MLS RADIO
3=MLS FILE

RC-5401



RC-5400



COPY-MULTIPLE is just successive iterations of the COPY-SINGLE format.

RC-5402

Figure 2 - Program Menu Flow

2 = PROGRAM/REVIEW

Program/Review allows you to select one of two routines: (1) revise existing data or (2) erase all old data and reprogram the radio with new data.

Entering a 2 on the keyboard selects Program/Review.

3 = PRINTOUT

Printout allows you to read the programmed data in the radio and print it out. Data to be printed may be read from:

1 = EEPROM
2 = MLS RADIO
3 = MLS FILE

Entering a 3 on the keyboard selects the PRINTOUT mode.

4 = COPY-SINGLE

Copy Single allows moving data from one device to another, including to the same device. Data may be read from:

1 = EEPROM
2 = MLS RADIO
3 = MLS FILE

5 = COPY-MULTIPLE

Copy-Multiple allows moving data from one device to multiple copy of another device by reading data only one time and writing to the output device several times.

6 = HEX PRINTOUT

Hex Printout allows the hex-data information to be printed out for review or modification. Data to be printed may be read from:

1 = EEPROM
2 = MLS RADIO
3 = MLS FILE

PROGRAM/REVIEW MENU

Entering a 2 from the Program Menu will select PROGRAM/REVIEW and display the Program/Review Menu on the screen --- a line at a time.

1 = REVISE EXISTING DATA
2 = (ERASE ALL) START ANEW

Read/Revise Existing Data - Entering a 1 will select REVISE EXISTING DATA; data to be read or revised may be selected from:

1 = EEPROM
2 = MLS RADIO
3 = MLS FILE

After making your selection and entering the corresponding digit on the keyboard, the program will advance to the Forms Menu where the data may be reviewed or revised under control of the Forms format.

Forms Menu

The Forms Menu allows you to set the operating characteristics of each channel. Programmable characteristics include setting the transmit and receive frequencies, enabling/disabling the carrier control timer, setting the Channel Guard tones, and enabling/disabling the STE (squelch tail eliminator). Programmable characteristics can be set on a per channel basis.

Programmable options include setting the allowable transmit time of the carrier control timer, and turning the scan and channel lights on or off.

PROGRAMMING PRELIMINARIES

- Be sure the MLS program module is installed in the PSM (Program Storage Module).

To determine if the MLS Module is present.

- Turn the URP on and clear it. (Press ON and then CLEAR on the keyboard).
- Enter a 1 to display the Primary Menu. The programmer will sequentially display all modules in the PSM.

NOTE

If the MLS module is not listed, turn the power off and refer to the EPROM Installation Instruction to install the MLS EPROM.

NOTE

The software in the URP has been written to provide you with a default answer. If you are in doubt of an exact entry, take the default by pressing the ▼ .

A sample program printout is included on page 9.

PROGRAMMING THE RADIO

- Connect the radio to the URP using interconnect cable, TQ2362.
- Enter the access number displayed on the keyboard for the MLS.
- The programmer will interrogate the file storage system of the URP. If there is not enough room to store a file, the programmer will display the following message:

NO ROOM FOR FILE - CONT Y/N?

If the data is to be written to the radio or EEPROM you may continue.

There are three ways to store a MLS file.

1. Replace an unused file in the URP with the new MLS file.
2. Store a file to the EPROM socket using an external ERPOM.
3. Write the file directly to the MLS radio.

PROGRAM/REVIEW MENU

Enter a 2 to display the Program Review Menu. The menu will be displayed a line at a time.

1 = REVISE EXISTING DATA

2 = (ERASE ALL) START A NEW)

NOTE

Enter a 1 if you are revising existing data. This will advance the program to the READ/REVISE Data Menu where you will select the source of the data to be revised and then advance directly to the Frequency Range Menu.

Enter a 2 again to program the radio with all data cleared. The program will then advance to the Frequency Range Menu.

FREQUENCY RANGE MENU

The Frequency Range Menu allows you to select which frequency band and frequency split within that band for which the radio is to be programmed.

