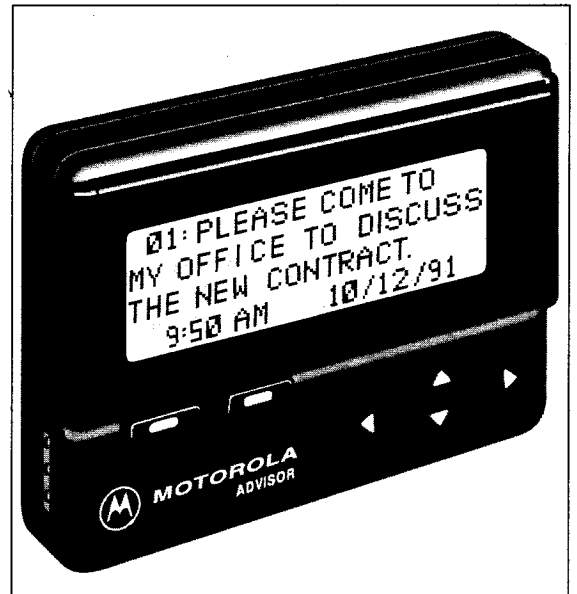




**MOTOROLA**

**ADVISOR®**

**GSC and POCSAG Alphanumeric Display Pagers**



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This manual provides descriptive data and service information for the Motorola product listed on the front cover. Schematic diagrams, parts lists, and printed circuit board layouts are either a part of this manual or contained in supplementary manuals.

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1. This device may not cause any harmful interference; and
2. This device must accept interference received, including interference that may cause undesired operation.

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1. This device may not cause interference; and
2. This device must accept any interference, including interference that may cause undesired operation of the device.



**MOTOROLA**

# ADVISOR™ SERIES Message Receivers GSC and POCSAG Alphanumeric Display

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## RELATED PUBLICATIONS (POCSAG)

OPERATING INSTRUCTIONS.....	6881011B82
SILENT ADVISOR OPERATING INSTRUCTIONS.....	6881011B84
VHF HIGH-BAND SERVICE MANUAL.....	6881019B20
UHF SERVICE MANUAL.....	6881019B25
900 MHz SERVICE MANUAL.....	6881019B30
VHF HIGH-BAND RECEIVER SERVICING SUPPLEMENT.....	6881103B02
UHF RECEIVER SERVICING SUPPLEMENT.....	6881103B03
900 MHz RECEIVER SERVICING SUPPLEMENT.....	6881103B07
DECODER SERVICING SUPPLEMENT (900 MHz PAGERS).....	6881104B14
DECODER SERVICING SUPPLEMENT (VHF AND UHF PAGERS).....	6881104B15

## RELATED PUBLICATIONS FOR GSC, HEBREW, THAI, SIMPLIFIED CHINESE, AND TRADITIONAL CHINESE

(ORDER THESE IN PLACE OF ANY MANUAL LISTED ABOVE)

OPERATING INSTRUCTIONS (THAI).....	6881011B51
OPERATING INSTRUCTIONS (TRADITIONAL CHINESE).....	6881011B76
OPERATING INSTRUCTIONS (SIMPLIFIED CHINESE).....	6881011B77
THEORY/MAINTENANCE MANUAL (THAI).....	6881011B59
VHF HIGH-BAND SERVICE MANUAL (ENGLISH).....	6881011B55
UHF SERVICE MANUAL (ENGLISH).....	6881011B60
900 MHz SERVICE MANUAL (ENGLISH).....	6881011B65
280 THEORY/MAINTENANCE SUPPLEMENT.....	6881026B36
280 MHz SERVICE MANUAL (ENGLISH).....	6881018B10
280 MHz RECEIVER SERVICING SUPPLEMENT (ENGLISH).....	6881103B08
DECODER SERVICING SUPPLEMENT (ENGLISH).....	6881104B10

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6881011B75-B

# VHF MODEL CHART 138-174 MHz

MODEL NUMBER													DESCRIPTION	
A03KLB5962DA													ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A03KLC5962DA													ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A03KLB5362DA													ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A03KLB5662AA													ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A03KLC5662AA													ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A03KLB5305AA													HEBREW ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A03KLC5305AA													HEBREW ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A03KLB5162AA													ALPHANUMERIC PAGER, WITH VIBRATOR, 2400 BPS POCSAG	
A03KLB5366BA													SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A03KLB5966BA													SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A03TQB5962AA													ALPHANUMERIC PAGER, LINGUIST	
ITEM NUMBER													DESCRIPTION	
X	X	X	X	X	X	X	X	X	X	X	X	X	NBN8129	LIGHT PACK TRAY
X	X	X	X	X	X	X	X	X	X	X	X	X	1562440B01	HOUSING, FRONT
X	X	X	X	X	X	X	X	X	X	X	X	X	NRN8525	LCD ASSEMBLY
X	X	X						X	X	X	X		NYN5480	BACK COVER, LATCH, BATTERY DOOR
			X	X	X	X							NYN1282	BACK COVER ASSEMBLY
X	X	X	X	X	X	X	X	X	X	X	X	X	1505039W01	CARRYING CASE
X	X	X	X	X	X	X	X	X	X	X	X	X	NRN6649	BELT CLIP
X	X	X	X	X	X	X	X	X	X	X	X	X	NRN4819	BATTERY, ALKALINE (AAA)
X	X	X						X	X	X	X		NYN5459	VIBRATOR
			X	X	X	X							NRN8329	VIBRATOR ASSEMBLY
X	X	X	X	X	X	X	X	X	X	X	X	X	KXN6300AA	FIRST OSCILLATOR CRYSTAL
A	A	A	A	A	A	A	A	A	A	A	A	A	NXN8007	SECOND OSCILLATOR CRYSTAL (LOW SIDE) 17.445 MHz
A	A	A	A	A	A	A	A	A	A	A	A	A	NXN8008	SECOND OSCILLATOR CRYSTAL (HIGH SIDE) 18.355 MHz
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4050	RECEIVER BOARD (138.000-142.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4051	RECEIVER BOARD (143.000-148.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4052	RECEIVER BOARD (148.600-151.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4053	RECEIVER BOARD (152.000-158.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4054	RECEIVER BOARD (159.000-163.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4055	RECEIVER BOARD (164.000-168.999 MHz)
A	A	A	A	A	A	A	A	A	A	A	A	A	AARD4056	RECEIVER BOARD (169.000-174.000 MHz)
X	X	X						X	X	X			NLN3545	DECODER BOARD, POCSAG
			X	X									NLN3544	DECODER BOARD, GSC
				X	X								NYN1236	DECODER BOARD, POCSAG, HEBREW
X	X	X	X	X	X	X	X	X	X	X	X	X	6881104B31	CHINESE DECODER SUPPLEMENT
O	O	O	O	O	O	O	O	O					6881011B82	OPERATING INSTRUCTIONS
									O	O	O		6881011B84	SILENT ADVISOR OPERATING INSTRUCTIONS
O	O	O	O	O	O	O							6881019B20	VHF SERVICE MANUAL
O	O	O						O	O	O	O		6881103B02	VHF RECEIVER SUPPLEMENT
O	O	O	O	O				O	O	O	O		6881104B10	DECODER SUPPLEMENT
O	O	O	O	O	O	O	O	O	O	O	O	O	6881011B75	THEORY/MAINTENANCE MANUAL (ENGLISH)

KEY: X = ITEM INCLUDED A = ALTERNATE ITEM SUPPLIED-CHOICE DEPENDS ON CARRIER FREQUENCY O = NO-COST OPTION

# UHF MODEL CHART

## 406-512 MHz

MODEL NUMBER										DESCRIPTION	
A04KLB5962DA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A04KLC5962DA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A04KLB5362DA										ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A04KLC5362DA										ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A04KLB5662AA										ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A04KLC5662AA										ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A04KLB5966BA										SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A04KLB5366BA										SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A04KLB5162AA										ALPHANUMERIC PAGER, WITH VIBRATOR, 2400 BPS POCSAG	

# 900 MHz MODEL CHART

## 929-932 MHz

MODEL NUMBER										DESCRIPTION	
A05KLB5962EA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A05KLC5962EA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A05KLB5362EA										ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A05KLC5362EA										ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A05KLB5662BA										ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A05KLC5662BA										ALPHANUMERIC PAGER, WITH VIBRATOR, GSC	
A05KLB5966BA										SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG	
A05KLB5366BA										SILENT ALPHANUMERIC PAGER, WITH VIBRATOR, 1200 BPS POCSAG	
A05KLB5162AA										ALPHANUMERIC PAGER, WITH VIBRATOR, 2400 BPS POCSAG	

# VHF IDEOGRAPHICAL MODEL CHART (Page 1 of 2)

## 138-174 MHz

MODEL NUMBER										DESCRIPTION	
A03AZB5962BA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A03AZC5962BA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A03AZB5362BA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A03AZC5362BA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A03AZB5972CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS GSC, SIMPLIFIED CHINESE	
A03AZC5972CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS GSC, SIMPLIFIED CHINESE	
A03AZB5372CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS GSC, SIMPLIFIED CHINESE	
A03AZC5372CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS GSC, SIMPLIFIED CHINESE	
A03AZB5962AA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG, VIETNAMESE	
A03AZB5362AA										ALPHANUMERIC PAGER, WITH VIBRATOR, 512 BPS POCSAG, VIETNAMESE	
										ITEM NUMBER	DESCRIPTION
X	X	X	X	X	X	X	X	X	X	NBN8129	LIGHT PACK TRAY
X	X	X	X	X	X	X	X	X	X	1562440B01	HOUSING, FRONT
X	X	X	X	X	X	X	X	X	X	NRN8525	LCD ASSEMBLY
X	X	X	X	X	X	X	X	X	X	1562440C25	BACK COVER, LATCH, BATTERY DOOR
X	X	X	X	X	X	X	X	X	X	1505039W01	CARRYING CASE
X	X	X	X	X	X	X	X	X	X	NRN6649	BELT CLIP
X	X	X	X	X	X	X	X	X	X	NRN4819	BATTERY, ALKALINE (AAA)
X	X	X	X	X	X	X	X	X	X	NRN8329	VIBRATOR
X	X	X	X	X	X	X	X	X	X	KXN6300AA	FIRST OSCILLATOR CRYSTAL
A	A	A	A	A	A	A	A	A	A	NXN8007A	SECOND OSCILLATOR CRYSTAL (LOW SIDE) 17.445 MHz
A	A	A	A	A	A	A	A	A	A	NXN8008A	SECOND OSCILLATOR CRYSTAL (HIGH SIDE) 18.355 MHz
A	A	A	A	A	A	A	A	A	A	AARD4050	RECEIVER BOARD (138.000-142.999 MHz)
A	A	A	A	A	A	A	A	A	A	AARD4051	RECEIVER BOARD (143.000-148.599 MHz)
A	A	A	A	A	A	A	A	X	X	AARD4052	RECEIVER BOARD (148.600-151.999 MHz)
A	A	A	A	A	A	A	A	A	A	AARD4053	RECEIVER BOARD (152.000-158.999 MHz)
A	A	A	A	A	A	A	A	A	A	AARD4054	RECEIVER BOARD (159.000-163.999 MHz)
A	A	A	A	A	A	A	A	A	A	AARD4055	RECEIVER BOARD (164.000-168.999 MHz)
A	A	A	A	A	A	A	A	A	A	AARD4056	RECEIVER BOARD (169.000-174.000 MHz)
X	X	X	X							NLN3716	DECODER BOARD, TRADITIONAL CHINESE
								X	X	AALN4344	DECODER BOARD, VIETNAMESE
				X	X	X	X			NLN3570	DECODER BOARD, GSC, SIMPLIFIED CHINESE
X	X	X	X	X	X	X	X			6881104B31	CHINESE DECODER SUPPLEMENT
O	O	O	O							6881011B76	OPERATING INSTRUCTIONS, TRADITIONAL CHINESE
				O	O	O	O			6881011B77	OPERATING INSTRUCTIONS, SIMPLIFIED CHINESE
								X	X	6802902J05	OPERATING INSTRUCTIONS, VIETNAMESE
O	O	O	O	O	O	O	O	O	O	6881019B20	VHF SERVICE MANUAL
O	O	O	O	O	O	O	O	O	O	6881103B02	VHF RECEIVER
								O	O	6881104B15	DECODER SUPPLEMENT
O	O	O	O	O	O	O	O	O	O	6881011B75	THEORY/MAINTENANCE MANUAL (ENGLISH)

KEY: X = ITEM INCLUDED    A = ALTERNATE ITEM SUPPLIED    O = NO-COST OPTION

## 138–174 MHz

KEY: X = ITEM INCLUDED      A = ALTERNATE ITEM SUPPLIED      O = NO-COST OPTION



## UHF IDEOGRAPHICAL MODEL CHART (Page 1 of 2)

MODEL NUMBER												DESCRIPTION	
A04AZB5962BA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A04AZC5962BA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A04AZB5362BA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A04AZC5362BA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A04AZB5972CA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS GSC, SIMPLIFIED CHINESE	
A04AZC5972CA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS GSC, SIMPLIFIED CHINESE	
A04AZB5372CA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS GSC, SIMPLIFIED CHINESE	
A04AZC5372AA												IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS GSC, SIMPLIFIED CHINESE	

KEY: X = ITEM INCLUDED    A = ALTERNATE ITEM SUPPLIED    O = NO-COST OPTION

## 406–512 MHz

KEY: X = ITEM INCLUDED      A = ALTERNATE ITEM SUPPLIED      O = NO-COST OPTION

## 900 MHz IDEOGRAPHICAL MODEL CHART

MODEL NUMBER										DESCRIPTION	
A05AZB5962CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A05AZC5962CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, TRADITIONAL CHINESE	
A05AZB5362CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A05AZC5362CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, TRADITIONAL CHINESE	
A05AZB5372CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, SIMPLIFIED CHINESE	
A05AZC5372CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 512 BPS POCSAG, SIMPLIFIED CHINESE	
A05AZB5972CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, SIMPLIFIED CHINESE	
A05AZC5972CA										IDEOGRAPHICAL PAGER, WITH VIBRATOR, 1200 BPS POCSAG, SIMPLIFIED CHINESE	

KEY: X = ITEM INCLUDED      A = ALTERNATE ITEM SUPPLIED      O = NO-COST OPTION

## 278–284 MHz

KEY: X = ITEM INCLUDED      A = ALTERNATE ITEM SUPPLIED      O = NO-COST OPTION

## 1. INTRODUCTION

The Motorola ADVISOR message receiver is a miniature, microcomputer-controlled FM receiver, with a large graphic, liquid crystal display (LCD). The receiver is powered by a single AAA battery and operates in the high-band VHF frequency range (138-174 MHz), the UHF frequency range (406-512 MHz), and the 900 MHz frequency range (929-932 MHz).

The ADVISOR's large LCD is designed to display either 80 alphanumeric characters in 5 x 7 dot-matrix patterns or 14 ideographical characters in 16 x 16 dot-matrix patterns. The LCD uses "supertwist" technology for maximum contrast and readability.

The receiver uses the most advanced, self-contained, sealed, and custom-integrated circuits to perform the complex functions for paging. The receiver is housed in a high impact case which offers excellent protection against dust intrusion, vibration, and shock.

Lightweight and small in size, the unit can be comfortably carried in a pocket or purse, or it can be clipped on a belt or the waistband of a garment with either the clip or the carrying case.

The following features are standard in the ADVISOR message receiver:

- attractive, miniature styling
- functionally-grouped directional control buttons
- reprogrammable codeplug (EEPROM)
- special ESCALERT alerting tone
- high-contrast, graphic dot matrix liquid crystal display
- high-visibility electroluminescent backlighting
- microcomputer control with advanced software algorithms
- visual alert indicator
- real-time clock with time, date, and alarm
- nonvolatile message memory and time and date
- single AAA battery
- user-selectable alert screen
- intelligent function menu selections

The ADVISOR message receiver is capable of accepting tone-only, numeric, and alphanumeric messages. Message types for all addresses are stored in a programmable EEPROM.

Up to four identification codes (16 addresses) for each message receiver can be selected in the EEPROM codeplug. The codeplug is reprogrammed using the ADVISOR pager programming software (PPS) package and an IBM-compatible personal computer.

The unit responds to modulation consisting of a sequence of binary digital "words," using the Post Office Code Standardization Advisory Group (POCSAG) code. When the preamble, start code, and address words are transmitted in a sequence that matches the information stored in the codeplug, the receiver responds with either an audible alert tone, a silent alert ("Mem-O-Lert"), or a vibrating alert depending on the mode of operation. The receiver also responds with a visual alert, light-emitting diode (LED), as well as visual information on the display.

## 2. CONTROLS AND INDICATORS

(See Figure 1)

The following paragraphs describe the controls and indicators of the ADVISOR message receiver. For more information about the functions performed by the controls and indicators, refer to the Standard Features section of this manual. More information about the detailed operational description is given in the Operating Instructions (6881011B82).

### a. Liquid Crystal Display (LCD)

The four line LCD offers a high-contrast dot-matrix display for easy readability of characters. The LCD also features a timed electroluminescent (EL) backlight display for reading in low light conditions. Up to 80 characters (or 14 ideographical characters) can be displayed at one time.

In the alphanumeric mode, the display features a four line by 20-character dot-matrix display format, allowing up to 80 characters per screen.

In the ideographical mode, the display features a two line by 7-character dot-matrix display for a total of 14 ideographical characters per screen.

### b. On/Reset Button

The On/Reset button, located on the side of the receiver, is used to turn the receiver on, reset the receiver and the alerts, and to prompt for the receiver off command.

While the receiver is off, a single push of the On/Reset button turns the receiver on. When the receiver is turned on, it displays the power-up screen and generates the power-up alert. Once the receiver is on, the On/Reset button can be used to reset the receiver alerts or display the message status

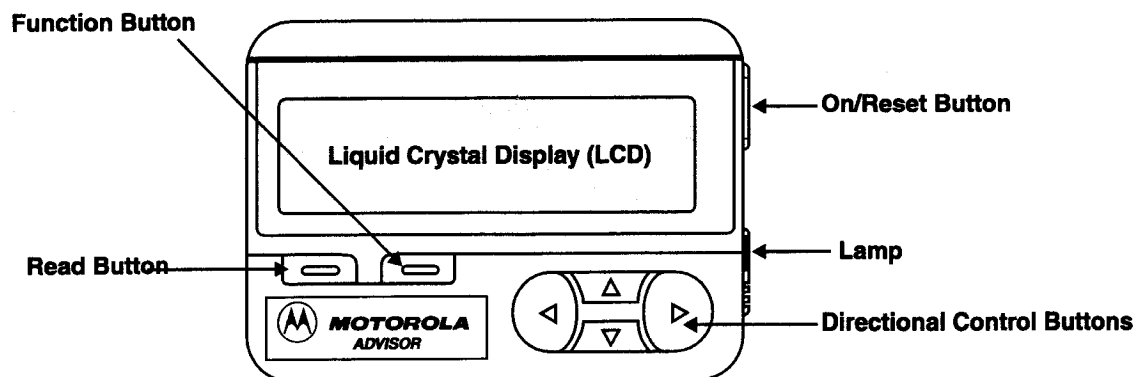
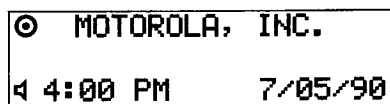


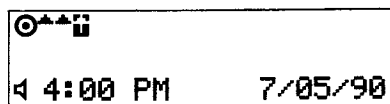
Figure 1. ADVISOR Message Receiver Control Buttons

screen. After eight seconds of no receiver activity, the display changes to the blank (standby) screen.

When the message status screen displays, pressing the On/Reset button causes the "PUSH FOR OFF" prompt to display.



*Power-Up Screen*



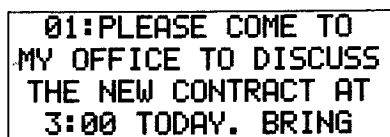
*Message-Status Screen*



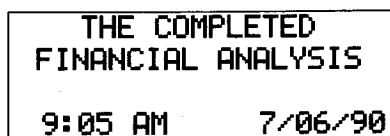
*Blank (Standby) Screen*

### c. Read Button

The Read button, located on the front of the receiver, is used to read messages. When pressed, the automatic scrolling mode of the receiver is activated. In this mode, each screen is shown for four seconds. Pressing the Read button one additional time while reading a message activates the freeze/advance mode. In this mode, each screen is shown for up to two minutes, or until the Read button is pressed again. After the entire message is read, the receiver reverts to the standby mode.



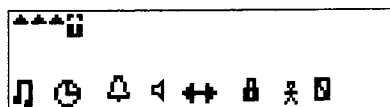
*1st Screen of a Message - Example*



*2nd Screen of a Message - Example*

### d. Function Button

The Function button, located on the front of the receiver, is used to activate the special features. When pressed, the function menu appears on the bottom line of the display. The function screen is intelligent, so the only function selections displayed are those appropriate for the present state of the receiver. When the Function button is pressed and held for one second, the EL backlight turns on. When the "PUSH FOR OFF" screen is displayed, press the Function button to turn the receiver off.



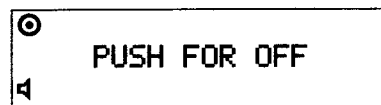
*Function Menu*

### e. Directional Control Buttons

The four clustered directional control buttons, located on the front of the receiver, are used to scroll the cursor up,



*Function Menu  
with No Messages in Memory*



*"PUSH FOR OFF" Screen*

down, left, and right. They have several functions which are explained more thoroughly in the applicable Users Guide publication.

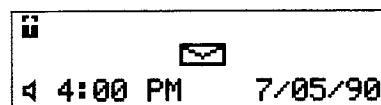
### f. Visual Alert Lamp

The visual alert lamp, located on the side of the receiver, flashes in synchronization with the receiver alerts.

## 3. PAGING OPERATION

The ADVISOR message receiver can be configured to accept tone-only, numeric display, and alphanumeric display pages. Page types for individual functions are programmed into the EEPROM.

