MOBILE RADIO

MAINTENANCE MANUAL

FOR

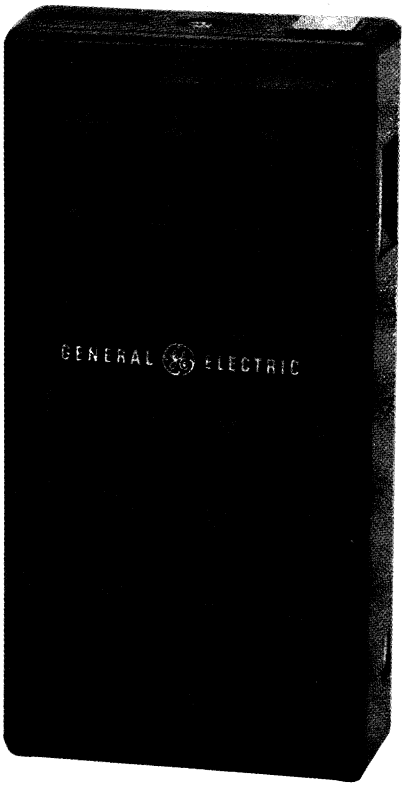
GENERAL ELECTRIC

Executive II

TONE AND VOICE PAGER

142-174 MHz

LBI31215



GENERAL ELECTRIC

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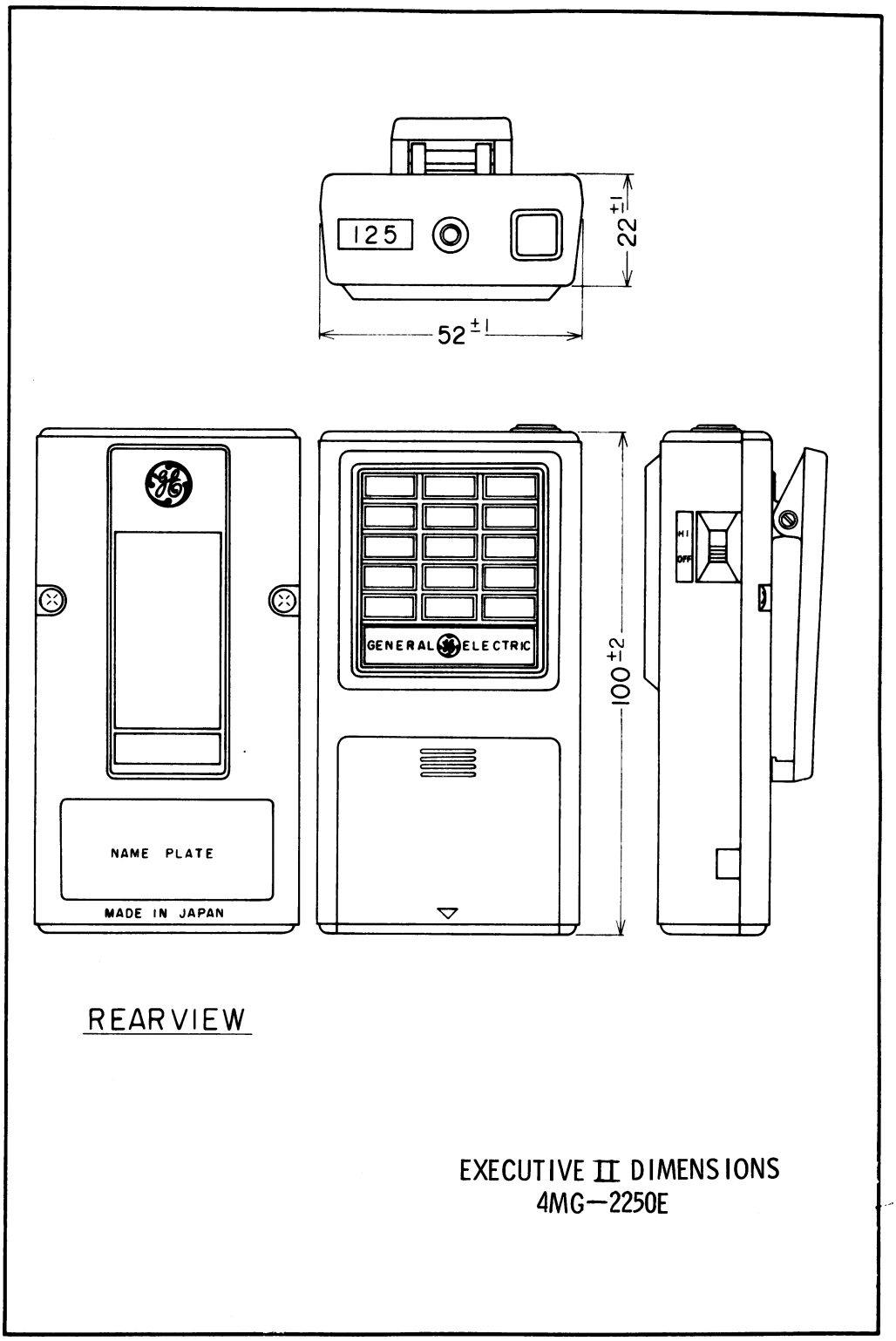
TYPICAL SPECIFICATIONS

FCC Identification Number	AXA9ERER146A & B
GE Type Number	ER-146-A: 148-160 MHz ER-146-B: 159-174 MHz 142-150.8 MHz
Frequency Range	142-174 MHz
Type of Operation	Tone and Voice
Decoder System	Type 99
Audio Power Output (4 Ohm Speaker)	
HI	150 milliwatts
LO	20 milliwatts
Current Drain (at 2.5 Volts)	
Standby	5.2 milliamperes
Receive	105 milliamperes
Battery Life	
Nickel-Cadmium	25 hours
Mercury	115 hours
Modulation Acceptance	±8 kHz
Channel Spacing	30 kHz
Selectivity (EIA)	-70 dB
Paging Sensitivity	7 uV/meter
Usable Sensitivity (12 dB SINAD)	18 uV/meter
Spurious Response	-56 dB
Frequency Stability	±5 PPM
Audio Distortion	5% maximum
Dimensions (H x W x D)	100 x 52 x 36 millimeters (with belt clip)
Weight	150 grams (5-1/4 ounces)

COMBINATION NOMENCLATURE

Digits 1&2	Digit 3	Digit 4	Digit 5	Digit 6	Digit 7
Product Code	Tone Option	Control	Alert Tone	Channel Spacing	Frequency Range
P8 Pager	**L** T99/Quick Call	**B** Push-to-reset	**W** Fixed Volume	**6** 30 KHz	**H** 142-153 MHz
					J 148-160 MHz
					K 159-174 MHz



REARVIEW

EXECUTIVE II DIMENSIONS
4MG—2250E

DESCRIPTION

The General Electric Executive II Pager is a highly reliable, extremely compact receiver for tone and voice paging applications.

The Pager is equipped with a built-in speaker and antenna, and is shipped with two nickel-cadmium rechargeable batteries and an external earphone.

The receiver is housed in a ruggedly-constructed case, with all operating controls conveniently mounted on the top and side of the case. An accessory jack on the top of the radio is provided for an external earphone.

Power for the Pager is normally supplied by two rechargeable nickel-cadmium batteries that fit in a separate battery compartment in the bottom section of the case. The batteries can be recharged either in or out of the receiver.

If desired, the Pager can also be operated by mercury, alkaline or zinc-carbon batteries. However, these batteries are not rechargeable.

The spring clip on the Pager may be used to clip the radio to a pocket or belt.

OPERATION

Turn the receiver on by placing the Power/Volume switch to Volume HI position (See Figure 1). Several short bursts of tone should be heard. The receiver is now ready to receive messages.

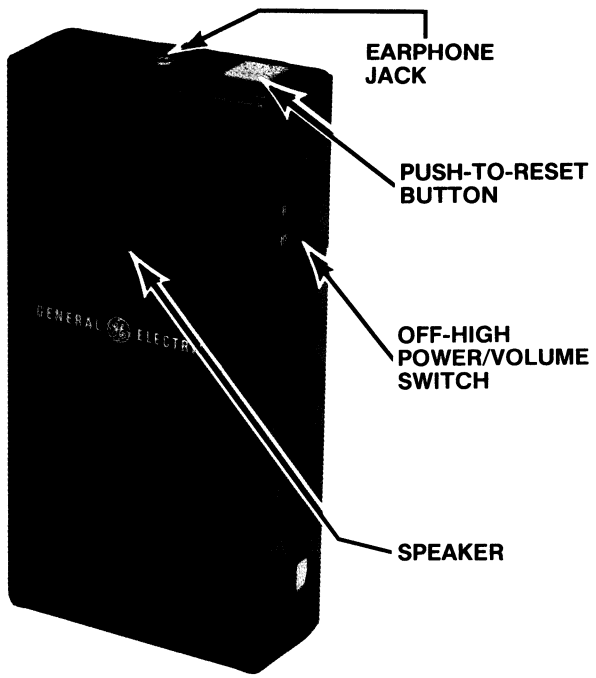


Figure 1 - Operating Controls

Before a message is received, a short, interrupted burst of tone will be heard, followed by a voice message. As soon as the message is completed, press the Push-to-Reset button to reset the receiver.