After entering a "2" the display will flash:

SELECT FREQUENCY RANGE

The Frequency Range Menu will then be displayed a line at a time:

1 = LOW BAND

2 = HIGH BAND

3 = UHF BAND

4 = 806-870 MHz

Enter the digit corresponding to the frequency range desired. After selecting the frequency range, the programmer displays the frequency band selected (Low Band, High Band, UHF Band, etc.) and will prompt you for the band split within that range.

SELECT BAND SPLIT

If 1 (Low Band) is selected, the display will flash:

LOW BAND

and display the following menu a line at a time.

1 = 29.7 - 42.0 MHz

2 = 42.0 - 50.0 MHZ

If 3 (UHF Band) is selected the display will flash:

UHF BAND

and display the following menu.

1 = 403.0 - 420.0 MHz

2 = 450.0 - 470.0 MHz

If the frequency range is High Band or the 800 MHz range, no band split menu is displayed, however, the display will flash the selected frequency band and advance to the Forms Menu.

2 = HIGH BAND

806-870 MHz

Enter the digit corresponding to the frequency band (and band split) to be programmed.

The programmer will advance to the Forms Menu

FORMS MENU

The Forms Menu, displayed one line at a time appears as follows:

1 = CHANNELS

2 = OPTIONS

3 = PRINT

4 = REVIEW/MODIFY COMPLETE

Selecting 4 will terminate the data inputting function.

You may wish to review the discussion in the introduction on the use of the arrow keys. Using the arrow keys will enable you to review the entire form a line at a time. Each form is described using a sub menu. This sub menu organizes data on each line for your convenience. If you get stuck while using the form, consulting the sub menu described for each form may help you understand what to do next.

If an input error occurs the URP will beep. Working in a noisy area will make the beep hard to hear thus causing you to take special note of a problem. Most of the errors that cause a beep will also have error messages associated with them. When an error message is displayed, it will remain on the screen until a key is pressed.

Channels

Enter a 1 from the keyboard. The display will flash:

CHANNELS

then:

ENTER CHANNEL (1-01) : 01

Up to 16 channels may be programmed, enter the number of the channel (For example: 01) to be programmed and press the ▼ . The display will show:

CH 01 TX 000.00000 MHz

Enter the transmit frequency assigned to channel 1 (or to the channel displayed) in megahertz. The frequency must be within the range of the band split selected or if programming 800 MHz, it must be within the 806-825 or 851-870 MHz range (Talk around repeater applications). After entering the assigned frequency, press the ▼ . The display will show:

CH 01 TX — CG : 000.0

Here you must enter the Channel Guard tone frequency assigned to channel 1 (or to transmit channel displayed) and press the ▼ or, if no Channel Guard is assigned for this channel, simply press the ▼ to advance to the next display.

NOTE

Refer to Table 1 for standard EIA Channel Guard tone frequencies.

Channel Guard tone frequencies must fall within the range of 67.0 to 210.7 Hz. They may be entered in 0.1 Hz increments. Enter the frequency assigned and press the ▼ .

NOTE

Should a tone frequency be entered in error, for a channel not assigned CG, you must enter 000.0 and press the ▼ to advance to the next screen.

CH 01 TX STE N

Here you have the option of enabling or disabling the Squelch Tail Eliminating function. This produces a phase shift before the transmitter turns off and allows the receiver to mute. Enter a "Y" to enable the STE function or press the ▼ to disable (default) the STE function.

The display will show:

CH 01 RX 000.00000 MHz

Table 1 - Standard Channel Guard Tone Frequencies

CHANNEL GUARD TONE FREQUENCIES					
67.0 Hz	88.5 Hz	103.5 Hz	123.0 Hz	146.2 Hz	173.8 Hz
74.4	91.5	107.2	127.3	151.4	179.9
77.0	94.8	110.9	131.8	156.7	186.2
79.7	97.4	114.8	136.5	162.2	192.8
82.5	100.0	118.8	141.3	167.9	203.5
85.4					210.7

Enter the receive frequency assigned to channel 1 (or to the channel displayed) in megahertz. The frequency must be within the range of the band split selected or if programming 800 MHz, it must be within the 851-870 MHz range.