When a message is received, the receiver emits a 12-second alert and displays the incoming message symbol (an envelope icon). The new message is indicated by a flashing full arrow (a square with a dot). After the message is stored, the display changes to the blank screen and the "on" symbol (a circle with a dot) in the upper left-hand corner of the display flashes. Reading any part of the message removes the unread message indication. (The "on" symbol no longer flashes.)



*Incoming Message Screen*

## 4. STANDARD FEATURES

### a. Address Capability

The ADVISOR message receiver is capable of receiving messages from up to 16 unique addresses. Each one of the 16 addresses can be programmed to respond to any one of the various page types (tone-only, numeric, or alphanumeric).

### b. Message Indication Types








Messages sent to the ADVISOR message receiver can be selected as individual, group, or maildrop. Individual and group messages, also referred to as personal messages, are shown on the first line of the message status screen. Group messages are indicated by a special group prompt at the end of the message. Individual messages can be indicated with the address number if the Show Source option is selected. Maildrop messages are displayed on the second line of the message status screen.

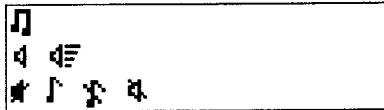
### c. Message Storage

The ADVISOR message receiver can store up to 20 personal messages (individual or group) that are shown on the first line of the message status screen. Newer (or unread) messages are located on the right side of the first line; older messages are located on the left side of the first line. The






#### **Audible Alert or Maildrop Alerts Selections:**

-  Escalator Alert: Increasing louder alert level
-  Loud Long Alert: 12-second alert at loudest level
-  Loud Short Alert: 2-second alert at loudest level
-  Soft Long Alert: 12-second alert at softest level
-  Soft Short Alert: 2-second alert at softest level
-  Chirp Alert: Chirp alert at loudest level
-  No Alert: No alert on incoming message



*Silent Alerts Screen*

#### **Silent Alert Selections:**

-  Chirp Alert: Chirp and vibrates
-  No Chirp Alert: No chirp, only vibrates
-  No Alert: No alert, no vibrator

#### **n. International Character Mapping**

The ADVISOR message receiver supports various languages throughout the world. To support these languages, the ASCII characters can be remapped to language-specific characters. Refer to Appendix A of this publication for the international characters and prompts supported by GSC and POCSAG receivers.

## **5. STANDARD IDEOGRAPHICAL FEATURES**

(Available in some models, contact a Motorola Sales Representative for further information.)

#### **a. Invalid Ideographical Character Symbol**

When a two-byte ideographic character which can not be displayed by the receiver is received, the invalid ideographical symbol (■) is displayed. This special symbol indicates the character cannot be displayed because it is out of range of the character ROM.

#### **b. Alphanumeric/Ideographical Mixed Message Mode**

Within an ideographical message, shift in and shift out characters can be sent to give alphanumeric characters. These alphanumeric characters are represented in 8x16 pixel fonts to effectively use the screen display area. When a shift in character is sent (\$0F hex), the characters that follow are shown in alphanumeric characters. When a shift out character is sent (\$0E hex), the characters that follow are shown as ideographical characters. Thus, a message can switch between 16x16 ideographical characters and 8x16 alphanumeric characters.

## **6. OPTIONAL MEMORY FEATURES**

#### **a. Maildrop**

Any of four address codes can be selected as maildrop. Maildrop messages differ from private messages as follows:

- Maildrop messages always go into a designated slot corresponding to the "address" number, i.e., address 2 messages goes into the second slot of line 2 of the display (slot #22).
- Maildrop messages cannot be locked.

- No duplication of maildrop messages is allowed.
- Maildrop messages cannot be transferred to the History Dump File.

#### **b. Save Maildrops**

If this option is selected, all maildrop messages are saved in nonvolatile memory upon power-up.

#### **c. Multiple Pages in One Page**

A single message can be sent to the ADVISOR message receiver with embedded escape characters (\$1B). When the receiver receives an escape character, it splits the message into the next message slot. This can be used with personal or maildrop messages.

#### **d. Memory Clean Up**

When the receiver is turned on, locked messages, unread messages, and the personal message file are stored in nonvolatile memory. Unlocked messages, read messages, maildrop messages, and the history dump file are erased from memory. When the receiver is powered up again, the remaining messages are moved to the first memory slots. Without this option selected, all memory is saved upon power-up.

#### **e. Delete Retain Memory**

With this option selected, all messages are deleted when the receiver is turned off. This option overrides the Memory Cleanup option.

#### **f. Duplication Message Detection**

When this option is selected, the receiver compares all incoming personal messages to messages already stored in memory. If duplication is detected, DUPLICATE displays at the beginning of the message to indicate the message has been received more than once. A message is considered duplicated if it meets the following criteria: it is received on the same address, it is the exact same length, and either all characters match or they match in errors.

If duplication is detected, the message with the least number of errors is stored in the same memory location, the latest time stamp is used, and the other message is discarded.

Comparison for duplication is not performed on maildrop messages.

#### **g. Sequential Lockout**

This option allows duplicated messages sent within the specified time-out period to be treated as if only one message was received. The receiver can be programmed to alert at either the end of the sequential lockout period, or to alert during the sequential lockout period. With the latter option, if the message is corrected, it alerts again. Thus, the receiver alerts with a message that is good, better, then best. If the print option is selected, the message is printed at the end of the sequential lockout period. New messages received during the sequential lockout period extend the lockout period for both (or all) locked out messages.

Sequential Lockout requires the Duplicate Message Detection option.

#### **h. Personal Message File (PMF)**

This option allows you to store personal messages in the personal message file (PMF). (Message storage is done by selecting the PMF symbol [PMF] in the Function menu.) As each message is selected, it is deleted from its message loca-



tion and added to the beginning of the PMF. This file is located in the 20th message slot on line 2 of the display.

The PMF cannot be deleted via the message status screen or the Function menu. However, when the delete symbol is selected from the Function menu while reading the PMF, the message currently displayed may be deleted. The display then reverts to the message status screen.

A total of 10 messages or 1,000 bytes can be stored in the PMF.

#### **i. History File**

When this option is installed, and receiver memory is full, the next incoming message causes the oldest, read, unlocked message to be transferred to the top of the history file. A total of 10 messages or 1,000 bytes can be stored in the history file. The history file is located in the 19th memory location on line 2 of the display.

### **7. OPTIONAL ALERT FEATURES**

Most alert options can be configured by accessing the Configurable Alerts menu from the Function menu. See Section 4.m. for a description of each of the alert choices.

#### **a. Vibrator**

This option is used to select the vibrator operation.

#### **b. Disable Alerts**

The LED, audio, and vibrator alerts are muted with this option. It overrides all other alert options and does not allow alerts to be changed via the set-alerts function.

#### **c. Bell Character Chirp**

When a message containing a bell character in the first block of the message is received, the receiver chirps. Up to eight bell characters can be sent. In POCSAG receivers, the chirp character is the "BEL" character (\$07). In GSC receivers, a "SHIFT 6" is the "BEL" character.

#### **d. Numeric Beep on Bad Data**

If this option is selected, the receiver alerts normally even if errors are detected in a numeric message. Without this option, the receiver does not alert and the message is not stored.

#### **e. Alphanumeric Beep on Bad Data**

If this option is selected, the receiver alerts normally even if errors are detected in an alphanumeric or ideographical message. Without this option, the receiver does not alert nor is the message stored.

This option may be used with the sequential lockout option to alert only when an error-free message is received. If an error-free message is not received from any of the transmitters, the receiver does not alert at all.

#### **f. Alert After Sequential Lockout Period**

While this option is selected, the receiver alerts only at the end of the sequential lockout period. Without this option selected, the receiver alerts when the message is first received.

#### **g. Audible Low Battery Alert**

When this option is enabled and a low battery condition exists, the receiver emits an alert at the lowest volume level and displays the low battery screen. Without this option enabled, the audible alert does not occur.

#### **h. Manual Reset**

With this option selected, the alerts must be manually turned off by pressing any button on the receiver; no automatic alert shut off occurs. If "Chirp Alert" is selected from the set-alerts screen, the receiver emits a continuous stream of chirps. If "No Alert" is selected from the set-alerts screen, the receiver remains in the message status screen when a message is received until a button is pressed.

#### **i. Reminder Alert**

While this option is selected and there are unread messages in memory, the receiver generates a chirp or vibration every two minutes.

#### **j. Alert Cadence**

A unique alert cadence can be selected for any address. This alert cadence is used for any audible alert. If the address is number 4, 8, 12 or 16, cadence can be selected. All other alerts give 8 cadence selections. The alert cadence tables are codeplug programmable.

### **8. TIME FUNCTION OPTIONS**

#### **a. Time Stamping**

If time stamping is selected, the time and the date the message was received is shown at the end of the message. A typical time stamp screen follows:

....end of my message.

8:48 AM 3/05/93

This shows the message was received at 8:48 A.M. on March 5, 1993.

#### **b. International Date**

The date can be set to display in two different formats: month/day/year or day/month/year, as in European countries. Therefore, March 30, 1993 can be displayed as 3/30/93 or as 30/3/93.

#### **c. Auto Alarm Turn On**

While the receiver is off, this option causes the receiver to automatically power up and generate the receiver alarm alert when the alarm time is triggered. Without this option selected, the alarm alert does not sound if the receiver is off.

### **9. DISPLAY OPTIONS**

#### **a. Alternate Prompts**

Alternate prompts can be selected for the power-up screen, no message screen, low battery, memory full, group indication, duplicate, tone only, receiver disabled, delete, or for the "push for off" screen. The group indication is in alphanumeric format only.

#### **b. Show Source**

If this option is selected, source information is displayed at the end of a message.

#### **c. Out-of-Range Indication**

This option is selected to give an out-of-range indication. The out-of-range timer is codeplug programmable. The timers for this option are independent of the sequential lockout timers.

## 10. RF OPTIONS

### a. Data Polarity

High-side or low-side injection can be selected via this codeplug option.

### b. POCSAG Signaling Rate Selection

POCSAG signaling rate of 512, 1200, or 2400 baud can be codeplug selected.

### c. POCSAG Dual Frame

Two independent frames can be selected for decoding. Each frame has two corresponding codes which provide a total of 16 addresses (sources) for POCSAG receivers. Selecting this option reduces the battery life by about 30% in batch (synchronous) mode.

The frames of codes A and B must be less than the frame of codes C and D. (The frame is the remainder of the address divided by 8.)

### d. POCSAG Dual Sync

(Not available on all models)

An alternate sync code word can be selected for use in a multiple sync environment. The system must support the alternate sync code word. This option is not compatible with the Dual-Frame option.

## 11. OVER-THE-AIR AND DOWNLOAD OPTIONS

### a. RF Programming Allowed

This option allows for over-the-air (OTA) programming. receivers without this option must be programmed using hard contacts.

### b. RF Silent Programming

When this option is selected, the receiver does not emit an audible reset when programmed OTA.

### c. Receiver Disabled

Select this option to disable the receiver via an OTA protocol.

### d. Download Password Enabled

When this option is selected, a password is required to program a receiver via the download mode (a password is always required to program via OTA).

### NOTE

If this option is selected, the receiver password must be logged and tracked by the customer. Motorola does not assume any responsibility for lost or forgotten passwords.

### e. "Dead" Receiver

If the download procedure is attempted with the wrong password eight times, the receiver is rendered "dead" and disabled. The CMOS support module (U2) will have to be replaced. One successful download with the proper password (before the receiver is "dead") resets the download count.

## 12. PRINTER OPTIONS

### a. Printer Enabled

With this option selected, the incoming message is sent to the printer after the receiver receives it, and the print one and print all icons are displayed. A linefeed is sent to the printer at the beginning and end of the message.

### b. Printer Baud Rate Selection

The baud for printer output can be selected for 300, 600, 1200, 2400, 4800, or 9600 bps. However, download is always 9600 bps regardless of this option.

### c. Printer Message Formatting

The ADVISOR message receiver can format alphanumeric messages for printing with 0, 20, 40, 60, or 80 characters per line. A linefeed is sent to the printer after the selected number of characters. If 0 (None) is selected, the ADVISOR message receiver does not format the message and a linefeed is sent to the printer only at the beginning and end of the message. The date and time stamp is also printed.

# THEORY OF OPERATION

## 1. INTRODUCTION

The ADVISOR alphanumeric message receiver consists of a radio frequency (RF) section and a microcomputer-controlled decoder section. A message is received via an RF carrier that is frequency-modulated by a coded binary sequence. The circuits in the RF section perform the RF to intermediate-frequency (IF) conversions and frequency demodulation. The decoder section processes the coded data using digital techniques, and controls the message memory, liquid crystal display (LCD), and alert tones depending on the model and type of message received.

## 2. GENERAL CIRCUIT DESCRIPTION

### a. Power

Operating power for both the receiver and decoder boards is obtained from the battery. On the receiver board, a 1-volt regulator supplies the RF circuitry with power. The decoder board receives its power from the battery and generates 3.1 volts, 5.2 volts, and -3.0 volts. The 3.1 volts is generated by the linear support module and supplies the microcomputer, CMOS support module, I/O expander, RAM, and display module. The -3.0 volts and 5.2 volts are also generated by the voltage multiplier module to supply the proper biasing to the liquid crystal display.

### b. Basic Receiver Circuit Description

As shown in Figure 2, the basic receiver circuits consist of the five receiver board stages: first, the antenna and amplifier/preselector (Q351/Q451/Q452/Q551/Q552) receives, amplifies, and filters the RF paging signal. Next the mixer (Q352/Q453/Q555) converts the RF paging signal to an intermediate frequency. Then the crystal filter (FL351/FL452/FL552) attenuates the signal above and below the RF carrier. The oscillator/multiplier (Q353/Q454/Q455/Q553/Q554) supplies the appropriate RF signal to convert the RF paging signal to the correct intermediate frequency. Finally, the IF/demodulator (U351/U451/U551) amplifies, filters and mixes the appropriate intermediate frequency to produce a 455 kHz second IF and demodulates the signal to retrieve the data. It also contains the voltage regulator, current reference, and low battery detection circuits.

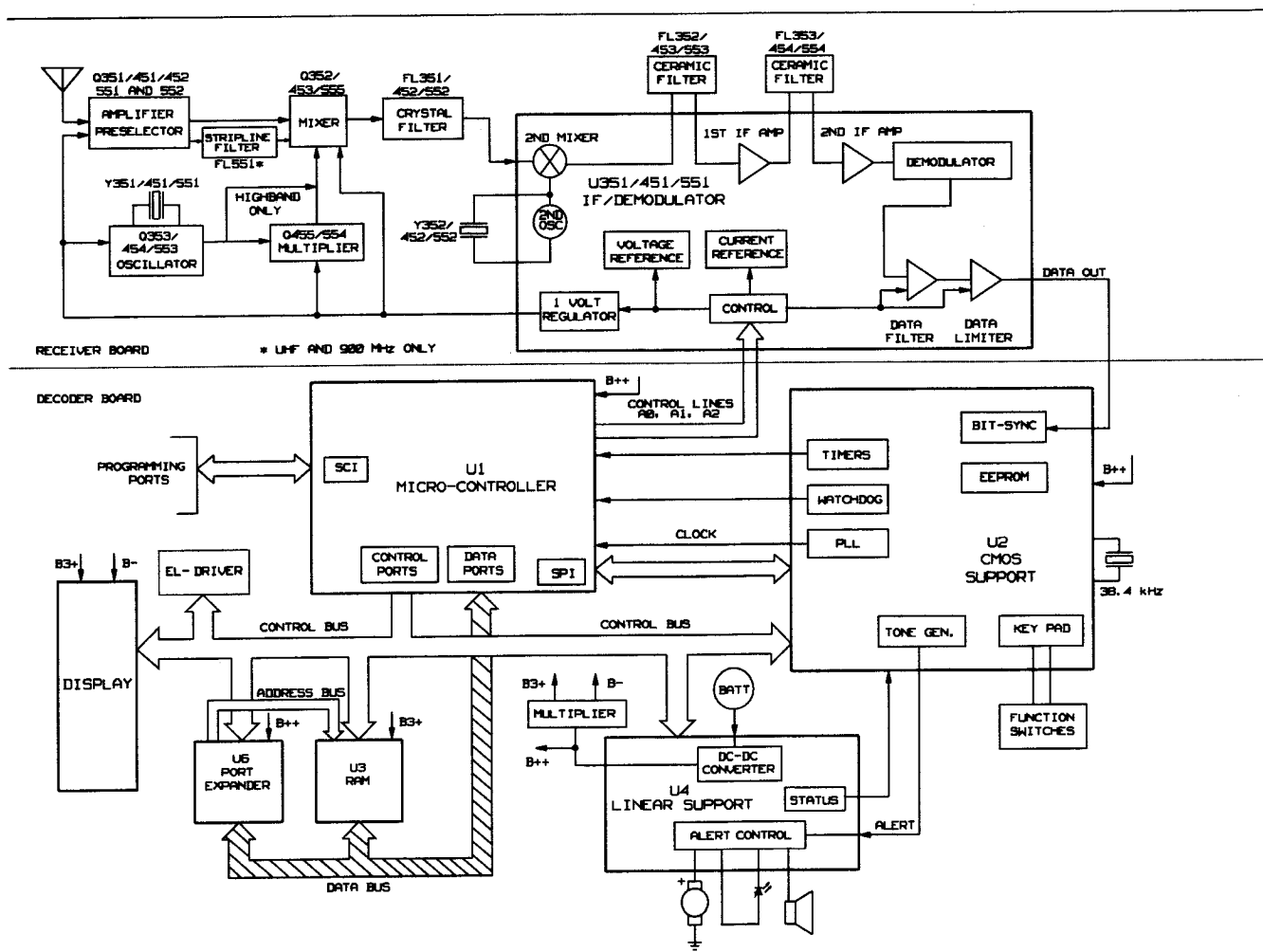


Figure 2. Functional Block Diagram

CGPB-902614-C

### c. Decoder Section

The decoder section consists of seven main functional blocks:

- Linear support module (U4)
- CMOS support module (U2)
- Microcomputer module (U1)
- I/O expander module (U6)
- RAM module (U3)
- Voltage multiplier module (U7)
- Display module

#### (1) Linear Support Module

The linear support module (U4) generates a boosted dc voltage for the microcomputer, CMOS support, I/O expander, and voltage multiplier. It can initiate the microcomputer program by generating a reset signal when the operating voltage for the decoder is below 2.7V. Other circuitry included on the linear support consists of:

- A circuit that alerts the microcomputer when the primary cell is removed
- A transducer driver, vibrator driver, and LED driver. The audio alert driver level is controlled by the linear support input lines
- An interface circuit for the voltage multiplier

#### (2) CMOS Support Module

The CMOS support module (U2) contains a 256-byte EEPROM, programmed with the options and address codes to which the receiver responds.

The CMOS support also contains a crystal oscillator circuit which operates with an external 38.4 kHz quartz crystal. This oscillator is used to clock the microcomputer. A frequency synthesizer in the CMOS support can be selected to clock the microcomputer during data decoding periods.

The CMOS support contains a bit synchronizer and an 8-bit accumulator for receiving the RF data. This circuit off-loads the microcomputer for accumulating and synchronizing the incoming RF signals.

The CMOS support communicates with the microcomputer via the Serial Peripheral Interface (SPI). The SPI consists of a Clock line (U2 pin 6), a Slave-Data-In line (U2 pin 7), a Slave-Data-Out line (U2 pin 8), and a Slave Select line (U2 pin 9). A typical SPI access is shown in Figure 3. Other circuitry within the CMOS support includes:

- An alert generator which supplies the 3.2 kHz audible alert tone during power up and alert periods
- A keypad encoder to detect switch closures
- Three modulo timers used to generate microcomputer interrupts for data decoding

#### (3) Microcomputer Module

The microcomputer (U1) controls the overall operation of the decoder. Each time the receiver is turned on, it reads the contents of the EEPROM and generates the power up sequence.

The microcomputer consists of: a microprocessor, read-only memory (ROM), random access memory (RAM), and input/output lines (I/O). The program in ROM controls the receiver circuits—powering them up and down at the proper times, decodes the binary information received, stores the received message in external RAM module U3, and controls

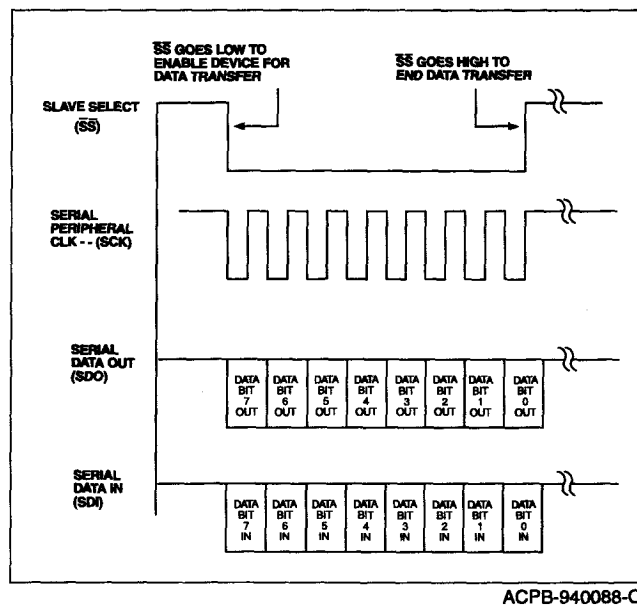


Figure 3. Typical SPI Access

both the supply voltage of the RAM and display module. It also processes user inputs from the keypad and generates the display screens.

#### (4) I/O Expander Module

The I/O expander (U6) is used to address the message memory RAM (U3). It also drives the control lines for the linear support module, controls the backlighting circuit, and controls the display module. It receives inputs from the microcomputer and sets the appropriate outputs as instructed.

#### (5) External RAM and Display Modules

The external RAM (U3) is either an 32K\*8 or an 8K\*8 static random access memory. It receives the message data from the microcomputer when the receiver's address is detected. It is configured read or write, as the data must be retrieved by the microcomputer to display the message.

The display module receives data for display from the microcomputer. The data is stored in RAM circuitry on the display driver ICs. A 20 kHz oscillator on the display module clocks the display driver circuitry and provides timing signals for the various LCD drive levels.