NOTE

Failure to press the Reset button after receiving a message may shorten battery life. Do not press the Reset button while receiving a message or an alert tone. Doing so will prevent you from receiving the message.

After receiving the first message, it may be desirable to reduce the volume by placing the OFF-HI switch in the LO position.

CHARGERS

A single unit desk-top charger is available for recharging the nickel-cadmium batteries in the radio as well as spare nickel-cadmium batteries.

NOTE

Temperature characteristics of nickel cadmium batteries prevent a full charge at temperature extremes. For maximum capacity, recharge the batteries at room temperatures between 65° to 85° Fahrenheit.

WARNING

Do not attempt to charge Mercury batteries. To do so may cause the batteries to explode.

To use the charger, connect the power cable to an appropriate power source. Place the Pager into the charger. The red light will turn on, indicating that the Pager is being charged. To charge spare nickel-cadmium batteries, place them into the battery insert. A second red light will come on to indicate that the batteries are being charged.

An earphone is available for use in high-noise areas, or for receiving messages in private. Plugging the earphone into the earphone jack disables the Pager speaker so that messages can only be heard through the earphone.

BATTERY INFORMATION

Two different types of batteries may be used in the Pager. The type and battery life for each battery is shown in the following chart.

Battery Type	Part Number	Typical Battery Life
Nickel-Cadmium (Rechargeable)	19A703502P1	24 Hours
Mercury (Not Rechargeable)	19A701300P1 Mallory MP401 Eveready EP401E	105 Hours

NOTE

Nickel-cadmium batteries should be fully re-charged before using.

BATTERY REPLACEMENT

The Pager is shipped from the factory ready for immediate operation upon installation of two fully charged batteries.

To install or replace the batteries:

1. Slide the Pager OFF-HI switch to the OFF position.
2. Press in the battery cover on the ridges at the top of the cover and slide cover down as shown.
3. Replace batteries according to the (+) and (-) signs in the battery compartment.

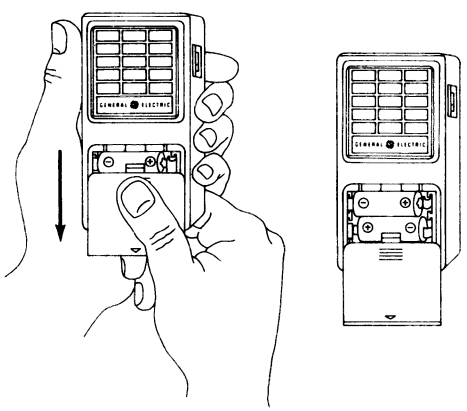


Figure 2 - Battery Replacement

WARNING

Do not dispose of either the rechargeable battery or the Mercury battery by burning. To do so may cause a battery to explode.

NOTE

There is no way to dispose of mercury batteries without possible polution except by returning them to the manufacturer for recycling.

Mallory Battery Company will buy all used mercury batteries at the current market price. Batteries are to be shipped prepaid, enclosing a packing slip indicating who is to receive payment for the batteries to:

Mallory Battery Company
Plant #2
Lexington, North Carolina 27292

CIRCUIT ANALYSIS

RECEIVER

Paging receiver Type ER-146-A, B or C is a double-conversion, superheterodyne receiver for tone and voice paging in the 142-174 MHz range. One circuit board contains both tone and voice circuits, and utilizes both discrete components and Thick Film Integrated Circuit Modules (IC's).

The receiver has intermediate frequencies of 10.7 MHz and 455 kHz. Adjacent channel selectivity is provided by using two, 2-pole ceramic filters.

References to symbol numbers mentioned in the following text are found in the Outline Diagram, Schematic Diagram and Parts List (See Table of Contents). A block diagram of the receiver is shown in Figure 3.

Receiver Front End

An RF signal from the antenna is coupled through the antenna circuit to the base of RF amplifier Q1. The antenna circuit consists of L1, CV1 and C1. The circuit is tuned by CV1.

The output of Q1 is coupled through three tuned circuits that provide most of the front end selectivity. The tuned circuits are L2, L3, L4 and associated circuitry. The output of L4 is coupled through C10 to the base of the first mixer.

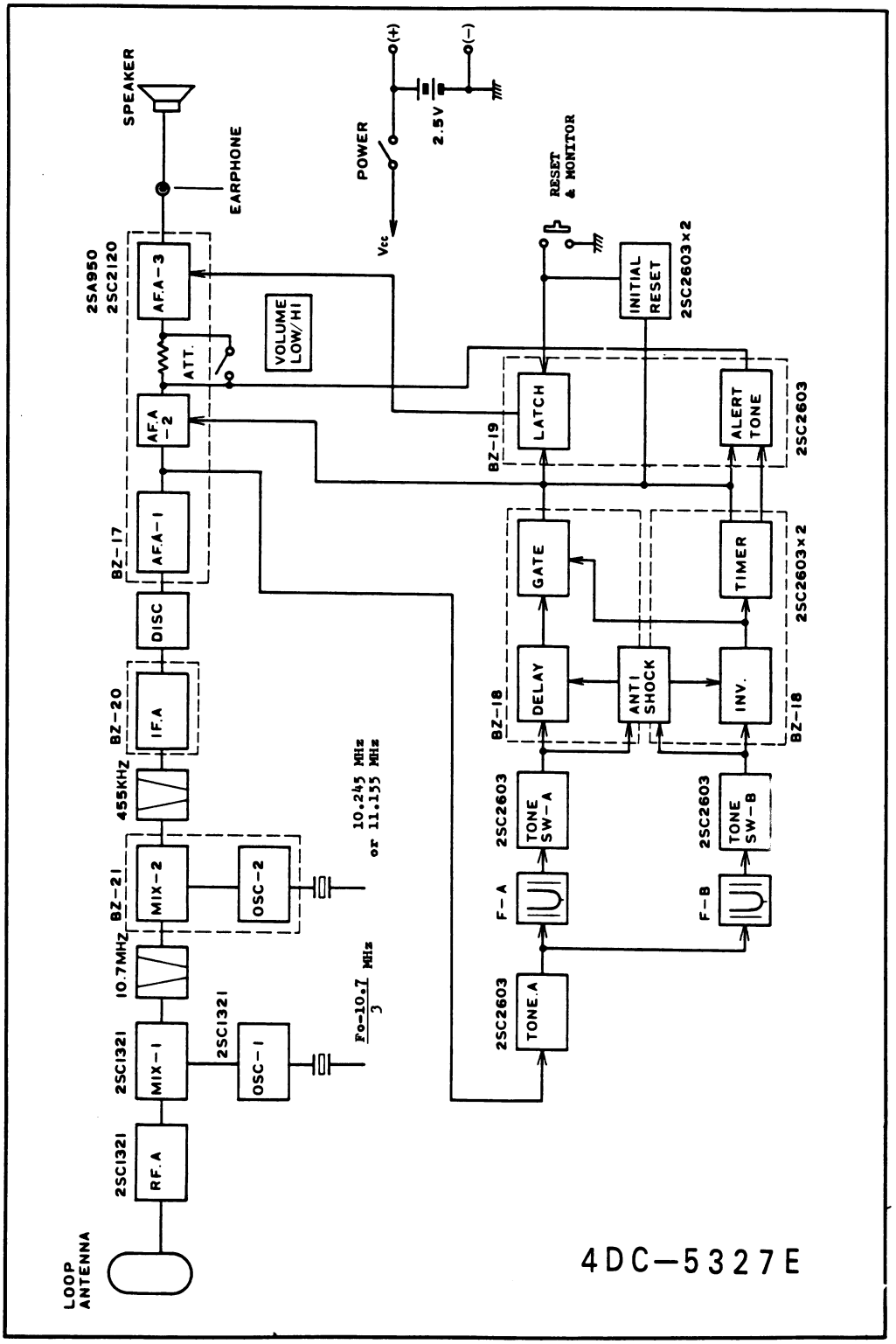


Figure 3 - Pager Block Diagram

1st Oscillator

Q2, X1, L5 and associated circuitry make up a Colpitts oscillator. The frequency is controlled by a third mode crystal operated at one third of the required injection frequency. L5 is used to set the oscillator on frequency. R3 is in parallel with X1 to ensure operation on the third overtone of the crystal. The injection frequency is the operating frequency (-) 10.7 MHz, and is coupled through C16 and applied to the first mixer. L6 is tuned to three times, the crystal frequency. The output to the 1st mixer is approximately 65 millivolts rms.