After entering the assigned frequency press the ▼ . The display will show:

CH 01 RX - CG : 000.0

Here you must enter the Channel Guard tone frequency assigned to receive channel 1 (or to the channel displayed) and press the ▼ , or just press the ▼ if Channel Guard is not assigned to this channel.

NOTE

Should a tone frequency be entered in error, for a channel not assigned CG, you must enter 000.0 and press the ▼ to advance to the next screen.

The display will show:

CH 01 RX STE N

Here you have the option of enabling or disabling the squelch tail elimating function for the receive channel displayed. Enter a "Y" to enable the STE function or press the ▼ to disable (default) the STE function.

The display will show:

CH 01 ENABLE CCT N

The Carrier Control Timer (CCT) prevents the transmitter from staying keyed continuously past a preset time period. Enter a Y to enable the Carrier Control Timer and press the ▼. Pressing a ▼ only will disable the Carrier Control Timer.

If an attempt is made to leave a channel, either by pressing ▼ after the CCT question or using the ENTER key, and a TX frequency has been programmed, but no RX frequency has been programmed, the URP will beep and display the following error message:

CH xx MUST HAVE RX FREQ

Press the ▼ to return to the "Channels Menu" and then to the appropriate channel by pressing the "Arrow" keys. Enter the assigned channel receive frequency.

When you leave CHANNELS by using the ENTER key and attempt to return to the Program/Review Menu, the URP checks to make sure the maximum allowable frequency spread is not exceeded. For example:

Suppose you are programming a highband radio and you enter the following frequencies -

Ch 1 TX=155.0000 MHz/Ch 2 TX=1650 MHz
Ch 1 RX=155.0000 MHz/Ch 2 RX=165.0 MHz

When you press the ENTER key the following message will appear:

TX SPREAD MUST BE < = 6■ MH

Press any key and the URP will display the following:

DO YOU WISH TO CORRECT Y/N ■

If you answer "Y", the URP will display a message telling which channel has the lowest frequency and which channel has the highest frequency.

LOW TX FREQ ON CHANNEL 1 ■

Press any key and the URP will display the following:

H1 TX FREQ ON CHANNEL 2 ■

The program will then return to the "ENTER CHANNEL (01-0X)" screen in order to enter allowable frequencies.

Enter the appropriate channel number and press the down ▼ to return to the Forms Menu. Use the arrow keys to access the appropriate channel and enter the correct frequency. Press "ENTER" to return to the Forms Menu.

If you answer "N" to the "DO YOU WISH TO CORRECT Y/N" question, the URP will return to the Forms Menu.

Following are allowable TX and RX spreads:

LO BAND TX SPREAD <= 1 MHz
RX SPREAD <= 1 MHz

HI BAND TX SPREAD <= 6 MHz
RX SPREAD <= 3 MHz

UHF BAND TX SPREAD <= 10 MHz
RX SPREAD <= 5 MHz

800 MHz TX - NO LIMIT
RX <= 10 MHz

NOTE

This completes the programming for 1 channel. Pressing the ▼ will cause the programmer to re-enter the channel programming sequence for the next higher channel. This sequence will be repeated until all channels have been programmed.

Options Menu

The Options Menu allows you to set the maximum allowable transmit time (controlled by the CCT), establish how the scan indicators operate, and to enable/disable the channel lights.

Enter a 2 to select the Options Menu. The display will show:

CCT 0 1 X 30 SECONDS

The option applies to all channels and allows you to set the maximum time the transmitter may be keyed continuously.