#### (6) Voltage Multiplier Module

The voltage multiplier module (U7) provides operating voltage for the display module. It boosts the 3.1V B++ voltage to approximately 5.2V and inverts the B++ to -3.0V. The 5.2V and -3.0V provide 8.2 Vdc for bias of the liquid crystal display. It is controlled by the microcomputer and is turned on only when access to the RAM and/or the display module is required.

#### (7) Data Bus

The heart of the decoder is the eight-bit data bus. All data transfers to and from the microcomputer are done along the data bus. The microcomputer controls the I/O expander, sends data to and retrieves data from the external RAM, and sends commands to the display module via this bus.

#### (8) EL Backlight

The electroluminescent (EL) display backlight is controlled by the microcomputer. When the Function button is

pressed and held for more than one second, the microcomputer turns on the EL backlight. The backlight remains on until the display goes into the blank mode or until the Function button is pressed and held for more than one second.

#### (9) Backup Battery

The memory backup battery (BT2) is used to preserve the contents of the message memory and real-time clock information during primary cell changes. All memory and time data is retained in the receiver for 15 minutes after the primary cell is removed. The receiver cannot power up without a primary cell in the receiver. Turn the receiver off before removing the primary cell. The circuitry present in the receiver prevents loss of memory when the primary battery is removed before the receiver is turned off. However, turn it off beforehand.

### 3. POCSAG PAGING FORMAT, CODE AND CODE CAPACITY

(Refer to POCSAG Paging Format, Figure 4)

#### a. General

The basic signaling pattern used in the ADVISOR message receiver is a sequence of coded binary data using the Post Office Code Standardization Advisory Group (POCSAG) code. The POCSAG code is a synchronous paging format that allows pages to be transmitted in a single batch structure. The POCSAG code provides improved battery-saving capability and an increased code capacity.

The POCSAG code format consists of a preamble and one or more batches of codewords. Each batch comprises a 32-bit frame synchronization code and eight 64-bit address

frames of two 32-bit addresses or idle codewords each. The frame synchronization code marks the start of the batch of codewords.

#### b. Preamble Structure

The preamble, shown in Figure 4, consists of 576 bits of an alternating 101010 pattern transmitted at a bit rate of 512, 1200, or 2400 bps. The decoder uses the preamble both to determine if the data received is a POCSAG signal and for synchronization with the stream of data.

#### c. Batch Structure

A batch consists of a frame synchronization code followed by 8 frames of two address codewords per frame (16 address codewords per batch). To maintain the proper batch structure, each frame is filled with either two address codewords, two idle codewords, two message codewords, or any appropriate combination of the three codeword types.

#### d. Frame Synchronization Code Structure

The frame synchronization (FS) code is a unique, reserved word that is used to identify the beginning of each batch. The FS code comprises the 32 bits:

01111100110100100001010111011000.

#### e. Optional Alternate Frame Synchronization Codewords

An alternate frame synchronization (AFS) code can be selected to support special systems or systems requiring increased coding capability. The AFS is generated in the same manner as an address codeword (i.e., BCH codeword with parity bits).

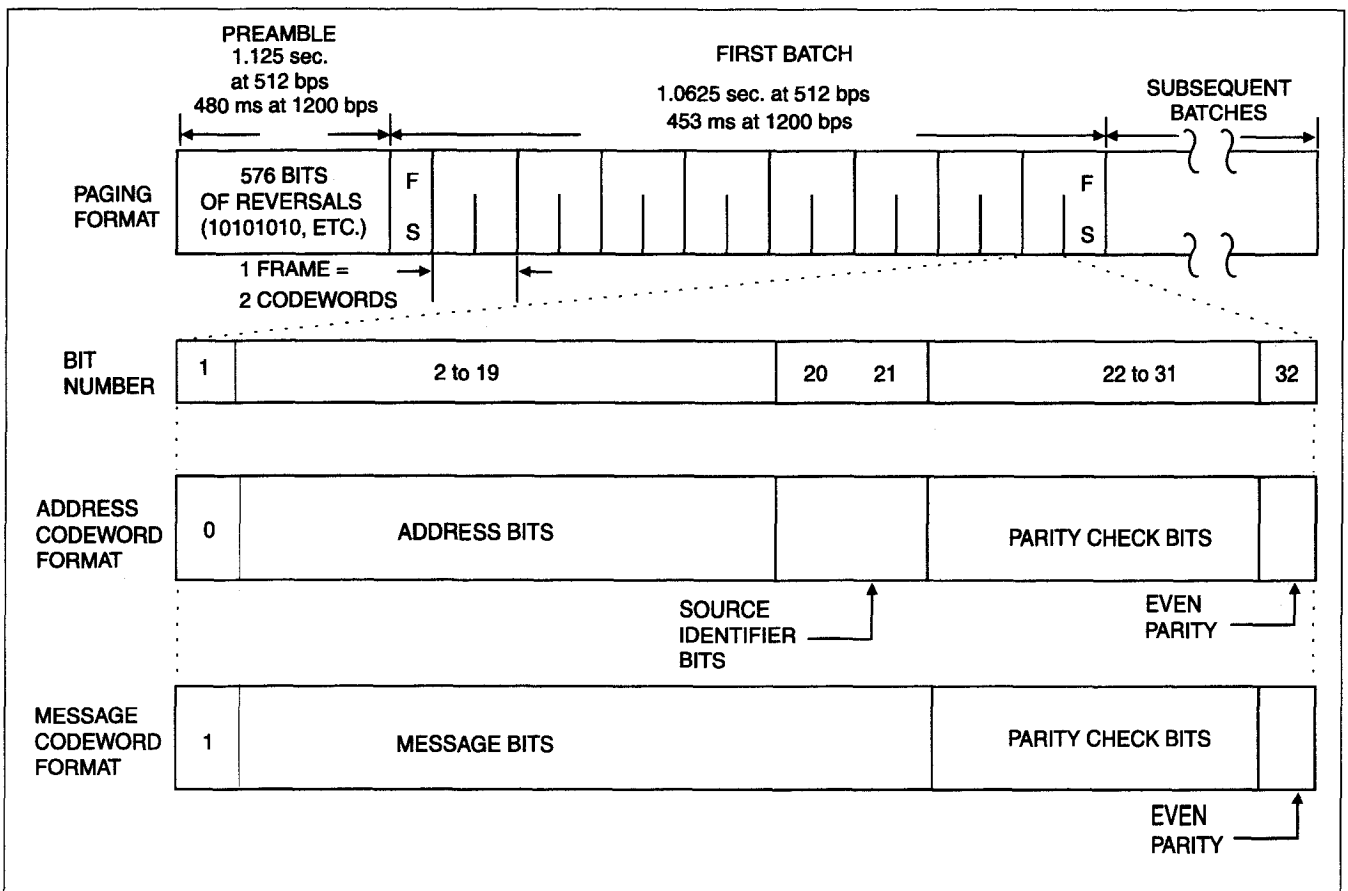


Figure 4. POCSAG Paging Format

ACPB-900615-0

The POCSAG signaling standard has reserved special codewords for the AFS from 2,000,000 to 2,097,151. The use of the AFS requires the paging system to support the AFS. The AFS changes to frame 0 on the programmer since no frame information is included in the AFS. The AFS use address 1 so bits 20 and 21 are 0. (Refer to the Description section of this manual.)

#### f. Address Codeword Structure

The structure of an address codeword is shown in Figure 4. An address codeword's first bit (bit 1) is always a zero. Bits 2 through 19 are the address bits. The receiver looks at these bits to find its own unique address. Each POC-SAG codeword is capable of providing address information for four different paging sources (Address 1 through Address 4). These addresses are determined by combinations of the values of bits 20 and 21 (the source identifier bits); these combinations are shown in Table 1. Bits 22 through 31 are the parity check bits, and bit 32 is the even parity bit.

**Table 1. Paging Source Address Combinations**

	Bit 20	Bit 21
Address 1	0	0
Address 2	0	1
Address 3	1	0
Address 4	1	1

The codeplug contains three bits that identify the frame location within each batch where the receiver looks for its address.

Power is removed from the receiver during all frames other than the precoded one, thus extending battery life.

#### g. Optional Dual-Frame Operation

Two different frames can be selected on the ADVISOR message receiver. This allows for more addresses on the receiver. Selecting this option degrades battery life because the receiver is on for the additional address frame. (See the Description section in this publication.)

#### h. Code Capacity

The combination of the codeplug's three pre-coded frame location bits and the address codeword's 18 address bits provides over two million different assignable codes. In this combination, the frame location bits are the least significant bits, and the address bits are the most significant.

#### i. Message Codeword Structure

The structure of a message codeword is shown in Figure 4. A message codeword always starts with a 1 in bit 1 and always follows directly after the address. Each message codeword replaces an address codeword in the batch.

#### j. Idle Codeword Structure

The idle codeword is a unique, reserved codeword used to take the place of an address in any frame that would not otherwise be filled with 64 bits.

Thus, if a frame contains only an address, an idle codeword is added to complete the 64-bit frame. The idle codeword comprises the following 32 bits:

01111010100010011100000110010111.

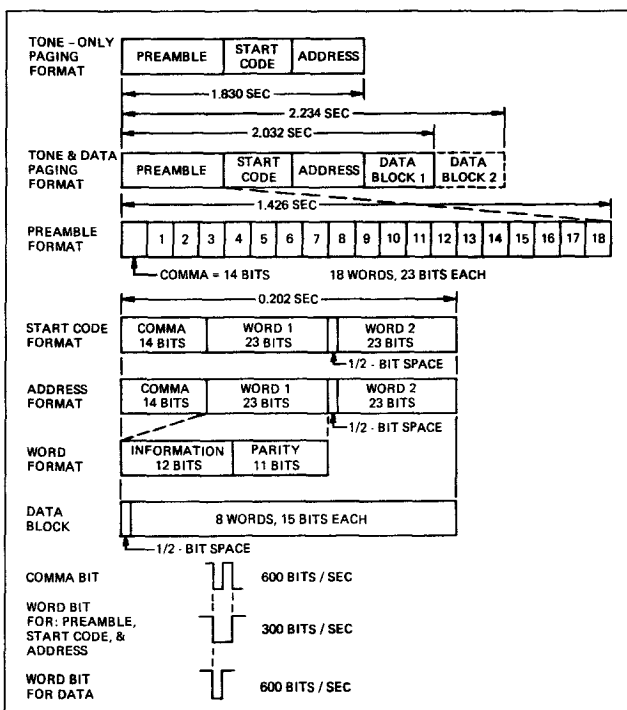
## 4. GSC PAGING FORMAT, CODE, AND CODE CAPACITY

(Refer to GSC Paging Format, Figure 5)

### a. General

The Golay Sequential Code (GSC) is an asynchronous paging format that allows pages to be transmitted individually or in batches and accommodates tone only and tone and data paging. It also provides improved battery-saving capability and increased code capacity.

The single cell address format consists of a preamble, a start code, and an address code. Receivers within the system are divided into groups via the preamble. This improves battery life as well as differentiate GSC transmissions from other coding schemes. The preamble also facilitates channel sharing without sacrificing battery life or false call integrity. The start code marks the end of the preamble and supplies timing information for batch mode decoding. The address code uniquely identifies each receiver. The batch mode of operation allows a string of addresses to be transmitted following the start code. Maximum throughput of receivers is achieved in the batch mode.



AEPF-11410-O

**Figure 5. GSC Paging Format**

### b. Preamble Structure

The preamble, shown in Figure 5, consists of a 14-bit comma followed by 18 identical 23-bit words. (Ten preambles divide the population of receivers into groups.) The comma is a 1,0 bit reversal pattern (squarewave) transmitted at 600 bits per second. The starting comma bit must have the same polarity as the first bit of the following word. The polarity of the preamble identifies the transmission mode (individual or batch).

### c. Start Code

The start code, shown in Figure 5, consists of 14-bit comma followed by two (23, 12) code words. The two Golay

code words (word 1 and word 2) are separated by a 1/2-bit space. The polarity of the 1/2-bit space is always the opposite of the first bit of the second word. Each word contains 12 information bits followed by 11 parity bits. In this application, the parity bits are those added to the information bits to assure that one word is not mistaken for another. Transmission time for the start code, including the comma, is 202 milliseconds (ms).

#### d. Address Structure and Code Capacity

The address format is identical to the start code format regarding the number of bits, the rules for comma, and the 1/2-bit space. The address word 2 code set consists of approximately 2,000 words and their complements, whereas the word 1 code set is limited to 50 words and their complements. The unique word 1/word 2 combination, selected from the two code sets, together provides for 100,000 GSC codes. The preamble word is selected from a code set of 10. Ten preamble codes along with 100,000 GSC codes provide a total of 1,000,000 assignable codes. The start code is always the same and common to every receiver in the system and is therefore not a factor in determining code capacity. Code capacity is a direct function of the preamble and the address.

Each GSC code is capable of providing four different addresses. The decoder can detect two binary words and it can also detect the inverse or complements of those words. Inverse binary words are created by substituting 1s for 0s and 0s for 1s within the binary string. The first of the four addresses is defined by the unique word 1/word 2 combination derived from GSC code. Three more addresses are created by inverting one or both of the binary words as shown in Table 2. The ADVISOR receiver is capable of responding to two different preambles, each of which can be assigned two codes, making it possible for a single receiver to be assigned up to 16 addresses.

**Table 2. GSC Receiver Address Combinations**

Address 1 - Word 1, Word 2
Address 2 - Word 1, Word 2
Address 3 - Word 1, Word 2
Address 4 - Word 1, Word 2

Up to four GSC codes are assigned to each receiver. Each GSC code is designed by a six-digit decimal number,  $IG_1G_0A_2A_1A_0$ , where I = Preamble Index,  $G_1G_0$ =Group Digits,  $A_2A_1A_0$ =Address Digits. These same numbers are used by test encoders and codeplug programmers to specify the receiver address. The numbers on the codeplug do not necessarily agree with the receiver cap code, since the cap code is a function of the system implementation. Ensure the code number listed on the codeplug is used when troubleshooting the receiver.

#### e. Batch Operation

The batch transmission format begins with an inverted preamble followed by the start code and up to 16 receiver addresses or data blocks. The extended batch scheme extends the batch mode in multiples of 16 addresses without requiring the retransmission of the preamble. Maximum throughput of receivers is possible with this mode. The batch mode of operation is the preferred method of address transmission for tone and data pages, although the single address

mode can be used. During high traffic periods, the extended batch mode can be used.

## 5. DETAILED CIRCUIT DESCRIPTION

(Refer to schematic diagram in applicable receiver supplement.)

#### a. Battery Voltage, Voltage Multiplier, Battery Saver Strobe Circuits

When the receiver is searching for preamble or data, the microcomputer first resets the data limiter counters of the 455 kHz if/demodulator module (U351/U451/U551) on the receiver board by setting the U351/U451/U551 status select lines A2, A1, A0 (U351/U451/U551 pins 28, 29, and 27, respectively) to logic 1, 1, 0 (see Table 3). This activates the internal voltage regulator of U351/U451/U551, which supplies power to the receiver's RF amplifier and oscillator sections. U351/U451/U551 is held in this state for approximately 8 ms so the receiver circuitry can stabilize. The U351/U451/U551 status select lines are then set by the bps POCSAG,  $A_2A_1A_0 = 010$  for 1200 bps POCSAG, or  $A_2A_1A_0 = 100$  for 2400 bps POCSAG) and the data limiter of U351/U451/U551 begins to track incoming data and sends binary data to the decoder.

**Table 3. U351/U451/U551 Control Line Function**

A2 LINE	A1 LINE	A0 LINE	DATA FILTER BANDWIDTH F - 300Hz	UPIO LINE	FUNCTION
1	1	1	-	-	OFF
1	1	0	f	LB	RESET
1	0	1	f	LB	HOLD1
1	0	0			Not Used
0	1	1	f	DATA	TRACK1
0	1	0	2f	DATA	TRACK2
0	0	1	3f	DATA	TRACK3
0	0	0			Not Used

OFF - U351/U451/U551 inactive, receiver circuits disables.  
 RESET - Resets data limiter counter thresholds for determining a logic 1 or a logic.  
 HOLD - Holds counter for determining logic 1 or logic 0 in their present state.  
 TRACK - Allows the data limit counters to follow the extremes of the recovered audio.  
 When the UPIO line - LB, a logic 1 indicates a good battery; a logic 0 indicates a low battery.

The receiver waits for a logic 1 and a logic 0 to occur first. This allows U351/451/551 to set the data limiter counter thresholds for determining whether a logic 1 or 0 is being received.

In POCSAG receivers, the receiver begins to search for its baud rate. If the receiver's baud rate is not detected within 32 bit times (62.5 ms for 512 bps POCSAG, 26.7 ms for 1200 bps POCSAG, and 13.3 ms for 2400 bps POCSAG) the /551 status select lines to  $A_2A_1A_0 = 111$  (after first changing to the 101 state for approximately 200 ms to check the low battery status) to disable the internal voltage regulator of U351/U451/U551 and remove the power to the receiver circuits.

In GSC receivers, the receiver searches for up to 151 ms for preamble.

This sequence is repeated every 1.000 seconds for 512 bps POCSAG, every 427 ms for 1200 bps POCSAG, and every 213.5 ms for 2400 bps POCSAG.

When the presence of preamble is detected by the receiver, the data limiter of U351/U451/U551 is held in the TRACK state by the microcomputer. This action keeps the receiver on so the CMOS support (U2 on the decoder board) can detect the frame synchronization code (FS) on pin 25. When FS is detected, and the receiver is not a frame 0 receiver, the microcomputer first sets A<sub>2</sub> A<sub>1</sub> A<sub>0</sub> to 1 0 1 (HOLD) for 200  $\mu$ s to check the low battery status. This action also saves the values of the data limiter thresholds so they do not need to be required when decoding resumes. The status select lines are then set to A<sub>2</sub> A<sub>1</sub> A<sub>0</sub> = 1 1 1, which turns off the receiver. The status select lines remain high until the frame occurs in the batch (the receiver's frame is determined by the frame bits contained in the address codeword the receiver reads this information from the codeplug when it powers up). If the receiver is a frame 0 receiver, the microcomputer holds U351/U451/U551 in the TRACK state since its frame occurs immediately following FS.

In GSC receivers, the receiver searches for its address in every frame of a given batch.

When the receiver's frame occurs in the batch, the microcomputer sets U351/U451/U551 status to HOLD (A<sub>2</sub> A<sub>1</sub> A<sub>0</sub> = 1 0 1) to maintain the previous data limiter thresholds attained when FS was detected. U351/U451/U551 is held in this state for approximately 8 ms so that the receiver circuitry can stabilize; then the microcomputer sets U351/U451/U551 to TRACK, begins to monitor the information in the frame, and determines if its address has been sent. If the receiver does not detect its address, the microcomputer disables the receiver until the next FS is expected to occur in the batch. If two consecutive expected occurrences of FS are not found, the receiver resumes normal battery-saving operation. If the correct address is detected, the receiver remains in TRACK until all of the incoming data following the address is decoded. The microcomputer then disables the receiver until the next FS is expected to occur in the batch. If FS is not found, the receiver resumes normal battery-saving operation.

#### **b. Antenna (E351) and RF Amplifier (Q351), High-Band VHF Receivers**

The antenna system for the high-band VHF receiver is formed by ferrite loop E351 which resonates with the capacitor array (C351A-B-C-D-E) and adjustable capacitor C352. Matching the antenna impedance to the input of RF amplifier Q351 is performed by fixed capacitors C353 and C354. By adjusting C352, the antenna can be tuned to the receiver's operating frequency.

The RF signal is coupled through C353 to the input of RF amplifier Q351. Due to the input characteristics of the RF amplifier, negative static discharge pulses could damage the amplifier. The protective diode, CR351, becomes forward biased with negative voltage and clamps the discharge to ground.

Neutralization of the RF stage is accomplished by feeding a portion of the signal developed across C355, C360, and L352 back to the base of Q351 via the parallel combination of C356 and R351. Resistors R351 and R352 provide dc bias stability for Q351.

The amplified signal from the collector of Q351 is passed through coupling capacitor C361 via a tuned circuit consisting of C363 and coil L353 which provides impedance matching to the base of the first mixer, Q352. The antenna circuitry, together with the two tuned circuits formed by C360 with L352 and C363 with L353, provide image and spurious response protection.

#### **c. Antenna (E451), RF Amplifier (Q451 and Q452), and Helical Filter (FL451), UHF Receivers**

The antenna system for the UHF receiver is formed by a single loop (E451) with a series adjustable capacitor (C451). Matching the antenna impedance to the input of the RF amplifier (Q451) is performed by capacitors C452, C453. By adjusting C451, the antenna can be tuned to the operating frequency of the receiver.

The RF signal is coupled through C453 to the input of RF amplifier Q451, Q452. Due to the input characteristics of the RF amplifier, negative static discharge pulses could damage the amplifier. A protective diode, CR451, becomes forward biased with negative voltage and clamps the discharge to ground. The RF signal is then amplified approximately 14 dB by Q451 and Q452. Q451 and Q452 form a cascoded amplifier by dc coupling. Resistors R451 and R452 provide dc bias stability for the RF amplifier.

The amplified signal from the collector of Q452 is passed through coupling capacitor C458 via a pretuned helical preselector (FL451) which is used for the entire bandsplit of 20 MHz maximum. This signal is then applied to the mixer (Q453) input base via a 50-ohm matching circuit consisting of C459, L453, C460, and a helical preselector.

#### **d. Antenna (E551) and RF Amplifier (Q551, Q552) 900 MHz Receivers**

The antenna system for the 900 MHz receiver is formed by the metal loop E551 in series with capacitor C551 and adjustable capacitor C552. Capacitor C553 matches the antenna impedance to 50 ohm and C556 and C557 match 50 ohm into the RF amplifier. By adjusting C552, the antenna can be tuned to the receiver's operating frequency.