1st Mixer and IF Filter

RF from the Pager front end is applied to the base of first mixer Q3. Injection voltage from the first oscillator is also applied to the base of Q3. The 10.7 MHz first IF frequency is coupled through L7 to 10.7 MHz filter FL1. L7 is used to match the mixer output to the input of FL1.

The highly-selective filter provides the first portion of the receiver IF selectivity. The 10.7 MHz output of FL1 is applied to the second mixer IC.

2nd Oscillator, Mixer and IF Filter

A1 and associated circuitry make up the 2nd oscillator and mixer. The crystal for the oscillator is X2. The oscillator operates at 10.245 MHz for low side injection of the 2nd IF (standard), or 11.155 MHz for high side injection for those radios determined to be operating on a tweet frequency. This frequency is mixed with the 10.7 MHz input to provide the 455 kHz 2nd IF frequency.

The output of A1 is coupled through ceramic filter FL2 which provides the 455 kHz selectivity. The filter output is applied to IF amplifier A2.

IF Amplifier and Detector

A2 and associated circuitry make up the IF amplifier. The amplifier IC also provides the 455 kHz limiting. The output of A2 is applied to the discriminator.

A discriminator is used to demodulate the 455 kHz signal. This type of detector provides a high degree of AM rejection. The recovered audio, tone and noise is applied to audio amplifier IC A51.

Audio Stages

The discriminator output is applied to audio amplifier A51 and to the decoder circuitry. Applying the proper sequential tones to the receiver activates the decoder circuitry and audio stages, causing the alert tone to be heard at the speaker.

After the alert tone is heard, the output of A51 is applied to the push-pull audio amplifiers (Q51 and Q52), and then to the speaker.

TYPE 99 DECODER

The Type 99 Decoder is a two-reed, sequential tone decoder for operation with any two-tone sequential encoder in individual call applications.

The two reeds mount at the bottom of the circuit board, and are available for operation on tone frequencies in the 517.5 to 967.5 Hz range.

The pager is also compatible with Motorola two-tone paging systems, and operates in both individual call and group call applications.

Timing waveforms for the decoder are shown in Figure 4 and 5. It is recommended that these waveforms be studied in conjunction with the circuit analysis for a better understanding of the decoder operation.

INDIVIDUAL CALL (Figure 4)

Tone A

An RF signal with tone A is applied to the Pager for approximately one second. When the tone is applied, the output of the discriminator is applied to limiter-amplifier Q53. The square-wave output of Q53 drives reed FL51.

If the correct Tone A is received, the output of FL51 is applied to amplifier Q54 which provides approximately 20 dB gain. The output of Q54 is rectified by D53 and D54. This DC voltage is applied to A52-1. The voltage activates a 0.7 second delay timer (R68 and C66) and then causes a positive pulse to appear at A52-8.

Tone B

After Tone A has been received, Tone B is applied to the receiver for three seconds. The tone is amplified by Q53 and applied to reed FL52. The reed output is amplified by Q55 (approximately 20 dB gain and rectified by D55 and D56. This output is applied to A53-1.

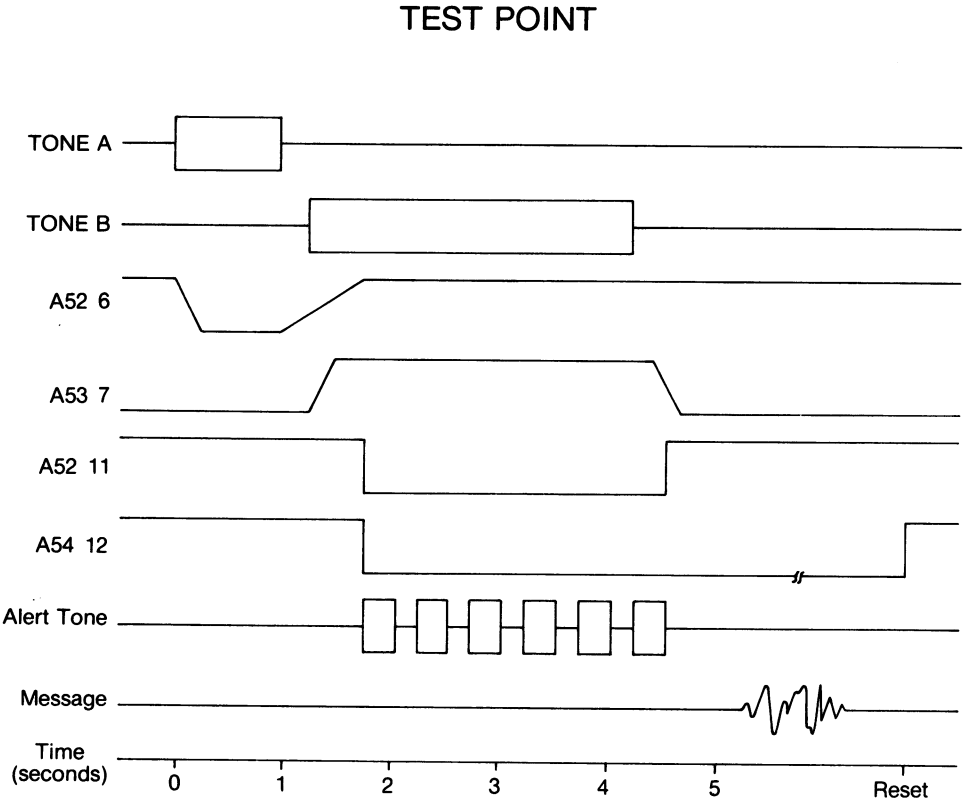


Figure 4 - Individual Call Timing Diagram

The voltages applied to A52-1 and A53-1 activate an "AND" gate in A52, causing the output at pin 11 to go low (ground) for approximately 2.5 seconds. The low is applied to A54-6 which activates the alert tone oscillator.

The continuous oscillator tone output is shunted to ground for 50 milliseconds at 100 millisecond intervals to provide the interrupted alert tone. The alert tone is then applied to pin 6 of A51.

At the same time the tone alert oscillator starts, pin 12 of A54 is switched to ground. This ground is applied to pin 9 of A51, turning the amplifier on. The amplifier remains on (A54-12 at ground potential) until the Reset button is pressed.

GROUP CALL (Figure 5)

In Group Call applications, only Tone B is applied in the same way as Tone B in Individual Call applications, and is applied for eight seconds. The low output (-0.2 VDC) of D55 and D56 is applied to A53-1. This allows C71 to charge through R72. This causes A53-11 to go low (Q56 off) and Q57 to turn on, causing the voltage at TP3 to go low. Turning off Q56 also applies a high (approximately 1.2 VDC) to A54-3, switching on the tone oscillator.

RESET CIRCUIT

Pressing the Reset button grounds A54-11. This causes A54-12 to go high and turns off audio amplifier A51 to reset the Pager.

ANTI-SHOCK CIRCUIT

When the Pager is subjected to a mechanical shock, both reeds will vibrate and apply a low to pin 1 of A52 and A53. This causes a high at pin 2 of A52 and A53 which disables A53 and A54 to prevent falsing.

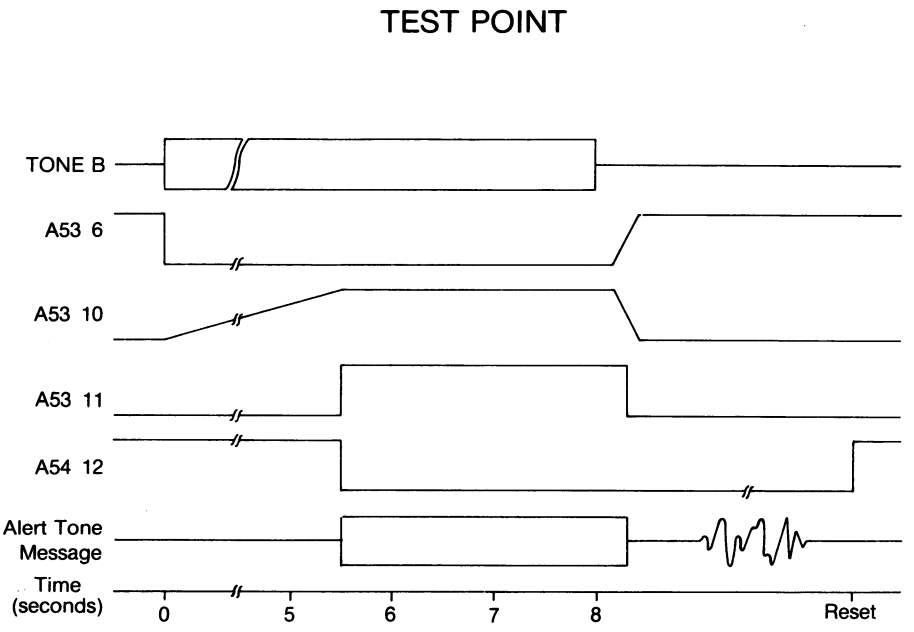


Figure 5 - Group Call Timing Diagram

DETERMINATION OF TONE FREQUENCIES

The Pager can receive and decode two-tone sequential signals coded in the GE Type 99 format or the Motorola format.