Allowable values are 0 to 15 (450 seconds). Multiply these values by 30 seconds to determine the total time allowed. Entering a "0.0" will disable the Carrier Control Timer. Enter the desired multiplier and press the ▼ . The display will show:

SCAN LIGHTS NORMAL? Y

This option allows you to determine how you want the scan indicator to operate. In normal scan operation no lights will flash. However, when a call is received the channel number and the appropriate status light will light i.e., P1, P2 or S. Enter "Y" and press the ▼ . Now press the ENTER key to return to the Forms Menu. If you want the channel light or status indicators to flash enter a N and press the ▼ . The display will show:

P1, P2, SCAN LIGHTS? Y

To select channel lights and status indicators to flash while scanning and the status indicators to light when a message is received enter a Y and press ▼ . The display will show:

CHANNEL NUMBER LIGHTS N

This option allows you to disable the channel lights only. The status indicators will flash when the priority channels are scanned and will light when a message is received on the priority channel. Enter a Y and press the ▼ . Press ENTER to return to the Forms Menu.

Print

Enter 3 to select PRINT. The following menu is displayed:

PRINT 1 = CHANNELS

PRINT 2 = OPTIONS

PRINT 3 = COMPLETE

This allows you to print the data stored in the URP memory. Simply press 1 (CHANNELS) or 2 (OPTIONS). After obtaining your printout, press 3 to return to the Forms Menu.

Review/Modify Complete

Enter a 4 from the keyboard and the display will show:

WRITE TO: 1 = EEPROM

WRITE TO: 2 = MLS RADIO

WRITE TO: 3= MLS FILE

This allows you the option of programming an EEPROM alone, programming the MLS through the external connectors on the rear of the radio, or creating a file to be stored in the URP for use at a later time.

Enter a 1, 2, or 3 from the keyboard. After the Programmer has written to the proper location it will return to the Program Menu.

When writing the data to the MLS FILE the display will flash:

WRITE TO MLS FILE

If an error occurs in the WRITE TO procedure, the entire "WRITE TO" sequence is repeated.

When writing to the MLS radio the following display will flash:

PLEASE WAIT -----

then

WRITING -----

VERIFYING -----

The programmer will now return to the WRITE TO Menu. After a successful WRITE TO operation, the programmer will advance to the Program Menu.

Enter a 1 or 2 from the keyboard. After the Programmer has written to the proper location it will return to the Program Menu.

This completes the programming sequence for the MLS radio.

PRINTOUT

If Printout is selected from the Program Menu, you may select the source from which the data is to be printed. Enter a 3 on the keyboard. The following menu will be displayed a line at a time:

READ FROM: 1 = EEPROM

READ FROM: 2 = MLS RADIO

READ FROM: 3 = MLS FILE

Enter the digit corresponding to the desired source. The programmer will flash the source. If 3 is selected:

READ FROM: 1 = EEPROM

The display will show:

- - - PRINTING

When the data is printed the programmer will return to the Program Menu.

COPY-SINGLE

Copy-Single is a utility function that allows you to copy data from the EEPROM, MLS RADIO, or the MLS FILE. Enter a 4 for Copy Single. The following menu will be displayed one line at a time.

READ FROM: 1 = EEPROM

READ FROM: 2 = MLS RADIO

READ FROM: 3 = MLS FILE

Select the source by entering a 1, 2, or 3.

If an I/O error occurs in the "READ FROM" procedure, the entire "READ FROM" sequence is repeated.

Following a successful "READ FROM" operation the system prompts the user to select a "copy-to" device from the following menu.

WRITE TO: 1 = EEPROM

WRITE TO: 2 = MLS RADIO

WRITE TO: 3 = MLS FILE

If an I/O error occurs in the "WRITE TO" procedure, the entire "WRITE TO" sequence is repeated.

COPY-MULTIPLE

COPY-MULTIPLE is much like COPY-SINGLE except that the write operation is repeated as many times as the operator responds "Y" to the following prompt:

AGAIN Y/N?

HEX PRINTOUT

HEX PRINTOUT gives you a hexadecimal dump of the programmed data. After selecting HEX PRINTOUT from the Primary menu, you are presented with the following menu:

READ FROM: MLS FILE

READ FROM: 2 = MLS RADIO

READ FROM: 3 = MLS FILE

Enter the source number of the data to be dumped, 1, 2, or 3. The display will flash the source, print the data and return to the Primary Menu.