The signal out of C557 is injected into a 2-stage common base amplifier (Q551 and Q552) which typically has 13 dB gain. The first stage has about 8 dB of gain and the second stage about 5 dB. This topology affords a stable design without the need for neutralization as well as a reasonable input impedance level (50 ohm). The input of Q551 (the emitter) has a broadband match which optimizes the stage noise figure. The output of this stage is matched to the input of the second stage with an interstage match (L556 and C559). The output of the 2nd stage is a high-Q node. This node provides 15 dB of image rejection as well. The output of this stage is matched to 50 ohm using C564.

The signal out of the RF amplifier is filtered by FL551. This filter is a 2-pole ceramic filter made out of a high-dielectric material. This filter affords 30 dB of rejection of the image signal at about 840 MHz.

#### **e. High-Conversion Circuit, High-Band VHF Receivers**

In the high-conversion circuit, the amplified RF signal is applied to the base of mixer transistor Q352. Also appearing is the injection signal generated in first oscillator Q353, which is controlled by crystal Y351. Crystal Y351 operates



in the 43.5667 to 64.3495 MHz range, depending on the RF carrier being received. Tuning of Q353 is done by L356 and L357. These tuning adjustments are peaked to provide maximum injection to the mixer, Q352. Coil L354 can then be adjusted to keep the injection signal on frequency as the adjustment for crystal Y351.

Two RF signals are fed into the mixer at TP2; the first oscillator signal and the RF carrier signal. The output from the high-conversion circuit is taken from the collector of Q352. Four RF signals are present: 1) the RF carrier signal; 2) the third harmonic (second harmonic for frequencies below 148.600 MHz) of the first oscillator; 3) the sum; and 4) the difference of these two signals. The difference signal is 17.900 MHz.

The IF signal at the collector of mixer Q352 passes through tuned circuit L354 and C364, which also acts as impedance matching for filter FL351.

#### **f. First Oscillator (Q454) and Multiplier (Q455), UHF Receivers**

The local oscillator signal ( $f_o$ ) is derived from a crystal-controlled oscillator circuit using crystal Y451 as a reference. Crystal Y451 is a highly stable device over temperature ( $\pm 5$  ppm) and operates at approximately 50-62 MHz. Capacitor C468 is selected to provide temperature compensation as determined by the crystal temperature characteristics and coil L455 is used to set the receiver to operate at the correct channel frequency. Transistor Q454 provides the gain needed for oscillation and the 3rd or 4th harmonic ( $3f_o$  or  $4f_o$ ) output of Q454 is injected into the multiplier.

The multiplier stage consists of a 2-pole filter, a common-emitter transistor (Q455), and a 2-pole output filter. The input filter consists of circuits L457, C469, C470, L458, C471, C472, and C473. These circuits pass the 3rd or 4th oscillator harmonic while attenuating all others. The filtered signal is then injected into the base of Q455. The signal at the collector of Q455 is filtered by L459, C475, C476, L460, and C477, which are tuned to the 6th or 8th harmonic ( $6f_o$  or  $8f_o$ ) of the oscillator (input  $\times 2$ ). Capacitor C471 adjusts for tolerances of the input filter components and Q455. The signal at this point is injected into the first mixer.

#### **g. First Mixer (Q453), UHF Receivers**

The signal out of filter FL451 is injected into the base of the mixer transistor Q453 via 50 ohm matching circuit C459, C460 and L453. Q453 is a static sensitive part—handle with the proper static precautions. The output of the mixer is matched to the crystal filter (FL452) with components C463, C464, L454, and R456. Tuning capacitor C463 adjusts for part tolerances in both the output match components and the crystal filter. The resulting mixer power gain is typically 10 dB, but since the impedance levels at its input and output are different, its voltage gain is 25 dB. Injection of LO signal into the mixer is accomplished with C478. The LO drive causes the mixer collector voltage to drop typically 20 mV with injection (worst case is 5 mV).

#### **h. First Oscillator (Q553) and Multiplier (Q554), 900 MHz Receivers**

The local oscillator signal ( $f_o$ ) is derived from a crystal controlled oscillator circuit using crystal Y551 as a reference. Crystal Y551 is a highly stable device over temperature and operates at 75.925 to 76.175 MHz. Capacitor C567 is

selected to provide temperature compensation as determined by the crystal temperature characteristics (a 4-level color code). It is important the crystal-capacitor-matched combination be maintained. (See receiver supplement for more information.) An adjustment circuit consisting of L560 and L561 is used to set the receiver to the correct channel frequency. Transistor Q553 provides the gain needed for oscillation and the 4th harmonic ( $4f_o$ ) output of Q553 is injected into the multiplier via C569.

The multiplier stage consists of a 2-pole input filter, a common-emitter transistor (Q554), and a 2-pole output filter. The input filter consists of circuits L562, C568, C569, L564, C570, and C572. These circuits pass the 4th oscillator harmonic while attenuating all others. The filtered signal is then injected into the base of Q554. The signal at the collector of Q554 is filtered by L565, C574, C575, and C576, which are tuned to the 12th harmonic ( $12f_o$ ) of the oscillator (input  $\times 3$ ). Capacitor C572 adjusts for tolerances of the input filter components and Q554. The signal at this point is injected into the first mixer.

#### **i. First Mixer (Q555), 900 MHz Receivers**

The signal out of filter FL551 is injected into the base of the mixer transistor Q555 and capacitor C578. Q555 is a static part, handle with the proper static precautions. The mixer input is matched to the filter with the network consisting of C578, C579, and L567. This network also provides 5 dB of image rejection. Inductor L567 is used to supply bias to Q555. The output of the mixer is matched to the crystal filter (FL552) with components C596, C599, L568, and R559. The resulting mixer power gain is typically 10 dB, but since the impedance levels at its input and output are different, its voltage gain is 25 dB. Injection of LO signal into the mixer is accomplished with C577. The LO drive causes the mixer collector voltage to drop typically 20 mV with injection (worst case is 5 mV).

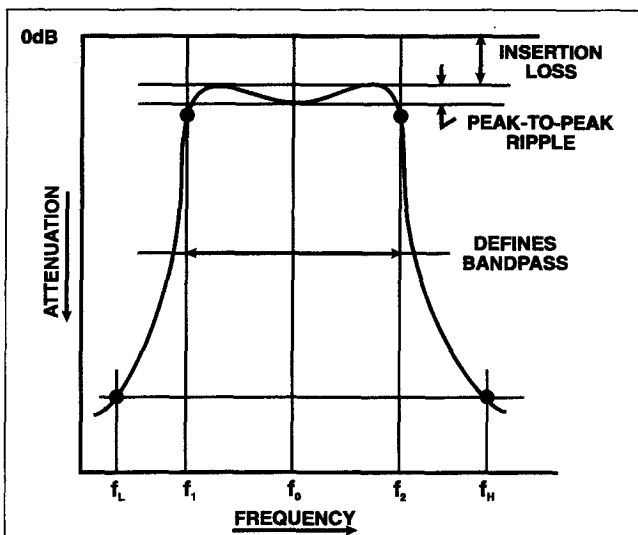
#### **j. Two-Pole Crystal Filter (FL351, FL452, FL552)**

The two-pole crystal filter is a very high-Q bandpass filter, resonant at the IF frequency. Depending on the frequency of the carrier, the IF frequency is 17.900 MHz or 45.000 MHz. While this description applies to both frequencies, only the 17.9 MHz signal is discussed.

The high-conversion output contains frequencies other than the desired 17.9 MHz. The very narrow bandpass filters out the signals above and below 17.9 MHz.

Figure 6 illustrates a typical bandpass filter response for a crystal filter. The figure illustrates a center frequency ( $f_o$ ) of 17.9 MHz. If a signal deviates 6 kHz above and below the center frequency, the crystal rejects signals less than 17.894 MHz ( $f_1$ ) or greater than 17.906 MHz ( $f_2$ ). The figure also shows the area between  $f_1$  and  $f_2$  (the bandpass) as having the lowest amount of rejection. Peak-to-peak ripple is the dB attenuation of the bandpass. The lowest loss, at ripple, is the insertion loss. For VHF, tuned circuit R355-L354-C364, along with the input circuit R358-L358-C371 to the second mixer, provides the IF output of the filter. This signal is

applied to the low-conversion and demodulation module, U351/U451/U551.



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Figure 6. Typical Bandpass Filter Response

#### k. Low-Conversion/Demodulation Module (U351/U451/U551)

The first IF signal from filter FL351/FL452/FL552 couples to the second mixer at pin 14 of low-conversion module U351/U451/U551. It mixes with the second oscillator frequency for an output of 455 kHz.

The second oscillator is a crystal-controlled unit (Y352/Y452/Y552). There are no peaking or tuning adjustments. The output of the second oscillator is coupled to the second mixer by feedback network C372-C373-C374 for VHF, and C549-C544-C545 for 900 MHz. (Second oscillator coil L462 for UHF is required to provide the needed third overtone.)

Output of the second oscillator must be 455 kHz above or below the first IF. Output of the second mixer (second IF) is routed through ceramic filters FL352/453/553 and FL353/454/554 and two internal IF amplifier stages. This further reduces the unwanted signals and provides better adjacent channel selectivity.

Output of FL353/454/554 is connected to test point M1 which is used to monitor the signal level from the stages prior to this point. It is valuable for tuning and troubleshooting. After the second IF amplifier, the signal is applied to the audio demodulator.

After demodulation, the audio is routed to a switchable low-pass filter network whose bandwidth is determined by the filter capacitors C382/482/582 and C383/483/583 and the status select lines A2 A1 A0 (pins 28, 29, and 27, respectively). The signal is then applied to the data limiter stage of U351/451/551. The status select lines also control the state of the data limiter and the function of pin 30 (UPIO). See Table 3 for status select line functions.

The data limiter produces a squarewave output on the UPIO line (unless a low battery output is selected), representative of the binary coded signal.

#### l. Decoder Section

There are six basic modes in which the decoder section operates:

- Power up
- Page search
- Message storage
- Display
- Off
- Memory retention

##### (1) Power Up

Two modes of power up can exist in the receiver. First, if a primary cell is inserted in the receiver with the B++ level at or below the minimum operating voltage for the microcomputer, the linear support module issues a reset to the CMOS support which in turn resets the entire decoder. The linear support boosts the primary battery voltage to generate the 3.1 V B++ supply for the decoder, and the microcomputer executes its initialization code. The peripheral circuits are initialized, the contents of the EEPROM are read from U2, a power up alert is issued, and the receiver enters the page search mode.

If the receiver is off and the primary cell is inserted with the B++ level at or above 2.6 V (the minimum operating level for the microcomputer), the power up alert is not generated and the receiver is turned on by pressing the On/Reset button.

A normal power up occurs when the receiver is turned on and the primary cell is in the receiver. This is the situation for the life of the primary cell. When the On/Reset button (S4) is pressed, the microcomputer checks to ensure a primary cell is present and proceeds with a power up alert, then enters the page search mode. If no primary cell is present, the receiver does not power up.

##### (2) Page Search

This is the main operating mode of the receiver. This mode includes the battery-saving and data decoding modes. During battery saving intervals, the microcomputer is in a low speed, low power mode. The CMOS support (U2) interrupts the microcomputer every 15.65 ms for 512 baud POC-SAG, 6.7 ms for 1200 baud POC-SAG and GSC, and 3.33 ms for 2400 baud POC-SAG. The microcomputer instructs the CMOS support, via pin PC4, to shift the clock frequency to 1.2288 MHz from the slower 38.4 kHz. The processor does some timing maintenance and checks for button depressions; it slows down after approximately 0.6 ms. Every 125 ms, the processor stays in the high speed mode long enough to do additional internal timing maintenance.

When a button is pressed, the processor brings either pin 20 or pin 21 of U2 low. U2 decodes which switch has been pressed and latches the switch data into an internal register. This register is then read by the microcomputer on the next interrupt. During battery saver intervals, the decoder is in the slow mode for approximately 95% of the time. The microcomputer counts the interrupts from U2, and when it is time for the battery saver interval to end, U2 interrupts the microcomputer and the decoder enters the data decoding mode.

In the data decoding mode, the receiver circuitry is turned on by asserting the proper signal levels on ports PA2, PA1, and PA0 (TP21, TP20, and TP19, respectively). If a page is detected, the microcomputer causes the decoder to enter the message storage mode. If no preamble, sync, or address is detected, the decoder turns off the receiver circuitry and

reverts to the battery saver mode (until the data decoding mode is necessary).

### **(3) Message Storage**

Once the receiver's address is detected, the decoder enters the message storage mode. The microcomputer immediately instructs U4 to turn on the voltage multiplier. This is done by setting the high volt signal high. The B+++ (TP15) is then boosted to approximately 5.2 V, and the Vlcd (TP11) is driven to -2.6 V. This supplies bias for the display driver module circuits. The microcomputer is busy decoding and storing a message. The microcomputer instructs the I/O expander to assert the proper address on U3. The microcomputer stores the data byte in U3. This is repeated until the entire message is stored. At that time, the decoder enters the display mode.

### **(4) Display Mode**

During the display mode, the microcomputer looks at the message data stored in U3, retrieves the appropriate character data from the internal ROM, writes the display data to the display ICs, and turns on the display. The display mode is entered by pressing either the Read, Function, or On/Reset button or automatically during receipt of an incoming message.

If the display mode is entered by pressing one of the buttons mentioned above, the microcomputer turns on the voltage multiplier. If the data is an alphanumeric message, the microcomputer reads the binary data in U3, looks up the appropriate character in its internal ROM, and outputs the data directly to the display module.

If the display mode is entered because of an incoming message, the microcomputer sends the data to the display module and turns the display module on. It then instructs U2 to send out the proper alert tone sequence to the linear support module U4. If an audible alert is selected, the microcomputer sets the proper audio levels by setting ports PC6 and PC7 on U6. These lines drive the audio control lines on U4. The audio level is changed according to the selected alert sequence. If Silent mode is selected, the microcomputer sets port PC 3 on U6 to a logic one, turning the linear support module's vibrator driver on. The LED flashes in all alert modes.

### **(5) Off Mode**

The receiver is turned off by pressing the On/Reset button twice from the standby (blank) screen. The "PUSH FOR OFF" screen displays an arrow pointing to the Function button. Press the Function button to turn the receiver off. The microcomputer turns off the display module, the voltage multiplier, the receiver circuitry if needed, and reverts to the slow clock mode. In this mode, the linear support module continues to boost the battery voltage to 3.1 V, retaining all messages and time and date information in memory. The microcomputer remains inactive until the On/Reset button is pressed to turn the receiver on.

### **(6) Memory Retention**

This mode is entered only when the primary cell is removed. U4 alerts the microcomputer, and, if necessary, the microcomputer shuts down all circuitry except the crystal oscillator. The backup cell (BT2) supplies the operating voltage for the entire decoder. Messages are retained in memory and the time and date is continually kept. This mode may be sustained for at least 15 minutes at room temperature. Some

decrease of this time can occur at higher operating temperatures.

Protection circuitry is present to prevent loss of messages if the primary cell is removed without turning the receiver off, but it is highly recommended the receiver be turned off first. If the primary cell is returned before three seconds elapse, the receiver reverts to the standby (blank) screen, without issuing an alert. If more than three seconds elapse, the receiver powers up as outlined above.

# MAINTENANCE

## 1. INTRODUCTION TO TROUBLESHOOTING METHODS

### a. General

The ADVISOR alphanumeric message receiver combines leadless component technology with a unique miniature design to provide a unit that lends itself well to serviceability. The receiver's circuitry is contained in two individual sections. One section is the receiver printed circuit board. The second section is the decoder printed circuit board, which includes a microcomputer and LCD driver module/LCD. To disassemble the receiver and remove the major assemblies, refer to the Disassembly Procedure in the applicable service manual.

### CAUTION

Leadless component technology requires the use of specialized equipment and procedures for repair and servicing. Irreparable damage to the receiver can result from service by unauthorized persons. Unauthorized attempts to remove or repair parts may void any existing warranties or extended performance agreements with the manufacturer.

### b. Corrective Maintenance

Corrective maintenance involves two basic procedures: localization/isolation of trouble, and replacing the defective component.

Localization of trouble to a defective circuit in the unit is most easily accomplished by performing the test procedures outlined in the subsequent paragraphs. Localization involves tracing the trouble to the defective circuit causing the abnormal operation. Isolation means tracing the trouble to a defective component within the localized circuit. Frequently, once the circuit is localized, the source of trouble can be isolated through visual inspection of component wiring.

Defining the problem is the most important step in the isolation of a malfunction. Inaccuracy of problem definition and unfamiliarity of operation can lead to the introduction of additional problems in the message receiver. With the basic understanding of the receiver operation, troubles can be isolated by analyzing the following:

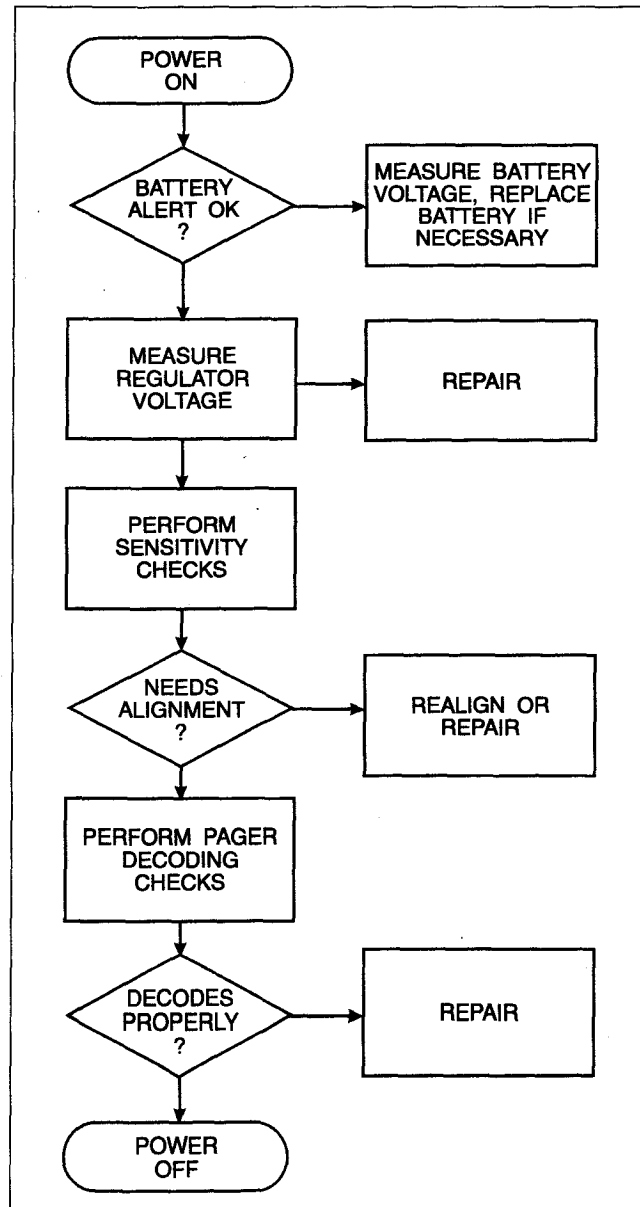
- Are most, some, or all functions inoperative?
- Which particular modes are inoperative? Concentrate on troubleshooting circuits that are common to the inoperative modes.

Integrated circuits (ICs) and codeplugs are very reliable components that do not need to be replaced unless it is definitely indicated they are defective. Before replacing an IC, ensure the external components in the circuit are normal. Signal tracing with a scope is the preferred IC testing method. It gives a visual indication of an input signal condition, its pulses (shape and/or distortion), and the timing of pulses. The input and output oscilloscope check can easily isolate a defective IC.

Circuit voltages are given in various key places on the schematic diagrams as an aid in the isolation process. Give particular attention to the dc voltages at the input and output

pins of the circuit and its decoupling circuits. Investigate a low voltage or a higher-than-normal voltage at the input or output before replacing the circuit. A generalized troubleshooting flowchart is shown in Figure 7.

Before any attempt is made to change a component, check the circuit to ensure the problem causing the original failure is identified and corrected; otherwise, damage to the new replacement part may occur.



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Figure 7. Troubleshooting Flow Chart

## 2. TEST EQUIPMENT

Recommended test equipment for testing and aligning the receiver is listed in the following chart. Either the listed items or their equivalents can be used.

**Test Equipment Chart**

EQUIPMENT IDENTIFICATION	APPLICATION
Motorola R1201 Series Signal Generator or Motorola R1060 Series Signal Generator** or Motorola R-2001 Series, or Motorola R220B Communications System Analyzer (includes a SINAD meter, a digital voltmeter, and a frequency counter).	Used to generate carrier frequencies at accurate RF levels in order to perform reliable and consistent performance checks
Motorola RTL = 1150 Universal Encoder	Generates precise frequencies and timing necessary to produce the message receiver's code for test encoding a signal generator
Motorola Software Package (NLN3594, NLN3595, or NLD3596)	Used for reading and programming POCSAG codeplugs
Motorola S-1053 ac Voltmeter	Signal level measurements
Motorola S1339 RF Millivoltmeter	RF/IF signal and oscillator injection voltage measurements
Motorola S-1063 dc Voltmeter or Motorola R-1001 Digital Multimeter	General testing - for dc voltage analyzing measurements
Motorola R-1055 Frequency Counter	Used to count IF frequency during carrier frequency alignment
Motorola R-1028 Oscilloscope or Tektronix T-921 Oscilloscope*	General troubleshooting - necessary for analyzing receiver-decoder waveforms

\* Not available through Motorola Parts Depot

\*\* Since external RF fields can cause unpredictable test results, an important point to be considered when purchasing a service monitor or generator is the amount of leakage present in the immediate area of the equipment. This leakage is directly related to the integrity of the electrical seals around the high-level RF-producing sections in the generator (i.e., synthesizer, attenuator, connectors) and is usually radiated into the area immediately in front of the generator through meter faces, dials, switches, etc. The Motorola National Service Organization recommends the following test be performed to verify acceptable RF leakage levels:

RF leakage should not exceed the level required to increase the IF rise at M1 (IF metering point) in an ADVISOR message receiver by more than 0.5 dB when the receiver is placed 12 inches (30.5 cm) from the front panel. The generator should be adjusted for this test in the following manner: (1) generator frequency set to exact carrier frequency; (2) attenuator set to 0.5  $\mu$ V output level; and (3) generator output terminated into a 50 $\Omega$  load.