The GE tone frequencies range from 517.5 Hz to 967.5 Hz. Motorola tone frequencies range from 288.5 Hz to 1433.4 Hz. The Pager is capable of both Individual and Group Call. However, the Group Call will operate only with the Motorola signaling format.

GE FORMAT

INDIVIDUAL CALL

Tables I and II enable the technician to determine the tone frequencies without opening the radio to examine the reed networks.

For example, assume the paging number to be 123. The first digit of the paging number is a 1. Look in Table I, and read down the column labeled "100's Digit" to a 1. Read horizontally across to the column labeled "10's Digit". The tone group is B. The second digit of the paging number is a 2. The tone number is B2. Look in Table II and down the column labeled "Tone Designator" to find B2. Read horizontally across to the column labeled "Tone Frequency". The first tone frequency is 787.5 Hz.

To determine the second tone frequency look in Table I and as before, find the first digit of the paging number 1. Read horizontally across to the column labeled "1's Digit".

The second tone group is A. The third digit of the paging number is a 3 and the Tone Designator is A3. In Table II read down the column labeled "Tone Designator" and find A3. Read horizontally across the column labeled "Tone Frequency". The second tone frequency is 802.5 Hz.

For different paging numbers, locate the first digit in the "100's Digit" column and determine the tone frequencies as described in the example. For a complete description of tone applications see DATAFILE BULLETIN DF-5000-3A.

100's Digit	10's Digit	1's Digit
	For 1st Tone	For 2nd Tone
0	A	A
1	B	A
2	B	B
3	A	A
4	C	C
5	C	A
6	C	B
7	A	C
8	B	C
9	Not Used	

TABLE I - Tone Groups

TONE GROUP	TONE DESIGNATOR	TONE FREQUENCY
	A0	682.5 Hz
	A1	592.5 Hz
	A2	757.5 Hz
	A3	802.5 Hz
	A4	847.5 Hz
	A5	892.5 Hz
	A6	937.5 Hz
	A7	547.5 Hz
	A8	727.5 Hz
	A9	637.5 Hz
	B0	652.5 Hz
	B1	607.5 Hz
	B2	787.5 Hz
	B3	832.5 Hz
	B4	877.5 Hz
	B5	922.5 Hz
	B6	967.5 Hz
	B7	517.5 Hz
	B8	562.5 Hz
	B9	697.5 Hz
	C0	667.5 Hz
	C1	712.5 Hz
	C2	772.5 Hz
	C3	817.5 Hz
	C4	862.5 Hz
	C5	907.5 Hz
	C6	952.5 Hz
	C7	532.5 Hz
	C8	577.5 Hz
	C9	622.5 Hz
Diagonal Tone		742.5 Hz

TABLE II - Tone Generator Frequencies

MOTOROLA FORMAT

INDIVIDUAL CALL

(See Table III). Then Table IV is used to determine the actual tone frequencies.

The first digit of the code determines the tone groups used in the code (See Figure 3). Then Table IV is used to determine the actual tone frequencies.

For a code of 124, the tone groups used are shown in Table III. (Tone A and Tone B are both located in Tone Group 1.) Tone A is tone number 2 in Tone Group 1, and Tone B is tone number 4. Refer to the following examples for additional information.

EXAMPLE 1 - Code 098:

The digit "0" in Table III (First Digit of Code) shows that Tone A is in Tone Group 4, and Tone B is in Tone Group 2 (See Table IV).

Tone number 9 in Tone Group 4 is 524.6 Hz.

Tone number 8 in Tone Group 2 is 879.0 Hz.

EXAMPLE 2 - Code 265:

The digit "2" in Table III shows that both Tone A and Tone B are both in Tone Group 2.

Tone number 6 is 788.5 Hz.

Tone number 5 is 746.8 Hz.

First Digit of Code	Group from Which Tone A is Selected	Group from Which Tone B is Selected
1	1	1
2	2	2
3	1	2
4	4	4
5	5	5
6	2	1
7	4	5
8	5	4
9	2	4
0	4	2
A	3	3

TABLE III - Motorola-Type Coder Numbers

GROUP CALL

In Group Call application, the Tone Group is determined by Table V, while the frequency is determined by Table IV. Refer to the following examples.

NOTE

Group Call code numbers range from 00 to 99. However, there are several Group Calls with the same Tone B frequency. This limits the total number of Group Calls to 40.

EXAMPLE 1 - Group Call Code 07 (also code 27 and 37):

The digit "0" in Table V shows that Tone B is in Tone Group 2 along with 20 to 29 and 30 to 39. Tone number 7 in Tone Group 2 is 832.5 Hz (See Table IV).

Tone No.	Tone Group 1	Tone Group 2	Tone Group 3	Tone Group 4	Tone Group 5	Tone Group 6
1	349.0 Hz	600.9 Hz	288.5 Hz	339.6 Hz	584.8 Hz	1153.4 Hz
2	368.5 Hz	634.5 Hz	296.5 Hz	358.6 Hz	617.4 Hz	1185.2 Hz
3	389.0 Hz	669.9 Hz	304.7 Hz	378.6 Hz	651.9 Hz	1217.8 Hz
4	410.8 Hz	707.3 Hz	313.0 Hz	399.8 Hz	688.3 Hz	1251.4 Hz
5	433.7 Hz	746.8 Hz	953.7 Hz	422.1 Hz	726.8 Hz	1285.8 Hz
6	457.9 Hz	788.5 Hz	979.9 Hz	445.7 Hz	767.4 Hz	1321.2 Hz
7	483.5 Hz	832.5 Hz	1006.9 Hz	470.5 Hz	810.2 Hz	1357.6 Hz
8	510.5 Hz	879.0 Hz	1034.7 Hz	496.8 Hz	855.5 Hz	1395.0 Hz
9	539.0 Hz	928.1 Hz	1063.2 Hz	524.6 Hz	903.2 Hz	1433.4 Hz
0	330.5 Hz	569.1 Hz	1092.4 Hz	321.7 Hz	553.9 Hz	1122.5 Hz

Table IV - Motorola Tone Frequencies and Groups

EXAMPLE 2 - Group Call Code 98 (also code 48 and 88):

The digit "9" in Table V shows that Tone B is in Tone Group 4 along with 40 to 49 and 80 to 89. Tone number 8 in Tone Group 4 is 496.8 Hz.

GROUP CALL CODE NUMBER	TONE GROUP (Tone B)
00 - 09	TG2
10 - 19	TG1
20 - 29	TG2
30 - 39	TG2
40 - 49	TG4
50 - 59	TG5
60 - 69	TG1
70 - 79	TG5
80 - 89	TG4
90 - 99	TG4

TABLE V - Group Call Tone Groups (TG)

DISASSEMBLY

To gain access to the receiver board for servicing:

1. Loosen the two screws in the back cover and lift off cover.
2. With the speaker facing down, carefully loosen the board in front cover.
3. Carefully turn the Pager over in the palm of the hand (speaker facing up) and lift off the front cover.

When replacing the board in the case, hold the case with the speaker grill facing down and insert the earpiece jack through the hole in the top of the case. Make sure the speaker is properly located. Then gently press the board up into the case and tighten the two screws in the back cover.

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

GENERAL ELECTRIC*
U.S.A.

EQUIPMENT:

1. Spectrum Analyzer
2. Multimeter
3. 2.5 Volt Power Supply
4. Frequency Counter
5. Oscilloscope
6. Distortion Analyzer (with floating instrument circuit ground)
7. Test Fixture JA52VT-1
8. Signal Generator
9. 2-Tone Generator

PROCEDURE

1. Remove Printed Board assembly from case and batteries from their compartment
2. Mount Printed Board assembly on alignment test fixture
3. Set RF on signal generator
4. Set signalling tone frequencies on two-tone generator
5. Turn on power (+2.5 VDC)
6. Connect spectrum analyses probe to TP1 and display injection
7. Adjust L6 for max injection level
8. Adjust L5 for proper injection frequency (Inj. Freq. = RF - IF)
9. Adjust front end tuning elements (CV1, L2, L3, L4) for best SINAD
10. Measure chassis usable sensitivity (12 dB SINAD) to check for correct alignment. Sensitivity should be -118 dBm

SERVICE NOTE

There is a 16 dB coupling loss in the test fixture.