SAMPLE PRINTOUT

```
MON 07:35:24 & NOV 24 1986
MLS V0.9
CH    FREQUENCY    CHAN GUARD    STE  CCT
--    ---------    ----------    ---  ---
 1 TX 162.98750       067.5       Y    Y
   RX 163.90000       207.2       Y

 2 TX 164.69000       098.6       N    N
   RX 163.28000       088.4       N

 3 TX 000.00000       000.0       N    N
   RX 000.00000       000.0       N

      OPTIONS
    -----------
CCT  1 X 30 SECONDS
SCAN LIGHTS NORMAL?      N
P1, P2, SCAN LIGHTS?     Y
CHANNEL NUMBER LIGHTS?   Y
```

SAMPLE HEX PRINTOUT

```
-----------------------------
000:  02 20 03 00 03 85 80 84
      18 28 04 CB 9E A3 32 85
010:  7F 88 74 03 85 01 2A DA
      03 00 00 00 00 00 00 00
020:  00 00 00 00 00 00 00 00
      00 00 00 00 00 00 00 00
030 THRU 0FF SAME AS 2 ROWS ABOVE
```

EPROM INSTALLATION

Programmed EPROMs for the various General Electric programmable mobile radios are required in the Program Storage Module before radio programming can be accomplished. These EPROMs are provided separately, as ordered, and are not initially installed in the Program Storage Module. The following installation procedure is suggested (refer to Figure 3):

CAUTION

The EPROM devices can be destroyed by static discharges. Before handling one of these, the installer should be discharged by touching the test bench ground bus. The PW board and EPROM should also be at ground potential. EPROMs should be stored in conductive material.

1. Remove the Program Storage Module from the system I/O Module. Turn off the handheld computer before disconnecting.
2. Remove the four screws from bottom cover and open. Do not remove boards.
3. Install the first EPROM in socket 1, the second in socket 2, etc. (Note socket designations are in numerical sequence. Programs will be displayed according to socket number).
4. Close the cover and replace the four screws in bottom.
5. Reinstall the Program Storage Module in the programmer.

PRINTER PAPER REPLACEMENT

(Refer to vendor instruction manual)

1. Remove paper cover by sliding in direction of arrow (away from printer head).
2. Insert new roll of thermal paper with leading edge going into feed mechanism. Leading edge must come from bottom of roll.
3. Advance paper using paper feed knob. Note: Knob rotates in direction of arrow only.
4. Replace paper cover.

NOTE

Damage may result to thermal head if printer is activated without paper being set correctly.

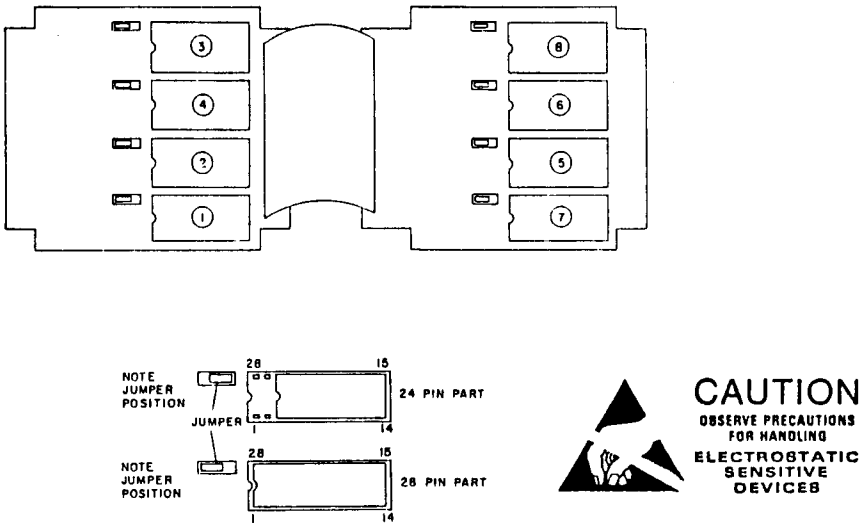


Figure 3 - Installation Instructions

IN CASE OF DIFFICULTY

It is possible that on occasion, unexplained problems will occur which may be caused by static electricity, jostling the unit, etc. The programmer may fail to operate as described or the word "RESET" may appear in the display. If this occurs, press CLEAR once to return to the start of the program being run. The data previously entered will be lost, but no data stored in files will be affected.