Discuss corrective action for Motorola equipment which does not meet the above specification with a Motorola National Service Test Equipment Representative.

## 3. SPECIALIZED TOOLS AND SERVICE AIDS

This section briefly explains unique tools and servicing equipment available from Motorola for use in servicing and troubleshooting the ADVISOR alphanumeric message receiver.

### a. Radiation Test Fixture (RTL-1005) and Adapter (RPX-4687)

The RTL-1005 Radiation Test Fixture is a standard Motorola test fixture that can be used with many different Motorola receivers. (See Figure 8.) It has a contact flip down assembly (RPX-4687) to monitor the IF metering point of the radio.

The RPX-4687 Radiation Test Fixture Adapter modifies the test fixture so it accepts the receiver. It also supplies the correct flip down assembly to provide a means of monitoring the IF metering point (M1).

### b. MAV PACK (VID-952)

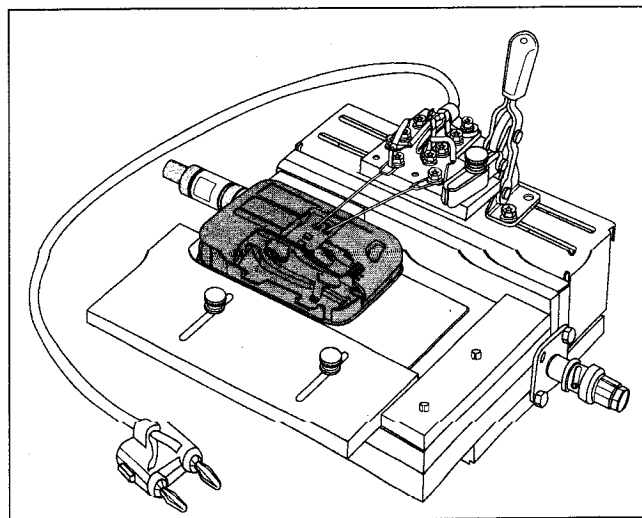
The VID-952 Motorola Audiovisual Package (MAV-PACK) is a video tape training program on leadless component repair techniques. This VHS format video cassette and supplemental literature describe the removal and replacement of leadless components using the following specialized equipment:

- RPX-4033 Laurier Hot Gas Bonder
- RPX-4234 Regulator and Hardware Kit

- 0180386A65 Desoldering Tweezers
- RSX-1002 Desoldering Station
- RSX-1008 Weller Soldering Station

This MAV-PACK is highly recommended for technicians who intend to service this and other Motorola receivers using leadless components. This VHS videotape is in standard half-inch format and is available from:

Motorola National Service Training  
1300 North Plum Grove Road  
Schaumburg, Illinois 60173



AIPB-942595-A

*Figure 8. Radiation/Alignment Test Fixture*

### c. Tools and Service Aids Chart

The following chart lists the previously discussed service aids and other recommended tools for servicing the ADVISOR Alphanumeric message receiver.

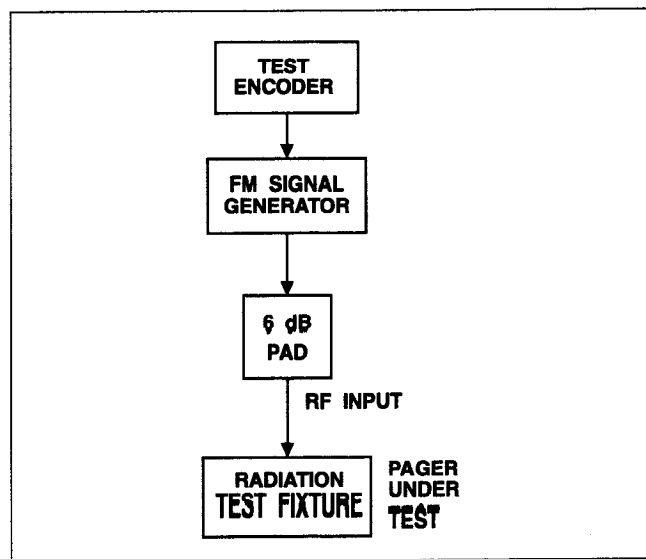
**Tools and Service Aids Chart**

EQUIPMENT IDENTIFICATION	APPLICATION
Motorola RTL-1005 Radiation Test Fixture	Facilitates service and warping (requires adapter RPX-4687)
Motorola RPX-4687 Radiation Test Fixture Adapter/Flip-down Head Attachment RPX-4687	Modifies the RTL-1005 Radiation Test Fixture to accept the miniature receiver
Motorola MAV-PACK 3/VID-952 Audiovisual Package	Leadless Component Repair Techniques
RLN-4062A Edsyn Hot-Air Machine	Required for soldering and desoldering leadless components
6680381B08 Hot-Air Tip 0.39 x 0.39 square inch	Used with the RLN4062A for soldering and desoldering chip carriers
6680381B04 Hot-Air Tip 0.02 gap, 0.351 inch wide	Used with the RLN4062A for soldering and desoldering display
RSX-1002 Desoldering Station and vacuum-operated solder remover	Temperature-controlled soldering iron
RSX-1008 Weller Soldering Station	Small tip iron and holder - useful for some leadless component repair
ST-207 Curved Nose Seizer or Straight Forceps Seizer (Motorola part number 6883117C01)	For heat transfer from component leads during soldering
ST-1191 Wrist Strap	Grounding wrist strap used for grounding sensitive devices
Alignment Tuning Tools (Motorola part numbers 668381B21 and 6680329A63)	Facilitates alignment
0162486C01 Display Lens Repair Fixture	Used to remove lens from display module
1580390B70 Alignment Housing	Used to hold receiver in place during alignment
6605960F01 Lens Disassembly Tool	Used to facilitate lens removal

## 4. TROUBLESHOOTING

### a. Paging Sensitivity Check

Paging sensitivity is measured by reducing the RF input signal level to the lowest level that produces an alert tone on three successive trials. Refer to the Alignment Procedure in the applicable service manual for operation. Place the unit in the RTL-1005 Radiation Test Fixture (see Figure 8) and connect the test equipment as shown in Figure 9.



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Figure 9. Paging Sensitivity Check

Perform the following steps:

- (1) Determine the paging codes (address 1, address 2, address 3, and address 4 as applicable) and the carrier frequency under test.

- (2) Set the address 1 code on the test encoder.
- (3) Set the FM signal generator to the carrier frequency of the receiver, with a relatively strong output level of about 200V to ensure the unit pages.
- (4) Connect the output of the test encoder to the FM generator external modulation input and adjust the data amplitude for  $\pm 4.5$  kHz deviation.
- (5) Using the test encoder, initiate the paging code. The receiver emits an interrupted alert tone each time the paging code is initiated.
- (6) Reduce the RF signal level from the FM signal generator to the lowest level that produces an alert on three successive trials. This level should be less than 16  $\mu$ V for high-band. Shield the pager from the encoder to protect the pager from rf spray from the encoder.
- (7) Set the address 2 code on the test encoder and perform steps (6) and (7). (The codeplug must be programmed for at least two addresses.)
- (8) Repeat steps (6) and (7) with address 3 then address 4 set on the test encoder. (The codeplug must be programmed for four addresses.)

This completes the paging sensitivity check. Failure indicates that a defect exists. Making the following 10 dB rise measurement should further isolate the trouble to either the receiver or decoder circuits.

### b. 10 dB Rise Measurement

This measurement checks total receiver RF performance. The 10 dB rise measurement can be used to isolate the RF section of the receiver from the demodulator and decode circuits when a paging sensitivity problem is analyzed. Refer to the Alignment and Disassembly procedures in the service

manual and remove the back cover. Enter the RF test mode. Place the receiver in the RTL-1005 Radiation Test Fixture (Figure 8). Proceed as follows:

- (1) Connect the test equipment as shown in Figure 10. Refer to the circuit board component layout diagram in the respective service manual for location of test points.

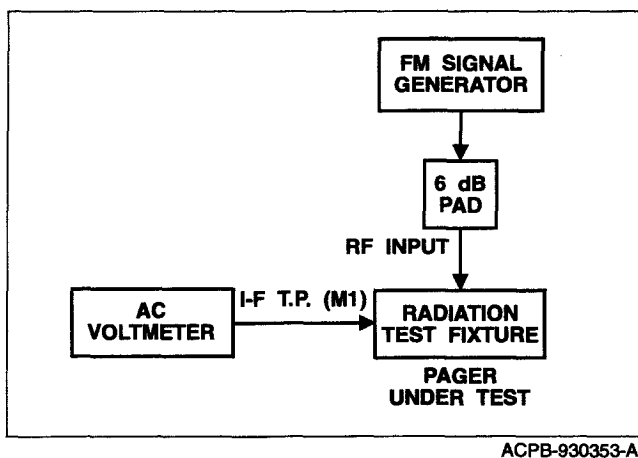


Figure 10. 10 dB Rise Measurement

- (2) Ensure the receiver is in the RF test mode and note the receiver noise level as indicated on the ac voltmeter.
- (3) Apply an unmodulated signal from the RF signal generator at the receiver carrier frequency and increase its level until the indication at the IF test point rises 10 dB above the noise level noted in step (2).

The output from the RF signal generator should be less than 50  $\mu$ V.

### c. Receiver Circuit Checks

If the receiver failed the 10 dB rise test, determine if it failed marginally or by a considerable amount. A marginal failure normally means it required more than 50  $\mu$ V but less than 100  $\mu$ V to produce the 10 dB rise at M1. In this case, try aligning the receiver to see if this improves the sensitivity. Refer to the Alignment Procedure in the service manual. If little or no improvement is achieved after alignment is completed, troubleshoot the receiver as outlined in the following text and in the troubleshooting charts.

#### (1) Oscillator Warp Range

The oscillator warp range is the difference between the highest and lowest IF frequencies obtained while varying warp oscillator L356/L455/L561. Enter the RF test mode and monitor metering point M1 with a frequency counter. Set the RF signal generator to the receiver's exact carrier frequency and at a sufficient level to trigger the frequency counter. Tune the warp coil and note the highest and lowest IF frequencies displayed by the counter. The difference between these two frequencies (warp range) should be between 7 and 15 kHz.

#### (2) Mixer Injection Voltage Measurement

Enter the RF test mode and monitor the collector of Q352/Q453/Q555 and note the maximum and minimum dc voltage levels. The maximum dc voltage occurs when the oscillator is inactive. The minimum dc voltage occurs at the frequency of maximum oscillator activity (most RF output). The difference between these two dc voltage levels should be between 5 mV and 40 mV.

Another way of expressing the mixer injection voltage measurement is mixer  $\Delta I$ . Mixer  $\Delta I$  is a formulated percentage measurement representing the amount of current change at the mixer's output when the oscillator is off (maximum dc voltage), then on (minimum dc voltage). Mixer  $\Delta I$  is defined by the following equation:

$$\text{Mixer } \Delta I = \frac{V_{\text{max}} - V_{\text{min}}}{1 - V_{\text{mas}}} \times 100\%$$

Where:  $V_{\text{max}}$  is when the oscillator is inactive.  
 $V_{\text{min}}$  is when the oscillator is most active.

With a properly functioning mixer/tripler circuit, mixer  $\Delta I$  should be between 2 and 15%, which corresponds to the 5 and 40 mV difference reading in the previous measurement.

If the mixer injection voltage measurement is incorrect or cannot be obtained, it indicates that either the mixer or oscillator is not working properly. In this case, troubleshoot the oscillator and mixer circuits by checking the dc voltages given in the service manual schematic diagram and then by checking for the defective component. Refer to the Receiver Troubleshooting Charts. (See Figures 13, 14 and 15.) If the injection measurement is normal, proceed with the noise level and takeover measurements.

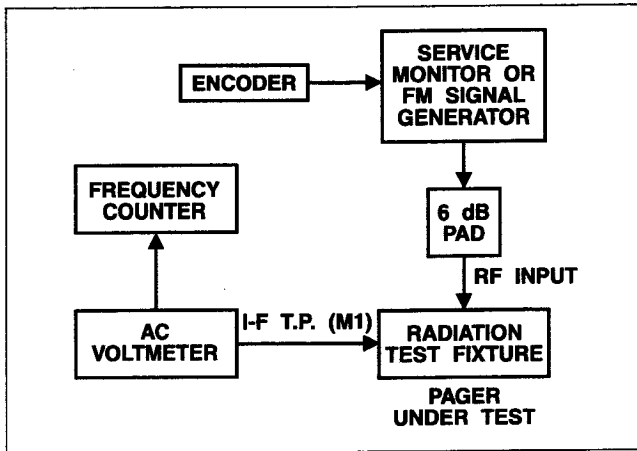
#### (3) Takeover/Noise Level Measurements

To check the RF amplifier and mixer circuits, takeover measurements are recommended. The RF takeover is defined as the drop in the receiver noise level (measured at M1) when the RF amplifier is disabled from the receiver (i.e., the base of Q351/Q451/Q551 is grounded). The mixer takeover is the drop in the noise level measured at M1 when the mixer stage and the RF amplifier are disabled.

The theory behind system noise figure and receiver sensitivity shows that a receiver with sufficient takeover has a noise figure dominated by the noise figure of the RF amplifier. In other words, with sufficient RF takeover, the noise of the stages following the RF amplifier has been "taken over" and the receiver noise level is as good as the noise figure of the RF amplifier.

- Receiver Noise Level - With the receiver in a tuning housing and no RF signal applied, measure the ac voltage at M1. The ac voltage reading (noise level) should be between -50 dB and 60 dB for a properly aligned/tuned receiver.
- Takeover Measurements - Due to the very high frequencies involved at the front end of the receiver, a probe with a shunt capacitance as low as 1 pF is sometimes sufficient to detune a circuit and cause inaccurate readings. To perform the takeover measurements, remove the cover from the receiver housing and set up the test equipment as illustrated in Figure 11.
  1. Apply 1.3 Vdc to the battery contacts.
  2. Monitor M1 with an ac voltmeter.
  3. Tune the receiver as described in the Tuning Procedure section of the appropriate service manual.
  4. Turn the RF signal generator off and note the ac voltage (noise level) at M1.
  5. Short the base of the RF amplifier (Q351/451/551) to ground and note the noise level drop. With a properly functioning RF amplifier, the noise level drops 6 to 9

dB, which indicates the proper amount of gain in the stage.



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Figure 11. Takeover Measurements Test Equipment Setup

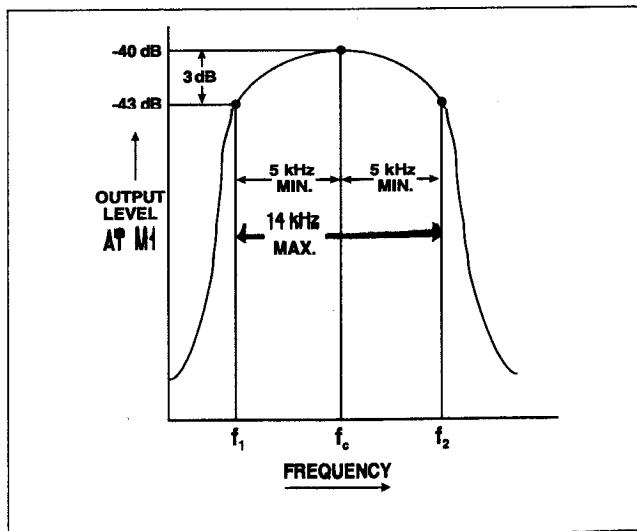
Excessive RF takeover indicates the RF amplifier may be noisy or regenerative. Low RF takeover does not always indicate the RF amplifier is defective. Either too much or too little gain in any other stage causes loss of RF takeover. To determine whether the RF amplifier is at fault, first check the mixer takeover.

Mixer takeover is measured in the same manner as the RF takeover. With the base of the RF amplifier still shorted, place a short on the base of the mixer (Q352/453/555). The noise level at M1 should drop 3 to 5 dB. If the noise level drops less than 2 dB, recheck mixer injection.

#### (4) System Bandwidth Measurement

To check system bandwidth, use the same test equipment setup used to perform the 10 dB rise measurement (Figure 10). Adjust the RF generator level to the receiver's exact carrier frequency to produce a reference reading of -40 dB (on HP400FL ac voltmeter) at M1. Increase the RF signal generator frequency to produce a 3 dB drop in the voltage level at M1. The signal generator frequency should be  $\geq 5$  kHz above the carrier frequency.

Perform the same measurement below the carrier frequency. The signal generator frequency should be  $\geq 5$  kHz below the carrier frequency. The total bandwidth should not exceed 14 kHz. (See Figure 12.)



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Figure 12. Bandwidth Measurement Detail

If the difference between  $f_c$  and  $f_1$  or  $f_2$  is less than 5 kHz, or the total bandwidth is less than 10 kHz or greater than 14 kHz, connect the ac voltmeter to TP4 (input of the second mixer) and repeat the bandwidth measurement. If the bandwidth is still outside the prescribed limits, replace the crystal filter (FL351/FL452/FL552). If the bandwidth is within the prescribed limits, the IF filter is bad. Replace FL352/FL453/FL553 or FL353/FL454/FL554. If after replacing the IF filter, the bandwidth is still outside the prescribed limits, replace U351/U451/U551 on the receiver board.

#### a. Decoder Circuit Checks

Three troubleshooting charts are provided at the end of this manual. The following table provides a quick, preliminary check of possible problem areas. However, refer to the troubleshooting charts and the diagnostic waveforms on the schematic diagram for a complete guide to troubleshoot the decoder circuit board.

MALFUNCTION	PROBABLE CAUSE
Receiver does not turn on	1. Battery voltage and polarity 2. B++ voltage
No display or partially active display	1. Broken LCD 2. Damaged display contacts. 3. B3+ voltage
No page/inactive data port	1. Receiver section 2. Receiver board socket

The decoder troubleshooting charts are divided into three groups:

- No display on power up (Figure 16)
- No alerts (Figure 17)
- Miscellaneous (Figure 18)

A quick overview of the charts is presented below.

#### (1) No Display on Power Up (Refer to Figure 16)

- System Voltage Checks** - Check the battery voltage (B+) on the power supply and ensure good contact is made with the circuit board (TP12). Nominal B+ should be between 1.2 and 1.5 volts. Check B++ (TP4). Voltage should be at least 3.1 volts.
- Clock Checks** -
  - Check pin 3 of U2. This signal should be a dampened triangular wave of frequency 1.2288 MHz when pin 10 of U2 is high, and a rectangular wave of 38.400 kHz when pin 10 of U2 is low.
  - Check the crystal oscillator and pins 11 and 13 of U2. The sinusoidal frequency should be 38.400 kHz. Also check pin 9 of U2 to ensure communications are occurring between U1 and U2.
- Communication and Codeplug Checks** - Ensure U1 and U2 are communicating correctly via the SPI bus by checking U2 pins 6, 7, 8, and 9 (refer to Figure 3). Also, ensure the codeplug is programmed correctly.
- Reset Checks** - Check pin 5 of U2 to ensure the line remains high (within 100 mV of B++). If there is a problem with the  $\mu P$  or U2, this line periodically pulses low, otherwise, it remains high. An oscilloscope is needed to monitor this line. Also, check pin 14 of U2 to ensure it also remains high. This line switches low only when B++ falls below 2.7 volts.



- (e) Display Voltage Checks - Check that B3+ (TP15) is at least 5.1 volts and that B- (TP11) is at least -2.8 volts. Activate the B3+ and B- voltage multipliers by pressing the On/Reset button, to turn the display on. While the display blank, B3+ and B- should be at least 3.0 volts.

## (2) No Alerts

(Refer to Figure 17)

- (a) Set-Alerts-Screen Check - Activate the set-alerts-screen function. Make sure that "No Alert" is NOT selected in the set-alerts screen.
- (b) Codeplug Checks - Check the codeplug and ensure the alerts (such as vibrator) are selected. Check the power up and alarm-tone cadences.
- (c) LED Checks - Check the LED by turning the receiver off and then back on again. If the LED is not operating properly, check it by removing the battery and placing 3.0 volts in series with a 100 ohm resistor across the LED. Observe the waveform while alerting (TP2). If the waveform is okay, replace U4, otherwise replace U2.
- (d) Audible Alerts - Audible alerts are in phase with the LED alerts. First ensure the receiver is in the audio mode and not in the silent mode (check for speaker symbol). Ensure that "No Alert" is NOT selected in the second line of the set-alerts screen. Next, ensure the transducer contacts are okay. Observe the waveform at TP10 when alerting. If the waveform is okay, replace the transducer. If not, check that U4 is receiving the correct logic high signals on pins 15 and 16. Also, verify the alert waveform (TP2) is okay. If the waveform is okay, replace U4, otherwise, replace U2.
- (e) Vibrator Alert - Ensure the receiver is in silent mode and has the vibrator option selected in the codeplug. Ensure that "No Alert" is NOT selected in the third line of the set-alerts screen. Check the spring contacts and ensure they are okay. Also, check the springs themselves and ensure they are okay and the printed circuit board contacts are clean and free of debris. Check the vibrator by placing 1.3 Vdc across the terminals. Finally, test the decoder board vibrator drive circuits.