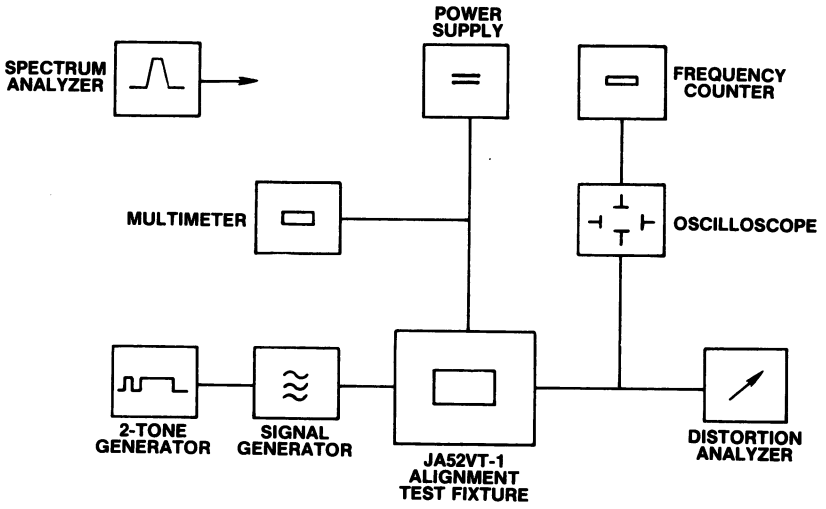


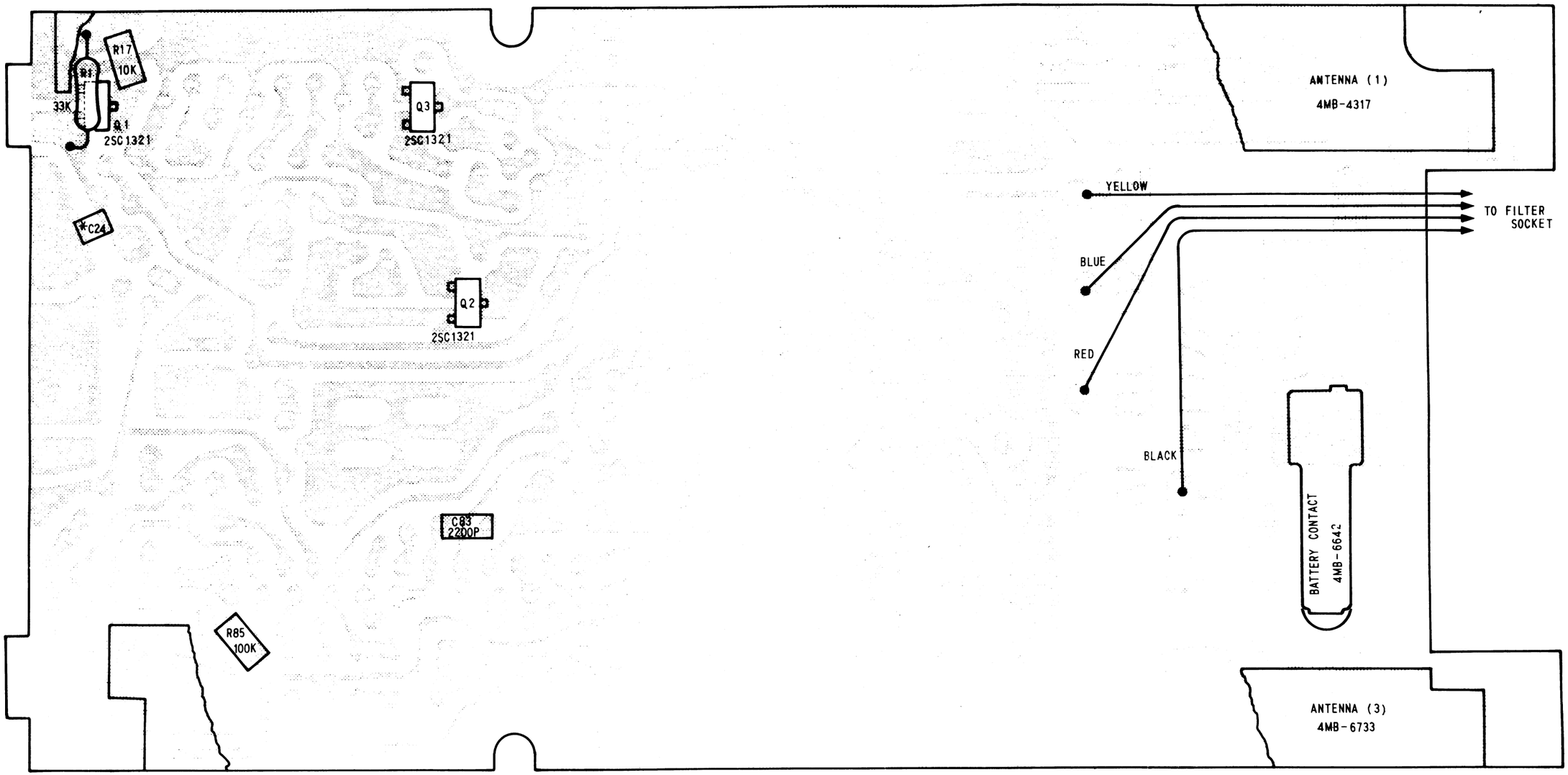
Figure 6 - Alignment Setup

TROUBLESHOOTING PROCEDURE

Listed below are the standard voltage readings taken with Volume switch in the "H" position and a supply voltage of 2.5 Volts.

Condition Test Point	Stand-By	No Modulation, RF input: 40dBuV	150mW at 1 kHz, 40dB 70%	Decoder Low State	Decoder High State
LO(OSC) TP1	71mV	-----	-----	-----	-----
DISC out TP2	-----	1.8mVrms noise	97mVrms	-----	80mVrms noise
LATCH out TP3	-----	-----	-----	0.08DCV	2.46DCV
RFA (Q1-base)	0.72DCV	-----	-----	-----	-----
RFA (Q1-collector)	1.2DCV	-----	-----	-----	-----
OSC-1 (Q2-collector)	2.26DCV	-----	-----	-----	-----
OSC-1 (R5 lk) (Q2-emitter)	0.98DCV	-----	-----	-----	-----
MIX-1 (Q3-base)	0.67DCV	-----	-----	-----	-----
MIX-1 (Q3-collector)	0.88DCV	-----	-----	-----	-----
MIX-2 (A1-6 Collector)	2.02DCV	-----	-----	-----	-----
MIX-2 (A1-3 bias)	1.09DCV	1.09DCV	-----	-----	-----
OSC-2 (A1-4 Collector)	0.6DCV	0.6DCV	-----	-----	-----
OSC-2 (A1-5 base)	0.48DCV	0.48DCV	-----	-----	-----
IFA (A2-4 power source)	1.68DCV	-----	-----	-----	-----
AFA					
(A51-1 base)	1.63DCV	-----	1.57DCV	-----	-----
(A51-2 emitter)	1.17DCV	-----	1.09DCV	-----	-----
(A51-5 collector)	0.66DCV	-----	0.65DCV	-----	-----
(A51-6 differential base)	1.23DCV	-----	1.16DCV	-----	-----
(A51-8 collector or Q51, Q52)	1.2DCV	-----	1.2DCV	-----	-----
(A51-9 gate)	1.52DCV	-----	0.03DCV	-----	-----
(A51-10 I.C. center)	1.2DCV	1.2DCV	1.17DCV	-----	-----
(A51-11 I.C. out B)	0 DCV	0.63DCV	0.58DCV	-----	-----
(A51-12 I.C. out A)	2.0DCV	1.8 DCV	1.77DCV	-----	-----
(A51-13 I.C. power source)	2.5-0.013DCV	2.5-0.1DCV	2.5-0.1DCV	-----	-----
220 Ω	0.06mA	0.46mA	0.46mA	-----	-----
Tone Amp. (Q53-collector)	1.0DCV	0.72DCV	1.05DCV	-----	-----
Tone B Amp. (Q55-collector)	0.74DCV	0.75DCV	0.75DCV	-----	at receiving; 0.75DCV
Current Drain	4.9mA	19mA	9 4mA	-----	-----
D57	1.2DCV	1.2DCV	1.2DCV	-----	-----