NOTE

Be sure all modules and the HHC are firmly in place.

If "RESTART" appears, press CLEAR twice. This should return you to the primary menu.

If you cannot reach the primary menu by pressing CLEAR twice, turn the computer off by means of the ALL-OFF switch in the back of the unit. You will have to remove the I/O Adaptor from the case and the computer from the I/O Adaptor to reach the switch. Wait about two minutes and turn the ALL-OFF switch on. Then using the AC Adaptor as a power source, press ON and then CLEAR. The word "RESTART" should appear in the display and pressing CLEAR again should display the primary menu. Otherwise the computer needs servicing. This procedure results in the loss of all internally stored files, including time and date.

HELPFUL SUGGESTIONS

The following suggestion may facilitate programming with the Universal Radio Programmer.

1. Select a display speed not greater than 6 or 7 for most convenient data entry.

2. If the MLS program does not show up in the Primary menu, try removing the Hand Held Computer from the programmer turning it "ON" (with "ON KEY") type the CLEAR key a few times; turn the unit "OFF" with the normal "OFF KEY"; then re-insert into the suitcase and try again. If this fails to reveal the MLS remove the GE Program Storage Module, open it and extract the MLS EPROM. Examine the EPROM for any physical damage (e.g. broken or bent pins). If the EPROM appears to be undamaged return it to the Program Storage Module, but be sure to insert it in a different socket than the one it was just extracted from. Replace the Program Storage Module and try again to gain access to the program.

3. DO NOT Plug/Unplug peripherals when the system is executing an application program. To be sure of the state of the unit depress CLEAR a few times until you see the PRIMARY menu being displayed. Then turn the unit off via the normal "OFF KEY" prior to inserting or removing modules or capsule programs.

4. The Panasonic BASIC Capsule program options (purchase from Panasonic) has special exiting procedures that one should carefully observe else one may have to play the "ALL OFF" game with the ALL OFF switch in the back of the Hand Held Computer.

5. You may purchase a variety of peripherals and software capsules for the Hand Held Computer from Panasonic. However, this MLS is designed for use only with the basic computer, the GE Program Storage Module and GE I/O Module. As such, inclusion of other devices or other Capsules programs may cause problems. If a problem arises, simply unplug the problem Peripheral/Capsule when programming MLS.

APPENDIX A

FILE OPERATIONS

The programmer offers several facilities for managing radio data saved in files. For more detailed information, consult the sections of the Panasonic Hand Held Computer - Instructions for Use titled "File System" and "Beyond the Primary Unit with the I/O Key". MLS data written to (and read from) the MLS FILE is written to (and read from) a file named MLS which is created automatically the first time radio data is written. The file can be deleted, renamed, or copied as required.

EXPANDING FILE STORAGE WITH PROGRAMMABLE MEMORY PERIPHERALS

Optional Panasonic Programmable Memory (RAM) Peripherals can be added to increase file storage capacity. Peripherals are available in several capacities, and one peripheral can be installed in each unused I/O adaptor slot.

Each Programmable Memory Peripheral, and internal RAM, are separate memory areas. Only one area can be active at a time, and only files stored in that area are available to the MLS program, or other programs. To find the current area, or change the current area designation, press the I/O key to enter the I/O menu. Each peripheral, and each memory area is displayed, with the space remaining, and the current area is in reverse image. For example:

1=RADIO I/O IN, OFF, SLOT=2

2=RADIO I/O IN, OFF, SLOT=2

3=RADIO I/O IN, OFF, SLOT=3

4= INT RAM 6520 FREE

5=EXT RAM, 7542 FREE, SLOT=4

Change the current memory by pressing the number displayed with the desired memory area.

Press the I/O key to return to the Primary Menu.

DELETING A FILE

It may be desirable to delete the MLS file if the memory space occupied by it is required for other files.

1. Return to the PRIMARY menu if not already there.
2. Select the file system by pressing "3" (3 = FILE SYSTEM). The computer will display a menu listing all (visible) files. Items 1 and 2 are special functions used to copy and create files.