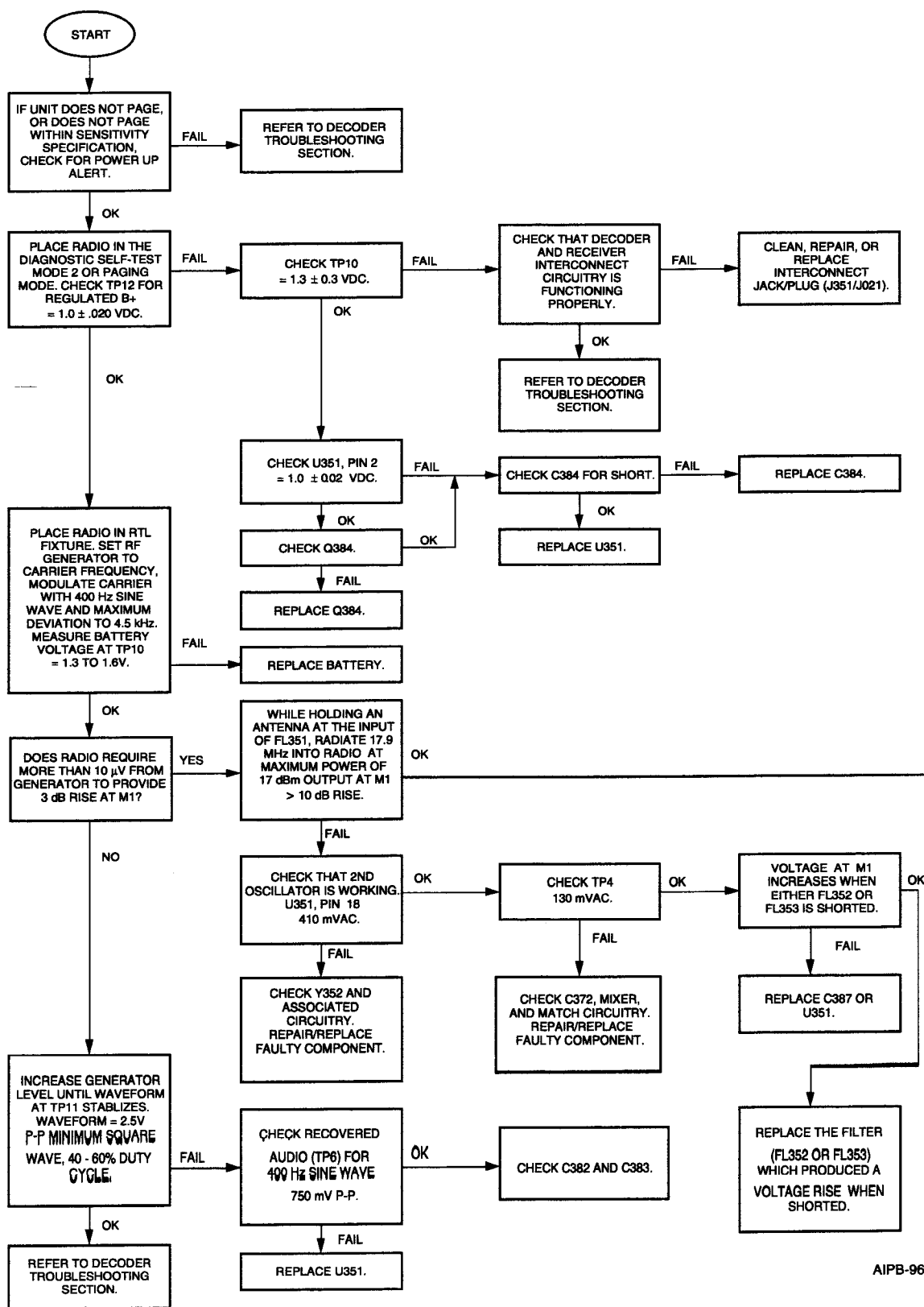
## (3) Miscellaneous

(Refer to Figure 18)

- (a) On/Reset Button Does Not Respond - Check the integrity of the On/Reset button by pressing the button and testing for continuity across the terminals. Ensure the On/Reset button elastomer is firmly in place in the housing and not contorted. Check that TP17 and TP22 drop below 0.1 volts when the On/Reset button is pressed; if not, replace U2.
- (b) Front Panel Buttons Do Not Respond - Ensure the button pad is clean and free of debris. Clean if necessary. Ensure the switch and PC contacts are clean. Test to ensure the corresponding test points (see schematic) drop to 0.1 volts when the correct switch is closed. Also make sure the switch pad is correctly oriented and not binding with the receiver housing when reassembled.
- (c) No EL Backlighting - Check correct activation of EL backlighting by pressing and holding the Function button for more than one second while the receiver is in the message-status screen mode (not in the blank mode). (NOTE: Backlighting cannot be activated when the receiver is in the blank mode, and automatically shuts off

when the receiver returns to the blank mode.) Check EL connections. When activated, check the transformer (T1, pin 5) waveform (approximately 90 Vpp, 4.5 kHz; varies over battery voltage). If okay, replace EL backlight. If not, check for continuity of the coils by measuring the resistance between pins 1 and 2, the resistance between pins 2 and 4, and the resistance between pins 5 and 8. The resistances from pins 1 to 2 and from pins 2 to 4 should be less than 5 ohms, and the resistance from pins 5 to 8 should be less than 100 ohms. A faint, high pitched hum is not unusual and is due to the windings in the coils. If resistance is not okay, replace the transformer (T1). Finally, test the decoder board EL backlight circuits.

- (d) Messages Lost When Receiver Turned Off or Primary Cell Removed - Check memory options and ensure they provide desired operation. Check backup cell voltage after ensuring that a fresh primary battery has been in the receiver for at least one hour. Backup battery should be at least 2.8 V. If not, replace primary battery. Turn receiver off and remove primary battery. After one minute, the backup battery should be at least 2.4 V. If not, replace the backup battery. If the backup battery is not the problem, check the rest of the backup battery circuitry. NOTE: After replacing the backup battery, check the voltages again to ensure that no damage occurred to the battery and the battery leads were not shorted during soldering.



(continued on next page)

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Figure 13. VHF Troubleshooting Flowchart (1 of 2)

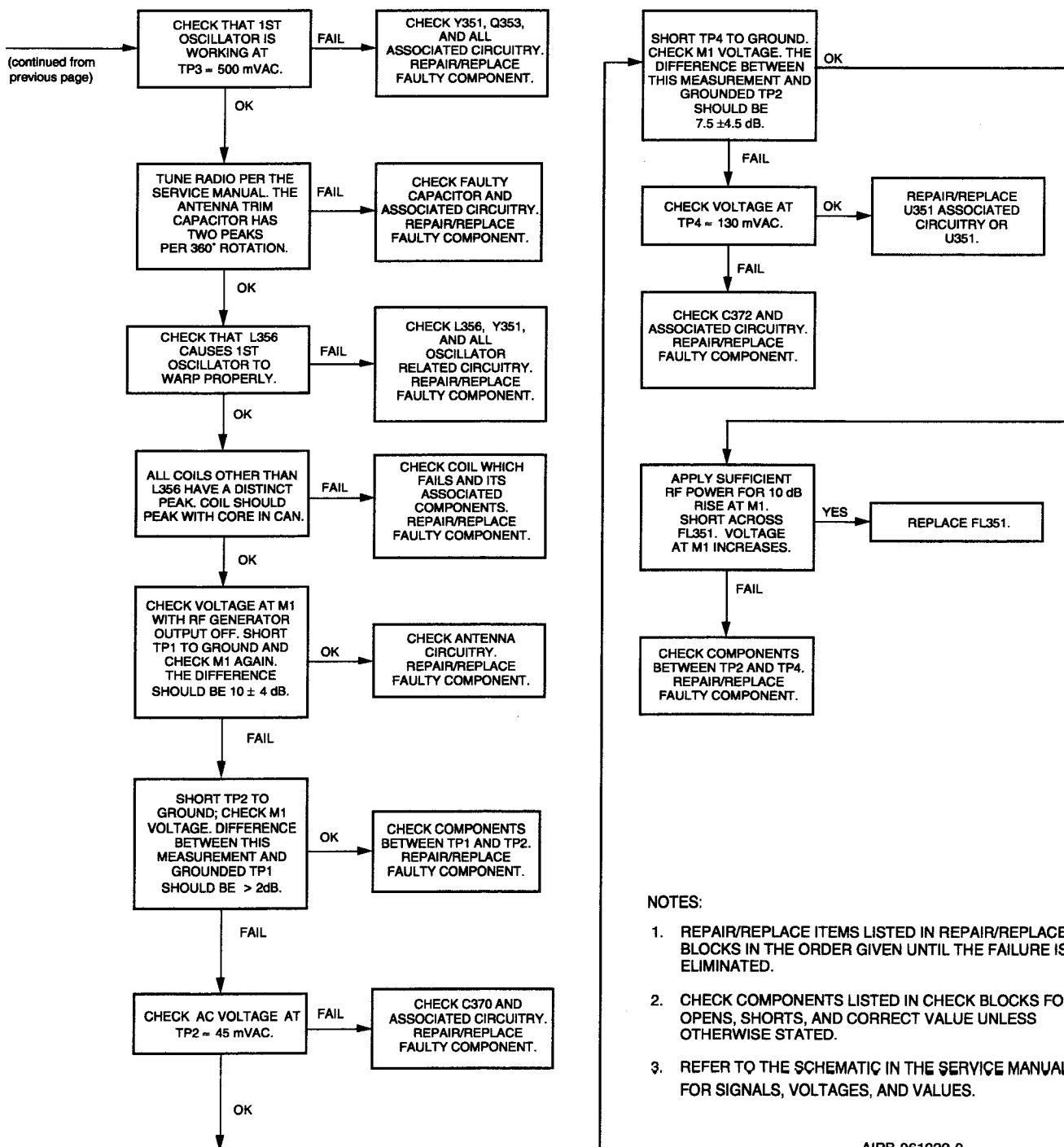
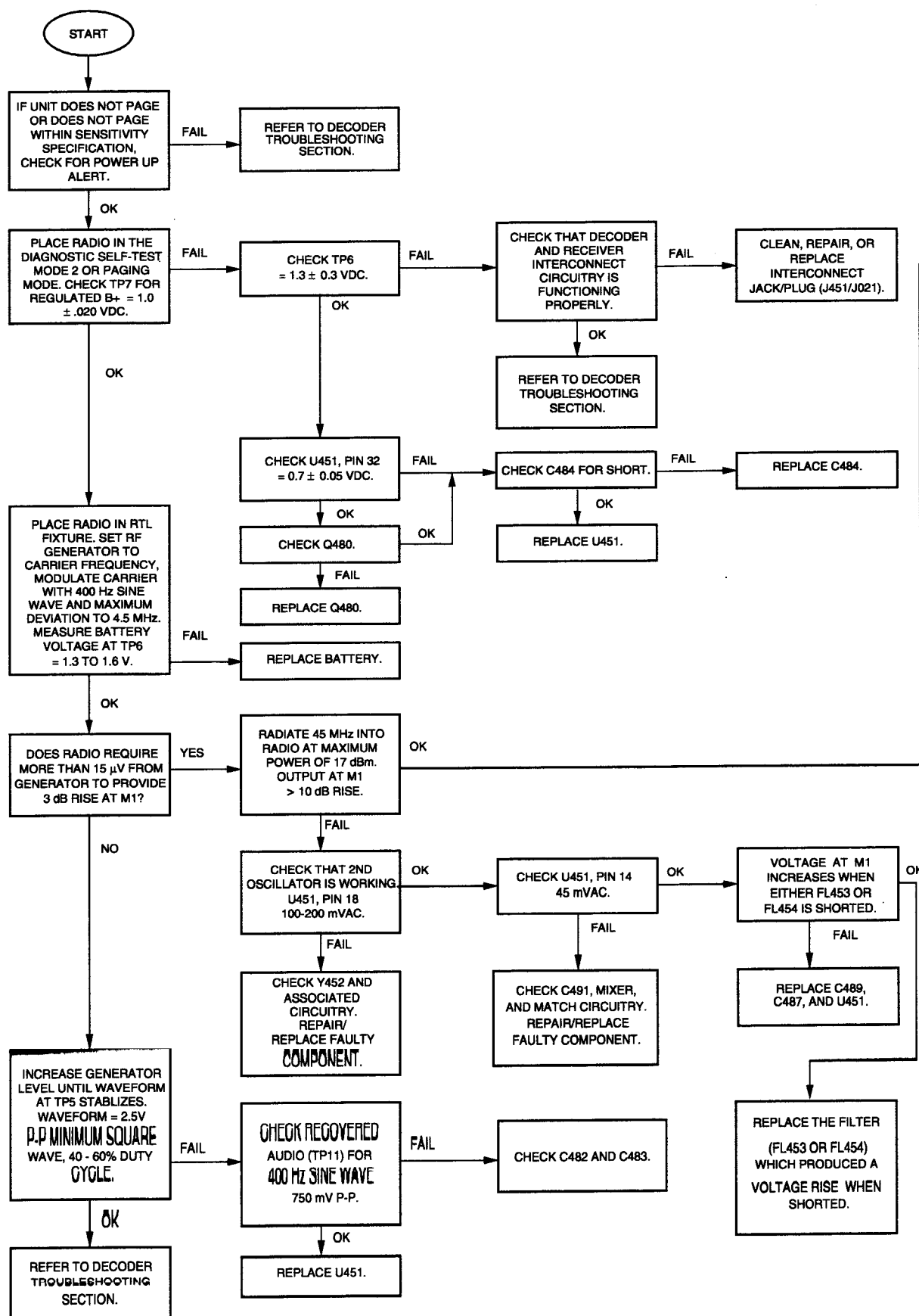
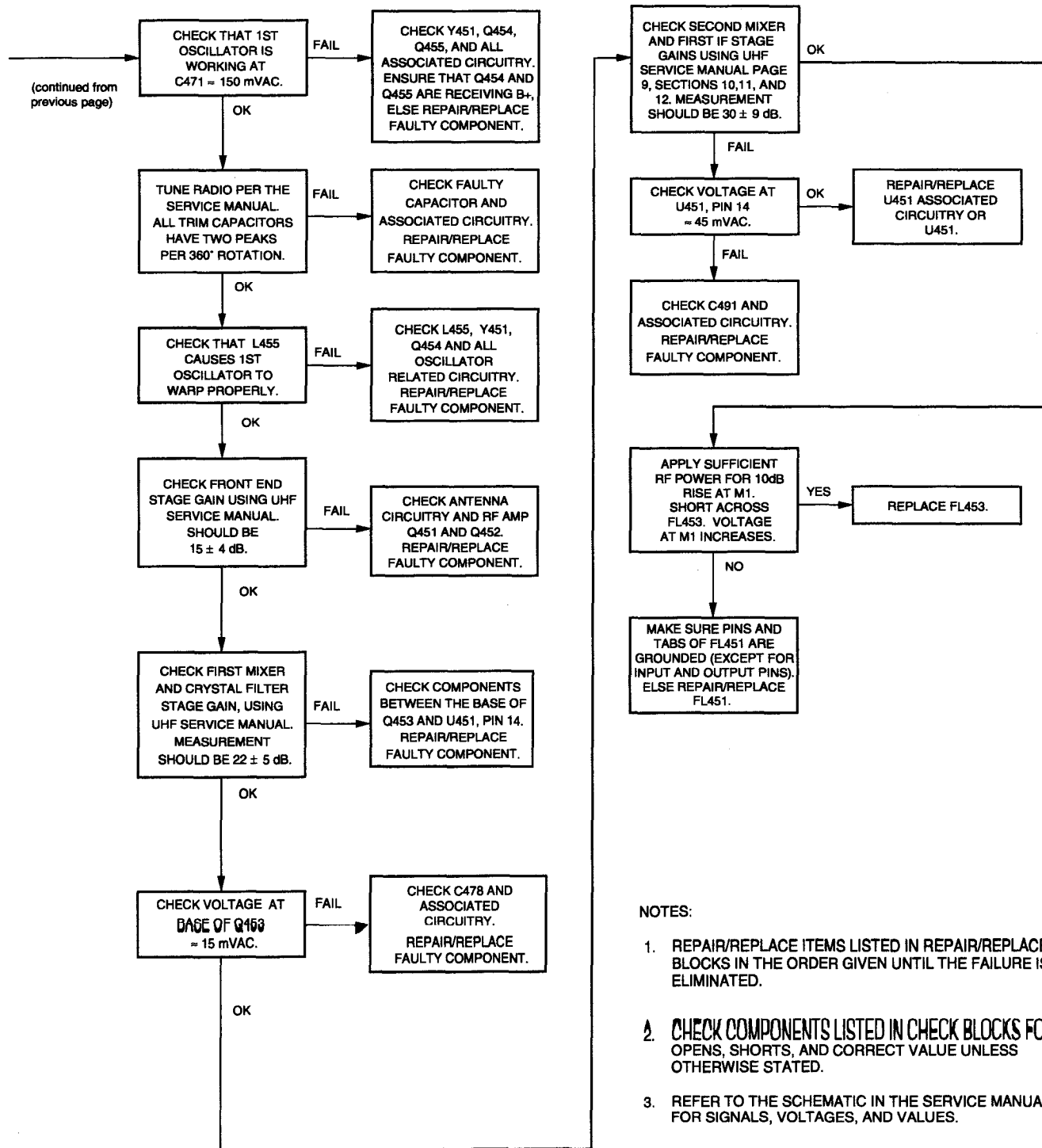


Figure 13. VHF Troubleshooting Flowchart (2 of 2)



AIPB-961233-0

Figure 14. UHF Troubleshooting Flowchart (1 of 2)



AIPB-961234-0

Figure 14. UHF Troubleshooting Flowchart (2 of 2)

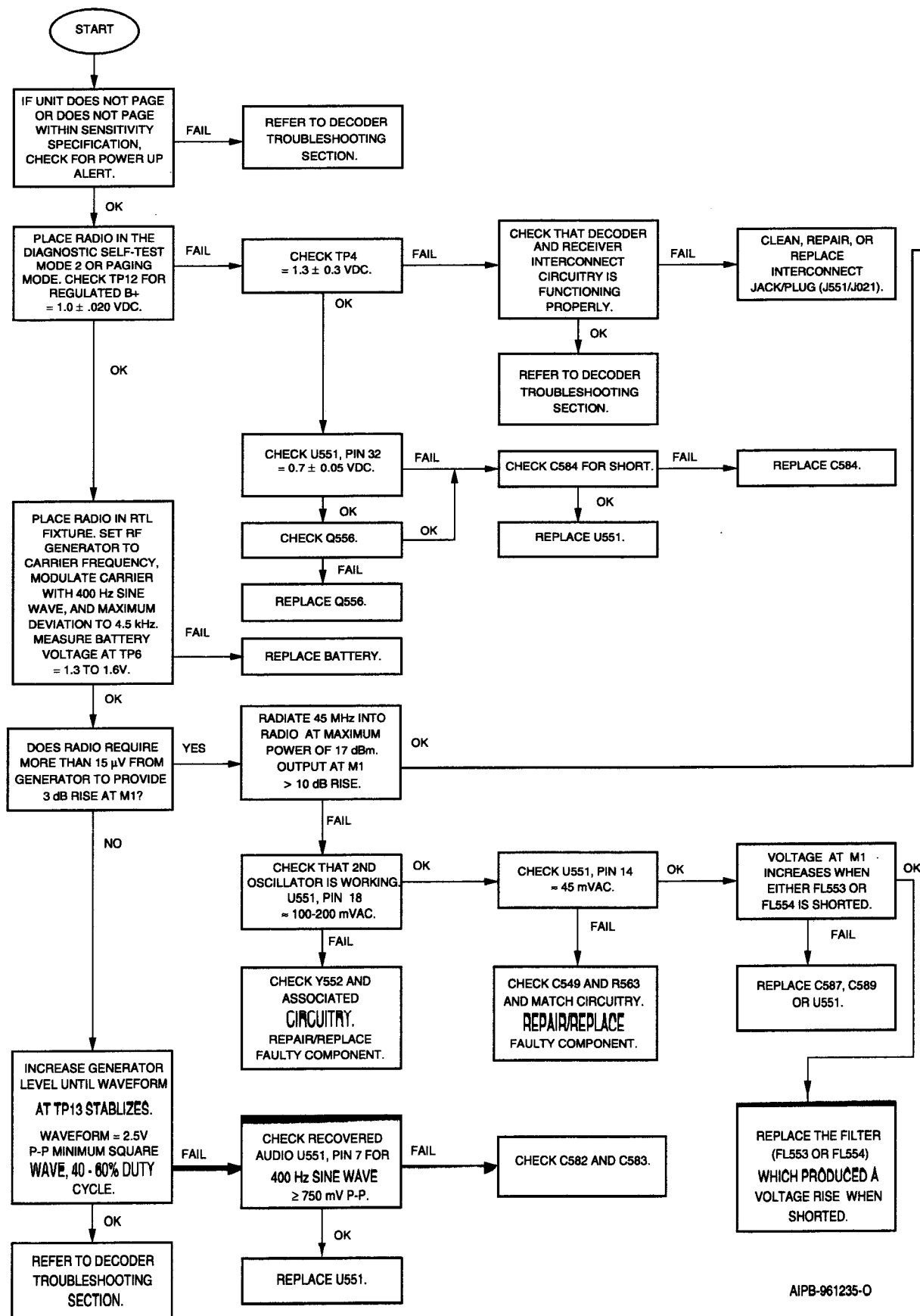
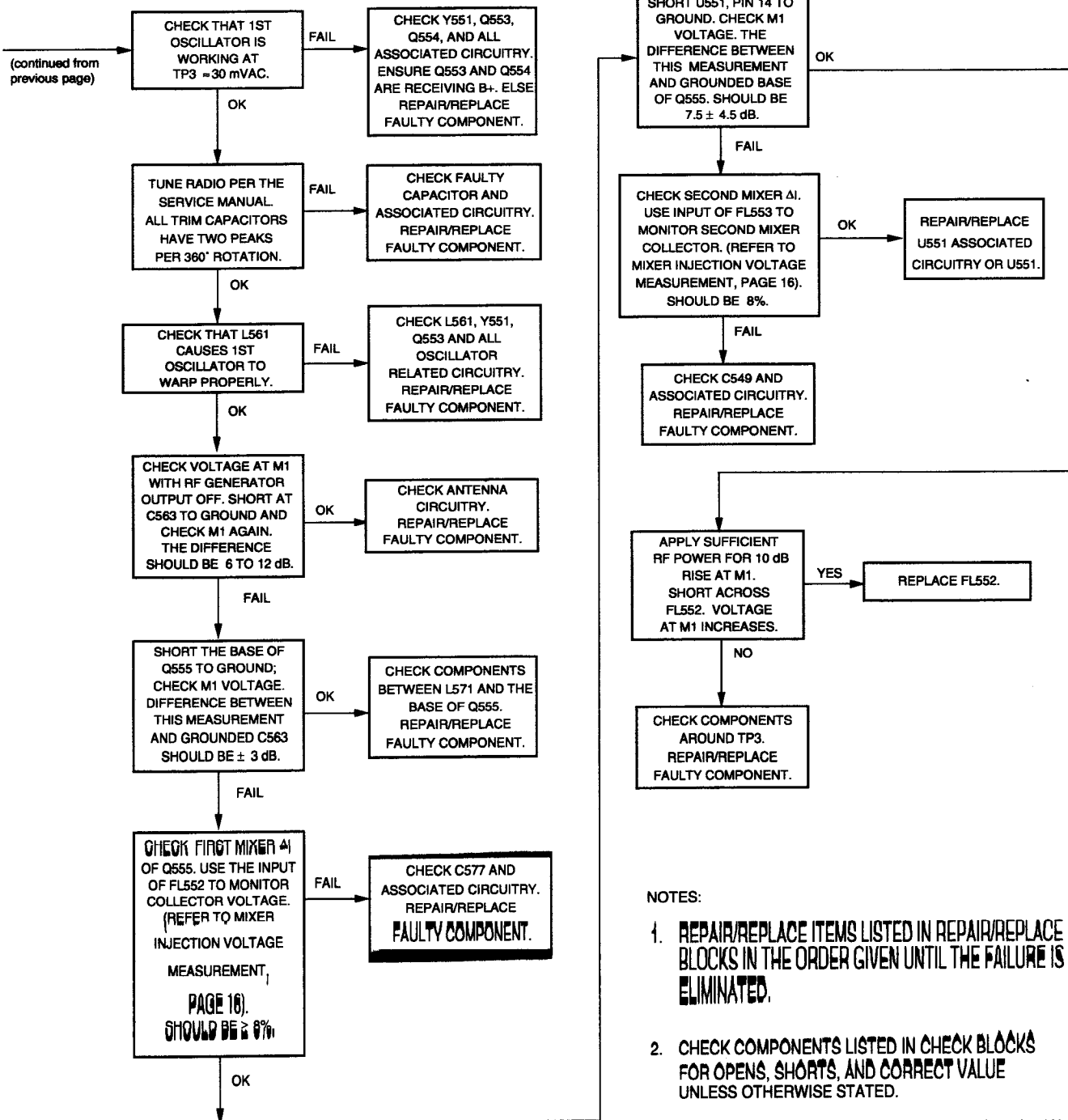