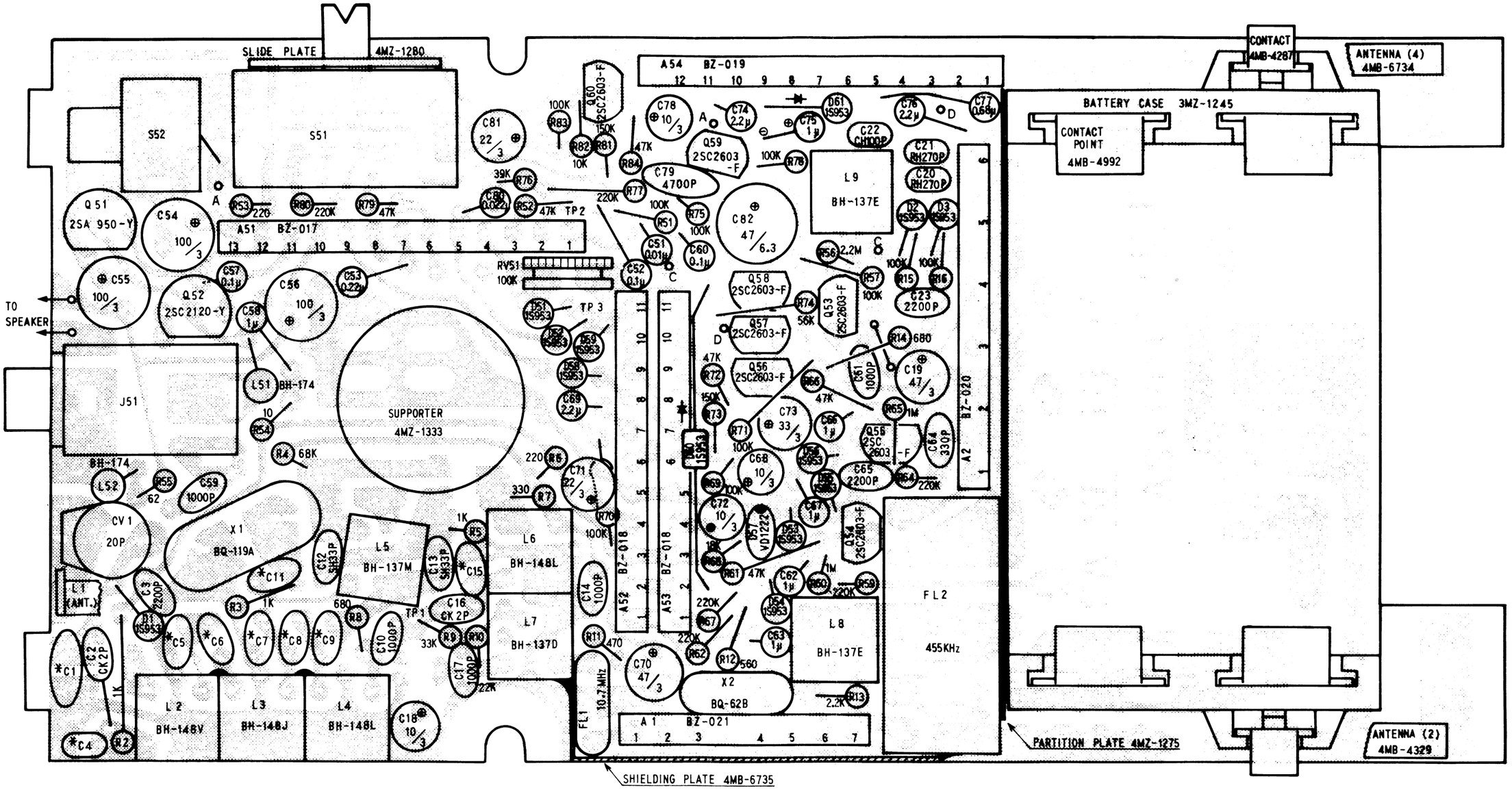
STANDARD VOLTAGE READING



3PK-1972AE

* MARK : Frequency dependent parts

OUTLINE DIAGRAM



✳ MARK : Frequency dependent parts

3PK—1972BE

OUTLINE DIAGRAM

ANT RFA MIX-1 MIX-2/OSC-2 IFA DISC - Demod. the 455 kHz sig.

L1 CV1 20P *C1 D1 1S953 Q1 2SC1321 *C24 *C5 *C6 L2 BH-148V R17 10K *C4 L3 BH-148J *C8 *C7 *C9 L4 BH-148L C10 1000P R8 680 C16 CK2P Q3 2SC1321 TP1 R10 22K R9 33K C17 1000P C18 10/3 L7 BH-137D R11 470 FL1 10.7 MHz A1 BZ-021 X2 10.245 or 11.155 MHz (BQ-628) L8 BH-137E R13 2.2K R12 560 FL2 455KHz A2 BZ-020 C19 47/3 R14 680 C20 RH270P C21 RH270P R15 100K D2 1S953 L9 C23 2200P D3 1S953 R16 100K C22 CH100P

C2 CK2P R1 33K R2 1K L5 BH-137M C3 2200P R6 220 L6 BH-148L *C11 *C15 Q2 2SC1321 R7 330 C12 SH33P C13 SH33P R5 1K R4 68K C14 1000P X1 Fo-10.7/3 (MHz) (BQ-119A) R3 1K

OSC-1

* MARK : Frequency dependent parts

AFA received Audio TONE NOISE

D52 1S953 RV51 100K D51 1S953 C54 100/3 Q51 2SA950 R53 220 C55 100/3 R54 10 L51 BH-174 L52 BH-174 R55 62 EAR J51 SP51 4Ω C59 1000P Q52 2SC2120 C56 100/3 C57 0.1/35 C58 1/15 C52 0.1/35 C51 0.01/35 A51 BZ-017 TP2 R52 47K C53 022/35 R51 100K C60 0.1/35

R68 18K R69 100K D57 VD1222 C68 10/3 R70 100K C69 2.2/6 D58 1S953 TP3 D59 1S953 C83 2200P D61 1S953 C75 1/15 Q59 2SC2603 R78 100K C76 22/6 A54 BZ-019 C74 2.2/6 C77 0.68/25 C78 10/3 S52 RESET C82 47/6.3 R84 47K R81 150K R82 10K R83 100K C81 22/3 Q60 2SC2603 R85 100K A52 BZ-018 C70 47/3 C71 22/3 D60 1S953 R74 56K R71 100K A53 BZ-018 C72 10/3 R72 47K C73 33/3 R73 150K Q56 2SC2603 Q57 2SC2603 Q58 2SC2603 R75 100K C80 0.022/35 R76 39K R77 220K R79 47K R80 220K S51 HI HIGH LOW OFF

BT51 BT52 2.5V BATTERY CHARGING CONTACTS CHARGING INTERLOCK

TONE-A

R57 100K R56 2.2M R58 100K FL51 R59 220K R60 1M R61 47K R62 220K D54 1S953 C62 1/15 C61 1000P J52 Q53 2SC2603 Q54 2SC2603 20db gain D53 1S953 C63 1/15 VDC

TONE-B

R63 100K FL52 R64 220K R65 1M R66 47K R67 220K D56 1S953 C66 1/15 C64 330P C65 2200P Q55 2SC2603 20db gain D55 1S953 C67 1/15 VDC

Q53 square wave output

3DC-5328E

SCHEMATIC DIAGRAM

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
A1	Integrated Circuit	BZ-021		SW/0800210002
A2	Integrated Circuit	BZ-020		SW/0800200002
A51	Integrated Circuit S19/	BZ-017		SW/0700170002
A52	Integrated Circuit	BZ-018		SW/0700180002
A53	Integrated Circuit	BZ-018		SW/0700180002
A54	Integrated Circuit	BZ-019		SW/0700190002
BT51	Nickel-Cadmium Battery	1.25V	P-15NTO3	
BT52	Nickel-Cadmium Battery	1.25V	P-15NTO3	
C1	Ceramic Capacitor			
	142MHz - 153MHz	50V	SH39pF	SW/2000019321
	148MHz - 160MHz	50V	SH36pF	SW/2000018321
	159MHz - 174MHz	50V	SH36pF	SW/2000018321
C2	Ceramic Capacitor	50V	CK2pF	SW/2000103321
C3	Ceramic Capacitor	50V	2200pF	SW/2000406321
C4	Ceramic Capacitor			
	142MHz - 153MHz	50V	RH36pF	SW/2004420321
	148MHz - 160MHz	50V	RH33pF	SW/2004419321
	159MHz - 174MHz	50V	RH27pF	SW/2004417321
C5	Ceramic Capacitor			
	142MHz - 153MHz	50V	PH16pF	SW/2000211321
	148MHz - 160MHz	50V	PH15pF	SW/2000210321
	159MHz - 174MHz	50V	PH12pF	SW/2000208321
C6	Ceramic Capacitor			
	142MHz - 153MHz	50V	CK1.5pF	SW/2000102321
	148MHz - 160MHz	50V	CK1pF	SW/2000101321
	159MHz - 174MHz	50V	CK1pF	SW/2000101321
C7	Ceramic Capacitor			
	142MHz - 153MHz	50V	PH13pF	SW/2000209321
	148MHz - 160MHz	50V	PH12pF	SW/2000208321