1=NEW FILE

2=COPY FILE

for example:

3=DELTA-MOBILE

for example:

4= MLS

5=etc.

3. Choose the MLS file by pressing the number displayed with it (4 in this example). MLS will appear in reverse image.
4. Delete the file by depressing the "DELETE" and key. The programmer will begin displaying the menu of files (less the deleted file).
5. Return to the primary menu by pressing the "CLEAR" key twice.

RENAMING A FILE

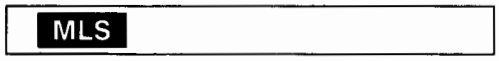
Any file in the current memory area can be renamed.

1. First make certain that the desired radio data has been written to the MLS FILE.

2. Return to the PRIMARY menu if not already there.

3. Select the file system by pressing "3" (3 = FILE SYSTEM). The computer will display a menu listing all (visible) files, as described above.

4. Choose the MLS FILE, or any other desired file, by pressing the number displayed with it (4 in the example). The file name will appear in reverse image and the blinking cursor will be left after the last character of the file name.

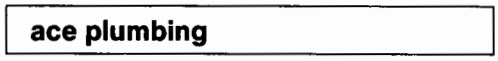


5. Use the RIGHT ARROW and LEFT ARROW keys to reposition the cursor and type in the new name. The new name can be longer than the original name, up to 24 characters. Delete excess characters by pressing the DELETE key and then the RIGHT ARROW or LEFT ARROW keys, to delete the character at the cursor.

NOTE

It is better to add characters to the file name than to replace the file name. The added characters can simply be deleted if it is necessary to program another radio from the file, and the type of radio is not forgotten.

For example:



or

6. Press the ENTER key when the name is correct. The programmer will beep, flash "CAN'T EDIT", and begin displaying the file menu again. The modified file name should appear in the menu.

RESTORING THE RENAMED FILE

The file must be renamed back to MLS (must be uppercase) for the MLS program to use it. Use the renaming procedure described above. Be careful to rename or delete any MLS file that already exists, to avoid confusing the computer with two identically-named files.

NOTE

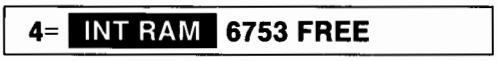
MLS is not a text file and cannot be edited by the editing commands described in the Panasonic literature. In addition, the MLS program will reject text files, or files created by other programs, that have been renamed MLS. DO NOT name non-MLS files MLS.

PRINTING THE FILE LIST

A list of all (visible) files in the current memory can be printed using the following procedure.

1. First make certain the computer is in the Primary Menu.

2. Press the I/O key to display the I/O menu. The computer will display a menu of I/O devices and RAM. A typical I/O menu is displayed below:



3. If the printer is off (PRINTER OUT, OFF,SLOT=x), press the number displayed with the printer (3 in the example).

4. Press the I/O key to return to the PRIMARY menu.

5. Press the "3" key to enter the file system. The printer will print everything that appears on the display.

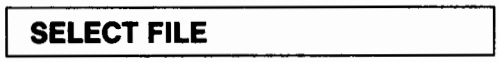
6. When a complete list of files has been printed, press the CLEAR key twice to return to the PRIMARY menu.

7. Press the I/O key to display the I/O menu. Then press the key corresponding to the printer to turn the printer off. Press the I/O key again to return to the Primary Menu.

COPYING A FILE

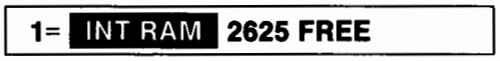
You may wish to copy a file from one memory area to another or to create a duplicate copy of a file. First make sure that the file to be copied is in the current memory area. If not, change the current memory designation as required, using the I/O menu.

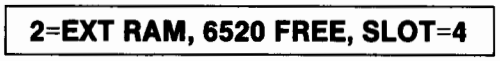
1. If not in the Primary Menu, press CLEAR twice to return to the Primary Menu.
2. Press the "3" key to enter the file system.
3. Press the "2" key for COPY FILE; this prompt appears:



A menu of all the file names in the current memory will be displayed. Press the number of the file to be copied; and the following prompt appears followed by a menu of destination memory areas. The current memory is displayed in reverse image.