Figure 15. 900 MHz Troubleshooting Flowchart (1 of 2)



```

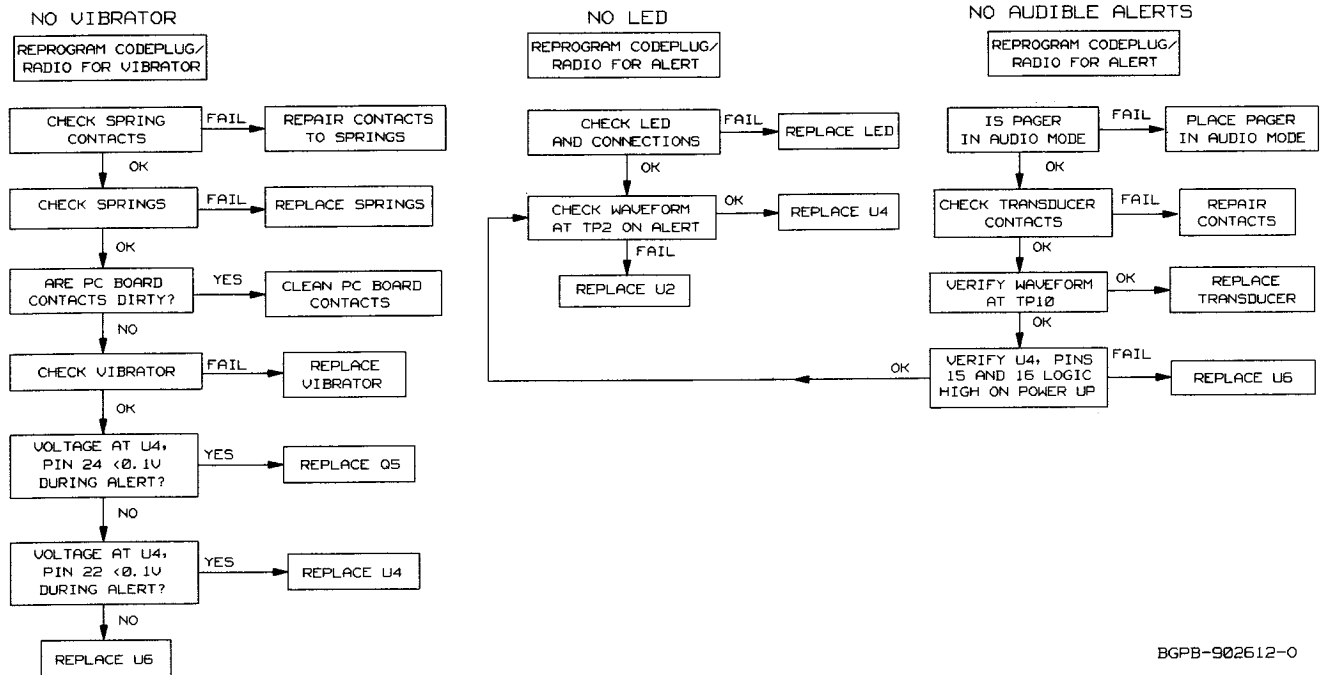
graph TD
    START([START]) --> B1[CHECK FOR B+ AT TP 12 <1.3V>]
    B1 -- OK --> B2[CHECK FOR B++ AT TP 4 ~3.1V]
    B1 -- FAIL --> B3[CHECK B+ CONTACTS]
    B3 -- FAIL --> B4[REPAIR B+ CONTACTS]
    B3 -- OK --> B5[VERIFY B+ SUPPLY]
    B5 -- FAIL --> B6[REPAIR/REPLACE B+ SUPPLY]
    B5 -- OK --> B7[CHECK FOR SOLDER SHORTS ON B+ SUPPLY]
    B7 -- FAIL --> B8[REPAIR/REPLACE AND TEST]
    B7 -- OK --> B9[REPLACE DECODER BOARD]
    B2 -- OK --> B10[CHECK WAVEFORM AT U2, PIN 3 <CLOCK>]
    B2 -- FAIL --> B11[CHECK FOR OPENS OR SHORTS ON B++]
    B11 -- FAIL --> B12[REPAIR/REPLACE AND TEST]
    B11 -- OK --> B13[CHECK CR6]
    B13 -- FAIL --> B14[REPLACE CR6]
    B13 -- OK --> B15[CHECK L1 CONTACTS & WAVEFORM]
    B15 -- FAIL --> B16[REPAIR/REPLACE L1]
    B15 -- OK --> B17[CHECK C19, C20]
    B17 -- FAIL --> B18[REPLACE C19, C20]
    B17 -- OK --> B19[REPLACE U4]
    B10 -- OK --> B20[CHECK WAVEFORM AT U2, PIN 5 <RESET>]
    B10 -- FAIL --> B21[VERIFY WAVEFORM AT THE CRYSTAL]
    B21 -- OK --> B22[REPLACE U2]
    B21 -- FAIL --> B23[CHECK COMPONENTS C1, C2, R5, & R6]
    B23 -- FAIL --> B24[REPAIR/REPLACE AND TEST]
    B23 -- OK --> B25[REPLACE CRYSTAL]
    B20 -- OK --> B26[CHECK SPI COMMUNICATIONS AT U2, PINS 6, 7, 8, AND 9]
    B20 -- FAIL --> B27[CHECK VOLTAGE AT U2, PIN 14 >3.0V]
    B27 -- OK --> B28[REPLACE U1]
    B27 -- FAIL --> B29[CHECK C6]
    B29 -- OK --> B30[REPLACE U4]
    B29 -- FAIL --> B31[REPLACE C6]
    B26 -- OK --> B32[REPROGRAM CODEPLUG AND RETEST]
    B32 -- OK --> B33[CHECK B3+ AT TP15 ~5.3V]
    B33 -- OK --> B34[CHECK B- AT TP11 ~2.8V]
    B33 -- FAIL --> B35[CHECK FOR SOLDER SHORTS ON B3+]
    B35 -- FAIL --> B36[REPAIR/REPLACE AND TEST]
    B35 -- OK --> B37[CHECK WAVEFORM AT C14]
    B37 -- OK --> B38[CHECK C16]
    B38 -- OK --> B39[REPLACE U7]
    B38 -- FAIL --> B40[REPLACE C15]
    B37 -- FAIL --> B41[CHECK C14, C15 AND CR4]
    B41 -- OK --> B39
    B41 -- FAIL --> B42[REPLACE C14, C15 OR CR4]
    B34 -- OK --> B43[CHECK R30 THRU R37]
    B34 -- FAIL --> B44[CHECK C17]
    B44 -- FAIL --> B45[REPLACE C17]
    B44 -- OK --> B46[CHECK U7, PIN 5]
    B46 -- OK --> B47[REPLACE Q4]
    B46 -- FAIL --> B48[TEST CR4, CR11, C14, AND C15]
    B48 -- FAIL --> B49[REPAIR/REPLACE]
    B48 -- OK --> B50[REPLACE U7]
    B43 -- OK --> B51[CHECK R16 THRU R20]
    B43 -- FAIL --> B52[REPLACE]
    B51 -- OK --> B53[CHECK R40]
    B51 -- FAIL --> B54[REPLACE]
    B53 -- OK --> B55[DOES THE UNIT ALERT?]
    B53 -- FAIL --> B54
    B55 -- OK --> B56[REPLACE DISPLAY]
    B55 -- FAIL --> B57[REPLACE DECODER BOARD]
  
```

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28



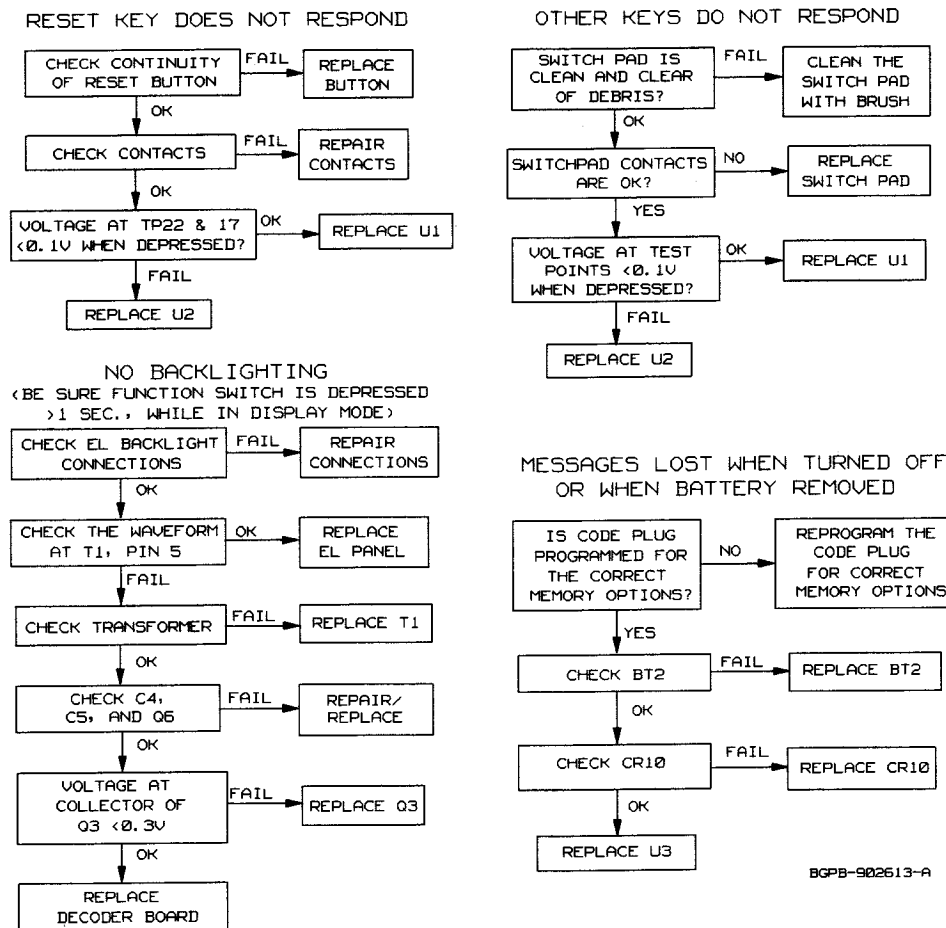
# NO ALERTS



BGPB-902612-0

Figure 17. "No Alerts" Troubleshooting flowchart

# MISCELLANEOUS



BGPB-902613-A

Figure 18. "Miscellaneous" Troubleshooting Flowchart

## NOTES

[illegible]

## NOTES

Handwriting practice lines consisting of 40 horizontal rows. Each row is defined by two dotted lines, with a solid line in the center of each row to guide letter height.

## NOTES

Handwriting practice lines consisting of 20 rows of dotted lines on a solid background, designed for tracing or copying practice.

# APPENDIX A

The ADVISOR message receiver supports various languages throughout the world. To support these languages, the ASCII characters can be remapped to language-specific characters. These characters are represented in 6 by 8 pixel fonts to effectively use the display-screen area. The tables in this appendix show the supported characters and prompts.

Also included in this appendix, are the R1150C Code Synthesizer alphanumeric test messages for the ADVISOR message receiver supported characters.

## 1. ALPHABETICAL CHARACTER SETS

Table A-1 through Table A-7 show the alphabetical character sets supported by the ADVISOR message receiver.

Table A-1. English Alphabetical Set

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	[	k	{
C	FF	FS	,	<	L	\	l	
D	CR	GS	-	=	M	]	m	}
E	SO	RS	.	>	N	^	n	~
F	SI	US	/	?	O	_	o	SP

Table A-3. Icelandic Alphabetical Set

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	@	P	`	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	Á	"	2	B	R	b	r
3	ETX	á	#	3	C	S	c	s
4	EOT	í	\$	4	D	T	d	t
5	ENQ	i	%	5	E	U	e	u
6	Ö	Ó	&	6	F	V	f	v
7	ð	ó	'	7	G	W	g	w
8	BS	þ	(	8	H	X	h	x
9	ð	þ	)	9	I	Y	i	y
A	LF	Ð	*	:	J	Z	j	z
B	Ý	ESC	+	;	K	[	k	{
C	ý	Æ	,	<	L	\	l	
D	CR	æ	-	=	M	]	m	}
E	Ú	É	.	>	N	^	n	~
F	ú	é	/	?	O	_	o	SP

Table A-2. Russian Alphabetical Set

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	ю	п	Ю	П
1	SOH	DC1	!	1	а	я	А	Я
2	STX	DC2	"	2	б	р	Б	Р
3	ETX	DC3	#	3	ц	с	Ц	С
4	EOT	DC4	\$	4	д	т	Д	Т
5	ENQ	NAK	%	5	е	у	Е	У
6	ACK	SYN	&	6	ф	ж	Ф	Ж
7	BEL	ETB	'	7	г	в	Г	В
8	BS	CAN	(	8	х	ь	Х	Ь
9	HT	EM	)	9	и	ы	И	Ы
A	LF	SUB	*	:	й	з	Й	З
B	VT	ESC	+	;	к	ш	К	Ш
C	FF	FS	,	<	л	э	Л	Э
D	CR	GS	-	=	м	щ	М	Щ
E	SO	RS	.	>	н	ч	Н	Ч
F	SI	US	/	?	о	_	О	SP

Table A-4. Polish Alphabetical Set

	0	1	2	3	4	5	6	7
0	NUL	DLE	SP	0	Ę	P	Ą	p
1	SOH	DC1	!	1	A	Q	a	q
2	STX	DC2	"	2	B	R	b	r
3	ETX	DC3	#	3	C	S	c	s
4	EOT	DC4	\$	4	D	T	d	t
5	ENQ	NAK	%	5	E	U	e	u
6	ACK	SYN	&	6	F	V	f	v
7	BEL	ETB	'	7	G	W	g	w
8	BS	CAN	(	8	H	X	h	x
9	HT	EM	)	9	I	Y	i	y
A	LF	SUB	*	:	J	Z	j	z
B	VT	ESC	+	;	K	Ż	k	Ó
C	FF	FS	,	<	L	Ł	l	Ł
D	CR	GS	-	=	M	Ń	m	Ż
E	SO	RS	.	>	N	Ś	n	Ć
F	SI	US	/	?	O	_	o	SP

Table A-5. Arabic Alphabet Set

	0	1	2	3	4	5	6	7
0		ع		0	ا	ب	ـ	د
1	A		!	1	ـ	ج	ح	ط
2	P	خ	"	2	ت	ث	ذ	ز
3	M		#	3	ا	ب	ج	د
4		هـ	\$	4	ا	ب	ج	د
5	ح		%	5	ا	ب	ج	د
6		ع	ر	6	ا	ب	ج	د
7	ل		و	7	ا	ب	ج	د
8		ح	(	8	ا	ب	ج	د
9	ع	خ	)	9	ا	ب	ج	د
A		ا	*	:	ا	ب	ج	د
B	ح		+	:	ا	ب	ج	د
C	ا	ب	.	<	ا	ب	ج	د
D		س	-	=	ا	ب	ج	د
E			.	>	ا	ب	ج	د
F			/	؟	ا	ب	ج	د

Table A-6. Arabic/English Alphabet

	0	1	2	3	4	5	6	7
0		G		0	ا	ب	ـ	د
1	A		P	1	ـ	ج	ح	ط
2	P	H	Q	2	ا	ب	ج	د
3	M		R	3	ا	ب	ج	د
4		I	\$	4	ا	ب	ج	د
5	B		S	5	ا	ب	ج	د
6		J	ر	6	ا	ب	ج	د
7	C		و	7	ا	ب	ج	د
8		K	T	8	ا	ب	ج	د
9	D	L	U	9	ا	ب	ج	د
A		M	V	:	ا	ب	ج	د
B	E		+	W	ا	ب	ج	د
C	F	N	.	X	ا	ب	ج	د
D		O	-	Y	ا	ب	ج	د
E			.	Z	ا	ب	ج	د
F			/	؟	ا	ب	ج	د

Table A-7. Vietnamese Alphabetic Character Set

	0	1	2	3	4	5	6	7
0	NUL	F	SP	0	È	P	Ó	Ũ
1	O	%	Â	1	A	Ă	Ò	Ú
2	-	J	Ă	2	Ỡ	R	Ơ	Ù
3	+	"	À	3	C	Ý	Ổ	Ụ
4	EOT	W	Ã	4	D	T	Ỡ	Ủ
5	I	!	À	5	E	U	Ố	Û
6	=	Z	Á	6	Đ	V	Ỡ	Ú
7	S	*	À	7	Ỡ	Ỡ	Ỡ	Ỡ
8	\$	Q	À	8	H	X	Ơ	Ụ
9	B	)	À	9	Ỡ	Ỡ	Ỡ	Ỡ
A	LF	(	Á	:	Ề	Ề	Ỡ	Ỡ
B	G	ESC	À	Ặ	K	Ề	Ỡ	Ỡ
C	.	?	À	Ề	L	Ề	Ỡ	Ỡ
D	CR	,	À	Ề	M	Ỡ	Ỡ	Ỡ
E	SO	#	À	Ề	N	Ỡ	Ỡ	Ỡ
F	SI	/	À	Ề	Ề	Ỡ	Ỡ	

## 2. INTERNATIONAL STANDARD CHARACTER SETS

**Table A-8. ISO 8859-1**  
**Part 1: Latin Alphabet Number 1**

	0	1	2	3	4	5	6	7
0	NUL	~	SP	0	@	P	`	Ð
1	␣	~	!	1	A	Q	Á	À
2	␣	^	"	2	B	R	Â	Ó
3	ETX	_	#	3	C	S	Ã	Ô
4	EOT	§	\$	4	D	T	Ä	Õ
5	⌘	²	%	5	E	U	Å	Ö
6	×		&	6	F	V	Æ	Ø
7	÷	ETB	'	7	G	W	Ç	Ù
8	£	³	(	8	H	X	È	Ú
9	•	~	)	9	I	Y	É	Û
A	LF	.	*	:	J	Z	Ê	Ü
B	<	ESC	+	;	K	[	Ë	{
C	¿	¥	,	<	L	\	ì	Ò
D	CR	±	-	=	M	]	í	}
E	>	·	.	>	N	Þ	î	Ñ
F	í	US	/	?	O	Ý	Ï	SP

**Table A-9. ISO 8859-2**  
**Part 2: Latin Alphabet Number 2**

	0	1	2	3	4	5	6	7
0	NUL	\	SP	0	À	P	`	Ð
1	␣	]	!	1	A	Q	Á	Ř
2	␣	^	"	2	B	R	Â	Ó
3	ETX	_	#	3	C	S	Ã	Ô
4	EOT	§	\$	4	D	T	Ä	Õ
5	⌘	{	%	5	E	U	Å	Ö
6	×		&	6	F	V	Ç	Ř
7	÷	ETB	'	7	G	W	Ç	Ú
8	£	}	(	8	H	X	Č	Ů
9	<	~	)	9	I	Y	É	Ů
A	LF	.	*	:	J	Z	Ě	Ž
B	=	ESC	+	;	Ł	K	Ĳ	Ż
C	>	¥	,	;	Ł	Ł	Ĳ	Ń
D	CR	±	-	;	Ł	M	Ů	Ś
E	@	;	.	;	Ń	N	Ś	Ś
F	[	US	/	?	O	Ý	Ď	SP