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
	159MHz - 174MHz	50V	PH10pF	SW/2000206321
C8	Ceramic Capacitor			
	142MHz - 153MHz	50V	CK0.5pF	SW/2000100321
	148MHz - 160MHz	50V	AK0.35pF	SW/2009400310
	159MHz - 174MHz	50V	AK0.35pF	SW/2009400310
C9	Ceramic Capacitor			
	142MHz - 153MHz	50V	PH13pF	SW/2000209321
	148MHz - 160MHz	50V	PH12pF	SW/2000208321
	159MHz - 174MHz	50V	PH10pF	SW/2000206321
C10	Ceramic Capacitor	50V	1000pF	SW/2000405321
C11	Ceramic Capacitor			
	142MHz - 153MHz	50V	SL100pF	SW/2000034321
	148MHz - 160MHz	50V	SL100pF	SW/2000034321
	159MHz - 174MHz	50V	SL47pF	SW/2000326321
C12	Ceramic Capacitor	50V	SH33pF	SW/2000017321
C13	Ceramic Capacitor	50V	SH33pF	SW/2000017321
C14	Ceramic Capacitor	50V	1000pF	SW/2000405321
C15	Ceramic Capacitor			
	142MHz - 153MHz	50V	PH13pF	SW/2000209321
	148MHz - 160MHz	50V	PH12pF	SW/2000208321
	159MHz - 174MHz	50V	PH10pF	SW/2000206321
C16	Ceramic Capacitor	50V	CK2pF	SW/2000103321
C17	Ceramic Capacitor	50V	1000pF	SW/0000405321
C18	Tantalum Capacitor	3.15V	10μF	
C19	Tantalum Capacitor	3.15V	47μF	
C20	Ceramic Capacitor	50V	RH270pF	SW/2004441321
C21	Ceramic Capacitor	50V	RH270pF	SW/2004441321
C22	Ceramic Capacitor	50V	CH100pF	SW/2004135321
C23	Ceramic Capacitor	50V	2200pF	SW/2000406321
C24	Ceramic Capacitor (Chip)			
	142MHz - 153MHz	50V	PH8pF	
	148MHz - 160MHz		-	

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
	159MHz - 174MHz		-	
C51	Tantalum Capacitor	35V	0.01μF	SW/2012005501
C52	Tantalum Capacitor	35V	0.1μF	SW/2012011501
C53	Tantalum Capacitor	35V	0.22μF	SW/2012013501
C54	Tantalum Capacitor	3.15V	100μF	SW/2019002501
C55	Tantalum Capacitor	3.15V	100μF	SW/2019002501
C56	Tantalum Capacitor	3.15V	100μF	SW/2019002501
C57	Tantalum Capacitor	35V	0.1μF	SW/2012011501
C58	Tantalum Capacitor	15V	1μF	SW/2012003501
C59	Ceramic Capacitor	50V	1000pF	SW/2000405321
C60	Tantalum Capacitor	35V	0.1μF	SW/2012011501
C61	Ceramic Capacitor	50V	1000pF	SW/2000405321
C62	Tantalum Capacitor	15V	1μF	SW/2012003501
C63	Tantalum Capacitor	15V	1μF	SW/2012003501
C64	Ceramic Capacitor	50V	330pF	SW/2000400321
C65	Ceramic Capacitor	50V	2200pF	SW/2000406321
C66	Tantalum Capacitor	15V	1μF	SW/2012003501
C67	Tantalum Capacitor	15V	1μF	SW/2012003501
C68	Tantalum Capacitor	3.15V	10μF	
C69	Tantalum Capacitor	6.3V	2.2μF	SW/2012001501
C70	Tantalum Capacitor	3.15V	47μF	
C71	Tantalum Capacitor	3.15V	22μF	
C72	Tantalum Capacitor	3.15V	10μF	
C73	Tantalum Capacitor	3.15V	33μF	
C74	Tantalum Capacitor	6.3V	2.2μF	SW/2012001501
C75	Tantalum Capacitor	15V	1μF	SW/2012003501
C76	Tantalum Capacitor	6.3V	2.2μF	SW/2012001501
C77	Tantalum Capacitor	25V	0.68μF	SW/2012004501
C78	Tantalum Capacitor	3.15V	10μF	
C79	Ceramic Capacitor	50V	4700pF	SW/2000407321
C80	Tantalum Capacitor	35V	0.022μF	SW/2012007501

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
C81	Tantalum Capacitor	3.15V	22μF	
C82	Aluminum Capacitor	6.3V	47μF	SW/202251803
C83	Ceramic Capacitor (Chip)	50V	2200pF	
CV1	Variable Capacitor	250V	20pF	SW/2090012803
D1	Diode (Silicon)	1S953		SW/0500017501
D2	Diode (Silicon)	1S953		SW/0500017501
D3	Diode (Silicon)	1S953		SW/0500017501
D51	Diode (Silicon)	1S953		SW/0500017501
D52	Diode (Silicon)	1S953		SW/0500017501
D53	Diode (Silicon)	1S953		SW/0500017501
D54	Diode (Silicon)	1S953		SW/0500017501
D55	Diode (Silicon)	1S953		SW/0500017501
D56	Diode (Silicon)	1S953		SW/0500017501
D57	Diode Varistor	VD1222		SW/0500028501
D58	Diode (Silicon)	1S953		SW/0500017501
D59	Diode (Silicon)	1S953		SW/0500017501
D60	Diode (Silicon)	1S953		SW/0500017501
D61	Diode (Silicon)	1S953		SW/0500017501
FL1	Ceramic Filter	10.7MHz	SFE-10.7MA5C	SW/5010011321
FL2	Ceramic Filter	455KHz	CFK-455F	SW/5010005321
FL51	Reed Filter		EFM-R15M or S	
FL52	Reed Filter		EFM-R15M or S	
J51	Earphone Jack	2.5ϕ	HSJ0465-01-010	SW/3700070718
J52	Filter Socket		FS-412	
L1	Antenna Coil			

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
L2	RF Coil	BH-148V		
L3	RF Coil	BH-148J		SW/3001481001
L4	RF Coil	BH-148L		SW/3001481201
L5	RF Coil	BH-137M		
L6	RF Coil	BH-148L		SW/3001481201
L7	IF Coil	BH-137D		SW/3001370401
L8	IF Coil	BH-137E		SW/3001370501
L9	IF Coil	BH-137E		SW/3001370501
L51	Choke Coil	BH-174		SW/3001740001
L52	Choke Coil	BH-174		SW/3001740001
Q1	Transistor (NPN)	2SC1321-Q4		SW/0213211501
Q2	Transistor (NPN)	2SC1321-Q4		SW/0213211501
Q3	Transistor (NPN)	2SC1321-Q4		SW/0213211501
Q51	Transistor (PNP)	2SA950-Y		SW/0009502324
Q52	Transistor (NPN)	2SC2120-Y		SW/0221202324
Q53	Transistor (NPN)	2SC2603-F		SW/0226033806
Q54	Transistor (NPN)	2SC2603-F		SW/0226033806
Q55	Transistor (NPN)	2SC2603-F		SW/0226033806
Q56	Transistor (NPN)	2SC2603-F		SW/0226033806
Q57	Transistor (NPN)	2SC2603-F		SW/0226033806
Q58	Transistor (NPN)	2SC2603-F		SW/0226033806
Q59	Transistor (NPN)	2SC2603-F		SW/0226033806
Q60	Transistor (NPN)	2SC2603-F		SW/0226033806
R1	Carbon Film Resistor	1/8W	33KΩ	SW/1000105803
R2	Carbon Film Resistor	1/8W	1KΩ	SW/1000070803
R3	Carbon Film Resistor	1/8W	1KΩ	SW/1001070803
R4	Carbon Film Resistor	1/8W	68KΩ	SW/1001112803
R5	Carbon Film Resistor	1/8W	1KΩ	SW/1001070803

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
R6	Carbon Film Resistor	1/8W	220Ω	SW/1001055803
R7	Carbon Film Resistor	1/8W	330Ω	
R8	Carbon Film Resistor	1/8W	680Ω	SW/1001066803
R10	Carbon Film Resistor	1/8W	22KΩ	SW/1000101803
R11	Carbon Film Resistor	1/8W	470Ω	SW/1001062803
R12	Carbon Film Resistor	1/8W	560Ω	SW/1001064803
R13	Carbon Film Resistor	1/8W	2.2KΩ	SW/1001078803
R14	Carbon Film Resistor	1/8W	680Ω	SW/1000066803
R15	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R16	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R17	Thick-film Chip Resistor	1/8W	10KΩ	
R51	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R52	Carbon Film Resistor	1/8W	47KΩ	SW/1000108803
R53	Carbon Film Resistor	1/8W	220Ω	SW/1001055803
R54	Carbon Film Resistor	1/8W	10Ω	SW/1000124803
R55	Carbon Film Resistor	1/8W	62Ω	SW/1000142803
R56	Solid Resistor	1/8W	2.2MΩ	
R57	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R58	Thick-film Chip Resistor	1/16W	100KΩ	
R59	Carbon Film Resistor	1/8W	220KΩ	SW/1000124803
R60	Carbon Film Resistor	1/8W	1MΩ	SW/1001139803
R61	Carbon Film Resistor	1/8W	47KΩ	SW/1001108803
R62	Carbon Film Resistor	1/8W	220KΩ	SW/1001124803
R63	Thick-film Chip Resistor	1/16W	100KΩ	
R64	Carbon Film Resistor	1/8W	220KΩ	SW/1000124803
R65	Carbon Film Resistor	1/8W	1MΩ	SW/1001139803
R66	Carbon Film Resistor	1/8W	47KΩ	SW/1001108803
R67	Carbon Film Resistor	1/8W	220KΩ	SW/1001124803
R68	Carbon Film Resistor	1/8W	18KΩ	SW/1001099803
R69	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R70	Carbon Film Resistor	1/8W	100KΩ	SW/1000116803