For example:





Press the number corresponding to the desired destination memory area. When the copying is complete, the original file system menu will return.

APPENDIX B

DEFAULTS AND ACCEPTABLE VALUES

SUBJECT	ACCEPTABLE VALUES	DEFAULTS
Channel #	1 thru 16	1
TX Frequency	0 or range selected by the user	0
RX Frequency	0 or range selected by the user	0
Channel Guard	EIA standards	NONE
CCT	0:00, 0:30, 1:00, 1:30, 2:00, 2:30, 3:00	0:30
STE	Y or N	N

APPENDIX C

ERROR CODES/MESSAGES/CONDITIONS

The Programmer will display a number of error messages when certain error conditions are encountered.

1. NO SPACE - This message may occur if somehow there is not enough unused RAM memory to execute this program. This could result from other uses of the Hand Held Computer such as with the FILE system, or perhaps with basic. The MLS will not attempt to execute until you provide enough RAM. The ultimate "fix" to a RAM problem (i.e. the last resort) is to turn the "ALL OFF" switch OFF for a few minutes.

2. VERIFY ERROR - Indicates data written to or read from the EEPROM socket did not check during the verify read operation.

3. I/O ERROR - xxx - Where "xxx" is an I/O error resulting from invalid I/O of some sort and will cause the system to repeat the I/O sequences until the error condition is cleared.

4. NO FILE or WRONG TYPE - NO FILE is not actually an error. If no data has been written to the MLS File, this message results from an attempt to READ the file data.

5. NO ROOM FOR FILE - CONT Y/N? - This is also not actually an error. This message appears when there is insufficient file space to store a MLS file. If you do not need to make a file copy, but rather want to write to the EEPROM socket you can still get full access to the program by answering yes (Y). Answering no (N) returns the system to the HHC's main menu. If a file is desired it will be necessary to enter the HHC's file system and delete a file or files until enough space in RAM is created to hold the MLS module file.

6. LEGAL VALUES ARE - This message, followed by either a range or a list of numbers, is given when an attempt has been made to enter an unacceptable value. The message will remain on the screen until the ENTER key is hit. The program will then return to the screen containing the invalid data which you can then correct.

7. LAST ENTRY, ENTER TO LEAVE - This message is flashed when you try to go past the last screen available in the current menu item. After flashing, the program automatically returns to the last screen.

8. INVALID FREQUENCY - This message appears when the frequency is in range but is invalid. This message will remain on the screen until the ENTER key is hit.

9. CH xx MUST HAVE RX FREQ - This message appears when an attempt is made to enter a channel with a TX frequency but no RX frequency.

10. TX SPREAD MUST BE <= xx MHZ - This message appears when an attempt is made to enter channels with TX frequencies that have a difference greater than the allowable separation. Allowable TX spreads are as follows:

    LO BAND - 1 MH
    HI BAND - 6 MH
    UHF BAND - 10 MH

11. RX SPREAD MUST BE <= xx MHZ - This message appears when an attempt is made to enter channels with RX frequencies that have a difference greater than the allowable separation. Allowable RX spreads are as follows:

    LO BAND - 1 MH
    HI BAND - 3 MH
    UHF BAND - 5 MH
    800 BAND - 10 MH

SERIAL I/O INTERFACE ERRORS

The Serial I/O error messages have an error number associated with them.

I/O ERROR ##

---

1 - Logical device number invalid
2 - Logical device number not assigned
3 - Invalid operation
4 - Device control ROM absent
5 - Operation already pending on this device
6 - No RAM workspace available for device
7 - Input buffer is within 5 characters of overflowing
B - Parity error
D - Framing error
E - Overrun error
F - Input buffer overflow
10 - Output buffer overflow

GENERAL ELECTRIC COMPANY • MOBILE COMMUNICATIONS DIVISION
WORLD HEADQUARTERS • LYNCHBURG, VIRGINIA 24502 U.S.A.