**Table A-10. ISO 8859-3**  
**Part 3: Latin Alphabet Number 3**

	0	1	2	3	4	5	6	7
0	NUL	\	SP	0	Š	P	`	Ĝ
1	␣	~	!	1	A	Q	Á	À
2	␣	^	"	2	B	R	Â	Ó
3	ETX	_	#	3	C	S	Ĥ	Ô
4	EOT	§	\$	4	D	T	Ä	Ĝ
5	⌘	{	%	5	E	U	Č	Ö
6	×		&	6	F	V	Č	Ĝ
7	÷	ETB	'	7	G	W	Ç	Ú
8	£	}	(	8	H	X	È	Ů
9	•	~	)	9	I	Y	É	Ů
A	LF	.	*	:	J	Z	Ê	Ü
B	=	ESC	+	;	K	[	Ë	Ů
C	¿	¥	,	<	L	Ž	ì	Ò
D	CR	±	-	;	Ĥ	M	]	í
E	@	·	.	>	N	Š	î	Ñ
F	í	US	/	?	O	Ĭ	Ĭ	SP

**Table A-11. ISO 8859-4**  
**Part 4: Latin Alphabet Number 4**

	0	1	2	3	4	5	6	7
0	NUL	\	SP	0	À	P	`	Ð
1	␣	]	!	1	A	Q	Á	Ä
2	␣	^	"	2	B	R	Â	Ķ
3	ETX	_	#	3	C	S	Ã	Ô
4	EOT	§	\$	4	D	T	Ä	Õ
5	⌘	{	%	5	E	U	Å	Ö
6	×		&	6	F	V	Æ	Ø
7	÷	ETB	'	7	G	W	Ĳ	Ú
8	£	}	(	8	H	X	Č	Ů
9	<	~	)	9	I	Y	É	Ů
A	LF	.	*	:	J	Z	Ě	Ž
B	=	ESC	+	;	Ģ	K	Ĳ	Ē
C	>	¥	,	;	Ů	L	Ĳ	Ō
D	CR	±	-	;	Ů	M	N	Ĳ
E	@	;	.	;	Ů	N	D	Ĳ
F	[	US	/	?	O	R	I	SP

**Table A-12. ISO 8859-5**  
**Part 4: Latin/Cyrillic Alphabet**

	0	1	2	3	4	5	6	7
0	NUL	\	SP	0	A	P	`	Ð
1	И	Ј	!	1	A	Q	Á	Ä
2	Й	^	"	2	B	R	Â	Å
3	ETX	_	#	3	C	S	Ã	Ö
4	EOT	§	\$	4	D	T	Ä	Ó
5	€	{	%	5	E	U	Å	Ô
6	×		&	6	F	V	Æ	Ø
7	÷	ETB	'	7	G	W	Į	Ú
8	£	}	(	8	H	X	Č	Û
9	<	~	)	9	I	Y	Ě	Ü
A	LF	.	*	:	J	Z	Ě	Ž
B	=	ESC	+	G	K	Ť	Ě	Ě
C	>	¥	,	Ů	L	Ł	Ě	Ő
D	CR	±	-	Ů	M	N	í	Ī
E	@	;	.	Ů	N	D	Ī	Š
F	[	US	/	?	O	R	İ	SP

**Table A-14. ISO 8859-8**  
**Part 8: Latin/Hebrew Alphabet**

	0	1	2	3	4	5	6	7
0	NUL	~	SP	0	@	P	ס	ך
1	И	~	!	1	A	Q	ב	ד
2	Й	½	"	2	B	R	ג	ע
3	ETX	!	#	3	C	S	ד	ף
4	EOT	§	\$	4	D	T	ה	פ
5	€	²	%	5	E	U	ו	ץ
6	×	`	&	6	F	V	ז	צ
7	÷	ETB	'	7	G	W	ח	ק
8	£	³	(	8	H	X	ט	ך
9	°	©	)	9	I	Y	ל	ש
A	LF	.	*	:	J	Z	מ	נ
B	<	ESC	+	;	K	[	ס	{
C	¿	¥	,	<	L	\	ע	
D	CR	±	-	=	M	]	פ	}
E	>	'	.	>	N	^	ק	~
F	i	US	/	?	O	_	ר	SP

**Table A-13. ISO/IEC 8859-7**  
**Part 7: Latin/Greek Alphabet**

	0	1	2	3	4	5	6	7
0	NUL	~	SP	0	@	P	`	Π
1	И		!	1	A	Q	Γ	Σ
2	Й	½	"	2	B	R	Δ	Τ
3	ETX	!	#	3	C	S	Α	Φ
4	EOT	§	\$	4	D	T	Ε	Τ
5	€	²	%	5	E	U	Η	Τ
6	×		&	6	F	V	Ι	Ξ
7	÷	ETB	'	7	G	W	Θ	·
8	£	³	(	8	H	X	Ψ	'
9	°	©	)	9	I	Y	Ω	-
A	LF		*	:	J	Z	Ι	!
B	<	ESC	+	;	K	[	Α	{
C	¿	¥	,	<	L	\	Ο	
D	CR	±	-	=	M	]	Ω	}
E	>	'	.	>	N	^	'	~
F	i	US	/	?	O	_	'	SP

**Table A-15. ISO/IEC 8859-9**  
**Part 9: Latin Alphabet Number 5**

	0	1	2	3	4	5	6	7
0	NUL	~	SP	0	@	P	`	Ġ
1	И	~	!	1	A	Q	Á	À
2	Й	^	"	2	B	R	Â	Ó
3	ETX	_	#	3	C	S	Ã	Ô
4	EOT	§	\$	4	D	T	Ä	Õ
5	€	²	%	5	E	U	Å	Ö
6	×		&	6	F	V	Æ	Ø
7	÷	ETB	'	7	G	W	Ç	Ù
8	£	³	(	8	H	X	È	Û
9	°	~	)	9	I	Y	É	Ü
A	LF	.	*	:	J	Z	Ê	Û
B	<	ESC	+	;	K	[	Ë	{
C	¿	¥	,	<	L	\	Ì	Ò
D	CR	±	-	=	M	]	Í	}
E	>	'	.	>	N	Š	Î	Ñ
F	i	US	/	?	O	ı	İ	SP



**Table A-16. ISO/IEC 8859-10**  
**Part 10: Latin Alphabet Number 6**

	0	1	2	3	4	5	6	7
0	NUL	—	SP	0	@	P	Œ	Ɔ
1	Ɔ	—	!	1	A	Q	Ɔ	Ɔ
2	Ɔ	½	"	2	B	R	Ɔ	Ɔ
3	ETX	!	#	3	C	S	Ɔ	Ɔ
4	EOT	§	\$	4	D	T	Ɔ	Ɔ
5	¢	²	%	5	E	U	Ɔ	Ɔ
6	×	·	&	6	F	V	Ɔ	Ɔ
7	÷	ETB	·	7	G	W	Ɔ	Ɔ
8	£	³	(	8	H	X	Ɔ	Ɔ
9	°	©	)	9	I	Y	Ɔ	Ɔ
A	LF	·	*	:	J	Z	Ɔ	Ɔ
B	<	ESC	+	;	K	[	Ɔ	{
C	¿	¥	,	<	L	\	Ɔ	
D	CR	±	-	=	M	]	Ɔ	}
E	>	·	.	>	N	^	Ɔ	~
F	ı	US	/	?	O	_	ı	SP

### 3. GSC SUPPORTED CHARACTERS

Table A-17 shows the international characters supported by GSC pagers.

**Table A-17. GSC International Characters**

CHARACTER GROUP	TRANSMITTER CHARACTER SEQUENCE	CHARACTER DISPLAYED
Group 1	SHIFT, 0 SHIFT, 1 SHIFT, 2 SHIFT, 3 SHIFT, 4 SHIFT, 5	ä ö ü ñ £ ¥
Group 2	SHIFT, 7 SHIFT, 8 SHIFT, 9 SHIFT, : SHIFT, '	ç é è ê ì
Group 3	SHIFT, < SHIFT, = SHIFT, > SHIFT, ? SHIFT, @	Å ß Ö Š £

### 4. POCSAG SUPPORTED CHARACTERS

Table A-18 shows the international characters supported by POCSAG pagers.

**Table A-18. POCSAG International Characters**

ASCII Set		U.S.		Germany		Switzerland		France		Sweden		Portugal		Spain		U.K.		Italy		Denmark/ Norway	
Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex	Char	Hex
#	23	#	23	#	23	ù	81	£	80	£	80	£	80	i	82	£	80	£	80	#	23
\$	24	\$	24	\$	24	\$	24	\$	24	\$	24	\$	24	\$	24	\$	24	\$	24	\$	24
@	40	@	40	\$	84	à	84	à	83	È	86	@	85	@	85	@	85	\$	84	\$	84
[	5B	[	5B	Ä	7F	é	8A	.	87	Ä	7F	[	5B	ç	89	[	5B	.	87	/E	88
\	5C	\	5C	Ö	8E	ç	8B	ç	8B	Ö	8E	\	5C	Ñ	8D	\	5C	ç	8B	Ø	8C
]	5D	]	5D	Ü	92	è	90	\$	84	Å	91	]	5D	º	8F	]	5D	é	8A	Å	91
^	5E	^	5E	^	5E	í	94	^	5E	Ü	92	^	5E	º	93	^	5E	^	5E	^	5E
_	5F	_	5F	_	5F	è	95	_	5F	_	5F	_	5F	_	5F	_	5F	_	5F	_	5F
,	60	,	60		60	ô	96	é	60	é	8A	,	60	¿	97	,	60	ü	81	,	60
{	7B	{	7B	ä	99	ä	99	ä	8A	ä	99	{	7B	ç	8B	{	7B	à	83	œ	98
	7C		7C	ö	9D	ö	9D	ù	81	ö	9D		7C	à	9B		7C	ò	9C	ø	9A
}	7D	}	7D	ü	9F	ü	9F	è	95	å	9E	}	7D	Ü	92	}	7D	è	95	å	9E
-	7E	-	7E	ß	A0	û	A3	-	A1	ü	9F	-	A1	ü	9F	-	7E	ì	A2	-	A1
DEL	7F	SP	20	SP	20	SP	20	SP	20	SP	20	SP	20	SP	20	SP	20	SP	20	SP	20

## 5. INTERNATIONAL PROMPTS

Table A-19, Table A-20, and Table A-21 show the international prompts supported by the ADVISOR message receiver.

**Table A-19. International Prompts (Table 1 of 3)**

ENGLISH	PUSH FOR OFF	MEMORY FULL	LOW CELL	DUPLICATE	tone ONLY	PAGER DISABLE	DELETE	GROUP
GERMAN	AUSS-CHALTEN	SPEICH. VOLL	BATTERIE!	MEHRFACH RUF	TONRUF	NICHT ANKUFABAR	LOESCHEN?	GRUPPENRUF
FRENCH	ENTEINDRE	MEMOIR 100%	PILE FAIBLE	RAPPEL	BIB SEUL	HORS SERVICE	EFFACER?	*GROUPE*
SWEDISH	TRYCKA AV?	MINNET FULLT	BATTERI SLUT	DUBBLERAT	ENDAST TON	URKOPPLAD!	RADERA?	GRUPPANROP
DANISH	TRYSLUKKER	HUKOMM. FULK	TOMT BATTERI	GENOPKALD	TONEOPKALD	UDE AF DRIFT	SLETTE:	GRUPPEKALD
NORWEGIAN	TRYKK FOR AV	FULLT MEM-ORY	SKIFT BATT.	ANDROPS-KOPI	TONE OPPKAL	ANROPS-SPERRET	SLETTE?	GRUPPEN-KALL
PORTUGUESE	PRIMA/DESLIG	MEM. CHEIA	PILHA GASTA	DUPLICADO	SO TOM	DESACTIVA	APAGAR?	CHAM. GRUPO
SPANISH	PULSE P DESC	MEM. LLENA	PILA BAHIA	DUPLICADO	SOLO TONO	DESC APARATO	BORRAR?	-GRUPO-
ITALIAN	SPEGNERE	MEMOR. PIENA	BATT SCARICA	DUPLICATO	SOLO TONO	DISABILITATO	CANCELLO?	-GRUPPO-
FINNISH	SULJE LAITE	EI TILLA	PARIST. LOPPU	TOISTOVIESTI	PIIPAU	EL VERKOSSA	POISTA?	YHTEISHAKU
DUTCH	DRUKKEN/UIT	GEHEUGEN VOL	BATTERY LEEG	DUPLIKAAT	TOON OPROEP	INAKTIEF	VERWIJDER?	GROEP-OPR.

**Table A-20. International Prompts (Table 2 of 3)**

ENGLISH	PUSH FOR OFF	MEMORY FULL	LOW CELL	DUPLICATE	tone ONLY	PAGER DISABLE	DELETE	GROUP
GREEK	ΚΛΕΙΣΤΟ	ΜΝΗΜΗ ΓΕΜΑΤΗ	ΜΠΑΤΑΡΟΛΑ	ΔΙΠΛΟΤΥΠΟ	ΤΟΝΟΣ ΜΟΝΟ	ΕΚΤΟΣ ΛΕΙΤΟΥΡΓΙΑΣ	ΑΚΥΡΩΣΕ	ΓΚΡΟΥΠ
UKRAINIAN	ВІДКЛЮЧЕННЯ	НЕМА ПАМ'ЯТІ	ЗАМ. БАТАРЕЇ	ПОВТОРЕННЯ	ТОН. ВИКЛИК	ПЕЙДЖЕР ВІДКЛЮЧЕНО	ВИЛУЧИТИ?	ГРУПА
BELOUSSIAN	ВЫКЛЮЧЭННЕ	НЯМА ПАМ'ЯЦІ	ЗМЯНІЦЕ БАТ	ПАЎТОР	ТАНАЛ	ПЭЙДЖЭР АДКЛЮЧАНЫ	ВЫДАЛІЦЬ?	ГРУПА
BULGARIAN	ИЗКЛЮЧВАНЕ	ПЪЛНА ПАМЕТ	РАЗР. БАТЕРИЯ	ПОВТ.СЪОБЩ.	ТОНОВО СЪОБЩ.	ЗАБРАНА ЗА ЧЕТЕНЕ	ИЗТРИВАНЕ?	ГРУП.СЪОБЩ
LATVIAN	IZSLĒGT \$EIT	PILNA ATMIŅA	NOMAINIT BAT	DUBLIKĀTS	TIKAI SIGNAL	ATSLĒGTS PEIDŠERS...	IZDZĒST ?	GRUPA
TURKISH	BASIP KAPA	HAFIZA DOLU	PİL AZ	ÇAGRI TEKRAR	SADECE TON	âAÖRÇ GAPALI	SİL ?	GRUP
HUNGARIAN	KIKAPC-SOLÁS?	MEMORIA TELE	ELEM GYENGE	ISMÉTLÉS	HANGJELZÉS	MÁKÜDÖSÉLET ILTVA...	TÖRLENDŐ ?	CSOPORT

**Table A-21. International Prompts (Table 3 of 3)**

ENGLISH	RUSSIAN	ICELANDIC	POLISH	ARABIC
MOTOROLA	МОТОРОЛА	MOTOROLA	MOTOROLA	موتورولا
PUSH FOR OFF	ВЫКЛЮЧЕНИЕ	SLOKKVA ?	NACISNAĆ WYŁ	أضبط للقفل
MEMORY FULL	НЕТ ПАМЯТИ	MINNI FULLT	PAMIĘĆ ZAŁAD	ذاكرة ممتلئة
LOW CELL	ЗАМЕНИТЕ БАТ	RAFHLADA	BATER. WYŁAD	خلية ضعيفة
DUPLICATE	ПОВТОР	ENDURTEKNING	POWTÓRZENIE	مكررة
tone ONLY	ТОНАЛ. ВЫЗОВ	TONBOD	TONALNA	صوتي فقط
PAGER DISABLED	ПЕЙДЖЕР ОТКЛЮЧЕН	OVIRKT	PAGER NIESPRAWNY	جهاز مقفل
DELETE ?	УДАЛИТЬ ?	EYDA ?	USUNIAĆ ?	أمحي ؟
GROUP	ГРУППА	HOPKELL	GRUPOWA	مجموعة

## 6. R1150 CODE SYNTHESIZER ALPHANUMERIC TEST MESSAGES FOR POCSAG PAGERS

Table A-22. R1150 Code Synthesizer II Test Message

LANGUAGE	MESSAGE DISPLAYED
ENGLISH	MOTOROLA R1150-POCSAG PAGING TEST
POLISH	MOTOROLA R1150-POCSAG PAGING TEST
ICELANDIC	MOTOROLA R1150-POCSAG PAGING TEST
RUSSIAN	моторола р1150-поцсаг тест
ARABIC	حد شد ز دچءز 0511 - ذءأسم ذء اءءاشءش

## 7. ARABIC CHARACTER MAPPING

Arabic, modified Arabic, and Persian characters are listed in Table A-23. The table provides a character code for Arabic/Persian letters at the beginning, middle, unconnected at end, and connected at end characters. For example, Arabic letter BAA has a beginning character code of 48. If Arabic letter BAA occurs in the middle of the word, it has a character code of 6C. If BAA is a letter not connected at the end of the word, the character code is 48+5C. If BAA is connected at the end of the word, the mapping character code is 48+5C.

Table A-23. Arabic Mapping Table for PAIR CGROM

ARABIC LETTER	BEGINNING	MIDDLE	UNCONNECTED, AT END	CONNECTED, AT END
01. ALEF	47	6B	47	6B
02. BAA	48	6C	48+5C	48+5C
03. TAA	4A	6D	4A+5C	4B+5C
04. THAA	4B	6E	4B+5C	4B+5C
05. JEEM	4C	4C	10 (or 4C+5F)	0B (or 4C+5F)
06. HAA	4D	4D	05 (or 4D+5F)	18 (or 4D+5F)
07. KHAA	4E	4E	12 (or 4E+5E)	19 (or 4E+5F)
08. DAL	4F	6F	4F	6F
09. THAL	50	70	50	70
10. RA	51	71	51	71
11. ZAIN	52	72	52	72
12. SEEN	53	53	53+27	53+27
13. SHEEN	54	54	54+27	54+27
14. SAD	55	55	55+27	55+27
15. DAD	56	56	56+27	56+27
16. TAH	57	57	57	57
17. DHAH	58	58	58	58
18. AIN	59	73	07 (or 59+5F)	09 (or 73+5F)
19. GHAIN	5A	74	14 (or 5A+5F)	16 (or 74+5F)
20. FA	61	61	61+5C	61+5C
21. QAF	62	62	62+5C	62+5C
22. CAF	5D	77	63	63
23. LAM	64	78	64+5C	78+5C
24. MEEM	65	79	65+26	79+26
25. NOON	66	7A	66+5C	7A+5C
26. HA	67	7B	5E	40
27. WAW	68	68	68	68
28. ALEF MAQSURAH	69	69	69	69
MODIFIED CHARACTERS				
29. YA	7E	7D	6A	6A
30. HAMZAH	41	41	41	41
31. ALEF MADDAH	42	7C	42	7C
32. ALEF HAMZAH	43	7C	43	75
33. WAW HAMZAH	44	44	44	44
34. HAMZAH under ALEF	45	45	45	45
35. YA HAMZAH	45	46	69+41	69+41
36. TATWIL (extd)	60	60	60	60
37. TAA MARBUTAH	49	40	49	40
38. HA MARBUTAH	76	76	5E	76
39. LAM-ALEF	5B	5B	5B	5B
PERSIAN CHARACTERS				
40. PEH	0C	0C	0C+5C	0C+5C
41. TCHEH	1A	1A	1A+5F	1A+5F
42. JEH	1C	1C	1C	1C
43. GAF	1D	1D	1D+5C	1D+5C

## 8. ARABIC MESSAGE RESULTS

Examples 1-3 shown below are the result of sending send data bytes to a pager configured for either Arabic or Arabic/English mix.

Example 4 shows the result of sending the send data bytes to an Arabic/English mix pager only.

### EXAMPLE 1

ذهب التلميذ إلى المدرسة

Send: 50 67 6C 5C 20 47 64 6D 78 79 7D 70 20  
45 64 69 20 47 64 79 6F 51 53 40

02: ذهب التلميذ  
إلى المدرسة  
<03>  
11:51 AM 16/03/95

### EXAMPLE 2

رافق الاب ابنه إلى الجامعة

Send: 51 47 61 62 5C 20 47 5B 48 5C 20 45 48 7A 76 20  
45 64 69 20 47 64 4C 6B 65 73 40

06: رافق الاب ابنه  
إلى الجامعة  
<03>  
12:05 PM 16/03/95

### EXAMPLE 3

وصل الطبيب إلى المستشفى

Send: 68 55 78 5C 20 47 64 57 6C 7D 48 5C 20  
45 64 69 20 47 64 79 53 6D 54 61 69

07: وصل الطبيب  
إلى المستشفى  
<03>  
12:24 PM 16/03/95

### EXAMPLE 4

MOTOROLA تقدم لكم أحدث وأدق  
التكنولوجيا لعام 1995

Send: 01 19 1D 32 1D 28 1D 03 20 4A 62 6F 65 26 20 64 77 79 26 20  
43 4D 6F 4B 5C 20 68 20 43 4F 62 5C 20 47 64 6D 77  
7A 68 64 68 4C 7D 6B 20 64 73 6B 65 26 20 35 39 39 31

MOTOROLA: 07  
تقدم لكم أحدث وأدق  
التكنولوجيا لعام  
1995

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When ordering replacement parts or equipment, include the Motorola part number and description used in the service manual or supplement.

When ordering crystals or channel elements, specify the Motorola part number, description, crystal frequency, and operating frequency desired.

When the Motorola part number of a component is not known, use the product model number or other related major assembly along with the description of the related major assembly and of the component in question.

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Motorola (China) Electronics Ltd.  
Shanghai Pager Service Centre  
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16 Henan Road South  
Shanghai 200002, P.R.C.  
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Fax: 86-21-6374-2714

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271 Huang Pu Da Dao West  
Tian-He District  
Guangzhou 510620, P.R.C.  
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San Severo S/N, Barajas Park  
28042 Madrid, Spain  
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Fax: 34-1-329-1933

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São Paulo Pager Care Center  
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Richmond Hills, Ontario, Canada L4B2N3  
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Santa Fe de Bogota, Colombia  
Phone: 571-615-5769  
Phone: 571-615-6941

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