PAGING RECEIVER, VHF HB, TONE & VOICE PARTS LIST

REF.NO	DESCRIPTION			PARTS NO.
R71	Carbon Film Resistor	1/8W	100KΩ	SW/1000116803
R72	Carbon Film Resistor	1/8W	47KΩ	SW/1001108803
R73	Carbon Film Resistor	1/8W	150KΩ	SW/1001120803
R74	Carbon Film Resistor	1/8W	56KΩ	SW/1000110803
R75	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R76	Carbon Film Resistor	1/8W	39KΩ	SW/1001144803
R77	Carbon Film Resistor	1/8W	220KΩ	SW/1001124803
R78	Carbon Film Resistor	1/8W	100KΩ	SW/1000116803
R79	Carbon Film Resistor	1/8W	47KΩ	SW/1001108803
R80	Carbon Film Resistor	1/8W	220KΩ	SW/1001124803
R81	Carbon Film Resistor	1/8W	150KΩ	SW/1001120803
R82	Carbon Film Resistor	1/8W	10KΩ	SW/1001093803
R83	Carbon Film Resistor	1/8W	100KΩ	SW/1001116803
R84	Carbon Film Resistor	1/8W	47KΩ	SW/1001108803
R85	Thick-film Chip Resistor	1/8W	100KΩ	
RV51	Variable Resistor	100K (B)		SW/1049011803
S51	Slide Switch	SJ0725		SW/4200001224
S52	Push Switch	SJ4792		SW/4100001224
SP51	Speaker	40ϕ	4Ω	SW/5210001370
X1	Crystal	BQ-119A		
X2	Crystal	10.245MHz or 11.155MHz	BQ-62B	SW/4506210221

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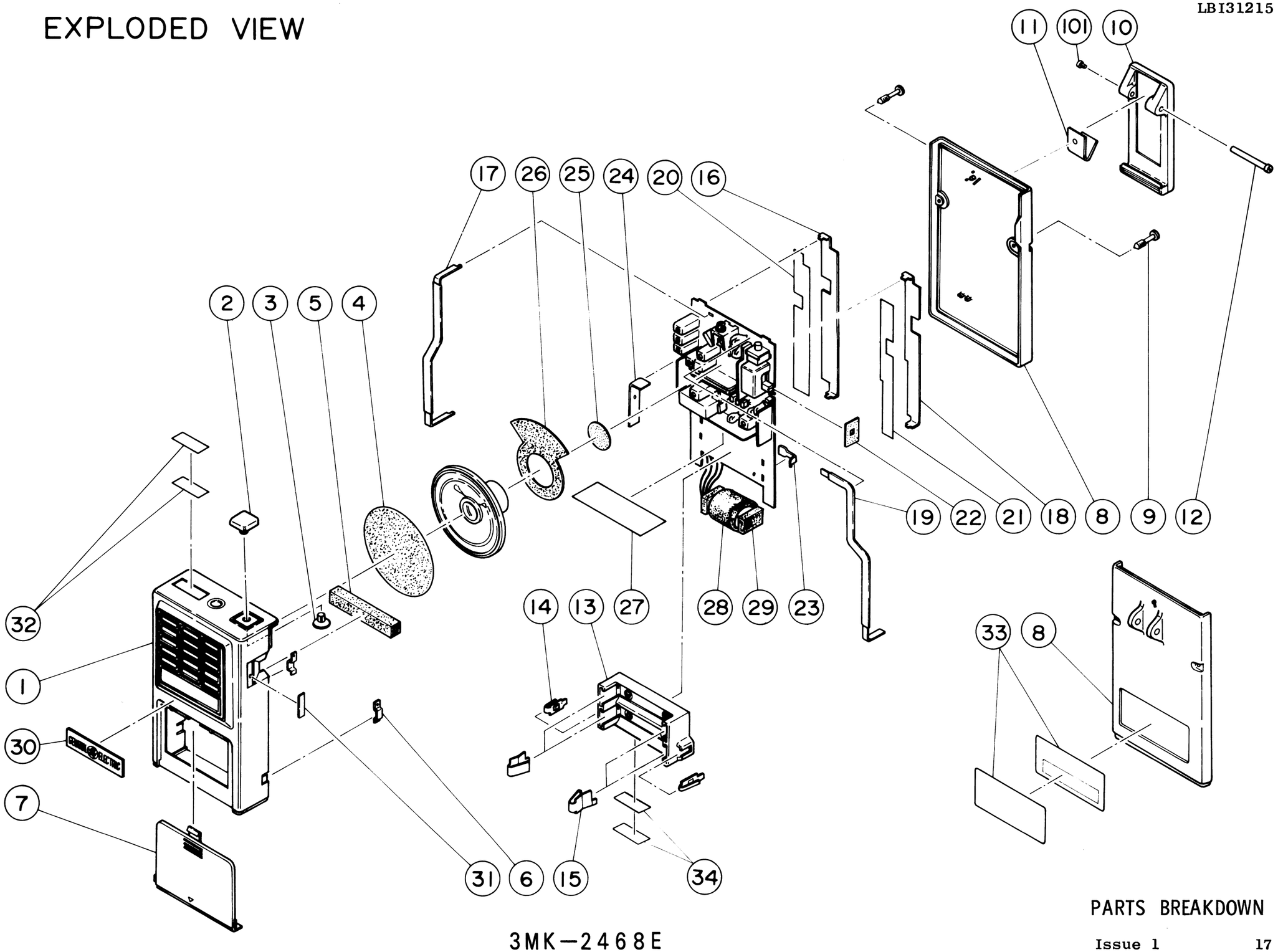
PARTS BREAKDOWN

SYMBOL No.	NAME OF PARTS	DESCRIPTION	Q'TY	REMARKS
1	FRONT CASE	SW/~~2~~519MZ-1892	1	
2	PUSH BUTTON (1)	SW/4MZ-1760-2	1	
3	PUSH BUTTON (2)	SW/4MZ-1761-2	1	
4	SPEAKER NET	SW/4MZ-1277	1	
5	CUSHION	SW/4MZ-0489-57	1	
6	CONTACT	SW/4MB-4288	2	
7	BATTERY COVER	SW/3MZ-1895	1	
8	REAR COVER	SW/2MZ-1893	1	
9	ANTI REMOVABLE SCREW	SW/4MH-0634	2	
10	CLIP	SW/3MZ-1894	1	
11	SPRING	SW/4MB-5960	1	
12	CLIP PIN	SW/4MH-0829	1	
13	BATTERY CASE	SW/3MZ-1245	1	
14	CONTACT	SW/4MB-4287	2	
15	CONTACT POINT	SW/4MB-4992	4	
16	ANTENNA (1)	SW/4MB-4317	1	
17	ANTENNA (2)	SW/4MB-4329	1	
18	ANTENNA (3)	SW/4MB-6733	1	
19	ANTENNA (4)	SW/4MB-6734	1	
20	INSULATOR	SW/4MZ-1266	1	
21	INSULATOR	SW/4MZ-1970	1	
22	SLIDE PLATE	SW/4MZ-1280	1	
23	BATTERY CONTACT	SW/4MB-6642	1	
24	SHIELDING PLATE	SW/4MB-6735	1	
25	SUPPORTER	SW/4MZ-1333	1	
26	INSULATOR	SW/4MZ-1308	1	
27	PARTITION PLATE	SW/4MZ-1275	1	
28	CUSHION (PORON)	SW/4MZ-1971-1	1	
29	CUSHION (PORON)	SW/4MZ-1971-2	2	
30	NAME PLATE	SW/4MN-1770	1	
31	SWITCH NAME PLATE	SW/4MN-1741	1	
32	CALL SEAL	SW/4MN-1771	1	
33	MAIN NAME PLATE	SW/3MN-1772-2	1	
34	NUMBER SEAL	SW/4MN-1883	1	
101	CYLINDER SCREW	SW/⊖ M1.7×5	1	

4DT—1794E

EXPLODED VIEW



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